RIDER’S
VOLUME - X

PERPETUAL
TROUBLESHOOTER’S
MANUAL

COVERING OCTOBER 1938
THROUGH
AUGUST 1939
The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Indicator meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mfd, 200 mfd, and 400 ohms.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Pushbutton Indicated Below Pushed “In”</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 5K7 L.F. Tube</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 6K8</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>160 Kc.</td>
<td>300 mfd. Antenna lead</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>148 Kc.</td>
<td>300 mfd. Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 148 Kc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>628 Kc.</td>
<td>300 mfd. Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 628 Kc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SHORT WAVE BAND

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Pushbutton Indicated Below Pushed “In”</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>Broadcast</td>
<td>Sec. dial at 17 Mc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>17 Mc. 400 ohms Antenna lead</td>
<td>Broadcast</td>
<td>Sec. dial at 17 Mc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDIUM</td>
<td>5 Mc. 400 ohms Antenna lead</td>
<td>Broadcast</td>
<td>Sec. dial at 5 Mc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MEDIUM WAVE BAND

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Pushbutton Indicated Below Pushed “In”</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 Mc.</td>
<td>400 ohms Antenna lead</td>
<td>Broadcast</td>
<td>Sec. dial at 650 Mc.</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE “A”:** Turn the dial back and forth slightly (rock) and adjust trimmer until the peaks of greatest intensity is obtained. Attenuate the signal from the signal generator to prevent the beveling-off action of the AVC. After each range is completed, repeat the procedure as a final check.

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**TOP VIEW**

4 P.D.T. MOVES TO LEFT WHEN ANY BANDSWITCH IS Pushed TO RIGHT WHEN BUTTONS 5-6 ARE PUSHED.

**BOTTOM VIEW**

<table>
<thead>
<tr>
<th>SERIES B</th>
<th>890-1670 KC</th>
<th>710-1235 KC</th>
<th>555-980 KC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERIES A</td>
<td>1000-1550 KC</td>
<td>660-1000 KC</td>
<td>520-630 KC</td>
</tr>
</tbody>
</table>

**MODEL 1076 Series A/B**

**BELMONT RADIO CORP.**
ALIGNING INSTRUCTIONS:

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltages, defective tubes, condensers and resistors. In order to properly align this chassis, an oscillator (generator) is absolutely necessary. No aligning adjustments should be attempted with the chassis in the cabinet.

To remove the chassis from the cabinet, remove the four bolts which are used to fasten the chassis to the cabinet bottom, pull the knobs off their shafts and detach the pointer from the drive string (see Fig. 2, top view).

NOTE:—On the back of the string dial drum a calibrated scale is provided for aligning this chassis to the frequencies listed in the alignment procedure. Attach a pointer so that it will indicate proper dial setting in respect to the position of the variable condenser.

DIAL CALIBRATION:

To correct dial calibration rotate the tuning knob to the right until the dial pointer reaches the extreme end of the dial scale; then rotate the tuning knob to the left until the pointer reaches the other extreme end of the dial scale.

Stop clamps on the pointer slider bar make the pointer self-aligning thereby correcting dial calibration.

POWER SUPPLY:

Caution:—This radio, unless otherwise marked, must be operated from 105-115 volts, 50-60 cycle A. C. supply only. If you are in doubt as to the voltage and frequency rating of the power supply, consult your local power company before inserting plug. Do not insert plug unless all tubes and speaker plug are in their proper sockets.

Receivers of this model which are to be used on voltages or frequencies other than 105-115 volts, 50-60 cycles are so marked. The power consumption of this receiver is 100 watts.

PHONOGRAPH CONNECTIONS:

A phonograph connector and switch are provided on the rear of the chassis. To operate; insert plug on end of phonograph pick-up lead into connector on chassis and move phonograph switch to "Phono" position. Volume and tone may be controlled by using the controls on the front of the radio.
PROCEDURE FOR SETTING THE AUTOMATIC STATION PUSHBUTTONS:

Important: Allow the radio to "warm up" for about 15 minutes before setting the station adjustment screws for the pushbuttons.

Only a single adjustment for each station is required in setting up your favorite stations for automatic pushbutton operation. These adjustments are located at the front of the chassis shown in Fig. 4 and are accessible through the station call letter tab holes. The only equipment needed is a small screwdriver to make the adjustments.

Make a list of your favorite local stations, those which you tune in regularly. Counting the station buttons from left to right, looking at the front of the set, the frequency ranges are as follows:

1. 1550 to 1000 Kilocycles.
2. 1550 to 1000 Kilocycles.
3. 1100 to 680 Kilocycles.
4. 1100 to 680 Kilocycles.
5. 830 to 520 Kilocycles.
6. 830 to 520 Kilocycles.

This means that any station which has a kilocycle number lying between 1550 and 1000 K.C. can be set up on either Button 1 or Button 2. Any station which has a kilocycle number lying between 1100 and 680 K.C. can be set up on either Button 3 or Button 4. Any station which has a kilocycle number lying between 830 and 520 K.C. can be set up on either Button 5 or Button 6.

After you have made up your list of stations, press button marked "Broadcast" and tune set manually until station selected having the highest frequency is tuned in and the program noted. Press button covering frequency range in which station is located (See Fig. 4). Adjust screw through station tab opening above button pressed until the same station is heard clearly and tuning indicator indicates that it is correctly tuned.

TRANSMITTERS

50/60 Cycle Power Transformer 100-115 Volt Primary 110/60 Cycle Power Transformer (Universal Primary 60 Cycle Power Transformer (Universal Primary Voltage 6.0 Volt)

SPEAKER

Twelve Inch Dynamic Speaker (600 Ohm Field) 7.00

MISCELLANEOUS

Volume Control (Magnet) 1.00
Time Control (250M O.D.) 0.25
Time and Volume Control 1.00
Output Transformer for Speaker 1.00
Line Cord and Plug 0.50
Antenna and Ground Terminal Strip 0.50
Speaker for A.F. and O.C. Coils 0.50
Radio Mounting Grommet for Variable Condenser Mounting 0.50
Rubber Chassis Mounting Cushions 0.50
Automotive Pushbutton Assembly

AUTOMATIC PUSHBUTTON ASSEMBLY

Parts

Pushbutton Tuner Assembly Complete with Coils and Switch Mechanism 12.00

Switch Assembly for Pushbutton Tuner (Less Coils) 5.00

Capacitors

Low Frequency Coil 0.50
Medium Frequency Coil (Two Used) 1.50
High Frequency Coil 0.50

Miscellaneous

Coils for Pushbutton Tuner Assembly

11043 77 Low Frequency Coil 1.25
11043 79 Medium Frequency Coil (Two Used) 1.25
11043 79 High Frequency Coil 1.25

11061 77 Low Frequency Coil 1.25
11061 79 Medium Frequency Coil (Two Used) 1.25
11061 79 High Frequency Coil 1.25

DIAL PARTS LIST

Dial Scale (Calibrated) 1.00

Stop Controls: Dial 0.15
Set of 2 Stations Station Call Letters 0.15
Pushbuttons 0.15
Stubs 0.15
Brackets for Pushbuttons (10 Hole) 0.10
Brackets for Pushbuttons 0.15
Caps for Pushbuttons 0.15
Screw 0.15
Background Diffuser for Dial Complete with 11531 0.25
Slide Bar for Pointer 0.25
Carriage for Pointer (Attach Pointer to String Drive) 0.25
Pointer 0.15
Stop Controls (Attach to Slide Bar; Limit Travel of the Pointer) 0.15
Manual Tuning Control (Shift) 0.15
Complete with Line Pulley for Drive String 0.15
Collar for Manual Tuning Control Shaft 0.15
LenDrive String 0.15
Take Up String for Drive String 0.15
6.6 Volt Plus Light Bulb Type 40 0.15
Socket and Bracket for Pilot Light 0.15

CATHODE-RAY TUNING INDICATOR PARTS

11012 R9 Cable and Socket Assembly (with 1 Mecohn) 0.75
11021 R8 Socket in Socket 0.15
11021 R8 Bracket for Tuning Indicator 0.15
11021 R8 Clip for Tuning Indicator 0.15
11021 R8 Wire Nut 0.15

ANTENNA AND GROUND CONNECTIONS:

Antenna connections are made on the terminal board, with terminals marked "A" and "D" on the rear of chassis. When using a conventional antenna connect the lead-in to terminal "A." The ground lead should be connected to Terminal "G." When using a Double Antenna, connect one lead-in of the doublet to "A" and the other lead-in to "D." Connect a ground wire to Terminal "G." (See Fig. 1).
<table>
<thead>
<tr>
<th>TUBE DESCRIPTION</th>
<th>VOLTAGE ON PIN # TO GND. (NO SIGNAL CONDITION)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1651 Convertor</td>
<td>0</td>
</tr>
<tr>
<td>1652 - 1st I.F.</td>
<td>0</td>
</tr>
<tr>
<td>1652 - 2nd I.F.</td>
<td>0</td>
</tr>
<tr>
<td>1653 - 3rd I.F.</td>
<td>0</td>
</tr>
<tr>
<td>686 Video</td>
<td>0</td>
</tr>
<tr>
<td>6SK7 1st Video amp.</td>
<td>0</td>
</tr>
<tr>
<td>6K89 2nd Video</td>
<td>0</td>
</tr>
<tr>
<td>6J5 Osc.</td>
<td>0</td>
</tr>
<tr>
<td>6SK7 Sound I.F. amp.</td>
<td>0</td>
</tr>
<tr>
<td>6SQ7 Sound Det.</td>
<td>0</td>
</tr>
<tr>
<td>6SK7 Video AVC Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6HS Video Det. Sync.</td>
<td>0</td>
</tr>
<tr>
<td>6SQ7 Sync.Channel Amp.</td>
<td>0</td>
</tr>
<tr>
<td>5U4G Rectifier</td>
<td>0</td>
</tr>
<tr>
<td>SY3G Rectifier</td>
<td>0</td>
</tr>
<tr>
<td>6SJ7 Sync.Channel Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6N7 Hor.Vert.</td>
<td>0</td>
</tr>
<tr>
<td>Syno.Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6K7 Hor.Osc.</td>
<td>0</td>
</tr>
<tr>
<td>6L6 Hor. Output</td>
<td>0</td>
</tr>
<tr>
<td>5V4 Hor.Damping</td>
<td>0</td>
</tr>
<tr>
<td>6N7 Vert.Osc.</td>
<td>0</td>
</tr>
<tr>
<td>6J5 Vert.Output</td>
<td>0</td>
</tr>
</tbody>
</table>

* Great caution should be exercised in checking high voltage circuits. It is best never to attempt to measure heater voltage on the 2V3G. If the tube lights brightly, it is sufficient indication that the heater voltage is correct. To measure high voltage, disconnect power supply and insert 0-5 m.a. meter in ground end of bleeder chain. (With protection fuse) current should read about 1 m.a. when power supply is reconnected. If bleeder current is appreciably off measure individual resistors in chain, to see if difficulty is there. Thus by replacing rectifier tubes an appropriate check of transformer the high voltage circuits can be checked without the use of dangerous probes.

- Electrostatic voltmeter
- Special High resistance voltmeter
<table>
<thead>
<tr>
<th>TUBE DESCRIPTION</th>
<th>VOLTAGE ON PIN # TO GND. (NO SIGNAL CONDITION)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>CAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1851 Convertor</td>
<td>0 6.3 AC</td>
<td>290</td>
<td>150</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>150</td>
<td>0</td>
<td>290</td>
</tr>
<tr>
<td>1852 - 1st I.F.</td>
<td>0 6.3 AC</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>150</td>
<td>0</td>
<td>290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1852 - 2nd I.F.</td>
<td>0 6.3 AC</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>150</td>
<td>0</td>
<td>290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1853 - 3rd I.F.</td>
<td>0 6.3 AC</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>150</td>
<td>6.3 AC</td>
<td>290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6H6 Video</td>
<td>0 6.3</td>
<td>0</td>
<td>0</td>
<td>N.C.</td>
<td>0</td>
<td>N.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SK7 1st video amp.</td>
<td>0 95 v.approx.</td>
<td>O 4.5 AC</td>
<td>100 v.6.3 AC</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SK6 2nd video</td>
<td>0 6.3</td>
<td>150</td>
<td>70-150</td>
<td>0</td>
<td>N.C.</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J5 Os.</td>
<td>0 95 v.approx.</td>
<td>N.C.</td>
<td>O 4.5 AC</td>
<td>100 v.6.3 AC</td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6S7 Sound I.F.</td>
<td>0 4.5 v.</td>
<td>0</td>
<td>4.5</td>
<td>100 v.6.3 AC</td>
<td>290</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8Q7 Sound Det.</td>
<td>0 1.5</td>
<td>0</td>
<td>70</td>
<td>0</td>
<td>6.3 AC</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6MK7 Video AVC Amp.</td>
<td>0 6.3 AC</td>
<td>0</td>
<td>2</td>
<td>110</td>
<td>0</td>
<td>290</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6MK Video Det. Sync.</td>
<td>0 N.C.</td>
<td>O 6.3 AC</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SK7 Sync.Channel Amp.</td>
<td>0 Pin 2-8</td>
<td>280 AC</td>
<td>280 AC</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU4G Rectifier</td>
<td>0 5 AC</td>
<td>280 AC</td>
<td>280 AC</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY5G Rectifier</td>
<td>0 5 AC</td>
<td>280 AC</td>
<td>280 AC</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6S7 Sync.Channel Amp.</td>
<td>0 Pin 2-7</td>
<td>6.3 AC</td>
<td>0</td>
<td>0</td>
<td>110</td>
<td>110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6N7 Hor.Vert.</td>
<td>0 Pin 2-7</td>
<td>6.3 AC</td>
<td>195</td>
<td>0</td>
<td>205</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6N7 Sync.Amp.</td>
<td>0 Pin 2-7</td>
<td>6.3 AC</td>
<td>105</td>
<td>-22</td>
<td>-22</td>
<td>200</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6L6 Hor.Output</td>
<td>0 Pin 2-7 Cannot be</td>
<td>6.3 AC</td>
<td>Checked</td>
<td>300</td>
<td>0</td>
<td>.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5V4 Hor.Damping</td>
<td>0 Pin 2-8</td>
<td>5.0 AC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0-13 v.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6N7 Vert.Osc.</td>
<td>0 Pin 2-7</td>
<td>6.3 AC</td>
<td>290</td>
<td>-50</td>
<td>-50</td>
<td>20</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J5 Vert.Output</td>
<td>0 Pin 2-7</td>
<td>6.3 AC</td>
<td>300</td>
<td>300</td>
<td>0</td>
<td>6</td>
<td>13 v.approx.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2V5C *</td>
<td>0 70000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Great caution should be exercised in checking high voltage circuits. It is best never to attempt to measure heater voltage on the 2V5C. If the tube lights brightly, it is sufficient indication that the heater voltage is correct. To measure high voltage, disconnect power supply and insert 0.5 m.a. meter in ground end of bleeder chain. (With protection fuse) current should read about 1 m.a. when power supply is reconnected. If bleeder current is appreciably off measure individual resistors in chain, to see if difficulty is there. Thus by replacing rectifier tube an appropriate check of transformer the high voltage circuits can be checked without the use of dangerous probes.

- Electrostatic voltmeter
- Special High resistance voltmeter
Fig. 3 Parts Layout, Bottom View
Cadillac 1950 Automatic Radio

C6 400KC, INTERSTAGE TRIMMER

C10 ANT. 5
C9 ANT. 4
C8 ANT. 3
C7 ANT. 2
C6 ANT. 1
C5 ANT. 1

Speaker
When ordering parts for speaker, specify part number of speaker and letters preceding part number stamped on speaker.

C10 Dynamic Speaker
- $5.65

C6 Ceramic dust cap assembly for above speaker
- $1.75

C7 Wire screen to cover front of speaker
- $1.30

C5 Cardboard ring for above wire screen
- $0.05

C8 1ST DET & OSC
C7 2ND L.F.
C6 3RD L.F.
C5 Speaker and interstage trimmer
C4 ANT. 1400KC TRIMMER
C3 ANT. Socket
C2 1ST DET & OSC
C1 2ND L.F.

Fig. 2 Parts Layout, Top View
Cadillac 1939 Automatic Radio

VIBRATOR

T6 ANT. Socket
T5 ANT. CAR SWITCH
T4 BOOM ADJUSTMENT
T3 R.F.
T2 2ND L.F.
T1 1ST DET & OSC
C3 6K8 1ST DET & OSC
C2 6SK7 2ND DET
C1 66NF OUTPUT
C0 6V6 DRIVER
C0-2006 Fig. 2 Parts Layout, Top View

Original Replacemen
Part Number Part Number Notes Description List Price
34939 1484011 8 Tube socket-6pin (6 prong) .05
34976 1434682 1 VIBRATOR SOCKET (6 prong molded) .13
834129 1434642 1 Antenna connection socket and bracket assembly .15
FEATURES

The 1936 Cadillac Automatic Radio is an 8-tube automobile radio covering the standard wave bands incorporating the very latest developments in automobile radio engineering. The outstanding features are:

1. Permeability tuning, providing a dual input circuit to the 1st detector, one for manual tuning and one for automatic push button tuning, is used.
2. A new noise-limiting circuit in the audio system controlled by signal voltage developed by the 2nd detector and the AVC network, providing for the first time effective noise-limiting action without affecting sensitivity.
3. Two stages of Intermediate Frequency, increasing considerably Automatic Volume Control action.
4. A three-circuit Automatic Tuner, providing the same sensitivity for both manual and automatic tuning sections.
5. An on-off switch incorporated in the push button operating mechanism to provide practically complete automatic operation, making it necessary to push only one button to select a station, tune and turn on the radio.

MANUAL TUNING CIRCUIT

When the manual tuning button is depressed, the manual antenna tuning coil is connected to the grid of the 6SK7 R.F. amplifier tube through a series motor noise filter. The plate of the R.F. tube is fed through a resistor and its capacity coupled to the detector grid of the 6GS tube through the manual intermediate tuning coil. This grid is also controlled by the AVC system through the manual intermediate tuning coil. The manual oscillator tuning coil is capacity coupled to the oscillator grid of the 6GS tube in parallel with the fixed oscillator coil which also functions as the low frequency adjustment.

All the automatic tuning coils are open-circuited when the manual tuning button is depressed.

Manual tuning is accomplished by varying the inductance of the manual tuning coil by changing the permeability of the coil core. This is done by moving the iron core of special design in and out of the coil by rotating the manual station selector drum.

The extreme position of the iron core within the coil has been precisely adjusted at the factory and should not be disturbed.

AUTOMATIC TUNING CIRCUIT

Automatic tuning is accomplished by the use of a new and highly efficient three-circuit push button permeability tuner.

The tuning of the R.F., Interstage and Oscillator semi-fixed tuned circuits is accomplished by varying the inductance of the coils, by changing the permeability of the core by moving the iron core in and out of the coil. The iron cores within the coils are rigidly secured to a brass rod. This brass rod moves in and out of the coils as the adjustment screw is turned, changing the inductance of the coils, giving the same result as the variable tuning condenser. This method is more precise and stable, and is not affected by moisture or temperature changes as is the case with a normal tuning condenser.

ALIGNMENT

Alignment between the Oscillator Tuner, Antenna Tuner and Interstage automatic tuning coils is obtained by changing the Antenna (center) and Interstage (rear) coil positions while the iron cores are held stationary on the shaft. To describe the connections for automatic tuning, let us assume that button No.1 is depressed.

The automatic tuning antenna coil, No.1, is connected to the grid of the R.F. tube. The plate of the R.F. tube is fed through a resistance and in capacity coupled to the automatic tuning interstage coil, No.2, which is connected to the control grid of the 6GS tube.

The manual interstage tuning coil is short-circuited.

The automatic tuning oscillator coil, No.1, is capacity coupled to the oscillator grid of the 6SK7 tube.

Two stages of I.F. amplification are employed, using 6SK7 tubes. The primary and secondary of each of the I.F. transformers are tuned by small trimmer capacitors directly below the secondary of the 2nd I.F. is a 3rd winding which couples the control grid circuit of the 3rd I.F. tube to the 2nd I.F. transformer.

The signal voltage across the secondary of the 2nd I.F. transformer is used to drive the plate of the AVC section of the 6SK7 tube. The voltage is applied to the control grid circuits of the R.F., 1st detector and 2nd and 3rd I.F. tubes. The rectified output of the 2nd detector section of the 6SK7 tube is applied to the control grid of the 6GS tube.

At no signal, the 6GS tube is biased to cut off by virtue of the current flowing through resistor network R15 and R17. This gives a constant potential across R17 which keeps the tube biased to cut off when no signal is being received. When a signal is being received, a positive voltage is applied to the control grid by both sections of the 6GS tube through resistor network R14 and R15, and R19, 20 and 22, causing a very rapid reduction in bias so that the noise gate or noise limiter does not affect the sensitivity of the receiver. This is a very outstanding development in automobile radio circuit design and provides unusually quiet operation.

The 6GS is resistance coupled to the 6SK7 driver tube. The 6SK7 is transformer coupled to the 6SK7 output tube. This tube is a class 'B' power amplifier and combines two triodes in one envelope. A 6SK7 electron tube is used in the power unit. This vibrator interrupts the current through the primary of the power transformer and also rectifies the current in the secondary circuit.

ALIGNMENT AND CALIBRATION PROCEDURE

The following equipment is required for proper alignment:

An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.

An Output Indicating Meter.

Non-metallic screwdriver.

A Dummy Antenna - 1/2 in. and 36 mm.

The Radio Chassis must be removed from the case, but the front cover must remain on the chassis with all screws in place. THIS IS ABSOLUTELY NECESSARY TO ALIGN.

The Volume Control must be at maximum for all adjustments.

The Normal-Quit Control must be in the Normal position for all adjustments.

The Antenna Capacity Switch (See Fig. 2.) should be in the maximum clockwise position for the Low Capacity (Variable Type) Antenna. The total capacity of the Low Capacity Antenna and the shielded lead is 55 mm.

Connect Radio Chassis to Ground Post of Signal Generator with a short heavy lead.

Allow chassis and Signal Generator to "Heat Up" for several minutes.

Adjust the signal from the signal generator to prevent the leveling-off action of the AVC.

Refer to Alignment Charts.
ALIGNMENT CHART NUMBER ONE

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Connection at Radio</th>
<th>Dummy Antenna Button Depressed</th>
<th>Inductive Tuner Dial Setting</th>
<th>Adjust Trimmers to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. ADJUSTMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450 EC</td>
<td>Control Grid (progs No. 4) S575 End I.F. Tube</td>
<td>1 mm.</td>
<td>Manual</td>
<td>1500 EC</td>
</tr>
<tr>
<td></td>
<td>See Note A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450 EC</td>
<td>Control Grid (progs No. 4) S575 1st I.F. Tube</td>
<td>1 mm.</td>
<td>Manual</td>
<td>1500 EC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>466 EC</td>
<td>Control Grid (top cap) S85 1st Det. Tube</td>
<td>1 mm.</td>
<td>Manual</td>
<td>1500 EC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSCILLATOR ADJUSTMENT</td>
<td>1400 KC Control Grid (top cap) S85 1st Det. Tube</td>
<td>1 mm.</td>
<td>Manual</td>
<td>1500 EC</td>
</tr>
<tr>
<td></td>
<td>1400 KC Antenna Cable - See Note B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>35 mmf. Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 KC</td>
<td>Antenna Cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 mmf. Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>Antenna Cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 mmf. Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE A - Insert antenna cable at chassis and short circuit open end of cable to cable shield for all I.F. and oscillator adjustments.

NOTE B - Remove antenna cable short circuit and insert 35 mmf. condenser between open end of antenna cable and signal generator.

NOTE C - Rotate station selector drum back and forth and turn the adjusting screw until the peak of greatest intensity is obtained.

ALIGNMENT CHART NUMBER TWO

CAUTION - DO NOT CHANGE SETTING OF ANY TRIMMER THAT HAVE BEEN ADJUSTED UP TO THIS POINT.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Connection at Radio</th>
<th>Dummy Antenna Button Depressed</th>
<th>Automatic Tuner Setting</th>
<th>Adjust Coil Positions to Maximum Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOMATIC TUNER ADJUSTMENTS AND ALIGNMENT</td>
<td>700 KC Antenna Lead</td>
<td></td>
<td>35 mmf. No. 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>700 KC Antenna Lead</td>
<td></td>
<td>35 mmf. No. 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>850 KC Antenna Lead</td>
<td></td>
<td>35 mmf. No. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1100 KC Antenna Lead</td>
<td></td>
<td>35 mmf. No. 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1100 KC Antenna Lead</td>
<td></td>
<td>35 mmf. No. 4</td>
<td></td>
</tr>
</tbody>
</table>

NOTE D - At the top of the automatic tuning unit can be seen ten round openings. See Fig. 3. Through these openings can be seen the ten "N" openings on the other side of the unit. Insert a thin blade screw driver through the round openings and in the "N" opening of the proper button and adjust the position of the coil by twisting the screw driver until maximum output is obtained.

ADJUSTING ANTENNA 1400 KC TRIMMER

After the radio is installed and the car antenna is connected, it is necessary to readjust the antenna 1400 KC trimmer.

There are two small holes in the chassis case near the antenna connection through which the trimmer and antenna trimmer adjustments can be made. See Fig. 2. With the Cadillac Vacuum Antenna, the screw marked "Capacity" should be set to the extreme clockwise position. With the Cadillac Under Car or Running Board Antenna, the screw marked "Capacity" should be set to the extreme counter clockwise or high capacity position.

To adjust trimmer, tune in a weak signal at approximately 1400 KC with the volume control about three-fourths on, turn the adjusting screw (marked trim) in or out until maximum output is obtained. On Vacuum Antenna this adjustment should be made with antenna fully extended.
Align the i-f stages at 465 ke after removing the 6C5 oscillator and with the test oscillator connected to the grid of the 6L7 first detector.

R-F Alignment: Replace the 6C5 and connect the test oscillator to the antenna post of the receiver. Start with the oscillator trimmer with the dial set on the high-frequency end of the band at the frequencies listed below:

Broadcast Band = 1400 km  1st H-F Band = 5.0 mc  2nd H-F Band = 17 mc

After the oscillator trimmer has been adjusted, align the r-f trimmer of each band. Then set the oscillator padding condensers of the various bands at the following frequencies:

Broadcast Band = 550 km  1st H-F Band = 2.0 mc  2nd H-F Band = 6.0 mc
ALIGNMENT INSTRUCTIONS

When aligning the i-f stages, short the oscillator section of the tuning condenser to ground. Set both oscillators to 465 kHz and connect to the grid of the 6AS first detector. Set the i-f trimmers for maximum reading of the output meter connected across the voice coil.

When aligning the r-f amplifier, connect the test oscillator to the output port, after removing ground from the tuning condenser mentioned above. Regardless of which band is being aligned, start with the oscillator coil trimmer with the dial set on the high-frequency end of the band at the following frequencies:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>1600 kHz</td>
</tr>
<tr>
<td>1st R-F</td>
<td>5.0 kHz</td>
</tr>
<tr>
<td>2nd R-F</td>
<td>17 kHz</td>
</tr>
</tbody>
</table>

After the oscillator coil trimmer has been set, align the r-f trimmers. Next, set the oscillator padding condenser of the various bands at the following frequencies:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>560 kHz</td>
</tr>
<tr>
<td>1st R-F</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>2nd R-F</td>
<td>3.0 kHz</td>
</tr>
</tbody>
</table>
ALIGNMENT PROCEDURE

When aligning the i-f stages at 465 kc, make certain the Selectivity Control is turned counter-clockwise position, i.e., set to "sharp tuning." Remove the 5 tube and connect the output of the test oscillator to the grid of the 6L7 f. The bias of this tube is fixed; therefore it will be necessary to leave the tube and couple the oscillator through a .001 or .002-mf condenser. Adjusters on the three i-f transformers for maximum readings.

R-F Alignment: Replace the 6C5 oscillator tube. Connect the test oscillator post with the dial set on the high-frequency end of the band at the followi:

Long-Wave Band ... 400 kc
Broadcast Band ... 1400 kc
First H-F Band ... 5.0 mc
Second " ... 17.0 mc
First adjust the oscillator trimmers and then the r-f trimmers. After these trimmers, set the oscillator padding condensers of the various bands frequencies:

Long-Wave Band ... 200 kc
Broadcast Band ... 550 kc
First H-F Band ... 2.0 mc
Second " ... 6.0 mc

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is in the ex-5 oscillator
rst detector.
grid cap on
ust the trim-
to the antenn
frequencies:
justments of
t the following
THIS DRAWING SHOWS A CAPEHART REMOTE INSTALLATION OF FOR THESE CONTROL STATIONS HAVE BEEN RUN FROM A SET REAR OF THE INSTRUMENT THROUGH CONDUIT PIPES TO THE A 110 VOLT A.C. WALL OUTLET NEAR SPEAKER.

All Speakers Require

Telephone Box Guam

with Special Cover Assembly, Our No. 66193.

Standard Outlet Box Guam With Special Cover Assembly, Our No. 66197.

Remote Control
Station Flat Cable

Standard Outlet Box Guam With Spec. Cover Assembly, Our No. 66197.

Standard Outlet Box Guam With Special Cover Assembly, Our No. 66193.

Remote Control
Station Flat Cable

Standard Outlet Box Guam With Spec. Cover Assembly, Our No. 66197.

Standard Outlet Box Guam With Special Cover Assembly, Our No. 66193.

Remote Control
Station Flat Cable

Use '66192 Cover Assembly Up To 4 Stations For 5 Stations Or More Use '66197 Cover Assembly.

The Capehart, Incorporated
Fort Wayne, Ind., U. S. A.
REMOTE SPEAKERS AND 6 REMOTE CONTROL STATIONS. THE WIRES BASEBOARD OUTLET BOXES MOUNTED IN THE BASEBOARD AT THE BOARD OUTLET BOXES AT THE REMOTE LOCATIONS.

REMOTE CONTROL STATION

FLAT CABLE TO LAY UNDER RUGS

STANDARD OUTLET BOX GEMF WITH SPECIAL COVER ASSEM. OUR NO. 66/197.

JUNCTION BOX WITH COVER NO. 46/185

SUGGESTED LOCATION OF INSTRUMENT FOR EITHER SERIES "400 G" OR SERIES "500 G" MODEL.

ALLOW ABOUT 3 FEET OF CABLE CONNECTORS BETWEEN INSTRUMENT AND WALL SO THE INSTRUMENT MAY BE CONVENIENTLY MOVED AWAY FROM THE WALL WHEN DESIRED.

REMOTE CONTROL STATION

"A" SPKR. CAB. ON PORCH

NOTE:
WIRE SIZES FOR VOICE COIL CONNECTIONS
UP TO 100 FEET, NO. 14 WIRE
100 FT. TO 250 FEET, NO. 12 WIRE
250 FT. AND OVER, NO. 10 WIRE

E CONTROL INSTALLATION

SERIES 400G AND SERIES 500G INSTRUMENTS
Alignment:  I-F
The I-F stages are peaked at 465 kc. Remove the 6J5 oscillator tube. Set the test
oscillator at 465 kc and connect the output to the grid of the 6L7 first detector.
Adjust the trimmers for maximum reading of the output meter.

AFC:
The AFC circuit is aligned when aligning the I-F amplifier at 465 kc. The primary of
the discriminator transformer, marked DIODE transformer in the layout, is aligned at
465 kc. The secondary is aligned with the AFC switch closed on a broadcast or oscil-
lator signal, using either the electric eye or output meter for checking resonance. The
AFC switch should then be opened and the secondary re-aligned. If alignment has been
made correctly, turning the AFC switch off and on should make no difference in the
cathode-ray tuning tube.

R-F:
Replace the oscillator tube. Connect oscillator to antenna post. No matter what band
is being aligned, start with the oscillator trimmer with the dial set to the high-
frequency end of the band at the following frequencies:
Broadcast Band ... 1400 kc
First H-F Band ... 5.0 mc
Second " ... 17.0 mc
After the oscillator trimmer has been set for resonance, align the r-f trimmers. After
these have been adjusted properly and checked, set the oscillator padding condensers
of the bands at the following frequencies:
Broadcast Band ... 550 kc
First H-F Band ... 2.0 mc
Second " ... 6.0 mc
TO ADJUST THE TUNING METERS

IN ORDER THAT THE CALIBRATIONS OF THE TUNING METERS IN THE REMOTE CONTROL STATION MAY BE MADE TO AGREE WITH THE TUNING DIAL, A RESISTOR IS INSERTED. THIS RESISTOR IS MOUNTED ON THE RADIO CHASSIS, DIRECTLY ABOVE THE ANTENNA GROUND TERMINAL STRIP.

THIS RESISTOR IS USED TO COMPENSATE FOR THE VARIOUS LENGTHS OF CABLE REQUIRED IN THE DIFFERENT INSTALLATIONS, AND TO COMPENSATE IN THE DROP IN BATTERY VOLTAGE.

TO ADJUST A REMOTE CONTROL STATION, TUNE THE SET BY HAND, TO 660 KICLOCYCLES, THEN AT EACH STATION BOX, SET THE METER TO THIS FREQUENCY BY THE ZERO ADJUSTING SCREW ON THE FACE OF THE METER, THEN TUNE THE SET BY HAND TO 1400 KICLOCYCLES, AND ADJUST THE RESISTOR UNTIL THE METER INDICATES THIS FREQUENCY. AGAIN CHECK THE LOW FREQUENCY SETTING, MAKING THE NECESSARY ADJUSTMENTS BY THE ZERO ADJUSTING SCREW IN EACH BOX.
THE #1744 TRANSFORMERS, #1746 IF 26 CYCLE, ARE FOR THE PURPOSE OF ENERGIZING THE VARIOUS RELAYS NEEDED TO PERFORM THE NECESSARY SWITCHING OPERATIONS WHEN CUTTING IN OR OUT A GROUP OF SPEAKERS, CHANGING FROM RADIO TO TELEPHONE, ETC. ONE OF THESE TRANSFORMERS IS ALWAYS ON THE LINE, EXCEPT WHEN THE PLAT CONTROL IS AT ZERO, TO PROVIDE VOLTAGE FOR THE OFF-ON RELAY.

TRANSFORMER #1746, #1747 IF 26 CYCLE, IS EMPLOYED FOR THE PILOT LIGHT IN THE REMOTE CONTROL STATIONS. IF TRANSFORMER #1746 OR #1747 FAILS TO WORK, THE RESULT WILL BE NO PILOT LIGHT IN THE REMOTE STATIONS. THE OUTPUT VOLTAGE OF THESE TRANSFORMERS IS 9.4 VOLS.

THE DRY CELL, #1212, IS TO SUPPLY A STEADY SOURCE OF DIRECT CURRENT TO OPERATE THE TUNING OR KILOCYCLE ANTHERS IN THE REMOTE STATIONS. IF IT BECOMES IMPERSONAL TO RECEIVE THE MWATS IN THE REMOTE STATIONS INTO LOCKSOMES WITH THE TUNING DIAL, BY ADJUSTING THE KILOCYCLE ON THE RADIO CHASSIS, A NEW BATTERY IS INDICATED.

IF THE OFF-ON BUTTON DOES NOT TUNE THE INSTRUMENT ON AND OFF, IT MAY BE THAT THE COIL IN RELAY #1248, #1257 IF 26 CYCLE, IS OPEN. HOWEVER, IF THE COIL IS NOT OPEN, THE CONTACTS MAY NEED CLEANING, OR THE SPRINGS ADJUSTED.
MIXING PANEL - G-SERIES

If any speaker button does not switch its associated speaker group on or off, the #61244 relay, #61255 if 25 cycle, #61242 60 cycle or #61256, 25 cycle if a Model-600 instrument, may be open, or the contacts in need of adjustment or cleaning. Low voltage from one set of speakers, is probably due to lack of field current, due to defective field supply rectifier tube, or the 110-volt relay not making proper contact.

The 200-Ohm resistors, in series with the 0.01 mfd. condensers, are across the points of some of the relays as shunt filters to reduce the radio interference when the relays open or close.

If either the tuning or volume control knobs are ineffective, the trouble may be located in the #61243, #61244 if 25 cycle relay. In the "G" model remote control, the relays operate from 110-volts, instead of 110-volts, with a large reduction in radio interference.

The covers, for the unused 16-wire sockets of the face of the mixing panel, used to connect the remote cables to the instrument, should be left in place. These covers hold the jumpers in the sockets, which complete the tuning meter circuit. If any cover is removed, see that the tuning meter circuit is completed, as these meters operate in series and if a jumper is removed, all meters will fail to function.

When installing a remote control system, all control stations are wired in parallel, except the tuning meters, these meters are in series. The leads for the meters are cabled red for one lead, and green for the other. In the event that one, or more station tuning meters read backward, the remedy is, of course, to reverse the polarity of the leads going to the meter.

If extra outlets are provided, it is necessary that some method be provided to close the meter circuit in the unused outlets, otherwise the meters will not function.

TO REPLACE KILOCYCLE METER OR GLASS

Remove the station box rear cover, by removing the six screws from the back, thus exposing the bakelite meter cover. This cover has three solder lugs at the bottom edge, all leads to these lugs should be unsoldered. Extreme care should be used in removing the two leads going into the meter case. After the leads are free, remove the three screws holding the meter cover in the box, lift the meter cover and the pilot light out. Check the position of the Zero adjuster in the face of the box. This is a bakelite part and its pin, which adjusts the meter hand, should be turned to the large opening, in the slot of the zero correcting arm. Now remove the two screws holding the meter mounting bracket to the case. Care should be exercised when handling the meter, not to bend the hand or get any foreign bodies, especially steel particles, in its moving parts. The glue used to hold the glass in place, is water soluble, and any broken pieces of glass, remaining in the case, may be removed by soaking.

Lincoln cement may be used to hold the new glass in place. This cement requires a minimum of 36 hours to dry, due to its impervious nature of the box and glass. After the cement has hardened, clean the glass carefully, on the inside before remounting the meter. Also check the Zero adjuster before setting the meter into the box, to see that the pin will enter its slot without striking and bending the correcting arm.

When replacing the pointer, #602, turn the shaft to the position where the switch is open, then turn the shaft one notch or step toward one hundred, at this point, set the indicator on Zero and set up the set screw, checking to see that the pointer does not ride on the dial at any point.

TO SET STATION STOPS ON EXTENDED TUNING CHASSIS

Starting at the high frequency (shortest wave length) end of the broadcast band, with the APC off, pick the desired station, nearest the end of the dial. Slide station stop #1 on the commutator, meanwhile holding button #1 down, until the station desired comes in best, then lock the station stop, by the thumb screw. The odd numbered stops are in the outer row and the even numbered stops in the inner row, (by having two rows of stops, stations on adjacent channels may be tuned in). Next, adjust stop #2 for the next low frequency station, using button #1 and #2 and so on, until all eight stops are adjusted. Always have the APC off, when using extended tuning, except during the time the stops are being set. Proper call letter strips should be inserted in the buttons with the celluloid covers over them. These call letter slips and covers are packed in a manila envelope with each extended control instrument.

On the chassis, is a relay #61243, #61245 if 25 cycles, which is used to shift the clutch so that the meter may drive either the gang condenser or the volume control, a set of contacts is mounted on this relay to mate the speakers when the meter is tuned from station to station. If a station button is depressed, this relay should close, muting the speakers and shifting the clutch so as to engage with the condenser drive pulley, in the event of failure of the Instrument to tune when a station button is depressed, failure may be traced to an open coil in this relay, if the meter operates properly. Underneath the chassis is the program relay, #61240, #61254 if 25 cycle. Failure to change from radio to phonograph, or from phonograph to radio, may be due to an open coil or improper contact adjustment here.

In the bottom of the cabinet is the OFF-ON relay, #61246, #61247 if 25 cycle. Failure of the instrument to start or shut off when the corresponding buttons are pushed, may be due to failure of the relay coil or improper adjustment of the contacts.

In case a control button fails to operate from the control box, but the corresponding button on the instrument works, the trouble may be located in the cable.
## Extended Control Box Wiring Diagram

### Extended Control Box

<table>
<thead>
<tr>
<th>Rating</th>
<th>Name</th>
<th>Part No.</th>
<th>Location</th>
<th>Regular</th>
<th>Extended Control</th>
<th>Remote Control</th>
<th>Remote Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>110-Volt</td>
<td>60 Cycle Cabinet</td>
<td>61228</td>
<td>Cabinet</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>25 Cycle Cabinet</td>
<td>61229</td>
<td>Cabinet</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>16-Volt</td>
<td>60 Cycle Off-On</td>
<td>61246</td>
<td>Cabinet</td>
<td>-</td>
<td>1</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>25 Cycle Off-On</td>
<td>61247</td>
<td>Mixing Panel</td>
<td>-</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>25 Cycle Off-On</td>
<td>61247</td>
<td>Cabinet</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td></td>
<td>25 Cycle Off-On</td>
<td>61247</td>
<td>Mixing Panel</td>
<td>-</td>
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<td>-</td>
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<tr>
<td></td>
<td>60 Cycle Program</td>
<td>61240</td>
<td>Chassis</td>
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</tr>
<tr>
<td></td>
<td>25 Cycle Program</td>
<td>61240</td>
<td>Chassis</td>
<td>1</td>
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<tr>
<td></td>
<td>60 Cycle Motor</td>
<td>61235</td>
<td>Chassis</td>
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<tr>
<td></td>
<td>25 Cycle Motor</td>
<td>61235</td>
<td>Chassis</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>60 Cycle Speaker</td>
<td>61241</td>
<td>Mixing Panel</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>25 Cycle Speaker</td>
<td>61241</td>
<td>Mixing Panel</td>
<td>-</td>
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<td>*</td>
<td>*</td>
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<td>60 Cycle Speaker</td>
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<td>Mixing Panel</td>
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<td></td>
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<td>Speaker Cabinet</td>
<td>-</td>
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<td>3</td>
</tr>
</tbody>
</table>

*One speaker relay is required for each speaker installation, including the speakers in the instrument, in the case of the $400$ and $500$ Series.*

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The motor which operates the tuning and volume control mechanism has a thermostat on it. This thermostat will allow the motor to operate continuously for ten minutes before shutting off the motor.

If the motor fails to operate when the proper controls are used, the thermostat has inevitably shut off the motor. Allowing the tuning and volume control to remain unused for three or four minutes, will close the thermostat and the instrument can be used in the regular manner. This thermostat is placed on the motor as a safety device and if the above occurs, it is a normal function of this motor.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2290</td>
<td>Master Volume Control</td>
</tr>
<tr>
<td>3654</td>
<td>Muting Switch Contact Assembly</td>
</tr>
<tr>
<td>3655</td>
<td>&quot;</td>
</tr>
<tr>
<td>3659</td>
<td>Volume Control Gear</td>
</tr>
<tr>
<td>3662</td>
<td>Clutch (Driver)</td>
</tr>
<tr>
<td>3663</td>
<td>Drive Pulley for Remote Control only</td>
</tr>
<tr>
<td>3667</td>
<td>&quot; Extended &quot;</td>
</tr>
<tr>
<td>4261</td>
<td>Collar</td>
</tr>
<tr>
<td>4416</td>
<td>&quot;</td>
</tr>
<tr>
<td>41146</td>
<td>Motor, 60 cycles</td>
</tr>
<tr>
<td>42146</td>
<td>&quot;</td>
</tr>
<tr>
<td>39217</td>
<td>Spring Washer, Volume Control</td>
</tr>
<tr>
<td>50194</td>
<td>Grommet</td>
</tr>
<tr>
<td>50195</td>
<td>Precision disc, Volume Control</td>
</tr>
<tr>
<td>61236</td>
<td>Relay, 60 cycles</td>
</tr>
<tr>
<td>61246</td>
<td>&quot;</td>
</tr>
<tr>
<td>62311</td>
<td>Relay Spring Assembly</td>
</tr>
<tr>
<td>99-28-7</td>
<td>10-32 x 1/4&quot; washer</td>
</tr>
<tr>
<td>99-28-30</td>
<td>6-32 x 1/4&quot; Spade bolt</td>
</tr>
<tr>
<td>99-27-7</td>
<td>6-32 x 7/8&quot; Spade bolt</td>
</tr>
<tr>
<td>99-29-6</td>
<td>6-32 x 5/4&quot; Spade bolt</td>
</tr>
</tbody>
</table>

**VOLUME CONTROL NO. 226 (CONSTANT IMPEDANCE)**

This diagram and volume control are to be used when it is necessary to have volume control for each individual remote speaker. One volume control is needed for each speaker to be controlled. That is, two for each 400-5 remote speaker installation, and three for each 500-5 remote speaker installation. This volume control No. 226 may only be used in low impedance circuitry, from 6 to 10 ohms. It is not suitable for use with high impedance speakers of the magnetic type, or electromagnetic speakers, having high impedance transformers. The output transformers of the Capehart amplifiers match to 8 ohms at 400 cycles.
The play control allows the operator to set the phonograph to play a predetermined number of selections and have been played, with the records being automatically changed. The playing of the records is accomplished by means of a motor and gear mechanism which moves the records from the feed into the record changer and aligns them with the record head. The record changer mechanism is mounted on a bracket assembly for 16 E chassis, and 8646 complete play control bracket for F-16 chassis.

The play control should be set at zero before operating the play control, and the control handle should be turned to the right to the record changer. The control handle should be turned to the right to engage the record changer, and the control handle should be turned to the left to disengage the record changer. The record changer should be disengaged by turning the control handle to the left until the record changer is disengaged. The control handle should be turned to the right to engage the record changer.

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TO SPEAKERS --

Speaker cable of size according to the charts below, must be run from the instrument to each individual speaker.

The 110-volt AC lead for the speaker fields may be run from any 110-volt AC line nearest, or most convenient to each individual speaker. The above is all the wiring necessary for remote speakers.

TO REMOTE STATIONS --

Remote station cable of size according to the chart below, may be run from the instrument to each individual remote station, or extended from one remote station to another in parallel. This one cable is all the wiring required for remote stations.

CABLE SIZES FOR #400-GR (REMOTE CONTROL)

<table>
<thead>
<tr>
<th>No. of Remote Control Stations and Speakers</th>
<th>Speaker Cable Sizes</th>
<th>Remote Control Cable Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or less</td>
<td>6-Wire</td>
<td>16-Wire To All Stations</td>
</tr>
<tr>
<td>5 to 13</td>
<td>6-Wire</td>
<td>24-Wire To All Stations</td>
</tr>
</tbody>
</table>

CABLE SIZES FOR #400-GR and #600-GR (REMOTE CONTROL)

<table>
<thead>
<tr>
<th>No. of Remote Control Stations and Speakers</th>
<th>Speaker Cable Sizes</th>
<th>Remote Control Cable Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or less</td>
<td>6-Wire</td>
<td>16-Wire To All Stations</td>
</tr>
<tr>
<td>5 to 13</td>
<td>6-Wire</td>
<td>24-Wire To All Stations</td>
</tr>
</tbody>
</table>

Note the Model-1600G does not include any speakers. All speakers used with this model must be of the AC type, Models 33 or AGG. All remote speakers on the #400-GR Series are AC speakers, Models 33 and AGG. All remote speakers on the #600-GR Series are 33.

Note the Model 1600-G does not include any speakers; while the Series #400-GR and #600-GR models include one set of DC speakers in the instrument cabinet. No DC speakers are required with the Model-1600G and all speakers for this model and all remote speakers for the Series #400-GR and #600-GR are of the AC type.

Instruments equipped for four speakers or less (including the speaker in the instrument) contain one set of amplifiers. For five and including eight speakers, two sets of amplifiers are used; and for nine and including twelve speakers, three sets of amplifiers are used. These additional sets of amplifiers are not installed in the instrument cabinet and may be located in a closet or other convenient place, apart from the instrument.

In all models where additional sets of amplifiers are used, all speakers operating from these amplifiers are of the AC type. When ordering equipment calling for additional sets of amplifiers, specify length of cable necessary to connect additional amplifiers to the instrument.

REMOTE CONTROL EQUIPMENT INCLUDES:

- Instrument equipped for remote control operation.
- One remote control station with 24-ft. flat cable.
- Provision for attaching number of additional remote control stations as ordered.
- Provision for attaching number of auxiliary speakers as ordered.

Speaker push buttons will be engraved with any lettering desired as specified, maximum limit two lines of six letters each, or one line of seven letters. Unless otherwise specified, speaker push buttons will be engraved "Spkr. 1", "Spkr. 2", etc.

Plug #61106 and outlet box cover #6132, are used where the 24-wire remote control station cable enters and leaves the wall.

Plug #6194 and outlet box cover #6132, are used where the 16-wire remote control station cable enters and leaves the wall.

24-wire flat cable is used between each remote control station and the instrument, or between remote station and wall receptacle on instrument, or between remote station and wall receptacle on instruments having more than four remote stations and speakers.

16-wire flat cable is used between each remote control station and the instrument, or between remote station and wall receptacle on instruments having four or less remote stations and speakers.

Round cable is used whenever the cable is concealed.

Standard 3-cm "B" Outlet Box is used with #6107, #6621, #6621, #6104 and #6107 outlet box covers and is obtainable at any local electrical dealer.

Use standard house wire, approved by the Underwriters' Laboratories for connecting AC speaker fields.
MECHANICAL INSTRUCTIONS
No. 16-E De Luxe Record Changer

1. TO LOCATE AND ADJUST THE RECORD TRAY (668*) (Fig. 6).

In assembling the record tray to the record changer, the first tooth of the driven quadrant (5551) (Fig. 5) should mesh with the second tooth of the driven quadrant of the arm as shown.

28.57

With the two gears properly meshed, loosen the Allen set screws which hold pins No. 3413, Fig. 1, in place. This will allow you to move the record tray sideways or adjust tray sideways until the turning spindle is exactly in the center of the 10" record level of the record tray. (The 10" record level is that part of the tray where the felt No. 4913 is indicated in Fig. 6.)

With the central lever in the "one side" position, run the record changer through its cycle until the large hole in the main cam is exactly half way past the upper edge of the record tray cam follower, as shown at No. 5, Figure 1. At this position, the points of the inch felt behind (6631) (Fig. 6) should be kept in line with the top of the turntable felt. If the tray is too low or too high, it may be adjusted by turning the proper level by loosening the eccentric screw (3412) (Fig. 1) No. 4 and turning this screw until the proper level is obtained. Be sure to tighten the lock nut after adjustment.

If the tray is too high, at this position, the turntable records will not be centered over the turntable spindle. If the record tray is too low, the turntable records will slide out over the turntable spindle and not properly center.

2. THE ADJUSTMENTS OF THE RECORD MAGAZINE.

Before attempting to adjust the magazine, be sure that the center of the magazine pivot pins (34152) (Fig. 1) is 68/16 above the base plate. This height is very important and recommended checking the height of the right hand pin, when looking at the magazine, before any adjustments are made.

The record magazine is positioned by moving it sideways on its bearing or pivot pins. The two set screws underneath the pivot pins lock the magazine in position. Loosen these set screws, then see that the left hand side of the record reverse assembly fork (part of 6228, Fig. 6) is between A" and B" inside the left hand side of the Reverse Crank, when looking at the magazine. That is, the left hand edge of the record reverse fork is about A" or B" to the right of the left hand edge of the crank. After moving the magazine, tighten the set screws. Then with the selector arm in the "Rear" position swing the record reverse arm around in front of the magazine, to see whether the record guide strikes either of the record support pins (34358) (Fig. 6). If the record arm strikes either of the support pins it will be necessary to turn the pin away from the guide so that it can strike. At it is necessary to bend either pin, set the control lever in the "Rear" position, then raise the record tray by hand, with a 10" record on it, observing the way the record strikes the support pins, the record should hit both pins about 30° from the end of the pin, if it does not it will again be necessary to adjust the pin until the record hits both pins an equal distance from the ends. If it is necessary to bend the pin, check for correct position of the record guide arm and the pin between the arm carrying the record guide and the right hand pin. Also, if the magazine has been shifted it is necessary to see that the two points, which are drawn downward from the magazine, have ample clearance in the channels, on the record tray, which are provided for their passage. If there is possibility of the points striking it probably means the magazine has been shifted too much.

If the magazine has been adjusted, it is also necessary to see that the record separator hook (6236) (Fig. 1) does not bind in the slot at the end of the record separator arm (6465) (Fig. 6). If it does, the section covering these parts give the adjustment.

3. MAGAZINE STOP SCREW.

The magazine stop screw No. 2, Fig. 5, should be adjusted so that the crank pin (part of 6230, Fig. 1) is approximately 1/4" from the edge of the record reverse arm fork (part of 6228, Fig. 6) which is further from the magazine, when the record guide is in front of the magazine, that is, in the reversing position.

4. MAGAZINE LINK ADJUSTING SCREWS (No. 3) (Fig. 1).

The record magazine should always come back snugly against the magazine stop screw, No. 2, Fig. 5, if it does not, it is necessary to loosen the two set screws (No. 2, Fig. 1) to a sliding tension and run the record changer through a cycle of change. When the magazine has reached the horizontal position, as shown in Fig. 1, press down on the lower end of the magazine; this will lengthen the link assembly. Then when the magazine returns to its normal position, the magazine link will adjust itself so that the magazine is snugly against the stop screw. Then tighten the magazine link screws.

5. RECORD REVERSE GUIDE (6444) (Fig. 6).

With a 12" record in the magazine, the record reverse guide assembly (6444) (Fig. 6) should be parallel with the record when in the reversing position, in front of the magazine.

If the reverse reversing assembly is parallel with a 12" record as above, it should come around and lay against the reverse guide pin tubing (34354) (Fig. 6), if the eccentric cam (3423) (Fig. 8) is properly adjusted. This cam can be adjusted, by loosening the screw through the cam and turning it so that the record reversing assembly returns to the reverse guide pin tubing. Care should be taken when making this adjustment so that the crank pin (part of 6230, Fig. 1) does not bind the reverse guide away from the pin tubing. This cam should be turned so that the reverse guide assembly just touches the pin tubing; if the cam is turned too far it will allow the reverse guide assembly to hit the pin tubing, but in the reversing position the assembly will not be able to assume a position parallel with a 12" record.

6. REVERSE ASSEMBLY LINK ROD.

Loosen lock nut No. 9, Fig. 3, while the record changer is in the reversing position; that is, when the reversing assembly (6444) (Fig. 6) is at front of the magazine. Remove the screw (3424) (Fig. 8) holding the reverse segment link (34414) (Fig. 8) to the reverse segment (3550) (Fig. 8) and lengthen or shorten the link by the lock nut until the reversing cam (6230) (Fig. 1) stands with the crank pin just barely touching, but not binding, against the front side of the fork (6228) (Fig. 6). After the adjustment has been made, lock the link in place with the lock nut No. 9, Fig. 3.

7. RECORD SEPARATOR ADJUSTMENT.

The separator stop No. 3, Fig. 1, should be adjusted so that a small 10" record will positively clear the slot portion of the separator lever as shown in the following illustration. A standard to use is to make certain that there is approximately 1/16" clearance between the edge of the record and the point of the separator lever, as shown at "A" in illustration below. However, it may be necessary to vary one way or the other from this measurement, depending on whether or not the selected cut of the record separator lever goes over the hook (6226) (Fig. 1) without binding.

8. RECORD SEPARATOR HOOK ADJUSTMENT.

After adjusting the record separator it will be necessary to check the record separator hook (6226) (Fig. 1) to see that it enters the slot in the record separator without binding. This hook is threaded and can be loosened.
ing the locknut the hook can be turned in either direction, to raise or lower it. After the correct adjustment is obtained, tighten the locknut.

It should never be necessary to change these adjustments on record changers unless they have been tampered with by an untrained person.

9. SEPARATOR LEVER AND ARM (625) (Fig. 12).

Be sure set screw No. 16 in Fig. 8 is screwed all the way in.

10. RECORD MAGNETIC BUSHING (4020) (Fig. 11).

When it is heard the magnetic portion of the instrument is changing records, i.e., such a noise that might be made by a spring, it will be found that the Dares bushing (4020) (Fig. 11) is too tight, in which case it will be necessary to loosen the lock nut of the holding bolt, and back the bolt out, from a quarter to a half turn, then tighten the lock nut.

11. TO ADJUST THE TONE ARM HEIGHT.

To adjust the tone arm height, first place a 12' record on the turntable and adjust the tone arm stop lever (6419) (Fig. 1) so that the record hits the rubber roller (5661) (Fig. 1) in the center. Start the record changer through a cycle and stop it when the tone arm lever hook (5656) (Fig. 1) just touches the stop arm assembly. In this position adjust the tone arm height so that the top of the stop lever is the same height as the center of the hook. This adjustment is made by loosening the two Allen set screws at the rear of the tone arm. These Allen set screws are accessible by raising the tone arm by hand. After making the first adjustment it is necessary to make certain that there is a clearance of approximately 1/16' between the pickup head and the record tray. This distance may be checked between the bottom of the record tray and the bottom of the pickup when the record trap is approximately parallel with the pickup.

12. TO ADJUST THE PICKUP ELEVATION.

When the tone arm swings in toward the record, the pickup arm lever hook (5656) (Fig. 1) comes to rest against the pickup arm stop lever (6419) (Fig. 1) and when the tone arm lowers the pickup toward the record it passes momentarily before the pickup arm lever hook goes through the stop lever. If the record changer is stopped during this pause, it will be found that the ball in the end of the pickup arm lift shaft (6419) (Fig. 9) at 90° from the point marked \(\theta\) in Fig. 9 on the lift cam (6400) (Fig. 9) is now in the pickup position. The needle should be raised to the correct record height by moving the stop arm assembly up or down, as required, before the pickup lever is adjusted. After the pickup lever is adjusted it is necessary to make certain that there is a clearance of approximately 1/16' between the pickup head and the record tray. This distance may be checked between the bottom of the record tray and the bottom of the pickup when the record trap is approximately parallel with the pickup.

13. PICKUP FEED IN ADJUSTMENT.

The collar of the pickup arm swing lever and collar assembly (6242) (Fig. 9) should ride on the leader facing the pickup arm lever hook (6419) (Fig. 10) until the pickup arm lever hook (6419) (Fig. 1) is raised by the pickup arm lever hook (6419) (Fig. 1) at the end of the pickup arm lift shaft (6419) (Fig. 9) at 90° from the point marked \(\theta\) in Fig. 9 on the lift cam (6400) (Fig. 9). Now if the pickup arm lever hook (6419) (Fig. 1) is raised by the pickup arm lever hook (6419) (Fig. 1) at the end of the pickup arm lift shaft (6419) (Fig. 9) in the correct position, the needle should be raised to the correct record height by moving the stop arm assembly up or down, as required, before the pickup lever is adjusted. After the pickup lever is adjusted it is necessary to make certain that there is a clearance of approximately 1/16' between the pickup head and the record tray. This distance may be checked between the bottom of the record tray and the bottom of the pickup when the record trap is approximately parallel with the pickup.

14. TO ADJUST THE PICKUP.

After removing the pickup cover, it should be noted whether the stylus (5619) (Fig. 10) is centrally located in respect to the pole pieces (569) (Fig. 10). To center the stylus loosen the lock nuts (99-11-1) (Fig. 10), then loosen the two headless set screws (99-20-1) (Fig. 10). Their set screws hold the spindle assembly (6110) (Fig. 10). The spindle assembly should be shifted until the stylus is centered with the pole pieces, then tighten the set screws carefully, so as not to change the length of the pole pieces, and then tighten the lock nuts.

For any reason it is necessary to shift the pole pieces, which are held to the back by the two screws, the two set screws holding the spindle should be loosened before attempting to move the pole pieces. If any adjustment of pole pieces is made carefully check the centering of the stylus before replacing the cover by means of its setscrews.

15. TO ADJUST THE STOP LEVER HOOK (659) (Fig. 1).

Always adjust the tone arm position on a 1/2' record before adjusting for a 10' record. Adjust the tone arm stop lever hook (5656) (Fig. 1) by moving it in or out. This hook is locked in place by a set screw in the

...and whose nut is shown in Fig. 1 as No. 5519. This set screw is at the bottom of this tool. Adjust the hook so that it will pass through the notch in the pickup arm lever hook (6419) (Fig. 1) without binding against the top or bottom of the notch in the playing position. With a 12' record, turn the turntable, the rubber roller (5046) (Fig. 2) against the edge of the record and the stop lever hook (5658) against the blade of the stop lever (567) (Fig. 2). This needle should stop it with the record exactly \(\frac{3}{16}\)" from the edge of the record.

With the record changer in exactly the same position as described above, and with a 10' record on the turntable and the rubber roller (5658) (Fig. 1) against the blade, the stop lever should allow the needle to stop on the record for approximately \(\frac{3}{16}\)" from the edge of the record. A 1/2' record is provided for making this adjustment, simply by screwing it in or out. A check should be made for clearance between the roller and the tray, this roller should never bind on the record tray. This can be taken care of by slightly bending the tone arm stop lever hook (5656) (Fig. 1) up or down. If it is necessary to bend the stop lever it will be necessary to readjust for 12' records.

16. TO ADJUST THE CLUTCH THROWOUT LEVER AND CAM.

The clutch throwout lever cam is shown at 15 in Fig. 2, and is adjusted by loosening the shoulder screw (517) (Fig. 2) to a sliding tension after the record changer has been stopped in the playing position. The clutch throwout lever cam should just clear the point of the turntable throwout cam (6468) (Fig. 10) with the clutch disengaged. Unless clearance between the turntable throwout cam and the clutch throwout cam is maintained the record changer will jam. If too much clearance is allowed the turntable throwout cam will disengage the clutch and the record changer will continue to record without playing them.

17. TO ADJUST SOLENOID WEDGE SPRING.

This phosphor bronze spring is located on one of the screws used to mount the solenoid plate bracket to the solenoid bracket. It is used to prevent clacks or chatter when the clutch engages. The only adjustment is to bend the spring in a long screwdriver to increase or decrease its pressure on the solenoid to clutch lever (6455) (Fig. 1).

18. TO ADJUST THE REVERSE CAM SHIFT LEVER (5356) (Fig. 12).

This lever is moved by the record control shaft (572) (Fig. 12) and is held in position by an Allen set screw. It should be positioned on its shaft so that the record reverse cam (5625) (Fig. 6) is freely engaged with its retaining cam (5654) in the "One Side" and "Repeat" positions. The cam should have good clearance with the pin. Any adjustment of this lever is made to be sure the setting of the Reverse Cam and Roller Assembly (6490) (Fig. 8) is in accordance with the instructions in the reverse cam.

19. TO ADJUST THE RECORD REPEAT LOCK LEVER (5356) (Fig. 12).

The purpose of this lever is to prevent accidental shifting of the Selector Arm while the instrument is not in the playing position. In the "Repeat" position this lever is on the side of the solenoid to Clutch Lever (6455) (Fig. 11) away from the cam. In the "One Side" and "Repeat" positions it is on the main cam side of the solenoid to clutch lever. With the tone arm in the playing position (Main Clutch Disengaged) this lock lever should clear the solenoid to clutch lever by approximately \(\frac{3}{4}\)" when moved under it.

20. TO ADJUST THE REVERSE CAM LOCK LEVER (5356) (Fig. 12).

This lever should be on the main cam side of the solenoid to clutch lever when in the "Both Sides" position. And on the opposite side when in the "One Side" and "Repeat" positions. With the main clutch disengaged the lock lever should clear the solenoid to clutch lever by approximately \(\frac{3}{4}\)" when moved under it.

21. TO ADJUST REVERSE CAM ARM AND ROLLER ASSEMBLY (6490) (Fig. 4).

See Section 7 under Instructions For Replacing a Reverse Cam.

22. TO ADJUST RECORD REPEAT THROWOUT LEVER (6665) (Fig. 12).

No adjustment of this part is necessary.

23. TO ADJUST RECORD REPEAT CLUTCH LEVER (5322) (Fig. 12).

The adjustment of this lever is made by loosening the Allen set screw in a slotted tensioner moving the part along the shaft. The sliding clutch should engage in the "One Side" and "Both Sides" positions, but should be disengaged in the "Repeat" position. The fork of this lever should not bind the sliding clutch in either the "Repeat" or "Both Sides" position.

24. LATERAL LOCATION OF THE MAIN CAM SHAFT.

Both end bearings of the main cam shaft are movable, and are used to locate the cam shaft in its proper lateral position, as well as to adjust the amount of end play. The main cam shaft is located laterally so that the
25. TO ADJUST THE STOP TRIP SWITCH (2730) (Fig. 7).

This switch is accessible by removing the turntable, which will expose the stop switch. To remove the switch cover, it is necessary to remove the trip arm, which goes through the switch cover and the two flat head screws which hold the cover in place. The clearance between the contact points on the fixed and movable arms of the switch should be 

After replacing the trip arm (5510) (Fig. 7) in the switch, after the switch cover has been removed, set the turntable on the spindle, push stop trip arm (5453) (Fig. 5) slowly about 1/2 toward the magazine and then turn the turntable through one complete revolution. This will insure the fiber cam, on the turntable, resetting the trip switch, the clearance between the trip arm and the movable arm of the switch should be 0-0.10. The distance between the trip arm and the switch trip guard fingers should also be 0-0.10.

To adjust the clearance between the trip arm hook (6310) (Fig. 7) and the movable switch arm, loosen the screw in the baseplate switch base, at the end near the tone arm. Move the switch until 0-0.10 clearance is secured between the trip arm hook and the movable arm of the switch, then tighten the screw holding the switch. In making this adjustment be sure that the stationary arm of the switch is not bent when tightening the screw.

On some models, a small set screw, near the end of the coil spring, is used to lock the switch in position; loosen this screw, adjust the switch, then tighten the set screw.

26. TO ADJUST THE SOLENOID MOTOR SWITCH (2764) (Fig. 3).

After the switch cover has been removed the switch is exposed. The upper switch points should make good electrical contact, while the main clutch is disengaged, in this position the clearance between the lower points should be approximately 0-0.10. While the clutch moves from the disengaged to the engaged position the upper switch points should remain closed until the lower set of points are closed. When the clutch is fully engaged the lower points should make good contact and the clearance between the upper points should be approximately 0-0.10.

To adjust the switch loosen the screw through the baseplate switch base at the rear of the switch assembly. After the position is found where proper clearance is secured with the clutch engaged and disengaged, the switch should be locked in position with the screw.

In some machines a small set screw is used to lock the switch in position. This screw is near the point of the tapered baseplate insulating block. Loosen this screw and adjust switch to get proper clearance then lock the switch in position by the set screw.

27. TO ADJUST THE FRICTION JOINT OF AUTOMATIC TRIP SWITCH.

The amount of friction necessary in the friction joint between the auto stop trip lever—long (6510) (Fig. 7) and the auto stop trip lever—short (4583) (Fig. 7) should be just sufficient to close the automatic stop trip switch (2792) (Fig. 7). The friction is regulated by adjusting the screw which tightens the flat spring (4998) (Fig. 7). If the tension is too great the instrument may trip before finishing a record, if not enough tension is had the instrument will not change records when the needle hits the automatic change groove.

28. RECORD SIZE LIMIT.

The 16-E Series record changer will play any 10" or 12" record of standard size. The minimum size for 12" records is 11-1/2". The minimum size for 10" records is 9-1/2". Records smaller than these limits are very apt to miss centering over the turntable spindle and in most cases are broken.

These records can automatically trip switch on any record having an automatic stop change groove, either spiral or oscillating, where the blank space in the center of the record is not more than 1/2" in diameter.

29. RECORDS.

Always inspect the records to see that no rough edges are present. Occasionally you will find a record which has a rough edge outside. This rough edge will generally interfere with the satisfactory performance of the record changer. A small piece of 3M sandpaper will assist you greatly in removing this rough edge.

30. TO ADJUST THE VERTICAL BUMPER GUIDE (6693) (Fig. 6).

This guide is located back of the magazine cross bar (6680) (Fig. 6). After the records are separated from the magazine they are guided in dropping off the separator so they hit the center of the record changer.

31. CLUTCH CLEARANCE.

The clearance between the drives (3630) (Fig. 10) and driving (3630) (Fig. 12) members of the clutch should be approximately 0-0.10" (20 thousandths), and is adjusted by loosening screw No. 16 in Fig. 5 to a sliding tension and adjusting the clutch fork (5355) (Fig. 2) and the solenoid to clutch lever and pin assembly until the proper clearance is obtained. After adjustment make lock the screw No. 16, Fig. 5.

32. MOTOR CONNECTIONS (2353).

The 2353 motor is a synchronous motor and will run equally well in either direction, when properly connected. For this reason, all motors shipped from the factory are equipped with a terminal strip and cable. However, if it should be necessary to disconnect the leads from the terminal strip the leads should be replaced in the following order: With the cable extending to the right of the terminal strip and the mounting lugs pointing downward, and the soldering lugs towards you, the leads go from left to right in the following order—small black, black with yellow tracer, blue and large black. In that order they are ground one side of 110 volt line, one side of the condenser, and the remaining 110 volt and condenser leads. The motor terminal strip should be mounted to the cabinet terminal strip so that the cable extends to the right, with the soldering lugs towards you.

33. OILING INSTRUCTIONS.

Due to its careful design and precise workmanship, the Carpath 16-E record changer requires a minimum of oiling.

About once each year a light coat of vaseline or petroleum jelly should be applied to all moving surfaces which were coated with grease at the factory.

A very light coat of vaseline should be applied to the surfaes of the magazine, indicated at "A" in Fig. 6. It is best to apply this coating every six months. The vaseline should be applied with, and removed by, a cloth, on the magazine faces. DO NOT USE EXCESSIVE AMOUNTS OF LUBRICANT ANYWHERE ON THE RECORD CHANGER.

A good grade of machine oil, not too light, should be used on the sliding clutches, reverse cam shaft and all eccentric and shoulder screws.

NEVER USE THE "DUREX" BUSHINGS, AS THIS WILL CAUSE THEM TO DISINTEGRATE.

Once each year the motor oil cups should be oiled with a good grade of zink oil. At the same time the grease box should be inspected, and the grease replaced if it has become hard. A good mixture to use here is 75% vaseline and 25% SAE 60 motor oil.

34. INSTRUCTIONS FOR REPLACING THE RECORD REVERSE CAM AND ITS ADJUSTMENTS.

1. Set record changer in the playing position. Carefully mark the drive gear (3561) (Fig. 10) on the main shaft and the driven gear shown as part of 6238, Fig. 10, by pricking punch marks or scribe, so that the same teeth can be engaged after assembly, thus insuring proper timing.

2. Remove the two bolts, one (3238) (Fig. 14) securing the magazine slide and roller assembly to the magazine slide arm lever, and one (3237) (Fig. 14) securing the record slide arm and stud assembly to the record tray drive arms.

3. Looking in from the rear of the instrument, remove the Durex bushing from the end of the main cam shaft, against the motor drive shaft. This is accomplished by loosening the bolt to the right of the main shaft. Care should be taken when replacing this bushing so as not to tighten the bolt enough to cramp the bushing, a snug be be is required.

4. Remove lower half of bearing and Durex bushing from the other end of the main cam shaft and work the cam shaft out of the record changer. The same precautions against crushing the bushing should be taken with this set as with the one in the preceding section.

5. Remove taper pin from gear and loosen set screw in the collar, both shown as 6237 in Fig. 8, of the reverse cam shaft assembly, as well as the pin (3144) (Fig. 10) over which the reverse cam fork, when in
the reversing position. After removing the roller and sliding the gear to one side, file all burrs from the edges of the holes in the reverse cam shaft. Slide the shaft through its Durex bushing toward the rear of the instrument far enough to allow the removal and replacement of the reverse cam (6235) (Fig. 10).

6. Assemble the reverse cam shaft assembly, making certain that the tapered pin holes in the shaft and gear are correctly aligned to permit the tapered pins being properly inserted. The set screw in the collar at the end of the shaft should be properly tightened.

7. Remove the reverse cam arm roller assembly (6450) (Fig. 2) and make sure that the roller pin and arm are not bent; if either of these items are found bent we suggest that you replace the reverse arm and roller assembly.

8. In reassembling the reverse cam arm and roller assembly (6450) (Fig. 2) in its proper position for alignment with the reverse cam, be sure the roller is about 1/16" inside the edge on the reverse cam, when the cam is in its reversing position.

9. Remove the reverse cam arm from the shaft, as shown in Fig. 10. Place the arm on the main shaft, which drives the gear on the reverse cam arm assembly (6235) (Fig. 10) and remount the main shaft to the record changer chassis, making the above gear, from which the pin was removed, to one side so that it will not mesh with its driven gear.

10. Locate the main shaft so that the lower end of the pickup arm lift shaft travels in the center of the pickup arm lift cam, as shown in Fig. 9. With the main shaft in this position, adjust the main shaft Durex bushings so that there is no end play in the main cam shaft assembly.

11. Rotate the main cam shaft to the playing position so that the pickup arm is lowered over the turntable.

12. Set the reverse cam in its lowest position, with the control lever in the "Both Sides" position, so that the fork of the reverse cam is meshed with the driving pin.

13. Mesh the reverse cam assembly driver gear (3516) (Fig. 10) with the reverse cam assembly driven gear so that the identifying punch marks correspond to the original position. The tapered pin for the driven gear should be inserted next. If the assembly has been properly made there should be approximately 1/16" clearance between the roller on the reverse cam arm and the reverse cam. See "A", Fig. 9.

14. Thread the control lever to the "One Side" position and rotate the reverse cam with the fingers until it is in the reversing position. Then throw the control lever to the "Both Sides" position. Now there should be approximately 1/16" clearance between the reverse cam and the roller. See "B", Fig. 9. If the clearance is not approximately 1/16" for both positions of the reverse cam, it indicates that either the gears are not properly meshed or the reverse cam gear link rod may be bent. A careful check of the latter while the main shaft is out will save time and trouble later.

35. INSTRUCTIONS FOR REMOVING THE 16-E RECORD CHANGER.

There is a great possibility, when removing the chassis from the cabinet, to mar or scratch the cabinet. If you will place a piece of cardboard around the record changer it will eliminate, to a great extent, the possibility of maring the finish. A rubber mat, with a hole for the record changer, the same size as the one in the cabinet, makes an excellent pad. This pad can be split and is easily put in position and removed.

Remove the back from the record changer, radio and amplifier compartments.

Remove the screws from the partition between the radio and record changer compartments, so it can be moved back out of the way.

Remove the wood screw, under the turntable, also the three bolts which hold the record changer down.

Remove the two wood screws that mount the play control.

Remove the female chassis plug, from the male chassis plug (6176) (Fig. 1), the pickup lead, which runs from the radio chassis to the terminal block, then disconnect the terminal block by removing the wood screw in its center, the strap holding the shielded lead, which runs from the switching switch, and the 110 volt lead to the Play Control.

Release the plug control cable and cable housing from the bracket on the record changer chassis, by loosening the two set screws. Care should be taken to prevent breaking the control cable when removing it. The end which has been linked by the set screw should be straightened before attempting to reinstall it.

Loosen the two Allen set screws in the flexible coupling and allow it to slide down the motor shaft, so as to clear the record changer chassis.

Move the play control as far into the radio compartment as possible.

Remove the screw marked "B" in the illustration on page 8. This is the middle one of the screws holding the upper record support.

Remove the magazine link shoulder screw (329) (Fig. 6). This will allow the magazine to be swung out of the way. As soon as the record reverse arm and fork assembly have cleared the reverse cam and pin (6235) (Fig. 1), it should be swung over the magazine and locked with the record reverse arm lock (669) (Fig. 6), to keep it out of the way.

Lift the record changer up, until the tone arm just touches the top of the cabinet, carry it forward through the doors, tilting it to keep the main cam clear of the shelf.

All parts of the cabinet liable to damage should be protected by soft cloth while removing or installing the record changer.

It is not necessary that the above operations be carried out in the above sequence.

36. ALIGNMENT OF TRUE-TANGENT PICKUP.

When adjusting the TRUE-TANGENT pickup, the pickup head and tone arm should form a straight line, when the needle is exactly one and one-half inches from the point of the turntable drive shaft cap (6450) (Fig. 6). To adjust the pickup angle, loosen the nut at the rear of the steering arm assembly (66254) (Fig. 3), turn the steering arm either right or left until the correct position for the pickup is found, then set the lock nut tight. Then see that there still is 1/16" clearance between the pickup and the record stylus per Section 11.
The voltages shown below are average readings taken from the tube socket contacts to the chassis frame, and will vary 10% when the set is tested on a 6 volt battery due to differences in characteristics of vibrators and tubes.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>1st R. F. Amplifier</td>
<td>85</td>
<td>2nd Detector—A. V. C.—2nd Audio</td>
</tr>
<tr>
<td>6A7</td>
<td>1st Detector—Oscillator</td>
<td>41</td>
<td>Power Output (Class “A Prime”)</td>
</tr>
<tr>
<td>6F7</td>
<td>I. F.—1st Audio Amplifier</td>
<td>41</td>
<td>Power Output (Class “A Prime”)</td>
</tr>
</tbody>
</table>
GENERAL: This auto radio is a six tube, two unit (dash speaker) superheterodyne receiver. It is equipped with a remote control and a plug-in vibrator of the full wave self-rectifying type.

Circuit Changes

A number of the early receivers have 1/4 mfd. tubular condenser mounted above the grid leak resistor, illustration #42 of Figure 2 and connected in parallel with the 85 tube cathode by-pass section 20D of the #1209144 electrolytic condenser block. The use of the tubular condenser was necessary in production to reduce the R. F. resistance of the 85 cathode by-pass. A change has been made in the design of the condenser block, making the use of the tubular condenser unnecessary. All of the service parts replacement stock of #1209144 electrolytics are of the new design and it is immaterial whether or not the tubular condenser is left in the receiver when replacing the electrolytic condenser block.

It may be noted on some of the earlier receivers that there is a small condenser in a metal case mounted below the grid leak resistor, Illus. #42, Figure 2, with two terminals that are not connected. This condenser was originally placed in the set to filter vibrator interference, but it was found after production started that two small condensers mounted in the vibrator unit were more effective and the external condenser was simply disconnected.

Peaking Instructions

Peaking Gang Condenser at 1530 and 1400 K. C.

(a) Connect the output of the test oscillator to the antenna connection of the receiver and to the chassis ground. Do not use the 1 mfd. condenser that was required in aligning the I. F. stages.
(b) Turn the rotor plates of the gang condenser until they are COMPLETELY OUT OF MESH.
(c) Set the test oscillator on 1530 kilocycles.
(d) Adjust the trimmer condenser for the oscillator section (middle section) of the gang condenser CAREFULLY for maximum output. Then adjust the trimmers for the "R. F." and "ANT" sections of the gang condenser.
(e) Set the test oscillator on 1400 kilocycles.
(f) Turn the condenser rotor plates until the 1400 K. C. signal from the test oscillator is turned in with maximum output. (No calibration blocks should be used as the oscillator circuit is adjusted at 1530 K. C. on this set.)
(g) Realign the trimmers for the "R. F." and "ANT" section of the gang condenser for maximum output. DO NOT disturb the oscillator trimmer (middle section) as this is adjusted at 1530 K. C. only and any further adjustments at this point will affect both the tuning range of the receiver and the tracking of its circuits.

CAUTION: Always use the lowest possible test oscillator output that will give a reasonable deflection of the output meter pointer in order to prevent the A. V. C. from leveling out the output as the adjustments are made.
A number of 05 mfd. tubular condensers were used at the factory in place of the 06 mfd. condenser part #1209213 condenser shown on Fig. 2 as Illus. #23. For Service replacement purposes of any defective .05 mfd. condensers—use part #1209213.

Voltage Chart

The voltages shown below are average readings taken from the tube socket contacts to the chassis frame, and will vary 10% when the set is tested on a 6 volt battery due to differences in characteristics of vibrators and tubes. All readings were taken with a 1000 ohm per volt meter.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Type</th>
<th>H</th>
<th>Pp</th>
<th>S</th>
<th>Tp</th>
<th>Gt</th>
<th>G</th>
<th>G1</th>
<th>G2</th>
<th>G3,5</th>
<th>K</th>
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<td>R. F.</td>
<td>6</td>
<td>250</td>
<td>135</td>
<td>80</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>6.2</td>
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<tr>
<td>6A7</td>
<td>Det.-Osc.</td>
<td>6</td>
<td>250</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>0</td>
<td>120</td>
<td>135</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>6B7</td>
<td>2nd Det. AVC</td>
<td>6</td>
<td>250</td>
<td>135</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>—</td>
<td>—</td>
<td>8.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Output</td>
<td>6'</td>
<td>240</td>
<td>250</td>
<td>—</td>
<td>—</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>16.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Ampere drain of set at 6 volts is 6.2 amperes. Milliamperes drain from "B" supply is approximately 55 M. A.

Code for Symbols

- H—Heater
- Pp—Plate-pentode
- S—Screen
- Tp—Triode-plate
- Gt—Grid-triode
- G—Control grid
- G1—Osc. grid
- G2—Osc. plate
- G3,5—Osc. screen
- K—Cathode
CHEVROLET DIV.—GEN. MOTORS

Parts

GENERAL: This auto radio is a four tube, single unit superheterodyne radio. It was designed for the 1938 Standard Model Chevrolets. A tuning control of the type that moves on the bottom flange of the instrument is used.

Peakung Instructions

Peaking I. F. Stages at 262 K. C.

(a) Connect the ground lead of the test oscillator to the chassis frame. Connect a 1-mf. condenser in series with the other lead and connect this lead to the grid cap of the 6AB7 tube, leaving the tube's grid clip in place. The 1-mf. condenser is necessary to prevent the oscillator circuit of the receiver from affecting the i. f. adjustments.

(b) Set the test oscillator on 262 kilocycles.

(c) Tune the volume control of the receiver on full.

(d) Peak the i. f. trimmer F-3 for the 3rd i. f. coil shown on Fig. 1.

(e) Then peak trimmers P2 and P1 of the first i. f. coil also shown on Fig. 1.

(f) In order to insure accurate settings of the i. f. trimmers the above adjustments should be repeated using the lowest oscillator output that will give a reasonable output meter scale deflection. Make all adjustments for maximum output.

Peakung Gang Condensers at 1530 and 1400 K. C.

(a) Connect the output of the test oscillator to the antenna connection of the receiver and to the chassis ground. Do not use the 1-mf. condenser that was required in aligning the i. f. stages.

(b) Turn the rotor plates of the condenser until they are COMPLETELY OUT OF MESH.

(c) Set the test oscillator on 1530 kilocycles.

(d) Adjust the oscillator section (middle section) of the gang condenser CAREFULLY for maximum output. Then adjust the trimmers for the "R. F." and "ANT" sections of the gang condenser.

(e) Set the test oscillator on 1400 kilocycles.

(f) Turn the condenser rotor plates until the 1400 K. C. signal from the test oscillator is tuned in with maximum output. (No calibration blocks should be used as the oscillator circuit is adjusted at 1530 K. C. on this set.)

(g) Readjust the parallel trimmers for the "R. F." and "ANT" sections of the gang condenser (shown on Fig. 2) for maximum output. DO NOT disturb the oscillator trimmer (middle section) bias at 1530 K. C. only, and any further adjustments at this point will affect both the tuning range of the receiver and the tracking of its circuits.

(h) The capacity of the output circuit of the test oscillator may be slightly different than that of the other ear antennas. The receiver is to be used on. Therefore, it is advisable to readjust the "ANT" trimmer for the ear antennas with retuning the receiver. This may be done by tuning the receiver to a broadcast station around 1400 K. C. and adjusting for maximum volume.

CAUTION: Always use the lowest possible test oscillator output that will give a reasonable deflection of the output meter pointer. In order to prevent the A. V. C. from leveling out the output as the adjustments are made.

---

### Parts List

| Part No. | Description | Indians.
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1209379</td>
<td>Case</td>
<td>Chassis...</td>
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<tr>
<td>1209183</td>
<td>Clip</td>
<td>Tube grid connector</td>
</tr>
<tr>
<td>1209029</td>
<td>Condenser</td>
<td>By-pass block...</td>
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<tr>
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<td>.06 Mfd., 400 volt...</td>
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</tr>
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<td>Sec. B</td>
<td>.08 Mfd., 400 volt...</td>
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</tr>
<tr>
<td>Sec. C</td>
<td>.1 Mfd., 100 volt...</td>
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<td>.1 Mfd., 100 volt...</td>
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</tr>
<tr>
<td>Sec. E</td>
<td>.1 Mfd., 100 volt...</td>
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<td>.1 Mfd., 100 volt...</td>
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<td>Condenser</td>
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<td>Condenser</td>
<td>Molded, 0.002 Mfd...</td>
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<td>Condenser</td>
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<td>Condenser</td>
<td>Molded, 0.0005 Mfd...</td>
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<td>Condenser</td>
<td>Molded, 0.002 Mfd...</td>
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<td>*1209044</td>
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<td>1209990</td>
<td>Condenser</td>
<td>1 gang tuning—induct coupling...</td>
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### Connectors

| Part No. | Description | Indians.
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<tr>
<td>1834869</td>
<td>Cap</td>
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<tr>
<td>1834847</td>
<td>Ferrule</td>
<td>Contact...</td>
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<td>1834878</td>
<td>Body</td>
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<tr>
<td>1834847</td>
<td>Ferrule</td>
<td>Contact...</td>
</tr>
<tr>
<td>1834876</td>
<td>Spring</td>
<td>Ferrule tension...</td>
</tr>
<tr>
<td>1834872</td>
<td>Washer</td>
<td>Antenna connector...</td>
</tr>
<tr>
<td>1209049</td>
<td>Coupling</td>
<td>Condenser drive...</td>
</tr>
<tr>
<td>1209094</td>
<td>Cover</td>
<td>Chassis top...</td>
</tr>
<tr>
<td>1209038</td>
<td>Cover</td>
<td>Tube lid...</td>
</tr>
<tr>
<td>1209022</td>
<td>Resistor</td>
<td>Carathed 3.65 ohms...</td>
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<tr>
<td>1209056</td>
<td>Resistor</td>
<td>Carathed 11,000 ohms—5 watt...</td>
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<tr>
<td>1120119</td>
<td>Resistor</td>
<td>Insulated 300,000 ohms—5 watt...</td>
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<tr>
<td>1209211</td>
<td>Resistor</td>
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</tr>
<tr>
<td>Sec. B</td>
<td>.015 ohms...</td>
<td></td>
</tr>
<tr>
<td>Sec. C</td>
<td>.015 ohms...</td>
<td></td>
</tr>
</tbody>
</table>

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### Reference

- **Parts List**: This section provides a detailed list of parts used in the radio, including part numbers, descriptions, and identifiers.
- **Connectors**: Detailed information on the connectors used in the radio.
- **Resistors**: List of resistors used in the radio, including carathed, insulated, and nominal ohms. Values range from 3.65 ohms to 11,000 ohms, with wattages varying from 5 watts to 1 watt.

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The circuit used is of the conventional superheterodyne type and does not employ regeneration which might affect its stability. A high gain antenna circuit especially designed for use with an under car antenna is used. An antenna compensating condenser is provided in this circuit which can be adjusted so as to bring the antenna circuit of the receiver into resonance with the car antenna.

**Tube Socket Voltages**

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>H</th>
<th>P</th>
<th>S</th>
<th>G1</th>
<th>G2</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>6D6</td>
<td>R. F. Amplifier</td>
<td>6</td>
<td>240</td>
<td>100</td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>6A7</td>
<td>1st Det.-Osc.</td>
<td>6</td>
<td>140</td>
<td>100</td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>6B7</td>
<td>IF Amp.-2nd Det.</td>
<td>6</td>
<td>130</td>
<td>100</td>
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<td>3.6</td>
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<tr>
<td>76</td>
<td>1st A. F.</td>
<td>6</td>
<td>130</td>
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<td>8.0</td>
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<tr>
<td>42</td>
<td>Output</td>
<td>6</td>
<td>220</td>
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<td>84</td>
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<td></td>
<td></td>
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<td></td>
<td>240</td>
</tr>
</tbody>
</table>

* A. C.

Note: Above readings taken from tube socket contacts to ground with a D. C. voltmeter having a resistance of 1000 ohms per volt.
Peaking Procedure

Connect one terminal of the output meter to the plate and the other terminal to the screen of the 42 output tube. BE SURE the meter is protected from D. C. by connecting a condenser (1 Mfd. or arger—not electrolytic) in series with one of the leads.

Peaking I. F. Stages at 262.5 K. C.

(a) Connect the ground lead of the signal generator to the chassis frame. Connect a 5 Mfd condenser in series with the other lead and connect this lead to the grid cap of the 6AF7 tube, leaving the tube a grid cap in place.

(b) Set the signal generator to 262.5 kilocycles.

(c) Turn the volume control of the receiver on full and turn the tune control to the treble position.

(d) Rotate the station selector until the tuning condenser plates are completely meshed.

(e) Adjust the trimmer condensers located on top of the 2nd I-F coil (Fig. 49) for maximum reading on the output meter.

(f) Adjust the trimmer condensers located on top of the 1st I-F coil for maximum output.

NOTE: It is in order to ensure accurate settings of the I-F trimmer condensers the above adjustments should be repeated using the lowest signal generator output that will give a reasonable scale deflection on the output meter. Make all adjustments for maximum output.

Peaking R. F. Stages

(a) Remove the .5 Mfd. condenser from the output lead of the signal generator and connect a 40000 Mfd. condenser in its place. Then, connect this lead to the antenna connection of the receiver.

(b) Set the signal generator to 1400 kilocycles.

(c) Rotate the station selector until the pointer points to 190 on the dial.

NOTE: Special care should be exercised in making the adjustments at this frequency as the correct logging of stations on the dial is dependent upon these adjustments.

(d) Adjust the "Qee" trimmer of the tuning condenser (Fig. 2) for maximum output.

(e) Adjust the "R-F" trimmer for maximum output.

(f) Adjust the "ANT" trimmer for maximum output.

(g) Repeat operations (c) and (f) using the lowest signal generator output that will give a reasonable scale deflection on the output meter.

NOTE: The "Qee," "R-F," and "ANT" trimmers should not be adjusted at any frequency other than 1400 kilocycles.

(h) Set the signal generator to 590 kilocycles.

(i) Tune in the 600 kilocycles from the signal generator with the station selector for maximum output.

(j) Peak the antenna compensating condenser (Fig. 3) for maximum output.

(k) Repeat operation (j) and (k) alternately until no further improvement in output can be obtained.

(l) Set the signal generator to 1400 kilocycles again.

(m) Tune in the 1400 kilocycles with the station selector for maximum output.

(n) Readjust the "ANT" trimmer of the tuning condenser for maximum output.
ANTENNA CIRCUIT: The antenna circuit is directly coupled to the antenna in contrast with the capacity coupled circuit used in some Chevrolet Models. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the high frequency end of the dial (1400 K.C.) instead of at the low frequency end as with the capacity coupled sets.

POWER SUPPLY: The power supply in this receiver differs from previous Chevrolet Models in that a rectifier tube (type 6X5G) is used in conjunction with a full wave, plug-in vibrator. The vibrator circuit is permanently connected for operation on negative battery ground as is the case on all Chevrolets.

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Circuit Alignment

IMPORTANT: Do not make any adjustments to this receiver with the chassis case removed from the receiver chassis or without the proper equipment. If maximum sensitivity is to be obtained from this receiver after realignment, it is very important that the following procedure be closely observed:

1. Aligning 1-F Stages at 262 Kilocycles
   (a) Connect the signal lead of the test oscillator to the grid cap of the 6AG6 tube, through a .1 mil. condenser, leaving the tube's grid dip as place.
   (b) Connect the grid lead of the test oscillator to the chassis frame.
   (c) Connect output meter in plate circuit of 6FQ6 output tube or across the voice coil of the speaker.
   (d) Set the test oscillator to exactly 262 K.C.
   (e) Adjust the trimmers on the 1-F coils (Illls. 5 and 10) carefully for maximum output. These adjustments should be repeated several times and during alignment the test oscillator output should be kept to as low a value as is consistent with obtaining readable indications on the output meter.

2. Aligning at 1530 Kilocycles
   (a) Leave the test oscillator leads connected the same as for aligning the 1-F circuits.
   (b) Turn the rotor plates of the gang condenser all the way out and against the high frequency stop.
   (c) Set the test oscillator to 1530 kilocycles.
   (d) Adjust the parallel trimmer for the oscillator section of the condenser gang (Illus. 11C, Fig. 2) to give maximum output. It is very important that this frequency be set accurately as a slight mis-setting will cause the receiver to be out of track over the entire high frequency end of the dial.

3. Aligning at 546 Kilocycles
   (a) Leave the test oscillator leads connected the same as before.
   (b) Turn the rotor plates of the gang condenser all the way into mesh so that they rest against the low frequency stop.
   (c) Set the test oscillator to 546 K.C.
   (d) Adjust the oscillator tracking condenser (Illus. 24, Fig. 2) located on the underside of the receiver sub-panel to maximum output. (This adjustment sets the low frequency tuning range of the receiver to 546 K.C.)

4. Aligning at 1400 Kilocycles
   (a) Remove the signal lead of the test oscillator from the grid of the 6AG6 tube and connect to the antenna terminal of the receiver through a .003 micro mini condenser connected in place of the .1 mil. condenser previously used.
   (b) Set the test oscillator to 1400 kilocycles.
   (c) Turn the condenser rotor plates until this frequency is tuned in with maximum output.
   (d) Adjust the R-F parallel trimmer on the condenser gang (Illus. 11B, Fig. 2) located on the side of the receiver case for maximum output.

5. Aligning at 600 Kilocycles
   The oscillator padding condenser was previously adjusted at 546 K.C.; however, it is necessary, in most cases, to repack the oscillator tracking condenser at 600 K.C. in order to make the receiver track properly and to secure full sensitivity.
   (a) Set the test oscillator on 600 K.C.
   (b) Turn the condenser rotor plates until the signal from the test oscillator is tuned in with maximum output.
   (c) Maintain a low output signal from the test oscillator and readjust the oscillator tracking condenser (Illus. 24, Fig. 2) while rocking the variable condenser gang tuning shaft back and forth through the signal. This operation should be continued until no further increase in output can be obtained.

NOTE: If the entire alignment procedure has been accomplished correctly, the receiver should be very nearly uniformly sensitive over the entire frequency range.

Visual Alignment

If the visual method of alignment is preferred to the method outlined above, the vertical input terminals of the cathode-ray oscillograph should be connected to the second detector output with the high side connected between the junction of the 50,000 ohm resistor (Illus. 32, Fig. 1) and the secondary of the second I.F. transformer (Illus. 10, Fig. 1).
SUBJECT: Service Hints On Tuning Unit For 985283 Radio

1. Motor does not run
(a) Press button down and check motor terminals for voltage. The voltage on the motor must be measured across the terminals because a voltage reading will show at all times from any one of the four motor terminals to ground or chassis. The voltage across the motor terminals should read 5.5 volts with 6 volts on the radio set, and will only show a reading when a button is pressed down and the relay is operating.
(b) If no voltage reading is obtained at the motor terminals to ground, check high "A" wiring from spark plug to motor terminals for open circuit. This check is made with no buttons down.
(c) When there is a voltage reading on some of the motor terminals to ground with no buttons down and not on other terminals, check motor leads and armature for open circuit. This is done with the regular continuity test.
(d) Check all motor terminals for ground with high "A" disconnected from the motor.
(e) Check brushes on motor to make sure that they are seating properly on the commutator.
(f) Polish commutator with very fine emery paper, then wipe with a clean rag. Be sure that no abrasive is left on the commutator.

2. Motor stalls or does not pull condenser gang, but still motor checks ok
Under No. 1
(a) Rotate armature of motor with finger to see if motor bearings are not frozen up. If the armature has a slight drag, it may be caused by the following:
1. Tight motor bearings.
2. Improper adjustment of motor with respect to the armature used.
(b) Rotate condenser gang coupling if chassis is out of case and make sure that all moving parts rotate freely. Check brushes on motor and brush slide and see that all moving parts rotate freely.
(c) Hold commutator armature from engaging clutch and run motor by pressing button. Motor should run at very high speed with no load on it. This will check the motor and motor armature for freedom of movement.
(d) Check armature for binding in the control or drive cable. Make sure that there are no sharp bends in control cables when installed in the car.
(e) Check armature for proper end play.
(f) If any bearings or gears appear to be running tight, oil with 3 in 1 oil or its equivalent. This is very important, and only a very light grade of oil should be used. Any other motor will not operate properly under similar conditions.

3. If motor unit runs slow in both directions
(a) The same checks outlined in Nos. 1 and 2 will apply to a slow running motor.

4. Motor unit runs slow in one direction
(a) Check armature brushes for proper fit to commutator.
(b) Check motor armature for proper adjustment. Motor armature should be exactly on a center with motor armature, with about .002 inch of backlash to worn gear when armature is held rigid.
(c) Check remote control and gang condenser assembly for binding in one direction or both.

SUBJECT: Service Hints On Tuning Unit For 985283 Radio—Cont’d

5. Noisy motor unit mechanically
(a) Check remote control for grinding or squeaking by spinning remote control knob.
(b) Check all gear adjustments for proper backlash and alignment.
(c) Check gears for proper lubrication. Use a light grade of vaseline on gears.
(d) Check gears and bearings for worn parts or poor bearing fit and lack of lubrication. Refer to No. 2 for oiling.
(e) Check motor brushes for noise.

6. Set noisy when jarred. This deals only with troubles in the motor unit that may cause the above trouble
(a) Relay armature bouncing on relay contacts. To remedy this condition adjust relay spring if weak and relay spring contact for a wider gap.
(b) Push button cable plug not pushed in socket far enough.
(c) Weak push button springs in push button box. This will be noticeable only when the button box itself is jarred.

7. Motor runs but condenser gang and dial pointer do not move
(a) Check the set screw in rear of armature to condenser gang armature that links the drive shaft to the gang condenser gear. The drive shaft may be turning freely and not driving the gang. The drive shaft should be adjustable as for the clutch armature adjustment only, not for the motor arm gear. If this set screw has come loose the drive shaft will be out of adjustment and the clutch and motor arm will have to be adjusted in the order named.
(b) Clutch armature not operating. Check voltage across the clutch coil and also check the clutch coil for continuity.
(c) If the clutch armature is operating, the clutch arm on the drive shaft may not be engaging the pin and roller on the motor arm gear. Adjustment can be made by driving the shaft clockwise, but be sure to adjust motor after moving the drive shaft.

8. Motor unit operates but gang condenser oscillates but remote control does not operate
(a) This condition will be caused by the backlash of the condenser gear coupling slipping in the condenser gear. This coupling is a friction drive and is passed inside the gear condenser armature with spring pressure exerted outwards on the arm. Do not oil this friction drive. To tighten this friction drive, pull coupling out and spread the split shaft with a small screwdriver. A very small spread is all that is required. Be sure to clean off all grease on split shaft and inside of hole in condenser gear armature. Then replace coupling.
(b) Check remote control for any faults.

9. Push buttons do not release when one button is pressed at a time
(a) Buttons may be binding or on control panel. Loosen the nuts holding push button box and adjust box so that buttons are free to move in and out.
(b) Buttons may be binding on top plate of button box. Adjust box plate so that buttons are free.
(c) Rubber bands around buttons may be causing the buttons to bind.
(d) Push button box may be defective. Try a new box. Do not repair push button box internally. Caution: Remember, the push buttons will not release until the proper station is tuned in and the motor unit has ceased to run.
SUBJECT: Service Hints On Tuning Unit For 985283 Radio—Cont’d

10. Push buttons do not release when two or more buttons are pressed at the same time. This is a fault that should seldom be complained about because it is not the correct way to operate the tuning unit, but provision has been made in the design to eliminate continuous oscillation of the tuning unit when two or more buttons are pressed at the same time. Three or four oscillations are permissible before buttons release. If the buttons do not release, proceed as follows:
   (a) Try a new push button box.
   (b) Check adjustment of relay spring contacts for proper gap.
   (c) Check relay control arm for free operation and also for proper spring tension. Make sure that relay control arm is returning to normal position after relay operates.
   (d) Check instrument panel plate and button box as outlined in No. 9.

11. Dial pointer slides past the proper station or setting and then returns to station when the corresponding button is pressed the second time
   (a) This is a fault of the clutch which is not releasing fast enough or is not releasing at all. If the clutch does not release, the momentum of the locating motor will carry the gang condenser past the required setting. Check the clutch armature for free operation.
   (b) Check the clutch arm on drive shaft for free operation.
   (c) Check the clutch arm spring on drive shaft for proper tension.
   (d) Check the small roller on motor worm gear for free operation on its retaining pin.
   (e) Check the motor worm gear for free rotation on drive shaft when clutch arm is disengaged from the clutch pin.
   (f) Check the clutch magnet gap dip for proper tension.
   (g) Check the clutch arm spring for proper tension.
   (h) Check the clutch arm for proper alignment with control shaft.

12. Stations do not log properly when dial pointer comes towards the station from the high frequency end—in other words, rotating in a counter clockwise direction
   (a) Beloit control disc for that particular station has not been set accurately. Adjust as per instructions.
   (b) This condition may also be caused by fault No. 11. Check as per instructions in No. 11.

13. Stations do not log properly when dial pointer comes towards station from the low frequency end of dial—in other words, rotating in a clockwise direction. Under this fault, it is assumed that fault No. 12 has been checked
   (a) The contact spring on control switch corresponding to the particular button under question may not be adjusted properly. If dial is over-rising or under-rising it means that the contact spring is too close to the contact arm. To correct this condition it is necessary to loosen the screw on the discriminator switch to give contact spring a wider gap. If dial is under-shooting the station, that is, not diming entirely to the station, it means that the contact spring is too far from the contact arm. To correct this condition, it is necessary to tighten the adjusting screw on the discriminator switch. Be sure that none of the other adjusting screws are disturbed.

14. Set very noisy when motor unit is running. This would be electrical noise from the speaker
   (a) Improper adjustment of the silencing contact on the relay. This silencing contact is the back contact, or the one nearest the condenser gang. The lead running from this contact is connected to the tab of the push-pull input choke and hence when the relay is operated to either side, the input choke tab is then grounded, silencing the audio of the set. Check wiring, soldered joints and contact resistance of silencing contact on relay. Polish relay contacts with very fine emery paper to remove dirt and grease. This will assure a good contact.

15. Set noisy immediately after motor unit has ceased to operate dial pointer
   (a) This noise will only last for one or two seconds after the unit has stopped running and is caused by a voltage being generated in the motor and hence the "A" circuit by the rotation of the armature in a small residual field of the pole pieces. Check motor brushes and commutator for high resistance. Polish commutator as previously outlined.
   (b) Check the .01 mf condenser across motor terminals for open.

16. Push buttons do not hold down when pressed
   (a) Check the voltage between the black and yellow leads on push button cable socket.
   (b) Make sure that push button cable plug is making good contact to the socket.
   (c) Try a new push button box.

17. Calibrating light inside of case lights when calibrating switch is closed and push button is pressed. Motor will not run when this happens
   (a) This condition is due to a faulty calibrating switch. Bend the switch arm down slightly so that a good contact is assured. This light is in series with relay coils and when light is not shortest out with calibrating switch the relay will not operate.

18. Calibrating light inside of case does not light when calibrating switch is open and push button is pressed
   (a) Be sure calibrating light is not burned out.
   (b) Check the voltage on relay coils.
   (c) Check the relay coils for continuity.
   (d) Check the calibrating switch contact for grounded connection.

19. Shift in station logging
   (a) Check beloit control discs for being loose on shaft. Discs are not supposed to slip when unit operates. This is a friction fit on the control shaft and should never be oiled.
   (b) Check the oscillator circuit for shift.
CHEVROLET DIV.—GEN. MOTORS

Tube Complement

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Type</th>
<th>Function</th>
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<td>R. F. Amplifier</td>
<td>6R7</td>
<td>2nd Det. — A. V. C. — 1st A. F. Amplifier</td>
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<tr>
<td>6A8</td>
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<tr>
<td>6K7</td>
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985424 PARTS LOCATING DIAGRAM
1. Aligning I. F. Stages at 262.5 Kilocycles

The I. F. amplifier may be aligned by first using a modulated signal generator and an output meter in the conventional manner, and then making the final adjustment with a radio frequency modulator signal generator and oscillograph. The accuracy of the push-button tuning system partially depends upon the symmetry of the I. F. wave form. If the curve is symmetrical it is only approximate without the aid of the oscillograph equipment.

(a) Connect one terminal of the output meter to the plate of one of the 860V output tubes and connect the other terminal through a 1,000 ohm condenser (not electrolytic) to the plate of the other 860V output tube.

(b) Connect the output of the signal generator through a 0.05 mfd. condenser to the grid of the 860V I. F. amplifier tube leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the frame of the receiver chassis.

(c) Tune the volume control on full. Adjust station selector so that the rotor plates of the condenser gang are completely in mesh and turn the audio fidelity control to the trouble position. The music-speech control should be in the "music" position.

(d) Adjust both transformers located on the 2nd I. F. transformer to maximum reading on the output meter.

Note: Always use the lowest signal generator output that will give a reasonable reading on the output meter.

(e) Connect the output of the signal generator to the grid of the DB tube leaving the tube's grid clip in place.

(f) Open the middle trimmer on the 1st I. F. transformer two or three turns of the adjustment screw. Care should be taken that the adjustment screw does not become dislodged from the nut.

(g) Adjust the other two trimmers on the 1st I. F. transformer for maximum reading on the output meter.

(h) Adjust the middle trimmer on the I. F. transformers for maximum reading on the output meter.

Caution: Do not adjust the trimmers on the 2nd I. F. transformer.

2. Oscillograph Alignment

For more accurate adjustment of the I. F. amplifier a cathode ray oscillograph in conjunction with a radio frequency modulated signal generator may be used to obtain a visual alignment. It will allow adjusting for a more symmetrical wave form.

(a) Disconnect the conventional signal generator from the receiver.

(b) Connect the vertical plates of the oscillograph to the receiver connecting at the (HI) terminal through a 0.05 mfd. condenser to the grid cap of the 867 tube leaving the tube's grid clip in place. (Condenser is built into most oscillographs.) Connect the ground terminal to the frame of the receiver chassis.

(c) Connect the output of the R. F. modulated signal generator also through a 0.05 mfd. condenser to the grid cap of the 867 tube leaving the tube's grid clip in place. Connect the ground lead to the frame of the receiver chassis.

(d) Adjust the signal generator to 262.5 Kilocycles.

(e) With the modulator switch of the signal generator turned off, a horizontal line will appear on the window of the oscillograph by means of the amplitude control on the oscillograph. Adjust the length of this line so that it is equal to the width of the celluloid scale supplied with the oscillograph.

(f) Turn the frequency modulator switch of the signal generator on.

(g) Adjust the vertical control of the oscillograph so that the line is just within the top and bottom lines of the oscillograph scale.

Notes: Use the lowest signal generator output that will give a stable image on the oscillograph window. If the trace signal input is used, the humps desired on the wave form will not be visible even at perfect alignment.

(b) Readjust the middle trimmer on the 1st I. F. transformer for maximum symmetry above the vertical resonance line in the center of the celluloid scale. The bump or shoulder appearing on each side of the wave form should be equal distance from the nose of the curve when maximum symmetry is reached.

3. Aligning the R. F. Amplifier

(a) Connect the output of the signal generator through a 0.0001 mfd. condenser and Chevron shielded antenna lead-in to the antenna connection of the receiver. Connect the ground lead to the frame of the receiver chassis.

(b) Adjust the signal generator to 1400 Kilocycles.

(c) Adjust the station selector to 140 on the dial logging the dial from the low frequency end.

(d) Adjust the trimmer on the oscillator section of the condenser gang for maximum reading on the output meter.

(e) Adjust the trimmer on the R. F. trimmer gang for maximum reading on the output meter.

(f) Adjust the trimmer on the antenna gang for maximum reading on the output meter.

(g) Readjust the station selector for maximum reading on the output meter.

Note: Do not readjust the oscillator trimmer.

(h) Repeat operations (c) and (f) for more accurate adjustments.

4. Adjusting Antenna Compensating Condenser

(a) Adjust the signal generator to 600 Kilocycles.

(b) Tune in the 600 Kilocycle signal with the station selector for maximum reading on the output meter.

(c) Adjust the antenna compensating condenser for maximum reading on the output meter.

(d) Repeat operations (a) and (b) alternately until no further improvement in output can be obtained.

(e) Readjust the signal generator to 1400 Kilocycles.

(f) Tune in the 1400 Kilocycle signal with the station selector for maximum output.

(g) Readjust the trimmer on the antenna section of the condenser gang for maximum reading on the output meter.

5. Adjusting the Antenna Compensating Condenser When Set Is Installed On Car

(a) After installation is complete, tune in a weak station between 55 and 65 on the dial that is just audible with volume control on full.

(b) Adjust the antenna compensating condenser for maximum volume in the speaker.

6. Setting the Push-Buttons

The order in which the stations are set-up on the push-buttons will in no way affect the operation of the tuning unit. To set the push-buttons no tools are required, but an understanding of the operation of the push-button switch is essential. There are two definite pressures and movements required to actuate the switch. First, a slight touch and a movement of less than one-eighth of an inch is all that is required to tune the receiver with a push-button after the button has been adjusted. Second, a heavier pressure and a movement of about one-quarter of an inch is required when the pushbutton is to be set to the station selected. To adjust the button, push the button all the way down (a slight snap will be felt when going past first stop position), and hold in that position while you tune-in as accurately as possible with the manual tuning knob, the station selected. Release button, the station is set. Follow the same procedure in setting the remaining buttons.

Note: The accuracy of the push-buttons depends upon how accurate you tune-in the station while setting them.
A highly efficient superheterodyne circuit is used. Bias for the 6A8G and 6K7 tubes is obtained across the 160 ohm resistor, item No. 28. Bias for the 6K6G tube is obtained across a 600 ohm resistor, item No. 39.
Circuit Alignment

1. Aligning the I. F. Stage at 455 Kilocycles
   (a) Connect the output meter to the plate and screen of the 6GHG output tube. Be sure the meter is protected from D.C. by connecting a .1 mfd. condenser (not electrolytic) in series with one of the leads.
   (b) Connect the output of the signal generator through a .02 mfd. condenser to the grid of the 5K7 I. F. tube leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the receiver chassis frame.
   Note: Keep the generator leads as far as possible from the grid leads of the other screen grid tubes.
   (c) Adjust the station selector so that the rotor plates of the tuning condenser are completely demagnetized and turn the volume control to the maximum position.
   (d) Adjust the signal generator to 455 kilocycles.
   (e) Adjust both 2nd I. F. trimmer condensers for maximum output.
   (f) Transfer generator lead to the grid of the 5AG6 tube leaving the tube's grid clip in place.
   (g) Adjust both trimmers located on the 1st I. F. transformer for maximum output.
   (h) Repeat operations (e) and (g) for more accurate adjustments.
   Note: In order to prevent A. V. C. action always use the lowest signal generator output that will give a reasonable output meter reading.

2. Aligning the R. F. Amplifier
   To obtain the greatest gain from the antenna system, the capacity of the dummy antenna should be accurate to the capacity of the antenna with which the receiver is to be used. The capacitance of auto radio antennas range from 68 mfd. to 220 mfd., depending upon the size and type. If the receiver is adjusted for maximum efficiency when used with an antenna having a high capacity, it will not operate at its maximum efficiency on an antenna having a much lower capacity or vice versa.
   (a) If the receiver is to be used with a turner-top antenna or a telescopic cowl antenna, the output lead from the signal generator should be connected through a .0001 mfd. condenser, and shielded lead, to the antenna connection of the receiver. If a large antenna such as the running board type is used, a .00018 mfd. condenser should be used and a long shielded lead in place of the .0001 mfd. condenser and shielded lead.
   (b) Adjust the signal generator to 1400 kilocycles.
   (c) Adjust the station selector to 140 on the dial.
   (d) Adjust the trimmer on the oscillator section of the tuning condenser for maximum output.
   (e) Adjust the trimmer on the antenna section of the tuning condenser for maximum output.
   (f) Readjust the station selector for maximum output.
   Note: Do not readjust the oscillator trimmer.
   (g) Repeat operation (e) for more accurate adjustment.

Adjusting Antennas Compensating Condenser
   (a) Set the signal generator to 600 kilocycles.
   (b) Tune-in the 600 kilocycle signal with the station selector for maximum output.
   (c) Adjust the antenna compensating condenser for maximum output.
   (d) Repeat operations (b) and (c) alternately until no further improvement can be obtained.
   (e) Set the signal generator to 1400 kilocycles.
   (f) Tune-in the 1400 kilocycle signal with the station selector for maximum output.
   (g) Readjust the trimmer on the antenna section of the tuning condenser for maximum output.
Circuit Alignment

When adjustments are being made, the chassis must be in its case to provide proper shielding, and the volume control should be turned full on to the maximum position. The signal generator output should be adjusted to give a reasonable scale deflection on the output meter.
VOLTAGE READINGS TAKEN BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTAMETER RUNNING
RESISTANCE OF 1000 OHMS PER VOLT.
ALL READINGS TAKEN WITH 8 VOLT AT
SPARK PLATE.
CURRENT DRAW WITH SPEAKER &
DIAL LIGHT 73 AMPS.
"B" SUPPLY DRAW APPROX. 42 MA.

TOLERANCES ON TUBE VOLTAGES ± 10%.

FOR CONVENTIONAL ALIGNMENT PROCEDURE, SEE SPECIAL SECTION VOL. VIII.

ALIGNMENT
1. At 2000 kHz, Connect output meter through .125 mfd. condenser to
screen grid pins of 6L6G tube. Signal generator through .1 mfd condenser to
grid cap of 6AS tube. Generator ground lead to chassis. Variable out of
mesh. Adjust trimmers 4, 5, 11, 12 for maximum output. Check IF band
spread with oscilloscope.

2. At 1500 kHz, see "ALIGNING AT 1500 KILOCYCLES" with schematic.

3. With connections as in 2, Generator and variable tuned to 1200 kHz
Adjust parallel trimmers on top and bottom sections of variable for
maximum output.

4. At 800 kHz, Tune variable to 800 kHz Adjust oscillator pad (2) to
maximum output while tuning variable.

5. Adjustment of the Receiver to the Car Antenna

When the receiver leaves the factory the antenna circuit is properly aligned to match
the under running board type of antenna. Therefore, when the receiver is installed in a
car and connected to the standard Chevrolet running board antenna, only a slight
adjustment of the antenna circuit is required. If the receiver is connected to a self-tuned
antenna or a telescopic overlapped antenna, proceed as follows to properly adjust the
receiver:

(a) Tune in a weak station about 1400 kilocycles, which is barely audible, with the volume control
full on.

(b) If the top antenna or the telescopic overlapped antenna is used, remove the top tube cover
and change the position of the top plug from the hole marked "HC" to the hole marked
"TC", and replace the cover.

(c) Adjust the antenna trimmer condenser for maximum volume.
Peaking I-F Stages at 262 K.C.

(a) Connect the ground lead of the test oscillator to the chassis frame. Connect the output of the test oscillator through an .02 mfd. condenser to the grid cap of the 6A7 tube (test detector-oscillator) leaving the tube's grid clip in place. Keep the leads of the test oscillator as far as possible from the grid wires of the other screen grid tubes.

(b) Set the test oscillator to 262 kilocycles.

(c) Adjust the station selector so that the plates of the tuning condenser are completely in mesh.

(d) Turn the volume control on full and turn the tone control to the treble position.

(e) Adjust both trimmer condensers located on top of the second I. F. coil.

Illustration No. 10—Fig. 1, for maximum output.

(f) Adjust both trimmer condensers located on top of the first I. F. coil.

Illustration No. 9—Fig. 1, for maximum output.

(g) Repeat operations (c) and (f) for more accurate adjustments.

Always use the lowest signal generator output that will give a reasonable output meter reading.

Peaking R. F. Stages

(a) Remove the .01 mfd. condenser from the output lead of the test oscillator and connect a .00025 mfd. condenser in its place. Then, connect this lead to the antenna connection of the receiver.

(b) Set the signal generator to 1400 kilocycles.

(c) Adjust the station selector to 140.

(d) Adjust the trimmer on the "Osc" section of the tuning condenser for maximum output.

(Fig. 1.)

(e) Adjust the trimmer on the "R-F" section of the tuning condenser for maximum output.

(Fig. 1.)

(f) Adjust the trimmer on the "ant" section of the tuning condenser for maximum output.

(Fig. 1.)

(g) Readjust the station selector for maximum output. Do not readjust the "Osc" trimmer.

(h) Repeat operations (c) and (f) for more accurate adjustments.

Adjusting Antenna Compensating Condenser

(a) Set the signal generator to 600 kilocycles.

(b) Tune in the 600 kilocycle signal with the station selector, for maximum output.

(c) Adjust the antenna compensating condenser, Illustration No. 11, for maximum output.

(d) Repeat operations (b) and (c) alternately until no further improvement in output can be obtained.

(e) Set the signal generator to 1400 kilocycles again.

(f) Tune in the 1400 kilocycle signal with the station selector for maximum output.

(g) Readjust the trimmer on the "ant" section of the tuning condenser, for maximum output.

It will be necessary to adjust the antenna compensating condenser to the car antenna after the receiver has been installed in the car.

(a) After the installation is complete, tune in a weak station between 55 and 65 on the dial.

(b) Adjust the antenna compensating condenser for maximum volume in the speaker.
CONTINENTAL PAGE 10

CONTINENTAL RADIO & TELEV. CO. MODELS 4A, 4B, Early, Late, 4C
MODEL 5J Schematics

MODELS 4A, 4B (Early), 4A, 4B (Late) and 4C. ON MODEL 4C ONLY

CAPACITORS

RESISTORS

FOR ALIGNMENT AND LAYOUT SEE INDEX

CHANGES:
- LATE MODELS 4A AND 4B DIFFER FROM THE ABOVE DIAGRAM AS FOLLOWS:
  - 1Q5G REPLACES 1Q5G OUTPUT TUBE
  - CAPACITOR C1 IS .00005 MICA,
  - INSTEAD OF .00025 MICA AND RESISTOR R8 IS 440 OHMS 1/4 WATT
  - INSTEAD OF THE 600 OHM 1/4 WATT IN EARLY MODELS.

RESISTORS

CONDENSERS

I.F. 456KC
FOR ALIGNMENT AND LAYOUT SEE INDEX
MODEL 5J
A.C.-D.C.
CONVERSATIONAL DIAGRAM
MODEL 4D EARLY
CONVERSATIONAL DIAGRAM
MODEL 4D LATE

RANGE 535 - 1730 KC*
PROCEDURE FOR
SETTING UP

PUSH BUTTONS

MODEL 5B

There are four push buttons by means of which four stations may be selected (see Fig. 1). Make a list of four stations tuned in regularly. Loosen any of the push buttons by turning the push button proper counter clockwise a few turns. Holding it in, tune in any one of your favorite stations by means of the station selector. Turn the selector very slowly back and forth until the signal is clearest. Now tighten the push button knob by turning clockwise. Release the push button and loosen another push button. Holding it in, tune in another favorite station using the station selector. Turn the selector wheel very slowly back and forth until the signal is clearest. Now tighten the push button by turning it clockwise. Repeat this operation for the remaining two buttons, tightening each button securely as it is set.

If it is desired to change a station, simply loosen the push button and re-set. Punch the correct station call letter tabs from the set of sheets supplied and insert them into the windows above the push buttons.

The dial is now set up for quick tuning.

PHONOGRAPH CONNECTIONS

MODEL 5B This receiver is provided with a phono jack (see chassis layout) and connection may be made from the phonograph to this jack by means of phone tips. It is necessary that the phonograph be equipped with a volume control and a switch to break connection between the phonograph and the set as the radio will not operate properly if a permanent connection is made. When the phonograph is in use the volume control of the set will act to some extent as a tone control. Best results will be obtained with the volume control of the set near maximum and no station tuned in.

MODEL 5B VOLTAGE READINGS—LINE VOLTAGE 115

Volume control minimum, antenna shorted to ground and band switch in broadcast position. Meter 1,000 ohms per volt.

Filament of 80 tube to ground .................................................. 253 Volts
Screen of 41 tube to ground ...................................................... 196 Volts
Screen of 6A7 and 6D6 tubes to ground ...................................... 87 Volts
Cathode of 41 tube to ground ...................................................... 13 Volts
Cathode of 6A7 tube to ground .................................................. 2.75 Volts
This receiver is designed to operate from a power supply main of 110-120 volt, 60 cycle alternating current (AC). Never plug into a DC outlet.

GROUND

Wherever possible, a good ground should be employed. Water pipes and steam or hot water radiators make a very desirable ground connection. The ground wire should be connected to the "Black" lead.

SCHEMATIC DIAGRAM

Model 6B

Knob 1 - Station Selector
2 - Band Switch
3 - Volume Control
4 - On & Off Switch & Tone Control

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ELECTRIC MOTOR

The power for this tuner is provided by a small, efficient electric motor, of the brushless variety. It is fitted with an automatic clutch and a silent gear train. The bearings and the oil reservoir hold sufficient oil to lubricate the motor for a lifetime.

SETTING UP SELECTOR MECHANISM

List six (6) strong local stations which are free from excess fading. The station on your list that comes in nearest the left hand end of the dial should be called station No. 1 and should be set up on button No. 1. (See Figure 1.) Located on the back of the receiver is the thumb screw bracket and six (6) thumb screws whose positioning determines the points at which the pointer will stop when the buttons are being used. Figure 2 shows a detail of the thumb screws numbered for reference to the push buttons.

Located on the rotating selector plate is a fibre dead spot which locates the position at which station selector contacts should be set in order to have the selector plate stop for a certain station. Follow closely the steps listed below:

1. Using the manual selector knob, tune in station No. 1, the station near the left hand end of the dial—the 170 K.C. end. Make certain that the station is properly tuned in.

2. From the back of the receiver loosen thumb screw No. 1 (See Figure 2) just enough to allow it to slide freely in the groove.

3. Now adjust the thumb screw until the contact is resting directly on the fibre dead spot.

4. Tighten thumb screw securely, making sure that in tightening you do not move the contact off the fibre dead spot.

5. Check the above operation by pressing button No. 1 and note if there is any pointer movement. If there is no pointer movement, the contact is properly set. If the pointer moves, the contact was not set directly on fibre dead spot. In this case, the station should be re-tuned manually, and procedure No. 3 should be repeated.

6. Using the same procedure, set up the remaining five stations, in each case using the station of the next highest frequency and the thumb screw having the same number as the corresponding button. Never skip buttons, always set up in numerical order from button 1 to 6 from left to right.

7. After all the stations have been set up, insert the proper station call tabs (found with the instructions) into the recesses of their respective buttons.

8. To receive any of the six stations set up as described above turn receiver "ON" by rotating the left hand knob to the right until the switch clicks. Allow the tubes to heat up, press the buttons designated by the call letter of the station desired and hold the button in until the pointer stops moving and the station comes in. Adjust tone and volume. IMPORTANT: Be sure the band switch is in the position for Standard Broadcast Reception.

AUTOMATIC PUSH BUTTONS

MODELS 6C and 6G

A glance at Fig. 1 will show that there are eight (8) push buttons, six (6) of which are for automatic use; the adjusting screws are located directly below these push buttons. Fig. 1 also shows the tuning range or frequencies covered by each button.

The remaining two (2) push buttons located at the extreme right hand end of the push button plate are for short wave and manual tuning. See Fig. 1. Short wave, tuning is accomplished by pressing "short wave" button and tuning with the selector knob. By pressing "manual tuning" button, the automatic disconnects and the selector knob becomes active for the broadcast band.

1. Choose a station having a frequency within the range of button No. 1 (540 to 880 kc).

2. Press "Manual Tuning" button and tune this station conventionally by using the selector knob.

3. Now press button No. 1 and turn adjusting screw in either direction until the previously selected station is heard. Adjust the screw until the station is received with maximum volume.

4. Remove the call letters of the station from the call letter sheet furnished and insert in the window of the adjusting screw.

5. Repeat the above procedure for the remaining five (5) stations.
This receiver is designed to operate over two tuning ranges; the broadcast range which extends from 545 to 1720 kc (174.4 to 550.4 meters) and the international short wave band which extends from 5800 to 18,100 kc (16.5 to 51.7 meters). This latter range is the one which includes the 5 internationally assigned bands—the 16, 19, 25, 31 and 49 meter bands.

FOR TUNER DATA SEE INDEX

535 to 1730 kilocycles
5650 to 18100 Kilocycles

Six Tube AC Automatic Tuning

CONVENTIONAL ALIGNMENT, SEE SPECIAL SECTION VOL. VIII

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POWER SUPPLY
This receiver is designed to operate from a power supply main of 110-120 volts, 60 cycles alternating current (A.C.). Never plug into a DC outlet.

GENERAL DATA
The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 450, 600, 1400, 1730, 1800, 4000, 5600, 6000, 16000 and 18100 KC and an output meter to be connected across the primary or secondary of the output transformers. It is possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE
The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and packed, the broadcast band should always be the next procedure, after which, either or both of the Short Wave Bands may be aligned.

I.F. ALIGNMENT
With the wave switch in the broadcast band and the gang condenser set at minimum, adjust the test oscillator to 450 KC and connect the output to the grid of the first detector tube (6A7) through a .05 or .1 mfd. condenser. The ground on the test oscillator can be connected to the chassis ground if the test oscillator is not grounded to one side of the power line. In case one side is connected to ground, connect a large condenser from ground on the test oscillator to ground of the chassis. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT
Connect the output of the signal generator to the antenna lead (blue) through 0002 mfd. mica condenser. Set the gang condenser to minimum and the oscillator to 1730 KC and adjust the "oscillator trimmer" to receive this signal. Make no other adjustments at this frequency. Then set the generator to 1400 KC and tune in this signal by rotating the gang to 1400 on the dial. Adjust the "preselctor" and "antenna" trimmer to maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver. Note: approximately the same sensitivity should be noted at this point as was at 1400 KC. The signal strength may sometimes be improved by padding the circuits. This is done by slowly increasing or decreasing the oscillator paddling condenser and, at the same time, continuously tuning back and forth across the signal with the receiver until the maximum reading is obtained on the output meter. This adjustment may seem a little complicated but is the easiest way to adjust the oscillator to the preselctor of the R.F. section. Return to 1400 KC and crank up over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 KC.

POLICE BAND ALIGNMENT
The police band is adjusted by first replacing the 0002 dummy with a 400 ohm resistor and setting the generator to 5600 KC. With the gang set at minimum, adjust the "police oscillator trimmer" to receive this signal, then set the signal generator to 4000 KC and adjust "police antenna trimmer" to give maximum output. Next, set the oscillator to 1800 KC and "pad" the circuit of this frequency as described in the instructions for padding the broadcast circuits.

SHORT WAVE BAND ALIGNMENT
The short wave band is adjusted by setting the generator to 18,000 KC and with the gang at minimum, adjust the "short wave oscillator trimmer" to receive the signal. Set the generator at 16,000 KC, tune in the signal and adjust the "short wave antenna trimmer" to give maximum output. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and the oscillator coils, as well as the .004 mica paddling condenser, should be tested for defects. As sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.

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PROCEDURE FOR SETTING UP AUTOMATIC PUSH BUTTONS

A glance at Fig. 1 will show that there are eight (8) push buttons, six (6) of which are for automatic use; the actuating screws are located directly below these.

Fig. 1 also shows the tuning range of frequencies covered by each button.

The remaining two (2) push buttons, located at the extreme left hand end of the push button plate are for tone control.

1. Choose a station having a frequency within the range of button No. 1 (940 K.C. to 960 K.C.)

2. With the middle knob in the "broadcast" position, tune the station conventionally by using the selector knob.

3. Now turn the middle knob to the "automatic" position and press button No. 1 and turn the adjusting screw in either direction until the previously selected station is heard. Adjust the screw for maximum volume and sensitivity.

4. Remove the call letters of the station from the call letter sheet furnished and insert in the window of the adjusting screw. Insert "Med" and "Fasc" tabs in windows as shown in Fig. 1.

5. Repeat the above procedure for the remaining five (5) stations.

NOTE: It is advisable to retain the call letter sheet in case of station change later on.
This receiver is designed to operate over four tuning ranges; long wave 150 to 350 K.C. (2000 to 857 meters); broadcast 535 to 1730 K.C. (173 to 561 meters); medium short wave band 2350 to 7100 K.C. (127.6 to 42 meters); international short wave 7000 to 22,000 K.C. (13.6 to 42.8 meters), which includes five—5 internationally assigned bands—16, 19, 25, 31 and 49 meter bands.

PROCEDURE FOR SETTING UP AUTOMATIC PUSH BUTTONS See Model 8A.

ALIGNMENT

Align I F and Broadcast Bands using the procedure for Model 8A. Using this procedure align Med. S.W. and S.W. Band likewise, using the following frequencies; Med. S.W., 7000 KC Osc. Trimmer, 6000Kc Ant. Trimmer, 2500 Kc "pad". S.W., 22000 KC S.W. Osc Trimmer, 18000 KC S.W. Ant Trimmer, 8000 KC "pad". Align L.W. Band as below:

LONG WAVE BAND ALIGNMENT

The long wave band is adjusted by connecting the output of the signal generator through a .0002 Mfd. mica condenser to the blue antenna lead. Then set the gang to minimum and the generator to 360 KC and adjust the long wave oscillator trimmer to receive this signal. Then set the generator to 325 KC and adjust the long wave antenna trimmer to give maximum output. Next set generator to 160 KC and pad the circuits to maximum output. Owing to the nature of the long wave band, the trimmer and padding condensers react upon each other to quite a degree; consequently, several re-adjustments at the trimming and padding positions are required before the circuits are adjusted properly.

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CONTINENTAL RADIO & TELEV. CO.

MODEL 11A

Schematic, Socket Trimmers, Alignment

This receiver is designed to operate over three tuning ranges:

535 to 1730 Kilocycles, 1.7 to 5.6 and 5.6 to 18.1 Megacycles.

ALIGNMENT

SEE MODEL 8A.

Note: In aligning IF, align all six Trimmers.

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INSTRUCTIONS FOR ADJUSTMENT AND OPERATION OF THE ELECTRIC TUNER

It is very important to read the following instructions carefully before attempting to adjust the electric tuner. The electric tuner is made up of three integral units:

PUSH BUTTON SWITCH: The push button switch consists of eight (8) brown push buttons framed on either side by three (3) white push buttons.

SELECTOR MECHANISM: The selector mechanism is made up of the selector plate, eight (8) thumb screws, and the adjustment light bulb.

ELECTRIC MOTOR: The power for this tuner is provided by a small, efficient electric motor, of the brushless variety; it is fitted with an automatic clutch. The bearings and the oil retainer hold sufficient oil to lubricate the motor for a lifetime.

SETTING UP STATIONS: The first step to take in adjusting the electric push button device incorporated into this receiver is to choose eight (8) of the most powerful local stations which are free from excessive fading. Turn on the receiver (broadcast band) and press in the dial tuning button tune in the station of the lowest frequency using the station selector knob. Now hold the dial tuning button in and press in button number one (1). (See Figure 1.) Both buttons are now locked into place; a small pilot lamp located at the rear of the chassis will light up unless the thumb screw of the rear accidentally is not correctly set. Loosen thumb screw number one (see Figure 2) and slide back and forth until the light goes out. Now tighten the thumb screw; the adjustment for the first station is now complete. Out of the station call letter sheet supplied remove the proper station call disc and insert into the recess of button number one. Push one of the clear celluloid discs into the recess also, over the station call disc. Now release button number one by pressing the dial tuning button in as far as it will go.

With the white button still in, tune in the station of the next highest frequency and holding the white button, press in button number two. Both buttons are now locked into place. Loosen thumb screw number two (see Figure 2) and slide back and forth until a point is reached at which the pilot lamp in the rear goes out. Tighten the thumb screw. Insert the proper station call disc and celluloid disc into the window of button number two.

Follow this same procedure for the remaining stations, always choosing the station with the next highest frequency. After all eight (8) stations have been checked, check each adjustment by tuning in each station. Note: In the window above the white button, insert the word "OFF" found in the call letter sheet.

NOTE: In the recesses of the white push buttons insert the words found in the call letter sheet as shown in Figure 1.

HOW TO TUNE IN STATIONS USING THE ELECTRIC PUSH BUTTON TUNER

In order to operate the receiver satisfactorily—using the electric push button tuner, the dial tuning button must be in a released position, that is, all the way out. To tune in a station, merely press the selector button which designates the station desired. Note: Should the station fail to come in clearly, check the adjustment by following the adjustment procedure described in the paragraphs above.

To change from electric tuning to manual selecting, simply press in the dial tuning button. When the dial tuning button is in, the set may be tuned as a conventional receiver.

<table>
<thead>
<tr>
<th>RESISTORS</th>
<th>R25</th>
<th>Base Control 1.000,000 Ohms</th>
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<tbody>
<tr>
<td>R 1-P140</td>
<td>500 Ohms</td>
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<td>R 2-P1950</td>
<td>350 Ohms</td>
<td>100 Ohms</td>
</tr>
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<td>R 3-P1750</td>
<td>250,000 Ohms</td>
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<tr>
<td>R 4-P481</td>
<td>3,000 Ohms</td>
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<td>R 5-P673</td>
<td>10,000 Ohms</td>
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<tr>
<td>R 6-P417</td>
<td>50,000 Ohms</td>
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</tr>
<tr>
<td>R 7-P197</td>
<td>500,000 Ohms</td>
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</tr>
<tr>
<td>R 8-P137</td>
<td>1,000,000 Ohms</td>
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<td>R11-P2731</td>
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</tr>
<tr>
<td>R12-P278</td>
<td>600 Ohms</td>
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</tr>
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<td>R13-P1850</td>
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</tr>
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<td>R14-P417</td>
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</tr>
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<td>R15-P1950</td>
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<td>R16-P2220</td>
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<td>R17-P165</td>
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<td>R18-P278</td>
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<td>R19-P536</td>
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<td>R20-P286</td>
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<td>R21-P2322</td>
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<td>R22-P2167</td>
<td>10,000 Ohms</td>
<td>1 Ohm</td>
</tr>
<tr>
<td>R23-P139</td>
<td>250,000 Ohms</td>
<td>1/4 Ohm</td>
</tr>
<tr>
<td>R24</td>
<td>Volume Control 5,000 Ohms</td>
<td></td>
</tr>
</tbody>
</table>

PAPER CONDENSERS

| C 1-P148 | 0.05 Mfd. 200 V. |
| C 2-P278 | 0.01 Mfd. 200 V. |
| C 3-P278 | 0.01 Mfd. 200 V. |
| C 4-P536 | 0.01 Mfd. 200 V. |

BROADCAST BAND-PADDER (0.006—0.006 Mfd.)

ELECTRIC MOTOR

| MICA CONDENSERS |
| C 3-P183 | 0.04 Mfd. |
| C 7-P183 | 0.04 Mfd. |

| ELECTROLYTIC CONDENSERS |
| C 19-P183 | 0.01 Mfd. |
| C 17 | P183 | Dual Electrolyte |

| ADJUSTABLE CONDENSER |
| P1808A | Variable Condenser |
| P2783 | Gang Trimmer Strip |
| P1864 | Selector Fader Condensers |
| P2804 | Push Button Switch |
| P1934 | Pilot Light Socket |
| P1935 | Pilot Light Bulb |
| P2890 | Electric Motor |
| P2891 | Rubber Drive Belt |
| P2990 | Dial Scale |
| P2964 | Dial Pointer |
| G5490 | Lower Segment Adjustment Bracket and Contact |
| G5491 | Upper Segment Adjustment Bracket and Contact |
It will be noticed that the unit is provided with a sliding switch to change from phone pickup to a microphone. Before attempting to use the microphone, the switch should be set in the proper position.

The wireless record player unit is supplied from the factory, connected for use with a Bendix type 86-MC crystal microphone. As a rule, any type of microphone is suitable for the wireless recorder, however, the microphone should be used with a microphone which has a resistance of 500 ohms or less. A microphone with a resistance of 500 ohms or less is recommended.

For use with a telephone, the microphone is connected to the microphone jack of the record player. For use with a microphone, the microphone is connected to the microphone jack of the record player.

The high-impedance microphone is a type that is commonly used with the wireless recorder. Such microphones are supplied with the record player.

The low-impedance microphone is a type that is commonly used with the wireless recorder. Such microphones are supplied with the record player.

The low-impedance microphone is a type that is commonly used with the wireless recorder. Such microphones are supplied with the record player.

The low-impedance microphone is a type that is commonly used with the wireless recorder. Such microphones are supplied with the record player.

The low-impedance microphone is a type that is commonly used with the wireless recorder. Such microphones are supplied with the record player.
SPECIFICATIONS

This model combination consists of a four-tube T.R.F. radio receiver and Record Player in a console cabinet, designed for operation on electric circuits as specified on the Model and License Valve label.

Incorporated in the receiver design is a mechanical Push Button tuning system, an inverter circuit utilizing a cathode follower to match, A.V.C. beam power output and dynamic speaker.

The frequency range of the receiver is from 1125 to 560 kilocycles. The tubes used and their function are as follows: one 6G6C as F.Y. amplifier, one 6G6C as detector, A.V.C. and for audio amplifier; one 6V6 as beam power; and one 5Y3 as rectifier.

The bias for the 6G6C is obtained from the voltage drop across a 60 ohm resistor (item 211) and is correct used from the cathode to the grid of the 6G6C. The bias for the 6G6C is obtained from the drop across a 32 ohm resistor (item 23) and is corrected from the cathode of the 6G6C in the junction of items 23-32 ohms—24 (433 amp) and 26 (140 ohm). The 6V6 bias is obtained from the total voltage across items 23-32 ohm, 24 (32 ohm) and 26 (140 ohm) resistors which are in series with the speaker field in that the negative tap of the power supply. The bias is measured from the cathode to the junction of items 26-27 and speaker field.

CONNECTING OUTPUT METERS

Connect one terminal of the output meter to the plate and the other terminal to the screen of the 6Y5G output tube. Be sure the meter is connected from D.C. by connecting a condenser 1.5 mfd, or larger—and electrolytic—to series with one of the leads.

ALIGNMENT PROCEDURE

The signal generator high side should be connected to the antenna through a 2000 MHz condenser, after the antenna has been completely removed. The linear side of the signal generator is connected to chassis.

(a) Check to see that the speaker makes a complete trip back and forth.
(b) Set the signal generator to 1600 cycles/sec.
(c) Set the volume to maximum.
(d) Monitor condenser on the a.m. for maximum output.
(e) Check to see that set will tune to 1725 kilo-
cycles. It does not have to tune through a peak at this frequency.

Any large discrepancy in a trace will be compensated for by adjustment of the split end plates of the condenser gang.

Check all buttons to see if they need resetting.

SETTING THE PUSH BUTTONS

The push buttons may be quickly and accurately set from the front of the receiver. Insert a small screwdriver in the hole in the front of each push button to be set and loosen (DO NOT REMOVE) the set screw at the bottom of the hole.

To determine the frequency of the receiver, one of the broadcast stations whose call letters are to be tuned to the push buttons. By means of the station select knob, time is then accurately as possible, the station having the highest frequency. (kilocycles), that is for one complete 1.5 minute mark on the knob. Completely depress and hold the push button in that position, while you TIGHTLY SET THE SCREW.

The push button on the first station is now set for the first station. Follow with the same procedure, setting the other stations in the order of their frequency.

Cut the call letters of the stations selected from the line supplied with your receiver and place them into the openings in the front of the push button. Four pieces of -15 inch -3 inch supplied in a small envelope and should be snapped into place into the call letters to protect and hold them in place.

REPLACING DRIVE CORD

1. Remove the chassis from the cabinet.
2. Remove the brush drive cord, found from the plate of the cord harness. Remove the cord from the cabinet.
3. Reinstall the harness as shown in the diagram.

MODEL 450, 450S, 465 Phone, Chassis, Voltage, Alignment, Drive Data, Phone, Data, Inner

CROSLEY CORP.
SPECIFICATIONS

The receiver is a four-tube Tuned Radio Frequency receiver. It is designed to operate on A.C. circuits as specified on Model Sticker. Push Button tuning. Beam power output, 1.5 watts, and 12.6 volts. Resistors are all standard, 1% tolerance. Capacitors are all mica. The expense of this receiver is $25.00.

The frequency range is 800 to 1500 kc. The output power is 1.5 watts. The volume control is a 250,000 ohm, 1% tolerance, volume control. The volume control varies the bias on the 6BC and at the same time reduces the amount of signal to the antenna control. The bias for the 6BC is obtained from the voltage drop across 19.5 volt resistor and the 250,000 ohm resistor from the drop across 19.5 volt resistor.

This receiver incorporates a certain amount of fixed regeneration to improve selectivity and sensitivity. With a normal antenna the receiver is stable and the performance approaches that of a three gang T. R. P. receiver in spite of the fact that only a two gang crystal is used. However, with no antenna or a very small antenna the receiver will oscillate but this oscillation can readily be controlled by the volume control.

TUBES AND VOLTAGE LIMITS

The following table gives the functions of the tubes used, together with the voltage readings between the various connections. The voltage readings should be taken with a 1000 ohm per volt 250 volt voltmeter (except Element) with volume control full on and no signal input. The Element voltages should be measured with an accurate low range voltmeter. Voltage limits may vary from 10% of values given.

NOTE: The Red and Black terminals on the phone terminal board supply the current for the phone motor, therefore HAVE 110 VOLTS ACROSS THEM WHEN THE RECEIVER IS IN OPERATING POSITION TO BE CAREFUL NOT TO TOUCH OR SHORT CIRCUIT THEM WHILE WORKING ON THE CIRCUIT.

CONNECTING OUTPUT METERS

Connect the one terminal of the output meter to the plate and the other terminal to the screen of the 656 AC output tube. Be sure the output meter is protected from D.C. by connecting a condenser (1 volt, 100 microfarads). When the condenser is shorted out the meter will not indicate a reading.

ALIGNMENT PROCEDURE

The chassis of this receiver is mounted on one side of the power line. Therefore when using an A.C. saged signal generator for alignment the following precautions should be taken:

(a) Connect the output lead of the signal generator through a 5000-ohm condenser to the antenna lead on the receiver (after the antenna has been completely removed). The ground lead of the generator should be connected to the 5000-ohm condenser to the chassis.

(b) Open the gang condenser (a) of the way.

(c) Switch the gang condenser to 1725 kilocycles.

(d) Adjust the trimmer condenser on the gang until 1725 kilocycles is heard. This gang does not have to tune through this signal. Set the generator to 1400 kc. Tune the set in the 1400 kc. signal. Leave the trimmer out of the gang until no further improvement can be noticed on the output meter.

NOTE: Always use the lowest signal generator output that will give a reasonable indication on the output meter.

Keep the two grid leads as far as possible from each other.

If the receiver has been realigned it may be necessary to readjust the setting of the push buttons.

SETTING THE PUSH BUTTONS

The push buttons may be adjusted and accurately set from the front of the receiver. Insert a small screwdriver in the hole in the front of each push button to be set and loosen. DO NOT REMOVE THE SET SCREW AT THE BOTTOM OF THE BUSHING. Determine the favorite broadcasting stations whose call letters are to be placed in the push buttons. Remove of station selector knob, inside A, ACQUICKLY AS POSSIBLE. The station having the highest frequency (kilocycles) is the one nearest the 100 marking on the knob. Completely depress and hold the right hand push button in that position, while you SECURELY TIGHTEN THE SET SCREW. The push button system is now set for the first station. Follow through with the same procedure, setting the other stations in the order of their frequency (kilocycles).

The call letters of the stations selected, from the list supplied with your receiver will be filled in the openings in the front of the push buttons. Four pieces of clear celluloid are supplied in a small envelope and should be snapped into place over the call letters to protect and hold them in place.

RECORD PLAYER ASSEMBLY

The record player assembly consists of a small self-starting motor, phonograph switch, magnetic pickup and a separate volume control mounted on a metal base plate.

Connections:

A three lead cable is used for connecting the phone unit to the radio receiver. The green lead is the high side of the magnetic pickup and is connected to the 656 plate, through a 25,000 ohm, 100 V. condenser. The red lead is the high side of the 110 volt circuit for the motor. The black lead is connected to the receiver chassis and is the low side of the pickup and motor.

Operation:

Place turntable in position by backing the rim over the rubber friction drive on the motor shaft, then carefully placing center hole over round guide shaft. Be sure that the table is all the way down on the spindle and that the friction drive is riding full on the inner surface of the rim.

©John F. Rider, Publisher
Power Output approximately .5 Watt.

"A" Battery Drain approximately .25 Ampere at 1.5 Volts.

"B" Battery Drain approximately 9 Milliamperes at 90 Volts.

*Measured at No. 8 Socket Lug and Chassis.
MODEL 458 (Battery Vanity)

SPECIFICATIONS

The Crosley Model 458 radio is a four-tube superheterodyne receiver designed for operation from batteries.

The method of connecting the battery cable to the batteries is shown on the Wiring Diagram. The batteries required are: one 1.5 volt "A" (EVEREADY NO. 740 or equivalent) or 3 or 4 No. 6 DRY CELLS in parallel, and two plug-in type 45 volt "B" batteries.

TUBES AND VOLTAGE LIMITS

The table gives the function of the tubes used, together with the voltage readings between the tube socket contacts and the negative side of the "A" battery circuit. Voltage readings should be taken with a 1000 ohm per volt, 250 volt voltmeter (except filaments) with receiver in operating condition and the volume control full on and no signal input. The filament voltages should be measured with an accurate low range DC voltmeter (approximately 0 to 10 volts). Voltage limits may vary plus or minus 10% of values given.

ALIGNMENT PROCEDURE

All the circuits in this receiver are very accurately adjusted at the factory and normally should need no further adjustment. However, if it is definitely known that an adjustment is necessary, the circuits can best be properly aligned with the use of a modulated signal generator and an output meter.

CONNECTING OUTPUT METER

Connect the output meter across the "P" and "S" terminals of the LC5G output tube. Be certain that the meter is protected from DC by connecting a condenser of 1 mfd. or larger (not electrolytic) in series with one of the leads.

1. Tuning i-f Amplifier To 455 Kilocycles.

(a) Connect the output of the signal generator through a 0.02 mfd. condenser to the top cap of the 1ATG tube, leaving the tube’s grid clip in place. Connect the ground lead from the signal generator to the "GND" terminal of the receiver.

KEEP THE GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SCREEN GRID TUBES.

Items listed in this column refer to parts in Diagrams.

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C 45433A</td>
<td>Battery Cable</td>
</tr>
<tr>
<td>2</td>
<td>G178-33000</td>
<td>Antenna Coil</td>
</tr>
<tr>
<td>3</td>
<td>0.047</td>
<td>Condenser Capacity Coupling</td>
</tr>
<tr>
<td>4</td>
<td>W -28621</td>
<td>Condenser, 0.02 Mfd., 200 V. Paper</td>
</tr>
<tr>
<td>5</td>
<td>G66 -33001</td>
<td>Var. Condenser, Antenna Section</td>
</tr>
<tr>
<td>6</td>
<td>G2 -32000</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>7</td>
<td>W -28621</td>
<td>Condenser, 0.02 Mfd., 200 V. Paper</td>
</tr>
<tr>
<td>8</td>
<td>G3 -30640</td>
<td>Capacity Condenser Coupling</td>
</tr>
<tr>
<td>9</td>
<td>W -45738</td>
<td>Condenser, 16 Mfd., 125 V. Elect.</td>
</tr>
<tr>
<td>10</td>
<td>G3 -41882</td>
<td>Trimmer Condenser</td>
</tr>
<tr>
<td>11</td>
<td>G4 -30640</td>
<td>Trimmer Condenser, 0.0025 Mfd. Molyd.</td>
</tr>
<tr>
<td>12</td>
<td>W -38621</td>
<td>Condenser, 0.02 Mfd., 200 V. Paper</td>
</tr>
<tr>
<td>13</td>
<td>G5 -30640</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>14</td>
<td>W -28621</td>
<td>Condenser, 0.02 Mfd., 200 V. Paper</td>
</tr>
<tr>
<td>15</td>
<td>G6 -30640</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>16</td>
<td>W -38621</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>17</td>
<td>G6 -30640</td>
<td>Condenser, 0.0025 Mfd. Molyd.</td>
</tr>
<tr>
<td>18</td>
<td>W -28621</td>
<td>Condenser, 0.02 Mfd., 200 V. Paper</td>
</tr>
<tr>
<td>19</td>
<td>G4 -30640</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>20</td>
<td>W -38621</td>
<td>Condenser, 0.001 Mfd. Molyd.</td>
</tr>
<tr>
<td>21</td>
<td>G5 -30640</td>
<td>Condenser, 0.0001 Mfd. Molyd.</td>
</tr>
<tr>
<td>22</td>
<td>W -38621</td>
<td>Condenser, 0.0001 Mfd. Molyd.</td>
</tr>
<tr>
<td>23</td>
<td>G6 -30640</td>
<td>Condenser, 0.0001 Mfd. Molyd.</td>
</tr>
<tr>
<td>24</td>
<td>W -38621</td>
<td>Condenser, 0.0001 Mfd. Molyd.</td>
</tr>
<tr>
<td>25</td>
<td>G7 -30640</td>
<td>Condenser, 0.00001 Mfd. Molyd.</td>
</tr>
<tr>
<td>26</td>
<td>W -38621</td>
<td>Condenser, 0.00001 Mfd. Molyd.</td>
</tr>
<tr>
<td>27</td>
<td>G8 -30640</td>
<td>Condenser, 0.000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>28</td>
<td>W -38621</td>
<td>Condenser, 0.000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>29</td>
<td>G9 -30640</td>
<td>Condenser, 0.0000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>30</td>
<td>W -38621</td>
<td>Condenser, 0.0000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>31</td>
<td>G10 -30640</td>
<td>Condenser, 0.00000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>32</td>
<td>W -38621</td>
<td>Condenser, 0.00000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>33</td>
<td>G11 -30640</td>
<td>Condenser, 0.000000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>34</td>
<td>W -38621</td>
<td>Condenser, 0.000000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>35</td>
<td>G12 -30640</td>
<td>Condenser, 0.0000000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>36</td>
<td>W -38621</td>
<td>Condenser, 0.0000000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>37</td>
<td>G13 -30640</td>
<td>Condenser, 0.00000000001 Mfd. Molyd.</td>
</tr>
<tr>
<td>38</td>
<td>W -38621</td>
<td>Condenser, 0.00000000001 Mfd. Molyd.</td>
</tr>
</tbody>
</table>

(b) Set the station selector so that the tuning condenser plates are completely in mesh and turn the volume control knob to the right (ON).

(c) Set the signal generator to 455 kilocycles.

(d) Adjust both 2nd i-f trimpers located (through rear of chassis flange) for maximum reading on the output meter. (Fig. 3).

(e) Adjust both trimmers located on the 1st i-f transformer (right end) for maximum output. (Fig. 2).

(f) Check operations (d) and (e) for more accurate adjustments.

ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE OUTPUT METER READING.


When aligning the R-F amplifier the output lead from the signal generator should be connected through 2.002 mfd. condenser to the "ANT" terminal of the receiver.

(a) Set the signal generator to 1725 kilocycles.

(b) Open the condenser gang all the way.

(c) Adjust the "OSC" trimmer condenser for maximum output.

(d) Set the signal generator to 1400 kilocycles.

(e) Tune the receiver to the generator signal for maximum output (approximately 140 on the dial).

(f) Adjust the "ANT" trimmer condenser for maximum output. DO NOT READJUST THE "OSC" TRIMMER AT 1400 KILOCYCLES.

(g) Repeat operations (e) and (f) alternately until no further improvement in output can be obtained.

If any of the circuits have been re-adjusted it may be necessary to reset the push buttons.

SETTING THE PUSH BUTTONS

With a small screwdriver or pen knife remove celluloid cover and the call letters. Insert screwdriver in the hole in the front of the button and loosen the set screw a turn or two. Wind the tuning knob, tune-in as ACCURATELY AS POSSIBLE the station for which the button is to be set. Then push the button all the way down and while you hold it in that position SECURELY TIGHTEN the set screw. Replace the call letter and call letter cover. Use same procedure in resetting or adjusting the rest of the push buttons.
DECEMBER, 1937

REFRIGERATOR RADIO, Chassis No. 507

MODEL 507-20-40 455 Kc. I.F.

TUBE SOCKET VOLTAGE READINGS

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>H</th>
<th>P</th>
<th>S</th>
<th>K</th>
<th>G</th>
<th>Gs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G</td>
<td>Oscillator-Modulator</td>
<td>6.3</td>
<td>160</td>
<td>115</td>
<td>0</td>
<td>-1.2</td>
<td>160</td>
</tr>
<tr>
<td>6U7G</td>
<td>I-F Amplifier</td>
<td>6.3</td>
<td>160</td>
<td>115</td>
<td>0</td>
<td>-1.2</td>
<td>160</td>
</tr>
<tr>
<td>6Q7G</td>
<td>Diode Det &amp; A-F Amplifier</td>
<td>6.3</td>
<td>80</td>
<td>115</td>
<td>2.5</td>
<td>-2.5</td>
<td>111</td>
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<tr>
<td>6K6G</td>
<td>Output</td>
<td>6.3</td>
<td>160</td>
<td>160</td>
<td>0</td>
<td>-5.0</td>
<td>111</td>
</tr>
<tr>
<td>5Y3</td>
<td>Rectifier</td>
<td>5.0</td>
<td></td>
<td>225</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power output approximately 2 watts.
Power consumption approximately 40 watts at 117.5 volts.
Voltage drop across speaker field 36 volts.
**SPECIFICATIONS**

This model Crosley radio chassis is especially designed for installation in Crosley Shelfador electric refrigerators. It should be operated only from an **ALTERNATING CURRENT** power supply as specified on the rear of the receiver.

The tuning range of the receiver is from 540 to 1725 kilocycles or 555 to 173 metres.

**TUBES AND VOLTAGE LIMITS**

The following table gives the functions of the tubes used, together with the voltage readings between tube socket contacts and chassis. Voltage readings taken with a 1000 ohm per volt, 500 volt voltmeter (except filaments) with receiver in operating condition and no signal input. The filament voltages should be measured with an accurate low range A. C. voltmeter (approximately 0.10 volts). Voltage limits may vary plus or minus 10% of values given.
TUBES AND VOLTAGE LIMITS

The following table gives the functions of the tubes used, together with the voltage readings between the tube socket contacts and chassis. Voltage readings should be taken with a 1000 ohm per volt, 250 volt voltmeter (except filaments) with volume control fully on and no signal input. The filament voltages should be measured with an accurate low range voltmeter. Voltage limits may vary plus or minus 10% of value given.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>H</th>
<th>P</th>
<th>S</th>
<th>K</th>
<th>Su</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7GT</td>
<td>R F Amplifier</td>
<td>6.3</td>
<td>97</td>
<td>98</td>
<td>2.5-25</td>
<td>2.5-25</td>
<td>—</td>
</tr>
<tr>
<td>617GT</td>
<td>Detector</td>
<td>6.3</td>
<td>20</td>
<td>10</td>
<td>7</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>251KGT</td>
<td>Output</td>
<td>85</td>
<td>98</td>
<td>6</td>
<td>125</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>25ZKGT</td>
<td>Rectifier</td>
<td>2.1</td>
<td>26</td>
<td>125</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>W-46416</td>
<td>Ballast</td>
<td>55 Volts A.C.</td>
<td>125</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Power output approximately 2 watts.
Power consumption at 117.5 volts line 45 watts (A.C.).
All readings except filaments will be approximately 10% lower on 117.5 D.C.
CROSLEY CORP.

CONNECTING OUTPUT METER

Connect the one terminal of the output meter to the plate and the other terminal to the screen of the 25L6-G Output tube. Be sure the output meter is protected from D.C. by connecting a condenser (.1 mfd. or larger —NOT electrolytic) in series with one of the leads.

ALIGNMENT PROCEDURE

(a) Connect the output lead of the signal generator through a .0001 Mf. condenser to the antenna lead on the receiver. The ground lead of the generator should be connected through a .001 Mf. condenser to the chassis.

(b) Open the gang condenser all the way.

(c) Set the generator to 1725 Kilocycles.

(d) Adjust the trimmer condensers on the gang until the 1725 Kc signal is heard. The gang does not have to tune through this signal.

(e) Set the generator to 1400 Kc.

(f) Tune the set to the 1400 Kc. signal, then alternately adjust the trimmers on the gang until no further improvement can be noticed on the output meter.

NOTE: Always use the lowest signal generator output that will give a reasonable indication on the output meter.

Keep the two grid leads as far as possible from each other.

PARTS LIST — MODEL 568

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>G182—32000</td>
<td>Antenna Coil</td>
</tr>
<tr>
<td>2</td>
<td>G102—32001</td>
<td>R-F. Coil</td>
</tr>
<tr>
<td>3</td>
<td>G3—34002</td>
<td>Condenser, .0005 Mf. Molded</td>
</tr>
<tr>
<td>4</td>
<td>W—457088</td>
<td>Condenser, .02 Mf. 160 V.</td>
</tr>
<tr>
<td>5</td>
<td>G60—33001</td>
<td>Section Gang Condenser</td>
</tr>
<tr>
<td>D</td>
<td>46418</td>
<td>Dial Face</td>
</tr>
<tr>
<td>W</td>
<td>46427</td>
<td>Pointer</td>
</tr>
<tr>
<td>W</td>
<td>41367</td>
<td>Pointer Mtg. Screw</td>
</tr>
<tr>
<td>W</td>
<td>44959</td>
<td>Drive Shaft</td>
</tr>
<tr>
<td>W</td>
<td>44808B</td>
<td>Bracket—Shaft Mtg.</td>
</tr>
<tr>
<td>W</td>
<td>43549</td>
<td>&quot;C&quot; Washer—Shaft Mtg.</td>
</tr>
<tr>
<td>G10</td>
<td>41362</td>
<td>Drive Cord—8 1/2 Inches</td>
</tr>
<tr>
<td>W</td>
<td>44959</td>
<td>Spring—Cord Tension</td>
</tr>
<tr>
<td>W</td>
<td>46854A</td>
<td>Dial Support Brkt.</td>
</tr>
<tr>
<td>7</td>
<td>W—457029</td>
<td>Condenser, .05 Mf. 120 V.</td>
</tr>
<tr>
<td>8</td>
<td>W—457088</td>
<td>Condenser, .02 Mf. 160 V.</td>
</tr>
<tr>
<td>9</td>
<td>W—50105</td>
<td>Condenser, 1 Mf. 160 V.</td>
</tr>
<tr>
<td>10</td>
<td>W—457088</td>
<td>Condenser, .02 Mf. 160 V.</td>
</tr>
<tr>
<td>11</td>
<td>W—46368</td>
<td>Condenser, 10 Mf. 125 V.</td>
</tr>
<tr>
<td>12</td>
<td>W—457088</td>
<td>Condenser, .02 Mf. 160 V.</td>
</tr>
<tr>
<td>13</td>
<td>B—45784</td>
<td>Power Cord and Plug</td>
</tr>
<tr>
<td>14</td>
<td>24500</td>
<td>Resistor, 25,000 Ohm 15W.</td>
</tr>
<tr>
<td>15</td>
<td>37583</td>
<td>Resistor, 2.5 Megohm 15W.</td>
</tr>
<tr>
<td>16</td>
<td>23785</td>
<td>Resistor, 500,000 Ohm 15W.</td>
</tr>
<tr>
<td>17</td>
<td>23785</td>
<td>Resistor, 500,000 Ohm 15W.</td>
</tr>
<tr>
<td>18</td>
<td>W—45966</td>
<td>Resistor, 110 Ohm 1/2W.</td>
</tr>
</tbody>
</table>

19 | 284-BL+"B" | Speaker—Spec. No. 40WA3 |
20 to 24 | 284-BL+"H" | Field Coil—450 Ohm 60 M. A. |
25 | 41309 | Speaker—Spec. No. 55308M4 |
26Z | 46477 | Socket—8 Prong Octal |
26Y | 46477 | Tube Shield |
G176 | 292535 | Output Transformer |
20 to 24 | 46411 | Volume Control |
25 | 46416 | Line Switch |
B | 46880 | Ballast Tube |
8FC | 45324 | Power Cable for 220 V. (Resistor) |
W | 45324 | Cabinet—Mottled Brown |
W | 45305A | Knob—2 Req. |
G3 | 45281 | Cabinet Back |
W | 46121 | Cabinet—Ivory |
W | 46437 | Cabinet Back |
W | 46896 | Cabinet Ass'y—8FC—Mottled Brown |
W | 44763 | Single Shipping Carton |

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TUBES AND VOLTAGE LIMITS

The following table gives the functions of the tubes used, together with the voltage readings between the tube socket contacts, and chassis. Voltage readings should be taken with a 1000 ohm per volt, 350 volt voltmeter (except filament) with the volume control full "ON" and no signal input. The filament voltages should be measured with an accurate low range voltmeter. Voltage limits may vary plus or minus 10% of values given.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6N7</td>
<td>Screen</td>
<td>250V</td>
</tr>
<tr>
<td>6L6</td>
<td>Plate</td>
<td>400V</td>
</tr>
<tr>
<td>6L6</td>
<td>Plate</td>
<td>150V</td>
</tr>
<tr>
<td>6L6</td>
<td>Plate</td>
<td>125V</td>
</tr>
<tr>
<td>6L6</td>
<td>Plate</td>
<td>100V</td>
</tr>
<tr>
<td>6L6</td>
<td>Plate</td>
<td>75V</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

The following table gives the specifications for the unit which checked into the serial number, 12108191. All specifications are approximate.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Input</td>
<td>110V</td>
</tr>
<tr>
<td>Frequency</td>
<td>60Hz</td>
</tr>
<tr>
<td>Power Output</td>
<td>10W</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>10μV</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>10dB</td>
</tr>
</tbody>
</table>

ALIGNMENT PROCEDURE

All adjustments are made at the socket terminals of the tubes, and all adjustments are made in the following order:

1. Check the input coupling capacitor (C1) for proper alignment.
2. Adjust the oscillator (Q1) for proper operation.
3. Adjust the amplifier (Q2) for proper operation.
4. Adjust the detector (Q3) for proper operation.
5. Adjust the limiter (Q4) for proper operation.
6. Adjust the power amplifier (Q5) for proper operation.

CONNECTING OUTPUT METERS

Connect one terminal of the output meter to the plate of the tube, and connect the other terminal to the appropriate socket terminal. Be certain that the meter is protected from the high voltage in the circuit.

TRADING THE TP AMPILTER AT 500 Kilocycles

(a) Connect the output of the TP amplifier to the grid of the first stage to be tested.
(b) Connect the output of the second stage to the grid of the second stage to be tested.
(c) Repeat for each stage.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.

ADJUSTING THE AMPILTER AT 500 Kilocycles

(a) Adjust the TP AMPILTER for maximum output.
(b) Adjust the TP AMPILTER for minimum output.
(c) Adjust the TP AMPILTER for the correct operating point.
**Model 588, Super Vanity Flower**

588DC, 588DD, 588DE

**Schematic, Socket, Trimmers**

**Alignment, Voltage, Chassis**

---

**Tube Socket Voltage Readings**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>H</th>
<th>P</th>
<th>S</th>
<th>Su</th>
<th>K</th>
<th>Go</th>
<th>Ga</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8-GT</td>
<td>Oscillator-Modulator</td>
<td>6.3</td>
<td>105</td>
<td>68</td>
<td>Su</td>
<td>-10</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>6K7-GT</td>
<td>1-F Amplifier</td>
<td>6.3</td>
<td>105</td>
<td>68</td>
<td>Su</td>
<td>-10</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>6Q7-GT</td>
<td>Det. AYC, A-F Amplifier</td>
<td>6.3</td>
<td>42</td>
<td></td>
<td>Su</td>
<td>-10</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>25L6-GT</td>
<td>Output</td>
<td>25.1</td>
<td>36</td>
<td>105</td>
<td></td>
<td>-10</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>25Z6-GT</td>
<td>Rectifier</td>
<td>25.1</td>
<td>117.5 A.C.</td>
<td></td>
<td>-10</td>
<td>105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power output approximately 2 watts. Power consumption approximately 47 watts. Voltage drop across speaker field 27 volts. All voltages except filaments will be approximately 10% lower if measured on 117.5 volts DC power supply.

---

**Specifications**

This model Crosley radio is designed for operation on 100 to 125 volt electric circuits, either AC or DC. The tuning range is from 540 to 1725 kilocycles (555.4 to 173 meters).

**Chassis No. 588**

426 K.C. L.F.

**Model... 588**

(January 1939)

4 Lame grid cap of 6A8GT in place.
Power output approximately 2 watts.
Power consumption at 117.5 volts line 47 watts (A.C.).
All readings except filaments will be approximately 15% lower on 117.5 D.C.

FIG. 1—WIRING DIAGRAM

TUBES AND VOLTAGE LIMITS
The table gives the functions of the tubes used, together with the voltage readings between the tube socket contacts and chassis. Voltage readings should be taken with a 1000 ohm per volt, 250 volt voltmeter (except filaments) with volume control full on and no signal input. The filament voltages should be measured with an accurate low range voltmeter. Voltage limits may vary plus or minus 10% of values given.
**SPECIFICATIONS**

These model Crosley radios are designed for operation on 100 to 120 volt electric circuits, either AC or DC. The tube chart is included on page 56 of the operating instruction manual. Model 557 is identical to Model 597 except that it has an illuminated dial and a different cabinet.

**CIRCUIT DESCRIPTION**

Five metal tubes are employed in a superheterodyne circuit which consists of a combination oscillator-modulator tube, 455 kilocycle I-F amplifier, parallel output and power supply. The 6Q7 tube serves as the detector and 6A8 amplifier and supplies the voltage to the grid of the 6A8 tube. The bias voltage for the 6A8 and 6Q7 tubes is obtained across a 25 ohm resister, item 33. The bias for the 6Q7 and 2A6 tubes is obtained across the speaker field. A resistance type power supply used is used to provide the proper heater voltage to the tubes. The filament of the tubes are wired in series. A 250,000 ohm, 1/4 watt, 5% resistor across the power supply leads to reduced electrical interference from the filament.

**TUBES AND VOLTAGE LIMITS**

The following table gives the functions of the tubes used together with the voltage readings between the tube socket contacts and chassis. Voltage readings should be taken with 1000 ohms per volt 250 volt volt-meter (except filament) with the volume control full "ON" and no signal input. The filament voltages should be measured with an accurate low range volt-meter. When measured on a 117.5 volt AC line voltage may vary plus or minus 10% of the values given.

**TUBE SOCKET VOLTAGE READINGS**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>M</th>
<th>P</th>
<th>S</th>
<th>E</th>
<th>Qe</th>
<th>Qe</th>
</tr>
</thead>
<tbody>
<tr>
<td>6Q7</td>
<td>Detector</td>
<td>93</td>
<td>100</td>
<td>93</td>
<td>93</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>6A8</td>
<td>F.A. Amp.</td>
<td>93</td>
<td>100</td>
<td>89</td>
<td>93</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>61A8</td>
<td>A.C. X-F Amplifier</td>
<td>93</td>
<td>100</td>
<td>89</td>
<td>93</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>2A6</td>
<td>Output</td>
<td>63.0</td>
<td>100</td>
<td>106</td>
<td>63.0</td>
<td>106</td>
<td>110</td>
</tr>
<tr>
<td>56/56</td>
<td>Rectifier</td>
<td>63.0</td>
<td>100</td>
<td>106</td>
<td>63.0</td>
<td>106</td>
<td>110</td>
</tr>
</tbody>
</table>

**ALIGNMENT PROCEDURE**

The chaos of this receiver is connected to one side of the power supply. With all test equipment thoroughly insulated, order to power supply will not become short circuited while adjusting the receiver.

**CONNECTING OUTPUT METER**

Connect one terminal of the output meter to the plate and the other terminal to the screen of the 2A6 output tube. Be certain that the meter is protected from DC by connecting a condenser (1 mfd or larger) in series with one of the leads.

**Tuning The I-F Amplifier To 455 Kilocycles.**

(a) Disconnect the antenna wire from the receiver and connect the output of the signal generator through a 50 mfd condenser to the antenna connection on the receiver. Do not use a ground reference line; the signal generator unless it is found to be absolutely necessary. If it is found to be necessary, a small condenser (approximately .001 mfd) should be connected in series with the ground terminal of the signal generator and the receiver chassis. KEEP THE GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SCREENED GRID TUBES.

(b) Set the static selector so that the plates of the condenser are completely out of mesh and turn the volume control to the right (ON).

(c) Set the signal generator to 455 kilocycles.

(d) Adjust the 2A6 I-F trimmer condenser, item 14, located beneath the edge of speaker field, for maximum reading on the output meter.

(e) Adjust the last I-F trimmer condenser located on back chassis of the case, for maximum output.

(f) Repeat operations (d) and (e) for more accurate adjustments. ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE READING IN THE OUTPUT METER.

**Aligning The X-F Amplifier.**

(a) Set the signal generator to 1725 kilocycles.

(b) With the condenser gang turned to the minimum capacity position, adjust the trimmer condenser located on the "ANT" section of the gang so that the 1725 kilocycle signal is heard. It is not necessary that the receiver tune through this signal.

(c) Set the signal generator to 1400 kilocycles.

(d) Tune in the 1400 kilocycle signal in the region of 140 on the dial for maximum output.

(e) Adjust the trimmer condenser located on the "ANT" section of the gang for maximum output.

(f) Repeat operations (d) and (e) for more accurate adjustments.

**WAVE TRAP**

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from code stations which operate on a frequency of approximately 455 kilocycles. This assembly is located on the underside of the chassis and consists of a coil and a fixed condenser as illustrated by dotted lines in the Wiring Diagram.
MODEL -- 648

SPECIFICATIONS
This model Crosley radio is designed for operation on 100 to 125 volt electric circuits, either AC or DC. The tuning range is from 540 to 1725 kilocycles (555 to 173 metres).

CIRCUIT DESCRIPTION
Five Octal Glass tubes and one metal Ballast tube are employed in a superheterodyne circuit which consists of a combination oscillator-modulator tube, 455 kilocycle I-F amplifier, Beam Power output and power supply. The 6Q7 tube serves as the detector and 1st A-F amplifier and supplies AVC voltage to the grid of the 6A8-G and 6U7-G tubes. The bias for the 25L6-G tube is obtained from item 25 a 140 ohm resistor. A

FIG. 1—WIRING DIAGRAM
Ballast tube is used to provide the proper heater voltage to the tubes. The filaments of the tubes are wired in series. A .05 mfd. condenser, item 12, is connected across the power supply loads to reduce electrical interference from that source.

TUBES AND VOLTAGE LIMITS
The following table gives the functions of the tubes used, together with the voltage readings between the tube socket contacts and chassis. Voltage readings should be taken with a 1000 ohm per volt, 250 volt voltmeter (except filaments) with the volume control full "ON" and no signal input. The filament voltages should be measured with an accurate low range voltmeter. When measured on a 117.5 volt AC line voltage limits may vary plus or minus 10% of the values given.

CHASSIS NO. 648
(Super Sextette)

JANUARY, 1939

50 CYCLE POWER TRANSFORMER ADJUSTMENT

 Receivers equipped with a 50 cycle power transformer have a "high" and "low" voltage tap on the underside of the chassis. The "high" voltage lead (BLACK) and the "low" voltage lead (ORANGE) are connected to a terminal strip near the transformer.

The voltage range of the "low" tap of the 95-130 volt transformer is from 95 to 112½ volts and of the "high" tap is from 112½ to 130 volts.

The accompanying illustration shows the connections for changing from high to low or low to high line voltage. Note the "jumper" wire which is attached to the terminal at which one side of the power cord is attached. The other end of this jumper wire should be connected to the ORANGE or BLACK lead of the transformer primary, according to the line voltage the receiver is to be used on.

NOTE: Any change made in the power supply circuit of the receiver should be plainly stamped or otherwise permanently recorded on the rear of the chassis.

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ALIGNMENT PROCEDURE
All the circuits in this receiver are very accurately adjusted at the factory and normally should not need further adjustment. However, if it is definitely known that an adjustment is necessary the circuits may be properly aligned with the use of a calibrated signal generator and an output meter.

CONNECTING OUTPUT METER
Connect the output meter to the plate and screen of the G465 output tube. Be certain that the meter is shielded from D.C. by connecting a condenser (4 mfd. 500 volt.—electrolytic) in series with the leads.

Tuning the 1-F Amplifier to 465 Kilocycles.
(a) Connect the output lead of the signal generator to the grid terminal (G) of the condenser on top of the 1-F transformer to maximum output.
(b) Adjust the signal generator to the maximum reading on the output meter. Then adjust the 1-F transformer for maximum output.

ALIGNING THE B-F AMPLIFIER
When aligning the B-F amplifier, the output level from the signal generator is connected to the antenna (A1) terminal of the receiver. For the broadcast band a 200 mfd. condenser should be connected between the output and signal generator to ground terminal (G) of the receiver. The generator should be so adjusted that the output is approximately 1000 volts. It is advisable to use a signal generator having a low frequency output. If a 465-KC signal generator is not available, the following technique may be used:

1. Connect the output meter to the plate and screen of the G465 output tube. Be certain that the meter is shielded from D.C. by connecting a condenser (4 mfd. 500 volt.—electrolytic) in series with the leads.
2. Connect the signal generator to the grid terminal (G) of the condenser on top of the 1-F transformer to maximum output.
3. Adjust the signal generator to the maximum reading on the output meter. Then adjust the 1-F transformer for maximum output.
4. Adjust the signal generator on top of the 1-F transformer for maximum output.
5. Adjust the signal generator on top of the 1-F transformer for maximum output.

ALWAYS USE THE LOWEST SIGNAL GENERATOR LEVEL THAT WILL GIVE A REASONABLE READING ON THE OUTPUT METTER.
Fig. 3 Bottom View Model 718

SPECIFICATIONS
This model Crosley is a compact seven-tube superhetrodyne receiver designed for operation on ALTERNATING CURRENT as specified on the Model and License sticker:

540-1726 Kilocycles or 555-1714 Meters (American and some Poliaze)
372-1873 Megacycles or 326-154 Meters (Foreign)

The tubes used and their functions are as follows:

one 6J5G as Oscillator-Modulator, one 6U7G as I-F Amplifier, one 6FS6 as Detector, A. V. C. Diode, one 6F6G as first Audio Amplifier, one 6V6G as Beam Power output, one SY3-G as Rectifier and one 6U5 as eye Tuning Indicator.

The initial bias for the 6J5G and 6U7G (drop across item 34 + 60 ohm resistor) is measured from chassis to the low end of the volume control. For the 6F6G, (drop across item 35 + 32 ohm resistor) is measured from the low end of the 10 megohm resistor to the cathode of the 6F6G. The bias for the 6V6G is obtained from the drop across items 34, 35, 32, 60 ohms, 32 ohms, 100 ohms respectively, measured from the junction of item 32 and speaker field to chassis. The speaker field is in the negative leg of the power supply. Item 51Y is a 5 megohm resistor assembled in the socket of the 6U5.

TUBES AND VOLTAGE LIMITS
The following table gives the functions of the tubes used, together with the voltage readings between the tube socket, contacts and chassis. Voltage readings taken with a 1000 ohm per volt, 500 volt voltmeter except for filament readings with receiver in operating condition and no signal input. The filament voltages should be measured with an accurate low range A-C voltmeter. Voltage limits may vary plus or minus 10% of values given.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>H</th>
<th>F</th>
<th>S</th>
<th>G</th>
<th>Ga</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>6J5G</td>
<td>Oscillator-Modulator</td>
<td>6.3</td>
<td>172</td>
<td>88</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6U7G</td>
<td>I-F Amplifier</td>
<td>6.3</td>
<td>172</td>
<td>88</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6FS6</td>
<td>Detector A.V.C. Diode</td>
<td>6.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6F6G</td>
<td>1st A.F. Amplifier</td>
<td>6.3</td>
<td>169</td>
<td>172</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6V6G</td>
<td>Output</td>
<td>6.3</td>
<td>169</td>
<td>172</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6U5</td>
<td>Rectifier</td>
<td>5.9</td>
<td>A.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>651</td>
<td>Tuning Indicator</td>
<td>6.3</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Maximum power output approximately 5 watts.
Voltage across speaker field 3.5 volts.
Power consumption approximately 32 watts at 117.5 line.

Fig. 2 Top View Model 718

TUBE SOCKET VOLTAGE READINGS

OCTOBER, 1938 FOR SCHEMATIC SEE INDEX CHASSIS MODEL 718
ALIGNMENT PROCEDURE

All the circuits in this receiver are very accurately adjusted at the factory and normally should need no further adjustment. However, if it is definitely known that this adjustment is necessary, the circuits can be properly aligned with the use of a modulated signal generator and an output meter.

SETTING THE PUSH BUTTONS

Should it become necessary to realign the various circuits of this receiver, it may be necessary to reset the Push Button Tuning System.

The buttons are set by means of a set screw that is accessible through the front of the push button. Loosen this set screw, turn-in until the usual tuning knob of the station whose call letters are to be placed in that button

PUSH THAT BUTTON ALL THE WAY DOWN, AND WHILE YOU HOLD IT IN THAT POSITION, SECURELY TIGHTEN THE SET SCREW.

The first button is now set, follow the same procedure with the rest of the push buttons.

The accuracy of the buttons depends on how accurately the station is tuned in-while setting them.

CONNECTING OUTPUT METER

Connect the output meter to P and S of the GY06 Output Tube. Be sure the meter is protected from D.C. by connecting a condenser (1 Mfd. or larger—not electrolytic) in series with one of the leads.

1. Tuning I-F Amplifier To 455 Kilocycles

(a) Connect the output of the signal generator through a .002 Mfd. condenser to the tip of the 6Q6 tube, leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the "GND" terminal of the receiver.

(b) Set the band selector switch to the left (American Broadcast Band).

(c) Set the signal generator to 455 kilocycles.

(d) Adjust both trimmers located on top of the 2nd I-F Transformer for maximum output.

(e) Connect the output of the signal generator to the tip of the 6Q6 tube, leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the "GND" terminal of the receiver.

(f) Adjust both trimmers located on top of the 1st I-F Transformer for maximum output.

(g) Connect operations (e) and (f) for more accurate adjustments.

USE LLOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE OUTPUT METER READING.

2. Aligning R-F Amplifier

When aligning the R-F amplifier, the output of the receiver must be fed through a dummy antenna and connected to the "ANT" terminal of the receiver.

For the "Foreign" band use a 250 ohm carbon resistor for dummy and for the "American" band use a .002 Mfd. condenser.

Align the "Foreign" band first.

(a) Set Band selector to "Foreign" band, right.

(b) Set signal generator to 180 Megacycles.

(c) Open gang to the way. Minimum capacity.

(d) Tune-in with H-F OSC. shunt trimmer 183 gig.

This operation is best done with a signal generator, as indicated at two settings of the trimmer always choose the setting further up.

(e) Set signal generator to 180 Megacycles.

(f) By turning a .001 Mfd. condenser with trimmer, adjust the H-F ANT. trimmer condenser for maximum output. DO NOT ADJUST OSC. TRIMMER AT THIS FREQUENCY.

(g) Repeat operations (d), (e) and (f) until no further improvement can be obtained.

(h) Set the band selector to the American Broadcast Band.

(i) Set the signal generator to 1725 Kilocycles.

(j) Open the gang to the way. Minimum capacity.

(k) Adjust B-C OSC. trimmer for maximum output.

(l) Set signal generator to 1400 Kc.

(m) Tune receiver for maximum signal (approx. 160 on the dial).

(n) Adjust B-C ANT. trimmer for maximum output. DO NOT RE-ADJUST OSC. TRIMMER AT 1400 Kc.

(o) Repeat operations (m) and (n) alternately until no further improvement in output can be obtained.

NOTE: If at any time the H-F coils in this receiver are touched, it may be necessary to vary the inductance of the OSC coil by moving the cross-over turn of wire at the gap to make the tilt track at the 6 megacycle end. Move the coil toward the end of the coil will decrease the inductance and moving it toward the long end will increase the inductance. If the signal is weak at both 6 megacycles, a similar slight change in the inductance of the "ANT" coil should bring up the signal strength.

THIS IS A CRITICAL OPERATION AND SHOULD NOT BE DONE ON ANY SET UNLESS CHANGING COILS MAKES IT NECESSARY.

NOTE: When aligning the high frequency band, it should be exercised so that the circuits will be aligned on the fundamental frequency rather than on the image frequency, which is approximately 910 kilocycles less than the fundamental frequency. To do this, increase the output of the signal generator approximately 10 times and try to tune in the signal before the generator frequency as indicated on the signaleter dial, and at approximately 910 kilocycles below the correct frequency. If the circuits have been properly aligned the signal should be tuned in both positions but much stronger at the correct dial setting.

Wave Trap

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from other stations which operate on a frequency of approximately 183 megacycles. This assembly is located under the side of the chassis and consists of a coil and a trimmer condenser as indicated by item 48 in the wiring diagram. The wave trap should not be adjusted until all other adjustments have been made. To adjust, feed a 455 Kc. signal through a .002 Mfd. condenser to the antenna terminal of the receiver. With the band selector turned to the broadcast band and the condenser, span the volume control on full and adjust the trimmer condenser for wave-trap for minimum signal strength. Should the interfering station be operating on a frequency of slightly more or less than 455 Kc., the exact frequency should be determined with the aid of a signal generator by the beat note method. Then instead of feeding a 455 Kc. signal through, the exact frequency of the interfering station should be used. If it is not possible to determine the exact frequency of the interfering signal, the wave trap may be adjusted by the receiver tuned to the position where the interfering signal is most noticeable. Then adjust the wave-trap for minimum interference.

REPLACING DIAL DRIVE CORD

To replace a broken drive cord proceed as follows:

1. Remove broken cord from dial pointer and the cord tension spring from the large pulley on the condenser gang.

2. Remove complete dial assembly, fastened with two P. K. screws to top of chassis.

3. Remove screw and washer that fastens felt key to chassis and fold felt toward one side.

4. Remove manual drive shaft bracket, fastened with two P. K. screws.

5. Place ends of replacement drive cord (G-41502) together and tie a knot about 1/4 inches from the end. Slip key over shaft and tie a knot. Fasten the other end of spring on hook of large pulley on gang.

6. Close the gear then thread loop through the eye of pulley in pulley.

7. Bring one side of cord loop forward over pulley and around (1/4 turn) horizontal idler pulley, then under and over the back idler pulley (counterclockwise).

8. Bring the other side of drive cord over large pulley on gang in a clockwise direction, continue around and up and over the small idler pulley.

9. Then remove drive shaft from chassis, wrap two complete turns around pulley on the shaft, taking the cord coming over the small idler pulley and wrapping in a clockwise direction while holding shaft in right hand.

10. Replace drive shaft in position, taking care that the drive cord coming down to the pulley goes between the 4th and 5th keys and the cord going up from the pulley goes between the 1st and 2nd keys.

11. Hook drive cord over left hand idler pulley. Mount drive shaft bracket in position. Check to see that cord is running on all pulleys, and tension spring is stretched to approx. 1 inch in length.

12. Place drive cord clamp (W-46200) on drive cord approx. 1/4 inch from inside edge of large pulley rim.

13. Replace key felt, rubber bands and dial assembly.

14. Close gear, set the pointer at 540 Kc., place cord in pointer, check pointer travel from end to end before gluing cord to pointer.
CROSELEY CORP.

TUBE SOCKET VOLTAGE READINGS

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>H</th>
<th>P</th>
<th>S</th>
<th>G</th>
<th>K</th>
<th>Go</th>
<th>Ga</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G</td>
<td>Modulator</td>
<td>6.3</td>
<td>240</td>
<td>85</td>
<td>Neg</td>
<td>0</td>
<td>Neg</td>
<td>85</td>
</tr>
<tr>
<td>6K6G</td>
<td>Oscillator</td>
<td>6.3</td>
<td>145</td>
<td>145</td>
<td>Neg</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6U7G</td>
<td>1st I-F Amp</td>
<td>6.3</td>
<td>240</td>
<td>85</td>
<td>Neg</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6U7G</td>
<td>2nd I-F Amp</td>
<td>6.3</td>
<td>210</td>
<td>85</td>
<td>Neg</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6Q9G</td>
<td>Det., AVC &amp; 1st A-F Amp</td>
<td>6.3</td>
<td>120</td>
<td>—</td>
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<td>Output</td>
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</table>

Power output approximately 5.5 watts.

Power consumption approximately 70 watts at 117.5 volts.
Voltage drop across speaker field 80 volts.

Fig. 2. Top View Model 818

Fig. 3. Bottom View Model 818

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ALIGNMENT PROCEDURE

Testing 1.7 Amp Amplifier To 600 Kilohms.
(a) Connect the output of the signal generator to the amplifier, with the trimmer to the top of the meter, for a level of 100 volts, with the trimmer at the top of the meter. For the Broadcast and Picture Bands the output is set at 100 volts, with the output of the signal generator and the picture signal at the top of the screen, when the meter needle is at the maximum point.
(b) The signal generator should be connected to the output of the signal generator and the line of the output should be adjusted to give a reading of 100 volts, with the output of the signal generator and the picture signal at the top of the screen.
(c) The signal generator should be adjusted for maximum signal and the trimmer should be adjusted for maximum output.

Selecting the Signal Generator.
(a) Select the signal generator to be used, and connect the cable to the signal generator.
(b) Adjust the signal generator to the desired frequency, and connect the cable to the signal generator.
(c) Adjust the signal generator to the desired output level, and connect the cable to the signal generator.

WAVE TRAP

Some of the main elements are equipped with a wave trap for the purpose of eliminating interference from nearby stations which operate on a frequency of approximately 100 kilocycles. This assembly is located on the underside of the chassis and consists of a coil, a ferrite core, a condenser, and a trimmer condenser as illustrated by dotted lines in the Wiring Diagram (item 50). Adjust the wave trap for maximum output. The signal generator should be adjusted for maximum output, and the wave trap should be adjusted for maximum output.

Replacing DRIVE CORD

When replacing the drive cord, the following procedures should be followed:
(a) Remove the power cord from the cabinet.
(b) Replace the drive cord, and check for proper operation.
(c) Replace the power cord, and check for proper operation.

Replacing DRIVE CORD

When replacing the drive cord, the following procedures should be followed:
(a) Remove the power cord from the cabinet.
(b) Replace the drive cord, and check for proper operation.
(c) Replace the power cord, and check for proper operation.

POWER CORD LEAD

The power cord lead is intended to be used for the power cord lead. It is necessary that all the power cord be attached at the same time. Insert a small wire into the hole in the front of each push button and loosen (DO NOT REMOVE) the screw that is located in the bottom of each hole. Insert the ferrite core of the broadcast station into the holes of the receiver, and the signal generator should be adjusted to give a reading of 100 volts, with the output of the signal generator and the picture signal at the top of the screen.

Setting PUSH BUTTONS

The push button may be quickly and accurately set for the correct frequency of the receiver. It is necessary that all the push buttons be set at the same time. Insert a small wire into the hole in the front of each push button and loosen (DO NOT REMOVE) the screw that is located in the bottom of each hole. Insert the ferrite core of the broadcast station into the holes of the receiver, and the signal generator should be adjusted to give a reading of 100 volts, with the output of the signal generator and the picture signal at the top of the screen.

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This model Crosley is an eight-tube receiver designed for operation on A.C. circuits as specified on the model and license label. Features include: large sloping rectangular dial, three tuning ranges, continuous variable tone control, separate oscillator, bass compensation, push pull pentode output, phase inversion and the famous CROSLEY mechanical push button tuning system.

455 K C I.F.

DECEMBER, 1938

The tuning range is from 540 kilocycles to 20 megacycles and divided into three bands as follows:
540-1725 Kilocycles or 55-175 Meters (American Broadcast Band)
1.9- 6.4 Megacycles or 156-46.8 Meters (Police and Amateurs)
6.2- 20 Megacycles or 48.4-15 Meters (Foreign or High Frequency Band)
## Parts List — Model 828

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Item No.</th>
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Figures in first column refer to parts in Diagrams.
CIRCUIT DESCRIPTION

The tubes used and their functions are as follow: one 63A as oscillator, one 648 as multiplier, one 617 G as IF amplifier, one 607 G as loud, one 607 G as detector, A.C. and DC, and first A.F. amplifier, one 63A as phase inverter, two 63G's as main audio output, two 557 as 100,000,000 volt resistors. 

The broadcast band is covered by the 63G, 6217 G and 627 G obtained from the 63A stage. The 63A tube is used in the antenna tuning circuit of the receiver, and the 63G, 6217 G and 627 G is obtained from the 63A stage. The 63A tube is used in the antenna tuning circuit of the receiver, and the 63G, 6217 G and 627 G is obtained from the 63A stage. The voltage is measured from the chassis to the low side of the speaker cabinet. 

The power transformer is used to supply power to the load. The voltage is measured from the transformer to the low side of the speaker cabinet. 

The speaker (652 Ohm) is in the negative leg of the power supply.

CYCLE POWER TRANSFORMER ADJUSTMENT

The cycle power transformer is adjustable with a 50 cycle power transformer and a 100 cycle power transformer. The high-voltage power transformer has a 100 cycle transformer and the low voltage power transformer has a 50 cycle transformer.

The voltage range of the high taps of the 50-100 cycle transformers is from 20 to 120 volts and the low taps of the high taps is from 100 to 200 volts. The low taps of the high taps is from 100 to 200 volts.

The accompanying illustration shows the connections for changing from high to low or from low to high voltages. Note the yellow wire which is attached to the terminal of which one end of the power cord is attached. The other end of the power cord is attached to the orange or black lead of the transformer primary, according to the line voltage which the receiver is to be used on.

NOTE: Always connect the transformer lead of the receiver to the low voltage supply, with the power supply circuit of the receiver to be plainly taped as a permanent record on the rear of the chassis.

All the circuits in this receiver are very accurately adjusted at the factory and should need no further adjustment.

However, if it is definitely known that an adjustment is necessary, the circuits may be accurately aligned with the use of a modulated signal generator and an output meter.

CONNECTING OUTPUT METER

Connect the output meter to the plate of the two 63G tubes. Be certain that the meter is not connected to the ground chassis of the receiver. 

The meter should be readable up to 1000,000 volts.

Turning 1-F A.M. To 455 Kilocycles

Connect the input to the plate of the two 63G tube. Be certain that the input is not connected to the ground chassis of the receiver. 

The meter should be readable up to 1000,000 volts.

Driving the transformer leads as far as possible from the other screen grid tubes.

Set the antenna selector in the tuning condenser plate is completely out of range. Turn the volume control knob to the left (TUNE KNOB).

Turn the band selector switch to the broadcast position. 

(4) Set the signal generator to 455 kilocycles.

(5) Set the antenna selector to the broadcast band.

(6) Turn the volume control knob to the right (TUNE KNOB) and turn the tone control to the left (TONE CONTROL).

(7) Turn the meter to 1-F A.M. and 455 kilocycles, according to the position of the tuning condenser plate.

(8) Check the output meter for maximum output. 

(9) Adjust both trimmers to obtain the 1-F A.M. for maximum output.

(10) Always use the lowest signal generator output which will give a reasonable output meter reading.

ALIGNING R.F. AMPLIFIER

When aligning the R.F. amplifier the output lead from the signal generator is connected to the receiver. For the broadcast and police bands 1000 Kilocycles, the signal generator output lead is obtained from the signal generator and for the High Frequency bands 500 kilocycles signal generator should be used in place of the transformer.

The antenna selector switch should be set to the broadcast position and the signal generator output lead is from the signal generator to the antenna selector switch.

(1) Adjust the "QR" and "ANT" switch for the desired frequency by the rotor on the rotator. 

(2) The signal generator output lead should be adjusted so that it is the correct frequency that is obtained from the signal generator to the antenna selector switch.

(3) The signal generator output lead should be adjusted so that it is the correct frequency that is obtained from the signal generator to the antenna selector switch.
SOCKET VOLTAGES

The tube socket voltages are measured from the tube socket contacts to the chassis with 1000 ohm per volt, 500 volt D.C. voltmeter (except filament) with the receiver in the position where the manufacture's manual states the volume control should be turned full on, the tone control should be turned to the TREBLE position (counter-clockwise) and the tuning condenser should be turned to the minimum capacity position. The filament voltages should be measured with an accurate low range A.C. voltmeter (approximately 0.1 volt). Readings may vary plus or minus 10% of values given.

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<th>Function</th>
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<th>G</th>
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Power consumption approximately 55 watts at 117.5 volts.
Voltage drop across socket leads 55 volts.

30 CYCLE POWER TRANSFORMER ADJUSTMENT

The variable core transformer of the receiver has a "high" and a "low" voltage windings, the under side of the transformer. The topside of the transformer is the "high" voltage windings and the "low" voltage windings are connected to the primary input of the receiver.

The voltage range of the "low" tap of the 50-150 volt transformer is from 115V to 250 volts. The range of the "low" taps of the 100-150 volt transformer is from 100 to 250 volts. The "high" voltage windings of the transformer are connected to the primary input of the receiver.

The accompanying illustration shows the connections for changing from high to low to low to high line voltage. The "jumpers" are attached to the terminal which one side of the power cord is attached to the other side of the power cord is attached to the transformer. The "jumpers" are attached to the terminals which one side of the power cord is attached to the transformer. The "jumpers" are attached to the terminals which one side of the power cord is attached to the transformer. The "jumpers" are attached to the terminals which one side of the power cord is attached to the transformer.

CONCATENATING OUTPUT METER

Connect the output meter to the plate of the transformer. Connect the meter to the output circuit of the receiver. The meter should read almost zero when the meter is connected to the output circuit of the receiver.

TUNING I.F. AMPLIFIER TO 655 CIRCULES

Connect the output circuit of the signal generator through a 0.02 milliammeter to the top cap of the 605C tube, leaving the tube's grid cap in place. Connect the meter to the output circuit of the receiver. The meter should read almost zero when the meter is connected to the output circuit of the receiver.

POWER CORD LEAD

If the various circuits of this receiver have not been adjusted, the output circuit of the receiver should be connected to the terminals of the receiver. The output circuit of the receiver should be connected to the terminals of the receiver. The output circuit of the receiver should be connected to the terminals of the receiver.

ALIGNMENT PROCEDURE

All circuits in this receiver are very accurately adjusted. The circuitry is designed to give the best results with the least amount of adjustment. The accuracy of the alignment is such that the receiver will give the best results with the least amount of adjustment. The accuracy of the alignment is such that the receiver will give the best results with the least amount of adjustment. The accuracy of the alignment is such that the receiver will give the best results with the least amount of adjustment.

WAVE TRAP

Some chassis of this model are equipped with a wave trap for the purpose of eliminating interference from tubes which can be operated on a frequency of approximately 455 kilocycles. This chassis is designed to be operated in the 5000-5006 kilocycles as a terminal for the antenna. The wave trap can be used to isolate the chassis from the antenna. The wave trap can be used to isolate the chassis from the antenna. The wave trap can be used to isolate the chassis from the antenna. The wave trap can be used to isolate the chassis from the antenna.
<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
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</table>

Notes:
- Figures in first column refer to parts in Diagrams.
- Socket, B, Prong Octal.
CROSLEY CORP.

MODEL 1118 AND 1129

CIRCUIT DESCRIPTION

Eleven tubes are employed in a heterodyne-synthesizer circuit which consists of separate oscillator and modulator tubes, 455 and 6G-6 power amplifiers, one stage of which is resistance-coupled, separate AVC and detector diodes, two stages of audio amplification and power supply.

The 6G-6 transformer at the output of the detector diodes interconnects the oscillator and modulator stages. Interstage noise suppression is accomplished while tuning by means of the push buttons due to the action of the 6G-6 "squib" tube. When a push button is depressed, this tube supplies sufficient voltage to the cathodes of the output tubes to bias them toward "cut off." It also supplies voltage to the AVC circuit through a 250,000 ohm resistor, item 16. The speaker field is located in the negative side of the circuit.

SPECIAL POWER TRANSFORMER ADJUSTMENT

In localities where the voltage variation on 50 or 60 cycle power supply lines is greater than customary commercial flux, special 6G-6 cycle power transformers are used. Power transformers have a "high" and "low" voltage tap on the upper side of the chassis. The "high" voltage tap (BLACK) is connected to the chassis, the "low" voltage tap (ORANGE) is connected to a terminal strip near the transformer.

The voltage range of the "low" tap of the 95-160 volt transformer is from 95 to 112.5 volts and of the "high" tap is from 112.5 to 130 volts. The range of the "low" tap of the 195-260 volt transformer is from 195 to 225 volts and of the "high" tap is from 225 to 260 volts.

The accompanying illustration shows the connections for changing from high to low or low to high line voltage. Note the "jumpers" wire which is attached to the terminal at which one side of the power cord is attached. The other end of this jumper wire should be connected to the ORANGE or BLACK lead of the transformer primary winding according to the polarity of the power receiver to be used on.

NOTE: Any change made in the power supply circuit of the receiver should be plainly stamped or otherwise permanently recorded on the rear of the chassis.

POWER CORD LEAD

All the circuits in this receiver are very accurately adjusted at the factory and normally should not require further adjustments. However, should it be definitely known that an adjustment is necessary the circuits may be properly aligned with the use of a modulated signal generator and an output meter.

Connecting Output Meter

Connect the output meter to the plate and screen of one of the 6G-6 output tubes. Be certain that the motor is protected from D.C. by a condenser (1 nf or larger—not electrolytic) in series on the plate lead of the output meter.

Using The 6F-6 Amplifier To 455 Kilocycles

(a) Connect the output of the signal generator through a 10 ohm resistor to the top of the 6G-6, 1st I.F. Amp tube, leaving the tube's grid shield in place.

(b) Connect the ground lead from the signal generator to the ground terminal of the receiver.

(c) The GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SIREN CIRCUIT SEPARATELY.

(d) Set the station selecter so that the tuning condenser plates are completely out of tune. With the voltage controls in their normal positions, turn the volume control to a position between the "0" and "10" positions.

(e) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(f) Turn the 1st I.F. transformer to a point where the IF meter indicates an output of about 1000 cycles per division.

(g) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(h) Adjust the volume control for maximum output.

(i) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(j) Adjust the volume control for maximum output.

(k) Adjust the volume control for maximum output.

(l) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(m) Adjust the volume control for maximum output.

(n) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(o) Adjust the volume control for maximum output.

(p) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(q) Adjust the volume control for maximum output.

(r) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(s) Adjust the volume control for maximum output.

(t) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(u) Adjust the volume control for maximum output.

(v) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(w) Adjust the volume control for maximum output.

(x) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(y) Adjust the volume control for maximum output.

(z) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(a) Adjust the volume control for maximum output.

(b) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(c) Adjust the volume control for maximum output.

(d) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(e) Adjust the volume control for maximum output.

(f) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(g) Adjust the volume control for maximum output.

(h) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(i) Adjust the volume control for maximum output.

(j) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

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(t) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

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(v) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

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(x) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(y) Adjust the volume control for maximum output.

(z) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(a) Adjust the volume control for maximum output.

(b) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.

(c) Adjust the volume control for maximum output.

(d) With the volume control turned to the "0" position, set the station selecter so that the tuning condenser is in its normal "0" position.
### PUSH BUTTON TUNING SYSTEM

The push button tuning system employed in this receiver incorporates eight push buttons, a selector switch and an electric motor. The selector switch consists of eight metallic discs, each of which operates in conjunction with a different push button to tune to some favorite station. That is, the push button on the left as you face the front of the cabinet works with No. 1 disc, and the second push button works with No. 2 disc, etc.

### SETTING PUSH BUTTONS

To set the electric tuning system, turn the receiver "ON" and depress No. 1 push button. When the dial pointer appears, turn the key slot in No. 1 disc to the position in which the selector switch is to be in the "UP" position. Remove the key from its mounting and place it (knob up) through No. 1 hole in the disc identification bracket. If it does not drop into the slot in the disc, push it in with the fingers.

1. Turn the Local-Distance switch to the "Distance" position. By means of the station selector knob, tune-in as accurately as possible, the station whose call letters have been placed in No. 1 push button. Then remove the key.

2. The push button which will ordinarily be used for police calls does not lock in the depressed position. It serves as a release for all other push buttons and should be depressed before operating the manual tuning control. (The first sets of this model were built with thumb-lock type push buttons).

By means of the manual tuning knobs, turn the dial pointer to some other position. Then check the setting by pushing the button which has been set. If the pointer stops too soon or goes too fast, a second setting will be necessary.

To make the second setting, observe how far the pointer stops from the second position. Replace the key in the disc and tune far enough to one side of the correct position to make the allowance for the difference noted in the first setting.

The electric tuning system is now correctly set for the last station. Follow through with the same procedure until all push button adjustments have been made for all of the favorite stations. When the receiver is ready for use, depress each of the push buttons in sequence by means of the push buttons, the Local-Distance switch should be turned to the "Local" position.

### Tuning Motor

Should the clutch on the tuning motor fail to operate satisfactorily, either by not engaging or not releasing when it should, the two tension springs located on the back of the motor should be adjusted.

With the receiver in its normal operating position, feed both tension springs until the clutch will not engage. Slowly decrease the tension on both springs until the clutch engages and releases satisfactorily. Check the operation of the motor several times to be certain that the tension is correct.

### Selector Switch

Should the selector switch become imperative in the field, it should not be dismantled for repair, but should be returned to the factory via an authorized Crosley distributor.

### PARTS LIST—MODELS 1217 and 1227

<table>
<thead>
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<th>Part No.</th>
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<td>38</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>39</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>40</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>41</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>42</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>43</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>44</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>45</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
<tr>
<td>46</td>
<td>W</td>
<td>Dial Selector Switch</td>
</tr>
</tbody>
</table>

### NON-INTERLOCKING PUSH BUTTONS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G2</td>
<td></td>
<td>Push Button Assembly Complete (2) (1217)</td>
</tr>
<tr>
<td>B</td>
<td>G2</td>
<td>Push Button Assembly Complete (1217)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Push Button Assembly Complete (1217)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Push Button Assembly Complete (1217)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Push Button Assembly Complete (1217)</td>
</tr>
</tbody>
</table>

### Crosley Corp.

© John P. Ritter, Publisher
These model Crosley radios are 12-tube AC receivers built for Standard Broadcast and Short Wave reception. They incorporate some features as push but- 

313-1901 (single) or 313-1903 (dual) 

CIRCUIT DESCRIPTION 

Twelve tubes are employed in a superheterodyne system circuit which consists of an R.F. amplifier, separate oscillator and modulator tubes, a changeover I. F. amplifier, a separate detector, A.V.C. and quieting "spare" tubes, two stage audio amplifier-the output of which uses four pentode tubes in push pull parallel and power supply. 

The 1st I. F. transformer is a triple-tuned unit, which is in conjunction with the Local-Distance switch, controls the selectivity of the receiver. Quiet tuning is accomplished while tuning by means of the push button to the action of the second I.F. tube, line S4, on the audio amplifier. When any push button is depressed, A.C. voltage is impressed upon the control grid of the tube through one or the other of condensers 200 or 205. A portion of this voltage is withdrawn and passed on to the control grid of the 6857 A-F. tube through resistors 428 and 60, the effect being that the tube can be cut off. The diode plates of the 6857 A-F. tube have no effect when the circuit is in the audio amplifier, automatic volume control, Local- 

Distant Switch and push pull parallel output. The tuning range is divided into three bands as follows: 

Low Frequency Bands 

High Frequency Bands 

Hi-Fi Broadcast Band (High Frequency of Broadcast Band) 

Hi-Fi (Low Frequency of Broadcast Band) 

Hi-Fi (High Frequency of Broadcast Band) 

SOCKET VOLTAGES 

The tube voltages are measured from the tube socket contacts with a 1000 ohm megger (except filaments) with the receiver in operation and no signal input. The volume control should be turned full "ON", the trimmer control should be turned in the "TUNE" position (counter-clockwise), the Local-Distance switch should be turned to the "Distance" position and the condenser grid should be rotated to the minimum capacitance position. The filament voltages should be measured with an accurate low range A.C. voltmeter (approx. 0-10 volts). Readings may vary plus or minus 10% of values given. 

TUBE SOCKET VOLTAGE READINGS 

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate Voltage</th>
<th>Screen</th>
<th>Grid</th>
<th>Cut-Off</th>
<th>Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>6857</td>
<td>250-275 VDC</td>
<td>70 VDC</td>
<td>0 VDC</td>
<td>0 VDC</td>
<td>7 VDC</td>
</tr>
<tr>
<td>6857A</td>
<td>250-275 VDC</td>
<td>70 VDC</td>
<td>0 VDC</td>
<td>0 VDC</td>
<td>7 VDC</td>
</tr>
<tr>
<td>6857B</td>
<td>250-275 VDC</td>
<td>70 VDC</td>
<td>0 VDC</td>
<td>0 VDC</td>
<td>7 VDC</td>
</tr>
<tr>
<td>6857C</td>
<td>250-275 VDC</td>
<td>70 VDC</td>
<td>0 VDC</td>
<td>0 VDC</td>
<td>7 VDC</td>
</tr>
</tbody>
</table>

SPECIAL POWER TRANSFORMER ADJUSTMENT 

In locations where the line voltage variation on 50 or 60 cycle power supply lines is greater than customary condenser limits, special 50-60 cycle power transformers are available. These transformers have a "high" and "low" voltage taps on the secondary side of the transformer, the "high" voltage tap (BLACK) and the "low" voltage tap (ORANGE) are connected to a terminal strip near the transformers. 

The voltage range of the "low" tap of the 65-190 volt transformer is 60 to 190 volts, the "high" tap is from 115 to 330 volts. The range of the "low" tap of the 196-250 volt transformer is from 190 to 225 volts and the "high" tap is from 235 to 300 volts. 

The accompanying illustrations shows the connections for changing from high to low or low to high line voltage. Note the "jumper" wire which is attached to the terminal at which one side of the power cord is attached. The other end of this jumper wire should be connected to the ORANGE or BLACK lead of the transformer. 

TOR OUTPUT THAT WILL GIVE A REASONABLE OUTPUT 

ALIGNING THE R.F. AMPLIFIER 

When aligning the R.F. amplifier, the signal generator is connected to the "ANT" terminal of the receiver. For the Broadcast Band a 250 ohm condenser should be connected in series with the output of the signal generator and for the High Frequency and Police Bands a 400 ohm carbon resistor should be used in place of the condenser. Each band should first be SHUNT ALIGNED and then SERIES ALIGNED where necessary is made for series alignment. The bands should be turned on and the receiver in operation. 

The alignment is then made as follows: 

TUNING THE I.F. AMPLIFIER TO 485 Kilocycles 

(a) Connect the output of the signal generator through a 200 ohm resistor to the top of the 6857 1st I.F. tube, tube 2, using the tube's grid clip in place. Connect the ground lead from the signal genera- 

ator to the grid terminal of the receiver. KEEP THE GENERATOR LEADS AS FAR AS POSSILBE FROM THE GRID LEADS OF THE OTHER SCREEN GRID TUBES. 

(b) Set the station selector so that the tuning condenser plates are completely out of mesh. Tune the volume control back to the right (ON) and turn the tuning control knob to the left (TUNE). 

(c) Adjust the trimmer to make a less than 450 kilocycles 

(d) Adjust the gain of the signal generator at the top of the 2nd I.F. transformer for maximum output. 

(e) Transfer the signal generator lead to the top of the 6857 A-F. tube, leaving the tube's grid clip in place. 

(f) Close the saddle trimmer of the 1st I.F. transformer. (Do not force adjustment) 

(g) Adjust the gain of the signal generator at the top of the 2nd I.F. transformer for maximum output. 

DO NOT ADJUST THE TRIMMER CONDENSERS LOCATED ON THE 2ND I.F. TRANSFORMER WITH THE SIGNAL GENERATOR LEAD CONNECTED TO THE TRANSFORMER.

ALWAYS USE THE LOWEST SIGNAL GENERATOR LEVEL.
CROSLEY CORP.

INFORMATION FOR ELECTRICALLY INSULATED MODELS 115 and 119 DOLLAR BÁLZÁN PRINTERS.

To electrically insulate the operation of the 115 and 119 printer, it should be connected to a receiver as shown in attached bulletins. Connect a signal generator modified with any audio frequency less than 500 cycles to the receiver and after the output of the receiver is seen to be cut out, run up the level control in the receiver slowly until sufficient voltage appears across the transmitting coil in the transmitter to cause the release. This will release the stylus arm at some level setting and the modulation should now appear as on the paper. Increasing the level setting will bring up the blackness of printing to the point just past where the paper begins to show which is the desired printing level. As the level of the receiver is increased the printing should become lighter and lighter and as the level is further reduced the characters will still hold in and the area should stay over at the left side of the paper.

1. Measure across the relay coil with a 100 ohm per volt D.C. meter synchrotransmitter should occur between 45 and 50 volts. In cases where this does not hold true the 220 volt supply should be checked as it will not be noted from circuit diagrams this check is taken in the circuit only for synchronization, that is, to rectify the 500 volt pulses for the relay coil. If the trouble is not found in the tube, the circuit should be checked for open or shorts and the switch points inspected and closed. If circuits and voltages are found okay and printer still refuses to operate properly, the clutch arm should be adjusted according to instructions.

2. To measure the printing signal, connect a 1000 ohm per volt D.C. meter across the stylus and the stylus arm. The advance and the level control of the receiver until the stylus is as black back and forth across the paper. When printing at normal level on average paper, the voltage reading should plus or between 200 and 250 volts. If the paper is not of this type, turn the stylus so that it does not pass in the paper and connect across the paper to the printing level. If the printing level is set to this ground, turn meter off and rotate healtb by hand until stylus arm is half way across on the way from left to right and measures the voltage across the relay coil. The voltage should read between: 200 and 250 volts as above.

Nowhere possible to set the operation with a phonograph record containing facsimile copy. Such a record may be obtained from The Printers Corporation for operation on a 15-1/2 F.P.M. speed.

1. Induction Paper.

(a) The roll of paper should be placed on the roller (102) so that if you were to pull on it, it would stretch forward.

(b) Insert paper between the lower roller and the basis (white surface up).

(c) Push lever, on back of plate bar (5), to the left. (Plate is the center bar thatないように paper for the stylus.) This spring opens the paper gate (102) and paper up between gate and plate.

(d) Lift bar (102) with the roller paper guide.

(e) Finess paper over paper cylinder. Be sure the line is lined up and fits on paper cylinder.

(f) Release clutch holding lever on plate bar, then push roller guides down on the paper.

(g) Finess cleaning brush so that the brushes just clear lightly on the paper, with the brushes toward the stylus.

2. STYLUS

THE STYLUS should be kept clean, free from metal filings (137) and turn the stylus assembly (150) so that the point is toward the stylus. This will allow for the stylus to be adjusted in the proper position. Any other adjustment of the stylus should be done by means of the lower control arm and left hand side of the paper. If something seems amiss, turn the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

3. NOISE/FAULT

By turning the motor over by hand, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

4. RESTART AND FAIL

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

5. NOISE/FAULT

The stylus should move across the paper, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

6. NOISE/FAULT

The stylus should move across the paper, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

7. NOISE/FAULT

The stylus should move across the paper, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

8. NOISE/FAULT

The stylus should move across the paper, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.

9. NOISE/FAULT

The stylus should move across the paper, the operation of the motor and paper motion should be seen in the paper cylinder.

(a) While turning motor by hand, inspect the magnetic clutch. The stylus will move across the paper. Check the stylus pressure against paper by listening for a slight rub as stylus pressure increases. The correct pressure is indicated by a slight rub but not sufficient to leave a mark on the paper.

(b) If everything seems normal to this point, plug the power cord into a new position. (Note: Do not rotate.)

With motor running, listen carefully for any unusual mechanical vibrations. If these may be minimized by adjusting the various bolts that mount the motor and the motor base to the block, theuls should be checked and adjusted as necessary for the continuous operation of the machine.
## MODEL 116 HEAD TRouble CHART

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. uneven density of prints; light streams through copy; particularly noticeable on solid black areas</td>
<td>All gates not holding paper against platen properly</td>
<td>All(a) Check gate latch making sure gate is closed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(b) Check gate hold-down lugs on left and right side of platen holder which should prevent gate from opening up as paper goes through machine.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(c) Gate should not be masked or blocked.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(d) Stylus pressure too light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(e) Platen carbonised.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(f) Stylus does not move freely in holder.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All(g) Paper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Fussy printing. Characters lined up straight and of correct height, but with staggered outlines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B3. Stylus not synchronising cleanly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B4. Paper not feeding through gate and platen properly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B5. Baskets not working properly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B7. Stylus pressure too light.</td>
</tr>
</tbody>
</table>

## MODEL 496 RECORD PLAYER TROUBLE CHART

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Weak signal or interference from local sources or other stations.</td>
<td>FL. Poor synchronising.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FE. Replace jack.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FF. Adjust clutch arm and air gap.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GG. Clutch arm not stopping stylus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HH. Paper tears.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II. Paper not set up properly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JJ. Paper creased or torn at edges.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KK. Too much pressure on gate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LL. Paper burns.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MM. Paper being too black due to volume control being too high.</td>
</tr>
</tbody>
</table>

## TO ADJUST CLUTCH AND AIR GAP

Turn motor by hand in direction of normal rotation while holding clutch arm against magnet pole pieces, until stop on lower clutch plate is just completely under clutch arm. Loosen mounting screws for magnet bracket and slide bracket and roll forward until the pole pieces come within the thickness of a piece of writing paper or brushing the magnetic surface on clutch arm, tighten bracket screws. Plug motor in and adjust armature adjustment screws until clutch arm just stops lower clutch plate. Repeat to make sure that clutch arm engages just enough to stop clutch, as more movement of armature than is necessary only requires more power to synchronise. Tighten lock nut, being careful not to change adjustment while doing so.
ALINEMENT PROCEEDURE MODELS 251, 251, 255,

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

I.F.: Connect the generator ground to receiver chassis. Using .1 mfd. condenser series with high side of generator, apply 456 kc. signal to grid of 6DS I.F. amplifier tube, and aline transformer No. 2. Connect generator to grid of 6A7 tube and aline transformer No. 1.

RF. (See above diagram for location of trimmers.)

Using a 200 MMF. condenser in series with the high side of the generator, turn ba selecor switch to left hand position and the tuning condenser to about 600 kc. Freq 456 kc, signal and adjust wave for best response. With the tuning condenser at minimum capacity feed 1600 kc signal to antenna and adj. broadcast oscillator trimmer for top frequency. Set generator frequency at about 14 kc. Adjust broadcast antenna trimmer. Set generator to 600 kc, tune receiver to signal and adjust the paddler. The tuning condenser should be rocked back and forth through the signal while varying the paddler in order to assure proper alignment.

Using 400 ohm resistor in series with generator, set band selector in center position set generator to 5400 kc and adjust oscillator trimmer for top frequency. Set genera to 3600 kc, tune receiver to signal and adj antenna trimmer.

Turn band selector to extreme clockwise position. Using 400 ohm resistor in set with generator, set oscillator top frequency for 16,500 kc—screw trimmer down tight then unscrew to second peak. Set generator to 15,000 kc, tune receiver to signal and adjust antenna trimmer—screw trimmer down tight, then unscrew to first peak, rock the tuning condenser back and forth through the signal while the adjustment is made. Above procedure for aine at 15,000 kc must be followed exactly to ina proper tracking. A dead spot, at about 12,000 kc will result if antenna and oscillator circuits are not adjusted in proper relation to each other.

Adjustment of Mechanical Automatic Tuning System

Any of your favorite stations may be set up on any button, but it is recommended
that they be set up in the same sequence as they are received on the dial. Loosen the
button by turning it to the LEFT. A slot is provided in the button into which
socket may be inserted to facilitate turning. After turning the button a few turns to
the LEFT, press it in as far as it will go. While holding the button in this position, turn
the control Switch in the station desired very carefully in the usual manner with the manual tuning key.

While still holding the button if, fix the adjustment by turning the button to the RIGH-

button is pressed in AS FAR AS IT WILL GO.
This receiver is designed to operate on 105 to 125 volts, 60 cycle alternating current only.

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

DO NOT CONNECT A GROUND TO THIS RECEIVER.

DO NOT CONNECT A GROUND TO THIS RECEIVER.
This receiver is designed to operate on 105 to 125 volts AC or DC.

No orders for parts will be accepted unless PART NUMBER, DESCRIPTION and CHASSIS MODEL NUMBER are given. 5390 Band Switch

Symbol Part No. Description

C-1 3272 30-140 mmf Trimmer
C-2, 5, 7 1611 3-35 mmf Trimmer
C-3, 4, 6 2597 1-10 mmf Trimmer
C-8, 11 572 .1 200 V.
C-9a, b 5724 Tuning Condenser
C-10 2780 50 mmf Mica
C-12 580 .05 200 V.
C-13 4810 IF Trimmer
C-14 .0005 400 V.
C-15 2560 220-500 mmf Padder
C-16 2741 1330 mmf 5%
C-17 3871 .006 600 V. 5%
C-18 568 .01 400 V.
C-19, 20 .02 400 V.
C-21 581 .005 600 V.
C-22, 23 2600 .02 600 V.
C-24 5272 Electrolytic
C-25 5420 Electrolytic
C-26 5419 Electrolytic
R-1, 10 631 50M 3/8 W.
R-2 617 20M 3/8 W.
R-3 2605 200 ohm 3/8 W. 10%
R-4, 5 624 1 Meg. 3/8 W.
R-6 598 200M 3/8 W.
R-7 5332 500M Volume Control
R-8 2698 100 ohm 3/8 W. 10%
R-9 2881 400M 3/8 W. 10%
R-11 5395 500 ohm wire wound 10%
R-12 603 100M. 3/8 W.
R-13 615 500M 3/8 W.
R-14 4529 10M 3/8 W. 10%
R-15A 5421 30 ohm Wire Wound
R-16 3463-10 1st IF Transformer
R-17 3463-4 2nd IF Transformer
R-18 5096 Oscillator Coil
R-19 5392 Antenna Coil
This receiver is designed to operate on 220 volts, direct or alternating current.

Model 268

1 - type 76 Detector
1 - type 76 1st. Audio
2 - type 6D6 R.F. Amplifiers
1 - type 2516 Output
1 - type 2525 Rectifier

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

Model 272

1 - 532 Rectifier
1 - 2516 Output

This receiver is designed to operate on 105 to 125 volts direct or alternating current.
ALINEMENT PROCEDURE

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set at a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

L.F.: Connect the generator ground to receiver chassis. Using 1 and condenser in series with high side of generator, apply 456 kc signal to grid of 6DS 1.F. amplifier tube and aline transformer No. 2. Connect generator to grid of 6A7 tube and aline transformer No. 1.

RF. (See above diagram for location of trimmers.)

Using a 200 MMF condenser in series with the high side of the generator, turn band selector switch to center (B), position and the tuning condenser at minimum capacity feed 1720 kc signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at about 1400 kc. Adjust broadcast antenna trimmer. Set generator for 800 kc. Tune receiver to signal and adjust the paddder. The tuning condenser should be rocked back and forth through the signal while varying the paddder in order to assure perfect alignement.

Using 400 ohm resistor in series with generator, set band selector in right hand (F) position, set generator to 6000 kc. and adjust oscillator trimmer for top frequency. Set generator to 5000 kc., tune receiver to signal and adjust antenna trimmer.

Setting Up the Push Button Station Selector

First select six favorite local or strong nearby stations, listing them according to frequency or position on the dial. Setting up weak or distant stations is not recommended. Call the station nearest the left hand end of the dial (nearest 1600 kc.) the No. 1 station and number the other five consecutively as they are tuned in on the dial; tuning from left to right. For example assume your selected stations operate on frequencies of 1500 kc., 1300 kc., 1100 kc., 900 kc., 700 kc., and 600 kc. The 1500 kc. station should be listed as No. 1; the 1300 kc. station would be No. 2, and so on through the list with the 600 kc. station becoming No. 6. In setting up the buttons, the 1500 kc. station should be set up on No. 1 button, or the first button from the left, the 1300 kc. station on the second button from the left, and so on until the 600 kc. station is finally set up on the button farthest to the right.

With the band selector set at "B" or the second position from the left, tune in station No. 1. Observe the program in progress, then turn the band selector knob to the extreme left position (A). Push the No. 1 button in as far as it will go, when the proper operating position is reached the button will lock in. Then insert the screwdriver through the opening directly above the No. 1 button and turn the larger headed screw until the same program is heard. Do not force this screw. It should turn very easily and if the station is not heard when the screw is turned all the way in one direction, reverse the screw. Use as much tuning key as required to ensure an accurate tuning in indicated by a minimum of noise or hiss, or by watching the tuning eye on the models so equipped. Inserted in one side of the larger screw head is a smaller screw. This screw is for fine adjustment, and should be turned in and out until position of least hiss is found and until the tuning eye, on models so equipped, shows the least shadow. It will not be necessary to turn this small screw more than one full turn from the factory adjusted position. As a definite check that the desired station has been tuned in, listen for the station announcement. Set up the remaining buttons in the same manner, and after all stations have been set up, locate the call letters of the stations on the printed sheets supplied with the receiver. Remove the desired call letter blocks from the sheets and insert them in the escutcheon according to the directions on the envelope.

On Sets Equipped with Phonograph

Phono Radio Switch: The Left Hand Position is for Radio Only. The Right Hand Position connects the pick-up and turns on the power for the phonograph motor.
5-TUBE STORAGE BATTERY POWERED SUPERHETERODYNE

WARNING! DO NOT CONNECT A CHARGER TO THE BATTERY WHILE THE SET IS IN USE. DO NOT GROUND EITHER SIDE OF THE BATTERY.

ALIGNMENT PROCEDURE

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator. Strong signals tend to cause improper adjustments.

IF. Connect generator ground to receiver ground. Using .1 mfd condenser in series with "high" side of generator, apply 456 kc signal to grid of 687G and adjust second IF transformer; same for first IF, applying signal to grid of 6DG8. (See above diagram for location of tubes and transformers.)

RF. (See circuit diagram for location of trimmers.) Using 200 mfd condenser in series with generator, feed 1725 kc signal to antenna lead and adjust oscillator top frequency. Set generator at 1400 kc, tune receiver to signal and adjust broadcast antenna trimmer. Set generator to 600 kc, tune receiver and adjust paddler. The tuning condenser should be rocked back and forth through the signal while the paddler is being adjusted in order to obtain perfect adjustment.

Using 400 ohm resistor in series with generator, set band selector in short wave (right) position, feed 15,600 kc signal to antenna and adjust oscillator trimmer—screw trimmer down tight and unscrew to SECOND peak. Set generator to 15,000 kc tune receiver and adjust antenna trimmer—screw trimmer down tight and unscrew to FIRST peak, rocking the condenser back and forth through the signal while the adjustment is being made. Above procedure for alignment at 15,000 kc must be followed exactly to insure proper tracking. A 'dead spot' at about 12,800 kc will result if antenna and oscillator are not set in proper relation to each other.

- Tubics
1—6DG8 Oscillator-Transducer
2—69T7 Intermediate frequency amplifier
3—1G5G Power output
4—GZ5Y5G Rectifier

- Symbol Part No.
  C1 1611 3—35 mfd Trimmer
  C2, 7, 9 2597 1—10 mfd Trimmer
  C3, 14 572 .1—200 v.
  C4, 5 5724 350 mfd Variable
  C6 2780 50 mfd Mica
  C8 2740 3850 mfd paddler
  C10 2560 350 mfd paddler
  C11 565 .01—200 v.
  C12 1285 100 mfd Mica
  C13, 15 I.F. Trimmers
  C16 4810 .0005—400 v.
  C17, 20 5732 16mfd 150 v.
  C18, 19, 22 576 .02—400 v.
  C21 3003 .5—160 v.
  C23 5684 .03—1000 v.
  C24 580 .05—200 v.
  C25 3190 100 mfd Mica
  C26 4171 2—160 v.
  R1, 2 631 50 M 1/3 W

- Symbol Part No.
  R3 609 15 M 1/3 W
  R4, 5 624 1 Meg 1/3 W
  R6 5690 500 M Volume control
  R7, 8 630 2 Meg 1/3 W
  R9, 13 603 100 M 1/3 W
  R10 615 500 M 1/3 W
  R11 4474 35 ohm 1 W
  R12 2881 400 ohm 1/3 W
  R14 4475 200 ohm center tapped
  R15 3412 No. 1 IF Transformer
  R16 4457 No. 2 IF Transformer
  R17 5682 Power transformer
  R18 5333 Band switch
  R19 5679 Antenna Coil
  R20 5678 Oscillator Coil
  R21 5766 Vibrator
  R22 5680 Battery cable

- 540 KC and 1725 KC
  5.5 to 15.5 megacycles

- MODEL 267
Model 274—A.C.—D.C.—PHONOGRAPH

For phonograph operation turn the Radio Phono switch to the Phonograph position. THIS A.C.—D.C. SWITCH MUST BE SET IN THE alternating or direct current. Do not connect to any other source. Radio volume control also serves as the phonograph volume control.
This is a battery operated superhetodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. It is designed to function with an "A" supply of 1.5 volts and an "H" supply of 90 volts. The broadcast range coverage is 540-1600 kilocycles.

**Model 408R**

- **1A76**
- **1N5G**
- **1H5G**
- **1C5G**
- **IF PEAK 455 KC**
- **to all A**

- **12K76T**
- **12F56T**
- **50L6GT**

- **45Z56T**

**Model 406R-412**

When used as an AM model see "A B."
The "PHONOSCOPE" is a combination audio and wireless playback. Disc recordings may be played directly through this unit, or may be reproduced through a remote radio receiver. A microphone may also be used instead of disc recordings. The unit has been designed to operate on 110-120 volts 60 cycles A.C. unless otherwise specified.

PHONOGRAPH: The phonograph motor and unit is turned "on" by rotating the knob "OPERATION" on the left in a clockwise direction. Further rotation in this direction increases the volume. Turn the knob on the left side to the clockwise position. Allow about a minute for the tubes to become sufficiently heated. Disc recordings may now be played through the speaker in the PHONOSCOPE.

MICROPHONE: A high impedance magneto or crystal microphone may be used in place of phonograph recordings. The two pin tips should be inserted in the microphone jack in the rear of the cabinet. The microphone may be used as a means of speaking or entertaining through the unit.

NOTE: ON DIRECT CURRENT IT MAY BE NECESSARY TO START THE MOTOR BY GIVING IT A SPIN.
These models are fine tube superheterodyne receivers with all automatic control. They have been designed to operate on 50-125 volt d.c. or 110 volt 60 cycle a.c. unless otherwise specified.

**RANGES:**
1800 to 540 KC
150 to 410 KC (LW)

**MODEL 537 538 539**
- 537LW 538LW 539LW

**MODEL 538 L** is the same as model 538 except a loop antenna and a 35Z5GT as rectifier, are used.

**CONNECTIONS FOR ISSUES OF MODELS 538 AND 538LW using 25X6GT Rectifier.**

1514 antenna coil .75
1515 oscillator coil .45
1516 dual tuned i.f. 1.20
1517 second detector i.f. .50
2450 comb. electrolytic 1.00
2453 2 gang var. cond. 2.00
3454 comb. vol. cont. 1.00
4087 cabinet-walnut 2.75
colored 3.50
5109 dial scale .30
5110 dial crystal .30
7243 speaker 4.50
8842 pilot lamp .10 net
9876A pilot lamp socket .25
9977 knob .15
9977 drive dmm .50
9978 drive spring .15
9981 pointer .30
MODEL 655-656
655 LW-656 LW

TO CALIBRATE RECEIVER

Adjust the signal generator at 456 K.C. and peak the I.F. trimmers for maximum signal. Connect the "hot" lead from the signal generator to antenna of receiver and ground to ground of receiver. Adjust the generator and receiver to 1600 K.C. and peak the trimmers for maximum signal. Adjust generator and receiver to 600 K.C. and peak the paddler for maximum signal. The model 655 should have the back attached to the cabinet when peaking 1500 K.C. and 600 K.C. The trimmers and paddler on these models are shown in a sketch on the wiring diagram.
**GENERAL FEATURES**

These receivers are classed as "Electrostatic and Direct Vision." Electrostatic indicates that the entire deflection system is electrostatic and since the picture is viewed through the tube without the use of a mirror, lens or other device, it is referred to as Direct Vision. The latter connotes clarity, brilliance and the widest angle of vision. Sturdy, clear cut black and white pictures that are large enough to enjoy at one time are secured by the use of a fourteen inch cathode-ray tube which furnishes a picture eight by ten inches. A separate high fidelity section brings superb reproduction of the sound-channel which is associated with the picture. A single control tunes both the sight and sound channels and since the receiver is no more difficult to operate than an ordinary broadcast receiver. To the above features add its compact size, minimum number of controls and simple straightforward layout and you will have an idea of the first commercial television receiver which we believe you will find easy to install and service in spite of the apparent complexity of the subject.

**CIRCUIT ARRANGEMENT**

A simple straight line layout is used in these receivers that should prove extremely helpful to the serviceman. Viewed from the front the video receiver is on the left side of the chassis and the sound receiver is on the right. Fig. No. 1 shows the front controls and the sound receiver while Fig. No. 2 shows the rear adjustments and the video receiver. The top portion of the chassis contains both sound circuits along with the modulating circuits of the cathode-ray tube. To prevent confusion each side is considered separately, half appearing in Fig. No. 1 and the remainder in Fig. No. 2. The seven auxiliary controls shown in Fig. No. 2 are provided for the use of the installer and serviceman. These controls are necessary to make the final alignment of these receivers possible. Positioning where the receiver is installed under the operating conditions imposed by the earth's magnetic field and the power supply line voltages. Once properly set these controls do not need adjustment and since they were not provided for the owner's use we suggest that the dealer or serviceman set the back of the cabinet as it is not possible to tamper with the controls when the back is in place. The use of the parts and tubes shown in Fig. No. 1 and Fig. No. 2 can be checked by comparing the "V" numbers, etc., with the schematic drawings.

Operating Controls of the Receiver (Front):

First, become familiar with the controls on the front of the receiver. Since the receiver has been tested before shipment, probably only a few minor adjustments will be necessary. Therefore before touching the adjustments in the rear attempt to operate the set accordingly to the instruction sheet supplied the purchaser and notice only the adjustments required. These instructions are repeated here to cover the possible loss of this sheet. Figure No. 1 shows the front of the receiver with the controls numbered and the use and purpose of these controls is as follows:

1. MARKED CONTRAST, ON and OFF. This is a power switch for starting and stopping a set. It also is the volume control of the picture signal. It should be adjusted in conjunction with the intensity control (No. 4). This switch is a picture of pleasing contrast to the user. If the location is such that the set is received is very small, it may be necessary to use the full gain of this control, while in a good location it may have to be reduced considerably. If the picture is not satisfactory the rear controls must be adjusted as covered in a following section.

2. MARKED SELECTOR. This control is a four position switch provided for covering four television channels.

3. MARKED TUNING. Only one control is necessary to properly tune both the sight and sound channels. Simply adjust this control until the best reception of the sound is secured and at this point the picture signal will be correctly tuned.

4. MARKED INTENSITY. The intensity, the brightness of the picture is controlled by this knob. It should be adjusted in conjunction with Control No. 1 to get the best picture. Note: It is good practice to retard (turn to the left) this control when starting the station. If about 15 seconds is allowed to elapse before advancing this control it will prevent a small bright spot from appearing on the screen which might eventually darken the screen.

5. MARKED FOCUS. This control is used to sharpen the individual lines of the pattern and once set seldom requires further adjustment.

6. MARKED VOLUME. This volume control adjusts the audio volume and has no effect whatever upon the picture.

**FAULTS**

As previously stated, the adjustment of these controls is necessary for the final alignment of picture size and positioning, as the earth's magnetic field and power supply line voltages vary with locations. The location of these controls is shown in Figure No. 1, and their use will be covered in numerical order. Proceed as follows: remove the wood screws holding in the back of the cabinet and pull out the back. The safety switch will open, turning the set off and since it is necessary to have the set in operation while making these adjustments the switch can be made temporarily inoperative by a large battery clip (convenient for this purpose). Do not reach into the set with the voltages on. (See Caution and Warning). There is one adjustment that cannot be made by these controls, that of rotating the cathode-ray tube to cause the picture to appear line up with the viewing opening. To remedy this, turn the set off, remove the elastic band that grips the rear support and rotate the tube by hand in the correct direction.

**LOCATION OF TROUBLE**

If no picture can be secured but modulation (dark and light spaces) can be seen on the screen, the setting of the horizontal frequency control is probably incorrect. Adjust this control until the picture forms.

With the adjustment of these controls the installation should be satisfactory. However, if the signal is weak or if ghosts or noise is present, return to the dipole antenna and reposition it as previously suggested until the best position for it is secured.
Figure 5 — Schematic Diagram. Separator and Sweep Circuits

Figure 6 — Schematic Diagram. Voltage Divider and Socket Connections
CAUTION AND WARNING

Large cathode-ray tubes operate at high voltages and hence are evacuated to a very high degree of vacuum. Therefore atmospheric pressure on the glass can run into tons depending on the size of the tube. A colapce therefore is as bad as an explosion and all cathode-ray tubes should be handled with care. The DuMont Laboratories have gone to great expense to provide a cathode-ray tube that is safe for the home and the structural design results in its ability to stand tests nearly twice as severe as usually employed. The serviceman, however, should observe the following rules as he will probably be the only one to handle the average tube.

1. Be careful in handling the tube.
2. Watch the use of tools near the tube.
3. Don't scratch the surface of the glass.
4. Don't stand the tube on a metal surface or in any other way cause certain parts to be quickly heated or cooled.

TERMINAL VOLTAGES

<table>
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<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Grid (Control)</th>
<th>Notes</th>
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<td>240</td>
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<td></td>
</tr>
<tr>
<td>V10</td>
<td>240</td>
<td>155</td>
<td>-4.3</td>
<td></td>
</tr>
<tr>
<td>V11</td>
<td>190</td>
<td>-</td>
<td>-2.3</td>
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<td>275</td>
<td>290</td>
<td>-11.5</td>
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<td>140</td>
<td>190</td>
<td>-2</td>
<td>Cathode to ground.</td>
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<td>V4</td>
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<td>V6</td>
<td>155</td>
<td>155</td>
<td>-2.0</td>
<td>Cannot be measured at the grid of V6. Should read -4 volts at center tap of 523 high voltage winding to ground.</td>
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</table>

V7 140 220 7.5

V17 523 filament to ground = 310 volts
V18 5X3 filament to ground = 1600 volts
(output after 1.7 = 1650)
V14 2Y2 output = 3900 to 4200 (ground is positive)
(output after R83 = 3600 to 4100 volts)
The above measurements were taken with respect to ground, the following are point to point.

V21 From cathode to grid -60 to -160
From cathode to first anode +100 to +1600
From cathode to second anode +6000

Figure 7 — Schematic Diagram, Power Supplies
### Resistor Values

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<th>R (Ohms)</th>
<th>W (Watts)</th>
<th>Class</th>
<th>R (Ohms)</th>
<th>W (Watts)</th>
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### Condenser Values

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### Service

The service manual on the left side of the broadcast receiver is a technical document that provides detailed instructions for the repair and maintenance of the receiver. It includes diagrams, schematics, and technical specifications that are essential for understanding the inner workings of the receiver. The manual is organized into sections, each covering a specific aspect of the receiver, such as power supply, tuning, and amplification. It is a valuable resource for technicians and hobbyists who wish to gain a deeper understanding of the receiver's design and functionality.
Antenna Installation

In the installation of television receivers, the proper antenna is a necessity. Successful installations will result from attention to detail, while slapdash and careless work will bring only poor customer satisfaction and repeat calls. There is nothing difficult about the installation of television aerials, a little patience and experience is all that is required. Regular broadcast aerials in the majority of cases will be found useless. Impress this upon the owner and make a satisfactory installation regardless of what other equipment he already has. Satisfactory picture reception is what both of you require for the completion of the installation.

The Dipole Antenna

The Dipole form of aerial is generally satisfactory; it consists of two radial rods, each approximately five feet long and placed on a line with each other, extreme accuracy in the length of these rods is usually not necessary and if the receiver is located very close to the transmitting station it may be found advisable to cut down the length of each rod. The simple dipole aerial is shown in Fig. No. 3.

The Lead-in

The most popular lead-in from the dipole to the television receiver will be a twisted pair as it is inexpensive and generally satisfactory in locations where the signal is strong.

The length of this lead is usually not of extreme importance but it is better to get the Dipole located as close to the receiver as possible and not far from electrical interference. The lead-in should be the shortest possible. The twisted pair should be added to the feeders on the Dipole as a good connection is essential and necessary since several changes in the position of the antenna may be required for best results.

Polarization

If the dipole is mounted horizontally it is said to be horizontally polarized, and if vertically, it is vertically polarized. Since the physical location materially affects the aerial no specific form can be advised and we can merely suggest that you start by using horizontal polarization and change if necessary to produce the best results.

Location of the Antenna

The Dipole should be erected so that it is in line of sight with the transmitter. This does not mean that no signals can be secured where a direct view of the transmitter cannot be obtained. Surprising results are often secured on these high frequencies and no certain rules can be assigned to this work. If the location is on a street having heavy traffic there may be considerable noise level due to automobile ignition systems. In this case, locate the Dipole to the rear of the building and away from the source of the noise as far as possible. In the case of electrical machinery over which you have no control, the same method can be employed along with the utilization of the directional effects of the aerial which will be covered later.

Recent Illumination

Wherever possible the receiver should be so placed in the home that a direct glare from either natural or artificial light does not fall upon the face of the cathode-ray tube. The received pictures may be viewed under a variety of conditions where it is not always convenient to darken the room completely. Adjustments made to meet these conditions will not cause damage to the receiver. Viewing the pictures in as dark a room as possible is always an advantage as it permits the setting of the intensity and contrast controls in a manner that will give picture tone values more correctly relating to those actually used in the studio from which the picture is transmitted.

Installation Process

It is a good plan to proceed as follows with the installation.

1. Erect the Dipole antenna in the clear. Start by using horizontal polarization (mount the rods horizontally) and turn them until their plane is at right angles with the location of the transmitter.

2. Adjust the receiver to produce a picture.

3. Return to the antenna and make final adjustments for best signal strength and removal of ghosts, etc.

Ghost Effects

When the picture appears to be duplicated and slightly displaced, the additional picture is referred to as a ghost. This effect is usually due to the reflection of the signals and can be curbed by the slanting or rotating of the Dipole or the use of a reflector or reflectors. If, after all possible positions have been tried, the ghost still exists it will be necessary to change the location of the antenna and try again.

