RIDER’S
VOLUME - XII

PERPETUAL
TROUBLESHOOTER’S
MANUAL
REG. U.S. PAT. OFF.

COVERING JULY 1940
THROUGH
TO APRIL 1941
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:

1. Push Button Switch
   - The push button switch consists of one (1) white button (extreme left) and eight (8) brown buttons, whose numerical sequence is arranged from left to right. The white button is provided for connecting the set from automatic electric push button tuners to manual knob tuning. The brown buttons are provided for automatic electric tuning.

2. Selector Mechanism
   - The selector mechanism is made up of the selector plate, eight (8) thumb screws, and the adjustment light bulb.

3. 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 rear train. The bearings and the oil reservoir hold sufficient oil to lubricate the motor for a lifetime.

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, stations which are free from static, for tuning on the receiver. Spread these stations over the range of your territory, using the station selector knob. Now hold the white button down and press in button number one (1), next to the white button. See Figure 4. Both buttons are now locked into place, a small pilot lamp located on the rear of the chassis will light up within 10 seconds, the thumb screw at the rear center position to be correctly set. The thumb screw is a number one (1) button, as shown in Figure 5, for order of thumb screw turned upward to allow it to slide freely back and forth until the light comes out. Now turn the thumb screw; the adjustment for the first station is now complete. Out of the station coil, the selector knob should be turned slowly, and the selector knob in the position of the station number one (1) by pressing the white button in an off state. This will go.

With the white button still on, tune in the station of the most suitable frequency and hold the white button, press in button number two (2). Both buttons are now locked into place, the thumb screw number two (2) next to the white button. Point is reached at which the pilot lamp in the rear goes out. Reinstall the selector knob, the selector button number two (2) is shown in Figure 6. As before, follow the same procedure for the remaining stations, always choosing the station with the next highest frequency. After all eight (8) stations have been chosen, check the automatic tuning by tuning in each station. Note: In the window above the white button insert the word "off" found in the coil letter sheet.

HOW TO TUNE IN STATIONS USING THE ELECTRIC PUSH BUTTON TUNER

To operate the receiver automatically, using the electric push button tuner, the white button must be in the 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 paragraph above. If by chance one of the buttons is pressed in, it may be released by pressing any one button all the way in. To change from automatic tuning to manual selection, simply press the white button. When the white button is in, the set may be tuned as a conventional receiver. Note: If it is desired to have Short Wave or Police while the set is being operated with push buttons, it is not necessary to change over from push button tuning to manual tuning. Simply turn the knob and proceed to tune with the selector knob.
IF PEAKED AT 456 KC

FREQUENCY RANGE -
550 to 1700 KC
1700 to 5400 KC
5600 to 18100 KC

LOW FREQUENCY ALIGNMENT

With the wave switch in the broadcast band position and the grid condenser set at minimum. Adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6A7) through a .05 ohm, .1 mh condenser. The ground on the test oscillator can be connected to the chassis ground. Allow all four I.F. trimmers to reach or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Connect the output of the signal generator to the antenna lead (900) through a 0.002 mh micro condenser. Set the grid condenser to minimum and the oscillator to 1720 KC and adjust the "oscillator trimmer" to receive this signal. Make no other adjustments of this frequency. Then set the generator to 1400 KC and tune in the signal by rotating the gang to 1400 on the dial. Adjust the "preselector" and "circuit" trimmer to maximum signal. Set the signal generator to 600 KC and tune in the signal on the receiver. Notice approximately the same sensitivity should be noted at this point as were at 1400 KC. The signal strength may sometimes be improved by adjusting the circuits. This is done by slowly increasing or decreasing the oscillator padding condenser. If 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 preselector of the R.F. section. Return to 1400 KC and check on over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustment was made at 900 KC.

TONE CONTROL

ON & OFF SWITCH & VOLUME CONTROL

BAND SWITCH

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IF ALIGNMENT - Wave change Sw, in BC-position. Gang condenser at minimum, generator at 456 KC, output to 1A6 CG thru 05 MFD condenser, Generator grounded to receiver, align four trimmers of IF transformers.

BROADCAST - Generator connected to antenna lead thru 200 MFD condenser, and set at 1400 KC. Gang condenser at minimum. Trim oscillator then Antenna trimmer pad the oscillator circuit at 600 KC while rocking gang condenser.

SHORT WAVE - Generator at 6000 KC, start rotating gang condenser from HF end, when signal is heard, adjust antenna trimmer (Sw) for maximum peak.

Repeat all adjustments for maximum performance.
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.

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.)

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.

NOTE: COLOR OF WIRES TO CORRESPOND WITH COLOR OF PAINT SPOTS ON SPEAKER FIELD. BLACK FIELD & KG NO. YELLOCl FIELD & KG NO. RED NO CONNECTION
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, speaker, open circuit, or grounded bias resistor, bypass condenser, inadequate or excessively long antennas, 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 I.F. STAGE AT 465 KILOCYCLES:
(a) Connect the ground lead of the test oscillator to the chassis or set around lead. Connect the other lead of the test oscillator to the grid cap of the 6A7 tube through a .02 Mfd. 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 1720-1400 KILOCYCLE BAND:
(a) Remove test oscillator lead from grid of the 6A7 tube and attach it to the receiver antenna lead through a .00025 Mfd. series condenser.
(b) Check tuning dial adjustment by turning gang condenser until pointer touches 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 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 gang 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 600 kilocycles.
(h) While rocking the tuning condenser back and forth adjust 600 KC oscillator pad condenser which is accessible through the hole in the top of the chassis adjacent to the gang condenser for maximum 500 kilocycle signal response.

ALIGNING 2.3-6.3 MEGACYCLE BAND:
(a) Replace .00025 Mfd. Test oscillator antenna lead series condenser with a 400 ohm resistor.
(b) Adjust band selector switch for 2.3-6.3 megacycles 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 6 M.C. antenna trimmer which is mounted on coil located on top of chassis for maximum sensitivity.
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.
USE THE FOLLOWING DUMMY ANTENNAS——
I.F.——.02 MFD CONDENSER
540-1720 KC——.00025 MFD CONDENSER
(CONNECT DUMMIES IN SERIES WITH SIGNAL LEAD)

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

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CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.
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SEE SPECIAL SECTION VOL. VIII.
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII.
ELIMINATION OF INTERFERENCE CAUSED BY A 32-VOLT LIGHT PLANT

Two kinds of static-like noise may be heard when you operate your 32 volt radio at the same time the generating plant is charging the plant batteries.

Static-like noise due to the motion of the brushes on the commutator may resonate and the direction of the commutator, may cause the noise to vary with the rotation of the commutator. Proper placement of the commutator and the brushes will usually eliminate this type of noise.

When eliminating these electrical disturbances always open the radiator or the radiator in which they appear.

Useful Installations

Install spark plug suppressor on the spark plug and connect the high tension lead to the suppressor, as shown in Figure 3.

For four cylinder plants use two spark plug suppressors attached to each spark plug.

CAUTION: Disconnect batteries from generator before attaching suppressor equipment.

Connect one 3 Mfd. 320 volt condenser between one positive brush and the generator frame and one condenser between one negative brush and the generator frame as shown in Figure 2.

FOUR CYLINDER PLANTS: For four cylinder plants attach a condenser to the positive and negative brushes as shown in Figure 2.

Extreme Cases

To determine if the high tension wire is radiating into the antenna, disconnect the antenna and ground from the receiver and if the noise is eliminated or modified, the noise is radiated from the antenna. In such a case, obtain a piece of electrical tape which will just slide over the high tension wire and a piece of copper braid shielding which will just slip over the lead. Cut a piece of braid long enough to cover the high tension wire from the coil to the spark plug suppressor. Cut a piece of shielding that will be one inch shorter than the lead. When the shielding is extended over the lead.

Ignition Noise on Battery Leads

Sometimes the ignition interference will travel up the battery leads. This condition can be corrected as follows: Attach a 3 Mfd. condenser between the POSITIVE terminal at the top of the control box and the negative terminal of the battery. Attach a 3 Mfd. condenser between the NEGATIVE terminal at the top of the control box and the control box frame.

Ignition Interference on Supply Leads

In extreme cases the ignition interference will travel up the supply leads to the radio receiver. This condition can be corrected by attaching a 3 Mfd. condenser between the ungrounded side of the line in the mains switch box and ground for the grounded side of the line if one side of the line is grounded.

Grounding

Some cases may require a thorough grounding of the system. This may be accomplished by running a No. 18, 5 ft. copper wire from the generator frame to a good ground. Connect all metal switch boxes should also be grounded.

If it is necessary to surround the supply lines, first ground them temporarily, one at a time through a 32 volt lamp. One side of the line will light the light, but the other will not. The side which will NOT light the light should be grounded.

DO NOT apply any of the remedies listed under "Extreme Cases", before trying the ones listed under "Useful Cases".

SLIP the leads over the high tension lead. SLIP the shielding over the lead so that it is one-half inch from each end of the lead. Wrap some wire copper wire around the shielding near the end of the lead to hold the shielding in place. SOLID the wire to the shielding so that it does not slip due to plant vibration. The shield may be taped in place if the tape is very adhesive. DO NOT USE FRANKLIN TAPE.

Solder a short length of wire to the shielding and ground it under the nearest screw in the generator frame.

This receiver is designed for operation on 32 volt battery plants only and must not be used on battery plants of a higher rate voltage than 32 volts without a voltage regulator.

The power plug attached to the end of the power cord must be inserted correctly IN THE 32 VOLT POWER SUPPLY OUTLET OR RECEPTACLE. OTHERWISE THE SET WILL NOT OPERATE. After inserting the plug and turning on the receiver, the set does not operate after approximately one minute, remove the plug and turn it half-way around and reinstall it in the power receptacle.

A 4 AMPERE FUSE is located on the face of the chassis underneath receptacle marked "Fuse" and protects the receiver from damage should a defective component be inserted in the set or if it is connected to the improper supply. Continued burning of fuses on the proper supply is indicative of some defect. THE WARRANTY IS VOID IF THE RECEIVER IS OPERATED WITH THE FUSE SHORTED OUT OR WITH A FUSE LARGER THAN 4 AMPERES.
ALIGNMENT

B.C.BAND. Osc. and dial at 1400 KC .0002 mfd.

Adjust B.C. OSC. trimmer to max. Similarly B.C. Pad at
600 KC. Then recheck at 1400 KC.
INT. BAND. Dial and osc. at
5100 KC .0002 mfd. with 400 ohm
in series as dummy. Adj. ANT.
and OSC trimmers to max. Adj.
Pad at 1800 KC. Recheck 5100 KC.
S.W. BAND. 400 ohm dummy. Osc.
dial at 15 MC. Adjust S.W.
ANT. and OSC trimmers to max.

SENSITIVITY Check at 6000 KC
for proper alignment. If rec-
ceiver lacks sensitivity check
the .0035 mica condenser
for short circuit.

IF PEAK 465 KC
ALIGNMENT
I.F. 465 KC, to grid of 6A7, Adjust IF trimmers.
INT. BAND. Dial and Osc. at 5100 KC .0002 mfd. cond. with 400 ohm series res. as dummy. Adjust ant. and osc. trimmers to max.
Adjust Pad at 1800 KC. Recheck adjustment 5100 KC
S.W. BAND. 400 ohm dummy oscillator and dial at 15 KC. Adjust S.W. ant. and osc. trimmers to max.
Check sensitivity at 6000 KC to check for proper alignment. If the receiver lacks sensitivity check the .0035 cond. (mica) for short circuit.

BROAD OSC TRIMMER
INTER OSC TRIMMER
S.W. OSC. TRIMMER

BOTTOM VIEW OF CHASSIS
PADDERS

REAR OF CHASSIS

STATION SELECTOR

FRONT OF CHASSIS

BAND SWITCH

OSC. COIL & TRIMMER ASSEMBLY

IF PEAK 465 KC
PUSH-BUTTON ADJUSTMENT

Nine stations operating in the 1500-540 kilocycle band may be automatically push-button 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 aerial which will be used with the radio attached to the receiver when setting push buttons.
(b) Operate radio for at least 15 minutes before calibrating push buttons.
(c) Obtain transmitter frequency—number of kilocycles—and call letters of the new stations you wish to set push-button tune from radio log or newspaper radio station list.

Adjust Push Buttons for Selected Stations by:

(a) Remove band switch knob to the NEXT TO MAXIMUM RIGHT HAND POSITION—540-1750 Kilocycle Band Manual Tuning Position.
(b) Using regular manual tuning knob carefully tune in one of the selected stations whose transmitter frequency is closest to one of the 330-860 kilocycles. Make a mental note of the kind of programs on this station, so that when push button is adjusted for this particular station has instructed in paragraph 3, it will be seen to come in at the station by the type of program being transmitted.
(c) Rotate band switch knob to maximum right hand position.
(d) Press in one of the three push buttons marked 330-860 kilocycles on diagram.
(e) NOTE: STATION MAY BE DISTURBED OR IN SOME INSTANCES ANOTHER STATION MAY BE HEARD.

(3) GRASP END OF PUSH BUTTON AND BY SLOWLY TURNING THIS BUTTON CAREFULLY TURN IN THE SELECTED 330-860 Kilocycle Station that Was Previously Tuned In With Manual Control.

(4) Slowly turn in one direction, then if the wanted station is not heard turn in opposite direction, watch tuning eye and adjust so that the two open ends of the green inverted "V" on the tuning eye are closest together at which point the signal will be heard with greatest volume and clearest tone.

(5) Press station call letter of the station just tuned in out of call letter sheet supplied and insert into depression adjacent to push button just adjusted.

(a) After the first 330-860 kilocycle push button has been properly set, the other eight push buttons should be adjusted in the same manner preferably in the following order:

1. Set remaining two push buttons marked 330-860 kilocycles on diagram for any two stations operating between 330-860 kilocycles.

2. The three push buttons marked 660-1170 kilocycles should be adjusted for any three selected stations operating between 660 and 1170 kilocycles.

3. Adjust the three push buttons marked 860-1550 kilocycles on diagram for any three selected stations operating between 860 and 1550 kilocycles.

IMPORTANT

For Manual Tuning the Band Switch must be in next to maximum right hand position. When adjusting Push Buttons or when Push Button tuning after Push Buttons have been set, Band Switch must be in maximum right hand position.

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MODEL E10850

ALLIED RADIO CORP.

IF PEAK 456 KC

CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII

Note: In aligning IF, align all six trimmers.

PAD BROADCAST BAND AT 600KC
PAD POLICE BAND AT 1800 KC
CHECK SENSITIVITY AT 6000 KC

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This receiver is designed to operate over three tuning ranges with a horizontal pointer movement: the broadcast band which extends from 535 to 1700 kilocycles (KCI) (735 to 560 Meters), Police and Aviation Band which extends from 1700 to 5600 kilocycles (2.7 to 5.6 Megacycles or 535 to 1750 Meters), and 11.5 to 18.1 Megacycles (MC) or 16.5 to 22.5 Meters. This latter range is the one which includes the four internationally assigned bands—the 16.5, 22.5, 31.5, and 40 meter bands.

This receiver is designed to operate from a power supply unit of one or 220-volt, 50 cycle alternating current (A.C.). Never plug it into a DC outlet.

**Floating Chassis**

Loosen the four (4) important mounting screws and two (2) wooden strips that secure the chassis to the cabinet and remove the two (2) wooden strips that are underneath the chassis. This allows the chassis to float and rest on the rubber pads used for this purpose. After the strips have been removed, adjust the chassis in the cabinet so that the front control knobs sit in the center of the front control slots. Do not resurface the mounting screws. Make sure the mounting screws and wooden strips to use in case the set is reshipped or moved. Otherwise, damage may be done to the finished unit.

**Grounding Chassis**

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 ground lead (black). Where the above mentioned ground facilities are not available, a good outside ground may be had by running a metal pipe or ground rod about six feet into moist earth. An excellent one can be prepared by driving a hole and lining it with charcoal, in which the ground rod is placed. The charcoal will surround the ground rod and maintain a moist condition throughout the year.

**Replacement Parts List**

**Carbon Resistors**

- C-2172A 250 Kilo-ohms 20% Watt 20% Watt
- C-2172B 250 Kilo-ohms 20% Watt 20% Watt
- C-2172C 250 Kilo-ohms 20% Watt 20% Watt
- C-2172D 250 Kilo-ohms 20% Watt 20% Watt
- C-2172E 250 Kilo-ohms 20% Watt 20% Watt
- C-2172F 250 Kilo-ohms 20% Watt 20% Watt
- C-2172G 250 Kilo-ohms 20% Watt 20% Watt
- C-2172H 250 Kilo-ohms 20% Watt 20% Watt

**Electrolytic Capacitors**

- C-2172I 500000 20% Watt 20% Watt
- C-2172J 500000 20% Watt 20% Watt
- C-2172K 500000 20% Watt 20% Watt
- C-2172L 500000 20% Watt 20% Watt
- C-2172M 500000 20% Watt 20% Watt
- C-2172N 500000 20% Watt 20% Watt
- C-2172O 500000 20% Watt 20% Watt
- C-2172P 500000 20% Watt 20% Watt

**Mica Capacitors**

- C-2172Q 10000 20% Watt 20% Watt
- C-2172R 10000 20% Watt 20% Watt
- C-2172S 10000 20% Watt 20% Watt
- C-2172T 10000 20% Watt 20% Watt
- C-2172U 10000 20% Watt 20% Watt
- C-2172V 10000 20% Watt 20% Watt
- C-2172W 10000 20% Watt 20% Watt
- C-2172X 10000 20% Watt 20% Watt

**Ceramic Capacitors**

- C-2172Y 10000 20% Watt 20% Watt
- C-2172Z 10000 20% Watt 20% Watt
- C-2172AA 10000 20% Watt 20% Watt
- C-2172BB 10000 20% Watt 20% Watt
- C-2172CC 10000 20% Watt 20% Watt
- C-2172DD 10000 20% Watt 20% Watt
- C-2172EE 10000 20% Watt 20% Watt
- C-2172FF 10000 20% Watt 20% Watt

**Inductors**

- C-2172GG 50000 20% Watt 20% Watt
- C-2172HH 50000 20% Watt 20% Watt
- C-2172II 50000 20% Watt 20% Watt
- C-2172JJ 50000 20% Watt 20% Watt
- C-2172KK 50000 20% Watt 20% Watt
- C-2172LL 50000 20% Watt 20% Watt
- C-2172MM 50000 20% Watt 20% Watt
- C-2172NN 50000 20% Watt 20% Watt

**Miscellaneous**

- C-2172OO 50000 20% Watt 20% Watt
- C-2172PP 50000 20% Watt 20% Watt
- C-2172QQ 50000 20% Watt 20% Watt
- C-2172RR 50000 20% Watt 20% Watt
- C-2172SS 50000 20% Watt 20% Watt
- C-2172TT 50000 20% Watt 20% Watt
- C-2172UU 50000 20% Watt 20% Watt
- C-2172VV 50000 20% Watt 20% Watt

**Power Transformer**

- C-2172WW 50000 20% Watt 20% Watt
- C-2172XX 50000 20% Watt 20% Watt
- C-2172YY 50000 20% Watt 20% Watt
- C-2172ZZ 50000 20% Watt 20% Watt

**Audio Socket**

- C-2172AAA 50000 20% Watt 20% Watt
- C-2172BBB 50000 20% Watt 20% Watt
- C-2172CCC 50000 20% Watt 20% Watt
- C-2172DDD 50000 20% Watt 20% Watt

**Reference Points**

- C-2172EEE 50000 20% Watt 20% Watt
- C-2172FFF 50000 20% Watt 20% Watt
- C-2172GGG 50000 20% Watt 20% Watt
- C-2172HHH 50000 20% Watt 20% Watt

**Power Chassis**

- C-2172III 50000 20% Watt 20% Watt
- C-2172JJJ 50000 20% Watt 20% Watt
- C-2172KKK 50000 20% Watt 20% Watt
- C-2172LLL 50000 20% Watt 20% Watt

**Grounding Chassis**

- C-2172MMM 50000 20% Watt 20% Watt
- C-2172NNN 50000 20% Watt 20% Watt
- C-2172OOO 50000 20% Watt 20% Watt
- C-2172PPP 50000 20% Watt 20% Watt

**Reference Points**

- C-2172QQQ 50000 20% Watt 20% Watt
- C-2172RRR 50000 20% Watt 20% Watt
- C-2172SSS 50000 20% Watt 20% Watt
- C-2172TTT 50000 20% Watt 20% Watt

**Grounding Chassis**

- C-2172UUU 50000 20% Watt 20% Watt
- C-2172VVV 50000 20% Watt 20% Watt
- C-2172WWW 50000 20% Watt 20% Watt
- C-2172XXX 50000 20% Watt 20% Watt
ALLOYED RADIO CORP

MODELS 110650 AND 110880

It is very important that you 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 (9) brown push buttons flanked 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, stations which are free from excess hiss. Turn on the receiver (broadcast radio) and press in the dial tuning button, tune in the station at 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 at the rear accidentally happens to be correctly set. Loosen thumb screw number one (See Figure 2) in order of thumb screw (for order of thumb screw) enough to allow it to slide freely 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 disc and 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 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.

**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 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 this adjustment by following the adjustment procedure described in the paragraph above.

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

**PARTS LIST FOR MODEL 110650**

**RESISTORS**
- R1—6149 500 Ohm ¼ Watt
- R2—6150 350 Ohm ¼ Watt
- R3—6139 200 Ohm ¼ Watt
- R4—6141 300 Ohm ¼ Watt
- R5—6141 500 Ohm ¼ Watt
- R6—6137 500 Ohm ¼ Watt
- R7—6127 600 Ohm ¼ Watt
- R8—6127 1,000,000 Ohm ¼ Watt
- R11—6271 25,000 Ohm 1 Watt
- R12—6127 500 Ohm ¼ Watt
- R13—6141 600 Ohm ¼ Watt
- R14—6147 50,000 Ohm ¼ Watt
- R15—6139 200,000 Ohm ¼ Watt
- R16—6122 200,000 Ohm ¼ Watt
- R17—6122 200,000 Ohm ¼ Watt
- R18—6127 200 Ohm ¼ Watt
- R19—6127 200 Ohm ¼ Watt
- R20—6127 200 Ohm ¼ Watt
- R21—6127 220 Ohm 2 Watt
- R22—6127 220 Ohm 2 Watt
- R23—6127 700 Ohm ¼ Watt
- R24—6127 2,000,000 Ohms

**TRANSFORMERS AND COILS**
- PT110 Fuwier Transformer
- P1100 1st L.F. Transformer
- P2704 2nd L.F. Transformer
- P2711 3rd L.F. Transformer
- G5794 Oscillator Coil Assembly
- G5310 Police and Short Wave Antenna Coil
- G5347 Broadcast Antenna Coil

**PAPER CONDENSERS**
- C1—6149 0.5 Mfr. 200 V.
- C2—6127 0.0008—0.0016 Mfr.
- C4—6127 0.0008 Mfr.

**MICA CONDENSERS**
- C3—6183 0.004 Mfr.
- C7—6183 0.001 Mfr.
- C11—6183 0.001 Mfr.
- C21—6183 0.0025 Mfr.
- C27—6183 0.001 Mfr.

**ELECTROLYTIC CONDENSERS**
- C16—6199 Dual Electrolytic
- C17—6199 Electrolytic

**ADJUSTABLE CONDENSERS**
- P12100A Variable Condenser
- P2742 Gooch Trimmer Strip
- P1682 Oscillator Paralleling Condensers
- P2634 Push Button Switch
- P1150 Pilot Light Socket
- P1150 Pilot Light Bulb
- P2689 Electrical Motor
- P2689 Rubber Drive Belt
- P2888 Dial Scale
- P2644 Dial Pointer
- G5462 Lower Segment Adjustment Bracket and Contact
- G5463 Upper Segment Adjustment Bracket and Contact

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SERVICE NOTES for "AUTOMATIC-TUNE" WHEEL DIAL

DIAL MECHANISM

4011 DRUM ASSEMBLY WITH 4012 SECONDARY PULLEY
4013 SECONDARY DRIVE CORD WITH EYE TERMINALS
4024 DISC-TRANSPARENT DIAL SCALE BACKGROUND
4008 PULLEY-BEST CAST FOR DIAL SCALE
2754 SET SCREW 6-32 .010 S.W.G. (.3/8") CUP POINT
2754 SET SCREW 6-32 (.400"
4012 SECONDARY PULLEY (DIE CAST) WITH SPRING AND TENSION SPRING FOR SECONDARY CORD
3814 PRIMARY DRIVE CORD WITH EYE TERMINALS
2756 SPRING LOCK FOR DRIVE SHAFT

WHEN INSTALLING PART No. 4005 GLASS ASSEMBLY WITH No. 4005 SHAFT ATTACHED carefully follow procedure in order given:
(a) Insert No. 4005 shaft into main bushing 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 screws.
(d) Loosen the two set screws in brass spacers collar on the No. 4005 shaft.
(e) Adjust brass spacers 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 retighten brass collar and No. 2754 die cast pulley set screws. 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) Locking at back of dial, wrap dial cord twice around No. 4355 drive shaft in CLOCKWISE direction.
(b) Hook No. 3462 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.

4. INSERT CELLULOID ENVELOPE INTO A METAL TAB FRAME BY:
(a) Fold cut-off end of celluloid envelope to metal tab holder and insert cut-off envelope into metal frame.
(b) Gently push celluloid toward cut end of envelope and inner edge of envelope envelop tab frame.
(c) Arrange tabs in numerical order according to station frequency.

5. SET THE METAL TAB HOLDERS ON DIAL:
(a) Set the first metal tab holder for the station that broadcasts on the lowest frequency—least number of kilocycles—then set the next metal tab holder for the station operating on the next lowest frequency, continuing on in this way until all tabs have been set for all of the selected stations.
(b) Carefully turn the dial in the station which broadcasts on the highest frequency—largest number of kilocycles.
(c) Insert celluloid envelope between edge of dial and metal face plate—Lightly press on end of knurled tab into surface until its pulled down and tab holder remains the celluloid envelope on the dial at which point station card tab holder will appear directly above the indicator line on the face of the instrument.
(d) Tighten tab holders as much as possible without moving dial by turning knurled tab in the opposite direction of the dial tab.

3. PLACE EACH SELECTED STATION CALL LETTER PAPER STRIP INTO CELLULOID ENVELOPE:
(a) Fold celluloid envelope with cut off end of celluloid envelope with printed call letters upward.

REPLACING No. 4000 Dial Glass Scale Assembly
As it requires special tools to properly set part No. 4005 shaft assembly on part No. 4000 glass scale—we will ship all orders for No. 4000 glass scales with the No. 4005 shaft assembly on the glass scale.
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 hooks in the No. 4009 die cast pulley and to the No. 4052 & 4202 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 out 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.

(c) 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 CLOCKWISE 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.

NOTE:***********************

FOR ##1, MODEL NUMBERS ARE B10600, 1, 2, 3, 4, 5

## #2, B10572, 95, 56

## #3, B10566, 6, 7, 8

## #4, B10590, 1, 2, 3, 4, 5, 6

COMPLETE WHEEL DIAL ASSEMBLY LESS ERecUTECION

MISCELLANEOUS PARTS USED IN ABOVE ASSEMBLIES
SERVICE NOTES for PUSH BUTTON DIAL

FROM ONE TO TEN STATIONS OPERATING ON FREQUENCIES SEPARATED BY FORTY KILOCYCLES OR MORE MAY BE AUTOMATICALLY TUNED BY PROPERLY SETTING PUSH BUTTONS.

IT IS A SIMPLE MANNER TO AUTOMATIC TUNE THE STATIONS ON YOUR DIAL WHEN THE BUTTONS HAVE BEEN PROPERLY SET-JUST PLACE UNDER FINGER INTO THE SURFACE OF THE DIAL UNTIL THE SHAPE ADJUSTMENT TO THE BUTTONS IS PROPERLY SET. THE DIAL SHOULD BE PROPERLY TUNED IN AND THE METAL DISC PLACED UNDER NEARLY OR STATION LETTERS ARE TO BE PLACED IN THE DIAL AS SHOWN.

WHILE A PUSH BUTTON MAY BE SET FOR DISTANT STATIONS, SHORTER RESULTS WILL BE OBTAINED IF THE STATIONS SELECTED FOR AUTOMATIC TUNE ARE SHORTLY OR NEARLY LOCAL STATIONS.

AFTER IT IS DETERMINED WHAT STATIONS YOU WISH TO AUTOMATIC TUNE BUTTONS ON YOUR DIAL, THE PROPER SETTING OF THE PUSH BUTTONS AS SHOWN IS TO BE TAKEN.

NOTE STATION PUSH BUTTONS:

- Gently press desired round paper station card button near out of station card edge.
- Always set the first push button for the desired station first. Button should be closest to indicator line on face of dial.
- Lower Push Button slowly and steadily until it is clear of dial.
- Carefully set the station card buttons as desired.
- Lower the Push Button slowly and steadily until it is clear of dial.
- Carefully set the station card buttons as desired.
- Lower the Push Button slowly and steadily until it is clear of dial.

FOR OTHER ASSEMBLIES SEE "AUTOMATIC TUNE" WHERE DIAL ASSEMBLIES.

PARTS LIST

COMPLETE PUSH BUTTON DIAL ASSEMBLY LESS ESCUTCHEON

| Part No. | Description | Cost
|---------|-------------|-----|
| 211     | Dial Assembly Used With Model 1 Complete Assembly Less Escutcheon | $12.75
| 212     | Dial Assembly Used With Model 1 Complete Assembly Less Escutcheon | $12.75
| 213     | Dial Assembly Used With Model 2 Complete Assembly Less Escutcheon | $13.75
| 214     | Dial Assembly Used With Model 2 Complete Assembly Less Escutcheon | $13.75
| 215     | Dial Assembly Used With Model 3 Complete Assembly Less Escutcheon | $14.75
| 216     | Dial Assembly Used With Model 3 Complete Assembly Less Escutcheon | $14.75

MICROSCOPIC PARTS USED IN ABOVE ASSEMBLIES

| Part No. | Description | Cost
|---------|-------------|-----|
| 4047    | Cap Push Button | $0.15
| 4048    | Celluloid Disc Station Call Letter Cover | $0.15
| 2814    | Coed Primary Drive Cord | $0.15
| 4013    | Coed Secondary Drive Cord | $0.15
| 4041    | Cap Assembly Push Button with Chip and Compressing Button | $0.15
| 4096    | Board Indicator Assay For Model 1 & 4 | $0.35
| 4097    | Board Indicator Assay For Model 2 & 3 | $0.35
| 4011    | Drive Drum Ass. With 4021 Secondary Pulley and Rubber Disc Coupler | $0.25
| 4355    | Drive Shaft | $0.15
| 4027    | Disc Translucent Dial Scale Backing for Model 1 | $0.50
| 3984    | Disc Translucent Dial Scale Backing for Model 2 & 3 | $0.50
| 4028    | Disc Translucent Dial Scale Backing for Model 4 | $0.50
| 3771    | Escutcheon | $1.00
| 4040    | Hub Cap | $0.15
| 4339    | Pulley Dial Scale Drive (Die Cast) | $0.15
| 4329    | Pulley Drive (Die Cast) | $0.15
| 4329    | Pulley Drive (Die Cast) | $0.15
| 4030    | Scale Calibrated Glass Scale with 4000 Scale Assay | $0.75
| 2754    | Screw For Pulley 6/32 x 1/8" H.S.H.C. Cup No. 6 | $0.03
| 4037    | Slide Stop Push Button Bolt | $0.10
| 4356    | Spring Lock For Drive Shaft | $0.10
| 3453    | Spring Tension For Secondary Cord | $0.97
| 3462    | Spring Tension For Primary Cord | $0.97

Prices are subject to change without notice.

When ordering parts be sure to mention part number and order all parts from one vendor.

NOTE: FOR #1, MODEL NUMBERS ARE B10600, 1, 2, 3, 4, 5

**ALLIED RADIO CORP.**
Remove the grid lead from the 6K8 converter tube. Connect the live side of the signal generator to the grid of the 6K8 through a small mica condenser 200 to 500 mf. Connect the ground side of the signal generator through a similar condenser to the lead that was removed from the cap of the tube. Connect a resistor of 200 to 500 ohms between the grid of the tube and the grid lead. Connect the ground or shield of the signal generator to B--. Be sure that there is no direct connection between the signal generator and an external ground or directly to the power supply line.

Using a 5,000 ohm per volt D.C. meter with a voltage range of 20 volts as a resonance indicator, connect it across the 50,000 ohm limiting resistor. Set the signal generator at 4.3 M.C. and set the attenuator for about a 5-volt reading on the voltmeter. Align the three I.F. coils for a maximum reading, the same as an amplitude set.

Check the shape of the resonance curve by changing the signal generator to 4.2 M.C. and 4.4 M.C. The output reading either side of resonance should be about the same.

To align the discriminator, connect the signal generator, the same as for the I.F. alignment. Set the generator at 4.3 M.C. Connect the voltmeter across the two diode load resistors. Using an insulated screwdriver adjust the secondary trimmer to zero voltage. Shift the signal generator to 4.2 M.C. and 4.4 M.C. Adjust the primary trimmer so that the D.C. readings are equal and opposite in polarity.

To align the R.F. and oscillator, connect the signal generator to the two leads at the back of the chassis. With the generator set at 40 M.C. adjust the oscillator, R.F. and antenna trimmers for maximum signal with the set tuned to the low frequency end of the dial, 50 M.C. and check the frequency and the alignment.
BELMONT RADIO CORP.

MODELS 151, 536

BELMONT PAGE 12

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH A HIGH RESISTANCE VOLTMETER BETWEEN SOCKET TERMINALS AND B —
volume control

12SA7
12SK7
12SQ7
35L6GT

12SK7
12SQ7
35L6GT
35Z5GT

I.F. 455 K.C.

(1) CANNOT BE MEASURED WITH VOLTMETER. AT MINIMUM.
(2) OSCILLATOR VOLTAGE TO BE MEASURED WITH A.F. GROVE IN SERIES WITH VOLTMETER LEADS.

All voltages as indicated on the voltmeter chart are measured with 117 volt D.C. line.

REAR OF CHASSIS

VIEW LOOKING AT BOTTOM OF CHASSIS

NOTE: THE ANTENNA COIL ASSEMBLY IS MADE SO THAT IT IS MOVABLE LEFT OR RIGHT. WHEN MAKING THE ADJUSTMENT AS GIVEN IN THE ALIGNMENT PROCEDURE, MOVE THE COIL ASSEMBLY VERY SLOWLY. IT CAN BE MOVED BY HAND OR BY PIVOTING THE END OF THE BLADE OF A SCREWDRIVER IN THE HOLE AND ENGAGING THE BLADE IN THE GEAR TEETH OF THE COIL ASSEMBLY.

Setting the Automatic Pushbuttons

Make a list of your favorite stations. Push out the call letters of those stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Press one of the buttons all the way down and hold it firmly. Now tune in the station you want with the tuning knob. Tune back and forth until the station is clear, then release the button.

NOTE: If the tuning knob turns quite hard when the button is held down firmly (loosen the reset lock screw several turns with a screwdriver or coin (quarter).

Continue, setting each of the remaining pushbuttons in the same way. Now turn the tuning knob all the way to the right and tighten the reset lock screw. This screw prevents the pushbuttons from slipping off the stations you have set. To change stations loosen lock screw and proceed as above.

October 1940

For Alignment data see Index

Parts

- Antenna coil—Permeability tuning assembly complete
- Oscillator coil—Permeability tuning assembly complete
- Input L. F. coil—455 Kc.
- OUTPUT L. F. coil—455 Kc.
- Output transformer
- F. M. speaker
- Switch on volume control
- Pilot light

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# Alignment Procedure

**IMPORTANT**:—See alignment instructions

- 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.

## Band Signals

<table>
<thead>
<tr>
<th>Band</th>
<th>Signal Generator Frequency Setting</th>
<th>Dummy Antenna Setting</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>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of ESA7</td>
<td>Rooster full open (Plates out of mesh) Four trimmers on top (See Fig. 1)</td>
<td>Output and Input L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of ESA7</td>
<td>Rooster full open (Plates out of mesh) Trimmer rest section of gang.</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE** “A”—Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

**Frequency Range**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>535 to 1000 Kc.</td>
<td>55 Watts</td>
</tr>
</tbody>
</table>

**Power Consumption**

- 35 Watts

**Power Output**

- 800 Milliwatts Undistorted

**Selectivity - 85 KC Broad at 1000 Times Signal at 1000 KC**

**Sensitivity (for .5 Watts Output) - 30 Microvolts Average**

**Speaker**

- 5 in. P. M. Dynamic

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**Models**

- 151 & 656

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**Models**

- 862

---

**NOTE** “B”—After the antenna coil has been moved at 1400 Kc, it is necessary to check the antenna trimmer (C3) adjustment again at 1700 Kc. If no appreciable change in trimmer adjustment is made in the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1700 Kc.

---

Reduce to 9/16
### Model 518

**FREQUENCY RANGE**

540 to 1720 K.C.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Core (Dial Setting)</th>
<th>Trimmers Adjusted (Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td></td>
<td>465 Kc. 1 MFD.</td>
<td></td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</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></td>
<td>465 Kc. 1 MFD.</td>
<td></td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</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>1720 Kc. 20 MFD.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C) (See bottom of Fig. 3)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1720 Kc. 20 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (D) (See bottom of Fig. 3)</td>
<td>Antennas</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 20 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Adjust position of antenna coil up or down (See Fig. 4)</td>
<td>Antenna Coil</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1720 Kc. 20 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Adjust to trimmer (C) (See Fig. 3)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**—The antenna coil assembly is made so that it is movable up or down. When making the adjustments as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one end of the blade of a screwdriver in the hole and engaging the blade in the gear mesh of the coil form.

### Model 794

(Serial No. OA297000 and up)

**Series A**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</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>Trimmers Adjusted (Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td></td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 12A87</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>
</tr>
<tr>
<td></td>
<td></td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 12A87</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>
</tr>
<tr>
<td></td>
<td>17 M. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 12 M.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 M. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 M.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 M. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 M.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1500 Kc. 20 mfd.</td>
<td>Grid of 12A87</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>560 Kc. 20 mfd.</td>
<td>Grid of 12A87</td>
<td>Broadcast</td>
<td>Set Dial at 340 Kc.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 20 mfd.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Broadcast series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 20 mfd.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C2 (See Fig. 5)</td>
<td>Iron Core Tracking Coil</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**—The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 12A87 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, 1520 and 340 K.C. The loop antennas need not be connected to the radio when making these adjustments.

**NOTE**—Loop alignment is made with the chassis mounted in the cabinet and the loop antennas connected to the terminal board. The signal generator is connected to the "ANT." and "GND." terminals and the trimmer on the terminal board connected to "EXT." terminal (See Fig. 1).

**FREQUENCY RANGE**

5.7 to 18.3 MC.

After each band is completed, repeat the procedure as a final check. It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.
# ALIGNMENT PROCEDURE

## BAND

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dist Setting)</th>
<th>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. F.</strong></td>
<td>465 Kc.</td>
<td>.1 MFD</td>
<td>Connect to Terminal “A” (See Fig. 1)</td>
<td>Iron Cores All the way out</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>.1 MFD</td>
<td>Connect to Terminal “A” (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>BROADCAST BAND</strong></td>
<td>1600 Kc.</td>
<td>.1 MFD</td>
<td>Connect to Terminal “A” (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>200 MMF</td>
<td>Connect to Terminal “B” (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>200 MMF</td>
<td>Connect to Terminal “B” (See Fig. 1)</td>
<td>Turn Dial to 1400 Kc.</td>
<td>Adjust position of antenna coil right or left. (See Note &quot;A&quot;)</td>
<td>Antenna Coil Adjustment</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>300 MMF</td>
<td>Connect to Terminal “B” (See Fig. 1)</td>
<td>Turn Dial to 1600 Kc.</td>
<td>Adjust trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;B&quot;)</td>
</tr>
</tbody>
</table>

### NOTE “A”
The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

### SERVICE NOTES:
- 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.

### 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 voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

### NOTE “B”
After the antenna coil has been tracked at 1400 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1600 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1600 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1600 Kc.
### Model 534

**Power Consumption**
- 35 Watts

**Power Output**
- 800 Milliwatts Undistorted

**Sensitivity for 50 Milliwatt Output**
- 20 Microvolts Average

**Selectivity**
- 65 KC Broad at 1000 Times Signal at 1000 KC

**Tuning Frequency Range**
- 535 to 1650 KC

**Intermediate Frequency**
- 455 KC

**Speaker**
- 5 in. P.M. Dynamic

#### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Convection to Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.F.</strong></td>
<td>455 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7 I. F. Tube.</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>BROAD-CAST BAND</strong></td>
<td>1500 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>CAST BAND</strong></td>
<td>1400 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

Loop aerial should be connected when aligning receiver.

**NOTE**—Mount the chassis and the loop antenna in the cabinet, connect the loop antenna to the chassis. Adjust the antenna trimmer through hole in bottom of cabinet.

**NOTE**—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

### Model 695

#### SIGNAL GENERATOR

<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>Convection to Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.F.</strong></td>
<td>455 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7 I. F. Tube.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 KC</td>
<td>1 MFD.</td>
<td>Grid of 125A7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>SHORT WAVE BAND</strong></td>
<td>17 MC</td>
<td>400 Ohms</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 17 MC</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 MC</td>
<td>400 Ohms</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 17 MC</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>6 MC</td>
<td>400 Ohms</td>
<td>External Antenna and B-</td>
<td>Short Wave</td>
<td>Set Dial at 6 MC</td>
<td>Trimmer C12</td>
<td>Short Wave oscillator series pad (See Note &quot;A&quot;)</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>BROAD-CAST BAND</strong></td>
<td>1600 KC</td>
<td>.1 mmf.</td>
<td>Grid of 25A4</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 KC</td>
<td>200 Ohms</td>
<td>External Antenna and B-</td>
<td>Broadcast</td>
<td>Set Dial at 1400 K.C.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>800 KC</td>
<td>200 Ohms</td>
<td>External Antenna and B-</td>
<td>Broadcast</td>
<td>Set Dial at 800 K.C.</td>
<td>Trimmer C12</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio when making all adjustments. Loop alignment is made with the chasis mounted in the cabinet and the loop antenna connected.

**NOTE**—Turn the dial back and forth slowly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

#### Power Consumption
- 35 Watts

#### Tuning Frequency Range
- Broadcast: 540 to 1600 KC
- Shortwave: 5.6 to 18.3 MC

#### Intermediate Frequency
- 455 KC

#### Speaker
- 5 in. P.M. Dynamic

After each band is completed, repeat the procedure as a final check.

Attenuate the signal from the signal generator to prevent the leveling-off action of the AVC.
Power Supply

This radio is equipped with a universal transformer, 40 to 60 cycles which has the following taps: 90-110-130-150-200 volts.

A rotary switch mounted on top of the transformer selects the proper voltage tap.

Set the switch for various line voltages to conform with the following table:
90 mark for current of .85 to 1.05 volts
110 mark for current of 1.05 to 1.25 volts
120 mark for current of 1.25 to 1.45 volts
130 mark for current of 1.45 to 1.65 volts
200 mark for current of 2.10 to 2.30 volts.

To set the switch, unsew the set screw on the side of the switch and rotate the knob so that the mark desired shows up in the small framed window on the top of the switch. Tighten the set screw.

MODEL 542 SERIES A

Power Consumption - 55 Watts
Power Output - 1½ Watts Undistorted
Tuning Frequency Range

Broadcast Band - 540 to 1735 KC
Medium Band - 2.2 to 7 MC
Short Wave Band - 6.8 to 23 MC
<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</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>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Functions</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>Grid of 4SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Output</td>
<td>I.F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>21 Mc.</td>
<td>400 Ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme Right Rotation)</td>
<td>Set Dial at 21 MC</td>
<td>Trimmer (C)</td>
<td>Short wave oscillator</td>
<td>See Note “A”</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>MEDIUM WAVE BAND</td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>Antenna lead</td>
<td>Medium Wave</td>
<td>Set Dial at 21 MC</td>
<td>Trimmers (C6 CD)</td>
<td>Medium wave oscillator and antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>12 Mc.</td>
<td>400 Ohms</td>
<td>Antenna lead</td>
<td>Medium Wave</td>
<td>Set Dial at 23 MC</td>
<td>Trimmer (C2)</td>
<td>Medium wave oscillator and antenna</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1500 Kc.</td>
<td>200 mmf</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1500 Kc</td>
<td>Trimmer (C3)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc</td>
<td>Trimmer (C11)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MODEL 542—SERIES A**

The loop antenna should be connected to the radio when making all R.F. adjustments.

**MODEL 681—SERIES A**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</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>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Functions</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>Grid of 4SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Chassis View)</td>
<td>Output</td>
<td>I.F.</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>37 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 37 MC</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>8 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 8 Mc</td>
<td>Trimmer C2</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc</td>
<td>Trimmer C3</td>
<td>Short wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1000 Kc.</td>
<td>200 mmf</td>
<td>Grid of 4SA7</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>200 mmf</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MODEL 6796

PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (see Fig. 4). Make a list of the six stations you desire to tune in regularly; any number up to six may be included.

1. Punch out the set of call letter tabs supplied, the call letters of the stations you have selected.

2. Choose the desired pushbutton and a tab is provided for inserting the call letter tab. (See A, Fig. 2.)

3. Insert the call letter tab.

NOW, PROCEED AS FOLLOWS—

1. Push the dial tuning knob hard enough to make it latch in.

2. Rotate the dial tuning knob to the left (counter-clockwise), until the knob can be turned any further without the dial latching.

3. Push in all the way any one of the pushbuttons and hold in firmly (this holds the dial tuning knob). Both the dial tuning knob and the pushbutton should be pushed in hard enough to make them stay latched in. The reason for holding the dial tuning knob in firmly when the pushbutton is pressed in is due to the latching mechanism in the Remote Tuner Unit which is so constructed as to release the dial tuning knob entirely when a pushbutton is pressed in. When setting up stations for automatic tuning, however, it is necessary to hold both the dial tuning knob and the pushbutton latched in together.

4. Press in on the pushbutton which is latched in. Holding it in, turn it in by means of the dial tuning knob until the station indicated on the station call letter tab on this pushbutton is the same as the call letter on the dial tuning knob. When the dial tuning knob is turned clockwise, both will rotate clockwise. When the dial tuning knob is turned in the opposite direction, the pushbutton is released.

5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in so that both the pushbutton and the dial tuning knob are latched in together. Holding the pushbutton in firmly, turn in the stations indicated on the call letter tab on this pushbutton.

6. Follow this procedure until you have tuned in all of your favorite stations.

7. When the last pushbutton has been properly set up, it is necessary to release it from the latched-in position before the tuning mechanism can be locked. To release this pushbutton, press the pushbutton release pin on the bottom of the station button. This will stop the latching mechanism and all the pushbuttons will be released to out position. (See B, Fig. 2.)

8. Next, press the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the left (counter-clockwise), until the knob can be turned any further without the dial latching.

9. This will lock the tuning mechanism and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.

10. Press in any one of the pushbuttons and—YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuning mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counter-clockwise), until the knob cannot be turned any further without the dial latching.

2. To set a pushbutton, push in all the way and hold in firmly both the pushbutton and the dial tuning knob so that both latch in. Hold in firmly the pushbutton and tune in the station by means of the dial tuning knob. Set all the pushbuttons in the same manner.

3. To unlock the last pushbutton, press the pushbutton release pin on the bottom of the station button.

4. To lock the tuning mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise), until the knob can be turned any further without the dial latching.

5. All the pushbuttons must be in out position when locking the tuning mechanism.


dia attached to the rear of the cabinet, is the dial tuning knob.

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 pushbuttons. (Note: Locking screw “C” is loose when radio is shipped from factory.)

CHANGING STATIONS:

If you should desire to change any station you have selected, loosen the locking screw “C” one or two turns. Hold in the dial tuning knob on which the station is to be changed and turn in the new station desired. Release the push button. (Note: If the dial mechanism works hard when setting up a new station on one of the automatic pushbuttons, it is due to the locking screw not being tight. Loosen the locking screw “C” until the dial mechanism works freely.)

Be sure to retrack the dial tuning knob, otherwise the stations you have previously selected will not be adjusted to the push buttons.

The set is now set up for automatic tuning.
### MODEL 671

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</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>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Functions</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD</td>
<td>Grid of 6SA7</td>
<td>Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top (See Top View)</td>
<td>Input and Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</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>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output rock oscillator dia. (See note &quot;C&quot;)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1600 Kc. 200 mfd.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C3</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>550 Kc. 200 mfd.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGNMENT</td>
<td>450 Kc. 400 mfd.</td>
<td>External Antennas and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1450 Kc.</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note B)</td>
<td>450 Kc. 400 mfd.</td>
<td>External Antennas and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MODEL 616

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</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>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Functions</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc. .1 MFD</td>
<td>Grid of 6SA7</td>
<td>L.F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top (See Chassis View)</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C5</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C2</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>External Antennas and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C3</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output rock oscillator dial. (See note &quot;C&quot;)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1600 Kc. 200 mfd.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td>550 Kc. 200 mfd.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGNMENT</td>
<td>140 Kc. 200 mfd.</td>
<td>External Antennas and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 140 Kc. (See Chassis View)</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See Note B)</td>
<td>450 Kc. 200 mfd.</td>
<td>External Antennas and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc. (See Chassis View)</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE "A"**—The signal generator is connected to the "ANT." and "GND." leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1000 and 1355 Kc.).

The loop antenna should be connected to the radio when making these adjustments.

**NOTE "B"**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." terminals.

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

After each band is completed, repeat the procedure as a final check.

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**Model 671**: USE NOTES BELOW

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**Model 616**:
Six-Tube A.C.-D.C. Superheterodyne Receiver with Automatic Tuning and Self-Contained Loop Antenna

Frequency Range—535 - 1600 Kilocycles
I. F. Frequency 455 Kc.

FOR TUNER & ALIGNMENT DATA, SEE INDEX

Receivers of this model which are to be used on voltages other than 105-125 volts A.C. (50/60 cycle), or 105-125 volts D.C. are so marked. The power consumption of this receiver is 35 watts.

VOLUME CONTROL ON-OFF SWITCH

Code Part Description
No. No.

RESISTORS
R1 130010 150M ohm—5 w.
R2 130060 100 ohm—5 w.
R3 130100 100M ohm—5 w.
R4 130181 5M ohm—5 w.
R5 130251 100M ohm—5 w.
R6 130292 15 ohm—5 w.
R7 130296 200 ohm—1 w.
R8 130297 1000 ohm—1 w.
R9 130298 100 ohm—1 w.
R10 130299 20 ohm—1 w.
R11 1304 3 megohm—5 w.
R12 130166 150 ohm—5 w.
R13 13012 50M ohm—5 w.
R14 130193 3 megohm volume control
R15 1303 500M ohm—5 w.
R16 1303 200M ohm—5 w.

CONDENSERS
C1 130011 .01 x 400 v.
C2 129132 .00025 mica
C3 129260 .02 x 400 v.
C4 1293 1000 mica
C5 1295 1000 mica
C6 1296 50 mil.,—150 w.v.v.
C7 1299 50 mil.—150 w.v.v.
C8 1299 20 mil.—150 w.v.v.
C9 1299 50 mil.,—120 w.v.v.
C10 1299 .001 x 200 v.
C11 1295 .001 mica
C12 1295 .001 mica

PARTS
T1 111145 Loop Antenna Assembly
T2 110528 Oscillator Coil
T3 101890 Input I.F. Coil—465 kc.
T4 108140 Output I.F. Coil—465 kc.
T5 102058 Output Transformer
T6 112057 5" P.M. Speaker
L1 125 Loading Coil
S1 On-off switch on volume control
P1 107249 Pilot light T4
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 antennas—1 mfd., 125 mmfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 6SK7 L.F.</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimers C5, C20 (See Fig. 3)</td>
<td>Output L.F. Adjust to maximum output</td>
</tr>
<tr>
<td>I.F.</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 6SK7</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimers C1, C2 (See Fig. 5)</td>
<td>Output L.F. Adjust to maximum output</td>
</tr>
<tr>
<td>I.F.</td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 6AMGT</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimers C4, C6 (See Fig. 6)</td>
<td>Input L.F. Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1555 Kc. 125 mmfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1555 Kc.</td>
<td>Trimers C5 (See Fig. 4)</td>
<td>Oscillator Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1400 Kc. 125 mmfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimers C5, C3 (See Fig. 5)</td>
<td>Antenna and R.F. Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1080 Kc. 125 mmfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1080 Kc.</td>
<td>Trimers C5 (See Fig. 6)</td>
<td>Antenna series adj. See note &quot;C&quot;</td>
</tr>
</tbody>
</table>

NOTE "A" IMPORTANT: To align the output L.F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the diode tuned circuit. Connect the resistor at indicated by points "X" and "Y" on the circuit diagram and the bottom view of the radio chassis Fig. 5. A red dot on top of output L.F. can designate location of trimmer "C1." 

NOTE "B": Before adjusting trimmer C1 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C3 or C9 after the 10M ohm resistor has been removed.

NOTE "C" Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see "Adjusting Antenna Trimmer."

ALIGNMENT OF THE IRON CORES

The iron cores for the antenna, R. F. and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment, unless it becomes necessary to replace a coil, or if the adjustments have been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

Fig. 4.—Bottom View of Remote Tuner

IMPORTANT—ADJUSTING ANTENNA TRIMMER:
Tune in any weak station between 600 and 800 kc.
Make sure that the antenna shunt trimmer on the bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment "C1," Fig. 4).
Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment "C2," Fig. 4).

NOTE: If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer "C2," turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer "C1" on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.
Model 681

Series A

Resistors

- 6.8 kΩ, 1W (R1)
- 1MΩ, 1/2W (R6)
- 2.2MΩ, 1W (R7)
- 10kΩ, 1W (R10)
- 100kΩ, 1W (R11)
- 1MΩ, 1/2W (R12)
- 10MΩ, 1W (R13)
- 100MΩ, 1/2W (R14)
- 1GΩ, 1W (R15)
- 10GΩ, 1/2W (R16)
- 100GΩ, 1W (R17)

Capacitors

- 0.01µF, 630V (C1)
- 0.05µF, 100V (C2)
- 0.1µF, 100V (C3)
- 0.2µF, 100V (C4)
- 0.5µF, 100V (C5)
- 1µF, 100V (C6)
- 2.2µF, 100V (C7)
- 10µF, 100V (C8)

Power Consumption: 55 Watts
Power Output: 2.2 Watts Undistorted
Sensitivity: 500 Milliwatts Input 15 Microvolts Average
Selectivity: 47 EC Band at 1000 Times Signal at 1000 EC
Tuning Frequency Range: Broadcast Band - 535 to 1600 EC
Shortwave Band - 5.43 to 18.3 MC
Intermediate Frequency: 455 KC

Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Next push one of the pushbuttons all the way in as far as it will go and hold it there. Now tune the station you want with the tuning knob. Tune back and forth until the station is clear and distinct, then release the button. Continue setting each pushbutton in the same way. Now rotate the tuning knob to the right (clockwise) as far as it will turn.

Looking at the back of the cabinet note the reset lock screw on the left hand side of the chassis, (see chassis view).

Rotate the reset lock screw to the right (clockwise) by means of the pin thru the shaft.

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 pushbuttons. Pressing the proper button will now tune the station you want. (NOTE: Locking screw is loose when radio is shipped from factory)

To change stations simply loosen the reset lock screw and repeat the procedure above.

BELMONT RADIO CORP.

BELMONT, PA

Model 681

Series A
MODEL 705

Intermediate Frequency

455 KC

Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place, (push directly on front of button). Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure.

Power Consumption - - - - - - 80 Watts
Power Output - - - - - - - - - - 2½ Watts Undistorted
Sensitivity for 500 Milliwatt Output: 10 Microvolts Average
Selectivity - 35 KC Broad at 1000 Times Signal at 1000 KC
Tuning Frequency Range: Broadcast Band - 540 to 1600 KC

BRC (795) Series A Form No. 795−A
31M Band - - - - - - - - - - - - - - - 3.1 to 10 MC
25M Band - - - - - - - - - - - - - - - 11.4 to 12.1 MC
19M Band - - - - - - - - - - - - - - - 14.9 to 15.4 MC
The following equipment is required for alignment:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequency.
- Output circuit wattmeter.
- A signal generator which will produce a signal of at least 500 milliwatts.
- A 50 ohm antenna lead of at least 10 feet long.
- A 50 ohm antenna lead of at least 10 feet long.
- A 50 ohm antenna lead of at least 10 feet long.
- A 50 ohm antenna lead of at least 10 feet long.

Do not realign the band spread scales unless you are sure that they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stop. (A piece of plotting paper is about the right thickness and will serve as a gauge). The clearance between the bar and the core must be the same at both stops. If not you can raise or lower the tuning knob slightly and try again.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

Pushbutton Tone Control

This button has three tone positions: Bass—Medium—Trebble. Each time you push the button the tone will change to one of these positions. Change to one position and then to the next.

Radio-Phono Pushbutton Switch

This pushbutton switches the radio to the phone position. It should be kept with the other buttons for radio operation—only turned on to use a phonograph. A phone jack is provided on the chassis. You should connect an external phonograph to your radio. (Phone jack is shown in the chassis view.)
**Phonograph-Television or FM. Jack**

If television or frequency modulation (FM) programs are available in your community, this radio may still be used in conjunction with the necessary converters.

The jack marked phono-television-FM in the top view will accommodate either the Phonogram or a television or FM converter.

### Power Consumption
- 75 Watts

### Power Output
- 3 Watts Undistorted

### Sensitivity for 500 Milliwatt Output:
- 20 Microvolts Average

### ALIGNMENT PROCEDURE

- **Volume control—Maximum all adjustments.**
- **Connect radio ground 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 m, 200 mms., 400 ohms.**

**Pushbutton Tuning**

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come (pull with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place (push directly on front of button). Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure above.

### BAND SIGNAL GENERATOR Frequency Setting Dummy Antenna Connection to Radio Position of Band Switch Variable Condenser Setting Trimmer adjusted (in Order Shown) Trimmer Function Adjustment

<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>Trimmer adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc 1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>I.F.</td>
<td>455 Kc 1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Top View)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT</td>
<td>12 Mc 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 12 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>WAVE</td>
<td>12 Mc 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 12 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>6 Mc 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 5 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>3600 Kc 200 mms.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>355 Kc 200 mms.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 355 Kc.</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>(See Note A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOOP</td>
<td>3400 Kc 200 mms.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 3400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>600 Kc 200 mms.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>(See Note B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE "A"—** The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1540 and 355 K. C.)

The loop antennas should be connected to the radio when making these adjustments.

**NOTE "B"—** Loop alignment is made with the chassis mounted in the cabinet and the loop antennas connected. The signal generator is connected to the "ANT." and "GND." terminals.

**NOTE "C"—** Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

**NOTE "D"—** Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.
**IMPORTANT:** See Aligning Instructions.

**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 antennas—1 ml, 200 mm, 400 ohms.

**SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>BAND</th>
<th>MODEL 796</th>
<th>MODEL 797</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>Frequency Setting</td>
<td>Frequency Setting</td>
</tr>
<tr>
<td>465 Kc</td>
<td>455 Kc</td>
<td>1 MFD</td>
</tr>
<tr>
<td>465 Kc</td>
<td>455 Kc</td>
<td>1 MFD</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>Trimmers (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc</td>
<td>17 Mc</td>
<td>400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>17 Mc</td>
<td>17 Mc</td>
<td>400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc</td>
<td>Trimmer C6</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>5 Mc</td>
<td>5 Mc</td>
<td>400 Ohms External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 5 Mc</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BROADCAST 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>Trimmers (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1570 Kc</td>
<td>1590 Kc</td>
<td>250 mfd</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOOP ALIGNMENT</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>Trimmers (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1490 Kc</td>
<td>1460 Kc</td>
<td>200 mfd External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1460 Kc</td>
<td>Trimmer C1</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>520 Kc</td>
<td>500 Kc</td>
<td>200 mfd External Antenna and Ground</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 500 Kc</td>
<td>Trimmer C2</td>
<td>Low Cut Tracking Coil</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**NOTE: "A"—The signal generator is connected to the "ANT.,” and "GND." terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground antenna when setting the Broadcast Band oscillator and frequencies, (1570 and 1592 K. C.).

**The loop antenna need not be connected to the radio when making these adjustments.**

**NOTE: "B"—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT.." and "GND." terminals and the jumper on the terminal board connected to "EXT." terminal.**

**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 the voltage chart are measured with 115 volts A. C. on the primary of the power transformer.

Resistors 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.

**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 connections, weak or 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.

It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

To remove the chassis from the cabinet, pull off the knobs and take out the 4 bolts holding the chassis flange to the control panel.
Model 797
Series A
(Serial No. OD428100 and up)

FOR TUNER DATA
SEE INDEX

PARTS

BELMONT RADIO CORP.

FIG. 3—TOP VIEW
THE RECORDER AND PHONOGRAPH

Model 797  Series A

Unpack the microphone and plug it into the chassis. The microphone socket is shown in Fig. 3.

Insert a playback needle in the phone playback arm.

Insert a special cutting stylus (needle) in the cutter arm as shown in Fig. 2. Handle this needle with care.

Be sure the needle is tight after each recording. Should it loosen during the recording, it will chatter and ruin your record.

The cutting stylus is razor sharp and must not be dropped on the record or allowed to rest on the turntable.

For best operation, the instrument should be level in all directions. To check this, place a small level, if you have one, on the turntable. If you do not have a level, a marble will do. If the marble rolls off the turntable, it is low in the direction in which it rolls. Place something under the console until the machine is reasonably level.

HOWLING:

If the microphone is held too close to the loud speaker, it will feed back and start a loud “howl”. Keep the microphone well away from the recording cabinet with its back toward the cabinet.

If the recording switch is in radio position and the microphone volume control is turned on, feedback will occur and a very loud howl will start. Be sure to turn the microphone volume control to zero when playing radio.

SHAVING:

The cutting stylus cuts a fine shaving that is just a little thicker than a human hair. These shavings should not be allowed to gather under the cutting stylus.

Just before lowering the cutting arm on the record, hold one finger on the center of the record for a moment. This will create a static charge that will pull the shavings toward the center pin.

While cutting, gently brush the shavings from the left side of the record in toward the center pin, allowing them to collect there until the recording is completed.

CUTTING ARM ADJUSTMENTS:

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks this adjustment may sometimes have to be altered. With a blank record on the table, the height adjustment shown in Fig. 2 should be adjusted so that the bottom of the cutting arm is 3⁄4” from the top of the record blank. Make this measurement carefully at the front end beside the stylus screw.

The screw adjustment can be turned to raise or lower the arm.

Several blank grooves should now be cut to see if the groove is the proper depth. The depth adjustment screw shown in Fig. 2 will increase the depth of the groove if turned to the right and will decrease the groove if turned to the left.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, not enough wall will be left between grooves and the playback needle will break through from one track to the next after a few playings.

The proper depth of groove will leave about the same space between the groove as the groove is wide. Hold a finished record toward the light and you can usually see if the grooves are spaced correctly.

A properly cut groove will leave a shaving just a little heavier than a human hair.

RECORDING RADIO PROGRAMS:

Turn the radio on and tune into the program you wish to record. Turn microphone volume control to zero (left). Put recording switch in record position. The volume will drop. Start motor and then gently lower cutting needle onto blank record, about 3⁄4” from outer edge.
### Setting the Pushbuttons

Make a list of your 6 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the slot on top of each pushbutton. (Except the two end ones).

Next pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place. (Push directly on front of button). Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want.

If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure.
Tuning Frequency Range

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Connection to Radio</th>
<th>Dummy Antenna</th>
<th>Position of Band Switch</th>
<th>Dist Pointer Setting</th>
<th>Trimmers Adjusted in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7 (L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 100 Kc.</td>
<td>Two Trimmers on Top</td>
<td>E.P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 100 Kc.</td>
<td>Two Trimmers on Top</td>
<td>E.P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>31M</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View)</td>
<td>C1</td>
<td>Osc.</td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>49M</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View)</td>
<td>C1</td>
<td>Osc.</td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.5 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.5 Mc.</td>
<td>(See Trimmer View)</td>
<td>T6</td>
<td>Osc.</td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View)</td>
<td>T6</td>
<td>Osc.</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>200 muf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 100 Kc.</td>
<td>(See Trimmer View)</td>
<td>C1</td>
<td>Osc.</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>200 muf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>(See Core View)</td>
<td>T2</td>
<td>R.F.</td>
</tr>
</tbody>
</table>

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the “Iron Core Adjustment View” now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the trimmer adjustments as shown on the alignment chart.

Should you wish to use an external phonograph it should be plugged into the phone jack shown in the chassis view. The radio-phonograph button on the front panel will then switch from radio to phone operation.

If televisions or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-phonograph in the top view will accommodate either the Phonograph or a television or FM converter.
Television and Fm. Jack

If television or frequency modulation (F.M) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-pickup jack in the chassis view will accommodate either the phono or a television or F.M converter.
How to Make Perfect Recordings

The microphone must be connected to the chassis at all times.

Insert a playback needle in the playback arm.

Insert a special cutting stylus (needle) in the cutting arm. Handle this needle with care.

Be sure the needle is tight after each recording. Should it loosen during the recording, it will chatter and ruin your record.

**Cutting Needle**

The cutting stylus is very sharp and must not be dropped on the record or allowed to rest on the turntable.

For best operation, the instrument should be level in all directions. To check this, place a small level, if you have one, on the turntable. If you do not have a level, a marble will do. If the marble rolls off the turntable, it is low in the direction in which it rolls. Place something under the cabinet until the machine is reasonably level.

**Shavings**

The cutting stylus cuts out a fine shaving that is just a little thicker than a human hair. These shavings should not be allowed to gather under the cutting stylus.

**Cutting Arm Adjustments**

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks this adjustment may sometimes have to be altered.

**MODEL 616**

With a blank record on the table, the height adjustment on the cutter arm should be adjusted so that the needle thread is centered in the slot when the needle rests on a blank record.

With a blank record on the table, the height adjustment under the cutter arm should be adjusted so that the bottom of the cutting arm is 1/16" from the top of the record blank. Make this measurement carefully at the front end beside the stylus screw.

The screw adjustment can be turned to raise or lower the arm.

Several blank grooves should now be cut to see if the groove is of proper depth on Model 616.

The depth adjustment screw on the cutter arm increases the depth of the groove as it is turned to the right and will decrease the groove if it turns to the left.

**Model 801**

The depth adjustment screw on the cutter arm will increase the groove as it is turned to the letter "H" and will decrease the groove if turned in the other direction. For a medium groove turn to "M".

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, the needle will be left between grooves and the playback needle will break through from one track to the next after a few playings.

A properly cut groove will leave a shaving just a little heavier than a human hair.

The proper depth of groove will leave about the same space between the groove as the groove is wide. Hold a finished record toward the light and you can usually see if the grooves are spaced correctly.

**Recording Voice Model 616**

Turn the radio volume control nearly full on. Recording switch should be on record "Mike" position. Start motor, and set cutting needle gently on start of record. Turn mike switch on and talk.

**Microphone Recording Model 601**

Turn the microphone volume control well up. Phone microphone should be in "Phono" position. Put microphone in "Mic" manual position. Start motor, and set cutting needle gently on start of record. Adjust volume indicator lights the same as in recording radio programs.

**Operating the Phonograph**

Turn radio on and tune in the program you wish to record. Put recording switch in "Record" position. The volume will drop. Start motor and gently lower cutting needle onto blank record, about 1/8" from outer edge.

**Recording Radio Model 601**

Turn the radio on and tune in the program you wish to record. Put manual switch in manual position. Start motor and slowly lower cutting needle onto blank record, about 1/8" from outer edge. Radio Volume will drop—Adjust volume control to read volume. indicator light is off and white indicator light continues to flicker.

Put your record on turntable and start motor. Place playback arm on record and control tone and volume with the radio volume and tone control knobs.

Be sure mike control is turned off when playing records.
Setting for Size of Record

The changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see the selectors of arms. The position of these arms determine the setting for different size records. To set for 10" or 12" records, it is merely necessary to grasp the posts by the knobs at the top, lift, and turn until the 10" or 12" arrows are pointing toward the center of the turntable. When either the 10" or 12" position, the posts will snap into place except when they are lifted by hand. Be sure to set both posts for the same size record.

Loading

See that the selecting arms of both posts are turned toward the center of the turntable as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

Starting the Changer

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and adjust the phonograph-radio knob, to the phonograph position.

2. Turn the switch knob on the Recessed Changer panel to "OFF." The motor will then start and the record changer will go into automatic operation of its own accord.

How to Select a Record

First press the switch knob on the Changer panel. You can do it any time after the needle has come into contact with the record.

Playing Individual Records

Should it be desired to play an individual record merely, set the machine as described above for the proper size (10" or 12") as indicated on the selecting arms, then place the record on top of the arm, select the desired arm, and turn the knobs described under "Starting the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

Unloading

First switch off the motor. Grasp each post by its knob at the top and turn them out of the way.

Lift the played record from the turntable. Then return the posts to the proper playing positions as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

Turning Off Changer

Throw switch knob to "OFF" position.

Lift tone arm and place it in the rest position. If you happen to turn off the Changer switch while the mechanism is going through a "change cycle," you will notice that it does not stop until the cycle has been completed, and the tone arm is again in playing position, at which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch, be sure to turn it off while needle is resting upon a record, otherwise, the selecting arms cannot be correctly reset.

To avoid warping of records, never leave records resting on posts.

If Changer is Left Running

No damage will be done if you forget to turn off Changer after it has played its last load of records. It will simply repeat the last record until stopped or released.

Phonograph Needles

Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, as well as their limitations, for use in ordinary phonographs, where the needle can be changed after each record. For playing ten or more records at one set-up, as with this Changer, no attempt should be made to use ordinary steel or fibre points, since continued use of worn points will be likely to ruin both quality of reproduction and the records as well.

Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that, no matter what the quality of the tone arm, amplifier and speaker, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that particular care be taken to select good needles, and to see that they are changed often enough so that the records are not damaged and the quality of the music is not impaired.

In general there are two types of needles which can be satisfactorily used on an Automatic Record Changer, those which require changing after approximately 12 records, and the so-called permanent type needles which are rated in terms of "hours of service." In no case should the manufacturers' claims for these needles be exceeded, since in all probability the needles are rated in terms of their maximum life. If at any time short of the rated life, particularly in the case of the semi-permanent type needles, there is any reason to suspect that the needle has become unduly worn, it would probably be advisable to replace it with a new one. Never under any conditions should a needle be removed from the tone arm head and then reapplied; needle manufacturers' claims notwithstanding.

For convenience, the tone arm on your changer may be raised to a nearly vertical position, so that the needle may be easily inserted; the needle screw should be tightened firmly.

Radio-Phono Pushbutton

Switch Model 801

This pushbutton switches from the radio to the phonograph position. It should be level with the other buttons for radio operation—or pulled out to use the phonograph.

The volume and tone controls also operate when playing records.

Pushbutton Tone Control

This button has three tone positions: Bass—Middle—Treble. Each time you push the button it will change the tone to one of these positions—change it any time to the tone you like best.
The following equipment is required for aligning:
- AM and 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 ft., 200 mm., and 400 ohms.

### Band Information

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Antenna Lead</th>
<th>Position of Band Switch</th>
<th>Dial Polarity Setting</th>
<th>Trimmer Adjusted in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L.F.</strong></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SR7 (L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>19M</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td><strong>31 METER</strong></td>
<td>5.6 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View) 30</td>
<td>R. F. Act.</td>
</tr>
<tr>
<td><strong>49 METER</strong></td>
<td>4.1 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) 70</td>
<td>R. F. Act.</td>
</tr>
<tr>
<td><strong>25 METER</strong></td>
<td>11.8 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) 70</td>
<td>R. F. Act.</td>
</tr>
<tr>
<td><strong>19 METER</strong></td>
<td>15.2 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) 70</td>
<td>R. F. Act.</td>
</tr>
<tr>
<td><strong>BROADCAST</strong></td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) 100</td>
<td>R. F. Act.</td>
</tr>
<tr>
<td><strong>1400 Kc.</strong></td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>(See Iron Core Adjustment View)</td>
<td>110 M.</td>
<td>R. F. Act.</td>
</tr>
</tbody>
</table>

### Phonograph-Television and FM Jack

Should you wish to use an external phonograph it should be plugged into the phone jack shown in the chassis view. The radio-phone switch on the chassis will then switch from radio to phone operation.

If television or frequency modulation (FM) programs ever become available in your community the radio may still be used in conjunction with the necessary converters.

The jack marked phono-television-FM in the chassis view will accommodate either the Phono or a television or FM converter. **Service Notes**

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stop. (A piece of blotting paper is about the right thickness) Next rotate each iron core until the .05 millimeter and will serve as a gauge. The clearance of the bar must be the same at both stops. If far off you can raise one driven automatically and equalize them. Minor adjustments may be made the trimmer adjustments as shown with the drive bar adjustments.
Do not realign the bandspread scale unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" and turn the tuning knob until the drive bar comes within 1/4 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

- Tone control-Treble
- Volume control-Maximum all adjustments
- Connect radio chassis to ground of signal generator with a short heavy lead
- Connect dummy antenna, volar inc series with generator output lead
- Connect output meter across primary of output transformer
- Allow chassis and signal generator to "heat up" for several minutes.

**Power Consumption**
- A Battery - 300 MA
- B Battery - 13.5 MA

**Power Output**
- 210 MW Undistorted

**Sensitivity**
- 50 Milliwatt Output: 10 Microvolts Average
- Selectivity: 24 KC Broad at 1000 Times Signal at 1000 KC
- Tuning Frequency Range: Broadcast Band - 535 to 1750 KC
- 46M Band - 1.8 to 6.1 MC
- 31M Band - 9.1 to 10 MC
- 25M Band - 11.4 to 12.1 MC
- 19M Band - 14.9 to 15.4 MC

**Intermediate Frequency**
- 455 KC

**Speaker**
- 8 in. FM Dynamic

**TRIMMER VIEW**

<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>Dial Pointer Setting</th>
<th>Trimmers Adjusted in Order Shown</th>
<th>Trimmer Function Setting</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>655 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 1N3 (L.F.)</td>
<td>Broadcast</td>
<td>Two Trimmers on Top</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 1A7</td>
<td>Broadcast</td>
<td>Two Trimmers on Top</td>
<td>Input</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**10 METER BAND**
- 9.6 Mc. 400 ohms Antenna lead 31M
- 6.1 Mc. 400 ohms Antenna lead 49M
- 11.8 Mc. 400 ohms Antenna lead 25M
- 15.2 Mc. 400 ohms Antenna lead 10M

**BROAD-CAP BAND**
- 1750 Kc. 200 mfd. Antenna lead Broadcast (See Trimmer View) C6
- 1400 Kc. 200 mfd. Antenna lead Broadcast (See Trimmer View) C4

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—1.0 m, 200 mfd., and 400 ohms.
TUNING CONTROLS: Tuning is accomplished by means of the conventional manual tuning control, or by means of five push buttons which mechanically rotate the variable condenser gang to preslected frequencies. An electric clutch is provided which automatically disconnects the manual tuning mechanism when a button is pressed.

NOTE: Do not attempt to operate the push button tuning unless the set is connected to a 5 volt battery and the switch turned "on".

Setting up the push buttons for any desired station may be done as follows:
1. Remove the button by depressing the spring located on the bottom of each button, and pulling straight out.
2. Loosen the screw with a coin or a screw driver.
3. Carefully tune in the desired station by means of the manual control.
4. Push the loosened screw in as far as possible and tighten.
1. Aligning I.F. Stages at 260 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the signal lead of the signal generator to the grid cap of the 6H8 tube through a .02 mfd. condenser leaving the grid cap in place.
   (c) Connect the output meter from the plate prong of one 6Y6 tube to the plate prong of the other 6Y6 tube.
   (d) Set the signal generator to 260 kilocycles and turn volume control on full.
   (e) Set the condenser gap to a point around 800 kilocycles where no station is received.
   (f) Adjust the four screws of the two I.F. transformers, one on top and one on the bottom of each transformer, in the order R4A and R4C (illus. 6 & 8, Figs. 3 & 4) until maximum output is obtained. Repeat these adjustments with 200 output from the signal generator as possible for a readable indication on the output meter.
   (g) Checking Selectivity Curves: The Cathode Ray Oscillograph should be used to check the shape of the I.F. curve after completing the alignment procedure. Slight readjustments of the I.F. transformers may be necessary to obtain a symmetrical curve. Connect the Cathode Ray Oscillograph from the point as shown on the schematic circuit diagram or from "O" lug on the second I.F. Cell (Fig. 7).

2. Aligning at 1800 Kilocycles
   (a) Turn tuning condenser plate all the way out and against the high frequency stop.
   (b) Set the signal generator to 1800 kilocycles and adjust the oscillator trimmer (illus. E, Fig. 2) for maximum output.

3. Aligning at 4000 Kilocycles
   (a) Release the .02 mfd. condenser and connect the signal lead of the signal generator to the antenna connection of the set through .000025 condenser.
   (b) Set the signal generator to 4000 kilocycles.
   (c) Rotate the variable plates of the gap condenser until the signal is tuned for maximum output.
   (d) Adjust the R.F. and antenna parallel trimmers (illus. D, Fig. 8) for maximum output.

4. Alignment at 600 Kilocycles
   (a) Set the signal generator to 600 kilocycles.
   (b) Tune this signal in on the set.
   (c) Adjust the oscillator coil iron core aligning screw (illus. E, Fig. 2) while rotating the condenser gap back and forth through the signal until maximum output is obtained.
   (d) Repeat adjustment made under "alignment at 1800 Kilocycles."

5. Adjustment of Radio to Car Antenna
   The radio should be adjusted to the car antenna after mounting in the car. The following adjustment should be made:
   (a) Tune in a weak station near the high frequency end of the dial (approximately 500 K.C.).
   (b) Adjust the antenna trimmer (illus. G, Fig. 6) for maximum output. DO NOT DISTURB THE OSCILLATOR OR I.F. TRIMMERS WHILE MAKING THIS ADJUSTMENT.

ANTENNA SYSTEM: The 1940 Buick uses a roof peak antenna as standard equipment. Optional equipment is a vacuum operated whip antenna. The roof peak antenna has a capacity of .000038 mfd. and the vacuum operated of .00007 mfd. The 1940 Buick Deluxe Radio is designed to operate satisfactorily with either type of antenna.
Due to the fact that the iron cores have been sealed in place at the factory, only the trimmer adjustments as outlined under capacity alignment should be made unless the cores of the iron cored tuning unit are changed.

CAPACITY ALIGNMENT

1. I.F. Alignment at 200 Kc.
   (a) Connect an output meter across the test terminals on the left side of the speaker cover, leaving the speaker connected.
   (b) Connect the ground lead of the signal generator to the chassis frame.
   (c) Connect the signal lead of the signal generator to the grid of the 780 tube through the S1 air condenser.
   (d) Tune the volume control on full and tone control to the extreme treble end. Set the signal generator at 200 Kc. Tune the receiver to a frequency where no signals or best notes may be heard and so that when the tuning control is moved in narrow limits no appreciable change in output may be noted.
   (e) Adjust the I.F. trimmers A, B, C, D for maximum output, beginning with trimmer A.

2. Alignment at 1500 Kc.
   (a) Connect the signal lead of the signal generator to the receiver antenna connection through a 70 mmf. condenser or 7244018 alignment dummy.
   (b) Tune the manual tuning control of the receiver to the stop at the extreme high frequency end of the dial.
   (c) Set the signal generator to 1500 Kc.
   (d) Adjust the oscillator trimmer F for maximum output.

3. Alignment at 1400 Kc.
   (a) Set the signal generator to 1400 Kc.
   (b) Tune the receiver to the signal and adjust the trimmers F and G for maximum output. Signal generator signal should be as low as possible and still give a satisfactory meter reading.

   This type of tuning circuit does not require alignment at 500 Kc.

4. Alignment with Car Antenna

   Antenna trimmer G must be adjusted to match car antenna when receiver is installed, using a weak station signal between 1000 and 1500 Kc. The antenna should be fully extended when making this adjustment.

   CAPACITY AND INDUCTANCE ALIGNMENT

   To be used only when there is definite evidence of iron cores being out of adjustment.

1. I.F. Alignment at 200 Kc.

   Follow the procedure as outlined under I.F. Alignment at 200 Kc. Capacity Alignment.

2. Alignment at 1500 Kc.
   (a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 mmf. condenser.
   (b) Set signal generator to 1500 Kilocycles.
   (c) Rotate the manual tuning mechanism until the high frequency stop is reached. Mechanically align the iron cores K, H, J by setting the oscillator core K so that its front edge projects out 1 1/2" from the end of the coil form and the antenna and R.F. core K & J project 1 1/2" from the end of the respective coil windings. Note that one of the above measurements is from the coil form while the others are from the windings.
   (d) Adjust the oscillator trimmer E, R.F. trimmer F, and antenna trimmer G for maximum output.

3. Alignment at 1400 Kc.
   (a) Set signal generator to 1400 Kc and tune set to this signal.
   (b) Adjust the R.F. core J for maximum output.
   (c) Adjust the antenna core H for maximum output.

4. Alignment at 1350 and 1400 Kc.
   (a) Repeat alignment of trimmer E and trimmers F and G at 1350 Kc.
   (b) Repeat alignment of cores H and J at 1400 Kc. Apply shunts to the cores screw to seal the adjustment.

5. Alignment with car antenna

   Antenna trimmer G must be adjusted to match car antenna when receiver is installed, using a weak station signal between 1000 and 1500 Kc. The antenna should be fully extended when making this adjustment.

   AUTOMATIC PERMEABILITY TUNING

   The automatic push button tuning unit has been made compact by combining the manual and automatic tuning units so that they both use the same three iron cores which are "ganged" together in one reciprocating unit actuated by a small mechanical motor. This highly efficient three-circuit push button unit makes the iron cores back and forth like pistons in the tuning coils, which varies the inductance of the coils by changing the permeability of the magnetic circuit.

   For manual tuning, this is accomplished by first depressing and then rotating the manual station selector knob. For automatic tuning, pressing an automatic tuning button causes the cores to be moved to a pre-set position and locked in place by the button latch mechanism, which prevents the cores from shifting position until released by the use of another of the automatic push buttons or by use of the manual control.

   Changing the stations selected by the buttons in a simple operation. The button to be set to a new station is depressed until it locks in. Then the button is rotated exactly like a manual tuning knob until the desired station is turned in. Pressing any tuning button will release the depressed button.

   The call letters of the stations to which the automatic tuner is pre-set are inscribed above the chrome plated selector buttons, whenever the instrument panel lights are turned on, the call letters are illuminated. Identification of the station to which the radio is tuned is facilitated by three indicators; the selector light is lit when the button is in its depressed position, the corresponding call letters are more brightly illuminated than the other light letters of the other four stations, and finally, the dial pointer indicates the station frequency.

   N.B.: Do not turn any knob at any time unless a new station setting is desired, as the tuning position of a button is changed whenever it is turned regardless of whether its depressed or not.

   CADILLAC 1941 AUTOMATIC RADIO (Front Corp.) PART NO. 7240371

   Power Output
   5 Watts Undistorted at 6.0 Volts.
   Power Consumption
   7.0 Amperes at 6.0 Volts.
   Sensitivity
   2.5 Microvolts at 1 Watt out at 26 KC
   Selectivity at 1000 times signal
   545 to 1500 Kc
   Tuning Range
   6" Permanent Magnet Dynamic
   Speaker
   Automatic Tuning (All buttons)
   Intermediate Frequency Peak
   280 Kc
   Antenna Trimmer Range
   45 to 90 nfd
TO CONTROL THE VACUUM AERIAL.

To the left of the volume control rod is the knob which controls the vacuum aerial. Pulling this button upward will raise the aerial and pushing it downward will lower the aerial. The vacuum aerial has two rods, one sliding their full height, the inner rod being extended manually.
TO CHANGE STATION SETTING OF BUSH BUTTONS

The five push buttons should be set up for five stations which are received favorably in your vicinity. The procedure for setting up the push buttons is as follows:

1. Turn on the radio and allow it to warm up from ten to fifteen minutes.
2. Depress button to be set up until it latches and remains depressed.
3. Without pressing or holding the button down, turn it, as in manual tuning, until the desired station is tuned in. This should be done very carefully until the station comes in sharp and clear, free from background noise.
4. Repeat this process for any other buttons which you wish to change.

The setting of any button may be changed at any time by following this procedure.

CAUTION: TURNING ANY OF THE BUSH BUTTONS CHANGES THE STATION SETTING. DO NOT TURN ANY BUTTON UNLESS YOU WISH TO CHANGE THE SETTING.

CAPACITY ALIGNMENT

1. Aligning L.F. stages at 455 K.C.
   (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 of the T98.
   (c) Connect an output meter across the speaker voice coil. (If speaker is disconnected a 6 ohm load may be used instead).
   (d) Set signal generator to 455 K.C.
   (e) Turn the set volume control on full and tune the set to a position where no squalls or beat notes may be heard, and so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output. The tone control should be rotated to its extreme high position (clockwise).
   (f) Adjust the I.F. trimmers A, B, C, and D, and the I.F. core adjustment E until maximum output is obtained.
   (g) Repeat these adjustments with an low output from the signal generator as possible for more accurate alignment.
   (h) Connect the signal generator to the antenna connection of the set through a 70 mmfd. condenser.
   (i) Adjust the I.F. trap adjustment M for minimum output.

2. Alignment at 3500 K.C.
   (a) Leave signal generator connected the same as for the I.F. trap adjustment.
   (b) Tune the set to the extreme high frequency position against the stop.
   (c) Set the signal generator to 3500 K.C.
   (d) Adjust the oscillator trimmer F for maximum output.

3. Alignment at 800 K.C.
   (a) Set the signal generator to 800 K.C. and tune the set to this signal.
   (b) Adjust the R.F. trimmer G and the antenna trimmer H for maximum output.

CAPACITY AND INDUCTANCE ALIGNMENT

1. Aligning I.F. stages at 455 K.C.
   Align the I.F. stages as outlined under paragraph 1 under "Capacity Alignment".

2. Mechanical Alignment of cores
   (a) Turn the manual control of the set to the high frequency end, against stop.
   (b) Remove the pointer plate (note insulating washers under mounting screw) without disturbing the tuning mechanism.
   (c) Using a spare core as a gauge, adjust the oscillator core K so that its rear surface is exactly flush with the front end of the oscillator coil winding.
   (d) Manually tune the set to a point where the front surface of the oscillator core is flush with the front end of the oscillator coil fiber mounting bushing.
   (e) Adjust the antenna and R.F. cores J and L so that the front surfaces of these cores are flush with the front ends of the coil fiber mounting bushing. Mechanically align the cores so that all three are just at the point of entering their respective windings when the tuning mechanism is against the high frequency stop.
   (f) Replace the pointer plate assembly.

3. Aligning at 1400 K.C.
   (a) Connect the signal lead of the signal generator to the antenna connection of the receiver through a 70 mmfd. condenser.
   (b) Tune the manual control of the set to the high frequency end against stop.
   (c) Set signal generator to 1400 K.C.
   (d) Adjust the oscillator trimmer F for maximum output.

4. Aligning at 600 K.C.
   (a) Leave the signal generator connected the same as before and set frequency to 600 K.C.
   (b) Tune in this frequency on the set.
   (c) Adjust the R.F. trimmer G for maximum output.
   (d) Adjust the antenna trimmer H for maximum output.

5. Aligning at 1400 K.C.
   (a) Set the signal generator to 1400 K.C. and tune set to this signal.
   (b) Adjust the antenna core J and the R.F. core L for maximum output.

6. Resizing at 600 and 1400 K.C.
   (a) Repeat the alignment outlined under paragraphs 4 and 5 with as low an output from the signal generator as possible.
   (b) Apply cement to the core screws to prevent their changing alignment.

7. Adjusting receiver to car antenna.
   After the receiver is installed in the car, readjust the antenna trimmer H on a weak station near 1400 K.C.
CHEVROLET DIV.—GEN. MOTORS

Solenoid Relief Valve
This valve is of the bell type and will operate only when the receiver is setting in normal operating position.

The automatic station selection tuning system is operated by a single bar. The system can be
pre-set for five stations, each station having a corresponding number which is visible in small
windows to the right of tuning dial as that station is tuned in. To set the automatic tuning system
to the five stations, proceed as follows:

1. Turn the receiver on and allow a sufficient length of time to permit the tubes to reach their
   normal operating condition.
2. Depress the automatic station selector until No. 5 is visible in the small window to the right
   of the dial.
3. Depress the large push-bar and hold in the depressed position while carefully tuning in manually
   the station which is to be represented by the figure 1 in the small window. Release bar and
   the first station has been set. Depress the push-bar and hold in that position then tune in manually
   the second station, and so on, until the five station positions have been set.

To tune the receiver with the automatic station selector bar, merely keep depressing the bar
until the program you wish to hear is tuned in. The numbers 1 to 5 which appear in the small
window to the right of the dial, will indicate the station.

NOTE: The accuracy of the automatic station selector depends upon how accurately the
station is tuned in manually when setting it up. Always tune to a point where the clearest
reception is obtained.

Tube Complement

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<th>Type</th>
<th>Function</th>
<th>Type</th>
<th>Function</th>
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<td>6A5GT</td>
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<td>Output (Push-pull)</td>
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<td>6L5GT</td>
<td>I.F. Amplifier</td>
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<td>6Q1GT</td>
<td>2nd Det. A.V.C. Driver</td>
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Circuit Description

The circuit used in this receiver is the conventional superheterodyne type and does not use
any regeneration. The eight tubes employed are an R.F. amplifier: combination
oscillator-modulator tube; 262.5 k.c. I.F. amplifier, the first transformer of which is
triple tuned, push-pull output, and power supply. The 6R7GT tube supplies A.V.C.
voltage to the grids of the 6N7GT R.F. amplifier, the 6A5GT and the 6K7GT I.F.
A.F. tube. Bias for the 6K7GT R.F. amplifier and the 6A5GT is developed across a
750 ohm variable resistor (sensitivity control, item 59) which has a fixed minimum
of approximately 140 ohms. The bias for the 6K7GT I.F. amplifier is developed across
a 400 ohm resistor (item 63). The bias for the 6K7GT 1st audio tube is developed
across a 1300 ohm resistor (item 84). The bias for the 6R7GT tube is developed across
two resistors, one of 350 ohms (item 73), the other of 2400 ohms (item 74). These
two resistors form a voltage divider, feeding a portion of the bias voltage through the
300,000 ohm R.F. A.V.C. load resistor (item 86) to the grid of the 6K7GT providing
approximately one volt (q). Bias for the 6V6GT output tubes is developed across a
220 ohm resistor (item 83), between the 6K7GT 1st audio plate and the 6K7GT (driver)
grid for the transistor capacity network comprising the tone color control. The 6K7GT
plate is coupled through a .1 mfd. condenser to one side of the center tapped audio
input choke.

READINGS TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OMS PER VOLT, ALL VOLTAGES EXCEPT THE HEATER VOLTAGES MEASURED ON THE 0-250 VOLT SCALE.

**A** BATTERY 1.4 VOLTS, CURRENT DRAIN 250 M.A.

**B** SUPPLY DRAIN APPROXIMATELY 10 M.A.

* READINGS MUCH LOWER THAN ACTUAL VOLTAGE BECAUSE OF HIGH SERIES RESISTANCE.

**DESCRIPTION:** Batteries must be in their proper positions before making any adjustments.

**ALIGNING 1-F OUTPUT AT 100 CYCLES:**

Connect the signal lead of the test oscillator through a 1 mfd. capacitor to terminal 'X' on variable condenser J66 (see Parts Layout), which is the grid lead of the 1F tube.

Connect the ground lead of the test oscillator to the chassis frame.

Connect the output meter through a 0.1 mfd. condenser from the plate plug 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. To prevent short circuit of "B" battery turn volume control to maximum. Adjust the trimmers 1S, 1C and 4D on the 1-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 value as is consistent with obtaining a readable indication on the output meter.

**ALIGNING AT 100 CYCLES:**

Leave the test oscillator leads connected the same as for aligning the 1-F circuits.

Turn the rotor plates of the gang condenser all the way in and against the high frequency stop.

Adjust the condenser 

Adjust the condenser 1D (see Parts Layout) for maximum output. *(it is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the entire high frequency end of the dial.)*

**ADJUSTING THE ANTENNA TRIMMER 1400:**

Remove the signal lead of the test oscillator from the grid of the IR5 tube. Run a wire from the output terminal of the test oscillator, bringing it close near the receiver. **NOTE:** No metallic connection is made between the test oscillator and the receiver. Turn the condenser rotor plates until this frequency is tuned in with maximum output.

Adjust the Antenna trimmer 1400 (see Parts Layout) for maximum output.

**ADJUSTING AT 500 CYCLES:**

Turn the condenser rotor plates until the radiated signal from the test oscillator is tuned in with maximum output.

Maintain a low output signal from the test oscillator and adjust the oscillator scaling adjustment on item 2 (see Parts Layout) while recording the variable condenser gang tuning short back and forth through the signal.

This operation should be continued until no further increase in output can be obtained.

After the above operation turn the condenser rotor plates to the high frequency stop position. Check the 1600 K.C. setting and if necessary readjust trimmer 1600. Then return to 1400 K.C. for final antenna trimmer adjustment.

If the entire alignment procedure has been accomplished correctly, the receiver should be uniformly sensitive over the entire frequency range.
3-34 . 985695
Date 10-1-40

FIG. 1. CIRCUIT DIAGRAM

FIG. 2. PARTS LOCATING DIAGRAMS (TOP AND BOTTOM VIEWS)
Circuit Description

The circuit used in this receiver is the conventional superheterodyne type and does not use any regeneration. A special tone control circuit is employed to give the desired tone without change of frequency. The tuning circuits are tuned by varying the inductance of the varactors, and oscillator coils by means of iron cores which slide in and out of the coils like pistons. The alignment of the cores has been fixed at the factory and they should not require readjustment unless the cores have been changed.

Circuit Alignment

The trimmer condensers in this receiver have been carefully aligned at the factory and should require no further adjustment (except the antenna trimmer) unless tampered with or a coil has been replaced. It is possible not to attempt any adjustment until it is definitely known that alignment is necessary. Due to the fact that the iron cores are sealed in place at the factory, only the trimmer adjustment as outlined under “Capacity Alignment” should be made unless the coils of the iron cores tuning stili are changed. A signal generator and an output meter must be used to align the receiver correctly. To make all alignment adjustments the front and back covers must be removed. All trimmer condensers are readily accessible.

Capacity Alignment

1. I.F. Alignment at 260 Kilocycles

(a) Connect a 100 condenser between the plate of the 6VQ6 output tube and one terminal of the output socket. Connect the second terminal of the output socket to ground. This will prevent the meter from DC voltage.

(b) Connect the ground lead of the signal generator to the chassis frame.

(c) Connect the plate lead of the signal generator to the grid cap of the 6A9G tube through a 100 condenser. Leave the grid condenser on the tube in place.

(d) Tune the set volume control on full and tune trimmer control on “mid.” Position. Adjust the signal generator to 260 kilocycles. Tune the receiver to a frequency where no peaks or humps may be heard and stop the meter to be included through核准 limits of the meter. The trimmer adjustment should be made so that a change in output is noticed.

(e) Adjust the I.F. trimmer (a), (b), (c), and (d) for maximum output.

2. Alignment at 1560 Kilocycles

Set the signal generator to 1560 kilocycles.

(a) Connect the signal lead of the signal generator to the receiver antenna connection through a 70 milli-ohm condenser.

(b) Tune the receiving control on the receiver to the spot at the extreme high frequency end of the dial.

(c) Adjust the signal generator to 1560 kilocycles.

(d) Adjust the audio trimmer (a) for maximum output.

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

(f) Adjust the antenna trimmer (g) for maximum output.

3. Alignment at 1600 Kilocycles

(a) Adjust the signal generator to 1600 kilocycles.

(b) Tune the receiver to the signal and adjust the trimmers (f) and (g) for maximum output.

The signal generator output should be as low as possible and still give a satisfactory meter reading. Note: The type of tuning does not require alignment at 800 kc.

4. Alignment with Car Antenna

Antenna trimmer (g) must be adjusted to match car antenna when the receiver is installed. Use a weak medium signal near 1560 kilocycles. When a weak signal has been used in tune volume control on full and adjust antenna trimmer for maximum output. Note: When making this adjustment the antenna should not manually adjusted.

Inductance and Inductance Alignment

This should be used only when there is definite evidence of the iron cores being out of alignment.

1. I.F. Alignment at 260 Kilocycles

The same procedure as previously outlined should be followed.

2. Alignment at 1560 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 milli-ohm condenser.

(b) Adjust the signal generator to 1560 kilocycles.

(c) Adjust the antenna control on full and tune trimer (c) for maximum output.

(d) Adjust the antenna control (c) for maximum output. Note: When checking maximum output, adjust antenna control on full and note the inductance of the cores so any capacity will affect readings.

3. Alignment at 1600 Kilocycles

(a) Adjust the signal generator to 1600 kilocycles and tune the set to the signal.

(b) Adjust the R.F. trimmer (f) for maximum output.

(c) Adjust the antenna control (c) for maximum output.

(d) Adjust the antenna control (c) for maximum output. When the alignment has been made and the core cores are cemented.

4. Realignment at 1560 and 1600 Kilocycles

(a) Repeat alignment of trimmer (a) and (d) and (e) at 1600 kilocycles.

(b) Repeat alignment of cores (k) and (l) and (m) at 1560 kilocycles. When this alignment has been made and the core cores will cement.

5. Alignment with Car Antenna

Antenna trimmer (g) must be adjusted to match car antenna when receiver is installed. Use a weak medium signal near 1560 kilocycles that is audible with volume control on full. Adjust antenna trimmer for maximum output. Note: The antenna should be fully extended when making this alignment.

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1. Aligning I.F. Stages at 455 Kilocycles
   (a) Connect the signal lead of the test oscillator to terminal "X" on variable condenser 25A (see parts layout) which is the grid lead of the 6SA7GT tube through a .1 mfd. condenser.
   (b) Connect the ground lead of the test oscillator to the chassis frame.
   (c) Connect a .1 mfd. condenser between the plate prong of the 6V6GT output tube and one terminal of the output meter. Connect the second terminal of the output meter to ground. This will protect the meter from d.c. voltages.
   (d) Set the signal generator at 455 kilocycles.
   (e) Turn volume control on full.
   (f) Adjust the trimmer condensers (a), (b), (c), and (d), on the I.F. transformers for maximum output.

   These adjustments should be repeated several times, and during alignment the signal generator output should be kept to as low a value as is consistent with obtaining a readable indication on the output meter.

2. Aligning at 1560 Kilocycles
   (a) Leave the signal generator leads connected the same as for aligning the I.F. circuit.
   (b) Turn the rotor plates of the gang condenser all the way out and against the high frequency stop (h).
   (c) Set the signal generator at 1560 kilocycles.
   (d) Adjust condenser (e), (see parts layout) for maximum output.

   NOTE: It is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the entire high frequency end of the dial.

3. Aligning the Antenna Stage
   (a) Remove the signal lead of the signal generator from the grid of the 6SA7GT tube and connect to the antenna terminal of the receiver through a .000075 mfd. mica condenser connected in place of the .1 mfd. condenser previously used. NOTE: It is very important that a .000075 mfd. mica condenser be used when aligning the antenna stage of the receiver in order that this circuit can be made to track properly.
   (b) Adjust the signal generator to 1400 kilocycles.
   (c) Turn the condenser rotor plates until the 1400 k.c. signal is tuned in with maximum output.
   (d) Adjust antenna trimmer (g), (see parts layout) for maximum output.

4. Aligning at 600 Kilocycles
   (a) Adjust the signal generator to 600 kilocycles.
   (b) Turn the condenser rotor plates until the signal from the generator is tuned in with maximum output.
   (c) Maintain a low output signal from the signal generator and adjust the oscillator tapping condenser (f), (see parts layout) 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.
   (e) After the above operation, turn the condenser rotor plates to the high frequency stop position. Check the 1560 k.c. setting and if necessary readjust trimmer (e) then return to 1400 k.c. for final antenna trimmer adjustment.

   NOTE: If the entire alignment procedure has been accomplished correctly the receiver should be uniformly sensitive over the entire frequency range.
FIG. 1. CIRCUIT DIAGRAM

ANTENNA SYSTEM: There are two antenna systems available for use with this receiver: the telescopic cowl antenna, and the telescopic rod-type antenna. Either of these antennas will operate very efficiently when used with this Chevrolet radio.

A motor noise filter is built into the set end of the antenna system.

I.F. = 455 K.C.

Date 10-1-40

3-36 - 985697

CHEVROLET DIV.-GEN. MOTORS
Circuit Alignment

The adjustable condenser and magnetic cores in this receiver have been very carefully adjusted at the factory and should require no further adjustment. (Except antenna trimmer, item 24) unless tampered with or a defective unit has been replaced. It is advisable not to attempt any adjustment unless it is definitely known that an adjustment is necessary.

To align the circuits of this receiver correctly a signal generator and an output meter must be used. It is very probable that the receiver is not at the correct frequency to be used and that all adjustments must be made in sequence. Starting with the 4-1/2 mfd. amplifier, then adjusting the broadcast band, and finally the short wave band. Shifting the dialing of either the 4-1/2 if. or R.F. circuits will result in wide variations of the dial. All R.F. and I.F. adjustments are accessible after removing the speaker, top cover and rear bottom cover. The I.F. primary windings are adjusted by magnetics core screws Nos. 150, 152 and 154, located on top of the I.F. transformers (Fig. 1); and the secondary windings are adjusted by core screws Nos. 151, 153 and 155, located at the bottom of each I.F. transformer (Fig. 1).

1. Aligning I.F. Stages at 455 Kilocycles
(a) Connect one terminal of the output meter to the plate of one of the 8V6GT output tubes and connect the other terminal through a 1 mfd. condenser to the plate of the other 8V6GT output tube.
(b) Connect the output of the signal generator through a 10,000 ohm resistor to the grid of the 1st i-f. tube, K243 (Pin No. 4). Connect the ground lead from the signal generator to the grid of the second resonator channel.
(c) Tune the control condenser as far as possible on both channels.
(d) Adjust the signal generator to 455 kilocycles.
(e) Adjust core screws (150 and 152) on the 2nd i-f. transformer for maximum reading on the output meter. (NOTE: Always use the lowest signal generator output that will give a reasonable indication on the output meter.)
(f) Connect the signal generator lead through the 81 condenser to the grid of the 1st i-f. tube, K243 (Pin No. 4), and adjust core screws (152 and 153) on the 2nd i-f. transformer for maximum output. (NOTE: The lead should be long enough to clear the resonator channels.)
(g) Adjust the signal generator lead through the 81 condenser to the grid of the 8060 tube (Pin No. 8) and adjust core screws (153 and 155) in the 1st i-f. transformer for maximum output.

2. Aligning the R.F. Amplifier

The main tuning controls should never be touched unless a null or error is explained. Where one of these has been explained the calculated broadcast band alignment procedure (No. 3) should be followed. Generally when checking the B.54 for proper working the following procedure and sequence must be used. There are three tuning screws properly labeled "Antenna," "Output," and "R.F." The broadcast band is designated by the letter "A" and the short wave band are designated by the symbols indicating the bands--X1, X2, X3, and X5. The leads are arranged in the usual assembly.

(a) "A" Band, or Broadcast Band:
(i) If the dial pointer is in calibration, exactly on the "A" band, antennas and R.F. trimmers at 600 kilocycles. If the pointer is slightly off calibration readjust the oscillator trimmer and then tune antenna and R.F. trimmers for maximum output at 600 kilocycles.
(ii) 30 Meter Band:
Using a signal of 8-10 megacycles, tune in the signal with the antenna. If the pointer is slightly off calibration readjust the oscillator trimmer and then tune antenna and R.F. trimmers for maximum output at 8-10 megacycles.
(iii) 20 Meter Band:
Using a signal of 11.8 megacycles tune in the signal with the receiver. If the pointer is slightly off calibration readjust the oscillator trimmer and then tune the antennas and R.F. trimmers for maximum output at 11.8 megacycles.
(iv) 18 Meter Band:
Using a signal of 12.5 megacycles tune in the signal with the receiver. If the pointer is slightly off calibration readjust the oscillator trimmer and then tune the antennas and R.F. trimmers for maximum output at 12.5 megacycles.
(v) 16 Meter Band:
Using a signal of 12.8 megacycles tune in the signal with the receiver. If the pointer is slightly off calibration readjust the oscillator trimmer and then tune the antennas and R.F. trimmers for maximum output at 12.8 megacycles. (NOTE: The 16 meter band after turning the tuning of the other short wave bands, therefore it must always be aligned first. It is usually unnecessary that the antenna trimmers (item 24) be aligned first on the broadcast band for proper tuning.)

3. Broadcast Band Alignment

Six adjustments are provided which include trimmers Nos. 28, 29 and 31, and condensers with item 30. No. 28, 29 and 31 are located on the rear panel. No. 106 is located on the left side of the front panel and is connected through the radio to the 8N6GT rectifier tube, and connects the other terminal through a 3 mfd. condenser to the plate of the other 8N6GT rectifier tube.

(a) Tune the receiver to the extreme high frequency end of the band.
(b) Tune each of the three core screws (No. 104, 105 and 106) in a counter-clockwise direction the full turn. NOTE: This is done in order to separate the core from the eddy currents for enough so that the core will not have any effect on the frequency of the circuits.
(c) Connect the signal generator through a 250 megacycles resistor to the standard Chevrolet shielded antenna lead-in. Connect the ground lead from the signal generator to the shield of the antenna lead-in cable.
(d) Connect one terminal of the output meter to the plate of one of the 8V6GT output tubes and connect the other terminal through a 1 mfd. condenser to the plate of the other 8V6GT output tubes.
(e) Adjust the frequency of the signal generator to 1800 kilocycles and turn the oscillator core screw (110) clockwise until maximum output is obtained.
(f) Change the frequency of the signal generator to 1800 kilocycles and turn the core screw for maximum output at 1800 kilocycles.

Complete Short Wave Alignment

Because of the extreme range of the receiver, it is necessary that the short wave bands be monitord continuously in accordance with the following procedure. Be sure to make all adjustments in the order specified.

(a) Check broadcast band antennas (item 29) for maximum peaking. This is very important.
(b) Tune the receiver so that the dial pointer is at the extreme high frequency end of the 21 meter band and adjust the magnetic core screws (110, 112 and 113) so that each core and is flush with the shell (items Nos. 7, 11, 13 and 19) which extend beyond the shell.
(c) Connect the signal generator through a 500 megacycles resistor to the Chevrolet shielded antenna lead-in. Connect the ground lead from the signal generator to the shield of the lead-in.
(d) Turn the band selector to 22 meters and turn the volume control to the maximum position.
(e) Adjust the signal generator frequency to 8 megacycles and move the pointer to 8 megacycles on the dial scale.
(f) Tune the core screw (110) in a clockwise direction until the peak is obtained, and then adjust for maximum reading on the output meter.
(g) Connect the signal generator through a 900 megacycles resistor to the Chevrolet shielded antenna lead-in. Connect the ground lead from the signal generator to the shield of the lead-in.
(h) Move the core screw (110) in a clockwise direction until the peak is obtained, and then adjust for maximum reading on the output meter.
(i) Repeat all operations starting with (f) until no further improvement can be obtained.

General Alignment Information

Alignment of the short wave bands should never be attempted without first peaking trimmer condenser No. 30 in accordance with the procedure outlined under "Broadcast Band Alignment" (No. 3). A slight misalignment of this trimmer condenser will result in unsatisfactory short wave operation, the reason being that trimmer condenser No. 30 in the line on all bands but should be peated on the broadcast band only. The most satisfactory method of aligning or checking the short wave bands is on a actual reception of short wave stations at lowest frequency by adjusting the magnetic core oscillator call for each band, so that the short wave band is in the correct position on the dial. In occasion the set is being serviced in a location where the earth level is high enough to prevent reception of short wave stations a signal generator should be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the signal generator as a slight error will produce considerable inaccuracies on the short wave bands.

When aligning the magnetic core trimmer in the auxiliary short wave coils, if more than one peak is found, where the peak specified is the alignment procedure for each band.

Adjusting Antenna Compensating Condenser

The adjustment should be made after the receiver has been properly installed in the car. Tune the receiver to a weak signal at the high frequency end of the broadcast band at about 1800 kilocycles. This signal should be just audible with volume control on full. Adjust the antenna compensating condenser for maximum signal strength. NOTE: When aligning the antenna trimmer condenser, be sure that the antenna is fully extended.

Instructions for Removal of Cell Unit

(a) Remove the top rear housing, and speaker cover from the receiver.
(b) Remove the two nuts securing the rear shielded cell assembly.
(c) Remove the two No. 5 self tapping screws that hold the antenna connnector to the side of the case, then solder the antenna cable shielding from the rear grounding lugs which will leave the rear panel free for the antenna. Bé sure to close the gap between the antenna lead-in cable and the side leads. Unbend the leads from the antenna, R.F. and oscillator coil assembly which are to be removed.
(d) Remove the two No. 4 screws which hold the shielded centering bracket to the main tuner frame. Place tension on the output line, taking care that the antenna does not get damaged. Unbend the small connector (item 22) from the case.
(e) Remove the No. 3 copper lead from the end of the shield bracket to be found at the center of the cell case. Remove the two remaining rear shielded cell leads. The short lead wire is which is held in place by the motor is to be removed after the main assembly is
CHEVROLET DIV.—GEN. MOTORS

MODEL 985697

(footnote) to the grid of the R.F. amplifier tube 6SK7 which also receives its A.V.C. bias through the filament resistor of the 696 resistor (item 68).

In the broadcast band position the filter choke (item 1) is included in the circuit and in conjunction with the input capacity of the tube constitutes a low-pass filter which effectively prevents unwanted disturbances from reaching the R.F. tube. The variable trimmer (item 24) is used for compensating the slight variations in the effective capacity of the antenna and the shielded lead-in cable. Bias for the 6SK7 tube is developed across the 680 ohm resistor (item 65).

The 6SA7 tube serves the combined functions of 1st detector and oscillator. In the short wave position the oscillator section of 6SA7 uses the conventional Hartley circuit, however the band switching arrangement of this section differs slightly from that of the antenna and RF sections, in that a 31-meter auxiliary oscillator coil (item 36) is permanently mounted across the main tuning coil (item 15) and a tap is brought out for return to the cathode. In changing to the 23, 19 and 16 meter bands, the respective auxiliary oscillator coils (items 17, 18 and 19) are shortened in parallel to the previous combination. The negative coefficient (200 mfd. condenser (item 40)) in parallel to the main tuning coil (item 15) constitutes the temperature compensating arrangement for the short wave bands. In the broadcast band the oscillator uses a modified Colpitts circuit arrangement formed by the main tuning inductance (item 14) 3900 mfd. condenser (item 36) and condensers consisting of items 42, 43 and 44 in which item 42 is the negative temperature coefficient condenser.

The two 6SK7 tubes are used in the two stage R.F. amplifier. In the short wave position, both tubes get their bias from the 470 ohm resistor (item 98), but in the broadcast position a 1200 ohm variable resistor (item 81) is connected in series with the 470 ohm resistor and is adjusted in the factory for uniform sensitivity. The variable resistor (item 41) increases the bias on the 6SK7 tubes, therefore the I.F. stage gain in the broadcast position is less than that in the short wave position so that the desired sensitivity is obtained on all bands.

The 6SK7 tube serves three distinct functions. The diode plate No. 3 is used for signal detection. Diode No. 1 is used for supplying bias for the tube limiting circuit, while the triode part is used for the audio amplifier. Diode plate No. 4 gets its signal from the primary of the first I.F. transformer through the 66 mfd. capacitor (item 36). The urn mark on the transformer is labeled with a 150,000 ohm resistor (item 80) the bias for the noise-limiting circuit is more than twice the DC voltage of the rectified signal. The bias for the tube is developed across the 1000 ohm resistor (item 94).

The 6186 tube performs two functions. Plate No. 1 is used in the noise limiter circuit, and plate No. 2 is used for amplifying A.V.C. through the 2nd cathode of the 6186 tube which is connected to the cathode of the 6SK7. The voltage developed across the 1000 ohm resistor (item 94) also acts as a delayed bias for the A.V.C. system.

The two 6186 tubes are used in the push-pull output circuit and each get their bias from the 330 ohm resistor (item 91). The 684 tube is used as the cold cathode rectifier with a conventional mercury-arc type rectifier.

**Diagram:**

- **Bottom View of Tube Sockets:**
  - Reading taken from tube socket connections to grounding with a B.C. voltmeter having a resistance of 1000 ohms, and a battery 6.3 volts.
  - Current drain of 8A, 8B supply drain approximately 1 W.

**6SK7 Diagram:**

- **6SK7 Circuit Diagram:**
  - This circuit is used in this receiver, in the conventional superhet type with two stages of I.F. and two tuned I.F. circuits. In the short wave position the band switch operates by shunting respective coils (with their variable trimmer coils) across the main variable tuning inductances in the antenna, R.F. and oscillator circuits. When tuning either of the four short wave bands the signal is fed through the 100 mfd. condenser.

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**BROADCAST BAND**

535 - 1,730 KILOCYCLES

**SHORT WAVE BAND**

5,150 - 16,100 KILOCYCLES

*IF 455 K.C.*

Fig. 1—Top View of Chassis

**Short Wave Oscillator Coil** (Part No. 3721)

Looking at the connection end in a clockwise direction starting at the mounting lug side the connections are: No. 1, Plate; No. 2, B+; No. 3, Grid; No. 4, Grid. No. 4 is grounded to the mounting bracket.

Primary—No. 1 and No. 2—Resistance 8 ohm.
Secondary—No. 3 and No. 4—Resistance .07 ohm.

**First IF Transformer** (Part No. P3048)

Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

**Second IF Transformer** (Part No. P3736)

Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

**VOLTAGE CHART**

All voltages measured with a 1,000 ohm per volt meter on 150 volt scale. For the following voltages the “B” battery section of the power pack should read 94½ volts under load.

<table>
<thead>
<tr>
<th><strong>1A7GT TUBE</strong></th>
<th><strong>Volts</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate—P—ground</td>
<td>86½</td>
</tr>
<tr>
<td>Screen—Gs—to ground</td>
<td>86½</td>
</tr>
<tr>
<td>Grid—G—to ground</td>
<td>31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>INSGT</strong></th>
<th><strong>Plate—P—to ground</strong></th>
<th>86½</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1HSCT</strong></td>
<td><strong>Plate—P—to ground</strong></td>
<td>84</td>
</tr>
<tr>
<td><strong>IQSGT</strong></td>
<td><strong>Plate—P—to ground</strong></td>
<td>86½</td>
</tr>
</tbody>
</table>

**Speaker** (Part No. P4045) 6" PM Type.

- D.C. voice coil resistance: 2.8 ohms
- Voice coil impedance: 240 cycles: 2.9 ohms

**Broadcast Antenna Coil** (Part No. G6636)

Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.

Primary—No. 3 and No. 4—Resistance 25.3 ohms.
Secondary—No. 1 and No. 2—Resistance 2.1 ohms.

A gimmick coil of 5.5 mmid. connects to terminals No. 2 and No. 3.

**Broadcast Oscillator Coil** (Part No. P3723)

Looking at the connection end (with dot) in a clockwise direction starting at the chassis the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.

Primary—No. 2 and No. 3—Resistance 2.8 ohms.
Secondary—No. 4 and No. 1—Resistance 4.9 ohms.
ALIGNMENT DATA

I.F. ALIGNMENT

Adjust the signal generator to 455 K.C. and connect the output to the grid of the first detector tube (6SA7) through a .05 or .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1630 K.C. and connect the output to a shielded loop radiator and place this loop about two feet from the signal generator antenna. If no loop radiator is available the output of the signal generator should be connected to the antenna clip of the loop antenna thru a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the B.C. oscillator trimmer (upper left, front of chassis) to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer (on rotary loop antenna) to peak. Set the signal generator to 600 K.C., tune the signal and then slowly increase or decrease the B.C. oscillator padding condenser (top of chassis, center) and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

Return to 1400 K.C. and again go over the adjustments of this frequency to be certain that they were not put a little out of alignment when adjustment was made at 600 K.C. * or to A.M. lead on models without loop.

SHORT WAVE BAND ALIGNMENT

Adjust the signal generator to 18,100 K.C. and connect the output to the antenna clip through a 400 ohm resistor. Set the gang condenser to minimum capacity and adjust the S.W. oscillator trimmer (lower left, front of chassis) to receive this signal. Set the signal generator to 16,000 K.C., tune signal and adjust the S.W. antenna trimmer (upper right, front of chassis) to peak. As there is no variable low frequency padding condenser on this band, the sensitivity of the receiver should be checked at 6000 K.C. to determine whether the circuits are in line at this frequency. Should the receiver lack sensitivity at 6000 K.C., the antenna and oscillator coils, as well as the padding condenser should be tested.

I.F. ALIGNMENT

Models XJ5, XJ55, XJ55-PH

Adjust the signal generator to 455 K.C. and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. Connect ground of signal generator to chassis ground through a .1 mfd. condenser. On XJ55 only connect ground of signal generator to common ground thru a .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1630 K.C. and connect the output to the antenna lead, through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer to peak. In case of bent plates, set the signal generator and the receiver to 600 K.C. and bend the plates into the position for maximum output.

SHORT WAVE BAND ALIGNMENT

Set the signal generator to 6000 K.C., tune the signal and adjust the short wave antenna trimmer to give maximum output. Set the signal generator to 3000 K.C., tune the signal and then slowly increase or decrease the short wave antenna padding condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

MODELS J6, XJ6, A7, B7, A77, 62-B7

PROCEDURE FOR SETTING UP PUSH BUTTONS

Loosen one of the push buttons by inserting a screwdriver thru the center hole in the push button to the locking screw and turn the locking screw clockwise one full turn and push in, while holding this screw in tune in the desired station by means of the station selector. Turn the selector very slowly back and forth until the signal is clearest. Now while still holding the above screw in, tighten it by turning clockwise. Release and turn the station selector to one end of the dial; then check the button by pushing it down and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

Release the push button and repeat the above procedure for the remaining buttons.

If it is desired to change a button to a different station simply reset by repeating the above procedure.

Punch the correct station call letter tabs from the set of sheets supplied and insert them from the side into the grooves in the front of the push buttons. Punch celluloid squares from the sheet supplied and insert in the above mentioned grooves over the station call letter tabs. The dial is now set up for quick tuning and all that is necessary is to push the button of the desired station down and then release.
POWER SUPPLY

This receiver is designed to operate on a single unit General 60B-6L or Burgess 6TA-60. The battery will fit inside the cabinet in back of the chassis.

A large single unit battery may also be used with this model such as the Burgess 17G-650, Evershed 748, Ray-O-Vac No. AB-22, Bond 5228 or General 60DL-11L and will provide the most economical operation.

**Speaker** (Part No. P4311) 5" PM Type

D.C. voice coil resistance .................................................. 3.1 ohms
Voice coil impedance at 400 cycles ........................................ 3.5 ohms

**Antenna Coil** (Part No. G-6274)

Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant.; No. 4, ground. No. 4 is grounded to the mounting bracket.

Primary—No. 3 and No. 4—Resistance 24.6 ohms.
Secondary—No. 1 and No. 2—Resistance 2.2 ohms.

A gimmick coil of 5.5 mmd, connects to terminals No. 2 and No. 3.

**Oscillator Coil** (Part No. P4306) (Red & Brown Dots)

Looking at the connection end (with dots) starting at the chassis in clockwise direction the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, ground.

Primary—No. 2 and No. 3—Resistance 2.2 ohms.
Secondary—No. 4 and No. 1—Resistance 5.7 ohms.

**First IF Transformer** (Part No. P4323)

Primary—Blue white, plate; red white, B+—Resistance 12.1 ohms
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms

**Second IF Transformer** (Part No. P3960)

Primary—Blue white, plate; red white, B+—Resistance 15.1 ohms
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms

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**ALIGNMENT:**

IF - 455kc thru .05 or .1mfd cond.
EE - With 1730kc sig. thru .0002mfd cond., gang at minimum, adj. osc. trim. If gang cond. plates are bent, adj. with 600kc sig.

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On XD5 only connect ground of signal generator to common ground thru a .1 mfd. condenser.

**Speaker** (Part No. P3553) 5" PM Type
- D.C. voice coil resistance: \( .34 \text{ ohms} \)
- Voice coil impedance at 400 cycles: \( .38 \text{ ohms} \)

For CONVENTIONAL ALIGNMENT see Spec. Section Vol. VIII

**Oscillator Coil** (Part No. P3744) (D5 only)
- Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding: No. 3, tap.
  - No. 2 and No. 1—Resistance 4.9 ohms.
  - No. 3 and No. 1—Resistance 4.3 ohms.

**Oscillator Coil** (Part No. P3917) (XD5 only)
- Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, tap; No. 2, start of winding; No. 3, end of winding:
  - No. 3 and No. 1—Resistance 4.9 ohms.
  - No. 2 and No. 1—Resistance 4.3 ohms.

**First I.F. Transformer** (Part No. P3923)
- Primary—Blue, plate; red, B+—Resistance 21.9 ohms.
- Secondary—White, grid; black, AVC—Resistance 20.9 ohms.

**Secondary I.F. Transformer** (Part No. P3924)
- Primary—Blue, plate; red B+—Resistance 23.8 ohms.
- Secondary—White, grid; black, AVC—Resistance 23.7 ohms.

**Electrolytic Condenser** (Part No. P3355)
- Red, 30 mfd., 150 volt; green, 20 mfd., 150 volt; black, negative for both sections.

**D5 & XD5**

C2, C12, and R1 are used in Model XD5 only.

In D5 Model only, all common grounds are connected to chassis ground.

<table>
<thead>
<tr>
<th>CONDENSERS</th>
<th>C9 .002 600</th>
<th>R2 20,000</th>
<th>W</th>
<th>D5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 .001 600</td>
<td>C10 20.0 150</td>
<td>R3 15,000,000</td>
<td>W</td>
<td>D5</td>
</tr>
<tr>
<td>C2 .02 400</td>
<td>C11 30.0 150</td>
<td>R4 2,000,000</td>
<td>W</td>
<td>D5</td>
</tr>
<tr>
<td>C3 .0005 Mica</td>
<td>C12 .05 400</td>
<td>R5 1,000</td>
<td>W</td>
<td>D5</td>
</tr>
<tr>
<td>C4 .05 200</td>
<td>R6 500,000</td>
<td>Vol. Cont.</td>
<td>D5</td>
<td></td>
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<tr>
<td>C5 .005 Mica</td>
<td>R7 5,000,000</td>
<td>W</td>
<td>D5</td>
<td></td>
</tr>
<tr>
<td>C6 .0025 Mica</td>
<td>R8 250,000</td>
<td>W</td>
<td>D5</td>
<td></td>
</tr>
<tr>
<td>C7 .01 400</td>
<td>R9 500,000</td>
<td>W</td>
<td>D5</td>
<td></td>
</tr>
</tbody>
</table>

In RD5 Model only, all common grounds are connected to chassis ground.

Models D5 and XD5 are the same except for a few parts and that the XD5 is approved by the Underwriters Laboratories. A condenser is used in the XD5 model to provide a floating ground.

**Voltages**—Line 115 Volts AC—Power Consumption 30 Watts.

Volume Control maximum. Meter 1000 ohms per volt, 150 volt scale.
- Plate (3) of 12SA7 tube to common ground: \( 80 \text{ volts} \)
- Screen (4) of 12SA7 tube to common ground: \( 62 \text{ volts} \)
- Plate (6) of 12SK7 tube to common ground: \( 80 \text{ volts} \)
- Screen (3) of 12SK7 tube to common ground: \( 62 \text{ volts} \)
- Plate (3) of 50L6 tube to common ground: \( 97 \text{ volts} \)
- Screen (4) of 50L6 tube to common ground: \( 62 \text{ volts} \)
- Cathode (2) of 50L6 tube to common ground: \( 5.5 \text{ volts} \)
- Cathode (3) of 35Z5 tube to common ground: \( 102 \text{ volts} \)
**Aligning Frequencies:**
- IF trims. - 455KC; BC-OSC. - 1550KC; BC-PAD (nearest tuning shaft on front of chassis) - 540KC; Re-check BC-OSC.
- Finally BC-ANT. at 1400 KC.

**Conventional Alignment**
SEE SPECIAL SECTION -- Vol.VIII

**1W Antenna Coil (Part No. P4019)**
Looking at the connection end with dot in a clockwise direction starting at the mounting lug the terminals are: No. 1, grid; No. 2, ant.; No. 3, sec. ground; No. 4, pit. ground.
Primary—No. 2 and No. 3—Resistance.......................... 199.7 ohms
Secondary—No. 3 and No. 1—Resistance.......................... 29.4 ohms

**B. C. Oscillator Coil (Part No. P4018)**
Looking at the connection end with dot in a clockwise direction starting at the chassis the terminals are: No. 1, grid; No. 2, plate; No. 3, B+; No. 4, pad.
Primary—No. 2 and No. 3—Resistance.......................... 2.9 ohms
Secondary—No. 4 and No. 1—Resistance.......................... 9.1 ohms

**L. W. Oscillator Coil (Part No. P4017)**
Looking at the connection end with dot in a clockwise direction starting at the chassis the terminals are: No. 1, pad; No. 2, B+; No. 3, plate; No. 4, grid.
Primary—No. 3 and No. 2—Resistance.......................... 4.8 ohms
Secondary—No. 1 and No. 4—Resistance.......................... 11.9 ohms

**First LF Transformer (Part No. P3962)**
Primary—Red white, B+; blue white, plate—Resistance........ 11.8 ohms
Secondary—White, grid; black white, AVC—Resistance........ 23.9 ohms

**Second LF Transformer (Part No. P3990)**
Primary—Blue white, plate; red white B+—Resistance......... 15.1 ohms
Secondary—White, grid; black white, AVC—Resistance......... 11.8 ohms

**Power Change Switch**
The power change switch connects the tube filaments in series (7 1/4 volt on AC-DC operation and parallel (1 1/2 volt) on battery operation.
AC 105 to 125 volts, 60 cycles or DC 105-125 volts

For CONVENTIONAL ALIGNMENT see Spec. Section Vol. VIII.

In Model J5 all common grounds become chassis grounds, C1, C3, C5, R2, and R6 are omitted.

Point "A" is connected to point "B" and point "C" to point "D."

Voltage—(tube to common ground) Line 117 Volts AC—

Volume Control maximum. Meter 1000 ohms per volt, 150 volt scale.

Models J5 and XJ5 are the same except for a few parts and that the XJ5 is approved by the Underwriters Laboratories. A condenser is used in the XJ5 model to provide a floating ground.

Oscillator and Short Wave Antenna Coils (Part No. G6187) J5 & XJ5

Looking at the five terminal connection end in a clockwise direction starting at the mounting bracket, the connections are: No. 1, ground; No. 2, grid; No. 3, B.C. osc. tap; No. 4, open; No. 5, open. Looking at the other end in a clockwise direction starting at the mounting bracket, the connections are: No. 6, pad; No. 7, open; No. 8, switch; No. 9, ant. No. 3 and No. 2—Resistance...6.9 ohms No. 6 and No. 9....3 ohm No. 1 and No. 3—Resistance...4 ohm No. 8 and No. 2....3 ohm

First LF Transformer (Part No. P9223)

Primary—Blue, plate; red B—Resistance 29.4 ohms.
Secondary—White, grid; black, AVC—Resistance 20.3 ohms.

Second LF Transformer (Part No. P9244)

Primary—Blue, plate; red B—Resistance 22.2 ohms.
Secondary—White, diode; black, AVC—Resistance 22.1 ohms.

Speaker (Part No. P4169) 5" Dynamic.

Field Resistance 400 ohms
D.C. voice coil resistance 3.6 ohms
Voice coil impedance at 400 cycles 4.0 ohms
This receiver is designed to operate from a power supply main of 110-120 volts, 60 cycle alternating current (A.C.) **Never plug in a D.C. outlet.**

ALIGNMENT: IF - 455ko thru .05 or .1mf cond. BC - With 163kce thru shielded loop radiator, 2 ft. from loop antenna; OR to blue lead of loop antenna thru .0002mf cond., gang at minimum, adjust osc. trim.

With 1400ko adj. Ant. trim. - If gang plates are bent adj. with 600ko.

Fig. 2—Top View of Automatic Record Changer

Fig. 3—Top View of Chassis
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of eight 10", or seven 12" records of the standard 78 R.P.M. type. Records of the last few years with the standard eccentric or spiral stopping groove on the inside and an eccentric on the outside will operate the automatic mechanism. However, records of any size up to 12" may be played manually.

OPERATION

Before operating the phonograph, either automatically or manually, be sure that the pickup is down and can be pulled by hand. If not, a "go" must be completed to bring it down. To do this, turn the knob in the "Go" position. The turntable will begin to revolve and the cycle of motion on the pickup arm will be repeated. When the pickup arm comes down, turn off the Turntable Switch.

CAUTIONS

Never use force to start or stop the motor or any part of the wear-and-tear mechanisms or pickup arm.

1. The use of records which have been warped or damaged through improper care, may cause the mechanism to jam and damage the instrument. Records which have been warped will jam and cause one or another when playing, resulting in unsatisfactory reproduction.

2. This instrument is not recommended for playing 10" and 12" records in mixed sequence. If this service is desired, all records must be played perfectly flat.

3. When the Index and Record Select Lever is set on "10" and playing the last selection, the pickup will come down in position for 10" record and repeat the playing of the record on a 10" diameter unless the turntable switch is turned on. Any inactivity of the turntable switch under this condition indicates that the records used are not perfectly flat or the records are not sufficiently smooth to permit normal operation of the separation in the pickup arm in each record in sequence on the turntable.

4. Do not leave records on the record holder during the warmer weather in warm, dark. Keep in a place where it will be in a constant temperature and not in a place where it will be exposed to direct sunlight.

5. The needle must be installed according to directions under "Picking up the needle from the socket" in "Record Selector Switch" under proper operation of the instrument.

6. The two red matting rolls which hold the Automatic Record Player in the "Do not" position must be removed before using the Automatic Record Player in the "Do not" position.

LEVELING—When a record has been played, the pickup moves back, and the needle is automatically set into the starting groove of this record. If the needle fails to enter the starting groove, rotate the right-hand side of the cabinet by inserting this spring under the feet. As the needle slides over a few grooves, raise the left-hand side of the cabinet in a similar manner.

8. LUBRICATION—A few drops of good quality light machinery oil should be applied about every six months at the base of the spindle below the arm and under the turntable.

CONTROLS AND MECHANISM

INDEX AND RECORD SELECT LEVER

This lever is located near the front center of the cabinet. In Index, the index plate marked for four positions—"Manual," "12," "10," and "Reject." When it is desired to change record selections manually, this lever should be set on the "Manual" position. With the lever in the "12," position, the mechanism is set to play a series of 12" records automatically. To play either a series of 10" records or 12" records, the lever should be set at the "10" position. To select a record being played, or to start the cycle changing in case the record has played, it is necessary to set the lever at the "12," position. If a series of 12" records is to be played, the lever should be set on the "12" position after the last record has been played. If a series of 10" records is to be played, the lever should be set on the "10" position after the last record has been played.

SWITCHABLE TABLE

The Switch is located just in front of the Index and Record Select Lever. It controls the current to the turntable mechanism. To turn on the turntable, push the switch to the "On" position. To stop the turntable, push the switch to the "Off" position.

NEEDLE

The use of high-grade playing needles is absolutely essential. The operation of this instrument, on the needle, is only good for one or at the most two records. If any needle is used too long, distortion and poor quality will be obtained and also the records will be damaged.

The pickup is the new crystal type, with a hole in the top for insertion of needle. When not playing, the pickup should be moved to the right beyond the turntable and placed against the edge of the record arm in the groove on the outside of the needle plate. The pickup must be in this position to change needle. To insert a needle, loosen the needle screw on the front of the pickup, place needle in hole at top so that it drops down against the needle plate and then tighten the needle screw.

NEEDLE SELECTOR

The extending tab on the needle groove plate of the needle box controls the needle selector. To change a needle, place pickup in rest position, loosen needle screw and press the extending tab on the needle groove plate to drop the used needle into the box below. Release tab allowing the needle groove 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, rotate the record holder shelves by lifting with the fingers under the shell, and swing clear of the outer edge of record. Also pass back vertical lever farthest to the rear record holder post. The turntable is now accessible. Before locating the mechanism for automatic operation, swing the record holder shelves back into position.

AUTOMATIC OPERATION

1. See that the pickup is over the needle groove plate with the needle properly in place. If not, complete a "cycle" as explained in the first paragraph under "Operation."" 2. With the Index and Record Select Lever at "Manual," place the first of the series of records on the turntable and the remainder of the series up to seven 10" or six 12" records on the record holder post (see Fig. 3). The records should be arranged in the desired order with the desired selection from top to bottom on the turntable.

3. Set the Index and Record Select Lever to the proper position. (See Controls Index and Record Select Lever.)

TO PLAY RECORDS MANUALLY:

MANUAL OPERATION

1. Proceed as in step 1, under "Automatic Operation.

2. Place a record on the turntable with the desired selection up to the arm.

3. Set the Index and Record Select Lever to the "Manual" position.

4. Proceed as in steps 4, 5, 6, and 7 under "Automatic Operation.

When the playing is finished, be sure that the turntable has stopped rotating. Shut the stacker to the record groove plate. Never leave the pickup with the needle resting on a record or the turntable.

VOLTAGE CHART

All voltages measured with 1,000 ohm per volt meter on the 300 volt coil. All voltages 110 volts A.C. Volts control maximum and no standard load in power consumption of 75 watts.