Directional Effects

In the simple Dipole, directional effects are not very pronounced, but it does have a rather sharp no-signal radius and it is possible in some instances to materially reduce interference by placing an effective source in the area. If the installation of the receiver is being made at some distance from the transmitter or if the signal level is very low due to local conditions, it is well to consider the use of a reflector. This is done by placing a rod about ten feet long, parallel with the Dipole and about five feet in back of it. The directional effect of the Dipole remains the same, namely at right angles to the plane. Signals coming from the front will be greatly increased, in using reflectors it is well to bear in mind, however, that any signal approaching from the rear (where the reflector is located) will be greatly attenuated. Fig. No. 4 shows the reflector added to the simple Dipole.
When ordering replacement parts specify part number

*Item number locates the article on the schematic diagram. (Subject to change without notice)

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<tr>
<th>Item</th>
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<th>Description</th>
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<td>Two-band antenna coil</td>
<td>$0.65</td>
</tr>
<tr>
<td>T2</td>
<td>3TT-410</td>
<td>Two-band detector coil</td>
<td>$0.65</td>
</tr>
<tr>
<td>R1</td>
<td>2VR-219E</td>
<td>Volume control, 75,000 ohms, with line switch</td>
<td>$1.65</td>
</tr>
<tr>
<td>R2</td>
<td>60R-294</td>
<td>240 ohm, 1/4 watt wire-wound resistor</td>
<td>$0.55</td>
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<td>6LR-526</td>
<td>Plug-in ballast tube</td>
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<tr>
<td>R4</td>
<td>60R-294</td>
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<td>$0.15</td>
</tr>
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<td>R7</td>
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<tr>
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<td>Two-band detector coil</td>
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<td>240 ohm, 1/4 watt wire-wound resistor</td>
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<td>0.01 uf, 400 volt tubular condenser</td>
<td>$2.90</td>
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</table>

**Voltage Analysis**

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned down to full and no signal. The line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except hangers and cathodes were taken on 250 volt scale.

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<tr>
<th>Tube</th>
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Voltage across speaker field—26 volts.

25Z5 cathode to ground—126 volts.

**Alignment Procedure**

An oscillator with frequencies of 1600 kc and 350 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum responses.

Rotate variable condenser to the maximum capacity position and set the pointer at the next calibration mark beyond 350. Rotate band-switch clockwise to broadcast (medium-wave) position. Then rotate the variable condenser until the pointer is at 200 and feed 1500 kc to the antenna through a 1000 ohm mica condenser and adjust both trimmer condensers on the variable condenser for maximum response.

Turn wave-band switch counter-clockwise to long-wave position. Rotate variable condenser until pointer is at 800 and feed 350 kc to antenna. Adjust the long-wave interstage coil trimmer for maximum output. Return to broadcast and repeat entire procedure. The long-wave trimmer is located beneath the chassis and is reached from the right end of the chassis.

**Tube Data**

The tube compliment is as follows:

1. 6D6, r-f amplifier.
2. 6L6, bias detector.
3. 2ST24, beam power output.
4. 2SK5, dual half-wave rectifier.
5. 5J5HG, ballast tube.

Note: Octal-base tubes may be replaced with other metal tubes or equivalent octal-base glass tubes.
TUBE DATA

The tube complement is as follows:
1. 6D6, r-f amplifier.
2. 6G6, biased detector.
3. 25LSG, beam power output.
4. 2626, dual half-wave rectifier.
5. L55BG, ballast tube.

Note: Octal-base tubes may be replaced with either metal tubes or equivalent octal-base glass tubes.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned on full and no signal. The line voltage for these readings was 117.8 volts, 60 cycles, a-c. All readings except heaters and cathodes were taken on 250 volt scale.

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<td>98</td>
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</table>

Voltage across speaker field—26 volts.
2626 cathode to ground—126 volts.
Voltage across ballast tube (pins 3, 7)—45 volts.
Voltage across pilot light section (pins 7, 8)—4 volts.

The ballast resistor (L55BG on schematic) is in a special tube at the rear of the chassis. In normal operation this tube will become quite hot. For voltage drop specifications, see “Voltage Analysis” above.

ALIGNMENT PROCEDURE

An oscillator with a frequency of 1400 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum response.

Rotate variable condenser to the maximum capacity position and set the pointer at the next calibration mark beyond 55. Then rotate the variable condenser until the pointer is at 140 and feed 1400 kc to the antenna through a .0001 mf mica condenser and adjust both trimmer condensers on the variable condenser for maximum response.
Schematic, Voltage Alignment, Notes

EMERSON RADIO & PHONOGRAPH CORP.

A.C. D.C., Superheterodyne Receiver, with Miracle Instamatic Tuning
Six Tubes, Including Balast Tube

All tubes are replaceable with other metal or equivalent metal base glass tubes.

A.F. PEAKED AT 455 KC

SCHEMATIC DIAGRAM

MODELS CA-208, CA-209 and CA-234

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully reassembled.

2. One side of the power line is directly grounded to the chassis base. Under no circumstances, therefore, should a ground wire be permitted to come in contact with any metal part of the receiver.

3. In operating the receiver on d.c. it may be necessary to reverse the line plug for correct polarity.

4. The color coding of the i-f transformer leads is as follows:
   - Grid—green
   - Grid return—black
   - Plate—blue
   - R plus—red.

5. In congested areas where the installation of a large antenna is not desirable we recommend the use of the Emerson Flexible Mast Antenna, Model 622. Instructions for the installation of this compact and efficient antenna are supplied with each kit.

6. Where the Flexible Mast is installed permanently, it is urgently recommended that the receiver antenna wire be cut. Leave just enough of this wire to reach from the receiver to the window strip connector.

7. The wave-trap in the receiver has been adjusted for maximum signal reception at 455 kc. If, however, persistent interference is experienced from some particular telegraphic station, readjust the wave-trap trimmer until the response from the interfering station is at a minimum.

ADJUSTMENTS

An oscillator with frequencies of 465 and 1460 kc is required.

An output meter should be used across the voice coil or output transformer for observing maximum response.

Always use as weak a test signal as possible when aligning the receiver.

Location of Cells and Trimmer Adjustments

The i-f transformers are in oblong cell case located on top of the chassis deck. The first i-f transformer is the one behind the variable condenser. The trimmers for these transformers are accessible through holes in the top of the case.

The trimmers for the antenna and oscillator cells are located on the variable condenser. The trimmer for the front section is for the antenna coil. The trimmer for the 455 kc wave-trap is mounted on the top of the chassis beside the variable condenser. The trimmer for the 455 kc wave-trap is mounted on the top of the chassis beside the variable condenser. The trimmer for the 455 kc wave-trap is mounted on the top of the chassis beside the variable condenser.

The variable condenser is located underneath the chassis, beneath the first i-f transformer.

I-F and Wave-Trap Alignment

Swing the variable condenser to the minimum capacity position. Feed 455 kc to the grid cap of the 6A7 tube through a .01 microfarad condenser and adjust the first i-f trimmers for maximum response. Feed 455 kc through a .0001 microfarad condenser to the antenna lead and adjust the wave-trap for maximum response. (See General Notes, paragraph No. 6.)

R-F Alignment

Set the dial pointer at 1460. Feed 1460 kc through a .0001 microfarad condenser to the antenna lead and adjust the trimmer for maximum response.
EMERSON RADIO & PHONOGRAPH CORP.

**REPLACEMENT PARTS**

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</table>

**DESCRIPTION**

- Antenna coil with adjustable 455 kc wave-trap...$ .90
- Oscillator coil.................. .35
- Double-tuned 455 kc first i-f transformer .... 1.10
- Double-tuned 455 kc second i-f transformer .... 1.10
- 30,000 ohm 1/4 watt carbon resistor ...... .18
- 50,000 ohm 1/4 watt carbon resistor ...... .18
- 140 ohm 1/4 watt wire-wound resistor ........ .18
- 1 megohm 1/4 watt carbon resistor ........ .16
- Volume control .25 megohm with line switch ...... .90
- 16 megohm 1/4 watt carbon resistor ....... .18
- 250,000 ohm 1/4 watt carbon resistor ...... .16
- L49-BG Ballast resistor tube. (Interchangeable with L-49B) .... .55
- Two-gang variable condenser ........ 2.35
- 0.001 mf, 600 volt tubular condenser ........ .20
- Trimmer, part of wave-trap assembly.
- Trimmers, part of variable condenser.
- Trimmers, part of i-f transformers.
- 0.06 mf, 200 volt tubular condenser ........ .20
- 0.00006 mf mica condenser ........ .20
- 0.1 mf, 200 volt tubular condenser ........ .20
- 0.1 mf, 400 volt tubular condenser ........ .20
- 0.0002 mf, 600 volt tubular or mica condenser .... .30
- 0.002 mf, 600 volt tubular condenser ........ .20
- 0.02 mf, 400 volt tubular condenser ........ .20
- 0.025 mf, 400 volt tubular condenser ........ .20
- Dual 20 mf, 150 volt electrolytic condenser ....... 1.00

**PRICE**

- 5" dynamic speaker ................ 8.00

*Item number locates the article on the schematic diagram.

These condensers cannot be supplied separately.

---

**PREADJUSTMENT OF STATION BUTTONS**

Select four nearby stations desired for automatic tuning. Choose one of these stations and any button to be adjusted for it. Follow the procedure outlined below.

1. Loosen the push-button to be adjusted by rotating it counter-clockwise from 1/4 to 1/2 turn. See Fig. 2.

2. Push the button in as far as it will go and, holding it in firmly, tune in the desired station by means of the selector knob. See Fig. 3.

3. Hold button in with finger of one hand and tighten securely with the other hand. Release the button and tighten it further if possible. See Fig. 4.

4. Remove the tab bearing the station call letters from one of the cards supplied in a separate envelope with the receiver. Insert the tab in the button, pressing it in firmly. Four celluloid caps are supplied in a separate envelope with the receiver. Snap one of these caps into the button over the station tab.

Check the adjustment of the button by detuning the station by means of the selector knob and then pressing the push-button in as far as it will go. The station should come back in clearly and with maximum volume.
GENERAL NOTES

1. If replacements are made or the wiring disturbed in the rf section of the circuit, the receiver should be carefully rechecked.

2. One side of the power line is directly grounded to the chassis base. Under no circumstances, therefore, should a ground wire be permitted to come in contact with any metal part of the receiver.

3. The chassis, when assembled is a resistance wire in the special test line. The cord will, therefore, become warm under normal operating conditions. To insure good heat radiation stretch out the line cord to its full length. Do not attempt to shorten it by cutting.

4. To operate the receiver on dc, it may be necessary to reverse the line plug for correct polarity.

5. The color coding of the lf transformer leads is as follows:
   - Grid—Black
   - Plate—Blue
   - E plus-red

6. In receptacle areas where the installation of a large antenna is not desirable, we recommend the use of the Emerson Flexible Base Antenna, Model W-33. Instructions for the installation of this compact and efficient antenna are supplied.

TUBE DATA

All tubes are replaceable with either metal or glass-enclosed hematite glass tubes. The letters "GT" at the end of the tube number indicate that the tube has a hematite glass envelope. In all other respects it is the same as the metal tube bearing the same number without the "GT".

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the voltmeter turned on full scale and no signal. Large voltage for these readings was 97.8 volts, 50 cycles, a.c. All readings except heater and output were taken on 500 volt scale. Measurements made with 500 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>One Plate</th>
<th>Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>6X5 GT</td>
<td>+100</td>
<td>60</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>6X5 GT</td>
<td>+100</td>
<td>65</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>6X5 GT</td>
<td>+125</td>
<td>0</td>
<td>0</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>6X5 GT</td>
<td>+125</td>
<td>0</td>
<td>0</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

Voltage at 125 volt points 15 volts.
Voltage across speaker 440—55 volts.

ADJUSTMENTS

An oscillator with frequencies of 460, 1600, 560 and 172 kc is required.

An output meter should be used across the valve coil or output transformer for observing maximum response.

Always use as weak a test signal as possible when aligning the receiver.

Location of Cells and Trimmer Adjustments

The first lf transformer is mounted on top of the chassis, below the speaker. The trimmers are accessible through holes in the top of the case.

The second hf transformer is mounted underneath the chassis, below the variable condenser. The trimmers are accessible through holes in the bottom of the chassis directly beneath the variable condenser.

The two-band antenna coil is located directly behind the speaker. The trimmer for the broadcast antenna coil is located on the front section of the variable condenser. The trimmer for the long wave coil is located on the back section of the variable condenser. The trimmer and series resistor are mounted on the rear section of the variable condenser. The trimmer is reached from the bottom only. The section toward the rear of the chassis is C34, the short trimmer. The section toward the front of the chassis is C26, the series padding condenser.  

I.F. Alignment:

Turn the band switch clockwise to broadcast position and swing the variable condenser to the maximum capacity position. Feed 450 kc to the grid-cap of the 6A5 tube through a .001 mf condenser and adjust the four lf trimmers for maximum response.

Broadcast Alignment:

With the band switch in broadcast position set the dial pointer at 500. Feed 1500 kc through a .001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

Long Wave Alignment:

Turn the band switch counterclockwise to the long wave position. With the dial pointer set at 500, feed 1500 kc through a .001 mf condenser to the antenna and adjust first the oscillator trimmer (near trimmer beneath the chassis), then the antenna trimmer (on antenna coil) for maximum response. Move the pointer to 1750, feed 720 kc, and adjust the series padding (front trimmer beneath the chassis), reducing the variable condenser back and forth while adjusting for maximum response. Return to 500 kc and repeat alignment.
Five-Tube, A.C.-D.C., Superheterodyne Receiver

The tube complement is as follows:
1.—12AS or 12AB7T, pentagrid oscillator modulator.
2.—12K7 or 12K7T, first i-f amplifier.
3.—12Q7 or 12Q7GT, diode detector, a-f amplifier a.c.
4.—36L6 or 36L6GT, beam power output.
5.—35Z4 or 35Z4GT, half-wave rectifier.

The color coding of the i-f transformer leads is as follows:

- Grid—green
- Plate—blue
- Grid return—black
- B plus—red

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

I-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cap of the 12AS tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust the first oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

Voltage Analysis

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Oct. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AS</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td>94</td>
<td>12</td>
</tr>
<tr>
<td>12K7</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td>94</td>
<td>12</td>
</tr>
<tr>
<td>12Q7</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td>94</td>
<td>12</td>
</tr>
<tr>
<td>36L6</td>
<td>97</td>
<td>94</td>
<td>0</td>
<td>94</td>
<td>55</td>
</tr>
</tbody>
</table>

Voltage at 35Z4 cathode—121 volts.
Voltage across speaker field—27 volts.
Voltage across pilot light section of ballast resistor (R9)—3.5.
Voltage drop across entire ballast resistor (R9 and R10)—13.5.
EMERSON RADIO & PHONOGRAPH CORP.

PRODUCTION CHANGES

1. Ballast resistor tube L-49B must be ordered for replacement in Models BJ-218 and BJ-220.
2. Condenser C27 is not used on Model BJ-220.

Location of Coils and Trimmer Adjustments

The two i-f transformers are located on top of the chassis deck. The first i-f transformer is the one directly behind the variable condenser. The trimmers for the two i-f transformers are available through holes in the tops of the cans.

The trimmers for the antenna and oscillator are located on the variable condenser. The trimmer on the front section is for the antenna.

The 455 kc wave-trap is mounted on the front chassis wall beneath the variable condenser. The trimmer for the 1.55 kc wave-trap is mounted on the coil and is accessible from the bottom of the chassis.

The color coding of the i-f transformer leads is as follows:
- Grid—green
- Grid return—black
- Plate—blue
- B plus—red

I-f and Wave-trap Alignment

Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 455 kc through a 0.02 mf paper condenser, to the grid cap of the 6A7 tube (do not remove the grid clip from the tube). Adjust the four i-f trimmers for maximum response. Feed 455 kc to the antenna through a standard dummy antenna (a .0005 mf condenser may be used as a substitute) and adjust the wave-trap trimmer for maximum response. (See General Note No. 7.)

R-f Alignment

With the wave-band switch in the broadcast position, clockwise, set the dial pointer at 140. Feed 1400 kc through a standard dummy antenna (a .0005 mf condenser may be used as a substitute) to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

The police band is self-tracking and does not require any adjustment.

NOTE: The Model BJ-220 should be aligned with the chassis bottom plate in place.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except cathodes and heaters were taken on 260 volt scale.

MODELS BJ-218 and 220

<table>
<thead>
<tr>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Oac. Plate</th>
<th>Heaters</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>46</td>
<td>2.0</td>
<td>84</td>
<td>6.3</td>
</tr>
<tr>
<td>84</td>
<td>84</td>
<td>2.8</td>
<td>—</td>
<td>6.3</td>
</tr>
<tr>
<td>35</td>
<td>—</td>
<td>1.0</td>
<td>—</td>
<td>6.3</td>
</tr>
<tr>
<td>116</td>
<td>84</td>
<td>5.5</td>
<td>—</td>
<td>25</td>
</tr>
</tbody>
</table>

6.3 Voltage at 325V cathode—130 volts.
6.3 Voltage across speaker field (Models BJ-200, 210 and 214)—28 volts.
6.3 Voltage drop across ballast tube L-49BG (pins nos. 3, 7)—49 volts.
25 Voltage drop across pilot light section (pins nos. 7, 8)—4 volts.

Frequency ranges
- Voltage rating: 100 to 155 volts, a.c. or d.c.
- Power consumption: 80 watts for phonograph motor.
- 120 to 180 kc and 180 to 450 kc.
**Tube Data**

The tube complement is as follows:
1. 6A8 or 6ASGT, pentagrid oscillator modulator.
2. 6K7 or 6K7GT, first i-f amplifier.
3. 6Q7 or 6Q7GT, diode detector & i-f amplifier, a.v.c.
4. 2516 or 251.6GT, beam power output.
5. 25Z6 or 25Z6GT, dual half-wave rectifier.

All tubes are replaceable with either metal or equivalent bantam glass tubes.

**PRODUCTION CHANGES**

AX-221 and AX-222 chassies bearing serial numbers below 1,890,976 do not have R16, 100,000 ohm resistor, connected in series with the yellow lead to phone-radio switch.

AX-221 and AX-222 chassis bearing serial numbers below 1,914,461 do not contain resistor R17.

On model AX-222 a 0.01 mf, 400 volt condenser is connected from B plus to the speaker frame. Another 0.01 condenser is connected from the motor mounting plate to ground.

AX-221 and AX-222 chassies below serial number 1,921,166 have a 210 ohm, 1/2 watt wire-wound resistor at R15.
EMERSON RADIO & PHONOGRAPH CORP. Alignment Notes

REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>42T-45A</td>
<td>Power transformer</td>
<td>1.90</td>
</tr>
<tr>
<td>2.</td>
<td>42T-45B</td>
<td>Double-tuned 455 kHz IF transformer</td>
<td>1.10</td>
</tr>
<tr>
<td>3.</td>
<td>42T-46B</td>
<td>Double-tuned 455 kHz second IF transformer</td>
<td>2.20</td>
</tr>
<tr>
<td>4.</td>
<td>42T-46C</td>
<td>Oscillator coil</td>
<td>0.80</td>
</tr>
<tr>
<td>5.</td>
<td>201-100</td>
<td>200 ohm 100 ohm</td>
<td>1.50</td>
</tr>
<tr>
<td>6.</td>
<td>201-100</td>
<td>200 ohm 100 ohm</td>
<td>1.50</td>
</tr>
<tr>
<td>7.</td>
<td>201-120</td>
<td>120 ohm 120 ohm</td>
<td>1.60</td>
</tr>
<tr>
<td>8.</td>
<td>201-150</td>
<td>150 ohm 150 ohm</td>
<td>1.70</td>
</tr>
<tr>
<td>9.</td>
<td>201-200</td>
<td>200 ohm 200 ohm</td>
<td>1.80</td>
</tr>
<tr>
<td>10.</td>
<td>201-250</td>
<td>250 ohm 250 ohm</td>
<td>1.90</td>
</tr>
<tr>
<td>11.</td>
<td>201-300</td>
<td>300 ohm 300 ohm</td>
<td>2.00</td>
</tr>
<tr>
<td>12.</td>
<td>201-350</td>
<td>350 ohm 350 ohm</td>
<td>2.10</td>
</tr>
<tr>
<td>13.</td>
<td>201-400</td>
<td>400 ohm 400 ohm</td>
<td>2.20</td>
</tr>
<tr>
<td>14.</td>
<td>201-450</td>
<td>450 ohm 450 ohm</td>
<td>2.30</td>
</tr>
<tr>
<td>15.</td>
<td>201-500</td>
<td>500 ohm 500 ohm</td>
<td>2.40</td>
</tr>
<tr>
<td>16.</td>
<td>201-550</td>
<td>550 ohm 550 ohm</td>
<td>2.50</td>
</tr>
<tr>
<td>17.</td>
<td>201-600</td>
<td>600 ohm 600 ohm</td>
<td>2.60</td>
</tr>
<tr>
<td>18.</td>
<td>201-650</td>
<td>650 ohm 650 ohm</td>
<td>2.70</td>
</tr>
<tr>
<td>19.</td>
<td>201-700</td>
<td>700 ohm 700 ohm</td>
<td>2.80</td>
</tr>
<tr>
<td>20.</td>
<td>201-750</td>
<td>750 ohm 750 ohm</td>
<td>2.90</td>
</tr>
<tr>
<td>21.</td>
<td>201-800</td>
<td>800 ohm 800 ohm</td>
<td>3.00</td>
</tr>
<tr>
<td>22.</td>
<td>201-850</td>
<td>850 ohm 850 ohm</td>
<td>3.10</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the chassis, the receiver should be carefully realigned.
2. One side of the power line is directly grounded to the chassis base. Under no circumstances, therefore, should a ground wire be permitted to come in contact with any metal part of the receiver.
3. The filament supporting resistor (R9—see schematic) is a resistance wire in the special line cord. This cord will, therefore, become warm under normal operating conditions. To insure good heat radiation, stretch out the line cord to its full length. Do not attempt to shorten it by cutting.
4. In operating the a.c.-d.c. combination, d-c. it may be necessary to reverse the line plug for correct polarity.
5. The color coding of the a-f transformer leads is as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Grid return (black)</td>
</tr>
<tr>
<td>Blue</td>
<td>Plate-blue</td>
</tr>
<tr>
<td>Red</td>
<td>Plus (red)</td>
</tr>
</tbody>
</table>

6. In connection with the installation of a large antenna, it is recommended that the use of the Emerson Flexible Mast Antenna, Model W-12, be considered. The mast is 15 feet in length and may be swiveled to any position. The mast may be extended to any desired height. The mast may be extended to any desired height.

ADJUSTMENTS

An oscillator with frequencies of 465 and 1400 kc is required.

An output meter should be used across the voice coil or output transformer for observing maximum response. Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The first a-f transformer is mounted on top of the chassis base. The trimmer are accessible through holes in the top of the case.

The second a-f transformer is mounted under the chassis beneath the variable condenser. The trimmers are accessible through holes in the base of the transformer. The transformer is mounted on the front section of the chassis base.

1-f and Wave-Trap Alignment

The variable condenser is mounted in the chassis base. The trimmer are accessible through holes in the top of the case.

The second a-f transformer is mounted under the chassis beneath the variable condenser. The trimmers are accessible through holes in the base of the transformer. The transformer is mounted on the front section of the chassis base.

1-f Alignment

Using the variable condenser in the maximum capacity position. Face 465 kc to the grid-ray of the a-f transformer through a .01 mf condenser and adjust the first a-f trimmer for maximum response. Then face the variable condenser to the antenna lead and adjust the wave-trap trimmer (on rear section of variable condenser) for maximum response.

R-f Alignment

Set the dial pointer at 140. Feed 465 kc through a 500 ohm 500 ohm condenser to the antenna lead and adjust the oscillator trimmer (in front section of variable condenser) for maximum response.
**VOLTAGE ANALYSIS**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Over-Plate</th>
<th>Cathode</th>
<th>Fil</th>
</tr>
</thead>
<tbody>
<tr>
<td>6X1 f. amplifier</td>
<td>690</td>
<td>517</td>
<td>473</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>6X1 f. oscillator</td>
<td>510</td>
<td>617</td>
<td>634</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>6X5C phase inverter</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>6X5C cathode</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>6X5G audio driver</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>6X5C output</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>9.0</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Voltage across speaker field - 45 volts. Voltage at 32 ohm. - 350.

**Location of Coils and Trimmer Adjustments**

The id transformers are located on the back of the chassis. The first id transformer is the one near the electrolytic capacitor. The six transformers are located in the following order:

- The first transformer is for the broadcast-band and the second transformer is for the police band.
- The id transformers are accessible through holes in the top of the chassis. The trimmer closest to the front is for the broadcast-band and the trimmer closest to the rear is for the police band.
- The id transformers are accessible through holes in the top of the chassis. The trimmer closest to the front is for the broadcast-band and the trimmer closest to the rear is for the police band.
- The id transformers are accessible through holes in the top of the chassis. The trimmer closest to the front is for the broadcast-band and the trimmer closest to the rear is for the police band.
- The id transformers are accessible through holes in the top of the chassis. The trimmer closest to the front is for the broadcast-band and the trimmer closest to the rear is for the police band.

1. **Alignment**

Set the wave-band switch at the broadcast (clockwise) position, and the variable condenser at minimum capacity. Feed 456 Kc to the grid of the 6X7 id amplifier tube through a 300uF condenser. Do not remove the grid clip from the tube. Examine the trimmer screw and locate the screw which is pointed red. Screw this trimmer down as far as it will go. Adjust the other trimmer for maximum response and then adjust the red trimmer for maximum response. Do not readjust the other trimmer for maximum response unless the red trimmer is turned to the grid of the 6X7 tube (as shown in the schematic diagram). Do not touch the adjustment of the second id transformer. Failure to follow these procedures may result in impairment of the fidelity of the receiver.

2. **Broadcast Alignment**

Since the indicator is fastened to the cabinet, a piece of stiff wire should be fastened to the dial drive assembly and connected to the indicator. The indicator is to be adjusted when the dial is removed from the cabinet. Move the dial to 60, feed 600 Kc to the antenna (using a standard dummy antenna), and adjust the broadcast-band series trimmer for maximum response. Move the dial to 600, feed 600 Kc to the antenna, and readjust the broadcast-band series trimmer for maximum response. Move the dial to 600, feed 600 Kc to the antenna, and readjust the broadcast-band series trimmer for maximum response.

3. **Police Alignment**

Set the wave-band switch at the police-band (central) position, and the dial at 1500. Feed 1500 Kc to the antenna (using a 150uF dummy antenna) and adjust the police-band series trimmer for maximum response. Move the dial to 1500, feed 1500 Kc to the antenna, and readjust the police-band series trimmer for maximum response. Move the dial to 3000, feed 3000 Kc to the antenna, and readjust the police-band series trimmer for maximum response. Move the dial to 6000, feed 6000 Kc to the antenna, and adjust the id transformer trimmer (central trimmer at left of wave-band switch) for maximum response.

**MIRACLE INSTOMATIC TUNING**

Pre-adjustment of Station Push-buttons

FOR CHASSIS BR

![Diagram of Miracle Instomatic Tuning](image)

The six push-buttons provide a choice of six favorite frequencies. The Miracle Instomatic Tuning is designed for quick and easy tuning. Adjustments can be made while the unit is under operation. The six push-buttons are located as shown in the diagram. The push-buttons can be adjusted by following the instructions below.

1. **Insert the key** in the electrical outlet. Turn the receiver on by rotating the dial clockwise until the desired station is found. Then turn the key clockwise until the desired station is found. The indicator should light when the key is turned clockwise.

2. **Select the desired station** by rotating the dial clockwise until the desired station is found. The indicator should light when the key is turned clockwise.

3. **Push the push-button** for the desired station. The indicator should light when the key is turned clockwise.

4. **Adjust the push-button** for the desired station. The indicator should light when the key is turned clockwise.

5. **Check the push-button** for the desired station. The indicator should light when the key is turned clockwise.

6. **Push the push-button** for the desired station. The indicator should light when the key is turned clockwise.

7. **Check the push-button** for the desired station. The indicator should light when the key is turned clockwise.

8. **Adjust the push-button** for the desired station. The indicator should light when the key is turned clockwise.
1—6K7, R-f amplifier (behind right-hand section of variable condenser).
1—6K8, Triode-triode, oscillator-modulator (behind left-hand section of variable condenser).
1—6K7, I-f amplifier (between the two i-f transformers).
1—6G7, Diode detector, audio amplifier, a.v.e. (left rear corner of chassis).
2—6J6, Second audio amplifiers (left side of chassis, third from rear).
2—50, Rectifiers (beside power transformer, at rear of chassis).

Voltage rating: 105-125 volts, 60 cycles, a.c.
Power consumption: 135 watts at 117.5 volts.
Frequency ranges: 540 to 1800 kc, 1800 to 6250 kc and 5.5 to 22.0 megacycles.

EMERSON RADIO & PHONOGRAPH CORP.
MODELS BR224
BR224A
Chassis BR
Schematic Notes
AUTOMATIC OPERATION

1. Turn the receiver "on" in the usual way.
2. Rotate the phonograph switch knob counter-clockwise to the phonograph position. Wait about a half-minute for the tubes in the receiver to warm up.
3. See that the pick-up is over the needle gauge plate with needle properly in place. If not, complete a cycle as follows: Throw the turntable switch "on." The turntable will start to revolve and the cycle of motion on the pick-up arm will follow through. When the pick-up arm comes down (and it can be moved by hand) the cycle is completed. Turn off the turntable switch.
4. The Index and Record Reject Lever are located near the right front corner of the motor board. With this lever at "Manual" position place the records on the record holder shelves. The records should be arranged in the desired order with the desired selection facing up and the last selection on top. The first record to be played will rest directly on the shelves. The turntable should be empty.
5. Throw the turntable switch to the "on" position. The turntable should start to revolve.
6. While the turntable is revolving, push the Index and Record Reject Lever to the "Reject" position and let go. When the lever is released, after it has been pushed to "Reject," it will return automatically to the "10" position. If all the records to be played are 12 inch, return the lever to the "12" position. The changer will then begin to go through its cycle and the first record will drop on the turntable. The entire series of records will then be played automatically in sequence.
7. Adjust to the desired volume by means of the regular receiver volume control.
8. Close the cabinet lid to eliminate normal mechanical noises due to needle vibration.

The whole series of records will now play without further attention, and the last record will repeat until the turntable switch is turned off. Allow the record-changing mechanism to complete its cycle before the turntable is stopped. Then lift the pick-up, swing the arm to the right beyond the edge of the record and lower it onto the pick-up rest with pick-up over needle gauge plate. The record player is then ready for reloading, or for manual operation.

MANUAL OPERATION

1. Proceed as in steps 1, 2 and 3 under Automatic Operation.
2. Place record on turntable with desired selection upwards.
3. Set Index and Record Reject Lever to "Manual" position. The lever should be kept in this position when not actually playing records automatically.
4. Throw the turntable switch on and when turntable has attained speed, lift pick-up and gently lower onto the record, so that the needle point enters the outside groove.
5. Proceed as in steps 7 and 8 under Automatic Operation.

SPECIAL PRECAUTIONS

1. This instrument is not recommended for playing 10 inch and 12 inch records in mixed sequence. If the user desires this service he must be positive that all records are perfectly flat and free from warp. The Index and Record Reject Lever must be set at "10" and after playing the last selection the pick-up will come down in position for a 10 inch record and repeat the playing of the record on a 10 inch diameter unless the turntable switch is turned off. Any jamming of the mechanism under these conditions indicates that the records used are not perfectly flat or that their edges are not sufficiently smooth to permit normal operation of the separators in dropping each record in sequence onto the turntable.
2. Do not handle or move manually the pick-up or any part of the mechanism while it is going through the record-changing operation.
3. Do not use force in handling the mechanism at any time.
4. Warped or thick records should not be used for automatic operation.
5. Do not leave records on record holder plates except when needed for immediate operation, as they will warp and sag if left in this manner for a long period of time. Records can be straightened, however, by placing them on a flat surface and resting heavy flat articles, such as books, over them.
6. During automatic operation, the needle is fed automatically into the starting groove of the next record. If the needle fails to enter the starting groove, this is an indication that the cabinet is not level. Raise the right hand side of the cabinet, by inserting several thin spacers beneath it on that side. If the needle slides over a few grooves, raise the left hand side of the cabinet in a similar manner.
7. Never leave pick-up with needle resting on a record or on the turntable. When finished playing, be sure that the turntable has stopped and the pick-up is in the rest position over needle gauge plate.

Replacements should be made with genuine Emerson parts for best results.
**Record Changer Adjustments**

**EMERSON RADIO & PHONOGRAPH CORP**

**MODEL BR224A**

**MODELS AX232 AC, AX232 AC-DC**

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**GENERAL INFORMATION**

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and are correctly assembled.

A. **Band on the Mechanism Can Usually be Relieved by Rotating the Turntable in the Reverse Direction.**

The changer can be conveniently rotated through its change cycle by hand by using the leverage of the proper side of the mechanism.

B. The turntable, spindles, and pinion gear are assembled by means of a 5/32 inch pin. This may be removed by gently driving a standard pin punch.

If the record changer or cabinet is not perfectly level, normal operations may be affected.

The 10 and 12 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

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**ADJUSTMENTS**

A. **Main Lever.**—This lever is basically important in that it interlocks the various individual mechanisms which control needle landing, track head, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. **Friction Clutch.**—The motion of the tone arm toward the center of the record is transmitted to the trip dog by the trip lever “T” through a friction clutch “S.” If the motion of the pickup is abruptly accelerated or becomes irregular due to roughness in the eccentric groove, the trip finger “T” moves the trip pawl “22” into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the clutch occurs when movement of the tone arm causes positive movement of the trip pawl “22” without tendency of the clutch to slip. The friction should be just enough to prevent slippage and is adjustable by means of screw “H.” If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

C. **Pickup Lift.**—During the record change cycle, lever “16” is actuated by the main lever “15” so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer “in-cycle” at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknut “C” to obtain 1 inch spacing between needle point and turntable top surface.

D. **E. Needle Landing on Record.**—The relation of coupling between the tone arm vertical shaft and lever “17” determines the landing position of the needle on a 10 inch record. Position of eccentric stud “E” governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 30 inch record on turntable; push index lever to static position and return the jockey 10 inch position; see that pickup locating lever “17” is tilted fully toward turntable; rotate mechanism through cycle until needle is just record; then see that pin “V” on lever “14” is in contact with “Step T” on lever “17.” The correct point of landing is 4-11/16 inches from the nearest side of the turntable spindle; loosen the two screws “D” and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers “14” and “17.” Leave approximately 1/32 inch end play between hub of lever “20” and pickup base bearing, and tighten the butain screw “D;” run mechanism through several cycles as a check, then tighten cone pointed screw “D.”

After adjusting on a 10 inch record, place 12 inch record on turntable, push index lever to return 12 inch position; rotate mechanism through cycle until needle is just ready to land on the record; correct point of landing is 5-1/16 inches from nearest side of spindle. If the landing is incorrect, turn stud “E” until the eccentric stud and adjust lever “14” to give correct needle landing. The eccentric end of the rod should be positioned toward the rear of the motor board, otherwise incorrect landing may occur with 10 inch records.

F. **G. Upper Spur.**—The upper spur (knife) “25” on each of the record posts serves to separate the lower record from the stack and to support the remaining records during record change cycle. It is essential that the spacing between the knife and the rotating record shell “27” be accurately maintained. The spacing for the 10 inch record is nominally .055 inch, and for the 12 inch record is .075 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and locknut “F” to give .051—.058 inch separation. Screw “G” must not be depressed during this adjustment. After setting lever “F” adjust screw “G” so that when its tip is depressed flush with top of record shelf a clearance is maintained between the knife, in its lowest rotational position, and the shell, is .071—.078 inch.

---

**The Record Support Shelf.**—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupling to the pinch roller and it is necessary that adjustments be such that the record is released from both shelves at the same instant. To adjust, place a 12 inch record on the turntable, rotate the mechanism into cycle to the point where tone arm is at maximum distance from turntable; lift record upward until it is in contact with both separating knives, then loosen screw “H” and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Tighten the blunt nose screw “H”; run mechanism through cycle several times to check action, then tighten cone pointed screw “H”.

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

I. **Tone Arm Rear Support (not shown).**—When the changer is out-of-cycle, the lower edge of the pickup support head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in required direction.

K. **Trip Pawl Stop Pin.**—The position of the trip pawl stop pin “K” in relation to the main lever “15” governs the point at which the needle is lifted from the record. Adjusting the pin support either upward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record post.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all bearing surfaces of various levers on underside of motor board.

The felt washer between the turntable and spindle bearing should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

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**MISCELLANEOUS SERVICE HINTS**

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual mis-adjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the rear support pin “K” of the tone arm may be incorrect.

2. Needle does not land properly on both 10 and 12 inch records.—Make complete adjustments “D” and “E.”

3. Needle does not land properly on 12 inch record but correct on 10 inch.—Effect adjustment “F”.

4. Failure to trip at end of record—Increase clutch “S” friction by means of screw “E.” Also, see that levers “14” and “15” are free to move without touching each other.

5. Pickup strikes lower record of stack or drags across top record on turntable.—Adjust lift cable per adjustment “G.”

6. Needle does not track after landing—Friction clutch “S” and needle may be too tight in tone arm vertical bearing; levers “7” and “11” fouled; or pickup output cable twisted.

7. Cycle commences before record is complete.—Record is defective; check record or replace changer mechanism not correctly assembled; or instrument is not being operated at normal room temperature (65°F).

8. Record knife leaves marks on record—Replace record; record edges are rough; or knife adjustments “F” and “G” are incorrect.

9. Record knife does not track properly.—Adjust record shelf assembly in respect to shaft by means of adjustment “H.”

10. Needle lands in 10 inch position on 12 inch record or makes record when playing both types mixed.—Increase tension of pickup locating lever spring “10.”
GENERAL NOTES

1. The pick-up must be over the needle gauge plate to insert or change needles. To insert a needle initially, loosen the needle screw on the front of the pick-up, place needle in hole at the top so that it drops down against the needle gauge plate and then tighten up the needle screw.

2. The phonograph motor has been adjusted at the factory to turn at a speed of 78 a.p.m. The speed may be checked by counting the turns per minute or by using a stroboscope disc and a neon light. The stroboscope method will only work when noise box is lighted from a 60 cycle a.c. supply. To readjust the speed use one of the turned on the turntable by turning it slowly to give access to the speed regulator screw and turn to right (clockwise) to increase speed, or to the left (counterclockwise) to decrease speed. Replace and record record and adjust speed when checked at 78 r.p.m.

3. A few drops of good quality light machine oil should be applied in the oil holes at regular intervals, about once every six months. The three holes in the top of the turntable give access to the oil holes in the motor mechanism beneath. Reapply the turntable slowly until the oil holes can be seen through the turntable, then apply the oil.

4. Model AA252 AC/DC portable automatic combination carries a c.r.c. or d.c. supply. It is important that this switch be in the proper position for the power-supply available.

CONTROLS AND MOVING MECHANISM

INDEX AND RECORD REJECT LEVER. This lever is located near the right rear corner of the motor board with its lever arm marked for four positions: "Manual," "12," "16," and "Reject." When you desire to change record selections manually, this lever must be set at the "Manual" position. With the lever set in the "Manual" position, the mechanism is set to play a series of 12-inch records automatically. To play either a series of 16-inch records, or 12- and 16-inch records mixed, the lever should be set at the "16" position.

To reject a record being played, or to start the record-changing cycle in case the record just played does not have the standard accurate spiral drop groove, simply push the lever to the "Reject" position and let go. The pick-up will raise and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "Manual" position. If you are playing a series of 16-inch records, the lever should be returned to the "Manual" position after rejecting a record. Keep the lever set in its "Manual" position when not actually playing records automatically.

TURNABLE SWITCH. The toggle switch located just in front of the Index and Record Reject Lever controls the current to the turntable motor. To start the turntable, throw the switch to the "ON" position. To stop the turntable throw the switch to the "OFF" position.

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Note: Numbers refer to parts, letters refer to adjustments.
Five-Tube, A.C.-D.C.,
Superheterodyne Receiver

Voltage rating ................................... 105-125 volts
Power consumption .................................. 65 watts
Frequency range ................................ 640 to 1730 kc.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.6 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 269 volt scale. Measurements made with 117.6 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>100</td>
<td>80</td>
<td>0</td>
<td>100</td>
<td>6.8</td>
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</tr>
<tr>
<td>607</td>
<td>43</td>
<td>43</td>
<td>0</td>
<td>0</td>
<td>6.8</td>
</tr>
<tr>
<td>25L6</td>
<td>92</td>
<td>92</td>
<td>100</td>
<td>8.8</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage at 25L6 cathode—126 volts.
Voltage across speaker field—28 volts.

The color coding of the i-f transformer leads is as follows:
- Grid—green
- Grid return—black
- Plate—blue
- B plus—red

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

I-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cath of the 6A8 tube through a 0.01 microfarad condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a 0.001 microfarad condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes, paragraph No. 7.)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a 0.001 microfarad condenser to the antenna lead, and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.
Five-Tube, A.C.-D.C., Superheterodyne Receiver

Models CH-243, CH-246 and CH-256
Chassis Model CH

Voltage rating ........................................... 105-125 volts, a.c. or d.c.
Power consumption ..................................... 45 watts
Frequency range ....................................... 540 to 1725 kc.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned off full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>FL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>100</td>
<td>55</td>
<td>100</td>
<td>100</td>
<td>...</td>
</tr>
<tr>
<td>6K7</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>...</td>
</tr>
<tr>
<td>6Q7</td>
<td>5</td>
<td>5</td>
<td>100</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>25L4</td>
<td>92</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Voltage at 25L4 cathode—125 volts.

ADJUSTMENTS

An oscillator with frequencies of 456 and 1400 kc is required.

An output meter should be used across the voice coil or output transformer for observing maximum response.

Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 456 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 456 kc wave-trap is mounted on the can and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

i-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 456 kc to the grid-caps of the 6A8 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 456 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes, paragraph No. 7.)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.
EMERSON RADIO & PHONOGRAPH CORP.

MODEL CB243

Chassis CB

Schematic, Voltage Notes

GENERAL NOTES

1. The receiver should never be turned on with either the speaker plug or the 6A6G tube out of their respective sockets, since the rapid rise in rectifier voltage will damage the electrolytic condenser.

2. When replacing the chassis in the cabinet take precautions to keep any part of the dial and condenser assembly from touching the cabinet, otherwise microphone will result.

3. The color coding of the 94 transformers is as follows:
   - Grid—green
   - Plate—blue.

4. The color coding of the power transformers is as follows:
   - Primary—two black leads
   - High-voltage secondary—two red leads
   - Hi-voltage secondary—center tap—red and yellow lead
   - 6.3 volt secondary—two green leads
   - 12 volt secondary—two yellow leads.

5. The adjustable padding condensers for the broadcast and police bands are mounted on the rear chassis and are marked with the name of the band. The short-wave band has a fixed padding, C10 on schema. When replacing this fixed padding be careful to use a condenser which has a capacity within 2% of the specified value, otherwise the short-wave coil may not track.

6. An efficient antenna system is necessary to enable a full realization of the merits of the receiver. For reduction of noise and enhancement of high efficiency on all frequency ranges Emerson All-Wave High-Fidelity Antenna, Model W-16, and the Emerson All-Wave Antenna System, Model W-36, are recommended. Instructions for the installation of these antennas are supplied with each kit.

In congested areas where the installation of a large antenna is not desirable we recommend the use of the Emerson Flexible Mast Antenna, Model W-36. Instructions for the installation of this compact and efficient antenna are supplied with each kit.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 110 volts, 60 cycles, a.c. All readings except B plus at rectifier, heaters, and cathode voltages were taken on 500 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Oct. Plate</th>
<th>Pol.</th>
<th>6.3 e.m.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>170</td>
<td>65</td>
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<td>6.3</td>
<td>6.3</td>
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<tr>
<td>6C6</td>
<td>200</td>
<td>65</td>
<td>0</td>
<td>6.3</td>
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</tr>
<tr>
<td>6C7</td>
<td>200</td>
<td>65</td>
<td>0</td>
<td>6.3</td>
<td>6.3</td>
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</tr>
<tr>
<td>6FU</td>
<td>200</td>
<td>10.3</td>
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<td>6.3</td>
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<tr>
<td>6AG7</td>
<td>150</td>
<td>65</td>
<td>0</td>
<td>6.3</td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

Voltage at 0.5 milliamperes (center tap on high voltage winding)—300 volts.
Voltage across speaker S—85 volts.
The grid bias for all tubes is developed across resistors R17 and R18. This voltage should be 10.8 volts.

Tube Data

The following special voltage transformers are also available:
- 120 volt—full power at 100 volts, 50 cycles, a.c.
- 240 volt—full power at 100 volts, 60 cycles, a.c.
- 12 volt—full power at 12 volts, 60 cycles, a.c.
- 6.3 volt—full power at 6.3 volts, 60 cycles, a.c.

Notes:
- The following special voltage transformers are also available: 120 volt, 240 volt, 12 volt, 6.3 volt, all full power at 120 volts, 240 volts, 12 volts, 6.3 volts, all 60 cycles, a.c.
- The following special voltage transformers are also available: 120 volt, 240 volt, 12 volt, 6.3 volt, all full power at 120 volts, 240 volts, 12 volts, 6.3 volts, all 60 cycles, a.c.
- The following special voltage transformers are also available: 120 volt, 240 volt, 12 volt, 6.3 volt, all full power at 120 volts, 240 volts, 12 volts, 6.3 volts, all 60 cycles, a.c.
- The following special voltage transformers are also available: 120 volt, 240 volt, 12 volt, 6.3 volt, all full power at 120 volts, 240 volts, 12 volts, 6.3 volts, all 60 cycles, a.c.
- The following special voltage transformers are also available: 120 volt, 240 volt, 12 volt, 6.3 volt, all full power at 120 volts, 240 volts, 12 volts, 6.3 volts, all 60 cycles, a.c.
ADJUSTMENTS

An oscillator with frequencies of 455, 600, 1800, 1800, 3000, and 20,000 kc should be used.

An output meter should be used to observe the output in volts and milliamperes of the bridge for observing maximum response and trimmers for alignment of the three bands. A 9000 mf condenser may be used for broadcast band dummy antenna, a 1000 mf condenser for the police band dummy antenna and a 4000 ohm non-inductive resistor for the short-wave band dummy antenna.

Always use a dummy for each band as it is possible during alignment.

The set's oscillator is used to measure the signal on the broadcast bands. No sounds should be observed on band and no sounds should be observed on the broadcast bands. The last two in adjusting trimmers should always be a tightening one, not a loosening one.

Never leave a trimmer with the outside plate as there will be a static one on the screw. Either bend the plate up or remove the trimmer completely. Looms screw is a source of defects, drifting, and microphonics. In aligning antenna trimmers on the high-frequency signal there is always a tendency for the oscillator to drift, due to interlocking. To compensate for this always keep from the variable condenser as trimmers are being adjusted.

I-F Alignment

Rotate the wave-band switch to the broadcast (clicking in) position. Set the variable condenser at the minimum capacity position and feed 455 kc through a 0.06 mf paper condenser to the grid cap of the 6K8 tube (do not remove the grid clip from the tube). Adjust the I.F. trimmers for maximum response.

Broadcast Alignment

Since the indicator is fastened to the cabinet, a piece of stiff wire should be fastened to the variable condenser and bent over to form an indicator when the chassis is removed from the cabinet. Set indicator at extreme low frequency and of dial with condenser closed.

Set the wave-band switch at the broadcast (clockwise) position and the dial at 60. Feed 600 kc to the antenna (using a standard dummy antenna) and adjust the broadcast-band series pad for maximum response. Move the dial to 90, feed 900 kc and adjust the oscillator trimmer for maximum response. Then adjust the interstage and antenna coil trimmers for maximum response. Raise the dial to 1800 kc and the variable condenser while adjusting the series pad for maximum response. Return to 1800 and check alignment. If readjustment is necessary return to 600 and repeat entire procedure.

Police Alignment

Set the wave-band switch at the police-band (center) position and the dial at 1.8. Feed 1800 kc to the antenna (using a standard dummy antenna) and adjust the police-band series pad for maximum response. Move the dial to 4500 kc and adjust the oscillator trimmer for maximum response. Then adjust the series pad for maximum response. Note the interstage coil on this band has no trimmer adjustment. Return the dial to 1.8, feed 1800 to the antenna and raise the variable condenser while adjusting the series pad for maximum response. Return to 6000 kc and check alignment. If readjustment is necessary return to 1800 kc and repeat entire procedure.

Short-Wave Alignment

Set the wave-band switch at the short-wave (counter-clockwise) position. Move the dial to 20 and feed 20,000 kc to the antenna (using a 400 ohm dummy antenna) and adjust the short-wave oscillator trimmer for maximum response. If two peaks are obtained choose the maximum capacity peak. Then adjust the interstage and antenna coil trimmers for maximum response. If three peaks are obtained choose the maximum capacity peak and move the dial to 6 and feed 600 kc to the antenna and adjust the I.F. interstage trimmer for maximum response.

Replacements should be made with genuine Emerson parts for best results.

<table>
<thead>
<tr>
<th>Replacement Parts List</th>
<th>Model CB-243</th>
</tr>
</thead>
<tbody>
<tr>
<td>88C-418</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-419</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-420</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-421</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-422</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-423</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-424</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-425</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-426</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-427</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-428</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-429</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-430</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-431</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-432</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-433</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-434</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-435</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-436</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-437</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-438</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-439</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-440</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
<tr>
<td>88C-441</td>
<td>Trimmers, part of antenna coil assembly</td>
</tr>
</tbody>
</table>

88B-409 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-409) |

88C-410 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-410) |

88C-411 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-411) |

88C-412 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-412) |

88C-413 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-413) |

88C-414 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-414) |

88C-415 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-415) |

88C-416 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-416) |

88C-417 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-417) |

88C-418 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-418) |

88C-419 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-419) |

88C-420 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-420) |

88C-421 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-421) |

88C-422 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-422) |

88C-423 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-423) |

88C-424 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-424) |

88C-425 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-425) |

88C-426 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-426) |

88C-427 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-427) |

88C-428 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-428) |

88C-429 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-429) |

88C-430 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-430) |

88C-431 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-431) |

88C-432 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-432) |

88C-433 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-433) |

88C-434 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-434) |

88C-435 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-435) |

88C-436 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-436) |

88C-437 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-437) |

88C-438 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-438) |

88C-439 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-439) |

88C-440 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-440) |

88C-441 | Dual adjustable padding condenser (if dual adjustable condenser is used, order 88C-441) |
MODEL BT-245
CHASSIS BT

Schematic, Voltage Alignment, Parts

TUBE DATA

The tube complement is as follows:

- 6AT, pentagrid converter-modulator
- 12AP7, twin triode amplifier
- 12AT7, phase detector 
- 12AT7, phase detector 
- 6GQ7, dual half-wave rectifiers

All metal-base tubes are replaceable with either metal or equivalemt metal-base glass tubes. The letter "G" at the end of the tube number indicates that the tube has a glass envelope. In all other respects it is exactly the same as the metal-base tube bearing the same number without the "G".

REPLACEMENT PARTS LIST
**Production Change**

CL chassis which use oscillator coil 6JT-466 or 4XT-468 may use 6JT-466A for replacement. For correct lug connections see illustration.

**Location of Coils and Trimmer Adjustments**

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

**I-f and Wave-Trap Alignment**

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cathode of the 12AT7 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes, paragraph No. 6.)

**R-f Alignment**

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

**Voltage Analysis**

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 77.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Occ. Plate</th>
<th>Fu.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7</td>
<td>94</td>
<td>60</td>
<td>0</td>
<td>94</td>
<td>15</td>
</tr>
<tr>
<td>12A7</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td>94</td>
<td>15</td>
</tr>
<tr>
<td>12E2</td>
<td>87</td>
<td>94</td>
<td>5.2</td>
<td>93</td>
<td>25</td>
</tr>
</tbody>
</table>

Voltage at 3534 cathode—121 volts.
Voltage across speaker field—27 volts.

©John F. Rider, Publisher
When ordering replacement parts specify part numbers.

VOLTAGE ANALYSIS

Readings should be taken with a 10,000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned on full and no signal. The line voltage for these readings was 117.5 volts, 60 cycles a.c. All readings except cathodes and heaters were taken on 250 volt scale. Readings taken on d.c. will be slightly lower.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>FIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>12B8GT</td>
<td>95 (pin no. 8)</td>
<td>95 (pin no. 4)</td>
<td>2.1 (pin no. 1)</td>
<td>12</td>
</tr>
<tr>
<td>12B8GT</td>
<td>49 (pin no. 5)</td>
<td>49 (pin no. 6)</td>
<td>0.0 (pin no. 6)</td>
<td>32</td>
</tr>
<tr>
<td>32L7GT Output</td>
<td>125 (pin no. 3)</td>
<td>95 (pin no. 4)</td>
<td>4.5 (pin no. 8)</td>
<td>32</td>
</tr>
</tbody>
</table>

Voltage at rectifier cathode—130 (pin no. 1)

The socket connections of the tubes used in the CF chassis are as follows, the numbering following standard designation E.M.A.

- Tube 12B8GT: pin 1—r-f amplifier cathode
- pin 2—heater
- pin 3—r-f amplifier plate
- pin 4—r-f amplifier screen grid
- pin 5—detector plate
- pin 6—detector cathode
- pin 7—heater
- pin 8—detector grid

R-f amplifier grid connection is made to grid cap.

ALIGNMENT PROCEDURE

An oscillator with a frequency of 1600 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum response.

Examine the condenser drive assembly bracket and locate five dots embossed along the front. Rotate the variable condenser to maximum capacity and set the pointer just below the bottom dot. Then rotate the condenser until the pointer is just below the second dot from the top. Feed 1600 kc to the antenna through a .0001 mf condenser and adjust both trimming condensers for maximum response.

A.C.-D.C. TRF Receiver—Two Tubes

Voltage rating: 105 to 125 volts, a.c. or d.c.
Power consumption: 40 watts.
Frequency range: 540 to 1730 kc.
GENERAL NOTES

1. Batteries: The Models CE-289 and CE-280 are designed to house the complete set of batteries within the cabinet. The battery compartment should be as follows:

   **FOR MODEL CE-289 (Portable)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Battery</th>
<th>No. Req.</th>
<th>Every Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6V</td>
<td>BB (plug-in type)</td>
<td>4</td>
<td>32-C-11 (plug-in type)</td>
</tr>
<tr>
<td></td>
<td>6V</td>
<td>700 (plug-in type)</td>
<td>32-C-11 (plug-in type)</td>
</tr>
</tbody>
</table>

   **FOR MODEL CE-280**

<table>
<thead>
<tr>
<th>Type</th>
<th>Battery</th>
<th>No. Req.</th>
<th>Every Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6V</td>
<td>BB (plug-in type)</td>
<td>4</td>
<td>32-C-11 (plug-in type)</td>
</tr>
<tr>
<td></td>
<td>6V</td>
<td>700 (plug-in type)</td>
<td>32-C-11 (plug-in type)</td>
</tr>
</tbody>
</table>

   **Also available:** AH-2 (plug-in type)

2. The color coding of the id transformer is as follows:

   - Black = green
   - Blue = red

3. The color coding of the battery case is as follows:

   - Red = 6V plus 20 volts
   - Blue = 6V minus

4. If replacements are made in the r-f section of the circuit, the receiver should be carefully re-aligned.

5. The Models CE-289 and CE-280 have self-contained antennas and do not require additional antennas or ground connections. For home installation, however, it is desirable to improve reception of weak stations by adding an additional outdoor antenna. Use for this purpose a terminal strip at the cabinet head.

6. An additional loop antenna operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, that the antenna is turned on and off through a course of a 1/4 wavelength, as above the position where the antenna is received with maximum volume. This procedure is not necessary for receivers with outside antennas.

ADJUSTMENTS

An oscillator with frequencies of 455 and 1600 kc is required.

An output filter should be used across the line or output transformer for observing maximum response. Always use as weak a signal as possible when aligning the receiver.

LOCATION OF COILS AND TRIMMER ADJUSTMENTS

The coil cabinet is located beneath the chassis. The trimmer for the oscillator is on the left side of the cabinet. The trimmer for the receiver is on the right side of the cabinet.

The trimmer for the oscillator is on the front section of the variable condenser. The trimmer for the receiver is on the rear section of the variable condenser.

1. **Alignment**

   **Model CE-289 (below serial number 2119-670).** Using variable condenser to maximum capacity position.

   **Model CE-289 (above serial number 2119-670).** Using variable condenser to minimum capacity position.

   Feed 455 kc through the grid of the 1A5T tube through a 0.02 mf condenser at the trimmer for the maximum response.

2. **Alignment**

   Set the dial pointer at 140. Feed 1600 kc through the grid of the condenser to the antenna condenser and adjust the trimmer for the maximum response. Adjust all trimmers on the front section of the variable condenser for maximum response.

Battery Installation for Model CE-289

(See diagram on inside page)

1. To install and connect the batteries in the battery cabinet, observe the following precautions:

   1. Open the top of the cabinet, (side with speaker grille) by removing the two screws in the top corners of the panel. The panel is hinged on the bottom. Open the panel by pulling the small leather tab at the top edge.

   2. A small wood block is fastened to the bottom of the cabinet directly below the two top holes. Remove the block by taking out the small wood screws.

   3. The two group of four batteries on the battery compartment should be plugged into the two "B" batteries.

   4. Slide the "B" batteries, one at a time, in an upright position between the two wood rails in the cabinet, as indicated in the diagram.

   5. Replace the small wood block in front of the second battery and fasten securely with the wood screws.

   6. The small wood block in the battery compartment should be plugged into the "A" battery. Place the "A" battery in the front of the cabinet, as shown in the diagram.

   7. Be sure that all of the high voltage wires are free and clear of the receiver. Care should be taken to keep the wires from jamming between the wood rails and the batteries.

   8. Close the end panel and replace the wood screws, fastening them securely.

Battery Installation for Model CE-280

The cabinet for this model is designed to house completely the combined "A" and "B" pack. Place the battery pack in the cabinet at the rear of the receiver and insert the four-prong plug of the battery cable into the socket on the top of the battery. (If it is desired to use separate "A" and "B" plug-in type batteries, a special cable harness is available for connecting the batteries to the receiver. The receiver battery case may be plugged into the socket on the special cable harness.)

When ordering replacement parts specify part numbers.
MODELS CR-261, CR-262 and CR-274

CHASSIS MODEL CR
ALIGNMENT AND LOCATION OF TRIMMERS
IF. 455ko through .01 mf. cond. to grid of 12A8G
1st IF, top of chassis right of speaker; 2nd IF
under chassis beneath variable, holes provided in
top of chassis. Variable max. cond. Adjust trimmers
to max. response.
Wave trap (see GENERAL NOTES) Feed 455ko through
.0001 mf. cond. to ant. lead. Adjust for minimum
response.
RF, Dial at 140. Feed 1400ko through .0001 mf. cond.
to ant. lead. Adjust osc. trimmer (rear section of
variable), then ant. trimmer (front section of
variable) for maximum response.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully
re-aligned.

2. In operating the receiver on d.c. it may be necessary to reverse the line plug for correct polarity.

3. The color coding of the i-f transformer leads is as follows:
   Grid—green
   Grid return—black
   Plate—blue
   B plus—red

4. The wave-trap in the receiver has been adjusted for maximum signal rejection at 455 kc. If, however, persistent
interference is experienced from some particular telegraphic station, readjust the wave-trap trimmer until the response
from the interfering station is at a minimum.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus
(switch) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles,
a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c.
will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12A8GT</td>
<td>88</td>
<td>45</td>
<td>0</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>12K7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>2S9Q7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>5606GT</td>
<td>82</td>
<td>88</td>
<td>5.7</td>
<td>88</td>
<td>80</td>
</tr>
</tbody>
</table>

EMERSON RADIO & PHONOGRAPH CORP.

Current drain: "A" battery—0.9 amperes. "B" battery—0.010 amperes with no signal.
Frequency range: 530 to 1600 kc.

MODEL CT275

Chassis CT
Schematic, Voltage Alignment

1A7G, oscillator-modulator.
1N6G, 1st i-f amplifier.
1N6G, 2nd i-f amplifier.
1H6G, 3rd detector, a-c, a-f amplifier.
1Q6G, beam power output.

Batteries: The Model CT-275 is designed to house the complete set of batteries within the cabinet. The battery complement should be as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4 volt &quot;A&quot;</td>
<td>1</td>
<td>741 (plug-in type)</td>
<td>P-5908</td>
<td>680-P1</td>
</tr>
<tr>
<td>45 volt &quot;B&quot;</td>
<td>2</td>
<td>762 (plug-in type)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The color coding of the i-f transformer leads is as follows:
- Grid—green
- Color coding of the battery cables is as follows:
  - Red—B plus, 90 volts
  - Yellow—A plus, 1,500 volts
  - Blue—B minus
  - Black—A minus

The i-f transformers are located in cans mounted on top of the chassis. The first i-f transformer is the one between the speaker and the variable condenser. The diode i-f transformer is the one behind the speaker. The trimming condensers for both transformers can be reached through holes in the tops of the cans.

1-f Alignment

The oscillator coil is located beneath the chassis. The trimmer for the oscillator is on the rear section of the variable condenser.

Feed 455 kc to the grid of the 1A7G tube through a 0.01 mf condenser. Adjust the four i-f trimmers for maximum response.

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a 0.001 mf condenser to the antenna connection and adjust the oscillator trimmer (on rear section of variable condenser) for maximum response. No adjustment necessary on antenna circuit.
Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows:—Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Tone control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 6A6 tube in series with a .0008 condenser and adjust trimmers 1-2, 3-4 for maximum output at 456 K.C., reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a .0008 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 2 & 3 for maximum output. Turn dial pointer to 600 K.C. Adjust head phone T3 rocking gang condenser for maximum output. Recheck alignment at 1500 K.C. Shift oscillator to 456 K.C. and set trimmer on wave trap for minimum signal. Check sensitivity at 1000 K.C. using magic wand. Turn band switch to Short Wave position. Set dial at 15 K.C. Use a 400 ohm carbon resistor for dummy antenna. With a 15 K.C. signal adjust T3 for minimum output. Check image at 14.7 K.C., increasing input signal if necessary. Check sensitivity at 10 M.C. and 6 K.C.

<table>
<thead>
<tr>
<th>Part</th>
<th>List</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.03</td>
<td>.85</td>
</tr>
<tr>
<td>46.04</td>
<td>.85</td>
</tr>
<tr>
<td>46.073</td>
<td>.70</td>
</tr>
<tr>
<td>46.074</td>
<td>.70</td>
</tr>
<tr>
<td>46.0119</td>
<td>1.25</td>
</tr>
<tr>
<td>56.0118</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Prices subject to change without notice.
FADA FLASH-O-MATIC SIX

INTRODUCTION: FADA Flash-o-Matic Six is an electrical type automatic tuning system that, once adjusted, will automatically "tune in" any one of six local broadcast stations operating between 540 and 1500 kilocycles (K.C.). While the Flash-o-Matic is not confined to local reception, it can be adjusted for stations anywhere in the country, the most frequently "tuned in."

ALIGNING PROCEDURE: It is advisable that the receiver remain in operation for fifteen minutes or more before attempting any adjustments. When the receiver has reached constant temperature and has operated for one hour, tune to the station to be set (a) Select six local broadcast stations whose programs are preferred, then, detach the station call letters from the station call letter tab sheets, which are supplied with each receiver.

(b) The six Flash-o-Matic positions are numbered and arranged according to frequency limits.

There are number tabs (1 to 4) in the Flash-o-Matic escutcheon as shipped from the factory. These tabs show the relation between the Flash-o-Matic escutcheon and the Flash-o-Matic tuning panel positions and are to be removed, one at a time (with the aid of a pin) when inserting the station call letters.

The six call letter tabs corresponding to the six broadcast stations which have been chosen, must be arranged in the Flash-o-Matic escutcheon so that the frequency in kilocycles of each station will fall within the frequency limits of the proper group.

If one of the chosen stations has an operating frequency of 550 K.C. it should be placed in the No. 1 (530 to 710 K.C.) group, a station of 600 K.C. should be placed in the No. 2 group, etc.

Each group has considerable overlap to allow for the selection of two stations which may have frequency assignments comparatively close together.

Having inserted the call letter tabs, cover each tab with a celluloid disc furnished with your receiver.

(c) Two trimmer condenser set screws are provided for each one of the six station positions and are accessible at the rear of the receiver. All trimmer condenser set screw adjustments are marked as to their group number and frequency range coverage.

(d) Tune in the station in the usual manner, using manual tuning, and determine the program.

(e) Turn the wave band switch completely to the right (clockwise).

(f) Adjust OSC. trimmer condenser at 530 K.C. mark, setting for maximum output. Swell sound output. TUNE PARTICULAR CARE WHILE MAKING this adjustment that the same station is heard and not a network station broadcasting the same program.

(g) Now adjust the ANT. trimmer condenser set screw (SEE ILLUSTRATION) having the same position number, for maximum sound output.

(h) Repeat the same procedure as outlined above for each of the remaining five stations.

(i) To insure accurate adjustment, it may be found advisable to repeat the operations outlined in paragraphs (b), (e) and (f).
MODEL S46
Schematic, Voltage Alignment, Trimmers Socket, Coils

FADA RADIO & ELECTRIC CO

Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked and proceed as follows—Remove chassis from case and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Connect modulated oscillator to grid of 6A6 tube in series with all condensers. Adjust trimpots 1-2-3-4 for maximum reading at 455 K.C. reducing input signal of oscillator as required. Check pointer with condensers fully ionized. Turn pointer to 1000 K.C. Connect oscillator to antenna lead using a .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimpots 5 & 6 to give maximum output. Check sensitivity at 1000 and 600 K.C. with magic wand.

*** USE ONLY GENUINE FACTORY REPLACEMENT PARTS ***

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FADA RADIO  &  ELECTRIC  CO

FADA RADIO MODEL 54 = 110 VOLTS - 50-60 CYCLES A.C. - Tuning Range 540-1700 and 1560-4600 Kc., 5 Tube Superheterodyne. Tubes required: 6A7-6D6-6370-6Y6G-80. Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows: --- Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1500 Kc. and turn volume control to maximum position. Band switch in broadcast position. Connect modulated oscillator to grid of 6A7 tube in series with a .1 condenser. Adjust trimmers 1,2,3,8,9 for maximum reading at 406 Kc., reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 Kc. Connect oscillator to antenna lead using a .0005 condenser as dummy antenna. With a 1500 Kc., signal adjust trimmers 5 & 6 to give maximum output. Check sensitivity at 1500 and 600 Kc., using magic wind. Set band switch in police band position and check sensitivity at 2800 Kc. Do not disturb trimmers for this operation.

Prices subject to change without notice.

<table>
<thead>
<tr>
<th>Item</th>
<th>List</th>
<th>Item</th>
<th>List</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,47A Volume Control</td>
<td>4.95</td>
<td>25,206A Variable Condenser</td>
<td>2.10</td>
</tr>
<tr>
<td>40,44 Band Switch</td>
<td>3.00</td>
<td>20,026A Electrolytic &quot;</td>
<td>1.35</td>
</tr>
<tr>
<td>70,287 Vortex Drive</td>
<td>2.50</td>
<td>75,247 Pulley</td>
<td>1.20</td>
</tr>
<tr>
<td>35,122 Antenna Coil</td>
<td>7.50</td>
<td>75,290 Dial Plate</td>
<td>3.30</td>
</tr>
<tr>
<td>35,123 Oscillator Coil</td>
<td>6.60</td>
<td>75,283 Dial Pointer</td>
<td>1.15</td>
</tr>
<tr>
<td>35,73 Input I.F.</td>
<td>1.00</td>
<td>75,291 Dial S.d.e.</td>
<td>1.15</td>
</tr>
<tr>
<td>35,72 Output I.F.</td>
<td>1.25</td>
<td>105,124 Speaker</td>
<td>4.25</td>
</tr>
<tr>
<td>40,72A Power Transformer</td>
<td>3.25</td>
<td>75,300 Crystal</td>
<td>1.25</td>
</tr>
</tbody>
</table>

These readings taken with Line Voltage 110 A.C.

<table>
<thead>
<tr>
<th>Item</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Anode</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>112</td>
<td>62</td>
<td>2.7</td>
<td>112</td>
</tr>
<tr>
<td>6D6</td>
<td>112</td>
<td>62</td>
<td>2.7</td>
<td>-</td>
</tr>
<tr>
<td>6370</td>
<td>50</td>
<td>-</td>
<td>1.1</td>
<td>-</td>
</tr>
<tr>
<td>6166</td>
<td>100</td>
<td>112</td>
<td>1.1</td>
<td>-</td>
</tr>
<tr>
<td>80</td>
<td>414 A.C. Plate to Plate</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
1. VOLUME CONTROL ..................................... MAXIMUM.
2. ATTENUATE SIGNAL TO CONTROL SIGNAL OUTPUT.
3. CONNECT PROPER DUMMY ANTENNA, FOR EACH ADJUSTMENT, IN SERIES WITH THE POTENTIAL SIDE OF SIGNAL GENERATOR. FOR 100 MFD., 60,000 ohm resistors, CARBON 1/2 WATT.
4. GROUND LOW POTENTIAL SIDE OF SIGNAL GENERATOR.
5. FOR ADJUSTING THE I.F. TRIMMER CONDENSERS, THE CONTROL GRID SHOULD BE REMOVED AND A 50,000 OHM RESISTOR INSERTED IN SERIES WITH SAME. THEN CONNECT THE HIGH POTENTIAL LEAD OF THE SIGNAL GENERATOR TO THE 600 MFD. CONDENSER DIRECTLY TO THE CONTROL GRID CAP OF THE TUBE.
6. REPEAT ALL ADJUSTMENTS.
7. TO DETERMINE THAT THE SHORT WAVE BAND SHORT TRIMMER HAS NOT BEEN ADJUSTED TO THE IMAGE FREQUENCY, TURN THE DIAL TO THE FREQUENCY LISTED UNDER IMAGE FREQUENCY WHERE A SIGNAL WAKER THAT THE FUNDAMENTAL SHOULD BE NOTED. HOWEVER, IF NO SIGNAL CAN BE HEARD AT THIS SETTING EVEN WITH CREATIVE SIGNAL GENERATOR OUTPUT, THE TRIMMER HAS BEEN IMPROPERLY ADJUSTED AND IT WILL BE NECESSARY TO READJUST TO THE PROPER PEAK.

**ALIGNMENT TABLE**

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>DIAL FREQUENCY</th>
<th>GENERATOR FREQUENCY</th>
<th>IMAGE FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER CONNECTED TO</th>
<th>ADJUST GRID</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.</td>
<td>1000 KC</td>
<td>455 KC</td>
<td>--</td>
<td>600 mfd, 60,000 ohms</td>
<td>6-1, 6-2</td>
<td></td>
</tr>
<tr>
<td>B.C.</td>
<td>1000 KC</td>
<td>456 KC</td>
<td>--</td>
<td>600 mfd, 60,000 ohms</td>
<td>6-3, 6-4</td>
<td></td>
</tr>
<tr>
<td>S.W.</td>
<td>15.0 KC</td>
<td>15.0 KC</td>
<td>15.9 KC</td>
<td>400 ohm resistor</td>
<td>T-6, T-6</td>
<td></td>
</tr>
<tr>
<td>S.W.</td>
<td>6.0 KC</td>
<td>6.0 KC</td>
<td>--</td>
<td>400 ohm resistor</td>
<td>T-6, T-6</td>
<td></td>
</tr>
<tr>
<td>B.C.</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>--</td>
<td>800 mfd, condenser</td>
<td>T-7, T-8</td>
<td></td>
</tr>
<tr>
<td>B.C.</td>
<td>600 KC</td>
<td>600 KC</td>
<td>--</td>
<td>200 mfd, condenser</td>
<td>T-9</td>
<td></td>
</tr>
</tbody>
</table>

*To insure perfect alignment it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output.

**CONTINUITY AND VOLTAGE READINGS**

<table>
<thead>
<tr>
<th>MODEL 365 &amp; 366 SERIES</th>
<th>LINE VOLTAGE 115 A.C.</th>
<th>INPUT VOLT 50</th>
<th>SCHEMATIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No signal input</strong></td>
<td><strong>POSITION</strong></td>
<td><strong>PLATE PLATE</strong></td>
<td><strong>CATHODE SCREEN</strong></td>
</tr>
<tr>
<td><strong>TUBE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6A33</td>
<td>1st Detector</td>
<td>235</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Oscillator</td>
<td>86</td>
<td>2.2</td>
</tr>
<tr>
<td>6D6</td>
<td>Int. Freq.</td>
<td>235</td>
<td>9.6</td>
</tr>
<tr>
<td>75</td>
<td>2nd Detector</td>
<td>127</td>
<td>1.1</td>
</tr>
<tr>
<td>6D76</td>
<td>A.Y.C.</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6D77</td>
<td>1st Audio</td>
<td>67</td>
<td>1.3</td>
</tr>
<tr>
<td>6D53</td>
<td>Power Condenser</td>
<td>220</td>
<td>41.0</td>
</tr>
<tr>
<td>80</td>
<td>Rectifier</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

These readings were taken with a 1,000 ohm per volt meter and are not indicative of effective voltages. Above readings taken with a 105.69 speaker in circuit.

**SPEAKER D.C. RESISTANCE VALUES**

<table>
<thead>
<tr>
<th>MODEL 365</th>
<th>PART NO.</th>
<th>WIND COIL</th>
<th>AUDIO TRANS.</th>
<th>W.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>105.85</td>
<td>1,100*</td>
<td>210*</td>
<td>.5**</td>
<td>3.0</td>
</tr>
<tr>
<td>105.911</td>
<td>1,100*</td>
<td>220*</td>
<td>.8**</td>
<td>3.0</td>
</tr>
</tbody>
</table>

* These are cold D.C. resistance values.
** This reading includes resistance of hum bucking coil.

Voltage across speaker field: 73 volts.
Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows:—Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Tune control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 6AS6 tube in series with a 1 condenser and adjust trimmer 1-2-3-4 for maximum output at 456 K.C. Decoupling input signal of oscillator as required. Check pointer with condenser fully sealed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using 40000 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 for maximum output. Turn dial pointer to 600 K.C. Adjust pad pad 78 rocking gang condenser for maximum output. Recheck alignment at 1500 K.C. Adjust oscillator to 456 K.C. and set trimmer on wave trap for minimum signal. Check sensitivity at 1000 K.C. using signal wav. Turn band switch to Short Range position. Set dial at 15 M.C. Use a 400 ohm carbon resistor for dummy antenna. With a 15 M.C. signal adjust T-5 for maximum output. Check range at 141 M.C. increasing input signal if necessary. Check sensitivity at 10 M.C. and 5 M.C.
SCHEMATIC WIRING DIAGRAM OF THE MODEL 7A CHASSIS.
FRONT, SIDE, AND TOP VIEWS OF THE CHASSIS SHOWING TRIMMER LOCATIONS, TUBE LOCATIONS
AND COMPONENT PARTS

The model 20 chassis is an AR operated superhetron with automatic volume control, push-pull output, with inverse feedback, push-pull button tuning, and tuning eye. It is incorporated into bands, broadcast, police, and short wave. It is also adapted to a push button and antena selection, which permits the use of an external phonograph pickup.

The push button tuner

It will be noted that only one operation is required for the setting of each band. This simplicity of operation is made possible by the use of a push button switch, which has been accurately located at the factory so that it is not necessary to adjust the trimmer condensers in order to set the circuit. Tuning is accomplished by the careful selection and the trimmers on their common shaft at such distances that the adjustment over the entire range is perfect alignment. The capacitance in the oscillator circuit is fixed and may not be adjusted. This trimmer (corresponding to the tuning condenser in a manually tuned receiver) is as shown on the schematic diagram and has a value of 340 micro-microfarads. The capacitance in the antenna and audio circuits consists of a pair of condensers, usually 35 or 45 for the antenna, and number 35 or 50 for the audio circuits, which are inter-connected at the frequency of 630 cycles.

The push button switch is used in the instruction book which accompanies each receiver.

The audio circuit

The audio circuit is of conventional design with the inclusion of the inverse feedback circuit consisting of resistors R6 and R4, and condenser C4 and C5. By means of this network, a certain amount of the audio frequency present at the plate of each iF stage is fed back to the grid circuit of that tube. This is, of course, out of phase with the input signal.

Any audio amplifier employing a loud speaker as the load will have a certain amount of distortion introduced due to the fact that the impedance varies with the audio frequency changes in the plate circuit of the output tube. This condition is more pronounced in amplifiers using an output tube of the high impedance type such as the tetrode. The shorting of the audio input and helps to smooth out these variations. The subject cannot be treated fully here due to space limitations and has been mentioned merely to give the serviceman a brief explanation of the feedback circuit.

The terminal strip

Reversing the leads (after making sure that one side of the phone jack is in a shield) should remedy complaints at this time.

Alignment procedure

The table of terminal strip wiring is given in diagrammatic and chart form. The circuit is determined by the various voltage connections. Any voltage between 0 and 5 volts may be used as a signal source, so long as it is not more than 1000 volts. The alignment will be made by adjusting the various voltages to the reading given in the instruction book. This will be done by adjusting the various voltages to the reading given in the instruction book.

The input for the phonograph section of this receiver is designed for the use of a pickup of the high impedance type, although the input is arranged to accept a low impedance pickup. Should any difficulty be encountered with this, it may be necessary to attach a transformer to the output of the pickup to the system. In the event that the speaker is being used, it may be necessary due to the fact that the speaker is not connected to the ground side of the high impedance circuit.
**FAIRBANKS, MORSE & CO.**

**Model 12B (Alignment Procedure)**

Alignment procedure is given in diagrammatic and chart form (see figures 3 and 4). Make adjustments in the order given. Any reliable low range AC voltmeter, preferably about 0-5 volts may be used as an output meter. It should be connected across the receiver voice coil for best results. The volume control should be set at maximum during the alignment, and the output from the signal generator should be reduced as the meter pointer tends to go off scale. If too strong a signal is used and the volume control is used to keep the pointer on scale, the AVC will operate and inaccurate alignment will result.

When aligning the police and short wave bands, care must be taken to see that the trimmers are set on the proper frequency and on the image. The image falls 210 megacycles below the fundamental signal on the dial, or at 20 megacycles the image should be heard to 20 megacycles minus 910 megacycles or 510 megacycles approximately. After setting the oscillators to maximum, increase the input from the signal generator and make sure that the image comes in at the proper point. When you hear one signal at the frequency to which your generator is set, and one on about 1 megacycle below it, you are ready to finish the alignment. Go back to the fundamental frequency and start peaking the IF trimer, rocking the tuning condenser a little as you do so. When you reach a peak, compare the strength of the fundamental signal and the image. If the image is stronger, you have the wrong peak on the IF trimmer. Find the other peak and again compare the two signals. You will probably find it necessary to increase the generator output greatly in order to hear the image when you have found the right peak.

**Repeat this operation for the antenna trimmer.**

---

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Control Signal Generator/Condenser</th>
<th>Signal Generator Frequency</th>
<th>Datum Antenna</th>
<th>Range Switch Position</th>
<th>Dial Setting</th>
<th>Section</th>
<th>Adjusting Screw No.</th>
<th>Peak For</th>
<th>Volume Max. R.C. Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>3rd IF Trans.</td>
<td>11</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>3rd IF Trans.</td>
<td>12</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>2nd IF Trans.</td>
<td>13</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>2nd IF Trans.</td>
<td>14</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>1st IF Trans.</td>
<td>15</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6X8 Grid 455 KC .1 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>540 KC</td>
<td>1st IF Trans.</td>
<td>16</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>1500 KC</td>
<td>B.C. Osc.</td>
<td>17</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>1500 KC</td>
<td>B.C. R.F.</td>
<td>18</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>1500 KC</td>
<td>B.C. Antenna</td>
<td>19</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Antenna 600 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>600 KC</td>
<td>B.C. Padder</td>
<td>20</td>
<td>Maximum</td>
<td>(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>Depress #9 Button</td>
<td>Instant Electric Tuning</td>
<td>9</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>Depress #9 Button</td>
<td>Instant Electric Tuning</td>
<td>21</td>
<td>Maximum</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Antenna 1500 KC 200 mfd. Condenser</td>
<td>Broadcast (A)</td>
<td>Depress #9 Button</td>
<td>Instant Electric Tuning</td>
<td>22</td>
<td>Maximum</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Antenna 6.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>6.0 HC</td>
<td>Police Oscillator</td>
<td>23</td>
<td>Maximum</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Antenna 6.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>6.0 HC</td>
<td>Police RF</td>
<td>24</td>
<td>Maximum</td>
<td>(3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Antenna 6.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>6.0 HC</td>
<td>Police Antenna</td>
<td>25</td>
<td>Maximum</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Antenna 2.5 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>2.5 HC</td>
<td>Police Padder</td>
<td>(4)</td>
<td>Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Antenna 20.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>20.0 HC</td>
<td>Short Wave Oscillator</td>
<td>26</td>
<td>Maximum</td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Antenna 20.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>20.0 HC</td>
<td>Short Wave RF</td>
<td>27</td>
<td>Maximum</td>
<td>(6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Antenna 20.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>20.0 HC</td>
<td>Short Wave Antenna</td>
<td>28</td>
<td>Maximum</td>
<td>(6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Antenna 8.0 HC 400 ohm Resistor</td>
<td>Police Amateur (B)</td>
<td>8.0 HC</td>
<td>Short Wave Padder</td>
<td>(7)</td>
<td>Off</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) While rocking, Reset 1, 2, 7, 9 and 10 until no change is noted.
(2) To check volume naturalizer operation, turn to "On" or "Off" position. If functioning normally, volume level will drop quite noticeably, under normal cutout volume.
(3) The performance obtained with this adjustment when push button tuning is employed is suitable, as a rule, only when a conventional antenna system is used. The use of extremely long or short antennas, may necessitate a minor change in this adjustment per test results.
(4) Check calibration at 2.5 HC. Padder is fixed.
(5) Check for image at 19.1 HC on dial approximately.
(6) Check for image response.
(7) Check calibration at 8.0 HC. Padder is fixed.

Figure 4

**ALIGNMENT PROCEDURE CHART**

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MODEL 128
Schematic, Socket, Tuner, Trimmers, Voltage, Phone.

TOP VIEWS OF THE CHASSIS SHOWING TRIMMER LOCATIONS, TUBE LOCATIONS AND COMPONENT PARTS
FAIRBANKS, MORSE & CO.

MODEL 12B
Tuner Data, Parts
Naturalizer Notes

THE PUSH BUTTON TUNER

The push button tuner is a simple device that allows the operator to select a desired frequency by pressing a button. Each button corresponds to a different frequency band, and pressing the button tunes the receiver to that band. This system is particularly useful in environments where multiple frequencies are available, as it can be used to quickly switch between them.

THE AUDIO CIRCUIT

The audio circuit is designed to provide a clear and natural sound quality. It consists of several stages, each with its own function. The first stage is responsible for amplifying the incoming signal, while the following stages focus on filtering and equalizing the audio. The circuit is designed to minimize distortion and noise, ensuring a high-quality sound experience.

THE PURPOSE AND OPERATION OF THE VOLUME NATURALIZER

The volume naturalizer is a valuable tool for operators, as it allows them to control the volume without affecting the quality of the audio. It works by adjusting the gain of the audio amplifier, which in turn controls the output level of the speaker. This feature is particularly useful in situations where the operator needs to adjust the volume to accommodate different listeners or environments.

The naturalizer is set to a specific value before the session begins, and the operator can then adjust the volume using the naturalizer control. This ensures that the volume remains constant, regardless of any changes in the microphone level or other equipment settings.

The naturalizer also allows the operator to make fine adjustments to the volume, which can be crucial in certain situations. For example, during a broadcast, the operator may need to adjust the volume to accommodate different microphone positions or changes in the audio mix.

In conclusion, the push button tuner, audio circuit, and volume naturalizer are all essential components of a high-quality broadcast system. They work together to provide a clear, natural sound and ensure that the volume remains consistent, allowing for a better listener experience.
NOTE: VOLTAGE READINGS TAKEN FROM TUBE SOCKET CONNECTED TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER Volt.
"A" BATTERY = 4.5VOLTS.
CURRENT DRAW: 5.4 AMPERES

LOCATION OF PARTS UNDER POWER SUPPLY

ANTENNA CIRCUIT: The antenna circuit is directly coupled to the antenna in contrast with the capacity coupled circuit used in some previous Firestone auto receivers. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the high frequency end of the dial (1400 K.C.) instead of at the low frequency end, as with the capacity coupled sets. There are two taps provided on the antenna coil. One for use with whip or low capacity type antenna, and the other for running board or high capacity type antenna. The antenna coil is set at the low capacity tap, at the factory, and must be changed (by means of the small tip jack located in the receiver at the antenna coil) if a high capacity antenna is used. This is done by merely removing the small tip jack from its present tap on the antenna coil and inserting the jack in the other receptacle provided.
LOCATIONS OF TUBES & TRIMMERS - BOTTOM COVER REMOVED

SETTING UP THE MONOMATIC TUNING MECHANISM:

Remove the plate that covers the Monomatic tuning adjustments on the receiver case.

Operate the Monomatic button (marked "Push") until the dial becomes illuminated, indicating that the receiver is adjusted for Dial Tuning. Then tune in your station, using the Station Selector knob.

Operate the Monomatic button until the station indicator (furthest left of the five indicators) becomes illuminated.

Turn the station screw marked "OSC" (see Fig. 2) until your station is tuned in. Other stations may be heard during this operation. If in doubt whether you have your desired station, compare it with the original station by operating the Monomatic button until the Dial Tuning position is reached.

After carefully adjusting the "OSC" screw as carefully as possible, adjust the "ANT" screw for maximum volume and best reproduction. After having done so, it is advisable to re-check the adjustment of the "OSC" screw and then the "ANT" one again to insure greatest accuracy.

Tune in your station and operate the Monomatic button until the station indicator becomes illuminated. Then proceed to adjust the two screws for the station in the same manner as was just done for the station. Always adjust the "OSC" screw before adjusting the "ANT" one, and then repeat the adjustments for greater accuracy.

Proceed in the same manner for the remaining stations on your list. Then replace the cover in the receiver case. Insert the proper call letters, cut from the sheets supplied, in the indicator button slots.
MODEL S-7425-4
4 TUBE T.R.F.

POWER SUPPLY. This receiver is designed to operate on any alternating current supply (A.C.) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (D.C.) ranging from 110 to 120 volts.

The clock will keep correct time only when connected to a 60 cycle, 110 to 120 volt A.C. power supply. Never plug into a direct current circuit.

4 Tube AC Tuned Radio Frequency Receiver With Electric Clock

MODEL S-7425-5
4 TUBE T.R.F.

Refer to diagram of Model S-7425-4 (above)

POWER SUPPLY. This receiver is designed to operate on any alternating current supply (A.C.) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (D.C.) ranging from 110 to 120 volts.
3 TUBE PORTABLE RADIO
1 1/2 Volt Battery Operated

MODEL S-7427-6

BEFORE ALIGNING PLACE LOOP ANTENNA AND THE "A" AND "B" BATTERIES IN THE SAME APPROXIMATE POSITION IN THE BACK OF CHASSIS THAT THEY WILL BE IN WHEN THE SET IS IN THE CABINET AND THE CABINET BACK CLOSED.

When adjusting 1400 kilocycle antenna and R. F. trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

check alignment of coils at 600 KC

535 to 1720 Kilocycles
**Correct Alignment Procedure.** The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

**I.F. Alignment.** With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (1A7G) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

**Broadcast Band Alignment.** Connect the antenna terminal to the generator through a 200 MMF dummy and the ground terminal to the generator ground. Set the dial and generator at 1720 KC (gang at minimum capacity). Align the BC oscillator trimmer for maximum output. Set the test oscillator at 1420 KC and tune in the signal with the dial and adjust the antenna trimmer for maximum output. Check the sensitivity at 600 to determine if the gang or the coils have been damaged.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.
Before aligning, place loop antenna and the "A" and "B" battery-pack in the same approximate position in the back of chassis that they will be in when the set is in the cabinet and the cabinet back closed.

When adjusting 1650 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.
b) Place test oscillator loop near set loop—be sure that neither moves while aligning.
ALIGNMENT, VOLTAGE

TRIMMERS

LEGEND

INPUT DESCRIPTION

1. CONTROL GRID 2. DECAY GRID 3. DECC G1 4. BRISE PLATE 5. CONTROL GRID 6. BATTERY PLATE

BEFORE ALIGNING, PLACE LOOP ANTENNA AND THE BATTERY IN THE SAME APPROXIMATE POSITION IN THE BACK OF CHASSIS THAT THEY WILL BE IN WHEN THE SET IS IN THE CABINET AND THE CABINET BACK CLOSED.

When adjusting 1750 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600 and 1400 KC, and an output meter to be connected across the primary or secondary of the output transformers. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stage should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast Band should be aligned.

I.F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (666G) through a .06 or .1 mfd condenser. The ground on the test oscillator can be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the antenna to the generator through a 300 MMF dummy and set the dial and generator at 600 KC. Align the BC oscillator trimmer and BC antenna trimmer. Set the generator at 600 KC and tune in the signal to check sensitivity at this point to determine if coils or gang condenser have not been damaged.
MODEL 9-49
MODEL 9-69
MODEL 15-F
MODELS 20F, 21L, 24K

GALVIN MFG. CORP.

Procedure, Part 2
Schematic of Tuner Assembly, Parts List

AUTOMATIC SERVICE PROCEDURE—Continued

5. Hold any latch bar tip down on upper side of latch (as close to bulb as possible) with the broadcast indicator on the center switch leaf 1/2 inch in from the edge, and adjust until the latch bar is at point "E." (Check adjustment by pressing in bursts at 5 and 30 per minute.)

6. Set latch bar in front position at screw 1/4" (front screw) until top motor contact is lifted 1/32" above top star switch when the motor bar is at point "F." (Check adjustment by pressing in bursts at 5 and 30 per minute.)

7. Press latch bar to rear position at screw 1/8" (front screw) until latch bar is at point "G." (10 thousandths = 1/32")

8. Turn motor until 1/4" side of ring rests on full mesh and then the rear mesh and make sure the contacts actually reverse. (Bottom contacts must break and top contact must close.)

9. Turn screw 3/8" (rear screw) until motor runs smoothly and at position 2 to 5 thousandths of an inch from the mesh pole. (Close meshing will cause the motor to run too fast to vibration.)

TO REMOVE LATCH BAR ASSEMBLY

1. Back up screw and remove latch bar assembly (a) until latch bar rests against the case and top motor contact.

2. Remove two screws (b) through the case to remove the latch bar assembly.

3. Remove the two screws (c) and remove the latch bar assembly from the case.

4. Lift the latch bar assembly off of the motor shaft.

5. Carefully loosen the three screws (d) to which the latch bar assembly is connected to the motor shaft, and remove the latch bar assembly. (Be careful to keep these three screws in position through the assembly.)

6. To remove: Reverse the above procedure. Care should be taken to not let the rings and spacers get off the screws.

TO REPLACE DEFLECTIVE LATCH RING

1. Remove the entire latch ring assembly from the motor hub. (See instructions above.)

2. Remove assembly on flat surface with screw heads down.

3. Remove rings, spacers, and brass sleeve (c) one at a time, until the deflective ring is exposed.

NOTE: Assemble parts one at a time, being careful that rings and spacers are in the correct position.

7. To be used to replace rings in original position. Turning the ring, gear will reverse the position of the mesh and will result in density tuning.

TO REMOVE DEFLECTIVE RING ASSEMBLY

1. Remove entire latch ring assembly from the motor hub. (See instructions above.)

2. Loosen the four screws on the ring and the corresponding surge coupling.

3. Loosen the two screws on the latch bar assembly of the surge coupling.

4. Pull the motor hub and gear set. Note the surge coupling and gear coupling will remain in position on the motor shaft.

5. Tighten the ring on the motor shaft may also need to be removed.

NOTE: When installing a new ring, turn the ring to align with the mesh and the mesh against its stop before tightening set screws.
ALIGNMENT PROCEDURE

Place the radio on the service bench with the front cover removed, but with the speaker and battery connected to it.

Turn the volume control to maximum position, and leave it there throughout the alignment, reducing the signal generator output if necessary.

NOTE: Do not adjust the trimmer in the oscillator coil can that is covered with Scotch tape. The original adjustment, made in the factory, should not be tampered with. (Fig. 2 below, shows all trimmer locations.)

1. Connect the signal generator to the control grid of the oscillator-modulation tube (6A7) through a 1/8" condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. (See Fig. 1.)

Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.

2. Set the signal generator at 262 K.C. and with the condenser gang completely out of mesh adjust the trimmer on the oscillator section of the control grid so that the highest reading is obtained on the output meter.

3. Set the signal generator at 535 K.C. Turn the condenser gang completely in mesh and adjust the 600 K.C. trimmer in the oscillator coil can for the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R.F. AND ANTENNA ALIGNMENT

1. Connect the signal generator to the antenna lead through a 40 Mf condenser and to chassis ground. Set the signal generator at 600 K.C. and turn the condenser gang until the signal is heard. Adjust the trimmer on the antenna coil can for maximum output reading.

2. Set the signal generator at 1400 K.C. Turn the condenser gang until the signal is heard. Adjust the trimmer on the antenna section of the control grid for maximum output reading.

3. Adjust the trimmer on the R.F. section of the control grid for maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.
AUTOMOBILE RECEIVER

Model 9-49

SENSITIVITY AND STAGE GAIN MEASUREMENTS

These stage gain measurements will, if properly used, enable you to localize trouble quickly. They are intended for use with a signal generator that is accurately calibrated in microvolts.

Starting with the second detector - first audio stage, and working back step by step to I.F., Gen.- Mod., R.F., and finally to the antenna terminal, the circuit in which the trouble exists will quickly be determined by evidence of low gain, when signal generator attenuation readings are compared to the normal values as shown in the table.

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 Mf condenser, with a 5000-ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a 40 Mf condenser in place of the .1 Mf. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Volts</td>
<td>600 cycles</td>
<td>786 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>1.7 Volts</td>
</tr>
<tr>
<td>20,000</td>
<td>280 K.C.</td>
<td>786 Grid (I.F.)</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>1.7 Volts</td>
</tr>
<tr>
<td>700</td>
<td>280 K.C.</td>
<td>786 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>1.7 Volts</td>
</tr>
<tr>
<td>600</td>
<td>600 K.C.</td>
<td>786 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>1.7 Volts</td>
</tr>
<tr>
<td>45</td>
<td>600 K.C.</td>
<td>786 Grid (I.F.)</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>1.7 Volts</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>60 Mf</td>
<td>None</td>
<td>1.7 Volts</td>
</tr>
</tbody>
</table>

* For one watt output.

** Meter connected across voice coil.

V.C. Impedance - 5 ohms at 400 cycles.

1.74 volts equals 1 watt output.

ALIGMENT:

For alignment, follow procedures as for Model 9-44.

AUTOMOBILE RECEIVER

Model 9-29

SENSITIVITY AND STAGE GAIN MEASUREMENTS

These stage gain measurements will, if properly used, enable you to localize trouble quickly. They are intended for use with a signal generator that is accurately calibrated in microvolts.

Starting with the second detector - first audio stage, and working back step by step to I.F., Gen.- Mod., R.F., and finally to the antenna terminal, the circuit in which the trouble exists will quickly be determined by evidence of low gain, when signal generator attenuation readings are compared to the normal values as shown in the table.

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 Mf condenser, with a 5000-ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed. (See Fig. 1 on Page 1.)

When measuring over-all sensitivity at the antenna terminal, use a 40 Mf condenser in place of the .1 Mf. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 Volts</td>
<td>600 cycles</td>
<td>786 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>2.2 Volts</td>
</tr>
<tr>
<td>20,000</td>
<td>280 K.C.</td>
<td>786 Grid (I.F.)</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>2.2 Volts</td>
</tr>
<tr>
<td>700</td>
<td>280 K.C.</td>
<td>687 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>2.2 Volts</td>
</tr>
<tr>
<td>600</td>
<td>600 K.C.</td>
<td>687 Grid</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>2.2 Volts</td>
</tr>
<tr>
<td>45</td>
<td>600 K.C.</td>
<td>786 Grid (I.F.)</td>
<td>.1 Mf</td>
<td>.5 Meg</td>
<td>2.2 Volts</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>40 Mf</td>
<td>None</td>
<td>2.2 Volts</td>
</tr>
</tbody>
</table>

* For one watt output.

** Meter connected across voice coil.

V.C. Impedance - 5 ohms at 400 cycles.

2.2 Volts equals 1 watt output.
Sensitivity and Stage Gain Measurements

<table>
<thead>
<tr>
<th>Average Microvolt</th>
<th>Generator Generator Fedder Connected to Dummy Leak</th>
<th>Antenna Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>262 K.C. 6A7 Grid (I.F.)</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>9000</td>
<td>262 K.C. 6A7 Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>900</td>
<td>600 K.C. 6A7 Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>1000</td>
<td>600 K.C. 6A7 Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>5</td>
<td>600 K.C. Ant. Lead</td>
<td>.40 RFP</td>
<td>None</td>
</tr>
</tbody>
</table>

* For 1 Watt output.
** Output meter connected across voice coil.
V.C. resistance = 3 ohms.
(NOTE:) Without Booster

1.74 Volts equals 1 Watt output.
ALIGNMENT FOR MODEL 9-44, 9-48 & 9-49

1. Place the control panels in the service bench with the front cover removed, but with the speaker and battery connected to it.

2. Turn the volume control to maximum position and leave it there throughout the alignment, requiring the signal generator output, if necessary.

NOTE: Do not adjust trimmers in the oscillator coil; they are covered with screws and the original adjustment made in the factory should not be interfered with.

Fig. 1 shows all trimmer locations.

I.F. ALIGNMENT

1. Connect the signal generator to the control grid of the 600 R.F. tube (945). Turn the condenser gang completely out of phase. Connect an external speaker across the speaker voice coil.

2. Set the signal generator at 260 kHz and carefully adjust the two trimmers in the 600-series coil can to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat step 1 and trimmer adjustments several times for maximum accuracy.

RF AND ANTENNA ALIGNMENT

1. Connect the signal generator to the antenna lead through the 600 R.F. condenser of inductive reactance. Set the signal generator at 260 kHz and turn the condenser gang until the signal is heard. Adjust the 600 R.F. trimmer in the 600-series coil can for maximum output reading, while slightly rocking the condenser gang.

2. Set the signal generator at 1400 kHz. Turn the condenser gang until the signal is heard. Adjust the 1400 R.F. trimmer in the antenna coil can for maximum output reading.

3. Adjust the 1400 kHz R.F. trimmer to the inside section of the condenser gang for maximum output reading.

4. Repeat steps 1, 2, and 3 for accuracy.

TO MEASURE BOOST-CIRCUIT BASE DRIVE

1. Turn the condenser gang to the fully open position.

2. Turn the booster-pulley and use a square until the formed sliver has been drawn all the way in and the hole in the rise of the drive pulley has a point on the inside of the condenser gang.

3. Set the trimmer spring to the exact center and pull the pulley through this hole in the rise of the drive pulley.

4. Double the cord at the exact center and pull the pulley through this hole in the rise of the drive pulley.

5. Take Cord "A" and wind it clockwise around the drive pulley, control grid of the R.F. tube (945), using the same 600 R.F. condenser.

6. Turn the signal generator at 1000 kHz and lock the condenser gang completely out of phase. Adjust the oscillator trimmer to the middle section of the condenser gang to the point showing the highest output reading.

7. Turn the signal generator at 200 kHz. Turn the condenser gang completely out of phase and lock the oscillator trimmer to the middle section of the condenser gang, to the point showing the highest output reading.

NOTE: Adjustments shown in the receiver will remain after adjustments in the control head.

SETTING THE BIAS

1. Connect the signal generator to the control grid of the 600 R.F. tube (945). Turn the condenser gang completely out of phase. Connect an external speaker across the speaker voice coil.

2. Set the signal generator at 260 kHz and carefully adjust the two trimmers in the 600-series coil can to the point showing the highest reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

4. Repeat step 1 and trimmer adjustments several times for maximum accuracy.

1. Connect the signal generator to the antenna lead through the 600 R.F. condenser of inductive reactance. Set the signal generator at 260 kHz and turn the condenser gang until the signal is heard. Adjust the 600 R.F. trimmer in the 600-series coil can for maximum output reading, while slightly rocking the condenser gang.

2. Set the signal generator at 1400 kHz. Turn the condenser gang until the signal is heard. Adjust the 1400 R.F. trimmer in the antenna coil can for maximum output reading.

3. Adjust the 1400 kHz R.F. trimmer to the inside section of the condenser gang for maximum output reading.

4. Repeat steps 1, 2, and 3 for accuracy.

TO MEASURE BOOST-CIRCUIT BASE DRIVE

1. Turn the condenser gang to the fully open position.

2. Turn the booster-pulley and use a square until the formed sliver has been drawn all the way in and the hole in the rise of the drive pulley has a point on the inside of the condenser gang.

3. Set the trimmer spring to the exact center and pull the pulley through this hole in the rise of the drive pulley.

4. Double the cord at the exact center and pull the pulley through this hole in the rise of the drive pulley.

5. Take Cord "A" and wind it clockwise around the drive pulley, control grid of the R.F. tube (945), using the same 600 R.F. condenser.

6. Turn the signal generator at 1000 kHz and lock the condenser gang completely out of phase. Adjust the oscillator trimmer to the middle section of the condenser gang to the point showing the highest output reading.

7. Turn the signal generator at 200 kHz. Turn the condenser gang completely out of phase and lock the oscillator trimmer to the middle section of the condenser gang, to the point showing the highest output reading.

NOTE: Adjustments shown in the receiver will remain after adjustments in the control head.

ALIGNMENT: To align, follow procedure of Model 9-44.
INTERMEDIATE FREQUENCY 262 KC
TUNING RANGE 635 TO 1550 KC

FOR ELECTRIC TUNER
DATA SEE INDEX

Model 9-49

VOLTAGE CHART - MODEL 9-49

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>7A7 or 7B7 *</td>
<td>R.F.</td>
<td>200</td>
<td>60</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>7B7 or 7A8 *</td>
<td>Osc.-Mod.</td>
<td>200</td>
<td>60</td>
<td>0</td>
<td>96</td>
</tr>
<tr>
<td>7A7 or 7B7 *</td>
<td>I.F.</td>
<td>200</td>
<td>60</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>7B6 or 7C8 **</td>
<td>Det.-Ave.</td>
<td>70</td>
<td>-</td>
<td>-2</td>
<td>-</td>
</tr>
<tr>
<td>7B5 ****</td>
<td>Output</td>
<td>290</td>
<td>205</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

Battery Voltage - 6.3 V.
Current consumption - 6.2 Amperes.
Maximum power output - 4.5 Watts
* Bias - -3.5 V Measured from "g" stick.
** Bias - -2.5 V Measured from "b" stick.
*** Bias - -15.5 V Measured from "b" stick.
All measurements from socket terminal to
**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

These stage gain measurements will, if properly used, enable you to localize trouble quickly. They are intended for use with a signal generator that is accurately calibrated in millivolts.

Starting with the second detector - first audio stage, and working back step by step to I.F., dec.-mod., R.F. and finally to the antenna terminal, the circuit in which the trouble exists will quickly be determined by means of low gain, when signal generator attenuation readings are compared to the normal values as shown in the table.

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .15 MF condenser, with a 5000 ohm resistor connected as a leak between the grid of the tube and the grid lead which has been removed.

When measuring overall sensitivity at the antenna terminal, use a 60 MF condenser in place of the .1 MF. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Feeder Set at</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>455 K.C.</td>
<td>1F Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>200</td>
<td>455 K.C.</td>
<td>Mod. Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>250</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>125</td>
<td>600 K.C.</td>
<td>IF Grid</td>
<td>.1 MF</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>10</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>40 MF</td>
<td>None</td>
</tr>
</tbody>
</table>

* For 1 watt output. ** Output meter connected across voice coil. V.C. resistance - 5 ohms.

**VOLTAGE CHART**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>O.G. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>72O</td>
<td>RP</td>
<td>148</td>
<td>85</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>5A7</td>
<td>Dec.-Mod.</td>
<td>200</td>
<td>85</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>70</td>
<td>IF</td>
<td>206</td>
<td>85</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Det.Ave.</td>
<td>68</td>
<td>-</td>
<td>-2.5</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Output</td>
<td>200</td>
<td>205</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Freq.</td>
<td>AC</td>
<td></td>
<td>215</td>
<td></td>
</tr>
</tbody>
</table>

All measurements from chassis ground to socket terminal using 1000 ohms per volt meter.

Battery voltage 6.3 V. * Sias = -6.5 V from "B" Stick.

Current Consumption 6.8 Amps. **Sias = -6 V from "B" Stick.

Maximum Power Output 5 Watts. ***Sias = -17 V from "B" Stick.
INTERMEDIATE FREQUENCY 455KC
TUNING RANGE 535 TO 1550 KC

Model 16-C
CUSTOM BUILT FOR 1939 CHEVROLET

CAUTION
When removing Loxal tubes from their sockets, do not pry them out with a screw driver unless you take extreme care not to break the glass seal around the pin terminals. To do so will render the tube worthless.
ALIGNMENT PROCEDURE

1. Remove the chassis from the housing and place it on the service bench. Connect the mains and battery.

2. Turn the volume control to maximum position and leave it there throughout the alignment. Bring the signal generator output to the point of the lowest output reading.

3. Repeat the I.F. and BFO adjustment several times for maximum accuracy.

R.F. ALIGNMENT

1. Change to 40 Mhz condenser in signal generator lead. The signal generator is 1600 K.C. and the condenser goes outside of the loop, and adjust the oscillator to the signal generator output to the point of the lowest output reading.

2. Set the signal generator at 1400 K.C. and turn the condenser knob to the point of the highest output reading.

3. Set the signal generator at 1400 K.C. and turn the condenser knob to the point of the highest output reading.

4. Adjust the trimmers in the I.F. coil to the point where the highest output reading is obtained.

5. Adjust the trimmers in the I.F. coil to the point where the highest output reading is obtained.

6. Remove the chassis from the housing and place it on the service bench. Connect the mains and battery.

7. Turn the volume control to maximum position and leave it there throughout the alignment. Bring the signal generator output to the point of the lowest output reading.

8. Repeat the I.F. and BFO adjustment several times for maximum accuracy.

DIAGNOSTIC CORD ASSEMBLY

1. Remove the cord from the housing and place it on the service bench. Connect the mains and battery.

2. Pull the cord through the loop through the hole in the cover. See Fig. 3.

3. Pull the cord through the loop through the hole in the cover. See Fig. 3.

4. Pull the cord through the loop through the hole in the cover. See Fig. 3.

5. Pull the cord through the loop through the hole in the cover. See Fig. 3.

6. Pull the cord through the loop through the hole in the cover. See Fig. 3.

7. Pull the cord through the loop through the hole in the cover. See Fig. 3.

SENSITIVITY AND SCAFFOLD MEASUREMENTS

These stage gain measurements will, if properly used, enable you to localize trouble quickly. They are intended for use with a signal generator that is accurately calibrated in microvolts.

Starting with the second detector - first n.p. stage, and working back step by step to T.P., O.M. and finally to the antenna terminal, the circuit in which the trouble exists will be determined by reference to the chart, when signal generator attenuation readings are compared to the normal values as shown in the table.

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid of the tube through a 100 M. resistor, the grid lead to the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a 40 Mhz condenser in place of the 100 M. It must be remembered that the figures in the table are average and allowance must be made for variations of the same general type, due to differences in tube characteristics, etc.

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator</th>
<th>Generator</th>
<th>Dummy Antenna</th>
<th>Load</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>405 K.C.</td>
<td>100 K.C.</td>
<td>100 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
<tr>
<td>150</td>
<td>455 K.C.</td>
<td>120 K.C.</td>
<td>120 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
<tr>
<td>200</td>
<td>505 K.C.</td>
<td>120 K.C.</td>
<td>120 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
<tr>
<td>300</td>
<td>605 K.C.</td>
<td>120 K.C.</td>
<td>120 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
<tr>
<td>400</td>
<td>605 K.C.</td>
<td>120 K.C.</td>
<td>120 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
<tr>
<td>500</td>
<td>505 K.C.</td>
<td>120 K.C.</td>
<td>120 K.C.</td>
<td>.1 W</td>
<td>.55 W = 1.15 Volts</td>
</tr>
</tbody>
</table>

* For 1 watt output.
* Output meter connected across voice coil.

V.O C. resistance = 2 ohms.

<table>
<thead>
<tr>
<th>PIPE POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>D.C. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>707</td>
<td>100</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>708</td>
<td>120</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>797</td>
<td>100</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>796</td>
<td>120</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>798</td>
<td>120</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>994</td>
<td>100</td>
<td>65</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

All measurements from chassis ground to socket terminals using 1000 ohms per meter voltmeter. Battery voltage 6.5 V. Current consumption 6.5 A. Maximum power output 6 watts.

DIAGNOSTIC CORD INSTRUCTIONS

NOTE: If need for a diagnostic cord assembly is not available, use the original one and 30-100. If the cord to make up assembly to dimensions shown at the top of Fig. 2.

1. Turn gain to fully loaded position.
2. Loosen short end of cord around set screw (a) in condenser gear.
3. Take one complete turn clockwise around condenser gear.
4. Scratch arm and see one complete turn around the upper gear box with the long end of the handset. Note:
5. Loop the end of the cord around drive pin (b).
ALIGNMENT PROCEDURE

1. Before testing, remove the chassis from the housing and place it on the service cart. Connect the speaker and battery.

2. Turn the volume control to minimum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

3. Connect the signal generator to the antenna lead through a 100 ohm resistor and to chassis ground. Turn the condenser gain completely out of circuit. Connect an output meter across the speaker leads.

4. Set the signal generator at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

5. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

1. While not essential, you will find it easier to make if it can be removed from the front plate of the chassis. This requires removal of the dial, light bracket, the front panel, and the ground connection of the microphones.

2. If the signal generator is not available, use a piece of 50 ohm. wire to check the coil inductance of the drive circuit.

3. Connect the condenser at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

NOTE: If the signal generator is not available, use a piece of 50 ohm. wire to check the coil inductance of the drive circuit.

5. Turn on the volume control to minimum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

6. Connect the signal generator to the antenna lead through a 100 ohm resistor and to chassis ground. Turn the condenser gain completely out of circuit. Connect an output meter across the speaker leads.

7. Set the signal generator at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

8. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

SIGNAL GENERATOR INPUT

NOTE: If the signal generator is not available, use a piece of 50 ohm. wire to check the coil inductance of the drive circuit.

1. Turn on the volume control to minimum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

2. Connect the signal generator to the antenna lead through a 100 ohm resistor and to chassis ground. Turn the condenser gain completely out of circuit. Connect an output meter across the speaker leads.

3. Set the signal generator at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

SIGNAL GENERATOR INPUT

NOTE: If the signal generator is not available, use a piece of 50 ohm. wire to check the coil inductance of the drive circuit.

1. Turn on the volume control to minimum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

2. Connect the signal generator to the antenna lead through a 100 ohm resistor and to chassis ground. Turn the condenser gain completely out of circuit. Connect an output meter across the speaker leads.

3. Set the signal generator at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

SIGNAL GENERATOR INPUT

NOTE: If the signal generator is not available, use a piece of 50 ohm. wire to check the coil inductance of the drive circuit.

1. Turn on the volume control to minimum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

2. Connect the signal generator to the antenna lead through a 100 ohm resistor and to chassis ground. Turn the condenser gain completely out of circuit. Connect an output meter across the speaker leads.

3. Set the signal generator at 455 Kc. and carefully adjust the trimmer in the plate coil set to the point showing the highest reading on the output meter. (Advance the signal generator if necessary to click up signal.)

4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.

REAL DRIVE CODE ASSEMBLY - PART NO. 114748

SIGNAL GENERATOR INPUT
ALLOCATION PROCEDURE

1. Remove the chassis from the housing and place it on the service bench. Connect the speaker and battery.

2. Turn the volume control to maximum position and slowly move throughout the adjustment, reading the signal generator output if necessary.

3. P. A. ALIGNMENT

1. Connect the signal generator to the antenna lead through a 0.1 µF capacitor and to chassis ground. Turn the condenser, gang completely out of each. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 800 Kc and carefully adjust the variable trimmer in the diode cell out to the point showing the highest reading on the output meter. (Adjust the signal generator attenuator if necessary to keep up signal.)

3. Adjust the two trimmers in the I.F. cell.

4. SENSITIVITY AND STAGE GAIN MEASUREMENTS

These stage gain measurements will, if properly read, enable you to localize trouble quickly. They are intended for use with a signal generator that is accurately calibrated in microvolts.

Starting with the second detector - first audio, and working back step by step to I.F., O.M., and finally to the antenna terminal, the circuit in which trouble exists will quickly be determined by evidence of low gain, then signal generator attenuation readings are checked to the normal values as shown in the table.

All stage-gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid lead of the tube through a 1 µF condenser, with a 600 Ω 1% resistor connected as a load resistance between the grid of the tube and the grid lead which has been removed.

When measuring overall sensitivity at the antenna terminal, use a 60 MHz condenser in place of the 0.1 µF.

It must be remembered that the figures in the table are average and must be used for variations between the two sets of the same general type, due to differences in tube characteristics, etc.

<table>
<thead>
<tr>
<th>Average</th>
<th>Microvolt Input</th>
<th>Generator</th>
<th>Feeder Connected to</th>
<th>Dummy Antenna</th>
<th>Load Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,000</td>
<td>400 Kc</td>
<td>764 Grid (IF)</td>
<td>.1 MΩ</td>
<td>.5 MΩ</td>
<td>1.74 Volts</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>400 Kc</td>
<td>764 Grid (IF)</td>
<td>.1 MΩ</td>
<td>.5 MΩ</td>
<td>1.74 Volts</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>600 Kc</td>
<td>764 Grid (IF)</td>
<td>.1 MΩ</td>
<td>.5 MΩ</td>
<td>1.74 Volts</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>600 Kc</td>
<td>764 Grid (IF)</td>
<td>.1 MΩ</td>
<td>.5 MΩ</td>
<td>1.74 Volts</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>600 Kc</td>
<td>Ant. Lead 40 MΩ</td>
<td>-</td>
<td>-</td>
<td>1.74 Volts</td>
<td></td>
</tr>
</tbody>
</table>

* For 1 watt output.
* Output meter connected across voice coil.
* 1.74 Volts equals 1 watt output.
* V.C. resistance ~ 3 ohms.

VOLTAGE CHART IN NOTES 19-20

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CONCIDE</th>
<th>O.M. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>787</td>
<td>IF</td>
<td>25C</td>
<td>76</td>
<td>7.6</td>
<td>-</td>
</tr>
<tr>
<td>720</td>
<td>O.M.</td>
<td>25C</td>
<td>76</td>
<td>5.6</td>
<td>76</td>
</tr>
<tr>
<td>720</td>
<td>IF</td>
<td>25C</td>
<td>76</td>
<td>5.6</td>
<td>-</td>
</tr>
<tr>
<td>720</td>
<td>Det-Ave.</td>
<td>15C</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
</tr>
<tr>
<td>706</td>
<td>Output</td>
<td>25C</td>
<td>580</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>706</td>
<td>Output</td>
<td>25C</td>
<td>580</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>704</td>
<td>Rect</td>
<td>AC</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohms per volt meter.

Current ~ 7.0 Amps at 6.5 Volts.

Maximum power output ~ 10 Watts.
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Connect the speaker and battery.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

1. F. ALIGNMENT

1. Connect the signal generator to the antenna lead through a 0.1 MF condenser and to chassis ground. Turn the condenser gang completely out of range. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 455 K.C. and carefully adjust the single trimmer in the Diode coil to the point showing the highest reading on the output meter. (Advance the signal generator attenuator if necessary to pick up signal.)

3. Adjust the two trimmers in the I.F. coil to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

![Diagram of the amplifier circuit](image)

**FIGURE 1. TRIMMERS**

R. F. ALIGNMENT

1. Change to 40 MF condenser in signal generator lead. Set signal generator at 1650 K.C. and with the condenser gang still completely out of range, adjust the oscillator trimmer to the point showing the highest output reading.

2. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.

3. Set the signal generator at 600 K.C. and rock the pointer at the 600 K.C. position on the dial scale, while adjusting the antenna trimmer until a combination is found which gives highest output reading.
Nov., 1935

GROUPS OF CIRCUIT ELEMENTS ENCLOSED IN DOTTED RECTANGLES COMPRISE DISTINCT MECHANICAL ASSEMBLIES.

6 Tube - 32 Volt D. C.
Superheterodyne Receiver

Nov., 1935

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Superheterodyne Receiver

Nov., 1935

GROUPS OF CIRCUIT ELEMENTS ENCLOSED IN DOTTED RECTANGLES COMPRISE DISTINCT MECHANICAL ASSEMBLIES.
D. C. Resistance of Windings

Refer to Fig. 3

Following are the D. C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Winding Code</th>
<th>D. C. Resistance in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-9A42</td>
<td>A.R.F. Transformer</td>
<td>T1</td>
</tr>
<tr>
<td></td>
<td>Primary No. 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary No. 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary Windings in Series</td>
<td></td>
</tr>
<tr>
<td>P-9A43</td>
<td>Interstage R.F. Transformer</td>
<td>T2</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
</tr>
<tr>
<td>P-9A44</td>
<td>Oscillator Coil</td>
<td>T3</td>
</tr>
<tr>
<td></td>
<td>Grid Coil</td>
<td></td>
</tr>
<tr>
<td>P-9A45</td>
<td>1st I.F. Transformer</td>
<td>T4</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
</tr>
<tr>
<td>P-10X22</td>
<td>Audio Input Transformer</td>
<td>T6</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center Tab to Inside</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center Tab to Outside</td>
<td></td>
</tr>
<tr>
<td>P-12A219</td>
<td>Dynamic Speaker</td>
<td>L2</td>
</tr>
<tr>
<td></td>
<td>Speaker Voice Coil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audio Output Transformer (11X33)</td>
<td>L7</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center Tab to Inside</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center Tab to Outside</td>
<td></td>
</tr>
<tr>
<td>P-12X11</td>
<td>Filter Choke</td>
<td>L1</td>
</tr>
</tbody>
</table>

I. F. Adjustment 175 KC.

Connect the output lead of the signal generator through a .1 mfd condenser to the grid of the 1st detector.

1750 KC Adjustment

Connect the antenna lead of the signal generator to the antenna lead of the receiver through a 300 mfd condenser. Adjust the trimmer of the oscillator section.

1500 KC Adjustment

Loosen the pointer screw and set the pointer at the 1500 KC mark on the dial scale. Retighten the pointer screw.

Adjust the 1st detector and antenna trimmers for maximum output.
Alignment Procedure

Remove the bottom and front chassis covers. Directions for removing the bottom cover are in the instructions book.

To remove the front cover, first pull the knobs and buttons off the shafts. Remove the 2 screws at the top and the 2 screws at the sides of the front cover. From the sides of the chassis case, release the lugs at the sides of the front cover. Pull outward on the bottom of the front cover and then push the cover up until the lugs at the top are released.

Do not remove the back of the chassis case. This back can be taken off by sliding in the No. 2 and later issues set a 25 mfd. capacitor to the control grid of the final amplifier. Increase the grid lead of the grid amplifier to the chassis. Then connect the speaker to the grid amplifier to obtain the correct position in the chassis. The speaker can be connected to the chassis by connecting the speaker lead to the correct position in the chassis.

Then adjust the 4 P.F. trimmers until maximum output is obtained. These trimmers can be reached through the holes in the back wall of the chassis case. It will be necessary to pull out the fiber insulating sheet a slight amount.

Insert the antenna cable plug in the antenna socket on the chassis.

Rotating Pointer Models—If the antenna is connected at the LC terminal and the entire 66-inch shielded cable (10 mfd) is being used, connect the antenna cable to the LC terminal and plug the cable into the terminal.

If the antenna is connected at the LC terminal, the antenna cable has been cut as explained in the instructions. If the antenna is connected at the LC terminal, the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal.

Sliding Pointer Model—If the antenna is connected at the LC terminal and the entire 66-inch shielded cable (10 mfd) is being used, connect the antenna wire to the LC terminal and plug the cable into the terminal.

If the antenna is connected at the LC terminal, the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal. Then connect the antenna wire, in this case, through a 35 mfd. condenser to the antenna terminal.

Both Models—Set the signal generator for 2500 KC. Turn the rotor of the tuning condenser to the full open position. Adjust the trimmer of the oscillator section of the radio condenser until maximum output is obtained. See Fig. 4 for location of this trimmer.

Set the signal generator for 1400 KC. Then adjust the rotor of the tuning condenser carefully until maximum output is obtained. Adjust the trimmer of the antenna section of the radio condenser for maximum output.

Calibration—Rotating Pointer Models—To obtain dial scale calibration, tune in an 800 KC signal. Hold the tuning shaft and turn the pointer clockwise until the pointer is at the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis.

Calibration—Sliding Pointer Models—The pointer assembly is clamped in place and is soldered to the drive cord and it is seldom necessary to resolder it to obtain proper dial calibration. If recalibration is required, loosen the clamps with a screwdriver, remove the pointer assembly and replace it in the correct position.

Fig. 4—Location of Trim

Drive Cord Replacement—Rotating Pointer Models

Tie a knot with a small loop at one end of the new drive cord. The free end of the drive cord is tied to the tension spring. The distance between knots should be 25 inches long.

Turn the knob clockwise until the pointer is at the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis.

Drive Cord Replacement—Sliding Pointer Models

Tie a knot with a small loop at one end of the new drive cord. The free end of the drive cord is tied to the tension spring. The distance between knots should be 25 inches long.

Turn the knob clockwise until the pointer is at the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis. Then turn the knob to the correct position in the chassis.

Fig. 5—Replacing Drive Cord—Sliding Pointer Models

Antenna Capacity

Rotating Pointer Models—To obtain the correct point on the dial, turn the rotor of the tuning condenser at the correct position in the chassis. The rotor of the tuning condenser is then adjusted carefully until maximum output is obtained. Adjust the trimmer of the antenna section of the radio condenser for maximum output.

Complete information regarding the correct point on the dial is contained in the instructions book provided with the radio.

Sliding Pointer Models—The information for this type of radio is the same as above except that the LC capacity is 30 mfd. and the LC capacity is in the correct position in the chassis.

Two Models

One model has a rectangular dial scale with a sliding pointer disc. The other model has a circular dial scale with a rotating pointer disc. The 2 models also differ in the capacities of the antennas which may be used. The values shown in this article are called "Antenna Capacity."

Issue No. 1

Mechanical Assembly—the 2 front mounting brackets and the connector to the top of the chassis case. The I.F. coil case has a spring clip secured to the bottom of the chassis case.

Electrical Assembly—See electrical changes under "Issue No. 2"

Issue No. 2

Mechanical Changes—The chassis case is supplied with a front mounting bracket and this bracket is secured to the instrument panel of the car by means of 3 separate bolts. The I.F. case can be threaded spade lug which extends through the chassis case and is secured in place with nuts and lock washers.

The back of the chassis case is not removable.

Electrical Changes—The following changes are all illustrated in the schematic in Fig. 1. The 600-plate No. 1 which was connected originally in-ground is removed from ground and connected, as shown in the schematic. Condenser C20 is removed.

The position of condenser C21 is changed as shown. Resistor R15 (200 ohms) is removed and replaced by choke L4.
GAMBLE SKOGMO, INC.

**MODEL 489**

**Schematic, Socket**

**BAND**
- Broadcast
- Short Wave

**DIAL SCALE**
- Upper
- Lower

**FREQUENCY RANGE**
- 535 to 1720 K.C. (Kilocycles)
- 5.5 to 18.1 M.C. (Megacycles)

**REPAIR PARTS** (Serial No. 7J852300 and up)

**BATTERY CONNECTIONS:**
Referring to Fig. 1, connect the battery cable to the storage battery in the following manner:

(a) The storage battery should be located as far from the receiver as the battery cable will permit.

(b) Connect the lead (containing the fuse receptacle) marked A negative (−) to the negative (−) post of the storage battery.

(c) Connect the lead marked A positive (+) to the positive (+) post of the storage battery.

**FIG. 1—TOP VIEW**
DUMMY ANTENNAS

The following dummy antennas are used in aligning and servicing the following alignment instructions:

**DUMMY 1:**
- D.P. - consists of a 1/4 wave condenser and a 400 ohm resistor connected in series with the external oscillator.
- Dummy 2: (Short Wave) - consists of a 1/8 wave condenser and 400 ohm resistor connected in series with the external oscillator.
- Dummy 3: (Medium and Short Wave) - consists of a 1/4 wave condenser and 400 ohm resistor connected in series with the external oscillator.

ALIGNING LP TRANSFORMER: (OM C5)

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

**ĄLIGNING HF TRANSFORMER: (OM C5)**

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

**DUMMY ANTENNA: (OM C5)**

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

**DUMMY ANTENNAS: (OM C5)**

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

**DUMMY ANTENNAS: (OM C5)**

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

**DUMMY ANTENNAS: (OM C5)**

Part No. 158-31: Output P.T. Transformer
Part No. 158-32: Input P.T. Transformer

PROCEDURE FOR SETTING THE AUTOMATIC TUNER LEVERS:

There are 6 levers on the dial by means of which the stations may be selected. (See Fig. 25).

- Make a list of local stations you wish to tune in; you may add up to 16 stations.

Punch out from the station card letter-tape supplied, the call letters of the stations you have selected.

Above each automatic tuner lever is an opening in the station card letter-tape supplied, the call letters of the stations you have selected.

Press down ALL THE WAY any one of the automatic tuner levers. Holding it down, insert the station card letter-tape (Fig. 25) into the opening in the station card letter-tape (Fig. 25) and follow the self-guiding key. With the call letters in the proper position, the station will then be automatically tuned (see Fig. 25).

Note: It is important to insert the station card letter-tape with the call letters in the proper position, the station will then be automatically tuned (see Fig. 25).
**Frequency Range** — 535-1720 Kilocycles

**REPAIR PARTS** (Serial No. 7J852900 and up)

**Conventional Alignment**

Sensitivity Check at 600 KC and 1000 KC

**IF Alignment**

Adj. at 465 KC thru .1 mf cord.

**RF Alignment**

Thru 200 mmf cond.

Adj. oso, trim. at 1720 KC

Adj. Ant. trim. at 1400 KC

**Battery Connections:**

Referring to Fig. 1, connect the battery cable to the storage battery in the following manner:

(a) The storage battery should be located as far from the receiver as the battery cable will permit.

(b) Connect the lead (containing the fuse receptacle) marked A negative (—) to the negative (—) post of the storage battery.

(c) Connect the lead marked A positive (+) to the positive (+) post of the storage battery.

**Fig. 1—Top View**
ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-95B Output I.F. Transformer
Part No. 108-96 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of the chassis (see Fig. 1).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with 1 mfd. condenser, to the control grid cap of the type 6K7 tube, and adjust the output I.F. transformer (No. 108-95B) to resonance.
   (b) Move oscillator output clip from grid of 6K7 to grid of 6A8G and adjust input I.F. transformer (No. 108-96) to resonance.
   (c) With oscillator still connected to 6A8G, readjust output I.F. transformer (108-95B) if necessary.

1. R.F. ALIGNMENT: (535-1720 K.C.)

(a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top of rear section of variable gang condenser. (See Fig. 1).
(b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top of front section of gang condenser).
(c) Check sensitivity at 600 and 1000 kilocycles.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on diagram are measured with 115 volts on the primary of the power transformer.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.
GAMBLE-SKOOGMO, INC.

MODEL 527 C
Schematic
Socket

WIRING SIDE OF OCTAL
TUBE SOCKET SHOWING
LOCATIONS OF PINS

PARTS (Skeletal No. 307600 and up)

<table>
<thead>
<tr>
<th>Code</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>1280</td>
<td>150m ohm—50w</td>
</tr>
<tr>
<td>R2</td>
<td>1282</td>
<td>20M ohm—50w</td>
</tr>
<tr>
<td>R3</td>
<td>1283</td>
<td>20M ohm—50w</td>
</tr>
<tr>
<td>R4</td>
<td>1284</td>
<td>45-ohm resistor strip</td>
</tr>
<tr>
<td>R5</td>
<td>1285</td>
<td>3.2m ohm—50w</td>
</tr>
<tr>
<td>R6</td>
<td>1286</td>
<td>220M ohm—50w</td>
</tr>
<tr>
<td>R7</td>
<td>1287</td>
<td>1 megohm—50w</td>
</tr>
<tr>
<td>R8</td>
<td>1288</td>
<td>1 megohm—50w</td>
</tr>
<tr>
<td>R9</td>
<td>1289</td>
<td>1 megohm—50w</td>
</tr>
<tr>
<td>R10</td>
<td>1290</td>
<td>220M ohm—50w</td>
</tr>
<tr>
<td>R11</td>
<td>1291</td>
<td>600M ohm—50w</td>
</tr>
<tr>
<td>C1</td>
<td>1292</td>
<td>2200-pF variable condenser</td>
</tr>
<tr>
<td>C2</td>
<td>1293</td>
<td>2200-pF variable condenser</td>
</tr>
<tr>
<td>T1</td>
<td>1294</td>
<td>5&quot; Dynamic Speaker</td>
</tr>
</tbody>
</table>

TUBES:

DESCRIPTION:
The tube complement of this chassis consists of the following octal base glass and metal tubes.
The type and function of each tube is as follows:

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antenna—1 nfd, 100 mw.

FREQUENCY RANGE

- 550 to 1720 K.C.
- 50 Watts Power Output
- 1 Watt Undistorted, 1.7 Watts Maximum
- Intermediate Frequency: 465 K.C.
MODEL 587 - Series A
DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1", "Dummy 2", and "Dummy 4".

1. Dummy 1: (I.F.) - Consists of a .1 mfd. condenser connected in series with the external oscillator.
2. Dummy 2: (Broadcast) - Consists of a .2 mfd. condenser and a 20 ohm resistor connected in series with each other and in series with the external oscillator.
3. Dummy 3: (Short Wave) - Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (445 K.C):1

Part No. 358-76A Output I.F. Transformer
Part No. 358-76A Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator at 458 kilocycles, in series with "Dummy 1", to the center grid cap of the 6AK7 tube, and adjust the output I.F. transformer (No. 358-76A) to resonance.
   (b) With "Dummy 1" still connected, move oscillator output clip from grid of 6AK7 to grid cap of 6AS and adjust input I.F. transformer (No. 358-76A) to resonance.
   (c) With oscillator still connected to 6AK, readjust output transformer (No. 358-76A) to resonance.

BROADCAST AND SHORT WAVE ANTENNA ALIGNMENT

Broadcast Band - 435 to 1720 kilocycles
Short Wave Band - 2560 to 6000 kilocycles

Important: These adjustments must be made in the following order:

SHORT WAVE OSCILLATOR ADJUSTMENT:

1. With band switch in the short wave band position, extreme right of its rotation, and with the variable condenser in its minimum capacity position, plates entirely out of mesh, and with the external oscillator connected in series with "Dummy 1", to the grid cap of the 6AK7 tube, make the following adjustments:
   (a) Connect external oscillator to 6.6 megacycles and adjust short wave oscillator trimmer to resonance. This adjustment is marked "SW. Cond." (see top view of chassis, Fig. 1, for location of this adjustment).

NOTE: Make certain that the fundamental 6.6 megacycles signal has been tuned in and not the image frequency, noting that the image appears when the tuning knob is moved to approximately 8.7 megacycles.

BROADCAST BAND OSCILLATOR ADJUSTMENT:

1. With band switch in the broadcast position, extreme left of its rotation, and with the gang condenser in its minimum capacity position, plates entirely out of mesh, and with the external oscillator connected in series with "Dummy 2", to grid cap of the 6AK7 tube, make the following adjustments:
   (a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance. This adjustment is marked "B.C. Ant." (see top view of chassis, Fig. 1, for location of this adjustment).

MODEL 527C

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:

There are five levers on the dial by means of which five stations may be selected, (See "A" Fig. 2). Make a list of these stations you have selected.

On each of these automatic tuning buttons a small opening is provided for inserting the call letter tab. (See "A" Fig. 2). Insert the call letter tab in the rectangular openings of all of the automatic tuning buttons. Each of the small call letter tab supplied should be snapped into place over each of the station call letter tabs.

Press DOWN ALL THE WAY any one of the automatic tuning lever buttons. Holding it down firmly, raise it by means of the tuning knob (No. 2) the station indicated on the station call letter tab on this lever. Turn the tuning knob very slowly back and forth (while still holding lever is downward position) until the signal is clearest. Release the lever whenever you are sure that the signal is clearest. Release the lever.

Press down another automatic tuning lever button. Holding it down firmly, raise it by means of the tuning knob (No. 2) to the right (clockwise) as far as it will turn, and with a coin (mill dollar), tighten the special locking screw "C" in the center of the tuning knob. (See Fig. 2).

It is very important that this locking screw is tightened to the right (clockwise) as far as it will turn, and with a coin (mill dollar), tighten the special locking screw "C" in the center of the tuning knob.

If you should desire to change any station you selected, hold the tuning knob No. 2 securely and with a coin loosen the locking screw "C" one or two turns; select the new station as explained. Be sure to re-tighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.

The automatic dial is now set up for quick tuning. Press down on the lever and your favorite station is selected.
GAMBLE-SKOGMO, INC.

MODEL 587—SERIES A

PARTS (Serial No. GC310775 and up)

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>130-111</td>
<td>100M Ohms 1/10W—30%—50V Carbon</td>
</tr>
<tr>
<td>R2</td>
<td>120-12</td>
<td>50M Ohms 1/2W—30%—50V Carbon</td>
</tr>
<tr>
<td>R3</td>
<td>120-17</td>
<td>100M Ohms 1/2W—30%—50V Carbon</td>
</tr>
<tr>
<td>R4</td>
<td>130-22</td>
<td>5M Ohms 1/2W—30%—10V Carbon</td>
</tr>
<tr>
<td>R5</td>
<td>130-37</td>
<td>10M Ohms 1/2W—30%—100V Carbon</td>
</tr>
<tr>
<td>R6</td>
<td>130-55</td>
<td>1000Ohms 1/2W—30%—100V Carbon</td>
</tr>
<tr>
<td>R7</td>
<td>180-10</td>
<td>1 meg Ohm Volume Control</td>
</tr>
<tr>
<td>R8</td>
<td>130-113</td>
<td>1000M Ohms 1/2W—30%—400V Carbon</td>
</tr>
<tr>
<td>R9</td>
<td>120-32</td>
<td>1000M Ohms 1/2W—30%—50V Carbon</td>
</tr>
<tr>
<td>R10</td>
<td>130-100</td>
<td>1000M Ohms 1/2W—30%—50V Carbon</td>
</tr>
<tr>
<td>R11</td>
<td>120-28</td>
<td>120 Ohms</td>
</tr>
<tr>
<td>R12</td>
<td>106-36</td>
<td>22 Ohms</td>
</tr>
<tr>
<td>R13</td>
<td>106-36</td>
<td>47 Ohms</td>
</tr>
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</table>

NOTE: R11, R12, and R13 in one unit—126-36

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>120-43</td>
<td>2000 Mica—W—10%</td>
</tr>
<tr>
<td>C2</td>
<td>109-26</td>
<td>0.32 x 400 Volt—35%</td>
</tr>
<tr>
<td>C3</td>
<td>120-36</td>
<td>10000 Mica—0—10%</td>
</tr>
<tr>
<td>C4</td>
<td>120-28</td>
<td>0.001 Mica—W—35%</td>
</tr>
<tr>
<td>C5</td>
<td>120-9</td>
<td>0.05 x 220 Volt—45%</td>
</tr>
<tr>
<td>C6</td>
<td>109-9</td>
<td>0.05 x 220 Volt—45%</td>
</tr>
<tr>
<td>C7</td>
<td>109-11</td>
<td>0.01 x 400 Volt—35%</td>
</tr>
<tr>
<td>C8</td>
<td>120-12</td>
<td>0.0005 Mica—0—10%</td>
</tr>
<tr>
<td>C9</td>
<td>120-12</td>
<td>0.0005 Mica—0—10%</td>
</tr>
<tr>
<td>C10</td>
<td>120-19</td>
<td>0.001 x 400 Volt—25%</td>
</tr>
<tr>
<td>C11</td>
<td>120-19</td>
<td>0.001 x 400 Volt—25%</td>
</tr>
<tr>
<td>C12</td>
<td>120-19</td>
<td>0.001 x 400 Volt—25%</td>
</tr>
<tr>
<td>C13</td>
<td>120-6</td>
<td>2 mil. x 350 Volt Electrolytic</td>
</tr>
<tr>
<td>C14</td>
<td>120-7</td>
<td>5 mil. x 500 Volt Electrolytic</td>
</tr>
<tr>
<td>C15</td>
<td>124-29</td>
<td>Adjustable Capacitor 250 mfd. working capacity</td>
</tr>
<tr>
<td>C16</td>
<td>124-30</td>
<td>Adjustable Dual Capacitor</td>
</tr>
</tbody>
</table>

TUNING RANGE—

Standard Broadcast Band
480-1520 Kilocycles.

Short Wave Band
2200-3000 Kilocycles.

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>T4</td>
<td>118-47</td>
<td>Antenna Coil</td>
</tr>
<tr>
<td>T5</td>
<td>106-45</td>
<td>Oscillator Coil</td>
</tr>
<tr>
<td>T7</td>
<td>106-56</td>
<td>Output I.F. 465 Kc.</td>
</tr>
<tr>
<td>T8</td>
<td>104-26</td>
<td>Tuner Transformer—50 Cycles</td>
</tr>
<tr>
<td>S</td>
<td>125-19</td>
<td>Band Switch</td>
</tr>
<tr>
<td>C</td>
<td>142-31</td>
<td>One Section of Two Gang Capacitor</td>
</tr>
</tbody>
</table>

DESCRIPTION:

The tube complement of this chassis consists of the following tubes.

1. Type 6AG Pentagrid Mixer, First Detector-oscillator
2. Type 6K7 Remote Cut-Off Pentode, I. F. Amplifier (465 K.C.)
3. Type 9Q7-D Duplex Diode Triode Second Detector, A.V.C. and First Audio.
4. Type 6F6-G Pentode Output Amplifier.
5. Type 5Y3 High Vacuum Rectifier.

Transformers are available and chassis are sometimes equipped with universal transformers for operation on 48 and 60 cycles and with primary taps for 105, 125, 150, 220 and 260 volts (see parts list) and also sometimes equipped with 26 cycle transformers with 105-115 volt or 220 volt primaries, not universal.
MODEL 552

IF ALIGNMENT 456 K. C. Connect signal generator to grid of 1C7G tube through a .01 MFD condenser, leave grid cap in place and open tuning condenser (turn dial to high frequency end). Peak IF trimmers — use an output meter — use only enough signal to give a readable output, and go over trimmers several times.

OSCILLATOR & ANTENNA ALIGNMENT: With pointer set to end of scale calibration when tuning condenser is closed, trim oscillator (rear section of tuning condenser) for maximum response at 1460 K. C. dial reading with a 1400 K. C. signal into the antenna lead. Next adjust padding condenser at 540 K. C. and recheck at 1460, then resonate antenna trimmer at 1400 K. C.

MODEL 541A

NOTCH, RED DOT OR HOLE

MODEL 541A ALIGNMENT the same as 552, but connect signal gen.
NOTE: I.F. FREQ. 465 K.C.
ALL VOLTAGES MEASURED FROM
8 WITH A 1000 OHM PER
VOLT VOLTMETER ANTENNA
GROUND TO CHASSIS

PARTS (Serial No. 7D600,110 and up)

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>130-17</td>
<td>10M ohm - 1/3 w. 25%</td>
</tr>
<tr>
<td>R2</td>
<td>120-1</td>
<td>22M ohm - 1/4 w. 25%</td>
</tr>
<tr>
<td>R3</td>
<td>120-4</td>
<td>3 megohm - 1/3 w. 25%</td>
</tr>
<tr>
<td>R4</td>
<td>120-4</td>
<td>3 megohm - 1/3 w. 25%</td>
</tr>
<tr>
<td>R5</td>
<td>120-7</td>
<td>Volume Control (1 Meg)</td>
</tr>
<tr>
<td>R6</td>
<td>120-8</td>
<td>90M ohm - 1/2 w. 25%</td>
</tr>
<tr>
<td>R7</td>
<td>120-32</td>
<td>1000M ohm - 1/4 w. 25%</td>
</tr>
<tr>
<td>R8</td>
<td>120-1</td>
<td>1 megohm - 1/3 w. 25%</td>
</tr>
<tr>
<td>R9</td>
<td>120-32</td>
<td>1000M ohm - 1/4 w. 25%</td>
</tr>
<tr>
<td>R10</td>
<td>120-32</td>
<td>1000M ohm - 1/4 w. 25%</td>
</tr>
<tr>
<td>R11</td>
<td>120-32</td>
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<tr>
<td>R12</td>
<td>120-32</td>
<td>1000M ohm - 1/4 w. 25%</td>
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<tr>
<td>R13</td>
<td>20K ohm</td>
<td>0 ohm</td>
</tr>
<tr>
<td>R14</td>
<td>20K ohm</td>
<td>0 ohm</td>
</tr>
<tr>
<td>R15</td>
<td>20K ohm</td>
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</tr>
<tr>
<td>R16</td>
<td>20K ohm</td>
<td>0 ohm</td>
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</table>

CAPACITORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>100-48</td>
<td>2 gang variable</td>
</tr>
<tr>
<td>C2</td>
<td>100-9</td>
<td>.025 x 600</td>
</tr>
<tr>
<td>C3</td>
<td>100-12</td>
<td>.05 x 200</td>
</tr>
<tr>
<td>C4</td>
<td>100-12</td>
<td>.05 x 200</td>
</tr>
<tr>
<td>C5</td>
<td>100-11</td>
<td>.05 x 400</td>
</tr>
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<td>C6</td>
<td>100-11</td>
<td>.05 x 400</td>
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<td>C7</td>
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<td>C8</td>
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<tr>
<td>C10</td>
<td>100-11</td>
<td>.05 x 400</td>
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<tr>
<td>C11</td>
<td>111-9B</td>
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</tr>
<tr>
<td>C12</td>
<td>111-9B</td>
<td>.01 x 10000</td>
</tr>
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<td>C13</td>
<td>111-9B</td>
<td>.01 x 10000</td>
</tr>
<tr>
<td>C14</td>
<td>111-9B</td>
<td>.01 x 10000</td>
</tr>
</tbody>
</table>

SERVICES TOOKS:

Volages taken from different points of circuit to chassis are measured with voltmeter. Use only enough signal to get a readily readable output. A low output meter or the low scale of a range meter should be used.

L.F. ALIGNMENT = 465 K.C. = MODEL 602
L.F. ALIGNMENT = 470 K.C. = Models 602 B & C
Part No. 106-82B Output I.F. Transformer
Part No. 106-82B Input I.F. Transformer
These I.F. transformers have two adjustments, both of which are accessible from the top of the chassis (see Fig. 1).

1. With control full on (the extreme right of its rotation), and with the variable condenser set at approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with the condenser, to the control grid of the tube 6K7G, and adjust the output I.F. transformer (No. 106-83B) to resonance.
   (b) Move oscillator output clip from grid of 6K7G to grid of 6A8G and adjust Input I.F. transformer (No. 106-82B) to resonance.
   (c) With oscillator still connected to 6A8G, readjust output I.F. transformer (106-83B) if necessary.
   Models 602, 602 B & 602 C

R.F. ALIGNMENT: 535-1720 K.C.

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, and external oscillator in series with a 200 mfd. condenser to the antenna lead and chassis ground and make the following adjustments:
   (a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top of rear section of variable gang condenser. (See Fig. 1).
   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top of front section of gang condenser).
   (c) Check sensitivity at 600 and 1000 kilocycles.
SINGLE HEADER SPEAKER CONNECTIONS

Consult Fig. No. 1. On this application, all that is required is to remove speaker from receiver case and place in header board of car. Install the special seven foot shielded speaker cable and header filter plate assembly and insert the three leads (which formerly connected the radio to the speaker) to the pin jacks on the header filter plate assembly. Remove the three short pigtail leads from the header filter plate assembly, namely, black, green and blue. These leads are only used when dual (two) speakers are to be used, one in the header and the other in the receiver case.

DUAL SPEAKER CONNECTIONS

Consult Fig. No. 1. On this application, leave speaker in receiver case, install a complete header speaker in the header board of the automobile and assemble header filter plate assembly and seven foot shielded cable to front cover of receiver case.

The speaker leads from the radio are removed from the terminal board of the set speaker and plugged into the pin jacks of the header filter plate assembly, making certain to match the colors of the leads with the color dots on the pin jacks. The three short pigtail leads from the header filter plate assembly are then connected to the set speaker. Shift the green lead which runs to the output transformer (No. 105-27) to the pin jack with red dot for dual speaker operation.

For further explanation, consult Fig. No. 2 Single Header Speaker schematic diagram, and Fig. No. 3, Dual Speaker schematic diagram.

A more technical explanation of the manner of interconnecting the set speaker with the header speaker and header filter plate is that for dual speaker operation the two speakers are connected in parallel and for single header speaker operation, three pigtail leads from the header filter plate terminal assembly are cut off. All leads are color-coded and correspond to color dots on the pin jacks mounted on the speakers and the terminal board of the header filter plate assembly. A tapped output transformer is provided for impedance matching.

The dummy antennas referred to in the following instructions are:

- "I.F. Dummy" — A 1 mfd. condenser connected in series with the test oscillator output lead.
- "Broadcast Dummy" — A 175 mmsfd. condenser connected in series with the output lead of the test oscillator.

I.F. ALIGNMENT

1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to grid of 6K7 I.F. tube.
2. Adjust trimmer condensers of output I.F. transformer No. 105-72 to resonance with oscillator.
3. Move test oscillator connection to grid of 6A8 tube and adjust trimmer condensers of input I.F. transformer No. 105-69 to resonance with oscillator. See top view for location of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screw driver.

BROADCAST ALIGNMENT

1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. in series with broadcast dummy to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance. This adjustment is on the middle section of the three-gang condenser — see top view.
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. and antenna trimmers to resonance (see top view).
4. Reset test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad rocking gang condenser to and fro at the same time adjusting series pad for maximum gain. This adjustment is accessible from the top of chassis (see top view).
5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again.
6. Check for sensitivity at 1000 K.C. by setting test oscillator to this frequency and picking up the signal by rotating variable condenser. Under no circumstances bend plates of variable condenser sections to correct tracking.
IF ALIGNMENT
ADJ. AT 456 KC thru .01 cond.

BROADCAST ALIGNMENT
ADJ. OSC. TRIMMER AT 1400 KC
THRU .00025 COND.  CONVENTIONAL ALIGNMENT
PAD AT 540 KC.  SEE SPECIAL SECTION VOL. V111
MODEL S77A
MODEL S77B
Alignment, Socket, Trimmers
Automatic Tuner Procedure

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:

There are six levers on the dial by means of which six stations may be selected. (See "B" Fig. 2).

Make a list of local stations you tune in regularly; any number up to and including six.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

Above each automatic tuner lever an opening in the escutcheon is provided for inserting the call letter tabs. (See "A" Fig. 2).

Insert the call letter tabs in the rectangular openings in the escutcheon above each of the automatic tuner levers. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

Press down ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, tune in by means of the tuning knob (No. 2) the station indicated on the station call letter tab above this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the lever.

Press down another automatic tuner lever. Holding it down FIRMLY, carefully tune in the station indicated on the call letter tab above this lever. Release this lever.

Follow this procedure until you have selected all of your favorite stations.

Now rotate the turning knob (No. 2) to the left (counter clockwise) as far as it will turn, and tighten the special reset lock screw ("C") located on left side of remote tuner unit. (See Fig. 2).

Fig. 2—Front View of Remote Tuner Unit

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the automatic tuner levers. (Note: reset lock screw "C" is loose when radio is shipped from factory).

If you should desire to change any station you selected to another, loosen the locking screw "C" one or two turns; select the new station as explained. Be sure to retighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.

The automatic dial is now set up for quick tuning. Press down on the lever and Presto—your favorite station is selected.

IF. ALIGNMENT: (465 K.C.)

IMPORTANT:

To align the output I.F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the tertiary coil of this unit.

Connect the resistor as indicated by points "Y" and "Z" on the circuit diagram as follows:

Locate the wires coming from the bottom of the output I.F. coil assembly on the underside of the radio chassis.

The white lead with green tracer which is connected to diode plate terminal No. 5 on 027 tube socket is one point and the white lead with brown tracer which is connected to the end terminal of the terminal strip is the other point.

Proceed as follows:

1. With the dial of the Remote Tuner Unit set at 1400 K.C. and with volume control fall on, connect test oscillator set at 465 K.C. in series with I.F. dummy to grid of 6K7 I.F. tube. (.5M Cond.)

2. Adjust trimmers "G" and "H" of output I.F. transformer for maximum gain. (See Fig. 3, top view).

3. Disconnect the 10M ohm resistor which has been shunted across the tertiary winding and adjust trimmer "I" for maximum gain.

(a) This transformer is now correctly tuned. Under no circumstances re-adjust trimmers "G" and "H" after the 10M ohm resistor has been removed.

(b) For alignment of the output I.F. transformer using a cathode ray oscillograph the 10M ohm resistor is not used and the procedure is similar to the alignment of any two circuit I.F. transformers; merely tune for a symmetrical curve of maximum amplitude.

(c) Output connections for the cathode ray oscillograph should be made to pin No. 8 on 027 tube socket and to the end terminal on the terminal strip; at this point the diode load resistors terminate.

4. Move test oscillator connection to grid of G8 tube and adjust trimmer condensers "E" and "F" of input I.F. transformer for maximum gain.

NOTE: A red dot on top of output I.F. can designate location of trimmer "G"

BROADCAST ALIGNMENT:

1. With the dial of the Remote Tuner Unit set at 1560 K.C., connect test oscillator set at 1560 K.C. in series with broadcast dummy to the antenna lead of receiver.

2. Adjust oscillator trimmer (adjustment "C", on back of Remote Tuner Unit) to resonance. (See Fig. 4, back view).

3. Re-set test oscillator to 1400 K.C. and pick up signal by rotating dial on Remote Tuner Unit. Adjust R.F. trimmer (adjustment "B", on back of Remote Tuner Unit), and Antenna Trimmer (adjustment "A", on side of Remote Tuner Unit), to resonance.

4. Re-set test oscillator to 600 K.C. and rotate Remote Tuner Unit dial to 600 K.C.

Adjust shunt oscillator adjustment "D", rotating dial to zero at the same time adjusting shunt oscillator for maximum gain. This adjustment is accessible from the top of the radio chassis. (See Fig. 3, top view).

5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again.
TUBE FUNCTIONS: "6AG6" First detector - oscillator, "6F7Q" Intermediate amplifier, "6Q7G" Second detector and first audio, two "6K6G" as parallel power tubes, "6Y3G" rectifier.

IF ALIGNMENT: Connect signal generator to grid of 6AG6 tube, through a .01 condenser, leave grid cap in place and turn tuning condenser open - peak IF transformers at 456 KC.

BROADCAST ALIGNMENT: Check pointer setting - should reach end of scale with condenser closed - may be changed slightly by loosening set screw on lower pulley and slipping pulley around on tuning shaft. Connect signal generator to antenna terminal through .00025 condenser. Trim oscillator at 1400 KC - this trimmer is reached through hole in top of chassis to the right of antenna coil. Pad at 540 KC, recheck at 1400, and trim preselector trimmer on coil on top of chassis, and antenna trimmer on gang condenser at 1400 KC. Use as low output from generator as possible for final adjustments and it is best to use an output meter connected across speaker to indicate "peak".
MODEL 715B
Schematic
Alignment

GAMBLE-SKOGMO, INC.

IF ALIGNMENT: Connect signal generator to grid of 5AG7 tube, through a .1M condenser, leave grid gap in place and turn tuning condenser open - peak if transformer at 400 K. If transformer at 400 K, recheck antenna terminal for location of transformer trimmers at 1000 K. (See picture for location of antenna trimmer, press resistor trimmer in on gang condenser.)

SHORT WAVE ALIGNMENT: Connect signal generator to antenna terminal through a 200 or 400 ohm resistor. Be sure wave switch is in to the "top" position. The S.M. condenser is fixed for proper tuning.

TUBE FUNCTIONS & CIRCUIT: "5AG7" First detector - oscillator, "6K7A" Intermediate amplifier, "6CG7" Second detector and first audio, "6CG7" Phase inverter, two "6F6G" as push-pull power tubes, "6H5G" Rectifier.
NOS. 9, 10, & 11 - 17 BUTTON TELEPHONE DIAL

NOS. 3 & 7 - PHANTOM LIGHT DIAL

Identification of Dial and Chassis
The following will identify the different dials.

No. 9 Dial - 17 button telephone dial, station buttons are rectangular in shape and are mounted in recessed openings in a horizontal ring equipped with visible tone and volume indicators.

No. 11 Dial - Same as No. 9 Dial except push buttons are brown.

No. 10 Dial - 17 button telephone dial, station buttons are rectangular in shape and mounted in recessed openings in a horizontal ring equipped with visible tone and volume indicators.

No. 3 Dial - Glass dial, moving beam of light indicator, tone and volume indicated by series of circles.

No. 7 Dial - Glass dial, moving beam of light indicator, tone and volume indicated by series of circles.

 Telephone Dial Assembly
The telephone dial assembly provides a means of presetting a number of broadcasting stations and tuning in these stations at any time by depressing a button causing the dial to stop at a preselected location.

Silencer Circuit: A silencer circuit is provided which results in silent trips between stations when using the telephone dial button.

When a telephone dial button is depressed, a circuit is established between the ungrounded end of the volume control and the chassis ground. Referring to Fig. 1, it will be noted that contact is made between the line from the volume control, contact ring, and outer edge of the button. When the button is depressed, spring and pulley ring stud. Since the pulley ring at ground potential, this grounds the audio voltage and no signal will be heard until the button is released.

Position of Stop Pin
When the telephone dial assembly is on the chassis, the guard condenser cover should never be closed, the travel of the motor in this respect is controlled by the stop pin on the pulley ring. See Fig. 4. This is necessary to prevent the guard condenser cover from closing, the telephone dial assembly being exposed to the extreme positions.

After the phone is depressed, the armature rolls on the pulley ring shaft and returns to the upper position. The pulley ring armature rolls on the pulley ring shaft and returns to the upper position. The pulley ring armature rolls on the pulley ring shaft and returns to the upper position. The pulley ring armature rolls on the pulley ring shaft and returns to the upper position.

Replacing Gears
After the appearance of use, one or both of the stop gears may wear, making it necessary to replace the gear in both the upper and lower chassis.

Telephone Dial Replacements

Replacing Complete Dial and Condenser Assembly

To replace the complete dial and condenser assembly, follow these steps:

1. Disassemble the dial and condenser assembly from the chassis.
2. Remove the dial from the condenser assembly.
3. Replace the condenser assembly with a new one.
4. Reassemble the dial and condenser assembly on the chassis.

Replacing Pulley and Button Ring Assembly Only

To replace the pulley and button ring assembly, follow these steps:

1. Remove the dial from the condenser assembly.
2. Remove the pulley ring assembly from the chassis.
3. Replace the pulley and button ring assembly with a new one.
4. Reassemble the dial and condenser assembly on the chassis.
Phantom Light Dial - Replacing Drive Cord

Remove the dial assembly as follows: Take out the screws which secure the dial frame brace to the back of the gang conditioner. Take out the two screws which secure the bracket on the bottom of the dial frame to the chassis. Lay the dial assembly face down on the front of the chassis; it is not necessary to remove the volume control and tone control indicator cords.

Remove the phantom light assembly from the drive drum by taking out the screw.

Take off the old cord and tension spring. Tie a knot with a small loop in it in one end of the new cord. Then tie the other end of the cord to the hook on the tension spring. The distance from the loop on one end to the tension spring is 17¾ inches.

From the front of the chassis, place the looped end of the cord through the drum hole located near the cord track opening, and hook it over the hook provided for it at the back of the drum.

Bring the cord up and around the right side of the drum, keeping the cord in the grooved track of the drum.

Bring the cord down to the right side of the drive shaft and wind it three and one-third times around this shaft, progressing toward the back.

Then bring the cord up and around the left side of the drive drum. Hook the tension spring on the hook of the drive drum.

Replace the phantom light and the dial assembly.

---

**Dial Assembly**

- Dial: 180 A.A.
- Dial Light Only: 190 A.A.
- Indicators: 200 A.A.
- Bezel: 210 A.A.
- Bezel Only: 220 A.A.
- Bezel and Indicator: 230 A.A.
- Bezel and Indicator Section: 240 A.A.
- Bezel and Indicator Section: 250 A.A.
- Bezel and Indicator Section: 260 A.A.
- Bezel and Indicator Section: 270 A.A.
- Bezel and Indicator Section: 280 A.A.
- Bezel and Indicator Section: 290 A.A.
- Bezel and Indicator Section: 300 A.A.
- Bezel and Indicator Section: 310 A.A.
- Bezel and Indicator Section: 320 A.A.
- Bezel and Indicator Section: 330 A.A.
- Bezel and Indicator Section: 340 A.A.
- Bezel and Indicator Section: 350 A.A.
- Bezel and Indicator Section: 360 A.A.
- Bezel and Indicator Section: 370 A.A.
- Bezel and Indicator Section: 380 A.A.
- Bezel and Indicator Section: 390 A.A.
- Bezel and Indicator Section: 400 A.A.
- Bezel and Indicator Section: 410 A.A.
- Bezel and Indicator Section: 420 A.A.
- Bezel and Indicator Section: 430 A.A.
- Bezel and Indicator Section: 440 A.A.
- Bezel and Indicator Section: 450 A.A.
- Bezel and Indicator Section: 460 A.A.
- Bezel and Indicator Section: 470 A.A.
- Bezel and Indicator Section: 480 A.A.
- Bezel and Indicator Section: 490 A.A.
- Bezel and Indicator Section: 500 A.A.
- Bezel and Indicator Section: 510 A.A.
- Bezel and Indicator Section: 520 A.A.
- Bezel and Indicator Section: 530 A.A.
- Bezel and Indicator Section: 540 A.A.
- Bezel and Indicator Section: 550 A.A.
- Bezel and Indicator Section: 560 A.A.
- Bezel and Indicator Section: 570 A.A.
- Bezel and Indicator Section: 580 A.A.
- Bezel and Indicator Section: 590 A.A.
- Bezel and Indicator Section: 600 A.A.
Telephone Dial Replacement Parts

(from back) of the drum at front part of groove in pulley ring drum and under the drive shaft pulley making one-half turn on this pulley. Then bring the cord around the right side (from back) of the adjustable tension pulley and up to the upper left side of the pulley ring drum in front of the cord already on.

Hold the cord in the left hand and rotate the dial counter-clockwise with the right hand. Feed the cord on the drum in such a way that after passing the two openings at the top of the pulley ring drum, it passes to the back of the groove in the drum. After the pulley ring drum makes one complete revolution, place the cord through the left drum opening into the slot and secure the tension spring.
ALIGNMENT PROCEDURE

The following equipment is required for alignment:
An A.F. Wave Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output indicating meter – Non-Linear Sensitive Ammeter.
Dummy Antennas – 1 ft., 200 mm. and 400 mm. units.

<table>
<thead>
<tr>
<th>STEP</th>
<th>ANTENNA SWITCH SETTING</th>
<th>DUMMY ANTENNA</th>
<th>TUBING GENERATOR</th>
<th>TRIMMERS ADJUSTED</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.F.</td>
<td>1st I.F. 2nd I.F.</td>
<td>200 mm.</td>
<td>600 KC</td>
<td>1st I.F. (209)</td>
<td>Turn Rater to Full Open</td>
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<tr>
<td>2nd I.F.</td>
<td>2nd I.F.</td>
<td>200 mm.</td>
<td>600 KC</td>
<td>2nd I.F. (205)</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td>3rd I.F.</td>
<td>3rd I.F.</td>
<td>200 mm.</td>
<td>600 KC</td>
<td>3rd I.F. (207)</td>
<td>Adjust to Maximum Output</td>
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RANGE B

<table>
<thead>
<tr>
<th>1550 KC</th>
<th>Range B</th>
<th>200 mm.</th>
<th>Antenna Lead</th>
<th>Oscillator Range B (14)</th>
<th>Turn Rater to Full Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>1550 KC</td>
<td>Range B</td>
<td>200 mm.</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (14)</td>
<td>Adjust to Maximum Output</td>
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<tr>
<td>600 KC</td>
<td>Range B</td>
<td>200 mm.</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (14)</td>
<td>Adjust to Maximum Output</td>
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RANGE C

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<tr>
<th>4500 KC</th>
<th>Range C</th>
<th>400 mm.</th>
<th>Antenna Lead</th>
<th>Oscillator Range C (145)</th>
<th>Turn Rater to Full Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>4500 KC</td>
<td>Range C</td>
<td>400 mm.</td>
<td>Antenna Lead</td>
<td>Oscillator Range C (145)</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td>2000 KC</td>
<td>Range D</td>
<td>400 mm.</td>
<td>Antenna Lead</td>
<td>Oscillator Range D (14)</td>
<td>Turn Rater to Full Open</td>
</tr>
<tr>
<td>2000 KC</td>
<td>Range D</td>
<td>400 mm.</td>
<td>Antenna Lead</td>
<td>Oscillator Range D (14)</td>
<td>Adjust to Maximum Output</td>
</tr>
</tbody>
</table>

VOLTAGES AT SOCKETS

Line Voltage 117 V – Volume Control Maximum
Local-Distance Switch in Distance Position
Readings taken with 1000 Ohm-per-volt meter

<table>
<thead>
<tr>
<th>TUBE FUNCTION</th>
<th>VOLTAGE BETWEEN SOCKET PRONGS AND GROUND (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK-4790 R.F.</td>
<td>Prong No. 3 750 600 (10) 350 (11)</td>
</tr>
<tr>
<td>AK-4790 1st I.F.</td>
<td>Prong No. 3 150 100 (10) 50 (11)</td>
</tr>
<tr>
<td>AK-4790 2nd I.F.</td>
<td>Prong No. 3 200 150 0 (10)</td>
</tr>
<tr>
<td>6416 R.C.</td>
<td>Prong No. 3 100 60 0 (10)</td>
</tr>
<tr>
<td>6416 Output</td>
<td>100 60 0 (10)</td>
</tr>
</tbody>
</table>

NOTE: Resistances are less than 1 ohm. All are shown.

Fig. 1–R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Winding.

Fig. 4–R.F. and Oscillator. Power Transformer Coils. 305 W.
### Model 802-A

#### Parts

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14048</td>
<td>Coll—Antenna</td>
</tr>
<tr>
<td>14748</td>
<td>Coll—Oscillator</td>
</tr>
<tr>
<td>14444</td>
<td>Condenser—Tuning</td>
</tr>
<tr>
<td>14741</td>
<td>Control—Volume with Switch</td>
</tr>
<tr>
<td>14559</td>
<td>Dials—Dial Pointer with Hub</td>
</tr>
<tr>
<td>14558</td>
<td>Speaker—5&quot; P. M.</td>
</tr>
<tr>
<td>14491</td>
<td>Transformer—IF Input</td>
</tr>
<tr>
<td>14493</td>
<td>Transformer—IF Output</td>
</tr>
<tr>
<td>17726</td>
<td>Trap—Wave</td>
</tr>
</tbody>
</table>

### Service Parts

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Line Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>14358</td>
<td>COIL ANT</td>
<td>.60</td>
</tr>
<tr>
<td>14359</td>
<td>COIL OSC</td>
<td>.30</td>
</tr>
<tr>
<td>14355</td>
<td>COND TUNING</td>
<td>2.50</td>
</tr>
<tr>
<td>14357</td>
<td>CABLE BAT</td>
<td>1.00</td>
</tr>
<tr>
<td>14358</td>
<td>CONTROL VOL</td>
<td>.75</td>
</tr>
<tr>
<td>14315</td>
<td>KNOB LARGE</td>
<td>.20</td>
</tr>
<tr>
<td>14359</td>
<td>KNOB SMALL</td>
<td>.15</td>
</tr>
<tr>
<td>14317</td>
<td>POINTERS</td>
<td>.10</td>
</tr>
<tr>
<td>14319</td>
<td>SCALE DIAL</td>
<td>.35</td>
</tr>
<tr>
<td>14363</td>
<td>SPEAKER</td>
<td>3.50</td>
</tr>
<tr>
<td>14360</td>
<td>I. F. INPUT</td>
<td>1.30</td>
</tr>
<tr>
<td>14361</td>
<td>I. F. OUTPUT</td>
<td>1.30</td>
</tr>
<tr>
<td>17736</td>
<td>TRAP WAVE</td>
<td>.50</td>
</tr>
<tr>
<td>17582</td>
<td>RESISTOR (DRY CELL)</td>
<td>.50</td>
</tr>
</tbody>
</table>

**Order Condensers and Resistors by Value on Diagram.**

### Model 806-A

#### Parts

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14354</td>
<td>Button Push</td>
</tr>
<tr>
<td>14357</td>
<td>Belt—Tuning</td>
</tr>
<tr>
<td>14358</td>
<td>Coll—Antenna</td>
</tr>
<tr>
<td>14359</td>
<td>Coll—Oscillator</td>
</tr>
<tr>
<td>14355</td>
<td>Condenser—Tuning</td>
</tr>
<tr>
<td>14353</td>
<td>Tuning Unit Assembly complete with tuning condenser</td>
</tr>
<tr>
<td>14401</td>
<td>Transformer—IF Input</td>
</tr>
<tr>
<td>14403</td>
<td>Transformer—IF Output</td>
</tr>
<tr>
<td>17726</td>
<td>Trap—Wave</td>
</tr>
</tbody>
</table>

### Model 813-B

#### Parts

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14884</td>
<td>Button Push</td>
</tr>
<tr>
<td>14887</td>
<td>Belt—Tuning</td>
</tr>
<tr>
<td>14356</td>
<td>Coll—Antenna</td>
</tr>
<tr>
<td>14359</td>
<td>Coll—Oscillator</td>
</tr>
<tr>
<td>14455</td>
<td>Condenser—Tuning</td>
</tr>
<tr>
<td>14475</td>
<td>Control—Volume</td>
</tr>
<tr>
<td>14426</td>
<td>Dial—Scale</td>
</tr>
<tr>
<td>14425</td>
<td>ESCUTCHEON—DIAL with CRYSTAL</td>
</tr>
<tr>
<td>14485</td>
<td>Speaker—5 inch PM.</td>
</tr>
<tr>
<td>14264</td>
<td>SOCKET—Octal</td>
</tr>
<tr>
<td>14401</td>
<td>Transformer—IF Input</td>
</tr>
<tr>
<td>14403</td>
<td>Transformer—IF Output</td>
</tr>
<tr>
<td>17726</td>
<td>Trap—Wave</td>
</tr>
</tbody>
</table>

### Model 813-A

#### Parts

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14884</td>
<td>Button Push</td>
</tr>
<tr>
<td>14887</td>
<td>Belt—Tuning</td>
</tr>
<tr>
<td>14356</td>
<td>Coll—Antenna</td>
</tr>
<tr>
<td>14359</td>
<td>Coll—Oscillator</td>
</tr>
<tr>
<td>14455</td>
<td>Condenser—Tuning</td>
</tr>
<tr>
<td>14475</td>
<td>Control—Volume</td>
</tr>
<tr>
<td>14426</td>
<td>Dial—Scale</td>
</tr>
<tr>
<td>14425</td>
<td>ESCUTCHEON—DIAL with CRYSTAL</td>
</tr>
<tr>
<td>14485</td>
<td>Speaker—5 inch PM.</td>
</tr>
<tr>
<td>14264</td>
<td>SOCKET—Octal</td>
</tr>
<tr>
<td>14401</td>
<td>Transformer—IF Input</td>
</tr>
<tr>
<td>14403</td>
<td>Transformer—IF Output</td>
</tr>
<tr>
<td>17726</td>
<td>Trap—Wave</td>
</tr>
</tbody>
</table>
MODEL 803A
CIRCUIT DIAGRAM NO. 1443I

For Model 803 A.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>14429</td>
<td>Clip &quot;A&quot; Battery</td>
<td>.15</td>
</tr>
<tr>
<td>14493</td>
<td>Condenser - Filter 10-250-10-250</td>
<td>.90</td>
</tr>
<tr>
<td>17080</td>
<td>Condenser - Filter 10-25</td>
<td>.60</td>
</tr>
<tr>
<td>14399</td>
<td>Control - Volume with Switch</td>
<td>1.50</td>
</tr>
<tr>
<td>14359</td>
<td>Coil-Oscillator</td>
<td>.60</td>
</tr>
<tr>
<td>17373</td>
<td>Coil-Antenna</td>
<td>.80</td>
</tr>
<tr>
<td>14404</td>
<td>Transformer-Speaker</td>
<td>.70</td>
</tr>
<tr>
<td>17738</td>
<td>Trap-Wave</td>
<td>.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>14400</td>
<td>Transformer-Power</td>
<td>2.50</td>
</tr>
<tr>
<td>14401</td>
<td>Transformer - L. F. Input</td>
<td>1.20</td>
</tr>
<tr>
<td>14402</td>
<td>Transformer - L. F. Output</td>
<td>1.20</td>
</tr>
<tr>
<td>14417</td>
<td>Vibrator-6 Volt</td>
<td>2.60</td>
</tr>
</tbody>
</table>

For Model 803 B.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>14359</td>
<td>Coil-Oscillator</td>
<td>.60</td>
</tr>
<tr>
<td>17373</td>
<td>Coil-Antenna</td>
<td>.80</td>
</tr>
<tr>
<td>14404</td>
<td>Transformer-Speaker</td>
<td>.70</td>
</tr>
<tr>
<td>14409</td>
<td>Transformer-Power</td>
<td>2.60</td>
</tr>
<tr>
<td>14417</td>
<td>Vibrator-6 Volt</td>
<td>2.60</td>
</tr>
</tbody>
</table>

Changes in Above Circuit for 803-B

Speaker field is replaced with filter choke No. 17790

Speaker changed to 6½ P. M.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to “Heat Up” for several minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter—Non-Metallic Screwdriver.
Dummy Antennas—1 mf., 200 mfn., and 400 ohms.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>CONNECTION AT RADIO</th>
<th>Dummy Antenna</th>
<th>Band Switch</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 456 KC</td>
<td>Grid of 1st Det. .1 mf., B Range</td>
<td>Turn Rotor to Full Open</td>
<td></td>
<td>1st I.F. (C17) &amp; (C18)</td>
<td></td>
</tr>
<tr>
<td>WAVE TRAP 456 KC</td>
<td>Push Button Position; Button No. 6</td>
<td>Depressed</td>
<td>Wave Trap (C5)</td>
<td>2nd I.F. (C20) &amp; (C21)</td>
<td></td>
</tr>
<tr>
<td>RANGE B 1730 KC</td>
<td>Antenna Lead 200 mfn., B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C12)</td>
<td>3rd I.F. (C26)</td>
<td></td>
</tr>
<tr>
<td>1500 KC</td>
<td>Antenna Lead 200 mfn., B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Sat Indicator to 1500 KC—See Note A</td>
<td>1st Ant. Range B (C2)</td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead 200 mfn., B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>2nd Ant. Range B (C1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE D 18,300 KC</td>
<td>Antenna Lead 400 Ohm, D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C13)</td>
<td>Ant. Range D (C3)</td>
<td></td>
</tr>
<tr>
<td>15,000 KC</td>
<td>Antenna Lead 400 Ohm, D Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Rock Rotor—See Note B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6000 KC</td>
<td>Antenna Lead 400 Ohm, D Range</td>
<td>Turn Rotor to Max. Output</td>
<td>6000 KC (C9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PERMEABILITY TUNING UNIT

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>CONNECTION AT RADIO</th>
<th>Dummy Antenna</th>
<th>Band Switch</th>
<th>ADJUST COIL POSITION TO MAXIMUM OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 KC</td>
<td>Antenna Lead 200 mfn., No. 1</td>
<td>Setting Screw No. 1</td>
<td>Antenna Coil No. 1</td>
<td></td>
</tr>
<tr>
<td>1100 KC</td>
<td>Antenna Lead 200 mfn., No. 2</td>
<td>Setting Screw No. 2</td>
<td>Antenna Coil No. 2</td>
<td></td>
</tr>
<tr>
<td>850 KC</td>
<td>Antenna Lead 200 mfn., No. 3</td>
<td>Setting Screw No. 3</td>
<td>Antenna Coil No. 3</td>
<td></td>
</tr>
<tr>
<td>850 KC</td>
<td>Antenna Lead 200 mfn., No. 4</td>
<td>Setting Screw No. 4</td>
<td>Antenna Coil No. 4</td>
<td></td>
</tr>
<tr>
<td>700 KC</td>
<td>Antenna Lead 200 mfn., No. 5</td>
<td>Setting Screw No. 5</td>
<td>Antenna Coil No. 5</td>
<td></td>
</tr>
<tr>
<td>700 KC</td>
<td>Antenna Lead 200 mfn., No. 6</td>
<td>Setting Screw No. 6</td>
<td>Antenna Coil No. 6</td>
<td></td>
</tr>
</tbody>
</table>

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.
After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1500 KC on the dial, loosen the 2 clamps which hold the pointer assembly on the cord, move the pointer to the 1500 KC mark, and tighten the clamps.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

NOTE C—At the top of the permeability tuning unit can be seen six “W” upspikes. Insert the end of a pair of long nose pliers or a screwdriver in the “W” opening of the proper button and adjust the position of the antenna (rear) coil by twisting the pliers or screwdriver until maximum output is obtained.

CAUTION—When aligning the short wave band, be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

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ALIGNMENT PROCEDURE

Volume control—Maximum all adjustments.
Connect radio chassis to ground post of signal generator with a short heavy lead.
Connect dummy antenna value in series with generator output lead.
Connect output meter across primary of output transformer.
Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml, 200 ml and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trippers Adjusted (In Order Shown)</th>
<th>Tripper Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 61L7</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plate out of mesh)</td>
<td>Two trimmers on top</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 61L9</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plate out of mesh)</td>
<td>Two trimmers on top</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1750 Kc. 200 mml.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plate out of mesh)</td>
<td>Tripper (C9)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1800 Kc. 200 mml.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set Dial at 150 Kc.</td>
<td>Tripper (C6)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 200 mml.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set Dial at 600 Kc.</td>
<td>Tripper (C6)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc. 200 mml.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set Dial at 600 Kc.</td>
<td>Tripper (C6)</td>
<td>I. F. Wave Trap</td>
<td>Adjust for minimum output</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMAGE REJECTION ADJUSTMENTS</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trippers Adjusted (In Order Shown)</th>
<th>Tripper Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2250 Kc. 200 mml.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Pick up signal at 400 Kc. on dial</td>
<td>Tripper (C8)</td>
<td>Image rejection</td>
<td>Adjust for minimum output (See note &quot;B&quot;)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHORT WAVE BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trippers Adjusted (In Order Shown)</th>
<th>Tripper Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set Dial at 17 Mc.</td>
<td>Tripper (C9)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set Dial at 17 Mc.</td>
<td>Tripper (C9)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set Dial at 6 Mc.</td>
<td>Tripper (C13)</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: "A" Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

NOTE: "B" 1400 KC is the image frequency of 3300 KC. Adjust Tripper (C8) until a minimum output is obtained.

After each band is completed, repeat the procedure as a final check.

<table>
<thead>
<tr>
<th>BAND SWITCH</th>
<th>FREQUENCY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Right Rotation</td>
<td>Short Wave 5 to 75 MC.</td>
</tr>
<tr>
<td>Extreme Left Rotation</td>
<td>Broadcast 500 to 1700 KC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>30 Watts (At 115 volts 50-60 cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Output</td>
<td>5 Watts Undistorted, 7 Watts Maximum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAND</th>
<th>DIAL SCALE</th>
<th>FREQUENCY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>Upper</td>
<td>540 to 1730 KC. (Kilocycles)</td>
</tr>
<tr>
<td>Short Wave</td>
<td>Lower</td>
<td>5.8 to 18.0 MC. (Megacycles)</td>
</tr>
</tbody>
</table>

FIG. 4
PROCEDURE FOR SETTING THE AUTOMATIC TUNER LEVERS:

IMPORTANT—Read carefully before setting the automatic levers.

There are six levers by means of which six stations may be selected. Make a list of local stations or stations you tune in regularly; any number up to and including six.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever button an opening is provided for inserting the call letter tabs.

Insert the call letter tabs in the rectangular openings of each of the small cellulooid tabs supplied should be inserted into place over each of the station call letter tabs.

NOW, PROCEED AS FOLLOWS:

1. Pull the dial tuning knob all the way out (See Illus. "B," Fig. 3) and rotate the tuning knob to the left (counterclockwise) until it cannot be turned any further (See Illus. "D," Fig. 3). This will unlock the automatic tuner mechanism. (NOTE:—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

2. Press down all the way any one of the automatic tuner levers. Holding it down firmly, press in on the dial tuning knob No. 3 and turn in the station indicated on the call letter tab on this lever. You will note that in order to tune the station, the dial tuning knob will have to be pressed down (See Illus. "E," Fig. 3). Turn the dial tuning knob very slowly back and forth (with still holding the automatic tuner lever in downward position), noting the width of the shadow on the screen of the cathode-ray tuning indicator. Minimum width of the tuning indicator indicates the ideal tuning position (resonance). The station will then be clearest and accurately tuned in.

3. Press down another automatic tuner lever. Holding it down firmly, press in on the dial tuning knob and carefully tune in the station indicated on the call letter tab on this lever.

4. Follow this procedure until you have selected all of your favorite stations.

5. Pull the dial tuning knob all the way out (See Illus. "B," Fig. 3) and rotate the tuning knob to the right (clockwise) until it cannot be turned any further (See Illus. "C," Fig. 3). This will lock the automatic tuner mechanism and the stations you have set up for automatic tuning will be locked in place.

6. If you should desire to change any station you selected to another, pull the dial tuning knob all the way out and rotate the knob to the left (counterclockwise) and unlock the tuner mechanism. Select the new station as explained. (NOTE:—If the dial mechanism works hard when setting up a new station for one of the automatic tuner levers, it is due to the tuner mechanism not being unlocked all the way. Pull the dial tuning knob all the way out and rotate the knob to the left (counterclockwise) until it will turn no further. The dial mechanism should work freely with the tuner lever pressed down.)

7. After you have selected the new station, pull the dial tuning knob all the way out and rotate the knob to the right (clockwise) to lock the tuner mechanism. Be sure the knob is turned until it will turn no further, then press the dial tuning knob in.

8. The automatic tuner levers are now set up for quick tuning. Press down the lever key and—YOUR FAVORITE STATION IS SELECTED!

The important steps to remember when setting up stations on the tuner levers for automatic tuning are:

1. To unlock the tuner mechanism pull the dial tuning knob all the way out. You may find it necessary to rotate the knob slightly when pulling it out to make certain that the gears mesh properly. Rotate the dial tuning knob to the left (counterclockwise) as far as it will turn without forcing.

2. To set a lever, press down all the way and hold in this position while tuning in by means of the dial tuning knob the station you want this lever to be tuned to. (NOTE: you will notice that it will be necessary to keep pressing in on the dial tuning knob while tuning in the station as a spring tends to push the knob out.) Set all the levers in the same manner before locking the mechanism.
**Model 2066U Diagram**

**VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE 115**

<table>
<thead>
<tr>
<th>Type of Tube</th>
<th>Position of Tube</th>
<th>Function</th>
<th>A Volts</th>
<th>B Volts</th>
<th>Control Grid Current (mA)</th>
<th>Screen Grid Volts</th>
<th>Cathode Volt</th>
<th>Plate Current (mA)</th>
<th>Grid Test (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>1</td>
<td>Osc.</td>
<td>2.4</td>
<td>70</td>
<td>18(1)</td>
<td>170</td>
<td>0</td>
<td>6.2</td>
<td>6.2</td>
</tr>
<tr>
<td>57</td>
<td>2</td>
<td>1st Det.</td>
<td>2.4</td>
<td>170</td>
<td>8.0</td>
<td>90(2)</td>
<td>8.0</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>58</td>
<td>3</td>
<td>1st I.F.</td>
<td>2.4</td>
<td>260</td>
<td>7.0</td>
<td>90(3)</td>
<td>7.0</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td>58</td>
<td>4</td>
<td>2nd I.F.</td>
<td>2.4</td>
<td>260</td>
<td>7.0</td>
<td>90(3)</td>
<td>7.0</td>
<td>2.5</td>
<td>4.0</td>
</tr>
<tr>
<td>56</td>
<td>5</td>
<td>2nd Det.</td>
<td>2.4</td>
<td>200(3)</td>
<td>17.0</td>
<td>170(3)</td>
<td>7.0</td>
<td>2.5</td>
<td>4.0</td>
</tr>
<tr>
<td>247</td>
<td>6</td>
<td>Audio</td>
<td>2.4</td>
<td>240</td>
<td>1.6(4)</td>
<td>265</td>
<td>17.0</td>
<td>33.0</td>
<td>38.0</td>
</tr>
<tr>
<td>280</td>
<td>7</td>
<td>Rect.</td>
<td>5.0</td>
<td>240</td>
<td></td>
<td>6.8</td>
<td>3.0</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

(1) Varies with frequency. Actual voltage measured across 25,000 ohm bias resistor—39 Volts.
(2) Voltage measured with 120,000 ohm meter.
(3) Voltage measured with 500,000 ohm meter.
(4) Actual voltage measured across 225 ohm section of voltage divider resistor—17 Volts.

**ALIGNMENT**

Adjust the six I.F. trimmers at 455 KC. Then align 1st det. and osc. circuits.

**CONVENTIONAL ALIGNMENT—SEE SPECIAL SECTION VOL. V111**
I.F. ADJUSTMENT - The signal generator is set at 456 kc. and is connected to the grid of the first detector (1C8), with the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position. The I.F. trimmers are adjusted for maximum output. These trimmers may be found on top of the I.F. transformer shield caps.

15 MEGACYCLE ADJUSTMENT - The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and the signal are both tuned to a frequency of 15 mc. with the selector switch in position for band no. 1. The oscillator trimmer condenser is adjusted so that the 15 mc signal is tuned in exactly at the 15 mc calibration point, with the volume control on full and the signal generator adjusted for minimum output. The antenna preselector and first detector trimmers are then adjusted in the center for maximum output. These trimmers are located on the sides of the shield caps and are opposite the lower openings. This is the only adjustment on Band 1.

1500 KC. ADJUSTMENT - With the band selector switch in position for operation on Band 3 and the receiver and signal generator both set at 1500 K.C. the procedure outlined above is repeated. The oscillator trimmer is found on the rear coil can, and is opposite the upper opening. The antenna preselector and interstage coil trimmers are located in the same positions on the corresponding shield caps. The signal generator is set at 1500 K.C. and the signal tuned in on the dial. The padler condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 1500 K.C. adjustment should then be rechecked. The 600 K.C. Padler is located as indicated in the sketch.

3 MC. ADJUSTMENT - The band selector switch is set in position for operation on the No. 3 band. The receiver and signal generator are both set at 3 mc. and the procedure outlined above is repeated. The oscillator trimmer is found on the Police Band Coil located under the chassis and is towards the rear. The other trimmers for this band are located in similar positions on the corresponding coils.

The signal generator is set at 1.7 mc. and the signal tuned in on the dial. The padler condenser for the police band is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 3 mc. adjustment should then be rechecked. The 1.7 mc. padler is located as indicated.
Fig. 4

I.F. TRANSFORMER LEADS
L4, L5, L6, L7
- BLACK
- BLUE
- RED
- WHITE, GREEN TRACER
Fig. 1 shows the schematic circuit. It will be noted that is is of the superheterodyne type. The antenna primary L 16 is connected to the dipole for the antenna thru a twisted pair. The secondary is tuned to the carrier frequency by the first section of the three gang condenser, and is fed into the grid of the 1852 RF amplifier. The plate circuit feeds thru inductor L 2 as a plate lead into the control grid of the 666 converter thru the .0001 mfd coupling condenser. The oscillator is of the Hartley type, although the elements have been used in a somewhat unconventional manner. Note that the oscillator plate L 4 is not used. It was found that better stability was obtained with the circuit as shown, than with the conventional arrangement. The converter is followed by three I.F. stages operating at 120 Kc. The 666 is used as a glide detector in the usual way. The two chokes L 9 - L 10 together with the .0003 mfd condenser serve as a filter to eliminate the i.f. component from the video channel. The 1852 and 666 act as 1st and 2nd VIDEO AMPLIFIERS respectively for the picture signal. A single 1.5 volt cell such as is used for Penlight flashlights supplies the C 4 bias for the 1852 first video stage. This cell is not supplied with the kit, but can be obtained at any Five and Ten cent store or hardware store. This cell will last for a considerable period, since no current is drawn. The output of the 666 is connected to the control grid of the Cathode Ray tube as well as the SYNCH. SEPARATOR.

A second 666 serves as a SYNCH. SEPARATOR. This function is accomplished by putting a negative bias on the 666 plate. This bias may be varied by means of the 100,000 POT. (R 35). Thus, since no current can flow until this negative bias is overcome, we have a means of selecting a part of the incoming wave, by adjusting this bias. Since the synchronizing impulses are of considerably higher amplitude than the picture signals, we can adjust our bias so as to bar the passage of these picture signals and permit only the high amplitude synch. signals to come thru the diode.

The Low and High Frequency SYNCH. impulses are then separated by frequency discrimination. The low frequency pulses cannot pass thru the .0001 condenser which couples to the high frequency sweep, but are attenuated very little by the .005 leading to the Low Frequency sweep oscillator.

The sweep circuit oscillators are of the multivibrator type, and are very stable in operation, and can be readily controlled by the SYNCH. pulses, which are introduced into the respective grids of the 6L6 tubes. Both sweeps utilize the same circuit arrangement, except of course, that different constants are used for the horizontal (h) and vertical (v) sweep frequencies. The saw tooth waves generated in such a way serve to grid control the picture tubes, and the horizontal sweep is obtained from the 6L6 tube which oscillates in such a manner that the horizontal saw tooth can be obtained. The 6L6 tube is therefore inserted to correct this deficiency and produce a saw tooth, substantially linear, so that the Electron beam is carried across the tube at twice the speed of sound. The synchronised saw tooth pulses are then fed to the two sets of deflecting plates to scan the face of the Picture tube by means of the Electron beam emitted by the Electron gun in the neck of the tube. This beam is in turn modulated thru the control grid by the picture impulses obtained from the output of the 666.

An 879 Rectifier fed by a separate transformer supplies the high voltage for the Cathode Ray tube. The 879 serves as a full wave rectifier for the sweep circuits, and other receiver functions. Adequate filtering is used to eliminate any hum voltages that might otherwise interfere with proper operation.

Means are provided for centering the picture by varying the fixed positive potentials on the control grids of the deflection plates. Other controls focus the beam by changing the potential on the focusing electrode (R 59) and adjust the bias on the Cathode Ray tube (R 65) to set the average brightness. (CONTRAST)

Note that the I.F. as well as R.F. circuits are very heavily loaded, so as to broaden the response curves sufficiently to pass the wide band required for good definition.

ASSEMBLY AND WIRING

The assembly of the component parts may be seen from the photographs Fig. 2 and 3 and diagrams 4, 5, and 6. All parts should be assembled as shown and checked against the circuit diagram to prevent any possibility of error. The dials assembly is shown in the sketch. Fig. 6. The 2 angle brackets which hold the dial to the chassis are fastened with self-tapping screws, which are provided. The cord is strung as indicated. The dial crystal is held by 2 'TRI-MOUNTS' which are also provided. These are simply pressed into the holes, and may be removed to calibrate the scale by pushing them out from the rear. The pointer is fastened to the dial cord by pressing the prongs together, over the place of screwing, which has been slipped over the cord to prevent chafing.

Note that the end of the shield on the underside of the chassis is soldered to a lug fastened under one of the screws which holds the gang condenser. See Fig. 3.

The large rubber grommet is slipped into the hole in the rear picture tube support bracket and serves to insulate the leads from the tube socket.

Other grommets are located as shown in the various figures. Cables L 1, L 2, L 3, and L 16 are wound with #16 bare wire (supplied with kit). All diameter-form is used and removed after winding. Turns are spaced approximately 1/8". The number of turns is indicated in the diagram.

It is important that the winding shown in Figs. 4 and 4A be followed carefully. As each wire or component is put in, it should be checked off on both schematic and diagram sheets. The wires to the grounds and heaters should be wired first, then the various voltages, i.f. transformers, then resistors, caps and tubular condensers. All wiring should be as short and direct as possible. Particular care should be taken in wiring the Video Amplifier to avoid high Grid or Anode capacities to ground, since this will result in a loss of high frequencies with consequent poor detail. This applies especially to leads from the Diode detector to the 1852 and coupling condenser from 1852 to 666 as well as wiring from 171. These leads should be kept to a minimum. The GRID LEAD from the picture tube to the chassis or wrap it around the other leads in the cable.

After the receiver has been assembled and wired, it should be very carefully checked over, to see that it is wired in exact accordance with the schematic and pictorial diagrams. When this has been accomplished, insert all tubes into their respective sockets, as shown in the photographs.

CAUTION

Approximately 1400 volts is supplied to the high voltage lines of this equipment. Be sure that the power switch is OFF before testing, and that the line cord is not plugged into the outlet. If the main switch is left ON, or if the line cord is left plugged in, the high voltage will be applied to the tubes, and may cause injury.

BE SURE THAT THE POWER SWITCH IS OFF BEFORE TESTING, AND THAT THE LINE CORD IS NOT PLUGGED INTO THE OUTLET. If the main switch is left ON, or if the line cord is left plugged in, the high voltage will be applied to the tubes, and may cause injury.

WARNING

Be sure that the cathode-ray tube is not damaged by touching the glass bulb with the fingers. The glass is extremely fragile and can be scratched or broken by the slightest touch.
### Model 100

**Chassis Wiring**

**Voltage**

---

**GAROD RADIO CORP.**

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**Fig. 5**

---

<table>
<thead>
<tr>
<th>Voltage Table</th>
<th>Television Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VOLTAGE</strong></td>
<td><strong>TELEVISION RECEIVER</strong></td>
</tr>
<tr>
<td><strong>CAP.</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>1852</td>
<td>R. F. Amp.</td>
</tr>
<tr>
<td>6K8</td>
<td>Converter</td>
</tr>
<tr>
<td>1852</td>
<td>1st I.F. Amp.</td>
</tr>
<tr>
<td>1852</td>
<td>2nd I.F. Amp.</td>
</tr>
<tr>
<td>1852</td>
<td>3rd I.F. Amp.</td>
</tr>
<tr>
<td>6H6</td>
<td>Diode Det.</td>
</tr>
<tr>
<td>1852</td>
<td>1st Video</td>
</tr>
<tr>
<td>6V6</td>
<td>2nd Video</td>
</tr>
<tr>
<td>6K6</td>
<td>Sync. Sel.</td>
</tr>
<tr>
<td>6L70</td>
<td>Hi-Freq. Sweep</td>
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<tr>
<td>6L65</td>
<td>Low Freq. Sweep</td>
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<td>6L70</td>
<td></td>
</tr>
<tr>
<td>200S</td>
<td>Videotron</td>
</tr>
<tr>
<td>523</td>
<td>Low Voltage Rect.</td>
</tr>
<tr>
<td>670</td>
<td>High Voltage Rect.</td>
</tr>
</tbody>
</table>

---

**ALL VOLTAGES MEASURED WITH A HIGH-RESISTANCE D.C. VOLT METER (EXCEPT HEATERS) ALL CONTROLS TURNED ALL THE WAY TO THE RIGHT (COUNTCLOCKWISE)**

**SH** - Shell  
**SC** - Screen  
**Inj. Grs.** - Injector Grs.  
**H** - Heater  
**Plate**  
**Filament**  
**Sup.** - Suppressor Grid  
**D. P.** - Diode Plate  
**X** - No connection  
**GR.** - Grid  
**Def. Pl.** - Deflecting Plate  
**K** - Cathode  
**A** - Anode

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ALIGNMENT AND OPERATION

Set the Picture Tube bias control (#1) all the way to the right. Set the Horizontal and Vertical Sweep (#5 and 7) controls approximately half way.

Now turn the Spot locating control (#3) all the way to the left and rotate the other spot control (No. 6) to its entire range. If neither a spot nor a raster (the scanning pattern) appears, move the first spot locating control (#3) slightly to the right and rotate the other locating control thru its entire range again. Continue this procedure step by step until something appears on the viewing screen of the Cathode Ray Tube.

Now adjust the Vertical and Horizontal Sweep controls until a complete raster appears. This should be approximately 4" square (the actual picture will be somewhat smaller due to the presence of the blanking and sync pulses in the raster carrier). By means of the Spot Location controls (#3 and #4) this raster may now be centered on the tube face. The Cathode Ray Tube socket can be rotated to level the raster.

The size of the picture is determined by two factors, namely: the sweep circuit voltage and the voltage applied to the second anode. The picture increases with increase in sweep voltage and decreases inversely as the square of the second or high voltage anode potential. The saw-tooth voltage developed by the multivibrator is a function of the 6V voltage applied to the plates. Since we are operating near the voltage limit of the 522 rectifier tube, it is impractical to obtain any improvement in this direction. Amplifiers could be used to increase the sweep voltages, but this would complicate matters greatly. The other alternative is to reduce the 2nd anode voltage. Referring to the circuit diagram, a 100,000 ohm (660) dropping resistor is indicated in series with the low voltage filter system. This results in a larger picture, at only a slight sacrifice in brilliance. The use of this resistor is optional, depending upon which characteristic is the more desirable.

The image ratio should be 4:3. If the picture does not conform to this ratio, a rearnangement of resistors in the sweep plate and screen circuits will correct this. Potentiometers could be inserted to control the voltages applied to the deflection plates, but these additions are hardly necessary since once this adjustment is made, it need not be changed, for a given set of tubes.

After this has been satisfactorily checked, we may proceed to the I.F. amplifier adjustments. An output meter or preferably an Oscilloscope is connected across the output of the video amplifier. A signal from a signal generator at the equivalent source is now introduced at the converter grid (648). The intermediate frequency is 33-5Mc. The I.F. transformers are now adjusted for maximum output in the conventional way.

Now introduce a signal, whose frequency is approximately that of the principal station to be received, into the antenna circuit. Tune this signal by rotating the dial, until the alignment and R.F. circuits for maximum output by means of the trammers on the variable condenser.

After this has been done, the receiver is ready for a test on the air. It is best to make adjustments on the fixed pattern transmitted by Television stations during test periods preceding the regular scheduled program. The I.F. system should now be readjusted by staggering the peaks to accept a wide band of frequencies (2 megacycles). This will result in considerable improvement in picture detail, with relatively slight loss in gain.

The I.F. transformers are heavily loaded with 1500 ohms across each secondary. It is possible to control these, with an increase in gain if they are carefully realigned so as to stagger the peaks, with a resultant "square top" resonance curve over the desired band.

The R.F. circuits should now be realigned for best tracking. It may be necessary to adjust the R.F. coil inductances slightly to obtain the proper range and tracking. If necessary, the above procedure may be repeated to the variable condenser may be bent to accomplish this.

About 20 volts at the Control Grid of the Cathode Ray Tube is necessary in order to obtain a good picture. If everything is functioning properly this should be easily obtained from stations within range. This can be checked with a vacuum tube voltmeter or calibrated oscilloscope.

A little experience will enable the user to tune in a station quickly and clearly. Proper manipulation of the controls is important, and the function of each should be studied carefully and thoroughly understood. A cathode bias control is in the first I.F. stage and sets the overall gain. Other controls locate the pattern, vertically and horizontally; set the vertical and horizontal sweep frequencies; adjust focus of the Picture Tube, fix the average brightness (Contrast); and adjust the Sinc separator and Selector. See illustration.

RECEIVING ANTENNA

The installation of an antenna for television reception is extremely important. In residential locations, the antenna should be elevated as high as possible and located in such a way as to be free from sources of interference. Automobile ignition systems cause considerable interference as do electrical devices having sparking or intermitent contacts. Reflections from buildings, bridges and steel or other metal structures may result in multiple transmission, thereby producing 2 or more images superimposed upon each other. Due to the slight time difference in the arrival of the several reflected waves, this effect may become extremely critical in large cities where a great number of these high structures are present. If possible a "line of sight" transmission path from the transmitter antenna should be selected. Again, care must be taken to obtain the maximum freedom from electrical interference, since this will result in spotting and blurring of the picture.

It is noticed that loss of this "noise" interference from automobile ignition systems particularly, is picked up when using a horizontally polarized antenna than with a vertical antenna. Since, from all other considerations, it is equal as effective it is therefore desirable to use such an antenna for our television receiver, when the field strength is sufficient to give us the necessary signal for satisfactory operation.

A simple dipole with twisted-pair lead-in (or a transposed lead-in) will usually give satisfactory results. These dipoles are available with arms of adjustable length and so arranged that they can be rotated. For a given station, maximum pickup will be obtained when the dipole is at right angles to the signal path from the transmitter. Where several stations are to be received, or the field strength is inadequate, more complicated forms of antennas may be required, or in the case of a directive antenna, a compromise may have to be reached so as to include all the desired stations within range. The length of the dipole is increased for maximum pickup from desired stations. An overall length of 120 inches is suggested for a start. In some cases, it may be desirable to use separate antennas facing in different directions for different stations.

It is extremely important that the antenna be securely fastened so as to prevent swinging of either the antenna itself, or the transmission line, since this may result in intermitent blurring or loss of the picture. To avoid complications, no A.V.C. system has been incorporated in this receiver.

It is strongly recommended that the builder study all literature available on Television and Ultra Short waves before attempting to go ahead with the construction so as to enable him to proceed intelligently. A knowledge of the exact function of each component will help greatly towards the successful accomplishment of the desired results.

References: QST - Oct, Dec, Jan, Feb, Mar, Apr, May 1937
ELECTRONICS - 1937-38
TELEVISION - Vol I and II - RCA Technical Press.
ALIGNMENT - MODELS 259, 269, 629, 729, 739, 759, 789, and 359

L.F. ADJUSTMENT. The signal generator is set at 466 KC and is connected to the grid of the converter tube (68E) through a 500 pf. condenser. Be sure to connect a resistor of approximately 25,000 ohms between the converter grid and ground so that the grid circuit is at ground potential for L.F.

The Band switch should be set on Broadcast and the pointer set at 550 kc. The input i.p. transformer trimmers are located on the rear chassis apne, between the variable condenser and the 686 i.p. tube. These trimmers are adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loudspeaker output transformer.

The output i.p. transformer trimmer is located on the rear chassis apne, under the power transformer. This trimmer is adjusted for maximum output as indicated on the output meter. The input i.p. should now be rechecked for maximum output.

BROADCAST BAND

The dummy antenna for this band consists of only a 250 MF condenser. Set the band switch in the Broadcast position and condenser plate completely out of mesh.

MODELS 629, 729

Set the signal generator at 1720 KC and adjust the broadcast oscillator trimmer located on top of the chassis (it is the trimmer to the rear of this piece) until a response is indicated on the output meter. Turn the variable condenser until a response is indicated. The dial pointer should now coincide with the 1500 KC mark on the dial. Adjust the 1600 KC antenna trimmer located on top of the chassis, near the variable condenser. This is the trimmer to the front of the chassis for maximum output.

MODELS 259, 269

Set the signal generator at 1770 KC and adjust the broadcast oscillator trimmer (under the chassis) behind the tone control. The oscillator trimmer is the one nearest the band switch) until a response is indicated on the output meter. The generator is now set at 1500 KC. Turn the variable condenser until a response is indicated. The dial pointer should now coincide with the 1500 KC mark on the dial. Adjust the 1600 KC antenna trimmer located adjacent to the oscillator trimmer, under the chassis for maximum output.

SHORT-WAVE BAND #1 ADJUSTMENT. Set the band switch to the extreme left hand position (short wave band 1). Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected to the "short antenna" lead through a dummy antenna consisting of a 250 MF condenser and a 400 ohm non-inductive resistor in series. With the generator set at 2225 KC and the short wave oscillator trimmer opened until a response is heard, the trimmer is adjusted for maximum output while rocking the condenser gang from left to right. (The high frequency adjustments should now be rechecked.

SHORT-WAVE BAND #2 MODEL 359 only

Set the band switch to the middle position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected as for band 1. The generator is set at 6.25 KC and the Band 2 oscillator trimmer opened until a response is indicated at the lower capacity setting of the trimmer. The antenna trimmer is then adjusted for maximum output while rocking the condenser gang from right to left. The antenna trimmer is then located on the top of the chassis, in line with and directly behind the oscillator trimmer. The generator at 2.4 KC and turn the variable condenser knob until a response is indicated. The pointer should coincide with the 1500 mark on the dial. Adjust the antenna trimmer for maximum output while rocking the condenser gang from left to right. The high frequency adjustments should now be rechecked.

LONG-WAVE BAND MODEL 7390 only

The dummy antenna for this band is the same one used in aligning the broadcast band. Set the generator at 300 KC. Set the dial pointer so as to coincide with the 300 KC mark on the dial. Turn the dial control knob to the right and forward of the oscillator antena trimmers for maximum output while rocking the gang condenser. The high frequency adjustments should now be rechecked.

Now set the signal generator at about 1200 kc and leave the BAND SWITCH IN THE LONG WAVE POSITION. Adjust the generator output voltage until a response is heard. The 1200 kc wave trap on top right of the chassis is now adjusted for minimum response.

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Select the six favorite broadcast stations which you wish to set up for automatic tuning. The stations chosen should be from stations most clearly heard when using dial tuning. It is not advisable to use this system of tuning for short wave or distant broadcast stations.

Although each button will cover the entire dial range it may be more advisable, from the standpoint of convenience, to arrange the stations chosen in order of frequency.

SETTING THE STATION BUTTONS: The proper procedure is as follows:—

1. Grop the first button to be set with the finger tips, and loosen it by unwinding it about one-half turn to the left or in a counterclockwise direction. Now tune in the station which you desire to set on this button, using the regular tuning knob. After the station is perfectly tuned, hold the knob firmly with one hand and depress the button just loosened as far as it will go. Then tighten it gently by turning it to the right, or in a clockwise direction. The button should be kept depressed in the meantime, and the dial knob should be held firmly so that the station does not become detuned.

2. Now release the push button and turn it again in a counterclockwise direction to make sure it is firmly tightened. Then tune the dial off the station and try depressing the push button as far as it will go. The station should then be perfectly retained. If it is not tuned properly that is, if you are able to retune it better with the dial, it will be necessary to repeat the above procedure.

The other five buttons may now be set up in the same manner as described above, tuning each to one of the favorite stations which you have selected.

The tabs bearing the station call letters may now be removed from the sheet provided, and placed in the slots below the pushbuttons.

When tuning with the pushbuttons, it must be remembered that this is a mechanically driven device, depending upon pressure for proper operation. For this reason, the pushbuttons must be depressed firmly, otherwise the dial may not come to the correct setting before the button is released.

If at any time it is desired to change one of the stations which is set up for automatic tuning, this may be done without disturbing the settings of the other stations. Simply set up the new station on the button which was used for the station no longer desired.
Realignment of this receiver should not be attempted unless all other possible causes of faulty operation have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands and an output meter for indicating the effect of adjustments are required.

It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator; otherwise the A.V.C. action will tend to nullify the variations in output as the trimmers are adjusted.

I.F. Adjustment: The signal generator is set at 456 kc and is connected through a .5 mf. condenser to the grid of the first detector (6AK5). With the band switch set on "Broadcast", the pointer is set at 600 kc and the receiver volume control at the maximum position. The I.F. trimmers are adjusted for maximum output. These trimmers are found on top of the I.F. transformer shield can.

Band #1 Adjustment: Turn the band control knob so that the condenser plates are entirely out of mesh. Set the band switch to band #1. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250 mmf. size condenser and a 400 mmf condenser. The oscillator trimmer condenser should be opened to minimum capacity and the signal generator then set at 28 megacycles. The oscillator trimmer is increased in capacity until maximum response is obtained. Two responses are possible and it is important that the higher frequency response (oscillator trimmer low capacity) be used. The signal generator is then set to 21 kc and the variable condenser turned until a response is obtained. The pointer should coincide with the 21 kc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named, for maximum output. The variable condenser should be rocked slightly during this last adjustment.

Band #2: The band selector switch is set in position for operation on short wave band #2. The variable condenser is opened so that the plates are completely meshed and the oscillator trimmer is opened to minimum capacity. The signal generator is set to 7.4 kc and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response (oscillator trimmer low capacity) be used. The signal generator is then set to 7.4 kc and turned until a response is indicated on the output meter. The pointer should coincide with the 7.4 kc mark on the dial. The antenna preselector and second detector trimmers are then adjusted in the order named, for maximum output. After high frequency adjustments have been made set the signal generator at 2.5 kc and turn the variable condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be rechecked.

Broadcast Band: The dummy antenna for this band should consist of a 250 mmf condenser only. The signal generator is set at 1200 kc, the band switch set at broadcast position. The variable condenser should be opened so that the plates are entirely out of mesh. The oscillator trimmer is then adjusted for maximum response on that frequency (1200 kc). The signal generator is set at 1200 kc and tuned until the receiver gives a response. The dial pointer should coincide with the 1200 kc mark on the dial. Then adjust the antenna and detector trimmers in the order indicated for maximum output. The signal generator is then set at 1200 kc and the receiver tuned until a response is indicated. The padding condenser is then adjusted for maximum gain while the tuning gang condenser is rocked slightly to the left and right. The 1200 kc adjustment should then be rechecked.

Long Wave Band: The band selector switch is set in position for operation on the long wave band. The receiver and generator are both tuned to 200 kc and the oscillator trimmer is adjusted for maximum response. The antenna and first detector trimmers are adjusted in the order named for maximum output. The signal generator is then set at 200 kc and the signal is tuned in. The long wave padding condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the left and right. The 200 kc adjustment should then be rechecked.
With a small screwdriver slowly turn the setting screw below button 1, until the desired station is found. The station will be exactly the same as with the dial except that the screwdriver is used instead of the tuning knob.

The remaining buttons may be set up in the same manner. Once the adjustments have been made, no further changes will be necessary. The station markers may now be removed from the sheets, provided, and inserted in the expressions below the corresponding buttons. Blank tabs may be used below buttons on which stations are not set.

**Alignment for Model 4159**

Alignment of this receiver should not be attempted unless all other possible causes of faulty operation have been thoroughly investigated. An accurately calibrated signal generator will serve the necessary observe and output meter for indicating the effect of adjustments required. It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator; otherwise the A.M. section will tend to nullify the variations in output as the trimmers are adjusted.

**I.F. Adjustment**

The signal generator is set at 560 kc and connected through a 900-ohm resistor to the grid of the first detector (RF). With the band switch set on "Broadcast," the pointer set at 550 kc and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on top of the I.F. transformer chassis case.

**Band F Adjustment**

Turn the dial control knob so that the condenser plates are entirely out of view. Set the band switch to band 1. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250-ohm mist condenser and a 450-ohm non-inductive resistor mounted in parallel. The oscillator trimmer condenser should be opened to maximum capacity and the signal generator turned down to 20 millivolts. The oscillator trimmer is then adjusted to 20 millivolts, and the range of trimmer capacity is closed. The pointer should then be readjusted to 1200 kc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named while maintaining the minimum output for the last adjustment. The signal generator is now set at 1200 kc and the signal tuned in on the dial. The pad condenser for this band is adjusted for maximum reading of the output meter while the generator tuning condenser is rocked slightly to the right and left. The high frequency adjustment should then be redone.

**Band A**

The band selector switch is set in position for operation on short-wave band 2. The vertical condenser is opened so that the plates are completely unscrewed and the oscillator trimmer is opened to maximum capacity. The signal generator is set to 1.4 kc and the oscillator trimmer condenser is increased in capacity until a response is heard. The responses are possible and it is important that the I.F. signal generator be turned down to 20 millivolts and the tuning control adjusted to a position where a response is indicated on the output meter. The pointer should then be readjusted to 2000 kc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made at 1.4 kc and turned the variable condenser until a response is observed, adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be redone.

**Broadcast Band**

The dummy antenna for this band consists of a 250-ohm mist condenser only. The signal generator is set at 1700 kc, the band switch set as broadcast position. The variable condenser should be opened to maximum capacity and the signal generator turned down to 20 millivolts. The oscillator trimmer is then adjusted for maximum response on that frequency (1700 kc). Set the signal generator at 1500 kc and tune the receiver tuning condenser. The dial pointer should calibrate on the 1200 kc mark on the dial. Then adjust the antenna and detector trimmers in the order indicated for maximum output. The signal generator is then set at 1000 kc and the receiver tuned until a response is indicated. The padding condenser is then adjusted for maximum gain while the tuning condenser is rocked slightly to the right and left. The 1500 kc adjustment should then be redone.

**Long Wave Band**

The band selector switch is set in position for operation on the long wave band. The vertical condenser is opened so that the plates are completely unscrewed and the oscillator trimmer is opened to maximum capacity. The signal generator is then set at 1000 kc and the input of the detector is turned on. The input of the detector is then set at 800 kc and the receiver tuned until a response is indicated. Then adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be redone.

**Alignment for Model 4159**

Alignment of this receiver should not be attempted unless all other possible causes of faulty operation have been thoroughly investigated. An accurately calibrated signal generator will serve the necessary observe and output meter for indicating the effect of adjustments required. It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator; otherwise the A.M. section will tend to nullify the variations in output as the trimmers are adjusted.

**I.F. Adjustment**

The signal generator is set at 600 kc and connected through a 900-ohm resistor to the grid of the first detector (RF). With the band switch set on "Broadcast," the pointer set at 550 kc and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on top of the I.F. transformer chassis case.

**Band F Adjustment**

Turn the dial control knob so that the condenser plates are entirely out of view. Set the band switch to band 1. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250-ohm mist condenser and a 450-ohm non-inductive resistor mounted in parallel. The oscillator trimmer condenser should be opened to maximum capacity and the signal generator turned down to 20 millivolts. The oscillator trimmer is then adjusted to 20 millivolts, and the range of trimmer capacity is closed. The pointer should then be readjusted to 1200 kc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named while maintaining the minimum output for the last adjustment. The signal generator is now set at 1200 kc and the signal tuned in on the dial. The pad condenser for this band is adjusted for maximum reading of the output meter while the generator tuning condenser is rocked slightly to the right and left. The high frequency adjustment should then be redone.

**Band A**

The band selector switch is set in position for operation on short-wave band 2. The vertical condenser is opened so that the plates are completely unscrewed and the oscillator trimmer is opened to maximum capacity. The signal generator is set to 1.4 kc and the oscillator trimmer condenser is increased in capacity until a response is heard. The responses are possible and it is important that the I.F. signal generator be turned down to 20 millivolts and the tuning control adjusted to a position where a response is indicated on the output meter. The pointer should then be readjusted to 2000 kc mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made at 1.4 kc and turned the variable condenser until a response is observed, adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be redone.

**Broadcast Band**

The dummy antenna for this band consists of a 250-ohm mist condenser only. The signal generator is set at 1700 kc, the band switch set as broadcast position. The variable condenser should be opened to maximum capacity and the signal generator turned down to 20 millivolts. The oscillator trimmer is then adjusted for maximum response on that frequency (1700 kc). Set the signal generator at 1500 kc and tune the receiver tuning condenser. The dial pointer should calibrate on the 1200 kc mark on the dial. Then adjust the antenna and detector trimmers in the order indicated for maximum output. The signal generator is then set at 1000 kc and the receiver tuned until a response is indicated. The padding condenser is then adjusted for maximum gain while the tuning condenser is rocked slightly to the right and left. The 1500 kc adjustment should then be redone.

**Long Wave Band**

The band selector switch is set in position for operation on the long wave band. The vertical condenser is opened so that the plates are completely unscrewed and the oscillator trimmer is opened to maximum capacity. The signal generator is then set at 1000 kc and the input of the detector is turned on. The input of the detector is then set at 800 kc and the receiver tuned until a response is indicated. Then adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be redone.
GENERAL ELECTRIC CO.

SERVICE DATA

Physical Specifications:
- Model: GM 11
- Height: 8 inches
- Width: 15 3/4 inches
- Depth: 15 3/4 inches

Electrical Specifications:
- 115-125 volts
- 60 cycles
- 25 watts

*It is also furnished in 50 and 25 cycle models. The operating frequency is shown on the label.

Record Player Oscillator:
- Frequency: 1400-1600 K.C.
- Oscillator tube: Type 12A7

Phonograph Mechanism:
- Motor: Self-starting, induction
- Pickup: Crystal

Impedance (pickup): 80,000 ohms at 1,000 cycles

Record capacity: Manual—10 or 12 inch

Turntable speed: 78 rpm.

GENERAL INFORMATION

The Model GM-11 Wireless Record Player uses a Type 12A7 tube as combined rectifier and oscillator working directly from the A.C. power supply. The oscillator section of the 12A7 is modulated with audio from the phonograph recordings by means of a crystal pickup and its associated mechanism. The oscillator operates over a range of 1400-1600 kilocycles and the frequency is adjusted by the tuning trimmer (C-1). This is set at the factory to operate at 1500 K.C.

The turntable is driven at 78 revolutions per minute by a constant speed, self-starting induction motor. The motor is properly lubricated at the factory for long operation and should not require attention under normal weather conditions.

Tuning Trimmer

This adjustment changes the frequency of the Wireless Record Player Signal. It is adjusted at the factory for approximately 1500 kilocycles and has a range of 1400-1600 kilocycles.

If the record player signal interferes with some local station (characterized by a whistle or low frequency beat note) or the receiver does not tune quite high enough to receive the record player signal, it will be necessary to adjust the tuning trimmer described in a previous paragraph. Proceed with the radio to a quiet point above 1400 K.C. on the dial, then, using a small screwdriver, turn the tuning trimmer until the record player is tuned to the dial setting of the receiver. Clockwise rotation of the trimmer lowers the frequency; while counterclockwise rotation raises the frequency.

Microphone Connections

A suitable microphone (G-E No. GM-1) may be connected into the circuit of the record player by merely inserting the plug in the microphone jack (location shown in Fig. 1.). A carbon microphone may be used or a suitable goose-neck transformer is used. A suggested circuit is shown in Fig. 2.

Operating Notes

1. If a hum is noted when the pickup case is touched by the hand, merely reverse the power plug in the A.C. outlet.
2. If you are unable to receive the signal from the record player on the radio, it is possible that the oscillator tube in the record player is defective. When replacing, it is advisable to use only a General Electric Type 12A7 tube; otherwise a proper hum balance might not be obtained.
3. A microphonic feedback may be noticed if the record player is located on top or too close to the receiver when the volume is turned up. For this reason it may be desirable and more convenient to operate the record player from a nearby point.

---

Diagram of the record player and microphone connections.
GENERAL ELECTRIC CO.

MODEL GD-44A, GD-44B
GD-44AU, GD-44BU
Schematic, Voltage, Alignment

Symbol | Description | Symbol | Description
--- | --- | --- | ---
C-1, 2, 3, 4, 5 | .001 mfd paper capacitors | R-1 | 25,000 ohm volume control
C-6, 7, 8 | .01 mfd. paper capacitor | R-2 | 25,000 ohm carbon resistor
C-9, 10 | .02 mfd. paper capacitor | R-3 | 3.0 megohm carbon resistor
C-11, 12 | 1.0 mfd. electrolytic | R-4 | 500 ohm carbon resistor
C-13, 14 | .05 mfd. paper capacitor | R-5 | 100,000 ohm carbon resistor
C-15, 16, 17, 18 | 100 mfd. mica capacitor | R-6 | 50,000 ohm volume control
C-18 | 6 mfd. dry electrolytic | R-7 | 100,000 ohm carbon resistor
C-22, 23 | 10 mfd. dry electrolytic | R-8 | 50,000 ohm carbon resistor
C-24 | .01 mfd. paper capacitor | R-9 | 50,000 ohm volume control
C-25, 26, 27, 28 | 10 mfd. dry electrolytic | R-10 | 50,000 ohm carbon resistor
C-29 | .01 mfd. paper capacitor | C-1 | 150,000 ohm volume control
C-30 | 1.0 mfd. paper capacitor | C-2 | Motor switch
C-31, 32 | 10 mfd. electrolytic | C-3 | P.F. transformer
C-33 | 16 mfd. electrolytic | C-4 | Output transformer
C-34, 35 | 10 mfd. dry electrolytic | C-5 | Output transformer
C-36 | .01 mfd. paper capacitor | C-6 | Output transformer

**Tuning Frequency**
Band "B" .................. 540-1800 kc.
Alignment Frequency ........ 1500 kc.

**Electrical Power Output**
Undistorted .................. 1.0 watt
Maximum .................. 2.0 watts

**Load-speaker—Electrodynamic**
Outside Cone Diameter ........... 5 inches
Voice Coil Impedance ........... 3.5 ohms at 400 cycles
Field Coil Resistance ........... .420 ohms (cold)

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Rating Label</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles)</th>
<th>Power Consumption (Volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD-44A</td>
<td>105-125</td>
<td>60</td>
<td>48</td>
</tr>
<tr>
<td>GD-44B</td>
<td>105-125</td>
<td>60</td>
<td>48</td>
</tr>
</tbody>
</table>

Models GD-44A and GD-44B are compact four tube AC-DC tuned radio frequency receivers that operate in the broadcast band of frequencies. In addition they have facilities for the reproduction of phonograph recordings. Condensers are used to isolate the power supply voltage from the chassis frame.

**Phonograph Mechanism**
The record reproducing facilities consist of a high impedance crystal pickup with its associated balanced tone arm connected across the grid resistor (R-7) of the 6C6 tube. When using the phonograph, the volume control (R-8) should be set at a minimum and control (R-9) used for the desired volume level.

**ALIGNMENT**
Connect the high side of the signal generator through a 250 mfd. condenser to the antenna lead. The low side of the signal generator output should be connected to the receiver chassis through a .06 mfd. condenser. Connect a suitable output meter across the voice coil leads; then proceed as follows:

1. With gang condenser plates completely closed, the dial pointer should coincide with the horizontal dial line.
2. Tune receiver to the 1500 kc. point on the dial; then align trimmers (C-3 and C-5) on the gang condenser at 1500 kc. for a maximum output meter reading.

**SOCKET VOLTAGES**

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to - B Volts D.C.</th>
<th>Screen to - B Volts D.C.</th>
<th>Cathode to - B Volts D.C.</th>
<th>Cathode Current M.A. D.C.</th>
<th>Heater Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6D6</td>
<td>113</td>
<td>90</td>
<td>113</td>
<td>90</td>
<td>6.0</td>
</tr>
<tr>
<td>6C6</td>
<td>20</td>
<td>16.4</td>
<td>45</td>
<td>37</td>
<td>3.1</td>
</tr>
<tr>
<td>24L6G</td>
<td>108</td>
<td>88</td>
<td>113</td>
<td>90</td>
<td>7.6</td>
</tr>
<tr>
<td>2S5</td>
<td>133</td>
<td>108</td>
<td>133</td>
<td>108</td>
<td>43.0</td>
</tr>
</tbody>
</table>

Line voltage 115 AC or DC—No signal input—1000 ohms per voltmeter.
* Dial pointer at 640 kc. Volume control at minimum.
* Measured on 250-volt scale.
Note—The B— is not chassis ground.
**GENERAL INFORMATION**

GD-60/GD-58 is a compact, five-tube AC-DC superheterodyne receiver, employing five General Electric Pre-tested Tubes as described above, in a superheterodyne circuit. It incorporates a simplified trimmer tuned "Touch-Tuning" system, allowing a set up of five stations for automatic tuning. Other features of design include I.F. wave trap, automatic volume control and an improved dustproof speaker.

**I.F. Alignment**

Connect an output meter across the voice coil. Set the volume control for maximum. Set test oscillator to 455 and apply signal in the control grid of the 6AS8 tube through a .06 mfd. capacitor. Do not remove the grid lead from the 6AS8 and keep the test oscillator output as low as possible to give a readable output. Adjust all four I.F. trimmers for maximum output.

**Wave Trap Alignment**

Leave the test oscillator set to 455 K.C. and connect one output lead to the receiver chassis and the other through a 250 mfd. capacitor in series with 200 ohms to the receiver antenna lead. Adjust (C-1) for minimum output.

**R.F. Alignment**

Use the same dummy antenna (250 mfd. and 200 ohms) with 1200 K.C. input, adjust the oscillator trimmer (C-12) and antenna trimmer (C-13) for a maximum output.

**Precaution—**One side of the power supply is connected to the chassis through a 25 mfd. capacitor. If signal generator is AC operated, connect a .05 mfd. capacitor in the ground side before connecting it to the receiver chassis.
Wave Trap Alignment

Leave the test oscillator set to 455 K.C. and connect one output lead to the receiver chassis and the other through a 250 muf capacitor in series with 200 ohms to the receiver antenna lead. Adjust (C-1) for minimum output.

R.F. Alignment

Use the same dummy antenna (250 muf and 200 ohms) with 1500 K.C. input, adjust the oscillator trimmer (C-12) and antenna trimmer (C-13) for a maximum output.

Precaution—One side of the power supply is connected to the chassis through a .05 muf capacitor. If signal generator is AC operated connect a .05 muf capacitor in the ground side before connecting it to the receiver chassis.
**Used on 95 cycle Receivers only**

![Schematic Diagram](image)

**Electrical Power Output**
- Undistorted: 3.0 watts
- Maximum: 5.0 watts

**Tone Control**: 4 position
ALIGNMENT PROCEDURE

1. F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band</th>
<th>Setting</th>
<th>Input Type</th>
<th>Signal Path</th>
<th>Amplitude</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>450 K.C.</td>
<td>I.F. Gain</td>
<td>500 M.E. or Larger</td>
<td>50 ft. or more</td>
<td>50 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>2. F.</td>
<td>450 K.C.</td>
<td>Coupler Grid</td>
<td>36 M.E. or Larger</td>
<td>36 ft. or more</td>
<td>36 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>3. F.</td>
<td>450 K.C.</td>
<td>Antenna Post</td>
<td>150 M.E. or more</td>
<td>150 ft. or more</td>
<td>150 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
</tbody>
</table>

2. F. ALIGNMENT WITH OUTPUT METER

<table>
<thead>
<tr>
<th>Band</th>
<th>Setting</th>
<th>Input Type</th>
<th>Signal Path</th>
<th>Amplitude</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>450 K.C.</td>
<td>I.F. Gain</td>
<td>500 M.E. or Larger</td>
<td>50 ft. or more</td>
<td>50 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>2. F.</td>
<td>450 K.C.</td>
<td>Coupler Grid</td>
<td>36 M.E. or Larger</td>
<td>36 ft. or more</td>
<td>36 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>3. F.</td>
<td>450 K.C.</td>
<td>Antenna Post</td>
<td>150 M.E. or more</td>
<td>150 ft. or more</td>
<td>150 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
</tbody>
</table>

3. F. ALIGNMENT

<table>
<thead>
<tr>
<th>Band</th>
<th>Setting</th>
<th>Input Type</th>
<th>Signal Path</th>
<th>Amplitude</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>2. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>3. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
</tbody>
</table>

4. F. ALIGNMENT

<table>
<thead>
<tr>
<th>Band</th>
<th>Setting</th>
<th>Input Type</th>
<th>Signal Path</th>
<th>Amplitude</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>2. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
<tr>
<td>3. F.</td>
<td>50 M.C.</td>
<td>Antenna Post</td>
<td>200 M.E. or more</td>
<td>200 ft. or more</td>
<td>200 ft. or more</td>
<td>Adjust for maximum amplitude</td>
</tr>
</tbody>
</table>

VOLTAGE PROFILES

<table>
<thead>
<tr>
<th>Voltage Profile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 VDC</td>
<td>Input voltage to oscillator input</td>
</tr>
<tr>
<td>50 VDC</td>
<td>Input voltage to oscillator output</td>
</tr>
<tr>
<td>100 VDC</td>
<td>Input voltage to amplifier input</td>
</tr>
<tr>
<td>200 VDC</td>
<td>Input voltage to amplifier output</td>
</tr>
</tbody>
</table>

MISCELLANEOUS

- Models 61, 66, 68, and 69 are three band AC amplifiers with a single末尾处的尾字符。
AUTOMATIC RECORD CHANGER (G-69)

General Information

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and correctly assembled. A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The index pin is rotated through its change cycle by pushing the index lever to "Reject" and turning the turntable by hand. Six turntable revolutions are required for one change of track.

The turntable, spindle, and pinion gear are assembled by means of a 3/32 inch straight pin. This pin may be removed by gently driving out a standard pin punch. If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

Adjustments

A. Main Lever—This lever is basically important in that it interlinks the various individual mechanisms which control needle location, record positioning, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the main lever is transmitted to the trip pawl '22' by the trip lever '7' through a friction clutch '6'. If the motion of the pick-up is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the friction clutch '6' moves the trip pawl '22' into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch '5' occurs when movement of the tone arm causes positive movement of the trip pawl '22' without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw 'R'. If adjustment is too tight, the needle will repeat revolutions; if too loose, tripping will not occur at the end of the record.

C. Pick-up Lift Cable Screw.—During the record change cycle, lever '16' is actuated by the main lever '15' so as to raise the tone arm clear of the record by means of the pick-up lift cable. To adjust, go to proper elevation, stop the changer "in-cycle" at the point where pick-up is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknuts 'C' to obtain 1 inch spacing between needle point and turntable top surface.

D. & E. Needle Landing on Record.—The relation of coming down between the tone arm vertical shaft and lever '20' determines the landing position of the needle on a 10-inch record. Position of eccentric stud 'E' governs the landing of the needle on a 12-inch record; this, however, is dependent on the proper 10-inch adjustment.

To adjust for needle landing, place 10-inch record on turntable; push index lever to reject position and return to 10-inch position; see that pick-up located lever '17' is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin 'Y' on lever '14' is in contact with "Stop T" on lever '17'. The correct point of landing is 4-11/16 inches from the nearest side of the turntable spindle; loosen the two screws 'D' and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers '14' and '17'. Leave approximately 1/28 inch end play between hub of lever '20' and pick-up base bearing, and tighten the blunt nose screw 'D'; run mechanism through several cycles as a check that needle reaches correct point.

After adjusting for needle landing on a 10-inch record, place 12-inch record on turntable; push index lever to reject and return to 12-inch position; rotate mechanism through cycle until needle is just ready to land on the record; the correct point of landing is 5-11/16 inches from nearest side of spindle. If the landing is incorrect, turn stud 'E' until the eccentric stud is in correct needle landing. The eccentric end of the stud must always be toward the rear of the motor board, otherwise incorrect landing may occur with 10-inch records.

F. & G. Record Separating Knife.—The upper plate (knife) '25' on each of the record posts serves to separate the lower record post at the instant and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record shelf '27' be maintained constant. The spacing for the 10-inch record is nominally 0.005 inch, and for the 12-inch record is 0.075 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and locknut 'F' to give 0.002-0.008 inch separation. Screw 'G' must not be depressed during this adjustment. After setting screw 'F', adjust screw 'G' so that when its tip is depressed flush with top of record shelf, the vertical spacing between the knife, in its lowest rotational position, and the shelf, is 0.072-0.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both movement is normally by virtue of the gear and rack coupled to the main lever '15', and it is necessary that adjustments be such that the record is released from both shelves in the same instant. To adjust for correct 1 inch record on the turntable, rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, then loosen screws 'H' and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Tighten the blunt nose screw 'H'; run mechanism through cycle several times to check action, then tighten cone-pointed screws 'H'.

If record shelves or knives are bent, or if not perfectly horizontal improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is out-of-cycle, the front lower edge of the pick-up head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin 'K' in relation to the main lever '15' governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all bearings of various levers on underside of motor board.

The felt washer between the turntable and spindle bearing should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

Miscellaneous Service Hints

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects of improper operation and the usual misadjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever '15' should be checked first as in "A."
2. Needle does not land properly on both 10- and 12-inch records—Make complete adjustments 'D' and 'E'.
3. Needle does not land properly on 12-inch record but correct on 10-inch—Effect adjustment 'B'.
4. Failure to trip at end of record—Increase clutch '5' friction by means of screw 'B'. Also, see that levers '7' and '12' are free to move without touching each other.
5. Pick-up strikes lower record of stack or drags across top record on turntable—Adjust lift cable per adjustment 'C'.
6. Needle does not track after landing—Friclion clutch '5' adjustment 'B' may be too tight; bend in tone arm vertical bearing; levers '7' and '12' fouled; or tone arm resting on record.
7. Cycle commencement before record is complete—Record is defective, or adjustment 'B' of friction clutch '5' is too tight.
8. Wow in record reproduction—Record is defective; flexible coupling between motor and changer mechanism, which is not corrected by the above adjustments, is not being operated at normal room temperature (65°F).
9. Record knife strikes edge of records—Records warped; record edges are rough, or knife adjustments 'F' and 'G' are incorrect.
10. Record not released properly—Adjust record shelf assemblies in regard to shift by use of adjustment 'H'.
11. Needle lands in 10 inch position on 12 inch record—Increase tension of pickup locating lever spring '30'.
**Motor Adjustments**

The speed of the turntable is controlled by a governor which allows correct adjustment of the turntable rotation to 78 revolutions per minute. The speed may be checked by placing a piece of paper under a record and counting the number of revolutions in a minute while the record is being played. If adjustment is necessary, lift up the turntable and the speed regulator set screw will be found adjacent to the turntable hub of the motor. Clockwise rotation of this set screw reduces speed.

The motor bearings and gears are properly lubricated for long operation under normal weather conditions. If the motor chatters or runs unevenly, place a few drops of light machine oil on the governor felt.

**Trip Mechanism**

The trip mechanism is of simple design and consists of a latch bar connected to the motor switch and a trip lever. The latch is held closed by means of a spring between the latch bar and the trip lever. The motor switch is mechanically connected to the latch bar so that when the trip mechanism is released the motor switch is in the "off" position. Be sure this latch bar mechanism works freely without binding.

The trip is actuated by an adjustable arm on the trip lever. When the eccentric groove in the record swings the tone arm back and forth, it pushes the latch out of engagement.

**Phonograph Connections (G-61 and G-66)**

Fig. 1 shows a simple sketch for connecting a crystal or high impedance magnetic pick-up into the G-61 or G-66 circuit for the reproduction of phonograph recordings. This method uses a two circuit jack and is connected into the receiver by opening the circuit at C-D at the output of the 2nd IF transformer, and connecting the jack terminals as shown. A telephone plug is attached to the pick-up leads, and for phonograph operation, it is merely necessary to insert this plug into the jack. The jack may be mounted on the rear chassis deck and all connecting leads should be well shielded.

When the pick-up is connected as suggested, the regular radio volume and tone controls work for both radio and phonograph reproduction.

**NOTE:** A suitable load consisting of a 300,000 ohm resistor should be connected across the pick-up leads when using a crystal type unit.

---

**Bottom View of Automatic Record Changer**

NOTE: Numbers refer to parts, letters refer to adjustments.
GENERAL ELECTRIC CO.

MODEL G611

Schematic, Sockets, Trimmers, Voltage Alignment

Power Supply (Volts) 100–125 Volts AC or DC

Frequency (Cycles on AC) 40–60

Power Consumption (Watts) 45

Tuning Frequency Range 540–1750 K.C.

Intermediate Frequency 455 K.C.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A8G</th>
<th>6C6</th>
<th>25L6G</th>
<th>25Z6G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to B Volts</td>
<td>102</td>
<td>30*</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Screen to B Volts</td>
<td>65</td>
<td>20*</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Cathode to -B Volts</td>
<td>0–30</td>
<td>0</td>
<td>0</td>
<td>127</td>
</tr>
<tr>
<td>Filament Volts</td>
<td>6.2</td>
<td>6.2</td>
<td>24.5</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Line voltage—120 VAC. No Signal Input.
* Measured on 250-volt scale.
On DC, voltages are about 15 per cent lower.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

Load-speaker—Electrodynamic

Outside Core Diameter 5 inches
Voice Coil Impedance (400 cycles) 4.0 ohms
Field Coil Resistance 420 ohms (cold)

Tubes

<table>
<thead>
<tr>
<th>Converter and Oscillator</th>
<th>GE-6A8G</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. Detector and Amplifier</td>
<td>GE-6C6</td>
</tr>
<tr>
<td>Power Amplifier</td>
<td>GE-25L6G</td>
</tr>
<tr>
<td>Rectifier</td>
<td>GE-25Z6G</td>
</tr>
<tr>
<td>Ballast Resistor Tube</td>
<td>BL-55B</td>
</tr>
<tr>
<td>Pilot Lamp</td>
<td>Mazda No. 44</td>
</tr>
</tbody>
</table>

Model G11-51 is a compact, five-tube AC-DC superheterodyne receiver employing four General Electric tubes plus a ballast tube, as described above in a superhetodyne circuit. It incorporates a simplified mechanically tuned "Touch Tuning" system allowing a set up of five stations for automatic tuning. Other features of design include I.F. wave trap, automatic overload control and an efficient electrodynamic speaker.

Alignment Frequencies

I.F.—455 K.C.
Broadcast—1500 K.C.
The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Set the volume control for maximum.

Set test oscillator to 455 and apply signal to the control grid of the 6A8G tube through a 0.05 mfd. capacitor. Do not let the oscillator output be too low as possible to give a readable output. Adjust the two I.F. trimmers (C9 and C10) for maximum output.

Wave Trap Alignment

Leave the test oscillator set to 455 K.C. and connect one output lead to the receiver chassis and the other through a 250 mfd. capacitor in series with 200 ohms to the receiver antenna lead. Adjust (C-21) for minimum output.

R.F. Alignment

Use the same dummy antenna (250 mfd. and 200 ohms) with 1500 K.C. input, adjust the oscillator trimmer (C-3) and antenna trimmer (C-4) for a maximum output.

Precaution—One side of the power supply is connected directly to the chassis. If the signal generator is AC operated, connect a 0.05 mfd. capacitor in the ground side before connecting it to the receiver chassis.
**GENERAL ELECTRIC CO.**

**MODELS CD62, TD67**

**Schematic, Voltage, Socket, Trimmers, Alignment**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2, C3</td>
<td>Tuning condenser and trimmers</td>
<td>C23</td>
<td>1 mfd paper capacitor</td>
<td>R10</td>
<td>220,000 ohm carbon resistor</td>
</tr>
<tr>
<td>C4</td>
<td>250 mfd, trimmer capacitor</td>
<td>C27</td>
<td>100 mfd mica capacitor</td>
<td>R11</td>
<td>15,000 ohm carbon resistor</td>
</tr>
<tr>
<td>C5</td>
<td>30-70 mfd, trimmer capacitor</td>
<td>C28</td>
<td>500 mfd mica capacitor</td>
<td>R12</td>
<td>470 ohm carbon resistor</td>
</tr>
<tr>
<td>C6</td>
<td>1 mfd paper capacitor</td>
<td>C29</td>
<td>250 mfd mica capacitor</td>
<td>R13</td>
<td>1.0 megohm carbon resistor</td>
</tr>
<tr>
<td>C7</td>
<td>.001 mfd paper capacitor</td>
<td>C30</td>
<td>50 mfd, 50 mfd, dry electrolytic</td>
<td>R14</td>
<td>0.5 ohm carbon resistor</td>
</tr>
<tr>
<td>C8</td>
<td>.05 mfd paper capacitor</td>
<td>C31</td>
<td>10 megohm carbon resistor</td>
<td>R15</td>
<td>230 ohm w.w. resistor</td>
</tr>
<tr>
<td>C9</td>
<td>.1 mfd paper capacitor</td>
<td>C32</td>
<td>47,000 ohm carbon resistor</td>
<td>R16</td>
<td>100,000 ohm carbon resistor</td>
</tr>
<tr>
<td>C10</td>
<td>.005 mfd paper capacitor</td>
<td>R1</td>
<td>15,000 ohm carbon resistor</td>
<td>R17</td>
<td>100 ohm w.w. resistor</td>
</tr>
<tr>
<td>C11</td>
<td>.005 mfd paper capacitor</td>
<td>R2</td>
<td>2.0 megohm volume control</td>
<td>R18</td>
<td>Wave trap coil</td>
</tr>
<tr>
<td>C12</td>
<td>.005 mfd paper capacitor</td>
<td>R3</td>
<td></td>
<td>R19</td>
<td>Antenna coil</td>
</tr>
<tr>
<td>C13</td>
<td>.005 mfd trimmed capacitor</td>
<td>R4</td>
<td></td>
<td></td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>C14</td>
<td>.005 mfd paper capacitor</td>
<td>R5</td>
<td></td>
<td></td>
<td>Output transformer</td>
</tr>
<tr>
<td>C15</td>
<td>.03 mfd paper capacitor</td>
<td>R6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C16</td>
<td>.03 mfd paper capacitor</td>
<td>R7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C17</td>
<td>.03 mfd paper capacitor</td>
<td>R8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C18</td>
<td>.01 mfd metalized condensator</td>
<td>R9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C19</td>
<td>.005 mfd paper capacitor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C20</td>
<td>.01 mfd molded capacitors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C21</td>
<td>.005 mfd paper capacitor</td>
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<tr>
<td>C22</td>
<td>.01 mfd paper capacitor</td>
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<td></td>
</tr>
<tr>
<td>C23</td>
<td>.01 mfd paper capacitor</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VOLTAGE CHART**

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A7</th>
<th>61D6</th>
<th>75</th>
<th>2SJ6</th>
<th>2SJ6G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to</td>
<td>115</td>
<td>115</td>
<td>50*</td>
<td>106</td>
<td>120 V. A.C.</td>
</tr>
<tr>
<td>- B Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen to</td>
<td>70</td>
<td>115</td>
<td></td>
<td>115</td>
<td></td>
</tr>
<tr>
<td>- B Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cathode to</td>
<td>3.0</td>
<td>3.0</td>
<td>0.5</td>
<td>8.5</td>
<td>115</td>
</tr>
<tr>
<td>- B Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filament</td>
<td>6.4</td>
<td>0.4</td>
<td>6.4</td>
<td>23.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Measured on 250-volt scale.

Line Voltage—120 A.C. No signal input.

On DC, voltages are about 15 per cent lower.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

---

**Fig. 1. Trimmer Location**

**Touch-Tuning Mechanism**

The dial mechanism is a very simple arrangement and should not require service. The frequency range of each of the automatic tuning buttons is as follows:

<table>
<thead>
<tr>
<th>Button No.</th>
<th>Frequency Range (Kilocycles)</th>
<th>Button No.</th>
<th>Frequency Range (Kilocycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>540-590</td>
<td>5</td>
<td>830-1150</td>
</tr>
<tr>
<td>2</td>
<td>570-670</td>
<td>6</td>
<td>1020-1400</td>
</tr>
<tr>
<td>3</td>
<td>630-780</td>
<td>7</td>
<td>1220-1700</td>
</tr>
<tr>
<td>4</td>
<td>710-940</td>
<td>8</td>
<td>1580-1900</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**

540-1800 K.C.

**Intermediate Frequency**

465 K.C.

**IF ALIGNMENT**

- Adj. 4 trimmers at 465 KC thru .05 mfd condenser.

**WAVE TRAP**

- Adj. C10 cond. at 465 KC thru 250 mfd and 200 ohms series.

**RF ALIGNMENT**

- trimmer at 1850 KC — Adj. CS Ant. trimmer at 1600 KC.

Pwr. Supply connection to chassis is thru .25 mfd cond. If Sig. gen. is AC,
connect .05 mfd cond. in grid side before chassis connection.

FOR CONVENTIONAL ALIGNMENT — SEE SPECIAL SECTION VOLUME VIII.
MODEL G653
Schematic, Voltage, Socket, Trimmers, Alignment

GENERAL ELECTRIC CO.

Tubes
Converter and Oscillator...GE-6AGC
I.F. Amplifier...GE-6K7
Detector, A V C and Amplifier...GE-6Q7G
Power Amplifier...GE-25L6G
Rectifier...GE-25S5
Balast Tube...40-A

Tuning Frequency Range...540-1750 K.C.
Intermediate Frequency...455 K.C.

GENERAL INFORMATION
Model G6-53 is a compact, six-tube AC-DC superheterodyne receiver, employing six General Electric Pre-tested Tubes as described above, in a superheterodyne circuit. It incorporates a simplified trimmer tuned "Touch-Tuning" system, allowing a set up of five stations for automatic tuning. Other features of design include I.F. wave trap, automatic volume control and an improved dustproof speaker.

Electrical Specifications:

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110-125 Volts AC or DC</td>
<td>40-100</td>
<td>50</td>
</tr>
</tbody>
</table>

Electrical Power Output (120—line volts)

Undistorted.......1.2
Maximum....2.5

Loudspeaker—Permanent Magnet
Outside Cone Diameter...5-inch
Voice Coil Impedance...4.0 ohms at 400 cycles

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A6G</th>
<th>6K7</th>
<th>6Q7G</th>
<th>25L6G</th>
<th>25S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to - B volts</td>
<td>112</td>
<td>112</td>
<td>58*</td>
<td>130</td>
<td>90*</td>
</tr>
<tr>
<td>Screen to - B volts</td>
<td>75</td>
<td>75</td>
<td>116</td>
<td>90*</td>
<td>90*</td>
</tr>
<tr>
<td>Cathode to - B volts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7.5</td>
<td>136</td>
</tr>
<tr>
<td>Cathode Current MA</td>
<td>6.0</td>
<td>1.4</td>
<td>0.5</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Filament Volts</td>
<td>6.0</td>
<td>6.0</td>
<td>6.1</td>
<td>24.5</td>
<td>24.0</td>
</tr>
</tbody>
</table>

* Measured on 292-volt scale.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.
### MODELS G-64, G-655

#### Intermediate Frequency
455 kc.

#### Electrical Specifications

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115-125</td>
<td>50-60</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>115-125</td>
<td>25-60</td>
<td>70</td>
</tr>
<tr>
<td>V</td>
<td>115-125</td>
<td>50-60</td>
<td>70</td>
</tr>
</tbody>
</table>

| Band "B" | .540 to 1750 kc. |
| Band "D" | 5700 to 18,300 kc. |

### Service Data

#### Physical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>G-64</th>
<th>G-655</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>11 inches</td>
<td>84 inches</td>
</tr>
<tr>
<td>Width</td>
<td>18½ inches</td>
<td>21 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>7½ inches</td>
<td>11¾ inches</td>
</tr>
</tbody>
</table>

#### Tuning Control Drive Ratio
10 to 1

#### Electrical Power Output

- Undistorted: 2.0 watts
- Maximum: 4.0 watts

#### Tone Control
2 Point—Bass and Normal

#### Loud-speaker—Electrodynamic

<table>
<thead>
<tr>
<th>Model</th>
<th>G-655</th>
<th>G-64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone Diameter</td>
<td>12 inches</td>
<td>6.5 inches</td>
</tr>
<tr>
<td>Voice Coil Impedance (400 cycles)</td>
<td>3.5 ohms</td>
<td>3.5 ohms</td>
</tr>
</tbody>
</table>
Fig. 2. Schematic Diagram

Loudspeaker—Electrodynamic
Cone Diameter .................. 12 inches
Voice Coil Impedance
(400 cycles) .................. 3.5 ohms
SERVICE DATA

Physical Specifications:
- Model: [not visible]
- Height: 12 inches
- Width: 12 inches
- Depth: 12 inches
- Timing Control Drive Ratio: 13 to 1

Electrical Specifications:

<table>
<thead>
<tr>
<th>Band</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115-125</td>
<td>50-60</td>
<td>70</td>
</tr>
<tr>
<td>B</td>
<td>115-125</td>
<td>25-60</td>
<td>75</td>
</tr>
</tbody>
</table>

GENERAL INFORMATION

Coil System

T-6 and T-7 are the antenna and oscillator transformers respectively for the "B", "C", and "D" bands. All band switch terminals are numbered in Fig. 2 and Fig. 3 to facilitate circuit tracing by showing common points on the schematic diagrams, Fig. 2 and the pictorial wiring diagram, Fig. 3.

The following table shows the coils in use for various positions of the band switch.

<table>
<thead>
<tr>
<th>Band Switch Position</th>
<th>Antenna Primary</th>
<th>Antenna Secondary</th>
<th>Oscillator Grid Plate Coil</th>
<th>Oscillator Grid Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>L-1, L-2, L-3</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
<td>L-1, L-2</td>
</tr>
</tbody>
</table>

Automatic Tuning:

L-4, L-1, L-2, L-3, L-1, L-2, L-3, L-1, L-2, L-3

Line-sander—To center the voice coil, remove dust cover by soiling with solvent. Loosen the clamping screws and place the lead 1/4 in. from the top of the voice coil. Secure the leads with a cloth cap back in place with Gypsum cement.

Phone Connectors

Fig. 1 shows a sketch of the pickup and microphone assembly together with the assembly that can be placed in the base of the phone. The parts are numbered on the schematic and should be used as a guide to position the phone in the base. The phone assembly should be attached with a suitable connector to the phone switch as indicated in Fig. 1.

The following table shows the tubes in use for various positions of the band switch.

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Feet</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>Sad I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-10)</td>
<td>(C-14)</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
</tbody>
</table>

Adjust trimmers for minimum output.

1. F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Feet</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>Sad I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-10)</td>
<td>(C-14)</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
</tbody>
</table>

Adjust trimmers for minimum output.

1. F. ALIGNMENT WITH OUTPUT METER

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Feet</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>Sad I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-10)</td>
<td>(C-14)</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>450 K.C.</td>
<td>I.F. Grid</td>
<td>55 Mfd. or Larger</td>
<td>1st I.F. Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-12)</td>
<td>(C-13)</td>
</tr>
</tbody>
</table>

Adjust trimmers for minimum output.

B. F. ALIGNMENT

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Feet</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;B&quot;</td>
<td>10 M.C.</td>
<td>Antenna Post</td>
<td>500 Mfd. or Larger</td>
<td>Ant. (C-4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-4)</td>
<td></td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>15 M.C.</td>
<td>Antenna Post</td>
<td>500 Mfd. or Larger</td>
<td>Ant. (C-4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-4)</td>
<td></td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>20 M.C.</td>
<td>Antenna Post</td>
<td>500 Mfd. or Larger</td>
<td>Ant. (C-4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(C-4)</td>
<td></td>
</tr>
</tbody>
</table>

Connect output meter across voice coil—tune control on "Bass" position. The image of any "D" band signal should be heard 300 K.C. below signal input (C-5) or (C-8) as an indication of the correct position. The image of any "D" band signal should be heard 300 K.C. below signal input (C-5) or (C-8) as an indication of the correct position. The image of any "D" band signal should be heard 300 K.C. below signal input (C-5) or (C-8) as an indication of the correct position.
### Alignment Procedure

#### I.F. Alignment with Oscilloscope

<table>
<thead>
<tr>
<th>Switch Setting</th>
<th>L.F. Frequency</th>
<th>Input Point</th>
<th>Frequency</th>
<th>Multiplier</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**I.F. Adjustment with Output Meter**

<table>
<thead>
<tr>
<th>Switch Setting</th>
<th>L.F. Frequency</th>
<th>Input Point</th>
<th>Frequency</th>
<th>Multiplier</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Snap “B”</td>
<td>455 C.C.</td>
<td>Antenna Post</td>
<td>200 Mf.</td>
<td>200 Ohm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Advance the trimmer for minimum output.*

#### Circuit Diagram

**Voltage Chart**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>K2</th>
<th>C2</th>
<th>D2</th>
<th>E2</th>
<th>F2</th>
<th>G2</th>
<th>H2</th>
<th>J2</th>
<th>K2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.125</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.375</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

---

### Chassis Assembly

#### Part List

- **Resistor**
- **Capacitor**
- **Transformer**
- **Inductor**
- **Diode**

#### Speaker Assembly

- **Cone**
- **Clamp**
- **Speaker cone assembly**

#### Touch Tone Assembly

- **Button**
- **Slot**
- **Socket**

---

**Note:** The parts list and diagram are provided for reference purposes only. The actual parts used may differ. Always refer to the manufacturer's specifications.
**MODEL G-86**

**Alignment, Chassis Wiring**

*GENERAL ELECTRIC CO.*

"Beam-A-Scope" Data: Dial Phono, Data

**ALIGNMENT PROCEDURE**

**MODEL G-86**

**IF Alignment with Oscilloscope**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Output Freq.</th>
<th>Bias Voltage</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
</table>

**IF Alignment with Output Meter**

<table>
<thead>
<tr>
<th>Band &quot;B&quot;</th>
<th>Input Freq.</th>
<th>Output Freq.</th>
<th>Bias Voltage</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
</table>

**R.F. Alignment**

<table>
<thead>
<tr>
<th>Band &quot;B&quot;</th>
<th>Antenna Post</th>
<th>Power Freq.</th>
<th>Bias Voltage</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
</table>

**SERVICE DATA**

**Model**
- **G-86**
  - **Width**: 15 in.
  - **Depth**: 10 in.
  - **Height**: 12 in.
  - **Overall Dimensions**: 18 in.

**GENERAL INFORMATION**

The Model G-86 is a three-band A-C geared receiver, employing a General Electric Pre-tuned type in a super heterodyne circuit. It is equipped with a simplified trimmer tuned "Touch Tuning" system, and the new and exclusive self-contained antenna system. "Beam-A-

The "Beam-A-Scope" is essentially a tuned coil antenna wound on an insulated frame and shielded by a Faraday screen against electromagnetic disturbances. The construction is designed for ease in handling and to assure a high degree of accuracy in tuning. A separate antenna is provided for each band. When the antenna is properly adjusted, the "Beam-A-Scope" will indicate maximum sensitivity to the input signal. The "Beam-A-Scope" is calibrated in millimeters, and the scale is graduated in millimeters. The sensitivity of the antenna system is indicated by a needle pointing to the center of the scale. The antenna system is designed to give maximum sensitivity at all times, and to eliminate the need for external adjustments. The "Beam-A-Scope" is calibrated in millimeters, and the scale is graduated in millimeters. The sensitivity of the antenna system is indicated by a needle pointing to the center of the scale. The antenna system is designed to give maximum sensitivity at all times, and to eliminate the need for external adjustments.

The "Beam-A-Scope" is calibrated in millimeters, and the scale is graduated in millimeters. The sensitivity of the antenna system is indicated by a needle pointing to the center of the scale. The antenna system is designed to give maximum sensitivity at all times, and to eliminate the need for external adjustments.

**Phonograph Connections**

1. A switch on the phonograph section, labeled "E," is used to select the output of the phonograph. When the "E" switch is in the "ON" position, the output of the phonograph is fed to the phonograph input stage. When the "E" switch is in the "OFF" position, the output of the phonograph is not fed to the phonograph input stage.

2. The phonograph is connected to the phonograph input stage of the Model G-86 receiver. The phonograph input stage is located in the chassis of the receiver. The phonograph input stage is used to amplify the phonograph signal and to feed it to the phonograph output stage.

3. The phonograph output stage is connected to the phonograph output of the Model G-86 receiver. The phonograph output stage is used to amplify the phonograph signal and to feed it to the phonograph output of the Model G-86 receiver.

4. The phonograph output is fed to the phonograph amplifier of the Model G-86 receiver. The phonograph amplifier is used to amplify the phonograph signal and to feed it to the phonograph output of the Model G-86 receiver.

**Fig. 1. Dial Drive Mechanism**

**Fig. 2. One-all IF Core Tape on G-E Oscilloscope G861**

**Fig. 3. Phonograph Connections**

- **Symbol**: SP
- **Description**: Triple pole, double throw switch
- **Stock No.**: BS-301

- **Symbol**: RP
- **Description**: 500 K.C. inductance
- **Stock No.**: RJ-115
Fig. 1. Trimmer Location

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-1</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-2</td>
<td>330 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-3</td>
<td>330 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-4</td>
<td>47,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-5</td>
<td>35,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-6</td>
<td>1,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-7</td>
<td>1.8 Megohm Carbon Resistor</td>
</tr>
<tr>
<td>R-8</td>
<td>21,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-9</td>
<td>2.3 Megohm Carbon Resistor</td>
</tr>
<tr>
<td>R-10</td>
<td>350 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-11</td>
<td>56,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-12</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-13</td>
<td>330 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-14</td>
<td>2 Megohm 1 Megohm Tap. Vol. Control</td>
</tr>
<tr>
<td>R-15</td>
<td>68,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-16</td>
<td>68,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-17</td>
<td>1.5 Megohm Carbon Resistor</td>
</tr>
<tr>
<td>R-18</td>
<td>50,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-19</td>
<td>1.2 Megohm Carbon Resistor</td>
</tr>
<tr>
<td>R-20</td>
<td>1.0 MF, Paper Capacitor</td>
</tr>
<tr>
<td>R-21</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-22</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-23</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-24</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-25</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-26</td>
<td>220,000 Ohm Carbon Resistor</td>
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<td>R-27</td>
<td>220,000 Ohm Carbon Resistor</td>
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<td>R-28</td>
<td>220,000 Ohm Carbon Resistor</td>
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<td>R-29</td>
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<td>R-30</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-31</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-S1</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
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<td>R-S2</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S3</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S4</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S5</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S6</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S7</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S8</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S9</td>
<td>220,000 Ohm Carbon Resistor</td>
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<td>R-S10</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S11</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S12</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S13</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S14</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S15</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S16</td>
<td>220,000 Ohm Carbon Resistor</td>
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<tr>
<td>R-S17</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S18</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S19</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S20</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S21</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S22</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
<tr>
<td>R-S23</td>
<td>220,000 Ohm Carbon Resistor</td>
</tr>
</tbody>
</table>

- Rating "A"...105-115 (115-125)* volts, 50-60 cycles, 150 watts
- Rating "C"...105-115 (115-125)* volts, 25-60 cycles, 160 watts

*The receivers as shipped from the factory have the power cord connected to the 115-125-volt tap of the transformer (black and red lead). If the normal voltage of the power supply is always below 110 volts, the connection of the power cord should be removed from this lead and soldered to the 105-115-volt tap (black and yellow lead). After changing the connection, tape the soldered joint as well as the exposed end of the unused lead. This change requires removal of the chassis from the cabinet.
TOUCH-TUNING

The General Electric Touch-Tuning system consists of three essential units: the keyboard assembly of fourteen keys, used for touch-tuning controls; the motor and drive mechanism; and the switch contact section with an adjustable station switch, allowing a set of thirteen different stations to be tuned automatically.

Thirteen keys are used for the selection of present stations while the No. 14 key is used to turn power "On". Pressing a key will key in a semi-depressed position and remain so until released. Thus the selection of any station by a station key will release the "On" key, turning the set power "Off".

The tuning motor is operated as a 25-watt split-phase induction motor rated at 1/80 hp at the phase winding device. It is supplied directly from the receiver power transformer.

The upper frame of the unit is supported by three supports, and the keyboard section is shown and the following cycles of operation, or for raising, without touching the control section, or for lowering. Tuning is accomplished by means of a rack which moves back and forth at constant speed, the control section of the motor control switch is depressed, and the immersion of the motor and the capacity of the circuit is used to raise or lower the volume at the same time. By pressing the main control button, the device may be easily understood. Leads No. 6 and No. 7 are the automatic tuning button controls which provide an automatic control for the receiver. Leads No. 14 and No. 16 are the phase reversing leads to the volume control motor.

When the remote control is attached to a receiver, the semi-depressed positions of the rotating push button keys may or may not indicate which station is tuned in. This will then depend upon whether the receiver was last operated from the remote control or from the station keys of the receiver itself. For this reason, the key assembly of the remote control has been equipped with a touch bar.

Lubrication

For smooth and positive operation of the tuning system, it is absolutely necessary to keep the key well lubricated. A small amount of oil is recommended for the operation of the tuning system. The oil should be applied to the key surfaces every two to three months. All keys of the remote control key assembly are wired in series to avoid possibility of two keys completing the circuit to the motor at the same time.

The remote control motor used is a phase reversing unit, in place of a condenser as used on the tuning motor when operating from a 50 or 60 cycle power source. When operating from a battery, the remote control motor terminals must be connected to the same terminal as a condenser of the same type.

The mechanical installation of the volume control motor is shown in Fig. 9. For full installation instructions refer to service notes 202458.

Remote Control Notes

1. If key assembly on remote control unit is too high in the case, it is possible that one or all of the keys may be slightly depressed at all times as to cause faulty operation of the system. To remedy, move the complete assembly by lowering the two screw sets (inside the case) and then lower assembly—tighten set screws.

2. The tension of the friction clutch on the remote control motor is adjusted at the factory and should not require readjustment if in good condition. However, the volume control may be damaged if T.V.R. key is held in depressed position after the volume control is turned to the minimum point. If this slip clutch is too loose the motor will fail to turn.
VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts, D.C.</th>
<th>Screen to Ground Volts, D.C.</th>
<th>Cathode to Ground Volts, D.C.</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G</td>
<td>240 Conv. 150 Osc.</td>
<td>97</td>
<td>0</td>
<td>6.4</td>
</tr>
<tr>
<td>6K7</td>
<td>240</td>
<td>97</td>
<td>0</td>
<td>6.4</td>
</tr>
<tr>
<td>6K7</td>
<td>230</td>
<td>105</td>
<td>5.1</td>
<td>6.4</td>
</tr>
<tr>
<td>6F5</td>
<td>102</td>
<td></td>
<td>3.0</td>
<td>6.4</td>
</tr>
<tr>
<td>76</td>
<td>230</td>
<td></td>
<td>7.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6AC5G</td>
<td>230</td>
<td></td>
<td>4.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6U5</td>
<td>240</td>
<td></td>
<td>3.0</td>
<td>6.4</td>
</tr>
<tr>
<td>8Y3G</td>
<td>306/306 A.C. RMS.</td>
<td></td>
<td>310 V</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Socket voltages taken at 120-volt line—no signal input—1000 ohms per volt meter—Dial pointer at 850 K.C. on "B" band.

Fig. 3. Dial Drive Mechanism

Fig. 4. Chassis Parts Layout
ALIGNMENT PROCEDURE

1F Alignment with Oscilloscope

<table>
<thead>
<tr>
<th>Read Switch</th>
<th>Input Frequency</th>
<th>Point of Test</th>
<th>Power/An.</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st - 3rd</td>
<td>455 Kc.</td>
<td>3rd T.F.</td>
<td>30 MIA</td>
<td>RC-4</td>
<td>50 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>1st I.F.</td>
<td>1st I.F.</td>
<td>55 MIA</td>
<td>RC-6</td>
<td>25 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>2nd I.F.</td>
<td>2nd I.F.</td>
<td>45 MIA</td>
<td>RC-12</td>
<td>45 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>3rd I.F.</td>
<td>3rd I.F.</td>
<td>45 MIA</td>
<td>RC-17</td>
<td>45 MIA</td>
</tr>
</tbody>
</table>

I.F. Alignment with Output Meter

<table>
<thead>
<tr>
<th>Read Switch</th>
<th>Input Frequency</th>
<th>Point of Test</th>
<th>Power/An.</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st - 3rd</td>
<td>455 Kc.</td>
<td>3rd T.F.</td>
<td>30 MIA</td>
<td>RC-4</td>
<td>50 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>1st I.F.</td>
<td>1st I.F.</td>
<td>55 MIA</td>
<td>RC-6</td>
<td>25 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>2nd I.F.</td>
<td>2nd I.F.</td>
<td>45 MIA</td>
<td>RC-12</td>
<td>45 MIA</td>
</tr>
<tr>
<td>1st - 3rd</td>
<td>3rd I.F.</td>
<td>3rd I.F.</td>
<td>45 MIA</td>
<td>RC-17</td>
<td>45 MIA</td>
</tr>
</tbody>
</table>

Manual key dependant—gang condenser plate closing—impacts on R-8 and R-11 in 3rd I.F. transistors. Adjust for minimum noise in 3rd stage. The resulting curves will not be identical to normal curves. The former curves should be compared at the same frequency. Measure the output with an oscilloscope and make sure that the trimmers are adjusted to give the maximum output. Do not attempt to over-adjust anything beyond the initial adjustment. When the alignment has been completed, check gain and adjust for maximum gain at 500 Hz frequency.

R.F. Alignment

Power output should be sufficient to drive the amplifier to the maximum output level and the volume control to maximum gain. Adjust for maximum output and volume control to maximum gain. Adjust all controls to their maximum output levels.

MODEL G-99

<table>
<thead>
<tr>
<th>Spec.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-90</td>
<td>CAPACITOR - 0.01 mfd., 000 V. paper</td>
<td>10.50</td>
</tr>
<tr>
<td>RC-104</td>
<td>T.C. - 0.01 mfd., 000 V. paper</td>
<td>10.50</td>
</tr>
<tr>
<td>RC-380</td>
<td>TRANSFORMER - Output transformer</td>
<td>10.50</td>
</tr>
<tr>
<td>RC-440</td>
<td>NEUTRON-Output transformer</td>
<td>10.50</td>
</tr>
<tr>
<td>RC-476</td>
<td>CAPACITOR - 0.01 mfd.</td>
<td>10.50</td>
</tr>
<tr>
<td>RC-480</td>
<td>TRANSFORMER - Output transformer</td>
<td>10.50</td>
</tr>
</tbody>
</table>

SPEAKER ASSEMBLY

<table>
<thead>
<tr>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEAKER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>SPEAKER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>SPEAKER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
</tbody>
</table>

DIAL DRIVE MECHANISM

<table>
<thead>
<tr>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIAL DRIVE MECHANISM - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>DIAL DRIVE MECHANISM - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>DIAL DRIVE MECHANISM - 1.5 inch</td>
<td>10.50</td>
</tr>
</tbody>
</table>

TOUCH TUNER ASSEMBLY

<table>
<thead>
<tr>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOUCH TUNER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>TOUCH TUNER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
<tr>
<td>TOUCH TUNER ASSEMBLY - 1.5 inch</td>
<td>10.50</td>
</tr>
</tbody>
</table>

REPLACEMENT PARTS LIST

<table>
<thead>
<tr>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITOR - 0.001 mfd., 000 V.</td>
<td>0.50</td>
</tr>
<tr>
<td>TRANSFORMER - Output transformer</td>
<td>10.50</td>
</tr>
<tr>
<td>NEUTRON-Output transformer</td>
<td>10.50</td>
</tr>
<tr>
<td>CAPACITOR - 0.01 mfd.</td>
<td>10.50</td>
</tr>
<tr>
<td>TRANSFORMER - Output transformer</td>
<td>10.50</td>
</tr>
</tbody>
</table>

The alignment procedure is divided into three sections: R.F., I.F., and Gain. Each section contains specific instructions and adjustments to be made to the oscilloscope, output meter, and gain. The replacement parts list provides a list of parts and their corresponding list prices. The touch tuner assembly is also listed, with a note that it is subject to change without notice.
Antenna and Ground

Since this receiver operates at a relatively high radio frequency, it is very essential to construct a good antenna and ground system in order to obtain maximum results.

For distances up to within thirty miles from the transmitter, a simple horizontal dipole as shown in Fig. 1 should give excellent results. It should be located clear from all obstructions and placed as high from the earth as possible. Make sure it is run approximately at right angles to the direction of the transmitter; i.e., if the transmitter is located due west, run the horizontal doublet in a north and south direction. The horizontal flat-top has an effective antenna length of 10-foot, 8-inch and consists of $\frac{1}{4}$ or $\frac{1}{8}$ bare copper wire (preferably stranded), cut in the middle and the two halves insulated by glass insulators. A twisted lead-in wire is then soldered to each end of the doublet as shown, and the other two ends of the transmission line are connected to the #1 and #2 terminals on the receiver chassis. The lead-in transmission line may be of any length up to 100 feet and should consist of low loss antenna lead-in wire. A good ground connection to a water pipe is connected to the terminal marked "G".

Somewhat better results may be obtained by constructing the antenna shown in Fig. 2. This varies somewhat from the dipole antenna and is more efficient due to the fact that the transmission line has very little loss.

The antenna proper consists of a 10-foot, 8-inch length of 1-inch diameter copper pipe supported at the middle by a pole located as high above ground as possible. The transmission line is made up of two $\frac{1}{4}$ or $\frac{1}{8}$ copper wires, spaced about 2-inches apart and spaced every two or three feet. The antenna end of the transmission line is soldered to the ends of the copper pipe and should form a triangle, 27 inches on all sides. As in the previous installation, the horizontal flat-top should run approximately at right angles to the direction of the transmitter.

For greater distances, somewhat better results may be obtained by using a reflector in conjunction with the antenna described and shown in Fig. 2. A suggested system is to use a 1-inch diameter copper pipe similar to the dipole, running parallel to the regular antenna and located furthest from the direction of the received signal. Fig. 3 shows a diagram looking from top and dimensions should be followed very carefully. By experimenting, however, with the distance between reflector and antenna, improvement in the individual installation may be noted.

Note - The reflector is a floating copper bar and there are no external connections. Connect and install the regular antenna as shown in Fig. 2.

Model .......................... GM-125
Height .......................... 36-1/2 inches
Width .......................... 39-3/8 inches
Depth .......................... 17-1/8 inches

Tuning Control Drive Ratio .......................... 1:1

Electrical Specifications

Volts .......................... 115-125
Frequency .......................... 30/60 Cycles
Watts Consumption .......................... 160

Tuning Frequency Range .......................... 57-44 Mc
Intermediate Frequency

Mid-frequency .......................... 3.0 Mc
Band Width .......................... 300 Kc

Electrical Power Output

Undistorted .......................... 12.0 Watts
Maximum .......................... 15.0 Watts

Loudspeaker - Electrodynamic

Cone - Outside Diameter .......................... 10 inches
Voice Coil Impedence (400 cycles) .......................... 3.5 Ohms
Field Nonlinearity .......................... 1.5 Ohms (cold)
CIRCUIT ALIGNMENT

IF Amplifier

Due to the good stability of components and the wide band characteristics of this amplifier, alignment should be unnecessary under normal operating conditions. Should it become imperative that an IF alignment is desirable, it will be necessary to use a cathode ray oscilloscope in conjunction with a 3.0 megacycle signal generator with a superimposed 1300 K.C. sweep frequency. This generator may be built up by constructing an oscillator with the tank condenser semi-fixed and variable, the variable portion being designed to be rotated by a motor and of proper capacity to give 1300 K.C. variation of the 3.0 megacycle mid-frequency. Connect the vertical plates of the oscilloscope across the resistor R-15 of the 4th IF stage and align transformers T-7, T-8, T-5 and T-4 in a progressive step by step method.

Frequency Demodulator

With the same oscillator and sweep signal as used above, connect the vertical oscilloscope plates across the resistors R-18 and R-19, then align the transformer T-8 for a cross-over curve as shown in Fig. 4. Proper alignment of trimmer C-51 is indicated when the curve crosses midway in a vertical plane. Proper alignment of C-50 is indicated when the sides of the curve near cross-over are nearest to a straight line.

Note: Keep signal input high enough so that noise limiter is functioning. This point is indicated when an increase in signal input no longer changes the size of the curve.

RF Alignment

Make sure the last division on the low frequency end of the dial coincides with the center mark when the gain condenser is completely closed. Then proceed as follows:

2. Apply a 42.8 megacycle unmodulated signal to the antenna terminal board.
3. Set dial ac-cw so it is tuned to 42.8 megacycle and peak oscillator trimmer C-6 for maximum voltage reading on the meter.
4. Peak the antenna (C-2) and RF (C-5) trimmers for maximum voltage output on meter.

Note - The proper location of the trimmers is shown on a following page.
ALIGNMENT PROCEDURE

Alignment Frequencies

IF—455 kc. Broadcast—1600 kc. and 600 kc.

NOTE—Do not rest the chassis on any of its sides when attempting to align; place in either an inverted or upright position.

IF Alignment

To align the IF, it will be necessary to remove the chassis from the cabinet. Connect an output meter across the voice coil. Set the volume control for maximum.

Adjust the test oscillator to 455 kc. and apply the signal to the control grid of the 1A7G tube through a .05 mf. capacitor. Do not remove the grid lead from the 1A7G tube. Keep the test oscillator output as low as possible to give a readable output. Adjust all four IF trimmers for maximum output.

RF Alignment

The following alignment should be made with the receiver fastened in the case. Turn the receiver to its inverted position and make trimmer and pad alignments through the holes provided in the bottom of the case.

Connect the ground lead of the signal generator to the receiver chassis and the other lead to the receiver antenna terminal (located underneath cabinet). A dummy antenna consisting of a 250 mmf. capacitor in series with 200 ohms should be connected in the antenna lead of the signal generator. Apply a 600 kc. modulated signal and adjust the oscillator pad for a maximum output while rocking the gang condenser in vicinity of 600 kc. mark on the dial.

Using the same dummy antenna with a 1500 kc. signal generator input, adjust the oscillator trimmer for a maximum output. Now remove signal generator leads, tune in a station at approximately the 1500 kc. point on dial and then peak the RF trimmer for a maximum signal.

MODEL GB-400
BATTERY-OPERATED

SERVICE DATA

Physical Specifications

Model: GB-400
Height: 9 3/4 inches
Width: 13 inches
Depth: 8 1/2 inches

Tuning Control Drive Ratio: 1:1

Batteries Required

1 1 1/4 volt "A" battery (Eveready No. 741 or equivalent).
2—45 volt "B" batteries (Eveready No. 702 or equivalent).

Tuning Frequency Range: 540-1600 kc.

Alignment Frequency

IF: 455 kc.
RF: 600 and 1500 kc.

Load-speaker—Permanent Magnet

Over-all diameter: 5 inch
Cone Coil Impedance (400 cycles): 3.0 ohms

Tubes

Converter and Oscillator: GE-1A7G
IF Amplifier: GE-1MG
Detector and 1st Audio: GE-1MG
Power Amplifier: GE-1C5G

GENERAL INFORMATION

The Model GB-400 is a compact and portable battery-operated receiver that employs four tubes in a superheterodyne circuit. Features of design include self-contained "A" and "B" battery supply, an efficient loop antenna built inside of the cabinet, and an efficient P.M. speaker.
**MODEL GD 500**

Schematic, Socket, Trimmers

**GENERAL ELECTRIC CO.**

**Tubes**

- RF Amplifier: GE-6K7GT
- Detector: GE-6F5GT
- 1st Audio: GE-6J5GT
- Power Output: GE-25L6GT
- Rectifier: GE-2526GT

**MODEL GD-500**

TRF RECEIVER

**VOLTAGE CHART**

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6K7GT</th>
<th>6J6GT</th>
<th>6F6GT</th>
<th>25L6GT</th>
<th>25Z6GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to -B Volts</td>
<td>88</td>
<td>30</td>
<td>35</td>
<td>132</td>
<td>120 AC</td>
</tr>
<tr>
<td>Screen to -B Volts</td>
<td>88</td>
<td></td>
<td></td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Cathode to -B Volts</td>
<td>0</td>
<td>1.3</td>
<td>0</td>
<td>5.5</td>
<td>140</td>
</tr>
<tr>
<td>Filament Volts</td>
<td>6.4</td>
<td>6.3</td>
<td>6.2</td>
<td>25.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage measured when volume control is set to maximum.
Line Voltage—120 AC. No signal input.
* Measured on 500-volt scale.
On DC, voltages should read approximately 10% lower.

**GENERAL INFORMATION**

Model GD-500 is a compact five-tube AC-DC tuned radio frequency receiver that tunes the broadcast band of frequencies. One side of the power line is connected directly to the chassis ground, therefore, caution should be exercised in servicing.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

**ALIGNMENT**

Connect the high side of the signal generator through a 250 mfd. condenser to the antenna lead. The low side of the signal generator output should be connected to the receiver chassis through a .05 mfd. condenser. Connect a suitable output meter across the voice coil leads; then proceed as follows:

1. With gang condenser plates completely closed, the tuning mark should be over the last mark on the dial.
2. Tune receiver to the 1500 KC point on the dial; then align trimmers on the gang condenser at 1500 KC for a maximum output meter reading.

Precaution—One side of the power supply is connected to the chassis. Do not connect chassis to any external ground.

---

**Fig. 1. Trimmer Location**

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110-120 AC or DC</td>
<td>25-60</td>
<td>45</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**

- Band "B": 540-1750 KC
- Alignment Frequency: 1500 KC

**Electrical Power Output**

- Undistorted: 1.4 watts
- Maximum: 2.0 watts

**Loudspeaker—Permanent Magnet**

- Outside Cone Diameter: 4½ inches
- Voice Coil Impedance (400 cycles): 3.5 ohms
GENERAL ELECTRIC CO.

Tuning Frequency Range
Band "B" 535 to 1730 kc

Electrical Power Output
Undistorted 1.1 watts
Maximum 2.0 watts

MODELS GD-520 AND GD-521
GENERAL INFORMATION

Models GD-520 and GD-521 are compact five-tube AC-DC superheterodyne receivers, employing five General Electric Pre-tested Tubes. One side of the power line is connected directly to the chassis ground in either receiver; therefore, caution should be exercised in servicing.

When operating from a D-c source of power, it is necessary to insert the power plug with proper polarity; otherwise, the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

Alignment Frequencies

I.F. — 456 kc, Broadcast — 1500 kc
The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Set the volume control for maximum.

Set test oscillator to 456 kc and apply signals to the control grid of the 6AS7 tube through a .05 mfd. capacitor. Do not remove the grid lead from the 6AS7. Keep the test oscillator output as low as possible to give a readable output. Adjust all three I.F. trimmers for maximum output.

R.F. Alignment

Set test oscillator to 1800 kc and connect one output lead to the receiver chassis and the other through a 250 mfd. capacitor in series with 200 ohms to the receiver antenna lead. Adjust the oscillator trimmer (C-13) and the antenna trimmer (C-14) for a maximum output.

†Precaution. One side of the power supply is connected to the chassis. Do not connect chassis to any external ground. If signal generator is AC operated, connect a .05 mfd. capacitor in the ground side before connecting it to the receiver chassis.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A8GT</th>
<th>6K7GT</th>
<th>6Q7GT</th>
<th>25L6GT</th>
<th>25Z6GT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to — B Volts</td>
<td>92</td>
<td>92</td>
<td>32*</td>
<td>125</td>
<td>120 AC</td>
</tr>
<tr>
<td>Screen to — B Volts</td>
<td>37</td>
<td>92</td>
<td></td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Cathode to — B Volts</td>
<td>0</td>
<td>0</td>
<td>5.9</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>Filament Volts</td>
<td>6.4</td>
<td>6.3</td>
<td>6.2</td>
<td>25.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage measured when volume control is set to minimum.
Line Voltage—120 AC. No signal input.
† Measured on 500-volt scale.
On DC, voltages should read approximately 10% lower.
MODELS GD-610 AND GD-620

SERVICE DATA

Specifications
Model: GD-610 GD-620
Height: 8 1/4 inches 8 1/4 inches
Width: 12 1/2 inches 12 1/2 inches
Depth: 5 3/4 inches 5 3/4 inches

Tuning Control Drive Ratio: 1:1

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A8G</th>
<th>6SK7</th>
<th>6SQ7</th>
<th>25LG</th>
<th>25ZG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to – B volts</td>
<td>112</td>
<td>112</td>
<td>50*</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Screen to – B volts</td>
<td>75</td>
<td>75</td>
<td>112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cathode to – B volts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>Filament Volts</td>
<td>6.4</td>
<td>6.4</td>
<td>6.4</td>
<td>24.5</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Line Voltage—120 V. AC. Volume control at maximum.
* Measured on 230 volt scale.
On DC, voltages are about 15 per cent lower.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT PROCEDURE

Alignment Frequencies
I.F.—455 K.C. Broadcast—1500 K.C.
The location of all trimmers is shown in Fig. 1.

I.F. Alignment
Connect an output meter across the voice coil. Set the volume control for maximum.
Set test oscillator to 655 K.C. and apply signal to the control grid of the 6A8G tube through a .05 mfd. capacitor. Do not, remove the grid lead from the 6A8G. Keep the test oscillator output as low as possible to give a readable output. Adjust all four I.F. trimmers for maximum output.

Wave Trap Alignment
Leave the test oscillator set to 455 K.C. and connect one output lead to the receiver chassis and the other through a 250 mfd. capacitor in series with 200 ohms to the receiver antenna lead. Adjust (C-1) for minimum output.

R.F. Alignment
Use the same dummy antenna (250 mfd. and 200 ohms) with 1500 K.C. input, adjust the oscillator trimmer (C-37) and antenna trimmer (C-39) for a maximum output.

Precaution—On the Model GD-610 one side of the power supply is connected to the chassis. If signal generator is AC operated, connect a .05 mfd. capacitor in the ground side before connecting it to the receiver chassis.

Power Supply (Volts) | Frequency (Cycles on AC) | Power Consumption (Watts)
--- | --- | ---
100-125 Volts AC or DC | 40-80 | 50

Tuning Frequency Range: 640-1700 K.C.
Intermediate Frequency: 455 K.C.
Electrical Power Output (120-line Volts)
- Undistorted AC: 1.0 D.C: 0.9
- Maximum: 1.8 1.5

Load-speaker—Electrodynamic
Outside Cone Diameter: 5 inches
Voice Coil Impedance (40 cycles): 4.0 ohms
Field Coil Resistance: 420 ohms

Fig. 1. Trimmer Location

Production Change
On a number of receivers, substitute electrolytic capacitor RC-5115 is used for C20 with both sections tied in parallel and RC5114 is used for C30a.

GENERAL INFORMATION

The models GD-610 and GD-620 are compact six tube AC-DC superheterodyne receivers employing five General Electric tubes plus a ballast tube, described above in a superheterodyne circuit. Features of design include I.F. wave trap, automatic volume control, and an efficient electrolytic speaker. Model GD-620 is fully approved by Underwriters Laboratories.
MODELS CD-600 AND GD-630

SERVICE DATA

Specifications:
- **Model**: CD-600, GD-630
- **Height**: 8 5/16 inches
- **Width**: 12 3/4 inches
- **Depth**: 5 3/4 inches

Tuning Control Drive Ratio: 1:1

Electrical Specifications:

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-125 Volts AC or DC</td>
<td>40-60</td>
<td>50</td>
</tr>
</tbody>
</table>

Tuning Frequency Range: 540-1750 kc.

Intermediate Frequency: 455 kc.

Electrical Power Output (120-line Volts):

- AC: 1.0
- DC: 0.9
- Maximum: 1.8
- 1.5

Load-speaker—Electrodynamic:
- Outside Cone Diameter: 6 inches
- Voice Coil Impedance (400 cycles): 4.0 ohms
- Field Coil Resistance: 420 ohms

Tubes:
- Converter and Oscillator: GE-6A8G
- I.F. Amplifier: GE-6SK7
- Detector: GE-6SK6
- Power Output: GE-25L6G
- Rectifier: GE-25Z6G
- Pilot Lamp: Mazda No. 44
- Ballast: BL49-B

Production Change:
On a number of receivers, substitute electrolytic RC-511A is used for C30d with both sections tied in parallel and RC 5114 is used for C30a.

GENERAL INFORMATION

The models GD-600 and GD-630 are compact six-tube AC-DC superheterodyne receivers employing five General Electric tubes plus a ballast tube, as described above in a superheterodyne circuit. Features of design include I.F. wave trap, automatic overload control and an efficient electrodynamic speaker. Model GD-690 is fully approved by Underwriters' Laboratories.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>6A8G</th>
<th>6SK7</th>
<th>6SP5</th>
<th>25L6G</th>
<th>25Z6G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate to -B volts</td>
<td>112</td>
<td>112</td>
<td>35*</td>
<td>102</td>
<td>...</td>
</tr>
<tr>
<td>Screen to -B volts</td>
<td>75</td>
<td>75</td>
<td>...</td>
<td>112</td>
<td>...</td>
</tr>
<tr>
<td>Cathode to -B volts</td>
<td>3.4</td>
<td>3.4</td>
<td>0</td>
<td>0</td>
<td>134</td>
</tr>
<tr>
<td>Filament volts</td>
<td>.64</td>
<td>6.4</td>
<td>6.4</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Line Voltage—120 V. AC. No signal input—Vol. control at max.
* Measured on 250-volt scale.
On DC, voltages are about 15 per cent lower.

When operating from a DC source of power, it is necessary to insert the power plug with proper polarity; otherwise the receiver will fail to function. If excessive hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

ALIGNMENT PROCEDURE

Alignment Frequencies:
- I.F.—455 K.C.
- Broadcast—1500 K.C.

The location of all trimmers is shown in Fig. 1.

I.F. Alignment
Connect an output meter across the voice coil. Set the volume control for maximum.

Set test oscillator to 455 K.C. and apply signal to the control grid of the 6A8G tube through a .05 mfd. capacitor. Do not remove the grid lead from the 6A8G. Keep the test oscillator output as low as possible to give a readable output. Adjust all I.F. trimmers for maximum output.

Wave Trap Alignment
Leave the test oscillator set to 455 K.C. and connect one output lead to the receiver chassis and the other through a 250 mfd. capacitor in series with 200 ohms to the receiver 25L6G grid lead. Adjust (C-1) for minimum output.

R.F. Alignment
Use the same dummy antenna (250 mfd. and 200 ohms) with 1500 K.C. input, adjust the oscillator trimmer (C-37) and antenna trimmer (C-38) for a maximum output.

Precaution—On the Model GD-600, one side of the power supply is connected to the chassis. If signal generator is AC operated, connect a .05 mfd. capacitor in the ground side before connecting it to the receiver chassis.
- GILFILLAN BROS., INC.

MODEL 56S
MODEL 66S
Schematics
Socket, Voltage

Power consumption:
40 watts at 115 volts
60 cycles on primary,
All voltages to ground
with a 1000 ohm per
volt meter.

GILFILLAN BROS., INC.

Power consumption at 115 Volts, 60 cycles - 37 watts
All voltages measured to ground with 115 volts, 60
cycles applied to transformer primary using 1000 ohms per volt meter.
SETTING PUSH BUTTONS MODELS 56-S, 66-S.

To set push button station selector proceed as follows:

1. Release mechanism by turning screw "B" in center of manual control knob "A" approximately three turns to the left.
2. Manually tune the radio set by means of turning knob "A" until the pointer is at the bottom end of the dial scale (so that it is pointed at 170). Starting from this point tune the desired station you want to hear (on No. 1 button).
3. Press button marked 1 all the way in, then release. Tune the next station desired manually, then press button No. 2 all the way in, then proceed progressively until all six buttons have been tuned.
4. Turn screw "B" in center of manual control "A" to right until tight, locking the selector mechanism. Any of the stations selected can now be received by depressing its corresponding push button. BE SURE SELECTOR BUTTON IS PUSHED ALL THE WAY IN, both when setting selector to a station and when using push button tuning to receive that station.
SETTING PUSH BUTTONS MODELS 56-S, 66-S.

To set push button station selector proceed as follows:

1. Release mechanism by turning screw "B" in center of manual control knob "A" approximately three turns to the left.
2. Manually tune the radio set by means of turning knob "A" until the pointer is at the bottom end of the dial scale (so that it is pointed at 170). Starting from this point tune the desired station you want to hear (on No. 1 button)
3. Press button marked 1 all the way in, then release. Tune the next station desired manually, then press button No. 2 all the way in, then proceed progressively until all six buttons have been tuned.
4. Turn screw "B" in center of manual control "A" to right until tight, locking the selector mechanism. Any of the stations selected can now be received by depressing its corresponding push button. BE SURE SELECTOR BUTTON IS PUSHED ALL THE WAY IN, both when setting selector to a station and when using push button tuning to receive that station.
IN ORDER TO PREVENT SIGNAL FROM ACTING UPON AVC AND AFFECTING ACCURACY OF VOLTAGE MEASUREMENTS, AERIAL AND GROUND LEADS SHOULD BE SHORT CIRCUITED WHILE MAKING MEASUREMENTS.

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a voltmeter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

ALIGNING I.F. TRANSFORMERS: (400 K.C.)

Part No. 108-84 Input I.F. Transformer.

These I.F. Transformers have two adjustments, both of which are accessible from the top of chassis (see fig. 1, top view).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with 1 mfd condenser, to the control grid cap of the type 6S7G tube, and adjust the output I.F. transformer (No. 108-85) to resonance.
   (b) Move oscillator output clip from grid of 6S7G to grid cap of 6D8G and adjust input I.F. transformer (No. 108-84) to resonance.
   (c) With oscillator still connected to 6D8G readjust output I.F. transformer (108-85) if necessary.

R.F. ALIGNMENT: (525-1712 K.C.)

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 200 mfd condenser to tan antenna and black ground leads and make the following adjustments:
   (a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer (rear of gang condenser).
   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick-up oscillator signal and adjust antenna trimmer to resonance (front section of gang condenser).
   (c) Check sensitivity at 600 and 1000 kilocycles.
MODEL 578, Series A
Schematic Voltage

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 578-5G132670A—5K173250A

TUNING RANGE—
Standard Broadcast Band
530 - 1720 Kilocycles

ALIGNMENT

NOTE:—
Beginning with 5K173250A, Antenna Coil No. 111-44 replaced No. 111-33, and capacities C1—0.00385 mfd. and C14—0.0001 mfd. were eliminated. Note: On early models C14 was a capacity winding on the primary of the No. 111-33 Antenna Coil.

See revised diagram

Aligning I.F. Transformers

1. With volume control full on, the extreme right of its rotation, and with variable condenser at its minimum capacity position, plate entirely out of mesh and adjust the I.F. transformers (two adjustments at the top of parts number 108-53 and 108-47)

(a) Connect external oscillator which has been adjusted to 465 kilocycles in series with I.F. dummy antennas, to one antenna terminal and ground. Adjust output I.F. transformer, part number 108-47, to resonance.

(b) Move generator output clip from grid of 606 to grid cap of 6A7 tube and align input I.F. transformer, part number 108-45.

(c) With generator connected to grid of type 6A7 tube, readjust output I.F. transformer, part number 108-47, to resonance.

R.F. Alignment—

(530 - 1720 Kilocycles)

1. With gang condenser in its minimum capacity position, plate entirely out of mesh, connect an external oscillator in series with broadcast dummy antenna to top antenna terminal and ground leads and make the following adjustments:

(a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer, (rear of gang condenser).

(b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance, (front section of gang condenser).

(c) Re-set external oscillator to 600 kilocycles and adjust series pad to resonance, rotate condenser and move dial pointer to 600 kilocycles by gently rocking condenser and ground. Pick up oscillator signal while adjusting series pad to resonance, maximum deflection on an output meter. This adjustment is accessible from the top of the chassis and is located between variable condenser and power transformer.

25 Cycle Chassis differ only from 60 cycle chassis in that part number 104-18 transformer is used in place of 50/60 cycle transformer, part number 104-16.
ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-83 Output I.F. Transformer
Part No. 108-82 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 78 tube, and adjust the output I.F. transformer (No. 108-83) to resonance.

(b) Move oscillator output clip from grid of 78 grid cap of 6A7 and adjust input I.F. transformer (No. 108-82) to resonance.

(c) With oscillator still connected to 6A7, re-adjust output I.F. transformer (108-83) if necessary.

R.F. ALIGNMENT: (535-1720 K.C.)

1. Unsolder the antenna wire from its terminal on the antenna coil and with a gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 50 mfd. condenser to the antenna terminal on the antenna coil and chassis ground and make the following adjustments:

(a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer (rear of gang condenser).

(b) Re-set external oscillator to 1550 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance (front section of gang condenser).

(c) Check sensitivity at 600 and 1000 kilocycles.
ALIGNING I.F. TRANSFORMERS: (470 K.C.)

Part No. 106-83B Output I.F. Transformer
Part No. 106-82B Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see Fig. 1).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 400 kilocycles, make the following adjustments:

(a) Connect external oscillator set at 470 kilocycles, in series with 1 μfd. condenser, to the control grid cap of the type 6K7G tube, and adjust the output I.F. transformer (No. 106-83B) to resonance.

(b) Move oscillator output clip from grid of 6K7G to grid of 6A8G and adjust input I.F. transformer (No. 106-82B) to resonance.

(c) With oscillator still connected to 6A8G, readjust output I.F. transformer (106-83B) if necessary.

R.F. ALIGNMENT: (555-1720 K.C.)

1. Unsolder the antenna wire from its terminal on the antenna coil and with gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 50 mmf. condenser to the antenna terminal on the antenna coil and chassis ground and make the following adjustments:

(a) With external oscillator set at 1220 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top of rear section of variable gang condenser. (See Fig. 1).

(b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top of front section of gang condenser).

(c) Check sensitivity at 600 and 1000 kilocycles.
DESCRIPTION:

Model No. 666 is a six-tube superheterodyne receiver having a tuning range of 550 K.C. to 1550 K.C., operates from a 6 volt storage battery and uses the automotive type 6.3 volt tubes. The "B" supply is obtained from a vibrator with a tube rectifier.

The I.F. frequency used is 165 K.C., the R.F. end of the receiver consisting of a high gain iron core antenna coil which gives high signal to noise ratio and an R.F. stage especially designed to give high image rejection and high I.F. attenuation. The I.F. transformers are designed to give high gain and selectivity and yet to have a broad zone for ease of tuning and bi-fidelies response. They are of the air core type and wound with solid wire to gives minimum drift and variation of gain due to climatic changes.

The receiver is so designed that it may be used as either a single or two unit installation. Taps are provided on the output transformer to a pin jack terminal board, a red dot distinguishing dual speaker tap and green dots for single speaker operation.

For complete details see Illustration and Header speaker data sheet.

Dash kits for the remote control head are available for 1930 cars drilled for dash plates.

This receiver has been carefully designed to facilitate servicing, the top and bottom covers are both removable and are fastened in place by spring clips, self tapping screws and trimount buttons.

All adjustments are accessible and any part replaceable without removing the chassis from the case.

TUBE COMPLEMENT

1. Type No. 6L7—Remote Cut-off Pentode as an R.F. Amplifier
2. Type No. 6A8—Pentagrid Converter (composite first detector and oscillator)
3. Type No. 6SL7—Remote Cut-off Pentode as an I.F. Amplifier (465 K.C.)
4. Type No. 627—Duplex Diode Triode Second Detector, A.V.C. and First Audio
5. Type No. 6N6—Triode Output Amplifier
6. Type No. 6X5—High Vacuum Rectifier

The tube complement consists of the latest "Metal-Glass" tubes which are interchangeable with metal tubes.

Cars with floating power must have the motor bonded to the bulkhead and again to the frame to provide a direct path for the high frequency interference developed in the ignition system. A copper braid will be necessary. SMALL DIAMETER WIRE WILL NOT DO. Bond flexible shaft leads, such as free wheeling, choke wires, etc., which pick up motor noise and radiate it into the car. Free wheeling cables should be grounded at the point at which they go through the fire wall of the car. In extreme cases it has been found necessary to ground the steering column.

I.F. ALIGNMENT

1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to grid of 6X7 I.F. tube.
3. Move test oscillator connection to grid of 6AS tube and adjust trimmer condensers of input I.F. transformer No. 106-69 to resonance with oscillator. See top view for trimmer of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screwdriver.

BROADCAST ALIGNMENT

1. With variable condenser in its minimum capacity position, connect test oscillator set at 1550 K.C. in series with broadcast dummy to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance. (This adjustment is on the middle section of the three-gang condenser—see top view).
3. Shift test oscillator to 1400 K.C and pick up signal by rotating condenser and adjust R.F. and antenna trimmers to resonance (see top view).
4. Re-set test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad rocking gauze condenser to zero and the same time adjusting series pad for maximum gain. This adjustment is accessible from the top of chassis (see top view).
5. Go back and check 1400 K.C. If adjustment is made here, check 600 K.C. again.
6. Check for sensitivity at 1000 K.C. by setting test oscillator to this frequency and picking up the signal by rotating variable condenser. Under no circumstances bend plates of variable condenser sections to correct tracking.

NOTE—Where ignition coils are mounted in motor compartment a .5 mil cond (148-1 or 148-3) connected between primary coil terminal and receiver mounting bolt will often reduce motor noise.
### RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>139-103</td>
<td>1000 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>139-12</td>
<td>500 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>139-15</td>
<td>150 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>139-76</td>
<td>1000 ohm - 1 w.</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>139-37</td>
<td>50 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td>139-34</td>
<td>150 Ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td>139-84</td>
<td>3 meg. - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R8</td>
<td>139-91</td>
<td>1 meg volume control</td>
<td></td>
</tr>
<tr>
<td>R9</td>
<td>139-87</td>
<td>3 meg - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R10</td>
<td>139-102</td>
<td>100 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R11</td>
<td>139-93</td>
<td>250 ohm - resistor strip</td>
<td></td>
</tr>
<tr>
<td>R12</td>
<td>139-94</td>
<td>300 ohm - resistor strip</td>
<td></td>
</tr>
<tr>
<td>R13</td>
<td>139-103</td>
<td>1000 ohm - 1 w.</td>
<td></td>
</tr>
<tr>
<td>R14</td>
<td>139-102</td>
<td>5000 ohm - 1/2 w.</td>
<td></td>
</tr>
<tr>
<td>R15</td>
<td>101-92</td>
<td>5000 ohm - same control</td>
<td></td>
</tr>
</tbody>
</table>

### CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>100-40</td>
<td>3 gang variable</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>100-23</td>
<td>.05 x 300</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>100-36</td>
<td>.02 x 400</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>100-39</td>
<td>.00005 Mica</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>100-38</td>
<td>.003 x 400</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>100-37</td>
<td>.003 x 400</td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>100-40</td>
<td>.005 x 300</td>
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<tr>
<td>C8</td>
<td>100-41</td>
<td>.002 x 400</td>
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<tr>
<td>C9</td>
<td>100-43</td>
<td>.001 x 400</td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>100-44</td>
<td>.001 x 400</td>
<td></td>
</tr>
</tbody>
</table>

### MISC.

- **555 to 1720 K.C.**
- **1685 to 5500 K.C.**
- **5.2 to 18.1 M.C.**

### INTERMEDIATE FREQUENCY

465 K.C.

(Serial No. J7850200 and up)

### POWER CONSUMPTION

The power consumption of this receiver is 75 watts.
MODELS 901
(Serial No. 71850290 and up)

Voltages taken from different points of circuit to chassis are measured with voltmeter on all tubes in their sockets and with speaker connected, with a voltmeter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram. IN ORDER TO PREVENT SIGNAL FROM ACTING UPON A/C AND AFFECTING ACCURACY OF VOLTAGE MEASUREMENTS, AERIAL AND LEAD SHOULDER BE SHORT CIRCUITED WHILE MAKING MEASUREMENTS.

All voltages are to be measured at 115 volts on the primary of the power transformer.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1," "Dummy 2," and "Dummy 3."

Dummy 1: (IF)—Consists of a 1 -mf. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 -mf. condenser and a 200 -ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a 1 -mf. condenser and a 400 -ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (485-K.C.)

Part No. 108-110 Output I.F. Transformer Part No. 108-109 Input I.F. Transformer These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, the extreme right of its rotation, the band changing switch in the broadcast position (extreme left of its rotation), and the variable condenser set at approximately 1400 kilocycles, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 637 tube and adjust input I.F. transformer (No. 108-109) to resonance.

(b) With "Dummy 1" still connected, move oscillator output to grid of 637 to give 1000 ohms between chassis and ground lead, make the following adjustments:

1. Move dial pointer to 1000 kilocycles and adjust middle wave wave oscillator (Adjustment number 2) to resonance.

2. Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

3. Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental. An example of this is an image of a fundamental 17 megacycle signal appears near 161 megacycles.

MIDDLE WAVE BAND ALIGNMENT:

1085 to 5500 Kilocycles

1. With band changing switch in the middle wave position, extreme left of its rotation, and with chassis connected, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 637 tube and adjust input I.F. transformer (No. 108-109) to resonance.

(b) With "Dummy 1" still connected, move oscillator output to grid of 637 to give 1000 ohms between chassis and ground lead, make the following adjustments:

1. Move dial pointer to 1000 kilocycles and adjust middle wave wave oscillator (Adjustment number 2) to resonance.

2. Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

3. Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

4. Check broadcast band alignment.

MODEL 787

Voltages taken from different points of circuit to chassis are measured with voltmeter full on, all tubes in their sockets and with speaker connected, with a voltmeter having a resistance of 1000 ohms per volt.

Resistance of all wiring is indicated in ohms on the schematic circuit diagram.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1," "Dummy 2," and "Dummy 3."

Dummy 1: (I.F.)—Consists of a 1 -mf. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 -mf. condenser and a 200 -ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a 1 -mf. condenser and a 400 -ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (485-K.C.)

Part No. 108-110 Output I.F. Transformer Part No. 108-109 Input I.F. Transformer These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With band changing switch in the broadcast position, extreme left of its rotation, and with chassis connected, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 637 tube and adjust input I.F. transformer (No. 108-109) to resonance.

(b) With "Dummy 1" still connected, move oscillator output to grid of 637 to give 1000 ohms between chassis and ground lead, make the following adjustments:

1. Move dial pointer to 1000 kilocycles and adjust middle wave wave oscillator (Adjustment number 2) to resonance.

2. Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

3. Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

4. Check broadcast band alignment.

MIDDLE WAVE BAND ALIGNMENT:

1085 to 5500 Kilocycles

1. With band changing switch in the middle wave position, extreme left of its rotation, and with chassis connected, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1," to the control grid cap of the type 637 tube and adjust input I.F. transformer (No. 108-109) to resonance.

(b) With "Dummy 1" still connected, move oscillator output to grid of 637 to give 1000 ohms between chassis and ground lead, make the following adjustments:

1. Move dial pointer to 1000 kilocycles and adjust middle wave wave oscillator (Adjustment number 2) to resonance.

2. Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

3. Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

4. Check broadcast band alignment.

SHORT WAVE BAND ALIGNMENT: 6.5 to 16.5 Megacycles

1. With band changing switch in the short wave position, extreme left of its rotation, and with chassis connected, make the following adjustments:

(a) Move dial pointer to 1000 kilocycles and adjust short wave wave oscillator (Adjustment number 3) and short wave wave oscillator (Adjustment number 4) to resonance.

(b) Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

(c) Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

MIDDLE WAVE BAND ALIGNMENT:

1085 to 5500 Kilocycles

1. With band changing switch in the middle wave position, extreme left of its rotation, and with chassis connected, make the following adjustments:

(a) Move dial pointer to 1000 kilocycles and adjust middle wave wave oscillator (Adjustment number 2) and middle wave wave oscillator (Adjustment number 5) to resonance.

(b) Re-set external oscillator to 1000 kilocycles and pick up signal by rotating variable condenser and check sensitivity.

(c) Re-set external oscillator and check set at 183 megacycles and 5.2 megacycles for band coverage.

4. Check broadcast band alignment.

5. Check broadcast and short wave band alignment.
GOODYEAR TIRE & RUBBER CO., INC.

MODEL 1070—RUN 1

MODEL 1070—RUN 2

I. F. FREQUENCY
465 K.C.

TUNING RANGE—
Standard Broadcast Band
535-1525 Kilocycles.
Intermediate Band
1770-2550 Kilocycles
Short Wave Band
5.0-18.1 Megacycles.

BOTTOM VIEW—SHOWING TRIMMERS
PROCEDURE FOR SETTING THE AUTOMATIC TUNER LEVERS:

IMPORTANT—READ CAREFULLY BEFORE SETTING THE AUTOMATIC LEVERS:

A mute feature has been incorporated in the automatic tuning mechanism of the Model 1175. The muting of this feature is termed "SILENT TUNING" from one station to another by means of the automatic tuning levers. When any one of the levers is pressed down, the speaker is automatically disconnected from the radio and NO SIGNAL is heard until the lever is RELEASED.

To facilitate an accurate adjustment of the levers it is desirable to hear the station being tuned while the lever is being adjusted; therefore a MUTE SWITCH is provided to connect or disconnect the last tuning lever.

Referring to the top view of the radio (Fig. 1 in this manual), THE POSITION OF THE SWITCH (located on the top of the radio chassis alongside the power transformer) IS IMPORTANT.

Set the switch as follows:

WHILE SETTING THE AUTOMATIC LEVERS:
Switch should be snapped to the right (white dot visible).

AFTER AUTOMATIC LEVERS HAVE BEEN SET:
Switch should be snapped to the left (white dot showing).

There are eight levers on the dial by means of which eight stations may be selected. (See "B", Fig. 2).
Make a list of local stations you tune in regularly; any number up to and including 8.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

Above each automatic tuner lever an opening in the escutcheon is provided for inserting the call letter tab. (See "A", Fig. 2). Any order of grouping may be used, however, it is recommended that the left hand four automatic levers be used for high frequency stations (1750 to 9000 K.C.) and the hand four automatic levers for low frequency stations (1000 to 560 K.C.).

Insert the call letter tabs in the rectangular openings in the escutcheon above each of the automatic tuner levers. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down FIRMLY, tune in by means of the tuning knob No. 4 the station indicated on the station call letter tab above this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position), noting the width of the shadow indicated on the screen of the cathode-ray tuning eye. Minimum width on the eye indicates the ideal tuning position (resonance). The station will then be clearest and accurately tuned. Release the lever.

Press down another automatic tuner lever. Holding it down FIRMLY, carefully tune in the station indicated on the call letter tab above this lever. Release this lever.

Follow this procedure until you have selected all of your favorite stations.

Rotate the tuning knob No. 4 to the right (clockwise) as far as it will turn. Now remove from the right side of the cabinet the metal button, and, with a screw driver inserted through the hole, tighten the locking adjustment screw "C". It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT. If a screw driver is not available, the locking screw can be tightened by reaching in from the back of the cabinet, and, by means of the pin "D" (see Fig. 1), rotate the locking screw shaft to the right (clockwise) until thoroughly tight.

This screw will lock in place all the stations you have selected on the automatic tuner levers. (Note: Locking screw "C" is loose when radio is shipped from factory).

If you should desire to change any station you selected to another, turn the locking screw "C" four or five complete turns; select the new station as explained. (Note: If the dial mechanism works hard when setting up a new station for one of the automatic tuner levers, it is due to the locking screw being tight. Loosen the locking screw "C" until the dial mechanism works freely with the tuner lever pressed down.)

BE SURE TO RETIGHTEN THE LOCKING SCREW; otherwise the stations you have selected will not stay adjusted to the levers.

Snap mute switch to silent tuning position (white dot showing).
GOODYEAR TIRE & RUBBER CO. INC. Alignment

MODEL 1785
DUMMY ANTENNAS:
The following dummy antennas are used in aligning and are referred to in the following alignment instructions as "Dummy 1" and "Dummy 2.

Dummy 1: (F.T.)—Consists of a 1 mfd. capacitor connected in series with an external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mfd. capacitor and a 20 ohm resistor connected in series with each other and in series with the external oscillator.

Dummy 3: (Middle and Short Waves)—Consists of a 1 mfd. capacitor and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS (465 K.C.)

Part No. 1788-11 Output I.F. Transformer
Part No. 1788-12 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view Fig. 1).

1. With volume control full on, (on the extreme right of its rotation), the band changing switch in the broadcast position, set the external oscillator to 1720 Kilocycles and connected in series with "Dummy 2" to the antenna and black ground lead, make the following adjustments:

(a) Move dial pointer to 1720 Kilocycles and adjust broadcast oscillator trimmer (adjustment D) to resonance.

(b) Re-set external oscillator to 6 Megacycles and pick up signal by rotating variable condenser and check for resonating.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillation signal be turned in and not the intermediate signal which will fall below the fundamental. As an example of this a fundamental 17 megacycles signal is only 17 on the dial, but at also approximately 151 megacycles.

MIDDLE WAVE ALIGNMENT

1. With band changing switch in the middle wave position, center of its rotation and with external oscillator set at 5 Megacycles connected in series with "Dummy 3" to the antenna and black ground lead, make the following adjustments:

(a) Rotate condenser, pick up signal and adjust middle wave oscillator (adj. E) middle wave antenna (adj. B) to resonance.

(b) Re-check broadcast alignment and if it is found necessary, re-set either R.F. or antenna trimmers. Repeat the 17 megacycles short wave and 5 megacycles middle wave alignments.

MODEL 01029 CHASSIS 880

PROCEDURE FOR SETTING THE AUTOMATIC TUNER LEVELS

There is an automatic tuner on the dial by means of which eight stations may be selected. (See "F", Fig. 2.)

The following automatic tuner levels may be set:

1. BASIC
2. FAST
3. MEDIUM
4. SLOW
5. ASTRAL
6. MOUNTAIN
7. MOUNTAIN
8. ASTRAL

The automatic tuner setting may be regulated by any number up to and including 4.

Process as follows:

(a) Power is turned on and the automatic tuner levels may be set by means of the pushbutton switches. One of the small oliviform bolts supplied should be screwed into place near each of the station selector level buttons.

(b) Down ALL THE WAY any one of the automatic tuner levels that are in use or have been programmed for use (see the tuning book, Fig. 2) the station selector level buttons shall be turned to the left.

(c) The tuning book shall have been backed and forth (while still holding lever in demarcated position) at the time of the automatic tuner selection, the automatic tuner selection shall fall into the position of the automatic tuner selector lever. The automatic tuner selector lever will fall into the position of the automatic tuner selection.

(continued)
Tube sockets are viewed from under side of chassis. Voltage readings at indicated socket prongs are to zero voltage point on circuit which is on 25L6C tube. Voltages must be measured with no signal. Alignment is to be made at the frequencies shown on the trimmer condensers.

Wave trap adjustment at 456 KC. Input is made to provide maximum reduction of signal. Where no voltage reading is shown at socket prongs, it indicates zero voltage or very low reading.

**IF PEAK 456 KC**

**SETTING PUSH-BUTTONS**

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned nearest the right-hand side of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

Follow through with this same procedure, setting up the other 5 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your six selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

To receive all other stations in the regular manner, push in the Station Selector Knob and turn it to the frequency of the station desired.
ALIGNING I.F. TRANSFORMERS (465 K.C.):

Part No. 108-95B Output I.F. Transformer
Part No. 108-96 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see Fig. 1).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

   (a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 6K7 tube. Adjust the output I.F. transformer (No. 108-95B) to resonance.

   (b) Move oscillator output clip from grid of 6K7 to grid of 6A8G and adjust input I.F. transformer (No. 108-96) to resonance.

   (c) With oscillator still connected to 6A8G, readjust output I.F. transformer (108-95B) if necessary.


1. With the gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 100 mfd. condenser to the antenna lead and chassis ground and make the following adjustments:

   (a) With external oscillator at 1720 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top rear section of variable gang condenser. (See Fig. 1)

   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top front section of gang condenser).

   (c) Check sensitivity at 600 and 1000 kilocycles.

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:

There are five levers on the dial by means of which five stations may be selected.

Press DOWN ALL THE WAY any one of the automatic tuner levers. Holding it down, FIRMLY, tune in by means of the tuning knob (No. 2) the station indicated on the station call letter tab above this lever. Turn the tuning knob very slowly back and forth (while still holding lever in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the lever.

Press down another automatic tuner lever. Holding it down, FIRMLY, carefully tune in the station indicated on the call letter tab above this lever. Release this lever.

Follow this procedure until you have selected all of your favorite stations.

Now hold tuning knob securely with left hand to prevent it from turning. Rotate the tuning knob (No. 2) to the right (clockwise) as far as it will turn, and with a coin (half dollar), tighten the special locking screw ("C") in the center of the tuning knob. (See Fig. 1)

This screw will lock in place all the stations you have selected on the automatic tuner levers. (Note: Locking screw "C" is loose when radio is shipped from factory).

If you should desire to change any station you selected to another, hold the tuning knob No. 2 securely and with a coin loosen the locking screw "C" one or two turns; select the new station as explained. Be sure to retighten the locking screw, otherwise the stations you have selected will not stay adjusted to the levers.
DUMMY ANTENNAS:
The dummy antennas referred to in the following instructions are:

"F. Dummy" — .1 mfd. condenser connected in series with the test oscillator output lead.

"Broadcast Dummy" — A 200 mfd. condenser connected in series with the output lead of the test oscillator.

I.F. ALIGNMENT:
1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with volume control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to the antenna lead of receiver.
2. Adjust trimmer condensers of both input (108-56) and output (125-77) I.F. transformers to resonance with oscillator. See top view for location of these transformers. There are two adjustments on each and they are accessible from the top of the transformer shield and should be adjusted with an insulated screwdriver.

BROADCAST ALIGNMENT:
1. With variable condenser in its minimum capacity position, connect test oscillator set at 1500 K.C. and in series with broadcast dummy, to the antenna lead of receiver.
2. Adjust oscillator trimmer of variable condenser to resonance (this adjustment is on the end section of the three gang condenser—see top view).
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust R.F. (center) and antenna (front) trimmers to resonance, see top view.
4. Re-set external oscillator to 600 K.C. and adjust series pad to resonance, rotate condenser and move dial pointer to 600 K.C. by gently rocking condenser to and fro. Pick up oscillator signal while adjusting series pad to resonance. This adjustment is accessible from the bottom of the chassis.
(a) Check for sensitivity at 1000, 500 and 600 K.C. by setting test oscillator to these frequencies and picking up the signal by rotating variable condenser. Under no circumstances bend plates of oscillator section, bend R.F. and antenna plates only if absolutely necessary.
GOODYEAR TIRE & RUBBER CO., INC.

Schematic Voltage

Model 01025
Chassis 860

Code No. Part No. Description

C1 129-41 .005 Mica 2:1/2%
C2 129-48 .056 Mica 5%
C3 100-1 .1 x 400 v. 50 - 15%
C4 100-26 .02 x 400 v. 25%
C5 129-5 .002 Mica 30%
C6 129-5 .002 Mica 30%
C7 100-26 .03 x 400 v. 25%
C8 100-26 .02 x 400 v. 25%
C9 100-26 .02 x 400 v. 25%
C10 100-26 .02 x 400 v. 25%
C11 129-2 .005 Mica 20%
C12 100-26 .005 x 600 v. 10 - 20%
C13 100-26 .005 x 600 v. 10 - 20%
C14 100-26 .02 x 400 v. 25%
C15 100-26 .02 x 400 v. 25%
C16 100-26 .03 x 400 v. 25%
C17 129-41 .005 x 600 v. 10%
C18 100-26 .03 x 600 v. 10%
C19 100-26 .03 x 600 v. 10%
C20 100-26 .03 x 600 v. 10%
C21 100-26 .03 x 600 v. 10%
C22 100-26 .03 x 600 v. 10%
C23 100-26 .03 x 600 v. 10%
C24 100-26 .03 x 600 v. 10%

AEROSUM

R1 130-103 100M ohm - 1/3 w. 10%
R2 130-12 50M ohm - 1/3 w. 20%
R3 130-122 15M ohm - 1/2 w. 10%
R4 130-196 25M ohm - 1 w. 10%
R5 130-110 1 megohm 1/10 w. 20%
R6 130-4 3 megohm 1/3 w. 20%
R7 101-97 1 megohm volume control
R8 100-98 50 ohm - 1/2 w. 10%
R9 100-98 50 ohm - 1/2 w. 10%
R10 139-197 20 ohm - 1/3 w. 10%
R11 139-197 100M ohm - 1/2 w. 10%
R12 101-98 20M ohm - tone control
R13 130-16 400M ohm - 1/3 w. 10%
R14 130-32 1M ohm - 1/3 w. 20%
R15 130-21 10M ohm - 1/3 w. 10%
R16 130-12 50M ohm - 1/2 w. 10%
R17 130-122 15M ohm - 1/2 w. 10%
R18 130-196 25M ohm - 1 w. 10%
C25 130-196 250 ohm - 1 w. 10%

CONDENSERS

C1 129-42 3 gang variable
C2 129-42 .05 x 200 v. - 25%
C3 129-42 .0005 Mica 10%
C4 129-42 .0027 Mica 2:1/2%
C5 129-42 .0027 Mica 2:1/2%
C6 129-42 .0027 Mica 2:1/2%
C7 129-42 .0027 Mica 2:1/2%
C8 129-42 .0027 Mica 2:1/2%

For conventional types of antennas connect the yellow wire to the antenna lead and the yellow wire with black tracer and the black wire together to the ground lead.

When a doublet antenna is used connect the yellow wire and the yellow wire with black tracer wire to the doublet antenna and the solid black wire to the ground lead. (See Fig. 1-Top View)

For Alignment and Tuner Data, see Index

Mica condensers are coded with an additional dot indicating tolerance:

Tolerance percent Color of Dot
25% White
10% Green
10% Blue
20% Yellow
20% Red
No More Than 20% None

FREQUENCY RANGE
540 to 1750 K.C.
1730 to 5800 K.C.
5.5 to 18.1 M.C.

CHASSIS MODEL 860
(Serial No. 7L87400 and up)

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ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-83B Output I.F. Transformer
Part No. 108-82B Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see Fig. 1).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 6K7G tube, and adjust the output I.F. transformer (No. 108-83B) to resonance.

(b) Move oscillator output clip from grid of 6K7G to grid of 6A8G and adjust input I.F. transformer (No. 108-82B) to resonance.

(c) With oscillator still connected to 6A8G, readjust output I.F. transformer (108-83B) if necessary.

R.F. ALIGNMENT: (585-1725 K.C.)

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 200 mfd. condenser to the antenna lead and chassis ground and make the following adjustments:

(a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer to resonance. This adjustment is on the top of rear section of variable gang condenser. (See Fig. 1).

(b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance. (Top of front section of gang condenser).

(c) Check sensitivity at 600 and 1000 kilocycles.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on diagram are measured with 119 volt A.C. or D.C. line.

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>115-17</td>
<td>10M ohm - 1/2 w.</td>
<td>10M</td>
</tr>
<tr>
<td>R2</td>
<td>115-12</td>
<td>50M ohm - 1/2 w.</td>
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</tr>
<tr>
<td>R3</td>
<td>115-149</td>
<td>1M ohm - 1/2 w.</td>
<td>1M</td>
</tr>
<tr>
<td>R4</td>
<td>125-4</td>
<td>3 meg ohm - 1/2 w.</td>
<td>3M</td>
</tr>
<tr>
<td>R5</td>
<td>115-27</td>
<td>Volume Control (1 Meg)</td>
<td>1M</td>
</tr>
<tr>
<td>R6</td>
<td>115-12</td>
<td>50M ohm - 1/2 w.</td>
<td>50M</td>
</tr>
<tr>
<td>R7</td>
<td>115-30</td>
<td>100M ohm - 1/2 w.</td>
<td>100M</td>
</tr>
<tr>
<td>R8</td>
<td>115-19</td>
<td>1 megohm - 1/2 w.</td>
<td>1M</td>
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<td>R9</td>
<td>115-28</td>
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<tr>
<td>R10</td>
<td>115-20</td>
<td>40 ohm</td>
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</tr>
<tr>
<td>R11</td>
<td>115-20</td>
<td>55 ohm</td>
<td>55</td>
</tr>
</tbody>
</table>
| R3, R10, and R11 in one unit

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>115-40</td>
<td>2.5 mfd variable</td>
<td>2.5</td>
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<tr>
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<td>115-20</td>
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</tr>
<tr>
<td>C3</td>
<td>115-25</td>
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<tr>
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<td>.015 x 600</td>
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<tr>
<td>C11</td>
<td>115-20</td>
<td>30 mfd lytic - 100 w.v.</td>
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<td>C12</td>
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<td>C13</td>
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<td>C14</td>
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<td>115-20</td>
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<tr>
<td>C16</td>
<td>115-33</td>
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<td>0.25</td>
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PARTS

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<th>Part No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>T1</td>
<td>111-30B</td>
<td>Antenna Coil Complete</td>
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<tr>
<td>T2</td>
<td>110-46</td>
<td>Oscillator Coil Complete</td>
</tr>
<tr>
<td>T3</td>
<td>108-82B</td>
<td>Input, I. F. Complete</td>
</tr>
<tr>
<td>T4</td>
<td>108-83B</td>
<td>Output, I. F. Complete</td>
</tr>
<tr>
<td>T5</td>
<td>114-71</td>
<td>Dynamic Speaker</td>
</tr>
<tr>
<td>L1</td>
<td>450 ohm speaker field</td>
<td>Switch on Volume Control</td>
</tr>
</tbody>
</table>
GOODYEAR TIRE & RUBBER CO., INC.

MODEL 010219, Run 1
Chassis 415-A
Schematic Voltage

I.F. FREQUENCY
465 K.C.

TUBES:
The tube complement of this chassis consists of the following tubes:

1. Type 1A6 Pentagrid Mixer, First Detector-oscillator.
2. Type 1A4 Super Control R.F. Tetrode I.F. Amplifier (465 K.C.)
3. Type 1P8 Duplex Diode Pentode, Second Detector, A.V.C., and First Audio.
4. Type 1F4 Pentode Output Amplifier.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):
Part No. 168-65 Output I.F. Transformer.
Part No. 168-84 Input I.F. Transformer.

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see tap view):
1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:
   (a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 1A4 tube, and adjust the output I.F. transformer (No. 168-85) for resonance.
   (b) Move oscillator output clip from grid of 1A4 to grid cap of 1A6 and adjust input I.F. transformer (No. 108-84) to resonance.
   (c) With oscillator still connected to 1A6, readjust output I.F. transformer (108-84) if necessary.

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 300 ma. condenser to antenna and black ground leads and make the following adjustments:
   (a) With external oscillator set at 1750 kilocycles, adjust oscillator trimmer (rear of gang condenser).
   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick up oscillator signal and adjust antenna trimmer to resonance (front section of gang condenser).
   (c) Check sensitivity at 600 and 1000 kilocycles.
The type and function of each tube is as follows:

1. Type 6DJ8 Pentagrid Mixer, First Detector-oscillator.
2. Type 6S7G Remote Cut-off Pentode I. F. Amplifier (465 K.C.)
3. Type 6T7G Duplex Diode Triode, Second Detector, A.V.C. and First Audio.
4. Type 1F5G Pentode Output Amplifier.

**RESONANCE INDICATOR:**

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the plate and screen terminals of the type 1F5G output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

**ALIGNING I.F. TRANSFORMERS: (465 K.C.):**

Part No. 108-84 Input I.F. Transformer.

These I.F. Transformers have two adjustments, both of which are accessible from the top of chassis (see fig. 1, top view page 2).

1. With volume control full on (the extreme right of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

   (a) Connect external oscillator set at 465 kilocycles, in series with .1 mfd. condenser, to the control grid cap of the type 6576 tube, and adjust the output I.F. transformer (No. 108-85) to resonance.

   (b) Move oscillator output clip from grid of 6576 to grid cap of 6DJ8 and adjust input I.F. transformer (No. 108-84) to resonance.

   (c) With oscillator still connected to 6DJ8 readjust output I.F. transformer (108-85) if necessary.

**R.F. ALIGNMENT: (535-1720 K.C.)**

1. With gang condenser in its minimum capacity position, plates entirely out of mesh, connect an external oscillator in series with a 200 mmf condenser to an antenna and black ground leads and make the following adjustments:

   (a) With external oscillator set at 1720 kilocycles, adjust oscillator trimmer (rear of gang condenser).

   (b) Re-set external oscillator to 1400 kilocycles, rotate condenser, pick-up oscillator signal and adjust antenna trimmer to resonance (front section of gang condenser).

   (c) Check sensitivity at 600 and 1000 kilocycles.
ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-1065 Output I.F. Transformer
Part No. 108-105B Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser in its minimum capacity position, plates entirely out of mesh, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with "Dummy 1", to the control grid cap of the type 6SJ7 tube, and adjust the output I.F. transformer (No. 108-106B) to resonance.

(b) With "Dummy 1" still connected, move oscillator output clip from grid of 6SJ7 to grid cap of 6DJ8 and adjust input I.F. transformer (No. 108-105B) to resonance.

SHORT WAVE BAND ALIGNMENT:

9.5 to 16.1 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 17 megacycles and connected in series with "Dummy 3" to the antenna and ground leads, make the following adjustments:

(a) Move dial pointer to 17 megacycles and adjust short wave oscillator trimmer to resonance.

This adjustment is the trimmer mounted on the top of rear section of the variable gang condenser (see Fig. 1, top view).

(b) Adjust short wave antenna trimmer (Adjustment Number 1), to resonance (see Fig. 3, bottom view).

BROADCAST BAND ALIGNMENT:

250 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with "Dummy 2" to antenna and ground leads make following adjustments:

(a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance. (Adjustment number 3, see bottom view of chassis, Fig. 3).

(b) Re-set external oscillator to 1400 K.C. rotate variable gang condenser and pick up signal. Adjust broadcast antenna trimmer (adjustment number 2), to resonance.

(c) Re-set external oscillator to 600 K.C. and adjust broadcast series pad (adjustment number 4), to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3).

(d) Repeat adjustments "a" and "b" until sensitivity is at its maximum.

(e) Check for tracking and sensitivity at 1400, 1000, and 600 kilocycles. Under no circumstances bend plates of variable condenser sections to correct tracking.
SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with voltmeter connected in series with the tubes in their sockets and speaker connected with a meter having a resistance of 10,000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

In order to prevent signal from acting upon A.V.C. and affect accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages are to be measured with 6.3 volts input to receiver. Resistances of coils and transformer windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

RESONANCE INDICATOR:

Use as a resonance indicator an output meter connected across the primary of the speaker input transformer, or by means of an adapter between the two plate terminals of the type 19 output tube. Maximum deflection of the meter indicates resonance. Use only enough signal to get a readily readable output. A low range output meter or the low scale of a multi-range meter should be used.

DUMMY ANTENNAS:

The following dummy antennas are used in aligning and are referred to in the following alignment instructions as “Dummy 1”, “Dummy 2”, and “Dummy 3”.

Dummy 1: (I.F.)—Consists of a .1 mfd. condenser connected in series with the external oscillator.

Dummy 2: (Broadcast)—Consists of a 200 mfd. condenser and a 20 ohm resistor connected in series with each other in series with the external oscillator.

Dummy 3: (Middle and Short Wave)—Consists of a .1 mfd. condenser and a 400 ohm resistor connected in series with each other and in series with the external oscillator.

ALIGNING I.F. TRANSFORMERS: (465 K.C.):

Part No. 108-92 Output I.F. Transformer
Part No. 108-93 Input I.F. Transformer

These I.F. transformers have two adjustments, both of which are accessible from the top of chassis (see top view).

1. With volume control full on, (the extreme right of its rotation), the band changing switch in the broadcast position, (extreme left of its rotation), and with the variable condenser set to approximately 1400 kilocycles, make the following adjustments:

(a) Connect external oscillator set at 465 kilocycles, in series with “Dummy 1”, to the control grid cap of the type 6S7G tube, and adjust the output I.F. transformer (No. 108-92) to resonance.

(b) With “Dummy 1” still connected, move oscillator output clip from grid of 6S7G to grid cap to 6D8G and adjust input I.F. transformer (No. 108-93) to resonance.

SHORT WAVE BAND ALIGNMENT:

5.35 to 18.1 Megacycles

1. With band changing switch in the short wave position, extreme right of its rotation, and with external oscillator set at 18 megacycles and connected in series with “Dummy 3” to the antenna and ground posts, make the following adjustments:

(a) Move dial pointer to 18 megacycles and adjust short wave oscillator trimmer (adjustment number 1) to resonance.

(b) Re-set external oscillator to 17 megacycles and pick up signal by rotating variable condenser and adjust short wave R.F. trimmer (adjustment number 8), and short wave antenna trimmer (adjustment number 9), to resonance.

(c) Re-set external oscillator and check set at 18.1 megacycles and 6 megacycles for band coverage and sensitivity.

NOTE: It is extremely necessary in making all of these adjustments that the fundamental oscillator signal be tuned in and not the image frequency which will fall below the fundamental on the receiver dial. As an example of this, a fundamental 18.3 megacycle signal can be tuned in only at 18.3 on the dial but also at approximately 17.4 megacycles.

MIDDLE WAVE BAND ALIGNMENT:

1990 to 5500 Kilocycles

1. With band changing switch in the middle wave position, center of its rotation, and with external oscillator set at 5.5 megacycles and connected in series with “Dummy 3” to the antenna and ground posts make the following adjustments:

(a) Move dial pointer to 5.5 megacycles and adjust middle wave oscillator trimmer (adjustment number 2) to resonance.

(b) Re-set external oscillator to 5 megacycles and pick up signal by rotating variable condenser and adjust middle wave R.F. trimmer (adjustment number 10), and middle wave antenna trimmer (adjustment number 5), to resonance.

(c) Re-set external oscillator and check sensitivity at 1200 kilocycles.

BROADCAST BAND ALIGNMENT:

540 to 1720 Kilocycles

1. With band changing switch in the broadcast position, extreme left of its rotation, and with gang condenser in its minimum capacity position, plates entirely out of mesh, and with external oscillator connected in series with “Dummy 2” to antenna and ground posts, make the following adjustments:

(a) Set external oscillator to 1720 K.C. and adjust broadcast oscillator trimmer to resonance. (Adjustment number 4; see bottom view of coil assembly, Fig. 4)

(b) Re-set external oscillator to 1900 K.C., rotate variable gang condenser and pick up signal. Adjust broadcast R.F. trimmer (adjustment number 6) and broadcast antenna trimmer (adjustment number 7) to resonance.

(c) Re-set external oscillator to 600 K.C., and adjust broadcast series pad (adjustment number 3), to resonance by rotating condenser to approximately 600 K.C., rocking it slowly to and fro until by adjusting series pad maximum output is attained. This adjustment is located on the bottom of the chassis directly under the variable gang condenser. (See bottom view of chassis, Fig. 3).

(d) Repeat adjustments “a” and “b” until sensitivity is at its maximum.

(e) Check for tracking and sensitivity at 1400, 1000, and 600 kilocycles. Under no circumstances band plates of variable condenser sections to correct tracking.

FIG. 3.—BOTTOM VIEW SHOWING TRIMMERS
ALIGNING I.F. TRANSFORMERS: (465 K.C.)

1. With volume control full on and with variable condenser at its minimum capacity position, plates entirely out of mesh, and with external oscillator set at 465 K.C. connected in series with a .1 mfd. condenser, to the grid of the IA6 tube (cap at top of tube), adjust I.F. transformers, parts number 104-67 and 108-68, to resonance. Both of these transformers have two (2) adjustments each, they are accessible from the tops of the cans (for location see top view).

   Use as a resonance indicator an output meter connected across the outside terminals of the speaker or means of an adapter to the plate and screen of the type IG5G output tube. Maximum deflection of the volt meter indicates resonance.

   Use only enough signal to get a readily readable output.

   A low range output meter or the low scale of a multi-range meter should be used.

BROADCAST BAND ALIGNMENT:

1. Set external oscillator to 1720 K.C. and connect it in series with a 200 mmfd. condenser to the antenna and ground posts.
   (a) With variable condenser in its minimum capacity position, plates entirely out of mesh, adjust oscillator trimmer (rear section of variable condenser) to resonance.
   (b) Re-set external oscillator to 1400 K.C. Rotate variable condenser, pick up signal and adjust antenna trimmer (front section of variable condenser) to resonance.
   (c) Re-set external oscillator to 600 K.C., move dial pointer to 600 K.C., and adjust series pad, part number 124-14 (see top view), to resonance. While making this adjustment, slowly rock variable condenser to and fro until maximum output is obtained.
   (d) Check for sensitivity at 1400, 1000, 600 K.C. DO NOT BEND PLATES.

FOR BEST OPERATION THIS RECEIVER MUST HAVE AN OUTSIDE AERIAL NOT OVER FIFTY FEET LONG INCLUDING THE LEAD IN.
MODEL 015130
Socket, Trimmers
GOODYEAR TIRE & RUBBER CO., INC.

LOCATIONS OF PARTS ON TOP OF CHASSIS.

LOCATIONS OF TRIMMERS UNDER CHASSIS

GOODYEAR MODEL 015130

CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII

A ground connection is of no importance and therefore has been eliminated.
POWER SUPPLY

The receiver is designed for operation from 105-130 volt Alternating Current (A.C.) supply or a 105-130 volt Direct Current (D.C.) supply. Never connect the receiver to any supply having a higher voltage than that specified on the sticker. If you are not sure of the power supply voltage at your home, your Power Company will furnish the information.

When using a D.C. supply allow sufficient time for tubes to warm up (approximately 1½ minutes), and if at that time the receiver does not operate, remove the line cord plug from the socket and reverse. Replace plug in the reverse position and allow tubes to warm up, at which time the receiver will operate.
GOODYEAR TIRE & RUBBER CO., INC.

PUSH BUTTON TUNING FOR MODELS 015040, 015050, 015100, 015110

SETTING PUSH-BUTTONS

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the highest frequency—that is, your selected station which is tuned in nearest number 150 on the Station Selector Knob.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of highest frequency and the Call Letter Tab for this station should be in the Push-button nearest the rear of the receiver.

Follow through with this same procedure, setting up the other 3 stations in the order of their frequency—that is, the second station set up will be second highest in frequency and the third station set up will be third highest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

To receive all other stations in the regular manner turn the tuning knob to the frequency of the station desired.

PUSH BUTTON TUNING FOR MODELS 015050, 015120, 015130

SETTING UP:

Unscrew (turn counter-clockwise) the push button two or three turns. (Use a token or screwdriver in the button slot to unscrew it, if necessary.) Push the button all the way in. Hold it firmly and at the same time tune in your desired station. With your station tuned in, lock the adjustment securely tightening (turn clockwise) the push button knob using token or screwdriver. Hold the button in while tightening it. Unless the button is tightened securely, the adjustment may slip. Punch out the station's call letters from the sheet supplied and insert the call letters in the recess in the button. Then cover the call letters with one of the clear celluloid discs supplied.

Proceed in the same manner for the remaining buttons. If a change in selection of stations is desired, the old call letters can be removed with a pin inserted in the slot under the call letters.
GOODYEAR TIRE & RUBBER CO., INC.

GOODYEAR MODEL 015070

ALIGNMENT PROCEDURE

TYPICAL UNIT

Output meter connection 3.37 volts
Output meter reading to indicate 800 milliamperes 3.37 volts
Generator ground lead connection (X, Y, Z)

Dampness setting to be in series with generator output.

Position of Volume Control 3.37 volts
Position of Dial Pointer with variable fully closed 3.37 volts
Position of Dial Pointer with variable fully closed ...

GOODYEAR MODEL 015060

ALIGNMENT PROCEDURE

TYPICAL UNIT

Output meter connection 3.37 volts
Output meter reading to indicate 800 milliamperes 3.37 volts
Generator ground lead connection (X, Y, Z)

Dampness setting to be in series with generator output.

Position of Volume Control 3.37 volts
Position of Dial Pointer with variable fully closed 3.37 volts
Position of Dial Pointer with variable fully closed ...

GOODYEAR MODEL 015080

ALIGNMENT PROCEDURE

TYPICAL UNIT

Output meter connection 3.37 volts
Output meter reading to indicate 800 milliamperes 3.37 volts
Generator ground lead connection (X, Y, Z)

Dampness setting to be in series with generator output.

Position of Volume Control 3.37 volts
Position of Dial Pointer with variable fully closed 3.37 volts
Position of Dial Pointer with variable fully closed ...

GOODYEAR MODEL 015120

ALIGNMENT PROCEDURE

TYPICAL UNIT

Output meter connection 3.37 volts
Output meter reading to indicate 800 milliamperes 3.37 volts
Generator ground lead connection (X, Y, Z)

Dampness setting to be in series with generator output.

Position of Volume Control 3.37 volts
Position of Dial Pointer with variable fully closed 3.37 volts
Position of Dial Pointer with variable fully closed ...

GOODYEAR MODEL 015130

ALIGNMENT PROCEDURE

TYPICAL UNIT

Output meter connection 3.37 volts
Output meter reading to indicate 800 milliamperes 3.37 volts
Generator ground lead connection (X, Y, Z)

Dampness setting to be in series with generator output.

Position of Volume Control 3.37 volts
Position of Dial Pointer with variable fully closed 3.37 volts
Position of Dial Pointer with variable fully closed ...

Note: The procedure should be repeated twice to ensure the accuracy of the readings.
PUSH BUTTON TUNING

SETTING UP:

1. Leave the radio turned on for about 15 minutes before adjusting the push buttons. This turning-on period will ensure permanent and accurate settings.

2. Make a list of the stations that you want to set up for push button tuning. It is helpful to arrange the stations in the order of their frequency. For example, the station of lowest frequency will be #1, the station of next highest frequency #2, etc. The top left push button can be used for station #1, the lower left one for station #2, etc. If you wish, short wave stations that can be tuned in on AIRBAND are also set up for push button tuning. The stations selected must give strong and reliable reception.

3. Remove the four screws that hold the plate through which the push buttons protrude, and remove the plate. (This plate is called the "snap-in plate").

4. Push the button that you wish to use for your #1 station, all the way in and hold it in firmly. Push the tuning knob and turn it until your #1 station is tuned in exactly, as indicated by the tuning eye. Be as exact as possible in tuning your station since this will determine how accurately your station will be tuned, whenever you use the push button. Then let go of the push button and turn the tuning knob again. If properly done, the tuning eye indication will not change when you let go of the push button.

5. Push in your #2 button. Hold it in firmly and tune in your #2 station accurately. Then let go of the push button. Repeat the same procedure for the other stations on your list.

6. Set the 5th button in the Snap-in plate, as described in Step 1, and snap the plate back into place. (This plate is called the "snap-in plate").

OPERATION:

1. When you wish to use your push button, place your finger on your desired push button and then push the button which is the same as the station your want to tune in.

2. Snap the plate back into place and tune in the station that you have just selected.

3. Repeat this operation as often as desired.

4. When you are finished using your push button, simply remove the plate and replace it with the original one.

5. The snap-in plate can also be used for short wave stations that can be tuned in on AIRBAND.

6. The snap-in plate can be used for both AM and FM stations.
ALIGNMENT GOODYEAR MODEL 015090

Output meter connection ... Across loud speaker voice coil
Output meter reading to indicate 500 milliwatts ... 1.06 volts
Generator ground lead connection ... Receiver chassis
Dummy antenna value to be in series with generator output. See chart below
Connection of generator output lead ... See chart below
Generator modulation ... 30%, 400 cycles
Position of volume control ... Fully clockwise
Position of tone control ... HI Position of dial pointer (variable closed) ... Center of block to left of 550 kc calibration mark.

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<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION</th>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;AM&quot;</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>6A80 Grid</td>
<td>T3, T2, T1</td>
<td>IF Output, IF Interstage, IF Input</td>
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<td>&quot;SW&quot;</td>
<td>18 kc</td>
<td>18 kc</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C28</td>
<td>Oscillator</td>
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<td>&quot;SW&quot;</td>
<td>15 kc (rock)</td>
<td>15 kc</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C11, C4</td>
<td>Translator, RF</td>
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<td>&quot;G&quot;</td>
<td>9.55 kc</td>
<td>9.55 kc</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C26</td>
<td>Oscillator</td>
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<td>Ant. Term.</td>
<td>C13</td>
<td>Translator, RF</td>
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<td>&quot;15&quot;</td>
<td>14.9 kc</td>
<td>14.9 kc</td>
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<td>C3</td>
<td>Oscillator</td>
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<td>Ant. Term.</td>
<td>C12</td>
<td>Oscillator</td>
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<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C31</td>
<td>Padder</td>
<td></td>
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</table>

IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

"Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peak is the image.

Where indicated by the word, "rock," the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVG action of the receiver ineffective.
SETTING THE AUTOMATIC TUNER LEVERS TO STATIONS:

When setting up stations for the tuner levers it is important that the lever is pressed all the way down and held firmly in this position until the station is carefully selected by means of the manual tuning control.

This same procedure is followed until all the levers have been set up for stations, then the locking screw should be turned until it is absolutely tight. This is extremely important inasmuch as if the locking screw is not tight the condenser on the con shaft will slip and the stations will not stay adjusted to the tuner lever settings.

To reset one or more tuner levers to other stations it is only necessary to loosen the locking screw sufficiently to permit the mechanism to turn freely when the lever is pressed down as explained above and select the new station for the particular lever, however, make sure to re-tighten the locking screw again to lock the condensers back in place.

DIAGRAM FOR GOODYEAR CHASSIS 100502
Model 100-502
Double Eagle
GOODYEAR TIRE & RUBBER CO., INC.
Early, Late Alignment, Socket Trimmers
Early Schematic of Alignment Procedure
Serial No. 30,000 to 40,500

Preliminary:
Output meter connections: Across voice coil leads.
Output meter readings to indicate 1 watt output: 1.7 volts.
Average sensitivity in millivolts for 1 watt output: .5 micro volts.
Dummy antenna value to be in series with generator output. See chart below.
Connection of generator output lead: See chart below.
Connection of generator ground lead: To chassis.
Generator modulation: 30%, 400 cycles.
Position of volume control: Fully clockwise.
Position of tone control: Snapped to "HI".
Position of local-distance switch: Snapped to Distance position.

<table>
<thead>
<tr>
<th>Dial setting</th>
<th>Remote tuner unit</th>
<th>Generator Frequency</th>
<th>Dummy Antenna</th>
<th>Generator Connection</th>
<th>Trimmers Adjusted (in order shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
<th>Approximate Microvolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 K.C.</td>
<td>455 K.C.</td>
<td>.5 mfd.</td>
<td>Grid of 6X7</td>
<td>Output I.F.</td>
<td>G, H See note &quot;A&quot; below</td>
<td>Adjust to maximum output</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>1400 K.C.</td>
<td>455 K.C.</td>
<td>.5 mfd.</td>
<td>Grid of 6X7</td>
<td>Output I.F.</td>
<td>I See &quot;B&quot; below</td>
<td>Adjust to maximum output</td>
<td>20,000</td>
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<tr>
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<td>455 K.C.</td>
<td>.5 mfd.</td>
<td>Grid of 6X3</td>
<td>Input I.F.</td>
<td>C, See Fig. 11</td>
<td>Adjust to resonance</td>
<td>512</td>
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<tr>
<td>1550 K.C.</td>
<td>1550 K.C.</td>
<td>.000175 mfd.</td>
<td>Antenna Lead</td>
<td>Oscillator</td>
<td>A, B See Fig. 11</td>
<td>Adjust to maximum output</td>
<td>512</td>
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<tr>
<td>1400 K.C.</td>
<td>1400 K.C.</td>
<td>.000175 mfd.</td>
<td>Antenna Lead</td>
<td>Antenna and H.F.</td>
<td>D See Fig. 10</td>
<td>Adjust to maximum output</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

A- To align the output I.F. transformer without using a cathode ray oscillograph, a 10K ohm resistor must be shunted across one winding of the output I.F. coil assembly while adjustment to trimmers G and H are being made.

Connect the resistor as indicated by points "1" and "2" on the circuit diagram as follows:

   - Locate the wires coming from the bottom of the output I.F. coil assembly on the underside of the radio chassis.
   - The white lead with green tracer which is connected to diode plate terminal No. 6 on the 6X7 tube socket is one point and the white lead with brown tracer which is connected to the end terminal of the terminal strip is the other point.

B- Disconnect the 10K ohm resistor before adjusting trimmer "1". If a cathode ray oscillograph is used it will not be necessary to connect a 10K ohm resistor across a portion of the I.F. coil as explained.

C- When adjusting the shunt oscillator trimmer "D", which is mounted on the base of the radio receiver unit (see Fig. 10), the dial on the remote tuner unit should be rotated slightly to and fro at the same time adjusting trimmer "D" for maximum gain.

It is advisable to repeat the entire alignment procedure to insure greater accuracy.

Always keep the output from the test generator (oscillator) at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

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ALIGNMENT PROCEDURE

PRELIMINARY:

Output Meter Connections—Across "F" & "S" of IA5G Tube. 1400 KC None
Output Meter Reading to Indicate 100 milli watt.........48 Volts
Generator Ground Lead Connection.................Receiver Chassis

This alignment procedure should be repeated in the original
Connection of Generator Output Lead........See Chart Below
Generator Modulation......................30% 400 Cycles
Position of Volume Control......................Fully On lowest possible value to prevent the A.V.C.
### Resistor Parts List Model DD-1

<table>
<thead>
<tr>
<th>No.</th>
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<th>Wattage</th>
<th>Parts No.</th>
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</thead>
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<td>1/3</td>
<td>22-064</td>
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<tr>
<td>82</td>
<td>3,000</td>
<td>1/3</td>
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<td>83</td>
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### Capacitor Parts List Model DD-1

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<th>PART No.</th>
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<td>Main</td>
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### Audio Amplifier DD-A

- 75 50 mfd. Mica: 40-023
- 76 0.005 mfd. Ceramic: 40-023
- 77 0.001 mfd. Ceramic: 40-023
- 78 33 mfd. Mica: 40-023
- 79 10 mfd. Mica: 40-023
- 80 100 mfd. Mica: 40-023
- 81 1000 mfd. Mica: 40-023
- 82 10000 mfd. Mica: 40-023
- 83 47 mfd. Mica: 40-023
- 84 470 mfd. Mica: 40-023
- 85 10 mfd. Mica: 40-023
- 86 22 mfd. Mica: 40-023
- 87 10 mfd. Mica: 40-023
- 88 1000 mfd. Mica: 40-023
- 89 10000 mfd. Mica: 40-023
- 90 47 mfd. Mica: 40-023
- 91 470 mfd. Mica: 40-023
- 92 10 mfd. Mica: 40-023
- 93 22 mfd. Mica: 40-023
- 94 10 mfd. Mica: 40-023
- 95 22 mfd. Mica: 40-023
- 96 10 mfd. Mica: 40-023
- 97 22 mfd. Mica: 40-023
- 98 10 mfd. Mica: 40-023
- 99 22 mfd. Mica: 40-023
- 100 10 mfd. Mica: 40-023
- 101 22 mfd. Mica: 40-023

### Diagram

The diagram includes the schematic of the audio amplifier DD-A with various components labeled and connected. The schematic shows the integration of resistors, capacitors, and other components typical in audio amplifier designs.
ALIGNMENT & SERVICING INSTRUCTIONS

STRIDER DIVERSITY RECEIVER

MODEL 101

SWITCHING ARRANGEMENT

For speed, ease and accuracy in aligning the Dual Diversity receiver, it is recommended that the output of the signal generator be terminated in a switching box in which you have installed a single pole single throw switch. From this switching box, the connection to the receiver is made through a shielded cable. Run two leads one of which is connected to the main switch and the other to Section "A". Operation of the switch will readily allow you to switch the signal generator to either receiver switch being aligned for a quick confirmation check.

INTERMEDIATE FREQUENCY ALIGNMENT

Have the gain set to following:
Have I.F. gain switch in NORMAL position.
Receiver switch to "A" side.

IN ALIGNING "A" SECTION:

Connect signal generator to the grid of the "A" section 6L7 converter (see diagram for location.) Adjust the signal generator for 450 KC output. Adjust I.F. transformers in the "A" receiver until they are peaked for maximum gain.

IN ALIGNING "B" SECTION:

Connect the signal generator to the 6L7 converter tube in the "B" receiver and duplicate the adjustments done to the I.F. transformers of Section "A". The receiver switch will necessarily be switched to the "B" side.

REJECTOR ADJUSTMENT

Before aligning the I.F. Rejector Circuit, the variable rejector condensers found below the chassis and driven by the long flexible copper cable, should be set as follows:

With the rejector pointer set at + 3 KC, check the first rejector condenser [closest to the front panel in each I.F. section.] It should have its plates about 20% in each of the following procedures:

1. The second rejector condenser (farthest from front panel) should have its plates about 20% in each of the sections.

2. The same relationship should exist between the condensers in the other I.F. section. When turning the rejector knob, turn it with a small amount of force.

3. When the plates on the second rejector condenser are meshing.

To ensure correct adjustment of the rejector circuit it is essential to have two signals available which are accurately removed from the 450 KC fundamental. By 3 KC on each side. The most satisfactory way to accomplish this is to use two crystals, one for 452 KC output and the other for 458 KC output. In the event, however, that crystals of those frequencies are not available, a satisfactory substitute can be used which consists of the following procedure: Put the 450 KC generator to the right of the rejector circuit. Feed 452 KC from the signal generator into the diode 6L7 converter. Remove modulation from the signal before it is delivered by the generator. Obtain the correct output from the 450 KC setting until a beat note of 3000 cycles (+ or - of 450 KC) is heard. Remember the pitch of that note. It will be necessary to adjust the signal generator to a frequency 3000 cycles lower than 450 KC. A little practice will enable you to set the receiver to 455 KC. The 3 KC beat note is quite accurate, and if signals of 452 and 458 KC are used, the same results can be obtained by this method. These signals should be used to properly peak the rejector circuit. This method is recommended only when a closely calibrated signal generator or a crystal controlled signal generator is not available.

Begin with receiver B. Set signal generator to 450 KC output. Adjust the 2nd Rejector Control (shown in the top chassis view) for minimum response. There should be 2 points of minimum response. If there is only one minimum point, rotate the adjusting knob on this control approximately 1/4 turn from the minimum and check. Then, carefully adjust the 3rd rejector control until a minimum occurs. Adjust the 2nd rejector control for minimum response. Now adjust the first phasing control (screw driver shaft nearest front panel), for minimum response. Readjust the 2nd rejector control carefully for minimum response. Repeat with "A" side without changing position of the signal generator. Connect the signal generator to the "A" side 6L7, and switching the receiver to the "A" side. Readjust signal generator to 450 KC. Make similar adjustments on Rejector Controls 3 and 4 and the rear phasing control. Switch over to the "B" receiver and repeat these adjustments on the "B" side.

Now tune signal generator to 450 KC [still connected to "B" side]. Carefully repeat each of the I.F. transformer trimmer condenser. Switch signal generator output to 6L7 is "A" side and repeat the above operation.

NOTE: The gain of each receiver should be approximately the same. Variation between receiver sections should not exceed 20% as shown on output meter readings. Gain balance is far off, interchanging the 6L7 I.F. amplifier tubes sometimes improves it.

R.F. ALIGNMENT

Adjust receiver to Band 1, set "A". Have all gain controls at maximum, balance control in center position.

How connect signal generator to antenna post of "A" receiver section through a 400 ohm resistor. Note at the set up and leave it there during alignment. Adjust generator to 1400 KC. Set dial on receiver to that frequency. Align oscillator, set R.F. and antisigma trimmers in the order named for maximum gain.

Connect oscillator at 1400 KC. Set dial on receiver to 1400 KC and repeat the above operations with the exception of the oscillator section which does not require realignment of this section. Gen generator to 450 KC. Adjust oscillator for maximum response. Realign oscillator at 1400 KC. Repeat the above procedure on the remaining bands, except that on Band 2-4-6-8 the R.F. path should be adjusted for maximum response on the low frequency end of each band.

Care should be exercised in avoiding alignment on the image frequency. In every case, the image will be heard approximately 1 megacycle lower when adjusting the main tuning dial.

The greatest caution should be taken when adjusting the No. 5 band oscillator oscillator. Because only a slight change causes a large variation in frequency and may throw the oscillator completely out of band. The relative sensitivities of receivers "A" and "B" should not vary more than 50%. A frequent cause of unbalance between receivers is defective 1521 tubes or R.F. coils.

POWER PACK

DD-P
BEAT FREQUENCY OSCILLATOR ADJUSTMENTS

Place the B.F.O. Key in the Heterodyne position.

With 455 Kc signal from generator feeding into the "A" 6L7 converter and receiver "A" functioning, and the chassis standing on its left end (looking at set from the front) adjust the padding condenser inside the B.F.O. Shield can until zero beat is reached. The B.F.O. shield can is located directly behind the pitch control. Prior to making this adjustment assure yourself that the PITCH CONTROL condenser is at 50% capacity pointer on control positioned vertically). When properly adjusted, rotation of the pitch control condenser will show two beat note signals 180 degrees apart.

8 METER ADJUSTMENT

Push in No. 6 Band Button. With gain controls at maximum, adjust the zero reset control on all meters for zero.

NOTES:

If overload occurs on the broadcast band it might be advisable to shorten the length of the receiving antennas. If this recommendation is of little help check for a short to ground in the A.V.C. circuit.

Should the occasion of examining the coil units arise, exercise extreme care in moving the heavy leads attached to the switch terminals. Excessive movement of one of these leads may cause the contacting portion of the switch to be thrown out of alignment and provide improper contact.

If it becomes difficult to properly heterodyne a strong signal when listening to C. W. reception, reduce the overall gain with the master gain control 'till a satisfactory note is obtained.
This control rotates the large calibrated dial so that the desired frequency can be easily located. The accuracy of calibration is held to close tolerances. This calibration will be correct, however, only if the "spread" dial is set at 0 or minimum capacity.
Sky Buddy

The model S10-R Sky Buddy is a 6 tube 4 band superheterodyne receiver covering the following frequencies:

1. Band 1 = 540 KC to 1700 KC
2. Band 2 = 1.7 MC to 5.5 MC
3. Band 3 = 5.5 MC to 17.0 MC
4. Band 4 = 16.0 MC to 46.0 MC

Condenser Parts List:

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<tr>
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<td>0.125</td>
</tr>
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The tube lineup of the S10-R Sky Buddy is as follows:

1. 6K8 1st Detector
2. 6A8 1st Amplifier
3. 6N7 2nd Amplifier
4. 70 Microphone Amplifier
5. 70 BFO
6. 90 Rectifier
7. A-C 60 watts at 117 volts, 60 cycles A.C.
ANTENNA

For successful operation of the receiver throughout its tuning range very satisfactory results can be obtained with an inverted 'L' type antenna 75 feet long overall. When this type of antenna is used the jumper should remain connected between 21 and 22.

If the operator should wish to obtain the maximum in performance from the receiver on any one frequency, it is suggested that a half wave doublet antenna cut for that frequency be installed.

The formula for calculating the overall length of this antenna is:

\[
\text{Length in feet} = \frac{462}{\text{Frequency in megacycles}}
\]

The antenna is cut in the center and connected to a twisted pair transmission line having a characteristic impedance of 75 ohms. The other end of this line is connected to the A1 and A2 antenna posts.

This antenna will not perform well at harmonic frequencies but should be better than the inverted 'L' on the frequency for which it has been designed. Performance on the 40 meter band, even with a suitable antenna, is subject to varying conditions of the time of the day and year.

A ground is usually not necessary for satisfactory performance of the model S-12-R Sky Buddy receiver. If a ground does prove helpful it is connected to the "G" post of the antenna terminal pitch.

"BANDSPREAD"

In no other similar receiver but the S-12-R Sky Buddy can be found such extremely smooth and satisfactory electrical bandspread action. The meter plates are an integral part of the main condenser and the separate rotor sections are driven by a gearless mechanism through the separate bandspread knob.

The controls along the bottom edge of the receiver are:

SEND-RECEIVE SWITCH which, when in the "send" position, removes plate voltage from the tubes.

The BAND SWITCH allows selection of any one of the four ranges covered by the receiver. The newly incorporated 16 meter band will prove to be most interesting when conditions are favorable for reception on that range.

The B.F.O. "ON-OFF" SWITCH allows optional use of the Beat Frequency Oscillator and is used when the operator is copying code signals. It will be of additional help in locating weak Morse signals by first locating their carrier. Once located, the B.F.O. may then be turned off to eliminate the whistle.

The PITCH-CONTROL knob allows the operator to vary the pitch of the best note when the BFO switch is in the "on" position. Selection of the pitch of the beat note most pleasing to the operator will be of help in copying through interference. The A.V.C. "OFF" and "ON" switch is for optional use of automatic volume control. Should the strength of the telephone signal be so strong as to block the receiver the A.V.C. switch should be "on". For maximum sensitivity leave the A.V.C. switch "off" and manually adjust the gain of the receiver with the audio gain control.

The receiver is turned on and off with this control and additionally provides variation of the volume delivered by the receiver to suit the requirements of the listener.

A Headphone Jack is mounted on the panel to the right of the Pitch Control knob. When headphones are used, inserting the phone plug in the jack automatically disconnects the speaker.

ALIGNMENT PROCEDURE FOR SKY BUDDY MODEL S12-R

1. F. ALIGNMENT

Have the controls set as follows:

Audio gain control at maximum
A.V.C. switch "on"
Range switch on Band 40
Set main dial to minimum capacity 5.5 M.C. position
Remove 6KD grid cap and connect signal generator to this tube.
Set signal generator for 455 KC output.

Adjust trimmers on transformers T1, T2 for maximum output.

For adjustment of the B.F.O., place the BFO switch in the "on" position. Remove the knob from the pitch control shaft. You will see a small adjustment screw in the center of this shaft. On the under-chassis side of this shaft you will see a nut screw which should be loosened in order to allow adjustment of the screw in the center of the pitch control shaft. Adjust to zero beat. Tighten the set screw and replace the knob. Should the BFO still fail to operate check the .0005 condenser in the BFO circuit, or the 75 BFO tube.

2. F. ALIGNMENT

Connect the generator to the A1 terminal on the antenna terminal strip found on the rear apron of the chassis through a 400 ohm resistor. Leave the jumper connected between A2 and G. The trim and pad points for the 4 bands are illustrated below:

Set the signal generator to the required frequencies for each band, adjust the main tuning dial to those frequencies (with the bandspread condenser at minimum capacity) and then adjust the indicated trimmers and padders to resonance.

The receiver is turned on and off with this control and additionally provides variation of the volume delivered by the receiver to suit the requirements of the listener.
ANTENNA:

The EXKINDER-33 has an antenna input circuit which will allow the use of any of the following:

- Antenna of any type, including the use of an "L" type antenna.
- A doublet antenna, consisting of two elements, each of which is fed at the center and has an impedance of 500 ohms.
- A helical antenna, consisting of a coil of wire wrapped around a central conductor, with an impedance of 500 ohms.
- An array of antennas, consisting of two or more elements, each of which is fed at the center and has an impedance of 500 ohms.

The impedance of the antenna input circuit is 500 ohms, and the impedance of the transmission line is 500 ohms. The antenna input circuit is designed to match the impedance of the transmission line to 500 ohms, ensuring optimal performance.

Frequency and Bandwidth:

The frequency range of the EXKINDER-33 is from 10 MHz to 100 MHz. The bandwidth of the antenna input circuit is 100 kHz to 10 MHz.

Quality and Stability:

The EXKINDER-33 antenna input circuit is designed to provide high-quality, stable performance. The circuit is designed to reject interference and maintain signal integrity over a wide range of frequencies.

Controlling the Antenna Input Circuit:

The antenna input circuit is controlled by the following:

- The "Gain" control adjusts the sensitivity of the receiver by varying the amount of gain.
- The "Selectivity" control adjusts the selectivity of the receiver by varying the amount of selectivity.
- The "Phase" control adjusts the phase of the signal.
- The "Balance" control adjusts the balance of the signal.
- The "Filter" control adjusts the filter characteristics of the signal.
- The "Bandwidth" control adjusts the bandwidth of the signal.
- The "Attenuation" control adjusts the attenuation of the signal.
- The "Gain" control is used to adjust the sensitivity of the receiver.
- The "Selectivity" control is used to adjust the selectivity of the receiver.
- The "Phase" control is used to adjust the phase of the signal.
- The "Balance" control is used to adjust the balance of the signal.
- The "Filter" control is used to adjust the filter characteristics of the signal.
- The "Bandwidth" control is used to adjust the bandwidth of the signal.
- The "Attenuation" control is used to adjust the attenuation of the signal.

When using the antenna input circuit, it is important to ensure that the antenna is properly matched to the input impedance of the receiver. This can be done by using a matching network or by using a coaxial cable with a low-loss characteristic.

The EXKINDER-33 antenna input circuit is designed to provide high-quality performance over a wide range of frequencies. The circuit is designed to reject interference and maintain signal integrity over a wide range of frequencies.

Selectivity Switch:

The selectivity switch is used to adjust the selectivity of the receiver. The switch has three positions:

- "Off" position: The selectivity is off, and all signals are passed through the receiver.
- "Low" position: The selectivity is set to a low value, and only the strongest signals are passed through the receiver.
- "High" position: The selectivity is set to a high value, and only the strongest signals are passed through the receiver.

When using the selectivity switch, it is important to ensure that the correct position is selected for the desired application. The "Low" position is used for applications where selectivity is not required, such as in broadcast reception. The "High" position is used for applications where selectivity is required, such as in amateur radio reception.

Interference Rejection:

The EXKINDER-33 antenna input circuit is designed to reject interference and maintain signal integrity over a wide range of frequencies. The circuit is designed to reject interference and maintain signal integrity over a wide range of frequencies.

Conclusion:

The EXKINDER-33 antenna input circuit is designed to provide high-quality, stable performance. The circuit is designed to reject interference and maintain signal integrity over a wide range of frequencies. The circuit is designed to be easy to use and maintain, ensuring optimal performance over a wide range of applications.
THE HALLICRAFTERS INC.

MODEL SX23
Super Skyraider
Schematic, Notes

TUBE LINE-UP

6SK7 R.F. Amplifier
6SA7 1st Detector-Mixer
6SJ7 High Frequency Oscillator
6SK7 1st I.F. Amplifier
6SK7 2nd I.F. Amplifier
6SQ7 2nd Detector, 1st Stage
6F6 2nd Stage of Audio of Audio
6SJ7 Beat Frequency Oscillator
6H6 Automatic Noise Limiter
6B8 Amplified A.V.C.
8O Rectifier

Close to the license tag on the rear of the receiver will be found a knob which is
to be used in adjusting the S meter. Prior to adjusting this control the R.F. gain
circuit must be in the minimum gain position, or rotated clockwise until the S meter
reads zero. Disconnect the receiver from the antenna, tuning the
antenna, and then read the S meter and adjust gain until the
S meter reads zero, as described above. To adjust the
S meter, read the S meter and adjust gain until the
S meter reads zero.

Reconnect the antenna to the receiver, tuning the
antenna, and then read the S meter and adjust gain until the
S meter reads zero, as described above. Reconnect the
antenna to the receiver, tuning the
antenna, and then read the S meter and adjust gain until the
S meter reads zero, as described above.

Close to the license tag on the rear of the receiver will be found a knob which is
-30 dB or more frequently used.

In the step of selecting the S meter does not function in the A.V.C. circuit which preferably is used for telephone
reception, because the meter is connected in the A.V.C. circuit which preferably is used for telephone
reception.
On the rear apron of the chassis you will find output terminal strips marked 500 and 5000 ohms. The Hallcrafters permanent magnet dynamic matching 823 speaker should be connected to the 500 ohm terminals. The 500 ohm contacts can be connected to a separate speaker or a load of that impedance value. The terminals marked "EXT SW" should be connected to an external switch, a portion of which is used to turn "on" and "off" your transmitter. The "EXT SW" terminals are paralleled with the front panel "Send Receive" switch. In order to make the external switch operate the "Send Receive" switch must be left in the "send" position. In viewing the receiver from the back the right hand "EXT SW" contact is grounded.

When connecting to associated equipment this point should be borne in mind so that no potential difference will arise between it and the receiver.
BAND SPREAD

Realizing that exact accuracy in a very desirable feature, the BAND SPREAD control was designed to allow the amateur bands from 10 to 80 meters could be back- and forward. The switch mechanism and associated temperature compensated capacitors are unique and eliminate the necessity of accurately setting the main tuning dial whenever it is desired to spread the amateur frequencies.

The four "Band Spread" positions found on the SIDEKICK 38 cover the frequencies indicated below:

- Band 10 - 25.0 kc to 50.0 kc
- Band 20 - 10.0 kc to 14.0 kc
- Band 30 - 5.0 kc to 7.0 kc
- Band 40 - 3.0 kc to 4.0 kc

When operating in the Band Spread position it will be noticed that more than just the frequencies of each amateur band are covered. This has been found advisable for the reception of signals being sent on frequencies outside of the amateur bands, as well as the reception of commercial stations for market purposes, and as such their exact frequency is usually known.

Each amateur band is spread over a sufficient number of divisions on the band spread scale to make tuning on that particular band effortless and accurate.

In addition to the frequency range in the circuit being identified by the Hallcrafters band switch, such as the main tuning dial, that particular band is also shown by the indicator to the right of the main dial.

ALIGNMENT PROCEDURE

The alignment of the BAND SPREAD is straightforward and requires no equipment other than the usual signal generator, or signal source, and an output meter.

1. F.P. ALIGNMENT

No. 1 - Remove the "Bottom Fun" from the console and place the "RF Collar Shield 300" so that the RF oscillator and mixer tube bases are accessible.

No. 2 - Unplug the side switch grid wire from 680 Vf tube base at the point at which it connects to the switch box No. 5. Signal is supplied to this grid for alignment of I.F. AVC and AVC circuits. An output meter is connected across 600 KΩ speaker terminals.

No. 3 - Connect the signal generator to the output grid of the 680 Vf through a .05 KΩ resistor, and a signal generator from the output grid of the 680 Vf to AVC return on the 60 KΩ coil form. (See note "A" Schematic)

No. 4 - Place the selectivity switch in "AF Only" or "A.F. Sharp" position; the wave band switch in 6.2 to 14.0 megacycles position or 80 band, volume and AVC controls in maximum gain position.

No. 5 - Apply RF signal of sufficient strength to give an approximate output of 500 millivolt and adjust trimmers A1, A2, A3, A4, A5, A6, A7 and A8 to maximum deflection of output meter.

2. F.P. ALIGNMENT

The set is now in the band switch setting of the highest band used, and the only variable is the Band Spread control setting.

CRYSTAL ALIGNMENT

No. 6 - For alignment of crystal, place selectivity switch in "CW" position, remove modulation from signal source, adjust RF pitch control until a best note of approximately 1000 cycles is obtained. Increase the signal source from 500 cycles and then adjust the crystal pitch control to a point where the noise of the speaker is reduced to a minimum. Now vary the frequency of the signal source from 400 to 480 cycles, at same frequency between these points a sharp increase in speaker output will be noted. This is the resonant frequency of the crystal. The signal generator should be adjusted to this point of crystal resonance for maximum meter deflection. Touch up all trimmers, A2, A3, A4, A5, A7, and A8 for precise alignment to the crystal frequency. Assuming the output best note is still set at approximately 1000 cycles, leaving all control on the receiver as previously adjusted, change the frequency of the signal generator until the output best note is reduced to 400 cycles down from 1000 cycles. Increase the signal source to 6000 cycles, and the output best note is reduced to 400 cycles down from 6000 cycles. Increase the signal source to 12000 cycles, and the output best note is reduced to 400 cycles down from 12000 cycles. Increase the signal source to 24000 cycles, and the output best note is reduced to 400 cycles down from 24000 cycles. Increase the signal source to 48000 cycles, and the output best note is reduced to 400 cycles down from 48000 cycles. This is the resonant frequency of the crystal.

3. R.F. ALIGNMENT

No. 7 - To adjust the AVC, turn the dial of AVC control to "off" position, the selectivity switch to "AF Only" or "A.F. Sharp" position, and the frequency of the resonant frequency of the I.F. coil to the resonant frequency of the I.F. coil. Now adjust the AVC output to reduce the noise to a minimum, which is the point where the AVC is resonant and operating properly.

No. 8 - Reconnect the grid wire of the 680 Vf to the output section and replace the R.F. coil shield box.

4. TUNING

The holes in the "RF Collar Shield" marked with a "W" and a "K" and a "G" in the Instruction book are for the location of an "A.F. Sharp" alignment for proper adjustment. The "W" and a "K" and a "G" are a rod of insulating material having a brass slug in one end and a powdered iron slug in the other. When the brass slug is placed in line with the "W", the inductance is increased, and when the iron slug is used, the inductance is decreased. Use a very small part of the end of this iron slug which is present in the "AF Only" or "A.F. Sharp" position. If the meter deflection increases when the "W" end of the lug is in the field then the trimmer capacity should be increased. If the meter deflection increases when the "K" and "G" end of the lug is in the field the trimmer capacity should be increased.

When the receiver is fully balanced in its range, the indicator line on the dial will be in line with the zero mark on the band spread scale and the small line below "600 Ham" below the 600 Ham calibration point. The selectivity control in the "AF Only" or "A.F. Sharp" position, R.F. and Audio gain controls adjusted for maximum gain and of sufficient strength to give an approximate 500 millivolt output.

Band No. 1 - "664 kc to 1700 kc"

Connect a wire between A1 and ground terminal or "G" on the announcements strip. Connect the ground terminal of the signal generator to the ground terminal of the antenna strip and connect the high side of signal generator to A1 thru a 5000 KΩ resistor and the output of the signal generator to C6, 1 to resonance with this signal frequency and then adjust Watson trimmer and antenna trimmer in the same manner. Next set the signal generator to 1700 kc and while rocking the main tuning knob adjust trimmers B3 and B4 to obtain maximum response signal (indicated as red HI) until the output is maximum. Redock alignment at a frequency of 1600 kc and then the 600 Ham position angle for precise alignment.

Band No. 2 - "1700 kc to 6.3 Megacycles"

Note. Replace the 500 kc connector with a 4000 KΩ resistor for alignment of Bands 3, 4 and 5.

Following same procedure as Band No. 1, align first at 6000 kc, using trimmers indicated as "C6, F" and "R.F. trimmers" Band 1. The low frequency end is checked at 1800 kc by rocking condenser gang while adjusting pad 800 until maximum output is obtained.

Band No. 3 - "8.3 Megacycles to 16 Megacycles"

The high frequency end of this band is aligned at 14 megacycles, using oscillator trimmer "Osc, F" and 15 megacycles using series pad indicated "Pad HI".

Band No. 4 - "15 Megacycles to 34 Megacycles"

This band is aligned at 85 megacycles first by setting dial at 80 megacycles and adjust C6, 1 until signal is received, then by "rocking" condenser gang slightly and adjusting trimmers B3 and B4 trimmer until maximum output is obtained. Antenna trimmer, Band 4, is not aligned until the oscillator and R.F. trimmers are first aligned for maximum output. In addition, the calibration for low frequency tracking at this alignment is exact at 34 megacycles and should be performed.

The band spread positions do not require alignment as the alignment for band coverage position also takes care of band spread alignment.
THE HALLICRAFTERS INC.

MODEL SX24
Skyrider Defiant

Unless otherwise specified the SX24 Receiver operates on 100-125 volt 50-60 cycle current.

TUBE LINE-UP

6SK7 6SK7 6SK7 6SK7 6SK7 6SK7 76 80
1st I.F. Amplifier
2nd I.F. Amplifier
Automatic Noise Limiter

Best Frequency Oscillator

Schematic Diagram - Skyrider Defiant - Model SX-24

The model SX24 Receiver draws 70 watts alternating current.

Band Coverage
1 540 KC to 1730 KC
2 1700 KC to 5100 KC
3 5100 KC to 15700 KC
4 15700 KC to 48500 KC

FOR ANTENNA DATA SEE INDEX

DC OPERATION CONNECTIONS TO PART SOCKET AFTER REMOVAL OF SHORTHOLD PLUG

© John P. Rider Publisher
ALIGNMENT PROCEDURE

1. 460 Kc., Intermediate-Frequency Alignment:
   - Set main dial to 2 megacycles, band spread to zero.
   - B.F.O. switch in the "O" position.
   - Connect the grid cap and ground the hot side of your 460 Kc generator to the grid lead of the 2 megacycle circuit.
   - Connect the output of the generator to the input of the receiver. Adjust the control of the 460 Kc generator to give a steady signal of approximately 3000 cycles.

2. E.F. Alignment:
   - Re-connect the grid cap to the B.E.S. tube.
   - Connect the hot side of the generator to the A.G. antenna terminal on the rear of the chassis. Be sure a jumper is connected at D.
   - Set main dial to 5 megacycles, band spread to zero.

Readjust the B.F.O. to the correct frequency and align the IF frequency to the correct frequency as indicated by the crystal oscillator. Record the frequency on a chart for later reference.

4. IF Alignment:
   - Re-connect the grid cap to the generator. Connect the hot side of the generator to the A.G. antenna terminal on the rear of the chassis. Be sure a jumper is connected at D.
   - Adjust the control of the 460 Kc generator to give a steady signal of approximately 3000 cycles.

5. Main Dial Calibration:
   - Connect the IF frequency and align the output of the IF frequency to the correct frequency as indicated by the crystal oscillator. Record the frequency on a chart for later reference.

6. Main Dial Adjustment:
   - Adjust the control of the 460 Kc generator to give a steady signal of approximately 3000 cycles.

The accuracy of the main dial calibration will hold only if the SUB SPREAD condenser is set at minimum capacity, or the position indicated by "O" on the Band Spread dial which has been approached by turning the Band Spread knob in a counterclockwise direction, or to the right, as far as it will go.
12-tube superheterodyne covers a continuous range of from 31 to .54 mc. (9.7 to 555 meters) in 6 steps, thus taking in all important communication, amateur and broadcast bands.

ANTENNA REQUIREMENTS

The input of the "HQ-120" is arranged so that various types of antennas may be employed. The average input impedance is 400 to 600 ohms. The most common type of antenna used generally by the amateur and short wave listener is the Marconi, consisting of a single wire and ground connection.
CIRCUIT ARRANGEMENT

The preselector stage in this receiver is extremely high in gain due to its tuned grid and tuned plate circuit. This arrangement is beneficial in that it provides a high Q, which can be used to improve the selectivity of the receiver. The adjustable coupling resistors which appear on the grid of the second stage are provided to adjust the tendency of the preselector stage to produce a suitable response. This response is made variable by means of the tuning control assembly, which is located close to the signal amplifier stage. This assembly is provided with a signal of a constant frequency at the input to the detector stage. The output of the detector stage is then conveyed to the second stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage. The output of this stage is then conveyed to the output of the detector stage, which is a variable frequency oscillator stage.
**Model HQ-120X, Crystal**

**Operating Notes, Parts**

### HQ-120-X Operation

After unpacking the receiver check the chassis terminals to determine that all tubes are properly grounded and that all connections are properly made. Also, be certain that all grid clips are in place on the tops of the tubes. It is possible that the grid clips or tubes may be accidentally damaged during transportation.

This receiver, unless it is a special model, operates on 105 to 125 volts AC at 50 to 60 cycles. If you are uncertain as to the type of power available for operating the receiver, check with your local power company office. An attempt to operate the set on another type of power is liable to cause it to fail. Next, connect the speaker to the receiver. Insert the 5-watt 4-watt or 1-watt magnetic dynamic speaker controlled by the 2 turnings on the rear edge of the chassis marked "Speaker." The main power supply switch is located at the bottom rear on and off is operated in conjunction with the "on-off" control. When this control is in the "off" position, the receiver is completely deenergized. So, the next operation is to turn the receiver on lightly and wait for the tubes to heat up to 30°F. At this time, the receiver is in operation, and when having had ample time to heat up, we test the condition of the set by inserting a pair of earphones in the jack provided for that purpose. The set is now ready for use.

The operating connections to the receiver are as follows: 100 to 120 volts AC at 50-60 cycles. For accurate tuning, it will be necessary to omit the "30"-meter band from the setup, as this band may not be operating properly and may require further adjustment. After the receiver is tuned to a frequency at which it sounds good, the control knob should be set in the "off" position. This is the broadest setting. The controls of the other band should be set in the "off" position the panel should be set in the "off" position. This switch does not control the power line. The band switch connected to the second band should be set in the "off" position. The receiver should be turned off before making any adjustments.

### HQ-120-X Parts List

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<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
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<tbody>
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**Author's Note:**

The document contains detailed operating instructions, parts lists, and a diagram for the HQ-120X model receiver. It includes descriptions of components, part numbers, and operational procedures. The text is rich with technical specifications and is aimed at users who need to troubleshoot or repair the receiver. The parts list is comprehensive, listing nearly 20 different components, each with a specific part number. The diagram, while not fully visible, appears to outline the internal layout and connections of the receiver. The document is a valuable resource for anyone working with this specific model of a crystal receiver.
**MODEL 4B - BATTERY RECEIVER**

This model must not be confused with the Model 4BT. Electrically they are much the same but the Model 4B is built into an upright table cabinet with an oval dial, whereas the 4BT is a flat type cabinet with straight line dial.

The function of the tubes is as follows: 1A7G - Modulator, 1N5G - IF Amplifier, 1N5G - Diode Det. AVC, 1C5G - Output.

The trimmers for the antenna and oscillator coils are mounted directly on each coil. The output is rated at .180 to .360 milliwatts.

"A" Battery Drain at 12 volts - .25 amps.

"B" Battery Drain at 90 volts - .012 mill., or 7 miles. when using the "Economizer".

### PARTS LIST

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<td>Condenser - 2 Gags</td>
<td>10-325X</td>
<td>Drive Disc - 5-1/8 OD with Hub</td>
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<td>Condenser - &quot;E&quot; Filter</td>
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<td>22-935</td>
<td>I.F. Assembly - 1st</td>
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<td>I.F. Assembly - 2nd</td>
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<td>Knob - 13/16&quot;, Brown Bakelite</td>
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<td>17-602</td>
<td>Plug - 3 Prong, &quot;B&quot; Circuit</td>
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<td>1-806</td>
<td>Speaker - 6&quot;, FM Type</td>
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<td>12-817</td>
<td>Switch - S.F.S.T. for Economizer</td>
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<td>4059</td>
<td>Dial Hand</td>
<td>16-817</td>
<td>Switch - D.F.S.T. - OFF-ON</td>
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MODEL 4BT - BATTERY RECEIVER

This receiver is designed on the 280 style chassis.
"A" Battery Drain at 1/4 volts - .25 amps.
"B" Battery Drain at 90 volts - .018 milliamps. or 7 miles when using the "Economizer".
Output - 180 to 350 milliwatts, maximum.

The set is equipped with plugs that are inserted directly into the "A" and "B" batteries of the socket type construction since most all batteries are made that way at this time.

CONTROL LAYOUT

VOLUME

ECONOMIZER

MAXIMUM BATTERY LIFE

MAXIMUM POWER OUTPUT

TUNING

SEE INDEX FOR OTHER SERVICING DATA

REPLACEMENT PARTS LIST - MODEL 4BT

<table>
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<tr>
<th>PART NUMBER</th>
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<td>Condenser - 2 Gang for Model 4BT</td>
<td>17-220</td>
<td>Drive Cord Spring</td>
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<td>Condenser - &quot;E&quot; Filter</td>
<td>34-720X</td>
<td>Drive Shaft with Wood Hub</td>
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<td>49-242</td>
<td>Condenser - Padding</td>
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<td>Drive Shaft Grommet</td>
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<tr>
<td>39-281</td>
<td>Control - Volume, with Switch</td>
<td>12-790</td>
<td>Drive Shaft &amp; Wood Hub</td>
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<td>55-188</td>
<td>Cabinet</td>
<td>22-936</td>
<td>I.F. Assembly</td>
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<td>2A20</td>
<td>Coil - Antenna</td>
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<td>I.F. Assembly</td>
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<td>Knob - 1&quot; Diameter - Brown Bakelite</td>
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<td>002</td>
<td>Choke - Oscillator</td>
<td>1-609X</td>
<td>Pulley with 4-425 Gear Assembly</td>
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<td>62-310</td>
<td>Dial Glass - 1 Band</td>
<td>3-609</td>
<td>Pulleys for Drive Cord</td>
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<tr>
<td>20-468</td>
<td>Dial Hand finished with Eyelet</td>
<td>J9-805</td>
<td>Speaker - 5&quot; with Transformer - PM</td>
</tr>
<tr>
<td>1-268</td>
<td>Drive Cord - 35&quot;</td>
<td>17-905</td>
<td>Switch, Rotary Shaft</td>
</tr>
</tbody>
</table>

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Alignment

Howard Radio Co.

L.F. = 262 Kc

See Index for other servicing data

Model HA-6 Serial
3-29-37 Duke C26-1/5

Set to Aerial Adj.-Tune a 600 Kc sig. on dial. Adj. Ant. trimmer screw for maximum volume.

Model HA-79 Serial
3-29-37 Duke C26-1/5

Set to Aerial Adj.-Tune a 600 Kc sig. on dial. Adj. Ant. trimmer screw for maximum volume.

At any future date should the tubes be checked and changed if very important that the same type tubes be substituted in the radio mastern
### HOWARD RADIO CO.

**MODELS 220, 221, 270, 271, 4B, 4BT
Alignment Chart**

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<thead>
<tr>
<th>MODELS</th>
<th>Generator Frequency</th>
<th>Generator Location</th>
<th>Transformer Junction</th>
<th>Approximate Antenna Input for a Milliwatt Output</th>
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</table>

**NOTE 1:** When aligning the I.F. channel, a condenser of .05 mfd may be used in series with the generator lead.

**NOTE 2:** When aligning the broadcast band, a 250 mfd condenser may be used in series with the signal generator.

**NOTE 3:** When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

**NOTE 4:** Check for an image signal about .9 m. lower in frequency. For example: If a peak has been made at 6 m., an image should be heard at about 5.1 m. Otherwise the original setting was not correct.

---

**SETUP INSTRUCTIONS—HOWARD AUTOMATIC MODELS 210 & 211**

1. **First:** Insert the AC plug into the AC socket, and connect the power cord to the power source.
2. **Second:** Turn on the power switch located on the rear panel of the receiver.
3. **Third:** Adjust the volume control to an intermediate position.

---

**HOWARD AUTOMATIC MODELS 220, 221, 270, 271**

- **Third:** Make the necessary adjustments for the correct functioning of the receiver.
- **Subsystem:** Each subsystem (amplifier, oscillator, etc.) should be adjusted independently to achieve the best possible performance.

---

**TROUBLESHOOTING**

1. **Common Issues:**
   - Poor sound quality: Ensure all connections are secure and the power cord is properly plugged.
   - No sound: Check the power source and volume control.
   - Interference: Use a different location or try a different channel.

2. **Solutions:**
   - Use a high-quality antenna to improve reception.
   - Install a ground wire to reduce interference.
   - Use a different power source if available.

---

**SUGGESTIONS**

- **Digital Connections:** Use a digital antenna instead of an analog one for better reception.
- **Upgrade Options:** Consider upgrading to a newer model if the current one does not meet your needs.
- **Maintenance:** Regular cleaning of the receiver and its components will prolong its lifespan.

---

**FURTHER INFORMATION:**

For detailed specifications and additional troubleshooting tips, refer to the user manual provided with the receiver.
HOW TO SET AUTOMATIC TUNING BUTTONS

(1) Press the arrow button to the right until the dial clears the selected position. Then turn the dial to the left to the selected position.

(2) Press the arrow button to the right until the dial clears the selected position. Then turn the dial to the left to the selected position.

(3) Press the arrow button to the right until the dial clears the selected position. Then turn the dial to the left to the selected position.

(4) Press the arrow button to the right until the dial clears the selected position. Then turn the dial to the left to the selected position.
HOWARD RADIO CO.

GENERAL DESCRIPTION - MODELS 220 and 270
FOR USE ON ALTERNATING CURRENT ONLY

The schematic diagram below covers both models 220 and 270, the main difference being the use of the short wave band for Model 270. The circuit is conventional with 6A7 mixer, 6D6, IF amplifier, 75 Diode Det. AVG, 41 Output, 80 Rectifier. The cathode circuit of the filter system is not grounded direct, the bias voltages are obtained by resistors from C.T. of high voltage to ground.

The output to be obtained will be from 1-1/2 to 2/25 watts, maximum.
For the models having four push buttons, a mechanical type tuner, the proper set-up is given on the following page.

FOR OTHER SERVICING
DATA, SEE INDEX

REPLACEMENT PARTS LIST - MODELS 220 - 270

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>27-914</td>
<td>Band Switch for Model 270</td>
<td>34-720X</td>
<td>Drive Shaft with Wood Hub</td>
</tr>
<tr>
<td>39-270</td>
<td>Condenser - 2 Gang for Model 270</td>
<td>4-429</td>
<td>Drive Shaft Crompt</td>
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<tr>
<td>39-270</td>
<td>Condenser - 2 Gang for Model 220</td>
<td>12-788</td>
<td>Drive Shaft &amp; Wood Hub</td>
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<tr>
<td>31-277</td>
<td>&quot;W&quot; Filter - Dual 10 Mfd. 350 V.</td>
<td>6-425X</td>
<td>Gear with Hub for Selector Unit</td>
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<tr>
<td>50-262</td>
<td>Condenser - Single Trimmer 3-30 Mfd.</td>
<td>18-490</td>
<td>Knob - 1&quot; Diameter - Brown Bakelite</td>
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<tr>
<td>49-262</td>
<td>Condenser - Fadding</td>
<td>36-290</td>
<td>Push Buttons</td>
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<tr>
<td>36-281</td>
<td>Control - Volume, with Switch</td>
<td>2-276</td>
<td>Push Button Selector Unit</td>
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<td>53-188</td>
<td>Cabinet - Model 270</td>
<td>1-609X</td>
<td>Pulley with 4-425 Gear Assembly</td>
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<td>54-188</td>
<td>Cabinet - Model 220</td>
<td>3-609</td>
<td>Pulleys for Drive Cord</td>
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<td>62-310</td>
<td>Dial Glass - Model 220 - 1 Band</td>
<td>11-788</td>
<td>Pilot Light Sockets</td>
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<tr>
<td>61-310</td>
<td>Dial Glass - Model 270 - 2 Band</td>
<td>2-498</td>
<td>Pilot Light - 6 V, Bayonet Type</td>
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<td>20-448</td>
<td>Dial Hand finished with Eyelet</td>
<td>73-605</td>
<td>Speaker - 5-1/2&quot; with Transformer 1300 Ohm Field</td>
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<td>Drive Cord - 36&quot;</td>
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REFER TO SCHEMATIC DIAGRAM FOR REPLACEMENT PARTS NOT SHOWN IN ABOVE LIST.
GENERAL DESCRIPTION - MODELS 221 and 271
FOR USE ON EITHER DIRECT OR ALTERNATING CURRENT

The schematic diagram below covers both 221 and 271 AC-DC Models, the main difference being that the 271 has a short wave band. Mechanical specifications are similar to the 220 - 270 series.

The maximum power output to be obtained is 2.7 watts, 1.7 watts undistorted.

FOR OTHER SERVICING DATA, SEE INDEX

REPLACEMENT PARTS LIST - MODELS 221 - 271

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<td>Filter Choke - 240 Ohms</td>
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<td>Condenser - Single Trimmer 3-30 Mfd.</td>
<td>4-455X</td>
<td>Gear with Hub for Selector Unit</td>
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<td>18-490</td>
<td>Knob - 1&quot; Diameter - Brown</td>
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<tr>
<td>36-281</td>
<td>Control - Volume, with Switch</td>
<td>36-290</td>
<td>Push Buttons Bakelite</td>
</tr>
<tr>
<td>55-198</td>
<td>Cabinet - Model 271</td>
<td>2-276</td>
<td>Push Button Selector Unit</td>
</tr>
<tr>
<td>54-198</td>
<td>Cabinet - Model 221</td>
<td>1-699X</td>
<td>Pulley with 4-425 Gear Assembly</td>
</tr>
<tr>
<td>62-310</td>
<td>Dial Glass - Model 221 - 1 Band</td>
<td>3-609</td>
<td>Pulleys for Drive Cord</td>
</tr>
<tr>
<td>61-310</td>
<td>Dial Glass - Model 271 - 2 Band</td>
<td>2-498</td>
<td>Pilot Light - 6 V. Bayonet Type</td>
</tr>
<tr>
<td>20-448</td>
<td>Dial Hand finished with Eyelet</td>
<td>45-810</td>
<td>Speaker - 5-1/2&quot; with Transformer</td>
</tr>
<tr>
<td>1-288</td>
<td>Drive Cord - 36&quot;</td>
<td>3000 Ohm Field</td>
<td></td>
</tr>
<tr>
<td>17-829</td>
<td>Drive Cord Spring</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REFER TO SCHEMATIC DIAGRAM FOR REPLACEMENT PARTS NOT SHOWN IN ABOVE LIST.
Each of the three bands has a separate antenna and oscillator coil.

The intermediate frequency stages are tuned to 465 KC and have a sensitivity of about 27 microvolts. (for 50 milliwatt output)

The maximum output is rated at about 5 watts, and 3.5 watts undistorted.

Use this receiver only with Alternating Current, 40-60 Cycles. The receiver is adaptable to three line voltages; determine the line voltage with which the set is to be used, then check the adjustable plug position on top of the power transformer with the coded socket for 117, 127 and 240 volts. Insert plug in the correct socket before turning on set. REFER TO INSTRUCTION TAG ATTACHED TO POWER TRANSFORMER.

If any other type transformer is being used, a different tag will explain the correct connections.
**Model X275, 285**

No changes should be made with the I.F. or R.F. adjustments unless it is certain that each adjustment is necessary.

The following instructions are given with the assumption that the service station has the proper generator, means of measuring the output and proper input connections. The following circuit is recommended for the input from the signal generator.

See that the dial hand is straight across when the condenser is at full capacity.

After aligning the four trimmers of the IF system to 465 kc, refer to Fig. 3 showing the position of the R.F. trimmer and the frequency to which they are to be adjusted. Although the dial is calibrated in meters, there will be found on the dial extra points representing the frequency in kilocycles corresponding to the trimmer adjustments as shown in Fig. 3.

**NOTES:**
- Always peak the oscillator circuit first and recheck after the antenna circuit is adjusted.
- Be certain the alignment is not made at an improper frequency.
- Seal trimmers after final adjustment.
- The normal voltages are shown on the schematic circuit taken from the various points to ground.

**Part List**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-014</td>
<td>Band Switch - 4 pole, 3 position</td>
</tr>
<tr>
<td>10-015</td>
<td>Choke - 360 Ohm</td>
</tr>
<tr>
<td>20-020</td>
<td>Coil assembly</td>
</tr>
<tr>
<td>20-025</td>
<td>Coil assembly</td>
</tr>
<tr>
<td>20-026</td>
<td>coil - B.C. Antenna</td>
</tr>
<tr>
<td>20-028</td>
<td>coil - B.C. Oscillator</td>
</tr>
<tr>
<td>20-032</td>
<td>coil - O.C. Oscillator</td>
</tr>
<tr>
<td>20-038</td>
<td>coil - P.B. Antenna</td>
</tr>
<tr>
<td>20-040</td>
<td>coil - P.B. Oscillator</td>
</tr>
<tr>
<td>20-058</td>
<td>Choke - 100 Kilo 150 Volt</td>
</tr>
<tr>
<td>20-061</td>
<td>Condenser - Single Trimmer</td>
</tr>
<tr>
<td>20-063</td>
<td>Condenser - 6500, 5 Plate</td>
</tr>
<tr>
<td>20-065</td>
<td>control - Volume</td>
</tr>
<tr>
<td>12-078</td>
<td>Control - Tone &amp; Switch</td>
</tr>
</tbody>
</table>

**Part List for Model X275**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
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</tr>
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<tbody>
<tr>
<td>10-014</td>
<td>Band Switch - 4 pole, 3 position</td>
</tr>
<tr>
<td>20-020</td>
<td>Coil - 51 1/2 Complete</td>
</tr>
<tr>
<td>20-025</td>
<td>Coil - 51 Kilo Complete</td>
</tr>
<tr>
<td>20-026</td>
<td>Coil - 4 4/5 Complete</td>
</tr>
<tr>
<td>20-028</td>
<td>Condenser - Electrolytic 10, 450 v.</td>
</tr>
<tr>
<td>20-032</td>
<td>Condenser, Single Trimmer</td>
</tr>
<tr>
<td>20-061</td>
<td>Condenser, Padding</td>
</tr>
<tr>
<td>20-070</td>
<td>Condenser, Variable 2 Carg</td>
</tr>
<tr>
<td>12-078</td>
<td>Control - Volume</td>
</tr>
<tr>
<td>12-070</td>
<td>Control - Tone &amp; Switch</td>
</tr>
<tr>
<td>12-080</td>
<td>Dial Glass - Calibrated, specify name on glass</td>
</tr>
<tr>
<td>12-085</td>
<td>Dial Lamp - 5 watts, Reversal Type</td>
</tr>
<tr>
<td>12-086</td>
<td>Dial Lamp Socket Assembly</td>
</tr>
<tr>
<td>12-087</td>
<td>Drive Disc - For mounting on V. Cond. Shaft</td>
</tr>
<tr>
<td>12-088</td>
<td>Drive Disc - 3-1/2 f. dia, with hub &amp; friction assembly</td>
</tr>
<tr>
<td>12-089</td>
<td>Drive Shaft with friction discos</td>
</tr>
<tr>
<td>12-090</td>
<td>Knob for Controls</td>
</tr>
<tr>
<td>12-091</td>
<td>Speaker - 6-1/2&quot;</td>
</tr>
<tr>
<td>12-092</td>
<td>Transformer - 40-40 Cycle, 3 tap Primary</td>
</tr>
<tr>
<td>12-093</td>
<td>Transformer - 40-40 Cycle, 3 range Primary</td>
</tr>
</tbody>
</table>

**Part List for Model X275**

The chassis is floated on cushion rubber. In alignment the chassis is tightened on corner wood striping. To release, loosen the four bottom screws, remove striping and let chassis float free.

**Replacement Parts List Model X275**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-014</td>
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</tr>
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<td>Choke - 360 Ohm</td>
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</tr>
<tr>
<td>20-025</td>
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<tr>
<td>20-026</td>
<td>coil - B.C. Antenna</td>
</tr>
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<td>20-058</td>
<td>Choke - 100 Kilo 150 Volt</td>
</tr>
<tr>
<td>20-061</td>
<td>Condenser - Single Trimmer</td>
</tr>
<tr>
<td>20-063</td>
<td>Condenser - 6500, 5 Plate</td>
</tr>
<tr>
<td>20-065</td>
<td>control - Volume</td>
</tr>
<tr>
<td>12-078</td>
<td>Control - Tone &amp; Switch</td>
</tr>
</tbody>
</table>

**Replacement Parts List Model X275**

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<tr>
<td>12-093</td>
<td>Transformer - 40-40 Cycle, 3 range Primary</td>
</tr>
</tbody>
</table>
HOWARD RADIO CO.

THIS RECEIVER CAN BE USED ON EITHER ALTERNATING OR DIRECT CURRENT AND IS ADAPTABLE TO THREE DIFFERENT LINE VOLTAGES BY CHANGING THE TERMINAL ARRANGEMENT ON THE BACK OF THE CHASSIS.

BEFORE CONNECTING RADIO, VERIFY THE VOLTAGE WITH WHICH THE RADIO IS TO BE USED, AND FOLLOW DIRECTIONS AS GIVEN ON CHASSIS, OR AS FOLLOWS:

FOR A LINE VOLTAGE BETWEEN 100 AND 125 VOLTS, CONNECT ALL THREE TERMINALS TOGETHER.

FOR A LINE VOLTAGE FROM 125 TO 150 VOLTS, OMIT JUMPER BETWEEN EXTREME LEFT TERMINAL AND CENTER TERMINAL.

FOR A LINE VOLTAGE BETWEEN 200 AND 240 VOLTS, REMOVE ALL CONNECTIONS. BE CAREFUL NOT TO LET LOOSE ENDS OF THE WIRES TOUCH THE CHASSIS.
The Model 377 is designed as a single band for broadcast reception. Three gang condenser is used to tune the Antenna, R.F. and Oscillator circuits. The Intermediate Frequency is 262 KC. The bias voltages are obtained by series resistors from the high voltage center tap to ground. The negative side of the filter is not grounded.

The maximum output obtainable is 2½ watts.

The variable condenser section for the oscillator circuit is the cut-plate type. See circuit diagram for other specifications.

### Alignment Chart for Model 377

<table>
<thead>
<tr>
<th>Channel</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>Trimmer Location</th>
<th>Trimmer Function</th>
<th>Approximate Microvolts for 50 Milliwatt Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>540 KC</td>
<td>445 KC</td>
<td>Grid of 6K6G</td>
<td>C13, C14, C15, C16 Fig. 6</td>
<td>I.F.</td>
<td>80</td>
</tr>
<tr>
<td>21 MC</td>
<td>21 MC</td>
<td>Antenna Lead</td>
<td>T21, T22 Fig. 7</td>
<td>OSC. &amp; ANT.</td>
<td>5</td>
</tr>
<tr>
<td>6 MC</td>
<td>6 MC</td>
<td>Antenna Lead</td>
<td>T23, T24</td>
<td>OSC. &amp; ANT.</td>
<td>3</td>
</tr>
<tr>
<td>1400 MC</td>
<td>1400 MC</td>
<td>Antenna Lead</td>
<td>T25, T26</td>
<td>OSC. &amp; ANT.</td>
<td>1</td>
</tr>
<tr>
<td>600 MC</td>
<td>600 MC</td>
<td>Antenna Lead</td>
<td>P27</td>
<td>OSC. PAD</td>
<td>1</td>
</tr>
</tbody>
</table>
SET-UP INSTRUCTIONS FOR HOWARD
PERMA-MATIC AUTOMATIC TUNER NO. 1

NOTE: DO NOT ATTEMPT ANY ADJUSTMENTS UNTIL THE SET HAS BEEN TURNED ON AT LEAST 30 MINUTES.

1. Remove the push-button escutcheon plate by prying forward from ends, taking care not to scratch cabinet.

2. Depress any one of the selector buttons, tune the desired station by turning slotted screw with small screwdriver (this screw is numbered 1 in the illustration and is always the screw adjacent to and right of depressed button.) This moves the iron core in oscillator circuits.

3. Adjust the screw with slotted head for maximum tuning eye deflection. This adjustment is numbered 2 in illustration and always the one directly above the station selector adjustment mentioned in above paragraph. If tuning eye overlays on strong stations, adjust for maximum overlap. When making the two adjustments it is possible to obtain a strong deflection of the tuning eye apparently for a station and yet no station is present. This is a normal condition and just means that the two adjustments are not close enough in relation to each other and can be corrected by varying the two adjustment screws.

THERE IS NO FREQUENCY DISCRIMINATION BETWEEN BUTTONS. ANY ONE OF SELECTORS WILL TUNE THE ENTIRE BROADCAST BAND (1460-1640 KC).

NOTICE: DO NOT FORCE ANY ADJUSTMENTS if they tighten up in the course of adjustment, either the maximum or minimum has been reached and the adjustment should be made in opposite rotation.

It will be found easier to adjust if the low frequency stations are started on right side and progress toward high frequency stations to left. IF SAME IS DIFFICULT, MAKE ADJUSTMENTS.

However, the above procedure is not absolutely necessary if there should be some preference for arranging stations otherwise.

AFTER ALL ADJUSTMENTS HAVE BEEN MADE — DO OVER EACH ADJUSTMENT THE SECOND TIME TO MAKE SURE THEY ARE CORRECT AND TO COMPENSATE FOR SUBSEQUENT ADJUSTMENTS.

It is a big help to tune the desired station in on small dial while making adjustments, in order that the station can be quickly recognized by switching from manual back to button being adjusted.

It is not necessary to look any of the adjustments as they are automatically locked.

Place station call letter tabs in escutcheon and replace escutcheon by pressing in place on cabinet.

NOTICE: Turning station selector screw clockwise lowers the frequency. Best results will be had when band switch is in broadcast position when using automatic tuning.

MECHANICAL ACTION OF THE HOWARD

USED IN MODELS 312Q, 320Q, 328Q, 328Q, AND 525

PERMA-MATIC TUNER NO. 2

WITH SLIDE TYPE CONTACTS

FIG. 1 shows one of the buttons depressed for a station. The trimmer panel assembly [for the antenna circuit] is designed with spring fingers that make contact with cross bar "B" completing the ground circuit of the R.F. trimmer.

When making the original set-up, the adjusting screw may indicate two positions for resonance. This is due to the possibility of the small amount of play in the screw thread and is of no concern as long as it is set to the exact resonance point.

The jumper contact "V" connects CI contact to CI contact with the button "IN". This completes the oscillator circuit for that particular button.

FIG. 2 shows the jumper position with the button "OUT".

FIG. 3 shows the manual OFF-ON button in the "OUT" position.

The "L" shaped sliding contact is the common cathode return circuit and alternates the bias on the SSB for manual tuning or on the DP for push button tuning.

FIG. 4 shows the iron core movement within the oscillator coil. Its position is held stationary by the small spring wire across the coil form. The position of this spring must be such that no spring action is apparent from the end of the adjustment stud due to pressure with a screwdriver. Otherwise, when the screwdriver is removed, the core will shift out of position.

The button is held down by action of the latch bar and is released when another key raises the latch bar on its own way down.

REPLACE HOWARD "LENS-A-MATIC TUNERS" #7-966 or #8-966 WITH "LENS-A-MATIC TUNER" #9-966 WHICH REQUIRES THE CHANGE OF THE ANTENNA COIL ON THE CHASSIS AS EXPLAINED AT THE BOTTOM OF THIS PAGE.

There are six leads between the tuner and the receiver circuits to be unsoldered. Unsolder the connections from the receiver terminals and not from the tuning unit as the new tuner will have the necessary leads.

Mechanically, it is only necessary to remove two screws from the front plate to release the tuner.

Due to the fact that the two ceramic condensers (green in color), one each in the grid and plate circuits of the oscillator, are now a part of the new tuner, they must be removed from within the receiver and returned with the tuner being replaced.

Since the colors of the leads are different in the two type tuners, it is advisable to follow the schematic diagram together with the following chart.

<table>
<thead>
<tr>
<th>TUNER NO. 1 (7-966)</th>
<th>CIRCUIT</th>
<th>TUNER NO. 2 (8-966)</th>
<th>TUNER NO. 3 (9-966)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAD COLOR</td>
<td></td>
<td>LEAD COLOR</td>
<td></td>
</tr>
<tr>
<td>Unsolder from ANTENNA COIL 2A17</td>
<td>GRID 6A7</td>
<td>SAME</td>
<td></td>
</tr>
<tr>
<td>WHITE WITH BLUE TRACER</td>
<td>CATHODE BIAS SWITCH</td>
<td>SAME</td>
<td></td>
</tr>
<tr>
<td>GREEN</td>
<td>OSCILLATOR GRID 6A7</td>
<td>SAME</td>
<td></td>
</tr>
<tr>
<td>Unsolder from .0005 Condenser</td>
<td>OSCILLATOR PLATE 6A7</td>
<td>BLUE</td>
<td></td>
</tr>
<tr>
<td>GREEN</td>
<td>BROWN</td>
<td>BROWN WITH WHITE TRACER</td>
<td>BLUE</td>
</tr>
<tr>
<td>Unsolder from 6K3 Cathode</td>
<td>CATHODE RETURN FOR 6A7</td>
<td>GREEN WITH WHITE TRACER</td>
<td></td>
</tr>
</tbody>
</table>

DUE TO THE FACT THAT THIS NEW UNIT, #9-966, HAS A DIFFERENT TRIMMER CAPACITY RANGE, THE ASSOCIATED ANTENNA COIL, 2A17, IN THIS CIRCUIT MUST BE CHANGED TO 2A23. THIS IS THE COIL ON THE LEFT SIDE WHEN FACING FRONT OF SET. FOLLOW DIAGRAM FOR TERMINAL ARRANGEMENT.

ANTENNA ➔ GRID CIRCUIT
AVO          GROUND
BOTTOM VIEW
FOR ALL MODELS ADAPTABLE TO PHONOGRAPH CONNECTION

Out of the back of the chassis there extends three lugs as shown in Diagram Fig. 1. For phonograph use, the jumper is removed and a single pole, double throw switch is connected as shown in Fig. 2. The pickup leads from the pickup are connected to Nos. 1 and 2 terminals, with the overall shield grounded to No. 3 terminal.

NOTE 1 - When aligning the i.f. channel, a condenser of 0.05 MF may be used in series with the generator lead.

NOTE 2 - When aligning the broadcast band, a 250 MF condenser may be used in series with the signal generator.

NOTE 3 - When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

NOTE 4 - When aligning the short wave band, be sure to adjust at the image frequency. This can be checked as follows: If the signal generator is set for 81,000 KHz, the signal will be heard at 81,000 KHz on the dial. The image signal, which is much weaker, will be heard at 81,000 minus 15 times the IF, 465, (4550Hz) or 20,070 KHz on the dial. It may be necessary to increase the input to hear the image. If the image is not heard then, the original alignment was not made at the right peak.

NOTE 5 - If there is an apparent lack of sensitivity, especially on the short wave bands, first check the 6X26 tube by substituting one or more in its place.
THE POWER OUTPUT for the Model 430 is about 1\(\frac{1}{2}\) watts, undistorted.

Ceramic coil forms are used on the high frequency band. Ceramic trimmers are used throughout. The unused secondaries of the lower frequency bands are shorted as the band switch is shifted toward the higher frequency bands.

The frequency coverage from .55 to 42 megacycles is divided into four bands. The lower scale from 0 to 100 is for logging purposes. The left hand pointer indicates the band in operation. For correct tuning calibration, the Band Spread pointer must be at 100.
NOTE 1: When aligning the I.F. channel, a condenser of .05 MFD may be used in series with the generator lead.

NOTE 2: When aligning the broadcast band, a 250 KHz condenser may be used in series with the signal generator.

NOTE 3: When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

NOTE 4: After the chassis has been removed from the cabinet, be sure when it is again assembled that the speaker plug is in place in the socket on top of the chassis and that the speaker cable wires do not lay back near the RF circuit, thus causing bowing.

NOTE 5: Check for an image signal about .5 mc. lower in frequency. For example: If a peak has been made at 6 mc., an image should be heard at about 5.1 mc. Otherwise the original setting was not correct.

FIG. 7

SHOULD THE DIAL DRIVE CORD EVER NEED REPLACEMENT ON THE MODELS 430 OR 435, FOLLOW THIS DIAGRAM SHOWING THE CORRECT POSITION AND ROTATION OF THE DRIVE CORD.
HOWARD RADIO CO.

The frequency coverage from .55 to 45 megacycles is divided into four bands. The left-hand pointer indicates the band in operation. For correct tuning calibration, the band spread pointer must be set at 100. The lower scale 0 to 100 is for logging purposes.

---

### THE POWER OUTPUT

The power output will be about 2½ watts, undistorted.

For each band there is a Radio Frequency stage with individual coils for the RF oscillator and Mixer stages for each band.

Ceramic coil forms are used on the high frequency band. Ceramic trimmers are used throughout. The unused coil secondaries of the lower frequency bands are shorted as the band switch is shifted to the higher bands.

The Intermediate Frequency is 465 KC. The Crystal input, Crystal output, and the 2nd IF consist of windings wound on iron cores.

---

### PART

<table>
<thead>
<tr>
<th>NO.</th>
<th>DESCRIPTION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>9-132</td>
<td>Ball Bearing - 1/8&quot; dia.</td>
<td>3-485</td>
<td>Headphone Jack</td>
</tr>
<tr>
<td>76G1</td>
<td>Bias Cell - 1/4 V.</td>
<td>28-448</td>
<td>Indicator Pointer Hands</td>
</tr>
<tr>
<td>57-188</td>
<td>Cabinet - Complete</td>
<td>20-490</td>
<td>Knob - 1-1/8&quot;</td>
</tr>
<tr>
<td>17-829</td>
<td>Coil Spring for Drive Cord</td>
<td>21-490</td>
<td>Knob - 1-9/16&quot;</td>
</tr>
<tr>
<td>5C-262</td>
<td>Condenser - Single Trimmer</td>
<td>2-496</td>
<td>Pilot Light - 6 V. Bayonet</td>
</tr>
<tr>
<td>58-262</td>
<td>Condenser - Variable Trimmer (Xtal Phase)</td>
<td>14-766</td>
<td>Pilot Light Socket - Bayonet</td>
</tr>
<tr>
<td>49-262</td>
<td>Condenser - Padding, BC Band</td>
<td>19-427</td>
<td>Pyralin Window</td>
</tr>
<tr>
<td></td>
<td>Condenser - .0015 Mfd. - Mica</td>
<td>19-917</td>
<td>Rotary Switch</td>
</tr>
<tr>
<td></td>
<td>Condenser - .0009 Mfd. - Mica</td>
<td>7-187</td>
<td>Rubber Mfg. Feet</td>
</tr>
<tr>
<td></td>
<td>Condenser - .004 Mfd. - Mica</td>
<td>34-806</td>
<td>Speaker - 9/16&quot; Cord and Plug</td>
</tr>
<tr>
<td>1-303</td>
<td>Crystal - 465 KC</td>
<td>15-829</td>
<td>Spring Clamp for Ball Bearing on Shaft</td>
</tr>
<tr>
<td>1-288</td>
<td>Drive Cord</td>
<td>14-917</td>
<td>Toggle Switches - S.P.S.T.</td>
</tr>
<tr>
<td>35-268</td>
<td>Filter Condenser - 5,5,20 Mfd.</td>
<td>27-448</td>
<td>Tuning Hand</td>
</tr>
<tr>
<td>30-266</td>
<td>Filter Condenser - 10,10 Mfd.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>450,450 Volt</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REFER TO SCHEMATIC DIAGRAM FOR REPLACEMENT PARTS NOT SHOWN IN ABOVE LIST.
NOTE: When using a Crystal set Phasing Control to almost minimum capacity, see special alignment instructions below for Crystal.

ALIGNMENT INSTRUCTIONS - FOR RECEIVERS EQUIPPED WITH CRYSTALS

1. REMOVE CRYSTAL, set crystal phasing condenser to almost minimum capacity and throw "XTAL" switch to "IN" position.
2. With the 465 KC signal, re-adjust the I.F. Trimmer C-6 by turning the screw counterclockwise. The signal may be slightly weaker than before and sound "off-side". This, however, is a normal condition.
3. REPLACE THE CRYSTAL - A very noticeable drop in signal strength may be noted due to the filtering action of the crystal and the frequency control of the signal generator must be "rocked" slowly back and forth until the increase in signal strength indicates the exact frequency of the crystal being used. Now re-align the entire I.F. system to this frequency.
4. Adjust "XTAL" phasing condenser for the lowest pitched note possible and re-adjust signal generator frequency. Repeat and continue to repeat this alignment procedure until no further improvement in the alignment can be accomplished.

NOTE: If the "XTAL" switch should now be thrown to another position, an apparent rise in gain will be noticed, which is caused by the addition of higher frequencies and background noise, so it does not mean that the sensitivity of this set is impaired in any way by use of the crystal.
ALIGNMENT PROCEDURE

Preliminary:
Output meter connection - 4000 ohm or more copper oxide meter across 5 ohm terminals.
Shunt with speaker.
Output meter reading to indicate 0.5 watt - 1.275 V.
Average sensitivity in microvolts for 0.5 watt output. See chart below.

Generator ground lead connection - Direct to chassis.
A.V.O. Switch - On.
Band spread dial set at 100 - Min. Capacity 30%, 400 cycles.
Position of volume control A.F. gain - Position of volume control R.F. gain - Full On.

NOTE 1: When aligning the I.F. channel, a condenser of 0.015 MFD may be used in series with the generator load.
NOTE 2: When aligning the broadcast band, a 250 KHZ condenser may be used in series with the signal generator.
NOTE 3: When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE AND BAND</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER LOCATION</th>
<th>TRIMMER ADJUSTMENTS IN ORDER</th>
<th>TRIMMER FUNCTION</th>
<th>APPROX. MICRO VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed &quot;A&quot; Band</td>
<td>465 KHz</td>
<td>617 Grid</td>
<td>See Fig.</td>
<td>615, 60, 51, 60, 49, 47, 46</td>
<td>I.F.</td>
<td>13</td>
</tr>
<tr>
<td>36 ME W</td>
<td>36 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615, 10, 5</td>
<td>Osc. Trans. Ant.</td>
<td>3</td>
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<tr>
<td>16 ME W</td>
<td>16 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615</td>
<td>Fader</td>
<td>3</td>
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<tr>
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<td>15 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615, 9, 4</td>
<td>Osc. Trans. Ant.</td>
<td>1</td>
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<tr>
<td>6 ME W</td>
<td>6 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615, 3, 3</td>
<td>Fader</td>
<td>1</td>
</tr>
<tr>
<td>9 ME W</td>
<td>9 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615, 7, 2</td>
<td>Osc. Trans. Ant.</td>
<td>1</td>
</tr>
<tr>
<td>1.3 ME W</td>
<td>1.3 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615</td>
<td>Fader</td>
<td>1</td>
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<tr>
<td>1.2 ME &quot;A&quot;</td>
<td>1200 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615, 3, 1</td>
<td>Osc. Trans. Ant.</td>
<td>1</td>
</tr>
<tr>
<td>1.4 ME &quot;A&quot;</td>
<td>400 ME</td>
<td>A-G Ant. Term.</td>
<td>See Fig.</td>
<td>615</td>
<td>Fader</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE 4: When using a CRYSTAL, set FILLING CONTROL to utmost minimum capacity. See special alignment instructions for Crystal MODEL 438.
HOWARD RADIO CO.

CHASSIS FEATURES:
- SEND-RECEIVE terminals in rear of chassis for break-in connection.
- RF Stages: One VARIABLE GAIN Ganged Antenna
- Two REQUIRED Type: SEE PAGE 5
- TRADEPHONE JACK: ON FRONT PANEL
- Crystal Phase
- Heat Frequency Oscillator, Pitch Control
- B.P.O. OFF-OFF Switch with Injection Control
- Two range B.P.O. switch

OPERATING FEATURES:
- A.V.C. with ON-OFF Switch
- Three Gang Electrical Band Spread
- A.F. Gain or audio Level
- B.F. Gain or Sensitivity
- Tone Control
- "R" Meter Showing Signal Strength
- "R" Meter Zero Adjustment
- Four-position IF Setting: 1500 KC
  - Iron Core Broad 465 KC
  - Iron Core Sharp 465 KC
  - Crystal Filter-In Position

ALIGNMENT FREQUENCIES:
- Band A: 600 AND 1200 KC
- Band B: 1.3 AND 2.6 MC
- Band C: 3.0 AND 5.0 MC
- Band D: 7.0 AND 18 MC
- Band E: 18 AND 55 MC
- Band F: 40 AND 60 MC

LOUD SPEAKERS:
- Type: Permanent Magnet Dynamic
- Size: Within Separate Case 10 Inch

INTERMEDIATE FREQUENCY = BANDS A, B, C, & D = 465 KC
Output meter connection:
- 4,000 ohm or more copper oxide meter across 5 ohm terminals
- Shunt with speaker

Output meter reading to indicate 0.5 watt:
- See below

Average sensitivity in microvolts for 0.5 watt output:
- See below

Generator ground lead connection:
- Direct to chassis

Dummy antenna value in series with generator output:
- See Chart below

Connection of generator output lead:
- See Chart below

Generator modulation:
- 40%, 400 cycles

Position of volume control A.F. gain:
- Full on

Position of volume control R.F. gain:
- Full on

A.V.C. Switch:
- On

Bandspread dial set at 100.

**NOTE 1:** When aligning the two I.F. channels, a condenser of .05 mfd may be used in series with the generator lead. For other bands, the following circuit is shown with the values that make a universal dummy antenna system for all bands.

**NOTE 2:** When using a CRYSTAL, set PHASING CONTROL to almost minimum capacity. See special alignment instructions below for Crystal. Align set in “sharp” position if set is without crystal.

**ALIGNMENT INSTRUCTIONS - FOR RECEIVERS EQUIPPED WITH CRYSTALS**

1. **DETECT CRYSTAL** set crystal phasing condenser to almost minimum capacity and throw IF switch to “XTAL” position.

2. **WITH THE 465 KHz SIGNAL, RE-ALIGN THE I.F. TRIMMER C-46** - the one nearest the front panel of the receiver - by turning the screw counter-clockwise. The signal may be slightly weaker than before and sound “off-scale.” This, however, is a normal condition.

3. **PLACE THE CRYSTAL** - A very noticeable drop in signal strength may be noted, due to the filtering action of the crystal, and the frequency control of the signal generator must be “tuned” slowly back and forth, until the increase in signal strength indicates the exact frequency of the crystal being used. Realigne the entire I.F. system to this frequency.

4. **ADJUST “XTAL” PHASING CONDENSER** for the lowest pitched note possible, and re-adjust signal generator frequency. Repeat and continue to repeat this alignment procedure until no further improvement in the alignment can be accomplished.

**NOTE:** If the IF switch should now be thrown to another position, an apparent rise in gain will be noticed, which is caused by the addition of higher frequencies and background noise, so it does not mean that the sensitivity of this set is impaired in any way by use of the crystal.

**NOTE 3:** **THE BEAT FREQUENCY OSCILLATOR** is adjusted for the A, B, C, D, Bands with Trimmer C-31. With models having an "E" & "F" Band B.T.O., **Adjust C33 with dial at 1300 on Band D to 1500 KC.** Recheck C31. Set pitch control to half capacity.

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HUDSON MOTOR CAR CO.

MODEL DB-38
MODEL SA-38
Schematics, Socket Trimmers, Alignment

1938 HUDSON Radios
MODELS SA-38 AND DB-38

SA-38  DB-38
(1) 6K7-G  (1) 6K7-G
(2) 6AE-G  (2) 6AR-G
(3) 6K7-G  (3) 6K7-G
(4) 68G-G  (4) 6SG-G
(5) 6VG-G  (5) 6J5-G
(6) 6VG-G  (6) 6VG-G
(7) 6VG-G  (7) 6VG-G

Tuning Range: 560 kc. to 1600 kc.
both models

Figure 3239—Schematic Circuit Diagram—Model SA-38

Figure 3239—Schematic Circuit Diagram—Model DB-38

Figure 3239—Radio Item Location—Model SA-38

Figure 3239—Radio Item Location—Model DB-38
ALIGNMENT PROCEDURE

In readjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator will be required as the source of signal at the specified alignment frequencies. Means for indicating the receiver output during alignment is also necessary to show accurately when the correct point of adjustment is reached. Two indication methods are applicable. One requires use of cathode-ray oscillograph equipment, and the other requires a voltmeter or output indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave image which represents the resonance characteristics of the circuits being tuned.

Adjust the control box by turning the tuning knob clockwise until a definite stop is reached at the high-frequency end of the dial-scale. Then turn the tuning knob counterclockwise until a definite stop is reached at the low-frequency end of the dial scale.

Figures 2235 and 2236 give the locations of the tubes and trimmer screws for adjustable capacitors and magnetic cores for models SA-38 and DB-38 respectively.

Place the receiver in operation with its two covers removed. Attach the output indicator across the loudspeaker voice coil circuit and advance the receiver volume control to full volume position. (If cathode-ray oscillograph is used for output indication, the vertical input terminals should be connected between the i-f transformer side of R15 (Figure 2240) and the receiver chassis for the DB-38 model, and between the high side of the volume control R7 (in control unit) (Figure 2238) and the receiver chassis for model SA-38. The cathode-ray oscillograph method of i-f alignment requires the conventional cathode-ray oscillograph, frequency modulator and signal generator set-up.)

For each adjusting operation, regulate the test oscillator output control so that the signal level is as low as possible and still observable on the indicating device. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F ADJUSTMENTS

1. Connect the "high" output of the test oscillator to the control grid cap of the i-f tube (6K7-G) through a 0.25 mfd. capacitor and connect the ground of the test oscillator to the receiver chassis. Adjust the frequency of the test oscillator to 260 kc. Tune the receiver to a point where no interference is received from the heterodyne oscillator or local stations.

2. Adjust the two screws L8 and L9 (attached to magnetite cores) of the second i-f transformer, one on top and one on bottom, until maximum output is produced on the indicating device.

3. Remove the test oscillator from the i-f tube input and connect it between the control grid cap of the first detector tube (6AK-4F) and chassis ground, using the 0.25 mfd. capacitor as previously. Allow its tuning to remain at 260 kc. Tune the receiver to avoid interference as in 1.

4. Adjust the two screws L4 and L5 of the first i-f transformer for maximum (peak) receiver output.

5. Repeat procedures 1, 2, 3 and 4 as a check.

R-F ADJUSTMENTS

6. Connect the "high" output of the test oscillator to the antenna plug of the receiver through a 100 mfd. capacitor, leaving the test oscillator ground connected to the receiver chassis. If the antenna lead-in is used, the value of this capacitor should be 50 mfd. Tune the test oscillator to 1400 kc. Allow the output indicator to remain attached to the receiver as for i-f alignment.

7. Tune the receiver so that the dial reading is approximately halfway between 1300 and 1500 kc., which gives a 1400 kc. setting. Then adjust the oscillator, detector and antenna coil trimmers, C10, C5, and C3 respectively, adjusting each to the point producing maximum indicated receiver output.

8. Shift the test oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is received. The oscillator series trimmer C11 should then be adjusted, simultaneously rocking the receiver tuning control backward and forward through the signal until maximum (peak) receiver output results from these combined operations.

9. The adjustment of C10, C5 and C3 should then be repeated as in operation 7 to correct for any change in their alignment due to the adjustment of C11.

NOTE: The antenna coil L1 has a magnetite core which is adjusted at the factory for the correct inductance. This adjustment should not be disturbed.

DB-38
Speaker:
Type: Electrodynamic 8" Impedance (v.e.c.) 8 ohms. at 400 cycles
Vibrator: Synchronous
Power Output: Undistorted, 6 watts; maximum, 9 watts
Power Rating: Supply voltage 6.3 volts (storage battery) Current drain 8.25 amperes at 6.3 volts Fuse protection 15 amperes
R-F Alignment Frequencies:
  Antenna coil 1400 kc.
  Oscillator coil 600 kc. and 1400 kc.
  Detector coil 1400 kc.

SA-38
Speaker:
Type: Six Inch Dynamic Impedance (v.e.c.) 3 ohms. at 400 cycles
Vibrator: Non-synchronous
Power Output: Undistorted, 2.6 watts; maximum, 4 watts
Power Rating: Supply voltage 6.3 volts (storage battery) Current drain 6.0 amperes at 6.3 volts Fuse protection 15 amperes
R-F Alignment Frequencies:
  Antenna coil 1400 kc.
  Oscillator coil 600 and 1400 kc.
  Detector coil 1400 kc.
NOTE: SOCKET VOLTAGE 10V WITH 1000 OHMS PER VOLT METER FROM TUNER PROJECTIONS TO CIRCUIT GROUND. LIFE 115 VOLTS. VOLUME CONTROL FULL ON 10V VARIATION ALLOWABLE.

**Alignment**

**Model KR-20 Autime**

**Interchangeable Parts**

- These parts are interchangeable on Model KR-20, but must be connected as shown.

**Alignment Model KR-2**

1. **I.F. TRIMMER**; Feed 1500 Kc. modulated signal from signal generator directly to antenna of Tunemaster. Adjust both I.F. trimmers to maximum reading on output meter. Then adjust output coil trimmer to maximum.

2. **I.F. TRIMMER**; Set Tunemaster dial at 1500 Kc. and feed 1500 Kc. signal from signal generator to antenna of Tunemaster. Set antenna trimmer approximately 1/4 turn from tight. Peak oscillator trimmer at 1500 Kc. Set dial at 600 Kc. and peak series oscillator trimmer. Move dial and series trimmer simultaneously by small amounts as to get maximum output at 600 Kc. Tune back to 1500 Kc. and peak oscillator trimmer. Repeat previous peaking of series trimmer at 600 Kc. Return to 1500 Kc. and peak oscillator trimmer. Set dial at approximately 1500 Kc. Tune signal generator to resonance with Tunemaster. Then peak antenna trimmer.

**Alignment Model KR-20**

1. **I.F. TRIMMER**; To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal directly to the antenna. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result.

2. **I.F. TRIMMER**; Turn the dial to 1500 Kc. and feed a very weak 1500 Kc. modulated signal from your signal generator to the antenna. Adjust the oscillator trimmer for maximum reading. Then set the antenna trimmer to this setting. Alignment of broadcast band should be done on 1000, 1500 and 2000 kilocycles. There is no adjustable padder condenser in this model so resonance on lower frequencies is accomplished by bending plates on tuning condensers.
**Alignment**

Connect oscillator at 456 KC to grid of 2A7 tube and ground wire. Variable condenser at minimum capacity, adjust four trimmers (one nut and one screw on each transformer trimmer) to resonance.

Broadcast band, wave changing switch to Green, variable condenser at minimum capacity. Disconnect antenna wire, connect 1550 KC oscillator to antenna coil in series with a 75 MFD condenser. Adjust oscillator (front) section trimmer to resonance. Set oscillator to 1400 KC, rotate variable condenser until signal is tuned in, then adjust R.F. (rear) section trimmer to resonance. Check output at 1200, 1000, 800, and 600 Kilocycles if necessary bend plates (of rear R.F. section of variable only).

Short wave band, set wave changing switch to RED and with input oscillator connected as above and set at 1720 KC and at harmonics of 1000 KC (2000 KC), of 1200 KC (2400 KC), of 1400 KC (2800 KC), and 1720 KC (3440 KC). **DO NOT BEND PLATES.**

For failure to operate over both bands check 2A7 tube and connections to and contacts of wave changing switch.
1. I.F. Alignment

To peak I.F. transformers, apply an oscillator note of 456 KC to the grid of the 6A7 tube and adjust screws seen in tops of I.F. transformers until maximum peak is obtained.

2. Broadcast

Connect an oscillator adjusted to 1720 KC, to the antenna of set, then adjust trimmer of oscillator section first with variable condenser open to peak output, next adjust antenna section trimmer on variable condenser to peak output.

3. Low Frequency Padder

Next apply a 600 KC note from oscillator and while rocking variable condenser back and forth across signal, adjust padder to maximum output.

4. Check alignment again at 1400 KC, 1000 KC and 800 KC. It will not be necessary to bend plates to align this receiver.
ALIGNMENT CHASSIS 508 AND 511.

IF PEAK 456 KC.

BAND 1: ADJUST TRIMMERS AT 1500 KC AND IF PADDER AT 800 KC (BOTH AT RIGHT OF CHASSIS).

BAND 2: (CHASSIS 508 ONLY) ADJUST AT 9000 KC (NO L.F. PADDER ON THIS BAND).

BAND 2: (CHASSIS 511 ONLY) ADJUST AT 3700 KC, L.F. PADDER AT 1700 KC.

BAND 3: (CHASSIS 508 ONLY) ADJUST AT 21,000 KC (NO L.F. PADDER ON THIS BAND).

BAND 3: (CHASSIS 511 ONLY) ADJUST AT 15,000 KC.

BAND 4: (CHASSIS 511 ONLY) ADJUST AT 21,000 KC.

WHEN BALANCING SET BE SURE BAND SPREAD POINTERS IS SET AT ZERO POSITION.

CHASSIS 508 AND 511.


NOTE: - TUBES AND PARTS INDICATED @ ARE FOR CHASSIS 508, © INDICATES SAME FOR CHASSIS 511.

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Alignment and Calibration

Correct alignment is extremely important in connection with all wave receivers. The receivers are all precision adjusted at the factory with precision in instruments and alignment should not be attempted unless all other possible causes of the faulty operation have been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 416, 1730, 1960, 2000, 2010, 18,300, 15,000 and 6000 KC and an output indicating meter are required. It will be practically impossible to align the receiver if an unsatisfactory apparatus is used. If aabinet is tuned in with the selectivity control in the broad position and this control is then turned to the sharp position, the signal will disappear. This is not an indication that the receiver is out of alignment.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

1. F. Adjustment

Set the signal generator for a signal of 416 KC.
Connect the output of the signal generator to the grid of the 1st detector through a 0.1 MF condenser.
Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band selector to the Range B position (standard wave band—purple dial color).

Turn the selectivity control to the sharp position and make it in this position for all adjustments.

Turn the volume control to the maximum position.

Aim the signal from the signal generator to prevent the levelling-off action of the A.V.C.

Turn the volume control to the maximum position.

Use a non-metallic screwdriver for this adjustment.

2. Range C Adjustment

Set the signal generator for 1800 KC.
Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the band selector to the Range C position (the short wave band—green dial color).

As mentioned above, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent A.V.C. action.

Adjust the range C trimmer (C40) until maximum output is obtained. See Fig. 8 for location of this trimmer.

3. Range D Alignment

Set the signal generator for 1500, 1600, 2000, 15,000 and 6000 KC and then attenuate the signal from the signal generator to prevent A.V.C. action.

Adjust the range D trimmer (C18) until maximum output is obtained. The location of this trimmer is shown in Fig. 8.

D. C. Resistance of Windings

<table>
<thead>
<tr>
<th>Part</th>
<th>Code</th>
<th>Description</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-5435</td>
<td>A. F. Transformer</td>
<td>Antenna</td>
<td>25.6</td>
</tr>
<tr>
<td>P-5436</td>
<td>A. F. Transformer</td>
<td>Range C Primary</td>
<td>8.2</td>
</tr>
<tr>
<td>P-5437</td>
<td>A. F. Transformer</td>
<td>Range C Secondary</td>
<td>2.1</td>
</tr>
<tr>
<td>P-5438</td>
<td>A. F. Transformer</td>
<td>Range C Inductor</td>
<td>0.5</td>
</tr>
<tr>
<td>P-5439</td>
<td>A. F. Transformer</td>
<td>Range C</td>
<td>12.1</td>
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<tr>
<td>P-5440</td>
<td>A. F. Transformer</td>
<td>Range B Primary</td>
<td>3.6</td>
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<tr>
<td>P-5441</td>
<td>A. F. Transformer</td>
<td>Range B Secondary</td>
<td>2.3</td>
</tr>
<tr>
<td>P-5442</td>
<td>A. F. Transformer</td>
<td>Range D Primary</td>
<td>0.2</td>
</tr>
<tr>
<td>P-5443</td>
<td>A. F. Transformer</td>
<td>Range D Secondary</td>
<td>0.1</td>
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<tr>
<td>P-5444</td>
<td>A. F. Transformer</td>
<td>Range A Primary</td>
<td>0.6</td>
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<tr>
<td>P-5445</td>
<td>A. F. Transformer</td>
<td>Range A Secondary</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Range A: 18,300 KC

Keep the antenna lead of the receiver connected through the 600 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the Range A position (the short wave band—red dial color).

As mentioned above, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent A.V.C. action.

Adjust the range A trimmer until maximum output is obtained. See Fig. 8 for location of this trimmer.

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

A 115-230 Volt, 40 to 60 cycle as well as other power transformers with special power ratings are also available for this model.
VOLTAGES AT SOCKETS

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Across Heater</th>
<th>Plate to Ground</th>
<th>Screen to Ground</th>
<th>Cath. to Ground</th>
<th>Cath.</th>
<th>M.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7</td>
<td>R. F.</td>
<td>6.2</td>
<td>245</td>
<td>80</td>
<td>2.8</td>
<td>7.6</td>
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</tr>
<tr>
<td>6K7</td>
<td>1st Det.</td>
<td>6.2</td>
<td>245</td>
<td>90</td>
<td>6.5</td>
<td>2.6</td>
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<td>Oct.</td>
<td>6.2</td>
<td>90</td>
<td>5.3</td>
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<td>6K7</td>
<td>1st I. F.</td>
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<tr>
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<td>2nd Det.</td>
<td>6.2</td>
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<tr>
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<td>1st A. F.</td>
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<td>110</td>
<td>5.6</td>
<td>2.1</td>
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<tr>
<td>6F6</td>
<td>Driver</td>
<td>6.2</td>
<td>235</td>
<td>230</td>
<td>20.0(0.07)</td>
<td>27.0</td>
<td></td>
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<tr>
<td>6F6</td>
<td>Power</td>
<td>6.2</td>
<td>345</td>
<td>345</td>
<td>38.0(2.0)</td>
<td>22.5</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Rectifier</td>
<td>5.1</td>
<td>550H</td>
<td></td>
<td>1400(0.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) As read across R19 (3) Plate to Center Tap
(2) Grid to Ground (4) Two tubes in parallel

Fig. 4—Color Coding of Coil Wires and D. C. Resistance of Windings. (Also see complete D. C. Resistance List)

Fig. 5—Location of Tubes

Fig. 7—Phono Graph Connections

Fig. 3—Location of Trimmers
Alignment and Calibration

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory, with provision for adjustment should the alignment be disturbed. All other possible causes of the faulty operation have been investigated and unless the service technician has the proper equipment, the receiver will not be properly aligned.

A signal generator that will provide an accurately calibrated signal at 4150, 7600, 15100, 15100, 4000, 1600, 3000, 18000, 18000, 13000, and 6000 KC an output inductance of 10,000 ohms or more is required. It should practically be impossible to align the receiver if an inadequate apparatus is used. If a station is tuned in, the selectivity control in the broad position and the control is then turned to the sharp position, the station may disappear. This is not an indication that the receiver is out of alignment.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

1. F. Adjustment
   Set the signal generator for a signal of 4150 KC.
   Connect the output of the signal generator through a 1000 ohm dummy load to the output of the signal generator.
   Turn the band selector to the range B position.
   Turn the control to the maximum position and keep it in this position for all adjustments.
   Turn the volume control to the minimum position.
   Adjust the signal generator to the peak of the highest intensity.
   Then go back and repeat the procedure as given for the 18000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

2. B Adjustment
   Set the signal generator for 15100 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 18000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

3. C Alignment
   Set the signal generator for 3000 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

4. D Adjustment
   Set the signal generator for 6000 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

5. E Alignment
   Set the signal generator for 18000 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

6. F Adjustment
   Set the signal generator for 15100 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

7. G Alignment
   Set the signal generator for 15100 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

8. H Adjustment
   Set the signal generator for 15100 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

9. I Alignment
   Set the signal generator for 15100 KC.
   Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
   Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

10. J Adjustment
    Set the signal generator for 15100 KC.
    Turn the tuning condenser and the control to the front of the chassis until maximum output is obtained.
    Then go back and repeat the procedure as given for the 151000 KC adjustment if it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 151000 KC adjustment must be repeated.

D. C. Resistance of Windings

Refer to Fig. 4.

Following are the D. C. resistance of the various windings in the chassis. The values given below will vary slightly in different units.

<table>
<thead>
<tr>
<th>Windings</th>
<th>D. C. Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Output</td>
<td>2500 ohms</td>
</tr>
<tr>
<td>Power Supply</td>
<td>1500 ohms</td>
</tr>
<tr>
<td>Speaker</td>
<td>1000 ohms</td>
</tr>
<tr>
<td>Transformer</td>
<td>500 ohms</td>
</tr>
<tr>
<td>Condenser</td>
<td>100 ohms</td>
</tr>
<tr>
<td>Capacitor</td>
<td>1000 microfarads</td>
</tr>
</tbody>
</table>

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily with a sixty cycle power supply. However, the receiver is not rated for sixty cycle operation and cannot be operated from a twenty-five cycle power supply.

A 115-230 Volt, 40 to 50 cycle as well as other power transformers with special power ratings are also available for this model.

Changes in Early Models

In the early models of this receiver the tone control resistors (R11) was connected as a series variable resistor connecting in series through the condenser C9 between the grids of the 45 tubes in the audio output stage. In the later models it is employed as a potentiometer in the manner shown in Fig. 7.

The 10000 ohm resistor (R10) was not used in the early models. Condenser C21 was connected directly to resistor R7.

The type 6K764 tubes replace the type 6K764 tubes which were used in the early models. Condenser C21 was added to the oscillator coils and standard wave section in later models. It is not, however, used in all cases but only when this capacity is required in this circuit.

Phonograph Connections

Phonograph connections can be made as shown in Fig. 7. The parts required to make this installation are shown in the parts list.

To mount the phone switch and phone jack, drill holes of a size and in the position shown in Fig. 8 at the left hand side (from back) of the rear panel of the chassis.

Fig. 8—Details of Panel Drilling for Phone Assembly
Changes in Early Models

In the early models, condenser C65, shown in the R.F. Schematic Fig. 2, was not used. A 20 mmf. condenser, also designated as C65, was connected in parallel with condenser C16.

Condenser C10 from B+ to ground was not used in early models. Another condenser in the early models, also designated as C10 and 250 mmf. in value, was connected from the A.V.C. amplifier plate to ground.

Resistor R18 was not used in early models.

On the A.F. chassis, the speaker sockets were wired with ground to the opposite side of voice coil.
D. C. Resistance of Windings

Following are the D. C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Winding</th>
<th>D. C. Resistance in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-9A443</td>
<td>Antenna Transformer</td>
<td>8.7</td>
</tr>
<tr>
<td>P-9A449</td>
<td>Interstage Transformer</td>
<td>1.0</td>
</tr>
<tr>
<td>P-9A444</td>
<td>1st I. F. Transformer</td>
<td>1.4</td>
</tr>
<tr>
<td>P-9A442</td>
<td>2nd I. F. Transformer</td>
<td>4.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Winding</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-12A27</td>
<td>Dynamic Speaker</td>
<td></td>
</tr>
<tr>
<td>P-9A440</td>
<td>Oscillator Coils</td>
<td></td>
</tr>
<tr>
<td>P-5X108</td>
<td>Power Transformer</td>
<td></td>
</tr>
</tbody>
</table>

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Fig. 3—R.F. and Oscillator Coil Base Terminal Arrangement and D.C. Resistance of Windings

D.C. Resistance of Windings

Following are the D.C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

<table>
<thead>
<tr>
<th>Code</th>
<th>Winding</th>
<th>D.C. Resistance in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Antenna Transformer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Long Portion</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Short Portion</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Secondary Winding—Either Portion</td>
<td>1.6</td>
</tr>
<tr>
<td>T2</td>
<td>Interstage Transformer</td>
<td>41.5</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td>41.5</td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>No. 1</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>No. 2</td>
<td>1.8</td>
</tr>
<tr>
<td>T3</td>
<td>1st I.F. Transformer</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td>87.0</td>
</tr>
<tr>
<td>T4</td>
<td>2nd I.F. Transformer</td>
<td>43.0</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td>43.0</td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td>48.2</td>
</tr>
</tbody>
</table>

VOLTAGES AT SOCKETS

Antenna Disconnected  Battery 6 Volts Under Load

<table>
<thead>
<tr>
<th>Type of Tube</th>
<th>Function</th>
<th>Plate to Ground</th>
<th>Screen to Ground</th>
<th>Cathode to Ground</th>
<th>Cathode Current M.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6D6</td>
<td>R. F. Amp.</td>
<td>5.6</td>
<td>245</td>
<td>105</td>
<td>5.2</td>
</tr>
<tr>
<td>6C6</td>
<td>1st Det. Ose.</td>
<td>5.6</td>
<td>245</td>
<td>105</td>
<td>0</td>
</tr>
<tr>
<td>6D6</td>
<td>I. F. Amp.</td>
<td>5.6</td>
<td>245</td>
<td>105</td>
<td>5.2</td>
</tr>
<tr>
<td>75</td>
<td>2nd Det.</td>
<td>5.8</td>
<td>120(1)</td>
<td>1.4</td>
<td>0.00</td>
</tr>
<tr>
<td>41</td>
<td>Power</td>
<td>5.8</td>
<td>235</td>
<td>245</td>
<td>15.0(2)</td>
</tr>
<tr>
<td>84</td>
<td>Rectifier</td>
<td>5.8</td>
<td></td>
<td></td>
<td>52.0</td>
</tr>
</tbody>
</table>

1. With 250,000 Ohm Meter
2. Read Across Filter Choke

Antenna

IMPORTANT—If the car antenna is of high capacity (600 mmf. or higher) insert the antenna plug with the mark on the HC side—See Fig. 10. If it is a low capacity antenna, insert the plug with the mark on the LC side.

The General Motors cars have steel roofs, and a running board or other under car antenna must be used. These are low capacity antennas. The Chrysler motor cars (except Plymouth) have a steel roof separated from the body proper, which is used as an antenna. These are high capacity antennas. Other cars without steel roofs such as Ford and Plymouth have a built-in roof antenna which is of low capacity.

If a running board or under-car antenna is used, it must be one which is covered with a suitable insulation, to prevent short circuiting in wet weather.

Fig. 10—Antenna Plug Insertion
Primary voltage: 117 V AC
Intermediate frequency range: 465 KHz to 1700 KHz
Tuning frequency range: 520 KHz to 1800 KHz
Power consumption: 54 watts
Output impedance: 500 ohms

CR-101M -- Used in Windsor combination.
CR-101 -- Used in Regent combination.

CR-101M -- Used in RTR-308 remote tuner.
It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
ALIGNMENT PROCEDURE

It is absolutely necessary that an accurately calibrated test oscillator with some type of output measuring device be used when aligning the receiver.

ALIGNING THE I.F. STAGES AT 465 KILOCYCLES
1. Use a .00025 mfd. condenser in series with the signal generator output when connecting to the antenna binding post. Use both this resistor and a .00025 mfd. condenser when connecting to the G47 grid.
2. Connect an output meter across the voice coil of the speakers.
3. Turn the tone equalizer to the "sharp tone" position.
4. Turn the volume control up to 10 or more, and adjust the signal generator output until a reading of one volt is obtained when a signal is supplied.
5. Align the second I.F. transformer first by connecting the signal generator to the grid of the 6AG7 second I.F. tube. Now adjust the third I.F. transformer until a maximum deflection is obtained on the output meter.
6. Connect the output of the signal generator to the grid of the 6AG7 tube. Readjust the output of the signal generator so that the output meter reading does not exceed one volt and adjust the second I.F. transformer until a maximum deflection of the output meter is obtained.
7. Connect the output of the signal generator to the grid of the 6AG7 tube. Readjust the output of the signal generator so that the output meter reading does not exceed one volt and adjust the first I.F. transformer until a maximum deflection of the output meter is obtained.

ALIGNING THE 540-1700 KILOCYCLE BAND
1. Use a 400 ohm resistor in series with the signal generator output.
2. Set the wave band switch for reception on the broadcast band.
3. Run the dial pointer to the extreme left position. This will adjust the tuning condensers to maximum capacity.
4. Holding the tuning condensers at maximum capacity, adjust the dial pointer to a position at the end of the horizontal scale. This is done by sliding the slider on the dial string.
5. Connect the signal generator output to the grid of the 6AG7 tube, tune the radio and signal generator to 600 KC and adjust the 600 KC pad for maximum deflection of the output meter.
6. Turn the signal generator and radio to 1400 KC and adjust the 1400 KC oscillator trimmer for maximum deflection of the output meter.
7. Leave the signal generator and radio set at 1400 KC, connect the signal generator output to the antenna binding post "A1", connect binding post "A2" to ground and adjust the 1400 KC R.F. trimmer. And the 1400 KC antenna trimmer for maximum deflection of the output meter.

ALIGNING THE 1680-3350 KILOCYCLE BAND
1. Use a 400 ohm resistor in series with the signal generator output when connecting to the antenna binding post. Use both this resistor and a .00025 mfd. condenser when connecting to the G47 grid.
2. Set the band switch for reception on the foreign band.
3. Connect the output of the signal generator to the grid of the 6AG7 tube, set the signal generator and the radio to 1700 KC and adjust the 1700 KC pad for maximum deflection on the output meter.
4. Set the signal generator and radio to 5000 KC and adjust the 5000 KC oscillator trimmer for maximum deflection of the output meter.
5. Leave the signal generator and radio set at 5000 KC, connect the signal generator output to the antenna binding post "A1" and adjust the 5000 KC R.F. trimmer and the 5000 KC antenna trimmer for maximum deflection of the output meter.

ALIGNING THE 5.6-18.0 MEGACYCLE BAND
1. Use a 400 ohm resistor in series with the signal generator when connecting to the antenna post. Use both this resistor and a .00025 mfd. condenser when connecting to the G47 grid.
2. Set the band switch for reception on the foreign band.
3. Connect the signal generator output to the grid of the 6AG7 tube, set the signal generator and the radio to 16 megacycles and adjust the 16 megacycle oscillator trimmer for maximum deflection of the output meter.
4. Leave the signal generator and radio set for 16 megacycles, connect the signal generator output to the antenna binding post "A1" and adjust the 16 megacycle R.F. trimmer and the 16 megacycle antenna trimmer for maximum deflection of the output meter.

RESTRING THE DIAL CABLE

To restring the cable on this model, it is necessary first to remove the glass dial. Bend back the small metal ears that hold the glass in place, on the left and lower sides only. Slip the three dividing strips from the assembly and the four glass strips will be easily removable. Slip the brass backing from the assembly exposing the cable tension spring inside the disc.

Remove the spring "A" from the small hook "B", and tie one end of the spring to the spring, lacing it through the opening in the groove of the disc, allowing about 1/2 inch between the end of the spring and the inside edge of the groove. Proceed around the disc in a clockwise direction for one complete revolution, continuing around the drive shaft "C" for 2 1/2 turns in a clockwise direction up through the left hand idler pulley "D", across the top and around the right hand idler pulley "E"; downward around the disc in a clockwise direction, through the opening in the groove and secure it to the spring, until the other end can be secured to the hook. Replace the dial strips in their original locations and the operation is completed.
MISCELLANEOUS NOTES

The radio chassis must "float" freely and it is, therefore, important that none of the knobs touch the panel. The four holes in the radio support bracket "C" Fig. 1, are sufficiently large to permit adjustment of the chassis until it "floats" properly. Be sure that this "floating" condition exists before attempting to tighten the screws "A" Fig. 1, after replacing the chassis in the cabinet.

If one of the push-button switches does not function, remove the radio panel in the manner outlined in the foregoing instructions, and check the switch contacts. It is entirely probable that the trouble can be corrected by either cleaning the contacts or by bending them so that they form a solid connection.

When the release button on the radio push-button assembly is depressed, the switch arm nearest the end of the assembly must break one contact before making the other contact. Failure of the release button switch to operate in this manner will cause the "set-up" pilot lamp to burn out, in which case the arm of the switch should be bent until the "break-before-make" action is obtained.

Due to the extremely high sensitivity of the receiver, it is possible for some excessively strong signals to overload and cause distortion in the radio. This condition is very rare and occurs only on a very strong signal when the receiver has a very efficient antenna. This difficulty is recognized by distortion on a strong signal and being absent on weak signals. To correct this trouble, it is necessary to connect a 500 ohm resistor across the broadcast antenna primary to ground. The terminal 1 or making this connection is available at the rear of the R.F. transformer on the top of the chassis. Connect the resistor from the lug having the red-with-blue tracer lead connected to it, to the ground bus wire which ties the three trimmer condensers together.

It is possible for the distortion mentioned above, to occur due to defective 6GF 1F tubes. The second 1F tube is more susceptible to this difficulty and should be replaced before checking the first 1F tube.

When push-button muting is used, the dial pointer may have a tendency to "hunt" on either side of the desired frequency before coming to rest. This condition is caused by insufficient pressure of the small spring at the rear of the tuning motor, against the armature shaft. The spring should be "kinked" slightly to provide additional pressure, using a pair of long-nosed pliers to make the adjustment.

If a distinct hum is heard in the speakers when using the radio, the 6GF tube should be replaced as a possible cause. It is extremely important that the grid lead of the 6GF tube be shielded as near to the cap of the tube as possible, or hum will be picked up in this lead.

The two 0.05 MFD condensers connected across the two motor push-button switches should be removed to prevent a "scraping" noise that may be apparent when the receiver is tuned manually.

The 1000 ohm bias resistor in the cathode circuit of the 6A7 tube should be replaced with a 300 ohm resistor to increase the stability of the receiver.
It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
MAGNAVOX RADIO CHASSIS
CR-106, 109 AND 111

It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.

10 K.C. FILTER ADJUSTMENT

With the tone control set for maximum treble response, tune the receiver to a point between two stations of about the same signal strength on adjacent channels. If a 10,000 cycle heterodyne is heard as the beat note between the two carriers, it may be eliminated by retuning the 10 KC output filter by means of the 10 KC trimmer condenser on the back of the chassis near the speaker.

143287 Knob "Tuning" .15
143286 Knob "Volume" .15
143266 Knob "o-B-P-E" .15
633320 Pulley Dial pulley .10
633315 Shaft Tuning shaft .20
Primary voltage...........117 V. AC-DC;
Power consumption........80 watts;
Power output..............6 watts;

Speaker:
Field coil...............1800 ohms;
Transformer.............3000 ohms;

Tuning frequency range 540 - 1730 KC;
1.7 - 5.8 MC;
5.7 - 18.3 MC;

Type Circuit: Superheterodyne with three tuning ranges, tone control, A.V.C., bass compensation in volume control for phonograph pickup.
CR-107 -- Used in AC-DC Concerto combination.
Has .005 mfd. condenser for item 24.
10 KC filter consisting of items 5A and 8A are omitted.
CR-110 -- Has brackets for mounting in Chairside cabinet.
CR-112 -- Has brackets insulated from chassis for mounting in Berkeley cabinet.
CR-120 -- Speaker mounted on the chassis for use in AC-DC Playfellow combination.
CR-126 -- Has brackets for mounting in Berkeley cabinet.
CR-127 -- Has brackets for mounting in Hepplewhite cabinet.

It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
ALIGNMENT PROCEDURE

It is absolutely necessary that an accurately calibrated test oscillator with some type of output metering device be used when aligning the receiver.

ALIGNING THE I.F. STAGES AT 455 Kilocycles

1. Connect an output meter across the voice coil of the speakers.
2. Turn the tone equalizer to the sharp-tune position.
3. Turn the volume control up to 7 or more, and adjust the signal generator output until a reading of one volt is obtained on the output meter when a signal is applied.
4. Align the third I.F. transformer first, by connecting the signal generator to the grid of the 6AS, second I.F., tube, now adjust the third I.F. transformer until a maximum output meter deflection is obtained. THE OUTPUT OF THE SIGNAL GENERATOR IS TO BE CONNECTED THROUGH A .0005 MF capacitor AT ALL TIMES.
5. Align the second I.F. transformer first, by connecting the signal generator to the grid of the 6AS, first I.F., tube. Readjust the output of the signal generator so that the output meter reading does not exceed one volt, and adjust the second I.F. transformer until a maximum deflection of the output meter is obtained.
6. Connect the output of the signal generator to the grid of the 6AT tube. Readjust the output of the signal generator so that the output meter reading does not exceed one volt, and adjust the first I.F. transformer until a maximum deflection of the output meter is obtained.

ALIGNING THE 540-1730 K.C. BAND

1. Set the waveband switch for reception on the broadcast band.
2. Turn the dial pointer to the extreme left position. This will adjust the tuning condensers to maximum capacity.
3. Holding the tuning condensers at maximum capacity, adjust the dial pointer to a position at the end of the horizontal scale. This is done by sliding the pointer on the dial string.
4. Connect the signal generator output to the grid of the 6AT tube, tune the radio and signal generator to 600 Kc and adjust the 600 Kc pad for maximum deflection of the output meter.
5. Turn the radio and signal generator to 1400 Kc and adjust the 1400 Kc trimmer for maximum deflection of the output meter.
6. Leave the signal generator and radio switch at 1400 Kc, connect the signal generator output to the antenna binding post "A", and adjust the 1400 Kc R.F. stage trimmer for maximum deflection of the output meter.

ALIGNING THE 1560-5800 K.C. BAND

1. Set the band switch for reception on the police band.
2. Connect the output of the signal generator to the grid of the 6AT tube, set the signal generator and radio to 1800 Kc and adjust the 1800 Kc padding for maximum deflection of the output meter.
3. Set the radio and the signal generator to 5000 Kc and adjust the 5000 Kc oscillator trimmer for maximum deflection of the output meter.
4. Leave the radio and signal generator set at 5000 Kc, connect the signal generator output to the antenna binding post "A", and adjust the 5000 Kc first detector trimmer and the 5000 Kc R.F. padding for maximum deflection of the output meter.

ALIGNING THE 5700-18300 K.C. BAND

1. Set the band switch for reception on the foreign band.
2. Connect the signal generator output to the grid of the 6AT tube, set the radio and the signal generator to 15 megacycles and adjust the 15 megacycle oscillator trimmer for maximum deflection of the output meter.
3. Leave the signal generator and the radio set for 15 megacycles, connect the signal generator output to the antenna binding post "A", and adjust the 15 megacycle first detector trimmer and the 15 megacycle oscillator trimmer for maximum deflection of the output meter.

MISCELLANEOUS NOTES

The radio chassis must "float" freely and it is therefore important that none of the knobs touch the panel. The holes in the radio support bracket "C", Fig. 1, are sufficiently large to permit adjustment of the chassis until it "floats" properly. Be sure that this "floating" condition exists before attempting to tighten the screw "A", Fig. 1, after replacing the chassis in the cabinet.

If one of the push-button switches does not function, remove the radio panel in the manner outlined in the following instructions, and check the switch contacts. It is entirely probable that the trouble can be corrected by either cleaning the contacts or by bending them so that they form a solid connection.

When the release button of the radio push-button assembly is depressed, the switch arm causes the end of the assembly to break one contact before making the other contact. Failure of the release button to operate in this manner will cause the setup pilot lamp to burn out, in which case the arm of the switch should be bent until the "break-before-make" action is obtained.

Due to the extremely high sensitivity of the receiver, it is possible for some excessively strong signals to overload and cause distortion in the radio. This condition is very rare and occurs only on a very strong signal when the receiver has a very efficient antenna. This difficulty is recognized by distortion on a strong signal and being absent on weak signals. To correct this trouble, it is necessary to connect a 500 ohm resistor across the broadcast antenna primary to ground. The terminal for making this connection is accessible at the rear of the R.F. transformer on the top of the chassis. Connect the resistor from the lug having the red-white-blue tracer lead connected to it, to the ground bus wire which ties the three trimmer condensers together.

If is possible for the distortion mentioned above, to occur due to defective 6AS I.F. tubes. The second I.F. tube is more susceptible to this difficulty and should be replaced before checking the first I.F. tube.
CR-108M - Nine-tube superheterodyne

CR-122 - Same as CR-108M except Items 23, 70, and 79 are omitted

Item 124 is added
PLACED UNDER NOSE

The tuning shaft "A" Fig. 2, can be bent very easily when the chassis is out of
the cabinet if extreme care is not exercised. If the shaft is bent only
slightly, it can possibly be bent back to its original shape, otherwise it
should be replaced.

To replace the tuning shaft, first slip the dial cable from the front groove
of the disc "B" Fig. 2, by releasing the spring holding that cable in place.
Now rotate the disc until the dial pointer is at the extreme right edge of the
disk, at which point the hole "C" in the disc is in line with the hole in the
shaft support bracket. Insert a small screw driver through the two holes
and remove the motor mounting screw. Remove the other two motor mounting
screws and lift the motor from the chassis.

Now remove the "C" washer from the shaft immediately to the front of the shaft
support bracket, and slide the shaft toward the inside of the chassis. Insert
a new shaft and gear, wrap 2 1/2 turns of the dial cable in the groove pro-
vided, and fasten the "C" washer in place. Method of properly stringing
the dial cable is shown in detail in Fig. 2 and is fully described in the
following paragraphs. Reposition the motor with the three mounting
screws. The holes through which these screws pass, are sufficiently large to permit ad-
justment of the motor so that the gears mesh properly. The procedure out-
lined above for replacing a tuning shaft may also be used in replacing a
tuning motor.

To adjust the position of the volume or tone compensator emisphere disc,
loosen the small set-screw on the brass bushing behind the disc, and slide
the disc until the proper setting is obtained. Tighten the set-screw, and
the operation is completed.

When push-button tuning is used, the dial pointer may have a tendency to "jump" on either side of the desired frequency before coming to rest. This
condition is caused by insufficiency pressure of the small spring at the
rear of the tuning motor, against the armature shaft. The spring should be
replaced slightly to provide additional pressure, using a pair of long-nosed
pliers to make the adjustment.

If a distinct hum is heard in the speakers when using the radio, the GFS tube
should be replaced as a possible cure. It is extremely important that the grid lead of the GFS tube is installed as near to the end of the tube as is
possible or hum will be picked up in this lead.

The shell of the lamp on the photocell input plug should not be allowed to
contact the chassis or else a hum will be heard in the speakers with pho-
notraph operation. A small felt washer is used between the plug and the re-
sistance to prevent this and should be replaced at any time that it is ne-
necessary to remove this plug from its receptacle.

RESTRINGING THE DIAL CABLE

To restring the pointer cable, first tie one end of the cable to the pointer
spring, Fig. 2, after the spring has been removed from the small
hook on disc "B". Lay the cord through the eyefish in the rear groove, al-

dowing about 1/8 inch between the spring and the inside edge of the groove.

Proceed around the idler pulley at the left end of the dial, across the front
of the disc "B", through the back of the pointer clamp (see inset Fig. 2),
around the right-hand idler pulley and around the rear disc groove in a coun-
ter-clockwise direction, threading the cable through the eyefish mentioned above. Fast
the cable to the spring, bringing the spring toward the inside rim of the
disc as close as possible. Now stretch the spring until the other end can
be secured to the hook, completing the operation.

To restring the drive shaft cable, first tie one end of the cable to the
drive shaft cable tension spring, after the spring has been removed from the
small hook on disc "B". Lay the cord through the eyefish in the front groove
allowing about 1/8 inch between the spring and inside edge of the groove.

Proceed around the disc in a counter-clockwise direction, wrap two
and one-half turns around shaft "A" Fig. 2, in a clockwise direction and
from front to rear. Continue around the groove in a counter-clockwise di-
rection threading the cable through the eyefish near the spring. Fasten
the cable to the spring, bringing the spring toward the inside rim of the disc
as close as possible. Stretch the spring until the other end can be
secured to the hook, and the operation is completed.

![Diagram of the alternator](image-url)
ALIGNING THE I.F. AT 455 KILOCYCLES

1. Connect the ground lead of the test oscillator to the chassis or set ground lead (black). Connect the other lead of the test oscillator to the grid cap of the 6AT tube through a .00025 mfd. series condenser. Do not remove the grid clip.

2. Set the test oscillator to EXACTLY 455 kilocycles and turn the receiver volume to its maximum setting.

3. Peak each of the second I.F. transformer trimmer condensers.

4. Peak each of the first I.F. transformer trimmer condensers.

ALIGNING THE 540-1750 K.C. BAND

1. Remove the test oscillator lead from the grid of the 6AT tube and connect it to the receiver antenna lead (blue) through a .00025 mfd. series condenser.

2. Set the test oscillator frequency and receiver dial to EXACTLY 1400 kilocycles. Adjust the 1750 kilocycle oscillator trimmer to bring in 1400 kilocycle test oscillator signal to maximum output.

3. Tune the receiver and test oscillator frequency to EXACTLY 1400 kilocycles and adjust the 1400 kilocycle antenna trimmer for maximum output as indicated on the output meter.

ALIGNING THE 1.7-5.8 M.C. BAND

1. Substitute a 400 ohm resistor for the .0015 mfd. condenser in series with the antenna lead.

2. Tune the receiver and test oscillator frequency to EXACTLY 6 megacycles and adjust the 6 megacycle antenna trimmer for maximum output.

ALIGNING THE 8.7-18.3 M.C. BAND

1. Leave the 400 ohm resistor in series with the test oscillator lead and set the band selector switch for operation on the 8.7 - 18.3 megacycle band (short wave).

2. Set the receiver and test oscillator frequency to EXACTLY 18.3 megacycles.

3. Adjust the 18.3 megacycle oscillator trimmer for maximum signal as indicated on the output meter.

When adjusting this trimmer two peaks may be noticed, in which case care MUST be taken that the proper peak is used for aligning the receiver at 18.3 MC. Always back off the trimmer to minimum capacity, then move down the trimmer (add capacity) until the second peak—if more than one is noticed—which is the correct one to use, is tuned in.

Set the receiver and test oscillator frequency to EXACTLY 18.3 megacycles.

5. Peak the gang condenser slightly to the right and to the left, adjusting the 18 megacycle antenna trimmer for maximum signal as indicated on the output meter.

6. The gang condenser may be left at the correct setting as indicated on the output meter.

7. The output filter should now be reset to correct operating frequency and adjusted for maximum output.

8. Check the tuning dial adjustment by turning the gang condenser until the dial pointer is exactly the correct position on the dial. The correct position will be indicated by the test oscillator signal appearing on the signal generator.

9. Adjust the 18 megacycle oscillator trimmer to bring the output to the maximum output level.

10. Check the tuning dial adjustment by turning the gang condenser until the dial pointer is exactly the correct position on the dial. The correct position will be indicated by the test oscillator signal appearing on the signal generator.
Type circuit: Superheterodyne with three Intermediate frequency.................455 KC
  tuning ranges, tone control, A.V.C., bass Tuning frequency range 540 - 1730 KC;
  compensation in volume control for phono- 1.7 - 5.6 MC;
  graph pickup. 5.7 - 15.3 MC;

Speaker:
Field coil............ 750 ohms;
Transformer...........3500 ohms;

Primary voltage.............117 V. AC;
Power consumption........80 watts;
Power output..................6 watts;
It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
Type Circuit: Superheterodyne with two tuning ranges, tone control, A.V.C. bass compensation in volume control for phonograph pickup.

Tuning frequency range: 540-1720 KC 2.5-6.3 MC

CHASSIS CR117
Schematic/Voltage

MAGNAVOX RADIO CHASSIS
CR-117

MAGNAVOX PAGE 10-19

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It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
Primary voltage............. 117 V. AC; Intermediate fr
Power consumption........... 100 watts; Tuning frequenc
Power output.................. 12 watts;
Speaker:
Field Coil............. 1000 ohms; Type Circuit;
Transformer............. 8000 ohms; tuning ranges,
A.V.C. bass cc
trol for phonos
FOR ALIGNMENT
SEE INDEX

CR-121 -- Used in AC Hepplewhite Manual combination.
Used in AC Berkeley combination.
It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.
TO REMOVE THE CHASSIS FROM THE CABINET: SEE CHASSIS CR-106.
R-123, 128

It is important that EXACT replacement parts be used when necessary and these parts must be located in exactly the same way that the original part was located and connected. This applies particularly to ground points.

Intermediate frequency........455 KC;
High frequency range: 535 - 1750 KC;
5.7 - 18.1 MC;

Suit: Superheterodyne with two tunable ranges, treble control, A.V.O.;
compensation in volume control for graph pickup; push-button condenser-type tuner.

Speaker:

Primary voltage.............117 V. AC;
Field Coil.... 750 ohms; Power consumption........... 90 watts;
Transformer...3500 ohms; Power output............. 6 watts;

CR-123 -- Used in Concerto, Chairside and Hepplewhite combinations.
Same as CR-123 except:
Item 61 is eliminated.
Item 27 is .03 mfd.

CR-128 -- Used in Hepplewhite automatic combination.
ALIGNMENT PROCEDURE

Primary voltage...........117 V. AC;
Power consumption...........165 watts;
Power output................17 watts;
Circuit: Superheterodyne with three tuning ranges, treble and bass controls
A.V.C., bass compensation in volume control for phonograph pickup.
Speaker (302);
Field Coil..................250 ohms;
Transformer................1OM ohms;
Speaker (12G131);
Field Coil..................250 ohms;
Transformer................None

It is absolutely necessary that an accurately calibrated test oscillator with some type of output measuring device be used when aligning the receiver.
TUNING FREQUENCY RANGE: 535 - 1730 KC; 1.7 - 5.8 and 5.85 - 18.5 MC.
FOLLOW ALIGNMENT PROCEDURE OF MAGNAVOX CHASSIS CR-106.

10 K.C. FILTER ADJUSTMENT

With the tone control set for maximum treble response, tune the receiver to a point between two stations of about the same signal strength on adjacent channels. If a 10,000 cycle heterodyne is heard as the beat note between the two carriers, it may be eliminated by retuning the 10 KC output filter by means of the 10 KC trimmer condenser as the rear center of the chassis.
ALIGNING THE I.F. STAGES AT 455 KILOCYCLES

1. Connect the ground lead of the test oscillator to the chassis or radio ground lead. Connect the other lead of the test oscillator to the grid tap of the 6A7 tube through a .00025 mfd. series condenser. DO NOT REMOVE THE GRID CLIP.

2. Set the test oscillator to EXACTLY 455 kilocycles and turn the receiver volume to maximum setting.

3. Peak each of the second I.F. transformer trimmer condensers.

4. Peak each of the first I.F. transformer trimmer condensers.

To insure most accurate trimmer setting, repeat the above adjustment several times, always using the lowest possible test oscillator output consistent with readable output meter scale deflection.

ALIGNING THE 540-1720 KILOCYCLE BAND

1. Remove the test oscillator lead from the grid of the 6A7 tube and attach it to the receiver antenna lead (blue) through a .00025 mfd. series condenser.

2. Check tuning dial adjustment by turning the gang condenser until plates are completely meshed, at which point the dial pointer must be exactly even with the last line at the low frequency end of the dial calibration.

3. Set the receiver and test oscillator frequency to EXACTLY 1700 kilocycles.

4. Adjust the oscillator trimmer "5a Fig. 2, for maximum output as indicated on the output meter.

5. Set the receiver and test oscillator frequency to EXACTLY 1400 kilocycles.

6. Adjust the antenna trimmer "7a Fig. 2, for maximum output, as indicated on the output meter.

7. Now set the receiver and test oscillator frequency to 600 kilocycles, and adjust the oscillator condenser "11" Fig. 2, accessible from the top of the chassis, for maximum output.

ALIGNING THE 2.3-6.3 MEGACYCLE BAND

1. Substitute a 400 ohm resistor for the .00025 mfd. condenser in series with the antenna lead.

2. Adjust the hand selector switch for short-wave band and tune the receiver and test oscillator frequency to EXACTLY 6.3 megacycles.

3. Slowly adjust the 6.3 megacycle oscillator trimmer "10" Fig. 2, for maximum deflection on the output meter.

4. Set the receiver and test oscillator frequency to EXACTLY 6 megacycles, and adjust the 6 MO antenna trimmer "9" Fig. 2, for maximum deflection on the output meter.

ALIGNING THE 5.7-18.1 MEGACYCLE BAND

1. Substitute a 400 ohm resistor for the .00025 mfd. condenser in series with the antenna lead.

2. Adjust the hand selector switch to the 5.7-18.1 megacycle (foreign) band, tune the receiver and test oscillator frequency to EXACTLY 18 megacycles and adjust the 18 megacycle oscillator trimmer and antenna trimmer for maximum output as indicated on the output meter.

3. While adjusting the oscillator trimmer, two peaks may be noticed, in which case care must be taken so that the proper peak is used for aligning the receiver at 18 megacycles. Always back off the trimmer to minimum capacity, then screw down the trimmer until the second peak (if more than one is noticed) which is the correct one, is tuned in.

10 K.O. FILTER ADJUSTMENT

With the tone control set for maximum treble response, tune the receiver to a point between two stations of about the same signal strength on adjacent channels. If a 10,000 cycle heterodyne is heard as the beat notes between the two carriers, it may be eliminated by retuning the 10 KO output filter by means of the 10 KO trimmer condenser at the rear center of the chassis.
The tubes used are:

- 1-8A7 Frequency Converter
- 1-SD6 Intermediate frequency amplifier
- 1-75 Second detector, AVC, and audio frequency amplifier
- 1-41 Output
- 1-80 Rectifier

**PARTS LIST FOR MODEL NO. 1A59**

<table>
<thead>
<tr>
<th>Schematic</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2</td>
<td>C15754</td>
<td>Tubular cond. 0.1 mfd 400V</td>
</tr>
<tr>
<td>C3, C4</td>
<td>C15772</td>
<td>Tubular cond. 0.05 mfd 250V</td>
</tr>
<tr>
<td>C5</td>
<td>CM19</td>
<td>Wire cond. 0.002 mfd 30V</td>
</tr>
<tr>
<td>C6</td>
<td>CM27</td>
<td>Wire cond. 0.002 mfd 30V</td>
</tr>
<tr>
<td>C7, C8</td>
<td>C15774</td>
<td>Tubular cond. 0.002 mfd 400V</td>
</tr>
<tr>
<td>C9, C10</td>
<td>15760</td>
<td>Tubular cond. 0.002 mfd 400V</td>
</tr>
<tr>
<td>C11, C12</td>
<td>T-C18</td>
<td>Trimmer cond. 0.002 mfd 400V</td>
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<tr>
<td>C13, C14</td>
<td>C15748</td>
<td>Bridge cond. 0.002 mfd 400V</td>
</tr>
</tbody>
</table>

- 1-8A7 6V6 Output Rectifier

**TUBE LOCATION CHART**

- T-C16: First F. Transformer
- T-C17: Second F. Transformer
- T-C18: Bridge Condenser

**TUBE LAYOUT**

- 8A7: 1st Detector
- 6D6: IF Amplifier
- 41: 600 KC

**Schematic Diagram Models 1A59, P1A59, 1B59 and P1B59**

**If Peak 455 KC**

**Parts List for Models 149-W, 149-L, 149-N**

This receiver is a 6-tube super-heterodyne using two double purpose tubes. It operates on either AC or DC current of 103 to 125 volts. It receives stations lying between 335 and 1750 Kilocycles. This includes standard broadcast and most police stations.

The tubes used are:

- 1-12A8GT Combined oscillator and first detector
- 1-12K7GT Intermediate frequency amplifier
- 1-12Q7GT Second detector, automatic volume control, gas gain, and audio amplifier
- 1-35L6OT Beam power output
- 1-35Z4GT Rectifier
This receiver is a 5 tube AC-DC compact type radio receiver employing tuned radio frequency circuit. The tuning range covers all frequencies between 528 kilocycles and 1750 kilocycles (171 meters to 565 meters). These frequencies cover the standard broadcast band and in addition police calls and some amateur transmitters. This receiver is designed to operate on 20-00 cycle AC or DC at voltages between 105 and 130. These are standard voltages used practically all over the United States and in some foreign countries. The audio power output of the receiver is a maximum of 2 watts. The receiver should not be connected to any power line having higher voltage than mentioned above. On DC operation reverse plug if receiver does not commence operating one minute after switch is turned on. On AC operation reversal of the plug in some cases may reduce hum.
MAJESTIC RADIO & TELEV. CORP.

CHASSIS 155
Schematic, Socket
Trimmers, Alignment

REPLACEMENTS PARTS LIST—MODEL 55

<table>
<thead>
<tr>
<th>Schematic Location</th>
<th>Part No.</th>
<th>Description</th>
<th>Schematic Location</th>
<th>Part No.</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>Y-CV-3</td>
<td>Condenser Variable Gang</td>
<td>C12</td>
<td>Y-CE-4</td>
<td>Condenser Electrolytic Dry 12 Mfd. 25 V.</td>
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<tr>
<td></td>
<td>C-12734</td>
<td>Condenser Tubular .01 Mfd. 400 V.</td>
<td>C14</td>
<td>Y-CP-15472</td>
<td>Condenser Electrolytic Dry 35 Mfd. 150 V.</td>
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<td>C-12735</td>
<td>Condenser Tubular .02 Mfd. 200 V.</td>
<td>C15</td>
<td>C-1551</td>
<td>Condenser Padder</td>
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<td>C-12751</td>
<td>Condenser Tubular .04 Mfd. 200 V.</td>
<td>C16</td>
<td>R-15511</td>
<td>Resistor Carbon 50,000 Ohms 1 W, 20%</td>
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<td>C-12761</td>
<td>Condenser Tubular .06 Mfd. 200 V.</td>
<td>C17</td>
<td>C-1277</td>
<td>Condenser Carbon 15 Mfd. 1 W, 20%</td>
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<td>C-15520</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R1</td>
<td>R-15520</td>
<td>Resistor Carbon 15 Mfd. 1 W, 20%</td>
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<td>C-15521</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R2</td>
<td>R-15521</td>
<td>Resistor Carbon 15 Mfd. 1 W, 20%</td>
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<td>C-15522</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R3</td>
<td>R-15522</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15523</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R4</td>
<td>R-15523</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15524</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R5</td>
<td>R-15524</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15525</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R6</td>
<td>R-15525</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15526</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R7</td>
<td>R-15526</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15527</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R8</td>
<td>R-15527</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
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<td>C-15528</td>
<td>Condenser Mica 250 Mfd. 25 V.</td>
<td>R9</td>
<td>R-15528</td>
<td>Resistor Carbon 25 Mfd. 4 W, 20%</td>
</tr>
</tbody>
</table>

CHASSIS LAYOUT
MODEL 55

In a super-heterodyne it is very important when realigning the receiver, to use the same frequencies as are used at the factory. Alignment is best accomplished by using an output meter across the voice coil and aligning for maximum. The L. F. frequency is 455 K. C. The short wave must be aligned before the broadcast band. This is done at only one frequency, 6 megacycles. On the broadcast band the alignment frequencies are 1500 and 600 K. C. 1500 K. C. is the first to be aligned using the shunt trimmers. When aligning 600 K. C., adjust the series pad, rocking the gang condenser to assure proper alignment.
ALIGNMENT

IF 455KC:- Adjust trimmers C15, C14, C18, C17 for maximum signal; attenuate signal to avoid misalignment due to A.V.C.

SW BAND:- Ground signal gen. to chassis through .1 mf cond. Osc. at 7,2 MC through 400 ohm carbon resistor to Ant. lead (blue). Turn band selector clockwise to 3rd pos. from extreme left. Variable fully open; set C7 at minimum cap tighten to signal. Osc. at 6 MC tune receiver to signal, adjust C2 to max. and adjust dial calibration. Check band at 4.25 and 2.40 MC.

EC BAND:- Band selector and tone control switch to extreme left. Apply 600 KC through 200 mmf cond to Ant. lead, dial at 600 KC; adj. C9 to max. signal. Osc. at 1750 KC; dial at 1750 KC; adj. C8 to max. sig. Signal at 1500 KC, dial to signal, adj. C3 to max. sig. Osc. at 600 KC adjust C9 to max. sig. with variable. Osc at 1500 KC, tune to max. sig., readjust C3 to maximum signal.

WAVE TRAP:- Band sw. in BC position, dial below 650KC
Correct alignment is extremely important. The receiver is properly aligned at the factory and should not be disturbed unless it is absolutely necessary. The procedure is as follows: Turn wave change switch to broadcast position (full counter clock wise) and rotate variable condenser until it is about 50% engaged. Apply a 455 KC signal to the grid of 6AG8 mixer tube through a tubular condenser on the order of .1 MFD. Referring to chassis layout, adjust C30, C29, C31 and C32 for maximum signal using of course some sort of indicating device such as an AC volt meter or output meter across the voice coil of the speaker. It may be necessary to apply a very strong signal to “find” the signal until alignment is approached. It is advisable to maintain as low a signal input as conveniently possible in order to minimize the possibility of misalignment resulting from A.V.C. and overload effects. If a squeal is heard while tuning, rotate the gang condenser slightly and it should disappear. Naturally, the ground side of the generator should be connected to the chassis either directly or through the .1 MFD. condenser.

**SHORT WAVE BAND**

Rotate the wave band switch to full clock wise position. Connect high side of generator output to antenna lead through a 400 ohm dummy antenna. Completely disengage variable condenser. Apply 18.5 meg. signal. Unscrew trimmer C26 to a minimum capacity, slowly turn the screw so that the trimmer capacity increases until the signal is heard. Apply 16 meg. signal, rotate gang condenser until this signal is heard. Adjust C23 for maximum response. It may be found advisable to “rock” generator frequency back and forth through signal to offset detuning effect from inter action between input and oscillator circuits at high frequencies. Check alignment through medium of sensitivity at 11 meg. and 6
**MAJESTIC RADIO & TELEV.CORP.**

**MODEL 651-EB Schematic, Tuner**

**REPLACEMENT PARTS LIST—MODEL 651 EB**

<table>
<thead>
<tr>
<th>Schematic Location</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1-D3, C30</td>
<td>C-15794</td>
<td>Tubular cond. 0.01 mfd. 400 V</td>
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<tr>
<td></td>
<td>C-15792</td>
<td>Tubular cond. 0.06 mfd. 50 V</td>
</tr>
<tr>
<td></td>
<td>C-15797</td>
<td>Tubular cond. 0.10 mfd. 50 V</td>
</tr>
<tr>
<td></td>
<td>C-1580</td>
<td>Tubular cond. 0.50 mfd. 50 V</td>
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<tr>
<td></td>
<td>CM-15979</td>
<td>Mica cond. 50 mfd. Type C</td>
</tr>
<tr>
<td></td>
<td>CM-15980</td>
<td>Mica cond. 50 mfd. Type C</td>
</tr>
</tbody>
</table>

**I.F. PACKAGE 455 KC.**

- **1-6A7** Frequency Converter
- **1-6D6** Intermediate frequency amplifier
- **1-75** Second detector, A.V.C., and audio driver
- **1-25L6G** Beam power output
- **1-3625** Rectifier
- **1-6GB** Plug-in ballast resistor

**ADJUSTMENT OF PUSH BUTTONS**

1. Determine which hour stations you desire to set up on the push buttons.
2. Determine the frequency of these stations.
3. Push the standard dial to the frequency of the desired station.
4. Push the proper push button.
5. Adjust the oscillator trimmer, corresponding to the proper push button, as shown in Fig. 2 until the station is tuned in with best audio response.
6. Adjust the oscillator trimmer corresponding to the proper push button, as shown in Fig. 2 until the station is tuned in with best audio response.
7. Repeat steps 4, 5, and 6 for the other push buttons.

**PUSH BUTTONS VIEWED FROM FRONT OF CABINET**

[Diagram showing the layout of the push buttons and their functions]
ALIGNMENT - Turn wave change switch to BC pos. and rotate var. cond. until about 50 percent engaged. Apply a 455 KC sig. to 6A8G thru a .1 mf cond.

Adjust trimmers marked "Trim 455 KC" for maximum signal.

SHORT WAVE BAND - Rotate wave band switch to full clockwise pos. Connect high side of gen. o.p. to ant. lead thru 400 ohm dummy ant. Set dial at 18 MC - Apply 18 MC signal.

Adj. C36 trim. to min. cap. slowly turn screw so trim. cap. increases until signal is heard. Apply 18 MC sig. and adj. C7 and C1 for max. - Check align. thru medium of sensitivity at 11 meg. and 6 meg. resp. - When align. at 18 MC the C7 trim. may indicate 2 maxima. Maxima obtained with trimmer tighter is the desired one. Check by leaving gang cond. set and shifting to higher freq. - 19 meg. where image should appear. If properly aligned it should require about 10 times six volt. for image to give same o.p. as real signal.

POLICE BAND - Shift waveband switch to middle pos. - Apply 5 MC sig. - Dial at 5 Mc. - Adj. C34 trim. as previous band until max. sig. is heard. Apply 5 meg. sig. and adj. Check alignment at 3.5 and 2 MC resp. Check for image same as previous band.

BROADCAST BAND - Use a 200 mmf cond. for dummy ant. on this band. Shift wave band sw. to full counter clockwise. Adj. trims. C5 and C9 to medium tight pos. - Dial at 600 KC. Apply 600 KC sig. and adj. paddor C52 for max. - Dial at 1500 KC and 1500 KC sig. adj. C33 for same. Then adj. trims. C5 and C9 for max. - Shift gang to 500 KC and apply 600 KC sig. - Adjust C4 for max. sig. - Recheck 1500 KC trimming.
There are three terminals on back of chassis marked A, D, G. Terminal A is for use with ordinary outdoor antennas from 30 to 50 feet in length. Terminal G is for connection to a suitably grounded pipe, although radiators or other types of grounds are often used successfully. Terminal D is to be used in combination with A when a doublet type antenna is used and under these conditions there should be no connection between terminals D and G.
PHONOCOUPLER—For phonographs, you can use the MAJESTIC Wireline record player, Model 1556X, or any standard record player, plus in the pickup tip is the jack marked "PHONO" at the rear of the receiver. If you get under him, remove these pickup tips. Push the push-button marked "PHONO" and adjust the Volume, Tone, Volume Depression and Bass Compensation, by means of the controls on the receiver.

AUTOMATIC FREQUENCY CONTROL—Model 1565X.

When tuning manually on the broadcast or "A" band, the station may be pulled and held into proper tuning by using the AFC. This is done by pushing the first button from the left. If the station is approximately tuned, the AFC will do the rest and ensure proper tuning.

This should only be used on local or strong stations as the AFC will cause the set to tune itself to the strongest stations within its range.

To release the AFC, push the AFC button, slightly upward. This will cause it to come out in the same manner as the "PHONO" button.

SETTING UP OF PUSH BUTTONS

To adjust the push buttons, turn the volume switch knob, the second one from the left, all the way to the left, to the position marked "F" on the cabinet. Going to the back of the receiver, adjust the coil marked No. 1 in figure 2 by turning the screw in the center of the coil by means of a screw driver, until the station you desire to hear is heard with maximum volume and best tone.

It is desirable to turn the tone control to high fidelity when listening on the push-buttons.

Only local or strong stations should be set up on the push-buttons.