...
Speaker (Part No. P-4243) 6” PM Type.
D.C. voice coil resistance.................. 5.1 ohms
Voice coil impedance at 400 cycles........ 5.5 ohms

B.C. and S.W. Oscillator Coil (Part No. P-4226)
Looking at the mounting bracket end in a clockwise direction starting at the chassis, the connections are: No. 1, pad; No. 2, open. Looking at the other end in a clockwise direction starting at the chassis the connections are: No. 3, plate; No. 4, plate; No. 5, pad; No. 6, grid; No. 7, grid.
S.W. Primary—Nos. 4 and No. 5—Resistance.................. 44 ohms
B.C. Primary—Nos. 1 and No. 3—Resistance.................. 1.3 ohms
S.W. Secondary—Nos. 5 and No. 6—Resistance............... 99 ohms
B.C. Secondary—Nos. 1 and No. 7—Resistance............... 5.8 ohms

B.C. and S.W. Antenna Coil (Part No. P-4225)
Starting with the lug that is connected direct to ground in a clockwise direction, the terminals are: No. 1, ground; No. 2, open; No. 3, pad; No. 4, grid; No. 5, grid; No. 6, end.
S.W. Primary—Nos. 6 and No. 2—Resistance.................. 35 ohms
B.C. Primary—Nos. 1 and No. 2—Resistance.................. 24.1 ohms
S.W. Secondary—Nos. 3 and No. 4—Resistance................. 107 ohms
B.C. Secondary—Nos. 3 and No. 5—Resistance................. 2.9 ohms

First LF Transformer (Part No. P-4245)
Primary—Blue, plate; red, B+—Resistance.................. 26.2 ohms
Secondary—White, grid; black, AVC—Resistance............. 26.8 ohms

Second LF Transformer (Part No. P-4244)
Primary—Blue, plate; red, B+—Resistance.................. 15.1 ohms
Secondary—White, grid; black, AVC—Resistance............... 11.8 ohms

Band switch shown in broadcast position in schematic and in short wave position in pictorial view in lower left corner.

ALIGNING FREQUENCIES:
IF trim—455kc thru .05 or .1mc.
SW-Osc. — 18, 100kc thru 400 ohm res., gang cond. at minimum.
SW-ANT. — 16, 000kc thru 400 ohm res.
BC-Osc. — 1730kc thru 4000mc, gang cond. at minimum.
BC-ANT. — 1400kc.
BC-Osc. PAD — 600 kc. Recheck BC at 1400kc.

FIG. 7

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION

POWER SUPPLY
This receiver is designed to operate on either a 6 volt storage battery or a power supply main of 110-120 volts, 60 cycle alternating current (A.C.) Never plug in to a D.C. outlet.
AC 105 to 125 volts, 60 cycles or DC 105-125 volts. In model J6 all common grounds become chassis grounds. CI, C2, C10, R3 and R4 are omitted. Point "A" is connected to point "B" and point "C" to point "D".

Voltages—tube to common ground Line 117 Volts AC—Power Consumption 50 Watts.

Volume Control maximum. Meter 1000 ohms per volt, 150 volt scale.

Models J6 and XJ6 are the same except for a few parts and that the XJ6 is approved by the Underwriters Laboratories. A condenser is used in the XJ6 model to provide a floating ground.

On XJ6 only connect ground of signal generator to common ground thru a .1 mfd. condenser.

Speck. Section Vol. VIII
All voltages to ground with a 1,000 ohm per volt meter on the 250 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 45 watts.

**Short Wave Antenna Coil** (Part No. P3378)
Looking at the connection end in a clockwise direction starting at the mounting lug side the connections are: No. 1, AVC; No. 2, Ant; No. 3, Grid; No. 4, Ground.
Primary—No. 2 and No. 4—Resistance: 0.3 ohm
Secondary—No. 1 and No. 3—Resistance: 0.07 ohm

**Broadcast Antenna Coil** (Part No. G6031)
Looking at the connection end in a clockwise direction starting at the mounting strip the terminals are: No. 1, AVC; No. 2, grid; No. 3, Ant; No. 4, ground. No. 4 is grounded to the mounting strip.
Primary—No. 3 and No. 4—Resistance: 27.1 ohms
Secondary—No. 1 and No. 2—Resistance: 1.9 ohms

**Oscillator Coil** (Part No. P4185)
Looking at the mounting bracket end in a clockwise direction starting at the chassis the connections are: No. 1, pad; No. 2, B.C. grid; looking at the other end in a clockwise direction starting at the chassis the connections are: No. 3, ground; No. 4, sec. tap; No. 5, open; No. 6, S.W. grid; No. 7, tickler.
Tickler—No. 3 and No. 7—Resistance: 0.8 ohm
S.W. Secondary—No. 6 and No. 7—Resistance: 0.07 ohm
B.C. Secondary—No. 2 and No. 1—Resistance: 5.1 ohm

**Band Switch**
right 535 to 1730 kilocycles
left 16.57 to 53.10 meters

**Model K6**

**Speaker** (Part No. P4140) 5" PM Type
D.C. voice coil resistance: 3.1 ohms
Voice coil impedance at 400 cycles: 3.5 ohms

**CONDENSERS**

<table>
<thead>
<tr>
<th>No. Capacity (Mfd.)</th>
<th>Volts</th>
<th>No. Capacity (Mfd.)</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 .0001 Mic .00025 C2 .05 C3 .05 C4 .05 C5 .05 C6 .05 C7 .05 C8 .05 C9 .05</td>
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**RESISTORS**

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<tr>
<th>No.</th>
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<th>Volts</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
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<td>10,000,000 1/4</td>
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</tr>
<tr>
<td>R2</td>
<td>50,000 1/4 B10</td>
<td>50,000 1/4</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>100 1/4 B11</td>
<td>100 1/4</td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>100 1/4 B12</td>
<td>100 1/4</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>500-10% B13</td>
<td>500-10% B13</td>
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<td>R6</td>
<td>500-10% B14</td>
<td>500-10% B14</td>
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</tr>
<tr>
<td>R7</td>
<td>500-10% B15</td>
<td>500-10% B15</td>
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</tr>
</tbody>
</table>

**For CONVENTIONAL ALIGNMENT**

**First I.F. Transformer** (Part No. P4108) see Spec. Section Vol. VIII
Primary—Blue, plate; red, B+—Resistance: 18.2 ohms
Secondary—White, grid; black, AVC—Resistance: 15.1 ohms

**Second I.F. Transformer** (Part No. P4109)
Primary—Blue, plate; red B+—Resistance: 20.8 ohms
Secondary—White, diode; black, AVC—Resistance: 17.4 ohms
Speaker (Part No. P4206) 5½" PM. Board switch shown in broadcast position in schematic and in short wave position in pictorial view is lower set coils.

D.C. voice coil resistance
Voice coil impedance at 400 cycles

S.W. Antenna Coil (Part No. P3196)
Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, ground; No. 2, antenna; No. 3, switch; No. 4, ground.

Primary—No. 1 and No. 2—Resistance
Secondary—No. 3 and No. 4—Resistance

Oscillator Coil (Part No. P4194)
Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, plate; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open.

B.C. Primary—No. 1 and No. 5—Resistance
S.W. Primary—No. 5 and No. 2—Resistance
B.C. Secondary—No. 4 and No. 6—Resistance
S.W. Secondary—No. 2 and No. 7—Resistance

First I.F. Transformer (Part No. P4108)
Primary—Blue, plate; red B+—Resistance
Secondary—White, grid; black, AVC—Resistance

Second I.F. Transformer (Part No. P4109)
Primary—Blue, plate; red B+—Resistance
Secondary—White, diode; black, AVC—Resistance

6SK7 (RF TUBE)
Plate (8) to ground
Screen (6) to ground

S8A7 TUBE
Plate (3) to ground
Screen (5) to ground

6SK7 (IF TUBE)
Plate (8) to ground
Screen (6) to ground

6E6 TUBE
Plate (3) to ground
Screen (4) to ground
Cathode (5) to ground

SY9G TUBE
Filament (8) to ground

All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 60 watts.

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
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<td>1/4</td>
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<table>
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<tr>
<th>No.</th>
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<th>Mics</th>
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<td>Micros</td>
</tr>
<tr>
<td>C11</td>
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<td>Micros</td>
</tr>
<tr>
<td>C12</td>
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<td>Micros</td>
</tr>
<tr>
<td>C13</td>
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<tr>
<td>C14</td>
<td>0.001</td>
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<tr>
<td>C15</td>
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<td>Micros</td>
</tr>
<tr>
<td>C16</td>
<td>0.001</td>
<td>Micros</td>
</tr>
</tbody>
</table>

Fig. 1—Top View of Chassis

POWER SUPPLY
This receiver is designed to operate from a power supply main of 110-120 volts, 60 cycle alternating current (A.C.). Never plug in a D.C.
**MODEL B7**

Band Switch
left 535 to 1630 kilocycles
right 5,800 to 18,100 kilocycles

**FOR ALIGNMENT, PUSH-BUTTON**
**TUNER, PHONO RECORD-CHANGER**

**DATA---SEE INDEX**

---

**RESISTORS**

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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**CAPACITORS**

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<td>.0005</td>
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<tr>
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<td>.0005</td>
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<tr>
<td>C19</td>
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**SPEAKER** (Part No. P4223) 10" PM
D.C. voice coil resistance
37 ohms
Voice coil impedance at 400 cycles
4.1 ohms

**S.W. Antenna Coil** (Part No. P3198)
Looking at the connection end starting at the chassis in a clockwise direction, the terminals are: No. 1, ground; No. 2, antenna; No. 3, switch; No. 4, ground.
Primary—No. 1 and No. 2—Resistance
.37 ohm
Secondary—No. 3 and No. 4—Resistance
.08 ohm

**Oscillator Coil** (Part No. P4194)
Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open.
B.C. Primary—No. 1 and No. 5—Resistance
.29 ohm
S.W. Primary—No. 5 and No. 1—Resistance
.06 ohm
B.C. Secondary—No. 4 and No. 6—Resistance
.57 ohm
S.W. Secondary—No. 2 and No. 7—Resistance
.06 ohm

**First I.F. Transformer** (Part No. P4109)
Primary—Blue, plate: red, B+—Resistance
18.2 ohms
Secondary—White, grid: black, AVC—Resistance
15.1 ohms

**Second I.F. Transformer** (Part No. P4109)
Primary—Blue, plate: red, B+—Resistance
20.8 ohms
Secondary—White, diode: black, AVC—Resistance
17.4 ohms
Speaker (Part No. P-4490) 6½" P.M. Type.
D.C. voice coil resistance.................. 2.8 ohms
Voice coil impedance at 400 cycles........ 3.1 ohms

Oscillator Coil (Part No. P-4495)
Looking at the connection end in a clockwise direction starting at the chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tap.
No. 1 and No. 2—Resistance................ 4.5 ohms
No. 1 and No. 3—Resistance.............. 4.05 ohms
No. 2 and No. 3—Resistance.............. 0.45 ohms

First I.F. Transformer (Part No. P-4108)
Primary—Blue, plate; red, B+
Resistance................................. 18.2 ohms
Secondary—White, grid; black, AVC
Resistance................................. 15.1 ohms

Second I.F. Transformer (Part No. P-4109)
Primary—Blue, plate; red, B+
Resistance................................. 20.8 ohms
Secondary—White, diode; black, AVC
Resistance................................. 17.4 ohms

ALIGNING FREQUENCIES:
IF—455Kc, BC-Osc. — 1730Kc thru .0002mf; cond. gang at minimum.
BC-ANT. — 1400Kc; check gang cond. plates at 600Kc.

VOLTAGE CHART
Never plug in a D.C. outlet.
All voltages measured with a 1,500 ohm per volt meter on the 300 volt scale. Line voltage 117 volts. A.C. Volume control maximum and no signal tuned in. Power consumption 90 watts.

6SA7 TUBE
Plate (3) to ground.......................... 255
Screen (4) to ground......................... 93

6SK7 TUBE
Plate (8) to ground.......................... 255
Screen (5) to ground......................... 32

6SKG TUBE
Plate (3) to ground.......................... 240
Screen (4) to ground......................... 258
Cathode (8) to ground....................... 18

5Y3G TUBE
Filament (8) to ground..................... 266
Short Wave Bands 9.45 to 9.77, 11.65 to 11.96 and 15.05 to 15.35 Megacycles
Broadcast Band 540-1630 Kilocycles Police Band 2,200 to 7,000 Kilocycles

PHONOGRAPH CONNECTIONS MODEL A11
Connection may be made direct from the phono-
graph to this jack by means of phone tips, if the
phonograph pickup is of the high impedance type.
If the pickup is of the low impedance type, a coupl-
ing transformer must be used.

TELEVISION CONNECTIONS
The sound channel output from the second detector
of a Television Receiver may be plugged directly
into the Phono-Jack, thus using the speaker and
audio system of this receiver.

CONTINENTAL RADIO & TELEV. CORP.
MODELS A11, A11-PH

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This Record Changer will automatically play a series of up to twelve 10" or 78 RPM records. The automatic mechanism is designed to feed records without supervision; however, the user can override the automatic operation by rotating the manual selector switch to the manual position at any time. The automatic operation can be turned off by rotating the selector switch to the manual position when not in use.

When the record is finished, the automatic mechanism will return the pickup arm to the playing position. The records can be changed manually by rotating the selector switch to the manual position and then selecting the desired record. The automatic mechanism will feed the record automatically when it is selected.

This record changer is provided with two trip mechanisms so that automatic changing can be achieved from records with the conventional Eccentric Center Groove or with records lacking the Eccentric Center Groove, but which are recorded sufficiently near the center so that the automatic trip mechanism will operate.

This record changer is provided with an automatic control mechanism which will automatically change records when the selected record is finished. This feature is controlled by a selector switch located on the front panel of the record changer.

Caution: This record changer is designed to play records with the Eccentric Center Groove. It is not designed for records with the conventional record changer mechanism. If used with records lacking the Eccentric Center Groove, the automatic operation may not function properly.

LOADING
Turn the record lever assemblies to their normal position and then place the selected record (up to twelve 10" or 78 RPM records) on the record changer. Make sure the record is seated properly and that the needle is touching the record.

STARTING THE CHANGER
1. Turn the radio on and set the "Vol" control to the "Max" position.
2. Push the record lever assembly to the "Rec" position and release. The machine will automatic operation will start and the record changer will go into automatic operation.

ADJUSTING THE CHANGER
1. Turn the selector switch to the "Manual" position. The record changer will go into manual operation.
2. Adjust volume control to the desired level and balance tone control to the preferred setting.
3. Close reference to mechanical reproduction of sound by the needle.
4. Turn the control knob to the desired position and begin playback.
5. When the playback is finished, turn the selector switch to the "Rec" position and the record changer will go into automatic operation.

RECORDING A RECORD
To record a record it is necessary to use the power switch on the record changer to the "Rec" position. The record changer will go into recording mode and the record will be recorded as long as it is in contact with the record changer.

UNLOADING
1. Switch off the machine while the needle is in contact with the record.
2. Remove the pickup arm in the normal way.
3. Lift the record lever assembly upward and turn them out of the way.
4. Lift the picked record from the turntable.
5. Turn the record changer assembly until they snap back into position.

The trays may now be loaded with a new stack of records.

MANUAL OPERATION
Manual operation is used for all home recordings and records without machine control. This record changer is designed to perform automatically when used in connection with the record changer and is not designed for automatic operation.

1. Lift the record lever assembly upward and turn them out of the way.
2. Place record on turntable with the desired selection position.
3. Push the control button to the "Max" position.
4. When the turntable has attained speed, lift pickup arm and lower lever assembly to the record changer.
5. Adjust volume control to the desired position and balance tone control to the preferred setting.
6. Adjust cabinet to eliminate mechanical reproduction of sound by the needle.
7. When the playback is finished, turn the selector switch to the "Rec" position and the record changer will go into automatic operation.

This record changer is designed to provide a trip mechanism so that automatic changing can be achieved from records with the conventional record changer mechanism or records lacking the Eccentric Center Groove, but which are recorded sufficiently near the center so that the automatic trip mechanism will operate.

THE RATCHET TRIP
The Ratchet Trip requires no adjustment as its range of operation is greater than that of any standard records.

THE POSITIVE TRIP
This record changer is designed to operate at a distance from the center of the record (3). The machine will automatically change records when the selected record is finished. This feature is controlled by a selector switch located on the front panel of the record changer.

The ratchet trip is designed to operate at a distance from the center of the record (3). The machine will automatically change records when the selected record is finished. This feature is controlled by a selector switch located on the front panel of the record changer.

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The ratchet trip is designed to operate at a distance from the center of the record (3). The machine will automatically change records when the selected record is finished. This feature is controlled by a selector switch located on the front panel of the record changer.
PROCEEDURE FOR SETTING UP PUSH BUTTONS

The push buttons under the dial will provide instant tuning to any one of six stations. Make a list of the channel numbers between 200 and 1300 kilocycles, two between 670 and 1230 kilocycles, and the last two between 1000 and 1520 kilocycles. The adjustment of the push buttons are reached by using a voltmeter connected directly above the dial in the center. The top of the plate is numbered from 1 to 6 inclusive, and there are adjustments under the numbers 1 and 2 with the two stations between 670 and 1230 kilocycles and the two stations between 1000 and 1520 kilocycles. To set the aforementioned adjustments proceed as follows:

1. Turn knob to position 9 or 10.
2. Tunic in, by means of the station selector knob, the station selected above for number 1.
3. Turn knob to position 9 or 10.
4. Loosen wire and return the tuning eye directly above the pushbutton to avoid any possible damage.
5. Turn the adjustment screw directly above the tuning eye in the number 2 is again received and return firmly to desired tuning eye to the nearest channel.
6. Turn the adjustment directly below the aforementioned adjustment and the tuning eye is the nearest channel and the station is received.

The above procedure is repeated for each of the five tuning eyes. The tuning eyes should be carefully replaced.

MODEL B11

Valves—Line 117 volts A.C. Power consumption 165 watts. Volume control maximum. Loop antenna not connected and set tuned at station. Meter 20,000 volts per volt. Meter scales used are as follows: Scale "A", 10 volts; Scale "B", 20 volts; Scale "C", 25 volts; Scale "D", 500 volts.

<table>
<thead>
<tr>
<th>Model</th>
<th>Plate 9</th>
<th>Plate 10</th>
<th>Plate 11</th>
<th>Plate 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>B11</td>
<td>120</td>
<td>120</td>
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<table>
<thead>
<tr>
<th>Scale</th>
<th>Voltage</th>
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<tr>
<td>A</td>
<td>105</td>
</tr>
<tr>
<td>B</td>
<td>120</td>
</tr>
<tr>
<td>C</td>
<td>250</td>
</tr>
<tr>
<td>D</td>
<td>500</td>
</tr>
</tbody>
</table>

CONTINENTAL RADIO & TELEPH. CORP. ALL. A. H. B11
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of fourteen 12" or ten 12" records of the standard and 78 R.P.M. type. The records must all be of the same side when loading and may consist of less records than listed above. Records of the last few years with the standard eccentric or spiral spotting groove on the inside and 78 eccentric on the outside will operate the automatic mechanism. However, records of any size up to 12" may be played manually.

CAUTIONS

1. Never use force to start or stop the motor or any part of the record changing mechanism or pickup arm. The turntable is weighted for recording and will require about one minute to come to rest after the motor is turned off.

2. The use of records which have become warped or damaged thus improper care may cause the mechanism to jam and damage the instrument. Records which have become warped will slide on one another when playing, resulting in unsatisfactory reproduction.

3. Do not leave records on the selectors arms, as they are liable to warp, particularly so in summer climates. Keep your records in a record file (either on metal or cloth) when not in use. This will protect them from warping and dust.

4. If the automatic record changer is turned off by the motor switch knob while the mechanism is going through a 'change cycle,' the motor will not stop until the cycle is completed and the tone arm is in the play position. The tone arm may now be lifted to the rest position. It is desired to turn the record changer off by the use of any other switch than the one on the changer itself, be sure to turn it off while needle is resting upon record; otherwise the selecting arms cannot be correctly reset.

5. No damage will be done if you forget to turn off changer when it has played its entire load of records. It will simply repeat the last record until stopped.

6. LEVELING—For proper operation of the record changer and records the unit must be level.

PHONOGRAPH NEEDLES

Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, and as well as their faults, for use in ordinary phonographs, where needles can be changed after each record. For playing ten or more records at one sitting, with this Changer, such needles should be made to use ordinary reel or fibre points, since continued use of warm points will be likely to ruin both quality of reproduction and the records as well. Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that, no matter what the quality of the tone arm, stylus and needle, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that particular care be taken to keep good needles, and to see that they are changed often enough so as the records are not damaged and the quality of the music is not impaired.

It is recommended that a sapphire point needle be used as it is the only needle that can be satisfactorily used on both commercial records and home recordings. If any other type of needle is used it is necessary to change the needle every time it is desired to play home recordings. The needle should be replaced every thousand records before requiring replacement. Never under any condition should a needle be removed from the tone-arm head and then reinstalled. To install a new needle turn the tone arm to a nearly vertical position, loosen needle screw and install needle. The needle screw should now be finely tightened.

SETTING FOR SIZE OF RECORD

On each side there are selecting arms (See Fig. 2 and Fig. 3) and their position determines the setting for different sized records. To set for 10 or 12 inch records, it is necessary to grasp the base of the tone arm at the top, lift and turn until the 12 or 12" arrows are pointing toward the center of the turntable. When in either the 10" or 12" position, the tone arm may now be inserted into the groove of the record as shown.

LOADING

After both selecting arms are adjusted so the arrows mark the desired record size point to the center, the selected recordsten 12" or ten 12" are placed over the center pin so they will rest 2 to 3 inches above the center. Place the record desired last on top.

STARTING THE CHANGER

1. Move the manual control button (See Fig. 2) to the "AUTOMATIC" position.
2. Turn on the radio and push in the "PHONOGRAPH" push button.
3. Turn the switch knob on the Record Changer panel to "On." The motor will then start and the record changer will go into automatic operation.
4. Adjust volume control to the desired intensity and tone control to the preferred setting.
5. Close lid of the cabinet to eliminate mechanical reproduction of the record.
6. When the playing is finished, be sure turntable is stopped and tone arm is in the rest position. Never leave the tone arm with the needle resting on a record or the turntable.

RESEATING A RECORD

To select a record it is only necessary to press the switch knob on the record changer panel for a few seconds and then release. A record can be released any time the needle is in contact with the record.

UNLOADING

First switch off the motor. Grasp each end of the tone arm at the top and turn them out of the way. Turn the tone arm to the rest position. Lift the played records from the turntable, then return the tone arm to the proper playing position as indicated by the arrows on the selecting arms. (See Fig. 2 and 3). The Changer may then be cleaned with a new stack of records according to the size shown on the selecting arms.

MANUAL OPERATION

Manual operation is used for all home recordings and records without spiral grooves.

1. Move the manual control button as far as possible toward the needle arm and then move the tone arm to its extreme outside position. The combination of movements will result in the manual control button swinging into position at the end of the record track and will completely free the tone arm from all locked or automatic positions.
2. Place record on turntable with the desired selection upended.
3. Turn the switch knob on the record changer panel to "On." When the turntable is started, the tone arm will be lifted and then the tone arm will start to move. The tone arm points on the end groove.
4. Adjust volume control to the desired intensity and tone control to the preferred setting.
5. Close lid of the cabinet to eliminate mechanical reproduction of the record.
6. When the playing is finished, be sure turntable is stopped and tone arm is in the rest position. Never leave the tone arm with the needle resting on a record or the turntable.

ANTENNA CONTROL

The antenna control knob is located above the dial scale and controls the position of the rotary loop antenna. On week nights this knob should be turned right or left to the position of maximum output. In extremely noisy locations the knob should be turned to the point of minimum noise.

TELEVISION CONNECTIONS

The sound channel output from the second detector of a Television Receiver may be plugged directly into the Phone jack, thus using the speaker and audio system of this receiver. The above connection will greatly reduce the cost of Television Receiving Equipment because it eliminates the need for a speaker and audio system in the above equipment.
RECORER

This recorder will make up to 12 inch recordings. The recordings may be made from the microphone or radio; also the microphone and radio may be blended together in one recording.

CAUTIONS

1. Never try to record on a blank that is warped even though it be just slight.

2. When recording the recording needle will cut a fine thread, not a little thicker than a human hair, from the record blank and this thread should pile up toward the center of the blank. After the recording is completed, this thread may be caught up and removed. Although it is possible to remove this thread continually with a soft brush while the record is being cut, considerable care must be taken so that the thread is not caught around the recording needle or the thread may be blown up by touching it since either will cause poor recordings.

3. If the shadow's end of the record gather under the recording needle, the needle screw should be loosened and then righted in a way that is sure to keep the needle all the way in. Failure to keep the needle position of the needle will predict the trouble.

4. The recording arm must be in the rest position when playing back recordings or using the automatic record changer.

5. Never try to remove or replace a recorded or plain blank without the motor running.

6. Be sure the recording needle is tight after each recording. Should it loosen during a recording, it will chatter and ruin the record.

7. The recording needle is more sharp and must not be dropped or allowed to rest on the turntable. The recording needle should only be in contact with the record while actually recording or adjusting the Recorder Arm Height.

8. If the microphone is held too close to the speaker it will feed back and start a loud "howl." When recording from the microphone it should be kept well away from the cabinet and with the head toward the cabinet.

9. Never record nearer than one and one-half inches from the center of the record. When some recording disc it is not possible to record close to the center because of a large label, do not record closer than one-quarter inch from label.

TO RECORD A RADIO PROGRAM

1. Place a blank recording disc on the turntable with the driving pin, located in the top of the turntable about one inch from the center. Include the three black holes.

2. Set "Phone-Radio-Turntable" switch to "Radio Position." (Model 87)

3. Move the record control button so as to position toward the needle arm to move the tone arm to its extreme outside position. The combination of movements will result in the manual control button snapping into position at the end of the record. Automobiles will completely free the tone arm from all locked or automatic positions. (Model 87)

4. Turn radio on and tune desired station.

5. Play phonograph motor on.

6. Lift recording arm about three inches and move it to the edge of the blank. This will switch from playing back to record and decrease the volume. While holding the recording arm adjust the volume control until the volume level indicator (bulb above) is almost closed and lower the recording arm firmly on to the record so the recording needle starts about one-quarter inch from the edge of the blank disc. On bud music pitches the volume level indicator should completely close.

7. After the recording is complete leave record closer than one and one-half inches from the center. The recording arm should be returned to its rest position. Never leave the record arm resting on record or turntable.

TO RECORD FROM THE MICROPHONE

1. The procedure is the same as recording a radio program except the microphone volume control is used (Mod. 87, Photo-M87). (Model M-87, M-87-1, etc., turn to "Mike Position").

2. To record Microphone and Radio Program at the same time:

   a. The procedure is the same as recording a radio program except the microphone volume control is also used. The two may be blended as desired or only one used part of the time and by changing the volume control slowly, leaving from one to the other is obtained. Model B11 only.

PLAYBACK

As soon as a recording is completed it may be instantly played back after the recording arm is returned to its rest position and the "Playback" button is pushed in. (See Manual Playback)

RECORER ARM PRESSURE ADJUSTMENT

The pressure on the recording needle which determines the groove depth is controlled by the chromed plunger knob on the top of the recording arm. This knob has engraved upon it the letters "L, M, and H" indicating Light, Medium, and Heavy pressure and provides the very means of compensating for different types of recording needles, blanks or for the wearing of the recording needle after it is used. In general, the machine is properly set at the factory so that it will cut the average record correctly when this knob is in the "M" position No "M" Pos. for Mod. 87.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, not enough will be left to groove and the playback needle will break through from the track to the next after a few playings. The proper depth of groove will leave about the same space between the groove on the groove is wide. Hold a sharpened needle toward the light and you can usually see if the grooves are spaced correctly.

A properly cut groove will leave a shadow just a little heavier than a human hair.

RECORER ARM HEIGHT ADJUSTMENT

The height of the recording arm can be varied by means of the slotted screw head which is on the top of the arm and toward the back, approximately flush with the surface. In order to make this adjustment, it is necessary to insert a recording needle and with the motor turned off and a record blank on the turntable, place the recording arm only. CAREFULLY in the cutting position. Now raise or lower the recording arm by means of the above mentioned adjustment until the needle screw is approximately centered in the flat on the front end of the recording arm.

RECORDING NEEDLE

The recording needle or cutting stylus supplied with this recorder is a "Perno Point" and will make about 310 six-inch recordings. Since the condition of the recording needle may be determined by comparing the color of the newly recorded portion of the record with the unrecorded portion. A good recording needle will result in grooves having a higher brilliance than the unrecorded portion; as the needle wears or if the needle tip to begin with the cut portion will have faint lines and will eventually appear gray.

In case the recording needle tends to chatter as it is recording, it is advisable to replace it with a new needle.

The recording needle may be removed and replaced as desired, provided the adjustments are checked before recording. In all events, very precaution must be taken to protect the cutting point of all times, in cutting it should be lowered GENTLY on the blank with the turntable running.

INSTALLING NEW RECORDING NEEDLE

The recording needle is provided with a flat or one side and should be inserted in the needle hole so this flat is toward the needle screw, now with the needle all the way in tighten it by means of the needle screw. The recording arm adjustments must now be checked. See "Recording Arm Height Adjustment" and "Recording Arm Pressure Adjustment."
All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in. Power consumption 60 watts.

**Speaker** (Part No. P4283) 10" PM.
D.C. voice coil resistance: 3.7 ohms
Voice coil impedance at 400 cycles: 4.1 ohms

**S. W. Antenna Coil** (Part No. P3198)
Looking at the connection end starting at the chassis in a clockwise direction the terminals are: No. 1, plate; No. 2, B++; No. 3, grid; No. 4, pad.
Primary—No. 3 and No. 4—Resistance: .08 ohm
Secondary—No. 1 and No. 2—Resistance: .37 ohm

**Oscillator Coil** (Part No. P4194)
Looking at the mounting strip end in a clockwise direction starting at the chassis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open.
B.C. Primary—No. 1 and No. 5—Resistance: .29 ohm
S.W. Primary—No. 5 and No. 2—Resistance: .06 ohm
B.C. Secondary—No. 4 and No. 6—Resistance: 5.7 ohms
S.W. Secondary—No. 2 and No. 7—Resistance: .08 ohm

**First I.F. Transformer** (Part No. P4109)
Primary—Blue, plate; red, B—Resistance: 18.2 ohms
Secondary—White, grid; black, AVC—Resistance: 15.1 ohms

**Second I.F. Transformer** (Part No. P4109)
Primary—Blue, plate; red, B—Resistance: 20.8 ohms
Secondary—White, diode; black, AVC—Resistance: 17.4 ohms
**Model -- #10**

**Tubes May Be Metal or GT Type**

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**Socket Voltages Taken @ 117.5 Volt Line (A.C.)**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Pin 3</th>
<th>Pin 4</th>
<th>Pin 5</th>
<th>Pin 6</th>
<th>Pin 7</th>
<th>Pin 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>R. F. Amplifier</td>
<td>GND</td>
<td>H</td>
<td>3.0</td>
<td>GRID</td>
<td>3.0</td>
<td>92</td>
<td>H</td>
<td>91</td>
</tr>
<tr>
<td>6J7</td>
<td>Detector</td>
<td>GND</td>
<td>H</td>
<td>20</td>
<td>8</td>
<td>2.0</td>
<td>--</td>
<td>H</td>
<td>2.0</td>
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<tr>
<td>25L6</td>
<td>Output</td>
<td>GND</td>
<td>H</td>
<td>82</td>
<td>91</td>
<td>GRID</td>
<td>N.C.</td>
<td>H</td>
<td>5.8</td>
</tr>
<tr>
<td>25Z6</td>
<td>Rectifier</td>
<td>H</td>
<td>A.C.</td>
<td>120</td>
<td>A.C.</td>
<td>120</td>
<td></td>
<td></td>
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<tr>
<td>W-48416</td>
<td>Ballast Resistor</td>
<td>-165 Ohms (Cold)</td>
<td>Between No. 3 and No. 7 Pins with No. 7 and No. 8 Pins Tied Together.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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**Alignment**

(a) Connect the output lead of the signal generator through a .0001 mfd. condenser to the antenna lead on the receiver.

(b) Open the gang condenser all the way.

(c) Set the generator to 1712 kilocycles.

(d) Adjust the trimmer condensers on the gang until the 1712 kc. signal is heard. The gang should just 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.

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**Power Consumption @ 117.5 Volts Line—Approximately 43 Watts.**

**D.C. Drop Across Speaker Field—29 Volts.**

**Maximum Power Output Approximately 2.0 Watts.**
ALIGNMENT PROCEDURE

The chassis of this receiver is connected to one side of the power supply and for this reason all test equipment should be thoroughly insulated in order that the power supply will not become short circuited while aligning the receiver.

This does not apply to the models 111 as the power supply is isolated from the chassis by a 25 ml condenser.

CONNECTING OUTPUT METER

Connect one terminal of the output meter to the plate and the other terminal to the screen of the 6SK7 output tube. Be certain that the meter is protected from DC by connecting a resistance of 1.5 mil or larger in electrolyte series with one of the leads.

Tuning the F-F Amplifier to 455 Kilocycles

(a) Connect the output of the signal generator through a 100 mil condenser to the antenna connection (Blue or Red lead extending from rear of box) on the receiver. Do not use a ground return from the signal generator even if it is found to be absolutely necessary.

(b) Adjust the 2nd F-F trimmer condenser, Item 7, located in top of 2nd IF stage, for maximum reading on the output meter.

(c) Adjust the 1st F-F trimmer condenser, Item 7, located on top of 1st IF stage 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 ON THE OUTPUT METER.

ALIGNING THE R-F AMPLIFIER

(a) Set the signal generator to 1660 kilocycles.

(b) With the condenser gang turned to the minimum capacity position, adjust the trimmer condenser (Fig. 3) B. C. "OSC" so that the 1660 kilocycle signal is tuned. It is not necessary that the receiver be tuned through this signal.

(c) Set the signal generator to 1450 kilocycles.

(d) Tune in the 1450 kilocycle signal in the region of 140 or 150 on the dial for maximum output.

(e) Adjust the trimmer condenser B. C. "ANT" for maximum output (Fig. 1).

NOTE: Do not adjust the "OSC" trimmer.

(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 loop mounting bracket, Fig. 2, and consists of a coil, and a trimmer condenser as illustrated by the dotted lines in the Wiring Diagram (Item 55).

The wave trap should not be adjusted until all other adjustments have been made. To make the adjustment, feed a 455 kilocycle signal from the signal generator through a 50 ohm condenser to the antenna terminal of the receiver. With the wave trap set at approximately 60 on the dial and the volume control all the way up, adjust the trimmer condenser on the wave trap for minimum output.

Should the interfering station be operating on a frequency of slightly more or less than 455 kilocycles, the exact frequency should be determined with the aid of the signal generator. Then, instead of feeding a 455 kilocycle signal into the receiver the exact frequency of the interfering signal should be used. If it is not possible to determine the exact frequency of the interfering signal the antenna may be tuned to the receiver tuned to the position where the interfering signal is most noticeable. Then adjust the wave trap for minimum interference.
MODEL -- 13 & 14, J13 & J14

TUBES MAY BE METAL OR GT TYPES

455 Kc. I.F.
TO MAKE UNDERWRITERS APPROVED MODELS REMOVE CONNECTION BETWEEN "A" & "B" AND REPLACE WITH .25MC 160V. CONDENSER W.47413

MAY, 1940

Model 13: This model is a five-tube, two band superheterodyne receiver. It is designed for operation on 117 volt power circuits either D. C. or A. C. (50-60 cycles).

The tuning range is divided into two bands as follows:
540 to 1,600 Kilocycles (American Broadcast)
6.0 to 15.0 Megacycles (High Frequency or Foreign Band)

Model J-13: The same as model 13 with the exceptions as noted on the wiring diagram, and a slight difference in speaker design, necessary to meet Underwriters Laboratory requirements.

Model 14: The same as model 13 except the addition of a two position tone control connected as shown by items 43, a two position switch and 26, a .003 mf. condenser.

Model J-14: The same as model 14 with the exceptions as noted on the wiring diagram, and a slight difference in speaker design, necessary to meet Underwriters Laboratory requirements.
1.—Aligning I-F To 455 Kc.

(a) Connect the output lead of the signal generator through a .0001 mf. condenser to the antenna lead extending from the rear of the chassis. Do not use a ground return from the signal generator unless it is found to be absolutely necessary. If necessary a small condenser (.001 mf.) should be connected in series with the ground lead of the signal generator and the chassis.

(b) Open tuning gang condenser all the way (plates completely out of mesh). Turn volume control to maximum. On models 14 and J-14 turn tone control switch to right (treble). Turn band switch to the B. C. (left) position.

(c) Set the signal generator to 455 kilocycles.

(d) Adjust the two trimmer condensers on top of 2nd I-F assembly (Fig. 3) for maximum output.

(e) Adjust the two trimmer condensers on top of the 1st I-F assembly (Fig. 3) for maximum output.

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

2.—Aligning R-F Amplifier.

The short wave band 6-15 mc. must be aligned before the Broadcast Band 540-1600 kc.

(a) Connect the signal generator output lead through a dummy antenna (400 ohm carbon resistor) to lead (Blue or Red) extending from rear of chassis. Turn the band switch to S. W. (right) and open tuning condenser all the way.

(b) Set signal generator to 15.0 megacycles.

(c) Adjust the S. W. “OSC” trimmer condenser (Fig. 2) (on rear section of gang) for maximum output. The gang should just tune through this signal.

(d) Tune in 15.0 mc. signal with gang and while slowly rocking gang through signal, adjust the S. W. “ANT” trimmer condenser for maximum output. (Center trimmer on right end of chassis).

NOTE: When aligning the Short Wave band care should be exercised so that the circuits are aligned on the fundamental rather than on the image frequency which is approximately 910 kilocycles more than the fundamental. To check this increase the output of the signal generator approximately 10 times and try to tune in both, the fundamental, at the signal generator frequency as indicated on the dial and the image which should be approximately 910 kilocycles lower (approximately 14) on the dial.

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

(f) Replace 400 ohm carbon antenna dummy with a .0001 mf. condenser. Turn band switch to the Broadcast band, open gang condenser all the way, etc.

(g) Set the signal generator to 1650 kilocycles.

(h) Adjust B. C. “OSC” trimmer (rear trimmer right end of chassis) Fig. 3, for maximum output.

(i) Set signal generator to 1400 kilocycles.

(j) Tune in generator signal for maximum output then adjust B. C. “ANT” trimmer (front trimmer right end of chassis) Fig. 3, for maximum output.

(k) Repeat (h) and (j) for more accurate adjustments.

For voltage and wave trap data, see Model 11.
1.—Aligning I-F To 455 Kc.
(a) Connect the output lead of the signal generator through a .0001 mf. condenser to the antenna lead extending from the rear of the chassis. Do not use a ground return from the signal generator unless it is found to be absolutely necessary. If necessary a small condenser (.001 mf.) should be connected in series with the ground lead of the signal generator and the chassis.
(b) Open tuning gang condenser all the way (plates completely out of mesh). Turn volume control to maximum, turn tone control switch to right (trelle). Turn band switch to the B. C. (left) position.
(c) Set the signal generator to 455 kilocycles.
(d) Adjust the two 2nd I-F trimmer condensers located through front chassis flange, below speaker (Fig. 3) for maximum output.
(e) Adjust the two trimmer condensers on top of the first I-F assembly (Fig. 2) for maximum output.
(f) Repeat (d) and (e) for more accurate adjustments.
2.—Aligning R-F Amplifier.
The short wave band 6-15 mc. MUST be aligned before the Broadcast Band 540-1600 kc.
(a) Connect the signal generator output lead through a dummy antenna (400 ohm carbon resistor) to lead (Blue or Red) extending from rear of chassis. Turn the band switch to S. W. (right) and open tuning condenser all the way.
(b) Set signal generator to 15.0 megacycles.
(c) Adjust the S. W. "OSC" trimmer condenser (Fig. 2) on rear section of gang) for maximum output. The gang should just tune through this signal.
(d) Tune in 15.0 mc. signal with gang and while slowly rocking gang through signal, adjust the S. W. "ANT" trimmer condenser for maximum output. (Center trimmer on right end of chassis).
(For best results adjust at room temperature.)
NOTE: When aligning the Short Wave band care should be exercised so that the circuits are aligned on the fundamental rather than on the image frequency which is approximately 910 kilocycles more than the fundamental. To check this increase the output of the signal generator approximately 10 times and try to tune in both, the fundamental, at the signal generator frequency as indicated on the dial and the image which should be approximately 910 kilocycles lower (approximately 18) on the dial.
(e) Repeat (c) and (d) for more accurate adjustments.
(f) Replace 400 ohm carbon antenna dummy with a .0001 mf. condenser. Turn band switch to the Broadcast band, open gang condenser all the way, etc.
(g) Set the signal generator to 1650 kilocycles.
(h) Adjust B. C. "OSC" trimmer (rear trimmer right end of chassis) (Fig. 3), for maximum output.
(i) Set signal generator to 1400 kilocycles.
(j) Tune-in generator signal for maximum output then adjust B. C. "ANT" trimmer (front trimmer right end of chassis) (Fig. 3), for maximum output.
(k) Repeat (h) and (j) for more accurate adjustments.

---

Fig. 2—Top View Model 18, J-18

Fig. 3—Bottom View Models 18, J-18

---

POWER CONSUMPTION AT 117.5 LINE = 50 WATTS
MAXIMUM POWER OUTPUT = 1.2 WATTS
DROP ACROSS SPEAKER FIELD = 28.5 VOLTS

---

For wave trap data, see Model 11
Setting The Push Buttons (Models 21 and 22 Only)

If any of the circuits of the receiver have been re-aligned, it may be necessary to reset the push buttons. Lift up buttons to be reset and loosen the set screws two or three turns. Tune accurately the station to which the first button is to be set, with a small screwdriver inserted in the adjusting screw, push the adjusting screw ALL THE WAY IN and while holding it in this position, securely tighten the screw. It is essential that you apply a steady pressure while tightening the set screw in order to keep the mechanism lined up with the station tuned-in.

Fig. 1—Top View Models 21, 22

Fig. 2—Top View Model 20

Fig. 3—Bottom View Models 20, 21 and 23

Fig. 5—Socket Voltage Chart

Models 24, 25

The double pole double throw switch for changing from Radio to Phones or television sound, should be connected as shown in the diagram.

The terminals are coded as follows: 1, 2, 3, respectively. The No. 2 terminal connects to the high side of the phone pickup or television A-F connection.

NOTE: The jumper wire between No. 1 and No. 2 terminals must be removed when phone switch is connected. If phone switch is removed, it is absolutely essential that the jumper wire between No. 1 and No. 2 terminals be replaced. Be sure all connections are tight.

The No. 3 terminal is the ground or low side connection. The No. 1 terminal should be connected to the No. 3 terminal by some means (as indicated in the above diagram). This prevents any radio signals from the receiver from interfering with the phone or television sound reproduction.

Fig. 6—Centres Models 21 and 22

Fig. 4—Bottom View Models 20, 21 and 23
Broadcast Band — 550 to 1600 Kilocycles
Short Wave Band — 6.0 to 15.0 Megacycles
Special Police Band — 2.3 to 2.5 Megacycles

FIG. 2
CHASSIS NO. 26, 21 AND 23

All the circuits in this receiver are very accurately adjusted at the factory and actually should need no further adjustment. However, if it is definitely known that the receiver is operating below capacity, 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 the 6V5GT output tube. It is recommended that the meter be protected from D.C. by connecting a condenser (1.0 mil) in series with one of the leads.

Tuning I-F Amplifier To 455 Kilocycles

(a) Connect the output of the signal generator through a 0.01 mil, condenser, to the antenna input. (Blue).

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

(c) Tune the band selector switch to the Broadcast Band. (Left). Place switch on loop ant, to R. C. position.

(d) Set the signal generator to 455 kilocycles.

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

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

(g) Check operation (a) and (b) for more accurate alignment.

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

Aligning The R-F Circuits

(a) Connect the signal generator output through a 0.125 ohm resistor (in series with the antenna lead) to the input of the receiver and the generator return to the ground lead (Black).

(b) Set signal generator to 3.5 megacycles.

(c) Open tuning condenser all the way (water completely out of mesh), turn band switch to the right (short wave) and volume up. On models 21 and 23 turn tone control to middle position.

(d) Adjust the S. W. "OSC" trimmer, located on the gang condenser, for maximum output.

(e) Tune in signal generator frequency with the station selector knob (approximately 15 on the dial) and while shorting the station selector knob, adjust the S. W. "ANT" trimmer condenser, center trimmer on right end, and the receiver image which should come in around 14 on the dial. If image is not heard, the oscillator is aligned on the weak peak and S. W. "OSC" trimmer is further opened until constant peak is found.

(f) Repeat (a) to (e) for more accurate adjustments.

(g) Change the 600 ohm dummy antenna to a 4000 ohm (2000 milliamp) condenser. Turn band switch to R. C. position (left), open gang condenser all the way, etc.

(h) Set signal generator to 1570 kilocycles.

(i) Tune in 1450 kc, with tuning condenser, should be approximately 16 on the dial, then adjust the S. W. "ANT" trimmer (center trimmer, right end of chassis) for maximum output.

(j) Repeat (a) to (d) for more accurate adjustments.

(k) Take dummy antenna (4000 miliamp) align the Special Police Band antenna trimmer (there is no oscillator adjustment for this band).

(l) Set signal generator to 2.5 kilocycles.

(m) Place switch on loop antenna to Test position, then tune in the generator signal with gain, approx. 2.5 on the dial.

(n) Adjust trimmer on loop antenna for maximum output. CAUTION: Before pushing the switch on the loop antenna back to R. C. position if the receiver is to be used for broadcast reception.

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 consists of a coil and a trimmer condenser as illustrated by dotted lines in the Wiring Diagram.

The wave trap should not be adjusted until all other adjustments have been made. The adjustment, feed a 455 kilocycle signal from the signal generator through a 6000 ohm condenser into the antenna lead of the receiver. With the band selector switch turned to the Broadcast Band position, the gang condenser set to the mid position and 300 ohm load on the dial, and the volume control fully on, adjust the wave trap trimmer condenser, for MINIMUM output.

Should the interfering station be operating on a frequency of slightly more or less than 455 kilocycles, the exact frequency should be determined with the aid of the signal generator. Then, instead of feeding a 455 kilocycle signal into the receiver the exact frequency of the interfering signal should be used. It is not possible to determine the exact frequency of the interfering signal by means of the wave trap. An antenna may be attached to the receiver and the receiver tuned to the position where the interfering signal is most noticeable. Then adjust the wave trap for minimum interference.

VOLTAGE CHART

Table: [Table showing voltage measurements from various points to chassis @ 115V.]

NOTE: All voltages measured with the receiver set to the respective points. Voltages may vary 10% of values given.

DROP ACROSS SPEAKER FIELD: 14 Watts

MAXIMUM POWER OUTPUT @ 130 V. LINE: 60 Watts

MAXIMUM POWER CONSUMPTION @ 130 V. LINE: 90 Watts

The Crosley Corp.
Signal Generator

<table>
<thead>
<tr>
<th>Dummy Antenna</th>
<th>Frequency Setting</th>
<th>Input Connection to Receiver</th>
<th>Manned Switch</th>
<th>Tunning Cond. Setting</th>
<th>Trimmed Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 0.02 MF, 450 Kc.</td>
<td>Grid of 6AS7</td>
<td>B.C. Fully open</td>
<td>2nd L.F (2)</td>
<td>1st L.F (2)</td>
<td>Adjust for Maximum</td>
<td>Adjust for Maximum</td>
</tr>
<tr>
<td>2. 0002 MF, 1650 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B.C. Fully open</td>
<td>B.C. &quot;OSC&quot; Trimmer</td>
<td>Adjust for peak; gang does not have to tune thru signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 0002 MF, 600 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B.C. Approx. 60 on dial</td>
<td>B.C. &quot;OSC&quot; Series Trimmer</td>
<td>Adjust for maximum output; while rocking gang thru signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Repeat Step No. 3 to check possible shift due to series adjustment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 0002 MF, 1400 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B.C. Approx. 140 on dial</td>
<td>B.C. &quot;ANT&quot; Trimmer/ B.C. &quot;PRE&quot; Trimmer</td>
<td>Adjust for maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 400 ohm (carbon)</td>
<td>5.5 Mc. Ant. Lead (Blue)</td>
<td>Police Fully open</td>
<td>Pol &quot;OSC&quot;</td>
<td>Adjust for peak gang; does not have to tune thru signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. 400 ohm (carbon)</td>
<td>5.0 Mc. Ant. Lead (Blue)</td>
<td>Police Approx. 5.5</td>
<td>Pol &quot;ANT&quot;</td>
<td>Adjust for maximum output; while rocking gang thru signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. 400 ohm (carbon)</td>
<td>18.3 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>S.W. Fully open</td>
<td>S.W. &quot;OSC&quot;</td>
<td>Adjust for peak. Gang does not have to tune thru signal</td>
<td></td>
</tr>
<tr>
<td>9. 400 ohm (carbon)</td>
<td>18.0 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>S.W. Approx. 18</td>
<td>S.W. &quot;ANT&quot;</td>
<td>Adjust for maximum output while rocking gang thru signal</td>
<td></td>
</tr>
</tbody>
</table>

TRIMMER LOCATIONS

For Phonograph connections
See Model 20

For Voltage data
See Index
Standard Broadcast Band — 550 to 1600 Kilocycles
International Short Wave (Foreign) — 60 to 180 Megacycles
Special Service (Police, Amateurs, etc.) 1.6 to 5.0 Megacycles
SOCKET VOLTAGE CHART
Models 24, 25

6K6 OUTPUT
215 194
215 115
14.5 2.3
J.B.
H
J.B.
H
J.B.

GRID
6AB OSC. MOD.
115
H
119
5Y3 RECTIFIER
110
GRID

6K6 OUTPUT
6J5 INVERTER
125 120
49 2.3
J.B.
J.B.
J.B.

6SK7 I.F.
GRID
119

H = HEATER
J.B. = JUNCTION BLOCK
N.C. = NO CONNECTION

POWER CONSUMPTION AT 117.5 VOLTS = 65 WATTS
MAX. POWER OUTPUT AT 117.5 VOLTS = 5 WATTS
DROP ACROSS SPEAKER FIELD APPROX. 76 VOLTS
VOLTAGES MEASURED BETWEEN SOCKET PIN & GROUND
WITH A 250 VOLT, 1000 OHMS PER VOLT, VOLTOMETER
READINGS MAY VARY 10%

PHONO CONNECTIONS

Model 25

CONNECT TO TONE ARM OR TELEVISION SOUND TERMINALS
FOR NORMAL RADIO RECEPTION

PHONO OR TEL SOUND

DOUBLE POLE DOUBLE THROW SWITCH

ALL CONNECTING WIRES SHOULD BE INSULATED COPPER

REMOVE JUMPER BETWEEN TERMINALS NO. 1 & 2

Model 25

BOTTOM VIEW OF CHASSIS
SET UP PROCEDURE

Remove push button escutcheon.
Turn the set on and leave operate a sufficient length of time to permit the tubes to reach their normal operating conditions.

NOTE: To simplify the set up and insure accurate adjustments the following pre-adjustments should be made.

Tighten all the "ANT" Trimmer screws just moderately tight. See Fig. 1.

Turn the "OSC" screws to the left (counter-clockwise) until the end of the screw is about flush (even) with the top of the "ANT" padded condenser. Note: Care should be exercised when adjusting the "OSC" screws so that the selected station is not passed over, turn screws slowly.

It is essential that the frequency (kilocycles) of the station selected is within the range of the push button to be set for that station, see Fig. 1.

1. Turn the band switch to "B" position, first notch from left end. Using the station selector knob (upper right) carefully tune in the station to which the No. 1 push button is to be set. Note program.

2. Turn the band switch to the left ("A") and using a small screw driver, carefully turn the "OSC" screw to the right (clockwise) for the No. 1 push button (first screw on left in the upper row) until the station you tuned in (Manually) is heard again. Adjust for maximum output in speaker.

3. Adjust the No. 1 push button "ANT" adjusting screw for maximum volume in speaker. NOTE: If this adjustment does not seem to have much effect adjust loop antenna for minimum signal from that station, then adjust the "ANT" screw for maximum signal.

4. Turn band switch one notch to right "B" then back to "A" to check if push button is correctly adjusted. There should be no change in tone quality when switched from one to the other.

5. The set-up for No. 1 push button is now complete. Set up remaining buttons to be set, following the same procedure. adjusting the "OSC" screw first, then the "ANT" padder screw.

6. After all the buttons have been set, they should be rechecked, turning the loop antenna for minimum pickup on each station to insure accurate adjustments.

To tune the receiver with the push buttons the Band Switch must be turned all the way to the left "A" then completely depress the button which represents the station you wish to hear.
PHONO CONNECTIONS

CONNECT TO TONE ARM OR TELEVISION SOUND TERMINALS
SWITCH AS SHOWN IS SET FOR NORMAL RADIO RECEPTION
PHONO OR TEL SOUND
DOUBLE POLE DOUBLE THROW SWITCH
LO-SIDE
HI-SIDE
REMOVE JUMPER BETWEEN TERMINALS NOS. 1 & 2

For tuner data
See INDEX

Preliminary
Output Meter Connections
Generator Ground Connection
Dummy Antenna to be in series with generator output
Position of Volume Control
Position of Tone Control
Treble or Speech

ALIGNMENT PROCEDURE CHART

<table>
<thead>
<tr>
<th>Alignment Sequence</th>
<th>Dummy Antenna</th>
<th>Frequency Setting</th>
<th>Input Connection to Receiver</th>
<th>Band Switch</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>.02 MF</td>
<td>455 Kc.</td>
<td>Grid of 6ASQ1</td>
<td>B. C.</td>
<td>Fully open</td>
<td>2nd I.F.</td>
<td>Adj for Maximum, Adjust for Maximum.</td>
</tr>
<tr>
<td>2.</td>
<td>.0002 MF</td>
<td>1600 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Fully open</td>
<td>B. C. &quot;OSC&quot; Trimmer</td>
<td>Adj for peak: gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>3.</td>
<td>.0002 MF</td>
<td>600 Kc.</td>
<td>Ant. Lead (Blue)</td>
<td>B. C.</td>
<td>Approx. .60 on dial</td>
<td>B. C. &quot;OSC&quot; Series Trimmer</td>
<td>Adj for maximum output while rocking gang thru signal.</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Repeat Step No. 2 to check possible shift due to series adjustment.</td>
</tr>
<tr>
<td>6.</td>
<td>.0002 MF</td>
<td>5.3 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>Police</td>
<td>Fully open</td>
<td>Pol &quot;OSC&quot;</td>
<td>Adj for peak: gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>7.</td>
<td>.0002 MF</td>
<td>5.0 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>Police</td>
<td>Approx. .50</td>
<td>Pol &quot;ANT&quot; and R-F Trimmers</td>
<td>Adjust for maximum output while rocking gang thru signal.</td>
</tr>
<tr>
<td>8.</td>
<td>.0002 MF</td>
<td>18.6 Mc.</td>
<td>Ant. Lead (Blue)</td>
<td>S. W.</td>
<td>Fully open</td>
<td>S. W. &quot;OSC&quot;</td>
<td>Adj for peak: Gang does not have to tune thru signal.</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust for maximum output while rocking gang thru signal.</td>
</tr>
</tbody>
</table>

SOCKET VOLTAGES MEASURED @ 117.5 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS)
WITH 100 OHM PER VOLT, 500 VOLTS RANGE VOLTOMETER (D.C.)

PIN NUMBER

<table>
<thead>
<tr>
<th>TUBE FUNCTION</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>6K7CT—R. F. Amp</td>
<td>0</td>
<td>0</td>
<td>187</td>
<td>75</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
<td>2</td>
</tr>
<tr>
<td>6ASQ1—Osc. Mod</td>
<td>0</td>
<td>0</td>
<td>187</td>
<td>75</td>
<td>0</td>
<td>139</td>
<td>*6.3</td>
<td>1</td>
</tr>
<tr>
<td>6SK7—R. F. Amp</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>23</td>
<td>73</td>
<td>*6.3</td>
<td>228</td>
</tr>
<tr>
<td>6SQ7—Det. A.V.C—A. F.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>110</td>
<td>*6.3</td>
<td>0</td>
</tr>
<tr>
<td>6J5CT—Phase Invert.</td>
<td>0</td>
<td>0</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
<td>5.5</td>
</tr>
<tr>
<td>6FG6—Output</td>
<td>0</td>
<td>0</td>
<td>220</td>
<td>230</td>
<td>0</td>
<td>J.B.</td>
<td>*6.3</td>
<td>14.5</td>
</tr>
<tr>
<td>5Y3G—Rectifier</td>
<td>NC</td>
<td>329.0</td>
<td>J.B.</td>
<td>*358.0</td>
<td>J.B.</td>
<td>*358</td>
<td>J.B.</td>
<td>329.0</td>
</tr>
</tbody>
</table>

*Measure with A. C. Voltmeter.

Max. POWER OUTPUT @ 117.5 V. LINE...........8.0 Watts
POWER CONSUMPTION @ 117.5 V. LINE.........85 Watts
DROP ACROSS SPEAKER FIELD...................95.0 Volts
MODELS 27HD, 27HE

THE CROSLEY CORP.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>TUNING COND SETTING</th>
<th>TRIMMERS TO ADJUST</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 Kc</td>
<td>Grid 1A7GT</td>
<td>.02 MF</td>
<td>Fully open</td>
<td>2nd 1-F (1) located on front</td>
<td>Adjust for maximum signal.</td>
<td></td>
</tr>
<tr>
<td>45 S</td>
<td>Grid 1A7GT</td>
<td>.02 MF</td>
<td>Fully open</td>
<td>chassis flange 1st 1-F (2)</td>
<td>Adjust for maximum signal. Located top of 1st 1-F assembly.</td>
<td></td>
</tr>
<tr>
<td>1650</td>
<td>Ant. Lead</td>
<td>.0001 MF</td>
<td>Approx. 140</td>
<td>&quot;OSC&quot; Shunt on gang</td>
<td>Adjust for maximum output. Gang does not have to tune through signal.</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>Ant. Lead</td>
<td>.0001 MF</td>
<td>on dial</td>
<td>&quot;ANT&quot; Shunt on loop ant. through hole in right side of cabinet</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

Repeat above for more accurate adjustments

Battery drain .8 volts, 0.5 Amp. "B" Battery drain .5

Maximum power output @ 75 V, "B" approx. 300 M.W.

Maximum power output @ 90 V, "B" approx. 340 M.W.

Maximum power output @ 80 V, "E" approx. 200 M.W.

Power consumption @ 117.5 volts line—30 Watts

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ALIGNMENT PROCEDURE CHART  Models 29, 30

<table>
<thead>
<tr>
<th>Signal Generator</th>
<th>Frequency</th>
<th>Input Connection</th>
<th>Band Switch</th>
<th>Tuning Cond.</th>
<th>Trimmer Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>.020 MF</td>
<td>500 Hz</td>
<td>Grid of 200VAC</td>
<td>R.C. Fully open</td>
<td>Mid-Pos.</td>
<td>Adj. for maximum output while rocking gain up.</td>
<td></td>
</tr>
<tr>
<td>.003 MF</td>
<td>1000 Hz</td>
<td>Ant. Lead (Blue)</td>
<td>R.C. Fully open</td>
<td>Mid-Pos.</td>
<td>Adj. for maximum output while rocking gain up.</td>
<td></td>
</tr>
<tr>
<td>.005 MF</td>
<td>4000 Hz</td>
<td>Ant. Lead (Blue)</td>
<td>R.C. Approx. 50</td>
<td>Mid-Pos.</td>
<td>Adj. for maximum output while rocking gain up.</td>
<td></td>
</tr>
</tbody>
</table>

1. Repeat Step No. 2 to check possible shift due to series adjustment.
2. Adjust for peak gain of 200VAC signal.

IMPORTANT ALIGNMENT NOTES

When aligning the shortwave bands “OSC” trimmers care must be exercised to see that the circuits are aligned on the correct frequency and not on the image which is approximately 60 kilocycles below the indicated signal. To check the output, tune in the generator frequency and then turn in the image frequency which should be weaker than the fundamental, and care in approximately 30 kilocycles lower on the dial than the fundamental. If these bands cannot be tuned into, the “OSC” trimmer is adjusted to the wrong peak. (Correct peak in the second peak on trimmer from the closed position.

Repeat the original alignment procedure for more accurate adjustments. Always keep signal generator output as low as possible to prevent action of the A.V.C. circuit.

Models 28, 29, J50, 51BF, 34H

POWER CONSUMPTION @ 115 V. LINE... 50 Watts
POWER CONSUMPTION @ 115 V. LINE... 150 Watts (Including Phone Motor
DROP ACROSS SPEAKER FIELD... 74 Volts

*Measure with A.C. Voltmeter.

MAX. POWER OUTPUT @ 115 V. LINE... 50 Watts
POWER CONSUMPTION @ 115 V. LINE... 60 Watts (Radio Only)
TOTAL POWER CONSUMPTION @ 115 V. LINE... 150 Watts (Including Phone Motor
DROP ACROSS SPEAKER FIELD... 74 Volts

VOLTS MAY VARY 10% OF VALUES GIVEN.

J.B.—JUNCTION BLOCK

N.C.—NO CONNECTION

Models 28, 30

TRIMMER LOCATIONS

------ B-----

[Diagram of trimmer locations]

Models 28, 31, 34

FULLY ON

Position of Tone Control: Treble or Speech
Position of Volume Control: All the Way to Left (Off)

Position of Volume Control: Fully On

Position of Tone Control: Treble or Speech

J.B.—JUNCTION BLOCK

N.C.—NO CONNECTION

Models 28, 31, 34

TRIMMER LOCATIONS

------ B-----

[Diagram of trimmer locations]
For tuner, alignment voltage, see INDEX

Model 29

American Broadcast—550 to 1600 Kc. (545-187 Meters)
Police, Amateur, etc.—1600 to 5000 Kc. (187-60 Meters)
Short Wave (Foreign)—6.0 to 18.0 Mc. (50-16.6 Meters)
American Broadcast—550 to 1600 Kc. (545-187 Meters)
Police, Amateur, etc.—1600 to 5000 Kc. (187-60 Meters)
Short Wave (Foreign)—6.0 to 18.0 Mc. (50-16.6 Meters)
THE CROSLEY CORP.

Model 31B

**SOCKET VOLTAGES MEASURED @ 117.5 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS)**

WITH 1000 OHM PER VOLT, 500 VOLT RANGE VOLTOMETER (D.C.)

VOLTAGES MAY VARY 10% OF VALUES GIVEN

**SOCKET PIN NUMBER**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</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>6K7C</td>
<td>R.F. Amplifier</td>
<td>GND</td>
<td>GND</td>
<td>280</td>
<td>110</td>
<td>3.25</td>
<td>J.B.</td>
<td>*6.5</td>
<td>3.25</td>
</tr>
<tr>
<td>6A8GT</td>
<td>Osc.-Mod.</td>
<td>GND</td>
<td>GND</td>
<td>280</td>
<td>110</td>
<td>—</td>
<td>—</td>
<td>NEG.</td>
<td>135</td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F. Amplifier</td>
<td>GND</td>
<td>GND</td>
<td>280</td>
<td>110</td>
<td>3.6</td>
<td>110</td>
<td>3.6</td>
<td>280</td>
</tr>
<tr>
<td>6L76Q</td>
<td>Det.-A.V.C.-1st A-F.</td>
<td>GND</td>
<td>GND</td>
<td>175</td>
<td>50</td>
<td>—</td>
<td>A.V.C.</td>
<td>200</td>
<td>6.5</td>
</tr>
<tr>
<td>6J5</td>
<td>Driver</td>
<td>GND</td>
<td>6.5</td>
<td>145</td>
<td>265</td>
<td>GRID</td>
<td>J.B.</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>6V6C</td>
<td>Output</td>
<td>GND</td>
<td>GND</td>
<td>300</td>
<td>280</td>
<td>GRID</td>
<td>J.B.</td>
<td>18.5</td>
<td></td>
</tr>
<tr>
<td>6V6G</td>
<td>Output</td>
<td>GND</td>
<td>GND</td>
<td>300</td>
<td>280</td>
<td>GRID</td>
<td>J.B.</td>
<td>18.5</td>
<td></td>
</tr>
<tr>
<td>6L76Q</td>
<td>Mic. Amp. &amp; Ind. Rect.</td>
<td>GND</td>
<td>GND</td>
<td>95</td>
<td>110</td>
<td>DIODE</td>
<td>N.C.</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>6EG</td>
<td>Indicator-(Tun.-Level)</td>
<td>GND</td>
<td>GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5U4Q</td>
<td>Rectifier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


MAXIMUM POWER OUTPUT @ 117.5 V. Line = 20 Watts @ Voice Coil.
POWER CONSUMPTION @ 117.5 V. Line = Radio 115 Watts + Phono Motor 35 Watts = 150 Watts, Total.
Red/Gray to Red/Red/Yellow = 45 Volts.

Position of Volume Control... Fully On
Position of Tone Control... Treble or Speech

Model 35

**ALIGNMENT PROCEDURE CHART**

<table>
<thead>
<tr>
<th>Alignment Sequence</th>
<th>Dummy Antenna</th>
<th>Frequency Setting</th>
<th>Input to Receiver</th>
<th>Bandswitch</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer(s) Adjusted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>00M5F</td>
<td>450 Kc. Ant. Lead (Blue)</td>
<td>B.C.</td>
<td>Fully Open</td>
<td>2nd I.F. (3)</td>
<td>Adjust for Maximum output</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>400 ohm</td>
<td>15.3 M. Ant. Lead (Blue)</td>
<td>S.W.</td>
<td>Fully Open</td>
<td>S.W. &quot;OSC&quot;</td>
<td>Adjust for Peak. See footnote</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>400 ohm</td>
<td>15.0 M. Ant. Lead (Blue)</td>
<td>S.W.</td>
<td>Approx. 15</td>
<td>B.C. &quot;ANT&quot;</td>
<td>Adjust for Maximum while rocking gang back and forth</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>0062 MF</td>
<td>1650 Kc. Ant. Lead (Blue)</td>
<td>B.C.</td>
<td>Fully Open</td>
<td>B.C. &quot;OSC&quot;</td>
<td>Adjust for peak. Make sure the switch on loop is in B.C. position</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>0062 MF</td>
<td>1490 Kc. Ant. Lead (Blue)</td>
<td>B.C.</td>
<td>Approx 140</td>
<td>B.C. &quot;ANT&quot;</td>
<td>Adjust for Maximum output</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>0062 MF</td>
<td>2.5 M. Ant. Lead (Blue)</td>
<td>B.C.</td>
<td>Approx 2.5</td>
<td>Pol. Ant.</td>
<td>Adjust for Maximum output</td>
<td></td>
</tr>
</tbody>
</table>

When aligning the shortwave bands "OSC" trimmers care must be exercised to see that the circuits are aligned on the correct frequency which is approximately 910 kilocycles less as indicated on the dial. To check, increase generator output, tune-in the generator frequency and then tune-in the image frequency which should be weaker than the fundamental and come in approximately 910 kilocycles lower on the dial than the fundamental. If image cannot be tuned-in, the "OSC" trimmer is adjusted to the wrong peak. (Correct peak is the second peak on trimmer from the closed position).
THE CROSLEY CORP.

MODEL 33BG
455 K.C. I.F.

VOLTAGE CHART
ALL VOLTAGES MEASURED FROM SOCKET PIN TO CHASSIS @ 117.5 VOLT LINE

<table>
<thead>
<tr>
<th>TUBE SECTION</th>
<th>SOCKET PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7—Osc.-Mod.</td>
<td>0</td>
</tr>
<tr>
<td>6SK7—I. F. Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6S8Q7—Det. A.V.C.—1st A.F.</td>
<td>0</td>
</tr>
<tr>
<td>6V6GT—Output</td>
<td>0</td>
</tr>
<tr>
<td>6SK7—Mike Amp.</td>
<td>0</td>
</tr>
<tr>
<td>5Y3G—Rectifier</td>
<td>0</td>
</tr>
</tbody>
</table>

All voltages measured with 1000 OHM/Volt Voltmeter except heaters. Voltages may vary 10% of values given.

DROP ACROSS SPEAKER FIELD.................................................. 58 Volts
MAXIMUM POWER OUTPUT @ 130 V. LINE.................................... 6.5 Watts
MAXIMUM POWER CONSUMPTION @ 130 V. LINE.............................. 60 Watts

*Phono Motor 40 Watts additional.

MODEL 31BF

CROSLEY PAGE 12
ALIGNMENT:

I.F. -- Set signal generator to 455 kHz and connect to Red or Blue antenna lead through a 100 mmf dummy. Adjust 2nd i-f trimmers located through front chassis flange below speaker. Adjust 1st i-f trimmers for maximum output. See layout at left.

R.F. -- Set signal generator to 1850 kHz. Condenser gang to minimum. Adjust B.C. OSC. trimmer so that signal is heard. Set signal generator to 1400 kHz. Adjust tuning dial to 140 and adjust BC ANT. trimmer for maximum output.

NOTE: Do not readjust the OSC trimmer.
MODEL 36AM
THE CROSLEY CORP.

TUBE SOCKET VOLTAGE READINGS (MEASURED FROM SOCKET PIN TO CHASSIS)

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Pin Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7-GT</td>
<td>Oscillator-Modulator</td>
<td>46, 1.5</td>
</tr>
<tr>
<td>1N5-GT</td>
<td>I-F Amplifier</td>
<td>86, 1.5</td>
</tr>
<tr>
<td>1H5-GT</td>
<td>Detector &amp; 1st A-F Amp.</td>
<td>86, 16</td>
</tr>
<tr>
<td>1A5-GT</td>
<td>Output</td>
<td>84, 1.5</td>
</tr>
</tbody>
</table>

Power Output approximately 200 milliwatts.
"A" Battery Drain approximately 20 Ampere at 1.5 Volts.
"B" Battery Drain approximately 9.0 Milliamperes at 90 Volts.

ALIGNMENT PROCEDURE

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 1A5GT tube, leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the "GND:" lead or chassis. KEEP THE GENERATOR LEADS AS FAR AS POSSIBLE FROM THE GRID LEADS OF THE OTHER SCREEN GRID TUBES.
   (b) Slowly turn the condenser plates on the RF tank to between 80 and 100 per cent(final reading). (c) Adjust the station selector so that the signal generator is on the band of interest.
   (d) Adjust both trimmers on the 1st I-F transformer for maximum output.

2. Aligning R-F Amplifier
   (a) Set the signal generator to 1500 kilocycles.
   (b) Open the condenser gang all the way.
   (c) Adjust the "OSC" trimmer condenser on gang for maximum output.
   (d) Adjust the signal generator to 450 kilocycles.
   (e) Open the condenser gang all the way, and adjust both "ANT" trimmer condenser on gang for maximum output.

3. Adjust the receiver to the generator signal for maximum output (approximately 1400 on the dial).

G. Repeat operations (e) and (f) alternately until no further improvement in output can be obtained.
The vibrator is a 150 cycle full wave primary type. Bias for the 6A8GT and the 6SK7 is obtained from the voltage drop across item 27, a 100 ohm resistor. The 6SQ7 is operated at zero bias. Bias for the 6K6GT is obtained from the voltage drop across item 37, a 600 ohm resistor. A resistive "B" filter is used and consists of item 35, a 1400 ohm resistor and sections B and C of item 22, a three section electrolytic condenser (section A used as by-pass for output cathode).

Models A-150 and A-450 are manually tuned receivers while model A-350 has a five station mechanical push button tuning system.
Fig. 2-A—Top View Model A-450
Fig. 2-B—Top View Model A-350
Fig. 2-C—Top View Model A-150

Fig. 3-A—Bottom View Model A-450
Fig. 3-B—Bottom View Model A-350
Fig. 3-C—Bottom View Model A-150

Fig. 4-A—Socket Voltage Chart Model A-450
Fig. 4-B—Socket Voltage Chart Models A-150 and A-350

Conventional alignment; See Special Section Vol. VIII
1. **Aligning The I-F Amplifier (455 Kc.)**
   (a) Connect the output of the signal generator through a 02 mf or larger condenser to the top cap of the 6AR7 oscillator-modulator tube, leaving the tube's grid clip in place. Connect the ground lead from the signal generator to the chassis.
   (b) Set the signal generator to 455 kilocycles.
   (c) Open the tuning condenser all the way, turn the volume control on full.
   (d) Adjust both trimmers on the 2nd I-F transformer for maximum output. (See figure 3.)
   (e) Adjust both trimmers on the 1st I-F transformer for maximum output. (See figure 3.)
   (f) Repeat (d) and (e) for more accurate adjustments. **ALWAYS USE THE LOWEST SIGNAL GENERATOR OUTPUT THAT WILL GIVE A REASONABLE OUTPUT METER READING TO PREVENT A.V.C. ACTION.**

2. **Aligning R-F Amplifier**
   To obtain the greatest gain from the R.F. amplifier,

---

**SOCKET VOLTAGES MEASURED AT 1175 VOLTS LINE (BETWEEN SOCKET PIN AND CHASSIS)**

<table>
<thead>
<tr>
<th>SOCKET PIN NUMBER</th>
<th>SOCKET PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUBE FUNCTION</td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
<tr>
<td>8857—RF AMP</td>
<td>100 75 50 25 00</td>
</tr>
<tr>
<td>6AL5—O.C. MOD.</td>
<td>100 75 50 25 00</td>
</tr>
<tr>
<td>86K7—I-F AMP</td>
<td>100 75 50 25 00</td>
</tr>
<tr>
<td>6G6C—Det. 115 A.F.</td>
<td>110 80 60 40 20</td>
</tr>
<tr>
<td>6G6C—Output</td>
<td>220 220 220 220 220</td>
</tr>
<tr>
<td>6G6C—I-F AMP</td>
<td>320 320 320 320 320</td>
</tr>
<tr>
<td>6G5S—Indicator</td>
<td>220 220 220 220 220</td>
</tr>
</tbody>
</table>

**VOLTAGE DROP ACROSS SPEAKER FIELD = 77 VOLTS**

**MAXIMUM POWER OUTPUT @ 110 V. Line—75 Watts**

**POWER CONSUMPTION @ 117.5 V. Line—Radio 90 Watts, Phone Motor 35 Watts—TOTAL=135 WATTS**

Voltages may vary 10% of values given.

---

**Fig. 5—Socket Voltage Layout**

(c) Check the power input on the dial to see that it makes a complete ring, reset if necessary. Adjust the station selector to 140 on the dial.

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

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

(f) Readjust the station selector for maximum output. **DO NOT READJUST THE OSC TRIMMER.**

(g) **Repeat operation (e) for more accurate adjustment.**

2. **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, located to the right of antenna receptacle, for maximum output.
   (d) Repeat operations (b) and (c) alternately until no further improvement in sensitivity 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) Adjust 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.
SETTING PUSH BUTTONS for A160 and A250

The push buttons are easily reset if necessary. Remove the push button by pulling straight out. Loosen the set screw two or three turns. With the manual control tune-in station to which key is to be set. With a small screwdriver inserted in set screw push the key ALL THE WAY DOWN, then securely tighten set screw.

MARCH 1940

MODEL --- A250

455 KC. I.F.
I—RECORDERS

The quality and life of instantaneous home recordings is largely dependent upon the operation and maintenance of the various controls and the operation of the recording equipment. The type, model and make of the equipment must be considered.

The type and make of the equipment must be considered. The type and make of the equipment must be considered.

A—CUTTING NEEDLES

The cutting needles or stylus as furnished with the recording equipment will cut approximately 20, 40 or 60 carat records per hour, with a record length of 15 or 12 inches. These needles are subjected to constant wear and tear, and should be checked at regular intervals.

The needle shown in Fig. 1A is the type of needle used in most home recording equipment. The needle shown in Fig. 1B is the type of needle used in most home recording equipment. The needle shown in Fig. 1C is the type of needle used in most home recording equipment.

B—PLAY BACK NEEDLES

(Use Recorders with Automatic Record Changer.)

Instantaneous recorders (home recording) can be played back in the same position as in the recording. Use only those needles which have been designed for this purpose.

The needle shown in Fig. 2 is the type of needle used in most home recording equipment. The needle shown in Fig. 3 is the type of needle used in most home recording equipment. The needle shown in Fig. 4 is the type of needle used in most home recording equipment.

C—CUTTING ARM ADJUSTMENTS

The cutting arm of the recorder is adjusted by means of the loss of the surface of the record. The top of the arm and the pick-up mechanism are adjusted to make the arm correct. The needle shown in Fig. 5 is the type of needle used in most home recording equipment.

The adjustment of the depth of cut is accomplished by rotating the control knob on the cutting arm of the recorder to the correct position, set at the factory for 45-60 cm. The depth of cut is determined by the height of the needle and the position of the needle in relation to the record surface.
depth of cut is adjusted by rotating the screw approxi-
mately in the middle of the cutting arm and flush with
the top, small handwheel on the cutting arm. The screw
should be turned to the right (clockwise) Con-
versely to decrease the depth of the cut the screw should
be turned to the left (counter-clockwise). This screw
should in general be used in one rotation, when the
depth of cut is set, with the cutter being used in
a work shop of a smaller size.

When the cutting head is in its proper adjustment, and
the cutter arm is raised to the point (approximately 45\%)
where it can be freely moved over the record, the
cutting head need screw should just REST on
the bottom of the slot in the case of the arm—that is, in the
regular spring tension should be such that the
cutting head ALMOST FLOATS FREELY.

ALWAYS TRY A TEST CUT WITH A NEW CUT-
TING NEEDLE before making any adjustments, three
or four times while a normal observation indicates
locally adjustment, the whole tool may be due to a cutting
needle that has been dulled either through accident or
natural wear.

NOTE: Changing the arm height usually necessitates
a change in cutting depth adjustment and changing the
depth of cut may call for a slight variation in the arm
height adjustment to prevent cutting needle chatter or
reduce surface noise.

K. CUTTING LEVEL.

The cutting level as required for instantaneous recordings
as made on the two type recorders as used in
Crosley Recorders. The cutting level of the above
cutting needles is used and its condition and the type record blank used.

The cutting arm height is correct and the depth of cut is adjusted
the following cutting bands should give good results.

For those models having the cylinder type indi-
cator. The shadow on the indicator tube forms a narrow vertical line
approximately 1/25 wide for loud or peak sig-

nals. During recording this shadow will vary in width
in accordance with the loud and soft passages of the
program.

For the models equipped with a New Tube as a Cut-
ting Indicator the volume level should be raised
at the desired volume to obtain an even plathust
flow during loud or peak signals, and to ensure
cutting level can only be found by experimentation as
the type and condition of cutting needles and blank disc used.

F. RECORDS (BLANKS & CUT)

The record blanks for instantaneous home recording
 differ from commercial records in many respects. Com-
pare the player down and apply a slight pressure on the
 turntable of the Rubber Idler Drive Wheel.

B. Tight pivot bearings: Clocks (106, Fig. 6) for horizontals.
Also recording and straining against the rubber wheel (106, Fig. 8).
These should be from but can have no looseness or play.

If the pivot score, (106, Fig. 6) of the Cutter
Cartridge is tight, the Cutter Cartridge cannot follow a slight move
down variation of the record on turn-
A record cut in this manner with lines played back, have a high scratch level, rough cutting and a tenden-
ne for the needle to jump from one groove to
another.

C. Damaged Rubber Idler Drive Wheel (106, Fig. 6) Rubber
Idler Drive Wheel may have become damaged by:
1. Allowing oil or grease to come in contact with
the rubber wheel.
2. By allowing turnable to drag and cut into
the surface of the rubber of the Rubber Idler Drive
Wheel.
3. Damaging the turntable by hand while
the motor is running with a flat spot on
the surface of the rubber of the rubber
Idler Drive Wheel.
NOTE: If the Rubber Idler Drive Wheel has been
damaged in the above mentioned ways, it should be
replaced with a new one.

D. Vibration Reaching the Recorder While a Blank is Being Cut:
It is very important that the floor or the surface upon
which the Recorder rests remain quiet as any vibration
such as people walking across the floor or shaking
of the instrument which is the recorder is mounted will
magnetically affect the quality of the recording.

E. Recorder Not Level: It is very important that the
recorder is standing level. This can be checked by
placing a small level on the recorder and checking
same in two positions at right angles to each other and
then leveling instrument in which recorder is mounted.

F. Record Cutting Causing a Bad between Turn-
table and Turnable Spindle (106, Fig. 6) has been heat-
shaped, or by someone exerting a heavy pressure on
one of the turntables, it should be replaced with a new one. A bent
Turntable Spindle will cause the surface of the Turn-
table to move up and down while it is turning and, of
course, will seriously affect the quality of both record-
and play-back.

G. Record Cutting Causing A Bad between Turn-
table and Turnable Spindle (106, Fig. 6) and its Bearing:
It is very important that all record cuttings are re-
covered from Turntable Spindle and its bearing.

H. Turntable Drive Wheel (106, Fig. 6) Too Great:
If the tension on the Rubber Idler Drive Wheel is too
great, this will result in a scratch on the record.

NOTE: It is very important that no grease or
oil be applied on the surface of the Rubber
Idler Drive Wheel.

I. Turntable Drive Wheel (106, Fig. 6) Too Weak:
This will cause very bad speed variation. Turnable
will cause very bad speed variation of the turntable. Cuts
may also wrap around motor shaft and cause motor to
slow down or stop. To remove record cuttings, the
Turnable should be lifted by applying an even lifting
force at opposite edges of the turntable. The rubber
wheel should be taken off—Remove hairpin re-
ter and fiber washer and left wheel off, remove all
cuttings and replace wheel.

NOTE: It is very important that NO GREASE OR OIL
be applied to the surface of the rubber on drive wheel.

Turntable Drive Wheel may become damaged by:
1. By permitting turnable to drag and cut into
the surface of the motor wheel in any manner.
2. Damaging the turntable by hand while
the motor is still running to cause a flat spot on
the surface of the rubber drive wheel.
3. Allowing oil or grease to come in contact with
the rubber surface of drive wheel.

NOTE: If the rubber drive wheel has been damaged
in any of the above ways, replace with a new one.

B. Mechanical Vibration Transmitted to Recorder:
It is very important that the base upon
which Recorder rests remains quiet, as
any vibration such as people walking across the floor or shaking
of the instrument will seriously affect the quality of
the finished recording.

C. Recorder Not Level:
It is very important that recorder is standing level.
This can be checked by placing a small level on the
record player and checking same in two positions at right angles to each other and
then leveling instrument in which recorder is mounted.

D. Turntable Drive Wheel:
If the tension on the rubber drive wheel is too
great, this will result in a scratch on the record.

NOTE: It is very important that no grease or
oil be applied on the surface of the Rubber
Idler Drive Wheel.

E. Turntable Drive Wheel:
This will cause very bad speed variation. Turnable
will cause very bad speed variation of the turntable. Cuts
may also wrap around motor shaft and cause motor to
slow down or stop. To remove record cuttings, the
Turnable should be lifted by applying an even lifting
force at opposite edges of the turntable. The rubber
wheel should be taken off—Remove hairpin re-
ter and fiber washer and left wheel off, remove all
cuttings and replace wheel.
III—AUTOMATIC RECORD CHANGER

1—FUNCTION OF RECORD CHANGER WHEN IT IS GOING THRU A CHANGE CYCLE

The Record Changer plays and automatically changes 10 or 12-inch records as it goes through 10 or 12-inch records.

The Record Changer is started by turning the switch control knob. (See Fig. 21, to "ON" spot on the selector arm, and move the record from the drum to the turntable.)

The Record Changer is stopped by turning the switch control knob back to "OFF" position. (See Fig. 21, to "OFF" spot on the selector arm, and move the record from the turntable to the drum.)

The Record Changer is operated by turning the switch control knob to the desired position. (See Fig. 21, to the desired spot on the selector arm, and move the record from the drum to the turntable or from the turntable to the drum.)

2—ABOUT THE CHANGER

The Record Changer is mounted on a steel plate and is connected to the turntable by means of a flexible coupling. The turntable is driven by a motor which is located in the base of the Record Changer. The motor is connected to the turntable by a flexible coupling.

The turntable is a metal plate with a groove for the record. The record is placed on the turntable and the turntable is rotated by the motor.

The Record Changer is controlled by a selector arm which is moved to the desired position by means of a switch control knob. The selector arm is connected to the turntable by means of a flexible coupling.

3—OPERATING INSTRUCTIONS

1. Turn switch knob to "OFF" position.
2. Remove any records remaining on the selector arm.
3. Move the selector arm outwards until it catches in the outward position.
4. Turn the selector arm so that the record will clear them.
5. Remove records from turntable.

7—LUBRICATION

(A) Motor: The motor is equipped with oilless bearings and requires no lubrication.

(B) Turntable Spindle Bearings: These bearings are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with 1 to 2 drops of a light grade oil. The top bearing can be lubricated by lifting off the turntable. Make sure when replacing the turntable to see that it fits on the spindle and slip into slot in bottom of turntable hub and also that it does not rub any part of the spindle. To lubricate the record it is necessary to remove the turntable and apply oil to the spindle and slip into slot in bottom of turntable hub and also that it does not rub any part of the spindle. To lubricate the record it is necessary to remove the turntable and apply oil to the spindle and slip into slot in bottom of turntable hub and also that it does not rub any part of the spindle.
IV—SERVICE NOTES

1—Pickup Does Not Index Properly on Ten or Twelve-Five Records:

Adjustment for correct indexing of 10-inch records:

1. Swing tone arm outward until tone arm lever assembly is off the tone arm lever shaft (item 16, Fig. 12), which is held to the tone arm lever shaft by set screws.
2. Mark tone arm lever assembly and the panel (item 5, Fig. 12). This will give proper clearance at blade arm assembly (item 7, Fig. 12).
3. The tone arm lever assembly, (item 16, Fig. 12) is held against tone arm lever housing (item 16, Fig. 12) by the tension of tone arm lower lever springs (item 16, Fig. 12).
4. Next loosen the clamping screw in the Swivel Bracket Assembly (item 48, Fig. 13).
5. Move tone arm (item 60, Fig. 11) until its outside edge is 1/2" from the outside edge of the panel (item 5, Fig. 12) and tighten screw.

2—Record Changer Does Not Go Into Its Changing Cycle at End of Record:

(3) Check Alignment May Be Incorrect: The Record Changer should go into its changing cycle when the needle enters the edge groove and has traveled to a distance of 1/2" from the center of the turntable shaft.

If the Record Changer does not go into its changing cycle when the needle reaches the edge of a record, it is necessary to correct the edge of the turntable shaft.

If the Record Changer goes into its changing cycle before the record has reached a distance of 1/2" from the center of the turntable, the Tone Arm Trip Lever should be moved toward the center of the turntable.

3—Record Changer Does Not Go Into Its Changing Cycle When Switch Knobs is Turned On:

1. Make sure record is clean.
2. Check Trip Rod (item 32, Fig. 12) to see that it releases Trip Lever Assembly (item 30, Fig. 12), from Engagement Clutch Cam Assembly (item 7, Fig. 12), when Switch Knob is being turned on. Trip Lever Assembly is not released, Trip rod should be checked and adjusted by bending until Trip Lever clears Engagement Clutch Cam Assembly.
3. Make sure that Clutch Reset Plate (item 40, Fig. 12) clears Drive Link Assembly (item 31, Fig. 12).

4—Record Changes Continues to Execute Changing Cycle Without Playing Records:

(A) Trip Lever Assembly (item 20, Fig. 2) does not latch in Engagement Clutch Cam Assembly (item 7, Fig. 12), which may be due to causes listed below:

1. Trip Rod (item 32, Fig. 12), may be bent so that it is too short, leading Trip Lever Assembly from catching Engagement Clutch Cam Assembly.
2. Springs (item 24 or 35, Fig. 12) may be disconnected.

5—Sound When Needle is on Moving Record:

1. Mating switch (item 26, Fig. 12), may be out of adjustment. The contacts of this switch should be opened whenever the long blade is not resting on the edge of the Engagement Clutch Cam Assembly (item 7, Fig. 12).
2. The contacts remain closed after the long blade has left the hook, they should be adjusted by bending them until there is a separation of approximately 1/32".

6—Tone Arm Adjustments for 12" Records:

1. Turn both Control knobs until the arrows mark of "00" are pointing toward the center of the turntable.
2. Place a 10-inch record on the turntable.
3. Start Record Changer and note where needle contacts record. Correct contacting is about 1/32" from the outside edge of record.
4. Set record (item 50, Fig. 13), is operated by Selector Arm (item 61, Fig. 11). The 12" Selector Lever (item 10, Fig. 13) operates selector where each position is set for 12" records. When Tone Arm Lever Assembly (item 12, Fig. 11) contacts 12" Set Lever in the Tone Arm Motor (item 10, Fig. 11), contacts 12" Set Lever in the Tone Arm Motor (item 10, Fig. 11) and moves in either direction as required, and turns across.

7—Tone Arm Height Adjustments:

Set the Record Changer to the first position and turn it to "00" and allow Record Changer to go through a changing cycle with no record on the turntable. The distance between Turntable and the bottom surface of the Tone Arm should be approximately 1/8". Usually the distance can be obtained by adjusting the Tone Arm Height Adjusting Screw (item 76, Fig. 13). It is well to check the following points before making any adjustment:

Check distance between Selector Lever (item 51, Fig. 13), and Selector Crank Shaft Assembly (item 5, Fig. 2). This should be about 11/16" and adjusted so that the Selector Shaft Collar is not too close or too far from the End of the Tone Arm.

8—Tone Arm Lowers on Record Too Sudden:

If the Tone Arm lowers too slowly, the Spring Washer (item 50, Fig. 13) which is located between the Tone Arm Lift Link Assembly (item 51, Fig. 2) and Selector Crank Shaft Assembly (item 5, Fig. 2) is not under sufficient pressure. The Spring Washer in the Selector Shaft Collar (item 5, Fig. 2) should be loosened and the Selector Shaft Collar slightly loosened. If the Tone Arm lowers too quickly, the Spring Washer (item 50, Fig. 13) is not under sufficient pressure. The Spring Washer in the Selector Shaft Collar (item 5, Fig. 2) should be tightened and the Selector Shaft Collar slightly tightened.
ALIGNEMENT PROCEDURE

Connect an output meter across the speaker voice coil. The volume control should be set a few degrees from the maximum volume position. Use a weak signal from the generator; strong signals tend to cause improper adjustments.

IF Alignment: Connect the signal generator ground to the receiver chassis through a .1 mfd. condenser. Using a .1 mfd. condenser in series with the high side of the generator, apply a 455 kc. signal to the grid of the 6K7GT tube and align the 2nd IF transformer. Connect to the grid of the 6K8 tube and align the 1st IF transformer. (See Tube Layout Diagram for location of these adjustments.) From this position re-check both transformers again.

Broadcast Band Alignment: Turn the band switch to the Broadcast position, turn the tuning condenser all the way to the right, (minimum capacity), apply a 1720 kc. signal to the grid of the 6K8 tube and adjust the broadcast oscillator trimmer.

The oscillator coil is under the right hand end of the chassis and this trimmer is the one nearest the front of the chassis. To align the loop antenna, connect a single turn loop across the terminals of the generator, place the receiver about one foot in front of the single turn loop, set the generator at about 1400 kc., tune in the signal and adjust the trimmer on the loop antenna assembly for maximum response.

Short Wave Alignment: Using a 400 ohm resistor between the high side of the generator and the antenna terminal (on the LOOP frame), turn the tuning condenser to minimum capacity, set the generator at 18,500 kc., and adjust the short wave oscillator trimmer. This trimmer is immediately in back of the broadcast oscillator trimmer. Set the generator at about 17,000 kc., tune in the signal and adjust the short wave antenna trimmer for maximum response. This trimmer is mounted on the loop antenna.

NOTE: If considerable hum appears when the generator is connected as described above use smaller condensers between the generator and the receiver. The best way is to use a 1:1 transformer to isolate either the receiver or the generator from the line. The adjustments of this receiver are very stable and no aligning should be attempted unless absolutely necessary.
ALIGNMENT PROCEDURE SERIES 349

The alignment adjustments of this receiver are very simple. Should realignment be necessary, it should be attempted by a competent technician, using a calibrated test oscillator or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an output meter, with one or two calibrated balance trimmers or signal generator and an 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ALIGNMENT 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 mfd condenser in series with high side of generator, apply 555 kc. signal to grid of 6K3GT L.F. amplifier tube, and alien transformer No. 2. Connect generator to grid of 6K3GT tube and alien transformer No. 1.

R.F. (See above diagram for location of trimmers.)

Using a 200 M.MF. condenser in series with the high side of the generator, turn band selector switch to left band position and the tuning condenser to about 600 kc.

Feed a 555 kc. signal to the antenna and adjust wave trap trimmer for minimum response. With the tuning condenser at minimum capacity feed 1720 kc. signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator frequency 500kc. and turn receiver to signal and adjust the pad. The tuning condenser should be rocked back and forth through the signal while varying the padder in order to assure perfect alignment.

Using 400 ohm resistor in series with generator, set band selector in center position, set generator to 3825 kc. and adjust oscillator trimmer for top frequency. Set generator to 5000 kc. and turn receiver to signal and adjust antenna trimmer.

Turn band selector to extreme clockwise position. Using 400 ohm resistor in series with generator, set oscillator top frequency for 18,000 kc.—screw trimmer down tight, then unscrew to second peak. Set generator to 18,000 kc., tune receiver to signal and adjust antenna trimmer—screw trimmer down tight, then unscrew to first peak, rocking the tuning condenser back and forth through the signal while the adjustment is being made. Above procedure for alignment at 18,000 kc. must be followed exactly to insure proper tracking. A dead spot at about 12,000 kc. will result if antenna and oscillator circuits are not set in proper relation to each other.

<table>
<thead>
<tr>
<th>IF Peak 455 KC</th>
<th>STATION BAND SELECTOR SWITCH</th>
<th>VOLUME CONTROL</th>
<th>TONE ON-OFF SWITCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>6J5GT Phase Inverter</td>
<td>25AGT Power Output</td>
<td>6A6GT Oscillator-translator</td>
<td>6K7GT Intermediate Frequency Amplifier</td>
</tr>
<tr>
<td>6K8GT Antenna-Loop Switch</td>
<td>AC/DC Switch</td>
<td>broadcast range from 540 to 1720 kilocycles, short wave range</td>
<td>1.65 megacycles to 5.8 megacycles</td>
</tr>
</tbody>
</table>
INSTRUCTIONS FOR BATTERY INSTALLATION

Remove the batteries from the shipping carton. Save some of the packing. Pull the bottom of the loop away from the cabinet. From the inside of the two "A" batteries and place the batteries in the bottom of the cabinet. Fold a piece of the packing and wedge between the two "A" batteries. Plug the "B" leads into the two 45 volt "B" batteries and place these batteries on top of the "A" batteries with the plugs facing the sides of the cabinet. Before the "B" batteries are pushed all the way in, slip the loop over the "B" batteries and push the batteries and loop in as far as they will go. The long connection between the two "B" batteries should be towards the front of the cabinet away from the loop. Wedge some of the packing over the "B" batteries to keep them from being loose in the case.

WARNING

Be sure the switch is turned off when connecting batteries.

ALIGNMENT PROCEDURE

I.F. Frequency 455 KC. Set Range 450-1500 KC.

Connect the test oscillator or signal generator, to the set as follows: Connect the "hot" side of the signal generator to the grid of the 1AT7 tube, and the ground side to the chassis. If the set is aligned on AG or DC be sure that the test oscillator or signal generator is isolated from the receiver, line and back in the same direction as the speaker to indicate resonance. Align the I.F. trimmers at 455 KC. for maximum meter reading.

Turn the condenser plates all the way out. Set the test oscillator to 1000 KC and adjust the oscillator trimmer for maximum signal. Disconnect the test oscillator and tune in a weak station near 1000 KC. at full volume. Adjust the trimmer on the front of the variable condenser for maximum signal. When adjusting the trimmer do not set the receiver on or near the metal work bench or other large metal object, as it will affect the tracking of the receiver.
This receiver is designed to use only the whip type of antenna. Cowl or hinge pin mounting types or their equivalent should be used.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8216</td>
<td>10-ohm Flexohm Resistor</td>
<td>8223</td>
<td>Speaker, 4 inch</td>
</tr>
<tr>
<td>8205</td>
<td>Antenna Coil</td>
<td>6691</td>
<td>Front mounting bracket</td>
</tr>
<tr>
<td>8206</td>
<td>Oscillator Coil</td>
<td>6686</td>
<td>Steering Post mounting bar</td>
</tr>
<tr>
<td>6687</td>
<td>Volume Control</td>
<td>6696</td>
<td>Steering Post clamp</td>
</tr>
<tr>
<td>8211</td>
<td>10 x 10—350V x 20 25V</td>
<td>6739</td>
<td>Dial Escutcheon</td>
</tr>
<tr>
<td>8215</td>
<td>.005-1200V Buffer condenser</td>
<td>6740</td>
<td>Volume control knob</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8210</td>
<td>Variable condenser</td>
</tr>
<tr>
<td>6682</td>
<td>Tuning Dial</td>
<td>6694</td>
<td>Clamp bar (for screws)</td>
</tr>
<tr>
<td>6717</td>
<td>Spark plate</td>
<td>6746</td>
<td>Rear mounting straps</td>
</tr>
</tbody>
</table>

**ANTENNA ADJUSTMENT**

When the set is installed and the antenna is connected, tune in a weak station on or near 1400 kc. (140 on dial), turn volume full on, remove the upper snap button above the volume control, and with a long screwdriver, turn the adjusting screw in and out until maximum volume is obtained. Replace the snap button. The set is then adjusted.

**ALIGNMENT**

<table>
<thead>
<tr>
<th>PART</th>
<th>I.F. Frequency</th>
<th>Frequency Range</th>
<th>Dummy Antenna</th>
<th>Input to I.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.</td>
<td></td>
<td></td>
<td>1550—540 KC</td>
<td>30 MMF</td>
</tr>
<tr>
<td>8214</td>
<td></td>
<td>455 KC</td>
<td>1/10 MF</td>
<td></td>
</tr>
</tbody>
</table>

To align the I.F., feed the signal generator or test oscillator through a 1/10 MF condenser to the grid of the 6k6 tube, grounded the ground side of signal generator to the case. With volume control full on and a weak signal, adjust screws of 1st and 2nd I.F. transformers using a suitable output meter to indicate resonance.

The oscillator should be set at 1550 K.C. Turn variable condenser to minimum capacity and with a 30 MMF dummy antenna condenser connected to the antenna cable and a low signal input, set the oscillator to its top frequency. The antenna trimmer should be adjusted at 1400 KC. The antenna trimmer should be readjusted at this frequency when the set is installed in the car.
Two types of power transformers are available for these receivers. Unless specifically stated otherwise or a tag attached to the receiver it is equipped with a transformer for operation on 105 to 125 volts 50 to 60 cycle alternating current.

The receivers equipped with UNIVERSAL POWER TRANSFORMERS will operate on 110, 120, 150, or 225 volts 50 to 60 cycles alternating current. A small cover top of the transformer should be removed and the plug inserted in the proper clip for the voltage available.

For radio operation make certain that the Radio-Phone switch, which is on the phonograph motor panel, is turned to the left position.

For phonograph operation turn the Radio-Phone switch to the Phone position. THE AC-DO SWITCH MUST BE SET IN THE PROPER POSITION. (This switch is on the phonograph panel.)

105 TO 125 VOLTS, DIRECT OR ALTERNATING CURRENT.

12SA7 Translator
12SK7 Detector AVC
12SK7 IF Amplifier
501 GT Output
3SZ5 GT Rectifier
This receiver is designed to operate on 105-125 volts 25-60 cycles A.C. or D.C. The broadcast range coverage is 540-1700 K.C.

To Calibrate Receiver
Attach hot side of signal gen. to one of the flexible ant. loop leads. Connect ground side to rec. chassis. Peak I.F. Trimmers at 455 kc, Adj. rec. dial and sig. gen. to 1500 kc and peak variable condenser trimmers to max.

This model is a five tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 105-125 volts, 40-60 cycles A.C.-D.C. unless otherwise specified.
This model is a six tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 105-120 volts, 40-50 cycles A.C., D.C. unless otherwise specified.

IMPORTANT:

Since the loop used has a directional effect, it may be found necessary at times to turn the receiver for best reception on weaker stations.

I.F. PEAK 455KC

This is a miniature portable type radio receiver. It employs a superheterodyne circuit with full automatic volume control. A self-contained antenna loop is incorporated which makes the use of an outside aerial or ground unnecessary. The "A" supply consists of two dry-cell batteries, EVEREADY #500 or the equivalent. The "B" supply consists of one 6 7/10 volt battery, EVEREADY #467 or the equivalent. The range coverage is 540 to 1700 kilocycles.

INSTALLATION OF BATTERIES

Rest the cabinet on the knobs with the speaker grille facing you. Open up the door by sliding the latch of the lock toward the lever tab. Then pull on the tab. The dry cell batteries go on the right side. Slide them in the metal container so that the brass terminal of the battery runs along the narrow slot of the container (see sketch on cover). For the B" battery, merely snap the two connectors to the battery and place it in the cabinet with the terminals toward the left.
TO CALIBRATE RECEIVER

I.F. ALIGNMENT

Attach the antenna lead of the signal generator to the antenna lead of the receiver. Connect the ground side of the signal generator to the receiver chassis. Calibrate the model 549, the wave band switch should be in the broadcast position. Attach an output meter or resonance indicator across the primary leads of the speaker output transformer, or across the speaker voice coil. Adjust the signal generator to 685 kilocycles. Have the volume control at the maximum position. 3.7. adjusting screws for maximum output. Do not use a greater generator signal than is necessary to obtain a good output level.

BROADCAST ALIGNMENT

The model 549 and 555 have the adjusting trimmers on the variable condenser. The model 549 has individual trimmers on each coil and no trimmers on the variable condenser. Set the signal generator and receiver dial to 1050 kilocycles. Adjust the broadcast oscillator trimmer screws until the signal from the generator is heard. Peak the antenna trimmer screws for maximum output. The low frequency end of the receiver on the model 549 and 555 is automatically

generator and receiver to 600 kilocycles. Peak the broadcast pointer for maximum output. The variable condenser should be "rocked" during this operation.

SHORT WAVE ALIGNMENT

1. Slide the wave band switch button to the short wave position. Set the signal generator and receiver to 10 megacycles. Adjust the short wave oscillator coil trimmer until the generator signal is heard. Peak the short wave antenna coil trimmer for maximum output. The low frequency end of the dial is automatically adjusted.

2. To adjust the push buttons...

Insert a screwdriver blade into the hole in the button which is to be adjusted. After engaging the blade in the adjusting screw slot, loosen the screw by turning it one complete revolution counterclockwise. Keep the blade engaged in the slot and bear down on the screw driver so that the adjusting screw will remain depressed. Tune in the desired station with the station selector knob. Maintain enough pressure on the screw driver to keep the adjusting screw depressed, and, at the same time tighten it by turning it in a clockwise direction. The adjustment may be checked by setting the pointer in any position, pushing the knob down as far as it will go and noting if the intended station is received. The remaining knobs can be adjusted in the same manner. After all adjustments have been made the station tune and celluloid...
The model 565 is a combination portable battery and electric receiver. It uses the latest low noise tubes and employs a circuit designed for low power consumption. An antenna loop is incorporated which makes the use of an outside aerial unnecessary for reception in most localities. The receiver will operate with a 3.75 supply of 8 volts and a 4.5 supply of 90 volts. It will also operate on O.125 volt, 40-60 cycles A.C. or D.C. unless otherwise specified. Following is a list of manufacturers and their numbers of the tubes that may be used with this receiver. Other batteries may be used if the electrical and physical characteristics correspond to the recommended list.

**A battery (one required)**
- Type: **747**
- Type: **666**

**B battery (two required)**
- Type: **349**
- Type: **567**

The life of the batteries is from 250-300 hours, when the receiver is used about four hours per day.

**ANTENNA:** In most localities the receiver will operate satisfactorily without an outside antenna. For unobstructed locations, additional signal gain may be obtained by connecting the batteries. The receiver should be operated with the 3.75 supply.

**I.F. PEAK:** 455 KC
PHONOGRAPh OPERATION

The button on the top panel of the cabinet is the phonograph switch. When the slide switch button is on the "radio" side, the receiver will pick up radio signals. When on the "phone" side, the turntable will begin to turn and phonograph records may be reproduced through the receiver. For best results, the lid cover should be closed while playing records.

The model 669 is a RADIO-PHONO combination that provides reproduction of recordings with good fidelity as well as regular radio broadcast reception. All types of records up to 12 inches may be played with the lid closed. A self-starting motor together with a crystal pick-up are used for phonograph reproduction. The radio receiver employs a superheterodyne circuit using the latest low drain tubes for low power consumption. A self-contained antenna loop is incorporated which makes the use of an outside antenna unnecessary in most localities. It will operate on 105-125 volts, 60-60 cycles A.C. or D.C. The phonograph motor will function on 105-125 volts, 60 cycles A.C. only, unless otherwise specified. A range of 560-1700 kilocycles is covered by the receiver.
These models are superheterodyne receivers having full automatic volume control on all bands. They are designed to operate on 117 volts A.C., 50-60 cycles, unless otherwise specified. A slide rule instrument type dial with a high ratio tuning mechanism is used to facilitate station tuning. In addition, a circuit incorporating a semi-band spread feature is used to make station selection on some parts of the short wave bands almost as simple as on broadcast. The range coverage is 140-1650 K.C. (1350-1850 meters) 4.7-10 M.C. (64-30 meters) 11.8-28 M.C. (28-18.6 meters).

**List Price of Replacement Parts**

- 1475 wave trap odd .06
- 1507 filter transformer 4.20
- 1537 comb. cond. odd 1.75
- 1539 cond. cond. odd 1.15
- 1540 antenna loop 4.50
- 1610 dual band I.F. 6.00
- 1641 2nd det. I.F. 1.10
- 1644 2nd det. I.F. 1.10
- 1755A 2 gang var. cond. 2.00
- 1924 cond. electrolytic 1.50
- 9074 pointer .30
- 92108 pilot lamp shade .18
- 92108 pilot lamp shade .18

---

**To Calibrate Receiver**

1. **Local Adjustment**
   - Connect antenna lead of the signal generator to antenna lead of receiver and ground lead of generator to receiver chassis.
   - Short circuit front section of variable condenser.
   - Adjust generator to 466 K.C. and peak I.F. trimmers or maximum signal.

2. **Broadcast Adjustment**
   - Remove short from variable condenser. Have the wave band switch on broadcast position. Adjust the generator and receiver to 1500 K.C. Peak trimmers for maximum signal. Adjust generator and receiver to 600 K.C. and peak the broadcast pads for maximum signal. The variable condenser should be “rocked” during this operation.

**Prices**

- SHORT WAVE 4.7-10 M.C.
  - Pull 9074 knob to this band.
  - Adjust the generator and receiver to 15 K.C. and peak the trimmers for maximum signal.
  - The low frequency is automatically adjusted by a fixed calibrated pad.
  - Pull 9074 knob to this band.
  - Adjust the generator and receiver to 22 K.C. Peak trimmers for maximum signal.
  - The low frequency is automatically adjusted by a fixed calibrated pad.

**To Change Without Notice**

- Pull 9074 knob to this band.
- Adjust the generator and receiver to 15 K.C. and peak the trimmers for maximum signal.
- The low frequency is automatically adjusted by a fixed calibrated pad.
DeWald Radio Mfg. Corp.

Model 706

The phonograph unit will reproduce either home-made or commercial records up to 15 inches in diameter. When first used, the STEREO SWITCH should be in the PHONOGRAPH PLAY-ACT position. Make certain the receiver power is turned "on", and the volume control sufficiently advanced to allow reproduction through the speaker. Slide the tab of the switch to the motor-driven position, and after the turntable begins to rotate, the pickup arm (the one on the left of the unit) may be brought into contact with the record. When not in use, this arm should be placed on the arm rest provided.

Full automatic volume control and will operate on 100-110 volt, 60 cycle alternating current unless otherwise specified. An antenna loop has been incorporated which makes the use of an outside aerial or ground antenna unnecessary. A large slide rule and a type dial with a high tuning ratio is used for tuning stations easy and accurate. The range coverage is 500 to 1700 kilocycles. The recording instructions should be carefully read and followed for best results.

Prices Subject To Change Without Notice.
To Calibrate Receiver

I.F. Connect antenna lead of the signal generator to antenna lead of receiver and ground lead of generator to receiver chassis. Short circuit left section of variable condenser. Adjust generator to 456 kc., and peak I.F. trimmers for maximum signal.

Broadcast Alignment: Switch on broadcast position. Adjust generator and receiver to 800 kc., peak trimmers for maximum signal.

Short Wave Alignment: Switch on short wave position. Adjust the generator and receiver to 1,500 kc., and peak trimmers for maximum signal. The low frequency is automatically adjusted by a fixed calibrated pad.

Range Coverage

I.F. 456 kc.

880-174 meters, 112-27 meters, 30-12.5 meters
160-120 kc. 2.7-6.2 meters, 7.6-24 meters

Adjust generator and receiver to 30 m.c., and peak trimmers for maximum signal. The low frequency is automatically adjusted by a fixed calibrated pad.

How To Adjust the Push-Buttons

Tune in the desired station with the station selector knob. Determine which button is to be used to receive this station. Loosen this button by turning it in a counterclockwise direction approximately one full turn. Then push the button in as far as it will go and tighten with a coin in the button slot. The adjustment may be checked by setting the pointer in any position, making sure it is in an off position. After all adjustments are made, the station tabs and celluloids may be put on the button.
This model is a radio phonograph combination which operates on alternating current. It has full automatic volume control on all bands. The receivers with multi-tap transformers will operate on 117 V., 135 V., 150 V., 220 V., or 240 V., 40-60 cycles A.C. Those that do not have multi-tap transformers will operate on 117 volts, 60 cycles A.C. unless otherwise specified. A large slide rule instrument type dial with a high ratio tuning mechanism has been incorporated in order to make station tuning easy and accurate. An antenna loop which makes the use of an outside aerial unnecessary is also featured in these receivers. Provisions have been made for attaching a television unit to the receiver. The range coverage is as follows:

540-1675 Kc  2.7 - 9.0 Mc  8.0-34.0 Mc
585-178 Meters  112-33 Meters  37-12.5 Meters

6SA7 oscillator and first detector
6SK7 intermediate frequency amplifier
6SQ7 second detector, A.V.C. and first
6SQ7 phase inverter
6K6GT power output
5Z4 rectifier
6U5 tuning indicator

FOR OTHER DATA SEE INDEX

IF Peak 455 KC
I.F. ALIGNMENT CONVENTIONAL
This model is a five tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 540-1700 kilocycles. The receiver has been designed to operate on 110-120 volts, 25-60 cycles A.C.-E.C. unless otherwise specified.

MODEL 560

I.F. 455 KC

Frequency Range:
540-1700 KC

MODEL 560
ALIGNMENT: Attach the hot side of signal generator to one of the flexible antenna loop leads. Connect the ground side to the other flexible lead. Adjust signal generator to 455 Ko and peak I.F. trimmer screws for maximum signal. Adjust receiver dial and generator to 1500 Ko peak the variable condenser trimmer screws for maximum gain.

MODELS 906,907,908, MODELS 814,815,816,817

I.F. ALIGNMENT

Attach the antenna lead of the signal generator to the antenna lead of the receiver. Connect the ground side of the generator to the ground lead of the set. Turn the wave band switch knob of the receiver to broadcast position. Attach an output meter or resonance indicator across the primary leads of the speaker or across the voice coil terminals. Adjust the signal generator to 455 K.C. Have the volume control in the maximum position. Peak the I.F. adjusting screws to maximum output. Do not use a greater generator signal than is necessary to obtain a good output meter reading. For location of first and second I.F. transformers, see the tube layout diagram.

BROADCAST ALIGNMENT

Keep the receiver in the broadcast position. Set the signal generator to 1500 KC. and adjust the broadcast oscillator coil trimmer screw until the signal from the generator is heard. Peak the broadcast antenna loop trimmer for maximum output. Tune the receiver and signal generator to 600 KC. Adjust the broadcast paddler for maximum output. The variable condenser should be "rooked" during this operation.

SHORT WAVE ALIGNMENT

To calibrate the 2.7-9.0 M.C. band, turn the wave band switch to this range. Adjust the receiver dial and signal generator to 8.0 megacycles. Turn the oscillator coil trimmer screw until the generator signal is heard. Peak the detector coil trimmer for maximum output. The low frequency is automatically adjusted by a fixed calibrated paddler. To calibrate the 8.0 - 24.0 M.C. band, turn the wave band switch to this range. Adjust the receiver and signal generator to 22.0 megacycles and proceed adjusting the trimmers as for the 2.7-9.0 M.C. band.

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NOTES ON RECORDING MODELS 906, 907, 908

Before attempting to cut any records, it is important to observe the following precautions.

1. Records up to 10 inches in diameter may be cut.
2. A proper cutting stylus must be used in the cutting head.
3. Insert the cutting stylus into the head so that the flat portion of it will face the inlaid thumb screw.
4. Tighten the cutting stylus in position by means of the inlaid screw.
5. Great care must be exercised whenever moving the cutting arm. It should be raised to an angle of about 45 degrees before moving it along the horizontal plane, in order to avoid injury to the feed mechanism.
6. To check the adjustment of the cutting stylus, place a blank record on the turntable. Then bring the cutting head over the record and let it rest on the face of the record. If the cutting head is properly adjusted, it will be in a plane parallel to the record surface and the stylus perpendicular to it. This condition is obtained only when the base of the recording arm is adjusted to the correct height of $\frac{3}{4}$ inch above the record surface.
7. Whenever the recording arm is not being used, it should always be returned to its normal horizontal position to the right of the turntable. NEVER ALLOW THE CUTTING STYLUS TO REST ON THE TURNTABLE.
8. A new cutting stylus will cut dozens of records satisfactorily before being dulled so that replacement is necessary.
9. Some record blanks are made of inflammable material. Do not bring the thread material out from the record near a flame, or have it in direct contact with a hot object.

RECORD CUTTING PROCEDURE

Favorite radio programs may be easily recorded. Records may also be made of a person or group talking, singing, or playing instruments. The procedure for either type of recording is essentially the same. To make records of radio programs, the five point selector switch knob should be in the "RECORDING" position. When using microphones to record the switch knob should be in the "MICROPHONE RECORDING" position, and the plug at the end of the microphone cable inserted in the microphone socket. The microphone should be held at a distance of 6 to 12 inches from the sound.

Place the record blank on the turntable allowing the spring pin to come up through one of the small holes on the record. Snap the toggle switch to the "on" position. Before starting to cut the record, whether it be radio or microphone recording, the volume control must be adjusted by watching the tuning eye located in the middle of the dial. Components of the circuit have been so chosen to permit the "eye" to close just before the recorded volume becomes great enough to cause corruptions into adjacent grooves on the record. For this reason, it is necessary to adjust the control so that the "eye" just closes when recording. It may be necessary to regulate the volume during the cutting because of variations of signal input to the receiver.

Raise the cutting head so that it is at about 45 degrees angle with the turntable. Bring it over the record until the cutting stylus is about 1/8 inch from the edge of the record. Slowly lower the cutting edge onto the face of the disc. From now on, the cutting is done automatically. However, as the grooves are being cut, small changes will appear on the record surface. These changes should be brushed off occasionally. When the record is finished, the depth of cut may be observed by holding it in such a position that a light is reflected from the grooves. The depth of cut is correct, the grooves will appear to be about as wide as the space between the thread may also be checked by using a good quality of the thread being cut. It should not be coarse and stiff, nor light and fuzzy. Should the cut be unsatisfactory, it may be due to a dull cutting stylus or improper adjustment of the recording arm. The depth of cut may be regulated by an adjustment of the flat head screw on the top of the recording arm. Turning the screw to the left (counter-clockwise) decreases the depth of cut. Turning the screw to the right (clockwise) increases the depth of cut.
The oscillator coil is located underneath the chassis. The loop antenna acts as the antenna coil.

**I-f Alignment**

Swing the variable condenser to the minimum capacity position. Feed 455 kc to the grid of the 12SA7 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response.

Notes: The grid of the 12SA7 tube is connected to the input leg of the rear variable condenser section. Connection must be made with a test clip.

**R-f Alignment**

Set the dial pointer at 140. Set the signal generator at 1400 kc and feed the antenna into a loop of wire about 12 inches in diameter. Hold this radiating loop about 12 inches from and parallel to the receiver loop antenna. Advance the output of the signal generator until deflection is obtained on the output meter. Adjust first the oscillator trimmer, then the antenna trimmer, then the variable condenser for maximum response.

If the loop antenna has been replaced it may be necessary to adjust the loop inductance as follows. Adjust at 140. Set the pointer at 60 and feed 600 kc to the antenna lead. A portion of the outside turn of the loop may be swung to either side of the center to give maximum response. Readjust at 140.

**DIAL CORD REPLACEMENT**

Draw the cord snugly around the condenser pulley and knot it, with no slack, near the switch in the pulley, after which the spring may be hooked to the cord and pulley. The dial face should bear against the fibres washer when finally assembled.

| L1 | Loop antenna assembly (FC) |
| L1 | Loop antenna assembly (FG) |
| T4 | Oscillator coil |
| T2 | Double-tuned 455 kc i-f transformer |
| T4 | Double-tuned 455 kc second i-f transformer |
| R1 | 20,000 ohm 1/4 watt carbon resistor |
| R2 | 140 ohm 1/4 watt wire-wound resistor |
| R4 | 3 megohm 1/4 watt carbon resistor |
| R5 | Volume control 3 megohm with line switch (FC) |
| R3 | Volume control 3 megohm with line switch (FG) |
| R6 | 15 megohm 1/4 watt carbon resistor |
| R7 | 50,000 ohm 1/4 watt carbon resistor |
| C1, C2 | 200,000 ohm 1/4 watt carbon resistor |
| C1, C2 | Two-gang variable condenser (FC) |
| C1, C2 | Two-gang variable condenser (FG) |
| C3, C14 | 0.002 mf, 600 volt tubular condenser |
| C4, C15 | 0.002 mf, 600 volt tubular condenser |
| C1, C11 | Trimmer, part of variable condenser |
| C8, C9 | Trimmer, part of variable condenser |
| C10, C27 | 0.05 mf, 200 volt tubular condenser |
| C13 | 0.05 mf, 400 volt tubular condenser |
| C17, C18 | 0.02 mf, 400 volt tubular condenser |
| C20, C21 | Dual 20 mf, 150 volt dry electrolytic condenser (FC) |
| C20, C21 | Dual 20 mf, 150 volt dry electrolytic condenser (FG) |
| C4, C26 | 0.1 mf, 200 volt tubular condenser |
| C26 | 0.2 mf, 200 volt tubular condenser |
| 7BS-400 | 9" dynamic speaker |

**VOLTAGE ANALYSIS**

Voltage at 3525 cathode—120 volts.
Voltage across speaker field—32 volts.
Voltage across pilot light—4.5 volts.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7/6GT</td>
<td>88</td>
<td>—</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SK7/6GT</td>
<td>88</td>
<td>—</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SQ7/6GT</td>
<td>30</td>
<td>—</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>50LE6/GT</td>
<td>82</td>
<td>88</td>
<td>5.6</td>
<td>50</td>
</tr>
</tbody>
</table>
TYPE: Universal (battery, a.c.-d.c.) superheterodyne.

FREQUENCY RANGE: 540-1600 kc.

POWER SUPPLY: Battery, a.c. or d.c.

VOLTAGE RATING: (Line operation) 105-125 volts, a.c.-d.c.

POWER CONSUMPTION: (Line operation) 30 watts

CURRENT DRAIN:
- "A" battery 0.05 amp.
- "B" battery 0.01 amp.

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Location of Coils and Trimmer Adjustments

The oscillator coil is located beneath the chassis. The trimmer for the oscillator is on the front section of the variable condenser.

In Model EA and EF the loop antennas act as the antenna coil. The trimmer for the loops is on the rear section of the variable condenser.

In Model EB the antenna coil is mounted to the speaker frame.

The 114 transformers are located on the right of the variable condenser and the 1184 transformers to the left of the variable condenser. The trimmer condensers for these transformers can be reached through holes in the top of the case.

1-1 Alignment

Swing variable condenser to minimum capacity position. Feed 655 kc into the grid of the 1A7GT tube through a 0.01 mfd condenser. Adjust the four trimmers for maximum response.

R-1 Alignment

Set the dial pointer at 140. Feed 1400 kc from the signal generator into a loop of wire about six feet in diameter. Hold the receiving loop approximately one foot away from and parallel to the receiver loop antenna and advance the output of the signal generator until a maximum deflection is observed on the output meter. Adjust the oscillator trimmer (front section of variable condenser) until the indicator of the variable condenser (rear section of variable condenser) is maximum response.

BATTERY INSTALLATION

For models S12, S18, 339, 385, 389 and 390.

To install and connect the batteries in this cabinet observe the following procedures:

1. Remove the back panel of the cabinet by taking out the screws.

2. Locate the battery case coming from the receiver and identify the plugs on the cable ends.

3. Insert the three-portion plug on the battery cable into the "A" battery. Place the two batteries in the cabinets of the plugs and batteries facing each other. Push the batteries up against the front of the cabinet. The wood blocks at the rear corner and rear corner of the cabinet serve to hold the "B" batteries in place.

4. Insert the two-portion plug on the battery cable into the "A" battery. Place the "A" batteries, one at a time, above the respective hole of the cabinet. The plugs of the "A" batteries should be facing to the left, as indicated in the Illustrations. Push the "A" batteries into the left when placing them in the cabinet, in order to clear the small wood block to the front right-hand corner of the cabinet.

5. Replace the back panel of the cabinet and fasten it in place with the screws. See diagrams for other models.

VOLTAGE ANALYSIS

Iron core filter chokes. Readings should be taken with a 1000 ohm-meter voltmeter. Voltages are from point indicated to chassis with volume control turned on full and no signal. The battery voltages for these readings were "A" 6.0 volts, "B" 9.0 volts.

Double-tuned 455 kc first i.f. transformers.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Oct. Plate</th>
<th>Rd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>68</td>
<td>50</td>
<td>82</td>
<td>1.5</td>
</tr>
<tr>
<td>1N412</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>1.5</td>
</tr>
<tr>
<td>1N412, 2nd i.f.</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>1.5</td>
</tr>
<tr>
<td>1N412, 3rd i.f.</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>1.5</td>
</tr>
<tr>
<td>1N412, box (line operation only)</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>3.0</td>
</tr>
<tr>
<td>1N172GT/42 rectifier (Pin No. 1) (line operation only)</td>
<td>86</td>
<td>95</td>
<td>95</td>
<td>1.17</td>
</tr>
</tbody>
</table>


Chassis Model: EA

Volume control with line and battery switch (500,000 ohms) (EE, EA, EB, EE).

MODELS: EB-344 and EB-359

Chassis Model: EB

Volume control with line and battery switch (500,000 ohms) (EW).

MODELS: EE-340 and EE-390

Chassis Model: EE

Two-gang variable condenser.

<table>
<thead>
<tr>
<th>Value</th>
<th>0.0025</th>
<th>0.0025</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000 ohm</td>
<td>1500 ohm</td>
<td>10,000 ohm</td>
</tr>
</tbody>
</table>

Chassis Model: EW

BATTERY COMPLEMENT

Type Battery No. 700

454 volt "A" 2

Mini-25 volt "B" 2

Chassis Model: EE

For MODELS EA, EE, EB

BATTERY COMPLEMENT

<table>
<thead>
<tr>
<th>Type Battery No. 700</th>
<th>454 volt &quot;A&quot;</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-25 volt &quot;B&quot; 2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Chassis Model: EE

For MODELS EB, EF

BATTERY COMPLEMENT

<table>
<thead>
<tr>
<th>Type Battery No. 700</th>
<th>454 volt &quot;A&quot;</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-25 volt &quot;B&quot; 2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

PRODUCTION CHANGES

1. EA chassis bearing serial numbers below 3,605.6: (a) Resistor R17, 1000 ohm, part number PR-75. (b) Battery cable, part number 580-26A.
2. EA chassis bearing serial numbers below 1,100.0: (a) Cylinder mount, part number PE-256, in place of 1,100.0: (a) Cylinder mount, part number PE-256.
3. EA chassis which was spliced, part number 68U-657, was used instead of 68U-643.
4. EL chassis which was electrolytic, part number 5GC-26D, was used instead of 5GC-26E.
5. EE chassis which was electrolytic, part number 602E-460, was used instead of 602E-451.
LOCATION OF COILS AND TRIMMER ADJUSTMENTS

1. The first IF transformer is mounted on top of the chassis near the right of the variable condenser. The trimmers are accessible through holes in the top of the case.

2. The second IF transformer is mounted on top of the chassis between the variable condenser and the speaker. The trimmers are accessible through holes in the top of the case.

3. The loop antenna acts as the broadcast antenna coil. The short-wave antenna coil is the larger of the two coils mounted on the loop.

4. The trimmers for the antenna coils (loops) for both bands are located on a dial strip fanned to the loop board. The important trimmer is for short-wave and outermost trimmer for broadcast.

The oscillating coil is located underneath the chassis, just below the variable condenser. The trimmers for both bands are mounted on a dial strip beneath the first IF transformer. The short-wave trimmer is the one furthest from the mounting foot.

PRODUCTION CHANGES

2. Chassis using speaker 7YS10, may use 5656 for replacement.
3. Chassis bearing serial number above 6083-550 use 7T7-382B loading coil.
4. Chassis bearing serial number above 4083-550 use 7VW-249D loop antenna assembly.

DIAL CORD REPLACEMENT

Use a half turn of cord, part number 785-167A. Insert the cord plug into the condenser jack labeled with the word "loop". This will require that the cord plug be set at a 90° angle to the cord. Two pin should be made to the cord plug with a twist clip to the same lug. This lug is easily identified by the connection of the green lead to the loop.

VOLTAGE ANALYSIS

- Voltage at 300 volts — 120 volts.
- Voltage across speaker — 52 volts.
- Voltage across pilot light — 4.5 volts.

R-F ALIGNMENT

1. Set the wave-band switch counter-clockwise to the short-wave position. Set the dial pointer at 6 megacycles and feed 6 megacycles through the signal generator into a loop of wire about 12 inches in diameter. Hold the coil stationary and adjust the output of the generator until it produces a signal at the output meter. Adjust the first IF transformer (farthest from the condenser) and the short-wave transformer (second trimmer of trimmer strip on loop board) for maximum response.

2. Without changing the above setup, rotate the band-switch clockwise to the broadcast position, set the dial pointer at 150 and feed 1500 kc into the radiating loop. Adjust first the radiating loop, then the radiating coil, and then the antenna transformer (outward of trimmer on the loop) for maximum response. Rotate the dial to the lowest variable condenser section. Connections may be made with a twist clip to the variable condenser.

S-377, S-347, S-351

MODELS: DY-337

DY-349

DY-351

CHASSIS MODEL: DY

MANUFACTURED BY: EMERSON RADIO & PHONOGRAPH CORP.
MODEL: EA1-341  CHASSIS MODEL: EA1  TYPE: Universal (Battery, A.C.-D.C.) Superheterodyne.

PHONOGRAPH OUTLET IS AS SHOWN WHEN CHASSIS IS UPSIDE DOWN

AUTOMATIC RECORD CHANGER

Controls and Moving Mechanism

- **1. RECORD AND PLAYBACK LEVELS** - This control is located near the left front corner of the cabinet and is marked “LEVEL,” “PLAY,” and “RECORD.”
- **2. MECHANICAL LOCK-ON** - When the motor is turned off, the mechanism locks automatically when the record is inserted into the unit. This feature is especially useful when the machine is not in use.
- **3. RECORDING LEVEL** - The recording level is set by the knob on the front panel of the unit. It should be adjusted to the level where the microphone is located.
- **4. RECORDING SPEED** - The speed of the record is controlled by the knob on the front panel of the unit. It should be adjusted to the speed where the microphone is located.
- **5. RECORDING MUTE** - This switch is used to mute the microphone while recording. It should be used only when necessary to prevent feedback.

Special Precautions

1. The record and playback level controls are adjusted automatically.
2. The unit is turned off when not in use.
3. The record and playback level controls are not used when not in use.
4. The record and playback level controls are used when not in use.
5. The record and playback level controls are not used when not in use.

To Insert Needle

1. Place the needle on the needle guide plate to insert or remove the needle. This needle guide plate is located near the top of the record changer on the front panel of the unit.
2. Insert the needle through the needle guide plate and align it with the center of the record.
3. Tighten the needle with the screw on the front panel of the unit.
4. Place the needle on the needle guide plate to insert or remove the needle. This needle guide plate is located near the top of the record changer on the front panel of the unit.
5. Tighten the needle with the screw on the front panel of the unit.

Automatic Operation

1. Insert the record into the unit in the usual way, as explained above.
2. Make the record and playback level controls in the control panel. This unit is equipped with a record and playback level selector.
3. Press the record and playback level selector to the “PLAY” position. This selector should be set to the record and playback level selector on the front panel of the unit.
4. Press the record and playback level selector to the “RECORD” position. This selector should be set to the record and playback level selector on the front panel of the unit.

I-F Alignment

1. Place the switch on the rear of the unit in the “RECORD” position, and feed a test signal into the grid of the 4001 tube. Unplug the speaker output connector. The level of the record signal at the output of the I-F transformer shall be set to “4000” on the meter. Then adjust the trimmer to obtain the correct level for the receiver to clip.
2. Adjust the trimmer to obtain the correct level for the receiver to clip.
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 rotating the turntable in the reverse direction.

The changer can be conveniently started through its change cycle by pushing the index lever to "Reset" and revolving the turntable by hand. See 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.

The 10 and 11 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

ADJUSTMENTS

A. Main Lever.—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 until the changer is out-of-cycle, and adjust rubber bumper bracket 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 resisted by the tripod "22" by the trip lever "7" through a friction clutch "5." If the motion of the pickup is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the tripod "22" moves the tripod "17" 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 tripod "22." Without friction, the tripod "22" is free to pivot on the turntable, with the pin "22" contacting the pawl on the main gear, and the change cycle is started.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "16" is activated by the main lever "5" so as to raise the pickup arm. The position of the pickup arm is maintained by the pickup lift cable. To adjust for proper elevation, stop the changer in the "Reset" position, and turn the pickup head up to the maximum height above turntable plate, and has not moved outward. At this point adjust locknut "C" to obtain 1 inch clearance between the tone arm and the turntable top surface.

D. Needle Landing on Record.—The relationship of the tone arm vertical shaft and lever "20" determines the landing point of the needle on a 10 inch record. Proper selection of eccentric and "F" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch record position, the action, and the type of shutter used.

To adjust for landing, place 10 inch record on turntable, push index lever to position 12 and return to the 10 inch position; then adjust to make sure that pickup locating lever "17" tilts fully upward, turntable rotates through cycle until needle is ready to land, and then to make sure that pickup locating lever "17" tilts fully upward. Rotate turntable through cycle until needle is ready to land on the record, and then to make sure that pickup locating lever "17" tilts fully upward.

The correct point of landing is 3/16 inches on turntable plate, from the turntable edge. Lower the two screws "D" to "14" and adjust horizontal position of tone arm to proper distance from turntable edge. Leave approximately 3/16 inch end play between hub of lever "20" and pickup base bearing, and tighten the bluntnose screw "D." The mechanism must be rotated several cycles as a check, then tighten cone pointed screw "D." Adjust for landing on 10 inch record, place 12 inch record on turntable, push index lever to position 12 and return to 10 inch position; rotate turntable horizontally through cycle until needle is ready to land on record, and to make sure that pickup locating lever "17" tilts fully upward. Rotate turntable through cycle until needle is ready to land on record, and then to make sure that pickup locating lever "17" tilts fully upward.

Lubrication.—Petroleum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of the Tone Arm Rest Support (not shown).—When the changer is out of cycle, the cam engages the pickup lift cable, and the tone arm is resting in the "Reset" position. At this time, the cam is raised to the maximum height above turntable plate, and has not moved outward. At this point adjust locknut "C" to obtain 1 inch clearance between the tone arm and the turntable top surface.

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 change cycle starts. By raising the cam, the trip pawl stop pin support either toward or away from trip pawl beading stud, the roller can be made to enter the main lever or exist, respectively. The lever "15" is a pivot that is set to align with the Turner arm, is operated by the main lever, and is used to control the cam.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on undersides of motor board.

The feel of the trip pawl and bearing should be checked, and the bearing should be checked, and as required for proper operation.

Do not allow oil to drip on to contact with rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

MISCELLANEOUS SERVICE HINTS

In most service, the particular mechanism of the changer is generally exhibited in specific modes of proper operation. The following relation between effects of operation and various adjustments will enable ready adjustment in most cases.

For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A."
MODEL: EG-355  CHASSIS MODEL: BG
Location of Cells and Trimmer Adjustments

The battery cells in the EG-355 "cell pack" are held in place with a "cell holder" to which they are riveted. This cell holder is mounted on top of the chassis. The trimmer is adjustable for the length of the cells, but not for the shape of the cell holder. The "cell holder" is held in place by a locknut on the bottom of the cell holder. This locknut is turned with a key provided with the unit.

The lock nut then is turned to the desired position and the trimmer is adjusted as needed. The trimmer range is from 0 to 100.

1-6 Alignment

The trimmer is adjustable to the minimum capacity position. Follow the steps below to adjust the trimmer for maximum efficiency.

Note: The left and right hand trimmers are adjustable in the same manner as the right hand trimmer.

1. Adjust the trimmer for the minimum capacity position.
2. Turn the trimmer knob clockwise to the maximum capacity position.
3. Turn the trimmer knob counterclockwise to the minimum capacity position.
4. The trimmer is now ready for use.

DIAL CORD REPLACEMENT

Dial cords that are 10 inches long and 14 inches from the signal generator into a loop of wire about 12 inches in diameter. Hold the adjusting loop about 12 inches from the signal generator and adjust the output of the signal generator to a maximum. Adjust the trimmer for the desired position. The trimmer is now ready for use.

VOLTAGE ANALYSIS

Voltage is 250Vdc under 150Vdc. Voltage can be varied from 0 to 150Vdc by using a variable transformer. This is done by adjusting the voltage control on the instrument. The voltage for these readings was 150Vdc, 150Vdc, 150Vdc, and 150Vdc.

<table>
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VOLTAGE ANALYSIS

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MODEL DX-356
CHASSIS MODEL: DX

TYPE: Three-band superheterodyne.

FREQUENCY RANGES:
- 540-1750 kc. (555-170 meters)
- 2300-7500 kc. (120-40 meters)
- 6.9-22 mc. (43.5-13.6 meters)

Schematic diagram for chassis with serial numbers above 3,842,250

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PARTS LIST

L1, C9 Antenna choke and 455 kc fixed varicap...
L2 Broadcast antenna loading coil.
L3 Broadcast loop antenna assembly.
T1 Police and short-wave antenna coil.
T2 Three-band oscillator coil.
T3 Double-tuned 455 kc first IF transformer.
T4 Double-tuned 455 kc second IF transformer.
T5 Power transformer.
R1, R3 100 ohm 1/2 watt carbon resistor.
R4 20,000 ohm 1/2 watt carbon resistor.
R5 100,000 ohm 1/2 watt carbon resistor.
R6 0.03 1/2 watt carbon resistor.
R7 10,000 ohm 1/2 watt carbon resistor.
R8, R10 2 megohm 1/2 watt carbon resistor.
R9 Volumes control, 2.5 megohm with line switch.
R11, R13 .5 megohm 1/2 watt carbon resistor.
R14, R16 25 megohm 1/2 watt carbon resistor.
R15 2500 ohm 1/2 watt carbon resistor.
R17 2500 ohm 1/2 watt carbon resistor.
R18, R20 18 ohm 1 watt wire-wound resistor.
R19 50,000 ohm 1/2 watt carbon resistor.
R21 490 ohm 1 watt wire-wound resistor.
R24 10 megohm 1/2 watt carbon resistor.
C1, C2, C3 Two-gang variable capacitor.
C4, C5, C6 Triple trimmer, trimi for antenna circuits.
C7, C8 Trimmers, part of oscillator coil.
C9 2700 uf condenser, part of 455 kc waveform.
C10, C13 270,000 uf, 2500 volt tubular capacitor.
C11 32 uf, 350 volt mica capacitor.
C12 0.00001 mf, 500 volt mica capacitor.
C13 0.1 mf, 400 volt tubular condenser.
C14, C15, C16, C17 Trimmers, part of i-f transformers.
C18, C19 0.05 mf, 400 volt tubular condenser.
C20 0.002 mf, 400 volt tubular condenser.
C22, C23 0.00002 mf, 500 volt mica capacitor.
C24, C26 0.006 mf, 600 volt tubular condenser.
C27 0.01 400 volt mica condenser.
C28 0.01 400 volt tubular condenser.
C29 0.02 mf, 500 volt tubular condenser.
C30 16 mf, 400 volt dry electrolytic condenser.
C31 15 mf, 400 volt dry electrolytic condenser.
C32 0.01 mf, 400 volt molded condenser.
C34 0.002 mf, 400 volt tubular condenser.
C35, C36 Multiple dry electrolytic condenser.
C38 0.002 mf, 600 volt tubular condenser.

PRODUCTION CHANGE

1. Chassis bearing serial numbers below 3842250 use second i-f transformer, part number 8AT-55A.

VOLTAGE ANALYSIS

Chart should be used from 2.2 to 2000 microamperes at the plate supply and cathode voltages. Voltages below 2.2 microamperes are not important.

ADJUSTMENTS

An oscillator with frequencies of 425, 600, 1000, 1600 and 2000 kc should be used.

An output meter should be used across the voice coil or speaker output transformer for observing maximum response.

Use an dummy antenna for aligning the police and short-wave bands. A 4000 uf condenser in series with a 400 ohm carbon resistor may be used for the police dummy antenna. For the short-wave band a 400 ohm carbon resistor may be used.

Adjust always as weak a signal as possible during alignment.

The set's oscillator is higher in frequency than the signal on all three bands, so images should be observed on the low frequency side of the signals.

Always choose the minimum capacity peak on oscillator trimmers and maximum capacity peaks on antenna trimmers. The last motion in adjusting trimmers should always be a tightening one, not a loosening one.

Never leave the trimmer with the outside plate so that the trimmer cap is on the wire. Either bend the plates up or remove the screw entirely. Loose screws are a source of noise, drifting, and microphonic.

In aligning antenna trimmers on the high frequency signals there is always a tendency for the oscillator to drift, due to intercoupling. To compensate for this always keep running the variable condenser as the trimmers are being adjusted.

I-F Alignment

Set the wave-band switch to the broadcast (clockwise) position. Set the resistance control at the minimum capacity position and adjust 455 kc through a .032 mf paper condenser, the grid of the 607T tube. The input may be fed to the bottom of the trend condenser section. Adjust the four I-F trimmers for maximum response.

Broadcast Alignment

Set the wave-band switch to the broadcast (clockwise) position. Move the dial pointer at 600 and feed 1600 kc from the signal generator to a loop of wire about 12 inches in diameter. Move the receiver loop about 12 inches from the receiver loop and adjust the output level using a 1/4 watt 500 ohm variable condenser. The deflection is obtained on the output meter. Adjust the antenna coil trimmer using the antenna trimmer for maximum response. Place the trimmer at 70, feed 1600 kc and check the variable condenser while adjusting the plate resistor for maximum response. Return to 1600 kc and check alignment. If readjustment is necessary return to 600 kc and correct trimmers.

Police Alignment

Set the wave-band switch to the police band (center) position and the pointer at 63. Feed 6500 kc to the antenna using a 400 ohm dummy antenna and adjust the oscillator trimmer for maximum response. The police band padder is fixed and therefore requires no adjustment.

Short-Wave Alignment

Set the wave-band switch at the short-wave (counter-clockwise) position. Move the pointer to 30 and feed 20,000 kc to the antenna. Place the receiver loop about 12 inches from the receiver loop and adjust the short-wave oscillator trimmer for maximum response. Two peaks are obtained, choose the minimum capacity peak. Then adjust the antenna coil trimmer for maximum response. If two peaks are obtained choose the maximum capacity peak.

The color coding of the i-f transformers is as follows:

- Gold—green
- Blue—red
- Blue—red
- Black—black

The color coding of the power transformer is as follows:

- Primary—two black leads
- High-voltage secondary—two red leads
- High-voltage secondary—yellow lead
- 5 volt secondary—two yellow leads.
Operating the Recording Mechanism

Recording Levels

Recording Equipment

Cutting the Record

Recording Adjustments

Recording Arm Height

Specifications

Class DZ only

Recording Equipment

Class DV and DV

Class DZ only

Recording Equipment

Class DZ only
RECORDER ADJUSTMENTS

1. FUNCTION OF MANUAL CONTROL BUTTON AND RELATIVE PARTS.

When Manual Control Button (Item 84, Fig. 4) is moved to the Manual Play-Back recording position, it moves the Manual Control Slide (Item 102, Fig. 1) which in turn moves Clutch Lock Slide (Item 103, Fig. 1) into a position which prevents Engagement Clutch Cam Assembly (Item 79, Fig. 2) from rotating. When Engagement Clutch Cam Assembly is in the above mentioned position and is not free to rotate, the Changer will not go into its changing cycle.

Also when the Manual Control Button is in the above mentioned position, the Manual Control Slide has moved the Locator Lock Slide (Item 106, Fig. 1) into a position where it engages the Tone Arm Locator & Bushing Assembly (Item 12, Fig. 1) and prevents same from bearing against Tone Arm Lever Assembly (Item 19, Fig. 1) allowing the Tone Arm to swing freely without hindrance and without setting Changer into its changing cycle. When the Manual Control is in the automatic position the Changer will function normally as an automatic record changer.

2. POSSIBLE MECHANICAL CAUSES OF POOR RECORDINGS.

(a) Threads from record cuttings getting down onto Rubber Idler Drive Wheel (Item 81, Fig. 4) and between drive wheel and motor pulley. This will cause very bad speed variation of the turntable and, of course, will result in very inferior recording. Cuttings may also wrap around motor shaft and cause motor to slow down or stop.

To remove the record cuttings, the turntable should be lifted by applying an even lifting force at opposite edges of the turntable while the turntable spindle is gently tapped downward on its top end, and the record cuttings then removed. The Rubber Idler Drive Wheel should be taken off; this can be accomplished by unmapping the small snap cotter ring and slipping Rubber Idler Drive Wheel off its shaft, after which all record cuttings can be removed.

NOTE: It is very important that no grease or oil be gotten on the surface of the Rubber Idler Drive Wheel.

(b) Tight Pivot Bearings: Check Cartridge Pivot Screw (Item 108, Fig. 4) for binding. Also Recording Arm Pivot Screw (Item 107, Fig. 4) and Traverse Arm Pivot Screws (Item 101, Fig. 2). These bearings should all be free, but have no looseness or play.

If the Pivot Screw (Item 105, Fig. 4) of the Cutter Cartridge is tight, the Cutter Cartridge cannot follow a slight up and down variation of the record or turntable. A record cut in this manner will, when played back, have a high scratch level, rough cutting and a tendency for the needle to jump from one groove to another.

(c) Damaged Rubber Idler Drive Wheel (Item 83, Fig. 4). Rubber Idler Drive Wheel may have become damaged by:

1. Allowing oil or grease to come in contact with same.

2. By allowing turntable to drop and cut into the outside surface of the Rubber Idler Drive Wheel.

3. Stopping the turntable by hand while the motor is running will cause a flat spot on the surface of the Rubber Idler Drive Wheel.

NOTE: If the Rubber Idler Drive Wheel has been damaged in any of the above mentioned ways, it should be replaced with a new one.

(d) Vibration Reaching The Recorder While A Blank Is Being Recorded: It is very important the floor or the surface upon which the Recorder rests remain quiet as any vibration such as people walking across the floor or shaking of the instrument in which the Recorder is mounted will seriously affect the quality of the finished recording.

(e) Recorder Not Level: It is very important that the Recorder is standing level. This can be checked by placing a small level on the turntable and checking same in two positions at right angles to each other and then leveling Instrument in which Recorder is mounted.

(f) Bent Or Damaged Turntable Spindle: If the Turntable Spindle (Item 59, Fig. 4) has been bent in shipment, or by someone exerting a heavy pressure on one side, it should be replaced with a new one. A bent Turntable Spindle will cause the surface of the Turntable to move up and down while it is turning and, of course, will seriously affect the quality of both recording and play-back.

NOTE: When removing the Turntable an even upward lifting force should be applied at opposite edges of the Turntable while Turntable Spindle is gently tapped downward on its top end.

(g) Record Cutting Causing A Bind Between Turntable Spindle (Item 59, Fig. 4) And Its Bearing: It is very important that all record cuttings are removed from Turntable spindle and its bearing.

(h) Tension On Rubber Idler Wheel (Item 83, Fig. 4) Too Great: If the tension on the Rubber Idler Drive Wheel is too great, this will result in a "wow" or a rumble in the recording. To decrease the tension on Rubber Idler Drive Wheel, loosen the screw holding the lug which is located beneath the Rubber Idler Drive Wheel and turn it slightly in a clockwise direction. This will reduce the spring tension on the Rubber Idler Drive Wheel. When the spring tension is correct, the spring will be approximately at right angles to the lug.

(i) Tension On Rubber Idler Drive Wheel (Item 83, Fig. 4) Too Weak: This will cause very bad speed variation. Turntable will slow down and then speed up as audio current of varying intensity reaches the cutter cartridge.
The following is detailed information for adjusting the Record Changer mechanism. Do not make any adjustments before reading the instructions carefully.

1. **RECORD CHANGER ADJUSTMENTS FOR 10" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

2. **RECORD CHANGER ADJUSTMENTS FOR 12" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

3. **RECORD CHANGER ADJUSTMENTS FOR 15" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

4. **RECORD CHANGER ADJUSTMENTS FOR 18" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

5. **RECORD CHANGER ADJUSTMENTS FOR 20" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

6. **RECORD CHANGER ADJUSTMENTS FOR 25" RECORDS**

   (a) To locate the needle in the center of the record, turn the record on the stylus end in the opposite direction of the tone arm.
   (b) Use a needle gauge to measure the needle gauge. If the needle gauge is not centered, adjust the needle gauge to 0.005 inches.
   (c) If the needle gauge is 0.005 inches or less, move the needle gauge to center the needle.

7. **TONE ARM ADJUSTMENTS FOR 10" RECORDS**

   (a) Turn both knobs until the arrow marked "10" is pointing toward the center of the turntable.
   (b) Place a 10" record on the turntable and check tone arm.
   (c) Note where needle contacts record. Correcting a record is about 1/16" from the outside edge of record. If correcting a record is not correct as mentioned, loosen the screw which holds Tone Arm Locator Screw (item 17, fig. 1) and slide screw in or out as required, then tighten screw.

8. **TONE ARM HEIGHT ADJUSTMENTS**

   **1.** Lift the Record Changer 10" records, turn Switch to "OUT," and slide Record Changer to out in the turntable cycle without playing records.
   **2.** Record Changer to out in the turntable cycle with playing records.
   **3.** Record Changer to out in the turntable cycle with playing records.
   **4.** Record Changer to out in the turntable cycle with playing records.

9. **TONE ARM LOWERS ON RECORD TOO SLOWLY**

   If the Tone Arm lowers too slowly, the Spring Washer (item 50, fig. 1) which is located between the Tone Arm Lever Link Assembly (item 81, fig. 1) and Selector Shaft Crack Assembly (item 7, fig. 1) is not under sufficient pressure. The washer on the Selector Shaft Collar (item 6, fig. 1) should be replaced and the Selector Shaft Collar pressed upward slightly and tighten screws.

10. **LUBRICATION**

    **(a) Motor:** The motor is equipped with all-lubricated bearings and requires no lubrication.
    **(b) Turntable Speeds Bearings:** Lubricated at the factory and do not require lubrication for one year. After one year, they should be replaced by a new set at a high grade.
    **(c) Top bearing can be lubricated by fitting off the machine.** Make sure when replacing lubricant to set pin in Turntable Speed Bearing slot.
    **(d) Rubber roller drive belt:** Never oil the rubber belt. If it becomes dry, it may break. Always oil in contact with Rubber roller drive belt.
    **(e) Rubber drive belt:** This can be eliminated by gently lining up the track of record.
MODELS: EL-360, EL-361, EL-362 and EL-373
CHASSIS MODEL: EL
CHASSIS MODEL: EP

T1
T4
T4
T2
T2
T3
T3
R2, R0
R3
R4
R5
R5
R7, R8
R10
C1, C2
C1, C2
C3, C6
C4
C3
C5, C14
C6, C7, C8, C9
C14
C24
C20, C21
C20, C21
C25
C26
R15
R16
R15
R16
R16
R16
C27
R35
R35

Location of Coils and Trimmer Adjustments
The first i-f transformer is mounted on top of the
chassis deck to the left of the speaker. The trimmers
are accessible through holes in the top of the can.

The second i-f transformer is mounted on top of the
chassis deck to the right of the speaker. The trimmers
are accessible through holes in the top of the can.

The trimmers for the antenna and oscillator coils are
located on the variable condenser. In Model EL, the
trimmer on the front section is for the antenna coil
(loop). In Model EP the trimmer on the rear section
is for the antenna coil (loop). The oscillator coil is
located directly beneath the speaker.

I-f Alignment
Swing the variable condenser to the minimum capacity
position. Feed 455 kc to the grid of the 125A7GT
tube through a .01 mf condenser and adjust the four
i-f trimmers for maximum response. The grid of the
125A7GT tube may be reached by clipping the input
lead to the star point of the antenna section.

R-f Alignment
Set the dial pointer at 140. Feed 1400 kc from the
signal generator into a loop of wire about one foot in
diameter. Hold this radiating loop about 12 inches away
and parallel to the receiver loop antenna. Advance
the input to the loop until a satisfactory deflection is
obtained on the output meter. Adjust first the oscillator
trimmer then the antenna trimmer for maximum respon
se. If the loop antenna has been replaced it may be
necessary to retrack the loop inductance. With the
dial set at 60 feed 600 kc to the antenna lead. A portion
of the outside may be swung to either side of the center
to give maximum response. Repeat the trimmer align
ment at 140.

VOLTAGE ANALYSIS
Standing waves along line of waves. 800 volt tubes and
cathodes were taken on 100 volt scale, Meters in use 1750 volt d.c. will be three times those given.

FREQUENCY RANGE: 540-1600 kc.

PRODUCT CHANGES
1. Chassis bearing serial number 646-360 or 646-361 may use SLS-493 for replacement.
2. EP chassis bearing serial number above 613,593,512 use EPW-324 loop antenna.

125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.
125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.

125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.
125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.

125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.
125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.

125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.
125A7GT, pentagrid triode, 6-1500 volt plate, 6-1500 volt screen, 6-1500 volt grid, 6-1500 volt cathode, 6-1500 volt heater.
EMERSON RADIO & PHONOGRAPH CORP.

MODEL EV-384
Chassis EV

FREQUENCY RANGE:
540-1600 kc
533-187 meters.

TYPE: Portable single-band superheterodyne and phonograph recorder.

TYPE OF TUBES:
1—6SA7GT, oscillator-modulator
1—6SK7GT, i-f amplifier
1—6SQ7GT, diode detector, microphone preamplifier and a.c.
1—6V6GT, beam power output
1—5Y3G, full-wave rectifier
In addition, a 6E5 electron ray recording level indicator is used.

VOLTAGE ANALYSIS
Voltage at 5Y3G filament to ground—325 volts.
Voltage across speaker field—70 volts.

*Actual operating voltages cannot be measured because of high resistance in circuit.

†This tube is located in corner of chassis.

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 volts, 60 cycles, a.c. All read except B plus rectifier, heaters, and cathode voltages were taken on 300 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>FL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7GT</td>
<td>252</td>
<td>80</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>255</td>
<td>67</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>100</td>
<td>—</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>16SQ7GT</td>
<td>*48</td>
<td>—</td>
<td>0</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6V6GT</td>
<td>247</td>
<td>255</td>
<td>12</td>
<td>6.3 a.c.</td>
</tr>
</tbody>
</table>

POWER CONSUMPTION:
60 watts for radio.
95 watts for recorder and radio.

SEE INDEX FOR PHONO RECORDER DATA

The color coding of the i-f transformers is as follows:
Grid—green
B plus—red
Plate—blue
Grid return—black

The color coding of the power transformer is as follows:
Primary—two black leads
High-voltage secondary—two red leads
High-voltage secondary center tap—red and yellow lead
6.3 volt secondary—two green leads
5 volt secondary—two yellow leads.

A ground is necessary if the microphone is to be used for recording. Use the conventional method of grounding to a water pipe or steam radiator. Connect the ground to the flexible black lead emerging from the motor board.

POWER SUPPLY: a.c. only, 60 cycle.

VOLTAGE RATING: 105-125 volts.

MODEL: EV-384
CHASSIS MODEL: EV
—EV—51
**MODEL ER-369, ER-370**  
**Chassis ER**  
**PREADEVSTMENT OF PUSHBUTTONS FOR AUTOMATIC TUNING**  

**Models: ER-369 and ER-370**  
**Chassis ER**  

**PREADEVSTMENT OF PUSHBUTTONS FOR AUTOMATIC TUNING**

- **Route the wave-band switch to the broadcast (dial-home) position.** Set the variable condenser at the maximum capacitance position and feed 455 kc, through a 0.625 mfd paper condenser, into the grid of the 65647 tube. This input is to come in as the grid of the variable condenser section. Adjust the four id trimmers for maximum response.

**Broadcast Alignment**

- Set the wave-band switch at the broadcast (dial-home) position, and the pointer at 60. Feed 600 kc to the antenna (using a standard dummy antenna) and feed the broadcast wave-band switch for maximum response. Move the pointer to 100, feed 1600 kc, and adjust the oscillator coil trimmer for maximum response. Repeat the pointer at 60, feed 600 kc, and check the variable condenser while adjusting the wave-band switch for maximum response. Return to 1600 and check alignment. If alignment is necessary return to 600 and repeat entire procedure.

**Police Alignment**

- Set the wave-band switch at the police band (central position) and the pointer at 700 kc to the antenna (using a standard dummy antenna) and adjust the oscillator trimmer for maximum response. Then adjust the antenna trimmer for maximum response.

**Short-Wave Alignment**

- Set the wave-band switch at the short-wave (central position) and move the pointer to 20 and feed 20,000 kc to the antenna (using a 0.400 mfd capacitor) and adjust the short-wave trimmer for maximum response. Feed the wave-band switch for maximum response. When the wave-switch is obtained choose the maximum capacity peak. Then adjust the antenna trimmer for maximum response. If no peaks are obtained choose the maximum capacity peak. Then adjust the antenna trimmer for maximum response. When the wave-switch is obtained choose the maximum capacity peak.

**Location of Coils and Trimmer Adjustments**

The first id transformer is mounted on top of the chassis behind the variable condenser. The trimmers are accessible through holes in the top of the case.

The second id transformer is mounted beneath the chassis. The trimmers are accessible through holes in the rear of the chassis.

The oscillator coil is mounted underneath the chassis. The oscillator trimming condenser is located on the front section of the variable condenser.

The trimmer for the loop winding is mounted on the loop board. It is accessible through a cut-out in the cabinet and should be adjusted when the chassis is mounted in its position.

**I-F Alignment**

Set the variable condenser at the minimum capacitance position and feed 455 kc through a 0.625 mfd, 455 kc, and 400000 mfd values of the grid of the 6567Q tube. Adjust the four id trimmers for maximum response.

**Modulation**

The grid of the 6567Q tube is connected to the meter arm of the variable condenser section. Connection may be made with a 0.01 micromicrofarad condenser.

**L-R Alignment (LOOP ALIGHTMENT)**

Set the dial pointer at 150. Set the signal generator at 150 kc and feed an output into a large 0.01 micronfarad condenser. Hold the radio away from the loop and adjust the output of the signal generator until the meter deflects. Adjust the signal generator until the signal and variable condenser section (the loop condenser) is the maximum response.

If the loop antenna has been replaced it may be necessary to adjust the loop trimmer as follows: Mount an id transformer and the pointer at 60 and feed 450 kc to the id transformer. A portion of the output may be observed at the id transformer side of the loop. If the pointer indicates the same position, the loop trimmer is adjusted for maximum response.

**Radio**

With the selector switch in the "Radio" position the receiver may be used as an ordinary radio. The electron ray indicator near the top of the panel is a level indicator for recording and is not intended for use as an tuning indicator.

**Phonograph Operation**

With the selector switch in the "Phonograph" position the receiver may be used as an ordinary phonograph. Use the cutting needle in the reproducing pickup since this will immediately ruin the record.
VOLTAGE RATING: 105-125 volts.
POWER SUPPLY: A.C. only.
POWER CONSUMPTION: 85 watts for receiver.
120 watts for combination.
FREQUENCY RANGE:
540-1630 kc.
2.3-7.5 mc.
6.9-22.3 mc.
6S07GT, oscillator-modulator
6S07GT, i-f amplifier
6S07GT, diode detector, audio amplifier and a.v.c.
6S07GT, audio amplifier
5A6GT, audio amplifier
6U5 electron-ray tuning indicator.
6Y3G, full-wave rectifier.

VOLTAGE ANALYSIS
Voltage at 5Y3 filament to ground—345 volts.
Voltage drop across speaker field—90 volts.
* Same voltage for each tube.
* Same voltage for both cathodes.

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 volts, 60 cycles, a.c. All read 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>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6S07GT</td>
<td>235</td>
<td>72</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6S07GT</td>
<td>235</td>
<td>72</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>75</td>
<td>—</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>*6AE7GT</td>
<td>255</td>
<td>—</td>
<td>12</td>
<td>6.3</td>
</tr>
<tr>
<td>*6AC5GT</td>
<td>245</td>
<td>—</td>
<td>0</td>
<td>6.3</td>
</tr>
</tbody>
</table>
RECORD CHANGER ADJUSTMENTS

1. **Setup Does Not Index Properly on Torn 78s or Twelve-inch Records.**
   - Adjustment for correct indexing of 78s and 12-inch records.
   - Set up the changer and attach the record to the platter. Adjust the motor and control panel to the correct position. Check the indexing mechanism to ensure proper indexing.

2. **Miscellaneous Important Points.**
   - Make sure the motor and control panel are secure and in the correct position.
   - Check the indexing mechanism to ensure proper indexing.

3. **Record Changer Does Not Do Its Changing Cycle at End of Record.**
   - Make sure the motor and control panel are secure and in the correct position.
   - Check the indexing mechanism to ensure proper indexing.

4. **Time Arm Adjustments.**
   - Set the record to the correct position.
   - Adjust the time arm to the correct position.

5. **Time Arm Height Adjustments.**
   - Adjust the time arm to the correct position.

6. **Lubrication.**
   - Lubricate the record changer mechanism.

7. **Cleaning the Record Changer.**
   - Clean the record changer mechanism with a soft cloth.

8. **Record Changer Does Not Do Its Changing Cycle When Switch Knob Is Turned ON.**
   - Make sure the motor and control panel are secure and in the correct position.
   - Check the indexing mechanism to ensure proper indexing.

9. **No Sound When Needle Is On Moving Record.**
   - Check the motor and control panel to ensure proper positioning.
   - Check the indexing mechanism to ensure proper indexing.

10. **Automatic Phonograph Operation.**
    - Turn on the power to the record changer.
    - Place the record on the changer plate.
    - Turn on the power to the record changer.

11. **Setup for Recording.**
    - Set up the record changer to the correct position.
    - Check the indexing mechanism to ensure proper indexing.

12. **Setup for Broadcasting.**
    - Set up the record changer to the correct position.
    - Check the indexing mechanism to ensure proper indexing.

13. **Setup for Playback.**
    - Set up the record changer to the correct position.
    - Check the indexing mechanism to ensure proper indexing.
EMERSON RADIO & PHONOGRAPH CORP.

MOdELS: ES-374, ES-397
Chassis ES

VOLTAGE ANALYSIS

- Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from points indicated in ground (chassis) with 0.00% of ground as 0.00 volts. All readings except R, F, and 0.00% of ground. Voltages are in millivolts.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>F</th>
<th>EL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6G6</td>
<td>395</td>
<td>395</td>
<td>0</td>
<td>6.3 mA</td>
<td></td>
</tr>
<tr>
<td>6G7</td>
<td>255</td>
<td>0</td>
<td>0</td>
<td>6.3 mA</td>
<td></td>
</tr>
<tr>
<td>6Q6/GY</td>
<td>110</td>
<td>0</td>
<td>0</td>
<td>6.3 mA</td>
<td></td>
</tr>
<tr>
<td>6L6</td>
<td>245</td>
<td>255</td>
<td>212</td>
<td>6.3 mA</td>
<td></td>
</tr>
</tbody>
</table>

Production Changes
- The chassis bearing serial numbers above 3,250,000 are used.
- The chassis bearing serial numbers below 3,250,000 are used.

I/F Alignment
- Set the dial pointer at 150. Set the grid dissipation at 1500 k. Set the grid dissipation at 1500 k. Adjust the I/F trimmer to maximum response.
- The grid dissipation is adjusted to the best possible position.

Tone Arm Lift
- The tone arm lift is adjusted to the proper position.
- The tone arm lift is adjusted to the proper position.

Special Precautions
- The following precautions are of the utmost importance and should be observed:
  1. Do not handle or move manually the pickup arm or any part of the mechanism while a recording is going through the recording process.
  2. Do not use force in handling or manipulating the mechanism.
  3. Do not insert any recording tape unless it is properly aligned.

Note: The grid of the 6G6 tubes is connected to the common lead of the rear variable condenser section.

R-F Alignment
- Set the dial pointer at 150. Set the grid dissipation at 1500 k. Adjust the I/F trimmer to maximum response.
- The grid dissipation is adjusted to the best possible position.
VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated in ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117 volts, 60 cycles, a.c. All readings except B plus at 0 volts, A and C carbon voltages were taken on 250 volt cells.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>6827GT</td>
<td>164</td>
<td>60</td>
<td>1.25</td>
<td>6.3</td>
</tr>
<tr>
<td>6827GT</td>
<td>249</td>
<td>74</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6827GT</td>
<td>254</td>
<td>80</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6895GT</td>
<td>17</td>
<td>12</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6V6GT</td>
<td>246</td>
<td>21.5</td>
<td>0</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Voltage at r.f. filaments—350 volts.
Voltage across speaker field—63 volts.

DIAL CORD REPLACEMENT

Use a turn and a half of cord, part number 755-9767, at the cross arm and the connector plug and plug it, with no slack, near the switch in the policy, after which spring may be looked on the rear wall. The dial face should bear against the face when finally assembled.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated in 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 stage carbon voltages and carbon voltages were taken on 250 volt cells. Measurements made with 1732 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>Rl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AX7GT</td>
<td>85</td>
<td>85</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12AX7GT</td>
<td>85</td>
<td>85</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12AT7GT</td>
<td>25</td>
<td>—</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>506GT</td>
<td>98</td>
<td>85</td>
<td>5.0</td>
<td>50</td>
</tr>
</tbody>
</table>
Schematic for converter having separate AC-DC toggle switch

L1, L2 Line of filter choke.
R1 25 ohm 5 watt metal-clad resistor.
R2 2200 ohm 2 watt wire-wound resistor.
R3 2200 ohm 1 watt wire-wound resistor.
C1 0.1 mf, 400 volt tubular condenser.
C2 0.01 mf, 400 volt tubular condenser.
C3, C6 0.1 mf, 200 volt tubular condenser.
C4 3 mf, 200 volt paper condenser.
C5 0.05 mf, 400 volt tubular condenser.
C7 0.5 mf, 200 volt "A" condenser.
A C.D.C. toggle switch (used on early models)
A C.D.C. washer switch (used on late models).
Vibrator 117 volt, d.c. to a.c.

Schematic for latest series converter having A.C-D.C. switch mounted on unit

(For converters with a.c.-d.c. switch mounted on converter chassis.)

1. a. Disconnect two black motor leads; one from the motor switch and one from the chassis.
b. Solder each of the two black motor leads to the brown leads emerging from the converter.
c. Solder the red lead to the motor switch.
d. Solder the black wire to the receiver chassis.
e. Solder one green lead to the clamp on the phonograph motor, grounding the other green lead to some point in the ground circuit which will reduce vibrator hum.
f. Unit is shipped with a.c.-d.c. switch on converter in d.c. position.

The converter should not be turned on when phono-radio switch is in the radio position, as the vibrator noise will make the receiver unusable.

At no time should the a.c.-d.c. switch be thrown to the d.c. position when the line switch is plugged into a d.c. outlet.

IMPORTANT: Do not plug receiver into house outlet until having first ascertained that this supply is d.c. If house supply is a.c., remove lever-switch clamp and push switch to a.c. position. Always see that switch is in position corresponding to house supply (a.c. or d.c.). Replace clamp over switch after any change in switch position.

TYPE: Synchronous vibrator.
INPUT VOLTAGE: 105-125 volts.
INPUT CURRENT: D.C. only.
OUTPUT VOLTAGE: 105-125 volts.
OUTPUT CURRENT: A.C. only.
CAPACITY: 20 watts (maximum).
MODEL: DU-379 and DU-380
CHASSIS MODEL: DU

Location of Coils and Trimmer Adjustments

The first i-f transformer is located in the bottom outer edge of the chassis behind the lower flashlight cell. The brass screws which protrude from either end of the unit are the trimmer adjustment for tuning the transformer. The second i-f transformer is located between the 114 and 115 tubes. The single trimming screw extends from the end of the can.

The oscillator coil is located inside the chassis, beside the variable condenser. Trimmer for the oscillator is located on the lower section of the variable condenser.

The loop antenna acts as the antenna coil. Trimmer for the loop is located on the upper section of the variable condenser.

Type: Single-band (battery operated) superheterodyne.

The color coding of the i-f transformer leads is as follows:
- Grid—green
- Grid return—black
- B plus—red

The color coding of the battery cable is as follows:
- Red—B plus, 90 volts
- Blue—B minus

If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.

The receiver has a self-contained antenna and does not require additional antenna or ground connection. Model DU-379 has the loop antenna contained in the shoulder strap. If it is not worn around the shoulder it is important that the strap be stretched out into a loop of about the same width as the cabinet.

When Model DU-379 is worn about the shoulders, the correct position of the antenna may be found by the wearer turning through a quarter circle as mentioned below.

The self-contained loop antenna in Model DU-380 operates at maximum efficiency when its position is at right angles to the broadcasting source. It is important, therefore, that the station is tuned in, rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the receiver is received with maximum volume.

I-F Alignment DU-379, DU-380

Swing variable condenser to minimum capacity position.

Feed 455 kc to the grid of the 185 tube through a 0.01 mf condenser. Adjust the three i-f trimmer coil screws for maximum response. (Clip the i-f input to the center leg of the upper variable condenser section.)

R-F Alignment

Set the dial pointer at 110. Set the signal generator at 1500 kc and feed its output into a loop of wire about one foot in diameter. Hold the radiating loop at about one foot away from and parallel to the receiver loop antenna. Advance the output of the generator until deflection is obtained on the output meter. Adjust first the i-f trimmer (on lower section of variable condenser) then the antenna trimmer (on upper section of variable condenser) for maximum response.

Battery Installation

To install and connect the batteries in this cabinet observe the following procedure:

1. Remove the back panel of the cabinet by taking out the screw.
2. Examine the battery cable coming from the receiver and identify the fasteners on the terminal strip.
3. With the "B" battery out of the cabinet, snap the two fasteners on the terminal strip into the two "B" battery snap fasteners.
4. Place the "B" battery into the cabinet as shown in diagram. Slide the two "pull-tabs" over the flashlight cells and then push the cells into the two compartment shown in the diagram with the brass contact at the top.
5. Replace the back panel of the cabinet and fasten it in place with the screw.

PRODUCTION CHANGE

1. On all models, except early ones, R12 is removed.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed are from point indicated to chassis with volume control turned on full and no sound. The battery voltages for these readings were: "A"-1.5 volts, "B"-6.3 volts. All readings except diodes were taken on the 300 ohms scale, with battery "A" out.

For the 154 tube only 60 volts across the rectifier should be 7.5 volts with battery "B" out and battery tester "on".

The operating voltage of this tube cannot be measured because of the high resistance in the circuit.

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EMERSON RADIO & PHONOGRAPH CORP. MODELS DU-379.

EMERSON PAGE 124.
MODEL 116 IS IDENTICAL TO MODEL 116 EXCEPT FOR THE CIRCUITS SHOWN ABOVE, COVERING THE 530-1750 KC BAND ONLY.
Automatic Record
Changer
AC. Unit - Part No. 125.10
FADA RADIO & ELECTRIC CO
Automatic Record Changer
AC - DC Unit - Part No. 125.11

Before servicing the automatic record changer, inspect the assembly to see that all parts, parts all line up, gears, springs, etc. are in good order and are correctly assembled.

A bind or jam in 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 pushing the index lever to "Reset" and revolving the turntable properly.

A. Main Lever.-This lever is basically important in that it interlocks the various individual mechanisms which control needle landing, jarring, record separation, etc. The index position during the main cycle is as follows: when the main lever is "C", the index position is consistent with the turntable being off-volume; 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 pawl by "B" through a friction clutch 50. If the friction clutch 50 is abruptly accelerated or becomes irregular, the swinging will cause excessive wear.

The friction pin 53 moves the trip pawl into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch 50 occurs when movement of the tone arm causes positive movement of the trip pawl, 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 tone arm will rotate too-slowly at some loose, tripping will not occur at the end of the track.

C. Pickup Lift Cable Screw.-During the record change cycle, lever "B" is actuated by the main lever "C" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust the pickup for proper elevation, stop the change. "Invert" the clock at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknuts "C" to obtain a 1/16 inch clearance 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 "D" determines the landing position of the needle on a 10 inch record. Position of eccentric stud "D" governs the landing of the needle on a 12 inch record: however, its position is in no way related to 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 lever "B" is vertical and "E" is tilted forward; rotate mechanism through cycle until needle is just ready to land on the record; inspect stud "F" on lever "E" in contact with "Step I" on lever "17". The correct point of landing is 3/8 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 "17". Leave appropriate spacing behind stud "F" and "G" and tighten the blunt nose screw "F"; run mechanism through several cycles as a check, then tighten cone pointed screw "G".

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 5/16 inch from nearest side of spindle. If the landing is incorrect, turn stud "F" until the eccentric end adjusts "17" to give correct needle landing. The end of the stud must always be toward the rear of the motor base, otherwise incorrect landing may occur with 10 inch records.

NOTE: Numbers refer to parts-letters refer to adjustments

F. & G. Record Separating Knife.-The upper plate (knife) 28" 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 shell 29" be accurately maintained. The spacing for the 10 inch record is normally .008 inch, and for the 12 inch record is .075 inch.

To adjust, rotate the knife to the maximum vertical separation from the recorded portion of the shell and locknut "F" to give .055-.065 inch separation. Screw "G" must not be depressed during this adjustment. After setting screw "F" adjust screws "G" to that when tips are depressed flush with top of records and the record shell is .072-.078 inch above surface of motor base, it is necessary that adjustment be such that the record is released from both record guides at the same time. To adjust, place a 12 inch record on the turntable at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, then loosen nuts "15" and shift record slightly so that the curved inner edges of the shields are uniformly spaced at least 1/16 inch from record edge. Tighten the blunt nose screw "H"; run mechanism through several times to check action, then tighten cone pointed screw "H".

If record acheive 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 front lower edge of the pickup 20" is placed on a 1/16 inch above surface of motor base. 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 position of the trip pawl at the end of the cycle by bending the pin toward or away from the trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment point is made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.-Petrolatum or petroleum jelly should be applied to cam, main gear, pinion, 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 underside of motor board.

Apply a few drops of light machine oil to the motor spindle bearing and oil hole adjacent to the spindle bearing. The oil hole has a screw.

A. Top speed of motor is governed by gears, speeds 1/2" and 1/4" fouled or pickup output cable disconnected.

B. Cycle commences before record is complete.-Record is defective, or adjustment "B" of friction clutch incorrect.

C. Weak in record reproduction.-Record is defective, or instrument not being operated at normal room temperature (650 F).

D. Record knives strike edge of records.-Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.

E. Record not released properly.-Adjust record shell assemblies in respect to shaft by means of adjustment "H".

F. Needle lands in 10 inch position on 12 inch record or missing record when playing both types.-Increase tension of pickup locating lever spring "34".

On AC - DC Models only - Spindle loosens from motor. To tighten: remove turntable, hold governor of motor and tighten spindle.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited by a specific mode of improper operation. The following relations between effects on operation and the usual misadjustments will enable rapid pinpointing of a problem.

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.-Adjustment "E".

4. Failure to trip at end of record.-Increase clutch "F" friction by means of screw "B". Also, see that levers "7" and "12" are not touching each other.

5. Pickup strikes lower record of stack or drops across top record on turntable.-Adjust lift cable per adjustment "C".

6. Needle does not land properly on both 10 and 12 inch records.-Make complete adjustments "D" and "E".

7. Needle landing on record 10 Moscow 12 inches.-Check through above adjustments.

8. Record knives strike edge of records.-Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.

9. Record not released properly.-Adjust record shell assemblies in respect to shaft by means of adjustment "H".

10. Needle lands in 10 inch position on 12 inch record or missing record when playing both types.-Increase tension of pickup locating lever spring "34".

11. On AC - DC Models only - Spindle loosens from motor. To tighten: remove turntable, hold governor of motor and tighten spindle.

FILE OF TECHNICAL DEPARTMENT PUBLICATIONS

John R. Ricker Publisher
When aligning the short wave oscillator tighten the adjusting screw for maximum capacity and then loosen it until the first peak is reached. Do not use the signal head at the lower capacity setting as in triode receiver the oscillator works at a frequency lower than the one the R.F. is tuned to. If the loop is turned to 18MC the oscillator is tuned to 17,960Kc that is signal frequency minus I.F. frequency, instead of signal frequency plus I.F. frequency, or 18,430Kc as is customary.

| Grid of 12SA7 | Plate 12SA7 | 12 Gain |
| Plate of 12SK7 | Grid 12SK7 | 12 Gain |
| Grid of 12SK7 | Plate 12SK7 | Slight Loss |
| Plate of 12507 | Diode 12507 | 60 Gain |
| Grid of 12507 | Plate 12507 | 60 Gain |
| Grid of 355,667 | Plate 355,667 | 255 Loss |
| Oscillator Voltage | BT-66 | 5 Powr Gain |
| Voltage Loss in Output Transformer | 1800 Kc | 50 Loss |

Voltage for Alignment

<table>
<thead>
<tr>
<th>Steps</th>
<th>Dimen.</th>
<th>Set Generator at</th>
<th>Set Gang at</th>
<th>Adjust</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SET VOLUME CONTROL AT MAXIMUM OUTPUT.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>455 KC</td>
<td>Minimum</td>
<td>2nd I.F. TRIMMER</td>
<td>Top of I.F. TRANS.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>1720 KC</td>
<td>B.C. On Trimmer</td>
<td>B.C. On Trimmer</td>
<td>Nearest Point Of Chassis</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>1500 KC</td>
<td>Strongest Sig. &amp; Rock Gang</td>
<td>B.C. R.F. TRIMMER</td>
<td>On Loop Antenna</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>600 KC</td>
<td>600 Kc-Pod</td>
<td>S.W. Dec. TRIMMER</td>
<td>Middle Of Three</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>1000 KC</td>
<td></td>
<td>S.W. R.F. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>161 Kc</td>
<td>Minimum</td>
<td>S.W. Dec.</td>
<td>Middle Of Three</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td>16 Kc</td>
<td>Maximum</td>
<td>S.W. Dec.</td>
<td>Middle Of Three</td>
<td></td>
</tr>
</tbody>
</table>

* These trimmers are on a strip of three at the right hand end of the chassis.

When adjusting each band, use the same settings for maximum output and adjust for maximum sensitivity.

Oscillator Voltage | 1500 Kc | 5 |
Oscillator Voltage | 1500 Kc | 7 |
Voltage Loss in Output Transformer | 98% Loss |

All values above are approximate.

### TABULATION FOR ALIGNMENT

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect High Side Of Generator To</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust The Following</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SET VOLUME CONTROL AT MAXIMUM OUTPUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>455 KC</td>
<td>Minimum</td>
<td>1st I.F. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>1720 KC</td>
<td>B.C. On Trimmer</td>
<td>B.C. On Trimmer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>1500 KC</td>
<td>Strongest Sig. &amp; Rock Gang</td>
<td>B.C. R.F. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>600 KC</td>
<td>600 Kc-Pod</td>
<td>S.W. Dec. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td>S.W. R.F. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* These trimmers are on a strip of three at the right hand end of the chassis.

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**STRINGING DIAGRAM**

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**PUSH BUTTON SET UP**

(On BT-52 - BT-61 - BT-63 - BC-66)

When the push buttons are lifted a screw is exposed. This screw should be loosened by one or two turns by a screwdriver. Turn in the desired station manually, then firmly press the button until it hits the stop, making certain the gang settings does not change. Again lift the push button and tighten the screw. Manually detune the set, press the button just set up, if the adjustment was properly made proceed with the remaining buttons.
To properly align this receiver, a signal generator calibrated at 455 Kc., 1400 Kc., and 1730 Kc., is required. The oscillator trimmer is nearest the front panel and the loop trimmer is directly behind it.

Any combination of one 1 1/2 volt "A" battery and two 45 volt "B" batteries that will fit in the receiver case will be satisfactory. Battery drain is .2 amp., at 1 1/2 volts and 9 ma., at 90 volts.

**Tabulation for Alignment**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Use in Series with Generator</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>.02 Mfd. to Chassis Connect high side of generator to grid cap of 1A7G tube.</td>
<td>455 Kc.</td>
<td>Quiet Point</td>
<td>2nd I.F. trimmers</td>
<td>Top of 1st I.F. trans</td>
<td>Maximum output</td>
</tr>
<tr>
<td>2.</td>
<td>250 M.M.F.</td>
<td>1730 Kc.</td>
<td>1730 Kc.</td>
<td>Oscillator trimmer*</td>
<td>See note below</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>250 M.M.F.</td>
<td>1400 Kc.</td>
<td>1400 Kc. &amp; rock gang</td>
<td>Loop trimmer*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* See preceding paragraph for location of trimmers.
** Loop to consist of five to ten turns of insulated wire wound on a three to four inch form to be closely coupled to the loop antenna in the receiver.

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PUSH BUTTON SET UP

TO PREVENT THE BUTTONS FROM BEING SET UP ON THE WRONG STATIONS A SIGNAL GENERATOR SHOULD BE USED.

THE BUTTON TO THE EXTREME RIGHT IS THE MANUAL TUNING BUTTON.

ADJUST THE LOWER SCREW (SEE FIG.) FIRST AS THIS IS THE OSCILLATOR; THEN ADJUST THE UPPER SCREW FOR MAXIMUM OUTPUT.

STRINGING DIAGRAM

<table>
<thead>
<tr>
<th>STEPS WITH ANTENNA</th>
<th>SET GENERATOR AT</th>
<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED</th>
<th>TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SET VOLUME AND TONE CONTROLS AT MAXIMUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td>2ND I.F. TRIMMERS</td>
<td>Top of I.F. Trans.</td>
<td>Max. Output</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>455 Kc.</td>
<td>1ST I.F. TRIMMERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>250 MMFD.</td>
<td>WAVE TRAP TRIMMER</td>
<td>Rear of Chassis</td>
<td>Min. Output</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>1600 Kc.</td>
<td>Osc. B.C. TRIMMER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>1500 Kc.</td>
<td>R.F. B.C. TRIMMER</td>
<td>On Loop</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>600 Kc.</td>
<td>600 Kc. PAD</td>
<td>See Fig.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAXIMUM OUTPUT</td>
</tr>
<tr>
<td>9.</td>
<td>400 OHMS</td>
<td>5.4</td>
<td>Osc. Police Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>5 Mc.</td>
<td>R.F. Police Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>CHECK 1.8 MC.</td>
<td></td>
<td></td>
<td>Osc. S.W. Trimmer*</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>400 OHMS</td>
<td>18.1 MC.</td>
<td>Note A</td>
<td>R.F.S.W. Trimmer**</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td>16 MC.</td>
<td>Note B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>CHECK 6 AND 10 MC.</td>
<td>NOTE A</td>
<td>SET GANG AT MINIMUM.</td>
<td>NOTE B</td>
<td>STRONGEST SIGNAL AND ROCK GANG.</td>
</tr>
</tbody>
</table>

* TIGHTEN OSCILLATOR TRIMMER SCREW FOR MAXIMUM CAPACITY, THEN UNSCREW UNTIL SECOND PEAK IS SECURED.

** TIGHTEN R.F. TRIMMER SCREW FOR MAXIMUM CAPACITY, THEN UNSCREW UNTIL FIRST PEAK IS SECURED.
**PUSH BUTTON SET UP**

1. If the station you select for one of the buttons falls between 1500 to 1000 kilocycles be sure that pin jack is in the upper strip.
2. Adjust the brass screw at the side of the lower trimmer until the wanted station is heard most clearly.
3. Adjust the lower trimmer screw for maximum volume.
4. Press Manual button making certain the station is still tuned in; check this reception against the reception on the button just set up. If it is the same proceed with the next station on the list.
5. If the station you desire to pick up falls between 1000 and 550 kilocycles, you must remove the pin jack and place in the hole provided at the bottom edge of the upper trimmer (see figure 1).
6. Turn the lower trimmer screw back until the screw is off the trimmer plates.
7. Adjust the brass screw until the wanted station is heard most clearly.
8. Then adjust the upper trimmer until maximum volume is secured; if maximum volume cannot be had and upper trimmer screw is down tight you must finish tuning with the lower trimmer screw.

**ALIGNMENT INSTRUCTIONS**

An output meter and a signal generator are required for proper alignment of these sets. The oscillator should be calibrated at the following points, 855 Kc, 600 Kc, 900 Kc, 1400 Kc, 1600 Kc, 2.0 Mc, 5 Mc, 5.5 Mc, 6 Mc, 10 Mc, 16 Mc, and 19.0 Mc. Always keep the output of the signal generator as low as possible to prevent A.V.C. action and false settings. Connect the high side of the generator to the antenna terminal and the low side of it to the ground terminal making certain jumper on terminal strip is disconnected. Before aligning tighten wave trap trimmer screw.

**TABULATION FOR ALIGNMENT**

<table>
<thead>
<tr>
<th>Steps</th>
<th>In Series With Antenna</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SET VOLUME AND TONE CONTROLS AT MAXIMUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>250 mmfd.</td>
<td>1600 Kc.</td>
<td></td>
<td>Osc. B.C. Trimmer</td>
<td></td>
<td>See Fig.</td>
</tr>
<tr>
<td>6.</td>
<td>1400 Kc.</td>
<td>600 Kc.</td>
<td>Note B</td>
<td>R.F. B.C. Trimmer</td>
<td></td>
<td>Min. Output</td>
</tr>
<tr>
<td>7.</td>
<td>Recheck 1400 Kc.</td>
<td></td>
<td></td>
<td>Ant. B.C. Trimmer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td>600 Kc.</td>
<td></td>
<td>Osc. Police Trimmer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>400 Ohms</td>
<td>5 Mc.</td>
<td>Note B</td>
<td>R.F. Police Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>2 Mc.</td>
<td>Note B</td>
<td>Ant. Police Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Recheck 5 Mc.</td>
<td></td>
<td></td>
<td>Osc. S.W. Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td>18 Mc.</td>
<td>Note A</td>
<td>R. F.S.W. Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>400 Ohms</td>
<td>16 Mc.</td>
<td>Note B</td>
<td>Ant. S.W. Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td>6 Mc.</td>
<td>Note B</td>
<td>Osc. S.W. Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Recheck 16 Mc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Closest oscillator trimmer screw for maximum capacity, then unscrew until second peak is secured.
**Closest R.F. trimmer screw for maximum capacity, then unscrew until first peak is secured.

**NOTE A.** Set gang at minimum.
**NOTE B.** Strongest signal and rock gang.

## TUBE COMPLEMENT

<table>
<thead>
<tr>
<th>6SK7 R.F. AMPLIFIER</th>
<th>6SC7 PHASE INVERTER</th>
<th>MODELS</th>
<th>CHASSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7 CONVERTER</td>
<td>6SC7 DUO DRIVER</td>
<td>BK-110</td>
<td>C-32</td>
</tr>
<tr>
<td>6J5 OSCILLATOR</td>
<td>2 - 6V6 OUTPUT</td>
<td>BK-111</td>
<td>C-73</td>
</tr>
<tr>
<td>6SK7 I.F. AMPLIFIER</td>
<td>2 - 5Y3G RECTIFIERS</td>
<td>BK-112</td>
<td>C-32</td>
</tr>
<tr>
<td>6Q7 DET A.V.C. 1ST AUDIO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TABULATION FOR ALIGNMENT**

<table>
<thead>
<tr>
<th>STEPS</th>
<th>USE IN SERIES WITH ANTENNA</th>
<th>SET GENERATOR AT</th>
<th>SET GANG AT</th>
<th>ADJUST</th>
<th>LOCATED TO OBTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SET VOLUME CONTROL AT MAXIMUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td>2ND I.F. TRIMMERS</td>
<td>Top 2ND I.F. TRAN.</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td>1ST I.F. TRIMMERS</td>
<td>Top 1ST I.F. TRAN.</td>
</tr>
<tr>
<td>4.</td>
<td>250 MMFD.</td>
<td>455 Kc.</td>
<td></td>
<td>600 Kc.</td>
<td>B.C.</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>1600 Kc.</td>
<td></td>
<td></td>
<td>Side of Chassis</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>1500 Kc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>RECHECK 1600 Kc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>400 OHMS</td>
<td>18.1 Mc.</td>
<td></td>
<td>S.W. Osc. TRIMMER</td>
<td>Left Front of Chassis</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td>16 Mc.</td>
<td></td>
<td>S.W.R.F. TRIMMER</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>CHECK SIGNAL AT 6 Mc. AND 10 Mc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE A.** Set Gang at Minimum.

**NOTE B.** Strongest Signal and Rock Gang.
## STRINGING DIAGRAM

**(TUNING CHECKS ARE IN FULL ANTENNA POSITION)**

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## CHASSIS LAYOUT

---

### TABULATION FOR ALIGNMENT

<table>
<thead>
<tr>
<th>Steps</th>
<th>In Series With Antenna</th>
<th>Set Generator At</th>
<th>Set Gang At</th>
<th>Adjust</th>
<th>Located</th>
<th>To Obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
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</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>B.C. 250 WPF.</td>
<td>455 Kc.</td>
<td>Note A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>1000 Kc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>1500 Kc.</td>
<td>Note B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>600 Kc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td>7.0</td>
<td>Note A</td>
<td>Osc. Police Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>6.0</td>
<td>Note B</td>
<td>R.F. Police Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Check 2.2 Mc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td>22.0 Mc.</td>
<td>Note A</td>
<td>Osc. S.W. Trimmer*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td>18.0 Mc.</td>
<td>Note B</td>
<td>R.F.S.W. Trimmer**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note B</td>
<td>Strongest Signal and Rock Gang.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**TIGHTEN OSCILLATOR TRIMMER SCREW FOR MAXIMUM CAPACITY, THEN UNSCREW UNTIL SECOND PEAK IS SECURED.**

**TIGHTEN R.F. TRIMMER SCREW FOR MAXIMUM CAPACITY, THEN UNSCREW UNTIL FIRST PEAK IS SECURED.**

---

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CHAMPION RADIO MODEL 5141 ABT.

To balance I.F. Trans. Connect Osc. to Cap of GAB tube thru .05 cond. and adjust I.F. Trans. to 456 K.C.

456 K.C. Int. Freq. Trim at 1400 K.C.

MODEL 6141 A
456 K.C. S.F.T.
Trim at 1400 K.C.
Bend plates of Osc. Sec. of Var. Cond. for 600 K.C.

CHAMPION RADIO
MODEL 6141 ABT CHAMPION RADIO

456 K.C. INT FREQ. TRIMAT 1400 K.C.

TO BALANCE IF. TRANS. CONNECT OSC.
TO CAP OF 6AB TUBE THRU .05 COND.
AND ADJUST TRIMMERS TO 456 K.C.

NOTE: BE SURE PROPER CONNECTIONS
ARE MADE ON FILTER. TIE THE TWO TERMINALS
MARKED □ □ TOGETHER AND CONNECT
TO INPUT ON 25Z6 TUBE.

Ferguson Radio, Inc.
MICROPHONE CONNECTIONS

Provisions have been made so that a high impedance microphone may be connected to the record player. This will permit any sound picked up by the microphone to be heard through the radio receiver. The microphone cable should be equipped with standard 1/8" plugs which should be inserted into the holes in the plate marked 'MICROPHONE' at the rear of the record player.

TUBE LOCATIONS

Set the receiver to be used with this record player, to some frequency between 540 and 750 KC which is clear and free from interfering stations. Remove the plug near the volume control on top of the record player. Using an insulated screwdriver turn the screw, located beneath this plug, until the signal from the record player is heard in the receiver. This will be heard as a reduction in noise as the signal comes in tune with the receiver. If a record is being played, the music or sound from it may be tuned in. If it is desired to change the frequency, set the receiver to the new frequency and turn the screw until the signal is heard. The fact that stations which are entirely absent during the day may be present at night with strong signals, should be kept in mind in choosing the frequency to be used. Always choose a frequency which is free from strong interference at all times, day or night.

When the record player is located at some distance from the receiver, or under conditions when the signal from it is too weak, the coil of wire from the record player should be uncoiled enough to give a satisfactory signal. Under no conditions should more wire be uncoiled than is necessary for a reasonably strong signal in the receiver.
VOLTAGES SHOWN ON THE CIRCUIT DIAGRAM ARE FROM SOCKET TERMINALS TO CHASSIS BASE. IN MEASURING VOLTAGES USE A VOMETER HAVING A RESISTANCE OF AT LEAST 1000 OHMS PER VOLT. ALLOWANCES SHOULD BE MADE FOR VARIATIONS IN LINE VOLTAGE.

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1720 Kilocycles and includes the popular 1712 KC police channel.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all adjustments 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 peaked, the broadcast band should be adjusted.

I. F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 436 KC and connect the output to the grid of the first detector tube (12A8GT) 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.

Connect the test oscillator to the antenna of the set through a 200 mfd. (0.002) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.
Volatages shown on circuit diagram are from socket terminals to chassis base. In measuring voltages, use a voltmeter having a sensitivity of at least 1000 ohms per volt. Allowances should be made for variations in line voltage.

**TUNING RANGE**

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1720 Kilocycles and includes the popular 1712 KC police channel.

**ALIGNMENT PROCEDURE**

**GENERAL DATA.** The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control at 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 peaked, the broadcast band should be adjusted.

**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 (12A8GT) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all I.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT.** Remove chassis, shield, and loop antenna from cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set up on a metal bench.

Connect the test oscillator to the antenna of the set through a 200 mmyf. (4002) condenser. With the gang condenser set at minimum capacitance, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.
TO SET UP THE BUTTONS FOR AUTOMATIC TUNING:

1. Turn the set on and allow it to operate at least fifteen minutes before attempting to set up the buttons.

2. Make a list of the frequencies of six nearby stations to which you wish to set up the buttons. Be sure to select the most powerful nearby stations, since weak signals will not give satisfactory results. Also be sure to select stations that fall well within the frequency range of the buttons as shown in Fig. 1.

3. With the Band Switch in the "AM" Position tune in the station to be set up. Then turn the range switch to Automatic Position "AUT." Position and push the button to be set up, being sure to select a button with the proper frequency range (see Fig. 1).

4. At the back of the chassis, as viewed from the rear of the radio, will be found 12 holes numbered in pairs to correspond to the numbers of the buttons. See Fig. 1. Adjust the "a" screw with the number corresponding to the number of the button you have pushed in, until the same station is again heard. Tune accurately, adjusting for deepest tone.

5. Now adjust the "b" screw (located below the "a" screw) until maximum output is obtained. Make a final adjustment on the "b" screw, always tuning for deepest tone.

6. The set-up is now complete for this button.

The remaining buttons may be set up in the same way.

ALIGNMENT PROCEDURE

1. Connect the output meter across the voice coil or from the plate of the 6FQG output tube to ground through a .1 mf, condenser. (The more sensitive type should be connected across the voice coil.)

2. Connect the ground lead of the signal generator to the receiver chassis.

3. Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

4. Check the pointer to see that it is correctly set. Connect the loop antenna as shown in Fig. 2.

<table>
<thead>
<tr>
<th>Dummy Ant. in Sides with Sig. Gen.</th>
<th>Connection of Sig. Generator Output to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band 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 MFD Condenser</td>
<td>Log on Rear Section of Gong Cond.</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2</td>
<td>1st IF</td>
<td>Adjust for Maximum Output. Then Re-set Adjustment.</td>
</tr>
<tr>
<td>200 MF MFD Micro Condenser</td>
<td>External Anti. Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>1500 KC</td>
<td>5</td>
<td>Broadcast Oscillator (Stator)</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>200 MF MFD Micro Condenser</td>
<td>External Anti. Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>Tune to 1500 KC Generator Signal</td>
<td>6*</td>
<td>Broadcast Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>200 MF MFD Micro Condenser</td>
<td>External Anti. Terminal</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>Tune to 2.5 MC Generator Signal</td>
<td>7*</td>
<td>Broadcast Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>450 OHM Carbon Resistor</td>
<td>External Anti. Terminal</td>
<td>2.5 MC</td>
<td>Intermediate</td>
<td>Tune to 2.5 MC Generator Signal</td>
<td>8</td>
<td>Intermediate Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>450 OHM Carbon Resistor</td>
<td>External Anti. Terminal</td>
<td>16 MC</td>
<td>Foreign</td>
<td>16 MC</td>
<td>9</td>
<td>Foreign Condenser</td>
<td>Adjust for Maximum Output. Check to see if Proper Peak was Obtained by Tuning in Image in 16 MC. If Image does not appear, Realign of 16 MC with Trimmer Sfarther out. Recheck Image.</td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Anti. Terminal</td>
<td>16 MC</td>
<td>Foreign</td>
<td>16 MC</td>
<td>10</td>
<td>Foreign Antenna</td>
<td>Adjust for Maximum Output. Try to Increase Output by Realigning Trimmer and Returning Receiver Dial until Maximum Output is Obtained.</td>
</tr>
</tbody>
</table>

When making these adjustments the loop must be in the same relative position to the chassis as when in the cabinet. Using a weak radiated signal, repeat adjustment 6 after set is in cabinet.
# S-7404-6
## ALIGNMENT EQUIPMENT & PROCEDURE

1. Connect the output meter across the voice coil or from plate to plate of the EEC output tubes through 0.1 mfd. condenser. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the receiver chassis and plug black wire lead from chasis into the inside clip on loop drum top.
3. Turn the volume control to the maximum position and keep it in this position throughout the alignment procedure.
4. Push in the "Procedure" button and keep it pushed in. Check the pointers to see that it is correctly set at 548 KC. with sweep in full marks.
5. The loop must be connected as indicated in circuit diagram at all times.

<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>Band 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 N.M.S. Condenser</td>
<td>Long Pigtail on Chassis Condenser</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>1st I. F.</td>
<td>Adjust for Maximum Output. Then repeat adjustment.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>Clip on Long Pigtail</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>5</td>
<td>Adjust for Maximum Output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>Clip on Long Pigtail</td>
<td>1500 KC</td>
<td>Bandwidth</td>
<td>6</td>
<td>Adjust for Maximum Output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Long Pigtail</td>
<td>5 MC</td>
<td>Intermediate</td>
<td>8</td>
<td>Adjust for Maximum Output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Clip on Long Pigtail</td>
<td>16 MC</td>
<td>Broadcast</td>
<td>10</td>
<td>Adjust for Maximum Output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 N.M.S. Condenser</td>
<td>Short Pigtail</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>11</td>
<td>Adjust for Maximum Output.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Refer to Figure No. 7, later in this section, for proper switch setting. Use a weak output signal of approximately 1500 KC.

---

# S-7404-5 S-7406-6
## ALIGNMENT EQUIPMENT & PROCEDURE

<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>Band 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 N.M.S. Condenser</td>
<td>Long Pigtail on Chassis Condenser</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>1-2</td>
<td>1st I. F.</td>
<td>Adjust for Maximum Output. Then repeat adjustment.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>16 MC</td>
<td>Foreign</td>
<td>5</td>
<td>Foreign Antenna</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>16 MC</td>
<td>Foreign</td>
<td>6</td>
<td>Foreign Antenna</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>7</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>8</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
<tr>
<td>100 OHM Carbon Resistor</td>
<td>External Antenna Terminal Blue Wire</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>9</td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** These adjustments should be made with the set in the cabinet. Use a weak output signal of 1500 KC.
SOCKET VOLTAGES—ALL D.C. VOLTAGES MEASURED TO CHASSIS

ANTENNA GROUNDED

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>H</th>
<th>K</th>
<th>G</th>
<th>G 1</th>
<th>S</th>
<th>SU</th>
<th>P</th>
<th>D 1</th>
<th>D 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>R.F.</td>
<td>6.0 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>95</td>
<td>0</td>
<td>285</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6SA7</td>
<td>1st Det.</td>
<td>6.0 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>8</td>
<td>95</td>
<td>285</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J5GT</td>
<td>Oscillator</td>
<td>6.0 A.C.</td>
<td>0</td>
<td>—8</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F.</td>
<td>6.0 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>95</td>
<td>0</td>
<td>285</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SQ7</td>
<td>2nd Det., A.V.C., A.F.</td>
<td>6.0 A.C.</td>
<td>3</td>
<td>Note B</td>
<td>175</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J5GT</td>
<td>Phase Inverter</td>
<td>6.0 A.C.</td>
<td>2</td>
<td>0</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F6G</td>
<td>Output</td>
<td>6.0 A.C.</td>
<td>20</td>
<td>0</td>
<td>285</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F6G</td>
<td>Output</td>
<td>6.0 A.C.</td>
<td>20</td>
<td>0</td>
<td>285</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6U5</td>
<td>Tuning Eye</td>
<td>6.0 A.C.</td>
<td>—3</td>
<td>Note A</td>
<td>T—95 Volts*</td>
<td>Plates 375 V. A.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5Y3G</td>
<td>Rectifier</td>
<td>5.0 A.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE A: Due to the high resistance of resistors No. 16, No. 7, No. 8, and No. 9, only very slight deflections of the voltmeter will be obtained.

NOTE B: Voltage is —5 volts measured at resistor No. 66.

*Voltages measured at end of tuning eye cable.

Use a high resistance voltmeter of at least 1000 ohms per volt.

WITHOUT NOTICE
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 across the plates of the 8F6G output tubes depending on the type of 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 "C" terminal at the back of the chassis. NO "A" and "B" terminals on this terminal strip must be connected together.

3. Tune the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

4. Push in the "Selectivity" button and keep it pushed in. Check the pointer to see that it is correctly set.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Sig. Generator Output to Receiver</th>
<th>Connection of Sig. Generator Output Frequency</th>
<th>Signal Generator Frequency</th>
<th>Band 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 MFD Condenser</td>
<td>Lug on Middle Section of Ganged Cond.</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2</td>
<td>2nd I.F.</td>
<td>Adjust for Maximum Output. 2nd I.F. Adjustment.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>3-4</td>
<td>1st I.F.</td>
<td>Adjust for Minimum Output. 1st I.F. Adjustment.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>Tune to 1500 KC Generator Signal</td>
<td>5</td>
<td>Wave Trap</td>
<td>Adjust for Minimum Output. Wave Trap.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>1500 KC</td>
<td>Broadcast</td>
<td>Tune to 1500 KC Generator Signal</td>
<td>6</td>
<td>Broadcast Oscillator</td>
<td>Adjust for Maximum Output. Broadcast Oscillator.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>&quot;A&quot; Terminal</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>Tune to 600 KC Generator Signal</td>
<td>7</td>
<td>Broadcast Detector</td>
<td>Adjust for Maximum Output. Broadcast Detector.</td>
</tr>
</tbody>
</table>

- Bottom View: SW OSC 20 MC, INT OSC 6 MC, B.C. OSC 1500 KC, 500 KC, 600 KC, 6 SK7, 6 SA7, 6 SQ7, 6 JG GT, 6 F6G, 5 Y3G.
**PUSH-BUTTON TUNER SWITCH**

*LETTERS ON TERMINALS OF SWITCHES SHOWN ABOVE CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE SWITCHES SHOWN IN THE CIRCUIT DIAGRAM.*

**MISCELLANEOUS PARTS**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>114043</td>
<td>Band indicator slide &amp; strip</td>
<td>$0.36</td>
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<tr>
<td>113442</td>
<td>Bracket—for tuning eye</td>
<td>$1.16</td>
</tr>
<tr>
<td>114032</td>
<td>Bracket and pulley assembly—right hand</td>
<td>$1.34</td>
</tr>
<tr>
<td>114034</td>
<td>Bracket and pulley assembly—left hand</td>
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<tr>
<td>117703</td>
<td>Cable &amp; socket for tuning eye</td>
<td>$1.00</td>
</tr>
<tr>
<td>114855</td>
<td>Clamp for dial cord</td>
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<tr>
<td>114042</td>
<td>Clamp for dial scale</td>
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<tr>
<td>112798</td>
<td>Clip for mfg. wave trap coil</td>
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<tr>
<td>110800</td>
<td>Clip—for tuning eye support</td>
<td>$0.14</td>
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<tr>
<td>114031</td>
<td>Collar—for bond switch shaft</td>
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</tr>
<tr>
<td>85242</td>
<td>Clip—instrument for antenna switch</td>
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<td>113178</td>
<td>Cord—dial</td>
<td>$3.00</td>
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<tr>
<td>116949</td>
<td>Cord—dial drive (supplied in 6 ft. length)</td>
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<tr>
<td>117057</td>
<td>Cord—drive (supplied in 2 feet lengths)</td>
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<tr>
<td>111873</td>
<td>Cushion—rubber rest for back of chassis</td>
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<tr>
<td>117740</td>
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<td>113339</td>
<td>Drum—dial drive</td>
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<td>114052</td>
<td>Escutcheon—dial</td>
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<tr>
<td>113890</td>
<td>Escutcheon—eye</td>
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<tr>
<td>114053</td>
<td>Escutcheon—push button</td>
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<tr>
<td>113347</td>
<td>Gear—on range switch shaft</td>
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<tr>
<td>113207</td>
<td>Gear—plano on auxiliary range switch shaft</td>
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<tr>
<td>119097</td>
<td>Knob for tuning or volume</td>
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<tr>
<td>117697</td>
<td>Light shield</td>
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<th>Part No.</th>
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<td>117662</td>
<td>Pointer assembly</td>
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<tr>
<td>112762</td>
<td>Pulley—dial cord drive</td>
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<td>Pulley—on bond indicator shaft</td>
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<td>114057</td>
<td>Push button</td>
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<td>112463</td>
<td>Rubber bushing—chassis mfg.</td>
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<tr>
<td>83624</td>
<td>Screw—self tapping 8x4'</td>
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<tr>
<td>85040</td>
<td>Screw—No. 6 Hex. Hd.</td>
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<tr>
<td>85927</td>
<td>Set screw—8-32 sq. head</td>
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<tr>
<td>111116</td>
<td>Screw—No. 5x3/4; mechanism mfg.</td>
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<tr>
<td>112874</td>
<td>Screw—No. 10x1/8 chassis mfg.</td>
<td>$0.01</td>
</tr>
<tr>
<td>114014</td>
<td>Screw—special head for mfg. escutcheon</td>
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<td>117661</td>
<td>Shaft—auxiliary range switch shaft</td>
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<tr>
<td>114084</td>
<td>Slide and strap assembly for tone indicator</td>
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<td>114117</td>
<td>Socket—dial lamp</td>
<td>$1.18</td>
</tr>
<tr>
<td>83427</td>
<td>Socket—octal base (standard)</td>
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<tr>
<td>110025</td>
<td>Socket—octal base (with special ground)</td>
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<td>117704</td>
<td>Socket—for speaker 5 prin.</td>
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<td>110080</td>
<td>Spencer—steel, mechanism mfg. to chassis</td>
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<tr>
<td>113177</td>
<td>Spring—dial cord tension</td>
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<tr>
<td>114156</td>
<td>Spring—for bond indicator drive</td>
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<tr>
<td>114041</td>
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<td>Terminal strip—G.D.A.</td>
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<td>117664</td>
<td>Tuning shaft</td>
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<td>110290</td>
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<tr>
<td>116530</td>
<td>Washer (paper) for back of knobs</td>
<td>$0.03</td>
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Note
Mention Code No. 347 when ordering parts.
BACK VIEW OF RANGE SWITCH DECKS.

FRONT DECK

MIDDLE DECK

BACK DECK

PUSH-BUTTON TUNER SWITCH

TOP

BOTTOM

LETTERS ON TERMINALS OF SWITCHES SHOWN ABOVE CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE SWITCHES SHOWN IN THE CIRCUIT DIAGRAM.

FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

ALIGN

POLICE BAND

OSC - 5.6 MC

OSC - 1600 Kc

ANT - 5 MC

SHORT WAVE

OSC - 18.1 MC

ANT - 16 MC

SOCKET VOLTAGES—ALL D.C. VOLTAGES MEASURED TO CHASSIS

ANTENNA GROUNDED

DIAL TUNED TO 540 K.C.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>H</th>
<th>K</th>
<th>G</th>
<th>G1</th>
<th>S</th>
<th>SU</th>
<th>P</th>
<th>D1</th>
<th>D2</th>
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<td>Note A</td>
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<td>Note A</td>
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<td>150</td>
<td>245</td>
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<td>115</td>
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<td>6SK7</td>
<td>I. F.</td>
<td>6.3 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>100</td>
<td>150</td>
<td>245</td>
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<td>0</td>
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<td>100</td>
<td>150</td>
<td>245</td>
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<td>A.V.C.</td>
<td>6.3 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>100</td>
<td>150</td>
<td>245</td>
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<td>6SQ7</td>
<td>1st Audio</td>
<td>6.3 A.C.</td>
<td>0</td>
<td>Note A</td>
<td>100</td>
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<td>245</td>
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<td>Inverter</td>
<td>6.3 A.C.</td>
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<td>Note A</td>
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<td>150</td>
<td>245</td>
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<tr>
<td>6V6G</td>
<td>Audio</td>
<td>6.3 A.C.</td>
<td>15</td>
<td>245</td>
<td>232</td>
<td>232</td>
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<td>6.3 A.C.</td>
<td>15</td>
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<tr>
<td>5Y3</td>
<td>Rect.</td>
<td>5 A.C.</td>
<td>230 A.C.</td>
<td>230 A.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

NOTE A: Due to the high resistance in the circuit, only very slight deflections of the voltmeter will be obtained.
Circuit Features

This chassis is an 8 tube, three band, push button tuning heterodyne receiver. The tuning ranges are 530 to 1700 kc, 2.3 to 7.0 mc and 6.8 to 22.8 mc.

Incorporated 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 the 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 gang condenser. The push-button switch provides a simple rapid method of effecting this substitution.

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 "Auto" or "Foreign" position, this R.F. stage is not utilized.

A feature of this set is the special push-pull output stage. Instead of using a push-pull input transformer or a separate phono input stage, the phase inversion circuit is built into the audio output stage. The more sensitive type should be connected across the voice coil.

1. Connect the output meter across the voice coil or between the plates of the 8000 output tubes depending upon the type of meter.
2. Connect the ground lead of the signal generator to the receiver chassis or to the "0" terminal at the back of the chassis. NOTE: The "0" and "p" terminals on this terminal strip must be connected together.
3. Adjust 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 in full mesh with the pointer properly set, then retighten the set screw.

<table>
<thead>
<tr>
<th>H.F. CONDENSER</th>
<th>CONTROL GRID OF G.M. TUBE</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>BAND SWITCH POSITION (INDICATED BY DIAL)</th>
<th>RECEIVER DIAMETER (INCHES)</th>
<th>TRIMMER NO.</th>
<th>TRIMMER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>465 KC</td>
<td>465 KC</td>
<td>BROADCAST</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1-2</td>
<td></td>
<td>AND I.F.</td>
<td>ADJUST FOR MAXIMUM OUTPUT. THEN REPEAT ADJUSTMENT.</td>
</tr>
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<td>6000 OHM CARBON RESISTOR</td>
<td>ANTENNA TERMINAL</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>5</td>
<td>WAVE TRAP</td>
<td>PORTANT GENERATOR SIGNAL</td>
<td>ADJUST FOR MINIMUM OUTPUT. USING A STRONG GENERATOR SIGNAL.</td>
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<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA TERMINAL</td>
<td>1500 KC</td>
<td>BROADCAST</td>
<td>6</td>
<td>BROADCAST</td>
<td>BROADCAST DIODE (SHUNT)</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA TERMINAL</td>
<td>600 KC</td>
<td>BROADCAST</td>
<td>9</td>
<td>BROADCAST</td>
<td>BROADCAST DIODE (SHUNT)</td>
<td>ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY ADJUSTING TRIMMER AND RETURNING RECEIVER DIAL UNLEASHER UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td>1200 OHM CARBON RESISTOR</td>
<td>ANTENNA TERMINAL</td>
<td>600 KC</td>
<td>BROADCAST</td>
<td>10</td>
<td>INTERMEDIATE</td>
<td>INTERMEDIATE DIODE</td>
<td>ADJUST FOR MAXIMUM OUTPUT. CHECK TO SEE IF PROPER RESISTANCE IS OBTAINED BY TUNING IN IMAGE AT APPROX. 10 MC. IF IMAGE DOES NOT APPEAR SHARP AT 6 MC, WITH TRIMMER SCREEN FURTHER OUT, ADJUST RESISTOR.</td>
</tr>
<tr>
<td>400 OHM CARBON RESISTOR</td>
<td>ANTENNA TERMINAL</td>
<td>20 MC</td>
<td>BROADCAST</td>
<td>12</td>
<td>FOREIGN</td>
<td>BROADCAST DIODE</td>
<td>ADJUST FOR MAXIMUM OUTPUT. TRY TO INCREASE OUTPUT BY ADJUSTING TRIMMER AND RETURNING RECEIVER DIAL UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
</tbody>
</table>

Top View of Chassis

©John F. Rider, Publisher
TUNING RANGE AND DIAL CALIBRATION

This receiver is designed to operate over the standard broadcast and South American Countries; also the popular 1712 kilocycle band which extends from 535 to 1720 Kilocycles (KCl) (174 to 580 KCl Police Band. Add a zero to figures on the scale to obtain Meters). The upper scale is calibrated from 55 to 170 (Standard Kilocycles). The lower scale is calibrated directly in meters. If strong Broadcasts, this band covers all Standard Broadcast frequencies, tons are listed by kilocycles (KCl). Use the upper scale and if of the United States, Canada, Mexico, Cuba and many Central they are listed by meters use the lower scale.

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 458, 600, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. 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 PROCEDE. 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 458 KC and connect the output to the grid of the first detector tube (12A8GT) 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. Remove chassis, and loop antenna from cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set up on a metal bench.

Connect the test oscillator to the antenna of the set through a 200 mfd. (.0002) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

CAUTION: NEVER LEAVE RECORDS ON TURNTABLE, EXCEPT WHILE PLAYING THEM. THE RECORDS WILL BECOME DAMAGED BY WARPING.
Models B2RC, B3RC and B4RC

IMPORTANT

All service adjustments on Motorola Record Changers should be made with the instrument in a normal operating position.

Before attempting to service or adjust this Record Changer, check the records first to make sure they are not scratched or damaged. The instrument will handle most of the 10 or 12 inch records now available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition and should not be by any means difficult to handle. Records that are too thick, too thin, or that are oversize of oversize, as regards diameter of center hole, are not all 10 and 12 inch records and the Changer will not play them.

Most of the 78 records, however, may be played out at a time.

The record support platform is adjustable for either 10 or 12 inch records, depending upon which "lip" is turned toward the source of the turntable. The platform may be swung in an arc of 180 degrees, so that either the 10 or 12 inch lip may point toward the spindle.

Underneath the mounting plate, an addendum to the platform support shaft is an eccentric mechanism which moves a push switch mounted near one corner of the mounting plate in contact with the automatic change switch previously discussed. When this switch is closed, it energizes the electro-magnet assembly in the same fashion as does the automatic change switch.

Theory of Operation

As in most modern phonograph turntables, power is derived from an electric motor. This power is transmitted to the turntable through a geared down pin drive of the friction type.

The turntable is keyed to a small drive pulley, which in turn drives a large (6 inch) pulley through a spring belt, both of which units being located on top of the base plate. (See Fig. 1). The 3 inch pulley transmits power by direct drive to another small pulley located under the mounting plate. This small pulley in turn drives the large (4 inch) main drive wheel, also located under the mounting plate.

When the turntable revolves, all of these pulleys and various mentioned above, also revolve regardless of which or what the changer is going through. As part of the changer revolves, the automatic change switch is activated, and the automatic change switch is actuated, which is a switch assembly in the eccentric groove of the record, through the spring wind which actuates the movable switch blade. If the switch fails to operate positively, the changeover mechanism automatically makes the changeover, thus preventing any misalignment of the adjustment screw as shown in Fig. 7. To make the adjustment, place a record on the turntable, start it revolving, and move the pick-up over to the end of the record. Adjust screw (F) until switch closes the magnets. Circuit breaker starts to open cycle. When points visually to make sure they do not remain closed after cycle is completed.

If the changer immediately starts another cycle, it is an indication that the points are not making or breaking. In such cases, adjusting the recording system (Fig. 6) does not have enough tension. This tension may be increased by setting it up another way.

Diagram of Automatic Change Switch

CIRCUIT BREAKER

AUTOMATIC CHANGE

SWITCH

MAGNET

ARMATURE

DRIVE PAWL

ELEVATING PIN

PICK-UP

REJECT SWITCH

ELECTRICAL CIRCUIT

FIG. 2

PICK-UP

ELEVATING PIN

AUTOMATIC

CHANGE

SWITCH

CIRCUIT BREAKER

FIG. 3
CHANGING CYCLE

By referring to the various photographs and figures which will be found in this service manual, you can readily follow through the changing cycle from the continuity given hereafter.

1. The needle in the pick-up finishes a record and enters the eccentric groove.

2. As the pick-up has already approached the eccentric groove, a phenolic bronze spring clip has gripped a pin of the automatic change switch.

3. When the needle enters the eccentric groove on the record, the pick-up oscillates slightly, which in turn causes the automatic change switch to make contact.

4. The first movement consists of the automatic change switch which is necessary to start the changing cycle. When the switch closes, a small electric magnet is energized. The electromagnet pulls a cam which is mounted to the cam wheel to fall down and engage in one of the notches which are provided on the upper surface of the main drive wheel. (See Fig. 2.)

![Diagram of Main Drive Wheel and Eccentric Cam]

5. Since the main drive wheel is already revolving, the engagement of the cam causes the cam wheel to revolve with it.

6. When the cam wheel starts to revolve, it causes several things to occur. In the first few degrees of revolution, it opens a circuit breaker switch (Fig. 3) which automatically opens the magnet circuit, thereby de-energizing it, to prevent "chattering.

![Diagram of Circuit Breaker Switch and Trip Lever]

7. The next few degrees of rotation causes the pick-up elevating pin to rise up on an inclined section of the cam, thereby elevating the pick-up and lifting the needle from the record which has just been played. (See Fig. 3.)

8. A few more degrees of revolution causes the pick-up guide groove on top of the cam wheel. This part of the mechanism is not visible, since the cam wheel is mounted too close to the mounting plate, but Fig. 4 shows a drawing of the upper surface of the cam wheel. At the cam wheel revolves with the pin in the groove, it causes the pick-up to swing out beyond the edge of the record so it will not be out of the way when the next record falls on the turntable.

9. The cam wheel continues its revolution, and at another point on its circumference a roller on the end of the trip-lever rides up an inclined section on the cam. This trip-lever is the cooper-plated rod which is hinged approximately in the center by running through a die cast fulcrum block. As the roller on one end of the trip-lever rolls up the incline of the cam, the other end of the trip-lever bears against the push rod which operates the record release, which is located near the top of the spindle, causing it to push the next record off its support, thereby dropping it on the turntable. (See Fig. 5.)

10. The cam continues to revolve, the groove in the top bringing the pick-up back over the edge of the record to the proper position where the needle will fall near the first groove when it comes down.

11. A few more degrees of revolution, and the pick-up elevating pin rides down another incline, permitting the needle to settle gently on the first groove of the record. (Fig. 5.)

12. At this point, the cam has completed one full revolution of 360 degrees. At the same time the needle touches the record, the drive pulley hits the magnet armature, which forces it up, thereby disengaging it from the notch in the drive wheel. The cam wheel therefore stops, the turntable continues to revolve, and the record is played.

13. During the last few degrees of revolution, the circuit breaker switch has again been closed, as its fibre stud rides up an incline on the lower surface of the cam. (Fig. 3.) This switch must be closed at all times except when the instrument is going through a changing cycle, otherwise, it would be impossible to start a new changing cycle automatically.

![Diagram of Spindle Cap, Record Release Trigger, and Trip Lever]

---

FIG. 6

MAIN DRIVE WHEEL
10'-12' ECCENTRIC CAM

TRIP LEVER
LOCKNUT @
ADJUSTMENT SCREW 

10'-12' SELECTOR LEVER

FIG. 5

SPINDLE CAP
RECORD RELEASE TRIGGER
PUSH-ROD
FULCRUM
SPRING

FIG. 4

ECCEITRIC CAM
GUIDE PIN
GUIDE GROOVE
STOP PIN
SELECTION LEVER
CAME WHEEL

FIG. 3

ECCEITRIC CAM
GUIDE PIN
GUIDE GROOVE
STOP PIN
SELECTION LEVER
CAME WHEEL

FIG. 2

TO ADJUST PICK-UP POSITION

This adjustment is made to change the needle to drop in the first groove of the record, as the Changer completes each cycle.

1. Turn the record support to the 10 inch position. (See Fig. 1.)
2. Place a standard 10 inch record on the turntable and start it revolving.
3. Press the "Start-Reverse" button. The Changer will now start a changing cycle.
4. Do not let the Changer complete the cycle, but stop it at the point where the pick-up starts to drop down towards the outer rim of the record. If the cycle is stopped at the right point, the pick-up will still be "in cycle" and will not be free to swing back and forth. Check this gently. Do not exert too much sidewise pressure on the pick-up.
5. Now loosen the two hex-nosed set screws (A) in the ball crank casting (B), which you can see in Fig. 7.
6. With the set screws loose, the pick-up arm can now be moved back and forth. Move it to the point where the needle rests directly over the first groove of the record.

TO ADJUST PICK-UP RELEASE

1. Place a stack of 10 inch records on the changer, after turning the record support platform to the "10 inch" position.
2. Start the turntable revolving.
3. Press the "Start-Reverse" button.
4. If the first record does not drop to the turntable, double check the record to make sure that it is not too thick, or that the diameter of the center hole is not undersized, causing it to bind.
5. If the record proves to be normal, and is not causing the failure, loosen lock nut (C) which locks adjustment screw (D), as shown in Figs. 6, 8, or 7.
6. With a slab-head wrench, turn screw (E) a fraction of a turn clockwise, and press the "Start-Reverse" button again, checking to see if record is released.
7. If the record fails to drop, tighten screw (E) a trifle at a time, testing after each adjustment, until setting is reached, which releases record.
8. Tighten lock nut (C), after which a few more records would be changed, to make sure that this did not alter adjustment of screw (D).

NOTE: If the Changer stalls during the adjustment procedure, it may be an indication that screw (D) is too tight, in which case it should be turned back (counter-clockwise).

TO LINE UP RECORD PLATFORM

It is important that all points on the "lip" of the record support platform be equidistant from the center point of the spindle. This will assure that all points on the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly.

1. To check this alignment, turn the spindle-cap so it is in alignment with the rest of the spindle, which is the correct position for removing records. (See Fig. 8.)
2. Turn the record support platform to the "10 inch record" position, making sure it is turned all the way to the stop.
3. Slip a standard 10 inch record over the spindle and check to make sure it clears the lip of the platform at all points. (See Fig. 9.)
4. If one point on the lip extends farther than the other, the position of the record support may be adjusted after loosening the two hex-nosed set screws (E), located directly under the numeral "10" on the record support. (See Fig. 9.)

CAUTION: Make sure the eccentric selector arm, which is located near the base, is turned all the way to its stop. (See Fig. 4.)

TEST: After tightening the set screws, test the adjustment by running a 10 inch record through a complete cycle and check the point where the needle rests. If the needle misses the record by one inch, the record platform is 360 degrees, out of line with the eccentric arm, and should be turned one-half turn without turning the arm.
VOLTAGE
* Bias -3 V. from B stick.
** Bias -2.5 V. from B stick.
*** Bias -16 V. from B stick.
Current - 5.6 Amps, at 6.3 Volts.
Maximum power output - 8 watts.

For all readings from chassis ground
with 1000 ohms per volt meter.

For Elect. Automatic Tuner, see Model EST Tuner ** Vol. X
Model 550
ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker and battery connected to it.
Turn the voltage control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

1. If necessary, adjust the trimmer in the I.F. coil can that is covered with Scotch Tape. The original adjustment, made in the factory, should not be tampered with. (Fig. 1 below, shows all trimmer locations.)

2. Adjust the 1400 K.C. I.F. trimmer in the R.F. coil can for maximum output reading.

3. Set the signal generator at 880 K.C. and turn the condenser gang until the signal is highest. Adjust the antenna condenser for maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

Model 22-S
Model 25-N
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Connect the power and battery.

Turn the voltage control to maximum positions and leave there throughout the alignment, reducing the signal generator output if necessary.

NOTE: If the radio is to be operated on a Motorola Booster antenna, a special dummy antenna accessory part No. D-1150 must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Connect the signal generator to the antenna lead through a 100 K.C. condenser.

2. Turn the signal generator on at 880 K.C. and adjust the trimmer in the I.F. coil can for maximum output reading.

3. Adjust the trimmer in the I.F. coil can for the point showing the highest output reading.

4. Recheck the I.F. and Diode adjustment for maximum accuracy.

R.F. ALIGNMENT

1. Change to 40 M.F. condenser in signal generator lead. Set signal generator at 1200 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

2. Set the signal generator at 900 K.C. and turn the condenser gang to the point showing the highest output reading.

Sensitivity and Stage Gain Measurements

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 M.F. condenser; with a 100 K.C. resistor connected as a load resistance between the grid terminal of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. D-1150, in place of the .1 M.F. It must be remembered that the figures in the table are average and allowances must be made for variations between two sets of the same general type, due to differences of tube characteristics, etc.

Model 550

<table>
<thead>
<tr>
<th>Model 550</th>
<th>Model 22-S</th>
<th>Model 25-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTENNA LEAD</td>
<td>GENERATOR</td>
<td>GENERATOR</td>
</tr>
<tr>
<td>INPUT</td>
<td>FEEDER</td>
<td>CONNECTED TO</td>
</tr>
<tr>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>42,000</td>
<td>250 K.C.</td>
<td>I.F. Grid</td>
</tr>
<tr>
<td>600</td>
<td>250 K.C.</td>
<td>Mod. Grid</td>
</tr>
<tr>
<td>960</td>
<td>500 K.C.</td>
<td>.5 M.F.</td>
</tr>
<tr>
<td>40</td>
<td>500 K.C.</td>
<td>R.F. Grid</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
</tr>
</tbody>
</table>

* For one watt output.
** Meter connected across noise coil.
1.76 volts equals 1 watt output for 5 cm voice coil.

NOTE: If not used with a Motorola Booster antenna, substitute a 40 M.F. condenser for the Special Dummy.

Model 22-S

<table>
<thead>
<tr>
<th>Model 22-S</th>
<th>Model 25-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTENNA LEAD</td>
<td>GENERATOR</td>
</tr>
<tr>
<td>INPUT</td>
<td>FEEDER</td>
</tr>
<tr>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>15,000</td>
<td>460 K.C.</td>
</tr>
<tr>
<td>180</td>
<td>460 K.C.</td>
</tr>
<tr>
<td>200</td>
<td>600 K.C.</td>
</tr>
<tr>
<td>50</td>
<td>600 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* For one watt output.
** Meter connected across noise coil.
1.76 volts equals 1 watt output.
Sensitivity and Stage Gain Measurements

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 µF condenser, with a 1000 Ω 1/2 watt resistor connected as shunt 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 special dummy, part No. 1118018, in place of the .1 µF. 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 type, due to difference of tube characteristics, etc.

### Average Microwatt Input

<table>
<thead>
<tr>
<th>Gain</th>
<th>Generator Feeder Connected to</th>
<th>Antenna Capacity</th>
<th>Leakt</th>
<th>Output Power Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000</td>
<td>12,000</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.5</td>
</tr>
<tr>
<td>1,000</td>
<td>240</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>500</td>
<td>100</td>
<td>1000 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>500 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
</tr>
</tbody>
</table>

*For one watt output.*

*Note: If set is not used with a Motorola booster antenna, substitute a 40 µF condenser for the Special Dummy.*

Model No. 27-D-6

Specifically Designed to be Installed in 1940

**Chrysler, DeSoto, Dodge, Plymouth**

Sensitivity and Stage Gain Measurements

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 µF condenser, with a 1000 Ω 1/2 watt resistor connected as shunt 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 special dummy part No. 1118018, in place of the .1 µF. 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 type, due to different of tube characteristics, etc.

### Average Microwatt Input

<table>
<thead>
<tr>
<th>Gain</th>
<th>Generator Feeder Connected to</th>
<th>Antenna Capacity</th>
<th>Leakt</th>
<th>Output Power Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.5</td>
<td>.5 Wm</td>
</tr>
<tr>
<td>1,000</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.1 Wm</td>
</tr>
<tr>
<td>500</td>
<td>1000 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.1 Wm</td>
</tr>
<tr>
<td>50</td>
<td>500 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.1 Wm</td>
</tr>
</tbody>
</table>

*For one watt output.*

*Note: If set is not used with a Motorola booster antenna, substitute a 40 µF condenser for the Special Dummy.*

Model No. 34K-6 and 34K-7

For 1940 Packard

Alignment Procedure

1. Connect the signal generator to the control grid of the oscillator tube and to chassis ground with a 1500 Ω 1/2 watt resistor in series with lead. Turn the condenser gauge completely out. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 455 K.C. and carefully adjust the trimmer in the grid coil can to the point showing the highest output reading. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

### R.F. Alignment

1. Connect the signal generator at 455 K.C. and turn the condenser gauge to the point showing the highest output reading.

2. Set the signal generator at 1200 K.C. and adjust the antenna trimmer to the point showing the highest output reading.

### I.P. Alignment

1. If the radio is to be operated on a Motorola booster antenna, a special dummy antenna (Motorola part No. 1118010) must be lead in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

2. Set the signal generator at 1200 K.C. and with the condenser gauge still completely out of mesh, adjust the oscillator trimmer in the point showing the highest output reading.

3. Set the signal generator at 1200 K.C. and turn the condenser gauge to the point showing the highest output reading.

4. Set the signal generator at 600 K.C. and turn the condenser gauge until the dial pointer reads 000 K.C. Adjust the oscillator band to the point showing the highest output reading.

5. Leave the signal generator set at 600 K.C. and adjust the antenna trimmer in the point showing the highest output reading.

6. Leave the signal generator set at 600 K.C. and adjust the antenna trimmer in the point showing the highest output reading.

7. Leave the signal generator set at 600 K.C. and adjust the antenna trimmer in the point showing the highest output reading.
Model 38-F
SPECIFICALLY DESIGNED TO INSTALL IN 1941 FORD AND MERCURY

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>GAIN CONTROLLER</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR</th>
<th>ADJUST</th>
<th>GENERATOR CONNECTED TO</th>
<th>TUNING NO. SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN ORDER</td>
<td>SET AT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid 1-2-3-4</td>
<td>3960 K.C.</td>
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<tr>
<td>2</td>
<td>1000 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid 1-2-3-4</td>
<td>1800 K.C.</td>
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<td>3</td>
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<td>Special Dummy</td>
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<td>1400 K.C.</td>
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<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>.1 Mfd.</td>
<td>Special Dummy</td>
<td>8</td>
<td>1400 K.C.</td>
<td></td>
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<tr>
<td>5</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>Special Dummy</td>
<td>9</td>
<td>500 K.C.</td>
<td></td>
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</tbody>
</table>
| * Use special dummy Part No. 2506707 or Booster Coil Part No. 24828761

in series with a 30 Maf. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>AVERAGE MICROWATT GENERATOR INPUT</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR CONNECTED TO DUMMY ANTENNA</th>
<th>LEAK OUTPUT</th>
<th>CAPACITY</th>
<th>RESISTANCE MEASURING</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>500 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>700 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>1000 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>2000 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>2500 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>3000 K.C.</td>
<td>I.P. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Maf.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>Volume Control Set at Maximum</td>
<td>Tone Control Set at Voice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| * Use Special Dummy Part No. 2506707 or Booster Coil Part No. 24828761

in series with a 30 Maf. condenser.

DIAL CORD INSTRUCTIONS

TUNING CORD
1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gear to fully seated position.
4. Cut a length of 30 lb. silk fish cord 80 inches long.
5. Thread one end of cord through hole (X) in drive pulley and with an ordinary paper clip fasten it to the tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one half turn around drive pulley and up to tuning shaft. (See Fig. 2.)
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction, one full turn to hole (X).
( See Fig. 2.)

TUNING CORD—Continued
9. Thread the cord ends (inside pulley) through eyelet (Part No. 257684) and knot cord ends together.
10. Fasten one end of spring (Part No. 4A14789) to cord and the other end to hole (Y) in drive pulley.
11. Cut off surplus cord and place a drop of shellac on cord knot.

POINTER CORD
1. Remove the chassis from the housing, and place on service bench.
2. Remove broken string.
3. Set condenser gear to fully closed position.
4. Cut a length of 15 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (C) in condenser pulley and with an ordinary paper clip fasten it to the tuning bracket to hold it in place. (See Fig. 3.)
6. In a clockwise direction run cord to idler pulley No. 1.
7. Route cord around idler pulley No. 1, as shown in Fig. 3, and then across chassis to idler pulley No. 2.
8. Continue around idler pulley No. 2 as shown in Fig. 3 and back across chassis to idler pulley No. 3.
9. Route cord around idler pulley No. 3 and in a clockwise direction around condenser pulley to hole (D).
10. Remove the paper clip from other end of cord and knot the two cord ends together inside of condenser pulley. Fasten one end of tension spring (Part No. 4A14796) to cord and other end to hole (D) in the condenser pulley. Place a drop of shellac on cord knot.
11. Cut off surplus cord and replace pointer.
12. To set pointer to correct frequency, turn in a station of known frequency and adjust pointer on cord. Fasten pointer to cord with a drop of shellac.
For 1941 PLYMOUTH, DODGE, DE SOTO and CHRYSLER

Sensitivity and Stage Gain Measurements - Model 370-1

Average

<table>
<thead>
<tr>
<th>Microvolt</th>
<th>Generator</th>
<th>Dummy</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set At</td>
<td>Feeder</td>
<td>Antenna</td>
<td>Capacity</td>
</tr>
<tr>
<td>30,000</td>
<td>I.F. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>470</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>550</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>500</td>
<td>R.F. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>400</td>
<td>Ant. Lead</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum
- Max. Watt = 1.74 Volts
- Output meter connected across voice coil.
- Use Special Dummy Part No. X227677 or Booster Coil Part No. 24B26751 in series with a 50 mF condenser.

Sensitivity and Stage Gain Measurements - Model 370-2

Average

<table>
<thead>
<tr>
<th>Microvolt</th>
<th>Generator</th>
<th>Dummy</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set At</td>
<td>Feeder</td>
<td>Antenna</td>
<td>Capacity</td>
</tr>
<tr>
<td>9,500</td>
<td>I.F. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>250</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
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<tr>
<td>300</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>300</td>
<td>R.F. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
<tr>
<td>95</td>
<td>Ant. Lead</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum
- Max. Watt = 1.74 Volts
- Output meter connected across voice coil.
- Use Special Dummy Part No. X227677 or Booster Coil Part No. 24B26751 in series with a 50 mF condenser.

To Retaining Pointer Cord - Models 370-1 and 370-2

Remove push-button tone switch assembly, (bend switch on J77-1 only) and control head from chassis. (This requires removal of three (two on J77-2) screws from the front end of the control head, one from the J77-1 and one (J77-2 only) of the control head, and a "w" washer from the volume control shaft.)

Cut a 50 inch length of 1/8 insilk fish cord.

Lay control head on service bench and route cord through the two eyelet holes and around idler pully, exactly as shown in Fig. 5.

Adjust cord so both ends are approximately equal length and idle pully, exactly as shown in Fig. 6.

Set point at approximately 550 K.C. on dial scale and tighten cord on pointer clips. Center pointer to a drop of shellac on control head. (See Fig. 5.)

Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.

Turn gang to fully meshed position. This will place hole in condenser pulley at the top.

Remove paper clip from cord and clip to control head as shown in Fig. 5.

Cut 1/8 inch of cord, (J77-1 only) and tie a "w" washer from the volume control shaft.

Cut a 20 inch length of 1/8 insilk fish cord.

Lay control head on service bench and route cord through the two eyelet holes and around idler pulley, exactly as shown in Fig. 5.

Attach cord so both ends are approximately equal length and idle pully, exactly as shown in Fig. 6.

Set point at approximately 550 K.C. on dial scale and tighten cord on pointer clips. Center pointer to a drop of shellac on control head. (See Fig. 5.)

Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.

Remove the chassis from the housing, and place on service bench with the tuning unit. (See Fig. 5.)

Place a drop of shellac on control head. (See Fig. 5.)

Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.

Turn gang to fully meshed position. This will place hole in condenser pulley at the top.

Remove paper clip from cord and clip to control head as shown in Fig. 5.

Cut 1/8 inch of cord, (J77-1 only) and tie a "w" washer from the volume control shaft.

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Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.

Remove the chassis from the housing, and place on service bench with the tuning unit. (See Fig. 5.)

Place a drop of shellac on control head. (See Fig. 5.)

Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.

Turn gang to fully meshed position. This will place hole in condenser pulley at the top.

Remove paper clip from cord and clip to control head as shown in Fig. 5.

Cut 1/8 inch of cord, (J77-1 only) and tie a "w" washer from the volume control shaft.

Cut a 20 inch length of 1/8 insilk fish cord.

Lay control head on service bench and route cord through the two eyelet holes and around idler pulley, exactly as shown in Fig. 5.

Attach cord so both ends are approximately equal length and idle pully, exactly as shown in Fig. 6.

Set point at approximately 550 K.C. on dial scale and tighten cord on pointer clips. Center pointer to a drop of shellac on control head. (See Fig. 5.)

Mount control head and tone switch (tone switch on J77-1 only) back on chassis. Replace "w" washer on volume control shaft.
TUNING CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 26 inches long.
5. Thread one end of cord through slot (B) in drive pulley and wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2).
6. Assemble the pulleys and fasten to drive shaft with hooks (C) in drive pulley.
7. Route cord around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through slot (E).
9. Slip the two cord ends through eyelet (Part No. 627/628) inside of pulley.
10. Knot the two ends together and fasten to eyelet (Part No. 4141775). Hook other end of spring to hole (C) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord through slot (A) in condenser pulley and wind cord one full turn around condenser pulley to hold in place. (See Fig. 3).
6. In a clockwise direction, run cord around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and down over idler pulley No. 1.
9. Route cord down and around condenser pulley one-half turn to slot (A).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No. 4141775) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

ALIGNMENT CHART MODEL 38-0

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser</th>
<th>Dummy Antenna</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td>Set At</td>
<td>Connected To</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-2-5-4</td>
<td>250 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>545 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
<td>545 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* Use special dummy Part No. 1247876 or booster coil Part No. 24K28751 in series with a 35 Mfl. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microvolt</th>
<th>Generator Feeder</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,700</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfl.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfl.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfl.</td>
<td>1.74</td>
</tr>
<tr>
<td>12</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfl.</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum.
* 1 Watt = 1.74 Volts.
** Output meter connected across voice coil.
*** Use special dummy Part No. 1247876 or booster coil Part No. 24K28751 in series with a 35 Mfl. condenser.
**Model 40-P**

**SPECIFICALLY DESIGNED TO INSTALL IN 1941 PONTIAC**

**Model 43-H**

**SPECIFICALLY DESIGNED TO INSTALL IN 1941 HUDSON**

**Model 44-K**

**SPECIFICALLY DESIGNED TO INSTALL IN 1941 PACKARD**

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To Generator</th>
<th>Adjust Trimmer No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1800 K.C.</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>2800 K.C.</td>
<td>To Special Dummy</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>500 K.C.</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 13202767 or Booster Coil Part No. 244327651 in series with a 35 Mfd. condenser.

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000</td>
<td>285 K.C.</td>
<td>.1 Mfd.</td>
<td>1.2 Meq.</td>
<td>1.74</td>
</tr>
<tr>
<td>950</td>
<td>285 K.C.</td>
<td>.1 Mfd.</td>
<td>1.2 Meq.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>285 K.C.</td>
<td>.1 Mfd.</td>
<td>1.2 Meq.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>500 K.C.</td>
<td>.1 Mfd.</td>
<td>1.2 Meq.</td>
<td>1.74</td>
</tr>
<tr>
<td>15</td>
<td>500 K.C.</td>
<td>Ant. Lead</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum

Tone Control Set at Voice Position

**MODEL 40 P**

**DIAL CORD INSTRUCTIONS**

**POINTER CORD**

Remove the chassis from housing and place on service bench.

Remove broken string.

Turn the gang to fully opened position.

Cut a length of 15 lb. silk fish cord 27 inches long.

Thread one end of cord thru hole (a) in pointer pulley and with an ordinary paper clip fasten it to the tuning shaft bracket then place it in the finished place in Fig. 2.

In a counter-clockwise direction route cord to idler pulley No. 3 and around it in a clockwise direction.

Route cord across chassis to idler pulley No. 2 and around it in a clockwise direction.

Route cord back across chassis and down over idler pulley No. 1.

Route cord down and around pointer pulley to hole (a).

Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley.

Fasten one end of spring (Part No. 41A14101) to cord and the other end to hook in pointer pulley.

Cut off surplus cord. Place a drop of sealed on cord knot.

To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of sealed.

**TUNING CORD**

Remove the chassis from housing and place on service bench.

Remove the broken string.

Turn the gang to fully meshed position.

Cut a length of 30 lb. silk fish cord 28 inches long.

Thread one end of cord thru hole (b) in drive pulley and with an ordinary paper clip fasten it to tuning shaft bracket so that cord will stay in place.

In a counter-clockwise direction, wind cord one full turn around drive pulley and up to idler pulley No. 5.

Continue around idler pulley No. 5 and down to tuning shaft.

Drop cord four full turns in a counter-clockwise direction around tuning shaft and continue down to idler pulley No. 4.

Continue in a counter-clockwise direction around idler pulley No. 4 and to hole (b) in drive pulley.

Thread both ends of cord (inside pulley) thru stilet (Part No. 527001) and knot both ends together.

Fasten one end of spring (Part No. 41A10501) to cord and other end to hole in drive pulley. See Fig. 2.

Place a drop of sealed on cord knot.
B.C. OSC. TRIMMER (UPPER)
ADJUST AT 1600 K.C.

SW. ANT. TRIMMER (LOWER)
ADJUST AT 3.2 M.C.

LOOP ANT TRIMMER
ADJUST AT 1400 K.C.-USE INSULATED SCREWDRIVER

ALIGNMENT CHART

Volume Control Set at Maximum

OPERATIONS GAN G CONDENSER
IN ORDER SET AT DUMMY ANTENNA BAND SWITCH SET AT GENERATOR CONNECTED TO ADJUST. TRIMMERS No. GENERATOR SET AT

1 Minimum
1600 K.C. 1 B.C. Osc-Mod. Grid 1-2-3-4 455 K.C.
2 Minimum 400 ohms B.C. External Antenna Terminal 5 1600 K.C.
3 1400 K.C. 400 ohms B.C. External Antenna Terminal 6 1400 K.C.
4 3.2 M.C. 400 ohms S.W. External Antenna Terminal 7 3.2 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>MICROVOLT</th>
<th>GENERATOR SET AT</th>
<th>GENERATOR FEEDER CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>LEAK RESISTOR</th>
<th>OUTPUT METER READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Neg.</td>
<td>.38</td>
</tr>
<tr>
<td>70</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Neg.</td>
<td>.38</td>
</tr>
<tr>
<td>90</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Neg.</td>
<td>.38</td>
</tr>
<tr>
<td>25</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Neg.</td>
<td>.38</td>
</tr>
<tr>
<td>3</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 ohms</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

Volume Control set at Maximum
* .05 Watts = .38 Volts

** Output Meter connected across voice coil
### ALIGNMENT CHART MODELS S60-494, S60-514, S612-500

#### SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS S60-494-500-505-506-507-508-509

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser</th>
<th>Dummy Generator</th>
<th>Adjust Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>4</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maxima.**

- **.05 Watts .35 Volts.**
- **Output meter connected across voice coil.

#### SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS S60-500-505

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser</th>
<th>Dummy Generator</th>
<th>Adjust Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>4</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maxima.**

- **.05 Watts .35 Volts.**
- **Output meter connected across voice coil.

#### SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS S60-506-507-508

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser</th>
<th>Dummy Generator</th>
<th>Adjust Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum 1700 K.c.</td>
<td>.1 Mfd.</td>
<td>1.0 Mfd.</td>
</tr>
<tr>
<td>4</td>
<td>Minimum 1700 K.c.</td>
<td>.2 Mfd.</td>
<td>2.0 Mfd.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maxima.**

- **.05 Watts .35 Volts.**
- **Output meter connected across voice coil.

#### VOLUME CHART MODELS S60-494-500-505-506-507-508

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs-Mos.</td>
<td>65</td>
<td>65</td>
<td>0</td>
</tr>
<tr>
<td>LV</td>
<td>65</td>
<td>65</td>
<td>0</td>
</tr>
<tr>
<td>40-40-VAC-AP</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>16-16-AP</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
</tbody>
</table>

All voltages measured from common negative. Line Voltage 117 Volts A.C.

**VOLUME CHART MODEL S60-507-508**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>40-40-VAC-AP</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>16-16-AP</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Obs-Mos.</td>
<td>75</td>
<td>75</td>
<td>0</td>
</tr>
</tbody>
</table>

Measurements from socket terminal to chassis ground using 1000 ohms per voltmeter.
Line Voltage - 117 Volts A.C.
SPECIFICALLY DESIGNED TO INSTALL IN 1941 STUDEBAKER

TUNING CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully opened position.
5. Thread one end of cord through slot (B) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2).
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through slot (B). Tie it to a spring (Part No. 41A14758). Hook other end of spring to hole (C) in drive pulley.
9. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open position.
5. Thread one end of cord through slot (A) in condenser pulley and with an ordinary paper clip fasten it to tuning shaft bracket to hold in place. (See Fig. 2).
6. In a clockwise direction run cord around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and down over idler pulley No. 1.
9. Route cord down and around condenser pulley one-half turn to slot (A).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No. 41A11091) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

SENSITIVITY AND GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Input</th>
<th>Generator</th>
<th>Dummy</th>
<th>Output Meter</th>
<th>Leakage</th>
<th>Capacity</th>
<th>Resistance</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.360</td>
<td>220 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>220 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>710</td>
<td>400 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>400 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>1.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>400 K.C.</td>
<td>To Special Dummy</td>
<td>None</td>
<td>None</td>
<td>1.74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum. 1 Watt = 1.74 Volts.

Tone Control Set at Voice.

Use Special Dummy Part No. 1328787.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang</th>
<th>Condenser</th>
<th>Dummy</th>
<th>Generator</th>
<th>Adjust Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td></td>
<td>Set At</td>
<td>Set At</td>
<td>Connected To</td>
<td>Trimmers No. Set At</td>
</tr>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-2-3-4</td>
<td>223 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1200 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
<td>1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>540 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>6</td>
<td>540 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1200 K.C.</td>
<td>e</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>1200 K.C.</td>
<td>e</td>
<td>To Special Dummy</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>800 K.C.</td>
<td>e</td>
<td>To Special Dummy</td>
<td>9</td>
<td>800 K.C.</td>
</tr>
</tbody>
</table>

Use Special Dummy Part No. 1328787 or Booster coil Part No. 2445275L in series with a 35 Mfd. condenser.
**MODEL 45E TUNING CORD**

1. Remove the chassis from the housing and place on service bench.
2. Remove the broken string.
3. Turn the gong to fully meshed position.

5. Thread one end of cord thru hole (A) in drive pulley and with an ordinary paper clip fasten to tuning shaft bracket so that cord will stay in place.
6. In a clockwise direction wind cord one full turn around drive pulley and up to tuning shaft. See Fig. 2.
7. Route cord 1 turn around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley to hole (A).
9. Thread both ends of cord (inside pulley) thru eyelet (Part No. 507984) and knot ends together.
10. Pass one end of spring (Part No. 41A14769) to cord and other end to hole (B) in drive pulley.
11. Cut off surplus cord and place drop of shellac on cord knot.
12. Pinch eyelet on cord with a pair of pliers.

**MODEL 44K TUNING CORD**

1. Remove the chassis from the housing and place on service bench.
2. Remove the broken string.
3. Turn the gong to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 26 inches long.
5. Thread one end of cord thru hole (B) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2.)
7. Route cord 1 turn around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley to hole (B).
9. Slip the two cord ends through eyelet (Part No. 507984) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41A14769). Hook other end of spring to hole (B) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

**POINTER CORD**

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gong to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord thru hole (C) in pointer pulley and with an ordinary paper clip fasten to the tuning shaft bracket to hold in place. (See Fig. 3.)
6. In a counterclockwise direction route cord to idler pulley No. 1 and around it in a clockwise direction.
7. Route cord across chassis to idler pulley No. 2 and around it in a clockwise direction.
8. Route cord back across chassis and around idler pulley No. 3.
9. Route cord counterclockwise around pointer pulley to hole (C).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley.
11. Pass one end of spring (Part No. 41A13921) to cord and the other end to hole in pointer pulley.
12. Cut off surplus cord. Place a drop of shellac on cord knot.
13. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of shellac.

**TUNING SHAFT**

- Figure 2
- Figure 3
- Figure 4

**IDLER PULLEYS**

- Figure 2
- Figure 3

**DRIVE PULLEY**

- Figure 2
- Figure 3

**CONDENSER PULLEY**

- Figure 2
- Figure 3

**ODAL PLAYER**

- Figure 2
- Figure 3

**MODEL 44K**

- Figure 2
- Figure 3
TUBE

6A7  Osc.-Mod.  160  90  0  160
6DG  IF      160  90  3.5  --
2527GT Det.-Ave.  95  --  0  --
25B6G  Output  190  160  28  --
2525** Output  190  160  28  --
Rect. Pl--0  --  X1--0
PZ--195  --  X2--100

PLATZ  SCREEN  CATHODE  OSC. PLATE

IF PEAK 455 KC

* Bias -1.5 V. from bias cell.
** Voltage doubler tube.

Measurements from B-- to socket terminal, using 1000 ohms per volt meter.
Model 45-N

SPECIFICALLY DESIGNED TO INSTALL IN 1941 NASH

DIAL CORD INSTRUCTIONS

TUNING CORD

Remove the die cast escutcheon and the bottom cover from the receiver. The escutcheon is fastened by means of 9 screws and the bottom cover is fastened with two nuts and lockwashers.

Remove the broken string.

Cut a length of 20 lb. silk fish cord 26 inches long.

Thread one end of cord thru hole (x) in drive pulley and with an ordinary paper clip fasten cord to tuner bracket so that cord will stay in place.

(Cont. in next column)

SENSITIVITY AND NOISE GAIN MEASUREMENTS

Average Microvolt Generator Generator Dummy Leak Output Generator
Input Set At Connected To Power Cavity Capacity Meter Resistance Reading

25,000 300 X.C. I.P. Grid .1 MFD .5 Meg. 1.77
635 635 X.C. Mod. Grid .1 MFD .5 Meg. 1.77
16 635 X.C. Mod. Grid .1 MFD .5 Meg. 1.77
8 600 X.C. R.F. Grid .1 MFD .5 Meg. 1.79

Volume Control Set at Maximum. Tone Control Set at Voice.

* 1 Watt = 1.74 Volts.
** Output meter connected across voice coil.
*** Use Special Dummy Part No. 1226767.

ALIGNMENT CHART

Operations Using Dummy Generator
In Order Dummy Generator Connected To Adjust Generator
Set At Antenna Connected To Frequency No. Set At

1 Minimum .1 MFD Geo.-Mod Grid 1-8-3-4 262 X.C.
2 1600 X.C. .1 MFD Geo.-Mod Grid 5 1600 X.C.
3 265 X.C. .1 MFD Geo.-Mod Grid 6 265 X.C.
4 1600 X.C. To Special Dummy 7 1600 X.C.
5 1600 X.C. To Special Dummy 8 1600 X.C.
6 600 X.C. To Special Dummy 9 600 X.C.

* Use Special Dummy Part No. 1226767 or Booster Coil Part No. 24526761 in series with a 36 Mfd. Condenser.

In a counter-clockwise direction wind cord one turn on drive pulley and route to idler pulley No. 4. See Fig. 2.

Route cord through idler pulley No. 4 and down to tuning shaft.

Wind four full turns in a clockwise direction on tuning shaft and continue down to idler pulley.

Route cord under idler pulley No. 5 and to hole (x) in drive pulley.

Thread cord ends through eyelet (Part No. 677684) inside of pulley.

Fasten end of spring to one end of idler pulley (Part No. 41A14756). Hook other end of idler to hole (y) in idler pulley.

With a pair of pliers pinch eyelet on cord and place drop of seal on cord knot.

POINTER (Cont.)

1. Remove the die cast escutcheon and the bottom cover from the receiver (see step 1 above).
2. Remove the broken string.
3. Turn gang to fully opened position.
4. Cut a length of 10 lb. silk fish cord 27 inches long.
5. Thread one end of cord thru hole (c) in condenser pulley. See Fig. 3. With an ordinary paper clip fasten to tuner bracket so that cord will stay in place.
6. Route cord in a counter-clockwise direction from hole (c) to idler pulley No. 1.
7. Route cord clockwise around pulley No. 1 and across chassis to idler pulley No. 2.
8. Continue counter-clockwise around pulley No. 2 and back across the chassis to idler pulley No. 3.
9. Continue around idler pulley No. 3 and in a counter-clockwise direction around condenser pulley to hole (c).
10. Remove the paper clip and knot the two ends of cord together inside of pulley. Fasten one end of spring (Part No. 41A14781) to cord and hook other end to hole in condenser pulley. Place a drop of seal on cord knot.
11. Cut off surplus cord and assemble pointer to cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten with a drop of seal.
13. Minor calibration errors may be corrected by loosening set screw (2) in drive pulley and moving condenser pulley. Tighten set screw (3) after adjustment.

MODEL 45-N

Figure 2

Figure 3
FOR OTHER DATA, SEE INDEX
CIRCUIT DIAGRAM MODELS 57BP1 & 2

FOR OTHER DATA, SEE INDEX

CIRCUIT DIAGRAM MODELS 65BP1-2-3-4
### Alignment Chart Models 548A-1-2

#### Operations in Order

<table>
<thead>
<tr>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

#### Gage Condenser Set At

| 1950 K.C. |
| 1790 K.C. |
| 1790 K.C. |

#### Dummy Antenna

| 1300 K.C. |
| 200    |
| 200    |

#### Generator Connected To

| 1200 K.C. |
| 800    |
| 1400 K.C. |

#### Adjust Transformers No.

| 1-6-5-4 |
| 2       |
| 8       |

#### Generator Set At

| 450 K.C. |
| 450 K.C. |
| 1800 K.C. |

#### Volume Control Set at Maximum

### Sensitivity and Stage Gain Measurements Models 548A-1-2

#### Average Microwell Input

| 4000 |
| 8000 |
| 12000 |

#### Generator Pad Set At Connected to Dummy Antenna

| I.F. Grid |
| Mod. Grid |
| Ant. Terminal |

#### Sensitivity Resistance Reading

| .5 Meg |
| .5 Meg |
| .5 Meg |

#### Output Meter Resistance Reading

| .36 |
| .36 |
| .36 |

### Alignment Chart Models 548B-1-2-3-4

#### Operations in Order

| 1         |
| 2         |
| 3         |

#### Gage Condenser Set At

| 1790 K.C. |
| 1790 K.C. |
| 1400 K.C. |

#### Dummy Antenna

| 200    |
| 200    |
| 200    |

#### Generator Connected To

| 1-6-5-4 |
| 8       |
| 7       |

#### Volume Control Set at Maximum

### Sensitivity and Stage Gain Measurements Models 488B-1-2-3-4

#### Average Microwell Input

| 7000 |
| 12000 |
| 7000 |

#### Generator Pad Set At Connected to Dummy Antenna

| I.F. Grid |
| Mod. Grid |
| Ant. Terminal |

#### Leakage Resistance Reading

| .5 Meg |
| .5 Meg |
| .5 Meg |

#### Output Meter Resistance Reading

| .36 |
| .36 |
| .36 |

### Alignment Chart Model 551A

#### Operations in Order

| 1         |
| 2         |
| 3         |

#### Gage Condenser Set At

| 1790 K.C. |
| 1790 K.C. |
| 1400 K.C. |

#### Dummy Antenna

| 200    |
| 200    |
| 200    |

#### Adjust Transformers No.

| 1-6-5-4 |
| 2       |
| 8       |

#### Generator Set At

| 450 K.C. |
| 450 K.C. |
| 1800 K.C. |

#### Volume Control Set at Maximum

### Tone Control Set in Tuba Position

### Sensitivity and Stage Gain Measurements Model 551A

#### Average Microwell Input

| 3500 |
| 400 |
| 45   |

#### Generator Pad Set At Connected to Dummy Antenna

| I.F. Grid |
| Mod. Grid |
| Ant. Terminal |

#### Leakage Resistance Reading

| .5 Meg |
| .5 Meg |
| .5 Meg |

#### Output Meter Resistance Reading

| .36 |
| .36 |
| .36 |

### Alignment Chart Models 560E, 560F, 560G

#### Operations in Order

| 1         |
| 2         |
| 3         |

#### Gage Condenser Set At

| 1790 K.C. |
| 1790 K.C. |
| 1400 K.C. |

#### Dummy Antenna

| 200    |
| 200    |
| 200    |

#### Adjust Transformers No.

| 1-6-5-4 |
| 2       |
| 8       |

#### Generator Set At

| 450 K.C. |
| 450 K.C. |
| 1800 K.C. |

#### Volume Control Set at Maximum

### Output Meter Connected across voice coil.

### Notes:
- Wave Trap Adjustment set for minimum deflection on output meter.
- Volume Control set at Maximum.
- All voltages measured from common negative with 1000 ohm per volt meter.
SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>AVERAGE MICROVOLTS</th>
<th>GENERATOR SET AT</th>
<th>FEEDER CONNECTED TO</th>
<th>DUMMY ANTENNA CAPACITY</th>
<th>LEAK RESISTANCE</th>
<th>OUTPUT METER READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2800</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>30</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>35</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>7</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 Ohm</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

VOLTAGE Measurements from socket terminal to chassis ground using 1000 ohms per volt meter.
Line Voltage - 117 Volts.

FOR ALIGNMENT, SEE MODEL 61D (with loop) Vol. XI

Volume Control set at maximum. * .05 Watts = .38 Volts ** Output meter connected across voice coil.
Battery voltage 6.3 V.  Current consumption 5.1 Amps.  Maximum power output 4.5 Watts.

* Bias – 3.0 V measured from “B” stick.
** Bias – 2.0 V measured from “B” stick.
*** Bias – 15.0 V measured from “B” stick.
All measurements from socket terminal to chassis ground, using 100 ohms per volt meter.

Model P-69-14 is a variable frequency receiver, designed to cover the Police Bands between 1550 K.C. and 2900 K.C. It is equipped with a 6-button electric automatic tuner so that any of six pre-selected police bands may be tuned in automatically.

FOR DATA ON E7T ELECT. AUTOMATIC TUNER, SEE E7T TUNER—Vol.X
POLICE CRUISER Model P-69-14

ANTENNA ADJUSTMENT

Proceed as follows:
1. Turn the receiver to maximum volume.
2. Turn the dial to a spot near 1600 K.C. that is entirely free from stations.
3. With a screw driver, adjust the antenna trimmer screw for maximum noise level.
4. After first trimming on noise level, tune in a weak station near 1600 K.C. and check the accuracy of the adjustment by readjusting the trimmer for maximum volume.

The antenna trimmer screws may be reached through a small hole in the receiver housing. Replace the plug button after adjustment.

TO SET AUTOMATIC TUNER

NOTE: Before setting any station, let the set warm up for not less than ten minutes. If you wish you can "reset" the automatic tuner on the service bench before installing the radio in the car. Use a short aerial and peak the antenna trimmer to it. Then readjust the antenna trimmer after the installation in the car.

IMPORTANT: You will note that the 9-contact plug on the end of the control head cable has one pin that is shorter than the others. For the "setting up" procedure, this plug should be inserted in its receptacle on the receiver only half way. This will cause all of the magnet terminals to be connected. You will not permit the tuning motor to run during the adjustment, since the short pin will not make contact thereby holding the motor circuit open. The motor should not be run at any time during the "setting up" procedure.

1. Loosen the AUTOMATIC LOCKING SCREW which can be reached by removing a plug button in the receiver housing. This screw should be turned counter-clockwise four or five revolutions - far enough to assure plenty of looseness.
2. Turn the dial all the way to the low frequency end (1550 K.C.)
3. Press the first button and hold it down. A faint "click" should be heard, indicating that the tuning magnet has attracted the latch bar.
4. Holding the magnet energized, turn the dial manually all the way to the high frequency end (2500 K.C.) and then all the way back to the low frequency end (1550 K.C.).
5. Still pressing on the button, turn in the station to be set on that button.
6. Proceed to set the remaining five stations. For each station follow steps 2, 3, 4, and 5, as outlined above. AT NO TIME IN THE SETTING UP PROCEDURE SHOULD THE TUNING MOTOR BE PERMITTED TO RUN.

7. Tighten the automatic locking screw very securely. Do not hold the tuning knob while locking the automatic, but allow the mechanism to turn to its natural stop.
8. Replace the plug button, making sure the spring contact in it touches the locking screw. This is essential for motor noise reasons.
9. Push the plug all the way into the receptacle on the receiver housing so the short motor pin will also make contact.

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 R.F. coil can that is covered with Scotch Tape. The original adjustment, made in the factory, should not be tampered with. (Fig. 3 below, shows all trimmer locations.)

1. Connect the signal generator to the control grid of the Osc. Mod. tube (6SN7) through a .1 ohm 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. 2) Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.
2. Set the signal generator at 950 K.C. and carefully adjust the single trimmer in the Diode 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 the I.F. and Diode adjustment several times for maximum accuracy.

R.F. ALIGNMENT

1. Connect the signal generator to the antenna terminal through a 150 NEC condenser.
2. Set the signal generator at 2900 K.C. and with the condenser gang completely out of mesh adjust the 2900 K.C. trimmer in the oscillator coil can to the point showing the highest output reading.

Figure 2

3. Set the signal generator at 1550 K.C. Turn the condenser gang completely in mesh and adjust the 1600 K.C. pad in the oscillator coil can for the highest output reading.

NOTE: The adjustments above set the ranges so the receiver will track with the calibrations in the control panel.

4. Set the signal generator at 1600 K.C. and turn the condenser gang until the signal is heard. Adjust the 1600 K.C. pad in the antenna coil can for the maximum output reading.
5. Set the signal generator at 2900 K.C. Turn the condenser gang until the signal is heard. Adjust the 2900 K.C. trimmer in the antenna coil can, for maximum output reading.
6. Adjust the 2900 K.C. trimmer in the R.F. coil can for maximum output reading.

Figure 3
VOLTAGE CHART

MODELS 103K1 AND 103CE2

<table>
<thead>
<tr>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F. Amp.</td>
<td>225 V.</td>
<td>95 V.</td>
<td>0</td>
</tr>
<tr>
<td>Osc. Mod.</td>
<td>225 V.</td>
<td>95 V.</td>
<td>0</td>
</tr>
<tr>
<td>I.F. Amp.</td>
<td>135 V.</td>
<td>--</td>
<td>-5.5 V.</td>
</tr>
<tr>
<td>Det. A.F.</td>
<td>135 V.</td>
<td>--</td>
<td>-5.5 V.</td>
</tr>
<tr>
<td>Phase Inv.</td>
<td>135 V.</td>
<td>--</td>
<td>-5.5 V.</td>
</tr>
<tr>
<td>Pwr. Amp.</td>
<td>225 V.</td>
<td>225 V.</td>
<td>9.0 V.</td>
</tr>
<tr>
<td>Rectifier</td>
<td>325 V. AC</td>
<td>--</td>
<td>320 V. (from filament)</td>
</tr>
</tbody>
</table>

Measurements from socket terminal to chassis ground using 1000 Ohms per volt meter.
Line Voltage - 117 Volts.
### Alignment Chart Models 1051, 1052

<table>
<thead>
<tr>
<th>Operation</th>
<th>Ganged Condenser</th>
<th>Dummy Antenna</th>
<th>Switch</th>
<th>Generator</th>
<th>Connects To</th>
<th>Trimmer No.</th>
<th>Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 1700 K.C.</td>
<td>1.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.5 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>468 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Maximum 1700 K.C.</td>
<td>1.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.5 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>2700 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>0.7 MΩ</td>
<td>0.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>830 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>0.7 MΩ</td>
<td>0.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>0.7 MΩ</td>
<td>0.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>1500 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>0.7 MΩ</td>
<td>0.1 MΩ</td>
<td>0.1 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>0.05 MΩ</td>
<td>1600 K.C.</td>
</tr>
</tbody>
</table>

### Sensitivity and Stage Gain Measurements Models 1051, 1052

<table>
<thead>
<tr>
<th>Average Microwell Input</th>
<th>Generator Connected To</th>
<th>Dummy Antenna Connected To</th>
<th>Sensitivity</th>
<th>Gain (in db)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0.5 MΩ</td>
<td>0.1 MΩ</td>
<td>-30</td>
<td>50 MΩ</td>
</tr>
<tr>
<td>400</td>
<td>0.5 MΩ</td>
<td>0.1 MΩ</td>
<td>-25</td>
<td>50 MΩ</td>
</tr>
<tr>
<td>300</td>
<td>0.5 MΩ</td>
<td>0.1 MΩ</td>
<td>-20</td>
<td>50 MΩ</td>
</tr>
<tr>
<td>200</td>
<td>0.5 MΩ</td>
<td>0.1 MΩ</td>
<td>-15</td>
<td>50 MΩ</td>
</tr>
<tr>
<td>100</td>
<td>0.5 MΩ</td>
<td>0.1 MΩ</td>
<td>-10</td>
<td>50 MΩ</td>
</tr>
</tbody>
</table>

### Volume Control Set at Minimum

- 0.05 Watts = 0.05 Volts

### Volume Control Set at Maximum

- 0.05 Watts = 0.05 Volts

---

**Alignment Chart Models 1051 and 1052**

1. Remove all dials and panels from front and rear of chassis.
2. Attach a length of 24 in. test wire from end to 24 in. length.
3. Turn the gain to fully unscrew position.
4. Insert end of cord through hole in rim of large dial.
5. With an ordinary paper clip inserted in hole to hold in place.
6. Slide cord in a clockwise direction around the condenser pulley and down to the tuning shaft.
7. Use cord in a clockwise direction eight times around the tuning shaft up to the condenser pulley.
8. Thread end of cord through hole in large dial.
9. With an ordinary paper clip inserted in hole to hold in place.
10. Slide cord in a clockwise direction around the condenser pulley and up to inner pulley hub.
11. Continue cord clockwise as seen from front around inner pulley No. 3 and around outer pulley No. 4 to pointer pulley.
12. Thread end of cord through hole in pointer pulley and knot both ends together securely.
13. Insert end of tension spring (Part No. 431418) to cord.
14. Connect other end of spring to hook on pointer pulley.
15. Replace dial pulleys.
16. To test pointer to correct frequency, knob in a position of known frequency and adjust position of pointer on tuning.
17. Clamp pointer on attaching a pair of pliers and move with a drop of solenoid on front panel spring.
18. Adjust trimmer No. 3 to bring point to desired position.

---

**Volume Control Set at Minimum Position**

- 0.05 Watts = 0.05 Volts

---

**Diagram**

[Diagram of alignment and sensitivity measurements with specific connections and positions indicated.]
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. Connect the signal generator to the antenna lead through a 0.1 µF capacitor and to chassis ground. Turn the condenser knob completely out of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 450 K.C. and carefully adjust the single trimmer in the Diode cell arm to the point showing the highest reading on the output meter. (Advance the signal generator attenuator if necessary to pick up signal.) See Fig. 1.

3. Adjust the two trimmers in the I.F. arm to the point showing the highest output reading.

4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

1. If the radio is to be operated on a Motorola Booster antenna, a special dummy antenna, Motorola Part No. 46936, must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

2. Set the signal generator at 1550 K.C. and with the condenser knob still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 1400 K.C. and turn the condenser knob to the signal at 1600 K.C. Adjust the antenna trimmer on the condenser knob to the point showing the highest output reading.

4. Set the signal generator at 600 K.C. and turn the condenser knob until the dial pointer reads 600 K.C. Rock the pointer at the 600 K.C. position on the dial scale, while adjusting the antenna pad-

5. Recheck step No. 3.

NOTE: The antenna pad is reacted through a hole in the bottom of the chassis base, directly under the antenna coil can.

POINTER CORD INSTRUCTIONS

1. Remove the chassis from the housing.

2. Remove the broken string.

3. Set the condenser knob to fully open position.

4. Cut a length of 34 lb. dial cord 24 inches long.

5. Thread one end of the cord through slot ‘A’ in the condenser pulley, and with an ordinary paper clip fasten it to the idler pulley bracket to hold it in place. (See Fig. 2).

6. Run the cord over bead idler pulley No. 1 and around it in a clockwise direction.

7. Route string across chassis to idler pulley No. 2, and around it in a clockwise direction.

8. Route cord back across chassis and around idler pulley No. 3, in a counter-clockwise direction.

9. Route cord around condenser pulley three-quarters turn to slot ‘A’.

10. Remove the paper clip from end of cord and knot the two ends of cord together inside of pulley. Fasten one end of the tension spring (4A11091) to the cord and the other end to hole in the condenser pulley.

11. Cut off surplus cord.

12. To set pointer to correct frequency, tune in a station of known frequency, preferably one between five and six hundred K.C. and attach the pointer to the cord so that the proper frequency is indicated, because the pointer cannot be slid on the cord.

SENSITIVITY DATA - Model 250

<table>
<thead>
<tr>
<th>Microvolt Input</th>
<th>Generator Connected to</th>
<th>Dummy Ant. Capacity</th>
<th>Leakage Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>6900</td>
<td>L.F. Grid</td>
<td>.1</td>
<td>.5 MΩ</td>
<td>1.75</td>
</tr>
<tr>
<td>220</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 MΩ</td>
<td>1.75</td>
</tr>
<tr>
<td>70</td>
<td>R.F. Grid</td>
<td>.1</td>
<td>.5 MΩ</td>
<td>1.75</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Lead</td>
<td>40 MΩ</td>
<td>None</td>
<td>1.75</td>
</tr>
</tbody>
</table>

* For one watt output
** Meter connected across voice coil
1.75 volts equals 1 watt output for 3.5 cm voice coil

NOTE: If a Motorola Booster antenna is used substitute a Special Motorola dummy part No. 1134518 or 46438 Booster coil No. 279308 in series with a 25 MΩ condenser in place of the 40 MΩ condenser.
### Model 251

**Sensitivity and Stage Gain Measurements**

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>System Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Resistance</th>
<th>Leaking</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000 225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600        225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300        225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180        600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.5       600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alignment Chart Model 251**

- Use Special Dummy Part No. 1226797 or Booster Coil Part No. 0428751 in series with a 35 Mf Condenser.