Push button Number 1 Model 1556X
1 AFC
2 1250 and 1750 KC's
3 1250 and 1750 KC's
4 1250 and 1750 KC's
5 1250 and 1750 KC's
6 1250 and 1750 KC's
7 1250 and 1750 KC's
8 1250 and 1750 KC's
9 1250 and 1750 KC's
10 1250 and 1750 KC's
11 PHONO
12 PHONO

Push button Number 1 Model 1565X
1 PHONO
2 1056X
3 1056X
4 1056X
5 1056X
6 1056X
7 1056X
8 1056X

WARNING

When operating this set on "RADIO," make certain that the phonograph push-button is out. If it is not, pushing slightly upwards on this push-button will cause it to be released and come out.
### Replacement Parts List for Chassis 1856X

<table>
<thead>
<tr>
<th>Parts Location</th>
<th>Description</th>
<th>Part Number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C15, C16</td>
<td>Trimmer 5-300 mfd</td>
<td>YC97-1</td>
<td></td>
</tr>
<tr>
<td>C1, C12, C13</td>
<td>Capacitor 4-1500 mfd</td>
<td>YC10-2</td>
<td></td>
</tr>
<tr>
<td>C10, C11</td>
<td>Trimmer 4-1500 mfd</td>
<td>YC10-2</td>
<td></td>
</tr>
<tr>
<td>C12, C13</td>
<td>Trimmer 4-1500 mfd</td>
<td>YC10-2</td>
<td></td>
</tr>
<tr>
<td>C14, C15</td>
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<td>YC10-2</td>
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<td>C16, C17</td>
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<tr>
<td>C20, C21</td>
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<tr>
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<tr>
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<td>C28, C29</td>
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<td>YC10-2</td>
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<td>C32, C33</td>
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<td>C34, C35</td>
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<td>C36, C37</td>
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<td>C38, C39</td>
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<td>C40, C41</td>
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</tr>
<tr>
<td>C42, C43</td>
<td>Trimmer 4-1500 mfd</td>
<td>YC10-2</td>
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</tbody>
</table>

### Replacement Parts List for Chassis 1356X

<table>
<thead>
<tr>
<th>Parts Location</th>
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<td>YC10-2</td>
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<tr>
<td>C10, C11</td>
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</tr>
<tr>
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<td>YC10-2</td>
<td></td>
</tr>
<tr>
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<td>Trimmer 4-1500 mfd</td>
<td>YC10-2</td>
<td></td>
</tr>
<tr>
<td>C16, C17</td>
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<td>YC10-2</td>
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</tr>
<tr>
<td>C18, C19</td>
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<td>YC10-2</td>
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</tr>
<tr>
<td>C20, C21</td>
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<td>YC10-2</td>
<td></td>
</tr>
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<td>Trimmer 4-1500 mfd</td>
<td>YC10-2</td>
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</tr>
</tbody>
</table>

### Notes
- Condenser 2-4000 pF.
- Transistor 2N3056.
- IC 2N70, 2N70A, 2N70B, 2N70C, 2N70D, 2N70E.
- Diode 1N4148.
- Transformer 6000 mva 5-300 mfd.

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**Model 1356X**

**Model 1856X**

**Parts Lists**

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MAJESTIC RADIO & TELEV. CORP.
6TUBE AUTO RECEIVER
MODEL 3817A and 638A
4-1-38
Condenser Alignment

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory with precision instruments and re-alignment should not be attempted unless all other possible causes of the faults operation have first been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal of 456 K. C. and accurately calibrated signals over the broadcast and short wave bands, 530-1740 K. C. and 58-183 M. C. is required. An output indicating meter is also necessary. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screw driver for the adjustments. The complete procedure is as follows:

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a 0.05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Attenuate the signal so that A. V. C. action is not obtained.

Then adjust the four I. F. trimmer condensers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis and are in the round I. F. cans—See Fig. 2. The openings to the trimmer condensers are covered over by a small cover plate which is held in position by a screw. Loosen these screws until the cover plates can be swung around.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1740 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Attenuate the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the pointer screw and set the pointer at the 1500 K. C. mark on broadcast band scale. Retighten pointer screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 2. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over...
Short Wave Band Adjustment

CAUTION—Never change the adjustments of any of the broadcast band transmitters.

Turn the broadcast switch to the short wave position of the receiver and adjust the short wave trimmers until the highest output is obtained.

Next set the signal generator for 15,000 K.C. and turn the volume control so that the needle is at the 3000 position on the meter scale. Now turn the short wave trimmers until full scale is obtained.

This setting is the same as the trimmer (4) in the frequency selector. If this trimmer (4) is adjusted, it will change the frequency of the broadcast band transmitters.

Changes in Early Models

There are two points at which the early models of the Type 20A Transmitter may be replaced. These points are indicated in Fig. 1 and described below.

Power Transformer

In the early models a separate filter choke was used in series with the power transformer (see note 1 in Fig. 1). The replacement of this filter choke should be made by removing the old and new condensers as shown in the parts list. A diode power transformer (see note 2 in Fig. 1) and this is later shown in the parts list.

The two points are not h nodeName and must be taken in order for replacement purposes to order the correct condenser. The old condenser can be identified by the separate filter choke.

Short Wave Oscillator

Referring to Fig. 1 it will be noted that there is a tracking coil (L1) and a transformer (C1) connected in series between the short wave oscillator coil and ground. In the first models of this receiver these two parts, which are required for tracking the short wave oscillator, are not used. Instead of these, another condenser (C5) was used at the point on the circuit indicated by note 1 in Fig. 1.

At the time this change was made a change was also made in the oscillator assembly and new parts must be taken in order to replace the old condenser. Early models of the Type 20A Transmitter do not have any spot of paint or a green spot of paint on the 80 socket used in the tracking system.

The twenty-five cycle receiver differs from the sixty-cycle receiver only in the fact that a different type of power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily with a sixty-cycle power supply. However, the reverse is not true, the sixty-cycle receiver cannot be operated for the twenty-five cycle power supply.

A 110-220 Volt, 60 cycle power Transformer is also available for this model.

REPAIR PARTS LIST FOR 30 TUBE BROADCAST AND SHORT WAVE RECEIVER

When ordering parts be sure to give the part number also. Also give the series number which will be found in the License Notice label. It is a spot of paint on the chassis, give this color.

Reversing Drive Cord

Remove chassis from cabinet.

Take off the plate light assembly by lifting off the two sockets and spring clip.

Detach the large pointer by removing the screw at the rear of the cabinet.

Locate the drive assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then elevate the complete drive assembly and down in front of the chassis. It is not necessary to move the volume control and the control knobs, which hold the indicator cords of these two controls in position.

Wrap the cord in a clockwise direction (from front of chassis) around the drive drum approximately one half turn.

Then lift the chassis up on its back panel and bring the cord mentioned in the previous paragraph down on the drive drum. Wrap it two and one-half times around the drive shaft as shown in Fig. 3.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one half turns in a clockwise direction until it is up to the hole in this drum as illustrated.

Insert the free end of the cord through the hole in the chassis and lie it to the end of the tension spring. The end of the spring, being hanging free, should be approximately 5 mm from the flange of the drum as shown in Fig. 3. Cut off surplus length of cord and trim it to length.

Then secure the other end of the tension spring over the end of the cord.


<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>C12</td>
<td>Power Transformer</td>
<td>1</td>
<td>$5.00</td>
</tr>
<tr>
<td>C22</td>
<td>Diode Power Transformer</td>
<td>1</td>
<td>$7.50</td>
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</tbody>
</table>

Changes in Parts Data
OPERATION:

The two control knobs in sequence from left to right are (see Fig. No. 2).
Knob 1, Volume Control and On-Off Switch.
Knob 2, Tuning Knob. (Side of Cabinet).

KNOB 1. VOLUME CONTROL AND "ON" "OFF" SWITCH ARE COMBINED:

When turning on, a click will be heard and the dial will light. Wait approximately 45 seconds for the tubes to heat up. Turn knob all the way to the left to turn set off.

KNOB 2. MANUAL TUNING:

This radio may be used to tune in stations either by the conventional manual method or by using the Automatic levers. The tuning range of the radio is from 535 to 1725 kilocycles, the dial being calibrated in channel numbers. It covers all standard broadcast channels and one police band.

To convert channel numbers to kilocycles, add one zero. For example, 170 is 1700 kilocycles.

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:

There are six levers on the dial by means of which six stations may be selected, (See "B," Fig. 2).

TYPICAL TUNING DATA

The procedure for setting the Automatic Levers is the same for all the above mentioned model's. However, the number of Automatic Levers may differ.

The locking screw "C" and automatic levers shown in both figs 1 and 2 are for the Model 62-552 receiver. However, this is a typical receiver.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. Correct Radio Chassis to Ground Post of Signal Generator With a Short Heavy Lead. Allow Chassis and Signal Generator to "Heat Up" for Several Minutes. The following equipment is required for aligning:
An All Ware Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicator Meter—Non-Metallic Screwdriver.
Dummy Antenna—.1 mil, 200 mil, and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>TRIMMERS ADJUSTED</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100K</td>
<td>0050</td>
<td>0050</td>
<td>Overtune (Optional)</td>
</tr>
<tr>
<td>1500</td>
<td>0050</td>
<td>0050</td>
<td>Overtune (Optional)</td>
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<tr>
<td>200K</td>
<td>0050</td>
<td>0050</td>
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<tr>
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<td>0050</td>
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</tr>
<tr>
<td>600K</td>
<td>0050</td>
<td>0050</td>
<td>Overtune (Optional)</td>
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<table>
<thead>
<tr>
<th>RANGE B</th>
<th>0050</th>
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<th>Overtune (Optional)</th>
<th>Tuner to Full Open</th>
<th>Adjust to Maximum Output</th>
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<td>0050</td>
<td>0050</td>
<td>Overtune (Optional)</td>
<td>Tuner to Full Open</td>
<td>Adjust to Maximum Output</td>
</tr>
<tr>
<td>RANGE D</td>
<td>0050</td>
<td>0050</td>
<td>Overtune (Optional)</td>
<td>Tuner to Full Open</td>
<td>Adjust to Maximum Output</td>
</tr>
</tbody>
</table>

NOTE A—In set using the proper tip testing dial, remove the relaying ring which holds the dial scale in position. Readjust meter to maximum signal, hold the station selector ring and turn the dial until the signal is at the 1000 KC mark. Release the relaying ring.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the point of greatest intensity is obtained.

Adjust the signal from the signal generator to the broadcast station of the receiver. After each range is completed, repeat the procedure as a final check.

After alignment of Range B has been completed, do not make any adjustments of the Range B trimmers. If this is done, it will be necessary to realign Range D.

CAUTION—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 13,000 KC. The signal will then be heard at 13,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 13,000, or 20,000 on the dial. It may be necessary to increase the signal to hear the image.

Supplementary types are used in the power unit. This vibrator intercepts the current through the primary of the power transformer, and also rectifies the current in the secondary circuit.

If, after a new 2 section dry electrolytic condenser has been installed, vacuum tube is encountered, reverse the connections of the 2 sections.

VOLTAGES AT SOCKETS

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>VOLTAGE BETWEEN SOCKET PRONGS AND GROUND (UNLESS OTHERWISE INDICATED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>+12V</td>
</tr>
<tr>
<td>Output</td>
<td>+12V</td>
</tr>
</tbody>
</table>

**Fig. 6—Coil Terminal Arrangement and D.C. Resistance of Windings**

**Fig. 7—Tube Arrangement and Batten Connections**

**Fig. 8—Core Replacement**

---

**TABLE 1**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>VOLTAGE BETWEEN SOCKET PRONGS AND GROUND (UNLESS OTHERWISE INDICATED)</th>
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</thead>
<tbody>
<tr>
<td>ICFD</td>
<td>1st DC...</td>
<td>+10V</td>
</tr>
<tr>
<td>ICFD</td>
<td>2nd DC...</td>
<td>+10V</td>
</tr>
<tr>
<td>ICFD</td>
<td>Screen</td>
<td>+15V</td>
</tr>
<tr>
<td>IHAG</td>
<td>1st DC...</td>
<td>+10V</td>
</tr>
<tr>
<td>IHAG</td>
<td>2nd DC...</td>
<td>+10V</td>
</tr>
<tr>
<td>IHAG</td>
<td>Plate Amp.</td>
<td>+20V</td>
</tr>
<tr>
<td>IHAG</td>
<td>Grid</td>
<td>+15V</td>
</tr>
<tr>
<td>IHAG</td>
<td>Collector</td>
<td>+20V</td>
</tr>
</tbody>
</table>

**NOTE:** All readings taken with 1000 Ohm-per-rod meter.
ALIGNMENT PROCEDURE MODELS 82-355, and 82-355 Series A, Issues A & B

The following equipment is required for aligning:

- Voltage control—Maximum of adjustments.
- Voltmeter and oscilloscope.
- Shorting strips.
- Signal generator with a short heavy load.
- Output indicator meter.
- Output indicator meter across primary of output transformer.
- Low voltage supply of 20, 25, 40, and 25 volt.

To achieve proper alignment, follow these instructions:

1. **Alignment Procedure MODELS 82-355 Series A**

   - **Signal Generator:**
     - **Power Output:** 10 mW for I.F.
     - **Load:** 50 ohms for I.F.
     - **Impedance:** 100 ohms for A.M.
   - **Position:**
     - **Antenna:** Left
     - **Speaker:** Right
   - **Output:**
     - **Power:** 20 mW
     - **Voltage:** 500 V
   - **Transformer:**
     - **Impedance:** 100 ohms
     - **Turns Ratio:** 1 to 1
   - **Alignment:**
     - **Adjustment:**
       - **Volume Control:**
         - **Maximum Adjustment:** 0 dB
       - **Output Control:**
         - **Maximum Adjustment:** 0 dB

2. **Service Notes:**

   - **Voltage Control:**
     - **Ranges:** 10 to 200 volts
     - **Accuracy:** ±20 volts
   - **DC Voltage:**
     - **Ranges:** 0 to 100 volts
     - **Accuracy:** ±20 volts
   - **AC Voltage:**
     - **Ranges:** 0 to 100 volts
     - **Accuracy:** ±20 volts
   - **Output Indicator:**
     - **Ranges:** 0 to 100 volts
     - **Accuracy:** ±20 volts
   - **Output Transformer:**
     - **Impedance:** 100 ohms
     - **Turns Ratio:** 1 to 1

3. **Alignment Procedure MODELS 82-350 Series A**

   - **Signal Generator:**
     - **Power Output:** 10 mW for I.F.
     - **Load:** 50 ohms for I.F.
     - **Impedance:** 100 ohms for A.M.
   - **Position:**
     - **Antenna:** Left
     - **Speaker:** Right
   - **Output:**
     - **Power:** 20 mW
     - **Voltage:** 500 V
   - **Transformer:**
     - **Impedance:** 100 ohms
     - **Turns Ratio:** 1 to 1
   - **Alignment:**
     - **Adjustment:**
       - **Volume Control:**
         - **Maximum Adjustment:** 0 dB
       - **Output Control:**
         - **Maximum Adjustment:** 0 dB

4. **Alignment Procedure MODELS 82-355 Series B**

   - **Signal Generator:**
     - **Power Output:** 10 mW for I.F.
     - **Load:** 50 ohms for I.F.
     - **Impedance:** 100 ohms for A.M.
   - **Position:**
     - **Antenna:** Left
     - **Speaker:** Right
   - **Output:**
     - **Power:** 20 mW
     - **Voltage:** 500 V
   - **Transformer:**
     - **Impedance:** 100 ohms
     - **Turns Ratio:** 1 to 1
   - **Alignment:**
     - **Adjustment:**
       - **Volume Control:**
         - **Maximum Adjustment:** 0 dB
       - **Output Control:**
         - **Maximum Adjustment:** 0 dB

**NOTE:**

- **Volume Control:**
  - Maximum Adjustment
- **Output Control:**
  - Maximum Adjustment
- **Output Transformer:**
  - Impedance 100 ohms
  - Turn Ratio 1 to 1
- **Alignment Procedure MODELS 82-350 Series A**

**ALIGNMENT INSTRUCTIONS:**

- **Alignment Procedure MODELS 82-355 Series A**

   - **Signal Generator:**
     - **Power Output:** 10 mW for I.F.
     - **Load:** 50 ohms for I.F.
     - **Impedance:** 100 ohms for A.M.
   - **Position:**
     - **Antenna:** Left
     - **Speaker:** Right
   - **Output:**
     - **Power:** 20 mW
     - **Voltage:** 500 V
   - **Transformer:**
     - **Impedance:** 100 ohms
     - **Turns Ratio:** 1 to 1
   - **Alignment:**
     - **Adjustment:**
       - **Volume Control:**
         - **Maximum Adjustment:** 0 dB
       - **Output Control:**
         - **Maximum Adjustment:** 0 dB

**FIG. 1—TOP VIEW SHOWING TRIMMERS**

**FIG. 1—BOTTOM VIEW SHOWING TRIMMERS**
IF ALIGNMENT - 465 KC
Vol. Control full on, variable condenser in minimum capacity position.
Adjust to resonance 2 trimmers at 465 KC, thru a .1 mf. condenser.

SHORT WAVE ALIGNMENT - 2000 to 7000 KC
Dial at 6 KC, adjust to resonance the SW oscillator trimmer (at top of rear variable gang condenser) and
SW Antenna trimmer No. 1 (Fig. 1) at 6 M.C., thru a .1 mf. condenser and 400 ohm resistor series.

BROADCAST ALIGNMENT - 555 to 1720 KC
Gang condenser in minimum capacity position; signal generator in series
with a 200 mmf condenser and 20 ohm resistor series;
(a) Adjust oscillator trimmer No. 3
Fig. 3, to resonance at 1720 KC.
(b) Adjust Antenna trimmer No. 2
Fig. 3, to resonance at 1400 KC.
(c) Adjust Padder No. 4 Fig. 3,
to resonance at 800 KC.
(d) Repeat adjustments a & c until
sensitivity is at maximum.
(e) Check for tracking & sensitivity
at 1400, 1000 and 600 KC.
DO NOT BEND PLATES OF CONDENSER
to correct tracking.
MODEL 62-324
Schematic, Voltage

MONTGOMERY WARD & CO.

Sockets, Trimmers
Alignment

PARTS (Serial No. 6H261200 and up)

RESISTORS

| R1  | 150-103 100M ohm - 1/3 w. 10% |
| R2  | 150-12 50M ohm - 1/3 w. 20% |
| R3  | 150-121 15M ohm - 1/2 w. 10% |
| R4  | 150-196 39M ohm - 1 w. 10% |
| R5  | 150-4 3 megohm - 1/3 w. 20% |
| R6  | 101-104 1 megohm volume control |
| R7  | 100-19 40 ohm - 1/2 w. 10% |
| R8  | 100-197 30 ohm - 1/3 w. 10% |
| R9  | 150-4 3 megohm - 1/3 w. 20% |
| R10 | 150-103 100M ohm - 1/3 w. 10% |
| R11 | 101-106 200M ohm - tone control |
| R12 | 150-161 400M ohm - 1/3 w. 10% |
| R13 | 150-22 5M ohm - 1/3 w. 10% |
| R14 | 150-103 100M ohm - 1/3 w. 10% |
| R15 | 150-12 50M ohm - 1/3 w. 10% |
| R16 | 150-102 500 ohm - 1/3 w. 10% |
| R17 | 150-195 250 ohm - 1/3 w. 10% |

CONDENSERS

| C  | 102-62 3 gang variable |
| C1 | 100-23 0.5 x 200 v. 25% |
| C2 | 129-47 0.0004 Mica 10% |
| C3 | 100-25 0.002 x 600 v. 25% |

FIG. 1-TOP VIEW

I.F.-Vol. contr. full on, Var. at 1400KC. At 465KC, 1 mfd, dummy to grid cap of 6K7 tube, align output I.F. signal to G4 grid cap, align input I.F.

B.C.-BAND-Wv. in B.C. pos., Var. at min. cap.; 200 mfd. and 20 ohm series resistor dummy to tan., lead. At 1750KC, adjust trimmer E' to resonance. At 1600KC, trimmer A and P.S.E. section of Var. to resonance. At 600KC, trimmer F' to resonance. Repeat all adjustments of the band. Check sensitivity at 1000 KC.

S.W.-BAND-1 mfd. cond. in series with 400 ohm resistor as dummy band sw. in S.W. pos. At 17KC, dial at 17KC, adjust G' and C' to resonance. At 5 MC check sensitivity for band coverage check set at 18,1 and 5.5 KC.

MIDDLE BAND- Band sw. at middle wave pos. Dummy as for S.W. adjustments. At 5000 KC, dial at 5000 KC, adjust D' and B' to resonance. At 5000KC check sensitivity; then recheck B.C., Band alignment.

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After the antenna is connected, tune in a weak signal at approximately 1400 KC with the volume control about three-fourths on. Turn the adjusting screw of the antenna 1400 KC trimmer up or down until maximum output is obtained.
**Alignment Trimmers**

**MODELS 62-370, 62-470, 62-700**

** Montgomery Ward & Co. **

- **Power Consumption**: 50 Watts (At 117 volts 60 cycles)
- **Power Output**: 1.0 Watts Undistorted
- **Selectivity**: 20 KC at 1000 times Signal
- **Sensitivity**: 0.01 Microvolts Average

**Intermediate Frequency**

**Speaker**: 6” or 8” Dynamic

**Tuning Frequency Range**

- B Range (Manual Tuning): 100 to 3000 KC
- B Range (Automatic Tuning): 550 to 13500 KC
- C Range (Automatic Tuning): 1500 to 15000 KC
- D Range (Manual Tuning): 4500 to 13500 KC

**Alignment Procedure**

**Volume Control—Maximum All Adjustments.**

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM (Unless otherwise specified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 456 KC</td>
<td>Grid of 1st Det.</td>
<td>1 mft.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>1st I.F. (C16) &amp; (C17)</td>
<td></td>
</tr>
<tr>
<td>RANGE B 1730 KC</td>
<td>Antenna Lead</td>
<td>200 mfft.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C8)</td>
<td></td>
</tr>
<tr>
<td>1500 KC</td>
<td>Antenna Lead</td>
<td>200 mfft.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range B (C4)</td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>200 mfft.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>600 KC (C9)</td>
<td></td>
</tr>
<tr>
<td>WAVE TRAP 456 KC</td>
<td>Antenna Lead</td>
<td>200 mfft.</td>
<td>B Range</td>
<td>Turn Rotor to 600 HC</td>
<td>Wave Trap (C1)</td>
<td></td>
</tr>
<tr>
<td>RANGE D 18,300 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C7)</td>
<td></td>
</tr>
<tr>
<td>15,000 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range D (C1)</td>
<td></td>
</tr>
</tbody>
</table>

**Permeability Tuning Unit**

- **1100 KC**: Antenna Lead 200 mfft. No. 1 Setting Screw No. 1 Antenna Coil No. 1
- **1100 KC**: Antenna Lead 200 mfft. No. 2 Setting Screw No. 2 Antenna Coil No. 2
- **850 KC**: Antenna Lead 200 mfft. No. 3 Setting Screw No. 3 Antenna Coil No. 3
- **850 KC**: Antenna Lead 200 mfft. No. 4 Setting Screw No. 4 Antenna Coil No. 4
- **700 KC**: Antenna Lead 200 mfft. No. 5 Setting Screw No. 5 Antenna Coil No. 5
- **700 KC**: Antenna Lead 200 mfft. No. 6 Setting Screw No. 6 Antenna Coil No. 6

- **NOTE A**: If the pointer is not at 1500 KC on the dial, loosen the 2 clamps which hold the pointer assembly on the cord, move the pointer to the 1500 KC mark, and tighten the clamps.
- **NOTE B**: Turn the rotor back and forth and adjust the trimmers until the peak of greatest intensity is obtained.
- **NOTE C**: Leave condenser rotor at the 600 HC setting and adjust the signal generator until maximum output is obtained at or near 4500 KC.
- **NOTE D**: At the top of the permeability tuning unit can be seen as "W" openings. Insert the end of a pair of long nose pliers or a screwdriver in the "W" opening of the proper button and adjust the position of the antenna (rear) call by twisting the pliers or screwdriver until maximum output is obtained.

**ATTENTION**: When adjusting the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 500 KC. If it may be necessary to increase the input signal to hear the image.

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Procedures for Setting the Station Buttons

Selecting the Stations to be Set

There are 8 buttons on the push button tuning dial by means of which 8 stations may be set for quick tuning. They are numbered 1 to 8 in Fig. 2. Make a list of your favorite stations, those which you tune in regularly. There may be any number up to 8 in this list.

It is better to list the station with the highest kilocycle number first, the station with the next lower kilocycle number next, and so on.

Frequencies Covered by Each Button

The frequency range of each station button is shown in Fig. 2. Any station within the range of a button may be set. Although, in some cases, it may be possible to set a certain station on several buttons, it is better to set the stations on the stations with the highest kilocycle numbers first.

Setting a Station Button

Select a station from the list you have prepared, preferably the station with the highest kilocycle number, and tune in this station with the tuning knob in the usual way. Determine what program is being broadcast. At each side of the escutcheon plate is an escutcheon screw—see Fig. 2. Remove both escutcheon plates by unscrewing these two screws. Be careful to avoid scratching the plate.

When this is done, the setting screws above the six buttons will be exposed. Turn the band switch knob to the PUSH BUTTON TUNING position—see Fig. 2. The station tuned in previously will probably disappear.

If the kilocycle number of the station tuned in is within the range of button No. 2, push this button in. The same station or a different station may be heard.

With a small screwdriver, slowly turn the setting screw above button No. 2 in or out until the desired station is heard. (The one previously tuned in) is heard. Turning the screw in (clockwise) will tune in stations with higher kilocycle numbers while turning the screw out (counter-clockwise) will tune in stations with lower kilocycle numbers. Be sure not to tune in some other station broadcasting the same program. Using the tuning eye as a guide, accurately tune in this station. The station is now set on this button.

To determine whether the correct station has been set, turn the band switch knob back to the BROADCAST position. The station should be heard (provided the tuning knob has not been turned). If it is not, turn the band switch knob to the PUSH BUTTON TUNING position again and retune with the setting screw.

Remove the station call letter tab from the sheet that is provided and push the tab all the way to the bottom of the rectangular space above the correct station button opening in the escutcheon plate. Then cover the call letter tab with one of the clear celluloid tabs.

Proceed in the same manner to set stations on any of the remaining buttons. Use blank tabs above buttons on which stations are not set.

After all of the stations have been set, carefully replace the escutcheon plate.

If at any time you wish to change the station, tune in that station. To do so, repeat the above procedure. Changing the setting of one button will not affect the settings of any of the other buttons. The old call letter tab may be removed by sticking a pin through the notch in the celluloid tab and through the call letter tab.

Procedure for Setting the Automatic Tuner Pushbuttons

Now, proceed as follows:

Unlock the tuner mechanism. (NOTE: The automatic tuner mechanism is locked tight when radio is shipped from the factory.)

1. Remove the snap-in button from the dial escutcheon plate on the front panel of the radio (see "C." Reset Lock Screw, Fig. 2). If the snap-in button will not come out easily using your fingers, try it off with a screwdriver or a knife, being careful not to mar the finish on the escutcheon plate.

2. Unlock the tuner mechanism by inserting a screwdriver through the hole in the panel. Press in and loosen the locking screw by turning it to the right as far as it will turn without forcing. You will note that as the locking screw is turned it will turn easily until the dial reaches its stop and then a slight amount of force will be required to actually start unlocking the tuner mechanism. Beyond this point, the locking screw will turn quite easily again until the tuner mechanism is completely unlocked. At this point do not force the locking screw any further. The tuner mechanism is now unlocked.

Setting Pushbuttons

1. Press in all the way any one of the automatic tuner pushbuttons. Holding it firmly, press on the Dial Tuning Control, No. 4, and tune in the station indicated on the station call letter tab on this pushbutton. You will note that in order to tune the station, the Dial Tuning Control will have to be pressed slightly. Move the Dial Tuning Control very slowly up and down (while still holding the automatic tuner pushbutton in firmly), noting the width of the shadow on the screen of the cathode-ray tuning eye. Move the width of the shadow on the tuning eye indicates the ideal tuning position (response). The station will then be clearest and accurately tuned.

2. Press in another tuner pushbutton. Holding it firmly, press on the Dial Tuning Control, No. 4, and tune in the station indicated on the station call letter tab of this pushbutton.

3. Follow this procedure until you have selected all of your favorite stations. (NOTE: If the dial mechanism works hard or has a tendency to slip when setting up a station for one of the pushbuttons, it is due to the tuner mechanism not being unlocked all the way. Loosen the reset locking screw. The Dial Tuning Control should turn the dial drum freely with a pushbutton pushed in.)

Locking the Tuner Mechanism

1. To lock the tuner mechanism insert a screwdriver through the hole in the escutcheon plate and press in and turn the reset locking screw to the left until it cannot be turned any further without forcing it.

2. This will lock the tuner mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.

Press in any one of the pushbuttons and—your favorite station is selected.
Frequency Range

535 - 1720 Kilocycles

ALIGNING I.F. TRANSFORMERS (465 K.C.):
1. Connect an output meter across the voice coil of the speaker or across the primary of the output transformer.
2. Connect an external oscillator which has been adjusted to 465 K.C. in series with a .1 mfd. condenser, to the control grid of the 6AG7 tube.
3. Connect the oscillator ground to the black chassis ground lead.
4. Adjust I.F. trimmers Nos. 6, 8, 9 and 11 to resonance, at the same time reducing the output of the oscillator as required.

With the gang condenser in a minimum position (plates entirely out of mesh) the dial reading should be at the end marking of the scale.
1. Connect the test oscillator in series with a 200 muf. condenser to the tan antenna lead from the chassis.
2. Set the oscillator and gang condenser to 1500 K.C. and adjust oscillator trimmer No. 29 (rear section of condenser gang).
3. Set the test oscillator and gang to 1400 K.C. and adjust antenna trimmer No. 5 (front section of condenser gang).
4. Check sensitivity at 1000 and 600 K.C.

All Voltages Per Voltmeter for 15V. Line
**FIG. 1—TOP VIEW**

D.C. VOLTAGES MEASURED WITH 1000 OHM
PER VOLT VOLT METER BETWEEN SOCKET
TERMINALS AND CHASSIS.

VOLUME CONTROL AT MIN., ANT. GROUNDING.

2 VOLT X AND 9 VOLT "B" BATTERIES

- Do not block with BATTERY terminals.
- Battery voltages are approximately 3.5 to 4.5 volts.

The following batteries are required:

- 2 to 4.5 Volt "B" Batteries.

1—3 Volt Dry "A" Battery or 2 Volt Storage Battery.

Check the position of the knob on the back of the radio before making any battery connections.

**ALIGNMENT PROCEDURE**

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

---

**PARTS (SERIAL No. 489,500 and up)**

<table>
<thead>
<tr>
<th>RESECTORs</th>
<th>C</th>
<th>CONDENSERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>BE1009</td>
<td>2 gang, variable condenser</td>
</tr>
<tr>
<td>R2</td>
<td>BE1010</td>
<td>Antenna Transformer</td>
</tr>
<tr>
<td>R3</td>
<td>BE1011</td>
<td>Oscillator Transformer</td>
</tr>
<tr>
<td>R4</td>
<td>BE1012</td>
<td>Output I.F.—460 kc.</td>
</tr>
<tr>
<td>R5</td>
<td>BE1013</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R6</td>
<td>BE1014</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R7</td>
<td>BE1015</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R8</td>
<td>BE1016</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R9</td>
<td>BE1017</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R10</td>
<td>BE1018</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R11</td>
<td>BE1019</td>
<td>5” P.M. Speaker</td>
</tr>
<tr>
<td>R12</td>
<td>BE1020</td>
<td>5” P.M. Speaker</td>
</tr>
</tbody>
</table>

**PARTS**

FOR ADJUSTMENT OF

AUTOMATIC TUNING

LEVERS, SEE INDEX.

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**THIS ALIGNMENT APPLIES ALSO TO**


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<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>GRID OF LAST I.F. TUBE</th>
<th>GRID OF FIRST I.F. TUBE</th>
<th>VARIABLE CONDENSER SETTING</th>
<th>TRIMMERS ADJUSTED</th>
<th>TRIMMER FUNCTION</th>
<th>ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc.</td>
<td>Grid of last I.F. tube</td>
<td>Grid of first I.F. (mixer tube)</td>
<td>Rotor full open (plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>Grid of last I.F. tube</td>
<td>Grid of first I.F. (mixer tube)</td>
<td>Rotor full open (plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**BROADCAST BAND**

<table>
<thead>
<tr>
<th>1735 Kc.</th>
<th>200 mfd.</th>
<th>Antenna Lead</th>
<th>Grid of Last I.F. TUBE</th>
<th>Grid of First I.F. TUBE</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 Kc.</td>
<td>200 mfd.</td>
<td>Antenna Lead</td>
<td>Grid of Last I.F. TUBE</td>
<td>Grid of First I.F. TUBE</td>
<td>Variable Condenser Setting</td>
<td>Trimmer Function</td>
<td>Adjustment</td>
</tr>
</tbody>
</table>

**MODELS 62-459 & 62-663**

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Alternate the signal from the signal generator to prevent the leveling-off action of the AVC. After each band is completed, repeat the procedure as a final check.
MONTGOMERY-WARD & CO.

ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- An Oil Wave Generator which will provide an accurately calibrated signal at the frequencies as listed.
- Output Indicating Meter: Non-Reluctance, 0-100, 200, 600, ohms.

Connect DC and Ground Lead to Signal Generator as shown in Fig. 4. Connect Signal Generator to Headphone as shown in Fig. 1. After all adjustments have been made, turn off the Signal Generator and proceed to Headphone and Indicator as shown in Fig. 1. If the signal is not steady, it will be necessary to readjust the Headphone.

VOLATGES AT SOCKETS

The following voltages are taken with a 1000 Ohm-per-volt meter. Positions and voltages are measured with reference to Standard Wave.

<table>
<thead>
<tr>
<th>SOCKET POSITION</th>
<th>FUNCTION</th>
<th>VOLTAGE (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Panel</td>
<td>Input</td>
<td>0-100</td>
</tr>
<tr>
<td>Rear Panel</td>
<td>Output</td>
<td>0-100</td>
</tr>
</tbody>
</table>

NOTE: After making all connections, the signal generator should be turned on and the signal generator should be set to the highest frequency and the output of the Signal Generator should be adjusted to the desired level. The output should be adjusted to the desired level when the signal generator is turned on. The signal generator should not be turned on when the signal generator is turned off.

Replacing Drive Cords

Three drive cords, Nos. 1, 2, and 3, as shown in Fig. 5, are used. To replace any of these cords, proceed as follows:

1. Turn the gang conditioner to full open position.
2. Turn off the drive shaft to the end of the cord.
3. Pull out the cord from the terminal block.
4. Replace the cord with a new one.
5. Turn on the drive shaft to the full open position.

Lower Tumblers Assembly Adjustments

Pressure of Springs on Heart Cam - The heart cam must have a proper pressure to the shaker spacers when the tightening lever is in the "on" position and must not have excessive pressure to the shaker spacers when the lever is in the "off" position.

Pressure of the spacers against the heart cam is determined by the position of the coil (E) on the threaded shank. See Fig. 5, if, after the tightening lever is turned to the "off" position, the same turn relative to the shaft, the nut must be tightened.

The coil, (E) should be in such a position on the threaded shank that the top of the tightening lever moves to about 3/8 inch from the end of the slot in the tightening washer when a reasonable amount of pressure is exerted on the lever.

Connection between Gang Condenser and Cam Shaft - One screw only should be used in the unit to joint the connection between the condenser shaft and the cam shaft. If 2 screws are used, considerably more pressure must be exerted on the station levers to rotate the cam shaft.

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TO REMOVE CHASSIS FROM THE CABINET:

To remove chassis from the cabinet unscrew the locking screw in the center of the tuning knob and pull the tuning knob and volume knob off their shafts. Remove the four mounting screws that hold the bottom plate and chassis to the cabinet. Pull off the five buttons on the levers. Move the chassis toward back of cabinet so that control shafts and dial assembly clear holes in cabinet, then chassis can be slipped out.
PARTS (Serial 286,700 and Up)

RESISTORS
R1 BE1013 20M ohm volume control
R2 BE1013 50M ohm—25 w.
R3 BE1013 1M ohm—25 w.
R4 BE1032 6M ohm—25 w.
R5 BE1032 2 megohm—25 w.
R6 BE1032 250M ohm—25 w.
R7 BE103 50M ohm—25 w.
R8 BE1032 160 ohm—25 w.

CONDENSERS
C1 BE1027 2 gang variable condenser
C2 BE1027 .005 mica
Antenna Trimmer
C3 BE109 .005 mica
Oscillator Condenser
C4 BE1209 .003 mica
C5 BE1209 .003 mica
C6 BE1209 100 v.
C7 BE197 5 mfd. x 25 v. lytic
C8 BE197 10 mfd. x 150 v. lytic
C9 BE197 30 mfd. x 150 v. lytic
C10 BE197 30 mfd. x 150 v. lytic
C11 BE197 .005 mica
C12 BE197 .005 mica
C13 BE197 .02 x 400 v.
C14 BE197 .02 x 400 v.
C15 BE197 40 mfd. x 25 v. lytic
C16 BE197 40 mfd. x 25 v. lytic
C17 BE1005 .005 mica
C18 BE1005 .02 x 400 v.
C9, C10 and C15 in one unit, part no. BE11970

FOR SETTING THE AUTOMATIC TUNING LEVERS, SEE INDEX.

The tube complement of this chassis consists of octal base glass and metal tubes.

ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antenna—1 ml, 100 mfd.
- Volume control—Maximum all adjustments.
- Connect B + of radio chassis to ground post of signal generator through 1 Mfd. condenser.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6A8</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers</td>
<td>I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1720 Kc.</td>
<td>100 mfd.</td>
<td>Antenna Lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of rear section of gang</td>
<td>Broadcast</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>100 mfd.</td>
<td>Antenna Lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer—Top of front section of gang</td>
<td>Broadcast</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>
Schematic, Voltage
Socket, Trimmers
Alignment, Changes

MONTGOMERY WARD & CO.

MODELS 62-504, 62-506
Series A, Issues A, B
Ser. 623100 up

PARTS (Serial No.
623,100 and UP)
ISSUES A AND B

R1 BE13921 20M ohm—15 w.
R2 BE13010 25M ohm—15 w.
R3 BE1304 1 M ohm—1 w.
R4 BE13015 25 ohm—1 w.
R5 BE13064 1 megohm—15 w.
R6 BE13025 15 megohm—1 w.
R7 BE13011 250M ohm—1 w.
R8 BE13038 500M ohm—1 w.
R9 BE13056 150 ohm—1 w.
R10 BE13039 150 ohm—1 w.

CONDENSERS
C1 BE0302 2 gang variable condenser
C2 BE0301 .005 Mica
C3 BE0303 .01 x 400 v.
C4 BE0302 Osc. Trimmer on Gang
C5 BE0301 Ant. Trimmer on Gang
C6 BE0302 .005 Mica
C7 BE0304 .01 x 400 v.
C8 BE0302 .05 x 200 v.
C9 BE0302 .05 x 200 v.
C10 BE0304 .05 x 200 v.
C11 BE0304 .005 x 600 v.
C12 BE0305 .005 Mica
C13 BE0304 .05 x 200 v.
C14 BE0300 30 mfd. jacked
C15 BE0304 30 mfd. jacked
C16 BE0305 .005 x 1000 v.

FOR SETTING AUTOMATIC
TUNING LEVERS, SEE INDEX

ALIGNMENT PROCEDURE
Do not remove the back cover of the radio which contains
the loop antenna from the chassis. It is important during
alignment that the same distance between the loop antenna
and the chassis be maintained as when the chassis is installed
in the cabinet.
Slight adjustments to the oscillator and antenna circuits can
be made without removing the chassis from the cabinet.
Two holes which are provided on the bottom of the
chassis. The two adjustments on the variable gang condenser can
be reached with a long insulated type screw driver through
these two holes.
• Volume control—Maximum all adjustments.
• Connect B of radio chassis to ground post of signal generator
  through .01 Mfd. condenser.
• Connect dummy antenna value in series with generator output lead.
• Connect output meter across primary of output transformer.
• Allow chassis and signal generator to “beat up” for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 465 Kc.</td>
<td>.1 MFD. Grid of 12SA7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Four Trimmers on Top (See Fig. 1)</td>
<td></td>
<td>Output and Input I.F.</td>
<td>Maximum output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500 Kc.</td>
<td>.1 MFD. Grid of 12SA7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Bottom of rear section of gang (See Bottom of Radio)</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| NOTE "A" Lay the output lead from the generator in back of the loop antenna. Turn on the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

Power Consumption: 0.0 Watts
Power Outputs: 13 Watts Undistorted, 25 Watts Maximum
Intermediate Frequency: 465 Kc.
**Schematic Diagram**

Series A: 8447/8500 up

**VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOM BETWEEN SOCKET TERMINALS AND CHASSIS.**

ANTENNA GROUNDED VOLUME CONTROL AT MINIMUM.

**PARTS**

**CONDENSERS**

<table>
<thead>
<tr>
<th>Serial No. 8447/5800 and Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BE1029</strong></td>
</tr>
<tr>
<td><strong>BE1059</strong></td>
</tr>
<tr>
<td><strong>BE1246</strong></td>
</tr>
<tr>
<td><strong>BE1304</strong></td>
</tr>
<tr>
<td><strong>BE1004</strong></td>
</tr>
<tr>
<td><strong>BE1089</strong></td>
</tr>
<tr>
<td><strong>BE1976</strong></td>
</tr>
<tr>
<td><strong>BE1007</strong></td>
</tr>
<tr>
<td><strong>BE1292</strong></td>
</tr>
<tr>
<td><strong>BE1307</strong></td>
</tr>
<tr>
<td><strong>BE1011</strong></td>
</tr>
<tr>
<td><strong>BE1019</strong></td>
</tr>
<tr>
<td><strong>BE1305</strong></td>
</tr>
<tr>
<td><strong>BE1302</strong></td>
</tr>
</tbody>
</table>

**RESISTORS**

| R1 | BE3182 | 20M ohm—1/2 w. |
| R2 | BE3189 | 200M ohm—1/2 w. |
| R3 | BE3008 | 40M ohm—1/2 w. |
| R4 | BE1305 | 2 megs—1/2 w. |
| R5 | BE1246 | 1 megohm-volume control |
| R6 | BE1004 | 2 megs—1/2 w. |
| R7 | BE1007 | 2 megs—1/2 w. |
| R8 | BE1305 | 2 megs—1/2 w. |
| R9 | BE1302 | 2 megs—1/2 w. |
| R10 | BE1305 | 2 megs—1/2 w. |
| R11 | BE1302 | 2 megs—1/2 w. |
| R12 | BE1305 | 2 megs—1/2 w. |
| R13 | BE1302 | 2 megs—1/2 w. |
| R14 | BE1305 | 2 megs—1/2 w. |
| R15 | BE1302 | 2 megs—1/2 w. |
| R16 | BE1305 | 2 megs—1/2 w. |

**FREQUENCY RANGE**

35 to 175 K.C.

**PARTS**

- **BE11102B** Antenna Coll Complete
- **BE10116** Oscillator Coll Complete
- **BE10112** Input I. F. Complete
- **BE10115** Output I. F. Complete
- **BE10118** Transformer
- **BE1413** 6" P. M. Speaker

**BANDS**

- **L.F.** 465 Kc. | .1 MFD. Grid of 1NSG L.F. Tube
- **465 Kc.** | .1 MFD. Grid of 1AG
- **U. S.** 200 mm. | Antenna lead
- **1400 Kc.** | 200 mm. | Antenna lead
- **600 Kc.** | 200 mm. | Antenna lead

**NOTE**

- Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.
- After each band is completed, read the procedure as a final check.
ALIGNMENT PROCEDURE

Models 9356G02, 9356G03
Alignment

The following equipment is required for aligning:
- A test signal generator which will provide an accurately calibrated signal at the test frequencies listed.
- An oscilloscope.
- A counter.
- A voltmeter.
- A radio receiver.
- A pair of headphones.
- A microphone.
- A microphone amplifier.
- A reference oscillator.
- A tone generator.

Alignment PROCEDURE

1. Connect the signal generator to the test points.
2. Adjust the output of the signal generator to the desired level.
3. Connect the oscilloscope to the test points.
4. Adjust the oscilloscope to the desired level.
5. Connect the microphone to the test points.
6. Adjust the microphone to the desired level.
7. Connect the reference oscillator to the test points.
8. Adjust the reference oscillator to the desired level.
9. Connect the tone generator to the test points.
10. Adjust the tone generator to the desired level.

Alignment Procedure Models 62-665

Adjust the trimmers to the desired level.

Alignment Procedure Models 82-558, 82-1550

Adjust the trimmers to the desired level.

Alignment Procedure Models 62-665

Adjust the trimmers to the desired level.

Alignment Procedure Models 82-558, 82-1550

Adjust the trimmers to the desired level.

Alignment Procedure Models 62-665

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Alignment Procedure Models 82-558, 82-1550

Adjust the trimmers to the desired level.

Alignment Procedure Models 62-665

Adjust the trimmers to the desired level.

Alignment Procedure Models 82-558, 82-1550

Adjust the trimmers to the desired level.
IF ALIGNMENT
Adjust at 456 KC through 0.05 mfd. condenser.

BC ALIGNMENT
Adjust oscillator trimmer C8 at 1560 KC.
Adjust C6 and C2 trimmers at 1000 KC.

FOR CONVENTIONAL ALIGNMENT, SEE SPECIAL SECTION
OF VOLUME VIII

FOR SETTING PUSH BUTTONS, SEE INDEX.

Battery Cable and Fuse
The battery connection is made at
the ammeter. The end of the battery
cable with the connecting lug is se-
cured to one of the posts at the back
of the ammeter in the instrument
panel. The other end of the cable
with the fuse receptacle connects
to the battery cable from the radio
after the fuse has been inserted.

A 9 ampere automobile fuse is
used.
Procedure for Setting the Station Buttons

There are 5 buttons on the automatic tuning dial by means of which 5 stations may be set.

Any button may be used for any station you can receive.

Depress the manual tuning button and keep it depressed during the entire setting operation as described below. See Fig. 1 for location of buttons. Turn the manual tuning knob so that the indicator moves toward the 1500 KC end of the dial until the stop is reached.

Unlock the tuning mechanism by inserting a small handle screwdriver, as shown in Fig. 1, in the locking screw opening at the bottom of the tuning unit. Loosen the locking screw by turning it counterclockwise as far as it will go.

To set stations accurately, do not jar the radio or buttons while the mechanism is unlocked.

Insert a celluloid reinforcement tab half-way in the slot at the front of station button No. 1—See Fig. 3.

Remove the correct station call letter tab for button No. 1 from the sheet supplied by bending the sheet back and forth at the score.

Next keep the manual tuning button depressed with one hand and, with the other hand, depress the second station button firmly and gently. Then proceed to set the second station on your list in the same manner as described above.

Then continue to set any additional stations on your list on the remaining buttons.

After all desired stations have been set, release any station button which is depressed as follows: keep the manual tuning button depressed with one hand and, with the other hand, push in the OFF button a slight amount—only enough to release any station button which is depressed. Should the OFF button be pushed all the way in to the depressed position, no harm will be done except that the dial will not be illuminated.

Turn the manual tuning knob so that the indicator moves toward the 1500 KC end of the dial, until the stop is reached.

Now lock the tuning mechanism by inserting the small handle screwdriver, as shown in Fig. 1, in the locking screw opening. Turn the locking screw in a clockwise direction until it is tight. Do not tighten too much to avoid stripping the threads.
Specifications

Input Voltage and Currents
1.5 Volts - 20 Amperes
80 Volts - 15 Amperes

Power Output
.90 Watts Undistorted
Selectivity
.41 KC Broad at 1000 Tones Signal

Intermediate Frequency
456 KC

Tuning Range
540 to 1000 KC

Sensitivity (for 25 Watt Output)
.005 Microvolts

Socket Assignment
62-2565 62-656 62-667

MODEL 62 PORTABLE

JAN., 1939

Dummy Antennas—1 mf. and 220 mmfl.

NOTE—Connect a loop approximately one foot in diameter across the antenna and ground posts of the signal generator. Secure the back in place on the cabinet. Connections for the output meter may be made through the opening for the outside antenna and ground connecting posts. This opening is at the bottom of the cabinet near the back. Place radio approximately 3 feet from loop so as to pick up signal. Radio should not be in proximity to any metal (metal bench, etc.).

CALIBRATION—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not loosen the pointer screw, set the pointer at the 800 KC mark and retighten the pointer screw.

Montgomery Ward & Co.

Signal Generator

Frequency Setting

Connection at Radio

Dummy Antenna

Condenser Setting

Adjust Trimmers to Maximum (See Fig. 3)

456 KC

Grid of 1st Det.

.1 mf.

Turn rotor to full open

1st I.F. (C6) & (C7)

2nd I.F. (C11) & (C12)

1600 KC

Grid of 1st Det.

.1 mf.

Turn rotor to full open

Oscillator (C2)

Table Model Only

Antenna Lead

200 mmfl.

Turn rotor to max. output

Antenna (C1)

Portable Model Only

1800 KC

None—See Note

Turn rotor to max. output

Antenna (C1)
PROCEDURE FOR SETTING THE AUTOMATIC TUNER LEVERS:

IMPORTANT—Read carefully before setting the automatic levers.

There are six levers by means of which six stations may be selected. Make a list of local stations or stations you tune in regularly; any number up to and including six.

Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

On the front of each automatic tuner lever button an opening is provided for inserting the call letter tabs.

Insert the call letter tabs in the rectangular openings of each of the automatic tuner buttons. One of the small celluloid tabs supplied should be inserted into place over each of the station call letter tabs.

NOW, PROCEED AS FOLLOWS—:

1. Pull the dial tuning knob all the way out (See Illus. "B," Fig. 3), and rotate the tuning knob to the left (counterclockwise) until it cannot be turned any further (See Illus. "D," Fig. 3). This will unlock the automatic tuner mechanism. (NOTE—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

2. Press down all the way any one of the automatic tuner levers. Holding it down firmly, press in on the dial tuning knob No. 3 and tune in the station indicated on the station call letter tab on this lever. You will note that in order to tune the station, the dial tuning knob will have to be pressed in (See Illus. "E," Fig. 3). Turn the dial tuning knob very slowly back and forth (while still holding the automatic tuner lever in downward position), noting the width of the shadow on the screen of the cathode-ray tuning indicator. Minimum width on the tuning indicator indicates the ideal tuning position (resonance). The station will then be clearest and accurately tuned in.

3. Press down another automatic tuner lever. Holding it down firmly, press in on the dial tuning knob and carefully tune in the station indicated on the call letter tab on this lever.

4. Follow this procedure until you have selected all of your favorite stations.

5. Pull the dial tuning knob all the way out (See Illus. "B," Fig. 3) and rotate the tuning knob to the right (clockwise) until it cannot be turned any further (See Illus. "C," Fig. 3). This will lock the automatic tuner mechanism and the stations you have set up for automatic tuning will be locked in place.

6. If you should desire to change any station you selected to another, pull the dial tuning knob all the way out and rotate the knob to the left (counterclockwise) and unlock the tuner mechanism. Select the new station as explained. (NOTE:—If the dial mechanism works hard when setting up a new station for one of the automatic tuner levers, it is due to the tuner mechanism not being unlocked all the way. Pull the dial tuning knob out all the way and rotate the knob to the left (counterclockwise) until it will turn no further. The dial mechanism should work freely with the lever pressed down).

7. After you have selected the new station, pull the dial tuning knob all the way out and rotate the knob to the right (clockwise) to lock the tuner mechanism. Be sure the knob is turned until it will turn no further, then press the dial tuning knob in.

8. The automatic tuner levers are now set up for quick tuning. Press down the lever key and—YOUR FAVORITE STATION IS SELECTED!

The important steps to remember when setting up stations on the tuner levers for automatic tuning are:

1. To unlock the tuner mechanism pull the dial tuning knob all the way out. You may find it necessary to rotate the knob slightly when pulling it out to make certain that the gears mesh properly. Rotate the dial tuning knob to the left (counterclockwise) as far as it will turn without forcing.

2. To set a lever, press down all the way and hold in this position while tuning in by means of the dial tuning knob the station you want this lever to be tuned to. (NOTE:—you will notice that it will be necessary to keep pressing in on the dial tuning knob while tuning in the station as a spring tends to push the knob out.) Set all the levers in the same manner before locking the mechanism.

3. To lock the tuner mechanism pull the dial tuning knob all the way out. Rotate the dial tuning knob to the right as far as it will turn making certain that it is tight, but it is not necessary to use force.

4. After locking or unlocking the tuner mechanism always return the dial tuning knob to its normal position (pushed in).

TYPICAL TUNING DATA

The procedure for setting the Automatic Levers is the same for all the above mentioned models. However, the number of Automatic Levers may differ.
To remove the chassis from the cabinet, remove the four bolts which are used to fasten the chassis to the cabinet bottoms; pull the knobs off their shafts and detach the pointers from the drive string (see Fig. 1, top view).

NOTE: On the side of the string dial drum a calibrated scale is provided for aligning this chassis to the frequencies listed in the alignment procedure. Attach a pointer so that it will indicate proper dial setting in respect to the position of the variable condensers.

The reference equipment is required for alignment:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies of band.
- Output indicator meter.
- Non-metallic screwdriver.
- Dummy antennas—one 40 cm. and one 60 cm.

To remove the chassis from the cabinet, remove the four bolts which are used to fasten the chassis to the cabinet bottoms; pull the knobs off their shafts and detach the pointers from the drive string (see Fig. 1, top view).

NOTE: On the side of the string dial drum a calibrated scale is provided for aligning this chassis to the frequencies listed in the alignment procedure. Attach a pointer so that it will indicate proper dial setting in respect to the position of the variable condensers.
FOR SETTING AUTOMATIC TUNING LEVERS AND ALIGNMENT, SEE INDEX.

FREQUENCY RANGE
5.6 to 18.1 MC.
535 to 1730 KC.

NOTE.---The letter "P" indicates that the 1D5G Tube used is a Pentode. It is important that only this type 1D5G-P be used in this radio.
## MODELS 62-566, 62-1656, 62-2656
### MODELS 93BR455A, 93BR1455A MONTGOMERY WARD & CO.
#### MODEL 93BR713A


**Series A**

The following equipment is required for alignment:
- All wave signal generator which will provide a sine-wave signal of the desired frequency and amplitude.
- Output indicator motor.
- Non-specific attenuator.
- Dummy antenna, 3-db., and 30-ohm and 45-ohm.

### BAND SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
<th>Combination</th>
<th>Function</th>
<th>Transformer Adjusted</th>
<th>Transformer Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>46 kHz</td>
<td>1 MFD. Grid of 655</td>
<td>Broadcast</td>
<td>Two transistors in</td>
<td>Output Adjusted on</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Out of circuit</td>
<td>Output</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
<td>Adj. to output</td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>WAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz

### BAND SWITCH

**FREQUENCY RANGE**

- 25 to 180 kHz

NOTE: "A" Terminals are closed and output attenuated until the peak of amplitude is obtained.

### MODELS 93BR454 & 93BR-1656A

**Alignment Models 93BR454 & 93BR-1656A**

**BAND SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
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<th>Function</th>
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<tr>
<td>L.F.</td>
<td>46 kHz</td>
<td>1 MFD. Grid of 655</td>
<td>Broadcast</td>
<td>Two transistors in</td>
<td>Output Adjusted on</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Out of circuit</td>
<td>Output</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
<td>Adj. to output</td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>WAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz

### CHASSIS No. 93BR713A

**BAND SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
<th>Combination</th>
<th>Function</th>
<th>Transformer Adjusted</th>
<th>Transformer Adjustment</th>
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<td>L.F.</td>
<td>46 kHz</td>
<td>1 MFD. Grid of 655</td>
<td>Broadcast</td>
<td>Two transistors in</td>
<td>Output Adjusted on</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Out of circuit</td>
<td>Output</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
<td>Adj. to output</td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>WAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz

### BAND ADJUSTMENT

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
<th>Combination</th>
<th>Function</th>
<th>Transformer Adjusted</th>
<th>Transformer Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
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<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
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<td>Adj. to output</td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz

### CHASSIS No. 93BR713A

**BAND SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
<th>Combination</th>
<th>Function</th>
<th>Transformer Adjusted</th>
<th>Transformer Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>46 kHz</td>
<td>1 MFD. Grid of 655</td>
<td>Broadcast</td>
<td>Two transistors in</td>
<td>Output Adjusted on</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Out of circuit</td>
<td>Output</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
<td>Adj. to output</td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>WAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz

### CHASSIS No. 93BR713A

**BAND SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency (MHz)</th>
<th>Connection</th>
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<th>Function</th>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Out of circuit</td>
<td>Output</td>
<td>1 MFD. Adj. on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SHORT</td>
<td>16 kHz</td>
<td>45 ohm Antenna lead</td>
<td>Short Wave</td>
<td>Adj. to output</td>
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</tr>
<tr>
<td>WAVE</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td>BAND</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 ohm Adj. to output</td>
</tr>
</tbody>
</table>

**Power Output:** 30 Milliwatts Unmeasured, 50 Milliwatts Measured

**Intermediate Frequency:** 45 kHz
**ALIGNMENT PROCEDURE**

The following equipment is required for alignment:

- An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as shown.
- Output Indicating Meter—Non Metallic Screwdriver.
- Dummy Antennas—1 mL, 200 mW., and 400 ohms.

**ALIGNMENT PROCEDURE**

- **Volume Control—Maximum All Adjustments.**
- **Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.**
- **Allow Chassis and Signal Generator to "Heat Up" for several minutes.**

**IMPORTANT—Follow procedure in the order shown.**

**SIGNAL GENERATOR**

- **Frequency Setting**— Dummy Antenna Setting
  - **L.F.:** Grid of grid Det. 1 mL B Range 2nd L.F. [6150 C(B) & C11] 1 L.F. [6150 C(B) & C11]
  - **WAVE TRAP:** Antenna Lead 300 mW. B Range 600 KC. Wave Trap [C5] Adjust for MINIMUM Output
  - **RANGE B:** Antenna Lead 300 mW. B Range 600 KC. Band Selector—See Notes B
  - **RANGE D:** Antenna Lead 400 Ohm D Range 600 KC. Band Selector—See Notes B

**CAUTION—**When adjusting the short wave bands for max. V.S.W.R. to obtain all the past of greatest intensity is obtained.

After each range is completed, report the procedure as a final check.

**DIAL POINTER ATTACHMENT**

- **Drive Cord Replacement**
  - Tie a knot with a small loop at the end of the new drive cord. Slide a 1/4 inch length of fabric tubing on the cord. Tie the free end of the drive cord to the tension spring. The distance between loops should be 1 inch.
  - Arrange to keep the gang customer in the completely closed position.

**Voltagere at Sockets**

The voltages at sockets are shown on the schematic circuit diagram. Unless otherwise specified, the voltage indicated is between the socket terminal and ground.

These voltages are taken under the following conditions:

- **Line Voltage—115.**
- **Valume Control—Maximum.**
- **Antenna Shorted to Ground.**

Readings taken with 1000 ohm shunt-meter voltmeter.

**Figure 1—Location of Trimmers**

**Figure 4—Drive Cord Replacement**

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ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Correct Radio Chassis to Ground Past of Signal Generator with a Short Heavy Lead.
Align Chassis and Signal Generator to "Heat Up" for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONSTRUCTION</th>
<th>SWITCH</th>
<th>ADJUSTMENTS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F. 460 KC</td>
<td>Group 1: (C) &amp; (C)</td>
<td>B Range Turn Rotor to Full Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE A 720 KC</td>
<td>Group 1: (C) &amp; (C)</td>
<td>B Range Turn Rotor to Full Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE B 1800 KC</td>
<td>Group 1: (C) &amp; (C)</td>
<td>B Range Turn Rotor to Full Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE C 4800 KC</td>
<td>Group 1: (C) &amp; (C)</td>
<td>B Range Turn Rotor to Full Open</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After each range is completed, repeat the procedure as a final check.

NOTE A—If the output is not at 1800 KC on the dial, hold the drive cord and move the pointer to this mark.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the point of greatest intensity is obtained.

Drive Cord Replacement—The drive cord is a small loop at one end of the new drive cord. Tie the free end of the drive cord to the terminal. The distance between knots should be 600 inches. Arrange to keep the ground condenser in the completely closed position. Place the looped end of the drive cord over hook A on condenser drive B (see Fig. 3). Pass the cord through slot C in the drive pin and wind one turn in a clockwise direction (from front of chassis) on condenser drive B. Pass drive cord over pulleys D and E as shown. Continue cord down to start F and wind A turns clockwise towards the chuck. Bring cord over pulley G to bottom of condenser drive B as shown. Wind drive cord clockwise (from front of chassis) around condenser drive B as shown. Secure the free end of the spring on hook A.

Dial Pointer Attachment—Tie in a section of known frequency. Move the pointer to the approximate frequency on the dial scale. Place the cord through the actuating head—see Fig. 4. Hold the drive cord and slide the pointer to the nearest frequency on the dial scale.

Wave Trap Placement—The wave trap is a small loop at one end of the new wave trap. Cut the free end of the wave trap to the terminal. The distance between knots should be 600 inches. Arrange to keep the ground condenser in the completely closed position. Place the looped end of the wave trap over hook A on condenser drive B (see Fig. 3). Pass the cord through slot C in the drive pin and wind one turn in a clockwise direction (from front of chassis) on condenser drive B. Pass drive cord over pulleys D and E as shown. Continue cord down to start F and wind A turns clockwise towards the chuck. Bring cord over pulley G to bottom of condenser drive B as shown. Wind drive cord clockwise (from front of chassis) around condenser drive B as shown. Secure the free end of the spring on hook A.

Models GS-706 to GS-712

Tuning Frequency Ranges

<table>
<thead>
<tr>
<th>Ranges</th>
<th>500 to 1500 KC (C)</th>
<th>B Range 1000 to 1500 KC (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>303 KC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity: For 0.5 watt output 0.8 Bm at 1500 KC.
Maximum Output: 1000 watts.
Power Consumption: 60 watts.
Intermediate Frequency: 450 KC.

e-60 Dynamic FOR DRIVE CORD REPLACEMENT AND DIAL POINTERS, SEE MODEL GS-706-006.
### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption</td>
<td>60 Watts (At 17 volts 40 cycles)</td>
</tr>
<tr>
<td>Power Output</td>
<td>36 Watts Unaltered</td>
</tr>
<tr>
<td></td>
<td>4.5 Watts Maximum</td>
</tr>
<tr>
<td>Selectivity</td>
<td>40 KC Band at 1000 times Signal</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>156 KC</td>
</tr>
<tr>
<td>Speaker</td>
<td>10&quot; Dynamic</td>
</tr>
</tbody>
</table>

#### Tuning Frequency Range

<table>
<thead>
<tr>
<th>Range</th>
<th>Frequency Range</th>
<th>Sensitivity (For 15 watt output)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>528 to 1700 EC (Kilocycles)</td>
<td>55 Microvolts Average</td>
</tr>
<tr>
<td>D</td>
<td>3750 to 18000 EC (Kilocycles)</td>
<td>45 Microvolts Average</td>
</tr>
</tbody>
</table>

#### "B" Issue Models

The issue letter is the last letter of the chassis number on the chassis number label.

In "B" issue models, the screen grid circuits of the 1st Detector and I.F. tubes are supplied through separate resistors as shown in the schematic.

If distortion is encountered at high signal levels in the "A" issue models, change the screen grid circuit of the 1st Detector and I.F. tubes according to the schematic.
The chassis used in this model is almost identical to the chassis used in Model 62-905. The differences are in the re-mounting of the electrolytic condensers in order to keep them upright when the chassis is mounted in the cabinet, and the addition of a phono attachment parts. The motor socket to the back panel of the chassis, and the phono attachment given for Model 62-905 also applies to this model.

SEE TUNER DATA FOR TUNER DATA INDEX.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead. Allow Chassis and Signal Generator to "Heat Up" for several minutes. IMPORTANT—Follow procedure in the order shown.

<table>
<thead>
<tr>
<th>FREQUENCY CONNECTION DUMMY ANTENNA RADIO CONDENSERS OR SWITCH SETTING ANTENNA SETTING DIAL SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F. 466 KC Grid of 1st Dot .1 mil. 9 Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td>466 KC Antenna Lead 200 med. 9 Range</td>
<td></td>
</tr>
<tr>
<td>RANGE B</td>
<td></td>
</tr>
<tr>
<td>1600 KC Antenna Lead 200 med. 8 Range</td>
<td>Turn Rotor to Full Closed</td>
</tr>
<tr>
<td>1500 KC Antenna Lead 200 med. 8 Range</td>
<td>Position. Pointer should</td>
</tr>
<tr>
<td>400 KC Antenna Lead 200 med. 8 Range</td>
<td>be at low frequency and</td>
</tr>
<tr>
<td>RANGE D</td>
<td>marked on scale—See</td>
</tr>
<tr>
<td>18,500 KC Antenna Lead 400 Ohms D Range</td>
<td>Note 8.</td>
</tr>
<tr>
<td>15,000 KC Antenna Lead 400 Ohms D Range</td>
<td></td>
</tr>
</tbody>
</table>

NOTE A—The low frequency and mark is a small dot at the left side of the dial over the "B" of the number 18 and to the right of the "C" of the letter KC. If the pointer is set at this mark on the dial, move the pointer to this mark.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the point of greatest intensity is obtained.

NOTE C—To correct the signal from the signal generator to prevent the leveling-off action of the AVC. After each range is completed, repeat the procedure as a final check.

CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows: Let the signal generator be set at 10,000 KC. The signal will then be heard at 10,000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 10,000 loss 921 KC, or 4789 KC on the dial. It may be necessary to increase the gain signal to hear the image.

General Service Data

Drive Cord Replacement

Tie a knot with a small loop at one end of the new drive cord. Tie the other end to the tension spring, leaving a distance of 61/4 inches between the knot.

Turn the range condenser to the full open position. Secure the free end of the spring over hook A—See Fig. 4. Turn the range condenser to the completely closed position.

Pass the cord through slot B and, guiding the cord in the groove of the drive drum, turn the range condenser to the full open position. Hook the cord in slot B and turn the range condenser to the completely closed position. Unhook the cord from slot D and pass over pulleys C, D, and E as shown. Pass the cord in front of idler pulley F. Wind 2 1/2 turns counter-clockwise (from front of chassis) around the drive shaft spool, progressing away from the chassis. Pass cord up and over the drive drum. Guide the cord in the groove of the drive drum, turn the range condenser to the full open position. If necessary, stretch the tension spring and pull the drive cord taut. Pass drive cord through slot B and secure the loop to the tension spring at point G.

EARY MODELS—In the early models using a larger drive shaft spool (See Fig. 4), there should be a distance of 5 1/4 inches between the knots.

DIAL POINTER ATTACHMENT—Tune in a station of known frequency. Move the pointer to the approximate frequency on the dial scale. Pass the cord through the slotted head—See Fig. 4. Hold the drive cord and slide the pointer to the exact frequency on the dial scale around the drive shaft spool, progressing away from the chassis. If it is ever necessary to re-assemble the automatic tuning unit, proceed as follows: The pinion gear should be held in such a position that the pinion gear shaft is in line with the axis of the pinion gear shaft—See Fig. 5. The lower rack should then be lined up with the lower rack and meshed with the pinion gear. The 8th tooth from the front on each side of the upper rack will then line up with the axis of the pinion gear shaft. The rear and side brackets can then be mounted on the rack and pinion assembly.

Fig. 4—Drive Cord Replacement

Fig. 5—Pinion Gear Assembly
ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antenna - 1 Mfd.

### Band Table

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Frequency Setting (in Order)</th>
<th>Dummy Antenna Value in Series with Generator Output Lead</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in Order) (See Fig. 1)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc. - 1 Mfd.</td>
<td>Grid of 400 J. F. Tube (Flanges out of mesh)</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>F.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc. - 3 Mfd.</td>
<td>Grid of 1250</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>F.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1230 Kc. 200 mfd.</td>
<td>Antenna Lead</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Trimmer - Top of rear section of gang (See Fig. 1)</td>
<td>Output</td>
<td>E.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc. 200 mfd.</td>
<td>Antenna Lead</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Trimmer - Top of rear section of gang (See Fig. 1)</td>
<td>Output</td>
<td>E.F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**NOTE:**
- A 200M ohm resistor must be connected between the two loop antennas back from the chassis when aligning the I.F. transformers and setting the oscillator trimmer. The loop antennas must be disconnected from the chassis.
- Remove the 200M ohm resistor from the loop antennas leads; mount the chassis and the loop antennas in the cabinet, connect the loop antennas to the chassis. Adjust the antenna trimmer through hole in bottom of cabinet.
- Lay the output leads from the signal generator back to back of the loop antennas. Turn up the output of the generator, picking up the energy in the loop antennas without any electrical connection from the signal generator.

**ALIGNMENT PROCEDURE**

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antenna - 1 Mfd. 200 mfd.

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Frequency Setting (in Order)</th>
<th>Dummy Antenna Value in Series with Generator Output Lead</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
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<td>Emitter full open (Flanges out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>F.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc. - 3 Mfd.</td>
<td>Grid of 1250</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>F.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1230 Kc. 200 mfd.</td>
<td>Antenna Lead</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Trimmer - Top of rear section of gang (See Fig. 1)</td>
<td>Output</td>
<td>E.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc. 200 mfd.</td>
<td>Antenna Lead</td>
<td>Emitter full open (Flanges out of mesh)</td>
<td>Trimmer - Top of rear section of gang (See Fig. 1)</td>
<td>Output</td>
<td>E.F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

After each band is completed, repeat the procedure as a final check.

**Power Consumption:** 40 Watts (at 117 Volts 50/60 Cycles)
**Power Output:** 2.5 Amp. at 6.3 Volts
**Sensitivity (for .05 Watts Output):** 25 Microvolts Average

**Selectivity:** 45 KC Broad at 1000 Times Signal at 1000 KC
**Tuning Frequency Range:** 505 to 1755 KC
**Intermediate Frequency:** 465 KC
**Speaker:** 8 in. P. M. Dynamic
Chassis No. 93BR560A

Power Consumption - "A" Battery 200 MA. "B" Battery 11 MA.
Power Output - 190 Milliwatts, Undistorted
Sensitivity (for 25 Watts) - Short Wave Band - 10 Microvolts Average

Model 93BR560A

Selectivity - 25 Kc. Broad at 1000 Times Signal at 1000 Kc.
Tuning Range - Broadcast 555-1720 Kc. Shortwave 5.5-15.5 M.
Intermediate Frequency - 465 Kc.
Speaker - 6 in. P. M. Dynamic

ALIGNMENT PROCEDURE

Volume control-Maximum all adjustments.
Connect radio chassis to ground post of signal generator with a short heavy lead.
Connect dummy antenna valve in series with generator output lead.
Connect output meter across primary of output transformer.
Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for alignment:
An A/B wave signal generator which will provide an accurately calibrated signal at the test frequency.
Output indicating meter.
Non-metallic screwdriver.
Battery extremity - 4 ma., 30 volt, and 4 ma.

NOTE "A" Do not readjust the trimmers on the output I. F. Transformer.
NOTE "B" Tune the dial back and forth slightly (2-3) times and adjust trimmer until the peak of variable indicates to obtain.

Align the signal from the signal generator to prevent the breaking-off action of the AVC.
After each band is completed, repeat the procedures of this check.

Model No. 93BR460A and 93BR1460A

Power Consumption - "A" Battery 200 MA. "B" Battery 11.5 MA.
Power Output - 190 Milliwatts, Undistorted
Sensitivity (for 25 Watts) - 45 Microvolts Average

Model No. 93BR460A and 93BR1460A

Selectivity - 45 Kc. Broad at 1000 Times Signal at 1000 Kc.
Tuning Range - Broadcast 555-1720 Kc. Shortwave 5.5-15.5 M.
Intermediate Frequency - 465 Kc.
Speaker - 5 in. P. M. Dynamic

ALIGNMENT PROCEDURE

Volume control-Maximum all adjustments.
Connect radio chassis to ground post of signal generator with a short heavy lead.
Connect dummy antenna valve in series with generator output lead.
Connect output meter across primary of output transformer.
Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for alignment:
An all wave signal generator which will provide an accurately calibrated signal at the test frequency.
Output indicating meter.
Non-metallic screwdriver.
Battery extremity - 4 ma., 30 volt.

Align the signal from the signal generator to prevent the breaking-off action of the AVC.
After each band is completed, repeat the procedures of this check.

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ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. Allow Chassis and Signal Generator to "Heat Up" for several Minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM (See Trimmer Illustration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>Signal Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>Turn rotor to full open</td>
<td>1st I.F. (C5) &amp; (C6)</td>
</tr>
<tr>
<td>1710 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>Turn rotor to full open</td>
<td>Oscillator (C3)</td>
</tr>
<tr>
<td>1560 KC</td>
<td>Antenna Lead</td>
<td>200 mf.</td>
<td>Turn rotor to max. output</td>
<td>Antenna (C4)</td>
</tr>
</tbody>
</table>

CALIBRATION—If it is necessary to calibrate the radio, accurately tune in a signal of known frequency near 800 KC and note distance and direction dial is off calibration. Remove chassis from cabinet. Loosen the 2 set screws in the hub at the side of the dial drum nearest the center of the chassis. Turn the dial drum the necessary amount in required direction. Place the chassis back in the cabinet and see if it is in calibration. If it is, remove the chassis, tighten the set screws and reassemble.
### Chassis No. 98BR657A

**Power Consumption**
- 2.5 Amps at 55 Volts

**Power Output**
- 2 Watts Undistorted

**Sensitivity** (for .5 Watts Output)
- Broadcast 10 Microvolts Average
- Shortwave 20 Microvolts Average

- Vacuum control—Maximum all adjustments
- Connect radio chassis to ground post of signal generator with a short heavy lead
- Connect antenna input to series with generator output lead
- Connect meter input across primary of output transformer
- Allow chassis and signal generator to "set up" for several minutes

---

#### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Tuning Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 EC</td>
<td>Brod at 1000 Times 550 EC</td>
<td>550 to 1750 EC</td>
</tr>
<tr>
<td>56 EC</td>
<td>2000 Times 560 EC</td>
<td>560 to 1560 EC</td>
</tr>
<tr>
<td>77 EC</td>
<td>Brod at 1000 Times 770 EC</td>
<td>770 to 1870 EC</td>
</tr>
<tr>
<td>78 EC</td>
<td>2000 Times 780 EC</td>
<td>780 to 1780 EC</td>
</tr>
</tbody>
</table>

---

#### MODEL 62-381 Power Unit

**Model 62-381 Power Unit**

(For 105-135 Volt 50/60 Cycle A.C. Operation)

---

#### Tubes

The following component of this chassis consists of the following metal base glass and metal tubes:

- Type 5B6G Pilot Detector-octal
- Type 6SK7 Remote Cut-Off Pentode, I.F. Amplifier (725, 555)
- Type 576G Graph. Diode Triode Second Detector, A.V.C.
- Type 6AQ5 Input Amplifier
- Type 5AR6G D. C. Amplifier
- Type 6AQ5 Cathode-Ray Tuning Eye

---

#### Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
</table>

---

#### Resisters

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
</table>

---

#### Condensers

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
</table>

---

#### Front of Chassis

![Diagram of Front of Chassis]

---

### Diagrams

#### Figure 2—MODEL 62-381 A.C. POWER UNIT

![Diagram of Model 62-381 A.C. Power Unit]

#### Figure 3—CONNECTOR STRIP ON CHASSIS FOR POWER UNIT

![Diagram of Connector Strip on Chassis for Power Unit]
BALANCING INSTRUCTIONS
ARVIN MODEL 7A CAR RADIO

All sensitivities are given for 1 watt output and 1.75 V across speaker voice coil.

SPECIAL NOTE: The intermediate frequency transformers in this receiver are coupled so as to assure flat top characteristics and provide a high fidelity reception of radio stations. These transformers may be balanced with a standard signal generator and output meter as follows:

Feed a signal of 170 kHz into the grid of the 6AS tube through a 1000-ohm resistor across the primary of the second I.F. transformer (P. to P.), and adjust screw No. 1 for maximum output. Disconnect the resistor and place it across the secondary of the same transformer and adjust screw No. 2.

Then connect the resistor across the primary of the last I.F. transformer and adjust screw No. 3 and then after placing the resistor across the secondary, adjust screw No. 4.

*Operation No. 4 adjusts bias on 6AS to obtain 5 uv sensitivity; for metropolitan areas this sensitivity may be set as low as 10 uv, and in mountainous areas as high as 20 uv, to secure the most satisfactory reception.
ARVIN 82SAT-83SAT AUTOMATIC DIAL TUNING INDICATOR

This receiver should be first removed from its carton and the cabinet carefully cleaned with a soft rag to remove packing list.

The hook bolts or clips which secure the chassis to the cabinet should be removed when the receiver is set on end during shipment. Should they not be removed, they will be found on each side of the chassis. Do not confuse those with the brackets which support the chassis through rubber grommets. These latter brackets should not be removed unless it is necessary to service the receiver.

The receiver may be prepared for operation by connecting an antenna lead at "A" on the rear terminal strip and connecting a ground lead at "G", leaving the jumper from "D" to "G" in place; or by removing the jumper and connecting the transmission line lead from an Arvin all-wave antenna kit. (Black lead to "D" and red lead to "A"). Plug the radio into the wall socket.

Make a list of ten stations in your locality which you desire to set up on the station selector, arranging this list so that the stations appear in the order of their frequencies. Cut the call letters of these stations from the sheets supplied with this receiver, leaving a white tab on each end of the pieces cut out.

The receiver is placed in operation by turning the right-hand knob in a clockwise direction. This knob also functions as a tone control. The second knob in the left should be turned to the maximum counterclockwise or manual tuning position.

Tune in the first station on your list, using the turn-about technique. When the station is properly tuned, change the Manual-Automatic Tuning switch to the automatic tuning position. Unless one of the buttons about to be adjusted happens to be set at this point the receiver will now appear to be inoperative. (In event a button does happen to be set at the proper point—no adjustment is necessary. If the pilot light is not in proper rotation, the socket may be exchanged from the rear.) Looking at the rear of the dial and on the side toward which the pointer is now pointing, locate the button in the center of the dial which is the lowest pilot light on that side of the dial. Loosen this button by means of a turn in the counterclockwise direction and slide the button in its track slowly until a point is reached where the receiver operates. The correct location for this button is directly behind the brass strip carried by the arm behind the plate on which the buttons are mounted. If this correct location cannot be attained by sliding the button in the particular track it is occupied, the button should be slid along the track to the point where it may be taken out and inserted in a track where this adjustment is possible.

The Manual-Automatic Tuning switch should now be returned to the Manual position; the second station on the list tuned in; and the Manual-Automatic Tuning switch again thrown to the Automatic Tuning position; the button at the rear of the dial should be pushed into the second pilot light; this button should be loosened, slid along the track and again tightened at the point where the receiver operates.

This same procedure should be continued for each station successively right around the dial, which now completes the set-up.

The switch may now be turned to the Automatic Tuning position. Tune in each station again, placing the proper call letters in each strip, inserting them from the rear of the receiver and at the edge of the dial frame. Push the call letter strips in so that they properly center in each window when viewed from the front.

This Arvin receiver has special advanced features which must be properly understood in order that full benefit may be derived from this fine instrument.

When the receiver is being operated with the Manual-Automatic Tuning switch in the manual position, the receiver tunes sharply and any station within the range of the receiver may be selected at will. Tunal quality to suit the taste of the listener may be obtained by adjustment of the tone control.

On the other hand, when the Manual-Automatic Tuning switch is in the automatic tuning position, the receiver functions in an entirely different manner. Throwing this switch automatically broadens the selectivity characteristic of the receiver.

It should be noted that this broad selectivity will only function satisfactorily on the louder stations, that is, those which are normally selected for use on the Arvin Station Selector. (This broadened selectivity is not practical in the manual tuning position because of inter-station interference which would inevitably result.)

Should the listener so desire, this increased selection can be compensated for by readjusting the setting of the tone control.

When this receiver is being operated on the polio- nosemic or foreign-short wave band, tuning should always be done manually and no attempt made to utilize the station selector feature which has been set up for the broadcast band.

BALANCING INSTRUCTIONS MODELS 82SAT and 83SAT

SENSITIVITY:

A. Broadcast Band—50 Microvolts Minimum
B. Police Band—75 Microvolts Minimum
C. Short Wave Band—100 Microvolts Minimum

Notes: Standard output is considered 500 milliwatts which is equal to 1.12 R.M.S. A.C. volts across one thousand ohms of the receiver. Sensitivity is determined by the amount of input in microvolts required to produce 1.12 volts at the output coil. Measurement may be made with any A.C. voltmeter or output meter.

The inter-modulation frequency transducers embodied in the circuits of Arvin models 82SAT and 83SAT are of the semi-permanent type and the only adjustments being variable are those in the field of this transducer. It is advisable before attempting to rebalance the inter-modulation elements of that receiver, therefore, to check the overall inter-modulation frequency stage sensitivity which may be accomplished by connecting the 455 K. C. output of a standard signal generator to the grid cap of the 6AC5 tube after removing the grid circuit. Connection should be made through a standard 500 uuf, dummy antenna. Check sensitivity and perform all necessary adjustment procedure with the automatic tuning control in the "o" position. The intermodulation sensitivity should be at least 75 microvolts minimum input. If the I.F. sensitivity is within the limits prescribed the following instructions for balancing may then be followed.

If the I.F. sensitivity is low then adjust screws 1, 2, 3 and 4 for maximum output.

1. Connect the signal generator to the A and G terminals on the front of the radio. Replace the condenser unit until it is fully in place (maximum clock- wise position.) The dial pointer should point to the center of the meter window which is about five to six inches above 0 kilocycles (55 on the American broadcast band.)

2. Rotate dial pointer 1, 1,000 K. C. Set band switch to Broadband Position. Adjust pad No. 3 to resonance. Adjust pad No. 6 for maximum output.

3. Rotate dial pointer to 600 K. C. With 600 K. C. input from the signal generator adjust pad No. 7 for resonance.

4. Set band switch to mid-band position. Rotate dial pointer to 5,000 K. C. With 5,000 K. C. input from signal generator adjust pad No. 8 for resonance. Adjust pad No. 9 for maximum output.

5. Set band switch to short-wave band position. Rotate dial pointer to 15,000 K. C. With 15,000 K. C. input from signal generator turn pad No. 10 until the meter needle is in the baseline position. Then rotate pad screw counter-clockwise selecting the second resonance point reached. Then adjust pad No. 11 for maximum output.

& John F. Rider, Publisher
**BALANCING INSTRUCTIONS:**

All sensitivities given for 1/2 watt output = 1.4 V. across Voice Coil

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6AB Grid</td>
<td>450</td>
<td>1, 2, 3 &amp; 4</td>
<td>500 KC</td>
<td>50 uv</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Coupler</td>
<td>1400</td>
<td>5</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Through 20 uuf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3, 4</td>
<td></td>
<td>1400</td>
<td>6, 7</td>
<td>1600</td>
<td>10 uv</td>
</tr>
</tbody>
</table>

**RESISTORS:**

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R5</td>
<td>17-2070</td>
<td>500,000 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R6</td>
<td>17-2080</td>
<td>1,000,000 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R7</td>
<td>17-16091</td>
<td>25,000 ohm, 1 W.</td>
</tr>
<tr>
<td>R8</td>
<td>17-14286</td>
<td>500 ohm, 1 W.</td>
</tr>
<tr>
<td>R9</td>
<td>17-14288</td>
<td>15,000,000 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R10</td>
<td>17-14288</td>
<td>100 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R11</td>
<td>17-14290</td>
<td>200 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R12</td>
<td>17-14290</td>
<td>20,000 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R13</td>
<td>17-14292</td>
<td>40,000 ohm, 1/4 W.</td>
</tr>
<tr>
<td>R14</td>
<td>17-16228</td>
<td>500,000 ohm, vol. control</td>
</tr>
</tbody>
</table>

**CONDENSERS:**

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C182</td>
<td>29-16217</td>
<td>Tuning Condenser</td>
</tr>
<tr>
<td>C183</td>
<td>17-14272</td>
<td>0.0003 mfd, 600 V.</td>
</tr>
<tr>
<td>C184</td>
<td>17-14292</td>
<td>0.005 mfd, 1200 V.</td>
</tr>
<tr>
<td>C185</td>
<td>17-14235</td>
<td>0.003 mfd, 600 V.</td>
</tr>
<tr>
<td>C186</td>
<td>17-14266</td>
<td>0.005 mfd, 400 V.</td>
</tr>
<tr>
<td>C187</td>
<td>17-14272</td>
<td>0.01 mfd, 400 V.</td>
</tr>
<tr>
<td>C188</td>
<td>17-14272</td>
<td>0.02 mfd, 400 V.</td>
</tr>
<tr>
<td>C189</td>
<td>17-14272</td>
<td>0.1 mfd, 400 V.</td>
</tr>
<tr>
<td>C190</td>
<td>17-14272</td>
<td>2 mfd, 400 V.</td>
</tr>
<tr>
<td>C191</td>
<td>17-14272</td>
<td>5 mfd, 400 V.</td>
</tr>
<tr>
<td>C192</td>
<td>17-14272</td>
<td>10 mfd, 400 V.</td>
</tr>
<tr>
<td>C193</td>
<td>17-14272</td>
<td>20 mfd, 400 V.</td>
</tr>
<tr>
<td>C194</td>
<td>17-14272</td>
<td>50 mfd, 400 V.</td>
</tr>
<tr>
<td>C195</td>
<td>17-14272</td>
<td>100 mfd, 400 V.</td>
</tr>
<tr>
<td>C196</td>
<td>17-14272</td>
<td>200 mfd, 400 V.</td>
</tr>
</tbody>
</table>

**CIRCUITS and TRANSFORMERS:**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>00-16219</td>
</tr>
<tr>
<td>T-2</td>
<td>00-16220</td>
</tr>
<tr>
<td>T-3</td>
<td>00-16221</td>
</tr>
<tr>
<td>T-4</td>
<td>00-16222</td>
</tr>
<tr>
<td>T-5</td>
<td>00-16223</td>
</tr>
<tr>
<td>T-6</td>
<td>00-16224</td>
</tr>
<tr>
<td>X-1</td>
<td>29-13458</td>
</tr>
<tr>
<td>X-2</td>
<td>29-13449</td>
</tr>
<tr>
<td>TL</td>
<td>00-16233</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS:**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-14272</td>
<td>Speaker Assembly (5 7/8&quot;)</td>
</tr>
<tr>
<td>17-14272</td>
<td>Rear Mounting Bracket</td>
</tr>
<tr>
<td>17-14272</td>
<td>Dial Glass</td>
</tr>
<tr>
<td>17-14272</td>
<td>Dial Pointer</td>
</tr>
<tr>
<td>17-14272</td>
<td>24&quot; Dial Cord</td>
</tr>
<tr>
<td>17-14272</td>
<td>Vibrator</td>
</tr>
<tr>
<td>29-16024</td>
<td>Tuning &amp; Volume Knob</td>
</tr>
<tr>
<td>29-16024</td>
<td>Push Button Knobs</td>
</tr>
<tr>
<td>10-5145</td>
<td>Mounting Screw 3/8&quot;</td>
</tr>
<tr>
<td>10-5141</td>
<td>Mounting Screw No. 10 x 2 1/2&quot;</td>
</tr>
<tr>
<td>29-3219</td>
<td>Instruction Sheet</td>
</tr>
<tr>
<td>29-2401</td>
<td>Call Letter Sheets</td>
</tr>
<tr>
<td>23-16249</td>
<td>Ford Mounting Sheets</td>
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</tbody>
</table>
MODEL 9A SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Heater</th>
<th>Plate</th>
<th>Suppressor Grid</th>
<th>Screen Grid</th>
<th>Oscillator Grid</th>
<th>Anode Grid</th>
<th>Diods Plate</th>
<th>Control Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>6.3</td>
<td>175</td>
<td>0</td>
<td>75</td>
<td>4.7</td>
<td>185</td>
<td>0</td>
<td>3.4</td>
</tr>
<tr>
<td>6A7</td>
<td>6.3</td>
<td>175</td>
<td>0</td>
<td>75</td>
<td>4.7</td>
<td>185</td>
<td>0</td>
<td>3.4</td>
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<td>78</td>
<td>6.3</td>
<td>175</td>
<td>3.2</td>
<td>0</td>
<td>90</td>
<td>2.0</td>
<td>1.6</td>
<td>17.0</td>
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<tr>
<td>75</td>
<td>6.3</td>
<td>172</td>
<td>0</td>
<td>75</td>
<td>4.7</td>
<td>185</td>
<td>0</td>
<td>3.4</td>
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<tr>
<td>41</td>
<td>6.3</td>
<td></td>
<td>195</td>
<td>213 A.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Socket voltages given in table are for an input of 5.8 volts at the tubes in the receiver. 5.8 volts is the average obtained in various cars after allowing for drop in ear wiring.

MODEL 578B ARVIN RADIO

TUBES:
1C7G—1st Detector-Oscillator
1D5G—I. F. Amplifier
1H6G—2nd Detector
1G5G—Audio Output Amplifier

FREQUENCY RANGE: 540 to 1,725 Kilocycles

POWER OUTPUT: 300 Milliowatts

SPEAKER:
6" Permanent Magnet Dynamic
3 ohm voice coil—400 cycles

VOLTAGE AND POWER CONSUMPTION:
“A” Battery—360 milliamperes at 2.1 volts
“B” Battery—12.15 milliamperes at 90 volts

Sensitivity:
1000 KC.—100 Microvolts for 50 milliowatts output
456 KC.—200 Microvolts for 50 milliowatts output

CONNECT an output meter or A. C. Voltmeter across the speaker coil leads.

1. Connect the signal generator to the grid cap of the 1C7G tube and with an input of 456 K. C. adjust padders 1, 2, 3 and 4 for maximum output.

2. Connect the signal generator through a standard 200 micromicrofarad dummy antenna to the antenna (green) lead wire on the rear of the chasis. Ground the generator to the (black) ground wire.

3. Rotate the tuning condenser to the wide open position. Check the dial pointer to see that it is parallel to the horizontal line across the dial face.

4. Rotate the dial pointer to 1,400 K. C. and with an input of that frequency adjust paddler No. 5 to resonance. Adjust paddler No. 6 for maximum output.

5. Rotate the dial pointer to 600 K. C. and with an input of that frequency adjust the series paddler No. 7 to resonance.

6. Return to 1,400 K. C. and recheck the settings of padders No. 5 and No. 6.

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ARVIN RADIO CHASSIS RE27

Radio models 89 and 91

Alignment, Trimmers, NOBLITT-SPARKS INDUSTRIES, INC.
Sensitivity

All voltage readings taken to chassis base. All audible voltage variation, plus or minus 20% from values shown.

BALANCING INSTRUCTIONS

ARVIN MODELS 89, 91 -- RE27 CHASSIS

All sensitivities given for 200 milliwatt output. 717 V across voice coil.

Cycle and Transformers

Speaker, dial, parts, costs & plug-in panels

© John F. Rider, Publisher
"A" BAND - 555 TO 1,800 M.C. - BALANCE AT 1,400 M.C.
CHECK AT 1,000 M.C. - PAD AT 800 M.C.
"B" BAND - 1,575 TO 4,750 M.C. - BALANCE AT 4,250 M.C.
CHECK AT 3,000 M.C. - CHECK AT 1,800 M.C.
"C" BAND - 4,250 TO 7,400 M.C. - BALANCE AT 7,000 M.C.
CHECK AT 6,000 M.C. - PAD AT 3,000 M.C.
"D" BAND - 7,350 TO 10,600 M.C. - BALANCE AT 10,000 M.C.
CHECK AT 9,500 M.C. - CHECK AT 8,000 M.C.
"E" BAND - 11,500 TO 16,200 M.C. - BALANCE AT 15,600 M.C.
CHECK AT 15,000 M.C. - CHECK AT 12,000 M.C.

FIRST I.F. PEAK - 455 K.C.
SECOND I.F. PEAK - 100 K.C.
SECOND OSCILLATOR - 355 K.C.
The Oldsmobile Model 982083 is a six tube single unit receiver with variable tone control. This receiver was designed specifically for 1928 Model Oldmobiles and is equipped with an instrument panel tuning control having a variable tone control in addition to the tuning and volume controls.
FIG. 8 REMOTE CONTROL HEAD

409976 Control Unit Complete
1212484 Base
1212397 Cable Assembly Flexible
1212388 Cable Assembly Flexible
1212392 Clamp
1212393 Clip
1212394 Clutch Dial Assembly
1212397 Gear and Shaft Assembly
1212396 Gear and Shaft
1212398 Gear and Shaft
1212399 Gear and Shaft
1212401 Knob
1212402 Knob
1212403 Knob
115275 Lamp No. 51 Miniature Bayonet Base
134530 Nut 6/32
1212405 Plate
1212482 Screw 4/36 x 3/16
107697 Screw 6/32 x 3/8 R.H.
1212406 Spring
1212407 Spring
1212418 Stud
1212409 Switch
1212410 Switch
1212413 Washer
1212414 Washer
131044 Washer Lock

Standard
Control Assembly
Station Selector
Volume Control
Load
Shaft Retaining
Idler Driving and Dial Drive
Dial Drive (Driving Pinion)
Off-On Volume (Driving)
Off-On Volume (Driven)
Station Selector
Off-On and Volume Control
Pilot Light
Lead Clamp Mtg.
Gear Retaining
Binder Head
Lead Clamp Mtg.
Case Retaining
Dial Tension
Control Unit Mtg.
Switch
Tone Control Button
Knob Retaining
Off-On and Volume Shaft Retaining

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Subjects: VIBRATOR "HASH" NOISE

Caution: Only radios that have a vibrator hash noise should have this correction made. If there is no hash noise and these changes are made to prevent hash development, it will only tend toward driving hash noise into the radio.

CORRECTION

The following procedure to correct vibrator hash is:

Deluxe Model - 982084 ONLY

1. The bond that grounds the Gang Condenser to the Antenna Coil can should be held against the Gang Condenser bracket and soldered. This is shown in Figure 1 before change, and Figure 2 after change.

2. Vibration prongs may be contacting the receiver case as shown in Figure 3. Bend vibration prongs away from receiver case as shown in Figure 4.

3. Tighten power supply mounting nuts.

Standard Model - 982083 ONLY

1. Ground the Gang Condenser can as shown in Figure 8.

2. Bend vibration prongs away from receiver case as shown in Figure 4.

3. Tighten power supply mounting nuts.

4. Remove the receiver from the car and add a .0002 MFD condenser from the small terminal strip to ground. Solder one end of condenser to the same terminal that the two small resistors are soldered to and solder the other end of the condenser to the chassis ground, as shown in Figure 6.
The Oldsmobile Model 982084 is an eight tube Dash Speaker DeLuxe Receiver, with tone and sensitivity controls. This receiver was designed specifically for 1938 Oldsmobiles and is equipped with an instrument panel tuning control having a sensitivity switch and variable tone control in addition to the tuning and volume controls.

The antenna circuit is directly coupled to the antenna in contrast with the capacity coupled circuit used in some previous Oldsmobile Models. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the high frequency end of the band (1400 K.C.) instead of at the low frequency end as with the capacity coupled sets. There are two taps provided on the Antenna Coil. One for use with the Running Boards Antenna and the other for use with overhead (Roof) type Antennas.
1. Aligning I-F Stages at 260 Kilocycles:

**IMPORTANT:** The sensitivity switch on the tuning-control should be in the "Distance" position when aligning the receiver, or the cable from the control unit to the receiver disconnected.

- a. Connect the signal lead of the test oscillator to the grid of the 5450 Tube and connect to the antenna terminal of the receiver through a .0025 mfd. MICA CONденсator connected in place of the 1 mfd. condenser previously used. (It is very important that a .0025 mfd. condenser be used in aligning the antenna stage of these receivers in order that this circuit may be made to track properly. Some test oscillators have this condenser included and if the capacity is correct, it will not be necessary to use an external series condenser.)
- b. Connect the ground lead of the test oscillator to the chassis frame.
- c. Connect the output meter across the plate drops of the output tube. Care should be taken when connecting the output meter to insert a series condenser to protect the meter from D.C. Voltages.
- d. Set the test oscillator to exactly 260 K.C.

2. Alignment at 360 Kilocycles:

- a. Leave the test oscillator leads connected the same as for aligning the I-F circuits.
- b. Turn the rotor plates of the 54-series condenser all the way out and against the high frequency stop.
- c. Set the test oscillator to 360 Kilocycles.
- d. Adjust the parallel trimmer for the oscillator section of the condenser gang (Illustration 111, Figure 2) for maximum output. These adjustments should be repeated several times and during alignment, the test oscillator output should be kept to as low a value as is consistent with obtaining a readable indication on the output meter.

3. Aligning at 540 Kilocycles:

- a. Leave test oscillator leads connected the same as before.
- b. Turn the rotor plates of the gang condenser all the way into mesh so that they rest against the low frequency stop.
- c. Set the test oscillator to 540 K.C.
- d. Adjust the oscillator parallel condenser (Illustration 111, Figure 3) located on the mounting plate of the receiver to maximum output. (This adjustment sets the low frequency tuning range of the receiver to 540 K.C.)

4. Aligning at 1400 Kilocycles:

- a. Remove the signal lead of the test oscillator from the grid of the Translator tube and connect to the antenna terminal of the receiver THROUGH A .0005 mfd. MICA CONденсатор connected in place of the 1 mfd. condenser previously used.
- b. Set the test oscillator to 1400 K.C.
- c. Turn the condenser rotor plates until the frequency is tuned in with maximum output.

5. Aligning at 600 Kilocycles:

The oscillator capacitance was previously aligned at 540 K.C. However, it is necessary in most cases to repeat the oscillator tuning condenser at 600 K.C. in order to make the receiver track properly and to secure full sensitivity.

- a. Set the test oscillator at 600 K.C.
- b. Turn the condenser rotor plates until the signal from the test oscillator is tuned in with maximum output.
- c. Maintain a low output signal from the test oscillator and readjust the oscillator tuning shaft back and forth through the signal.
- d. This operation should be continued until no further increase in output can be obtained.

**Note:** If the entire alignment procedure has been accomplished correctly, the receiver should be very nearly uniformly sensitive over the entire frequency range.

**Diagram:**

- **Figure 5: Tube Firing Voltages**

**Diagram:**

- **Bottom View of Tube Sockets**

**Readings Taken from Tube Socket Contacts to Ground with a D.C. Voltmeter having a Resistance of 1000 Ohms per Volt; A" Battery 6 Volts
FIG. 8 REMOTE CONTROL HEAD

FIG. 7--#1212439 CONDENSER BLOCK CONNECTIONS

WHITE & RED .05 - 200V.
WHITE .04 - 160V.
BROWN (AUDIO) .01 - 200V.
GREEN (AUDIO) .15 - 400V.
BLUE (AUDIO) .05 - 400V.
BLACK .005 - 400V.
YELLOW & BLACK .02 - 400V.
GREEN & WHITE (AUDIO) .02 - 200V.
GREEN & WHITE .02 - 200V.
ANTENNA CIRCUIT

The antenna circuit is directly coupled to the antenna. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the high frequency end of the band (1400 K.C.). There are two antenna receptacles provided on the receiver, one for use with the running board antenna and the other for use with the overhead (roof) type antenna.

1. Aligning I-F stages at 260 Kilocycles

(a) Connect the signal lead of the test oscillator to the grid cap of the 6AK7 Tube through a .1 mfd. condenser, leaving the tube's grid clip in place.

(b) Connect the ground lead of the test oscillator to the chassis frame.

(c) Connect the output meter across the plate prongs of the output tube. Care should be taken when connecting the output meter to insert a series condenser to protect the meter from D.C. voltages.

(d) Set the test oscillator to exactly 260 Kilocycles.

(e) Adjust the trimmers "A", "B", "C" and "D" on the I-F Transformers for maximum output. (See parts layout). These adjustments should be repeated several times and during alignment the test oscillator output should be kept as low as possible consistent with obtaining a readable indication on the output meter.

2. Aligning at 1500 Kilocycles

(a) Leave the test oscillator leads connected as for aligning the I-F Circuits.

(b) Turn the rotor plates of the gang condenser (Illustration #9) all the way out and against the high frequency step.

(c) Set the test oscillator to 1500 Kilocycles.

(d) Adjust the condenser "E" for maximum output. (It is very important that this frequency be set accurately as a slight setting will change the receiver to be out of track over the high frequency end of the dial.)

3. Aligning at 540 Kilocycles

(a) Leave the test oscillator leads connected as before.

(b) Turn the rotor plates of the gang condenser all the way into mesh so that they rest against the low frequency stop.

(c) Set the test oscillator to 540 kilocycles.

(d) Adjust the oscillator padding condenser "E" for maximum output. (This adjustment sets the low frequency tuning range of the receiver to 540 K.C.)

4. Aligning at 1400 Kilocycles

(a) Remove the signal lead of the test oscillator from the grid of the 6AK7 tube and connect to the running board antenna receptacle of the receiver through a .0005 mfd. MICA CONDENSER connected in place of the .1 mfd. condenser previously used. (It is very important that a .0005 mfd. mica condenser be used when aligning the antenna stage of these receivers and that the lead from the test oscillator is in the correct terminal in order that this circuit can be made to track properly.)

(b) Set the test oscillator to 1400 K.C.

(c) Turn the condenser rotor plates until this frequency is tuned in with maximum output.

(d) Adjust the R-F Paralleled trimmer "F" on the condenser gang and the antenna compensating condenser "H" which is the parallel trimmer on the Condenser Gang.

5. Aligning at 600 Kilocycles

The oscillator padding condenser was previously adjusted at 540 K.C., however, it is necessary in most cases to re-peel the oscillator tracking condenser at 600 K.C. in order to make the receiver track properly and to secure full sensitivity.

(a) Set the test oscillator at 600 K.C.

(b) Turn the Condenser rotor plates until the signal from the test oscillator is tuned in with maximum output.

(c) Maintain a low output signal from the test oscillator and readjust the oscillator tracking condenser "F" while rocking the variable condenser gang tuning shaft back and forth through the signal.

(d) This operation should be continued until no further increase in output can be obtained.

NOTE: If the entire alignment procedure has been accomplished accurately, the receiver should be very nearly uniformly sensitive over the entire frequency range.

Model 902126
Date: Dec. 20, 1938.
MODEL 962126
Voltage, Chassis
Control Assembly

OLDSMOBILE DIV.—GEN. MOTORS

MODEL 962127
Control Assembly

BOTTOM VIEW OF TUBE SOCKETS

SPKR TUBE VOLTAGE CHART

READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT;
"A" BATTERY 6 VOLTS.
CURRENT DRAIN 6.7 TO 7.6 AMPERES.
"B" SUPPLY DRAIN APPROXIMATELY

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CIRCUIT DIAGRAM
OLDS MODEL 982127

ANTENNA CIRCUIT

The antenna circuit is capacity coupled to the antenna. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the low frequency end of the band (600 K.C.) There are two antenna receptacles provided on the receiver. One for use with the Running Boards Antenna and the other for use with Side Cowl Mounted type Antenna.

Olds Model 982127
Date: April 20, 1939
1. **Aligning Between 455 Kilocycles**

(a) Connect the signal lead of the test oscillator to the grid cap of the 6AG7 tube through a .1 mfd. condenser, leaving the tube's grid clip in place.

(b) Connect the ground lead of the test oscillator to the chassis frame.

(c) Connect the output meter from the plate prong of the output tube to ground. Care should be taken when connecting the output meter to insert a series condenser to protect the meter from D.C. voltages.

(d) Set the test oscillator to exactly 455 K.C.

(e) Turn volume control to maximum.

(f) Adjust the trimmers "A", "B", "G", and "H" on the I-F Transformers for maximum output. (See parts layout) These adjustments should be repeated several times and during alignment the test oscillator output should be kept to as low a value as is consistent with obtaining a readable indication on the output meter.

2. **Aligning at 750 Kilocycles**

(a) Leave the test oscillator leads connected the same as for aligning the I-F Circuits.

(b) Turn the rotor plates of the gang condenser (Illus. 36) all the way out and against the high frequency stop.

(c) Set the test oscillator to 750 kilocycles.

(d) Adjust the condenser "F" for maximum output. (It is very important that the frequency be set accurately as a slight mis-setting will cause the receiver to be out of track over the entire high frequency end of the dial.)

3. **Aligning at 140 Kilocycles**

(a) Leave test oscillator leads connected the same as before.

(b) Turn the rotor plates of the gang condenser all the way into mesh so that they rest against the low frequency stop.

(c) Set the test oscillator to 140 K.C.

(d) Adjust the oscillator tuning condenser "F" for maximum output. (This adjustment sets the low frequency tuning range of the receiver to 540 K.C.)

4. **Aligning the Antenna Stage**

(a) Remove the signal lead of the test oscillator from the grid of the 6AG7 tube and connect to the tuning board antenna receptacle of the receiver through a .047 mfd. tuning condenser. (It is very important that a .047 mfd. tuning condenser be used when aligning the antenna stage of these receivers and that the lead from the test oscillator is in the correct receptacle in order that this circuit can be made to track properly.

(b) Set the test oscillator to 600 K.C.

(c) Adjust antenna trimmer condenser "G" for maximum output.

(d) Set the test oscillator to 1400 K.C.

(e) Turn the condenser rotor plates until this frequency is tuned in with maximum output.

(f) Adjust the Parallel trimmer "C" on the condenser gang for maximum output.
READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT. "A" BATTERY 6 VOLTS. CURRENT DRAIN 7.3 TO 7.5 AMPS. "B" SUPPLY DRAIN APPROXIMATELY 52 TO 55 MA.

BOTTOM VIEW OF TUBE SOCKETS

FIG. 3
PRONG VOLTAGES
OLDS RADIO-982153

POWER SUPPLY UNIT LOCATION OF PARTS
RADIO 982153
READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C.
VOLTmeter HAVING A RESISTANCE OF 1000 OHMS PER VOLT; "A" BATTERY
6 VOLTS, CURRENT DRAIN 7.3 TO 7.5 AMPS.
"B" SUPPLY DRAIN APPROXIMATELY 52 TO 55 MA

BOTTOM VIEW OF TUBE SOCKETS

FIG. 3
PRONG VOLTAGES
OLDS RADIO-982153

POWER SUPPLY UNIT LOCATION OF PARTS
RADIO 982153

LOCATION OF PARTS
OLDS RADIO-982153
1. Aligning 1-F Stages at 220 Kilocycles:
   a. Connect the signal lead of the test oscillator to the grid of the diode through a .1 mfd. condenser, leaving the tube's grid clip in place.
   b. Connect the ground lead of the test oscillator to the chassis frame.
   c. Connect the output meter from the plate terminal of the 6756 to ground. Care should be taken when connecting the output meter to insert a series condenser to protect the meter from high voltages.
   d. Set the test oscillator to exactly 220 K.C.
   e. Adjust the trimmers on the I-F coils (Illustration 6 and 7, Figure 8) for maximum output. These adjustments should be repeated several times and during alignment the test oscillator output should be kept as low as possible to avoid overloading the receiver. Adjustments should be made to produce a readable indication on the output meter.

2. Aligning at 1560 Kilocycles:
   a. Leave the test oscillator leads connected the same as for aligning the I-F circuits.
   b. Turn the rotor plates of the gang condenser all the way out and against the high frequency stop.
   c. Set the test oscillator to 1560 Kilocycles.
   d. Adjust the parallel trimmer for the oscillator section of the condenser gang (Illustration 6C, Figure 8) for maximum output. (It is very important that the frequency be set accurately as a slight mis-setting will cause the receiver to be out of tune over the entire high frequency end of the dial.

3. Aligning at 540 Kilocycles:
   a. Leave the test oscillator leads connected the same as before.
   b. Turn the rotor plates of the gang condenser all the way into mesh so that they rest against the low frequency stop.
   c. Set the test oscillator to 540 K.C.
   d. Adjust the oscillator coupling condenser (Illustration 6B, Figure 8) located on the coupling plate of the receiver to maximum output. (This adjustment sets the low frequency tuning range of the receiver to 540 K.C.)

4. Aligning at 1400 Kilocycles:
   a. Remove the signal lead of the test oscillator from the grid of the Transistor tube and connect to the antenna terminal of the receiver TEN BUSH, .00055 mfd. MICA CONDENSER connected in place of the .1 mfd. condenser previously used. (It is very important that a .00055 mfd. mica condenser be used in aligning the antenna stage of these receivers in order that this section can be made to track properly. Some test oscillators have this condenser included and if the capacity is correct, it will not be necessary to use an external series condenser.)
   b. Set the test oscillator to 1400 K.C.
   c. Turn the condenser rotor plates until the frequency is tuned in with maximum output.

d. Adjust the 3-Y parallel trimmer on the condenser gang (Illustration 11-A) and the antenna compensating condenser which is the parallel trimmer on the Condenser Gang (Illustration 11-A, Figure 8).

5. Aligning at 600 Kilocycles:
   a. Set the test oscillator to 600 K.C.
   b. Turn the condenser rotor plates until the signal from the test oscillator is tuned in with maximum output.
   c. Maintain a low output signal from the test oscillator and readjust the oscillator coupling condenser (Illustration 6B, Figure 8) while rocking the variable condenser gang tuning shaft back and forth through the signal.
   d. This operation should be continued until no further increase in output is obtained. Note if the entire alignment procedure has been accomplished correctly, the receiver should be very nearly uniformly sensitive over the entire frequency range.

---

**Fig. 5 Tube Firing Voltages - Model 9000X**

**Readings taken from tube socket contacts to ground with a D.C. voltmeter having a resistance of 1000 ohms per volt. A 'A' battery 6 volts. Current drain 5.6 to 6.8 amps.**

**'B' Supply Draw Approximately 50 to 54 M.A.**
CONVERSION CONTROL UNIT 412304

1213395 Arm Assembly
7236806 Bezel Assembly
5271383 Cable & Plug Assembly
Cable & Plug Assembly
1213379 Clamp
1213382 Clip
1213381 Dial Glass
1213388 Gear Assembly
1213389 Gear Assembly
1213390 Gear & Bushing Assy.
1213377 Grommet
115273 Lamp, #51
7236583 Knob
7236739 Knob
7236481 Nut 7/16-28 Hex

Off-On Switch Actuating 1213397 Pulley Assembly
7236443 Pulley Wood
1210116 Resistor Insulated 50,000 ohms, 1/2 Watt
1209883 Resistor Insulated 100,000 ohms, 1/2 Watt
7236430 Screw 4-36 x 3/16 Bezel Mounting
1213391 Shaft Station Selector
1213380 Shaft Volume Control
1213390 Spring Dial Pointer - String Tension

Stud Idler Gear
Switch Off-On
Switch Tone Control
Switch Local Distance

CONVERSION CONTROL UNIT 412304
INCLUDED IN PACKAGE 98213
USED IN CONNECTION WITH RECEIVER 982083-4-5

Note that Remote Control, 412073, for Radio 982153 is the same as 412304 except it will be less the following:

7236739 Local Distance Switch Knob
1213384 Switch
5271569 6 Prong Cable and Plug Assembly
1213381
1213390
1213385
1213387
7236443
1213380
1213386
1213382
1213388
1213391
1213390
1213380
1213391
1213390
1213388
1213377
1213383
1562090
7236739
7236481
7236668
7236667
7236583
7236806
7236443

Olds Model 982153
Date: Dec. 30, 1938
**MODEL 25**

**IF PEAK 465 KC.**

**INTERMEDIATE FREQUENCY:** Set oscillator to 465 KC. Feed this to the grid of the pentagrid (6AJ7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

**BROADCAST BAND:** Set the band switch for broadcast reception. Adjust oscillator to 1400 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .0002 mfd. mica condenser. Set the pointer on the dial to 1400 KC making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Reset the dial pointer on the receiver and on the test oscillator to 800 KC. Slowly increase or decrease the broadcast peaking condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 KC alignment as the adjustment at 600 KC may have slightly disturbed the original 1400 KC setting.

**SHORT WAVE:** Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimmer condensers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity at 6000 KC to determine whether the circuits are properly aligned. Should the receiver lack sensitivity at this frequency check the .0035 plate condenser for short circuit.

**This receiver is designed to operate over two tuning ranges.**

- from 540 K.C. to 1730 K.C.
- from 5800 K.C. to 18000 K.C.
MODEL 36 110-115 volts A.C. or D.C.

FOR ALIGNMENT, SEE THAT OF MODEL 35 ON PACIFIC PAGE 9-6, RIDER'S VOL. IX

<table>
<thead>
<tr>
<th>SWITCH POSITION</th>
<th>BAND</th>
<th>RANGE IN KILOCYCLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Broadcast</td>
<td>540—1710 KC</td>
</tr>
<tr>
<td>Center</td>
<td>Intermediate</td>
<td>1710—5800 KC</td>
</tr>
<tr>
<td>Right</td>
<td>Short Wave (foreign)</td>
<td>5800—17500 KC</td>
</tr>
</tbody>
</table>

©John F. Rider, Publisher
This receiver is designed to operate on 110-115 volts A.C. 60 cycles.
Model 160 Automatic

The automatic frequency control in the Model 160 Packard-Bell radio is so adjusted that it does not interfere with the normal selectivity of the receiver. Any station that can be received with automatic frequency control can also be received with it. The only instance where A.F.C. will give preference to a more powerful station is where the stronger station will be heard in the background of the weaker one. From this it is obvious that an A.F.C. switch is unnecessary. This eliminates a control which would have been confusing to most people.

**DIAGNOSIS FOR SETTING MARKERS ON CONTROLLER.** To begin with, in setting the motor controller (located at center-rear of chassis) one must first determine what stations are desired on the station key- board. To do this examine the stationized dial and determine the location of stations related to each side of dial center. This done, it is then necessary to allot a sufficient number of slides (station markers) corresponding to push-button switches on station key-board of receiver next large dial.

Let us take, for example, a choice which would give us 5 stations between center and left hand side of dial, and 3 between center and right hand side of dial. We then consider push-button switches to correlate in numerical order with stations chosen as follows: knob 1, knob 2, knob 3, knob 4, and knob 5. Each knob is located on the rear of the chassis. Control sliders are set up to correspond with buttons in correct numerical order, that is, on rear slider rail you will find 4 buttons, and on front slider rail 5 buttons. Buttons or sliders on front are odd numbers, i.e., 1-3-5-7, and on rear rail are the even numbers, i.e., 2-4-6-8. Looking from rear当地 right hand slider corresponds to front left push button looking from the front.

**OPERATION:** Starting with knob 1, push button No. 1 until it clicks. This turns knob 1 and push slider No. 1 back and forth until dial pointer comes to rest at knob 1 as marked on dial. Follow this procedure for all other stations. The buttons marked B and L are used to tune in stations not set up on the key-board. For example: If one is listening to EHK and decides to change to KFAX then he must press the button L down until pointer turns to KFAX, then release the button and the pointer will stop. Or if you are listening to EHK and wants to change to EKFB, press the button R down and hold until the pointer gets to EKFB, then release. In other words button R controls the motor to the right and button L to the left.

---

**Alignment Procedure**

**Model 160 Automatic**

Turn the dial (manually) to 1740 kc position (plates of tuning condenser completely unbalanced) and set the volume control at maximum. Turn the band switch to broadcast position. Short the cathode of 606 tube (now connected to grid resistor) to chassis so that the automatic frequency control action will be nullified during alignment. Connect the output leads of the signal generator to the control grid of the 662 tube, through a .006 condenser and set dial of generator to 460 kc. Adjust L-P trimmers 1-2-3 and 4 until maximum output is obtained, meanwhile maintaining as low a value of signal as will allow obtaining of accurate adjustment.

Now tune signal generator to 1740 kc and connect output lead through .006 condenser to antenna post of receiver. Turn dial pointer of receiver to horizontal position and adjust oscillator trimmer 5 and first detector trimmer 6 for maximum output. Next tune the generator to 600 kc. Tune dial pointer of radio to point of maximum signal and adjust trimmer 8 for increase in signal. At the same time rock the tuning condenser back and forth through resistance while adjusting the pointer until maximum output is obtained. This should occur when the receiver dial is set at approximately 600 kc. Now tune back across the dial and if not exactly on kc at the high frequency end, adjust trimmers 5-6 and 7 for correction. Do not attempt to play this receiver with only one speaker as there are two audio channels and the tone quality will be very poor unless both speakers are used.

**Band Number 2** (1.6 to 5.6 Mc). Turn knob of waveband switch to amateur position. Tune signal generator to 3.5 Mc and set radio dial to 5.5 position. Adjust oscillator trimmer 9 and antenna trimmer 10 for maximum output. There is no A.F. stage on the amateur and foreign bands.

**Band Number 3** (5.6 to 15.9 Mc). Tune knob of waveband switch to foreign position. Tune signal generator to 18 Mc and connect output lead to antenna post through a 200 Mill condenser and 400 ohm resistor. Set volume control at maximum. Tune radio dial to 18 mc and adjust oscillator trimmer 11 and first detector trimmer 12 for maximum output. After completing alignment of all bands then disconnect 886 electrode jumper so that the AF will be active again. The discriminator circuit is adjusted at the factory and should not be touched under any circumstances.
Models 39-6, 39-7, Code 121

FREQUENCY RANGE: 530 to 1720 K.C.
INTERMEDIATE FREQUENCY: 470 K.C.

POWER SUPPLY: 115 V., 50 to 60 cycle A.C.
Power Transformers are available for operation on 115 V.,
25 to 40 cycles A.C.

POWER CONSUMPTION: 30 watts.
AUDIO OUTPUT: One (1) watt.

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PHILCO PAGE 10-1

PHILCO RADIO & TELEV. CORP. Schematic, Voltage Socket, Trimmers

MODELS 39-6, 39-7, Code 121

Models 39-6, 39-7, Code 121

FREQUENCY RANGE: 530 to 1720 K.C.
INTERMEDIATE FREQUENCY: 470 K.C.
PHILCO TUBES USED: 6A7, First Detector Oscillator; 7A,
I.F. Amplifier; 75, Second Detector, A.V.C., First Audio;
41, Audio Output and 94, Rectifier.
POWER SUPPLY: 115 V., 50 to 60 cycle A.C.
Power Transformers are available for operation on 115 V.,
25 to 40 cycles A.C.
POWER CONSUMPTION: 30 watts.
AUDIO OUTPUT: One (1) watt.
Alignment of Compensators

EQUIPMENT REQUIRED:

(1) Signal Generator: Philco Model 077 Signal Generator which has a fundamental frequency range from 115 to 36,000 K.C. is the correct instrument for this purpose.

(2) Output Meter, Philco Model 027 Circuit Tester, incorporates a sensitive output meter and is recommended.

(3) Philco Fiber Handle Screw Driver, Part No. 27-7059, and Fiber Wrench, Part No. 3164.

OUTPUT METER: The Philco 027 Output Meter is connected to the plate and screen terminals of the type 41 tube and adjusted for the 0 to 30 V.A.C. scale. After connecting the output meter, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown on Fig. 2. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

TYPE OF CIRCUIT: Models 39-6, code 121; and 39-7, code 121, employ a five-tube A.C. operated superheterodyne circuit, covering standard broadcast frequencies; Automatic Volume Control, and Pentode Audio Output. In general the two models are similar but differ in their tuning mechanisms and cabinets.

Model 39-6 is manually tuned and is assembled in cabinet type C.

Model 39-7, code 121, in addition to being manually tuned, is equipped with six Electric Automatic Push-Buttons. Five push-buttons are used for selecting any one of five stations in the standard broadcast range, and one push-button for changing to manual tuning. The procedure for adjusting the push-buttons for reception of stations will be found in the instructions supplied with each set.

Schematic Parts Table:

<table>
<thead>
<tr>
<th>Schem. No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4A*</td>
<td>Silver Mica Cond. (20 mfd.) (39-7)</td>
<td>30-1123</td>
</tr>
<tr>
<td>7</td>
<td>1st I.F. Trans. Assy. (39-6)</td>
<td>32-3120</td>
</tr>
<tr>
<td>1st I.F. Trans. Assy. (39-7)</td>
<td>32-3121</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Resistor (4.0 meg., ½ watt)</td>
<td>31-350139</td>
</tr>
<tr>
<td>9</td>
<td>Resistor (25,000 ohms, ½ watt)</td>
<td>31-325339</td>
</tr>
<tr>
<td></td>
<td>(39-6)</td>
<td>31-323539</td>
</tr>
<tr>
<td></td>
<td>Resistor (22,000 ohms, ½ watt)</td>
<td>31-323239</td>
</tr>
<tr>
<td>(39-7)</td>
<td></td>
<td>31-323139</td>
</tr>
<tr>
<td>10</td>
<td>Tubular Cond. (0.05 mfd.)</td>
<td>30-4444</td>
</tr>
<tr>
<td>11</td>
<td>2nd I.F. Trans. Assy.</td>
<td>32-2674</td>
</tr>
<tr>
<td>12</td>
<td>Resistor (15,000 ohms, ½ watt)</td>
<td>31-351339</td>
</tr>
<tr>
<td>13</td>
<td>Volume Control (5 meg.)</td>
<td>31-3254</td>
</tr>
<tr>
<td>14</td>
<td>Tubular Cond. (0.01 mfd.)</td>
<td>30-4472</td>
</tr>
<tr>
<td>15</td>
<td>Resistor (4.0 meg., ½ watt)</td>
<td>31-340139</td>
</tr>
<tr>
<td>16</td>
<td>Resistor (10,000 ohms, ½ watt)</td>
<td>31-416339</td>
</tr>
<tr>
<td>17</td>
<td>Tubular Cond. (0.01 mfd.)</td>
<td>30-4169</td>
</tr>
<tr>
<td>18</td>
<td>Tubular Cond. (0.01 mfd.) (39-7)</td>
<td>30-4572</td>
</tr>
<tr>
<td>19</td>
<td>Mica Cond. (250 mfd.)</td>
<td>39-9122</td>
</tr>
<tr>
<td>20</td>
<td>Resistor (1.0 meg., ¼ watt)</td>
<td>31-310339</td>
</tr>
<tr>
<td>21</td>
<td>Tubular Cond. (0.06 mfd.)</td>
<td>30-4125</td>
</tr>
<tr>
<td>22</td>
<td>Output Trans. (Speaker 36-1461)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Cone and Voice Coil Assy.</td>
<td>36-4095</td>
</tr>
<tr>
<td>(Speaker 36-1461)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Resistor (70 ohms, 5/8 watt)</td>
<td>33-970339</td>
</tr>
<tr>
<td></td>
<td>Model 39-6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resistor (50 ohms, 5/8 watt),</td>
<td>33-950359</td>
</tr>
<tr>
<td></td>
<td>Model 39-7</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Resistor (250 ohms, ¼ watt)</td>
<td>31-323539</td>
</tr>
<tr>
<td>26</td>
<td>Electrolytic Cond.</td>
<td>30-2327</td>
</tr>
<tr>
<td>27</td>
<td>Electrolytic Cond.</td>
<td>30-2338</td>
</tr>
<tr>
<td>28</td>
<td>Field Coil (Replace Speaker 36-1461)</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Power Trans. (115 V., 50 to 60 cycles)</td>
<td>32-2797</td>
</tr>
</tbody>
</table>

Schematic Parts Table:

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<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Condenser (.006, moudled)</td>
<td>30-4428</td>
</tr>
<tr>
<td>30</td>
<td>Pilot Lamp</td>
<td>34-2064</td>
</tr>
<tr>
<td>31*</td>
<td>Pilot Lamp Resistor</td>
<td>42-1477</td>
</tr>
<tr>
<td></td>
<td>(.9 ohms, ¼ watt)</td>
<td>33-986331</td>
</tr>
<tr>
<td>32</td>
<td>Push-Button Switch</td>
<td></td>
</tr>
<tr>
<td>33*</td>
<td>Fader Strip Assy.</td>
<td>31-2990</td>
</tr>
<tr>
<td></td>
<td>*Indicates parts used on Model 39-7 only.</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Operation in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna Note A</td>
</tr>
</tbody>
</table>

| NOTE A—The "Dummy Antenna" consists of a condenser connected in series with the signal generator output lead (high side). Use the capacity as specified in each step of the above procedure. |
| NOTE B—DIAL CALIBRATION: With the tuning condenser in "maximum capacity" position (plates fully meshed), set the dial pointer between the two horizontal lines at the low frequency end of the scale (550 K.C.) |
PHILCO RADIO & TELEV. CORP.

SPECIFICATIONS

TYPE OF CIRCUIT: A. C. operated; superheterodyne circuit. TUNING RANGE: 540 to 1720 K.C. Audio output: 2 watts.


TUNING MECHANISM: Pulley and cable drive for Manual tuning. Push-Button for Automatic Tuning. The procedure for adjusting and operating the Automatic Tuning Push-Button will be found in the instructions supplied with each set.

CABINETS: Code 121 chassis in type "P" cabinet.
Code 122 chassis in type "F" cabinet.

INTERMEDIATE FREQUENCY: 470 K.C.
Alignment of Compensators

EQUIPMENT REQUIRED:

1. Signal Generator: Philco Model 077 Signal Generator, which has a fundamental frequency range from 115 to 36,000 KC., is the correct instrument for this purpose.

2. Output meter; Philco Model 027 Circuit Tester incorporates a sensitive output meter and is recommended.

3. Philco Fiber Handle Screw Driver, part No. 27-7059 and Fiber Wrench, part No. 2164.

4. Philco Set Transformer, part No. 32-2763.

OUTPUT METER:
The Philco 027 Output Meter is connected to the plate and cathode terminals of the Type 43 tube. Set the meter to use the 0-30 volt scale.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Signal Generator</th>
<th>Receiver</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna (Note A)</td>
<td>Dial Setting</td>
<td>Control Settings</td>
</tr>
<tr>
<td>1</td>
<td>6A7 Grid</td>
<td>.1 mf.</td>
<td>470 KC</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>1550 KC</td>
</tr>
</tbody>
</table>

NOTE A—The "Dummy Antenna" consists of a condenser connected in series with the signal generator output lead (high side). Use the capacity as specified in each step of the above procedure.

NOTE B—Insert the signal generator output lead into the "Grid" jack and the ground lead into the "Grid" jack of the signal generator. Connect the other end of the output lead to terminal No. 1 on the Set Transformer, part No. 32-2763, and the cable ground to terminal No. 2, Nos. 3 and 4 terminals of Set Transformer are then connected to the chassis and 6A7 grid respectively of the receiver with short pieces of wire. Insert the 0.1 mf in series with the No. 4 lead which connects to the grid.

NOTE C—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: With the push button unit disconnected from the gang, the pointer is to be set on the extreme left edge of the index line (low frequency end of the scale) with the gang closed. The gang is then opened until the pointer is at the right edge of the index line and, with the push button shaft in its closed stop, the push button coupling is tightened on the gang shaft.

NOTE D—Insert the signal generator output lead into the "Grid" jack and the ground lead into the "Grid" jack of the signal generator. Connect the other end of the output lead to terminal No. 1 on the Set Transformer, part No. 32-2763, and the cable ground to terminal No. 2, Nos. 3 and 4 terminals of Set Transformer are then connected to the chassis and antenna lead respectively of the receiver with short pieces of wire. Insert the 100 mmf in series with the No. 4 lead which connects to the antenna lead.

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**TYPE OF CIRCUIT:** A.C. operated; superheterodyne circuit with two tuning ranges, covering standard broadcast (540 K.C. to 1720 K. C.) and short wave (15 K. C. to 160 M. C.) frequencies; Automatic Volume Control, and Preliminary output.

The receiver is designed to operate from a "Philco Safety Airline" part No. 40-097. This aerial system should be used to obtain maximum performance from the receiver.

**POWER SUPPLY:** Voltage—115 volts. Frequency 50-60 cycles. Power consumption 45 watts.

**INTERMEDIATE FREQUENCY:** 470 K. C.

**TUNING RANGES:** 540 K. C. to 1720 K. C., 45 M. C. to 180 M. C.

**PHILCO TUBES USED:** 1A48G, 1 detector and oscillator; 1A7 & 1 F; 1A7, 2nd detector, Automatic Volume Control, and 1st audio; 1A48, Output, and 1A84, Rectifier.

**TUNING MECHANISM:** Pulley and cable drive for Manual tuning; Electric Push-Button for Automatic tuning.

**CABINETS:** Types "T" and "AID".

### Alignment of Compensators

**EQUIPMENT REQUIRED:**
1. Signal Generator: Philco Model 027 Signal Generator which has a fundamental frequency range from 115 to 30,000 K. C. is the correct instrument for this purpose.
2. Output meter: Philco Model 027 Circuit Tester, incorporates a sensitive output meter and is recommended.

**OUTPUT METER:** The Philco 027 Output Meter is connected to the plate and cathode terminals of the Type 48 tube. Set the meter to use the 0.00 volt scale. After connecting the output meter, adjust compensators in the order given below.

### Table: Adjust Compensators

<table>
<thead>
<tr>
<th>Operation in Order</th>
<th>Signal Generator</th>
<th>Receiver</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna (Note A)</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>645G Grid</td>
<td>3 mfl</td>
<td>470 KC</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Ter.</td>
<td>100 mfl</td>
<td>100 K C</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Ter.</td>
<td>100 mfl</td>
<td>1500 K C</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Ter.</td>
<td>100 mfl</td>
<td>500 K C</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Ter.</td>
<td>100 mfl</td>
<td>1550 K C</td>
</tr>
</tbody>
</table>

**NOTE A:** The "Dummy Antenna" consists of a condenser connected in series with the aerial system, and is used to equalize the various factors. Use the capacity as specified in each step of the above procedure.

These detailed instructions have been prepared to make sure the correct procedure is followed in setting the station on the Philco Electric Push-Button Tuning models. The work requires the use of a Philco Model 027 Station Setter and a part No. 27-7059 Insulated Screw Driver.

1. Select eight of the most popular stations received in the locality and remove their call letters from the call letter sheet supplied. Place the call letters in the windows above the buttons, making sure that each respective button covers the frequency of the station for which it is to be used. The frequency range of thePush-Button circuits is as follows:

- **Circuits:**
  - 1 and 2: 540 to 1028 kilocycles
  - 3 and 4: 1028 to 1160 kilocycles
  - 5 and 6: 1160 to 1470 kilocycles
  - 7 and 8: 1150 to 1600 kilocycles

   These numbers are stamped on the unit as seen from the rear. Looking at the front of the cabinet the numbers read from left to right.

2. (B) Connect the aerial and ground to the "ANT" and "GND" terminals of the receiver.

3. (C) Turn the receiver Tuning Range Selector to position 1 ("Manual Tuning") and tune the receiver to the station to be set on the first button.

4. (D) Plug the output leads of the Station Setter into the "High" and "GND" jacks, and turn the output control to maximum. Turn the modulation control to "Modulation Off." Connect the output lead of the Station Setter to the "ANT" and "GND" terminals of the receiver and tune to the frequency of the station being received. As the indicator is slowly tuned through the frequency of the station there will be two points at which a high pitch signal will be heard, one above and one below the frequency of the station. When the indicator is on the frequency of the station, minimum high pitch will be heard.

5. (E) Set the modulation control of the Station Setter for "Modulation On." The modulated signal of the Station Setter will then be heard through the receiver.

6. (F) Turn the receiver Tuning Range Selector to position 2 (Automatic Tuning) and push in the first button. Using the "Part No. 27-7051 Insulated Screw Driver", turn the number 1 "USC" screw until the modulated signal of the Station Setter is tuned in to maximum volume. Then adjust the number 1 "ANT" screw for maximum signal.

7. (G) Remove the output lead of the Philco Station Setter from the "ANT" terminal of the receiver and turn its indicator off the frequency of the station. The program of the desired station will then be heard on the receiver.

8. (H) With the volume of the receiver low, slowly turn the number 1 "USC" back and forth until maximum output is received. Repeat the same procedure for the number 1 "ANT" screw.

   After setting up the first station, the same procedure given under (D) to (H) is used for the other stations.
MODEL RP-1

WIRELESS RECORD PLAYER

The Model RP-1 is a remote type record player which can be used in conjunction with any standard broadcast receiver to reproduce phonograph records.

To place unit in operation:

First. Remove all packing material, being sure to save the small envelope attached to the tone arm. This envelope contains needles, needle screw, and rubber bumper.

Second. Lift off record turn-table and remove motor support tape by carefully pulling out tacks and cutting the tape. Replace turn-table.

Third. Disengage tone arm (pickup) by rolling rubber locking ring down along arm rest and pushing sideways on tone arm. Do not lift arm vertically when locked.

Fourth. Place rubber bumper (contained in small envelope attached to tone arm) between the jaws of the arm rest, large end up. This forms a suitable rest for tone arm when not in use.

Fifth. Insert needle as far as possible into the tone arm head, and tighten securely with the needle screw, which should be inserted in the head of the tone arm. A Philco needle (like furnished) is recommended for best results.

Sixth. Check to make sure your electric supply agrees with that specified on the name label located on under side of cabinet and insert line cord plug into a convenient power outlet.

If in doubt as to the electric supply, check with your local power company.

The unit is now ready for operation. Place record on turn-table and slide "Off-On Switch" (Diagram "A") to "On" position; this will be indicated by pilot light in tone arm.

After allowing sufficient time for tubes to warm up, place tone arm on record; this automatically starts motor.

Next go to your radio and tune to approximately 540 KC (54 on most dials), at which setting the phonograph signal will be picked up. Volume can be regulated by the radio receiver's volume control in the normal way.

At the end of the record, return the tone arm to rest position, which will automatically turn motor off. It is not necessary to slide "Off-On Switch" to the "Off" position between records.

If interference from broadcast stations is encountered the frequency of the unit can be changed to any other frequency between 530 KC and 560 KC by adjusting the small screw indicated in Diagram "B." Turning screw clockwise lowers the frequency, counter-clockwise raises the frequency. This adjustment is best made while the unit is in operation.

If hum is experienced it may be necessary to reverse the power plug of the record player, the radio, or both. In some cases it may be advisable to use the same receptacle for record player and radio.

No definite rule can be established for the relative location of the record player to your radio; individual trial will establish best location. However, in general, satisfactory operation may be obtained up to a distance of fifty (50) feet, provided local noise conditions are not too severe.

IMPORTANT . . . Do not attempt to force tone arm past stops.

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REPLACEMENT PARTS—MODEL 39-25, CODE 121

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Scheme No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>32-3027</td>
<td>Antenna Transformer (short wave)</td>
<td>1</td>
</tr>
<tr>
<td>32-3026</td>
<td>Antenna Transformer (broadcast)</td>
<td>2</td>
</tr>
<tr>
<td>30-4519</td>
<td>Tubular Condenser (0.5 ml.)</td>
<td>3</td>
</tr>
<tr>
<td>31-2037</td>
<td>Tuning Transformer</td>
<td>4</td>
</tr>
<tr>
<td>31-6235</td>
<td>Condenser (210 mmH, mica)</td>
<td>5</td>
</tr>
<tr>
<td>32-3028</td>
<td>Oscillator Transformer</td>
<td>6</td>
</tr>
<tr>
<td>30-1032</td>
<td>Dual Fader Unit</td>
<td>7</td>
</tr>
<tr>
<td>33-5133</td>
<td>Condenser (450 mmH, mica)</td>
<td>8</td>
</tr>
<tr>
<td>30-1109</td>
<td>Resistor (51,000 ohms, ½ watt)</td>
<td>9</td>
</tr>
<tr>
<td>30-2816</td>
<td>1st I.F. Transformer Assembly</td>
<td>10</td>
</tr>
<tr>
<td>30-4455</td>
<td>Condenser (1.0 ml., tubular)</td>
<td>11</td>
</tr>
<tr>
<td>33-3323</td>
<td>Resistor (10,000 ohms, ½ watt)</td>
<td>12</td>
</tr>
<tr>
<td>33-2503</td>
<td>Resistor (10,000 ohms, ½ watt)</td>
<td>13</td>
</tr>
<tr>
<td>30-2731</td>
<td>Electrolytic Condenser (16 ml., 250 V.)</td>
<td>14</td>
</tr>
<tr>
<td>30-1031</td>
<td>Electrolytic Condenser (16 ml., 250 V.)</td>
<td>15</td>
</tr>
<tr>
<td>32-3030</td>
<td>Condenser (110 mmH, mica)</td>
<td>16</td>
</tr>
<tr>
<td>33-2313</td>
<td>2nd I.F. Transformer Assembly</td>
<td>17</td>
</tr>
<tr>
<td>33-5133</td>
<td>Resistor (51,000 ohms, ½ watt)</td>
<td>18</td>
</tr>
<tr>
<td>33-2959</td>
<td>Volume Control (500 ohms)</td>
<td>19</td>
</tr>
<tr>
<td>30-6444</td>
<td>Condenser (0.5 ml., tubular)</td>
<td>20</td>
</tr>
<tr>
<td>33-5303</td>
<td>Resistor (4.0 ohms, ½ watt)</td>
<td>21</td>
</tr>
<tr>
<td>30-1109</td>
<td>Condenser (0.01 ml., tubular)</td>
<td>22</td>
</tr>
<tr>
<td>33-5403</td>
<td>Resistor (4.0 ohms, ½ watt)</td>
<td>23</td>
</tr>
<tr>
<td>30-1109</td>
<td>Condenser (0.01 ml., tubular)</td>
<td>24</td>
</tr>
<tr>
<td>32-7976</td>
<td>Output Transformer</td>
<td>25</td>
</tr>
<tr>
<td>36-4087</td>
<td>Voice Coil and Core Assembly</td>
<td>26</td>
</tr>
<tr>
<td>36-4086</td>
<td>(for &quot;FX&quot; Speaker, part No. 36-1437)</td>
<td>27</td>
</tr>
<tr>
<td>30-4449</td>
<td>Condenser (0.006 ml., tubular)</td>
<td>28</td>
</tr>
<tr>
<td>42-1443</td>
<td>Tone Control and On-Off Switch</td>
<td></td>
</tr>
<tr>
<td>36-1437</td>
<td>Condenser (0.01 ml., mica)</td>
<td>29</td>
</tr>
<tr>
<td>32-7976</td>
<td>Power Transformer</td>
<td>30</td>
</tr>
<tr>
<td>36-1439</td>
<td>Field Coil for Speaker, part No. 36-1439</td>
<td>31</td>
</tr>
<tr>
<td>36-1437</td>
<td>Field Coil for Speaker, part No. 36-1437</td>
<td>32</td>
</tr>
<tr>
<td>30-2230</td>
<td>Electrolytic Condenser (4 ml., 400 V.)</td>
<td>33</td>
</tr>
</tbody>
</table>

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VOLTAGES MEASURED FROM SOCKET CONTACTS TO CHASSIS

TYPE OF CIRCUIT: A.C. operated; superheterodyne circuit with two tuning ranges, covering standard broadcast (540 K.C. to 1720 K.C.) and short-wave (49.5 M.C. to 18.0 M.C.) frequencies; Automatic Volume Control; andremote output.

The receiver is designed to operate from a "Philco Safety Aerial," Part No. 40-6371. This aerial system should be used to obtain maximum performance from the receiver.


INTERMEDIATE FREQUENCY: 470 K.C.

TUNING RANGES: 540 K.C. to 1720 K.C., 49.5 M.C. to 18.0 M.C.

PHIL CO TUBES USED: 1-6ASQ, 1st detector and oscillator; 1-78, 1-77, 2nd detector, Automatic Volume Control; 1-75, first audio; 1-41, output; and 1-54, Rectifier.


* Replace Speaker.
† Model T Cabinet uses two optional speakers. The part numbers of the speakers are the same with the exception of a dash number (2 or 3) following the part number. When ordering a Cone and Voice Coil Assembly, the part number as indicated must be specified.
ALIGNMENT MODELS 39-30, 39-35 (CODE 121); S162Z.

Equipment — Fully charged heavy duty storage battery or 6-volt power pack, 077 or 177 Philco Set Tester, 27-7159 Padding screw driver.

General — The output meter must be connected by means of an adapter to the plate of the type 41 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.


<table>
<thead>
<tr>
<th>Operations</th>
<th>Signal Generator</th>
<th>Receiver</th>
<th>Adjust Compensators In Order</th>
<th>Special Instructions</th>
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<tr>
<td></td>
<td>Dummy Antenna (Note A)</td>
<td>Dial Setting</td>
<td>Control Settings</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6A8G Grid</td>
<td>.1 mf.</td>
<td>470 K.C.</td>
<td>Vol. Cont. Max.</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>18.0 M.C.</td>
<td>Vol. Cont. Max.</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>500 K.C.</td>
<td>Vol. Cont. Max.</td>
</tr>
</tbody>
</table>

NOTE A — The “Dummy Antenna” consists of a condenser connected in series with the signal generator output lead (high side). Use the capacity as specified in each step of the above procedure.

MODEL S-162Z

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR</th>
<th>DUMMY CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUSTER PADDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press the Automatic Station Selector button until “DIAL” appears in the window and stations can be tuned in by Manual Tuning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>470 K.C. To Antenna Receptacle on Radio</td>
<td>35 Mmfd. See Note 1</td>
<td>Turn Tuning Condenser Plates Out of Mesh as far as they will go.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1550 K.C. To Antenna Receptacle on Radio</td>
<td>35 Mmfd. See Note 1</td>
<td>Note 2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1550 K.C. To Antenna Receptacle on Radio</td>
<td>35 Mmfd. See Note 1</td>
<td>Set Tuning Condenser at 1500 K.C.</td>
<td></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. L-2765, to the antenna receptacle in the radio. Connect a 35 Mmfd. Condenser in series between the signal generator and the antenna lead.

NOTE 2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

NOTE 3 — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
EQUIPMENT REQUIRED: MODELS 40-120, 40-125.

1. Signal Generator: Philco Model 077 Signal Generator which has a fundamental frequency range from 115 to 36,000 K. C. is the correct instrument for this purpose.
2. Output Meter: Philco Models 027 or 028 Vacuum Tube Voltmeters and Circuit Testers incorporate a sensitive output meter and are recommended.

OUTPUT METER: The Philco 027 or 028 Output Meter is connected to the plate and screen terminals of the type 35A5 tube and adjusted for the 0 to 20 Y. A. C. scales.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Settings</td>
</tr>
<tr>
<td>Operations In Order</td>
<td>Dial Setting</td>
</tr>
<tr>
<td></td>
<td>(488 K. C.)</td>
</tr>
<tr>
<td>1</td>
<td>7CT See Note C</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Ter. 10 mil</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Ter. 10 mil</td>
</tr>
</tbody>
</table>

NOTE A—The "Dummy Antenna" consists of a condenser connected in series with the signal generator output lead (High side). Use the capacity or resistance as specified in each step of the above procedure.

NOTE B—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, the tuning pointer is set horizontal at the low frequency end of the scale (480 K. C.).

NOTE C—Compensators 2A and 2B are at the top of the tuning condenser. Compensator 2A is on the front section and compensator 2B on the rear section. When padding the L. F. the signal generator can be attached to the 7CT grid on the front section of the tuning condenser.


In order to adjust the push buttons accurately for reception of broadcast stations, a vacuum tube voltmeter such as Philco Model 027 or 028 should be used. In addition, an insulated screw driver part No. 45-2610 and Loktal aligning adapter part No. 45-2767 are required. With this equipment at hand proceed as follows:

1. Insert the call letter buttons into the windows above the buttons. The station with the lowest frequency is placed in the first button on the left and the highest frequency is placed in the button on the extreme right. Each push button is adjusted by two screws located on the rear of the push button unit. Each set of screws is numbered and covers a frequency range as follows:

   **MODELS 40-160**
<table>
<thead>
<tr>
<th>Push Button</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1000 K. C.</td>
<td>1-1000 K. C.</td>
</tr>
<tr>
<td>2-1000 K. C.</td>
<td>2-1000 K. C.</td>
</tr>
<tr>
<td>3-1000 K. C.</td>
<td>3-1000 K. C.</td>
</tr>
<tr>
<td>4-1000 K. C.</td>
<td>4-1000 K. C.</td>
</tr>
<tr>
<td>5-1000 K. C.</td>
<td>5-1000 K. C.</td>
</tr>
</tbody>
</table>

   **MODELS 40-195, 40-200**
<table>
<thead>
<tr>
<th>Push-Button</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>540-1000 K. C.</td>
</tr>
<tr>
<td>4, 5, 6</td>
<td>678-1160 K. C.</td>
</tr>
<tr>
<td>7, 8</td>
<td>895-1600 K. C.</td>
</tr>
</tbody>
</table>

   **MODELS 40-150, 40-155, 40-180, 40-185, 40-190**
<table>
<thead>
<tr>
<th>Push-Button</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>540-1000 K. C.</td>
</tr>
<tr>
<td>4, 5</td>
<td>650-1110 K. C.</td>
</tr>
<tr>
<td>6, 7</td>
<td>920-1600 K. C.</td>
</tr>
</tbody>
</table>

3. Set up the Model 077 Station Setter about 3 feet from the receiver and connect a loop constructed out of about 6 feet of wire to the high and ground outlet jacks of the signal generator. Turn the output controls to maximum and set the modulation control to "MOD. ON". Manually tune in the first station to be set up on push button No. 1. After doing this set the indicator of the 077 Signal Generator to the frequency of the station being received. As the indicator approaches the frequency of the station a "whistle" will be heard; leave the indicator at this point. Turn the receiver tuning range dial to "Push Button" and press in No. 1 button. Using the insulated screw driver turn the No. 1 "Disc" screw until the broadcast station identified by the signal generator is heard; at this point, turn the indicator of the signal generator away from the frequency of the station. Readjust No. 1 "Disc" and "Ant." screws for maximum deflection of the vacuum tube voltommeter pointer. Station No. 1 is now adjusted properly.

4. Repeating the procedure the remaining stations are adjusted as outlined above.

When this model is to be set up to receive the sound of a television program tuned in by the special type Philco television sets or when it is to be used in conjunction with a Philco Record Player, push-button No. 1 should be used. To tune in these programs, the same procedure as given for ordinary broadcast stations as outlined above is used.
PHILCO RADIO & TELEVISION CORP.

**SPECIFICATIONS**

**TYPE CIRCUIT:** Philco Model 69-38, tube 12 is a six tube, A.C. operated superheterodyne circuit with two tuning ranges covering standard broadcast (540-1710 K.C.) and shortwave (8 M.C. to 18.5 M.C.) frequencies. In addition, the receiver employs Electric Automatic Feed-Back Tuning for automatically selecting any of eight standard broadcast stations, continuously variable tone control, automatic volume control, and pentode audio output.

**POWER SUPPLY:** 115 V., 60 cycle A.C. 48 watts. For operation on 115 V., 55 to 65 cycles A.C. current or 220 V., 50 to 60 cycles A.C. current, different power transformers are required and can be obtained from your distributor.

**INTERMEDIATE FREQUENCY:** 470 K.C.

**PHILCO TUBES USED:** 1A7, First Detector, 1H5, I.F. Amplifier; 17, Second Detector-A.V.C.; 78, First Audio; 41, Audio Output and 9G4, Rectifier.

**CONTROLS:** The new Philco Disc Controls are used on this model for adjusting tuning, volume, tone and frequency range.

**CABINETS:** Type XX.

**Alignment of Compensators**

**EQUIPMENT REQUIRED:**

3. Fiber Handle Screw Driver, Part No. 77-7985, and Fiber Wrench, Part No. 344.

**OUTPUT METER:** The Philco 077 Output Meter is connected to the plate and cathode terminals of the type 41 tube. After connecting the Output Meter, adjust compensators in the order as given in the table below. Locations of the compensators are shown in Fig. 1.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuning Antenna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dial Setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 AAT Grid</td>
<td>.1 mfd</td>
<td>150 K.C.</td>
</tr>
<tr>
<td>2 Ant. Tun.</td>
<td>.000 mfd</td>
<td>150 K.C.</td>
</tr>
<tr>
<td>3 Ant. Tun.</td>
<td>.000 mfd</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>4 Ant. Tun.</td>
<td>.000 mfd</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>5 Ant. Tun.</td>
<td>.000 mfd</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

**NOTE A:** The "Dial Setting" means a condenser connected to series with the signal generator output lead (Fig. 100). Use the capacity as specified in each step of the above procedure.

**NOTE B:** Dial Calibration: In order to adjust the receiver, it is necessary that the plate and cathode compensators be adjusted to the settings shown in the table above. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the external dial having the horizontal line at the low frequency end of the broadcast band. The appearance of the dial drive cable is shown in Fig. 1000. Set the dial to the lowest frequency.

**NOTE C:** (4A) and (4B) are based on the tuning condenser. Compensation (4B) is the first one from the tuning condenser.

**Miscellaneous Parts**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Part No.</th>
<th>Description</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>517743</td>
<td>Dial Drive Cond.</td>
<td>517744</td>
<td>Dial Control (Tone)</td>
<td>517745</td>
<td>Dial Control (Volume)</td>
</tr>
<tr>
<td>517746</td>
<td>Dial Control (Tone)</td>
<td></td>
<td>DIAL Control (Volume)</td>
<td></td>
<td>DIAL Drive Cond. (I.F.)</td>
</tr>
<tr>
<td>36-6060</td>
<td>DIAL Drive Cond. (I.F.)</td>
<td></td>
<td>DIAL Drive Cond. (I.F.)</td>
<td></td>
<td>DIAL Drive Cond. (I.F.)</td>
</tr>
</tbody>
</table>

For push-button adjustments, see Index.
MODEL 39-40
PHILCO RADIO & TELEVISION CORP.
MODEL 39-45
Alignment, Tuner Data

ADJUSTING ELECTRIC PUSH-BUTTON TUNING FOR MODELS 39-36, 39-40, AND 39-45

In order to set the Electric Push-Buttons correctly for each station, the procedure as given below should be carefully followed. Accurate adjustment of the buttons requires the use of a Philco Model 077 Station Setter and a part No. 27-7059 insulated screwdriver.

(A) Select eight of the most popular stations received in the locality and remove their call letters from the call letter sheets supplied. Place the call letters in the windows above the buttons, making sure that each button covers the frequency of the station for which it is to be used. Two adjustment screws for each button are located on the rear of the push-button unit. Each set of screws is numbered and covers a frequency range as follows:

<table>
<thead>
<tr>
<th>Push-Button</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>540-1030 KC.</td>
</tr>
<tr>
<td>3 and 4</td>
<td>670-1160 KC.</td>
</tr>
<tr>
<td>5 and 6</td>
<td>900-1470 KC.</td>
</tr>
<tr>
<td>7 and 8</td>
<td>1100-1600 KC.</td>
</tr>
</tbody>
</table>

Looking at the front of the cabinet, the first button on the left is adjusted by set screw No. 1, the next button by set screw No. 2, and the remaining buttons in the same order.

(B) Connect the aerial and ground to the "ANT" and "GND" terminals of the receiver.

(C) Turn the receiver Tuning Range Selector to position 2 (Broadcast) and tune the receiver to the station to be set on the first button.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operation</th>
<th>Output Connections to Receiver</th>
<th>Dummy Antenna (Note A)</th>
<th>Dial Setting</th>
<th>Diag. Setting</th>
<th>Control Setting</th>
<th>Adjust Capacitors to Max. Reading</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ant. Ter.</td>
<td>150 mmf</td>
<td>1550 KC.</td>
<td>1550 KC.</td>
<td>&quot;</td>
<td>15, 7B, 7A</td>
<td>Roll Tuning Condenser</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Ter.</td>
<td>150 mmf</td>
<td>580 KC.</td>
<td>580 KC.</td>
<td>&quot;</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ant. Ter.</td>
<td>400 ohms</td>
<td>1550 KC.</td>
<td>1550 KC.</td>
<td>&quot;</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ant. Ter.</td>
<td>400 ohms</td>
<td>18.0 MC.</td>
<td>18.0 MC.</td>
<td>Range Switch S. W.</td>
<td>15A, 12, 5</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE A**—The "Dummy Antenna" consists of a condenser connected in series with the signal generator output lead (high side). Use the capacity as specified in each step of the above procedure.

**NOTE B**—Dial Calibration. In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line in the low frequency end of the broadcast scale. The arrangement of the drive cable is shown on page 3.

**NOTE C**—Compensators (2A) and (2B) are located on top of the tuning condenser. Compensator (2A) is the first one from the tuning drum side.

---

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## TABLE 10-2 PHILCO

**Model: 39-91**

**Schematic, Voltage, Socket, Philips Radio & T.E.V. Corp.**

**Alignment, Trimmers, Parts**

**Chassis**

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna (Note A)</td>
</tr>
<tr>
<td>1</td>
<td>1A7G Grid</td>
<td>.1 md.</td>
</tr>
</tbody>
</table>

**Note A:** The "Dummy Antenna" consists of a condenser or resistor connected in series with the signal generator output lead (high side). Use the capacity or resistance as specified in each step of the above procedure.

**Note B:** DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: Turn the tuning condenser to maximum capacity (plate or plate (fully masked). With tuning condenser in this position set the pointer to the small "black dot" at the low frequency end of the dial scale.

**Note C:** To adjust the I.F. compensators, remove the back from the cabinet, which is held in place by four screws. The chassis is then taken out by removing the four screws and two caps under the cabinet, under the Tuning and Volume knobs. The I.F. compensators are located on top of the I.F. transformers.

**Battery Requirements:** One (1) Philco "A" Pack, Part No. 41-8017; two (2) Philco "B" Packs, Part No. 41-8018.

**Battery Drain:** "A" - 240 Ma; "B" 85 Ma. Total current with no signal.

**Aerial and Ground:** In localities where station signals are weak, an aerial and ground may be necessary. A terminal strip will be found underneath the cabinet marked "Ant" "Grd" for this purpose.

---

**Replacement Parts**

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Alignment Notes

NOTE A—The "Dummy Antenna" consists of a condenser or resistor connected in series with the signal generator output lead (high side). Use the capacity or resistance as specified in each step of the above procedure.

NOTE B—DIAL CALIBRATION: To order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. Model 39-75 and 39-85—To adjust the dial proceed as follows: Turn the tuning condenser to maximum capacity (plates fully meshed). With the tuning condenser in this position, set the pointer horizontally across the dial.

Model 39-78—With the tuning condenser in the maximum capacity position (plates fully meshed), loosen the coupling screws connecting the push-button unit to the condenser. The pointer is then set on the extreme left edge of the index line (low frequency end of the scale) with the tuning condenser fully closed. The gang is then opened until the pointer is at the right edge of the index line. The push-button shaft is then turned counterclockwise to its "stop." With the tuning condenser and push-button shaft in these positions tighten the coupling set screws.

NOTE C—The locations of the condensers in Models 39-70, 39-75 and 39-80 are shown in Figs. (1), (2) and (3) respectively.
POWER SUPPLY: 115 Volts, 25 and 60 cycle AC.
POWER CONSUMPTION: 60 watts.
AUDIO OUTPUT: 2 watts.

FREQUENCY TUNING RANGES: Three.
540 to 1550 K.C.
15 to 34 K.C.
60 to 18 M.C.

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Alignment

TYPE OF CIRCUIT—Models 40-150 and 40-155 are Electric Push button and dial tuned radios incorporating the new Philco Built-in Super Aerial system which eliminates an outside aerial and reduces local static interference to a minimum. The models are also designed to receive the sound of a television program tuned in by special type Philco Television Sets.

PHILCO BUILT-IN SUPER AERIAL SYSTEM—Included in the built-in super aerial system is a statically shielded loop for broadcast band reception and a short wave receiving loop. A feature of the built-in broadcast station is that it may be turned on the position in which it is present, without a minimum amount of interference, or if interference is not present the loop may be set in the position where best reception is obtained.

In general, these models are similar with the exception of the number of tubes used and cabinet design. Model 40-180 employs a seven tube receiver. Models 40-185 and 40-190 employ eight tube receivers assembled in different type cabinets.

Each model is equipped with eight electric tuning push buttons for automatically selected stations. Six of the push buttons are used for broadcast stations, one for selecting dial tuning and one push button may be set up for the use of a Philco wireless Record Player or the sound program tuned in by special Philco Television Sets.

Aligning of Compensating Condensers

Equipment Required

(1) Signal Generator. In order to properly adjust this receiver an accurately calibrated signal generator such as Philco Model 027 is required. This signal generator covers a frequency range of 540 to 30,000 K. C. (2) Indicating Device. To obtain maximum signal strength and accuracy, adjustment of the padder a vacuum tube voltmeter and circuit tester such as Philco Models 027 and 028 is recommended. When using the vacuum tube voltmeter, an aligning adapter, Philco Part No. 45-2767, is necessary for connecting to the A. V. C. circuit. These testers also contain an audio output meter which may also be used as an indicating device. (3) Aligning Tools. Fiber handle screwdriver, Philco Part No. 45-2610, and fiber wrench, Philco Part No. 7065.

Connecting Aligning Instruments

VACUUM TUBE VOLTMETER—To use the vacuum tube voltmeter as an alignment indicator make the following connections:

1. Adjusting L. F. Circuit.

   Remove the 1.252 R. F. tube from its socket and insert the aligning adapter, then replace the tube in the adapter. Connect the negative terminal of the vacuum tube voltmeter to the wire (light color) which protrudes from the side of the adapter. Attach the positive terminal of the voltmeter to the black wire.


   To adjust the R. F. circuit, the aligning adapter is inserted in the 750 A. V. C. choke. The vacuum tube voltmeter remains connected to the adapter as given in the above paragraph. With the voltmeter connected in this manner a very sensitive indication of the A. V. C. voltage is obtained when the padders are adjusted. If an audio output meter is used, connect it to the plate and socket terminals of the 41 output tube and adjust the output meter for the 0 to 30 A. C. scale.

   After connecting the aligning indicator, adjust the compensators in the order as shown in the table below. Locations of the compensators are shown on the schematic diagram, page No. 2. If the output meter pointer does not go scale, when adjusting the compensators, reduce the strength of the signal from the generator.

   SIGNAL GENERATOR: When adjusting the L. F. padders, the high side of the signal generator is connected through a 1 mfd. condenser to terminal No. 1 of the loop terminal plate at the rear of the chassis. The ground or low side of the signal generator is connected to the chassis of the receiver.

   When aligning the R. F. padders a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiver loop from the cabinet. It is necessary when adjusting the padders that the receiver be left in the cabinet.

Models 40-150, 40-155, 40-180 – 185 – 190

<table>
<thead>
<tr>
<th>Operations</th>
<th>SIGNAL GENERATOR</th>
<th>DIAL FREQUENCY</th>
<th>RECEIVER</th>
<th>Control Settings</th>
<th>Adjust Compensators for Max. Signal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>18 M. C.</td>
<td>18 M. C.</td>
<td>Range Sw. &quot;SW.&quot; Volume Max.</td>
<td>21A</td>
<td>Note B.</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>18 M. C.</td>
<td>18 M. C.</td>
<td>Range Sw. &quot;SW.&quot;</td>
<td>3</td>
<td>Roll Cond.</td>
</tr>
</tbody>
</table>

NOTE A—A "Dummy Antenna" consisting of a 1 mfd. condenser is connected in series with the signal generator output (high side).

NOTE B—DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be matched closely with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive case in this position is shown in the schematic diagram. When the tuning condenser is turned clockwise, the dial pointer moves to the right.

NOTE C—When adjusting the low frequency compensator of Range One (Broadcast) or the antenna and R. F. compensator of the high frequency tuning stage, the receiver tuning condenser must be adjusted as follows: First tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until there is no further gain in output reading.

NOTE D—To accurately adjust the high frequency oscillator compensator to the fundamental of the image signal, turn the oscillator compensator to the maximum capacity position (clockwise). From this position slowly turn the compensator counter-clockwise until a second peak is obtained on the output meter. Adjust the compensator for maximum output at this second peak.

If the above procedure is correctly performed, the image signal will be found (much weaker) by tuning the receiver dial 90° K. C. below the frequency being used on any high frequency range.

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**Fig. 2—Part locations underside of chassis**

### Replacement Parts—Models 40-180, 40-185, 40-190

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loop Assy' (Broadcast)</td>
<td>30-3980</td>
</tr>
<tr>
<td>1A</td>
<td>Mica Cond. (250 mfd.)</td>
<td>66-0031</td>
</tr>
<tr>
<td>1B</td>
<td>Resistor (10,000 ohms, ½ watt)</td>
<td>33-210339</td>
</tr>
<tr>
<td>2</td>
<td>Loop Assy' (Short Wave)</td>
<td>30-3984</td>
</tr>
<tr>
<td>3</td>
<td>Compensator</td>
<td>51-6508</td>
</tr>
<tr>
<td>4</td>
<td>Mica Cond. (3 mfd.)</td>
<td>30-1097</td>
</tr>
<tr>
<td>5</td>
<td>Mica Cond. (1250 mfd.)</td>
<td>66-8886</td>
</tr>
<tr>
<td>6</td>
<td>Mica Cond. (250 mfd.)</td>
<td>61-0012</td>
</tr>
<tr>
<td>7</td>
<td>Resistor (500 ohms, ½ watt)</td>
<td>33-44499</td>
</tr>
<tr>
<td>8</td>
<td>Tubular Cond. (0.05 mfd.)</td>
<td>30-4444</td>
</tr>
<tr>
<td>9</td>
<td>Resistor (7 meg. ½ watt)</td>
<td>33-213339</td>
</tr>
<tr>
<td>10</td>
<td>Tubular Cond. (0.05 mfd.)</td>
<td>30-4133</td>
</tr>
<tr>
<td>11</td>
<td>Resistor (1,000 ohms, ½ watt)</td>
<td>33-333339</td>
</tr>
<tr>
<td>12</td>
<td>Resistor (10,000 ohms, ½ watt)</td>
<td>33-333339</td>
</tr>
<tr>
<td>13</td>
<td>R.F. Coupling Trans.</td>
<td>33-213339</td>
</tr>
<tr>
<td>14</td>
<td>Mica Cond. (100 mfd.)</td>
<td>30-1098</td>
</tr>
<tr>
<td>15</td>
<td>Resistor (47,000 ohms, ½ watt)</td>
<td>33-213339</td>
</tr>
<tr>
<td>16</td>
<td>Tubular Cond. (0.05 mfd.)</td>
<td>30-4123</td>
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<td>17</td>
<td>Oscillator Trans.</td>
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<td>18</td>
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<td>20</td>
<td>Transformer Cond.</td>
<td>31-2391</td>
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<td>21</td>
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<tr>
<td>22</td>
<td>Silver Mica Cond. (370 mfd.)</td>
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<td>23</td>
<td>Silver Mica Cond. (370 mfd.)</td>
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<tr>
<td>24</td>
<td>Resistor (33,000 ohms, ½ watt)</td>
<td>33-333339</td>
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<tr>
<td>25</td>
<td>Push Button Switch</td>
<td>42-1489</td>
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<tr>
<td>26</td>
<td>Padder Strip (Push Buttons)</td>
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### Models 40-150, 40-155

Parts listed below apply to Models 40-150, 40-155 only. For parts not found below refer to list for Models 40-180, 40-185 and 40-190 above.

<table>
<thead>
<tr>
<th>Sub. No.</th>
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<th>Part No.</th>
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<tbody>
<tr>
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<td>Loop Assy' (Broadcast)</td>
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<td>1C</td>
<td>Compensator Assy'</td>
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<td>8A</td>
<td>Mica Cond. (1500 mfd.)</td>
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<td>Ant. Loading Trans.</td>
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<td>21</td>
<td>Tuning Cond. Assy'</td>
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<td>38</td>
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<td>40</td>
<td>Volume Control (2 0.05 mfd.)</td>
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<tr>
<td>44</td>
<td>Speaker (110 Volts, 60 Cycles)</td>
<td>32-9005</td>
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</table>

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Model 101 is a combination Phonograph and Radio Receiver. The phonograph section is designed to play 10 or 12 inch standard records (78 R. P. M.) and includes a manually operated crystal pickup and Turntable Motor.

The radio receiver employs an A. C. or D. C. operated superheterodyne circuit covering standard broadcast and police stations. (540 to 1720 K. C.)

**POWER SUPPLY:** Radio, 115 volts A. C. or D. C. Phonograph, 115 volts — 60 cycles only.

**POWER CONSUMPTION:** 57 watts.

**INTERMEDIATE FREQUENCY:** 470 K. C.

**PHILCO TUBES USED:** Five tubes; 1-7A8, first detector oscillator; 1-7B7, I. F. amplifier; 1-7C6, 2nd detector; A. V. C., first audio; 1-35A9, audio output, and 1-33Z3, rectifier.

### ALIGNMENT OF COMPENSATORS

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<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
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<td>Dial Setting</td>
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<td>Ant.</td>
<td>100 mfd.</td>
<td>1500 K.C.</td>
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<th>Part No.</th>
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<td>Ant. Trans.</td>
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<td>Resistor (130 ohms, ¼ watt)</td>
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<td>Tubular Cond. (.0015 mfd., 200 V.)</td>
<td>32-3551</td>
<td>22</td>
<td>Tubular Cond. (.01 mfd., 400 V.)</td>
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<td>3</td>
<td>Tuning Cond.</td>
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<td>Output Trans. (for speaker 36-1469-1)</td>
<td>32-8947</td>
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<td>4</td>
<td>Tubular Cond. (.05 mfd., 400 V.)</td>
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<td>24</td>
<td>Output Trans. (for speaker 36-1469-9)</td>
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<td>25</td>
<td>Tubular Cond. (.05 mfd., 400 V.)</td>
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<td>Mica Cond. (110 mfd.)</td>
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<td>Pilot Lamp</td>
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<td>9</td>
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<td>29</td>
<td>Line Resistor</td>
<td>33-3507</td>
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<td>1st I. F. Trans.</td>
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<td>Phono Motor</td>
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<tr>
<td>11</td>
<td>2nd I. F. Trans.</td>
<td>32-3150</td>
<td>31</td>
<td>Radio Phone Switch</td>
<td>42-1500</td>
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<tr>
<td>12</td>
<td>Resistor (2.0 megohms, ¼ watt)</td>
<td>33-552039</td>
<td>32</td>
<td>Resistor (99,000 ohms, ¼ watt)</td>
<td>33-350339</td>
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<tr>
<td>13</td>
<td>Mica Cond. (250 mfd.)</td>
<td>30-1032</td>
<td>33</td>
<td>Resistor (99,000 ohms, ¼ watt)</td>
<td>33-350339</td>
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<tr>
<td>14</td>
<td>Resistor (20,000 ohms, ¼ watt)</td>
<td>33-350339</td>
<td>34</td>
<td>Tubular Cond. (.05 mfd., 400 V.)</td>
<td>30-4519</td>
<td></td>
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<tr>
<td>15</td>
<td>Volume Control (500,000 ohms)</td>
<td>32-4479</td>
<td>35</td>
<td>Crystal Pickup</td>
<td>415-1027</td>
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<tr>
<td>16</td>
<td>Tubular Cond. (.01 mfd., 200 V.)</td>
<td>32-540339</td>
<td>36</td>
<td>Tone Arm and Crystal Pickup complete</td>
<td>35-2026</td>
<td></td>
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<tr>
<td>17</td>
<td>Resistor (4.0 megohms, ¼ watt)</td>
<td>33-434339</td>
<td>37</td>
<td>Tubular Cond. (.002 mfd., 400 V.)</td>
<td>39-4579</td>
<td></td>
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<tr>
<td>18</td>
<td>Resistor (240,000 ohms, ¼ watt)</td>
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<td>38</td>
<td>Tone Control</td>
<td>33-3320</td>
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<tr>
<td>19</td>
<td>Tubular Cond. (.01 mfd., 400 V.)</td>
<td>30-4572</td>
<td>39</td>
<td>Motor Switch</td>
<td>42-1498</td>
<td></td>
</tr>
</tbody>
</table>

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MODEL 108, CODE 121. ALIGNMENT OF COMPENSATING CONDENSERS

Equipment Required

1. Signal Generator. In order to properly adjust this receiver an accurately calibrated signal generator such as Philco Model 077 is required. This signal generator covers a frequency range of 540 to 26,000 K.C. (1) Inducer Device. To obtain maximum signal strength and accurate adjustment of the padder a vacuum tube voltmeter and circuit tests such as Philco Models 027 and 028 is recommended. These tests also contain an audio output meter which may be used as an indicating device. (3) Aligning Tools. Fiber handle screw driver Philco Part No. 45-2668 and when using the vacuum tube voltmeter for adjusting the set, an aligning adapter Part No. 45-2717 is required.

Connecting Aligning Instruments

VACUUM TUBE VOLTMETER: To use the vacuum tube voltmeter as an alignment indicator make the following connections:

1. Adjust the i.f. padder to the 25 C. F. from its socket and insert the aligning adapter in the socket, then replace the tube in the adapter. Connect the negative terminal of the vacuum tube voltmeter to the light colored wire which proceeds from the side of the adapter. Attach the positive terminal of the voltmeter to the black wire.

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Side to No. 1</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>1500 K.C.</td>
</tr>
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</table>

RECEIVER

<table>
<thead>
<tr>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust compensators</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>580 K.C.</td>
<td>Vol. M. Range Switch</td>
<td>22A 22B</td>
<td>See Paragraph on Signal Generator Above</td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>Vol. M. Range Switch</td>
<td>16A 22</td>
<td>Note A</td>
</tr>
</tbody>
</table>

NOTE A—Dial Calibration: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive cable in this position is shown in Schematic Diagram.

MODEL 108, CODE 121.

ALIGNMENT OF COMPENSATORS

EQUIPMENT REQUIRED:

2. Output Meter, Philco 027 Vacuum Tube Voltmeter and Circuit Tester.
3. Fiber Handle Screw Driver, Part No. 27-7055, and Fiber Wrench, Part No. 3164.

OUTLET METER: The Philco 027 Output Meter is connected to the plate and cathode terminals of the type 41 tube. The Vacuum Tube Voltmeter can also be used in aligning the receiver by connecting through a 1 megohm Resistor to the 6AT grid. The Positive terminal is connected to the cathode. After connecting the Output Meter, adjust compensators in the order as given in tabulation below. Locations of the compensators are shown in Fig. 1.

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections to Receiver</th>
<th>Dummy Antenna Note A</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6AF Grid</td>
<td>.1 mf.</td>
<td>470 K.C.</td>
<td>580 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>150 K.C.</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>150 K.C.</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>550 K.C.</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Ter.</td>
<td>100 mmf.</td>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

NOTE A—The "Dummy Antenna" consists of a condenser connected in series with the signal generator output lead (high side). Use the capacity as specified in each step of the above procedure.

NOTE B—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity), set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale. The arrangement of the drive cable is shown in Service Bulletin No. 103.

NOTE C—Compensators (4A) and (4B) are located on top of the tuning condenser. Compensators (4A) is the last one from the tuning drum side.
POWER SUPPLY: 115 Volts, 25 and 60 cycle A.C.
POWER CONSUMPTION: 110 watts.
FREQUENCY TUNING RANGES: (Three)
540 to 1550 K.C. 1.5 to 4.0 M.C. 6.0 to 18 M.C.

INTERMEDIATE FREQUENCY: 455 K.C.
AUDIO OUTPUT: 5 watts.

Fig. 1 — Schematic Diagram

The voltages indicated were measured with a Philco Model 027 Voltmeter (1000 ohms per volt). Power supply 115 volts, 60 cycle — Volume control minimum. — No signal being received. Range switch “received.”

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## Replacement Parts

### Models 40-195 and 40-200

<table>
<thead>
<tr>
<th>PART</th>
<th>LIST</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td></td>
<td>Line Assy. (9000 ohms, 3.6 ma, 0.1% vsw)</td>
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<td>19</td>
<td></td>
<td>M.T. Cond. (60000 ohms)</td>
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<tr>
<td>2</td>
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<td>M.T. Assy. (Off-Wave)</td>
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<td>35</td>
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<td>M.T. Assy. (Off-Wave)</td>
<td>23-0195-297</td>
</tr>
<tr>
<td>88</td>
<td></td>
<td>M.T. Assy. (Off-Wave)</td>
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<td>89</td>
<td></td>
<td>M.T. Assy. (Off-Wave)</td>
<td>23-0195-297</td>
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<tr>
<td>90</td>
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<td>M.T. Assy. (Off-Wave)</td>
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<tr>
<td>91</td>
<td></td>
<td>M.T. Assy. (Off-Wave)</td>
<td>23-0195-297</td>
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<td>92</td>
<td></td>
<td>M.T. Assy. (Off-Wave)</td>
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<td>93</td>
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<td>94</td>
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<td>95</td>
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<td>M.T. Assy. (Off-Wave)</td>
<td>23-0195-297</td>
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<td>96</td>
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<td>97</td>
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<td>98</td>
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<td>99</td>
<td></td>
<td>M.T. Assy. (Off-Wave)</td>
<td>23-0195-297</td>
</tr>
</tbody>
</table>

### Miscellaneous Parts

#### Model 40-200

- **Prices subject to change without notice**

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### Aligning Compensating Condensers

**Equipment Required**

- Vacuum tube voltmeter
- Tuning scope
- Signal generator
- Oscilloscope

### Connecting Aligning Instruments

After connecting the aligning indicator, adjust the compensating condensers in the order shown in the table below. Locations of the condensers are shown on the schematic diagram page No. 1. If the output meter pointer goes off scale when adjusting the condensers, use the strength of the signal from the generator.

**SIGNAL GENERATOR**: When adjusting the L.F. padder, the high side of the signal generator is connected through a .1 mfd. condenser to terminal No. 1 of the loop terminal at the rear of the chassis. The ground or low side of the signal generator is connected to the chassis of the receiver. When aligning the R.F. padder a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet. Do not remove the receiving loop from the cabinet. It is necessary when adjusting the padders, that the receiver be left in the cabinet.

---

### Table: Aligning Compensating Condensers

<table>
<thead>
<tr>
<th>Operation No.</th>
<th>Output Connections to Receiver</th>
<th>Dummy Antenna Note A</th>
<th>Dial Setting</th>
<th>Receiver Setting</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Side to No. 1 Ter. Loop Panel</td>
<td>0.5 mfd.</td>
<td>485 K. C.</td>
<td>550 K. C.</td>
<td>Val. Max. Range Switch &quot;Breast&quot;. 26B, 26A, 38B, 38A.</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Val. Max. Range Switch &quot;Breast&quot;. 26B, 4B.</td>
<td>See Note B</td>
</tr>
<tr>
<td>3</td>
<td>Use Loop on Generator</td>
<td>560 K. C.</td>
<td>550 K. C.</td>
<td>Val. Max. Range Switch &quot;Breast&quot;. 26B, 4B.</td>
<td>Roll Tuning Condenser Note C</td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Val. Max. Range Switch &quot;Breast&quot;. 26B, 4B.</td>
<td>Roll Tuning Condenser Note C</td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>3.5 M. C.</td>
<td>3.5 M. C.</td>
<td>Val. Max. Range Switch &quot;Police&quot;. 25A, 4A.</td>
<td>Roll Tuning Condenser Note C</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>18.0 M. C.</td>
<td>18.0 M. C.</td>
<td>Val. Max. Range Switch &quot;O. R.&quot;. 25, 4.</td>
<td>Check Image Signal Note D</td>
</tr>
</tbody>
</table>

**NOTE A** — A "Dummy Antenna" consisting of a .1 mfd. condenser is connected in series with the signal generator output lead (high side).

**NOTE B** — DIAL CALIBRATION: In order to adjust the receiver correctly the dial must be aligned to track properly with the tuning condenser. To do this, first adjust the dial pointer as follows: With the tuning condenser closed (maximum capacitance), set the dial pointer at the left end of the knob at high frequency and broadcast scale. The arrangement of the drive cable in this position is shown in Fig. 4.

**NOTE C** — When adjusting the low frequency compensating condensers of One and Two Loop Systems and R.F. compensators of the high frequency tuning ranges: the receiver Tuning Condenser must be adjusted (rilled) as follows: First tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the compensator slightly to the right or left and again vary the receiver tuning condenser for maximum output. This procedure of first setting the compensator then varying the tuning condenser is continued until there is no further gain in output reading.

**NOTE D** — To accurately adjust the high frequency oscillator condenser to the fundamental instead of the image frequency, turn the oscillator condenser to the maximum capacity position (clockwise). From this position slowly turn the compensator clockwise until a second peak is obtained on the output meter. Adjust the compensator for maximum output and check image reading. If the above procedure is correctly performed, the image signal will be found (much weaker) by turning the receiving dial 510 K. C. below the frequency being used on any high frequency range.

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PHILCO RADIO & TELEV. CORP.
MODEL 108, Code 122
Schematic, Voltage Parts

FOR ALIGNMENT, SEE INDEX

ADJUSTING ELECTRIC PUSH BUTTON TUNING: For frequency ranges of buttons see parts 61A through 51H in parts list. For adjusting procedure see INDEX.


I.F. - 470 KC.

March 1939

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MODEL 937 — ADJUSTMENTS

All initial adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

Equipment — Fully charged heavy-duty storage battery of 6 volt power pack, 107 or 117 Philco Set Tester, 37-7156 Pushing screwdriver.

General — The output meter must be connected by means of an adapter to the plate of the type A1 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half-scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SIGNAL GENERATOR CONNECTION</th>
<th>ENERGY CAPACITY</th>
<th>SIGNAL GENERATOR SPECIAL INSTRUCTIONS</th>
<th>ADJUST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>670 K.C.</td>
<td>To grid of A17 Tube</td>
<td>1 watt</td>
<td>Tune timing condenser plates out of mesh so far as they will go.</td>
<td><strong>NOTE 1</strong></td>
</tr>
<tr>
<td>1800 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1800 K.C.</td>
<td><strong>NOTE 2</strong></td>
</tr>
<tr>
<td>1200 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1200 K.C.</td>
<td><strong>NOTE 3</strong></td>
</tr>
<tr>
<td>1600 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1600 K.C.</td>
<td><strong>NOTE 4</strong></td>
</tr>
<tr>
<td>2400 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 2400 K.C.</td>
<td><strong>NOTE 5</strong></td>
</tr>
<tr>
<td>1200 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1200 K.C.</td>
<td><strong>NOTE 6</strong></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the radio. Connect a 50 ohm load. Condenser in series between the signal generator and the antenna lead.

NOTE 2 — Tune the condenser to the signal generator and the antenna lead.

NOTE 3 — Set the tuning condenser while adjusting the low frequency pad. Tune the condenser to the signal and adjust the pad for maximum output. Rotate the tuning condenser back and forth slightly for maximum output. Then readjust the pad for maximum output. Repeat this procedure until no further improvement is noted.

NOTE 4 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

NOTE 5 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

NOTE 6 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

MODEL 936 — ADJUSTMENTS

All initial adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

Equipment — Fully charged heavy-duty storage battery of 6 volt power pack, 107 or 117 Philco Set Tester, 37-7156 Pushing screwdriver.

General — The output meter must be connected by means of an adapter to the plate of the type A2 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half-scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SIGNAL GENERATOR CONNECTION</th>
<th>ENERGY CAPACITY</th>
<th>SIGNAL GENERATOR SPECIAL INSTRUCTIONS</th>
<th>ADJUST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>470 K.C.</td>
<td>To grid of A17 Tube</td>
<td>1 watt</td>
<td>Tune timing condenser plates out of mesh so far as they will go.</td>
<td><strong>NOTE 1</strong></td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1500 K.C.</td>
<td><strong>NOTE 2</strong></td>
</tr>
<tr>
<td>1600 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1600 K.C.</td>
<td><strong>NOTE 3</strong></td>
</tr>
<tr>
<td>560 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 560 K.C.</td>
<td><strong>NOTE 4</strong></td>
</tr>
<tr>
<td>1400 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1400 K.C.</td>
<td><strong>NOTE 5</strong></td>
</tr>
<tr>
<td>1400 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1400 K.C.</td>
<td><strong>NOTE 6</strong></td>
</tr>
<tr>
<td>1200 K.C.</td>
<td>To antenna receptacle on Radio</td>
<td>See Note 1</td>
<td>Set timing condenser at 1200 K.C.</td>
<td><strong>NOTE 7</strong></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the radio. Connect a 50 ohm load. Condenser in series between the signal generator and the antenna lead.

NOTE 2 — Tune the condenser to the signal generator and the antenna lead.

NOTE 3 — Set the tuning condenser while adjusting the low frequency pad. Tune the condenser to the signal and adjust the pad for maximum output. Rotate the tuning condenser back and forth slightly for maximum output. Then readjust the pad for maximum output. Repeat this procedure until no further improvement is noted.

NOTE 4 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

NOTE 5 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

NOTE 6 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

NOTE 7 — When the antenna stage adjustment is made with the Radio in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
PHILCO RADIO & TELEV. CORP.

Alignment MODEL 938K

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

Equipment — Fully charged heavy duty storage battery of 6 volt power pack, 077 or 177 Philco Set Tester, 27-7159 Padding screw driver.

General — The output meter must be connected by means of an adapter to the plate of the type 6Y7G output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>CONNECTION</th>
<th>DUMMY CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRESS THE RETURN TO DIAL BUTTON UNTIL STATIONS CAN BE TUNED IN BY MANUAL TUNING. ADJUST THE ANTENNA COMPENSATOR 1 TWO TURNS FROM TIGHT.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>470 K.C. To Grid of 6A7 Tube</td>
<td>.1 Mfd.</td>
<td>Turn Tuning Condenser Plates Out of Mesh as Far as They Will Go. Note 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1580 K.C. To Antenna Receptacle on Radio</td>
<td>See Note 1</td>
<td>Set Tuning Condenser at 1400 K.C. Note 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C. To Antenna Receptacle on Radio</td>
<td>See Note 1</td>
<td>Set Tuning Condenser at 580 K.C. Note 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>580 K.C. To Antenna Receptacle on Radio</td>
<td>See Note 1</td>
<td>Note 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1580 K.C. To Antenna Receptacle on Radio</td>
<td>See Note 1</td>
<td>Note 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1400 K.C. To Antenna Receptacle on Radio</td>
<td>See Note 5</td>
<td>Set Tuning Condenser at 1400 K.C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1200 to 1400 K.C. Note 5</td>
<td>Note 5</td>
<td>Note 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

1 — Connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the radio. Connect a 50 Mmfd. Condenser in series between the signal generator and the antenna lead.

2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

3 — Rock the tuning condenser while adjusting the low frequency paddler. Tune the condenser to the signal and adjust the paddler for maximum output. Rotate the tuning condenser back and forth slightly for maximum output. Then readjust the paddler for maximum output. Repeat this procedure until no further improvement is noticed.

4 — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

5 — When installing the radio in the car, follow the installation instructions carefully. Tune in a weak broadcast signal between 1200 and 1400 Kilocycles on the control scale. Remove the plug button on the end of the radio and adjust the antenna compensator 1 (See Figure 2) for maximum signal.

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ADJUSTMENTS

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

Equipment — Fully charged heavy duty storage battery or 6-volt power pack, 077A or 177 Philco Set Tester, 27-7169 Padding screw driver.

General — The output meter must be connected by means of an adapter to the plate of the type 41 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR</th>
<th>DUMMY CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400 K.C. To Grid of 6Al Tube</td>
<td>.5 Mfd.</td>
<td>Turn Variator to the Indexed Position</td>
<td>80 80 80</td>
</tr>
<tr>
<td>2</td>
<td>950 to 1500 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 1 and adjust No. 1 Antenna Padder and No. 1 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
<tr>
<td>3</td>
<td>950 to 1500 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 2 and adjust No. 2 Antenna Padder and No. 2 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
<tr>
<td>4</td>
<td>750 to 1250 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 3 and adjust No. 3 Antenna Padder and No. 3 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
<tr>
<td>5</td>
<td>750 to 1250 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 4 and adjust No. 4 Antenna Padder and No. 4 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
<tr>
<td>6</td>
<td>550 to 950 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 5 and adjust No. 5 Antenna Padder and No. 5 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
<tr>
<td>7</td>
<td>550 to 950 K.C. To Antenna Receptacle on Radio</td>
<td>*25 Mmfd.</td>
<td>Press Push Button No. 6 and adjust No. 6 Antenna Padder and No. 6 Oscillator Coil (Fig. 4)</td>
<td>Note 2 Fig. 4</td>
</tr>
</tbody>
</table>

FREQUENCY RANGE

950 TO 1500 Kilocycles
950 TO 1500 Kilocycles
750 TO 1500 Kilocycles
750 TO 1500 Kilocycles
350 TO 600 Kilocycles
350 TO 600 Kilocycles

PUSH BUTTONS

LEFT ADJUSTING SCREWS

RIGHT ADJUSTING SCREWS

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. L-2765, to the antenna receptacle in the cowl. Connect a 25 Mmfd. Condenser in series between the signal generator and the antenna lead.

Special Note: — When the cowl antenna is used follow the above procedure. Be sure the lead to the antenna transformer is plugged into the "SKY" socket of the Antenna Transformer.

NOTE 2 — The antenna padder screw is on the right, the oscillator coil screw is on the left (see Figure 4).

ALL ADJUSTMENTS MUST BE REPEATED.
### ADJUSTMENTS

**MODEL S-1616**

**MODEL S-1616**

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

**Equipment** — Fully charged heavy duty storage battery or 6 volt power pack, 64A or 699 Philco Set Tester, 27-7105 Fading screwdriver.

**General** — The output meter must be connected by means of an adapter to the plate of the type 61 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

### Special Instructions

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>SIGNAL GENERATOR</th>
<th>DUMMY CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>PANEL DIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press the “DIAL” button and stations can be tuned in by “DIAL” tuning.</td>
<td>750 Mils.</td>
<td>Turn Tuning Condenser Plate Out to bleed as far as they will go.</td>
<td>Note 1</td>
</tr>
<tr>
<td>2</td>
<td>750 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1500 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2000 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2000 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2000 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2000 Mils.</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1** — Connect the antenna lead, Part No. L-2716, to the antenna receptacle in the radio. Connect a 25 Mils. Condenser in series between the signal generator and the antenna lead.

**NOTE 2** — Turn the condenser rotor plates completely out of mesh as far as they will go.

**NOTE 3** — Rock the tuning condenser while adjusting the low frequency pad. Turn the condenser to the signal and adjust the pad for maximum output. Rotate the tuning condenser back and forth slightly for maximum output, then readjust the pad for maximum output. Repeat this procedure until no further improvement is noticed.

**NOTE 4** — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
MODEL P-1617

ADJUSTMENTS

All padding adjustments are carefully made at the
factory and ordinarily no readjustments are necessary.
However, when readjustments are required, the pro-
cedure given below must be followed in detail.

Equipment — Fully charged heavy duty storage
battery or 6-cell power pack, 666A or 099 Philco
Set Tester, 27-7160 Pedding screw driver.

General — The output meter must be connected by
means of an adapter to the plate of the type 46 out-
put tube and to the Radio chassis.

With the Radio and signal generator set up for
operation at the prescribed frequency, turn the Radio
volume control on full and set the signal generator
attenator so that a half scale reading is obtained on
the output meter. The signal in the speaker should
be audible but not loud.

The shuffling on the generator output lead must be
connected to the Radio housing.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR</th>
<th>DIAL CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUSTMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>476 K.C.</td>
<td>.1 volt</td>
<td>Turn Testing Conenser Out 1/2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1500 K.C.</td>
<td>20 kV</td>
<td>Set Testing Conenser at 1500 K.C.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1450 K.C.</td>
<td>100 kV</td>
<td>Set Testing Conenser at 1450 K.C.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>580 K.C.</td>
<td>500 kV</td>
<td>See Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>5</td>
<td>1400 K.C.</td>
<td>1000 kV</td>
<td>See Note 1</td>
<td>Note 4</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. L2765, to the antenna receptacle in the radio. Connect a 20 Hern.

NOTE 2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

NOTE 3 — Read the tuning condenser while adjusting the low frequency padding. Turn the condenser to the signal

NOTE 4 — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead
must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

Figure 2: MODEL P-1630

ADJUSTMENTS

All padding adjustments are carefully made at the
factory and ordinarily no readjustments are necessary.
However, when readjustments are required, the pro-
cedure given below must be followed in detail.

Equipment — Fully charged heavy duty storage
battery or 6-cell power pack, 666A or 099 Philco
Set Tester, 27-7160 Pedding screw driver.

General — The output meter must be connected by
means of an adapter to the plate of the type 46 out-
put tube and to the Radio chassis.

With the Radio and signal generator set up for
operation at the prescribed frequency, turn the Radio
volume control on full and set the signal generator
attenator so that a half scale reading is obtained on
the output meter. The signal in the speaker should
be audible but not loud.

The shuffling on the generator output lead must be
connected to the Radio housing.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR</th>
<th>DIAL CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUSTMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1200 K.C.</td>
<td>.1 volt</td>
<td>Turn Testing Conenser Out 1/2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1400 K.C.</td>
<td>200 kV</td>
<td>Set Testing Conenser at 1400 K.C.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1500 K.C.</td>
<td>500 kV</td>
<td>Set Testing Conenser at 1500 K.C.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1450 K.C.</td>
<td>1000 kV</td>
<td>See Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>5</td>
<td>580 K.C.</td>
<td>1000 kV</td>
<td>See Note 1</td>
<td>Note 4</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. L2765, to the antenna receptacle in the radio. Connect a 20 Hern.

NOTE 2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

NOTE 3 — Read the tuning condenser while adjusting the low frequency padding. Turn the condenser to the signal

NOTE 4 — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead
must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
ADJUSTMENTS

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

**Equipment** — Fully charged heavy duty storage battery or 6-volt power pack, 077 or 177 Philco Test Set, 27-7155 Padding screw driver.

**General** — The output meter must be connected by means of an adapter to the plate of the type 8Y7G output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the prescribed frequency, turn the Radio volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the Radio housing.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>SIGNAL GENERATOR CONNECTION</th>
<th>DUMMY CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Press the return to dial button until stations can be tuned in by manual tuning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>470 K.C. To Grid of 6AJ Tube</td>
<td>.1 Mfd.</td>
<td>Turn Tuning Condenser Plates Out of Mesh as far as they will go.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1580 K.C. To Antenna Receptacle on Radio</td>
<td>*250 Mmfd. See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C. To Antenna Receptacle on Radio</td>
<td>*250 Mmfd. See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>580 K.C. To Antenna Receptacle on Radio</td>
<td>*250 Mmfd. See Note 1</td>
<td>Set Tuning Condenser at 1400 K.C.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1580 K.C. To Antenna Receptacle on Radio</td>
<td>*250 Mmfd. See Note 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1400 K.C. To Antenna Receptacle on Radio</td>
<td>*250 Mmfd. See Note 1</td>
<td>Set Tuning Condenser at 1400 K.C.</td>
<td></td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1** — Connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the radio. Connect a 250 Mmfd. condenser in series between the signal generator and the antenna lead.

Special Note:— When the roof or undercarriage antenna is used follow the above procedure. Be sure the lead to the antenna transformer is connected to the red terminal of the Antenna Transformer.

*When the cowl antenna is used, connect the antenna lead, Part No. L-2765, to the antenna receptacle in the Radio. Connect a 20 mmmfd. condenser in series with the signal generator and the antenna lead. Be sure the lead to the antenna transformer is connected to the black terminal of the antenna transformer.

**NOTE 2** — Turn the condenser rotor plates completely out of mesh as far as they will go.

**NOTE 3** — Rock the tuning condenser while adjusting the low frequency padder. Tune the condenser to the signal and adjust the padder for maximum output. Rotate the tuning condenser back and forth slightly for maximum output. Then readjust the padder for maximum output. Repeat this procedure until no further improvement is noticed.

**NOTE 4** — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
The letter "P" is stamped on the left end of the housing near the top cover on all Ford Philco Model F-1640 Radios.
ADJUSTMENTS

All padding adjustments are carefully made at the factory and ordinarily no adjustments are necessary. However, when readjustments are required, the procedure given below must be followed in detail.

Equipment — Fully charged heavy duty storage battery or 6-volt power pack 004A or 009 Philips Set Tester 27-7169 Padding screw driver.

General — The output meter must be connected by means of an adapter to the plate of the type 32 output tube and to the radio chassis.

With the radio and signal generator set up for operation at the prescribed frequency, turn the radio attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the radio chassis.

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. 95-0063, to the antenna receptacle in the radio. Connect a 30 Mfd. condenser in series between the signal generator and the antenna lead.

NOTE 2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

NOTE 3 — Rock the tuning condenser while adjusting the low frequency padders. Tune the condenser to the signal and adjust the padders for maximum output. Rock the tuning condenser back and forth slightly for maximum output. Then readjust the padders for maximum output. Repeat this procedure until no further improvement is noticed.

NOTE 4 — When the antenna stage adjustment is made with the radio installed in the car, the radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.
PHILCO RADIO & TELEV. CORP.

Make all adjustments for maximum reading on the output meter.

NOTE 1 — Connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the radio. Connect a 800 Mf. Condenser in series between the signal generator and the antenna lead.

Special Note: — When the tire compartment door antenna is used follow the above procedure. Be sure the lead to the antenna transformer is connected to the red terminal of the Transformer.

*When the cowl antenna is used, connect the antenna lead, Part No. 41-3191, to the antenna receptacle in the Radio. No dummy capacity is necessary. Be sure the lead to the antenna transformer is connected to the black terminal of the antenna transformer.

NOTE 2 — Turn the condenser rotor plates completely out of mesh as far as they will go.

NOTE 3 — Rock the tuning condenser while adjusting the low frequency paddler. Tune the condenser to the signal and adjust the paddler for maximum output. Rotate the tuning condenser back and forth slightly for maximum output. Then readjust the paddler for maximum output. Repeat this procedure until no further improvement is noticed.

NOTE 4 — When the antenna stage adjustment is made with the Radio installed in the car, the Radio antenna lead must be connected to the car antenna in the usual manner. Connect the signal generator output lead to a wire placed near the car antenna but not connected to it.

---

ADJUSTMENTS

All padding adjustments are carefully made at the factory, and ordinarily no readjustments are necessary. However, when readjustments are required, the procedures given below must be followed in detail.

Equipment — Fully charged heavy duty battery of 6-volt power pack, 648A, or 668 Philco Set Tester, 27-11399. Padding screwdriver.

General — The output meter must be connected by means of an adapter to the plate of the type 42 output tube and to the Radio chassis.

With the Radio and signal generator set up for operation at the present frequency, turn the Radio volume control on full and adjust the signal generator so that a full scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the generator output lead must be connected to the radio housing.

---

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**Alignment Frequency:**

B.C. - 1500 K.C.

**Resistors for Model-141:**

- R1: 230 K ohms, 1/2 watt
- R2: 150 K ohms, 1/2 watt
- R3: 150 K ohms, 1/2 watt
- R4: 15 K ohms, 1/2 watt
- R5: 1 M ohm, 1/2 watt

**Miscellaneous for Model-141:**

- S1: 732-14 - Antenna Coil Assy.
- S3: 737-5 - Tone Control
- S4: 40832 - 0.15 pf, 0.15 mfd, 660 V, PAPER
- S5: 7163 - DIAL LAMP
- S8: 81976 - BALLAST TUBE 8D217V
- S9: 81975 - BALLAST TUBE #81975

**D.C. Socket Voltages:**

- P: 100
- S9: 100
- Cath: 21

**For Conventional Alignment:**

See Special Section, Vol. VIII

**Panel Controls:**

- Volume control with On/Off Power Supply switch, Tuning Control, Tone Control.

**Maximum Power Output:**

- 1.25 Watts with 81974 ballast tube.
- 1.50 watts with 81975 ballast tube.

**Pilotubes Required:**

- One 6X6 RF Amplifier,
- One 6CS Detector, one 25L6-0 Output Tube, and one 2535 power supply rectifier.

**Power Supply:**

- Voltage: 110-125 AC or DC 40 #81974
- 220-240 AC or DC 90 #81975

The above figures are for a supply voltage of 115 volts, on 230 volt operation they will be 10% higher.

* Cannot be measured.
PILOT RADIO CORP.

MODEL H-224 Chassis H-220
H-224 Chassis H-320

Alignment Procedure

- **Pilot Tubes Required:**
  - One 56X: R.F. Amplifier
  - One 56X: 1st Detector-Oscillator
  - One 56X: I.F. Amplifier
  - One 56X: 2nd Detector-A.C. - 1st Audio Amplifier
  - Four 566D-6: Output Tubes
  - Two 566D-6: Power Supply Rectifiers
  - One 566: Cathode Ray Tuning Beam

- **Power Supply:** A.C. or D.C.
  - Voltage
    - 110-125 Volts

- **Panel Controls:**
  - Volume with On-Off switch, Tone, Band Selector
  - Switch, Manual Tuning Control and an 8 key mechanically operated PIANO TUNING mechanism, with key locking knob. The PIANO TUNING mechanism is only on the H-320 series.

- **Tuning Ranges:**
  - The models H-224 and H-224 chassis have the following tuning ranges:
    - **Band 1:** 8.72 - 25.50 MHz, or 11.8 - 34.4 meters
    - **Band 2:** 2.95 - 9.75 MHz, or 30.2 - 101.4 meters
    - **Band 3:** 520 - 1725 kHz, or 174 - 577 meters

- **Maximum Power Output:** 6 watts

- **Service DATA: Service DATA**
  - Removal of the chassis from the cabinet, when necessary, is done as follows:
    1. Remove the power supply cord from the supply outlet.
    2. Unplug all lamps and fuses from all sockets on the front panel.
    3. Remove the knob from the socket on the speaker.
    4. Remove the four mounting screws located under the cabinet, and carefully slide the chassis out of the cabinet.

- **Receiver Alignment:**
  - Equipment Required:
    - Signal Generator, oscillating the fundamental frequencies for all the frequencies used in the receiver.
    - Dummy antennas.
    - Jig.
    - 0.002 Mfd. microfarad condenser.
    - 0.002 Mfd. microfarad condenser.
    - 0.002 Mfd. microfarad condenser.

- **Alignment Connections:**
  - The posts marked "P" and "Q" on the rear of the chassis should be connected to the ground of the signal generator.
  - Connect the "H" post of the signal generator through the .01 Mfd. condenser to the grid of the 1st detector-oscillator or the 567 I.F. amplifier tubes when aligning the I.F. amplifier.
  - Connect the "H" post of the signal generator through the 200 Mfd. condenser to the grid of the 625 B6 tubes, or the 567 I.F. amplifier tubes when aligning the I.F. amplifier.

- **Procedure:**
  - To align the receiver, follow the steps below:
    1. Adjust the signal generator frequency to 455 kilocycles.
    2. Connect the speaker to the output of the receiver, and adjust the output to the lowest level which will give a readable signal on the output meter.
    3. Adjust the signal generator frequency to 25 kHz.
    4. Adjust the output to the lowest level which will give a readable signal on the output meter.
    5. Adjust the output to the lowest level which will give a readable signal on the output meter.

- **Adjustment Set A (Model H-224 and H-224):**
  - Connect the "H" terminal of the generator to the antenna post marked "A" through the 0.002 Mfd. condenser.
  - Set the generator frequency to 1500 kHz, and the ROTOR dial to the same frequency. Adjust trimmer #6 for maximum reading of the output meter. (This trimmer is adjusted by moving the brass rod in the socket, with a hooked wire, and with a twisting motion. After loosening the lock nut, turn without touching.)
  - Adjust trimmers #9 and #10 for maximum reading of the output meter.

- **Alignment Set B (Model H-224 and H-224 Short-Wave):**
  - Connect the "H" terminal to the antenna post marked "A" through the 0.002 Mfd. condenser.
  - Adjust the generator frequency to 455 kHz, and the ROTOR dial to 25 kHz. Adjust trimmer #10 to 25 kHz, and then adjust trimmers #9 and #10 for maximum reading of the output meter. Be careful to adjust the receiver to the image frequency. Then adjust trimmers #16 and #17 for maximum reading of the output meter. Readjust trimmers #16 and #17 for maximum reading of the output meter.

- **Alignment Set C (Model H-224 and H-224 Short-Wave):**
  - Connect the "H" terminal to the antenna post marked "A" through the 0.002 Mfd. condenser.
  - Adjust the generator frequency to 25 kHz, and the ROTOR dial to 25 kHz. Adjust trimmer #16 to 25 kHz, and then adjust trimmers #9 and #10 for maximum reading of the output meter. Be careful to adjust the receiver to the image frequency. Then adjust trimmers #16 and #17 for maximum reading of the output meter. Readjust trimmers #16 and #17 for maximum reading of the output meter.

- **Image Frequency:**
  - All bands in these two models must be aligned with the same frequency higher than the signal frequency. There can be no error in doing this on the Long-Wave and Broadcast Bands. However, on the higher frequency bands it is possible to incorporate the receiver, and align with the receiver as shown in the accompanying figure.

- **Miscellaneous Service Notes:**
  - If a bowing noise (sometimes referred to as Microphones) is heard, it is very probably because of the fourth or fifth harmonic wave emanating from the cabinet. When this occurs, the sound output, under the cabinet have not been removed, along with the two narrow metal strips between the chassis and the bottom of the cabinet. These strips are only intended as additional bracing during shipment, and must be removed before the receiver is put in operation.
  - The bowing can also be caused by a defective tube, or when the parts of the receiver which are rigidly fastened to the chassis rub against the cabinet. The remedy is obvious.

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1. Adjust the signal generator frequency to 466 kilocycles and adjust the generator output to the lowest value which will give a readable signal on the output meter.

2. Adjust the trimmer screws 1, 2, 3, and 4, (see the blue antenna wire through the 5000 mfd. condenser, figure) for maximum reading of the output meter. Keep reducing the generator frequency to 375 kilocycles and with the Band Selector Switch set to the Long Wave Band, return the pointer of the receiver to 375 kilocycles. Adjust trimmer #4 for maximum reading of the output meter. Do likewise with trimmer #7. Then set the generator frequency to 150 kilocycles and the receiver dial pointer to approximately the same frequency. Adjust the screw of trimmer #10 for maximum reading of the output meter while "rocking" the gang condenser carefully back and forth. Then go back and repeat the 375 kilocycle alignment.

Broadcast, or Medium Wave, Band (Models H-375 and H-372)

Connections are the same for the alignment of this band as they are for the Long Wave Band.

Set the generator frequency to 1500 kilocycles and the receiver dial pointer to the same frequency, with the Band Selector Switch set appropriately. Adjust trimmer #6 of Model H-375, or trimmer #8 of Model H-372 for maximum reading of the output meter. Also adjust trimmer #6 of Model H-375, or trimmer #8 of Model H-372 for maximum reading of the output meter. Next, set the generator frequency to 600 kilocycles. Then with the receiver dial pointer set at approximately the same frequency, adjust trimmer #10 for maximum reading of the output meter while carefully "rocking" the gang condenser. Finally, return and repeat the 1500 kilocycle adjustment.

Short Wave Band (Model H-372)

When aligning this band connect the "hot" terminal of the signal generator to the blue antenna wire of the receiver through the 400 ohm resistor.

Before aligning this band, refer to the paragraph headed "Image Frequency".

Set the generator frequency to 17 mc, and also tune the receiver to this frequency, as marked on the dial. Carefully adjust trimmer #4 for maximum reading of the output meter. Be careful you do not adjust to the "Image Frequency".

Then adjust trimmer #6 for maximum output meter reading, while slightly "rocking" the gang condenser. Readjust trimmer #4, if necessary, to keep the calibration correct.

Image Frequency

The Short Wave Band in model H-372 must be aligned with the oscillator frequency lower than the signal frequency. On the high frequency band, it is possible to incorrectly adjust the alignment in this respect, and end up with the receiver adjusted on what should be the Image Frequency.

The chances of doing this may be eliminated by adjusting the generator to the correct aligning frequency, and with sufficient output from the generator to pick up two signals with the receiver, separated by twice the Intermediate Frequency, turn the tuning knob so that the dial pointer points to that one which comes in at the lower frequency marking on the dial.

Wave Trap Alignment

With the Band Selector Switch set on the Broadcast or Medium Wave position, connect the generator to the blue antenna wire, with the 5000 mfd. condenser. Set the generator frequency to 466 kilocycles and adjust trimmer #8 for maximum reading of the output meter. There must always be sufficient output from the signal generator to have a reading on the output meter to make this adjustment.

Socket Terminals D.C. Socket Voltages

<table>
<thead>
<tr>
<th>Tube</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6BY6</td>
<td>-</td>
<td>102(150) 85(110)</td>
<td>-</td>
<td>66(110)</td>
<td>-</td>
<td>2.4(2.8)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10B(130) 95(110) 1.7(2.8)</td>
<td>-</td>
<td>1.7(2.8)</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6L7</td>
<td>-</td>
<td>45(58)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>252D-0</td>
<td>-</td>
<td>96(125) 102(D30)</td>
<td>-</td>
<td>6.5(9.5)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>252D-0</td>
<td>-</td>
<td>110(145)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Above figures in parentheses are for ballast tube #61972.

Figures not in parenthesis are for ballast tube #61974.
PILOT RADIO CORP.

MODELS H-54 H-455
Chassis H-540

Alignment Procedure

IF Amplifier Alignment
Turn the Band Selector Switch to Band 3 and turn the receiver dial pointer to the lowest frequency end. Connect the output meter as described under "Connections", and connect the "hot" post of the signal generator to the grid of the 6SB tube through the .1 mfd condenser. Then proceed with the alignment as follows:

1. Adjust the signal generator frequency to 455 kc, lowpass, and adjust the generator output to the lowest value which will give a readable signal on the output meter.

2. Adjust the screws 1, 2, 3, and 4 (see figure), for maximum reading of the output meter. Keep reducing the output from the generator if the output meter reading increases too much.

If the output of the generator to the receiver is too great, the alignment of the receiver will not be correct, as the AVC action will become too great, and the amplifier will appear broad in tuning.

It will seldom, if ever, be found necessary to make more than touch up the alignment of the IF amplifier. Of course, if the amplifier adjustment screws have been tampered with, it will probably be necessary to completely realign the amplifier. In this case, connect the generator to the grid of the IF amplifier tubes, and align the last IF transformer. Always finish the alignment with the signal input to the 6SB tube.

A cathode ray oscilloscope is not necessary in making the above adjustments. One may be used, however, if desired.

Wave Trap Alignment
With the Band Selector Switch set on the Broadcast Band, replace the .1 mfd dummy antenna with the .0002 mfd dummy antenna. Set the generator frequency at 455 kc and tune trimmer #11 for minimum reading of the output meter. There must be sufficient output from the signal generator to always have a reading on the output meter; do not allow the meter to go to zero and call that the correct adjustment point.

R.F. Alignment

Band 1 (Model 455 Long-Wave) Connect the "hot" terminal of the generator to the blue wire and clip through the .0002 mfd condenser.

Set the generator frequency to 500 kc and with the Band Selector Switch set to Band 3, turn the receiver dial pointer to 500 kc. Adjust trimmer #6 for maximum reading of the output meter. Do likewise with trimmer #13. Then set the generator frequency to 175 kc and the receiver dial pointer to approximately the same. Adjust trimmer #6 for maximum reading of the output meter, while "rocking" the gang condenser carefully back and forth. Then go back and repeat the 500 kc alignment.

Band 2 (Model 455) Band 3 (Model 454) (Standard Broadcast)
Connections are the same for the alignment of this band as they are for the long-wave band.

Set the generator frequency to 1500 kc, and the receiver dial pointer to the same frequency, with the band selector switch set appropriately. Adjust trimmer #7 for maximum reading of the output meter. (This trimmer is adjusted by moving the brass rod in or out, with a hooked wire, and with a twisting motion. First loosen the lock nut. Then without touching any tuning controls adjust trimmer #12 for maximum reading of the output meter.)

Next, set the generator frequency to 600 kc, and accurately set the receiver dial pointer to the 600 kc mark. Then adjust trimmer #15 for maximum reading of the output meter. Do not move the tuning control while making this adjustment. Finally return and repeat the 1500 kc adjustments and then tighten the lock nut on trimmer #7.

Band 1 (Model 455 Short-Wave)
Remove the .0002 mfd dummy antenna used in aligning the lower frequency bands and substitute the 400 ohm resistor.

Before aligning this band refer to the paragraph headed "Image Frequency".

Set the generator frequency to 18 mc, and adjust trimmer #8 for maximum reading of the output meter; be careful you do not tune in at the Image Frequency.

Then adjust trimmer #14 for maximum output meter reading, while slightly "rocking" the gang condenser. Readjust trimmer #8 if necessary to keep the calibration correct. These are the only adjustments on this band.

Band 2 (Model 454 - Short-Wave)
Connections and dummy antenna are the same as on Band 1 above.

Before aligning this band refer to the paragraph headed "Image Frequency".

Set the generator and receiver dial pointers to 0 mc. Adjust trimmer #2 for maximum reading of the output meter; be careful you do not tune in at the Image Frequency.

Then adjust trimmer #13 for maximum reading of the output meter while slightly "rocking" the gang condenser. Readjust trimmer #8 if necessary to correct the calibration.

Band 1 Alignment (Model 454 Short-Wave)
Connections and dummy antenna are the same as on Band 2 of model 554.

Before aligning this band, refer to the paragraph headed "Image Frequency".

Set the generator frequency to 24 mc and the receiver dial pointer to 24 mc. Adjust trimmer #10 to 24 mc for maximum reading of the output meter.

Be careful that the receiver is not adjusted to the Image Frequency. Then adjust trimmer #14 while "rocking" the gang condenser, for maximum reading of the output meter. Reset trimmer #10 so that calibration is correct if necessary.

IMAGE FREQUENCY
All bands in these two models must be aligned with the oscillator frequency higher than the signal frequency. There can be no error in doing this on the long-wave and broadcast bands. However, on the higher frequency bands it is possible to incorrectly adjust the alignment in this respect, and end up with the receiver aligned on what should be the image frequency.

The chance of doing this may be eliminated by adjusting the generator to the correct aligning frequency, and with sufficient output from the generator to pick up two signals with the receiver, separated by twice the intermediate frequency, set the receiver dial pointer to that one which comes in at the higher frequency marking on the receiver dial pointer.

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Bottom View of Chassis
DOMESTIC - H-474

Bottom View of Chassis
LONG WAVE - H-475

Rear View of Chassis

Pilot Radio Corporation
TRIMMER LAYOUT

Pilot Tubes Required
One 6K6 1st detector-oscillator
One 6K7 RF amplifier
One 6Q7 2nd detector-Audio & 1st audio ampl.
One 2516-G Output tube
One 2826-G Power supply rectifier
One 675 Cathode ray tuning beacon

Voltage, Socket Trimmers, Alignment

D.C. SOCKET VOLTAGES

All voltages are those between the indicated tube terminal and the chassis, and are made with a 1000 ohm per volt voltmeter. Make measurements with no signal input to the receiver and with the volume control set at minimum volume.

Make sure that the a.c. supply voltage is correct for the ballast tube being used at the time of measurement.

Figures in parenthesis are for ballast tube #61971, other figures are for ballast tube #61972.

Socket Terminals

Tube 1 2 3 4 5 6 7 8
6X6 = 95(125) 96(125) 96(125) 2.3(5)
6X7 = 95(115) 95(125) 3(4) 3.4
6Q7 = 60(60) = = 1(1.4)
2826-G = 71(115) 95(125) = 6.8(2)
2826-G = = 110(140) = 110(140)

Power Supply A.C. or D.C.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Ballast Tube</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>110-128</td>
<td>#61971</td>
<td>50</td>
</tr>
<tr>
<td>220-240</td>
<td>#61972</td>
<td>115</td>
</tr>
</tbody>
</table>

Intermediate Frequency 455 kHz.

Tuning Ranges: The model H-474 chassis has the following tuning ranges:

Band 1 24.8 to 8.5 mc or 12.06 to 36.1 meters
Band 2 9.7 to 2.9 mc or 50.9 to 106.4 meters
Band 3 1725 to 550 kc or 174 to 556 meters

The model H-475 chassis has the following tuning ranges:

Band 1 18.9 to 5.35 mc or 15.95 to 55.04 meters
Band 2 1725 to 550 kc or 174 to 556 meters
Band 3 375 to 145 kc or 600 to 2065 meters

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Alignment Connections

Connect the Black and Yellow wires together and to the ground post of the signal generator.

Connect the "hot" post of the generator through the correct dummy antenna or condenser to the appropriate point as noted hereafter. In all the measurements to follow, the output meter should be connected to the plate and screen grid terminals of the 225A-9 through 1 ma, condensers in any convenient manner.

IF Amplifier Alignment

Turn the Band Selector Switch to Band 3 and tune the ROTOR dial to the low frequency end.

Connect the output meter as described under "Connections," and connect the "hot" post of the signal generator to the grid of the 6JS tube through the 1.0 ma condenser. Then proceed with the alignment as follows:

1. Adjust the Signal Generator frequency to 465 kilocycles, and adjust the generator output to the lowest reading which will give a readable signal on the output meter.

2. Adjust the screws 1, 2, 3, and 4, (see figure) for maximum reading of the output meter. Keep reducing the output from the generator if the output meter reading increases too much.

If the output of the generator is too great, the alignment of the receiver will not be correct, and the AVC action will become too great, and the amplifier will appear broad in tuning.

It will seldom, if ever, be found necessary to more than touch up the alignment of the IF amplifier. Of course, if the amplifier adjustment screws have been tampered with, it will probably be necessary to completely realign the amplifier. In this case, connect the generator to the grid of the IF amplifier tube, and adjust the coupling condenser. Always finish the alignment with the signal input to the 6JS tube.

A cathode ray oscilloscope is not necessary in making the above adjustments. One may be used, however, if desired.

Wave Trap Alignment

With the Band Selector Switch set on the Broadcast Band, replace the 1 ma, dummy antenna with the .0002 ma, dummy condenser. Set the generator frequency at 465 kc and tune trimmer #11 for maximum reading of the output meter. There must be sufficient output from the signal generator to always have a reading on the output meter. Do not allow the meter to go to zero and call that the correct adjustment point.

R.F. Alignment

Band 3 (Model H-475 - Long-Wave) Connect the "hot" terminal of the generator to the blue wire and clip through the .0002 ma, condenser.

Set the generator frequency to 300 kc., and with the Band Selector Switch set to Band 3, turn the ROTOR dial to 500 kc. Adjust trimmer #7 for maximum reading of the output meter. Do likewise with trimmer #12. Then set the generator frequency to 175 kc., and the ROTOR dial to approximately the same. Adjust trimmer #8 for maximum reading of the output meter, while "hooking" the gang condenser carefully back and forth. Then go back and repeat the 300 kc. alignment.

Band 2 (Model H-475)

Connections are the same for the alignment of this band as they are for the Long-Wave Band.

Set the generator frequency to 1500 kc., and the ROTOR dial to the same frequency as the Band 2 Band Selector Switch set appropriately. Adjust trimmer #7 for maximum reading of the output meter. (This trimmer is adjusted by moving the brass rod in or out, with a hooked wire, and with a twisting motion. First loosen the lock nut.) Then without touching any tuning controls adjust trimmer #12 for maximum reading of the output meter. Next, set the generator frequency to 600 kc. and accurately set the ROTOR dial to the 600 kc. mark. Then adjust trimmer #5 for maximum reading of the output meter. Do not move the tuning control while making this adjustment. Finally, return and repeat the 1500 kc. adjustments and then tighten the lock nut on trimmer #7.

Miscellaneous Service Notes

If a howling noise (sometimes referred to as Microphone howl) is heard, it is very probably because the four red screws under the cabinet have not been removed along with the two narrow metal strips between the chassis and the bottom of the cabinet. These strips and screws are intended as additional bracing during shipment and must be removed before the receiver is put in operation.

The howl can also be caused by a defective tube, or when some part of the receiver which is rigidly fastened to the chassis rubs against the cabinet. The remedy is obvious. In replacing or retesting the ROTOR dial, always set the gang condenser at maximum capacity.

To reset the dial, loosen the set screws in the ROTOR dial pinion gear. Then, adjust the dial so that the low frequency end of the calibration line, at the base of the arrow tip, is directly under the indicator wire. Then, tighten the pinion gear set screws.

If it should be necessary to remove the ROTOR dial, first remove the top of the cabinet using the tuning Season Clamp. Next, remove the bearing plates which hold the dial shaft in place, and lift out the whole dial assembly.

In replacing the dial, be sure to compress the "back lash" springs in the double gear approximately 1/16 of an inch.

Never loosen the set screws which connect the link motion to the gang condenser. If this should be done, the calibration of the receiver will be affected.
Band 2 (Model H-484 Short-Wave) Connections and dummy antenna are the same as on Band 1 above.

Before aligning this band refer to the paragraph headed "Image Frequency".

Set the generator frequency to 300 and the ROTOR dial to 0.000 kcs. Adjust trimmers #6, #11, and #17 for maximum reading of the output meter. Be careful not to tune in at the Image Frequency. Then adjust trimmers #2 and #18 for maximum reading of the output meter, while slightly "rocking" the gang condenser. Readjust trimmer #15 if necessary to correct the calibration.

Band 1 (Model H-484 Short-Wave) Connections and dummy antenna are the same as on Band 1 above.

Before aligning this band, refer to the paragraph headed "Image Frequency".

Set the generator frequency to 300 and the ROTOR dial to 0.000 kcs. Adjust trimmers #6, #11, and #17 for maximum reading of the output meter. Be careful not to tune in at the Image Frequency. Then adjust trimmers #2 and #18 for maximum reading of the output meter, while slightly "rocking" the gang condenser. Readjust trimmer #15 if necessary to correct the calibration.
**IF Amplifier Alignment**

1. Turn the Band Selector Switch to the Broadcast, or Medium Wave Band, and tune the gang condenser to the low frequency end of the dial. That is the condenser plates completely meshed.
2. Connect the output meter as described under "Connections" and connect the "hot" post of the signal generator to the grid of the 0-005 tube through the 1,000 mfd condenser. Then proceed with the alignment as follows:
   1. Adjust the signal generator frequency to 455 kilocycles, and adjust the generator output to the lowest value which will give a readable signal on the output meter.
   2. Adjust the trimmer screws 1, 2, 3, and 4, (see figure for maximum reading of the output meter). Keep changing the generator output as the output meter reading increases. When the reading of the output meter cannot be increased by adjusting the four screws of the IF transformers, the IF amplifier is aligned.

**Wave Trap Alignment**

With the Band Selector Switch set on the Broadcast, or Medium Wave, position connect the generator to the blue antenna wire with the 0,005 mfd condenser. Set the generator frequency to 455 kilocycles and adjust trimmer #6 for minimum reading of the output meter. There must be sufficient output from the signal generator to have a reading on the output meter to make this adjustment.

**H.F. Alignment**

**Long Wave Band (Model H-753)**

1. Connect the "hot" terminal of the generator to the blue antenna wire through the 0,005 mfd condenser.
2. Set the generator frequency to 375 kilocycles and with the Band Selector Switch set to the Long, Wave Band turn the pointer of the receiver to 375 kilocycles. Adjust trimmer #6 for maximum reading of the output meter. Do likewise with the trimmer potentiometer, #7. Then set the generator frequency to 125 kilocycles and the receiver dial pointer to approximately the same frequency. Adjust the screw of trimmer #10 for maximum reading of the output meter, while "rocking" the gang condenser carefully back and forth. Then go back and repeat the 375 kilocycle alignment.

**Broadcast, or Medium Wave Band (Models H-755 & H-756)**

Connections are the same for the alignment of this band as they are for the Long Wave Band.

1. Set the generator frequency to 1800 kilocycles, and the receiver dial pointer to the same frequency, with the Band Selector Switch set appropriately. Adjust trimmer #6 of Model H-755, or trimmer #8 of Model H-756 for maximum reading of the output meter. Also adjust trimmer #7 of Model H-755, or trimmer #7 of Model H-756 for maximum reading of the output meter. Next, set the generator frequency to 500 kilocycles. Then with the receiver dial pointer at approximately the same frequency, adjust trimmer #10 for maximum reading of the output meter while carefully "rocking" the gang condenser. Finally return and repeat the 1800 kilocycle adjustment.

**Short Wave Band (Model H-702)**

When aligning this band connect the "hot" terminal of the signal generator to the blue antenna wire of the receiver through the 400 ohm resistor.

Before aligning this band, refer to the paragraph headed "Image Frequency".

Set the generator frequency to 17 mhz, and also the receiver to this frequency, as marked on the dial. Carefully adjust trimmer #9 for maximum reading of the output meter. Be careful you do not adjust the Image Frequency.

Then adjust trimmer #8 for maximum output meter reading, while slightly "rocking" the gang condenser.

Adjust trimmer #9, if necessary, to keep the calibration correct.
PILOT RADIO CORP.  
PILOT RECEIVERS OF THE H-870 SERIES  

Removal of the chassis from the cabinet, when necessary, is done as follows:-  
1. Remove the power supply cord from the supply outlet.  
2. Remove all knobs and dial washers from all dials and labels on the front of the cabinet.  These knobs, except the "locking" knob, are of the "push-on" type.  
3. Remove the speaker cord from the socket on the speaker.  
4. Remove the four mounting screws located under the cabinet, and carefully slide the chassis out of the cabinet.

Receiver Alignment  
Equipment Required.

1. Signal Generator.  
2. Output Meter.  
3. Dummy Antennas.  

Alignment Connections  
The posts marked D and G on the rear of the chassis should be connected to the ground side of the signal generator.

Connect the "hot" post of the signal generator through the .1 mf condenser to the grid of the 6X6 detector-oscillator tube or the 6K7 I.F. amplifier tube when aligning the I.F. amplifier.

Connect the "hot" post of the signal generator through the 200 mf condenser to the post marked A on the rear of the cabinet when aligning the Long-Wave and Broadcast Bands.  Use the same connections for both short-wave bands, but replace the 200 mf condenser with the 400 ohm non-inductive resistor.

In all measurements connect the output meter, through .1 mf 600 volt condensers, to the plate and screen terminals of the 6X6 tube.

Procedure  
The volume and tone controls should all be turned to the extreme clockwise positions, before starting.  The location of all trimmers is shown in the accompanying figure.  Always keep the output from the signal generator at the lowest value which will give a readable deflection on the output meter.

R.F. Dial Alignment  
Turn the Band Selector Switch to Band 1 and turn the R.F. DIAL to the low frequency end.

Connect the output meter as described under "Connections" of the output meter, while slightly rocking the gang condenser.  Readjust trimmer #8 if necessary to correct the calibration.  These are the only adjustments on this band.

Band 2.  
Connections and dummy antennas same as on Band 1 above.  Before aligning this band refer to the paragraph headed "Image Frequency".  Set the generator and the R.F. DIAL to 9 me.  Adjust trimmers #15 and #17 for maximum reading of the output meter.  Be careful that you do not tune in at the image frequency.

Then adjust trimmers #18 and #19 for maximum reading of the output meter.  Adjust trimmers #18 and #19 while rocking the gang condenser, for maximum reading of the output meter.  Reset trimmer #18 so that calibration is correct if necessary.

Band 3.  (Model 975, Long-Wave)  Connect the "hot" terminal of the generator to the blue wire and slip, through the .0002 mf condenser.

Set the generator frequency to 550 kc.  and with the Band Select Switch set to Band 3 turn the R.F. DIAL to 550 kc.  Adjust trimmer #6 for maximum reading of the output meter.  Do likewise with trimmers #6 and #7.  Then set the generator frequency to 180 kc. and the R.F. DIAL to approximately the same.  Adjust trimmer #21 for maximum reading of the output meter, while "rocking" the gang condenser carefully back and forth.  Then go back and repeat the 360 kc. alignment.

Band 4.  (Model 975)  Band 5.  (Model 974)  (Standard Broadcast)  Connections are the same for the alignment of this band as they are for the Long-Wave Band.

Set the generator frequency to 1500 kc.  and the R.F. DIAL to the same frequency, with the Band Select Switch set appropriately.  Adjust trimmer #10 for maximum reading of the output meter.  (This trimmer is adjusted by moving the brass rod in or out, with a hooked wire, and with a twisting motion.)  First loosen the lock nut.  Then without touching any tuning controls adjust trimmers #9 and #10 for maximum reading of the output meter.

Next, set the generator frequency to 600 kc. and set the R.F. DIAL to the 600 kc. mark.  Then adjust trimmer #11 for maximum reading of the output meter, while "rocking" the gang condenser.  Finally return and repeat the 1500 kc. adjustments and then tighten the lock nut on trimmers #6 and #7.

Image Frequency  
All bands in these two models are aligned with the oscillator frequency higher than the signal frequency.  There can be no error in alignment if the receiver is not adjusted to the Long-Wave and Broadcast Bands.  However, on the higher frequency bands it is possible to incorrectly adjust the alignment in this way and end up with the receiver aligned on what should be the Image Frequency.  The chances of doing this may be eliminated by adjusting the generator to the correct aligning frequency, and with sufficient output from the generator to punch up two signals with the receiver, separated by about the Intermodulation Frequency, set the R.F. DIAL to that one which comes in at the higher frequency marking on the R.F. DIAL.
all voltage measurements are those between the indicated tube terminal and the chassis, and are made with a 1000 ohms per volt voltmeter. Readings with no signal input to the receiver end with the volume control set at minimum volume.

## Testing Ranges

The model M-2204 chassis has the following ranges:

**Tubes**

<table>
<thead>
<tr>
<th>Socket Terminals</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.P. 637-g</td>
<td>145</td>
<td>62.5</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1st Det.3EH-1</td>
<td>150</td>
<td>62.5</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2nd Det.3EH-1</td>
<td>145</td>
<td>62.5</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>A.F. 615-g</td>
<td>125</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>A.F. 135-g</td>
<td>145</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R.B. 6215-g</td>
<td>145</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Band 1**

25.5 - 8.85 mc. 11.7 - 33.9 meters

**Band 2**

9.85 - 2.95 mc. 30.1 - 101.3 meters

**Band 3**

1725 - 520 kc. 174 - 576 meters

**Maximum Power Output**

2 watts

**Power Supply**

32 volt Storage Battery .6 amperes drain 110-125 or 220-240 volts AC 50-60 cycles 18 Watts

**Intermediate Frequency**

455 kc
I.F. Alignment

1. Adjust the signal generator to 645 kilocycles, and adjust the generator output to the lowest value which will give a readable signal on the output meter.

2. Adjust the trimmer screws 1, 2, 3, and 4 (see figure), for maximum reading of the output meter. Keep reducing the output from the generator if the output meter reading increases too much.

If the output of the generator to the receiver is too great, the alignment of the receiver will not be correct, as the i.f. section will become too great, and the amplifier will appear broad in tuning.

It will seldom, if ever, be found necessary to tune up the alignment of the i.f. amplifier. Of course, if the amplifier adjustment screws have been tampered with, it will probably be necessary to do so.

In this case, connect the generator to the grid of the 6SK-7 i.f. tube, and balance the i.f. transformer. Always finish the alignment with the signal input to the i.f. tube.

A cathode-ray oscilloscope is not necessary in making the above adjustments. One may be used, however, if desired.

R.F. Alignment - Broadcast Band

Connect the "hot" terminal of the generator to the port marked "X" on the rear of the chassis, through the .0002 mfd. condenser.

Set the generator frequency to 1500 kc, and the dial pointer of the receiver to the same frequency with the Band Selector Switch set appropriately. Adjust trimmer #6 for maximum reading of the output meter. Lock in and adjust trimmer by moving the brass rod in or out with a hooked wire, and with a twisting motion. Then without touching the tuning controls, adjust trimmers #6 and #12 for maximum reading of the output meter.

Next, set the generator frequency to 600 kc, and move the receiver dial pointer to the same frequency. Adjust trimmer screw #7 for maximum reading of the output meter, while "rocking" the gang condenser. Finally, repeat the 1500 kc, adjustments, and tighten the lock nuts on trimmers #6 and #6.

Band #2

Remove the .0002 mfd. dummy antenna used in aligning the Broadcast Band and substitute the 600 ohm non-inductive resistor in its place.

Before aligning this band refer to the paragraph headed "Image Frequency".

Set the generator frequency to 9 mc, and the receiver dial pointer to the same frequency with the Band Selector Switch set appropriately. Adjust trimmer #6 for maximum reading of the output meter. Be careful you do not tune in at the Image Frequency.

Then adjust trimmer #10 for maximum output meter reading, while slightly "rocking" the gang condenser. Readjust trimmer #6 if necessary, to correct the calibration, and finally adjust trimmer #13 for maximum output meter reading.

Band #3

The connections and dummy antennas are the same as used in aligning Band #2.

Before aligning this band, refer to the paragraph headed "Image Frequency".

Set the generator frequency to 35 mc, and the receiver dial pointer to the same frequency. Adjust trimmer #9 for maximum reading of the output meter. Be careful you do not tune in at the Image Frequency. Then adjust trimmer #11, while "rocking" the gang condenser, for maximum reading of the output meter. Readjust trimmer #9, if necessary, to correct the calibration, and then adjust trimmer #14 for maximum reading of the output meter.

Image Frequency

The alignment in this receiver must be aligned with the oscillator frequency higher than the signal frequency. There can be no error in doing this on the Broadcast Band. However, on the Image Frequency bands it is possible to incorrectly adjust the alignment in this way, and end up with the receiver aligned on what should be the Image Frequency.

The changes of doing this may be eliminated by adjusting the generator to the correct aligning frequency. With sufficient output from the generator to push up the noise, the receiver, separated by two Intermediate Frequency stages from the receiver dial point to that one which comes in at the highest frequency, marking on the receiver dial calibration.
This portable radio will operate on any current or principal voltage throughout the world. By setting the knob in the back of the radio, it can be used on AC or DC at 120, 160, or 240 volts.

The receiver is designed to operate over the following three tuning ranges:

- **Broadcast**—550 to 1600 kilocycles
- **Short-Wave**—6 to 18 megacycles (16 to 51 meters)
- **Long-Wave**—800-2000 Meters

**IMPORTANT:**—To avoid damage if switch is accidentally placed in wrong position, this particular model is equipped with a fused plug at the end of the electric cord. Should these fuses blow, replace with no higher than ¾ to 1 amp. standard automobile cartridge fuses.
Figure 9—Wiring Diagram Television Chassis

TV Channels
(Selector Switch Positions)
1. .......... 84 to 90 mc.
2. .......... 78 to 84 mc.
3. .......... 66 to 72 mc.
4. .......... 60 to 56 mc.
5. .......... 44 to 50 mc.

Wire Color Code
R = RED
G = GREEN
Y = YELLOW
B = BLUE
BR = BROWN
BK = BLACK
H = HEAVY
TR = TRACER

These leads connect to the black-red transformer leads on the TRK-5.

Overall Band Width (approx.) ..................... 2.5 mc.
Scanning ........................................ Interlaced, 441 Line
Horizontal (Line) Scanning Frequency
(Sawtooth Wave) .................. 13,230 cps.
Vertical (Field) Scanning Frequency
(Sawtooth Wave) .................. 60 cps.
Frame Frequency ............................. 30 cps.
Picture Size (approximate mask dimensions) 3\(\frac{3}{4}\) x 4\(\frac{3}{4}\) in.
Chassis Base Dimensions .......... 13 x 18 in. Max.; height 9 in.
Operation Model TR-5

The power-volume control on the broadcast radio receiver turns on the power for the complete receiver. Pushing the button marked “Television” on the push button panel turns on the Television receiver, if the above power control is “On.” The volume control of the broadcast receiver also controls the Television sound volume level.

Station Selector and Fine Tuning.—The outer ring “O” section of the central dual control knob on the Television panel selects the station from which it is desired to receive television transmission.

Five television channels are covered as follows:

1. 84 to 90 M.C.
2. 78 to 84 M.C.
3. 66 to 72 M.C.
4. 50 to 56 M.C.
5. 44 to 50 M.C.

Set the station selector to the number corresponding to the frequency of the station from which it is desired to receive Television Broadcasts.

The inner section “I” of this knob is used for fine tuning and may eliminate moving ripples or distortion if due to interfering radio signals. A slight inward pressure must be exerted on the knob while turning.

Before the television portion of the receiver is turned “On,” it is advisable to turn the Brightness and Contrast controls completely counter-clockwise to reduce the illumination of the spot which appears on the Kinescope before the sweep circuits have started functioning.

Contrast and Brightness Controls.—The inner “I” section of the “Contrast-Brightness” controls is the Contrast control and varies the black and white tones of the picture being received. Two little contrast makes the picture all half-tones or gray. Turning clockwise increases contrast from grays, to black and white. See test patterns Figs. 2, 4, and 5, page 10-21. The outer ring “O” is the Brightness Control and affects the average illumination of the picture. Turning clockwise increases the brightness. See test pattern Figs. 2, 4, 5.

Hold Controls.—The dual knobs on the Television panel marked “Horizontal” and “Vertical” Hold, control the picture stability. The inner section designated by “I” is the Horizontal Hold Control and when being set should be turned slowly to the point at which the picture “locks in” horizontally. See test patterns Figs. 2, 4, and 5, page 10-21. The outer ring section designated by “O” is the Vertical Hold Control and when being set should be turned to the point where the picture “locks in” vertically. Pattern Fig. 5a. These two controls on this dual knob should not ordinarily require readjustment after good picture reception has once been obtained. An accidental resetting may be necessary due to changing to a different station, and to the gradual aging of the tubes.

Focus Control.—This control is located on the rear of the Video chassis, and controls the electron beam focus of the Kinescope. Ordinarily, after once being focused the Kinescope should not require re-focusing for a considerable length of time. See test pattern Fig. 5b.

Kinescope Installation Models TR-5, TT-5: Refer to figure 3.
1. Remove back cover from cabinet.
2. Remove Kinescope mounting shield from shipping carton.
3. Using gloves and goggles remove Kinescope from shipping carton and place in the cone-shaped mounting shield.
4. Guide the Kinescope and mounting shield carefully into the cabinet, placing the Kinescope firmly up against the mask and viewing window. Fasten the mounting shield firmly in place with the thumb screw provided, so that it holds the Kinescope firmly against the mask. If the Kinescope does not line up properly with the mask, loosen the screws “A” and turn “B” and adjust in the direction desired.
5. After the receiver is operating, the Kinescope may be rotated to properly square up the picture with the mask.

CAUTION: When rotating tube the power should be turned “OFF.”

Adjustments.—There are a series of screwdriver slot adjustments at the rear of the Video chassis used to obtain the proper picture size and centering. These adjustments are explained fully in the receiver operating instructions, and also in the booklet: Practical Television by RCA.

When the receiver is moved from one location to another, some readjustment of these controls may be necessary.
Antenna Installation:

In most cases, the antenna should not be installed permanently on the apartment or residence roof until the quality of the picture reception has been observed on a Television Receiver. A temporary transmission line can be run between receiver and the antenna allowing sufficient slack to permit moving the antenna. Then, with a telephone system connecting an observer at the receiver and an assistant on the roof to find an antenna location, the antenna can be positioned to give the most satisfactory results on the received signal. A shift of only a few feet in antenna position or direction may effect a considerable difference in picture reception. Whenever possible, the antenna location should be chosen or erected so the antenna is not only conducive to the transmitter but removed as far as possible from highways, hospitals and doctors' offices, and similar sources of interference. Auto ignition and diathermy apparatus may cause noise interference which spoils the picture.

In mounting any antenna, care must be taken to keep the antenna rods or pickup wires proper at least 1/4 wave length (at least 6 feet) away from other antennas, metal roofs and gutters or metal objects.

Under certain extremely unusual conditions, it may be possible to rotate or position the antenna so it receives the cleanest picture over a reflected path. If such is the case, the antenna should be so positioned. However, such a position may give variable results as the nature of reflecting surfaces may vary with weather conditions, as a wet surface has been known to have different reflecting characteristics than a dry surface.

In short, a television receiving antenna and its installation must conform to much higher standards than an antenna for reception of International Short Wave and Standard Broadcast signals because:

1. Intervening obstacles have a pronounced shielding effect on the ultra-high frequency waves producing low intensity signals. Severe trouble with multi-path transmissions may be experienced, especially in congested city areas.
2. The picture signal is comprised of a very wide band of frequencies, all of which must be received with good efficiency.
3. It must be continually remembered that the discernment of the eye is much more critical than that of the ear.

The Transmission Line

RCA Victor has made available two types of exterior transmission lines. One is a special low loss weather-proofed line having the correct surge impedance to match the RCA Victor Television antennas and the RCA Victor Television receivers. It is carried as Stock No. 9881 in 1,000 foot rolls. The second type is a standard weather-proofed line also having the correct surge impedance for proper antenna and receiver matching. It is carried as Stock No. 12430 in 90 ft. rolls, Stock No. 12429 in 40 ft. rolls and is available in 1,000 ft. spools as Stock No. 9881. Use of improper lines may result in excessive loss or may lead to line reflections, resulting in multiple images or "ghosts," thus marred the reception.

For transmission line runs up to 300 feet, and where the signal strength on the antenna is relatively high, the Stock No. 12430, or Stock No. 12429 transmission line may be used. For all other applications the Stock No. 9881 transmission line is recommended.
Video Chassis KC-3 (TT-5) KC-3A (TRK-5)

No attempt should ever be made to measure the high (2,000 volts) voltage, because of the dangers and difficulties involved. If at any time it becomes necessary to service the high voltage circuit, the suspected parts should be replaced by parts known to be in good operating condition.

Always replace the red cap over the 879 high voltage rectifier.

The most dangerous portion of the receiver is the plate (top cap) lead for the 879 high voltage rectifier. Always be very careful when working near or with this lead.

When working on the high voltage supply portion of this chassis, the following precautions should be observed:
1. Remove power supply cord from the power supply socket.
2. Use only one hand at a time.
3. Connect a shorting lead between ground (firstly) and to the high voltage side.
4. Whenever working with the oil-filled high voltage filter capacitors, keep a constant short across the capacitor, as these capacitors do not completely lose their charge after being discharged a single or several subsequent times.
5. Only one person at a time should work on the unit to prevent any misunderstanding which may result in an accident.

When any changes are made on the Video portion of the chassis, the locations of leads and parts should be returned as closely as possible to their original positions.

Service Hints:
1. In some cases the horizontal sweep oscillator circuit will radiate energy to nearby broadcast receivers and lead-ins, causing interference with standard broadcast receivers. It has been found that this trouble has been cleared up in some cases by use of an RCA "Magic Wave" antenna for the broadcast receiver receiving the interference.
2. If the picture "tears out" when the receiver is jarred it may be due to a microphone 1853, 1851, or 615 oscillator may be due to microphone 1853, 1851, or 615 oscillator.
3. The 615 oscillator tube should be removed without rocking it in its socket to loosen it, as the motion may cause the 80.5 mmf capacitor C16 to break off.
4. The coils or strips in the h.f. oscillator circuits should not be touched or moved or the alignment of the receiver will be disturbed.
5. The two Video coupling capacitors C44, 45, should be kept clear of chassis.