### Model 501

**Sensitivity and Stage Gain Measurements**

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>System Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Resistance</th>
<th>Leaking</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,560 225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300        225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alignment Chart Model 501**

- Use Special Dummy Part No. 1226797 or Booster Coil Part No. 0428751 in series with a 35 Mf Condenser.

### Model 401

**Sensitivity and Stage Gain Measurements**

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>System Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Resistance</th>
<th>Leaking</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,400 225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900        225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300        225 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180        600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45         600 K.C.</td>
<td>1 F. Grid</td>
<td>.5 Mag.</td>
<td>1.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alignment Chart Model 401**

- Use Special Dummy Part No. 1226797 or Booster Coil Part No. 0428751 in series with a 35 Mf Condenser.
MODEL 361

FREQUENCY RANGE
545 KC TO 1600 KC

I.F. = 262 KC

Tune Control Set At Voice
** Output meter connected across voice coil.
*** Use Special Dummy Part No. 126767 or
Booster Coil Part No. 24126751 in series
with a 25 MA. Condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<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>48.500</td>
<td>262 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>1,100</td>
<td>262 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>1,500</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.6 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>10</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

VOLTAGE CHART

<table>
<thead>
<tr>
<th>TUBE</th>
<th>PLATE TO GND.</th>
<th>SCREEN TO GND.</th>
<th>CATH. TO GND.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SD7GT</td>
<td>110 V.</td>
<td>40 V.</td>
<td>0</td>
</tr>
<tr>
<td>6SA7GT</td>
<td>110 V.</td>
<td>110 V.</td>
<td>0</td>
</tr>
<tr>
<td>6SK7GT</td>
<td>115 V.</td>
<td>110 V.</td>
<td>8.5 V.</td>
</tr>
<tr>
<td>6S7GT</td>
<td>40 V.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6U6GT</td>
<td>130 V.</td>
<td>115 V.</td>
<td>0</td>
</tr>
</tbody>
</table>

FOR ALIGNMENT

DATA,

INDEX

SEE

INDEX

GALVIN MFG. CO.
MODEL 500

GALVIN MFG. CO.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

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 .001 MF capacitor. A 680 K. resistor connected as a load 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 capacitor in place of the .001 MF.

It must be remembered that the figures in the tables are average and allowances must be made for variations between sets of the same general type, due to differences in tube characteristics, etc.

<table>
<thead>
<tr>
<th>AVERAGE MICROVOLTS INPUT</th>
<th>GENERATOR SET AT</th>
<th>GENERATOR CONNECTED TO</th>
<th>DETECTING ANTENNA CAPACITY</th>
<th>LEAK RESISTANCE</th>
<th>OUTPUT VOLTAGE READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>220 K.C.</td>
<td>I.F. Grid</td>
<td>.2 MF</td>
<td>.5 Meg</td>
<td>1.78 Volts</td>
</tr>
<tr>
<td>600</td>
<td>220 K.C.</td>
<td>Mod. Grid</td>
<td>.2 MF</td>
<td>.5 Meg</td>
<td>1.78 Volts</td>
</tr>
<tr>
<td>100</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.2 MF</td>
<td>.5 Meg</td>
<td>1.78 Volts</td>
</tr>
<tr>
<td>400</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.2 MF</td>
<td>.5 Meg</td>
<td>1.78 Volts</td>
</tr>
<tr>
<td>500</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>40 Meg</td>
<td>1.78 Volts</td>
<td></td>
</tr>
</tbody>
</table>

* For one watt output, the meter connected across voice coil. 1.78 volts equals 1 watt output for 8 ohm voice coil.

NOTE: Use special part no. 400500B or Motorola Booster No. 7908 in series with a 68 MF capacitor.

VOLTAGE CHART - MODEL 500

<table>
<thead>
<tr>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CURRENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF</td>
<td>195</td>
<td>72</td>
<td>2.7</td>
</tr>
<tr>
<td>Det. Mod.</td>
<td>195</td>
<td>72</td>
<td>2.7</td>
</tr>
<tr>
<td>I.F.</td>
<td>195</td>
<td>72</td>
<td>2</td>
</tr>
<tr>
<td>Det. Ant.</td>
<td>195</td>
<td>72</td>
<td>12</td>
</tr>
<tr>
<td>Output</td>
<td>200</td>
<td>200</td>
<td>13</td>
</tr>
<tr>
<td>Rect.</td>
<td>250</td>
<td>130</td>
<td></td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter. Current 6.6 amps at 6.6 volts. Maximum power output 10 watts.
All voltages measured from socket terminal to chassis ground using 1000 Ohm per volt meter.
Current 6.5 amps at 6.3 volts.
Maximum power output 3.5 watts.

FOR DATA ON E14T ELECT. AUTOMATIC TUNER,
SEE TUNER E5T---Vol.X
GALVIN MFG. CO.

MODEL 701

PAGE 12-22 MOTOROLA

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NOTE: Model 700 uses tuner E12T which is identical to the E5T. See Motorola Pages 10 - 12.
GALVIN MFG. CO.

SENSITIVITY AND STAGE GAIN MEASUREMENT

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 1.0 mfd condenser with a .005 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 special dummy part #2119016 in place of the .75 mfd. It must be remembered that the figures in the table are averages and allowances 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 MICROVOLTS</th>
<th>GENERATOR SET AT</th>
<th>INPUT ANTENNA</th>
<th>LEAK RESISTANCE</th>
<th>METER RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,600</td>
<td>300 K.C.</td>
<td>I.F. Grid</td>
<td>.1 mfd</td>
<td>.5 meg</td>
</tr>
<tr>
<td>255</td>
<td>300 K.C.</td>
<td>Mod. Grid</td>
<td>.1 mfd</td>
<td>.5 meg</td>
</tr>
<tr>
<td>14</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 mfd</td>
<td>.5 meg</td>
</tr>
<tr>
<td>255</td>
<td>600 K.C.</td>
<td>A.F. Grid</td>
<td>.1 mfd</td>
<td>.5 meg</td>
</tr>
<tr>
<td>1.5</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

* For one watt output
+ Meter connected across voice coil
1.76 Volts equals 1 watt output for 3 & 4 voice coils
Use special dummy part No. 2119016.

NOTE: If set is used with a Motorola booster antenna, substitute a 4.0 mfd. condenser for the special dummy.

VOLUME CHART

<table>
<thead>
<tr>
<th>TUBE POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F.</td>
<td>225</td>
<td>60</td>
<td>3.8</td>
</tr>
<tr>
<td>Dec. Mod.</td>
<td>225</td>
<td>60</td>
<td>3.8</td>
</tr>
<tr>
<td>I.F.</td>
<td>225</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>Det. AVC</td>
<td>120</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>A.F.</td>
<td>120</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>OUTPUT</td>
<td>225</td>
<td>225</td>
<td>36</td>
</tr>
<tr>
<td>Output</td>
<td>225</td>
<td>225</td>
<td>36</td>
</tr>
<tr>
<td>Rect.</td>
<td>250</td>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

Current 8 amp. at 6.3 volts.

Maximum power output 10 watts.

NOTE: Numbers to listed values refer to marked numbers on circuit diagram.

John F. Rider, Publisher
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, as you can reverse it.

Make a list of your five favorite stations, those which you tune in regularly. It is better to list the station with the lowest dial number first, the station with the next higher dial number second, and so on.

Deprass the manual tuning knob 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 points toward the 1500 kc end of the dial until the stop is reached.

UNLOCK THE TUNING MECHANISM by inserting a 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 STATION ACCURATELY, DO NOT touch the radio or buttons while the manual tuning knob is unlocked.

KEEP THE MANUAL TUNING BUTTON DEPRESSED WITH ONE HAND and, with the other hand, depress the first (left hand) position button. Both will require care. Select the first station from the list you have made and tune in this station by means of the manual tuning knob.

Next, keep the manual tuning button depressed with one hand and, with the other hand, depress the second station button firmly and gently, and proceed to set the second station on your list in the manner as described above.

Then continue to set any additional stations on your list in 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 distance enough to release any station button which is depressed. Should a button be pushed all the way in 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 1500 kc end of the dial, until the stop is reached.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (300 mw, total capacity of antenna and shielded cable), an adapter must be used. The adapter is inserted in the socket at the bottom of the tuning unit case. Then the antenna plug is inserted in the adapter. A shielded antenna cable with bayonet connector plug is required. The plug on the antenna cable is inserted in the socket at the bottom of the tuning unit case as shown in Fig. 1. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 30 to 60 mw. Types of Low Capacity Antennas -Door hinge; filaree; over-the-rod types which are mounted quite a distance from the metal rod of the car. The antenna should be mounted on the same side of the car as the tuning unit.

Alignment Procedure

Remove grille and speaker from speaker unit.

Remove the chassis from tuning unit, and route the antenna cable and dummy antenna according to "General Installation Item" in this manual.

Set the signal generator for 456 kc and connect the output of the signal generator through a 325 S. condenser to the center grid of the 6SA7 fet detector tube (pin No. 9). Connect the ground lead of the signal generator to the tuning unit chassis. Set the volume control at maximum and the Local- Distance switch to the distance position. At this point the signal from the signal generator will be picked up by the antenna. The signal should be 150 kc and connected to the output of the signal generator. Set the signal generator for 150 kc. Turn the tuning knob until the maximum current is obtained in the tuning cords as the signal will be at its maximum level. Then set the oscillator trimmer (Fig. 1) until maximum output is obtained. Set the signal generator for 1000 kc and, turn the tuning knob until maximum output is obtained. Then set the oscillator trimmer (Fig. 1) until maximum output is obtained. Set the signal generator for 1000 kc and, turn the tuning knob until maximum output is obtained. Then set the oscillator trimmer (Fig. 1) until maximum output is obtained. Set the signal generator for 1000 kc and, turn the tuning knob until maximum output is obtained. Then set the oscillator trimmer (Fig. 1) until maximum output is obtained.

For the door hinge and over-the-rod type antenna, the antenna head must be shielded all the way to the antenna. When the antenna cable is connected to the antenna head, the shielded cable should be pushed back under the insulation of the antenna head.
GAMBLE SKOGMO, INC.

MODEL 509
MODEL C800

Do not restring the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" to turn the tuning knob until the drive bar comes within 1/32 to 1/16 from the stops. (A piece of blue paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If not, you can raise or lower the drive screw gently and equalize the sides. Minor adjustments may be made with the drive bar adjustments.

Next, rotate each iron core until the fine score marks are even with the edge of the coil form.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency</th>
<th>Distance to Panel</th>
<th>Position of Band Spread</th>
<th>Dip Pointers Adjusted to</th>
<th>Trimmer's Adjusted to</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>2.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>2.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>3.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>3.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>4.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>4.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>5.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>5.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>6.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>6.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>7.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>7.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>8.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>8.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>9.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>9.5</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>10.0</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

### POWER OUTPUT

Power Consumption: 100 Watts
Power Output: 5 Watts Undistorted
Sensitivity for 50 Milliwatt Output: 10 Microvolts Average
Selectivity: 38 Kc Broad or 1000 Times Signal at 1000 Kc
Tuning Frequency Range: Broadcast Band: 550 to 1710 Kc

### TRIMMER VIEW

The following equipment is required for alignment:
- An all-wave signal generator which will provide an accurately calibrated signal at the test frequencies.
- A crystal-controlled oscillator.
- A discriminator meter, 20 mfd. and 600 ohms.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency</th>
<th>Distance to Panel</th>
<th>Position of Band Spread</th>
<th>Dip Pointers Adjusted to</th>
<th>Trimmer's Adjusted to</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 METER BAND</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>40 METER BAND</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>20 METER BAND</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>15 METER BAND</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD. CAST</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>100 Hz.</td>
<td>1 MFD. Grid of 5557 (C.F.)</td>
<td>Broadcast</td>
<td>Two Trim at 1/16 in.</td>
<td>Two Trim at Top</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>
Model 415 is a 5-tube superheterodyne radio receiver for operation on a 117 volt A.C., 60 cycle or 117 volt D.C. supply. This receiver covers a frequency range from 540 Kilocycles to 1750 Kilocycles (K.C.).
L.F. Frequency 465 K.C.

**ALIGNMENT PROCEDURE**

- **Frequency Range**: 330 to 1720 K.C.

**BAND** | **SIGNAL GENERATOR** | **Dummy Antenna** | **Connection to Radio** | **Variable Condenser Setting** | **Trimmers Adjusted** | **Function** | **Adjustment** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>465 Kc.</td>
<td>1 MFD. Grid of 6A8</td>
<td>Rotor full open</td>
<td>Two trimmers</td>
<td></td>
<td>I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST</td>
<td>1200 Kc.</td>
<td>100 mfd.</td>
<td>Antenna Lead (Plates out of mesh)</td>
<td>Trimmer Top of rear section of gang (See Fig. 1)</td>
<td>I.F. Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc.</td>
<td>100 mfd.</td>
<td>Antenna Lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

The following equipment is required for aligning:

- An all wave signal generator.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antenna—1 ml, 100 mfd.

The tubes complement of this chassis consists of the following octal base glass and metal tubes:

1. Type 6A8 Pentagrid Mixer, First Detector-oscillator.
2. Type 6J7 Second Detector.
5. Type 62A Ballast Tube.

*FOR TUNER ADJUSTMENTS SEE GAMBLE-SKOGMO MODEL 527-A, VOLUME X*
IMPORTANT: See Aligning Instructions

ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the testing frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 Mfd., and 200 Mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial 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.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>I. F.</td>
<td>Input</td>
<td></td>
</tr>
<tr>
<td>1690 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>1690 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>1480 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Turn Dial to 1690 Kc.</td>
<td>Adjust trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;B&quot;)</td>
<td></td>
</tr>
<tr>
<td>1690 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Turn Dial to 1690 Kc.</td>
<td>Adjust trimmer (C3)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;B&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

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 voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control at minimum, 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 the voltage chart are measured with 117 volt 60 cycle A.C. line.

Resistance 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.

NOTE "A"—The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure move the coil assembly very slowly, it can be moved by hand or by turning one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B"—After the antenna coil has been tracked at 1480 Kc. it is necessary to check the antenna trimmer (C3) adjustment again at 1690 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1480 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1690 Kc.
PROCEDURE FOR SETTING THE AUTOMATIC PUSHER BUTTONS

4. Press in on the pushbutton which is latched in. Holding it firmly, turn in by means of the dial tuning knob the station indicated on the station call letter tab on this pushbutton. Turn the dial tuning knob very slowly back and forth (while still pressing in firmly on the pushbutton) until the station is clearly heard. The station will then be accurately tuned in.

5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in position, until the pushbutton is latched in position. The dial tuning knob and the pushbutton are selected in this manner. The pushbutton is removed from the station indicated on the station call letter tab on this pushbutton.

6. Follow this procedure until you have tuned in all of your favorite stations.

7. When the last pushbutton has been properly set, it is necessary to release it from the latch-in position. To release the pushbutton, press the pushbutton release pin on the bottom of the station. This will trip the latching mechanism and all the pushbuttons will be released to the normal release pin position. (See Fig. 3A.)

8. Now, Press on the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without force. This will lock the station and all the stations that have been set up on the pushbuttons will be locked in place for automatic tuning.

9. Press in and out one of the push buttons, and--YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the station mechanism press on the dial tuning knob and make it stay turned in. Rotate the dial tuning knob to the right (clockwise) to the normal release pin position. (See Fig. 2A.)

2. To set a pushbutton. Push in all the way and hold until the pushbutton and dial tuning knob are selected. Hold in firmly the pushbutton and the dial tuning knob until the station is heard clearly. The pushbutton is now set and selected.

3. To release the last pushbutton press the pushbutton release pin on the bottom of the station.

4. To lock a tuner mechanism push on the dial tuning knob hard enough to make it stay turned in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without force. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

CHANGING STATIONS:

If you should desire to change any station you have selected to another, loosen the locking screw "C" one or two turns. Hold in push button on which the station is to be changed and turn in new station desired. Release the push button. (NOTE: If the dial mechanism works hard when setting up a new station for one of the automatic push buttons it is due to the locking screw being too tight. Loosen the locking screw "C" until the dial mechanism works freely with the push button pressed in.)

To return to position by tightening the locking screw, otherwise the stations which have been previously selected will not stay adjusted to the push buttons.

The set is now set up for automatic tuning.
### TECHNICAL DATA—Model No. C671

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption Radio Only</td>
<td>70 Watts</td>
</tr>
<tr>
<td>Motor Only</td>
<td>20 Watts</td>
</tr>
<tr>
<td>Power Output</td>
<td>2.1 Watts Undistorted</td>
</tr>
<tr>
<td>Sensitivity for 500 Milliwatt Output</td>
<td>15 Microvolts Average</td>
</tr>
<tr>
<td>Selectivity 51 KC Broad at 1000 Times</td>
<td></td>
</tr>
<tr>
<td>Tuning Frequency Range Broadcast Band</td>
<td>590 to 1800 KC</td>
</tr>
<tr>
<td>Shortwave Band</td>
<td>5.45 to 18.3 MC</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>455 KC</td>
</tr>
<tr>
<td>Speaker</td>
<td>8 in. Electro Dynamic</td>
</tr>
</tbody>
</table>

**Band and Phono Switch**

This knob switches the tuning from the broadcast stations to the shortwave band, and also to the "Phono" position. Turn the knob to "Broadcast" for broadcast stations and to "Phono" to play records. The points marked 49M-31M-25M-20M-19M-16M on the dial scale are shortwave broadcast channels. The 49M and 31M channels are best during darkness. The other channels are best in daylight. Tune short waves very slowly.

### ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio ground 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 transformers.
- 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-mfl, 200 mfl, 400 ohms.

#### SIGNAL GENERATOR

<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 Conductor Setting</th>
<th>Trimmer (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 6SA7 Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top (See Top View)</td>
<td>Input and Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>17 Mc. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>WAVE BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>6 Mc. 400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1600 Kc. 200 mfl.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND</td>
<td>530 Kc. 200 mfl.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>LOOP ALIGN-</td>
<td>1400 Kc. 200 mfl.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc. (See Top View)</td>
<td>Trimmer C3</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>MENT (See</td>
<td>600 Kc. 200 mfl.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc. (See Top View)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**NOTE A**—The signal generator is connected to the "ANT." and "GND." leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies (1600 and 500 K. C.). The loop antenna should be connected to the radio when making these adjustments.

**NOTE B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." leads.

**NOTE C**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate 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.
ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- A 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, 125 mm.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Conversion to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>465 Kc</td>
<td>.1 MFD</td>
<td>Grid of 66X7 I.F. Tube</td>
<td>Set dial at 140 Kc</td>
<td>CS9, CS9 (See Fig. 3)</td>
<td>Output I.P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc</td>
<td>.1 MFD</td>
<td>Grid of 66X7</td>
<td>Set dial at 140 Kc</td>
<td>CS9 (See Fig. 3)</td>
<td>Output I.P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc</td>
<td>.1 MFD</td>
<td>Grid of 6AG7</td>
<td>Set dial at 140 Kc</td>
<td>CS9, CS9 (See Fig. 3)</td>
<td>Output I.P.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Conversion to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>1565 Kc</td>
<td>125 mm</td>
<td>Antenna lead</td>
<td>Set dial at 1565 Kc</td>
<td>CS9, CS9 (See Fig. 4)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc</td>
<td>125 mm</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc</td>
<td>CS9 (See Fig. 4)</td>
<td>R.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>600 Kc</td>
<td>125 mm</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc</td>
<td>CS9 (See Fig. 4)</td>
<td>Antenna series adj.</td>
<td>See note &quot;C&quot;</td>
<td></td>
</tr>
</tbody>
</table>

NOTE "A": IMPORTANT: To align the output I.F. transformer without using a cathode ray oscillograph, a 10M ohm resistor must be shorted across the grid tuned circuit. Connect the resistor as indicated by points "A" and "B" on the circuit diagram and the bottom view of the radio chassis Fig. 1. A red dot on the output I.F. bus designates location of trimmer "C9." Remove the 10M ohm resistor. Under no circumstances re-adjust trimmers CS9 or CS9 after the 10M ohm resistor has been removed.

NOTE "B": Before adjusting trimmers C9 or CS9, the 10M ohm resistor is not used.

NOTE "C": Maximum gain for this adjustment depends on the capacity of the antenna system and the car in which the radio is installed. For the proper alignment of this adjustment see "Adjusting Antenna Trimmer," page 8.

ALIGNMENT OF THE IRON CORES

The iron cores for the antenna, R.F., and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment unless it becomes necessary to replace a coil or any adjustments have been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

Fig. 4.—Bottom View of Remote Tuner

IMPORTANT—ADJUSTING ANTENNA TRIMMER:

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment "C1," Fig. 4).

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment "C2," Fig. 4, Page 7).

NOTE: If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer "C2," turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer "C1" on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.
### ALIGNMENT PROCEDURE

<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>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 6SK7 L.F.</td>
<td>Broadcast</td>
<td>Roy full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 6SA7 Mixer</td>
<td>Broadcast</td>
<td>Roy full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4 (See Fig. 4)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>
| (See Note A) | 6 Mc.             | 400 Ohms      | External Antenna and Ground | Short Wave             | Set Dial at 5 Mc.           | Trimmer C7 (See Fig. 4) | Short Wave oscillator series pad | Adjust to maximum output (See note “C”)
| BROAD-CAST BAND | 1570 Kc.         | 200 m.mf.     | Grid of 6SA7        | Broadcast               | Rotor full open (Plates out of mesh) | Trimmer C5 (See Fig. 4) | Broadcast oscillator | Adjust to maximum output |
| (See Note A) | 532 Kc.           | 200 m.mf.     | Grid of 6SA7        | Broadcast               | Set Dial at 532 K.C.         | Trimmer C8 (See Fig. 4) | Broadcast oscillator series pad | Adjust to maximum output |
| LOOP ALIGNMENT | 1400 Kc.         | 200 m.mf.     | External Antenna and Ground | Broadcast               | Set Dial at 1400 Kc.         | Trimmer C1 (See Fig. 5) | Broadcast antenna | Adjust to maximum output |
| (See Note B) | 600 Kc.           | 200 m.mf.     | External Antenna and Ground | Broadcast               | Set Dial at 600 Kc.          | Trimmer T2 (See Fig. 5) | Iron Core Tracking | Adjust to maximum output |

**NOTE “A”**—The signal generator is connected to the “ANT.” and “GND.” terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies (1570 and 532 K.C.). The loop antenna need not be connected to the radio when making these adjustments.

**NOTE “B”**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected to the terminal board. The signal generator is connected to the “ANT.” and “GND.” terminals and the jumper on the terminal board connected to “EXT.” terminal (See Fig. 1).

**NOTE “C”**—Turn the dial back and forth slowly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate 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.

**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 the voltage chart are measured with 115 volts A.C. 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.**

**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.

It is important during loop alignment that the same distance between the loop antenna and the chassis be maintained as when the chassis is installed in the cabinet.

To remove the chassis from the cabinet, pull off the knobs and take out the 4 bolts holding the chassis flange to the control panel.
Automatic Record Changer—Operating Instructions

MODELS 0371 and 0671

Setting for Size of Record
The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selection areas. The position of these areas determines the size of records. The 10" and 12" records are selected as follows:

---

Starting the Changer
1. Turn the Changer on at the Changer panel and turn on the Changer switch to the "ON" position.
2. Turn the switch knob on the Changer to the "OFF" position.

Unloading
First switch off the motor. Then press the button at the top and turn it to the left.

Lift the record from the turntable, place it on the proper position, and turn the record on the turntable.

The Changer should then be turned to the next position according to the slot shown on the selecting area.

Turning Oil Changer
The Changer switch should be turned to the "OFF" position.

To avoid wearing of records, never leave records on the Changer.

How to Reject a Record
Mostly the reject switch is located on the bottom of the Changer panel. It can be turned on and off by turning the reject switch to the "OFF" position.

Playing Individual Records
Should the desired record be played individually, simply press the button at the top of the Changer panel and turn on the Changer switch to the "ON" position.

How to Make Perfect Recordings

1. Cutting Needle
2. Microphone Recording
3. How to Use Too Much Volume
4. Shaving
5. Cutting Arm Adjustments

---

Cutting Needle
The cutting needle is made to cut the record in the "ON" position. It must not be changed on the record or it will be damaged.

For best operation, the instrument should be level in all directions. To check this, place a level on the instrument and adjust the level as necessary.

Microphone Recording
Turn the microphone switch to "ON" position. Then press the record button until the microphones are at the desired level.

How to Use Too Much Volume
The most frequent cause of poor recordings is too much volume or overloading. If you are using your records for these needs, the volume should be turned down until the instrument is at a safe level.

Shaving
The cutting arm should not be shaved in a manner that leaves the cutting blade too short for the record. This causes the cutting blade to jam and fail to cut the record.

Cutting Arm Adjustments
The cutting arm is adjusted at the factory for proper operation, however, it is not recommended to adjust the arm.

---

NOTE: Some records of the same group may be played from the same group, but if you use the same group, you must play the same record.

The microphone switch is to be turned to "OFF" position when recording.

The two microphone lights are used for recording and playback.

How to Use Too Much Volume
The most frequent cause of poor recordings is too much volume or overloading. If you are using your records for these needs, the volume should be turned down until the instrument is at a safe level.

Shaving
The cutting arm should not be shaved in a manner that leaves the cutting blade too short for the record. This causes the cutting blade to jam and fail to cut the record.

Cutting Arm Adjustments
The cutting arm is adjusted at the factory for proper operation, however, it is not recommended to adjust the arm.

---

Automatic Record Changer—Operating Instructions

MODELS 0971 and 0981

Operating the Recorder

Model C971

NOTE: Some records of the same group may be played from the same group, but if you use the same group, you must play the same record.

The microphone switch is to be turned to "OFF" position when recording.

The two microphone lights are used for recording and playback.

How to Use Too Much Volume
The most frequent cause of poor recordings is too much volume or overloading. If you are using your records for these needs, the volume should be turned down until the instrument is at a safe level.

Shaving
The cutting arm should not be shaved in a manner that leaves the cutting blade too short for the record. This causes the cutting blade to jam and fail to cut the record.

Cutting Arm Adjustments
The cutting arm is adjusted at the factory for proper operation, however, it is not recommended to adjust the arm.

---

NOTE: Some records of the same group may be played from the same group, but if you use the same group, you must play the same record.

The microphone switch is to be turned to "OFF" position when recording.

The two microphone lights are used for recording and playback.

How to Use Too Much Volume
The most frequent cause of poor recordings is too much volume or overloading. If you are using your records for these needs, the volume should be turned down until the instrument is at a safe level.

Shaving
The cutting arm should not be shaved in a manner that leaves the cutting blade too short for the record. This causes the cutting blade to jam and fail to cut the record.

Cutting Arm Adjustments
The cutting arm is adjusted at the factory for proper operation, however, it is not recommended to adjust the arm.
Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

Television and Fm. Jack

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-pickup jack in the chassis view will accommodate either the Phono or a television or FM converter.

Speaker 10 in. Electro Dynamic
# Alignment Procedure

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>CONNECTION TO RADIO</th>
<th>POSITION OF BAND SWITCH</th>
<th>VARIABLE CONDENSER SETTING</th>
<th>TRIMMERS ADJUSTED</th>
<th>TRIMMER FUNCTION</th>
<th>ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>465 Kc.</td>
<td>Grid of G97</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Two trimmers on top</td>
<td>1. P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>605 Kc.</td>
<td>Grid of S97</td>
<td>Mixer</td>
<td>Rotor full open</td>
<td>Two trimmers on top</td>
<td>1. P.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C11</td>
<td>Short Wave oscillator</td>
</tr>
<tr>
<td>WAVE</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C2</td>
<td>Short Wave R.F.</td>
</tr>
<tr>
<td>BAND</td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna &amp; Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C3</td>
<td>Short Wave R.F.</td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1580 Kc.</td>
<td>200 mill.</td>
<td>Grid of G97 R.P. Tube</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C4</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td>BAND</td>
<td>540 Kc.</td>
<td>200 mill.</td>
<td>Grid of G97 R.P. Tube</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td>LOOP</td>
<td>1600 Kc.</td>
<td>200 mill.</td>
<td>Grid of G97 R.P. Tube</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>600 Kc.</td>
<td>200 mill.</td>
<td>External Antenna &amp; Ground</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer T1</td>
<td>Iron Core Tracking Coil</td>
</tr>
</tbody>
</table>

**NOTE:**
- The signal generator is connected to the “ANT.” and “GND.” terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the G97 R.P. Tube and ground terminal when setting the Broadcast Band oscillator and frequencies, (1580 and 540 Kc.).

The loop antenna must not be connected to the radio when making these adjustments.

**ALIGNING INSTRUCTIONS:**

**CAUTION:** No aligning adjustments should be attempted without first thoroughly checking 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. It is important during loop alignment that the loop antenna and the chassis be installed in the cabinet.

To remove the chassis from the cabinet, remove the two chassis mounting bolts which are used to hold the chassis to the cabinet shelf; take the knobs off their shafts and disconnect the loop antenna.

**SERVICE NOTES:**

- Volages taken from different points of circuit to chassis are measured with a voltmeter full on all tubes in their all D.C. voltages are usually caused by a detached electrolytic socket or speaker connected, with a volt meter having a condenser; open by-pass condensers frequently cause oscillation and distorted tone.

- All voltages as indicated on the voltage chart are measured with 117 volts A.C. on the primary of the power transformer.

**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.

**TELEVISION CONNECTIONS:**

Television will not be available for nation wide use for some time to come; however, Television audio connections are provided on this radio for the reception of Television sound. Connect audio output leads of television receiver to connector provided on rear of receiver chassis as shown in above illustration and snap switch to “Television” position.
Tuning Frequency Range

Broadcast Band - 540 to 1600 KC
49M Band - 5.9 to 6.1 MC
31M Band - 9.1 to 10 MC
25M Band - 11.4 to 12.1 MC
19M Band - 14.9 to 15.4 MC

Phonograph-Television and Fm. Jack

Should you wish to use an external phonograph it should be plugged into the phono jack shown in the chassis view. The radio-phonograph switch on the chassis will then switch from radio to phono operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-phonograph-FM in the chassis view will accommodate either the Phono or a television or FM converter.

Signal Generator

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Setting</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Potentiometer Setting</th>
<th>Trimmer Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6SK7 (I.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 400 Kc.</td>
<td>Two Trimmers</td>
<td>L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 1500 Kc.</td>
<td>Two Trimmers</td>
<td>L. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>96 Mc.</td>
<td>600 ohms</td>
<td>Antenna lead</td>
<td>31M</td>
<td>Set Dial at 96 Mc.</td>
<td>(See Trimmer View) C8</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>61 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>49M</td>
<td>Set Dial at 61 Mc.</td>
<td>(See Trimmer View) C9</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>25M</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T15</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>400 ohms</td>
<td>Antenna lead</td>
<td>19M</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>200 mfd.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) C16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

First refer to the "Iron Core Adjustment View" now turn the tuning-knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine screw marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.
PHONOGRAPH CO.
WITH PUSH BUTTON TUNING

6 STATION BUTTONS
8 TUBES
3 BANDS

SPECIFICATIONS

Power Consumption 71 Watts (At 117 volts 60 cycle
88 Watts (Phonograph Operation)

Power Output 4.0 Watts Undistorted
5.0 Watts Maximum

Selectivity 30 KC Broad at 1000 times Sign

Intermediate Frequency 456 K

Speaker 10" Electro-Dynam

Receivers of this model which are to
be used on 25 cycle, 230 volt, or
other service are so marked on label.

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Antenna and Ground

Two loop antennas are incorporated in the speaker chamber and may be used for broadcast band and short wave reception. For the reception of local or nearby stations, an outside antenna is usually not required. The use of the loop antenna may, in some locations, provide best broadcast band operation.

In general, however, more stations will be heard and noise will sometimes be reduced by using an outside antenna.

For best reception of short wave stations, an outside antenna is recommended.

A white wire will be found coming out of the chassis. Connect this wire to the outside antenna lead.

On the back panel of the chassis base is a screw (marked GND) under which the ground wire should be fastened.

Important—A good antenna and ground are essential for best operation of this radio. Connections should be clean and tight. Do not use an old outside antenna as in most cases it will be unsatisfactory.

Voltages at Sockets

Line Voltage—117.
Volume Control—Maximum.
Antenna Shorted to Ground.

Readings taken with 1000 ohm-per-volt meter. Plate and screen voltages are read on 500 volt scale.
MODULATION HUM

In case modulation hum (hum with signal) is encountered on the above model, the trouble may be due to the 6SK7 1st A.F. tube. Interchange this tube with the 6SK7 R.F. and 6SK7 I.F. tubes. Note the results. The 6SK7 1st A.F. tube may be left in either the R.F. or I.F. tube sockets if the arrangement reduces the hum.

If the hum is still appreciable after the above procedure try out several new 6SK7 1st A.F. tubes. Use the one which reduces the hum to a minimum.

Setting the Station Buttons

There are 6 buttons on the automatic tuning dial by means of which 6 stations may be set for quick tuning.

It is better to list the station with the lowest kilocycle number first, the station with the next highest kilocycle number next, and so on.

Any button may be used for any station you can receive, although it will be more convenient to set the stations so that the kilocycle numbers decrease from left to right.

Setting a Station Button

Turn the manual tuning knob so that the pointer moves toward 1700 KC until the stop is reached.

At the right side of the escutcheon (from the front) will be seen a cap which covers a hole in the escutcheon—See Illustration. Pull off this cap.

At the end of the tube in back of the hole in the escutcheon is the locking screw. Using a small handle screwdriver, unlock the mechanism by turning this screw several turns in a counter-clockwise direction.

Select the first station from the list you have prepared, and carefully tune this station by means of the manual tuning knob using the tuning eye as a guide.

With one hand, hold the manual tuning knob to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way down. It will go down easily at first and then a firm gentle pressure must be applied to push it down the rest of the way. It is better to start with the left hand button.

Hold this button all the way down. With the other hand, see whether or not this station is still accurately tuned in by moving the tuning knob a slight amount back and forth while observing the tuning eye. Be sure to hold the button all the way down.

Release the button after the station is tuned in.

Carefully tune in the second station on your list. Then hold the tuning knob and push the second button slowly and firmly all the way down. Check for accurate tuning.

Proceed in the same manner to set any additional stations on your list on the remaining station buttons.

After all the stations are set, it will be necessary to lock the mechanism so that the settings will not change. Turn the manual tuning knob so that the pointer moves toward 1700 KC until the stop is reached. Then, with the SMALL HANDLE screwdriver, turn the locking screw in a clockwise direction until it is tight. Tighten the locking screw firmly but not excessively to avoid stripping the threads.

Replace the cap over the hole.

Insert a celluloid reinforcement tab half way in the slot at the front of the first station button.

Remove the correct station call letter tab for this button from the sheet supplied by bending the sheet back and forth at the score marks. Place the call letter tab in front of the celluloid reinforcement tab and insert it in slot. Push both tabs all the way in the button slot. Follow the same procedure for inserting the station call letter tabs in any other buttons.

If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of any of the other buttons.

Television Sound Connections

If Television programs ever become available in your community the audio amplifier and speaker of this radio may be used to reproduce Television sound in conjunction with any "Television Picture Receiver and Sound Converter."

On the back panel of the chassis base is a socket to which is connected the phono cable shielded pin tip. Upon removal of this pin tip, the connector on the cable from a television receiver can be inserted in the socket. (The cable conductor must be a single shielded pin tip type, part No. M33.)

When Television sound reproduction is desired, the knob above the dial of the radio should be turned to the Phonograph position. For radio reception, the knob should be in the Radio (R) position.
GAMBLE-SKOGMO, INC.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH SETTING</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>460 KC</td>
<td>Grid of 1st Det.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>1st L.F.</td>
<td>(C17) &amp; (C18) &amp; (C21) &amp; (C24)</td>
</tr>
<tr>
<td>RANGE B</td>
<td>1750 KC</td>
<td>Antenna Lead</td>
<td>200 mm.</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range B (C15)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1800 KC</td>
<td>Antenna Lead</td>
<td>200 mm.</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range B (C4) &amp; Int. Range B (C9)</td>
<td></td>
</tr>
<tr>
<td>RANGE C</td>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>200 mm.</td>
<td>Turn Rotor to Max. Output</td>
<td>600 KC (C45) &amp; 1470 (C6) Rock Rotor—See Note C</td>
<td></td>
</tr>
<tr>
<td>RANGE D</td>
<td>7000 KC</td>
<td>Antenna Load</td>
<td>400 Ohm</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range C (C14)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6000 KC</td>
<td>Antenna Load</td>
<td>400 Ohm</td>
<td>Turn Rotor to Max. Output</td>
<td>Ant. Range C (C3) &amp; Int. Range C (C4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22,000 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>Turn Rotor to Max. Output</td>
<td>Oscillator Range D (C13)</td>
<td></td>
</tr>
<tr>
<td>LOOP RANGE B</td>
<td>1500 KC</td>
<td>See Note D</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Loop Trimmer (C23) &amp; See Note E</td>
<td></td>
</tr>
<tr>
<td>LOOP RANGE C</td>
<td>5000 KC</td>
<td>See Note D</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Loop Trimmer (C22) &amp; See Note E</td>
<td></td>
</tr>
<tr>
<td>LOOP RANGE D</td>
<td>21,000 KC</td>
<td>See Note D</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td>Loop Trimmer (C21) &amp; See Note C</td>
<td></td>
</tr>
</tbody>
</table>

After each range is completed, repeat the procedure at the previous range.

NOTE A—For all adjustments, with the exception of the 3 loop range adjustments, the pin tip should be in the external antenna hole of the Antenna Selection Socket—See Illustration on page one.

NOTE B—If the pointer is not at 1500 KC on the dial, remove pointer from drive cord. Turn in a 1500 KC signal. Set pointer at the 1500 KC mark on the dial scale. Attach pointer to drive cord.

NOTE C—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

NOTE D—Re-install in cabinet. Connect a loop approximately one foot in diameter across the antenna and ground posts of the signal generator. Place signal generator so that this loop is between 3 and 10 feet from loop in cabinet. Insert pin tip in loop antenna hole of Antenna Selection Socket—See Illustration or schematic page.

Drive Cord Replacement

Use a drive cord approximately 70 inches in length. Tie a large knot with a small loop at one end of the new drive cord. Thread outer end of cord up through hole in rim of condenser drive pulley. Pull cord through hole and fasten large knot is fixed against pulley rim.

Turn gang condenser to completely closed position. Remove guide arm from front of chassis—See illustration.

Wind 3/4 turn in a clockwise direction (from right side of chassis) around condenser drive pulley. Wind cord over pulleys A, B, and C as shown. Wind 1 1/2 turns in a clockwise direction (from front of chassis) around tuning control shaft. Turn should progress toward the chassis.

Wind 1 1/2 turns in a clockwise direction (from right side of chassis) around condenser drive pulley. This turn should be at left side (from front of chassis) of pulley groove. Pass cord through hole in pulley rim. Secure tension spring to cord loop. Knob other end of cord to spring. Stretch spring and secure free end to hook on drive pulley. Replace guide arm.

Dial Pointer Attachment—Tune in a signal of known frequency. Set the pointer at this frequency on the dial scale. Secure pointer to cord—See illustration.

Note E (CONSOLE MODELS)—Turn knob of loop until output is maximum.

CAUTION—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 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 5060 less 912 KC, or 4088 KC on the dial. It may be necessary to increase the input signal to hear the image.
Alignment: Peak i.f. transformers at 455 kc. Set generator to 1500 kc and tune in with osc trimmer on gang, front section. Adjust ant trimmer for maximum output.

Alignment: Peak i.f. at 455 kc. Adjust B-C osc trimmer (under chassis on apron) to 1500 kc. Adjust b-c pad to 15 kc. Tune in. Set s-w osc trimmer so that dial points to this frequency. Align s-w ant trimmer (top of chassis on s-w ant coil to right of gang condenser.)
12 TUBE - 4 BAND AC-DC RECEIVER

PARTS

BAND SWITCH SHORT CIRCUITS COILS OF LOWER FREQUENCY THAN THE ONE IN USE
GAROD MODELS 399, 4990; 1039, 1049; 1540; 3109; 4123; 4124; 4410

ALIGNMENT

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 1555 kc and is connected through a .5 mmfd condenser to the grid of the first detector (OK3). 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 are found on tops of the I.F. transformer shield cans.

Band #1 Adjustment: Turn the dial 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 mmfd mica condenser and a 400 ohm non-inductive resistor. The oscillator trimmer condenser should be opened to minimum capacity and the signal generator then set to 2400 cycles. The oscillator trimmer is then increased in capacity until maximum response is obtained. Two responses are possible and it is important that the high frequency response (oscillator trimmer low capacity) be used. The signal generator is then set to 6100 kc and the variable condenser turned until a response is obtained. The pointer should coincide with the 6100 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. The signal generator is now set at 7.0 kc and the signal tuned in on the dial. The paddler condenser for this band is adjusted for maximum reading of the output meter while the generator running condenser is rocked slightly to right and left. The high frequency adjustment should then be rechecked.

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 unmeshed and the oscillator trimmer is opened to minimum capacity. The signal generator is set to 7.0 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. Set the signal generator at 7 mc and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 mc marker 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 set the signal generator at 2.5 mc and turn the variable gang condenser until a response is observed. Adjust the paddler condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and the left. The higher frequency adjustment should then be rechecked.

Broadcast Band: The dummy antenna for this band should consist of a 250 mmfd condenser only. The signal generator is set at 16200 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 increased in capacity until a response is heard. Set the signal generator at 1500 kc and tune the receiver until a response is indicated. The dial pointer should coincide with the 1500 kc marker on the dial.

The signal generator is then set at 500 kc and the receiver tuned until a response is indicated. The paddler condenser is then adjusted for maximum gain while the tuning gang condenser is rocked slightly to the left and right. The 1600 kc adjustment should then be rechecked.

MODELS 1049, 1540, 4124, 4410 and 4990. (ONLY)

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 300 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 150 kc and the signal is tuned in. The long wave paddler condenser is adjusted for maximum response while the tuning gang condenser is rocked slightly to the left and right. The 300 kc adjustment should then be rechecked.

NOTE: Refers to models 399, 4990; 1039, 1049; 1540; and 3109.

(1) 4560 kc
(2) 225 mc
(3) 21 mc
(4) 7.2 mc
(5) 7.4 mc
(6) 1720 kc

Then adjust the antenna and detector trimmers in the order indicated for maximum output.
GENERAL ELECTRIC CO.

MODEL JM-23
MODELS HE-100, HE-100H, HE-100L, HE-100LH, HE-105, HE-105L

REPLACEMENT PARTS LIST
MODEL JM-23

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB-041</td>
<td>BOTTOM COVER—Cabinet bottom cover</td>
<td>$0.30</td>
</tr>
<tr>
<td>RC-083</td>
<td>CAPACITOR—.005 mfd. 600 V. paper</td>
<td>$0.20</td>
</tr>
<tr>
<td>RC-059</td>
<td>CAPACITOR—.01-1 mfd. line capacitor</td>
<td>$0.50</td>
</tr>
<tr>
<td>RC-096</td>
<td>CAPACITOR—.1 mfd. 200 V. paper (C-3)</td>
<td>$0.30</td>
</tr>
<tr>
<td>RC-021</td>
<td>CAPACITOR—100 mfd. mica (C-3)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RC-2002</td>
<td>CLAMP—Crystal clamp</td>
<td>$0.10</td>
</tr>
<tr>
<td>RC-026</td>
<td>CLIP—Oscillator coil mounting clip (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RC-017</td>
<td>CATCH—Tone arm catch for securing to rest</td>
<td>$0.10</td>
</tr>
<tr>
<td>RC-051</td>
<td>CAPACITOR—.1 mfd. 1000 V. dry electrolytic (C-3)</td>
<td>$0.70</td>
</tr>
<tr>
<td>RC-6520</td>
<td>CAPACITOR—Trimmer capacitor (C-1)</td>
<td>$0.40</td>
</tr>
<tr>
<td>RC-318</td>
<td>CORD—Power cord</td>
<td>$0.40</td>
</tr>
<tr>
<td>RC-016</td>
<td>FOOT—Rubber foot for cabinet (Pkg. 3)</td>
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<tr>
<td>RC-016</td>
<td>GRID CAP—6A8G control grid cap (Pkg. 5)</td>
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<tr>
<td>RH-114</td>
<td>HAIRPIN COTTER—Swivel retaining cotter</td>
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<tr>
<td>RC-073</td>
<td>KNOB—Power switch control knob</td>
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<tr>
<td>RL-026</td>
<td>COIL—Oscillator coil (L-1)</td>
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</tr>
<tr>
<td>RN-001</td>
<td>NUT—Speed nut for mounting motor assembly (Pkg. 3)</td>
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</tr>
<tr>
<td>RN-088</td>
<td>NUT—Power switch clamping nut (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RS-102</td>
<td>NEEDLE CUP—Rubber needle cup</td>
<td>$0.10</td>
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<tr>
<td>RS-506</td>
<td>PICK-UP—Crystal pick-up</td>
<td>$0.75</td>
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<tr>
<td>RP-031</td>
<td>POST—Tone arm sweep post (C-1)</td>
<td>$0.15</td>
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<tr>
<td>RQ-1261</td>
<td>RESISTOR—1200 ohms 1/2 W. carbon (R-2) (Pkg. 5)</td>
<td>$0.70</td>
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<tr>
<td>RQ-1279</td>
<td>RESISTOR—6600 ohms 1/2 W. carbon (R-2) (Pkg. 6)</td>
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<tr>
<td>RQ-1299</td>
<td>RESISTOR—47000 ohms 1/2 W. carbon (R-2, 4) (Pkg. 5)</td>
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<tr>
<td>RQ-1309</td>
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<td>RQ-1331</td>
<td>RESISTOR—1.0 megohm 1/2 W. carbon (R-3) (Pkg. 5)</td>
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<tr>
<td>RR-040</td>
<td>REST—Tone arm rest</td>
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<tr>
<td>RS-200</td>
<td>SOCKET—6A8G tube socket (Pkg. 5)</td>
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<tr>
<td>RS-204</td>
<td>SOCKET #4 tube socket (Pkg. 5)</td>
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<td>RS-888</td>
<td>SCREW—Needle clamping screw</td>
<td>$0.10</td>
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<tr>
<td>RS-890</td>
<td>SCREW—Crystal clamp and catch screw</td>
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</tr>
<tr>
<td>RS-988</td>
<td>SWIVEL—Tone arm swivel assembly</td>
<td>$0.15</td>
</tr>
<tr>
<td>RS-3058</td>
<td>SWITCH—Power control switch</td>
<td>$0.50</td>
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<tr>
<td>RT-020</td>
<td>TRANSFORMER—Power transformer</td>
<td>$2.20</td>
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<tr>
<td>RT-021</td>
<td>TRANSFORMER—Power transformer, 50 cycles</td>
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<td>RT-912</td>
<td>TONE ARM—Crystal tone arm</td>
<td>$0.65</td>
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<tr>
<td>RW-114</td>
<td>WEIGHT—Tone arm weight</td>
<td>$0.65</td>
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Voltage Chart

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd. Volts</th>
<th>Screen to Gnd. Volts</th>
<th>Cathode to Gnd. Volts</th>
<th>Filament Volts</th>
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<tbody>
<tr>
<td>6SK7</td>
<td>215</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
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<tr>
<td>6K8</td>
<td>Conv—220 Osc—105</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7(1.P.)</td>
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<td>98</td>
<td>3</td>
<td>6.3</td>
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<tr>
<td>6H6</td>
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<td>6.3</td>
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<tr>
<td>6SF5</td>
<td>110</td>
<td></td>
<td>1</td>
<td>6.3</td>
</tr>
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<td>6J5G</td>
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<td>4</td>
<td>6.3</td>
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<td>6VG6</td>
<td>290</td>
<td>230</td>
<td>11.8</td>
<td>6.3</td>
</tr>
<tr>
<td>SUG4</td>
<td>277 a-c</td>
<td>300</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>6UG</td>
<td>170</td>
<td></td>
<td>6.3</td>
<td></td>
</tr>
</tbody>
</table>

HE-100, HE-100H, HE-100L, HE-100LH, HE-105, HE-105L

GENERAL INFORMATION

The Model JM-23 Wireless Record Player is a two-tube transmitter using a type §4 tube as a rectifier and a type 6A8G as an oscillator. Audio modulation is applied to the control grid of the 6A8G from a properly loaded crystal pickup circuit. The oscillator operates over a range of 1400-1600 kilocycles and the frequency is adjusted by the tuning trimmer (C-1). This trimmer is set to operate at approximately 1500 K.C. at the factory.

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.

The power control is a three-position switch. When this control is turned to the extreme counterclockwise position, all power is removed from the record player. When switched to the center position, power is applied to both the motor and the transmitter. When turned to the extreme clockwise position, power is supplied to the transmitter but is removed from the motor. This last position provides a means of stopping turntable rotation without letting the tubes cool down between operating temperatures.

FREQUENCY ADJUSTMENT

To adjust the frequency of the oscillator turn the tuning knob which is accessible through a hole in the bottom cover near the power control knob. This is a screwdriver control. Clockwise rotation of the trimmer raises the frequency while counterclockwise rotation lowers the frequency. Since the electrical capacity of the hand may detune the transmitter somewhat if rested on the record player during adjustment, it is best to rest the record player on the edge of a table or bench with the tuning trimmer side of the record player just far enough out from the edge to allow screwdriver adjustment of the tuning trimmer.
GENERAL INFORMATION

Models HE-50 and HE-540 are three-band receivers employing five General Electric Pre-tested Tubes in a superhetodyne circuit. Features of design include "Alnico" magnet dynamic speaker, beampower output, iron core I.F. transformers, single-ended tubes, and degenerative feedback. Model HE-50 is an A-C receiver available in three classes of voltage and frequency rating. Model HE-540 is an AC-DC receiver using an improved rectifier circuit.

Models HE-64L and HE-640L are similar to the above models except for tuning frequency coverage and incorporation of a tuning indicator. Model HE-64L is an A-C receiver while Model HE-640L is an AC-DC receiver.

Coil Data

All antenna and oscillator transformer switch terminals are numbered in Figs. 6, 7, 10, and 11 to facilitate in locating these common points on the schematic diagrams Figs. 4, 5, 8, and 9.

The following tables show the coils in use for the various positions of the band-change switch.

<table>
<thead>
<tr>
<th>Band Switch Position</th>
<th>Antenna Primary</th>
<th>Antenna Secondary</th>
<th>Oscillator Grid</th>
<th>Oscillator Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;A&quot;</td>
<td>Section 16 to 17 of L1</td>
<td>Section 2 to 5 of L2</td>
<td>Section 6 to 10 of L1</td>
<td>Section 9 to 10 of L2</td>
</tr>
<tr>
<td>Band &quot;B&quot;</td>
<td>Section 16 to 17 of L1</td>
<td>Section 2 to 5 of L2</td>
<td>Section 6 to 10 of L1</td>
<td>Section 9 to 10 of L2</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>Section 3 to 5 of L1</td>
<td>Section 3 to 5 of L2</td>
<td>Section 7 to 10 of L1</td>
<td>Section 11 to 10 of L2</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>Section 3 to 5 of L1</td>
<td>Section 4 to 5 of L2</td>
<td>Section 8 to 10 of L1</td>
<td>Section 12 to 10 of L2</td>
</tr>
</tbody>
</table>

Resistances

<table>
<thead>
<tr>
<th>Coil</th>
<th>Model</th>
<th>Section</th>
<th>Resistance Measured Between Points</th>
<th>Resistance (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>HE-50, 540</td>
<td>B Primary</td>
<td>1 and 5</td>
<td>22</td>
</tr>
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<td></td>
<td></td>
<td>B Secondary</td>
<td>2 and 5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Secondary</td>
<td>3 and 5</td>
<td>.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 6</td>
<td>.02</td>
</tr>
<tr>
<td>Antenna</td>
<td>HE-64L, 640L</td>
<td>A Primary</td>
<td>1 and 5</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Secondary</td>
<td>2 and 5</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Secondary</td>
<td>3 and 5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Primary</td>
<td>16 and 17</td>
<td>.2</td>
</tr>
<tr>
<td>Oscillator</td>
<td>HE-50, 540</td>
<td>B Band Coil</td>
<td>6 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Band Coil</td>
<td>7 and 10</td>
<td>.8</td>
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<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.02</td>
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<tr>
<td>Oscillator</td>
<td>HE-64L, 640L</td>
<td>A Band Coil</td>
<td>6 and 10</td>
<td>10</td>
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<td></td>
<td></td>
<td>B Band Coil</td>
<td>7 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.03</td>
</tr>
<tr>
<td>1st I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>9 to 12</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>15 to 19</td>
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<tr>
<td>2nd I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>14 to 18</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>7 to 9</td>
<td></td>
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<td>Output Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>9 to 12</td>
<td>265</td>
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<td></td>
<td>Secondary</td>
<td>15 to 19</td>
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<td>Power Transformer</td>
<td>HE-50, 64L</td>
<td>Primary 110 V. Tap</td>
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<td></td>
<td></td>
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<td>Red to Red</td>
<td>240</td>
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<tr>
<td></td>
<td></td>
<td>Green to Yellow to Yellow</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

Loud-speaker

The voice coil is accurately and permanently centered; the factory should and seldom give trouble. In case a voice coil needs recentering, it will be necessary to replace the entire cone and voice coil assembly.

Note: In no case should the magnet be removed from the assembly position as it will lose magnetism.

Phonograph Connections

Figs. 1a and 1b show simple methods for connecting a cry tal or high impedance magnetic pickup into the receiver circuit for the reproduction of phonograph recordings. S-1 is triple-pole, double-throw switch. A suitable loading circuit composed of a resistor or capacitor network should be used across the pickup leads when using a crystal type unit. It is very important that the pickup leads have a sheath such as copper braid to prevent hum interference. This shield should be connected to the chassis ground.

Remove the jumper between phone-terminals 1 and 2 or make connections as shown in Figs. 1a and 1b.

When the pickup is connected as shown, the regular radio volume and tone controls work for both radio and phonograph reproduction. The following are suggested parts:
**Alignment Procedure**

The alignment is given in tabular form on this page. Use a graphic or oscilloscope for the alignment procedure.

**I.F. ALIGNMENT - OSCILLOSCOPE**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Desired Voltage</th>
<th>Transformer</th>
<th>Comments</th>
</tr>
</thead>
</table>

**I.F. ALIGNMENT WITH OUTPUT METER**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Output</th>
<th>Desired Voltage</th>
<th>Transformer</th>
<th>Comments</th>
</tr>
</thead>
</table>

**VOLTAGE CHARTS (Models HE-50 and HE-640L)**

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Voltage</th>
<th>Screen to Grid Voltage</th>
<th>Cathode to Grid Voltage</th>
<th>Plate to Grid Plate to Ground</th>
<th>Screen to Grid Plate to Ground</th>
<th>Cathode to Grid Plate to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>132</td>
<td>100</td>
<td>20</td>
<td>6SA7</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>6SK7</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6SK7</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>6SK9</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6SK9</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>6VR9</td>
<td>100 (AC)</td>
<td>100 (DC)</td>
<td>0.5</td>
<td>6VR9</td>
<td>100</td>
<td>0.5</td>
</tr>
<tr>
<td>6VR10</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6VR10</td>
<td>80</td>
<td>10</td>
</tr>
</tbody>
</table>

**Voltage Chart (Models HE-50 and HE-640L)**

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Voltage</th>
<th>Screen to Grid Voltage</th>
<th>Cathode to Grid Voltage</th>
<th>Plate to Grid Plate to Ground</th>
<th>Screen to Grid Plate to Ground</th>
<th>Cathode to Grid Plate to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>132</td>
<td>100</td>
<td>20</td>
<td>6SA7</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>6SK7</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6SK7</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>6SK9</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6SK9</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>6VR9</td>
<td>100 (AC)</td>
<td>100 (DC)</td>
<td>0.5</td>
<td>6VR9</td>
<td>100</td>
<td>0.5</td>
</tr>
<tr>
<td>6VR10</td>
<td>100</td>
<td>80</td>
<td>10</td>
<td>6VR10</td>
<td>80</td>
<td>10</td>
</tr>
</tbody>
</table>

**Physical Specifications**

- **Models:** HE-50, HE-640, HE-640L
- **Height:** 15 inches
- **Width:** 11 inches
- **Depth:** 10 inches
- **Weight:** 3.7 pounds

**Tuning Frequency Range**

- **Models HE-50 and HE-640**
  - **Band "A"**
    - **Model:** 500-1700 K.C.
  - **Band "B"**
    - **Model:** 2500-7000 K.C.
  - **Band "C"**
    - **Model:** 750-8700 K.C.

**Intermediate Frequency**

- **Model:** 455 K.C.

**Electrical Specifications**

- **Maximum Output:** 2.5 watts
- **Load Impedance:** 690 ohms
- **Noise Figure:** 15 dB

**Alignment Procedure (Continued)**

**R.F. ALIGNMENT - MODELS HE-50 AND HE-640**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Transformer</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Band &quot;D&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The image of &quot;D&quot; band should be heard 100 K.C. below the input signal. When C-3 is on proper peak, E-4 should be 33 K.C. while rocking the gang condenser.</td>
</tr>
</tbody>
</table>

**R.F. ALIGNMENT - MODELS HE-640 AND HE-640L**

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Transformer</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Band &quot;B&quot;</td>
<td>1300 K.C. with modulation</td>
<td></td>
<td></td>
<td></td>
<td>Peak trimmer for maximum output.</td>
</tr>
</tbody>
</table>

**Alignment Procedure (Continued)**

- **Cathode Current:** 0.7 ma.
- **Screen Current:** 7.3 ma.
- **Gang Condenser:** 100 K.C. above output
### General Electric Co.

**Models J-51, J-53, J-54, and J-54W**

**Parts Description List**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2a</td>
<td>Antenna section of tuning condenser</td>
</tr>
<tr>
<td>C2b</td>
<td>Oscillator section of tuning condenser</td>
</tr>
<tr>
<td>C4</td>
<td>47 mfd. mica capacitor</td>
</tr>
<tr>
<td>C5</td>
<td>470 mfd. mica capacitor</td>
</tr>
<tr>
<td>C10</td>
<td>.05 mfd. paper capacitor</td>
</tr>
<tr>
<td>C12</td>
<td>.005 mfd. paper capacitor</td>
</tr>
<tr>
<td>C13</td>
<td>.003 mfd. paper capacitor</td>
</tr>
<tr>
<td>C14</td>
<td>.033 mfd. mica capacitor</td>
</tr>
<tr>
<td>C15</td>
<td>.068 mica capacitor</td>
</tr>
<tr>
<td>C16</td>
<td>.05 mfd. paper capacitor</td>
</tr>
<tr>
<td>C17a</td>
<td>30 mfd. 120 V. dry electrolytic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C17b</td>
<td>40 mfd. 100 V. dry electrolytic</td>
</tr>
<tr>
<td>C18</td>
<td>4.7 mfd. mica capacitor</td>
</tr>
<tr>
<td>C19</td>
<td>.01 mfd. paper capacitor</td>
</tr>
<tr>
<td>C20</td>
<td>Bead type</td>
</tr>
<tr>
<td>C21</td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>L1</td>
<td>1st. I.F. transformer</td>
</tr>
<tr>
<td>L2</td>
<td>2nd. I.F. transformer</td>
</tr>
<tr>
<td>L3</td>
<td>2.2 megohm carbon resistor</td>
</tr>
<tr>
<td>R3</td>
<td>470,000 ohms carbon resistor</td>
</tr>
</tbody>
</table>

**Resistance Values**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R4</td>
<td>0.5 megohm volume control</td>
</tr>
<tr>
<td>R5</td>
<td>4.7 megohm carbon resistor</td>
</tr>
<tr>
<td>R6</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R7</td>
<td>100 mfd. paper capacitor</td>
</tr>
<tr>
<td>R8</td>
<td>330 mfd. mica capacitor</td>
</tr>
<tr>
<td>R9</td>
<td>1,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R10</td>
<td>13 ohm carbon resistor</td>
</tr>
<tr>
<td>R11</td>
<td>Power switch</td>
</tr>
<tr>
<td>T1</td>
<td>Transformer</td>
</tr>
</tbody>
</table>

### Replacement Parts List

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-B-005</td>
<td>BOARD—Terminal board (2)</td>
</tr>
<tr>
<td>R-B-026</td>
<td>BUSHING—Tuning shaft bushing</td>
</tr>
<tr>
<td>R-B-045</td>
<td>BACK COVER—Cabinet back cover for Model J-51</td>
</tr>
<tr>
<td>R-B-046</td>
<td>BACK COVER—Cabinet back cover for Model J-53</td>
</tr>
<tr>
<td>R-B-047</td>
<td>BACK COVER—Cabinet back cover for Models J-54 and J-54W</td>
</tr>
<tr>
<td>R-B-1015</td>
<td>BOARD—Terminal board (1)</td>
</tr>
<tr>
<td>R-B-1102</td>
<td>BRACKET—Tuning condenser bracket</td>
</tr>
<tr>
<td>R-B-1112</td>
<td>BRACKET—Beam-a-Scope bracket</td>
</tr>
<tr>
<td>R-C-001</td>
<td>CAPACITOR—600 mfd. 600 V. paper (C-12, 15)</td>
</tr>
<tr>
<td>R-C-015</td>
<td>CAPACITOR—60 mfd. 600 V. paper (C-1, 17)</td>
</tr>
<tr>
<td>R-C-027</td>
<td>CAPACITOR—5 mfd. 440 V. paper (C-10)</td>
</tr>
<tr>
<td>R-C-028</td>
<td>CAPACITOR—2 mfd. 600 V. paper (C-19)</td>
</tr>
<tr>
<td>R-C-029</td>
<td>CAPACITOR—2 mfd. 600 V. paper (C-19)</td>
</tr>
<tr>
<td>R-C-034</td>
<td>CAPACITOR—10 mfd. 600 V. paper (C-14)</td>
</tr>
<tr>
<td>R-C-035</td>
<td>CAPACITOR—20 mfd. 600 V. paper (C-91)</td>
</tr>
<tr>
<td>R-C-036</td>
<td>CORD—Power cord</td>
</tr>
<tr>
<td>R-C-020</td>
<td>CUSHION—Pointing guide plate spacer cushions (Pkg. 5)</td>
</tr>
<tr>
<td>R-C-0163</td>
<td>CAPACITOR—30 mfd. 120 V. 40 mfd. 150 V. dry electrolytic (C-17a, 17b)</td>
</tr>
<tr>
<td>R-C-703</td>
<td>CONDENSER—Tuning condenser and drum assembly (C-2a, 2b)</td>
</tr>
<tr>
<td>R-C-7032</td>
<td>CONDENSER—Drum assembly (C-2a, 2b)</td>
</tr>
<tr>
<td>R-C-817</td>
<td>CORD—Driving cord</td>
</tr>
<tr>
<td>R-C-901</td>
<td>CONE ASSEMBLY—Speaker cone assembly</td>
</tr>
<tr>
<td>R-P-169</td>
<td>DIAL—Dial scale for Models J-51 and J-53</td>
</tr>
<tr>
<td>R-P-159</td>
<td>DIAL—Dial scale for Models J-54 and J-54W</td>
</tr>
<tr>
<td>R-P-241</td>
<td>DRUM—Dial, hub, and screw assembly</td>
</tr>
<tr>
<td>R-P-597</td>
<td>DRUTCHEN—Dial crutchend</td>
</tr>
<tr>
<td>R-P-592</td>
<td>FASTENER—Fastener for mounting cabinet back on Models J-54 and J-54W (Pkg. 10)</td>
</tr>
<tr>
<td>R-P-556</td>
<td>FASTENER—Beam-a-Scope bracket fastener (Pkg. 5)</td>
</tr>
<tr>
<td>R-P-567</td>
<td>FASTENER—Cabinet back fastener for Models J-51 and J-53 (Pkg. 5)</td>
</tr>
<tr>
<td>*R-H-111</td>
<td>HAMMER COTTER—Fitting on cabinet back (Pkg. 10)</td>
</tr>
<tr>
<td>R-K-040</td>
<td>KNOB—Control knob for Models J-51 and J-53</td>
</tr>
<tr>
<td>R-K-049</td>
<td>KNOB—Control knob for Models J-54 and J-54W</td>
</tr>
<tr>
<td>R-K-052</td>
<td>KNOB—Control knob for Models J-51 and J-53</td>
</tr>
<tr>
<td>R-L-025</td>
<td>COIL—Oscillator coil (L-2)</td>
</tr>
<tr>
<td>R-L-051</td>
<td>MASK—Dial back panel reflector mask</td>
</tr>
<tr>
<td>R-N-003</td>
<td>NUT—Speed nut for mounting dial scale on Models J-51, J-53, J-54 and J-54W (Pkg. 5)</td>
</tr>
<tr>
<td>R-N-010</td>
<td>NUT—Speed nut for mounting dial scale on Models J-54 and J-54W (Pkg. 5)</td>
</tr>
<tr>
<td>*R-T-001</td>
<td>NUT—Bush retaining nut (Pkg. 5)</td>
</tr>
<tr>
<td>R-P-189</td>
<td>PLATE—Pointer plate assembly</td>
</tr>
<tr>
<td>R-P-190</td>
<td>POINTER—Dial scale pointer</td>
</tr>
<tr>
<td>R-P-321</td>
<td>FULLY—Pointer cord pulley and stud (Pkg. 5)</td>
</tr>
</tbody>
</table>

*Used on previous receivers. (Prices Subject to Change without Notice)*

### Front of Chassis

**Socket Voltages**

- **+500 VAC**
- **+350 VAC**
- **+150 VAC**
- **+75 VAC**

**Voltage Measured between Socket Terminals and -**

- **+500 VAC** at 050 Volts Full Scale
- **+350 VAC** at 050 Volts Full Scale
- **+150 VAC** at 050 Volts Full Scale
- **+75 VAC** at 050 Volts Full Scale
MODELS J-51, J-53, J-54, and J-54W

Over-all Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>J-51</th>
<th>J-53</th>
<th>J-54, J-54W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>81/2 inches</td>
<td>81/2 inches</td>
<td>71/2 inches</td>
</tr>
<tr>
<td>Width</td>
<td>13 inches</td>
<td>141/2 inches</td>
<td>101/2 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>61/4 inches</td>
<td>61/4 inches</td>
<td>61/4 inches</td>
</tr>
</tbody>
</table>

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115 AC or DC</td>
<td>40-80</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>115 AC or DC</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Tuning Control Drive Ratio .................................. 14:1

Tuning Frequency Range ........................................ 540-1000 KC

Intermediate Frequency ........................................ 455 KC

Electrical Power Output (117 line volts)

Undistorted ..................................................... 1.5 watts

Maximum ......................................................... 2.5 watts

Load-speaker—“Alnicco” Magnet Dynamic

Outside Cone Diameter .......................................... 5 inches

Voice Coil Impedance (400 cycles) .............................. 3.5 ohms

Tubes

Converter and Oscillator ........................................ GE-12SA7GT

I.F. Amplifier .................................................. GE-12B7

Det., Aud., A.V.C. ................................................ GE-12SQ7GT

Audio Output .................................................... GE-50L9GT

Rectifier ......................................................... GE-38Z5GT

Dial Lamp ......................................................... MAZDA No. 47

GENERAL INFORMATION

Models J-51, J-53, J-54 and J-54W are compact, five-tube superheterodyne receivers which can be operated from either an AC or DC source of power. Model J-51 and J-53 cabinets are in matched walnut veneers. Model J-54 and J-54W cabinets are plastic in oak and gray-white respectively. All models incorporate the following design features: Built-in Beam-a-Scope, 5-inch dynaphone speaker, increased dial length, automatic volume control, and beam power output.

The glass tubes used in the converter and detector stages are interchangeable with metal tubes if the receiver is realigned following the change.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. .............................................. 455 KC

R.F. .............................................. 1650 and 1600 KC

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

To insert the R.F. signal use either a standard I.R.E. dummy antenna between the signal generator and the receiver antenna post, or loop-couple the generator signal to the receiver Beam-a-Scope. A distance of two feet between generator loop and receiver Beam-a-Scope will insulate from over-coupling. When using an I.R.E. dummy antenna for R.F. alignment, do not connect the signal generator ground to the receiver chassis.

With the gang condenser wide open, align oscillator trimmer (C-23) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-2a) for maximum output.

Precaution

If the signal generator is AC operated use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains

Gain

Antenna Post to Converter Grid .......... 4.0 at 1000 KC

R.F. on Converter Grid to I.F. on I.F.

Amplifier Grid .................................. 40 at 1000 KC

I.F. on Converter Grid to I.F. on I.F.

Amplifier Grid .................................. 50 at 455 KC

I.F. Amplifier Grid to Detector Plate .... 50 at 455 KC

(2) 0.16-volt, 400-cycle signal across the volume control will give 3/4-watt speaker output.* (Volume control turned to maximum.)

(3) Average DC voltage developed across oscillator grid resistor (R-1) ............. 15 volts

* Variations of + 20% permissible. All readings obtained with enough signal input to give 3/4-watt speaker output.

Fig. 1. Trimmer Location

Fig. 2. Frequency-degree Reference Chart

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**PHYSICAL SPECIFICATIONS**

- **Models:** JE-51, JE-510, JE-61, JE-61L
- **Height:** 10 1/4 inches, 11 3/4 inches
- **Width:** 19 1/4 inches, 22 1/4 inches
- **Depth:** 8 3/4 inches, 9 inches
- **Drive Ratio:** 22:1
- **Electrical Power Output:**
  - JE-51: 2.7 watts, 3.0 watts
  - JE-510: 2.7 watts, 3.0 watts
  - JE-61: 2.7 watts, 3.0 watts
  - JE-61L: 2.7 watts, 3.0 watts
- **Maximum:** 5.0 watts, 6.0 watts
- **Tone Control:** 3-position
- **Load-speaker—"Alnico" Magnet Dynamic**
  - Cone Diameter: JE-51: 8 inches, JE-510: 8 1/2 inches, JE-61: 8 inches, JE-61L: 8 inches
  - Voice Coil Impedance (400 cycles): 3.5 ohms

**Tubes**

- **Models JE-51, JE-510**
  - Converter and Oscillator: GE-6SA7
  - I.F. Amplifier: GE-6SK7
  - Det., Aud. AVC: GE-6SQ7
  - Power Output: GE-25C6G
  - Rectifier: GE-25Z6G
  - Dial Lamp: (2) Mazda No. 44

- **Models JE-61, JE-61L**
  - Converter and Oscillator: GE-6SA7
  - I.F. Amplifier: GE-6SK7
  - Det., Aud. AVC: GE-6SQ7
  - Power Output: GE-25C6G
  - Rectifier: GE-25Z6G
  - Tuning Indicator: GE-8U5
  - Dial Lamp: (2) Mazda No. 44

**Notes:**
- "V" rated receivers may be operated on 40 cycles provided the power supply voltage is reduced so as not to exceed the following equivalents: 110 volts on the 125-volt tap or 200 volts on the 225-volt tap.
VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>153</td>
<td>106</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7</td>
<td>153</td>
<td>106</td>
<td>3</td>
<td>6.3</td>
</tr>
<tr>
<td>6SQ7</td>
<td>62*</td>
<td>0</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>25C0G</td>
<td>221</td>
<td>153</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>6U5**</td>
<td>153</td>
<td></td>
<td></td>
<td>6.3</td>
</tr>
</tbody>
</table>


* Use a high resistance voltmeter.
** Used only on Models JE-61 and JE-61L.

SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*
   (a) Antenna Post to Converter Grid at
       250 K.C. 6.0
       1000 K.C. 4.0
       4000 K.C. 3.3
       18000 K.C. 2.4
   (b) R.F. on Converter Grid to I.F. on 6SK7
       Grid at
       250 K.C. 25
       1000 K.C. 36
       4000 K.C. 30
       18000 K.C. 28
   (c) I.F. on Converter Grid to I.F. on 6SK7
       Grid at
       455 K.C. 55

(2) Voltage across the diode load to give 1/2 watt speaker output at
400 Cycles .666*

(3) DC voltage developed across oscillator grid resistors (R4) at
   250 K.C. 9.8*
   1000 K.C. 8.6*
   4000 K.C. 9.7*
   18000 K.C. 7.7*

* Variations of +10%, -20% are permissible.

COIL RESISTANCE DATA

<table>
<thead>
<tr>
<th>Coil</th>
<th>Model</th>
<th>Section</th>
<th>Resistance Measured Between Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>JE-51, 510, 61</td>
<td>B Primary</td>
<td>1 and 5 22</td>
</tr>
<tr>
<td></td>
<td>JE-61L</td>
<td>B Secondary</td>
<td>2 and 5 5</td>
</tr>
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<td></td>
<td></td>
<td>C Secondary</td>
<td>3 and 5 .9</td>
</tr>
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<td></td>
<td>D Secondary</td>
<td>4 and 5 .02</td>
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<td>1 and 5 110</td>
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<td></td>
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<td>3 and 5 5</td>
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<td>D Primary</td>
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<td>B Band Coil</td>
<td>6 and 10 3</td>
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<td>C Band Coil</td>
<td>7 and 10 .8</td>
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<td>All Models</td>
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<td>6 and 10 10</td>
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<td></td>
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<td>B Band Coil</td>
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<td>JE-51, 61, 61L</td>
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<td>Primary</td>
<td>250 V. Tap 24</td>
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<td></td>
<td>Secondary</td>
<td>Red to Red 250</td>
</tr>
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<td></td>
<td></td>
<td>Secondary</td>
<td>Green to Green .5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>Yellow to Yellow .5</td>
</tr>
</tbody>
</table>
GENERAL INFORMATION

Models JF-11 and JF-110 are similar to the models in design except that the JF-11 has been designed for use as a low-frequency input device for the following: 1. To provide a low-frequency input for the bandswitches. 2. To provide a high-frequency input for the bandswitches. 3. To provide a medium-frequency input for the bandswitches. 4. To provide a low-frequency input for the bandswitches.

For operation of the 100-Mc. dummy antenna, see Fig. 4. A Bandswitch Position. 1. Band "B" or 1000 Mc. 2. Band "Q", or 100 Mc. 3. Band "W", or 1000 Mc. 4. Band "R", or 1000 Mc. 5. Band "W", or 100 Mc. 6. Band "W", or 100 Mc.

Use a standard I.R.E. dummy antenna in making all R.P. adjustments. A P.I.R. dummy antenna is and 150-Mc. dummy antenna is also available. All P.I.R. dummy antennas are used in connection with oscilloscopes. A P.I.R. dummy antenna is and 150-Mc. dummy antenna is also available. All P.I.R. dummy antennas are used in connection with oscilloscopes.

CONVERSION FOR SPECIAL LINE VOLTAGES

Values in parentheses refer to 115 Vac. values. Values in square brackets refer to 230 Vac. values. Values in parentheses refer to 115 Vac. values. Values in square brackets refer to 230 Vac. values.

115 Volt Ac—(Pages 203-204)

Remove transformer iron cores from JF-11, JF-110, and all subassemblies related to the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer.

115 Volt Dc—(Pages 193-120)

Remove transformer iron core from JF-11, JF-110, or all subassemblies related to the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer.

110 Volt—(Pages 115-115)

Remove transformer iron cores from JF-11, JF-110, or all subassemblies related to the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer. Remove the transformer iron core from the transformer.

R.F. ALIGNMENT—MODELS JF-11, JF-110, AND JF-110A

**Fig. 4. Chassis Parts Layout**

**GENERAL INFORMATION**

This two-band receiver employs five General Electric pre-tested tubes in a superheterodyne circuit. The circuit incorporates a wave trap and a two-point tone control. A signal from the antenna is coupled by the antenna transformer to the control grid of the 6A7 oscillator and converter tube. After conversion to 455 kc., the signal is amplified at this frequency by the intermediate frequency amplifier which employs two double tuned I.F. transformers.

The diode part of the 75 tube is used as a detector and provides the a.v.c. voltage. The 75 tube is resistance-coupled to the 41 pentode amplifier output tube.

Minimum bias is supplied for all tubes except the 75 by the voltage drop over the resistance R-8 and R-12. Bias for the 75 tube is supplied by the voltage drop over R-12.

Negative feed back is used to improve the tone of reproduction. In this circuit, voltage is fed back from the voice coil circuit to a tap on the volume control. This feedback voltage is out of phase with the input voltage to the audio amplifier. Engineers have shown that the resulting degeneration reduces distortion arising in the audio amplifier and extends the tone range.

**ALIGNMENT PROCEDURE**

**I.F. Alignment**

Connect an output meter across the voice coil. Set the volume control for maximum.

Set the test oscillator to 455 kc. and connect one output lead to the receiver chassis and the other through a 0.1 Mfd. condenser to the control grid of the 6A7. Do not remove the grid lead from the 6A7 as this would remove the minimum bias from this tube. Keep the test oscillator output as low as possible to give a readable output. The four I.F. trimmers (see Fig. 2) should be adjusted in the following sequence for maximum output.

1. Secondary trimmer (C-9) on second I.F. transformer
2. Primary trimmer (C-8)
3. Secondary trimmer (C-7) on first I.F. transformer

**Wave Trap Alignment**

Leave the test oscillator set to 455 kc. and connect one output lead to the receiver chassis and the other through a 250 Mfd. condenser in series with 400 ohms to the receiver antenna lead. Adjust C-10 for minimum output.

**R.F. Alignment**

A careful examination of the diagram, Fig. 1, will disclose that the “D” band, oscillator trimmer C-4 must first be set before any adjustment of the broadcast oscillator trimmer C-23 can be made. The image of any signal on “D” band should be tuned in 910 kc. below the input signal when C-4 is on the correct peak. Example: 18 mc. image is at 17.09 mc.

Use the same dummy antenna (250 Mfd. and 400 ohms) as used for the wave-trap alignment.

Rock the gang condenser when peaking the trimmers (C-11 or C-5).

**Band Switch Signal Frequency Adjust Trimmer**

1. “D” 18 mc. C-4 (only)
2. “B” 1600 kc. C-23 and C-3
4. “B” 1600 kc. C-23 and C-3

**Note:** Be sure that the setting of C-4 made in No. 1 is not disturbed during any other part of the alignment. If it is changed the whole R.F. alignment procedure should be repeated.

**Fig. 2. Trimmer Location**
GENERAL ELECTRIC CO.

MODEL GE-53

POWER CONSUMPTION (LABEL A) 65 WATTS, (LABEL B) 70 WATTS

<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>C6</td>
<td>R. P. Trimmer Capacitor, &quot;D&quot; Band</td>
<td>C40</td>
<td>Paper Capacitor, 0.001 Mfd.</td>
<td>R10</td>
<td>Carbon Resistor, 2.2 Megohms</td>
</tr>
<tr>
<td>C7, C13</td>
<td>Osc. Trimmer Capacitor, &quot;D&quot; Band</td>
<td>C41</td>
<td>Paper Capacitor, 0.03 Mfd.</td>
<td>R11</td>
<td>Carbon Resistor, 330,000 Ohms</td>
</tr>
<tr>
<td>C11</td>
<td>Osc. Padder Capacitor, &quot;B&quot; Band</td>
<td>C42</td>
<td>Electrolytic Capacitor, 0.6 mfd.</td>
<td>R12</td>
<td>Carbon Resistor, 330,000 Ohms</td>
</tr>
<tr>
<td>C12, C14</td>
<td>Capacitor, 470 Mfd.</td>
<td>C43</td>
<td>Paper Capacitor, 0.02 Mfd.</td>
<td>R13</td>
<td>Carbon Resistor, 12,000 Ohms</td>
</tr>
<tr>
<td>C19</td>
<td>Mica Capacitor, 3.3 NF.</td>
<td>C44</td>
<td>Paper Capacitor, 0.03 Mfd.</td>
<td>R14</td>
<td>Carbon Resistor, 3900 Ohms</td>
</tr>
<tr>
<td>C21, C22</td>
<td>Mica Capacitor, 17 Mfd.</td>
<td>C45</td>
<td>Paper Capacitor, 0.01 Mfd.</td>
<td>R15</td>
<td>Carbon Resistor, 22 Ohms</td>
</tr>
<tr>
<td>C23, C24</td>
<td>Mica Capacitor, 270 Mfd.</td>
<td>C46</td>
<td>Paper Capacitor, 0.03 Mfd.</td>
<td>R16</td>
<td>Carbon Resistor, 330 Ohms</td>
</tr>
<tr>
<td>C25</td>
<td>Mica Trimmer, 165,000 Mfd.</td>
<td>C47</td>
<td>Paper Capacitor, 0.001 Mfd.</td>
<td>R17</td>
<td>Volume Control, 2 Megohms, tap at 15,000 Ohms</td>
</tr>
<tr>
<td>C26, C27</td>
<td>Mica Trimmer, 5-250 Mfd.</td>
<td>C48</td>
<td>Paper Capacitor, 0.012 Mfd.</td>
<td>R18</td>
<td>Power Transformers</td>
</tr>
<tr>
<td>C28</td>
<td>Mica Trimmer, 50-250 Mfd.</td>
<td>C49</td>
<td>Paper Capacitor, 0.1 Mfd.</td>
<td>T1</td>
<td>Output Transformers</td>
</tr>
<tr>
<td>C29</td>
<td>Mica Trimmer, 10-60 Mfd.</td>
<td>C50</td>
<td>Molded Paper Capacitor, 0.01 Mfd.</td>
<td>T2</td>
<td>Speaker, 8.74 Inches (G-58)</td>
</tr>
<tr>
<td>C30, C31</td>
<td>Mica Trimmer, 0-10 Mfd.</td>
<td>C51</td>
<td>Dry Electrolytic Capacitor, 8 Mfd.</td>
<td>L1</td>
<td>Speaker, 10 Inches (G-56)</td>
</tr>
<tr>
<td>C32, C33</td>
<td>Mica Trimmer, 11-60 Mfd.</td>
<td>C52</td>
<td>Dry Electrolytic Capacitor, 8 Mfd.</td>
<td>S1</td>
<td>Band Switch</td>
</tr>
<tr>
<td>C34, C35</td>
<td>Mica Trimmer, 165,000 Mfd.</td>
<td>C53</td>
<td>Carbon Resistor, 4,700 Ohms</td>
<td>S2</td>
<td>Tone Control Switch</td>
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<tr>
<td>C36</td>
<td>Mica Trimmer, 50-250 Mfd.</td>
<td>C54</td>
<td>Carbon Resistor, 16,000 Ohms</td>
<td>S3</td>
<td>Power Switch (Part of Volume Control)</td>
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<td>C37</td>
<td>Mica Trimmer, 10-60 Mfd.</td>
<td>C55</td>
<td>Carbon Resistor, 10 Megohms</td>
<td>S4</td>
<td>Push-button Switches</td>
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<td>C38</td>
<td>Mica Trimmer, 11-60 Mfd.</td>
<td>C56</td>
<td>Carbon Resistor, 100,000 Ohms</td>
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<tr>
<td>C39</td>
<td>Mica Trimmer, 11-60 Mfd.</td>
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<td></td>
<td></td>
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</table>

SOCKET VOLTAGES

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<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current M.A. D.C.</th>
<th>Heater Volts A.C.</th>
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<td>Converter 236</td>
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<td></td>
<td>Oscillator 186</td>
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<td>6K7</td>
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<td>65</td>
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<td>0</td>
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<td></td>
<td>320</td>
<td>51.4</td>
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<td>5.3</td>
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</tbody>
</table>

A.C. line voltage—120. No signal input. 1000 ohms per volt meter. Dial pointer at 530 ohms on "B" band.

* Measured on 500-volt scale.

Fig. 1. Pick-up Connections
GENERAL INFORMATION

The Models J-62 and J-620 are compact six-tube AC superheterodyne receivers employing General Electric Pre-tested Tubes. Features of design include dual built-in Beam-a-Sopes, visual dial, voltage-doubling rectifier system, broadcast and short-wave coverage, and automatic volume control. Both models are Underwriters' approved and use the same chassis. Model J-62 has a mahogany cabinet. Model J-620 uses a bleached mahogany cabinet.

If an excessive amount of hum is noticed while the receiver is operating, reverse the power plug in the receptacle.

SPECIFICATIONS

Electrical Rating

Power Supply: 115 AC
Frequency (Cycles on AC): 25-90
Power Consumption (Watts): 55

Tuning Frequency Range

Band "B": 540-1600 KC
Band "D": 580-18,000 KC

Intermediate Frequency: 455 KC

Electrical Power Output (117 Line Volts): Undistorted: 3 watts
Maximum: 4.5 watts

Load-speaker—"Alnico" Magnet Dynamic
Outside Cone Diameter: 5 inches
Voice Coil Impedance (400 cycles): 3.5 ohms

SPECIAL SERVICE INFORMATION

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

(1) Stage Gains*
Antenna Post to Converter Grid at 1000 KC
Converter Grid to 6SK7 Grid at 455 KC

(2) Audio Gain
A 400-cycle signal of .06 volts across the volume control will give approximately ½-watt speaker output. (Volume control turned to maximum.)

(3) DC voltage developed across oscillator grid resistor (R-4) averages at
1000 KC
10,000 KC

* Variations of +10%, -20% permissible. All readings obtained with enough input signal to give ½-watt speaker output.
CHASSIS REMOVAL

Note: Care must be exercised in removing either the cabinet back or the chassis to avoid changing the shape of either the shortwave or broadcast loops. These loops are factory formed to give a certain inductance and any alteration in the loops in the field will throw the chassis out of alignment.

Disconnect all leads from the speaker terminals. Un螺丝 the wood screws which secure the short-wave loop to the cabinet. Remove the three chassis bolts and knobs. The chassis is now free from the cabinet.

ALIGNMENT PROCEDURE

Alignment Frequencies:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Band</th>
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<tbody>
<tr>
<td>655 KC</td>
<td>&quot;B&quot;</td>
</tr>
<tr>
<td>1500 and 500 KC</td>
<td>&quot;B&quot;</td>
</tr>
<tr>
<td>1800 and 6000 KC</td>
<td>&quot;B&quot;</td>
</tr>
</tbody>
</table>

The location of trimmers for the above models is shown in Fig. 1. All R.P. trimmers are accessible through holes in the back cover or through the bottom of the cabinet.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plate and set the dial pointer to the first dial mark at the low end of the scale. Turn the band switch to "B" band (counter-clockwise).

Set the trimmer at 455 KC and apply signal to the control grid of the 6SA7 tube through a 500,000 ohm. Keep the meter on a dial reading of approximately 150. Adjust all I.F. trimmers for maximum meter reading. Turn the receiver back to the station of interest. The receiver should now be in alignment.

R.F. Alignment

The use of a standard I.R.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator signal to the receiver by means of a loop attached to the receiver so that the loop is mounted in the cabinet. The receiver should be set to the highest frequency in the broadcast band and the signal generator adjusted to this frequency. The signal generator is now turned to a lower frequency and the receiver is tuned to match the signal generator. The receiver is then turned to another frequency and the signal generator is adjusted to this frequency. The receiver is then tuned to match the signal generator. This process is repeated until the receiver is tuned to all frequencies in the broadcast band. The receiver should now be in R.F. alignment.

Fig. 1. Chassis Parts Layout

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout. A more detailed diagram and table are shown in Fig. 4. The numbering will also aid in routing the coil or switch if replaced.

Fig. 6. Socket Voltages

Fig. 7. Dial Cord Stripping Diagram

Fig. 3. Frequency-degree Reference Chart

Fig. 2. Pointer-guide clip. Set the gang condenser plate to the desired frequency. Place the pointer-guide clip at the desired frequency. Move the pointer-guide clip to the desired frequency. Move the pointer-guide clip to the desired frequency. Move the pointer-guide clip to the desired frequency.

Fig. 8. Chassis Diagram
MODEL J63

GENERAL ELECTRIC CO.

**Electrical Rating**
- 116 Volts, 25-60 cycles AC; or 115 volts DC. 55 watts

**Tuning Frequency Range**
- Broadcast Band: 540-1600 KC
- Intermediate Frequency: 455 KC
- Short-wave Band: 6800-18,000 KC

**Electrical Power Output (117 line volts)**
- Undistorted: 3 watts maximum
- Maximum: 4.5 watts

**Load-speaker—Alnico Magnet Dynamic**
- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

**Special Service Information**
- The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage Gains**
   - Antenna Post to Converter Grid—4.3 at 1000 KC
   - Converter Grid to 6SK7 Grid—602 at 655 KC
   - 6SK7 Grid to 6SJ7 Diode Plate—100 at 455 KC

2. **Audio Gain**
   - 0.6 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/2-watt speaker output.

3. **DC Voltage Developed**
   - Across oscillator grid resistor (R4) averages 10.5 volts at 1000 KC or 8.0 volts at 10,000 KC.
   - Variations of +10 or -20% permissible.

---

**Symbol | Description**
---
C1 | Tuning condenser
C2A | "B" band antenna trimmer
C2B | "B" band antenna trimmer
C2C | "D" band antenna trimmer
C2D | "D" band antenna trimmer
C2E | "B" oscillator padder
C2F | 400 mfd. mica capacitor
C2G | 4.7 mfd. mica capacitor
C2H | 3600 mfd. 0.6-volt mica capacitor
C2I, 13 | 500 mfd. mica capacitor

**Symbol | Description**
---
R1 | 0.5 megohm volume control
R2 | 1000 ohms carbon resistor
R3 | 10 megohm carbon resistor
R4 | 33,000 ohms carbon resistor
R5 | 27 ohms carbon resistor
R6, R7 | 470,000 ohms carbon resistor
R8 | 22,000 ohms carbon resistor
R9 | 30 megohm carbon resistor
R10 | 100,000 ohms carbon resistor
R11 | 4.7 megohm carbon resistor
R12 | 3300 ohms carbon resistor
R13 | 300 ohms carbon resistor
R14 | 100,000 ohms carbon resistor
R15 | 18 megohm carbon resistor
R16 | 30 ohms 2-W wire wound resistor
R17 | 21.43 ohm ballast resistor
R18 | 1500 ohms 1-W wire wound resistor
R19 | 1500 ohms 1-W wire wound resistor
S1 | Band switch
S2 | Power switch
T1 | 1st I.F. transformer
T2 | 2nd I.F. transformer
T3 | Output transformer
SPECIFICATIONS

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>110-125</td>
<td>50-60</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>110-125</td>
<td>25</td>
<td>85</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band                        540-1600 KC
Short-wave Band No. 1                2300-7000 KC
Short-wave Band No. 2                7000-22,000 KC

Intermediate Frequency                455 KC

Electrical Power Output

Undistorted                           2.85 watts
Maximum                                4.5 watts

Tone Control                           3-position

Load-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter                  6 1/2 inches
Voice Coil Impedance                   3.5 ohms

Tubes

Converter and Oscillator               GE-6SA7
I.F. Amplifier                         GE-6SK7
Det., Aud., AVC                         GE-6Q7
Audio Driver                           GE-6J5GT
Audio Output                            GE-6Y6G
Rectifier                               GE-5Y3G
Dial Lamp                               (2) MAZDA No. 44

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 5, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 1. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.
Model J-71 is a seven-tube, superheterodyne receiver designed to operate from an alternating current power supply. The receiver incorporates the latest developments in radio, among which are the General Electric Dual Beam-a-Scope. Broadcast and short-wave No. 1 signals are selected by the Beam-a-Scope which is mounted at one end of the cabinet. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet above the chassis.

Additional features include single-ended tubes, iron-core oscillator station selector coils, five feather-touch tuning station keys, one Phono-Frequency Modulation-Television key, tone monitor circuit and automatic volume control.

Phono-FM-Tel

This receiver is equipped with a pin jack on the rear apron of the chassis and a Phono-FM-Tel key for adapting it to use with record players, frequency modulation converters, and television picture receivers with sound converters. General Electric plug, Stock No. RP-146, fits the pin jack.

Fig. 4. Tube and Trimmer Location

Fig. 3. Cabinet Holes for Trimmer Adjustment

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>50-80</td>
<td>75</td>
</tr>
<tr>
<td>C</td>
<td>110-125</td>
<td>25</td>
<td>85</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band: 540-1600 KC
Short-wave Band No. 1: 3300-6900 KC
Short-wave Band No. 2: 18000-22000 KC

Intermediate Frequency: 455 KC

Electrical Power Output

Undistorted: 2.85 watts
Maximum: 4.5 watts

Tone Control: 3-position

Load-speaker—“Alnico” Magnet Dynamic

Outside Cone Diameter: 6⅛ inches
Voice Coil Impedance: 3.5 ohms
ALIGNMENT PROCEDURE

The alignment procedure is given in the table below. This is a standard I.R.E. practice in series to ensure that all R.F. equipment is representative. R.F. alignment can be performed by loop-sampling the generator signal to the receiver. Beam-scan checking is not recommended and is not recommended to exceed the two circuits. Keeping a distance of two feet or more between the generator loop and receiver is good practice in reducing any parasitic feedback. The relative position of the beam-scan probe may be found by observing the loop signal in the receiver. When determining the short-loop beam leads from the loop, be sure to support the loop while checking the loop. The loop terminals are provided to indicate the short-loop beam leads.

Loudspeaker

The voice coil is a motor and permanently centered at the factory and should not require adjustment. If a voice coil must be removed, it will be necessary to replace the voice coil assembly.

R.F. Alignment

With Chassis Mounted in Cabinet

The alignment procedure can be performed by using the "B.C." and "SW" band controls. Any alignment attempted on the "SW" band will be satisfactory. The relative position between the chassis and broadside probes should maintain the alignment of the chassis as described in the cabinet. Since the glass size is fixed in the chassis cabinet the mast must be used in the alignment. The B.C. band is the one with the most emphasis on improving the cabinet alignment. From the reference chart, Fig. 7, the degree readings for the corresponding frequency settings may be determined. Using a straight edge across the chart, interpolate the line to determine the degree angle. The degree readings should be recalculated from the chart and the chart should be used for further alignment. From the chart, Fig. 7, the degree readings for the corresponding frequency settings may be determined. The degree readings should be recalculated from the chart and the chart should be used for further alignment.

Special Service Information

The following information will be very useful in servicing receivers equipped with VTVMs or similar test equipment.

(3) Special Service Information

1. "B.C." Band
2. "SW" Band
3. Other bands

- Check the alignment of the receiver with the chassis mounted in the cabinet.
- Check and adjust the alignment of the receiver with the chassis mounted in the cabinet.
- Check the alignment of the receiver with the chassis mounted in the cabinet.

L.F. Alignment with Oscilloscope

1. "B.C." Band
2. "SW" Band
3. Other bands

- Check the alignment of the receiver with the chassis mounted in the cabinet.
- Check the alignment of the receiver with the chassis mounted in the cabinet.
- Check the alignment of the receiver with the chassis mounted in the cabinet.

L.F. Alignment with Output Meter

1. "B.C." Band
2. "SW" Band
3. Other bands

- Check the alignment of the receiver with the chassis mounted in the cabinet.
- Check the alignment of the receiver with the chassis mounted in the cabinet.
- Check the alignment of the receiver with the chassis mounted in the cabinet.

Fig. 1. Soldered Voltage LEVEL VIEW OF CHASSIS

Fig. 2. Dial Drive Bending Diagram
MODELS J-71, JB-508, JB-513, JB514

GENERAL ELECTRIC CO.

IA7GT  IN5GT  IH5GT  IT5GT

FOR OTHER DATA
SEE INDEX

MODEL J-71

Tubes
R.F. Amplifier................. GE-6SK7
Converter and Oscillator...... GE-6SA7
I.F. Amplifier................ GE-6SK7
Det., Aud., AVC.............. GE-6SQ7
Audio Driver................ GE-618GT
Audio Output............... GE-6V6G
Rectifier................... GE-5Y3G
Dial Lamp.................... (2) MAZDA No. 44

Fig. 6. Chassis Parts Layout

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 1. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

SETTING UP THE RECEIVER

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

2. The black speaker lead should be connected to the speaker terminal which is grounded to the speaker frame.

3. A method of setting up station keys which will assure driftproof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.
GENERAL ELECTRIC CO.

SERVICE DATA

Rectifier

Models JB-508, JB-513, JB514

Models JB-508, JB-513..................GE-35Z4GT
Model JB-514.........................GE-117Z6GT

GENERAL INFORMATION

The Models JB-513 and JB-514 are portable, five-tube, superhetodyne receivers which are designed to operate on any one of three types of power supplies as listed under electrical specifications. Features of design include power selector switch, built-in Beam-a-Scope, 3-inch dynapower speaker and automatic volume control. Model JB-508 and JB-513 have a dial light which operates when the receiver is connected to an AC or DC power supply.

The Model JB-508 is a portable radio-phonograph combination employing a radio chassis similar to JB-513. The phonograph consists of a spring-wound Swiss motor and crystal pickup. The Swiss motor will play two 10-inch records with one winding. A speed regulator controls the speed above and below 78 R.P.M.

Model JB-514 has full Underwriters' approval. To switch these models from battery to external power supply operation, open the small door in the side of the cabinet, slide the button switch to "Line," which is to the right, and insert the cord plug in a power supply of the proper voltage and frequency. The button switch selects the battery or line power supply.

When these models are working on batteries, they will perform as soon as turned on. However, when operating on an external power supply, sufficient time must be allowed for the tubes to become heated. When operating from a DC power source of power, it is necessary to insert the power plug with the 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.

BATTERY AND TUBE INSTALLATION

Models JB-513 and JB-514

The batteries may be installed or replaced without removing the Beam-a-Scope antennas from the chassis. Place the two "A" batteries on the bottom of the cabinet with the terminals facing each other. Place the "B" battery on one of the battery sockets facing the battery. The "A" and "B" batteries are connected in series by the 3-prong plug connectors cut into the socket terminals in the chassis.

To replace the tubes it is necessary to detach the Beam-a-Scope from the supporting block. Do not strain the two leads connected to the Beam-a-Scope.

Model JB-508

To install or replace batteries remove the five wood screws which hold the motorboard in place, and raise the panel. (Note—The motor crank must be removed from the crank socket before the panel can be raised.) The panel can be freed if the two plug connectors are pulled out of the socket terminals in the chassis. Access to the battery compartment having been made, loosen the battery block held by the wing nuts. Place the two "B" batteries in the bottom sections, terminals inward, and insert the two 3-prong plug connectors. The "A" battery is placed on top of the "B" batteries with terminal toward the removable block and the 2-prong plug connector attached. Replace the battery block and tighten the wing nuts.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. . . . . 455 KC    Broadcast—1700 and 1500 KC

General Alignment Notes

This receiver must be removed from the carrying case in order to perform the alignment. Special care must be exercised to place the batteries, Beam-a-Scope and chassis in the same relative positions with respect to one another as these components occupied in the case; otherwise, alignment will not be satisfactory. When aligning Model JB-508 the radio-phonograph switch must be on "radio."

VOLTAGE CHART

(Receiver connected to 120 Volt AC line)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd. Volts</th>
<th>Screen to Gnd. Volts</th>
<th>Filament to Gnd. Volts</th>
<th>Filament * Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>92</td>
<td>38</td>
<td>3.2</td>
<td>1.6</td>
</tr>
<tr>
<td>1N5GT</td>
<td>92</td>
<td>92</td>
<td>4.8</td>
<td>1.6</td>
</tr>
<tr>
<td>1H6GT</td>
<td>10</td>
<td>92</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>1H5GT</td>
<td>88</td>
<td>92</td>
<td>0.4</td>
<td>1.6</td>
</tr>
<tr>
<td>35Z4GT*</td>
<td>120 AC</td>
<td>125 Cathode to Gnd.</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>117Z6GT*</td>
<td>120 AC</td>
<td>120 AC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Used only in Models JB-513 and JB-508.
** Used only in Model JB-514.

Line—120 Volts AC.

Maximum Volts—Gang Closed—No signal input.

All voltages measured to chassis ground in Models JB-508-514.

Voltages measured to B minus in Model JB-514.
ALIGNMENT PROCEDURE

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 adjustments marked (1) 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.

<table>
<thead>
<tr>
<th>Place band</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. ALIGNMENT use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 455 K.C.</td>
<td>.0001 Mfd. condenser, high side to grid cap of 1K6 tube. Do not remove cup.</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>
<td></td>
</tr>
<tr>
<td>2.2 TO 7.5 M.C. BAND</td>
<td>1 7.5 M.C.</td>
<td>7.5 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
<td>Adjust 7.5 M.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2 Approx. 6 M.C.</td>
<td>6 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
<td>While rocking gang condenser adjust 6 M.C. antenna and R.F. trimmers for maximum output.</td>
</tr>
<tr>
<td>7.5 TO 24 M.C. BAND</td>
<td>1 24 M.C.</td>
<td>24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
<td>Adjust 24 M.C. oscillator trimmer for maximum output. Be sure to use proper peak. The image of the 24 M.C. Signal should be heard at 24.81 M.C. when the correct peak is used.</td>
</tr>
<tr>
<td></td>
<td>2 Approx. 20 M.C.</td>
<td>20 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post</td>
<td>While rocking gang condenser adjust 20 M.C. antenna and R.F. trimmers for maximum output.</td>
</tr>
</tbody>
</table>

THE FOLLOWING DATA WILL BE USEFUL TO SERVICE MEN EQUIPPED WITH VACUUM-TUBE VOLTMETERS OR SIMILAR VOLTAGE MEASURING INSTRUMENTS:

1. Stage Gains
   - Antenna Post to 6ST R.F. Grid 8 at 1000 K.C.
   - 6ST R.F. Grid to 6KS Converter Grid 12 at 1000 K.C.
   - 6KS Converter Grid to 6ST I.F. Grid 20 at 1000 K.C.
   - 6ST I.F. Grid to 6T8 Diode Plate 50 at 1000 K.C.

2. Audio Gains
   - A 600 cycle signal of 0.6 volts across volume control will give approximately 75 watt speaker output. Volume control turned to maximum.

3. DC voltage developed across oscillator and resistor (50) averages 15 volts at 1000 K.C.

* Variations of ±10% are permissible.
Models HM-80A and HM-85A

General Electric Frequency Modulation Receivers, Models HM-80A and HM-85A are designed for the reception of ultra-short-wave broadcasting as developed by Major Edward H. Armstrong. These receivers of the superheterodyne type using eight General Electric Pre-tested Tubes are similar to Models HM-50 and HM-85 respectively. Certain circuit changes have been incorporated in the Models HM-80A and HM-85A to increase sensitivity, improve limiter action, and assure greater stability. A revised schematic diagram and additional replacement parts list are incorporated in this sheet.

For specifications, general information and alignment procedure, refer to HM-80 Service Notes. The tube complement is altered by the substitution of a 6AC7/1852 in place of the 6SK7 1st I.F. amplifier tube.

OSCILLATOR DRIFT CORRECTION NETWORK

The placement of the parts comprising this network materially affects the amount of oscillator drift correction. For maximum performance the positions of the 47-ohm, 1-watt resistor (R-28) and the 5-mmf. compensating capacitor (C-39) should be adjusted until they are parallel and separated by exactly 1/4 inch.
SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*

(a) Antenna Post to R.F. Amplifier Grid at
   1000 KC  4.4
   4000 KC  2.6
   18,000 KC  2.2

(b) R.F. Amplifier Grid to Converter Grid at
   1000 KC  6.0
   4000 KC  12.0
   18,000 KC  8.2**

(c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
   1000 KC ("B" Manual)  40.0
   4000 KC  35.0
   18,000 KC  35.0

(d) I.F. on Converter Grid to I.F. on 1st I.F. Grid at
   455 KC ("B" Manual—Gang Closed)  42.0

(e) I.F. Amplifier Grid to Detector Grid at
   455 KC  117.0

(2) Voltage Across Volume Control to Give 1/4-watt Speaker Output at
   400 Cycles  0.075*.

(3) DC voltage developed across oscillator grid resistor (R-3) with the gang closed.
   "B" Band  7.6*
   "C" Band  6.2*
   "D" Band  5.1*

* Variations of +10%, -20% are permissible.

** On "D" band, stray oscillator voltage may upset reading.
### SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F.</td>
<td>225</td>
<td>105</td>
<td>5.8</td>
<td>3.6</td>
<td>6.4</td>
</tr>
<tr>
<td>6L7</td>
<td>235</td>
<td>105</td>
<td>5.8</td>
<td>8.2</td>
<td>6.4</td>
</tr>
<tr>
<td>6J6G</td>
<td>190</td>
<td></td>
<td>0</td>
<td>10.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6K7 I.F.</td>
<td>215</td>
<td>105</td>
<td>3.6</td>
<td>9.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6F5</td>
<td>*120</td>
<td></td>
<td>0.9</td>
<td>0.7</td>
<td>6.4</td>
</tr>
<tr>
<td>6L6G</td>
<td>230</td>
<td>235</td>
<td>12</td>
<td>70</td>
<td>6.4</td>
</tr>
<tr>
<td>6U5</td>
<td>Target 190</td>
<td></td>
<td>1.5</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>5U4G</td>
<td>298</td>
<td>298</td>
<td></td>
<td></td>
<td>5.1</td>
</tr>
</tbody>
</table>


*Measured on 300-volt scale.

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**Fig. 4. Trimmer Location**
Models HE-100, HE-100H, HE-105

**Fig. 5. Trimmer Location**
Models HE-100L, HE-100HL, HE-105L
Fig. 8. Chassis Parts Layout
Models HE-100, HE-100H, HE-105

Fig. 9. Chassis Parts Layout
Models HE-100L, HE-100LH, HE-105L
Fig. 3. Chassis Parts Layout

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>50-60</td>
<td>115</td>
</tr>
<tr>
<td>C</td>
<td>110-125</td>
<td>25-60</td>
<td>120</td>
</tr>
</tbody>
</table>

 Tubes

R.F. AMPLIFIER .................. GE-6SK7
CONVERTER AND OSCILLATOR ........ GE-8SA7
I.F. AMPLIFIER .................. GE-8SK7
DEP. AVC ........................ GE-6J5GT
1st AUDIO DRIVER ................. GE-6J5GT
2nd AUDIO DRIVER ................. GE-6J5GT
PHASE INVERTER .................. GE-6J5GT
POWER OUTPUT .................... (2) GE-6V6C
RECTIFIER ....................... GE-5Y3G
DIAL LAMP ....................... (2) Mazda No. 44

Fig. 6. Pointer-Guide Clip Setting with Gang Condenser Closed (See "R.F. Alignment with Chassis Outside of Cabinet")

Fig. 7. Dial Cord Stringing Diagram

Fig. 9. Short-wave Beam-a-Scope Connections
### Tuning Frequency Range

| Broadcast Band | 540–1700 KC |
| Short-wave Band No. 1 | 2400–7000 KC |
| Short-wave Band No. 2 | 7000–22,000 KC |

### Electrical Power Output

| Undistorted | 10 Watts |
| Maximum | 12 Watts |

### Tone Control

 Loud-speakers—"Alnico" Magnet Dynamic

- Speaker diameters: 4 inches and 6 1/4 inches
- Voice coil impedances: 3.5 ohms and 2.9 ohms

### GENERAL INFORMATION

Model J-106 is a ten tube superheterodyne receiver designed to operate from a 6-volt dry battery power supply. The receiver incorporates the latest developments in radio among which are the General Electric Dual Beam-a-Scoops. Broadcast and short wave No. 1 signals are selected by the cylindrical Beam-a-Scope. Short wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet above the chassis. Additional features include single-dial tubes, iron-core oscillator station selector coils, six therapist Tuning station keys, one Phono-Frequency Modulation-Television key, an "Off" key, a "Manual" key, Dual Dynapower speakers, tone monitor circuit and automatic volume control.

### Phono-FM-Television

This receiver is equipped with a pin jack on the rear apron of the chassis and a Phono-FM-Television key for adapting it to use with record players, frequency modulation converters and television receivers. General Electric plug, Stock No. RP-145, fits the pin jack.

### SETTING UP THE RECEIVER

The following remarks will assist the serviceman in correctly setting up the receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.
2. After releasing the shipping screws, the position of the chassis should be checked to insure accurate tuning. Close the gang condenser plates and push the chassis one way or the other until the pointer lines up with the first markings on the left side of the dial.
3. The black speaker leads should be connected to the speaker terminals which are grounded to the speaker frame.
4. A method of setting up station keys which will assure driftproof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned.

### CHASSIS OR BEAM-A-SCOPE REMOVAL

Before either the chassis or Beam-a-Scope can be removed, the leads between them must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals on the two phosphor-bronze strips and the screw which clamps the terminal of the yellow wire.

### Figs. 8 and 9 show the correct location of the Beam-a-Scope leads when reconnecting. The cylindrical Beam-a-Scope leads must be threaded through the slot in the cabinet shelf which is immediately below the antenna-ground terminal board. The leads can then be brought out to the position of the output in the back of the cabinet shelf where they can be inserted in the Beam-a-Scope terminals.

To remove the cylindrical Beam-a-Scope the following procedure is recommended: Disconnect the four Beam-a-Scope leads. Unscrew the long self-tapping screw which prevents the Beam-a-Scope from rotating continuously in one direction. The screw is located in the cabinet shelf. Pry loose the cardboard strip which is stapled to the bottom of the cabinet and which holds the bottom of the Beam-a-Scope in place. The Beam-a-Scope can now be rotated from right to left until it comes loose. Note: The upper pivot bolt by which the Beam-a-Scope is supported should never be loosened or removed.

When replacing the cylindrical Beam-a-Scope it should be screwed on approximately five turns from the position where the bolt first takes hold. The self-tapping screw in the cabinet shelf should then be screwed down until it acts as a stop for the projection next to the terminals. The screws should not be run down so far that it contacts the projection on the opposite side from the terminals as this will limit rotation to only 180 degrees. The cardboard strip should be placed over the bottom Beam-a-Scope pivot and stapled to the cabinet in such a position that the Beam-a-Scope hangs vertically and is free to turn without rubbing on the strap.

### Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. The voice coil is adjustable, it will be necessary to replace the entire cone and voice coil assembly.

### Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains*
   - Antenna Post to R.P. Grid at
     - 1000 KC: 0.5
     - 4000 KC: 3.0
     - 18,000 KC: 2.0
   - R.F. Grid to Convergrd Grid at
     - 1000 KC: 5.0
     - 6000 KC: 2.0
     - 18,000 KC: 2.0
   - R.F. on Converter Grid to I.F. on Ist I.F. Grid at
     - 1000 KC: 50
     - 4000 KC: 50
     - 18,000 KC: 40
   - Converter Grid to Ist I.F. Grid at
     - 455 KC: 55
   - I.F. Amplifier Grid to Detector Grid at
     - 455 KC: 75

### (3) DC Voltage Developed Across Oscillator Grid Resistor (R-6) at

- 1000 KC: 8.5
- 4000 KC: 8.5
- 18,000 KC: 7.5

* Variations of ±20% permissible. All readings obtained with enough input signal to give 1/2-watt speaker output.

### Alignment Procedure

The alignment procedure is given in table form. The use of a standard R.F. during alignment all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator to the receiver Beam-a-Scope if care is exercised not to overdrive the test circuits. Keeping a distance of two feet or more between the generator loop and receiver Beam-a-Scope will generally assure freedom from overcoupling. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are accessible through holes in the back of the cabinet or from the top of the cabinet (see Fig. 1). Metal objects such as meters, tools, etc. should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

### R.F. ALIGNMENT

**WITH CHASSIS OUTSIDE OF CABINET**

R.F. alignment can be performed only on the "BC" and "SW-1" bands with the chassis outside the cabinet. Any alignment attempted on "SW" band will not be satisfactory. The diagonal position between the chassis and cylindrical Beam-a-Scope should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of a 0–180° calibrated scale which is mounted to the back of the dial reflector plate. From the reference chart, the degree readings for corresponding frequency settings may be obtained.

---

**Fig. 1. TRIMMER LOCATION**

---
GENERAL ELECTRIC CO.

MODEL J-105
(Golden Tone)

(continued)

continued by laying a straight edge across the chart
perspendicular to the line of figures and sliding the
straight edge along to the various frequency set-
tings desired. The degree readings will be found
on either of the degree scales above or below the
dial scale. To use these degree readings, first com-
pletely close the gang condenser plates and then
slide the pointer along the cord until the inside
edge of the right-hand pointer-guide clip is in line
with the 0° mark. (See Fig. 6.) By using this
edge of the clip as the degree-scale pointer the
receiver may be tuned to any frequency. Ex-
ample: By rotating the tuning control until this
edge of the clip is in line with 15°, the receiver
will be tuned to 1500 KC on the “BC” band.

The “BC” and “SW-1” band alignment pro-
cedure is the same as outlined in steps 2 to 5 in-
clusive of the chart “R.F. Alignment with Chassis
Mounted in Cabinet.”

After the alignment has been performed on the
“BC” and “SW-1” bands the chassis should be
mounted in the cabinet and “SW-2” band align-
ment checked as described in steps 6 to 8 of the
chart “R.F. Alignment with Chassis Mounted in
Cabinet.”

Note: After moving the pointer along the cord
to use one of the guide clips as a reference point
for the degree scale, it will be necessary after re-
assembly in the cabinet for the gang condenser
plates to be closed and the pointer to be moved
back along the cord so that it lines up with the
first dial markings on the left.

ALIGNMENT CHART

I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC Sweep</td>
<td>I.F. Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any station key other than Phono-FM-Talk key. Connect audio input of oscilloscope to chassis ground and junction of R-22 and R-33. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. Finish by retrimming 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. “BC” Band</td>
<td>455 KC Sweep</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>1st I.F. trimmers, C-7, C-8</td>
<td></td>
</tr>
</tbody>
</table>

I.F. Alignment with Output Meter

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “BC” Band</td>
<td>455 KC with Modulation</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any key other than Phono-FM-Talk key. Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st I.F. trimmers, C-7, C-8</td>
<td></td>
</tr>
</tbody>
</table>

R.F. Alignment With Chassis Mounted in Cabinet

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. “BC” Band</td>
<td>580 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. Padder (C-25)</td>
<td>Set dial pointer to 1300 KC and peak trimmer for maximum output while rocking the gang condenser.</td>
</tr>
<tr>
<td>5. “SW-1” Band</td>
<td>6 MC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-19)</td>
<td>Set pointer to 580 KC and peak signal while rocking gang condenser.</td>
</tr>
<tr>
<td>6. “SW-2” Band</td>
<td>21 MC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-19)</td>
<td>Set pointer to 21 MC and tune in signal with (C-21) Peak output with (C-22) while rocking gang condenser. When (C-19) is on proper peak, image of 21 MC signal should be heard 510 KC below or on 20.09 MC.</td>
</tr>
</tbody>
</table>
| 7. “SW-2” Band      | 8 MC with Modulation | Antenna Post | I.R.E. | | This operation may or may not be necessary depending on how much the short-wave Beam-a-SCOPE leads have been moved from their correctly dressed positions. Re-
positioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-SCOPE strap leads closer or farther apart. The moving should be done with an insulated rod or stick. |

8. Repeat Operation 6 if the short-wave Beam-a-SCOPE leads are moved appreciably in Operation 7.
Physical Specifications

- Model: HB-408
- Height: 97 1/4 inches
- Width: 14 3/4 inches
- Depth: 13 3/8 inches
- Weight: 19 1/2 lbs.

Tuning Control Drive Ratio: 5.5:1

Battery Specifications

- "A" Battery
  - General 8 F-1 or 1—Eveready No. 741
- "B" Battery
  - General V-30-B or 2—Eveready No. 762

Battery Life

Using the above recommended batteries a battery life from 200 to 250 hours can be expected providing the daily operation does not exceed four hours. If the daily operation exceeds four hours the battery life will be reduced due to the fact that the batteries do not have sufficient time to revitalize themselves.

Tuning Frequency Range: 550-1600 K.C.

Intermediate Frequency: 455 K.C.

 Loud-speaker—Permanent Magnet

- Outside Cone Diameter: 4 inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

Tubes

- Converter and Oscillator: 1A7G
- I.F. Amplifier: 1NSG
- Detector-Amplifier: 11H5G
- Output: 1Q5G

SERVICE INFORMATION

On later production models the 360-ohm output biasing resistor (R-8) was changed to 430 ohms. This change reduced battery drain while not appreciably affecting power output.

ALIGNMENT PROCEDURE

Alignment Frequencies


The location of all trimmers is shown in Fig. 1.

I.F. Alignment

In order to align this receiver for I.F. the four wood screws holding the motorboard to the cabinet will have to be removed. Raise the front edge of the motorboard being careful not to let the cabinet cover swing back and place a strain on the hinges. The phono-switch cable will limit the amount which the front edge of the motorboard can be opened. Prop the motorboard in the opened position and proceed with I.F. alignment. (Note: Do not let the phono-switch cable come near the INSG grid leads. Standard dressing is to force the cable down in the space between the 1H5G tube and the 2nd I.F. transformer.)

Connect an output meter across the voice coil. Set the volume control for maximum. With the test oscillator set to 455 K.C. apply signal to the control grid of the 1A7G converter tube through a .05-mfd. capacitor. Do not remove the grid leads from the tubes. Keep the test oscillator output as low as possible to give a readable output. Adjust all four I.F. trimmers for maximum output.

R.F. Alignment

Return the motorboard to its normal cabinet position. (Note: Before R.F. alignment be sure that all parts are in their normal positions in the cabinet.) It is not necessary to screw the motorboard to the cabinet as it may be convenient to raise the motorboard slightly from time to time to locate the heads of the trimmer screws. It must be remembered however, that R.F. trimmer adjustments should only be made when the motorboard is down in position.

Access to the R.F. trimmers is made possible by removing the three snap fasteners on the right side of the cabinet. The upper left-hand trimmer is the 1500-K.C. oscillator trimmer. The upper right-hand trimmer is the 1500-K.C. antenna trimmer. The lower trimmer is the 580-K.C. pad.

The test signal may be applied by connecting across the test oscillator terminals a loop of ten turns of wire approximately one foot in diameter. Place the loop parallel to the plane of the back panel of the cabinet and not closer than one foot. With 1500 K.C. input adjust the oscillator and antenna trimmers for maximum output. Change input signal to 580 K.C. and peak the 580-K.C. (C-10) pad by rocking the gang condenser.
GENERAL INFORMATION


These receivers incorporate the following features: Single-ended tubes, automatic volume control, plate antenna, dynatone speaker, beam power output and a dial lamp.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ........................................ 455 KC
R.F. ........................................ 1750 and 1500 KC

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Tune the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

Apply the R.F. alignment signals through a standard I.F. dummy antenna to the receiver antenna port. With the gang condenser wide open, align the oscillator trimmer (C.7) to 1750 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak antenna trimmer (C.5) for maximum output.

Precaution

If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating transformer is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out transformer.

Fig. 1. Trimmer Location

Over-all Dimensions:

Height ................................ 8 inches
Width .................................. 9 3/4 inches
Depth .................................. 5 1/2 inches

Tuning Control Drive Ratio

6:1

Electrical Specifications

<table>
<thead>
<tr>
<th>Models</th>
<th>VOLTAGE RATING</th>
<th>FREQUENCY (Cycles per Second)</th>
<th>POWER CONSUMPTION (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-501, 501W</td>
<td>105-125</td>
<td>40-60</td>
<td>3/1</td>
</tr>
<tr>
<td>J-502, 502W</td>
<td>105-117</td>
<td>40-60</td>
<td>3/1</td>
</tr>
</tbody>
</table>

Tuning Frequency Range .................................. 550-1750 KC
Intermediate Frequency ................................ 455 KC
Maximum Power Output .................................. 1.5 Watts

Load-speaker—"Alnicos" Magnet Dynamic

Outside cone diameter .................................. 4 inches
Voice coil impedance (400 cycles) ............. 3.1 ohms
GENERAL ELECTRIC CO.

NOTE: 1. For 50-60 cycle receivers connect X to Y and short out R-11. For 25 cycle receivers connect X to Z and insert R-11 as shown in schematic.
2. Models J-501 and J-501W have B minus grounded to chassis, no wiring being required. Models J-502 and J-502W have a separately wired B minus system which is not grounded to chassis.
3. These models were built using either a 1237 or 123KT I.F. amplifier tube. The tubes are not interchangeable because of the different type socket requirements.

Symbol | Description | Symbol | Description | Symbol | Description
--- | --- | --- | --- | --- | ---
C-1 | 0.05 mfd. paper capacitor (Used only in J-502 and J-502W) | C-16 | 330 mfd. mica capacitor | R-2 | 22,000 ohms carbon resistor
C-2 | 0.02 mfd. paper capacitor (Used only in J-502 and J-502W) | C-17 | 0.01 mfd. paper capacitor | R-3 | 2.2 megohm carbon resistor
C-3 | 0.01 mfd. paper capacitor | C-18 | 0.03 mfd. paper capacitor | R-4 | 0.3 megohm volume control
C-4 | 5 to 7 mfd. (part of L-3) | C-19a | 150 V. dry electrolytic | R-5 | 4.7 megohm carbon resistor
C-5 | 50 mfd. Antenna condenser | C-19b | 30 mfd. 150 V. dry electrolytic | R-6 | 220,000 ohms carbon resistor
C-6a | Section of tuning condenser | C-20 | 0.05 mfd. paper capacitor | R-7 | 470,000 ohms carbon resistor
C-6b | Antenna section of tuning condenser | C-21 | 0.05 mfd. paper capacitor | R-8 | 150 ohms carbon resistor
C-7 | Oscillator trimmer on panel | C-22 | 100 mfd. mica capacitor | R-9 | 2700 ohms I.W. carbon resistor
C-8 | 0.05 mfd. paper capacitor | C-23 | 1st I.F. transformer | R-10 | 10,000 ohms carbon resistor
C-9 | 0.01 mfd. paper capacitor | L-1 | 2nd I.F. transformer | R-11 | 15 ohms carbon resistor (Used on 25 cycle sets only)
C-10 | 120 mfd. mica capacitor | L-2 | Antenna coil | T-1 | Output transformer
C-11 | 0.068 mfd. paper capacitor | L-3 | Oscillator coil | P-1 | 10,000 ohms carbon resistor
C-12 | 0.05 mfd. paper capacitor | L-4 | Dial lamp, MARINO No. 47 | R-1 | 330,000 ohms carbon resistor (Used only in J-502 and J-502W)
C-13 | 0.03 mfd. paper capacitor | R-1 | 330,000 ohms carbon resistor (Used only in J-502 and J-502W)

-50 WATTS-

POWER CONSUMPTION: 50 WATTS

Tuning Frequency Range: 550-1720 KC
Intermediate Frequency: 455 KC
Maximum Power Output: 1.5 Watts

Load-speaker—"Alino" Magnet Dynamic
Outside cone diameter: 4 inches
Voice coil impedance (400 cycles): 3.1 ohms

Tubes
Converter and Oscillator: GE-12SA7
I.F. Amplifier: GE-12SK7 or 12B7
Det. AVC: GE-12SQ7
Power Output: GE-50L6GT
Rectifier: GE-352GT
DiaL Lamp: MARINO No. 47

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd. Volts</th>
<th>Screen to Gnd. Volts</th>
<th>Cathode to Gnd. Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>73</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SK7</td>
<td>73</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>12SQ7</td>
<td>73</td>
<td>73</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>50L6GT</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>50</td>
</tr>
<tr>
<td>352GT</td>
<td>112 AC</td>
<td>112 AC</td>
<td>112 AC</td>
<td>50</td>
</tr>
</tbody>
</table>

Precaution
If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Fig. 1. Trimmer Location

R.F. Alignment
Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver antenna post through a standard I.F.E. dummy antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)
NOTE: 1. For 50-60 cycle receivers connect X to V and short out R-11. For 25 cycle receivers connect X to Z and insert R-11 as shown in schematic.

2. Models L500 and L530 have B minus grounded to chassis omitting R1 and C3; also a jumper is used in place of C1. Models L510 and L560 have a separately wound B minus system which is not grounded to chassis except through R1 and C2.

- RC-072 C2 CAPACITOR—0.06 mfd, 200 V. paper.
- RC-138 C2 CAPACITOR—0.05 mfd, 600 V. paper.
- RC-283 C2 CAPACITOR—0.01 mfd, 250 V. paper.
- RC-7099 C5f, b CONDENSER—Tuning condenser
- RC-072 C5f CONDENSER—0.05 mfd, 200 V. paper.
- RC-284 C5c CAPACITOR—0.03 mfd, 250 V. paper.
- RC-284 C5g CAPACITOR—0.005 mfd, 600 V. paper.
- RC-374 C5h CONDENSER—0.01 mfd, 250 V. paper.
- RC-284 C5b CONDENSER—0.06 mfd, 250 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.
- RC-072 C6 CONDENSER—0.05 mfd, 200 V. paper.

Intermediate Frequency............................................................. 455 KC
Maximum Power Output............................................................. 1.5 watts

Load-speaker—PM Dynamic
- Outside Cone Diameter......................................................... 4 inches
- Voice Coil Impedance (400 Cycles)........................................... 3.5 ohms

I.F. Alignment
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 Kc and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd capacitor and adjust progressively the trimmers in the 2a and 1st I.F. transformer cans.

R.F. Alignment
Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 Kc signal to the receiver antenna post through a standard I.R.E. dummy antenna. Align the oscillator trimmer (C-7 to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)

Precaution
If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Special Service Information
The following information will be very useful in servicing receivers if a vacuum tube voltmeter, or similar voltage measuring instrument is available.

1. Stage Gains*
   - Antenna Post to Converter Grid....4.0 at 1000 Kc I.F. on Converter
   - Amplifier Grid......................50 at 455 Kc
   - I.F. Amplifier Grid to Diode Plate..45 at 455 Kc

2. 0.20-volt, 400-cycle signal across the volume control will give 3½-watt speaker output.* (Volume control turned to maximum.)

3. Average DC voltage developed across oscillator grid leak........................................... 8 volts

* Variations of ±20% permissible. All readings obtained with no signal input to give 3½-watt speaker output.
Fig. 2. Schematic Diagram
Model JB-513

Fig. 3. Schematic Diagram
Model JB-514
Fig. 1. Schematic Diagram—Model JB-525

ALIGNMENT AND VOLTAGES

MODELS JB-523, JB-524, JB-630, JB-631

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII

VOLTAGE CHART
(117 line volts)

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Cathode Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>90 (conv.)</td>
<td>60</td>
<td>1.2 to 1.8</td>
<td>1.3 to 1.8</td>
</tr>
<tr>
<td>1N5GT</td>
<td>90</td>
<td>60</td>
<td>1.2 to 1.8</td>
<td>1.3 to 1.8</td>
</tr>
<tr>
<td>1H5GT</td>
<td>85</td>
<td>90</td>
<td>1.2 to 1.8</td>
<td>1.3 to 1.8</td>
</tr>
<tr>
<td>3524GT</td>
<td>117 AC</td>
<td>117</td>
<td>35</td>
<td>140</td>
</tr>
<tr>
<td>117Z6GT</td>
<td>117 AC</td>
<td>117</td>
<td>35</td>
<td>140</td>
</tr>
</tbody>
</table>

* Voltages are operating voltages in circuits with high series resistance. The actual voltages will be lower depending on the voltmeter leading. Above voltages should be held within ±5%, with 117 volt AC line.

R.F. Alignment

Connect high side of signal generator to one of Beam-a-Scope primary leads and ground side to other primary lead. Turn tuning condenser completely out of mesh (open). Set generator to 1700 KC. Adjust oscillator trimmer (cut section of tuning condenser) until generator signal is heard through speaker. Then reset generator to 1600 KC and tune receiver to signal. Peak antenna trimmer on tuning condenser for maximum output.
ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. Broadcast R.F. Short Wave
.455 Kc. 1500 and 600 Kc. 17,000 Kc.
JE530. 18,000 Kc.
JE531X.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 Kc. and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SK7 through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure applying the 455 Kc. signal to the control grid of the 12SA7 and aligning the 1st I.F. transformer. Do not remove the grid leads from the tubes. Finish alignment by over-all adjustments.

R.F. Alignment

Refer Sketch "Trimmer Location." Apply R.F. signals through a standard 1 R.E. dummy to the antenna terminal.

"C" Band (Model JE530—5500-18,500 Kc.)

Rotate band switch to clockwise position and set dial pointer and signal generator to 17 megacycles. Align by rotating S.W. osc. trimmer located on rear section of variable condenser. Peak the S.W. detector trimmer located on front section of variable condenser for maximum signal while rocking the gang condenser. The image of 17 Mc. should be heard at 16.99 Mc.

"C" Band (Models JE531, JE531X—4600-16,000 Kc.)

Same procedure as above, but align osc. trimmer at 15 megacycles. Image will be heard at 14.09 Mc.

"B" Band (All models—540-1700 Kc.)

Rotate band switch to counterclockwise position and set dial pointer and signal generator to 1500 Kc. Align by turning the broadcast oscillator trimmer screw. Peak broadcast detector screw for maximum signal. Set screw for maximum signal. Set receiver dial and signal generator to 900 Kc. and adjust the broadcast pad for maximum signal while rocking the gang condenser. Retrim at 1500 Kc.
One side of the power line is connected directly to the chassis, therefore, caution should be exercised when servicing.

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on A-C)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 AC</td>
<td>50-60</td>
<td>30</td>
</tr>
<tr>
<td>105-125 DC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Electrical Power Output**

- Undistorted: 1.0 watt
- Maximum: 1.7 watts

**Loud-speaker—Permanent Magnet Type**

- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.8 ohms
- D.C. Coil Resistance: 3.4 ohms

**ALIGNMENT PROCEDURE**

The location of alignment trimmers is shown in Figs. 1 and 2.

**I.F. Alignment**

- Connect an output meter across the voice coil. Turn the volume control to maximum. Set signal generator to 455 K.C. and keep the generator output as low as a readable meter reading will permit.
- Apply signal to the grid of the 12SA7GT through a .05 capacitor. Align all I.F. trimmers (C-14, 15 and 16) for a maximum meter reading.

**R.F. Alignment**

Set the signal generator to 1730 K.C. and connect the output to the blue antenna lead through a .01 micro mica capacitor. Rotate the gang condenser to wide open and align the oscillator trimmer. Readjust signal generator output to 1400 K.C. and after tuning in signal by rotating the gang condenser, peak the antenna trimmer. The alignment is now complete unless the gang condenser plates have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 K.C. and bend the plates into position of maximum output.

*Precaution—If signal generator is A-C operated use an isolating transformer between the power supply and the radio receiver power output. The use of an isolating capacitor is not recommended as A-C current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

**SERVICE INFORMATION**

**Oscillator Coil**

Looking at connection end in clockwise direction starting at chassis the terminals are No. 1, end of winding; No. 2, start of winding; No. 3, tip.

No. 1 to No. 2: 4.8 ohms
No. 1 to No. 3: 4.2 ohms

**First I.F. Transformer**

Primary: Blue, plate; red. B+: 32.1 ohms
Secondary: White, grid; black, A.V.C.: 33.2 ohms

**Second I.F. Transformer**

Primary: Blue, plate; red. B+: 24.2 ohms
Secondary: White, grid; black, A.V.C.: 24.1 ohms

**Electrolytic Condenser**

Red. 30 mfd., 150 volts; green, 20 mfd., 150 volts; black, common terminal.

**SOCKET VOLTAGES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate To Gnd (Volts)</th>
<th>Screen To Gnd (Volts)</th>
<th>Cathode To Gnd (Volts)</th>
<th>Filament Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>12K7GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>812J7GT</td>
<td>40</td>
<td>67</td>
<td>0</td>
<td>5.5</td>
</tr>
<tr>
<td>35Z5GT</td>
<td>115 AC</td>
<td>102</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

Line—115 Volts AC, Volume Control Maximum.

Antenna shorted to ground.

*Measured on 260 volt scale of 1000 ohms per volt meter.
NOTED: ON 40-60 cycle receivers, omit K12 and connect A-B and X-Z. ON 25 cycle receivers, add R12 and connect X-Y. Omit R16 when No. 51 dial lamp is used.

Intermediate Frequency .............. 455 KC

Electrical Power Output (117 line volts)
Undistorted ........................................... 1.0 watts
Maximum ............................................. 1.5 watts

Loudspeaker—PM Dynamic
Outside Cone Diameter .................... 5 inches
Voice Coil Impedance (400 cycles)........... 3.5 ohms

IF Alignment
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a 0.1 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment
When making the following alignment the loop antenna must be bolted to the chassis by the screw and spacer mounting. The RF signal should be capacity coupled to the receive loop by placing a two-foot piece of wire for an antenna on the test oscillator output post (high side). Keeping this antenna two feet away from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed in close proximity to the loop when making this alignment.

With the gain condenser plate completely closed, the pointer should line up with the first mark on the left of the scale. Set the signal generator to 1500 KC. Align (C-1b) to the signal while the pointer is on the 1500 KC mark. Peak (C-1a) for maximum output.

Special Service Information
The following information will be very useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments.

(1) Stage Gains
Antenna to RP grid—3.8 at 1000 KC
RF grid to converter grid—0.0 at 1000 KC
Converter grid to IF grid—46 at 455 KC
IF grid to 12SQ7 diode plate—75 at 455 KC

(2) Audio Gain
.14 volts, 400 cycles signal across volume control with control set at maximum, will give approximately ½ watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R4) averages 100 volts at 1000 KC.
Variations of ±20% permissible. All readings obtained with enough signal input to give ½ watt speaker output.

Fig. 1. Dial Stringing Diagram

Models J602 and J603 are six-tube AC-DC superheterodyne receivers with Underwriters' Approval listing. The Model J602 is housed in a mahogany plastic cabinet, while the Model J603 has an ivory plastic cabinet.

Both the Mazda No. 47 and No. 51 dial lamps were used during production. When lamp No. 51 is used, the resistor R16 should be omitted.

Either the metal or glass type 12B7 tube may be used in the RF or IF stage. However when the glass tube is used in the IF stage, a tube shield must be used to prevent oscillation at the low frequency end of the broadcast band.
GENERAL ELECTRIC CO.
MODELS: J-61, J-66

IF PEAK 455 KC

35250T RECTIFIER

NOTES:
On 40-60 cycle receivers, omit R12 and connect A & Z.
On 25 cycle receivers, add R12 and connect X-Y.
* Omit R16 when No. 51 Mands dial lamp is used.

Circuit Diagram:

- Band Switch Wiring
- RF alignment procedure is given in table form. All RF alignments may be made with the chassis removed from the cabinet. However, if alignments are made with the chassis and loop antennas securely bolted in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metallic objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect Test-Osc to</th>
<th>Test-Osc Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12B7 IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C6 &amp; C7 *</td>
</tr>
<tr>
<td>2</td>
<td>6957 Conv. grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C4 &amp; C5</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Coupled</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C22**</td>
</tr>
<tr>
<td>4</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C2 (Orig.)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C23* (Orig.)</td>
</tr>
<tr>
<td>7</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C24** (Ant.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak.
** Also use minimum condenser when making alignment.

A" rating—115 Volts AC or DC, 40-60 cycles, 35 watts
"C" rating—115 Volts AC or DC, 25 cycles, 35 watts

Special Service Information

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage measuring instruments.

1. Stage gains
   - Antenna post to RF grid—3.0 at 1000 KC
   - RF grid to converter grid—6.0 at 1000 KC
   - Converter grid to IF grid—50 at 455 KC
   - IF grid to 12S07 diode plate—75 at 455 KC

2. Audio gains
   - 14 volts, 400 cycles signal across variable control watt output will give approximately 1/2 watt speaker output.
   - 3. DC voltage developed across oscillator grid resistor (R4) averages 9.0 volts at 1000 KC or 8.0 volts ± 10,000 KC.

* Variations of ±20% permissible. All readings obtained with enough signal input to give 1/2-watt speaker output.
**MODEL J-629**

**GENERAL ELECTRIC CO.**

**PHOTO-RADIO-RECORDING SWITCH POSITION**

**A—Radio**

**B— Phonograph**

**C— Radio Recording**

**D— Microphone Recording**

---

**Table:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>RADIO CHASSIS</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-1</td>
<td>C-14</td>
<td>470 mfd. mica capacitor</td>
<td>R-6</td>
<td>1.0 megalohm carbon resistor</td>
</tr>
<tr>
<td>C-2</td>
<td>C-15</td>
<td>220 mfd. mica capacitor</td>
<td>R-7</td>
<td>3300 ohms carbon resistor</td>
</tr>
<tr>
<td>C-3</td>
<td>C-16</td>
<td>47 mfd. mica capacitor</td>
<td>R-8</td>
<td>39,000 ohms carbon resistor</td>
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<tr>
<td>C-4</td>
<td>C-17</td>
<td>.01 mfd. mica capacitor</td>
<td>R-9</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C-5</td>
<td>C-18</td>
<td>.002 mfd. mica capacitor</td>
<td>R-10</td>
<td>150 ohms carbon resistor</td>
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<tr>
<td>C-6</td>
<td>L-1</td>
<td>Beam diode</td>
<td>R-11</td>
<td>1000 ohms 1 W. carbon resistor</td>
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<tr>
<td>C-7</td>
<td>L-2</td>
<td>Oscillator coil</td>
<td>R-12</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C-8</td>
<td>L-3</td>
<td>0.1 mfd. i.f. transformer</td>
<td>R-13</td>
<td>5.6 ohms W. W. resistor</td>
</tr>
<tr>
<td>C-9</td>
<td>L-4</td>
<td>0.05 mfd. i.f. transformer</td>
<td>R-14</td>
<td>BL-42-B ballast resistor</td>
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<tr>
<td>C-10</td>
<td>L-5</td>
<td>0.05 mfd. paper capacitor</td>
<td>R-15</td>
<td>7.0 ohms W. W. resistor</td>
</tr>
<tr>
<td>C-11</td>
<td>L-6</td>
<td>0.05 mfd. paper capacitor</td>
<td>S-1</td>
<td>Power switch (comb. with R-3)</td>
</tr>
<tr>
<td>C-12</td>
<td>L-7</td>
<td>0.1 mfd. paper capacitor</td>
<td>S-2</td>
<td>Radiophone-record switch</td>
</tr>
<tr>
<td>C-13</td>
<td>L-8</td>
<td>0.5 mfd. paper capacitor</td>
<td>T-1</td>
<td>Output transformer</td>
</tr>
<tr>
<td>C-14</td>
<td>L-9</td>
<td>0.05 mfd. paper capacitor</td>
<td>T-2</td>
<td>Cutter transformer</td>
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<tr>
<td></td>
<td>L-10</td>
<td>0.1 mfd. paper capacitor</td>
<td>T-3</td>
<td>Microphone jack</td>
</tr>
</tbody>
</table>

**Outside Core Diameter**

**Voice Coil Impedance (400 cycles)**

---

**ALIGNMENT CONVENTIONAL**

SEE SPECIAL SECTION VOL. VIII

TRIM ANT. OSC. 1500 KC; PAD 580 KC

POWER CONSUMPTION—75 WATTS

---

**Special Service Information**

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage Gain**
   - Antenna Post to Converter Grid—6 at 1000 KC
   - Converter Grid to 6SK7 GT Grid—30 at 455 KC
   - 6SK7 GT Grid to 6DJ7 GT Det. Plate—100 at 450 KC

2. **Audio Gain**
   - 3000 volts, 400 cycles signal across control with control set to maximum will give approximately 44-going watt speaker output.

3. **DC voltage developed across oscillator and resistor (R-1) averages in volts.**

4. **Variations of +10, -20% permissible.**

---

**RECORDING ADJUSTMENTS**

**Cutting Head Pressure**

The pressure is controlled by means of the adjustment screw located midway back on top of the recording arm.

The pressure should be adjusted so that by inspection with a magnifying glass, the uncut portion of the record between the grooves is the same width as the groove. At no time should pressure be great enough to cut through the acetate surface enough to show the metal base of the record. A clockwise rotation of the screw increases pressure.

**Cutting Arm Adjustment**

The adjustment at the rear and underneath the cutting arm, controls the height above the record blank at which the cutting arm rides. This adjustment should be set so that when resting in the recording position on the record, the screw of the cutting head rides halfway down in the needle screw cap.

**Lead Screw Follower Arm Pressure Adjustment**

The pressure is varied by the phosphor bronze spring adjustment underneath the follower arm assembly on the follower arm. The pressure should be great enough so that when the recording head is in the recording position, the follower bronze spring should rest at the bottom of the lead screw groove. Too great pressure will cause binding, while too little pressure is liable to cause overlapping of the grooves.

---

**Fig. 1. Trimmer Location**

**VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND MINUS B**

**LINE VOLTAGE 115, MAXIMUM VOLUME**

**NO SIGNAL INPUT**

**WHEN OPERATED ON C.C. POWER SUPPLY, VOLTAGES ARE ABOUT 120 VOLTS.**

**MEASURED ON 5-VOLT SCALE OF 1000 OHMS PER Volt METER.**

**MEASURED ON 50-VOLT SCALE OF 1000 OHMS PER Volt METER.**
NOTE—The schematic diagram shown is for Models J-654 and J-654W. For Models J-644 and J-644W, omit items C17, C18, and R-13; ground B— to chassis; omit the tertiary winding from T3 and return R7 to the ungrounded secondary of T3.

### PARTS DESCRIPTION LIST

<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</td>
<td>.01 mfd. paper capacitor</td>
<td>C16a, 16b</td>
<td>.05 mfd. electrolytic</td>
<td>R9</td>
<td>470,000 ohm carbon resistor</td>
</tr>
<tr>
<td>C2</td>
<td>.08 mfd. paper capacitor</td>
<td>C17</td>
<td>.05 mfd. paper capacitor</td>
<td>R10</td>
<td>130 ohm carbon resistor</td>
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<tr>
<td>C3a, 3b</td>
<td>Tuning condenser</td>
<td>C18</td>
<td>.20 mfd. paper capacitor</td>
<td>R11</td>
<td>1000 ohm carbon resistor</td>
</tr>
<tr>
<td>C4</td>
<td>.01 mfd. mica capacitor</td>
<td>R1</td>
<td>33,000 ohm carbon resistor</td>
<td>R12</td>
<td>Ballast resistor tube</td>
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<tr>
<td>C5-C6</td>
<td>I.F. trimmers</td>
<td>R2</td>
<td>2.2 megohm carbon resistor</td>
<td>R13</td>
<td>120,000 ohm carbon resistor</td>
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<tr>
<td>C7</td>
<td>470 mfd. mica capacitor</td>
<td>R3</td>
<td>6.8 megohm volume control</td>
<td>L1</td>
<td>Brain-a-Stage</td>
</tr>
<tr>
<td>C8</td>
<td>.02 mfd. paper capacitor</td>
<td>R4</td>
<td>4.7 megohm carbon resistor</td>
<td>L2</td>
<td>Oscillator coil</td>
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<tr>
<td>C10</td>
<td>.01 mfd. mica capacitor</td>
<td>R5</td>
<td>470,000 ohm carbon resistor</td>
<td>L3</td>
<td>1st I.F. transformer</td>
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<td>1000 mfd. paper capacitor</td>
<td>R6</td>
<td>1.0 megohm carbon resistor</td>
<td>T2</td>
<td>2nd I.F. transformer</td>
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<td>C12-C13</td>
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<td>R7</td>
<td>3000 ohm carbon resistor</td>
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<td>Output transformer</td>
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<td>C14</td>
<td>.05 mfd. paper capacitor</td>
<td>R8</td>
<td>39,000 ohm carbon resistor</td>
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<td></td>
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<tr>
<td>C15</td>
<td>.05 mfd. paper capacitor</td>
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</tbody>
</table>

### Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. **Stage Gains**
   - Gain*:
     - Antenna Post to Converter Grid: 4.0 at 1000 KC
     - I.F. on Converter Grid to I.F. on I.F.
       - Amplifier Grid: 35 at 455 KC
       - I.F. Amplifier Grid to Diode Plate: 60 at 455 KC
   - 0.05 volt, 400-cycle signal across the volume control will give 1/4-watt speaker output.* (Volume control turned to maximum.)

2. **Average RF voltage developed from oscillator cathode to B—**
   - Variations of ±20% permissible. All readings obtained with enough signal input to give 1/4-watt speaker output.

### I.F. ALIGNMENT CONVENTIONAL

**TRIM OSC 1650 KC; ANT 1500 KC**

**Intermediate Frequency**

- 455 KC

**Electrical Power Output (117 line volts)**

- Undistorted: 1.5 watts
- Maximum: 2.5 watts

**Load-speaker—Alnico Magnet Dynamic**

- Outside Cone Diameter: 8 inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

---

**Fig. 1. Tube and Trimmer Location**

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**Socket Voltages**

---

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GENERAL ELECTRIC CO.

MODEL HP-657-A

MODEL HP-657-A

SERVICE DATA

Over-all Dimensions

Height ........................................ 8 inches
Width ........................................ 12¾ inches
Depth .......................................... 7½ inches

Tuning Control Drive Ratio ............. 5:1

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>105-125 AC or DC</td>
<td>40-60</td>
<td>50</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band ......................... 540-1650 KC
Police Band .............................. 2800-7800 KC

Electrical Power Output

Undistorted .............................. 0.8 watts
Maximum .................................. 1.6 watts

Load-speaker—Permanent Magnet

Outside Cone Diameter .................. 5 inches
Voice Coil Impedance (400 cycles) ... 3 ohms

Tubes

Converter-Oscillator .................. GE-12SA7
I.F. Amplifier ......................... GE-12SK7
Detector—AVC ........................... GE-12SQ7
1st Audio Amplifier ................. GE-12SO7
Audio Output ........................... GE-35L6GT
Rectifier ............................... GE-35S6GT
Dial Lamp ................................ Mazda No. 47

GENERAL INFORMATION

Model HP-657-A is a compact, six-tube, AC-DC, superheterodyne radio designed to receive programs on the broadcast and police-amateur-aircraft bands of frequency. Antenna and ground connections are not necessary as the built-in "Beam-a-Scope" provides adequate pick-up; however, terminals are provided on the cabinet back for connecting antenna and ground leads when signal strengths are low. The receiver is equipped with five mechanical "Feathertouch Tuning" keys adjustable by removing the keys and loosening the binding screws with a screwdriver. Additional design features include Underwriters' approval, full automatic volume control, continuously variable tone control, and single-ended tubes.

When operating from a DC source of power it is necessary to insert the power plug with the proper polarity. If the receiver fails to function with the power plug inserted one way, reverse the plug. If any hum is noticed when the receiver is used on AC, reverse the power plug as above.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ........................................ 455 KC
Broadcast R.F. ......................... 1650, 1500 and 600 KC
Police R.F. ............................... 7000 KC

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SK7 through a .05 mfd capacitor and align the 2nd I.F. transformer. Repeat the procedure applying the 455 KC signal to the control grid of the 12SA7 and aligning the 1st I.F. transformer. Do not remove the grid leads from the tubes. Finish alignment by over-all adjustments.

R.F. Alignment

Apply R.F. signals either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the signal generator output which can be magnetically coupled to the receiver Beam-a-Scope.

1. Rotate the gang condenser to maximum open and apply 1650 KC signal to Beam-a-Scope. Peak oscillator trimmer on right-hand section of gang condenser (as viewed from front) for maximum output.

2. Change generator signal to 1500 KC and set dial pointer to 1500 KC mark. Peak antenna trimmer on left-hand section of gang condenser.

3. Set pointer and generator signal to 600 KC. Peak broadcast pad while rocking the gang condenser. Broadcast pad is first from front on right side of chassis.

4. Rotate band switch to clockwise position and set dial pointer to the 7.0 MC mark. With 7.0 MC input signal align rear trimmer on right side of chassis and peak trimmer located in small antenna coil on top of chassis.
MODEL J-678
GENERAL ELECTRIC CO.

Alignment Frequencies

I.P. 455 KC  R.F. 1500 and 5000 KC

The location of all trimmers is shown in Fig. 1.

L.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the grid of the 6S6GT through a 0.5-mfd. capacitor and to the 2nd IF transformer. Repeat the procedure, applying the 455 KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by overall adjustments.

R.F. Alignment

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the anode output which can be manually coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-9) on 580 KC while rocking the gang condenser. Retrin at 1500 KC.

Precisation

If the signal generator in AC operated, use an isolating transformer between the power supply and the receiver power input. The use of an isolating transformer is not recommended as AC current through the capacitor will introduce hum modulation and or create the possibility of a burned out signal generator attenuator.

Special Service Information

The following data will be very useful to servicemen equipped with vacuum tube test meters or similar measuring instruments.

1. Stage Gain
   - Antenna post to 6SA7GT grid: 4 at 1000 KC
   - 6SA7GT grid to 6K6GT grid: 30 at 455 KC
   - 6K6GT grid to 6Q7GT det. plate: 100 at 455 KC

2. Audio Gain
   - 0.96 volts, 500 cycles signal across volume control with control set to maximum will give approximately 1/2 watt speaker output.

3. DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

   * Variations of +10%, -20% permissible.

Electrical Rating

- A.R. Rating 115 volts, 80 cycles AC, 75 watts
- A.R. Rating 115 volts, 60 cycles AC, 75 watts

Intermediate Frequency Range 455 K.C.

Electrical Power Output

- Undistorted 2.0 watts
- Maximum 2.2 watts

Load-speaker—PM Dynamic

- Outside cone diameter 6.5 inches
- Voice coil impedance (400 cycles) 3.5 ohms

Phonograph Mechanism

Type mechanism Manual

Recordable speed 78 R.P.M.
MODEL J-709

TECHNICAL AND SERVICE INFORMATION

Model J-709 combination uses the same chassis and record-changer mechanism as the Model H-708, data for which will be found in Vol. XI. The schematic Fig. 3 above and parts view of the automatic changer, Fig. 5 below, are correct to care for the Model J-709.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>Antenna section tuning condenser</td>
</tr>
<tr>
<td>C-2</td>
<td>Oscillator section tuning condenser</td>
</tr>
<tr>
<td>C-3</td>
<td>&quot;B&quot; band padding capacitor</td>
</tr>
<tr>
<td>C-4</td>
<td>3000 mmf. mica condenser = 5%</td>
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<tr>
<td>C-5</td>
<td>3-30 mmf. &quot;B&quot; antenna trimmer</td>
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<tr>
<td>C-6</td>
<td>3-20 mmf. &quot;B&quot; oscillator trimmer</td>
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<tr>
<td>C-7</td>
<td>3-20 mmf. &quot;B&quot; oscillator trimmer</td>
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<tr>
<td>C-8</td>
<td>0.1 mf. paper capacitor</td>
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<tr>
<td>C-9</td>
<td>0.1 mf. paper capacitor</td>
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<tr>
<td>C-10</td>
<td>0.1 mf. paper capacitor</td>
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<tr>
<td>C-11</td>
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<tr>
<td>C-12</td>
<td>0.1 mf. paper capacitor</td>
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<tr>
<td>C-13</td>
<td>0.1 mf. paper capacitor</td>
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<td>0.1 mf. paper capacitor</td>
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<td>C-16</td>
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<tr>
<td>C-22b</td>
<td>0.022 mf. paper capacitor</td>
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<tr>
<td>C-22c</td>
<td>0.022 mf. paper capacitor</td>
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<tr>
<td>C-22d</td>
<td>0.022 mf. paper capacitor</td>
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<tr>
<td>L-1</td>
<td>Beam-a-Scope</td>
</tr>
<tr>
<td>L-2</td>
<td>&quot;D&quot; antenna coil</td>
</tr>
<tr>
<td>L-3</td>
<td>&quot;B&quot; oscillator coil</td>
</tr>
<tr>
<td>L-4</td>
<td>1st I.F. transformer</td>
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<tr>
<td>L-5</td>
<td>2nd I.F. transformer</td>
</tr>
<tr>
<td>L-6</td>
<td>1/4 mh. antenna choke</td>
</tr>
<tr>
<td>M-1</td>
<td>60-cycle phonograph motor</td>
</tr>
<tr>
<td>M-2</td>
<td>90-cycle phonograph motor</td>
</tr>
<tr>
<td>M-3</td>
<td>15-cycle phonograph motor</td>
</tr>
<tr>
<td>P-1, P-2</td>
<td>Dial lamps, Mazda No. 44</td>
</tr>
<tr>
<td>R-1</td>
<td>33,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-2</td>
<td>2.2 megohms carbon resistor</td>
</tr>
<tr>
<td>R-3</td>
<td>2000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-4</td>
<td>0.01 megohms volume control</td>
</tr>
<tr>
<td>R-5</td>
<td>15 megohms carbon resistor</td>
</tr>
<tr>
<td>R-6</td>
<td>1000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-7</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-8</td>
<td>1000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-9</td>
<td>3300 ohms carbon resistor</td>
</tr>
<tr>
<td>R-10</td>
<td>32,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-11</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-12</td>
<td>200 ohms 1 W. carbon resistor</td>
</tr>
<tr>
<td>R-13</td>
<td>500 ohms 2 W. carbon resistor</td>
</tr>
<tr>
<td>R-14</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-15</td>
<td>27 ohms carbon resistor</td>
</tr>
<tr>
<td>R-16</td>
<td>35,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-17</td>
<td>33 ohms 2 3/4 W. wire wound</td>
</tr>
<tr>
<td>R-18</td>
<td>20 ohms 2 W. wire wound</td>
</tr>
<tr>
<td>R-19</td>
<td>22 ohms 2 W. carbon resistor</td>
</tr>
<tr>
<td>R-20</td>
<td>100,000 ohms carbon resistor</td>
</tr>
<tr>
<td>S-1</td>
<td>Band switch</td>
</tr>
<tr>
<td>S-2</td>
<td>Power switch on volume control</td>
</tr>
<tr>
<td>S-3</td>
<td>Radio-phonograph switch</td>
</tr>
<tr>
<td>S-4</td>
<td>Tone control</td>
</tr>
<tr>
<td>S-5</td>
<td>Motor power switch</td>
</tr>
<tr>
<td>T-1</td>
<td>Output transformer</td>
</tr>
</tbody>
</table>
MODELS J-718 AND J-728

SPECIFICATIONS

Over-all Dimensions

Height ........................................... 3 1/4 inches
Width ........................................... 3 1/4 inches
Depth ........................................... 16 inches

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (volts)</th>
<th>Frequency (cycles on AC)</th>
<th>Power Consumption (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>60</td>
<td>92</td>
</tr>
<tr>
<td>A</td>
<td>110-125</td>
<td>50</td>
<td>92</td>
</tr>
<tr>
<td>C2</td>
<td>110-125</td>
<td>25</td>
<td>103</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band ................................. 540-1600 KC
Short-wave Band No. 1 ......................... 2300-6600 KC
Short-wave Band No. 2 ......................... 6600-22,000 KC

Intermediate Frequency ......................... 465 KC

Electrical Power Output

Undistorted ..................................... 4 Watts
Maximum ........................................ 5.5 Watts

Load-speaker—“Alnic” Magnet Dynamic

Outside Speaker Diameter ....................... 14 inches
Voice Coil Impedance ......................... 3.5 ohms

Tubes

R.F. Amplifier .................................. GR-6SK7
Converter and Oscillator ....................... GR-6SK7
I.F. Amplifier .................................. GE-480
Det., Apl., A.C. ................................. GE-480 or GT
Audio Driver .................................... GE-482C
Audio Output .................................... GR-6Y6C
Rectifier ....................................... GE-4Y5G
Dial and Pilot Lamps ......................... (4) Mazda No. 44

Phonograph Mechanism

Type .............................................. Automatic Record Changer
Record Capacity ................................ 12-inch records
10-inch records .................................. 8
12-inch records ................................... 7
Type Pick-up .................................... Crystal
Turntable speed .................................. 78 Rpm

GENERAL INFORMATION

Models J-718 and J-728 are radio-automatic phonograph combinations each incorporating a seven-tube, three-band, A-C radio receiver. The only difference between these two models is in the cabinet.

Setting Up the Receiver

The following remarks will assist the serviceman in correctly setting up these receivers for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

2. The black speaker lead should be connected to the speaker terminal which is grounded to the speaker frame.

3. A method of setting up station keys which will assure driftproof adjustments is to turn each micro screw adjustment to its extreme counter-clockwise position, and then turn slowly in a clockwise direction until the desired station is tuned in.

Beam-a-Scope Removal

Before either the chassis or Beam-a-Scopes can be removed the leads between them must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by pulling the pin-plug connections out of the Beam-a-Scope terminals. The short-wave Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals to the phosphor bronze strap and green leads, and the screw which clamps the terminal of the yellow lead.

Fig. 3 shows the location of the Beam-a-Scope leads when connected.

To remove the cylindrical Beam-a-Scope, the following procedure is recommended: Disconnect the four Beam-a-Scope leads. Pry loose the card-board strap which is stapled to the bottom of the cabinet and which holds the bottom end of the Beam-a-Scope in place. The cylindrical Beam-a-Scope can now be tilted enough out of vertical to allow continuous rotation of it. Rotate the Beam-a-Scope from right to left until it comes loose. Note: The upper pivot bolt by which the Beam-a-Scope is supported should never be loosened or removed.

When replacing the cylindrical Beam-a-Scope it should be screwed up on the bolt approximately five turns or until the blocking bolt prevents more than 180° rotation when the Beam-a-Scope hangs vertically. The cardboard strap which holds the bottom pivot of the Beam-a-Scope in place should be re-stapled in such a position that the Beam-a-Scope hangs vertically and is free to turn without rubbing on the strap.

Load-speaker

The voice coil is accurately and permanently centered at the factory, and should seldom give trouble. In case a voice coil needs retouching, it will be necessary to replace the entire cone and voice coil assembly.

Notes: In no case should the magnet be removed from the assembled position.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available:

1. STAGE GAIN:

(a) Antenna Post to R.F. Grid at 1.000 KC ............... 5.5
4.000 KC ............... 2.5
16.000 KC ............... 2.4

(b) R.F. Grid to Converter Grid at 1.000 KC ............... 5.5
4.000 KC ............... 2.5
16.000 KC ............... 2.4

(c) R.F. on Converter Grid to I.F. on lst I.F. Grid at 1.000 KC ............... 6.0
4.000 KC ............... 3.5
16.000 KC ............... 4.5

(d) I.F. on Converter Grid to I.F. on 2nd I.F. Grid at 465 KC ............... 75
60.000 KC ............... 70

(e) I.F. Amplifier Grid to Detector Plate at 465 KC ............... 75
60.000 KC ............... 70

2. Voltage across volume control to give 15-watt speaker output at 450 cycles.

3. DC voltage developed across oscillator grid resistor (R-7) at 1.000 KC ............... 3.2
4.000 KC ............... 3.2
16.000 KC ............... 4.2

* Variations of ±20% permissible. All readings obtained with enough signal input to give 15-watt speaker output.

Frequency-degree Reference Chart

<table>
<thead>
<tr>
<th>Frequency (KC)</th>
<th>160°</th>
<th>100°</th>
<th>60°</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 KC</td>
<td>160°</td>
<td>100°</td>
<td>60°</td>
</tr>
<tr>
<td>1500 KC</td>
<td>150°</td>
<td>100°</td>
<td>60°</td>
</tr>
<tr>
<td>2000 KC</td>
<td>150°</td>
<td>100°</td>
<td>60°</td>
</tr>
</tbody>
</table>

Fig. 4. Dial Cord Stringing Diagram
GENERAL ELECTRIC CO.
ALIGNMENT PROCEDURE

The alignment procedure is given in table form below. The use of a standard I.R. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop-coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of a few feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are available either through holes in the back apron of the chassis or from the top of the chassis deck. See Fig. 1 for trimmer location. Metal objects such as meters, tools, etc., should not be placed on top of the receiver or cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>465 KC Sweep</td>
<td>I.F. Grid and Chassis Ground</td>
<td>.05 Mfd. or larger</td>
<td>2nd I.F. Trimmers C-10, 11</td>
<td>Gang condenser plates open. Depress any station key other than the menu key. Connect audio input of oscilloscope to chassis ground and top of volume control. Adjust trimmers in order mentioned for a single symmetrical maximum of amplitude and phase. Finish by retuning 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>Green lead on &quot;BC&quot; Beam-a-Scope terminal board and chassis ground</td>
<td>.05 Mfd. or larger</td>
<td>1st I.F. Trimmers C-8, 9</td>
<td>Gang condenser plates open. Depress any key other than the menu key. Connect audio input of oscilloscope to chassis ground and top of volume control. Adjust trimmers in order mentioned for a single symmetrical maximum of amplitude and phase. Finish by retuning 2nd I.F. trimmers.</td>
</tr>
</tbody>
</table>

I.F. Alignment with Output Meter

1. "BC" Band | 466 KC with Modulation | Green lead on "BC" Beam-a-Scope terminal board and chassis ground | .05 Mfd. or larger | 2nd I.F. Trimmers C-10, 11, 1st I.F. trimmers C-8, 9 | Gang condenser plates open. Depress any key other than the menu key. Connect audio input of oscilloscope to chassis ground and top of volume control. Adjust trimmers in order mentioned for a single symmetrical maximum of amplitude and phase. Finish by retuning 2nd I.F. trimmers. |

R.F. Alignment with Chassis Mounted in Cabinet

1. "BC" Band | 1500 KC with Modulation | Antenna Post | I.F.E. | Osc. (C-8) | Set pointer to 1500 KC and tune in signal with (C-8). Peak output with (C-2). |
|              |                 |               |       |         |          |
| 2. "BC" Band | 560 KC with Modulation | Antenna Post | I.F.E. | Osc. Peaker (C-12) | Set pointer to 500 KC and peak signal while rocking gang condenser |

5. Repeat operation 3 if "BC" band trimmers are badly out of alignment.

6. "SW" Band | 6 MC with Modulation | Antenna Post | I.F.E. | Osc. (C-5) | Set pointer to 6 MC and peak signal while rocking gang condenser. |
|              |                 |               |       |         |          |
| 7. "SW" Band | 21 MC with Modulation | Antenna Post | I.F.E. | Osc. (C-4) | Set pointer to 21 MC and tune in signal with (C-4). Peak output with (C-3) while rocking gang condenser. When (C-4) is on proper peak, image of 21 MC signal should be heard 910 KC below or 20.00 MC. |
|              |                 |               |       | Ant. (C-3) |          |
| 8. "SW" Band | 8 MC with Modulation | Antenna Post | I.F.E. |         | This operation may or may not be necessary depending on how much the short-wave Beam-a-Scope leads have been moved from their correctly damped position. Re-positioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-Scope phosphor-bronze lead closer or farther away from the green lead. The moving should be done with an insulated rod or stick. |

9. Repeat operation 7 if the Beam-a-Scope leads are moved in operation 8.

R.F. ALIGNMENT

With Chassis Outside of Cabinet

R.F. alignment can be performed only on the "BC" and "SW" bands with the chassis outside of the cabinet. Any alignment attempted on "SW" band will not be satisfactory. The same relative position between the chassis and broadcast loop should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of a 0-180° calibrated scale which is cemented to the back of the dial reflector plate. From the frequency-degree reference chart the degree readings for corresponding frequency settings may be obtained. To use this scale, place the pointer along the dial until the left-hand edge of the pointer guide slide lines up with the 0° mark. By using this left-hand edge as a reference from the rear of the slide as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 158° the receiver will be tuned to 1000 KC on the "BC" band.

The "BC" and "SW" band alignment procedure is the same as outlined in steps 2 to 6 inclusive of the chart — R.F. Alignment with Chassis Mounted in Cabinet. After the alignment has been performed on the "BC" and "SW" bands the chassis should be mounted in the cabinet and "SW" band alignment checked as described in steps 7 to 9 of the chart — R.F. Alignment with Chassis Mounted in Cabinet.

Note: After moving the pointer along the cord to the left-hand edge as a reference pointer for the degree scale it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the potentiometer be moved back along the cord so that it lines up with the first dial markings on the left.

Fig. 1. Trimmer Location
Fig. 2. Interconnection Diagram
Note: The oscillator coil and band switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch are replaced. I.F. transformer connections are shown as an aid in replacement.

**Tubes**
- R. F. Amplifier: GE-6SK7
- Converter and Oscillator: GE-6SA7
- I. F. Amplifier: GE-6SK7
- Det., Aud., A.V.C.: GE-6JQ7
- Phase Inverter: GE-6JQG or GT
- Audio Output: (2) GE-6VQG or GT
- Rectifier: GE-5Y3G
- Dial Lamp: (2) MAZDA No. 44

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains*
   - (a) Antenna Post to R. F. Grid at
     - 1000 KC: 6.5
     - 4000 KC: 3.0
     - 18000 KC: 2.3
   - (b) R. F. Grid to Converter Grid at
     - 1000 KC: 5.0
     - 4000 KC: 3.0
     - 18000 KC: 2.0
   - (c) R. F. on Converter Grid to I. F. on 1st I. F. Grid at
     - 1000 KC: 4.7
     - 4000 KC: 4.7
     - 18000 KC: 3.9
   - (d) I. F. on Converter Grid to I. F. on 1st I. F. Grid at
     - 455 KC: 55
   - (e) I. F. Amplifier Grid to Detector Plate at
     - 455 KC: 77
   - (2) Voltage across Volume Control to Give 1/4-watt Speaker Output at
     - 400 cycles: .05 volts
   - (3) DC Voltage Developed Across Oscillator Grid Resistor (R-7) at
     - 1000 KC: 6.0
     - 4000 KC: 5.5
     - 18000 KC: 3.9

*Variations of ± 20% are permissible. All readings obtained with enough input signal to give 1/4-watt speaker output.
GENERAL ELECTRIC CO.

SPECIFICATIONS

Over-all Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>J-808, 818, 828</th>
<th>J-809</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>35 inches</td>
<td>37 3/4 inches</td>
</tr>
<tr>
<td>Width</td>
<td>36 3/8 inches</td>
<td>36 3/8 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>17 3/4 inches</td>
<td>17 3/4 inches</td>
</tr>
</tbody>
</table>

Tuning Control Drive Ratio

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles per Second)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>110-125</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>A7</td>
<td>110-125</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>C2</td>
<td>110-125</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast Band</td>
<td>540–1600 KC</td>
</tr>
<tr>
<td>Short-wave Band No. 1</td>
<td>2300–7000 KC</td>
</tr>
<tr>
<td>Short-wave Band No. 2</td>
<td>7000–22,000 KC</td>
</tr>
</tbody>
</table>

Intermediate Frequency

455 KC

Electrical Power Output

Undistorted: 10 watts
Maximum: 12 watts

GENERAL INFORMATION

These models each contain an eight tube superheterodyne receiver which is designed to obtain the best results from an alternating current power supply. Dual Beam-a-Scopes ensure satisfactory performance at all frequencies within the tuning ranges of the receiver. Broadcast and short-wave No. 1 signals are selected by the tuned circuits and Beam-a-Scope. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet. Additional features in the receiver are: fine line oscillator signal selector; five feathertouch tuning station keys; and automatic volume control.

Phono-FM-Tel

All models are designed to allow the ready connection of separate record players, frequency modulation converters, and television picture receivers with sound converters. Models J-808, J-818 and J-828 are equipped with a pin jack immediately in back of the plug connection on the bottom panel of the chassis. Model J-809 is equipped with a pin jack on the back panel of the chassis into which a plug connection is made from the tone arm of the automatic record changer. If a separate record player, frequency modulation converter, or television picture receiver with sound converters is to be used with the Model J-808, the record changer plug connection can be removed and the auxiliary plug connection made. General Electric plug, Stock No. RP-149, flat pin jack. The left-hand feathertouch tuning key, marked "Tel-FM", on Model J-808, J-818 and J-828, and "Phono" on Model J-809, when depressed switches the receiver from radio to operation with the auxiliary equipment.

Setting Up the Receiver

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs, have the way on their respective shafts, the dial reflector plate should be held in place by a pin from the rear.

2. The black speaker lead should be connected to the 14-inch speaker terminal which is grounded to the speaker frame and to the 6 3/4 inch speaker terminals which is not grounded. This will assure proper phasing of the speakers.

3. A method of setting up station keys which will assure drift-proof adjustment is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.

Chassis or Beam-a-Scope Removal

Models J-808, 818 and J-828

The chassis is anchored to the chassis board which in turn is held in place by three wood screws located along the bottom edge. Removal of these wood screws will allow the chassis to be dropped down and taken out. These three wood screws are located at the top of the chassis board. The cabinet is then removed from the cabinet sides.

To remove the cylindrical Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads and the Beam-a-Scope drive cord. Remove the two wood screws which hold the Beam-a-Scope drive shaft in place. Then turn the screw clear out to the stop. Swing the stop block of the cylindrical Beam-a-Scope, till or raise the cabinet off the floor. To remove the wood screws which hold the support in place. The Beam-a-Scope can now be rotated from right to left until it is free.

Model J-809

The chassis is held in place on the speaker shelf by four mounting bolts accessible from the bottom side. Removal of these bolts will free the chassis from the shelf.

To remove the cylindrical Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads. Remove the Beam-a-Scope drive cord. With a screwdriver remove the two wood screws which hold the bottom Beam-a-Scope support to the cabinet. These screws are accessible from the top side of the support next to the lower rear cross-member of the cabinet. The Beam-a-Scope can now be rotated from right to left until it comes loose from the upper pivot.

The Beam-a-Scope drive mechanism is held in place by two bolt and nut assemblies. The nuts are accessible from the bottom side of the plate. In attempting to remove these nuts, the bolt is found to turn then it will be necessary to remove the chassis and then the bolt heads. This mechanism will have to be removed to replace the control drum or the drive cord. When replacing the drive cord, it will be best to take out the Beam-a-Scope and drive unit as one assembly allowing the cord to be completely restrung before remounting the assembly.

Load-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. If for any reason it needs recentering, it will be necessary to replace the entire cone and voice coil assembly.

Notes—In no case should the magnet be removed from the assembled position.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available:

(1) Stage Gains

(a) Antenna Post to R.P. Grid at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 KC</td>
<td>5.5</td>
</tr>
<tr>
<td>4000 KC</td>
<td>2.5</td>
</tr>
<tr>
<td>18000 KC</td>
<td>2.5</td>
</tr>
</tbody>
</table>

(b) R.P. to Converter Grid at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 KC</td>
<td>5.5</td>
</tr>
<tr>
<td>4000 KC</td>
<td>3.5</td>
</tr>
<tr>
<td>18000 KC</td>
<td>2.5</td>
</tr>
</tbody>
</table>

(c) R.P. on Converter Grid to I.P. on 1st I.P. Grid at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>50</td>
</tr>
<tr>
<td>18000 KC</td>
<td>50</td>
</tr>
</tbody>
</table>

(d) I.P. on Converter Grid to I.P. on 1st I.P. Grid at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>60</td>
</tr>
<tr>
<td>18000 KC</td>
<td>60</td>
</tr>
</tbody>
</table>

(e) I.P. Amplifier Grid to Detector Plate at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>55</td>
</tr>
<tr>
<td>18000 KC</td>
<td>55</td>
</tr>
</tbody>
</table>

(2) Voltage across volume control to give 15-watt speaker output at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
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</thead>
<tbody>
<tr>
<td>400 cycles</td>
<td>0.65 volts</td>
</tr>
<tr>
<td>18000 KC</td>
<td>7.8</td>
</tr>
<tr>
<td>4000 KC</td>
<td>7.8</td>
</tr>
<tr>
<td>18000 KC</td>
<td>7.8</td>
</tr>
</tbody>
</table>

(3) DC voltage developed across oscillator grid resistor (R-7) at

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 cycles</td>
<td>0.68 volts</td>
</tr>
<tr>
<td>18000 KC</td>
<td>7.8</td>
</tr>
<tr>
<td>4000 KC</td>
<td>7.8</td>
</tr>
<tr>
<td>18000 KC</td>
<td>7.8</td>
</tr>
</tbody>
</table>

* Variations of ±20% permissible. All readings obtained with enough signal input to give 15-watt speaker output.

Fig. 8. Dial Cord Stringing Diagram
**ALIGNMENT PROCEDURE**

The alignment procedure is given in table form below. The use of a standard R.F. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation, all R.F. alignment trimmers are available either on top of the chassis or through holes in the back apron as shown in Fig. 1. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet. Also, the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

**Fig. 1. Trimmer Location (All Models)**

<table>
<thead>
<tr>
<th>ALIGNMENT CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I.F. ALIGNMENT WITH OSCILLOSCOPE</strong></td>
</tr>
<tr>
<td><strong>Band</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td><strong>1. &quot;BC&quot; Band</strong></td>
</tr>
<tr>
<td><strong>2. &quot;BC&quot; Band</strong></td>
</tr>
<tr>
<td><strong>L.F. ALIGNMENT WITH OUTPUT METER</strong></td>
</tr>
<tr>
<td><strong>Band</strong></td>
</tr>
<tr>
<td><strong>1. &quot;BC&quot; Band</strong></td>
</tr>
<tr>
<td><strong>2. &quot;BC&quot; Band</strong></td>
</tr>
<tr>
<td><strong>4. &quot;BC&quot; Band</strong></td>
</tr>
<tr>
<td><strong>R.F. ALIGNMENT WITH CHASSIS MOUNTED IN CABINET</strong></td>
</tr>
<tr>
<td><strong>Band</strong></td>
</tr>
<tr>
<td><strong>6. &quot;SW&quot; Band</strong></td>
</tr>
<tr>
<td><strong>7. &quot;SW&quot; Band</strong></td>
</tr>
<tr>
<td><strong>8. &quot;SW&quot; Band</strong></td>
</tr>
</tbody>
</table>

9. Repeat operation 7 if the Beam-a-Scope leads are moved in operation 8.

BEAM-A-SCOPE REMOVAL

Before either the chassis or Beam-a-Scope can be removed, the leads between them must be disconnected. Fig. 1 shows the location of the Beam-a-Scope leads when connected.

Model J-1106—To remove Beam-a-Scope, disconnect the leads, unscrew the two lower screws, pull the board rearward and then pry loose the cardboard back which is stapled to the bottom of the cabinet and holds the Beam-a-Scope in place. Now rotate the Beam-a-Scope from right to left until it is loose. Note: The upper pivot bolt support should never be loosened.

To replace the Beam-a-Scope the reverse procedure is followed and the trap should be resatled to the cabinet.

Model J-1108—To remove Beam-a-Scope from this model, use the same procedure as above with the exception of the bottom support removal. This receiver uses a two wooden support held in place by two wooden screws which are accessible from underneath the cabinet base. When the screws are removed the wood support can be removed allowing the Beam-a-Scope to be replaced from right to left until it is free.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains
(a) Antenna Post to R. F. Grid at
1000 KC. 6.5
4000 KC. 3.0
18000 KC. 2.3
(b) R. F. Grid to Converter Grid at
1000 KC. 6.0
4000 KC. 3.0
18000 KC. 2.2
(c) R. F. on Converter Grid to I. F. on 1st I. F. Grid at
1000 KC. 47
4000 KC. 47
18000 KC. 38
(d) I. F. on Converter Grid to I. F. on 1st I. F. Grid at
455 KC. 55
(e) I. F. Amplifier Grid to Detector Plate at
455 KC. 77

(2) Voltage Across Volume Control... giving 34-watt Speaker Output at 400 cycles... 0.05 volts

(3) DC Voltage Developed across Oscillator Grid Resistor (R. 7) at
1000 KC. 6.0
4000 KC. 6.5
18000 KC. 3.9

* Variations of ± 20 per cent are permissible. All readings obtained with enough input signal to give 34-watt speaker output.

** 34-watt speaker output at 400 cycles is equivalent to a reading of 1.32 volts as measured by a high resistance A-C voltmeter across the voice coil of the receiver speaker.

Phonograph Mechanism (Model J-1108)

Type Automatic Record Changer
Record Capacity: Twelve 10-inch or ten 12-inch records
Type Pickup: Crystal
Turntable Speed: .78 Rpm

ALIGNMENT PROCEDURE

The alignment procedure, performed with the chassis in the cabinet, is given in table form below. All R. F. alignment is performed by capacity coupling the test oscillator to the receiver input. This is accomplished by using a three-foot piece of wire as an antenna connected to the high side of the test oscillator output and brought to within three feet of the Beam-a-Scope input when making the alignment. Metal objects such as tools, meters, etc. should not be placed on top of the cabinet.

Before making the R F. alignment make sure the pointer is set to the line at the left-hand edge of the dial scale when the gang condenser plates are closed. Output meter alignment is preferable and the meter may be connected across the voice coil; then turn volume control to maximum. Keep the signal input as low as possible to avoid A V C action.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Test-Osc. Connect to</th>
<th>Osc. Output Frequency</th>
<th>Pointer Setting</th>
<th>Tune Trimmer for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7J F. grid in series with .05 mfd</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C16 &amp; C17</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6SA7 grid in series with .05 mfd</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C13 &amp; C14</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Use Capacity Coupling 580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C11**</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Use Capacity Coupling 1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C8</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Repeat step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Use Capacity Coupling 6.0 MC</td>
<td>&quot;SW1&quot; Band 6.0 KC</td>
<td>C7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Use Capacity Coupling 21.0 MC</td>
<td>&quot;SW2&quot; Band 21 MC</td>
<td>C6*</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Use Capacity Coupling 21.0 MC</td>
<td>&quot;SW2&quot; Band 21 MC</td>
<td>C11**</td>
<td></td>
</tr>
</tbody>
</table>

** Use minimum capacity peak.
*** Rock gang condenser for optimum peak.

R. F. Alignment with Chassis Outside of Cabinet

R. F. alignment can be performed only on the "BC" and "SW1" bands with the chassis outside of the cabinet. Any alignment attempted on "SW2" band will not be satisfactory. The same relative position of the chassis and loosely wound loop should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of 0-180° calibrated scale which is cemented to the back of the dial reflector plate. From the "frequency-degree reference chart" the degree readings for corresponding frequency settings may be obtained. To use these readings, first completely close the gang condenser plates and then slide the pointer along the cord until the left-hand edge of the pointer-guide slide lines up with the 0° mark. By using this left-hand edge (as viewed from the rear) of the slide as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 154°, the receiver will be tuned to 1500 KC on the "BC" band.

The "BC" and "SW1" band alignment procedure is the same as outlined in steps 3 to 6 inclusive of the chart—"R. F. Alignment with Chassis Mounted in Cabinet."

The chassis should be mounted in the cabinet and "SW2" band alignment checked as described in steps 7 and 8 of the chart.

NOTE: After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

FREQUENCY-DEGREE REFERENCE CHART

<table>
<thead>
<tr>
<th>&quot;BC&quot; Band</th>
<th>&quot;SW1&quot; Band</th>
<th>&quot;SW2&quot; Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 KC. 154°</td>
<td>0.0 MC. 143°</td>
<td>21 MC. 162°</td>
</tr>
<tr>
<td>1000 KC. 104°</td>
<td>4.0 MC. 96°</td>
<td>12 MC. 107°</td>
</tr>
<tr>
<td>500 KC. 20°</td>
<td>2.5 MC. 20°</td>
<td>7 MC. 28°</td>
</tr>
</tbody>
</table>
Plug in AC cord, turn "Off Volume" knob on, push in "Broadcast" button, and select stations as desired by using tuning knob.

Use same procedure, though push in "Intermediate Short Wave" or "Short Wave" buttons for tuning these bands.

To set broadcast band stations to buttons for instantaneous tuning:

Remove decorated cover above long row of knobs (with fingernail or screw driver). This will expose six pairs of screws. These are the iron-core tuners and padders. From left to right these iron cores tune stations for buttons number two to seven, inclusive. Select the six stations desired, remove the call letters from the station tab sheet, insert the tabs in the buttons, assigning the station with the lowest KC frequency to button No. 2 and, in order, to the station with the highest KC frequency to button No. 7.

To actually set stations to the buttons:

By means of manual tuning, play the station to be set; then push the button at which the station is to be set; then with a screw-driver, turn iron-core (long screw) till station is located. Adjust station to loudest volume, using paddler screw (short screw); then readjust long screw till station is set to a point where the tuning eye is at its most closed position. The station is then "set" to the button.

This procedure must be repeated for each station to be set to each button, and it is suggested that, after the stations are all once set to their buttons, they be rechecked before replacing the cover.

Standard broadcast antenna is mounted on a swivel in rear of cabinet. For tuning some more distant stations, it may be desirable to rotate antenna to position of loudest volume or, if necessary, an outside antenna may be connected to a green wire lead coming from this broadcast loop. For short wave tuning, some locations will require an outside antenna. This outside antenna should be connected to the green wire coming from the short wave loop, which is located directly above the chassis. If extra antenna is desired for both short wave and standard broadcast performance, both green antenna leads can be joined together satisfactorily to one outside antenna.

If a phonograph or microphone is to be used, they should be plugged into the rear of the chassis in place provided and so marked. To use as a phonograph or with microphone, push in "Phono" button. In the rear of the chassis is provided a 110 volt plug. This is for your convenience for using this radio with a phonograph attachment or with a lamp.

A six-prong outlet is provided in the chassis pan. This outlet is wired into the circuit and can be used only in conjunction with a special microphone pre-amplifier and control that has been designed especially for recording purposes. The consumer owning this receiver may purchase a portable recorder and, by connecting it to our microphone pre-amplifier, it is possible to make recordings of the highest quality.
B. F. GOODRICH

MODELS R-399, R-405

TRIM 1400 KC
PAD 600 KC
FREQUENCY RANGE -
535 to 1720 KC

CONVENTIONAL ALIGNMENT SEE SPECIAL SECT., VOL. VIII

FREQUENCY RANGE -
550 to 1700 KC
1700 to 5400 KC
5600 to 18100 KC

FOR OTHER DATA SEE INDEX

FOR OTHER DATA SEE INDEX
FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL.VIII
MODELS R-404, R-415A

FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

TRIM 1400 KC (BB)
PAD 600 KC (BB)
TRIM 6000 KC (SW)

FREQUENCY RANGE
555 to 1750 KC
2200 to 6500 KC

MODEL R-415A

TRIM OSC 1630 KC FOR CONVENTIONAL ALIGNMENT
TRIM ANT 1400 KC SEE SPECIAL SECTION VOL. VIII
WAVE TRAP ADJUSTMENT

At the rear of the chassis near the Antenna and Ground posts is an adjustment screw connected to a trap circuit for elimination of code interference when operating on the broadcast band. If code interference is encountered adjustment of this screw will filter it out. It is to be used only if such interference is experienced in broadcast reception. It's use prevents code transmitters operating on a frequency around 455 K.C. from being received by the I.F. amplifier which is tuned to 455 K.C.

SERVICE DATA FOR ALL BANDS

If it is suspected that the oscillator has stopped but is doubtful due to the presence of the usual amount of noise level, it is suggested that the oscillator plate voltage be checked. To ascertain whether the tube ductor is oscillating, ground the oscillator grid of the 6A8 (short stator and rotor plates of oscillator section on gang condenser). If oscillating properly, grounding this is liable to permanently warp the plates and the grid will cause an appreciable drop in oscillator voltage. Grounding or shorting the stator and grid condenser from tracking...
Eight Tube AC Superheterodyne

ALIGNMENT DATA AND SERVICING

GENERAL DATA
The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400, 1730, 1800, 4000, 5625, 6000, 16,000 and 18,100 KC. An output meter to be connected across the primary or secondary of the output transformers is possible, all alignments should begin with the volume control set at maximum and the test oscillator output set 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 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 456 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. 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 a 200pfd, 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 6000 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 padding condenser and, at the same time, continuously backing off 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 capacitors and receiver. Return to 1400 KC and align the output meter with the receiver. Again go over the adjustments of this frequency to be certain that they were not put slightly out of alignment when adjustments were made at 6000 KC.

POLICE BAND ALIGNMENT
The police band is adjusted by first replacing the .001uF dummy with a 400 ohm resistor and setting the generator to 1600 KC. With the gang set at minimum, adjust the “polarization trimmer” to receive this signal, then set the signal generator to 4000 KC and adjust “polarization 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 16,100 KC and with the gang at minimum, adjust the “short wave oscillator trimmer” to receive the signal. Then set the generator to 18,000 KC 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 lose sensitivity at 6000 KC, the antenna and oscillator coils, as well as the .001 mica pad trimmer, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal voltage.
ALIGNMENT MODELS R-412 and R-412A—Trim Osc 1780 KC, Ant 1400 KC Ped 600 KC

C10 and C12 used in some models. In others, point "A" is connected to chassis.
CONVENTIONAL ALIGNMENT PROCEDURE FOR BOTH THESE MODELS
FOR FULL DETAILS SEE SPECIAL SECTION VOL. VIII.

TRIM OSC 1730 KC
TRIM ANT 1400 KC

FOR OTHER DATA SEE INDEX

C10 and C12 used in some models. In others point "A" is connected to chassis.
**Range 536 - 1730 Kilocycles**

**Correct Alignment**

The intermediate frequency 6F1 tube should be aligned properly as the last step.

**Procedure**

**Model R-416**

- After the LF transformers have been properly aligned and packed, the Broadcast Band alignment should be the next procedure.

**LF Alignment**

- Adjust the test oscillator to 405 KC and connect the output to the grid of the first detector tube (SA7) through a 0.005 mfd. condenser. The ground on the test oscillator can be connected to the chassis ground. Adjust one of the LF trimmers to peak or minimum reading on the output meter.

**Broadcast Band Alignment**

- Adjust the oscillator to 1230 KC and connect the output to the antenna lead. Then connect the condenser trimmer (SA7) to receive this signal. After this has been completed, the next step is to set the generator to 1400 KC and after tuning in the signal adjust the antenna trimmer to peak. This is all that is necessary for the alignment unless the plate of the condenser has been bent out of shape. In case of bent plates, set the antenna trimmer and the receiver to 600 KC and bend the plates into the position for maximum output.

**Procedure for Setting Up Push Buttons**

There are four push buttons by means of which four stations may be selected (See Fig. 1). Make a list of four stations used in regular order. Loosen any of the push buttons by turning the push button proper counter clockwise a few turns. Holding it in, turn 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.

**Model R-416**

- 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.

VOLTAGES — Line 115 Volts AC. **Model R-416**

- Volume control minimum. Antenna shorted to ground. Meter 1000 ohms per volt.

- **Model R-416**

  - Filament of 80 tube to ground... 250 volts
  - Screen of 81 tube to ground... 167 volts
  - Screens of 6A7 and 6G6 tubes to ground... 94 volts
  - Cathode of 41 tube to ground... 82 volts
  - Cathode of 6A7 tube to ground... 31 volts

**Speaker (Port No. P306)**

- Field resistance... 1,500 ohms
- DC voice coil resistance... 4.6 ohms
- Voice coil impedance at 400 cycles... 5 ohms
POWER SUPPLY

The power supply of this portable radio uses one Ray-O-Vac No. P96A, General
No. 6-F-1, Burgess No. 6FP1 or Eveready No. 743. Portable "A" battery
and two Ray-O-Vac No. 5303, General No. V 30-B, Burgess No. B20P1
or Eveready No. 762 Portable "B" batteries.

ALIGNMENT

BROADCAST BAND

Trim Ant. - 1400 ke

I. F. - 455 ke

TOP VIEW OF CHASSIS

IF ALIGNMENT

Remove the chassis from the cabinet and
connect one end of a 100,000 ohm resistor
to the grid of the 1A7 tube and the other end to the A.V.C. lanhnostock
clip (See "antenna and ground" for location of this clip). Adjust the
signal generator to 455 KC and connect the output to the grid of the
first detector tube (1A7) thru a .05 or .1 mfd. condenser. The ground of
the signal generator should be connected to the chassis ground. Align
all I.F. trimmers to peak or maximum reading on the output meter.

SERVICE INFORMATION

Speaker (Part No. P3465) 5" PM Type
D.C. voice coil resistance..................... 2.9 ohms
Voice coil impedance at 400 cycles 3.5 ohms

Oscillator Coil (Part No. P3318) (Brown Dot)
Primary—No. 2 and No. 3—1.7 ohms.
Secondary—No. 4 and No. 1—4.9 ohms

First I.F. Transformer (Part No. P3048)
Primary—Blue white, plate; red white B+—12.1 ohms.
Secondary—White, grid; black white, A.V.C.—24.9 ohms

Second I.F. Transformer (Part No. P2806)
Primary—Blue white, plate; red white B+—15.1 ohms.
Secondary—White, grid; black white, A.V.C.—11.8 ohms.
I.F. 455 KC
TRIM OSC 1610 KC
TRIM ANT 1400 KC

MODEL R-419

I.F. ALIGNMENT
Remove the receiver chassis from the cabinet and connect a 100,000 ohm resistor to the green and yellow leads in place of the loop antenna to which they were originally connected. Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (1A7) through a .05 or .1 mfd condenser. The ground on the signal generator should be connected to the chassis ground. Align all I.F. trimmers to peak or maximum reading on the output meter.

FOR OTHER DATA, SEE INDEX

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

MODEL R-420

FOR OTHER DATA SEE INDEX

BATTERY SELECTION
This receiver is designed to operate entirely from a 6 volt storage battery. It requires no other batteries. It will operate from any storage battery having a capacity ranging from 90 to 175 ampere hours. It is suggested, for the sake of greatest economy, that the largest possible capacity battery be used. The following is a schedule giving the number of hours of service on a single charge from batteries of standard capacities. A fully charged battery will provide satisfactory power for the periods specified before requiring additional charge.

90 Ampere Hour Capacity provides 60 hours
100 Ampere Hour Capacity provides 66 hours
110 Ampere Hour Capacity provides 73 hours
120 Ampere Hour Capacity provides 80 hours
150 Ampere Hour Capacity provides 100 hours
170 Ampere Hour Capacity provides 113 hours
This receiver is designed to operate over two tuning ranges: the broadcast range which extends from 535 to 1790 Kilocycles (KC) (173.4 to 561 meters), and the International Short Wave Band which extends from 5650 to 18,100 Kilocycles (KC) (16.5 to 53 Meters). This latter range is the one which includes the internationally assigned bands—the 19, 25, 31, 39 and 49 meter bands.
B. F. GOODRICH

MODELS R-423, R-436

I.F. 455 KC

TRIM OSC- 1730 KC (BB)
TRIM OSC- 15100 KC (SW)
PAD OSC- 600 KC (BB)
TRIM ANT- 1400 KC (BB)
TRIM ANT- 16000 (SW)

FOR ALIGNMENT PROCEDURE
SEE MODEL R-411

MODEL R-423

TRIM OSC- 1550 KC (BB)
OTHER ALIGNMENT DATA SAME AS MODEL R-411

MODEL R-436
IF ALIGNMENT — Wave change Sw. in B.C position, Gang condenser at minimum, generator at 456 KC, output to 1A6 CG thru 0.05 MFD condenser. Generator grounded to receiver, align four trimmers of IF transformers.

BROADCAST — Generator connected to antenna lead thru 200 MFD condenser, and set at 1400 KC. Gang condenser at minimum, Trim oscillator then Antenna trimmers pad the oscillator circuit at 600 KC while rocking gang condenser.

SHORT WAVE — Generator at 6000 KC, start rotating gang condenser from HF end, when signal is heard, adjust Antenna trimmer (Sw.) for maximum peak. Repeat all adjustments for maximum performance.
Power Supply

This receiver is designed to operate on a single unit Roy-O-Vac No. AD-62, Burgess 17G-D60, Eveready 748 or General 60DL-11-L battery. No other batteries are required as this battery is a combination 90 volt "B" battery and a 1½ volt "A" battery. To use separate batteries a P2863 battery adapter cable is required.

In some models all common grounds become chassis grounds, C1, C3, C5, R2, and R6 are omitted.

Point "A" is connected to point "B" and point "C" to point "D."

For other data see Index

April 1940
B. F. GOODRICH

MODEL R-450

MODEL R-470

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Capacity</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C8</td>
<td>.002</td>
<td>600</td>
</tr>
<tr>
<td>C9</td>
<td>.001</td>
<td>600</td>
</tr>
<tr>
<td>C10</td>
<td>1200</td>
<td>400</td>
</tr>
<tr>
<td>C11</td>
<td>.05</td>
<td>400</td>
</tr>
<tr>
<td>C12</td>
<td>.25</td>
<td>200</td>
</tr>
<tr>
<td>C13</td>
<td>1200</td>
<td>400</td>
</tr>
<tr>
<td>C14</td>
<td>.0005</td>
<td>600</td>
</tr>
<tr>
<td>C15</td>
<td>1200</td>
<td>400</td>
</tr>
<tr>
<td>C16</td>
<td>.0025</td>
<td>400</td>
</tr>
<tr>
<td>C17</td>
<td>.01</td>
<td>400</td>
</tr>
<tr>
<td>R1</td>
<td>150,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>150,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>150,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>500,000</td>
<td>1.25</td>
</tr>
<tr>
<td>R5</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R6</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R7</td>
<td>500,000</td>
<td>1.25</td>
</tr>
</tbody>
</table>

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>200,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>300,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>5 Meg</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>500,000</td>
<td>1.25</td>
</tr>
</tbody>
</table>

I.F. PEAK - 455 KC
TRIM OSC. - 1730 KC
TRIM ANT. - 1400 KC

CONVENTIONAL ALIGNMENT

VOLTAGES: Line 115 v. AC. Power consumption, 30 watts.
Volume control maximum. Water 1000 ohms per volt. Read from point indicated to common ground.

MODEL R-470

For SOCKET LAYOUT
See INDEX

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GOODRICH PAGE 12
RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>500,000</td>
<td>5/6</td>
</tr>
<tr>
<td>R2</td>
<td>4,000</td>
<td>5/6</td>
</tr>
<tr>
<td>R3</td>
<td>100,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R4</td>
<td>25,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R5</td>
<td>5,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R6</td>
<td>220</td>
<td>1/6</td>
</tr>
<tr>
<td>R7</td>
<td>10,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R8</td>
<td>5,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R9</td>
<td>5,000</td>
<td>1/6</td>
</tr>
<tr>
<td>R10</td>
<td>1,000,000</td>
<td>1/6</td>
</tr>
</tbody>
</table>

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Capacity (Mfd.)</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.00012</td>
<td>500</td>
</tr>
<tr>
<td>C2</td>
<td>.00025</td>
<td>500</td>
</tr>
<tr>
<td>C3</td>
<td>.0005</td>
<td>500</td>
</tr>
<tr>
<td>C4</td>
<td>.001</td>
<td>500</td>
</tr>
<tr>
<td>C5</td>
<td>.0025</td>
<td>500</td>
</tr>
<tr>
<td>C6</td>
<td>.003</td>
<td>500</td>
</tr>
<tr>
<td>C7</td>
<td>.005</td>
<td>500</td>
</tr>
</tbody>
</table>

FOR OTHER DATA SEE INDEX

FOR OTHER DATA SEE INDEX
The ECONOMIZER switch is located on the top left of chassis. Always have this switch in the "NE" battery position when first placing the radio in operation or when installing a new battery.
Automatic Unit

Principle of Operation

The basic circuit of any radio receiver is the inductance coil and tuning condenser which determines the frequency to which the system is tuned. The frequency at which this circuit resonates can be varied in two ways: either by holding the inductance coil at a fixed value of inductance and changing the capacity of the condenser, or by holding the condenser at a fixed value of capacity and changing the inductance of the coil. This is so because the frequency is proportional to the inductance times the capacity and changing one or the other will change their product.

Previous push-button systems accomplished their purpose in one of two ways. They either rotated the tuning condenser mechanically with an electric motor, or disconnected the tuning condenser by means of a switch and substituted preset fixed-condenser in the antenna and oscillator circuits.

In the push-button system the entire oscillator circuit (cond and gang condenser) is disconnected and in its place is put a silvered mica condenser of fixed capacity and a coil, the inductance of which can be varied by means of an iron slug that moves with a screw adjustment, inside the coil. This is the second system of tuning mentioned above and has the following advantages in this case. The condenser is made by electroplating a small deposit of silver on each side of a piece of mica and encasing the whole unit in a weatherproof compound. The silver, having a low temperature coefficient has a negligible expansion with changes in temperature, and humidity has no effect because of the weatherproof compound. Therefore, changes in the condenser capacity are controlled. The coil is impregnated with a moisture-proof wax and the whole circuit is tuned by varying the inductance of the coil. The only uncontrollable factor in the system is the variation in capacity of the wiring and other parts. But this variation is so small that its detuning effect is not noticeable to the ear.

In the system the silvered mica condenser which tunes all six of the push-button coils is in the main part of the receiver and connected on the wave switch. The push-button coils are mounted on the push-button unit and are adjusted from the back by slotted screws. The adjustable padding condensers directly above the slotted screws are used to align the antenna coil in the receiver to each of the push-button coils depending on which button is pushed. Variation in capacity of this pad has no effect on the tuning of the system. It simply drops the sensitivity slightly.

Instructions for Pre-setting “Fingertip Control” Circuits for Six Stations in the Broadcast Tuning Range

The automatic tuning unit is located immediately above the receiver chassis, the circuits being adjustable from the rear of this unit. Although it is possible to adjust the circuits without the aid of a signal generator, for best results it is recommended that a serviceman be allowed to pre-set the tuning circuits in the following manner.

Turn the wave change switch to the left. Six stations in the broadcast band may be chosen, and the tabs on which are printed the call letters of these stations should be selected from the sheet provided and inserted in the cut-out slots. It is preferable to place the tabs in the slots according to frequency; that is to say, the low frequency stations should appear as the left as the unit is faced and the high frequency stations at the right.

The tuning circuits corresponding to a given station will be found at the rear of the automatic unit housing, immediately behind the station call letter tab slot. Assuming that you are facing the rear of the receiver and it is desired to set up WJZ at 760 kilocycles on the third circuit from the right, the following is the recommended procedure. Adjust the signal generator, modulated with an audio frequency, to 760 kilocycles. Using a small screwdriver adjust the converter oscillator circuit, third hole from right in the lower row, until signal is loudest. Then adjust antenna circuit, third hole in upper row, until signal is at a maximum.

Readjust converter circuit carefully for maximum signal strength. Other frequencies may be set up in a similar manner on the remaining circuits.

If a signal generator is not available turn the wave switch to the middle position for manual tuning and tune the receiver to the desired station. Then turn the switch to the left (“fingertip-control” automatic position) and adjust the automatic unit oscillator and antenna circuits exactly as described above. Repeat procedure until all desired stations are set up. When all desired stations are set up recheck all oscillator adjustments for calibration accuracy.

The frequency range of the automatic tuning circuits is as follows:

<table>
<thead>
<tr>
<th>Circuits</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>1550-970 Kilocycles</td>
</tr>
<tr>
<td>3 and 4</td>
<td>250-750 Kilocycles</td>
</tr>
<tr>
<td>5 and 6</td>
<td>970-540 Kilocycles</td>
</tr>
</tbody>
</table>

Replacement Parts

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>Padder</td>
<td>34187</td>
</tr>
<tr>
<td>84</td>
<td>Oscillator Trans. Asy</td>
<td>40141</td>
</tr>
<tr>
<td>85</td>
<td>Padder</td>
<td>34186</td>
</tr>
<tr>
<td>86</td>
<td>Oscillator Trans. Asy</td>
<td>40139</td>
</tr>
<tr>
<td>87</td>
<td>Padder</td>
<td>34185</td>
</tr>
<tr>
<td>88</td>
<td>Oscillator Trans. Asy</td>
<td>40186</td>
</tr>
</tbody>
</table>
Connect an output meter across the speaker volume control and turn receiver volume control on full. Turn wave switch to Manual position and variable condenser to extreme high frequency end of scale. Connect a 470 K.C. signal generator to the grid of the 6fty tube through a condenser in the order of 0.02 mfd capacity. Keep the signal on a low audible level and adjust trimmer (C4) (See Fig. 2) for maximum output. Then adjust trimmers (C2) and (C5) (See Fig. 1) for maximum output. Finally repeat (C4) adjustment.

Broadcast and Shortwave Band Adjustments:

Near the following adjustments must proceed in order specified:

1. Turn variable condenser to maximum capacity and set points on small for approximately 1/2 inch above top horizontal wave dividing line. Turn wave switch to a frequency of 1500 K.C. and adjust a 1500 K.C. generator or secondary lead through a 100 mfd condenser. Turn wave switch to manual position. Volume control should be on full.

2. Loose trimmer (C2) and adjust trimmer (C5) until signal is produced. Then adjust (C3) for maximum output.

3. Turn center knob to Shortwave position, substitute a 400 mfd condenser for the condenser in the signal generator lead and set generator to a frequency of 1500 K.C. and adjust trimmer (C9) until signal is produced. Then adjust (C3) for maximum output.

4. Turn center knob back to manual and substitute the 100 mfd condenser for the 400 mfd condenser in the signal generator lead. Set signal generator to 1500 K.C. and adjust trimmer (C5) until signal is produced. Set signal generator to 600 K.C. With the set tuned close to 600 K.C. on the dial, vary the gang condenser slowly back and forth, adjusting (C6) at the same time until maximum signal is indicated. Finally check dial for calibration accuracy against signal generator at the 1500 K.C. point. If found to be incorrect, repeat 1500 K.C. adjustment procedure outlined in step number (1).

All of the above adjustments must be made before pre-setting the automatic circuits.
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 in nearest the top 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 3 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 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.
MODEL 690
GOODYEAR TIRE & RUBBER CO., INC.

NOTE:
C4 and C9 are in one unit P-118-1
C7 and C8 are in one unit P-118-3.
P23 and C55 are in one unit P-118-17.
R10 and R15 are in one unit P-108-6.
Numbers prefixed by letter 'H' are part numbers.
Voltage taken from points indicated to chassis ground. Vol. control on full no signal.
Serial No. 40001 up.

DESCRIPTION:
Model 690 is a six tube superheterodyne receiver, with an intermediate frequency of 175 K.C. and a tuning range of from 520 to 1850 K.C. This receiver has been carefully designed to facilitate servicing, the top and bottom covers are both removeable and are fastened in place by spring clips. All adjustments are accessible and any part replaceable without removing the chassis from the cabinet.

SERVICE NOTES:
Voltage taken from different points of circuit to chassis are measured with voltmeter control full on, all tubes in their sockets and speaker connected, with a volt meter 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.V.C. and affecting 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.

Resistance of coils and transformer windings are indicated in ohms 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.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the cap of the tube. Tubes may be checked very easily by replacing with other tubes which are known to be good. If fuse blows out frequently and insulating sleeve has been properly placed over fuse, the trouble is probably in the motor, it should be replaced.

Do not attempt to make any adjustments on the vibrators.

ANTENNA CONNECTION:
The antenna is connected to the receiver by means of the antenna cable. The antenna wire is the single black wire projecting from the end of the cable. Splay this wire to roof antenna lead and ground the pig-tail shielding as close to the corner post of the car as possible.

On open and convertible models where the antenna strap or plate antennas are used it may be necessary to ground the exhaust pipe and muffler to the frame at both ends with heavy copper braids.

CONNECTIONS TO BATTERY:
The battery cable, number 132-2, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 143-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.

GENERATOR INTERFERENCE:
Remove the generator cutout mounting screw and fasten the condenser (148-1) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely.

Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>500 Ω 0.5 W</td>
</tr>
<tr>
<td>R9</td>
<td>1000 Ω 0.5 W</td>
</tr>
<tr>
<td>R5</td>
<td>560 Ω 0.5 W</td>
</tr>
<tr>
<td>R4</td>
<td>3900 Ω 0.5 W</td>
</tr>
<tr>
<td>R3</td>
<td>250 Ω 0.5 W</td>
</tr>
<tr>
<td>R6</td>
<td>1200 Ω 0.5 W</td>
</tr>
<tr>
<td>R8</td>
<td>1200 Ω 0.5 W</td>
</tr>
<tr>
<td>R7</td>
<td>250 Ω 0.5 W</td>
</tr>
</tbody>
</table>

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C10</td>
<td>100 μF 500 V</td>
</tr>
<tr>
<td>C11</td>
<td>100 μF 500 V</td>
</tr>
<tr>
<td>C12</td>
<td>100 μF 500 V</td>
</tr>
<tr>
<td>C13</td>
<td>100 μF 500 V</td>
</tr>
<tr>
<td>C14</td>
<td>0.01 μF 500 V</td>
</tr>
<tr>
<td>C15</td>
<td>0.01 μF 500 V</td>
</tr>
<tr>
<td>C16</td>
<td>0.01 μF 500 V</td>
</tr>
<tr>
<td>C17</td>
<td>0.01 μF 500 V</td>
</tr>
<tr>
<td>C18</td>
<td>0.01 μF 500 V</td>
</tr>
<tr>
<td>C19</td>
<td>0.01 μF 500 V</td>
</tr>
</tbody>
</table>

IF PEAK 175 KC

DUMMY ANTENNAS.

IF: A 1 μF condenser connected in series with the test oscillator output lead.

Broadcast: A 200 μF condenser connected in series with the output lead of the test oscillator.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII
PILOT LAMP:
The pilot lamp is a 6.3 volt 150 Mill. type (No. 47) and should be replaced with such, in order that the filament voltages across the radio tubes do not change.

FREQUENCY RANGE:
- Broadcast: 538 K.C. to 1760 K.C.

POWER SUPPLY:
- Power Main: 105-130 Volts AC/DC
- Power Consumption: 30 Watts

ALIGNMENT FREQUENCIES:
- Antenna: Oscillator
- Trimmer: Trimmer
- 1450 K.C: 1760 K.C

INTERMEDIATE FREQUENCY: 455 K.C.

POWER OUTPUT:
- Type: Single Class A
- Undistorted: 1.4 Watts
- Maximum: 2 Watts

ALIGNMENT PROCEDURE

Output Meter Connections: Across Load Speaker Voice Coil
Output Meter Reading to Indicate 1 Watt: 1.9 Watts
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%, 450 Cycles
Position of Volume Control: Fully On

TRIMMER

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTIONS (In Order Shown)</th>
<th>TRIMMER ADJUSTMENT</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 K.C.</td>
<td>.1 mfd.</td>
<td>12A8GT</td>
<td>T4-T5</td>
<td>I.F.</td>
</tr>
<tr>
<td>Closed</td>
<td>455 K.C.</td>
<td>.0002 mfd.</td>
<td>Antenna Conn.</td>
<td>T1 (Min. Output)</td>
<td>Wave Trap</td>
</tr>
<tr>
<td>Fully Open</td>
<td>1760 K.C.</td>
<td>.0002 mfd.</td>
<td>Antenna Conn.</td>
<td>C13</td>
<td>Osc. Trimmer</td>
</tr>
</tbody>
</table>

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.
When adjusting T1, Antenna Wave Trap, Trimmer, increase generator output. To obtain clearly defined trimmer setting for a minimum output.
LOCATION OF PARTS ON TOP OF CHASSIS

C10  Condenser .03 mf. 600V
C8  Condenser .02 mf. 400V
C5  Condenser .0001 mf. mica
C11  Condenser .01 mf. 200V
C3  Condenser .0001 mf. mica
C1  Condenser .008 mf. 200V
C2  Condenser .001 mf. 400V
C4  Condenser .05 mf. 200V
G1  Condenser 1 mf. 200V
C9  Condenser Electrolytic (49x10) & 20 mf.
C11  Condenser Variable C12 & C13
R4  1012524124  Control Volume 500M
R7  101218239  Resistor 47M ohm 1/2W
R6  1012251261  Resistor 220M ohm 1/2W
R5  1012551261  Resistor 22M ohm 1/2W
R2  1012551261  Resistor 47M ohm 1/2W
R1  1012551261  Resistor 10 meg. ohm 1/2W
R8  1012551261  Resistor 150 ohm 1/2W
T2  101218239  Transformer Antenna
T4  1012551261  Transformer 1st I.F.
T3  1012551261  Transformer 2nd I.F.
T1  1012551261  Transformer Oscillator
T1  1012551261  Wave Trap (coll. & trimmer)

FOR SETTING OF PUSH-BUTTONS SEE MODEL 015140

HOW THE AUTOMATIC PUSH-BUTTON TUNER FUNCTIONS:

This unit is mechanically operated by means of a proven cam and lever action, designed to rotate a shaft 90 degrees. Since the variable gang condenser shaft must rotate 180 degrees, a 2 to 1 step up mechanical lever action is incorporated to give full rotation to the gang condenser. Three links are used to transmit the operation of the push-button to the variable gang condenser; first, a driven lever or link connected to the tuner lever bar; second, a driven lever arm connected to the gang condenser shaft; and third, a connecting link connecting the two lever arms together mechanically.

The plunger bar that retains the screw type push-buttons, also holds a cam to itself by a shoulder rivet. This cam floats on the rivet proper and is locked into position with a small square plate, floating in the plunger bar. To lock cam into position, screw the push-button knob toward the right (clock-wise). The end of the push-button screw will then force a small square plate known as a brake shoe against the periphery of the cam. The push-button must be tightened firmly after the position of the station selection is determined.

To change the setting of the cam, the push-button knob must be loosened by rotating it toward the left (counter-clockwise). When this push-button screw is loosened, it will automatically release the brake shoe from the cam, leaving the cam free to rotate and set its new position to the setting of the lever bar.

If it becomes necessary to realign the tuner in relation to the gang condenser, the following procedure should be followed to assure perfect tuning operation:

1. Attach driver arm to the lever bar by means of two machine screws, making sure that they are assembled with lockwashers and tightened securely.

2. Slip the drum assembly, which consists of the drum, drum hub, and the driven arm, over the variable condenser shaft but do not tighten set screws.

3. Connect these two lever arms by slipping the connecting link over the heads of the shoulder rivets. This link has a slight bend (offset) about 1/3 of its length and is to be installed with the shorter end towards the top and the offset towards the rear when looking at it from the drum end. Attach the tension spring between the two shoulder rivets. This spring is incorporated to take up all the unnecessary slack in the drive.

4. In making the final adjustment, that of setting the condenser in relation to the tuner, close the condenser completely to maximum capacity and rotate drum with the left hand in a clock-wise rotation, until the driver arm comes gradually down to within 1/4 of an inch of the variable condenser shaft. When in this position, tighten set screws in the drum hub with the right hand.

It is essential that all set screws be tightened securely so as to prevent a variation from original setting.

If, for some reason, a replacement is necessary for some particular item on the tuner proper, such as a lever bar, cam, plunger bar or brake shoe, it would be advisable to return the complete tuner proper for replacement.
Band 1 - 110 Kc to 410 Kc  
(2730 to 733 meters)
Band 2 - 400 Kc to 1500 Kc  
(750 to 200 meters)
Band 3 - 1.7 Mc to 5.9 Mc  
(177 to 51 meters)
Band 4 - 5.3 Mc to 18 Mc  
(56 to 15.7 meters)

NOTE: The SKYRIDER MARINE Model S22R is an AC-DC receiver which operates on 110/125 volts only. Should operation be desired from a lower voltage DC source, an external converter delivering 110/125 volts should be used. A 220 volt DC Model S22R is available on order and uses a special 220 volt filament transformer.

If an inverted "L" antenna is used, connect lead-in to A, and leave the jumper between A and G. If an "all wave" doubler is used, connect the transmission line to A and A, with the jumper removed from A and G. A separate antenna may be used for one s-w band; use a half-wave antenna whose length can be calculated from

\[
\text{Length in feet} = \frac{463}{\text{Frequency in megacycles}}
\]
ALIGNMENT PROCEDURE

1000 kc IF ALIGNMENT.

Tune receiver to 5,000 kc with the band switch in 65 position.

Connect hot side of signal generator to 600-ohm grid gap through 1 nfd condenser. Ground output to 1,000 kc.

Adjust screws S1 to S6 inclusive on 1F transformers A-B-C-D for maximum gain.

BFO ADJUSTMENT - With a 1000 kc signal being fed into the IF amplifier and the BFO switch ON, place the Pitch Control on the 1000 kc dot and adjust the BFO knob until the pitch control from the front of the panel will enable you to vary the frequency of the best note to your satisfaction.

R.F. ALIGNMENT

Connect hot lead of Signal Generator to A1 through dummy antenna shown in Table. Leave Junper connected between A2 and 0. Ground of Generator to chassis.

<table>
<thead>
<tr>
<th>BAND</th>
<th>REG. DIAL SETTING</th>
<th>LINE, VAC. SET,</th>
<th>DUMMY ANTENNA</th>
<th>HIGH FREQUENCY END</th>
<th>LOW FREQUENCY END</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>128 kc 128 kc</td>
<td>0.005 mfd</td>
<td>C0</td>
<td>C0</td>
<td>P0</td>
</tr>
<tr>
<td>2</td>
<td>250 kc 250 kc</td>
<td>0.005 mfd</td>
<td>C0</td>
<td>C0</td>
<td>P0</td>
</tr>
<tr>
<td>3</td>
<td>400 kc 400 kc</td>
<td>0.005 mfd</td>
<td>C0</td>
<td>C0</td>
<td>P0</td>
</tr>
<tr>
<td>4</td>
<td>1000 kc 1000 kc</td>
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R.F. ALIGNMENT

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**Frequency Range:** 500 kHz to 2.5 MHz

- 1-1/2
- 1/3 Wire Wound
- S. Meter Zero Adj.
- Wire Wound
- 10
- 1-1/2
- 1/3
- 1/3
- 1/3
- 1/3
Tune the signal generator to 5.16 megacycles and align transformers T1, T2, T5, and T6 for maximum response.

A variac for accurate setting is necessary for accurate alignment.

This alignment process should be repeated at least once to ensure excellent sensitivity.

To align: Disconnect the isolators before turning the selectivity switch to the broad position and the AM/FM switch to the AM position.

Leave the signal generator set at the frequency originally used for IF alignment with the isolator left on. Rotate the trimmer control on the selectivity transformer (T5) secondary loop (which is the signal that is fed to the antenna). As this point is approached, the output of the signal generator is reduced while the output meter gives a readable indication. Adjust the trimmer control of the selectivity transformer for maximum response.

Next, tune the signal generator on either side of resonance and note the maximum output in each case as indicated on the output meter. These values should be the same for good balance. If they are not, then tune the signal generator to the lower of the two peaks and adjust the trimmer control of the second transformer for maximum response.

Repeat this process until the output is equal to or close to the output of the transformer previously noted.

Reset the balance as above and readjust the trimmer until both output readings are alike when the signal generator is tuned to either side of resonance.

If a balance cannot be obtained, it is an indication that the selectivity trimmer control has been adjusted off the proper setting and will require a very slight readjustment in either direction. The direction of adjustment that causes the output to increase the most is the correct one. Care must be taken in adjusting the trimmer control as a slight misalignment can result in the distorted reception of frequency-modulated signals.

IF Alignment:

Connect a high-frequency signal generator to the antenna terminals (A4) through a 240 ohm resistor and the ground of the generator to the ground terminal of the receiver. Leave terminal A1 connected to the ground terminal.

The Ferris Signal Generator Model 110 is recommended for alignment purposes. If this is not available, a standard signal generator may be used.

The controls should be set in the same position as for IF alignment. Set the AM/FM switch to the AM position. Set the bandswitch to band A.

Adjust both the trimmer C6 until the signal is heard. The frequency of the oscillator is higher than the frequency of the signal. Next, adjust trimmer C6 and the antenna trimmer for maximum response.

Next, tune the signal generator to 26 megacycles and adjust padder C5 for maximum response while reading the tuning control. Then repeat the alignment at the higher frequency and as described.

LAMP 1:

Tune the receiver and signal generator to 26 megacycles. Adjust trimmer C6 until the signal is heard. In this band, the frequency of the oscillator is lower than that of the signal. Adjust the antenna trimmer and trimmer C5 for maximum response while reading the tuning control. No padding adjustment is provided for the low-frequency end of this band.

LAMP 2:

Tune the receiver and signal generator to 100 megacycles. Adjust trimmer C6 and the antenna trimmer for maximum response while reading the tuning control. No padder compensation adjustment is provided.

Ensure the lamp is at the high-frequency oscillator coil. The white wire winding, one end of which is connected to a terminal in the primary, is the input to the oscillator. By carefully adjusting the trimmer control, it may be possible to obtain the highest frequency in the frequency range. This trimmer should be adjusted while the trimmer control is at the high-frequency end of the band.

Repeat the adjustment of C5 as described above after shifting the frequency of the oscillator.

As the frequency of the oscillator is increased, the frequency of the signal is increased and the padder compensation adjustment is made for the low-frequency end of this band.
ERS INC.

Power Consumption—at 117 volts—60 cycles—138 watts
Power Consumption—DC operation—18 amp. at 6 volts
or 108 watts
Power Output —8 watts undistorted
Sensitivity—(for .05 watts output) Bands 1 to 5—2 MV
and under; 6th band 4 MV
Selectivity—IF broad (high fidelity) 12 kc
IF Sharp 4.1 kc
Frequency Range RF—Note: These are the actual frequen-
cies covered corresponding to nominal figures in-
dicated on the front panel.

550 to 1,620 kilocycles
1.5 to 3.1 megacycles
2.9 to 5.9 megacycles
5.75 to 11.5 megacycles
10.3 to 21.5 megacycles
20.4 to 42 megacycles

Frequency response AF (audio filter out broad IF)—tone
control high-70 to 3000 cycles = 2½ DB
Speaker Output Impedances—5000 and 500 ohms
Intermediate Frequency—455 kc
The following measurements made with a 20,000 ohms per volt meter and taken from the socket terminal indicated to ground or receiver chassis. Antenna and ground were disconnected from the receiver when these measurements were taken and the RF and AF gain controls set at maximum. "DL" means Dead Lug but will indicate voltage when used as a tie. Normal tolerance allows a variation of ±10% from the indicated values.

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<th>FUNCTION</th>
<th>SOCKET TERMINALS</th>
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<td>0.1 4.15 170 6.3 227</td>
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<td>RF Amp. (2)</td>
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<td>1st Audio Amp.</td>
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<td>5Z3</td>
<td>Rectifier</td>
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ALIGNMENT PROCEDURE MODEL SX-28—SUPER SKYFRIER

Equipment Needed for Aligning:
1. An all wave signal generator which will provide an accurately calibrated signal at the test frequencies indicated.
2. A signal generator for measuring the maximum output when varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.
3. Switch to "Xtal Sharp" and adjust C4 for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.
4. A sharp peak will be obtained when the correct adjustment has been reached.
5. A sharp peak will be obtained when the correct adjustment has been reached.

Switch to "Xtal Sharp" and adjust C4 for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.

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Alignment of Controls—Prior to alignment—IF and RF.

Setting of controls prior to alignment—IF and RF.

1. Tone control at maximum high frequency position (600-BPD at 0—Bass switch at Bass—all—AF Gain as adjustable—RF Alignment position 3.5 to 1.6 band—RF alignment depending on band alignment.

2. Selectivity control at sharp IF—Send—Receive switch in Receive—Crystal plating at #3 on left side—ANL—OFF on 6-AC OFF.

3. Important! Have headphones connected so logging scale reads 100.

4. Antenna trimmer adjusted for Maximum gain at each RF alignment point on Bands 3-4-5.

5. Note: Antenna trimmer not in circuit on Bands 1-2-3-

6. 355 Kc—IF Alignment Tone must read to 3400 kc on 55 to 1.6 mc band. Connect the hot lead from the signal generator to 6L7B in front of buffer—Ground the chassis. Roughly adjust the aligning screws of T2, the lower screw of which is accessible through hole in right mounting bracket, for maximum gain. Now adjust lower screw of T2 (do not adjust upper screw). Also adjust C1 and the air variable condenser at the top of T2 for maximum gain.

Switch to Crystal Board Position—Turns on BPO and adjusts to a tone of about 1000 cycles. Vary the frequency of the signal generator while adjusting the top screw on T2 until the output goes through a maximum, dip down, and then goes up again. Adjust the phasing control for maximum selectivity and then back off the top screw on T2 until the output reaches a maximum value between the two maximum values just noted. The frequency of the signal generator should be varied over a small range while adjusting the top screw of T2. A sweeping tone, in contrast to the usual sharp crystal tone, will be apparent when the correct adjustment has been reached.

Switch to "Xtal Sharp" and adjust C4 for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.

Switch to "Xtal Sharp" and adjust C4 for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.

RF ALIGNMENT

Connect hot lead of signal generator to A1—through dummy antenna shown in table. Leave jumper connected between A1 and G. General of Generator to Chassis.

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<th>Rec. Dial Setting</th>
<th>Sig. Gen. Freq.</th>
<th>Dummy Antenna</th>
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Familiar amounts of time were noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.

Switch to "Xtal Sharp" and adjust C4 for maximum output while varying signal generator frequency. Two points of maximum output will be noted corresponding to two adjustments of C4. Either one of these points may be used at which to locate C4, a sharply peaked tone will result at the correct alignment.

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FREQUENCY RANGE
(Megacycles)

(80 meter band)  -  4.0 - 3.5
(40    )  -  7.3 - 7.0
(20    )  - 14.4 - 14.0
(10    )  - 30.0 - 28.0

BANDSPREAD - DIAL DIVISIONS

0 - 86
0 - 76
0 - 88
0 - 70

Band  Coverage
1  540 kc to 1500 kc
2  1.45 mc to 4.3 mc
3  4.12 mc to 11.9 mc
4  11.26 mc to 30.5 mc
Without changing the frequency of the generator after completing I.F. alignment, turn H.P. switch clockwise from 'A' position 500 Hz to 'B' position 2000 Hz. Relocate oscillator to obtain maximum signal from signal generator. Adjust screw 35p to desired tone (approximately 3000 cycles).

NOTE: It is also possible to adjust the H.P. switch without changing the signal generator by turning the signal generator to the desired tone and adjusting screw 35p to obtain maximum signal. The results may be more uniform for a slight offset in oscillator frequency. When adjusting the trimmers and trimmer for maximum signal, the oscillator frequency will be less than the signal frequency on #6 band.

Connect box lead of signal generator to 250 wire on output plug end low side of generator in Bsink wire. A dummy antenna is unnecessary.

For a #6 and #7 band, it may be necessary to "tuck" the mini tuning condensers in a manner such that the #6 and #7 bands are adjusted for 2500 Hertz. Then adjusting the trimmers and trimmers for maximum signal, the oscillator frequency will be less than the signal frequency on #6 band.
### Parts List

#### Resistors

<table>
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<tr>
<th>No.</th>
<th>Value</th>
<th>Wattage</th>
<th>No.</th>
<th>Capacity</th>
<th>Value</th>
<th>PTC</th>
<th>Type</th>
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#### Capacitors

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<td>mica</td>
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</table>

### Error to Be Considered

1. **The Operator** - Errors of the operator which depend entirely on his experience may be difficult to predict. Even after he has familiarized himself with the adjustment of the "ERROR CORRECTION" control, he need only allow about a 1/10 degree as strong static-free signals that produce a NULL of about 2 degrees will. If the NULL should develop 10 degrees or more, the operator, by means of the "ERROR CORRECTION" control, can prevent allowing more than 2 degrees.

2. **Motion of the Compass** - Tacking and yawning usually only affect the ship's course. The HELMMAKER must apply the correct magnetic deviation to the compass indication and must sometimes estimate possible error at the time readings are taken.

3. **Indicator Error** - occurs in plotting the earth's spherical volume, on the chart, the INDICATOR CHART, as a plane area. Since INDICATOR CORRECTION is necessary only as rare occasions, as shown by Figure 7, it will not be treated in detail.

4. **Land Effect** - occurs when the signal passes over land before the course of water. In this respect, radio waves are comparable to light passing through materials of various densities. (Figure 5 illustrates the effect.)

**CAUTION** - Do not rely on readings taken over land or along a shoreline.

5. **Night Effect** - occurs at night and is noticeable at sunrise and sunset. The effect is noted at night and during the day. It is evident by a broadening of the NULL and poor or nil reading at distances greater than 200 miles. Over short ranges the effect is negligible.

6. **Radio Compass Deviation** - must be determined and accounted for as in the magnetic compass. A calibration curve (Figure 10) determined as indicated by the self-explanatory Figure 9, can be made with the aid of the PELICANS, immediately after installation.

If the Radio Compass is not in line with the LOWER LINE, the CALIBRATION curve will be similar to that shown by the dotted line.

**REMEDIES** are immediately evident to the operator.
Setting of controls prior to I.F. Alignment

1. "OFF" control to NORMAL.
2. "Volume" on FULL.
3. "Sharpness" on FULL.
4. Main tuning dial set at 3 kc.
6. Connect i.f. generator to grid of 6SK7.
7. Ground lead of generator to chassis of receiver.
8. Adjust indicated trimmers as per instructions.

Setting of controls for I.F. Alignment

1. All controls similar to I.F. alignment.
2. Receiver dial adjusted to the aligning frequency.
3. NOTE: Generator connected to receiver inductively by forming a loop with a few turns of wire and placing it in the field of the loop on the receiver - leave end of wire free.

NOTE: On the beacon band the slug P, is used for calibrating the center of the band the red, P, for calibrating the low frequency end of the band.

ALICE receiver and signal generator to reach operating temperature before making adjustments.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SW. GEN.</th>
<th>DIAL DIAL SETTING</th>
<th>DONNY</th>
<th>PAR</th>
<th>TUNING OR BASS</th>
<th>ADJUSTMENT</th>
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<td>Inductive P</td>
<td>P</td>
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</table>
The Model HT-7 Frequency Standard is designed to be operated on 110-120 volt 50-60 cycle alternating current. It is suggested that the user connect the HT-7 to a receiver. "A" terminal on Standard to antenna post on receiver and "B" terminal to receiver ground post. After you have become familiarized with the way the HT-7 should be operated, the wire which is connected to the "A" post on the standard can be more loosely coupled to the receiver by twisting this wire around the antenna lead. The most satisfactory amount of coupling has been reached.

1000 EC: Set the Off-ON Switch to the Off position and the Switch to the "B" position. Now turn the Band Switch to the Standard to F1 band. The receiver should be adjusted for standard broadcast band coverage during these initial steps of adjustment. With the best coverage in the receiver turned off you should be able to hear a strong signal at 1000 EC in the broadcast band and at every 1000 EC throughout the tuning range of the receiver.

The 1000 EC frequency is obtained to a tolerance of ±0.04% and has a temperature coefficient of about 5 cycles per megacycle per degree centigrade. Obviously, the 1000 EC standard should be used in such a manner as to approximately locate the even 1000 EC intervals. For accurate measurements, the crystal switch should be placed in the 1000 EC position.

100 EC: Place the crystal switch at the 100 EC position. A signal from the standard will now be heard every 100 EC on the receiver.

NOTE: To accurately adjust the Standard the following procedure should be carefully followed: Place the crystal switch at the 1000 EC position. Turn off the best frequency oscillator in the receiver. Now tune in a broadcast station, preferably WNY, transmitting on an even 1000 EC frequency (100-200-300 etc.). Tune in this signal accurately. Place the crystal switch in the 1000 EC position. Unplug the tuned crystal, then plug it back in and tune in this signal again. Unplug the tuned crystal again, plug it back in, and tune in this signal accurately. Repeat this procedure until the crystal switch is accurately tuned.

In the 1000 EC position the crystal has a temperature drift of about 10 cycles per megacycle per degree centigrade. Temperature variations in normal service over several months cause frequency variations of approximately 60 parts per million.

The harmonics of the 1000 EC oscillator become noticeable when above 7 megacycles. A harmonic amplifier with a tunable output circuit is provided to raise the output level so that it will be usable through the 100 EC band. By setting the "Band Switch" to position 2, 3, 6, 9 or 12, and adjusting the "Output tuning" control, a point will be found where sufficient output is provided for all checking purposes.

20 EC: With the crystal switch set at the 100 EC position, a multimeter, hooked to a crystal, frequency, is inserted into the circuit. This will provide output signals which will be heard every 10 EC apart between the 100 EC points.

The presence of the 20 EC harmonics allows the standard to be set to zero hash with any domestic broadcast station by inserting a hash mark as they are spaced 100 EC apart. It is recommended by the FCC that broadcast stations remain within 50 cycles plus or minus of their assigned frequency. Station spacing remains 5 or 10 cycles in 50 cycles or less, or any constitute accurate checking points. Highest accuracy is, of course, obtained when beating against WNY, but broadcast carrier allows sufficient accuracy for most purposes.

The adjustment screw on the rear of the unit selects the sub-harmonics of 100 EC which is the multimeter output. If this control is improperly adjusted, there may be more or less than 10 signals between 100 EC points (100 EC points plus 8 or 10 signals being heard instead of 9). Count the number of 20 EC harmonics between 100 EC points and if you find more or less than 10, adjust this control until 9 signals are heard between the 100 EC markers. This adjustment is originally made at the factory so it is impractical for further adjustment will be found necessary. Once the multimeter has been locked to the proper sub-harmonics the output will be very stable.

USES

The HT-7 will be of great help in providing an accurate source of signal energy for receiver alignment purposes. With the multimeter in the standard it will be the standard receiver or output frequency for frequency checking, the HT-7 fills a needed want. The edges of the various amateur bands can be immediately established roughly by using the 1000 EC output signal. Exact band edge location can be determined by selecting the 1000 EC output frequency, in the 10 EC position the standard can then be used for frequency measurement purposes by interpolating between dial divisions and the frequency of the standard. For example, if you wish to measure a signal on 7642.5 on the receiver, place the standard to 1000 EC and locate the band edge on 7600 EC. Then switch the standard to the 1000 EC position and count over two 10 EC points. We have now located 7620 EC. Now set to 10 EC crystal position and count over six 10 EC points from 7620. We now have 7680 EC. Lay the dial setting for 7680 EC. See two more divisions to 8780. This represents a difference of three divisions to lower 10 EC, consequently the 10 EC represents 3 divisions on the dial. To locate our standard frequency of 7625 EC simply move the dial 3 divisions past 7652 (the 7600 calibration point) or merely to 7685 EC.
**OPERATION**

Although the "Super-Pro" is a highly technical piece of apparatus, with quite a large number of components, it is relatively easy to operate. There are 7 microphones on the panel. However, they are not all used at the same time. The number of microphones used for each setting depends on the type of sound, the conditions of the reverberation, and the type of system being used.

The main control is the "main switch," which turns the "main switch," and is also used for switching on and off the various sections of the "main switch." The "main switch" is located in the same position as the "main switch." When the "main switch" is turned on, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch." The "main switch" is used to turn off the "main switch." When the "main switch" is turned off, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch."

The "main switch" is used to control the amount of sound produced in the various parts of the "main switch." The "main switch" is used to turn off the "main switch." When the "main switch" is turned on, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch." The "main switch" is used to turn off the "main switch." When the "main switch" is turned off, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch."

**CROSSOVER NETWORK:** The "main switch" is used to control the amount of sound produced in the various parts of the "main switch." The "main switch" is used to turn off the "main switch." When the "main switch" is turned on, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch." The "main switch" is used to turn off the "main switch." When the "main switch" is turned off, the "main switch" is used to control the amount of sound produced in the various parts of the "main switch."
ANTENNA SYSTEM = Built-in loop with available connection from outside antenna. On short wave band, outside antenna required. BROWN lead to antenna, and BLACK lead to ground.

TYPE = Conventional

POWER OUTPUT = (MAX.) = 6 Watts; UPO = 4 Watts

CONSUMPTION = Receiver, 70 WATTS; Recorder, 30 WATTS; Changer, 30 WATTS.

POWER SUPPLY = (Standard Models) = 105-125 V, 60 Cycles

TUNING RANGES = 540 to 1700 KC, 5.5 to 18 MC. I.F. = 465 KC

MODEL = 302-R console Recorder

302-R Table Model Recorder

302-HA Console Recorder with Automatic Record Changer

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Switch Position</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Notes</th>
<th>Trimmers Adjusted (in order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>540</td>
<td>465 KC</td>
<td>Grid of 6A8GT</td>
<td>A, D</td>
<td>I, 12, 13, 14</td>
<td>IF</td>
</tr>
<tr>
<td>SK</td>
<td>16 MC</td>
<td>16 MC</td>
<td>Brown Ant. lead</td>
<td>B, E</td>
<td>Q0, A6</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>BC</td>
<td>1400 KC</td>
<td>1400 KC</td>
<td>Brown Ant. lead</td>
<td>C, D</td>
<td>07, A8</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>BC</td>
<td>600 KC</td>
<td>600 KC</td>
<td>Brown Ant. lead</td>
<td>C, D</td>
<td>P0, A9</td>
<td>Osc. Pad.</td>
</tr>
</tbody>
</table>

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 16 MC, then a weaker image will be heard at 15,070 KC, in other words 950 KC less on the dial.

C- When adjusting this pod, move the tuning knob back and forth and adjust padder until the peak of greatest intensity is obtained.

D- See that the tuning knob is set exactly on the last line above 540 when the condenser is at maximum capacity.

E- Check for oscillator cross-over between 16 and 18 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

SOCKET VOLTAGE READINGS:

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR</th>
<th>GRID</th>
<th>PLATE</th>
<th>OSC</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8GT</td>
<td>Mixer</td>
<td>3</td>
<td>95</td>
<td>225</td>
<td>140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6S9GT</td>
<td>I.F. Amp</td>
<td>3</td>
<td>95</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6Q7GT</td>
<td>Diode &amp; Mic. Gain</td>
<td>3</td>
<td>95</td>
<td>225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6Q7GT</td>
<td>Audio</td>
<td></td>
<td></td>
<td></td>
<td>75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the "Duplicate Record" position, the tuning eye is again in the circuit, for indication of proper cutting level, the cutting head circuit is complete, and the duplication is made from the original blank in position on the automatic turntable. The microphone is in use for another superimposed registration if desired.

With our automatic record changer models when duplicating from a small 45" record, due to the fact that this record, having a small surface, is liable to slip on the turntable, we have provided a spring finger that slips over the spindle that locks this record in place.

All chassis models have the input socket for the automatic changer pick-up, or if the model is not equipped with the automatic changer, a conventional turntable and crystal pick-up may be plugged into this socket and the duplication of the record can be accomplished.
In the "Record-Radio & Mic." position, the radio circuit remains the same as in "Radio" position. The microphone circuit becomes effective as the short is removed from the Mic. Gain Control. The percentage of radio and/or microphone is then controlled with the dual control feeding the 6QG7 Audio and the Mic. Gain Control.

The 6US now becomes the visual amplitude indicator of the recording voltage. The voltage is taken from the output plate (6V6), rectified and applied to the grid of the 6US.

The cut-out head circuit is completed.

The proper voltage level for the cutting operation is very important. Too high a level as indicated by the continuously overlapping of the tuning eye results not only in feed-back, but actual overcutting of the record, resulting in distortion. However, it seems that the general practice is for the operator to more often "undercut" the recording by not providing sufficient cutting voltage. This results in a high background level and poor quality.

The series condenser (002) in one side of the cutting head circuit is a controlling compensator for high response when recording. Increasing the value of this condenser will increase the high frequency effect in recording.

In the "Mic. P.A." position, only the microphone is in the circuit. An additional microphone extension is usually used with the microphone at a remote point, using the receiver as a public address system.

As shown in the above diagram, the tuning eye becomes inactive.

In the "Record Mic." position, the radio diode is opened, the bias circuit is opened at the mixer tube, cutting out the radio, and the cutting head circuit is closed.

With the Howard "PA" Series, the automatic changer is included. With the switch in this position the audio system remains the same as in "Play-Back" position, except the pick-up arm of the changer is in use.

A pilot light is switched on over the changer unit when switch is in this position.

In the "Play-Back" position the pick-up connects to one section of the dual volume control from which the audio output is regulated in the conventional manner.

The resistor directly in shunt with the play-back or pick-up circuit is a compensator controlling the low frequency response at "Play-Back" position. Decreasing this value will decrease the low response.
HOWARD RADIO CO.

GENERAL ADJUSTMENTS
ON
RECODER MECHANISM.

CUTTING HEAD POSITIONING ADJUSTMENT

The cutting head position has been adjusted properly at the factory, using HOWARD Home Recording Blanks. However, this adjustment by noticing if the cutting needle locking screw will locate itself in the vertical center of the clearance slot (See Fig. 1), when the record is being cut.

When necessary to change the position of this screw in the slot, loosen locking nut (See Fig. 2) and turn screw "A" to the right to raise needle locking screw; or turn to the left to lower.

After any adjustment is completed, be sure to tighten locking nut.

CUTTING NEEDLE PRESSURE ADJUSTMENT

For quality recordings, it is of vital importance that the right amount of pressure is obtained with the cutting needle. Observe the character of the shaving as the record is being cut. The size of the shaving should be about the size of a human hair (approx. .005). If it is too heavy, the groove in the record may be too close to the adjacent groove which would cause distortion. If the shaving appears to be too fine and "kinky", an insufficient pattern will be cut with distortion as a result.

Before making any change in the amount of pressure, FIRST BE SURE THE CUTTING NEEDLE ITSELF IS NOT DEFECTIVE, LOOSE OR MOUNTED WRONG, since the conditions as mentioned above due to improper pressure can also be caused by a defective needle. Check needle first.

When necessary TO INCREASE thickness of shaving thread (See Fig. 3) TURN CUTTING PRESSURE adjustment "B" to the right. TO DECREASE thickness of shaving thread, turn adjustment to the left.

THE CORRECT HEIGHT OF FOLLOWER ARM IN RELATION TO THE CUTTER ARM is obtained by seeing that the pivot post (which is a fixed part of the follower arm) is flush with the bushing on the top side of the arm platform. See Fig. 4. Also see that there is a small clearance between the pivot post bushings "G" and "H" when the cutting arm is lowered to the cutting position. The two hex. head screws "M" - "N" permits both this adjustment and at the same time the very important FOLLOWER ARM ADJUSTMENT IN RELATION TO THE SWING OF THE CUTTER ARM as follows: When the follower arm touches the follower arm stop, the cutting stylus should be just outside the edge of the paper label on the Howard Record blanks.

THE BRONZE SPRING ADJUSTMENT ON THE FOLLOWER ARM. When the cutting arm is in cutting position, the bronze spring tongue should seat firmly into the bottom of the spiral groove of the lateral feed screw. This pressure should be great enough so that there will be no tendency of the knife edge tongue to climb out of the thread causing uneven grooves and distortion. However, too much pressure is to be avoided.

The screw "F" controls this tension, and if the spring lifts itself away from the tip of this screw in the cutting position, it indicates too much pressure. This may also be caused by the follower arm being too low or bent downward for some reason.

END PLAY ADJUSTMENT OF LATERAL FEED SCREW. Loosen locking nut for screw "C", turn screw slowly to the right until the end play cannot be felt; reverse screw slightly to the left to allow running clearance, and tighten lock nut.
AUDIO FEED-BACK is controlled by placing Selector Switch in position for a recording. Turn fader to extreme left and adjust Mic. Gain Control just below the feed-back point.

THE CRYSTAL TYPE CUTTING HEAD is energized by a special 70,000 ohm secondary winding (a part of the output transformer) that matches the impedance of the cutting head.

THE CUTTING HEAD CRYSTAL MICROPHONE AND CRYSTAL PLAY-BACK units are so designed and compensated to provide uniform frequency response for recording and playback.

In the "Radio" position, the ground circuit return for the mixer tube bias is completed through the switch. Radio scanning is accomplished by opening the mixer tube cathode.

The GUN becomes the conventional tuning eye tube, since the grid is connected through the switch directly to the A.V.C. line.

The Microphones output circuit is shorted out.

Before we consider the cause and remedy of some of the troubles that may be encountered with any recording device, it is necessary to review the fundamental purpose of the records and needles themselves.

RECORD BLANKS

The ideal record material is that substance that has the right quality of material to respond to the vibrations of the cutting stylus and yet have the right amount of "GRANUING" so when used with the play-back needle, the needle takes most of the wear and not the record pattern.

Needle scratch will be objectionable with records having too coarse a grain material base. However, we do not recommend the use of non-metallic needles to reduce this needle scratch condition. For practical use the loss of volume with this type needle requires increase of audio volume and the background increases likewise.

NEEDLES

The function of a play-back needle is to act as a transmission medium between the modulated record grooves and the reproducing unit. Therefore, the frequency characteristic of a needle depends upon its shape, material, and size. The metallic needles are superior to non-metallic for a greater range of response. Likewise, the heavier shank needles will naturally have a greater range.

Regarding the playing life of a needle, generally speaking the metallic type may be grouped into about three classes: (1) The soft metallic one-play type; (2) Hard steel type, 10 or 25 plays; (3) Semi-permanent and permanent types, 500 or 2000 plays.

It must be remembered that the causes of faulty reproduction and the quick wearing out of records can more often be due to dull or rough edge needles than from the type of needle or record blank.

This also applies to the cutting needle which, although it may be in the permanent life class, can become chipped by rough handling or damaged when used with inferior grade blanks on which the cutting is insufficient, and the cutting needle may cut through to the hard core of the blank.

Since the actual depth of the grooves is nearly three thousandths of an inch (.003") for safety the coating should be at least twice that thickness.

Getting back to the reproducing needle, since the variations that the needle is to follow are lateral in nature, it is obvious that the needle is not supposed to be extremely pointed so as to ride in the bottom of the groove; and at the other extreme it is obvious that the needle should not be too blunt (like a dull needle) so as to ride near the top edge of the groove, losing all of the higher frequencies. Since the bearing surface, or radius point, of the needle should be slightly over two thousandths of an inch (.002") it becomes apparent as to what happens to the quality when the point becomes blunt so that the diameter is greater than what we can call the "Wave Length" of the higher frequency pattern in which the blunt needle could not follow the small curve variation for the high frequency reproduction. Never rotate the needle in the socket once it has been used.

SERVICE NOTES

This crystal unit similar in structure to the regular reproducing head, is likewise subject to extreme temperatures both hot and cold.

Heat at about 125° Fahrenheit will begin to soften the crystals and permanently damage the unit. Average temperatures encountered in the home a distance from the radiator should not cause trouble.

Coldness does not cause permanent damage, the effect being to "stiffen" the unit resulting in an increase of background "rumble" if a recording is made during that period.

To bounce either the play-back or the cutter head around carelessly will invite trouble. Severe shock against the end of the needle may not fracture the crystal, but at least the needle (or stylus) mounting will be damaged or the edge of the needle may be roughened which would ruin the next record.

Forcing the cutting arm by hand when it is not raised enough for the follower arm to become disengaged may throw arms out of alignment with each other.

Under a magnifying glass, the grooves should appear as about the width as the spaces between them for proper cut. If the thread is coarse and stiff, try new cutting needle, then if necessary, refer to procedure of adjustments given herein.

When the record is being cut, watch the shavings as they leaves the needle and see that it winds toward the center of the record and does not work back underneath the cutting needle causing it to bounce over the shavings.

If the thread is light, fluffy, or not continuous, after trying new cutting needle, refer to procedure of adjustment given herein.
This condition is the normal result of improper use of the "Mic. Gain Control" with the visual indicator for proper cutting voltage. Overcutting of the record is also possible with too high an input. At the other extreme, lack of sufficient input results not only in poor quality, but also raises the background level. Any recording system as sensitive as the Howard Recorder, is capable of picking up the mechanical vibrations of the motor. The sacrificing of this sensitivity to eliminate any possibility of motor rumble is not the cure or is it necessary. Under normal conditions of operation in which both the motor frame and turntable unit are suspended on soft rubber cushions, the rumble will not be recorded if:

1. The amplitude of the signal is sufficient when the blank is being cut.
2. The Tone Control is in the treble position at the time of recording.
3. The cutting stylus is in good condition and is MOUNTED TIGHT.
4. The crystal is at room temperature at the time of recording.
5. The play-back needle is not dull or has become "shouldered".

By "wobble" we mean the ring-songs effect with low frequencies predominating. We first consider the possibility that something has happened to vary the motor speed during recording. (See Speed Regulation below).

Although the recorder base is mounted on rubber feet at each corner, it is essential that the wing screws remain drawn tight against the washers. When the base floats too freely, vibrations are introduced into the drive mechanism causing a wobble effect if played back. Examine the grooves closely, if there appears to be a chipped spiral effect across the blank, you can be sure that the vibrations have created a regular pattern of their own due to the wing screws being too loose at each corner of the base. Tighten them.

Consider the possibility that the cutting needle might have been loose. After the customary trial of a new play-back needle, check the mounting of the play-back arm. It is held in place with a "Y" shaped band that should maintain its tension causing the arm to vibrate. It can be tightened by removing arm and spreading out fingers for more tension.

"Wobble" effect can be caused if the original cutting was made too heavy and which might be reproduced satisfactorily with one type needle having a wide point, but another type needle having an extremely fine point will wobble around the bottom of the groove with incomplete uneven registration.

The motor being of a constant speed synchronous type, operating at its rated frequency, should not vary. However, we must check the frequency marking as shown on the motor frame with the power line.

It is suggested that the speed of the motor be checked in the conventional manner by the use of a cardboard stroboscope disc using a gas illuminated electric light.

The correct speed with the play-back arm in place on the record is 78 R.P.M.

The speed of the motor when used in a district requiring a converter cannot be depended upon.

Irregularities of speed can be caused by excessive sandings wound around the motor spindle and rubber drive mechanism beneath the turntable.

There is a compensating resistor in the cutter circuit that will tend to make the play-back appear to have a lower frequency response.

In recordings where the high frequencies seem to be missing, be sure to ascertain if the original recording was incorrectly made with the Tone Control in the "Bass" position.

Another reason for lack of "highs" is of course either a blunt play-back needle, or the vibration of the record during a previous play-back by a damaged needle that has trimmed the grooves of its pattern for "highs".

The elements affecting the cutting and reproducing of a blank have been outlined above. We are making no mention of the audio system of the radio since it is conventional and requires no special service attention other than the usual check of tubes, operating voltages and motor switch contact points.
POWER SUPPLY — (Standard Models) = 105-125 V, 60 Cycles AC

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>Min. Cap.</td>
<td>465 KC</td>
<td>6A8 Grid</td>
<td>A</td>
<td>J1, 12, 13, 14, 14</td>
<td>IF</td>
</tr>
<tr>
<td>SW</td>
<td>18 MC</td>
<td>18 MC</td>
<td>Brown lead</td>
<td>B, D, E</td>
<td>09, 16</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>Int.</td>
<td>6.5 MC</td>
<td>6.5 MC</td>
<td>Brown lead</td>
<td>07, 16</td>
<td>Osc. Ant.</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>BC</td>
<td>600 KC</td>
<td>600 KC</td>
<td>Brown lead</td>
<td>C</td>
<td>P11</td>
<td>Osc. Pad.</td>
</tr>
</tbody>
</table>

NOTES

A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 18 MC then a weaker image will be heard at 17,070 KC, in other words 530 KC less on the dial.
C - When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D - See that the tuning hand is set exactly on the last line above 640 when the condenser is at maximum capacity.
E - Check for oscillator cross-over between 18 and 92 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

SPEAKER = Electro-Dynamic SIZE = 8" V.C.O.P.S. (6000 CPS) = 4 Ohms FIELD = 1200 Ohms

SOCKET VOLTAGE READINGS:

Voltage taken from ground with line voltage at - 117 AC.
High voltage reading off rectifier - 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A90T</td>
<td>Mixer</td>
<td>1.5</td>
<td>105</td>
<td>165</td>
<td>195</td>
</tr>
<tr>
<td>6N6T</td>
<td>IF</td>
<td>4.5</td>
<td>100</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td>6J7</td>
<td>Det.</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AX7</td>
<td>Output</td>
<td>106</td>
<td>150</td>
<td>185</td>
<td></td>
</tr>
</tbody>
</table>
NOTE 1: When aligning the I.F. channel, a condenser of .001 MFD may be used in series with the generator load.

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 above wave bands, a 500 ohm resistor may be used in series with the signal generator.

NOTE 4: After the chassis has been removed from the cabinet, be sure that 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 HV circuit, thus causing bowline.

NOTE 5: Check for an image signal about 10 cm lower in frequency. For example, if a p.m. has been made at 0 kHz, an image should be heard at about 1 kHz. Otherwise the original setting was not correct.
MODELS—435-436-437 "PROGRESSIVE SERIES"

TYPE 3-820 EXTERNAL SPEAKER is designed especially for use with Howard Communications Receivers. The input impedance is of the correct value to perfectly match the output transformer of Models 435, 436, 437, and 450. The speaker unit consists of a heavy duty high efficiency permanent magnet, 8" dynamic speaker mounted in an acoustically treated (felt lined) welded steel cabinet finished in fine suede wrinkle, supplied with a 5 ft. spade terminal cable.

NOTE:—The Progressive Series 435, 436, 437, is based on the Model 435 receiver. The 436 is the 435 circuit with the addition of the noise silencer and additional features. The progressive additions to the original 435 circuit may include: 605 Carrier Level Meter, 3-820 External Speaker, 650 Pre-Selector, 660 Frequency Monitor, 655 Loop Kit, and 610 Power Pack. For data on these, SEE INDEX.

TYPE 610 "B" POWER PACK. For conversion of 6 Volts d.c. to 200 Volts d.c. for operation of Howard Models 435, 436, and 437 Communications Receivers from 6 Volt Storage Battery, the Type 610 Power Pack is a convenient and practical converter. A four prong plug fits the socket on Model 435, 436, and 437 Receivers, carrying both A and B power to the set. Only two connections from the Power Pack to the storage battery are required. Ample length of cable is provided. Battery current drawn for Model 435 is 6.6 amps; for Model 436 is 6.9 amps; and Model 437 is 7.75 amps. ON and OFF Switch on Power Unit.

EXTERNAL CONNECTIONS

As we face the back of the receiver, the first three screw terminals coded V3, V2, and V1. Terminal strip at the right coded G, D, A are of which V3 and V2 must be shorted when using the Antenna and Ground connections. For the term connected, the built-in speaker, can be adapted for the conventional type of flat-top antenna system. Use of the Howard external speaker No. 3-820 leaves the shorting wire between G" and D" and by connecting the external antenna, connect Antenna to "A". Connect ground to "G", leads from the external external dynamic speaker to lugs V3 and V1.

If a doublet antenna is used, remove the jumper between G and D and attach doublet wires to B and A and a ground to "G".

We have found it inadvisable to recommend a definite length of antenna due to variable conditions. We do, however, suggest that you refer to the recommendations as given in the A. R. R. L. Antenna handbook.

The single terminal next to the antenna-ground strip is coded for use with the Howard Model 650 Pre-Amplifier.

ADAPTATION FOR BATTERY SUPPLY

When it is desired to use "A" and "B" batteries when the Howard 610 Power Pack is not available, connect as follows:

- Remove the jumper from the battery power socket. Connect "B" 250 Volts to terminal marked "B" in diagram. Connect one side of the 6 Volt "A" supply to terminal marked "A". Connect the other side of the "A" supply and "B" to the chassis ground terminal.

The "B" current required for Models 425 and 436 is 60 Mills. The "A" current requirement is 2.9 Amps. This includes the 605 Carrier Level Meter.

The "B" current required for Model 437 is 62 Mills. The "A" current requirement is 3.5 Amps, allowing for the 605 Carrier Level Meter.
The following are the Engineering Specifications for Model 435, 436.

POWER CONSUMPTION: 50 Watts, 105-125 Volts, A.C. 60 Cycle

INTERMEDIATE FREQUENCY: 465 KC

FREQUENCY RANGE - Divided into four bands as follows:

0.55 to 1.7 mc (545-176 meters) 5.5 to 10 mc (54-16.6 meters)
1.7 to 5.6 mc (176-54 meters) 17 to 43 mc (17-7 meters)

SPEAKER SYSTEM
Built-in 6½" Electro Dynamic
Connections provided for External Speaker (Howard Type 3-920)

POWER OUTPUT
Type: Single 6K6G
Maximum: 2½ Watts
FREQUENCY RANGE - Divided into four bands as follows:

- .55 to 1.7 mc (545-176 meters)
- 1.7 to 5.6 mc (176-54 meters)
- 5.6 to 18 mc (54-16.6 meters)
- 17 to 43 mc (17-7.7 meters)

POWER CONSUMPTION: .60 Watts, 105-125 Volts, A.C. 60 Cycle

INTERMEDIATE FREQUENCY

SPEAKER SYSTEM

Built-in 6½" Electro Dynamic Connections provided for External Speaker (Howard Type 3-820)

POWER OUTPUT

Type: Single 6K6G
Maximum: .4 Watts

The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 850 to 1050 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R.F. Output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The Oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 60 and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.

The Power Supply for this unit is self-contained, and is for use on 105-125 Volts, A.C. 40-60 Cycle. Available at other voltages and frequencies on special order.
The alignment is made with the BFO Off, the AVC Off, and the Band Spread set to 100.

The main dial band must stop EXACTLY on the last line at the end of the scale when the condenser is fully closed without force on the tuning control.

There should be an overload effect on powerful broadcast stations when the AVC is Off.

1. After the alignment of the I.F. stages is completed, align the BFO system as follows:
   a. Set pitch control 3 turns back from the "IN" position and turn on the BFO Switch.
   b. Adjust the trimmer in the BFO can to obtain maximum sound which will be a hissing noise. Turn tuning knob to be sure this sound is not some tunable frequency that is causing it.
   c. Check beats against some broadcast station to determine if the strength of the beat is normal.

NOTE 6: In this band (17 to 45 MC) only the oscillator follows the received signal 465 KC lower in frequency and will be found at about 37 MC. This will determine if the alignment was correctly made at 36 MC.

NOTE 7: Check for image on all bands except the 17 to 45 MC band at a point 600 KC lower on the dial.

NOTE 8: Rock main dial slightly for points of maximum signal as the padding condenser is being adjusted.

1. Set pitch control 3 turns back from the "IN" position and turn on the BFO Switch.
2. Adjust the trimmer in the BFO can to obtain maximum sound which will be a hissing noise. Turn tuning knob to be sure this sound is not some tunable frequency that is causing it.
3. Check beats against some broadcast station to determine if the strength of the beat is normal.

NOTE 7: In this band (17 to 45 MC) only the oscillator follows the received signal 465 KC lower in frequency and will be found at about 37 MC. This will determine if the alignment was correctly made at 36 MC.

NOTE 8: Check for image on all bands except the 17 to 45 MC band at a point 600 KC lower on the dial.
THE HOWARD CARRIER LEVEL METER gives an indication of the strength of the signal carrier in microvolts as delivered at the receiver.

The meter scale is calibrated from 0 to 50. When the meter set control (R. F. Gain) located directly below meter, is set exactly on the 50 division, the reading on the meter will be the actual microvolts delivered to the receiver.

Before using the carrier level meter, tune the signal to exact resonance with the meter switch in the OFF position, and adjust the R. F. GAIN CONTROL to a point where the signal is just audible. This will not throw the meter off scale when the meter switch is thrown to the ON position. Follow instructions given below.

The AVC Switch must be ON.
The Meter Switch must be ON.
The BFO Switch must be OFF.

To avoid the possibility of introduced error, the BFO Switch is so connected that the meter is not in the circuit when the BFO Switch is in the ON position. Therefore the meter can be used only when the BFO Switch is in the OFF position.

The maximum deflection of the meter pointer is the true indication of resonance in tuning. With a strong signal the meter will naturally be thrown off scale until the R. F. Control is rotated counter-clockwise. A point will be reached during this rotation where the meter hand is at 50. Then the input value in microvolts is read directly at the position of the pointer knob. For better accuracy this reading is multiplied by a correction factor as given on a separate chart to cover the various bands calibrated for each receiver.
FOR OTHER DATA SEE INDEX

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave Band</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimers Adjusted (In order shown)</th>
<th>trimmer Function</th>
<th>GO CHECK FOR IMAGE at</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO</td>
<td>Min. Cap. 465 KO</td>
<td>Grid of 6A8OT</td>
<td>A,D</td>
<td>I1, I2, I3, I4</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>SW</td>
<td>10 MC</td>
<td>15 MC</td>
<td>Ant. Brown lead</td>
<td>B, E</td>
<td>G5, G5, G7, G9</td>
<td>Osc. RF, Ant. 17</td>
</tr>
<tr>
<td>PB</td>
<td>1.5 MC</td>
<td>1.5 MC</td>
<td>Ant. Brown lead</td>
<td>B, E</td>
<td>G5, G5, G7, G9</td>
<td>Osc. RF, Ant. 17</td>
</tr>
<tr>
<td>BO</td>
<td>1400 KO</td>
<td>1400 KO</td>
<td>Ant. Brown lead</td>
<td>C, E</td>
<td>11 R12</td>
<td>Osc. RF</td>
</tr>
</tbody>
</table>

A: Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B: When aligning the short wave bands, do not adjust to the i.m.'s frequency. For example, if the adjustment is correctly made at 13 MC, then a weaker image will be heard at 17,070 KC, in other words 950 KC less on the dial.
C: When adjusting this pad, move the tuning hand back and forth and adjust pad until the peak of greatest intensity is obtained.
D: See that the tuning hand is set exactly on the last line above 500 when the condenser is at maximum capacity.
E: Check for oscillator cross-over between 10 and 26 MC. If necessary for stability, turn the mixer trimmer 1/32 inch.

SOCKET VOLTAGE READINGS:

Voltage taken from ground with line voltage at -117 V. High voltage reading off rectifier = 540 V. Drop across speaker field = 96 V. Voltage taken with 1,000 OHM per volt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>Grid</th>
<th>SCR.</th>
<th>PLATE</th>
<th>OSC.</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>RF</td>
<td>2#</td>
<td>100</td>
<td>245</td>
<td>6A8OT Inverter</td>
<td>7</td>
<td>125</td>
</tr>
<tr>
<td>6A8OT</td>
<td>Mixer</td>
<td>3#</td>
<td>100</td>
<td>245</td>
<td>140</td>
<td>6V6OT Output</td>
<td>16</td>
</tr>
<tr>
<td>6SK7</td>
<td>I.P. Amp.</td>
<td>3#</td>
<td>100</td>
<td>245</td>
<td>140</td>
<td>6V6OT Output</td>
<td>16</td>
</tr>
<tr>
<td>6Q7OT</td>
<td>Diode &amp; Mic. Gain</td>
<td>80</td>
<td>65</td>
<td>Tuning &amp; level cont.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6Q7OT</td>
<td>Audio</td>
<td>70</td>
<td>90</td>
<td>Heat.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONSUMPTION - Receiver, 90 WATTS; POWER SUPPLY - (Standard Models)
105-125 V. 60 Cycles
Charger, 30 WATTS. Recorder, 30 WATTS; I.F. = 465 KC TYPE = Iron Core
POWER OUTPUT - (MAX.)
11 Watts; U.P.O. = 6 Watts
TUNING RANGE = 540 to 1700 KC, 2.2 to 7.5 KC and 7 to 26 MC.
MODEL = 568-R
10 tube console Recorder 568-RA Recorder with Automatic Record Changer
**HOWARD RADIO CO.**

**MODEL 702**

**POWER SUPPLY - (Standard Models) = 105-125 V. AC-DC**

**POWER OUTPUT - (MAX.) = 1 Watt**

**UPC .5 W.**

**CONSUMPTION 30 WATTS**

---

**VOLUME CONTROL AND SWITCH-NO. 85-281**

**V.C. IMP. (400QPS) = 5 Ohms**

**FIELD = 450 Ohms**

**SPEAKER = Electro-Dynamic**

**SIZE = 5"**

**TUNING RANGES = 540 to 1720 KC and 4.6 to 16 MC (178-580 and 18-65 Meters)**

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>Wave-Band Switch Position</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
<th>Check for Image at</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC</td>
<td>540</td>
<td>456</td>
<td>Grid of 125A7</td>
<td>A</td>
<td>$I_1, I_2, I_3, I_4$</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>14 MC</td>
<td>14 MC</td>
<td>Ant. (Brown)</td>
<td>B</td>
<td>$0_{A_6}$</td>
<td>Osc. Ant.</td>
<td>13 MC</td>
</tr>
<tr>
<td>KC</td>
<td>14 KC</td>
<td>14 KC</td>
<td>Ant. (Brown)</td>
<td></td>
<td>$0_{A_7}$</td>
<td>Osc. Ant.</td>
<td></td>
</tr>
</tbody>
</table>

A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 14 MC, then a weaker image will be heard at 13,070 KC, in other words 900 KC less on the dial.

The tubes are connected in series in the order shown by the schematic diagram.

The dual section filter condenser has a common negative, but note that it does not return to ground as the can is insulated from the chassis.

---

**TUBE**

<table>
<thead>
<tr>
<th>Function</th>
<th>Cathode SCR Grid Plate</th>
<th>Osc Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>12SK7</td>
<td>3.5 95</td>
<td>95</td>
</tr>
<tr>
<td>12SQ7</td>
<td>95</td>
<td>45</td>
</tr>
<tr>
<td>506GT</td>
<td>6 9 82</td>
<td></td>
</tr>
</tbody>
</table>

**SOCKET VOLTAGE READINGS:**

Voltage taken from ground with line voltage at = 117 V. AC.

High voltage reading off rectifier = 115 V.

Drop across speaker field = 20 V.

Voltage taken with 1,000 Ohm per volt meter, from cathode return to points as given.
Available at other voltages and frequencies.
The Howard Type 650 Pre-Amplifier is designed to be used with ANY RECEIVER and covers a frequency range of .55 mc. to 43 mc. The Pre-Amplifier is constructed for the use with an antenna having either single wire or doublet lead-in or the Howard Type 655 Loop Antenna Kit.
The use of the Loop Kit, Type 655, with this Pre-Amplifier will be indispensable in separating interfering signals and reducing certain noise conditions.
The Antenna-Loop Switch provides a convenient shift from either the loop or an external antenna system.
This unit is coupled to the back of the regular receiver without changing the receiver in any way.
The "IN-OUT" Switch allows the unit to be switched out of the input system allowing the regular antenna to be coupled directly to the receiver.

**TYPE 655 LOOP KIT**
The Kit consists of four separate loops having band coverage as follows:

<table>
<thead>
<tr>
<th>NO. OF LOOP</th>
<th>COVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L14</td>
<td>1700 KC to 550 KC</td>
</tr>
<tr>
<td>L13</td>
<td>5.6 MC to 1.7 MC</td>
</tr>
<tr>
<td>L12</td>
<td>9.5 MC to 5.6 MC</td>
</tr>
<tr>
<td>L11</td>
<td>54 MC to 22 MC</td>
</tr>
</tbody>
</table>

The Pre-Amplifier has a special switch position for the 30 MC LOOP (L11). When the switch is on this position, the Loop Trimmer is connected directly to the Loop, and the variable condenser disconnected from the Loop. This is done to secure a loop of more effective height on the 30 MC BAND.

When using loops covering the three lower frequency ranges and with switch at Loop, the Loop Trimmer is used to bring the Loop into exact resonance with the incoming signal to secure greater loop performance. The High Frequency end range of the three lower frequency loops can be extended by having loop switch on 30 MC LOOP. In this position the Loop Trimmer will cover the following ranges:

- L11 1400-1900 KC
- L13 4.4-6 MC
- L12 3.5-22 MC
DUE TO THE CRITICAL ADJUSTMENTS THAT ARE REQUIRED WITH THE FREQUENCY MONITOR, MODEL 660, WE DO NOT ADVISE THAT ANY ATTEMPT BE MADE TO CALIBRATE THIS UNIT; WE THEREFORE SUGGEST IF IT HAS BEEN DETERMINED THAT THE UNIT IS OFF CALIBRATION, IT SHOULD BE SENT BACK TO THE FACTORY FOR A RECALIBRATION.

The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 100 to 10,000 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R. F. Output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 80 and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.
ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band Switch Position</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-22</td>
<td>18</td>
<td>16 MC</td>
<td>Ant. Lead</td>
<td>0, 5</td>
<td>Osc., Ant.</td>
<td></td>
</tr>
<tr>
<td>2.2-7</td>
<td>6.5</td>
<td>6.5 MC</td>
<td>Ant. Lead</td>
<td>0, 4, 5</td>
<td>Osc., Ant.</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>1400</td>
<td>1400 MC</td>
<td>Ant. Lead</td>
<td>0, 1</td>
<td>Osc., RF</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>600</td>
<td>600 KC</td>
<td>Ant. Lead</td>
<td>P₁, P₂</td>
<td>Osc., Pad.</td>
<td></td>
</tr>
</tbody>
</table>

Voltage taken from ground with line voltage at - 115 V.Ac.
High voltage reading off rectifier - 320 V.
Drop across speaker field - 100 V.
Voltage taken with 1,000 Ohm per volt meter.
Tune set off station.

Voltage taken from ground with line voltage at - 115 V.Ac.
High voltage reading off rectifier - 320 V.
Drop across speaker field - 100 V.
Voltage taken with 1,000 Ohm per volt meter.
Tune set off station.

TUBE | FUNCTION | CATHODE | SCR.GRID | PLATE | OSC. PLATE |
-----|----------|---------|----------|-------|------------|
6GF7 | RF       | 75 - 100| 212      |       |            |
68A7 | Converter| 75 - 100| 215      | 75-100|            |
6SK7 | I.F. Amp.| 75 - 100| 150      |       |            |
6SK7 | I.F. Amp.| 75 - 100| 206      |       |            |
6H6  | Det.     |         |          |       |            |
6SF5 | Audio    |         | 25       |       |            |

TUBE | FUNCTION | CATHODE | SCR.GRID | PLATE |
-----|----------|---------|----------|-------|
6GF5 | Base Amp.|         |          | 112   |
6J5GT| Inverter | 6.5     |          | 130   |
6V6GT| Output   | 13      | 220      | 206   |
6V6GT| Output   | 12      | 220      | 210   |
6Y33  | Rectifier|         |          |       |
6U5   | Tuning Eye|        |          |       |
AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS
OF THE LOW FREQUENCY BANDS ARE SHORTED OUT
I.F. 485 K.C.

FOR OTHER DATA, SEE INDEX

AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS
OF THE LOWER FREQUENCY BANDS ARE SHORTED OUT
I.F. 485 K.C.
**Wave-Band Switch Position**

<table>
<thead>
<tr>
<th>Wave-Band Switch Position</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>Max. Cap.</td>
<td>465 Kc</td>
<td>Converter Grid</td>
<td>A, D</td>
<td>I₁, I₂, I₃, I₄</td>
<td>IF</td>
</tr>
<tr>
<td>7-22 Mc</td>
<td>21</td>
<td>21 Mc</td>
<td>Ant. (Brown)</td>
<td>B</td>
<td>O₅, A₆</td>
<td>Osc., Ant.</td>
</tr>
<tr>
<td>2.2-7 Mc</td>
<td>6</td>
<td>6 Mc</td>
<td>*</td>
<td></td>
<td>O₇, A₈</td>
<td>Osc., Ant.</td>
</tr>
<tr>
<td>2.2-7 Mc</td>
<td>2.2</td>
<td>2.2 Mc</td>
<td>*</td>
<td></td>
<td>P₉</td>
<td>Osc. Pad.</td>
</tr>
<tr>
<td>Broadcast</td>
<td>1400</td>
<td>1400 Mc</td>
<td>*</td>
<td></td>
<td>O₁₀, A₁₁</td>
<td>Osc., Ant.</td>
</tr>
<tr>
<td>Broadcast</td>
<td>600</td>
<td>600 Mc</td>
<td>*</td>
<td></td>
<td>P₁₂</td>
<td>Osc. Pad.</td>
</tr>
</tbody>
</table>

**A**—Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reach through the two holes on the top of each I.F. can.

**B**—When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 21 Mc, then a weaker image will be heard at 21,000 Kc less 850 Kc, or about 20,150 Kc on the dial.

**C**—When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.

**D**—See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

Voltage taken from ground with line voltage at - 120 V.
High voltage reading off rectifier - 320 V.
Drop across speaker field - 58 V.
Voltage taken with 1,000 Ohm per volt meter.
Band Switch in 80 position except R.F. Stage measurements.

**Socket Voltage Readings**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Cathode</th>
<th>Grid</th>
<th>Plate</th>
<th>Grid</th>
<th>Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7</td>
<td>R.F. SM</td>
<td>8.5</td>
<td>2.5</td>
<td>96</td>
<td>96</td>
<td>210</td>
</tr>
<tr>
<td>6SA7</td>
<td>Mix.</td>
<td>110</td>
<td>266</td>
<td>110</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F. Amp.</td>
<td>2</td>
<td>110</td>
<td>230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F. Amp.</td>
<td>4</td>
<td>110</td>
<td>230</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Cathode</th>
<th>Grid</th>
<th>Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>88Q7</td>
<td>Diode-AVC</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6V607T</td>
<td>Output</td>
<td>12.5</td>
<td>265</td>
<td>250</td>
</tr>
<tr>
<td>80</td>
<td>Rest.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>085</td>
<td>Tuning Eye</td>
<td>206</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This sheet is a part of Form 76-490, 76-490, or 77-490 for International Models 790, 795, 780, etc.

The below layout shows the order of the drive cord for the tuning and Band Spread mechanisms should any servicing or replacement be necessary.

The below diagrams are the trimmer location layout for the International Series, such as the Model 790.