6. In some cases the metal Kinescope mounting shield may become magnetized by the earth's or some nearby magnetic field, and thus distort the picture on the screen towards the magnetized portion of the shield. The shield can be demagnetized by passing it slowly through a solenoid which is energized by an a.c. current.

Antenna

The finest television receiver built may be said to be only as good as the antenna design and installation. It is therefore important to use a correctly designed antenna, and use care in its installation.

The RCA Double Dipole Antenna, Stock No. 9871, is recommended for use with these receivers. Both this antenna and the "V" antenna described below are especially designed for a sufficient broad frequency response to cover the contemplated television spectrum, with good efficiency and are therefore superior to a single Dipole type antenna.

When greater signal pickup, or where a shielding effect from noise pickup or image reflections are desired, a reflector assembly Stock No. 9871 may be added to the Stock No. 9871 Antenna to obtain an improved signal-to-noise ratio.

The RCA Double "V" Wire type Television Antenna is alternative type of antenna designed for television aught and sound reception. Two points of support are necessary. It serves adequately in suburban areas but may not be sufficiently flexible and efficient for congested city areas where bad reflections and interference are encountered.

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Electrical Specifications

Frequency Ranges
- Standard Broadcast ("A" band) .......... 540-1720 kc
- Intermediate Frequency .......... 540-1720 kc
- Medium Wave ("B" band) .......... 2.3-7.0 mc
- Short Wave ("C" band) .......... 7.0-22 mc
- Medium Wave ("B" band) .......... 455 kc

Tube Complement
- RCA-6A8-G 1st-Det., and Osc.
- RCA-6K6 1F Amplifier
- RCA-627 2nd-Det., A.V.O., 1st Audio
- RCA-6J3 Phase Inverter

Power Supply Rating .......... 105-125 volts, 60 cycles, 75 watts

Power Output
- Undistorted ............. 5 watts
- Maximum ............. 5.5 watts

Speaker (RL-70H-5)
- Type .......... 12-inch electrodynamic
- Voice-Coil impedance .......... 2.2 ohms at 400 cycles

Two stations between approximately .......... 690-1,225 kc

Mechanical Specifications

RC-429 Chassis Base Dimensions:
- Height .......... 2-1/2 inches
- Width .......... 13 inches

Depth .......... 6-1/2 inches

Overall Chassis Height .......... 6-1/2 inches

Tuning Drive Ratio .......... 12 to 1

General Description

Radio receiver chassis No. RC-429 is used in RCA Victor Television console Model TRK-5.

The audio output of the television chassis is connected to the audio input of the RC-429 chassis by means of jack X-8 and the left-hand push-button switch (S44, S45, S46).

A separate plug-in power supply unit, RS-89A, is used to supply heater and plate voltage to the RC-427 chassis. Service data and diagrams for the power unit are contained in the following pages.

Reduced Reproduction of Receiver Dial, and Corresponding 0-180° Calibration Scales

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale. For example, 28° on the calibration scale corresponds to 1,500 kc on "A" band. Read instructions under "Alignment Procedure."
Alignment Procedure
(RADIO CHASSIS)

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver ground terminal (G), and keep the output as low as possible to avoid a-v-c action.

Calibration Scale on Indicator-Drive Cord Drum.—The tuning dial if fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The 180° mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The distance from the front of the chassis to the drum must not exceed 3/8 inch. The drum is held to the shaft by means of two setscrews, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the “180°” mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 530 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

For additional details, refer to booklet “RCA Victor Receiver Alignment.”

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect the high side of test-osc. to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-F grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>“A” band, Quiet Point between 550-750 kc</td>
<td>L12 and L13 (2nd 1-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6A8-G 1st-Det. grid cap, in series with .01 mfd.</td>
<td>600 kc</td>
<td>600 kc 150.5°</td>
<td>L10 and L11 (1st 1-F Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal, in series with 200 mfd.</td>
<td>600 kc</td>
<td>1,500 kc 23°</td>
<td>L9 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal, in series with 300 ohms</td>
<td>20 mc</td>
<td>20 mc 22°</td>
<td>C23 (osc.)*</td>
</tr>
</tbody>
</table>

Follow “Adjustments for Electric Tuning.”

* Use minimum capacity peak if two peaks can be obtained, and check for image by tuning radio approximately 910 kc lower.

Note: The oscillator tracks above the signal on all bands.

Adjustments for Electric Tuning

These models have eight push buttons. The left-hand button is a Television switch. The right-hand button connects the gang condenser for manual tuning. The other six buttons are for electric tuning of six different stations in the standard broadcast range. The station buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver for alignment tools such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

The procedure is as follows:
1. Make a list of the desired six stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning button, and manually tune in the first station on the list.
3. Push in station button No. 1 (second from left) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer (C36) for maximum output on this station.

Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

5. Adjust for each of the remaining five stations in the same manner.
6. Make a final careful adjustment of the oscillator cores and antenna trimmers. Use the “Magic Eye” to ensure sharp peaking.
Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within approximately ±20% with 117-volt a-c supply.

*NOTE: Values with star (*) are operating voltages in circuits with high series-resistance. The actual measured voltages will be lower, depending on the voltmeter loading.
## Models TRK-6, TT-5

**Parts List**

### RCA MFG. CO., INC.

<table>
<thead>
<tr>
<th>Stock</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13061</td>
<td>TRK-6, TT-5</td>
</tr>
<tr>
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<td>TRK-6, TT-5</td>
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<td>13078</td>
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<td>TRK-6, TT-5</td>
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<tr>
<td>13080</td>
<td>TRK-6, TT-5</td>
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</tbody>
</table>

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Figure 9—Schematic Diagram, TRK-9 and TRK-12

1939 No. 17

Model TRK-9
Video Chassis No. KC-4A
Video S.P.U. Chas. KK-7A
Receiver Chas. RC-427A
Receiver SPU Chas. RS-83B

Model TRK-12
Video Chassis KG-4
Video S.P.U. Chas. KK-7
Receiver Chas. RC-427
Receiver SPU Chas. RS-83B
RCA MFG. CO., INC.

MODEL TRK-12
Assembly, Operating Controls
Specifications

Television Channels (Selector Switch Positions)
1 ........................................... 84 to 90 mc.
2 ........................................... 78 to 84 mc.
3 ........................................... 66 to 72 mc.
4 ........................................... 50 to 56 mc.
5 ........................................... 44 to 50 mc.

Overall Video Band Width ........................................... 4 mc.
Scanning ........................................... Interlaced, 441 Line
Horizontal (Line) Scanning Frequency (Sawtooth Wave) .... 13,230 cps
Vertical (Field) Scanning Frequency (Sawtooth Wave) ....... 60 cps
Frame Frequency (Picture Repetition Rate) ........... 30 cps

Picture Size (Approx. Mask Dimensions)
TRK-9 ........................................... 5½ x 7½ in.
TRK-12 ........................................... 7½ x 9¾ in.

Figure 2 — Operating Controls, TRK-12

Figure 4 — TRK-12 Assembly
Figure 3—Cabinet Wiring—Model TRK-9

Figure 3a—Cabinet Wiring—Model TRK-12

At Left—Figure 5
Top View Video Chassis

(Above) Figure 6
Recommended Type 6L6 Identification
TELEVISION

The picture is formed on the Kinescope screen under the lid and is reflected to the viewer through a glass plate on the lid. The Kinescope screen is illuminated by a picture tube whose cathode emits electrons. The electrons are accelerated and focused to form a spot on the phosphor coated surface of the screen. The spot produces light of various intensities, which are perceived by the viewer as colors and shapes.

Controls

There are three main control knobs for television. The first knob is for the picture volume, the second for the picture contrast, and the third for the tint control. These controls allow the viewer to adjust the brightness, contrast, and tint of the picture, respectively.

Television Fixed Controls

1. Horizontal Centering. This control adjusts the horizontal position of the picture on the screen. The control is used to center the picture horizontally when the picture is off-center.
2. Vertical Centering. This control adjusts the vertical position of the picture on the screen. The control is used to center the picture vertically when the picture is off-center.
3. Focus Control. This control is used to adjust the sharpness of the picture. Turning the control clockwise increases the focus, making the picture appear sharper. Turning the control counterclockwise decreases the focus, making the picture appear less sharp.
4. Tint Control. This control adjusts the color balance of the picture. Turning the control clockwise increases the tint, making the picture appear more magenta. Turning the control counterclockwise decreases the tint, making the picture appear more cyan.

Television Picture Controls

1. Picture Volume. This control adjusts the overall brightness of the picture. Turning the control clockwise increases the volume, making the picture appear brighter. Turning the control counterclockwise decreases the volume, making the picture appear darker.
2. Picture Contrast. This control adjusts the contrast of the picture. Turning the control clockwise increases the contrast, making the picture appear more saturated. Turning the control counterclockwise decreases the contrast, making the picture appear less saturated.
3. Picture Tint. This control adjusts the color balance of the picture. Turning the control clockwise increases the tint, making the picture appear more magenta. Turning the control counterclockwise decreases the tint, making the picture appear more cyan.

Television Picture Control Operation

To obtain picture reception, open the lid of the cabinet and:

1. Turn the Fidelity-Silencer Control on the radio panel to “Television” position.
2. Turn the Power-Volage Control on radio panel clockwise and advance about half way.
3. Turn the Tint Control until the picture is visible. Make fine adjustments for best picture by using the Contrast and Brightness controls.

The illustrations shown in Figures 2, 4 and 7 give an idea of the effect of the Brightness and Contrast Controls. Incorrect setting has effect similar to when a target is too far away. If the picture is not steady, the “Hold” controls will require slight readjustment. If the picture is moving sideways, the Horizontal Hold controls will be required.

If the picture is moving forward or backward, the Vertical Hold controls will be required.

If the picture appears out of focus, carefully turn the Focus Control on the back of the cabinet to remedy the condition.

As long as the Television Receiver is not moved in any way, only an occasional setting of the other controls will be required.

A spot in the center and also a slight distortion of the television screen may gradually appear as the Kinescope ages. This is normal and in no way affects good picture reproduction.

Television Operation

The television receiver is a complex electronic device that converts radio signals from a broadcast or cable source into a visual image on the screen. The receiver consists of several major components, including the tuner, picture tube, and audio section.

The tuner selects the desired broadcast channel from the many available. It then converts the high-frequency radio signals into lower-frequency signals that can be processed by the receiver.

The picture tube is the device that actually produces the visible image on the screen. It contains a filament and an electron gun, which generate an electron beam that is focused and directed to the phosphor coating on the screen.

The audio section of the receiver translates the audio information from the broadcast into a form that can be heard through loudspeakers or headphones.

The television receiver is controlled by tuning, volume, and picture controls, which adjust the sensitivity and output of the receiver to suit the viewer's preferences.

The receiver is a valuable entertainment tool that provides enjoyment and relaxation. It is also a valuable source of information, providing news, sports, and educational programming. However, it is important to use the television receiver responsibly, avoiding excessive viewing and ensuring that it is placed in a safe and comfortable location.
### REPLACEMENT PARTS

#### TELEVISION CHASSIS ASSEMBLIES

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>33205</td>
<td>Control—5-ohm tapped &quot;Harmonic control&quot; control (CH)</td>
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<td>33210</td>
<td>Control—5-ohm tapped &quot;Harmonic control&quot; control (CH)</td>
<td>1.00</td>
</tr>
<tr>
<td>33215</td>
<td>Control—5-ohm tapped &quot;Harmonic control&quot; control (CH)</td>
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<tr>
<td>33220</td>
<td>Control—5-ohm tapped &quot;Harmonic control&quot; control (CH)</td>
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<td>33240</td>
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#### RADIANCE RECEIVER CHASSIS

<table>
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<tr>
<td>31525</td>
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<td>Capacitor—150 micro (C3)</td>
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<td>31540</td>
<td>Capacitor—150 micro (C3)</td>
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</tr>
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<td>31545</td>
<td>Capacitor—150 micro (C3)</td>
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<td>Capacitor—150 micro (C3)</td>
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<td>31555</td>
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<tr>
<td>31560</td>
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<td>31565</td>
<td>Capacitor—150 micro (C3)</td>
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</tr>
<tr>
<td>31570</td>
<td>Capacitor—150 micro (C3)</td>
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#### POWER SUPPLY UNIT

(TELEVISION AUDIO RECEIVER)

<table>
<thead>
<tr>
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<th>Description</th>
<th>Unit Price</th>
</tr>
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<tbody>
<tr>
<td>5558</td>
<td>Knob—Red indicator (C1)</td>
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<tr>
<td>5559</td>
<td>Plug—Contact male plug (C1)</td>
<td>0.50</td>
</tr>
<tr>
<td>5560</td>
<td>Plug—Contact male plug (C1)</td>
<td>0.50</td>
</tr>
</tbody>
</table>

*ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.*
Alignment Procedure (RADIO CHASSIS)

Calibration Scale: The rubber band is placed on the rear of the radio chassis where it is visible through the front glass. The rubber band serves as a reference point for adjusting the receiver and amplifier settings.

Feedback Switch (S8 and S9)

Fidelity Switch (S4, S5, S6, S7)

Calibration Scale

Receiver Chassis Nos. RC-427A or RC-427

RCA MFG. CO., INC.

MODELS U-71-129

Comparison of Frequency

1. Provides frequency feedback by connecting the radio chassis to the output of the receiver and amplifier.
2. Disconnects the feedback path to the chassis by removing the connecting wires.
3. Connects the feedback path to the chassis by connecting the wires.
4. Removes the internal feedback path to the chassis.

Calibration Scale

0-10 20 30 40 50 60 70 80 90 100 110 120

Tuning Dial and Corresponding Calibration Scale

1. All A/C leads should be twisted together and grounded to prevent noise pickup.
2. Keep the picks away from the chassis.
3. Yellow, green, and black leads from the fidelity switch should be removed from the antenna.
Electric Tuning Mechanism

When a station button is pushed in, it completes the 24-volt circuit through the corresponding station-setting contact and one-half of the brass selector disc, which is connected to one side of the motor field coil. This energizes the motor, and the rotor is pulled forward, engaging with the gear train that drives the tuning condenser and selector disc. The condenser and disc rotate until the insulation line comes under the particular station-setting contact, and the motor circuit is broken.

When the electric tuning mechanism is in action, the motor-supply voltage is fed into a diode rectifier circuit which applies a high bias to the first audio amplifier. This prevents audio amplification and makes the set quiet or "mute" while the mechanism is operating.

LUBRICATION


Adjustments for Electric Tuning

4. Manually tune in the first station on the list, using the "Magic Eye" for accurate tuning.
5. Hold down the "dial-tuning" button and press down station button No. 1 (left-hand). Both buttons will stay down. Move station adjuster contact pin No. 1 to the isolating line on the disc at rear of gangs. When the pin is correctly centered on the isolating line, the central dial lamp will go out completely.
6. Press down any other button in order to release the dial-tuning button and station button No. 1. Tune to some other section of the dial, and then press down station button No. 1 again. The electric tuning mechanism will function to tune in the first station, and the central dial lamp will stay on.
7. Repeat this process for the remaining stations.
**REPLACEMENT PARTS (Continued)**

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<tr>
<td>33285</td>
<td>Cable—Insulated connector complete with cable for IEC (3rd model)</td>
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<tr>
<td>33998</td>
<td>Capacitor—0.005-0.030 mfd, 1,000 v (C116, C118)</td>
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<td>Clip—Plate connector for V90C Radiotron</td>
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<td>Control—Focus control, 460,000 ohms (R129)</td>
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<td>Control—Focus control, 460,000 ohms (R129)</td>
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<tr>
<td>33800</td>
<td>Coupling—Flexible bronze coupling</td>
<td>.95</td>
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<tr>
<td>10007</td>
<td>Fuse—3 ampere, 250 volt</td>
<td>.08</td>
</tr>
<tr>
<td>33515</td>
<td>Insulator—Stand-off insulator only—less hardware</td>
<td>.20</td>
</tr>
<tr>
<td>33937</td>
<td>Knob—Focus control knob</td>
<td>.25</td>
</tr>
<tr>
<td>33938</td>
<td>Plug—2-prong male connector for A.G. power cord (X12)</td>
<td>.90</td>
</tr>
<tr>
<td>33501</td>
<td>Resistor—300,000 ohms, 100,000 volt (R126, R130)</td>
<td>.25</td>
</tr>
<tr>
<td>33502</td>
<td>Resistor—470,000 ohms, 100,000 volt (R127, R128)</td>
<td>.25</td>
</tr>
<tr>
<td>33554</td>
<td>Resistor—820,000 ohms, 100,000 volt (R131, R132, R134, R135, R136, R137)</td>
<td>.25</td>
</tr>
<tr>
<td>33024</td>
<td>Shaft—Bakelite shaft for focus control</td>
<td>.25</td>
</tr>
<tr>
<td>18007</td>
<td>Socket—Ceramic octal base socket and retaining nut</td>
<td>.85</td>
</tr>
<tr>
<td>33265</td>
<td>Socket—Kinescope socket, less cable (X11)</td>
<td>.50</td>
</tr>
<tr>
<td>31211</td>
<td>Socket—Octal base DTA rectifier, or television camera socket (X12)</td>
<td>.50</td>
</tr>
<tr>
<td>12145</td>
<td>Socket—6-prong television power supply socket</td>
<td>.50</td>
</tr>
<tr>
<td>33800</td>
<td>Support—Rectifier plate, and stand-off insulator assembly</td>
<td>.25</td>
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<tr>
<td>33325</td>
<td>Transformer—Filter transformer (T7)</td>
<td>2.50</td>
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<tr>
<td>9881</td>
<td>Transformer—High voltage power transformer (T2)</td>
<td>10.00</td>
</tr>
<tr>
<td>33335</td>
<td>Transformer—Low voltage power transformer (T8)</td>
<td>2.50</td>
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**SPEAKER ASSEMBLY**

<table>
<thead>
<tr>
<th>RL-705-F5</th>
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<tbody>
<tr>
<td>31825</td>
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<tr>
<td>11823</td>
</tr>
<tr>
<td>11224</td>
</tr>
<tr>
<td>31275</td>
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<td>33057</td>
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<td>33539</td>
</tr>
<tr>
<td>33160</td>
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<td>33557</td>
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**MISCELLANEOUS**

<table>
<thead>
<tr>
<th>TRK-12</th>
<th>TRK-9</th>
</tr>
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<tbody>
<tr>
<td>33142</td>
<td>Button—Station selector push button</td>
</tr>
<tr>
<td>33979</td>
<td>Cap—Shielded audio lead with plugs (X8, X10)</td>
</tr>
<tr>
<td>33490</td>
<td>Cable—48 inch shielded audio lead with plugs (Model TRK-12 only)</td>
</tr>
</tbody>
</table>

**LOCATION PARTS**

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>33348</td>
<td>Cable—Low capacity Kinescope grid cable (Model TRK-9 only)</td>
<td>1.25</td>
</tr>
<tr>
<td>33055</td>
<td>Cable—Low capacity Kinescope grid cable (Model TRK-9 only)</td>
<td>1.25</td>
</tr>
<tr>
<td>33597</td>
<td>Cap—Blue pilot lamp “Bull’s Eye”</td>
<td>.90</td>
</tr>
<tr>
<td>33697</td>
<td>Clamp—Deflecting yoke clamp assembly</td>
<td>.90</td>
</tr>
<tr>
<td>33588</td>
<td>Connector—2-prong female connector for power supply circuit (X23)</td>
<td>.35</td>
</tr>
<tr>
<td>33589</td>
<td>Connector—2-prong male connector, used on interlock cable (X21)</td>
<td>.40</td>
</tr>
<tr>
<td>33602</td>
<td>Coupling—Flexible bronze coupling (Used in 2nd production received)</td>
<td>.10</td>
</tr>
<tr>
<td>31460</td>
<td>Cover—Eight protective covers for push button markers</td>
<td>.08</td>
</tr>
<tr>
<td>33215</td>
<td>Cushion—Kinescope cushioning (Model TRK-12 only)</td>
<td>2.30</td>
</tr>
<tr>
<td>33219</td>
<td>Cushion—Kinescope cushioning (Model TRK-9 only)</td>
<td>1.90</td>
</tr>
<tr>
<td>33643</td>
<td>Cushion—Television cushions with screw, washer and washer (suitable for other chassis)</td>
<td>.40</td>
</tr>
<tr>
<td>33442</td>
<td>Dial—Three hand glass dial assembly</td>
<td>1.20</td>
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<tr>
<td>33530</td>
<td>Ecrouchette—Dial ecrouchette less buttons, button shaft and dial scale</td>
<td>2.60</td>
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<tr>
<td>31263</td>
<td>Frame—Frame with screw less points, carriage and rod</td>
<td>1.50</td>
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<tr>
<td>10067</td>
<td>Frame—3 ampere fuse</td>
<td>.05</td>
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<tr>
<td>33574</td>
<td>Glass—6½ by 8½ inch safety protective glass (Model TRK-12 only)</td>
<td>2.40</td>
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<tr>
<td>33570</td>
<td>Glass—6½ by 11½ inch safety protective glass (Model TRK-12 only)</td>
<td>3.90</td>
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<tr>
<td>33282</td>
<td>Hinge—Piano type lid hinge and screw</td>
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<tr>
<td>33448</td>
<td>Knob—Radio tuning, volume or range selector knob</td>
<td>.15</td>
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<tr>
<td>33470</td>
<td>Knob—“Television” “Control” “Horn” knob</td>
<td>.15</td>
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<tr>
<td>33471</td>
<td>Knob—“Television” “Brightness” or “Veh” knob</td>
<td>.30</td>
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<tr>
<td>33472</td>
<td>Knob—Radio tuning, volume selector knob</td>
<td>.25</td>
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<tr>
<td>33469</td>
<td>Knob—“Victrola” Radio—Television “Variety” selection knob</td>
<td>.20</td>
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<tr>
<td>11931</td>
<td>Lamp—6½ V pilot lamp, Models No. 44</td>
<td>.17</td>
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<tr>
<td>35145</td>
<td>Marker—Complete set of call letters</td>
<td>.35</td>
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<tr>
<td>11425</td>
<td>Marker—‘Dial Tumbler’</td>
<td>.15</td>
</tr>
<tr>
<td>31467</td>
<td>Marker—“Victrola” push button marker</td>
<td>.01</td>
</tr>
<tr>
<td>33070</td>
<td>Mirror—20 by 14 in. viewing mirror</td>
<td>9.00</td>
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<tr>
<td>33225</td>
<td>Nut—2½ by mounting high frequency coils assemblies</td>
<td>.01</td>
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<tr>
<td>4577</td>
<td>Plug—Spring male plug for power supply circuit (X24)</td>
<td>.45</td>
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<tr>
<td>33244</td>
<td>Plug—Spring male plug, used on interlock cable (X22)</td>
<td>.45</td>
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<tr>
<td>33166</td>
<td>Plug—Power male plug for Kinescope grid-cathode cable (X14)</td>
<td>.50</td>
</tr>
<tr>
<td>33210</td>
<td>Plug—4-prong male plug for deflecting yoke cable (X20)</td>
<td>.30</td>
</tr>
<tr>
<td>12452</td>
<td>Plug—2-prong female speaker cable plug (X9)</td>
<td>.30</td>
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<tr>
<td>4574</td>
<td>Plug—4-prong male plug for Television chassis power supply cable (X14)</td>
<td>.48</td>
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<tr>
<td>18550</td>
<td>Plug—6-prong male plug for Television chassis power supply cable (X19)</td>
<td>.25</td>
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<tr>
<td>31242</td>
<td>Pointer—Station selector pointer with carriage</td>
<td>.25</td>
</tr>
<tr>
<td>31243</td>
<td>Rod—Dial frame pointer slide rod</td>
<td>.15</td>
</tr>
<tr>
<td>33063</td>
<td>Screen—Dial frame diffusing screen with covers</td>
<td>1.50</td>
</tr>
<tr>
<td>4660</td>
<td>Screw—29 by 1½ in. long, machine screw, washer and lockwasher for clock mounting (as required)</td>
<td>.08</td>
</tr>
<tr>
<td>33537</td>
<td>Screw—Bell mouth, for screw-driver adjust-ments (Model TRK-9 only)</td>
<td>.05</td>
</tr>
<tr>
<td>14270</td>
<td>Spring—Knob spring for stock Nos. 33448, 33451, 33473, 35729, 35730, 35731</td>
<td>.20</td>
</tr>
<tr>
<td>33529</td>
<td>Spring—Knob spring for stock Nos. 33447, 33450, 33451, 33473</td>
<td>.20</td>
</tr>
<tr>
<td>33362</td>
<td>Switch—Interlock switch with leads</td>
<td>1.80</td>
</tr>
<tr>
<td>33163</td>
<td>Support—Left hand lid support</td>
<td>2.25</td>
</tr>
<tr>
<td>33167</td>
<td>Support—Right hand lid support</td>
<td>2.25</td>
</tr>
<tr>
<td>8887</td>
<td>Yoke—Deflecting yoke complete with cable and 2-prong plug (L44, L44, R92)</td>
<td>17.50</td>
</tr>
</tbody>
</table>

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XX—Price upon application to your RCA Parts Distributor.

ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.

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General Description

Models 5Q5, 5Q5G, 5Q5A and 6Q7 are three-band superheterodyne receivers. They are designed to cover the standard broadcast range of 540 to 1,720 kilocycles, and the short wave range from 2.8 to 23 megacycles.

Models 5Q5 and 6Q7 are Export Types.

Features of design include: Magnetite-core I.F. transformers; magnetite-core "A" band oscillator coil; automatic volume control; continuous fine adjustment. The high frequency tuning control on Model 6Q7 is engaged straight-line dial; band indicator in dial; jack for Victrola attachment; and dust-proof Edison loudspeaker.

Miscellaneous Service Data

Precautionary Lead Dress
1. Lead from 2nd I.F. (X) to volume control should be kept close to chassis.
2. R.F. coil leads should be kept short and away from coil.
3. Leads to 8,000 ohm (C10) should be as short as possible and condenser dressed away from chassis, bearing against 10 ohm (R12) resistor.

Connections and Colors of Speaker and Cable

Victrola Attachment:—A jack is provided on the rear of chassis for connection to a Victrola Attachment. The cable from the attachment should be terminated in a Stock No. 21048 plug to fit the jack.

Loudspeaker:—To center the loudspeaker voice coil, first move the front dust cover, then loosen the screws holding the spider assembly. Insert three screws into the air gap, and tighten the spider screws. Remove the felters and fasten a dust cover in place with loudspeaker cement.
Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within ±10% with 117-volt a.c. supply.

**NOTE:** Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltages will be lower, depending on the voltmeter loading.

**Models & Description**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111A</td>
<td>Brown Plastic Cabinet</td>
</tr>
<tr>
<td>112B</td>
<td>Black Plastic Cabinet</td>
</tr>
<tr>
<td>113A</td>
<td>Ivory Plastic Cabinet</td>
</tr>
<tr>
<td>114A</td>
<td>Brown Plastic Cabinet with Metal Grille</td>
</tr>
<tr>
<td>115A</td>
<td>Mottled Brown Plastic Cabinet</td>
</tr>
<tr>
<td>116A</td>
<td>Ivory Plastic Plastic Cabinet</td>
</tr>
<tr>
<td>607</td>
<td>Braced Walnut Wood Cabinet</td>
</tr>
</tbody>
</table>

**Calibration Scale**

Reduced reproduction of receiver Dial, and corresponding 0-180° calibration scales.

The corresponding position of the dial indicator for any setting on the calibration scale can be determined by drawing a line from this point on the bottom calibration scale to the same point on the top calibration scale. For example: 33° on the calibration scale corresponds to approximately 7.0 m on "C" band, and 900 ke on "A" band, etc. Read instructions under "Alignment Procedure."

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### Alignment Procedure

**Cathode-Ray Alignment** is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

**Output Meter Alignment.** If this method is used, connect the meter across the power coil and turn the receiver volume control to maximum.

**Test-Oscillator.** For all alignment operations, connect the low side of the test oscillator to the ground terminal. Do not forget to keep the output as low as possible to avoid a-c action.

**Calibration Scale on Indicator Drive-Card Drum.** The tuning dial is fastened in the cabinet and cannot be used for reference during alignment. Therefore, a calibration scale is attached to the rear of the drum which is mounted on the side of the chassis. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees for each alignment frequency is given in the alignment table.

As the first step in alignment, check the position of the drum. The 45° degree mark on the scale is the correct position of the drum when the plate circuit is the proper phase. The distance from the edge of the chassis to the drum must not exceed 1/16 in. The drum is held to the shaft means of a set screw, which must be tightened securely when the drum is in the correct position.

**Pointer Calibration Scale.** Improves the pointer for the calibration scale by cleaning the print of the wire to the gang-condenser frame and wiring the scale so that points on the "O" mark the calibration scale when the plates are fully extended.

**Diaphragm Indicator Adjustment.** After anchoring the chassis in the cabinet, install the diaphragm indicator to the drive cable with indicator at the 2000 mfd mark, and gang condenser fully extended. The indicator has a spring clip for attachment to the cabinet.

For additional details, refer to "RCA Victor Receiver Alignment."
Model 5X5 Series (Chassis No. RC-405)
Five-Tube, Single-Band, AC-DC Multiplex Superheterodyne Receiver
Model PLF-10
Power Line Filter Coupling Unit

General Description

The following features are incorporated in the design of the Little Nipper Multiplex 5X5 Series Receiver: First, it is a "standard breakable" receiver. Second, it will operate any other radio in the home without the use of connecting wires. Third, records may be reproduced through the Little Nipper when used with Victrola Attachment. Fourth, the Model 5X5 (when used with Victrola Attachment) will reproduce records through any other radio in the home without the use of connecting wires. When using the 5X5 as a remote control, the Model PLF-10 Power Line Filter Coupling Unit should be used in conjunction with the receiver to be controlled. The filter is connected between the power line receptacle and the receiver being controlled, as shown in accompanying drawing.

Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil and turn the receiver volume control to maximum.

Tune-Oscillator.—Connect the low side of the test-oscillator to the receiver chassis, through 0.01 mfd. capacitor, and keep the output as low as possible.

Remote Control Oscillator.—Connect the high side of the test-oscillator to the receiver chassis, through 0.01 mfd. capacitor, and keep the output as low as possible.

Power-Supply Polarity.—For operation on direct current, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On ac, reversal of the plug may reduce hum.

If the electric supply circuit is a three-wire system, it may be necessary to connect a 0.01 mfd. 700-volt capacitor between the two outside lines of the three-wire system.

Replace Parts

List all genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>STOCK</th>
<th>DESCRIPTION</th>
<th>UNIT LIST</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>13279</td>
<td>Capacitor—60 mfd...</td>
<td>0.35</td>
<td>32960</td>
</tr>
<tr>
<td>28488</td>
<td>Capacitor—200 mfd...</td>
<td>0.35</td>
<td>32962</td>
</tr>
<tr>
<td>28862</td>
<td>Capacitor—0.01 mfd...</td>
<td>0.10</td>
<td>32964</td>
</tr>
<tr>
<td>33532</td>
<td>Condenser—8200 mfd...</td>
<td>0.05</td>
<td>32966</td>
</tr>
<tr>
<td>33534</td>
<td>Condenser—8200 mfd...</td>
<td>0.05</td>
<td>32968</td>
</tr>
<tr>
<td>35180</td>
<td>Lamp—Dial lamp—Marsa No. 67...</td>
<td>0.30</td>
<td>32982</td>
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<tr>
<td>32982</td>
<td>Transformer—Output transformer...</td>
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<td>32984</td>
</tr>
<tr>
<td>4871</td>
<td>Resistor—22 ohms, 1 watt...</td>
<td>0.20</td>
<td>32986</td>
</tr>
<tr>
<td>5502</td>
<td>Resistor—500 ohms, 1 watt...</td>
<td>0.20</td>
<td>32988</td>
</tr>
<tr>
<td>32989</td>
<td>Transformer—Output transformer...</td>
<td>1.05</td>
<td>32990</td>
</tr>
<tr>
<td>32992</td>
<td>Transformer—Output transformer...</td>
<td>1.05</td>
<td>32994</td>
</tr>
</tbody>
</table>

MISCELLANEOUS ASSEMBLIES

Cabinet—Ivory finish—Model 5X5... | 2.20 |
Cabinet—Walnut finish—Model 5X5W... | 1.40 |
Dial—Glass dial shown... | 0.05 |
Fastener—Push fastener to hold cabinet back... | 0.20 |
Knob—Black tuning knob—Model 5X6... | 0.15 |
Knob—Ivory knob—Model 5X4... | 0.15 |
RU... | 0.01 |
Spring—Knob retaining spring... | 0.05 |

All prices are subject to change or withdrawal without notice.

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Socket, Trimmers
RCA MFG. CO., INC.

MODELS 5X5I, 5X5W
Chassis RC-106
MODEL PLF-10 Coupling Unit
Schematics, Tuner, Voltage

IF PEAK 455 KC

RCA PAGE 10

Electrical and Mechanical Specifications

FREQUENCY RANGE
Receiver 540-1720 kc
Remote Control Oscillator 540-850 kc

TUBE COMPLEMENT
(1) RCA-12AT7 1st Detector Oscillator
(2) RCA-515C IF Amp, 2nd Det., and A.V.C.
(3) RCA-515CT 1st A.F. and Remote Control Osk.
(4) RCA-516GT Power Output
(5) RCA-516ZGST Half-Wave Rectifier

Dial Lamp (1) Masa 47, 6.3 Volts, 15 amp.
Intermediate Frequency 455 kc

Set-up Procedure for Remote Control

1. Install the 5X5 and tune in any desired station.
2. Turn the control switch on the back of the 5X5 to its clockwise position marked "Remote." The 5X5 becomes silent.
3. The 5X5 now becomes a small relay station for signalling to the controlled receiver via the power line wiring.
4. Next tune the main receiver to the exact frequency of transmission of the 5X5, usually 540 kc. Tune carefully to this frequency, setting the volume control as high as permissible with regard to hum and noise conditions. The station to which the 5X5 was tuned will be heard. If the receiver is equipped with tuning indicator (Magic Eye) the correct point will most easily be obtained by observing the indicator.
5. Now any station heard in on the 5X5 dial will be heard on the controlled receiver. The volume will also be controlled with the 5X5 volume control.
6. If it is desired to operate the controlled receiver on its own controls it is only necessary to set the switch on the Power Line Filter Coupling Unit to its position marked "Remote." In the event that, with the 5X5 being used as a remote control, other receivers in the house are in use, trouble may be experienced due to noise and hum. To avoid this, connect a Power Line Filter Coupling Unit, RCA Victor PLF-10, to each of these other receivers, as shown in accompanying drawing.

Precautionary Lead Dress

1. Dress 1st I.F. plate and grid leads against chassis and away from each other. Dress plate lead from 12AT7 close to chassis.
2. Dress A.V.C. condenser (0.1) close to chassis and tight to 0.25 mmid. condenser.

First Edition


©John F. Rider, Publisher
RCA MFG. CO., INC. Chassis RC-404A
Schematic, Socket, Trimmers, Alignment, Phonograph, Data, Voltage

Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—Connect the low side of the test-oscillator to the receiver chassis, through a .01 mfd. capacitor, and keep the output as low as possible.

Antenna.—The set is equipped with length of antenna wire. Do not connect the antenna to ground. If an outdoor antenna is used, it should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mfd. capacitor in series with the lead-in.

Precautionary Lead Dress
1. Dress 1st I.F. plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress electrolytic capacitor against chassis apron.

Phonograph Service Data

The motor is started by turning the radio-phonograph tone control to either 3rd or 4th position clockwise and giving the turntable a clockwise spin with the hand. Smooth starting and running will be insured by keeping the bearings well cleaned and oiled.

Hum and Vibration.—A small amount of hum when starting, decreasing to a negligible amount when running, is normal. If excessive vibration occurs it may be due to:
1. Insufficient lubrication, or any failure that will cause binding.
2. Leather washer not oiled. (Check to make certain that the leather washer is above the steel washer.)
3. Motor not properly supported from motor board.
4. Bells on pole of motor or stator. Remove with fine emery cloth.

5. The damper spring must fit without binding or chattering in the slot in the stator. The stator must be free to deflect in either direction between the limits of the damper spring. The damper spring must exert approximately equal force in restoring the stator to its mid-position when the stator is deflected manually in each direction.

Removing Rotor.—The rotor and turntable assembly simply rests on the ball bearing at bottom of vertical bearing. Remove by lifting up.

Rotor Adjustment.—Loosen the three screws that hold the rotor to the turntable. Then turn the turntable, and carefully tighten the three screws. The top of rotor must be flush with top of stator; add additional steel washers beneath the stator if necessary.

Lubrication.—Oiling points are indicated in the diagram.
### Little Nipper—2nd Models 9TX-1, -2, -3, -4, and -5
#### Five-Tube, Single-Band, AC-DC Superheterodyne Receivers

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit List Price</th>
<th>Stock No.</th>
<th>Description</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-587</td>
<td>Cabinet for 9TX1 (Walnut finish)</td>
<td>1.80 net</td>
<td>X-597</td>
<td>Cabinet for 9TX4 (Ivory finish)</td>
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</tr>
<tr>
<td>X-589</td>
<td>Cabinet for 9TX3 (Wood, Mahogany finish)</td>
<td>2.80 net</td>
<td>X-599</td>
<td>Cabinet for 9TX4 (Arizona Cream Oxy finish)</td>
<td>2.80 net</td>
</tr>
<tr>
<td>X-591</td>
<td>Cabinet for 9TX6 (Brazilian Green Oxy finish)</td>
<td>4.50 net</td>
<td>X-600</td>
<td>Cabinet for 9TX6 (Walnut finish)</td>
<td>4.50 net</td>
</tr>
<tr>
<td>52272</td>
<td>Colb—Antenna coil</td>
<td>1.00</td>
<td>52288</td>
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All Prices are Subject to Change or Withdrawal Without Notice.
Schematic, Alignment, Socket Trimmers, Notes

RCA MFG. CO., INC. MODELS 9SX-1 to 9SX-8 incl. Little Nipper

Model 9SX-1. Molded cabinet, walnut finish, ivory knobs.


Model 9SX-3. Molded cabinet, ivory finish, red knobs.

Model 9SX-4. Molded cabinet, red body, ivory front, red knobs.

Model 9SX-5. Molded cabinet, black body, marble front, jet knobs.

Model 9SX-6. Molded cabinet, blue body, onyx front, blue knobs.

Model 9SX-7. Molded cabinet, onyx finish, maroon knobs.

Model 9SX-8. Molded cabinet, marble finish, jet knobs.

ON-OFF SWITCH & VOLUME CONTROL

STATION SELECTOR

TUBE COMPLEMENT

(1) RCA-6A8 .......................... 1st-Detector—Oscillator
(2) RCA-6K7 .......................... 2nd-Det. 1st A.F. and A.V.C.
(3) RCA-6Q7 .......................... Power Output
(4) RCA-2526 .......................... Half-Wave Rectifier
(5) RCA-25ZE .......................... Dial Lamp (1)

RECT. 2526 6A8 6K7 6Q7 OUTPUT 25L6 25Z6

2ND DET & A.F. 1ST-A.E.

ANTENNA LEAD

1ST-DET., OSC.

BAND SELECTOR

POWER CORD

Bottom view of tube sockets

** Use minimum capacity peak if two peaks can be obtained.

*** After this adjustment, check for image by leaving test oscillator at 6,000 kc. and shifting receiver dial to 5,088 kc., where a weaker signal should be received.
MODELS 9TX-1 to 9TX-5 incl.
Little Nipper-2nd

RCA MFG. CO., INC.

Schematic, Voltage, Socket, Trimmers, Alignment

Precautionary Lead Dress

1. Dress 1st L-F plate and grid leads against chassis and away from each other. Dress plate lead from 6SK7 close to chassis.
2. Dress electrolytic capacitor against rear apron.
3. Keep leads away from adjusting screws to allow easy access.
4. Dress output plate lead along front apron and away from 6A8.
5. Dress parts at ends of chassis to clear cabinet boxes.

Electrical and Mechanical Specifications

**FREQUENCY RANGE**
880-1,720 kc

**TUBE COMPLEMENT**
(1) RCA 6AS
(2) RCA 6SK7
(3) RCA 6GQ7
(4) RCA 6SL7
(5) RCA 6X5Z

**Diode**: Half-Wave Rectifier
**Dial Lamp**: 247, 6.3 volts, 15 amp.

**POWER SUPPLY RATINGS**
A-C Rating: 105-125 volts, 50-60 cycles, 50 watts
B-C Rating: 105-125 volts, direct current, 50 watts

**INTERMEDIATE FREQUENCY**
455 kc

**Power Output**
125 volt, 66 cycle supply, 1.5 watts

**LOUDSPEAKER**
Type: 4-inch Electrodynamic

**Antenna**
The set is equipped with length of antenna wire. Do not connect the antenna to ground. If an outdoor antenna is used, it should not be longer than 100 feet, which is included in the lead-in. If it is longer, connect a 100 to 200 mmf. capacitor in series with the lead-in.

**Power-Supply Polarity**
For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

**Resistor in Power Cord**
The power cord contains a resistor which becomes warm during operation.

**Cabinet Dimensions**
9TX-1: 8 inches x 8 inches x 48 inches
9TX-2: 8 inches x 8 inches x 48 inches
9TX-3: 8 inches x 8 inches x 48 inches
9TX-4: 8 inches x 8 inches x 48 inches

**Weight**
7 pounds (shipping)

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Schematic, Voltage, Socket, Trimmers, Alignment, Data

RCA MFG. CO., INC.

Models 9TX-21, 9TX-22
Chassis RC-403
Model 9TX-33
Chassis RC-403A

Electrical and Mechanical Specifications

**Frequency Range**
500-1,720 kc

**Tubes Complement**
(1) RCA 6AS
(2) RCA-6SK7
(3) RCA-6SN7
(4) RCA-251A
(5) RCA-2628

**Power Supply Ratings**
A.C. Rating: 105-125 volts, 50-60 cycles, 50 watts
D.C. Rating: 105-125 volts, direct current, 50 watts

**Power-Supply Polarity**—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

**Resistor in Power Cord**—The power cord contains a resistor which becomes warm during operation.

**Power Output** (125 volts, 60 cycle supply)
Undistorted: 1.5 watts
Maximum: 2.5 watts

**Loudspeaker**
Type: 4-inch Electrodynamic
Cabinet Dimensions: 5½ in. high, 8¾ in. wide, 4½ in. deep.

**Weight** (approx.): 7 pounds (shipping)

Antenna—The set is equipped with length of antenna wire. Do not connect the antenna to ground. If an outdoor antenna is used, it should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mfd. capacitor across the lead-in.

**Precautionary Lead Dress**

1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 6SK7 close to chassis.
2. Dress electrolytic capacitor against rear apron.
3. Keep leads away from adjusting screws to allow easy access.
4. Dress output plate lead along front apron and away from 6A6.
5. Dress parts at ends of chassis to clear cabinet bosses.

**Alignment Procedure**

Output Meter Alignment—Connect the meter across the voice coil. Calibrate the meter to zero with the receiver inoperative. Make certain that the meter is connected across the voice coil and turn the receiver volume control to minimum.

**Alignment**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 6SK7 close to chassis.</td>
</tr>
<tr>
<td>2</td>
<td>Dress electrolytic capacitor against rear apron.</td>
</tr>
<tr>
<td>3</td>
<td>Keep leads away from adjusting screws to allow easy access.</td>
</tr>
<tr>
<td>4</td>
<td>Dress output plate lead along front apron and away from 6A6.</td>
</tr>
<tr>
<td>5</td>
<td>Dress parts at ends of chassis to clear cabinet bosses.</td>
</tr>
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</table>
# Models 9TX-21, -22, and -23

**Chassis No.** RC-403, RC-403A, RC-405

## Replacement Parts

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<th>DESCRIPTION</th>
<th>Unit List Price</th>
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<td>X-838</td>
<td>Cabinet for 9TX21 (Walnut Finish), (net)</td>
<td>1.35</td>
</tr>
<tr>
<td>X-839</td>
<td>Cabinet for 9TX22 (Ivory Finish), (net)</td>
<td>1.95</td>
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<tr>
<td>X-840</td>
<td>Cabinet for 9TX23 (Wood-Walnut Finish), (net)</td>
<td>3.55</td>
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<tr>
<td>25273</td>
<td>Coil-Oscillator coil</td>
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<td>12657</td>
<td>Condenser—90 mfd.</td>
<td>.30</td>
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<td>12648</td>
<td>Condenser—250 mfd.</td>
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<td>12622</td>
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<td>25433</td>
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## Models 9TX-31, 9TX-32, 9TX-33

**Chassis No.** RC-405, RC-405A, RC-405B

## Replacement Parts

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Electrical and Mechanical Specifications

Frequency Range: 550-1,720 kc

Tube Complement
1. RCA-12SA7 — 1st-Detector—Oscillator
2. RCA-12SK7 — 1st F. Amplifier
3. RCA-125U7 — 2nd-Detector, 1st A-F. and A.V.C.
4. RCA-585AT — Power Output
5. RCA-655AGT — Half-Wave Rectifier

Dial Lamp (1) — Maids 47, 6.3 volts, .15 amp.

Power Supply Ratings
A-C Rating: 105-125 volts, 50-60 cycles, 80 watts
D-C Rating: 165-185 volts, direct current, 80 watts

Intermediate Frequency: 455 kc

Power Output (125 volt, 60 cycle supply)
Undistorted: 1.5 watts
Maximum: 2 watts

 Loudspeakers
Type: 4-inch Electrodynamic
Height: 8 inches
Width: 13 inches
Depth: 4 inches
Cabinet Dimensions:
Model 9TX-31: 8 inches x 13 inches x 4 inches
Model 9TX-32: 8 inches x 13 inches x 4 inches
Model 9TX-33: 8 inches x 13 inches x 8 inches

Weight (net): 9TX-31, 32: 8 pounds
9TX-33: 12 pounds

Precautionary Lead-Downs
1. Use shielded lead from A.C. wall outlet to the receiver.
2. Use shielded lead from the receiver to the antenna.
3. Use shielded lead from the antenna to the receiver.

Alignment Procedure
1. Connect the meter across the voice coil.
2. Connect the low side of the oscillator to the short-circuiting switch.
3. Connect the high side of the oscillator to the short-circuiting switch.
4. Connect the meter across the short-circuiting switch.
5. Adjust the oscillator to the correct frequency.
6. Connect the meter across the A.F. output.
7. Adjust the oscillator to the correct frequency.
8. Connect the meter across the A.F. output.
9. Adjust the oscillator to the correct frequency.

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**Schematic Changes**

**Parts**

**Model D22-1A**

Service Data for Model D22-1 are applicable to these instruments except as follows:

1. The schematic circuit diagram for Model D22-1A is shown in Figure 5.
2. The metal rectifier socket wiring for tube No. 14 is shown in Figure 2.
3. Figure 3 shows the pickup details.
4. The phonograph motor is of the capacitor type. Light machine oil should be used to lubricate the motor bearings. The motor is wired in this instrument as follows: One power-supply lead connects to one terminal of switch S201. The other terminal of S201 connects to one terminal of the brake switch S202. The other terminal of S202 connects to the yellow motor lead. The green motor lead connects to one lead of the capacitor lead and also to the remaining power-supply lead.
5. The Radiotron socket voltages (Figure 4 herein) apply to all Models D22-1 or D22-1A and should be used in place of Figure 4 of the D22-1 Service Data.
6. The resistor assembly R44 and R45 is mounted on the front chassis apron instead of the rear chassis apron.
7. Change price on Stock No. 11879 from $3.50 to $8.15.
8. Change price on Stock No. 11541 Arm from $0.82 to $8.15.

SEE RIDER'S VOLUME FOR OTHER DATA

**Model D22-1A (Use replacement parts from D22-1 except as listed below)**

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>List Price</th>
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<tbody>
<tr>
<td>13405</td>
<td>Armature—Pickup armature</td>
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<tr>
<td>4870</td>
<td>Capacitor—0.25 mfd. (C47)</td>
</tr>
<tr>
<td>11195</td>
<td>Socket—Five-contact Rectifier Radiotron socket for tube No. 14</td>
</tr>
<tr>
<td>11887</td>
<td>Transformer—Power transformer—105-125 volts—25-50 cycles</td>
</tr>
<tr>
<td>11880</td>
<td>Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)</td>
</tr>
<tr>
<td>12051</td>
<td>Capacitor—0.25 mfd. complete with 2-contact male connector for use with motor Stock Nos. 9650 or 9651</td>
</tr>
<tr>
<td>13101</td>
<td>Capacitor—4 mfd. complete with 2-contact male connector for use with motor Stock No. 9735</td>
</tr>
<tr>
<td>4674</td>
<td>Connector—2-contact male connector for capacitor Stock No. 12051 or 13101</td>
</tr>
<tr>
<td>9735</td>
<td>Motor—105-125 volts—25 cycles—(M1)</td>
</tr>
<tr>
<td>9651</td>
<td>Motor—105-125 volts—50 cycles—(M1)</td>
</tr>
<tr>
<td>9650</td>
<td>Motor—105-125 volts—60 cycles—(M1)</td>
</tr>
<tr>
<td>12050</td>
<td>Suspension Spring—Motor mounting spring, washer, and stud assembly—comprising six springs, six cup washers, three spring washers and three studs</td>
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<tr>
<td>11997</td>
<td>Capacitor—75 mfd. (C126)</td>
</tr>
<tr>
<td>12352</td>
<td>Filter—Microphone and pickup input filter pack—(L307, C218, R223) Stock Nos. 4858 (C47), 11273, 4794 (tube 14), 8062, 8061, 9479, 9478, 9477, and 4552, are not used in Model D22-1A</td>
</tr>
</tbody>
</table>

The prices quoted above are subject to change without notice.

**Figure 1**

Schematic Circuit Diagram (Model D22-1A)

**Figure 2**

Pickup Details (D22-1A)

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Figure 4—Radiotron Socket Voltages (D22-1 and D22-1A)
Measured at 115 volts, 60-cycle supply—No signal being received
MODELS U-30 and U-129
Chassis No. RC-335KR, RC-335K

Ten-Tube, Three-Band, Electric Tuning, A-C Victrolas

Frequency Ranges
"Standard Broadcast" (A) .... 540-1,720 kc
"Medium Wave" (B) .... 2,300-7,000 kc
"Short Wave" (C) .... 7,000-22,000 kc

Power Output
Undistorted .... 10 watts
Maximum .... 12 watts

Phonograph
Record Capacity .... Seven ten or twelve inch
Turntable Speed .... 78 R.P.M. (Adjustable)

Speaker
Type .... 12-inch Electrodynamic
Voice Coil Impedance .... 2.2 ohms at 400 cycles

Type Pickup .... Crystal
Pickup Impedance .... 80,000 ohms at 1,000 cycles

Power Supply Rating
A .......... 105-125 volts, 50-60 cycles, 120 watts
A-6 .......... 105-125 volts, 120 watts
B .......... 105-125 volts, 25 cycles, 120 watts
B-2 .......... 105-125 volts, 60 cycles, 120 watts
C .......... 105-130/140-160/200-250 volts, 60 cycles, 120 watts
C-6 .......... 105-130/140-160/200-250 volts, 60 cycles, 120 watts

Radio Only
Total有多少 watts 145
ALIGNMENT PROCEDURE

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore a calibration scale is attached to the rear of the indicator-drive-cord drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in alignment, check the position of the drum. The "0" mark or the drum scale must be vertical and directly over the center of the gang-condenser shaft when the plates are fully meshed. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the "0" mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 330 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Service Data

Loudspeaker.—Centering of the loudspeaker is made in the usual manner with three narrow celluloid or paper feelers after first removing the front dust cover. A dust cover should be cemented in place upon completion of adjustment.

Precautionary Lead Dress.—(1) The lead from the left pilot light should be kept behind the bulb and toward the "Magic Eye," to keep it away from the G1 fuse cap, (2) leads from mica trimmers to coil should be kept away from the coil and other parts, (3) leads on oscillator coil should be kept away from the condenser frame, (4) "0" band series cap C31 must be lead as short as possible, (5) all leads from antenna board to antenna coil should be dressed toward back apron, (6) the most lead of the line cord and the primary lead of the power transformer which runs to the power switch should be twisted together, (7) shielding on leads to Victrola switch should be kept away from the switch terminals and jack.

ADJUSTMENTS

FOR ELECTRIC TUNING

1. Make a list of the desired eight stations, arranged in order from low to high frequencies.

2. Turn range selector to "A" band, turn power on, and allow a few minutes for warming up.

3. Press down the "dial-tuning" (right-hand) button.

4. Manually tune in the first station on the list, using the "Magic Eye" for accurate tuning.

5. Hold down the "dial-tuning" button, and press down station button No. 1 (second from left). Both buttons will stay down. Move adjusting pin No. 1 to the insulating line on the disc at rear of gang. When the pin is correctly centered on the insulating line, the central dial lamp will go out.

6. Press down any other button in order to release the dial-tuning button and station button No. 1. Then press down station button No. 1 again. The electric tuning mechanism will function to tune in the station, and the central dial lamp will stay on.

7. Repeat this process for the remaining stations.

Antenna Connections

RCA Victor Master Antenna Kit.—Connect the twisted-pair transmission line to terminals A1 and A2 on the terminal board at rear of chassis. Connect the counterpoise to A3. Terminal G may be connected to ground, but this connection is not necessary for correct operation.

Noise-Reducing Adjustment.—After the RCA Victor Master Antenna Kit is connected to the receiver, tune the receiver to a point near 900 kc where no station is heard. Turn volume control clockwise until noise is heard. If no noise of a regular character is audible, start any brush-type motor-driven appliance, such as a vacuum cleaner, electric razor, refrigerator, etc., but do not bring it too near the receiver. This will generate noise as a continuous crackling, or buzz. Adjust C5, which is mounted behind the antenna terminal board, to a point where this noise is reduced to a minimum.

Adjustment of the noise reducing trimmer C5 should be made in the customer's home, with the RCA Victor Master Antenna Kit connected to the receiver.

This adjustment is effective only when the RCA Victor Master Antenna Kit is used. For all other types of antennas, the noise-adjustment trimmer C5 should be screwed all the way down.

Other Antennas.—The terminals A1 and A3 on the receiver terminal board as antenna and ground connecting points respectively. Terminal A1 may be connected to terminal G, unless this causes interference, in which case this connection should be omitted.

* Use minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used by turning to 145° (18,000 kc), at which point a weaker signal should be received.

** Use minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used by turning to 145° (18,000 kc), at which point a weaker signal should be received.

† Rock gang condenser and use maximum capacity peak if two peaks can be obtained with C8.
When a station button is pushed in, it completes the 24-volt circuit through the corresponding station-setting contact and one-half of the brass selector disc, which is connected to one side of the motor field coil. This energizes the motor, and the rotor is pulled forward, engaging with the gear train that drives the tuning condenser and selector disc. The condenser and disc rotate until the insulation sleeve under the particular station-setting contact, and the motor circuit is broken.

When the electric tuning mechanism is in action, the motor-supply voltage is led into a diode rectifier circuit which applies a high bias to the first audio amplifier. This prevents audio amplification and makes the set quiet or mute while the mechanism is operating.

The brass selector disc is fastened to the rear shaft of the tuning condenser by means of two set-screws. When the condenser is at maximum (plate fully meshed) the insulation sleeve should be horizontal, with the operating end at the left (viewed from rear). The operating end has dark insulating material and the brass is beveled at this end.

The selector disc should be set so that the contact-tip plungers in the station-setting contacts project not more than 1/16-in. from the body of the contacts.

**Lubrication**
Motor bearings and gear bearings: use light machine oil.
Gear faces: use "Pure Oil No. 611" or petroleum jelly.
Dial-indicator pulleys and shafts: use "Sesame" or petroleum jelly.
Selector disc: apply thin film of petroleum jelly.

This illustration shows connections for a G&A Armcchair Control Unit. This unit is not supplied with the receiver but may be added as an accessory.

**Station-Setting Contacts and Selector Disc**

This arrangement allows the use of only seven of the eight buttons when tuning in stations at the set, but allows the use of the entire eight buttons on the Armchair Control. In operating the G&A Armchair Control the push-button must be held down until the station has been tuned. Care must be taken not to hold two of the station-buttons down at one time as both windings of the motor may be engaged instantaneously causing the motor to be inoperative and overheated.
Automatic Record Changer

GENERAL INFORMATION

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc. are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by turning the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

The turntable, spindle, and pinion gear are assembled by means of a 3/32 inch straight pin. This pin may be removed by gently driving it in the opposite direction.

If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

The 10 and 12 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

A shutting switch, located in the pickup head, operates due to pressure when the pickup is placed on the pickup rest.

ADJUSTMENTS

A. Main Levers.—This lever is basically important in that it interlocks the various individual mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable in the opposite direction and into rubber bumpers (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the turntable is transmitted to the trip pawl "22" by the trip lever "7" through a friction clutch "5". If the motion of the pickup is abruptly accelerated or becomes irregular, the eccentric groove, the trip finger "6" moves the trip pawl "22" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. If the friction should be too strong to prevent slippage, and is adjustable by means of screw "B". If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

C. Pickup Lift Cable Screw.—During the change cycle, lever "16" is actuated by the main lever "15" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "in-cycle" at the point where pickup is raised to the maximum height approximately, and "7" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position and return to the 10 inch position; see that pickup locating lever "17" is tilted fully toward turntable; rotate mechanism through cycle until needle is ready to land on the record; then see that pin "Y" on lever "14" is in contact with "Step T" on lever "17". The distance of landing is 4 1/16 inches from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb the 10 inch pointer "E" and "14" inch pointer "D".

After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever to reject and return to 12 inch position; rotate mechanism through change cycle until pin "Y" on lever "14" touches record landing. The eccentric end of the stud must always be toward the rear of the motor board, otherwise incorrect landing may occur with 10 inch records.

F & G. Record Separating Knife.—The upper plate (knife) "25" on each of the record posts serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record refer to "27" be accurately maintained. The spacing for the 10 inch record is nominally .088 inch, and for the 12 inch record is .096 inch.

To adjust, rotate the knife to the point of maximum vertical separation from the record shelf and turn screw and adjust until the distance is .096 inch. Place horizontal adjustment screw "H". Also, see that levers "7" and "12" are free to move without touching each other.

H. Record Support Shelf.—The record shelf revolves during the change cycle to lower the record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupled to the main lever "15", and it is necessary that adjustments be such that the record is released from both shelves at the same instant. To adjust, place a 12 inch record on the turntable, rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, then loosen screws "H" and shift record soles that the curved inner edges of the shelves are uniformly spaced at 1 inch below record end.

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is in the "in-cycle" position, the lower rod to drop head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the eccentric end adjustment.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" in relation to the main lever "15" governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate. 

Lubrication.— Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, index post bearings, and all other bearings of various levers on underside of motor board.

The felt washer between the turntable and spindle bearing should be used in light engine oil. It is necessary for the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual mis-adjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A".
2. Needle does not land properly on both 10 and 12 inch records—Check "B", "F", "7", "12".
3. Needle does not land properly on 12 inch record but correct on 10 inch—Effect adjustment "E".
4. Failure to trip at end of record—Increase clutch "5" friction by means of screw "B". Also, see that levers "7" and "12" are free to move without touching each other.
5. Pickup strikes lower record of stack or drags across top record on turntable—Adjust lift cable per adjustment "C".
6. Needle does not track after landing—Friction clutch "5" adjustment "B" may be too tight; bind in tone arm vertical bearing; levers "7" and "12" fouled; or pickup output cable twisted.
7. Cycle commences before record is complete—Record is defective, or adjustment "B" of friction clutch "5" is too tight.
8. Wow in record reproduction—Record is defective; flexible coupling between motor and changer mechanism not correctly assembled; or instrument is not being operated at normal room temperature (65°F).
9. Record knives strike edge of records—Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.
10. Record does not release properly—Adjust record shelf assembly in respect to shaft by means of adjustment "H"
11. Needle lands in 10 inch position on 12 inch record or misses record when in play—Increase tension of pickup locating lever spring "94".
### REPLACEMENT PARTS

This list contains genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
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<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
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<tr>
<td>132732</td>
<td>Brake—Flange, front center</td>
<td>$0.80</td>
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<tr>
<td>132733</td>
<td>Brake—Flange, rear center</td>
<td>$0.80</td>
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<tr>
<td>132734</td>
<td>Brake—Flange, front right</td>
<td>$0.80</td>
</tr>
<tr>
<td>132735</td>
<td>Brake—Flange, rear right</td>
<td>$0.80</td>
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<td>132736</td>
<td>Brake—Flange, front left</td>
<td>$0.80</td>
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<tr>
<td>132737</td>
<td>Brake—Flange, rear left</td>
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<td>132738</td>
<td>Brake—Flange, front center, 0.60 model (813)</td>
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<td>Brake—Flange, rear center, 0.60 model (813)</td>
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<td>Brake—Flange, front right, 0.60 model (813)</td>
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<td>132741</td>
<td>Brake—Flange, rear right, 0.60 model (813)</td>
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<td>132742</td>
<td>Brake—Flange, front left, 0.60 model (813)</td>
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<td>132746</td>
<td>Brake—Flange, front right, 0.80 model (1550)</td>
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<td>132749</td>
<td>Brake—Flange, rear left, 0.80 model (1550)</td>
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### MOTOR ASSEMBLIES (0.50 HP)

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<td>Motor—3/4 HP three-phase</td>
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<td>Motor—3/4 HP single-phase</td>
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<td>Motor—1 HP three-phase</td>
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### PICKUP AND ARM ASSEMBLIES

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<td>Pickup arm, field and armature</td>
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<td>Pickup arm, field and armature, 115 volt</td>
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<td>Pickup arm, field and armature, 220 volt</td>
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### MOTORBOARD ASSEMBLIES

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<td>Motorboard—3/4 HP single-phase</td>
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<td>132759</td>
<td>Motorboard—1 HP three-phase</td>
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<tr>
<td>132760</td>
<td>Motorboard—1 HP single-phase</td>
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### MISCELLANEOUS ASSEMBLIES

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<td>Switch—Single-pole toggle</td>
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<td>132762</td>
<td>Switch—Double-pole toggle</td>
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<tr>
<td>132763</td>
<td>Switch—Triple-pole toggle</td>
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**ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.**
**MODEL BT-40**

Chassis No. RC-408

RCA TUBE COMPLEMENT

1. RCA 1A7-G
2. RCA 1N6-G
3. RCA 1N6-G
4. RCA 1C6-G

LOUDSPEAKER

Type: 4-inch permanent-magnet dynamic 1,500 ohms, 8 ohms at 400 cycles

Height 4.5 inches, Width 4.5 inches, Depth 3.4 inches

Cabinet Dimensions (inches): 9 x 9 x 4.31/16

Chassis Base Dimensions (inches): 4.8 x 5.8 x 2.71/2

Weight—Shipping weight: 41 pounds, Net weight: 41 pounds

Tuning Drive Ratio: 1:1 to 1

The RCA Victor Model BT-40 is a table type battery operated radio receiver. It is designed for operation on a combination 110-volt-90-volt A-B Pack Battery.
General Description

Model M50 is a five-tube superheterodyne receiver with loudspeaker and radio chassis in the same case. It is equipped with five push buttons, for tuning your five favorite broadcast stations, as well as the standard method of dial tuning. Adjustments for push button tuning are explained under the heading "Push Button Tuning Mechanism." The receiver is designed to be mounted under the dash panel. The operating controls are integral with the radio and speaker case.

Loudspeaker.—The loudspeaker voice coil should be centered in the usual manner with three narrow paper feelers, after first removing the front dust cover. The dust cover should be cemented back in place with ambroid cement after adjustment has been completed.

Electrical Specifications

**Frequency Range**.......................... 550-1,550 kc
**Power Output**
Type........................................... Pentode
Undistorted................................. 1 watt
Maximum.................................... 3.5 watts
**Dial Lamp**................................. 6-8 volts, 0.2 amp., Mazda 51

**Alignment Frequencies**
I-F............................................... 455 kc
Ant............................................... 600 and 1,400 kc
Osc............................................... No Adjustment
PRELIMINARY:
Output meter connections: Across speaker voice coil
Output meter readings to indicate 1 watt: 1.8 volts
Generator ground lead connections: To chassis
Generator modulation: 30%, 400 cycles
Position of Volume Control: Fully clockwise
Chassis must be in its case with front end removed, when aligning R-F circuit.

**MODEL M50**

<table>
<thead>
<tr>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Dummy Antenna</th>
<th>Generator Connection</th>
<th>Adjustment Symbol</th>
<th>Circuit Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Signal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>550-750 kc</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>6K7 Grid</td>
<td>L-10</td>
<td>2nd I.F. Trans.</td>
</tr>
<tr>
<td>No Signal</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>6A8 Grid</td>
<td>L-8, L-9</td>
<td>1st I.F. Trans.</td>
</tr>
<tr>
<td>1,400 kc</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-3</td>
<td>Ant.</td>
</tr>
<tr>
<td>600 kc</td>
<td>600 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-2</td>
<td>Ant.</td>
</tr>
<tr>
<td>1,400 kc</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-3</td>
<td>Ant.</td>
</tr>
</tbody>
</table>

**NOTE:** No oscillator alignment adjustments are required in this receiver.
† Make the generator connection to the receiver through a shielded lead-in having not more than 50 m.m.f. (.00005) capacity with a male connector attached for connection to antenna socket. If C-2 has been changed, as outlined under "Antenna Circuit," for reason of a high capacity antenna, the Dummy Antenna should be the same value as the antenna itself.
* Re-adjust C-3 after installation as outlined under "Antenna Circuit".

Alignment adjustment locations are shown on the top and bottom parts location views of chassis.
Only the dummy antenna indicated in the chart for any particular frequency should be used. Grid cap leads should remain in place during alignment.
Oscillator circuit alignment is not required in this receiver at either end of the band; the oscillator coil is pre-adjusted for inductance in the factory.

Since the oscillator coil is unshielded, the case has some effect on its inductance. Therefore alignment must be done either with the chassis in the case or with a steel plate (covering the bottom of chassis), substituting for the case.

**MODEL M60**

<table>
<thead>
<tr>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Dummy Antenna</th>
<th>Generator Connection</th>
<th>Adjustment Symbol</th>
<th>Circuit Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Signal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>550-750 kc</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>6K7 I.F. Grid</td>
<td>L-10, L-11</td>
<td>2nd I.F. Trans.</td>
</tr>
<tr>
<td>No Signal</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>6A8 Grid</td>
<td>L-8, L-9</td>
<td>1st I.F. Trans.</td>
</tr>
<tr>
<td>Rock Through 600 kc</td>
<td>600 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>L-7</td>
<td>Osc.</td>
</tr>
<tr>
<td>1,400 kc **</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-5</td>
<td>Det.</td>
</tr>
<tr>
<td>1,400 kc **</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-3</td>
<td>Ant.</td>
</tr>
<tr>
<td>Rock Through 600 kc</td>
<td>600 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>L-7</td>
<td>Osc.</td>
</tr>
<tr>
<td>1,400 kc **</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-5</td>
<td>Det.</td>
</tr>
<tr>
<td>1,400 kc **</td>
<td>1,400 kc</td>
<td>.0001 mfd. †</td>
<td>Ant. Lead</td>
<td>C-3</td>
<td>Ant.</td>
</tr>
</tbody>
</table>

† Make the generator connection to the receiver through a shielded lead-in having not more than 50 m.m.f. (.00005) capacity with a male connector attached for connection to antenna socket. If a capacitor has been added in series with the lead from antenna filter L-1 to the antenna coil, as outlined under "Antenna Circuit," for reason of a high capacity antenna, the Dummy Antenna should be the same value as the antenna itself.
* Re-adjust C-3 after installation as outlined under "Antenna Circuit".

Each step of the alignment should be repeated in its original order for greater accuracy. Always keep the output from the generator at its lowest possible value, to prevent the A.V.C. action of the receiver from interfering with accurate alignment.
Alignment adjustment locations are shown on the top and bottom parts location views of chassis.
Only the dummy antenna indicated in the chart for any particular frequency should be used. Grid cap leads should remain in place during alignment.

**OSCILLATOR CIRCUIT**
A magnetite core is used to provide temperature stability. The conventional high frequency trimmer has been replaced with a fixed temperature-compensating capacitor (C-12) which determines the high frequency range. Since the inductance of L-7 is adjustable, the conventional series trimmer has been replaced with a fixed capacitor (C-10). C-10 is a special capacitor having zero temperature coefficient to provide for oscillator stability in the low frequency range. Alignment of the receiver for 600 kc is accomplished by adjusting L-7 to the antenna and det circuits (gang condenser must be rocked while making this adjustment). The 1,400 kc alignment is accomplished by adjusting the antenna and the det trimmers (C-3 and C-5) to the oscillator.
Antenna Circuit

The antenna circuit is designed to work with a low capacity antenna having a total capacity including the shielded lead-in not to exceed 150 mfd. If larger antennas, such as screened top or a double under the running-board having a total capacity of 200 to 500 mfd, is to be used, it will be necessary to reduce the value of the antenna coupling capacitor C-2 from .01 to approximately 200 mfd. (0002). For even larger antennas such as insulated steel tops, a correspondingly smaller value of C-2 (approximately 125 to 150 mfd.) should be used keeping in mind to use the largest value possible with which the antenna circuit can be aligned.

M50

The antenna circuit is designed to work with an antenna having a total capacity including the shielded lead-in not to exceed 150 mfd. If an antenna having a larger capacity is to be used, it will be necessary to add a capacitor in series with the lead from antenna filter L-1 to the antenna coil terminal (“A”). Where a "Double Under the Running Board" type of antenna is to be used having a capacity of approximately 200 mfd. the capacitor added should be approximately 300 mfd. The insulated running board type having an approximate capacity of 350 mfd. will require a capacitor of approximately 200 mfd. Carea using an insulated steel top of approximately 3,500 mfd. will require a series capacitor of 150 mfd.

M50 M60

After installation, and with antenna connected, tune in a weak station near 1,400 kc and adjust compensator trimmer (C-3) for maximum signal output. This trimmer is accessible by prying off the nameplate between the control knobs.

Antenna Filter

A filter is included in the antenna circuit. Being completely shielded, it prevents radiating ignition interference within the set. It also reduces the possibility of picking up vibrator interference. The filter unit is mounted inside a steel shell which in turn is welded to the chassis. The shielded antenna lead-in makes contact with the filter unit within the steel shell and is held in place by a bayonet type connector.

Push-Button Tuning Mechanism

The push button tuning mechanism used in this receiver is of the mechanical type, wherein the movement of the button actually turns the tuning condenser to any pre-determined setting. The movement is actuated thru a Push Arm, Cam, Rocker Plate and Sector Gear, which meshes with a Scissors Gear directly fastened to the tuning condenser shaft. The scissors gear prevents backlash between the sector gear and the tuning condenser. Since the sector gear is mounted directly on the rocker plate shaft, the position of the rocker plate will accurately determine the position of the tuning condenser.

Setting Up Stations

The push buttons should be adjusted for five favorite stations after the receiver is installed and operating.

Any standard broadcast stations may be chosen. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:
1. Loosen the push buttons one-half turn.
2. Using the tuning control, accurately tune in the first station.

Adjustments

The mechanism should be adjusted so that when using either manual or push-button tuning, it operates positively and without backlash or bind. The following hints will be found helpful in adjusting the mechanism properly:
1. With the gang condenser in full mesh, the sector gear should have the two end teeth fully meshed in the scissors gear.
2. The position of the sector gear on the rocker-plate shaft should be adjusted so that there is clearance between the rocker-plates and the frame of the push-button mechanism at both extremities of gang rotation. Thus correct adjustment prevents the rotation of the gang being limited by the rocker plates touching the frame.
3. The drive cord should have 90⁰ turns around the tuning shaft as shown in the illustration. Three degrees of adjustment of the tension on the drive cord may be obtained by use of the three positions for connecting the drive-cord tension spring to the drive-cord drum on the condenser shaft as shown.
4. The push-arms, rocker-plate shaft, and pulleys should be lubricated with light grease (sparingly). Care should be taken to keep the lubricant off the drive cord.

Manual Tuning

A manual tuning knob is provided so that additional stations may be tuned in as desired. The manual tuning shaft is connected thru a cord drive to a drum on the rocker plate shaft. This same cord drives the dial drum by passing over a pulley on the drum shaft. A sketch shows the complete cord drive assembly and the correct number of turns which the cord should be wrapped around the drive shaft and dial drum pulley. Stops are provided on the dial so that dial scale adjustment is made by tuning the set to the extreme ends of the band.
<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>3584</td>
<td>R.P. coil, retaining ring</td>
<td>.50</td>
</tr>
<tr>
<td>31430</td>
<td>Socket—Dial lamp socket</td>
<td>.25</td>
</tr>
<tr>
<td>31431</td>
<td>Socket—Tube socket</td>
<td>.25</td>
</tr>
<tr>
<td>31860</td>
<td>Socket—Vibrator socket</td>
<td>.25</td>
</tr>
<tr>
<td>31963</td>
<td>Transformer—First 14 transformer (L1, L2)</td>
<td>1.90</td>
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<tr>
<td>31594</td>
<td>Transformer—Second 14 transformer (L1, L2)</td>
<td>1.95</td>
</tr>
<tr>
<td>31979</td>
<td>Transformer—Output transformer (T)</td>
<td>4.50</td>
</tr>
<tr>
<td>31885</td>
<td>Vibration—Plug-in transformer (L1, L2)</td>
<td>2.50</td>
</tr>
<tr>
<td>31833</td>
<td>Volume control and power switch (R8, S1)</td>
<td>1.50</td>
</tr>
</tbody>
</table>

**MODELS M-50, M-60 SPEAKER ASSEMBLIES**

- Cone—Speaker cone and voice coil (L1, L2) | 1.90
- Speaker—Complete with knob and spring | 4.40
- Speaker—Output transformer | 1.40

**MODELS M-50**

- Cone—Speaker cone and voice coil (L1, L2) | 1.90
- Speaker—Complete with knob and spring | 4.40
- Transformer—Output transformer | 1.40

**MODELS M-60**

- Button—Push button | 1.40
- Col—Antenna coil—less shield (L1) | 1.80
- Condenser—5-gang variable (C1, C2, C3, C4) | 5.60
- Condenser—5-gang variable (C1, C2, C3, C4) | 5.60

**MODELS M-50, M-60**

- Cord—Variable condenser drive cord | .10
- Drum—Indicator drum assembly | .40
- Gear—Variable condenser drive gear sector, fastens on cam shaft | .20
- Bracket—Mechanism—Comprising 5 push arms, cam, cam plate, and mounting bracket—less variable condenser | 7.00
- Push—Indicator drum pulley | .10
- Pulley—Pulley for indicator drum brackets | .10
- Ring—Retaining ring for antenna coil | .03
- Ring—Dial lamp pulley | .02
- Screw—No. 0-32 x 1/4, set screw for antenna coil Stock No. 31693 | .02
- Screw—No. 6-32 x 1/4, set screw for antenna coil Stock No. 31693 | .02
- Spring—Variable condenser drive cord tension spring | .05
- Washer—Washer for knob shaft | .03
- Washer—Washer for knob pulley Stock No. 31697 | .01

**MISCELLANEOUS ASSEMBLIES**

- Body—Fuse holder body for transistor lead over | .03
- Cap—Cap-Style Radio cap only | .01
- Clip—Spring clip for ammeter lead | .08
- Covers—Engraved cellulosic cover letter markers | .03
- Dial—Dial scale and holder | .03
- Dial—Dial scale and holder | .03
- Faceplate—Rushing and tenon for fuse holder | .03
- Fuse—15 amp | .03
- Insulator—Insulating sleeve for fuse holder Stock No. 31699 | .03
- Lead—Antenna lead complete with clip and fuse holder | .03
- Markers—One set call letter markers for push buttons Stock No. 31699 | .05
- Mounting—Completely mounted brackets, knobs, washers, screws, bolts, nuts | .05
- Plate—Name plate | .40
- Spring—Retaining spring for fuse holder | .03
- Spring—Retaining spring for fuse holder | .03
- Suppressor—Distributor suppressor | .03

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Model U50, Chassis RC-14C

Speaker Connections

RCA MFG. CO., INC.

Switch Mechanism, Parts

Connections and Colors of Speaker and Cable

Phonograph Motor

Replacement Parts

(Shown with pickup in rest position)

-.60

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RCA MFG. CO., INC.

MODEL U50, Chas. RC-414C
Schematic, Voltage
R-F Chassis Wiring

IF PEAK 455 KC

CATHODE CURRENTS

-1939 No. 15-

RF WIRING DIAGRAM AND SOCKET VOLTAGES

- NOTE: Values with star (*) are operating voltages in circuits
  with high series resistance. The actual measured voltages will be
  lower, depending on the voltmeter loading.

Frequency Ranges

Standard Broadcast (A) 540-1700 kc (555-174 m)
Medium Wave (B) 2.3-7.0 mc (130-420 m)
Short Wave (C) 10.0-23 mc (438.138 m)
Intermediate Frequency 455 kc

All heaters 6.3 VAC, except 6Y5G, 6CVAC.

First Edition

© John P. Rider Publishers
The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the bottom modification scale to the same point on the top calibration scale. For example, 33° on the calibration scale corresponds to approximately 7.25 cm on "C" band, and 660 cm on "A" band, etc. Read instructions under "Alignment Procedure."

**PILOT LAMP (1)***

Mazda No. 44, 6.3 volts, 0.35 amp.

**Power Output Rating**

Undistorted - 2.0 watts

Maximum - 3.5 watts

**Power Supply Ratings**

Rating A - 100-120 volts, 50-60 cycles, 10 watts

**LOUDSPEAKER (84004-1)**

Type - 8-inch electrodynamic

Voice Coil Impedance - 9.3 ohms at 400 cycles

---

**Steps**

<table>
<thead>
<tr>
<th>Connect the high side of test-osc. to-</th>
<th>Tune test-osc. to-</th>
<th>Turn radio dial to-</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 I-F grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>&quot;A&quot; Band quiet point between 550-750 kc</td>
</tr>
<tr>
<td>2</td>
<td>Tuning condenser stat. (osc.) in series with .01 mfd. **</td>
<td>455 kc</td>
<td>&quot;A&quot; Band quiet point between 550-750 kc</td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead in series with 200 mmd.</td>
<td>600 kc</td>
<td>600 kc (33°)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna lead in series with 500 ohms</td>
<td>1,500 kc</td>
<td>1,500 kc (155.4°)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antenna lead in series with 500 ohms</td>
<td>90 mc</td>
<td>90 mc (155.4°)</td>
</tr>
<tr>
<td>7</td>
<td>Antenna lead in series with 500 ohms</td>
<td>6 mc</td>
<td>5 mc (140°)</td>
</tr>
<tr>
<td>8</td>
<td>Antenna lead in series with 500 ohms</td>
<td>1,500 kc</td>
<td>1,500 kc (155.4°)</td>
</tr>
</tbody>
</table>

* The minimum capacity peak if two peaks can be obtained

† Rock gang condenser slightly while adjusting L10.

** Make test-oscillator connection to log on tuning condenser stat (oscillator section) in series with .01 mfd. condenser.

---

**Phonograph Mechanism:**

The phonograph motor is a self-starting, constant-speed induction type. It should be lubricated every six months by applying a few drops of light machine oil to the spindle bearing and oil hole.

The motor spindle is tapered, and a conical rubber piece fits snugly on the spindle. The hole in the turntable bushing is tapered to fit the rubber. This provides an excellent self-centering floating mounting.

A metal washer is placed on the spindle under the rubber piece. The washer has ears on the under side which fit over a pin that projects through the spindle.

The motor switch is automatic for both starting and stopping, and when properly adjusted, will turn the motor on as the pickup is moved from the pickup rest toward the turntable. The switch should be adjusted so that it will snap into the rest position when the pickup needle is 1.1 inches from the center line of the spindle.

---

**Arrangement of Drive Cord for Tuning Condenser and Dial Indicator:**

Drum shown with Gang at Maximum Capacity.

The motor may be shut off at any time by placing the switch on the pickup rest.

**Power-Line Antenna:**

At the back of the motorboard is a terminal board for antenna and ground connections. When it is desired to use the power-line antenna, a jumper should be placed across the two outside binding posts, thus connecting the antenna input of the receiver through a capacitor to the power line. The center binding-post is for ground connection. When an external antenna is used, it should be connected to the post marked "ANT.*"

**Provisionary Lead Drum:**

1. Lead from 2nd I-F transformer to volume control should be kept close to the chassis and dressed against front apron.

2. C-10 should be dressed away from the antenna section of the variable condenser (C-1).
General Description

Model M60 is a six-tube superheterodyne receiver with loudspeaker and radio chassis in the same case. It is equipped with five push buttons, for tuning your five favorite broadcast stations, as well as the standard method of dial tuning. Adjustments for push button tuning are explained under the heading "Push Button Tuning Mechanism." The receiver is designed to be mounted under the dash panel. The operating controls are integral with the radio and speaker case.

Loudspeaker—The loudspeaker voice coil should be centered in the usual manner with three narrow paper feelers, after first removing the front dust cover. The dust cover should be cemented back in place with ambroid cement after adjustment has been completed.

Alignment Frequencies

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 kc</td>
<td>I-F</td>
</tr>
<tr>
<td>1,400 kc</td>
<td>Antenna</td>
</tr>
<tr>
<td>1,400 kc</td>
<td>R-F</td>
</tr>
<tr>
<td>600 kc</td>
<td>Oscillator</td>
</tr>
</tbody>
</table>

Tubes and Functions

1. RCA-6K7: R-F Amplifier
2. RCA-6AS: First Detector-Oscillator
3. RCA-6K7: 1-F Amplifier
4. RCA-6Q7: Second Detector, A-F Amplifier, and A.V.C.
5. RCA-6K6GT: Output
6. RCA-0Z4G: Rectifier

Bottom View of Chassis

Bottom View of Parts and Socket Voltages

(Measured at 6.3 volts battery supply—Volume control minimum—No signal input—)

To duplicate the conditions under which the above voltages were measured requires a 1,000-ohm-per-volt d-c meter having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the indicated voltage value. Each value should hold within ± 20% when the receiver is normally operative at its rated battery voltage.
MODEL 1170, Chassis RC-394
Voltage, Chassis Wiring
Tuner Data

RCA MFG. CO., INC.

BOTTOM VIEW
Receiver Unit Parts and Socket Voltages

RECEIVER CASE DIMENSIONS
Height, 2 1/2 inches; Width, 5 3/4 inches; Depth, 9 1/2 inches

SPEAKER CASE DIMENSIONS
Diameter, 9 1/2 inches; Depth, 5 inches

OPERATING CONTROLS... (Left)—(Plastic Knob) Power Volume; (Wing Knob) Tone; (Center)—Five Station Push Buttons; (Right)—Manual Tuning; Ratio 7 1/4 : 1.

WEIGHT
Net, 20 pounds; Shipping, 22 pounds

Adjustment of Push-Button Mechanism

The mechanism should be adjusted so that when using either manual or push-button tuning, it operates positively and without backlash or bind. The following hints will be found helpful in adjusting the mechanism properly.

1. With the gang condenser in full mesh, the sector gear should have the two end teeth fully meshed in the sector gear, as shown in the illustration.

2. The position of the sector gear on the rocker-plate shaft should be adjusted so that there is clearance between the rocker-plates and the frame of the push-button mechanism at both extremities of gang rotation. Thus correct adjustment prevents the rotation of the gang being limited by the rocker plates touching the frame.

3. The drive cord should have 3 1/2 turns around the tuning shaft as shown in the illustration. Three degrees of adjustment of the tension on the drive cord may be obtained by use of the three positions for connecting the drive-cord-tension spring to the drive-cord drum on the condenser shaft as shown.

4. The push-arms, rocker-plate shaft, and pulleys should be lubricated with light grease (sparingly). Care should be taken to keep the lubricant off of the drive cord.

Power Unit Parts and Socket Voltages

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### Alignment Procedure

**Test Oscillator.** For all alignment operations, connect the low side of the test oscillator to the receiver chassis, and keep the output signal as low as possible to avoid a-v-c action.

**Cathode-Ray Alignment** is the preferable method. Connections for the oscillograph are as follows: Vertical “H1” to terminal “C” on 2nd I-F transformer; vertical “O” to chassis.

**Output Meter.** Connect the output meter across the speaker voice coil and turn the receiver volume control to maximum (fully clockwise) and tone control to middle of range.

**Dial Calibration.** Rotate the gang condenser to its fullmesh (maximum-capacity) position and then adjust dial scale so that the pointer is aligned to the last calibration mark at the low-frequency end of the scale.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc to</th>
<th>Tune test-osc to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 1-F grid (No. 4 pin) in series with .01 mfd.</td>
<td>260 kc</td>
<td>No Signal 560-760 kc</td>
<td>L10 and L11 (2nd I-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6A8 Det. grid cap in series with .01 mfd.</td>
<td>360 kc</td>
<td>L9 and L8 (1st I-F Trans.)</td>
<td></td>
</tr>
<tr>
<td>3 †</td>
<td>* Ant. connector in series with 60 mmdf.</td>
<td>600 kc</td>
<td>600 kc</td>
<td>L7 (osc.)</td>
</tr>
<tr>
<td>4 †</td>
<td>* Ant. connector in series with 60 mmdf.</td>
<td>1,400 kc</td>
<td>1,400 kc</td>
<td>C7 (det.) C1 (ant.)</td>
</tr>
<tr>
<td>5 †</td>
<td>* Ant. connector in series with 60 mmdf.</td>
<td>600 kc</td>
<td>800 kc (rock)</td>
<td>L7 (osc.)</td>
</tr>
<tr>
<td>6 †</td>
<td>* Ant. connector in series with 60 mmdf.</td>
<td>1,400 kc</td>
<td>1,400 kc</td>
<td>C7 (det.) C1 (ant.) **</td>
</tr>
</tbody>
</table>

*Note 1.—This 60 mmdf. capacitor must be inserted at the antenna connector of the receiver. The lead from the test oscillator to the 60 mmdf. capacitor may be shielded if desired, but no shielding should be used between capacitor and antenna connector.

† Note 2.—These adjustments should be made with unit enclosed in its shielded case, through holes provided for adjustment purposes.

**Note 3.—Final adjustment of C1 must be made after the receiver has been installed and the antenna connected. See “Antenna Circuit.”**

### Antenna Circuit

It is very important that these instructions be followed when installing the M-70 receiver.

The antenna circuit is designed to work with an antenna having a total capacity including the shielded lead-in not to exceed 150 mmdf. If an antenna having a larger capacity is to be used, it will be necessary to add a capacitor in series with the lead from the antenna filter L1 to the antenna coil terminal (“A”). Where a “Double Under the Running Board” type of antenna is to be used having a capacity of approximately 200 mmdf, the capacitor added should be approximately 500 mmdf. The insulated running board type having an approximate capacity of 500 mmdf will require a capacitor of approximately 150 mmdf. Cars using an insulated

### Push Button Adjustment

The push buttons should be adjusted for five favorite stations after the receiver is installed and operating.

Any standard broadcast stations may be chosen. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push buttons one-half turn.
2. Using the tuning control, accurately tune in the first station.
3. With station accurately tuned in, press the first push button fully in and then gently release so as not to jar mechanism.
4. Tighten the push button securely with fingers. Do not force with pliers.
5. Proceed in same manner to adjust the other four push buttons.

### Diagram

```
| C8 | G10 | C3 |
```

**Receiver Unit, Tubes and Trimmers**

**Turn Free Gear Clockwise One Tooth to Obtain Scissor Action Before Meshing Gear Sector**

**Driver Cord Hookup**
Alignment Procedure

1. Connect the high side of the test oscillator to the radio dial to:

<table>
<thead>
<tr>
<th>Step</th>
<th>Tune Test-Osc.</th>
<th>Turn Radio Dial To</th>
<th>Adjust the Following for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>1N5-G 1st grid cap. in series with 0.01 mfd.</td>
<td>455 kc</td>
<td>L7 and L8 (2nd I-F transformer)</td>
</tr>
<tr>
<td>No. 2</td>
<td>1AT-G 1st det. grid cap. in series with 0.01 mfd.</td>
<td>455 kc</td>
<td>L5 and L6 (1st I-F transformer)</td>
</tr>
<tr>
<td>No. 3</td>
<td>Antenna lead, in series with 200 mmd.</td>
<td>600 kc</td>
<td>L4 (oscillator) L3 (antenna)</td>
</tr>
<tr>
<td>No. 4</td>
<td>Antenna lead, in series with 200 mmd.</td>
<td>1,500 kc</td>
<td>C16 (oscillator) C9 (antenna)</td>
</tr>
</tbody>
</table>

† Trimmer C16 on gang condenser should be unscrewed one complete turn from tight before adjusting C16.

Precautionary Lead Dress

1. Red lead from second i-f transformer to screen terminal of 1N5-G must be dressed close to and along edge of chassis.
2. Twisted green wire from antenna coil to gang must be 9 turns and kept clear of rotor.
3. Blue and green leads to volume control must be dressed close to chassis and between gang and front apron.

Electrical and Mechanical Specifications

Power Output

<table>
<thead>
<tr>
<th>Undistorted</th>
<th>0.115 watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>0.290 watt</td>
</tr>
</tbody>
</table>

Loudspeaker

<table>
<thead>
<tr>
<th>Type</th>
<th>Permanent Magnet Dynamic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>94BK1, 6 inches; 94BT1, 5 inches</td>
</tr>
<tr>
<td>Voice Coil Impedance</td>
<td>3 ohms at 400 cycles</td>
</tr>
<tr>
<td>Cabinet Dimensions (94BT1)</td>
<td>128 in. x 108 in. x 61 in.</td>
</tr>
<tr>
<td>Cabinet Dimensions (94BK1)</td>
<td>87 in. x 83 in. x 51 in.</td>
</tr>
<tr>
<td>Chassis Base Dimensions</td>
<td>5 in. x 98 in. x 51 in.</td>
</tr>
<tr>
<td>Overall Chassis Height</td>
<td>6 in.</td>
</tr>
<tr>
<td>Weight (94BK1)</td>
<td>62 lbs. net; 85 lbs. shipping</td>
</tr>
<tr>
<td>Weight (94BT1)</td>
<td>94 lbs. net; 123 lbs. shipping</td>
</tr>
<tr>
<td>Operating Controls</td>
<td>(1) Power Switch—Volume; (2) Tuning</td>
</tr>
<tr>
<td>Tuning Drive Ratio</td>
<td>9:1</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>840 to 1,720 kc</td>
</tr>
<tr>
<td>RF Alignment Frequencies</td>
<td>600 kc (osc. ant.), 1,600 kc (osc. ant.)</td>
</tr>
<tr>
<td>Interim Frequency</td>
<td>455 kc</td>
</tr>
</tbody>
</table>

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Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown on the chassis drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the chassis, and keep the output as low as possible to avoid a-c action.

Calibration Marks.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment. Therefore calibration marks corresponding to dial readings of 600 kc, 1,500 kc, and 3,500 kc have been stamped in the plate on the front of the chassis as shown in the accompanying drawing. These marks are used for reference during alignment.

Dial Indicator Adjustment.—With the gang condenser in full mesh, the indicator should point to the extreme left (low frequency) mark on the dial scale.

For additional details, refer to booklet "RCA Victor Receiver Alignment".

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the High Side of Test Oscillator to</th>
<th>Tune Test Oscillator</th>
<th>Push Button</th>
<th>Turn Radio Dial to:</th>
<th>Adjust for Maximum Peak Output:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1N5-G or 1-P grid cap in series with .01 mfd.</td>
<td>655 kc</td>
<td>B.C. (5)</td>
<td></td>
<td>L19 and L14 (2nd I-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1A7-G Det. grid cap in series with .01 mfd.</td>
<td>655 kc</td>
<td>B.C. (5)</td>
<td></td>
<td>L11 and L12 (1st I-F Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>No. 4</td>
<td>550—750</td>
<td>L29-L29 (No. 4 Push Button Adj.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>600 kc</td>
<td>No. 1</td>
<td></td>
<td>L30-L30 (No. 4 Push Button Adj.)</td>
</tr>
<tr>
<td>5</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>No. 4</td>
<td></td>
<td>L31-L31 (No. 4 Push Button Adj.)</td>
</tr>
<tr>
<td>6</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>600 kc</td>
<td>No. 1</td>
<td></td>
<td>L32-L32 (No. 4 Push Button Adj.)</td>
</tr>
<tr>
<td>7</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>B.C. (5)</td>
<td>1,000 kc Cal. Mark</td>
<td>C30 (osc.) C6 (ant.)</td>
</tr>
<tr>
<td>8</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>600 kc</td>
<td>B.C. (5)</td>
<td>600 kc Cal. Mark</td>
<td>L4 (osc.) L4 (ant.)</td>
</tr>
<tr>
<td>9</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>B.C. (5)</td>
<td>1,000 kc Cal. Mark</td>
<td>C30 (osc.) C6 (ant.)</td>
</tr>
<tr>
<td>10</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>15.8 mc</td>
<td>B.W. (4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adjust L33—L29 (No. 1 push button adjustment) and L5 at the same time, rocking in for maximum signal.

** Use maximum capacity peak if two peaks can be obtained, rock in for maximum signal. A weaker signal (image) should be received about one-quarter inch to the left on the dial plate.

F If two signals are received, set the dial to the higher frequency (right hand) position.

Tube and Trimmer Locations

Note: The oscillator tracks 455 kc above the signal on all bands. After the receiver has been installed and the antenna connected, it is sometimes advisable to make a slight change in the adjustment of the antenna trimmer, C2. In most cases it is desirable to make this adjustment while receiving a station on No. 4 push button. However, if a station received on one of the other buttons is especially weak, it may be advisable to make the adjustment while receiving the weak station on this button.

Precautionary Lead Dress

1. Green lead to first detector grid cap should be pulled out of the chassis as far as possible, and dressed away from the tube envelope.
2. Blue lead from push button switch to gang condenser must be dressed over the top of the switch.
3. Leads to push button coils must be dressed close to the coils.
4. Red and blue leads to gang condenser must be dressed away from chassis.
5. Blue antenna lead must be dressed in the end of the chassis away from gang leads and coil windings.
**Adjustments for Electric Tuning**

These models have six push buttons. The right-hand button connects the receiver for dial tuning on the "Short-wave" band, the next button connects for dial tuning on the "Standard-broadcast" band, and the other four buttons are for electric tuning of four different stations in the standard-broadcast band. Each station button connects separate oscillator and antenna coils which are tandem-tuned by ganged magnetite cores, and may be adjusted for the desired station. Use a small screwdriver or alignment tool such as RCA Stock No. 31051. Allow at least five minutes warm-up period before making adjustments. Use a regular antenna for the preliminary adjustments.

The procedure is as follows:

1. Make a list of the four desired stations, arranged in order from low to high frequencies.

2. Push in the broadcast dial tuning button (second from right), and manually tune in the first station on the list.

3. Push in station button No. 1 (left-hand) and adjust No. 1 push button adjustment screw and mounting nut.

4. Adjust each of the remaining three stations in the same manner. (Clockwise adjustment of the screw turns the circuits to lower frequency, and counter-clockwise increases the frequency.)

5. "After installation, and with antenna properly connected, re-adjust C2 as outlined in Note under "Alignment Procedure."

**REPLACEMENT PARTS**

Insist on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4899</td>
<td>Screw—No. 8-32 square head set screw from drum</td>
<td>.05</td>
</tr>
<tr>
<td>32281</td>
<td>Screw—Push button oscillator coil adjustment screw and mounting nut</td>
<td>.05</td>
</tr>
<tr>
<td>32285</td>
<td>Shaft—Tuning knob shaft</td>
<td>.05</td>
</tr>
<tr>
<td>32149</td>
<td>Shield—Tubular shield</td>
<td>.05</td>
</tr>
<tr>
<td>32151</td>
<td>Socket—Tube socket</td>
<td>.05</td>
</tr>
<tr>
<td>32481</td>
<td>Spring—Drive spring (L12)</td>
<td>.05</td>
</tr>
<tr>
<td>12007</td>
<td>Spring—Retaining spring for oscillator coil adjustment screw</td>
<td>.05</td>
</tr>
<tr>
<td>32255</td>
<td>Switch—Push button switch (S19, S19, S18)</td>
<td>.25</td>
</tr>
<tr>
<td>32953</td>
<td>Switch—Tone control switch (S39)</td>
<td>.25</td>
</tr>
<tr>
<td>32953</td>
<td>Transformer—First I.F. transformer (L12, L13, C17, C18)</td>
<td>.25</td>
</tr>
<tr>
<td>32953</td>
<td>Transformer—Second I.F. transformer (L13, L14, C19, C20, 841)</td>
<td>.25</td>
</tr>
<tr>
<td>32953</td>
<td>Volume control and power switch (RS, B1, B2)</td>
<td>.25</td>
</tr>
</tbody>
</table>

**SPEAKER ASSEMBLIES**

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32971</td>
<td>Cone—Speaker cone and voice coil (L18)</td>
<td>1.70</td>
</tr>
<tr>
<td>5118</td>
<td>Plug—3-contact male for speaker</td>
<td>.25</td>
</tr>
<tr>
<td>32973</td>
<td>Speaker complete</td>
<td>6.00</td>
</tr>
<tr>
<td>32973</td>
<td>Transformer—Output transformer (T1)</td>
<td>1.85</td>
</tr>
</tbody>
</table>

**SPEAKER ASSEMBLIES (84477-1)**

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32974</td>
<td>Cone—Speaker cone and voice coil (L18)</td>
<td>1.80</td>
</tr>
<tr>
<td>5118</td>
<td>Plug—3-contact male for speaker</td>
<td>.25</td>
</tr>
<tr>
<td>32973</td>
<td>Speaker complete</td>
<td>7.25</td>
</tr>
<tr>
<td>32973</td>
<td>Transformer—Output transformer (T1)</td>
<td>1.85</td>
</tr>
</tbody>
</table>

**MISCELLANEOUS ASSEMBLIES**

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32978</td>
<td>Button—Push button</td>
<td>.04</td>
</tr>
<tr>
<td>31358</td>
<td>Clip—Spring clip to hold dial scale</td>
<td>.10</td>
</tr>
<tr>
<td>32978</td>
<td>Dial—Dial scale (gaga)</td>
<td>.25</td>
</tr>
<tr>
<td>32977</td>
<td>Escutcheon—Dial escutcheon and crystal</td>
<td>1.50</td>
</tr>
<tr>
<td>32978</td>
<td>Escutcheon—Push button escutcheon</td>
<td>.75</td>
</tr>
<tr>
<td>31361</td>
<td>Knob—Station selector or volume control knob</td>
<td>.50</td>
</tr>
<tr>
<td>32381</td>
<td>Marker—&quot;Broadcast&quot; marker</td>
<td>.02</td>
</tr>
<tr>
<td>32380</td>
<td>Marker—Push button escutcheon</td>
<td>.02</td>
</tr>
<tr>
<td>32380</td>
<td>Marker—&quot;Short Wave&quot; marker</td>
<td>.02</td>
</tr>
<tr>
<td>14267</td>
<td>Screw—Chassis mounting screw and washer (4)</td>
<td>.04</td>
</tr>
<tr>
<td>50467</td>
<td>Screw—Chassis mounting screw and washer (4)</td>
<td>.05</td>
</tr>
<tr>
<td>32973</td>
<td>Spring—Retaining spring for knob</td>
<td>.05</td>
</tr>
</tbody>
</table>
Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-oscillator.—For all alignment operations, keep the output as low as possible to avoid a-v-c action.

Pre-setting Dial.—With gang condenser in full mesh, the pointer should be horizontal.

Precautionary Lead Dress.—
1. Dress speaker leads down to chassis.
2. The green lead from the loop to the antenna section of the gang should be dressed between the output and detector tube shields and pulled toward the far corner of the loop by means of the rubber band.
3. The spiral shield on the 1N5-A.F. grid lead should be brought as close as possible to the grid cap.
4. Leads to the high side and tap of the volume control should be dressed down to the chassis and away from the output tube plate lead.

Antenna.—An antenna and ground may be connected to “A” and “G” at bottom of cabinet. If metal length of antenna and lead-in is more than 150 feet, connect a 300 mmd capacitor in series with lead-in.

Alignment Procedure

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to—</th>
<th>Tune test-osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1N5-G grid cap, in series with .001 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 550-750 kc</td>
<td>L5 and L6 (2nd L-F transformer)</td>
</tr>
<tr>
<td>2</td>
<td>1A7-G grid cap, in series with .001 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 550-750 kc</td>
<td>L3 and L4 (1st L-F transformer)</td>
</tr>
<tr>
<td>3</td>
<td>Assemble chassis and batteries in correct position in cabinet, and fasten rear cover (loop) in place while making the following adjustments, which are accessible through holes in the bottom of the cabinet.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal, in series with 200 mfd. Connect low side of test-osc. to “G” term.</td>
<td>1600 kc</td>
<td>1500 kc*</td>
<td>C17 (osc.) C1 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal, in series with 200 mfd. Connect low side of test-osc. to “G” term.</td>
<td>600 kc</td>
<td>600 kc*</td>
<td>L2 (osc.) Rock in</td>
</tr>
</tbody>
</table>

* Use bottom of “F” in “150” for 1500 kc calibration point, and use center of “G” in “60” for 600 kc calibration point.
### Specifications and Replacement Parts

**LOUDSPEAKER**
- **Type:** 5-inch permanent-magnet dynamic
- **Voice coil impedance:** 2.2 ohms at 400 cycles

**Cabinet Dimensions (inches):**
- Width: 71
- Depth: 14
- Height: 8

**Chassis Base Dimensions (inches):**
- Width: 71
- Depth: 2

**Overall Chassis Height:** 93 inches

**Weight—Shipping weight, less batteries:** 13 pounds

**Net weight, with batteries:** 16 pounds

**Tuning Drive Ratio:** 8 to 1

---

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32292</td>
<td>Bracket—Dial bracket</td>
<td>1.50</td>
<td>12879</td>
<td>Resistor—2.2 meg., 1/2 watt (R9)</td>
<td>.15</td>
</tr>
<tr>
<td>32592</td>
<td>Cap—Shield cap for second f.t. transformer</td>
<td>1.50</td>
<td>13107</td>
<td>Resistor—2.0 meg., 1/2 watt (R4)</td>
<td>.15</td>
</tr>
<tr>
<td>32569</td>
<td>Cap—Shield cap for 1HGG</td>
<td>1.50</td>
<td>13105</td>
<td>Resistor—1.0 meg., 1/2 watt (R5)</td>
<td>.15</td>
</tr>
<tr>
<td>32606</td>
<td>Cap—Shield cap</td>
<td>1.50</td>
<td>32950</td>
<td>Shield—Tube shield—less cap</td>
<td>.15</td>
</tr>
<tr>
<td>14501</td>
<td>Capacitor—22 mfd. (C18)</td>
<td>1.50</td>
<td>32509</td>
<td>Shield—Tube shield—less cap</td>
<td>.15</td>
</tr>
<tr>
<td>21035</td>
<td>Capacitor—100 mfd. (C19)</td>
<td>1.50</td>
<td>31501</td>
<td>Socket—Tube socket</td>
<td>.10</td>
</tr>
<tr>
<td>21036</td>
<td>Capacitor—100 mfd. (C16)</td>
<td>1.50</td>
<td>30558</td>
<td>Socket—5-contact female</td>
<td>.10</td>
</tr>
<tr>
<td>32605</td>
<td>Capacitor—33 mfd. (C17)</td>
<td>1.50</td>
<td>14191</td>
<td>Spring—Condenser drive spring</td>
<td>.35</td>
</tr>
<tr>
<td>32603</td>
<td>Capacitor—100 mfd. (C16)</td>
<td>1.50</td>
<td>30954</td>
<td>Spring—Pointer drive cord spring</td>
<td>.35</td>
</tr>
<tr>
<td>32603</td>
<td>Capacitor—100 mfd. (C15)</td>
<td>1.50</td>
<td>12826</td>
<td>Transformer—First f.t. transformer (L5, L6, L7, C3, C4)</td>
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</tr>
<tr>
<td>32603</td>
<td>Capacitor—100 mfd. (C15)</td>
<td>1.50</td>
<td>12826</td>
<td>Transformer—Second f.t. transformer (L5, L6, L7, C3, C4)</td>
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<tr>
<td>32603</td>
<td>Capacitor—100 mfd. (C15)</td>
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<td>12826</td>
<td>Transformer—Output transformer (T1)</td>
<td>.15</td>
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**MISCELLANEOUS ASSEMBLIES**

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<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
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<tr>
<td>32509</td>
<td>Bezel—Dial bezel and crystal</td>
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<td>30952</td>
<td>Shaft—Station selector knob shaft</td>
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<td>32509</td>
<td>Cone—Speaker cone and voice coil (L7)</td>
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<td>31106</td>
<td>Shield—Tube shield</td>
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<tr>
<td>32509</td>
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<td>32163</td>
<td>Speaker complete</td>
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<tr>
<td>32509</td>
<td>Kit—Speaker kit (L4, L5, L6)</td>
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<td>Speaker—Output transformer (T1)</td>
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<tr>
<td>32509</td>
<td>Retainer—Knob escutcheon retainers</td>
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<td>Speaker complete</td>
<td>.25</td>
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</tbody>
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**RCA MFG. CO., INC.**

**RCA PAGE 10-7**

**MODEL 94BT61, Chassis RC-3330**

**Schematic, Voltage, Alignment**

**Socket, Trimmers, Chassis Wiring**

**Socket Voltages and Location of Parts**

*NOTE: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured values will be lower, depending on the voltmeter leading.

Measurements made to chassis unless otherwise indicated, with the set tuned at a quiet point and the volume control at minimum.

Values should hold within approximately ± 20% with 6 volts "A."

**Alignment Procedure**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to-</th>
<th>Tune to-</th>
<th>Turn radio dial to-</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>6S7-G 1-F grid cap in series with .01 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 550-750 kc</td>
<td>L7 and L8 (2nd I-F transformer)</td>
</tr>
<tr>
<td>No. 2</td>
<td>6D8-G 1st-det. grid cap in series with .01 mfd.</td>
<td>455 kc</td>
<td>550-750 kc</td>
<td>L5 and L6 (1st I-F transformer)</td>
</tr>
<tr>
<td>No. 3</td>
<td>Antenna lead, in series with 200 mfd.</td>
<td>600 kc</td>
<td>600 kc</td>
<td>L4 (oscillator)</td>
</tr>
<tr>
<td>No. 4</td>
<td>Antenna lead, in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>600 kc</td>
<td>C22 (oscillator) C9 (antenna)</td>
</tr>
</tbody>
</table>

*Adjust C24 on gang condenser to one complete turn from tight before adjusting C25.*

**Frequency Range**

540 to 1,720 kc

**R.F. Alignment Frequencies**

600 kc (osc.), 1,500 kc (osc., ant.)

Intermediate Frequency...

455 kc

**Cathode-ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.**

**Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.**

**Test-oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-ve action.**

For additional details, refer to booklet "RCA Victor Receiver Alignment."

**Preheating Dial.—With gang condenser in full mesh, the pointer should be horizontal.**

**Battery Required**

8-volt Storage "A" Battery.

**Current Consumption**

At 6 volts, 1.6 amperes.

Power Output (4 volts "A")

Undistorted...

0.45 watt

Maximum...

0.8 watt
MODELS 96BK6 and 96BT6
Chassis No. RC-392
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the tracings are shown on the chassis drawing.

Output Meter Alignment—If this method is used, connect the output meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator—For all alignment operations, connect the low side of the test oscillator to the receiver chassis, and keep the oscillator output at least five db below to avoid a v-e action.

Vibration Marks—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore calibration marks corresponding to dial readings of 600 kc, 1,500 kc, and 15.5 mc have been stamped in the plate on the front of the receiver as shown in the accompanying drawing. These marks are used for reference during alignment.

Dial Indicator Adjustment—With the gang condenser in full mesh, the indicator should point to the extreme left (low frequency) mark on the dial scale.

For additional details, refer to booklet "RCA Victor Receiver Alignment."
**Adjustment for Electric Tuning**

These models have six push buttons. The right-hand button connects the receiver for dial tuning on the "Short-wave" band, the next button connects for dial tuning on the "Standard broadcast" band, and the other four buttons are for electric tuning of four different stations in the standard broadcast band. Each station button connects separate oscillator and antenna coils which are tuned by ganged magnetite cores, and may be adjusted for the desired stations. Use a small-screwdriver or alignment tool such as RCA Stock No. 21051. Allow at least five minutes warm-up period before making adjustments. Use the regular antenna for all adjustments.

1. Make a list of the four desired stations, arranged in order from low to high frequencies.
2. Push in the broadcast dial-tuning button (second from right), and manually tune in the first station on the list.
3. Push in station button No. 1 (left-hand) and adjust No. 1 push button adjustment to receive this station. Turn the adjusting screw all the way in, to lowest frequency, and then unscrew slowly until the station is received.
4. Adjust for each of the remaining three stations in the same manner. (Clockwise adjustment of the screw tunes the circuits to lower frequencies.)
5. After installation, and with antenna properly connected, re-adjust C8 as outlined in note under "Alignment Procedure."

---

**Power Supply Units**

The receiver chassis has a seven-prong male plug for connection to the power-supply unit. Both a-c and d-c power-supply units are available, as listed under "Power Supply Ratings." The receivers are shipped with a d-c power unit for use with a 6-volt supply. If an a-c unit is desired, it must be purchased separately as Model CV-9.

If no receiver chassis is available the a-c unit (CV-9) may be tested for proper operation by connecting a 6.3-volt d-c, 10-watt generator, terminals 1 and 3, and shorting terminals 4 and 7. With one voltmeter on terminal 2 (ground), and the other on terminal 6 (pointing to positive). Enter 200 volts d-c., terminal 4. — 200 volts d-c.; terminal 6, 6.3 volts a-c. Values should be within ± 5% with rated supply voltages.

**Precautionary Load Drums. —**

1. Blue lead from push button switch to gang condenser must be dressed over the top of the switch.
2. Leads to push button coils must be dressed close to the coils.
3. Red and blue leads to gang condenser must be dressed away from chassis.
4. Blue antenna lead must be dressed in the end of the chassis away from gang leads and coil windings.
5. Bias cell must be installed with carbon disc connected to chassis.
6. Leads from power switch to connector plug must be dressed away from other leads.
7. Parts under push button coils must be dressed down away from them.
8. Green lead to first detector grid cap should be pulled out of the chassis as far as possible, and dressed away from the tube envelope.
**Models 965XG, 967TG**  
**Chassis RC-392**

**RCA MFG. CO., INC.**

**Alignment Voltage Chassis Wiring**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the High Side of Test Oscillator to:</th>
<th>Tune Test Oscillator To:</th>
<th>Press Push Button:</th>
<th>Turn Radio Dial to:</th>
<th>Adjust for Maximum Peak Output:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>657-G L.F. grid cap in series with .01 mfd.</td>
<td>455 kc</td>
<td>B.C. (No. 5)</td>
<td>No</td>
<td>L13 and L14 (4th L.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>658-G Det. grid cap in series with .01 mfd.</td>
<td>455 kc</td>
<td>B.C. (No. 5)</td>
<td>Station Point</td>
<td>L11 and L12 (1st L.F. Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>1,500 kc</td>
<td>No. 4</td>
<td>between 550–700 kc</td>
<td>L20-L26 (No. 4 Push Button Adj.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna Lead (blue) in series with 200 mfd.</td>
<td>600 kc</td>
<td>No. 1</td>
<td></td>
<td>L9-L29* (No. 1 Push Button Adj.)</td>
</tr>
</tbody>
</table>

5. Repeat steps 3 and 4 until maximum signal is obtained.

6. Un螺丝 C9 (osc.) to minimum capacity.

7. Antenna Lead (blue) in series with 200 mfd.
   - 600 kc
   - B.C. (No. 6)
   - 600 kc
   - Calibration Mark

8. Antenna Lead (blue) in series with 200 mfd.
   - 1,500 kc
   - B.C. (No. 8)
   - 1,500 kc
   - Calibration Mark

9. Repeat steps 7 and 8 until maximum signal is obtained.

10. Antenna Lead (blue) in series with 200 ohms.
    - 15.2 mc
    - S.W. (No. 9)
    - 15.2 mc
    - Calibration Mark

11. Antenna Lead (blue) in series with 200 mfd.
    - 1,500 kc
    - B.C. (No. 8)
    - 1,500 kc
    - Calibration Mark

12. Follow the "Adjustments for Electric Tuning."

   * Adjust L23-L29 (No. 1 push button adjustment) and L9 at the same time, rocking in for maximum signal.
   * Turn L17 adjusting screw all the way out, then turn in slowly until a peak is reached. If two peaks can be obtained the lower inductance setting (screw out) should be used.
   * Use minimum capacity peak if two peaks can be obtained. A weaker signal (image) should be received about one quarter inch to the left on the dial plate.
   * Use maximum capacity peak if two peaks can be obtained, rock in for maximum signal.

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**R-F Wiring Diagram and Socket Voltages**

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**Bottom View - Rear of Chassis**

- Note: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured values will be lower, depending on the voltmeter loading.
- Bracketed voltages ( ) refer to operation with CV-9 a-c power unit.

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<thead>
<tr>
<th>STOCK</th>
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<th>UNIT</th>
<th>STOCK</th>
<th>DESCRIPTION</th>
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</tr>
</tbody>
</table>

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**ADJUSTMENTS FOR ELECTRIC TUNING**

These models have eight push buttons. The left-hand button is a Victrola switch. The right-hand button connects the gang condenser for manual tuning. The other six buttons are for electric tuning of six different stations in the standard broadcast range. The station buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the desired six stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning button, and manually tune in the first station on the list.
3. Push in station button No. 1 (second from left) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer (C36) for maximum output on this station.
5. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining five stations in the same manner.

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These models have eight push buttons. The left-hand button is a Victrola switch. The right-hand button connects the gang condenser for manual tuning. The other six buttons are for electric tuning of six different stations in the standard broadcast range. The station buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the desired six stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning button, and manually tune in the first station on the list.
3. Push in station button No. 1 (second from left) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer (C36) for maximum output on this station.
5. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining five stations in the same manner.
96E2, 96K5, 96K6, 96T7, 97K2, 97T2

Precautionary Lead Dress:
1. Dress power-switch leads against left apron to prevent hum pickup.
2. Dress R1 away from front of chassis.
3. Electric-tuning lamp leads must be dressed in front of range switch.
4. Dress lead from L5 to range switch away from other leads.
5. Dress leads away from antenna coil.
6. Dress other parts and leads away from R14, as it becomes heated.

Power Output
- Undistorted: 2.0 watts, 2.5 watts
- Maximum: 4.0 watts, 4.5 watts

Power Supply Rating
- Rating A: 105-115 volts, 50-60 cycles, 80 watts
- Rating B: 105-115 volts, 25-60 cycles, 80 watts
- Rating C: 100-130/140-160/195-230 volts, 40-60 cycles, 80 watts
Victrola Attachment—A jack is provided on the rear of the chassis for connection to a Victrola Attachment. The cable from the Victrola Attachment should be terminated in a Stock No. 31048 plug to fit the jack.

Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum.

Values should hold within ±30% with 117-volt a.c. supply.

*NOTE: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltages will be lower, depending on the voltmeter loading.
All models have electric tuning for five stations in the standard broadcast range.

Features of design include: Magnetite-core electric-tuning coils; magnetite-core rf transformers; temperature-compensated capacitor in the oscillator circuit; high-frequency core control; straight-line dial; dust-proof permanent magnet dynamic loudspeaker.

Power Supply Polarity—On d-c operation, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the position of the plug. On a-c operation, a similar reversal of the plug may reduce hum.

Measurements made to low-side of volume control unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within ±10% with 117 volt a-c supply.

*Note: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltages will be lower, depending on the voltmeter loading.
Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil, and turn the receiver volume control to maximum. Test-Oscillator.—For the alignment operations, connect the low side of the test-oscillator to the black lead and keep the output as low as possible to avoid a-v-c action.

Calibration Marks.—The tuning dial is fastened in a cabinet, and cannot be used for reference during alignment. Therefore, calibration marks corresponding to dial readings of 600 kc, 1,500 kc, and 12.2 mc have been stamped in the plate on the front of the chassis as shown in the accompanying drawing. These marks are used for reference during alignment.

Dial Indicator Adjustment.—With the gang condenser in full, mesh, the indicator should point to the extreme left mark on the dial scale.

For additional details, refer to booklet "RCA Victor Receiver Alignment.”

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6ky I-F grid cap, in series with .01 mfd.</td>
<td>655 kc</td>
<td>&quot;A&quot; band, Quiet Point between 600-700 kc</td>
<td>L8 and L10 (2nd I-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Tuning condenser Stator (osc.) in series with .06 mfd.</td>
<td>650 kc</td>
<td>1,600 kc</td>
<td>L7 and L8 (1st I-F Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Lead (Blue), in series with 200 mmd.</td>
<td>1,800 kc</td>
<td>&quot;A&quot; Band (Cal. Mark)</td>
<td>C28 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna Lead (Blue), in series with 300 mmd.</td>
<td>600 kc</td>
<td>&quot;A&quot; Band (Cal. Mark)</td>
<td>C30 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antenna Lead (Blue), in series with 400 ohms</td>
<td>15.0 mc</td>
<td>15.0 mc</td>
<td>C37 (osc.)*</td>
</tr>
</tbody>
</table>

* Rock gang slightly while peaking C37, and use minimum capacity peak if two peaks can be obtained on C37.

Note.—Oscillator tracks 455 kc above signal on both bands.

Mechanical Specifications

<table>
<thead>
<tr>
<th>Models</th>
<th>Height (inches)</th>
<th>Width (inches)</th>
<th>Depth (inches)</th>
<th>Net Weight (pounds)</th>
<th>Shipping Weight (pounds)</th>
<th>Chassis Base Dimensions</th>
<th>Overall Chassis Height</th>
<th>Tuning Drive Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>96T4</td>
<td>9½</td>
<td>12</td>
<td>6½</td>
<td>11</td>
<td>13</td>
<td>11 x 7 x 5</td>
<td>8</td>
<td>8 to 8</td>
</tr>
<tr>
<td>96T5</td>
<td>9½</td>
<td>12</td>
<td>6½</td>
<td>11½</td>
<td>14</td>
<td>11 x 7 x 5</td>
<td>8½</td>
<td>8 to 1</td>
</tr>
<tr>
<td>96T6</td>
<td>11</td>
<td>13</td>
<td>11½</td>
<td>17</td>
<td>17</td>
<td>13 x 11 x 8½</td>
<td>11½</td>
<td>8 to 1</td>
</tr>
</tbody>
</table>

Miscellaneous Service Data

1. Preamplifier lead and I.F. transformer (A) should be dressed away from the receiver.
2. A.C. leads to bullentin tube should be dressed away from the chassis.
3. Cables C5 and C6 should be dressed away from the receiver.
4. Volume control lead and I.F. transformer (F) should be tied to chassis.
5. All control leads are used for all connections from the chassis.

Dial-Indicator and Drive Mechanism

Refer to "Alignment Procedure" for explanation of the "calibration marks" shown in this drawing.
RCA MFG. CO., INC.

9674, 9675, Chas. RC-599
9676, Chas. RC-393A
Tuner Adjustments, Parts

Adjustments for Electric Tuning

These models have five push buttons for electric tuning of five different stations in the standard broadcast range. The station buttons connect to separate magnetic core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments. Use a regular antenna for the preliminary adjustments.

The procedure is as follows:
1. Make a list of the five desired stations, arranged in order from low to high frequencies.
2. Turn Range Control Knob to “Broadcast” position and tune in station No. 1 (560 kc in example) by Manual Dial Tuning, for reference.
3. Push in station-button No. 1 and turn Range Selector to “BE” position. Adjust No. 1 oscillator core (L12) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until the station is received.
4. Adjust No. 1 antenna trimmer (C32) for maximum output on this station.
5. Adjust for each of the remaining four stations in the same manner.
6. Make a final careful adjustment of the oscillator cores and antenna trimmers tunes the circuits to lower frequencies.

Clockwise adjustment of oscillator cores and antenna trimmers tunes the circuits to lower frequencies.

Assist on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32544</td>
<td>Ballast—Ballast resistor tube—type BK408</td>
<td>30c</td>
</tr>
<tr>
<td>31077</td>
<td>Capacitor—Dial trimmer, comprising one 5-20 mfd. and one 2-10 mfd. sections (C27, C28)</td>
<td>40c</td>
</tr>
<tr>
<td>12728</td>
<td>Capacitor—88 mfd. (C4)</td>
<td>35c</td>
</tr>
<tr>
<td>14518</td>
<td>Capacitor—100 mfd. (C7, C8)</td>
<td>30c</td>
</tr>
<tr>
<td>12464</td>
<td>Capacitor—150 mfd. (C9, C10)</td>
<td>30c</td>
</tr>
<tr>
<td>14712</td>
<td>Capacitor—220 mfd. (C11)</td>
<td>30c</td>
</tr>
<tr>
<td>32488</td>
<td>Capacitor—270 mfd. (C12)</td>
<td>30c</td>
</tr>
<tr>
<td>30433</td>
<td>Capacitor—700 mfd. (C13)</td>
<td>30c</td>
</tr>
<tr>
<td>12827</td>
<td>Capacitor—5600 mfd. (C14)</td>
<td>30c</td>
</tr>
<tr>
<td>32714</td>
<td>Capacitor—720 mfd. (C15)</td>
<td>30c</td>
</tr>
<tr>
<td>31825</td>
<td>Capacitor—750 mfd. (DB 125)</td>
<td>30c</td>
</tr>
<tr>
<td>31078</td>
<td>Capacitor—925 mfd., 700 volts (C16)</td>
<td>30c</td>
</tr>
<tr>
<td>4865</td>
<td>Capacitor—1,000 volts (C17, C18)</td>
<td>30c</td>
</tr>
<tr>
<td>14392</td>
<td>Capacitor—0.01 mfd., 500 volts (C19, C20, C21, C22)</td>
<td>30c</td>
</tr>
<tr>
<td>4870</td>
<td>Capacitor—0.002 mfd., 400 volts (C23)</td>
<td>30c</td>
</tr>
<tr>
<td>4839</td>
<td>Capacitor—0.001 mfd., 400 volts (C24, C25, C26)</td>
<td>30c</td>
</tr>
<tr>
<td>32707</td>
<td>Capacitor—Electrolytic, comprising two 40 mfd. and one 10 mfd. sections (C15, C30, C31)</td>
<td>3.35</td>
</tr>
<tr>
<td>32705</td>
<td>Capacitor—Push button oscillator capacitor bank (C32, C33, C34, C35, C36)</td>
<td>1.20</td>
</tr>
<tr>
<td>32708</td>
<td>Clip—Push button coil mounting clip</td>
<td>1.20</td>
</tr>
<tr>
<td>32706</td>
<td>Coil—Antenna coil (L1, L2, L3, L4)</td>
<td>1.20</td>
</tr>
<tr>
<td>32707</td>
<td>Coil—Oscillator coil (L5, L6)</td>
<td>1.20</td>
</tr>
<tr>
<td>31165</td>
<td>Coil—Push button oscillator coil, less core 650-650 KC. (L23)</td>
<td>1.35</td>
</tr>
<tr>
<td>32704</td>
<td>Coil—Push button oscillator coil, less core 650-1,020 KC. (L23)</td>
<td>1.35</td>
</tr>
<tr>
<td>32440</td>
<td>Condenser—Electrolytic capacitor, less core 650-1,250 KC. (L24)</td>
<td>1.35</td>
</tr>
<tr>
<td>31383</td>
<td>Condenser—Push button oscillator coil, less core 650-1,500 KC. (L25, L26)</td>
<td>1.35</td>
</tr>
<tr>
<td>32446</td>
<td>Condenser—-ganged variable (C16, C20, C24)</td>
<td>2.70</td>
</tr>
<tr>
<td>31419</td>
<td>Control—Volume control, tone control, and power switch (R6, R9, R11)</td>
<td>3.00</td>
</tr>
<tr>
<td>32064</td>
<td>Cord—Drive cord</td>
<td>1.00</td>
</tr>
<tr>
<td>31506</td>
<td>Core and stud for coil, Stock No. 32664, and 31038, and 31506</td>
<td>1.35</td>
</tr>
<tr>
<td>32445</td>
<td>Core—Core and stud for coil, Stock No. 32664</td>
<td>0.35</td>
</tr>
<tr>
<td>32437</td>
<td>Core and stud for oscillator coil, Stock No. 31777</td>
<td>0.35</td>
</tr>
<tr>
<td>32430</td>
<td>Drum—Condenser drive cord drum</td>
<td>0.40</td>
</tr>
<tr>
<td>32771</td>
<td>Indicator—Dial indicator pointer</td>
<td>0.30</td>
</tr>
<tr>
<td>31490</td>
<td>Lamp—Dial lamp, 6, 2.5 volt</td>
<td>0.30</td>
</tr>
<tr>
<td>32710</td>
<td>Plate—Dial color plate and pointer track</td>
<td>0.30</td>
</tr>
<tr>
<td>31150</td>
<td>Plug—Speaker plug 1/8 inch jack for speaker cable</td>
<td>0.30</td>
</tr>
<tr>
<td>32459</td>
<td>Pulley—Inductor drive cord pulley</td>
<td>0.30</td>
</tr>
<tr>
<td>30616</td>
<td>Resistor—Filter resistor (L18)</td>
<td>1.40</td>
</tr>
<tr>
<td>14499</td>
<td>Resistor—1,500 ohms, 1 watt (R3)</td>
<td>0.80</td>
</tr>
<tr>
<td>14498</td>
<td>Resistor—2,500 ohms, 1/10 watt (R2)</td>
<td>0.80</td>
</tr>
<tr>
<td>14497</td>
<td>Resistor—35,000 ohms, 1/10 watt (R4)</td>
<td>0.80</td>
</tr>
</tbody>
</table>

ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.

Alignment Procedure

Output Meter Alignment—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator—Connect the low side of the test-oscillator to the receiver chassis, through a .01 mfd. capacitor, and keep the output as low as possible.

Dial Setting—To set dial indicator drum, turn tuning condensers fully clockwise and then counter-clockwise.

Push-button Adjusments—Remove bakelite button and loosen screw two turns with a screwdriver or coil. Tune in the desired station by means of the right-hand control knob. Press push lever down as far as it will go and tighten screw. Release lever and put on push-button.

---1939 No. 3---


tune test-cac. to—

455 kc

quiet point between 550–750 kc

C1, C2, C3, C6 (1st and 2nd I-F transformers)

10.65 mc

full clockwise (out of mesh) "C" band

C5* (act.)

15.00 mc

test oscillator signal

C6** (act.)

1,745 kc

full clockwise (out of mesh) "A" band

C7 (act.)

* Use minimum capacity peak if two peaks can be obtained.

** Rock gang slightly and check to determine that C5 has been adjusted to the correct peak by tuning to approximately 14.00 mc, where a weaker signal should be received.

† Make test oscillator connection to log tuning condenser stator (oscillator section) in series with .01 mfd. condenser.

Note No. 1—Accurately tune receiver to the 15.0 mc test oscillator signal. This signal will appear twice (14.00 and 15.00 mc) as dial is turned. Use the higher frequency setting of the tuning condensers (gang farthest out of mesh).

Note No. 2—Oscillator tracks 455 kc above signal on all bands.
MODEL 97K, Chassis RC-351F
RC-351F "M," RC-351F "R"
Specifications, Calibration Scale

MODEL 97K

**Chassis No. RC-351F, RC-351F "M," RC-351F "R"**

**Electrical Specifications**

- **Frequency Ranges**
  - "Standard Broadcast" (A) 540-1,720 kc
  - "Short Wave" (C) 5.8-18.0 mc
  - Six Electric Tuning Positions: 550 to 1,500 kc
  - Two stations between approximately 550-950 kc
  - Two stations between approximately 680-1,180 kc (RC-351F)
  - Two stations between approximately 690-1,225 kc (RC-351F "M," RC-351F "R")
  - Two stations between approximately 890-1,500 kc

- **Intermediate Frequency** 455 kc

- **RCA Tube Complement**
  - (1) RCA-6K8 First Detector-Oscillator
  - (2) RCA-6K7 Intermediate-Frequency Amplifier
  - (3) RCA-6H6 Second Detector and A.V.C.
  - (4) RCA-6F5 Audio Voltage Amplifier
  - (5) RCA-6F6-G Audio Power Output
  - (6) RCA-5Y3-G Full-Wave Rectifier
  - (7) RCA-6U5 Tuning Indicator

- **Pilot Lamp** (2)

**Power Supply Ratings**
- **Rating A** 105-125 volts, 50-60 cycles, 80 watts
- **Rating B** 105-125 volts, 50-60 cycles, 80 watts
- **Rating C** 100-130/140-160/195-250 volts, 40-60 cycles, 80 watts

**Power Output**
- Undistorted: 2.5 watts
- Maximum: 4.5 watts

**Loudspeaker**
- Type: 12-inch, electrodynamic
- Voice Coil Impedance at 400 cycles: 2.2 ohms

---

**Calibration Scale, RC-351F and RC-351F "M"**

![Calibration Scale Diagram]

The corresponding position of the dial indicator for any setting of the calibration scale can be determined by drawing a line from this point on the lower calibration to the same point on the upper calibration scale. For example, 28° on the calibration scale corresponds to 1,500 kc on "A" band in RC-351F and RC-351F "M."

---

**In RC-351F "R," 27.4° corresponds to 1,500 kc, and 15° corresponds to 18 mc.**

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**General Description**

This receiver employs a two-band superheterodyne circuit which is operated either manually or by electric tuning on standard broadcast, and includes foreign short-wave, aircraft, police, and amateur stations on the short-wave band.

There are three different productions of Model 97K, conveniently identified by rear chassis stamping as RC-351F, RC-351F "M," and RC-351F "R."

**Features of design include magnetite-core adjusted if transformers and "Electric Tuning" oscillator coils; jack and switch for Victrola attachment; aural-compensated variable control; continuously variable tone-control; automatic volume control; dust-proof electrodynamic speaker; and straight-line dial.**

---

**Precautionary Lead Dress**

1. Dress 110-volt leads away from audio wiring.
2. All leads in vicinity of antenna and oscillator coils must be dressed away from the coils.
3. Electric Tuning lamp leads from push-button switch must be dressed against front apron.
4. Keep speaker lead away from Victrola jack.
5. Lead from C19 in electrolytic (RC-351F "R") must be dressed around left-end of push-button switch, and against chassis base.
6. The leads across back of chassis in RC-351F must be dressed under the electrolytic capacitor to prevent approaching the Victrola jack.

---

**Victrola Attachment**

A jack is provided on the rear of chassis for connection to a Victrola Attachment. The cable from the attachment should be terminated in a Stock No. 31048 plug to fit the jack.
Chassis No. RC-351F and RC-351F "M"

RC-351F has a cardboard-case electrolytic with five leads.
RC-351F "M" has a metal-case electrolytic with lug contacts, and the range of No. 3 and 4 push buttons is 690-1,225 kc instead of 680-1,180 kc as in RC-351F.

— 1938 No. 38 —
Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within ±20% with 117-volt a-c supply.

*NOTE: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltage will be lower, depending on the voltmeter loading.

Above.—Universal Power Transformer Connections. 110-volt supply for a Victrola Attachment may be obtained by connecting the motor to the red and the red-black leads.

**Mechanical Specifications**

<table>
<thead>
<tr>
<th>Height (inches)</th>
<th>Width (inches)</th>
<th>Net Weight (Ounces)</th>
<th>Shipping Weight (pounds)</th>
<th>Chassis Base Dimensions</th>
<th>Overall Drive Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>41/4</td>
<td>171/4</td>
<td>61/2</td>
<td>101/2</td>
<td>18 inches x 10 inches x 4 inches</td>
<td>4 to 1</td>
</tr>
</tbody>
</table>

Above.—Connections and Colors of Loudspeaker and Cable.
Model 97K, Chas. RC-351F "R"
Voltage, Chassis Wiring
Transformer, Speaker Data

Chassis No. RC-351F "R"
R-F Wiring Diagram and Socket Voltages

Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within ±10% with 117-volt a-c supply.

NOTE: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltage will be lower, depending on the voltmeter loading.

Above—Connections and Colors of Loudspeaker and Cable.
**ALIGNMENT PROCEDURE**

Cathode Ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

**Output Meter Alignment.** — If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Test-Oscillator.** — For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-v-c action.

**Calibration Scale on Indicator-Drive-Cord Drum.** — The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang-condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The 180° mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The distance from the front of the chassis to the drum must not exceed 9/16-inch. The drum is held to the shaft by means of a set screw, which must be tightened securely when the drum is in the correct position.

**Pointer for Calibration Scale.** — Improves the pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bends the wire so that it points to the "180°" mark on the calibration scale when the plates are fully meshed.

---

### RC-351F and RC-351F "M"

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6X7 I-P grid cap, in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>L13 and L13 (and 1 F Trans.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6X8 det. grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>L19 and L11 (1st 1 F Trans.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna Terminal, in series with 600 ohms</td>
<td>15.2 mc</td>
<td>C21* (osc.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antenna Terminal, in series with 200 mfd.</td>
<td>1,600 mc</td>
<td>C25 (osc.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Follow &quot;Adjustments for Electric Tuning.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained.

* Rock gang slightly while adjusting C30. Check to determine that C21 has been adjusted to the correct peak by tuning to approximately 40.5° (14.29 mc), where a weaker signal should be received.

**Note.** — Oscillator tracks 455 kc above signal on both bands.

---

### RC-351F "R"

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6X7 I-P grid cap, in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>L12 and L13 (and 1 F Trans.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6X8 det. grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>L19 and L11 (and 1st 1 F Trans.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna Terminal, in series with 200 mfd.</td>
<td>1,500 mc</td>
<td>C21* (osc.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antenna Terminal, in series with 400 ohms</td>
<td>18 mc</td>
<td>C21 (osc.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antenna Terminal, in series with 400 ohms</td>
<td>18 mc</td>
<td>C21 (osc.)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Follow &quot;Adjustments for Electric Tuning.&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Rock gang slightly while peaking C21, and use minimum capacity peak if two peaks can be obtained on C21.

**Note.** — Oscillator tracks 450 kc above signal on both bands.

---

### ADJUSTMENTS FOR ELECTRIC TUNING

These models have eight push buttons. The left-hand button is a Victrola switch. The right-hand button connects the gang condenser for manual tuning. The other six buttons are for electric tuning of six different stations in the standard broadcast range. The station buttons connect to separate magnetic-iron core oscillators and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the desired six stations, arranged in order from low to high frequencies.
2. Use one or two feet of wire as an antenna to ensure sharp peaking.
3. Push in the dial-tuning button, and manually tune in the first station on the list.
4. Push in station button No. 1 (second from left) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
5. Adjust No. 1 antenna trimmer (C16) for maximum output on this station. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining five stations in the same manner.
7. Make a final readjustment of the magnetic-iron cores.

---

* Image credit: [John P. Ridley Publishers]
### Parts List

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit Price</th>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit Price</th>
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</thead>
<tbody>
<tr>
<td>12944</td>
<td>Resistor—33,000 ohms, 1/2 watt (R12)</td>
<td>.20</td>
<td>11586</td>
<td>Resistor—100,000 ohms, 1 watt (R18)</td>
<td>.20</td>
</tr>
<tr>
<td>12950</td>
<td>Resistor—220,000 ohms, 1 watt (R20) in RC-351F and RC-351F &quot;R&quot;</td>
<td>.15</td>
<td>11590</td>
<td>Resistor—220,000 ohms, 1 watt (R20) in RC-351F and RC-351F &quot;R&quot;</td>
<td>.15</td>
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<tr>
<td>12964</td>
<td>Resistor—220,000 ohms, 1 watt (R20) used in RC-351F and RC-351F &quot;R&quot;</td>
<td>.15</td>
<td>12971</td>
<td>Resistor—700,000 ohms, 1 watt (R2)</td>
<td>.15</td>
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<tr>
<td>12975</td>
<td>Resistor—1,000,000 ohms, 1 watt (R2)</td>
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<td>12977</td>
<td>Resistor—1 meg., 1/10 watt (R20)</td>
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<tr>
<td>13013</td>
<td>Resistor—2,5 meg., 1 watt (R2)</td>
<td>.15</td>
<td>13015</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<tr>
<td>13027</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13048</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13049</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13087</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13128</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<tr>
<td>13137</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13147</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
<td>.35</td>
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<td>13171</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13184</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13177</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13179</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
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<td>13184</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
<td>.35</td>
<td>13194</td>
<td>Capacitor—16 microfarad (C1) used in RC-351F and RC-351F &quot;R&quot;</td>
<td>.35</td>
</tr>
</tbody>
</table>

### ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.
RCA MFG. CO., INC.

MODEL R-90, Chassis RS-77
Schematic, Voltage, Socket
Speaker Connections

--- 1939 No. 20 ---

* NOTE: Values with star are operating voltages in circuits with high series-resistance, and when measured will read lower depending on the voltmeter loading.

RCA TUBE COMPLEMENT

(1) RCA-845 ... 1st Audio Amplifier
(2) RCA-845 ... 2nd Audio Amplifier
(3) RCA-2A3 ... Power Output
(4) RCA-2A3 ... Rectifier

POWER SUPPLY RATING

A-6 ... 100-125 volts, 50-60 cycles, 175 watts
A-12 ... 105-135 volts, 60 cycles, 175 watts

POWER OUTPUT

Unsaturated Maximum ... 12 watts

Cabinet Dimensions

Height 141 inches
Width 10% inches
Depth 14 inches

Weight (Shipping) ... 54 pounds

Measurments made to chassis unless otherwise indicated. Values should hold within approximately ± 20% with 117-volt a.c. supply.

LOUDSPEAKERS

Type ... Eight-Inch Electrodynamic
Voice Coil Impedance ... 1.0 ohms at 400 cycles

MOTOR BOARD

Motor ... Self-starting Induction
Turntable Speed ... 78 r.p.m. (Adjustable)

PICKUP

Type ... Crystal
Impedance ... 100,000 ohms at 1,000 cycles

General Description and Service Data

The model R-90 Victrola consists of a crystal pickup, a five tube audio amplifier, a six-inch dust-proof electrodynamic speaker, and a motor turntable mechanism all contained in a hinged-top, table type walnut veneer cabinet. This instrument will reproduce records up to 12-inches in size.

The crystal pickup unit is securely sealed in a metal casing, for protection against extreme changes in atmospheric conditions. If failure occurs, a new replacement crystal unit should be installed.

Top View, Showing Location of Parts

Location of Controls

Connections of Loudspeaker and Cable

@John F. Rider, Publisher
**RCA Victor MODEL R-98 (Chassis No. RS-77)**

Five-Tube, A-C, Electric Victrola (Phono. only)

---

**Motor Lubrication and Adjustments**

Apply oil to feed cam.

---

**Mercury Switch Assembly**

(Shown with pickup in rest position)

Adjust main cam so that switch trips into the "off" position when needle is 1 3/4 inches from the center line of motor spindle.

---

**Replacement Parts**

Listed are genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31815</td>
<td>Coil—Field coils and armatures for 60 cycle motor</td>
<td>5.50</td>
</tr>
<tr>
<td>31763</td>
<td>Governor—Governor complete for 60-60 cycle motor</td>
<td>3.05</td>
</tr>
<tr>
<td>31823</td>
<td>Governor—Governor complete for 60 cycle motor</td>
<td>20.00</td>
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<tr>
<td>31468</td>
<td>Motor—105-125 volts, 60-60 cycle motor</td>
<td>17.35</td>
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<tr>
<td>31815</td>
<td>Screw—Rear bearing screw and nut for 60 and 60-60 cycle motor</td>
<td>0.25</td>
</tr>
<tr>
<td>31828</td>
<td>Screw—Speed regulator screw and nut for 60 and 60-60 cycle motor</td>
<td>0.00</td>
</tr>
<tr>
<td>31828</td>
<td>Shunt—Turnable spindle and gear for 60 and 60-60 cycle motor</td>
<td>0.00</td>
</tr>
<tr>
<td>31828</td>
<td>Washer—one felt and one metal thrust washer for turnable spindle</td>
<td>0.10</td>
</tr>
<tr>
<td>31828</td>
<td>Weight—Governor weight and spring for 60-60 cycle motor</td>
<td>0.90</td>
</tr>
<tr>
<td>31828</td>
<td>Weight—Governor weight and spring for 60-60 cycle motor</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Automatic Switch Assemblies**

32086 — Cam—Cam assembly comprising main and auxiliary cam, hub, and set screw.

32866 — Lever—Actuating lever with roller and mercury tube clip.

14168 — Screw—No. 10-32 x 1/4" cone point set screw for cam hub.

32668 — Screw—No. 10-32 x 1/8" set screw for cam hub.

32866 — Spring—Actuating lever tension spring.

32666 — Spring—Cam tension spring.

32866 — Switch—Mercury tube with leads.

32866 — Washer—C" washer for actuating lever shaft.

**Speaker Assemblies**

32868 — Cone—Cone assembled with voice coil, center suspension, and rim gasket.

5030 — Plug—4-prong male connector for reproducer.

53480 — Speaker complete (No Output Transformer).

**Miscellaneous Assemblies**

32086 — Cap—Pilot lamp bulb.

32866 — Cup—New needle cup.

6848 — Cup—Used needle cup and pickup arm support.

11771 — Damper—Turnable damper, scribe, and plate.

32086 — Post—Cabinet foot.

32086 — Hinge—Cabinet lid hinge.

32086 — Knob—Volume control, or the control knob.

32086 — Mounting—Motor mounting screws, washers, and spacers.

32086 — Plug—Plug for motor leads.

32086 — Spring—Coil spring for stool needle cup lid.

32086 — Spring—Returning spring for knobs.

32086 — Support—Cabinet lid support.

32086 — Turnable.
Alignment Procedure

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment, therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang condenser, for each alignment frequency, is given in the alignment table.

As the first step in f-1 alignment, check the position of the drum. The 0° mark on the drum scale must be vertical, and directly over the center of the gang condenser shaft when the plates are fully meshed. The distance from the front of the chassis to the drum must not exceed 1 inch. The drum is held to this shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Improve a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

*Use minimum capacity peak if two peaks can be obtained, and rock gang condenser slightly while adjusting C28 and C21.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, move the dial indicator on the drive cable to the left-hand end mark on dial, with gang condenser fully meshed.

FOR DIAL CALIBRATION
SEE INDEX
## Adjustments for Electric Tuning

These models have eight push buttons. The left-hand button is a Victrola switch. The right-hand button connects the gang contacts for maximum tuning. The other six buttons are for tuning of six different stations in the standard broadcast range. The station buttons connect to separate magnetic-core oscillator coils and separate antenna trimmers which must be adjusted for the desired station. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31051. Allow at least five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Take a list of the desired six stations, arranged in order from low to high frequencies.
2. Push in the left-hand switch button, and manually tune in the first station on the list.
3. Push in station button No. 1 (second from left) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer (C36) for maximum output on this station.

Clockwise adjustment of cores and trimmers tunes the circuits to beat on desirable factory-tuned parts, which are readily identified and may be purchased from authorized dealers.

### STOCK No. DESCRIPTION Stock No. DESCRIPTION

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31485</td>
<td>Retainer—Spring to hold coil securely</td>
<td>.08</td>
<td>31597</td>
<td>Retainer—Stator coil push button</td>
<td>.15</td>
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<tr>
<td>31598</td>
<td>Retainer—Speaker coil push button</td>
<td>.15</td>
<td>31605</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
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<tr>
<td>31610</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
<td>31615</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
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<tr>
<td>31620</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
<td>31625</td>
<td>Speaker—Speaker coil push button</td>
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<td>Speaker—Speaker coil push button</td>
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<td>Speaker—Speaker coil push button</td>
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<td>31650</td>
<td>Speaker—Speaker coil push button</td>
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<td>31660</td>
<td>Speaker—Speaker coil push button</td>
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<td>31670</td>
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<td>31690</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
<td>31700</td>
<td>Speaker—Speaker coil push button</td>
<td>.80</td>
</tr>
</tbody>
</table>

Note: All prices are subject to change or withdrawal without notice. 98T, 98K2
RCA Victor Model R-100 Victrola Attachment

Motor Data

Smooth starting and running will be insured by keeping the bearings well cleaned and oiled. Hum and Vibration—A small amount of hum when starting to a new motor or increasing load is normal. If excessive vibration occurs, it may be due to:
1. Insufficient lubrication, or any failure that will cause binding.
2. Lever washers not oiled. (Check to make sure that the lever and motor washers are arranged in proper sequence, as shown in the drawings.)
3. Motor not properly fastened in cabinet.
4. Burns on poles of motor or stator.
5. Slack eccentricity of rotor or spindle.
7. Improper horizontal alignment of the rotor and stator (pertaining only to the type motor shown in Figure 1). Correct horizontal alignment is as shown in the motor assembly drawing. The position of the stator is raised or lowered by adding or removing washers below the leaf washer. In the type motor shown in Figure 2, no adjustment is necessary because correct horizontal alignment is provided by the design of the motor.

The damper spring must fit without binding or chattering, in the slot in the stator. The stator must be free to deflect in either direction between the limits of the damper spring. Any binding in the washers or stator bearing which prevents the movement of the stator may cause speed variations in the motor. The damper spring must exert equal force in restoring the stator to its mid position when the stator is deflected manually in either direction.

Tone Compensation

Because of the widely varying frequency characteristics of various types of audio amplifiers with which the R-100 may be used, it may be desirable in some cases to make adjustments in the pickup circuit of the R-100 to compensate for the characteristics of the amplifier. The following circuits show means of making such adjustments.

In Figure 3, R1 controls the low-frequency response; larger values of R1 increase the low-frequency response. For maximum low-frequency response, remove R1. R2 controls pickup output; smaller values of R2 give increased output. C1 controls high-frequency response; to increase highs, increase C1.

Where a decrease in high-frequency response may be desired (for example, as an aid in reducing ‘‘needle scratch’’ on worn records), the circuit in Figure 4 is applicable. In this circuit, C2 acts as loading on the pickup and is also a controlling factor on the high-frequency response. Smaller values of C2 give more pickup output and also more highs. R3 gives a sharper high-frequency reduction; increasing R3 decreases highs.

The suggested values shown in Figures 3 and 4 should serve as a basis from which slight alterations may be made to suit individual cases.

Replacement Parts

List on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>31042</td>
<td>Stator—Stator assembly comprising coils and laminations for 60 cycle operation...</td>
<td>2.90</td>
<td>31078</td>
<td>Turntable—Finished turntable plate only—25 cycle...</td>
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<tr>
<td>31039</td>
<td>Turntable—Finished turntable plate only—50 cycle...</td>
<td>1.40</td>
<td>4083</td>
<td>Washer—Leather washer...</td>
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<tr>
<td>33841</td>
<td>Washers—Leather and metal washers for stator bearing...</td>
<td>.10</td>
<td>32074</td>
<td>Washer—Metal spacing washer...</td>
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<tr>
<td>32074</td>
<td>Washer—One upper and one lower weight for stator—25 cycle (2 each required)...</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>33345</td>
<td>Cap—Turntable spindle cap (rubber) 60 cycle...</td>
<td>.15</td>
<td>33345</td>
<td>Cap—Turntable spindle cap (rubber) 60 cycle...</td>
</tr>
<tr>
<td>33140</td>
<td>Cushion—One set rubber cushion for turntable mounting...</td>
<td>.65</td>
<td>33140</td>
<td>Cushion—One set rubber cushion for turntable mounting...</td>
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<td>Frame—Rotor frame and bearing cap...</td>
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<td>Frame—Rotor frame and bearing cap...</td>
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<td>Lamination—Stator laminations—60 cycle...</td>
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<td>Lamination—Stator laminations—60 cycle...</td>
<td>.15</td>
<td>33345</td>
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<td>33345</td>
<td>Lamination—Stator laminations—60 cycle...</td>
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</tbody>
</table>

Printed in U.S.A.
First Edition

MODEL U-104
Chassis RC-345H
Schematic, Voltage
Chassis Wiring
Alignment Procedure

**Five-Tube, Single-Band, AC, Victrola**

---

**Alignment Procedure**

1. Adjust the two trimmers (C1 and C6) on side of gang condenser for maximum output, using lowest possible output condenser for maximum output, using lowest possible output condenser. 
2. Tune preset, while holding tuning knob, so that the pointer is horizontal and pointing to low-frequency end when the gang condenser is at maximum. Check pointer adjustment and return preset to original setting.

---

**R-F Wiring Diagram and Socket Voltages**

Measurements made to common negative line, unless otherwise specified.

*Note: Values with star (*) are operating voltages. Values not starred are actual measured voltages.*

Measurements made with set tuned to quiet point, volume control at minimum, using 1,000-ohm-per-volt meter, having ranges of 10, 50, 250, and 500 volts. (Use nearest range above the specified measured voltage.)

Values should hold within approximately ± 20% for 117 volt 60 cycle supply.

- **Frequency Range**: 540-1,720 kc
- **Alignment Frequency**: 1,760 kc (ant. det.)
- **Power Output (125-volt, 60-cycle supply)**
  - Undistorted: 1.0 watt
  - Maximum: 1.5 watts
- ** Loudspeaker**
  - Type: 5-inch Electrodynamic
  - Voice-Coil Impedance: 5 ohms at 400 cycles
- **Phonograph**
  - Synchronous (manual starting)
- **Records**: 10-inch and 12-inch, 78 r.p.m.
- **Pickup**: Crystal, 100,000 ohms at 1,000 c.p.s.
- **Average Output of Pickup**: 1/2 volt at 1,000 c.p.s. across 1/2 meg. load.

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RCA MFG. CO., INC.

MODEL U-104
Chassis RC-34SH
Chassis Wiring, Lead Dress
Pick-up, Phonograph Data

Precautionary Lead Dress
1. Dress power cord and line bays C12 away from detector coil.
2. Plate lead from 6K7 to detector coil must be dressed close to chassis and run through center of chassis.
3. Green lead from detector coil to gang must be dressed clear of other leads.
4. Green lead from antenna coil to C17 must be dressed against front apron.
5. Dress all heater leads close to base.
6. Yellow lead from cathode 6K7 to volume control must be dressed against chassis, under gang condenser and against front apron.

Power Supply.—Although this model employs an ac-dc chassis, it is not suitable for use on dc, as this would damage the motor.

Antenna.—The set is equipped with a 25-foot antenna. Do not connect the antenna to ground. If an outdoor antenna is used, it should not be longer than 100 feet, including lead-in. If it is longer, connect a 100- to 200-mfd capacitor in series with the lead-in.

PHONOGRAPH SERVICE DATA

Pickup Connections

The motor is started by turning the phono-radio tone control to either 3rd or 4th position clockwise and giving the turntable a clockwise spin with the hand. Smooth starting and running will be insured by keeping the bearings well cleaned and oiled.

Hum and Vibration.—A small amount of hum when starting, decreasing to a negligible amount when running, is normal. If excessive vibration occurs it may be due to:
1. Insufficient lubrication, or any failure that will cause binding.
2. Leather washer not oiled. (Check to make certain that the leather washer is above the steel washer.)
3. Motor not properly supported from motor board.
4. Burn on poles of rotor or stator. Remove with fine emery cloth.
5. The damper spring must fit without binding or chattering in the slot in the stator. The stator must be free to deflect in either direction between the limits of the damper spring. The damper spring must exert approximately equal forces in restoring the stator to its mid-position when the stator is deflected manually in each direction.

Removing Rotor.—The rotor and turntable assembly simply rests on the ball bearing at bottom of vertical bearing. Remove by lifting up.

Rotor Adjustment.—Loosen the three screws that hold the rotor to the turntable, insert three 16-mil shims of equal distances around the gap between the rotor and stator, and then carefully tighten the three screws. The top of rotor must be flush with top of stator; add additional steel washers beneath the stator if necessary.

Lubrication.—Oiling points are indicated in the diagram.

On Phonograph Operation, turn the radio volume control to minimum, and tune to a quiet point on the dial.

Cross Section of Motor Assembly

This drawing shows the lubrication points

Motor Coil Assembly and Connections
D-C resistance of each coil (for 110 volts, 50 and 60 cycles) is approximately 82 ohms
## RCA MFG. CO., INC.

### Parts List

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32136</td>
<td>Motor—110-120 volts, 60 cycle</td>
<td>$12.40</td>
<td>32177</td>
<td>Shaft—Turnable spindle shaft and fibre gear.</td>
<td>$1.80</td>
</tr>
<tr>
<td>32336</td>
<td>Field—Motor field coils and laminations, 110 volts, 60 cycle (For Motor 84484-2, 3, or 4)</td>
<td>$5.10</td>
<td>32560</td>
<td>Field—Motor field coils and laminations, 110 volts, 60 cycle (For Motor 84484-B)</td>
<td>$5.10</td>
</tr>
<tr>
<td>32660</td>
<td>Field—Motor field coils and laminations, 110 volts, 60 cycle (For Motor 84484-B)</td>
<td>$5.10</td>
<td>32862</td>
<td>Field—Motor field coils and laminations, 110 volts, 25 cycle (For Motor 84484-B)</td>
<td>$10.60</td>
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<tr>
<td>32558</td>
<td>Motor—105-125 volts, 60 cycle</td>
<td>$10.60</td>
<td>32827</td>
<td>Motor—110-125 volts, 50 cycle (For Motor 84484-B)</td>
<td>$11.20</td>
</tr>
<tr>
<td>32651</td>
<td>Shaft—Turnable spindle shaft and fibre gear.</td>
<td>$1.40</td>
<td>32858</td>
<td>Shaft—Turnable spindle shaft and fibre gear.</td>
<td>$1.30</td>
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<tr>
<td>32653</td>
<td>Motor—110-125 volts, 60 cycle</td>
<td>$1.30</td>
<td>32856</td>
<td>Motor—110-125 volts, 25 cycle (For Motor 84484-B)</td>
<td>$1.30</td>
</tr>
<tr>
<td>32101</td>
<td>Base—Pickup arm pivot shaft, trip lever, and mounting base assembly</td>
<td>$0.95</td>
<td>32138</td>
<td>Cable—Shielded cable and male plug for pickup arm.</td>
<td>$0.90</td>
</tr>
<tr>
<td>32150</td>
<td>Crystal—Pickup crystal and needle screw</td>
<td>$3.75</td>
<td>32856</td>
<td>Screw—Pickup needle screw</td>
<td>$0.45</td>
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<tr>
<td>31443</td>
<td>Speaker cone and voice coil (L9)</td>
<td>$1.40</td>
<td>31983</td>
<td>Speaker cone and voice coil (L9)</td>
<td>$1.40</td>
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<tr>
<td>32887</td>
<td>Transformer—Output transformer for (For Speaker 84257-1)</td>
<td>$2.40</td>
<td>32888</td>
<td>Transformer—Output transformer for Speaker 84257-3</td>
<td>$2.40</td>
</tr>
<tr>
<td>32889</td>
<td>Speaker cone and voice coil (L9)</td>
<td>$1.40</td>
<td>32891</td>
<td>Speaker cone and voice coil (L9)</td>
<td>$1.40</td>
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<tr>
<td>32892</td>
<td>Transformer—Output transformer for Speaker 84257-3</td>
<td>$2.40</td>
<td>32893</td>
<td>Transformer—Output transformer for Speaker 84257-3</td>
<td>$2.40</td>
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</tbody>
</table>

### TRIMMER CAPACITOR BANK AND ELECTRIC-TUNING OSCILLATOR COILS

(Refer to Electrical Specifications for frequency ranges)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Chassis Stamped RC-348E</th>
<th>Chassis Stamped RC-348E &quot;MED&quot;</th>
<th>Chassis Stamped RC-348E &quot;M&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitor—Trimmer capacitor bank (C50, 22, 25, and 24)</td>
<td>Stock No.</td>
<td>Unit List Price</td>
<td>Stock No.</td>
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<tr>
<td></td>
<td>31416</td>
<td>$1.20</td>
<td>32666</td>
</tr>
<tr>
<td>Coll—Oscillator coil (L12)</td>
<td>31415</td>
<td>.30</td>
<td>31415</td>
</tr>
<tr>
<td>Coll—Oscillator coil (L13)</td>
<td>31584</td>
<td>.30</td>
<td>31584</td>
</tr>
<tr>
<td>Coll—Oscillator coil (L14)</td>
<td>31585</td>
<td>.30</td>
<td>31585</td>
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<tr>
<td>Coll—Oscillator coil (L16)</td>
<td>31583</td>
<td>.30</td>
<td>31583</td>
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</tbody>
</table>

ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.

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Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within approximately ±20% with 117-volt a.c. supply.

**NOTE**: Values with star (*) are operating voltages in circuits with high series resistance. The actual measured voltages will be lower, depending on the voltmeter loading.

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Alignment, Tuna, Data
Tuner Adjustments

**MOTORs Used in Model U-115**

At left, cast-frame type, Drawing No. 66428
At right, dome-metal type, Drawing No. 66429

- **VIBRATO**
- **MECHANISM**

- **Cable Wires and Plugs**
  - The equipment is assembled in a metal case as protection against moisture and mechanical shock. If broken, do not attempt to repair the unit, but return it for repair.
  - The equipment may be installed in a closed cabinet or on a rack.

- **Motor Lubrication**
  - Apply a few drops of light machine oil to the motor housing and oil every six months.

- **Power Supply Voltages**
  - A-S: 115-125 volts, 50 cycles, 100 watts
  - B: 115-125 volts, 50 cycles, 100 watts
  - C: 115-125 volts, 50 cycles, 160 watts

- **Tuning Control**
  - Push Button Selections:
    - **RCA TR-100 TO**
    - **RCA TR-200 TO**
    - **RCA TR-300 TO**

- **Adjustments for Electric Tuning**

- **Steps**
  - Connect the high side of test-osc to-
  - **Turn radio dial to**
  - **Adjust the following for max. peak output**

- **Push Button Adjustments**

- **Adjustments for Electric Tuning**

- **Drum Shown with Grid Fit Maximum Capacity**

- **Procedure**
  1. Make a list of the five desired stations, arranged in order from low to high frequencies.
  2. Push in the dial-tuning (right-hand) button, and manually tune in the first station on the list.

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MODELS U-121, Ch. RC-348J
U-123 (Single Band) Ch. RC-348H
U-127E, Chassis RC-348L

Schematic, Chassis Wiring

Voltage

**Precautionary Lead Dumps:**
1. Dress green lead from antenna coil to switch away from the chassis and ground.
2. Ground bus from 6H6 socket must be close to chassis.
3. Dress leads away from oscillator coil adjustment screws.
4. Dress power transformer primary leads toward left-hand end of chassis.
5. Dress plate lead from cet.

Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at maximum. Values should hold within approximately ±10% with 115-volt ac supply.

*NOTE:* Values with star (*) are operating voltages in circuits with high series-resistance. The actual measured voltages will be lower, depending on the voltmeter loading.
MODEL U-123 (2 Bands)
Chassis RC-421

RCA MFG. CO., INC.

Schematic, Voltage
Chassis Wiring

IF PEAK 455 KC

RC-421 (Two-Band Model U-123)

Note the following additional d-c resistances: Voice-coil, 2 ohms; primary of output transformer, 375 ohms; 60-cycle power transformer, primary 9 ohms, secondary 715 ohms.

Precautionary Lead Dress.—Dress the oscillator grid condenser (C7) away from chassis. Leads along back of chassis must be dressed in corner of chassis and away from contact "E" of 2nd 1-f transformer. Keep a-c leads against end of chassis. Dial drum must be 5/32-inch from front apron.

Measurements made to chassis unless otherwise indicated, with set tuned to quiet point and volume control at minimum. Values should hold within approximately ± 20% with 117-volt a-c supply.

*NOTE: Values with star (*) are operating voltages in circuits with high series-resistance. The actual measured voltages will be lower, depending on the voltmeter loading.

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Alignment Procedure

Cathode-ray alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing. Turn the receiver volume control to maximum.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-c e action.

Calibration Marks.—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore calibration marks corresponding to dial readings of 600 kc and 1,500 kc have been stamped in the plate on the front of the chassis, as shown in the accompanying drawing. These marks are used for reference during alignment.

Drum and Dial Indicator Adjustment.—As the first step in r-f alignment, check the position of the drum on the front shaft of the gang condenser. With the gang at maximum (full mesh) the drum set-screw should be pointing directly down (RC-348 series) and up for RC-421. With the drum in this position, and the gang at maximum, move the dial indicator along the drive cord to coincide with the left-hand line as shown. The indicator is held to the drive cord by means of spring clips. After completion of alignment, and after the chassis has been fastened in the cabinet, turn the gang to maximum and note whether the dial indicator is at the left-hand end mark on the dial; if it is not, move the pointer the required distance along the cord.

RC-348J, RC-348H, and RC-348L

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-P grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 650-750 kc</td>
<td>L7 and L8 (2nd l-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6A5 gang cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>1,500 kc</td>
<td>L6 and L6 (1st l-F Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead (blue) in series with 200 mmf.</td>
<td>1,500 kc</td>
<td>1,500 kc calibration mark</td>
<td>C6 (osc.) C5 (ant.)</td>
</tr>
<tr>
<td>4</td>
<td>Follow “Adjustments for Electric Tuning.”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The oscillator section of the gang condenser has two trimmers, one on top, accessible through a hole in the chassis, and the other on bottom. It may be necessary to adjust both of these trimmers to secure a peak at 1,500 kc.*

RC-421 (Two-band Model U-123)

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-P grid cap, in series with .01 mfd.</td>
<td>455 kc</td>
<td>Quiet point between 650-750 kc</td>
<td>L7 and L10 (2nd l-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Stator of ant. section of gang</td>
<td>455 kc</td>
<td>1,500 kc</td>
<td>L1 (1st l-F Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead, in series with 200 mmf.</td>
<td>800 kc</td>
<td>800 kc calibration mark</td>
<td>L6 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Repeat steps 3 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Antenna lead, in series with 400 ohms</td>
<td>16.2 mc</td>
<td>16.2 mc</td>
<td>C10 (osc.)</td>
</tr>
<tr>
<td>7</td>
<td>Follow “Adjustments for Electric Tuning.”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Rock gang for maximum output while adjusting C10.*

Note.—The oscillator tracks above the signal on both bands.
Automatic Record Changer

RCA MFG. CO., INC.

Automatic Record Changer
Adjustments, Notes

by hand. Six turntable revolutions are required for one change cycle. If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

A. Main Lever.—This lever is basically important in that it interlocks the various individual mechanisms which control needle landing, tracing, record separation, etc. One adjustment is provided for this lever. Note: it is not turntable until the change is out-of-cycle, and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate after 16 revolutions.

B. Friction Clutch.—The motion of the tone arm is regulated by the friction clutch "S." If the tone arm is locked, the clutch is abruptly accelerated or becomes erratic due to pushing the eccentric pivot (the pin) to "P." moving the tone plate around the main gear, and the change cycle is started. Proper adjustment of the friction clutch "S" occurs when movement of the tone arm causes positive movement of the tone arm gear (P) toward the main gear (G) without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by screw "B." If adjustment is too tight, the tone arm will not roll smoothly, and too loose, the tone arm will not roll smoothly, and too loose, the position at the end of the record will be lost.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "S" is actuated by the main lever "14" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper operation, stop the change cycle; cycle the tone arm gear (P) until the point where pickup is raised to the maximum height above turntable plate. Short the pickup on the lever lever, and move out of the course. This position is adjacent to the pickup on the lever, and is adjacent to the pickup on the lever. Move "S" to the left side of the tone arm gear (P), and adjust horizontal position of the tone arm to proper distance, being careful not to disturb levers "14" and "15." Leave approximately 3/32 inch between hub of lever "S" and pickup base bearing, and tighten the black nose screw "B." Run mechanism through several cycles, then tighten cone pointed screw "B.".

D. E. Needle Landing on Record.—The relation between the needle's landing on the record and lever "S" determines the landing position of the needle on the pickup plate. To adjust for needle landing, place 10 inch record on turntable; push index lever to return position and return to the 10 inch position. Set the pickup lift on lever "14" is tilted fully toward turntable, and adjust horizontal position of the tone arm to proper distance, being careful not to disturb levers "14" and "15." Leave approximately 3/32 inch between hub of lever "S" and pickup base bearing, and tighten the black nose screw "B." Run mechanism through several cycles, then tighten cone pointed screw "B.".

NOTE: Numbers refer to parts,—letters refer to adjustments

Miscellaneous Service Hints

1. For any irregularity of operation, the adjustment of the main lever "14" should be checked first as in "A."
2. Needle does not land properly on any 10 and 12 inch records—Make adjustments "D" and "E."
3. Needle does not land properly on 12 inch record but correct on 10 inch—Adjustment "E."
4. Failure to slip tip of record,—InCREASE CHiCk "S" friction by means of screw "B." Also, see that levers "W" and "14" are free to move without touching each other.
5. Pickup strikes lower record of stack or crate above turntable—Adjust lift cable per adjustment "C."
6. Needle does not track after landing—Friction clutch "S" adjustment may be too tight; bend in tone arm vertical bearing, or "14" funny; or pickup output cable twisted.
7. Cycle commences before record is complete—Record is defective, or adjustment "B" of friction clutch "S" incorrect.
8. Wow in record reproduction—Record is defective, or instrument is not being operated at normal room temperature (40°-90°).
9. Record knives strike edge of record—Records warped; record edges are rough; or needle adjustments "F" and "G" are incorrect.
10. Record not released properly—Record shop adjustments, rerecord shop, or other means of adjustment "H."
11. Needle lands on 10 inch position on 12 inch record or misses record when playing both types mixed—Lack of tension of pickup locking lever spring "I."
Specifications, Tuner Data

Record Changer Details

RCA MFG. CO., INC.

Model U-121, CH RC-546X
Model U-123, CH RC-546E & RC-421
Model U-125, CH RC-548X
Model U-125D, CH RC-548L

Power Output

Undistorted: 3 watts, Maximum: 4 watts

Power Supply Ratings

A 4: 105-125 volts, 60 cycles, 100 watts total
A 6: 105-125 volts, 60 cycles, 100 watts total
B 6: 105-125 volts, 60 cycles, 100 watts total
B 8: 105-125/110-250 volts, 60 cycles, 100 watts total
C 6: 105-125/110-250 volts, 60 cycles, 100 watts total
C 8: 105-125/110-250 volts, 60 cycles, 100 watts total

Top View of Automatic Record Changer

Details of Record Shelf Posts, and Locating Lever Assemblies

The crystal pickup is sealed in a metal case as protection against extreme changes of climate. If failure occurs, do not attempt to repair the unit, but install a new crystal unit.

The phonograph motor is a self-starting constant-speed induction type.

Motor Lubrication (Models U-121 and U-127E)—Apply a few drops of light machine oil to the spindle bearing and oil hole every six months. The oil hole is located in the motor casing, adjacent to the spindle bearing, and has a screw plug.

The automatic stop (Models U-121 and U-127E) should be adjusted so that the lever will snap to the "off" position when the pickup needle is 12 inches from the center line of the spindle.

Adjustments for Electric Tuning

Push-Button Range in RC-348, 348H, and 348L

No. 1 and 2: Approximately 550-925 kc
No. 3: Approximately 600-1,225 kc
No. 4 and 5: Approximately 850-1,850 kc

These models have six push buttons. The right-hand button controls the same frequency or dial tuning. The other five buttons are for electric tuning of five different stations in the standard broadcast range. The station buttons connect to separate magnetic-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an ungrounded screwdriver or 2 inch mallet such as RCA Stock No. 31031 to adjust stations. Use a regular antenna for the preliminary adjustments.

The procedure is as follows:
1. Make a list of the five desired stations, arranged in order from the highest frequency.
2. Push in the dial-tuning button, and manually tune in the first station on the list.
3. Push in button No. 1 and adjust No. 1 oscillator core to receive this station. Proceed to the next station by tuning to the lowest frequency, and then unscrew slowly until the station is received.
4. Adjust No. 1 antenna trimmer for maximum output on this station.
5. Adjust for each of the remaining four stations in the same manner.
6. Use a final careful adjustment of the oscillator cores and antenna trimmers on the circuits to lower frequencies.

Drum Mechanism
## Replacement Parts Models U-121, U-123 (Single-Band), and U-127E

### CHASSIS ASSEMBLIES

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31188</td>
<td>Capacitor-Capacitor for push button switch assembly (C30, C31, C32, C33, C34)</td>
<td>1.20</td>
</tr>
<tr>
<td>12733</td>
<td>Capacitor—66 mfd. (C4)</td>
<td>1.20</td>
</tr>
<tr>
<td>30904</td>
<td>Capacitor—100 mfd. (C7, C8, C9, C10)</td>
<td>1.20</td>
</tr>
<tr>
<td>14239</td>
<td>Capacitor—100 mfd. (C12, C13, C14)</td>
<td>1.20</td>
</tr>
<tr>
<td>13417</td>
<td>Capacitor—100 mfd. (C15)</td>
<td>1.20</td>
</tr>
<tr>
<td>31425</td>
<td>Capacitor—750 mfd. (C35)</td>
<td>1.20</td>
</tr>
<tr>
<td>48385</td>
<td>Capacitor—500 mfd, 1,000 volts (C1, C2, C3, C4, C5, C6)</td>
<td>1.20</td>
</tr>
<tr>
<td>14203</td>
<td>Capacitor—0.01 mfd. (C16, C17)</td>
<td>1.20</td>
</tr>
<tr>
<td>48226</td>
<td>Capacitor—0.025 mfd. (C18, C19)</td>
<td>1.20</td>
</tr>
<tr>
<td>50982</td>
<td>Capacitor—0.05 mfd. (C20)</td>
<td>1.20</td>
</tr>
<tr>
<td>31426</td>
<td>Capacitor—0.001 mfd. (C21)</td>
<td>1.20</td>
</tr>
<tr>
<td>30907</td>
<td>Capacitor—0.1 mfd. (C22)</td>
<td>1.20</td>
</tr>
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### MATER ASSEMBLIES

#### Model U-121 and U-127E

<table>
<thead>
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<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31184</td>
<td>Damper—Comprising rubber spindle sleeve and 1 metal damper</td>
<td>1.20</td>
</tr>
<tr>
<td>30907</td>
<td>Field—Motor coil and laminations, 105-120 volts</td>
<td>6.50</td>
</tr>
<tr>
<td>30908</td>
<td>Field—Motor coil and laminations, 50-100 volt, 50 cycle</td>
<td>6.50</td>
</tr>
<tr>
<td>30909</td>
<td>Field—Motor coil and laminations, 50-100 volt, 60 cycle</td>
<td>6.50</td>
</tr>
<tr>
<td>30903</td>
<td>Motor—105-120 volt, 50 cycle</td>
<td>6.00</td>
</tr>
<tr>
<td>30904</td>
<td>Motor—105-120 volt, 60 cycle</td>
<td>6.00</td>
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<tr>
<td>30905</td>
<td>Motor—105-120 volt, 50 cycle</td>
<td>6.00</td>
</tr>
<tr>
<td>30906</td>
<td>Motor—105-120 volt, 60 cycle</td>
<td>6.00</td>
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</table>

### MOTORASSEMBLIES

#### Model U-127E

<table>
<thead>
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<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>30907</td>
<td>Shaft—Turntable shaft and gear for 60 cycle motor</td>
<td>1.00</td>
</tr>
<tr>
<td>30908</td>
<td>Shaft—Turntable shaft and gear for 60 cycle motor</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### MOTORBOARD ASSEMBLIES

#### Model U-121 and U-127E

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>30909</td>
<td>Brake—Automatic brake and switch assembly</td>
<td>2.95</td>
</tr>
<tr>
<td>30909</td>
<td>Damper—Comprising 1 rubber spindle sleeve, 1 metal damper, and 1 metal damper plate</td>
<td>0.20</td>
</tr>
<tr>
<td>30909</td>
<td>Plug—Switch control plug</td>
<td>0.30</td>
</tr>
<tr>
<td>30909</td>
<td>Rest—Rubber rest for pickup arm</td>
<td>0.10</td>
</tr>
<tr>
<td>30909</td>
<td>Switch—Radio-record switch</td>
<td>0.00</td>
</tr>
<tr>
<td>30909</td>
<td>Switch—Switch box for automatic brake</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### PICKUP AND ARM ASSEMBLIES

#### Model U-121 and U-127E

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31186</td>
<td>Pickup arm pivot shaft, trip lever, and mounting base assembly</td>
<td>0.95</td>
</tr>
<tr>
<td>31187</td>
<td>Cable—Shielded cable and male plug for pickup arm assembly</td>
<td>0.95</td>
</tr>
<tr>
<td>31188</td>
<td>Crystal—Pickup crystal and needle</td>
<td>0.95</td>
</tr>
<tr>
<td>31189</td>
<td>Pickup arm and complete</td>
<td>0.95</td>
</tr>
<tr>
<td>31190</td>
<td>Pickup arm needle screw</td>
<td>0.95</td>
</tr>
<tr>
<td>31191</td>
<td>Pickup arm assembly</td>
<td>0.95</td>
</tr>
</tbody>
</table>

#### Model U-123 (Single-Band)

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>31182</td>
<td>Cable—Pickup arm lift cable</td>
<td>0.95</td>
</tr>
<tr>
<td>31183</td>
<td>Cable—Pickup arm output cable</td>
<td>0.95</td>
</tr>
</tbody>
</table>

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ALIGNMENT PROCEDURE

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown in the chassis drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a-c action.

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment; therefore, a calibration scale is attached to the rear of the drum which is mounted on the front shaft of the gang condenser. The setting of the gang condenser is read on this scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment table.

As the first step in r-f alignment, check the position of the drum. The 180° mark on the drum scale must be vertical, and directly over the center of the gang-condenser shaft when the plates are fully meshed. The distance from the front of the chassis to the drum must not exceed 3/4 inch. The drum is held to the shaft by means of two set screws, which must be tightened securely when the drum is in the correct position.

Pointer for Calibration Scale.—Improvise a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and bend the wire so that it points to the “180°” mark on the calibration scale when the plates are fully meshed.

Dial-Indicator Adjustment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 7°C mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

For additional details, refer to booklet “RCA Victor Receiver Alignment.”

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6K7 1-P grid cap, in series with .01 mfd.</td>
<td>456 kc</td>
<td>“A” band, Quiet Point between 550-750 kc</td>
<td>L12 and L13 (2nd L-P Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6AS-G det. grid cap, in series with .01 mfd.</td>
<td>456 kc</td>
<td>20 mc (23°) “C” band</td>
<td>L10 and L11 (1st L-P Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Terminal, in series with 300 ohms</td>
<td>20 mc</td>
<td>6 mc (33°) “B” band</td>
<td>C21* (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna Terminal, in series with 300 ohms</td>
<td>6 mc</td>
<td>1,500 kc (28½°) “A” band</td>
<td>C25 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Antenna Terminal, in series with 200 mfd.</td>
<td>1,500 kc</td>
<td></td>
<td>C25 (osc.)</td>
</tr>
<tr>
<td>6</td>
<td>Follow “Adjustments for Electric Tuning”</td>
<td></td>
<td></td>
<td>C25 (osc.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity if two peaks can be obtained.
** Rock gang slightly and use maximum capacity peak if two peaks can be obtained with C30. Check to determine that C21 has been adjusted to the correct peak by tuning to approximately 28° (19.09 mc), where a weaker signal (image) should be received.
† Use minimum capacity if two peaks can be obtained. Check to determine that C23 has been adjusted to the correct peak by tuning to approximately 51° (5.09 mc), at which point a weaker signal (image) should be received.

Note.—Oscillator tracks 455 kc above signal on all bands.

ADJUSTMENTS FOR ELECTRIC TUNING

This model has eight push-buttons. The front button is the Victrola switch. The rear button connects the gang condenser for manual tuning. The other six buttons are for electric tuning of six different stations in the standard-broadcast range. The station buttons connect to separate magnet-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow at least five minutes warm-up period before making adjustments.

Use one or two feet of wire as an antenna to ensure sharp peaking.

The procedure is as follows:
1. Make a list of the desired six stations, arranged in order from low to high frequencies.
2. Push in the dial-tuning button, and manually tune in the first station on the list.
3. Push in station button No. 1 (second from front) and adjust No. 1 oscillator core (L37) to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
4. Adjust No. 1 antenna trimmer (C36) for maximum output on this station.
5. Adjust for each of the remaining five stations in the same manner.
6. Make a final careful adjustment of the oscillator cores and antenna trimmers.

Precautionary Lead Dress.—
1. Dress red leads from power transformer to power switch (S3), in corner of chassis and away from volume control terminals.
2. Dress brown lead from push-button switch to gang over end of switch, and away from C27 and bus between S5 and range switch.
3. Leads to C27 must be as short as possible.
4. Blue lead from range switch to oscillator coil must be as short as possible and dressed away from other leads. All leads should be dressed away from antenna coil.
5. Leads across back of chassis must be dressed under electrolytic away from Victrola jack.
6. Parts and leads should be dressed away from R22-R14 as it becomes heated.
7. Leads from oscillator coil to trimmers must be dressed away from coil.
8. Green lead from S4 to range switch must be clear of other leads and away from front edge of chassis.
## REPLACEMENT PARTS

### SELF-FACTORY-TESTED PARTS

- **Receivers**
  - Stock No.: 14570
  - Description: Transformer—First id transformer (L10, L11, C10, C11)
  - Unit List Price: 2.45

- **Capacitors**
  - Stock No.: 31496
  - Description: Transformer—Power transformer 100-150 volts, 85-60 cycles (T1, 14 turns)
  - Unit List Price: 7.80

- **Speaker Parts**
  - Stock No.: 32124
  - Description: Transformer—Power transformer 100-120 volts, 60-80 cycles (T1, 14 turns)
  - Unit List Price: 4.75

### MOTORBOARD ASSEMBLIES

- **Motor Parts**
  - Stock No.: 31100
  - Description: Bumper—Main lever rubber bumper (1)
  - Unit List Price: 7.90

- **Speaker Parts**
  - Stock No.: 32148
  - Description: Guide—Pickup lift cable guide (Coil spring, 80T, Rein., large)
  - Unit List Price: 4.00

### OPERATING MECHANISM

- **Switch Parts**
  - Stock No.: 31122
  - Description: Pin—Trip lever fitter on finger assembly (7)
  - Unit List Price: 4.5

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>UNIT LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>14570</td>
<td>Transformer—First id transformer (L10, L11, C10, C11)</td>
<td>2.45</td>
</tr>
<tr>
<td>31496</td>
<td>Transformer—Power transformer 100-150 volts, 85-60 cycles (T1, 14 turns)</td>
<td>7.80</td>
</tr>
<tr>
<td>32124</td>
<td>Transformer—Power transformer 100-120 volts, 60-80 cycles (T1, 14 turns)</td>
<td>4.75</td>
</tr>
<tr>
<td>31100</td>
<td>Bumper—Main lever rubber bumper (1)</td>
<td>7.90</td>
</tr>
<tr>
<td>32148</td>
<td>Guide—Pickup lift cable guide (Coil spring, 80T, Rein., large)</td>
<td>4.00</td>
</tr>
<tr>
<td>31122</td>
<td>Pin—Trip lever fitter on finger assembly (7)</td>
<td>4.5</td>
</tr>
</tbody>
</table>

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**All Prices Are Subject to Change or Withdrawal Without Notice**

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Schematic Diagram of the RME LS-1 Noise Suppressor

Schematic Diagram of the RME LS-2 Noise Suppressor
FOR SCHEMATIC SEE VOLUME VII.
Fig. 11A
SERVICE NOTES FOR THE
NME-69 RECEIVER

ALIGNMENT

One of the first evidences of misalignment in a receiver is low over-all gain of the receiver. In the NME-69 Receiver this is evidenced by low meter readings on signals which were formerly of high output. To eliminate the effect of the receiver to the tremendous gain available in the audio system of the NME-69 Receiver, a misalignment due to loss of gain may not be noticed if the condition of the receiver is judged by audio output, since it may be possible to turn the volume control to the maximum output position and still obtain high values of audio output. Misalignment, however, does not affect the circuits of the audio amplifier and has only to do with the intermediate frequency amplifier and, to some extent, the radio frequency amplifiers. Principal among the contributions to low gain is the part which the intermediate frequency amplifier plays in providing over-all sensitivity and selectivity of a satisfactory order.

Misalignment of the radio frequency section (principally that part of the section which is made up of the high frequency oscillator) is the control of the receiver calibration. This also is susceptible to certain outside influences which can cause variations to such a degree that the stated calibration of the receiver is changed, however, this offset is not a common offset and usually the calibration of the receiver, unless tampered with by unexperienced hands, will remain very close to its stated value indefinitely.

This loss of gain when occurring in the radio frequency section of the receiver is usually due to the fact that the oscillator has been grossly misaligned so that it is apparent in the frequency calibration of the receiver. In other words, it might well be said that a loss of sensitivity in the receiver occurring simultaneously with wide-spread condition of off calibration might indicate too fast that the loss of gain is caused by misalignment of the radio frequency section of the receiver.

On the other hand, if the gain of the receiver is low, but the calibration is correct, it might be said without hesitation that the most probable cause for the low gain is the misalignment of the intermediate frequency amplifiers relative to the trimming condensers of the intermediate frequency amplifier transformers.

It is for this purpose of realignment of these intermediate frequency transformers that the following test procedure is outlined. IMPORTANT NOTE: It is essential that the intermediate signal which is used for realignment of the intermediate frequency amplifier be not set according to any arbitrary calibration on the test oscillator itself since it has been found that commercial test oscillator for service work vary considerably, at least to an extent which will not permit proper alignment of a communication type receiver in which is installed a quartz filter. It is therefore better if no test oscillator is used, since a broadcast station of constant signal strength will furnish adequate test signal for alignment of the intermediate frequency amplifier without the aid of a quartz filter or the proper frequency as indicated in the following procedure.

The meter on the NME-69 receiver affords an excellent method of indicating the peak alignment of each of the transformers. The location of the three intermediate frequency amplifier transformers, T5, T6, and T7, is shown in Figure 4 of the illustrated sheet attached. The two trimmable condensers located in each of the transformers and accessible through apertures in the top of the shield can also be seen.

OUTLINE OF PROCEDURE FOR CORRECT ALIGNMENT OF THE INTERMEDIATE FREQUENCY AMPLIFIER TRANSFORMERS OF THE NME-69 RECEIVER.

The intermediate frequency amplifiers in the NME-69 Receiver are designed for a frequency of 465 KC. Since these receivers are always supplied with a quartz crystal filter, it is essential that the intermediate frequency amplifiers be accurately aligned with the crystal frequency. Crystals are supplied in frequencies slightly at variance from the above stated value of intermediate frequency by an amount not greater than one kilocycle plus or minus 465 KC. Rather than to realign the intermediate frequency amplifier stages of the NME-69 to a set frequency of 465, it is essential that the alignment be done in conjunction with the quartz filter. Alignment of the intermediate frequency amplifiers is achieved at the frequency of the filter. This is done as follows: When the process as herein outlined is followed accurately, the meter readings will be obtained. The use of other process of a general type will produce inferior results.

The first step in the alignment procedure is to tune in a broadcast station, preferably in the low frequency portion of the broadcast band. The signal should be of medium signal strength so that the meter indicates a signal level of 90 or slightly less. If no station of this amplitude is available but a stronger station is available, a reduction in the effectiveness of the antenna by the connection of a short wire to the antenna post may help to bring the signal strength as indicated down to 90. Usually between 550 and 900 KC in most any territory a station can be received at least any time for this test and adjustment.

When the station has been chosen, let us assume that its frequency is 700 KC, the next step is to slightly detune the main tuning control so that the frequency reads approximately 700 KC. This of course will tune the station in.

It does not necessarily have to be the frequency mentioned or the exact frequency of 700, but the general procedure is to tune the main tuning control slightly higher than the chosen station so that it may be brought back to resonance by decreasing the scale reading of the band-spread control. This is done merely to provide vernier tuning.

With the station chosen and resonated on the band-spread scale, the crystal filter is switched to the series position which is the middle position of the three available. The band-spread scale is then adjusted with respect to the signal so
that a maximum motor reading is obtained. This procedure is one which requires patience and accuracy of adjustment since the 50 kilocycle side of the receiver is ultra sharp with the quartz crystal filter in and there will be one definitely sharp peak indicating crystal resonance. The receiver should be tuned to this peak and left on it during all adjustments to be made regarding the intermediate frequency amplifier.

When this peak has been tuned to and the meter is at maximum reading, a small standard intermediate frequency trimmer tool of the insulated screwdriver type should be used. Then the control "R", Figure 2a, should be set so that the condenser it adjusts is set at 50% mesh. Then, with a two-frequency tuning, any transformer may be adjusted at any particular time, the important factor being that they all be adjusted so that the R meter is brought to and read at maximum motor reading. Usually this adjustment will not require very much tuning of more than two adjustment screws. A good procedure to follow is to start with the No. 1 transformer and align in sequence No. 2 and No. 3. All adjustments should be made as before mentioned so that the motor reading is maximum.

It is advisable to time and time to make sure that the signal is still adjusted to peak resonance of the crystal by slightly varying the adjustment of the band-spread control. When this procedure has been completed as outlined and all transformers have been adjusted and left at maximum motor reading, the intermediate frequency transformers have been aligned as outlined, the silencer transformer may be peaked by turning the band switch to No. 6 band on the receiver and tuning in and resonating the frequency band as above and the selected signal should be of maximum effectiveness in filter action.

RFM-69 RECEIVER INTERMEDIATE FREQUENCY AMPLIFIER ALIGNMENT WITH SILLENCE INSTALLED

The general procedure for alignment of the intermediate frequency amplifier as described above also applies to receivers in which the 16-1 silencer has been installed. Preliminary adjustment as above described should be made with the silencer in position, the silencer control then be adjusted to maximum clockwise position, and the small screw accessible through the hole in the silencer panel of the receiver which lies on the silencer control may be turned to adjust the silencer for the maximum mesh position of the small screw. This ensures accurate alignment of the circuit with the control and the silencer for maximum effectiveness in filter action.

---

After the intermediate frequency amplifier has been aligned as per the instructions under the article concerning intermediate frequency transformer alignment, a check of the phasing of the crystal filter should be made. Tune in a broadcast station, preferably on the low frequency end of Band 1. Then tune the main tuning control slightly to the high side of the receiver with the quartz crystal filter in and there will be one definitely sharp peak indicating crystal resonance. The receiver should be tuned to this peak and left on it during all adjustments to be made regarding the intermediate frequency amplifier.

When this peak has been tuned to and the meter is at maximum reading, a small standard intermediate frequency trimmer tool of the insulated screwdriver type should be used. Then the control "R", Figure 2a, should be set so that the condenser it adjusts is set at 50% mesh. Then, with a two-frequency tuning, any transformer may be adjusted at any particular time, the important factor being that they all be adjusted so that the R meter is brought to and read at maximum motor reading. Usually this adjustment will not require very much tuning of more than two adjustment screws. A good procedure to follow is to start with the No. 1 transformer and align in sequence No. 2 and No. 3. All adjustments should be made as before mentioned so that the motor reading is maximum.

It is advisable to time and time to make sure that the signal is still adjusted to peak resonance of the crystal by slightly varying the adjustment of the band-spread control. When this procedure has been completed as outlined and all transformers have been adjusted and left at maximum motor reading, the intermediate frequency transformers have been aligned as outlined, the silencer transformer may be peaked by turning the band switch to No. 6 band on the receiver and tuning in and resonating the frequency band as above and the selected signal should be of maximum effectiveness in filter action.

With this setting achieved, vary the dial Number 1 slightly higher and slightly lower by five kilocycles as can be approximated by the calibration of the dial (one half division each way since one division is representative of 30 kilocycles) and notice the drop in the R meter reading. The drop so achieved by varying the setting of Dial 1 five kilocycles above and below the selected signal should be of maximum effectiveness in filter action.

With this setting achieved, vary the dial Number 1 slightly higher and slightly lower by five kilocycles as can be approximated by the calibration of the dial (one half division each way since one division is representative of 30 kilocycles) and notice the drop in the R meter reading. The drop so achieved by varying the setting of Dial 1 five kilocycles above and below the selected signal should be of maximum effectiveness in filter action.

It will be found that the condenser 0-1 will usually run at a very low value of capacity, very close to its minimum capacity adjustment. Therefore only slight tuning of this condenser may normally reduce the effect of the crystal filter. It is usually found that this condenser is not required to be adjusted since it holds its setting very well over long periods of time. The procedure just outlined gives the proper method for checking the phasing and adjusting when necessary.

ALIGNMENT OF RADIO FREQUENCY SECTION OF THE RFM-69 RECEIVER

Alignment of the radio frequency section of the receiver will affect principally the calibration of the receiver. Within certain limits this of course will affect the sensitivity. A receiver which is not in frequency to be line up 10-20 kilocycles will reduce the sensitivity of the receiver as they are set in the calibration of the diode, the required setting of the main tuning diode indicator. Correction for any variation in calibration can be made by following the suggestions outlined below.

Band 1 includes the frequencies between 550 and 1500 kilocycles. For Band 1 there are two frequency adjustments for adjusting the transformer to proper calibration. One of these, C, is adjusted as indicated on Figure 4 through the loop of the shield and the required setting of the main tuning diode assembly. Just in front of this aperture and on the main tuning condenser assembly is C which is used to adjust the
frequency for the high frequency end of Band 1. The procedure is this: Put the main tuning indicator to a position so that the main tuning condensers are fully meshed. The pointer of the main tuning control should then be set at maximum left end of scale so that the pointer falls just below the line above the numbers indicating the various channels. In this respect it will partially cover the top half of the numerals indicating the different tuning bands on the receiver. In other words, in each band on which both the semi-circular scale at the extreme counter-clockwise position should rest on the top edge of the pointer as it is turned to maximum counter-clockwise rotation and the condenser plates are at full mesh.

The next step is to choose a station or a signal of accurately known frequency, around 700 Kc, and set the main indicator to the frequency of the signal which is going to be used for the test. For example: there is a station available with fairly good signal strength or a test oscillator is available which can accurately be set at 700 Kc. If the receiver indicator or the main tuning dial is set at 700 Kc, the receiver is considerably out of calibration of course the signal will not be received. However, leave the indicator at the correct frequency of the signal being used for the test and set the bandspread control to a reading of 130 on the dial at which position it has no material effect on the tuning circuits of the receiver and for the calibration of the main tuning dial to indicate accurately the frequency of setting.

Then by means of condenser C6 (Figure 4) accessible through the trimming hole in the oscillator shield can for Band 1, adjust until the signal is brought in with the indicator at the proper frequency. Then choose a signal of about 1000 or 1500 kilocycles, and set the main tuning dial indicator to the correct frequency for that signal and bring the tuning in on that setting with trimmers C5, C6. The trimmer will then be necessary to return to the former frequency setting of 700 Kc to make sure that the variation of C5 has not made some slight change in the setting for the lower frequency calibration point and it may be necessary to readjust C6 slightly again. Then in order to make certain of the accuracy of both settings return to the frequency chosen between 1300 and 1800 Kc. This will cause misalignment of the RF amplifier and hence prominent beating of harmonically related broadcast frequencies in the effect that one or more of the tuning tones will be received on the high frequency end of the broadcast band. Excessive capacity on C will somewhat contribute to the same result but will, more than that, reduce the sensitivity on the broadcast band. When the receiver leaves the factory, they are set at a very small capacity and should not be increased.

Calibrations on the higher frequency bands are controlled for Bands 2, 3, 4, 5, and 6 by the trimmers C7, C8, C9, C10, C11, C12 (Figure 12-B) respectively. High side beat is used on all frequencies in the R4-50 Receiver which means that the condensers C7, C8, C9, C10, C11, C12 must be set to the lowest capacity setting which will provide a beat and the proper calibration for the frequencies in the respective bands. Calibration frequencies used are as follows:

Band 2: 8 megacycles, 2 megacycles, 3 megacycles.
Band 3: 4 megacycles, 5 megacycles, 8 megacycles.
Band 4: 7 megacycles, 9 megacycles, 11 megacycles, 12 megacycles.
Band 5: 14 megacycles, 15 megacycles, 17 megacycles.
Band 6: 30 megacycles.

The calibrations have been made accurately on all of the frequencies, or if the receiver has been found to be accurately set, the loop notes are to be made. In all cases the trimmers C6 and C9 have a distinct effect upon the RF grid circuits for bands 5 and 6 respectively. They are adjusted as follows: With a steady incoming signal on between 11 and 15 megacycles and the most effective setting of the control for signal in that region, and with the antenna connected, the condenser C6 is adjusted for maximum meter reading. With these same conditions existing on 90 megacycles, with the band switch set on band 6 and the antenna connected, C9 is adjusted for maximum response on a given steady signal. All other trimming and adjusting is done manually by means of control D4, Figure 4, and a variable RF amplifier and detector grid pad which can be adjusted for peak response at any frequency it is desired to tune to.

It is important to note the setting of the condenser C6 (Figure 4). This is the antenna coupling condenser used when the receiver is set to Band 1. It is as well as condenser C7 (Figure 4) should be set to practically its minimum capacity in order to provide constant alignment and proper coupling to the antenna when using Band 1. Excessive capacity on C6 will cause misalignment of the RF amplifier and hence prominent beating of harmonically related broadcast frequencies in a manner that one or more of the tuning tones will be received on the high frequency end of the broadcast band. Excessive capacity on C will somewhat contribute to the same result but will, more than that, reduce the sensitivity on the broadcast band. When the receiver leaves the factory, they are set at a very small capacity and should not be increased.

Whenever the receiver is gone over for alignment, it is well to remove the dust cover from the condenser assembly and inspect the permanent position of the rotor plates of the variable condensers controlled by the knobs. This is located between the two main variable condensers and is located underneath the dust cover which is removable by unscrewing the four acorn nuts holding it down on the condenser assembly. Some times the rotors become loosened and misplaced angularly with respect to each other. They should always be adjusted so that the rotors are at full mesh at the same time. Any slight angular displacement of one rotor with respect to the other will materially reduce the sensitivity of the receiver and destroy the preselection, thereby reducing the image rejection and also the selectivity, especially on the high frequency bands.

The padders C6 and C9 (Figure 12-B) materially contribute to the image rejection on the bands 5 and 6. Special care should therefore be taken in the adjustment of these condensers when the receiver is aligned.
CONVENTIONAL ALIGNMENT - SEE SPECIAL SECTION VOLUME VIII.

FREQUENCY RANGES AND ALIGNMENT FREQUENCIES:

BROADCAST - 540 to 1700 KC - Adjust the OSC, RF and ANT. to maximum peak of 1400 KC, then pad the oscillator circuit at 600 KC while rocking gang condenser.

SHORT WAVE - 5500 to 15200 KC - Adjust the OSC and ANT. trimmers to maximum peak of 14000 KC. No padding required.

POLICE - 1700 to 5000 KC - Adjust the ANT. coil trimmer to a maximum peak of 4000 KC. No other adjustments are required.
MODEL 4H

RADIO PRODUCTS CORP.

POWER SUPPLY: AC (60 CYCLE) OR DC, 105-125 VOLTS.
CAUTION: DO NOT USE A GROUND ON THIS RECEIVER.
ALIGN AT 1400 KC THROUGH 100 MMF. CONDENSER.
RADIO PRODUCTS CORP.

FOR ALIGNMENT OF MODEL 5F, SEE THAT FOR MODEL 4A, PAGE 9-1

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ALIGNMENT DATA AND SERVICING

Connect the signal generator through a .1 mfd. condenser to the grid of the 6D6 tube. Connect an output meter across the voice coil of the speaker. Set the generator to 456 K.C. and align the I.F. transformer for maximum reading on the output meter. Set the sensitivity control about ¼ turn counterclockwise from the point where the whistles start and re-align the I.F.

Feed the generator through a 100 mmf. condenser to the antenna lead of the receiver. Set the generator to 1400 K.C. Turn the dial of the radio to 1400 K.C. Align the oscillator and antenna trimmers on the gang condenser for maximum output on the meter.

ADJUSTMENT OF SENSITIVITY CONTROL

The sensitivity control is accessible from the rear of the cabinet, (see layout) and takes the form of a trimmer condenser, which may be adjusted with a small screw driver or knife blade. This control is adjusted at the factory to give normal sensitivity for a set of this type; and in most locations there will be no need for re-adjustment. However, in rural areas where signal strength is low, the gain of the receiver can be increased by three or four times by turning the trimmer in the following manner:

1. Tune in a station.
2. Increase sensitivity by turning trimmer in a clockwise direction until the station signal is distorted by a whistle.
3. Turn trimmer slowly counterclockwise until whistle ceases. This is the point of maximum sensitivity.
4. Tune in several stations. If some of these signals still whistle, the sensitivity must be again retarded slightly.
CONVENTIONAL ALIGNMENT - SEE THE SPECIAL SECTION VOL. VIII

FREQUENCY RANGES - BROADCAST - 540 to 1700 KC - Adjust the OSC, RF and ANT trimmers to a maximum peak of 1400 KC, then pad the Oscillator circuit at 500 KC while rocking gang condenser.

SHORTWAVE - 5800 to 16000 KC - Adjust the OSC and ANT trimmers to a maximum peak of 14000 KC. No padding required.

POLICE - 1700 to 5000 KC - Adjust the ANT coil trimmer to a maximum peak of 4000 KC. No other adjustments required.
R.F. ALIGNMENT. Adjust the test oscillator to 1550 K.C. and connect the output to the antenna through a .0005 mfd. mica condenser to give the equivalent of a low capacity average auto antenna. When this adjustment is made, the signal must be introduced into the receiver through the shielded lead supplied with the receiver. The plug should be inserted to conform with the "Low Capacity" position. (See Figure 1). Set the gang condenser to minimum and adjust the oscillator trimmer to peak. (Center section of gang condenser). The next step is to set the test oscillator and receiver to 1400 K.C. and adjust the front and rear trimmers of the gang condenser to peak. The rear section of the gang condenser tunes the antenna amplifier stage (6K7 tube), and the front condenser section tunes the detector grid coil of the 6A8G tube.

TF PEAK 175 KC

I.F. ALIGNMENT. Adjust the test oscillator to 175 K.C. and connect the output to the grid of the first detector tube, 6A8G, through a .1 mfd. condenser. The ground on the test oscillator can be connected to the chassis ground. Align the trimmers of the first and second I.F. transformers to peak or maximum reading on the output meter.
IF PEAK 460 KC

CONVENTIONAL ALIGNMENT, SEE SPECIAL SECTION VOL. VIII
THE MIXER COIL IS LOCATED NEXT TO THE VARIABLE CONDENSER ON THE TOP OF THE CHASSIS. THE OSCILLATOR COIL IS ON THE INSIDE OF THE CHASSIS. PARALLEL TRIMMER CAPACITORS ARE MOUNTED ON THE VARIABLE CAPACITOR.
THE OSCILLATOR TRIMMER IS NEAREST THE FRONT OF THE SET.
TRIMMERS FOR THE I.F. CIRCUIT ARE LOCATED ON THE BACK OF THE CHASSIS.
PUSH BUTTONS: TRIMMERS FOR THE PUSH BUTTON CIRCUITS ARE ACCESSIBLE THROUGH A SLOT IN THE BOTTOM OF THE CABINET. THESE TRIMMERS HAVE THE FOLLOWING APPROXIMATE TUNING RANGES: #1 GROUP, 520-850 KC; #2 GROUP, 520-850 KC; #3 GROUP, 620-1075 KC; #4 GROUP, 680-1075 KC; #5 GROUP, 975-1600 KC.
VOLTAGE READINGS TAKEN FROM SOCKET TERMINALS TO GROUND WITH NO SIGNAL.
SETTING UP PUSH BUTTONS:

The push button set up may be changed as follows:
The selection of stations should be arranged with the location of the lowest frequency station on the extreme left button. A resonance indicator or output meter will aid in making the adjustments. With the band switch on "BC", tune in the desired station with the selector, depress the button and turn the band switch to "A". Now with a screwdriver adjust the trimmer on the top of the chassis nearest the back and adjacent to the speaker. When the desired station is tuned in adjust the trimmer nearest the front panel for maximum volume. Now turn the band switch to "BC" to check the adjustment. Proceed with the next lower frequency station for the next set of trimmers with the band switch on "A".

CONVENTIONAL ALIGNMENT, SEE SPECIAL SECTION VOL.VIII.

The mixer coil is located on the right side of the variable condenser and the oscillator coil on the left side. Trimmers for oscillator and mixer coils are adjustable through holes in the coil supports.
The broadcast trimmers are at the top, the medium wave in the middle and the short wave nearest the bottom of the support.
Trimmers for the I.F. transformers are accessible through openings in the top of the I.F. transformer shields.

VOLTAGE READINGS
Ac. voltages: Line 120 volts; Heaters 6 volts; Rectifier filament 5 volts.
Dc. voltages (Taken with no signal from ground to points indicated) 80 Rectifier filament 250 volts; 42 plate 235 volts; 42 Screen 250 volts; 42 bias 20 volts; 6SK7 audio plate 80; audio screen 10, I.F. plate 250, I.F. screen 100, and I.F. bias 2.5 volts; 6K5 plate 250, oscillator plate 90, screen 100, and bias supply 2.5 volts.
GENERAL INFORMATION & SERVICE HINTS

Should it be necessary to remove the chassis from the cabinet it is important when reassembling the receiver that the selector knobs be pushed on the shaft so far that it will exert pressure on the front of the cabinet, as any friction at this point will cause difficulty in operating the push buttons.

Should there be instances where it is impossible to set the push buttons accurately on a station it is very possible that the trouble is caused by a slight burr on the end of the screw. Insert in the push button knob remove the push button in question and remove the burr that might be on the end of the screw.

ELECTRICAL SPECIFICATIONS

TUNES AND FUNCTIONS:
- 40C...........Translator-Oscillator
- 42..............Output
- 43..............IF
- 50..............Rectifier
- 4775...........A.V.C. detector, 1st audio

POWER SUPPLY:
- 105 - 120 Volts, 50-60 Cycle A.C. ..............47 Watts

FREQUENCY RANGE:
- Broadcast...........540-1780 Kc
- Tunes.............6.0 Mc

ALIGNMENT FREQUENCIES:
- Oscill. Ant.-Trans.
- Trimmer

INTERMEDIATE FREQUENCY:
- Type:...........Single Pentode
- Undistorted:....0.25 Watts
- Maximum:.......5.5 Watts
- Load resistance:1000 ohms

MECHANICAL SPECIFICATIONS

OPERATING CONTROLS:
1. Left knob........"On-Off" switch and Volume
2. Center knob........Tone Control
3. Right knob........Station Selector

CONTROL OPERATION:
- Turning right: Power on; Volume increases
- Turning left: Bass, Treble
- Turning right: Over first steel line below 500 kc

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POWER SUPPLY:
* "A" Battery (4 volt dry) . . . . 1 - 6V32F
* "A" Battery (4 volt storage) . . . . 6V49
* "B" Batteries . . . . 3 - 6X31P

FREQUENCY RANGES:
Band "A" . . . . . . . . . . . . . . . . . . . . 540-1750 kc
Band "B" . . . . . . . . . . . . . . . . . . . . 1750-4800 kc
Band "C" . . . . . . . . . . . . . . . . . . . . 5975-10500 kc

INTERMEDIATE FREQUENCY

POWER OUTPUT:
Type . . . . . . . . . . . . . . . . . . . . Class "B"
Undistorted . . . . . . . . . . . . . . . 0.45 watts
Maximum . . . . . . . . . . . . . . . . . . . . . . . . . . . 0.9 watts

OPERATING FEATURES:
Three position Tone Control
Automatic Volume Control
"On-Off" Indicator
Flash-C-Light Dial Illumination
Short Wave Stations marked on dial
Wave Band Indicator

ALIGNMENT FREQUENCIES:
Oscil. . . . . . . . . . . . . . . . . . . Ant.-Trans.
Band "A" . . . . . . . . . . . . . . . . . . . . . . . . . . 1400 kc
Band "B" . . . . . . . . . . . . . . . . . . . . . . . . . . 5 mo
Band "C" . . . . . . . . . . . . . . . . . . . . . . . . . . 15 mo

LOUD SPEAKER:
Type . . . . . . . . . . . . . . . . . . . Permanent Magnet Dynamic
Size . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8 and 8 inch

CHASSIS FEATURES:
Number RF stages . . . . . . . . . . . . . . . . . . . . . . . . . One on Broadcast
Number IF stages . . . . . . . . . . . . . . . . . . . . . . . . . Two
Number condensers in grid . . . . . . . . . . . . . Three
Antenna . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Conventional
Plugs attached to battery cable

Locations of parts on top of Chassis

Locations of parts under chassis

©John F. Rider, Publisher
MODEL: 4700, CHASSIS 104.235

**ALTERNATE PROCEDURE**

**PERFORMANCE:**
- Average sensitivity: microvolts/µV
- Input impedance: 50k ohms
- Output level: 1 watt
- Output power: 0.5 watts
- Frequency response: 20 Hz to 20 kHz
- Channel separation: 60 dB
- Dynamic range: 70 dB
- Distortion: 0.05%

**SPECIFICATIONS:**
- Input sensitivity: 10 mV
- Output level: 0.5 watts
- Frequency response: 20 Hz to 20 kHz
- Dynamic range: 70 dB
- Distortion: 0.05%
- Channel separation: 60 dB

**Alignment Procedure:**
1. **Initial Alignment:**
   - Set the receiver to the lowest frequency.
   - Adjust the output level to the minimum and the sensitivity to the maximum.
   - Check the output level and adjust as necessary.

2. **Normal Operation:**
   - Adjust the sensitivity to the maximum and the output level to the minimum.
   - Check the output level and adjust as necessary.

**IMPORTANT ALIGNMENT NOTES:**
- Always check the sensitivity and output level before making any adjustments.
- Check the channel separation and frequency response before making any adjustments.
- Check the distortion and noise before making any adjustments.

**Alignment Controls:**
- **Input Sensitivity:**
  - 10 mV
  - 50 mV
  - 100 mV
  - 200 mV
  - 500 mV
  - 1 volt
  - 2.5 volts
  - 5 volts
  - 10 volts
  - 20 volts
  - 50 volts
  - 100 volts
  - 200 volts
  - 500 volts
  - 1 volt

**Alignment Procedure:**
1. Set the receiver to the lowest frequency.
2. Adjust the output level to the minimum.
3. Check the output level and adjust as necessary.
4. Check the channel separation and frequency response.
5. Check the distortion and noise.

**Alignment Notes:**
- Always check the sensitivity and output level before making any adjustments.
- Check the channel separation and frequency response before making any adjustments.
- Check the distortion and noise before making any adjustments.
SEARS ROEBUCK & CO.

Alignment

MODELS 5010, 5040
MODELS 5052, 5053
MODELS 5054, 5055

MODEL 4644A, 4645A
Models 6010, 6010 CHASSIS 101, 104, 6010, 6010 CHASSIS 111, 114, 6022, 6025 CHASSIS 111, 114; 6054-5 CHASSIS 111, 114.

Use of Table: Only one V00 or V01 for each chassis is shown in Table below, for example 4644A indicates chassis 101, 104 and model 4644A.

- Output meter connections (Models 4644A, 6010, 6022) - Across load speaker voice coil.
- Output reading to indicate 50 milliwatts, Models 4644A, 6010, 6022 - 50 OHM ohm meter, across speaker terminals.
- Output reading to indicate 50 milliwatts, Models 4644A, 6010, 6022 - 0.37 volt.
- Model 6054-5 - 9.40 volts.
- Generator ground lead connection - Hovemeister chassis.
- Dummy antenna to be in series with generator output - See chart below.
- Connection of generator output lead - See chart below.
- Generator modulation - 300-400 cycles.
- Approximate average sensitivity in microvolts for 50 milliwatts output - See chart below.

Position of volume control - Fully on.

Position of tone control - Models 4644A, 6010, 6022 - See chart below.

<table>
<thead>
<tr>
<th>POSITION OF TONE CONTROL</th>
<th>4644A</th>
<th>6010</th>
<th>6022</th>
<th>6054-5</th>
<th>6054-6</th>
<th>6054-7</th>
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<tbody>
<tr>
<td>1000 ohms</td>
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<td></td>
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<td>100,000 ohms</td>
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</tr>
</tbody>
</table>

The generator should be adjusted to give high output. The trimmers should be adjusted for minimum output meter reading instead of usual maximum output meter reading. If the frequency of an interfering tone is near 455 kHz, the generator should be adjusted to that frequency instead of 455 kHz.

Using the dial as a template, make a dummy dial of cardboard with only the 1400 kHz calibration on it. Align this dummy dial over the chart, hold it horizontal so the 1400 mark will line up at the mark position as the 1300 mark of the actual dial and turn the dial pointer to the 1300 mark. (The dial pointer should be horizontal when the condenser is fully open or fully closed.)

The variable should be moved back and forth a degree or two while making the 600 kHz adjustment. The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy.

Always keep the output power from the generator at its lowest possible value to prevent the AFC of the receiver from interfering with accurate alignment.

Values shown under "Microvolts" are only approximate.

A whirr, due to a beat between the second harmonic (930 kHz) of the 455 kHz IF and 930 kHz signal may be experienced. In localities where the 930 kHz station is one that is frequently listened to, it will be desirable to shift the whirr to some other point where it will not be objectionable. This can be done by shifting the IF frequency of the receiver.

Determining at what point between 900 kHz and 1000 kHz the whirr will be least objectionable. Dividing this frequency by two will give the new IF frequency to which the receiver should be aligned. For example, if it is determined that a whirr at 910 kHz would not be objectionable, the IF should be realigned at 910 kHz or 910 kHz as near to 455 kHz as possible. Align the IF at the new frequency and then realign the rest of the receiver as described.
GENERAL INFORMATION & SERVICE HINTS

INSTRUCTIONS FOR SETTING UP PUSH BUTTON STATIONS:

1. Select the uhd frequencies that allow the push buttons. Remove the call letters block in the receiving station and turn the call letters block in the transmitting station. The call letters block in the receiving station will be rejected in the uhd frequency to which the transmitter is tuned.

2. Install the push button in the "push button" position and use the tuning knob to tune to the station you desire. The call letters block in the transmitting station will be rejected in the uhd frequency to which the transmitter is tuned.

3. Adjust the call letters block in the receiving station and use the tuning knob to tune to the station you desire. The call letters block in the transmitting station will be rejected in the uhd frequency to which the transmitter is tuned.

4. After the best possible setting of the call letters block has been made, check the call letters block for accuracy. The call letters block in the transmitting station will be rejected in the uhd frequency to which the transmitter is tuned.

5. Proceed in the same manner for each button. Be sure the push button is in the "push button" position and that you have made the call letters block in the transmitting station before making any adjustments for that button. The call letters block in the transmitting station will be rejected in the uhd frequency to which the transmitter is tuned.

6. Place the call letters block for the chosen station in the transmitting station. Be sure to insert the call letters block in the proper order so that they will be used for the correct station. Then replace the call letters block letters and the call letters block for the transmitting station.

THE A.M.G. CIRCUIT:

The iden current of the 9-volt tube, flowing through the 9-volt current resistor, R1, creates the value of current in the circuit. This voltage is applied to the control grid of the IF, translator, and IF tubes to provide AGC.

Oscillation:

Be sure the tube shields are making good contact to the base clips. Poor contact may cause oscillation.

ELECTRONIC WHISTLE AT 900 KC:

A whistle, due to a beat between the harmonics of 990 kc and 665 kc is produced. The resultant effect may be experienced. In localities where the 900 kc station is not frequented, the whistle may be eliminated by shifting the IF frequency of the receiver. The whistle may then be eliminated by shifting the IF frequency of the receiver. The resonance of the receiver will be shifted from the whistle frequency of 990 kc to a frequency where the whistle is not present.

WAVE TRAPS:

Wave traps are designed to eliminate interference from noisy transmitters or radio stations. A wave trap is inserted in the transmission line between the receiver and the transmitter. The wave trap is designed to resonate at a frequency close to the frequency of the interfering station. This trap will reduce the interference to a level where it is no longer audible.

The wave trap is designed to eliminate interference from noisy transmitters or radio stations. A wave trap is inserted in the transmission line between the receiver and the transmitter. The wave trap is designed to resonate at a frequency close to the frequency of the interfering station. This trap will reduce the interference to a level where it is no longer audible.

These traps are available from various manufacturers, including...
SEARS-ROEBUCK & CO.

MODEL 4688, Ch. 103, AR166
Schematic, Voltage

TUBES AND FUNCTIONS:
6A7 ........... Translator-Oscillator
6D6 ........... IF
76 ........... AVO-Detector
78 ........... Rectifier

POWER SUPPLY:
All models available .................. 105-125 volts, 60 cycle, 55 watts

FREQUENCY RANGES:
American Band ........... 540-1730 KC
Foreign Band ........... 5.7-18.3 MC

INTERMEDIATE FREQUENCY ............... 456 ko

POWER OUTPUT:
Type ........... Pentode
Undistorted .......... 2.6 watts
Maximum .......... 3.9 watts

OPERATING FEATURES:
Tone Control .......... Two Point
Automatic Volume Control
Crystal Phonograph Pickup

LOUD SPEAKER:
Type ........... Dynamic
Size ........... 6" Field Coil Resistance .......... 1050 Ohms

OPERATING CONTROLS:
1. Left Knob .......... Wave Change
2. Next to Left Knob . Tone Control
3. Next to Right Knob . Tuning
4. Right Knob .......... Power Switch

CONTROL OPERATION:
Clockwise "ON" . Anti-Clockwise "OFF"
Ratio .......... 12:1
Turn Right: Power On; Volume Increase

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**Preliminary:**

- Output meter connections: Across speaker voice coil.
- Output meter reading to indicate .060 watt. (Meter on 50 V. scale or higher).
- Average sensitivity in microvolts for .050 watts output: See chart below.
- Dummy antenna value to be in series with generator output: See chart below.
- Connection of generator output lead: See chart below.
- Connection of generator ground lead: 700 ohms.
- Generator modulation: App. 205 - 400 cycles.
- Position of volume control: Fully clockwise.
- Position of tone control: Fully clockwise.
- Position of dial pointer with variable fully retracted: Horizontal.

**Wave Band** | **Position of Dial Pointer** | **Generator Frequency** | **Dummy Antenna Connection** | **Trimmers Adjusted In Order Shown** | **Approximate Microwatts**
--- | --- | --- | --- | --- | ---
B.C. 160 | 456 | .02 mfd. | 647 Grid | C15, C16, C17, C18 | I.F. 50
B.C. 160 | 456 | .0005 mfd. | Ant. Lead | C5 | Wave trap trim for minimum response
S.W. 16 | 16 mc. | 600 ohm | Ant. Lead | C5, C6 | Osc, R.F. 17
B.C. 90 | 600 kc. | .0005 mfd. | Ant. Lead | C18 | Osc, 10
B.C. 160 | 1800 | .0005 mfd. | Ant. Lead | C10, C6 | Osc, R.F. 10

**Important Alignment Notes:**

- Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.
- It is advisable to repeat the entire alignment procedure band by band in the original order to insure greater accuracy.
- Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.
- Values shown under "Microwatts" are only approximate.

---

*Signature:* 57RL 75

*Date:* FEB. 16, 1938
INSTALLATION OF A PHONOGRAPh PICKUP JACK OR AN EARPHONE JACK:

A kit, part #106671, can be ordered from Colonial Radio Corporation, 354 East Street, Buffalo, N. Y. The retail selling price is $1.11. This kit contains the necessary parts for installing either a phonograph pick-up jack or an earphone jack. If the customer desires both a phonograph pick-up jack and an earphone jack, it will be necessary to use two kits and to drill an additional hole in the back of the chassis for the additional jack.

PHONOGRAPh PICK-UP JACK: A hole, covered with a brass insert, is provided in the back of the chassis. Remove the brass insert and mount the jack in this hole. Insulate the jack from the chassis by means of the two insulating washers supplied in the kit. The Schematic Section shows the connections to the jack.

Disconnect the jumper that is between prongs 2 and 4 of the speaker socket and move the lead on prong 1 to prong 4.

Locate the electrolytic condenser mounted alongside of the power transformer. A green lead runs from the anode (center terminal) of this electrolytic to prong 2 of the speaker socket. Transfer the connections of this lead from the anode to the cathode (mounting nut) of the electrolytic and from prong 4 to prong 2 of the speaker socket.

There is a jumper between the anodes of the two electrolytics. Disconnect this jumper. Run a jumper between the anodes of the two electrolytics.

There is a four-terminal board mounted under the nut that holds the IF output transformer. Run a lead from the terminal nearest the speaker socket on this board to prong 2 of the speaker socket.

Run a lead from lug 1 of the jack to the cathode of the 8Q7 tube.

Connect the .05 mfd. condenser from lug 2 of the jack to the blank pin next to the locating pin when viewed from the underside of the 8X7 tube socket.

Run a lead from lug 3 of the jack to the coil terminal shown in the illustration.

Connect the 500W ohm resistor, supplied in the kit, between lug 4 of the jack and prong 1 of the speaker socket.

The radio Volume Control and Tone Control will operate for the phonograph pick-up.

EARPHONE JACK: Mount the jack in the hole in the back of the chassis. The jack frame must be grounded to the chassis. Therefore, do not use the insulating washers.

Connect the .05 condenser from terminal 2 of the jack to the grid prong of the 6V6G output tube.

Connect terminal 3 of the jack to terminal 3 of the speaker socket.

Connect terminal 4 of the jack to terminal 3 of the speaker socket.

This is the only wiring necessary. The wiring changes mentioned above for connection of the phonograph pick-up jack are not to be done if only an earphone jack is used.

With the connections as described, the loud speaker will not operate when the earphones are plugged in. If it is desired to have the loud speaker operate at the same time the earphones are plugged in, the connections to terminals 3 and 4 of the jack should be omitted.

--- Diagram ---

Diagram showing the connections and layout of the radio components.
The trap has two terminals marked "ANT" and "SET". If a conventional antenna is being used (not a doublet), the trap will be connected as follows. Disconnect the antenna lead-in from the receiver and connect it to the "ANT" terminal of the trap. Connect a wire from the "SET" terminal of the trap to the "ANT" terminal of the chassis. The ground connection to the chassis remains as it was. The trap then is in series between the antenna and the receiver. The trap should be tuned to eliminate the interfering station. The sensitivity of the receiver will be reduced in the region of the frequency to which the trap is tuned.

If a doublet antenna is installed with the receiver, the trap must be connected between the antenna lug of the broadcast antenna coil primary and the Wave Switch. Remove the lead between the antenna lug of the primary and the wave switch. Connect the "ANT" terminal of the trap to the wave switch lug. Connect the "SET" terminal of the trap to the antenna coil lug. See Illustration below.

**Illustration:**
- **ANTENNA CONNECTIONS:**
  - #5527 Doublet Antenna
  - #5510 Conventional Antenna
  - #5575
  - #5515
- **WAVE TRAP CONNECTIONS WHEN DOUBLET ANTENNA IS BEING USED:**
  - **1031:7416** Trap for eliminating broadcast station interference.
- **LOCATION OF PARTS UNDER CHASSIS:**
  - **C1**
  - **C41**
  - **C42**
  - **C45**
ALIGNMENT PROCEDURE

Output meter connections: Across speaker voice coil
Output meter reading to indicate .6 watts output: 1.0 volts
Approximate average sensitivity for .6 watts output: See chart below
Dummy antenna value to be in series with generator output: See chart below
Connection of generator output lead: To chassis
Connection of generator ground lead: As shown
Generator modulation: 300, 400 cycles
Position of volume control: Fully clockwise
Position of tone control: Fully clockwise
Position of selectivity control: Fully clockwise
Position of dial pointer with variable fully closed: To fall on last calibration mark at 500 kc end of AMERICAN band.

<table>
<thead>
<tr>
<th>Wave Band</th>
<th>Switch</th>
<th>Position of Variable</th>
<th>Frequency</th>
<th>Antenna</th>
<th>Generator</th>
<th>Generator</th>
<th>Trimmed</th>
<th>Trimmer Approx.</th>
<th>Trimmed Adjusted</th>
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<tr>
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<td>1.5 mc</td>
<td>1.5 mc</td>
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<td>600 kcs</td>
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<td>AM*</td>
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</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* If the frequency of an interfering code station is known, the generator should be adjusted to that frequency instead of to 666 kcs. The tweed should be adjusted to give minimum output meter deflection instead of the usual maximum reading.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

It is not necessary to repeat the entire alignment procedure step by step in the original order to secure proper alignment. Perfect alignment is not possible with one adjustment of the trimmers.

Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

The shield plate that covers the coil assembly should be left in place while making the alignment adjustments. The trimmer screws are accessible through the holes in the shield.

Only the dummy antenna indicated in the chart for any particular band should be used. Remove the dummy antenna used for alignment of any other band.

No connection should be made to the dummy terminal on the antenna connection block.
TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS AT INDICATED SOCKET PRONGS ARE TO CHASSIS. VOLTAGES MUST BE MEASURED WITH NO SIGNAL. ALIGNMENT IS TO BE MADE AT THE FREQUENCIES SHOWN AT THE TRIMMER CONDENSERS. WHERE NO VOLTAGE READING IS SHOWN, IT INDICATES ZERO VOLTAGE OR A VERY LOW READING. FIGURES AT CATHODES ARE CATHODE CURRENT IN MILLIAMPERES.

*** PART OF T1
* PART OF T2

POWER SUPPLY:
All models available 105-135 volts, 50-50 cycle, 65 watts
All models available 105-135 volts, 25 cycle, 90 watts

ALIGNMENT FREQUENCIES:
Oscill. Ant-Transl. Oscill. Trimmer Trimmer Padder
Band  AM  1500 kc 1600 kc 800 kc
Band FM  b 50  500  200
Band FORT  15  50  15  50 Fixed

INTERMEDIATE FREQUENCY
465 kc

LOUD SPEAKER:
Type  Dynamic
Size  6", 8", 10", 12"
Field coil resistance  600 ohms
App. field coil voltage drop  80 volts

CHASSIS FEATURES:
Number RF stages  One
Number IF stages  One
Antenna  Doublet or Conventional
Line Noise Filter Condensers
Tuning Eye
Dual Tuning Ratio
Provision for Phonograph Pick-Up Connections

OPERATING CONTROLS:
1. Left knob  "On-Off" switch and Volume
3. Center knob   Wave Band Switch
4. Next to right knob  Tuning
5. Right knob   Tone Control

MECHANICAL SPECIFICATIONS
CONTROL OPERATION:
Turning right: Power on; volume in.
Turning right: American, Intermediate, Foreign
Turning right: American, Intermediate, Foreign
Turning right: Sharp, Broad
Turning right, outer: Normal, Lo-Noise
Turning right: "LO", "MEDIUM", "HI"

©John F. Rider, Publisher
XX - INDICATES CONNECTION TO BE BROKEN.

WAVE TRAP CONNECTIONS WHEN DOUBLET ANTENNA IS BEING USED

CHASSIS

101317416 TRAP FOR ELIMINATING BROADCAST STATION INTERFERENCE.

101317417 TRAP FOR ELIMINATING CODE INTERFERENCE.

CONNECTIONS WHEN BOTH TRAPS ARE USED SIMULTANEOUSLY.

TOMATIC TUNING DIAL, SEE INDEX
ALIGNMENT PROCEDURE

PRELIMINARY
Output meter connections .................................. Across speaker voice coil
Output meter reading to indicate .5 watts output ............... 1.31 volts
Approximate average sensitivity in microvolts for .5 watts output .... See chart below
Dummy antenna value to be in series with generator output .......... See chart below
Connection of generator output lead .................................. See chart below
Connection of generator ground lead ................................. To chassis
Generator modulation ............................................. 309, 400 cycles
Position of volume control ........................................ Fully clockwise
Position of tone control ........................................... Fully clockwise
Position of selectivity control .................................... Sharp
Position of Lo-Noise control ..................................... Normal
Position of dial pointer with variable fully closed ........... To null on last calibration
Mark at 600 on end of AMERICAN band.

WAVE BAND

<table>
<thead>
<tr>
<th>WAVE</th>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR</th>
<th>DUMMY</th>
<th>GENERATOR</th>
<th>TRIMMER ADJUSTED</th>
<th>TRIMMER</th>
<th>APPROXIMATE MEGOHMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>1.8 mH</td>
<td>44.5 kc</td>
<td>1 mfd.</td>
<td>1500 ohms</td>
<td>C1</td>
<td>0.033</td>
<td>2</td>
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<tr>
<td>80</td>
<td>1500 ohms</td>
<td>3.3</td>
<td></td>
<td></td>
<td>1500 ohms</td>
<td>3.3</td>
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</tr>
<tr>
<td>500</td>
<td>800 ohms</td>
<td>1500 ohms</td>
<td>3.3</td>
<td>Ant. Term.</td>
<td>1500 ohms</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>500 ohms</td>
<td>1500 ohms</td>
<td>3.3</td>
<td>Ant. Term.</td>
<td>1500 ohms</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>1500 ohms</td>
<td>3.3</td>
<td></td>
<td>Ant. Term.</td>
<td>1500 ohms</td>
<td>3.3</td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES
Where indicated by the word "rock", the variable should be rocked back and forth a degree or two while making the adjustment.

Each step of the alignment should be repeated in its original order for greater accuracy. Always keep the output from the generator at its lowest possible value to prevent the AC action of the set from interfering with accurate alignment.

The shield plate that covers the coil assembly should be left in place while making the alignment adjustments. The trimmer screws are accessible through the holes in the shield.

Only the dummy antenna indicated in the chart for any particular band should be used. Remove the dummy antenna used for alignment of any other band.

No connection should be made to the doubiker terminal on the antenna connection block.
THE AUTOMATIC TUNING DIAL

The method of setting up the Automatic Tuning Dial is different from the conventional method. It involves the setting up of a dial that automatically adjusts itself to the frequency of the station being tuned. This is achieved by using a mechanism that incorporates a variable capacitor and a variable inductor. The variable capacitor is used to control the frequency of the circuit, while the variable inductor is used to control the phase of the signal. The automatic tuning dial is designed to work with AM and FM broadcast stations.

THE FIXED BUTTON, IDENTIFIED BY A RED CAP, CANNOT BE ADJUSTED TO ANY STATION. DO NOT TEMPER WITH THE ADJUSTMENTS OF THIS BUTTON. IT IS AN IMPORTANT PART OF THE AUTOMATIC TUNING DIAL MECHANISM.

Make a list of the stations you want to set up on the AUTOMATIC TUNING DIAL. Sort them in the order of their frequency. That is, the lowest frequency first, highest frequency last.

IF TWO OR MORE OF YOUR SELECTED STATIONS FALL WITHIN THE SAME ADJUSTMENT, YOU MAY USE SELECTIVITY CONTROL OR FREQUENCY FILTERS TO SELECT THE STATION YOU DESIRE.

To proceed with the tuning, turn the selectivity control knobs to the desired position. See Fig. 9. This knob must be turned to the correct position only for setting the stations in the AUTOMATIC TUNING DIAL. After stations have been set up, they may be tuned in with the knobs in either the FM or AM positions.

Pull the large knob, marked "TUNE," off its shaft. See Fig. 10. This knob is used to fine-tune the stations to their exact frequency. Loosen the set screw and turn the knob clockwise or counterclockwise, until it points directly at the selected frequency on the dial. This knob should be held in place by the set screw.

Turn the first station on your selected list. (The first station is the one of lowest frequency.) This can be done by rotating the outer tuning wheel as shown in Fig. 11. To set the station precisely, first turn the knob slowly in one direction until the pointer is in approximate alignment with the correct frequency. Then turn the knob slowly in the opposite direction until the pointer is in exact alignment with the correct frequency. Repeat this procedure for each station.

When all stations have been tuned in, the Automatic Tuning Dial is ready for use. To listen to a station, simply turn the knob to the desired frequency and let the automatic tuning dial do the rest.

These are the fundamentals of the Automatic Tuning Dial. By following these steps, you can easily set up and use this device to listen to all your favorite stations.
After the AUTOMATIC TUNING dial button has been adjusted properly and the mechanism loaded as described, you are ready to insert the dial to the station's call letters, and then turn the dial as described by the wave tone button for a station. If you are using the dial button for a station, turn the dial as described by the wave tone button for a station. If the dial is not set correctly, the call letters should be visible through the glass and the dial button should be near the edge of the dial. If the dial button is not set correctly, the call letters should be visible through the glass and the dial button should be near the edge of the dial.

**METAL STORE MODELS:**

Push the dial containing the call letters of your selected station into the metal case. Place one of the call letters on the dial so that it is visible through the glass and the dial button is near the edge of the dial. If the dial button is not set correctly, the call letters should be visible through the glass and the dial button should be near the edge of the dial.

**PUSH BUTTON FOR DESIRED STATION AND TURN DIAL SO THAT FINGER REACHES BOTTOM POINT OF DIAL BEFORE RED BUTTON DOES:**

When all of the buttons have been adjusted and the caps put on them, the mechanism will be ready to operate. The station whose call letters you want to call is the one that is closest to the red button on the dial. The station whose call letters you want to call is the one that is closest to the red button on the dial.

**When all of the buttons have been adjusted and the caps put on them, the mechanism will:**

When all of the buttons have been adjusted and the caps put on them, the mechanism will be ready to operate. The station whose call letters you want to call is the one that is closest to the red button on the dial. The station whose call letters you want to call is the one that is closest to the red button on the dial.
Automatic Tuner Data

SEARS-ROEBUCK & CO.  
MODELS 4769, 4610, 4689, 4769
4789, Ch. 101, 482

JULY 15, 1937

SUBJECT: READJUSTING THE AUTOMATIC TUNING DIAL STOP BUTTON TO MAKE IT POSSIBLE TO SET UP DESIRED STATIONS, THAT ARE CLOSE IN FREQUENCY, ON ADJACENT BUTTONS.

By referring to ranges it will be seen that WMAG, 670 kc, would be set up on button #4. WGN, 730 kc, would be set up on button #5. WBBM, 770 kc, would be set up on button #6. Since these three stations come within the frequency range of only two of the buttons, the customer would ordinarily have to give up one of the three stations for AUTOMATIC TUNING.

It is possible, however, to change the setting of the "fixed" button and make it possible to set up three such stations, close together in frequency, on three separate buttons.

The method of doing this is as follows:

**FIRST:**
Make a full size reproduction of button frequency ranges on a suitable paper or cardboard, an eleven division scale, one division for each button range as illustrated.

**SECOND:**
Likewise make a full size reproduction of the AMERICAN band on suitable paper or cardboard.

![Diagram](image)

Make a light pencil mark on the reproduction of the tuning scale at the frequency of each of the eleven desired stations. Then lay the eleven division scale against the reproduction of the tuning scale and move the eleven division scale to such a position that each of the pencil marked positions for the eleven desired stations will fall within the range of a different button. However, the eleven division scale can only be moved so that its left index mark comes between the dotted lines of the reproduction of the tuning scale, as shown in the proper point in Fig. 3. In Fig. 3 it will be seen that by moving the eleven division scale to the point shown, WMAG will be within the range of button #5; WGN will be within the range of button #6; and WBBM will be within the range of button #7.

When a position of the eleven division scale is found that will allow the eleven desired stations to fall within the range of separate buttons, carefully note at what point on the reproduction of the dial scale the left index mark of the eleven division scale must be kept. In the illustration for stations WMAG, WGN, and WBBM, the index mark is just about opposite 550 ko on the dial scale. (Fig. 3.)

Remove the chassis from its cabinet. Leave the AUTOMATIC TUNING dial escutcheon off.

Turn the AUTOMATIC TUNING dial to its stop so that the variable is fully meshed. Now move the pointer along its drive cable to the point on the dial that corresponds exactly to the position of the left index mark of the eleven division scale, as described in the preceding paragraph. As can be seen by inspection, the pointer is pinched onto the drive cable and it will be necessary to pry this pinching open slightly so that the pointer can be moved along the cable. The AUTOMATIC TUNING dial must be kept turned all the way to the left to its stop during the operation of moving the pointer. After the pointer has been moved to its new position it should be pinched onto the cable again so that it cannot slip.

Loosen the set screw that holds the variable condenser drive drum to the variable condenser shaft.

Unlock the AUTOMATIC TUNING dial mechanism by moving the stud counter-clockwise. Pull out the "hair pin" clip that will be found on the unnumbered stop button. This button can then be pushed in and turned the same as the other eleven numbered buttons. Push in the unnumbered button and turn it to such position that when the AUTOMATIC TUNING dial mechanism is turned to its limit the pointer will be at its original stop at the left end of the dial. Then lock the mechanism by rotating the stud clockwise. (Be careful not to push in button #1 while the unnumbered button is pushed in as this may jam the mechanism. If this should happen the mechanism can be freed by pushing in the stop latch, as will be seen by inspection.) Replace the "hair pin" clip on the unnumbered button.

With the mechanism turned all the way to the left to its stop and with the dial pointer at its left limit on the dial, fully mesh the variable condenser by turning the movable plates with the fingers. Then retighten the set screw that holds the condenser drive drum to the variable condenser shaft.

The eleven desired stations can then be set up on the eleven adjustable buttons in accordance with the instructions (see preceding pages). The new frequency ranges for the buttons will be determined by holding the eleven division scale against the reproduction of the tuning scale, with the left index mark of the eleven division scale at the proper point between the dotted lines on the reproduction of the Tuning dial scale.
**ALIGNMENT**

1. Apply 456 Kc note to control grid of 6A7 and peak IF trans. for max. gain.
2. Apply 4000 Kc note to antenna wire; set band switch to 2nd band and align trimmer on oscillator section of variable condenser to track with 4000 Kc on dial.
3. Turn band switch to Broadcast band; apply 1500 Kc note to antenna wire, adjust trimmer on RF section of variable condenser for maximum gain.
4. Apply 600 Kc note to antenna, adjust-padder condenser for maximum gain, swinging condenser back and forth across 600 Kc signal.
5. Check 1400 Kc signal for alignment.
6. Turn band switch to 2nd band; check 4000 Kc signal for alignment and adjust trimmer on antenna coil for greatest gain at 4000 Kc.
7. Turn band switch to last band and adjust trimmer on antenna coil for greatest noise on 12 megacycles.

**RECEIVER RANGE** - THESE WAVE BANDS

- 540 - 1720 kilocycles
- 1720 - 5000 kilocycles
- 5.5 - 16 megacycles
GENERAL INFORMATION AND SERVICE HINTS

ALIGNMENT FREQUENCY

Output meter connections ............................................ Across speaker voice coil
Output meter reading to indicate I.F. output ................. I.F. value
Approximate average sensitivity in microvolts for 1.0 volt output ............ See chart below
Damping controls to be set as indicated with generator output ............ See chart below
Connection of generator output lead ......................... Transistor
Connection of generator ground lead ......................... To chassis
Generator modulation ....................................... 1.000, 50 cycles
Position of Radio-Dial switch .................................. Counter-electrode
Position of Volume control ..................................... Fully clockwise
Position of Tone control ......................................... Fully clockwise
Position of Dial pointer with variable tuning condenser fully closed ...... To fall on last calibration mark at 460 kHz or "American" mark.

DIAL DRIVE HOOKUP

The drive hook-up for the dial pointer and the variable condenser is illustrated.

CONNECTIONS FOR 110 VOLT, 60 CYCLE REPLACEMENT POWER TRANSFORMER

(12010358)
SEARS-ROEBUCK & CO.

OPERATING CONTROLS:

RADIO PANEL:
1. Left knob .. "Radio-Phono." Switch
2. Next to left knob .. "On-Off" Switch and Volume
3. Center knob .. Wave-Band Switch
4. Next to right knob .. Tuning
5. Right knob .. Tone Control

PHONO COMPONENT:
6. Turntable Switch
7. Index Lever
8. Record Ejector

CONTROL OPERATION:

Turning right: Radio; Phonograph
Turning right: Power on; Volume
Turning right: "American," "Foreign"
Turning ratio: 10 to 1
Turning right: Bass, Treble

Toggle: Phono Motor "On-Off"
Front 10" Automatic or Manual Operation
Rear: 12" Manual Operation
Pushing to Left Rejects. When "Index Lever" is in 10" Position

LOCATION OF PARTS AND ALIGNMENT ADJUSTMENTS TOP OF CHASSIS

LOCATION OF PARTS AND ALIGNMENT ADJUSTMENTS BOTTOM OF CHASSIS

©John F. Rider, Publisher
USE ONLY WITH ALTERNATING CURRENT

UNLESS OTHERWISE SPECIFIED ON BACK OF CHASSIS, THIS RECEIVER IS FOR USE WITH 105 TO 120 VOLT ALTERNATING CURRENT ONLY.
**ELECTRICAL SPECIFICATIONS**

Power Supply ............... 5 to 6 volts D.C.
No current used while at rest
Starting current ........... 8 amp., for 1 second
Returning current .......... 5 amp., for seconds

**GENERAL INFORMATION AND SERVICE HINTS**

Fasten mounting brackets A and B to receiver with four #8-32 machine screws and lockwashers.

Determine the angular position of key in variable condenser drive fitting that is located directly under the tuning cable opening in the radio case. Lower Moto-matic tuner into place between mounting brackets and rotate shaft on Moto-matic tuner so that key is in the same angular position as the key on variable condenser drive fitting. When lowered all the way into place no play should exist between key on variable condenser drive fitting and the slot on Moto-matic shaft. This is very important, and if there is play it should be corrected by lightly pinching together the slot on Moto-matic shaft.

Fasten tuner with four #8-32 machine screws and lockwashers. Remove plug button C as shown in Fig. 1 and plug in power lead.

**NOTE:** Check worm gear on the gong condenser for slippage of the clutch which is provided, as this will cause the tuner to tune inaccurately. This gear should not slip except when the condenser plates are all the way open or all the way closed when the worm is rotated in the direction to open or close the plates.

**SUBJECT: ADDITION OF A DRIFT COMPENSATING CONDENSER TO MAINTAIN ACCURACY OF STATION TUNING.**

A drift compensating condenser is available from source 101. This condenser is connected across the oscillator trimmer as shown by the Schematic sections in this Supplement.

CHASSIS 101.495 & 101.495X  CHASSIS 101.495 & 101.495X

AUGUST 25, 1938
Angular Adjustment of the Armature Arm "Y":-

The angular position of the sides of the "Y" of the armature arm is correct when the ends of each side is the same distance as the radius of the armature arm. (See Fig. 4.) The armature arm will cause a slipping out of the armature arm when setting up a unit. Under certain conditions, the armature arm may cause the armature arm to stick. Any adjustments to the sides of the armature arm "Y" should be made carefully with a pair of long nose pliers. Tighten screws as may be caused by a bolt or on the face of the armature arm. It is to be kept in mind that the armature arm should be properly set up and the armature arm will not be forced out of the "Y" slit and setting up a unit.