---

**TUBE FUNCTION**

| TUBE  | CATHODE | BNC. || PLATE |
|-------|---------|------|-------|
| 6AJ7 | R.F. | 3.5 | 36 | 328 |
| 6AL7 | N.S. | 5 | 36 | 330 |
| 6AL7 | N.S. | 3 | 36 | 330 |
| 6AQ7 | I.P.G. | 3 | 36 | 321 |
| 6AQ7 | I.P.G. | 3 | 36 | 221 |

**SHEET VOLTAGES**

<table>
<thead>
<tr>
<th>Model 780</th>
<th>6 V.</th>
<th>81 V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AJ7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>6AL7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>6AQ7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**TUBE TRIMMER ADJUSTMENTS**

<table>
<thead>
<tr>
<th>Wave Band/Stock Position</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Generator Direction</th>
<th>See Note</th>
<th>Primary Action (In order shown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>1400 DC</td>
<td>1600 DC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MODEL 790 ALTIMETER PROCEDURE**

- The sheet layout is a part of Form 76-490, 76-490, or 77-490 for International Models 790, 795, 780, etc.
- The below layout shows the order of the drive cord for the tuning and Band Spread mechanisms should any servicing or replacement be necessary.
- The below diagrams are the trimmer location layout for the International Series, such as the Model 790.

---

**TUBE FUNCTION**

| TUBE  | CATHODE | BNC. || PLATE |
|-------|---------|------|-------|
| 6AJ7 | R.F. | 3.5 | 36 | 328 |
| 6AL7 | N.S. | 5 | 36 | 330 |
| 6AL7 | N.S. | 3 | 36 | 330 |
| 6AQ7 | I.P.G. | 3 | 36 | 321 |
| 6AQ7 | I.P.G. | 3 | 36 | 221 |

**SHEET VOLTAGES**

<table>
<thead>
<tr>
<th>Model 790</th>
<th>6 V.</th>
<th>81 V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6AJ7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>6AL7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>6AQ7</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**TUBE TRIMMER ADJUSTMENTS**

<table>
<thead>
<tr>
<th>Wave Band/Stock Position</th>
<th>Position of Dial Pointer</th>
<th>Generator Frequency</th>
<th>Generator Direction</th>
<th>See Note</th>
<th>Primary Action (In order shown)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>1400 DC</td>
<td>1600 DC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MODEL 790 ALTIMETER PROCEDURE**

- The sheet layout is a part of Form 76-490, 76-490, or 77-490 for International Models 790, 795, 780, etc.
- The below layout shows the order of the drive cord for the tuning and Band Spread mechanisms should any servicing or replacement be necessary.
- The below diagrams are the trimmer location layout for the International Series, such as the Model 790.
ELECTRICAL SPECIFICATIONS

I.F. Frequency 455 K.C.
I.F. Sensitivity (from 6K8 Grid) = 50 Microvolts for ½ Watt Output
Power Output, Max. 5 Watts; Undistorted 2.3 Watts

SPEAKER

5-inch P. M. Dynamic
Voice Coil Impedance 3.5 Ohms at 400 cycles

TUNING RANGE

540 K.C. to 1580 K.C.

VOLTAGE READINGS

6 volts at the set
0Z4 cathode to chassis = 225 volts.
Output of filter = 205 volts (set B+).
0Z4 Rectifier
Plate to cathode of 6V6 output tube pins = 3(+) and 8(−) = 205 volts.
Cathode of 6V6 output (pin #8) to chassis 10 volts.
Screens of 6K7—6K8 (pin #4) to chassis 95 volts.
Screen of 6V6 to chassis (pin #4) 205 volts.

TO ALIGN I.F.

Attach signal generator “hot” lead to grid of 6K7 through a 1/10 MF condenser, connect ground side of generator to case. Set signal generator at 455 K.C., turn volume control to maximum, attach an output meter or resonance indicator, either the plate circuit of the 6V6 tube or across the voice coil terminals of the speaker. Adjust 2nd I.F. transformer for maximum output. Shift hot generator lead to 6K8 grid and adjust 1st I.F. transformer for maximum output. Recheck 2nd I.F. adjustment, with generator connected to 6K8 grid. Do not use greater generator signal than is necessary to obtain good output meter reading. For location of 1st and 2nd I.F. transformers, see tube layout diagram. I.F. sensitivity = approximately 60 microvolts for ½ watt output, measured from 6K8 grid.

TO ALIGN R.F.

Use standard cowling antenna cable to connect signal generator to set. Connect a 35 microfarad condenser to the signal generator “hot” terminal and the other side of the condenser to the antenna cable. Connect the ground side of the signal generator to the shield side of the cable. Turn variable condenser to zero capacity. Set signal generator to 1580 K.C. Adjust trimmer on oscillator section (front section of condenser) until signal is heard. Tune set to approximately 1400 K.C., set signal generator to this frequency, and adjust antenna compensator for maximum output. R.F. sensitivity 6 microvolts at 1400 K.C. and 10 microvolts at 600 K.C. for ½ watt output.

MODEL #160808 JA-40

Current Drain 5.25 Amps at 6.3 Volts 1940—Hudson

Fuse 14 Ampere

NOTE. Receivers with serial numbers above 14000 have a 1/10 MF condenser across vibrator points and a 200 ohm resistor in the cathode of the 6N6G7 tube.
ALIGNMENT PROCEDURE FOR MODEL JA-41 ONLY

IMPORTANT: The Simplified Alignment Procedure should always be used unless adjustments on the inner core have become too severe that it cannot be seen or heard under these conditions

Use the "General Alignment Procedure" only if the receiver is not performing at the time frequency and power after the Simplified Procedure has been completed. The General Alignment Procedure is also necessary if the receiver is not performing at the time frequency and power after the Simplified Procedure has been completed.

Simplified Alignment Procedure

1. Remove top covers of receiver, both speaker section and control cover.

2. Remove trimmer capacitors and maximum volume is obtained.

3. Calibrate dial as shown under "Dial Calibration" to give the correct output at the time frequency and power.

4. Trim the trimmer capacitors to maximum volume.

5. Trim again to give the correct frequency and maximum volume.

6. After the receiver has been calibrated in the receiver, turn the knob on the receiver to a frequency near the desired frequency. Adjust the trimmer capacitors to get the correct output. Turn the knob to a frequency near the desired frequency. Adjust the trimmer capacitors to get the correct output.

7. After the receiver has been calibrated in the receiver, turn the knob on the receiver to a frequency near the desired frequency. Adjust the trimmer capacitors to get the correct output. Turn the knob to a frequency near the desired frequency. Adjust the trimmer capacitors to get the correct output.
### Parts List

<table>
<thead>
<tr>
<th>Diagram Warner</th>
<th>Hudson</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BO-183847</td>
<td>Condenser—mica 360 mm/d.</td>
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<tr>
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<td>Condenser—mica 360 mm/d.</td>
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<tr>
<td>4</td>
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<td>9</td>
<td>BO-183919</td>
<td>Condenser—mica 360 mm/d.</td>
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</table>

### Diagram Warner

- **IF 455 KC**
- **(rect)**
- **VIBRATOR**
- **6X5GT**

### SOCKET Voltages

<table>
<thead>
<tr>
<th>Socket</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>6.3 V</td>
</tr>
<tr>
<td>6SK7</td>
<td>6.3 V</td>
</tr>
<tr>
<td>6SQ7</td>
<td>6.3 V</td>
</tr>
<tr>
<td>6V6GT</td>
<td>6.3 V</td>
</tr>
</tbody>
</table>

### IMPORTANT

- Use high resistance voltmeter of at least 1000 ohm per volt.
- The bias for the control grid of the 6V6GT tube is 12.5 volts measured across resistor No. 25.
CHASSIS WIRING DIAGRAM FOR MODEL DB-41

HOW TO SET UP PUSH BUTTONS ON MODELS SA-41 AND DB-41

1. Operate set for 10 minutes before set-up.
2. TO UNLOCK MECHANISM
   a) Turn tuning control downward until dial pointer is at "SET".
   b) Move black set up switch to right.
   c) Push up locking knob and turn clockwise approximately 2 turns, or until slight resistance is felt. Pull locking knob down to disengage.
3. Push in selected button as far as it will go and leave manually in neutral position, while holding button m.
4. Follow same procedure for other buttons. After setting any button, do not touch it again until next change is to be made.
5. TO LOCK MECHANISM
   a) Move locking control downward until dial pointer is at "OFF".
   b) Push up locking knob and turn counterclockwise as far as possible by hand. Pull locking knob down to disengage.

MODEL SA-41 TUBE LOCATIONS

Terminals of code shown in the circuit diagrams on the adjacent pages are lettered to correspond to similarly lettered terminals on the chassis wiring diagrams and coil illustrations shown on the page. Terminals which are connected together carry the same letter.
1—Type 12SK7 R. F. Amplifier.
1—Type 12SA7 Mixer, First Detector-oscillator.
1—Type 12SQ7 Second Detector, A.V.C. and First Audio.
1—Type 35L6GT Beam Output Amplifier.
1—Type 35Z5GT High Vacuum Rectifier.

ALIGNMENT

Connect B- of radio chassis to ground post of signal generator through .1 mF condenser.

I.F. peak 455 Kc. I.F. alignment conventional—see Vol. VIII.

SPECIAL NOTE:
Trim oscillator at 1650 Kc.
Trim antenna at 1400 Kc. (May signal generator lead near, but not on, loop—when adjusting trimmer.)
Calibrating the Radio

To calibrate the radio, tune in a station of known frequency. Remove the dial lamp assembly from the back of the control unit. The calibration screw is at the bottom of the dial lamp tube. Hold the tuning knob. Insert a fine bladed screwdriver and turn this screw until the pointer is at the frequency of the station being received.

A short insulated screwdriver will be helpful.

ALIGNMENT PROCEDURE

Remove Grille, Speaker, Trimmer Caps and Rear Cover From Chassis Case—(See Figs. 3 and 5).

Volume Control—Maximum All Adjustments.

Local-Distance Switch—"Distance" Position.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>IRON CORE SETTING</th>
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</thead>
<tbody>
<tr>
<td>Control Grid</td>
<td>456 KC</td>
<td>.05 mfd.</td>
<td>1st L.F. (C11) &amp; (C12)</td>
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<tr>
<td>(pin No. 8)</td>
<td>564 KC</td>
<td>1st Del. Tube</td>
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<table>
<thead>
<tr>
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<th>FREQUENCY CONNECTION</th>
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<th>EXTREME POSITION</th>
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<tbody>
<tr>
<td>1540 KC</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td>out of Coil</td>
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<td>See Note A</td>
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<table>
<thead>
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<th>FREQUENCY CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>EXTREME POSITION</th>
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<tbody>
<tr>
<td>1000 KC</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td>Tune to Max. Output with Tuning Knob</td>
</tr>
<tr>
<td>See Note A</td>
<td>See Note A</td>
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<table>
<thead>
<tr>
<th>OSCILLATOR</th>
<th>FREQUENCY CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>EXTREME POSITION</th>
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</thead>
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<tr>
<td>1000 KC</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td>int. (C6)</td>
</tr>
<tr>
<td>See Note A</td>
<td>See Note A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjust Trimmers to Maximum (See Figs. 3 and 5).

Allow Chassis and Signal Generator to "Heat Up" for Several minutes.

The following equipment is required for aligning:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—.05 mfd., See Note A.

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1000 KC—Readjust Antenna Trimmer C4 for maximum output.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mfd. If the cable, for example, has a capacity of 30 mfd., use a 30 mfd. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Hold the tuning knob. Insert a fine bladed screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.
CHASSIS CR-152
CR-161

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

NOTE
MEASURE HEATER AND FILAMENT VOLTAGES DIRECTLY ACROSS SOCKET TERMINALS

ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINALS TO GROUND WITH A 1000 OHM/VOLT VOM WITH BAND-SWITCH IN BROADCAST POSITION A (H) HEATERS 6.3 VOLS A.C.
MEASURE QTH NODES ON 50V SCALE
ALL OTHERS ON 600V SCALE. LINE VOLTAGE 117V A.C.

IF - 455K
BAND SWITCH SHOWN IN COUNTER-CI
(SHORT WAVE BAND) VIEWED

CR-152 -- Used in Belvede

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E MAGNAVOX CO. INC.

15-40

POSITION INT.

 kombination.
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOLUME VIII.
BE SURE THAT THE BAND EXPANDER SWITCH IS SET IN "SHARP-TUNE" POSITION WHEN ALIGNING THE SST. THIS IS DONE BY ROTATING THE TREBLE CONTROL TO THE LEFT AS FAR AS POSSIBLE.

SPECIFICATIONS
Primary voltage..................127 V. AC; Intermediate frequency...............465 Kc;
Power consumption...............150 watts; Tuning frequency range: 585 - 1720 Kc;
Speaker (12C131)...................8.6 - 10.4 kW;
Field Coil.........................880 ohms; Circuit: Superheterodyne with three tuning
Transformer.......................TONE ranges, treble and bass controls, I.F. band
expansion, amplified a/f, inverse feedback
Speaker (20E8)......................Field Coil.........................880 ohms; circuit, bass compensation in volume control
Transformer.......................TONE ranges, for phonograph pickup, push button condenser-
(For dual speakers)
type tuner temperature stabilized.
CR-156 -- Used in Regency Commode Combination
Used in Contemporary Combination
Used in Georgian Combination
Used in Hepplewhite Combination
Used in Chairside Combination
Contemporary Combination
Georgian Combination
Hepplwhite Combination
Chairsid Combination
KC.

Drawn in counter clockwise
Wave bands viewed from front.

12/15/40
Contemporary Combination
Georgian Combination
Hepplewhite Combination
Chairs ide Combination
KC.

DOWN IN COUNTER CLOCKWISE
WAVE BANDS VIEWED FROM FRONT.

12/18/40
1. Connect the "high" side of the generator output to the grid (G8) of the 6SA7 converter, and the "low" side of the generator to the ground of the chassis. The connection to the grid is most easily made by connecting to the output of a variable condenser in the tuning gang. The grid of the converter does not furnish enough signal, and it will be necessary to make this connection directly to the control grid of the 6SA7 tube and to disconnect the antenna coil from this grid. This point is indicated at "B" on the schematic diagram.

2. Connect a 2000 or 3000 microammeter in series with the "ground" and of the 100,000 ohm resistor (R6). This is point "B" on the diagram. Connect the positive terminal of the meter to ground. This will measure the grid current of the 6AK7 tube. A reading of 50 to 100 microammeters is all that should be expected at this point. If an Amperex or a D.C. electronic voltmeter is available, it can be connected directly across this 100,000 ohm resistor (R6) without disconnecting the resistor. This measures the limiter grid bias voltage. A reading of 5 to 10 volts should be considered normal.

3. Set the generator at 4350 kc, and align the I.F. trimmers for maximum grid current in the 6AK7 tube as indicated by the microammeter or voltmeter.

4. The I.F. stages are now aligned: Remove the microammeter and re-connect the 100,000 ohm resistor (R6) as it was before.

5. The discriminator will be adjusted next. Connect the microammeter in series with the "ground" and of the 100,000 ohm resistor (R6). This is indicated as point "X" on the diagram. The positive side of the meter is connected to ground. Instead of this, a high impedance electronic voltmeter, such as an Amperex or similar device, can be connected across this resistor. This measures the discriminator output current or voltage.

6. Adjust the test generator to 4375 kc. Adjust both trimmers on the discriminator transformer (T7) for a peak. Adjust the output of the generator so that the meter reads at least 50 microammeters or 10 volts. Readjust the oscillator to 4350 kc, adjus the trimmer nearest the S57 tube until the current or voltage is zero. A non-metallic screwdriver is essential; this is an extremely important operation. Reset the oscillator to 4375 kc, and note the meter reading.

Now reverse the meter connections so that the negative terminal is connected to ground. Set the generator to 4265 kc, and the meter reading should be within 1% of being the same. If not, the tuning of the discriminator transformer was not done carefully enough and must be repeated. This completes the adjustment of the discriminator. Re-connect the 100,000 ohm load resistor (R6) to restore the circuit to its original condition.

7. Re-connect the control grid of the 6SA7 to the mixer coil if this connection had been removed and disconnect the generator from this point.

8. The antenna, mixer, and oscillator coils are now ready to be aligned. Check to see that the dial pointer is at the end of the dial calibration (41.25 mc), when the tuning gang is fully meshed.

9. Prepare to measure the limiter grid current by again connecting the microammeter as described in paragraph 2.

10. If an extremely exact signal generator is available, it may be used for setting the oscillator to the dial calibration. The generator is connected to the antenna post through a 70 ohm resistor. Otherwise it will be neces
REPLACEMENT PARTS LIST

Schematic Location Part Number Condensers
C1, C2—C16, C17 Y-CT-24 Trimmer
C40, C15 Y-CV-33 Variable
C4, C11, C12 C-15754 .01 mfd. 400 V. Tubular
C10 C-49 .005 mfd. 400 V. Tubular
C13, C29 C-15756 .05 mfd. 400 V. Tubular

CONDENSERS
C-15752 .05 mfd. 200 V. Tubular
C9, C30 CM-31 100 mufd. 30% Mica
C14 CM-29 50 mufd. 30% Mica
C18 Y-CT-27 Padder Condenser
C20, C21, C22, C23, C24 Y-CT-31 Trimmer Strip
C25 CM-34 150 mufd. 5% Silvered Mica
C26 CM-33 250 mufd. 5% Silvered Mica
C27, C28 Y-CE-43 Electrolytic Condenser
C31 C-18 .01 mfd. 400 V. Tubular
C32, C33 CM-30 250 mufd. 50% Mica
C39 CM-9 5500 mufd. 5% Mica

RESISTORS
R1 R-15601 100 ohm ¼ W 20% Carbon
R2 R-54 50K ohm ¼ W 20% Carbon
R3 R-15541 5K ohm ¼ W 20% Carbon
R4 R-15544 15K ohm 1 W 20% Carbon
R5 R-15500 2 megohm ¼ W 20% Carbon
R6 R-VC-33 Volume Control
R7, R9 R-15517 1 megohm ¼ W 20% Carbon
R8, R12 R-15512 250K ohm ¼ W 20% Carbon
R10, R11 R-87 70 ohm ¼ W 20% Carbon

CONTROLS
R13 Y-VC-33 Tone Control
S1 Y-SW-25 2 pos. band switch
S2 Y-SW-19 6 button Switch
PRE-SETTING OF PUSH BUTTONS

The push-buttons may be easily set to receive any five stations desired provided that three of them lie between 540 and 1100 KC, one of them between 800 and 1250 KC, and one of them between 1200 and 1600 KC. Note on the diagram that push button number 1 covers the range 1200-1600 KC. If the station selected lies between those frequencies then push the button in as far as possible and with a small screwdriver adjust the screw from the back of the receiver that corresponds to that button until the station desired can be heard as loudly as possible. Complete the adjustment by adjusting the corresponding trimmer from the top of the chassis until maximum volume again results. In making these adjustments, it is desirable to keep the volume control turned down to low volume. By pressing button number 2, the corresponding coil adjusting screw and trimmer condenser may be adjusted to the next station and the same process repeated for the balance of the buttons.

Resistor

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Condensers</th>
<th>Value</th>
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<tbody>
<tr>
<td>R2</td>
<td>100 ohm 1/4 W 20% Carbon</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>50K ohm 1/4 W 20% Carbon</td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>5K ohm 1/4 W 20% Carbon</td>
<td></td>
</tr>
<tr>
<td>R5, R16</td>
<td>15K ohm 1 W 20% Carbon</td>
<td></td>
</tr>
<tr>
<td>R6, R10</td>
<td>2 megohm 1/2 W 20% Carbon</td>
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Volume and Tone Controls

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<th>Condensers</th>
<th>Value</th>
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<td>R7, R9</td>
<td>1 megohm 1/2 W 20% Carbon</td>
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<tr>
<td>R8, R15, R17</td>
<td>250K ohm 1/2 W 20% Carbon</td>
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<tr>
<td>H11, H12</td>
<td>70 ohm 1/2 W 20% Carbon</td>
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Description

<table>
<thead>
<tr>
<th>Part No.</th>
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<tbody>
<tr>
<td>Y-CS-100</td>
<td>Loop Antenna</td>
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<tr>
<td>Y-CS-96</td>
<td>Short Wave Antenna Coil</td>
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<tr>
<td>Y-CS-71</td>
<td>Oscillator Coil</td>
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<tr>
<td>Y-CI-43</td>
<td>1st I.F. Transformer</td>
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<tr>
<td>Y-CI-44</td>
<td>2nd I.F. Transformer</td>
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<tr>
<td>LB-G-11W</td>
<td>Lights for Phono Compartment</td>
</tr>
</tbody>
</table>
CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

The tuning range is 540-1800 Kilocycles.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

The battery packs recommended to be used:
Burgess No. 17G580 or equivalent
Eccrady No. 748 or equivalent
Ray-O-Vac No. 4B8-2 or equivalent

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION
VOLUME VIII

The tubes used are:
1-6A7 Frequency converter
1-806 Intermediate frequency amplifier
1-76 2nd detector, AVO and audio driver
1-41 Output
1-60 Rectifier

This is a five (3) tube Alternating Current (AC) receiver. This set operates on 110-115 Volts 60 Cycles current. The tuning range is from 540 to 1750 Kilocycles. This includes standard broadcast and most city police stations. This set is equipped with automatic volume control and a Majestic Hi-Q Loop Antenna shielded by a Faraday screen.
The frequency coverage is from 540 to 1650 kilocycles, i.e. from 555 to 182 meters. This includes the standard broadcast band and some police calls.

The tubes used are:

1—1A7GT  
2—1A5GT  
3—1H5GT  
4—1DB6GT  
5—707GT  

Output and Rectifier Tubes Used on Line Operation Only.

The receiver is equipped with three push buttons. The first from the right is for line operation. The middle push button is for battery operation. The left hand push button is to turn the set off.
CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOLUME VIII.

The tubes used are:
- 1-6A7 First detector
- 1-76 Oscillator
- 1-6D6 I.F. Amplifier
- 1-75 Second detector, automatic volume control and first audio amplifier
- 1-41 Output
- 1-80 Rectifier

STATION INDICATORS
Setting Up Of Buttons see Index

CHASSIS LAYOUT
## ALIGNMENT PROCEDURE

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency</th>
<th>Antenna</th>
<th>Connection to Radio</th>
<th>Assignments</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer Capacitor Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
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<tbody>
<tr>
<td>I.F.</td>
<td>46 Mc</td>
<td>1 MHz</td>
<td>Grid of 56.3</td>
<td>Broadcast</td>
<td>Low trap, Front panel</td>
<td>See Fig. 1</td>
<td>Low trap, Front panel</td>
<td>Low trap, Front panel</td>
<td>Low trap, Front panel</td>
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<tr>
<td></td>
<td>46 Mc</td>
<td>1 MHz</td>
<td>Grid of 56.3</td>
<td>Broadcast</td>
<td>Low trap, Front panel</td>
<td>Low trap, Front panel</td>
<td>Low trap, Front panel</td>
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### SHORT WAVE BAND

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<thead>
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<th>3 Mc</th>
<th>30 Mc</th>
<th>Antenna lead</th>
<th>Low trap</th>
<th>At % Mc</th>
<th>Low trap, Front panel</th>
<th>Low trap, Front panel</th>
<th>Low trap, Front panel</th>
<th>Low trap, Front panel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 Mc</td>
<td>3 Mc</td>
<td>Front panel</td>
<td>Low trap</td>
<td>At % Mc</td>
<td>Low trap, Front panel</td>
<td>Low trap, Front panel</td>
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### MEDIUM WAVE BAND

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<tr>
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<th>4 Mc</th>
<th>3 Mc</th>
<th>Antenna lead</th>
<th>Medium Wave</th>
<th>Set dial</th>
<th>Medium wave, Medium wave</th>
<th>Medium wave, Medium wave</th>
<th>Medium wave, Medium wave</th>
<th>Medium wave, Medium wave</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 Mc</td>
<td>4 Mc</td>
<td>Antenna lead</td>
<td>Medium Wave</td>
<td>Set dial</td>
<td>Medium wave, Medium wave</td>
<td>Medium wave, Medium wave</td>
<td>Medium wave, Medium wave</td>
<td></td>
</tr>
</tbody>
</table>

### BROADCAST BAND

<table>
<thead>
<tr>
<th></th>
<th>3 Mc</th>
<th>10 Mc</th>
<th>Antenna lead</th>
<th>Broadcast</th>
<th>Set dial</th>
<th>Broadcast, Broadcast</th>
<th>Broadcast, Broadcast</th>
<th>Broadcast, Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 Mc</td>
<td>3 Mc</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set dial</td>
<td>Broadcast, Broadcast</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TEST FREQUENCY USED

- **I.F.**
  - 46 Mc: 490 Hz
  - 46 Mc: 490 Hz

- **Short Wave**
  - 3 Mc: 300 Hz
  - 30 Mc: 300 Hz

- **Medium Wave**
  - 4 Mc: 400 Hz
  - 3 Mc: 300 Hz

- **Broadcast**
  - 3 Mc: 250 Hz
  - 10 Mc: 100 Hz

**Power Consumption: 5 Watts at 117 Volts**

**Power Output:** 15 Watts Unadjusted, 3 Watts Maximum

---

### Setting the Station Buttons

**Setting a Station Button**

Turn the manual tuning knob so that the dial pointer moves toward 1550 KC until the station is reached. At the top of the escutcheon (from the front) will be seen a set button which rotates a hole in the escutcheon. Set the pointer at this point. Do not jar the tuning knobs while the mechanism is unlocked.

Select the first station from the list you have prepared, and carefully tune in this station by rotating the manual tuning knob until the signal is clearest and strongest.

With one hand, hold the manual tuning knob to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way in. It is better to start with the top button. Hold this button all the way in. With the other hand, see whether or not this station is still accurately tuned in by turning the tuning knob a slight amount back and forth. Be sure to hold the button all the way in.

Release the button slowly after the station is tuned in.

**CAUTION—Do not touch this button again while the mechanism is unlocked as the setting may be altered.**

Carefully tune in the second station on your list. Then hold the step tuning knob and push the second button slowly and firmly all the way in. Check for correct tuning. Proceed in the same manner to set any additional stations on your list in the same manner. After all the stations are set, it will be necessary to lock the mechanism so that the settings will not change. Turn the manual tuning knob so that the dial pointer moves toward 1550 KC until the stop is reached. Then, with a small, HANDELWELD screwdriver, turn the locking screw in a clockwise direction until it is tight. Tighten the locking screw firmly but not excessively to avoid stripping the threads. Replace the cap over the hole.

Remove the correct station call letter from the list supplied by bending the sheet back and forth at the score mark until the tab can be broken off. Press the tab all the way to the bottom of the space provided in the button. Cover the call letter tab with a celluloid tab, pressing this in until it snaps into place.

If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one station will not affect the setting of any of the other buttons.
DRIVE CORD REPLACEMENT

To a knot with a small loop at each end of new drive cord. The distance between knots should be 3/16 inches. Turn gang condenser to full open position—see illustration.

Thread one end of drive cord down through hole in groove of drive pulley. Pass loop on hook on pulley. Wind other end of cord 1/4 turn counterclockwise (from pulley side of sheet) around drive pulley. Wind cord under lettered A. Wind 3 turns clockwise (from front of sheet) around tuning control shaft. Turn should project away from sheet.

Continuous cord over other studs B and C as shown. Then wind cord 1/2 turn counter-clockwise (from drive pulley side of sheet) around drive pulley. This turn should be on left side (from rear of sheet) of pulley groove. Passed cord through hole in drive pulley. Heat loop on tension spring. Fasten other end of spring to hook on pulley.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Intermediate Frequency</th>
<th>456 KC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker</td>
<td>5 F.M. Dynamic</td>
</tr>
<tr>
<td>Tuning Frequency Range</td>
<td>500 to 1000 KC</td>
</tr>
<tr>
<td>Sensitivity (For 25 Watt Output)</td>
<td>250 Milliwatts Maximum</td>
</tr>
<tr>
<td>External Antenna</td>
<td>60 Microvolts Average</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:

- Dummy Antenna—1 mfl & 100 mmd.

NOTE A—Assembly sheet in cabinet. Replace back on sub趁 you. Connect second post of signal generator to external ground clip on set.

NOTE B—if the pointer is not at 400 KC on the dial, remove pointer from drive cord. Turn in a 400 KC mark. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.
### Models No. 04BR-511A and 04BR-512A ALIGNMENT PROCEDURE

**IMPORTANT:** See Aligning Instructions

- 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 Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Functions</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top of output I. F. can</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top of input I. F. can</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1720 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Metal Antenna Backplate</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C7) (See bottom of chassis view)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1720 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Outside Antenna Clip</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C8) (See bottom of chassis view)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1720 Kc.</td>
<td>.20 MFD.</td>
<td>Connect to Outside Antenna Clip</td>
<td>Turn Dial to 1600 Kc.</td>
<td>Adjust position of antenna coil (See coil assembly view)</td>
<td>Antenna Coil Adjustment</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1720 Kc.</td>
<td>.20 MFD.</td>
<td>Connect to Outside Antenna Clip</td>
<td>Turn Dial to 1200 Kc.</td>
<td>Adjust trimmer (C3) (See bottom of chassis view)</td>
<td>Antenna</td>
<td>Check for tracking</td>
</tr>
</tbody>
</table>

**NOTE "A"**—The antenna coil assembly is made so that it is movable. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

**NOTE "B"**—After the antenna coil has been tracked at 1400 Kc. it is necessary to check the trimmer coil (C8) adjustment again at 1200 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1400 Kc. Those two adjustments should be tried several times until no change of trimmer adjustment is required at 1200 Kc.

---

### Model No. 04BR-570A

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator.
- 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 Frequency Setting</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>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SG I. F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of output I. F. can</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SGI (Plates out of mesh)</td>
<td>Two trimmers on top of input I. F. can</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1650 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SGI (Plates out of mesh)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of gang (See top view)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1400 Kc.</td>
<td>(See Note &quot;A&quot;)</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer—Top of gang (See top view)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE "A"**—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, keeping the energy in the loop antenna without any electrical connection from the signal generator.

---

Loop aerial should be connected when aligning receiver and should be the same distance from the chassis as when mounted in the cabinet.
RESISTORS

<table>
<thead>
<tr>
<th>Diagram Part</th>
<th>Ref. No.</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>BE100114</td>
<td>2200 ohm—5 w.</td>
</tr>
<tr>
<td>R2</td>
<td>BE10094</td>
<td>50M ohm—55 w.</td>
</tr>
<tr>
<td>R3</td>
<td>BE10090</td>
<td>200M ohm—55 w.</td>
</tr>
<tr>
<td>R4</td>
<td>BE10015</td>
<td>75 ohm—15 w.</td>
</tr>
<tr>
<td>R5</td>
<td>BE10003</td>
<td>40 ohm—5 w.</td>
</tr>
<tr>
<td>R6</td>
<td>BE1004</td>
<td>3 megohm—55 w.</td>
</tr>
<tr>
<td>R7</td>
<td>BE10011</td>
<td>25M ohm—55 w.</td>
</tr>
<tr>
<td>R8</td>
<td>BE10015</td>
<td>25 ohm—55 w.</td>
</tr>
<tr>
<td>R9</td>
<td>BE10110</td>
<td>1 megohm volume control</td>
</tr>
<tr>
<td>R10</td>
<td>BE10257</td>
<td>5 megohm—55 w.</td>
</tr>
<tr>
<td>R11</td>
<td>BE10020</td>
<td>500M ohm—55 w.</td>
</tr>
<tr>
<td>R12</td>
<td>BE10100</td>
<td>500M ohm—55 w.</td>
</tr>
<tr>
<td>R13</td>
<td>BE10166</td>
<td>120 ohm—55 w.</td>
</tr>
<tr>
<td>R14</td>
<td>BE10087</td>
<td>1200 ohm—1 w.</td>
</tr>
</tbody>
</table>

CONDENSERS

<table>
<thead>
<tr>
<th>C-</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.001 x 400 v.</td>
</tr>
<tr>
<td>C2</td>
<td>.015 x 400 v.</td>
</tr>
<tr>
<td>C3</td>
<td>.05 x 400 v.</td>
</tr>
<tr>
<td>C4</td>
<td>.05 x 400 v.</td>
</tr>
<tr>
<td>C5</td>
<td>25 mfd. mica</td>
</tr>
<tr>
<td>C6</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C7</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C8</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C9</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C10</td>
<td>40 mfd. mica</td>
</tr>
<tr>
<td>C11</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C12</td>
<td>30 mfd. mica</td>
</tr>
<tr>
<td>C13</td>
<td>10 mfd. mica</td>
</tr>
<tr>
<td>C14</td>
<td>10 mfd. mica</td>
</tr>
<tr>
<td>C15</td>
<td>10 mfd. mica</td>
</tr>
<tr>
<td>C16</td>
<td>10 mfd. mica</td>
</tr>
</tbody>
</table>

POWER CONSUMPTION

- 35 watts

Sensitivity for 50 Milliwatt Output:

800 Milliwatts Undistorted

SELECTIVITY

- 65 KC Broad at 1000 Times Signal at 1000 KC

Loop aerial should be connected when aligning receiver.

NOTE "A"—Mount the chassis and the loop antenna in the cabinet, connect the loop antenna to the chassis. Adjust the antenna trimmer through hole in bottom of cabinet. See Fig. 2-10.

NOTE "B"—Lay the output lead from the signal generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the signal generator.

PARTS

- T1 BE11182 Loop antenna—complete assembly
- T2 BE11045 Oscillator coil
- T3 BE10140I Input I. F.—455 kc.
- T4 BE10141D Output I. F.—455 kc.
- T5 BE10154 Output Transformer
- T6 BE11401 5" P. M. Speaker
- L1 BE12211 Loading coil
- S1 On-off switch on volume control
- P1 BE10249 Pilot light bulb T47

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTAGE METER,內部 REMAIN C. C. AT A MINIMUM. 125 VOLTS A. C. MEASURED ACROSS C. C. TO GROUND 30 VOLTS A. C. MEASURED ACROSS C. C. TO GROUND 90 VOLTS A. C. MEASURED ACROSS C. C. TO GROUND 440 VOLTS A. C. MEASURED ACROSS C. C. TO GROUND (See Note "A" and "B")
REPLACING PUSH-BUTTONS

Should it ever be necessary to replace a broken or lost pushbutton you will notice they are made in two parts, a clear front and brown body. To separate the two portions first take off the escutcheon. Push the button in—Next push the brown body of the button back until it snaps free from the clear front. You can now lift the clear portion off and take out the brown body. To replace the pushbutton, reverse the procedure.

HOW TO REMOVE CHASSIS

Should it ever be necessary to take the chassis out of the cabinet be sure to pull the plug from the light socket. Next pull the control knobs off the shafts and take the escutcheon off.

Turn the spring clips clear of the back and take the back off—be sure to disconnect the loop aerial and the speaker plug, also the plugs from the phono unit. Remove the chassis mounting screws and lift the chassis out.

SERVICE NOTES

Voltages taken from different points of circuit to chassis are measured with voltage control at minimum, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers shut 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.

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 voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet. Although the short wave bands on this radio are of the band spread type the Alignment Procedure is not difficult. However because each short wave scale covers only a small portion of the short wave spectrum you must do the work carefully and your oscillator must be accurate.

Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows:

First refer to the “Iron Core Adjustment View” now turn the tuning knob until the drive bar comes within 1/64 to 1/32 from the stops. (A piece of blotting paper is about the right thickness and will serve as a gauge). The clearance of the bar must be the same at both stops. If far off you can raise one drive screw gently and equalize them. Minor adjustments may be made with the drive bar adjustments.

Next rotate each iron core until the fine score marks are even with the edge of the coil forms.

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

MODELS 903A, 907A, 1106A, 1106A

PHONOGRAPH-TELEVISION AND FM. JACK

Should you wish to use an external phonograph it should be plugged into the phono jack shown in the top view—The on-off radio-phono knob on the front panel will then switch from radio to phono operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-television-FM in the top view will accommodate either the Phono or a television or FM converter.

MODELS 513A, 514A

SETTING THE AUTOMATIC PUSHBUTTONS

Make a list of your 5 favorite stations. Push out the call letters of these stations from the call letter sheets supplied. Insert a call letter in the front of each pushbutton.

Next pull one of the pushbuttons all the way out as far as it will come (pull with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place. (Push directly on front of button) Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock in place when setting up the station.

To change stations simply repeat the procedure above.
Model No. 04BR-515A

- Volume control—Maximum all adjustments.
- Connect B to 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.

**SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Core (Dialed 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>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Core All the way out (See Top View)</td>
<td>Two trimmers on top</td>
<td>Output</td>
<td>I. F. Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Core All the way out (See Top View)</td>
<td>Two trimmers on top</td>
<td>Input</td>
<td>I. F. Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Core All the way out (See Top View)</td>
<td>Trimmer (C)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Antenna Plate See Trimmer View</td>
<td>Iron Core All the way out (See Top View)</td>
<td>Trimmer (C)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Antenna Lead See Trimmer View</td>
<td>Turn Dial to 1600 Kc. (See Note “A”)</td>
<td>Adjust position of antenna coil right or left</td>
<td>Antenna Coil Adjustment</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>200 MFD.</td>
<td>Connect to Antenna Lead See Trimmer View</td>
<td>Turn Dial to 1580 Kc. (See Note “B”)</td>
<td>Adjust trimmer</td>
<td>Check for tracking</td>
<td>(See Note “B”)</td>
</tr>
</tbody>
</table>

**NOTE “A”**—The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by pivoting one edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

**NOTE “B”**—After the antenna coil has been tracked at 1600 Kc, it is necessary to check the antenna trimmer (C) adjustment again at 1500 Kc. If no appreciable change in trimmer adjustment is made the coil is in track. If the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1600 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required at 1600 Kc.

Model Nos. 04BR-679A

- 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.

**SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</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>455 Kc.</td>
<td>.5 MFD.</td>
<td>Grid of 5X7G L.F. Tube (Plates out of mesh)</td>
<td>Rotor full open</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Output</td>
<td>I. F. Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.5 MFD.</td>
<td>Grid of 6ASC (Plates out of mesh)</td>
<td>Rotor full open</td>
<td>Two trimmers on top (See Fig. 2)</td>
<td>Input</td>
<td>I. F. Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1550 Kc.</td>
<td>175 mmf.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of middle section of condenser</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>175 mmf.</td>
<td>Antenna lead</td>
<td>Set dial at 1600 Kc. (See Fig. 2)</td>
<td>Trimmers—Top of front and rear section of condenser</td>
<td>Antenna and R. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>175 mmf.</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc. (See Fig. 2)</td>
<td>B.C. Series Fad</td>
<td>Oscillator</td>
<td>Adjust to maximum track series dial. (See note “A”)</td>
</tr>
</tbody>
</table>

**NOTE “A”**—Turn the dial back and forth slightly (rack) and adjust trimmer until the peak of greatest intensity is obtained. Trimmed is located on top of chassis along side of gauge. Adjust the signal from the signal generator to prevent the leveling-off action of the AVC.

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 Mfd., and 200 Mfd.
FIG. 1—GENERAL INSTALLATION VIEW

RADIO LOCATION

Determine the most desirable mounting location. (See Fig. 1—General Installation View, page 2.)

In the majority of installations it will be found that the radio can be mounted under the dash panel directly to the left of the steering column.

BONDING

Cars with boosting 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. 5/8" copper braid will be necessary, SMALL DIAMETER WIRE WILL NOT DO. Bend flexible shaft leads, such as free wheeling, choke wires, etc., which pick up motor noise and reradiate it into the car. Free wheeling cables should be grounded at the point at which they go through the firewall of the car. In extreme cases it has been found necessary to ground the steering column.

GENERATOR INTERFERENCE

Remove the generator cutout mounting screw and fasten the condenser (100-81) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely.

Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

PROCEDURE FOR SETTING THE AUTOMATIC LEVERS

There are five levers on the dial by means of which five stations may be selected. (See "B" Fig. 2.)

Make a list of local stations you tune in regularly; any number up to and including five. 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 an opening is provided for inserting the call letter tabs. (See "A" Fig. 2.)

Insert the call letter tabs in the rectangular openings of 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. 1) the station you have assigned to 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 assigned to this lever. Release this lever.

Follow this procedure until you have selected all of your favorite stations.

Now rotate the tuning knob (No. 1) to the right (clockwise) as far as it will turn, and tighten the special locking screw ("C") located on left side of tuner dial assembly. (See Fig. 2.)

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: Locking 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 your favorite station is selected.

ADJUST ANTENNA TRIMMER

Tune in a weak signal at approximately 600 K.C. with volume control about three-fourths on. Adjust trimmer screw "X" until maximum output is obtained. (See Fig. 1, Adjustment "X" on right side of radio.)

L.F. ALIGNMENT (465 K.C.)

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 G5K7 I.F. tube.
2. Adjust trimmer condensers of output I.F. transformer No. 108121 to resonance with oscillator.
3. Move test oscillator connection to grid of G5A7 tube and adjust trimmer condensers of input I.F. transformer No. 108139 to resonance with oscillator. 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. (See Fig. 3—top view, page 3.)

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 the rear section of the two-gang condenser—see top view, Fig. 3.)
3. Shift test oscillator to 1400 K.C. and pick up signal by rotating condenser and adjust antenna trimmer (front section of ganging condenser) to resonance (see top view, Fig. 3.)
4. Re-set test oscillator to 600 K.C. and rotate variable condenser to 600 K.C. Adjust series pad in the antenna circuit for maximum gain. This pad is mounted on the side of the antenna can, adjustment "X".
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.
When the A Battery is fresh the economizer switch on the back of the chassis should be pushed to the right. After the radio has been in use several weeks and reception becomes weaker push the switch to the left, (the white dot will show). Leave in this position until new batteries are installed.

---

**Specifications**

- **Power Consumption**: "A" Battery 50 MA; "B" Battery 8 MA.
- **(On A.C. or D.C. 35 Watts)**
- **Power Output**: 100 Milliwatts, Undistorted
- **200 Milliwatts, Maximum**
- **Sensitivity (for .05 Watts)**: 50 Microvolts Average
- **Selectivity**: 52 Kc. Broad at 1000 Times Signal at 1000 Kc.
- **Tuning Range**: 540 to 1550 Kc.
- **Intermediate Frequency**: 465 Kc.
- **Speaker**: 5 in. P. M. Dynamic

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**Parts**

- **Conductors**
  - J1: BE101121 Loop Antenna
  - J2: BE101124 Oscillator Cond.
  - J3: BE101125 Power Control
  - J5: BE101129 Switch for output control
  - J6: BE101130 Cut-off switch in line cord
  - J7: BE101131 Pilot light TV

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**Circuit Diagram**

- **Ref. Part No.**
  - BE101101 115 V.A.C.
  - BE101102 115 V.A.C.
  - BE101103 115 V.A.C.
  - BE101104 115 V.A.C.
  - BE101105 115 V.A.C.

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**Resistors**

- **Ref. Part No.**
  - 2000 ohms 2 mfd.
  - 5000 ohms 2 mfd.
  - 10,000 ohms 2 mfd.
  - 1 megohm 2 mfd.
  - 10 megohms 2 mfd.
  - 10,000 megohms 2 mfd.
  - 100 megohms 2 mfd.
  - 1 Gohm 2 mfd.

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**Trimmers**

- **Ref. Part No.**
  - 1000 ohms 2 mfd.
  - 5000 ohms 2 mfd.
  - 10,000 ohms 2 mfd.
  - 100,000 ohms 2 mfd.
  - 1 mfd.
  - 10 mfd.
  - 100 mfd.

---

**Power Transformer**

- **Ref. Part No.**
  - 115 V.A.C.
  - 115 V.A.C.
  - 115 V.A.C.
  - 115 V.A.C.
MODEL 04WG-568

**Input Voltages and Currents**
- 4.5 Vdc—30 Amps Max.
- 12V Volt—30 Amps Max.

**Power Output**
- 12V Volt—22 Watts Max.
- 12V Volt—30 Watts Max.

**Selectivity**
- 30 Kc Baud at 1000 Times Signal

**Intermediate Frequency**
- 455 Kc

**Adjustment Procedure**

The following equipment is required for aligning:
- A/V Signal Generator which will provide an accurately calibrated signal at the frequencies as listed.
- Output Indicator Meter—Non-Metallic Screwdriver.
- Dummy Antennas—100 ft. 1000 ohms.

**IMPORTANT—Follow procedure in the order shown.**

**Signal Generator**

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SWITCH SETTINGS</th>
<th>SELECTOR</th>
<th>SWIVEL BEAM</th>
<th>ADJUSTMENTS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 Kc</td>
<td>Grid in RF Out</td>
<td>0, 1000</td>
<td>0, 1000</td>
<td>0, 1000</td>
</tr>
<tr>
<td>30 Kc Baud</td>
<td>Grid in RF Out</td>
<td>0, 1000</td>
<td>0, 1000</td>
<td>0, 1000</td>
</tr>
<tr>
<td>455 Kc</td>
<td>Antenna Clip</td>
<td>0, 1000</td>
<td>0, 1000</td>
<td>0, 1000</td>
</tr>
<tr>
<td>1000 Kc</td>
<td>Antenna Clip</td>
<td>0, 1000</td>
<td>0, 1000</td>
<td>0, 1000</td>
</tr>
<tr>
<td>2000 Kc</td>
<td>Antenna Clip</td>
<td>0, 1000</td>
<td>0, 1000</td>
<td>0, 1000</td>
</tr>
</tbody>
</table>

**Drive Cord Replacement**

Wind 3/4 turns clockwise (from back of chassis) around tuning control shaft. These turns should be 20 degrees.

**Drive Cord**

Turn up with a small loop at the end of the drive cord. The distance between the two should be 120 degrees.

Wind the cord one complete turn counter-clockwise (from back of chassis) around drive pulley. Then proceed over idler shafts A, B, & C as shown.

**Drive Cord Attachment**

- Top view of back cover.
- Front view of back cover.
- Bottom view of back cover.

**MONTGOMERY WARD & CO.**

MODEL 04WG-568

**Input Voltages and Currents**

- 50 Kc Baud at 1000 Times Signal

**Selectivity**

- 50 Kc Baud

**Power Output**

- 500 Watts—Total

**Selectivity**

- 50 KC Bandwidth

**Drive Cord**

- 3/4 turns clockwise (from back of chassis) around tuning control shaft.

**Drive Cord Attachment**

- Top view of back cover.
- Front view of back cover.
- Bottom view of back cover.

**MONTGOMERY WARD & CO.**
**CAUTION**

The metal chassis is connected to one side of the line through a 2 mm condenser. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, the condenser will not be connected across the line and there will be an increase in hum.

Therefore, in any service work on the chassis, keep it on a wooden or other insulated surface to avoid contacts with ground. The person working on the set should avoid getting in contact with any ground.

**ALIGNMENT PROCEDURE**

**MODEL 04WG-510 MODEL 04WG-511**

**Power Consumption**… 28 Watts

**Power Output**… 107 Watts

**Selectivity**… 7500 Kc Band of out 1000 Hz Signal

**Intermediate Frequency**… 465 Kc

**CAUTION**

The metal chassis is connected to one side of the line through a 2 mm condenser. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, the condenser will not be connected across the line and there will be an increase in hum.

**Specifications**

**MODEL 04WG-512**

**Power Consumption**… 28 Watts

**Power Output**… 107 Watts

**Selectivity**… 7500 Kc Band of out 1000 Hz Signal

**Intermediate Frequency**… 465 Kc

**CAUTION**

The metal chassis is connected to one side of the line through a 2 mm condenser. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, the condenser will not be connected across the line and there will be an increase in hum.
Procedure for Setting the Automatic Pushbuttons

There are six pushbuttons on the front of the radio by means of which six stations may be selected (see "A," Fig. 2).

1. Make a list of local stations you tune in regularly; any number up to and including six.

2. Punch out from the set of station call letter tabs supplied, the call letters of the stations you have selected.

3. On the front of each automatic tuner button an opening is provided for inserting the call letter tabs. (See "A," Fig. 2)

4. Insert the call letter tabs in the rectangular openings in each of the automatic push buttons. One of the small celluloid tabs supplied should be snapped into place over each of the station call letter tabs.

5. Press in ALL THE WAY any one of the automatic tuner pushbuttons. Holding it it FIRMLY, tune in by means of the tuning knob (No. 4) the station you have assigned to this pushbutton. Turn the tuning knob very slowly back and forth (while still holding button in downward position) until the signal is clearest. The station will then be accurately tuned in. Release the pushbutton.

6. Press in another automatic tuner pushbutton. Holding it in FIRMLY, carefully tune in the station assigned to this pushbutton. Release this pushbutton.

7. Follow this procedure until you have selected all of your favorite stations.

8. Now rotate the tuning knob to the right (clockwise) as far as it will turn, and with a coin (quarter), 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 turned until it is ABSOLUTELY TIGHT.

This screw will lock in place all the stations you have selected on the pushbuttons. (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 reset locking screw two or three 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 pushbuttons, it is due to the locking screw being too tight. Loosen the reset locking screw until the dial mechanism works freely with the tuner pushbutton pressed in.)

BE SURE TO RETIGHTEN THE RESET LOCK SCREW, otherwise the stations will not stay adjusted to the pushbuttons.

The automatic dial is now set up for quick tuning.
SETTING THE AUTOMATIC PUSHBUTTONS

Pry out the metal button in cabinet opposite pushbutton locking screw.

Press one of the buttons all the way down and hold it FIRMLY. Now tune in the station you want with the tuning knob. Tune back and forth until the station is clear, then release the button. NOTE: If the tuning knob turns quite hard when the button is held down firmly, loosen the pushbutton locking screw several turns with a screwdriver.

Continue, setting each of the remaining pushbuttons in the same way. Now turn the tuning knob all the way to the right and tighten the pushbutton locking screw. This screw prevents the pushbuttons from slipping off the stations you have set. To change stations loosen locking screw and pro-
OPERATING THE PHONOGRAPH

Turn recording switch to "Playback position.

OPERATING THE PHONOGRAPH RECORDER

Turn record onto record and control turntable and volume with the volume control knob.

HOW TO MAKE PERFECT RECORDINGS

Unplug the microphone and check to see that it is plugged into the chassis. The microphone must be connected to the chassis at all times.

Insert a playback needle on the playback arm.

Insert a special cutting styli (needle) in the outer arm. Handle this needle with care.

Do not place the needle in the right after each recording. It should be left there during the recording. It will go well and read your record.

CUTTING NEEDLE

The cutting styli is very sharp and must not be dropped on the record or allowed to rest on the turntable.

For best operation, the instrument should be turned off in the direction of the turntable. To check this, place it on the small level, if you have one, in the turntable. If you do not have a level, a marble will do. If the marble rolls off the turntable, it is low in the direction in which it rolls.

Put something under the needle until the machine is ready for use.

SHAVINGS

The cutting styli cuts out a fine shaving that is just a little thicker than a human hair. These shavings should not be allowed to gather under the cutting styli.

While cutting, brush the shavings from the back up of the record in toward the center piece, allowing them to collect there until the recording is completed.

DO NOT USE TOO MUCH VOLUME

The most frequent cause of poor recordings is too much volume or overloading. If some passages of your recording are smooth and clear without other noises, you are probably using too small volume. Overloading occurs more often on strong passages. The remedy is to lower the volume until the correct volume and balance are achieved.

CUTTING ARM ADJUSTMENTS

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks the adjustments may sometimes have to be altered.

With a blank record on the table, the tone arm adjustment under the cutter arm should be set to sit so that the bottom edge of the cutting arm is 1/4" from the top of the record flange.

SETUP FOR SIZE OF RECORD

The Changer plays up to fourteen (14) or sixteen (16) records on one loading. All records must be the same size for each session.

On each page, you will see recording areas. The position of these areas determines the size of record to be cut.

LOADING

On the left side of the machine, there is a selector arm of both rings, and one of which is set for the size of the ring (16 or 16) as described in the preceding paragraph. Place the rack of records on the flats of the ring (16 or 16) as set for the size of the record. The rings will rest on the selector arm and will be turned on the selector arm.

STARTING THE CHANGER

Turn on the radio or turn it on and set the record pitch and damping controls for the turntable. Then turn the motor on and set the record pitch and damping controls for the turntable. Then turn the record on and set the record pitch and damping controls for the turntable. Then turn the record on and set the record pitch and damping controls for the turntable. Then turn the record on and set the record pitch and damping controls for the turntable. Then turn the record on and set the record pitch and damping controls for the turntable.
### ALIGNMENT PROCEDURE

**Model No. 04BR-615A**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Toy View)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Toy View)</td>
<td>Input I.F.</td>
<td>Adjust to maximum output</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>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C5</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C3</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C3</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**Broadcast Band**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1080 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>535 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

**Loop Alignment**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C1</td>
<td>Broadcast oscillator (See Toy View)</td>
<td>Series Pad</td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C7</td>
<td>I.F. Core</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**Note: A**—The signal generator is connected to the “ANT.” and “GND.” leads when aligning the Short Wave Band and to the grid of the 657 tube and antenna terminal when setting the Broadcast Band oscillator and frequencies (17 and 14 Mc. C.).

**Note: B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the “ANT.” and “GND.” terminals.

**Model 04BR-675A and 04BR-676A**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Toy View)</td>
<td>Output I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Toy View)</td>
<td>Input I.F.</td>
<td>Adjust to maximum output</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>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C5</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C5</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**Broadcast Band**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1080 Kc.</td>
<td>.1 mmf.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to signal</td>
<td></td>
</tr>
<tr>
<td>535 Kc.</td>
<td>.1 mmf.</td>
<td>Grid of 657</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to signal</td>
<td></td>
</tr>
</tbody>
</table>

**Loop Alignment**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer(s) Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C7</td>
<td>Broadcast oscillator (See Toy View)</td>
<td>Series Pad</td>
</tr>
<tr>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>External</td>
<td>Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C7</td>
<td>I.F. Core</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**Note: A**—The signal generator is connected to the “ANT.” and “GND.” leads when aligning the Short Wave Band and to the grid of the 657 tube and antenna terminal when setting the Broadcast Band oscillator and frequencies (17 and 14 Mc. C.).

**Note: B**—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the “ANT.” and “GND.” terminals.

**Note: C**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

**Note: D**—After each band is completed, repeat the procedure as a final check.
PHONOGRAPh CONNECTIONS: Insert phono pickup cable into phono socket (top of chassis). An a-c phono motor socket can be used to operate the record player motor.

TELEVISION SOUND AND F.M. CONNECTIONS: Audio amplifier and speaker of the receiver used to reproduce television sound or FM programs. Connect television picture receiver and sound converter or FM converter to phone socket. Turn knob to phone position.
**SPECIFICATIONS—Model No. 048R-620A**

- **Power Consumption**: Radio Only - 70 Watts, Radio and Motor - 90 Watts
- **Output Power**: 3.1 Watts Unmodulated
- **Sensitivity for 500 Millivolt Input**: 15 Microvolts Average
- **Selectivity**: 5.1 KC at 1000 Times Signal at 1000 KC

**Alignment Procedure**

- **Volume control**: should be at maximum.
- **Connector**: should be connected to signal generator with a short heavy lead.
- **Antenna**: should be connected to the proper terminal, usually marked with an arrow.
- **Power cord**: should be plugged into power supply.
- **Antenna switch**: should be in the 'Antenna' position.

**Adjustments**

- **Output Level**: should be adjusted to provide the maximum output with the signal generator at 100 millivolts.
- **Intermediate Frequency**: should be adjusted to provide the maximum output with the signal generator at 100 millivolts.
- **Speaker**: should be adjusted to provide the maximum output with the signal generator at 100 millivolts.

**Drive Cord Replacement**

Turn gauge to allow for correct bearing and tension. Ensure that the drive cord is properly seated. Check that the drive cord is not frayed or damaged. Replace if necessary.

**Antenna**

Two million Air Wave Antennas are used with this radio.

One of these antennas is a loop type and is used for broadcast reception. The other is a counterpoise coil and is used for reception on the short wave bands. The antenna is a single loop and is used for reception on the short wave bands. The antenna is a dual loop and is used for reception on the short wave bands.

For best reception, the loop antenna should be used. For maximum sensitivity, an outside antenna is recommended.
MODELS 04WG-622A, 04WG-623A MONTGOMERY WARD & CO.

MODEL 04WG-731

SPECIFICATIONS

Power Consumption... 28 Watts (At 117 volt AC Supply) Tuning Frequency Range...
Power Output. . . . . . . . . . . 13 Watts Radiated B Range...
B-wave Maximum...
Selectivity... 25 KC Band @ 1000 times Signal D Range...
Intermediate Frequency... 456 KC E Range...
Speaker... 5-7/8" P. D. Dynamic

CAUTION: The metal chassis is connected to one side of the line through a 2 md. condenser. Both AC and DC power lines are grounded on one side. If the side of the line not connected to the metal chassis through this condenser is grounded and the metal chassis comes in contact with an external ground, this condenser will be connected across the line and there will be an increase in hum. Therefore, in any service work on the chassis, keep it on a wood or other insulated surface to avoid contact with ground. The person working on the set should avoid getting in contact with any ground.

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The equipment in column at right is only for aligning:

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SETTING</th>
<th>CONNECTION</th>
<th>GROUNDING</th>
<th>DUMMY ATTEN. SETTING</th>
<th>BAND SWITCH SETTING</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO</th>
<th>TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF.</td>
<td>456 KC Signal Grid Filter &quot;A&quot;</td>
<td>Peter &quot;A&quot;</td>
<td>1 md.</td>
<td>B Range</td>
<td>Tune Rotor to Full Open</td>
<td>G Range</td>
<td>10000 Ohms</td>
<td></td>
</tr>
<tr>
<td>RANGE A</td>
<td>1600 KC Signal Grid Filter &quot;X&quot;</td>
<td>1 md.</td>
<td>B Range</td>
<td>Tune Rotor to Full Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE B</td>
<td>1600 KC External Antenna</td>
<td>External Antenna</td>
<td>1000 ohms</td>
<td>B Range</td>
<td>Tune Rotor to Max. Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE D</td>
<td>10.3 KC External Antenna</td>
<td>External Antenna</td>
<td>10000 Ohms</td>
<td>D Range</td>
<td>Tune Rotor to Full Open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANGE E</td>
<td>5000 KC External Antenna</td>
<td>External Antenna</td>
<td>10000 Ohms</td>
<td>D Range</td>
<td>Tune Rotor to Full Open</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SPECIFICATIONS

Power Consumption... 40 Watts (At 117 volt AC supply) Tuning Frequency Range...
Power Output... 22 Watts Unmodulated...
Selectivity... 40 KC Band @ 1000 times Signal Sensitivity...
Intermediate Frequency... 456 KC Sensitivity—External Antenna...
Speaker... 5-7/8" Electro-Dynamic

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

The following equipment is required for aligning:

An AM Wave Signal Generator which will provide a calibrated signal at the test frequencies listed.

Output Indicating Meter—Non-Metallic Scale.

Connect the Mark Antenna to the Mark Antenna jack on the receiver and insert the signal generator output into the receiver input.

After each change is completed, repeat the procedure at the next change.

CAUTION: When aligning the short wave band, be sure NOT to feed the signal frequency. This is not to be fed at all times. Let the antenna generator set the frequencies to 8000 KC. The signal will then be read by 8000 KC on the dial of the radio. The signal generator, which is the receiver will be read on 8000 line 390 KC or 8000 line 1400 KC on the dial. It may be necessary to re-tune the signal generator to avoid the short wave band.

After each change is completed, repeat the procedure at the next change.

NOTE: If the meter is not at 8000 KC or the dial of the radio the short wave band, the error may be caused by incorrect alignment of the receiver or by incorrect settings on the signal generator.

MOUNTING CONNECTIONS: Insert phone jack cable into phone socket (top of chassis). An a-c phone motor socket can be used to operate the a-c phone motor.

TELEVISION SOUN D AND P.W.M. CONNECTIONS: Auto amplifier and P.M. connections of the receiver used to reproduce television program on PW. FM CONNECTION: Connect television pictures receiver and sound converter or PW converter to phone socket. Turn knob to position.

NOTE: This equipment is not designed for use on television receivers which are not equipped with an a-c phone jack.

John B. Ridge, Publisher
**SPECIFICATIONS**

Input Voltages and Currents—Battery Operation
- "B" Batteries: 90 Volts—11.5 Ma.

Power Consumption (At 117 volts AC Supply) 28 Watts

Power Output
- Battery Operation: 150 Mw. Undistorted
- 350 Mw. Maximum
- AC Operation: 200 Mw. Undistorted
- 450 Mw. Maximum

Selectivity - 50 KC Broad at 1000 Times Signal
Intermediate Frequency - 456 KC
Speaker - 6 P.M. Dynamic
Tuning Frequency Range - 540 to 1600 KC
Sensitivity (For .05 Watt Output)
External Antenna - 10 Microvolts Average

**ALIGNMENT PROCEDURE**

The following equipment is required for aligning:
- 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 mf.

**SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>466 KC</td>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>1st L.F. (C6 &amp; C7)</td>
</tr>
<tr>
<td>1600 KC</td>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>3rd L.F. (C13 &amp; C14)</td>
</tr>
<tr>
<td>1400 KC</td>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>Oscillator (C3)</td>
</tr>
</tbody>
</table>

**NOTE A**—Reassemble chassis in cabinet.
Close back on cabinet.

**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, set the pointer at the 800 KC mark.

**DRIVE CORD REPLACEMENT**

Use a new drive cord 28 inches in length; tie one end to tension spring. Thread other end through hole in groove of drive pulley and pull spring flush against inside of pulley rim. Turn gang condenser to full open position—See illustration.

Wind cord 3/4 turn clockwise (from back of chassis) around drive pulley. Pass cord over idler studs A, B & C, as shown. Then wind cord 3/4 turn clockwise (from back of chassis) around drive pulley. This turn should be on left side (from gang condenser side of chassis) of pulley groove.

Thread cord through hole in pulley groove and tie to tension spring. Attach other end of spring to hook on drive pulley.
**SPECIFICATIONS**

- **Input Voltages and Currents—Battery Operation**
  - "A" Battery: 8 Volts—50 Ma.
  - "B" Batteries: 90 Volts—1.5 Ma.
- **Power Consumption (At 117 volts AC Supply):** 28 Watts
- **Power Output**
  - Battery Operation: 150 Mw. Undistorted
  - AC Operation: 420 Mw. Maximum
- **Selectivity:** 38 KC Broad at 1000 Times Signal
- **Intermediate Frequency:** 458 KC
- **Speaker:** 6" or 8" P.M. Dynamic
- **Tuning Frequency Range**
  - B Range: 528 to 1800 KC
  - D Range: 5750 to 18000 KC
- **Sensitivity—External Antenna** (For 0.5 Watt output)
  - B Range: 12 Microvolts Average
  - D Range: 20 Microvolts Average

**ALIGNMENT PROCEDURE**

- 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 m, 100 mmf., and 400 ohms.

**SIGNAL GENERATOR**

### FREQUENCY SETTINGS

- **I.F.**
  - 456 KC External Antenna Wire Point "A" .1 m.
- **RANGE B**
  - 1600 KC External Antenna Wire External Ground Wire 100 mmf.
  - 1400 KC External Antenna Wire External Ground Wire 100 mmf.
  - 600 KC External Antenna Wire External Ground Wire 100 mmf.
- **RANGE D**
  - 18,300 KC External Antenna Wire External Ground Wire 400 Ohm
  - 16,000 KC External Antenna Wire External Ground Wire 400 Ohm
  - 6000 KC External Antenna Wire External Ground Wire 400 Ohm
- **LOOP RANGE B**
  - 1400 KC External Antenna Wire External Ground Wire 100 mmf.

**CAUTION**—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 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.

**LOOMS**

- **EXTERNAL RANGE B**

**IMPORTANT**—Metal base tubes must be used in those sockets which shields are shown.

**DRIVE CORD REPLACEMENT**

- Turn gang condenser to full open position—See illustration. Use a new drive cord 42 inches in length.
- Tie one end of cord to tension spring.
- Pass other end of cord up through hole in groove of drive pulley. Pull cord through hole until spring is flush against inside of pulley rim.
- Pass cord under small pulley A—See illustration. Then wind 4 turns counter-clockwise (from back of chassis) around tuning control shaft. These turns should progress toward dial mounting plate. Pass cord over pulleys B, C, and D as shown. Then wind cord 3 turn counter-clockwise (from drive pulley side of chassis) around drive pulley. This turn should be on left side (from back of chassis) of pulley groove.
- Pass cord through hole in groove of drive pulley. Tie cord to tension spring. Faster other end of spring to hook on drive pulley.

**MODELS**

- 04-WG-673
- 04-WG-674
- 04-WG-903
ALIGNMENT PROCEDURE

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequency, as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mfd., 125 mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmer Adjusted (In Order Below)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L F</td>
<td>465 Kc. 1 mfd. Grid of 6SK7 L F. Tube</td>
<td>Set dial at 140 Kc.</td>
<td>Trimmer C19, C20</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc. 1 mfd. Grid of 6SK7</td>
<td>Set dial at 140 Kc.</td>
<td>Trimmer C3</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc. 1 mfd. Grid of 6AG7</td>
<td>Set dial at 140 Kc.</td>
<td>Trimmer C14, C15</td>
<td>Input</td>
<td>Adjust to maximum output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BROAD-CAST BAND

- 1564 Kc. 125 mfd. Antenna lead | Set dial at 135 Kc. | Trimmer C1 | Adjust maximum output |
- 1400 Kc. 125 mfd. Antenna lead | Set dial at 140 Kc. | Trimmer C3 | Adjust maximum output |
- 600 Kc. 125 mfd. Antenna lead | Set dial at 600 Kc. | Trimmer C11 | Adjust maximum output |

NOTE "A" IMPORTANT: To align the output L F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the plate tuned circuit. Connect the resistor as indicated by points "A" and "Y" on the circuit diagram and the bottom view of the radio chassis Fig. 1. A red dot on top of output L F. can designate location of trimmer "C10." 

NOTE "B" Edges of adjusting trimmer C19 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C19 or C20 after the 10M ohm resistor has been removed.

For alignment of the output L F. transformer using a cathode ray oscillograph the 10M ohm resistor is not used.

NOTE "C" Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For the proper alignment of this adjustment see “Adjusting Antenna Trimmer.”

ALIGNMENT OF THE IRON CORES

The iron cores for the antennas, R. F. and oscillator permeability coils have been very carefully adjusted at the factory and require no further adjustment, unless it becomes necessary to replace a coil, or if the adjustments has been tampered with.

The procedure for aligning the iron cores will be supplied with replacement coils when ordered.

IMPORTANT—ADJUSTING ANTENNA TRIMMER:

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the Bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment "C1," Fig. 4)

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment "C2," Fig. 4)

NOTE: If resonance (maximum output) cannot be obtained within the range of the antenna series trimmer "C2," turn the adjustment screw all the way out (counter clockwise) and then adjust the antenna shunt trimmer "C1" on the bottom of the remote tuner unit for a peak of maximum output.

The above arrangement will cover any antenna capacity that is now in use.
PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS:

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning (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.

On the top of each pushbutton a slot is provided for inserting the call letter tabs, (see A, Fig. 2). Insert the call letter tabs.

NOW, PROCEED AS FOLLOWS:-

1. Push the dial tuning knob in hard enough to make it latch in.

2. Rotate the dial tuning knob to the left (counter-clockwise), until the knob can not be turned any further without forcing.

You will note that as the knob is rotated it will turn easily until the pointer reaches the end of the dial scale and then a slight amount of force will be required to actually start unlocking the tuner mechanism. Beyond this point the knob will turn quite easily again until the tuner mechanism is completely unlocked. At this point do not force the knob any further. The tuner mechanism is now unlocked.

(NOTE.—Automatic tuner mechanism is locked tight when radio is shipped from the factory.)

3. Push in all the way any one of the pushbuttons and at the same time hold in firmly the dial tuning knob. Both the dial tuning knob and the pushbutton should be pushed hard enough to make them stay latched in.

The reason for holding the dial tuning knob in firmly when the pushbutton is pressed in is due to the latching mechanism in the Remote Tuner unit which is so constructed to release the dial tuning knob entirely when a pushbutton is pressed in. When setting up stations for automatic tuning, however, it is necessary that both the dial tuning knob and the pushbutton be latched in together.

4. Press in on the pushbutton which is latched in. Holding it in firmly, tune in by means of the dial tuning knob the station indicated on the station call letter tab on this pushbutton. Turn the dial tuning knob very slowly back and forth (while still pressing in firmly on the pushbutton), until the station is clearest. The station will then be accurately tuned in.

5. Push in all the way another pushbutton, at the same time holding the dial tuning knob in so that both the pushbutton and the dial tuning knob are latched in together. Holding the pushbutton firmly, tune in the station indicated on the call letter tab on this pushbutton.

6. Follow this procedure until you have tuned in all of your favorite stations.

7. When the last pushbutton has been properly set up, it is necessary to release it from the latched-in position before the tuner mechanism can be released; to release this pushbutton, press the pushbutton release pin on the bottom of the tuner unit. This will trip the latching mechanism and all the pushbuttons will be released to out position. (See Fig. 2A.)

8. Now, press on the dial tuning knob hard enough to make it latch in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it.

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.

9. Press in any one of the pushbuttons and—YOUR FAVORITE STATION IS SELECTED.

The important steps to remember when setting up stations on the pushbuttons for automatic tuning are:

1. To unlock the tuner mechanism press on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the left (counterclockwise) until the knob can not be turned any further without forcing it.

2. To set a pushbutton, Push in all the way and hold in firmly both the pushbutton and the dial tuning knob so that both latch in. Hold in firmly the pushbutton and tune in the station by means of the dial tuning knob. Set all the stations in the same manner.

3. To release the last pushbutton press the pushbutton release pin on the bottom of the tuner unit.

4. To lock the tuner mechanism push on the dial tuning knob hard enough to make it stay latched in. Rotate the dial tuning knob to the right (clockwise) until the knob can not be turned any further without forcing it. (NOTE: All the pushbuttons must be in out position when locking the tuner mechanism.)

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. These voltages are clearly indicated on the voltage chart.

In order to prevent signal from acting upon A.V.C. and affecting 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 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.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. If fuse blows out frequently, the trouble is probably in the vibrator, it should be replaced. Do not attempt to make any adjustments on the vibrators.

ALIGNING INSTRUCTIONS:

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been found to be normal. To properly realign this receiver, a test oscillator, as well as an output meter, must be used.

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ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio ground 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 mfd, 200 mfd, 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Positions of Band Switch</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>455 Ke. 1 mfd.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor fully open</td>
<td>Two trimmers on top</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>455 Ke. 1 mfd.</td>
<td>Grid of 6SA7</td>
<td>Mixers</td>
<td>(Plates out of mesh)</td>
<td></td>
<td>L. F.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHORT</td>
<td>1.7 Mc. 430 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 1.7 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>WAVE</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>6 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1600 Ke. 200 mfd</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor fully open</td>
<td>Two trimmers on top</td>
<td>Output L. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND (See Note A)</td>
<td>585 Ke. 200 mfd</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 585 Ke.</td>
<td>Trimmer C5</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>LOOP</td>
<td>460 Ke. 200 mfd</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 460 Ke.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>ALIGNMENT (See Note B)</td>
<td>50 Ke. 200 mfd</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 50 Ke.</td>
<td>Trimmer C3</td>
<td>Iron Core Tracking Coil</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: “A”—The signal generator is connected to the “ANT.” and “GND.” terminals on the rear of the chassis when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator and frequencies, (1600 and 585 Ke. C.).

The loop antenna should be connected to the radio when making these adjustments.

NOTE: “B”—Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the “ANT.” and “GND.” terminals.

HOW TO REMOVE CHASSIS

Should it ever be necessary to take the chassis out of the cabinet be sure to first pull the plug from the light socket. Next pull off all control knobs and take off the escutcheon. Pull out the loop aerial and speaker plugs, then remove the 4 chassis mounting screws and lift the chassis out.

NOTE—On the Mantel Model it is necessary to remove the screws and take the back off.

PHONOGRAPH-TELEVISION OR FM. JACK

Should you wish to use an external phonograph it should be plugged into the jack shown in the top view. The on-off radio-phono knob on the front panel will then switch from radio to phono operation.

If television or frequency modulation (FM) programs ever become available in your community this radio may still be used in conjunction with the necessary converters.

The jack marked phono-televisio-FM in the top view will accommodate either the Phono or a television or FM converter.

PUSHBUTTON TUNING

Pull one of the pushbuttons all the way out as far as it will come (pull, with fingers on top and bottom of button). Now tune in the station you want with the tuning knob—Tune back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place. (push directly on front of button) Continue setting each pushbutton in the same way.

TRIMMER VIEW FRONT CHASSIS FLANGE

Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.

To change stations simply repeat the procedure above.
Operating the Automatic Phonograph

The operation of the phonograph is simple but the phonograph instruction folder packed with this instruction book should be carefully read and understood before attempting to operate the record changer in operation.

The record changer is switched automatically in the section after it has started operating. Any number up to fourteen 78 rpm or ten 12 rpm records may be played consecutively without need of attention by the listener. Records 12 inch or 11 inch records may be used but one 78 rpm by playing at one time. Each record must have a run-off groove.

To turn the Phonograph On
Turn the on-off switch knob to the right.
A click will be heard and the deal will light. Wait 30 seconds for the tubes to heat.

To turn the Phonograph Off
The instructions for turning off the automatic record changer are as follows.

The phonograph instruction folder, if you are to turn the on-off switch knob to the left.
A click will be heard and the deal lamp will be off.

Home Recorder - Television
Frequency Modulation

Home Recorder

This radio is designed so that you may take advantage of a wave and extremely interesting form of entertainment. By replacing the record changer unit in this radio with a unit which includes a record player and a record changer, the new age of making your own records is opened to you.

Your favorite radio program, comedy, dance or symphony may be permanently recorded. By means of a microphone attachment, voice or music of your own production may be recorded.

For detailed instructions regarding this record outer unit, get in touch with your local Montgomery Ward store or the nearest Radio Order House.

Television Sound Connections

If Television programs over the radio become available in your community, the radio will be used only in conjunction with any Television Picture Receiver and Sound Converter.

The connection to the chassis base is exactly the same as described in the preceding article "Television Sound Connections."
**Models 04XG-803, 04XG-903**

**Montgomery Ward & Co.**

**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 Setting</th>
<th>Dummy Antenna</th>
<th>Band Switch Setting</th>
<th>Condenser Setting</th>
<th>Adjust Trimmers to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<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></td>
</tr>
<tr>
<td>1400 KC</td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>49 Meter</td>
<td>Turn Tuning Knob until Pointer is at 6.3 MC</td>
<td></td>
</tr>
<tr>
<td>600 KC</td>
<td>Antenna Lead</td>
<td>400 Ohm</td>
<td>49 Meter</td>
<td>Leave Setting as above</td>
<td></td>
</tr>
<tr>
<td>1400 KC</td>
<td>Antenna Lead</td>
<td>100 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Max. Output</td>
<td></td>
</tr>
</tbody>
</table>

**Short Wave Bands.**

| 6300 KC           | Antenna Lead       | 400 Ohm       | 49 Meter            | Turn Tuning Knob until Pointer is at 6.3 MC |
| 6300 KC           | Antenna Lead       | 400 Ohm       | 49 Meter            | Leave Setting as above |

**Loop Range B**

| 1400 KC           | Antenna Lead       | 100 mmf.      | B Range             | Turn Rotor to Max. Output |

---

**Model 04XG-903**

**Model 04XG-903**

CAUTION—Two of the coils in the band spread coil assembly, the 19 Meter Antenna and Oscillator coils, have adjustable iron cores in the "B" and later issues of this model. One of the adjusting screws extends out from the front panel of the chassis base at the left of the band switch. The other adjusting screw extends up from the chassis base in back of the tuning condenser.

DO NOT change the position of these adjusting screws as they have been properly set at the factory and cannot be satisfactorily re-adjusted in the field.

Adjust 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.

![Diagram](image-url)
ALIGNMENT PROCEDURE Model No. 04BR-903A and 04BR-907A, 04BR-904A and 04BR-906A, 04BR-1105A, 04BR-1106A

- Tone control—Tunable
- 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:
- All wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indication meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mil., 200 mfl., and 400 ohms.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Dial Pointer Setting</th>
<th>Trimmers Adjusted in Order Shown</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 9.0445 MC</td>
<td>45 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 85U (ond L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 900 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I.F. 4445 MC</td>
<td>45 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 85U (4st L.F.)</td>
<td>Broadcast</td>
<td>Set Dial at 900 Kc.</td>
<td>Three Trimmers on Top</td>
<td>Interstage F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>45 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 65A7</td>
<td>Broadcast</td>
<td>Set Dial at 900 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Output F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

| 31 METER BAND     | 9.6 Mc.           | 400 ohms       | Antenna lead        | 31M                     | Set Dial at 900 Mc.  | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |
| 49 METER BAND     | 6.1 Mc.           | 400 ohms       | Antenna lead        | 49M                     | Set Dial at 90 Mc.   | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |
| 25 METER BAND     | 11.8 Mc.          | 400 ohms       | Antenna lead        | 25M                     | Set Dial at 11.8 Mc. | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |
| 19 METER BAND     | 15.2 Mc.          | 400 ohms       | Antenna lead        | 19M                     | Set Dial at 15.2 Mc. | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |
| BROADCAST BAND    | 1600 Kc.          | 200 mfl.       | Antenna lead        | Broadcast               | Set Dial at 1600 Kc. | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |
|                   | 1400 Kc.          | 200 mfl.       | Antenna lead        | Broadcast               | Set Dial at 1400 Kc. | (See Trimmer View) C20          | R.F.             | Adjust to maximum output |

SPECIFICATIONS

Model No. 04BR-903A and 04BR-907A

- Power Output: - - - 5 Watts Undistorted
- Sensitivity for 500 Milliwatt Output: 10 Microvolts Average
- Selectivity - 35 KC Broad at 1000 Times Signal at 1000 KC
- Intermediate Frequency - 455 KC
- Speaker: - - - 10 in. Electro Dynamic

Model No. 04BR-904A and 04BR-906A

- Power Output: - - - 10 Watts Undistorted
- Sensitivity for 500 Milliwatt Output: 10 Microvolts Average
- Selectivity - 27 KC Broad at 1000 Times Signal at 1000 KC
- Intermediate Frequency - 455 KC
- Speaker: - - - 12 in. Electro Dynamic

SPECIFICATIONS

Model No. 04BR-1105A

- Power Output: - - - 120 Watts
- Sensitivity for 500 Milliwatt Output: 10 Microvolts Average
- Selectivity - 27 KC Broad at 1000 Times Signal at 1000 KC
- Intermediate Frequency - 455 KC
- Speaker: - - - 12 in. Electro Dynamic

HOME RECORDING

This radio is designed so you can replace the present record changer unit with one that also includes a record arm.
Power Consumption: 28 Watts (At 117 volts AC Supply)

Power Output: 8 Watt Undistorted
1.25 Watts Maximum

Selectivity: 50 KC Broad at 1000 times Signal

Tuning Frequency Range
B Range: 518 to 1730 KC
C Range: 2100 to 6500 KC

Sensitivity: (For .5 watt output)
B Range: 35 Microvolts Average
C Range: 35 Microvolts Average

TO REDUCE MODULATION HUM:
Insulate dial-lamp clip from mounting bracket.
Return condenser C2 to B- (point X on schematic)
instead of to chassis ground.
Dress leads from condenser C16 to volume control
as far as possible from heater leads.

Use ONLY a No. 31 dial lamp.

FOR OTHER DATA
SEE INDEX
Setting a Station Button

It is better to list the station with the lowest kilocycle number first, the station with the next higher kilocycle number next, and so on.

At the right side of the cabinet (from the front) will be seen a cap which covers a hole in the cabinet—See illustration. Pry off this cap, being careful not to scratch the cabinet. Removal of the cap will expose a large locking screw. Using a screwdriver, loosen the mechanism by turning this screw in a counterclockwise direction. The screw will turn easily until the dial stops rotating. Then exert a slight amount of additional pressure and continue to turn the screw about one and one-half complete turns.

With one hand, hold the manual tuning control to prevent it from turning and with the other hand, push one of the station buttons shown in the illustration all the way down. It will go down easily at first and then a firm gentle pressure must be applied to push it down the rest of the way. It is better to start with the left hand button.

Hold this button all the way down. With the other hand, see whether or not this station is still accurately tuned by moving the tuning control a slight amount back and forth while observing the tuning eye. Be sure to hold the button all the way down.

Release the button after the station is tuned.

Carefully tune in the second station on your list. Then hold the tuning control and push the second button slowly and firmly all the way down. Check for accurate tuning.

Proceed in the same manner to set any additional stations on your list on the remaining station buttons.

After all the stations are set, it will be necessary to lock the mechanism so that the settings will not change. Do this by turning the locking screw in a clockwise direction until it is tight. It will turn easily until the dial stops rotating—then additional pressure must be exerted. Tighten firmly but not excessively. Replace the cap over the hole.

ALIGNMENT PROCEDURE

Remove Jumper on Loop Antenna for All Adjustments. The following equipment is required for aligning:

Volume Control—Maximum All Adjustments.
Connect Ground Post of Signal Generator to B—(12SK7 —Prong No. 3) in Chassis.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH SETTING</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>456 KC</td>
<td>Signal Grid of 1st Det. Connect at Rotor of Large Gang Section</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to full open</td>
<td>1st L.F. (C11) &amp; (C12) 2nd L.F. (C13) &amp; (C14)</td>
</tr>
<tr>
<td>RANGE B</td>
<td>1730 KC</td>
<td>Signal 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>1500 KC</td>
<td>Red Antenna Screw at Back of Loop</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to max. output</td>
<td>Antenna Range B (C4)—See Illustration Page 1</td>
</tr>
<tr>
<td></td>
<td>6000 KC</td>
<td>Same as Above</td>
<td>.1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to max. output</td>
<td>600 HC (C8) Rock Rotor—See Note A</td>
</tr>
<tr>
<td>RANGE C</td>
<td>6500 KC</td>
<td>Same as Above</td>
<td>.1 mf.</td>
<td>C Range</td>
<td>Turn Rotor to full open</td>
<td>Oscillator Range C (C5)</td>
</tr>
<tr>
<td></td>
<td>6000 KC</td>
<td>Same as Above</td>
<td>.1 mf.</td>
<td>C Range</td>
<td>Turn Rotor to max. output</td>
<td>Ant. Range C (C11) Rock Rotor—See Note A</td>
</tr>
</tbody>
</table>

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

After each range is completed, repeat the procedure as a final check.

NOTE A—Turn the rotor back and forth and adjust the trimmer until the point of greatest intensity is obtained.

CAUTION—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 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.

If at any time you wish to change the setting of a button from one station to another, repeat the above procedure. Changing the setting of one button will not affect the setting of any of the other buttons.

CAUTION—DO NOT USE ANY GROUND.
FOR ALIGNMENT
SEE INDEX

IF PEAK 455 KC

ADJUST THIS ANTENNA BALANCING SCREW AFTER INSTALLATION OF THE RADIO ON THE CAR.
TUNE IN A WEAK STATION FROM 1200 TO 1400 KC. AND TUNE UNTIL MAXIMUM VOLUME IS OBTAINED.
ARVIN HOME RADIO

CHASSIS RE-80

12SK7
12SA7
12SK7
12SQ7
35L8GT

3525GT

RESISTORS
CONDENSERS
TRANSFORMERS
MICHELLES UNITS

1. IF PEAK 455 KC
   BALANCE 1400 KC-CHECK AT 600 KC
   NOBILITY SPARKS INDUSTRIES, INC
   COLUMBUS, INDIANA

ARVIN PAGE 12

NOBILITY SPARKS INDUSTRIES, INC.

MODEL 722, 722A, 793
All sensitivities given for 50 milliwatts output = .4 volts across Voice Coil.

<table>
<thead>
<tr>
<th>Operation No.</th>
<th>Connect Bal. Oscillator to</th>
<th>Balance Oscillator Frequency</th>
<th>Adjust</th>
<th>Dial Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1A7 Grid</td>
<td>455 kc</td>
<td>1st &amp; 2nd I.F. Trimmers</td>
<td>550 kc</td>
</tr>
<tr>
<td>2</td>
<td>Ant Post Through 20 nufd</td>
<td>1400 kc</td>
<td>Osc. Trimmer</td>
<td>1400 kc</td>
</tr>
<tr>
<td>3</td>
<td>Ant Post Through 20 nufd</td>
<td>1400 kc</td>
<td>Ant Trimmer</td>
<td>1400 kc</td>
</tr>
</tbody>
</table>

RADIO CHASSIS RE-82

Installation of Batteries:

To install batteries it will be necessary to remove the back of the cabinet which is fastened by six screws (three on each side). After removing the six screws, do not attempt to pull the back away from the radio without first disconnecting the pin jacks from the loop antenna.

When the back has been removed, turn the cabinet upside down (handle to the bottom).

Note the battery cable extending from the right side of the chassis. This cable terminates in one two-prong plug for the long "A" battery and two three-prong plugs for the smaller "B" batteries.

NOTE - CHANGE OVER SWITCH SHOWN IN BATTERY OPERATION POSITION.
Synchronizing Station Selector Controls

1. Disconnect the push button control cable (cloth covered cable) by pulling out the plug from the radio case.

2. Turn on the power switch and set the Automatic Station Selector Control to "Dial" position — that is, to the position where the word "Dial" appears at the window of the control.

3. Plug the cloth covered cable back into the radio.

The three preceding steps will have synchronized the Automatic Station Selector control system so that the numbers on the control dial correspond to the positions of the magnetic tuning switch in the radio.

The remote control Automatic Station Selector can be set to tune in five broadcast stations of your choice. The dial of the control unit carries the numbers 1 to 5 to designate the stations.

To tune in stations with push buttons

1. Set the Automatic Station Selector to position No. 1 (the numeral "1" appearing on the dial of the control unit). With the selector in this position the unit may be tuned to any station whose broadcast frequency lies between 900 and 1000 kilocycles.

2. Remove the slot cover on the front of the unit below the speaker grilles for access to the oscillator adjustment screws and antenna trimmers by adjusting which the tuning is accomplished. See Fig. 7.

3. Adjust (with screwdriver) oscillator adjustment screws No. 2 as shown in Fig. 7) until the broadcast signal of the desired station is received. Turning the oscillator adjustment screw in a clockwise direction lowers the frequency and turning it in a counter-clockwise direction increases the frequency.

4. Adjust antenna trimmer No. 3 to position where maximum volume is attained. The entire range of the antenna trimmers is covered within three counter-clockwise turns of the screw from tight position. Do not back screws out more than three turns. Counterclockwise rotation lowers the frequency. Counterclockwise rotation increases the frequency.

The preceding instructions outline completely the steps for setting up station selector position No. 1. For positions No. 2, No. 3, No. 4 and No. 5 the same general procedure is to be used.

Below is a table showing five station selector positions, the kilocycle range covered by each position and the oscillator screws and antenna trimmers by adjustment of which any desired station within the given range may be tuned.

<table>
<thead>
<tr>
<th>Position of Station Selector</th>
<th>Broadcast Range in Kilocycles</th>
<th>Oscillator Screws to Adjust for Maximum Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>900 to 1000</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1000 to 1200</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1200 to 1600</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1600 to 2000</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>2000 to 850</td>
<td>5</td>
</tr>
</tbody>
</table>
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.).

The Antenna System used with these receivers is of the extension rod type, mounting through the cowl of the body by the use of special insulators, conforming to the contour of the cowl. Raising and lowering of the rod is accomplished by means of a remote control on the instrument panel.
CIRCUIT ALIGNMENT

All of the adjustable condensers in this receiver are very accurately adjusted at the factory and will need no further adjustment (excepting antenna condenser "A") unless tampered with or a defective coil has been replaced. If realignment is found to be necessary, the circuits can be properly adjusted only with the use of a calibrated test oscillator or signal generator and an output meter.

DO NOT ATTEMPT TO REALIGN THE I-F STAGES OF THIS RECEIVER WITHOUT CAREFULLY NOTING THE INSTRUCTIONS BELOW:

1. Aligning I-F Stages at 260 Kilocycles
   (a) Turn volume control to the maximum position.
   (b) Connect the signal lead of the test oscillator through a .1 mfd. condenser to terminal K, which is the grid prong of the 7AM tube.
   (c) Connect the ground lead of the test oscillator to chassis frame.
   (d) Connect the output meter across the speaker voice coil at the terminal board mounted on the speaker.
   (e) Set the test oscillator to exactly 260 Kilocycles.
   (f) Adjust the trimmers "A", "B", "C" and "D" on the I-F Transformers 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.

2. Aligning at 1610 Kilocycles
   (a) Remove the signal lead of the test oscillator from the grid of the 7AM tube and connect it to the antenna terminal of the receiver through a .000075 mfd. MICA CONDENSER connected to place of the .1 mfd. condenser previously used. (It is very important that a .000075 mfd. MICA condenser be used when aligning the antenna stage of these receivers in order that this circuit can be made to track properly.)
   (b) Loosen lock screw "E" and tune the receiver by means of the manual control to the extreme high frequency position, against the stop, and tighten screw "E".
   (c) Set the test oscillator to 1610 Kilocycles.
   (d) Adjust the condenser "F" for maximum output. (It is very important that this frequency be set accurately as a slight missetting will cause the receiver to be out of track over the high frequency end of the dial.)
   (e) Adjust the antenna compensating condenser "G" for maximum output.
   (f) Adjust the R.F. trimmer condenser "J" for maximum output.

3. Adjusting the I-F Wave Trap
   (a) Leave the test oscillator lead the same as for aligning at 1610 K.C.
   (b) Set the test oscillator to exactly 260 K.C.

   (g) Adjust the trimmer "H" for minimum deflection on the output meter. (It may be necessary to increase the signal from the test oscillator when making this adjustment.)

NOTE: With permeability tuning it is necessary to adjust the capacity at only one frequency. The coils are so wound that tracking is automatic and the usual low frequency adjustments are not necessary.

If the entire alignment procedure has been accomplished accurately, the receiver should be uniformly sensitive over the entire frequency range.

Lock screw "E" maintains the location of the mechanical stop at the high frequency end of the band.

New frequency assignments to 1800 K.C. make it desirable for the receiver to cover this range, but due to local ordinances it is not permissible in all locations.

The high frequency stop is set at 1600 K.C. in production and after aligning the receiver, reset the stop to this frequency which is accomplished by loosening lock screw "E", tune in manually to 1600 K.C. and tighten screw "E".

Where ordinances permit, the high frequency stop may be set at any frequency up to 1800 K.C.
AUTOMATIC PUSH BUTTON TUNER

The iron cored automatic tuner consists of three coils with variable iron cores actuated by a rugged mechanical device for varying the position of the cores in the coils. Changing the position of the cores changes the inductance of the antenna, R.F. and oscillator coils, and provides a means of tuning the radio over the entire broadcast band. A special compensating condenser is employed in the oscillator circuit to prevent the set from drifting off station due to normal variations in car voltage and radio temperatures.
ANTENNA CIRCUIT

The antenna circuit is coupled directly to the antenna. The antenna coil is coupled to the grid of the R.F. amplifier through a high frequency filter which minimizes ignition and other high frequency interferences. Due to the antenna circuit being directly coupled to the antenna, the antenna adjustment screw must be adjusted to give maximum volume when the receiver is tuned to a weak station which is received between 130 and 150 on the dial.
CIRCUIT ALIGNMENT

Alignment Procedure: The trimmer condensers in this receiver have been carefully adjusted at the factory and should require no further adjustment (except the antenna trimmer) unless tampered with or a defective coil has been replaced. It is advisable not to attempt any adjustment unless it is definitely known that an adjustment is necessary.

An accurately calibrated test oscillator or signal generator and an output meter must be used to align the receiver circuits correctly. To make all alignment adjustments the front and back covers must be removed. All trimmers are readily accessible. The antenna trimmer is adjusted through a hole in the end of the case.

Due to the fact that the iron cores have been sealed in place at the factory only the trimmer adjustments as outlined under capacity alignment should be made unless the coils of the iron cored tuning unit are changed.

CAPACITY ALIGNMENT

1. I.F. Alignment at 260 K.C.
   (a) Connect an output meter across the speaker voice coil, leaving speaker connected.
   (b) Connect the ground lead of the signal generator to the chassis frame.
   (c) Connect the signal lead of the signal generator to the 7DB tube grid side of the R.F. Trimmer Condenser P through a 0.1 mfd condenser.
   (d) Turn set volume control on full and tone control to the extreme treble end. Tune the receiver to a frequency where no squeals or roar notes may be heard and so that when the tuning control is moved in narrow limits no appreciable change in output may be noted.
   (e) Adjust the I.F. trimmers A, B, C, and D for maximum output.

2. Alignment at 1600 K.C.
   (a) Connect the signal lead of the signal generator to the receiver antenna connection through a 75 mfd condenser.
   (b) Turn the manual tuning control of the receiver to the stop at the extreme high frequency end of the dial.
   (c) Set the signal generator at 1600 K.C.
   (d) Adjust the oscillator trimmer E for maximum output.
   (e) Adjust the R.F. trimmer F for maximum output.
   (f) Adjust the antenna trimmer G for maximum output.

3. Alignment at 1400 K.C.
   (a) Set the signal generator to 1400 K.C.
   (b) Turn the receiver to the signal and readjust the trimmers F and G for maximum output. Signal generator signal should be as low as possible and still give a satisfactory meter reading.

This type of tuning circuit does not require alignment at 600 K.C.

4. Alignment with Car Antenna

Antenna trimmer G must be adjusted to match car antenna when receiver is installed; use a weak station signal near 1400 K.C. The antenna should be fully extended when making this adjustment.

CAPACITY AND INDUCTANCE ALIGNMENT

To be used only when there is definite evidence of iron cores being out of adjustment.

1. I.F. Alignment at 260 K.C.

Follow the procedure as outlined under I.F. Alignment at 260 K.C. Capacity Alignment.

2. Alignment at 1600 K.C.

(a) Connect the signal lead of the signal generator to the antenna connection of the set through a 70 mfd condenser.

(b) Set signal generator to 1560 Kilocycles.

(c) Rotate the manual tuning mechanism until the high frequency stop is reached. Mechanically align the iron cores F, H, J by setting each core so that its front edge sticks out 1-1/16" from the end of the coil form and the antenna and R.F. cores H and J stick out 1-13/32" from the end of the respective coil windings.

(d) Adjust the oscillator trimmer E, R.F. trimmer F, and antenna trimmer G for maximum output.

3. Alignment at 1400 K.C.

(a) Set signal generator to 1400 K.C. and tune set to this signal.

(b) Adjust the R.F. core J for maximum output.

(c) Adjust the antenna core G for maximum output.

4. Realignment at 1560 and 1400 K.C.

(a) Repeat alignment of trimmer E and trimmers F and G at 1560 K.C.

(b) Repeat alignment of cores H and J at 1400 K.C. Apply shelles to the core screws sealing the adjustment.

5. Alignment with Car Antenna

Antenna trimmer G must be adjusted to match car antenna when receiver is installed; use a weak station signal near 1400 K.C. The antenna should be fully extended when making this adjustment.
1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the signal lead of the test oscillator to terminal "F" on variable condenser 53-A (See Parts Layout), which is the grid lead of the 6J7GT tube, through a .1 mfd. condenser.
   (b) Connect the ground lead of the test oscillator to the chassis frame.
   (c) Connect the output meter across the voice coil of the speaker.
   (d) Set the test oscillator to exactly 455 K.C.
   (e) Turn volume control to maximum.
   (f) Adjust the trimmers "A", "B", "C" and "F" 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 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 "H" (See Parts Layout).
   (c) Set the test oscillator to 1560 Kilocycles.
   (d) Adjust the condenser "F" (See Parts Layout) for 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 the Antenna Stage
   (a) Remove the signal lead of the test oscillator from the grid of the 6J7GT tube and connect to the Antenna Terminals of the receiver THROUGH a .000375 mfd. Mica Condenser connected in place of the .1 mfd. condenser previously used. (It is very important that a .000375 mfd. mica condenser be used when aligning the antenna stage of these receivers 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 Antenna Trimmer "G" (See Parts Layout) for maximum output.

4. Aligning at 600 Kilocycles
   (a) Set the test oscillator at 600 K.C. in order to make the receiver track properly and to secure full sensitivity.
   (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 adjust the oscillator padding condenser "F" (See Parts Layout) 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.
(e) After the above operation turn the condenser rotor plates to the high frequency stop position. Check the 1600 K.C. setting and if necessary readjust trimmer "F". Then return to 1400 K.C. for final antenna trimmer adjustment.

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

In addition to manual tuning, there are four push buttons which may be adjusted to tune-in the local broadcasting stations.

It is not necessary to set the buttons in order of broadcasting stations frequency, but for convenience it is desirable.

To adjust the buttons, proceed as follows:
1. Turn on receiver for ten minutes or more.
2. Loosen the four push buttons by turning each button counter clockwise about half a turn.
3. Tune in the first desired station manually and press in the first push button as far as it will go.
4. With the button held all the way in, tighten it gently. Then release it and tighten it securely.
5. Proceed in the same manner for the remaining stations.
6. After all of the buttons have been adjusted, recheck the setting. Push each button and see if the station may be tuned-in more accurately manually.
7. A station setting may be changed at any time by loosening the push button, tuning in the new station and re-setting the button.
8. After the push buttons have been adjusted, insert the dial letter tabs for the stations in their proper places above the buttons.
To Set Push Buttons

Remove station tab strip bar. This is held by two screws at each end of strip. Beginning at left with button #2 with low kilocycle frequency stations, five stations may be set on buttons in the order of their kilocycle frequency as follows:

Tune and play the station desired on manual tuning. (7th button) for identification purposes. Now, push button #2 in. Using small screwdriver, rotate #2 brass selector screw (oscillator) until desired station is heard with maximum volume. Then rotate #2 chrome selector screw (loop trimmer) until station is heard best.

Repeat this procedure for each of the other four broadcast station buttons using corresponding selector and trimmer screws until a total of five stations have been set.
PROCEDURE FOR SETTING UP
AUTOMATIC PUSHER BUTTONS

The remaining two (2) push buttons located at the extreme left hand end of the push buttons 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 989 kcs).
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 dial letters of the station from the dial letter sheet furnished and insert in the window of the adjusting screw.
5. Repeat the above procedure for the remaining five (5) stations.

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 the push buttons. Fig. 1 also shows the tuning range.

NOTE: It is advisable to retain the dial letter sheet or frequencies covered by each button.
### SERVICE INFORMATION

**SERVICE INFORMATION**

**1940 IMPERIAL COACH MODEL 71**

**SPEAKER** (Part No. P3989) 8" Dynalum

- **Field resistance** 1500 ohms
- **D.C. voice coil resistance** 2 ohms
- **Voice coil impedance** 400 cycles, 216 ohms
- **Voltage—line 115 volts A.C. Power consumption 60 watts**

- **Volume control maximum. Meter 20,000 volts per volt.**

**8 1/2**

- **Plug (d) to ground** 100 volts
- **Screen grid (G3) to ground** 94 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**6X6**

- **Plug (d) to ground** 100 volts
- **Screen grid (G3) to ground** 94 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**73 tube**

- **Plug to ground** 95 volts
- **Cathode to ground** 5 volts

**76 tube**

- **Plug to ground** 100 volts
- **Cathode to ground** 5 volts

**41 tube**

- **Plug to ground** 100 volts
- **Screen grid (G3) to ground** 94 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**38 tube**

- **Plug to ground** 200 volts

**License Plate (d) to ground** 200 volts

**Sheet Wave Antenna Coil (Part No. P3348)**

- **Primary—White, pink white B+**
- **Resistance—23.8 ohms**
- **Secondary—White, grid black white**
- **AVC—Resistance**

**64 tube**

- **Plug to ground** 105 volts
- **Cathode to ground** 5 volts

**215 tube**

- **Plug to ground** 100 volts
- **Cathode to ground** 5 volts

**41 tube**

- **Plug to ground** 94 volts
- **Screen grid (G3) to grid** 66 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**85 tube**

- **Plug to ground** 75 volts

**64 tube**

- **Plug to ground** 105 volts
- **Cathode to ground** 5 volts

**41 tube**

- **Plug to ground** 86 volts
- **Screen grid (G3) to grid** 66 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**85 tube**

- **Plug to ground** 75 volts

**Sheet Wave Antenna Coil (Part No. P3348)**

- **Primary—White, pink white B+**
- **Resistance—23.8 ohms**
- **Secondary—White, grid black white**
- **AVC—Resistance**

**85 tube**

- **Plug to ground** 100 volts
- **Cathode to ground** 5 volts

**41 tube**

- **Plug to ground** 86 volts
- **Screen grid (G3) to grid** 66 volts
- **Grid (G2) to grid** 66 volts
- **Cathode (C2) to ground** 354 volts

**85 tube**

- **Plug to ground** 75 volts

**TUNING DRIVE**

- **If the drive shaft slips when using manual tuning, turn the drive shaft slowly toward the power transformer until it clicks and then loosen the two set screws holding the drive shaft in place on the armature shaft. (See Fig. 1.)**

**Short Wave Occillator Coil (Part No. P3348)**

- **Primary—No. 2 and No. 4—Resistance**
- **Secondary—No. 1 and No. 2—Resistance**

**Broadcast Occillator Coil (Part No. P3353)**

- **Primary—No. 2 and No. 4—Resistance**
- **Secondary—No. 1 and No. 2—Resistance**

**Broadcast Occillator Coil (Part No. P3353)**

- **Primary—No. 2 and No. 4—Resistance**
- **Secondary—No. 1 and No. 2—Resistance**

**Power Transformer (Part No. P3358)**

- **Primary—White, pink white B+**
- **Resistance**

**Power Transformer (Part No. P3359)**

- **Primary—White, pink white B+**
- **Resistance—7.4 ohms**
- **Secondary—4.5 ohm grid black white**
- **Resistance—0.8 ohms**

**Loop Antenna**

- **Since the loop antenna acts also as the broadcast antenna and the set will not operate properly with the loop antenna disconnected.**

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### ALIGNMENT DATA

**L.F. ALIGNMENT**

Set the signal generator to 455 Kc and connect the output to the grid of the first detector tube (4X1) through a 0.01 or 0.1 condenser. Align all L.F. trimmers to peak or maximum reading on the output meter.

**BROADCAST BAND ALIGNMENT**

- **Adjust the signal generator to 1750 Kc and connect the output to the antenna lead (S) through a .002 or .001 condenser. Set the gain controls to maximum sensitivity and calibrate the oscillator trimmer to receive the signal.**

---

**TUNING DRIVE**

If the drive shaft slips when using manual tuning, turn the drive shaft slowly toward the power transformer until it clicks and then loosen the two set screws holding the drive shaft in place on the armature shaft. (See Fig. 1.)
ALIGNMENT DATA AND SERVICING
1939 COMMANDER MODEL 6D

GENERAL DATA

The alignment of this receiver requires the use of a test oscillator which will cover the frequencies of 650, 600, 1400, 1720, 6000, 16000 and 18000 KC and an output meter which is to be connected across the primary or secondary of the output transformer. If possible, all adjustments should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the A.V.C. 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 tested, the Broadcast Band should always be the next procedure, after which, the Short Wave Band 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 456 KC and connect the output of the oscillator or signal generator to the grid of the first detector tube (6DY6) through a .06 or .1 mfd. condenser. The ground the grid of 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 output of the signal generator to the antenna lead (blue) through a .0002 mfd. capacitor. Set the gang condenser to minimum and the oscillator to 1720 KC and adjust the broadcast 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 6000 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 padding 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 quickest 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 6000 KC.

SHORT WAVE BAND ALIGNMENT

The short wave band is aligned by setting the generator to 18000 KC and tuning the signal. Adjust the "short wave antenna" 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 oscillator and condenser cells, as well as the .004 mfd. padding condenser, should be tested for defects as sometimes these components become subject to mechanical or electrical injuries, despite their rugged construction and liberal ratings.
**MODELS TH-9, TH-18, TH-22, PT-25 (121-122); PT-27 (121-122); PT-29-31-37-38-39-45-47-49-51-53**

**CONNECTING ALIGNING INSTRUMENTS**

**AUDIO OUTPUT METER:** If an aligning indicator of this type is used, connect it to the plate and screen terminals of the output tube.

**VACUUM TUBE VOLTMETER:** To use the vacuum tube voltmeter as an aligning indicator, make either of the following connections:

1. **Attach the negative terminal of the voltmeter to any point in the circuit where the A.C. voltage can be observed.** Connect the positive terminal of the voltmeter to the grid of the output tube to observe the a.c. component at that point.

2. **Attach the voltmeter directly to the output tube.** This method is equivalent to connecting a meter with a voltage probe to the output of the circuit.

**SIGNAL GENERATOR:** When adjusting the volume control of the receiver, it is advisable to have the output signal generator connected to the antenna terminals of the receiver to ensure that the signal is being transmitted properly.

**MODELS TP-20, TP-21, TP-35-36-43, Codes 121-122; and 55-59-67**

**Procedure TP-35 and TP-45**

<table>
<thead>
<tr>
<th>RECEIVE</th>
<th>SIGNAL GENERATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**NOTE:** Turn the tuning condenser to the extreme high or low frequency position before pulling out the main tuning condenser. Insert a dip meter (a dip meter gauge between the two output tubes) and note the position of the condenser when the signal generator is at the extremity of its range.

**MODELS TH-14, TH-15, TH-16, TH-17, PT-26-28-33-41 (121-122); 46-48-50-57, PT-61 (121-122); and 65-66-69 (121-122)**

**SETTING AND OPERATING ELECTRIC PUSH-BUTTON TUNING**

Select five of your favorite nearby broadcast stations and select their call letters from the station call letter list shown below.

<table>
<thead>
<tr>
<th>CALL LETTERS</th>
<th>FREQUENCY RANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>550-1300 K.C.</td>
</tr>
<tr>
<td></td>
<td>1300-2500 K.C.</td>
</tr>
<tr>
<td></td>
<td>2500-5000 K.C.</td>
</tr>
<tr>
<td></td>
<td>5000-10,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>10,000-20,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>20,000-40,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>40,000-80,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>80,000-120,000 K.C.</td>
</tr>
</tbody>
</table>

**MODEL TP-21, TP-45-47-48-57-65 and 67**

**PT-62, PT-61, TH-15, TH-16, and TH-17**

Select the five stations listed above, and note the call letters of the stations. The number of the station list is your own personal preference. The frequency ranges of the stations are as follows:

<table>
<thead>
<tr>
<th>CALL LETTERS</th>
<th>FREQUENCY RANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>550-1300 K.C.</td>
</tr>
<tr>
<td></td>
<td>1300-2500 K.C.</td>
</tr>
<tr>
<td></td>
<td>2500-5000 K.C.</td>
</tr>
<tr>
<td></td>
<td>5000-10,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>10,000-20,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>20,000-40,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>40,000-80,000 K.C.</td>
</tr>
<tr>
<td></td>
<td>80,000-120,000 K.C.</td>
</tr>
</tbody>
</table>

The left-hand button of the push button, marked "55-59-67", corresponds to the frequency of the station that is being broadcast. The left-hand button of the push button, marked "121-122", corresponds to the frequency of the station that is being broadcast.

With the push button in the up position, the selected button will light. When the push button is pushed, the station selected will be broadcast. The push button will remain in the up position until the push button is pushed again. When the push button is pushed, the station selected will be broadcast. The push button will remain in the up position until the push button is pushed again.
MODELS TH-9, TH-18, TH-22

Models TH-14 and TH-16 are five tube, superheterodyne radios covering a frequency range from 540 to 1580 K. C.
These models are similar with the exception of the cabinets.

FOR OTHER DATA, SEE INDEX

Model TP-20 is a five tube, superheterodyne radio covering a frequency range from 540 to 1580 K. C. on the broadcast band and 2.3 to 2.5 M. C. on the local police tuning range.
Models TH-15 and TH-17 are five tube, electric push-button tuning, superheterodyne radios with a manual tuning range covering 540 to 1580 K.C.

These models are similar with the exception of the cabinet.

INTERMEDIATE FREQUENCY: 455 K.C.

Six electric push-buttons are provided on this model. Five are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

FOR OTHER DATA SEE INDEX

Model TP-21 is a five tube, electric push-button tuning superheterodyne radio with a manual tuning range covering 540 to 1580 K.

Six electric push-buttons are provided on this model. Five are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

INTERMEDIATE FREQUENCY: 455 K.C.
CIRCUIT DESIGN: Models PT-25, Codes 121 and 122, Pt-27, Codes 121 and 122, and PT-39 are five tube superheterodyne radios covering a frequency range from 540 to 1720 K.C. These models are similar with the exception of the cabinets. Codes 121 and 122 of Models PT-25 and PT-27 differ also in the type of cabinet used.

MODELS PT-25, PT-27, Codes 121-122; and PT-39

POWER SUPPLY: The receivers are designed for operation on either a 115 volt alternating current (A.C.) or 115 volt direct current (D.C.) power supplies.

Models PT-24, PT-28 and PT-36 are five tube superheterodyne radios covering a tuning frequency range from 540 to 1580 K.C. and designed with a built-in loop aerial for portable use. To obtain maximum performance, however, in steel reinforced buildings, apartment houses, hotels and other shielded locations where signal strength is weak, provisions are also provided at the rear of the cabinet for an outside aerial.

<table>
<thead>
<tr>
<th>MODEL PT-26</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>MODEL PT-28</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>MODEL PT-36</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tubular Condenser (.4015 mfd., 550V)</td>
<td>30-65556</td>
<td>10</td>
<td>Oscillator Transformer</td>
<td>32-3123</td>
<td>11</td>
<td>Tubular Condenser (.45 mfd., 300V)</td>
<td>30-69196</td>
</tr>
<tr>
<td>2</td>
<td>Antenna Transformer</td>
<td>76-2934</td>
<td>12</td>
<td>1st L.F. Transformer</td>
<td>32-2530</td>
<td>13</td>
<td>Resistor (32,000 ohms, 1/4 watt)</td>
<td>32-22354</td>
</tr>
<tr>
<td>3</td>
<td>Loop Antenna—Part of cabinet and loop Amp.</td>
<td></td>
<td>14</td>
<td>2nd L.F. Transformer</td>
<td>32-3991</td>
<td>15</td>
<td>Resistor (50,000 ohms, 1/4 watt)</td>
<td>32-328154</td>
</tr>
<tr>
<td>4</td>
<td>Tuning Condenser—PT-26 &amp; PT-28</td>
<td>31-2469</td>
<td>16</td>
<td>Mica Condenser (50 mfd.)</td>
<td>61-0043</td>
<td>17</td>
<td>Volume Control (500,000 ohms)</td>
<td>33-3360</td>
</tr>
<tr>
<td>5</td>
<td>Padding Condenser</td>
<td>51-9524</td>
<td>18</td>
<td>Resistor (47,000 ohms, 1/4 watt)</td>
<td>32-347154</td>
<td>19</td>
<td>Mica Condenser (150 mfd.)</td>
<td>61-0003</td>
</tr>
<tr>
<td>6</td>
<td>Tubular Condenser (.1 mfd., 300V)</td>
<td>30-44099</td>
<td>20</td>
<td>Tubular Condenser (.01 mfd., 300V)</td>
<td>30-64700</td>
<td>21</td>
<td>Resistor (4.7 meg., 1/4 watt)</td>
<td>32-347154</td>
</tr>
<tr>
<td>7</td>
<td>Condenser &amp; Choke Amp.</td>
<td>76-1019</td>
<td>22</td>
<td>Resistor (220,000 ohms, 1/4 watt)</td>
<td>32-422154</td>
<td>23</td>
<td>Tubular Condenser (.01 mfd., 400V)</td>
<td>30-45723</td>
</tr>
<tr>
<td>8</td>
<td>Resistor (32,000 ohms, 1/4 watt)</td>
<td>32-322154</td>
<td>24</td>
<td>Resistor (470,000 ohms, 1/4 watt)</td>
<td>32-447154</td>
<td>25</td>
<td>Resistor (1500 ohms, 1/4 watt)</td>
<td>32-115356</td>
</tr>
<tr>
<td>9</td>
<td>Mica Condenser (110 mfd.)</td>
<td>30-1130</td>
<td>26</td>
<td>Tubular Condenser (.04 mfd., 400V)</td>
<td>30-41189</td>
<td>27</td>
<td>Output Transformer—Part of Speaker No. 36-1169</td>
<td>36-1169</td>
</tr>
<tr>
<td>10</td>
<td>Speaker</td>
<td></td>
<td>28</td>
<td>Speaker</td>
<td>36-1169</td>
<td>29</td>
<td>Field Coil—Part of Speaker No.</td>
<td>36-1169</td>
</tr>
<tr>
<td>30</td>
<td>Electrolytic Condenser (20-20 mfd., 150V)</td>
<td>30-3638</td>
<td>31</td>
<td>Line Resistor</td>
<td>33 2567</td>
<td>32</td>
<td>Pilot Lamp</td>
<td>54-3058</td>
</tr>
<tr>
<td>33</td>
<td>Tubular Condenser (.44 mfd., 400V)</td>
<td>30-41189</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Models PT-29 and PT-31 are five tube superheterodyne radios covering a frequency range from 540 to 1720 K.C. on the broadcast band and 2.3 to 2.5 megacycles (M.C.) on the local police range. These models are similar with the exception of the cabinets.

**INTERMEDIATE**

**FREQUENCY: 470 K.C.**

1. Antenna Transformer 32-3144  
2. Tubular Condenser (0.0015 mfd., 250 v) 30-4555B  
3. Tuning Condenser 31-2437  
4. Switch 42-1668  
5. Tubular Condenser (0.05 mfd., 100 v.) 30-45195  
6. Tubular Condenser (0.15 mfd., 400 v.) 30-46658  
7. Resistor (17,000 ohms, .4 watt) 33-347154  
8. Mica Condenser (110 mfd.) 30-1210  
9. Oscillator Transformer 32-3152  
10. Tubular Condenser (0.5 mfd., 100 v.) 30-45198  
11. 1st I.F. Transformer 32-3149  
12. 2nd I.F. Transformer 32-3150  
13. Resistor (2.2 meg., .4 watt) 33-322154  
14. Mica Condenser (250 mfd.) 81-0028  
15. Resistor (13,000 ohms, .4 watt) 33-322334  
16. Volume Control (600,000 ohms) 33-32896  
17. Tubular Condenser (0.1 mfd., 100 v.) 30-44195  
18. Resistor (4.7 meg., .4 watt) 33-347154  
19. Resistor (1250,000 ohms, .4 watt) 33-425154

**PRODUCTION CHANGE**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.

**FOR ALIGNMENT**

**SEE INDEX**

Models PT-33, PT-41, Codes 121 and 122, PT-61, Codes 121 and 122, are five tube superheterodyne radios covering a frequency range from 540 to 1580 kilocycles (K.C.).

**MODELS**

**PT-29**

**PT-31**

**PT-33**

**PT-41**

**PT-61**

**INTERMEDIATE**

**FREQUENCY: 455 K.C.**

1. Loop Antenna Assem. (Code 121) 38-6558  
2. Loop Antenna Assem. (Code 122) 38-3178  
3. Tuning Condenser (Code 22) 31-2446  
4. Tubular Condenser (.05 mfd., 200 v.) 33-45195  
5. Tubular Condenser (.25 mfd., 100 v.) 33-64156  
6. Tubular Condenser (.47 mfd., .4 watt) 33-47154  
7. Mica Condenser (110 mfd.) 30-1150  
8. Oscillator Transformer 32-3113  
9. Tubular Condenser (.05 mfd., 200 v.) 33-45195  
10. 1st I.F. Transformer 32-3177  
11. 2nd I.F. Transformer 32-3178  
12. Resistor (2.2 meg., .4 watt) 33-322154  
13. Mica Condenser (150 mfd.) 61-0033  
14. Resistor (37,000 ohms, .4 watt) 33-32794  
15. Volume Control (600,000 ohms) 38-38506  
16. Tubular Condenser (.01 mfd., 200 v.) 33-44789  
17. Resistor (4.7 meg., .4 watt) 33-347154  
18. Resistor (1250,000 ohms, .4 watt) 33-425154  
19. Tubular Condenser (.01 mfd., 400 v.) 38-46708  
20. Mica Condenser (150 mfd.) 61-0033  
21. Resistor (470,000 ohms, .4 watt) 33-447154  
22. Resistor (1250,000 ohms, .4 watt) 33-311533

**PRODUCTION CHANGES**

Several parts were changed in these models and the code numbers changed from 121 to 122. These changes are as follows:

**MODEL PT-41**

1. Code 121  
2. Code 122  
3. Code 123  

**Dial** 27-3354  
**Codes** 27-3570  
**Instructions** 39-6570  
**Loop Antenna Assembly** 38-9858  
**Tuning Condenser** 31-2469  

**MODEL PT-61**

1. Code 121  
2. Code 122  
3. Code 123  

**Dial** 27-3354  
**Codes** 27-3570  
**Instructions** 39-6570  
**Loop Antenna Assembly** 38-9858  
**Tuning Condenser** 31-2469
Model PT-35 is a five tube superheterodyne radio, covering a frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and 2.3 to 2.5 megacycles (M. C.) on the local police band.

**INTERMEDIATE FREQUENCY: 470 K. C.**

Models PT-37 and PT-53 are five tube superheterodyne radios covering a tuning frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and 5.5 to 19 megacycles (M. C.) on the short wave band. These models are similar with the exception of the cabinet.

Model PT-38 is a five tube superheterodyne radio, covering a frequency range from 540 to 1720 kilocycles (K. C.) on the broadcast band and from 5.5 to 19 megacycles (M. C.) on the short-wave band.

**FOR OTHER DATA SEE INDEX**

Model PT-50 is a five-tube superheterodyne radio covering a frequency range from 540 to 1580 kilocycles (K. C.)
Models PT-43 and PT-55 are five tube superheterodyne radios, covering a frequency range from 540 to 1560 kilocycles (K. C.) on the broadcast band and 2.3 to 2.5 megacycles (M. C.) on the local police police range.

These models are similar with the exception of the cabinets. The circuit diagram and parts list shown below apply to both models.

**INTERMEDIATE FREQUENCY**: 455 K. C.

One 7A8, converter; one 7B7, I. F. amplifier; one 7C6, 2nd detector, 1st audio, A. V. C.; one 35A5, audio output and one 3623, rectifier.

**PRODUCTION CHANGE**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.

**FOR OTHER DATA AND TUNER, SEE INDEX**

**PRODUCTION CHANGES**

**MODEL PT-43**

Code number changed from 121 to 122 in addition to several part changes. These are as follows:

- Loop Aerial Ass'y: 38-9936, 32-3402
- Tuning Condenser: 31-2436, 31-2446

Models PT-45 and PT-47 are five tube electric push-button tuning, superheterodyne radios with a manual tuning range covering 540 to 1720 kilocycles (K. C.).

Six electric push-buttons are provided on these models. Five of the push-buttons are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

The procedure for adjusting and operating the electric push-buttons for stations will be found on page 10.

**INTERMEDIATE FREQUENCY**: 470 K. C.

One 7A8, converter; one 7B7, I. F. amplifier; one 7C6, 2nd detector, 1st audio, A. V. C.; one 35A5, audio output and one 3623, rectifier.

**PRODUCTION CHANGE**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.
Models PT-46 and PT-48 are five tube electric push-button tuning superheterodyne radios with a manual tuning range covering 540 to 1580 K.C.

These models are similar with the exception of the cabinets.

---

**FOR OTHER DATA AND TUNER, SEE INDEX**

One 7A8, converter; one 7B7, I.F. amplifier; one 7C6, 2nd detector, 1st audio, A.V. C.; one 35A6, audio output and one 35Z5, rectifier.

Models PT-49 and PT-51 are five tube electric push button tuning superheterodyne radios with a manual tuning covering 540 to 1720 K.C. on the broadcast range and 2.3 to 2.5 megacycles (M.C.) on the local police range. These models are similar with the exception of the cabinet.

Six electric push-buttons are provided on these models. Five of the push-buttons are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

**INTERMEDIATE FREQUENCY: 470 K.C.**

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47,000 ohms to 22,000 ohms.
Models PT-57 and PT-65 are five tube electric push-button tuning superheterodyne radios with a manual tuning range covering 540 to 1580 K.C. The models are similar with the exception of the cabinets.

INTERMEDIATE FREQUENCY: 555 K.C.

The frequency of the local oscillator tubes was changed from 17000 Mc to 25000 Mc.

Model PT-59 is a five tube electric push-button tuning superheterodyne radio with a manual tuning range of 540 to 1720 K.C., on the broadcast range and 23 to 25 megacycles (M.C.), on the local police range.

To stabilize the oscillator circuit, and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from .0100 mfd. to .0200 mfd.

For Alignment and Tuner, see index.
Model PT-63 is a four tube portable battery operated superheterodyne receiver designed for reception of standard broadcast stations. In addition, other features included are a loop aerial built into the cabinet, extremely sensitive permanent magnet field speaker, automatic volume control and pentode audio output. **Intermediate Frequency**: 455 K.C. **Tuning Range**: 540 to 1550 K. C. **Battery Current**: “A” 200 m. a. “B” 5.6 m. a.

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuning Condenser</td>
<td>51-2422</td>
<td>12</td>
<td>Tubular Condenser (.006 μf., 400 v.)</td>
<td>50-4576</td>
</tr>
<tr>
<td>2</td>
<td>Mica Condenser (15 mmf.)</td>
<td>61-0038</td>
<td>13</td>
<td>Mica Condenser (.005 μf.)</td>
<td>50-1114</td>
</tr>
<tr>
<td>3</td>
<td>Mica Condenser (22 mmf.)</td>
<td>50-1031</td>
<td>14</td>
<td>Mica Condenser (.004 μf.)</td>
<td>50-1311</td>
</tr>
<tr>
<td>4</td>
<td>Oscillator Transformer</td>
<td>50-3917</td>
<td>15</td>
<td>Resistor (4.7 meg., 1/2 watt)</td>
<td>53-9471</td>
</tr>
<tr>
<td>5</td>
<td>Resistor (220,000 ohms, 1/2 watt)</td>
<td>53-92154</td>
<td>16</td>
<td>Resistor (1.5 meg., 1/2 watt)</td>
<td>53-915154</td>
</tr>
<tr>
<td>6</td>
<td>1st. I. F. Transformer</td>
<td>53-3265</td>
<td>17</td>
<td>Resistor (255 ohms, 1/2 watt)</td>
<td>53-913226</td>
</tr>
<tr>
<td>7</td>
<td>Tubular Condenser (.1 μf., 400 v.)</td>
<td>50-4576</td>
<td>18</td>
<td>Output Transformer</td>
<td>53-9058</td>
</tr>
<tr>
<td>8</td>
<td>Tubular Condenser (.01 μf., 200 v.)</td>
<td>50-4576</td>
<td>19</td>
<td>Speaker</td>
<td>50-1481</td>
</tr>
<tr>
<td>9</td>
<td>Mica Condenser (110 mmf.)</td>
<td>50-1031</td>
<td>20</td>
<td>Cone Assembly</td>
<td>50-1481</td>
</tr>
<tr>
<td>10</td>
<td>Tubular Condenser (.06 μf., 200 v.)</td>
<td>50-4576</td>
<td>(for Speaker 36-1481 3)</td>
<td>56-4421</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Resistor (35,000 ohms, 1/2 watt)</td>
<td>53-92154</td>
<td>21</td>
<td>Electrolytic Condenser</td>
<td>50-2993</td>
</tr>
<tr>
<td>12</td>
<td>Mica Condenser (250 mmf.)</td>
<td>50-1031</td>
<td>22</td>
<td>Battery Cells</td>
<td>50-1487</td>
</tr>
<tr>
<td>13</td>
<td>Mica Condenser (66 mmf.)</td>
<td>61-0038</td>
<td>23</td>
<td>Resistor (5800 ohms, 1/4 watt)</td>
<td>53-948154</td>
</tr>
</tbody>
</table>

Model PT-66 is a five tube, electric push-button tuning, superheterodyne radio with a manual tuning range covering 540 to 1560 K. C. Six electric push-buttons are provided on this model. Five of the push-buttons are used for stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loop Antenna Assembly</td>
<td>32-3158</td>
<td>21</td>
<td>Resistor (150 ohms, 1/4 watt)</td>
<td>33-113338</td>
</tr>
<tr>
<td>2</td>
<td>Tuning Condenser</td>
<td>31-2424</td>
<td>22</td>
<td>Tubular Condenser (.04 μf., 600 v.)</td>
<td>30-1419</td>
</tr>
<tr>
<td>3</td>
<td>Tubular Condenser (.05 μf., 200 v.)</td>
<td>50-4576</td>
<td>23</td>
<td>Output Transformer</td>
<td>33-113338</td>
</tr>
<tr>
<td>4</td>
<td>Mica Condenser (.02 μf., 200 v.)</td>
<td>50-4576</td>
<td>(for Speaker 36-1449-1)</td>
<td>32-8947</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Resistor (22,000 ohms, 1/2 watt)</td>
<td>53-92154</td>
<td>(for Speaker 36-1449-9)</td>
<td>32-8944</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mica Condenser (110 mmf.)</td>
<td>50-1130</td>
<td>(for Speaker 36-1449-9)</td>
<td>32-8944</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oscillator Transformer</td>
<td>53-3159</td>
<td>24</td>
<td>Speaker</td>
<td>36-1489</td>
</tr>
<tr>
<td>8</td>
<td>Tubular Condenser (.05 μf., 200 v.)</td>
<td>50-4576</td>
<td>Cone Assembly</td>
<td>36-1489</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1st. I. F. Transformer</td>
<td>53-3157</td>
<td>(for Speaker 36-1449-9)</td>
<td>36-1489</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2nd. I. F. Transformer</td>
<td>53-3178</td>
<td>(for Speaker 36-1449-11)</td>
<td>36-1489</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Resistor (2.2 meg.)</td>
<td>53-92154</td>
<td>(for Speaker 36-1449-11)</td>
<td>36-1489</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mica Condenser (250 mmf.)</td>
<td>41-0033</td>
<td>25</td>
<td>Tubular Condenser (.04 μf., 600 v.)</td>
<td>36-1110</td>
</tr>
<tr>
<td>13</td>
<td>Resistor (37,000 ohms, 1/2 watt)</td>
<td>53-30154</td>
<td>Electrolytic Condenser</td>
<td>36-1110</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Volume Control (500,000 ohms)</td>
<td>53-5396</td>
<td>(20-20 mfd., 150 v.)</td>
<td>36-2283</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Tubular Condenser (.01 μf., 200 v.)</td>
<td>50-4410</td>
<td>26</td>
<td>Field Coil—Part of Speaker No. 36-1495</td>
<td>36-1495</td>
</tr>
<tr>
<td>16</td>
<td>Resistor (2.2 meg.)</td>
<td>53-92154</td>
<td>27</td>
<td>Pilot Lamp</td>
<td>34-5958</td>
</tr>
<tr>
<td>17</td>
<td>Tubular Condenser (.01 μf., 200 v.)</td>
<td>50-4576</td>
<td>28</td>
<td>Line Resistor</td>
<td>30-3837</td>
</tr>
<tr>
<td>18</td>
<td>Resistor (270,000 ohms, 1/2 watt)</td>
<td>53-92154</td>
<td>29</td>
<td>Push Button Switch</td>
<td>42-1485</td>
</tr>
<tr>
<td>19</td>
<td>Mica Condenser (250 mmf.)</td>
<td>41-0038</td>
<td>30</td>
<td>Pedaling Loudspeaker</td>
<td>51-6226</td>
</tr>
</tbody>
</table>
INTERMEDIATE FREQUENCY: 455 K. C.

To stabilize the oscillator circuit and prevent oscillation at the high frequency end of the tuning dial, the oscillator grid leak was changed from 47000 ohms to 22000 ohms.

Model PT-67 is a five tube electric push-button tuning, superheterodyne radio with a manual tuning range covering 540 to 1580 K. C. on the broadcast band and 2.3 to 2.5 M. C. on the local police range.

Six electric push-buttons are provided on this model. Five push-buttons are used for selecting stations and one push-button for selecting dial tuning. The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.
Models 40-81, 40-82, Codes 121 and 122 are 4-tube portable battery operated superheterodyne receivers. These receivers are similar to the exception of the type tube used. Incorporated in the receiver is a self-contained loop aerial and an extremely sensitive permanent magnet field speaker. In addition terminals are provided for connection of an outside aerial and ground. The receiver is operated from a self-contained A-B battery pack.

**TUNING RANGE:** 510 to 1550 K.C.

**INTERMEDIATE FREQUENCY:** 455 K.C.

**BATTERY CURRENT:**
- "A" Battery, 200 M.A.
- "B" Battery, 50 M.A.

**FOR ALIGNMENT**

**SEE INDEX**

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**Model 40-82, Code 121**, in a 4-tube portable battery operated superheterodyne radio and covers the standard broadcast frequency range from 540 to 1550 K.C. This model is similar to Philco Model 49-81, Code 122, with the exception of the cabinet, and several of the replacement parts.

The following service data listed for Model 40-81, Code 122, also applies to Model 40-82, Code 121. The parts used in 40-82 which differ from those shown for Model 10-81, Code 122, are as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knob</td>
<td>37-4874</td>
</tr>
<tr>
<td>Pointer</td>
<td>37-4891</td>
</tr>
<tr>
<td>Scale</td>
<td>37-8991</td>
</tr>
<tr>
<td>Tuning Condenser</td>
<td>13-3438</td>
</tr>
<tr>
<td>Grille Screen</td>
<td>66-3265</td>
</tr>
<tr>
<td>Cabinet</td>
<td>104474A</td>
</tr>
</tbody>
</table>

**MODEL 40-82**

Model 40-82 is similar to Model 40-81, Code 122, with the exception of the following parts:

<table>
<thead>
<tr>
<th>Component</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grille Screen</td>
<td>56-1559</td>
</tr>
<tr>
<td>Scale</td>
<td>57-8535</td>
</tr>
<tr>
<td>Pointer</td>
<td>56-1326</td>
</tr>
</tbody>
</table>

The service data listed for Model 40-81, Code 122, applies to Model 40-82.

**MODEL 40-81, CODES 121-122**

To improve the padding at 1560 K.C. condenser (2) 25 mmfd. Part No. 19-1137 changed to 15 mmfd. Part No. 51-9038.

Tuning condenser, dial scale, and pointer changed on later production receivers. These changes are as follows:

- **Early**
  - Production
  - Tuning Condenser: 51-14502
  - Dial Scale: 27-5238
  - Pointer: 56-1326

- **Later**
  - Production
  - Tuning Condenser: 51-14602
  - Dial Scale: 27-5239
  - Pointer: 56-1326

**MODEL 40-81, CODE 122**

To improve the operating characteristics of the receiver at 550 K.C. and prevent oscillation, the following items should be observed:

1. The loop wire going to the I.A.T grid wire from the I.A.T grid to the wiring panel and the wire from the tuning condenser antenna section lug to the wiring panel must be kept as far away from the I.A.T tube as is possible.
2. The second I.F. section must be tightly fastened to the sub-base so that no openings exist between the base and the bottom of the shield.
### Production Changes

The two codes of this model differ only in cabinets, speakers, and cables as shown below:

<table>
<thead>
<tr>
<th>Code</th>
<th>Model 40-95 Part Description No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-1477-3</td>
<td>Speaker ........................................ 35-1488-3</td>
</tr>
<tr>
<td>36-4121</td>
<td>Cone Assembly ................................ 36-4129</td>
</tr>
<tr>
<td>41-3478</td>
<td>Battery Cable ............................... 41-5505</td>
</tr>
<tr>
<td>32-8051</td>
<td>Speaker-Socket .............................. 27-6115</td>
</tr>
<tr>
<td>32-8051</td>
<td>Output Transformer .......................... 32-8051</td>
</tr>
</tbody>
</table>

### Intermediate Frequency: 455 K.C.

**Battery Drain:** "A" 200 M.A. "B" 7.2 M.A.

**Model 40-95** is a four (4) tube battery operated superheterodyne radio covering a tuning frequency range from 540 to 1720 K.C.

For Alignment, See Index

**Model 40-90** is a four (4) tube battery operated superheterodyne radio covering a tuning frequency range from 540 to 1720 K.C.

### Production Changes

To improve the padding at 1500 K.C. of receivers with oscillator transformer (2) Part No. 32-3184 identified with red paint on a red lead, the following adjustments should be made:

1. Bond the oscillator padding condenser on the tuning-condenser back after removing the screw and mic.
2. Set the top of the pointer even with the bottom of the 1500 K.C. division line with set tuned to 1500 K.C.

**Intermediate Frequency: 455 K.C.**

**Battery Drain:** "A" 200 M.A. "B" 7.2 M.A.
INTERMEDIATE FREQUENCY: 455 K.C.

BATTERY DRAIN: "A" 200 M. A. "B" 7.2 M. A.

MODEL 40-100

Model 40-100 is a four (4) tube battery operated superheterodyne receiver with electric push-button tuning. This model covers a tuning frequency range of 540 to 1720 K.C. Features of design included in this model are: low current drain tube; automatic volume control and pentode audio output. The differences in the "codes" of this model are in the cabinet. Code 121 is assembled in a table model cabinet and Code 122 in a floor model.

ELECTRIC PUSH-BUTTON TUNING: Five (5) push-buttons are used for the broadcast stations and one push-button for selecting "dial tuning." The push-buttons cover a frequency range as follows: 540 to 1600 kilocycles.

FOR ALIGNMENT AND TUNER, SEE INDEX

Model 40-105 is a four (4) tube battery operated superheterodyne radio covering a tuning frequency range from 540 to 1720 K.C.
### Setting and Operating Electric Push-Button Tuning

In order to adjust the electric automatic tuning push-button accurately for reception of broadcast stations, it is necessary to select a frequency on the dial and adjust the push-button. The push-button should be adjusted for the highest frequency station on the dial and then the push-button should be adjusted for the lowest frequency station on the dial. The push-button should be adjusted by the following procedure:

1. Select five (5), seven (7) or eight (8) of the most popular stations received in the locality (depending on the number of push-buttons on the model to be adjusted). Insert the station call letters into the push-buttons. The station with the lowest frequency is placed in the first push-button on the left and the highest frequency station in the extreme right push-button. Each push-button is adjusted by two set screws. These set screws are located on the rear of the chassis on push-button unit. Each set of screws is numbered and covered a frequency range as follows:

#### Frequency Ranges of Push-Buttons

<table>
<thead>
<tr>
<th>Models 40-100, 40-110</th>
<th>Models 40-119, 40-200</th>
<th>Models 40-128, 40-135</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Frequency Range</td>
<td>Push Button</td>
</tr>
<tr>
<td>1</td>
<td>500-1000 K.C.</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>4000-6400 K.C.</td>
<td>5</td>
</tr>
</tbody>
</table>

Looking at the front of the cabinet, the first button on the left is adjusted by the “On” and “Ant.” set screws No. 1; the first push-button by “On” and “Ant.” set screws No. 2, and the remaining push-buttons in order.

2. Turn the receiver on and set the “Tuning Range Selector” or push-button for “Dial” tuning.

3. Set up the Model 077 signal generator about 3 feet from the receiver and connect a loop aerial (made from a few turns of wire 12 inches in diameter) to the “High” and “Ground” output jacks of the signal generator. Turn the output controls to maximum and set the modulation control to “Mod. 0.”

4. Manually tune in on the radio the first station to be set up, (usually No. 1 push-button first). 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.

5. Turn the receiver tuning selector to “push-button” and press in No. 1 button. (Models without a tuning selector, simply press in push-button to be set up). Using the insulated screwdriver, turn the No. 1 “On” screw until the broadcast station identified by the signal generator is heard. Then turn signal generator indicator off the frequency of the station.

6. Readjust No. 1 “On” and “Ant.” screws until the station is heard clearly and distinctly. The adjustment of No. 1 push-button is then complete. After setting up the first station the same procedure as outlined above is used for the remaining stations.

While the above procedure is satisfactory in setting up push-buttons for stations, a very accurate adjustment can be obtained with a vacuum tube voltmeter. The instructions for using a vacuum tube voltmeter will be found on page 10 under “Using Vacuum Tube Voltmeter for Aligning Compensators and Adjusting Push-Buttons.”

When any of these models are to be set up to receive the sound of a television program, tuned in by special type Philco television sets, or if they are to be used in conjunction with a Philco Record Player, push-button No. 1 should be used. To adjust the push-buttons on these instruments, the same procedure as outlined above is used.

Further details for setting up this receiver for operation with Philco Television sets and Record Players are supplied with the instruments.

### MODEL 40-124, CODE 122

Model 40-124, Code 122, is similar to Code 121 with the addition of a loop aerial mounted inside the cabinet and several part changes in the aerial circuit. These changes are shown in the following circuit diagram and parts list. The service information in RIVER'S VOLUMES XI, for Model 40-124, Code 121, with these changes, applies to Model 40-124, Code 122.

<table>
<thead>
<tr>
<th>SCHEMATIC NUMBER</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antenna Transformer</td>
<td>32-3804</td>
</tr>
<tr>
<td>1A</td>
<td>Tubular Condenser (0.015 mfd)</td>
<td>30-4525</td>
</tr>
<tr>
<td>1B</td>
<td>Loop Assembly</td>
<td>32-3405</td>
</tr>
<tr>
<td>2</td>
<td>Tuning Condenser</td>
<td>31-2450</td>
</tr>
<tr>
<td>3</td>
<td>Wega Condenser (500 mfd)</td>
<td>30-1181</td>
</tr>
</tbody>
</table>

**Incorporating the New 6C4D5 Tube**: The tube 6C4D5 is normally used inPhilco Radio and Television receivers, but it may be replaced by a 6C40 tube, which is available in the Philco replacement parts catalog. The 6C40 is a similar tube that is compatible with the 6C4D5 specifications. However, the exact specifications and performance characteristics may differ slightly between the two tubes.
Models 40-120 and 40-125 are six (6) tube super-heterodyne receivers employing the new Philco built-in super aerial system which eliminates an outside aerial, and Philco High Efficiency Loktal tubes. In addition, other features of design are: two tuning ranges; special high gain R. F. stage; automatic volume control and a Beam power audio output stage. In general, these models are similar but differ in their tuning mechanisms and cabinets.

Model 40-120 is dial tuned and assembled in cabinet type "K." Model 40-125 is equipped with six electric push buttons for automatically selecting stations in addition to dial tuning. Five push buttons are used for stations one of which can be used in combination with a special type PHILCO TELEVISION receiver for the reception of television sound programs. The sixth push button selects dial tuning.

POWER SUPPLY: 115 volts A. C. or D. C. current.

POWER CONSUMPTION: 25 watts.

AUDIO OUTPUT: 1 watt.
ALIGNING PROCEDURE

CONNECTING THE ALIGNING METER
The signal generator and receiver are connected to the side of the meter. Adjust the meter to one of the 513166 (or 513167) meters. When adjusting the meter, be sure that the meter is at the correct frequency. Adjust the meter to the correct frequency by using the frequency dial. When the meter is at the correct frequency, the meter will indicate the correct frequency. When adjusting the meter, be sure that the meter is not at the correct frequency. Adjust the meter to the correct frequency by using the frequency dial.

MODELS 40-120 and 40-125

VACUUM TUBE VOLTMETER—To use the vacuum tube voltmeter as an alignment tool, place the following connections:

1. Adjusting L.F. Circuit.
   - Remove the 1200 P.F. from the socket and insert the alignment adapter (the tube in the adapter). Connect the negative terminal of the vacuum tube voltmeter to the positive terminal of the adapter, and the positive terminal of the vacuum tube voltmeter to the negative terminal of the adapter.

   - To adjust the R.F. circuit, apply the voltage from the socket to the adapter. Connect the negative terminal of the vacuum tube voltmeter to the positive terminal of the adapter, and the positive terminal of the vacuum tube voltmeter to the negative terminal of the adapter.

NOTE A—"Dummy Antennas" consists of a connector connected to the signal generator output lead (High impedance). Use the band of the meter to match properly with the tuning condenser.

NOTE B—"Dial Calibration" is to adjust the receiver correctly. If the dial is not at the correct position, the dial must be aligned to track properly with the tuning condenser.

NOTE C—"Alignment Accuracy" consists of the R.F. condenser in the receiver. Use the band of the meter to match properly with the tuning condenser.

NOTE D—"Dial Calibration" is to adjust the receiver correctly. If the dial is not at the correct position, the dial must be aligned to track properly with the tuning condenser.

NOTE E—"Alignment Accuracy" consists of the R.F. condenser in the receiver. Use the band of the meter to match properly with the tuning condenser.
Each model is equipped with eight electric tuning push buttons for automatically selecting 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 use with a Philco Record Player, or in combination with Philco Television sets for reception of television sound programs.

In general, these models are similar with the exception of the number of tubes used and cabinet design. Model 40-150 employs seven (7) tubes and Model 40-155, eight (8) tubes.

Fig. 1. Schematic diagram, models 40-150, 40-155

Fig. 2. Part locations, underside of chassis.

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NOTE A — DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to the manufacturer's calibration. To do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully filled) and set the condenser in this position, set the tuning pointer to the extreme left index line at the low frequency end of the broadcast band.

NOTE B — The oscillator pointer (13B) and antenna pointer (12A) are located on top of the tuning condenser (12B) at the rear and (12A) at the front of the tuning condenser.

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MODELS 40-130, 40-135, 40-170C5
MODEL 40-14C, 40-141
MODEL 40-160

Schematic Diagram Model 40-160

For Tuner
See Index

CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOL. VIII

Run 1: To prevent oscillation on push button tuning, resistors (9) Part No. 32-2081 were removed from R. F. transformer (9) secondary. A new resistor Part No. 32-2083 is now added across primary winding of the same transformer.

Production Changes

Models 40-135 and 40-170 are similar in design with the exception of the cabinets, speakers, and several circuit changes. The Service Information for Model 40-135 covers the Model 40-170 with the exception of the part changes listed below.

Sche. No. | Description | Part No.
--- | --- | ---
1 | Loop Assembly | 38-4905
2 | Mica Condenser | 30-1104
30 | Tubular Condenser (1.000 mfd., 600 V.) | 30-4604
31 | Tubular Condenser (0.02 mfd., 600 V.) | 30-1559
34 | Cone and Voice Coil Assembly (For Speaker Part No. 36-140-5) | 36-4080

Cable (A, C) | Cabinet | 10452A
Speaker | 36-1140

Production Changes

Models 40-150 Run 3, 40-135, 40-170C5

To prevent oscillation at the low end of the broadcast band and 2nd I. F. transformer (21) changed from Part No. 32-2281 to Part No. 32-3353.

Model 40-170C5

The speaker, Part No. 36-1400-3 and cone assembly, Part No. 36-4686 listed in No. 1 change notice for Model 40-170C8 has been changed on later production receivers to speaker 36-1340-A. The cone assembly for this new speaker is
PRODUCTION CHANGES

MODEL 40-105

Run 4 — Beginning with Run 1 receives the converter tube was changed from a type 27J2A to a 27J2A octal type.

Run 3 — 626S1 converter tube socket Part No. 27-6120 reversed 180 degrees to prevent oscillation at 18 M.C. This change was made to improve oscillation at 18 M.C. Cathode resistor (84) changed from Part No. 33-111339 carbon type to Part No. 33-111339 wire-wound.

MODEL 40-105

Run 4 — Beginning with Run 1 receives the converter tube was changed from a type 27J2 to a 27J2A octal type.

Run 3 — 626S1 converter tube socket Part No. 27-6120 reversed 180 degrees to prevent oscillation at 18 M.C. This change was made to improve oscillation at 18 M.C. Cathode resistor (84) changed from Part No. 33-111339 carbon type to Part No. 33-111339 wire-wound.

To prevent oscillation at the low end of the broadcast band the 2nd I. F. transformer (ST) changed from Part No. 32-32495 to Part No. 32-32495. The physical location of condenser (a) as shown in Figs. 2 of the service bulletin has been changed to prevent oscillation at 500 K.C. The condenser is now located in a space on the wire between the range switch and the volume control. The antenna lead is connected in a lug in the rear of the panel. This change is made in all chassis marked 40-105 and Run Nos. 1, 2, 3, and 4.

MODELS 40-180, 40-185, 40-190

Beginning with Run 1 "F" the receiver the converter tube was changed from a type 6AG6 to a 6J7 I.F. Tube sockets changed from Part No. 27-6120 to Part No. 27-6120.

This change reverses the order made on Run No. 4.

SCH. No. DESCRIPTION PART No. SCH. No. DESCRIPTION PART No. SCH. No. DESCRIPTION

1 Loop Assy. (Broadcast) 32-8898 32 Tubular Cond. (.05 mf.) 30-4519 64 Line Cond. (Bakelite, .01-01 mf.) 3901271
1A Mica Cond. (250 mmfd.) 31-0063 33 Tubular Cond. (2 mf) 30-4526 65 Pilot Lamp 154-2210
1B Resistor (9000 ohms, 3/4 watt) 33-10310 34 Tubular Cond. (.01 mf) 30-4419 66 Wave Switch 42-1400
2 Loop Assy. (Short Wave) 32-8984 35 Tubular Cond. (100 mmfd.) 30-4970 67 Diode 33-12509
3 Coupling Transformer 32-9208 36 Tubular Cond. (650 mmfd.) 32-8868 68 Cabinet Model 40-180 10721
4 Mica Cond. (3 mmfd.) 32-10677 37 Mica Cond. (250 mmfd.) 32-8861 69 Cabinet Model 40-185 10791
5 Mica Cond. (1250 mmfd.) 32-8861 38 Mica Cond. (250 mmfd.) 32-8868 70 Cabinet Model 40-190 10791
6 Mica Cond. (250 mmfd.) 32-8868 39 Resistor (900 ohms, 3/4 watt) 33-19419 71 Cabinet No. 4 10721
7 Resistor (390 ohms, 3/4 watt) 33-19419 40A Tubular Cond. (10,000 ohms, 3/4 watt) 30-4663 72 Pilot Lamp Assy. 65-2801
8 Resistor (10,000 ohms, 3/4 watt) 33-10310 41 Tubular Cond. (0.01 mf.) 30-4522 73 Spring (Drive Cord) 28-8891
9 Tubular Cond. (650 mmfd.) 32-8868 42 Tubular Cond. (650 mmfd.) 30-4522 74 Dial Lamp Assy. 27-5508
10 Tubular Cond. (100 mmfd.) 32-8861 43 Tubular Cond. (100 mmfd.) 30-4522 75 Dial Tuning From Assy. 36-9856
11 Tubular Cond. (300 mmfd.) 32-1011 44 Tubular Cond. (0.01 mf.) 30-4522 76 Drive Card Assy. 28-2138
12 Transformer Assy. 32-2195 45 Tubular Cond. (0.01 mf.) 30-4522 77 Knobs (Tuning, Tone, Volume) 27-4532
13 Coupling Transformer 32-2195 46 Tubular Cond. (0.01 mf.) 30-4522 78 Knobs (Push Buttons) 28-4552
14 Mica Cond. (650 mmfd.) 32-8861 47 Tubular Cond. (0.01 mf.) 30-4522 79 Knobs (Push Buttons) 28-4568
15 Mica Cond. (100 mmfd.) 32-1044 48 Tubular Cond. (0.01 mf.) 30-4522 80 Knobs (Speaker) 28-4568
16 Silver Mica Cond. (376 mmfd.) 33-1118 49 Tubular Cond. (0.01 mf.) 30-4522 81 Speaker 36-1379
17 Silver Mica Cond. (200 mmfd.) 33-1118 50 Tubular Cond. (0.01 mf.) 30-4522 82 Dial (Dial) 36-1379
18 Silver Mica Cond. (376 mmfd.) 33-1118 51 Tubular Cond. (0.01 mf.) 30-4522 83 Tab (Television) 27-9949
19 Tubular Cond. (300 mmfd.) 30-2139 52 Tubular Cond. (0.01 mf.) 30-4522 84 Tab (Antenna) 28-9949
20 Tubular Cond. (500 mmfd.) 30-2139 53 Tubular Cond. (0.01 mf.) 30-4522 85 Tuning Shaft Assy. 28-9874
21 Tubular Cond. (500 mmfd.) 30-2139 54 Tubular Cond. (0.01 mf.) 30-4522 86 Washers 28-2044
22 Tubular Cond. (500 mmfd.) 30-2139 55 Tubular Cond. (0.01 mf.) 30-4522 87 Washers 28-2044
23 Tubular Cond. (500 mmfd.) 30-2139 56 Tubular Cond. (0.01 mf.) 30-4522 88 Washers (Spring Type, Tuning Shaft Assy.) 28-186
PRODUCTION CHANGES

MODEL 40-195, 40-200

Beginning with Run "A" receivers the converter tube is changed from a type 436C metal to a 277 metal. The tube sockets are changed from Part No. 27-6129 to 27-6139.

This change is identical to the change made on Run "A" receivers.

MODELS 40-195, 40-200, 18-301

To improve the passing at 1590 K. C. a .001 myst. condenser Part No. 30-3897 was connected in parallel with the present condenser (22H). This change is on all sets marked Run B.

To prevent low frequency rumele on various points on the dial scale, another condenser Part No. 30-4854, .004 myst. was connected in parallel with the present condenser (14) in the base compensation circuit.

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 1200 R. F. tube from its socket and insert the aligning adapter, then replace the tube in the socket. Connect the negative terminal of the vacuum tube voltmeter to the wire which protrudes from the side of the adapter. Attach the positive terminal of the voltmeter to the chassis.

2. ADJUSTING R.F. CIRCUIT:
   - To adjust the R.F. circuit, the aligning adapter is inserted in the 7CS A.F. tube socket. 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 paddles are adjusted. If an audio output meter is used, connect it to the plate and socket terminals of the 45 type tube and adjust the output meter for the 0 to 20 K. C. scale.

After connecting the aligning indicator, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown on the schematic diagram page No. 2. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

SIGNAL GENERATOR: When adjusting the L. F. paddles, the high side of the signal generator is connected through a .1 milf condenser to terminal No. 1 of the loop terminal panel at the rear of the chassis. The ground on low side of the signal generator is connected to the chassis of the receiver.

When aligning the R. F. paddles a loop is made from a few turns of wire and connected to the signal generator output terminal; the loop is then placed two or three feet from the front of the cabinet. Do not remove the receiver from the cabinet. It is necessary when adjusting the paddles, that the receiver be left in the cabinet.

Fig. 3

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operations</th>
<th>Output Connections to Receiver</th>
<th>Dummy Antenna Plate A</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators in Order</th>
<th>Receiver Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Side to No. 1 Loop Pin</td>
<td>1.0 K. C.</td>
<td>600 K. C.</td>
<td></td>
<td>500 K. C.</td>
<td>280, 28A</td>
</tr>
</tbody>
</table>
| 2          | Use Loop As Connector          | 1000 K. C.           | 1000 K. C.  | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 3          | Use Loop As Connector          | 1000 K. C.           | 1000 K. C.  | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 4          | Use Loop As Connector          | 800 K. C.            | 800 K. C.   | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 5          | Use Loop As Connector          | 800 K. C.            | 800 K. C.   | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 6          | Use Loop As Connector          | 800 K. C.            | 800 K. C.   | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 7          | Use Loop As Connector          | 1000 K. C.           | 1000 K. C.  | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 8          | Use Loop As Connector          | 5.0 M. C.            | 5.0 M. C.   | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B
| 9          | Use Loop As Connector          | 10.5 M. C.           | 10.5 M. C.  | Vol. Max. Range Switch "Breadth" | 280, 48         | See Note B

SPECIAL INSTRUCTIONS

See Note A

See Note B

Vol. Max. Range Switches

Check Signal Strength

Codes 121-122

- 121: 1000 K. C., 800 K. C., 1000 K. C.
- 122: 1000 K. C., 800 K. C., 1000 K. C.
**FIG. 2. REPLACEMENT PARTS, UNDERSIDE OF CHASSIS.**

### REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower Assembly (Transistor)</td>
<td>30-113008</td>
</tr>
<tr>
<td>2</td>
<td>Upper Transformer (400 watts)</td>
<td>30-113003</td>
</tr>
<tr>
<td>3</td>
<td>Speaker (100 watts)</td>
<td>30-203019</td>
</tr>
<tr>
<td>4</td>
<td>Transformer (4000 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>5</td>
<td>Transformer (1500 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>6</td>
<td>Transformer (2500 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>7</td>
<td>Transformer (3000 watts)</td>
<td>30-301900</td>
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<tr>
<td>8</td>
<td>Transformer (3500 watts)</td>
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<td>9</td>
<td>Transformer (4000 watts)</td>
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<td>10</td>
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<td>Transformer (5000 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>12</td>
<td>Transformer (5500 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>13</td>
<td>Transformer (6000 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>14</td>
<td>Transformer (6500 watts)</td>
<td>30-301900</td>
</tr>
<tr>
<td>15</td>
<td>Transformer (7000 watts)</td>
<td>30-301900</td>
</tr>
</tbody>
</table>

**Miscellaneous Parts**

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Battery (1.5 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>17</td>
<td>Battery (9 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>18</td>
<td>Battery (12 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>19</td>
<td>Battery (15 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>20</td>
<td>Battery (18 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>21</td>
<td>Battery (20 volts)</td>
<td>30-203001</td>
</tr>
<tr>
<td>22</td>
<td>Battery (22 volts)</td>
<td>30-203001</td>
</tr>
</tbody>
</table>

**FIG. 3. SCHEMATIC DIAGRAM. WIRELESS REMOTE CONTROL.**

**FIG. 4. WIRING OF STEPPER UNIT. WIRELESS REMOTE CONTROL.**
PHILCO RADIO & TELEVISION CORP.

MODELS 40-215RX
40-217RX

SPECIFICATIONS

Models 40-215, code 181, and 40-217, code 182, are twelve (12) tube super-heterodyne, super-sensitive, Philco Wireless Receivers with automatic tuning and are equipped for use with a Wireless Record Player.

The Wireless Record Player will automatically tune in eight (8) broadcast stations, increase and decrease volume and turn on and off the radio without leaving the seat, and the control unit.

The Wireless Record Player automatically selects the proper station, and tunes in the station automatically. The receiver will automatically select the station, and the correct volume control is set at the correct volume control.

To use the vacuum tube voltmeter, it is important to ensure that the instrument is connected to the A, V, C circuit as shown:

1. Connect the negative (-) terminal of the voltmeter to the grid of the 78 A.F. tube and the voltmeter wire attached to the resistor.

2. Connect the positive (+) terminal to the chassis ground terminal.

Audio output meter: If this type of meter is used as an aligning indicator, it should be connected to the plate and grid terminals of one of the 12 tubes. Adjust the meter for 0 to 10 volt A.C. scale.

When aligning the R.F. filter, adjust the R.F. and I.F. compensators in the order shown.

Connections are also provided for remote localities where station signal strength is exceptionally weak.

POWER SUPPLY: 115 volts, 60 cycles.

This model can also be operated on a 220 volt, 2 cycle power supply, changing the power transformers and several parts as indicated on the replacement parts on page 78.

FREQUENCY TUNING RANGES:

110 to 130 K.C.
110 to 240 K.C.
40 to 24 M.C.
6.5 to 24 M.C.

INTERMEDIATE FREQUENCY: 450 K.C.

PHILCO TUBES USED: Mountain 132, R.F. Amplifier; 1260; Detector Oscillator; 18, I.F. Amplifier; 576; 3rd Detector; A.V.C. (a); Audio L.O; 12Z2; Push-pull output; 8, 27, 8, 27, 25, etc.

CABINET DIMENSIONS:

Height: 25.75" Width: 22" Depth: 14.5"

WIRELESS REMOTE CONTROL: 12.7/10, 14.5/14.5.

A.C. QUARTZ: 7 Watts.

CONNECTING ALIGNING INSTRUMENTS

RECEIVER CIRCUIT ADJUSTMENTS — Models 40-215, 40-217

1. Output Connections to Receiver

<table>
<thead>
<tr>
<th>Operation</th>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>101, 111 Grid</td>
<td>120 K.C.</td>
<td>800 K.C.</td>
<td>Vol. Max Range</td>
<td>41A, 41B</td>
<td>Turn Out 240 Full</td>
</tr>
<tr>
<td>3</td>
<td>Use Loop on Generator</td>
<td>180 M.C.</td>
<td>1000 K.C.</td>
<td>Vol. Max Range</td>
<td>23B, 2A</td>
<td>7A on 240 Full</td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>180 M.C.</td>
<td>1000 K.C.</td>
<td>Vol. Max Range</td>
<td>23B, 2A</td>
<td>7A on 240 Full</td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>180 M.C.</td>
<td>1000 K.C.</td>
<td>Vol. Max Range</td>
<td>23B, 2A</td>
<td>7A on 240 Full</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>180 M.C.</td>
<td>1000 K.C.</td>
<td>Vol. Max Range</td>
<td>23B, 2A</td>
<td>7A on 240 Full</td>
</tr>
</tbody>
</table>

NOTE A — DIAL CALIBRATION: In order to adjust the receiver, the dial must be aligned to match properly with the tuning condenser. To do this, follow these steps:

1. Connect the voltmeter to the grid of the 78 A.F. tube and the voltmeter wire attached to the resistor.

2. Connect the positive (+) terminal to the chassis ground terminal.

3. Adjust the meter for 0 to 10 volt A.C. scale.

4. Use the vacuum tube voltmeter to adjust the R.F. and I.F. compensators in the order shown.

5. Adjust the dial pointer to the correct position.

NOTE B — See Wireless Remote Control Amplifier adjustments.

NOTE C — If two peaks (signals) are observed on the adjusting meter when aligning the crystal filter, tune the crystal filter to the second peak from the maximum capacity position (on all the way in).

NOTE D — If two peaks (signals) are observed on the aligning meter when adjusting the receiver, tune the crystal filter to the first peak from the maximum capacity position (on all the way in). When adjusting the receiver to this first peak, the second peak (when the second peak is observed) should be observed from the maximum capacity position (on all the way in).
PHILCO RADIO & TELEVISION CORP. MODELS 40-501 (121), 40-502 (121, 122)

FIG. 2. PHONOGRAPH WIRING AS USED ON MODEL 40-502, CODE 122

FIG. 1. PHONOGRAPH WIRING AS USED ON MODEL 40-502, CODE 121

SPECIAL INSTRUCTIONS

NOTE A.—DIAL CALIBRATION: The dial pointer is adjusted by closing the tuning condenser (plate fully meshed) and setting the pointer on the dial below 55 on the dial.

PRODUCTION CHANGES

MODEL 40-501, CODE 121: 40-502, CODES 121-122

Beginning with sets marked Run 7 resistor 47,000 ohms. Part No. 35-84734, was changed to 47,000 ohms. Part No. 35-84734.

MODEL 40-502, CODE 122

Motor (33) 115 volts, 60 cycle. Part No. 35-1216. The turntable for the new motor is Part No. 35-1216.
Models 40-508 and 40-509 are radio-phonograph combinations consisting of an 8 tube electric push button tuning superhetodyne radio and an automatic record changer. The same radio receiver is used in each model. The automatic record changer and cabinet, however, are different.

Model 40-508 employs an improved type automatic record changer, Philco Part No. 35-1176, which plays twelve 10" records or ten 12" records at one loading.

Model 40-509 incorporates the Philco Inter-Mix Record Changer Part No. 35-1176. This record changer plays fourteen 10" and 12" records intermixed, or fifteen 10" or thirteen 12" records at one loading.

The radio receiver of these models contains 8 electric push buttons; 6 of the electric push buttons are used for reception of stations, one for television sound and one to switch to dial tuning.

In addition, the Philco Built-In Super Aerial System is included in these models. This system eliminates an outside aerial and reduces local static interference to a minimum.

Included in the Built-In Super Aerial System is a statically shielded loop for broadcast band reception and a shortwave receiving loop. A feature of the built-in broadcast band statically shielded loop is that it may be turned to the position in which it picks up a minimum amount of interference if interference is not present, the loop may be set in the position where best reception is obtained. Outside aerial connections are also provided for remote localities where signal strength is weak.

**Power Supply:** 115 volts, 60 cycle A. C.

**Power Consumption:**
- Model 40-508: 90 watts.
- Model 40-509: 110 watts.

**Tuning Ranges:**
- Three 540 to 1560 K. C.
- 1.5 to 3.4 M. C.
- 6 to 18 M. C.

**Intermediate Frequency:** 455 K. C.

**Audio Output:** 2 watts.

### Replacement Parts — Models 40-508, 40-509

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Loop Assy. (Broadcasts)</td>
<td>38-9440</td>
</tr>
<tr>
<td>14</td>
<td>Loop Assy. (Special)</td>
<td>38-9423</td>
</tr>
<tr>
<td>19</td>
<td>Resistor (4000 ohms, 1/2 watt)</td>
<td>38-10938</td>
</tr>
<tr>
<td>16</td>
<td>Condenser (12000 mfd.)</td>
<td>38-9493</td>
</tr>
<tr>
<td>17</td>
<td>Condenser (2500 mfd.)</td>
<td>38-6693</td>
</tr>
<tr>
<td>18</td>
<td>Resistor (300 ohms, 1/2 watt)</td>
<td>38-13979</td>
</tr>
<tr>
<td>20</td>
<td>Condenser (15 mfd.)</td>
<td>38-81939</td>
</tr>
<tr>
<td>21</td>
<td>Condenser (10 mfd.)</td>
<td>38-81939</td>
</tr>
<tr>
<td>22</td>
<td>Condenser (20 mfd.)</td>
<td>38-7979</td>
</tr>
<tr>
<td>23</td>
<td>Condenser (250 mfd.)</td>
<td>38-6693</td>
</tr>
<tr>
<td>24</td>
<td>Condenser (3300 mfd.)</td>
<td>38-43393</td>
</tr>
<tr>
<td>25</td>
<td>Push Button Switch</td>
<td>38-4368</td>
</tr>
<tr>
<td>26</td>
<td>Push Button Switch (Phone Buttons)</td>
<td>38-4392</td>
</tr>
<tr>
<td>27</td>
<td>Cone Strip Assy.</td>
<td>38-4392</td>
</tr>
<tr>
<td>28</td>
<td>Cone Strip Assy.</td>
<td>38-4392</td>
</tr>
<tr>
<td>29</td>
<td>Coil No. 1</td>
<td>38-2942</td>
</tr>
<tr>
<td>30</td>
<td>Coil No. 2</td>
<td>38-2942</td>
</tr>
<tr>
<td>31</td>
<td>Coil No. 3</td>
<td>38-2942</td>
</tr>
<tr>
<td>32</td>
<td>Coil No. 4</td>
<td>38-2942</td>
</tr>
<tr>
<td>33</td>
<td>Coil No. 5</td>
<td>38-2942</td>
</tr>
<tr>
<td>34</td>
<td>Coil No. 6</td>
<td>38-2942</td>
</tr>
<tr>
<td>35</td>
<td>Coil No. 7</td>
<td>38-2942</td>
</tr>
<tr>
<td>36</td>
<td>Coil No. 8</td>
<td>38-2942</td>
</tr>
</tbody>
</table>

### Miscellaneous Parts

- Automatic Record Changer (Model 40-509). Additional: Parts Bulletin 3000. 38-1180

- Power Supply: 115 volts, 60 cycle A. C.

- Power Consumption:
  - Model 40-508: 90 watts.
  - Model 40-509: 110 watts.

- Tuning Ranges:
  - Three 540 to 1560 K. C.
  - 1.5 to 3.4 M. C.
  - 6 to 18 M. C.

- Intermediate Frequency: 455 K. C.

- Audio Output: 2 watts.
## Connecting Aligning Instruments

### Model 40-2710

**Signal Generator:** The signal generator is connected to the receiver as indicated in the tabulations below under “Output Connections to Receiver.” A dummy antenna is also required. This is listed under column, “Dummy Antenna, Note A.”

**Vacuum Tube Voltmeters:** To use the vacuum tube voltmeter as an aligning indicator it should be connected to the A. V. C. circuit with the Philco aligning adaptor, Part No. 40-2711, as follows:

1. Remove the 5C5 tube from its socket and insert the aligning adaptor in the tube, then replace the tube in the socket.
2. Connect the negative terminal of the vacuum tube voltmeter to the light colored wire which protrudes from the side of the adaptor. Attach the positive terminal of the voltmeter to the black wire.

### Table: SIGNAL GENERATOR vs RECEIVER SPECIAL INSTRUCTIONS

<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>
<th>Central Settings</th>
<th>Adjust Compensators</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ant. &amp; Grid.</td>
<td>400 ohms</td>
<td>21 M. C.</td>
<td>21 M. C.</td>
<td>Range Switch “S.W.”</td>
<td>41B, 41A</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>14A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>500 K. C.</td>
<td>500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>15A (Not)</td>
<td>Half Gang</td>
</tr>
<tr>
<td>5</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>14A</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>175 K. C.</td>
<td>175 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>15 (Screw)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ant. &amp; Grid.</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE A:** The “Dummy Antenna” consists of a condenser or resistance 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: With the tuning condenser closed (maximum capacity), set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale.

**NOTE C:** When adjusting compensator (29) be sure to tune in the fundamental signal (21 M.C.) instead of the image signal. If the compensator is correctly adjusted, the image signal will be found by turning dial 910 K. C. below the fundamental signal, which will be 20,000 M. C.

### Model 40-2725

**Vacuum Tube Voltmeter:** To use the vacuum tube voltmeter as an aligning indicator it should be connected to the A. V. C. circuit as follows:

1. Connect the negative (-) terminal of the voltmeter through a 2 meg. resistor to the converter grid (6SJ7/G). The resistor must be connected directly to the grid of the tube and the voltmeter wire attached to the resistor.
2. Connect the positive (+) terminal to the chassis ground terminal.

### Table: SIGNAL GENERATOR vs RECEIVER SPECIAL INSTRUCTIONS

<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>
<th>Central Settings</th>
<th>Adjust Compensators</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SJ7/G</td>
<td>.1 mfd.</td>
<td>455 K. C.</td>
<td>580 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>32B, 32A, 32B, 32A</td>
<td>Note B</td>
</tr>
<tr>
<td>2</td>
<td>Antenna and Ground</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>27, 22B, 22A</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna and Ground</td>
<td>200 mfd.</td>
<td>500 K. C.</td>
<td>500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antenna and Ground</td>
<td>200 mfd.</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Range Switch “Brdcst”</td>
<td>27, 22B, 22A</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Antenna and Ground</td>
<td>200 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>27A</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antenna and Ground</td>
<td>300 mfd.</td>
<td>75 K. C.</td>
<td>175 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>27A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Antenna and Ground</td>
<td>300 mfd.</td>
<td>300 K. C.</td>
<td>300 K. C.</td>
<td>Range Switch “L.W.”</td>
<td>27A</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Antenna and Ground</td>
<td>400 ohms</td>
<td>21 M. C.</td>
<td>21 M. C.</td>
<td>Range Switch “S.W.”</td>
<td>2B, 15, 5</td>
<td>Note C</td>
</tr>
</tbody>
</table>

**NOTE A:** The “Dummy Antenna” consists of a condenser or resistance 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: With the tuning condenser closed (maximum capacity), set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale. See Schematic Diagram.

**NOTE C:** When adjusting compensator (29) be sure to tune in the fundamental signal (21 M.C.) instead of the image signal. If the compensator is correctly adjusted, the image will be found by tuning dial 910 K. C. below the fundamental signal, which will be 20,000 M. C.
SPECIFICATIONS

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.

The unit is designed to operate on various power supplies as follows:

- 110 volts, 60 cycles: 110 volts, 25 cycles: 100 volts, 60 cycles.

To operate on any one of these power supplies, it is necessary that the proper power transformer and turntable motor is used as indicated in the parts list below.

To operate the unit:—Place record on turntable and slide "On-Off 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 K.C., (64 on most receivers), 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, turn the tone arm to rest position, which will automatically turn motor off. It is not necessary to slide "On-Off 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 520 K. C. and 580 K. C. 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 most cases it is preferable to use different receptacles 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.

PRODUCTION CHANGES

Master On-Off switch changed from Part No. 41-1446 to 42-1446.

Two types of motor and turntable assemblies were used on this model. The part numbers are as follows:

Motor — 110 volts, 60 cycles...
Motor — 110 volts, 60 cycles...

Turntable for Motor 35-1223...

Turntable for Motor 35-1214...

REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motor Switch</td>
<td>42-1557</td>
</tr>
<tr>
<td>2</td>
<td>Motor Switch</td>
<td>42-1562</td>
</tr>
<tr>
<td>3</td>
<td>Power Trans. (110 V, 60 cycles)</td>
<td>32-8043</td>
</tr>
<tr>
<td>4</td>
<td>Line Condenser (60 mfl, 600 V)</td>
<td>390-056</td>
</tr>
<tr>
<td>5</td>
<td>Power Trans. (110 V, 60 cycles)</td>
<td>35-1223</td>
</tr>
<tr>
<td>6</td>
<td>Motor (110 V, 60 cycles)</td>
<td>35-1216</td>
</tr>
<tr>
<td>7</td>
<td>Motor (220 V, 60 cycles)</td>
<td>35-1004</td>
</tr>
<tr>
<td>8</td>
<td>Motor (220 V, 60 cycles)</td>
<td>35-1005</td>
</tr>
<tr>
<td>9</td>
<td>Motor (220 V, 60 cycles)</td>
<td>35-1006</td>
</tr>
<tr>
<td>10</td>
<td>Crystal Pickup and Tone Arm</td>
<td>35-2069</td>
</tr>
<tr>
<td>11</td>
<td>Crystal Cartridge</td>
<td>35-2069</td>
</tr>
<tr>
<td>12</td>
<td>Filter Resistor (10,000 ohms, 1/2 watt)</td>
<td>33-31034</td>
</tr>
<tr>
<td>13</td>
<td>Oscillator Grid Cond. (110 mfl.)</td>
<td>30-1031</td>
</tr>
<tr>
<td>14</td>
<td>Oscillator Grid Resistor (99,000 ohms, 1/2 watt)</td>
<td>33-399344</td>
</tr>
</tbody>
</table>

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Comp. Resistor (51,000 ohms, 1/2 watt)</td>
<td>33-351344</td>
</tr>
<tr>
<td>11</td>
<td>Comp. Cond. (606 ohms, 200 V)</td>
<td>30-4467</td>
</tr>
<tr>
<td>12</td>
<td>Electrolytic Condenser (6 mfl, 6 mfl, 150 V, 60 cy.)</td>
<td>30-2358</td>
</tr>
<tr>
<td>13</td>
<td>Grid Resistor (1 mfl, 1/2 watt)</td>
<td>33-510344</td>
</tr>
<tr>
<td>14</td>
<td>Cathode Bias Resistor (1000 ohms, 1/2 watt)</td>
<td>33-203944</td>
</tr>
<tr>
<td>15</td>
<td>Screen By-Pass (1 mfl, 200 V)</td>
<td>30-4400-S</td>
</tr>
<tr>
<td>16</td>
<td>Screen Resistor (51,000 ohms, 1/2 watt)</td>
<td>33-351344</td>
</tr>
<tr>
<td>17</td>
<td>Pilot Light (6-12 V)</td>
<td>34-2066</td>
</tr>
<tr>
<td>18</td>
<td>Oscillator Coil &amp; Fuser Assem.</td>
<td>32-2218</td>
</tr>
<tr>
<td>19</td>
<td>Micro Condenser (250 mfl.)</td>
<td>30-1032</td>
</tr>
<tr>
<td>20</td>
<td>Coupling Condenser (30 mfl.)</td>
<td>30-1059</td>
</tr>
</tbody>
</table>

Two types of 110 volt, 60 cycle motors were used on this model, when ordering be sure correct turntable is ordered for motor.
TYPE CIRCUIT: Model 60-2790, code 121, is an Eleven (11) Tube, Crystal operated Superheterodyne receiver. The features of design included in this model are three (3) tuning ranges for reception of standard, large wave and short wave broadcast stations; connections for attaching a high impedance telephone, phonograph, phonograph pickup or automatic volume control; continuously variable tone control; band espression and a degenerated push-pull audio output circuit.

POWER SUPPLY: 115 or 225 Volt, 50 or 60 Cycle AC. 115 or 230 Volt, 25 to 40 Cycle AC.

The receiver is adjusted for operation on either of the above operating voltages by inserting the plug as indicated on top of the power transformer.

TUNING RANGES: 150 to 350 K.C. 530 to 1720 K.C. 75 to 22 M.C.

89 Tubaal Cond. (0.02 mfd.) 24-2452
99 Output Transformer ... 38-3308
80 Coax and Voice Coil Assy. (Spkr. Pr. No. 36-1800) 21-3406
61 Electrolytic Condenser (60 mfd., 450 V.) ... 30-2445
81 Electrolytic Condenser (60 mfd., 450 V.) ... 30-2445
62 Field Coil (Replace Spkr.)
64 Tubaal Cond. (2.2 mfd.) 30-4587
20 Resistor (33,000 ohms, 1/2 watt) 33-553329
18 Resistor (100,000 ohms, 1/2 watt) 33-101039
19 Resistor (1/2 watt) 33-101039
19 Resistor (33,000 ohms, 1/2 watt) 33-333339
19 Resistor (150,000 ohms, 1/2 watt) 33-151039
20 Power Transformer (100-130 V. 200-260 V., 50-60 cycles 32-8007
37 Pilot Lamp (Dia.) 34-2004K
57 Pilot Lamp (Dial) (XX Cabinet only) 34-2210K
44 Wave Switch 44-1585

MISCELLANEOUS PARTS

Rope 30-1228
Cable and Plug (Power Supply) ... 30-1228
Spec. Export A.C. Plug 30-1267
Cabinet (40-27627X) 30-1229
Dial 30-1230
Drive Cord Assy. (Dial) 31-3407
Felt Strip (Basal Mag.) 31-2282
Gasket (Dial Mag.) 32-2538
Knob (Turner) 32-2538
Knob (Turner) 32-4822
Knob (Volume and Wave Switch) 32-4822
Knob (Tone Control) 32-4822
Pointer 56-1276

REPLACEMENT PARTS

Model 60-2790

SCH. No. DESCRIPTION

19 Antenna Trans. (Broad) 33-1228
2 Antenna Cond. (2000 mfd.) 33-1223
19 Antenna Trans. (S.W.) 33-1206
2 Mica Cond. (70 mfd.) 33-1117
1 Compensator ... 33-1234
3 Resistor (1,000 ohms, 1/2 watt) 33-510339
7 Tubular Cond. (65 mfd.) 30-4209
27 Compensator (3 sections) 30-4377
27 Oscillator Trans. (Bread) 30-2325
29 Osc Trans. (Long Wave) 30-2317
30 Oscillator Trans. (W.W) 33-2102
31 Compensator ... 31-4289
32 Compensator ... 32-4288
34 Tracking Condenser ... 34-4289
35 Resistor ... 35-4288
36 Tubular Cond. (65 mfd.) 30-4218
37 Mica Cond. (5 mfd.) ... 30-1202
38 Resistor (68,000 ohms, 1/4 watt) 33-368319
39 Resistor (25,000 ohms, 1/2 watt) 33-322339
41 Resistor (33,000 ohms, 1/2 watt) 33-333339
42 Resistor (150,000 ohms, 1/2 watt) 33-151039
43 Tubular Cond. (200 ohms) 30-4519
44 Resistor (1500 ohms, 1/2 watt) 33-215359
46 Resistor (30,000 ohms, 1/2 watt) 33-301039
47 Resistor (70,000 ohms, 1/2 watt) 33-234739
48 Tubular Cond. (100 ohms) 30-4541
49 Resistor ... 49-423359
50 Tubular Cond. (100 ohms) 30-4541
51 Compensator ... 51-423359
52 Tubular Cond. (2000 ohms) 30-4519
53 Resistor ... 53-423359
54 Resistor ... 54-423359
55 Resistor ... 55-423359
56 Resistor ... 56-423359
57 Resistor ... 57-423359
58 Resistor ... 58-423359
59 Resistor ... 59-423359
60 Resistor ... 60-423359
61 Resistor ... 61-423359
62 Resistor ... 62-423359
63 Resistor ... 63-423359
64 Resistor ... 64-423359
65 Resistor ... 65-423359
66 Resistor ... 66-423359
67 Resistor ... 67-423359
68 Resistor ... 68-423359
69 Resistor ... 69-423359
70 Resistor ... 70-423359
71 Resistor ... 71-423359
72 Resistor ... 72-423359
73 Resistor ... 73-423359
74 Resistor ... 74-423359
75 Resistor ... 75-423359
76 Resistor ... 76-423359
77 Resistor ... 77-423359

NOTE A: The " dummy Antenna" consists of a condenser or resistance connected in series with the signal generator output (high side). Use the capacity of 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: With the tuning condenser closed (minimum capacity), set the dial pointer on the 0 mark on the left edge (long pointer) of the broadcast range. See diagram for dial pointer card adjustment.

NOTE C: Before adjusting pointer 37A, 37B, 37C, 37D, 37E, 37F, and pointer 20, all the way up. After the pointers are adjusted to maximum, then adjust pointer 20 for minimum.
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 signal generator is then placed close to the loop of the radio.

Signal Generator: When adjusting the I. F. padders, the high side of the signal generator is connected through a .1 mf condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

<table>
<thead>
<tr>
<th>Operations 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>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of tuning</td>
<td>458 K. C.</td>
<td>540 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K. C.</td>
<td>1600 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1600 K. C.</td>
<td>1600 K. C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL POINTER CALIBRATION—In order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, turn the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

NOTE B—Before adjusting compensators, turn down (10B) to tight position. Then adjust the compensators for maximum output at the following order: 12A, 12B, 10A, and 10B.

NOTE C—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust paddle (1B) to maximum at this point.

NOTE D—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust paddle (1A) to maximum at this point.
Signal Generator. When adjusting the L.F. padders, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

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 signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled. Locations are shown on Schematic.

<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>Dial Setting</td>
<td>Dial Setting</td>
<td>Control Setting</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1000 K.C.</td>
<td>1000 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

NOTE A: DIAL POINTER CALIBRATION—In order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, turn the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

NOTE B—Before adjusting compensators, turn down (14B) to tight position. Then adjust the compensators for maximum output in the following order: 18A, 18B, 14A and 14B.

NOTE C—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust padder (6B) to maximum at this point.

NOTE D—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust padder (6A) to maximum at this point.
PHILCO RADIO & TELEVISION CORP.

MODEL PT87
MODELS PT30, PT42, PT44, PT49

SCHEMATIC DIAGRAM — PT-87

When aligning the R. F. generator a loop is made from a few turns of wire and connected to the signal generator output terminals. The signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

After connecting the aligning instruments adjust the compensators as shown in the tabulation below.

If the indicating meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

PART LOCATIONS — UNDERSIDE OF CHASSIS PT-87

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations in Order</td>
<td>Output Connections to Receiver</td>
<td>Control Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of tuning</td>
<td>440 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1300 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1300 K. C.</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 do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 560 K. C.

NOTE B: When adjusting the I.F. compensators of Models PT-30 and PT-49, turn compensator (11B) clockwise to the tightest position and pad compensators 11A, 13A and 13B to maximum output, then pad 11B to minimum.
Model 41-220, is manually tuned and employs two tuning ranges covering 540 to 1600 K.C. and 1.6 to 3.3 M.C.

Model 41-225 has Electric Push-button tuning in addition to Manual tuning and two tuning ranges covering the same frequencies as Model 41-220. The electric push-button mechanism consists of six (6) push-buttons. One push-button is used to turn the power source OFF and ON and the remaining five (5) for automatically tuning in broadcasting stations.
PHILCO RADIO & TELEVISION CORP. MODELS 41-220, 41-222

OPERATION

Place record on turntable and slide "Off-On Switch" (Figure 1) 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.

Tune the radio to approximately 540 KC. (54 or 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.

OPERATION VERY CLOSE TO THE RECEIVER: A range switch will be found on the lower side of the drawer. (See Figure 2). If the player is installed very close to the receiver, slide this switch to the "near" position for best tone quality. When the player is more than a short distance from the receiver, with the switch in the "near" position, the noise in the receiver will be louder than the music from the record. In this case, leave the range switch in the "distant" position. After the best position for the range switch is determined, it is not necessary to change it as long as the player and receiver are not moved. Note after changing position of switch it is advisable to either return the record player or the radio.

INTERFERENCE

If interference from broadcasting stations is encountered, the frequency of the unit can be changed to any other frequency between 530 KC. and 570 KC. by removing snap button and adjusting small screw indicated in Diagram "A". 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 most cases it is preferable to use different receptacles for record player and radio.

NOTE A - DIAL CALIBRATION: In order to adjust the receiver correctly, the dial must be aligned to read 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, set the tuning pointer on the extreme left index line at the low frequency end of the broadcast scale.

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Model 41-221 is manually tuned and is assembled in two type (C & Cl) cabinets. Type "C" is a diagonal grain Sapel wood cabinet with carrying handle. Cabinet Type "Cl" use diagonal grained walnut wood with ivory finished bezel, knobs and trim.

Model 41-226 incorporates Electric Push-button tuning in addition to manual tuning and is assembled in a sliced Walnut Cabinet. The electric push-button mechanism consists of six (6) push-buttons. One push-button is used to turn the power off and on. The remaining five (5) push-buttons automatically tune in stations.

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 signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.
PHILCO RADIO & TELEVISION CORP.
MODELS 41-230, 41-235 (121)

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 signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet. If adjustments are made outside the cabinet a service tuning scale, Part No. 45-2819, will be required. This scale is placed underneath the pointer on the metal dial plate.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

<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>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>Ant. Section of Tuning Cond.</td>
<td>455 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Loop—See above instructions</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop—See above instructions</td>
<td>1500 K. C.</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 do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the extreme left index line at the low frequency end of the broadcast scale.
SPECIFICATIONS

Model 41-240

TYPE OF CIRCUIT: Model 41-240, Code 126, is a seven 441 tube radio receiver. Features include a large aerial band switch for selecting the proper band for the desired station. The receiver employs the Philco "Direct" system for improved selectivity.

AUDIO OUTPUT: 100 mV at 1000 ohms

SELECTIVITY: Good

POWER SUPPLY: 12 volts B+ 15 volts B-

DIMENSIONS: Height 11 1/4 in. Width 18 1/4 in. Depth 9 1/4 in.

Model 41-245

TYPE OF CIRCUIT: Model 41-245, Code 125, is a seven 441 tube radio receiver. Features include a large aerial band switch for selecting the proper band for the desired station. The receiver employs the Philco "Direct" system for improved selectivity.

AUDIO OUTPUT: 100 mV at 1000 ohms

SELECTIVITY: Good

POWER SUPPLY: 12 volts B+ 15 volts B-

DIMENSIONS: Height 11 1/4 in. Width 18 1/4 in. Depth 9 1/4 in.

ALIGNING R.F. AND I.F. COMPENSATING CONDENSERS

THE FOLLOWING PROCEDURE IS THE SAME FOR BOTH MODELS.

Model 41-240

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operating Freq.</th>
<th>Output Coupling</th>
<th>Tuning Condenser</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>460 K.C.</td>
<td>460 K.C.</td>
<td>460 K.C.</td>
<td></td>
</tr>
<tr>
<td>500 K.C.</td>
<td>500 K.C.</td>
<td>500 K.C.</td>
<td></td>
</tr>
<tr>
<td>600 K.C.</td>
<td>600 K.C.</td>
<td>600 K.C.</td>
<td></td>
</tr>
<tr>
<td>650 K.C.</td>
<td>650 K.C.</td>
<td>650 K.C.</td>
<td></td>
</tr>
<tr>
<td>700 K.C.</td>
<td>700 K.C.</td>
<td>700 K.C.</td>
<td></td>
</tr>
<tr>
<td>750 K.C.</td>
<td>750 K.C.</td>
<td>750 K.C.</td>
<td></td>
</tr>
<tr>
<td>800 K.C.</td>
<td>800 K.C.</td>
<td>800 K.C.</td>
<td></td>
</tr>
</tbody>
</table>

RECEIVER

<table>
<thead>
<tr>
<th>Operating Freq.</th>
<th>Output Coupling</th>
<th>Tuning Condenser</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>460 K.C.</td>
<td>460 K.C.</td>
<td>460 K.C.</td>
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</tr>
<tr>
<td>500 K.C.</td>
<td>500 K.C.</td>
<td>500 K.C.</td>
<td></td>
</tr>
<tr>
<td>600 K.C.</td>
<td>600 K.C.</td>
<td>600 K.C.</td>
<td></td>
</tr>
<tr>
<td>650 K.C.</td>
<td>650 K.C.</td>
<td>650 K.C.</td>
<td></td>
</tr>
<tr>
<td>700 K.C.</td>
<td>700 K.C.</td>
<td>700 K.C.</td>
<td></td>
</tr>
<tr>
<td>750 K.C.</td>
<td>750 K.C.</td>
<td>750 K.C.</td>
<td></td>
</tr>
<tr>
<td>800 K.C.</td>
<td>800 K.C.</td>
<td>800 K.C.</td>
<td></td>
</tr>
</tbody>
</table>

MODEL 41-240 — PART LOCATIONS, UNDERSIDE OF CHASSIS

MODEL 41-245 — PART LOCATIONS, UNDERSIDE OF CHASSIS

Replacement Parts — Model 41-240

MISCELLANEOUS PARTS

PHILCO RADIO & TELEVISION CORP.
**FIG. 1 — SCHEMATIC DIAGRAM — MODELS 41-250, 41-255**

The above diagram is the complete electrical circuit for Model 41-255. The same general circuit is also used in Model 41-250 with the exception of the 2nd detector, 1st audio, A. V. C. wiring which is shown in Fig. 4.

**FIG. 2 — LOCATIONS OF PARTS AND TUBES UNDERSIDE OF CHASSIS — MODEL 41-250**

**FIG. 4 — 2ND DETECTOR AND AUDIO CIRCUIT MODEL 41-250**

FOR ALIGNMENT
AND TUNER
SEE INDEX

**JUNE 1946**

INSTALLATION OF DRIVE GEAR POINT AT LOW FREQUENCY END OF DIAL. DIAL CLOSED
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 the schematic.

NOTE B—When adjusting the low frequency compensator of the broadcast or the aerial paddles of the high frequency tuning range: the receiver Tuning Condenser must be adjusted (rolled) as follows: First, turn 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 maximum output reading is obtained.

NOTE C—Adjust compensator (27A) to first peak from closed position (maximum capacity). The aerial compensator (8A) must also be adjusted to maximum on the second signal peak by rolling the tuning condenser (See Note B). The aerial compensator (8A) must also be adjusted to maximum on the first signal peak by rolling the tuning condenser (See Note B).
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 signal generator is then placed close to the loop of the radio.

Schematic Diagram — Model 41-258, Code 122

<table>
<thead>
<tr>
<th>RECEPTOR</th>
<th>DIAL SETTING</th>
<th>CONTROL SETTING</th>
<th>ADJUST COMPENSATORS IN ORDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
<td>Vol. Max.</td>
<td>6B Tuning Condenser</td>
</tr>
<tr>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
<td>Vol. Max.</td>
<td>6A Tuning Condenser</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 do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 86 on the dial.

NOTE B: The police band padding is automatically adjusted by the standard broadcast padders.
Models 41-260 and 41-265 are seven (7) tube alternating current (A.C.) operated superheterodyne radios incorporating electric push button in addition to manual tuning—and the new Philco built-in American and overseas loop aerial system. These models are also designed to receive the sound of a television program tuned in by special type Philco Television Radios.

In general, these models are similar with the exception of the tuning ranges and cabinet design. Model 41-260 has two (2) tuning ranges covering 540 to 1720 K.C. and 9.0 to 12.0 M.C. Model 41-265 consists of three (3) tuning ranges covering 540 to 1720 K.C., 2.0 to 7.0 M.C. and 9.0 to 12 M.C.
PROCEDURE FOR SETTING AND OPERATING THE ELECTRIC PUSH BUTTON TUNING

To adjust the top point (A) of the coil, connect the output generator through the instrument to the coil and adjust the coil to the desired point. The coil should be adjusted to the center of the coil. For the electric push button to operate, the coil must be in the center of the coil. The coil should be adjusted to the center of the coil.

ADJUSTING ELECTRIC PUSH BUTTON TUNING

To adjust the electric push button tuning, select the channel in the instrument and set the coil to the desired point. The coil should be adjusted to the center of the coil. For the electric push button to operate, the coil must be in the center of the coil. The coil should be adjusted to the center of the coil.

ADJUSTING ELECTRIC PUSH BUTTON TUNING

To adjust the electric push button tuning, select the channel in the instrument and set the coil to the desired point. The coil should be adjusted to the center of the coil. For the electric push button to operate, the coil must be in the center of the coil. The coil should be adjusted to the center of the coil.

ADJUSTING ELECTRIC PUSH BUTTON TUNING

To adjust the electric push button tuning, select the channel in the instrument and set the coil to the desired point. The coil should be adjusted to the center of the coil. For the electric push button to operate, the coil must be in the center of the coil. The coil should be adjusted to the center of the coil.
SIGNAL GENERATOR: When adjusting the I.F. paddles, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

The phonograph is automatically started when the pickup is lifted from its rest. A special switch operated by the pickup rest, applies power to the phonograph motor and opens the cathode circuit of the radio. The sound output of the radio and phonograph is controlled by a new type dual volume control which also operates the power switch.

When aligning the R.F. paddles a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

After connecting the aligning instruments adjust the compensators as shown in the tabulation below. Locations are shown on Schematic.

If the indicating meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

---

**NOTE A—DIAL POINTER CALIBRATION**—In order to adjust the receiver correctly, the pointer must be adjusted to track properly with the tuning condenser. To do this, turn the tuning condenser to the maximum capacity (plates fully meshed). With the condenser in this position, set the tuning pointer on the first small line stamped in the scale plate on the left side.

**NOTE B**—Before adjusting compensators, turn down (18B) to tight position. Then adjust the compensators for maximum output in the following order: 12A, 12B, 10A, and 10B.

**NOTE C**—Turn tuning condenser until dial pointer is on the first small line stamped in the scale plate from right side of chassis. Adjust paddler (7B) to maximum at this point. If the radio is adjusted in the cabinet, set dial pointers to 1600 K.C.

**NOTE D**—Turn tuning condenser until dial pointer is on the second small line stamped in the scale plate from right side of chassis. Adjust paddler (7A) to maximum at this point.
In general, these models are similar with the exception of the audio circuits, number of tubes used and cabinet design. Model 41-220 is an eight (8) tube radio; Models 41-285 and 41-287 are nine (9) tube radios employing the same chassis but assembled in different cabinets, and Model 41-290 consists of a ten (10) tube chassis. These differences are shown in the schematic diagram and parts lists.

Other features of design included in these models are: Three tuning ranges covering the frequencies listed below, continuously variable tone control; audio bass frequency compensation at low volume; Push-pull pentode audio output circuit with screen Phase Inversion; New Type (12) twelve inch speaker and illuminated push button indicators.


FREQUENCY TUNING RANGES: 540 to 1720 K. C.; 2.5 to 7.0 M. C.; 9.0 to 12.0 M. C.
Either a vacuum tube voltmeter or an audio output meter may be used as a signal indicator when adjusting the receiver.

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, make the following connections: Attach the negative (-) terminal of the voltmeter to any point in the circuit where the A. V. C. voltage can be obtained. Connect the positive (+) terminal of the vacuum tube voltmeter to the chassis.

Audio Output Meter: Terminal No. 1 is provided on the loop aerial panel for connecting one lead of the audio output meter to the voice coil of the speaker. The other lead of the meter is connected to the chassis. When using these connections, the lowest A. C. scale of the meter must be used (0 to 10 Volts).

The audio output meter can also be connected between the plate of the output tube and the ground of the chassis.

Signal Generator: When adjusting the “I. F.” padders, the high side of the signal generator is connected through a .1 mf. condenser to terminal 4 of the loop aerial terminal panel at the rear of the chassis. The ground or low side of the signal generator is connected to the ground 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 receiving loop from the cabinet. It is necessary when adjusting the paddlers, that the receiver be left in the cabinet.

After connecting the aligning indicator, adjust the compensators in the order shown in the tabulation below. Locations of the compensators are shown on the schematic diagram. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

<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</td>
<td>Dial Setting</td>
<td>Control Setting</td>
<td>Adjust Compensation</td>
</tr>
<tr>
<td>to Receiver</td>
<td></td>
<td></td>
<td>in Order</td>
</tr>
<tr>
<td>1</td>
<td>High Side to No. 4</td>
<td>450 K. C.</td>
<td>26A, 26B, 27A, 27B, 27C</td>
</tr>
<tr>
<td></td>
<td>Terminal Loop Panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator</td>
<td>1500 K. C.</td>
<td>26A, 10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Use Loop on Generator</td>
<td>880 K. C.</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Use Loop on Generator</td>
<td>Repeat Operation No. 2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Use Loop on Generator</td>
<td>6 M. C.</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>Use Loop on Generator</td>
<td>12 M. C.</td>
<td>21A, 9A</td>
</tr>
<tr>
<td>7</td>
<td>Use Loop on Generator</td>
<td>18 M. C.</td>
<td>218, 9</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 the schematic.

NOTE B — When adjusting the compensator, the receiver Tuning Condenser must be adjusted (rolled) 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 maximum output reading is obtained.

NOTE C — Adjust compensator (21) to the Second signal peak from the tight (closed) position. The tuning condenser should also be Rolled when the paddler is being adjusted on this peak. See Note B on how to Roll the Condenser.

NOTE D — Adjust compensator (21A) to the First signal peak from the tight (closed) position. If the compensator is correctly adjusted the image signal will be weakly heard by leaving the receiver dial at 13 M. C. and turning the signal generator to 11,000 M. C.

NOTE E — Adjust compensator (21B) to the Second signal peak from the tight (closed) position. If the compensator is correctly adjusted the image signal will be weakly heard by leaving the receiver at 11 M. C. and turning the signal generator to 19,810 M. C. When adjusting compensator (9) roll the tuning condenser. See Note B on how to roll the condenser.

INSTALLATION OF DRIVE CORD
FIG. 5. SCHEMATIC DIAGRAM

The voltages indicated at the tube elements above.
PHILCO MODEL 027. LINE VOLTAGE 118 VOLTS, A. C. 80-120V.

SEPTEMBER, 1940

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TELEVISION CORP.

MODEL 41-316(121)

I.F. = 455 KC.

MODEL 41-316. CODE 121

RE MEASURED WITH A 1000 OHMS PER VOLT VOLTMETER.
SWITCH (BROADCAST). NO STATION BEING RECEIVED.
ADJUSTING FOR PUSH-BUTTON AND REMOTE CONTROL OPERATION

ADJUSTMENT CHART FOR MODEL 41-516

<table>
<thead>
<tr>
<th>PART</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 V</td>
</tr>
<tr>
<td>2</td>
<td>20 V</td>
</tr>
<tr>
<td>3</td>
<td>30 V</td>
</tr>
</tbody>
</table>

Operating Instructions:

1. Connect the power supply to the TV set.
2. Tune in a strong signal.
3. Adjust the remote control's range by turning the knobs.
4. Adjust the volume and contrast to your liking.

© John F. Rider, Publisher
When aligning the R.F. selector a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio. After connecting the aligning instruments adjust the compensators as shown in tabulation.

Locations of the I.F. compensators are on top of the tuning condenser, oscillator on the front, and aerial on rear. The 1st and 2nd I.F. transformers are on top of the chassis.

<table>
<thead>
<tr>
<th>Operations 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>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
<td>1500 K.C.</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 do this, proceed as follows: Turn the tuning condenser to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 850 K.C.
PHILCO RADIO & TELEVISION CORP.

MODELS 41-290, 41-295, 41-297, 41-299(121)

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations in Order</td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>High side to No. 4 terminal loop panel.</td>
<td>458 K. C.</td>
</tr>
<tr>
<td>2</td>
<td>Use loop on generator</td>
<td>1800 K. C.</td>
</tr>
<tr>
<td>3</td>
<td>Use loop on generator</td>
<td>580 K. C.</td>
</tr>
<tr>
<td>4</td>
<td>Use loop on generator</td>
<td>Perform operation No. 2 again</td>
</tr>
<tr>
<td>5</td>
<td>Use loop on generator</td>
<td>6 M. C.</td>
</tr>
<tr>
<td>6</td>
<td>Use loop on generator</td>
<td>12 M. C.</td>
</tr>
</tbody>
</table>

Note A — Dial Calibration: In order to adjust the receiver completely, 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 at 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 the schematic.

Note B — When adjusting the low frequency compensator of Range One (Broadcast) or the aerial paddles of the high frequency tuning range; the receiver Tuning Conondenser must be adjusted (rolled) as follows: First tune the compensator for maximum output, then vary the tuning condenser for maximum output. Now turn the compensator slightly to the right or left and again vary the condenser for maximum output. This procedure is first setting the compensator and then varying the tuning condenser.

Note C — To accurately adjust the high frequency oscillator compensator to the fundamental instead of the image signal, turn the oscillator compensator (17A) to the maximum capacity position (clockwise) from this position slowly turn the compensator counter-clockwise until a first peak is obtained at the output meter. Adjust the compensator for maximum output at this first peak. If the above procedure is correctly performed, the image signal will be tuned (much weaker) by turning the receiver dial 910 K. C. above the frequency being used on any high frequency range.

The aerial paddle (2) must be adjusted to maximum by rolling the tuning condenser. If two signal peaks occur when turning the paddle, adjust to maximum output on the second signal peak from the tight position (screw all the way down) of the paddle.

MODEL 41-603

Part Locations — Underside of Chassis

Audio Output Meter: If this type of aligning meter is used, connect it to the voice coil terminals of the speaker or from the plate of the 5A4 tube to the chassis. Adjust the meter for the 0 to 10 volt scale.

Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, make the following connections: Attach the negative (-) terminal of the voltmeter to any point in the circuit where the A. C. voltage can be obtained. Connect the positive (+) terminal of the vacuum tube voltmeter to the chassis.

Signal Generator: When adjusting the I. F. paddles, the high side of the signal generator is connected through a 4.7M ohm resistor to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

Operations in Order

<table>
<thead>
<tr>
<th>Output Connections to Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ant. Section of tuning</td>
</tr>
<tr>
<td>Loop see above instructions</td>
</tr>
<tr>
<td>Loop see above instructions</td>
</tr>
<tr>
<td>Loop see above instructions</td>
</tr>
</tbody>
</table>

Dial Setting

<table>
<thead>
<tr>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensator in Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800 K. C.</td>
<td>Vol Max. Range Switch Brdct.</td>
<td>17C</td>
</tr>
<tr>
<td>1800 K. C.</td>
<td>Vol Max. Range Switch Brdct.</td>
<td>8</td>
</tr>
<tr>
<td>12 M. C.</td>
<td>Range Switch &quot;S. W.&quot;</td>
<td>17, 4</td>
</tr>
</tbody>
</table>

Special INSTRUCTIONS

Model 41-604, 41-605, 41-607

Part Locations — Underside of Chassis

When aligning the R. F. paddles a loop is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio. The receiver can be adjusted in the cabinet or removed from the chassis.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled. After connecting the aligning instruments adjust the compensators as shown in the tabulation below. Locations of the compensators are shown in the schematic diagram.

If the indicating meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

Part Locations — Underside of Chassis

When adjusting the aerial paddle (2) of the high frequency tuning range; the receiver Tuning Condenser must be adjusted (rolled) 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 left or right and again vary the tuning condenser for maximum output. This procedure is first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

NOTE A — 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 (plate fully meshed). With the condenser in this position, set the tuning pointer on the small dot below 500 K. C. When adjusting the aerial paddle (2) of the high frequency tuning range; the receiver Tuning Condenser must be adjusted (rolled) 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 left or right and again vary the tuning condenser for maximum output. This procedure is first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

NOTE B — When adjusting oscillator compensator (17A) turn the oscillator compensator (17A) to the maximum capacity position (clockwise) from this position, slowly turn the compensator counter-clockwise until a first peak is obtained at the output meter. Adjust the compensator for maximum output at this first peak. If the above procedure is correctly performed, the image signal will be tuned (much weaker) by turning the receiver dial 910 K. C. above the frequency being used on any high frequency range.
A.—ADJUSTING WIDTH OF LIGHT-BEAM
To make this adjustment push the lamp socket assembly into its holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is 5/32” in width. The socket assembly is now rotated so that the spot light is vertical.

B.—POSITIONING THE LIGHT-BEAM
To position the light-beam on the light cell, turn the adjusting screw at the lower left side of the reproducer until the spot is half on the cell and half on the metal frame surrounding the cell.

C.—ADJUSTING INTENSITY OF LAMP
When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by compensator (22) located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.
2. While the record is playing, turn compensator in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

D.—INSTALLING NEW LAMP
When installing a new lamp in the socket, there are two positions in which the lamp can be inserted. Ordinarily, either of these positions can be used. In some cases, however, due to the lamp filament being off center, the lamp must be inserted in the position that gives the best centering of the spot of light on the vibrating mirror.
MODELS 41-608, 41-609
Codes 121 and 122

PHILCO RADIO & TELEVISION CORP.

Models 41-608 and 41-609, Code 122, are similar to Models 41-608 and 41-609, Code 121, with the exception of the phonograph amplifier tube and circuit. A type 7C6 tube is used in the phonograph amplifier in the 41-608 and 41-609, Code 122, chassis, whereas a 7C7 tube is used in the Code 121.

The Code 122 "Specifications", "Light-Beam Reproducer Adjustments" and "Aligning R. F. and I. F. Compensators" instructions are the same as those given for Code 121.

41-608 AND 41-609, CODE 122

TUBE SOCKET VOLTAGES

D. C. voltages were measured with a 1000 ohms per volt voltmeter, Philco Model G27. Line voltage 120 volts A. C., no signal being received — range switch broadband.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate Location</th>
<th>Radio Pos.</th>
<th>Phone Pos.</th>
<th>B. E. Val.</th>
<th>D. C. Val.</th>
</tr>
</thead>
<tbody>
<tr>
<td>78S Qst</td>
<td></td>
<td>27</td>
<td>182</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78S</td>
<td></td>
<td>27</td>
<td>182</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78S</td>
<td>Screen</td>
<td>7</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XYL 1st Det</td>
<td>Plate</td>
<td>130</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XYL 1st Det</td>
<td>Bias (Cathode)</td>
<td>9</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78Y 1st &amp; 2nd I. F.</td>
<td>Plate</td>
<td>227</td>
<td>185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78Y 1st &amp; 2nd I. F.</td>
<td>Screen</td>
<td>72</td>
<td>185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78Y 1st &amp; 2nd I. F.</td>
<td>Bias (Cathode)</td>
<td>1.5</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7C6 2nd Det. 1st Audio</td>
<td>Plate</td>
<td>108</td>
<td>140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7C6 Preampl.</td>
<td>Plate</td>
<td>45</td>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Output Phase Inv.</td>
<td>Plate</td>
<td>222</td>
<td>183</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Output Phase Inv.</td>
<td>Screen</td>
<td>222</td>
<td>183</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Output Phase Inv.</td>
<td>Plate</td>
<td>222</td>
<td>183</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Output Phase Inv.</td>
<td>Screen</td>
<td>222</td>
<td>183</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PART LOCATIONS — UNDERSIDE OF CHASSIS

MODELS 41-608, 41-609

NOTE — PARTS 51, 55, 57, 58 and 59 LOCATED ON TOP OF CHASSIS

OR CODE 121 ONLY

7C7 Preampl. | Plate |
|            | 45    |
|            | 65    |

PART LOCATIONS — UNDERSIDE OF CHASSIS

MODELS 41-608, 41-609

NOTE — PARTS 51, 55, 57, 58 and 59 LOCATED ON TOP OF CHASSIS

OPERATIONS IN ORDER

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>OUTPUT CONNECTIONS</th>
<th>DIAMETER SETTING</th>
<th>DIAMETRIC SETTING</th>
<th>CENTRAL SETTINGS</th>
<th>ADJUST COMPENSATOR IN ORDER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loop Signal Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Banda Switch &quot;Brad&quot;</td>
<td>11A, 7</td>
<td>Note B</td>
</tr>
<tr>
<td>3</td>
<td>Loop Signal Generator</td>
<td>580 K. C.</td>
<td>580 K. C.</td>
<td>Banda Switch &quot;Brad&quot;</td>
<td>7A</td>
<td>Roll comp. (7A) to &quot;max.&quot; Recheck Operation No. 2</td>
</tr>
<tr>
<td>4</td>
<td>Loop Signal Generator</td>
<td>12 M. C.</td>
<td>12 M. C.</td>
<td>Banda Switch S. W.</td>
<td>11, 6</td>
<td>Note C</td>
</tr>
</tbody>
</table>

NOTE A — Compensator (27A) must be adjusted before compensator (27B) and should be done in the following manner: Turn (27A) all the way up, then turn down selecting the first I. F. peak, compensator (27B) is now padded to maximum.

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, set the tuning pointer on the extreme left index line at the low frequency end of the broadcast scale.

NOTE C — Adjust padder (11) to the first signal peak from the right position. Roll padder (6) slowly to maximum on the second peak from base position.
EVISION CORP.

MODELS 41-616P
41-616PW (121)

NO STATION BEING RECEIVED.

FIG. 8. LOCATION OF PARTS, TUNING UNIT
ADJUSTMENT OF WIRELESS REMOTE CONTROL CIRCUITS

Model 41-814, Code 121

ADJUSTING CONTROL FREQUENCY AMPLIFIER

The wireless remote control unit is shipped with a different control frequency from that of the radio equipment. Therefore, when the control frequency is adjusted, it must be done with the radio equipment in a different state. The control frequency is adjusted to match the control frequency of the radio equipment. The control frequency is adjusted to match the control frequency of the radio equipment.

1. Attach the control frequency to the control frequency of the radio equipment.
2. Adjust the control frequency to match the control frequency of the radio equipment.
3. Adjust the control frequency to match the control frequency of the radio equipment.
4. Adjust the control frequency to match the control frequency of the radio equipment.
5. Adjust the control frequency to match the control frequency of the radio equipment.

ADJUSTING WIRELESS REMOTE CONTROL UNIT

A. The control frequency is adjusted to match the control frequency of the radio equipment.
B. The control frequency is adjusted to match the control frequency of the radio equipment.
C. The control frequency is adjusted to match the control frequency of the radio equipment.
D. The control frequency is adjusted to match the control frequency of the radio equipment.
E. The control frequency is adjusted to match the control frequency of the radio equipment.

ADJUSTING REMOTE CONTROL UNIT

A. The control frequency is adjusted to match the control frequency of the radio equipment.
B. The control frequency is adjusted to match the control frequency of the radio equipment.
C. The control frequency is adjusted to match the control frequency of the radio equipment.
D. The control frequency is adjusted to match the control frequency of the radio equipment.
E. The control frequency is adjusted to match the control frequency of the radio equipment.

LIGHT-SEAM ADJUSTMENTS

A. The control frequency is adjusted to match the control frequency of the radio equipment.
B. The control frequency is adjusted to match the control frequency of the radio equipment.
C. The control frequency is adjusted to match the control frequency of the radio equipment.
D. The control frequency is adjusted to match the control frequency of the radio equipment.
E. The control frequency is adjusted to match the control frequency of the radio equipment.
**Models 41-623, 41-624, 41-626 are radio phonograph combinations which are similar in design with the exception of the cabinet, phonograph mechanism and speaker.**

**CONNECTING ALIGNING INSTRUMENTS**

When aligning the R.F. padders a loop aerial is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

The receiver can be adjusted in the cabinet or removed from the cabinet.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

Signal Generator. When adjusting the I.F. padders, the high side of the signal generator is connected through a .1 mfd. condenser to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators in Order</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loop see above instructions</td>
<td>1600 K.C.</td>
<td>1600 K.C.</td>
<td>Vol. Max. Range Switch Brdct.</td>
<td>3B</td>
<td>Note B</td>
</tr>
<tr>
<td>3</td>
<td>Loop see above instructions</td>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
<td>Vol. Max. Range Switch Brdct.</td>
<td>3A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Loop see above instructions</td>
<td>12 M.C.</td>
<td>12 M.C.</td>
<td>Range Switch &quot;S.W.&quot;</td>
<td>3G, 3</td>
<td>Roll (3) for Max. Note C</td>
</tr>
</tbody>
</table>

**NOTE A:** To adjust the I.F. circuit properly, compensators 36A, 35A and 35B should be depadded first. All compensators are then adjusted to maximum in the order 36A, 36A, 35A and 35B.

**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, set the tuning pointer on the small dot below 500 K.C.

**NOTE C:** When adjusting oscillator compensator 3G, tune for maximum on the first signal peak from Tight position (compensator closed).

When adjusting the aerial pads of the high frequency tuning range the receiver Tuning Condenser must be adjusted (rolled) as follows: First tune the condenser 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 maximum output reading is obtained.

A. ADJUSTING WIDTH OF LIGHT BEAM

To make this adjustment put the lamp socket assembly into its holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is 1/2 in. in width. The socket assembly is now rotated so that the spot of light is vertical.

B. POSITIONING THE LIGHT BEAM

To position the light beam on the light cell, turn the adjusting screws at the lower left side of the reproducer until the spot is half on the cell and half on the metal frame surrounding the cell.

C. ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by Compensator 68 located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.
2. While the record is playing, turn compensator 68 in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.
C. ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by Compensator No. 37A located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.
2. While the record is playing, turn compensator 37A in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

Signal Generator. When adjusting the I. F. paddles, the high side of the signal generator is connected through a .1 mfd. capacitor to the antenna section of the tuning condenser. Connect the ground or low side of the generator to the chassis.

When aligning the I.F. paddles a loop aerial is made from a few turns of wire and connected to the signal generator output terminals; the signal generator is then placed close to the loop of the radio.

When adjusting the radio outside the cabinet the loop aerial should be placed in approximately the same position around or near the chassis as when assembled.

### SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Operations in Order</th>
<th>Output Connections to Receiver</th>
<th>Dial Setting</th>
<th>Dial Setting</th>
<th>Control Setting</th>
<th>Adjust Compensators in Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loop Signal Generator</td>
<td>1720 K. C.</td>
<td>1720 K. C.</td>
<td>Bands Switch &quot;Braced&quot;</td>
<td>11A</td>
</tr>
<tr>
<td>3</td>
<td>Loop Signal Generator</td>
<td>1500 K. C.</td>
<td>1500 K. C.</td>
<td>Bands Switch &quot;Braced&quot;</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Loop Signal Generator</td>
<td>800 K. C.</td>
<td>800 K. C.</td>
<td>Bands Switch &quot;Braced&quot;</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Loop Signal Generator</td>
<td>12 M. C.</td>
<td>12 M. C.</td>
<td>Bands Switch S. W.</td>
<td>11, 8</td>
</tr>
</tbody>
</table>

**NOTE A** — Compensator (27A) must be adjusted before compensator (27B) and should be done in the following manner: Turn (27A); all the way up, then turn down selecting the first I. F. peak, compensator (27B) is now padded to maximum.

**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, set the tuning pointer on the extreme left index line at the lowest frequency end of the broadcast scale.

**NOTE C** — Adjust paddle (11) to the first signal peak from the right position. Roll paddle (6) slowly to maximum on the second peak from loose position.
Vacuum Tube Voltmeter: To use the vacuum tube voltmeter as an aligning indicator, it should be connected to the A. V. C. circuit as follows:
1. Connect the negative (−) terminal of the vacuum tube voltmeter through a 2 megohm resistor to any point in the circuit where the A. V. C. voltage can be measured.
2. Connect the positive (+) terminal to the chassis ground terminal.

Audio Output Meter: If this type of meter is used as an aligning indicator, it should be connected to the plate and screen terminals of the 6K6EG tube, Model 41-712; 33A5E Model 41-713. Adjust the meter for the 0 to 30 volt A. C. scale.

After connecting the aligning meter, adjust the compensators in the order as shown in the tabulation below. Locations of the compensators are shown in the schematic diagram. If the output meter pointer goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

<table>
<thead>
<tr>
<th>Signal Generator</th>
<th>Receiver</th>
<th>Special Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Connections to Receiver</td>
<td>Dummy Antenna Note A</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>2 Ant. Lead</td>
<td>600 ohms</td>
<td>21 M. C.</td>
</tr>
<tr>
<td>3 Ant. Lead</td>
<td>600 ohms</td>
<td>6.0 M. C.</td>
</tr>
<tr>
<td>4 Ant. Lead</td>
<td>200 mmld.</td>
<td>1500 K. C.</td>
</tr>
<tr>
<td>5 Ant. Lead</td>
<td>200 mmld.</td>
<td>560 K. C.</td>
</tr>
</tbody>
</table>

NOTE A — The "Dummy Antenna" consists of a condenser or resistance 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: With the tuning condenser closed (maximum capacity) set the dial pointer on the first mark on the left edge (low frequency end) of the broadcast scale.

NOTE C — When adjusting compensator (4B) be sure to tune in the fundamental signal (21 M. C.) instead of the image signal. If the compensator is correctly adjusted the image signal will be found by turning signal generator dial 910 K. C. below the fundamental signal, which will be 20,000 M. C.

August, 1940
The code numbers (121, 122) of this model refer to the manner in which the power supply is connected for shipment. Code 121 is shipped with the voltage change switch in the 230 volts, 60 cycle A.C. position. Code 122 is shipped with the switch in the 115 volts, 60 cycle A.C. position.

POWER SUPPLY: 115 or 230 volts A.C., 50 to 60 cycle, 90 watts.

INTERMEDIATE FREQUENCY: 455 K.C.

TUNING RANGES:
Standard Tuning—540 to 1720 K.C.; 2.3 to 7.
7.2 to 22 M.C.
Spread Band Tuning—9.4 to 9.9 M.C.; 11.4 to 11.
14.3 to 15.6 M.C.; 17.3 to 18.2 M.C.; 20.9 to 21.

FIG. 6 — TUBE AND COMPENSATOR LOCATIONS, TOP OF CHASSIS

© John F. Rider, Publisher
I.F. = 455 KC.
Vacuum Tube Voltmeters: If a vacuum tube voltmeter is used as an aligning indicator, the negative (-) terminal is connected to the A. V. C. circuit of the receiver through a 2 meg. Ohm resistor. The positive (+) terminal is connected to the chassis or ground.

Signal Generator: When adjusting the "I. F." paddles the high side of the signal generator is connected through a 1/2 d. c. condenser to the loop tuning condenser of the receiver.

Models 41-841, 41-895

The Model 41-841 may be adjusted when operated by battery or 115 volts A. C. - D. C. power.

<table>
<thead>
<tr>
<th>Operations</th>
<th>SIGNAL GENERATOR</th>
<th>RECEIVER</th>
<th>SPECIAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Order</td>
<td>Output Connections to Receiver</td>
<td>Dial Setting</td>
<td>Dial Setting</td>
</tr>
<tr>
<td>1</td>
<td>See Paragraph on Signal Generator above</td>
<td>455 K.C.</td>
<td>540 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator as above</td>
<td>1500 K.C.</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

Model 41-851

| 1 | Stator Plate Loop Loop Tuning Condenser | 455 K.C. | 540 K.C. | Vol. Max. | 16A, 18A, 24A |
| 4 | Resonance Operation No. 18A |
| 5 | Loop on Generator | 8 M.C. | 8 M.C. | Range Switch "S.W." |
| 6 | Loop on Generator | 15 M.C. | 15 M.C. | Range Switch "S.W." |

NOTE A: DIAL CALIBRATION: Before adjusting the R. F. paddles the dial must be aligned to track properly with the tuning condenser. When the tuning condenser is moved, the dial pointer on the small dot below 350 K.C. shall move to the nearest point.

NOTE B: When adjusting the compensator be sure to tune in the fundamental signal (15 M.C.) instead of the image signal. If the compensator is incorrectly aligned, the image signal will be found by turning dial 910 K.C. below the fundamental signal, which will be 14,000 M.C.

Replacement Parts — Model 41-841, Code 121

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuning Condenser</td>
<td>31-2899</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Loop Antenna</td>
<td>31-2909</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Condenser (600 mm.)</td>
<td>31-2909</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td></td>
</tr>
</tbody>
</table>

Replacement Parts — Model 41-851, Runs 1 and 2

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Condenser (900 mm.)</td>
<td>31-2910</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Loop Antenna</td>
<td>31-2911</td>
<td>Parts 1A-15</td>
<td>Parts 1A-15</td>
<td></td>
</tr>
</tbody>
</table>

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>SCHE. No.</th>
<th>DESCRIPTION</th>
<th>PART No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Condenser (600 mm.)</td>
<td>31-2909</td>
</tr>
</tbody>
</table>
SIGNAL GENERATOR: When adjusting the "I.F." paddles the high side of the signal generator is connected through a .1 mfd. condenser to the loop tuning condenser stator lug which connects to the grid of the first detector tube. The ground or low side of the signal generator is connected to the chassis of the receiver. When aligning the R.F. paddles of the portable models a loop aerial is made from a few turns of wire and connected to the signal generator output terminals. The signal generator is then placed a few feet from the set. The loop aerial of the receiver should be assembled in the cabinet together with the battery when adjusting the R.F. paddles.

These models may be adjusted when operated by battery or 115 volts A.C.-D.C. power.

<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>Dial Setting</td>
</tr>
<tr>
<td>2</td>
<td>Use Loop on Generator as above</td>
<td>1500 K.C.</td>
</tr>
</tbody>
</table>

**NOTE A: DIAL CALIBRATION**—Before adjusting the R.F. paddles the dial must be aligned to track properly with the tuning condenser. To adjust the dial proceed as follows: With the tuning condenser in the closed position (maximum capacity), set the dial pointer on the small dot below 510 K.C.
Listed below are the Philco speakers, replacement cones and output transformers used in the 1939 and 1940 Philco home and auto radio line.

In some models two or more different type speakers are used. These speakers, however, are interchangeable and will have the same part number, with the exception of a suffix number -1, -2, etc., added to the part number. The core assemblies of these speakers are not interchangeable.

It is important when ordering core assemblies that the correct part number, as indicated on these pages, be specified.

### With Replacement Cones and Output Transformers

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Used In Models</th>
<th>Replacement Cone</th>
<th>Output Transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-1455-4</td>
<td>39-756T</td>
<td>36-4104</td>
<td>32-8015</td>
</tr>
<tr>
<td>36-1455-3</td>
<td>39-719T</td>
<td>36-4107</td>
<td>32-8017</td>
</tr>
<tr>
<td>36-1455-2</td>
<td>39-717T</td>
<td>36-4108</td>
<td>32-8018</td>
</tr>
<tr>
<td>36-1455-1</td>
<td>39-707T</td>
<td>36-4109</td>
<td>32-8019</td>
</tr>
<tr>
<td>36-1455-0</td>
<td>39-706T</td>
<td>36-4110</td>
<td>32-8020</td>
</tr>
</tbody>
</table>

**Speaker Numbers**
- 36-1455-4
- 36-1455-3
- 36-1455-2
- 36-1455-1
- 36-1455-0

**Used In Models**
- 39-756T
- 39-719T
- 39-717T
- 39-707T
- 39-706T

**Replacement Cones**
- 36-4104
- 36-4107
- 36-4108
- 36-4109
- 36-4110

**Output Transformers**
- 32-8015
- 32-8017
- 32-8018
- 32-8019
- 32-8020
### ALIGNING PROCEDURE MODEL AR-1

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>SIGNAL INDICATION</th>
<th>EMISSION CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>600 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>2 mW.</td>
<td>Mark 1</td>
</tr>
<tr>
<td>2</td>
<td>1400 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>3 mW.</td>
<td>Mark 2</td>
</tr>
<tr>
<td>3</td>
<td>1500 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>3 mW.</td>
<td>Mark 3</td>
</tr>
<tr>
<td>4</td>
<td>1600 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>3 mW.</td>
<td>Mark 4</td>
</tr>
<tr>
<td>5</td>
<td>1800 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>3 mW.</td>
<td>Mark 5</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1:** Turn the condenser rotor plates completely out of mark as far as they will go.

**NOTE 2:** Connect the aerial lead, Part No. 4-18518, to the output terminals of the radio. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 3:** When the aerial rotor adjustment is made with the radio installed in the car, the radio antenna lead must be connected to the car antenna. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 4:** When installing the radio in the car follow the directions carefully. Tune to a weak broadcast signal between 1500 and 1600 K.C. on the control. Before the final tuning of the radio and adjust the aerial compensator @ for maximum signal.

### MODEL AR-4

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>SIGNAL INDICATION</th>
<th>EMISSION CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 mW.</td>
<td>Mark 1</td>
</tr>
<tr>
<td>2</td>
<td>150 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 mW.</td>
<td>Mark 2</td>
</tr>
<tr>
<td>3</td>
<td>200 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 mW.</td>
<td>Mark 3</td>
</tr>
<tr>
<td>4</td>
<td>250 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 mW.</td>
<td>Mark 4</td>
</tr>
<tr>
<td>5</td>
<td>300 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 mW.</td>
<td>Mark 5</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1:** Connect the aerial lead, Part No. 4-18518, to the output terminals of the radio. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 2:** Turn the condenser rotor plates completely out of mark as far as they will go.

**NOTE 3:** Connect the aerial lead to the car antenna. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 4:** When installing the radio in the car follow the directions carefully. Tune to a weak broadcast signal between 1500 and 1600 K.C. on the control. Before the final tuning of the radio and adjust the aerial compensator @ for maximum signal.

### INSTRUCTIONS FOR ADJUSTING SHORT WAVE PADDERS

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>SIGNAL INDICATION</th>
<th>EMISSION CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 m.W.</td>
<td>Mark 1</td>
</tr>
<tr>
<td>2</td>
<td>1500 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 m.W.</td>
<td>Mark 2</td>
</tr>
<tr>
<td>3</td>
<td>2000 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 m.W.</td>
<td>Mark 3</td>
</tr>
<tr>
<td>4</td>
<td>2500 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 m.W.</td>
<td>Mark 4</td>
</tr>
<tr>
<td>5</td>
<td>3000 K.C.</td>
<td>To Aerial Receptacles on Radio</td>
<td>1 m.W.</td>
<td>Mark 5</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1:** Connect the aerial lead, Part No. 4-18518, to the output terminals of the radio. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 2:** Turn the condenser rotor plates completely out of mark as far as they will go.

**NOTE 3:** Connect the aerial lead to the car antenna. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 4:** When installing the radio in the car follow the directions carefully. Tune to a weak broadcast signal between 1500 and 1600 K.C. on the control. Before the final tuning of the radio and adjust the aerial compensator @ for maximum signal.

### MODEL C-1708

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>SIGNAL GENERATOR</th>
<th>EMISSION CAPACITY</th>
<th>SPECIAL INSTRUCTIONS</th>
<th>ADJUST PADDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>600 K.C.</td>
<td>To Antenna Receptacles on Radio</td>
<td>3 m.W.</td>
<td>Mark 1</td>
</tr>
<tr>
<td>2</td>
<td>1400 K.C.</td>
<td>To Antenna Receptacles on Radio</td>
<td>3 m.W.</td>
<td>Mark 2</td>
</tr>
<tr>
<td>3</td>
<td>1500 K.C.</td>
<td>To Antenna Receptacles on Radio</td>
<td>3 m.W.</td>
<td>Mark 3</td>
</tr>
<tr>
<td>4</td>
<td>1600 K.C.</td>
<td>To Antenna Receptacles on Radio</td>
<td>3 m.W.</td>
<td>Mark 4</td>
</tr>
<tr>
<td>5</td>
<td>1800 K.C.</td>
<td>To Antenna Receptacles on Radio</td>
<td>3 m.W.</td>
<td>Mark 5</td>
</tr>
</tbody>
</table>

Make all adjustments for maximum reading on the output meter.

**NOTE 1:** Turn the tuning control knob clockwise as far as it will go.

**NOTE 2:** Connect the aerial antenna lead, Part No. 4-18518, to the output terminals of the radio. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 3:** When the aerial rotor adjustment is made with the radio installed in the car, the radio antenna lead must be connected to the car antenna. Connect a 10 mm. Condenser in series between the signal generator and the aerial lead.

**NOTE 4:** When installing the radio in the car follow the directions carefully. Tune to a weak broadcast signal between 1500 and 1600 K.C. on the control. Before the final tuning of the radio and adjust the aerial compensator @ for maximum signal.
PHILCO RADIO & TELEV. CORP.

MODELS AR-5, AR-6, AR-7
AR-C-1708

PHILCO RADIO & TELEV. CORP.

SETTING UP ELECTRIC TUNING

MODEL C-1708

1. With the antenna installed and connected, tune on the radio and allow it to operate for twenty minutes before making any adjustments. The receiver must be adjusted with the sky-wave antennas fully extended and it is recommended that adjustments be made with the car in a shielded area such as a garage, workshop, or a steel recreational building. However, best results may be obtained using the new signal antenna. This allows setting up nearly instant stations on the buttons without having the car in a shielded area.

2. Push in the dial button and turn with manual control a weak station between 1560 and 1600 kilocycles. Pull push buttons of. Adjust the antenna compensator with a screwdriver by turning the adjusting screw until you have noListeners. Then adjust the antenna compensator to the nearest half kilocycle. Then adjust the antenna to the nearest half kilocycle. Then adjust the antenna to the nearest half kilocycle.

3. If numbers on buttons are not desired, adjust and move from the call letter hides, five call letter takes of popular stations received in the area in which the receiver is to be operated. Selecting stations within the range of each button as shown in illustration, Model C-1708. Reference to ephemera published in your local newspaper aids in quick selection of stations. Remove metal clips to install the tags in push buttons.

4. Push dial button and tune in the station you have chosen for the No. 1 button. After about ten minutes with the station tuned, identify the position of the station number button No. 1. Then push in the dial button and tuning indicator will show the No. 1 button for the station in the range of the frequency you are tuning. Then adjust the antenna compensator to the nearest half kilocycle. Then adjust the antenna to the nearest half kilocycle.

After the station has been tuned in accurately, (see illustration) a pair adjustment can be made by adjusting the screw, which is the outside shell of the adjusting screw. Use a larger screwdriver for this purpose. Careful adjustment of this screw will assure maximum performance in areas where broadcasting reception is poor.

Setting Up Automatic Tuning

MODEL AR-5, AR-6

Turn on the radio and allow it to operate for twenty minutes before making any adjustments. The receiver must be adjusted with the sky-wave antennas fully extended and it is recommended that adjustments be made with the car in a shielded area such as a garage, workshop, or a steel recreational building. However, best results may be obtained using the new signal antenna.

1. Set the tuning indicator to the station you want to change and push in the No. 1 push button. Then turn the No. 1 adjusting screw (inner screw) and move the station points for that position by turning the screwdriver counter-clockwise to increase frequency and clockwise to decrease frequency.

After the station has been tuned in accurately, (see illustration) a pair adjustment can be made by adjusting the screw, which is the outside shell of the adjusting screw. Use a larger screwdriver for this purpose. Careful adjustment of this screw will assure maximum performance in areas where broadcasting reception is poor.

ALIGNING PROCEDURE

MODEL AR-4

1. Set the tuning indicator to the station you want to change and push in the No. 1 push button. Then turn the No. 1 adjusting screw (inner screw) and move the station points for that position by turning the screwdriver counter-clockwise to increase frequency and clockwise to decrease frequency.

After the station has been tuned in accurately, (see illustration) a pair adjustment can be made by adjusting the screw, which is the outside shell of the adjusting screw. Use a larger screwdriver for this purpose. Careful adjustment of this screw will assure maximum performance in areas where broadcasting reception is poor.

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MODEL F-1541

SETTING UP AUTOMATIC TUNING

TURN THE RADIO ON AND ALLOW IT TO OPERATE FOR AT LEAST TWENTY MINUTES BEFORE MAKING ADJUSTMENTS.

1. Select five popular local stations whose frequencies come within the ranges of the five Automatic Tuning Circuits and list them on the back of the OWNER'S MANUAL under "STATION RECORD." For the Owner's reference, also on the chart above, the adjusting screws. List the lowest frequency station as No. "1" and so on down to the highest frequency (No. 1 Station) and note the program as it can be identified. Push the Automatic Station Selector once and No. "1" will appear in the indicator dial.

4. With a small screwdriver turn the SMALL No. 3 adjusting screw until the station is tuned in. Then adjust the LARGE No. 2 screw in the same way until maximum response is heard. IT IS VERY IMPORTANT THAT THESE ADJUSTING SCREWS BE SET ON A WEAK SIGNAL FROM THE STATION SO THAT THE CIRCUIT WILL BE

ALIGNING PROCEDURE MODEL AR-7

ADJUST THE AUTO COMPENSATOR 2 TURN WHEEL TURNS

1. Press the return to dial button until stations can be tuned in by manual tuning. Adjust the auto compensator 2 turn wheel turns.

NOTE 1. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 2. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

NOTE 3. With the auto compensation adjustment made, with the radio calibrated as in the Fig. 1 the radio meter is used to control the signal generator signal. Use a 1/2 wave meter which can be placed near the ear of the

NOTE 4. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 5. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

MODEL AR-8

OPERATION FREQUENCY SENSITIVITY SPECIAL INSTRUCTIONS

1. Press the return to dial button until stations can be tuned in by manual tuning. Adjust the auto compensator 2 turn wheel turns.

NOTE 1. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 2. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

MODEL F-1541

NOTES 1. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 2. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

NOTE 3. With the auto compensation adjustment made, with the radio calibrated as in the Fig. 1 the radio meter is used to control the signal generator signal. Use a 1/2 wave meter which can be placed near the ear of the

NOTE 4. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 5. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

MODEL AR-7

OPERATION FREQUENCY SENSITIVITY SPECIAL INSTRUCTIONS

1. Press the return to dial button until stations can be tuned in by manual tuning. Adjust the auto compensator 2 turn wheel turns.

NOTE 1. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 2. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

NOTE 3. With the auto compensation adjustment made, with the radio calibrated as in the Fig. 1 the radio meter is used to control the signal generator signal. Use a 1/2 wave meter which can be placed near the ear of the

NOTE 4. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 5. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 6. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 7. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

NOTE 8. With the auto compensation adjustment made, with the radio calibrated as in the Fig. 1 the radio meter is used to control the signal generator signal. Use a 1/2 wave meter which can be placed near the ear of the

NOTE 9. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 10. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 11. Connect the aerial lead, Bass. No. 5927, to the aerial receptacle in the radio. Connect a 64 Mfd. Condenser in series between the signal generator and the signal level.

NOTE 12. Turn the condenser until the signal comes out of peak as far as they will go and then adjust the signal generator to give you the desired output. Then adjust the signal generator so that the signal generator will not exceed the maximum output. Then adjust the signal generator so that the signal generator will not exceed the maximum output.

NOTE 13. With the auto compensation adjustment made, with the radio calibrated as in the Fig. 1 the radio meter is used to control the signal generator signal. Use a 1/2 wave meter which can be placed near the ear of the

NOTE 14. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.

NOTE 15. When calibrating the radio in the ear, follow the instructions carefully. A 1/2 wave broadcast signal between 30 and 90 MHz is the signal which is used, the signal is turned on and the signal generator is used.
**PHONOGRAPH OPERATION**

The motor is controlled by the automatic stop lever which is at the rear right side of the turntable. Volume for both, "Phono" and "Radio" is regulated by the same control on the front of the receiver.

The tone control and phono radio switch must be in either of the three clockwise positions for phonograph operation.

The screws for adjusting both the R.F. and I.F. amplifiers of this receiver, together with the frequencies at which they should be adjusted, are all pictured on the above diagram. When aligning the I.F. amplifier, the generator must be connected to the grid of the 12SK7 R.F. tube through a .1 mfd condenser. When aligning the receiver, first align the shortwave band connecting the generator to the antenna post with a 400 ohm resistor. Then align the broadcast band using a .0002 mfd condenser.

When aligning the loop, the receiver should be in the cabinet with the back in place. The adjusting condenser can be reached through the slot in the lower left hand side of the back.
TUNING RANGE

Broadcast Band 535 to 1720 kc.; or 561 to 174.0 meters
Band II 1.98 to 7.05 mc. or 152 to 42.5 meters
Band I 6.95 to 24.75 mc. or 43.2 to 12.1 meters

SERVICE NOTES

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I. F. amplifier, the generator must be connected to the grid of the 8SA7 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.

PHONOGRAPH AND TELEVISION JACKS

On the rear of the chassis is a set of “Pin” jacks. They are intended to be employed for connection with an electrical phonograph, or with the sound outlet of a television receiver.
This Pilot Superheterodyne Receiver has 5 tubes and operates on a 6 volt power supply at 2.2 amperes.

**SERVICE NOTES**

When aligning the I. F. amplifier, the generator must be connected to the grid of the 7A8 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.

**ANTENNA**

When using a doublet antenna, connect one lead-in wire to terminal "A" at the rear of the chassis, and the other lead-in wire to terminal "D". Remove the connecting link from terminals "D" and "G" and connect terminal "G" to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal "A" on the rear of the chassis. Leave the link between "D" and "G" terminals and connect a ground wire under terminal "G".
Model 191
A.C.-D.C. Receiver

TUNING RANGE
Broadcast Band 535 to 1720 kc.
Short Wave Band 5.6 to 19.8 kc.

ANTENNA

When using a doublet antenna, connect one lead-in wire to terminal “A” at the rear of the chassis, and the other lead-in wire to terminal “D”. Remove the connecting link from terminals “D” and “G” and connect terminal “C” to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to Terminal “A” on the rear of the chassis. Leave the link between “D” and “G” terminals and connect a ground wire under terminal “G”.

SERVICE NOTES

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I.F. amplifier, the generator must be connected to the grid of the 6SA7 tube through a .1 mfd condenser. When aligning the receiver on the Broadcast Band, connect the generator to the Antenna wire through a .0002 mfd condenser, and on the short wave band use a 400 ohm carbon resistor.
The screws for adjusting both the R.F. and I.F. amplifiers of this receiver, together with the frequencies at which they should be adjusted, are all pictured on the wiring diagram. WHEN ALIGNING THIS RECEIVER, IT MUST BE IN THE CABINET WITH THE LOOP ANTENNA CONNECTED AND THE BACK OF THE CABINET SCREWED ON. The adjusting condensers are reached through the hole in the lower left hand corner of the back, looking at the back. The I.F. amplifier can be aligned with the chassis out of the cabinet, but with the loop antenna connected.
This Pilot Superheterodyne Receiver has 12 tubes and a Cathode Ray Tuning Beam, and operates on an Alternating power supply.

**Tuning Range**
- Broadcast Band 535 to 1710 kc., or 561 to 174 meters
- Short Wave Band 5.6 to 16.8 kc., or 235 to 1.24 meters

This radio-phone unit with a combined recorder permits the owner to do the following things:-
1. Operate the receiver for Rx & Sw reception.
2. Play recorders.
3. Record radio programs.
4. Record his voice separately or in conjunction with a radio program.
5. Play recorded records back.
6. Do his own broadcasting by means of the microphone.

**Operation**
For the accomplishment of any of the above six functions, the following operations apply:

1. To OPERATE RADIO- After the "on-off" power switch has been turned on, simply press the button marked RADIO. Any of the upper knobs may be used in conjunction with the radio to change volume, tune in stations and to obtain the time you desire.
2. To OPERATE PHONOGRAPH- Simply press the button marked PHONO and use the upper knob to adjust volume, bass or treble.
3. To RECORD RADIO PROGRAMS- First tune the radio program to its proper setting. Have the bass control in a middle position. The treble control can be operated to suit the individual tastes. When the program is clearly heard, then press the button marked RADIO RECORDING. As soon as this is done, the speaker is muted although the radio program can still be heard. Be sure the phonograph unit is set on AUTOV. When the button marked RADIO RECORDING is pressed in, the volume control should be turned up until the recorder level indicator on the phonograph panel is nearly closed. Then raise the cutting head and place it on the blank record disc. During the course of recording, the recording level indicator will vary according to the level of the program.
4. To RECORD VOICE:
   - (a) Separate Voice-Record to record a voice, press button marked MICRO RECORDING. Be sure the microphone is set at the off position and proceed as in paragraph 5.
   - (b) Voice Recording: In Conjunction With a Radio Program- Set radio program as instructed in paragraph 3. Advance mixer to the right and speak or sing into the microphone. Adjust the mixer to proper proportion so either voice or radio program will sound loudest, as the case may be. By means of this process, you may, during the course of a radio program recording either (1) completely eliminate the program and insert your voice, (2) bring your voice into the foreground with the program in the background or (3) bring the program into the foreground with your voice in the background.
5. To PLAY BACK RECORDING- Proceed as in paragraph 3.
6. To OPERATE THE RADIO WITHOUT RECORDING- Press button marked MICRO in and speak into microphone. Adjust the microphone gain control to the desired level. It is advisable to turn the treble control to the extreme counter-clockwise position in order to cut down acoustic feedback.

**Service Notes**

The location of all adjustments used in re-aligning this receiver, and the frequencies at which these adjustments should be made, are shown in the accompanying diagram.

When aligning the I.F. amplifier, the generator must be connected to the grid of the 6SA7 tube through a 1 mfd capacitor. When aligning the receiver in the Broadcast Band, connect the generator to the antenna wire through a 0.01 mfd capacitor, and on the short wave bands, use a 400 ohm carbon resistor.

**Diagram**

This receiver contains the latest type of self-contained shielded loop aerial and will give excellent results even in distant localities where the signal from the broadcasting stations are faint. However, it may be necessary to turn the loop antenna located in the rear of the cabinet toward the direction of the incoming signal (since most broadcasting stations use the directional antennas), for the best reception from that particular station. For short wave or distant broadcast band reception, the use of an external antenna is required.

When using a double antenna, connect one lead-in wire to terminal "A" on the rear of the chassis, and the other lead-in wire to terminal "D". Remove the connecting link from terminals "P" and "Q" and connect terminal "Q" to a ground such as a cold water pipe or radiator. If an ordinary single wire antenna is used, connect the lead-in wire to terminal "A" on the rear of the chassis. Leave the link between "P" and "Q" terminals and connect a ground wire under terminal "Q". A double antenna kit complete with all accessories, can be purchased from your dealer. Ask to see the "Pilot Antenna Kit".
Model X-1452 is same as X-1453 except: AC ant. Coil is Part No. 73346; Osc. coil and BC Osc. coil is one unit, part No. 73358. (S.W. Padder No. 28123 is omitted) SW Osc. and Ant. trimmer adjustment is 12 MC.
**RCA MFG. CO. INC.**

**MODEL PRP-1**

**MODEL PRP-2**

**ELECTRICAL SPECIFICATIONS**

**Motor**

- **Type:** Universal
- **Speed:** 72.60 r.p.m.

**Turntable Speed**

- **Cartridge Speed:** 33 1/3 r.p.m.
- **Record Speed:** 45 r.p.m.

**Cryostat Turntable**

- **Impedance:** 10000 ohms at 1500 cycles
- **Average Output Voltage:** 15 milli-volts across 1000 ohms when played at 9000 cycles.

**GENERAL DESCRIPTION**

These instruments employ a crystal pickup unit which provides equal output voltage to the power amplifier. The crystal unit is contained in a metal case securely sealed against extremes of climate. An off-set mounting for the pickup head and an ideal tracking angle between the needle and record grooves.

The motor is a manual starting synchronous type, designed to operate with good regularity at speed of the standard 72.60 r.p.m. Mechanically, the motor consists of a laminated rotor and stator in the turntable bearing a number of radial poles and a stator with a corresponding number of poles. The field coil is wound on the stator to form the exciting magnetic flux. The rotor, stator and their bearing assembly are adequately insulated from the turntable, motor mounting, and cabinet by adequate flexible couplings and supports.

**CONNECTING RECORD PLAYER TO RADIO RECEIVER**

In connecting the player to a radio receiver care should be exercised to connect it at a point where there is sufficient gain between it and the speaker for full normal output. Usually two or more stages of audio amplification are required. The volume control must be thoroughly disconnected or killed when playing records, else the radio signal will be heard with the record's music.

**DO NOT CONNECT THE RECORD PLAYER INTO A PLATE OR CATHODE CIRCUIT.**

A thin film of carbon on the tone arm may be removed by placing the brush on the turntable side of the dust cover, using that side on which the brush rests.

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**Radio-Phono Switch supplied with Record Player**

- **Switching**
  - **Record Play:**
  - **Phono Play:**

**Models**

- PRP-1 (Regular)
- PRP-2 (Deluxe)
**TYPICAL CONNECTION DIAGRAMS**

**Retro Receivers where Receiver Volume Control is in Audio Input Circuit**

**Retro Receivers using Biased-Type Detector**

**Retro Receivers whose First Audio Amplifier Tube is of the Grid Cap Type**

**Tone Compensation**

Because of the widely varying frequency characteristics of various types of audio amplifiers with which these players may be used, it is desirable in some cases to make refinements in the pickup circuit to compensate for the characteristics of the amplifier.

In "A" R1 controls the low frequency response; higher values of R1 give increased lows. For maximum low frequency response, remove R1. R2 controls pickup output, smaller values of R2 giving 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 "B" 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 "A" and "B" should serve as a basis from which slight alterations may be made to suit individual cases.

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Alignment Procedure

Carbide-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.c. action.

Calibration Scale on Indicator-Driver-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 indicator driver-cord drum which is mounted on the 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 "300" 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 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.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows how the dial with 0-100" calibration scales drawn on top and bottom.

Position for Calibration Scale.—Properly 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 "300" mark on the calibration scale when the plates are fully meshed.

Dual-Indicator Alignment.—After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 50 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Tube and Trimmer Locations

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band range is on actual reception of short-wave stations of known frequency, by adjusting the magnetron core oscillator set so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where noise level is high enough to prevent reception of short wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce considerable inaccuracy on the spread-band dial. The frequency settings of the test-oscillator may be checked by one of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonic of the standard broadcast range of the test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 6769), or by zero-beating against standard broadcast stations.

A test oscillator is employed for spread-band alignment, as a final check should be made on actual reception of short-wave stations of known frequency, and the magnetron core oscillator for each band should be re-adjusted so that the stations come in at the correct points on the dial.

For additional information, refer to booklet "RCA Two Receiver Alignment."

A-C Power Supply

Model CV-112 is a separate power supply unit. It is used to provide operating voltages for Model 112 from an a-c supply source.

Precautionary Lead Dress:

1. All leads between antenna coil and switch must be as short as possible and kept away from the oscillator coil leads and switches.

2. Tap on 10-12 meter oscillator coil to pin No. 6 on oscillator tube socket must be dressed as far away from the air trimmer as possible.

3. All oscillator coil leads must be kept apart from each other, as well as other leads and parts.

4. Oscillator grid coupling condenser must be brought against parts on S2, and be kept away from the shield between S2 and S5.

5. Check for correct bias for oscillator, Do not adjust with voltmeter.

6. The speaker leads must be kept from the volume control and associated parts and leads.

7. The two paper condensers on the sides of the 2nd I.F. transformers must be held close to chassis to reduce interstage coupling.

Chassis No. RC-589

RCA Tube Complement

(1) RCA-165-H-6 1st Det.—Osc.
(2) RCA-166-G-6 1st I.F. Amplifier
(3) RCA-167-G-6 2nd I.F. Amplifier
(4) RCA-168-G-6 2nd Det. A.F. and A.V.C.
(5) RCA-166-G-6 Audio Driver Amplifier
(6) RCA-166-G-6 Power Input
The circuit for Models 1AX and 1AX2 is like that of Models LX and LX2 with the exception of the portion shown at the left. All other data apply.
Alignment Procedure

Calibration Scale on Indicator-Driver-Cord Drum.—The tuning dial is fastened to the hub and calibrated to be used for reference during the alignment procedure. Therefore, a calibration scale is attached to the indicator/driver-cord drum which is mounted on the shaft of the gauge assembly. The setting of the gauge is made in a scale which is calibrated in degrees. The correct setting of the gauge 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 "180° mark on the drum scale must be vertical and directly over the center of the gauge constant shaft when the plates are fully meshed. The drum is held in the shaft by means of two set screws, which may be tightened securely when the drum is in the correct position.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the dial with its 0°-180° calibration scale as seen from top and bottom.

Pointers for Calibration Scale.—Improve pointers for the calibration scale by bending a piece of wire to the gauge constant term, 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 finishing the chassis in the cabinet, attach the dial indicator to the drive shaft with an indicator at the dial indicator on the drive rate with an indicator in the mounting position. The dial indicator has a spring clip for attachment to the cable.

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band range is to use an actual reception of short-wave stations of known frequency and by adjusting the magnetic-beam oscillator for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced for an application, the noise level is high enough to prevent reception of short-wave stations, the test oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test oscillator, as a slight error will produce considerable inaccuracy on the spread-band dial. The settings of the test-oscillator may be checked by one or both of the following methods.

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard broadcast range of a test oscillator, first checking the frequency settings by means of means of a crystal calibrator (RCA Stock No. 957), or by zero-beating against standard broadcast stations.

When a test oscillator is employed for spread-band alignment, a dead check should be made on actual reception of short-wave stations of known frequency, and the magnetic-beam oscillator for each band should be re-adjusted so that the stations come in at the correct points on the dial.

* Use maximum capacity peak if two can be obtained. Check receiver to determine that C9 has been adjusted to the correct peak by tuning receiver to approximately 16-25 mc (02°) where a peak signal should be observed.

** Peak at minimum capacity if two peaks can be obtained.

NOTE: Oscillator tracks down signal on all bands.

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Synchronizing Speakers.—In order to get correct time quality from the loud speakers used in this model, it is essential that the two speakers be connected so that the diaphragms of both work in unison or synchronism. Therefore, the terminals of one speaker are reversed on the other end so that the set will be flat.

To test for proper connections, tune on receiver with volume down and connect the terminals of a 180°-volt dry cell across the voice-coil terminals of one of the speakers. If the diaphragms move in or get together at the instant of contact, the speaker connections are incorrect. If one moves out or the other moves in, they are back, and the voice-coil leads at one of the speakers should be reversed.

The movement of the diaphragms may be observed visually or by placing the finger-tips on each cone to feel the movement.

Precautionary Lead Dress.—

1. All leads between motor coils and switches must be as short as possible and kept away from motor coil leads and switches.

2. All motor coil leads must be kept apart from other leads and motor coil leads.

3. Blue plate lead of end 1 and 1 should be dressed underneath all other leads and motor coil leads.

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Dial-Indicator and Drive Mechanism

Connections and Colors of Loudspeaker and Motor Cables

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Motor Schematic

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Details of Record Shelf Posts, and Latching Lever Assemblies

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Tube and Trimmer Locations
Alignment Procedure

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-c action.

Electrical and Mechanical Specifications

Frequency Range ........................................... 540 - 1,600 kc
Intermediate Frequency ................................... 655 kc

RCA Tube Complement
(1) RCA-188 ....... 1st Det.—Qsc.
(2) RCA-174 ....... 2nd Det., A.F. and A.C.V.
(3) RCA-174 ....... A.F. Amplifier
(4) RCA-174 ....... Power Output

Power Supply Type Battery  Current Consumption Approximate Life (Intermittent Duty) Power Output
-A"—1.5 volt  0.25 amperes  3.5 hours  Undistorted  6.05 watts
Eveready No. 950

-B"—67.5 volts  4.5 milliamperes  25-40 hours  Maximum  0.12 watts
Eveready No. 467

LOUDSPEAKER
Type ........................................ 3-inch permanent magnet dynamic
V.C. Impedance ........................................ 3 ohms at 400 cycles

Cabinet Dimensions (inches) Height Width Depth
3 3 3

Weight ........................................ 31 lbs. (net) 48 lbs. (shipping)

Tuning Drive Ratio ................................. 1 to 1
Model 6QU is a three-band, table-type, superheterodyne Victrola housed in a wood cabinet. The phonograph mechanism is of the needle type, and will play either 10-inch or 12-inch records.

Virtually having “CS” or “BB” power rating may be made to operate on either 110 or 220 volts, conversion from one voltage to the other being made by means of a switch at the back of the cabinet.

**Phonograph Mechanism:**

The phonograph motor is a self-starting, constant speed induction type. It should be lubricated every six months. A few drops of light machine oil to the spindle bearing and all bushings are recommended.

The motor spindle is tapered, and a conical rubber piece fits snugly at the spindle bearing. The hole in the turntable housing is tapped to fit the rubber. This provides an excellent self-centering friction mounting.

A metal washer is placed on the spindle under the rubber piece. The washer has ears on the side which fit over a pin that projects through the gap condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Alignment Procedure:**

**Cathode-Ray Alignment** is the preferable method. Connections for the oscillograph are shown in the chassis drawings.

**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 is in, degrees, for each alignment frequency, is given in the alignment table.

As the first step in d-c alignment, check the position of the drum. The 0° mark on the drum scale must be vertical, and the center of the gap 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.** Improvise a pointer for the calibration scale by twisting a piece of wire to the gap condenser, and bend the wire so that it points to the 0° mark on the calibration scale when the plates are fully meshed.

**Indicator Adjustment.** After fastening the chassis in the cabinet, attach the dial indicator to the drive cable with indicator at the 0° mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Features of Design Include:** New type, single-ended tubes (654T and 650T); magnetic-core 1-F transformers; magneto-core oscillator coil on “A” band; automatic volume control; straight-line, edge-lighted dial; continuously variable tone control; supply-voltage change over switch (on “CS”- and “BB”-rating Victrolas).

**Miscellaneous Service Data:**

<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>655 kc</td>
<td>“A” Band quiet point between 500-700 kc</td>
<td>L10 and L11 (2nd I.F. trans.)</td>
</tr>
<tr>
<td>2</td>
<td>Tuning condenser in series with .01 mfd.</td>
<td>655 kc</td>
<td>800 kc, B Band “A” Band</td>
<td>L1 and L2 (1st I.F. trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna lead in series with 300 mmd.</td>
<td>655 kc</td>
<td>1,500 kc, 190 kc</td>
<td>C8 (ant.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna lead in series with 500 mmd.</td>
<td>655 kc</td>
<td>1,500 kc, 190 kc</td>
<td>C8 (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 in series with 400 ohms</td>
<td>655 kc</td>
<td>20 mc</td>
<td>C8 (ant.)</td>
</tr>
<tr>
<td>7</td>
<td>Antenna lead in series with 400 ohms</td>
<td>655 kc</td>
<td>6 mc</td>
<td>C8 (ant.)</td>
</tr>
<tr>
<td>8</td>
<td>Antenna lead in series with 400 ohms</td>
<td>655 kc</td>
<td>1,500 kc, 190 kc</td>
<td>C8 (ant.)</td>
</tr>
</tbody>
</table>

*Use minimum capacity peak if two peaks can be obtained.
† Rock gang condenser slightly while adjusting L1.
‡ Make test-oscillator connection to lug on tuning condenser stator (oscillator section) in series with .01 mfd. condenser.

**Note.**—Oscillator tracks 455 kc above signal on all bands.

---

**Arrangement of Drive Cord for Tuning Condenser and Dial Indicator.** Drum shown with Gang at Maximum Capacity.
Precautionary Lead Dress:

1. Dress the blue lead from the antenna lug to the No. 1 terminal on the range switch (S-1) close to the chassis and away from the gang for its entire length across the top of the chassis base.

2. Dress the yellow lead from the detector coil to No. 8 terminal on the range switch (S-2), directly away from the detector coil towards the rear apron.

3. Keep the blue lead from the detector coil to No. 9 terminal on the range switch (S-3), isolated from the other leads and parts.

4. Loop the bus wire from oscillator coil to No. 5 terminal on the range switch (S-3), directly away from these terminals and other parts as far as possible, bending the loop towards the center of the chassis.

5. Dress the 3,300 mfd. capacitor (C8) from the oscillator coil to No. 4 terminal on the range switch (S-3), directly toward the center of the chassis, being sure to clear the bus wire loop mentioned above (4).

6. Pull in the slack on the long yellow wire which runs from the terminal board in the rear corner to the tone control, at the tone control end, making the portion of the lead lying outside the front apron taut, and close to the apron.

Pilot Lamps (2) ........ Masda No. 47, 1.3 volts, 0.15 amp.

Power Supply Rating

D-C Rating (with vibrator-type power supply unit MI-8122)

- 6.3 volts, 3.2 amperes

A-C Rating (with CV-110 A-C power supply unit)


Power Output Rating

Maximum .................. 2.6 watts

Undistorted ................. 2.0 watts

Loudspeakers (Permanent-Magnet Dynamics)

7QB (RL-90-2) ............... 8-inch

7QBK (RL-71-3) ............. 12-inch

Voice-coil impedence at 400 cycles . 2.4 ohms
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 rth 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-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-oscillator shaft when the plates are fully meshed. The surface of the drum must be flush with the end of the gang-oscillator shaft. 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-oscillator 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 left-hand end mark on the dial scales and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

The pilot lights are illuminated by pressing in the volume-control knob. (The pilot lights are not controlled by this action when the receiver is operated with the CV-110 arc-power supply unit.)

<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 maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6S7-G 1-F grid cap in series with .01 mfd.</td>
<td>1000 kc</td>
<td>“A” band Quiet point between 560-750 kc</td>
<td>L14 and L15 (2nd I-F trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 1st det. grid cap in series with .01 mfd.</td>
<td>1000 kc</td>
<td>20 mc (22&quot;) “C” band</td>
<td>L12 and L13 (1st I-F trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 300 ohms</td>
<td>1000 kc</td>
<td>8.1 mc (27.0&quot;) “B” band</td>
<td>C7 (osc.)* (Rock C1 (ant.))</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 300 ohms</td>
<td>1000 kc</td>
<td>6.1 mc (27.0&quot;) “B&quot; band</td>
<td>C7 (osc.)** (Rock C2 (ant.))</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal in series with 200 mmf.</td>
<td>1000 kc</td>
<td>600 kc (143.5&quot;) “A” band</td>
<td>L7 (osc.) Rock Gang</td>
</tr>
<tr>
<td>6</td>
<td>Antenna terminal in series with 200 mmf.</td>
<td>1000 kc</td>
<td>1,500 kc (27.8&quot;) “A” band</td>
<td>C9 (osc.) C16 (det.) C3 (ant.)</td>
</tr>
<tr>
<td>7</td>
<td>Repeat steps 5 and 6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak (plunger cut) if two can be obtained. Check to determine that C6 has been adjusted to the correct peak by turning radio to approximately 19.09 mc where a weaker signal should be received.

** Use minimum capacity peak if two can be obtained. Check to determine that C7 has been adjusted to the correct peak by turning radio to approximately 5.19 mc where a weaker signal should be heard.

Note: Oscillator tracks above signal on all bands.
Alignment Procedure

models 10x, 11x-1

Output Meter Alignment.—If this method is used connect the meter across the voice coil, and turn the receiver volume control to maximum.

Electronic Voltmeter.—The electronic voltmeter in the Chameleon or VoltMaster provides an unobstructed output indicator. It should be connected to the AVC bus.

Test Oscillator.—Connect the low side of the test-oscillator to the receiver through a 0.01 mfd. capacitor. When the electronic voltmeter is used as an alignment indicator the output of the test oscillator should be adjusted to produce several volts of AVC. With the output meter aligned the method the oscillator output should be kept as low as possible.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet temporarily attached to the dial backing plate for quick reference during alignment.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Last Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>3554</td>
<td>Capacitor—0.05 mfd.</td>
<td>.25</td>
</tr>
<tr>
<td>37585</td>
<td>Capacitor—1 section of 0.05 mfd. and 1 section of 0.02 mfd.</td>
<td>.28</td>
</tr>
<tr>
<td>14933</td>
<td>Capacitor—0.01 mfd.</td>
<td>.20</td>
</tr>
<tr>
<td>5196</td>
<td>Capacitor—0.33 mfd.</td>
<td>.25</td>
</tr>
<tr>
<td>51967</td>
<td>Capacitor—0.02 mfd.</td>
<td>.18</td>
</tr>
<tr>
<td>4509</td>
<td>Capacitor—0.04 mfd.</td>
<td>.20</td>
</tr>
<tr>
<td>5845</td>
<td>Capacitor—0.06 mfd.</td>
<td>.20</td>
</tr>
<tr>
<td>5045</td>
<td>Capacitor—0.08 mfd.</td>
<td>.25</td>
</tr>
<tr>
<td>57355</td>
<td>Capacitor—0.04 mfd.</td>
<td>.25</td>
</tr>
<tr>
<td>36234</td>
<td>Coll—Oscillator coil</td>
<td>.30</td>
</tr>
<tr>
<td>37033</td>
<td>Condenser—Tuning condenser</td>
<td>.25</td>
</tr>
<tr>
<td>36555</td>
<td>Control—Volume control and power switch.</td>
<td>.50</td>
</tr>
<tr>
<td>38034</td>
<td>Cord—Drive cord (approx. 33 in. overall length).</td>
<td>.18</td>
</tr>
<tr>
<td>17098</td>
<td>Indicator—Station selector indication.</td>
<td>.20</td>
</tr>
<tr>
<td>37031</td>
<td>Plate—Back plate complete with pulleys—less dial.</td>
<td>.50</td>
</tr>
<tr>
<td>38250</td>
<td>Pulley—Drive cord pulley</td>
<td>.25</td>
</tr>
<tr>
<td>37365</td>
<td>Receptacle—Receptacle and terminal board.</td>
<td>.20</td>
</tr>
<tr>
<td>10912</td>
<td>Resistor—30,000 ohms, 1 watt.</td>
<td>.25</td>
</tr>
<tr>
<td>10918</td>
<td>Resistor—25,000 ohms, 1 watt.</td>
<td>.20</td>
</tr>
<tr>
<td>10914</td>
<td>Resistor—15,000 ohms, 1 watt.</td>
<td>.20</td>
</tr>
<tr>
<td>10915</td>
<td>Resistor—7,500 ohms, 1 watt.</td>
<td>.20</td>
</tr>
<tr>
<td>10923</td>
<td>Resistor—4,700 ohms, 1 watt.</td>
<td>.20</td>
</tr>
</tbody>
</table>

Replacement Parts

models 10x, 11x-1

Arrays on premise battery-loaded parts, which are readily identified and may be purchased from authorized dealers.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Last Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>59907</td>
<td>Cap—Dust cap</td>
<td>.60</td>
</tr>
<tr>
<td>58986</td>
<td>Cone—Cone complete with voice coil</td>
<td>1.50</td>
</tr>
<tr>
<td>57362</td>
<td>Speaker—6 inch dynamic speaker complete with cone and voice coil.</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Miscellaneous Assemblies

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Last Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>10940</td>
<td>Back—Cabinet back.</td>
<td>.20</td>
</tr>
<tr>
<td>10941</td>
<td>Clamp—Dial clamp (1 set)</td>
<td>.20</td>
</tr>
<tr>
<td>10942</td>
<td>Dial—Dial scales.</td>
<td>.20</td>
</tr>
<tr>
<td>10943</td>
<td>Feeler—Push-on lacer for back.</td>
<td>.10</td>
</tr>
<tr>
<td>10944</td>
<td>Knob—Volume control or tuning knob</td>
<td>.20</td>
</tr>
<tr>
<td>10945</td>
<td>Lamp—Dial lamp.</td>
<td>.15</td>
</tr>
<tr>
<td>10950</td>
<td>Spring—Retaining spring for knobs</td>
<td>.20</td>
</tr>
</tbody>
</table>

Alignment Procedure

Model 45x-18

Pre-Setting Dial.—With grid condenser in full mesh, the pointer should be adjusted so that it is horizontal.

Push Button Adjustment.—The push-buttons should be adjusted for the favorite stations after the receiver is operating, and has had a brief warm-up period. Any standard broadcasting stations may be chosen, it being preferable to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Push each button and loosen the push-button screws in back of the station marker recesses.
2. Accurately tune in the first station manually.
3. With the station accurately tuned, press in the first push-button and tighten the screw.
4. Place station marker tab in the recess.
5. Adjust four remaining push buttons in a similar manner.

Model 16x-4

Push Button Adjustment:

1. Make a list of the six desired stations, arranged in order from low to high frequencies, and manually tune in the first station on this list.
2. Push in station button No. 1 (extreme left) and adjust No. 1 oscillator core to receive the station.
3. Adjust antenna trimmer for maximum output. Clockwise core and trimmer adjustment tunes circuits to lower frequencies.
4. Adjust for each of the four remaining stations in a similar manner.
5. Make a final careful re-adjustment of oscillator cores and antenna trimmers.

Alignment Procedure

Model 10x, 11x-1

<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>125K7 grid in series with 0.01 mfd.</td>
<td>655 kC</td>
<td>Quiet point at 1,800 kC end of dial</td>
<td>C10, C9 1F Transformer</td>
</tr>
<tr>
<td>2</td>
<td>125A7 grid in series with 0.1 mfd.</td>
<td>655 kC</td>
<td>Quiet point at 3,700 kC end of dial</td>
<td>C21, C20 1F Transformer</td>
</tr>
<tr>
<td>3</td>
<td>Ammeter—amplifier in series with 250 mmd.</td>
<td>1,270 kC</td>
<td>1,270 kC</td>
<td>C18 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Radiated signal 1,200 kC</td>
<td>1200 kC</td>
<td>Resonance on signal</td>
<td>C15 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 2 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alignment Procedure

Model 45x-18

<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>125K7 F-P grid, in series with 0.01 mfd.</td>
<td>655 kC</td>
<td>Quiet point at 1,800 kC end of dial</td>
<td>C10, C9 1P Transformer</td>
</tr>
<tr>
<td>2</td>
<td>125A7 1st Dee. grid in series with 0.1 mfd.</td>
<td>655 kC</td>
<td>Quiet point at 3,700 kC end of dial</td>
<td>C21, C20 1P Transformer</td>
</tr>
<tr>
<td>3</td>
<td>125R-P grid in series with 0.1 mfd.</td>
<td>1,270 kC</td>
<td>1,270 kC</td>
<td>C18 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Radiated signal 1,200 kC</td>
<td>1200 kC</td>
<td>Resonance on signal</td>
<td>C15 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 2 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Models 7Q4 and 7QK4 are similar to Model 6Q4 except for the addition of a tuning indicator (RCA-6U5/6G5). The 7QK4 chassis uses an RCA-6F6 output tube, whereas the 7Q4 uses an RCA-6F6-G output tube.

The dial scale of Models 7Q4 and 7QK4, together with a table giving alignment frequencies and calibration degrees, is shown below. For additional alignment data, schematic diagrams, etc., refer to the service note on Model 6Q4.

### Tube Complement
1. RCA-6SK7
2. RCA-6SA7
3. RCA-6SK7
4. RCA-6SQ7
5. RCA-6F6-G (7Q4)
6. RCA-6Y3-G
7. RCA-6U5/6G5

### Loudspeakers
- 7Q4 (RL-63X-2) 8-inch electrodynamic
- 7Q4 (RL-70J-4) 12-inch electrodynamic
- V. C. Impedance 2.2 ohms at 400 cycles

### Cabinet Dimensions
- 7Q4: 15½-inches x 20½-inches x 9½-inches
- 7QK4: 38-inches x 26-inches x 11½-inches

### Calibration Scale

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Calibration Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>175 kc</td>
<td>52.8</td>
</tr>
<tr>
<td>360 kc</td>
<td>148.5</td>
</tr>
<tr>
<td>600 kc</td>
<td>92.0</td>
</tr>
<tr>
<td>1,500 kc</td>
<td>152.0</td>
</tr>
<tr>
<td>6.0 mc</td>
<td>150.0</td>
</tr>
<tr>
<td>20.0 mc</td>
<td>157.0</td>
</tr>
</tbody>
</table>

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.

### Dial Drive and Controls
For Models 7Q4, 7QK4 and 7Q4X

---

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Models 12AX, 12AX2 are the same as Models 12X, 12X2 with the exception of the circuit shown at the left. Rest of data apply to all models.

**Record Player**

A jack is provided on the rear of the set for attaching a Record Player. The cable from the Record Player should be terminated in a 900Ω plug to fit the jack.

For phonograph operation, tune the receiver to a quiet point on the dial, turn the radio volume control to minimum, and use the control on the Record Player to regulate volume.

For radio operation, always remove the record-player plug from the jack.

**Steps**

1. I.F. grid, in series with .01 mfd.
2. 1st Det. grid in series with .01 mfd.
3. Ant. terminal in series with 100 mfd.
4. Radiated signal 1000 kc
5. Repeat steps 3 and 4.

**Tune**

- Tune test oscillator to 1665 kc
- Tune radio dial to 1665 kc
- Turn radio dial to 1000 kc
- Gang at minimum
- Adjust the following for max. peak output

**Connect the high side of tonometer to**

- C10, C9, and 1.5 ohm transformer
- C8, C7, and 1.5 ohm transformer
- C14 (sec.)
- C10 (ant.)
GROUNDING

* Grounded to chassis in Model 14AX.

VOLTAGES SHOULD HOLD WITHIN ±5% WITH 117 V AC SUPPLY.
* MEASURED WITH CHAVALYST OR VOLTMETER.

Power Output
Undistorted...................... 9 watts
Maximum......................... 1.3 watts

Approx. Gain
Data using RCA Grid-3 Amplifier

Model 14AX is the same as Model 14X with the exception of the circuit shown above.

Loudspeaker (82161-1)
Type........................................ 3-inch permanent-magnet dynamic V.C. Impedance........................................ 3.3 ohms at 400 cycles

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-oscillator to</th>
<th>Tune test-oscillator 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>125K7 grid in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>Quiet Point</td>
<td>C10, C9 Bond-1 F Transformer</td>
</tr>
<tr>
<td>2</td>
<td>125A7 grid in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>1600 kc end of dial</td>
<td>C8, C7 1st I-F Transformer</td>
</tr>
<tr>
<td>3</td>
<td>Antenna term. in series with 47 mfd.</td>
<td>10 mc</td>
<td>10 mc</td>
<td>C21 (osc.) C23 (ant.)</td>
</tr>
<tr>
<td>4</td>
<td>Antenna term. in series with 200 mfd.</td>
<td>1600 kc</td>
<td>1600 kc</td>
<td>C14 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Radiation Loop</td>
<td>1300 mc</td>
<td>Resonance on Signal</td>
<td>C18 (ant.)</td>
</tr>
<tr>
<td>6</td>
<td>Radiation Loop</td>
<td>600 kc</td>
<td></td>
<td>C22 O.C. Rock in</td>
</tr>
</tbody>
</table>

* It is recommended that this step be repeated using a received station of known frequency.
** Use minimum capacity if two peaks can be obtained.

Precautionary Lead Dress—
1. Dress the power cable to switch on the volume control close to the chassis and away from all wires and leads and condensers.
2. Dress capacitors in the 12SQ7 grid circuit away from all wiring.
3. Green and black phonowires should be twisted and dressed away from other parts and leads.
4. 50L6-C7 filament wires should be dressed behind rear of chassis and away from the second I-F transformer leads.
5. Dress brown lead from second I-F transformer to 12SQ7 away from power cable.
6. Dress wire to No. 1 grid of the 12SA7 away from pilot lamp leads.
7. Dress wire from loop to variable condenser away from chassis.
8. Dress all capacitors, leads, etc. which come close to oscillator coil rigidly and as far as possible from it.

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ALIGNMENT PROCEDURE

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-c action.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect high side of test-oscillator to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1N5GT I-F grid cap, in series with .01 mfd.</td>
<td>650 kc</td>
<td>Quiet point at 1,000 kc end of dial</td>
<td>L4, L7 (2nd transformer)</td>
</tr>
<tr>
<td>2</td>
<td>1A7GT 1st-Dec. grid cap, in series with .01 mfd.</td>
<td></td>
<td></td>
<td>L4, L3 (1st I-F transformer)</td>
</tr>
<tr>
<td>3</td>
<td>Radiated signal 1,780 kc</td>
<td></td>
<td></td>
<td>C28 (Osc. Trimmer)</td>
</tr>
<tr>
<td>4</td>
<td>Radiated signal 1,400 kc</td>
<td></td>
<td></td>
<td>C20 (Ant. Trimmer)</td>
</tr>
<tr>
<td>5</td>
<td>Radiated signal near 600 kc</td>
<td></td>
<td></td>
<td>1.6 (Rock in)</td>
</tr>
<tr>
<td>6</td>
<td>Repeat steps 3, 4 and 5 until aligned</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Precautionary Lead Dress.—
1. Lead from I-F tube grid and from the loop to variable capacitor should not be disturbed after receiver has been aligned.
2. Grid lead to the 1N5GT tube should be kept away from leads to filament resistors.