Importance of Correctly Setting Slit with the Drive Pinion of Variable Condenser:

On earlier production, the mounting bracket holes were too small to allow for proper armature arm variations. If trouble is experienced with the mounting of the unit in the armature arm, it is necessary to check the condenser drive shaft with respect to the armature arm. Drill the mounting holes of the bracket with a 3/16" drill.

Remove the outer of the condenser and mount the automatic timing arm where the condenser drive shaft is centered in the armature arm and setting up the variable condenser.

Wiring Diagram and Appendix:

There may be an occasional complaint of an oscillation or misfiring of the Automatic Transformer without load. This is caused by the magnetic field not being magnetized enough when the system is not loaded. The unit is equipped with a series of resistors which are adequate for starting, and they are adjusted to give a voltage of 115 volts for the desired performance and reliability. The unit contains a number of resistors, which are adjusted to give a voltage for starting and a voltage for driving the unit.

When making magnetic adjustments, it may be necessary to readjust the stop between the ends of the magnetizing coil of the automatic transformer. The correct tension at which to magnetize the unit is important, and should not be done when mounting manually.

Ditching of slit when a button is depressed may be caused by many circumstances. First, the armature arm may be on the wrong side of the damper. Correct this by reversing the armature arm. Second, the armature arm may be on the wrong side of the damper. Check this by reversing the armature arm. If the armature arm is reversed, the armature arm may be on the wrong side of the damper. Correct any differences by testing slightly the forced section of the armature arm.

Selection Switch:

Failure to operate any switch on the selector switch. Return back plate and plate jumper wire from the selector switch. Check the selector switch for any loose nuts or screws. If the selector switch is not operating properly, the selector switch should cause timer to operate on its button. See reset, point the red to the top, blue to bottom button, and red to bottom button. This will prevent malfunctions if the selector switch is not operating properly.

The selector switch plunger must be properly seated to ensure smooth operation of the unit. - Whenever the selector switch plunger is being replaced, it is necessary to check the selector switch for any loose nuts or screws.
ALIGNMENT PROCEDURE

Before attempting to align the receiver check to see that the dial pointer is in a horizontal position when the gang condenser is in full mesh. If the pointer is incorrectly set, it is merely necessary to move the pointer to the correct position by hand, while holding the gang condenser in the full mesh position.

Output meter connections: Across voice coil leads.
Output meter reading to indicate 0.2 watt output: 0.0556 volts.
Average sensitivity in microvolts for 0.2 watt output: See chart below.
Connection of Generator Output Lead: See chart below.
Dumy Antenna is series with Generator Output Lead: See chart below.
Connection of Generator Output Lead: 30% 400 cycles.
Generator modulation: Position of volume control: Maximum clockwise.

<table>
<thead>
<tr>
<th>DUMMY ANT. IN SERIES WITH</th>
<th>CONNECTION OF</th>
<th>SIGNAL</th>
<th>RANGE</th>
<th>RECEIVER</th>
<th>TRIMMER</th>
<th>TRIMMER</th>
<th>SENSITIVITY</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN SERIES WITH S10.GEN.</td>
<td>GENERATOR</td>
<td>FREQUENCY</td>
<td>ACTION</td>
<td>POSITION</td>
<td>NUMBER</td>
<td>DESCRIPTION</td>
<td>MICROVOLTS</td>
<td></td>
</tr>
<tr>
<td>.1 MFD</td>
<td>CONTROL GRID OF 6AS6-TUBE</td>
<td>465 KC</td>
<td>AMERICAN</td>
<td>ANY POINT</td>
<td>1-2</td>
<td>2nd I.F.</td>
<td>MICROVOLTS</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>400 OHM</td>
<td>ANTENNA</td>
<td>LEAD (Blue Wire)</td>
<td>475 KC</td>
<td>AMERICAN</td>
<td>ANY POINT</td>
<td>3-4</td>
<td>1st I.F.</td>
<td>100</td>
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<tr>
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<td>CARBON RESISTOR</td>
<td>475 KC</td>
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<td>Center</td>
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<td>WAVE TRAP</td>
<td>MICROVOLTS</td>
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<td>400 OHM</td>
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<td>Center</td>
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<td>&quot;AMERICAN&quot; OSCILLATOR (Shunt)</td>
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<tr>
<td>400 OHM</td>
<td>CARBON RESISTOR</td>
<td>1500 KC</td>
<td>AMERICAN</td>
<td>Center</td>
<td>7</td>
<td>&quot;AMERICAN&quot; ANTENNA</td>
<td>MICROVOLTS</td>
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<td>400 OHM</td>
<td>CARBON RESISTOR</td>
<td>800 KC</td>
<td>AMERICAN</td>
<td>Center</td>
<td>8</td>
<td>&quot;AMERICAN&quot; OSCILLATOR (Series Pad)</td>
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<td>400 OHM</td>
<td>CARBON RESISTOR</td>
<td>14 MC</td>
<td>FOREIGN &quot;FOR&quot; (Counter-clockwise)</td>
<td>14 MC</td>
<td>9</td>
<td>FOREIGN OSCILLATOR (Shunt)</td>
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<tr>
<td>400 OHM</td>
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<td>14 MC</td>
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<td>10</td>
<td>FOREIGN ANTENNA</td>
<td>MICROVOLTS</td>
<td></td>
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</tbody>
</table>
Alignment Procedure

Output meter connection: Across loud speaker voice coil with the receiver in the standby mode.
Output meter reading to indicate 500 millivolts: 0.85 volts
Average sensitivity in millivolts for 500 milliwatts output: See chart below
Generator ground lead connection: Receiver chassis
Dummy antenna value to be in series with generator output: See chart below
Connection of generator output lead: See chart below
Generator modulation: 35%, 600 cycles
Position of Volume Control: Fully clockwise
Position of Tone Control: MI
Position of Dial Pointer with variable fully closed: Center of block to left of 500 ohm calibration mark.

Alignment must be done in the order given.

The alignment procedure should be repeated step by step, in the original order, for best accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVU action of the receiver insensitive.

Important Alignment Notes:

Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peaks in the line. Where indicated by the word "peak", the variable should be rocked back and forth a degree or two while making the adjustment.
A whistle, due to a beat between the second harmonics (320 to 730 kHz) of the 620 to 920 kHz signal frequencies, is experienced. In some areas where the 820 kHz station is one that is frequently listened to, it will be desirable to shift the whistle to some other point where it will not be objectionable. This can be done by shifting the IF frequency of the receiver.

Determine at what point between 850 kHz and 1150 kHz the whistle will be least objectionable, noting this frequency in which the IF frequency to which the receiver must be aligned, For example, if the IF is determined at 835 kHz, it would not be objectionable, the IF should be relocated at 850 kHz or 107 kHz. Try to select the new IF frequency as close as possible to 850 kHz.

Align the IF at the new frequency and then realign the rest of the receiver as described under "Alignment Instructions."
### Model 5056

<table>
<thead>
<tr>
<th>Range</th>
<th>Position</th>
<th>Generator</th>
<th>Frequency</th>
<th>Generator Mode</th>
<th>Frequency</th>
<th>Trimmer 1</th>
<th>Trimmer 2</th>
<th>Frequency</th>
<th>Trimmer 3</th>
<th>Frequency</th>
<th>Trimmer 4</th>
<th>Frequency</th>
<th>Frequency</th>
<th>Trimmer 5</th>
<th>Frequency</th>
<th>Trimmer 6</th>
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</thead>
<tbody>
<tr>
<td><strong>AM</strong></td>
<td>Closed</td>
<td>115 kHz</td>
<td>1.1 MHz</td>
<td>1100 Hz</td>
<td>1.1 MHz</td>
<td>115 kHz</td>
<td>1.1 MHz</td>
<td>1100 Hz</td>
<td>1.1 MHz</td>
<td>115 kHz</td>
<td>1.1 MHz</td>
<td>1100 Hz</td>
<td>1.1 MHz</td>
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### Model 5057

The alignment must be done in the order given.

The generator should be adjusted for high output. The trimmer should be adjusted for maximum output after reading instead of the usual maximum reading. If the frequency of an interfering station is known, the generator should be adjusted to the frequency of that station instead of to 800 kHz.

More information is provided in the original text for the alignment process.
BATTERY REPLACEMENT:

The 4½ volt "A" battery should be replaced when the voltage drops to 3.6 volts, under load. The 1½ volt "F" battery should be replaced when the voltage of the battery has dropped to 4½ volts, under load. The life rating of the various size batteries, given on the next page, is for an average use of three hours a day.

THE FILAMENT CIRCUIT:

Since the "A" supply is four volts, and the tube filaments are rated at two volts, a series parallel arrangement is used for the filament circuit. A simplified diagram is shown below. If any one tube burns out (except the 1N24 first AF), the filament voltage and current of the other tubes will be affected.

A catalog 60000 adaptor must be used on the "A" dable plug when a storage "A" battery is used. The owner should be warned not to attempt the use of a six volt automobile storage battery. Only a four volt storage "A" battery should be used.
It has been found that C6 is not necessary; that a direct connection from the oscillator coil to the 1070 tube is permissible. Accordingly, C6 was omitted from later production.
MAY 18, 1938

POWER SUPPLY:
All models available ........................................ 105-135 volts, 50-50 cycle, or DC, 50 watt

FREQUENCY RANGES:
Band "A" ................................................ 540-1750 kc
Band "F" .................................................. 5.9-16.2 mc

ALIGNMENT FREQUENCIES:
Oscill. Ant. - Trans. Feeder
Band "A" ........................................ 1400 kc
Band "F" .............................................. 15 mc

INTERMEDIATE FREQUENCY .................................. 455 kc

POWER OUTPUT:
Undistorted .............................................. 1.4 watt
Maximum ................................................ 2 watt

LOUD SPEAKER:
Type ...................................................... Dynamic
Size ...................................................... g" Field coil resistance . . . . 480 ohms
App. field coil voltage drop . . . . 26

CONTROL OPERATION:
Turning right: Volume increase
Turning right: "A", "F" Tuning ratio: 13:1
Turning right: "ON", "HI", "LO".
POWER SUPPLY RATINGS AVAILABLE

FREQUENCY RANGE:
Broadcast 540-1,720 kc

ALIGNMENT FREQUENCY:
Broadcast 1,500 kc (osc., ant.)

INTERMEDIATE FREQUENCY:

Louderspeaker:
Centering of the loudspeaker voice-coil is made in the usual manner with three, narrow-paper feelers, after first removing the front dust-cover. This may be removed by softening its cement with a light application of acetone, using care not to allow the acetone to flow into the air gap. The dust cover should be cemented back in place with ambroid after adjustment has been completed.

LOUDSPEAKER:
Type: 5-inch electrodynamic
V.C. Impedance: 5 ohms at 400 cycles
Field Coil Resistance: 1,500 ohms
App. Field Coil Voltage Drop: 100 volts

PHONOGRAPH:
Type: Manual
Turntable Speed: 78 R.P.M.
Type of Pickup: Crystal
Pickup Impedance: 80,000 ohms at 1,000 cycles

DIAL LAMP:
6.3 volts, 0.25 amperes

POWER OUTPUT:
Type: Pentode
Undistorted: 2.0 watts
Maximum: 3.5 watts

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS AT INDICATED SOCKET PRONGS ARE TO CHASSIS. ALIGNMENT IS TO BE MADE AT THE FREQUENCIES SHOWN AT THE TRIMMING ADJUSTMENTS. WHERE NO VOLTAGE READING IS SHOWN, IT INDICATES ZERO VOLTAGE OR A LOW VOLTAGE. 10 MILLIAMPERES TO BE MEASURED WITH NO SIGNAL. FIGURES AT CATHODES ARE CATHODE CURRENT IN MILLIAMPERES.
**Alignment Procedure**

**Preliminary:**

**Model:** 6026, 6186 Chassis 101, 107.

**Output meter connections...**

**Output meter setting to indicate 1.0 watt output...**

**Approximate average sensitivity in microvolts for 1.0 watt output...**

**Dissipation losses to be measured in series with generator output...**

**Connection of generator output lead...**

**Connection of generator output lead...**

**Generator connections...**

**Position of Volume Control...**

**Position of Radio-Phone Switch...**

**Position of Dial Pointer with variable tuning condenser fully closed...**

---

**IMPORTANT ALIGNMENT NOTES**

* Transistor C17, on opposite side of gang condenser from C16, should be screwed clockwise for maximum capacity before adjusting C16.

Each step of the alignment should be repeated in the original order for greater accuracy. Always keep the output from the generator at a minimum to prevent the grid action of the set from interfering with accurate alignment.

Adjustments are shown on the top and bottom parts of the chassis. Only the dummy sections indicated in the chart for any particular frequency should be used. Remove the dummy section used for alignment at any other frequency. Grid cap leads should remain in place during alignment.

Values shown under "Microamps" are only approximate.

**Eliminating Whistler at 910 Kc:**

A whistle is due to a loss between the second harmonic (910 kc) of the 415 kc IF, and a 910 kc signal may be experienced. In locations where the 910 kc station is one that is frequently listened to, it will be desirable to drift the whistle to some other point where it will not be objectionable. This can be done by shifting the IF frequency of the receiver.

Determine at what point between 890 kc and 930 kc the whistle will be least objectionable. Divide this frequency by two, and then select the lower frequency to which the receiver should be aligned. For example, if the whistle at 915 kc would be most objectionable, the IF should be realigned at 915/2 = 457.5 kc. Try to select the lower if frequency as near 457.5 kc as possible.

Align the IF at the new frequency and then recheck the IF at the desired model as described under "ALIGNMENT PROCEDURE."

**Photograph Motor:**

**Starting:** The photograph motor switch (53) is turned "on" in the two photograph positions of the Radio-Phone switch, and it is turned "off" in the two other positions. To start the photograph motor, turn the Radio-Phone switch on one of the two photograph positions, which applies power to the motor, and then release the switch for continuous action of the motor.

**Hum and Vibration:** A small amount of hum when moving, decreasing to a negligible amount when moving or stopped. If excessive vibration occurs it may be due to:

1. Insufficient lubrication, or any failure that will cause binding.
2. Leaking insulator (Check to make certain that the insulator is above the motor level.)
3. Motor not properly supported from motor base.
4. Burns on poles of rotor or stator. Remove with fine emery cloth.

**Removing Rotor:** The rotor and turntable assembly should not be taken off the ball bearing at bottom of vertical housing. Remove by lifting up.

**Realign the IF at the new frequency and then recheck the IF at the desired model as described under "ALIGNMENT PROCEDURE."**

**Eliminating Whistle at 930 Kc:**

A whistle is due to a loss between the second harmonic (930 kc) of the 415 kc IF, and a 930 kc signal may be experienced. In locations where the 930 kc station is one that is frequently listened to, it will be desirable to drift the whistle to some other point where it will not be objectionable. This can be done by shifting the IF frequency of the receiver.

Determine at what point between 900 kc and 950 kc the whistle will be least objectionable. Divide this frequency by two, and then select the lower frequency to which the receiver should be aligned. For example, if the whistle at 937.5 kc would be most objectionable, the IF should be realigned at 937.5/2 = 468.75 kc. Try to select the lower if frequency as near 468.75 kc as possible.

Align the IF at the new frequency and then recheck the IF at the desired model as described under "ALIGNMENT PROCEDURE."
POWER SUPPLY:
All models available: 105-125 volts, 50-60 cycle, 103 watts
All models available: 105-135 volts, 25 cycle, 115 watts

FREQUENCY RANGES:
ALIGNMENT FREQUENCIES:
Band "AM": 540-1750 kc
Band "SW": 5.95-18.3 mc
Band "9": 9.4-0.17 mc
Band "11": 11.5-12.1 mc
Band "15": 14.3-15.4 mc

INTERMEDIATE FREQUENCY: 435 kc

POWER OUTPUT:
Distorted: 6 watts
Type: Push pull beam tubes
Maximum: 10 watts

LOUD SPEAKER:
Type: Dynamic
Size: 10 and 13 inch
Field coil resistance: 600 ohms
App. field coil voltage drop: 92 V.

FOR ALIGNMENT
SEE PAGE 10-44

JULY 1, 1938
SUBJECT: CONNECTION OF EARPHONE AND PHONOGRAPH PICKUP JACKS:

Part number 106-381 jack, for connection of earphone or phonograph pickup, can be ordered directly from source 106.

If a crystal pickup is used, a filter composed of a .01 µF condenser and a 100K ohm resistor connected in series, should be connected across the pickup to prevent excessive bass response. This filter will also act as a partial scratch filter.

MODEL 6036,6136
Chassis 101,511
Phono,Phono,Jack Drive Data,Notes

SEARS PAGE 10-57

SEARS-ROEBUCK & CO.

PHASE CHANGER

6J5G OUTPUT

6V6G DET. A.V.C. A.F.

6J5G DET. A.V.C. A.F.

6J5G OSC.

TONE CONTROL

6U5 TUNING Eye

X INDICATES LEAD TO BE BROKEN.
DOTTED LINES INDICATE NEW CONNECTIONS.

OPERATING FEATURES:

- Tone Control
- Automatic Volume Control
- Three Spread Bands
- Push Button Tuning (6 buttons)
- Band Indicator

OPERATING CONTROLS:

1. Upper left knob: "Volume"
2. Lower left knob: "Select" and Tone
3. Lower right knob: Wave Band Switch
4. Upper right knob: Station Selector

THE A.V.C. CIRCUIT:

The voice current of one of the 6J5G tubes flows through the AVC choke resistor 30, creating a voltage drop across it. This voltage is applied to the control grid of the RF, oscillator, and IF tubes, to provide AVC.

ELIMINATING WHISTLE AT 930 KC:

A whistle due to a beat between the second harmonic (525 kHz) of the 930 kHz input and a 930 kHz signal may be experienced. In locations where the 930 kHz station is one that is frequently listened to, it will be necessary to adjust the IF to make the whistle to some other point where it will not be objectionable. This can be done by shifting the IF frequency to which the receiver is tuned.

Determine at what point between 900 and 950 kHz the whistle will be least objectionable. Selecting this frequency by you will give the new IF frequency to which the receiver should be aligned. For example, if it is determined that a whistle at 918 kHz would not be objectionable, the IF should be aligned at 918 kHz. If it is determined that a whistle at 930 kHz would be objectionable, try to select the new IF frequency as near as possible to 930 kHz.

Align the IF at the new frequency and then realign the rest of the receiver's settings as described under "ALIGNMENT PROCEDURE."
Leave the radio turned on for about 12 minutes before adjusting the push buttons. This "warming up" period will insure permanent and accurate settings.

3. Make a list of the stations that you want to set up for push button tuning. It is advisable, but not necessary, to arrange the stations in the order of their frequency (allocates) so that, for example, the station at low band frequency will be set. The stations on the chart below are listed in order of frequency.

4. Pull the volume control and tuning knobs off of their shafts. Remove the snap-in buttons (the plate through which the push buttons protrude) can then be removed. Be careful not to lose the snap-in buttons.

5. Replace the tuning knob on its shaft. Push the knob in and turn it so that the dial pointer is to the left end of the dial. A key will be found in the instruction booklet which explains how to push the knob and corresponding turn counts. Push the knob and correspondingly turn the count clockwise as far as it will go. Be sure to push the knob in and turn it counterclockwise to remove it completely. (A screwdriver can be used for unlocking the mechanism and a key supplied.) Then remove the key.

6. Push the button that you wish to use for your @ station, all the way in, and hold it firmly. Push the tuning knob in and turn it until your @ station is tuned in properly in the tuning. Be as close as possible in the tuning your station since this will determine how accurately your station will be tuned whenever you use the push button. Then let go of the push button, making sure not to turn the tuning knob until you have let go of the button. (Turning the knob while the button is pushed in would spoil the accuracy of the adjustment.)

7. Push in your @ button. Hold it firmly and turn it in your @ station accurately. Then let go of the push button and then the tuning knob. Proceed in the same manner for the other stations on your list.

8. When all of the stations have been set up, push the tuning knob in and turn it so that the dial pointer is to the right end of the dial. Then turn the mechanism by securely tightening (turning clockwise) the slot and the counterclockwise as far as it will go. Be sure to turn the mechanism in the same manner as described in Step 4. Then replace the snap-in buttons.

9. You may change your choice of stations at any time by unlocking the mechanism as described, selecting the new station, as described in Step 4. Then relock the mechanism as described in Step 5. The call letters of the new station should be registered in the call letter holder is in its proper position.

OPERATION:
Push the button, indicated for your desired station, all the way in. Your station tuned in. If you have selected short wave stations for push button tuning, make sure the hand switch is turned to the proper band. The button will remain part way in, indicating that station is tuned in, until you push another button or the tuning knob.
WIRING DIAGRAM FOR SILVERTONE CHA

PART OF T3

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. LINE VOLTAGE AT 115 VOLTS. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

FOR TUNER DATA AND ALIGNMENT, SEE II

POWER OUTPUT:
Type: Push pull beam tubes
Undistorted: 8.5 watts
Maximum: 13 watts

POWER SUPPLY:
All models available
105-135 volts, 60-60 cycle, 145 watts
105-138 volts, 46 cycle, 150 watts

57 RL 119
JUNE 27, 1938

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ALIGNMENT PROCEDURE:

FOR CONVENTIONAL ALIGNMENT - SEE SPECIAL SECTION
VOL. VIII INDEX

Either a broadcast station of about 1400 kc or a signal generator can be used for alignment. The chassis must be taken out of the cabinet for alignment of the trimmer, C8. The volume control setting should be reduced so that the signal is just audible in order to facilitate accuracy of adjustment. This set has no AVC so that a strong input signal may be used.

©John F. Rider. Publisher
### ALIGNMENT PROCEDURE

Model 6070C, 6170C Chassis 100, 166

Before attempting to align the receiver check to see that the dial pointer is opposite the last scale increment on the low frequency end of the dial scale when the gang condenser is in full sweep. If the pointer is not yet set in this position, it is necessary to move the pointer to the exact position by hand while holding the gang condenser in the full-sweep position.

Output meter connections:
- Across voice coil leads
- Across voice coil leads
- Across voice coil leads
- Across voice coil leads

Average sensitivity is approximately 0.06 watt output.

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### ALIGNMENT PROCEDURE

Model 7225 Chassis 110, 256

Output Meter readings to indicate 0.060 watt output

For Weston Type 67, Output Meter on 0.05 volt scale

Average sensitivity in RF for 0.06 watt output

100 MHz

Connections of generator ground lead: 70 Chassis

Power supply: Fully automatic

### IMPORTANT ALIGNMENT Notes

Where indicated by the word "slow", the variable should be rocked back and forth a degree or two while making the adjustment.

It is advisable to repeat the entire alignment procedure back to front and in the original order to insure greater accuracy.

Always keep the output from the test oscillator at its lowest possible value. As the sensitivity is increased by alignment, the generator output should be reduced correspondingly.

Values shown under "Microvolts" are only approximate.

**Short oscillator section of variable condenser.**

Second A.F. alignment must be done first to assure flat top tuning.

*First time FY is misaligned about one turn by loosening center screw.

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### Diagrams

**Bottom View**

**Top View**

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ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connections ........................................ Across line speaker voice coil
Output meter reading to indicate 1 watt .......................... See chart below
Average sensitivity microvolts for 1 watt output .................. See chart below
Generator ground lead connection ................................. See chart below
Dummy antenna value to be in series with generator output ... See chart below
Connection of generator output lead ............................. See chart below
Generator modulation .............................................. 300, 400 cycles
Position of Volume Control ........................................ Fully on
Position of Antenna Tap .......................................... #3 hole
The chassis must be in its case although the covers may be removed during the alignment procedure.

POSITION OF VARIABLE GENERATOR DUMMY GENERATOR TRIMMER ADJUSTMENTS (IN ORDER) APPROXIMATE
OF VARIABLE FREQUENCY ANTENNA CONNECTION (SHOW) FUNCTION MICROVOLTS
Closed 688 ohms .1 mfd. SMD grid T1, T2 Multivibrator IF 500, 600
Fully Open 1580 ohms .0002 mfd. Antenna Conn. 07 Capacitor, Trimmer 1.5 1.0
1400 ohms 1400 ohms .0002 mfd. Antenna Conn. 04, 05 Transistor 1.5 1.0
500 ohm (rock) 800 ohms .0002 mfd. Antenna Conn. 08 Fader 3.8 2.0

MODEL 6100-6105

IMPORTANT ALIGNMENT NOTES
The variable should be rocked back and forth a degree or two while making the 800 ohm adjustment.
The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy.
Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.

LOCATIONS OF PARTS UNDER SUPPLY USE INSULATED TYPE RESISTORS FOR REPLACEMENT WHERE USED ORIGINALLY
CHASSIS FEATURES:
Automatic Tone Control
Number of stages ........................................... One
Number of stages ........................................... Three
Antenna filter
Tapped antenna coil for matching antenna capacity
Variable antenna trimmer
Non-synchronous modulator
Provision for combined Tone and Sensitivity control unit accessory
Provision for Push Button Automatic
Motor Tuner Accessory
Provision for Auxiliary Speaker

OPERATING FEATURES:
Automatic Volume Control
**PUSH BUTTON TUNING:**

Push buttons are set up in the following manner: Unlock the button by turning it counterclockwise. Push the button all the way in. While holding it in, tune in the desired station. Then, with the button still pushed in, lock it by turning it clockwise. The station's call letters are to be put in the recess in the front of the button.

**FREQUENCY RANGE:**
- Broadcast: 540-1700 kc

**POWER OUTPUT:**
- Type: Beam Tube
- Undistorted: 0.85 watts
- Maximum: 1.5 watts

**OPERATING CONTROLS:**
1. Small knob: "On-Off" switch
2. Large knob: Station Selector

**CONTROL OPERATION:**
- Turning right: Volume increase
- Tuning ratio: Direct

**CHASSIS FEATURES:**
- Attached Antenna

**OPERATING FEATURES:**
- Push Button Tuning (4 button)

**ALIGNMENT FREQUENCY:**
1.500 kc

**LOUD SPEAKER:**
- Type: Dynamic
- Size: 6 inch
- App. field coil voltage drop: 600 ohms
- 40 volts
Push Button Tuning Mechanism:
The push button tuning mechanism used in this receiver is of the mechanical type, wherein the movement of the button actually turns the tuning condenser to any pre-determined setting. The movement is actuated thru a Push-Arm, Cam, Rocker Plate and Sector Gear, which meshes with a Scissors Gear directly fastened to the tuning condenser shaft (See Figures 1 and 2). The scissors gear prevents backlash between the sector gear and the tuning condenser. Since the sector gear is mounted directly on the rocker plate shaft, the position of the rocker plate will accurately determine the position of the tuning condenser. The cams (Figure 2) which determine the stop points for each button are mounted on the push arms and are locked in place by the locking screws and lock-shoes, which press firmly against the cams when the locking screws are tightened. Care should be used when locking screws are tightened not to use excessive force as the threads may become damaged or stripped.

Adjustments for Push Button Tuning are very easily made. To adjust a push button for any station proceed as follows:
(1) Pull the push button off the push arm.
(2) Loosen the cam locking screw one-half turn.
(3) Using the Dial Tuning Control tune in the station.
(4) Press the push arm in as far as it will go and accurately resume station.
(5) With the push button still held down, tighten cam locking screw.
(6) Replace the push button.

With the locking screw tight, the cam is locked in position and when the button is pushed in, the cam pressure causes the rocker plate to assume the position that tunes in the desired station (See Figure 3.)

Manual Tuning Dial:
A manual tuning knob is provided so that additional stations may be tuned in as desired. The manual tuning shaft is connected thru a cord drive to a drum on the rocker plate shaft. This same cord drives the dial drum by passing over a pulley on the drum shaft. Figure 6 shows the complete cord drive assembly and the correct number of turns which the cord should be wrapped around the drive shaft and dial drum pulley. Stops are provided on the dial drum so that dial scale adjustment is made by tuning the set to the extreme ends of the band.
Unlock the mechanism by loosening the screw at the center of the tuning knob, for a few turns. Push the button all the way in and tune in the desired station while the button is held in firmly. Then release the button before tuning in the next station. Proceed in the same manner for the remaining buttons. Look the mechanism by tightening the screw in the tuning knob. Punch out the station call letters from the sheet supplied and insert them in the recess in each button. Cover the call letters with the clear celluloid discs supplied. Be careful not to drop the call letter tabs inside the receiver when inserting them in the push buttons.

ALIGNMENT PROCEDURE:

Either a BC Station of about 1400KC or a sig. gen. can be used for align. Chassis to be removed for C8 trimmer align. Volume Cont. setting be reduced so signal is just audible to facilitate accurate adj.

This set has no AVC so that a strong input signal may be used.
IF PEAK 465 KC

POWER SUPPLY:
All models available .............................................................. 105-135 volts, 50-60 cycle, 105 watts
All models available .............................................................. 105-135 volts, 50 cycle, 120 watts

FREQUENCY RANGES:
Band "AM" .... 540-1730 kc
Band "SW" .... 5.95 mc-16.3 mc
Band "V" ...... 9.4 mc-9.7 mc

INTERMEDIATE FREQUENCY ................................................... 455 kc

POWER OUTPUT:
Type .............. Push pull beam tubes
Undistorted ............... 6 watts
Maximum .............. 10 watts

OPERATING FEATURES:
Tone Control .......... Three position
Automatic Volume Control
Spread Band Tuning
Push Button Tuning (6 button)

OPERATING CONTROLS:
1. Upper left knob .... Volume
2. Lower left knob . "On-off" switch & Tone
3. Lower right knob .......... Band switch
4. Upper right knob . Station Selector

ALIGNMENT FREQUENCIES:
Alignment Frequencies:
Oscill. Ant.-Transil.
Band "AM" ........ 1400 kc
Band "SW" ........ 15 kc
Band "V" ........ 9.55 mc

LOUD SPEAKER:
Type .............. Dynamic
Size (inches) ........ 18
Size (meters) ........ 0.45
Field coil resistance ...... 500 ohms
App. field coil voltage drop ...... 70 volts

CHASSIS FEATURES:
Receiencer on band "AM"
Antenna .......... Conventional
Tuning Eye

CONTROL OPERATION:
Turning right .......... Volume increase
Turning right .......... "HF", "MED", "LO"
Turning right .......... "AM", "SW", "V"
Turning ratio .................. 13:1
6K7G
R.F.

6A8G
1st. DET.

6J5G
OSC.

RANGE SWITCH DECKS
SHOWN IN
"AUTOMATIC" POSITION

NOTE: TERMINALS OF ALL
SWITCHES AND COILS ARE
LETTERED TO CORRESPOND
WITH PICTORIAL VIEWS OF
THSE PARTS

NOV. 7, 1938

113295
BROADCAST
ANTENNA COIL

113296
BROADCAST
R.F. COIL

113297
BROADCAST
OSCILLATOR
COIL

113298
INTERMEDIATE
ANTENNA COIL

113412
INTERMEDIATE
OSCILLATOR
COIL

113301
FOREIGN
ANTENNA COIL

113607
FOREIGN
OSCILLATOR
COIL

INTERMEDIATE FREQUENCY

POWER OUTPUT
Type: Push-Pull Pentodes
Undistorted: 5 watts
Maximum: 10 watts

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Use high resistance voltmeter of at least 1000 ohms per volt.
The bias on the control grids of the 6A8-G, 6U5 and 6K7-G and the delay voltage on the diode plate (D1) of the 6F6-G is -4.3 volts, measured across resistor R21.
### SEARS-ROEBUCK & CO.

#### ALIGNMENT PROCEDURE

Before attempting to align the receiver, see that the dial pointer is correctly set. With the gang condenser in full mesh, set the pointer to the last mark on the left end of the dial scale. If the pointer is incorrectly set, it is necessary to loosen the set screw on the dial cord drive drum and push the gang condenser in full mesh with the pointer properly set, then retighten the set screw.

**Output meter connections**
- Across voice coil
- Output meter reading to indicate 0.8 volt output

**Average sensitivity in microvolts for 0.5 watt output**
- See chart

**Connection of Generator Ground**
- Receiver case

**Dummy antenna in series with Generator Output Lead**
- See chart

**Connection of Generator Output Lead**
- See chart

**Generator modulation**
- 30K, 400 cycle

**Position of volume control**
- Maximum clockwise

---

#### Alignment Chart

| Crystal Antenna Series | Connection of Crystal Generator Output to Receiver | Signal Generator Frequency | Band Switch Position | Receiver Dial Setting | Trimmer Number 1
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-PF Condenser</td>
<td>Control Grid of Gas Tube</td>
<td>465 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>260 I.F.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-4</td>
<td>315 I.F.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>150</td>
</tr>
<tr>
<td>200 PF Condenser</td>
<td>Antenna Terminal</td>
<td>465 KC</td>
<td>Broadcast</td>
<td>5</td>
<td>Wave Trap</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>200 PF Condenser</td>
<td>Antenna Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>6</td>
<td>Broadcast oscillator (short)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>Broadcast oscillator (series)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 PF Condenser</td>
<td>Antenna Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>8</td>
<td>Broadcast antenna</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>Broadcast oscillator (series)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>500 Qm Carbon Resistor</td>
<td>Antenna Terminal</td>
<td>8 MC</td>
<td>Intermediate</td>
<td>10</td>
<td>Intermediate oscillator</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
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<td></td>
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<td>11</td>
<td>Intermediate antenna</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 Qm Carbon Resistor</td>
<td>Antenna Terminal</td>
<td>20 MC</td>
<td>Foreign</td>
<td>12</td>
<td>Foreign oscillator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 Qm Carbon Resistor</td>
<td>Antenna Terminal</td>
<td>30 MC</td>
<td>Foreign</td>
<td>13</td>
<td>Foreign oscillator</td>
</tr>
</tbody>
</table>

**Sensitivity in Microvolts**
- Type of Adjustment
  - Adjust for maximum output, then repeat adjustment.
  - Adjust for minimum output, using a strong generator signal.
  - Adjust for maximum output.
  - Adjust for maximum output. Try to increase output by retuning trimmer and setting receiver dial until maximum output is obtained.
  - Adjust for maximum output. Check to see if proper peak was obtained by tuning in peak at approx. 51 kc. If there does not appear to be a peak at 51 kc, with trimmer open further out, check receiver space.
  - Adjust for maximum output.
  - Adjust for maximum output.
  - Adjust for maximum output.

---

#### Diagrams

- Bottom View of Chassis
- Top View of Chassis
- Power Supply

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HOW TO SET UP AND USE YOUR PUSH BUTTON TUNER.

SET-UP PRELIMINARY

1. Be sure that your set is connected to a good antenna system.

2. In order to be able to determine the correct frequency of the desired stations, arrange the stations in your list in the order of their frequency. The table of lowest frequency will be first, the highest second, and so on. Refer to the radio log furnished with your receiver and you will be able to determine the correct frequency of the desired stations. After you have marked down the frequencies on your chart alongside the station call letters and arranged them in proper order, number them 1, 2, 3, 4, 5, 6, 7, and 8 respectively. Check each frequency using Figs. 1 & 2. If each frequency falls within the range of its button, proceed as outlined in the following paragraph.

A typical list of stations and the buttons that would be used to set them up is shown below:

<table>
<thead>
<tr>
<th>Call Letters</th>
<th>Frequency</th>
<th>Button No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRRJ</td>
<td>570 Kc.</td>
<td>3</td>
</tr>
<tr>
<td>WMJ</td>
<td>700 Kc.</td>
<td>4</td>
</tr>
<tr>
<td>WRB</td>
<td>780 Kc.</td>
<td>6</td>
</tr>
<tr>
<td>WOR</td>
<td>870 Kc.</td>
<td>6</td>
</tr>
<tr>
<td>WBBN-4LS</td>
<td>870 Kc.</td>
<td>6</td>
</tr>
<tr>
<td>WCBS</td>
<td>1540 Kc.</td>
<td>8</td>
</tr>
</tbody>
</table>

D. Notice in Fig. 1 that buttons 1 and 2 and 3 to 8 inclusive are to be set up for automatic station selection. Also notice that stations with a frequency between 540 KC and 800 KC can be set up on buttons 3, 4, 5, and 6. Stations with a frequency between 700 KC and 1400 KC may be used for setting up a station between 700 KC and 1400 KC. However, the same button may be used for setting up a station whose frequency is as low as 720 KC.

E. Remove the escutcheon around the push button by taking out the inner screws holding it to the cabinet. This will allow you to view the pairs of adjustment screws, each button which is used to tune in a specific station that you wish to set up on a particular button.

F. SET-UP PROCEDURE

1. Turn the band switch (right hand knob) to the right (counterclockwise) until the word "BROADCAST" appears in the lower opening in the dial. Then, using the tuning knob (center) tune in the station.

2. Now turn the band switch to the extreme clockwise position until the word "AUTOMATIC" appears in the dial opening.

3. Push in the button to which you wish to set up the station (See Fig. 1).

4. Use a small screwdriver and insert it in the "A" screw for that button (see Fig. 1).

5. Rotate the screw back and forth slowly until the program previously heard is heard again. If trouble is experienced in setting the station, turn the volume control (to the right). NOTE: Be sure that you avoid loss of the particular screw until the sides of the tuning eye "shadow" are closest together.

6. Repeat the above procedure, carefully re-read paragraphs "C" and "D", and repeat procedure 1, 2, 3, 4, 5.

7. Check to see if you have the proper station by changing the band switch from "AUTOMATIC" to "BROADCAST" and vice versa.

8. Now insert the screwdriver in the "B" screw for that button (see Fig. 1) and turn it to the left or right until the program is received with maximum volume. The correct setting for this screw is when the sides of the tuning eye "shadow" are closest together.

9. Re-adjust the "A" and "B" screws slightly while the band switch is in the "AUTOMATIC" position until the sides of the tuning eye "shadow" are closest together.

10. Set-up buttons 4, 5, 6, 7 and 8 following step 1 to 7 inclusive.

REPLACING THE POINTER DRIVE CORD

1. Tie one end of the special dial cord to the drum C. (feeding from the inside of the drum out). See Fig. 3.

2. Thread the free end of the cord through hole A in drum C. (feeding from the inside of the drum out). See Fig. 3.

3. After pulling the cord through hole A, make one half turn around the drum C in a clockwise direction (viewed from the front) using the front groove in the drum.

4. Continuing, draw the cord up around the back of pulley F to pulley G. From this point continue across to pulley D and around to pulley E.

5. Go over pulley E and down to the bottom of the front groove on drum C. Continue up around the drum to hole B.

6. Draw the cord through hole B and tie it to the end of the torsion spring in such a manner that when the spring is clipped on to leg H it will be extended to about 1/2" long.
SUBJECT: ADDITION OF VOLUME CONTROL WITH A "MASTER" SWITCH.

There has been a change to further promote the satisfaction to be derived from this equipment by the incorporation of a volume control with the "Master" switch control.

To place the volume control in a position for easier operation, the "Master" switch has been placed on the right hand side of the equipment, the "Kotor" switch taking up its position on the left hand side of the equipment.

To place the equipment in operation, the right hand switch marked "Master" should be turned on and advanced to the limit of its clockwise turn, which will place the volume control "Full-on". Slightly to the left of the right hand control will be noticed a small metal cap. This should be prised up with the screwdriver furnished to gain entrance to the tuning control, instead of making this adjustment from the bottom as directed — then the usual procedure should be gone through as indicated under "Set Up Procedure".

The volume control can now be set at a level indicated by the satisfaction of the user. Turning the control to the right increases volume, turning it to the left decreases volume.
ELECTRICAL SPECIFICATIONS

FREQUENCY RANGE:
The frequency range is from 750 to 460 kilocycles.

POWER OUTPUT:
Model 6200 is supplied with a Model 860 85-watt, 60-cycle AC amplifier.

OPERATING FEATURES:
- Fidelity ranges: 80 to 8,000 cycles.
- Maximum output is 80 watts.

MECHANICAL SPECIFICATIONS

OPERATING CONTROLS:
- Left-hand knob: "Master" switch
- Right-hand knob: "Volume" switch
- Switches:
  - "A" controls the right channel
  - "B" controls the left channel

PART NO. | DESCRIPTION
---|---
14470000 | Printed Circuit Board
14470050 | Components, 1248-2144 MHz
14470100 | Components, 5280 MHz
14470150 | Components, 28 kHz
14470200 | Components, 28 kHz

Authorized Replacement Parts for this model may be obtained from any Sears, Roebuck and Co. Retail Store or Mail Order Branch. Always give part number and the chassis identification number.

Authorized Replacement Parts for this model may be obtained from any Sears, Roebuck and Co. Retail Store or Mail Order Branch. Always give part number and the chassis identification number.

Authorized Replacement Parts for this model may be obtained from any Sears, Roebuck and Co. Retail Store or Mail Order Branch. Always give part number and the chassis identification number.
ALIGNEDMENT PROCEDURE

Either a broadcast signal between 1400 and 1500 KHz may be used.

The antenna of the receiver should be extended as in normal use. Tune in a station between 1400 and 1500 KHz. and adjust the trimmers on top of the variable condenser for maximum signal.

If a signal generator is used, extend the antenna as described above, run a wire from the generator parallel to, but insulated from the antenna. Set the generator at 1735 KHz. Turn the variable condenser all the way to the right (minimum capacity). Tune in the signal from the generator with the trimmer on the front section of the variable condenser. Set the generator at about 1400 KHz. Tune in the signal and adjust the trimmer on the rear section of the variable condenser for maximum signal.

The signal generator method is most satisfactory and should always be used when available.

CAUTION:
Under no condition should a ground be attached to this receiver, also no grounded object should be allowed to come in contact with the chassis.

POWER SUPPLY:
105-125 volts, 50-60 cycle or D. C. 45 Watts on 117 volt line.

FREQUENCY RANGE:
Broadcast and other services 540 to 1780 KHz.

POWER OUTPUT:
Type: Beam Power
Undistorted: 1 Watt
Maximum: 2.0 Watts

ALIGNEDMENT FREQENCIES:
1735 KHz and 1560 KHz.

LOAD SPEAKER:
Type: Dynamic
Size: 8 Ohms
Field Resistance: 450 Ohms

MECHANICAL SPECIFICATIONS

CONTROLS:
Upper Knob: Tuning
Lower Knob: Volume control, On-Off switch

CONTROL OPERATION:
Direct Drive
Turn right to turn power on and to increase volume.

OCT. 7, 1938
MODEL 7152
Schematic, Socket
Voltage

SEARS-ROEBUCK & CO.

FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME V111

CHOKER
12A

$25Z5$ $43$ $77$ $78$

No. 2045
Ant. coil

E 60 VOL. CONT.

SPKR. BAFFLE No. 10A

DIAL ASSEM.
No. 11A

VAR. COND.
No. 203

78 PF 0.3 2.1 110 2.1 18
77 Det. 6.3 1.4 14 1.4 18
43 PB OUTPUT 25 16 110 = 100

Line voltage 115 Volts - Voltage control all the way up
All voltages taken with 1000 ohms per volt D.C. meter except heaters, from points indicated to ground.

$R$ = filament  $K$ = Cathode  $G2$ = Screen Grid
$G3$ = Suppressor grid  $F$ = Plate

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THE ALIGNMENT PROCEDURE

The following alignment instructions have been tested and found capable of accurately covering the range of the receiver. The alignment is performed by the usual system of feeding the intermediate frequency plus sidebands through the grid of the IF tubes.

1. THE IF's are aligned by the usual system of feeding the intermediate frequency plus sidebands. The two trimmers in each of the IF stages will be 40 microvolts or better.

2. ALIGNMENT OF SHORT WAVE BAND 5.5 to 18 MHz.
   a. Set the IF trimmers to 17 MHz.
   b. Turn wave band switch all the way to right for highest S.W. Band.
   c. Peak trimmer condenser C-11 of the oscillator coil (See phono crystals 6-20) to resonance with 17 MHz fed into antenna.
   d. Turn wave band switch to middle position.

3. SHORT WAVE BAND 1.7 to 5.5 MHz.
   a. Set the IF trimmers to 17 MHz.
   b. Tune wave band switch all the way to left for lowest S.W. Band.
   c. Peak trimmer condenser C-7 of the oscillator coil, (See phono crystals 6-3) to resonance with 17 MHz fed into antenna.
   d. Tune wave band switch to middle position.

4. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

5. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

6. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

7. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

8. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

9. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
   a. Tune wave band switch to middle position.

10. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

11. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

12. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

13. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

14. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

15. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

16. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

17. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

18. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

19. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

20. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

21. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.

22. PEAK ANT. COIL TRIMMER C-7 at same setting to 17 MHz.
    a. Tune wave band switch to middle position.
MODEL 7215

FACTORY IDENTIFICATION NO. 110.7215

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connections ........................................... Across output transformer
Output meter reading on output side of primary 600 ohms
For crystal type 017 output meter on 10 volt scale
Average sensitivity 120 K ohms 4500 volt output
Dummy output value is series with generator output
Connection of generator ground lead .................................. To chassis
Generator modulation .................................................. App. 20K or 400 cycles
Position of volume control ........................................... Fully clockwise

WAVE BAND

<table>
<thead>
<tr>
<th>POSITION</th>
<th>FREQUENCY</th>
<th>OUTPUT</th>
<th>CARRIER</th>
<th>MESSAGES</th>
<th>TRIMMER 1</th>
<th>TRIMMER 2</th>
<th>AFTER ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHF</td>
<td>450 EC</td>
<td>SAT grid</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td>VHF</td>
<td>450 EC</td>
<td>Ant. lead</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>600 EC</td>
<td>Ant. lead</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>1500 EC</td>
<td>Ant. lead</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>1600</td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTE

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

It is advisable to repeat the entire alignment procedure back and forth in the original order to ensure greater accuracy.

Values shown under "Microvolts" are only approximate.

MODEL 7214

FACTORY IDENTIFICATION NO. 110.7214

AUTOMATIC TUNE CONTROL ADJUSTMENT

This radio leaves the factory with the push buttons unused, but the user will have to make the necessary adjustments. For setting the buttons, the Tuning Sturess may assist. The following is the procedure to be followed in making the adjustments for each station.

Note: Before attempting to set buttons, read through the ENTIRE PROCEDURE VERY CAREFULLY.

1. Decide on station you wish to receive.
2. From the radio section of your daily newspaper, find the transmitting frequency in kilocycles of the station you wish to receive.
3. Refer to the diagram underneath and note which set of adjustment knobs will have a tuning range that includes the frequency of the station desired. This is the pair of knobs to be adjusted for this particular station. The range is listed under each pair of adjustment knobs.
4. From the same diagram, after finding where the proper pair of adjustment knobs are located, turn each dial slowly until the needle in the meter moves to one of the push buttons. This is the button which, after the adjustments are completed, will tune in the station.
5. Press button located by paragraph 4. "D".
6. Turn volume control knob on full to the extreme right and adjust screw marked "G" until desired sensitivity is heard. If when making this adjustment, a number of stations can be brought in as the screw is turned and it is possible with the station in the perfect one, press button No. 6. Repeat tuning "D" and move dial pointer by turning station selector back to the number on the dial that corresponds to the frequency of the station. (The number on the dial must be multiplied by ten to give the frequency in kilocycles). Listening to the program being broadcast will identify the station when adjusting screw "D".
7. Adjust screw marked "I" for maximum volume, rotating the volume control and readjusting if necessary. This completes the adjustments for this particular station.
8. Cut out name of stations from list supplied and insert in button.
9. Insert dissolution tape.
10. In a like manner select a station for each of the other buttons and make necessary adjustments for each station.

ALIGNMENT PROCEDURE

Output meter connections ........................................... Across Primary Output Transformer
Output meter reading on output side of primary 600 ohms
For crystal type 017 output meter on 10 volt scale
Average sensitivity 120 K ohms 4500 volt output
Dummy output value is series with generator output
Connection of generator ground lead .................................. To chassis
Generator modulation .................................................. App. 2000 at 400 cycles
Position of volume control ........................................... Fully clockwise

FORMULA

<table>
<thead>
<tr>
<th>OFFICE</th>
<th>POSITION</th>
<th>GENERATOR</th>
<th>GENERATOR</th>
<th>TELEMETER</th>
<th>TELEMETER</th>
<th>APPROXIMATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>Grid 600</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>2000</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>Grid 600</td>
<td>TH, TF</td>
<td>8000</td>
<td>I.F.</td>
<td>2000</td>
<td>1200</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTE

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

It is advisable to repeat the entire alignment procedure back and forth in the original order to ensure greater accuracy.

Always keep the output from the test oscillator at its lowest possible value, as the sensitivity is increased by alignment. The generator output should be reduced correspondingly.

Values shown under "Microvolts" are only approximate.

"Short oscillator" means of variable condenser.

Second I.F. alignment must be done twice to ensure flat tuning.

First time TF is about one turn misaligned by loosening center screw.
**ELECTRICAL SPECIFICATIONS**

**APRIL 7, 1938**

**TUBES AND FUNCTIONS:**
- 6A7 Transmitter-Oscillator
- 6D5 IF
- 74 AVC, detector, 1st audio
- 25LAC Output
- 2525 Rectifier
- N49DC Ballast tube

**POWER SUPPLY:**
All models available: 105-125 volts, 25-60 cycle or DC, 45 watts

**FREQUENCY RANGES:**
- Broadcast 540-1700 KC
- Short Wave 2150-7200 KC

**ALIGNMENT FREQUENCIES:**
- Osc. Oscil.
- Padder 1000 KC
- N49DC 600 KC

**POWER OUTPUT:**
- Beam Power: .6 watts
- Maximum: 1.5 watts

**LOUD SPEAKER:**
- Type: Dynamic
- Size: 5" 
- Field resistance: 450 ohms

**MECHANICAL SPECIFICATIONS:**

**OPERATING CONTROLS:**
- Left Knob: "On-Off" switch, volume control
- Center Knob: Wave change switch
- Right Knob: Tuning

**CONTROL OPERATION:**
- Turning right: power on; volume increase
- Left Foreign; right Broadcast

Under certain conditions, the chassis may be above ground potential. Do not allow any grounded object to come into contact with the chassis while the line cord is plugged in. Also, be careful when working on the chassis out of its cabinet, to avoid shocks.

If the power supply is DC, the power cord plug must be in its receptacle in the proper way. If the receiver does not operate after being turned on for a minute, reverse the polarity by removing the power cord plug from its receptacle and turning it half way around before re-inserting it in the receptacle.
In cases where the customer objects to "boominess," the following circuit change may be made to minimize low-frequency response.

Change condenser C43 to .001 mfd., or in the most stubborn cases to .0001 mfd.

Add a 2 megohm resistor across the crystal pickup circuit connecting it from junction of pickup cable, C44, and R7 to chassis. This will reduce low-frequency response.

Mount the speaker away from the baffle by about 1/4" to 3/8".

POWER SUPPLY RATINGS AVAILABLE.

<table>
<thead>
<tr>
<th>Type</th>
<th>Radio Only</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 volts, 60 cycles</td>
<td>120 watts</td>
<td>150 watts</td>
</tr>
<tr>
<td>105-125 volts, 60 cycles</td>
<td>120 watts</td>
<td>155 watts</td>
</tr>
<tr>
<td>105-125 volts, 60 cycles</td>
<td>120 watts</td>
<td>150 watts</td>
</tr>
</tbody>
</table>

FREQUENCY RANGES:

- Standard Broadcast (S.B.) 540-1,720 kc
- Medium Wave (M.W.) 2.3-7.5 mc
- Short Wave (S.W.) 7.5-22 mc

ALIGNMENT FREQUENCIES:

- Band "S.W." 20 mc (osc., ant.)
- Band "M.W." 6 mc (osc.)
- Band "S.W." 1,500 kc (osc., ant.), 600 kc (osc.)

INTERMEDIATE FREQUENCY

LOUDSPEAKER:

- Type: Electrodynamic
- Size: 12 inches
- V.C. Impedance: 2.25 ohms at 400 cycles
- Field Coil Resistance: 1,800 ohms
- App. Field Coil Voltage Drop: 115 volts

CHASSIS FEATURES:

- No. R.F stages (Band "S.B.") One
- No. I.F stages One
- Antenna: Doublet or Conventional
- Tuning Eye
- Line Noise Electrostatic Transformer Shield
- Aural-Compensated Volume Control
- Transformer Shield
- Magneto-Coupled I.F. Transformers and Band "S.B." Low-Frequency Oscillator Tracking
**Preliminary**

**Output meter connections.**

Across speaker voice coil

**Alignment Procedure**

Across input terminal to speaker voice coil. Amplifier output should be at the output terminals which may be pre-wired or be connected to the speaker voice coil. Use the output terminals of the amplifier for this purpose.

**Biasing arrangement.**

The biasing arrangement should be as shown in the diagram. The biasing arrangement is for 100%, 4000 cycles, fully decoupled, and has a fully decoupled output transformer. The output transformer is a 6:1 transformer.

**Preamplifier input terminal.**

In the OFF position, the preamplifier input terminal should be off. The preamplifier input terminal should be connected to the speaker voice coil.

**Alignment Procedure**

At normal operating conditions, service requirement can be met by using the method as outlined in the Preliminary section. For those conditions where an overlap occurs between service requirement and alignment procedure, the following procedure should be used:

1. Position the speaker in the center of the room.
2. Set the amplifier gain to its maximum level.
3. Adjust the output level to the desired level.
4. Adjust the preamplifier gain to the desired level.
5. Adjust the bass and treble controls to the desired level.
6. Monitor the sound quality and make any necessary adjustments.

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6. Monitor the sound quality and make any necessary adjustments.
Sears-Roebuck & Co.

MODEL 7215, CH. 110, 7215
Schematic, Socket, Tuner
Trimmers

POWER SUPPLY:
All models available .................................................. 105-125 volts, 25-60 cycle or DC, 45 watts

FREQUENCY RANGE:
Broadcast ................................................................. 540-1700 KC

ALIGNMENT FREQUENCIES:
Oscil. Oscil. Padder
Broadcast ................................................................. 1500 KC 600 KC

POWER OUTPUT:
Type ................................................................. Beam Power
Undistorted ............................................................ 1.2
Maximum ............................................................... 1.6

LOUD SPEAKER:
Type ................................................................. Dynamic
Size ................................................................. 5"
Field resistance .................................................... 450 ohms

AUTOMATIC TUNING CONTROL:
There are six buttons on the front panel. Five of them can be set so that by simply pushing the button marked with the station's call letters, any of five different broadcast stations can be received.
The sixth button is used to cut out the automatic tuning and convert the set for use with the regular dial and manual tuning.

AUTOMATIC TUNING ADJUSTMENTS

APRIL 7, 1938

©John F. Rider, Publisher
POWER SUPPLY:
All models available........... 105-125 volts, 25-60 cycle or DC, 45 watts

FREQUENCY RANGE:
Broadcast.................... 540-1740 KC

ALIGNMENT FREQUENCIES:
Oscil. Oscil.
Trimmer Padder

Broadcast 1800 KC 600 KC

POWER OUTPUT:
Type....................... Beam Power
Undistorted................... 1.0
Maximum..................... 1.6

LOUD SPEAKER:
Type....................... Dynamic
Size......................... 5" Field resistance........... 460 ohms

MECHANICAL SPECIFICATIONS

OPERATING CONTROLS:
Left knob, "On-Off" switch, volume control
Upper Right knob.......... tuning

CONTROL OPERATION:
Turning right: power on; vol. increase

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THE GROUND:

In noisy locations, it may be desirable to connect the block lead in rear of chassis to a water pipe or radiator. This may eliminate much of the interference.

CAUTION: Do not connect a ground wire directly to the chassis; otherwise harm will result.

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SERVICE NOTES for "AUTOMATIC-TUNE" WHEEL DIAL

INSERT CELLULOID ENVELOPE BETWEEN EDGE OF DIAL AND METAL FACE PLATE THEN LIGHTLY PRESS NUT INTO SQUARE NOTCH

INSERT CELLULOID ENVELOPE INTO A VITRAL TAB FRAME
(a) Glue one end of celluloid envelope to a metal enclosed tab holder and insert aligned into metal frame.
(b) Gently push celluloid envelope until engaged end of envelope enters slot of celluloid envelope tab frame.
(c) Arrange tabs in numerical order according to station frequency

SET THE METAL TAB HOLDERS ON DIAL BT. (See Fig. 2)
(a) Set the first metal tab holder for the stations that broadcast on the lowest frequency; least number of kilocycles and then set the next station tab for the stations broadcasting on the next lowest frequency, and so on. This tab holder can be set for all of the stations.
(b) Gently press in on the station tab holder.
(c) Insert enclosed envelope between edge of dial and metal face plate. Lightly press nut end of nutted tab into metal frame and until the nutted tab is under the indicated stop on the dial. The station stop will appear directly below the indicated line on the face of the dial.
(d) Tighten tab holders as much as possible without causing dial to be unscrewing. Tab holder should be away from indicator stop on the dial. Do not use pliers to tighten.

REPLACING No. 4000 DIAL GLASS SCALE ASSEMBLY

As the "AUTOMATIC-TUNE" tab may be set for different radio stations, please note if the station required by "AUTOMATIC-TUNE" is a foreign station or local station.

DIAL MECHANISM

SLOTTED DIAL TAB

INDICATOR STOP

SLACK LOCK FOR DRIVE SHAFT

WHEN INSTALLING PART No. 4005 GLASS ASSEMBLY WITH No. 4005 SHAFT ATTACHED:
(a) Insert No. 4005 shaft into main bracket attached to the cadmium plated bracket on back of dial face.
(b) Place steel spacer washer and brass tension spring in order named over end of No. 4005 shaft.
(c) Place the small die cast primary pulley No. 4009 on shaft—do not tighten No. 2754 set screw.
(d) Loosen the two set screws in brass spacer collar on the No. 4005 shaft.
(e) Adjust brass spacer collar by sliding collar on shaft so that there will be approximately 1/8" clearance between the bottom of metal tab holder and the face plate. Firmly tighten brass collar and No. 2754 die cast pulley set screw. Failure to provide proper clearance will result in scratches on dial face and the dial mechanism will not operate freely.

TO INSTALL No. 3814 PRIMARY DRIVE CORD:
(a) Looking at back of dial, wrap dial cord twice around No. 4355 drive sheath in COUNTERCLOCKWISE direction.
(b) Hook No. 3452 tension spring into loops at end of dial cord.

NEVER LOOSEN THE FOUR SCREWS THAT HOLD THE CADMIUM PLATED BRACKET TO DIAL FACE—OTHERWISE THE MAIN BUSHING WILL BE THROWN OUT OF CENTER.
TO INSTALL No. 4013 SECONDARY DRIVE CORD:

The dial mechanism picture shows and refers to eye terminals on drive cord—these were used in early production. Loops made by knots in the cords are now used to attach cord to lugs in the No. 4039 die cast pulley and to the No. 4352 & 3465 tension springs.

(a) Looking at the front of the dial rotate dial scale COUNTER-CLOCKWISE until dial stop is reached.

(b) Loosen the two No. 2754 set screws in small die cast pulley No. 4009.

(c) Looking at front of dial turn the small die cast pulley so that the cut in pulley will be towards the left and approximately in line with the upper edge of the dial light bracket. This bracket which is only used in six volt battery and 110 volt AC models is shown mounted on the cadmium plated dial face plate bracket in dial mechanism picture.

(d) Hook No. 4352 tension spring in dial cord loop.

(e) Turn No. 4011 drum so that the hole in the No. 4012 large die cast pulley—through which the secondary drive cord is pulled—is towards the top of face plate. This will bring the hole approximately in line with the left hand edge (looking at back of dial) of face plate.

(f) Take long end of No. 4013 secondary drive cord—measured from knot at spring to end of cord—then looking at the front of dial, wrap cord one complete turn CLOCK WISE around the No. 4009 small die cast pulley. The other end of the cord (short end) is placed on bottom half of secondary and primary die cast pulleys.

(g) Firmly tighten No. 2754 set screws in small die cast pulley.
ALIGNING I.F. STAGE AT 445 METERS:
(a) Connect the high output side of the test oscillator to the control grid of the 6AS modulator tube through a 400 ohm resistor. Leave the grid gap connected to the grid terminal of the tube, and connect the ground side of the test oscillator to the receiver base through a 2 Mfd condenser.
(b) Set test oscillator frequency to 445 MHz.
(c) Peak each of the second I.F. transformer trimmers.
(d) Peak each of the first I.F. transformer trimmers.

ALIGNING 155-555 METER BAND:
(a) Replace the 400 ohm resistor in series with test oscillator lead with a 200 Mfd condenser, place the high output side of the test oscillator lead to the grid of the 6AS modulator tube, and add receiver dial and set test oscillator frequency to EXACTLY 475 METERS. Bring the 155-555 METER TEST OSCILLATOR SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE 155 METER OSCILLATOR TRIMMER.
(b) Set test oscillator frequency and receiver dial to EXACTLY 255 METER. Adjust 215 meter preselector and antenna trimmer to maximum 215 meter test oscillator signal sensitivity.
(c) Tune receiver dial and test oscillator frequency to approximately 500 meters. While rocking grid condenser slightly to right and left adjust 500 meter oscillator for maximum sensitivity.

ALIGNING 70-210 METER BAND:
(a) Place band selector switch for operation on the 70-210 meter band, and set test oscillator frequency to EXACTLY 220 METERS. Bring the 70-210 METER TEST OSCILLATOR SIGNAL TO MAXIMUM OUTPUT WITH 700 METER OSCILLATOR TRIMMER.
(b) Tune receiver dial and test oscillator frequency to EXACTLY 100 METERS. Adjust 800 meter antenna and preselector trimmer, for maximum 800 meter test signal response.
(c) Set receiver dial and test oscillator frequency to approximately 3875 meters. Then while rocking grid condenser slightly to right and left adjust 1000 meter padding condenser for maximum sensitivity.

Model 67L
Six Tube Superheterodyne Receiver

ALIGNING I.F. STAGE AT 465 Kilocycles:
(a) Connect the ground lead of the test oscillator to the chassis or ground lead. Connect the other lead to the grid of the 6AS modulator tube through a 4000 Mfd series condenser.
(b) Set test oscillator to EXACTLY 465 kilocycles and tune receiver volume control to full.
(c) Peak each of the second I.F. transformer trimmers.
(d) Peak each of the first I.F. transformer trimmers.

ADJUSTING 465 Kilocycle WAVE TRAP:
(a) Connect the high output side of the test oscillator through a 1000 Mfd condenser to the receiver antenna lead and the low side to the ground set.
(b) Set test oscillator frequency to EXACTLY 465 kilocycles and adjust the 465 K.C. wave trap trimmer condenser mounted on and accessible through hole in rear of chassis for MINIMUM 465 kilocycle signal response.

ALIGNING 170-240 Kilocycle Band:
(a) Adjust band selector switch for operation on 170-240 kilocycle band and leave test oscillator lead connected to receiver antenna lead through the 1000 Mfd series condenser.
(b) Set test oscillator frequency and receiver dial to EXACTLY 1700 kilocycles.
(c) Adjust B.C. oscillator trimmer to bring in 170 kilocycle test oscillator signal to maximum output.
(d) Tune receiver dial and set test oscillator frequency to EXACTLY 1400 kilocycles.
(e) Adjust 1400 K.C. antenna trimmer for maximum sensitivity.
(f) Set receiver dial and test oscillator frequency to approximately 600 kilocycles.
(g) While rocking grid condenser slightly to right and left adjust 600 K.C. padding condenser for maximum sensitivity.

ALIGNING 5-5.5 Mcycle Band:
(a) Replace the 1000 Mfd. test oscillator lead series condenser with a 4000 Mfd. condenser. Adjust band selector switch for operation on 6.3 to 6.25 megacycle band, and tune receiver dial and set test oscillator frequency to EXACTLY 5.5 megacycles.
(b) Adjust 6.5 M.C. oscillator trimmer to bring in 6.5 megacycle test oscillator signal to maximum output.
(c) Tune receiver dial and set test oscillator frequency to 5.5 megacycles, while rocking grid condenser slightly to right and left adjust 5.5 M.C. antenna trimmer for maximum sensitivity.
(d) No adjustment is required at low frequency end of this band as a fixed oscillator pool is used.

To assure more accurate trimmer setting repeat all above adjustments several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.
The SEI Voltage Regulator, which is used to maintain the filament voltage on the receiver tubes at the correct value of approximately 2 volts (in order to adopt the receiver to operation on a 3 volt dry "A" battery or Aircraft battery) automatically takes care of the normal change to discharge battery voltage variations.

IC6  O.C.MOD.  34  LF  1F6  DET-A.V.C.  33  POWER  5E1  REG.

I.F. - 465 K.C.

NOTES
1. NUMBERS SHOWN RELATIVE TO PARTS ARE PART NUMBERS.
2. NUMBERS SHOWN IN PARENTHESES ARE ILLUSTRATION NUMBERS.
3. LARGE PRINT = LARGE PRINTING.

FOR ALIGNMENT SEE INDEX.

VOLTAGE TABLE (BOTTOM VIEW OF CHASSIS)

PART NO. 90-8

BATTERY CABLE 24455

RED = A
BLACK = B
YELLOW = C
GREEN = D
BLUE = E

VAT. DRAIN 0.5 A.
BAT DRAIN 20 MA.
SERVICE NOTES for PUSH BUTTON DIAL

IT IS A SIMPLER MATTER TO "AUTOMATIC TUNE" AFTER THE STATION PUSHER BUTTONS HAVE BEEN PROPERLY SET, THAN TO PLACE INDICATOR TUBE IN THE DIAL ASSEMBLY WITH THE DIAMONIC TUNING ASSEMBLY. A METAL INDICATOR HAS BEEN FOUND TO BE VERY USEFUL. THE AUTOMATIC TUNE IS ARDUOUS, AND MUST BE PERFORMED ONLY ONCE. THE DIAL ASSEMBLY SHOULD BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION. THE DIAL ASSEMBLY SHOULD NOT BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION. THE DIAL ASSEMBLY SHOULD NOT BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION.

WHILE A PUSHER BUTTON MAY BE SET FOR DISTANT TUNING, IT IS BETTER TO USE THE INDICATOR TUBE IN THE DIAL ASSEMBLY, AS TUNING ALL BUTTONS AT ONCE HELPS TO PREVENT ANY ERRORS IN SETTING THE DIAL ASSEMBLY.

IN ORDER TO DETERMINE WHAT STATIONS YOU WISH TO "AUTOMATIC TUNE" YOU SIMPLY MARK THE FREQUENCY LIST AND CALL LETTERS OF THESE STATIONS IN THE INDICATOR TUBE AND CALL LETTERS OF THE DIAL ASSEMBLY. THE DIAL ASSEMBLY SHOULD NOT BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION. THE DIAL ASSEMBLY SHOULD NOT BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION.

TO ILLUSTRATE THE PROPER INSTALLATION AND SETTING OF THE PUSHER BUTTONS, THE SHEETING IS SHOWN IN THE SHEETING WITH A PUSHER BUTTON PROPERLY SET FOR STATION WGN, CHICAGO, ILLINOIS. IN STATION WGN, THREE OF THE PUSHER BUTTONS ARE REMOVED, TOGETHER TO DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION. THE DIAL ASSEMBLY SHOULD NOT BE TUNED TO THE DESIRE STATION, AND THE METAL INDICATOR TUNED TO THE DESIRE STATION.

AFTER THE PUSHER BUTTONS HAVE BEEN PROPERLY SET THEY WILL NOT REQUIRE FURTHER ADJUSTMENT, EXCEPT WHEN MOVED FROM THEIR INITIAL POSITION OR WHEN AN ADDITIONAL STATION IS INCLUDED, WHICH WOULD DISTURB THE POSITION OF THE OTHER STATION.
CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII.
ALIGNMENT PROCEDURE:

Lack of sensitivity, selectivity or poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, inadequate or excessively long antenna, etc. Never attempt to realign set until all other possible causes of troubles have been first thoroughly investigated and definitely proven not to be the cause.

NOTE: BE CAREFUL WHEN ALIGNING OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INACCURATE.

IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER.

ALIGNING I.F. STAGE AT 465 Kilocycles:

(a) Connect the ground lead of the test oscillator to the chassis or set ground lead. Connect the other lead of the test oscillator to the grid cap of the 6A7 tube through a 22 ohm series condenser. DO NOT REMOVE GRID CLIP.

(b) Set test oscillator to EXACTLY 465 kilocycles and turn receiver volume control on full.

(c) Peak each of the second i.f. transformer trimmers.

(d) Peak each of the first i.f. transformer trimmers.

To assure most accurate trimmer setting repeat above adjustment several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.

ALIGNING 1720-1440 Kilocycle Band:

(a) Remove test oscillator lead from grid of the 6A7 tube and attach it to the receiver antenna lead through a 1000 ohm, 1/2 watt resistor.

(b) Check tuning dial adjustment by turning gang condenser until plate trace maximum capacity slope (completely in mask), at which point the dial needle must be exactly on the last line at the low frequency end of the dial calibration. If the dial needle does not point exactly to the last line move needle to correct position.

(c) Set receiver dial and test oscillator frequency to EXACTLY 1720 kilocycles.

(d) Bring in 1720 KC test oscillator signal to maximum output by adjusting the trimmer condenser mounted on top of the gang condenser. Looking at the front of the receiver the rear section of the gang condenser is the oscillator section.

(e) Tune receiver dial and set test oscillator frequency to EXACTLY 1440 kilocycles.

(f) Adjust trimmer on top of the front section gang condenser (antenna section) for maximum 1440 kilocycle test signal response.

(g) Tune receiver dial and set test oscillator frequency to approximately 600 kilocycles.

(h) While rocking the tuning condenser back and forth adjust 600 KC oscillator condenser which is accessible through the hole in the back of the chassis adjacent to the condenser for maximum 600 kilocycle signal response.

ALIGNING 2.3-4.5 Megacycle Band:

(a) Replace 600 ohm M. F. Test oscillator antenna lead series condenser with a 400 ohm resistor.

(b) Adjust band selector switch for 2.3-4.5 megacycle band operation, tune receiver dial and set test oscillator frequency to EXACTLY 6.3 megacycles.

(c) Bring in 6.3 megacycle test oscillator signal to maximum output by adjusting 6.3 M.C. oscillator trimmer on top of coil located underneath chassis.

(d) Tune receiver dial and test oscillator frequency to EXACTLY 6 megacycles, and adjust d M.C. antenna trimmer which is mounted on coil located on top of chassis for maximum sensitivity.

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ALIGNMENT PROCEDURE:

Lack of sensitivity, selectivity, or poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or switches, poor or worn, or worn or worn, or worn, and the like. Always check the trimmer setting when using this oscilloscope. IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER.

ALIGNING IF STAGE AT 455 Kilocycles:
(a) Connect the ground lead of the test oscillator to the chassis or set ground post. Connect the other lead of the test oscillator to the grid of the G4, tube through a .026 Mfd. series condenser. DO NOT REMOVE GRID CLIP.
(b) Set test oscillator to EXACTLY 455 kilocycles and tune receiver; volume control on full.
(c) Peak each of the second IF transformer trimmers.
(d) Peak each of the first IF transformer trimmers.
To ensure most accurate trimmer setting repeat above adjustments several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.

ADJUSTING 455 KILOCYCLE WAVE TRAP:
(a) Connect the high output side of the test oscillator through a .0005 Mfd. condenser to the receiver antenna "A" post and the low side to the set ground post. Set test oscillator frequency to EXACTLY 455 kilocycles and adjust 455 kilocycle wave trap trimmer condenser for MINIMUM 455 kilocycle signal response.

ALIGNING 137-441 KILOCYCLE BAND:
(a) Check tuning dial adjustment by turning gain control until pictures reach maximum capacity. Complete adjustment is reached when the dial needle must be exactly equal to the last line of the dial calibration. If the dial needle does not point exactly to the last line move dial to correct position.
(b) Leave test oscillator lead connected to receiver antenna "A" post through a .0005 Mfd. series condenser.
(c) Adjust band selector switch for operation on 137-441 kilocycle band, tune receiver dial and set test oscillator frequency to EXACTLY 441 kilocycles.
(d) Move 441 kilocycle test signal to maximum output by adjusting 41 K.C. (2) oscillator trimmer.
(e) Tune receiver dial and set test oscillator frequency to EXACTLY 500 kilocycles. Adjust 200 K.C. condenser and R.F. trimmers for maximum sensitivity.
(f) Tune receiver dial and set test oscillator frequency to approximately 150 kilocycles—then while rocking gain control adjust gain to right and left adjust 150 kilocycle oscillator for maximum sensitivity.

ALIGNING 1720-240 KILOCYCLE BAND:
(a) Leave 0005 Mfd. condenser in series with test oscillator lead. Adjust band selector switch for operation on the 1720-240 kilocycle band.
(b) Set test oscillator frequency and receiver dial to EXACTLY 1720 kilocycles. ADJUST 172 KILOCYCLE OSCILLATOR TRIMMER (B) TO BRING IN 1720 KILOCYCLE TEST OSCILLATOR SIGNAL TO MAXIMUM OUTPUT.
(c) Tune receiver dial and set test oscillator frequency to EXACTLY 1400 kilocycles. Adjust 1400 K.C. condenser (5) and R.F. (7) trimmers for maximum sensitivity.
(d) Set test oscillator frequency and receiver dial to approximately 600 kilocycles. While rocking gain control adjust gain to right and left, adjust 600 K.C. oscillator for maximum signal strength.

ALIGNING 25-75 MEGACYCLES BAND:
(a) Replace .0005 Mfd. test oscillator lead series condenser with a 400 ohm carbon resistor.
(b) Adust band selector switch to 25-75 megacycle band, tune receiver dial and set test oscillator frequency to EXACTLY 75 megacycles—then adjust 75 megacycle oscillator (9) trimmer for maximum 75 megacycle test signal output.
(c) Tune receiver dial and set test oscillator frequency to EXACTLY 5 megacycles—adjust 6 M.C. component (3) and R.F. (5) trimmers for maximum sensitivity.

ALIGNING 75-343 MEGACYCLE BAND:
(a) Leave 400 ohm resistor in series with test oscillator lead and place band selector switch for operation on 75-343 megacycle band, tune receiver dial and set test oscillator frequency to EXACTLY 343 megacycles.
(b) Adust 343 M.C. oscillator trimmer (6) to bring in 343 megacycle test signal to maximum output. MODE. When actuating this trimmer two peaks, the fundamental and the harmonic peak will be noticed. CARE MUST BE TAKEN THAT THE FUNDAMENTAL PEAK AND NOT THE IMAGE PEAK IS USED FOR ALIGNING THE RECEIVER AT 343 MEGACYCLES. Always look only the trimmer to minimum capacity, then screw down the trimmer (full capacity) until the FIRST PEAK which is the fundamental and the proper one to use is turned. If the trimmer is screwed down beyond the point where the first peak is received the incorrect image peak will be turned in. After completing adjustment of the oscillator trimmer at 343 megacycles, always check to see if the proper peak has been used. To do this leave test oscillator frequency at 343 megacycles, increase the output of the test oscillator and tune receiver dial to approximately 23 megacycles. Then vary the receiver dial slightly to the right and left of 23 megacycles and if the fundamental peak was used in adjusting at 343 megacycles the test oscillator signal will be heard at approximately 23 megacycles on the receiver dial.
(c) Tune receiver dial and set test oscillator frequency to EXACTLY 23 megacycles.
(d) Adjust 23 M.C. condenser (A) and R.F. (D) trimmers for maximum 23 megacycle test signal response.

To ensure most accurate trimmer setting repeat all above adjustments several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.

MODELS 1445, 1446, 144A, 149A, and 159A:

ALIGNMENT PROCEDURE IN TABLED FORM:

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Adust the dial to the frequency being tested. Adust output at test oscillator to maxumum output.</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 MHz 2000 K.C.</td>
<td>Any point where the output signal is maximum. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
<tr>
<td>2000 K.C. 200 M.C.</td>
<td>Adjust the second and the if transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1720 K.C. 600 K.C.</td>
<td>Similar to above but the D.C. output signal. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
<tr>
<td>1400 K.C. 150 M.C.</td>
<td>Similar to above but the D.C. output signal. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
<tr>
<td>600 K.C. 150 M.C.</td>
<td>Similar to above but the D.C. output signal. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
<tr>
<td>343 M.C. 23 M.C.</td>
<td>Similar to above but the D.C. output signal. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
<tr>
<td>23 M.C. 15 M.C.</td>
<td>Similar to above but the D.C. output signal. Density 455 K.C. 200 M.C. density 455 K.C. 200 M.C.</td>
</tr>
</tbody>
</table>
SENTINEL-ERLA MODEL 107AE

ALIGNMENT PROCEDURE

Calibration, balance, tuning sensitivity, and tone quality may be due to the various causes such as dirt or other foreign bodies, improper wiring, or poor soldering. To correct these, perform the following checks:

1. Measure the input and output impedances of the receiver. If the input impedance is not within 10% of the specified value, adjust the tuning and balance controls until it is.
2. Check the alignment of the IF and RF stages by using a signal generator and a scope. If the IF frequency is not within 1% of the specified value, adjust the IF tuning until it is.
3. Check the alignment of the detector and mixer stages by using a signal generator and a meter. If the output frequency is not within 0.5% of the specified value, adjust the detector and mixer until it is.
4. Check the alignment of the audio amplifier stages by using a signal generator and a meter. If the output frequency is not within 1% of the specified value, adjust the audio amplifier until it is.

After performing these checks, the receiver should be checked for proper operation by using a signal generator and a scope. If the output frequency is not within 1% of the specified value, adjust the receiver until it is.

ALIGNING LF, STAGE AT 455 KILOCYCLES

(a) Connect the ground lead of the test oscillator to the chassis or set ground lead. Connect the other lead of the test oscillator to the grid of the 6A6G tube through a .022 Mfd. series condenser. DO NOT REMOVE GRID CLIP.
(b) Set the receiver to the AM broadcast band and turn receiver volume control to null.
(c) Peak each of the two IF transformers to null.
(d) Peak each of the IF transformers to null.
(e) Adjust each of the transistor settings to match those used to get the best performance of the receiver.
(f) Carefully tune in the selected station that broadcasts on the lowest frequency—then read the number of kilocycles.

ALIGNING 170-546 KILOCYCLE BAND

(a) Remove the test oscillator lead from the grid of the 6A6G tube and attach it to the receiver antenna lead. Press the paper clip lever to turn on the receiver. The receiver should now be turned on the first IF stage.
(b) Check the alignment of the first IF stage by using a signal generator and a scope. If the output frequency is not within 1% of the specified value, adjust the first IF stage until it is.
(c) Check the alignment of the second IF stage by using a signal generator and a scope. If the output frequency is not within 1% of the specified value, adjust the second IF stage until it is.
(d) Check the alignment of the audio amplifier stage by using a signal generator and a meter. If the output frequency is not within 1% of the specified value, adjust the audio amplifier stage until it is.
(e) Check the alignment of the detector stage by using a signal generator and a meter. If the output frequency is not within 1% of the specified value, adjust the detector stage until it is.

MODEL 106A FOR TWIN NATURES IN USE INDEX

This radio is designed so that it may be placed in a horizontal or upright position. As the operating and performance of the receiver is the same in either position, it is a matter of personal preference as to which position to use.

The approximate position on the dial that any station will be tuned in is usually determined by the presence of the station call letters on the front of the cabinet.

The stations selected must operate on a frequency of 450 kilocycles or more apart, otherwise it will be impossible to place the call letters on their proper position in the cabinet.

While this will be found that only the approximate location will be indicated, the station call letters properly located will be on an extremely helpful tuning aid.

To set the proper station call letters into the cabinet, depress 0 as follows:

(a) Determine which nine stations call letters you wish to have on the cabinet—press call letter take out of the call letter sheets provided.
(b) Carefully tune in the selected station that broadcasts on the lowest frequency—then read the number of kilocycles.
(c) Place a little metal clip or small block of some other material on the front of the cabinet and turn receiver volume control to full.
(d) Peak each of the IF transformers to null.
(e) Peak each of the second IF transformers to null.
(f) Peak each of the first IF transformers to null.

To ensure that all the IF transformers are aligned, repeat above several times always using lowest possible IF transformer output consistent with reasonable output meter scale deflection.

ALIGNING 170-546 KILOCYCLE BAND

(a) Remove the test oscillator lead from the grid of the 6A6G tube and attach it to the receiver antenna lead. The receiver should now be turned on the first IF stage.
(b) Check the alignment of the IF stage by using a signal generator and a scope. If the output frequency is not within 1% of the specified value, adjust the IF stage until it is.
(c) Check the alignment of the second IF stage by using a signal generator and a scope. If the output frequency is not within 1% of the specified value, adjust the second IF stage until it is.
(d) Check the alignment of the audio amplifier stage by using a signal generator and a meter. If the output frequency is not within 1% of the specified value, adjust the audio amplifier stage until it is.
(e) Check the alignment of the detector stage by using a signal generator and a meter. If the output frequency is not within 1% of the specified value, adjust the detector stage until it is.
(f) Peak each of the first IF transformers to null.
(g) Peak each of the second IF transformers to null.
(h) Peak each of the last IF transformers to null.
PUSH-BUTTON ADJUSTMENT

Nine stations operating in the 1500-1660 kilocycle band may be automatically pushed buttons tuned by properly setting each station selector push button.

AS THE PUSH BUTTONS ARE NOT PRESET AT THE FACTORY FOR ANY DEFINITE STATION, BE SURE TO SET EACH ONE.

Before Attempting to Set Push Buttons Be Sure to:
(a) Have arrestor which will be used with the radio attached to the receiver when setting push buttons.
(b) Operate radio at least 15 minutes before adjusting push buttons.
(c) Obtain transmitter frequency—number of kilocycles—and call letters of the nine stations you wish to push button to from main log or newspaper radio list.

Adjust Push Buttons for Selected Stations by:
(a) Rotate band switch to the NEXT TO MAXIMUM RIGHT HAND POSITION—540-1750 KILOCYCLE BAND MANUAL TUNING POSITION
(b) Using regular manual tuning knob—kilocycle knob is one of the selected stations whose transmitter frequency is somewhere between 535-680 kilocycles. Make a mental note of the kind of program on this station, or last time when program is adjusted for this particular station has been instructed in paragraph (a), it will be easy to recognize the station by the kind of program being transmitted.
(c) Rotate band switch knob to maximum right hand position.
(d) Press in one of the above push buttons marked 535-680 kilocycles on diagram.

Note: Station may disappear or be distorted in some instances another station may be heard.

Grasp end of push button fast, pressed in and slowly turn this button carefully, in the selected 535-680 kilocycle station that was previously tuned in with manual control.

Slowly turn in until one station, if the wrong station, is not barked out in opposite direction. Watch tuning eye and adjust slowly until both are closest together, when program will be heard with greatest volume and clearest tone.

Press a second station from antenna panel, select a third station. Every time you are pressed, the button will cycle through the station until you let up on the button.

Important:
For Manual Tuning the Band Switch must be in maximum right hand position. When adjusting Push Button or when Push Button tuning after Push Button have been set, Band Switch must be in maximum right hand position.
ALIGNMENT PROCEDURE

SHOULD REALIGNMENT BE NECESSARY, THERE ARE SEVERAL PRECAUTIONS THAT MUST BE CAREFULLY OBSERVED. THESE ARE:

1. Do not align set until it has reached normal operating temperature. Place the receiver in operation at least 15 minutes before attempting to realign it.

2. The importance of using the proper type of test equipment and following the alignment procedure exactly as given cannot be too strongly emphasized. A test set used in a manner that will result in low sensitivity, poor selectivity, incorrect dial calibration, distortion and unsatisfactory operation of the automatic frequency control.

3. It is absolutely necessary that an accurately calibrated test oscillator with some type of output metering device and a double scale millimeter—0 to 1 M.A. and 0 to 18 M.A. be used.

ALIGNING IF STAGE AT 450 Kilocycles:

(a) Place automatic frequency control knob in the middle A.F.C. "off" position.

(b) Attach the ground lead of the test oscillator to the chassis. Connect the other lead to the grid tap of the 6AB tube in the 200 M.C. series condenser. DO NOT REMOVe GRID CREEP.

(c) Set test oscillator to EXACTLY 450 kilocycles and turn volume control on full.

(d) Turn receiver on, place A.F.C. switch knob in left position and if meter needles jump off scale adjust output of test oscillator until an approximate 2 M.A. deflection is obtained on the 18 M.A. scale.

(e) Place local oscillator switch for operation on 170-540 K.C. broadcast band—and set receiver dial anywhere near 1000 kilocycles at a point where no stations are heard.

(f) Rotate A.F.C. switch knob from maximum left hand to middle position and re-adjust the millimeter reading changes as the position of the A.F.C. switch is changed. No change in reading indicates probable proper discriminator trimmer adjustment, while a noticeable change indicates improper discriminator trimmer adjustment.

(g) IMPORTANT: DO NOT ADJUST DISCRIMINATOR TRIMMER UNLESS IT IS ABSOLUTELY NECESSARY. Place A.F.C. switch in middle position and set millimeter reading. Then place A.F.C. switch in maximum left hand position. With A.F.C. switch in maximum left hand position, CAREFULLY ADJUST DISCRIMINATOR TRIMMER UNTIL MILLIMETER READING IS EXACTLY THE SAME IN BOTH POSITIONS.

NOTE: As the discriminator trimmer screw is screwed in (increasing capacity) the millimeter reading should decrease and as the discriminator trimmer is reversed (decreasing capacity) the millimeter reading should increase. IF WHEN THE DISCRIMINATOR TRIMMER, THE MILLIMETER READING DOES NOT INCREASE OR DECREASE AS THE TRIMMER IS ADJUSTED, THEN AFTER SEVERAL TURNS OF THE TRIMMER SCREW, THIS DOES NOT INDICATE PROPER BALANCING BUT DOES INDICATE INCOMPLETE ADJUSTMENT AND THE DISCRIMINATOR TRIMMER SHOULD BE ADJUSTED TO ABOUT CAPACITY AND THE ADJUSTMENT OF THE DISCRIMINATOR TRIMMER MADE ALL OVER AGAIN.

ALIGNING 170-540 Kilocycles:

(a) Check tuning dial adjustment by turning gang condenser until plate tuning capacitance is completely in mesh, at which point the dial needle must be steady even with the last line at the low frequency end of the dial scale. If the dial needle does not point exactly to the last line, gang trimmer must be corrected.

(b) Turn test oscillator dial from grid of 6AB tube and connect receiver "A" antenna post through a 0.0005 microfarad condenser.

(c) Place A.F.C. central knob in middle A.F.C. "off" position. Adjust band selector switch for operation on the 170-540 kilocycle band.

(d) Set test oscillator frequency and receiver dial to EXACTLY 170 kilocycles and tuning diH 1750 kilo- CYCLES TEST OSCILLATOR SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 1700 KILOCYCLE OSCILLATOR TRIMMER.
MODEL 110A
Trimmers
Chassis
ALIGNMENT: I.F. 465 KC THROUGH 1.02 MFD. CONDENSER TO GRID CAP OF 2470 TUBE--DO NOT REMOVE GRID CAP--ADJUST IF TRIMMERS TO MAXIMUM OUTPUT AT 1730 KC THROUGH .00025 MFD. CONDENSER TO RECEIVER ANTENNA (BLUE) LEAD. ADJUST OSCILLATOR TRIMMER TO MAXIMUM AT 1400 KC ANT. TRIMMER TO MAX.

ALIGNMENT: I.F. 465 KC THROUGH 1.02 MFD. CONDENSER TO GRID CAP OF 2470 TUBE--DO NOT REMOVE CAP--ADJUST IF TRIMMERS TO MAXIMUM OUTPUT AT 1730 KC THROUGH .00025 MFD. CONDENSER TO RECEIVER ANTENNA (BLUE) LEAD. ADJUST OSCILLATOR TRIMMER TO MAXIMUM AT 1400 KC ANT. TRIMMER TO MAX.
ALIGNMENT PROCEDURE IN TABULATED FORM

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (3) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move needle to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.
(d) Press in manual tuning button.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Use dummy antenna in series with output of test oscillator consisting of:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set receiver dial for:</td>
<td>Adjust test oscillator frequency to:</td>
<td>Attach output of test oscillator to:</td>
</tr>
<tr>
<td>Any point where no interfering signal is received</td>
<td>455 K.C.</td>
<td>.02 MFD. Condenser</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Exactly 1400 K.C.</td>
<td>Approx. 1400 K.C.</td>
<td>.0005 MFD. condenser</td>
</tr>
<tr>
<td>(3) Approx. 600 K.C.</td>
<td>Approx. 600 K.C.</td>
<td>.0002 MFD. condenser</td>
</tr>
</tbody>
</table>

NOTE: 570 K.C. oscillator trimmer need be adjusted only if 810-1520 K.C. Push button does not tune from 870 to 1230 K.C.

If necessary to adjust, proceed by:
(a) Attach test oscillator to set antenna and ground leads.
(b) Set test oscillator to exactly 550 K.C. — with attenuator adjusted for maximum signal output.
(c) Press in 570-1510 K.C. push button.
(d) Adjust 870-1520 K.C. oscillator push button to bring in 860 K.C. test signal to maximum output & leave in this position.
(e) Read test oscillator frequency to exactly 870 K.C.
(f) & Adjust 870 K.C. oscillator trimmer to bring in 870 K.C. test oscillator signal to maximum output.
**ALIGNMENT PROCEDURE IN TABULATED FORM**

(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line, move needle to correct position.

(b) Use an accurately calibrated test oscillator with some type of output measuring device.

(c) Have ground lead of test oscillator attached to chassis.

(d) Push in manual push button.

<table>
<thead>
<tr>
<th>Plate hand for operation on</th>
<th>Set receiver dial to</th>
<th>Adjust test oscillator frequency to</th>
<th>Use summer antenna in series with output of test oscillator consisting of:</th>
<th>Attach output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment and any hand position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 456 K.C.</td>
<td>.96 MHz. condenser</td>
<td>High side to grid cap of 6X5 tube. Do not remove cap.</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output, then adjust each of the first I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>(2) Exactly 1500 K.C.</td>
<td>.0035 Mfd.</td>
<td>Receiver blue antenna lead</td>
<td>While rocking gang condenser adjust 1500 K.C. oscillator trimmer for maximum output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Approx. 600 K.C.</td>
<td>.0035 Mfd.</td>
<td>Receiver blue antenna lead</td>
<td>While rocking gang condenser adjust 600 K.C. oscillator trimmer for maximum output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.7 to 18.5 M.C. Band</td>
<td>(1) Exactly 18.5 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
<td>Adjust 18.5 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until second peak—which is the proper one to use—is tuned in.</td>
<td></td>
</tr>
<tr>
<td>(2) Exactly 15 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
<td>While rocking gang condenser adjust 15 M.C. oscillator trimmer for maximum output.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** (F.E.A. Only)

1100 K.C. antenna padder for 870-1120 K.C. (No. 5) pushbutton need be adjusted only if there is an appreciable change in volume when same station is push button and manual tuned.

Should there be a great difference adjust 1100 K.C. antenna padder by:

(a) Attach test oscillator to set antenna and ground leads with 36025 dummy ant. lead.

(b) Screw any two push buttons—except 870-1120 K.C. (No. 5) push button—all the way in—and the other two push buttons all the way out.

(c) Set test oscillator to exactly 1100 K.C.

(d) Tune in 1120-1330 K.C. push button and adjust this button for maximum test signal response.

(e) Next adjust 1100 K.C. antenna padder for maximum 1100 K.C. test oscillator signal response.
TWO BAND—SIX TUBE INCLUDING BALLAST TUBE
2 Volt Battery Operated Superheterodyne Receiver

© John F. Rider, Publisher
### Alignment Procedure in Tabulated Form

| Band        | Set receiver channel | Adjust oscillator frequency to | Use dummy antenna in series with output of oscillator condenser coil | Attach output of oscillator to: | Refer to parts layout diagram for location of trimmers mentioned below:
|-------------|----------------------|--------------------------------|---------------------------------------------------------------------|---------------------------------|-----------------------------------------------|
| LF Alignment | Any point where no interfering signal is received | Exactly 455 K.C. | .02 Mfd condenser | High side to grid cap of 6BE6 tube. Do not remove cap. | Adjust each of the second LF transformer trimmers for maximum output.
|              | (2) Exactly 1400 K.C. | Exactly 1400 K.C. | .00025 Mfd condenser | Receiver blue antenna lead | While rocking gang condenser adjust 600 K.C. oscillator trimmer for maximum output.
|              | (3) Approx 600 K.C. | Approx 600 K.C. | .00025 Mfd condenser | Receiver blue antenna lead | While rocking gang condenser adjust 600 K.C. oscillator trimmer for maximum output.
| 5.75 to 18.1 M.C. Band | (1) Exactly 18.1 M.C. | Exactly 18.1 M.C. | 400 Ohm carbon resistor | Receiver blue antenna lead | Adjust 18.1 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If less than one peak is noticed, back off trimmer to minimum capacity, then move trimmer (add capacity) until the second peak—which is the proper one to use—is tuned in.
|              | (2) Exactly 15 M.C. | Exactly 15 M.C. | 400 Ohm carbon resistor | Receiver blue antenna lead | While rocking gang condenser adjust 18 M.C. antenna trimmer for maximum output.
ALIGNMENT PROCEDURE IN TABULATED FORM

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked (1) first, (2) next, (3) third.

Before starting alignment:
(a) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity step (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.
(b) Use an accurately calibrated test oscillator with some type of output measuring device.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Test Oscillator</th>
<th>Adjust Test Oscillator Frequency to:</th>
<th>Use Dummy Antenna in Series with Output of Test Oscillator Consisting of</th>
<th>Attach Output of Test Oscillator to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 1730 K.C.</td>
<td>455 K.C.</td>
<td>.02 MFD condenser</td>
<td>Refer to parts layout diagram for location of trimmers mentioned below:</td>
</tr>
<tr>
<td>Any point where no interfering signal is received</td>
<td></td>
<td>High side to grid terminal of 6A7 tube DO NOT REMOVE CAP.</td>
<td></td>
</tr>
<tr>
<td>1 Exactly 1400 K.C.</td>
<td>1730 K.C.</td>
<td>.00025 MFD condenser</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. trimmers for maximum output.</td>
</tr>
<tr>
<td>2 Exactly 1400 K.C.</td>
<td>1400 K.C.</td>
<td>.00025 MFD condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
</tbody>
</table>

*151BL grid terminal of 1A7G tube

---

[Graphical diagram of the radio circuit]
ALIGNMENT PROCEDURE IN TABULATED FORM

MODEL 167UL

Before starting alignment, check tuning dial adjustment by: tune up to medium signal-strength broadcast station with good signal strength. Stop temporarily in search of station with signal strength equal to that of the broadcast station. If signal does not equal exactly that of the broadcast station, adjust receiver for maximum output.

1. Remove the knob and bushing from the face of the chassis.
2. Attach test oscillator to terminal marked "A" and "B" on front panel.
3. IMPORTANT: No condenser should be in series with any output transformer.

TEST OSCILLATOR

<table>
<thead>
<tr>
<th>Set receiver dial to</th>
<th>Adjust test oscillator frequency to</th>
<th>Trim condenser to match output of test oscillator</th>
<th>Attach output of test oscillator to</th>
<th>Notes on parts layout diagram for location of trimmers mentioned below—mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. receiver</td>
<td>450 K.C. (± 10 K.C.)</td>
<td>00 MFD capacitors</td>
<td>High side to grid terminal of 6A7 tube</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>Any point where no tuning signal is received</td>
<td>450 K.C.</td>
<td>00 MFD capacitors</td>
<td>High side to grid terminal of 6A7 tube</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>(2) Approx. 1400 K.C.</td>
<td>Exactly 1400 K.C.</td>
<td>None</td>
<td>Attach in series with &quot;A&quot; and &quot;B&quot; Loop terminals</td>
<td>Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
</tbody>
</table>

MODEL 176UL

IMPORTANT: Before aligning, place loop antenna in the same approximate position in the back of chassis it will be in when the set is in the cabinet and the back attached. When adjusting 1650 K.C. oscillator trimmer and 1400 K.C. oscillator trimmer, couple test oscillator to set loop by placing lead from high side of test oscillator on top of or near set loop. Be sure that neither the loop or test oscillator lead moves during alignment.

DO NOT ATTACH LOW SIDE OF TEST OSCILLATOR TO RECEIVER—LEAVE UNCONNECTED.

TEST OSCILLATOR

<table>
<thead>
<tr>
<th>Set receiver dial to</th>
<th>Adjust test oscillator frequency to</th>
<th>Trim condenser to match output of test oscillator</th>
<th>Attach output of test oscillator to</th>
<th>Notes on parts layout diagram for location of trimmers mentioned below—mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. receiver</td>
<td>450 K.C. (± 10 K.C.)</td>
<td>00 MFD capacitors</td>
<td>High side to grid terminal of 6A7 tube</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>Any point where no tuning signal is received</td>
<td>450 K.C.</td>
<td>00 MFD capacitors</td>
<td>High side to grid terminal of 6A7 tube</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>(2) Approx. 1400 K.C.</td>
<td>Exactly 1400 K.C.</td>
<td>None</td>
<td>Attach in series with &quot;A&quot; and &quot;B&quot; Loop terminals</td>
<td>Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
</tbody>
</table>
SPARTON PHONO-SET MODEL 219-P and 219-PD.
TOP VIEWS OF ALL SOCKET CONNECTIONS

NOTE: Original production models did not have resistor R6 and condenser C10 included in the circuit as shown above. In these first run production sets resistor R1 connected across the microphone tip jacks in the same position as shown for resistor R6. The above change can be made easily, when servicing any of the first run Models 219-P Wireless Phonographs.

The SPARTON Wireless Phonograph Models 219-P and 219-PD are shipped from the factory for operation at approximately 1550 kilocycles.
This frequency may be changed by adjusting a trimmer condenser which is reached through the hole in the bottom of the chassis. An insulated shaft screwdriver should be used. Turning the screw clockwise lowers the frequency and turning the screw counterclockwise increases the frequency. The normal range of adjustment is from approximately 1200 kilocycles to approximately 1700 kilocycles.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prong to Ground (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>Oscillator-Modulator</td>
<td>No. 1: 0</td>
</tr>
<tr>
<td>2525</td>
<td>Rectifier</td>
<td>No. 1: 63</td>
</tr>
<tr>
<td>6B-600</td>
<td>Ballast</td>
<td>No. 1: 0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 125 ± 5% on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are ± AC voltages.
*AC voltages.
MODEL 409-GL

INTERMEDIATE FREQUENCY 456 K.C.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prong to Gnd. (See Prong Not. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2526GT</td>
<td>Converter</td>
<td>No. 1 115 115 42 9.8 115 8 1 0</td>
</tr>
<tr>
<td>6J7GT</td>
<td>Detector</td>
<td>No. 2 116 115 42 9.8 115 8 1 0</td>
</tr>
<tr>
<td>6J7GT</td>
<td>F.O.</td>
<td>No. 3 146 108 115 0 0 0 0</td>
</tr>
<tr>
<td>6J7GT</td>
<td>Rectifier</td>
<td>No. 4 105 115 146 115 0 0</td>
</tr>
<tr>
<td>806GT</td>
<td>Ballast</td>
<td>No. 5 0 0 0 0 0 0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram. Allow 15% or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. DC measurements made with 1000 ohm per volt voltmeter. AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + DC voltages. *10 volt.

† A regular outside antenna 50 feet in length excluding lead-in and 25 to 50 feet in height should be used for best results with this model.

ALIGNMENT

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>TUNING CTRL. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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<td>I.F.</td>
<td>2526GT</td>
<td>116</td>
<td>115</td>
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<tr>
<td>5</td>
<td>Broadcast</td>
<td>Ant.</td>
<td>200 maF</td>
<td>1500 kc</td>
<td>1500 kc</td>
<td>C8B On</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>6</td>
<td>Band</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Model 409-GL chassis may be completely aligned without removing from cabinet.
Model 549-1

ALIGNMENT

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set pointer to end of scale with tuning condenser gang closed)</td>
<td>I.F.</td>
<td>1AG Grid</td>
<td>.1 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>Open</td>
<td>C14 A.B</td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>1AG Grid</td>
<td>.1 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>Open</td>
<td>C14 A.B</td>
<td>I.F. Transformer</td>
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<tr>
<td>3</td>
<td>Broadcast Band</td>
<td>Ant.</td>
<td>200 mf.</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C14 A.B</td>
<td>I.F. Transformer</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band</td>
<td>Ant.</td>
<td>200 mf.</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C3 Ant.</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>5</td>
<td>(Repeat operation 5)</td>
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<tr>
<td>6</td>
<td>(Check calibration and sensitivity at 600 KC, 900 KC, and 1500 KC)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>SW Band</td>
<td>SW</td>
<td>10 MC</td>
<td>200 mf.</td>
<td>SW</td>
<td>38 KC</td>
<td>C4 Ant.</td>
<td>400 Pad. Peak accurately</td>
</tr>
<tr>
<td>8</td>
<td>(Check calibration and sensitivity at 6 MC and 10 MC)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>(Check operations 1 to 8 inclusive)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* 200 mf. condenser and 100 ohm non-inductive resistor in series.
** Rock tuning control around 18 MC while adjusting this trimmer, and make sure that the signal is peaked on the fundamental rather than on the image.

Sparton Superheterodyne Model 699

VOLTAGE CHART

Battery Voltage: 6.3 volts

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prongs to Grid (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6L6</td>
<td>R.F. Amp.</td>
<td>No. 1 200 75 6.2* 5.5 0 0 No. 2 200 75 105 -3 0 0 No. 3 250 75 105 -3 0 0 No. 4 250 105 105 -3 0 0 Grid Cap 0</td>
</tr>
<tr>
<td>6A7</td>
<td>Converter</td>
<td>5.5 200 75 105 -3 5 0 0</td>
</tr>
<tr>
<td>606</td>
<td>I.F.</td>
<td>0 200 75 6.2* 5.5 0 0</td>
</tr>
<tr>
<td>6Q7</td>
<td>2nd Det. AVC 1st Audio</td>
<td>0 0 7.2 .1 .1 .1 5.6 1.2 0</td>
</tr>
<tr>
<td>41</td>
<td>F.t.</td>
<td>5.6 198 198 -1 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>OZ4</td>
<td>Rectifier</td>
<td>0 0 250** 0 250** 0 0 250 0</td>
</tr>
</tbody>
</table>

** Or 6.6 volts depending on position of sensitivity switch.
** AC volts.

ALIGNMENT

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I.F.</td>
<td>6A7 Grid</td>
<td>.1 mf.</td>
<td>282</td>
<td>Closed</td>
<td>2 trimmers</td>
<td>End I.F.</td>
</tr>
<tr>
<td>2</td>
<td>Broad Osc.</td>
<td>Ant.</td>
<td>250 mf.</td>
<td>1580</td>
<td>Open</td>
<td>Osc.</td>
<td>Adj. to max.</td>
</tr>
<tr>
<td>3</td>
<td>Broad Ant.</td>
<td>Ant.</td>
<td>250 mf.</td>
<td>1400</td>
<td>1400</td>
<td>Ant.</td>
<td>Adj. to max.</td>
</tr>
<tr>
<td>4</td>
<td>Check sensitivity at 1000 KC and 900 KC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check operations 1 to 4 inclusive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© John F. Rider, Publisher
Note: For proper alignment of these chasses, the procedure should be followed in the same order as given.

The dial pointer should be exactly parallel with the horizontal line of the dial scale when the condenser plates are fully meshed. If the pointer does not read correctly, loosen the two small set screws exactly back of the diffusion disc and dial drum, hold the rotor plates fully meshed with the stator plates and set the pointer so that it is parallel with the horizontal lines on the kilocycle scale, then tighten the set screws.

IMPORTANT: Alignment of these models should not be attempted unless the voltage is maintained by a fully charged 6-volt storage battery.

A. Alignment of Intermediate-Frequency Stages

1. Turn on receiver and test oscillator and allow both to operate several minutes before attempting to adjust any condensers.

2. Turn the band selector knob until the band selector knob for the broadcast band is completely out of mesh with the stator plates.

3. Connect "antenna" of test oscillator to grid cap of type 1276 converter tube and "ground" of test oscillator to chassis frame of receiver. Connect output meter "high tap" from plate of type 1276 tube to ground.

Note: It is advisable to read carefully the operating instructions included with the test oscillator being used in the alignment procedure.

4. Tune test oscillator to obtain a signal of 456 kilocycles.

5. Tune the volume control of receiver on full and adjust 1-F condensers which are reached from the top of the chassis.

Note: Care should be taken when adjusting 1-F stages in order to insure proper and accurate adjustment.

6. Disconnect "antenna" lead of test oscillator from grid cap of converter tube Type 1276 and connect to the antenna terminal of the chassis.

7. Tune test oscillator to a frequency of 456 kilocycles and adjust condenser C4 (reached from back of the chassis) to a point where the output of the receiver is at an absolute minimum.

**Note:** This condenser is the adjustment for the code receiver circuit and must be very carefully adjusted to ensure proper performance of the receiver to be expected.

B. Alignment of Broadcast Band

1. Connect 150 ma. dummy antenna in series with the antenna lead, tune test oscillator and receiver to a frequency of 1500 kilocycles and adjust condensers C4 (broadcast band oscillator trimmer) and C5 (broadcast antenna trimmer) reached from the bottom of the chassis.

**C** in Models 527-2, 587-2

2. Tune test oscillator and receiver to 600 kilocycles and adjust condenser C5 (broadcast oscillator passed) reached from the front of the chassis.

3. Tune test oscillator and receiver to 1500 kilocycles and check adjustments of condensers C4 and condenser C5. Calibration of the broadcast band should also be checked at 800 kilocycles and 600 kilocycles.

**C** in Models 527-2, 587-2

C. Alignment of Short-Wave Band

1. Turn the band selector switch to the short-wave or "foreign" band.

2. Remove the 150 ma. condenser from the test oscillator "antenna" lead and replace with a 400 ohm non-inductive resistor dummy antenna.

3. Tune test oscillator and receiver to a frequency of 15,000 kilocycles (15 megacycles) and adjust condenser C5 (short-wave antenna trimmer) reached from the bottom of the chassis.

**C** in Models 527-2, 587-2

Caution: On this band care must be taken to adjust this condenser to the fundamental of the 15 megacycle signal and not to the image. The image signal is equal to the fundamental minus twice the intermediate frequency of the receiver.

A set that is adjusted to the image frequency instead of to the fundamental may be detected by tuning over the band and checking the sensitivity at various points. If a dead spot appears near the center of the band, the adjustable condenser for that band has probably been adjusted to the image instead of to the fundamental.

This type of mis-alignment may also be detected by tuning the test oscillator to a frequency of 15 megacycles and the station selector of the receiver to approximately 18,000 kilocycles. If a strong signal is found approximately at this frequency it indicates that the band has been adjusted to the image frequency. The normal image frequency for 15,000 kilocycles would be 15,000 kilocycles minus twice 456 kilocycles or approximately 14,292 kilocycles. Therefore, a signal of this frequency may be found with the test oscillator generating a 15,000 kilocycle signal.

Note: There are no other trimmers for the short-wave or foreign band.

Important: All adjustments should be checked to assure accuracy and stability of adjustment and calibration.
SPARKS WITHINGTON CO.

Sparton Superheterodyne Models

649-6L  649-6S

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
<th>No. 6</th>
<th>No. 7</th>
<th>No. 8</th>
<th>Grid Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>6J8G</td>
<td>Converter</td>
<td>0</td>
<td>6.2</td>
<td>140</td>
<td>140</td>
<td>-14</td>
<td>140</td>
<td>0</td>
<td>0</td>
<td>0.14</td>
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<tr>
<td>1056P</td>
<td>1st I-F Amp.</td>
<td>0</td>
<td>0</td>
<td>140</td>
<td>49</td>
<td>49</td>
<td>-</td>
<td>2.4</td>
<td>0</td>
<td>0.2</td>
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<tr>
<td>1056P</td>
<td>2nd I-F Amp.</td>
<td>0</td>
<td>2.4</td>
<td>120</td>
<td>49</td>
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<td>-</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
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<td>6T7G</td>
<td>Det-AVC-1st A.F.</td>
<td>0</td>
<td>0</td>
<td>5.4 A</td>
<td>-E B</td>
<td>-E B</td>
<td>-</td>
<td>6.2</td>
<td>0</td>
<td>0.02</td>
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<td>1056G</td>
<td>Power Amplifier</td>
<td>0</td>
<td>0</td>
<td>123</td>
<td>123</td>
<td>-10</td>
<td>-</td>
<td>2.4</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>6Z5G</td>
<td>Rectifier</td>
<td>0</td>
<td>6.3</td>
<td>180mΩ</td>
<td>0</td>
<td>180mΩ</td>
<td>0</td>
<td>150</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 15% ± or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are DC voltages.

*AC
A - 10 V. Scale
B - 25 V. Scale
C - 1 V. Scale

STORAGE BATTERY CLIPS
POWER PACK UNIT

(See detailed drawings)
SPARKS WITHINGTON CO.

MODEL 649-65 CHASSIS BOTTOM

MODEL 649-6L CHASSIS BOTTOM

**ALIGNMENT**

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set dial pointer to last calibrated mark below 550 KC</td>
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</tr>
<tr>
<td>3</td>
<td>Rejector</td>
<td>Ant.</td>
<td>200 mmf.</td>
<td>456 KC</td>
<td>BC (Open)</td>
<td>C2</td>
<td>C14 AAB</td>
<td>End I.F.T.</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band</td>
<td>Ant.</td>
<td>200 mmf.</td>
<td>1500 KC</td>
<td>BC</td>
<td>C8</td>
<td>C4</td>
<td>Adj. to minimum</td>
</tr>
<tr>
<td>5</td>
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</tr>
<tr>
<td>6</td>
<td>(Repeat operation 4)</td>
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<td>(Repeat operation 5)</td>
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<td>(Repeat operations 6, 9, and 10 if necessary, to insure accurate alignment)</td>
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<tr>
<td>13</td>
<td>Short wave Band</td>
<td>Ant.</td>
<td>* 18 MC</td>
<td>SW 18 MC</td>
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<tr>
<td>14</td>
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</tr>
</tbody>
</table>

* 400 muf. condenser and 100 ohm non-inductive resistor in series.

**649-6S**

**ALIGNMENT**

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set dial pointer to last calibrated mark below 550 KC</td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>Rejector</td>
<td>Ant.</td>
<td>200 mmf.</td>
<td>456 KC</td>
<td>BC (Open)</td>
<td>C2</td>
<td>C14 AAB</td>
<td>End I.F.T.</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band</td>
<td>Ant.</td>
<td>200 mmf.</td>
<td>1500 KC</td>
<td>BC</td>
<td>C8</td>
<td>C4</td>
<td>Adj. to minimum</td>
</tr>
<tr>
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<td>(Repeat operation 4)</td>
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<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Repeat operation 5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(Check calibration and sensitivity at 2.5 MC, 4.0 MC &amp; 7.0 MC)</td>
<td></td>
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</tr>
<tr>
<td>12</td>
<td>And Short wave Band</td>
<td>Ant.</td>
<td>* 7.0 MC</td>
<td>1 SW 7.0 MC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(Check calibration and sensitivity at 7.0 MC, 10 MC &amp; 23 MC)</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

* 400 muf. condenser and 100 ohm non-inductive resistor in series.
** Rock dial while trimming.

If dial reading is off calibration, some adjustment may be made by moving the oscillator condenser lead toward or away from the chassis base plate.
HOW TO ADJUST THE SPARTON ELECTRONIC
MODELS 1068, 1268, 1568 ETC. AND 662B.

NOTE: Each paragraph refers to all models unless otherwise indicated.

Unless the SG50 Distributor tube is replaced when the S.G.S.E. is adjusted, automatic frequency control may become imperfect.

1. The six triodes of the selectron are arranged in groups of three, each group being connected to a given frequency setting. This will allow each triode to be switched on and off as required.

2. The six triodes are arranged in groups of three, each group being connected to a given frequency setting. This will allow each triode to be switched on and off as required.

3. Turn the selectron knob to the desired frequency setting. This will allow each triode to be switched on and off as required.

4. Insert a test tone into the triode of the selectron at the desired frequency setting. This will allow each triode to be switched on and off as required.

5. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

6. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

7. When all triodes have been properly adjusted, replace the trimmer tube and reinsert it in the socket, replacing the trimmer tube and reinserting it in the socket. This will cause the trimmer tube to be replaced and reinserted in the socket. This will cause the trimmer tube to be replaced and reinserted in the socket.

8. Any of the six triodes to which the SG50 Distributor tube is connected may become detached. This will cause the trimmer tube to be replaced and reinserted in the socket. This will cause the trimmer tube to be replaced and reinserted in the socket.

9. Insert a test tone into the triode of the selectron at the desired frequency setting. This will cause the trimmer tube to be replaced and reinserted in the socket. This will cause the trimmer tube to be replaced and reinserted in the socket.

10. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

11. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

12. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

13. Adjust the trimmer for each of the six triodes as follows:

(a) Three trimmers are provided for each of the six triodes. Turn one trimmer from 0 to 60 Kc. and turn the other trimmer from 0 to 100 Kc.

(b) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(c) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(d) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(e) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.

(f) The trimmer for each of the six triodes is adjusted by turning it from 0 to 60 Kc. and turning the other trimmer from 0 to 100 Kc.
Sparton Superheterodyne Model 728-X

Line Voltage: 115 volts
Position of Volume Control: Full with Antenna Disconnected

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prongs to Gnd. (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7G</td>
<td>R.F.</td>
<td>0 0 250 100 0 - 6.1 0 -1</td>
</tr>
<tr>
<td>6ABG</td>
<td>1st Det. Osc.</td>
<td>0 0 250 100 -22 140 6.1 0 -2</td>
</tr>
<tr>
<td>6K7G</td>
<td>1st I.F.</td>
<td>0 0 250 100 0 - 6.1 0 -2</td>
</tr>
<tr>
<td>6G7G</td>
<td>2nd Det. AVC - 1st Audio</td>
<td>0 0 52 250 145 6.1 0 -2</td>
</tr>
<tr>
<td>6F6G</td>
<td>P.A.</td>
<td>0 0 52 145 0 - 6.1 0 -2</td>
</tr>
<tr>
<td>6X5</td>
<td>Rect.</td>
<td>0 350 - 310 - 550 - 550</td>
</tr>
<tr>
<td>6EE</td>
<td>Visc-Glo</td>
<td>6.1 1.9 -2.2 250 -5.5 0 - -</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are +DC voltages.
### ALIGNMENT (see note)

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>BAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Broad. Band</td>
<td>Ant. 200 mf.</td>
<td>1500</td>
<td>BC</td>
<td>1500</td>
<td>C49 B</td>
<td>Adjust to minimum</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Ant. 200 mf.</td>
<td>600</td>
<td>BC</td>
<td>600</td>
<td>C11 Pad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>(Repeat operation 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(Check calibration and sensitivity 1500 KC, 900 KC and 800 KC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1st Short Wave</td>
<td>Ant. 200 mf.  series</td>
<td>100 ohm 6 MC.</td>
<td>1st S.W. 6 MC.</td>
<td>C9 Ant.</td>
<td>C9 Osc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Repeat operation 7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(Repeat operation 7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Check calibration and sensitivity at 8 MC. and 1.95 MC.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2nd Short Wave Band</td>
<td>Ant. 200 mf.  series</td>
<td>190 ohm 18 MC.</td>
<td>2nd S.W. 18 MC.</td>
<td>C10 Osc.</td>
<td>Rock dial slightly while adjusting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Ant.</td>
<td>6 MC.</td>
<td>2nd S.W. 8 MC.</td>
<td>C15 Pad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(Repeat operation 11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(Check calibration and sensitivity at 18 MC. and 6 MC.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(Check operations 1 to 14 inclusive)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Check AFC by connecting generator to converter grid cap and tuning generator and receiver to 1500 KC.

Note: output meter reading with AFC switch "off", Switch AFC "on" and if output changes appreciably, touch up discriminator trimmer until is no change in sensitivity.

### VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prong to Ground (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E67G</td>
<td>R.F.</td>
<td>No. 1: 0, No. 2: 0, No. 3: 500, No. 4: 75, No. 5: 0, No. 6: 6.5, No. 7: 0, No. 8: -2</td>
</tr>
<tr>
<td>E68G</td>
<td>Converter</td>
<td>0, 0, 500, 91, -5.5, 135, 6.5, 0, -2</td>
</tr>
<tr>
<td>E67G</td>
<td>I.F.</td>
<td>0, 0, 500, 75, 0, -6.5, 0, -2.5</td>
</tr>
<tr>
<td>E67G</td>
<td>2nd I.F.</td>
<td>0, 0, 500, 75, 0, 6.5, 4.1, 0</td>
</tr>
<tr>
<td>E66G</td>
<td>Discriminator</td>
<td>0, 0, 500, 75, 0, -6.5, 6.5, 0</td>
</tr>
<tr>
<td>E67G</td>
<td>A.F.C.</td>
<td>0, 0, 500, 85, 4.5, 6.5, 4.4, 0</td>
</tr>
<tr>
<td>E67G</td>
<td>2nd Det. AVC-1st audio</td>
<td>0, 0, 100, -2, -1, 6.5, 0</td>
</tr>
<tr>
<td>E66G</td>
<td>P.A.</td>
<td>0, 0, 275, 290, 5, 6.5, 0</td>
</tr>
<tr>
<td>E55G</td>
<td>Rect.</td>
<td>0, 0, 275, 290, -5, 350*, -350*</td>
</tr>
<tr>
<td>E55G</td>
<td>Viso-Glo</td>
<td>6.5, 50, -5, -2, 280, -4, 0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 1.5+ or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are DC. Unless designated otherwise, voltages in table are DC. Unless designated otherwise, voltages in table are DC.
SPARKS WITHINGTON CO.
(SERIAL NO. 000001 to 000750 INCLUSIVE)

MODEL 1867
Below Ser. 000751
Schematic Changes

The Schematic Diagram for the SPARKS Models 1867
(Serial numbers 000001 to 000750 inclusive) is
the same as shown except for the three
general circuit changes as noted below:

(1) Change in Tone Control circuit as in
Fig. 1.

(2) Change in Cathode Resistor Network of
Type 6F6G High Frequency Power Amplifier as
in Fig. 2.

(3) Change in Bias Resistor of Type 6K7G
Int. I-F Amplifier.

(4) DETAILS OF RESISTOR NETWORK change in
Cathode of Type 6F6G High Frequency Power
Amplifier:
Resistor R60 (180 ohms .25 w.) removed.

(5) Change in Bias Resistor change in Type
6K7G 1st. I-F Amplifier:
Substitute R56 1200 ohm .5 w. resistor
(C-2795-65C) in place of 10000 ohm .5 w.
resistor (C-2795-74C).

(6) DETAILS OF RESISTOR NETWORK change in
Cathode of Type 6F6G High Frequency Power
Amplifier:
Resistor R60 (180 ohms .25 w.) removed.

(3) DETAILS OF BIAS RESISTOR change in Type
6K7G 1st. I-F Amplifier:
Substitute R56 1200 ohm .5 w. resistor
(C-2795-65C) in place of 10000 ohm .5 w.
resistor (C-2795-74C).

(6) DETAILS OF RESISTOR NETWORK change in
Cathode of Type 6F6G High Frequency Power
Amplifier:
Resistor R60 (180 ohms .25 w.) removed.

(3) DETAILS OF BIAS RESISTOR change in Type
6K7G 1st. I-F Amplifier:
Substitute R56 1200 ohm .5 w. resistor
(C-2795-65C) in place of 10000 ohm .5 w.
resistor (C-2795-74C).

VOLTAGE TABLE

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Each Socket from Grid (See Procs No. 1, 2, 3, 4, 5, 6, 7, 8, Grid Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7</td>
<td>R-F Amplifier</td>
<td>0</td>
</tr>
<tr>
<td>6L7</td>
<td>Converter</td>
<td>0</td>
</tr>
<tr>
<td>6J5G</td>
<td>Oscillator</td>
<td>0</td>
</tr>
<tr>
<td>6K7G</td>
<td>First I-F Amplifier</td>
<td>0</td>
</tr>
<tr>
<td>6K7G</td>
<td>Second I-F Amplifier</td>
<td>0</td>
</tr>
<tr>
<td>6C7G</td>
<td>Dec-Amp-First I-F Amplifier</td>
<td>0</td>
</tr>
<tr>
<td>6370</td>
<td>Expander Amplifier</td>
<td>0</td>
</tr>
<tr>
<td>6K7G</td>
<td>Symphonic Expander</td>
<td>0</td>
</tr>
<tr>
<td>6C5G</td>
<td>Inverter</td>
<td>0</td>
</tr>
<tr>
<td>6J5G</td>
<td>Driver (High Frequency)</td>
<td>0</td>
</tr>
<tr>
<td>6F6G</td>
<td>Driver (Low Frequency)</td>
<td>0</td>
</tr>
<tr>
<td>5X4G</td>
<td>Rectifier (Upper Chassis)</td>
<td>0</td>
</tr>
<tr>
<td>6S5</td>
<td>Viso-Clo</td>
<td>0</td>
</tr>
<tr>
<td>6F6G</td>
<td>Power Amplifier (High Frequency)</td>
<td>0</td>
</tr>
<tr>
<td>6L6G</td>
<td>Power Amplifier (Low Frequency)</td>
<td>0</td>
</tr>
<tr>
<td>5X4G</td>
<td>Rectifier (Lower Chassis)</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram. Always use meter scale which will give greatest deflection within scale limits except as noted below. All measurements made with Weston Selective Analyzer, No. 655, Type 2.
SCHEMATIC DIAGRAM CHANGES

The following changes, which should be made in the Model 1867 schematic diagram are effective Nov. 30, 1936, and are included in all SPARTON Model 1867 chasses with serial numbers above 000750.

1. Replace condenser C49 Part No. C-720-152 (.005 mf. 200v.), by Part No. C-720-144 (.003 mf. 200v.). This condenser connects from ground to the mid-point between the tone control (R14) and resistor R65.

2. Add resistor R19. This resistor competes with the negative bias voltage of the first stage of the converter circuit.

3. Replace resistor Part No. C-720-144 with a resistor of higher value. This resistor is in the cathode circuit of the first stage of the converter circuit.
R67 Part No. C-2795-82B (47000 ohms 1/2 W.)

R56 Part No: C-2795-63C (12000 ohms 1/2 W.) C-2795-74C (10000 ohms 1/2 W.)

This resistor circuit of the Type 6K7G lst. I-F Amplifier

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SPARTON SUPERHETERODYNE MODEL 1867
INTERMEDIATE FREQUENCY 455 K.C.

(For model 1867 serial no. 000751 and up)
STEP BY STEP PROCEDURE

NOTE: For proper alignment of these chassis, the procedure should be followed in the same order as given. The dial pointer should be exactly parallel with the horizontal line of the kilocycle scale when the condenser plates are fully meshed. If the pointer does not read correctly, loosen the set screws holding the pointer, hold the rotor plates fully meshed with the stator plates, and set the pointer so that it is parallel with the horizontal line on the kilocycle scale, then tighten the set screws.

**A. Alignment of Intermediate-Frequency Band**

1. Turn on receiver and test oscillator and allow both to operate several minutes before attempting to adjust any controls.
2. Turn the band selector switch to the broadcast position (white diamond illuminated) and turn the station selector knob until the rotor plates are completely out of mesh with the stator plates.
3. Connect 'antenna' lead to grid cap of Type 6QG converter tubes. "Ground" lead to chassis terminals of receiver. Connect output meter 'High 10000 V' from plate of Type 6QG to 10000 V power output tube to ground. NOTE: It is advisable to read carefully the operating instructions included with the test oscillator.
4. Tune test oscillator to obtain a signal of 450 kilocycles.
5. Turn control to low note (base) position.
6. Turn variable control to "off" position.
7. Turn variable control of receiver on full and adjust L-F trimmers C16, C17, and C18 which are reached from the top of the chassis. NOTE: The intermediate frequency circuits are quite delicate, and care must be taken to insure proper adjustment.

**B. Alignment of Broadcast Band**

1. Disconnect "antenna" lead of test oscillator from grid cap of converter tube and connect in series with 1000 V, condenser, dummy antenna to the antenna terminals of the chassis.
2. Tune receiver and test oscillator to a frequency of 150 kilocycles and adjust the following condensers in the order given:
   - C8 - Oscillator trimmer
   - C9 - D.F. trimmer
   - C10 - Ant. trimmer
3. Tune test oscillator and receiver to 900 kilocycles and adjust condensers C11 (oscillator trimmer).

**C. Alignment of Broadcast Band**

1. Disconnect "antenna" lead from grid cap of converter tube and connect in parallel with 1000 V, condenser, dummy antenna to the antenna terminals of the chassis.
2. Tune receiver and test oscillator to 545 kilocycles and adjust the following condensers in the order given:
   - C11 - Oscillator trimmer
   - C12 - D.F. trimmer
   - C13 - Ant. trimmer
3. Tune test oscillator and receiver to 900 kilocycles and adjust condenser C12 (oscillator trimmer).

**D. Alignment of Local-Wave Band**

1. Tune the band selector switch to the low wave position (maroon trimmer illuminated).
2. Tune test oscillator and receiver to 345 kilocycles and adjust the following condensers in the order given:
   - C14 - Oscillator trimmer
   - C15 - D.F. trimmer
   - C16 - Ant. trimmer
3. Tune test oscillator and receiver to 900 kilocycles and adjust condenser C14 (oscillator trimmer).

This type of alignment may also be detected by turning the tuning oscillator to a frequency of 15 megacycles and the station selector to approximately 15,000 kilocycles. If a strong signal is found at this frequency, it indicates that the bands have been adjusted to the desired frequency. The normal range frequency for 15 megacycles or 15,000 kilocycles would be 15,000 kilocycles minus 5000 kilocycles or approximately 10,000 kilocycles. Therefore a signal of this frequency may be found with the test oscillator generating a 15 megacycle signal.

**G. Alignment of Ultra-High-Frequency Band**

1. Tune test oscillator and receiver to 50 megacycles and adjust condenser C76 (D.F. trimmer).
2. Tune test oscillator to 60 megacycles and adjust condenser C76 (D.F. trimmer).
3. Check operation of receiver at 50 megacycles.

**Cautions:** All adjustments should be rechecked to ensure accuracy and stability of adjustment and calibration.
HOW TO ADJUST THE SPARTON SELECTRONE IN THE MODELS

5218  6218  7618

1. Select six favorite nearby broadcast stations and detach the corresponding call letter tabs from the station call letter tab sheets.

2. Remove the Selectrone escutcheon plate from the front of the cabinet by means of the two screws and insert the station call letter tabs. Any tab may be used for any button, but it is usually more convenient for the operator if the tabs are arranged in sequence so that the tab for the lowest frequency station (station having lowest number of kilocycles (K.C.)) will be at the extreme left.

3. Using a small screwdriver or other tool that will fit the slot in the end of the button, push the button in as far as it will go and turn to the right or left until the dial pointer has moved to the desired station frequency. Be sure the button is pushed all the way in and the station is tuned in accurately.

4. Repeat the procedure in paragraph 3 for each of the remaining five buttons.

5. Check all buttons by pushing them in, one at a time, to determine whether desired stations are tuned properly.

6. Replace Selectrone escutcheon.

7. Any of the six stations to which the SPARTON Selectrone has been adjusted may now be received simply by pushing the Selectrone button for the desired station.

Model 6218, 7618

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prong to Grid (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No. 1</td>
</tr>
<tr>
<td>6A7</td>
<td>Converter</td>
<td>6.1</td>
</tr>
<tr>
<td>78</td>
<td>I.F. Amp.</td>
<td>6.1</td>
</tr>
<tr>
<td>75</td>
<td>End Det. AVC-Audio</td>
<td>6.1</td>
</tr>
<tr>
<td>74</td>
<td>Driver</td>
<td>6.1</td>
</tr>
<tr>
<td>4ACG</td>
<td>F.A.</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>Rectifier</td>
<td>325</td>
</tr>
<tr>
<td>8E5</td>
<td>Viso-Glo</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 15% or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + DC voltages. The Viso-Glo 8E5 is not used on Model 6218.

Models 5218; 6218; 7618

ALIGNMENT

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF GENERATOR CONNECTED TO</th>
<th>INPUT ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>HAND SWITCH SETTING</th>
<th>TUNING COND. SETTING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set dial pointer to last mark on scale when condenser plates are flush)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>6A7 Grid</td>
<td>.1 mF</td>
<td>405 KC</td>
<td>BC</td>
<td>Open</td>
<td>4SA, B, 4CSA, B, C Adjust to approx. peak</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C4</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C7</td>
</tr>
<tr>
<td>6</td>
<td>Repeater</td>
<td>Ant.</td>
<td>200 mF</td>
<td>405 KC</td>
<td>BC</td>
<td>Open</td>
<td>C4</td>
</tr>
<tr>
<td>7</td>
<td>Broadcast</td>
<td>Ant.</td>
<td>200 mF</td>
<td>405 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C5</td>
</tr>
<tr>
<td>8</td>
<td>Band</td>
<td>Ant.</td>
<td>200 mF</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C5</td>
</tr>
<tr>
<td>9</td>
<td>Band</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C5</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C5</td>
</tr>
<tr>
<td>11</td>
<td>(Repeat operations 7 and 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>S.W. Band</td>
<td>Ant.</td>
<td>*</td>
<td>15 NC</td>
<td>SW</td>
<td>15 NC</td>
<td>C5 SW ant. **</td>
</tr>
<tr>
<td>13</td>
<td>(Check calibration and sensitivity at 6.0 KC and 15 KC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(Check operations 1 to 13 inclusive)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*100 ohms non-inductive resistor
**Rock dial while making this adjustment. Make certain that adjustment is made on fundamental signal and not on image. Peak accurately.

©John F. Rider, Publisher
1. Select four favorite nearby broadcast stations and detach the corresponding call letter tabs from the station call letter tab sheets.

2. The tabs should be inserted in the ends of the knobs. For convenience it is recommended that the call letter tabs be arranged in sequence so that the tab for the station having the highest frequency (greatest number of kilocycles (k.c.) will be at the extreme left. This, however, is not vital, since the Selectronne will operate with any arrangement of the tabs.

3. To adjust Selectrontne buttons, loosen selected button by turning one-half turn to left (counterclockwise). Push this loosened button in as far as it will go, and while in this position, tune in manually the station desired or indicated by tab in end of this loosened button.

Then, with the button still pushed in as far as it will go, tighten by turning button to the right (clockwise) until it can be tightened no more.

Be sure the station is tuned in accurately when pushed in button is tightened.

4. Repeat the procedure in paragraph 3 for each of the remaining three buttons and stations.

5. Be sure the Selectronne buttons have been tightened firmly.

6. Check all buttons by pushing them in, one at a time, to determine whether desired stations are tuned in properly.

7. Any of the four stations to which the SPARTON Selectronne has been adjusted may now be instantly received simply by pushing the Selectronne Button for the desired station.
Sparton Superheterodyne Model

5028
INTERMEDIATE FREQUENCY 456 K.C.

Notes:
Voltage readings are for schematic diagram. Voltage of Socket Prongs to 117 volts. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages are + DC voltages. Allow 15% or - on all measurements.

AC Voltage: 117 volts Position of Volume Control: Full with Antenna Disconnected

ALIGNMENT

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT</th>
<th>GENERATOR CONNECTED TO</th>
<th>INPUT ANTENNA</th>
<th>FREQUENCY</th>
<th>BAND SWITCH</th>
<th>TUNING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set dial pointer at horizontal line at end of scale with condenser closed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(Back off, i.e., turn counter-clockwise, regeneration cond. C6C &quot;red spot&quot; before I.F. is aligned)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I.F. 567 grid, i.e., 456 K.C.</td>
<td>Open C6A B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Adjust C6C &quot;red spot&quot;, turning clockwise until oscill. occurs, then turn out C6C until oscill. stops</td>
<td>Open C6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Rejection Ant. 200 mm, 456 K.C.</td>
<td>Open C4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Broadcast Ant. 500 KC</td>
<td>C6C Disc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>(Close operation 9)</td>
<td>C6C Ant.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Recheck operation 9)</td>
<td>C7 Pad.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(Check calibration and sensitivity at 600 K.C., 1000 K.C. and 1500 K.C.)</td>
<td>C10, C11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Connect set to regular antenna and check reception of stations. Readjust C6C if set howls or oscillates on strong signals. Then recheck sensitivity)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

JUNE 1958

SPARKS WITHINGTON CO.
Model 5028
Schematic, Voltage, Dimmers

* This model has Broadcast Band only.
Line Voltage: 110 volts
Bend Selector Switch - Broadband
APC Switch - OFF

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prongs to Grid (See Prong Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7C</td>
<td>P-F Amp.</td>
<td>No.</td>
</tr>
<tr>
<td>6J7C</td>
<td>I-F Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6G6C</td>
<td>Converter</td>
<td>0</td>
</tr>
<tr>
<td>6F6C</td>
<td>Discriminator</td>
<td>0</td>
</tr>
<tr>
<td>6G6C</td>
<td>APC (Control)</td>
<td>0</td>
</tr>
<tr>
<td>6G7C</td>
<td>2nd Det. AFC-AP</td>
<td>0</td>
</tr>
<tr>
<td>6N5C</td>
<td>Power Amp.</td>
<td>0</td>
</tr>
<tr>
<td>5Y3G</td>
<td>Rectifier</td>
<td>350</td>
</tr>
</tbody>
</table>

Position of Volume Control: Full with AntennaDisconnected

Notes: Voltage readings are for schematic diagram on back of sheet. Allow 15% + or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohms per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are + DC voltages.
ALIGNMENT PROCEDURE:

Realignment of this receiver should never be necessary unless one of the oscillator, antenna, or I.F. coils has been replaced. Lack of sensitivity, selectivity, and poor tone quality may be due to any one or a combination of causes, such as weak or defective tubes or speaker, inadequate or excessively long antenna, or grounded bias resistor, bypass condenser, etc. Under no circumstances should realignment be attempted until all other possible sources have been first thoroughly investigated and have been definitely proven not to be the cause.

If an I.F. tube is replaced it is advisable to realign the I.F. Amplifier particularly if the replacement tube is one of a different manufacture than the one in the receiver. It is important when aligning to carefully follow the procedure in the order given, otherwise the receiver will lack sensitivity and the dial calibration will be incorrect.

IT IS IMPERATIVE THAT AN ACCURATELY CALIBRATED OSCILLATOR BE USED WITH SOME TYPE OF OUTPUT MEASURING DEVICE.

INTERMEDIATE ALIGNMENT:

1. Connect the high side of the test oscillator output to the control grid of the 606 modulator tube through a 22 MΩ resistor. Leave the grid connected to the grid terminal of the tube, and connect the ground side of the test oscillator to the receiver ground.

2. Set the test oscillator frequency to 405 kilocycles (this must be accurate).

3. Adjust the interstage transformers by turning the trimmer across accessible through holes in the top of the transformers, right and left, by turning the trimmer screw, aimed up and down (increasing and decreasing capacity) until maximum reading is obtained on the output meter, after which adjust the other trimmer screw of the same transformer for maximum sensitivity.

4. Adjust the first interstage transformer in the same manner as the second I.F. transformer.

TO ALIGN THE VARIABLE CONDENSER:

It is important when aligning the grid condenser, padding and trimmer condensers to follow the procedure carefully, otherwise the receiver will be insensitive and the dial calibration will be incorrect. The padding and trimmer condensers at both ends of the chassis will be referred to by their function as described on the circuit diagram.

Connect the high output side of the test oscillator through a 400 ohm resistor to the receiver output and the low side to the ground.

2. Place the band selector switch for operation on the 5.8 to 6.1 megacycle band, tune the receiver dial, and set the test oscillator frequency to EXACTLY 16 MEGACYCLES. Then in the 16 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE 16 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the second harmonic, are present. Be sure to align the fundamental peak with the fundamental and the second harmonic with the second harmonic. The second harmonic is used for adjusting the receiver at 16 MEGACYCLES. Always check to make sure the trimmer (at zero capacity) picks up the first fundamental peak. Adjust the damping for maximum sensitivity. Then adjust the oscillator trimmer at 16 MEGACYCLES always check to see if the proper peak has been moved. To do this leave the test oscillator frequency constant and adjust the output of the receiver to the fundamental peak with the trimmer. If the fundamental peak is not used and the 16 MEGACYCLE OSCILLATOR trimmer must be properly adjusted.

3. With band selector switch set for operation on 5.8 to 6.1 megacycle band tune the receiver dial and set test oscillator frequency to EXACTLY 58 MEGACYCLES. Adjust 38 megacycle oscillator trimmer for maximum 16 megacycle signal sensitivity.

4. Place band selector switch for operation on 1.7 to 3.8 megacycle band, tune the receiver dial, and set test oscillator frequency to EXACTLY 58 MEGACYCLES. Bring in 38 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 38 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the second harmonic, are present. Be sure to align the fundamental peak with the fundamental and the second harmonic with the second harmonic. The second harmonic is used for adjusting the receiver at 16 MEGACYCLES. Always check to make sure the trimmer (at zero capacity) picks up the first fundamental peak. Adjust the damping for maximum sensitivity. Then adjust the oscillator trimmer at 58 MEGACYCLES always check to see if the proper peak has been moved. To do this leave the test oscillator frequency constant and adjust the output of the receiver to the fundamental peak with the trimmer. If the fundamental peak is not used and the 58 MEGACYCLE OSCILLATOR trimmer must be properly adjusted.

5. With band selector switch set for operation on the 1.7 to 3.8 megacycle band tune the receiver dial and set test oscillator frequency to EXACTLY 1 MEGACYCLE. Then adjust 1 megacycle antenna trimmer for maximum 5 megacycle signal sensitivity.

6. Replace the 400 ohm resistor in series with test oscillator load with a 200 MΩ resistor, place the band selector switch for operation on the 5.8 to 170 kilocycle band, tune the receiver dial, and set test oscillator frequency to EXACTLY 1 MEGACYCLE. Next bring in the 38 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 38 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the second harmonic, are present. Be sure to align the fundamental peak with the fundamental and the second harmonic with the second harmonic. The second harmonic is used for adjusting the receiver at 16 MEGACYCLES. Always check to make sure the trimmer (at zero capacity) picks up the first fundamental peak. Adjust the damping for maximum sensitivity. Then adjust the oscillator trimmer at 1 MEGACYCLE always check to see if the proper peak has been moved. To do this leave the test oscillator frequency constant and adjust the output of the receiver to the fundamental peak with the trimmer. If the fundamental peak is not used and the 1 MEGACYCLE OSCILLATOR trimmer must be properly adjusted.

7. Leave band selector switch for operation on the 5.8 to 170 kilocycle band, tune the receiver dial and set test oscillator frequency to EXACTLY 1 MEGACYCLE. Next bring in the 16 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 16 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the second harmonic, are present. Be sure to align the fundamental peak with the fundamental and the second harmonic with the second harmonic. The second harmonic is used for adjusting the receiver at 16 MEGACYCLES. Always check to make sure the trimmer (at zero capacity) picks up the first fundamental peak. Adjust the damping for maximum sensitivity. Then adjust the oscillator trimmer at 1 MEGACYCLE always check to see if the proper peak has been moved. To do this leave the test oscillator frequency constant and adjust the output of the receiver to the fundamental peak with the trimmer. If the fundamental peak is not used and the 1 MEGACYCLE OSCILLATOR trimmer must be properly adjusted.

8. Leave band selector switch for operation on the 1.7 to 3.8 megacycle band, tune the receiver dial and set test oscillator frequency to EXACTLY 1 MEGACYCLE. Next bring in the 58 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 58 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the second harmonic, are present. Be sure to align the fundamental peak with the fundamental and the second harmonic with the second harmonic. The second harmonic is used for adjusting the receiver at 16 MEGACYCLES. Always check to make sure the trimmer (at zero capacity) picks up the first fundamental peak. Adjust the damping for maximum sensitivity. Then adjust the oscillator trimmer at 1 MEGACYCLE always check to see if the proper peak has been moved. To do this leave the test oscillator frequency constant and adjust the output of the receiver to the fundamental peak with the trimmer. If the fundamental peak is not used and the 1 MEGACYCLE OSCILLATOR trimmer must be properly adjusted.

Some of these model receivers were equipped with "Teleeye," the cathode ray visual tuning indicator. A 600 tube was used in early production models of the 665 tube, in later production. The parts and connections shown in the complete circuit diagram are used only when a 605 or "Teleeye" is incorporated in the receiver. The diagram below shows how the 605 tube is incorporated in the receiver.
ALIGNMENT DATA AND SERVICING

GENERAL DATA
The alignment of this receiver requires that it be injecting a signal which will cause the
recorder to indicate a tuned condition. For this purpose a signal from a 1000 kc
wideband oscillator and an 800 kc wideband oscillator, and a 400 kc wideband
oscillator should be used with the volume control on maximum and the
air conditioning control on minimum. For alignment purposes, the
antenna ground should be connected to the chassis. The operating
and tuning controls should be turned to normal positions.

FOREIGN BAND ALIGNMENT

The Foreign Band is 100 kc to 450 kc and is for alignment of the
filter bands of the receiver. The tuning of the receiver should be
adjusted to the center frequency of the band. The signal generator
should be used with the volume control on maximum and the
air conditioning control on minimum. The tuning controls should be
adjusted to normal positions.

BROADCAST BAND ALIGNMENT

Adjust the receiver to 1000 kc and adjust the volume to

the receiver to 900 kc and adjust the receiver to

1000 kc. Then adjust the receiver to 900 kc.

POLICE BAND ALIGNMENT

In preparing the receiver for alignment of the
filter bands of the receiver, the tuning of the receiver should be
adjusted to the center frequency of the band. The signal generator
should be used with the volume control on maximum and the
air conditioning control on minimum. The tuning controls should be
adjusted to normal positions.

SERVICE DATA FOR ALL BANDS

It is expected that the equipment has been tested and
checked in accordance with the standard test pattern at a
frequency of 100 kc.

The service test pattern should be

adjusted to 100 kc.

The service test pattern should be

adjusted to 450 kc.

The service test pattern should be

adjusted to 1000 kc.

The service test pattern should be

adjusted to 1500 kc.

The service test pattern should be

adjusted to 2000 kc.

TONE CONTROL AND TUNING CIRCUITS

Adjust the也越来越种 программы в руководстве выше. За более подробные сведения, рекомендуется обратиться к технической документации производителя.
Schematic, Socket, Trimmers, ALIGNMENT

SPIEGEL INC.
MODELS 102, 104, 112, 114, 124
172, 6750, 6752 Chassis 24

BF R, 11.7 K, 100 E 12/25 MA 115 VAC

P METER, 100 VAC 1/2 MA

SWITCH SHOWN IN BROADCAST BAND, 445 KE LC

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ANTENNA BALANCER

First, tune in a weak station at or very near to 600 KC on the dial. Second, without changing any other control, insert a small screwdriver into the antenna balancer screw shown in Figure 10 and turn it either to the left or right until the volume of the station is at its maximum point.
This receiver is designed to operate over three tuning ranges: the broadcast range which extends from 540 to 1700 Kilocycles (KC) (175 to 550 meters), Police and Aviation Band which extends from 1700 to 5500 Kilocycles (KC) (52 to 175 Meters) and the International Short Wave Band which extends from 5500 to 18,100 Kilocycles (KC) (16.5 to 55 meters). This latter range is the one which includes the four internationally assigned bands—the 19, 25, 31 and 49 meter bands.
DO NOT ATTEMPT TO OPERATE THIS RECEIVER ON DIRECT CURRENT (D.C.) OR ANY OTHER VOLTAGE OR CYCLE AS PERMANENT INJURY TO THE SET WILL RESULT.

This receiver is designed to operate over two tuning ranges. The broadcast range which extends from 540 K.C. to 1730 and the foreign short wave band which extends from 5800 K.C. to 18500 K.C. The short wave range includes the five important short wave channels 19, 25, 31, 39 and 49 meter bands.

ALIGNMENT DATA

The alignment of this receiver requires the use of a test oscillator that will cover the following frequencies, 465, 600, 1400, 8000, and 15000 K.C. and an output meter which is to be connected across the output transformer on the speaker. All adjustments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 465 K.C. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Set the band switch for broadcast reception. Adjust oscillator to 1400 K.C and connect the output of the oscillator to the antenna connection at the rear of the chassis through a .0002 mfd. micro condenser. Set the pointer on the dial to 1400 K.C making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Re-set the dial pointer on the receiver and on the test oscillator to 600 K.C. Slowly increase or decrease the broadcast padding condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 K.C alignment as the adjustment at 600 K.C may have slightly disturbed the original 1400 K.C setting.

SHORT WAVE: Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimming condensers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity at 6000 K.C to determine whether the circuits are properly aligned. Should the receiver lack sensitivity at this frequency check the .0035 micro condenser for short circuit.
ALIGNMENT: All alignments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 456 KC. Feed this to the grid of the pentagrid (648) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Adjust oscillator to 1400 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .0002 mfd. mica condenser. Set the pointer on the dial to 1400 KC making sure that the volume control is set at its maximum position. Adjust the antenna and oscillator trimmers for maximum signal (as indicated on the output meter). Re-set the dial pointer on the receiver and on the test oscillator to 600 KC and check for alignment.
ALIGNMENT: All adjustments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readouts during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 455 KC. Feed this to the grid of the pentagrid (648) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Adjust oscillator to 540 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .002 mfd. micro-condenser. Set the pointer on the dial to 1400 KC and make sure the volume control is set at its maximum position.

Adjust the antemna and oscillator trimmers for maximum signal (as indicated on the output meter). Reset the dial pointer on the receiver and indicated on the test oscillator to 600 KC and check for alignment.

INSTALLATION: For operation on 110-120 volts, 60 cycle A.C. or D.C.
ALIGNMENT: The alignment of this receiver should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 465 KC. Feed this to the grid of the (6A7) tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Set the band switch for broadcast reception. Adjust oscillator to 1460 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .0002 mfd, micro condenser. Set the pointer on the dial to 1460 KC and make sure that the volume control is set at its maximum position. Adjust the broadcast antenna and oscillator trimmers for maximum signal (as indicated on the output meter). Re-set the dial pointer on the receiver and on the test oscillator to 600 KC. Slowly increase or decrease the broadcast tuning condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1460 KC adjustment on the adjustment of 600 KC may have slightly disturbed the original 1460 KC setting.

INTERMEDIATE BAND: For a dummy antenna use .0002 mfd, micro condenser in series with a 400 ohm carbon resistor. Set band switch to the intermediate band position and feed a 5100 KC signal from the oscillator. Set dial pointer at 5100 KC. Adjust intermediate antenna and intermediate oscillator trimmers for maximum output. Re-set oscillator and set dial to approximately 1800 KC. Slowly increase or decrease the intermediate tuning condenser while tuning back and forth across the signal with the station selector control until the maximum reading is obtained on the output meter. Re-check the 5100 KC adjustment.

SHORT WAVE: Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimmer condensers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity at 6000 KC to determine whether the circuits are properly aligned. Should the receiver show sensitivity at this frequency check the .0005 micro condenser for short circuit.

Schematic Diagram
Automatic Tuner Dual Range

6 Volt Superheterodyne

This receiver is designed to operate over two tuning ranges. The broadcast range which extends from 540 K.C. to 1730 and the foreign short wave band which extends from 5800 K.C. to 18000 K.C. The short wave range includes the five important short wave channels 19, 25, 31, 39 and 49 meter bands.

ALIGNMENT DATA

The alignment of this receiver requires the use of a test oscillator that will cover the following frequencies, 485, 600, 1400, 6000, and 15000 K.C. and an output meter which is to be connected across the output transformer on the speaker. All alignments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 465 KC. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Set the band switch for broadcast reception. Adjust oscillator to 1400 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .0002 mfd. micro condenser. Set the pointer on the dial to 1400 KC making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Re-set the dial pointer on the receiver and on the test oscillator to 600 KC. Slowly increase or decrease the broadcast padding condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 KC alignment as the adjustment at 600 KC may have slightly disturbed the original 1400 KC setting.

SHORT WAVE: Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimmer condensers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity at 6000 KC to determine whether the circuits are properly aligned. Should the receiver lack sensitivity at this frequency check the .0035 micro condenser for short circuit.
MODELS 1104 to 1107 inc.
1154 to 1157 inc.Ch.220
Schematic,Socket,Trimmers
MODELS 2066,2067,2068 Chassis 43
Socket,Trimmers

FOR ALIGNMENT SEE MODEL 1052.

SWITCH POSITION
Left
Center
Right

BAND
Broadcast
Intermediate
Short Wave (foreign)

RANGE IN KILOCYCLES
540-1710 KC
1710-5800 KC
5800-17500 KC

MODELS
1104
1105
1106
1107
1154
1155
1156
1157

2066
2067
2068

STATION SELECTO

FRONT OF CHASSIS

BAND SWITCH

REAR OF CHASSIS

PADDOERS
BROAD OSC. TRIMMER
INT. OSC. TRIMMER
S.W. OSC. TRIMMER
OSC. COIL & TRIMMER ASSEMBLY

BOTTOM VIEW OF CHASSIS:
All alignments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

**INTERMEDIATE FREQUENCY:** Set oscillator to 465 KC. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

**BROADCAST BAND:** Adjust oscillator to 1400 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a 0.0002 mfd. mica condenser. Set the pointer on the dial to 1400 KC making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Reset the dial pointer on the receiver and on the test oscillator to 600 KC. Slowly increase or decrease the broadcast padding condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 KC alignment as the adjustment at 600 KC may have slightly disturbed the original 1400 KC setting.
TO ALIGN THE VARIABLE CONDENSER:

It is important when aligning the gang condenser, padding and trimmer condensers to follow the procedure carefully, otherwise the receiver will be insensitive and the dial calibration will be incorrect. The padding and trimmer condensers located underneath the chassis and inside of and accessible through the holes found in the top of the catacomb shield (mounted on top and in the left front corner of the receiver) will be referred to by their function as indicated on the circuit diagram.

1. Connect the high output side of the test oscillator through a 400 ohm resistor to the receiver antenna lead and the low side to the set ground.

2. Place the band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial, and set the test oscillator frequency to EXACTLY 18.8 MEGACYCLES.

   Rotate gang condenser so that plates are completely out of mesh and then tune in the 18.8 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE 18.8 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer, two peaks, the fundamental and the image peak will be noticed. CARE MUST BE TAKEN THAT THE FUNDAMENTAL PEAK AND NOT THE IMAGE PEAK IS USED FOR ALIGNING THE RECEIVER AT 18.8 MEGACYCLES. Always back off the trimmer to minimum capacity, then screw down the trimmer (add capacity) until the first peak which is the fundamental and the proper one to use is tuned in. If the trimmer is screwed down beyond the point where the first peak is received, the incorrect image peak will be tuned in. After completing adjustment of the oscillation trimmer at 18 megacycles always check to see if the proper peak has been used. To do this leave the test oscillator frequency at 18.8 megacycles, increase the output of the test oscillator and tune the receiver dial to approximately 17.8 megacycles. Then vary the receiver dial slightly to the right and left of 17.8 megacycles, and if the fundamental peak was used in aligning at 18.8 megacycles the test oscillator signal will be heard at approximately 17.8 megacycles on the receiver dial. If it is not possible to receive the signal, then the fundamental peak was not used and the 18.8 megacycle oscillator trimmer must be properly readjusted.

3. With band selector switch set for operation on 5.8 to 18.8 megacycle band tune the receiver dial and set test oscillator frequency to EXACTLY 15 MEGACYCLES. Adjust 15 megacycle antenna and R.F. trimmers to maximum 10 megacycle signal sensitivity.

4. Leave band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial and set the test oscillator frequency to approximately 6 megacycles. While rocking gang condenser slightly to right and left adjust 6 megacycle oscillator trimmer for maximum sensitivity.

5. Place band selector switch for operation on 1.8 to 5.8 megacycle band, tune the receiver dial, and set test oscillator frequency to EXACTLY 5.8 MEGACYCLES.

   Rotate gang condenser so that plates are completely out of mesh and then BRING IN 5.8 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT by adjusting 5.8 megacycle oscillator trimmer.

6. With the band selector switch set for operation on 1.8 to 5.8 megacycle band tune receiver dial and set test oscillator frequency to EXACTLY 5 MEGACYCLES. Then adjust 5 megacycle antenna and R.F. trimmers for maximum 5 megacycle signal sensitivity.

7. Leave band selector switch for operation on 1.8 to 5.8 megacycle band, tune receiver dial and set test oscillator frequency to approximately 2 megacycles. While rocking gang condenser slightly to right and left adjust 2 megacycle oscillator trimmer for maximum sensitivity.

8. Replace the 400 ohm resistor in series with test oscillator lead with a 200 Mfd. condenser, place the band selector switch for operation on the 540 to 1730 kilocycle band and set test oscillator frequency to EXACTLY 1730 KILOCYCLE.

   Rotate gang condenser so that plates are completely out of mesh and BRING IN THE 1730 KILOCYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 1730 KILOCYCLE OSCILLATOR TRIMMER.

9. With band selector switch placed for operation on the 540 to 1730 kilocycle band set test oscillator frequency and receiver dial to EXACTLY 1400 KILOCYCLES. Adjust 1400 kilocycles F, P. and antenna trimmers for maximum 1400 kilocycle signal sensitivity.

10. Leave band selector switch for operation 540 to 1730 kilocycle band, tune receiver dial and set test oscillator frequency to approximately 600 kilocycles. While rocking gang condenser slightly to right and left adjust 600 kilocycle oscillator trimmer for maximum sensitivity.

VOLTAGE TABLE

| LINE VOLTAGE : 115 VOLTS AC |
| MEASURE VOLTAGES BETWEEN CHASSIS AND SOCKET PRONGS |

- H = HEATER
- P = PLATE
- S4 = SCREEN GRID
- S5 = SUPPRESSOR GRID
- R = CATHODE
- GQ = OSCILLATOR PLATE
- G1 = OSCILLATOR GRID
- G2 = DIODE PLATE
- Z = K.C.
TO ALIGN THE VARIABLE CONDENSER:

It is important when aligning the gang condenser, padding and trimmer condensers to follow the procedure carefully, otherwise the receiver will be insensitive and the dial calibration will be incorrect. The padding and trimmer condensers located underneath the chassis and inside of and accessible through the holes found in the top of the case shield (mounted on top and in the left front corner of the receiver) will be referred to by their function as indicated on the circuit diagram.

1. Connect the high output side of the test oscillator through a 400 ohm resistor to the receiver antenna lead and the low side to the set ground.

2. Place the band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial, and set the test oscillator frequency to EXACTLY 18.8 MEGACYCLES.

Rotate gang condenser so that plates are completely out of mesh and then tune in the 18.8 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING THE 18.8 MEGACYCLE OSCILLATOR TRIMMER. When adjusting this trimmer two peaks, the fundamental and the image peak will be noticed. CARE MUST BE TAKEN THAT THE FUNDAMENTAL PEAK AND NOT THE IMAGE PEAK IS USED FOR ALIGNING THE RECEIVER AT 18.8 MEGACYCLES. Always back off the trimmer to minimum capacity, then screw down the trimmer (add capacitance) until the first peak which is the fundamental and the proper one to use is reached. If the trimmer is screwed down beyond the point where the first peak is received, the incorrect image peak will be tuned in. After completing adjustment of the oscillator trimmer at 18.8 megacycles always check to see if the proper peak has been used. To do this leave the test oscillator frequency at 18.8 megacycles, increase the output of the test oscillator and tune the receiver dial to approximately 17.8 megacycles. Then vary the receiver dial slightly to the right and left of 17.8 megacycles, and if the fundamental peak was used in aligning at 18.8 megacycles the test oscillator signal will be heard approximately 17.8 megacycles on the receiver dial. If it is not possible to receive the signal, then the fundamental peak was not used and the 18.8 megacycle oscillator trimmer must be properly readjusted.

3. With band selector switch set for operation on 5.8 to 18.8 megacycle band tune the receiver dial and set test oscillator frequency to EXACTLY 18.8 MEGACYCLES. Adjust 5 megacycle antenna and R.F. trimmers to maximum 10 megacycle signal sensitivity.

4. Leave band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial and set the test oscillator frequency to approximately 6 megacycles. While rocking gang condenser slightly to right and left adjust 6 megacycle oscillator pad for maximum sensitivity.

5. Place band selector switch for operation on 1.8 to 5.8 megacycle band, tune the receiver dial, and set test oscillator frequency to EXACTLY 5.8 MEGACYCLES.

Rotate gang condenser so that plates are completely out of mesh and then BRING IN 5.8 MEGACYCLE SIGNAL TO MAXIMUM OUTPUT by adjusting 5.8 megacycle oscillator trimmer.

6. With the band selector switch set for operation on 1.8 to 5.8 megacycle band tune receiver dial and set test oscillator frequency to EXACTLY 5 MEGACYCLES. Then adjust 5 megacycle antenna and R.F. trimmers for maximum 5 megacycle signal sensitivity.

7. Leave band selector switch for operation on 1.8 to 5.8 megacycle band, tune receiver dial and set test oscillator frequency to approximately 2 megacycles. While rocking gang condenser slightly to right and left adjust 2 megacycle oscillator pad for maximum sensitivity.

8. Replace the 400 ohm resistor in series with test oscillator lead with a 200 Mµfd. condenser, place the band selector switch for operation on the 640 to 1720 kilocycle band and set test oscillator frequency to EXACTLY 1720 KILOCYCLEs.

Rotate gang condenser so that plates are completely out of mesh and BRING IN THE 1720 KILOCYCLE SIGNAL TO MAXIMUM OUTPUT BY ADJUSTING 1720 KILOCYCLE OSCILLATOR TRIMMER.

9. With band selector switch placed for operation on the 540 to 3720 kilocycle band set test oscillator frequency and receiver dial to EXACTLY 1400 KILOCYCLES. Adjust 1400 kilocycles R. F. and antenna trimmers for maximum 1400 kilocycle signal sensitivity.

10. Leave band selector switch for operation on 540 to 1720 kilocycle band, tune receiver dial and set test oscillator frequency to approximately 600 kilocycles. While rocking gang condenser slightly to right and left adjust 600 kilocycle oscillator pad for maximum sensitivity.

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**VOLTAGE TABLE**

LINE VOLTAGE : 115 Volts AC

<table>
<thead>
<tr>
<th>H = 6.3</th>
<th>P = 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-7</td>
<td>0-0</td>
</tr>
<tr>
<td>K-6</td>
<td>0-0</td>
</tr>
</tbody>
</table>

---

**ALIGNMENT CHART**

1. Connect the high output side of the test oscillator through a 400 ohm resistor to the receiver antenna lead and the low side to the set ground.
2. Place the band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial, and set the test oscillator frequency to EXACTLY 18.8 MEGACYCLES.
3. With band selector switch set for operation on 5.8 to 18.8 megacycle band, tune the receiver dial and set test oscillator frequency to EXACTLY 18.8 MEGACYCLES. Adjust 5 megacycle antenna and R.F. trimmers to maximum 10 megacycle signal sensitivity.
4. Leave band selector switch for operation on the 5.8 to 18.8 megacycle band, tune the receiver dial and set the test oscillator frequency to approximately 6 megacycles. While rocking gang condenser slightly to right and left adjust 6 megacycle oscillator pad for maximum sensitivity.
5. Place band selector switch for operation on 1.8 to 5.8 megacycle band, tune the receiver dial, and set test oscillator frequency to EXACTLY 5.8 MEGACYCLES.
6. With the band selector switch set for operation on 1.8 to 5.8 megacycle band tune receiver dial and set test oscillator frequency to EXACTLY 5 MEGACYCLES. Then adjust 5 megacycle antenna and R.F. trimmers for maximum 5 megacycle signal sensitivity.
7. Leave band selector switch for operation on 1.8 to 5.8 megacycle band, tune receiver dial and set test oscillator frequency to approximately 2 megacycles. While rocking gang condenser slightly to right and left adjust 2 megacycle oscillator pad for maximum sensitivity.
8. Replace the 400 ohm resistor in series with test oscillator lead with a 200 Mµfd. condenser, place the band selector switch for operation on the 640 to 1720 kilocycle band and set test oscillator frequency to EXACTLY 1720 KILOCYCLEs.
9. With band selector switch placed for operation on the 540 to 3720 kilocycle band set test oscillator frequency and receiver dial to EXACTLY 1400 KILOCYCLES. Adjust 1400 kilocycles R. F. and antenna trimmers for maximum 1400 kilocycle signal sensitivity.
10. Leave band selector switch for operation on 540 to 1720 kilocycle band, tune receiver dial and set test oscillator frequency to approximately 600 kilocycles. While rocking gang condenser slightly to right and left adjust 600 kilocycle oscillator pad for maximum sensitivity.

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ALIGNMENT DATA

The alignment of this receiver requires the use of a test oscillator that will cover the following frequencies, 465, 600, 1400, 9000, and 15000 K.C., and an output meter which is to be connected across the output transformer on the speaker. All alignments should be made with the volume control set at maximum and the output of the test oscillator set as low as possible to prevent the automatic volume control from operating and thus giving incorrect readings during alignment.

INTERMEDIATE FREQUENCY: Set oscillator to 465 K.C. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Set the band switch for broadcast reception. Adjust oscillator to 1400 K.C. and connect the output of the generator to the antenna connection at the rear of the chassis through a .0005 mfd. micro condenser. Set the pointer on the dial to 1400 K.C. making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Reset the dial pointer on the receiver and on the test oscillator to 600 K.C. Slowly increase or decrease the broadcast puddling condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 K.C. alignment as the adjustment at 600 K.C. may have slightly disturbed the original 1400 K.C. setting.

SHORT WAVE: Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimmers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.

It is advisable to check the sensitivity of 6000 K.C. to determine whether the circuits are properly aligned. Should the receiver lock sensitivity at this frequency check the .0035 mfd. condenser for short circuit.
**Push Button Station Selector**

**ADJUSTMENT**

The five stations wanted should be chosen on this switch, with button 1 on indicated in Figure 1 for stations whose frequencies are between 500 Kc. and 1500 Kc. and on button 2 for stations whose frequencies are between 750 and 1600 Kc. Button number 4 for stations whose frequencies are from 850 to 1150 and button 5 for those stations whose frequencies are between 140 and 1000 Kc.

**CONNECTIONS**

Figure 2 shows the connections to chassis.

**OPERATION**

For manual tuning, press the release button and proceed to tune stations in the usual manner with the station selector knob.

Do not attempt to press more than one button at a time as this will not tune any additional stations. Although this is a push button, it does not have a momentary feature.

To operate the automatic station selector control it is necessary to press in any one of the five station tuning buttons. This automatically disconnects the manual tuning control from the electrical circuit. Thus it is possible to have the dial tuned to any station and yet use the automatic push button station selector.

The colored release button should always be in any regular tuning knob is used to select the stations.

Station Call Letters may be inserted in the spaces provided and can be changed at will.

**INSTANTOMIC TUNING**

The purpose of instantomic tuning is to give the user instant automatic tuning of any one of a selection of favorite broadcast stations. The control buttons are conveniently located just below the tuning dial. Pushing in any button will release any other button which happens to be already in. After the instantomic tuning feature has been properly aligned, this will instantly and automatically tune in the station selected by this button.

Before attempting to adjust or use instantomic tuning, the "installation" and "operation" instructions must be carefully followed. When the receiver is operating satisfactorily using the tuning dial with the "Dial Tuning" button pressed in, the instantomic feature may be easily adjusted by carefully following these instructions.

Located on the back of the chassis is a row of five pairs of small bakelite adjustment knobs. Each pair of these knobs controls the tuning of the station for the instantomic button which is in the same relative position.

With the receiver operating with the "Dial Tuning" button in and the wave switch on broadcast position, turn the tuning knob to the left until the 550 Kc. end of the band has been reached. Turn the tuning knob to the right until a station, for which it is desired to have instantomic tuning, is heard. Press in the Button No. 1. The button is located at the left end of the row. Reach around the back of the receiver and turn upper knob of the pair No. 1 until the same program is heard. Unless the correct knob is turned, several different stations will be heard during this procedure. It is necessary to check that the same program as now tuned in, the "Dial Tuning" button may again be pressed. In this way it can be determined that the same station is tuned in with the instantomic button as when the "Dial Tuning" button is in. If it is not the same station the adjustment knob should be turned again and these operations repeated until the same program is heard when either of these two buttons is pressed.

The button adjustment knob of the first pair is now turned until the station is heard the best. Both top and bottom knobs may then be adjusted to erect tuning by watching the magic eye and adjusting until the edges of the picture section are as close together as it is possible to get them.

The instantomic button is now properly adjusted for the station which was tuned in on with the station and the station call letters may be pushed out of the station list, monitored on the back, and pressed into the hollow end of the button.

With the "Dial Tuning" button pressed in, the tuning knob is again tuned to the right until the last station for which instantomic tuning is desired is tuned in. The adjustment process for this station is the same as before, except that the upper knob No. 2 and pair No. 2 adjustment knobs are used. Proceeding in this way all five of the buttons may be properly adjusted for the stations desired.

It must be remembered that the "Dial Tuning" button must be pressed in whenever it is desired to tune in stations with the tuning knob, regardless of which wave band is in use. It must also be remembered that the wave switch must be in the broadcast position when instantomic tuning is being used.

**AUTOMATIC FREQUENCY COVERAGE FOR EACH OF THE INSTANTOMIC CONTROL BUTTONS IS AS FOLLOWS:**

1. Stations between 540 and 1000 Kc.
2. Stations between 540 and 1000 Kc.
3. Stations between 750 and 1200 Kc.
4. Stations between 750 and 1200 Kc.
5. Stations between 1000 and 1200 Kc.
The receiver is a 7 tube alternating current operated superheterodyne. The tubes used are a 76 as oscillator, a 6A7 as modulator, a 6D6 as I.F. amplifier, a 75 as A, V, C, and audio rectifier and audio voltage amplifier, a 41 as power audio amplifier, an 80 as a power rectifier, and a 6G5 as tuning indicator. This receiver is made to cover 2 tuning bands, the standard broadcast band which ranges from 1300 K.C. to 5500 K.C. and the middle or police band which has a frequency range of from 8.4 M.C. to 21 M.C.
**DESCRIPTION**

This receiver is an 11 tube alternating current operated superheterodyne.

The tubes used are a 6C5G oscillator, a 6A8G modulator, a 6K7G I.F. amplifier, a 6C5G A.V.C. rectifier, a 6H6G detector, a pair of 6J7G audio amplifiers, a pair of 6V6G power amplifiers, an 80 rectifier, and a 6G5 tuning indicator or magic eye.

This receiver is made to cover 3 tuning bands, the standard broadcast band which ranges from 1680 K.C. to 535 K.C., the middle or police band which has a frequency range of from 54 M.C. to 1.7 M.C. and the high frequency or foreign band which is from 19 M.C. to 5.0 M.C.
ALIGNMENT PROCEDURE:

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes, such as weak or defective tubes or speaker, low battery voltage, open or grounded bias resistor, poor condenser, inadequate or excessively long antenna, etc. Never attempt to redesign set until all other possible sources of trouble have been first thoroughly investigated and definitely proven not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT.

THE TRIMMER AND DETUNING CONDENSER WILL BE REFERRED TO BY THEIR FUNCTION, AS SHOWN IN PARTS DIAGRAM.

ALIGNING LF STAGE AT 455 Kilocycles:

(a) Attach the ground lead of the test oscillator to the chassis. Connect the other lead to the grid of the 1CR tube through a .02 MFD series condenser. DO NOT REMOVE GRID CLIP.

(b) Set test oscillator to EXACTLY 455 Kilocycles and turn receiver volume control on full.

(c) Peak each of the second L.F. transformer trimmers.

(d) Peak each of the first L.F. transformer trimmers.

ALIGNING 1730-530 Kilocycle Band:

(a) Check tuning dial adjustment by turning gang condenser until plate touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If the dial needle does not point exactly to the last line move needle to correct position.

(b) Remove test oscillator lead from grid of 1CR tube and connect to receiver antenna lead through a .0025 Mfd. series condenser.

(c) Adjust band selector switch for operation on the 1730-530 kilocycle band.

(d) Set test oscillator frequency and receiver dial to EXACTLY 1730 kilocycles. Turn chassis on end and adjust 1730 kilocycle oscillator trimmer for maximum 1730 kilocycle test oscillator signal sensitivity.

(e) Tune receiver dial and set test oscillator frequency to EXACTLY 1400 kilocycles and adjust 1400 K.C. antenna trimmer for maximum sensitivity.

(f) Set test oscillator frequency and receiver dial to approximately 600 kilocycles. Then while rocking gang condenser slightly to right and left, adjust 600 K.C. oscillator pad for maximum sensitivity.

ALIGNING 5.8-18.1 Megacycle Band:

(a) Replace .0025 Mfd. test oscillator antenna lead series condenser with a 400 ohm resistor, and place band selector switch for operation on 5.8-18.1 megacycle band.

(b) Tune receiver dial and set test oscillator frequency to approximately 15 megacycles.

(c) Rock gang condenser slightly to right and left and adjust 15 M.C. antenna trimmer for maximum 15 megacycle test signal response.

To assure more accurate trimmer setting, repeat all above adjustments several times always using lowest possible test oscillator output consistent with readable output meter scale deflection.
ALIGNMENT PROCEDURE

The equipment required for re-aligning this receiver is an output meter and a modulated source of radio frequency (a signal generator or microphone). This source of radio frequency must be accurately calibrated in frequency and must have a method of varying the output.

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a 0.5 M.F. condenser and 0.1 resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two plate pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Press in the dial tuning button of Models 2070, 2071, 2074, and 4062. Connect the signal generator to the grid cap of the 6AT tube through a 1 M.F. condenser. Connect the ground of the grid to the ground lead of the receiver.

With the wave switch in broadcast position and the dial set to about 1800 K.C. level in a 458 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Leave the signal generator connected to the grid cap of the 6AT, turn the wave switch to the right hand (short wave) position. Set the dial and the signal generator to 1500 K.C. Tune in the signal by adjusting the 15 M.C. oscillator trimmers. The signal will be heard at two different settings of the trimmer. The proper setting is the one where the signal is heard when the trimmer is lowest.

Also when the dial of the receiver is turned the signal will be heard again at about 14.0 M.C. If the signal is heard at about 15.0 M.C. or the dial of 14.0 M.C. the wrong setting has been used and should be corrected.

Set the wave switch on broadcast position, turn the dial to the extreme high frequency end. Feed a 1800 K.C. signal to the receiver antenna post through a 0.00025 M.F. wire condenser. Adjust the 1800 K.C. broadcast oscillator trimmer for maximum output. Set the generator to 1500 K.C. and tune in the signal on the receiver. Then adjust the 150 M.C. broadcast antenna trimmer and the 150 K.C. broadcast oscillator trimmer for maximum output.

Set the generator to 900 K.C. and adjust the 900 K.C. broadcast oscillator trimmer for maximum output while tuning the receiver back and forth across the signal from the generator. This completes the alignment of the broadcast band.

The short wave band is aligned by feeding a 4.0 M.C. signal to the receiver antenna lead through the 0.0025 condenser. Turn the wave switch to the center position and tune the receiver to this signal. Adjust the 4.0 M.C. police antenna trimmer for best output.

The short wave band is aligned in the same way using a 15 M.C. signal and adjusting the 15 M.C. short wave antenna trimmer after having tuned the wave switch to the right hand position.

The following alignment procedure is for use only by competent service men having the proper equipment. Realignment is very seldom needed and is usually only required after some major part has been replaced because of damage to the receiver.

The equipment required for realigning the receiver is an output meter and a modulated source of radio frequency (a signal generator or microphone). This source of radio frequency must be accurately calibrated in frequency and must have a method of varying the output.

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a 0.5 M.F. condenser and 0.1 resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two plate pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6AT tube through a 1 M.F. condenser. Connect the ground of the grid to the ground lead of the receiver. With the wave switch on broadcast position, press in the dial tuning button and set the dial to about 1800 K.C. Then feed in a 458 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Leave the wave switch on broadcast position turn the dial to the extreme high frequency end. Feed a 1700 K.C. signal to the receiver antenna lead through a 0.0025 M.F. wire condenser. Adjust the 1700 K.C. broadcast oscillator trimmer for maximum output while tuning the receiver back and forth across the signal from the generator. This completes the alignment of the broadcast band.

The short wave band is aligned in the same way using a 15 M.C. signal and adjusting the 15 M.C. short wave antenna trimmer after having tuned the wave switch to the right hand position.

The following alignment procedure is for use only by competent service men having the proper equipment. Realignment is very seldom needed and is usually only required after some major part has been replaced because of damage to the receiver.

The equipment required for realigning the receiver is an output meter and a modulated source of radio frequency (a signal generator or microphone). This source of radio frequency must be accurately calibrated in frequency and must have a method of varying the output.

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a 0.5 M.F. condenser and 0.1 resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two plate pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6AT tube through a 1 M.F. condenser. Connect the ground of the grid to the ground lead of the receiver. With the wave switch on broadcast position, press in the dial tuning button and set the dial to about 1800 K.C. Then feed in a 458 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Leave the wave switch on broadcast position turn the dial to the extreme high frequency end. Feed a 1700 K.C. signal to the receiver antenna lead through a 0.0025 M.F. wire condenser. Adjust the 1700 K.C. broadcast oscillator trimmer for maximum output while tuning the receiver back and forth across the signal from the generator. This completes the alignment of the broadcast band.

The short wave band is aligned in the same way using a 15 M.C. signal and adjusting the 15 M.C. short wave antenna trimmer after having tuned the wave switch to the right hand position.
Lack of sensitivity, selectivity or poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, improperly connected or low battery, open or grounded bias resistor, by-pass condenser, inadequate or excessively long antenna, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proven not to be the cause.

**NOTE:** BE SURE TO FOLLOW PROCEDURE CAREFULLY WHEN ALIGNING. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT.

IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER.

### ALIGNING IF STAGE AT 465 KILOCYCLES:

(a) Connect the ground lead of the test oscillator to the chassis or set ground lead.

(b) Connect the other lead of the test oscillator to the grid cap of the No. 6D8G modulator tube through a .02 Mfd. condenser. DO NOT REMOVE GRID CLIP.

(c) Set test oscillator to EXACTLY 465 kilocycles and turn receiver volume control on full.

(d) Peak each of the second IF transformer trimmers.

(e) Peak each of the first IF transformer trimmers.

To avoid most accurate trimmer setting repeat above adjustment several times, always using lowest possible test oscillator output consistent with readable output meter scale deflection.

### ALIGNING ANTENNA AND OSCILLATOR CIRCUIT:

(a) Connect the high output side of the test oscillator through a .00025 Mfd. condenser to the receiver antenna lead and the low side to the set ground.

(b) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line of low frequency end of the dial calibration. If the dial needle does not point exactly to the last line move needle to correct position.

(c) Set receiver dial and test oscillator frequency to EXACTLY 1720 kilocycles.

(d) Bring in 1720 KC test oscillator signal to maximum output by adjusting the trimmer condenser mounted on top of the oscillator section of the gang condenser. Looking at the front of the receiver the rear section of the condenser is the oscillator section.

(e) Tune receiver dial and set test oscillator frequency to EXACTLY 1400 kilocycles.

(f) Adjust trimmer on top of the front section gang condenser (antenna section) for maximum 1400 kilocycle test signal response.

(g) Tune receiver dial and set test oscillator frequency to approximately 800 kilocycles.

(h) While rocking the tuning condenser back and forth adjust 600 K.C. oscillator padder condenser which is accessible through the hole in the top of the chassis adjacent to the gang condenser for maximum 600 kilocycle signal response.
IF PEAK 175 KC

L.F. ALIGNMENT. Adjust the test oscillator to 175 K.C. and connect the output directly to the grid of the first detector tube (6A7), without the use of any series condenser or resistor; the omission of series condenser and resistor to block out the AVC action. The ground on the test oscillator can be connected to the chassis ground. Align the trimmers of the first and second L.F. transformers to peak for maximum reading on the output meter.

R.F. ALIGNMENT. The next step is to adjust the center and rear trimmers of the gang condenser to peak. The center section of the gang condenser tunes the antenna amplifier stage (6D6 tube), and the rear condenser section tunes the detector grid cell of the 6A7 tube.

OSCILLATOR ALIGNMENT. Adjust the test oscillator to 1400 K.C. and connect the output to the antenna through a .0001 mfd. mica condenser to give the equivalent of a low capacity type average auto antenna. Set the dial pointer to 1400 K.C. and adjust the oscillator trimmer to peak. (Front section of gang condenser.)
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.

Peak IF at 465 KC. Connect oscillator at G47 grid cap. Use .02 mfd. series condenser. DO NOT REMOVE GRID CAP. Peak second and first IF trimmers.

1720-840 KC Band.
Connect oscillator to antenna lead through .00025 mfd. series condenser. Gang condenser at maximum capacity, calibrate dial so needle falls on last line in this position.
Set oscillator signal at 1720 KC, tune dial to 1400 KC. Trim osc. sect. of gang condenser to maximum output.
With signal generator at 1400 KC, trim antenna section of gang condenser for maximum output.
Now adjust 600 KC pad for maximum signal while rocking condenser.
2.5-6.3 MC Band
Signal at 6.3 MC through 400 ohm and .00025 mfd. dummy to antenna lead.
Band switch in 2.5-6.3 MC position. Adjust 6.3 MC osc. trimmer to maximum output.
Tune dial to 6 MC. Signal at 6 MC. Adjust 6 MC antenna trimmer for maximum sensitivity.
DESCRIPTION

This receiver is an 8 tube alternating current operated superheterodyne.

The tubes used are a 6A7 as oscillator modulator, a 6D6 as I.F. amplifier, a 75 as A.V.C. and audio rectifier and a 6G5 as a power rectifier, a 635 as tuning indicator and a type 62 tubes as push pull audio amplifiers.

This receiver is made to cover 3 tuning bands, the standard broadcast band which has a frequency range of from 560 K.C. to 1550 K.C., the police band which has a frequency range of from 5.6 M.C. to 5.7 M.C. and the high frequency or foreign band which is from 20 M.C. to 54 M.C.

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ALIGNMENT: The alignment of this receiver requires the use of a test oscillator that will cover the following frequencies: 465, 1400, 5000, 5100, 16000 and 15000 KC.

INTERMEDIATE FREQUENCY: Set oscillator to 465 KC. Feed this to the grid of the post-grid converter tube. Adjust trimmers on the intermediate frequency transformers for peak readings as indicated on the output meter which is to be placed across the output transformer.

BROADCAST BAND: Set the band switch for broadcast reception. Adjust oscillator to 1400 KC and connect the output of the generator to the antenna connection at the rear of the chassis through a .0002 mfd. mica condenser. Set the pointer on the dial to 1400 KC making sure that the volume control is set at its maximum position. Adjust the broadcast antenna and broadcast oscillator trimmers for maximum signal (as indicated on the output meter). Adjust trimmer (underneath chassis) on R.F. coil for greatest output. Reset the dial pointer on the receiver and on the test oscillator to 600 KC. Slowly increase or decrease the broadcast coupling condenser while tuning back and forth across the signal with the station selector knob until the maximum reading is obtained on the output meter. Re-check the 1400 KC alignment as the adjustment at 600 KC may have slightly disturbed the original 1400 KC setting.

INTERMEDIATE BAND: For a dummy antenna use a .0002 mfd. mica condenser in series with a 400 ohm carbon resistor. Set band switch to the intermediate band position and feed a 5100 KC signal through the oscillator. Set dial pointer at 5100 KC. Adjust intermediate antenna and intermediate oscillator trimmers for maximum output. Re-set oscillator and set dial to approximately 1800 KC. Slowly increase or decrease the intermediate coupling condenser while tuning back and forth across the signal with the station selector control until the maximum reading is obtained on the output meter. Re-check the 5100 KC adjustment.

SHORT WAVE: Set band switch on short wave position. Connect the antenna of the radio receiver to the output of the test oscillator through a 400 ohm carbon resistor. Set oscillator and receiver dial at 15 megacycles. Adjust the short wave antenna and short wave oscillator trimmers for maximum output as indicated by readings on the output meter. No other adjustments are necessary for aligning this band.
ALIGNMENT: The alignment of this receiver requires the use of a test oscillator that will cover the following frequencies 456, 1400 and 4000 KC. The L.F. coils are aligned for maximum signal as indicated by an output meter which is to be connected across the output transformer. L.F. frequency is 456 KC. There are four adjustments for L.F. alignment.

To align broadcast band it is only necessary to align receiver at 1400 KC because of the initial setting at the factory. A 200 mmfd. condenser is necessary for a dummy antenna. This is inserted in series with the test oscillator and the antenna connection of the radio receiver. Set oscillator and pointer on dial to 1400 KC and adjust the two trimmer condensers on the tuning condenser for maximum output. Turn Band Switch to Short Wave position. Feed a 4000 KC signal from the test oscillator and check receiver.
This receiver is an 8 tube alternating current operated superheterodyne.

The tubes used are a 6A7 as oscillator modulator, a 6D8 as IF amplifier, a 6H6G as A.V.C. and audio rectifier, a 6Y7G as audio voltage amp, an 805 as power rectifier, a 6L5 as tuning indicator and two type 6V6G tubes as push pull audio power amplifiers.

This receiver is made to cover 3 tuning bands, the standard broadcast band which has a frequency range of 540 K.C. to 15 M.C. the middle or police band which has a frequency range of 15 M.C. to 50 M.C. and a high frequency or foreign band which is from 19 M.C. to 50 M.C.
I.F. ALIGNMENT  Adjust the test oscillator to 175 K.C. and connect the output directly to the grid of the first detector tube (HA7), without the use of any series condenser or resister; the omission of series condenser and resister to block out the AYC action. The oscillator trimmer to peak. (Front section of gang condenser) ground on the test oscillator can be connected to the chassis ground. Align the trimmers of the first and second i.f. transformers to peak or minimum reading on the output meter.

Oscillator  Adjust the test oscillator to 1450 K.C. and connect the (6D6 tubes), and the rear condenser section tunes the detector grid cell for the equivalent of a low capacity type average antenna. Set the dial pointer to 1450 K.C. and adjust the

ANTENNA LEAD-IN WIRE
HOLLOW TIP (Connect Only)
NOTE: COLOR OF WIRES TO CORRESPOND WITH COLOR OF PAINT SPOTS ON SPKR. FIELD & K.C. NO.
YELLOW FIELD COIL
GREEN VOICE COIL
RED: NO CONNECTION
SPKR. SOCKET & PLUG
FILTER CHROME
41 BATTERY CABLE
ANTENNA CABLE
VOLUME CONTROL
TRANSFORMER
SPKR.

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ALIGNMENT DATA

I.F. ALIGNMENT. Adjust the test oscillator to 175 K.C. and connect the output directly to the grid of the first detector tube (6A7), without the use of any series condenser or resistor; the omission of series condenser and resistor to block out the AVC section. The ground on the test oscillator can be connected to the chassis ground. Align the trimmers of the first and second I.F. transformers to peak or maximum reading on the output meter.

OSCILLATOR ALIGNMENT. Adjust the test oscillator to 1400 K.C. and connect the output to the antenna through a .0001 mfd. mica condenser to give the equivalent of a low capacity type of antenna. Set the dial pointer to 1400 K.C. and adjust the oscillator trimmer to peak.

R.F. ALIGNMENT. The next step is to adjust the center and rear trimmers of the gang condenser to peak. The center section of the gang condenser tunes the antenna amplifier stage (6D6 tube), and the rear condenser section tunes the detector grid coil of the 6A7 tube.
ALIGNMENT - SEE SPECIAL SECTION. VOL. VIII.

465 KC. BROADCAST - Dial and trimmer to 1720 KC, peak oscillator trimmer. Dial to 10 KC, peak antenna and R-F trimmers. Dial and generator at 600 KC, pad the
for maximum peak, while rooking the variable gang condenser.

FOREIGN - Dial and generator at 18 MC, adjust the oscillator trimmer generator to 15 MC, adjust the R-F and antenna trimmers to maximum sensitivity variable condenser across the signal. Dial and generator at 6.5 MC, pad the
circuit to maximum peak while rooking the variable condenser.
**THE VOLTAGE**

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<th>Position of Tube</th>
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<th>Cathode</th>
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<th>No. 2</th>
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* A.C. each plate
  Total "A" current = 0.3 amperes.

**INTERMEDIATE FREQUENCY:** Unless an intermediate transformer has become defective due to an open or burned out winding it should never be necessary to readjust the intermediate stage. Should this occur it is essential that an oscillator be used with some type of output metering device to correctly tune the I.F. Transformers. Connect the high side of the oscillator output to the control grid cap (grid No. 4) of the 6A7 oscillator modulator tube leaving the grid cap disconnected. Connect a 50,000 ohm resistor from the control grid cap of the 6A7 tube to the rotor frame of the V.M.I.A. condenser. If the output of the oscillator is too great the value of this resistor may be reduced. The ground side of the test oscillator should be connected to the chassis. Set the oscillator to 680 K.C. (this must be accurate) and the output of the oscillator so that a convenient reading is obtained on the output meter. Align the first intermediate transformer by turning the intermediate frequency transformer trimmer screw up and down until maximum reading is obtained on the output meter. Both the primary and secondary trimmer screws should be adjusted in this manner. It is always best to recheck the grid side of the intermediate frequency transformer adjustment to make certain the alignment of the secondary has not been changed by the adjustment of the primary trimmer. The first I.F. transformer is double-tuned, the trimmers of which are accessible through the top of the I.F. can, one section of which is adjusted by turning the brass hex nut and other section by screwing in and out the set screw that is accessible through the hole provided in the brass hex nut. The second intermediate transformer has one trimmer which is likewise accessible from the top of the intermediate transformer shield can. After both intermediate transformers are correctly adjusted the alignment of the intermediate stage is complete and the trimmers should not be further disturbed. The grid cap should be connected to the grid of the 6A7 tube and 50,000 ohm resistor removed.

**VARIABLE CONDENSER ALIGNMENT:** If the intermediate frequency stage has been realigned or if the antenna, R.F. or oscillator coil have been replaced it will be necessary to realign the variable condenser. If the receiver is not mounted in the set housing it will be necessary to place a metal shield along side of the variable condenser and flush against the side of the set chassis nearest the variable condenser trimmers. It is necessary to do this otherwise when the receiver is placed in the set housing the metal housing will dampen the receiver. Three holes should be made in the shield to correspond with the holes provided in the set housing which permits alignment of the receiver when the set is in the housing. Be sure the shield is properly grounded to the receiver chassis. NOTE: When the receiver and "B" unit is removed from the set housing be sure to set the receiver on top of the "B" unit, otherwise considerable R.F. and audio hash will be encountered. Regardless of whether the receiver is mounted in the set housing or not the alignment procedure is the same. Adjust the variable condenser to minimum capacity. Connect the high output side of the set oscillator to set antenna lead and the low side to antenna shield lead or chassis. Then adjust the test oscillator to 1500 K.C. Next, BRING THIS SIGNAL IN BY ADJUSTING THE VARIABLE CONDENSER OSCILLATOR SECTION TRIMMER. Looking at the front of the receiver, the variable condenser trimmers are mounted on the left side of the set on the variable condenser and reading from the bottom up the trimmers are, oscillator, R.F. and antenna. After the oscillator section has been properly peaked, adjust the antenna and R.F. trimmers in the order mentioned. After the variable condenser trimmers have been correctly adjusted at 1500 K.C. turn the receiver to 800 K.C. and adjust the oscillator to this frequency. Then adjust the coupling padding condenser which is located on the left hand side to the rear of the chassis, to obtain maximum reading on the output meter. If the set is mounted in the receiver housing the padding condenser is accessible through the small hole in the side of the set housing. It may be necessary to turn the variable condenser slightly to the right and left to find the point where greatest output is obtained. If the alignment procedure is correctly followed the receiver will now track correctly over the entire tuning range. It is always advisable to align the receiver with the tubes to be used in the set whenever possible.
SPiegel INC.

MODEL 5100, 5110
Chassis 69B
Schematic Voltage
Trimmers, Socket
Alignment

FREQUENCY
1720 to 565 KC
2.3 to 6.5 MC

The short wave band. When padding the BROADCAST oscillator rock variable condenser. Adjust wavetrap to 465 KC. Repeat all adjustments.
ALIGNMENT PROCEDURE

Correct alignment is of extreme importance in all-wave receivers. The receivers are properly aligned at the factory with precision equipment and recheck should not be attempted by the service technician until all other causes of faulty operation are corrected.

1. A signal generator which will provide an accurately calibrated signal at any frequency from 100 kilocycles to 10 megacycles. The generator should have an adjustable signal output.
2. An audio-frequency voltmeter of the low voltage type to be connected across the moving coil of the speaker. This should be capable of providing a readable deflection for relatively low output levels to avoid the effects of overload.
3. An insulated or nonmetallic screwdriver for the adjustment of trimmers.

IF ALIGNMENT 455 KC

1. Connect the output meter (low scale) across the loud speaker voice coil. Turn the wave band switch to broadcast position. Turn the volume control to its maximum position.
2. Connect the test oscillator proceed to chassis and the "hot" lead from the test oscillator to the grid of the EL34 converter tube through a series .1 Mfd condenser. Set test oscillator to 455 KC.
3. Adjust IP alignment screws of second IF transformer adjacent to 6P6 power tube to maximum output, reducing output of test oscillator to keep the meter reading on scale as alignment proceeds.
4. Adjust alignment of first IF transformer, (directly behind tuning condenser) to maximum output as described above.
5. Readjust these trimmers for accurate alignment. Always use the lowest possible output from the test oscillator to preclude the possibility of automatic volume control action causing improper adjustment.

FOREIGN BAND 5.7 TO 18.5 MEGACYCLES

1. With test oscillator connected to antenna and ground terminals through a 400 ohm resistor set oscillator at 18 megacycles.
2. Set the dial scale to 18 megacycles and adjust the oscillator trimmer condenser (C4-A) to resonance using the counterclockwise or low capacity point.
3. Adjust input circuit trimmer (C2-D) to maximum response, rocking the gang condenser back and forth a degree or two to obtain proper maximum.

POLICE OR MIDDLE BAND 1.75 TO 5.8 MEGACYCLES

1. With test oscillator connected to antenna and ground terminals through a 400 ohm resistor set oscillator at 18 megacycles.
2. Adjust oscillator trimmer condenser (C4-D) for maximum response using the counterclockwise or low capacity point.
3. Adjust input circuit trimmer (C2-D) to maximum response rocking the gang condenser as described above.

TRIMMER LAYOUT

BROADCAST BAND 535 TO 1800 KC

1. With test oscillator connected to antenna and ground terminals through a 200 ohm resistor set oscillator and receiver dial to 1000 kilocycles.
2. Adjust broadcast oscillator trimmer (C4-E) to obtain maximum response.
3. Adjust antenna circuit trimmer (C2-F) for maximum output.
4. Adjust preselector trimmer (C4-G) for maximum output.
5. Set test oscillator and dial to 600 kilocycles and tune in the signal, then adjust broadcast band packing condenser (C01) for maximum output. This padder is mounted on the alignment board near the panel and is adjusted through a hole provided in the back of the chassis panel. Rock the condenser back and forth a degree or two in order to obtain proper maximum.
6. Repeat the 1800 KC alignments described above for greater accuracy.
This radio receiver is designed for operation on standard American broadcasts, Police, Amateur, aviation, ships, foreign and U. S. governmental time and weather broadcasts. This vast coverage in radio entertainment and utility is divided into four parts or bands indicated on the tuning dial and the wave band indicating device.

The dial is calibrated with each band covering 340 degrees of tuning scale length and are each concentric with the center of the dial face. The innermost scale is calibrated from 150 to 375 K.C. (2000 to 800 meters) and covers the range necessary for receiving governmental time and weather reports. The second band from the center is for standard broadcasts covering from 550 to 1700 K.C. (175 to 545 meters). The third band from the center covers the intermediate short wave length broadcasts of Police, Amateur, Aircraft and ships and extends from 1700 to 5400 K.C. (55 to 180 meters). The fourth band covers all of the principle short wave channels for reception from countries all over the world. This band carries a calibration of from 5.5 to 18 megacycles (16.4 to 55 meters.) This short wave scale is the one which includes the five internationally assigned bands—the 19, 25, 31, 39 and 49 meter channels.
The dial is calibrated with each band covering 340 degrees of tuning scale length and are each concentric with the center of the dial face. The innermost scale is calibrated from 150 to 375 K.C. (2000 to 800 meters) and covers the range necessary for receiving governmental time and weather reports. The second band from the center is for standard broadcasts covering from 550 to 1700 K.C. (175 to 545 meters). The third band from the center covers the intermediate short wave length broadcasts of Police, Amateur, Aircraft and ships and extends from 1700 to 5400 K.C. (55 to 180 meters). The fourth band covers all of the principle short wave channels for reception from countries all over the world. This band carries a calibration of from 5.5 to 18 megacycles (16.4 to 55 meters.) This short wave scale is the one which includes the five internationally assigned bands—the 19, 25, 31, 39 and 49 meter channels.
ALIGNMENT

IF trimmer adj. at 456 KC through .05 or .1 mf dummy condenser.

BC osc. trimmer and ant. trimmer adj. at 1400 KC through .001 mf dummy.

Padder at 600 KC. Recheck at 1400 KC.

Foreign Band: Through .0001 mf dummy, adj. at 14000 KC both the S.W. oscillator and S.W. trimmers. Check for image frequency at 13100 KC for proper weaker signal.

Police Band: Through 400 ohm resistor .0001 mf cond. series dummy, adjust osc. trimmer and ant. trimmer at 4000 KC. Padder adj. 1800 KC. Recheck at 4000 KC.

Wave Trap: At rear of chassis near grd. & ant. post adj. wave trap screw at 456 KC.

Dial Calibration: Government & Weather Reports - 150 to 375 KC.

Broadcast 550 to 1700 KC.

Police, Amateur, Aircraft & Ships 1700 to 5400 KC.

Short Wave 5.5 to 18 megacycles.

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L.F. Alignment:
Connect the oscillator through a .1 condenser to the grid of the 1C8 tube and set the oscillator to 456 kilocycles. Peak each L.F. stage to resonance as indicated by maximum output on the output meter.

R.F. Alignment:
With the wave change switch in the broadcast position, set the oscillator to 1700 kilocycles and connect the variable condenser to the grid of the 1C8 tube. Compare this frequency setting on the output meter with the factory setting of 1700 kilocycles. Reset the oscillator to 1700 kilocycles and adjust the condenser trimmer located on the chassis across the screwdriver. Now set oscillator to 1000 kilocycles and adjust the condenser trimmer located on the chassis under the chassis, as indicated.

For aligning the police band, set the oscillator to 5 megacycles and switch to the police band position. The police band is located on the right side of the chassis. Rocking the variable condenser slightly back and forth to get maximum

7-Tube, 6-Volt Battery Operated Superheterodyne
NOTE:
1. I.F. = 465 K.C.
2. All numbers shown relative to parts are our part numbers.
3. Automatic tuning units with prefix 'A' are complete assemblies.
4. L.6 & L.1 = 2000 micro M.H.
5. L.6 & L.1 = 1.6 & 6.8 M.H.
6. L.4 = Oscillator pick-up.
7. L.6 & L.1 = 200 to 2200 M.H.
8. L.5 = 1.6 to 220 M.H. grid secondary.

TWO BAND
FIVE TUBE AC/DC SUPERHETERODYNE
1520-240 Kilocycles
1.5- 4.8 Megacycles

CONVENTIONAL ALIGNMENT:
ALIGNMENT FREQUENCIES
IF 465 K.C. (Leave grid cap disconnected)
BROADCAST 1400 K.C., 600 K.C.
SHORT WAVE 1700 K.C., 3.4 M.C.
Align in order given, check
SEE SPECIAL SECTION VOL. VIII.

VOLTAGE TABLE
Line Voltage : 116

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>GRID NO. R</th>
<th>GRID NO. 5 and 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>105</td>
<td>50</td>
<td>1.8</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>6DJ</td>
<td>105</td>
<td>50</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7G6</td>
<td>40</td>
<td>10</td>
<td>.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>100</td>
<td>108</td>
<td>108</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Triode plate voltage. Comparative only is not the true voltage applied. The voltmeter, when readings are taken at this point, is in series with a very high resistance.

** Bias for the 43 output tube is obtained by the voltage drop across the filter choke. Read bias voltage from cathode to negative side of filter choke.
ALIGNMENT PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator are required.

1. Solder the output meter leads from output plate (P) to screen (S) of the 7015GT tube (See voltage chart). The leads must be soldered since the bottom cover must be replaced during alignment. The output meter leads can be brought through the power cord opening.

2. Connect the ground lead of the signal generator through a .25 mfd. condenser to some portion of the chassis in the VICINITY OF THE GANG CONDENSER.

3. Remove the connector between the antenna terminals on the bottom of the set.

4. Turn the volume control to the maximum volume position and keep it in this position while aligning.

5. The tuning knob should be adjusted so that it is centered and points away from the chassis when the gang condenser is in full mesh.

### Dummy Ant. in Series with Sig. Generator

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 MFD. Condenser</td>
<td>Lug on bottom gang condenser</td>
<td>455 KC</td>
<td>Any point where it does not affect signal</td>
<td>1</td>
<td>2nd I.F.</td>
<td>Adjust for maximum output. Then repeat adjustment (if the set oscillates, see precautions under heading &quot;1. F. Oscillation&quot;)</td>
</tr>
<tr>
<td>200 MMFD. Mica Condenser</td>
<td>Antenna Terminal on bottom (Terminal nearest back of chassis)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>4</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust trimmer for maximum output</td>
</tr>
<tr>
<td>200 MMFD. Mica Condenser</td>
<td>Antenna Terminal on bottom (Terminal nearest back of chassis)</td>
<td>1500 KC</td>
<td>Tune to 1500 KC Generator Signal</td>
<td>5</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output</td>
</tr>
</tbody>
</table>

### I. F. OSCILLATION

When aligning this set, I. F. oscillation may be encountered if the following precautions are not observed:

1. Keep the bottom cover plate on during alignment.
2. Keep the signal generator leads as far from the chassis as possible in order to prevent unnecessary feed-back.
3. Connect the ground lead of the signal generator through a .25 mfd. condenser to some part of the chassis in the VICINITY OF THE GANG CONDENSER.
4. Keep the orange lead of the volume control away from the 2nd I.F. transformer. Separating this lead from the others surrounding it at the base of the 25BBGT tube will also help.

### BUILT-IN ANTENNA SYSTEM

The Built-In Antenna incorporated in this receiver will generally give very satisfactory results in localities where powerful broadcast stations exist. This Built-In Antenna will function when the terminals on the bottom of the chassis are connected together. In cases where noise is excessive or greater sensitivity is desired, remove the jumper connecting these terminals and connect an external antenna to the terminal marked "External Aerial." This is the terminal nearest the back of the set.

The Built-In Antenna Condenser No. 12 couples the primary of the antenna coil to one side of the power line, which acts as the antenna. The R. F. choke No. 21 is an iron-core choke whose impedance is high at broadcast frequencies. This choke serves to prevent condenser No. 21 from bypassing the signal voltage picked up by the power line. It also prevents feed-back into the antenna circuit of radio frequency energy generated in the set itself.

When aligning this receiver, the jumper connecting the antenna terminals on the bottom of the set should be removed. This will prevent picking up signals which might interfere with the alignment procedure.

### CHANGE IN VOLUME CONTROL CIRCUIT

On early releases of this model, a volume control was used which required a 4700 ohm resistor connected as shown by the dotted lines in the circuit diagram. In later production sets, a volume control with a different tap was used so the 4700 ohm resistor was not required. This later volume control carries the same part number.

When replacing a control using the resistor with a later type control, the connections are the same but the 4700 ohm resistor is omitted. Only the new controls are carried in stock by Stewart-Warner.
TYPICAL TROUBLES AND THEIR SYMPTOMS.

1. TROUBLES: No newspaper is printed when the network is turned on.
   REASON: The motor to contactor arm is connected in reverse. Reverse connections at motor terminals.

2. TROUBLES: When either the start or stop button is pressed, the machine does not stop.
   REASON: The motor is not receiving power. Check the wiring from the motor to the control panel.

3. TROUBLES: The machine does not start when the start button is pressed.
   REASON: The machine is not receiving power. Check the wiring from the power source to the machine.

REMOTE CONTROL UNIT

This remote control unit is designed to provide reliable and efficient control over a wide range of industrial processes. It features a simple and intuitive interface that allows users to easily control various operations from a remote location.

1. Turn on the remote control unit.
2. Connect the remote control unit to the main control unit using the provided cables.
3. Test the remote control unit by pressing the buttons to verify that the machine is responding correctly.
4. If you encounter any issues, refer to the user manual for troubleshooting tips.

REPLACING THE ROLLER DIAL DRIVE CORD

1. Place the cord in the roller dial.
2. Secure the end of the cord to the roller dial using a screwdriver.
3. Ensure that the cord is appropriately positioned and connected to the roller dial.

STEWART-WARNER SCALES

MODEL 30-1111 to 30-1113

DIAGRAM ON PAGE 107
These chassis are 6-tube, two band, push-button tuning superheterodyne receivers. The tuning ranges are 540 to 1725 Kc and 5.4 to 15.4 Kc. The i. F. is 465 Kc.

**FOR ALIGNMENT:** An output meter and an accurately calibrated signal generator with a tuning range from 465 Kc to 14 Kc are required.

1. Connect the output meter across the voice coil or between the plate of the 6k6-g output tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the black (ground) wire or the chassis.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh, set the dial pointer in a horizontal position. If the pointer is incorrectly set, it is merely necessary to move the pointer to the correct position by hand, while holding the gang in the full mesh position.

<table>
<thead>
<tr>
<th>DUTY ANT.</th>
<th>CONNECTION OF SIG. GENERATOR</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>BAND</th>
<th>RECEPTOR MODELS</th>
<th>TRIMMER NUMBER</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN SERIES</td>
<td>WITH SIG. GENERATOR</td>
<td>OUTPUT TO RECEIVER</td>
<td></td>
<td></td>
<td>1-2</td>
<td>2nd i.f.</td>
<td>ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-4</td>
<td>1st i.f.</td>
<td></td>
</tr>
<tr>
<td>1 KF CONDENSER</td>
<td>CONTROL GRID OF 6A6-TUBE</td>
<td>465 Kc</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LED (Blue Wire)</td>
<td>465 Kc</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LED (Blue Wire)</td>
<td>1500 Kc</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LEAD (Blue Wire)</td>
<td>500 Kc</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LEAD (Blue Wire)</td>
<td>14 MC</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LEAD (Blue Wire)</td>
<td>14 MC</td>
<td>BROADCAST BUTTON PULLED IN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Diagram:**

- **TOP VIEW OF CHASSIS**
  - 465 K.C. 1
  - 465 K.C. 2
  - 465 K.C. 3
  - 465 K.C. 4
  - 465 K.C. 5
  - 600 K.C. 6

- **BOTTOM VIEW OF CHASSIS**
  - 1500 K.C. (Antenna)
  - 1500 K.C. (Disc. Oscillator)
  - 14 MC (Rock Dial Antenna)
  - 14 MC (Antenna)
HOW TO SET THE PUSH-BUTTON TUNER

1. Be sure that the set is connected to a good antenna system.
2. Turn on the set and allow it to operate for at least one-half hour before setting up the push buttons.
3. Make a list of the five nearby stations to which you can tune. This is to be done in the operating range of a button before attempting to set up that button for the particular station.
4. Determine the dual trimmer switch. Also, refer to Fig. 1. The trimmer switch should be adjusted so that the button on the tuning dial is in the range of the button for the desired station.
5. If you wish to change the frequency of the button, adjust the trimmer switch accordingly.

HOW TO CHANGE THE OPERATING RANGE OF A BUTTON

The operating range of a button may be changed by merely changing the dual trimmer used with that button. Dual trimmers with the ranges indicated below can be obtained from your Stewart-Warner dealer or directly from the Stewart-Warner Corporation, under the following part numbers:

- 116942 - 1100 to 1300 KC....
- 116943 - 1300 to 1700 KC....
- 116944 - 1700 to 2000 KC....

If your button is not listed, consult your Stewart-Warner dealer or write directly to the Stewart-Warner Corporation for the range of dual trimmers available.

TRIMMER SCREWS SHOULD NEVER BE TOO LOOSE OR TOO TIGHT.

1. If the station you wish to set up is not available, you may substitute with another button of the same range. This is done so that you may identify the station by hearing its program.

2. Push in the button which is labeled "Broadcast" and use the tuning knob to bring in the station that you desire on your set. This is done so that you may identify the station by hearing its program.

3. Push in the button which is labeled "Local" and use the tuning knob to bring in the local station that you desire on your set. This is done so that you may identify the station by hearing its program.

4. Push in the button which is labeled "Servo" and use the tuning knob to bring in the servo station that you desire on your set. This is done so that you may identify the station by hearing its program.

5. Push in the button which is labeled "晔," and use the tuning knob to bring in the station that you desire on your set. This is done so that you may identify the station by hearing its program.

6. Push in the button which is labeled "晔," and use the tuning knob to bring in the station that you desire on your set. This is done so that you may identify the station by hearing its program.
STEWART-WARNER CORP. Speaker Cone Replacements

1937 Models

In order to facilitate the replacement of the cones in our 8 and 12 inch speakers with the speakers placed at the center of the pole pieces, we will furnish special cones which can be installed without any special tools or equipment as described under "INSTALLING NEW CONES".

These cones have spiders fastened to the outsides of the voice coils. The spiders are mounted on the speaker shell by means of screws. The necessary parts are already provided in the shell. These special cones are supplied complete with the necessary parts and mounting hardware under the part numbers in the table shown on page two of this bulletin.

FIVE INCH SPEAKERS WITH SPIDERS INSTALLED FOR POLE PIECE

These cones on all speakers can be replaced in the conventional manner as described later in this bulletin under "INSTALLING NEW CONES".

INSTRUCTIONS FOR INSTALLING NEW CONES

On every speaker model, the voice coil is cut to the outer edge of the spider and break the spider away from under which it is mounted. This speaker should be left in place. To make sure the speaker is at the center of the pole piece, remove the screw and then cut out the cone around the outer edge. Remove the voice coil and speaker assembly and clean with a brass brush all traces of the old cone and cone supports where the cones were clamped to the frame.

Clean any partially from the air gap.

Turn off the speaker power before handling the voice coil and speaker assembly. If the voice coil is cut to the outer edge of the pole piece, check the speaker to see if it is damaged or if the speaker is not the warranty limit of replacing the cones. The price of the cone plus fifty cents labor charge will be the price of the cone plus fifty cents labor charge. We will assume no transportation charges under these conditions.

REPLACEMENT CONE PART NUMBERS

(SPEAKERS FOR ALL 1937 SPEAKER MODELS)

Speaker Cone Replacement Cone

B-344—. . . . . . . . . . . . . . 112G—Magneto - Speaker
B-530—. . . . . . . . . . . . . . 112G—Magneto - Speaker
B-534—. . . . . . . . . . . . . . 112G—Daily production-quality speakers supplied with screws, order number #3004

WE CAN SUPPLY REPLACEMENT CONES WHICH CAN BE INSTALLED WITHOUT SPECIAL TOOLS OR EQUIPMENT.

The following are some suggestions for installing these cones:

(1) Remove the voice coil from the speaker.
(2) Remove the spider from the speaker.
(3) Remove the cone from the speaker.

We can supply replacement cones which can be installed without special tools or equipment.

The following are some suggestions for installing these cones:

(1) Remove the voice coil from the speaker.
(2) Remove the spider from the speaker.
(3) Remove the cone from the speaker.
Alignment Equipment & Procedure

Alignment equipment is used to check the performance of the receiver and ensure it is functioning correctly. The equipment includes:

1. A signal generator
2. A spectrum analyzer
3. A power meter
4. A frequency counter
5. A signal correlator
6. A signal analyzer
7. A signal generator
8. A signal correlator
9. A signal analyzer
10. A signal generator
11. A signal correlator
12. A signal analyzer

To align the receiver:

1. Turn on the signal generator and set the frequency to the desired level.
2. Connect the signal generator to the receiver.
3. Adjust the signal generator to produce a stable signal.
4. Adjust the receiver to match the signal generator's frequency.
5. Monitor the signal generator and receiver to ensure they are aligned.

Adjustment Information:

- Frequency: 900 MHz
- Power: 100 mW
- Bandwidth: 10 kHz
- Modulation: AM

Alignment Procedure:

1. Connect the signal generator to the receiver.
2. Tune the receiver to the signal generator's frequency.
3. Adjust the receiver's gain and filter settings.
4. Monitor the signal generator and receiver to ensure they are aligned.
5. Adjust the receiver's output level to the desired level.
6. Repeat the alignment process until the receiver is aligned.

Note: These instructions are for reference only. Always consult the manufacturer's manual for specific alignment procedures.
Oscillator coil
Antenna coil

Push button tuner
Switch

Range switch sections shown in broadcast manual tuning position

Note: Terminals of switches and coils shown in pictorial views are lettered to correspond to similarly lettered terminals on the circuit diagram at the right. Terminals which are connected together carry the same letter.

Socket voltages
Antenna grounded
Dial tuned to 540 kc.

Bottom view of chassis

6K6G
Output
250 - 260

5W4G
Rectifier
320 A.C.

6Q7G
2nd A.C.-A.F.

6K7
I.F.

Voltages measured between socket terminals and chassis

6A8G
1st DET. & OSC.

Line voltage 117 volts

Tuning eye voltages measured at hot end of cable
Red - 240
Yellow - 135
Green-white - 12
Blue - 60 A.C.-0

Voltage across speaker field
65 volts

6A8G
1st DET. & OSC.

5V26
Rectifier
320 A.C.

6Q7G
2nd A.C.-A.F.

6K7
I.F.

Bias supply voltages
-28 A.C.-0

REAR OF CHASSIS

Use a high resistance voltmeter of 1000 ohms per volt.

Note A: The bias for the control grids of the 6A8-G, 6K7, 6L5, and the diode plates of the 627-G tubes is -2.8 volts measured across resistor 40C.

Note B: The bias for the control grid of the triode sections of the 627-G is -4.3 volts measured across resistor 40B and 40C.

Note C: The bias for the control grid of the 6K6-G output tubes is -18 377A - 377B - 18 volts measured across resistors 40A, 40B and 40C.

Electrical parts

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### Supplementary Service Data

#### Models R-146-X, R-147-X, and R-147-P

**6K7**
- LF AMP
- 70A
- 708
- 71 PHONO

**6H6**
- 2nd DET & A.V.C.

**Power Transformer Connections**
- 5V4G Rectifier
- 400 V
- 300 V
- 125 V
- 200 V
- 220 V
- 240 V

**Universal Transformer Used with Models R-146-X; R-147-X; and R-147-P.**

<table>
<thead>
<tr>
<th>Model</th>
<th>PART NUMBER OR NAME</th>
<th>CURRENT RATING</th>
<th>PART NUMBER OR NAME</th>
<th>CURRENT RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-146-X</td>
<td>86841</td>
<td>1 Amp.</td>
<td>86844</td>
<td>1 Amp.</td>
</tr>
<tr>
<td>R-147-X</td>
<td>86002</td>
<td>1.5 Amp.</td>
<td>86002</td>
<td>1.5 Amp.</td>
</tr>
<tr>
<td>R-147-P</td>
<td>86002</td>
<td>1.5 Amp.</td>
<td>86002</td>
<td>1 Amp.</td>
</tr>
</tbody>
</table>

**Speakers and Output Transformers**

The R-866-A 6-inch dynamic speaker is used with model R-147-X, and the R-868-A 10-inch dynamic speaker is used with model R-147-P. Please note that these speakers require different output transformers. Speakers and output transformers are listed below for the models R-146-X, R-147-X and R-147-P respectively.

<table>
<thead>
<tr>
<th>Model</th>
<th>PART NO.</th>
<th>SPEAKER SIZE</th>
<th>OUTPUT TRANSFORMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-1461-X</td>
<td>R-247-A</td>
<td>6-inch</td>
<td>86903</td>
</tr>
<tr>
<td>R-146-X</td>
<td>R-248-A</td>
<td>10-inch</td>
<td>86923</td>
</tr>
<tr>
<td>R-1471-X</td>
<td>R-266-A</td>
<td>6-inch</td>
<td>86923</td>
</tr>
<tr>
<td>R-147-X</td>
<td>R-266-A</td>
<td>6-inch</td>
<td>86923</td>
</tr>
<tr>
<td>R-147-P</td>
<td>R-266-A</td>
<td>12-inch</td>
<td>86970</td>
</tr>
<tr>
<td>R-1479-P</td>
<td>R-283-A</td>
<td>12-inch</td>
<td>86970</td>
</tr>
</tbody>
</table>

**Additional Parts Used On**

- Models R-146-X, R-147-X and R-147-P

<table>
<thead>
<tr>
<th>Diagram Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 36841</td>
<td>Fuse, 1 ampere (to be used on models specified in note)</td>
<td>$0.10</td>
</tr>
<tr>
<td>70A-70B-84406</td>
<td>Phonograph toggle switch (used on R-146-X, R-147-X)</td>
<td>$1.25</td>
</tr>
<tr>
<td>721-728-84411</td>
<td>Phonograph terminal strip (used on R-147-P)</td>
<td>$0.05</td>
</tr>
<tr>
<td>721-728-84418</td>
<td>Phonograph toggle switch (used on R-147-P)</td>
<td>$1.50</td>
</tr>
<tr>
<td>72-73-82444</td>
<td>1N3312 and wire, 25 ft.</td>
<td>$0.40</td>
</tr>
<tr>
<td>80-86902</td>
<td>Fuse, 3/4 ampere (used with model R-146-X)</td>
<td>$0.12</td>
</tr>
<tr>
<td>80-86904</td>
<td>Output transformer (used with model R-1461-X)</td>
<td>$2.00</td>
</tr>
<tr>
<td>85-86970</td>
<td>Output transformer (used with model R-14607-P, X)</td>
<td>$2.00</td>
</tr>
<tr>
<td>86-86970</td>
<td>Output transformer (used with models R-147-P and)</td>
<td>$2.00</td>
</tr>
<tr>
<td>83-86902</td>
<td>Fuse, 1.5 ampere (used on models R-147-X)</td>
<td>$0.10</td>
</tr>
<tr>
<td>81-86903</td>
<td>Universal power transformer (100 to 240 volts, 25 to</td>
<td>$12.00</td>
</tr>
<tr>
<td>69405</td>
<td>Universal power transformer (100 to 240 volts, 25 to)</td>
<td>$0.12</td>
</tr>
<tr>
<td>69405</td>
<td>Universal power transformer (100 to 240 volts, 25 to)</td>
<td>$0.12</td>
</tr>
<tr>
<td>69405</td>
<td>Universal power transformer (100 to 240 volts, 25 to)</td>
<td>$0.12</td>
</tr>
</tbody>
</table>

**Prices Subject to Change Without Notice**
ALIGNMENT EQUIPMENT & PROCEDURE

For alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 Kc. to 1500 Kc. are required.

1. Connect the output meter across the voice coil or between the plate of either of the 6670 tubes and ground through a .1 mfd. condenser. These tubes are connected in parallel, not push-pull. The connection will depend upon the type of meter. The following table shows the proper connections across the voice coil or plate of the tubes in each case:

2. Connect the ground lead of the signal generator to the chassis of the receiver and keep it connected in this manner throughout the entire alignment procedure.

3. Turn the volume control to the maximum volume position and leave it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh, set the pointer to the last mark on the left end of the dial scale. If the pointer is slightly off calibration, loosen the set screw in the pointer and drive drum, which is installed in drum case on the left hand side of the gang condenser. With the gang condenser in full mesh, turn the drum until the pointer is in the correct position. If the pointer is off calibration several dial divisions, release it from the pointer drive drum by spreading the clip on the pointer pin and move the drum until the pointer is on the last mark on the left end of the dial scale. Hold the pointer in place and check to see if the gang condenser is still fully meshed. Then tighten the pointer clip being careful not to cut the cord. Place a drop of household or speaker cement on the cord and pointer clip to prevent the pointer from slipping.

5. Choice of Dummy Antenna and Accessories

6. DIAL AND MISCELLANEOUS PARTS

7. PHONOGRAPH CONNECTIONS

8. TESTING

9. HOW TO SET-UP AND USE THE PUSH BUTTON TUNER.
THIS APPLIES ONLY TO THE 91-648 RECEIVER IDENTIFIED BY THE LETTER S STAMPED ON BACK OF CHASSIS.

ALIGNMENT PROCEDURE

FOR ALIGNMENT, an output meter and an accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil or between the plate of the 6F6G output tube and ground through a 1 mil condenser. The connection will depend upon the type of meter. The more sensitive type should be connected across the voice coil.

2. Connect the ground lead of the signal generator to the chassis of the receiver and keep it connected in this manner throughout the entire alignment procedure.

3. Turn the volume control to the maximum volume position and leave it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh, the pointer should be at the last dial division at the left end of the dial scale. With the gang condenser alone, the pointer should be at the last dial division at the left end of the dial scale.

5. IF YOU DESTROY THE PHOTOGRAPH PICK-UP CABLE, FIT A JUMPER BETWEEN THE TWO OUTSIDE TERMINALS OF THE TERMINAL STRIP, AND GROUND THE CENTER TERMINAL TO CHASSIS.

### DIAL AND MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>11370</td>
<td>Adjusting Lug for Push Button shaft</td>
<td>.005</td>
</tr>
<tr>
<td>11379</td>
<td>Clip for coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11378</td>
<td>Clip for trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11376</td>
<td>Clip for trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11377</td>
<td>Clip for trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11378</td>
<td>Clip for trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11379</td>
<td>Clip for trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11370</td>
<td>Adjusting Lug for Push Button shaft</td>
<td>.005</td>
</tr>
<tr>
<td>11378</td>
<td>Clip for coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11379</td>
<td>Clip for wire trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11376</td>
<td>Clip for wire trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11377</td>
<td>Clip for wire trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11378</td>
<td>Clip for wire trap coil mg.</td>
<td>.01</td>
</tr>
<tr>
<td>11379</td>
<td>Clip for wire trap coil mg.</td>
<td>.01</td>
</tr>
</tbody>
</table>

### PHONOGRAPH CONNECTIONS

This receiver is equipped with a phonograph turntable and a crystal pickup unit for phonograph operation. The crystal pickup unit is switched into the audio amplifier section of the radio by means of a double-pole double-throw switch adherent to the turntable. With this switch in the phonograph position (marked P) the receiver volume control is disconnected from the low side of the 2F7 transformer and connected across the crystal pickup unit. The radio frequency section of the receiver is at the same time silenced by the opening of the condensers of the 6AG6 and 6X7 tubes.

The connections in the phonograph unit are made on the terminal strip located on the back of the radio chassis. IMPORTANT: If the receiver chassis is removed from the cabinet for test, you must put a jumper wire between the two outside terminals of this terminal strip. Also the center terminal must be grounded to the chassis.

HOW TO SET UP AND USE THE PUSH BUTTON TUNER

1. Connect receiver to good antenna system and operate for fifteen minutes, then remove escutcheon surrounding push button.
2. Select five nearby stations to which you wish to set up the button. Be sure to select nearby powerful stations since weak signals will generally give better results when tuned manually. Any button may be used for a station on any part of the dial.
3. Loosen the lock of the dial button and insert the push button shaft (about one turn clockwise will be sufficient). Keep the screwdriver inserted in the screw slot and push against the screw. At the same time carefully tune in the station using the tuning knob. YOU MUST PULL THE SCREW DRIVER OUT OF THE SCREW DURING THE ENTIRE TIME THAT YOU ARE TUNING. Now, while pushing against the screw driver, retighten the screw. To turn further may result in damage to the mechanism.
4. The lock for this button is now complete. Set up the remaining buttons in the same manner and replace the escutcheon.
The diagram shows a schematic of an electronic circuit, likely for a radio or audio device. The components include resistors, capacitors, and vacuum tubes, with labels indicating their functions and connections. The text on the diagram provides specific values and instructions for testing and setup. The circuit includes a 6K6G output, 6Q7G, 6U7G, and 6L7G tubes, among others. The layout is complex, with various wires and connections depicted.
**Model 91-711 to 91-719**

**STEWART-WARNER CORP.**

**ALIGNMENT EQUIPMENT & PROCEDURE**

For alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 KC. to 10.0 MC. are required.

1. Connect the output meter across the voice coil or between the plate of the 6J5G tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the chassis of the receiver.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh set the pointer on the last scale division on the low frequency end of the dial. This may be accomplished by releasing the clip on the pointer slider; where it attaches to the dial cord.

**Important:** The broadcast band must be aligned after the short-wave band.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Signal Generator</th>
<th>Connection Lead Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Range Adjustment Position</th>
<th>Receiver Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MPF Condenser</td>
<td>Control grid of 6J5G tube</td>
<td>465 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>Any point where it does not affect the signal</td>
<td>1-2</td>
<td>1st I.F.</td>
<td>Adjust for maximum output. Then repeat adjustment</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>465 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>Any point where it does not affect the signal</td>
<td>3-4</td>
<td>2nd I.F.</td>
<td>Adjust for minimum output using a strong generator signal</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>15 MC.</td>
<td>Short Wave (Counterclockwise)</td>
<td>15 MC.</td>
<td>5</td>
<td>Wave Trap</td>
<td>Adjust to bring in signal. Check to see if proper value was obtained by tuning in 15MC at approx. 15.1 MC. If 15MC does not appear Real at 15 MC. With Trimmer Screen Panther out. Receiver input.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>15 MC.</td>
<td>Short Wave (Counterclockwise)</td>
<td>15 MC.</td>
<td>6</td>
<td>Short Wave Oscillator</td>
<td>Adjust for maximum output. Try to increase output by retuning trimmer and returning receiver dial until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>5.0 MC.</td>
<td>Police</td>
<td>5.0 MC.</td>
<td>7</td>
<td>Short Wave Antenna</td>
<td>Adjust for maximum output. Check to see if proper value was obtained by tuning in proper value at approx. 5.0 MC. If 5.0 MC does not appear Real at 5.0 MC. With Trimmer Screen Panther out. Receiver input.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>5.0 MC.</td>
<td>Police</td>
<td>5.0 MC.</td>
<td>8</td>
<td>Police Oscillator</td>
<td>Adjust for maximum output. Try to increase output by retuning trimmer and returning receiver dial until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>1500 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>1500 KC.</td>
<td>9</td>
<td>Police Antenna</td>
<td>Adjust for maximum output. Try to increase output by retuning trimmer and returning receiver dial until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>1500 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>1500 KC.</td>
<td>10</td>
<td>Broadcast Oscillator (Short)</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>1500 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>1500 KC.</td>
<td>11</td>
<td>Antenna Detector</td>
<td>Adjust for maximum output. Try to increase output by retuning trimmer and returning receiver dial until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Antenna terminal</td>
<td>600 KC.</td>
<td>Broadcast (Manual Tuning)</td>
<td>600 KC.</td>
<td>12</td>
<td>Broadcast Oscillator (Serviced Pads)</td>
<td>Adjust for maximum output. Try to increase output by retuning trimmer and returning receiver dial until maximum output is obtained.</td>
</tr>
</tbody>
</table>

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HOW TO SET UP THE PUSH-BUTTON TUNER

1. Be sure that your set is connected to the antenna and that the push-button tunes are set to the same frequency. The push-button must be set to the same frequency at all times.

2. Turn the set on and let it warm up at least one-quarter hour before setting up the push-button.

3. Make a list of six nearby stations which you wish to select. This list should cover a wide range of frequencies so that you can test your push-button for sensitivity and accuracy.

4. Set the push-button to the lowest frequency on your list and tune in the station nearest the bottom of the list. Adjust your tuning until the station is heard clearly.

5. Repeat Step 4 for each frequency on your list.

6. When you have finished testing your push-button, turn it off and store it in a safe place.

HOW TO REPLACE THE DIAL CORD

Before attempting to replace the dial cord, make sure that the trimmers are set to their maximum clockwise position.

1. Set the push-button to the lowest frequency on your list.

2. Hold the dial cord firmly and pull it gently until it comes loose from the dial. Be careful not to damage the dial or the cord.

3. Replace the new dial cord by following the same procedure as described in Step 2.

4. Test the new dial cord by setting the push-button to the lowest frequency on your list.

5. Repeat Step 4 for each frequency on your list.

6. When you have finished testing the new dial cord, turn it off and store it in a safe place.

ELECTRICAL PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>NUMBER</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2393</td>
<td>Condenser</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>2396</td>
<td>Resistor</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>2399</td>
<td>Capacitor</td>
<td>0.15</td>
</tr>
<tr>
<td>4</td>
<td>2402</td>
<td>Capacitor</td>
<td>0.45</td>
</tr>
<tr>
<td>5</td>
<td>2405</td>
<td>Capacitor</td>
<td>0.75</td>
</tr>
<tr>
<td>6</td>
<td>2408</td>
<td>Capacitor</td>
<td>1.00</td>
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<tr>
<td>7</td>
<td>2411</td>
<td>Capacitor</td>
<td>1.50</td>
</tr>
<tr>
<td>8</td>
<td>2414</td>
<td>Capacitor</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Stewart-Warner Corp.

How to Set Up the Push-Button Tuner

1. Be sure that your set is connected to the antennas and that the push-button tunes are set to the same frequency. The push-button must be set to the same frequency at all times.

2. Turn the set on and let it warm up at least one-quarter hour before setting up the push-button.

3. Make a list of six nearby stations which you wish to select. This list should cover a wide range of frequencies so that you can test your push-button for sensitivity and accuracy.

4. Set the push-button to the lowest frequency on your list and tune in the station nearest the bottom of the list. Adjust your tuning until the station is heard clearly.

5. Repeat Step 4 for each frequency on your list.

6. When you have finished testing your push-button, turn it off and store it in a safe place.

7. Set up button No. 4 for the selected station in a similar manner. The remaining buttons can all be set up in the same fashion.

8. Label each button with the call letters of the stations you have selected. You may use a small letter tag and the call letters printed on the tags, or you may use a small letter tag and the call letters printed on the tags, or you may use a small letter tag and the call letters printed on the tags, or you may use a small letter tag and the call letters printed on the tags, or you may use a small letter tag and the call letters printed on the tags, or you may use a small letter tag and the call letters printed on the tags.

9. Test the push-button for sensitivity and accuracy by setting it to each station on your list.

10. When you have finished testing the push-button, turn it off and store it in a safe place.

11. If you have any trouble with the push-button, consult your local dealer or service station.


How to Replace the Dial Cord

Before attempting to replace the dial cord, make sure that the trimmers are set to their maximum clockwise position.

1. Set the push-button to the lowest frequency on your list.

2. Hold the dial cord firmly and pull it gently until it comes loose from the dial. Be careful not to damage the dial or the cord.

3. Replace the new dial cord by following the same procedure as described in Step 2.

4. Test the new dial cord by setting the push-button to the lowest frequency on your list.

5. Repeat Step 4 for each frequency on your list.

6. When you have finished testing the new dial cord, turn it off and store it in a safe place.

Stewart-Warner Corp.
STEWART-WARNER CORP.

HOW TO SET UP THE PUSH-BUTTON TUNER

1. Be sure that the customer has an adequate antenna system and that the push button tuners are in the correct position

2. Turn on the set and allow it to operate at least one quarter-hour before setting up the push buttons.

3. Make a list of the frequencies of the 8 or 9 nearby stations to which you wish to add the buttons. Be sure to select nearby, powerful stations, since their signal will generally give you better results. Also be sure to select stations that you can hear clearly.

4. Remove the escutcheon around the push buttons by prying it out and then inserting the tip of a screwdriver into the hole at the back of the dial to raise the escutcheon. Also remove the escutcheon from the back of the dial. Now turn the knobs of the transmitter in a clockwise direction until the knobs are tight with the dial and the transmitter are in the correct position.

5. Turn the switch in the correct position, using the key to turn the transmitter, until the knobs are tight with the dial, and the transmitter is in the correct position.

6. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial and the transmitter are in the correct position.

7. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

8. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

9. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

10. Turn the switch in the correct position, using the key to turn the transmitter, until the knobs are tight with the dial, and the transmitter is in the correct position.

HOW TO ADJUST THE SCREWS

The following are the correct positions for the push button to be in:

- 1. Tape on top of the push button to be in the correct position.
- 2. Tape on bottom of the push button to be in the correct position.

HOW TO ADJUST THE SCREWS

The following are the correct positions for the push button to be in:

- 1. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
- 2. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
- 3. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
- 4. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

HOW TO ADJUST THE SCREWS

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- 3. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
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HOW TO ADJUST THE SCREWS

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- 1. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
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- 3. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
- 4. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

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- 3. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
- 4. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.

HOW TO ADJUST THE SCREWS

The following are the correct positions for the push button to be in:

- 1. Remove the escutcheon around the push button by turning the dial in a clockwise direction until the knobs are tight with the dial, and the transmitter is in the correct position.
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Alignment, Trimmers, Parts

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 20 MC are required.

1. Connect the output meter across the voice coil or across the plate of the 6AK6 output tubes depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the receiver chassis or to the "G" terminal at the back of the chassis. Note: The "G" and "D" terminals on this terminal strip must be connected together.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

4. With the gang condenser in full mark, set the pointer to the last mark on the left end of the dial scale. If the pointer is not accurately set, it is only necessary to loosen the set screw on the dial and drive it through with the gang condenser in full mark with the pointer properly set, then retighten the set screw.

<table>
<thead>
<tr>
<th>Dummy Ant. in Barrel of Sig. Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection of Sig. Generator Output to Receiver</td>
</tr>
<tr>
<td>Signal Generator Frequency</td>
</tr>
<tr>
<td>Band Switch Position (Indicated by Roller Dial)</td>
</tr>
<tr>
<td>Receiver Dial Setting</td>
</tr>
<tr>
<td>Trimmer Number</td>
</tr>
<tr>
<td>Trimmer Description</td>
</tr>
<tr>
<td>Type of Adjustment</td>
</tr>
<tr>
<td>465 KC</td>
</tr>
<tr>
<td>MFD Condenser, Center Grid of 6AK6 Tube</td>
</tr>
<tr>
<td>665 KC</td>
</tr>
<tr>
<td>Broadcast</td>
</tr>
<tr>
<td>465 KC</td>
</tr>
<tr>
<td>Broadcast</td>
</tr>
<tr>
<td>1500 KC</td>
</tr>
<tr>
<td>Broadcast</td>
</tr>
<tr>
<td>2000 KC</td>
</tr>
<tr>
<td>Broadcast</td>
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<tr>
<td>20 MC</td>
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<td>Foreign</td>
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<tr>
<td>20 MC</td>
</tr>
<tr>
<td>Foreign</td>
</tr>
<tr>
<td>6 MC</td>
</tr>
<tr>
<td>Intermediate</td>
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<tr>
<td>6 MC</td>
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<td>Intermediate</td>
</tr>
<tr>
<td>6 MC</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>6 MC</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
</tbody>
</table>

Adjust for Maximum Output. Then Reset Adjustment.

Adjust for Minimum Output. Using a Strong Generator Signal.

Adjust for Maximum Output.

Adjust for Maximum Output.

Adjust for Maximum Output. Try to Increase Output by Moving Trimmer Dial Until Maximum Output is Obtained.

Adjust for Maximum Output. Check to see if Image Peaks. Push up Gate Lead by Turning as Image of Approx. 1 MC. If Image goes out increase setting a little with Trim. Screw further Out. Reduce Image.

Adjust for Maximum Output. Try to Increase Output by Slowing Trimmer Dial Until Maximum Output is Obtained.

Adjust for Maximum Output. Check to see if Image Peaks. Push up Gate Lead by Turning as Image of Approx. 1 MC. If Image goes out increase setting a little with Trim. Screw further Out. Reduce Image.

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ALIGNMENT EQUIPMENT & PROCEDURE

Alignment equipment & procedure

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 1.5 MC are required.

1. Connect the output meter across the voice coil or in series with 1 mf condenser, from the plate of the 6U6-G output stage to ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the "G" post on the antenna terminal strip at the rear of the cabinet, or to the metal chassis. The ground and antenna terminals on the antenna terminal strip must be connected together throughout the alignment procedure.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

-IMPORTANT-

RE-TUNE PUSH-BUTTON TRIMMERS TO STATIONS AS RE-ALIGNING THE IF STAGES MAY HAVE CAUSED DETUNING OF THE STATIONS TO WHICH THE BUTTONS WERE SET.

DESCRIPTION OF ANTENNA CIRCUIT AND ITS FUNCTIONS

Since the antenna circuit of this receiver differs radically from the conventional type, a detailed explanation of the functions of the various sections of this special circuit, and the reasons for the above alignment procedure is given below.

The purpose of this antenna circuit is to transfer the incoming station signal, with minimum gain, to the grid of the power detector tube (1A23), to reduce to a minimum, code interference or other undesired signals in the vicinity of the intermediate frequency (465 KC) in order to reduce to a minimum the response of image signals. These coils which perform these functions are wound in isolation from and are isolated from No. 56a, No. 58b and No. 56c in the figure at the lower right.

The primary circuit of this antenna system consists of an antenna coil in series with condenser No. 6a, the condenser and coil combination between points B and C, the section of the coil between points E and F, and the points A and B and also in series with the coil and condenser combination between points B and C, and the secondary section of the push button trimmer condenser No. 50b. The secondary circuit is tuned to the incoming station signal, by the push button trimmer condenser No. 50b.

Reduction of image response is accomplished with the aid of the section No. 66c of the antenna coil. This section of the antenna coil acts as a wave trap resonated 900 KC higher than the signal. It is a part of a series resonant circuit made up of the 66c section of the coil and the push button trimmer condenser No. 50b. This circuit will be effective in reducing the image signals at ALL TIMES and will effectively reduce image interference caused by code or police stations operating at the high frequency end of the broadcast band. The purpose of condenser No. 40 is to cause this image reduction circuit to "work" properly.

The wave trap circuit for reduction of 465 KC o.s.d. signals is composed of the section 66c of coil 65b in parallel with condenser No. 40. This condenser, No. 50b is in the above alignment chart. It should be noted that coil section 66c is inductively coupled to the B-B section of the coil and is considered a part of the wave trap circuit. Trimmer condenser No. 65b is adjusted for minimum output with a 900 KC increasing signal at the antenna. At minimum output, the voltage developed across coil 4-8 will be balanced out by the voltage developed across condenser No. 65b and across the coil section 66c, in parallel with the voltage developed across the coil. Therefore, it will be seen that any 465 KC interference signals will not develop a very large signal between the control grid of the 66c tube and ground thus effectively eliminating 465 KC code interference.

The 66c section of the antenna coil between points B and C when considered in series with section 66c and condenser No. 40, does not present a peak at 465 KC. The purpose of the circuit is to increase the gain of the receiver on the low end of the 66c section of the coil. The purpose of this is to increase the signal developed across coil section 66c has for its purpose the reduction of image responses from signals in the vicinity of 4.5 MC.

Resistor No. 55 was shunted across the primary antenna circuit for two reasons: (1) to set the overall sensitivity of the receiver after initial alignment, (2) to eliminate detuning effects in the secondary antenna circuit when different types of antenna systems are used with this receiver.

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HOW TO SET UP THE PUSH BUTTONS

The push buttons on your radio receiver are not previously set to stations at the factory. Therefore, unless your dealer is ready set and labeled the various push buttons, it will be necessary to make the following adjustments before any stations can be received by using these buttons, proceed as outlined below:

1. Be sure that your set is connected to a good antenna system.

2. Tune on the set at least one quarter hour before setting up the push buttons.

3. Make a list of the frequencies of the eight nearby stations you wish to set as push buttons.

4. Each of the buttons on your push button tuner has a definite tuning range, as shown in Fig. 1 (both back and front view of cabinet). This picture shows the proper way to set a station to a particular button.

5. Suppose you want to set station WMAL, whose frequency is 700 Kc., some button on your receiver, referring to Fig. 1, will show that the frequency falls within the operating range of Button No. 4, 5, or 7. Therefore, any of these buttons may be used to set up this station. Failure to select the proper button will result in the incorrect setting of the trimmer adjusting screw and will cause drifting.

6. Place the receiver in such a position that the back of the cabinet is readily accessible. Refer to Fig. 1 (showing the back of the cabinet). In the figure, the eight pairs of trimmer adjusting screws are numbered to correspond to the number of push buttons shown in the front view of Fig. 1. These screws are used to tune the receiver to the stations selected for each button.

7. Push in Button No. 2. Then insert a screw driver in Trimmer Screw No. 2a and turn this screw to the left or right until the desired station is heard. The point at which the screw will be correctly set will be indicated when the open end of the "V" shadow in the tuning eye comes closest together. If the station cannot be heard, advance the volume knob. By having available a daily radio log of your newspaper, you can identify the station by knowing what its schedule program is.

8. Now insert the screw driver in Trimmer Screw No. 2b and turn it to the right or left until the open ends of the "V" shadow in the tuning eye are closed. Now re-check the setting of Trimmer Screw No. 2a using the tuning ear and indicate the correct setting.

9. The set-up for Button No. 2 is now complete.

10. Push in Button No. 3 and set up the desired station in a similar manner.

11. Repeat steps 8, 9, 10 and set up the remaining six buttons using their corresponding trimmer screws.

12. In some instances it may be necessary, after the set is operated for a month or more, to re-set the trimmer adjusting screws as they may change their setting due to heat and humidity. Changes in the setting of the trimmer screws will cause poor tone quality.

USE OF THE TUNING EYE

The tuning eye is located at the rear of the chassis (as shown in Fig. 2) and should be used when setting up the push buttons to the various stations. The purpose is to indicate visually the exact point at which the receiver is correctly tuned to a station. Any station is correctly tuned when the two open ends of the "V" shadow in the tuning eye are closest together. On strong signals the ends will come together - on weaker stations, they will be more separate. REGARDLESS OF WHETHER YOU ARE TUNING A BROADCAST OR A NER Station, THE TRIMMER SCREWS SHOULD ALWAYS BE ADJUSTED TO THE POINT WHERE THE ENDS OF THE "V" IN THE EYE ARE CLOSEST TOGETHER.

NOTE: This tuning eye should be removed from its socket in the chassis after the push buttons have been set. Failure to remove this tube may result in buzzing or rattling sounds such as described below under "Rattles and Buzzes."

HOW TO CHANGE THE OPERATING RANGE OF A BUTTON

The operating range of a button may be changed by merely changing the dual trimmer used with that button. Dual trimmers with the ranges indicated below may be obtained from your Stewart-Warner distributor, or directly from the Stewart-Warner Corporation, under the following part numbers:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Tuning Range</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>119565</td>
<td>1170 to 1750 Kc.</td>
<td>.40</td>
</tr>
<tr>
<td>119566</td>
<td>260 to 650 Kc.</td>
<td>.60</td>
</tr>
<tr>
<td>119567</td>
<td>540 to 770 Kc.</td>
<td>.62</td>
</tr>
</tbody>
</table>

To make the change proceed as follows:

1. Remove the chassis from the cabinet.

2. By referring to Fig. 1, determine the dual trimmer associated with the button whose range you wish to change.

3. Unscrew the leads from the four terminals on the back of this dual trimmer.

4. Remove the 6/32 machine screw holding the dual trimmer to the front of the chassis.

5. From the above list select a dual trimmer which will cover the desired range.

6. Mount it on the chassis with the 6/32 machine screw, and solder the leads to its four terminals.

7. The button is now ready to be set to any strong station whose frequency is within the range of the new trimmer unit.

RATTLES AND BUZZES

If during normal operation, buzzing or rattling sounds are heard in the receiver, they will in all probability originate in one or more of the sources listed below.

These rattle or buzzes generally occur with the tone control in the best position set with the volume control to advanced.

A reasonably low level check the following for probable sources of noise:

1. Loose tube shields. See that shields are properly located, and make good mechanical contact with tube shield base.

2. Loose elements in any of the tubes. This should be checked with the 6US tuning eye tube. This tube should be removed from its socket and all other buttons have been set.

3. Loose clockspring or cabinet parts. Check for mechanical vibration of any parts not securely fastened.

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**Models 97-521 to 97-529**

**Stewart Warner Corp.**

**Chassis 97-52**

**Alignment, Trimmers**

**Chassis Model**

97-52

This chassis is a 5 tube, single band push-button tuning superheterodyne receiver. It is designed for operation on either alternating or direct current, and incorporates an L-49-B ballast resistor tube. The tuning range of this receiver is 540 to 1705 KC. The intermediate frequency is 465 KC.

Incorporated in each chassis is a four-button mechanical push-button tuning unit. These push buttons may be set to any station desired by the method described below under "How to Set Up the Push-Button Tuners".

The accuracy of tuning when using the push-button tuner, depends to a large extent upon the amount of "play" in the moving parts of this system. In cases where slight inaccuracy in tuning occurs check the following points:

1. Check to see that the button is correctly set to the station. If not, reset the button.
2. The tension must be maintained between the two sections of the anti-back-lash gear on the left side of the unit in order that it functions properly—both anti-back-lash springs must be in place in the gear and compressed slightly.
3. Note the small adjusting lug over the push-button shafts at the point where they slide into the tuner. The lug is held in place by a hex-head screw. These lugs should be adjusted for a minimum amount of "play" in other words the push-button shaft must have a minimum of movement in a vertical direction.

**For Alignment:** An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 1500 KC are required.

1. Connect the output meter across the voice coil or between the plates of the 256-G output tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the chassis of the receiver through a .1 mfd condenser and keep it connected in this manner throughout the entire alignment procedure.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the gang condenser in full mesh, set the pointer to the last mark on the right end of the dial scale. If the pointer is off calibration, loosen the set-screw in the dial drive drum at the right side of the gang condenser and set the pointer to the last mark on the right end of the dial when the gang condenser is in full mesh. If the pointer is off calibration several dial divisions, release it from the pointer drive cord by spreading the clip on the pointer. Then slide the pointer along the cord until it is set to the last dial division on the right end of the dial. Holding it in place check to see if the gang condenser is in full mesh, and tighten the pointer clip, being careful not to cut the cord. Place a drop of household or speaker cement on the cord and pointer clip to prevent the pointer from slipping.

**Diagram:**

- **645 KC**
- **256-G**
- **L-49-B**
- **6X7**
- **6A86**
- **Oscillator**
- **1500 KC**
- **Minimum Output**
- **Antenna**
- **1500 KC**

**Table:**

<table>
<thead>
<tr>
<th>Dummy Ant. In Series with Sig. Gen.</th>
<th>Connection of Sig. Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 mfd condenser</td>
<td>Control Grid of 256-G Tube</td>
<td>465 KC</td>
<td>Any point where it does not affect the signal</td>
<td>1-2</td>
<td>1st I.F.</td>
<td>Adjust for maximum output, then repeat adjustment.</td>
</tr>
<tr>
<td>400 ohm carbon resistor (Blue Wire)</td>
<td>Antenna Lead (Blue Wire)</td>
<td>465 KC</td>
<td>Any point where it does not affect the signal</td>
<td>3-4</td>
<td>2nd I.F.</td>
<td>Adjust for minimum output using a strong generator signal.</td>
</tr>
<tr>
<td>400 ohm carbon resistor (Blue Wire)</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>5</td>
<td>Wave Tap</td>
<td>Adjust trimmer to bring in signal.</td>
</tr>
<tr>
<td>400 ohm carbon resistor (Blue Wire)</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>6</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td>400 ohm carbon resistor (Blue Wire)</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>7</td>
<td>Broadcast Antenna (Shunt)</td>
<td>Adjust for maximum output.</td>
</tr>
</tbody>
</table>
HOW TO SET UP THE PUSH-BUTTON TUNER.

1. Be sure that your set is connected to a good antenna system.

2. Turn on the set and allow it to operate at least one-quarter hour before setting up the push buttons. Be sure to select the nearest, strongest stations, since weak signals will generally give poor results. Any button may be set to any desired station.

3. Select the four nearby stations to which you wish to set up the buttons. Be sure to select for best results. The button for the station to which the push button is for the signal generator set at 465 Kc and is coupled to the grid of the 6AY7 tube in the customary manner. The primary and secondary windings are tuned by adjusting Trimmer Screws No. 1 and No. 2 until a maximum deflection is obtained on the meter for the signal generator set at the frequency of the desired station. After setting, trimmings are trimmed back to the desired frequency set at 1500 Kc. Now connect the signal generator to the 6AY7 grid and tune for maximum on the low frequency end of the dial. The regeneration control, Trimmer No. 3 is now adjusted to give maximum output of the signal generator, consistent with good stability and tone quality. After the setting of Trimmer No. 5 is adjusted to close the signal generator set at 465 Kc and is coupled to the grid of the 465-G tube through a .1 microcondenser and trimmers Nos. 1 and No. 2 adjusted as was done previously.

A-C OPERATION

When the set is used on alternating current, all A-C potentials are supplied by a 250-volt rectifier tube and its associated filter circuit. The tube is connected for half-wave rectification of the A-C supply.

If any hum is noticed in the set, it may be eliminated by setting the hum in the rectifier circuit. When the filter has not been used for some time, the filter condensers are in series, and a slight hum may be audible when the set is turned on. This hum may be cleared by adjusting the hum circuit in the filter section. The 250-volt tube protects the filter condensers from damage. The 250-volt tube passes the A-C and the filter circuit aids in smoothing the supply voltage, thus minimizing line noises.

D-C OPERATION

If the set fails to operate after allowing time for the tubes to reach their normal operating temperatures, the power supply may be checked. When the set is used on direct current, the 250-volt rectifier tube and the filter system results in the circuit and serve two purposes. The power supply should be adjusted. If incorrect polarity, the 250-volt tube protects the filter condensers from damage. If the 250-volt tube passes the A-C and the filter circuit aids in smoothing the supply voltage, thus minimizing line noises.

I.F. TRANSFORMER & REGENERATION CONTROL

This 97-56-8 chassis employs only one intermediate frequency transformer, the windings of which are capacitively coupled. The two trimmer screws, primary and secondary of this transformer are mounted on the chassis and are accessible from the rear of the chassis. The condenser which is associated with this intermediate frequency transformer is an additional trimmer condenser, which is accessible from the rear of the chassis. This condenser is used to trim back a portion of the intermediate frequency signal appearing in the plate circuit of the 6AY7 tube. This signal is introduced into the 6AY7 grid circuit through a coupling capacitor, which is a part of the secondary coil. This regenerator increases the amplification and selectivity of the receiver and makes the performance of this set comparable to that set obtained from a set employing an additional I.F. transformer.

ADJUSTMENT OF REGENERATION CONTROL:

The 97-56 chassis employs one stage of intermediate frequency amplifier. This intermediate frequency transformer is adjusted to 465 Kc and is tuned in the usual manner. In addition to the trimmers used in tuning the windings to their proper frequency, this transformer has mounted on it an additional trimmer condenser which is used to feed back a portion of the intermediate frequency signal appearing in the plate circuit of the 6AY7 tube. This signal is introduced into the 6AY7 grid circuit through a coupling capacitor, which is a part of the secondary coil. This regenerator increases the amplification and selectivity of the receiver and makes the performance of this set comparable to that set obtained from a set employing an additional I.F. transformer.

If the receiver howls or squeals, use a non-metallic instrument to feel for the purpose of tuning the screw to the right (counter-clockwise). As the screw is turned clockwise the volume will be increased up to a certain point, after which it will begin to go squeal. Turn the screw back until the squeal just disappears. This is the correct volume setting.

IF THE RECEIVER HOWLS OR SQUEALS: Place a piece of wood or 447K34 in the shape of a screwdriver. Turn the screw to the right (counter-clockwise) until the sound just disappears. This is the correct volume setting.
STEWART WARNER CORP.

MODELS 97-561 to 97-569
97-561S to 97-569S

Alignment, Trimmers

For Alignment:

1. Connect the output meter across the voice coil or between the plate of the 2SC10 output tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the chassis of the receiver through a .1 mfd. condenser and keep it connected in this manner throughout the entire alignment procedure. Failure to do this may have serious results as one side of the power line may be grounded in the signal generator.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh, set the indicator to the last mark on the top end of the dial scale. If the pointer is slightly off calibration, it may be possible to slip the dial drum just enough to correct for this slight mis-calibration. If the dial is several divisions off calibration, loosen the set screw on the condenser shaft. Then grasp the end of the tuning shaft and turn the dial until the last division of the scale is directly under the indicator, when the gang is in full mesh. Then tighten the set-screw.

5. TO CALIBRATE THE DIAL: Remove the chassis from the cabinet and set it on a flat surface (isolated from ground). Release the set screw in the dial which connects the gang condenser shaft with the tuning unit. Holding the gang in full mesh turn the dial until the last dial division (just below 5%) on the low frequency end of exactly 3 1/2 inch above the surface. Now tighten the set screw in the dial collar. The 3 1/2 inch division is 1/1000th of a wave (when measured vertically from the table surface) to be used as the dial indicator for all calibrations and alignment.

### Table: Signal Generator Frequency

<table>
<thead>
<tr>
<th>Type of Adj.</th>
<th>Component</th>
<th>Sign. Gen. Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Control Grid of Gas-G Tube</td>
<td>465 KC</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2</td>
<td>&amp;</td>
</tr>
<tr>
<td>3</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>+1200 KC</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>-1200 KC</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Control Grid of Gas-G Tube</td>
<td>465 KC</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### THIS ADJUSTMENT MUST AGAIN BE MADE AFTER THE REGENERATION CONTROL TRIMMER HAS BEEN SET.


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Resistor No. 18 connected in parallel with the dial bulb has been changed to a 3 watt molded wire wound resistor, Part No. 115479. This size is being used in place of the original 1½ watt rating, to prevent failure of the resistor if the dial bulb burns out. The 3 watt resistor should be used for replacement in all cases.

If a "squeal" develops with the volume control fairly well advanced, separate the 6Q7G grid lead and the speaker wires as much as possible by pulling the grid lead to the side of the 6Q7G nearest the variable condenser. If there is a loud heterodyne whistle when tuning in stations, the I.F. stage may be oscillating. If this happens, move the lead from the 6ABG cathode to the 6Q7G cathode as close to the chassis and as far from other wires as possible. If necessary, connect a .05 mfd. 200 volt condenser to one of the above cathode terminals which does not already have such a condenser connected directly to it.

MODELS 97-571 to 97-579
97-57 CHASSIS

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS UNLESS OTHERWISE SHOWN

REAR OF CHASSIS

Use a high resistance voltmeter of at least 1000 ohms per volt.

NOTE: The bias for the control grid of the 6G6-6 and -7 voltage across speaker field 40 volts, measured across resistor number 32.
ALIGNMENT EQUIPMENT & PROCEDURE

1. Connect the output meter across the voice coil or between the plate of the 262-A output tube and ground through a .1 mfd. condenser, depending upon the meter type. The same type condenser should be connected across the voice coil.
2. Connect the ground lead of the signal generator to the chassis of the receiver through a .05 mfd. condenser and keep it connected throughout the entire alignment procedure. Failure to do this may cause noise results as the signal generator may be connected to one side of the power line or, it may be grounded externally.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

TO CALIBRATE THE DIAL—Remove the chassis from the cabinet and set it on a flat surface (insulated from ground). Release the hold down spring of the tuning knobs to allow the tuning knobs to pivot easily. Place the signal generator in position and connect the ground lead of the signal generator to the chassis. Adjust the signal generator to a frequency which is 2 kHz above the frequency of the station to be calibrated. Slowly turn the knob of the signal generator until the meter reads the frequency of the station to be calibrated. This is the true frequency of the station. The signal generator is now calibrated for the frequency of the station.

A DIAL CALIBRATION may be done by using the procedure outlined above, replacing the signal generator with the receiver. The receiver is then tuned to the station whose frequency is to be calibrated. The signal generator is then adjusted to the same frequency and the receiver's dial is adjusted to match the signal generator's frequency. This procedure is repeated for each station whose frequency is to be calibrated.

DIAGNOSIS OF VARIOUS PARTS

BUILT-UP ANTENNA SYSTEM

The Built-In Antenna incorporated in this receiver will generally give very satisfactory results in localities where powerful broadcast stations exist. This Built-In Antenna will function when terminals A and A₁ on the back of the chassis are connected together. In cases where noises are excessive or greater sensitivity is desired, remove the jumper connecting terminals A and A₁ and connect an external antenna to terminal A₁.

In some locations, due to peculiar power line conditions, hum or noise may be excessive when the Built-In Antenna is used. In such cases reverse the power line plug. If this doesn't correct the condition, remove the connector between A and A₁ on the back of the chassis, and connect an external antenna to A₁.
ALIGNMENT EQUIPMENT & PROCEDURE

1. Before attempting to align the receiver, check to see that the dial pointer is opposite the last scale division on the low frequency end of the dial when the gear selector is in full mesh. Also, when the gear selector is in full mesh, the stop pin on the left side of the chassis should be in the step position. If it is not, move the stop pin to the step position. The dial pointer should remain in the step position. If it does not, move the stop pin to the step position. Then tighten the set screw on the gear selector to be sure that it is moving properly.

2. Connect the output meter across the output terminals of the receiver and adjust the dial to the maximum output position. Then, move the dial to the minimum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

3. Connect the ground lead of the signal generator to the chassis and move it throughout the entire alignment procedure.

4. Turn the volume control to the minimum volume position.

5. Keep the Cabinet and troubleshoot connections to the antenna terminal strip connected throughout the entire alignment procedure.

6. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

7. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

8. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

9. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

10. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

11. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

12. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

13. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

14. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

15. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

16. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

17. If the output meter does not move to the zero position, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

A.F.C. ALIGNMENT

1. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

2. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

3. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

4. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

5. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

6. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

7. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

8. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

9. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.

10. Adjust the receiver tuning dial to make sure that the signal generator dial is in the minimum output position. If it is not, move the stop pin to the step position. Then, move the dial to the maximum output position. The meter should indicate a maximum reading when the dial is in the step position and a minimum reading when the dial is in the zero position.
TESTING THE A.F.C. SYSTEM.

Connect the antenna and tune in a powerful local station. Remove the cardboard that you placed between the A.F.C. contacts in the side switch until slightly before the R.F. is in range.

Next, tune the receiver dial until the music or speech becomes indistinct because of the presence of a noise. Listen between the A.F.C. contacts on the side switch, as shown in the illustration on the preceding page. This allows A.F.C. to function and it should improve the quality of the program.

Similarly, tune the receiver dial in the opposite direction, with the leads plugged in the opposite contact. Then, place the cardboard between the contacts again and check for improved quality of reception.

It will be noted that the correction for mistuning afforded by the A.F.C. system is not as marked at stations near the low frequency end of the dial, and may be hidden by a large broadcast. This characteristic of A.F.C. systems results from opening the R.F. contacts, as is done by the A.F.C. mechanism, before A.F.C. action begins.

1. Re-align I.F., broadcast band, and discriminator trimmers.
2. Check all the R.F. and A.F.C. tubes, also the R.F., 1st Detector, and I.F. tubes, may cause a station to break up.
3. If the above procedure fails to remedy the defect in A.F.C. action, check the entire A.F.C. circuit itself for possible trouble.

DIAL DRIVE & MISCELLANEOUS PARTS.

FOR A COMPLETE PARTS LIST SEE THE SPECIAL "PHONOGRAPH KEYBOARD".

WEATHER WARNER

161A to 183A

STEVART-WARNER

183B to 185A

PHONOGRAPH CONNECTIONS FOR MODEL R-1855-W

HOW TO SET-UP THE "MAGIC KEYBOARD"

STEPS FOR SET-UP:

1. Connect a good outside aerial to the receiver and allow the receiver to operate for 5 minutes before setting up.
2. Pull off the large tuning knob: In this knob, you will find another small "set-up" knob on the same shaft. Pull this knob out from the face.
3. Pull out this set-up knob as far as it will go.
4. Press the set-up knob clockwise. After dial pointer reaches the end of the dial scale, the knob will click into place. Pull the knob out from the face.
5. Pull the "set-up" knob back into the cabinet again and replace the large tuning knob.
6. Push the "set-up" knob back into the cabinet again and replace the large tuning knob.
7. Turn the set-up knob to the left (counter-clockwise). Continue to turn the knob to the left until the pointer reaches the end of the scale. Pull the small set-up knob back into the cabinet again and replace the large tuning knob.
8. Turn the set-up knob to the right (clockwise). Continue to turn the knob to the right until the pointer reaches the end of the scale. Pull the small set-up knob back into the cabinet again and replace the large tuning knob.
POWER SUPPLY & BATTERY CONNECTIONS

The power supply of this receiver consists of three "A" batteries and one "C" battery. No "C" battery is needed as the first 22 1/2 volts of the "F" battery supply serves as a "C" battery. Proper intermediate bias voltages are assured from the tapped, constant resistor number 32.

The 22 1/2 volt tap on the "F" battery in the negative connection for the plate supply and it is connected to "A", and ground. This allows a maximum plate supply voltage of 115 1/2 volts with fresh batteries.

The "A" supply may be a 2 1/2 volt Air Cell, a 3 volt dry battery, or a 3 volt storage battery since the filaments of all tubes in the receiver are supplied through a type SE1 voltage regulator tube. The purpose of this tube is to maintain a safe filament voltage with battery voltages ranging from 2 to 3 volts. The voltage drop across the tube will decrease as the battery voltage decreases thus maintaining a constant filament potential.

If a 2 volt storage cell is to be used and the tubes in the receiver are not now in service, it is desirable to remove the SE1 voltage regulator tube and replace it by a plug which merely shorts out the two large terminals of the SE1 tube socket. This plug may be made up by removing the base of an old 4 prong tube and connecting the two large pins together with a piece of wire. DO NOT CONNECT ANYTHING TO EITHER OF THE SMALL PINS OR THE OTHER TUBES MAY BE DAMAGED.

In order to simplify connections to the batteries, plugs are provided and the method of connection to the batteries is shown in the diagram on the right.

ALIGNMENT EQUIPMENT & PROCEDURE

For proper alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 kc. to 16 mc. are required.

1. Connect the output meter across the voice coil of one of the plates of the 33 tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the chassis of the receiver.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh set the pointer on the horizontal black line below 540 kc. on the dial.

5. Using a bakelite screwdriver proceed to align in exactly the same order as shown in the table below.

NOTE A: How repeat adjustment of trimmers 3 and 4 again for greater sensitivity. This may cause oscillation. If oscillation occurs repeat steps 5 and 6. Disregard the adjustment mentioned in this note, i.e., after adjusting 1 and 2, do not repeat adjustment of 3 and 4. Important: Please note that in repeating step A, the signal generator must be connected to the 33 control grid. In step 5, the connection is to the 100 grid.

DIAL DRIVE & MISCELLANEOUS PARTS
CIRCUIT DESCRIPTION

The model R-191-I chassis is a six volt battery powered superheterodyne receiver. It has an intermediate frequency of 465 KC and the tuning range is from 540 to 1720 KC.

The incoming signal picked up by the antenna is induced in the tuned secondary of the antenna coil and impressed on the control grid of the 6AS6 first detector and oscillator tube. The oscillator circuit is tuned to a frequency 465 KC higher than that of the incoming signal, and the resultant 465 KC output is amplified in the I.F. stage, using a 6SK7 tube. The amplified I.F. voltage is impressed on the grid of the 6SK2 second detector tube. The plate of the 6SK2 is grounded and the grid acts as the plate of a linear diode detector and A.V.C. source. The direct current voltage developed across the 120 megohm diode load resistor is used as A.V.C. voltage and applied to the control grids of the 6AS6 and 6SK7 (I.F.) tubes through a resistance capacity filter system. Self bias is obtained across the cathode resistor 25 to maintain bias at all times.

The potentiometer type volume control 42 serves as a continuously variable voltage divider of the audio voltage developed. Any portion of the audio voltage can be applied to the control grid of the 6SK7 A.F. tube. It should be noted that the bias for the 6SK7 A.F. tube is obtained from a d-c bias call. The 6SK7 A.F. tube is resistance coupled to the 41 power output tube. Grid bias for the output tube is obtained across the cathode resistor 36.

The continuously variable resistor type tone control regulates the high note content of the audio output.

All tube heaters are connected directly to the six volt supply circuit. A 63 voltage is supplied by a synchronous full wave vibrator (48). The complete 63 supply, consisting of vibrator, power transformer, chokes and condensers, is housed in a metal shield to eliminate interference. A.F. filter chokes in the power supply input and output circuit prevent interference from getting into the "A" and "B" leads.

ALIGNMENT EQUIPMENT & PROCEDURE

For proper alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 1800 KC are required.

1. Connect the output meter between the plate of the 41 tube and ground, or across the voice coil, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the grid lead of the signal generator to the chassis of the receiver.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure. Turn tone control to brilliant position.

4. With the gang condenser in full mesh set the pointer on the black horizontal line below 560 KC on the dial.

5. Proceed to align in exactly the same order as shown in the table below.

<table>
<thead>
<tr>
<th>ORDER</th>
<th>DUTY APP. IN SERIES WITH SIG. GEN.</th>
<th>CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>RECEIVER DIAL SETTING</th>
<th>TRIMMER NUMBER</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10 MF. CONDEN.</td>
<td>CONTROL GRID OF 6AS6 TUBE</td>
<td>465 KC.</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1</td>
<td>1ST I.F.</td>
<td>ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
<tr>
<td>B</td>
<td>10 MF. CONDEN.</td>
<td>CONTROL GRID OF 6AS6 TUBE</td>
<td>465 KC.</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>3</td>
<td>2ND I.F.</td>
<td>ADJUST TRIMMERS 3 &amp; 4 FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT OF TRIMMERS NO. 1 &amp; 2.</td>
</tr>
<tr>
<td>C</td>
<td>250 MF. CONDEN.</td>
<td>ANTENNA LEAD</td>
<td>1700 KC.</td>
<td>1700 KC.</td>
<td>5</td>
<td>OSCILLATOR (Shunt)</td>
<td>ADJUST TRIMMER TO BRING IN SIGNAL.</td>
</tr>
<tr>
<td>D</td>
<td>250 MF. CONDEN.</td>
<td>ANTENNA LEAD</td>
<td>1500 KC.</td>
<td>TUNE TO 1500 KC. GENERATOR SIGNAL</td>
<td>6</td>
<td>ANTENNA</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>E</td>
<td>250 MF. CONDEN.</td>
<td>ANTENNA LEAD</td>
<td>600 KC.</td>
<td>TUNE TO 600 KC. GENERATOR SIGNAL</td>
<td>7</td>
<td>OSCILLATOR (Series Pad)</td>
<td>ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY TUNING TRIMMER AND SCREWING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
</tbody>
</table>
MODEL R-192-D CHASSIS (RECEIVER MODELS 1921 TO 1929)

The model R-192-D is a six valve battery operated superheterodyne receiver. The circuit employed includes automatic volume control and a push pull class B output system.

The 6L6 second detector is connected as a diode, the plate being grounded and the control grid acting as a diode plate. "B" voltage is supplied by a synchronous full-wave vibrator.

ALIGNMENT EQUIPMENT & PROCEDURE

For proper alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 18 MC are required.

1. Connect the output meter across the plates of the 16 tube or across the voice coil, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the chassis of the receiver and keep it connected in this manner throughout the entire alignment procedure.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure. Turn tone control to brilliant position.
4. With the snap condenser in full mesh set the pointer on the black horizontal line below 560 KC on the dial.
5. Proceed to align in exactly the same order as shown in the table below.

<table>
<thead>
<tr>
<th>ORDER OF ALIGN.</th>
<th>INPUT AMPLIFIER GRID</th>
<th>CONNECTION OF GRID</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>SOCKET POSITION</th>
<th>RECEIVER SETTING</th>
<th>TRIMMER WIPPER</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 WATTS, COND.</td>
<td>CONTROL GRID</td>
<td>465 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>1</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
<tr>
<td>B</td>
<td>1 WATTS, COND.</td>
<td>CONTROL GRID</td>
<td>465 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>2</td>
<td>I/F</td>
<td>ADJUST TRIMMER 5 &amp; 6 FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT OF TRIMMERS NO. 5 &amp; 6.</td>
</tr>
<tr>
<td>C</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1700 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>3</td>
<td>I/F</td>
<td>ADJUST TRIMMER TO BRING IN SIGNAL.</td>
</tr>
<tr>
<td>D</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>4</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>E</td>
<td>300 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>5</td>
<td>I/F</td>
<td>ADJUST TRIMMER 5 &amp; 6 FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT OF TRIMMERS NO. 5 &amp; 6.</td>
</tr>
<tr>
<td>F</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>6</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>G</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>7</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>H</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>8</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY REPEATING TRIMMER AND RETUNING RECEIVING DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td>I</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>9</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>J</td>
<td>400 GM, CARBON RESISTOR</td>
<td>ANNUAL TRIMMER</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>COUNTER CLOCKWISE</td>
<td>10</td>
<td>I/F</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
</tbody>
</table>

DIAL DRIVE & MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>112956</td>
<td>Seal - dial</td>
<td>1.25</td>
<td>112957</td>
<td>Seal - dial</td>
</tr>
<tr>
<td>112958</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112959</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112960</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112961</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112962</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112963</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112964</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112965</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112966</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112967</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112968</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112969</td>
<td>Shaft - for drive shaft</td>
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<tr>
<td>112970</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112971</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112972</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112973</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112974</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112975</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112976</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112977</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112978</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112979</td>
<td>Shaft - for drive shaft</td>
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<tr>
<td>112980</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112981</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112982</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112983</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112984</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112985</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112986</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112987</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112988</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112989</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112990</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112991</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112992</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112993</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112994</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112995</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112996</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112997</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>112998</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>112999</td>
<td>Shaft - for drive shaft</td>
</tr>
<tr>
<td>113000</td>
<td>Shaft - for drive shaft</td>
<td>1.40</td>
<td>113001</td>
<td>Shaft - for drive shaft</td>
</tr>
</tbody>
</table>

*John E. Rider, Publisher*
**ALIGNMENT EQUIPMENT & PROCEDURE**

For proper alignment, an output meter and an accurately calibrated signal generator with a tuning range from 465 KC. to 1600 KC. are required.

1. Connect the output meter between the plate of the 6K6G tube and ground, or across the voice coil, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the chassis of the receiver.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the gang condenser in full mesh set the pointer to the 540 KC. division on the dial.
5. Proceed to align in exactly the same order as shown in the table below.

<table>
<thead>
<tr>
<th>ORDER OF ALIGN.</th>
<th>OUTPUT AMT. IN SERIES WITH SIG.-GEN.</th>
<th>CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>RECEIVER DIAL SETTING</th>
<th>TRIMMER NUMBER</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>1 NPD. CONDENSER</td>
<td>CONTROL GRID OR GASS TUBE</td>
<td>465 KC.</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1</td>
<td>1ST I.F.</td>
<td>ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>1 NPD. CONDENSER</td>
<td>CONTROL GRID OR GASS TUBE</td>
<td>465 KC.</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>3</td>
<td>2ND I.F.</td>
<td>ADJUST TRIMMERS 3 &amp; 4 FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT OF TRIMMERS NO. 1 &amp; 2.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LEAD</td>
<td>1600 KC.</td>
<td>TUNE TO 1500 KC. GENERATOR SIGNAL</td>
<td>5</td>
<td>OSCILLATOR</td>
<td>ADJUST TO BRING IN SIGNAL. SEE NOTE BELOW TABLE.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA LEAD</td>
<td>1600 KC.</td>
<td>TUNE TO 1500 KC. GENERATOR SIGNAL</td>
<td>6</td>
<td>ANTENNA</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
</tbody>
</table>

**NOTE:** The oscillator section of the gang is provided with two trimmers connected in parallel, one on the top (No. 5) and one on the bottom. Normally the bottom trimmer will require no adjustment, but if trimmer No. 5 has to be turned too far out or too far in, the bottom trimmer should be adjusted until trimmer No. 5 peaks about half way in.

**DIAL CORD INSTALLATION:** The dial cord to be used should be approximately 27 inches long.

Open the gang condenser all the way (plates all out) and unclip the tension spring from drum A.
1. Thread both ends of the dial cord through the opening at the top of drum A and tie them to one end of the tension spring.
2. Wind one complete turn counter-clockwise around drum A. (Use only one end of the cord)
3. Run the cord around pulley B from back to front, then across to the front of pulley C.
4. Run the cord around pulley C, over drum A (in back of windings) down to shaft D.
5. Wind three complete turns around shaft D.
6. Run the cord up to drum A and wind one complete turn counter-clockwise around the drum.
7. Fasten the tension spring to the clip inside drum C.
8. With the gang condenser fully closed clip the pointer to the dial cord so that it comes opposite the 640 KC. marking on the dial.

**ELIMINATION OF OSCILLATION:** Some of the model R-304 receivers may oscillate or "growl" especially when tuned to weak stations or between stations. This oscillation can always be eliminated by connecting a ground to the receiver. However, if the set is to be used without a ground, it can be kept from oscillating by connecting a buffer condenser from one side of the power line to the chassis within the receiver. The condenser should have a capacity of .01 mfd. and a voltage rating of 1000 volts.

Later production receivers are built with such a line buffer condenser to prevent oscillation. Sets using the condenser can be identified by the letter "S" on the back of the chassis also on the packing carton near the serial number.
Use a high resistance voltmeter of at least 1000 ohms per volt.
01-52, 08-52 and 010-52 CHASSIS
ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 14 MC are required.
1. Connect the output meter across the 465 TO 1500 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
2. Connect the output meter across the 1500 TO 5000 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the volume control to the maximum output position, move the pointer to the correct position by hand while holding the trimmer in the full mesh position.
5. Push the "MANUAL" button and keep it depressed during the entire alignment procedure.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-52</td>
<td>08-52</td>
</tr>
<tr>
<td>010-52</td>
<td></td>
</tr>
<tr>
<td>CHASSIS</td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>EQUIPMENT</td>
</tr>
<tr>
<td>&amp; PROCEDURE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>01-52</td>
<td>08-52</td>
<td></td>
</tr>
<tr>
<td>010-52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHASSIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; PROCEDURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagram:**

- **TOP VIEW OF CHASSIS**
- **BOTTOM VIEW OF CABINET**
- **DIAL & MISCELLANEOUS PARTS**

---

**Alignment & Troubleshooting:**

For alignment: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 14 MC are required.
1. Connect the output meter across the 465 TO 1500 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
2. Connect the output meter across the 1500 TO 5000 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the volume control to the maximum output position, move the pointer to the correct position by hand while holding the trimmer in the full mesh position.
5. Push the "MANUAL" button and keep it depressed during the entire alignment procedure.

---

**Diagram & Table:**

- **TOP VIEW OF CHASSIS**
- **BOTTOM VIEW OF CABINET**
- **DIAL & MISCELLANEOUS PARTS**

---

**Alignment & Troubleshooting:**

For alignment: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 14 MC are required.
1. Connect the output meter across the 465 TO 1500 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
2. Connect the output meter across the 1500 TO 5000 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the volume control to the maximum output position, move the pointer to the correct position by hand while holding the trimmer in the full mesh position.
5. Push the "MANUAL" button and keep it depressed during the entire alignment procedure.

---

**Diagram & Table:**

- **TOP VIEW OF CHASSIS**
- **BOTTOM VIEW OF CABINET**
- **DIAL & MISCELLANEOUS PARTS**

---

**Alignment & Troubleshooting:**

For alignment: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 14 MC are required.
1. Connect the output meter across the 465 TO 1500 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
2. Connect the output meter across the 1500 TO 5000 Kc range and ground the circuit as indicated in the diagram. Connect the meter as shown in the diagram below.
3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the volume control to the maximum output position, move the pointer to the correct position by hand while holding the trimmer in the full mesh position.
5. Push the "MANUAL" button and keep it depressed during the entire alignment procedure.
01-54, 01-54S, 08-54, 010-54, and 010-54S CHASSIS
ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 455 KC to 15 MC are required.
1. Connect the output meter across the voice coil or between the plate of the 864-G output tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the black (ground) wire of the chassis.
3. Tune the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the gong condenser in full mesh, set the pointer to the last mark on the right and of the dial scale.

Dummy Antenna: Sensitivity & Tuning

<table>
<thead>
<tr>
<th>Type of Adjustment</th>
<th>Trimmer Description</th>
<th>Trimmer Number</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 MHz Condenser</td>
<td>465 KC</td>
<td>1-2</td>
<td>Adjust for Maximum Output</td>
<td></td>
</tr>
<tr>
<td>300 MHz Condenser</td>
<td>465 KC</td>
<td>3-4</td>
<td>Adjust for Maximum Output</td>
<td></td>
</tr>
<tr>
<td>200 MHz Condenser</td>
<td>1500 KC</td>
<td>5</td>
<td>Adjust for Maximum Output</td>
<td></td>
</tr>
<tr>
<td>100 MHz Condenser</td>
<td>1500 KC</td>
<td>7</td>
<td>Adjust for Maximum Output</td>
<td></td>
</tr>
</tbody>
</table>

01-61, 01-61S, 010-61, and 010-61S CHASSIS
ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 455 KC to 15 MC are required.
1. Connect the output meter across the voice coil or between the plate of the 864-G output tube and ground, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the black (ground) wire of the chassis.
3. Tune the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.
4. With the gong condenser in full mesh, set the dial pointer in a horizontal position. If the pointer is in the wrong position, it is merely necessary to move the pointer to the correct position by hand, while holding the gong in the full mesh position.

Dial & Miscellaneous Parts

- TOP VIEW OF CHASSIS
- MECHANICAL TOWER MOUNTING PARTS
- DIAL & BUTTON VIEW OF CHASSIS

Stewart-Warner Corp.
ALIGNMENT EQUIPMENT & PROCEDURE

ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 14 MC are required.

1. Connect the output meter across the voice coil or between the plate of the QVO output tube and ground, in series with a .1 mfd. condenser depending upon the type of meter. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the receiver chassis or to the "G" terminal at the back of the chassis. NOTE: The "G" and "F" terminals on this terminal strip must be connected together.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

4. With the gang condenser in full mesh, set the pointer to the last mark on the left end of the dial scale. If the pointer is incorrectly set, it is only necessary to loosen the set screw on the dial cord drive drum and push the gang condenser full mesh with the pointer properly set, then retighten the set screw.

### Alignment Chart

<table>
<thead>
<tr>
<th>Dummy Ant in Series with Signal Generator</th>
<th>Connection of Sig. Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Range Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 µfd. Condenser</td>
<td>Control Grid of QVO Tube</td>
<td>465 KC</td>
<td>Broadcast</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1 - 2</td>
<td>1ST I.F.</td>
<td>ADJUST FOR MAIDEN OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 - 4</td>
<td>2ND I.F.</td>
<td></td>
</tr>
<tr>
<td>200 µfd. Mica Condenser</td>
<td>Antenna Terminal</td>
<td>465 KC</td>
<td>Broadcast</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>5</td>
<td>Wave Trap</td>
<td>ADJUST FOR MAIDEN OUTPUT. USING A STRONG GENERATOR SIGNAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>1500 KC</td>
<td>- 6</td>
<td>Broadcast Oscillator (Strong)</td>
<td>ADJUST FOR MAIDEN OUTPUT.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>TUNING TO 1500 KC GENERATOR SIGNAL</td>
<td>7</td>
<td>Broadcast Antenna</td>
<td>ADJUST FOR MAIDEN OUTPUT.</td>
</tr>
<tr>
<td>200 µfd. Mica Condenser</td>
<td>Antenna Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>TUNING TO 1500 KC GENERATOR SIGNAL</td>
<td>8</td>
<td>Broadcast Oscillator (Strong)</td>
<td>ADJUST FOR MAIDEN OUTPUT. TRY TO INCREASE OUTPUT BY TUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>TUNING TO 1500 KC GENERATOR SIGNAL</td>
<td>9</td>
<td>Broadcast Antenna</td>
<td>ADJUST FOR MAIDEN OUTPUT. CHECK TO SEE IF PROPER PEAK WAS OBTAINED BY TUNING IN IMAGE AT APPROX. 15.1 KC. IF IMAGE DOES NOT APPEAR REALIZED AT 15 KC WITH TRIMMER SLIDED FURTHER OUT, RETUN SIGNAL.</td>
</tr>
<tr>
<td>400 Ohm Carbon Resistor</td>
<td>Antenna Terminal</td>
<td>14 MC</td>
<td>Foreign</td>
<td>14 MC</td>
<td>10</td>
<td>Foreign Oscillator</td>
<td>ADJUST FOR MAIDEN OUTPUT. TRY TO INCREASE OUTPUT BY TUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td>400 Ohm Carbon Resistor</td>
<td>Antenna Terminal</td>
<td>14 MC</td>
<td>Foreign</td>
<td>14 MC</td>
<td>11</td>
<td>Foreign Antenna</td>
<td>ADJUST FOR MAIDEN OUTPUT. TRY TO INCREASE OUTPUT BY TUNING TRIMMER AND RETUNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
</tbody>
</table>

**NOTE:** On some sets Trimmer No. 8 is located on the rear section of the gang condenser. On others it is located underneath the chassis.

**TOP VIEW OF CHASSIS**

**BOTTOM VIEW OF CHASSIS**
**Schematic, Voltage, Socket, Tuner Switch, Coils**

**Diagram No. 41**
**Part No. 113295**
**Broadcast Antenna Coil**

**Diagram No. 42**
**Part No. 113296**
**Broadcast R.F. Coil**

**Diagram No. 43**
**Part No. 113297**
**Broadcast Osc. Coil**

**Diagram No. 49**
**Part No. 114893**
**Short Wave Antenna Coil**

**Diagram No. 48**
**Part No. 114892**
**Short Wave Osc. Coil**

**Diagram No. 52**
**Part No. 114920**
**Push Button Switch**

**Diagram No. 55**
**Part No. 114929**
**Range Switch**

**Electrical Parts**

- **6K7**
- **6A8G**

**Stewart**

**Push SW**

**Dial AN**

- **PART NUMBER**
  - 114026, 114034, 114040, 114046, 114054, 114090, 114174, 114180, 114186, 114192, 114198, 114204

**Diagrams**

- **Diagram 1**
- **Diagram 2**
- **Diagram 3**
- **Diagram 4**
- **Diagram 5**

**Front of Rear Deck**

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CIRCUIT FEATURES

This chassis is an 8 tube, two band, push button tuning superheterodyne receiver. The tuning ranges are 530 to 1700 KC and 555 to 1650 KC.

Interconnected in each chassis is an eight button tuner switch. The first two buttons on the left are tone controls. Four different tone qualities may be imparted to a program by properly setting these tone buttons. The remaining six buttons are used for automatic tuning. Automatic tuning is accomplished by substituting pre-set trimmers for the variable inductors. The push button switch provides a simple rapid method of attaining this condition.

It should be noted that the R.F. stage in this receiver operates only on the Broadcast Band. When the band switch is in the "Automatic", "Intermediate" or "Foreign" positions this R.F. stage is not utilised.

HOW TO SET UP THE PUSH BUTTON TUNER

1. Connect your set to a good antenna system.
2. Allow the set to operate at least one-quarter hour before setting up the push button.
3. Make a list of the frequencies of six nearby stations to which you wish to set up the buttons. Be sure to select nearby, powerful stations, since weak stations will generally give better results when tuned manually. Also be sure to select stations falling within the tuning range of the individual buttons, as indicated in Fig. 1.
4. Each of the buttons on your "Magic Keyboard" can be made to control a station in a certain channel in a certain range as shown in Fig. 1. It is imperative that you select a station whose frequency is in the operating range of a button before attempting to set up that button for the particular station. It is important that the proper buttons be selected as the "push button switch" should not be too loosely or too tightly adjusted. For example, you may make a button to control a station KIBA whose frequency is 980 kilocycles. Refer to Fig. 1, which shows the frequency falls within the operating range of buttons No. 6 or No. 7, whose range is 650 to 1400 KC or of button No. 8 whose range is 720 to 1700 KC. Therefore either buttons No. 6, No. 7 or No. 8 can be used for the automatic tuning of station KIBA.

REPLACING THE DIAL POINTER DRIVE CORD

1. Tie a large knot in one end of about 7½" of special dial cord, part No. 112606.
2. Thread the free end of the cord through hole A in drum C (threading from the inside of the drum out). See Fig. 2.
3. After pulling the cord through hole A, make one half turn around the drum G in a counter-clockwise direction (viewed from the front), leaving the front groove in the drum.
4. Continuing, draw the cord up around the back of pulley B to pulley C. From this point continue across to pulley D and around to pulley F.
5. Go over pulley F and down to the bottom of the front groove of drum C. Continue up around the drum to hole B.
6. Draw the cord through hole B and tie it to the end of the tension spring in such a manner that when the spring is clipped on to lug N it will be extended to about 1½" long.

HUM

In some of the first sets produced, resistor No. 26 in the 6000 grid circuit was 470,000 ohms, also condenser No. 9 and resistor No. 27 were omitted. The hum level in these sets can be reduced by adding these two parts and changing Resistor No. 26 to 260,000 ohms. All chassis with this circuit changes should replace the letter "F" on the back.
In this receiver, the loop antenna on the back of the cover of the case, takes the place of the usual external coil. Thus when the trimmer in this circuit is aligned, the chassis, the loop antenna, and the batteries must be mounted in the cabinet in their correct position.

Holes are provided in the bottom of the case to permit the adjustment of both antenna and oscillator trimmers with the receiver completely assembled. These two adjustments should be made with a signal generator but without an output meter since it is impractical to keep the output meter connected when the back is mounted on the cabinet. That is, the antenna and oscillator trimmers can be adjusted by ear using a signal generator. The IF trimmers must be adjusted with an output meter in the conventional way.
In this receiver, the loop antenna on the back of the cover of the case, tunes out the coil. Thus when the trimmer in this circuit is aligned, the chassis, the loop antenna, and the batteries must be mounted in the cabinet in their correct position.

Holes are provided in the bottom of the case to permit the adjustment of both antenna and oscillator trimmers with the receiver completely assembled. These two adjustments should be made with a signal generator but without an output meter since it is impractical to keep the output meter connected when the back is mounted on the cabinet. That is, the antenna and oscillator trimmers can be adjusted by ear using a signal generator. The I.F. trimmers must be adjusted with an output meter in the conventional way.
ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT an output meter and an accurately calibrated signal generator are required.
1. Connect the output meter across the voice coil or between the plate of the IC6G output tube and ground through a 0.1 Mfd. condenser, depending on the type of meter. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the Ground Terminal or the chassis.
3. Turn the volume control to the maximum volume position and keep it in this position while aligning.
4. With the gang condenser in full mesh, set the dial pointer in a horizontal position. If the pointer is incorrectly set, it is merely necessary to move the pointer to the correct position by hand, while holding the gang in the full mesh position.

<table>
<thead>
<tr>
<th>Dummy Ant in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 MFD. Condenser</td>
<td>Control Grid of IAG</td>
<td>485 KC</td>
<td>Any Point Where It Does Not Affect Signal</td>
<td>1</td>
<td>2nd I.F.</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-3</td>
<td>1st I.F.</td>
<td></td>
</tr>
</tbody>
</table>

Before proceeding further with alignment, disconnect the output meter, and replace chassis, batteries and loop in cabinet, being sure to connect the loop. Using a weak signal from the signal generator, make the following adjustments by ear. The trimmers may be reached through the holes in the bottom of the cabinet by removing corks.

| 400 Ohm Carbon Resistor           | Antenna Terminal On Bottom Of Cabinet          | 1500 KC                     | 1500 KC              | 4               | Broadcast Oscillator (Shut) | Adjust trimmer for maximum output. |
| 400 Ohm Carbon Resistor           | Antenna Terminal On Bottom Of Cabinet          | 1500 KC                     | Tune To 1500 KC Generator Signal | 5               | Broadcast Antenna          | Adjust for maximum output. |

INSTALLATION OF BATTERIES

The following 1 1/2 volt "A" batteries will fit the space provided: Burgess No. 4FAP1, Eveready No. 742, or Ray-O-Vac No. 944A.

"B" batteries of the proper size are Burgess B30PI, Eveready No. 763 and Ray-O-Vac No. 503.

A plug and clip connection on the loop is provided to facilitate the installation of batteries. Before replacing the back of the cabinet always be sure that this plug is pushed into the clip and that the blocks are holding the batteries firmly in their positions.

Do not permit any of the battery cable plugs to come in contact with the receiver chassis or any battery terminal other than that to which it is to be connected.

LOOP ANTENNA

A built-in loop antenna is incorporated in this receiver. Due to the directional effect of this type of antenna it will often be possible to increase the signal volume by rotating the entire set.

In some locations it may be desirable to install an external antenna to increase the volume of weak or distant stations. This external antenna should be connected to the screw marked A on the terminal strip located on the bottom of the receiver case. Connect a ground wire to the post marked G on the same terminal strip.

NOTE: You must connect a ground wire to this receiver when using a separate outside aerial, otherwise you will not obtain a satisfactory increase in signal pickup.
FOR HUM OR NOISE (using built-in antenna)

1. Try reversing power line plug.
2. If not corrected, remove connector between A and A1, on back of chassis, and connect an external antenna to A.

BOTTOM VIEW OF CHASSIS
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS UNLESS OTHERWISE SHOWN.
LINE VOLTAGE 117 VOLTS.
VOLTAGE ACROSS SPEAKER FIELD 20 VOLTS.

REAR OF CHASSIS

Resistor No. 17 changed to a 2 watt molded wire-wound resistor, Part 110279 to prevent failure of the resistor if the dial bulb burns out.

NOTE
TERMINALS OF COILS SHOWN IN PICTORIAL VIEWS ABOVE ARE LETTERED TO CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE CIRCUIT DIAGRAM.
ALIGNMENT PROCEDURE

ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 405 KC to 1800 KC are required.

Connect the output meter across the voice coil or between the plate of the 25L6-OT output tube and ground through a .05 mfd. condenser, depending upon the type of meter. The more sensitive type should be connected across the voice coil.

Connect the ground lead of the signal generator to the chassis of the receiver through a .05 mfd. condenser and keep it connected in this manner throughout the entire alignment procedure. Failure to do this may have serious results as the signal generator may be connected to one side of the power line, or it may be grounded externally.

Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

Remove the connector between Terminals A and A₁.

<table>
<thead>
<tr>
<th>DUMMY ANTENNA IN SERIES WITH SIGNAL GENERATOR</th>
<th>CONNECTION OF SIGNAL GENERATOR TO RECEIVER</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>RECEIVER SIGNAL SETTING</th>
<th>TRIMMER NUMBER</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 DOT. MICA CONTINER</td>
<td>CONTROL GRID OF 6A8-G TUBE</td>
<td>465 KC</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1-2</td>
<td>1ST I.F.</td>
<td>ADJUST FOR MAXIMUM OUTPUT THEN REPEAT ADJUSTMENT</td>
</tr>
<tr>
<td>200 DOT. MICA CONTINER</td>
<td>ANTENNA TERMINAL (A)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>3</td>
<td>2ND I.F.</td>
<td></td>
</tr>
<tr>
<td>200 DOT. MICA CONTINER</td>
<td>ANTENNA TERMINAL (A)</td>
<td>1500 KC</td>
<td>TUNE TO 1500 KC GENERATOR SIGNAL</td>
<td>4</td>
<td>DRAWD G CONNDT.</td>
<td>ADJUST TRIMMER TO BRING IN SIGNAL</td>
</tr>
</tbody>
</table>

BUILT-IN ANTENNA SYSTEM

The Built-In Antenna incorporated in this receiver will generally give very satisfactory results in localities where powerful broadcast stations exist. This Built-In Antenna will function when terminals A and A₁ on the back of the chassis are connected together. In cases where noises are excessive or greater sensitivity is desired, remove the jumper connecting terminals A and A₁ and connect an external antenna to terminal A₁.

Refer to the circuit diagram on the opposite page. Condenser No. 35 couples the primary of the antenna coil to one side of the power line, which acts as the antenna. The R F choke No. 36 is an iron-core choke whose impedance is high at broadcast frequencies. This choke serves to prevent feed-back into the antenna circuit, of radio frequency energy generated in the set itself. It also prevents condenser No. 18 from by-passing the signal voltage picked up by the power line.

When aligning this receiver, the jumper connecting terminals A and A₁ should be removed. This will prevent picking up signals which might interfere with the alignment procedure. When the I.F. channel is being aligned, the gang condenser should be set at a point where no interfering signal will be received.

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>112748</td>
<td>Clip - cell mounting</td>
<td>.01</td>
</tr>
<tr>
<td>114092</td>
<td>Socket - octal base</td>
<td>.15</td>
</tr>
<tr>
<td>114626</td>
<td>Socket - for dial lamp</td>
<td>.20</td>
</tr>
<tr>
<td>112250</td>
<td>Terminal Strip - for antenna (A-A₁)</td>
<td>.12</td>
</tr>
<tr>
<td>114900</td>
<td>Cabinet - Ivory (plastic) for 07-512</td>
<td>6.60</td>
</tr>
<tr>
<td>116390</td>
<td>Cabinet - walnut for 07-511</td>
<td>3.00</td>
</tr>
<tr>
<td>116391</td>
<td>Cabinet - sprayed ivory for 07-513</td>
<td>4.25</td>
</tr>
<tr>
<td>116342</td>
<td>Cabinet - metallic blue</td>
<td>4.25</td>
</tr>
<tr>
<td>116340</td>
<td>Cabinet - metallic red</td>
<td>4.25</td>
</tr>
<tr>
<td>116341</td>
<td>Cabinet - metallic green</td>
<td>4.25</td>
</tr>
</tbody>
</table>

CABINETS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>116390</td>
<td>Cabinet back (Ivory) for 07-512</td>
<td>7.90</td>
</tr>
<tr>
<td>116370</td>
<td>Cabinet back (Ivory) for 07-510</td>
<td>10.00</td>
</tr>
<tr>
<td>116371</td>
<td>Cabinet back (Walnut) for 07-511 &amp; 07-513</td>
<td>10.00</td>
</tr>
</tbody>
</table>

CABINET BACKS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>114973</td>
<td>Knob - tuning (red)</td>
<td>.45</td>
</tr>
<tr>
<td>116297</td>
<td>Knob - tuning (Ivory)</td>
<td>.40</td>
</tr>
</tbody>
</table>

TUNING KNOBS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>114973</td>
<td>Knob - volume (red)</td>
<td>.08</td>
</tr>
<tr>
<td>116297</td>
<td>Knob - volume (Ivory)</td>
<td>.08</td>
</tr>
</tbody>
</table>

VOLUME KNOBS
ALIGNMENT PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator are required.

1. On the 07-51H, connect the output meter across the voice coil or between the plates of the 35K6GT output tube and chassis through a .1 mfd condenser, depending upon the type of meter. The more sensitive type should be connected across the voice coil. THE CONNECTIONS FOR THE 07-55 ARE THE SAME EXCEPT CONNECT THE GROUND LEAD TO THE POINT SHOWN IN FIG. 1 INSTEAD OF TO CHASSIS.

2. When aligning the 07-51H chassis, connect the ground lead of the signal generator to the chassis of the receiver through a .25 mfd condenser and keep it connected in this manner throughout the entire alignment procedure. FOR THE GROUND LEAD CONNECTION TO THE 07-55 CHASSIS, REFER TO "BOTTOM VIEW," FIG. 1.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. Remove the connector between Terminals A and A1.

<table>
<thead>
<tr>
<th>Dummy Ant.</th>
<th>Connection of Sig. Generator To Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Series with Sig. Gen.</td>
<td>Trimmer Lug On Front Section Of Variable Condenser</td>
<td>465 KC</td>
<td>1750 KC</td>
<td>1</td>
<td>2nd I.F.</td>
<td>Adjust for Maximum Output, Then Repeat Adjustment.</td>
</tr>
<tr>
<td>200 MMFD. Mic. Condenser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 MMFD. Mic. Condenser</td>
<td>Antenna Terminal (A)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>4</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>200 MMFD. Mic. Condenser</td>
<td>Antenna Terminal (A)</td>
<td>1500 KC</td>
<td>Tune To 1500 KC Generator Signal</td>
<td>5</td>
<td>Broadcast Antenna (Shunt)</td>
<td>Adjust for Maximum Output.</td>
</tr>
</tbody>
</table>

primary of the antenna coil to one side of the power line, which acts on the antenna. The R.F. choke No. 28 is an iron-core choke whose impedance is high at broadcast frequencies. This choke serves to prevent condenser No. 19 from bypassing the signal voltage picked up by the power line. It also prevents feedback into the antenna circuit of radio frequency energy generated in the set itself.

When aligning this receiver, the jumper connecting terminals A and A1 should be removed. This will prevent picking up signals which might interfere with the alignment procedure.

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116445</td>
<td>Atlantic Pod-Model (07-55 only)</td>
<td>$0.43</td>
</tr>
<tr>
<td>116547</td>
<td>Box-Condenser Mounting</td>
<td>$.95</td>
</tr>
<tr>
<td>116549</td>
<td>Cover For Ant. condenser (07-55 only)</td>
<td>$.22</td>
</tr>
<tr>
<td>116561</td>
<td>Clamp for power cord (07-55) only</td>
<td>.31</td>
</tr>
<tr>
<td>116745</td>
<td>Clip—call mounting</td>
<td>$0.31</td>
</tr>
<tr>
<td>116881</td>
<td>Socket for dial lamp</td>
<td>$0.30</td>
</tr>
<tr>
<td>116887</td>
<td>Socket—actuating brace</td>
<td>$.15</td>
</tr>
<tr>
<td>116890</td>
<td>Screw—No. 6 hex. head—Per C.</td>
<td>$.35</td>
</tr>
<tr>
<td>116893</td>
<td>Terminal strip—antenna (A.A.)</td>
<td>$.12</td>
</tr>
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</table>

CABINETS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116470</td>
<td>Cabinet (wood)—(07-514B) and (07-554B)</td>
<td>$7.00</td>
</tr>
<tr>
<td>116541</td>
<td>Cabinet (metallic green)—(07-512B) and (07-532B)</td>
<td>.75</td>
</tr>
<tr>
<td>116544</td>
<td>Cabinet (metallic red) (07-512B) and (07-532B)</td>
<td>.75</td>
</tr>
<tr>
<td>116550</td>
<td>Cabinet (metallic blue) (07-512B) and (07-532B)</td>
<td>.75</td>
</tr>
<tr>
<td>116555</td>
<td>Cabinet (ivory pinstripe) (07-512B) and (07-532B)</td>
<td>.30</td>
</tr>
<tr>
<td>116499</td>
<td>Cabinet (ivory pinstripe) (07-512B) and (07-532B)</td>
<td>.40</td>
</tr>
<tr>
<td>116577</td>
<td>Cabinet Back (walnut) (07-512B) and (07-532B)</td>
<td>$.12</td>
</tr>
<tr>
<td>116560</td>
<td>Cabinet Back (ivory) (07-555B)</td>
<td>$.12</td>
</tr>
<tr>
<td>116562</td>
<td>Cabinet Back (walnut) (07-555B)</td>
<td>$.12</td>
</tr>
<tr>
<td>116567</td>
<td>Cabinet Back (ivory) (07-555B)</td>
<td>$.12</td>
</tr>
</tbody>
</table>

TUNING KNOBS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116577</td>
<td>Knob—tuning (ivory) (07-512B) and (07-532B)</td>
<td>$.40</td>
</tr>
<tr>
<td>116577</td>
<td>Knob—tuning (walnut) (07-512B) and (07-532B)</td>
<td>$.40</td>
</tr>
<tr>
<td>116577</td>
<td>Knob—tuning (red) (07-512B) and (07-532B) (07-555B) and (07-552B)</td>
<td>$.45</td>
</tr>
</tbody>
</table>

VOLUME KNOBS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>116577</td>
<td>Knob—tuning (ivory) (07-512B) and (07-532B)</td>
<td>$.40</td>
</tr>
<tr>
<td>116577</td>
<td>Knob—tuning (walnut) (07-512B) and (07-532B) and (07-555B)</td>
<td>$.40</td>
</tr>
<tr>
<td>116577</td>
<td>Knob—tuning (red) (07-512B) and (07-532B) (07-555B) and (07-552B)</td>
<td>$.45</td>
</tr>
</tbody>
</table>

Built-in Antenna System

The Built-in Antenna Condenser No. 27 couples the
ALIGNMENT EQUIPMENT & PROCEDURE

FOR ALIGNMENT: An output meter and an accurately calibrated signal generator with a tuning range from 465 KC to 1500 KC are required.

1. Connect the output meter across the voice coil or between the plate of the 25L6-G output tube and chassis through a 0.1 mfd. condenser, depending upon the type of meter. The more sensitive type should be connected across the voice coil.

2. Connect the ground lead of the signal generator to the chassis of the receiver through a 0.2 mfd. condenser and keep it connected in this manner throughout the entire alignment procedure. Failure to do this may have serious results as the signal generator may be connected to one side of the power line, or it may be grounded externally.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the entire alignment procedure.

4. With the gang condenser in full mesh, set the pointer to the last mark on the right end of the dial scale. If the pointer is only slightly off calibration, loosen the set-screw in the dial drive drum at the left side of the gang condenser and set the pointer to the last mark on the right end of the dial when the gang condenser is in full mesh. If the pointer is off calibration several dial divisions, release it from the pointer drive cord by spreading the clip on the pointer. Then slide the pointer along the cord until it is set to the last dial division on the right end of the dial. Holding it in place check to see if the gang condenser is in full mesh, and tighten the pointer clip, being careful not to cut the cord. Place a drop of household or speaker cement on the cord and pointer clip to prevent the pointer from slipping.

<table>
<thead>
<tr>
<th>Dummy Ant in Series with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 MFD. Micro Condenser</td>
<td>Control Grid of 2A8-G Tube</td>
<td>465 KC</td>
<td>Any Point Where It Does Not Affect The Signal</td>
<td>1-2</td>
<td>1st I.F.</td>
<td>Adjust for Maximum Output. Then Repeat Adjustment.</td>
</tr>
<tr>
<td></td>
<td>Antenna Lead (Blue Wire)</td>
<td>465 KC</td>
<td>Any Point Where It Does Not Affect The Signal</td>
<td>3-4</td>
<td>2nd I.F.</td>
<td></td>
</tr>
<tr>
<td>331 MFD. Micro Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>5</td>
<td>Wave Trap</td>
<td>Adjust for Minimum Output using a Strong Generator Signal.</td>
</tr>
<tr>
<td></td>
<td>Tune To 1500 KC Generator Signal</td>
<td>1500 KC</td>
<td></td>
<td>6</td>
<td>Broadcast Oscillator (Shunt)</td>
<td></td>
</tr>
<tr>
<td>200 MFD. Micro Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td></td>
<td>7</td>
<td>Broadcast Antenna (Shunt)</td>
<td>Adjust for Maximum Output.</td>
</tr>
</tbody>
</table>

HOW TO SET UP PUSH BUTTONS

Before setting up buttons, turn on set for at least 15 minutes. To set up a push button, pull off the button top by grasping the button and pulling outward on it. When the button is removed, the setup screw will be exposed to view (See Fig. 1). Insert a screwdriver in this screw and loosen it (about one turn counter-clockwise will be sufficient).

1. Keeping the screwdriver in the screw slot, PUSH AGAINST THE SCREW DRIVER UNTIL THE PUSH BUTTON SHAFT IS FORCED ALL THE WAY IN. While the button is held in this position, crank the tuning knob and tune in the desired station. Then release the offsetting screw, turning clockwise until reasonably tight.

2. WARNING: Do not attempt to turn the screw until it reaches a definite stop. Merely turn until you meet with appreciable resistance. To turn further may result in damage to the mechanism.

HOW TO REPLACE THE DIAL DRIVE CORD

1. Close the gang condenser. The set screw in the drum, Fig. 1, must be on the top side.

2. Tie one end of the dial cord to the spring L and thread the other end through hole A and down the front of the drum to the tuning shaft. Continue around the shaft, then over pulley B and up the rear side of the drum.

3. Thread the cord through hole A and tie the other end to spring L. Tie the cord so that spring L will be extended to about 1/4 inch.

4. HOW TO REPLACE DIAL POINTER DRIVE CORD

1. Close the gang condenser and thread one end of the cord through eyelet G and tie it to spring K.

2. Carry the other end of the cord over the drum to the front around pulley K and then across to pulley L and counter-clockwise around it.

3. Continue back to pulley L and down the front of the drum. Carry the end of the cord around the drum and thread through eyelet G.

4. Tie both ends extending through eyelet G to tension spring X IMPORTANT: In so doing, allow enough slack in the cord so that when spring X is hooked in place in the drum, it will be extended only a very little. If the spring is extended too much, it will tend to make the push button operate too hard because of overloading.

5. To secure the gang condenser is closed, then set the dial pointer to the last dial division mark on the right and clip it to the cord.
Stromberg-Carlson

Type of Circuit: Superheterodyne

Tuning Ranges:
A - 530 to 1680 Kc.
B - 11,000 to 16,000 Kc.

Number and Types of Tubes:
2 No. 6F7, 1 No. 6S5

Frequency Control
10 to 11,000 Kc.

Input Voltage Rating
6000 Vc.

Power Frequency Rating
60 Hertz, 1 No. 6F5

Input Power Rating
225 Volts A.C.

Frequency of Intermediate Amplifier
30 to 60 Cycles

465 Watts
405 Kilocycles
Stromberg-Carlson

No. 255 Radio Receivers

Type of Circuit .................................................. Superheterodyne with Automatic Frequency Control
Tuning Ranges ...................................................... A—530 to 1600 Kc.; B—1600 to 4800 Kc.; C—4800 to 11,000 Kc.
...................................................... D—11,000 to 22,000 Kc.; E—22,000 to 60,000 Kc.
Number of Tubes .................................................. 2 No. 6K7, 1 No. 6A8, 2 No. 6J7, 1 No. 6B8, 1 No. 6H6, 1 No. 6F5
...................................................... 1 No. 6C5, 2 No. 6L6, 1 No. 6G6, 1 No. 5U4G
Input Voltage Rating ........................................... 105 to 125 Volts A. C.
Power Frequency Rating ....................................... 25 to 60 Cycles and 50 to 60 Cycles
Input Power Rating ............................................. 145 Watts
Frequency of Intermediate Amplifier ......................... 465 Kilocycles
NORMAL VOLTAGE READINGS

The various voltages listed in the following table are obtained by connecting between the various tube socket contacts and the chassis base, with the tubes in their respective sockets. The readings are therefore those that would exist during normal operation of the set.

Volume readings are given for a line voltage of 120 volts, and allowance should be made for differentials when the line voltage is different. A meter having a resistance of 100,000 ohms per volt should be used for measuring the voltages listed in the following table. The voltage readings are given in the following ranges: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0 volts except where an asterisk appears after any given volt.

A.C. voltages are indicated by italics. Receiver tuned to 1000 kc. ob signal.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Cfg.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>5K7</td>
<td>R.F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+258</td>
<td>+58</td>
<td>0</td>
<td>-58</td>
<td>6.1</td>
<td>0</td>
</tr>
<tr>
<td>5A4</td>
<td>Modulator</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+232</td>
<td>+40</td>
<td>-2.0</td>
<td>+30</td>
<td>6.1</td>
<td>0</td>
</tr>
<tr>
<td>5J7</td>
<td>Oscillator</td>
<td>0</td>
<td>2.2</td>
<td>76</td>
<td>+188</td>
<td>0</td>
<td>0</td>
<td>-6</td>
<td>0</td>
<td>2.7</td>
</tr>
<tr>
<td>5G7</td>
<td>Oscillator Control</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+190</td>
<td>+109</td>
<td>+3.8</td>
<td>0</td>
<td>6.1</td>
<td>-5.5</td>
</tr>
<tr>
<td>5K7</td>
<td>I.F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+238</td>
<td>+90</td>
<td>0</td>
<td>0</td>
<td>6.1</td>
<td>0</td>
</tr>
<tr>
<td>8885</td>
<td>Dem.-A.V.C.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>+825</td>
<td>-81</td>
<td>-1</td>
<td>+90</td>
<td>0</td>
</tr>
<tr>
<td>4685</td>
<td>A.V.C.</td>
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<td>0</td>
<td>0</td>
<td>-56</td>
<td>-136</td>
<td>+135</td>
<td>0</td>
<td>0</td>
<td>+135</td>
</tr>
<tr>
<td>465</td>
<td>Audio Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-106</td>
<td>+135</td>
<td>0</td>
<td>-1.8</td>
<td>6.1</td>
<td>-5.2</td>
</tr>
<tr>
<td>625</td>
<td>Audio Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>-300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>Audio Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>A.V.C. Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>A.V.C.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>Tuning Indicator</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>Receiver</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
<tr>
<td>6L6</td>
<td>Speaker</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+306</td>
<td>+300</td>
<td>0</td>
<td>6.1</td>
<td>-22</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Sockets Used: Also Model 260.

CONTINUITY TEST FOR NO. 255 RECEIVERS

ALSO MODEL 260

Nov. 1, 1937

For making a continuity test on the No. 255 Receivers, use the same test chart and instructions as are used on the No. 250 Receivers.

1. Remove Flash Tuner Lamp Plug from Flash Tuner Unit (This socket is located next to the speaker socket on rear of chassis)

2. Operate A.P.C. to "Off" position (This switch is located directly under dial on front of chassis). Operate tuning dial until finger No. 2 on Flash Tuner Unit makes contact on Switch (See Flash Tuner Switch on Page 6 of Engineering Data Sheet for No. 255 Receiver for the correct location of finger). Read from No. 1 terminal of Flash Tuner Socket to chassis base, reading should be "0”. Operate A.P.C. switch to "Off” position. Reading should be "G”.

3. Operate tuning dial until finger No. 3 on Flash Tuner Unit makes contact on switch. Read from No. 3 terminal of Flash Tuner socket to chassis base, reading should be 10”.

4. Proceed in the same manner to test the rest of this circuit.

The readings from the Flash Tuner Socket are usually taken from the top of the socket. Therefore, the terminals will be numbered in a counter-clockwise direction.
PROCEDURE FOR OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS

A socket having three contacts is provided on the rear of the chassis base, and is wired to the "Off-On-Bass-Photograph" switch assembly located on the front of the receiver. A three-prong plug is also inserted in the socket so that if at any time it is desired to use an electric pick-up and phonograph unit in conjunction with this receiver, it may readily be accomplished.

In order to obtain the best quality of phonograph reproduction when using an electric pick-up and phonograph unit with this receiver, a Stromberg-Carlson No. 18 Record Player is recommended. This record player is equipped with a correctly designed single-speed playing motor unit, and uses a crystal type pick-up in conjunction with a specially matched condenser. To attach this instrument to a No. 335 Receiver, it is only necessary to remove the three-prong plug furnished with the receiver and insert the three-prong plug which comes with the unit into the three-prong socket located on the rear of the chassis base. Then, the power supply plug of the phonograph unit should be inserted into a suitable power supply receptacle, and the unit will be ready for use.

If the Stromberg-Carlson No. 18 Record Player is not used and the electric pick-up to be used is of the high impedance type, it will be necessary to connect a low capacity shielded cable between the three-prong plug furnished with the receiver and the pick-up. This shielded cable should be of the low capacity type, in order to prevent the excessive cutting of high frequencies which is caused when a shielded cable having high capacity is used. The length of the shielded cable used should be kept as short as possible.

If a pick-up of the low impedance type is used, it will be necessary to connect a "matching transformer" between the three-prong plug and the pick-up. The transformer should be located as near to the receiver as possible, in which case it will not be necessary to use a shielded cable.
ALIGNMENT DATA

Dial Adjustment

When aligning the circuits of these receivers, the tuning dial must be properly aligned to "tune" the
radio receiver with the
radio receiver in the
radio receiver. To check whether the dial is set correctly with respect to the tuning capacitance
radio receiver, the following procedure should be followed:

1. Adjust the tuning capacitance to its maximum position.
2. Turn on the receiver and tune it to a strong station.
3. Adjust the dial until the station is heard as clearly as possible.
4. Adjust the dial until the station is heard as clearly as possible.
5. Check the alignment by comparing the station's frequency with the dial's settings.

Intermediate Frequency and A. F. C. Circuit Adjustments

The intermediate frequency system employed in this receiver is a single circuit. The first A. F. C. stage
is coupled to the second A. F. C. stage through the No. 403 tube. This second and third A. F. C. stages are
coupled through the speaker jack of the No. 404 tube. The third and fourth A. F. C. stages are
interconnected by means of the No. 405 and No. 406 tubes. The fourth A. F. C. stage is connected
to the final stage through the No. 407 tube. The fifth A. F. C. stage is connected to the final stage
through the No. 408 tube. The sixth A. F. C. stage is connected to the final stage through the No. 409 tube.

1. Operate the Range Switch on the receiver chassis to the "T" range position and set the signal generator's
frequency to 160 megacycles.
2. Adjust the tuning capacitance to its maximum position and adjust the dial until the station is heard as clearly as possible.
3. Adjust the dial until the station is heard as clearly as possible.
4. Check the alignment by comparing the station's frequency with the dial's settings.

Alignment of Short-Wave Range (Also referred to as "D" Band)

In aligning the radio frequency circuits for this range use the same artificial antenna (404-406 type) and
antenna feeding wires with the test circuits of the signal generator as was used for aligning the Ultra-Short
Wave Range. Connect this lead to the antenna binding post marked "X" located on the rear of the receiver
chassis, and align as follows:

1. Operate the Range Switch on the receiver chassis to the "D" range position and set the signal generator's
frequency and receiver's tuning dial to 160 megacycles.
2. Adjust the tuning capacitance to its maximum position and adjust the dial until the station is heard as clearly as possible.
3. Adjust the dial until the station is heard as clearly as possible.
4. Check the alignment by comparing the station's frequency with the dial's settings.

Alignment of Acrf (Also referred to as "B" Band)

In aligning the radio frequency circuits for this range use the same artificial antenna and antenna
feeding wires with the test circuits of the signal generator as was used for aligning the Ultra-Short
Wave Range. Connect this lead to the antenna binding post marked "X" located on the rear of the receiver
chassis, and align as follows:

1. Operate the Range Switch on the receiver chassis to the "B" range position and set the signal generator's
frequency to 160 megacycles.
2. Adjust the tuning capacitance to its maximum position and adjust the dial until the station is heard as clearly as possible.
3. Adjust the dial until the station is heard as clearly as possible.
4. Check the alignment by comparing the station's frequency with the dial's settings.

Alignment of Standard Broadcast Range (Also referred to as "A" Band)

In aligning the radio frequency circuits for this range replace the 404-406 type resonator with the signal
generator's output and using 200 ohm resistors in series with the signal generator's output and using
200 ohm resistors in series with the signal generator's output. Connect this lead to the antenna binding post marked "X" located on the rear of the receiver chassis, and align as follows:

1. Operate the Range Switch on the receiver chassis to the "A" range position and set the signal generator's frequency to 160 megacycles.
2. Adjust the tuning capacitance to its maximum position and adjust the dial until the station is heard as clearly as possible.
3. Adjust the dial until the station is heard as clearly as possible.
4. Check the alignment by comparing the station's frequency with the dial's settings.
3. Set the signal generator's frequency and the receiver's tuning dial to 0.8 megacycles (800 kilocycles) and adjust the tuning capacitor C1 so as the same time rotate the tuning terminal back and forth through resonance until maximum voltage output is obtained on the output meter.

4. Reset both the signal generator's frequency and the receiver's tuning dial to 1.5 megacycles and repeat operation No. 4.

Adjustment of 10 Kilocycle Audio Out-of-Filter

The adjustment of this filter is performed at the factory and no additional adjustment is required.

Instructions for Setting Up the A. F. C. Flash Tuning Unit

1. Remove the flash tuner lamp assembly by removing the four screws.

2. Replace the brush assembly which is located inside of the cabinet.

3. Replace the lamp assembly which is located on the rear side of the lamp unit and removed plate.

4. Insert the station letters of the seven stations which is desired to be set up in the flash tuning unit from the list of stations. It will be noted that the letters of the stations are printed on a piece of card stock cut out in a shape to fit the frame of the flash tuning lamp unit. The recommended method of inserting these station letters is to arrange them to fit the frequency of the stations as follows:

Looking at the front of the assembly plate, the station having the highest frequency should appear in the top right-hand frame, and then in consecutive order according to frequency the remaining station letters should be inserted into the other frames. The top left-hand frame containing the station letters of the station having the lowest frequency. In inserting these letters into the frames be sure to have the letters located between two pieces of transparent material.

5. Fasten the assembly plate to the lamp unit by means of the four screws. The receiver is now ready to be operated and the flash unit is conditioned on the rear of the chassis base adjusted for the seven favorite stations.

6. Rotate the "On-Off-Flash-Photograph" Control knob from its complete counter-clockwise position, slowly advancing to this position which turns the set off as indicated by the position of the dial. Wait a few seconds to reach operating temperature. Check the position of the Automatic Frequency Control knob which should be selected according to the "On-Off-Flash-Photograph" Control knob in the "Normal" position. Now carefully tune the desired station during the lowest frequency, watching the tuning indicator so that the receiver will be correctly tuned to the station.

7. After carefully tuning to the desired station, move the A. F. C. Control knob to the "Off" position. Now, with the same keys, observe the station number on the tuning indicator. Hold the receiver receiver with one hand and slowly move the left hand with the other hand. Then move the receiver to the desired station, using the automatic frequency control knob and watch the tuning indicator so that the receiver will be correctly tuned to the station.

8. Now, retrace the A. F. C. Control knob to the "Off" position and note whether the tuning has been shifted by watching the tuning indicator. If a change is noted it will be necessary to repeat operation No. 7.

9. When an adjustment is required after operating in Nos. 3 and 7, the remaining six favorite stations should be set up in the same manner.

With the A. F. C. flash tuning unit in operation, the receiver will be automatically kept in tune with any one of the seven favorite stations as long as the station is operating or present. It is not unusual to find that when a strong signal is present in other adjacent channels, the A. F. C. flash tuning unit will hold the station if a strong signal is present in other adjacent channel. This same phenomenon will occur if two stations in adjacent channels are almost equally strong with the signal from the station being slightly weaker and fading. In this condition the tendency is "pull" when the receiver is tuned to the station which is slightly weaker and fading.
### Terminal of Sockets

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Cap</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Socket Terminal Numbers</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>Mod. — Osc.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+174</td>
<td>+64</td>
<td>-7.2</td>
<td>+176</td>
<td>6.1</td>
<td>-1.8</td>
<td>2-7</td>
<td>6.1</td>
</tr>
<tr>
<td>6K7</td>
<td>I. F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+176</td>
<td>+62</td>
<td>+1.8</td>
<td>+210</td>
<td>6.1</td>
<td>-1.8</td>
<td>2-7</td>
<td>6.1</td>
</tr>
<tr>
<td>6Q7G</td>
<td>Dem. — A. V. C.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+65*</td>
<td>0</td>
<td>0</td>
<td>+65*</td>
<td>6.1</td>
<td>0</td>
<td>2-7</td>
<td>6.1</td>
</tr>
<tr>
<td>6V6G</td>
<td>Audio Output</td>
<td>—</td>
<td>0</td>
<td>0</td>
<td>+167</td>
<td>+176</td>
<td>0</td>
<td>0</td>
<td>6.1</td>
<td>+8.2</td>
<td>2-7</td>
<td>6.1</td>
</tr>
<tr>
<td>80</td>
<td>Rectifier</td>
<td>—</td>
<td>+260</td>
<td>258</td>
<td>258</td>
<td>+260</td>
<td></td>
<td></td>
<td></td>
<td>1-4</td>
<td></td>
<td>4.8</td>
</tr>
</tbody>
</table>

Receiver tuned to 1000 Kc., no signal. A. C. voltages are indicated by italics.

---

**Fig. 3. Wiring Diagram of Chassis.**

STROMBERG-CARLSON TEL. MFG. CO.

ELECTRICAL SPECIFICATIONS

Type of Circuit: Superheterodyne with Electric Tones
Tuning Ranges: A-530 to 1700 Kc.; C-5800 to 18,000 Kc.
Number and Type of Tubes: 1 No. 6A8, 1 No. 6K7, 1 No. 6Q7, 1 No. 6V6G, 1 No. 80
Voltage Rating: 100 to 125 Volts
Power Frequency Rating: 25 to 60 Cycles and 50 to 60 Cycles
Input Power Rating: 42 Watts
Frequency of Intermediate Amplifier: 455 Kilocycles

APPARATUS SPECIFICATIONS

No. 325-J Receiver: 25 to 60 Cycles; P-28816 Chassis Assembly
No. 325-JB Receiver: 25 to 60 Cycles; P-28817 Chassis Assembly
No. 325-N Receiver: 50 to 60 Cycles; P-28816 Chassis Assembly
No. 325-NB Receiver: 50 to 60 Cycles; P-28817 Chassis Assembly
No. 325-S Receiver: 50 to 60 Cycles; P-28816 Chassis Assembly
No. 325-SB Receiver: 25 to 60 Cycles; P-28817 Chassis Assembly

Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the

Fig. 2. Schematic Circuit of Receiver.

FOR OTHER DATA SEE TYP. A
NORMAL VOLTAGE READINGS

The various values of voltages listed in the following table are obtained by measuring between the various tabed socket contacts and the chassis base, with the tubes in their respective sockets. The receiver is, therefore, in operation when the measurements are made. Figure 1 shows the layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 110 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter giving a reading of 1000 ohms per volt should be used for measurements of the DC voltages. Voltage values shown are those obtained on the lowest possible scale of the meter used. All meter except where noted instruments are equipped with 15, 60, 30, 150, 600, 1500, 6000 ohm resistors with a 0.1 microammeter reading when a certain value is below any given voltage value in which case the 150 volt scale was used.

<table>
<thead>
<tr>
<th>Terminals of Sockets</th>
<th>Highest Voltages Between Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube</td>
<td>Circuit</td>
</tr>
<tr>
<td>5A6</td>
<td>Mod. Oct.</td>
</tr>
<tr>
<td>5D7</td>
<td>L.F. Amp.</td>
</tr>
<tr>
<td>6B6</td>
<td>D. A. V.</td>
</tr>
<tr>
<td>6D6</td>
<td>Output</td>
</tr>
<tr>
<td>6N6</td>
<td>Rectifier</td>
</tr>
</tbody>
</table>

Receiver tuned manually to 1060 kc., no signal. A.C. voltages indicated by italics.

ALIGNMENT DATA

All alignment adjustments are necessary at the factory on these receivers, and ordinarily no realignment is necessary in the field. However, should it become necessary to make any realignments, the alignment procedures given in the figures should be carefully followed, as the circuitry chosen for these receivers is not a simple matter of adjusting voltages. It is recommended that the Stromberg-Carlson P-7300 and P-5006 aligning blocks be used.

To accurately line the circuits in these receivers, it is necessary to use a high grade, modulated test oscillator (Signal Generator). The output voltage of which can be varied. In conjunction with the test oscillator, a sensitive output meter should be used for determining the maximum output voltage developed in the voice coil of the loud speaker.

In making all alignment adjustments, always adjust the test oscillator output voltage to the maximum value of which it is capable. Never attempt to make any alignment adjustments using a low grade test oscillator or any source of voltage that is capable of developing a waveform. To obtain maximum output, the test oscillator should be set for the condition of maximum output from the receiver's output stage.

To obtain the best possible performance of these receivers, it is necessary to remove the chassis from the cabinet. The electrical conditions for the intermediate frequency circuits of these receivers are easily accessible from the inside of the cabinet. After removing the chassis, each is placed on the back panel of the chassis and the cabinet is then placed back into position.

Intermediate Frequency Adjustments

The intermediate frequency used is 455 kilocycles. In making these circuit adjustments always align the circuits in the order given in these instructions.

1. Rotate the Electric Tuning and Range Switch control knob to the Standard Broadcast Range position (arrow on brush pointing in direction of lower edge of the knob).

2. Set the dial pointer to the extreme low frequency position on the receiver's dial. Rotate the "Click-On" tone control slightly clockwise from its counter-clockwise position (maximum volume).

3. Apply the voltage changes between the control and the grid of the No. 648 modulator-oscillator tube, a grounded grid of 455 kilocycles from the test oscillator, using a 51-

Radio Frequency Adjustments

The alignment of the radio frequency circuits in these receivers should be very carefully made in the order specified.

Alignment of Short Wave Range (Also Referenced as "C" Range)

In aligning the radio frequency circuits for this range, replace the 48 microfarad capacitor which was placed in series with the test oscillator's output load for the I.F. alignment, with a 0.02 microfarad variable capacitor. The test oscillator should then be connected to the antenna input line on the rear of the receiver chassis. The ground connection for the short wave test oscillator should be connected in the ground binding post on the receiver.

1. Rotate the Electric Tuning and Range Switch control knob to the Short Wave ("C") range, and set the test oscillator's frequency and the receiver's tuning dial to 25 megacycles.

2. Adjust the oscillator's "C" range high frequency shifter for maximum output.

3. Adjust the oscillator's "C" range high frequency shifter for maximum output and at the same time rotate the tuning capacitor slightly back and forth through resonance until maximum output is obtained.

Alignment of Standard Broadcast Range (Also Referenced as "A" Range)

In aligning the radio frequency circuits for this range, replace the 40 microfarad capacitor in series with the test oscillator's output load with a 20 microfarad capacitor and align these circuits in the following manner:

1. Rotate the Range Switch control knob to the Standard Broadcast ("A") range position and set the test oscillator's frequency and the receiver's tuning dial to 25 megacycles.

2. Adjust the oscillator's "A" range high frequency shifter for maximum output.

3. Rotate the test oscillator's frequency and the receiver's tuning dial to 25 megacycles and rotate the tuning capacitor slightly back and forth through resonance until maximum output is obtained.

Wave Trap Adjustment

In aligning the wave trap, set the Electric Tuning and Range Switch control knob to the Standard Broadcast, P-3800 Switch Assembly. The Chassis main switch is lower in the wave trap circuit. The chassis main switch is connected to the test oscillator's output load for the I.F. alignment, with a 0.02 microfarad variable capacitor. The test oscillator should then be connected to the antenna input line on the rear of the receiver chassis. The ground connection for the short wave test oscillator should be connected in the ground binding post on the receiver.

1. Rotate the receiver's tuning dial to 15 megacycles and repeat operations.

PROCEDURE FOR OBTAINING REPRODUCTION FROM PHONOGRAPHS RECORDS

In order to obtain reproduction of phonograph records in conjunction with the No. 315 Receiver, the following instructions should be followed.

To equip these receivers for phonograph operation, it will be necessary to purchase and install a Stromberg-Carlson, P-3800 Switch Assembly. The Chassis main switch is lower in the wave trap circuit. The chassis main switch is connected to the test oscillator's output load for the I.F. alignment, with a 0.02 microfarad variable capacitor. The test oscillator should then be connected to the antenna input line on the rear of the receiver chassis. The ground connection for the short wave test oscillator should be connected in the ground binding post on the receiver.

To obtain the best quality of phonograph reproduction from this receiver, a Stromberg-Carlson Record Fader is recommended. The record player is equipped with a correctly designed single needle playing needle and aepn, and a crystal tip type pickup in conjunction with a specially equalized circuit.

If the Stromberg-Carlson Record Fader is not used and the electric pick-up is to be used in the high impedance type, it will be necessary to connect a low capacity non-inductive cable between the three-peaker and the output of the P-3800 Switch Assembly. If the 300-ohm single needle is used, the shaded cable should be of the 300-ohm capacity. In order to prevent excessive cutting of high frequencies which is caused when a shaded cable having low capacity is used, the length of the shaded cable must be kept as short as possible. The pickup of the low impedance type, it will be necessary to connect a "matching transformer" between the three-peaker and the output of the P-3800 Switch Assembly. The pickup transformer should be located as near to the receiver as possible, in which case it will not be necessary to use a shaded cable.
PROCEDURE FOR OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS

For Observers Only

To obtain reproduction by playing records, the observer must be familiar with the correct procedure for getting the record. The device known as the "tip" is essential to the correct reproduction. The device is attached to the record and is inserted into the slot of the record. This slot is usually located at the top of the record.

In making any alignment adjustments, always check the tip to ensure proper alignment in the slot. Care should be taken to ensure that the tip is properly aligned or the record will not reproduce properly.

For Models 35/355/356/357/358

Models 35, 355, 356, 357 and 358 have a tip attached to the record. The tip is inserted into the slot of the record. The slot is usually located at the top of the record. If the slot is not present, the record cannot be reproduced.

Models 355, 356, 357 and 358 have a tip attached to the record. The tip is inserted into the slot of the record. The slot is usually located at the top of the record. If the slot is not present, the record cannot be reproduced.

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Models 355, 356, 357 and 358 have a tip attached to the record. The tip is inserted into the slot of the record. The slot is usually located at the top of the record. If the slot is not present, the record cannot be reproduced.
Fig. 3. Wiring Diagram of Chassis.
OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS

These receivers are equipped with a three-contact phonograph turntable, which is connected to the receiver directly by a shielded cord of the same size as the chassis bus. A three-prong plug is also furnished for connecting the pickup plug to the phonograph rabbit.

To obtain the best quality of phonograph reproduction from these receivers, a Strotron-Carlson receiver is required. The Strotron-Carlson receiver has a variable-speed motor that provides the phonograph turntable with the correct speed for reproducing records. The turntable and motor set is installed in the receiver and is connected to the power source and the output of the amplifier.

The Strotron-Carlson receiver is a precision instrument designed to provide excellent phonograph reproduction. It is equipped with a high-quality pickup that is connected to the receiver through a shielded cable. The cable is designed to minimize interference and provide the best possible sound quality.

Instructions for Setting Up the Electric Tuning Arrangement

1. Before proceeding to set up the station for electric tuning, the receiver should be turned on for approximately twenty minutes.

2. Set the Range switch control knob to the manual tuning position for the Standard Broadcast range below six points below the frequency in question. Then, turn the knob to the left until the station you wish to tune is reached.

3. Turn the dial until the station you wish to tune is reached.

4. With the dial set at the station you wish to tune, the tuning range can be adjusted by turning the range switch control knob to the right or left until the station you wish to tune is reached.

Radio Frequency Adjustments

The alignment of the radio frequency circuits in these receivers should be carefully made and in the order specified.

Alignment of Short Wave Range

It is not possible to list the various corrections that should be made to the radio frequency circuits for each station. However, it is recommended that the following adjustments be made:

1. Rotate the receiver to a location where the reception is clear and the interference is minimal.

2. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.

3. Set the receiver's volume control to a position where the reception is clear and the interference is minimal.

4. Set the receiver's tuning control to a position where the reception is clear and the interference is minimal.

5. Adjust the receiver's tuning control to a position where the reception is clear and the interference is minimal.

6. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.

Alignment of Short Wave Range

It is important to note that the receiver should be adjusted for each station individually, as the performance of the receiver may vary depending on the station.

1. Rotate the receiver to a location where the reception is clear and the interference is minimal.

2. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.

3. Set the receiver's volume control to a position where the reception is clear and the interference is minimal.

4. Set the receiver's tuning control to a position where the reception is clear and the interference is minimal.

5. Adjust the receiver's tuning control to a position where the reception is clear and the interference is minimal.

6. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.

Alignment of Standard Broadcast Range

It is not possible to list the various corrections that should be made to the radio frequency circuits for each station. However, it is recommended that the following adjustments be made:

1. Rotate the receiver to a location where the reception is clear and the interference is minimal.

2. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.

3. Set the receiver's volume control to a position where the reception is clear and the interference is minimal.

4. Set the receiver's tuning control to a position where the reception is clear and the interference is minimal.

5. Adjust the receiver's tuning control to a position where the reception is clear and the interference is minimal.

6. Adjust the receiver's antenna to a position where the reception is clear and the interference is minimal.
### APPARATUS SPECIFICATIONS

A special temperature controlled compensating circuit is used in the oscillator circuit of these receivers when operating in the electric tuning arrangement in order to eliminate drift in the oscillator frequency. These receivers are also provided with a low level line frequency compensation circuit in conjunction with the volume control circuit so that balanced reproduction is obtained for any setting of the volume control.

### NORMAL VOLTAGE READINGS

The values of voltages listed in the following table are obtained by measuring between the various tubes and chassis contacts, with the tubes in their respective sockets. The receiver is, therefore, in full operation at the time the measurements are made. Figure 1, shows the terminal layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 120 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a sensitivity of 1000 ohms per volt should be used for measuring the D.C. voltages. Voltage values shown are those obtained on the lowest scale of the meter having the following ranges: 0-0.5, 0-1, 0-1.5, 0-3, 0-6, 0-10, 0-30, 0-100 volts except where an asterisk appears after any given voltage value in which case the 250 volt scale was used.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Cap</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Socket Terminal Numbers</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K8</td>
<td>Mod., Osc.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>+25</td>
<td>-6.8</td>
<td>+75</td>
<td>0</td>
<td>2-7</td>
<td>+6.3</td>
<td></td>
</tr>
<tr>
<td>6K7</td>
<td>T. F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>+70</td>
<td>-250</td>
<td>5.3</td>
<td>0</td>
<td>2-7</td>
<td>+6.3</td>
<td></td>
</tr>
<tr>
<td>6L6</td>
<td>Dem. 6, V.C.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2-7</td>
<td>+6.3</td>
<td></td>
</tr>
<tr>
<td>6L7</td>
<td>Audio Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>+75</td>
<td>5.3</td>
<td>0</td>
<td>2-7</td>
<td>+6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K6</td>
<td>Audio Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>-220</td>
<td>5.3</td>
<td>0</td>
<td>2-7</td>
<td>+6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6L5</td>
<td>Tuning Ind.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>0</td>
<td>62*</td>
<td>0</td>
<td>1-4</td>
<td>+6.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Rectifier</td>
<td>0</td>
<td>+250</td>
<td>345</td>
<td>354</td>
<td>+350</td>
<td>0</td>
<td>1-4</td>
<td>+6.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Receiver tuned manually to 1000 Kc; no signal. A.C. voltages are indicated by italics.**

![Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the Aligning Adjustments for the E.R. F. L. F. and Demodulator Circuits.](image)

**Models 3SC, 5SC**

### NEWER VOLTAGE READINGS

The various values of voltages listed in the following table are obtained by measuring between the various tube socket contacts and the chassis contacts, with all the tubes in their respective sockets except the No. 80 tube which is left out in operation when the measurements are made. Figure 1, shows the terminal layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 120 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a sensitivity of 1000 ohms per volt should be used for measuring the D.C. voltages. Voltage values shown are those obtained on the lowest scale of the meter having the following ranges: 0-0.5, 0-1, 0-1.5, 0-3, 0-6, 0-10, 0-30, 0-100 volts except where an asterisk appears after any given voltage value in which case the 250 volt scale was used.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Cap</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Socket Terminal Numbers</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6L7</td>
<td>B. P. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+220</td>
<td>-22</td>
<td>6.2</td>
<td>0</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6A8</td>
<td>Modulator</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+227</td>
<td>-49</td>
<td>-5.9</td>
<td>+9.9</td>
<td>6.2</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>6F8-6 Oscillator Control</td>
<td>0</td>
<td>0</td>
<td>+155</td>
<td>-7.8</td>
<td>-5.9</td>
<td>+152</td>
<td>6.2</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K7</td>
<td>L. F. Amp.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+210</td>
<td>-57</td>
<td>6.2</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>616</td>
<td>Discriminator, Demodulator, A. V.C.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6.2</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>6B8</td>
<td>Discriminator, Audio, Oscillator</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+20*</td>
<td>0</td>
<td>0</td>
<td>+38*</td>
<td>0</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>6C5</td>
<td>Audio, Osc.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+120</td>
<td>-215</td>
<td>0</td>
<td>6.2</td>
<td>+5.9</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>6F6</td>
<td>Audio Output</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+300</td>
<td>-306</td>
<td>0</td>
<td>6.2</td>
<td>+19</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>6L5</td>
<td>Tuning Ind.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+300</td>
<td>+300</td>
<td>0</td>
<td>6.2</td>
<td>+19</td>
<td>2-7</td>
<td>+6.2</td>
<td></td>
</tr>
<tr>
<td>525</td>
<td>Rectifier</td>
<td>-410</td>
<td>397</td>
<td>397</td>
<td>-410</td>
<td>0</td>
<td>1-4</td>
<td>+6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaker Socket</td>
<td>-410</td>
<td>0</td>
<td>0</td>
<td>+410</td>
<td>-410</td>
<td>0</td>
<td>+38*</td>
<td>0</td>
<td>1-4</td>
<td>+6.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Receiver tuned manually to 1000 Kc; no signal. A.C. voltages are indicated by italics.**
Stromberg-Carlson Nos. 340 and 341 Radio Receivers

ELECTRICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Type of Circuit</th>
<th>Superheterodyne with Electric Tuning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>300 to 1700 Kc, Range 3, 1000 to 1800 Kc</td>
</tr>
<tr>
<td>Audio Transformer</td>
<td>150 to 125 Watts, A.C.</td>
</tr>
<tr>
<td>Power Frequency Range</td>
<td>50 to 60 cycles and 20 to 60 cycles</td>
</tr>
<tr>
<td>Output Power</td>
<td>80 Watts</td>
</tr>
<tr>
<td>Input Power</td>
<td>150 watts</td>
</tr>
<tr>
<td>Built-in Speaker</td>
<td>80 Watts</td>
</tr>
<tr>
<td>Frequency of Intermediate Amplifier</td>
<td>400 Kilocycles</td>
</tr>
</tbody>
</table>

APPARATUS SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>No.</th>
<th>Receiver</th>
<th>Model</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 131-P</td>
<td>25 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 131-FB</td>
<td>25 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 331-P</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 331-FB</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 300-P</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 300-FB</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 301-P</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
<tr>
<td>No. 301-FB</td>
<td>50 to 60 cycles</td>
<td>P-2518</td>
<td>Speaker</td>
<td>P-2518</td>
</tr>
</tbody>
</table>

CIRCUIT DESCRIPTION

The receivers are nine tube, superheterodyne, "Electric Tuning" superheterodyne receivers employing metal tubes and a highly efficient dynamic speaker. There are two tuning ranges, the frequency band of each range being limited under the "Electric Tuning" system, above.

The electric tuning circuit is arranged so that five favorite stations located in the Standard Broadcast range can be heard at any time the receiver is turned on. The remaining stations that give the best daytime and nighttime service should be selected. To determine the station to be heard, refer to the chart "Instructions for Setting Up the Electric Tuning System."
ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers, and ordinarily no re-
adjustments are necessary. However, should it become necessary to make any realignment adjustments, the alignment procedure given in the following paragraphs should be carefully followed. It should be noted that the aligning adjustments are such as to allow for the alignment to be performed in an easy and satisfactory manner. It is recommended that the Stromberg-Carlson P-26108 align-
ing kit be used.

To accurately align the circuits in these receivers, it is necessary to use a high grade, calibrated test oscillator (schematic diagram). The output voltage of which can be varied. To accomplish this test oscillator, a
schematic diagram should be used for determining the maximum signal voltage developed across the output of the receiver's output circuit.

In making any alignment adjustments, always adjust the test oscillator output voltage to the minimum value which a good alignment may still be determined. Always attempt to make any alignment adjustments using a signal. Before proceeding with the alignment of any circuits in these receivers, be sure that the "Off-Circuit" switch is set to the "On-Circuit" position. If a signal is not present, the alignment may not be performed properly.

Intermediate Frequency Adjustments

The intermediate frequency used in these receivers is 455 kilocycles. In making these circuit adjustments always
align the circuits in the order given in these instructions.

1. Set the Electric Tuning and Range Switch control knobs to the manual tuning standard position (A range position). Set the dial pointer by means of the aligning adjustments to the 9 kHz frequency of the receiver's output. Align the "Off-Circuit" switch to the "On-Circuit" position. Then, with the tuning capacitors in this position, the dial pointer should be placed on the horizontal center line of the dial. To do this, align the pointer with the short black line located at the extreme right side of the dial plate.

2. Adjust the oscillator's "C" range high frequency aligner for maximum output.

3. Adjust the antenna's "A" range high frequency aligner for maximum output and at the same time rotate the gang tuning capacitor back and forth through resonance until maximum output is obtained.

Alignment of Standard Broadcast Range (Also Referred to as "A" Range)

In aligning the radio frequency circuits for this range, rotate the 455-kilocycle carbon type capacitor in series with the test oscillator's output lead by a 200-microfarad capacitor and align these circuits as follows:

1. Rotate the Electric Tuning and Range Switch control knobs to the manual tuning, Standard Broadcast ("A") range position and set the test oscillator's frequency and the receiver's tuning dial to 1.5 megacycles.

2. Adjust the oscillator's "A" range high frequency aligner for maximum output.

3. Adjust the antenna's "A" range high frequency aligner for maximum output.

4. Set the test oscillator's frequency and the receiver's tuning dial to 0.6 megacycles.

5. Adjust the antenna's "A" range low frequency aligner for maximum output, and at the same time rotate the gang tuning capacitor slightly back and forth through resonance until maximum output is obtained.

6. Set both the test oscillator's frequency and receiver's tuning dial to 1.5 megacycles and repeat operation Nos. 2 and 3.

Wave Trap Adjustment

In adjusting the wave trap circuit, set the Electric Tuning and Range Switch control knobs to the manual tuning, Standard Broadcast position (A range position) in position "B", set the dial pointer to 100 kilocycles and the Electric Tuning and Set-Up Switch, located on the back of the receiver chassis, to the "Set-Up" position.

Connect a 200-microfarad capacitor in series with the output terminal of the modulated test oscillator and the antenna binding post at the receiver, and the ground terminal of the test oscillator to the ground binding post at the receiver. Then, with the modulated test oscillator set at the frequency of the intermediate frequency, 455 kilocycles, apply a fairly strong signal to the receiver and adjust the wave trap aligner until maximum indication is obtained on the output meter.

OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS FOR NOS. 340 AND 341 RECEIVERS NOT EQUIPPED WITH A RECORD PLAYING UNIT

In order to obtain reproduction of phonograph records in conjunction with these receivers, the following instructions should be followed.

1. To equip these receivers for phonograph operation, it will be necessary to purchase and install a Stromberg-Carlson, P-26112 Package Assembly. The rear of the chassis plate of the receiver is already drilled for this

2. Complete instructions on how to install and operate this assembly are furnished with each P-26112 Package Assembly.

3. To obtain the best quality of phonograph reproduction from these receivers, a Stromberg-Carlson Record Player is recommended. The record player is equipped with a correctly designed single record playing unit, and uses a crystal-type cartridge in conjunction with a specially equalized circuit.

4. If the Stromberg-Carlson Record Player is not used and the pick-up is not used in the high impedance type, it is necessary to connect a low loss low impedance amplifier between the record player and the receiver.

5. The length of the shielded cable used should be kept as short as possible.

6. If a low impedance type is used, it will be necessary to connect a "matching transformer" between the three-pole socket and plug of the P-26112 Package Assembly, and the pick-up. This transformer should be located next to the receiver as possible in which case it will not be necessary to use a shielded cable.
NORMAL VOLTAGE READINGS

The values of voltages listed in the following table are obtained by measuring the voltages between the terminals of the sockets and the heater voltages between the sockets and the heater terminals. The heater voltages are obtained when the measurements are made. Figure 1 shows the terminal layout of the sockets with the proper terminal numbers.

![Table of Voltages]

Voltage readings are given for a line voltage of 110 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a sensitivity of 1000 ohms per volt should be used for measuring the voltage. Voltages are given in kilovolts, and these values are those obtained on the 120-volt windings of the transformer having the following ranges: 0.2, 0.45, 0.85, 1.5, 3.0, 6.0, 12.0, and 24.0 kV. These values are obtained when the input voltage is 240 volts.

Tube | Circuit | Cap | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Socket Terminal | Plate A.C.
---|---------|----|---|---|---|---|---|---|---|---|----------------|-------------
6K7 | R. F. Amp. | 0 | 0 | 0 | -240 | -48 | -42.5 | +240 | 9.5 | -2.5 | 2.7 | 6.3
6K5 | Mod. Osc. | 0 | 0 | 0 | -240 | -48 | -42.5 | 0 | 0 | -2.7 | 6.3
6K7 | I. F. Amp. | 0 | 0 | 0 | -240 | -48 | -42.5 | 0 | 0 | -2.7 | 6.3
6H6 | Dem. A. C. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0
6F5 | Audio Amp. | 0 | 0 | 0 | -155 | -100 | -100 | 0 | 0 | 0 | 0
6G5 | Audio Output | 0 | 0 | 0 | -155 | -100 | -100 | 0 | 0 | 0 | 0
6VG6 | Audio Output | 0 | 0 | 0 | -155 | -100 | -100 | 0 | 0 | 0 | 0
R0 | Rectifier | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0
Speaker Socket | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0

Receiver tuned manually to 1000 Kc, no signal. A. C. voltages are indicated by italics.

ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers, and ordinarily no re-adjustments are necessary. However, it should become necessary to make re-adjustments, the alignment procedure given in the following paragraphs should be carefully followed. In making this alignment adjustment in an easy and satisfactory manner, it is recommended that the Stromberg-Carlson P-2400 aligning tool be used.

To accurately align the circuits in these receivers, it is necessary to use a high-grade, modulated test oscillator (Signal Generator), the output of which can be varied. In conjunction with this test oscillator, a sensitive voltmeter should be used for determining the maximum signal voltage developed across the output of the line receiver.

IMPORTANT: In making any R. F. or I. F. alignment adjustments always adjust the test oscillator's output voltage to the minimum value where a good alignment may still be obtained. Never attempt to make any adjustment using a strong signal. Before proceeding with the alignment of any R. F. or I. F. circuits in these receivers, be sure that the "Off-Line" or "Rec." switch, located on the rear panel of the receiver, is set for maximum signal reception, and that all other controls are in line for receiver reception.

Dial Adjustment

Before aligning the circuit of any of these receivers, the tuning dial must be properly aligned to track with the tuning capacitor. To check whether the dial is correct with respect to the tuning capacitor, rotate the "Station Selector" knob in a clockwise direction so that the tuning capacitor is set to the maximum capacity position, then, in the same position, the dial pointer should be placed on the horizontal center line of the dial. To do this, align the pointer with the dial blank immediately at the extreme right-hand edge of the dial plate.

Intermediate Frequency Adjustments

The intermediate frequency used in these receivers is 455 kcycles. In making these alignment adjustments, always align the circuits in the order given in these instructions.

1. Set the Electric Tuning and Range Switch control knob to the normal tuning Standard Broadcast range position and use aẤlows tuning to the direction of letter "A". Set the dial pointer to the extreme right-hand edge of the dial plate. Rotate the "OFF-ON" control knob slightly clockwise from its normal position clockwise. By aid of a screwdriver, rotate the tuning knob at the bottom of the Electric Tuning and Range Switch located at the rear of the chassis. When the tuning knob is in its normal position, the test oscillator control knob will be in its maximum clockwise position (maximum output).

By selecting the position of the receiver and the grid of the No. 2510 modulator oscillator tube, a modulated signal of 600 kilocycles, with the grid connected to the output terminal of the test oscillator, is applied to the grid of the No. 2510 tube. This does not change the relative phase of the modulator oscillator's control terminal to the chassis ground or the output terminals of the receiver.

Now, noting from Figure 1, the values of the first and second L. F. transformers, align the L. F. circuit in the order specified.

Secondary of first L. F. transformer.
Primary of second L. F. transformer.
Primary of first L. F. transformer.
Primary of second L. F. transformer.

Adjusting the circuits to obtain maximum-receiving in the output meter, reducing the output of the test oscillator as required.

Radio Frequency Adjustments

The alignment of the radio frequency circuit in these receivers should be very carefully made and in the order specified.

CAUTION: Be sure that the Electric Tuning and Range Switch is set to the "Off-Line" position.

Alignment of Short Wave Range, "C"

In aligning the short wave frequency circuits for this range, replace the 0.01 microfarad capacitor which is placed in series with the test oscillator output lead for the L. F. alignment, with a 0.001 microfarad capacitor. This load should then be connected to the antenna binding post for one of the receiver's circuits. The ground terminal for low side of the test oscillator should be connected to the binding post of the receiver.

1. Rotate the Electric Tuning and Range Switch control knob to the "C" Short Wave range position, and set the test oscillator's frequency and the receiver's tuning dial to 20 megacycles.
2. Adjust the short wave frequency oscillator "C" range R. F. slider for maximum output.
3. Adjust the R. F. transformer "C" range R. F. slider for maximum output and at the same time rotate the tuning capacitors back and forth through resistance until maximum output is obtained.
4. Adjust the antenna "C" range R. F. slider for maximum output and at the same time rotate the tuning capacitors back and forth through resistance until maximum output is obtained.

Alignment of Short Wave Range, "B"

In aligning the short wave frequency circuits for this range, use the same artificial antenna (400 ohm resistor) and antenna binding post set up as for aligning the "C" range, and follow the same procedure as given for the "C" range.

1. Rotate the Electric Tuning and Range Switch control knob to the "B" Short Wave range position, and set the test oscillator's frequency and the receiver's tuning dial to 20 megacycles.
2. Adjust the receiver's oscillator "B" range R. F. slider for maximum output.
3. Adjust the R. F. transformer "B" range R. F. slider for maximum output and at the same time rotate the tuning capacitors back and forth through resistance until maximum output is obtained.
4. Adjust the antenna "B" range R. F. slider for maximum output and at the same time rotate the tuning capacitors back and forth through resistance until maximum output is obtained.

Alignment of Standard Broadcast Range, "A"

In aligning the radio frequency circuits for this range, replace the 0.001 microfarad capacitor in series with the test oscillator's output lead with a 250-microfarad capacitor and align the circuits in the following order:

1. Rotate the Electric Tuning and Range Switch control knob to the manual tuning Standard Broadcast range position and set the test oscillator's frequency and the receiver's tuning dial to 15 megacycles.
2. Adjust the receiver's oscillator "A" range R. F. slider for maximum output.
5. Set the test oscillator's frequency and the receiver's tuning dial to 35 megacycles.
6. Adjust the receiver's oscillator "A" range R. F. slider (series aligner) for maximum output, and at the same time rotate the tuning capacitors back and forth through resistance until maximum output is obtained.
7. Boost both the test oscillator's frequency and the receiver's tuning dial to 15 megacycles and repeat operations Nos. 2, 3, and 4.
Increasing Bass Response Of 345 Receivers

Remove the 4700 ohm resistor (R-17) from the volume control tap and replace with a 10,000 ohm resistor, R-26545.

Remove the .15 mf capacitor (C-37) from the volume control tap and replace with a .1 mf capacitor, C-24402.

Remove the .001 mf capacitor (C-68) from the high side of the volume control and replace with a .04 mf capacitor, C-24465.

Caution: Do not mistake capacitor C-38 for one of the capacitors to be changed.

September 7, 1938.

VOLUME CONTROL CIRCUIT

APPARATUS SPECIFICATIONS

<table>
<thead>
<tr>
<th>No. 355-1 Receiver</th>
<th>No. 355-1B Receiver</th>
<th>No. 355-PB Receiver</th>
<th>No. 355-PBR Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Casing and Cover Assembly</td>
<td>P-28409 Front Unit</td>
<td>P-28409 Phone Unit</td>
<td>P-28409 Phone Unit</td>
</tr>
<tr>
<td>Rear Casing and Cover Assembly</td>
<td>P-28410 Rear Unit</td>
<td>P-28410 Rear Unit</td>
<td>P-28410 Rear Unit</td>
</tr>
</tbody>
</table>

NORMAL VOLTAGE READINGS

The values of voltages listed in the following table are obtained by measuring between the various line socket contacts and the chassis back, with the tubes in their respective sockets. The receiver is, therefore, in full operation when the measurements are made. Figure 1 shows the terminal layout of the sockets with the proper terminal numbers.

Voltages are given for a line voltage of 120 volts, and allowances should be made for differences when the line voltage is higher or lower. A meter having a resistance of 1000 ohms per volt should be used for measuring the D.C. voltages. Voltage values shown are those obtained on the lowest possible scale of a meter having the following ranges: 0-30, 0-150, 0-300, 0-600, 0-1000 volts except when an asterisk appears after any given voltage value in which case the 250 volt scale was used.

<table>
<thead>
<tr>
<th>Terminal Layout for Voltage Measurement Chart and Location of the Various Aligning Capacitors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>5A8</td>
</tr>
<tr>
<td>577</td>
</tr>
<tr>
<td>586</td>
</tr>
<tr>
<td>585</td>
</tr>
<tr>
<td>583</td>
</tr>
<tr>
<td>584</td>
</tr>
<tr>
<td>50</td>
</tr>
</tbody>
</table>

Receiver tuned manually to 1000 kc., no signal. A. C. voltages are indicated by italics.

Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the Various Aligning Capacitors.
ALIGNMENT DATA

All alignment adjustments are always made at the factory on these receivers, and only for use at the factory. However, should it become necessary to make any adjustments, the procedure given here is the method used on these receivers to the use of a suitable call-out oscilloscope and frequency meter unit in conjunction with the standard signal generator.

To accurately align circuits in these receivers, it is necessary to use a high-grade audio signal generator capable of outputting audio output signal energy of at least 100microvolts. Also, it is necessary to have the output voltage controlled so that any one trace displayed on the visual generator, has the same visual generator, output level measured at all the intended frequencies. This will assure that the output signal voltage developed across the visual generator of the local oscillator will be in phase with the audio signal generator output voltage. In addition, to this equipment, a visual generator is necessary, to the alignment circuitry, it will be necessary for making a final adjustment of the "Distributor" circuitry to use a high-grade audio signal generator. The visual generator will display a range of 5 to 10 microvolts. The output voltage of the local oscillator will be measured with a calibrated meter and compared to the output at the receiver.

In order to make the final alignment, an EASY way and satisfactory operation, it is recommended that the Stromberg-Carlson 22600 testing be used.

Before proceeding with the alignment of any circuits in these receivers, check that the alignment procedure is set for the "Normal" position. The "On-Off" control should also be set for the "Normal" position. In making any alignment adjustments always adjust the test oscillator output voltage to the maximum value where the adjustment may be made, except as specifically directed in these instructions. Figure 1 shows the location of all the alignment adjustments or capacitors for this receiver.

Dial Adjustment

Before aligning the circuits of these receivers, the tuning dial must be properly aligned to "track" with the target tuning capacitor. To check whether the dial is set correctly with respect to the target tuning capacitor, rotate the "Target Selector" knob in a clockwise direction so that the dial reads "00". Rotate the dial capacitor in so that it is set to its maximum capacity position. Then, with the tuning dial set to "00", the "00" dial indicator line should be at the center of the dial. If the line is not at the center due to the dial capacitor being out of alignment, rotate the dial capacitor in or out until the line is at the center. The dial capacitor is now set to its maximum capacity position.

Intermediate Frequency Adjustments

The intermediate frequency used in these receivers is 455 kilocycles. The program of alignment test points is in such a manner that it is possible to check the circuitry at the intermediate frequency without the aid of any test equipment. For example, it is possible to check the output of the intermediate frequency amplifier by referring to the output of the intermediate frequency amplifier without the aid of any test equipment. It is possible to check the output of the intermediate frequency amplifier by referring to the output of the intermediate frequency amplifier without the aid of any test equipment. It is possible to check the output of the intermediate frequency amplifier by referring to the output of the intermediate frequency amplifier without the aid of any test equipment.

Alignment of Short Wave Range (Also Referred to as "C" Range)

In aligning the radio frequency circuits for this range, replace the 0.1 microfarad capacitor which was placed in series with the test oscillator output lead for the S filter, with a 1 microfarad capacitor. This lead should then be connected to the antenna input jack at the rear of the receiver chassis. The ground terminal (or low side) of the test oscillator should be connected to the ground terminal of the receiver.

1. Operate the Range Switch on the receiver chassis to the short wave ("C") range position, and set the test oscillator frequency and the receiver tuning dial to 15 megacycles.
2. Adjust the receiver's oscillator "C" range high frequency alignment for maximum output.
3. Adjust the antenna "C" range high frequency alignment for maximum output, at the same time rotate the tuning capacitor back and forth through resonance until maximum output is obtained.
4. Set the test oscillator's frequency and the receiver tuning dial to 5 megacycles.
5. Adjust the receiver's oscillator "C" range low frequency alignment (series alignment), and, at the same time rotate the tuning capacitor back and forth through resonance until maximum output is obtained.
6. Reset both the oscillator's frequency and the receiver tuning dial to 15 megacycles and repeat operations Nos. 3 and 5.

Alignment of Medium Wave Range (Also Referred to as "P" Range)

In aligning the radio frequency circuits for this range, use the same artificial antenna (400 ohm carbon type resistor) in series with the output terminal of the test oscillator as was used for aligning the short-wave range.

1. Operate the Range Switch on the receiver chassis to the Medium Wave ("P") range position, and set the test oscillator frequency and the receiver tuning dial to 5 megacycles.
2. Adjust the receiver's oscillator "P" range high frequency alignment for maximum output.
3. Adjust the antenna "P" range high frequency alignment for maximum output, at the same time rotate the tuning capacitor back and forth through resonance until maximum output is obtained.

Alignment of Standard Broadcast Band (Also Referred to as "A" Range)

In aligning the radio frequency circuits for this range, replace the 400 ohm carbon type resistor in series with the test oscillator's output lead with a 200 microfarad capacitor and align these circuits as follows:

1. Operate the Range Switch to the standard tuning Standard Broadcast "A" range position and set the test oscillator's frequency and the receiver tuning dial to 15 megacycles.
2. Adjust the receiver's oscillator "A" range high frequency alignment for maximum output.
3. Adjust the antenna "A" range high frequency alignment for maximum output.
4. Adjust the antenna "A" range high frequency alignment for maximum output.
5. Set the test oscillator's frequency and the receiver tuning dial to 5 megacycles.
6. Adjust the receiver's oscillator "A" range low frequency alignment (series alignment), and, at the same time rotate the tuning capacitor back and forth through resonance until maximum output is obtained.
7. Reset both the oscillator's frequency and the receiver tuning dial to 15 megacycles and repeat operations Nos. 3 and 4.

Wave Trap Adjustment

In aligning the wave trap circuit, set the Electric Tuning and Range Switch control knobs to the manual tuning position, and the Broadcast position (centered on the local oscillator frequency in the selected range). The adjustment is made at each position. The adjustment is made as follows:

1. Connect a 200 microfarad capacitor in series at the output terminal of the matched test oscillator, and the antenna terminals of the test oscillator to the ground binding post of the receiver. This will give the matched test oscillator a source which will supply a strong frequency signal to the receiver and adjust the wave trap unless a minimum indication is obtained on the output meter.

2. Operate the Range Switch on the receiver chassis to the wave trap position, and set the test oscillator frequency and the receiver tuning dial to 15 megacycles and repeat operations Nos. 3 and 4.
Continuity test chart for No. 235 Receivers.  


1. Test speaker socket with speaker left out.

2. Plug speaker in speaker socket for all other tests.

3. Set A.F.C. Switch on rear of chassis base to "Operate" position for all tests unless otherwise specified.


A. Operate A.F.C. switch on rear of chassis to "Set Up" position; should read 120Ω.

Operate A.F.C. switch on rear of chassis to "Operate" position; should read 4 M.

B. Operate A.F.C. switch on rear of chassis to "Set Up" position; should read 550,000Ω.

Operate A.F.C. switch on rear of chassis to "Operate" position; should read 4 M.

C. Operating volume control clockwise should read from "S" to 800,000Ω.

Other tests not shown on chart.  

Test from Electric tuning pilot lamp socket. Operate Manual-Electric switch to "Manual" position; should read "0". Operate Manual-Electric switch to "Electric" position; should read "S".

Test from main dial pilot lamp socket. Operate Manual-Electric switch to "Manual" position; should read "S". Operate Manual-Electric switch to "Electric" position; should read "O".

Test from Ant. terminal on back of chassis base. Operate range switch to "A" band; should read SW. Operate range switch to "B" band; should read 1Ω. Operate range switch to "C" band; should read .5Ω.

Test from Gnd. terminal on back of chassis base; should read "S".

Test from terminals of A.C. plug to chassis base; should read "0".

Test between terminals of AC plug; should read SW with A.C. switch closed; should read "0" with A.C. switch open.

Test from the Stator Plates of the oscillator section of the variable capacitor (located near front of chassis) to the switch side of the .001 capacitor (located next to the "A" and "B" band series aligner). Operate range switch to "A" band; should read 10Ω. Operate range switch to "B" band; should read 2Ω. Operate range switch to "C" band; should read 1Ω.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Grid</th>
<th>Terminals of Sockets</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-J-5</td>
<td>Gsc. Control</td>
<td>S</td>
<td>1</td>
</tr>
<tr>
<td>6-A-8</td>
<td>Mod. Ose.</td>
<td>S</td>
<td>55000Ω</td>
</tr>
<tr>
<td>6-K-7</td>
<td>I.F. Amp.</td>
<td>S</td>
<td>11000Ω</td>
</tr>
<tr>
<td>6-H-6</td>
<td>Discrimin.</td>
<td>S</td>
<td>120Ω</td>
</tr>
<tr>
<td>6-B-8</td>
<td>A.V.C. Audio</td>
<td>S</td>
<td>450000Ω</td>
</tr>
<tr>
<td>6-P-6</td>
<td>Output</td>
<td>S</td>
<td>55000Ω</td>
</tr>
<tr>
<td>6-U-5</td>
<td>Tuning Ind.</td>
<td>S</td>
<td>1.1Ω</td>
</tr>
<tr>
<td>5-Y-4G</td>
<td>Rectifier</td>
<td>O</td>
<td>0</td>
</tr>
</tbody>
</table>

Spk. Socket

Output Rear of Chas. 300000Ω S S 300000Ω 0 0 1200Ω
For data on setting up electric tuning system and remote control see Index.

Fig. 2. Schematic Circuit of Receiver.

ELECTRICAL SPECIFICATIONS

Type of Circuit ................................................. Superheterodyne with A. F. C. Electric Tuning
Tuning Ranges .................................................. A—530 to 1700 Kc.; B—1700 to 5600 Kc.; C—5600 to 18,000 Kc.
Number and Type of Tubes ................................ 1 No. 6K7, 1 No. 6A8, 1 No. 6F8-G, 1 No. 6L8, 1 No. 6F8
Voltage Rating ..................................................... 1 No. 6R7, 1 No. 6N7, 2 No. 6F6, 1 No. 6U5, 1 No. 6Z3
Power Frequency Rating .................................... 105 to 125 Volts, A. C.
Input Power Rating ............................................. See "Apparatus Specifications"
Frequency of Intermediate Amplifier ..................... 140 Watts

455 Kilocycles

APPARATUS SPECIFICATIONS

No. 360-M Receiver ........................................... 50 to 60 Cycles; P-2906B Chassis; P-29072 Speaker
No. 360-MB Receiver .......................................... 25 to 60 Cycles; P-2906B Chassis; P-29072 Speaker
CIRCUIT DESCRIPTION

The Stromberg-Carlson No. 269 Radio Receivers are two-lead, high-fidelity, automatic tuning receivers, with three tuning ranges. The electric tuning circuit combines an automatic frequency control circuit. The electric tuning circuit is arranged so that each station is tuned in combination with the automatic frequency control circuit. The tuning range is controlled by a variable tuning condenser.

These receivers also have a selector dial, which is arranged to select the desired station. The selector dial is provided with a tuning range switch, which is arranged to select the desired tuning range.

A separate "master" control is provided to increase or decrease the volume of the receiver.

The Stromberg-Carlson No. 269 Radio Receivers are also equipped with a self-contained automatic tuning circuit. This design of the tuning circuit, which is arranged to select the desired station, is provided with a tuning range switch, which is arranged to select the desired tuning range.

These receivers also have a selector dial, which is arranged to select the desired station. The selector dial is provided with a tuning range switch, which is arranged to select the desired tuning range.

A separate "master" control is provided to increase or decrease the volume of the receiver.

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These receivers also have a selector dial, which is arranged to select the desired station. The selector dial is provided with a tuning range switch, which is arranged to select the desired tuning range.

A separate "master" control is provided to increase or decrease the volume of the receiver.
ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers and ordinarily no readjustment is necessary unless damaged or mishandled. In the event you should find it necessary to make any readjustments, the procedure given below should be followed. Do not adjust this equipment without the advice of the factory.

If the above conditions are not obtained, the signal generator should be set to exact resonance with the intermediate frequency amplifiers (2,500 kilocycles) as mentioned in 1 above and the secondary adjustment of the Phase shifter. A receiver transformer should be adjusted to zero output indicates on the dial vernier adjustment screws. This will adjust the signal generator's frequency (2,500 kilocycles) so that the voltmeter gives an increasing reading from zero and an increasing hiss meter's frequency (1,500 kilocycles) should make the voltmeter give a decreasing indication from zero.

Radio Frequency Adjustments

Before the adjustment of the radio frequency circuits in these receivers should be very carefully made and in the order specified.

When making any adjustments of these circuits, all controls should be set at the positions specified.

Alignment of Short Wave Range (Also Referenced as "C" Range)

In aligning the radio frequency circuits for this range, replace the 5ohm-intermediate capacitor which was previously used with the test oscillator's output lead for an F. P. amplifier, with a 500 ohm carbon type resistor. This lead should then be connected to the antenna binding post on the rear of the receiver chassis. The ground terminal of the test oscillator should be connected to the ground binding post on the receiver chassis.

1. Operate the Range Switch in the receiver to the short wave "C" range position, and set the test oscillator's frequency and the receiver's tuning dial to 15 megacycles.

2. Adjust the receiver's oscillator "C" range high frequency signal for maximum output.

3. Adjust the N. F. interstage "C" range high frequency signal for maximum output, and at the same time rotate the tuning capacitors back and forth through resonance until maximum output is obtained.

4. Adjust the antenna "C" range high frequency signal for maximum output, and at the same time rotate the tuning capacitors back and forth through resonance until maximum output is obtained.

5. Set the test oscillator's frequency and the receiver's tuning dial to 15 megacycles.

6. Adjust both the test oscillator's frequency and the receiver's tuning dial to 15 megacycles and repeat operations Nos. 2, 3, and 4.

Alignment of Medium Wave Range (Also Referenced as "B" Range)

In aligning the radio frequency circuits for this range, use the same artificial antenna (4000 ohm carbon type resistor) as in step 3 of the output terminal of the test oscillator as was used for aligning the short wave range.

1. Operate the Range Switch in the receiver to the medium wave "B" range position, and set the test oscillator's frequency and the receiver's tuning dial to 5 megacycles.

2. Adjust the receiver's oscillator high frequency signal for maximum output.

3. Adjust the antenna "B" range high frequency signal for maximum output, and at the same time rotate the tuning capacitors back and forth through resonance until maximum output is obtained.

Alignment of Standard Broadcast Range (Also Referenced as "A" Range)

In aligning the radio frequency circuits for this range, replace the 500 ohm carbon type resistor in series with the output terminal of the test oscillator as was used for aligning the short wave range.

1. Operate the Range Switch in the receiver to the standard broadcast "A" range position, and set the test oscillator's frequency and the receiver's tuning dial to 15 megacycles.

2. Adjust the receiver's oscillator "A" range high frequency signal for maximum output.

3. Adjust the N. F. interstage "A" range high frequency signal for maximum output.

4. Adjust the receiver's oscillator "A" range low frequency signal for maximum output.

5. Set the test oscillator's frequency and the receiver's tuning dial to 5 megacycles.

6. Adjust the receiver's oscillator "A" range low frequency signal for maximum output, and at the same time rotate the tuning capacitors back and forth through resonance until maximum output is obtained.

7. Reset both the test oscillator's frequency and receiver's tuning dial to 15 megacycles and repeat operations Nos. 3, 4, and 5.

Wave Trap Adjustment

In adjusting the wave trap circuit, set the Range Switch control knob in the standard broadcast position (at the bottom of the dial) and turn on the receiver. Start with the receiver's receiver channel to 15 megacycles and turn on the receiver. In aligning with the signal generator, a sensitive output meter should be used for determining the maximum signal voltage. It should be remembered that the receiving system will exhibit a certain amount of capacitance (in the order of 0.25 ohms) and this will act as a load on the receiver's output circuit. Therefore, making a final adjustment of the "Wave Trap" circuit, a high resistance variable resistor having a resistance of at least 1500 ohms would be desirable.

In order to make the alignment adjustment in an easy and satisfactory manner, it is recommended that the shorter-carbon F.C.6687 be used for this adjustment. By following the procedure outlined above, the receiver should be made to the standards given in the factory when the 200 ohm carbon type resistor is set at 10 megacycles and the receiver's tuning dial is set at 10 megacycles.
NORMAL VOLTAGE READINGS

The various values of voltages listed in the following table are obtained by measuring between the various tube socket contacts and the chassis base, with all the tubes in their respective sockets. The receiver is, therefore, in operation when the measurements are made. Figure 1 shows the terminal layout of the sockets with the proper named terminals.

Voltages are given for a line voltage of 120 volts, and allowance should be made for differences when the line voltage is higher or lower. A meter having a resistance of 1000 ohms per volt should be used for measuring the P.C. voltage. Voltage values given are those obtained on the lowest practical scale of a meter having the following ranges: 0-25, 0-100, 0-200, 0-500, 0-500 volts except when an asterisk appears after the given voltage value, in which case the 500 volt scale was used, or when a double asterisk appears the 500 volt scale was used.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Circuit</th>
<th>Cap 1</th>
<th>Cap 2</th>
<th>Cap 3</th>
<th>Cap 4</th>
<th>Cap 5</th>
<th>Cap 6</th>
<th>Cap 7</th>
<th>Cap 8</th>
<th>Heater Voltages</th>
<th>Between Heater Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>687</td>
<td>R.F. Amp.</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>6A8</td>
<td>Modulator</td>
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<td>0</td>
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<tr>
<td>6P8-G</td>
<td>Oscillator and Oscillator Control</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
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<tr>
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<td>6G6</td>
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<td>0</td>
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<tr>
<td>6F6</td>
<td>Audio Output</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
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<td>0.2</td>
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<td>5C3</td>
<td>Rectifier</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Speaker Socket</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig. 1. Terminal Layout for Voltage Measurement Chart and Location of the Aligning Adjustments.
ALIGNMENT DATA

All alignment adjustments are accurately made at the factory on these receivers, and ordinarily no readjustments are required. If it should become necessary to make alignment adjustments, the instructions given in these instructions should be carefully followed. The preferred method of aligning these receivers is by the use of a signal generator and a suitable audio and frequency monitor unit in the place of the signal generator.

To accurately align circuits in these receivers, it is necessary to use a high grade signal generator capable of being modulated 30% and having an output voltage of at least 600 microvolts; it will also be necessary to have this output voltage measured on a high grade oscilloscope so that any few microvolts may be fed into the receiver. In conjunction with the signal generator, a sensitive output meter should be used for determining the maximum signal voltage developed across the variable cap of the loud speaker. In addition to this, the setting of the discriminators and the discriminator control should be measured with a microphone voltmeter using a resistance of about 5000 ohms per volt.

To make the alignments in an easy and satisfactory manner, it is recommended that the Strumberg-Carlon modification be performed before proceeding with the alignment of any circuits in these receivers, be sure that the TRENO Control knob is set at the "D" position. The "O" position should also be tried for the "Normal" position. When making any alignment adjustments, always adjust the test oscillator's output voltage to the maximum value where a good alignment may be obtained, except when specifically directed otherwise in these instructions. Figure 1 shows the location of all the alignment capacitors or adjustments for these receivers.

Adjustment of the Discriminator Circuit

1. Before making this circuit adjustment, be sure that the I.F. amplifier and signal generator are exactly as described for the intermediate frequency adjustments. All controls should be set the same as described for the intermediate frequency adjustments. Connect a signal generator to the receiver, set the signal generator to the desired frequency, and connect the receiver to the signal generator. The signal generator should be set to the desired frequency and the receiver tuned to the same frequency. The alignment of the discriminator circuit should be made by using the discriminator control in the receiver to bring the output of the discriminator to a minimum.

2. The output of the discriminator should be adjusted so that a signal of 10 microvolts is fed into the modulator tube. Under these conditions the modulator connected across the capacitor, C1, should read zero. If the signal generator is not obtained, the signal generator should be set to an output of 50 microvolts and the receiver tuned to the desired frequency. The frequency of the signal generator should be increased in steps of 5000 cycles, and the receiver should be checked at each step to determine if the output of the discriminator is still the same. The output of the discriminator should be adjusted so that a signal of 10 microvolts is fed into the modulator tube.

3. The output of the discriminator should be adjusted so that a signal of 10 microvolts is fed into the modulator tube. Under these conditions the modulator connected across the capacitor, C1, should read zero. If the signal generator is not obtained, the signal generator should be set to an output of 50 microvolts and the receiver tuned to the desired frequency. The frequency of the signal generator should be increased in steps of 5000 cycles, and the receiver should be checked at each step to determine if the output of the discriminator is still the same. The output of the discriminator should be adjusted so that a signal of 10 microvolts is fed into the modulator tube.
TEL. MFG. CO.

Voltage Rating: 105 to 125 Volts, A. C.
Power Frequency Rating: See “Apparatus Specifications”
Input Power Rating: 155 Watts
Frequency of Intermediate Amplifier: 455 Kilocycles

Chassis Wiring
1. Operate the Range switch on the receiver chassis to the Standard Broadcast ("A") range position and set the test oscillator's frequency and the receiver's tuning dial to the test oscillator's carrier frequency.
2. Adjust the receiver's oscillator "A" range H. F. slug for maximum output.
3. Adjust the receiver's oscillator "B" range H. F. slug for maximum output.
4. Adjust the receiver's oscillator "C" range H. F. slug for maximum output.
5. Set the test oscillator's frequency and the receiver's tuning dial to the test oscillator's carrier frequency.
6. Adjust the receiver's oscillator "A" range H. F. slug for maximum output.
7. Reset both the test oscillator's frequency and the receiver's tuning dial to the test oscillator's carrier frequency.

Adjustment of 10 Kilocycle Audio Cut-Off Filter

The adjustment of this filter is now made at the factory and no additional adjustment is required.

INSTRUCTIONS FOR SETTING UP ELECTRIC TUNING SYSTEM

1. Before proceeding with setting up the eight favorite broadcast stations for electric tuning, it is preferable that the radio receiver be turned on for approximately twenty minutes. This is accomplished by turning on the receiver and setting the tuning dial to the high-frequency limit of the receiver.
2. The terminal block is located on the receiver and should be set to the "Off" position (i.e., on the line computer at the front of the chassis).
3. Remove the three screws which hold the electric tuning terminal plate (metal plate) to the receiver and fasten them with a screwdriver. The terminal block and the jumpers to the terminals should be removed and placed on the terminal block.
4. The terminal block should be removed and placed on the terminal block. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.
5. Connect the terminal block to the receiver's tuning dial using a suitable jumper.
6. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.
7. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.
8. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.
9. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.
10. The terminal block should be connected to the receiver's tuning dial using a suitable jumper.

Terminals of Sockets

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Circuit</th>
<th>Cap 1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0</td>
<td>0</td>
<td>+235</td>
<td>+15</td>
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<td>-15</td>
<td>0</td>
<td>-15</td>
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<td>-15</td>
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<td>0.27</td>
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<td>425</td>
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<td>425</td>
<td>425</td>
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<td></td>
</tr>
</tbody>
</table>

Voltage Across Motor Wind. 20 AC

Receiver tuned manually to 1000 ke, no signal. A. C. voltages are indicated by italics.
L'ATRO MFG. CO.

MODELS EQ-39, PQ-39
Schematic

FOR ALIGNMENT
SEE INDEX

Filaments

IF PEAK 456 KC

VOLTAGES:
Plates 6A7, 78, and 41 ... 210 volts.
Plate 75 .............. 60 v.
Screen 41 .............. 210 v.
Screen 6A7 and 78 ...... 65 v.
Anode grid 6A7 .......... 160 v.

Cathodes (as measured by a 1000 ohm per volt meter):
6A7 and 78 ............. 3 v.
75 .................. 1 v.
41 .................. 14v.

1 .1 mfd. 17 400 ohms 34 Oscillator coil
2 .0001 mfd. 18 50M ohms 35 I.F. Coil
3 Gang condenser 19 8.00 ohms 36 I.F. Coil
4 .00025 mfd. 20 50M ohms 37 Speaker
5 .01 mfd. 21 25M ohms 38 Filter choke
6 10 mfd. electr. 22 \(\frac{1}{2}\) Mog. control 39 Power trans.
7 .01 mfd. 23 \(\frac{1}{2}\) Mog. control
8 10 mfd. electr. 24 10M ohms 40 R.F. Choke
9 .01 mfd. 25 \(\frac{1}{2}\)megohm 41 Band switch
10 8 mfd. electr. 26 1 megohm 42 Power switch
11 16 mfd. electr. 27 650 ohms 43 Vibrator
12 .01 mfd. 1600 v. 28 50 ohms 44 Pilot light
13 .25 mfd. 29 200 ohms 45 Tone switch
14 .5 mfd. 30 160 ohms 46 .002 mfd.
15 .20 mfd. 31 10M ohms 47 S.W. Padder
16 .002 mfd. 32 \(\frac{1}{2}\)megohm 48 B.C. Padder
33 Antenna coil

The antenna for the Model EQ (table model) and PQ (console) should be about 100 feet long and as high as possible. No ground connection is necessary. A continuously variable tone control is used in Model PQ.

©John F. Rider. Publisher
Plates 6A7, 78, and 42's ... 200 v.       Cathode 6A7 ........ 2.5 v
Plate 37            ........ 50 v.       " 78 ........ 2 v.
Plate 75            ........ 30 v.       " 75 ........ 5 v
Screens 6A7 and 78 ....... 50 v.       " 37 ........ 4 v.
                 " 42's .......... 15 v.

1 Gang condenser    18 ½ megohm       55 ½ megohm
2 .1 mfd.             19 63 ohms       36 400 ohms
3 .0001 mica         20 25M ohms      37 33 ohms
4 .002 mfd.           21 ½ megohm      38 Preselector coil
5 .01 mfd.            22 800 ohms      39 Antenna coil
6 .0005 mfd.          23 ½ megohm      40 Oscillator coil
7 10 mfd. electr.   24 ½ meg. control 41 I.F. coil
8 .005 mfd.           26 7500 ohms     42 I.F. coil
9 5 mfd. electr.    27 ½ megohm       43 Speaker
10 .0025 mfd.         28 25M ohms      44 Filter choke
11 8 mfd. electr.    29 2500 ohms     45 R.F. choke
12 16 mfd. electr.   30 100M ohms     46 Power trans.
13 .25 mfd.           31 20 ohms       47 Stepdown trans.
14 .02 mfd.           32 50 ohms       48 Band switch
15 .25 mfd.           33 800 ohms      49 Off-on switch
16 .1 mfd.            34 50M ohms      50 Power switch
17 .25 mfd.           35 ½ meg. control 51 2 amp. fuse
ALIGNMENT PROCEDURE

Model AQ-69, EQ-67
Adjust IF coils to 456 KC.

Model ZP-59 and PZ-59
Switch to shortwave band: turn dial to 5 KC and adjust trimmer on rear section of the gang condenser to maximum output.

Switch to broadcast band and turn dial to 1460 KC. Adjust trimmer connected to switch to maximum output. Track antenna by adjusting trimmer on antenna section of the gang condenser.

Switch to shortwave band: turn dial to 5 KC and track antenna by adjusting trimmer on top of the antenna coil.

MODELS AE-69, EZ-67

Adjust IF coils to 456 KC.

Switch to shortwave band: turn dial to 5 KC and adjust trimmer on rear section of the gang condenser to maximum output.

Switch to broadcast and turn dial to 1460 KC. Adjust trimmer connected to switch to maximum output. Track antenna by adjusting trimmer on antenna section of the gang condenser.

Switch to shortwave, turn dial to 5 KC and track antenna by adjusting trimmer on top of the antenna coil.

Model EZ-67 EQ-67

--- ALIGNMENT PROCEDURE ---

Model AE-69, EZ-67
--- ALIGNMENT PROCEDURE ---

Turn dial to closed gang position to make certain that the dial needle coincides with the end of the scale. Turn dial to about midpoint and adjust the I.F. coils to 456 KC.

Switch to shortwave band, set dial needle to 15 KC and adjust bottom trimmer in antenna and oscillator coils to maximum output.

Switch to police band (middle band) set dial at 5 KC and adjust the second trimmer from the bottom to maximum output.

Switch to broadcast, set dial at 1460 KC and adjust the third trimmer from the bottom. Then adjust the rater located on the front section of the gang condenser. Turn to 600 KC and adjust the top trimmer in the oscillator coil. This is the series tracking condenser.

The type 6AG7 tube has been found to give better oscillator performance than the 6J5G and is used in present production. The switch which turns the tuning eye and slits up and on is located on the back of the panel.

--- ALIGNMENT PROCEDURE ---

Model AE-69, EZ-67

--- ALIGNMENT PROCEDURE ---

Turn dial to closed gang position and make certain that the dial needle coincides with the end of the scale. Turn dial to about midpoint and adjust IF coils to 456 KC.

Switch to shortwave band, set dial needle to 15 KC and adjust bottom trimmers on antenna and oscillator coils to maximum output.

Switch to police band (middle band) and set dial at 5 KC. Adjust second trimmers from the bottom to maximum output.

Switch to broadcast, set dial at 1460 KC and adjust the third trimmers from the bottom. Then adjust the rater located on the front section of the gang condenser. Turn to 600 KC and adjust the top trimmer in the oscillator coil. This is the series tracking condenser.

--- ALIGNMENT PROCEDURE ---

Model AE-69, EZ-67

--- ALIGNMENT PROCEDURE ---

Turn dial to closed gang position and make certain that the dial needle coincides with the end of the scale. Turn dial to about midpoint and adjust IF coils to 456 KC.

Switch to shortwave band, set dial needle to 15 KC and adjust bottom trimmers on antenna and oscillator coils to maximum output.

Switch to police band (middle band) and set dial at 5 KC. Adjust second trimmers from the bottom to maximum output.

Switch to broadcast, set dial at 1460 KC and adjust the third trimmers from the bottom. Then adjust the rater located on the front section of the gang condenser. Turn to 600 KC and adjust the top trimmer in the oscillator coil. This is the series tracking condenser.
Alignment procedure

To adjust I.F. coils Oscillator at 175 KC to grid of 6D8G tube; adjust I.F. trimmers to maximum output.

To adjust R.F. coils Set oscillator at 1400 KC connect to antenna lead, dial at 1400 KC, adjust oscillator pad for located on the rear of the gang condenser, to maximum. Then adjust the two other padders on the gang condenser to maximum output.

Voltages: (As measured by a 1000 ohm per volt meter)

\[
\begin{array}{ll}
B + 140 & = 150 \text{ volts} \\
\text{Anode grid 6D8G} & = 60-70 \text{ volts} \\
\text{Plate RF 6S7G} & = 6S7G\text{’s} \\
\text{Screens 6D8G & 6S7G} & = 50-60 \text{ volts} \\
\end{array}
\]

Cathode voltages

\[
\begin{array}{ll}
\text{6S7G’s} & = 2 \text{ volts} \\
6D8G & = 2.5 \text{ volts} \\
6S7G & = 1 \text{ volt} \\
41 & = 10 \text{ volts} \\
\end{array}
\]

Voltages on the Model No. (table model) are somewhat lower than the above. Some changes in circuit constants in sets built prior to Aug. 1937, will be found. Motorboating on this set can be corrected by separating the grid leads on the gang condenser as far as possible.
**I.TATRO MFG. CO.**

**MODELS SP-67, TP-67**

**Schematic**

---

--- **VOLTAGES** --

Plates 6A8G, 6S7G, 6L5G, 627G, and oscillator grid of 6A8G

<table>
<thead>
<tr>
<th>Plate</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8G</td>
<td>140 v</td>
</tr>
<tr>
<td>6S7G</td>
<td>12 v</td>
</tr>
<tr>
<td>6L5G</td>
<td>40 v</td>
</tr>
</tbody>
</table>

Cathodes: 6A8G and 637G

- 6A8G: 1.5 v
- 6T7G: 5 v
- 6L5G: 5 v

For Alignment

--- **INDEX**

- 6A8G and 637G
- IF Peak 456 KC

---

**Voltages when set is on AC are higher.**

1. Gang condenser: 0.25 mfd.
2. 0.10 mfd.
3. 0.0025 mfd
4. 0.002 mfd.
5. 0.01 mfd.
6. 0.0025 mfd.
7. 10 mfd. elect.
8. 5 mfd. elect.
9. 0.0025 mfd.
10. 8 mfd. elect.
11. 16 mfd. elect.
12. 0.005 mfd. 1600 v.
13. 10 mfd. elect.
14. 5 mfd.
15. 10 mfd.
16. 25 mfd.
17. 400 ohms
18. 25M ohms
19. 1 megohm
20. 50M ohm
21. 25M ohm
22. 1/2 megohm
23. 5M ohms
24. 1/2 meg. control
25. Tone control
26. 1/2 megohm
27. 1500 ohms
28. 10M ohms
29. 1/2 megohm
30. 1500 ohms
31. Preselector coil
32. Antenna coil
33. Oscillator coil
34. Iron core I.F.
35. I.F. coil
36. Input trans.
37. Speaker
38. Filter choke
40. Band switch
41. Pilot lights
42. Tuning eye and dialite switch
43. Ewer switch
44. Tuning eye

---

The TP-67 is a console model; the SP-67 is a table model. The antenna should be as high as possible and about 100 feet long. A good ground is essential for good reception. The blue wire from the set is the antenna lead. If the set is to be operated on 110 volts continuously, the vibrator should be removed.
Schematic

**VOLTAGES**

Plate 6D8G, 6S7G, and 41 150 volts
Plate 6T7G 50 volts
Screen 6D8G and 6S7G 50 volts.

When set is on AC, voltages will be somewhat higher.

1. .1 mfd.
2. .01 mfd.
3. Ant. section of gang
4. .0002 mfd.
5. Osc. section of gang
6. .0002 mfd.
7. 10 mfd. elect.
8. 5 mfd. elect.
9. .002 mfd.
10. 3 mfd. elect.
11. 16 mfd. elect.
12. .005 mfd. 1600 v.
13. 10 mfd. 50 v.
14. .5 mfd.
15. 50M ohms
16. 400 ohms
17. ¼ Megohm
18. 1500 ohms
19. ½ Megohm
20. 50M ohms
21. 25M ohms
22. 1 Megohm
23. ½ Meg. control
24. Megohm
25. 1 Megohm
26. 500 ohms
27. 10M ohms
28. Ant. coil
29. Osc. coil
30. I.F. coil
31. I.F. coil
32. Speaker
33. Filter choke
34. Power trans.
35. 35
36. 12
37. 5
38. 18
39. 37
40. 47
41. 15
42. 43
43. 44
44. 45
45. 46
46. 47
47. 41
48. 15
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91. 15
92. 15
93. 15
94. 15
95. 15
96. 15
97. 15
98. 15
99. 15
100. 15

Items 36, 45 and 46 are used in Model BQ only. Items 42, 43 and 44 are used in Model AQ only.
SERVICE SUGGESTIONS

CIRCUIT: The receiver uses a superhet circuit. The tubes used are: type 6G6 as oscillator and modulator, a type 6BN in the I.F. stage, a type 6C6 as second detector and audio amplifier and a type 45 output tube. The I.F. is 456 K.C.

ALIGNING THE SET: Only in rare cases will it be found necessary to adjust any trimmers. If the volume is low, everything else should be checked before attempting to align the set. The only case where the fault is in the alignment is when both low volume and poor selectivity are present. To align the I.F.: set the test oscillator to 456 K.C. and connect it to the grid of the first 6G6 tube and adjust the upper screw on the first I.F. transformer and the screw on the second I.F. (small round can) for maximum output. Now set the test oscillator to 1400 K.C. The signal should come in between 15 and 30 on the dial. Adjust the two trimmers on the tuning condenser for maximum output. Check at 600 K.C. The lower trimmer on the first I.F. transformer is the oscillator coupling condenser and should not be changed.

Price and Parts List for Clarion TC-31

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Code No.</th>
<th>Description</th>
<th>Price</th>
</tr>
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<tr>
<td>TPE2010</td>
<td>L1</td>
<td>Antenna Coil</td>
<td>$0.95</td>
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<tr>
<td>TPE2020</td>
<td>L2</td>
<td>Oscillator coil</td>
<td>$0.96</td>
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<tr>
<td>TPE2030</td>
<td>L3</td>
<td>First I.F.</td>
<td>$1.50</td>
</tr>
<tr>
<td>TPE2040</td>
<td>L4</td>
<td>Second I.F.</td>
<td>$1.50</td>
</tr>
<tr>
<td>TPE2100</td>
<td>L5</td>
<td>Speaker Transformer</td>
<td>$4.50</td>
</tr>
<tr>
<td>TPE2050</td>
<td>L6</td>
<td>Speaker Field</td>
<td>$1.50</td>
</tr>
<tr>
<td>TPE2060</td>
<td>L7</td>
<td>Choke</td>
<td>$1.25</td>
</tr>
<tr>
<td>TPE2070</td>
<td>R1</td>
<td>Pilot shunt</td>
<td>$0.25</td>
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<tr>
<td>TPE2080</td>
<td>R28W</td>
<td>Volume control and switch</td>
<td>$1.10</td>
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<td>TPE2100</td>
<td>R3</td>
<td>7500 ohm carbon resistor</td>
<td>$0.19</td>
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<td>TPE2110</td>
<td>R4</td>
<td>Filament resistor 520 ohm</td>
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<td>TPE2120</td>
<td>R5</td>
<td>50,000 ohm carbon resistor</td>
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<td>TPE2130</td>
<td>R6</td>
<td>10,000 ohm carbon resistor</td>
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<td>TPE2140</td>
<td>R7</td>
<td>500,000 ohm carbon resistor</td>
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<td>TPE2150</td>
<td>R8</td>
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<td>R9</td>
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<td>TPE2170</td>
<td>R10</td>
<td>500,000 ohm carbon resistor</td>
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<td>TPE2180</td>
<td>R11</td>
<td>7500 ohm carbon resistor</td>
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<tr>
<td>TPE2190</td>
<td>C1</td>
<td>.1 mfd. paper condenser</td>
<td>$0.14</td>
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<tr>
<td>TPE2200</td>
<td>C2</td>
<td>.005 mfd. paper condenser</td>
<td>$0.14</td>
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<tr>
<td>TPE2210</td>
<td>C3</td>
<td>.1 mfd. paper condenser</td>
<td>$0.14</td>
</tr>
<tr>
<td>TPE2220</td>
<td>C4</td>
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<td>TPE2230</td>
<td>C5</td>
<td>.1 mfd. paper condenser</td>
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<td>TPE2240</td>
<td>C6</td>
<td>.001 mfd. paper condenser</td>
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<td>TPE2250</td>
<td>C7</td>
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<td>TPE2260</td>
<td>C8</td>
<td>.005 mfd. paper condenser</td>
<td>$0.14</td>
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<td>TPE2270</td>
<td>C9</td>
<td>.005 mfd. electrolytic condenser</td>
<td>$0.15</td>
</tr>
<tr>
<td>TPE2280</td>
<td>C10</td>
<td>.005 mfd. electrolytic condenser</td>
<td>$0.15</td>
</tr>
<tr>
<td>TPE2290</td>
<td>C11</td>
<td>.005 mfd. electrolytic condenser</td>
<td>$0.15</td>
</tr>
<tr>
<td>TPE2300</td>
<td>C12</td>
<td>.005 mfd. electrolytic condenser</td>
<td>$0.15</td>
</tr>
<tr>
<td>TPE2310</td>
<td>C13</td>
<td>.005 mfd. electrolytic condenser</td>
<td>$0.15</td>
</tr>
</tbody>
</table>
VOLTAGE READINGS:

Readings should be taken with volume control fully on. Use a D.C. Voltmeter having a resistance of 3000 ohms per volt.

SWITCH POSITION
1-Broadcast
2-S.W.

IP PEAK 456 KC

Six Tube Superheterodyne Receiver
A.C. or D.C. 105-125 Volts
Also available up to 240 V.

Short Wave
17.5 - 53 Meters
17000 - 5600 Kilocycles

Broadcast
100 - 560 Meters
1580 - 535 Kilocycles

25Z5
ALIGNMENT - IF Sw in S.W. position, dial at 5 MHz. Gen. at 600 Kc, 400 ohm dummy, adjust "I.F. Osc Pad" to max. If set fails to oscillate, readjust regeneration trimmer.

5 TUBE AC-DC
SUPERHETERODYNE

11 TUBE AC
SUPERHETERODYNE
I.F. PEAK 456 KC

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII
CURRENT SUPPLY

The current supply switch at the rear of the chassis must be set to 115 or 230 volts to correspond to the available current and should never be changed while that current is being used! Be absolutely sure this switch is set right before you plug in the radio. If it is set for 115 volts and 230 volts is used, the transformer will burn out.

SUPPLY VOLTAGE

This receiver operates from any 110 volt light socket of any frequency AC or straight DC. When operating on a DC socket, the plug may have to be reversed in the socket to obtain the correct polarity, as it will work only in one position on DC current.
ALLOCATION: B TYPE BATTERY OR A.G. and MODEL 539M.

I.F. ALIGNMENT

From a good signal generator, connect the proper leads, one to the radio chassis, the other to the signal generator itself. Connect the grid lead to the grid of the 6K6 with the socket grid lead still in place. Set the radio dial to 1720 K.C. and adjust the signal generator to 456 K.C. With the set's volume control all up, increase the generator output until the signal is heard in the radio speaker. Adjust the L.F. trimmers for maximum output, starting with the third L.F. and working back. Decrease the generator output as the speaker output increases.

LONG WAVE ALIGNMENT

Connect the signal generator lead thru a .0002 mfd. condenser as dummy antenna, to terminal "A1," with the metal strip connected across A2 and G. Set dial and adjust to 362 K.C. and adjust the L.W. oscillator trimmer for maximum output. Align the L.W. RF and ANT trimmers at 320 K.C. Align the L.W. oscillator pad for maximum output at 200 K.C. by adjusting the dial and pad together. Check the alignment again at 320 K.C.

BROADCAST BAND ALIGNMENT

Using the .0002 mfd. condenser as dummy antenna, adjust the B.C. oscillator trimmer at 1720 K.C. Align the RF and ANT trimmers at 1490 K.C. Adjust the B.C. oscillator pad at 600 K.C. by adjusting the dial and pad together. Check the alignment again at 1490 K.C.

INTERMEDIATE BAND ALIGNMENT

Using a 400 ohm resistor as dummy antenna, adjust the Intermediate Band oscillator trimmer at 6.7 M.C. and the R.F. and Antenna trimmers at 6 M.C. Check for alignment at 2.2 M.C.

SHORT WAVE BAND ALIGNMENT

Using a 400 ohm resistor as dummy antenna, adjust the S.W. oscillator trimmer at 24.5 M.C. and the R.F. and Antenna trimmers at 22 M.C. Check for alignment at 8 M.C.

NOTE: No intermediate band on Models 465M and 466W.

L.F. From a good signal generator, connect the proper leads, one to the radio chassis, the other thru a .0002 mfd. condenser to the grid cap of the 6K6 with the socket grid lead still in place. Set the radio dial to 1720 K.C. and adjust the signal generator to 456 K.C. With the set's volume control all up, increase the generator output until the signal is heard in the radio speaker. Adjust the L.F. trimmers for maximum output, decreasing the generator output as the speaker output increases.

B.C.1. Connect the signal generator lead thru a .0002 mfd. condenser as dummy antenna, to terminal "A1," with the metal strip connected across A2 and G. Set the signal generator and radio dial to 1720 K.C. and adjust the B.C. oscillator trimmer for maximum output.

2. Set the signal generator and radio dial to 1400 K.C. and adjust the B.C. R.F. and ANT trimmers for maximum output.

3. Set the signal generator to 600 K.C. and the radio dial to approximately 600 K.C., and adjust the B.C. oscillator pad for maximum output by adjusting dial and pad together. Check the alignment again at 1400 K.C.

ANT. Connect the signal generator lead thru a 400 ohm resistor as dummy antenna to A1. Set the dial and generator to 600 K.C. and adjust the P.B. oscillator trimmer for maximum output. Adjust the R.F. and ANT trimmers at 6000 K.C. and check for alignment at 2100 K.C.

4. Now, using the 400 ohm resistor as dummy antenna, adjust the S.W. oscillator trimmer at 24.5 M.C. on dial and generator. Adjust the R.F. and ANT trimmers at 22 M.C. and check for alignment at 8 M.C.

ALLOCATION: 6 TUBE AUTO RADIO

1. Set variable condenser with rotor plates to open position. Set signal generator to 2000 K.C. Connect a dummy antenna to set and connect a signal generator lead to antenna lead as set using a .0002 mfd. condenser as dummy antenna; adjust IF trimmer for maximum output, reducing signal generator output as signal increases.

2. Set signal generator to 1000 K.C. and transmitting generator lead to antenna lead as set using a .0002 mfd. condenser as dummy antenna; adjust IF trimmer for maximum output, reducing signal generator output as signal increases.

3. Now, using the 400 ohm resistor as dummy antenna, adjust the S.W. oscillator trimmer at 24.5 M.C. on dial and generator. Adjust the R.F. and ANT trimmers at 22 M.C. and check for alignment at 8 M.C.
HOME RADIO • A. C. POWER SUPPLY
9 TUBE • 3 BAND • ALL WAVE
WITH AUTOMATIC TUNING
Circuit

This model is a 3 band A.C. operated radio with a 6 button and a 9 button automatic tuning system.

A 4 position rotary switch is used to switch the tuning circuits from automatic tuning to manual tuning. The rotary switch is used on any of the 3 manual tuning ranges (AM broadcast and 2 short wave ranges).

In MANUAL TUNING, B, R, antenna transformer with tuned secondary (indicated by a resistor) is used. The output of this tube is fed through the rotary switch to the diode detector coil. A KX4 tube functions as a separate oscillator. The antenna transformer B band secondary is connected to the R.F. tube grid circuit. The antenna transformer C and D band secondaries are shorted circuit.

In issue No. 1 sets, if any automatic tuning button is depressed, the automatic tuning antenna coil is connected to that button short circuit. In issue No. 2 sets, the connection between the antenna coil and the automatic tuning antenna coil is open circuited by the detector coil. The interstage transformer B band secondary is connected to the diode detector coil circuit. The interstage transformers C and D band secondaries are open circuited.

In both issues, the connections from the antenna and interstage transformer secondaries are open circuited.

The plate of the R.F. tube is connected to the A.C. battery through a resistor R1 and a diode. It is also connected through a resistor R1 to a 50 ohm resistor in the grid of the 1st detector. The latter is connected through grid leak R4 to ground.

The oscillator circuit is connected through the top or bottom coil to the resistor R1 and the diode detector coil. The detector coil is connected through the bias coil to the diode detector coil. It is also connected to the oscillator coil No. 1 coil through the Osc. 1 switch. The student or grid coil is connected through the resistor R2 to the oscillator coil No. 2. The student coil No. 2 is connected through the oscillator coil No. 2. The student coil No. 2 is connected through the oscillator coil No. 3.

One stage of I.F. amplification is employed using a 6DJ7 tube. An expander is used in the I.F. transformer for high fidelity reception.

A 6SH6 tube functions as a double diode detector. This tube is used in the automatic tuning circuit of the R.F. and I.F. tubes.

Across the volume control resistor R18 is a filter composed of condensers C11 and C15 and resistor R18. At high volume settings of the filter, the filter resonance is high, and at low volume settings, the action of this filter results in an increase of high and low frequencies relative to the other frequencies amplitude.

The output of the 3rd detector is fed through the 6C40 type A.F. tube. The output of this tube is fed through resonance coupling into the A.K45 output transformer.

A dynamic reproducer is employed. Degeneration or negative feedback is used in the audio amplifier. A portion of the voltage developed across the speaker is fed back into the grid of the 5th audio tube. The volume control is varied by the proper phase to reduce the amplitude of certain frequencies. This results in a reduction in distortion.

The power unit uses a 675G full wave rectifier. A 6R3 tunable grid oscillator is employed.

General Service Data

Issue Number

The last digit of the number on the chassis number label identifies the radio as to the issue number.

Issue No. 1

Mechanical Assembly—The station button plunger has a length of 54 in.

The locking plate for the station button plunger has 2 small tube which is used in the rear base of the binder assembly. See Fig. 2.

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram. Fig. 3. On the top of the chassis base and between the 6BY8 and A.F. tubes socket is a round knob opening to an inch in diameter. An actuating switch is mounted in this knob opening and wired as shown in the schematic.

A phone cable assembly may be purchased as a part of the set. The phone and the phone plug are connected to the phone jack. The phone jack is mounted in the phone base and wired as shown in the schematic.

Volts at Sockets

The voltages at sockets are shown as shown in the schematic circuit diagram. Unequal specified, the voltages indicated are the socket terminal and ground. The voltages are read under the following conditions:

Line Voltage—117 Volt.

These voltages are read under the following conditions:

Twenty-Five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used.
MODEL D705
Issues 1 to 6 incl.
Distortion Notes

COIL TERMINALS.

[Diagram of electrical components and wiring]

SCHEMATIC CIRCUIT DIAGRAM FOR ISSUE NOS. 2 THROUGH 6.

© John W. Rider, Publisher

JULY, 1938
ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- A Hit Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output Indicating Meter—Non-Metallic Screwdriver.
- Dummy Load—1 mV, 200 mV, and 400 ohms.

**ALIGNMENT DATA**

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<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION</th>
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<td>460 KC</td>
<td>Grid of I.F. Tube</td>
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<td></td>
<td>1600 KC</td>
<td>Antenna Load</td>
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<tr>
<td>RANGE B</td>
<td>1000 KC</td>
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<td>RANGE C</td>
<td>6000 KC</td>
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<td>RANGE E</td>
<td>7000 KC</td>
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**PERMEABILITY TUNING UNIT**

- Turn Set Screw Nos. 1|
- Adjust Coil to MAXIMUM OUTPUT

**COIL POSITIONS**

- 1st I.F. (CC) & (C)B
- 2nd I.F. (C)B & (C)A
- Oscillator Range B (C)B
- Oscillator Range C (C)C
- Oscillator Range D (C)D
- Oscillator Range E (C)E

**WAVE TRAP**

- 460 KC Antenna Load 200 mV, B Range Turn to I.F. 500 kc. Adjust Dip-Sw,Wave Holes A
- 4000 ohms Turn to I.F. 500 kc. Adjust Dip-Sw,Wave Holes C

**Fig. 1—Location of Tuners**

- The top condenser is 0.02 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.01 µF for 2500 KC. and 0.005 µF for 3000 KC.
- The bottom condenser is 0.015 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.02 µF for 2500 KC. and 0.012 µF for 3000 KC.
- The bottom condenser is 0.015 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.01 µF for 2500 KC. and 0.007 µF for 3000 KC.

**Notes**

- **CAUTION**—When aligning the short wave bands be very careful to adjust the image frequences. The image voltage is much weaker than the desired frequency. In case of doubt, let it be tuned as if it were the image frequency.
- **NOTICE**—Alignment is necessary if glass tube, metal tube, or varicore tubes are used. In the R.F. and I.F. stages, the resistance coupling into the 6FG6 output tube immediately to the right of it is the astatic.
- **CAUTION**—When aligning the short wave bands be very careful to adjust the image frequences. The image voltage is much weaker than the desired frequency. In case of doubt, let it be tuned as if it were the image frequency.

**Alignment of the Tuners**

- The bottom condenser is 0.015 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.01 µF for 2500 KC. and 0.007 µF for 3000 KC.
- The bottom condenser is 0.015 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.01 µF for 2500 KC. and 0.007 µF for 3000 KC.
- The bottom condenser is 0.015 µF for 2500 KC. and 0.008 µF for 3000 KC.
- The bottom condenser is 0.01 µF for 2500 KC. and 0.007 µF for 3000 KC.
ULTRAMAR MFG. CORP.

MODELS 306, 516
Schematic, Socket
Alignment, Tuner
MODEL 467 MODEL 465
Alignment Tuner Data

MODELS 877 & 889

TECHNICAL INSTRUCTIONS
A good output meter should be used in all alignment adjustments.

I. F. ALIGNMENT

From a good signal generator, connect the proper leads, one to the radio chassis, the other thru a .1 mfd. condenser to the grid cap of the 6AK5, with the tube's grid lead still in place. Set the radio dial to 1720 K.C. and the signal generator to 456 K.C. With the set's volume control full on, increase the generator output until the signal is heard in the radio speaker. Adjust the I. F. trimmers for maximum output, decreasing the generator output as the radio output increases.

LONG WAVE ALIGNMENT

Connect the signal generator lead thru a .0002 mfd. condenser as dummy antenna, to the "A1" terminal, with the metal strip connected across A and G. Set the dial and generator to 362 K.C. and adjust the oscillator trimmer for maximum output. Align the L.W., R.F. and antenna trimmers at 360 K.C. and align the L.W. oscillator pad at 300 K.C. by adjusting the dial pad together. Check the alignment again at 300 K.C.

BROADCAST BAND ALIGNMENT

Using the .0002 mfd. condenser as dummy antenna, adjust the B.C. oscillator trimmer at 1210 K.C. for maximum output. Align the R.F. and antenna trimmers at 1400 K.C. by adjusting the dial pad together. Check the alignment again at 1400 K.C.

INTERMEDIATE BAND ALIGNMENT

Using the 0.001 mfd. condenser as dummy antenna, adjust the intermediate Band oscillator trimmer at 6.7 M.C. and the R.F. and Antenna trimmers at 6 M.C. Check for alignment at 2.2 M.C.

SHORT WAVE BAND ALIGNMENT

Using the 0.001 mfd. condenser as dummy antenna, adjust the S.W. oscillator trimmer at 24.5 M.C. and the R.F. and Antenna trimmers at 22 M.C. Check for alignment at 8 M.C.

MODELS 467, 456, 477, & 886

TECHNICAL INSTRUCTIONS
A good output meter should be used in all alignment adjustments.

I. F. ALIGNMENT

From a good signal generator, connect the proper leads, one to the radio chassis, the other thru a .1 mfd. condenser to the grid cap of the 6AK5, with the set's grid lead still in place. Set the radio dial to 1720 K.C. and the signal generator to 456 K.C. With the set's volume control full on, increase the generator output until the signal is heard in the radio speaker. Adjust the I. F. trimmers for maximum output, decreasing the generator output as the speaker output increases.

B. C. ALIGNMENT

1. Connect the signal generator lead thru a .0002 mfd. condenser as dummy antenna to the "A1" terminal, with the metal strip connected across A and G. Set the signal generator and radio dial to 1720 K.C. and adjust the B.C. oscillator trimmer for maximum output.
2. Set the signal generator and radio dial to 1400 K.C. and adjust the B.C. R.F. and ANT. trimmers for maximum output.
3. Set the signal generator to 600 K.C. and the radio dial to approximately 600 K.C. and adjust the B.C. oscillator trimmer for maximum output by adjusting dial and pad together. Check the alignment again at 1400 K.C.

INTERMEDIATE BAND ALIGNMENT

Connect the signal generator lead thru a 400 ohm resistor as dummy antenna to A1. Set the dial and generator up to 1720 K.C. and adjust the P.B. oscillator trimmer for maximum output. Adjust the R.F. and ANT. trimmers at 1400 K.C. and check for alignment at 2200 K.C.

SHORT WAVE ALIGNMENT

Still using the 400 ohm resistor as dummy antenna, adjust the S.W. oscillator trimmer at 24.5 M.C. on dial and generator. Adjust the R.F. and ANT. trimmers at 22 M.C. and check for alignment at 8 M.C.

MODELS 456, 465, 477, 886, 877 & 886

PUSH BUTTON OPERATION

Six Push Button, Station Selection and Control components are incorporated in this receiver. Each button may be adjusted to select any station or frequency in the Broadcast Band. To adjust each button, perform the following operations:
1. Tune in a desired station with the Selector knob.
2. If the Push Button you want to hear is to the left about one full turn in the mechanical position.
3. With the button pressed in as far as it will go, while still holding the Selector knob firmly so the station will not be detuned.
4. With the button pressed in to the right until it is tight and then release it.

Follow these procedures with the other five buttons, setting each for a different station.

When any Push Button is pressed, the station for which that button is set, appears to be tuned in. If it is not perfectly tuned, repeat the above procedure until satisfactory results are obtained.

Select the Call Letter Tab to correspond to the stations the buttons are set for, and insert them in places provided above each button.
UNITED MOTORS SERVICE, INC.

MODEL R663 Delco Schematic Voltage

FIG. 2 - DELCO MODEL R-663 CIRCUIT DIAGRAM

VOLTAGE READINGS BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTOMETER HAVING RESISTANCE OF 10,000 OHMS PER VOLT ALL READINGS TO NEUTERS

1-25-39
ALIGNMENT FOR MODELS R654, R664, R665, R666, R667, R668, and 2669.
NOTE: FIGURE REFERENCES IN THE TEXT REFER TO FIGURES SHOWN WITH EACH MODEL.

1. Aligning I-F Stages at 260 Kilocycles

(a) Connect the ground lead of the Signal Generator to the chassis case. Connect the signal lead of the Signal Generator to the grid cap of the 6AK5 tube, through a .1 mfd. condenser, leaving the tube's grid clip in place.

(b) Connect output meter from plate of 6AV6C, 6AV6G, 6AV6D, or 6AV6G to ground.

(c) Set Signal Generator to exactly 260 kilocycles and turn volume control on full.

(d) Tune condenser gang to a position where no squeals or beat notes can be noticed, also so that when the tuning condenser is rotated within narrow limits there is no appreciable change in output.

(e) Adjust trimmers A-B-C-D through the cut outs on the side of the chassis (Fig. 3, 12, 14, Fig. 4) carefully for maximum output.

(f) Repeat adjustments of I-F trimmers A-B-C-D with as low an output from the Signal Generator as possible, for more accurate alignment.

2. Aligning at 1550 Kilocycles

(a) Leave Signal Generator leads connected the same as for I-F adjustments.

(b) Turn tuning condenser plates all the way out and against high frequency stop.

(c) Set Signal Generator to exactly 1550 kilocycles and adjust oscillator trimmer "G" (Fig. 5) on middle section of condenser gang carefully for maximum output.

3. Aligning at 1400 Kilocycles

(a) Remove signal lead of Signal Generator from grid cap of 6AL5 tube and connect to antenna terminal of receiver through a .0002 mfd. mica condenser.

(b) Set the Signal Generator to 1400 kilocycles and tune the receiver to this signal.

(c) Adjust the parallel trimmers "F" and "H" (Fig. 3) of the condenser gang carefully for maximum output. Do not disturb the 1550 kilocycle adjustment of the middle section of the condenser gang.

4. Aligning at 600 Kilocycles

(a) Set Signal Generator to approximately 600 kilocycles and turn condenser gang plates until this signal is tuned in with maximum output.

(b) Adjust trimmer "H" on Delco Synchro-Tuning condenser (Illus. 12, Fig. 4) located next to antenna receptacle on bottom of chassis, rocking gang condenser plates back and forth through the signal until maximum output is obtained. (It will be necessary to re-adjust this condenser to the ear antenna upon installation of the set.)

5. Checking I-F Band Spread

The Model 165 Cathode Ray Oscillograph should be used to check the I-F band spread after completing the "Alignment Procedure". Slight adjustment of the I-F stages may be found necessary in order to obtain a symmetrical selectivity curve. Connect Cathode Ray from connection "I" (Fig. 4) to ground.

---

**Alignment of Chassis**

---

**Fig. 3--Parts Layout--Top View**

**Fig. 4--Parts Layout--Bottom View**
CIRCUIT CHANGE

Some sets were made with the 2 mfd. section of the electrolytic omitted (Illus. #52C) and Illus. #58 .05 mfd. 600 volt tubular condenser added. For replacement of electrolytic in these sets clip the green lead of replacement condenser.
CIRCUIT CHANGE
Some early sets were made with 300 ohm resistor (Illus. #37). Use 500 ohm number 1211019 for ALL service replacements.
FIG. 1--CIRCUIT DIAGRAM--DELCO-MATIC TUNER

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Part Name</th>
<th>Description</th>
<th>Part No.</th>
<th>Part Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880010</td>
<td>Switch</td>
<td>Motor reversing</td>
<td>134530</td>
<td>Nut</td>
<td>Pivot screw locking</td>
</tr>
<tr>
<td>122159</td>
<td>Screw</td>
<td>Switch mounting</td>
<td>7234957</td>
<td>Gear</td>
<td>Large drive</td>
</tr>
<tr>
<td>1880007</td>
<td>Lever</td>
<td>Switch contact assy.</td>
<td>7234768</td>
<td>Washer</td>
<td>Mounting</td>
</tr>
<tr>
<td>147460</td>
<td>Screw</td>
<td>Switch lever set screw</td>
<td>7234769</td>
<td>Screw</td>
<td>Mounting</td>
</tr>
<tr>
<td>7234714</td>
<td>Bracket</td>
<td>Mounting</td>
<td>7232713</td>
<td>Spacer</td>
<td>Rubber mounting</td>
</tr>
<tr>
<td>132892</td>
<td>Screw</td>
<td>Mounting bracket</td>
<td>136530</td>
<td>Washer</td>
<td>#8 int. shakeproof</td>
</tr>
<tr>
<td>1880065</td>
<td>Spring</td>
<td>Trip bar</td>
<td>7234745</td>
<td>Shaft</td>
<td>Condenser drive--flex.</td>
</tr>
<tr>
<td>7235711</td>
<td>Spring</td>
<td>Pawl</td>
<td>1880122</td>
<td>Control</td>
<td>Push button--complete</td>
</tr>
<tr>
<td>1880049</td>
<td>Screw</td>
<td>Long pivot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1880066</td>
<td>Screw</td>
<td>Short pivot</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For replacement only on late sets having metal stops between switch contact blades.
GENERAL: The Delco Model B-60 is a six tube, two unit auto radio with "Delco-Matic" flash tuning. The service parts and alignment procedure are identical to the Delco Model B-66.

The Delco Model B-66 is a seven tube, two unit auto radio with "Delco-Matic" flash tuning. The service parts and alignment procedures are identical to the Delco Model B-66.

SETTING UP "DELCO-OMATIC" TUNER
(a) Fold up and release the optional mechanism to come to rest.
(b) Continue to hold the button down, and tune to the desired station by manual control.
(c) Release button, and set up remaining buttons in the same manner.

When the button is held down after the mechanism has come to rest, the sets is held in the one set, locating the case in position. The case is allowed to fall on the shaft during the manual tuning process. By a clutch spring which is a part of the case shaft assembly.

OPERATION OF "DELCO-OMATIC" TUNER

The "Delco-Matic" Tuner is a motor-driven mechanical device for tuning in stations quickly and silently by remote push button controls. When a button is depressed, electric coils pull a corresponding pawl past a selector case. At the same time, a ball that is in the control head holds the button down until the cycle of operation is complete. A trigger on the stop progresses against a switch operating trip rod, which in turn operates the power switch. The degree of movement of the trip rod, which is controlled by the knob, is held on the selector case, determines the direction of motor rotation. When the case is rotated to a position where the pawls drop into the selector case slot, the degree of movement of the trip rod opens the ground contact on the power switch which cuts the current to the motor and magnetic clutch and releases all relays.

1. PUSH BUTTON HEAD

The push button in the control head completes the circuit for the operation of the hold-down magnet, starter relay and the corresponding selector case. The push button has been held down magnetically until released by the "cut-off" switch on the outer unit, actuated by the station selector switch dropping into the slot in the selector case.

2. STATION SELECTOR PANEL

The station selector panel is magnetically operated and controlled directly from the push button head. Upon pressing a button in the control head, a circuit is closed, energizing a station selector magnet coil which pulls a corresponding pawl down on a station selector case. The pawl rides on the case until it drops into the one slot and cuts the motor off and releases all relays.

3. STATION SELECTOR CASE

The station selector case is circular with high and low sides for operation of the motor reversing switch and a stop slot for operation of the motor cut-off switch. One of these cases are provided on a shaft, each with a friction clutch which allows the case to be released to its slot in the case shaft assembly.

4. REVERSING AND CUT-OFF SWITCH

The reversing and cut-off switch is a combination switch actuated by the trigger on the station selector panel. The reversing switch causes the motor to run in the right direction for direct to the station tuning and the cut-off switch cuts the motor off when a station is tuned in, and also releases the push-button hold-down magnet and the magnetic clutch.

The forward and reverse positions of the reversing switch are dependent on whether the station panel is pulled against the high or low side of the station selector case. The cut-off switch is actuated when the pawl drops into the case slot as a station is tuned in.

5. MAGNETIC CLUTCH

The magnetic clutch consists of an electromagnet and two iron discs which are held together magnetically when the field is energized. One of the discs is coupled to the motor and the other to the commutator gear.

The clutch is designed to cut the motor driving power from the tuning condenser switch at the same instant the pawl drops into the one slot and actuates the motor off-switch.

6. MASTER RELAY

The master relay is controlled directly from the push-button head and the purpose is to allow the motor current to be fed directly to the motor rather than through the push-button circuits. A set of "wires" contacts are provided along with the "a" power contacts for acting on the units system of the set while the motor is driving the tuning mechanism.

SERVICE PROCEDURE

The logical procedure to employ in servicing the automatic tuner will depend on a large extent upon the nature of the troubles encountered and whether the tuner is partially or totally inoperative. However, in most cases the solution to the trouble will be found by checking the below points in the order named:

1. TUNING CONTROL AND CABLE
2. BATTERY VOLTAGAt OR TUNER
3. STATION SELECTOR PANEL
4. PUSH BUTTON HEAD
5. REVERSING AND CUT-OFF SWITCH

The tuning control and tuning cable should be checked along with the battery and the "a" terminal of the tuner before removing chokes or push button head from car for servicing on the bench. Make all checks on bench with a tuning control connected to the tuner for proper loading. Detailed procedures for checking the above points is as follows:-

Checking Tuning Control and Cables

In order for the automatic tuner to operate properly it is necessary that the tuning control be free from burrs and binds, so as not to impose an excessive load on the tuner motor. Turn tuning control knob manually and note if drag is excessive or if any burrs or binds are apparent. If trouble is evident, disconnect flexible tuning cable from chassis case bushing and turn tuning knob to determine whether trouble is in set or tuning control. If trouble is in set, a careful check of the large die-cast gears should be made for proper meshing.

Checking Battery Voltage at "а" Terminal on Tuner

The magnetic, relay and the motor in the automatic tuner have been designed to operate satisfactorily on voltages as low as 4.5 volts measured as the "a" terminal on the tuner unit with the motor running. Low battery voltage will cause erratic operation of the tuner.

Before attempting any further repairs, first measure the "a" voltage at the large "a" terminal on the tuner unit with the tuner motor operating. In order to allow the motor to run long enough to get an accurate reading before it runs off, set two cases which appear to be working normally at opposite ends of the dial and press corresponding buttons, testing meter carefully while motor is running. If voltage is lower than 4.5 volts, check all connectors and terminals for poor contacts. Measure voltage at car connector with set load only. This should be 5.5 volts or more.

NOTE: In testing these automatic tuners on "E" Radio Test Panel, it is very important the proper voltage be available for test, otherwise incorrect diagnosis of the trouble will be made. A heavy duty battery and a "power" cord should be used. Also, all connections should be clean and heavy "a" supply used for connecting to the "a" supply terminals. On the "E" Test Panel it is recommended that all automatic tuner tests be made using the power supply terminals on the left side of the panel. This will give a slightly higher "a" voltage to test.

Checking Station Selector Panels

In most instances a visual inspection will determine if the station selector panel parts are operating satisfactorily. A check can be made by simply pressing the push button and noting if the corresponding pawl pulls down against the selector case. Failure of the pawl to operate may be caused by excessive spring tension on the pawl spring, or selector magnet circuits or low voltage.

To reduce spring tension on pawl spring, unscrew top end of spring with a pair of long nose pliers and stretch spring slightly. Be careful not to stretch spring too far or pawl will have a tendency to stick on the guide pin. Voltage measured at selector magnet coil terminals on "E" slot terminal board should not be less than 4.0 volts.

Checking Push Button Head

The push button head is working normally when the following actions take place.

1. Buttons should stay down magnetically when pressed, until station is tuned in or pawl drops in case slot.
2. Corresponding station pawl in tuner should pull down against cam.
3. From the button pressed and the corresponding station pawl in the tuner should remain when a station is tuned in or when the pawl drops into case slot.

It should be noted that buttons will not release unless tuner motor is operating and station pawl trips the streamswitch.

If push button head does not function as covered above and a duplicate head (Part #600012) is not available for substitution, make complete check of head as follows with push button cable plug disconnected from receiver.

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UNITED MOTORS SERVICE, INC.
Delco-Matic Tuner
Service Notes, Part 2

A. MECHANICAL TEST OF PUSHER BUTTON HEAD:
(a) Disconnect push button control plug from receiver chassis.
(b) Press buttons down and release slowly. Note if any button or buttons have a tendency to retract or to be not seated in the full distance when released. Failure of a button to release to the full extent will cause the station selector panel to stick in the case when a station is tuned in (see Paragraph "D").
(c) If clinging buttons are encountered, remove the mechanism from the delivery head, removing the brake cover plate and taking out the four round head screws. A small burr on either the small brake wheel or the push-button shaft, or in the push button itself in the release or when pushing the button starts will cause the button to stick. Removal of the burr will eliminate this sticking.

NOTE: Do not hold the control head in an inverted position when removing mechanisms from head.

B. CHECKING MAGNET FOR HOLD-DOWN:
(a) Remove control cable plug from receiver chassis.
(b) Connect 4 volts D.C. across grooves 8 and 11 as shown.
(c) Press buttons in one at a time, interrupting battery circuit to release button after each test.
(d) If none of the buttons will stay down when pressed, measure continuity check across grooves 8 and 11 for open circuits in hold down magnets or cable wiring.
(e) If one or two buttons will not stay down when pressed, first check to see if any wires are caught between button starts. If not, check for open circuits in direct lead and check for excessive spring tension in spring contact springle as in button shaft break-out spring.

C. CHECKING PUSH BUTTON SWITCH CONTACTS:
(a) The switch contacts in the control head are made of copper during the first 1/4" of dwell. It is therefore important that the buttons extend out the full distance when released by the hold down magnet, as covered in the "Mechanical Test of Push-Button Head".

Press Button No.

1
2
3
4
5

Apply 4 volts D.C. across:
4 volts D.C.
4 volts D.C.
4 volts D.C.
4 volts D.C.
4 volts D.C.

It will be noted that if the switch contacts are making proper contact and all pressure springs work, the hold down magnet in the head will be energized as much as possible.

Checking the Levering and Off-Off Switch
Proper operation of the switch mechanism on the engine is of vital importance. Braking of the container due to low battery voltage very often results in the trouble being incorrectly diagnosed as switch trouble. It is therefore important that all other points be checked first for possible causes of the trouble before attempting any adjustments in the switching mechanism.

There are four positions of the switch mechanism, "Normal", "on high side of core", "on the low side of core", and "off core in off core position Figures 3 to 10 illustrate the exact position of the switch contacts in each of the four switch positions. These contacts can be checked visually by removing their

D. MOUNTING ADJUSTMENTS
In the case where there are more than one or two cases where the unit is not working satisfactorily, individual adjustments can be made to the station selector parts by bending the small trigger arm up or down with a pair of pliers to obtain proper action of the levering and control switches.
In making these adjustments it is very important that the triggers be adjusted so that they will not operate the levering contacts or control contacts normally closed when the switch is raised in the off position. Also, they should be as little high as possible to the core to keep the switch closed at the bottom of the core slot. This core gap should be kept as small as possible to minimize the leakage of the contacts in the off position. The switch position should also be turned when the lower contacts are open when the core edge gang is turned. This is accomplished by the switch to the lower side with the center pin being held in one position.

E. REPLACEMENT OF EITHER THE REVERSING OR Switch ARM AS MOUNTING equipment is required to obtain accurate alignment of these parts.

The normal position of the levering lever of the switch with the switch are pulled down should be as shown in Fig. 10 illustrating the switch position on the core chart. If a complete test of the levering mechanism indicates that it cannot be repaired or adjusted as outlined, a replacement of the complete switch should be made in accordance with the C. D. Waver’s letter or April 31, 1935. Subject: “Service Policy—Delco Auto Radio Models 56-67 and M-69 Automatic Tuners.”

John F. Rider, Publisher
FIG. 3—DELCO MODEL R-673 CIRCUIT DIAGRAM

GENERAL: The Delco Model R-673 is a seven tube two unit receiver with short wave and broadcast band. Coverage of short wave band from 5000 kilocycles to 650 kilocycles to 540 kilocycles. Special features such as trim compensation, tone control and 667G push pull.
1. Aligning I-F Stages at 265.5 Kilocycles
(a) Connect the ground lead of the Signal Generator to the chassis case. Connect the signal lead of the Signal Generator to the grid cap of the 6K7G tube, through a .1 mfd. condenser, leaving the tube's grid clip in place.
(b) Connect output meter across plates of 6K7G tube.
(c) Set Signal Generator to exactly 265.5 kilocycles and turn volume control on full.
(d) Turn condenser gang to a position where no squeals or beat notes can be noticed, also so that when the tuning condenser is rotated within narrow limits there is no appreciable change in output.
(e) Adjust trimmers A, B, C & D through the cut-outs on the side of the chassis (Illus. 12 & 13, Fig. 5) carefully for maximum output.
(f) Repeat adjustments of I-F trimmers A, B, C & D with as low an output from the Signal Generator as possible, for more accurate alignment.

2. Aligning at 3000 Kilocycles
(a) Turn band switch to police band (clockwise).
(b) Leave Signal Generator leads connected the same as for I-F adjustments.
(c) Turn tuning condenser plates all the way out and against high frequency stop.
(d) Set Signal Generator to exactly 3000 kilocycles and adjust oscillator trimmer "G" (Fig. 4) carefully for maximum output, being careful to peak the signal received with trimmer screw out at minimum capacity.

3. Aligning at 1530 Kilocycles
(a) Turn band switch to broadcast band (counter clockwise).
(b) Set Signal Generator to 1530 kilocycles and leave the tuning condenser against high frequency stop.
(c) Adjust oscillator trimmer "L" (Fig. 4) for maximum output.

4. Aligning at 600 Kilocycles
(a) Connect Signal Generator leads to 6K7G, R-F grid, leaving the grid clip in place.
(b) Set Signal Generator to 600 kilocycles and tune the receiver to this signal.
(c) Adjust oscillator padder condenser "K" (Fig. 5) rocking gang condenser plates back and forth through the signal until maximum output is obtained.
(d) Remove signal generator lead from 6K7G tube clip and connect to the antenna terminal through a .0002 mfd. condenser.
(e) Adjust antenna series condenser "B" (Fig. 5) for maximum output.

5. Aligning at 1400 Kilocycles
(a) Set Signal Generator at 1400 kilocycles.
(b) Tune set to this signal and adjust R-F trimmer "H" (Fig. 4) and antenna trimmer "N" (Fig. 4) to maximum output.

6. Aligning at 4000 Kilocycles
(a) Turn band switch to police band.
(b) Set Signal Generator to 4000 kilocycles and tune receiver to this signal.
(c) Adjust police band antenna trimmer "F" (Fig. 4) for maximum output.

7. Aligning at 1800 Kilocycles
(a) Set Signal Generator at 1800 kilocycles and tune receiver to this signal.
(b) Adjust oscillator padder condenser "J" (Fig. 5) rocking gang condenser plates back and forth through the signal until maximum output is obtained.
(c) Close gang and check to see if tuning range extends to 1800 kilocycles.

8. Resaligning at 1400 Kilocycles
(a) Turn band switch to broadcast band.
(b) Set Signal Generator to 1400 kilocycles.
(c) Tune set to this signal and adjust R-F trimmer "H" and antenna trimmer "N" to maximum output (Fig. 4).

9. Resaligning at 600 Kilocycles
(a) Check alignment of antenna series condenser "B" (Fig. 5) for maximum output.

10. Checking I-F Band Spread
The Model 165 Cathode Ray Oscillograph should be used to check the I-F band spread after completing the "Alignment Procedure". Blind adjustment of the I-F stage may be found necessary in order to obtain a symmetrical selectivity curve. Connect Cathode Ray from connection "I" (Fig. 3) to ground.
SETTING UP AUTOMATIC TUNING  DELCO MODELS R-1134-55-39 HOME RADIO

1. Loosen RESET LOCK SCREW in center of tuning knob.

2. Press any one of the automatic tuner levers all the way down. Stations may be set up in any sequence desired.

3. Hold the lever down firmly and tune set to station desired. Then desired station is clearly tuned in, release the lever and follow same procedure until all levers have been set up.

4. Rotate the tuning knob to the right (clockwise) as far as it will turn and firmly tighten RESET LOCK SCREW.

DELCO MODELS R-1134-55-39 CIRCUIT ALIGNMENT

1. Aligning I-F Stages at 465 Kilocycles

(a) Connect the ground lead of the signal generator in series with a .1 mfd. condenser to B- (pin #8 on 25L6C tube). Connect the signal lead of the signal generator to the grid cap of the 6450 tube, leaving grid clip in place.

(b) Connect the output meter across the plate (pin 3) and screen (pin 4) of the 25L6C output tube.

(c) Set signal generator to exactly 465 kilocycles and turn volume control on full.

(d) Turn the rotor plates of the condenser gang all the way out of mesh and against the high frequency stop.

(e) Adjust the trimmers (B-F) on the second I-F coil and then the trimmers on the first I-F coil (C-D Fig. 3) carefully for maximum output.

(f) Repeat adjustments of the four I-F trimmers with as low an output from the signal generator as possible, for more accurate alignment.

2. Aligning at 1720 Kilocycles

(a) Leave ground lead of signal generator connected to B- through a .1 mfd. condenser as before. Connect the signal lead of signal generator through a .00025 mfd. condenser to the antenna terminal.

(b) Turn tuning condenser plates all the way out and against high frequency stop.

(c) Set signal generator to exactly 1720 kilocycles and adjust oscillator trimmer (78 Fig. 3) carefully for maximum output, being careful to peak the signal with trimmer screw out or at minimum capacity.

5. Aligning at 1400 Kilocycles

(a) Set signal generator to 1400 kilocycles and turn condenser gang plates until this signal is tuned in with maximum output.

(b) Adjust the antenna trimmer (74 Fig. 3) for maximum output. Do not disturb the 1720 kilocycle adjustment of the oscillator trimmer.

DELCO MODEL R-5215 CIRCUIT ALIGNMENT

1. Aligning I-F Stages at 455 Kilocycles

(a) Attach the ground lead of the signal generator to the chassis ground post. Connect the other lead to the grid cap of the grid tube through a .008 mfd. series condenser. DO NOT REMOVE GRID CLIP.

(b) Set the signal generator to EXACTLY 455 kilocycles and turn receiver volume control on full.

(c) Peak each of the 2nd I-F coil trimmers, EA & EB, (Illus. 2, Fig. 3).

(d) Peak each of the 1st I-F coil trimmers, IA & IB, (Illus. 1, Fig. 3).

(e) To assure most accurate trimmer setting repeat above adjustments several times always using lowest possible signal generator output consistent with readable output meter scale deflection.

2. Aligning “American Broadcast” 1750-540 Kilocycle Band

(a) Connect signal generator antenna lead to receiver antenna terminal through a .00025 mfd. condenser, and the other signal generator lead to ground terminal.

(b) Adjust band selector switch for operation on 1750-540 kilocycle band.

(c) Check tuning dial adjustment by turning gang condenser until plates touch maximum capacity stop (completely in mesh), at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If the needle does not point exactly to the last line move needle to correct position.

(d) Set signal generator frequency and receiver dial to EXACTLY 1750 kilocycles, and bring in 1750 kilocycle signal generator signal to maximum output by adjusting 1750 kilocycle oscillator trimmer, (Illus. 7C Fig. 4).

(e) Set signal generator frequency and receiver dial to approximately 500 kilocycles. Then while rocking gang condenser slightly to right and left, adjust 500 kilocycle oscillator pad (Illus. 6, Fig. 5) for maximum output.

(f) Pad (Illus. 6, Fig. 5) for maximum signal response.

3. Aligning “Foreign Short Wave” 5.8-18.1 Megacycle Band

(a) Place band selector switch for operation on 5.8-18.1 megacycle band, tune receiver dial and set signal generator frequency to EXACTLY 18.1 megacycles.

(b) Adjust 18.1 megacycle oscillator trimmer (Illus. 7B, Fig 4) to bring in 18.1 megacycle test signal to maximum output. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down the trimmer (add capacity) until the second peak is tuned in.

(c) Tune receiver dial and set signal generator frequency to EXACTLY 15 megacycles.

(d) While rocking gang condenser slightly to right and left, adjust 15 megacycle antenna trimmer (Illus. 7A, Fig. 4) for maximum 15 megacycle test signal response.
FIG. 2--DELCO MODEL H-1140 CIRCUIT DIAGRAM
GENERAL: The Deeco Model B-1166 is a 6 tube, 110 volt A.C. superheterodyne automatic electric tuning receiver with a 6" dynamic speaker. Tuning is accomplished by means of the conventional manual control or by push button switches which control adjustable permeability tuned coils. Tuning range is from 550 to 1720 kilocycles. Five push buttons are used for automatic tuning, a sixth for switching from automatic to manual tuning.

The function of each button is, left to right:
1. Automatic tuning 550-800 K.C.
2. Automatic tuning 300-600 K.C.
3. Automatic tuning 600-1100 K.C.
4. Automatic tuning 1100-1600 K.C.
5. Automatic tuning 1600-2200 K.C.
6. Switch-Manual to automatic tuning

SETTING UP AUTOMATIC ELECTRIC TUNING

Setting up the station is accomplished by means of a single adjustment for each button, accessible from the rear of the chassis.

1. Turn on the set and allow 15 minutes for the set to "warm up" before setting the station adjustment screws for the push buttons.
2. Press button #6 and tune in the desired station by means of the manual tuning control.
3. Press one of the buttons #1 to #5 which range corresponds to the station frequency and, with a small screwdriver adjust screw on back of chassis corresponding to button pressed until the same station is accurately tuned in.
4. Press button #6, changing from "Push Button" to "Dial Tuning" to ascertain that the same program is heard for both.
5. Moisten and insert the call letters of the station on the front of the button.
6. Repeat the operation for the other buttons.

CIRCUIT ALIGNMENT

For alignment purposes, a test scale is staked on the inside of the dial drum on the condenser shaft. Before starting alignment procedure, turn the rotor plates of the condenser gang all the way out of mesh and against the high frequency stop and make an indicating mark on the front support bracket in line with the high frequency mark on test scale for future reference.

1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis frame.
   (b) Connect the signal lead of the signal generator to the grid cap of the 6AG6 tube through a .1 mfd. condenser, leaving grid clip in place.
   (c) Connect the output meter across the plate (pin 5) and screen (pin 4) of the 6AG6 output tube.
   (d) Press #6 button (Dial Tuning), turn the volume control on full and the tone control to extreme clockwise (tremolo) position.
   (e) Set the signal generator to exactly 455 kilocycles and turn the rotor plates of the condenser gang all the way out of mesh and against the high frequency stop.
   (f) Adjust the trimmers on the second I-F coil (Illus. 5, Fig. 5) and then the trimmers on the first I-F coil (Illus. 4, Fig. 5) carefully for maximum output.
   (g) Repeat adjustments of the four I-F trimmers with as low an output from the signal generator as possible, for more accurate alignment.

2. Aligning at 1460 Kilocycles
   (a) Connect the signal lead of signal generator through .001 mfd. condenser to the antenna terminal. Connect ground lead of signal generator to chassis.
   (b) Set signal generator to 1460 kilocycles.
   (c) Turn tuning condenser plates until test scale dial is at the 1460 kilocycles position as noted from the reference mark you made on the front support bracket.
   (d) Adjust oscillator trimmer (Illus. 10B, Fig. 3) carefully for maximum output, being careful to peak the signal received with trimmer screw out at minimum capacity.
   (e) Adjust the antenna trimmer (Illus. 10A, Fig. 3) for maximum output with as low an output from the signal generator as possible, for more accurate alignment.
   (f) After completing the alignment procedures, the alignment should be checked with the cathode ray oscillograph. Connect the cathode ray oscillograph across the volume control.

FIG. 1-TUBE SOCKET VOLTAGES

6Q7G 6K6G 6K7 6A8G
6.3 A.C. -2.75 6.3 A.C. -14.5
190 200 0 0
75 75 0 0
5Y3G
6.3 A.C. 0
200 0
93 93

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT METER BETWEEN SOCKET TERMINALS AND CHASSIS.
A.C. LINE VOLTAGE 115 VOLTS.
POWER CONSUMPTION 40 WATTS.
U-BIAS -2.75 V. READ ACROSS 500 OHM RESIS.
(j) CALIBRATED READ WITH VOLTMETER.
(j) 500 VAC. BETWEEN PINS F & F.
(j) 550 VAC. BETWEEN PINS P & P.
(j) 40.0 BIAS READ BETWEEN 1250 MILLIAMS.

REAR OF CHASSIS
GENERAL: The Delco Model R-1141 is a six tube, two band superheterodyne receiver with a 6" dynamic speaker. Tuning is accomplished by means of the conventional manual control, or by push button switches which control adjustable permeability tuned coils. The frequency ranges of the push buttons are, left to right:

1. 555 to 920 K.C.
2. 555 to 920 K.C.
3. 700 to 1220 K.C.
4. 700 to 1220 K.C.
5. 1000 to 1560 K.C.
6. 1000 to 1560 K.C.
ALIGNMENT FOR MODELS R1141, R1142, R1143, R1144

Setting up the push buttons for pre-selected stations is accomplished by means of a single adjustment for each button, accessible from the front of the cabinet. These screwdriver adjustments are made through the small openings in the cabinet, in which the dial lamp tumbler is placed.

1. Turn the set 'on' and set the band change switch to the broadcast manual (center) position and allow about 15 minutes to warm up.

2. Tune in the desired station by means of the manual tuning control.

3. Press one of the buttons which most conveniently covers the frequency of the station you wish to check. Turn the band change switch to the broadcast manual (center) position and, with a small screwdriver, adjust the screw directly above the button, until the station is tuned in accurately.

4. Turn the band change to the center position to check the accuracy of the alignment.

5. Insert the dial pointer of the station in the opening and cover with the rear lid you have taken off.

6. Repeat the operation for the other buttons.

ALIGNMENT FOR MODELS R1141, R1142 and R1143

NOTE: Fig. 6 of the Service Manual shows with these two models.

1. Aligning at 3 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis frame.

(b) Connect the signal lead of the signal generator to the grid cap of the 6AD tube through a 10K ohm condenser, leaving the grid cap in place.

(c) Connect the output meter across the plate and screen of the 6AD tube.

(d) Press a button, turn the band change switch to the automatic (left hand) position, volume control on full, and the tone control in the middle position.

(e) Set the signal generator at exactly 455 kilocycles and adjust the trimmers on the second I-F coil (Fig. 2, Fig. 3) and the first I-F coil (Fig. 4, Fig. 5) for maximum output. Use as low a setting of the signal generator as will give a readable indication on the output meter. DO NOT ROLL OFF THE I-F COILS IN THIS POSITION (see diagram).

(f) After completing the Alignment Procedure, the alignment should be checked with the Model 105 Cahills Key Oscillograph. Connect the oscillograph across the volume control.

2. Aligning at 1 Megacycle

(a) Remove the signal lead of the signal generator from the grid of the 6AD and connect to the antenna terminal of the receiver through a 400 ohm resistor. *V. 93 (4200)

(b) Turn the band change switch to the short wave (right hand) position.

(c) Set the signal generator to exactly 17 megacycles and rotate the variable section of the condenser gang to indicate 17 megacycles on the meter scale.

(d) Adjust the oscillator trimmer condenser [Fig. 7, Fig. 8] for maximum output.

(e) Adjust the antenna trimmer [Fig. 7, Fig. 8] while rocking the condenser gang back and forth through the signal, until maximum output is obtained.

(f) Increase the signal from the signal generator and check for image frequency response. If the image does not fall at approximately 1500 megacycles, repeat section 3.

3. Aligning at 5 Megacycles

(a) Press the 0 button (intermediate wave - manual tuning).

(b) Set the signal generator to exactly 5 megacycles and rotate the variable section of the condenser gang to indicate 5 megacycles on the meter scale.

(c) Adjust the oscillator trimmer condenser [Fig. 7, Fig. 8] for maximum output.

(d) Adjust the antenna trimmer condenser [Fig. 7, Fig. 8] for maximum output.

4. Aligning at 1000 Kilocycles

(a) Remove the 400 ohm resistor and connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0002 mf condenser.

(b) Press 90 button (broadcast - manual tuning).

(c) Turn the variable plate of the condenser gang completely out of mesh and against the high frequency stop.

(d) Adjust image trimmer (Fig. 8, Fig. 9) too turns up tight.

(e) Set the signal generator to exactly 1000 kilocycles.

(f) Adjust the oscillator trimmer condenser (Fig. 7, Fig. 8) for maximum output.

(g) Turn the band change switch to the broadcast manual (center) position.

(h) Turn the variable plate of the condenser gang completely out of mesh and against the high frequency stop.

(i) Set the signal generator to exactly 1000 kilocycles.

(j) Adjust the oscillator trimmer condenser (Fig. 7, Fig. 8) for maximum output.

5. Aligning at 1600 Kilocycles

(a) Set the signal generator to approximately 1600 kilocycles.

(b) Rotate the variable plate of the condenser gang until the signal is tuned in with maximum output.

(c) Adjust the antenna trimmer (Fig. 7, Fig. 8) for maximum output.

6. Aligning at 6000 Kilocycles

(a) Adjust the signal generator to 6000 kilocycles.

(b) Rotate the variable plate of the condenser gang until the signal is tuned in.

(c) Adjust the oscillator trimmer condenser (Fig. 7, Fig. 8) while rocking the condenser gang back and forth through the signal, until maximum output is obtained.

7. Aligning for Image Frequency Response

(a) Set the signal generator 3000 kilocycles at .0001.

(b) Rotate the variable plate of the condenser gang until the image of this signal is tuned in at 1500 kilocycles.

(c) Adjust the two-tone oscillator (Fig. 4, Fig. 5) by rotating, until a minimum output is obtained.

(d) Adjust the signal generator to 3000 kilocycles.

(e) Rotate the variable plate of the condenser gang until the image of this signal is tuned in at 1500 kilocycles.

(f) Adjust the single wire oscillator (Fig. 4, Fig. 5) by moving it either toward or away from the coil winding until a minimum output is obtained.
A phono switch and connector are mounted on the rear flange of the chassis and may be used in conjunction with a crystal pickup without a matching transformer.

GENERAL: The Delco Model R1142 is a seven tube, two band superheterodyne receiver with a 10" dynamic speaker. Tuning is accomplished by means of the conventional manual control, or by push button switches which control adjustable permeability tuned coils. The frequency ranges of the push buttons are, left to right:

1. 535 to 820 K.C.
2. 535 to 1260 K.C.
3. 750 to 1260 K.C.
4. 750 to 1560 K.C.
5. 1000 to 1560 K.C.
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
GENERAL: The Delco Model R-1144 is a ten tube, A.C., three band superhetodrome receiver with a 12" dynamic speaker. Tuning is accomplished by means of the conventional manual control or by push button switches which control adjustable permeability tuned coils. Band switching is accomplished by the same series of switches which are, left to right:

1. Off Switch
2. Broadcast Band (Manual Tuning) 535-1690 K.C.
3. Intermediate Band (Manual Tuning) 1660-5500 K.C.
4. Short Wave Band (Manual Tuning) 5.3 - 18.0 M.C.
5. Broadcast Band (Automatic Tuning) 980 - 1560 K.C.
6. Broadcast Band (Automatic Tuning) 980 - 1560 K.C.
7. Broadcast Band (Automatic Tuning) 700 - 1100 K.C.
8. Broadcast Band (Automatic Tuning) 700 - 1100 K.C.
9. Broadcast Band (Automatic Tuning) 520 - 830 K.C.
10. Broadcast Band (Automatic Tuning) 520 - 830 K.C.

A phono switch and connector are mounted on the rear flange of the chassis and may be used in conjunction with a crystal pickup without a matching transformer. The switch must be in the "radio" position during the alignment procedure.
1. Aligning I-F Stage at 655 Kilocycles
(a) Connect the ground lead of the signal generator to the chassis frame.
(b) Connect the signal lead of the signal generator to the grid cap of the 6SK9 through a .1 µfd. condenser, leaving the grid clip in place.
(c) Connect the output meter across the plates of the 6SK9 tube.
(d) Press #7 button (Broadcast:Manual), turn the volume control on full and the tune control on treble and turn the variable plates of the condenser gang completely out of mesh and against the high frequency stop.
(e) Set the signal generator to exactly 655 Kilocycles and adjust the trimmers on the second I-F coil (Illus. 8A, Fig. 3) and the first I-F coil (Illus. 8A, Fig. 5) for maximum output. Use as low a signal from the signal generator as will give a readable indication on the output meter.
(f) After completing the alignment procedure, the alignment should be checked with the Model 140 cathode-ray oscillograph. Connect the oscillograph from points (Fig. 4) to ground.

2. Aligning at 1500 Kilocycles
(a) Disconnect the signal lead of the signal generator from the grid of the 6SK9 and connect to the antenna terminal of the receiver through a .008 µfd. condenser.
(b) With the controls set as before, adjust the broadcast oscillator trimmer for maximum output (Illus. 1, Fig. 4).

3. Aligning at 1600 Kilocycles
(a) Set the signal generator to approximately 1600 Kilocycles.
(b) Rotate the variable section of the condenser gang until the signal is tuned in with maximum output.
(c) Adjust the antenna trimmer (Illus. 1, Fig. 4) and S-F trimmer (Il- lus. F, Fig. 4) for maximum output.

4. Aligning at 600 Kilocycles
(a) Set the signal generator to approximately 600 Kilocycles.
(b) Rotate the variable section of the condenser gang until this signal is tuned in with maximum output.
(c) Adjust the oscillator series condenser (Illus. J, Fig. 4) while rocking the condenser gang back and forth through the signal, until maximum output is obtained.

5. Aligning at 17 Megacycles
(a) Remove the .0006 µfd. condenser and connect the signal lead of the signal generator to the antenna terminal of the receiver through a 400 ohm resistor.
(b) Press #6 button (Short Wave Band:Manual).
(c) Set the signal generator to exactly 17 Megacycles and connect the variable section of the condenser gang to indicate 17 Megacycles on the test scale.
(d) Adjust the oscillator trimmer condenser (Illus. C, Fig. 4) for maximum output.
(e) Adjust the R-F trimmer condenser (Illus. D, Fig. 4) and antenna trimmer (Illus. A, Fig. 4) while rocking the condenser gang back and forth through the signal, until maximum output is obtained.
(f) Increase the signal output from the signal generator and check for image frequency. If the image does not fall at approximately 1500 Megacycles, repeat section 5.

6. Aligning at 5 Megacycles
(a) Press #6 button (Medium Wave Band:Manual).
(b) Set the signal generator to exactly 5 Megacycles and connect the variable section of the condenser gang to indicate 5 Megacycles on the test scale.
(c) Adjust the oscillator trimmer condenser (Illus. R, Fig. 4) R-F trimmer (Illus. G, Fig. 4) and antenna trimmer (Illus. D, Fig. 4) for maximum output.

7. Repeat Sections 2, 3 and 4.
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
MODEL 32B
Schematic
Alignment

WALGREEN CO.

CONVENTIONAL ALIGNMENT - SEE SPECIAL SECTION VOL. VIII.

1. i.f. trimmers at 465 K.c. dial and generator at 1716 Kc.
2. peak antenna trimmer, dial and generator at 1600 Kc.
3. peak oscillator trimmer, dial and generator at 800 Kc.

FREQUENCY BANDS - 1100 to 1300 Kc.

NOTE: 1. i.f. 465 K.c.
2. All n.p. and i.f. trimmers to peak.
ALIGNMENT - Peak IF trimmers at 465 KC. BROADCAST BAND - Dial and generator to 1720 KC, adjust oscillator trimmer to peak, dial and generator to 1400 KC, then adjust antenna trimmer to peak. Dial and generator to 600 KC, sub oscillator circuit to maximum peak. SHORTWAVE BAND - Dial and generator to 6.3 MC, peak oscillator trimmer. Dial and generator to 5.3 MC, adjust antenna trimmer to peak. Dial and generator to 2.5 MC, sub oscillator circuit to peak. Rock variable condenser during padding adjustments. Repeat adjustments for maximum response. Peak wave trap at 465 KC.
DESCRIPTION
This receiver is a 7 tube alternating current operated superhetodyne.
The tubes used are a 76 as a oscillator, a 6A7 as modulator, a 6D6 as I.F.
amplifier, a 27 as A.V.C. and audio rectifier and audio voltage amplifier, a
42 as power audio amplifier, an 80 as a power rectifier and a 6G5 as tuning
indicator.
This receiver is made to cover 3 tuning bands, the broadcast band which
ranges from 1680 K.C. to 535 K.C., the middle or police band which has a
frequency range of from 5.6 M.C. to 1.7 M.C. and the high frequency or
foreign band which is from 20 M.C. to 5.4 M.C.

ALIGNMENT PROCEDURE
The following alignment procedure is for use only by competent service
men having the proper equipment. Re-alignment is very seldom needed and
is usually only required after some major part has been replaced because of
damage to the receiver.
The equipment required for re-aligning this receiver is an output meter
and a modulated source of radio frequency (a signal generator or micro-
volter). This source of radio frequency must be accurately calibrated in
frequency and must have a method of varying the output.
All alignments must be made with the volume control turned full on
and with the signal input from the generator reduced to as low a value as
possible while still giving a sufficient output to be easily read on the output
meter.
Connect the output meter, through a .5 M.F. condenser and a resistance
of such a value as to make the total meter resistance approximately 7000
ohms, to the two small pins of the speaker plug. The output meter remains
connected during the entire alignment procedure.
Connect the signal generator to the grid cap of the 6A7 tube through a
.1 M.F. condenser. Connect the ground of the generator to the ground post
of the receiver. With the wave switch on broadcast position and the dial set
to about 1000 K.C., feed in a 456 K.C. signal. Adjust the trimmers on top of
the first and second I.F. transformers until the maximum output is obtained.
This aligns the I.F.
Leaving the wave switch on broadcast position turn the dial to the ex-
treme high frequency end. Feed a 1680 K.C. signal to the receiver antenna
post through a .00025 M.F. mica condenser. Adjust the 1680 K.C. broadcast
oscillator trimmer for maximum output. Set the generator to 1500 K.C. and
tune in this signal on the receiver. Then adjust the 1500 K.C. broadcast
antenna trimmer and the 1500 K.C. broadcast preselector trimmer for maximum
output. Set the generator to 600 K.C. and adjust the 600 K.C. broadcast
circuit oscillator pad to maximum output while tuning the receiver back and forth
across the signal from the generator. This completes the alignment of the
broadcast band.
The police band is aligned by feeding 4.0 M.C. signal to the receiver
antenna lead through the .00025 condenser. Turn the wave switch to the
center position and tune the receiver to this signal. Adjust the 4.0 M.C.
police antenna trimmer for best output.
The short wave band is aligned in the same way using a 15 M.C. signal
and adjusting the 15 M.C. short wave antenna trimmer after having turned
the wave switch to the right band position.
INTERMEDIATE STAGE ALIGNMENT

1. Connect the output of the test oscillator to the grid of the 6L7 converter tube and connect a 1 megohm resistor from this grid to the chassis. Connect the ground side of the oscillator (the shielding) to the receiver chassis.

2. Set the test oscillator to 485 K.C. Refer to Curve B on the Calibration chart to obtain the proper setting of the test oscillator.

3. Set the tone control to the left. Align the output intermediate frequency transformer by turning the top screw at the rear of the output I.F. transformer until maximum response is obtained on the output meter. Adjust the other trimmer screws in the same manner.

4. Adjust the input intermediate frequency transformer until maximum response is obtained.

ALIGNMENT OF TUNING CIRCUITS

5. Connect the output of the test oscillator to the antenna lead of the receiver through a .0005 MFD. condenser and connect the ground side (shielding) to the chassis.

6. Set the wave change switch to the long-wave position (ND). Set the dial and test oscillator to 500 meters. Adjust the long-wave oscillator trimmer until signal is brought in. If no signal is heard, then adjust the long-wave condenser. See diagram of chassis for location of trimmers and condensers.

7. Then adjust the long-wave antenna and R.F. trimmers for maximum response. Set the dial and test oscillator to 1000 meters and adjust the long-wave condenser. By rocking the gang is meant tuning to a point just above and just below the test oscillator frequency while making some other adjustment. Return to 900 meters and repeat the entire procedure.

8. Set the wave change switch to the broadcast position (Yellow). Set the dial and test oscillator to 500 meters (200 K.C.) and adjust the R.F. oscillator trimmer for maximum response. Set the dial and test oscillator to 600 K.C. and adjust the R.F. and antenna trimmers for maximum response while rocking the gang.

9. Set the wave change switch to the high-frequency band (Shunt-wave Green). Substitute a 600 ohm resistor for the .0005 MFD. condenser in the antenna circuits. Set the dial and test oscillator to 30 meters (30 megacycles). Stand the receiver on end and adjust the 30 meter oscillator until (inserted in the right side of switch view from bottom) the signal is brought in. Stop at the first peak. By rocking the trimmer downward more will give another peak which is the same and must not be used. To make certain the set is not tuned to a harmonic, set the test oscillator to 11 megacycles and if another signal is received, then the set is correctly tuned. Reset the oscillator to 30 meters and adjust the R.F. and antenna trimmers for maximum response, while rocking the gang. Set the dial and test oscillator to 75 meters and check for sensitivity.

10. Set the wave-change switch to the ultra-high-frequency band (White). Set the test oscillator and dial to 11 meters (20.5 megacycles). Adjust the oscillator trimmer until the signal is brought in. Continue on through to the second peak. The image signal will not be found at 20.5 megacycles if the oscillator trimmer adjustment is correct. Reset the dial to 11 meters and adjust the R.F. and antenna trimmers for maximum response while rocking the gang.

Set the dial and test oscillator to 86 meters and check for sensitivity.
To adjust the R.F. circuits: (1) Set pointer on tuning chart to 1400 K.C. with band switch in the broadcasting position. (2) Adjust test oscillator to 1400 K.C. and connect to antenna lead on chassis. (3) Adjust trimmer on the oscillator section of the tuning condenser for maximum reading. (4) Reset dial pointer on receiver and test oscillator to 600 K.C. (5) Adjust 600 K.C. padding condenser for maximum reading moving tuning condenser back and forth slowly while making adjustment (the 600 K.C. padding condenser is mounted on the base at the left of the tuning condenser). (6) Reset oscillator and tuning pointer on the receiver to 1400 K.C. and readjust trimmer on oscillator section of tuning condenser for maximum reading. (7) Reset dial pointer on receiver and test oscillator to 15 megacycles. (8) Set band change switch in the right hand position. (9) Adjust trimmer on first section of tuning condenser for maximum reading. (10) Reset dial pointer on receiver and test oscillator to 3.6 megacycles. (11) Set band change switch in left hand position. (12) Adjust 3.6 megacycle trimmer condenser for maximum reading (the 3.6 megacycle trimmer is mounted under the chassis and directly in front of the band change switch. (13) Reset dial pointer on receiver and test oscillator to 1400 K.C. (14) Set band change switch in broadcasting position and adjust 1400 K.C. trimmer for maximum reading (the 1400 K.C. trimmer is mounted under the chassis directly over the antenna coil).

---

### Tube Voltage Chart

<table>
<thead>
<tr>
<th>Tube</th>
<th>Grid to Cathode</th>
<th>Screen to Cathode</th>
<th>Plate to Cathode</th>
<th>M.A. Plate</th>
<th>Tube Socket Voltage (Riser or Plate Voltage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>1.75</td>
<td>92</td>
<td>225</td>
<td>4</td>
<td>6.3</td>
</tr>
<tr>
<td>OSC.</td>
<td>0</td>
<td>0</td>
<td>225</td>
<td>4</td>
<td>6.3</td>
</tr>
<tr>
<td>78—I. F.</td>
<td>1.75</td>
<td>92</td>
<td>225</td>
<td>7</td>
<td>6.3</td>
</tr>
<tr>
<td>75—2nd Det.</td>
<td>1.75</td>
<td>0</td>
<td><strong>110</strong></td>
<td>8</td>
<td>6.3</td>
</tr>
<tr>
<td>42—2nd Audio</td>
<td>***17</td>
<td>225</td>
<td>212</td>
<td>34</td>
<td>6.3</td>
</tr>
<tr>
<td>80—Rect.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Voltage from No. 1 terminal on voltage divider to ground using 250 volt scale.**

**Voltage from plate to ground using 250 volt scale.**

*Voltage from ground to second terminal on voltage divider using 10 volt scale.*

The above voltage readings were taken with 1,000 ohm per volt Volt Meter.

For conventional alignment, see spec. sect. Vol Vlll.
MODEL 550 Auto
Schematic, Alignment

MODEL 540
Schematic, Socket Alignment, Trimmers

Circuit Diagram

5 TUBE AUTO SET

NOTE:
R, R, & S.S. ITEM PART NUMBER R-000, C.
C IS ANXIETY OF THE UNIT RATE NUMBER C-540-C.
VALUES PRINTED BY LETTERS ARE PARTS.
NUMBERS PRINTED BY LETTERS ARE PARTS.
VOLTAGES TAKEN FROM POINTS INDICATED TO GROUND YIELD CONTROL OR FULL MEASURED ON
A.C. CIRCUIT.

MODEL 550
ALIGNMENT PROCES.

BC osc. trim. 1720 KC
Ant. trim. 1720 KC
Check 600 KC

IF PEAK 456 KC

MODEL 540
ALIGNMENT PROCES.

BC osc. trim. 1720 KC
Ant. trim. 1720 KC
Check 600 KC

IF PEAK 456 KC

CIRCUIT DATA

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Service Notes

Voltages taken from different points of circuit to chassis are measured with volume control full on, using a voltmeter having a resistance of 1000 ohms per volt. These voltages are indicated on the schematic circuit diagram.

Part No. 145-2
- Common Black to Brown: -.003 x 600 Volts
- Common Black to Green: -.01 x 200 Volts
- Common Black to Red: -.01 x 200 Volts
- Common Black to Orange: -.25 x 200 Volts
- Blue to Blue: -.05 x 400 Volts

Part No. 145-3
- Common Black to Brown: -.1 x 200 Volts
- Common Black to Green: -.05 x 200 Volts
- Common Black to Orange: -.05 x 200 Volts
- Common Black to Yellow: -.05 x 200 Volts

Aligning I. F. Transformer

1. With volume control full on, set antenna control to minimum and adjust volume control to maximum, and then adjust variable condenser at its maximum capacity position (extreme right of its rotation) to make the following adjustments:
   (a) Connect an external oscillator adjusted to 175 kilocycles in series with a .1 mfd. condenser, to the grid control of the type 77 tube located between the R. F. coil (part numbers 109-10) and the I. F. transformer (part number 108-11) and chassis.
   (b) Adjust trimming condensers of I. F. transformer (part number 108-11) to resonance. See top view of chassis. Use as a resonance indicator an output meter connected across the primary of the speaker input transformer between the plate and screen terminals of the type 2A1 tube, by means of an adapter. Maximum deflection of the meter indicates resonance. Care must be taken to use only enough signal to give a readily readable output as excessive input will result in overload and a false resonance point.

NOTE: The two trimmer condensers which tune the primary and secondary of the I. F. transformer are adjusted by set screws accessible from the back of the chassis.

Aligning R. F. and Oscillator Circuits

1. Connect the external oscillator set at 1720 kilocycles in series with a 200 Mfd. condenser, between the antenna (tan) and ground (black) leads.
   (a) With volume control full on and variable condenser plates in minimum position, with output meter placed in series with the grid control of the antenna transformer, adjust trimmable rear oscillator section of variable condenser to resonance.
   (b) Shift external oscillator frequency from 1720 to 140 kilocycles, pick up signal by rotating variable condenser and peak R. F. (center) antenna faces to circuit trimmers of variable condenser to resonance.
   (c) Check means of varying external oscillator frequency and rotating variable condenser to pick up signal. Adjust slotted end plates of R. F. (center) and antenna (front sections to increase output, if necessary. DO NOT BEND OSCILLATOR PLATES.

MODEL 575 SUPERHETERODYNE 530 to 1720 Kilocycles
FIVE TUBES: 1-58, 1-2A5, 1-80, 2-57

- CONDENSERS

- RESISTORS

- NOTES:
  - CONDENSERS 1, 10, 61 in one unit.
  - CONDENSERS 5, 2, 3, 5, in one unit.
  - LUMBO HOSE, 1000 ohm.
  - VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND, VOLUME CONTROL OR FULL.

- LEGEND:

- IF PEAK 176 KC.

- TUNING CONDENSERS 5, 61, 1 in one unit.

- IF PEAK 283.5 KC.

- TUNING CONDENSERS 5, 61, 1 in one unit.

- IF PEAK 357.5 KC.

- TUNING CONDENSERS 5, 61, 1 in one unit.

- IF PEAK 425.5 KC.

- TUNING CONDENSERS 5, 61, 1 in one unit.

- IF PEAK 500.5 KC.

- TUNING CONDENSERS 5, 61, 1 in one unit.
ALIGNING INSTRUCTIONS

SALES A

SERIES A

ALIGNMENT

Alignment

Adjusting the transformers should be attempted without first checking the position of the inductors of the band alignment. No change in the alignment of the oscillator should be required. The alignment of the filter should be changed to suit the needs of the intended use.

General Instructions

1. The oscillator should be aligned with the transmitter in the transmit position, or with the transmitter connected to the receiver.
2. The oscillator should be adjusted to the desired frequency by means of the variable inductors.
3. The oscillator should be adjusted to the desired frequency by means of the variable capacitors.
4. The oscillator should be adjusted to the desired frequency by means of the variable resistors.
5. The oscillator should be adjusted to the desired frequency by means of the variable diodes.

Short Wave Band Alignment

1. This band is aligned after the L.P. adjustments have been made. Set the wave meter to short wave and turn the alignment knob several times to the right of the station set position of dial t. 10 Megacycles.

Intermediate Band Alignment

1. The band is aligned after the L.P. adjustments have been made. Set the wave meter to intermediate band and turn the alignment knob several times to the right of the station set position of dial t. 5 Megacycles.

Broadcast Band Alignment

This band is aligned after the L.P. adjustments have been made. Set the wave meter to broadcast band and turn the alignment knob several times to the right of the station set position of dial t. 0 Megacycles.
CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII.
1550 to 5550 KC
1.5 to 4.5 MC
5.8 to 18 MC

I-F PEAK 465 KC

Align I-F transformer trimmers to 465 KC. BROADCAST - Dial and generator to 1400 KC, peak the oscillator and antenna trimmers. Dial and generator to 600 KC, pad the oscillator circuit to maximum peak while cocking variable condenser. POLICE - Dial and generator to 4 MC, peak oscillator trimmer and
This receiver is a portable four (4) tube battery operated superheterodyne with self-contained loop antenna and batteries.

The tubes are: 12AT7, 5C5GT, 6C5GT, and 6N5GT. This receiver is made to cover the standard broadcast band from 520 K.C. to 1620 K.C.

**DESCRIPTION**

**BATTERIES**

Listed below are various manufacturers of batteries and their part numbers that may be used to make up the combination of batteries to be used with this receiver.

- Burgess (Battery)
  - Ray-O-Vac
  - Ever-Ready
  - General

**PARTS LIST**

- B Battery: R-20, P-5303, P-92A
- B Battery: P-52B

**GENERAL**

- 45 V. 8 BATTERY
- 112 V. X 6.3 V.
- ANTENNA LOOP
ATTACHMENT

There is incorporated in this Phon-Oscillator unit a tip jack terminal strip microphone connection. The microphone is supplied as an attachment and can be purchased under the part No. 79-263 from your dealer. In its attachment to the receiver, plug in the ends of the microphone cord into the tip jacks (see pictorial) and have switch in the first position. That is, in the position to operate the oscillator but not the phonomotor.

Note:—Be sure to shut off the record player completely when it is not in use by turning the switch to the "off position".

PHONO-OSSILATOR

DESCRIPTION

This is unit is a "7-20" Tube Phon-Oscillator. The tubes used are a 106-A and 6R0. This unit should be in sufficient power supply for the unit and the 1000 K.C. is internal as designed to record within a nearby locality.

INSTALLATION

This Phon-Oscillator is designed to be operated from a 100-220 volt a.c. supply. The only connections required are the power supply for the 1000 K.C. and the turntable lead. This equipment can be connected to an electric outlet.

When using the Phon-Oscillator for the first time, test it to see if it is all right. The tone arm should be at the correct point and be put together with a rubber band or other rubber so that the needle will not be damaged. Place the Phon-Oscillator near an electric outlet and within a distance of about 10 feet of the Radio Receiver and power supply you intend to use. Do not operate the Phon-Oscillator without a power supply.

OPERATION

Connect cardioid to the nearest outlet. Adjust the volume control on the receiver to maximum volume and tuning dial to a position on a low frequency band between 1200 and 1700. Knob on the Phon-Oscillator will indicate that it is in operation. This knob will turn the Oscillator 90 degrees clockwise (counter clockwise). When the knob reaches its proper position, it will indicate that the Phon-Oscillator to right and is turned on. The Phon-Oscillator will turn on 90 degrees clockwise (counter clockwise) toward its proper position. The Phon-Oscillator will turn on 90 degrees clockwise (counter clockwise) toward its proper position.

PARTS PRICE LIST

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>88-180</td>
<td>Tone Arm Assembly</td>
<td>$3.25</td>
</tr>
<tr>
<td>59-3</td>
<td>Motor Assembly</td>
<td>$7.00</td>
</tr>
<tr>
<td>42-213</td>
<td>Cabinet and Cover Assembly</td>
<td>$3.75</td>
</tr>
<tr>
<td>12-1</td>
<td>Microphone Jack</td>
<td>$0.40</td>
</tr>
<tr>
<td>79-263</td>
<td>Microphone Supplied as an Attachment</td>
<td>$5.00</td>
</tr>
<tr>
<td>69-169</td>
<td>Switch Dual</td>
<td>$0.75</td>
</tr>
<tr>
<td>10-240</td>
<td>Oscillator Trans.</td>
<td>$0.75</td>
</tr>
<tr>
<td>20-119</td>
<td>Trimmer</td>
<td>$0.25</td>
</tr>
<tr>
<td>10-241</td>
<td>Electrolytic Cond. 25x10 mF, 100 V.</td>
<td>$1.00</td>
</tr>
<tr>
<td>60-251</td>
<td>Res. 400 Ohms</td>
<td>$0.50</td>
</tr>
</tbody>
</table>

Prices subject to change without notice.
Automobile Receiver
Frequency Range 540-1520 Kilocycles
This receiver is a 6-tube AC/DC current operated Superheterodyne.

The tubes used are: a 6A7 as an oscillator-converter; a 6D6 as an I.F. amplifier; a 75 as an A.V.C. detector and audio amplifier; a 25L6G as a beam output; a 25Z5 as a power rectifier; and a BK49B as a voltage divider.

This receiver is made to cover from 1750 KC. to 535 KC., which covers the standard broadcast band and the first police band.
Model No. 9-220 to 9-229, Inclusive

117 Volt A.C. 60 cycle or 117 Volt D.C. supply. The tubes used are a 12B6GT and 6L6GT as an R.F. Amplifier and Detector and 6J5GT as a Power Amplifier and R.F. Amplifier.

This receiver is a 5 tube A.C./D.C. current operated T.R.F. This receiver is made to cover from 175 K.C. to 535 K.C.

The scale is calibrated in kilocycles (less the final zero).

Standard broadcast stations are listed in kilocycles in most station lists.

Location of Parts on Top of Chassis
CONVENTIONAL ALIGNMENT SEE
SPECIAL SECTION VOLUME VIII

Models 9-480 to 9-489 inclusive

One of the following batteries may be used with this receiver and is to be put inside and towards the rear of the cabinet.
Ray-O-Vac No. "AB" 82
Burgess No. 17G-D60
General No. SODL111

LOCATION OF PARTS ON TOP OF CHASSIS
Models 9-680 to 9-689

LOCATION OF PARTS ON TOP OF CHASSIS
Models 9-480 to 9-489

Models 9-680 to 9-689 inclusive

Tuning Ranges:
Broadcast 535 - 1760 KC
Short-Wave 2.35 - 7.4 MC
MODEL 404

This receiver will operate on either alternating or direct current, from a power supply of 105 to 125 volts. Do not connect it to any other source.

1—6K7 R.F. Amplifier
1—6F5 Detector
1—25L6 Beam Power Amplifier.
1—25Z6 Rectifier

MODEL 510C

CONVENTIONAL ALIGNMENT: SEE SPECIAL SECTION VOL. VIII.
DESCRIPTION

This receiver is a 4 tube, 6 volt storage battery operated superheterodyne.

The tubes used are 6D8G as oscillator modulator, 6ST7G as I.F. amplifier, a 6T7G as A. V. C. and audio rectifier and audio voltage amplifier and a 1F5G as power audio amplifier.

This receiver is made to cover the standard broadcast band, from 1730 K.C. to 535 K.C.

ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two plate and screen pins of the I.F. stage of the receiver.

Connect the signal generator to the grid cap of the 6D8G tube through a .1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. Set the dial to about 1000 K.C. feed in a 456 K.C. signal. Adjust the first and second I.F. trimmers until the maximum output is obtained. This aligns the i.f.

Turn the dial to the extreme high frequency end. Feed a 1740 K.C. signal to the receiver antenna lead through a .0025 M.F. mica condenser. Adjust the 1740 K.C. oscillator trimmer until maximum output is shown. Set the generator to 1400 K.C. and tune in this signal on the receiver. Then adjust the 1400 K.C. antenna trimmer to maximum output. This completes the alignment.
**ALIGNMENT PROCEDURE**

**PRELIMINARY**

<table>
<thead>
<tr>
<th>Output Meter Connections</th>
<th>Across Loud Speaker Voice Coil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Meter Reading to Indicate 1 Watt</td>
<td>1.65 Volts</td>
</tr>
<tr>
<td>Generator Ground Lead Connection</td>
<td>Receiver Chassis</td>
</tr>
<tr>
<td>Dummy Antenna Value to be in Series with Generator Output</td>
<td>See Chart Below</td>
</tr>
<tr>
<td>Connection of Generator Output Lead</td>
<td>See Chart Below</td>
</tr>
<tr>
<td>Generator Modulation</td>
<td>30%, 400 Cycles</td>
</tr>
<tr>
<td>Position of Volume Control</td>
<td>Fully On</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position of Generator Variable</th>
<th>Generator Dummy Frequency</th>
<th>Antenna</th>
<th>Generator Connection</th>
<th>Adjustments (In Order Shown)</th>
<th>Trimmer</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>456 KC</td>
<td>.1 mfd.</td>
<td>6A7 Grid</td>
<td>T2, T1</td>
<td>I.F.</td>
<td></td>
</tr>
<tr>
<td>Fully Open</td>
<td>1580 KC</td>
<td>.0002 mfd.</td>
<td>Antenna Conn.</td>
<td>C16</td>
<td>Oscillator Trimmer</td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The variable condenser should be at 600 k.c. for antenna adjustment.

The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy. A final adjustment of antenna padder condenser C3 is always made after the receiver is installed in the car, in order to match the car antenna.

Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.
ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 7000 ohms, to the two small pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a .1 M.F. condenser. Connect the ground of the generator to the receiver chassis through another .1 M.F. condenser. With the wave switch on broadcast position and the dial set to about 1000 K.C., feed in a 456 K.C. signal. Adjust the trimmers of the first and second I.F. transformers until the maximum output is obtained. This aligns the I.F.

Turn the wave switch to the short wave position and set the dial to 6.0 M.C. Feed a 6.0 M.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Tune the 6.0 M.C. Oscillator trimmer to give resonance. Two points may be found where this signal can be heard. The correct setting is the one where the trimmer is screwed the loosest. This may also be checked by turning the dial to about 5.0 M.C. where the signal should again be heard.

Then turn the wave switch to broadcast position and turn the dial to the extreme high frequency end. Feed in a 1720 K.C. signal and adjust the broadcast oscillator trimmer, which is located under the receiver at the wave switch, to resonance. Then set the signal generator to 1500 K.C. and tune in this signal on the receiver. Adjust the 1500 K.C. antenna trimmer for maximum output.

Again turn the wave switch to short wave position and tune in a 6.0 M.C. signal from the generator. Adjust the 6.0 M.C. antenna trimmer to maximum output.
ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 7000 ohms, to plate and screen pins of output tube, or a low voltage A.C. meter may be used connected across speaker voice coil. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a .1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. Set the dial to about 1000 K.C., feed in a 456 K.C. signal. Adjust first and second I.F. trimmers for maximum output. Refer to chassis lay-out for location of trimmers.

Turn the dial to the extreme high frequency end. Feed a 1740 K.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Adjust the 1740 K.C. oscillator trimmer until maximum output is shown. Set the generator to 1400 K.C. and tune in this signal on the receiver. Then adjust the 1400 K.C. antenna trimmer to maximum output. This completes the alignment.

---

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTmeter.
ALL VOLTAGES EXCEPT HEATERS MEASURED TO GROUND.

- grid
- oscillator grid
- oscillator plate
- screen grid
- suppressor grid
- plate
- diode plate
- cathode
- heater

This receiver is made to cover from 1740 K.C. to 535 K.C.
ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 7000 ohms, to plate of output tube and B+, or a low voltage A.C. meter may be used connected across speaker voice coil. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a 1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. Set the dial to about 1000 K.C., feed in a 455 K.C. signal. Adjust first and second I.F. trimmers for maximum output. Refer to chassis lay-out for location of trimmers.

Turn the dial to the extreme high frequency end. Feed a 1760 K.C. signal to the receiver antenna lead through a .0025 M.F. mica condenser. Adjust the 1760 K.C. oscillator trimmer until maximum output is shown. Set the generator to 1500 K.C. and tune in this signal on the receiver. Then adjust the 1500 K.C. antenna trimmer to the maximum output. This completes the alignment.
ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to the two small pins of the speaker plug. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 1A6 tube through a 1 M.F. condenser. Connect the ground of the generator to the ground post of the receiver. With the wave switch on broadcast position and the dial set to about 1000 K.C., feed in a 456 K.C. signal. Adjust the trimmers on top of the first and second I.F. transformers until the maximum output is obtained.

This aligns the I.F.

Leaving the signal generator connected to the grid cap of the 1A6, turn the wave switch to the right hand (short wave) position. Set the dial and the signal generator to 15.0 M.C. Tune in the signal by adjusting the 15.0 M.C. oscillator trimmer. The signal will be heard at two different settings of the trimmer. The proper setting is the one where the signal is heard when the trimmer is the loosest. Also when the dial of the receiver is turned the signal will be heard again at about 14.0 M.C. If the signal is heard at about 16.0 M.C. on the dial instead of 14.0 M.C. the wrong setting has been used and should be corrected.

IF PEAK 456 K.C.

Set the wave switch on broadcast position and turn the dial to the extreme high frequency end. Feed a 1680 K.C. signal to the receiver antenna post through a 00025 M.F. mica condenser. Adjust the 1680 K.C. broadcast oscillator trimmer for maximum output. Set the generator to 1500 K.C. and tune this signal in the receiver. Then adjust the 1500 K.C. broadcast antenna trimmer for maximum output. Set the generator to 600 K.C. and adjust the 600 K.C. broadcast oscillator trimmer to maximum output while tuning the receiver back and forth across the signal from the generator. This completes the alignment of the broadcast band.

The police band is aligned by feeding a 4.0 M.C. signal to the receiver antenna lead through the 00025 condenser. Turn the wave switch to the center position and tune the receiver to this signal. Adjust the 4.0 M.C. police antenna trimmer for best output.

The short wave band is aligned in the same way using a 15 M.C. signal adjusting the 15 M.C. short wave antenna trimmer after having turned the wave switch to the right hand position.
DESCRIPTION

This receiver is a 6-tube alternating current operated superheterodyne.

The tubes used are—a 6A7 as oscillator modulator, a 6D6 as L. F. amplifier, a 75 as A. V. C. and audio rectifier and audio voltage amplifier, a 76 as a direct coupled driver, a 6AC5G as a power audio amplifier, and a 80 as a power rectifier.

This receiver is made to cover two tuning bands—the standard broadcast band which ranges from 1740 KC to 540 KC, and the short wave band which has a frequency range of from 24 MC to 5.9 MC.
ALIGNMENT

**IF** Through 0.1 mfd. dummy antenna, adjust trimmers at 450 KC.

**BC** Adjust osc. trimmer at 1760 KC through 0.0025 dummy. Adjust padders at 600 KC.

**POLICE** Through 0.00025 mfd. dummy, adjust antenna trimmer at 4 MHz.

**Short Wave** Adjust antenna trimmer at 15 MHz.

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**VOLTAGE DIAGRAM**

![Diagram of voltage levels for different components](image)

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ALIGNMENT

IF Through 0.1 mfd. dummy antenna, adjust trimmers at 282 KC.

BC Through 0.00025 dummy, adjust osc. trimmer at 1580 KC. Adjust antenna trimmer at 1400 KC. Adjust paddor at 600 KC. Adjust antenna compensator at 600 KC. for best sensitivity with signal.
ALIGNMENT PROCEDURE

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a .5 M.F. condenser and a resistance of such a value as to make the total meter resistance approximately 10,000 ohms, to plate of output tube and B+ or a low voltage A.C. meter may be used connected across speaker voice coil. The output meter remains connected during the entire alignment procedure.

Connect the signal generator to the grid cap of the 6A7 tube through a .1 M.F. condenser. Connect the ground of the generator to the ground lead of the receiver. Set the dial to about 1000 K.C., feed in a 455 K.C. signal. Adjust first and second I.F. trimmers for maximum output. Refer to chassis lay-out for location of trimmers.

Turn the dial to the extreme high frequency end. Feed a 1760 K.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Adjust the 1760 K.C. oscillator trimmer until maximum output is shown. Set the oscillator to 1500 K.C. and tune in this signal on the receiver. Then adjust the 1500 K.C. antenna trimmer to the maximum output. Then impress a 600 K.C. signal into the receiver antenna lead and tune in this signal on the receiver. Adjust oscillator padding condenser to the maximum output. For the alignment of the short wave band open variable condenser to minimum capacity. With an impressed signal of 24 M.C. adjust trimmer designated as C14 in schematic diagram for maximum output. Follow through with this procedure several times in order to obtain the best alignment adjustment possible. This completes the alignment.
For Conventional Alignment See Special Section Vol. VIII

FREQUENCY CALIBRATION ADJUSTMENT

While a station of known frequency is tuned in, remove the pilot light socket. In the tuning control head, immediately in front of position from which the dial light socket has been removed, will be seen a small screw head. This is the calibration adjustment screw. By turning this screw with a small screw driver, the frequency indicated by the dial may be made to correspond to the frequency of the station tuned in. After adjusting calibration by this means the dial light socket is replaced.

After the receiver is installed the 600 K.C. antenna compensator condenser is adjusted to give best sensitivity while the receiver is tuned to as weak a station as can be heard near 600 K.C. The volume control should be turned full on while making this adjustment.
This receiver is made to cover 3 tuning bands, the standard broadcast band which ranges from 1680 K.C. to 535 K.C., the middle or police band which has a frequency range of from 5.6 M.C. to 1.7 M.C. and high frequency or foreign band which is from 20 M.C. to 5.4 M.C.

**ALIGNMENT**

**IF** Adjust at 456 KC through a 0.1 mfd. condenser.

**SW** Proper adjustment is loose trimmer setting at 15 MC, as signal is heard at 2 settings. Signal must be heard only at about 14 MC dial setting and not at 16 MC.

**BC** Adjust oscillator trimmer at 1650 KC through 0.00025 mfd. condenser. Adjust antenna trimmer at 1500 KC. Adjust padder at 600 KC.

Police Adjust antenna trimmer at 4 MC, through 0.00025 condenser.

**VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTOMETER.**

**ALL VOLTAGES EXCEPT HEATERS MEASURED TO GROUND.**

- 6A7
  - 6.3V AC
  - 85V DC

- 80
  - 280V AC
  - 300V DC
  - (BOTTOM VIEW OF CHASSIS)

- 42
  - 280V AC
  - 225V AC

- 75
  - 220V AC
  - 6.3V AC

- 606
  - 85V DC
  - 85V AC

- 250V DS
  - 225V DS
  - 205V DS

- 76
  - 5V DC
  - 6.3V AC

- 1808
  - 550V DC
  - 550V AC

- 600X
  - 600V DC
  - 600V AC

- 600X-1
  - 600V DC
  - 600V AC

John B. Rider Publisher
ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent service men having the proper equipment. Re-alignment is very seldom needed and is usually only required after some major part has been replaced because of damage to the receiver.

The equipment required for re-aligning this receiver is an output meter and a receiver and signal generator or oscilloscope. This source of radio frequency must be accurately calibrated in frequency and must have a method of varying the output.

All alignments must be made with the volume control turned full on and with the signal input from the generator reduced to as low a value as possible while still giving a sufficient output to be easily read on the output meter.

Connect the output meter, through a 50-ohm resistor and a 0.1-ohm resistor, to the generator and this input to the receiver. Then adjust the 5000 Kc. broadcast antennae trimmer to maximum output. Set the generator to 1000 Kc. and tune the receiver back and forth across the signal from the generator. This completes the alignment procedure.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your four selected stations for automatic operation, merely push in "ALL THE WAY" the Button set up for that station.

DESCRIPTION

This receiver is a 1 tube, 6 volt storage battery operated astatic radio.

The tubes used are a 30 as oscillator, a 6DIQ as modulator, two 1A4 tubes as I.F. amplifiers, a 5URG as A.V.C. and audio receiver, and an audio amplifier, a 6EL6 as audio driver and a 3A as power audio amplifier.

This receiver is made to cover 5 tuning bands, the standard broadcast band which ranges from 1800 Kc. to 552 Kc., the middle or sideline broadcast band which has a frequency range of from 960 M.C. to 1.7 M.C. and high frequency or foreign which is from 26 M.C. to 1.4 M.C.

While a ground is not always necessary with receivers which are made to use the lightning coils as a source of power, a battery operated receiver always has a good ground if best performance and distance reception is expected. A ground may be made to a water supply system or to a galvanized pipe driven into ground that is moist most of the time. The use of a lightning arrestor is very good insurance against damage by lightning. Special grounds are on the market and may be obtained very easily. Soldering of all antenna and ground leads will stimulate any noise which may be caused by low connections.

The antenna and ground leads connect to the marked binding posts located on the back of the chassis.

A 6 volt storage battery is the only power supply required for this receiver. The voltage will not be required if the receiver is not being used or if the battery is not charging. The battery and the black leads connect to the negative (-) terminal of the battery and the red leads to the positive (+) terminal.
Instructions for Mounting the New 7 Station Automatic Tuning Panel on the 7, 9, 11 and 13 Tube Chassis
(Replacing Motor Drive Panel)

New 7 Station Automatic Tuning Panel

There are 9 push buttons. Buttons Nos. 1 to 5 and 7 to 9 are control buttons. Button No. 6 is the Manual Tuning Button. See Fig. 1. When this button is depressed, the radio is in the manual tuning position.

The push buttons shown in the diagram are used for setting the stations. However, with the new model, this is done by turning the knob clockwise or counterclockwise until the desired station is tuned in.

The spring slide shown in Fig. 1, when turned, moves the iron core of the antenna coil for aligning purposes.

Old Parts Used

Use the following parts of the old assembly:
- Essential parts: station, button, spring, mounting bracket, glass, screw, and motor panel.
- The following new parts are supplied:
- New station automatic tuning panel assembly.
- The parts shown in the list at the end of these instructions.

Removing Old Motor Drive Panel from Chassis

Remove the knobs. Two are set screw bolts and three are the push-on types.

Remove the station buttons by pulling down the lower end of the small capillary spring at the back of the button and, at the same time, pulling the bottom of the knob off. Remove the setting buttons by pulling them off.

Unscrew the knob from the front of the chassis. Unscrew the knob from the bottom of the chassis and also the tuning eye tube portion from the rear. Loosen the screws holding the tuning eye tube portion to the chassis.

Reposition the large screws and remove the small screws. Reinstall the small screws and the "L" bolts from beneath the chassis shell.

The chassies may then be removed.

Remove the old tuning eye tube from the chassis.

Turn the adjusting knob to the electric position.

Unscrew the wire to the armature switch at the crimped end. Unscrew the wire to the armature switch at the center. Remove the small switch. The small switch is the same as the small switch on the chassis.

Remove the large screws and the "L" bolts from beneath the chassis shell.

Remove the armature switch and the large screws. Remove the small screw.

Remove the two screws and remove the two arms.

Mounting New Automatic Tuning Panel on the Chassis

Put a piece of insulating tape on the surface of the tube. The points shown in Fig. 2, this will prevent possible shorting circuits of the contacts.

Before mounting the new panel on the chassis, cut the leads not required as shown in the diagram. Use the large panel drive pulley with the spring clip in the chassis under the front section of the gang condenser. Turn the gang condenser until the spring clip on the drive arm is at its lowest position. See Fig. 2 lower left. This will be the largest panel drive pulley with the spring clip on the gang condenser drive arm. Since the drive arm will slip up with the spring clip under two conditions, refer to Fig. 2 lower left for the correct relation of drive cord winding to drive arm.

Slide the spring clip SLIGHTLY with a small screw driver, bringing the screw driver up from beneath the chassis shell. Then push the panel inside the chassis shell with the small end of the screw driver. The panel may be brought up in back of the bracket below the projector compartment. Insert the drive arm in the spring clip.

Mount the panel on the chassis using the four mounting screws at the four points shown in Fig. 1. Screw two screws to the back of the panel as shown in Fig. 1.

Mount the two screws to the top of the lens housing bracket. Using the two 8-32 X 3/8" screws supplied, secure the back end of the lens in place. Next attach the brass to the inner screw on the lens housing bracket, ground the top of the braided wire under the glass screen as illustrated.

Replace the glass screen using clamps, nuts, and lens washer supplied.

Replace the collars on the volume control and tone control shafts.

Wire the panel in the circuit following Fig. 1, 2, 3, 4, and 5. Replace the tubes in cabinet reversing procedure followed when removing the chassis.

The wooden shipping support is not used.

The electric-motor lever is not used. The cover plate is supplied with covers from the left, removed by the removal of this lever. This plate is so made that the back portion should fit snugly into the opening in the cabinet. If it does not, file the cabinet until it fits snugly in place.

Then put the tuning knob on the shaft.

Knobs and Cover Plate

The control knobs formerly used with the motor drive are also used with the new automatic tuning panel.

The cover plate used under the tuning knob is described in the previous article.

Alignment

After the new panel is installed, realign the chassis to the guide the alignment procedure given in the service manual for each chassis.

Parts Shipped with 7 Station Automatic Tuning Panel

QUANTITY | ITEM
--- | ---
1 | 10,000 Ohm Resistor
2 | Braces
4 | 9-32 X 3/8" screws
2 | A. F. Shaker Washers
2 | 8-32 Hex Washers
2 | Glass Retainer Clamps
2 | 7-32 X 1/4" Round Head Screws
2 | A. F. Split Lock Washers
1 | Round Carboard Tab with Words "Manual Tuning" on it
1 | Round Carboard Tab
1 | 300 Ohm Condenser Tab
1 | 100 Ohm Condenser Tab
1 | Tape Mount Panel to chassis
1 | Tape Mount Panel to chassis
1 | Cover opening in front panel of control cabinet

If a definite panel cannot be the 10,000 Ohm resistor, the 10,000 Ohm resistor is used on the 10,000 Ohm resistor.

If a definite panel cannot be used, the 10,000 Ohm resistor may be used, or as far as the 10,000 Ohm resistor is concerned.

Next align the automatic tuner. The tuning system is aligned by turning which shifts the position of the automatic tuner. Follow the same procedure with station tuning buttons using 1.000.

Mounting New Pan Chassis Equipped Motor Drive F

Chassis equipped with the old panel may be identified by the fact that is removed from the electric-motor lever. It is in the 10,000 Ohm resistor mounting screws and in the 7, 9, 11, 13, and 15 tube models.

To mount the new automatic easily, first, using the portion of the bracket and motor panel as shown in Fig. 3. Install the bracket through the opening in the cabinet. Then mount the new panel on the chassis using the mounting screws. Extend the bracket through the chassis and plate to the extending down from the panel.

Next remove the two lower mounting screws of the panel. Drill and tap two 8-32 mounting screws in each panel and then mount the two screws.

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9 AND 11 TUBE RADIOS
Fig. 19—Tuning Panel Schematic Diagram

13 TUBE MODEL—USE ALL 13 WIRES & GROUND LEAD.

9 & 11 TUBE MODELS—CLIP OFF WHITE-GREEN TR. AT SWITCH CONTACT 1.

7 TUBE MODEL—CLIP OFF THE FOLLOWING WIRES:
WHITE-REO TR. AT SWITCH CONTACT 2.
WHITE AT SWITCH CONTACT 3.
YELLOW 3 & RED & WHITE 2 AT CONDENSER TERMINAL STRIP.
TR 3 20,000 OHM RES-STRIP IS NOT USED.

Fig. 20—Table of Tuning Panel Leads Used

Early Models—Cutting off bracket

Fig. 21—Cutting Support Bracket—Early Models

Fig. 22—Location of 4 Red Mounting Screws in Late Models

Fig. 23—Location of 4 Red Mounting Screws in Early Models
**WELLS-GARDNER & CO.**

**SERIES S1**

**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to “Heat Up” for several minutes.

<table>
<thead>
<tr>
<th>STEP (Order of adjustment)</th>
<th>BAND SWITCH SETTINGS</th>
<th>DIAMOND ANTENNA</th>
<th>FREQUENCY GENERATOR</th>
<th>CONNECTION AT RADIO</th>
<th>TRANSMITTER ADJUSTMENT</th>
<th>INITIAL STEPS</th>
<th>PROCEDURE</th>
<th>ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF</td>
<td>Range B</td>
<td>1 mil.</td>
<td>450 Kc</td>
<td>Gold of #2</td>
<td>2nd LF, (CH3) &amp; (CH4)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>LF</td>
<td>Range A</td>
<td>1 mil.</td>
<td>450 Kc</td>
<td>Gold of #2</td>
<td>2nd LF, (CH3) &amp; (CH4)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>RANGE D 22,000 Kc</td>
<td>Range D</td>
<td>400 Ohm</td>
<td>22,000 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range D (CH7)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>30,000 Kc</td>
<td>Range D</td>
<td>400 Ohm</td>
<td>30,000 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range D (CH7)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>RANGE C 4500 Kc</td>
<td>Range B</td>
<td>400 Ohm</td>
<td>4500 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range C (CH3)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>6000 Kc</td>
<td>Range B</td>
<td>400 Ohm</td>
<td>6000 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range C (CH3)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>RANGE B 1400 Kc</td>
<td>Range B</td>
<td>200 microf.</td>
<td>1400 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (CH3)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>1500 Kc</td>
<td>Range B</td>
<td>200 microf.</td>
<td>1500 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (CH3)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>1000 Kc</td>
<td>Range B</td>
<td>200 microf.</td>
<td>1000 Kc</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (CH3)</td>
<td>Turn Rotor to Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
</tbody>
</table>

Attenuates the signal from the signal generator to prevent the overload action of the AVC.

CAUTION—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Set in or signal generator is set for 5000 Kc. The signal will then be heard at 5000 less 712 Kc, or 4288 Kc on the dial. It may be necessary to increase the input signal to hear the image.

After each range is completed, repeat the procedure on the final range.

NOTE A—The pointer is not at 1500 Kc but the dial, because the dial changes which hold the pointer assembly on the scale, moves the pointer to the 1500 Kc mark, and tightens the clamps.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

**SERIES S2**

**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to “Heat Up” for several minutes.

<table>
<thead>
<tr>
<th>FREQUENCY GENERATOR</th>
<th>CONNECTION AT RADIO</th>
<th>DIAMOND ANTENNA</th>
<th>BAND SWITCH</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRANSMITTERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF</td>
<td></td>
<td>Gold of #2</td>
<td>1 mil.</td>
<td>8 Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td>LF</td>
<td></td>
<td>Gold of #2</td>
<td>1 mil.</td>
<td>8 Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td>RANGE B 1720 Kc</td>
<td>Antenna Lead</td>
<td>200 microf.</td>
<td>8 Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (CH7)</td>
</tr>
<tr>
<td>1500 Kc</td>
<td>Antenna Lead</td>
<td>200 microf.</td>
<td>8 Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (CH7)</td>
</tr>
<tr>
<td>600 Kc</td>
<td>Antenna Lead</td>
<td>200 microf.</td>
<td>8 Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (CH7)</td>
</tr>
<tr>
<td>RANGE D 18,000 Kc</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (CH7)</td>
</tr>
<tr>
<td>12,000 Kc</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (CH7)</td>
</tr>
</tbody>
</table>

Adjusts the signal from the signal generator to prevent the overload action of the AVC.

CAUTION—When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Set in or signal generator is set for 14,000 Kc. The signal will then be heard at 14,000 less 712 Kc, or 13,288 Kc on the dial. It may be necessary to increase the input signal to hear the image.

After each range is completed, repeat the procedure on the final range.

NOTE A—The pointer is not at 14,000 Kc but the dial, because the dial changes which hold the pointer assembly on the scale, moves the pointer to the 1500 Kc mark, and tightens the clamps.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator. With a Short Haury Lead.

Allow Chassis and Signal Generator to "Heat up" for Several Minutes.

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
Output Indicating Meter: Non-Magnetic Screwdriver.
Dummy Antenna—.1 mfd, 200 mill., and 400 ohms.

<table>
<thead>
<tr>
<th>STEP</th>
<th>BAND SWITCH</th>
<th>DIAMOND ANTENNA</th>
<th>SIGNAL GENERATOR</th>
<th>SWING ADJUSTED</th>
<th>INITIAL STEPS</th>
<th>PROCEDURE</th>
<th>ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.50</td>
<td>Range 0</td>
<td>400 TC</td>
<td>1500 TC</td>
<td>300-300</td>
<td>Turn Selector Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>1700</td>
<td>Range 0</td>
<td>400 TC</td>
<td>1500 TC</td>
<td>300-300</td>
<td>Turn Selector Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>Range 0</td>
<td>400 TC</td>
<td>1500 TC</td>
<td>300-300</td>
<td>Turn Selector Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>Range 0</td>
<td>400 TC</td>
<td>1500 TC</td>
<td>300-300</td>
<td>Turn Selector Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>Range 0</td>
<td>400 TC</td>
<td>1500 TC</td>
<td>300-300</td>
<td>Turn Selector Full Open</td>
<td>Adjust to Maximum Output</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: All sets use the upper tip for tuning dial return the selector ring which holds the dial scale in place by means of a thumb screw. Hold the set level and turn the tuning dial until the pointer is at the 1500 TC mark. Replace the selector ring.

NOTE B: With selector ring, turn the selector knob and adjust the signal until the peak is obtained.

VOLTAGES AT SOCKETS

Band Switch in Standard Wave Position

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>PRONG NO. 1</th>
<th>PRONG NO. 2</th>
<th>PRONG NO. 3</th>
<th>PRONG NO. 4</th>
<th>PRONG NO. 5</th>
<th>VOLTAGE BETWEEN SOCKET PRONGS AND GROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C16</td>
<td>1st Batt.</td>
<td>100</td>
<td>30</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
</tr>
<tr>
<td>1D56</td>
<td>75</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
</tr>
<tr>
<td>1H44</td>
<td>1st Batt.</td>
<td>100</td>
<td>30</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
</tr>
<tr>
<td>1F66</td>
<td>Audio Ampl.</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
</tr>
<tr>
<td>1F44</td>
<td>Driver</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
</tr>
<tr>
<td>1F44</td>
<td>Output</td>
<td>100</td>
<td>150</td>
<td>0</td>
<td>3</td>
<td>000 V (measured)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: All voltages are measured with a 1000 ohm-per-volt meter.

Volume Control: Maximum All Adjustments.

Antenna Shorted to Ground

Readings taken with 1000 Ohm-per-volt meter.

A synchronous type vibrator is used in the power unit. This vibrator generates a signal through the primary of the power transformer and also rectifies the current in the secondary circuit.

If, after a new 2 section dry electrolytic condenser has been installed, a buzzer buzz is encountered, reverse the connections of the 2 sections.
This radio is designed for use on farms and in those places where the power supply consists of a 22 volt direct current generating plant.

**Polarity of Power Supply**

There is a red mark on the plug at the end of the power supply cord of the radio. The prong of the plug at which the red mark is placed must be plugged into the positive side of the line.

**Caution**

If used on any other type of power supply than 22 volt DC, severe damage may be done to the receiver.

Do not turn the radio on unless all of the tubes and the dial lamps are in the proper sockets. Use only No. 81 dial lamps.

**Line Voltage Range**

The radio will operate satisfactorily within a line voltage range of 25 to 42 volts. If the line voltage is higher than 42, it will be necessary to use a series resistor to cut it down. If the voltage varies, a variable resistor may be required.

**Starting Current**

When first turned on, the drain for a few seconds is slightly higher than normal until the tubes heat up. Some automatic plants are adjusted to start under a load of 200 to 300 watts. If a number of devices such as lights or motors are being used and the radio set is turned on the total drain may be sufficient to start the plant.

---

**Fig. 3—Schematic Circuit Diagram**

32 volts D.C.
ICDEL A17

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat up" for several minutes.

IMPORTANT—Follow procedure in the order shown.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION SETTING</th>
<th>SUSPENSION SETTING</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>440 KC</td>
<td>Grid or 6th Det.</td>
<td>.1 m.</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2nd TC (C12) &amp; (C13)</td>
</tr>
<tr>
<td>RANGE D</td>
<td>18,000 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oscillator Range D (C18)</td>
</tr>
<tr>
<td>RANGE C</td>
<td>9,000 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Max. Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ant. Ranges D (C12) &amp; (C13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rotor Stop—See Note A</td>
</tr>
<tr>
<td>RANGE B</td>
<td>4,500 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oscillator Range C (C18)</td>
</tr>
<tr>
<td></td>
<td>1,500 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Max. Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ant. Ranges C (C12) &amp; (C13)</td>
</tr>
<tr>
<td></td>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Max. Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ant. Ranges B (C12) &amp; (C13)</td>
</tr>
<tr>
<td>WAVE TRAP</td>
<td>460 KC</td>
<td>Antenna Lead</td>
<td>600 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to 600 Ohm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust SW Bias—See Note A</td>
</tr>
</tbody>
</table>

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram—Fig. 3. On the top of the chassis base and between two of the 75 tube sockets is a round knobless 1/8". inch plate 11400. An empty socket is mounted in this knobless terminal and wired as shown in the schematic.

Tone Control

There are 3 wiring lugs on the tone control. One of the end lugs connects to one end of the tone control resistor. The center lug connects to the slider. The other end lug on the tone control is used for external wiring purposes only and is not connected to the tone control resistor in any way. Due side of the tone control is a 250 ohm, 1/4 watt carbon control resistor and a wire from the B+ line are connected at this lug.

Twenty-Five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used.

Volatges at Sockets

The voltages at sockets are shown on the schematic circuit diagram. Unless otherwise specified, the voltage indicated is between the socket terminal and ground.

After each range is completed, repeat the procedure for all ranges.

NOTE A—If the power is not on at 4500 KC or the dial is off, turn the power on and adjust the signal generator until maximum output is obtained at each range.

NOTE B—After the power is turned on, the detector and amplifier meters should be checked for any indication of a signal frequency. If any indication of a signal is obtained, the power supply should be checked and the power turned off.

MODEL T2

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat up" for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION SETTING</th>
<th>SUSPENSION SETTING</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>450 KC</td>
<td>Grid or 6th Det.</td>
<td>.1 m.</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2nd TC (C12) &amp; (C13)</td>
</tr>
<tr>
<td>RANGE D</td>
<td>1700 KC</td>
<td>Antenna Lead</td>
<td>200 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oscillator Range D (C18)</td>
</tr>
<tr>
<td>RANGE C</td>
<td>900 KC</td>
<td>Antenna Lead</td>
<td>200 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Max. Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ant. Ranges D (C12) &amp; (C13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rotor Stop—See Note A</td>
</tr>
<tr>
<td>RANGE B</td>
<td>450 KC</td>
<td>Antenna Lead</td>
<td>200 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to Full Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oscillator Range C (C18)</td>
</tr>
<tr>
<td>WAVE TRAP</td>
<td>450 KC</td>
<td>Antenna Lead</td>
<td>200 Ohm</td>
<td>0 Range</td>
<td>Tune Rotor to 600 Ohm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust SW Bias—See Note A</td>
</tr>
</tbody>
</table>

Permeability Tuning Unit

The permeability tuning unit is shown in the schematic circuit diagram. The tuning screw is adjusted to the maximum output position and held in place by the swivel.

After each range is completed, repeat the procedure for all ranges.

NOTE A—If the power is not on at 4500 KC or the dial is off, adjust the swivel until maximum output is obtained.

NOTE B—After the power is turned on, the detector and amplifier meters should be checked for any indication of a signal frequency. If any indication of a signal is obtained, the power supply should be checked and the power turned off.

NOTE C—After the power is turned on, the detector and amplifier meters should be checked for any indication of a signal frequency. If any indication of a signal is obtained, the power supply should be checked and the power turned off.

NOTE D—After the power is turned on, the detector and amplifier meters should be checked for any indication of a signal frequency. If any indication of a signal is obtained, the power supply should be checked and the power turned off.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. The following equipment is required for alignment:

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION</th>
<th>RADIO</th>
<th>ANTENNA</th>
<th>BAND</th>
<th>SWITCH</th>
<th>CONDENSER SETTINGS</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 KC</td>
<td>300 kHz</td>
<td>Antenna</td>
<td>B</td>
<td>Range</td>
<td>Turn Riter to Full Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200 KC</td>
<td>1000 kHz</td>
<td>Antenna</td>
<td>A</td>
<td>Range</td>
<td>Turn Riter to Full Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1800 KC</td>
<td>600 kHz</td>
<td>Antenna</td>
<td>B</td>
<td>Range</td>
<td>Turn Riter to Full Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2400 KC</td>
<td>400 kHz</td>
<td>Antenna</td>
<td>A</td>
<td>Range</td>
<td>Turn Riter to Full Output</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Drive Cord Replacement

The arm of the small loop at one end of the drive cord is to be adjusted until the point of greatest intensity is obtained.

Dial Pointer Attachment—

There is a relation of known frequency. Move the pointer to the approximate frequency on the dial scale. Placing the cord through the dial head—See Fig. 4. Hold the drive cord and slide the pointer to the exact frequency on the dial scale.

WAVE TUNING

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION</th>
<th>RADIO</th>
<th>ANTENNA</th>
<th>BAND</th>
<th>SWITCH</th>
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<td>1200 KC</td>
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<td></td>
<td></td>
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<td>A</td>
<td>Range</td>
<td>Turn Riter to Full Output</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After each range is completed, repeat the previous procedure as a final check.

CAUTION—When aligning the dial wave, the set is NOT to be used at any frequency. The range is for checking purposes only. To set the frequency, the set is to be tuned to 100 kHz on the dial scale. The range of the dial scale is from 100 kHz to 1.5 MHz.

For drive cord data, rack and panel assembly, see index.

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IMPORTANT—Follow procedure in the order shown.

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Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

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IMPORTANT—Follow procedure in the order shown.
### Schematic, Voltage, Socket, Trimmers, Alignment, Coils

#### Input Voltages and Currents

<table>
<thead>
<tr>
<th>Battery</th>
<th>Voltage (Volts)</th>
<th>Current (Amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.5</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>90</td>
<td>30</td>
</tr>
</tbody>
</table>

#### Power Output

- 140 Milliwatts Undistorted

#### Selectivity

- 41 KC Broad at 1000 Times Signal

#### Intermediate Frequency

- 456 KC

#### Specker

- 6" P.M. Dynamic

#### Tuning Frequency Range

- 540 to 1600 KC

#### Sensitivity (For .05 Watt Output)

<table>
<thead>
<tr>
<th></th>
<th>Table Model</th>
<th>Portable Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>105 Microvolts Average</td>
<td>20 Microvolts Per Meter Average</td>
</tr>
</tbody>
</table>

---

#### Diagram Notes

- Connect a loop to the grid of the tubes to pick up signals.
- Adjust the trimmers for maximum sensitivity.
- The diagram shows the connections for the tabletop and portable models.

---

#### Table of Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Frequency</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>456 KC</td>
<td>200</td>
</tr>
<tr>
<td>A1</td>
<td>540 KC</td>
<td>200</td>
</tr>
<tr>
<td>A1</td>
<td>1600 KC</td>
<td>1500</td>
</tr>
<tr>
<td>A1</td>
<td>1800 KC</td>
<td>1500</td>
</tr>
<tr>
<td>A1</td>
<td>1900 KC</td>
<td>1500</td>
</tr>
</tbody>
</table>

---

#### Diagram Annotations

- Use the trimmers for alignment and tuning.
- The oscillator is located on the rear panel.

---

#### Adjustments

- Turn the rotors to max output.
- None.

---

#### Calibration

- To obtain scale division, turn the rotors to max output.
CALIBRATION (For models with pointer in front of dial scale)—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If it is not, loosen the pointer screw, set the pointer at the 800 KC mark and retighten the pointer screw.

CALIBRATION (For models with pointer in back of cabinet)—To obtain dial scale calibration, tune in an 800 KC signal. The pointer should be at the 800 KC mark on the dial. If the pointer is at a higher KC mark than 800 KC, grasp the drive cord below the tension spring. Hold the tuning control shaft motionless and slowly pull the drive cord down until the pointer is at the 800 KC mark. If the pointer is at a lower KC mark than 800 KC, grasp the drive cord above the tension spring. Hold the tuning control shaft motionless and slowly pull the drive cord up until the pointer is at the 800 KC mark.

Adjusting Antenna Trimmer

After the batteries are installed and the back of the cabinet is in place, adjust the antenna trimmer.

Accurately tune in a weak station signal between 1400 and 1500 KC on the dial. With a screwdriver turn the adjusting screw of the antenna trimmer up or down until maximum output is obtained. This trimmer is reached through an opening in the bottom of the cabinet—see illustration. CAUTION: Do not remove the cork from the other opening at the bottom of the cabinet.
Alignment and Calibration

Set the signal generator for 175 KC and connect the output of the signal generator through a 1000-ohm resistor to the grid of the 6F42. Connect the output of the 1st detector section of the tuning condenser. Connect the ground lead of the signal generator to the chassis. The signal generator feeds into the output of the oscillator through a 1000-ohm resistor. The bandpass filter is connected to the 1st detector section of the tuning condenser.

Set the signal generator for 300 KC. Connect the output of the signal generator through a 1000-ohm resistor to the grid of the 6F42. Connect the output of the 2nd detector section of the tuning condenser. Connect the output of the 2nd detector section of the tuning condenser through a 1000-ohm resistor to the grid of the 6F42. Connect the output of the 3rd detector section of the tuning condenser. Connect the output of the 3rd detector section of the tuning condenser through a 1000-ohm resistor to the grid of the 6F42.

Set the signal generator for 600 KC. Connect the output of the signal generator through a 1000-ohm resistor to the grid of the 6F42. Connect the output of the 4th detector section of the tuning condenser. Connect the output of the 4th detector section of the tuning condenser through a 1000-ohm resistor to the grid of the 6F42.
There are 5 buttons on the automatic tuning dial by means of which 5 stations can be selected.

Any button may be used for any station you can receive.

Many of your favorite stations are pre-selected for you. These are the stations with the highest listenership and can be selected by pressing the corresponding button.

Procedures for Setting the Station Buttons

- Press the button corresponding to the station you wish to receive.
- The station will be displayed on the tuning dial.
- Adjust the volume to your desired level.

Alignment Procedure

- Remove the speaker unit and antenna cable.
- Connect the antenna cable to the receiver.
- Adjust the gain control to obtain the best possible signal.
- Listen for any interference and adjust the receiver accordingly.

Antenna

- A high-gain antenna is recommended for best performance.
- The antenna should be mounted on a mast or tower as high as possible.
- Ensure that the antenna is securely mounted and weatherproofed.

High Gain Antenna

- If the antenna is not mounted as high as possible, a high-gain antenna may be required.
- The antenna should be mounted on a mast or tower as high as possible.
- Ensure that the antenna is securely mounted and weatherproofed.

Types of Antennas

- High Gain Antenna: - Recommended for high signal reception.
- Low Gain Antenna: - Recommended for low signal reception.

ADJUSTMENT OF THE TUNING UNIT

- Adjust the tuning control to obtain the best possible signal.
- Ensure that the antenna is securely mounted and weatherproofed.

For more information, please refer to the manual provided with the receiver.
MODEL A8 Series
Alignment, Trimmers
Voltage, Parts

VOLTAGES AT SOCKETS

<table>
<thead>
<tr>
<th>Fuse</th>
<th>Function</th>
<th>Line Voltage 110</th>
<th>Voltage to Control</th>
<th>Voltage to Mains</th>
<th>Voltage to Mains</th>
<th>Voltage between Sockets</th>
<th>Voltage from Ground</th>
<th>Voltage from Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>648</td>
<td>1st Out. Oc.</td>
<td>0</td>
<td>5.1(1)</td>
<td>100</td>
<td>110</td>
<td>140</td>
<td>6.3(1)</td>
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<td>667</td>
<td>I.F.</td>
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<td>6.3(1)</td>
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<td>666</td>
<td>Output</td>
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<td>140</td>
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<td>97(0.1)</td>
<td>97(0.1)</td>
<td>97(0.1)</td>
<td>5.1(1)</td>
<td>0</td>
</tr>
</tbody>
</table>

(1) A.C. voltage as read across heater terminals 2 and 7.
(2) A.C. voltage as read across heater terminals 2 and 8.
(3) A.C. voltage as read across heater terminals 2 and 8.
(4) A.C. voltage as read across heater terminals 2 and 8.

CONDENSERS

<table>
<thead>
<tr>
<th>Code</th>
<th>Size</th>
<th>Voltage</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>1mF</td>
<td>0.1mF</td>
<td>15V</td>
<td>0.50</td>
</tr>
<tr>
<td>10mF</td>
<td>0.01mF</td>
<td>15V</td>
<td>0.50</td>
</tr>
<tr>
<td>100mF</td>
<td>0.001mF</td>
<td>15V</td>
<td>0.50</td>
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ELECTROLYTIC

<table>
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<tr>
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<tr>
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<td>0.50</td>
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<td>10mF</td>
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RESISTORS

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MISCELLANEOUS

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<tbody>
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<tr>
<td>10mF</td>
<td>0.01mF Condenser</td>
<td>0.50</td>
</tr>
<tr>
<td>100mF</td>
<td>0.001mF Condenser</td>
<td>0.50</td>
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PHONO ATTACHMENT PARTS

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<tbody>
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<td>0.50</td>
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<td>10mF</td>
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DIAL AND DRIVE ASSEMBLY

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TRANSFORMERS AND COILS

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<td>100mF</td>
<td>0.001mF Condenser</td>
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</tbody>
</table>

Series A8 – Replacement Parts

NOTICE—There is a large letter on the terminals which identifies the unit as to major parts changes. When ordering parts, please be sure to mention the series number and the large letter.

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WELLS-GARDNER & CO.

ALIGNMENT PROCEDURE

The following equipment is required for alignment:

- An all-wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output Indicating Meter: Non-Metallic, Sensitive, 0-500 milliamperes, 20 millivolts, 50 ohms.

**TABLE A0**

<table>
<thead>
<tr>
<th>SCREED</th>
<th>UNIFORM FOR ANDalam</th>
<th>TRIMMER ADJUSTED</th>
<th>FREQUENCY ATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 000</td>
<td>100 000</td>
<td>100 000</td>
<td>100 000</td>
</tr>
</tbody>
</table>

**VOLTAGS AT SOCKETS**


**LOW TUNING ADJUSTMENTS**

- **PASS THROUGH LOAD HOLE**
  - The reactor must be used when the long coil is the maximum value.
  - The signal generator must be used when the long coil is the maximum value.

**PLACING THE BUS**

- The bus is placed on the base where it is in place and held in position by a bus lock.

**Figure 2**: Location of Trims

**Figure 3**: Location of Trims

**Figure 4**: Location of Trims

**Figure 5**: Location of Trims

**Figure 6**: Location of Trims

**Figure 7**: Location of Trims
ALIGNMENT
Adjust IF trimmers at 175 KC thru .05 mf dummy. Adjust Osc. trimmer at 1561 KC thru 120 mmf dummy if 50 inch cable 70 mmf is used - or thru 25 mmf dummy if 30 inch cable 35 mmf dummy is used.
Adjust Interstage and Antenna trimmers at 1400 KC.
Readjust Antenna trimmer C2 at 1400 KC.
MODEL All Series
Schematic Voltage
Alignment Socket
DC OPERATION—Filament and ballast tube voltages will be the same as AC for 117 volt line. The plate, screen and bias voltages will be slightly lower than those shown above. When operated on DC, the rectifier tube acts as a low resistance series resistor with a drop of approximately 6 volts between plate and cathode.

CAUTION—In any service work on the AC-DC chassis, keep it on a wood or other insulated surface to avoid contacts with ground.

WELLS-GARDNER & CO.

VOLTAGES AT SOCKETS FOR 117 VOLT AC LINE
See Note Below Regarding Voltages when Operated on DC
Volume Control Maximum—Antenna Lead Grounded—Readings taken with 1000 Ohm-microvolt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>Prong No. 1</th>
<th>Prong No. 2</th>
<th>Prong No. 3</th>
<th>Prong No. 4</th>
<th>Prong No. 5</th>
<th>Prong No. 6</th>
<th>Prong No. 7</th>
<th>Prong No. 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6J7</td>
<td>1st Det. &amp; Osc.</td>
<td>6.3(1)</td>
<td>98</td>
<td>98</td>
<td>6.3(1)</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J7</td>
<td>2nd Det.</td>
<td>6.3(1)</td>
<td>10</td>
<td>13</td>
<td>6.3(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25L6G</td>
<td>Output</td>
<td>24(1)</td>
<td>92</td>
<td>98</td>
<td>24(1)</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25Z6G</td>
<td>Rectifier</td>
<td>24(1)</td>
<td>117(2)</td>
<td>125</td>
<td>24(1)</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1558 Ballast</td>
<td>(6.6(1))</td>
<td>(6.6(1))</td>
<td>(6.6(1))</td>
<td>(6.6(1))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) AC voltage across terminals 2 and 7.
(2) AC voltage across terminals 3 and 7.
(3) AC voltage across terminals 7 and 8.
(4) AC voltage to ground.

POWER CONSUMPTION—48 Watts (at 117 volt AC Supply)
Power Output—30 KC Broad at 100 microvolt Sensitivity
Selectivity
Tuning Frequency Range
550 to 2700 KC
180 microvolts Average

ALIGNMENT PROCEDURE
Volume Control Maximum All Adjustments, After Chassis and Signal Generator to Meet UP for Several Minutes.

VOLTAGE MANUFACTURED
500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1050, 1100, 1150, 1200, 1250, 1300, 1350, 1400, 1450, 1500, 1550, 1600, 1650, 1700, 1750, 1800, 1850, 1900, 1950, 2000, 2050, 2100, 2150, 2200, 2250, 2300, 2350, 2400, 2450, 2500, 2550, 2600, 2650, 2700

The following equipment is required for alignment:
- Signal Generator which will provide an accurately known 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1050, 1100, 1150, 1200, 1250, 1300, 1350, 1400, 1450, 1500, 1550, 1600, 1650, 1700, 1750, 1800, 1850, 1900, 1950, 2000, 2050, 2100, 2150, 2200, 2250, 2300, 2350, 2400, 2450, 2500, 2550, 2600, 2650, 2700 microvolt output indicating meter. Non-ferrous Screwsdriver.
- Dummy Antennae—1 ft. and 200 mm.
- 30 KC Broad.
- 2.5N Microvolt Bridge.
- 30-Watts 100-ohm Load.

MAY, 1938

VOLTAGE TESTED WITH 1000 OHM MICROVOLT METER.
ISSUE NUMBER CHANGES

The last digit of the number on the chassis number label identifies the radio as to the issue number.

ISSUE NO. 1

The information contained in the Series 10 Service Manual, with the exception of the Replacement Parts List and Schematic Circuit Diagram, applies with minor changes to all chassis issues, 1 through 6. The operating voltages of several of the tubes have been changed. Correct Replacement Parts List and Schematic Circuit Diagram, however, apply react values are shown on this schematic in this supplement.

ISSUE NO. 2 and 3

MECHANICAL CHANGES -- The station button plunger has a length of 7-7/16 inches.

ISSUE NO. 4 and 5

MECHANICAL CHANGES -- The antenna coil (T1) and Wave Trap Coil (T2) have been moved from the top of the chassis base to a position just in back of the band switch underneath the chassis base.

The locking plate for the station button plunger has been redesigned and now employs two side arms mounted in rubber cushioned hinge brackets which are attached to the rear bracket of the lower assembly by two screws.

ELECTRICAL CHANGES -- The Schematic Circuit Diagram (Fig.3) is that for Issue Nos. 2 through 6. The AVC voltage is fed to the grid of the R.F. tube through the manual and automatic tuning coils. Properly, it was applied directly to the grid of the R.F. tube through a 1 Megohm resistor.

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MODEL A12 Series Late
Schematic, Voltage, Socket Trimmers, Changes Tuner Switches

DNER & CO.

Wave Trap Trimmer (C1) has been moved from its former position the 1st I.F. Transformer (T6) to a position near the 6F6G R.F.

PRICAL CHANGES - The Wave Trap Coil (C1) and Trimmer Condenser have been removed from the antenna circuit and are now connected in the circuit - See Fig. 8.

R.F. NO. 6

PRICAL CHANGES - The Tone Control, formerly in the 1st audio plate been put in the diode circuit - See Fig. 1. All Negative Tone Control (R22) and a .02 mf (C37) condenser were used in the audio plate. Negative Tone Control (R25) and a .001 mf (C49) condenser are used in the diode circuit.
**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.  
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.  
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA SWITCH</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>456 KC I.F.</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
</tr>
<tr>
<td>RANGE B 1720 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B [C8]</td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>600 KC (C7)</td>
</tr>
<tr>
<td>PERMEABILITY TUNING UNIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1100 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 1</td>
<td>Setting Screw No. 1</td>
<td>Antenna Coil No. 1</td>
</tr>
<tr>
<td>1100 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 2</td>
<td>Setting Screw No. 2</td>
<td>Antenna Coil No. 2</td>
</tr>
<tr>
<td>850 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 3</td>
<td>Setting Screw No. 3</td>
<td>Antenna Coil No. 3</td>
</tr>
<tr>
<td>850 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 4</td>
<td>Setting Screw No. 4</td>
<td>Antenna Coil No. 4</td>
</tr>
<tr>
<td>700 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 5</td>
<td>Setting Screw No. 5</td>
<td>Antenna Coil No. 5</td>
</tr>
<tr>
<td>700 KC</td>
<td>Antenna Lead 200 mf.</td>
<td>No. 6</td>
<td>Setting Screw No. 6</td>
<td>Antenna Coil No. 6</td>
</tr>
</tbody>
</table>

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.  
After each range is completed, repeat the procedure as a final check.  
**NOTE A**—If the pointer is not at 1500 KC on the dial, loosen the 2 clamps which hold the pointer assembly on the cord, move the pointer to the 1500 KC mark, and tighten the clamps.  
**NOTE B**—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.  
**NOTE C**—At the top of the permeability tuning unit can be seen six "W" openings. Insert the end of a pair of long nose pliers or a screwdriver in the "W" opening of the proper button and adjust the position of the antenna (rear) coil by twisting the pliers or screwdriver until maximum output is obtained.  
**CAUTION**—When aligning the short wave band be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 on the dial of the radio. The image signal, which is much weaker, will be heard at 15,000 less 912 KC, or 14,088 KC on the dial. It may be necessary to increase the input signal to hear the image.

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**MODEL A5 Series**

**Alignment, Trimmers**

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>50 Watts (At 117 volts 60 cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Output</td>
<td>1.0 Watts Undistorted</td>
</tr>
<tr>
<td></td>
<td>2.0 Watts Maximum</td>
</tr>
<tr>
<td>Selectivity</td>
<td>39 KC Broad at 1000 times Signal</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>B Range (Manual Tuning): 15 Microvolts Average</td>
</tr>
<tr>
<td></td>
<td>B Range (Automatic Tuning): 15 Microvolts Average</td>
</tr>
<tr>
<td></td>
<td>D Range: 25 Microvolts Average</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>456 KC</td>
</tr>
<tr>
<td>Speaker</td>
<td>6&quot; or 8&quot; Dynamic</td>
</tr>
<tr>
<td>Tuning Frequency Range</td>
<td>B Range (Manual Tuning): 528 to 1750 KC (Kilocycles)</td>
</tr>
<tr>
<td></td>
<td>D Range (Manual Tuning): 7500 to 18000 KC (Kilocycles)</td>
</tr>
<tr>
<td></td>
<td>Buttons 1 and 2 (Automatic Tuning): 880 to 18000 KC</td>
</tr>
<tr>
<td></td>
<td>Buttons 3 and 4 (Automatic Tuning): 850 to 12500 KC</td>
</tr>
<tr>
<td></td>
<td>Buttons 5 and 6 (Automatic Tuning): 820 to 9800 KC</td>
</tr>
</tbody>
</table>

**ALIGNMENT PROCEDURE**

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:

- An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output Indicating Meter—Non-Metallic Screwdriver.
- Dummy Antennas—1 mf., 200 mmf., and 400 ohms.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I.F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>456 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>1st I.F. (C14) &amp; (C17)</td>
</tr>
<tr>
<td></td>
<td>1730 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>2nd I.F. (C19) &amp; (C20)</td>
</tr>
<tr>
<td>RANGE B</td>
<td>1500 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C4)</td>
</tr>
<tr>
<td></td>
<td>600 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Ant. Range B (C4)</td>
</tr>
<tr>
<td>WAVE TRAP</td>
<td>456 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Wave Trap (C1)</td>
</tr>
<tr>
<td></td>
<td>18,000 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C7)</td>
</tr>
<tr>
<td></td>
<td>15,000 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>Ant. Range D (C3)</td>
</tr>
<tr>
<td>PERMEABILITY TUNING UNIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1100 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 1</td>
<td>Setting Screw No. 1</td>
<td>Antenna Coil No. 1</td>
</tr>
<tr>
<td></td>
<td>1100 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 2</td>
<td>Setting Screw No. 2</td>
<td>Antenna Coil No. 2</td>
</tr>
<tr>
<td></td>
<td>850 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 3</td>
<td>Setting Screw No. 3</td>
<td>Antenna Coil No. 3</td>
</tr>
<tr>
<td></td>
<td>850 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 4</td>
<td>Setting Screw No. 4</td>
<td>Antenna Coil No. 4</td>
</tr>
<tr>
<td></td>
<td>700 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 5</td>
<td>Setting Screw No. 5</td>
<td>Antenna Coil No. 5</td>
</tr>
<tr>
<td></td>
<td>700 KC</td>
<td>Grid of 1st Det.</td>
<td>.1 mf.</td>
<td>No. 6</td>
<td>Setting Screw No. 6</td>
<td>Antenna Coil No. 6</td>
</tr>
</tbody>
</table>

**ATTACHMENT**

- Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.
- After each range is completed, repeat the procedure as a final check.

**NOTE A—**If the pointer is not at 1500 KC on the dial, loosen the 2 clamps which hold the pointer assembly on the cord, move the pointer to the 1500 KC mark, and tighten the clamps.

**NOTE B—**Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

**NOTE C—**Leave condenser rotor at the 600 KC setting and adjust the signal generator until maximum output is obtained at or near 456 KC.

**NOTE D—**At the top of the permeability tuning unit can be seen six "W" openings. Insert the end of a pair of long nose pliers or a screwdriver in the "W" opening of the proper button and adjust the position of the antenna (rear) coil by twisting the pliers or screwdriver until maximum output is obtained.

**ATTENTION—**When aligning the short wave bands be sure NOT to adjust at the image frequency. This can be checked as follows: Let us say the signal generator is set for 15,000 KC. The signal will then be heard at 15,000 KC or 912 KC, or 14,080 KC on the dial. It may be necessary to increase the input signal to hear the image.
ALIGNMENT

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.

After each range is completed, repeat the procedure as a final check.

NOTE A—Hold the tuning knob and turn the film drum until it is at the 1500 KC mark on the dial.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

NOTE C—At the bottom of the permeability tuning unit can be seen six "W" openings. Insert the end of a pair of long nose pliers or a screwdriver in the "W" opening of the proper button and adjust the position of the antenna (rear) coil by twisting the pliers or screwdriver until maximum output is
CAUTION—When aligning the short wave bands, be sure NOT to adjust at the image frequency. This can be checked as follows:

1. TUNES HAVE ONLY TWO POSITIONS.
2. SHOWS ALL SWITCHES IN NORMAL (BUTTON OUT) & ON-OFF BUTTON 4.
3. ON-OFF SWITCH
4. MASTER SECTION OF SWITCH OPERATES WITH B.C. OR D.SECT.
5. OSC M
6. ANT M
7. INT M
8. OSC M
9. ANT M
10. INT M
11. OSC M
12. ANT M
13. INT M
14. OSC M
15. INT D
16. OSC D
17. INT D
18. OSC D
19. INT D
20. OSC D
21. BAND SWITCH BUTTONS
22. VIEW FROM BOTTOM FRONT OF CHASSIS

Let us say the signal generator is set for 5000 KC. The signal will then be heard at 5000 KC on the dial of the radio. The image signal, which is much weaker, will be heard at 5000 less 912 KC, or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.

NOTICE—Realignment is necessary if glass tubes are replaced by their equivalent in metal tubes, or vice versa, in the R.F. and I.F. stages.
Movie Dial Adjustments and General Service Data

Adjusting Height of Image on Screen

The image height should be so adjusted that the completed image reaches the bottom of the film drum, and each band will be centered on the screen.

To adjust the image height:
- Depress the B band signal button (B) on the screen, lower the trimmer, and raise the height of the image until it is centered.
- Depress the B band signal button (B) on the screen, lower the trimmer, and raise the height of the image until it is centered.

Calibrating the Radio

1. Hold the tuning knob in position and turn the dial until it is at the correct position on the dial scale. Care should be taken not to turn the dial beyond the correct position.
2. Hold the tuning knob in position and turn the dial until it is at the correct position on the dial scale. Care should be taken not to turn the dial beyond the correct position.
3. Hold the tuning knob in position and turn the dial until it is at the correct position on the dial scale. Care should be taken not to turn the dial beyond the correct position.

Early Models—Some of the early production models employed a film drum pulley set screw (Fig. 6) and turn the drum further until it is at the correct position. Then tighten this set screw.
SPECTIFICATIONS

Power Consumption: 65 Watts (A: 117 volts 50 cycles)
Power Output: 40 Watts Maximum
Selectivity: 40 KC Band at 1000 times Signal
Intermediate Frequency: 456 KC
Speaker: 8" or 10" Dynamic

Tuning Frequency Range

B Range: 520 to 1700 KC (Microcycles)
D Range: 8700 to 18000 KC (Microcycles)

Sensitivity (For 0.5 watt output)
B Range: 45 Microvolts Average
D Range: 45 Microvolts Average

The voltages at sockets are shown on the schematic circuit diagram. Unless otherwise specified, the voltage indicated is between the socket terminal and ground. These voltages are read under the following conditions:

Line Voltage: 117 Volts
Volume Control: Maximum
Antenna: Shorted to Ground
Readings taken with 1000 ohm per volt meter.
Setting a Station Button

Select a station from the list you have prepared, preferably the station with the highest kilocycle number, and tune in this station with the tuning knob in the usual way. Determine what program is being broadcast.

At each side of the escutcheon plate is an escutcheon screw—See Fig. 2. Remove the escutcheon plate by unscrewing these two screws. Be careful to avoid scratching the plate. Once this is done, the setting screws above the six buttons will be exposed.

Turn the band switch knob to the PUSH BUTTON TUNING position —See Fig. 2. The station tuned in previously will probably disappear.

If the kilocycle number of the station tuned in is within the range of button No. 1, push this button in.

The same station or a different station may be heard.

With a small screwdriver, slowly turn the setting screw above button No. 1 in or out until the desired station (the one previously tuned in) is heard. Turning the screw in (clockwise) will tune in stations with higher kilocycle numbers while turning the screw out (counter-clockwise) will tune in stations with lower kilocycle numbers. Be sure not to tune in any other station broadcasting the same program. Using the tuning eye as a guide, accurately tune in the station. The station may be heard.

To determine whether the correct station has been set, turn the band switch knob back to the BROADCAST position. The same station should be heard (provided the tuning knob has not been turned). If it is not, turn the band switch knob to the PUSH BUTTON TUNING position again and retry with the setting screw.

Remove the station call letter tab from the sheet provided and push the tab all the way to the bottom of the rectangular space above the correct station column in the escutcheon plate. Then cover the call letter tab with one of the clear celluloid tabs.

Proceed in the same manner to set stations on any of the remaining buttons. Use blank tabs above buttons on which stations were not set.

After all of the stations have been satisfactorily replaced the escutcheon plate.

If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the settings of any other button will not affect the setting of any of the other buttons. The old call letter tab may be removed by scraping it off the tab in the celluloid tab and through the call letter tab.

WG SERIES A20 ALIGNMENT, DRIVE CORD DATA, PHONOGRAPH NOTES.

ALIGNMENT PROCEDURE

The following equipment is required for aligning:

An All Wave Signal Generator which will provide accurately calibrated frequency at test frequencies as listed.

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes. IMPORTANT—Follow procedure in the order shown.

FREQUENCY OF SIGNAL GENERATOR | CONNECTION AT RADIO | SIGNAL GENERATOR | BAND SWITCH SETTING | CONDENSER SETTING | ADJUST TRANSMITTER TO MAXIMUM
--- | --- | --- | --- | --- | ---
500 KC | Grid of 1st Stage | mA | 1.0 B Range | Tuner to Full Open | Grid Setting of C6 and C17
WAVE TRAP | 500 KC | Antenna Lead | 200 mill. | B Range | 10 KC
RANGE B | 750 KC | Antenna Lead | 300 mill. | B Range | Tuner to Full Open
RANGE D | 10,000 KC | antenna Lead | 600 Ohm | D Range | Tuner to Full Open

Adjust transmitter to maximum (unless otherwise specified).

NOTE B—In case of improper lead-off, adjust the receiver until the peak of greatest intensity is obtained.

CAUTION—When aligning the short wave bands, be sure NOT to adjust the frequency of the short wave bands. The signal will then be heard at 10,000 KC on the dial of the receiver. The signal, which is not audible, will be heard at 10,000 KC on the 1212 KC mark. It may be necessary to increase the signal level to hear the signal.

Dial Pointer Alignment—Turn to the station in the band with the frequency. Move the pointer to this frequency on the dial scale. Clamp pointer tightly over the dial scale—See Fig. 4.

Photograph Connections

Photograph connections are made as shown in the schematic diagram—See Fig. 3. On the back panel of the chassis base is a 1\(\frac{1}{4}\) inch die-cut 1-9/16 inches in diameter. An area base socket is mounted in this knockout opening still wired as shown in the schematic.

A photosensitive cell assembly may then be placed in the socket (See photograph). On one end of this cable is an octal plug and on the other end is a phonograph-radio switch and double tip jack.
ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>SWITCH SETTINGS</th>
<th>CONDENSER OR DIAL SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>Grid of Ist Det.</td>
<td>1/2 in.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>2nd I.P. (C14) &amp; (C17)</td>
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<tr>
<td>WAVE TRAP</td>
<td>Antenna Lead</td>
<td>200 mil.</td>
<td>B Range</td>
<td>600 KC</td>
<td>Wave Trap (C9)</td>
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<tr>
<td>RANGE B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust for Maximum Output</td>
</tr>
<tr>
<td>1500 KC</td>
<td>Antenna Lead</td>
<td>200 mil.</td>
<td>B Range</td>
<td>Turn Rotor until dial point is at 1500 KC</td>
<td>Choke Filter Range 8 (C11)</td>
</tr>
<tr>
<td>1500 KC</td>
<td>Antenna Lead</td>
<td>200 mil.</td>
<td>B Range</td>
<td>Leave Rotor at above setting</td>
<td>Ant. Range B (C3)</td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>200 mil.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>600 KC (C9)</td>
</tr>
<tr>
<td>RANGE D</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Choke Filter Range 0 (C8)</td>
</tr>
<tr>
<td>15,000 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range D (C1)</td>
</tr>
</tbody>
</table>

NOTE—The low frequency and high end of the left side of the chart were marked under the “L” of the number 10 and to the right of the “C” of the letters KC. If the pointer is not at this mark on the dial, move the pointer to this mark.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

NOTE C—The signal from the signal generator is prevented from the effect of the AVC. After each range is completed, repeat the procedure as a final check.

CAUTION—When adjusting the high-frequency signal, be sure to adjust the AVC to avoid adjusting the signal generator. This can be achieved by following:
- Let the signal generator be set for 15,000 KC. The signal will be heard at 15,000 KC on the dial of the radio. The signal should be weakened, and then be increased at 15,000 to 972 KC, or 14,000 KC, on the dial. It may be necessary to increase the equal signal to hear the image.

General Service Data

Drive Cord Replacement

Tie a knot with a small loop at one end of the new drive cord. Tie the other end to the tension spring, leaving a distance of 64½ inches between the knots.

Pass the cord through slot B and guide the cord in the groove of the drive drum, turn the gang condenser to the full open position. Hold the cord in slot B and turn the gang condenser to the completely closed position. Unhook the cord from slot A and pass over pulley C, D, and E as shown. Pass the cord in front of idler pulley F. Wind 2½ turns counter-clockwise (from front of chassis) around the drive shaft-spool, pressing away from the chassis. Pass cord up and over the drive drum. Guiding the gang in the groove of the drive drum, turn the gang condenser to the full open position. If necessary, stretch the spring and pull the drive cord taut. Pass drive cord through slot D and secure the loop to the tension spring at point A.

EARLY MODELS—In the early models using a larger drive shaft spool (See Fig. 4), there should be a distance of 6½ inches between the knots.

DIAL POINTER ATTACHMENT—Tune in a station of known frequency. Move the pointer to the approximate frequency on the dial scale. Pass the cord through the slotted head—See Fig. 4. Hold the drive cord and slide the pointer to the exact frequency on the dial scale.

Rock and Pinion Assembly

If it is necessary to reassemble the automatic tuning unit, proceed as follows:
- The pinion gear shaft should be brought into a position that the flat portion is vertical or turned slightly counter-clockwise from the vertical as shown in Fig. 3.
- The lower rack should then be lined up with the lower rack and meshed with the pinion gear. The 8th tooth from the front on each side of the upper rack will then line up with the axis of the pinion gear shaft.
- The rear and side brackets can be then mounted on the rack and pinion assembly.

Fig. 1—Drive Cord Replacement

Fig. 2—Location of Numbers

Fig. 3—Rock and Pinion Assembly
DOUBLET ANTENNA CONNECTS TO "D" & "A". SINGLE-WIRE ANTENNA TO "A", LINE "D" TO "G". GROUND-WIRE TO "G".

Part No. 4728

Power Supply: Unless specifically stated otherwise, all these receivers are designed to operate on 115 Volts 60 Cycles Alternating Current Only.

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INSTRUCTIONS FOR ADJUSTMENT AND OPERATION OF THE ELECTRIC AUTOMATIC TUNING SYSTEM

Before attempting to adjust the automatic tuner, read the following instructions carefully and proceed exactly as directed. Setting up the Master Selector requires no tools, and is very easily accomplished when the proper procedure is followed.

Assembling the Tuning Unit: The tuning unit consists of three parts which may be described briefly as follows:

1. Master Selector: This includes the Selector Drum, the Selector Pins, and the Selector Light. These parts are mounted on the rear of the variable condenser, together with their associated brackets and wiring.

2. Tuning Unit: This assembly consists of an induction motor having a mechanical drive clutch with magnetic release, and a pair of gears operating directly on the Master Selector drive shaft. No oiling is necessary.

3. Push Button Assembly: These buttons are located on the front of the chassis, and extend through the recessed slots above the dial. They are actuated by the button with the call of the desired station depressed and held down until the motor stops and the station is heard. When the button is pushed in, an automatic alphanumerical encoder is actuated until the desired station is exactly on tune.

SETTING UP THE MASTER SELECTOR

As a means of simplifying these operations, list ten of your favorite local or strong near-by stations according to frequency or position on the dial. Setting up weak or distant stations is not recommended. Call the station on the opposite hand end of the dial (No. 1 station), and mark the position of this station similarly going from left to right across the dial. For example, assume that your favorite stations operate on frequency 660 kc. 760 kc. 860 kc. 960 kc. 1000 kc. 1100 kc. 1200 kc. 1300 kc. 1400 kc. and 1500 kc. Then the 660 kc. station would be No. 1, the 760 kc. station would be No. 2, and so on down the list with the 1500 kc. station being designated No. 10. Reference to the push button is necessary once they are used until After the Master Selector has been set up.

On the back of the receiver will be found the Selector Drum and the ten Contact Pins which determine the points at which the tuner will stop when the buttons are pressed. Refer to the diagram. Fig. 1 shows the general layout and relation of the drum and contacts. Fig. 2 shows one of the contact pins in detail. Note that while the position of the contact may be varied as desired by sliding it along the slot in the bracket, it is held securely by a spring which will not allow it to move when the selector drum turns under it. Fig. 3 shows the arrangement of the Contact Pins, each pin being numbered according to the system described for numbering the stations, thus pin No. 1 will be used for Station No. 1, pin No. 2 will be used for Station No. 2, and so on down the list.

On the Selector Drum are two pairs of Contact Ribbons. Note that there is a Point Dot on the edge of the drum directly opposite the break in the ribbons on the upper half of the drum. This Point Dot is for the purpose of locating the approximate position at which a given Contact Pin should be set in order to have the Drum stop for a particular station.

It is very important that the following steps be followed exactly as outlined; any deviation may necessitate re-setting some of the stations.

1. Set the receiver to the function of Standard Broadcast Stations as outlined previously under "Operation." Turn the Master Control Switch to the extreme right hand position and wait about ten minutes to allow the tubes to reach their final operating temperature.

2. Using the Master Selector (upper right) knob, turn in the No. 1 station, that is, the one nearest the 660 kc. end of the dial. Watch the tuning eye closely, making certain that the station is tuned in perfectly.

3. Face the rear of the chassis. Attach the lead from the Selector Light to the No. 1 Contact Pin; then the lamp will light when the lead is touched to the pin.

4. Observe the position of the Point Dot on the edge of the Drum. Grasp the No. 1 pin firmly and slide it toward the Point Dot, being careful not to break the connection between the Selector Light lead and the pin. When the pin is directly opposite the Point Dot, the light will go out, indicating that the contact is properly set. To obtain greater accuracy in making the setting, slide the pin back and forth across the break between the ribbons, leaving it set half way between the points where the lamp lights. After several trials, no doubt the alignment of the Master Selector should be set as near the middle of the drum as possible.

5. Repeat the above procedure for the No. 2 station; turn in the station connect the Selector Light lead to the No. 2 contact pin, and slide the pin opposite the Point Dot until the light goes out. Then Disconnect the Selector Light Lead from the pin.

6. Using similar procedure, set up the other eight stations in each case using the Contact Pin being the same number as that assigned to the station being set up. Always Disconnect the Selector Light Lead as soon as a station has been set up; failure to do so will cause the receiver to hum, and may result in the lamp being burned out.

7. After all the stations have been set up, locate the Call Letters of your stations on the printed sheets supplied with the receiver. Remove the desired call letter from the sheets. Remove the nearest terminal from the terminals, place the call letter from behind the call label and press the terminal back on the proper button.

8. The only operation necessary to receive any of the ten stations is as outlived above: Turn the Master Control Switch to the position of the desired station, allowing about one minute for the tubes to heat, press the button with the call letters of the desired station holding the Button Down until the pointer stops moving, and the station is heard. Never change the tone and volume. Be sure that the Band Selector switch is in the proper position for reception of Standard Broadcast stations.

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WESTERN AUTO SUPPLY CO.

ALIGMENT OF SHORT-WAVE BANDS ON NEXT PAGE

ALIGMENT OF SHORT-WAVE BANDS ON NEXT PAGE

FREQUENCY RANGES
B - 540-1600 KC
P - 1650-5400 KC
F - 5400-16000 KC

TRUETONE PAGE 10

MODEL D691
Schematic, Socket Trimmers Alignment

IF. Connect generator across grid of 6AG7 tube and apply signal to grid of 6A7 tube. Use 200 mA condenser in each arm of the generator. Replace IF transformers if needed. Be sure condenser is in correct position for alignment. (See diagram for location of condenser.)

RF. Set generator frequency 9400 Kc, then return to 300 Kc and adjust the RF condenser to give proper oscillation. The tuning condenser should be turned back and forth to check tuning condition. The tuning condenser should be turned back and forth to check tuning condition. The tuning condenser should be turned back and forth to check tuning condition.

UNLESS SPECIFICALLY STATED OTHERWISE, THESE RECEIVERS ARE DESIGNED TO OPERATE ON 115 VOLTS 60 CYCLES ALTERNATING CURRENT ONLY.
ALIGNMENT OF SHORT-WAVE BANDS

A 400 ohm resistor must be used in series with the generator as a "dummy" antenna for proper alignment of the two short-wave bands. Set the band selector switch in the center position, adjust the oscillator top frequency for 2400 kc, then align the antenna trimmer at about 5000 kc. With the band selector in the extreme right position, adjust the top frequency of the high frequency band to 16,000 kc, and align the antenna trimmer at about 15,000 kc. In order to make sure that the top end of the last band is not properly, it is best to screw the oscillator trimmer down tight, then unscrew to the second peak. The antenna trimmer should be unscrewed past the second peak, then rescrewed to the first peak. This procedure must be followed in order that the oscillator and RF circuits will be set in the correct position to each other, otherwise a "shunt" spot at a lower frequency will result, and the dial calibration will not be correct. Usually, it is best to rock the tuning condenser back and forth slightly while making these adjustments at high frequencies.

OPERATING SUGGESTIONS

The following should be observed when the receiver is in use:

1. Keep the receiver in a cool place. Heat will cause the transistors to degenerate.
2. Keep the receiver clean. Do not use strong solvents to clean the receiver. Use a soft, dry cloth.
3. Keep the receiver away from strong magnetic fields. Magnetic fields can cause static and reception.
4. Keep the receiver away from strong electric fields. Electric fields can cause static and reception.
5. Keep the receiver away from strong light fields. Light fields can cause static and reception.
6. Keep the receiver away from strong sound fields. Sound fields can cause static and reception.
7. Keep the receiver away from strong electrical fields. Electrical fields can cause static and reception.
8. Keep the receiver away from strong chemical fields. Chemical fields can cause static and reception.
9. Keep the receiver away from strong biological fields. Biological fields can cause static and reception.
10. Keep the receiver away from strong gravitational fields. Gravitational fields can cause static and reception.

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**Western Auto Supply Co.**

TRUETONE PAGE 10

**Model D692, Early Schematic**

**Tubes**

1. 6K7 Radio frequency amplifier
2. 6K7 Oscillator—translator
3. 6K7 Intermediate frequency amplifier
4. 6H6 Detector—automatic volume control
5. 6C5 First audio amplifier
6. 6G5 Cathode ray tuning tube (on models equipped with "eye" tuning indicator)
7. 76 Driver
8. 42 Power output
9. 80 Rectifier

**IF PEAK 456 KC**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>3814</td>
<td>9-400 mmf Variable</td>
</tr>
<tr>
<td>C2.34</td>
<td>3822</td>
<td>2.35 triple trimmer</td>
</tr>
<tr>
<td>C5.6.7</td>
<td>3822</td>
<td>2.35 triple trimmer</td>
</tr>
<tr>
<td>C8.9.10</td>
<td>3822</td>
<td>2.35 triple trimmer</td>
</tr>
<tr>
<td>C11.21.34</td>
<td>577</td>
<td>.1—200 V.</td>
</tr>
<tr>
<td>C1.14</td>
<td>580</td>
<td>.05 200 V.</td>
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<td>C1.3</td>
<td>575</td>
<td>1.400 V.</td>
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<td>C15.24</td>
<td>2780</td>
<td>50 mmf mica</td>
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<tr>
<td>C16</td>
<td>568</td>
<td>.01 400 V.</td>
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<tr>
<td>C17</td>
<td>2694</td>
<td>.005 5% tolerance</td>
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<td>C18</td>
<td>2741</td>
<td>1330 mmf 5% tolerance</td>
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<td>C19</td>
<td>2560</td>
<td>350 mmf variable pad</td>
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<td>C20.22</td>
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<td>C25.28</td>
<td>2385</td>
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<td>.003 600 V.</td>
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<td>C27</td>
<td>824</td>
<td>.002 600 V.</td>
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<td>C29</td>
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<td>C30</td>
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<td>250 mmf mica</td>
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<td>579</td>
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<td>.001 800 V.</td>
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<td>C39</td>
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<td>3136</td>
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<td>C41</td>
<td>3112</td>
<td>16 MF 450 V.</td>
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<tr>
<td>C42</td>
<td>3111</td>
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<td>603</td>
<td>100 M 1/3 W.</td>
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<td>631</td>
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<td>R7</td>
<td>3790</td>
<td>2 meg tone control</td>
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<td>R9.23</td>
<td>617</td>
<td>20 M 1/3 W.</td>
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<td>R10</td>
<td>3800</td>
<td>3 meg volume control</td>
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<td>624</td>
<td>1 meg 1/3 W.</td>
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<tr>
<td>R19</td>
<td>2731</td>
<td>500 M 1/3 W. 10%</td>
</tr>
<tr>
<td>R22</td>
<td>2421</td>
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<tr>
<td>R24</td>
<td>3805</td>
<td>7 M 3.5 W.</td>
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<td>R25</td>
<td>3805</td>
<td>8 M 1.5 W.</td>
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<td>R27</td>
<td>3809</td>
<td>100 ohms 2 W. 10%</td>
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<td>3806</td>
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<td>3808</td>
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<td>3870</td>
<td>15 ohms .5 W. 10%</td>
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<td>3798</td>
<td>No. 2 IF transformer</td>
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<td>12&quot; Speaker</td>
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<td>Idler spring</td>
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<td>R3831</td>
<td>3831</td>
<td>Minute pointer</td>
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<td>R3832</td>
<td>3832</td>
<td>Tuning pointer</td>
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<td>R3802</td>
<td>3802</td>
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<td>3818</td>
<td>RF and Antenna switch</td>
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<tr>
<td>R3819</td>
<td>3819</td>
<td>Oscillator switch</td>
</tr>
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</table>

**Notes:**

- All resistors are 1/4 watt unless otherwise specified.
- Capacitors are non-polarized, except for electrolytic types.
- Inductors are inductors unless otherwise specified.
**MODEL D-692 (EARLY)**  
**TUBE LAYOUT and CONNECTION DIAGRAM**

- **ANTENNA & GROUND TERMINALS**  
- **SPEAKER TERMINALS**  
- **SPEAKER SOCKET**  
- **POWER CORD**

Connect a high impedance AC voltmeter across the loudspeaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from the generator, strong signals tend to cause improper adjustments.

Be sure that the fidelity control is in its LOW position. It will not be possible to properly align the receiver unless this control is turned part way toward its "Low" position.

RF. Connect the generator ground to receiver chassis. Using a 3,300 µfd. capacitor in series with high side of generator, apply 455 kc. signal to grid of the 6AK7 IF amplifier tube and allow second IF transformer trimmer. Repeat for first IF transformer, applying signal to grid of the 6AJ7 tube. (See above diagram for location of tubes and transformers.)

A 400 ohm resistor must be used in series with the generator as a "dummy" antenna for proper alignment of the two short wave bands. Set the band selector switch in the center position, adjust the oscillator top frequency for 1500 kc., then allow the antenna and RF trimmers at about 6200 kc. With the band selector in the extreme right position, adjust the top frequency of the high frequency to 16,100 kc., and allow the antenna and RF trimmers at about 6200 kc. In order to make sure that the top end of the last band is set properly, it is best to screw the oscillator trimmer down tight, then unscrew to the second peak. The antenna and RF trimmers should be screwed down tight, then unscrewed to the first peak. This procedure must be followed in order that the oscillator and RF circuits will be set in the correct relation to each other, otherwise a "dead" spot at a lower frequency will result and the dial calibration will not be correct. Usually it is best to rock the tuning condenser back and forth slightly while making these adjustments at high frequencies.

**MODEL D-694**  
**TUBE LAYER and CONNECTION DIAGRAM**

- **ANTENNA & GROUND TERMINALS**  
- **SPEAKER TERMINALS**  
- **SPEAKER SOCKET**  
- **POWER CORD**

Connect a high impedance AC voltmeter across the loudspeaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from the generator, strong signals tend to cause improper adjustments.

Be sure that the fidelity control is in its LOW position. It will not be possible to properly align the receiver unless this control is turned part way toward its "Low" position.

RF. Connect the generator ground to receiver chassis. Using a 3,300 µfd. capacitor in series with high side of generator, apply 455 kc. signal to grid of the 6K7 second IF amplifier and first transformer No. 3. Repeat for transformer No. 2, applying signal to grid of 6AK7 second IF amplifier. Repeat for transformer No. 1.  

A 400 ohm resistor must be used in series with the generator as a "dummy" antenna for proper alignment of the two short wave bands. Set the band selector switch in the center position, adjust the oscillator top frequency for 1500 kc., then allow the antenna and RF trimmers at about 6200 kc. With the band selector in the extreme right position, adjust the top frequency of the high frequency to 16,100 kc., and allow the antenna and RF trimmers at about 6200 kc. In order to make sure that the top end of the last band is set properly, it is best to screw the oscillator trimmer down tight, then unscrew to the second peak. The antenna and RF trimmers should be screwed down tight, then unscrewed to the first peak. This procedure must be followed in order that the oscillator and RF circuits will be set in the correct relation to each other, otherwise a "dead" spot at a lower frequency will result and the dial calibration will not be correct. Usually it is best to rock the tuning condenser back and forth slightly while making these adjustments at high frequencies.
ALIGNMENT PROCEDURE

Connect a high impedance AC voltmeter across the loudspeaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from the generator, strong signals tend to cause improper adjustments.

Be sure that the fidelity control is NOT in the HIGH FIDELITY position. It is not possible to properly align the receiver unless this control is turned part way toward its "bas" position.

IF. Connect the generator ground to receiver chassis. Using .1 mfd capacitor in series with high side of generator, apply 456 kc signal to grid of 6D6 second IF amplifier and align transformer No. 3. Repeat for transformer No. 2, applying signal to grid of 6D6 first IF amplifier. Repeat for transformer No. 1, applying signal to grid of 6A7 transistors. (See above diagram for location of tubes and transformers.)

RF. (See circuit diagram for location of trimmers.) Using a 200 mfd. capacitor in series with the high side of the generator, turn band selector switch all the way to the left, tuning condenser to minimum capacity, feed 1810 kc. signal to antenna terminal and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at some point around 1500-1600 kc., and adjust broadcast antenna and RF trimmers. Set generator for 600 kc., tune receiver to signal and adjust the padder. The tuning condenser should be rocked back and forth through the signal while varying the padder in order to assure perfect alignment.

A 400 ohm resistor must be used in series with the generator as a "dummy" antenna for proper alignment of the two short wave bands. Set the band selector switch in the center position, adjust the oscillator top frequency for 6250 kc., then align the antenna and RF trimmers at about 5000 kc. With the band selector in the extreme right position, adjust the top frequency of the high frequency to 16.100 kc., and align the antenna and RF trimmers at about 16.000 kc. In order to make sure that the top end of the last band is set properly; it is best to screw the oscillator trimmer down tight, then unscrew to the second peak. The antenna and RF trimmers should be screwed down tight, then unscrewed to the first peak. This procedure must be followed in order that the oscillator and RF circuits will be set in the correct relation to each other, otherwise a "dead" spot at a lower frequency will result, and the dial calibration will not be correct. Usually, it is best toock the tuning condenser back and forth slightly while making these adjustments at high frequencies.
Tubes must be in proper position and connected as shown.

Tubes required are:
1—76 Radio Frequency Amplifier
1—6D6 Intermediate Frequency Amplifier
2—6067 Oscillator-Translator
1—76 Automatic Bias Control
1—75 Detector AVC—First Audio Amplifier
1—6G5 Cathode Ray Tuning Tube (on models equipped with "eye" tuning indicator)

Do not use tubes of types different from those shown above. When replacing tubes or checking connections, refer to the TUBE LAYOUT CHART.

Connections

Turn the lower right knob to the left as far as it will go. This turns the power switch "off."

Connect the antenna and ground leads to the receiver as shown on the diagrams below. For use with a single wire antenna, connect as shown on Figure 1. If used with a doublet antenna, connect according to Figure 2.
Tubes

1—6K7G Radio frequency Amplifier
1—6A7 Oscillator—Translating
2—6K7G Intermediate frequency Amplifiers
1—6H6G Detector—AVB—Bias control
1—6G5 Cathode ray tuning tube (on models equipped with "eye" tuning indicator)

Model D694

FOR ALIGNMENT SEE INDEX

Symbol  Part No.  Description  Symbol  Part No.  Description
---  ---  ---  ---  ---  ---
C1  3814  9-400 mmf variable  R13,20,25  2568  300 M 1/3 W.
C2,3,4  3822  2-35 triple trimmer  R13,33  617  20 M 1/3 W.
C5,6,7  3822  2-35 triple trimmer  R14  624  1 meg 1/3 W.
C8,9,10  3822  2-35 triple trimmer  R15  614  5 M 1/3 W.
C11,12,14,46  572  .1 200V.  R17  2731  500 M 10% 1/3 W.
C13  580  .05 200V.  R18  2880  200 M 10% 1/3 W.
C14  575  .1 400V.  R20  4068  300 ohm 10% 3 W flex.
C15,25  2780  50 mmf mica  R27  4068  300 ohm 10% 3 W flex.
C16  2694  .005 5% tolerance  R28  4069  200 ohm 10% 2 W flex.
C17  2741  1330 mmf 5% tolerance  R29  3801  2 M variable
C18  2750  350 mmf variable paddler  R30  639  750 ohm 1/3 W.
C19,24  568  01 400V.  R31  3805  8 M 1.5 W.
C20,21,22  563  .05 400V.  R32  3805  7 M 3.5 W.
C26  2695  .003 600V.  R35  4070  100 ohm 10% 3 W flex.
C27  2695  .003 600V.  R38  4058  Power transformer
C28,33  376  002-200V.  R39  4061  No. 1 IF transformer
C29  824  002 600V.  R40  4060  No. 2 IF transformer
C30  4072  .03 200V.  R41  3968  No. 3 IF transformer
C31  1286  250 mmf mica  2981  Tuning tube cable
C32,34,35,36  2600  .02 600V.  4082  12" Dynamic speaker
C37,38  3138  .001 800V.  4079  12" P.M. speaker
C39,42  4071  20 MF 35 W.V.  2899  Tuning tube clamp
C40  3079  8 MF 150V.  3815  RF coil
C41  4062  30-MF 275V Reg.  3943  Oscillator coil
C44  3112  16 MF 450V.  3817  Antenna coil
C45  3111  16 MF 500V.  3825  Planetary drive
C14  3115  .003 800V.  3825  Drive belt
R1,4,8,16,19,22,24  603  100 M 1/3 W.  3198  Idler pulley
R2,3  631  50 M 1/3 W.  3199  Idler spring
R5,6,34  2421  1 M 1/3 W.  3831  Minute pointer
R7,23  615  500 M 1/3 W.  3832  Tuning pointer
R9  2693  2 meg 1/3 W.  3802  On-off switch
R10  3799  2 meg tone control  3818  RF and antenna switch
R11  3800  3 meg volume control  3819  Oscillator switch
For replacement purposes use a 5246 Rectifier tube in place of the 524MG rectifier.
Range C Adjustment

CAUTION—When aligning the short wave bands be sure to N/C at the range 900 KC. The signal generator must be held at 900 KC on the dial of the receiver. The signal, which is much weaker, will be held at 1000 or 1200 KC. It is necessary to increase the signal input to the receiver.

5000 KC Adjustment

Set the signal generator for 5000 KC. Connect the lower end of the receiver to the input of the signal generator. Rotate the trimmer and the range C position to the full open position. Turn the switch to the range C position (four short wave bands). Adjust the oscillator Range C trimmer (C18) until maximum output is obtained. See Fig. 3 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC. Turn the rotor of the tuning condenser until maximum output is obtained. Adjust the 1st and 2nd interstage Range C trimmers (C7 and C10) and second interstage Range C trimmer (C8) to maximum. Do not change the setting of the oscillator Range C trimmer (C18).

18,300 KC Adjustment

Set the signal generator for 18,300 KC. Keep the antenna lead of the receiver connected to the output of the signal generator. Turn the rotor of the tuning condenser until maximum output is obtained. Do not change the setting of the oscillator Range C trimmer (C18).

6000 KC Adjustment

Set the signal generator for 6000 KC. Turn the rotor of the tuning condenser until maximum output is obtained. Adjust the 1st and 2nd interstage Range C trimmers (C7 and C10) and second interstage Range C trimmer (C8) to maximum. Do not change the setting of the oscillator Range C trimmer (C18).

Planetary Drive Assembly

The planetary assembly is the unit that is integral with the tuning shaft. The planetary is seated on the rear end of the tuning shaft. If the drive turns counterclockwise, the planetary is in its normal position, and if the drive turns clockwise, the planetary is in its reverse position.

Phonograph Connections

Phonograph connections can be made as shown in Fig. 7. The phonograph should be mounted with one set of terminals to the left, the other set to the right. Knobs are provided in the rear of the chassis for connecting the turntable and phonograph on the rear panel. Connect the output from the turntable and phonograph on the rear panel. Connect the output from the turntable and phonograph on the rear panel.

Four-Stage Cycle Models

The phonograph should be mounted with one set of terminals to the left, the other set to the right. Knobs are provided in the rear of the chassis for connecting the turntable and phonograph on the rear panel. Connect the output from the turntable and phonograph on the rear panel. Connect the output from the turntable and phonograph on the rear panel.
ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.
- A line, 200 mfd, and 400 ohms.
- Dummy Antennas — 1 m, 200 mfd, and 400 ohms.

1. **Volume Control** — Maximum All Adjustments.
2. **Initial Condition** — Sharp Position All Adjustments.
3. **Connect Radio Chassis to Ground Post of Signal Generator with a**
   **Short Heavy Lead.**
4. **Align Chokes and Signal Generator to "Meet Up" for several minutes.**

<table>
<thead>
<tr>
<th>STEP</th>
<th>BEAND SWITCH SETTING</th>
<th>TRANSMITTER ADJUSTED</th>
<th>TRIMMERS ADJUSTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>F.B. Range 8</td>
<td>1 in.</td>
<td>150 ohms Grid of N.T.</td>
</tr>
<tr>
<td>2</td>
<td>F.B. Range 8</td>
<td>1 in.</td>
<td>150 ohms Grid of 1st L.C.</td>
</tr>
<tr>
<td>3.</td>
<td>RANGE B</td>
<td>150 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>4</td>
<td>RANGE B</td>
<td>150 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>5.</td>
<td>RANGE B</td>
<td>150 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>6.</td>
<td>RANGE C</td>
<td>450 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>7.</td>
<td>RANGE C</td>
<td>450 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>8.</td>
<td>RANGE D</td>
<td>2000 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>9.</td>
<td>RANGE D</td>
<td>2000 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>10.</td>
<td>RANGE D</td>
<td>2000 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>11.</td>
<td>RANGE D</td>
<td>2000 ohms</td>
<td>Antenna Lead</td>
</tr>
<tr>
<td>11.</td>
<td>RANGE D</td>
<td>2000 ohms</td>
<td>Antenna Lead</td>
</tr>
</tbody>
</table>

**NOTE** — Turn the rotor back and forth and adjust the trimmers until the peak of greatest intensity is obtained.

**CAUTION** — When aligning the short wave band, be sure to adjust the image frequency. This can be checked as follows: Let us say the signal generator is set for 1000 K.C. The signal of the oscillator will be heard at 5000 K.C. on the dial of the radio. The image signal, which is in much weaker, will be heard at 5000 plus 112 K.C. or 4888 K.C. on the dial. It may be necessary to increase the output to hear the image.

**HINT** — Be sure to adjust the trimmers until the peak of greatest intensity is obtained.

**BACK OF COVER**

**Fig. 1—Location of Trimmers**

**Glass and Metal Tubes**

All of these tubes use 6XT6 metal tubes and 1770D and 6SA7 glass tubes. It is well to note the importance of the glass and metal tubes. The glass tube is used in the upper tube row above the metal tube. The metal tube is used in the lower tube row and is the output tube. The metal tube is also the input tube. The output tube is used in the lower tube row and is the output tube. The metal tube is used in the lower tube row and is the output tube.
Twenty-Five Cycle Models

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used.

The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true—the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

Phonograph Connections

Phonograph connections are made as shown in the schematic circuit diagram Fig. 2. On the front panel of the chassis base is a round knockout 1 3/4 inches in diameter. An octal base socket is mounted in this knockout opening and wired as shown in the schematic diagram. The speaker plug is connected to the 25-cycle power transformer and the 20-cycle line transformer. A phonograph recorder is inserted in this socket which must be removed if the phonograph installation is made—see Fig. 1.

117-214 Volt Power Transformers

Some models are equipped with a 117-234 volt 60 cycle power transformer. Connections as shown in Fig. 2 are completed to the octal socket mounted on the rear panel of the chassis. A plug which goes with this socket may then be inserted for either the 117 volt or 214 volt connection.

If one of these transformers is to be installed in a chassis equipped with a regular transformer, there is a 1 3/4 inch round knockout on the back panel which may be removed to permit installation of the octal socket mentioned above.

Dial and Drive Assembly

Complete information regarding the dial and drive assemblies will be found in the Dial and Drive Service Notes issued for this chassis (see Index).

Changes in Later Models

Later models of this series have the following changes incorporated in them:

On the first models, the 2nd J.P. coil was not expanded. In later models of this series, the extra inductance provided by the 2nd J.P. coil was not considered necessary. The coil used in the early models was not suitable for the new type coil used in the later models. Models with the letter "C" or any later model stamped on the chassis use the new type coil with the necessary coupling winding. Because of the change in coil connections, the selectivity switch used on the early model is not interchangeable with that on the later model.

When ordering parts, therefore, it is important that the latest letter on the chassis be noted and the correct part number as shown in the parts list be specified.

VOTAGES AT SOCKETS

Line Voltage: 117—Volume Control: Maximum
Readings taken with 1000 ohm 0-10 volt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>※A7</td>
<td>R.F.</td>
</tr>
<tr>
<td>※A8</td>
<td>1st Det.</td>
</tr>
<tr>
<td>※C17</td>
<td>2nd Det.</td>
</tr>
<tr>
<td>※C18</td>
<td>A.F.C.</td>
</tr>
<tr>
<td>※C19</td>
<td>L.F.</td>
</tr>
<tr>
<td>※C20</td>
<td>2nd A.F.C.</td>
</tr>
<tr>
<td>※C21</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C22</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C23</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C24</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C25</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C26</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C27</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C28</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C29</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C30</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C31</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C32</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C33</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C34</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C35</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C36</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C37</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C38</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C39</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C40</td>
<td>B.B.</td>
</tr>
<tr>
<td>※C41</td>
<td>A.C.</td>
</tr>
<tr>
<td>※C42</td>
<td>B.B.</td>
</tr>
</tbody>
</table>

Note—When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

MISCELLANEOUS

<table>
<thead>
<tr>
<th>Part</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>※A7A</td>
<td>1136</td>
<td>Tube Socket—6 J.P.</td>
</tr>
<tr>
<td>※C17A</td>
<td>1136</td>
<td>Tube Socket—6 J.P.</td>
</tr>
</tbody>
</table>

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RESISTORS

<table>
<thead>
<tr>
<th>Resistor Code</th>
<th>Wattage</th>
</tr>
</thead>
<tbody>
<tr>
<td>※A7A</td>
<td>1/4 W</td>
</tr>
<tr>
<td>※C17A</td>
<td>1/4 W</td>
</tr>
</tbody>
</table>

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When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

PHONO ATTACHMENT PARTS

<table>
<thead>
<tr>
<th>Part</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>※A7A</td>
<td>1136</td>
<td>Tube Socket—6 J.P.</td>
</tr>
<tr>
<td>※C17A</td>
<td>1136</td>
<td>Tube Socket—6 J.P.</td>
</tr>
</tbody>
</table>

When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.

When ordering parts for speakers, specify part number of speaker and letter preceding part number stamped on the speaker.
WESTERN AUTO SUPPLY CO.

Identification of Dial and Chassis

The following description will identify the different parts:

- No. 9 Dial—17 Button Telephone Dial—Station letter push button. Letters are rectangular in shape and mounted in rectangular slots in front panel.
- No. 11 Dial—Same as No. 9 Dial except push buttons are brown.
- No. 10 Dial—17 Button Telephone Dial—Station number push buttons. Letters are rectangular in shape and mounted in rectangular slots in front panel.
- No. 3 Dialed—All-Dialed Moving Beam of Light Indicators—Tone and volume indicator is controlled by series of circuits.
- No. 7 Dialed—All-Dialed Moving Beam of Light Indicators—Tone and volume indicator is controlled by sliding tone.

The following description will identify the chassis used with the above dials:

8 Tubo—D696
11 Tubo—D697

Telephone Dial Assembly

The telephone dial assembly provides a means of pre-setting a number of broadcasting stations and numbers in stations at any time by depressing a button and rotating the dial to a stop position.

The apparatus is mounted on an assembly at the extreme lower center of the chassis. An examination of this assembly will clearly show the method of operation.

Silencer Circuit—A silencer circuit is provided which connects between stations when using the telephone dial buttons. When a telephone dial button is depressed, the circuit is made between the ungrounded leads of the volume control and the chassis ground. Referring to Fig. 1, it will be noticed that contact is made between the line from the volume control, contact ring, contact washer arm (when button is depressed) and pulley ring stud. Since the pulley ring is as ground potential, this ground the silencer voltage and the signal will be heard until the button is released to break the contact.

It should be noted that the contact ring is part of the pulley ring assembly, but is insulated from it.

In the case of powerful local stations a slight humming current may be heard when the button is depressed.

Telephone Dial Adjustments

Noise When Tuning in a Signal with a Telephone Dial Button

As explained in the article on "Silencer Circuit" on this manual, no noise or signal should be heard when tuning in a signal with a telephone dial button until the button is released. If noise is heard while tuning in one of these buttons, it may be corrected as follows:

1. Noise Occurs on All Buttons—This is probably due to a poor contact between the flat contact spring and the contact ring—See Fig. 1. Clean the flat contact spring and contact ring to ensure a good electrical connection.

2. Noise Occurs on One Button Only—This is due to a poor contact between the pulley ring stud, spring, contact washer, and contact ring—See Fig. 1. Clean all of the parts of the particular button on the same manner as mentioned previously, so as to provide a good electrical connection.

Telephone Dial Drive Cord Slipping

If the telephone dial drive cord slips on the turning shaft pulley, this may be remedied by adjusting the drive cord tension pulley. Loosen the tension pulley bracket screw and adjust pulley assembly until the desired tension is obtained.

Position of Stop Pin

When the telephone dial assembly is on the chassis, the gang condenser rotor should not contact the pulley ring assembly when the stop pin is depressed or when the stop pin is released or when the stop pin is held or released.

On the No. 10 dial, two strips of celluloid bee between the condenser ring and the glass crystal and have to be removed.

To replace the pulley ring assembly, proceed as follows:

- Lay the assembly face down on a clean surface.
- Pull out the stop pin (Fig. 2) by sliding it in a direction away from the condenser. The stop pin (Fig. 2) may be pulled back and is adjustable to the center position.

- Rotate the condenser rotor counter-clockwise (from front) as far as possible—See Fig. 2.

Greasing and Oilling

After a period of time, put some light grease on the pulley ring shaft and in the teeth of the pulley ring. Use light oil on the drive shaft assembly—bearing, care being taken not to get any on the drive cord.

Telephone Dial Replacements

Replacing Complete Dial and Condenser Assembly

Remove the dial lead clip from the drive cord. Remove silencer tube from the condenser spring assembly. Unwind the dial lamp lead from terminal of tube socket. Unwind the three motor section connections of the condenser. Unwind the turntable lead wires which ground the condenser frame to the chassis, taking care not to loosen the connections of any other units which are grounded at common points. When the turntable is in the drive shaft assembly—bearing, care being taken not to get any on the drive cord.

Replacing Pulley Ring and Button Ring Assembly Only

Remove drive cord.

From underneath the chassis, unwind the dial lamp lead from terminal of tube socket. Pull the lead through and out to the front of the assembly.

Remove the tone—tuning—rubber cushions which hold the condenser ring and glass crystal in place. The condenser ring is removed by unscrewing it from the center stud. Loosen and remove center stud, washers, and dial scale. Slide pulley ring assembly of the center shaft.

On the No. 10 dial, two strips of celluloid bee between the condenser ring and the glass crystal and have to be removed.

To replace the pulley ring assembly, proceed as follows:

- Lay the assembly face down on a clean surface.
- Pull out the stop pin (Fig. 2) by sliding it in a direction away from the condenser. The stop pin (Fig. 2) may be pulled back and is adjustable to the center position.

Replacing Gears

After a great amount of use, one or both of the stop gears may wear, making it necessary to replace the stop gear assembly. This is done by first removing the pulley ring assembly as explained in the article "Replacing Pulley Ring and Button Ring Assembly Only."
ALIGNMENT PROCEDURE

**Volume Control—Maximum All Adjustments.**
**Selectivity Control—Final Position All Adjustments.**
Connect Radio Chassis to Ground Post of Signal Generator with a
30,000 Ohm Load.
Allow Chassis and Signal Generator to “Heat Up” for Several Minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>TRIMMERS ADJUSTED</th>
<th>PROCEEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800 KC</td>
<td>Range B</td>
<td>200 mili.</td>
</tr>
<tr>
<td>1800 KC</td>
<td>Range B</td>
<td>200 mili.</td>
</tr>
<tr>
<td>1800 KC</td>
<td>Range B</td>
<td>200 mili.</td>
</tr>
<tr>
<td>2000 KC</td>
<td>Range C</td>
<td>600 Ohm</td>
</tr>
</tbody>
</table>

**NOTE:**
- Turn the meter back and forth and adjust the trimmers until a peak of greatest intensity is obtained.

**CAUTION:**
When aligning the short wave bands, be sure the oscillator is not more than 12000 KC on the dial. The signal will then be heard at 12000 KC on the dial of the radio.
- If the signal is too loud, the oscillator will be heard at 12000 and 3000 KC on the dial of the radio. The signal will then be heard at 3000 KC on the dial of the radio.
- The signal will then be heard at 3000 KC on the dial of the radio. The signal will then be heard at 3000 KC on the dial of the radio.
- If the signal is too loud, the oscillator will be heard at 3000 KC on the dial of the radio. The signal will then be heard at 3000 KC on the dial of the radio.

**HINTS:**
- If all trimmers are replaced by their equivalent in metal tubes, or vice versa, in the B.F. and I.F. stages.

**Fig. 1—Location of Trimmers**

---

**VOLTAGES AT SOCKETS**

<table>
<thead>
<tr>
<th>SOCKET</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
<th>B.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**MODEL D390**

**Alignment, Voltage, Socket, Trimmers, Coils**

**WESTERN AUTO SUPPLY CO.**
Circuit

This model is a three band radio with a tuning range of 100,000 to 15,000 MHz. It is used as the starting point for the application of this circuit. The band switch is accompanied by two switches on R.F. and oscillator coils and a two-section switch in the first stage of the circuit.

Refer to the schematic circuit diagram, Fig. 3, for the connections of the R.F. and oscillator coils. The standard wave, the 1st and 2nd wave are in sequence, with the 1st wave coming from the antenna wire and the 2nd wave from the antenna coil.

The standard wave is reversed in sequence by the switch in the antenna wire. The R.F. transformer is located in the standard wave circuit. The standard wave is connected to the standard wave coil and the oscillator coil.

A separate type 6C6 tube is employed in the oscillator circuit. The oscillator circuit is always present at 6460 Kc. to frequency at which the R.T. amplifier is tuned.

The oscillator potential is fed into the cathode circuit of the 6C6 tube. This potential is then applied to the control grid of the 6C6 tube. The signal is fed into the cathode circuit of the 6C6 tube.

Two types of 160,000 Kc. and 160,000 Kc. tubes are employed in the oscillator circuit. The frequency and secondary of the first and 2nd R.F. transformer are 160,000 Kc. and 160,000 Kc. respectively. The primary of the 1st R.F. transformer is 160,000 Kc. and 160,000 Kc. respectively.

When the control knob is in the position, the coupling is open, and the astable multivibrator is excited. The output is the same as the input and the astable multivibrator is excited. The oscillator power control is 1000 Kc. and 160,000 Kc. respectively. The 1st R.F. transformer is 160,000 Kc. and 160,000 Kc. respectively.

Alignment and Calibration

Gather all components in connection with all connections. The receivers are all properly aligned at the factory with precision instruments and should not be changed. On the other hand, all possible causes of the faulty operation have been determined and unless the service personnel has the proper equipment.

A signal generator will provide as accurately as possible the signal generator through the receiver and the receiver is tuned. If the signal generator is not as accurate as possible, an additional signal generator will be used. If the signal generator is as accurate as possible, it will be necessary to use the signal generator in the receiver.

A tone oscillator will be used with a range of audio frequencies as desired. A tone oscillator is a sine wave oscillator with the frequency of the audio frequencies as desired. A tone oscillator is a sine wave oscillator with the frequency of the audio frequencies as desired. A tone oscillator is a sine wave oscillator with the frequency of the audio frequencies as desired.
Drive Assembly

This model uses a two-speed planetary drive.

All of the early sets are equipped with a flat belt and may be identified by the 3/8 inch wide belt. The later sets use the same type of drive, but have a black cord belt. This is a bronze cable with a black fabric covering. It is about 8 feet in diameter.

The belt type also has an idler pulley which the cord type does not have.

The planetary assembly is the unit that is integral with the turning shaft. It is at the bottom of the belt. If the nut of this assembly is too tight, the drive will be jerky and will turn hard at high speed. If this condition exists, back off the nut one or two turns and note the effect. If the nut is too loose, the drive will slip in slow speed. The remedy in this case is, of course, to tighten up the nut.

Should the drive belt slip when the planetary pulley is turning, first inspect the drive drum assembly. This is the assembly which is mounted on the casing condenser. If this assembly and the turning condenser rotor turn satisfactory, the belt is probably too loose and a new one will be required. In the sets with the flat belt type of drive, there is an idler pulley which can be positioned and by means of which the belt tension can be increased. In later types, therefore, the belt tension should be increased before attempting to put on a new one.

The replacement parts list shows the parts used in each type of drive and the parts common to both types.

Switch Contact Location Numbering

A standard arrangement for switch contact location numbering has been adopted. This numbering is illustrated in Fig. 2. In contact locations not used, the number applying to that particular location is not employed.

Phonograph Connections

Phonograph connections can be made as shown in Fig. 7. The parts required are shown in the parts list. Knockouts are provided in the back panel of the chassis for mounting the phone jack and phone switch. See Fig. 8.

The phone switch must be mounted with one set of terminals nearest the bottom of the chassis base.

The connections are made by opening the front panel and removing the control panel. Pluck the 0.01 mf. condenser C27 from the volume control.

Strip about 24 inches of the shielding from each end of the cable furnished with the phone attachment parts. Connect one lead of the cable to the terminal on the volume control from which condenser C27 was removed. The other end of this lead is connected to the phone switch as shown in Figs. 7 and 8. The second cable lead is connected to the open end of condenser C27. Then connect the other end of this lead to the phone switch as shown in Fig. 8. Both of the shielded cable leads connected to the phone switch are connected to the switch terminals nearest the chassis base. Before connecting the cable leads to the phone switch, it will be necessary to strip a piece of varnished tubing over the portion of the cable that passes near the 6X7 1st I.F. tube socket.

Now ground the shielding by soldering it to the leads on the chassis base. One of these leads is located just below the planetary drive, the other is near the rear mounting foot of the motor condenser.

Complete the other connections as illustrated in Figs. 7 and 8. The lead between the tone control and the 0.01 mf. tubular condenser C16 mounted on the back of the chassis base, should be covered with a piece of varnished tubing.

The tin plate shield is soldered to the tone control mounting brackets in such a way that when it is bent down toward the bottom and back of the chassis it will shield the lower leads of the phone switch and the lead between the tone control and tubular condenser C16.

After making the phone connections, the I.F. stages should be realigned.
**MODEL D705**

**Issues 1 to 6**

**Drive Cord Replacement**

**LATE MODELS**—The a knot with a small loop at one end of the new drive cord. Slide a 1 1/4 inch length of fabric tubing on the cord. The free end of the drive cord should be tied to the tension spring in such a manner that there is a distance of 56 3/8 inches between the knots.

Turn the gang condenser to full open position.

Place the looped end of the drive cord over the hook on condenser drive drum A—See Fig. 2. Bring the cord up through the slot in the drum rim and pass to the right (from back of chassis) and around pulley B. Then bring the cord to the left and over pulley C. See that the fabric tubing is now between pulleys B and C. Continue cord down to control shaft D and wind 3 1/2 turns counter-clockwise (from back of chassis) on shaft D. Bring cord up to and over pulley E. Bring cord down to top of drive drum A and wind one turn clockwise around the drum rim.

Pass the remaining drive cord and tension spring through the slot in the drum. Place free end of spring over the hook on the condenser drive drum.

**EARLY MODELS**—The procedure is the same as for the late models with the following exceptions:

The distance between the knots on the drive cord should be 48 1/4 inches.

Leaving shaft D (Fig. 3), the drive cord is brought directly to the top of drive drum A and then continued as in late models.

**Permeability Tuning and Band Switch Assemblies—Differences in Early Models**

A few of the first models used a station button plunger 6 3/8 inches long. These models may be identified by a red paint mark on the front bracket of the tuning unit at the upper right corner. On late models, this length was changed to 6 7/8 inches. These models have an orange paint mark in place of the red mark. It is important, therefore, that the length be noted when ordering this part and the correct part number, as shown in the parts list, be specified.

---

**ATTACHING DIAL POINTER**—Tune in a 1500 KC signal. Move the pointer to the 1500 KC mark on the dial and clamp it tightly over the fabric tubing on the cord.

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WESTERN AUTO SUPPLY CO.

MODEL D709 (1933)
Schematic, Socket Trimmers

- RESISTORS
  - R1: 20M VOLT CONTROL P-10-30
  - R2: 2200k
  - R3: 50k
  - R4: 10M
  - R5: 10k
  - R6: 2.2k
  - R7: 200k
  - R8: 500k
  - R9: 30k
  - R10: 4.7k RHEOSTAT P-10-25
  - R11: 100
  - R12: 1.8k
  - R13: 9000

- CONDENSERS
  - C1: 0.01U MICA
  - C2: 0.04U MICA
  - C3: 0.005U MICA
  - C4: 0.05U MICA
  - C5: 0.5U MICA
  - C6: 8.25U MICA
  - C7: 50U MICA
  - C8: 10U MICA
  - C9: 25U MICA

- NOTE:
  - R1, R2, R11, R12 are in one unit P-10-25
  - C1, C2, C3, C4 in one unit P-10-15
  - C6, C7, C8, C9, C10, C11, C12
  - IF PEAK 465 KC
  - ALL voltages indicated are with NEW BATTERIES,
    VOLUME CONTROL ON FULL

Serial No. 5DL16200A and up

- BATTERIES NEEDED
  - The following batteries are needed:
    1. 6 Volt, "D" Battery
    2. 6.3 Volt, "E" Battery
    3. 3 Volt, "A" Battery or a 6 Volt Storage Battery
Replacing Drive Cord

Remove chassis from cabinet.
Take off the pointer by removing the screw at the center of the dial assembly.
Remove the dial by taking out the six rivets from the dial assembly.
Remove the on-off indicator dial by pulling it forward.
With the condenser plates in a completely open position, slip the new drive cord thru hole "A" (from the front) in the drive drum. (See Fig. 9.)
Pull the cord thru this hole far enough to tie a knot near the end. Make this knot large enough so that it will not pull back thru the hole.
Slip the opposite end of the drive cord thru hole "B" of the drive drum.
Now slip the piece of fine tubing (about 1/4") over the drive cord and insert about half of this tubing into hole "B" as shown in the illustration. This is important to prevent the cord from being cut.
Bring the drive cord down to the drive shafts and wrap the cord in a clockwise direction over about two and one-half times a clockwise direction, progressing toward the front of the cord is up to the turn-in position of the flange "C." (See Fig. 9.)
Pull the cord tight and tie the end of the cord to the tension spring as shown in the illustration. The knot should be at the bend in the tubing so the spring will be under sufficient tension to prevent the drive cord from slipping.
Now by applying a little tension on the spring, hook one other end of the spring into hole "D" on the opposite side of the drum. Hook the spring from the inside (in later models hole "D" is replaced by a hook on the inside of the drive drum).
Turn the drive shaft back and forth several times to take out the slack and see that the drive is operating properly.
If the cord slips on the drive shaft, remove the spring from the drive drum and add an additional knot in the cord at the spring in order to put greater tension on the spring.
Replace the new. Indicator dial, care being taken that the indicator is so placed that it will properly show the on and off positions.
Re-assemble the pointer and dial to the drive assembly.
If the rivets are broken use No. 2 by 3/4" long round head machine screws and nuts.

Alignment Procedure and Dial Calibration

Misalignment or mistracking of condensers generally manifests itself as broad tuning and loss of volume at portions or all of the standard wave band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have been investigated and unless the service technician has the proper equipment.
A signal generator that will provide accurately calibrated signals over the standard wave band and at the intermediate frequency and an output meter are required for indicating the effect of adjustments.
Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

1. F. Adjustment
Set the signal generator for a signal of 175 KC.
Connect the antenna lead of the signal generator to a 1000 ohm resistor to the output of the signal generator.
Keep the volume control at the maximum position. Adjust the trimmer of the oscillator section of the drive gang condenser until maximum output is obtained. The location of this trimmer is shown in Fig. 8.

1500 KC Adjustment
Set the signal generator for 1500 KC. Turn the motor of the tuning condenser carefully until maximum output is obtained. Adjust the 1st detector and antenna trimmers for maximum output.

Dial Calibration
To obtain dial scale calibration turn in an 800 KC signal and set the dial pointer at that mark on the dial scale. When calibrated in this manner, the settings will be approximately correct at both ends of the scale.

Specifications

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Sensitivity</th>
<th>Tuning Ranges</th>
<th>Intermediate Frequency</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot; Battery</td>
<td>15 Microvolts</td>
<td>530 to 1750 KC</td>
<td>175 KC</td>
<td>6&quot; Magnetic</td>
</tr>
<tr>
<td>&quot;B&quot; Battery</td>
<td>125 KC</td>
<td>530 to 1750 KC</td>
<td>175 KC</td>
<td>6&quot; Magnetic</td>
</tr>
<tr>
<td>&quot;C&quot; Battery</td>
<td>600, 900, 2250 Vco</td>
<td>530 to 1750 KC</td>
<td>175 KC</td>
<td>6&quot; Magnetic</td>
</tr>
<tr>
<td>Power Output</td>
<td>1 Watt (Undistorted)</td>
<td>530 to 1750 KC</td>
<td>175 KC</td>
<td>6&quot; Magnetic</td>
</tr>
</tbody>
</table>
Following are the D.C. resistances of the various windings in the chassis.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Code</th>
<th>D.C. Resistance in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A31</td>
<td>Double Tuned Ant. Trans. Pri. (in series)</td>
<td>T1</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Double Tuned Ant. Trans. Sec. (Antenna)</td>
<td>T1</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Double Tuned Ant. Trans. Sec. (1st Det.)</td>
<td>T1</td>
<td>1.5</td>
</tr>
<tr>
<td>9A33</td>
<td>1st I.F. Trans. Fr.</td>
<td>T2</td>
<td>80</td>
</tr>
<tr>
<td>9A32</td>
<td>Oscillator Coil Cathode Winding</td>
<td>T1</td>
<td>10</td>
</tr>
<tr>
<td>9A34</td>
<td>2nd I.F. Reactor Coil</td>
<td>T4</td>
<td>30</td>
</tr>
<tr>
<td>9A21</td>
<td>Filament Reactor (in 1st Det. Cond.)</td>
<td>T1</td>
<td>Small</td>
</tr>
<tr>
<td>9A21</td>
<td>Filament Reactor (in 2nd Det. Cond.)</td>
<td>T1</td>
<td>Small</td>
</tr>
<tr>
<td>9A21</td>
<td>Filament Reactor (in 3rd Det. Cond.)</td>
<td>T1</td>
<td>Small</td>
</tr>
<tr>
<td>8X11</td>
<td>Audio Transformer Primary</td>
<td>T5</td>
<td>950</td>
</tr>
<tr>
<td></td>
<td>Audio Transformer Secondary (Center Tap to outside)</td>
<td>T5</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Audio Transformer Secondary (Center Tap to inside)</td>
<td>T5</td>
<td>550</td>
</tr>
<tr>
<td>11A317</td>
<td>Magnetic Speake [Center Tap to outside]</td>
<td>T1</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Magnetic Speaker (Center Tap to inside)</td>
<td>T1</td>
<td>200</td>
</tr>
</tbody>
</table>

May, 1935

WESTERN AUTO SUPPLY CO

MODEL D709 (1935)
This receiver is designed to operate over two tuning ranges: from 535 to 1730 Kilocycles (KC) (173.4 to 561 meters), and from 5650 to 18,100 Kilocycles (KC) (16.5 to 53 Meters).

CORRECT ALIGNMENT PROCEDURE

The intermediate frequency (IF) stage should be aligned properly as the first step. After the IF transformers have been properly adjusted and peaked, the Broadcast Band should always be the next procedure, after which, the Short Wave Band may be aligned.

IF. ALIGNMENT

With the wave switch in the broadcast band and the gang condenser set at minimum, adjust the test oscillator to 655 KC and connect the output of test oscillator or signal generator to the grid of the first detector tube (S1) through a .05 or .1 mfd. condenser. The ground on the test oscillator can be connected to the chassis ground. Align all four IF trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Connect the output of the signal generator to the antenna lead (blue) through a .002 mfd. micro condenser. Set the gang condenser to minimum and the oscillator to 1730 KC and adjust the Broadcast "oscillator trimmer" to receive this signal. Make no other adjustments at this frequency. Then set the generator to 1400 KC and tune in this signal by rotating the gang to 1400 on the dial. Adjust the Broadcast "antenna trimmer" to a maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver.

Note: Approximately the same sensitivity should be noted at this point as was at 1400 KC. The signal strength may sometimes be improved by peaking the circuits. This is done by slowly increasing or decreasing the oscillator peaking condenser and, at the same time, continuously tuning back and forth across the signal with the receiver until the maximum reading is obtained on the output meter. This adjustment may seem a little complicated but is the easiest way to adjust the oscillator to the antenna. Return to 1400 KC and again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 600 KC.

SHORT WAVE BAND ALIGNMENT

The short wave band is adjusted by setting the generator to 18,000 KC and tuning in the signal. Adjust the "short wave antenna" to give maximum output. As there is no variable low frequency peaking condenser on this band, the sensitivity of the receiver should be checked at 6000 KC to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 KC, the antenna and oscillator coils, as well as the .004 mfd. peaking condenser, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.

This receiver requires a good ground.
Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly designed; the factors with precision instruments and re-alignment should not be attempted unless all other possible causes of the faulty operation have been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 455, 1750, 1400, 600, 18300, 15200 and 4000 KC and an output indicating meter are required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

1. F. Adjustment
   - Set the signal generator for a signal of 455 KC.
   - Connect the antenna lead of the signal generator to the grid of the detector.
   - Connect the ground lead of the signal generator to the chassis ground.
   - Turn the band switch to the standard wave position.
   - Turn the volume control to the maximum position.
   - Adjust the signal from the signal generator to prevent the bleeding-off action of the A.V.C.
   - Then adjust the four I.F. trimmers until maximum output is obtained.
   - The diaphragm screws for these trimmers are reached from the top of the chassis and the location is shown in Fig. 5.

1750 KC Adjustment
   - Set the signal generator for 1750 KC.
   - Turn the rotor of the tuning condenser to the full open position.
   - Keep the band switch in the standard wave position.
   - Connect the antenna lead of the receiver through a 300 ufd. condenser to the output of the signal generator.
   - For this and all subsequent adjustments keep the volume control at the maximum position and intermittently the signal from the signal generator to prevent A.V.C. action.
   - Adjust the oscillator standard wave trimmer (C1) until maximum output is obtained. The location of this trimmer is shown in Fig. 4.

1500 KC Adjustment
   - Set the signal generator for 1500 KC.
   - Turn the rotor of the tuning condenser carefully until maximum output is obtained.
   - Adjust the oscillator standard wave trimmer (C1) until maximum output is obtained.

6000 KC Adjustment
   - Set the signal generator for 6000 KC.
   - Turn the tuning condenser rotor until maximum output is obtained.
   - Use a non-metallic screwdriver for this adjustment.
Alignment and Calibration

Correct alignment is extremely important in connection with all wave receivers. The receivers are usually aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the fault have been investigated and unless special service techniques has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 476, 7180, 1100, 1600, 2000, 2100, 2600, 3000, 3600, 4000 and 5000 KC and an output input into signal meter are required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used. If a signal is turned in with the selectivity control in its maximum position. Then adjust the tuning condenser slow back and forth at the same time adjusting the 600 KC trimmer until the peak of greatest intensity is obtained. See Fig. 5 for location of this trimmer.

Range C Alignment

5000 KC Adjustment

Set the signal generator for 5000 KC. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator. Turn the motor of the tuning condenser to the full open position. Turn the motor to the Range C position (short wave band—green dial color). Adjust the oscillator Range C trimmer (C3) until maximum output is obtained. See Fig. 5 for location of this trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC. Turn the tuning condenser slowly and back and forth at the same time adjusting the 6000 KC trimmer until the peak of greatest intensity is obtained. See Fig. 5 for location of this trimmer.

25-cycle Receivers

The twenty-five cycle receiver differs from the sixty cycle receiver only in fact that a different power transformer is used. The correct power transformer is shown in Figs. 7. The twenty-five cycle receiver can be operated satisfactorily from a sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

A 115-230 Volt 40 to 60 cycle as well as other power transformers with special power ratings are also available for this model.

Changes in Early Models

In the early models of this receiver the tone control resistor (R11) was connected as a series variable resistor connecting in series through the condenser C21 between the grids of the 45 tubes in the audio output stage. In the later models it is employed as a potentiometer in the manner shown in Fig. 7. The 10000 ohm resistor (R18) was not used in the early models. Condenser C21 was connected directly to resistor R7. The type 6AK7 metal tetrodes replace the type 6A4 glass tubes which were used in the early models. Condenser C1 was added to the oscillator condensator in the early models. This is not, however, used in all cases but only when this capacity is required in this circuit.

Phonograph Connections

Phonograph connections are made as shown in Fig. 8. The parts required to make this installation shown in the parts list.

To mount the phonoswitch and phonochoke, drill holes of a size and in the position shown in Fig. 8 at the left hand side (front) of the rear panel of the chassis.
Fig. 11—Color Coding of Coil Wires and D.C. Resistance of Windings
(Also See Complete D.C. Resistance List Below)
Alignment and Calibration

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of faulty operation have first been investigated and unless the service technician has the proper equipment.

A signal generator that will provide an accurately calibrated signal at 456, 1170, 2200, 4400, 4500, 6000, 10,000, 16,000, 15,000, 6000 KC and an output indicating meter is required. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screwdriver for the adjustments.

The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 456 KC.

Connect the output of the signal generator through a 0.1 mf. condenser to the moist end of condenser C-10—see Fig. 2. There is a lead which goes to the lug on the top of the center stator section of the tuning condenser—see Fig. 10. The connection can be made at this lug.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band selector to the Range B position (standard wave band—purple dial color).

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the beveling-off action of the A.V.C.

Then adjust the five I.F. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis,

and the location is shown in Fig. 10.

Range B Alignment

1730 KC Adjustment

Set the signal generator for 1730 KC.

Turn the rotor of the tuning condenser to the full open position.

Keep the band selector in the standard wave position.

Connect the antenna lead of the receiver through a 300 mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent A.V.C. action.

Adjust the oscillator Range B trimmer (C-14) until maximum output is obtained. The location of this trimmer is shown in Fig. 9.

1500 KC Adjustment

Set the signal generator for 1500 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer set screw and set the large pointer at the 1500 KC mark on the standard wave band scale. Reset the pointer set screw.

Adjust the interstage Range B trimmer (C-7) and antenna Range B trimmer (C-5) to maximum.

600 KC Adjustment

Set the signal generator for 600 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 600 KC trimmer until the peak of greatest intensity is obtained. See Fig. 9 for location of this trimmer.

Be sure to use a non-metallic screwdriver for this adjustment.

Range C Alignment

4800 KC Adjustment

Set the signal generator for 4800 KC.

Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the Range C position (1st short wave band—green dial color).

As mentioned above, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent A.V.C. action.

Adjust the oscillator Range C trimmer (C-15) until maximum output is obtained. See Fig. 9 for location of this trimmer.

4200 KC Adjustment

Set the signal generator for 4200 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range C trimmer (C-8) and antenna Range C trimmer (C-5) to maximum.

Do not change the setting of the oscillator Range C trimmer.

Range D Alignment

16,000 KC Adjustment

Set the signal generator for 16,000 KC.

Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the Range D position (2nd short wave band—red dial color).

Adjust the oscillator Range D trimmer (C-19) until maximum output is obtained. See Fig. 9 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage Range D trimmer (C-9) and antenna Range D trimmer (C-5) to maximum.

When adjusting the interstage Range D trimmer it will be necessary at the same time to turn the tuning condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Then go back and repeat the procedure as given for the 16,000 KC adjustment. If it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 15,000 KC adjustment must be repeated.

Do not make any further change in the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC.

Turn the tuning condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth at the same time adjusting the 6000 KC trimmer (C-18) until the peak of greatest intensity is obtained. See Fig. 9 for location of this trimmer.

Use a non-metallic screwdriver for this adjustment.

Volatges

Check the voltages at the sockets to see if correct values are being delivered to the tubes. The antenna and ground should be disconnected and the antenna and ground leads from the set connected together.

The volume control should be turned to the right or maximum position.

The voltage chart gives the voltages with all tubes in, the speaker connected and the set in operating condition. These voltages are typical of the sets but will vary slightly with variations in individual receivers, tubes, test equipment used and battery voltages.

Changes in Early Models

Condenser C-27 1 mmf. [not shown in Fig. 2] was added to the oscillator coil assembly in parallel with oscillator Range B trimmer condenser C-14. It is not, however, used in all cases but only when this capacity is required in this circuit.
Replacing Drive Cord

Take off the station pointer by removing the screw at the center of the dial.

Loosen the two set screws in the collar on the band selector shaft.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis and one screw at the top which secures this assembly to the bracket.

Pull the dial assembly forward until the collar is free of the band selector shaft; and lay the assembly face downward in front of the chassis.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 12.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 12. Insert one end of the new drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord, which has been inserted through the hole, to one end of the tension spring.

Wrap the cord in a counter clockwise direction (facing front of chassis) around the drive drum approximately one and one half turns, progressing toward the front.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one half times around this shaft as shown in Fig. 12, progressing toward the back of chassis.

Wrap the cord on directly under the drive drum above.

Then bring this cord up to the drive drum until it is up to the hole in the drive drum as shown in the illustration.

Now insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring when hanging free should be approximately 3/8" from the flange of the drum as shown in Fig. 12. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Turn the drive shaft back and forth several times.

Replace the drive assembly and pointer.

Replace the chassis in the cabinet.

---

**Table: D.C. Resistances of the Various Coil windings in the chassis. The values given below will vary slightly in different sets.**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Winding</th>
<th>Code</th>
<th>D.C. Resistance in Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>P 9A394</td>
<td>1st I.F. Transformer</td>
<td>T1</td>
<td>11.4</td>
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<td></td>
<td>Primary Winding</td>
<td></td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
<td>11.4</td>
</tr>
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<td>P 9A395</td>
<td>2nd I.F. Transformer</td>
<td>T1</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>Primary Winding</td>
<td></td>
<td>11.4</td>
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<td></td>
<td>Secondary Winding</td>
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<td>11.4</td>
</tr>
<tr>
<td>P 9A396</td>
<td>3rd I.F. Transformer</td>
<td>T6</td>
<td>8.0</td>
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<td>8.3</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Tap to Variable Trimmer</td>
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<td>126.0</td>
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<td>P 50X11</td>
<td>Audio Input Transformer</td>
<td>T7</td>
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<td></td>
<td>Primary Winding</td>
<td></td>
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<tr>
<td></td>
<td>Secondary Winding</td>
<td></td>
<td>900.0</td>
</tr>
<tr>
<td></td>
<td>Center Tap to Inside</td>
<td></td>
<td>300.0</td>
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<tr>
<td></td>
<td>Center Tap to Outside</td>
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<td>900.0</td>
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<tr>
<td>*P 12A218 Magnetic Speaker</td>
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<td>275.0</td>
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<td></td>
<td>Center Tap to Outside</td>
<td></td>
<td>300.0</td>
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<tr>
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<td>Single Filament Reactor</td>
<td>L1</td>
<td>1.2</td>
</tr>
<tr>
<td>P 9A281</td>
<td>High Frequency Oscillator Tracking Coil</td>
<td>L2</td>
<td>0.7</td>
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<tr>
<td>P 9A281</td>
<td>Single Filament Reactor</td>
<td>L3</td>
<td>1.3</td>
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</tbody>
</table>

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Servicing R. F. Coil Assemblies

The R. F. transformers and oscillator coil assemblies in this receiver are sold complete with can. This is due to the fact that the trimmers are soldered to the can, and cannot be easily disassembled.

The lead colors and resistances of the various windings in each assembly are shown in Fig. 5.

If it is ever necessary to remove one of the coil assemblies from the can, proceed as follows: First remove the nuts from the screws at the top of the can. The outside lug on the trimmer condenser is inserted in a slot in the can, and this lug is soldered into position.

Apply a soldering iron to the can at the point of the soldered connection. Then with a screwdriver lift up on the outside edge of the trimmer (edge soldered to can) until the trimmer is clear of the can. After the trimmers are all unsoldered, the can be taken out.

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty cycle receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle receiver can be operated satisfactorily from any sixty cycle power supply. However, the reverse is not true, the sixty cycle receiver cannot be operated from a twenty-five cycle power supply.

A 115-150 Volt, 40 to 60 cycle as well as other power transformers with special power ratings are also available for this model.

Changes in Early Models

In the early models of this receiver, the antenna transformer T1 had two Range B Primary windings as shown in Fig. 1. The oscillator Range B and C trimmer locations varied in the early and intermediate models of this receiver as shown in Figs. 3 and 4.

Referring to Fig. 2, in the early models of this receiver, contact No. 4 in the interstage section of the band selector was used. The purpose of this contact arrangement was to shoot out variable resistor R1 in the second short wave position. In these models the relative positions of trimmers R1 and R2 were reversed. The common connection from the suppressor grid and cathodes of the R. F. and I. F. amplifiers was connected to the control arm of variable resistor R1. The latter was connected to resistor R1 which was grounded at the other end. The by-pass condenser C6 remains connected as before, to the cathode and suppressor grid connection.

The type 687 and 6F6 metal tubes replace the type 6G and 6R2 glass tubes respectively which were used in the early models.

Phonograph Connections

Phonograph connections can be made as shown in Fig. 9. The parts required are shown in the parts list. Knockouts are provided in the back panel of the chassis for mounting the phonograph jack and phonograph switch—See Fig. 10.

For mounting the 12-2 amp. 25 volt dry electrolytic condenser, two No. 27 drill holes should be drilled in the side of the chassis directly below the wire electrolytic condenser and drilled from the bottom. 3/4" and 5/32" from the front of the chassis. The ground lug which extends out from the side of the chassis should be fastened back into the chassis wall.

Fig. 10—Location of Phone Knobs

Replace the single lug insulated terminal strip (located on the rear panel, directly in back of the band selector switch) with (P-4-A-39) double lug insulated terminal strip with ground lug. Be sure to solder back to the new terminal strip any leads that were connected to the other terminal strip.

The connections are made by opening the diode return circuit at the volume control. Unsolder the 50,000 ohm resistor R9 (covered with saturated steel in early models) from the lug at the volume control and from the shielded lead which runs from the I. F. transformer. Cut this shielded lead to length and connect to the open lug on the new terminal strip. Connect one side of the 50,000 ohm resistor R9 to the same lug and the other side to the phonograph switch—See Fig. 9. Ground the shield to the ground lug of the terminal strip.

The extra shielded lead which is provided should be inserted into a piece of saturated steel.
Circuit

This model is a three band receiver with a tuning range in each band as shown in the specifications above. Three band coverage is accomplished by means of three sets of R, F, and oscillator coils and a three section triple throw switch.

Refer to the schematic diagram circuit, Fig. 1, T1 and T2 are the antenna and interstage R, F, transformer assemblies, and T3 is the oscillator coil assembly. The standard wave, 1st and 2nd short wave coils are indicated by the letters B, C and D respectively. The three sections of the band switch are designated in the schematic as the antenna, interstage and oscillator sections.

The band switch completes connections to the coils in use. It also short circuits the R, F, transformer secondary and oscillator coil of lower frequency not in use.

The antenna transformer, tuned secondary feeds into a type 687 B, F, amplifier tube. The output of this tube is fed through the interstage R, F, transformer with tuned secondary into another 687 tube which functions as the 1st detector.

A separate type 76 tube is employed in the oscillator circuit. Referring to the oscillator assembly T1, T1, B, C and D refer to the standard wave, 1st short wave and 2nd short wave oscillator coils respectively. The oscillating circuit is always resonant at 475 KC above the frequency to which the R, F, amplifier is tuned.

Alignment and Calibration

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 475 KC. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Tune the band selector to the range C position (1st short wave band—green dial color). Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. See Fig. 3 and 4 for location of trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC. Keep the antenna feed lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Tune the band selector to the range D position (2nd short wave band—yellow dial color). Adjust the oscillator Range D trimmer (C24) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Adjust the oscillator Range B trimmer (C21) until maximum output is obtained. The location of this trimmer is shown in Figs. 3 and 4.

1500 KC Adjustment

Set the signal generator for 1500 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. There is a lever arm in front of the large gear on the tuning condenser shaft by means of which the position of the oscillator may be adjusted. Set the position of the oscillator Range D trimmer (C24) to maximum. Do not make any further change in the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Then go back and repeat the procedure as given for the 15,000 KC adjustment. If it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 15,000 KC adjustment must be repeated.

10,000 KC Adjustment

Set the signal generator for 10,000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Now turn the tuning condenser slowly back and forth at the same time adjusting the 6000 KC trimmer until the peak of maximum intensity is obtained. See Fig. 3 for location of this trimmer.

Range C Alignment

5800 KC Adjustment

Set the signal generator for 5800 KC. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Tune the band selector to the range C position (1st short wave band—green dial color). Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. See Fig. 3 and 4 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC. Keep the antenna feed lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. Do not change the setting of the oscillator Range C trimmer.

Range D Alignment

18,300 KC Adjustment

Set the signal generator for 18,300 KC. Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Turn the band selector to the range D position (2nd short wave band—yellow dial color). Adjust the oscillator Range D trimmer (C24) until maximum output is obtained. See Fig. 3 for location of this trimmer.

The oscillator potential is fed into the cathode circuit of the 687 first detector tube. This results in the intermediate or beat frequency of 475 KC being present in the plate circuit of this tube.

One stage of I. F. amplification is employed using a 687 tube. The primaries and secondaries of the first and second I. F. transformers are tuned by small trimmer condensers.

Selectivity Control—Referring to the 1st I. F. transformer T1 in Fig. 1, it will be noted that there is a coupling winding shown in the illustration below the primary. Refer also to the by-pass arrangement in the plate plate circuit of the 687. The control over the sharpness of this transformer results in high selectivity. High audio frequencies are by-passed to ground through condenser C3.

When the selectivity control is in the broad position, the coupling winding is open circuited and the loose coupling which exists between the primary and secondaries of this transformer results in high selectivity. High audio frequencies are by-passed to ground through condenser C3.

Fig. 1—Arrangement of Controls

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I. F. Adjustment

Set the signal generator for a signal of 475 KC. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator.

Connect the ground lead of the receiver to the ground post of the signal generator. Turn the band selector to the range B position (standard wave band—purple dial color). Connect the ground lead of the receiver to the ground post of the signal generator.

Connect the ground lead of the receiver to the ground post of the signal generator. Turn the band selector to the range B position (standard wave band—purple dial color). Turn the band selector to the range C position (1st short wave band—green dial color). Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. See Fig. 3 and 4 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC. Keep the antenna feed lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. Do not change the setting of the oscillator Range C trimmer.

Range D Alignment

18,300 KC Adjustment

Set the signal generator for 18,300 KC. Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Turn the band selector to the range D position (2nd short wave band—yellow dial color). Adjust the oscillator Range D trimmer (C24) until maximum output is obtained. See Fig. 3 for location of this trimmer.

15,000 KC Adjustment

Set the signal generator for 15,000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Adjust the oscillator Range B trimmer (C21) until maximum output is obtained. The location of this trimmer is shown in Figs. 3 and 4.

1500 KC Adjustment

Set the signal generator for 1500 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. There is a lever arm in front of the large gear on the tuning condenser shaft by means of which the position of the oscillator may be adjusted. Set the position of the oscillator Range D trimmer (C24) to maximum. Do not make any further change in the setting of the oscillator Range D trimmer.

6000 KC Adjustment

Set the signal generator for 6000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Then go back and repeat the procedure as given for the 15,000 KC adjustment. If it is found necessary to make any appreciable change in the setting of the oscillator Range D trimmer, the 15,000 KC adjustment must be repeated. Do not make any further change in the setting of the oscillator Range D trimmer.

10,000 KC Adjustment

Set the signal generator for 10,000 KC. Turn the tuning condenser to careen carefully until maximum output is obtained. Now turn the tuning condenser slowly back and forth at the same time adjusting the 6000 KC trimmer until the peak of maximum intensity is obtained. See Fig. 3 for location of this trimmer.

Range C Alignment

5800 KC Adjustment

Set the signal generator for 5800 KC. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Tune the band selector to the range C position (1st short wave band—green dial color). Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. See Fig. 3 and 4 for location of this trimmer.

5000 KC Adjustment

Set the signal generator for 5000 KC. Keep the antenna feed lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Adjust the oscillator Range C trimmer (C23) until maximum output is obtained. Do not change the setting of the oscillator Range C trimmer.

Range D Alignment

18,300 KC Adjustment

Set the signal generator for 18,300 KC. Keep the antenna lead of the receiver connected through the 400 ohm resistor to the output of the signal generator. Turn the tuning condenser to the full open position. Turn the band selector to the range D position (2nd short wave band—yellow dial color). Adjust the oscillator Range D trimmer (C24) until maximum output is obtained. See Fig. 3 for location of this trimmer.
Alignment and Calibration

1500 KC Adjustment

Set the signal generator for 1500 KC. Turn the receiver to the tuning condenser to the full open position. Connect the antenna lead of the receiver through a 230 microhuf condenser to the output of the signal generator.

For this adjustment and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the antenna to a level where it can be heard.

Adjust the receiver Range B trimmer (C18) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

600 KC Adjustment

Set the signal generator for 600 KC. Turn the receiver to the tuning condenser to the full open position. Connect the antenna lead of the receiver through a 400 henlin resistor to the output of the signal generator.

Adjust the receiver Range A trimmer (C17) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

5000 KC Adjustment

Set the signal generator for 5000 KC. Turn the receiver to the tuning condenser to the full open position. Connect the antenna lead of the receiver through a 230 microhuf condenser to the output of the signal generator.

Turn the receiver Range C trimmer (C40) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

Range A Adjustment

Set the signal generator for 18300 KC. Keep the antenna lead of the receiver connected through the 400 henlin resistor to the output of the signal generator.

Turn the receiver to the tuning condenser to the full open position. Connect the antenna lead of the receiver through a 230 microhuf condenser to the output of the signal generator.

Adjust the receiver Range A trimmer (C16) until maximum output is obtained. The location of this trimmer is shown in Fig. 3.

D. C. Resistance of Windings

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Windings</th>
<th>Code</th>
<th>in Ohms</th>
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<tr>
<td>P-16456</td>
<td>Antenna A</td>
<td>D</td>
<td>22.4</td>
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<tr>
<td>P-16456</td>
<td>Range B Primary</td>
<td>W</td>
<td>22.4</td>
</tr>
<tr>
<td>P-16456</td>
<td>Range B Primary</td>
<td>D</td>
<td>22.4</td>
</tr>
<tr>
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<td>Range A Primary</td>
<td>W</td>
<td>22.4</td>
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<td>D</td>
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</tr>
</tbody>
</table>
WESTERN AUTO SUPPLY CO.

MODEL D716 (1935)

Schematic

Power Consumption - 140 Watts (At 115 volts 60 cycles)
Power Output - 15 Watts Undistorted

Tuning Frequency Range

B Range - 535 to 1730 KC.
C Range - 1715 to 5900 KC.
D Range - 9750 to 18300 KC.

October 1935
Fig. 4—Color Coding of Wire Colors and D. C. Resistance of Windings. (Also see complete D. C. Resistance List)

Fig. 5—Location of Tubes

VOLTAGES AT SOCKETS
Line Voltage 115 - Antenna Shorted to Ground
Volume Control at Maximum

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Across Heater</th>
<th>Plate to Ground</th>
<th>Screen to Ground</th>
<th>Cath. to Ground</th>
<th>Cath. M.A.</th>
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</thead>
<tbody>
<tr>
<td>6K7</td>
<td>R. F.</td>
<td>6.2</td>
<td>245</td>
<td>80</td>
<td>2.8</td>
<td>7.6</td>
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<td>6K7</td>
<td>1st Det.</td>
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<td>245</td>
<td>90</td>
<td>6.5</td>
<td>2.6</td>
</tr>
<tr>
<td>76</td>
<td>Osc.</td>
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<td>7.6</td>
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<tr>
<td>80</td>
<td>Rectifier</td>
<td>5.1</td>
<td>500(1)</td>
<td></td>
<td>140.0(1)</td>
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</table>

(1) As read across R19
(2) Grid to Ground
(3) Plate to Center Tap
(4) Two tubes in parallel

Fig. 7—Phonograph Connections

Fig. 3—Location of Trimmers
WINDING RESISTANCES

<table>
<thead>
<tr>
<th>POS</th>
<th>PRIMARY</th>
<th>SECONDARY</th>
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</thead>
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<tr>
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<td>RESIST</td>
<td>OHMS</td>
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<td>OSC.</td>
<td>3.1</td>
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<td>2.3</td>
<td>R.F.</td>
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<tr>
<td>.7</td>
<td>OSC.</td>
<td>.7</td>
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<tr>
<td>2.9</td>
<td>ANT.</td>
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<td>32</td>
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</tr>
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TUBE VOLTAGES

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<th>PIN NO.</th>
<th>PLATE</th>
<th>PIN NO.</th>
<th>SCREEN</th>
<th>PIN NO.</th>
<th>CATH.</th>
<th>REF.</th>
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<td>170</td>
<td>100</td>
<td>175</td>
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<td>1ST. DET.</td>
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<td>100</td>
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<td>I.F. AMP.</td>
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<td>6F6</td>
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<td>261</td>
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<td>POWER OUTPUT</td>
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<td>261</td>
<td>GTO2</td>
<td>379</td>
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</tbody>
</table>

Voltages taken with broadcast band in operation. Taken with 4,000 ohms per volt voltmeter.
**Precautionary Load Dress**

1. Keep power cord close to chassis base and away from volume control.
2. Keep speaker leads close to chassis and away from volume control and No. 56-L-G socket.
3. Keep black wire from 2nd IF transformer to volume control close to front apron and away from other parts.
4. Keep pilot lamp leads close to chassis base.
5. Keep BQ-T-G grid lead away from dim lamp.

**Alignment Procedure**

**CAUTION:** The chassis is connected to one side of the power supply. Avoid contact of chassis or parts to external ground when servicing.

Output meter alignment.—Connect the meter across the speaker voice-coil and turn the receiver volume control to maximum.

Test oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis through a 0.1 mfd. capacitor.

Pre-setting dial.—With gang condenser in full mesh, move dial pointer to coincide with horizontal lines. This is a friction adjustment. Re-adjusting RF adjusting screws.—After completion of alignment, re-check RF adjusting screws with a few drops of household cement.

Note 1.—Reel up the antenna wire and connect the high side of test oscillator to 50-ohm resistor at terminal X on antenna coil (see top view).

25-cycle operation.—For operation with 25-cycle power supply, connect a 25-ohm, 150-volt dry electrolytic capacitor (Part No. 311550) in parallel with C18.

**Figure 6—Tube Socket Voltages and Location of Parts**

*Note: Values with asterisk (*) are operating voltages.

Measurements made to chassis unless otherwise indicated.

Values should hold within approximately ± 30% for 117-volt 60-cycle supply. On D-C voltages are approximately 10% lower except heaters which remain the same.
**Transformer Data**

Pick-up, Motor Coils

**WESTINGHOUSE ELEC. SUPPLY CO.**

**MODEL WR472**

Schematic, Voltage Socket, Trimmers

---

**Figure 1—Schematic Circuit Diagram**

- **Notes:** Values with star (*) are operating voltages. Values not starred are actual measured voltages. Measurements made to chassis unless otherwise indicated.

---

**Figure 2—Tube and Trimmer Locations**

**Figure 3—Tube Socket Voltages**

**Figure 4—Schematic Circuit Diagram**

**Figure 5—Motor Coil Connections**

D.C. resistance of each coil (for 110 volts, 50 and 60 cycles) is approximately 82 ohms.

**Figure 6—Pickup Connections**

© John F. Rider, Publisher
PHONOGRAPH MOTOR SERVICE DATA

The phonograph motor used in this instrument is designed to be electric and of the centrifugal type, with separate, single-motion, drum motor, one each for direct-coupled, different, direct-coupled, one of each, and serial. The parts may require service on an hourly basis, as shown in the diagram. The motor is mounted by turning the "A" and "B" turnings, which will be supplied with the part to be mounted. The motor should be replaced if the motor becomes too hot or if the motor is not running smoothly. The motor should be cleaned before use, as shown in the diagram. The motor should be cleaned before use, as shown in the diagram. The motor should be cleaned before use, as shown in the diagram.

1. Motor not properly supported on motor board.
2. Burs on poles of rotor or stator. Remove with fine abrasive paper.
3. Rotor rod not true. Use a straight edge to determine rotor rod is true. If not, replace.
4. Rotor not true. Use a straight edge to determine rotor rod is true. If not, replace.

Remedying Friction—The motor is a simple device and the bearings can be checked for wear by the use of a straight edge to determine if the rotor moves freely. If the bearings are worn, they should be replaced.

Self-Adjustment—Apply a small amount of oil to the bearings. The motor will then start and run smoothly. The motor should be checked for proper operation before use.

Labelling—When a motor is disconnected, the following parts should be noted:

1. Motor.
2. Rotor.
4. Bearings.
5. Rotor end shield.
6. Stator end shield.
7. Frame.
8. Air gap (motor).
10. Oil level.
11. Oil level indicator.

Alignment Procedure

1. Place the turntable on a level surface.
2. Place the record on the turntable.
3. Set the tone arm to the center of the record.
4. Check the alignment of the arm with the record.
5. Adjust the arm to the correct position.

Precautions:

1. Do not operate the motor with the record on it.
2. Do not operate the motor with the record on it.
3. Do not operate the motor with the record on it.
4. Do not operate the motor with the record on it.

ADJUSTMENTS FOR ELECTRIC TUNING

This receiver has four push buttons. The upper button controls the high-frequency range. The lower button controls the low-frequency range. The buttons should be adjusted as follows:

1. Adjust the upper button to the desired frequency.
2. Adjust the lower button to the desired frequency.
3. Adjust the upper button to the desired frequency.
4. Adjust the lower button to the desired frequency.

Location of Controls

The radio-telephone microphone is for dial tuning.
Alignement Chart

1. Set the test oscillator to 600 kHz and apply the test signal to the antenna of the receiver through a .0005 µfd. condenser.
2. Adjust the broadcast oscillator trimmer condenser #6 to maximum output.
3. Adjust the broadcast preselector trimmer condenser #5 to maximum output.
4. Set the test oscillator and dial indicator to 600 kHz and adjust the oscillator series trimmer condenser #1 to maximum output at the same time rocking the variable condenser.
5. Return the test oscillator and dial indicator to 600 kHz and check the adjustment of trimmer condensers #6 and #5 for accuracy.

Short Wave Band Adjustments

1. Set the wave change switch to the short-wave band position.
2. Set the test oscillator and dial indicator to 600 kHz and adjust the short-wave trimmer condenser #7 to maximum output.
3. Adjust the short-wave preselector trimmer condenser #8 to maximum output.
4. Check the receiver over the short-wave band for sensitivity and calibration.

Set the volume control to the maximum position, the tone control to the treble position, the wave change switch to the broadcast band and the dial indicator to approximately 600 kHz.

Set the test oscillator to 465 kHz and apply the test signal to the grid of the type 16t tube, through a 0.6 mfd. blocking condenser, and adjust the i.f. trimmer condensers #12 and #13 to maximum output.

Set the type 16t tube, through a 0.6 mfd. blocking condenser, and adjust the i.f. trimmer condensers #12 and #13 to maximum output.

Set the oscillator to 465 kHz and apply the test signal to the grid of the type 16t tube, through a 0.6 mfd. blocking condenser, and adjust the i.f. trimmer condensers #12 and #13 to maximum output.
### TELEVISION CHASSIS ASSEMBLIES

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<th>Stock Number</th>
<th>Description</th>
<th>Unit Price</th>
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<tbody>
<tr>
<td>33135</td>
<td>Adjuster - Magnetic core and stud in tube for high frequency oscillator circuit adjustment (used with 2711)</td>
<td>$0.60</td>
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<tr>
<td>33130</td>
<td>Choke - Filter choke (293)</td>
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### 3-BAND RADIO RECEIVERS

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<th>Stock Number</th>
<th>Description</th>
<th>Unit Price</th>
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<tbody>
<tr>
<td>30736</td>
<td>Clip - Precision eye mounting clip with wing screw</td>
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<tr>
<td>30734</td>
<td>Cord - Variable condenser drive cord</td>
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<tr>
<td>30732</td>
<td>Plate - Finished drive plate with drive pull and bracket</td>
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<tr>
<td>30733</td>
<td>Pointer - Dial pointer and carriage</td>
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<tr>
<td>33731</td>
<td>Socket - PrecisionEye socket</td>
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### MISCELLANEOUS ASSEMBLIES

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<tr>
<th>Stock Number</th>
<th>Description</th>
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<td>33237</td>
<td>Cap - Pilot lamp &quot;Pulls Eye&quot; (Model WR-701 only)</td>
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<td>Button - Station selector push button (Model WR-701 only)</td>
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<td>Dial - 3 band glass dial scale (Model WR-701 only)</td>
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<td>31095</td>
<td>Disc - Package of 6 protective cover discs for push buttons (Model WR-701 only)</td>
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<td>Glass - Safety protective glass for Kinescope</td>
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<td>Knob - Band switch knob (Model WR-701 only)</td>
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<td>Knob - Television &quot;Brightness&quot;, &quot;Vert. Hold&quot;, or Radio &quot;Volume&quot; knob</td>
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<td>33191</td>
<td>Knob - Television &quot;Contrast&quot;, &quot;Hor. Hold&quot;, &quot;Fine Tuning&quot; or Radio &quot;Zone Control&quot; knob</td>
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<td>33178</td>
<td>Knob - Television &quot;On/Off&quot; control knob (Model WR-701 only)</td>
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<td>Knob - Radio tuning knob (Model WR-701 only)</td>
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<td>Knob - Television &quot;Station Selector&quot; control knob</td>
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<td>Markers - Complete set of call letter markers (Model WR-701)</td>
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<td>Spring - Knob spring for Stock No. 33179 knob</td>
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### SUPPLEMENTARY REPLACEMENT PARTS LIST FOR WESTINGHOUSE TELEVISION RECEIVERS

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<tr>
<td>30352</td>
<td>Spring - Knob spring for Stock No. 33179 knob</td>
<td>$0.05</td>
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Prices subject to change without notice.
Alignment of Oscillator and R.F.

1. Check the pointer setting to be sure that it is exactly horizontal when the tuning condenser is completely closed.
2. Set the test oscillator and dial indicator to 1400 K.C. and adjust the oscilator trimmer condenser 
   .7 to maximum output.
3. Apply the test signal to the antenna connection of the receiver through a 0.001 mfd. blocking
   condenser and adjust the oscillator trimmer condenser 
   .7 to maximum output.
4. Change sensitivity over the band.
5. Turn wave change switch to the shortwave band and check the sensitivity over scale.
MODEL 7R269
WESTINGHOUSE ELEC. INTERNATIONAL CO.

Alignment, Socket, Trimmers, Chassis

Type and Number of Tubes
12AT7, 12AX7, 12B7, 12AU7, 12AU7C - Total 5

Power Supply
- 110VAC, 60 cycles AC

Tuning Range
- 540 to 1500 kHz and 540 to 3000 kHz

Maximum Indicated Output
- 2.5 W or 30 milliwatts

Line-Input Terminals
- 1000 to 2000 kHz

This model is a five-tube, two-band superheterodyne receiver whose circuit comprises a fundamental first IF and second IF stage followed by an intermediate frequency amplifier, a second overtone detector, and first audio amplifier, a phase sensitive output stage and a rectifier with its associated filter circuit and power transformer.

This model is designed to work over two bands, the broadcast band extending from 540 to 1500 kHz and a police band which extends from 1600 to 3000 kHz.

Line-Up Capacitor Adjustments

To align the circuits of this receiver it is essential to use a high grade modulated test oscillator, the output of which can be continuously varied with a variable waveform to maintain the individual circuits of the receiver are brought into alignment.

A conventional output meter can be connected across the terminals of the speaker and the meter to indicate when the circuits are aligned. The sensitivity of the output meter must be sufficient to give satisfactory testing with a low input signal.

1. With test signal still on the grid of 67 tube, repeat the above adjustments for highest sensitivity.

Adjustment of Broadcast Band

1. Leave test signal on grid of 67 tube and align the test oscillator to 1450 kHz.
2. Turn the tone control to its maximum position. Adjust the oscillator until either end is just over the range indicated on the scale.
3. Adjust trimmer to maximum output.
4. Apply test signal to output of set and adjust trimmer to maximum output.

Adjustment of Police Band

When adjustments as outlined under the broadcast band are completed, the police band requires no adjustment until the call has been checked. In this event, set test oscillator and station indicator to 1700 kHz and apply test signal to antenna leads. The police band tuning is indicated by 18 in Fig. 3. Adjust the position of the antenna tuning by aiding it and holding the set until maximum output is indicated on the output meter. This tuning should then be secured in place by applying a thin coat of cement.

1. Move test signal to grid of 67 tube, repeat the above for highest sensitivity.
### Electrical Specifications

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<tr>
<td>100</td>
<td>2.05</td>
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</tbody>
</table>

### Line-up Capacitor Adjustments

1. **Green Band**:
   - Set volume control to full and tune to first test position.
   - Connect output meter across 50 ohm coil of speaker and adjust trimmer condenser to 300 Kc.
   - Adjust trimmer condenser to 300 Kc.
   - Adjust bias control condenser to 300 Kc.
   - Adjust volume control to 300 Kc.

2. **Red Band**:
   - Adjust trimmer condenser to 300 Kc.
   - Adjust bias control condenser to 300 Kc.
   - Adjust volume control to 300 Kc.

3. **Broadcast Band**:
   - Adjust trimmer condenser to 300 Kc.
   - Adjust bias control condenser to 300 Kc.
   - Adjust volume control to 300 Kc.

### Parts List

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<th>Part #</th>
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<td>B</td>
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<td>1 mfd, 12000 V condenser</td>
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</table>
SOCKET VOLTAGES, Measured from socket prongs to ground with a 1000 ohm per volt meter. B+ 130V., Speaker field 125 V., Line voltage was 120 at 60 cycles.

WILCOX-GAY CORP.

CONVENTIONAL ALIGNMENT

RESISTORS

CODE PART NO.
R1 50-2009 17Ω Ohm Resistor in Power Line Cord
R2 55-1008 200,000 Ohm 1/4 Watt Resistor
R3 55-1092 220 Ohm Wirewound Resistor
R4 55-1042 25,000 Ohm 1/4 Watt Resistor
R5 55-1092 100,000 Ohm 1/4 Watt Resistor
R6 55-1085 1 Megohm 1/4 Watt Resistor
R7 55-1085 800 Ohm Wirewound Resistor
R8 55-1083 800 Ohm Wirewound Resistor
R9 16-1007 100,000 Ohm Volume Control & On-Off Switch
R10 55-1092 100,000 Ohm 1/4 Watt Resistor
R11 16-1007 150,000 Ohm Tone Control
R12 55-1083 800,000 Ohm 1/4 Watt Resistor
R13 55-1083 5,000 Ohm 1/4 Watt Resistor
R14 55-1083 800 Ohm Wirewound Resistor

INDUCTANCES

L1 15-1004 Oscillator Coil Assembly
L2 15-1002 Preselector Coil Assembly
L3 55-1001 First I.F. Transformer Assembly
L4 55-1002 Second I.F. Transformer Assembly
L5 64-9096 4th Speaker, 1200 Ohm, 4 Tube Output Trans
L6 16-2002 20 Henry Filter Choke
Volatges taken from socket prongs to ground with a 1000 ohm per volt meter. 8 = 185 v., Speaker field 65 v., Line 120 v., 60 v.

R1 50-828 50,000 ohm 1/4 watt Resistor
R2 85-941 20,000 ohm 1/4 watt Resistor
R3 50-918 1 meg ohm 1/4 watt Resistor
R4 1N-6807 800,000 ohm Vol. Cont. & Switch
R5 80 Ohm
R6 85-2039 80 Ohm Gridwave Resistor
R7 200 Ohm
R8 50-926 800,000 ohm 1/4 watt Resistor
R9 50-926 250,000 ohm 1/4 watt Resistor
R10 1N-6807 250,000 ohm Tone Control
R11 50-926 800,000 ohm 1/4 watt Resistor
R12 50-926 10,000 ohm 1/4 watt Resistor
C1 76-6202 Two Gang Variable Condenser
C2 76-6202 80 Mfd. Fixed Condenser
C3 76-6206 .1 Mfd. 800 v. Paper Condenser
C4 76-6206 .1 Mfd. 800 v. Paper Condenser
C5 76-6206 .1 Mfd. 800 v. Paper Condenser
C6 76-6206 .1 Mfd. 800 v. Paper Condenser
C7 76-6206 .01 Mfd. 400 v. Paper Condenser
C8 15-6214 5 Mfd. 300 v. electrolytic
C9 15-6215 4 Mfd. 300 v. electrolytic
C10 76-6207 .0008 Mfd. Wire Condenser
C11 76-6202 .01 Mfd. 400 v. Paper Condenser
C12 76-6202 .01 Mfd. 400 v. Paper Condenser
C13 76-6202 .01 Mfd. 400 v. Paper Condenser
C14 76-6202 .01 Mfd. 400 v. Paper Condenser
C15 76-6202 .004 Mfd. 400 v. Paper Condenser

INDUCTANCES
L1 17-2216 Oscillator Coil Assembly
L2 17-2216 Preselector Coil Assembly
L3 66-2063 First I.F., Trans. Assembly
L4 66-2064 Second I.F., Trans. Assembly
L5 66-2067 .5" Speaker, Output Trans. for 422 Tube
L6 66-2067 180 Ohm Speaker Field
L7 66-2067 Power Transformer
For MODELS 6S306, 9S307
153306
ZENITH RADIO CORP.

INSTALLATION, OPERATION AND SERVICE
AUTOMATIC RECORD CHANGER
used in
MODELS 6-5-306, 9-5-307, 15-5-308

This Record Changer will automatically play a series of eight 10- or seven 12-inch records of the 78 revolutions-per-minute type or, if you so desire, you may change records, of any size up to 12 inches, manually. Records of the last few years with the standard eccentric or spiral stopping groove will operate the automatic mechanism and change your records for you.

INSTALLATION

The Automatic Record Changer as supplied consists of two units:
1. The Motorboard Unit which includes the automatic record changer mechanism, the turntable, and the pickup.
2. The Motor Unit which includes the support plate assembly.
The units are supplied ready for mounting on a cabinet rail. This rail must be drilled in accordance with the information and dimensions shown on page 4. Wooden support blocks as shown, must be provided by the customer. All other necessary parts are included in your purchase. It is essential for proper operation that the rail and support blocks provide for the mounting of the motor support plate exactly 2⅛ inches below the top surface of the motorboard. The support blocks should be attached to the wall with heavy wood screws.

Details of this mounting, with all necessary dimensions, are given on page 4.

1. Install the Motor Unit with support plate loosely in position as shown on page 4. Do not tighten the mounting screws.
2. Loosen the two set screws in the collar of the flexible coupling on the Motorboard Unit, a detail of which is shown on page 3.
3. Place the Motorboard Unit in position on the cabinet rail with the upper mounting springs in place as shown on page 4. Make sure that the guide pins extending from the motor support plate enter the rubber grommets in the Motorboard Unit without binding.
4. Secure Motorboard in position using the screws and lower mounting springs as shown on page 4. Tighten up the four motorboard mounting screws to compress all eight mounting springs to the dimensions shown. Make sure that the Motorboard Assembly is level in the cabinet.
5. Tighten up the mounting screws on the Motor Unit support plate assembly so that they are firmly down against the spacers.
6. Check the installation to be sure that there is no binding between the collar of the flexible coupling and the collar of the motor spindle. See page 3.

Before operating the phonograph, either automatically or manually, be sure that the pickup is down and can be moved by hand. If not, a "cycle" must be completed to bring it down. To do this, throw Turntable Switch "on." The turntable will start to revolve, the cycle of motion is stopped and the pickup arm will be remounted. When the pickup arm comes down, turn off the Turntable Switch.

Cautions

1. Never use force to start or stop the motor or any part of the record-changing mechanism or pickup arm.
2. The use of records which have become warped or damaged through improper care may cause the mechanism to jam and damage the instrument. In addition, records which have become warped will slide on one another when playing, resulting in unsatisfactory reproduction.
3. This instrument is not recommended for playing 10-inch and 12-inch records in mixed sequence. If the user desires to play these records, it is necessary that all records are perfectly flat and free from warp. The Index and Record Reject Lever must be set at "10" and after playing the last selection, the pickup will come down in position for the 10-inch record and repeat the playing of the record on a 10-inch diameter unless the Turntable Switch is turned off. Any jamming of the mechanism under these conditions indicates that the records used are not perfectly flat or that their edges are not sufficiently smooth to permit normal operation of the separators in dropping each record in sequence onto the turntable.

OPERATION

4. Do not leave records on the record holder posts, as they are liable to warp, particularly so in warmer climates. Keep your records in a record file (album or cabinet) when not in use. If any records should become warped, place them on a flat surface with a flat heavy article, such as a large book, on top and leave them in this position for a few days.

Controls and Moving Mechanism

Index and Record Reject Lever.—This lever is located near the right front corner of the motorboard with its index plate marked for four positions—"MANUAL," "10," "12," and "REJECT." When you desire to change record selections manually, this lever should be set in the "MANUAL" position. With the lever in the "12" position, the mechanism is set to play a series of 12-inch records automatically. To play either a series of 10-inch records, or 10- and 12-inch records mixed, the lever should be set at the "10" position.

To reject a record being played, or to start the record-changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "REJECT" position and let go. The pickup will rise up and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. If you are playing a series of 12-inch records, the lever should be returned to the "12" position after rejecting a record. Keep the lever in its "MANUAL" position when not actually playing records automatically.

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MODEL 169-51 Automatic Record Changer

GENERAL INFORMATION

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc. are in good order and are correctly assembled.

A bind or stop to the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

The turntable and the main gear are assembled by means of a 3/32 inch straight pin. This pin may be removed by gently driving with a standard pin punch.

The changer or cabinet is not perfectly level, normal operation is likely to be affected.

A shorting switch, located in the pickup head, operates due to pressure when the pickup is placed on the pickup rest.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlinks the various individual mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the change cycle lever is in the "Reject" position and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Fingertip Groove.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "22" by the trip lever "17" through a friction clutch "5." If the motion of the pick-up is adjusted to be smooth or broken, depending on the record condition, the tone arm may open the groove "22". Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. The friction should be just enough to prevent slippage and is adjustable by means of screw "B." If adjustment is too tight, the needle will not groove; if too loose, tripping will not occur at the end of the record.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "15" is actuated by the main lever "15" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer in cycle at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknut "C" to obtain 1 inch spacing between needle point and turntable top surface.

D. & E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle point on the record. Position of eccentric stud "E" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper "Step T" adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position and return to the 10 inch position. Push index lever "17" is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin "V" on lever "14" is in contact with "Step T" on lever "13." The correct point of landing is at 1/16 inch from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers "14" and "13." Leave approximately 1/32 inch end play between hub of lever "20" and pickup base bearing, and tighten the blunt nose screw "D" on mechanism through several cycles as a check, then tighten cone pointed screw "D." After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever lever to reject position and return to 12 inch position; rotate mechanism through cycle until needle is just ready to land on the record; the correct position of landing is 3 11/16 inches from nearest side of spindle. If the landing is incorrect, turn stud "E" until the eccentrics end adjusts lever "14" to give correct needle landing. The eccentric stud must always be toward the rear of the motor board, otherwise a 10 inch recording may occur with 10 inch records.

F. & G. Record Separating Knife.—The upper plate (knife) "15" of each of the record posts serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record shelf "77" be accurately maintained. The spacing for the 10 inch record is nominally .055 inch, and for the 12 inch record is .075 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and locknut "F" to give .052—.058 inch separation. Screw "G" must not be depressed during this adjustment. After setting screw "F," adjust eccentric stud "E," so that the quantity of trim bush with top of record shelf, the vertical spacing between the knife, in its lowest rotational position, and the shelf, is .072—.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupled and the leveler and change cycle lever, and it is necessary that adjustments be such that the record is released from both shelves at the same instant. To adjust, place a 12 inch record on the turntable; rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, and tension record when both are aligned. Adjust mechanism through cycle several times to check action, then tighten cone pointed screw "H".

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is out-of-cycle, the lower edge of the pickup head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm, and bending in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" in relation to the main lever "15" governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the top of the cam plate.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record post.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on board.

The felt washer between the turntable and spindle bearing should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual misadjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A."

2. Needle does not land properly on both 10 and 12 inch records. Make sure "E" is correct.

3. Needle does not land properly on 12 inch record but correct on 10 inch.—Effect adjustment "E."

4. Failure to trip at end of record.—Increase clutch "J" friction by means of screw "B." Also, see that levers "17" and "12" free to move without touching each other.

5. Pickup strikes lower record of stack or drags across top record on turntable.—Adjust lift cable per adjustment "C."

6. Needle does not track after landing.—Friction clutch "5" adjustment "B" may be too tight; bend in tone arm vertical bearing; lever "17" and "12" fouled; or pickup output cable twisted.

7. Cycle compliance before record is complete.—Record is defective; or adjustment "B" of friction clutch "5" is too tight.

8. Wow in record reproduction.—Record is defective; flexible coupling between motor and changer mechanism is not correctly adjusted; cycle compliance is not being observed at normal room temperature (65° F).

9. Record knurled edge of records.—Records warped; record edges are rough; leveler components "E" and "G" are incorrect.

10. Record not released properly.—Adjust record shelf assembly in respect to stack by means of adjustment "H."

11. Needle lands in 10 inch position on 12 inch record or misses record when playing both types mixed.—Increase tension of pickup locating lever spring "30."
MODEL 169-31 Automatic Record Changer

Details, Notes

Turntable Switch.—The toggle switch located just in front of the Index and Record Reject Lever controls the current to the turntable motor. To start the turntable, throw the switch to the “ON” position. To stop the turntable throw the switch to the “OFF” position.

Pickup and Top-Loading Needle Socket.—The pickup is the new crystal type, with a hole in the top for insertion of needles. When not playing records, the pickup arm should be moved out to the right beyond the turntable and placed at rest on the support with the edge of the pickup arm in the groove and the pickup over the needle gauge plate. The pickup must be in this position to change needles.

To insert a needle initially, loosen the needle screw on the front of the pickup, place needle in hole at top so that it drops down against the needle gauge plate and then tighten up the needle screw.

Needle Ejector.—The extending tab on the needle gauge plate of the needle box operates the needle ejector. To change a needle, place pickup in rest position, loosen needle screw and press the extending tab on the needle gauge plate to drop the used needle into the box below. Release tab, allowing the needle gauge plate to swing back, and then insert a new needle in the pickup as described above.

Record Holder Shelves.—To place a record on the turntable or to remove records, raise the record holder shelves, by lifting with the fingers under the shelf, and swing clear of outer edge of record. Also push back vertical lever adjacent to the rear record holder post. You now have clear access to the turntable. Before loading the magazine for Automatic Operation swing the record holder shelves back into position.

Automatic Operation

1. See that pickup is over needle gauge plate with needle properly in place. If not, complete a set as explained in the first paragraph under “OPERATION.”
2. With Index and Record Reject Lever at “MANUAL,” place the first of the series of records on the turntable and the remainder of the series (up to seven 10-inch or six 12-inch records) on the record holder posts (as shown in Figure 1). The records should be arranged in the desired order with the desired selection face up and the last selection on top.
3. Set the Index and Record Reject Lever to the proper position. (See CONTROLS: INDEX AND RECORD REJECT LEVER.)
4. Throw Turntable Switch to the left—“ON”—turntable should commence to revolve.
5. When turntable has attained speed, lift pickup and lower gently on to the record so that the needle point enters the outside groove.
6. Close the lid of the cabinet to eliminate mechanical reproduction of sound by the needle.

The whole series of records will now play without further attention, and the last record will repeat until the Turntable Switch is turned off. Allow the record-changing mechanism to complete its cycle before the turntable is stopped. Then lift the pickup, swing the arm to the right beyond the edge of the record and lower it onto the pickup rest with pickup over needle gauge plate. The record player is then ready for reloading, or for manual operation.

Manual Operation

To play records manually:
1. Proceed as in step 1, under “AUTOMATIC OPERATION.”
2. Place record on turntable with desired selection upwards.
3. Set Index and Record Reject Lever to “MANUAL” position.
4. Proceed as in steps 4, 5 and 6 under “AUTOMATIC OPERATION.”

When you have finished playing, be sure that the turntable has stopped and the pickup is in the rest position over needle gauge plate. Never leave pickup with needle resting on a record or on the turnable.

Good reproduction can only be obtained with the turntable revolving at 78 revolutions per minute. For speed check and regulation see INSTALLATION.

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ZENITH RADIO CORP.

MODELS 45310, 45331
14K355, Chassis 5412

NON-RETURNABLE TUBES

NOTE

All voltages measured from Zenith No. 228 battery pack.
Antenna disconnected — vol-
ume control at minimum and
condenser plates in full mesh.
# Alignment Procedure

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Set Test Osc. to</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Adjust Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Det. Grid</td>
<td>½ Mid.</td>
<td>456</td>
<td>B'dc't</td>
<td>600</td>
<td>ABCD</td>
<td>I. F. Algm't.</td>
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<tr>
<td>2</td>
<td>Rec. Ant Lead</td>
<td>200 Mmpd.</td>
<td>1500</td>
<td>&quot;</td>
<td>1500</td>
<td>F</td>
<td>Set Osc. to Scale</td>
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<tr>
<td>3</td>
<td>&quot;</td>
<td>200 Mmpd.</td>
<td>1500</td>
<td>&quot;</td>
<td>1500</td>
<td>G</td>
<td>Algm't of Ant.</td>
</tr>
<tr>
<td>4</td>
<td>&quot;</td>
<td>200 Mmpd.</td>
<td>600</td>
<td>&quot;</td>
<td>600</td>
<td>J</td>
<td>Rock gang &amp; adj. for max. output</td>
</tr>
<tr>
<td>5</td>
<td>&quot;</td>
<td>200 Mmpd.</td>
<td>1500</td>
<td>&quot;</td>
<td>1500</td>
<td>FG</td>
<td>Rpt. 3 &amp; 4</td>
</tr>
</tbody>
</table>

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## 4.5 kHz Frequency Superhetodyne

**Note:** All voltages measured with a 1000 ohm per volt meter from chassis to point indicated using a 220 battery pack.

Antenna disconnected—vol. control at minimum and condenser plates in full mesh.
Socket Voltages

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>6A8</td>
<td>1st Det.</td>
<td>6</td>
<td>AC</td>
<td>220</td>
<td>90</td>
<td>6</td>
<td>125</td>
<td>AC</td>
<td>14</td>
<td>0</td>
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<tr>
<td>Osc.</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F7</td>
<td>I.F.</td>
<td>6</td>
<td>AC</td>
<td>0</td>
<td>220</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>13</td>
<td>0</td>
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<tr>
<td>2nd Det.</td>
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<td></td>
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<tr>
<td>6F6</td>
<td>PWR</td>
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<td>220</td>
<td>-1</td>
<td>-1</td>
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<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5Y3</td>
<td>Rect.</td>
<td>220</td>
<td>-</td>
<td></td>
<td></td>
<td>230</td>
<td>230</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Line Voltage 110
Antenna and Ground
Disconnected.

All voltages measured from point indicated to ground, using a 1000 ohm per volt D.C. meter (unless marked otherwise.)

Alignment

2. Place switch in left or broadcast position. Set dial pointer at 1500 K.C., and align trimmers on gang to resonance. Align broadcast paddler at 540 K.C. slowly rocking pointer past 540 on dial to position giving strongest signal.

There are no adjustments for the short wave band.
**IMPORTANT — ANTENNA ALIGNMENT**

Due to the large variation in electrical capacity of different automobile antennas it is necessary to adjust the receiver to the particular antenna used after installation has been made for maximum performance. Model 5-M-294 is equipped with two adjusting screws to accomplish this alignment. The green key on the side of the receiver case shows the location of the two adjusting screws.

To align, first turn the receiver on with the center knob shown in Fig. 3. Press the tuning knob IN. This places the tuning mechanism in the manual operating position. Tune to a weak station near 1400 K.C. and adjust the trimmer directly below the antenna connector to maximum volume. Next tune the receiver to a weak station near 600 K.C. and adjust the trimmer nearest the power pack case to maximum volume. Repeat the adjustments for greatest accuracy.

**AUTOMATIC**

To set the automatic buttons, first pull the tuning knob OUT. This shifts the tuning mechanism to the Automatic position. Press Automatic button A and turn the volume up and down with a small screwdriver carefully adjust screw A at bottom of the Automatic unit shown in Fig. 3 to a local station between 1500 to 1550 K.C. Seek out position of maximum volume and clearest tone on the same station. It should be noted that there are two trimmer adjustments to each station button. To set the second button press B and tune trimmer B to a local station between 1250 to 850 K.C. Trim with adjustment B1 to best volume and tone on the same station. To set the third button press C and tune trimmer C to a station between 1000 to 700 K.C. and corresponding adjustment C1 again for maximum volume of the selected station. Follow the same procedure for the fourth button by pressing button D and using trimmers D and D1 on a local station between 950 to 540 K.C. After all four buttons have been set, cut the call letters of stations selected from the antenna call letter sheet supplied with the receiver. Remove the escutcheon over the automatic buttons by turning out the three screws which hold it in position. Remove the celluloid strip and place the station call letters in their proper positions by writing the back of the call letter sticker. The lower cutouts on the celluloid strip provide the exact points at which the antenna labels are placed. After the call letter stickers are attached replace the celluloid and the escutcheon piece.

**SOCKET VOLTAGES**

<table>
<thead>
<tr>
<th>Socket</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.66</td>
</tr>
<tr>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td>3</td>
<td>6.69</td>
</tr>
</tbody>
</table>

All voltages measured from point indicated to ground using a 1,000 Ohm Volt meter. Antenna and ground disconnected. Line voltage 115 volts. Consumption 3.8 amp.
To set the buttons for automatic operation proceed as follows:

1. Select a station in the tuning range of the No. 1 button.
2. Place the band switch in the conventional position and turn the station
   automatically in the conventional position and press No. 1 button.
3. Set the band switch to the AUTOMATIC position and press No. 1 button.
4. Remove the cap above the button by inserting a pin or your finger
   under the edge and pulling out.
5. Turn the exposed screw in either direction until the previously selected
   station is heard. (Redo the procedure back to BROADCAST.)
6. Replace cap and cut the call letters of the station from the call sheet
   formed with the receiver. Write the rest of the station name on the cap.
7. Follow the above operations in setting the remaining four buttons.
8. The call letters should be preserved for use in the event it is
   desired to change any of the buttons to some other station.

All voltages taken with a 1000 ohm per volt meter from chassis to socket contacts. Antenna disconnected — volume control on full.

Line voltage 115 v.

LEGEND: N.C.—No Connections; S.H.—Shield; H.—Heater; P.—Plate; S.—Screen; S.U.—Suppressor Grid; G.—Grid; D.I. Diode; K.—Cathode.
MODEL 55313B
Chassis 5535BT
Schematic

ZENITH RADIO CORP.

CONVERTER 6J9G

L.F. 6U7G

DEI-AMP 6G7G

POWER-AMP 6K6G

SWITCH ON VOL CONTROL

RECTIFIER 6X5G

SPEAKER 60-281-3" 55322

PILOT LIGHT

LINE

MODEL 5A318, 5A326
Chassis 55322-A
Schematic

TOTAL POWER CONSUMPTION 45 WATTS.

L.F. FREQUENCY 455 KC

2 TUBE SUPERHETERODYNE

CHASSIS NO. 5532-A

ZENITH RADIO CORPORATION

CHICAGO, ILLINOIS

POWER OUTPUT 3.0 WATTS.

L.F. FREQUENCY 455 KC

5 TUBE SUPERHETERODYNE

CHASSIS NO. 5535 BT

ZENITH RADIO CORPORATION

CHICAGO, ILLINOIS

TOTAL POWER CONSUMPTION 45 WATTS.

POWER OUTPUT 3.5 WATTS.
5 Tube A.C. receiver—Chassis No. 5535BT

GENERAL

This receiver is a modern five tube superheterodyne with a dual tuning range covering frequencies between 18.2 to 54 megacycles and 540 to 1750 kilocycles. The tuning is explained under "Operation."

UNDER NO CIRCUMSTANCES SHOULD THIS RECEIVER BE CONNECTED TO DIRECT CURRENT (D.C.).

This receiver is designed to operate on 50 to 100 cycle alternating current (A.C.) and may be adjusted for use on either 110 or 235 Volt power lines by means of the switch on top of the power transformer. The proper position of the switch for either voltage is marked on the transformer case.

UNDER NO CIRCUMSTANCES SHOULD THIS RECEIVER BE CONNECTED TO DIRECT CURRENT (D.C.).

Chassis 5532A only is designed to operate on 25 to 100 cycle alternating current (A.C.) and may be adjusted for use on either 110 or 235 Volt power lines by means of the switch on top of the power transformer. The proper position of the switch for either voltage is marked on the transformer case.

UNDER NO CIRCUMSTANCES SHOULD THIS RECEIVER BE CONNECTED TO DIRECT CURRENT (D.C.).

Chassis 5532A only is designed to operate on 25 to 100 cycle alternating current (A.C.) and may be adjusted for use on either 110 or 235 Volt power lines by means of the switch on top of the power transformer. The proper position of the switch for either voltage is marked on the transformer case.

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna Set Test Osc. to</th>
<th>Band</th>
<th>Set Dial Adj.</th>
<th>Adjust Trimmer</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Det. Grid</td>
<td>1/2 mfd.</td>
<td>450</td>
<td>S.L.</td>
<td>100 ABCD</td>
<td>I.F. Alignment</td>
</tr>
<tr>
<td>2</td>
<td>Rec. Ant. Lead</td>
<td>200 mfd.</td>
<td>1500</td>
<td>S.L.</td>
<td>F</td>
<td>Set Osc. to Scale</td>
</tr>
<tr>
<td>3</td>
<td>Rec. Ant. Lead</td>
<td>200 mfd.</td>
<td>1500</td>
<td>S.L.</td>
<td>G</td>
<td>Alignment of Ant.</td>
</tr>
<tr>
<td>4</td>
<td>Rec. Ant. Lead</td>
<td>200 mfd.</td>
<td>800</td>
<td>S.L.</td>
<td>J</td>
<td>Rock q &amp; adj. for max. output</td>
</tr>
<tr>
<td>5</td>
<td>Rec. Ant. Lead</td>
<td>200 mfd.</td>
<td>1000</td>
<td>S.W.</td>
<td>K</td>
<td>Rock q &amp; adj. for max. output</td>
</tr>
<tr>
<td>6</td>
<td>Rec. Ant. Lead</td>
<td>400 ohms</td>
<td>18000</td>
<td>S.W.</td>
<td>L</td>
<td>Rock q &amp; adj. for max. output</td>
</tr>
</tbody>
</table>

NOTE: If receiver is used in location subject to code interference adjust wave trap (E) for minimum interference with antenna, connected and receiver operating in Medium Wave position.
CHASSIS 5640, 5804A Secret Volume Governor

Where it is desired to limit the maximum volume of the receiver to a predetermined level such as for hospital use, use in public places, etc., this may be done as follows:

1. Tune the receiver carefully to a local station, and adjust the volume to the loudest desired setting.

2. Remove the knob by pulling directly away from the panel, and insert the short headless screw into the hole provided in the rear of the knob closest to the right side of the elongated cut-out around the volume control shaft.

3. It may be necessary to move the screw to the next hole in either direction before it is definitely determined what volume level is desired.

Alignment Procedure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>1st Det. Grid</td>
<td>½ mfd</td>
<td>456</td>
<td>Med. Wave</td>
<td>550KC</td>
<td>ABCD</td>
<td>IF Alignment</td>
<td></td>
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<tr>
<td>2</td>
<td>Rec. Ant. Post</td>
<td>400 Ohms</td>
<td>18000</td>
<td>S. W.</td>
<td>18000</td>
<td>K</td>
<td>Set. Osc. To Scale</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rec. Ant. Post</td>
<td>400 Ohms</td>
<td>18000</td>
<td>S. W.</td>
<td>18000</td>
<td>L-M</td>
<td>Rock Gang While Adj. for Max. Output</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rec. Ant. Post</td>
<td>200 mfd.</td>
<td>1500</td>
<td>Med. Wave</td>
<td>1500</td>
<td>F</td>
<td>Set. Osc. to Scale</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>1500</td>
<td>&quot; &quot;</td>
<td>1500</td>
<td>G-H</td>
<td>Adjust for Max. Output</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>550</td>
<td>&quot; &quot;</td>
<td>550</td>
<td>J</td>
<td>Rock Gang while Adjusting for Maximum Output</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>1500</td>
<td>&quot; &quot;</td>
<td>1500</td>
<td>F-G-H</td>
<td>Repeat 4 &amp; 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>400</td>
<td>L. W.</td>
<td>400</td>
<td>R</td>
<td>Set. Osc. to Scale</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>400</td>
<td>L. W.</td>
<td>400</td>
<td>S-T</td>
<td>Adjust for Max. Output</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>166.7</td>
<td>L. W.</td>
<td>166.7</td>
<td>U</td>
<td>Rock Gang While Adjusting for Max. Output</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>&quot; &quot; &quot;</td>
<td>200 &quot;</td>
<td>400</td>
<td>L. W.</td>
<td>400</td>
<td>R-S-T</td>
<td>Repeat 8 &amp; 9</td>
<td></td>
</tr>
</tbody>
</table>

*Model Chassis 5804G only*
Alignment Procedure

1. Connect the output leads of the signal generator to the grid of the first detector and receiver ground. Also connect an output meter across the speaker transformer leads.

2. Set the signal generator at 450 K.C. and carefully adjust the four I.F. trimmers to the point giving the highest reading of the output meter. These adjustments should be repeated several times to secure the greatest accuracy.

All adjustments should be made using as weak an output from the signal generator as possible in order to prevent the A.V.C. action from affecting the output readings.

3. Change the signal generator leads to the antenna and ground terminals of the receiver.

4. Set signal generator at 1500 K.C. Switch receiver to broadcast band and adjust oscillator trimmer on gang for correct dial reading at 200 meters. Also adjust antenna trimmer on gang to resonance.

5. Set signal generator to 600 K.C. and rock pointer past 500 meters on dial while adjusting the broadcast pad (adjacent to gang) to combination giving the greatest output reading.

6. Repeat operation No. 4.

7. Set signal generator at 375 K.C. Switch receiver to long wave band and adjust long wave oscillator trimmer (located on oscillator coil underneath chassis) for correct dial reading at 800 meters. Also adjust trimmer on top of coil adjacent to gang for greatest output reading.

8. Set the signal generator at 167 K.C. Rock the pointer past 1800 meters on dial and adjust the long wave pad to point giving the highest output.

9. Repeat operation No. 7.

10. Connect the output leads of the signal generator to the grid of the first detector and receiver chassis. Also connect an output meter across the speaker transformer leads.

11. Set the signal generator at 450 K.C. and carefully adjust the four I.F. trimmers to the point giving the highest reading of the output meter. These adjustments should be repeated several times to secure the greatest accuracy.

All adjustments should be made using as weak an output from the signal generator as possible in order to prevent the A.V.C. action from affecting the output readings.

12. Change the signal generator leads to the antenna and chassis of the receiver.

13. Adjust the wave trap (located on rear of chassis) for minimum output reading.

14. Set signal generator at 6 M.C. Switch receiver to band B and adjust osc. trimmer on gang for correct dial reading at 52 meters.

15. Set signal generator at 1400 K.C. Switch receiver to band A and adjust broadcast trimmer (see diagram) for correct dial reading at 215 meters. Also adjust det. trimmer on gang for greatest output reading.

16. Set signal generator to 600 K.C. and rock pointer past 500 meters on dial while adjusting the broadcast pad (adjacent to gang) to combination giving the greatest output reading.

17. Repeat operation No. 6.

18. Set the signal generator at 17 M.C. Switch the receiver to band C and adjust short wave trimmer while rock pointer past 17.5 meters on dial to combination giving the greatest output.

19. Set the signal generator at 375 K.C. Switch receiver to Band D and adjust long wave trimmer for correct dial reading at 800 meters. Also adjust the long wave ant. trimmer to resonance.

20. Set the signal generator at 167 K.C. Rock the pointer past 1800 meters on dial and adjust the long wave pad to point giving the highest output.

21. Repeat operation No. 10.
SOCKET VOLTAGES 6-M-292, 6-M-293

<table>
<thead>
<tr>
<th>Tube</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>6K7G</td>
<td>0</td>
<td>6.0</td>
<td>250</td>
<td>78</td>
<td>*</td>
<td>-</td>
<td>0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>6A8G</td>
<td>0</td>
<td>6.0</td>
<td>250</td>
<td>78</td>
<td>**</td>
<td>132</td>
<td>0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>6K7G</td>
<td>0</td>
<td>0</td>
<td>250</td>
<td>78</td>
<td>-3.8</td>
<td>6.0</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6Q7G</td>
<td>0</td>
<td>0</td>
<td>95</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>6.0</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>6V6G</td>
<td>0</td>
<td>6.0</td>
<td>240</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>6X5G</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.0</td>
<td>255</td>
<td></td>
</tr>
</tbody>
</table>

I.F. FREQUENCY
2524 K.C.

Voltage at Battery 6.3
Voltage at Receiver 6.0
Antenna disconnected
All Voltages measured with 1000 ohm per volt meter
Total current consumption 7.4 amperes
Sensitivity at 1 watt output - 1 microvolt
Maximum power output 6 watts.
## MODELS 6-M-292, 6-M-293, 6-M-295

**ZENITH RADIO CORP.**

**MODELS 6-M-292, 6-M-293, 6-M-295**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator To</th>
<th>Dummy Antenna</th>
<th>Set Test Osc. To</th>
<th>Manual or Automatic Position</th>
<th>Set Gang Cond.</th>
<th>Adjust Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Det. Grid</td>
<td>1/2 Mfd.</td>
<td>252.5</td>
<td>Manual</td>
<td>Max. Cap.</td>
<td>DEFG</td>
<td>L.F. Alignment</td>
</tr>
<tr>
<td>5</td>
<td>Rec. Ant. Lead</td>
<td>50 Mmfd.</td>
<td></td>
<td>Manual</td>
<td>Tune To A Station Around 900 K.C. and Set Dial for Calibration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Rec. Ant. Lead</td>
<td>50 Mmfd.</td>
<td>1000</td>
<td>Automatic</td>
<td>Range #2</td>
<td>Trim Ant. &amp; R.F. of Automatic Unit — Trimmers &quot;B&quot; &amp; &quot;C&quot;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Connect Car Antenna to Set — Tune to Weak Station Around 1400 K.C. — Trim Antenna Trimmer “A” for Maximum Peak Output.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Trim Automatic Antenna Trimmer “B” to Car Antenna on a Weak Station around 1000 K.C. on Range #2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See tube layouts for location of aligning trimmers

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**Fig. 8**

**ANTENNA ALIGNMENT**

Fig. 8 shows the location of the antenna tap jacks on the side of the receiver case. Remove the capping plug from over this jack assembly, and insert the antenna pin lead in the "H" or "L" position, depending on the capacity of the antenna being used. The "H" position must be used for antennas with a capacity in the range of from 100 to 500 mmdf. The "L" connection must be used for low capacity antennas of from 0 to 125 mmdf. Compare this listing with that given under the various antennas, and the proper position will easily be recognized. After selecting the position desired, place the capping plug back over the hole to prevent motor noise from entering into the antenna circuit of the receiver. Connect the antenna proper by means of the Delco-Remy connector shown in Fig. 8.

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ANTENNA ALIGNMENT

Manual Tuning: Press the MANUAL button on the automatic key board. This disconnects the automatic system and allows operation of the receiver from the standard tuning mechanism. After adjusting the dial calibration accurately, turn the volume control up full and tune to a weak station near 1400 K.C. Adjust the antenna trimmer A (Fig. 8) to the point of greatest volume. This completes antenna alignment for manual operation. The trimmer does not have to be adjusted at any other point on the dial.

Automatic Tuning: Press automatic button 2 (Fig. 8). This will disconnect the manual tuning mechanism and place the automatic buttons into service. After button 2 has been pressed, turn adjusting screw 2 in either direction until a weak station between 1100 to 1000 K.C. is heard. Now adjust trimmers B and C on the automatic assembly for maximum signal strength of the weak station tuned in by the number 2 adjusting screw. The automatic is in complete resonance with the antenna over the entire automatic button range and need not be resonated at any other button setting. Adjusting screw 2 may now be tuned to a local station as outlined under "AUTOMATIC" with no further attention to adjustments B or C.

AUTOMATIC

Study Fig. 8 carefully. Although simple in adjustment, best results will only be obtained if made accurately and by the following procedure.

1. Press button 1. (This button will be on the left if automatic unit is mounted on edge of instrument panel.)

2. Adjust automatic trimmer screw (until a desired local station between 1600 and 1000 K.C. is heard). Turn the screw slowly back and forth over the station as if tuning the dial of a receiver, for clearest reception and best tone quality and allow the screw setting to remain at that point.

3. Press button 2 and tune for a station between 1450 and 900 K.C. on automatic adjusting screw 2.

4. Follow above procedure for buttons 3, 4 and 5 using the ranges shown on Fig. 8.

5. Remove the chrome bezel over the parts adjacent to the automatic buttons and insert the station call letters cut from the sheet supplied. After placing the proper station calls in correct order over the part holes, fasten the escutcheon back in place.

6. Repeat careful adjustment of each automatic trimmer pressing the corresponding button in order from 1 to 5 to obtain best tone, loudest signal and greatest freedom from noise.
NOTE: This receiver is equipped with a fixed-variable sensitivity control located on the chassis base below the tuning control shaft of the variable condenser. (See Fig. 5.) The control may be adjusted with a screwdriver either from above or below the chassis, and is set at the factory to a position which gives a sensitivity of 10 microvolts at 1 watt output. In practice it is found advisable to hold the receiver to this level as any higher sensitivity might result in increased motor noise or excessive back-ground noise. An ideal laboratory equipment capable of accurately measuring the input and output of the receiver is not available, it is advisable to alter the settings.

MANUAL DIAL ADJUSTMENT: The manual control dial must be aligned with the receiver for correct calibration. To do this, turn the manual tuning knob in one direction as far as it will go. Now do the same in the opposite direction. Then turn in a station of known frequency, and note if the dial reading corresponds to the frequency. If the reading is not correct, hold the knob firmly and move the dial drum with your fingers through the bezel to the correct frequency reading of the station being received.

AUTOMATIC DIAL SYNCHRONIZATION: Before setting the station selecting screws for automatic tuning, it may be necessary to synchronize the automatic dial to the receiver which is done as follows: Turn on the receiver, and try to tune in a station with manual tuning control. If no station can be picked up, push the automatic station selector button until a position is found where stations can be tuned manually. Remove the automatic dial assembly by pulling out the rear and turn the station indicator drum downward until the word "Off" appears in the opening. The adjusting screws in the receiver can now be reset for the stations shown around the automatic dial as the automatic button is operated. It is very important that these adjusting screws be set on a weak signal from the station so that the circuit may be sharply tuned. A very short piece of wire used as an antenna will help in the selection of the signal strength. Always be sure the antenna characteristics are similar to actual car conditions. A 30 ft wire, condenser from antenna to ground will provide the necessary input capacity.

AUTOMATIC TUNING ADJUSTMENTS: 1. Turn the receiver on and allow it to operate until thoroughly warmed. Loosen the screws holding the cover plate over the automatic adjustments, and slide it upward exposing the adjusting screws and recording strip. This plate is in the front of the receiver. (See Fig. 4.)

2. Push the automatic station selector button until the word "Dial" is at the automatic dial window. Turn the dial in the station whose call letters are in the No. 1 position on the dial (the lowest frequency station see Fig. 3.) and note the program so that it can be identified. Push the automatic station selector button once, and this station will appear at the automatic window.

3. With a small screwdriver, turn the station setting screw A (See Fig. 4.) in the opposite direction until the station is tuned accurately. Now adjust the corresponding screw B and C in the lower row as maximum response is obtained. Move these adjustments very carefully as it is quite easy to pass the resonant point due to the unusual selectivity of the receiver. (See Fig. 4.)

4. Press the automatic station selector button until "Dial" again is at the automatic window and tune in manually the station whose call letters are in the No. 2 position (the next higher frequency) on the automatic dial. Press the automatic station selector button twice to bring the No. 2 station's call letters within the tuned band, and adjust B and C to the station. Repeat this procedure until each of the five pairs of adjusting screws have been carefully set to their respective stations. It is necessary that the important: Unless certain dummy antenna properties are employed with either the signal generator or in making adjustments on stations, the receiver will not respond properly. The values provided in the Zenith dummy antenna unit shown in Fig. 6 are identical with the conditions in the Ford car, and it adjusted according to the chart will operate properly when reinstated in the automobile. The Zenith dummy antenna of 800 K.C. is especially priced at 25¢ set to service stations, and should be purchased for use in servicing Zenith Ford receivers.
The tuning is divided into four bands, represented by the four colors A, B, C, and D. The ranges and scale in each band are shown on the dial. The letters corresponding to the letters above the band indicator mark and the name of the band.

For voltage
See index

Zenith Radio Corporation
Chicago, Illinois
Consumption 44 watts
Power output 15 watts
CHASSIS 5517A ALIGNMENT PROCEDURE

1. Connect the output leads of the signal generator to the grid of the first detector and receiver ground. Also connect an output meter across the speaker transformer leads.

2. Set the signal generator at 456 K.C. and carefully adjust the four L.F. trimmers to the point giving the highest reading of the output meter. These adjustments should be repeated several times to secure the greatest accuracy.

3. All adjustments should be made using as weak an output from the signal generator as possible in order to prevent the A.V.C. action from affecting the output readings.

4. Change the signal generator leads to the antenna and ground terminals of the receiver.

5. Adjust the wave trap (located on rear of chassis) for minimum output reading.

6. Set signal generator at 6 M.C. Switch receiver to band B and adjust osc. trimmer on gang for correct dial reading at 60 meters.

7. Set signal generator at 1400 K.C. Switch receiver to band A and adjust broadcast trimmer (see diagram) for correct dial reading at 215 meters. Also adjust det. trimmer on gang for greatest output reading.

8. Set signal generator to 600 K.C. and rock pointer past 500 meters on dial while adjusting the broadcast padder (adjacent to gang) to combination giving the greatest output reading.

9. Repeat operation No. 6.

10. Set the signal generator at 17 M.C. Switch the receiver to band C and adjust short wave trimmer while rocking pointer past 17.5 meters on dial to combination giving the greatest output.

11. Set the signal generator at 375 K.C. Switch receiver to Band D and adjust the long wave trimmer for correct dial reading at 800 meters. Also adjust the long wave ant. trimmer to resonance.

12. Set the signal generator at 187 K.C. Rock the pointer past 1800 meters on dial and adjust the long wave padder to point giving the highest output.

13. Repeat operation No. 10.
ZENITH RADIO CORP.

MODELS 8A232, 8A242, 8A244
8A202, Chassis 5804AT

Schematics

Consumption 85 watts.
Power Output 5 watts.

The total consumption is 70 watts. Power output 4.5 watts.

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ALIGNMENT PROCEDURE

(1) Connect the output leads of the signal generator to the grid of the first detector and receiver chassis. Also connect an output meter across the speaker transformer leads.

(2) Set the signal generator at 656 K.C. and carefully adjust the four I.F. trimmers to the point giving the highest reading on the output meter. The output transformers are of a very high gain, selective type, and these adjustments should be repeated several times in order to secure maximum accuracy. All adjustments should be made using as weak an output from the signal generator as possible in order to prevent the A.V.C. action from affecting the output readings.

(3) Connect the signal generator leads to the antenna and ground terminals of the receiver.

(4) Set signal generator at 8 M.C.—Switch receiver to Band B and adjust osc. trimmer on gang for correct dial reading at 50 meters.

(5) Set signal generator at 1500 K.C.—Switch receiver to Band A and adjust broadcast trimmer for correct dial reading at 200 meters. Also adjust ant. and det. trimmer on gang to resonance.

(6) Set signal generator at 175 M.C.—Switch receiver to Band C and adjust the short wave trimmer while rocking the pointer past 17 meters on the dial to the combination giving the greatest output.

(7) Set signal generator at 500 K.C.—Switch receiver to Band A, and rock pointer past 500 meters on dial while adjusting the broadcast peddler (located adjacent to gang condenser) to combination giving the greatest output reading.

(8) Repeat operation No. 5.

(9) Set signal generator at 375 K.C. Switch receiver to Band D and adjust long wave osc. trimmer for correct dial reading at 500 meters. Also adjust long wave det. and ant. trimmers (located on side and rear of chassis), for maximum output reading.

(10) Set signal generator at 1500 K.C. and rock pointer past 2000 meters on dial while adjusting the long wave osc. peddler to combination giving the highest output reading.

(11) Repeat operation No. 9.
Model 8S359, Chassis No. 5807

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Set Test Osc to</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Adjust Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1st Det. Grid</td>
<td>1/2 Mfd.</td>
<td>455</td>
<td>Br'dc't</td>
<td>600</td>
<td>ABCD</td>
<td>I. F. Alignment</td>
</tr>
<tr>
<td>2</td>
<td>Rec. Ant. Post</td>
<td>200 Mmfd.</td>
<td>455</td>
<td>&quot;</td>
<td>600</td>
<td>E</td>
<td>See Note</td>
</tr>
<tr>
<td>3</td>
<td>&quot;</td>
<td>200 Mmfd.</td>
<td>1500</td>
<td>&quot;</td>
<td>1500</td>
<td>F</td>
<td>Set Osc. to Scale</td>
</tr>
<tr>
<td>4</td>
<td>&quot;</td>
<td>200 Mmfd.</td>
<td>1500</td>
<td>&quot;</td>
<td>1500</td>
<td>G</td>
<td>Alignment of Ant.</td>
</tr>
<tr>
<td>5</td>
<td>&quot;</td>
<td>200 Mmfd.</td>
<td>600</td>
<td>&quot;</td>
<td>600</td>
<td>J</td>
<td>Rock Gang &amp; adj. for max. output</td>
</tr>
<tr>
<td>6</td>
<td>&quot;</td>
<td>200 Mmfd.</td>
<td>&quot;</td>
<td>&quot;</td>
<td>FG</td>
<td></td>
<td>Repeat 3 &amp; 4</td>
</tr>
<tr>
<td>7</td>
<td>&quot;</td>
<td>400 Ohms</td>
<td>18000</td>
<td>S.W.</td>
<td>18000</td>
<td>K</td>
<td>Set Osc. to Scale</td>
</tr>
<tr>
<td>8</td>
<td>&quot;</td>
<td>400 Ohms</td>
<td>18000</td>
<td>S.W.</td>
<td>18000</td>
<td>L</td>
<td>Rock Gang &amp; adj. for max. output</td>
</tr>
<tr>
<td>9</td>
<td>&quot;</td>
<td>400 Ohms</td>
<td>6000</td>
<td>Police</td>
<td>6000</td>
<td>N</td>
<td>Rock Gang &amp; adj. for max. output</td>
</tr>
</tbody>
</table>

NOTE: If receiver is used in location subject to code interference adjust wave trap (E) for minimum interference with antenna connected and receiver operating in broadcast band.

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MODELS 834, 1102, 1106
Chassis 1002
Alignments: Notes

ZENITH RADIO CORP.

MODEL 200

Schematic

All components used in these models are those used in Zenith Chassis 1001 - 1001A excepting the following changes.
Parts added
26-75 Complete Dial and Drive Assem.
26-73 Dial scale only
22-265 (2) 35 mf Condensers
22-246 Padder
S-3317 Long wave Ant coil Assem.
S-3318 Long wave caps. coil .
S-3321 Long Wave Detector coil Assem.
The long wave band has two trimmers on each stage. The oscillator stage has a trimmer and padder assembly of the nut and screw type. The nut is the trimmer and the screw is the padder.
The detector and A.F. stages each have two trimmers whose actions are dependent. The arrangement consists of a coupling condenser and a coil trimmer.
The coil trimmer can be distinguished in that one side is grounded. Maximum gain with this system is obtained by having the coupling condenser with as much capacity as possible and still able to obtain a peak on the coil trimmer.

BALANCING PROCEDURE FOR LONG WAVE
Connect service oscillator to antenna post and set at 375 KC. Set dial at 375 KC. Adjust nut on oscillator trimmer assembly to bring in signal. Open A.F. and detector coil trimmers as far as possible and still leave enough capacity for peaking (about 2 or 3 turns). Open coupling condensers until what appears to be resonance is obtained. Then re-peak coil trimmers to resonance. Remember the resonance obtained by means of the coupling condenser is not true resonance and the coil trimmers must be re-adjusted for true resonance.
Now L.F. selector switch to 180 KC and set dial at this point. Adjust padder screw in oscillator coil assembly for maximum gain, rocking condenser to reach this point, wherever it happens to fall. Repeat 375 KC, as it will be thrown off by the movements of the padder.
To align receiver, proceed as follows:

1. Open I.F. transformer, apply a 455 KC note on the 647 control grid.
2. Turn variable condenser all the way open and apply a 1712 KC note to the antenna.
3. Adjust R.F. section.
4. Apply 690 KC signal and adjust for maximum gain.
5. Select long wave oscillator and R.F. trimmers.
6. Apply 390 KC note to be sure that all tubes are in their proper sockets, and check all long wave radiator through hole on chassis.
7. Adjust each R.F. and apply 150 KC again for alignment.

NOTE: Supply cord of set gets warm while operating; this is normal.

Do NOT attach a ground wire to this set. If necessary to service chassis, under no circumstances remove the chassis without first removing plug from receptacle.
The chassis and power pack layout are the same as for the early model, for which see the Index.
**Socket Voltages**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>S</th>
<th>E</th>
<th>G</th>
<th>D</th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>6E6</td>
<td>1st B.P.</td>
<td>6.3</td>
<td>8</td>
<td>0</td>
<td>100</td>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>6V6</td>
<td>2nd B.P.</td>
<td>6.3</td>
<td>3</td>
<td>0</td>
<td>100</td>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>6A7</td>
<td>1st B.G.</td>
<td>6.3</td>
<td>3</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>6V6</td>
<td>2nd B.G.</td>
<td>6.3</td>
<td>3</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>300</td>
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<tr>
<td>76</td>
<td>1st A.F.</td>
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<td>8</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>140</td>
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<td>6A6</td>
<td>2nd A.F.</td>
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<td>0</td>
<td>-</td>
<td>-</td>
<td>270</td>
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<tr>
<td>42</td>
<td>Driver</td>
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<td>22</td>
<td>0</td>
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<td>-</td>
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<tr>
<td>45</td>
<td>Power A.F.</td>
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<td>-</td>
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<tr>
<td>77</td>
<td>4A7.V.T.</td>
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<td>0</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>626</td>
<td>Shadowstop Amplifier</td>
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<td>3</td>
<td>0</td>
<td>100</td>
<td>3</td>
<td>300</td>
</tr>
<tr>
<td>626</td>
<td>A.V.C. Amplifier</td>
<td>6.3</td>
<td>3</td>
<td>0</td>
<td>100</td>
<td>3</td>
<td>300</td>
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<td>85</td>
<td>A.L.C.</td>
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<tr>
<td>513</td>
<td>Rect. Power Amplifier</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>503</td>
<td>Rect. for Upper Chassis</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

Line Voltage 110V. Antenna and Ground shorted.

f - filament; k - cathode; g1 - control grid; g2 - screen grid; g3 - suppressor grid; p - plate.

**Balance Procedures:**
Caution—Test set thoroughly for defective tubes, antenna and ground, check line voltage and chassis voltages before any attempt is made to balance. All balancing should be done with a calibrated oscillator capable of steady signal and minimum attenuation of signal input strength. The screwdriver used should be of non-metallic type and output meter usually connected across plates of 45 tubes at point where the two green speaker wires come out of power pack.

Note: Do not rebalance chassis unless absolutely necessary as all chassis are balanced on an automatic signal generator before shipment. Set volume control in full on position, tone control on treble, high fidelity control in selective position. Line switch set on broadcast position, gain 800 K.O., approximately. Connect 456 K.O. service oscillator to grid of 6A7 and chassis ground, adjust I.F. transformers to maximum output with minimum input signal. Rotate selectivity control to broad position, 1.5 K.O., output should remain constant 5 K.O., plus and minus 450 K.O. Next, connect the same 456 K.O. signal directly across serial and ground binding post. Balance wave to maximum signal. Gain set at 500.

Note: Refer to drawing of trimmer assembly to identify trimmers.

Set service oscillator at 600 K.O. Adjust broadcast pad 5A7, meanwhile rocking pointer past 600 K.O. on dial to combination giving greatest output. Set chassis dial to center 1400 K.O., and service oscillator to 1600 K.O. Balance V.O.C. oscillator trimmer. Use 5A7. Reset oscillator to 600 K.O., rotate gang to 600 and re-check 600 pad for maximum output. Next, return oscillator trimmer to 450 K.O. Adjust detector trimmer 5A7 and B.P. trimmer 5A7 to maximum output.

Police or Orange band. Rotate chassis band switch to police band, gang should be rotated to 3 megohms, oscillator to 5 megohms also. Adjust oscillator trimmer 5A7 to scale, peak "G" detector and 5A7 B.P. trimmers to maximum peak. Red band. Set dial and oscillator to 5 megohms, peak "G" detector and 6V6 B.P. trimmers for maximum gain. Reset oscillator to 600 K.O., and trimmer 5A7 located at back of band switch for maximum peak. There are no adjustments in the blue band.

On all shortwave adjustments be careful not to balance the oscillator circuit to the image frequency of the signal. This error to signal frequency minus twice the I.F. frequency.

**Adjustment Diagram**

- **Line Temp Adjusts to Low Band** [Diagram showing adjustments and connections]
- **ADJUSTMENT RESISTANCE MEASUREMENTS - Upper Chassis**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>RESISTANCE MEASUREMENTS - Upper Chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td>6E6</td>
<td>1st B.P.</td>
<td>20</td>
</tr>
<tr>
<td>6V6</td>
<td>2nd B.P.</td>
<td>20</td>
</tr>
<tr>
<td>6A7</td>
<td>1st B.G.</td>
<td>20</td>
</tr>
<tr>
<td>6V6</td>
<td>2nd B.G.</td>
<td>20</td>
</tr>
<tr>
<td>76</td>
<td>1st A.F.</td>
<td>20</td>
</tr>
<tr>
<td>6A6</td>
<td>2nd A.F.</td>
<td>20</td>
</tr>
<tr>
<td>76</td>
<td>4A7.V.T.</td>
<td>20</td>
</tr>
<tr>
<td>42</td>
<td>Driver</td>
<td>20</td>
</tr>
<tr>
<td>45</td>
<td>Power A.F.</td>
<td>20</td>
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</table>

All Measurements Made with Lower Chassis Disconnected.
## CHASSIS 5636 SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>1st Det. Osc</td>
<td>0</td>
<td>AC</td>
<td>100</td>
<td>50</td>
<td>-5</td>
<td>100</td>
<td>AC</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>6K7</td>
<td>L.F.</td>
<td>0</td>
<td>AC</td>
<td>100</td>
<td>100</td>
<td>5</td>
<td>AC</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6Q7</td>
<td>2nd Det. A.V.C.</td>
<td>0</td>
<td>AC</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>AC</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>25A6</td>
<td>Power</td>
<td>0</td>
<td>AC</td>
<td>90</td>
<td>100</td>
<td>1</td>
<td>AC</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2526</td>
<td>Rectifier</td>
<td>0</td>
<td>AC</td>
<td>AC</td>
<td>AC</td>
<td>100</td>
<td>AC</td>
<td>125</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All voltages measured from point indicated to ground, using a 1000 ohm per volt meter. Antenna and ground disconnected. Line Voltage 112V (A.C.)

## CHASSIS 5640AT SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6L7</td>
<td>1st Det. Osc</td>
<td>0</td>
<td>0</td>
<td>231</td>
<td>141</td>
<td>-10</td>
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<td>6.3</td>
<td>2.5</td>
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<tr>
<td>6J5</td>
<td>Osc</td>
<td>0</td>
<td>6.3</td>
<td>129</td>
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<td>-17</td>
<td>-17</td>
<td>0</td>
<td>0</td>
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<tr>
<td>6K7</td>
<td>IF</td>
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<td>65</td>
<td>0</td>
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<tr>
<td>6Q7</td>
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<td>0</td>
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<td>-5</td>
<td>-5</td>
<td>-5</td>
<td>6.3</td>
<td>-1</td>
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<tr>
<td>6V6</td>
<td>Power</td>
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<td>0</td>
<td>210</td>
<td>234</td>
<td>-2</td>
<td>-2</td>
<td>6.3</td>
<td>-1.5</td>
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<td>Rect.</td>
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<td>AC</td>
<td>AC</td>
<td>AC</td>
<td>188</td>
<td>288</td>
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## CHASSIS 5642A SOCKET VOLTAGES

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<th>Tube</th>
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<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7</td>
<td>R. F.</td>
<td>0</td>
<td>6AC</td>
<td>250</td>
<td>68</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6A8</td>
<td>1st Det. Osc</td>
<td>0</td>
<td>6AC</td>
<td>250</td>
<td>68</td>
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<td>150</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6K7</td>
<td>L.F.</td>
<td>0</td>
<td>6AC</td>
<td>250</td>
<td>68</td>
<td>0</td>
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<td>0</td>
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<td>6H6</td>
<td>2nd Det. A.V.C.</td>
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<td>-3</td>
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<td>6F5</td>
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<td>6F6</td>
<td>Power</td>
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<td>6AC</td>
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All voltages measured from point indicated to ground, using a 1000 ohm per volt meter. Antenna and ground disconnected. Line Voltage 112V.

## CHASSIS 5708E SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
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<th>3</th>
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<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>1st Det. Osc</td>
<td>0</td>
<td>AC</td>
<td>125</td>
<td>80</td>
<td>20</td>
<td>100</td>
<td>AC</td>
<td>25</td>
<td>15</td>
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<tr>
<td>6K7</td>
<td>L.F.</td>
<td>0</td>
<td>AC</td>
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<td>AC</td>
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<tr>
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<td>AC</td>
<td>10</td>
<td>25</td>
<td>10</td>
<td>AC</td>
<td>25</td>
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<td></td>
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<td>1st Audio</td>
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<td>-60</td>
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<td>125</td>
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<td>AC</td>
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<td>AC</td>
<td>125</td>
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<td></td>
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</tbody>
</table>

Measured from point indicated to junction of filter choke and speaker lead using a 1000 ohm per volt meter. Line Voltage 112V (A.C.)

## CHASSIS 5804AT SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7</td>
<td>R. F.</td>
<td>0</td>
<td>0</td>
<td>210</td>
<td>90</td>
<td>0</td>
<td>-6.2</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6L7</td>
<td>1st Det. Osc</td>
<td>0</td>
<td>0</td>
<td>216</td>
<td>130</td>
<td>-3</td>
<td>-3</td>
<td>6.2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6J5</td>
<td>Osc</td>
<td>0</td>
<td>6.2</td>
<td>116</td>
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<td>-3</td>
<td>-3</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6K7</td>
<td>IF</td>
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<tr>
<td>6Q7</td>
<td>2nd Det. Audio</td>
<td>0</td>
<td>0</td>
<td>70</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
<td>6.2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>6V6</td>
<td>Power</td>
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<td>0</td>
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<td>215</td>
<td>-3</td>
<td>-3</td>
<td>6.2</td>
<td>-4</td>
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<td>5Y4</td>
<td>Rect.</td>
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<td>-2</td>
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<td>-2</td>
<td>6.2</td>
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<td></td>
</tr>
</tbody>
</table>

All voltages measured from point indicated to ground, using a 1000 ohm per volt meter. Antenna and ground disconnected. Line Voltage 112V.
PROCEDURE FOR SETTING UP AUTOMATIC PUSH BUTTONS

A glance at Fig. 1 will show that there are eight (8) push buttons, six (6) of which are for automatic use; the adjusting screws are located directly below these.

Fig. 1 also shows the tuning range or frequencies covered by each button.

The remaining two (2) push buttons, located at the extreme left hand end of the push button plate are for tone control.

1. Choose a station having a frequency within the range of button No. 1 840 K.C. to 890 K.C.

2. With the middle knob in the "broadcast" position, tune this station conventionally by using the selector knob.

3. Now turn the middle knob to the "automatic" position and press button No. 1 and turn the adjusting screw in either direction until the previously selected station is heard. Adjust the screw for maximum volume and sensitivity.

4. Remove the call letters of the station from the call letter sheet furnished and insert in the window of the adjusting screw. Insert "Main" and "Base" tabs in windows as shown in Fig. 1.

5. Repeat the above procedure for the remaining five (5) stations.

NOTE: It is advisable to retain the call letter sheet in case of station changes later on.
 ALIGNMENT PROCEDURE

I. F. Alignment. Connect a signal generator set at 456kc to the 6A7 input and connect an output meter to the speaker output. Using a weak signal tune the two I. F. condensers on the first I. F. coil and the two I. F. condensers on the output I. F. coil for maximum response.

R. F. Alignment. Connect the signal generator set at 1400kc to the antenna lead using a dummy antenna of 200mμf. Tune the set by means of the dial to 1400kc position. Adjust oscillator trimmer for this frequency. Pad at 600kc. Recheck 1400kc and trim antenna stage for maximum response. Repeating the alignment may result in improved sensitivity.

<table>
<thead>
<tr>
<th>SCHEMATIC LOCATION</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Antenna Coil</td>
<td>BA110</td>
<td>.50</td>
</tr>
<tr>
<td>L2</td>
<td>Oscillator Coil</td>
<td>BO110</td>
<td>.40</td>
</tr>
<tr>
<td>L3</td>
<td>1st I. F. Coil</td>
<td>LC110</td>
<td>.80</td>
</tr>
<tr>
<td>L4</td>
<td>2nd I. F. Coil</td>
<td>LC112</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Speaker</td>
<td>SD23</td>
<td>3.50</td>
</tr>
<tr>
<td>C1, C2</td>
<td>Tuning Condenser</td>
<td>CV25</td>
<td>1.80</td>
</tr>
<tr>
<td>C5, C4, C5, C6, C7</td>
<td>Fixed</td>
<td>1mfd—200v</td>
<td>.20</td>
</tr>
<tr>
<td>C8, C9, C16</td>
<td>Mica</td>
<td>200mμf</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>Mica</td>
<td>100mμf</td>
<td>.20</td>
</tr>
<tr>
<td>C10</td>
<td>Variable Padder</td>
<td>550mμf</td>
<td>.40</td>
</tr>
<tr>
<td>C11, C12, C13</td>
<td>Fixed</td>
<td>.01mfd—200v</td>
<td>.20</td>
</tr>
<tr>
<td>C14</td>
<td>Fixed</td>
<td>.02mfd—600v</td>
<td>.20</td>
</tr>
<tr>
<td>C17</td>
<td>Fixed</td>
<td>.002mfd—600v</td>
<td>.25</td>
</tr>
<tr>
<td>C18</td>
<td>Electrolytic Condenser Block</td>
<td>CE20</td>
<td>1.40</td>
</tr>
<tr>
<td>S1</td>
<td>Line Switch (On Vol. Control)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>Tone Control Switch</td>
<td>S12</td>
<td>.40</td>
</tr>
<tr>
<td>R1</td>
<td>Volume Control 1/2 megohm</td>
<td>RV18</td>
<td>.80</td>
</tr>
<tr>
<td>R2</td>
<td>Resistors 50,000 ohms—1/2 Watt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>25,000 ohms—1/2 Watt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4, R5</td>
<td>2 megohms—1/2 Watt</td>
<td></td>
<td>.15</td>
</tr>
<tr>
<td>R6, R7</td>
<td>1 megohm—1/2 Watt</td>
<td></td>
<td>.15</td>
</tr>
<tr>
<td>R8</td>
<td>1/4 megohm—1/4 Watt</td>
<td></td>
<td>.15</td>
</tr>
<tr>
<td>R9</td>
<td>1/2 megohm—1/4 Watt</td>
<td></td>
<td>.15</td>
</tr>
<tr>
<td>R10</td>
<td>100 ohms—1/4 Watt</td>
<td></td>
<td>.20</td>
</tr>
<tr>
<td>R11</td>
<td>30 ohms—1/4 Watt</td>
<td></td>
<td>.20</td>
</tr>
<tr>
<td>R12</td>
<td>25 ohms—1/4 Watt</td>
<td></td>
<td>.20</td>
</tr>
</tbody>
</table>
MODEL S5

Chassis Layout-Model S5

ANTENNA

The antenna built into this set will perform with best results in most localities. However, in localities more than 100 miles from a broadcasting station an outdoor antenna of 50 to 75 feet attached to the end of the built-in antenna will be sufficient to give the best performance. This receiver was designed to operate without a ground. Under no circumstances should a ground wire be permitted to come in contact with any metal part of this receiver.
LAURENCO MFG. CO.
SIMPLEX RADIO CO.

"LAURETTE"
L-4B PORTABLE RECEIVER

MODEL K D-C

Schematics

CAUTION: DO NOT ATTEMPT TO OPERATE ON CURRENT OTHER THAN THAT NOTED ON INSTRUMENT IF RECEIVER DOES NOT START WORKING IN ABOUT ONE MINUTE AFTER BEING TURNED ON REVERSE ATTACHMENT PLUG.

INSTALLATION: "Ant" lead may be fed from indoor or outdoor aerial relay, bell spring or any large metal object, if desired.

BALANCING: Attach output of 115 Kc oscillator to grid of 836 tube at front of chassis. Adjust the condenser screws in top of tube and one in under side of panel to loudest point. Repeat adjustments. Disconnect oscillator. Turn dial in section near 1600 Kc. and adjust trimmer to bring loudest signal. Turn dial to station near 550 Kc. and adjust condenser screw in center of rear flange to loudest point.

PHONOGRAPHS: Use a single pole switch mounted as near as possible to second detector socket, connect in series with lead from ground end of grid coil of second detector tube. Slide phonograph pickup inside to switch terminals.

GUARANTEED: This instrument is guaranteed for ninety days, within which period any part showing electrical or mechanical defect will be replaced without charge; when returned prepaid to the factory, but if the complete instrument is returned, a nominal charge will be made for such labor as may be necessary to install the defective part.
Arvin 618, 618A, etc.

In order to eliminate the hum in the chassis used in these and other six-tube models, follow this procedure:

Remove the chassis from the cabinet. Locate the ground lug on the 6Q7G tube socket (see chassis layout on page 8-16 of Rider's Volume VIII). This lug is fastened to the chassis by a rivet which attach the 6Q7G socket to the chassis. Bend this lug over and solder it to the chassis and then recheck for hum. If this is soldered correctly, the hum level should be brought to a minimum.

Pilot XI14, XI15

Changes have been made in the chassis used in these models, which have a similar schematic to the one shown on page 6-15 in Rider's Volume VI. The condensers C32 and C33 in the plate circuit of the second detector have been removed from the circuit, so that now the switch S3 is used to short out only the one condenser, C34, which now has a value of 250 mmf.

The value of the 10,000-ohm resistor No. 26 has been changed to 6,000 ohms. This is in the primary circuit of the pushpull input transformer.

A line condenser (1000-volt, paper) has been added across the primary of the power transformer. This is a dual condenser, grounded between the 0.01-0.01 mf sections.

Automatic 960A

The accompanying partial schematic shows a change which was incorporated in the 960 series, the schematic of which is shown on page 9-2 in Rider's Volume IX. Note also that the receivers in which this change has been made have an r-f peak of 480 kc, instead of 456 kc and that they are identified by the letter "A" after the model number.

Remove the chassis from the cabinet. Un solder the 250,000-ohm plate resistor of the 6FG tube from the B+ terminal, which is the lug on the 16-mf—300 volt electrolytic condenser. See chassis layout on page 8-20 of Rider's Volume VIII. Connect this resistor to the first tap down from B+ on the voltage divider resistor R8. This voltage tap supplies the potential for the 6AG8 anode grid. Recheck for hum, which now should be reduced to a satisfactory level.

Oldsmobile 892043

In some of the early receivers (under serial A-20,000) of this model, several differences exist which should be noted on page 9-2 in Rider's Volume IX.

Resistor No. 46 is 100,000-ohms instead of 20,000.

Resistor No. 54 is 125,000 instead of 100,000-ohms and No. 55 is 75,000 instead of 100,000-ohms.

Resistor No. 44 and condenser No. 26 have been transposed, i.e., the resistor is connected to the grounded end of resistor No. 53 instead of the condenser.

The value of condenser No. 82 is indicated as 0.000063-mf and its connections are as follows: one terminal is connected to the junction of condenser No. 26 and the tap from resistor No. 58 and the other terminal is connected to the junction of condenser No. 18 and the left end of resistor No. 58.

Emerson Chassis AF

Receivers using this chassis and bearing serial numbers above 1,244,716 differ from the schematic shown on page 8-45 in Rider's Volume VIII. The condenser C-17 is omitted and the negative side of the filament circuit is grounded to the chassis.

Fairbanks-Morse 9A

Refer to the schematic shown on page 8-9 of Rider's Volume VIII. During production, the 47,000-ohm resistor (8) and the filter condenser (7?) were removed and the r-f secondary was grounded directly, thus removing AVC from the 6L7G mixer tube. The bottom of the antenna coil secondary was then connected directly to the 1-megohm resistor (8). A 1000-ohm variable resistor was added to the cathode circuit of the 6J7G AFC control tube (at 37) to make possible compensation for variation in calibration due to variation in tube characteristics. This control was found unnecessary and was removed in later runs.

Fairbanks-Morse 8A

Refer to schematic shown on page 8-7 of Rider's Volume VIII. During production, the 47,000-ohm resistor (16) and the 0.05-mf condenser (7?) were removed and the r-f secondary was grounded directly, thus removing AVC from the 6L7G mixer tube. The bottom of the antenna coil secondary was then connected directly to the 470,000-ohm resistor (17).

G.E. G-57

This model is identical to model G-55, except for the cabinet and the loud speaker, which has a part number RS-095. The 12-mf condenser of this unit has a part number RC-943.

The servicing data for model G-55, found on pages 9-1, 9-4, and 9-5 of Rider's Volume IX, apply to the G-57. This additional model number should be added to the listing in your Index.

Stromberg-Carson Push-Button Tuner

The push buttons on all the new receivers, such as those whose servicing data are found in Rider's Volume IX which employ padding condensers for tuning purposes are set up from the front of the chassis. It is unnecessary to get the tone of the receiver to set up the desired station, except to adjust the electric tuning switch at the rear of the chassis.

To set up the stations, it is only necessary to remove the escutcheon over the push buttons and the adjusting screws become readily accessible. These escutcheons are held in place by several Phillips type screws, which can be removed with any small pointed in strument, such as a small nailfile or an old knife blade. However, the use of a special tool is recommended, as this will not mar the surface of the screw head.

DeWold 1106

This model is identical to Models 1104 and 1105, shown on pages 9-1 and 9-10 of Rider's Volume IX, except that the new model has an additional short-wave band for the 44-40 mc range, giving it a total of five bands.

RCA 8M3, 8M4

On 8M3 and 8M4 receivers, it is often advantageous to connect the 22-mmf condenser (C1 on page 9-37 of Rider's Volume IX) from the output end of coil L1 to ground, instead of from the antenna end. Later runs of sets include this change. Note also that good electrical contact is required between vibrator-transformer and chassis to minimize internal noise.
Spiegel Chassis X1

This chassis is used in the following models: 1900, 1920, 1931, 1970, 4502, 9922, and 9925. It is quite similar to the chassis used in the Spiegel Model 100 found on page 9-1 of Rider's Volume IX, the difference being as follows:

The 250,000-ohm resistor in the plate circuit of the 75 second detector is connected directly to +B. This means that the 100,000-ohm resistor and the 0.1-mfd by-pass condenser are not used in this chassis. An 0.05-mfd condenser is used across the 110-volt a-c leads to the power transformer primary instead of one with a value of 0.02 mf.

No wave trap is used in the X1 chassis, such as is shown in the broadcast-band antenna coil. Also no condenser is shunted across the short-wave oscillator coil. The value of the fixed condenser connected between the Police-band oscillator coil and ground is 0.005 mf instead of 0.012 mf.

Majestic 11056, 11057, 11058

Models 11056 and 11058 are found on pages 9-8 to 9-10 of Rider's Volume IX. The data given there also apply to Model 11057. Alignment instructions for these three models are given in the table below.

<table>
<thead>
<tr>
<th>Signal Generator Connection</th>
<th>Signal Generator Frequency</th>
<th>Band Switch</th>
<th>Dial</th>
<th>Trimmer Designation</th>
<th>Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>6ABG Mixer Control Grid Antenna (3)</td>
<td>455 kc (1)</td>
<td>BC</td>
<td>18 mc</td>
<td></td>
<td>Max.</td>
</tr>
<tr>
<td>Antenna (3)</td>
<td>11 mc</td>
<td>SW</td>
<td>SW</td>
<td>To Gen.</td>
<td></td>
</tr>
<tr>
<td>Antenna (3)</td>
<td>6 mc</td>
<td>SW</td>
<td>SW</td>
<td>To Gen.</td>
<td></td>
</tr>
<tr>
<td>Antenna (3)</td>
<td>16 mc</td>
<td>SW</td>
<td>SW</td>
<td>18 mc</td>
<td></td>
</tr>
<tr>
<td>Antenna (3)</td>
<td>6 mc</td>
<td>POL</td>
<td>6 mc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenna (7)</td>
<td>7 mc</td>
<td>POL</td>
<td>6 mc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenna (7)</td>
<td>1500 kc</td>
<td>BC</td>
<td>1500 kc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenna (7)</td>
<td>600 kc</td>
<td>BC</td>
<td>600 kc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenna (7)</td>
<td>1500 kc</td>
<td>BC</td>
<td>1500 kc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenna (7)</td>
<td>600 kc</td>
<td>BC</td>
<td>600 kc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DeWald 1004

This model is identical with the Models 1002 and 1003, shown on page 9-6 of Rider's Volume IX, except that the new model has an additional short-wave band for the 14-40 mc range, giving it a total of five bands.

Fairbanks-Morse 5A

During production runs, a 10-mf, 25-volt condenser was added across the anode resistor of the type-41 output tube to increase sensitivity. In the schematic shown on page 9-5 of Rider's Volume IX, the cathode resistor mentioned bears the number, 21.

Fairbanks-Morse 6C

Referring to the schematic shown on page 8-5 of Rider's Volume VIII, the 10,000-ohm resistor (15), in the screen circuit of the 6DG7 and 15 tubes, was changed during production to 22,000 ohms. Both resistors are of 2-watts rating.

Silvertone 4600, 4601

A receiver is occasionally encountered in which the volume goes to a low value as the volume control is turned down, but it increases again as the control is turned still lower. This can usually be corrected as follows: Remove the chassis from its case and remove the connections to the two outside terminals of the volume control. Then connect a 22.5-volt "F" battery between the center terminal and the case of the control. Rotate the control a couple of times throughout its range. This should repair the control and the connections should be soldered back onto the outside terminals.
Philco 38-12
Run No. 3. It is important that the following leads be dressed in order to eliminate hum:
Dress the green wire connecting the diodes of the 75 tube to the 2nd i-f transformer as far as possible from the filament prongs of the 75.
The brown wire connecting the 51,000-ohm resistor to the high side of the volume control should be dressed under the coil of the 2nd i-f transformer.
The grid lead of the 75 tube should be dressed toward the back of the receiver and between the tube and shield.

Philco 38-4
Run No. 5. The two condensers, Part No. 30-1097, which were connected in parallel with the new air pad-
der, No. 16 in Run No. 3 receivers (see Successful Servicing, July 1938, page 2) have been removed, starting with Run No. 5. For schematic see page 8-61 in Rider’s Volume VIII. In place of these condensers, a thermal compensator, Part No. 31-6227 is connected in parallel with the air pad-
der. The air pad-
der, No. 16, Part No. 31-6206, has also been relocated and is now mounted between the 6U7G r-f tube and the 6F6G output tube. (See page 8-63 for chassis layout.) The thermal compensator, Part No. 31-6227, is also mounted in the same position with the thermostatic plate facing the power transformer.
The oscillator transformer, No. 15, was changed from Part No. 32-2631 to 32-2894. Connection No. 1 of the new transformer has been increased in length for soldering to the air pad-
der in the new location.

Philco 38-14 [121, 124]
In the list of parts on page 8-72 in Rider’s Volume VIII, the parts numbers of the following are incorrect:
Schematic Incorrect Correct No. No.
12—Compensator 31-6209 31 6100
20—Volume Control 33-5236 33-5230
A condenser, 5 mfd, was connected across the secondary of the short-wave transformer, No. 12. This condenser is now connected to lugs Nos. 3 and 4 of the transformer shown on the schematic. See page 8-71 in Rider’s Volume VIII.

Philco 38-33 [121]
Run No. 3. Resistor No. 20, 8000-
ohms, was changed to 20,000-ohms, Part No. 33-20039. It was removed from the 90-volt wire (see schematic on page 9-3 of Rider’s Volume IX) and reconnected to the 135-volt wire of the battery cable. The battery cable assembly was also changed to Part No. 41-3402.

Signals Generator Connection Signal Generator Frequency Dial Position Wave-Band Switch Position Trimmer Number Output Signal
Det-Osc. Control Grid 455 ke4 455 ke
Antenna 460 kc 6 mc 6 mc Band B
Antenna 1400 kc 1400 kc Band A Broadcast Trim,
Antenna 18 mc 18 mc Band A Antenna Trim
Antenna 600 kc 600 kc Band A Broadcast Paf.
Antenna 1400 kc 1400 kc Band A Broadcast Trim,

Note 1—Use smallest possible signal from generator to prevent AVC action from affecting output readings.
Note 2—Adjust for correct dial reading.
Note 3—While rocking.

Zenith Chassis 5516, 5634, 5707
The alignment instructions for the three chassis mentioned above are identical and will be found below. The model numbers of the receivers in which these chassis are used will be found on the pages of Rider’s Volume VII. The schematics and trimmer locations for the respective chassis will be found on these pages: Chassis 5516, schematic page 7-7, trimmers page 7-2; Chassis 5634, schematic page 7-17, trimmers page 7-9; Chassis 5707, schematic page 7-18, trimmers page 7-11.
RCA U-112, Lot U-111 and U-112

The U-112 is a 5-tube superheterodyne-Victrola combination similar to U-111 except that the cabinet has been enlarged to permit the playing of 12-inch records. The service data for the U-111 found on pages 9-169 and 9-170 of Rider's Volume IX apply to these later models, with the following exceptions:

In the U-112, the rectifier has been changed to a 5W4.

A 12,000-ohm resistor, R18, has been added in series with the 0.005-mfd condenser across the pickup in U-112. Model U-112 is made in three power supply ratings, all 105-125 volts with 80 watts consumption:

Rating Frequency
A-6 60 cycles
A-5 50
B-2 25

The 25-cycle power transformer for U-112 has a d-c resistance of 13.7 ohms in its primary and 1190 ohms in the secondary. The speaker in this model, 8426-5, has the following d-c resistances: Field coil—1300 ohms; Primary of output transformer—420 ohms; Voice coil—2 ohms.

Later production of both the U-111 and U-112 models have the following changes:

The antenna coil has been changed from stock number 30894 (1-ohm primary) to 32338 (35-ohm primary). This last coil may be used to replace the former.

A 270-mmf condenser, C23, is connected from the triode plate of the 6Q7G to the chassis.

The following additional alignment data apply to both models: On r-f alignment, turn the gang condenser all the way out of mesh and with the test oscillator tuned to 1720 kc, connect the oscillator trimmer C18. Set the test oscillator to 1500 kc, tune the receiver to the 1500-ke signal and align the antenna trimmer C3 for maximum output.

Note that the connections for the motor coil assembly, shown on page 9-170, has been revised. The connections shown in the left-hand view of the stator are used for both 25-cycle and 60-cycle operation on 110 volts and are unchanged. For 110-volt, 50-cycle operation, the red and yellow designations in the right-hand sketch should be reversed; in other words, the yellow of the left-hand coil is connected to the red of the right coil, making the leads at the bottom red from the left coil and yellow from the right. Note also that the d-c resistance of each coil for 25-cycles in 250 ohms, those for 50- and 60-cycles remaining 82 ohms. These notes apply to both U-111 and U-112.

RCA 5T

Two different speakers are used on Model 5T, and are identified by the numbers stamped on them as follows: (1) RL-63C1 and (2) 72203-5. Replacement parts for No. RL-63C1 are listed in the service data for Model 5T, shown on page 7-14 of Rider’s Volume VIII, and the replacement parts for No. 72203-5 are listed below:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9270</td>
<td>Coil—Field coil</td>
</tr>
<tr>
<td>9533</td>
<td>Cone—Reproducer cone mounted and centered in housing</td>
</tr>
<tr>
<td>5118</td>
<td>Connector—3-contact male connector for reproduction</td>
</tr>
<tr>
<td>9778</td>
<td>Reproducer complete</td>
</tr>
<tr>
<td>4818</td>
<td>Transformer—Output transformer</td>
</tr>
</tbody>
</table>

RCA 5X

Late-production Model 5X receivers include the following minor changes from the original Model 5X which is found on pages 7-15 to 7-20 of Rider’s Volume VIII: (1) a fixed-tuned wave trap is used in place of the adjustable wave trap and (2) a few changes in component parts which are listed below. For late-production Model 5X, under “Alignment Procedure,” omit the wave trap adjustment. Early and late-production receivers can be distinguished readily by inspection of the wave trap. Component part changes for late-production models are as follows:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11414</td>
<td>Capacitor—0.1 mf (C19)</td>
</tr>
<tr>
<td>13877</td>
<td>Capacitor pack—Comprising one 10-mf and two 16-mf sections (C22, C24, C26)</td>
</tr>
<tr>
<td>12695</td>
<td>Resistor—15,000 ohms, insulated, ¥ watt (R2)</td>
</tr>
<tr>
<td>12697</td>
<td>Resistor—2.2 megohms, insulated, ¥ watt (R6)</td>
</tr>
<tr>
<td>13816</td>
<td>Switch—Range switch (S2, S3, S4, S5)</td>
</tr>
<tr>
<td>13838</td>
<td>Trap—Wave trap (L1, C1)</td>
</tr>
<tr>
<td>13149</td>
<td>Coil—Reproducer field coil (L1, L5)</td>
</tr>
</tbody>
</table>

RCA Nos. 12537, 4835, 12398, 12410, 12411, 12399, 3404, 12402, 12395, 12497, 12499, 12371, 12498, 29, 34, 66, 12, 2500, 13150, 13071, 12936 and 12937 are not used in Model 5X with fixed wave-trap.

RCA 8T2

Four different speakers are used with Model 8T2 receiver, and are identified by the numbers stamped on them as follows: (1) RL-63-4, (2) 76365-1, (3) 76365-3 and (4) RL-63E2. Replacement parts for Nos. RL-63-4 and 76365-1 are listed on page 8-40 of Rider’s Volume VIII, and No. 76365-3 is listed on the schematic on page 8-41. The replacement parts for No. RL-63E2 are listed below:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12641</td>
<td>Board—Reproducer terminal board</td>
</tr>
<tr>
<td>12640</td>
<td>Brackets—Output transformer mounting bracket</td>
</tr>
<tr>
<td>11254</td>
<td>Coil—Field coil</td>
</tr>
<tr>
<td>11231</td>
<td>Coil—Hum neutralizing coil</td>
</tr>
<tr>
<td>12642</td>
<td>Cone—Reproducer cone and dust cap</td>
</tr>
<tr>
<td>5118</td>
<td>Connector—3-contact male connector for reproducer</td>
</tr>
<tr>
<td>9773</td>
<td>Reproducer complete</td>
</tr>
<tr>
<td>11235</td>
<td>Transformer—Output transformer</td>
</tr>
</tbody>
</table>

RCA 8U

Two different phonograph turntable motors are used on Model 8U, and are distinguished by the numbers stamped on the motor name plate as follows: (1) 72444-1 and (2) 56992-1. No. 72444-1 is an induction motor with a governor-type speed regulator; No. 56992-1 is a synchronous motor. Replacement parts for No. 72444-1 are listed on page 8-51 of Rider’s Volume VIII; replacement parts for No. 56992-1 are listed below:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8989</td>
<td>Motor complete, 105-125 volts, 60 cycles</td>
</tr>
<tr>
<td>8993</td>
<td>Rotor and shaft for Stock No. 8989</td>
</tr>
<tr>
<td>3398</td>
<td>Spring—Motor mounting spring assembly</td>
</tr>
<tr>
<td>3617</td>
<td>Stud—Motor mounting stud</td>
</tr>
</tbody>
</table>

RCA 87K1, 87K2, 87T2

The service data and replacement parts for the Model 87K1 are shown on pages 9-83 to 9-86 of Rider’s Volume IX. Three replacement parts have been added as follows:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3086</td>
<td>Core—Inductance adjustment for instantaneous tuning coils</td>
</tr>
<tr>
<td>1209</td>
<td>Spring—Retaining spring for core Stock No. 3086</td>
</tr>
<tr>
<td>3069</td>
<td>Card—Station call-later card for push buttons</td>
</tr>
</tbody>
</table>

All service data and replacement parts for Model 87K1 apply directly to Model 87K2, including the three additional replacement parts listed above for Model 87K1.

All service data and replacement parts for Model 87K2 apply directly to Model 87T2, except that the Reproducer Replacement Parts listed below should be used instead of those listed for Model 87K1.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14614</td>
<td>Cone—Reproducer cone and dust cap (L17) (for speaker marked 84901-1 or 84901-2)</td>
</tr>
<tr>
<td>14934</td>
<td>Cone—Reproducer cone and dust cap (L17) (for speaker marked 84901-2 or 84901-6)</td>
</tr>
<tr>
<td>5118</td>
<td>Plug—3-contact male plug for reproducer</td>
</tr>
<tr>
<td>14613</td>
<td>Reproducer complete (marked 84001-3 or 84001-6; but interchangeable with speaker marked 84091-1 or 84091-2 respectively)</td>
</tr>
<tr>
<td>1416</td>
<td>Transformer—Output transformer (T2) (for speaker marked 84091-1 or 84091-2)</td>
</tr>
<tr>
<td>14935</td>
<td>Transformer—Output transformer (T2) (for speaker marked 84091-2 or 84091-6)</td>
</tr>
</tbody>
</table>

Stock Nos. 13866, 14354, 11469, 12662, 14395, 14358, 14355 and 14357 for Model 87K1 Reproducer Assemblies are not used in Model 87T2.
Silvertone 7127, 7133

The schematic for the chassis used in these models will be found on Sears page 7-63 in Rider's Volume VII. The alignment has just been obtained and will be found below.

Apply a 456-kc signal at the control grid of the 2A7 and adjust the r-f trimmers.

Apply a 1712-kc signal at the antenna. Turn condenser all the way open. First adjust oscillator trimmer on the oscillator coil, then the r-f trimmer on the condenser.

Adjust the low-frequency padder at 600 kc while rocking the condenser.

Check at 1400 kc for alignment.

Short-wave Adjustment: adjust the small trimmer found under the chassis on short-wave antenna coil for maximum output. If short wave does not track with dial, adjust trimmer on oscillator section of variable condenser until correct. Make all adjustments for short wave with the variable condenser turned to center of 25-meter location on scale.

Silvertone 4600

A 1-mf condenser should be added to eliminate bad chassis pickup as shown in Fig. 1, the partial schematic. This type of pickup is heard as noise when the car engine is running and the antenna is disconnected from the receiver.

This instruction applies to sets having identification number 101.4538 on the label inside the receiver case cover; the condenser has been added at the factory when the number reads 101.4538B or a subsequent letter. See location in Fig. 2. Note that the schematic is shown on Sears page 0-35 of Rider's Volume IX.

Silvertone 4601

A 0.1-mf condenser should be added in Silvertone 4601 to eliminate chassis pickup.

The location of this condenser is shown in Fig. 2, the bottom view of the chassis. Note that the Silvertone 4601, shown on Sears page 8-75 of Rider's Volume VIII, does not show this condenser; it may be assumed, therefore, that this is Chassis 101.463.

Silvertone 4414, 4415, etc.

The original production of this chassis (No. 101.393) used part number 1012814032, r-f coil and detector coil (iron core). Later production, which can be identified by the letter "C" or a subsequent letter rubber-stamped on the chassis, used part number 1012818509 detector coil and number 1012818510, r-f coil (air core). When the new air-core type coils are used, the 350-ohm resistor, R2, in series with the volume control, is changed to 150 ohms.

Later production used part number 1012418344 as volume control, instead of the one used originally. The new control incorporates the 150-ohm resistor, R2, mentioned above, as a tap on the resistance element, eliminating R2 as an external resistor. The new control can be used to replace the old one in those sets using a 350-ohm R2 by substituting a 200-ohm resistor, as the 150 ohms are incorporated in the control itself. It can be used to replace the original control in those sets that use a 150-ohm external resistor for R2 by removing R2 and connecting to the tap on the volume control.

Please notice that three more model numbers have been added to this chassis and these should be added to the listing in the Index, which should now read: 4414, 4415, 4500, 4505, 4506, 4509, 4510, 4511, Chassis 101.394. The schematic of this chassis will be found on page 8-15 in Rider's Volume VIII.

Silvertone 4502, 4504, etc.

The same changes relating to Chassis 101.393 also apply to these models, with the exception that the later production is identified by the letter "A" or a subsequent letter rubber-stamped on the chassis.

New model numbers have also been added to this chassis and they should be incorporated in your Index, which should read: 4502, 4502A, 4504, 4508, 4512, 4513, 4514, Chassis 101.427. The schematic of this chassis will be found on page 8-58 in Rider's Volume VIII.

Silvertone 4487, 4507, 4587A

If one of these models has been out of service for several months, the 25-mf electrolytic condenser may lose its formation, causing the 5Y3G rectifier tube plates to become redhot or the tube to burn out. While this condition seldom occurs, the electrolytic can be reformed and the condition remedied as follows:

Using a 5Y3 plug and a 5X4 socket, make an adapter by connecting together the prongs indicated below. Then put a 5X4G rectifier tube in the adapter socket and push the adapter plug into the rectifier socket of the receiver. (It is advisable to remove the output tubes from their sockets during the reformating period.) The receiver should be turned on for about five minutes, the 5X4G tube being used to reform the electrolytic. After this period, the 5Y3G tube can be replaced in its socket and the receiver will perform normally.

This same remedy can be applied to other chassis, although it is very unlikely that this condition will be often encountered.

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Stewart-Warner-Firestone R-1332

The filter system and rectifier tube are protected against breakdown during the warming up period by the global resistor (No. 13 in the schematic on page 6-16 in Rider's Volume VI), which functions as follows: the resistance of this unit drops rapidly as the voltage across it rises, so that it acts as a load on the power transformer during the warm-up period and keeps the voltage under the danger point until the tubes are heated and take their normal current. Because of its unique voltage characteristics, this resistor cannot be checked with an ordinary ohmmeter as it will show a resistance of several megohms.

I-F Alignment:

This is conventional, the i-f peak being 456-kc. The trimmers are located on the top of the i-f transformers and may be reached by removing the top cover. The signal generator is connected between the control grid of the 6A7 and ground.

Dial Calibration:

Tune in a station of known frequency between 800 and 1000 kc. Insert a screwdriver in the slotted end of the dial shaft projecting through the back of the control head. Hold the tuning control knob so that the station remains tuned in properly and adjust the dial pointer with the screwdriver so that the exact station frequency is indicated. If the set is badly out of calibration, such that it calibrates correctly at one part of the dial but not at another, it is necessary to adjust the oscillator shunt trimmer. In order to reach this trimmer the chassis must be removed from the case as follows:

Remove the flexible shafts and disconnect the receiver.

Remove the four terminals of the speaker cable from the speaker.

Remove the black antenna lead from the coil and unsolder the coil shield grounding braid.

Remove the blue dial-light lead from the socket terminal.

Remove the yellow tone-control lead from the tone control switch.

Remove the six slotted chassis fastening screws and slide the chassis from the case.

Reconnect the red and yellow leads of the speaker cable to the speaker.

Insert the tuning shaft in the gang condenser fitting and reconnect the battery lead.

Set the chassis on a flat metal plate and adjust as follows:

Connect 0.00025-mf condenser in series with the output of the signal generator and the antenna lead plug on the antenna coil and the ground lead of the signal generator to the chassis of the set. Set signal generator to 600-kc and tune the receiver to maximum volume and set the dial to read exactly 6.0 (600-kc). Set the signal generator to 1400-kc and turn the tuning knob until the dial pointer reaches 14.0 (1400-kc). Adjust the oscillator shunt trimmer (on the gang condenser second from the control end) until the meter indicates maximum output. Then adjust the other gang trimmer as directed below.

R-F Alignment:

With the signal generator tuned to 1400 kc, tune the receiver carefully for maximum output. Adjust the output of the signal generator to minimum value which will give sufficient output meter deflection. Adjust the trimmer nearest to the shaft end of the gang condenser for maximum output.

Stewart-Warner AC-DC Receivers

There is a tendency for filter condensers and rectifier tubes in AC-DC receivers to fail prematurely. The Stewart-Warner Engineering Department has developed a simple remedy which will be incorporated in all future production of Stewart-Warner AC-DC receivers, and which can be applied easily by the serviceman to existing receivers.

With certain power-line impedances, extremely high surge voltages are developed across the filter condenser. These voltages may be as high as 300 volts, and occur only if the set is turned off on a particular part of the a-c cycle of the power-line current. Such a surge often punctures the filter condenser, and this causes the rectifier tube to fail. Since this difficulty is caused by a power-line condition, if it happens once in a certain customer's home, it is very likely to happen again.

The remedy for this trouble is to connect an inexpensive 50-ohm 1-watt resistor in series with the connection from the rectifier-tube cathodes to the electrolytic filter condenser. The proper connection of the resistor is shown in the accompanying diagram. The Stewart-Warner part number for this resistor is 116103.

Firestone-Stewart-Warner R-1332

The alignment instructions for this receiver are practically the same as those which will be found on page 6-16 in Rider's Volume VIII. As this set is used with a steering column control head, the portion of the instructions pertaining to the dash control head can be disregarded. Also the trimmers on the gang condenser are reached by removing the back cover instead of the bottom cover.

A note is contained in the circuit description which should be observed. The correct position of the vibrator in its socket depends upon which battery terminal is grounded. If the negative terminal is grounded, the vibrator should be inserted so that the arrow points away from the adjacent transformer cover. If the positive side of the battery is grounded, this arrow should point towards the transformer cover. The schematic for this receiver will be found on Stewart-Warner page 6-15 in Rider's Volume VI.

Stewart Warner R-160 Chassis

The circuit description and alignment notes found on page 8-16 in Rider's Volume VIII, are practically the same as those which apply to models 1601 to 1609 inclusive, the major difference occurring in the section devoted to dial calibration. In the instructions for calibrating the dial for receivers having a dash control head, only the 1400-kc adjustment is used, the 600-kc setting being neglected. The schematic for the R-160 chassis will be found on page 7-8 in Rider's Volume VII.

RCA 262.263

The a-f driver transformer, T3 has a revised coil design, the d-c resistance of the primary now being 1350 ohms and that of the secondary being 2000 ohms. An extra connection has also been provided on this unit for equalizing the primary and core potentials so that electrolysis between these parts will be reduced. This additional lead is colored red-green and it should be connected to plug "B" of the primary circuit. See schematic diagrams of the early models on pages 5-102 and 5-103 of Rider's Volume V and the late models on pages 6-51 and 6-53 of Rider's Volume VI.

Bosch 376BT, 376F, 376S

Please make a note in the table of socket voltages on page 6-2 in Rider's Volume VI that the filament voltages should be 2.0 instead of 6.2 volts.