BATTERY INSTALLATION

Model Type Cabinet
Chassis RC-527
15BP-1 Plastic
15BP-2 Brown
15BP-3 Brown
15BP-6 Wood

Chassis RC-527A
15BP-3 Gray Fabric
15BP-5 Blue
Leatherette

1940 No. 26 — First Ed. -9

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CURRENT CONSUMPTION
"A", 0.3 ampere—"B", 12 milliamperes
(In "Battery Saver" position, the "B" drain is reduced approximately
40%)

BATTERIES REQUIRED
"A"—"B" Pack (1.6 volt "A" 90 volt "B")

POWER OUTPUT
Undistorted........................................... 0.14 watts
Maximum.................................................. 0.26 watts

LOUDSPEAKER
Type......................................................... 5 inch permanent-magnet dynamic
Voice Coil Impedance........................................ 3.4 ohms at 400 cycles
Identification Number...................................... RL-93-1

Alignment Procedure
Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagrams.

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.

Electronic Voltmeter.—The electronic voltmeter in the Channelyst or Volt Ohmmyst provides an unexcelled output indicator. It should be connected to the AVC bus, and the test-oscillator output adjusted to produce several volts of AVC.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment.

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use scotch tape to hold the glass dial in this position.

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RCA MFG. CO., INC.

MODEL 16X, Ch. RC-462
MODELS 16X-1, 16X-2
Ch. RC-462A
MODEL 16X-5, Ch. RC-462E

MODEL 16X - SCHEMATIC DIAGRAM
FOR ALIGNMENT SEE INDEX

MODELS 16X-1, 2, 3 SCHEMATIC DIAGRAM
FOR ALIGNMENT SEE INDEX

Frequency Range ........................................... 595-1,720 kc

Power Output
Undistorted ............................................. 0.9 watts
Maximum .................................................. 1.4 watts

LOUDSPEAKER (RL-81A-5)
Type .......................................................... 5-inch permanent-magnet dynamic
V.C. Impedance ........................................... 4 ohms at 400 cycles

Power Supply Rating
105-125 volts, AC, 50 or 60 cycles, or DC ................. 30 watts
### Alignment Procedure

**Output Meter Alignment:** If the method is used, connect the meter across the voice coil, and turn the quiver control to minimum.

**Test-Oscillator:** For all alignment operations, keep the output as low as possible to avoid a-c action.

#### Models 16X, 16X-1, 16X-2, 16X-3

<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>125K7 grid in series with 0.01 mfd.</td>
<td>455 kc</td>
<td>C17, C18</td>
<td>C17, C18 (2nd I.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>125K7 grid in series with 0.2 mfd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna term, in series with 100 mmd.</td>
<td>1,790 kc (out of mesh)</td>
<td>C14 (oscillator)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Resonance on 1,790 kc signal</td>
<td>1,600 kc</td>
<td>C12 (antenna)</td>
<td></td>
</tr>
</tbody>
</table>

#### Models 16X-11, 16X-13, 16X-14

<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>125K7 I-F grid in series with 0.1 mfd.</td>
<td>455 kc</td>
<td>C13, C18</td>
<td>C13, C18 (1st I.F. Transformer)</td>
</tr>
<tr>
<td>2</td>
<td>125A7 1st def. grid in series with 0.1 mfd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna term, in series with 47 mmd.</td>
<td>19 kc</td>
<td>C18 (osc.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Resonance on 19 kc signal</td>
<td>18 mc</td>
<td>C11 (ant.)</td>
<td></td>
</tr>
</tbody>
</table>

### Replacement Parts

#### Model BP-10

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit Last Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>30092</td>
<td>Reel—10 megohm, J watt</td>
<td>$0.90</td>
</tr>
<tr>
<td>30082</td>
<td>Screw—No. 8-32 x 1 1/2 screw for knobs</td>
<td>$0.10</td>
</tr>
<tr>
<td>30048</td>
<td>Socket—Tube socket</td>
<td>$0.15</td>
</tr>
<tr>
<td>30083</td>
<td>Socket—1/4 tube socket</td>
<td>$0.30</td>
</tr>
<tr>
<td>30038</td>
<td>Transformer—First I.F. transformer</td>
<td>$1.90</td>
</tr>
<tr>
<td>30049</td>
<td>Transformer—Second I.F. transformer</td>
<td>$1.90</td>
</tr>
</tbody>
</table>

#### Speaker Assemblies

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>55981</td>
<td>Speaker—2 1/2 in. P. M. speaker, complete with cone and voice coil, loud output transformer</td>
</tr>
<tr>
<td>55982</td>
<td>Transformer—Output transformer</td>
</tr>
</tbody>
</table>

#### Miscellaneous Assemblies

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>55983</td>
<td>Antenna—Antenna loop and cover</td>
</tr>
<tr>
<td>55984</td>
<td>Barometer—Receive case bottom cover</td>
</tr>
<tr>
<td>55985</td>
<td>Center—Receive case center</td>
</tr>
<tr>
<td>55986</td>
<td>Handle—Carring handle and bracket</td>
</tr>
<tr>
<td>55987</td>
<td>Dial—Reel initial in each set comprising 55 groups of all the initials and tubes of remant</td>
</tr>
<tr>
<td>55988</td>
<td>Lid—Receive case top cover and panel</td>
</tr>
<tr>
<td>55989</td>
<td>Strap—Shoulder strap</td>
</tr>
<tr>
<td>55986</td>
<td>Switch—Power switch</td>
</tr>
</tbody>
</table>

*ALL PRICES ARE SUBJECT TO CHANGE OR WITHDRAWAL WITHOUT NOTICE.*

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**Power Consumption: 30 Watts**

**For Other Data See Index**

Precautionary Lead Dress—

1. Dress all capacitors, leads, etc., coming close to one coil rigidly and as far as possible from it.
2. Dress blue lead from loop trimmer against loop and around outside of 3825 tube.
3. Dress leads of 150 mfd. capacitor from terminal board to grid of 125AT as short and direct as possible.
4. Dress leads of peaking coil from plate of 18SK7 RF tube to terminal board as short and direct as possible.
5. Dress blue lead from SW ant. coil through same hole in base through which green lead from stator of rear section of the variable condenser passes.
Electrical and Mechanical Specifications

FREQUENCY RANGE ........................................... 530-625 kc

TYPE COMPONENT
1. RCA FA-42
2. RCA 522C-G
3. Half-Wave Rectifier
4. Dial Lamp
Manda 47, 6-8 volts, 15 amp.

POWER SUPPLY RATING
A-6. 105-125 volts, 60 cycles, 50 watts
A-5. 105-125 volts, 50 cycles, 50 watts

MOTOR
Type: Synchronous (Manual Starting)
Turntable Speed: 78 r.p.m.

Set-Up Procedure
1. Insert plug in power supply outlet, and turn the power switch-valve control knob on top of VA-21 to full clockwise position. Start a record on the VA-21. The motor is a synchronous manual-starting type, and requires a clockwise spin to start.
2. Tune the radio receiving set to a quiet point between 530-625 kc.
3. Tune the oscillator in the VA-21 to this frequency by adjusting the button on the rear of the VA-21 cabinet to obtain peak output on the receiver. Clockwise rotation decreases the frequency; counter-clockwise rotation increases the frequency.
4. Adjust the volume control for the highest volume that is likely to be required, and then use the VA-21 volume control, for further adjustment.
5. In noisy locations, it may be desirable to leave the VA-21 volume control turned full clockwise, and regulate the radio volume control for the desired level.
6. If there is insufficient volume, or excessive noise, the remedy is to couple the VA-21 to the radio receiver, by running a piece of insulated wire between the two units. Wrap one end (three or four turns) around the antenna lead-in on the radio, and wrap the other end (three or four turns) around the short wire that projects from the plug on the power cord of the VA-21. With an RCA Master Antenna, wrap the wire around the counter-plate lead where it attaches to the receiver terminal A9) or to the coupling unit (terminal B). With a loop receiver, place the end of the wire close to the loop.
7. If the radio receiver has push-button tuning, one of the buttons may be set up to tune in the VA-21 oscillator frequency. This button should be marked "Record Play." "

Precautionary Lead Dress
1. The power supply cord must be dressed between chassis and top of cabinet, away from grid of 6A8, and entirely away from 2526-G.
2. All leads to oscillator coil must be as short as possible.
3. All motor leads must be dressed away from rotor.
4. Pickup leads must be dressed away from top grid of 6A8, and kept away from the 2526-G.

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, 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. Burrs on poles of rotor or stator. Remove with fine emery cloth.
The damper spring must fit without binding or chattering in the slot in the stator. The motor 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 either direction.

Removing Rotor.—The rotor is to be turned counter-clockwise, and then slowly lifted upward.

Roto Adjustments.—Remove rotor from cabinet. Loosen the three screws that hold the rotor to the turntable, insert three 10-24 bolts at 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.

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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 output transformer, 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.S.O. action.

Calibration Scale on Indicator-Drive-Cord Drum.—The tuning dial is calibrated in the cabinet and cannot be used for reference during alignment. Therefore, a calibration scale is attached to the indicator-drive-cord drum which is mounted on the 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 "100°" 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 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 hang the wire so that it points to the "100°" 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 504 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnet-tone oscillator coil for each band so that the stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce considerable inaccuracy on the spread-band dials. The frequency settings of the test-oscillator may be checked by one or both of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard broadcast range of a test-oscillator, first checking the frequency settings on this range by means of a crystal calibrator (RCA Stock No. 8975), or by zero-beating against standard broadcast stations.

When a test oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnet-tone oscillator coil for each band should be re-adjusted so that the stations come in at the correct points on the dial.

Tube and Trimmer Location

Dial-Indicator and Drive Mechanism

Location of Controls

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 Inductor-Drive-Gear 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 indicator drive cord which is mounted on the gear drum for 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 where 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.

Pointing 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 640 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

Tube and Trimmer Location

Spread-Band Alignment.—The most satisfactory method of aligning or checking the spread-band ranges is on actual reception of short-wave stations of known frequency, by adjusting the magnet core oscillator coil for each band so that these stations come in at the correct points on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test oscillator, as a slight error will produce considerable inaccuracy on the spread-band scales. The frequency settings of the test-oscillator may be checked by one or both of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies at or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations of known frequency.

2. Use harmonics of the standard broadcast range of a test-oscillator, first checking the frequency settings on this range by means of an RCA crystal calibrator (RCA Stock No. 90732), or by zero-beating against standard broadcast stations.

When a test oscillator is employed for spread-band alignment, a final check should be made on actual reception of short-wave stations of known frequency, and the magnet core oscillator coil for each band should be re-adjusted so that the stations come in at the correct points on the dial.

Ballast Resistor

* Use minimum capacity peak if two can be obtained. Check image to determine that C2 has been adjusted to the correct peak by tuning receiver to approximately 14.55 mc (20°) where weaker signal should be received.

** Peak at minimum position of plunger if two peaks can be obtained.

*** Peak at minimum capacity if two peaks can be obtained.

NOTE: Oscillator tracks above signal on all bands.
Precautionary Lead Dress:
1. Dress I.F. plate and grid leads against chassis and away from each other.
2. Dress plate lead from 12SK7 close to chassis.
3. Dress leads from terminal board on loop support away from loop.

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.

Power Output (125 volts, 60 cycle supply)
Undistorted........... 0.8 watts
Maximum.............. 1.2 watts

Loadspeaker.................... 5 inch electrodynamic

Drive Cord Detail
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.

<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>12SK7 1-F grid in series with .01 mfd.</td>
<td>655 kc</td>
<td>Quiet Point 1,600 kc end of dial</td>
<td>C29, C38 2nd 1-F transformer</td>
</tr>
<tr>
<td>2</td>
<td>12BA7—3rd det. grid in series with .01 mfd.</td>
<td>655 kc</td>
<td>C97, C98 3rd 1-F transformer</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>radiated signal 1,600 kc</td>
<td>signal frequency</td>
<td>C28 (osc.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>radiated signal 1,800 kc</td>
<td></td>
<td>C28 (ant.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Electrical and Mechanical Specifications

**Frequency Range**
540-1,650 kc

**Intermediate Frequency**
455 kc

**Tube Complement**
1. RCA-12SK7 1st Det.—Osc.
2. RCA-12SK3 1-F Amplifier
3. RCA-12SQ7 2nd Det. A.V.C. and A.F Amplifier
4. RCA-50LS GT Power Output
5. RCA-5528-GT Rectifier

**Power Output**
Undistorted 0.9 watts
Maximum 1.2 watts

**Pilot Lamp**
1—Mazda No. 51, 6-8 volts, 0.2 amps.

**Power Supply Rating**
105-125 volts, 60 cycles 55 watts
105-125 volts, 60 cycles 55 watts

**Loudspeaker (RL-81A-4)**
Type: 8-inch permanent-magnet dynamic
V.C. Impedance: 4 ohms at 400 cycles

**Cabinet Dimensions (inches)**
10 14/16 Height, 8 11/16 Width, 11 11/16 Depth

**Weight (net)**
19 lbs.
21 lbs.

**Tuning Drive Ratio**
9:1

**Phonograph Motor Service Data**
The phonograph motor is of the self starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber tire idler on the rim of the turntable.
The motor should be lubricated once or twice a year by placing a few drops of S. A. E. 20 (or equivalent) on the turntable spindle and saturating the oil retaining felt pads on the motor shaft with S. A. E. 10 oil. Caution—The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

**Power Supply**
Although this model employs an ac/dc chassis, it is not suitable for use on d.c., as this would damage the motor.
Alignment Procedure

Using Calibration Scale—
1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so that the left end of ruler is at the reference mark at left-hand end of backing plate. Temporarily fasten the ruler with Scotch tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch scale drawn at bottom.

Dial-Pointer Adjustment—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect the high side of the test-osc. to</th>
<th>Turn 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>1-F grid, in series with .01 mfd.</td>
<td>650 kc</td>
<td>Quiet Point at H-F end of dial</td>
<td>1.6 and 1.7 (6-c. I.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid, in series with .01 mfd.</td>
<td>1,000 kc</td>
<td>1,000 kc</td>
<td>1.6 and 1.5 (6-c. I.F. Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal, in series with 200 mohm, (link open)</td>
<td>600 kc</td>
<td>600 kc</td>
<td>1.3 (c. o.m. Rock in)</td>
</tr>
<tr>
<td>4</td>
<td>2nd det. grid, in series with .01 mfd.</td>
<td>650 kc</td>
<td>650 kc</td>
<td>1.3 (c. o.m. Rock in)</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PHOTOGRAPH MOTOR SERVICE DATA—
The photograph motor is of the self-starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber-tired idler on the rim of the turntable.

The motor should be lubricated once or twice a year by placing a few drops of S. A. E. 20 (or equivalent) on the turntable spindle and saturating the oil retaining felt pads on the motor shaft with S. A. E. 10 oil. Caution—The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

Precautionary Lead Dress—
1. Dress power leads to AC switch away from terminals of volume control.
2. Dress heater leads to 6Q7 away from 10 megohm leak.
3. Dress C-14 and C-18 away from all heater and power supply leads.
4. Green lead to loop away from I.F. can.
5. Green lead from C-1 to bottom assembly away from oscillator.
6. Green phone lead from chassis and away from C-13.

The Photographic Tone Control—
The five positions of the knob are:
1. Fully counterclockwise—radio mellow tone with emphasis on lows and reduction of static and high pitched interference.
2. Radio full tone with all sound effects.
3. Phonograph—mellow tone with reduction of high pitched surface noise and emphasis on lows.
4. Phonograph—full tone—all sound effects from the record.
5. Phonograph—high tone—with reduction of bass resonance and low tones.
Alignment Procedure

**Model 46X-1, 46X-2, 46X-3**

**Chassis RC-459F, RC-459H**

2nd Production

1. Connect the high side of test oscillator to—
2. Tune test-osc. to—
3. Turn radio dial to—
4. Adjust the following for max. peak output—

**Model 54BP-1 Series Chassis RC-407B**

**Alignment Procedure**

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 1-F alignment, 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.

Pre-setting Dial.—With gang condenser in full mesh, the pointer should be adjusted so that it is vertical.

Antenna.—The set is equipped with a built-in loop antenna. If an outdoor antenna is used, it may be connected to the "ANT" terminal on rear of cabinet. 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.

**Model V-102, Ch. RC-624**

**2nd Production**

1. Connect the high side of test-oscillator to—
2. Tune test-osc. to—
3. Turn radio dial to—
4. Adjust the following for max. peak output—

**Push Button Adjustments**

The push buttons connect to separate magnetite-core oscillator coils and separate loop circuit trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. B1083. Allow about five minutes warm-up period before making adjustments.

The procedure is as follows:
1. Make a list of the five desired 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. Press in the left-hand button.
4. Adjust L20 to receive the first station. To secure the best adjustment, rotate the set for least pickup and adjust L20 for peak output.

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**SERVICE DATA**

Motor.—The drive motor is of simple design and substantial construction. It should require little or no service if properly maintained. Attention to lubrication of the moving parts and occasional cleaning of the mechanism will go far to prevent faulty operation. Should it become necessary to repair the motor, the following procedure should be applied: CAUTION.—Allow the motor mechanism to run down completely before attempting adjustment, repairs, or replacements.

Removing Motor from Cabinet.—Remove the winding key. To dismount the motor, unscrew the spindle cap and remove turntable, slightly tapping the spindle while exerting an upward lift on the turntable. Loosen the screw holding the speed-regulating lever and remove the latter. The three screws holding motor to motor board should then be loosened to permit removal of motor assembly.

Replacing Main Spring Barrel.—In case of main spring failure, the entire spring barrel and gear should be replaced. Remove the spring-barrel spindle screw by unscrewing to right. Remove C washer and two pillar screws holding bottom plate. Remove bottom plate, intermediate spindle shaft, and spring barrel. Reassemble parts in reverse sequence.

Winding Shaft Spring.—This spring functions as a friction ratchet. It may be removed as follows: Remove pin holding winding worm on shaft; remove winding shaft; then remove screw holding spring. Replace in reverse sequence.

Governor Adjustments.—The mesh of the worm and fiber gears is adjusted by rotation of the eccentric spindle bearings. The adjustments should be made so that the worm meshes properly with the fiber gear and rotates freely without binding. The bearings should be accurately aligned with each other. The minimum of spindle end-play which permits smooth operation should be used.

Speed Regulator Lever.—After assembly, adjust the speed regulator until the turntable rotates at 78 r.p.m.; loosen the speed regulator screw and set pointer to center of speed indicator scale; tighten screw and recheck turntable speed.

**CRYSTAL PICKUP**

- **Impedance**: 100,000 ohms at 1,000 cycles
- **Average Output Voltage**: 4 volts at 1,000 cycles
- **Temperature Coefficient**: ±0.05% per °C

**Radio Receivers**

- **Volume Control**: Is in the audio input circuit.
- **Slight Bias for Tube**: Is obtained through grid bias.

**General Description**

The R-103-S is designed for use with a battery-operated receiver where a mechanical type unit is desired because of the radio receiver portion of the chassis should be shielded or operated, to prevent radio signals being heard while the Victrola Attachment is in operation.

**Connecting Victrola Attachment to Radio Receivers**

In general, the Victrola Attachment must be used with radio receivers having at least two stages of high-gain audio amplification. The output of the Victrola Attachment should be connected to the input of the first audio tube, and at the same time the output of the radio receiver portion of the chassis should be shielded or operated, to prevent radio signals being heard while the Victrola Attachment is in operation.

**Methods of connecting the Victrola Attachment to various types of audio systems are given in the accompanying diagrams.**

**Tone Compensation**

Because of the widely varying frequency characteristics of various types of audio amplifiers with which the Victrola Attachment may be used, it may be desirable in some cases to alter the pickup circuit of the Victrola Attachment to compensate for the characteristics of the amplifier. The following circuits show typical such refinements.

- **A**—R1 controls the low-frequency response; larger values of R1 give increased lows. For maximum low-frequency response, remove R1. R2 controls pickup output, and smaller values of R2 give increased output. C1 controls high-frequency response; to increase high, 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 "B" is applicable. In this circuit, C2 is adjusted 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 "A" and "B" should serve as a basis from which slight alterations may be made to suit individual receivers.
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

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-motion.

Electronic Voltmeter.—The electronic voltmeter in the Channelyzer or Volt Ohmyst provides an unrivalled output indicator. It should be connected to the AVC bus, and the test-oscillator output produced to several volts of AVC.

Calibration for Alignment.—The dial calibration for alignment purposes can be set up in two ways:

1. The dial may be removed from the cabinet by undoing out the two spring pieces which clamp it in its mounting position. The condenser plates should then be turned into full mesh, the pointer adjusted to the scratch at the left end of the dial backing plate, and the dial placed on the frame so that its extreme left calibration mark coincides with the pointer. The dial may be held in place with scotch tape. In this manner the actual receiver dial is used for alignment. When alignment is finished, the scale should be replaced including the fibre light shields which are folded under the edges of the glass scale.

2. A calibration scale is attached to the tuning drum. The correct setting of the gang, in degrees, for each alignment frequency is given in the alignment table. Check the position of the drum, making sure that the 0 degree scale mark is horizontal with the gang in full mesh.

Pointer for Calibration Scale.—If method (2) is used, improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, from the wire so that it points to the 0 degree mark on the scale calibration when the plates are fully meshed.

Spread-Band Alignment.—Make final adjustment of C56 and C80 during actual reception of a station of known frequency near 9-k megacycles.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect high side of test-osc. to—</th>
<th>Tune test osc. to—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for maximum peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-P grid in series with .01 md.</td>
<td>465 kc</td>
<td>&quot;C&quot; Band Quiet Point at 18 cm end of dial</td>
<td>L21 and L22 (2nd I.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1st-det. grid in series with .01 md.</td>
<td>15.5 mc</td>
<td>15.5 mc</td>
<td>C56 (oc.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal (A), in series with 2.564 mc</td>
<td>9.5 mc</td>
<td>C56 (oc.), C56 (st.), C51 (st.)</td>
<td>Rock in</td>
</tr>
<tr>
<td>4</td>
<td>Stator of antenna section of gang, in series with 500 ohms</td>
<td>1,500 kc</td>
<td>2.44 kc</td>
<td>C57 (oc.)</td>
</tr>
<tr>
<td>6</td>
<td>Repeat steps 8 and 7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fasten chassis cabinet, see that link is closed on antenna terminal board, indicator at left end of dial scale with gang at maximum capacity.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Radiation loop consisting of two turns of wire 18 inches in diameter located 4 to 6 feet from receiver</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C61 (st.) (mounted on loop)</td>
</tr>
<tr>
<td>11</td>
<td>in series with 300 ohms</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C61 (st.) (mounted on loop)</td>
</tr>
<tr>
<td>12</td>
<td>Repeat steps 10 and 11.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained.

** Use maximum capacity peak if two peaks can be obtained.

NOTE: Oscillator tracks 465 kc above signal on all bands.

Push Button Adjustment

The station push buttons connect to separate magnetite-core oscillator coils and separate antenna trimmers which must be adjusted for each station. Use an insulated screwdriver or alignment tool such as the RCA Stock No. 81031. Allow at least five minutes warm-up period before making adjustments.

In the event that the receiver is to be used with an external antenna use one or two feet of wire (as an antenna) to ensure sharp peaking during the final adjustment procedure. For loop operation, the link should be strapped across terminals on back of set. In either case the procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn range selector to "PB" position, push in station button No. 3 (extreme left). Then adjust the No. 1 oscillator core (L14) to receive the station.
4. After oscillator core is set correctly, adjust C8 for maximum output.

Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

5. Adjust for each of the remaining stations in the same manner.
6. Make a final careful adjustment of the oscillator cores and antenna trimmers.

Owing to the relatively high r-f gain, it may be found that a given station can be tuned in at several different settings of the magnetite-core oscillator push-button coils. In such cases, it is advisable to unscrew the loop push-button trimmers to minimum capacity before adjusting the magnetite cores.

On the 860 to 1,500 kc push-button, the higher frequency stations may be received with L-9 either in or out (oscillator frequency either 465 kc below or 465 kc above the station frequency). The adjust with this core in its out position (oscillator frequency 465 kc above the station frequency) is the correct one.
**Alignment Procedure**

Cathode-Ray Alignment is the preferable method. Connections for the oscillator coils are shown in the schematic diagram.

**Output Meter Alignment**—if this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

**Tone-Oscillator**—for all alignment operations, connect the low side of the tone-oscillator to the receiver chassis, and keep the output as low as possible to avoid a.c. action.

**Electronic Voltmeter**—the electronic voltmeter in the Channel A or Volt Ohms yst provides an uncorrected output indicator. It should be connected to the A/V C bus, and the test-oscillator output adjusted to produce several volts of A/V C.

**Calibration for Alignment**—the dial calibration for alignment procedure is given in this form:

1. The dial may be removed from the cabinet by sliding out the two spring pieces which clamp it in its mounting position. The condenser plates should then be turned by the hand on the left end of the dial back into the frame so that its extreme left calibration mark coincides with the pointer. The dial may be held in place with Scotch tape. In this manner the actual receiver dial is used for alignment. When alignment is finished, the scale should be replaced including the fibre light shields which are folded under the ends of the glass scale.

2. A calibration scale is attached to the tuning drum. The correct setting of the gang, in degrees, for each alignment frequency is given in the alignment table. Check the position of the drum, making sure that the 0 degree scale mark is horizontal with the gang in full mesh.

**Pointer for Calibration Scale**—if method (3) is used, improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, and bend the wire so that it points to the 0 degree mark on the calibration scale when the plates are fully meshed.

**Spread-Band Alignment**—make final adjustment of C56, C72, and C60 "31-meter" trimmers during actual reception of a station of known frequency near 9.3 megacycles.

* Use minimum capacity peak if two peaks can be obtained.
** Use maximum capacity peak if two peaks can be obtained.

**NOTE:** Oscillator tracks 455 kc above signal on all bands.

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**Push Button Adjustment**

The station push buttons connect to separate magnetically-cored oscillator banks and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31051. Allow at least five minutes warming period before making adjustments.

In the event that the receiver is to be used with an external antenna, use the or two feet of wire (use an antenna) to ensure sharp peaking during the final adjustment procedure. For loop operation, the link should be strapped across terminals on back of set. In either case the procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range selector to "A" band, and manually tune in the first station on the list.
3. Turn range selector to "PB" position, push in station button No. 1 (extreme left). Then adjust the No. 1 oscillator core (L-27) to receive the station.
4. After oscillator core is set correctly, adjust C55 for maximum output.
5. Clockwise adjustment of core and trimmers tunes the circuits to lower frequencies.
6. Adjust for each of the remaining stations in the same manner.
7. Make a final careful adjustment of the oscillator cores and antenna trimmers.

Owing to the relatively high r.f. gain, it may be found that a given station can be tuned in at several different settings of the magnetically-cored oscillator push-button coils. In such cases, it is advisable to unscrew the loop push-button trimmers to minimum capacity before adjusting the magnetically-cored.

On the 880 to 1,550 kc push-button, the higher frequency stations may be received with L9 or L10 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustment with this core in its intermediate position (oscillator frequency 455 kc above the station frequency) is the correct one.

---

**Table**

<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 maximum peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L1 and L22 (2nd I-F trans.)</td>
<td>165 kc (340°)</td>
<td>Rock in C76, C50</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>L19 and L20 (1st I-F trans.)</td>
<td>16.6 mc (440°)</td>
<td>C56 (sec.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C72 (det.)</td>
<td>9.5 mc (85°)</td>
<td>C70 (det.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rock in C70, C51</td>
<td>2.44 mc (80.5°)</td>
<td>C75 (sec.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>600 kc (30.5°) (A band)</td>
<td>1,050 kc (180°)</td>
<td>C68 (sec.)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>600 ohms</td>
<td>1,050 kc (180°)</td>
<td>C68 (sec.)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>600 ohms</td>
<td>1,050 kc (180°)</td>
<td>C68 (sec.)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Repeat steps 6 and 7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fasten chassis in cabinet, close ant. link, adjust indicator to left-hand end of dial scales with gang closed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>C68 (ant.) (on loop)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Rock in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Repeat steps 10 and 11.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Alignment Procedure

Alignment Procedure

Model V-170
Ch. RC-623
RCA MFG. CO., INC.

Alignment Procedure

StANDARD BROADCAST

A DOMESTIC 55 60 70 80 100 120 140 160 BAND A

RCA Victrola

C FOREIGN 6 7 8 10 12 14 16 18 BAND C

INTERNATIONAL

Refer to RP-132 Service Data for information on Record Changer Mechanism.

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

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.

Electronic Voltmeter.—The electronic voltmeter in the Chassis or VoltOhm meter provides an unparalleled output indicator. It should be connected to the A.C. bus, and the test-oscillator output adjusted to produce several volts of A.C.

Calibration Scale.—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed in this service note can be used in conjunction with an ordinary 13-inch ruler as an accurate and convenient substitute for the regular dial.

Each method is described below.

Using Tuning Dial.—

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.

2. With gauge in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

3. Place the glass dial under the pointer so that the extreme left scale graduation coincides with the pointer. Use scotch tape to hold the glass dial in this position.

Using Calibration Scale.—

1. With gauge in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.

2. Place a flat 13-inch ruler on the dial backing plate so the left-hand end of ruler is at the reference mark at left-hand of backing plate. Temporarily fasten the ruler with scotch tape to the backing plate.

3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Dial-Pointer Adjustment.—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gauge in full mesh.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test-osc, etc.</th>
<th>Tune test osc. in</th>
<th>Turn radio dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-step grid, in series with 0.1 mfd.</td>
<td>600 kc</td>
<td>600 kc</td>
<td>7.1 and 7.18 (dial 9.7 Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>3-step, grid, in series with 0.1 mfd.</td>
<td>450 kc</td>
<td>450 kc</td>
<td>7.1 and 7.18 (dial 9.7 Trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal, in series with 900 ohms (link open)</td>
<td>15.2 mfd</td>
<td>15.2 mfd</td>
<td>C11 (osc.) CB select Rock in C4</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal, in series with 900 ohms (link open)</td>
<td>1,000 kc</td>
<td>1,000 kc</td>
<td>C9 (osc.) CB (ant.) Rock in C4</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal, in series with 900 ohms (link open)</td>
<td>500 kc</td>
<td>500 kc</td>
<td>C10 (osc.) Rock in C4</td>
</tr>
</tbody>
</table>

* The minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used, by tuning receiver to 14.23 mc., where a weaker signal should be received.

Note: Oscillator tracks above signal on both bands.
Calibration Scale—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scales printed in this service note can be used as an accurate and convenient substitute for the regular dial.

Each method is described below.

Using Tuning Dial—

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate. (1/16 inch to left of this mark in V-200.)
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Useotch tape to hold the glass dial in this position.

Using Calibration Scale, Model V-200—

1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 1/16-inch ruler on the dial backing plate so the left end of ruler is at the reference mark as left-end of backing plate. Temporarily fasten the ruler with街上 tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Using Calibration Scale, Model V-201—

A calibration scale is attached to the tuning knob. The correct setting of the gang, in degrees, for each alignment frequency is given in the alignment table. Check the position of the knob, making sure that the 1 degree scale mark is horizontal with the gang in full mesh. Improvised a pointer for the calibration scale by inserting a piece of wire to the chassis, and bend the wire so that it points to the 1 degree mark on the calibration scale when the dials are fully meshed.

Dial-Pointer Adjustment—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test-osc. to—</th>
<th>Tune test-osc.</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for maximum peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L.F. grid, in series with 0.03 mfd.</td>
<td>450 kc</td>
<td>L7 and L8 (Red L.F. Trans.)</td>
<td>L7 and L8 (Red L.F. Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid, in series with 0.03 mfd.</td>
<td>1,500 kc</td>
<td>L8 and L9 (1st L.F. Trans.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 300 mohm. (link open)</td>
<td>1500 kc</td>
<td>C5 (osc.)</td>
<td>C6 (ant. V-201)</td>
</tr>
<tr>
<td>4</td>
<td>600 kc</td>
<td>L3 (osc.)</td>
<td>Rock in</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 60 mohm, (link open)</td>
<td>1500 kc</td>
<td>C12 (osc.)</td>
<td>C12 (osc.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained. Check to determine that the correct peak has been used, by tuning receiver to 1450 kc, where a weaker signal should be heard. Note: Oscillator tracks above signal on both bands.

MODEL V-170

TUNER DATA

The push buttons connect to separate magnetic-core oscillator coils and separate loop circuit trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31531. Allow about two minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range switch to the broadcast position and manually tune in the first station on the list.
3. Turn range switch to push-button position and press in the left-hand button.
4. Adjust L10 to receive the first station. To secure the best adjustment, rotate the set for least pickup, and adjust L10 for peak output.
5. Adjust C45 for peak output on the first station.
6. Proceed in the same manner to adjust for the remaining stations.

On the 880 to 1,560 kc push-button, the higher frequency stations may be received, with L4 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustments with this core in its out position (oscillator frequency 455 kc above the station frequency) is the correct one.

NOTE: Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

RCA MFG. CO., INC.

MODEL V-200, CH. RC-518

RCA VICTROLA

INTERNATIONAL

Model V-201 Calibration Scale
The push buttons connect to separate magnetite-core oscillator coils and separate loop circuit trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool such as RCA Stock No. 31031. Allow about five minutes warm-up period before making adjustments.

1. Make a list of the desired stations, arranged in order from low to high frequencies.
2. Turn the range switch to the broadcast position and manually tune in the first station on the list.
3. Turn range switch to push-button position and press in the left-hand button.
4. Adjust core rod No. 1 to receive the first station. To secure the best adjustment, rotate the loop for least pickup and adjust core rod No. 1 for peak output.
5. Adjust trimmer screw No. 1 for peak output on the first station.
6. Proceed in the same manner to adjust for the remaining stations.
7. Repeat adjustments for best results.

On the 880 to 1,550 kc push-button, the higher frequency stations may be received with core rod No. 6 either in or out (oscillator frequency either 455 kc below or 455 kc above the station frequency). The adjustment with this core in its out position (oscillator frequency 455 kc above the station frequency) is the correct one.

NOTE: Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.
**Recorder Cutting Adjustments**

**IMPORTANT**

The cutting point of the stylus must be in perfect condition in order for a good recording to be obtained.

The stylus is supplied with a cutting point. This point should be at least 0.001" above the turntable surface to provide the proper cutting action.

**Procedure**

1. Slowly lower the stylus onto the record to be cut, but do not press down too hard.
2. Gently press the stylus into the record, but be careful not to break it.
3. Remove the stylus from the record and inspect it for any damage.
4. If the cutting point is damaged, replace it with a new one.

The cutting point should be checked periodically to ensure that it is still in good condition.

**Recorder Mechanism Adjustments**

If the stylus is not positioned correctly, it may cause problems during playback.

1. Adjust the stylus position so that it is centered over the record groove.
2. Adjust the headshell position so that it is parallel to the record groove.
3. Adjust the azimuth adjustment so that the stylus is positioned correctly over the record groove.

**Preliminary**

- **Turn on the record player and adjust the volume to a comfortable level.**
- **Adjust the headshell and azimuth controls to achieve the best possible sound quality.**
- **Check the phono cartridge and stylus for any damage.**

**Radio Recording**

1. **Connect the microphone to the radio receiver.**
2. **Adjust the volume control and tone controls to achieve the desired sound quality.**
3. **Place the microphone in the desired position.**

**Microphone Recording**

1. **Connect the microphone to the recorder.**
2. **Adjust the volume control and tone controls to achieve the desired sound quality.**
3. **Place the microphone in the desired position.**

**Mixed Recording**

The RCA Home Recorders have a built-in microphone for recording both microphone and line level signals. This allows for the recording of both spoken word and music in the same recording.

**Rumble**

- **Reduce the rumble by adjusting the tone controls or by using a rumble filter.**
- **Check the microphone and record for any damage.**

**Servicing**

- **Check the phono cartridge and stylus for any damage.**
- **Check the motor and headshell for any unusual noises.**
- **Check the power supply for any signs of wear or damage.**

**Additional Tips**

- **Keep the record player and microphone clean to avoid dust and scratches.**
- **Use a soft cloth to clean the record player and microphone.**
- **Avoid placing the record player and microphone in direct sunlight.**
**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.

**Frequency Range**
- 515-1720 kc
- Intermediate Frequency: 455 kc

**Power Output (117 volt, 60 cycle supply)**
- 1.0 watt

**For Other Data See Index**

1. Dress grid lead of 12SK7 close to chassis under condenser (C12).
2. Dress green and blue leads from i-f transformers close to chassis and away from each other.
3. Dress leads from terminal board on loop support away from loop.

**Speaker**
- 4-inch Electrodynamic

**Power Supply Ratings**
- 103-125 volts, direct current, or 50-60 cycles, 0.5 watts
Alignment Procedure

1. Connect the high side of test oscillator to the voice coil and turn the receiver volume control to maximum.

2. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

3. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

4. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

5. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

6. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

7. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

8. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

9. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

10. Connect 0.01 mf shielded wire to the grid of the oscillator and turn receiver volume control to maximum.

Phonograph Information

For information regarding the automatic record changer refer to service note covering RP-152 record changers.

Precautionary Lead Dress:

1. "A" Band lead from antenna coil high side to No. 5 terminal on range switch must be held to correct length.

2. Lead from No. 3 terminal on rear switch to the variable condenser must be held to correct length and dressed away from side arms.

3. Lead from No. 4 terminal on front section of range switch must be held to correct length and dressed to rear of waver.

4. Lead from No. 5 terminal on front section of range switch to oscillator must be held to length and dressed to rear of waver.

5. Dress the leads to the power switch as free as possible.

6. Dress lead from pickup plug to terminal board on side arms down and towards the side arms.

7. Dress plate leads on output tubes toward the chassis.

Calibration Scale

For the calibration scale, see the schematic diagram.
**Calibration Scale.**—The glass tuning dial may be easily removed from the chassis and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer’s home, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Each method is described below.

**Using Tuning Dial.**

1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With glass in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduations coincide with the pointer. Use a piece of tape to hold the glass dial in position.

**Using Calibration Scale.**

1. With glass in full mesh move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so the left end of ruler is at the reference mark at left-hand end of backing plate. Temporarily fasten the ruler with oak tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

**Dial Pointer Adjustment.**—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the glass in full mesh.
Push Button Adjustments

The push buttons connect to separate magnet-core coil, heavy duty relay and separate long current transformers which must be adjusted for the desired station. Use an insulated screwdriver or alignment tool such as RCA Stock No. 91011. Allow about five minutes warm-up period before making adjustments.

The procedure is as follows:

1. Make a list of the desired stations, arranged in order from low to high frequency.
2. Turn the range switch to the broadcast position and manually tune to the first station on the list.
3. Turn range switch to push-button position and press in the broadcast button.
4. Adjust core No. 1 to receive the first station. To increase the adjustment, lower the coil for best pickup, and adjust core Nos. 1 and 2 for peak output.
5. Adjust transformer No. 1 for peak output on the first station.

6. Proceed in the same manner to adjust for the remaining stations.
7. Repeat adjustments for best results.

Using Calibration Scale:

The push buttons are designed to be easily removed from the cabinet and temporarily replaced with bale push buttons. When replacements are desired during changes in station, the push buttons should be removed for setting, and the cabinet with the tuning dial set in the 'OFF' position. The resistance values may be referred to the reference mark on the tuning dial to the desired station frequency. The push button is then replaced in the cabinet, and tuning dial is then adjusted to the desired frequency by referring to the calibration scale.

Trimmer Adjustment:

Adjust the trimmers to replace in cabinet, tune the dial indicator to the station, and tune the dial to the desired frequency.

Input Impedance:

Contact the high end of the transformer to the input. Set trimmer and output to the desired frequency. The input impedance is then adjusted to the desired frequency by referring to the calibration scale.

Output Impedance:

Contact the output of the transformer to the output. Set trimmer and input to the desired frequency. The output impedance is then adjusted to the desired frequency by referring to the calibration scale.

Sample Calibration Table:

<table>
<thead>
<tr>
<th>Station Frequency</th>
<th>Resistance Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 kHz</td>
<td>5000 ohms</td>
</tr>
<tr>
<td>600 kHz</td>
<td>5500 ohms</td>
</tr>
<tr>
<td>650 kHz</td>
<td>6000 ohms</td>
</tr>
<tr>
<td>700 kHz</td>
<td>6500 ohms</td>
</tr>
</tbody>
</table>

Use only one transformer on.Tube.

NOTE: Check all adjustment with transformer removed. The transformer is used for the following steps:

1. Set the transformer to the desired station frequency.
2. Adjust the transformer to the desired station frequency.
3. Tune the dial to the desired station frequency.
4. Adjust the transformer to the desired station frequency.

*Adapter for calibration curves and measurement tests.
**Use carefully during measurement tests. (Check for output push to 'OFF' and tuning control to the desired station frequency.)
*Push on.
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.

CONVENTIONAL ALIGNMENT SEE SPECIAL SECTION VOLUME VIII

1. Dress grid lead of 12SK7 close to chassis under condenser (C12).
2. Dress green and blue leads from i-f transformers close to chassis and away from each other.
3. Dress leads from terminal board on loop support away from loop.
TECHNICAL INFORMATION AND SERVICE DATA

ADJUSTMENTS

A. Main Lever.—This lever is basically important as it controls the various individual mechanisms which control needle loading, stopping, record separation, etc. Before the assembly is completed, the needle should be inserted into the needle guide (4) so that the outlet is just above the needle post (2). The outlet should be just enough to prevent damage, and an additional 0.020 inch added to the outlet is necessary for the needle to separate properly. The outlet should be just enough to prevent damage, and should be just enough to prevent damage, and an additional 0.020 inch added to the outlet is necessary for the needle to separate properly.

B. Position Clamp.—The position of the tone arm should be adjusted to the record so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record.

C. Rubber Lift and Cable Screw.—During the record change cycle, the tone arm is positioned to the record so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record.

D. K.E. Needle Loading on Record.—The position of the tone arm is adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record.

E. Needle Loading on Record.—The position of the tone arm is adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record. The tone arm should be adjusted so that the tone arm is parallel to the record.

F. G. Record Separating Knife.—The upper plate (knife) is adjusted so that the upper plate (knife) is parallel to the record. The upper plate (knife) should be adjusted so that the upper plate (knife) is parallel to the record. The upper plate (knife) should be adjusted so that the upper plate (knife) is parallel to the record. The upper plate (knife) should be adjusted so that the upper plate (knife) is parallel to the record. The upper plate (knife) should be adjusted so that the upper plate (knife) is parallel to the record.
The RP-152 and RP-153 automatic record changers are very similar in design and construction. Most of the parts and adjustments are identical on both. The RP-153 turnable is driven through a worm gear in the motor housing while the RP-151 turntables are driven through a friction drive disc mounted under the turntable.

On Models RP-152 it is important that the drive motor spindle, and rubber tires on main driving disc and idler pulley be kept clean and free from oil, grease, dirt, or any foreign matter at all times. Any quick-drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field.

The rubber driven drive disc on Models RP-152 is not removable from the spindle. The turntable is fastened to the driving disc by three bolts. If necessary to remove these parts the spindle drive gear set screw should first be removed. The drive disc, turntable and spindle assembly can now be lifted upward from the motorboard. If this is done, great care should be taken not to bend the spindle.

To remove the turntable and spindle on the RP-152 type it is necessary to first remove the tapered pin in the turntable drive arm assembly. The turntable and spindle can then be drawn up through the motorboard bearing.

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 rotating 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.

When a record has been played the pickup moves out, another record is dropped down, and the needle is fed automatically into the starting groove of this record. If the needle fails to enter the starting groove, raise the left hand side of the cabinet by inserting thin spacers under the feet on that side. If the needle slides over a few grooves, raise the left hand side of the feet 3/8 - 1/4 inch.

The 1012-inch records must be absolutely flat for smooth operation.

A pickup shorting switch, located under the motorboard, operates when the pickup is moved outward to the pickup rest.

### Replacement Parts Model RP-153 (Conclusion)

<table>
<thead>
<tr>
<th>STOCK No.</th>
<th>DESCRIPTION</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>914077</td>
<td>Screw—No. 5-32 x 3/4 set screw for motor assembly (7)</td>
<td>.08</td>
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<td>Screw—No. 5-32 x 3/4 set screw for motor assembly (7)</td>
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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 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 by 10-inch. Effect adjustment "E."
4. Failure to trip at end of record. Increase clutch "S" friction by means of slot "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 "S" adjustment "B" may be too tight; bend 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 "S" is too tight.
8. Wow in record reproduction. Record is defective; or instrument is not being operated at normal room temperature; oil, grease, dirt, or other foreign matter on motor spindle, main driving disc or idler pulley rubber tire. Clean with any quick-drying naphtha.
9. Record knives strike 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 respect to shaft by means of adjustment "H."
11. When playing both types of records mixed and needle either lands in 10-inch position on 12-inch record or records mix entirely. Increase tension of mixed record discriminating lever spring "M."
**Frequency Ranges**

Long Wave ("X" Band) .................. 140-410 kc (2145-735 m)
Medium Wave ("A" Band) ............... 540-1,720 kc (555-174 m)
Short Wave ("B" Band) ................. 3.1-9.5 mc (97.5-315 m)
31 Meter Spread Band ................. 9.45-12 mc (31.8-41.3 m)
25 Meter Spread Band ................. 11.65-15.2 mc (25.6-29.9 m)
19 Meter Spread Band ................. 15.1-17.75 mc (19.9-23.7 m)
16 Meter Spread Band ................. 17.73-18.5 mc (16.9-16.2 m)
13 Meter Spread Band ................. 21.45-22.6 mc (13.95-13.3 m)

**Intermediate Frequency** ............ 455 kc

**Power Output Rating** .............. 50 watts
**Maximum** .......................... 60 watts

**Speakers (2)**
Type ................................... 12 in. Electrodynam
Voice Coil Impedance ................. 11.5 ohms at 400 cycles
RCA PAGE 12-11-72

MODEL Q8
Ch. RC-551

- 12SK7 Audio mixer
- 6J5 Audio Drive
- GEC7 Mixer
- 6B6 RF Amp, 2nd DET.
- 6B6 RF Amp, 1st DET.
- 6B6 RF Amp, 2nd DET.
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### Reference Table for Automatic Mechanism Adjustments

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Check and Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not play automatically</td>
<td>Shoulder relay arm 12, 33, 46, 48. Section 19. 10, 54 under recording arm open.</td>
</tr>
<tr>
<td>Errors on repeating automatically</td>
<td>Section 21, 22, Section 17, 15, 17.</td>
</tr>
<tr>
<td>Trips before record is finished</td>
<td>Section 27.</td>
</tr>
<tr>
<td>Does not play at end of record</td>
<td>Section 27, 25.</td>
</tr>
<tr>
<td>Does not feed record properly</td>
<td>Section 2, 3, 4.</td>
</tr>
<tr>
<td>Record does not move satisfactorily</td>
<td>Section 5, 7, 8, 9.</td>
</tr>
<tr>
<td>Does not reverse record properly</td>
<td>Section 6, 8, 10, 12, 13, 28.</td>
</tr>
<tr>
<td>Does not reverse record</td>
<td>Section 1, 5, 8, 8, 15, 18.</td>
</tr>
<tr>
<td>Pickup does not feed record on reverse</td>
<td>Section 5, 5, 5, 5, 5.</td>
</tr>
<tr>
<td>Chatter while recording</td>
<td>Section 21, or short circuits in relay top system.</td>
</tr>
<tr>
<td>Jumping noise while clamping record</td>
<td>Section 4.</td>
</tr>
<tr>
<td>Record Selector Lever does not work properly</td>
<td>Section 18, 18, 18.</td>
</tr>
</tbody>
</table>

* Made in record is not warped or everted or any scratch edges.

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### Magazine Stop Screw

The magazine stop screw "G" (Fig. 1), should be adjusted so that the crank pin (part of Fig. 1) is approximately 1/8" from the edge of the record reverse arm fork (part of 4, Fig. 1) which is further from the center of the magazine stop guide in front of the magazine, that is at the extreme position.

### Magazine Stop Switch

- The magazine stop button "B" (Fig. 1) should be adjusted so that the connection pin of the magazine stop switch (part of 3, Fig. 1) is approximately 1/8" from the edge of the record reverse arm fork (part of 4, Fig. 1) which is further from the center of the magazine stop guide in front of the magazine, that is at the extreme position.

### To Locate and Adjust the Record Tray (29) (Fig. 2)

In searching the record tray, the farthest and the closest, the lower tool of the device (103) (Fig. 3) should match with the two tools of the device in the same position as shown.

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### Reference Page 12-75

---

### Reference Table 12-101

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### RCA MFG. CO.

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### RCA PAGE 12-75
null
<table>
<thead>
<tr>
<th>Step</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn selectivity control maximum counter-clockwise for maximum selectivity.</td>
</tr>
<tr>
<td>2</td>
<td>S81G and I-P grid in series with C95.</td>
</tr>
<tr>
<td>3</td>
<td>6SK7 Int. I-P grid in series with C61 mfd.</td>
</tr>
<tr>
<td>4</td>
<td>C5A1 Int. Det. grid in series with C21 mfd.</td>
</tr>
<tr>
<td>5</td>
<td>With selectivity control in broad position retune L27, L60 for selectivity curve 2.</td>
</tr>
<tr>
<td>6</td>
<td>C5A1 Int. Det. grid in series with C21 mfd.</td>
</tr>
<tr>
<td>7</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>8</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>9</td>
<td>Repeat steps 7 and 8.</td>
</tr>
<tr>
<td>10</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>11</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>12</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>13</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
<tr>
<td>14</td>
<td>[ \text{Antenna Terminal in series with 500 mfd.} ]</td>
</tr>
</tbody>
</table>

**Note:**
- Connect oscilloscope to junction of R4 and C42. Also short junction of R13 and R12 to ground.
- Use of L60 should be approximately 3 in. long before adjusting C10.
- Use maximum inductance peak.
- Use maximum inductance peak.

**Oscillator Cutoff:**
- At Left—“Sharp”
- At Right—“Broad”

**Calibration Scale:**

![Calibration Scale Image]
External speakers may be connected to the terminal board at the rear of the cabinet under the phone connections. The terminal impedances of all the speakers connected in parallel or series should be approximately 500 ohms.

Speakers recommended for use with this instrument are RCA M6474A, M6480B or M6413 Speakers. The M6474A, M6480B are rated at 10 watts. The M6413 Speaker is rated about 4 watts. These speakers are rated for handling power as small rectangles. For larger auditors and larger installations consult your local RCA Commercial Service Bureau.

For outstanding, high volume applications the RCA M64700 (20 watts), M64710 (40 watts), or M64720 (50 watt compact speaker) speakers are recommended. As these speakers are constructed with ohm impedances, a matching transformer will be needed to match them to the 100 ohm output of the instrument.

The following tables show the impedances of the speakers listed above.

### AVAILABLE IMPEDANCES

<table>
<thead>
<tr>
<th>Value or Impedance</th>
<th>5 ohms</th>
<th>3 ohms</th>
<th>8 ohms</th>
<th>20 ohms</th>
<th>25 ohms</th>
<th>36 ohms</th>
<th>45 ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red to green wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Yellow to green wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Blue to yellow wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Blue to black wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Red to black wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Red to blue wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Blue to red wire</td>
<td>36 ohms</td>
<td>3 ohms</td>
<td>8 ohms</td>
<td>20 ohms</td>
<td>25 ohms</td>
<td>36 ohms</td>
<td>45 ohms</td>
</tr>
</tbody>
</table>

Note: As shipped from factory, M6413 Speakers have red and blue leads connecting to terminal board.

### AVAILABLE IMPEDANCES

<table>
<thead>
<tr>
<th>Value or Impedance</th>
<th>5 ohms</th>
<th>3 ohms</th>
<th>8 ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black to red wire</td>
<td>8 ohms</td>
<td>25 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Red to blue wire</td>
<td>8 ohms</td>
<td>25 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Blue to black wire</td>
<td>8 ohms</td>
<td>25 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Red to black wire</td>
<td>8 ohms</td>
<td>25 ohms</td>
<td>45 ohms</td>
</tr>
<tr>
<td>Blue to red wire</td>
<td>8 ohms</td>
<td>25 ohms</td>
<td>45 ohms</td>
</tr>
</tbody>
</table>

Locating Loudspeakers

When installing loudspeakers, make sure they are properly spaced so that they can be easily heard. The speaker enclosures are designed to match the loudspeaker in a typical speaker system. The sound wave will be distributed throughout the room, which means the speakers should be spaced at least 2 feet apart. The speakers should be as close to the listener as possible but not so close that the sound will be distorted. The speakers should be balanced on a stand or shelf to minimize any resonances that may occur. A final test is to have the speakers play a continuous tone at a volume setting of 40-50 watts. The sound should be clear and free from distortion. The speakers should not be placed on the floor or directly on the floor. The speakers should be placed in a safe and secure manner.

Automatic Phonograph Service

Magnetic Pickups

When connecting a pickup to the phonograph, it is important to connect the pickup to the proper terminals on the phonograph. The turntable of the phonograph is connected to the pickup terminals. The pickup is connected to the phonograph terminals. The pickup should be connected to the phonograph terminals as follows:

- Connect the black wire of the pickup to the black wire of the phonograph.
- Connect the white wire of the pickup to the white wire of the phonograph.
- Connect the red wire of the pickup to the red wire of the phonograph.
- Connect the ground wire of the pickup to the ground wire of the phonograph.

When connecting an external speaker to the phonograph, the speaker should be connected to the speaker terminals as follows:

- Connect the black wire of the speaker to the black wire of the phonograph.
- Connect the white wire of the speaker to the white wire of the phonograph.
- Connect the red wire of the speaker to the red wire of the phonograph.
- Connect the ground wire of the speaker to the ground wire of the phonograph.

When connecting an external subwoofer to the phonograph, the subwoofer should be connected to the subwoofer terminals as follows:

- Connect the black wire of the subwoofer to the black wire of the phonograph.
- Connect the white wire of the subwoofer to the white wire of the phonograph.
- Connect the red wire of the subwoofer to the red wire of the phonograph.
- Connect the ground wire of the subwoofer to the ground wire of the phonograph.

Lubrication

Due to its natural design and precise workmanship, the record changer requires a minimum of lubrication. Apply a very light coat of oil to the needle and to the needle holder. Do not apply any oil to the record changer mechanism. The record changer mechanism should be lubricated with a dry graphite spray. The needle should be lubricated with a dry graphite spray. The needle should be lubricated with a dry graphite spray.

Record Size Limit

The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism. The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism. The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism. The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism. The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism. The minimum size for 10" records is 0.45". Records smaller than 0.45" are unable to play the record changer mechanism.

Drive Clutch

The drive clutch is located on the motor shaft just above the reduction gear box. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension. The clutch should be adjusted so that there is no pre-tension.
The recording and playback notes are as follows:

**Important**

The groove width should almost equal, but not exceed, the distance between grooves. A magnifying glass is helpful in examining the grooves. If the grooves are too shallow, the phonograph needle will slide over them on playback. If the grooves are cut too deep, rumble will be excessive.

After examining the cuttings and the groove width, adjust the cutting pressure as required by means of the adjustment screw on top of the cutter bracket. Turn this clockwise to increase pressure and increase depth of groove. Turn counterclockwise to decrease pressure and decrease depth of groove.

Check the new adjustment by running more blank grooves.

Check the cuttings and groove width each time a new stylus is inserted, and whenever a different type of recording disc is used. Due to variations in material composition and hardness among different types of discs, the same cutting pressure adjustment will not give an equal depth of cut on all types. Thus, it may be necessary to change the adjustment previously set for one type of disc, when recording on a different type.

Excessive cutting pressure will cause ripple. The width of the groove should almost equal, but not exceed, the distance between grooves.

Check the groove width each time a new stylus is used, and each time a new disc is used.

When recording, use the maximum bass response, by turning the bass control to the maximum clockwise position.

On playback, use the least bass response, by turning the bass control to the maximum counterclockwise position.

Be certain that the motorboard and mechanism is "floating" free from the cabinet.

---

**Cutter Adjustment**

To adjust the stylus pressure for the correct depth and width of cut, the best procedure is to cut some blank grooves in a recording disc of the type that will be used. The stylus pressure can be regulated, by means of the adjustment screw on top of the cutter bracket, to produce the correct thickness of the hairlike cuttings. The cuttings should collect toward the center of the recording disc. If they collect toward the outside, the stylus is not correctly inserted, and must be adjusted by removal and reinsertion. If the threads continue to collect toward the outside, use a new stylus.

The cuttings should be even, thin, hairlike threads about three thousandths of an inch across or approximately the diameter of a human hair.

**Cutter Head Drive**—The cutting head drive screw (lead screw) should rotate freely and be free from end play. If end play is present loosen the jam screw which locks the cone point, so that the end away from driving gear and adjust this bearing until end play is eliminated (being careful not to cause binding), then tighten jam screw.

**Cutter Head Mounting**—Two cone pointed set screws support the cutter head and its mounting bracket. These should be adjusted to prevent end play but to permit free movement of the cutter head up and down.

**Record Threads**—Keep the drive gears and lead screw free from record threads.

**Equalizing Groove Width**—In order to keep the groove width cut at the inside and outside of equal depth, it may be necessary to adjust the blade bearing in which the spindle of the recording arm is placed, and which is located at the front end center of the phonograph board. To adjust this bearing loosen the set screw in the blade and move bearing up or down as desired. If the grooves at the edge of record are shallower then those at center of record, lower the bearing. If grooves at edge of record are deeper than those at center of record, then raise the bearing.

**Lubrication**—Keep the drive gears, lead screw, and other bearings surfaces well lubricated with Vestanoy Petroleum Jelly.

**Automatic** Cut-Off Switch Under Recorder Arm—When the Recorder Arm is swung in position over a record to make a recording, the weight of the arm is brought down on a switch mounted under the recorder arm switch bearing, opening the switch and making the Automatic Phonograph Inoperative.

This switch should be adjusted so that when the Recording Arm is in its rest, the switch is closed. I.e. the switch plunger is all the way in the hole, and the switch should be about 1/4 inch clearance between the top of switch, and the switch plate. When the Recording Arm is in the recording position, the switch is open, i.e. the switch plunger is pushed down.

**Cutter Heads**

---
QU5
Radio Break-Through on Phono:
In localities where a strong local broadcast signal is present, it can sometimes be heard very faintly on Model QU5 when the receiver is tuned to the signal and the radio-phonograph switch turned to the phone position.
This condition can be eliminated by removing one bus wire connection and changing the yellow lead on the radio-phonograph switch as shown in accompanying illustration.

VV2-35, VV2-55
Incorrectly Cut Windings Gear:
There is a possibility that several incorrectly cut areas (No. 10020) have reached the field. The gear teeth form a self-hand spiral when viewed from either side, whereas the correct cut is a right-hand spiral.

7QB
Transformer Polarity:
On some production receivers, the leads from the primary winding of the output transformer are color-coded in a manner to reverse to that shown in the Service Notes wiring diagram. That is, the red lead and the black-wire lead are interchanged.

BP-10
Replacing Lid or Front Panel:
When the molded lid (which contains the loop antena), or the chrome front panel requires replacement, it is not necessary to replace the complete assembly of lid and front panel, as either one may be replaced separately in a few minutes by taking out the hinge pins as described below.

The following parts are available for this purpose:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>28765</td>
<td>Lid and antenna (type without lid support)</td>
<td>2.00</td>
</tr>
<tr>
<td>27756</td>
<td>Chrome front panel (type without lid support)</td>
<td>3.00</td>
</tr>
<tr>
<td>27754</td>
<td>Lid and antenna (type with lid support)</td>
<td>2.00</td>
</tr>
<tr>
<td>27755</td>
<td>Chrome front panel (type with lid support)</td>
<td>2.00</td>
</tr>
<tr>
<td>27757</td>
<td>Two hinge pins and two hinge springs for BP-10</td>
<td>.50</td>
</tr>
</tbody>
</table>

The following parts are discontinued:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>28510</td>
<td>Antenna loop and cover (discontinued)</td>
<td>2.00</td>
</tr>
<tr>
<td>28513</td>
<td>Lid and chrome panel (discontinued)</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Installation Instructions:
First remove the three self-tapping screws that hold the chassis in the center case, and remove the case. Unscrew the leads from the loop lugs.
(a) With lid closed, cut hinge pins at point A (or with sharp cutters).
(b) Start removal of pin sections as shown, using long-nose pliers.
(c) Grab end of pin section with long-nose pliers and pull out of hinge.
(d) Install new lid, or new front panel, using the replacement hinge pins and springs, and springs, and other parts as provided with replacement lids and panels. Arrange springs as shown. Apply a small amount of "Thermoplastic Cement" (VY 2667) near each end of each pin to insure tight and permanent fitting.

Loose Control Knobs:
If for any reason either the tuning or volume control knob on Model BP-10 should become loose on its shaft, it may be repositioned in the following manner:
(a) Remove the loose control knob from its shaft and scrape the old cement from both shaft and control knob.
(b) Apply a generous even coating of a good cement to the shaft region which is to be covered. (e.g., Thermoplastic cement, VY 2667 is excellent for this purpose; it is a green fluid, easily thinned with acetone if necessary.
(c) Allow the cement on the shaft to air-dry, to evaporate any acetone present.
(d) Apply a small amount of heat to the shaft, sufficient to soften the cement.
(e) Insert knob on shaft while cement is still soft, and allow a few minutes for drying.

RC4 Filter Inserted in Audio Plate Circuit of Model 15BP to Reduce Hum

"A" Battery Polarity:
In the battery layout diagram at the top left of page 5 of the BP-10 Service Note (1469, No. 56), the 1.5 v., "A" battery is shown incorrect. The actual polarity is reverse to that shown, minus being at the top, and plus at the bottom.

10X Hum:
Keep heater lead wiring away from audio input circuit.

14BT, 14BT-2, 14BK Distortion and Loss of Sensitivity:
Some cases of loss of sensitivity, and distortion have been associated with frequency drift. In such an event, correction may be made by:
(a) Connecting a 1 mill serving transformer (RCA Stock No. 28784) from the high side of the oscillator section, at the gang condenser, to ground.
(b) Realigning the 1st detector and oscillator tuned circuits.
(c) Realigning the I.F. circuits if necessary.

15BP
Fidelity Change:
Should accentuation of the higher audio frequency register be desired, connect C-15, connected across the 1st. A.F. output, may be decreased from 200 to 300 ohms. A little of the following
(a) Shield the 1HS37 2nd det. A.F. tube by means of a tube shield securely grounded.
(b) Insert a filter network in the 1st audio plate circuit as shown in the accompanying diagram.

Dial Cord Slippage:
To remedy dial cord slippage, on Model 15BP add an extra turn of cord around the drive shaft, without lengthening the cord, thus securing better grip and increased spring tension.

15BP-7, RC-527C
Service Data:
Model 15BP-7 chassis is similar to the Model 15BP-7 (Page 12-26).
Model 15BP-7 has the late-type power switch circuit.

Miscellaneous Assemblies:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>28012</td>
<td>Dial—Dial scale (15BP-7)</td>
<td>1.00</td>
</tr>
<tr>
<td>27016</td>
<td>Indicators—Power switch</td>
<td>1.00</td>
</tr>
<tr>
<td>28642</td>
<td>Resistor—4 ohm resistor (1 watt)</td>
<td>2.00</td>
</tr>
<tr>
<td>27681</td>
<td>Resistor—Resistance power cord, 44 ohm</td>
<td>2.00</td>
</tr>
<tr>
<td>27684</td>
<td>Switch—Power switch</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Speaker Assemblies

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>25594</td>
<td>Cone—Cone complete with voice coil</td>
<td>1.00</td>
</tr>
<tr>
<td>25598</td>
<td>Transformer—Output transformer</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Miscellaneous Assemblies:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>26104</td>
<td>Crystal—Dial scale crystal</td>
<td>.50</td>
</tr>
<tr>
<td>25392</td>
<td>Decalcimata—Trade mark decal</td>
<td>.50</td>
</tr>
<tr>
<td>25622</td>
<td>Fastener—Snap fastener for cord holder</td>
<td>.10</td>
</tr>
<tr>
<td>25626</td>
<td>Handle—Carrying handle</td>
<td>.10</td>
</tr>
<tr>
<td>25512</td>
<td>Knob—Control knob</td>
<td>.10</td>
</tr>
<tr>
<td>25614</td>
<td>Spacer—Rubber substit for control shafts</td>
<td>.10</td>
</tr>
</tbody>
</table>

Price subject to change or withdrawal without notice.

VA-15
Stock Number Correction:
In the Replacement Parts List for Model VA-15 (published on the back of "Supplementary Information No. 2"), the lamp shade should be changed to read Stock No. 3787 instead of 36727.

16K, 1672, 1674, 1676, 17K, 19K, V-205, V-405
Increasing Sensitivity:
These models have an in-built R.F. stage which is resistance-coupled to the 1st detector. The sensitivity may be increased by changing the R.F. plate load resistor to a higher value, between 0,900 and 10,000 ohms. This change is not recommended for metropolitan locations owing to possibility of cross-modulation.
RCA MFG. CO., INC.

Models T64 and T80 are as follows:

Stock No.
35471 Knob—Tuning knob
35472 Knob—Volume control knob
35470 Knob—Range selector knob
35405 Knob—Volume control knob

K-80
Hum Modulation and Howl:
Tendency of occasional receivers towards hum modulation and howl may be investigated by:
(a) Rubber-mounting the loudspeaker by means of rubber bands, (R.B. 3776).
(b) "Kidney-ving" loop antennas by tapping winding in six places (2 each side, 1 top, and 1 bottom), using cellulose tape.

RP-145, RP-152 RECORD CHANGER
Centering Motor:
Should centering of the rotor be necessary, it may be accomplished quickly in the following steps:
(a) Remove the two long machine screws and lift off plastic end cover.
(b) Loosen the machine screws sufficiently to permit adjustment of stator laminations.
(c) Insert a .010-inch spacer between the rotor and each of the four stator field poles. Rotors should be equivalent from each pole, and accurately centered.
(d) Tighten screws and replace plastic cover.

RP-152 RECORD CHANGER
Stalling Going into Cycle:
The mechanism should be loaded with one record on the turntable. If stalling going into cycle takes place, it is probably due to insufficient tension in the other parts of the driving or bearing system (45). An additional metal washer should be inserted between the spring and its guide.

Stalling Coming Out of Cycle:
If the mechanism stalls as it is coming out of cycle, that is, when the pickup is at its farthest distance laterally from the turntable, it is probable that there is much tension in the bearing spring. Any metal washers in this assembly should be removed.

CAUTION: The mechanism is designed to handle a total of 8-15-inch records or 7-15-inch records.

RP-153 RECORD CHANGER
Motor Data:
Should it be necessary to rebuild or service any of these motors in the field, by replacing end heads on existing new rotors and shafts, it must be noted that the rebuilt motors should be operated continuously for not less than 48 hours before installation. The use of bronze bearings, diamond-tipped for accuracy, together with the hardened steel shaft at the rotor provides a very close fit. As a result, the motor must be run in approximately 48 hours, after which the oil has had a chance to cover all contact surfaces of shaft and bearings, and a very smooth-operating long-life bearing results.

RCA 156 TUBE TESTER
1SGT Data:
There has been some question as to the correct settings for testing 1SGT tubes. On chart earlier than that included in the 350-D and E, the information is incorrect. Correct test data follows:

TUBE TESTER 1SGT Type
Class Test Types Tube Chart
A A 1 5 4 4 6
VH-202, 207, 407

"Rumble":
Any instrument with the sensitivity and tone response of these home recorders is capable of picking up the mechanical vibrations of the motor. However, some precautions, in the design of these instruments, will not be recorded if the following precautions are observed:

LEVELING: Make sure the instrument is perfectly level.
PRETEND: Make certain that the motorboard and mechanism is "FLOATING" free from the cabinet. All four mounting springs should be at approximately equal tension.

FOllower ARM DAMPING WEIGHT
See that the lead weight is in place attached to the follower arm mechanism, as illustrated.
STYLES—Make sure that a perfect stylus is tightly inserted in the tone arm head. Because both stylus and retaining screw are of hard steel there is a tendency towards burning during turning. Tension should be checked before each cut.

INPUT LEVEL—Set for sufficient input level so that the "Magic Eye" just clears on modulation peaks.

Tone control settings—During recording, the tone-base control should be set for maximum bass. This permits the click of the power switch. The treble base control setting will depend on the degree of potential rumble present. For extreme cases, it should be set for minimum high during recording only, in order that the low frequencies in the selection or voice may have a full chance to mask any possible rumble.

DEPTH OF CUT—During recording, the shavings should be directed towards the spindle and away from obstructing the rotor path. The thickness of these shavings should be about that of human hair, or approximately .002 inches. An additional check on depth of cut is to inspect the recording under a magnifying glass. The groove width should approach but not exceed the distance between grooves. Depth of cut may be varied by means of the cutting- pressure ajusting screw at the top of cut arm.

Turntable Drive—If rumble persists, inspect the motor when possible, and replace parts (bearing and motor) for possible removal, flat spots, and scraping against bottom of turntable.

Recording Discs—Variations in material composition and hardness among different types of discs, the amount of cutting pressure adjustment will not give an equal depth of cut on all types. Then, it may be necessary to change the adjustment previously set for one type of disc when recording on a different type.

Follower Arm Weight:
Two other methods, besides the one shown in the Service Notes, have been used in attaching the lead weight to the tone arm. These are indicated in the following sketches. All three provide similar G.C. being the method used in latest production.

Three Mounting Arrangements of Follower-Arm Weight on Home Recording Models

VH-207, 407
18KT-G1 Bumpers:
When troubleshooting or when testing Models VH-267, and VHR 407 do not use any current source equal to, or greater than, that stated in the 18KT-G1 microphone; use the tester with no current through the microphone. Always test for +5 volts on the chassis with a voltmeter and not with a screwdriver.

V-300, V-301, V-302
Internal Phone Gain:
The model output from low cut records may be increased somewhat by effecting the following changes:

Models T64 and T80 have been incorporated in 2nd production.

Models T64 and T80 have been incorporated in 2nd production.
CV-112 CONVERTER

A-C Power Unit for Q88s:
The CV-112 is designed to convert Model Q88 from battery to a-C operation.

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>4686</td>
<td>Capacitor—05 mil., 400 volts (C1)</td>
<td>.30</td>
</tr>
<tr>
<td>30873</td>
<td>Capacitor—Electrolytic, 2,000 volts, 30 mil., 120 volts</td>
<td>1.50</td>
</tr>
<tr>
<td>30874</td>
<td>Capacitor—Electrolytic, 1,000 volts, 15 mil., 120 volts</td>
<td>.70</td>
</tr>
<tr>
<td>36547</td>
<td>Coil—High voltage choke coil 1200 ohms</td>
<td>2.00</td>
</tr>
<tr>
<td>36546</td>
<td>Coil—Low voltage choke coil 1200 ohms</td>
<td>2.00</td>
</tr>
<tr>
<td>36545</td>
<td>Coil—Low voltage choke coil</td>
<td>2.00</td>
</tr>
<tr>
<td>35512</td>
<td>Rectifier-1.5 volt rectifier</td>
<td>1.50</td>
</tr>
<tr>
<td>35525</td>
<td>Socket—4 contact power outlet</td>
<td>.50</td>
</tr>
<tr>
<td>20068</td>
<td>Socket—Tube socket</td>
<td>.50</td>
</tr>
<tr>
<td>36668</td>
<td>Switch—3-position center</td>
<td>1.00</td>
</tr>
<tr>
<td>32491</td>
<td>Switch—Voltage control switch</td>
<td>.50</td>
</tr>
<tr>
<td>36546</td>
<td>Transformer—Power transformer—110-220 volts, 50-60 cycle</td>
<td>5.00</td>
</tr>
</tbody>
</table>

MODELS 16T2, 16T3, 16T4

2nd Production (RC-509F, F1, F2):
In the 1st Production of these models, "A" band covers 540-1,500 kc. In 2nd Production, the range is extended to cover 460-1,800 kc. Calibration scales for use in alignment of the 2nd Production receivers are quoted on this page. Also in 2nd Production, the volume control is changed from .55 meg., to 3 meg., and the circuit is revised to isolate the control from the diode 6C4 current, as shown in the accompanying sketches. This isolation reduces the possibility of controls becoming "noisy." These changes should be made on any 1st Production receivers when this is done. For replacement parts list, refer to the original Service Notes, except for the items which are used in 2nd Production:

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37122</td>
<td>Coil—Push button oscillator coil for 540-1,500 kc range</td>
<td>.20</td>
</tr>
<tr>
<td>37125</td>
<td>Control—Volume control</td>
<td>1.10</td>
</tr>
<tr>
<td>36645</td>
<td>Control—Volume control and power switch</td>
<td>2.00</td>
</tr>
<tr>
<td>36650</td>
<td>Button—Push button, light brown</td>
<td>.15</td>
</tr>
<tr>
<td>37850</td>
<td>Dial—Glass dial scale</td>
<td>1.00</td>
</tr>
<tr>
<td>36145</td>
<td>Marker—Push button markers</td>
<td>.25</td>
</tr>
</tbody>
</table>

YHR-207, YHR-407

Changing 470 nuf. Capacitor C-53:
Some cases have been reported of break down of capacitor C-54 in the latter circuit. A higher voltage rating capacitor is now available under Stock Number 36143. The former type capacitor (black color) should be replaced with the new type (gray color) whenever these are serviced.

V-205, V-405, VHR-207, VHR-407

Radio Break-Through on Phone:
Radio break-through may occur in these models, due to capacity coupling between the 1F 6SK7 plate lead and 896 grid leads. When this condition exists, dress the 896 grid leads down against the chassis well away from the 6SK7 1F plate lead.

MODELS 16K and 16T3

2,400 KC Police Band:
Where desirable, reception of a police station in the 2,400 kc band may be obtained by adding a jumper connection from trimmer C to trimmer C40, and lining up push button No. 5 to the desired police station. Re-adjustment of C5 at 1,500 kc will be necessary.

MODELS 16K, 16T3, 16T4, 17K, 18T, 19K, 110K, 111K

Failure to Oscillate on Push-Button Tuning:
Should a case of non-oscillation on any push-button range be experienced, check the oscillator grid leak and preselector leak that it is less than 50,000 ohms. Some sets equipped a 33,000 ohm leak which was normally found troublesome with low line voltage.

Low-Frequency Oscillator Push-Button Coil:
To ensure low-frequency coverage on the push-button oscillator coil in these models, a high-frequency coil, Stock No. 37112, is used for the 540-1,500 kc push-button oscillator range.

MODELS 45X-11, 12, 13

Service Data for these models is given on pages 233 and 234 of the 1933 Bound Volume. Two changes have been made in 2nd Production:
(a) C-13 is connected to the grid of the 125D in the volume control, to provide more effective I.F. filtering.
(b) Diode plate No. 1 is connected to chassis instead of grid plate No. 2, to reduce residual hum.

MODELS 1673 (2nd Production, RC-509F)

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
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</tr>
</thead>
<tbody>
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<td>37122</td>
<td>Coil—Push button oscillator coil for 540-1,500 kc range</td>
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</tr>
<tr>
<td>37125</td>
<td>Control—Volume control</td>
<td>1.10</td>
</tr>
<tr>
<td>36645</td>
<td>Control—Volume control and power switch</td>
<td>2.00</td>
</tr>
<tr>
<td>36650</td>
<td>Button—Push button, light brown</td>
<td>.15</td>
</tr>
<tr>
<td>37850</td>
<td>Dial—Glass dial scale</td>
<td>1.00</td>
</tr>
<tr>
<td>36145</td>
<td>Marker—Push button markers</td>
<td>.25</td>
</tr>
</tbody>
</table>

VOLUME CONTROL CIRCUIT IN 2ND PRODUCTION 16T2, 16T3

RCA MFG. CO., INC.

RCA TONE GUARD

The RCA Tone Guard is an acoustic network around the upper part of the phonograph compartment in some models. It acts as a low-pass filter to reduce passage of the high-frequency sound that is generated and radiated directly into the air by the vibrating parts of the phonograph. A cross-section view of the Tone Guard and the equivalent electrical circuit are shown below. The series elements of the filter are formed by the normal slit between frame and lid. The shunt elements are formed by slots in the wood strip. The filtering action is very effective, as indicated in curve "A" below.

Curve "A"—Response Frequency Characteristic of Conventional Door and Cabinet (The Unit Alone)

Curve "B"—Response Frequency Characteristic of Tone Guard Relative to "A," Showing Reduction of High-Frequency Noise.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MODELS 16T2, 16T3, 16T4

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37122</td>
<td>Coil—Push button oscillator coil for 540-1,500 kc range</td>
<td>.20</td>
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<tr>
<td>37125</td>
<td>Control—Volume control</td>
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</tr>
<tr>
<td>36645</td>
<td>Control—Volume control and power switch</td>
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</tr>
<tr>
<td>36650</td>
<td>Button—Push button, light brown</td>
<td>.15</td>
</tr>
<tr>
<td>37850</td>
<td>Dial—Glass dial scale</td>
<td>1.00</td>
</tr>
<tr>
<td>36145</td>
<td>Marker—Push button markers</td>
<td>.25</td>
</tr>
</tbody>
</table>

Volume Control Circuit in 2nd Production 16T2, 16T3.
**RCA VICTROLA MECHANISM DATA**

**REPLACEMENT STUDS**

For Main Lever, Cam-and-Gea, or Trip Pawl:

In automatic record changers of the R.P. 188A, 188B, 189, 190, and similar types, loosening of the mounting studs on which the main lever, cam and gear, or trip pawl are pivoted may be caused by loosing the nut against the pawl pin at the end of the record-change cycle due to one or more reasons:

(a) The arm main of the lever slides over the thin pin in place of the arm pin instead of pressing against it during the first half of cycle. This causes the arm to make contact with the record.

(b) After being cleaned out of the way, the trip pawl has a tendency due to uneven location of the thin pin against the gear that the pawl pin and gear may make contact with the record.

(c) The index lever is put into “STOP” position while the mechanism is still in its change cycle. Caution customer against this.

Loose studs may be quickly and easily replaced by using special replacement studs that are available at the motor stop, motor arm, and one of the following:

Stock No. 38213 Main Lever replacement stud, with screw and washer...
Stock No. 38222 Cam-and-Gea replacement stud, with screw and washer...
Stock No. 38229 Trip Pawl replacement stud, with screw and washer...

**50-Cycle Motor Parts:**

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>Unit List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>37843</td>
<td>Bearing: Bottom bearing and bracket (50 cycle)</td>
<td>$ 8.50</td>
</tr>
<tr>
<td>37845</td>
<td>Fork-Motor field - 110 volts, 50 cycles</td>
<td>7.75</td>
</tr>
<tr>
<td>37846</td>
<td>Motor-105-125 volts, 60 cycles</td>
<td>14.00</td>
</tr>
<tr>
<td>37847</td>
<td>Pulley-Motor shaft pulley (50 cycle)</td>
<td>3.85</td>
</tr>
<tr>
<td>37848</td>
<td>Motor-Motor armature (50 cycle)</td>
<td>4.52</td>
</tr>
</tbody>
</table>

Parts normally used in R.P. 152 Service Notes (V.R.H. V.H.R. 207, and V.H.R. 407) are for 110 volt, 60 cycle motor only, except Stock No. 38240 which is used on both 60 and 50 cycle motors.

**Mechanical Motor Noise:**

Mechanical motor noise is due to armature and play sometimes develops with wear in the above instruments which use types of record changers. This can be eliminated by tightening the armature bearings. Care should be taken to avoid making them too tight which will cause binding.
### Alignment Procedure

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the transformer where the 30V, 1.5-ohm grid input is at 65 volts. If grid is at 65 volts, it is not necessary to connect the high side of the transformer.</th>
<th>Tone test.</th>
<th>Range Switch</th>
<th>Turn Radio Dial to</th>
<th>Adjust the following for max. peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect the high side of the transformer where the 30V, 1.5-ohm grid input is at 65 volts. If grid is at 65 volts, it is not necessary to connect the high side of the transformer.</td>
<td>650 kc</td>
<td>&quot;A&quot; band</td>
<td>10 V, 100 ohm</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>2</td>
<td>Connect the high side of the transformer where the 30V, 1.5-ohm grid input is at 65 volts. If grid is at 65 volts, it is not necessary to connect the high side of the transformer.</td>
<td>11.8 mc</td>
<td>6.3 ohm</td>
<td>11.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>5</td>
<td>Repeat steps 3 and 4 until aligned.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>6</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>7</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>8</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>9</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
<tr>
<td>10</td>
<td>Antenna terminal in series with 300 ohms.</td>
<td>15.8 mc</td>
<td>6.3 ohm</td>
<td>15.8 mc</td>
<td>L1L, L2L, L1L, L2L</td>
</tr>
</tbody>
</table>

- Use minimum capacity peak if two can be obtained.
- Use maximum capacity peak if two can be obtained.
- Use peak on the diode if two can be obtained.
- Check for maximum peak in the diode if two can be obtained.

### Calibration Scale

#### Reduced Reproduction of Receiver Dial and Corresponding 0-180° Calibration Scale

The corresponding portion of the dial indicator for any setting of the calibration scale can be determined by tracing a line from this point on the magnetic calibration scale to the same point on the primary scale. The readings are in degrees, and the scale can be used for determining the maximum output for a given frequency. The calibration scale can be used to determine the output for a given frequency.

### Frequency Range

- Standard Broadcast: 1000-1700 kc (1030-1670 kc)
- Medium Wave: 1700-11000 kc (1900-12000 kc)
- Short Wave: 11000-17000 kc (13000-19000 kc)
- VHF: 19000-20000 kc (20000-21000 kc)
- UHF: 21000-30000 kc (25000-35000 kc)
- IR: 30000-40000 kc (35000-45000 kc)

#### Power Output

- Maximum: 1.50 watts
- Minimum: 0.50 watts

### Precautions

- **Antenna:** Ensure antenna is properly grounded.
- **Interconnection:** Use high-qualityRG-59 coaxial cable.
- **Power Supply:** Use a regulated power supply.
- **Humidity:** Avoid operating in extremely humid conditions.
- **Temperature:** Operate within the specified temperature range.
- **RF Interference:** Minimize interference by using proper shielding.

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**Diagrams and Tables:**

- Calibration Scale Diagram
- Alignment Procedure Diagram
- Frequency Range Table
- Power Output Table
- Precautions List

---

**Notes:**

- Calibration Scale Diagram
- Alignment Procedure Diagram
- Frequency Range Table
- Power Output Table
- Precautions List
FREQUENCY RANGES

Long Wave ("X" Band)........ 140-410 kc (2145-735 m)
Medium Wave ("A" Band)...... 540-1,720 kc (555-174 m)
Short Wave ("B" Band)....... 3.1-9.5 mc (97.5-31.5 m)
31 Meter Spread Band....... 9.45-11.8 mc (31.8-25.4 m)
25 Meter Spread Band....... 11.6-15.2 mc (25.6-19.9 m)
19 Meter Spread Band....... 15.1-17.75 mc (19.9-16.9 m)
16 Meter Spread Band....... 17.73-18.5 mc (16.9-16.2 m)
13 Meter Spread Band....... 21.45-22.5 mc (13.95-13.3 m)

INTERMEDIATE FREQUENCY .... 455 kc

POWER OUTPUT RATING
Undistorted.................. 10 watts
Maximum...................... 12 watts

PILOT LAMPS .......... 10 Type No. 51 6-8 volts, 0.2 amps.

POWER SUPPLY RATING
105-125 volts, 50-60 cycles........ 125 watts
105-125 volts, 25-60 cycles........ 125 watts
100-130, 140-160, 195-250 volts, 40-60 cycles ........ 125 watts

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Precautionary Lead Dress:

1. All oscillator leads should be kept as short as possible.
2. Both yellow leads in the antenna switch section must be dressed towards the lug end and away from the coil windings, and also held to length.
3. Both yellow leads to adjacent lugs on detector coil must be dressed towards lug end and away from the coil windings, and also held to length.
4. The following leads should be held to length from No. 8 on S1 from No. 5 on S2 from No. 8 on S3
5. Lead from No. 4 on S15 must be dressed along the chassis away from all heater leads.
6. Lead from No. 5 on S15; well away from all heater leads.
7. The diode lead and the ground lead from the third I-F must be twisted.
8. The diode lead and the ground lead from A.V.C. I-F transformer must be twisted.
9. The lead on No. 9 of S15 should be away from the volume control and first audio tube.
10. The two condensers on the oscillator heater must be as short as possible and dressed away by at least 1/4" from the bracket, parts wired to it, the yellow lead, and the oscillator grid lead.
11. Green, blue and double enamel leads from the oscillator coil nearest the rear apron must bear tightly against each other.
12. The oscillator grid coupling condenser must bear tightly against the styrol; the sprayed mica must likewise bear on the styrol from the opposite side.
13. The long ground lead from the oscillator heater must be kept away from all condensers, resistors, and leads to R-F tubes.
**Step** | **Connect the high side of test-osc. to** | **Tune test osc. to** | **Turn radio dial to** | **Adjust the following for maximum peak output**
--- | --- | --- | --- | ---
3 | Connect the high side of test-osc. to 85 kc. | 455 kc | L57, L56 Third I-F Transformer |  
2 | Connect the high side of test-osc. to 80 kc. | 455 kc | L54, L53 Second I-F Transformer |  
3 | Connect the high side of test-osc. to 80 kc. | 455 kc | L51, L50 First I-F Transformer |  
5 | With selectivity control in broad position retrace L27, L34 for selectivity curve B. |  |  |  
6 | With selectivity control in sharp position see that curve 1 has not changed appreciably. |  |  |  
7 | Connect the high side of test-osc. to 300 momdc. | 1,500 kc | L17, L30 V.L.F. Transformer |  
8 | Connect the high side of test-osc. to 300 momdc. | 1,500 kc | L17, L30 V.L.F. Transformer |  
9 | Repeat steps 7 and 8. |  |  |  
10 | Repeat steps 7 and 8. |  |  |  
11 | Repeat steps 7 and 8. |  |  |  
12 | Repeat steps 7 and 8. |  |  |  
13 | Repeat steps 7 and 8. |  |  |  
14 | Repeat steps 7 and 8. |  |  |  
15 | Repeat steps 7 and 8. |  |  |  
16 | Repeat steps 7 and 8. |  |  |  
17 | Repeat steps 7 and 8. |  |  |  
18 | Repeat steps 7 and 8. |  |  |  
19 | Repeat steps 7 and 8. |  |  |  
20 | Repeat steps 7 and 8. |  |  |  

---

**Calibration Scale on Inductor-Drive-Cord Drum.** The tuning dial is fastened in the cabinet and cannot be used for tuning; therefore a calibration scale is attached to the inductor-drive-cord drum which is mounted on the 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 is degrees, for each alignment frequency, is given in the alignment table.

As the last step in alignment, check the position of the drum. The 82° 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 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.

To determine the corresponding frequency for any setting of the calibration scale, refer to the accompanying drawing which shows the dial with 0.185° calibration scale drawn at the sides.

**Points for Calibration Scale.**—Improve a pointer for the calibration scale by fastening a piece of tape to the gang-condenser frame, and bend the wire so that it points to the 82° mark on the calibration scale when the plates are fully meshed.

---

**Spread Band Alignment.**—The most satisfactory method of aligning or checking the spread-band range is on actual reception of short-wave stations of known frequency, by adjusting the zero-beating test-oscillator for each band so that these stations come in at the correct point on the dial.

In exceptional cases, when the set is being serviced in a location where the noise level is high enough to prevent reception of short-wave stations, a test-oscillator may be used for alignment, but an extremely high degree of accuracy is required in the frequency settings of the test-oscillator, as a slight error will produce unmeasurable accuracy on the spread-band dial. The frequency settings of the test-oscillator may be checked by use of either of the following methods:

1. Determine the exact dial settings of the test-oscillator (for frequencies in or close to the specified alignment frequencies) by zero-beating the test-oscillator against short-wave stations by known frequency.
2. Use harmonics of the standard broadcast range of a test-oscillator, and check that these harmonics fall within the range by means of a crystal calibrator (RCA Stock No. 37372), or by zero-beating against standard broadcast stations.

---

**RCA MFG. CO., INC.**

**Ch. RC-54**

**NOTE:** Oscillator tracks above all signals except on 14 and 15 meter bands.

**I.F. Selectivity Curves**

- **At Left:** "Band"" At Right: "Bread"
Top View Model QUSM

The QUSM is equipped with a magnetic pickup and the QUSC with a crystal pickup. The output of the crystal pickup is fed into the audio amplifier and the receiver through a switch and compensating circuit. On instruments using a magnetic pickup, a transformer and compensating circuit are used before the pickup and the audio input (see schematic diagram). The transformer has two jacks, the larger one (primary) for input from the pickup and the smaller one (secondary) for output to the compensating circuit. The components of the compensating circuit are mounted externally to the chassis on a terminal board in the cabinet.

Crystal Pickup:

The crystal pickup is sealed in a metal case; if failure occurs, do not attempt to repair the unit, but install a new crystal unit.

Magnetic Pickup:

The magnetic pickup used is of an improved design. The horseshoe magnet is rigidly welded into the pole pieces and is removable. There is a centring spring attached to the armature to maintain proper adjustment and to provide a floating effect on the movement of the armature. Service operations which may be necessary on the pickup are as follows:

Centering Armature—Refer to figure showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed it will be necessary to remove the pickup mechanism from the tone arm for readjustment. Unfasten the two screws at the rear of the pickup. Insert a small rod or nail into the armature hole and tighten the needle holding screw to hold the rod securely. If the armature clamping screws A and B have not been disturbed, screws C should be loosened which will permit the armature to be moved from side to side. The rod acting as a lever to perform this operation. The proper adjustment is obtained when the armature is brought to the mid position between the pole pieces. Screws C should then be tightened. The armature position should then be central between the pole pieces and at right angles to them. Check to make sure that the armature is not touching the pole. The air gap between the pole pieces and the armature should be kept free from dust, lint, and other foreign material which would obstruct the movement of the pickup armature.

Top View Model QUSC

Described above, then reassemble the remainder of the unit. Only non-cored solder should be used for soldering the coil leads and pickup leads to the pickup terminal board. This type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing—Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been maintained subjected to a strong a.c. field, isolated, or dropped, there may be an appreciable loss of magnetic strength. In such a case it will be necessary to remagnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the RCA Stock No. 9945 Pickup Magnetizer and charge the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnets and to remagnetize it so that the same polarity is maintained.

Damping Block—The visco-damper damping block which is attached to the front end of the armature should serve to reduce undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, the pickup mechanism should be removed from the tone arm. Remove screws D and the damping block from the pickup assembly. Make sure that the shaft of the armature which contacts the visco-damper is clean. Then insert the new damping block so that it occupies the same position as that of the original block, and is in correct vertical alignment with the armature. The hole in the visco-damper should be somewhat smaller than the diameter of the armature in order to permit a snug fit. With the damping block properly aligned on the armature, screw in with its washer should then be replaced. Heat should be applied to the armature (excepted side) so that the damping block will fuse at the point of contact and become rigidly attached to the armature. A special tool for applying heat, illustrated as shown, will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block, causing a small bulge on both sides.

Schematic Showing Magnetic Pickup Connections:

Note: new disk resistor substituted for 20,000 ohm crystal filter resistor on some models.

Attaching Damping Block:

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The HF-10 High Frequency Receiver is made in a standard model for operation when connected to supply lines supplying 115 volts at 50 or 60 cycles. Other voltages and frequencies may be used for operation of the instrument, if the receiver is specially made to accommodate them.
The phonograph motor has its bearing filled with oil and sealed at the factory and hence should not require lubrication in the field. However, under unusual conditions bearing oil should have its bearings lubricated occasionally with SAE. 10 oil. Care should be taken not to get oil or other foreign matter on the rubber dress. These tires and the motor spindle should be cleaned occasionally with quick drying solvents.

The turntable center bearing should also be lubricated occasionally with SAE. 10 oil.

**Motor Detail**

**Precautionary Lead Dress**

1. All leads between antenna coils and switch must be as short as possible and kept away from oscillator coil leads and switches.

2. All oscillator coil leads must be kept apart from each other and other leads and parts.

3. Blue plate lead of red I.F. should be dressed under other leads and out of case.

**Calibration Scale on Indicator-Driver-Cord Drum.** — The tone dialed in the cabinet and cannot be heard for reference during alignment, therefore a calibration scale is attached to the indicator driving cord and is calibrated directly on the shaft of the gang condenser. The setting of the gang condenser is read directly from the calibration dial which is calibrated in degrees. The correct setting of the gang is in degrees, for each alignment frequency, is given in the alignment table, which is calibrated in degrees.

At the first step in r.f. alignment, check the position of the drum.

1. The 180° mark on the drum scale must be vertical and directly over the center of the gang-condenser shaft, where 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.

2. To determine the corresponding frequency for any setting of the calibration drum, see the calibration table which shows the dial with a 180° calibration scale drawn at top and bottom.

3. Pointer for Calibration Scale — Improvised a pointer for the calibration scale by fastening a piece of wire to the gang-condenser frame, and lead the wire so that it is inserted in the 180° mark on the calibration scale where the plates are fully meshed.

4. Dial Indicator Adjustment — After fastening the pointer in the cabinet, attach the dial indicator to the drive cable with indicator at the 45° mark and gang condenser fully meshed. The indicator is a spring clip for attachment to the cable.

**Spread-Band Alignment.** — The most satisfactory method of aligning or checking the spread-band circuits is on actual reception of short-wave stations at known frequencies by adjusting the magnet-core oscillator coil for each band so that these stations come in at the correct points on the dial.

<table>
<thead>
<tr>
<th>Station</th>
<th>Frequency (kHz)</th>
<th>Tune test osc.</th>
<th>Range</th>
<th>Tune radio dial to</th>
<th>Adjust following (for max. peak output)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5</td>
<td>A</td>
<td>250</td>
<td>100°</td>
<td>L3 and L4 600 I.F.</td>
</tr>
<tr>
<td>2</td>
<td>3.9</td>
<td>C1</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
<tr>
<td>3</td>
<td>5.5</td>
<td>C2</td>
<td>120</td>
<td>100°</td>
<td>158.5 (ant.)</td>
</tr>
<tr>
<td>4</td>
<td>13.5</td>
<td>C3 (occ.)</td>
<td>120</td>
<td>100°</td>
<td>158 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td>15.5</td>
<td>C3 (occ.)</td>
<td>120</td>
<td>100°</td>
<td>158 (ant.)</td>
</tr>
<tr>
<td>6</td>
<td>455</td>
<td>C1</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
<tr>
<td>7</td>
<td>85.5</td>
<td>C1</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
<tr>
<td>8</td>
<td>95.5</td>
<td>C1</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
<tr>
<td>9</td>
<td>120</td>
<td>C2</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>C1</td>
<td>250</td>
<td>100°</td>
<td>L5 (occ.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two can be obtained. Check image to determine that C3 has been adjusted to the correct peak by turning receiver to approximately 16.25 mc 139° where weak signal should be received.

**Peak at minimum position of plunger if two peaks can be obtained.

***Peak at min. capacity if two peaks can be obtained.

**NOTE:** Oscillator takes above signal on all bands.
The HF-30X High Frequency Receiver is made in a standard model for operation when connected to supply lines supplying 115 volts at 50 or 60 cycles.

For other parts - see index.
Radio Mfg. Engineers, Inc.

Figure 2: Top View

Models HF-10
HF-50X

Socket in Pwr. chassis
Plug from R.F. chassis
A.F. Output
Noise Silencer

Sockets on Pwr. chassis
Plug on Cable
Cable from Panel
Speaker
Panel

Power Chassis
Filter Cond.
Audio Gain Control
R.F. CHASSIS

Socket in R.F. chassis
6270
6587

No. 2 2.2 P.T
635
639
1st I.F.
No. 3 1st I.F.
26-30 56-60
Cone Pad. Cone Pad.

No. 4 2nd I.F.
61S4
6140

2.1 M.Cr.

No. 5 1st I.F.
1852
R.F. Amp.

Tuning Condenser

Service Notes:
The HF-50X receiver is designed for convenient servicing by means of interconnection of the panel without having to disconnect any of the components connected together. The panel can be removed from the instrument by disconnecting two cables plugs and removing the entire assembly as a unit. Each component, consisting of the visible components, is viewed through the top of the receiver.

The intermediate frequency used in the HF-10 is 1500 kilocycles and there are three already located in a tuning dial. The intermediate frequency of the receiver may be selected by means of a tuning dial on the front panel of the receiver. The tuning dial is set to 1500 kilocycles and the band switch on the panel of the receiver is set to "O.C. P.T."

The intermediate frequency used in the HF-50X is 1500 kilocycles and there are three already located in a tuning dial. The intermediate frequency of the receiver may be selected by means of a tuning dial on the front panel of the receiver. The tuning dial is set to 1500 kilocycles and the band switch on the panel of the receiver is set to "O.C. P.T."

All calibrations are controlled by the trimmers (See Figure 2) marked "O.C. P.T."

One of these paddles controls the calibration of the intermediate frequency of the receiver. Adjustment is made by turning the knob in the proper direction, but usually there will be no necessity for making this adjustment unless the receiver has been changed in transit, or upon installation. After the intermediate frequency has been changed, the tuning dial will be found necessary to make any adjustments necessary for the particular band.

No external adjustments are necessary for the particular band. Adjustment of the tuning dial will be found necessary to make any adjustments necessary for the particular band.

For best alignment of the HF-50X, turn a station without the best signal, then align the tuning dial for best signal. This adjustment is accessible through the bottom of the cabinet of the receiver.
The RME Model DM-56A Frequency Expander is identical in circuit arrangement, with certain exceptions, to the DM-56, and has the same sensitivity to the high frequencies. The exceptions to the similarity are in the overall size of the housing, and the intermediate frequency developed for injection into the associated receiver.

In all units of this type it is necessary, of course, to use a complete type of receiver in conjunction with the expander in order to provide the facilities of modulation and audio reproduction, together with additional gain and selectivity. In the case of the DM-56A, this associated receiver is intended to be an automobile type of receiver, which will tune to 1550 kilocycles, practically all of the standard types of automobile receivers or similar equipment today will tune to this frequency.

The DM-56A is a stereo frequency expander and frequency synthesizer as a stereo frequency expander and mixer tube with its oscillator in over-all superheterodyne type of circuit. It must be used in conjunction with a regular receiver capable of tuning to a frequency of 10,000 IC (10 KG). The associated receiver therefore acts as an intermediate frequency amplifier unit and a demodulator and audio amplifier in order to reproduce both output of the expander.

**ANTENNAS**

It is suggested that for best results incoherer antennas are concerned for these DM-568a converters, that vertical radiators, grounded to the body of the car, be used. Figure 6 shows the suggested dimensions and general configuration of antennas recommended for use with the converter in the two frequency bands. It is to be understood, that for optimum results, one antenna will not be satisfactory for both frequencies. Reference to figure 4 will suggest various ways of constructing suitable pick-up antennas for use with these converters.

An antennachanger switch is provided on the DM-56 for connecting the antenna used on the triple terminal strip (see Fig. 2) to either the input or output of the associated receiver or directly to the receiver with which the instrument is associated. This is accomplished by setting the switch to the position marked "DM-56A" on the left position, or to the right position marked "DM-66A", as indicated in Figure 1.

The triple terminal strip is designed for connecting the antenna to be used for the 56 to 80 megacycle band and is the antenna which will probably be used on the receiver alone when the DM-56 is not connected in the circuit. In order to make it possible to get the best results from the terminal strip, a separate pair of terminals have been provided so that a double antenna may be connected into the primary coil of the five meter band. (See Fig. 2). The best performance will be obtained when an antenna is used especially designed for the middle frequency of the five meter amateur band—that is, 56 megacycles. It can either be a half wave double fed from the center of the DM-56 by means of a twisted pair or it can be a single wire antenna a half wave long placed vertically or horizontally (preferably horizontally) in space and fed to the receiver by connection to antenna terminal 3, in which terminal connection is made for the five meter band, and to the terminal marked "U" on the DM-56, see the page appended giving various configurations of antenna construction and the method of connections to the DM-56A for the various frequencies (Fig. 3).

**NOTE**

- For any type as above, double the length of the wire or other dimensions indicated for 56 MHz and connect as follows.

- Connect 3 and 4.
- Connect 4 and 5.
- Same as B. Make A.
- Connect 3 to ground.
RADIO MFG. ENGINEERS, INC.

MODELS DM-30X
MODELS DM-36 (late)
DM-36A

DM-36A ONLY
BATTERY CABLE 6.0V

---FIG. 1---
ANTENNA CHANGEOVERS 56-60 28-30 BAND SWITCH

FRENCH VIEWS
---FIG. 2---
ANTENNA CHANGEOVER SWITCH 56-60 28-30 POWER TRANSFORMER 56-60 850 MC. RECTIFIER 12-30X FILTER BLOCK

---FIG. 3---
BOTTOM VIEW
---DM-36A
---DM-35---

---FIG. 4---
TOP VIEW

IF SINGLE TUBE IS USED ON BAND 28-30 MC, CONNECT ANTENNA LEAD TO A1, AND GROUND A2 TO TERMINAL G.

IF SINGLE TUBE IS USED ON BAND 56-60 MC, CONNECT ANTENNA LEAD TO ANT-1, AND GROUND ANT-2 TO TERMINAL ‘G’ DIRECTLY BEHIND IT.

PADSERS CAREFULLY ADJUST TO MAXIMUM READING OF R-METER (AFTER 48 MINUTES WARM-UP). SINCE PADSERS WILL BE FOUND TO BE SET CLOSE TO THE MAXIMUM, ADJUST BY TURNING WHEELS SLOWLY BACK AND FORTH OVER A GIVEN SIGNAL OF EACH BAND.

DET-GRID PADSERS
56-60 MC. 28-30 MC.
R.F. GRID PADSERS.
ALIGNMENT

One of the first evidences of misalignment in a receiver is low overall gain of the receiver. In the RHE-70 receiver this is evidenced by low audio reading from signals which were formerly capable of producing high audio meter readings. Due to the tremendous gain available in the audio system of the RHE-70 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. Misalignments with the circuits of the audio amplifier and the radio frequency amplifiers, principal among the contributions to low gain, is the part which the intermediate frequency amplifier plays in providing overall sensitivity and selectivity of a satisfactory order.

Misalignment of the radio frequency section (principal part of the section which is made up of the high frequency oscillator) shows up in the receiver calibration. This section also is susceptible to certain outside influences which can cause variations to such a degree that the stated calibration of the receiver is changed to other values. However, this effect is not a common effect and usually the calibration of the receiver, unless tampered with by inexperienced 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 in place 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 a wide-spread condition might indicate that the alignment control is in error. And this is the reason why it is essential that the alignment control of the radio frequency section of the receiver be well adjusted.

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 tuning condensers of the intermediate frequency amplifiers transformers.

It is for the purpose of realignment of these intermediate frequency transformers that the following test procedure is outlined. IMPORTANT NO. 2. It is essential that the use of the RHE-70 intermediate signal which is used for realignment of the intermediate frequency amplifier must be set according to any arbitrary calibration on the test oscillator itself. Since it has been found that commercial test oscillators for service work vary considerably in accuracy, it is essential that the signal be properly calibrated. It is therefore better if no test oscillator is used. Instead of proper alignment of the intermediate frequency amplifier, the output of the quartz filter for establishing the proper i.f. frequency is indicated in the test procedure.

The meter on the RHE-70 receiver is excellent for indicating the peak alignment of the transformers. The location of the three intermediate frequency amplifiers transformers, 5-3, 5-4, and 5-5, to be adjusted in the circuit shown in Figure 4 of the illustrated sheet attached. The two padding condensers located in each of these transformers and accessible through apertures in the top of the shield can also be seen.

OTHER DATA IN VOLUME XI

OUTLINE OF PROCEDURE FOR CORRECT ALIGNMENT OF THE INTERMEDIATE FREQUENCY AMPLIFIER TRANSFORMER OF THE RHE-70 RECEIVER.

The intermediate frequency amplifiers in the RHE-70 Receiver are designed for a frequency of 455 Kc. Since these receivers are always supplied with a crystal, the actual crystal frequency is determined by the intermediate frequency amplifier transformers are accurately aligned with the crystal frequency. Crystals are supplied in frequencies slightly at variance from the above stated value of intermediate frequency. The receiver will not work unless the crystal frequency is an amount not greater than one kilocycle plus or minus 405 Kc. Rather than merely align the intermediate frequency amplifier stages of the RHE-70 to a set frequency of 455 Kc, it is essential to the alignment be done in conjunction with the quartz filter so that alignment of the intermediate frequency amplifier is simultaneous with the frequency of the filter. This is done as follows and the procedure is herein outlined is followed accurately, maximum results will be obtained. The use of any other procedure 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 one of medium signal strength so that the meter indicates a signal level of #8 or slightly less. If no station of this amplitude is available, a stronger station is available, a reduction in the efficiency 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 #6. Usually between 600 and 900 LC in most any territory a station can be received at any time for this test and adjustment.

When the station has been chosen, let us assume that its frequency is 700 Kc. The signal will be examined as it appears at the quartz filter and the trimmer condenser so that the frequency readings are approximately 765 or 700 Kc. Of course will tune the station out. It does not necessarily have to be the frequency of the filtered signal of the quartz filter. The procedure is to tune the main tuning control slightly higher than the chosen station so that if any brought back to resonance by decreasing the scale reading, of the band spread control. This is done merely to provide proper tuning.

With the station chosen and resonated on the band spread scale, the crystal filter is switched into the circuit by setting the phasing condenser to vertical upright position (approximately 500 ohms from "CRF") and the band spread scale is then adjusted with respect to the signal so that a maximum meter reading is obtained. This procedure is one which requires patience and accuracy of adjustment since the receiver is ultra sharp with the crystal filter in and there will be one definitely sharp peak indicating crystal resonance. The meter is tuned to this peak and left on during all adjustments to be made regarding the intermediate frequency amplifiers.

When this peak has been tuned to and the meter is at maximum reading, a small standard intermediate frequency trimmer condenser of the insulated screwdriver type should be used. When the selectivity control, additional steps are necessary. By adjusting the condenser it is possible to put the transformer 5-3 and 5-4 to align in sequence 8-1 and 9-1. All adjustments should be made as before mentioned so that the meter reading is maximum. It is advisable from time to time to make sure that the signal is still adjusted to peak resonance of the crystal by slightly varying the
PHASING CONTROL OPERATION

The phasing control of the MX-70 receiver, located on the front panel in the top right corner, is indicated by the words "CRUSTAL PHASING," directly to the left of which is the word "OFF." There is a stop associated with the shaft so that when the receiver is to be used with the crystal filter, rotation of the crystal phasing control is set so that the pointer points to the "OFF" position and further counter-clockwise rotation is impossible due to the stop. This indicates that the crystal filter has been removed from the circuit and normal receiver operation is possible. This function is provided by a cap operated switch connected with the phasing control of the crystal filter. In order to put the crystal into operation it is necessary to rotate the crystal phasing control clockwise to a position where the pointer is approximately in a vertical position, similar to that normally required of the selectivity control, located just below it.

Failure of the crystal to cut off the circuit when the crystal phasing control is set to the "OFF" position is due to the fact that too much has slipped or the switch contacts are bad and probably need adjustment. You can switch close when this pointer is in the "OFF" position, shorting out the crystal unit. Failure of the crystal to cut off the circuit when the crystal filter is in operation at all times. Slight pressure or bending of the contacts can improve this function should it fail.

When the crystal filter is being used the phasing function is provided by the variation in capacity of a phasing condenser controlled by the crystal phasing knob. Usually this is indicated by a minimum noise or background response when the receiver is tuned off the signal and the crystal is being used. This position, as before indicated, will be approximately one-quarter of a turn clockwise from the "OFF" position. Should the noise level vary, either clockwise or counter-clockwise, from this minimum noise response position change the rejection characteristic of the crystal to various slightly lower and lower frequencies for rejection purposes during QM from a heterodyne on a desired signal.

If the phasing control does not work it is indicative of the fact that probably a connection is broken that the V.P.C. in the crystal filter circuit is open. The continuity check between the grid of the first T.F. amplifier tube and the junction of resistor R47, and the automatic volume control terminal strip should show continuity when the crystal is in the operating position.

ALIGNMENT OF RADIO FREQUENCY SECTION OF THE MX-70 RECEIVER

Alignment of the radio frequency section of the receiver will first affect principally the calibration of the receiver. Within certain limits thus of course will also affect the sensitivity of the receiver although they of course will show up as variations in the calibration as indicated by the indicated settings of the tuning dial indicator. Correction for any variation in calibration can be made by following the suggestions outlined.

Band 1 includes the frequencies between 550 and 1500 KC. For band 1 there are two frequency adjustments for adjusting the indicator to proper calibration. The adjustments (condensers 2.5M and 2.5M) are indicated as letters on Figures 4 through the top or the reed switch or condenser in the rear of the main tuning condenser assembly. 2.5M adjusts the band 1 tuning for proper calibration in the low frequency portion of the range and 2.5M is the adjustment for the high frequency end of band 1. The procedure is to set the main tuning condenser to a position of about 95 on the main tuning condenser assembly. Then move the pointer of the main tuning condenser to where 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 this scale. In other words, the line which borders the semicircular 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 on a signal of accurately known frequency, around 700 KC, and set the main indicator to the frequency of the signal which is 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 be adjusted to be set at 700 KC. If the receiver is out of calibration of course the signal will not be heard. However, leave the indicator at the correct frequency of the signal being used for the test. If the random condenser control is not in line with the dial mark, it may be necessary to readjust condenser 2.5M slightly again. Then in order to make certain of the accuracy of both settings return to the frequency check between 1500 and 1500 KC or if necessary allow 0.050 or readjust condenser 2.5M again. After several checks on each frequency it will be found that the calibration can be made satisfactorily.

Calibrations on the higher frequency bands are controlled for Bands 2, 3, 4, and 5 by the trimmers 1.5M, 1.5M, 1.5M, and 1.5M respectively. High side band is used on all frequencies on the MX-70 receiver when means that all of the condensers 2.5M, 2.5M, 2.5M, 2.5M 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:

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band 2</td>
<td>2 megacycles and 3 megacycles</td>
</tr>
<tr>
<td>Band 3</td>
<td>4 megacycles, 5 megacycles, 6 megacycles</td>
</tr>
<tr>
<td>Band 4</td>
<td>7 megacycles, 9 megacycles, 11 megacycles</td>
</tr>
<tr>
<td>Band 5</td>
<td>13 megacycles, 15 megacycles, 17 megacycles</td>
</tr>
<tr>
<td>Band 6</td>
<td>20 megacycles</td>
</tr>
</tbody>
</table>

After the calibration has been made accurately on all of the frequencies, or if the receiver has been found to be accurately set as well as its calibration is concerned on all frequencies, the trimmers 2.5M
and 2.1 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 14 and 15 megacycles and the most effective setting of the resonator control for signal in that region, and with the antenna connected, the condenser 2.2 is adjusted for maximum meter reading. With these same conditions existing on 30 megacycles, with the band switch set on band 6 and the antenna connected, 2.1 is adjusted for maximum response on a given steady signal. All other tuning and adjusting is done manually by means of the resonator control, a variable RF amplifier and detector grid plug and can be critically adjusted for peak resonance at any frequency it is desired to tune to.

It is of importance to note the setting of the condenser 2.4 (Figure 4). This is the antena coupling condenser used when the receiver is set to Band 1. It should be set to practically its maximum capacity in order to provide constant alignment and proper coupling to the antenna when using Band 1. Excessive capacity in the condenser 2.6 will cause misalignment of the RF amplifier and hence pronounced blocking of harmonically related broadcast frequencies to the effect that a number of whistling tones will be received on the higher frequency end of the broadcast band. When the receiver leaves the factory it is set at a very small capacity and should not be set at any other capacity, or material reduction in the efficiency of operation will be produced.

The padders 2.8 and 2.1 materially contribute to the image signal rejection on the bands 5 and 6. Special care should therefore be taken in the adjustment of these condensers when the receiver is aligned.

**ADJUSTMENT OF THE BEAT OSCILLATOR**

The best oscillator has its frequency adjustable on the panel by means of the C.W. Tone control. This control is normally set for zero beat with the condenser 2.59 (C.W. Tone control) set at 50% mesh. If it is found that zero beat does not occur or that the best oscillator is not beating with the intermediate frequency to produce an audible tone, it is probably due to the fact that the best oscillator is tuning to a frequency other than the intermediate frequency of the receiver. This can be remedied by the following procedure:

1. Set the Band Switch to position number 1, and tune in a broadcast station so that it reads maximum on the R meter. With this condition existing, snap on the C.W. Tone Control.
2. Then by making certain that the condenser 2.69 is set to 50% mesh, the condenser 2.60 (Figure 4) located in the best oscillator compartment just below 2.59 (Figure 4) near the top plate of the chassis in front of the best oscillator tube should be adjusted by means of a screwdriver so that zero beat is achieved with the signal tuned in as before mentioned.

When this is achieved, the beat oscillator from minimum to maximum mesh will give a total frequency variation of eight kilocycles (plus or minus 4 kilocycles from zero beat).

Figure 4A shows the component layout for 69 receiver with 13-1 series mica filter. Figure 48 shows the layout of the section which was changed to accommodate the filter and therefore is stacked in the chassis layout. If the receiver is connected for use, the line drawing in connection with the photograph in Figure 4A or 4B will indicate the socket locations of the respective tubes.

---

*Note: The image contains diagrams and text that are not transcribed here.*
## PART OVER NUMBER

<table>
<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>100 mfd mica condenser</td>
</tr>
<tr>
<td>2.2</td>
<td>50 mfd adjustable mica</td>
</tr>
<tr>
<td>2.3</td>
<td>50 mfd adjustable mica</td>
</tr>
<tr>
<td>2.4</td>
<td>0.1 mfd, 400 volt, paper by-pass condenser</td>
</tr>
<tr>
<td>2.5</td>
<td>250 mfd mica grid condenser</td>
</tr>
<tr>
<td>2.6</td>
<td>0.1 mfd, 400 volt, paper condenser</td>
</tr>
<tr>
<td>2.7</td>
<td>Nominal 121 mfd adjustable from 75 to 125</td>
</tr>
<tr>
<td>2.10</td>
<td>105 mfd, adjustable from 75 to 125</td>
</tr>
<tr>
<td>2.11</td>
<td>70 mfd adjustable plus 156 mica</td>
</tr>
<tr>
<td>2.12</td>
<td>70 mfd adjustable</td>
</tr>
<tr>
<td>2.13</td>
<td>Front section of variable condenser</td>
</tr>
<tr>
<td>2.14</td>
<td>15 mfd, 450 volt, electrolytic in common container</td>
</tr>
<tr>
<td>2.15</td>
<td>10 mfd, 450 volt, electrolytic in common container</td>
</tr>
<tr>
<td>2.18</td>
<td>90 mfd mica condenser, adjustable from 75 to 125</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>15,000 ohms, 10 watt resistor</td>
</tr>
<tr>
<td>1.2</td>
<td>50,000 ohms, 1/2 watt resistor</td>
</tr>
<tr>
<td>1.3</td>
<td>300 ohms, 1/2 watt resistor</td>
</tr>
</tbody>
</table>

- **L1** - Band 1 r.f. grid coil
- **L2** - Band 2 r.f. grid coil
- **L3** - Coupler oscillator coil for Band 1 and 2

### I.F. Transformer
- Tapped to 1550 kc with low impedence output.

**Switch sections marked "A":** Band change switch.

**Switch sections marked "B":** Antenna changeover switch and line switch combination.

<table>
<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>30 henry filter choke</td>
</tr>
<tr>
<td>5.1</td>
<td>Power Transformer</td>
</tr>
</tbody>
</table>

©John F. Rider, Publisher
The RFM LF-90 Low Frequency Converter unit is designed to operate with any receiver which can be tuned to 1550 kilocycles, since this is the intermediate frequency generated by the converter unit. The function of the converter is to amplify and heterodyne all signals in the frequency range between 95 and 590 kilocycles to produce a constant frequency of 1550 kilocycles, which is fed out the converter on a twisted pair line and into the input terminals of the associated receiver.

The receiver can be either of the IRE Communication Receivers, or similar receivers, or even a broadcast type receiver which will tune to 1550 kilocycles.

A switch in the lower right hand corner marked "LF-90 IN" and "LF-90 OUT" is an antenna changeover switch, which is used for cutting the LF-90 into the circuit ahead of the receiver, or cutting it out as conditions may warrant, permitting the operator to use either the combination for long wave reception, or the receiver itself for regular tuning purposes. When the position is set in the "OUT" position the receiver circuits are switched off by means of a pair of contacts on this switch which remove the line voltage from the converter.

CAUTION: DO NOT REMOVE TOP OR BOTTOM COVER PLATES BEFORE REMOVING SERVICE CORD PLUG FROM LINE RECEPTACLE.

GENERAL INSTALLATION INSTRUCTIONS

The cabinet of the LF-90 unit is designed to match that of the RFM-69 and RFM-70 receivers, being identical in finish and in height to those cabinets. In general an external cabinet is to be set on the left hand side of the receiver cabinet as you face the instrument. On the rear of the LF-90 chassis (Figure 4) will be found three set screw terminals on a baietite strip marked "G", "A" and "A" respectively. The ground terminal, marked "G", should be connected to a good ground. If the antenna is connected to the topmost terminal marked "A", the middle terminal marked "B", being connected to "G". If any type of dipole antenna is used, or any antenna of the two wire feed type, the ground terminal "G" should be grounded and the feed lines may be connected to "A" and "B".

The two wires in the output cable, having red and yellow tracers respectively, are connected to the outside terminal marked "A" and the inside terminal marked "B" respectively on the receiver with which the LF-90 is used. This is with reference to RFM receivers. For receivers having only two terminal inputs—that is, antenna and ground—the yellow wire output from the LF-90 is connected to the ground terminal of the receiver and the red wire output is connected to the antenna terminal of the associated receiver.

After the unit has been connected up, as described, and plugged into the receptacle (make sure that the line voltage does not exceed 125 volts), the receiver with which the LF-90 is to be used should be connected up and adjusted to an operating condition. The intermediate frequency developed by the LF-90 unit is 1550 kilocycles. It is therefore necessary that the associated receiver be tuned to this frequency and all adjustments left so that the operating efficiency is a maximum. If it is not certain that the calibration of the receiver is exactly correct and that it may not be possible by merely reading the calibration on the dial to the receiver to 1550 kilocycles, a close approximation may be achieved by adjusting the receiver tuning to a point giving maximum background response from the LF-90. It is, of course, necessary that the LF-90 switch be set to the "IN" position and that the proper antenna be connected to the LF-90 antenna terminal strip.

When the adjustments just described have been made the LF-90 dial may be tuned to the frequency desired and the response will depend upon the gain control setting of the associated receiver. When tuning Band 1 the innermost calibrated arc is to be used and the band range is 95 to 250 kilocycles. If it is desired to tune in the range between 250 and 590 kilocycles, the band switch must be set to Band 2 and tuning will then be indicated by the calibrated scale in the outermost position. The dial markings are in kilocycles and the white line on the skirt of the tuning knob is the indicator. There are no gain control facilities on the LF-90, the performance being required to take care of any signal which the LF-90 develops for its operation. Outside of tuning, the other controls of the receiver can be used for developing best frequency tones, for telegraph reception, for crystal filter operation and for the control of audio level or radio frequency gain by either automatic or manual gain facilities, if they are provided in the particular receiver used. It is unnecessary to do any tuning adjustments on the associated receiver, since a constant frequency of 1550 KC. is developed by the LF-90 for input to the receiver. Any tuning is to be done on the LF-90 only, as indicated by the calibrated markings on the scale plate.

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Alignment of the radio frequency section of the receiver will affect, principally, lastly, and only to a small degree, the frequency of the receiver. To the extent that the frequency of the receiver may be affected, it will, of course, be possible to recalibrate it as indicated by the instructions on the receiver. The frequency of the receiver is also subject to changes, and these changes can be made by following the suggestions contained in the following paragraphs.

Alignment of the radio frequency section of the receiver is performed by setting the frequency to the desired value and then adjusting the frequency control until the desired frequency is achieved. This procedure is repeated for each frequency to be used.

The next step is to set the oscillator to the desired frequency and then adjust the frequency control until the desired frequency is achieved. This procedure is repeated for each frequency to be used.

The final step is to set the oscillator to the desired frequency and then adjust the frequency control until the desired frequency is achieved. This procedure is repeated for each frequency to be used.

Alignment of the audio frequency section of the receiver is performed by setting the audio frequency to the desired value and then adjusting the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

The next step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

The final step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

Alignment of the VHF frequency section of the receiver is performed by setting the VHF frequency to the desired value and then adjusting the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The next step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The final step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

Alignment of the IF frequency section of the receiver is performed by setting the IF frequency to the desired value and then adjusting the IF control until the desired IF frequency is achieved. This procedure is repeated for each IF frequency to be used.

The next step is to set the oscillator to the desired IF frequency and then adjust the IF control until the desired IF frequency is achieved. This procedure is repeated for each IF frequency to be used.

The final step is to set the oscillator to the desired IF frequency and then adjust the IF control until the desired IF frequency is achieved. This procedure is repeated for each IF frequency to be used.

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The next step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

The final step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

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The next step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

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Alignment of the VHF frequency section of the receiver is performed by setting the VHF frequency to the desired value and then adjusting the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The next step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The final step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

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The next step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

The final step is to set the oscillator to the desired audio frequency and then adjust the audio control until the desired audio frequency is achieved. This procedure is repeated for each audio frequency to be used.

Alignment of the VHF frequency section of the receiver is performed by setting the VHF frequency to the desired value and then adjusting the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The next step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

The final step is to set the oscillator to the desired VHF frequency and then adjust the VHF control until the desired VHF frequency is achieved. This procedure is repeated for each VHF frequency to be used.

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The final step is to set the oscillator to the desired IF frequency and then adjust the IF control until the desired IF frequency is achieved. This procedure is repeated for each IF frequency to be used.
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 antennas—1 Mfd. 50 Mmd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Coupling Setting</th>
<th>Trimmer(s) Adjusted</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F.</td>
<td>450 Kc.</td>
<td>1 MFD.</td>
<td>Grid of LAYOUT</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Four trimmers on top (See Fig. 3)</td>
<td>Output and input.</td>
</tr>
<tr>
<td>BROADCAST BAND (Band Switch in Broadcast Position)</td>
<td>1500 Kc.</td>
<td>1 MFD.</td>
<td>Grid of LAYOUT</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C16</td>
<td>Broadcast Antenna</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>5 MFD.</td>
<td>Antennas and Ground Terminals</td>
<td>Set dial at 1400</td>
<td>Trimmer C14</td>
<td>Adjust maximum output</td>
</tr>
<tr>
<td>LONG WAVE BAND (Band Switch in Long Wave Position)</td>
<td>400 Kc.</td>
<td>5 MFD.</td>
<td>Grid of LAYOUT</td>
<td>Set dial at +10 (Rotor plates full open)</td>
<td>Trimmer C16</td>
<td>Long Wave Antenna</td>
</tr>
<tr>
<td></td>
<td>400 Kc.</td>
<td>5 MFD.</td>
<td>Antennas and Ground Terminals</td>
<td>Set dial at 400</td>
<td>Trimmer C14</td>
<td>Adjust maximum output</td>
</tr>
<tr>
<td></td>
<td>225 Kc.</td>
<td>5 MFD.</td>
<td>Antennas and Ground Terminals</td>
<td>Set dial at 225</td>
<td>Trimmer C14</td>
<td>Adjust maximum output</td>
</tr>
</tbody>
</table>

**NOTE A**—The loop may be connected to the radio when making these adjustments. The ground of the signal generator is connected to the shell of the antenna socket at the lower lead from the signal generator in series with the proper dummy at the grid of the LAYOUT tube.

**NOTE B**—This adjustment should be made with the ground lead of the signal generator connected to the shell of the antenna socket. The other end of the signal generator is connected in series with a 50-Mfd. dummy to the antenna terminals.

**NOTE C**—Trimmers C14 and C16 can be reached by removing the Sea Pal Nameplate on the side of the cabinet.

When carefully used the instrument will indicate points within ±1 Degree.

A Radio Beacon Broadcast Chart may be obtained from the United States Coast Guard at Washington, D. C. This chart contains instructions for its use.

The Sea Pal should not be installed too near your compass or the speaker may either affect the reading of the compass. It is advisable to keep the unit away from metal as much as possible to eliminate excessive error in the readings.

Place the unit in line with the ship, that is, if you want the controls directly in front when you face the bow the back of the cabinet should point directly toward the bow. If the unit is used on one side of your cabin then it should be lined up so that it is parallel with a line drawn between the bow and the stern. The reason for keeping the unit in a parallel relation to the boat is that it will be easier to set the compass scale on top of the cabinet to conform to your compass settings when taking bearing.

There is an index marker opposite the compass scale locking screw which aids you to the scale in exact agreement with your compass when required.

In any radio compass there may be a deviation from a true reading due to the motor or other metal parts around the boat just as there is with a magnetic compass. The simplest method to determine the amount of deviation is to select a broadcast or beacon station which you can see from the ship—Point your ship directly at the station and then tune the loop to the “Null” point. If there is no error the loop pointer should point to the station straight ahead, parallel with a line from bow to stern. If there is a deviation, the pointer will not point exactly straight ahead. You can catch that, note how many degrees the variation is and allow for it in future readings or you can turn in the radio case so the loop pointer points straight ahead. This will correct for the error and you won’t need to make any future allowance.

Check for deviation on several stations and also with the boat turned 180 Degrees from the stations.

To use your compass as a homing device—Time in the station near the harbor. Route the loop to the point where the signal is loudest. Rotate the loop approximately 90 degrees to the “Null Point” (The point where the signal is loudest). This point is quite broad and is therefore not adequate enough to follow. You must therefore find the “Null” point (the point at which the station is weakest).

The Null point will be where the flat side of the loop faces the station. The pointer on the Loop should then point to the station. Follow this “Null” point all the way toward the station. When near the harbor of course you’ll pick up the harbor lights and marker buoys.

Since the “Null” point can be obtained when the loop pointer points either to the station or directly away from it you should check with your magnetic compass just to be certain your direction is not away from the station.

To determine your position at Sea it is only necessary to take bearings on two broadcast stations and transfer these bearings to your chart (map). To find your position first loosen the locking screws on the compass scale on top of the Sea Pal. Rotate the scale so it reads the same as your ships compass. Make the same correction as you would for your compass and hold the ships course steady.

Now tune in a broadcast or beacon station the position of which you know. Rotate the loop to a point where the signal is loudest—Now turn the loop to your station. The point where the signal is loudest. You may have to adjust the volume either up or down to find the “Null Point”. Having found the “Null”, the loop pointer should point directly at the station and on the scale you can now read in degrees the position of the station. Draw a line from this point land with a parallel rule out to sea, on your chart.

Now repeat the same operation on another known station which is located farther along shore. When you draw your line from this station it will cross the first line at some point on the water. That point is your position.
SEARS ROEBUCK & CO.

MODEL R71, R81

POWER SUPPLY:
All models available 106-135 v., 50-60 cycles AC; 70 watts
All models available 100-135 v., 25-60 cycles AC; 75 watts

POWER OUTPUT:

<table>
<thead>
<tr>
<th>POWER OUTPUT</th>
<th>FREQUENCY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>Pentode</td>
<td>Band &quot;A&quot;</td>
</tr>
<tr>
<td>Undistorted</td>
<td>540-6100 kc</td>
</tr>
<tr>
<td>Maximum</td>
<td>1.5 watts</td>
</tr>
<tr>
<td></td>
<td>Band &quot;C&quot;</td>
</tr>
<tr>
<td></td>
<td>5.95-13.5 kc</td>
</tr>
<tr>
<td></td>
<td>4.5 watts</td>
</tr>
</tbody>
</table>

LOUDSPEAKER:

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic</td>
<td>8 inch</td>
</tr>
<tr>
<td>Approx. field coil resistance</td>
<td>1100 ohms</td>
</tr>
<tr>
<td>Approx. field coil voltage drop</td>
<td>.85 v.</td>
</tr>
</tbody>
</table>

PRELIMINARY:
Output meter connection: Across loudspeaker voice coil.
Output meter reading to indicate 500 milliamps...1.5 volts.
Approximate microwatts input to indicate 500 milliamps output...See chart below.
Generator ground lead connection: To chassis.
Dummy antenna value to be in series with generator output...See chart below.
Connection of generator output lead: At mark to left of 550 kc calibration mark.
Position of Dial Pointer with variable fully closed.
Position of Tone Control: Fully clockwise.

MODELS R71, R81 AND R81

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION</th>
<th>SWITCH OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 md.</td>
<td>6K9G Grid T2, T1</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>600 kc</td>
<td>455 kc</td>
<td>.00005 md. Ant. Term.</td>
<td>G2 Wave Trap V</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>Open</td>
<td>610 kc</td>
<td>.00005 md. Ant. Term.</td>
<td>G3 Oscillator V</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.00005 md. Ant. Term.</td>
<td>G4 Transistor V</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>8000 kc(rock)</td>
<td>8000 kc</td>
<td>.00005 md Ant. Term.</td>
<td>G10 Speaker V</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>2.3 ma</td>
<td>2.3 ma</td>
<td>400 ohms Ant. Term.</td>
<td>G3 Transistor V</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>15 ma(rock)</td>
<td>15 ma</td>
<td>400 ohms Ant. Term.</td>
<td>G4 Transistor V</td>
</tr>
</tbody>
</table>

TRIMMERS ADJUSTED FOR CLIMATIC

<table>
<thead>
<tr>
<th>TRIMMER FUNCTION</th>
<th>TRIMMER ADJUSTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td>50</td>
</tr>
<tr>
<td>G2</td>
<td>Wave Trap</td>
</tr>
<tr>
<td>G3</td>
<td>Oscillator</td>
</tr>
<tr>
<td>G4</td>
<td>Transistor V</td>
</tr>
<tr>
<td>G10</td>
<td>Speaker V</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

JUNE 5, 1940

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POWER OUTPUT:
- Type: Push-pull pentodes
- Undistorted: 4 watts
- Maximum: 6 watts

JUNE 18, 1940

FREQUENCY RANGES:
- Band "A": 540-1610 kHz
- Band "B": 1475-2610 kHz
- Band "C": 5.85-18.3 kHz
- Band "D": 9.5-9.85 kHz

POWER SUPPLY:
- All models available: 105-135 V, 50-60 cycles AC; 25 watts
- All models available: 105-135 V, 50-60 cycles AC; 100 watts

ALIGNMENT PROCEDURE:

PRELIMINARY:

- Output meter connection: Across loudspeaker voice coil
- Output meter reading to indicate 500 milliwatts, 1.55 volts
- Approximate microvolts input for 500 milliwatt output: See chart below
- Generator ground lead connection: To chassis
- Dummy antenna value to be in series with generator output: See chart below
- Connection of generator output lead: To chassis
- Generator modulation: 50%, 400 cycles
- Position of Volume Control: Fully clockwise
- Position of Tone Control: M1
- Position of Dial Pointer with variable fully closed: At mark to left of 550 kc calibration mark

WAVE BAND SWITCH POSITION OF VARIABLE FREQUENCY DUMMY ANTENNA CONNECTION TRIMMERS ADJUSTED (IN ORDER) TRIMMER APPROXIMATE FUNCTION MICROVOLTS

- "A": Closed
- "A": 600 kc
- "A": 1200 kc
- "A": 1400 kc
- "B": 600 kc(rock)
- "G": 2.4 mc(rock)
- "G": 15 mc
- "D": 9.55 mc
- "D": 9.55 mc(rock)

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>FREQUENCY</th>
<th>DUMMY ANTENNA CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>450 kc</td>
<td>.000055</td>
<td>G50 Grid</td>
</tr>
<tr>
<td>450 kc</td>
<td>.00005</td>
<td>Ant. Term.</td>
</tr>
<tr>
<td>1200 kc</td>
<td>.000055</td>
<td>G50 Grid</td>
</tr>
<tr>
<td>1200 kc</td>
<td>.00005</td>
<td>Ant. Term.</td>
</tr>
<tr>
<td>1400 kc</td>
<td>.000055</td>
<td>G50 Grid</td>
</tr>
<tr>
<td>1400 kc</td>
<td>.00005</td>
<td>Ant. Term.</td>
</tr>
<tr>
<td>600 kc(rock)</td>
<td>60000</td>
<td>Ant. Term.</td>
</tr>
<tr>
<td>2.4 mc(rock)</td>
<td>34000</td>
<td>400 ohms</td>
</tr>
<tr>
<td>15 mc</td>
<td>15000</td>
<td>400 ohms</td>
</tr>
<tr>
<td>9.55 mc</td>
<td>955000</td>
<td>400 ohms</td>
</tr>
<tr>
<td>9.55 mc(rock)</td>
<td>955000</td>
<td>400 ohms</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES FOR TUNER DATA SEE INDEX

** The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

** If two peaks can be had, the correct one is with the trimmer screw further out. The other peak is the image.
SEARS-ROEBUCK & CO.
MODEL R101
Chassis 101.614
MODELS R81, R117

JUNE 18, 1940

ALIGNMENT PROCEDURE
INTERMEDIATE FREQUENCY 455 kc

Output meter connection: Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts: 1.6 volts
Approximate microvolts input for 500 milliwatts output: See chart below
Position of Volume Control: Fully clockwise
Position of Tone Control: Both buttons out
Position of Dial Pointer with variable fully closed: On first mark to left of 550 ko calibration mark

WAVE BAND

type

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>POSITION OF VARIABLE</th>
<th>FREQUENCY</th>
<th>DUMMY GENERATOR CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>Closed</td>
<td>455 ko</td>
<td>.1 mfd</td>
<td>6K9G Grid</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>Fully open</td>
<td>1650 ko</td>
<td>0.0005 mfd</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>1400 ke</td>
<td>1500 ko</td>
<td>0.0005 mfd</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>2.4 mJ</td>
<td>2.4 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>Open</td>
<td>18.3 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;D&quot;</td>
<td>16 mJ (rock)</td>
<td>16 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>9.5 mJ</td>
<td>9.55 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;F&quot;</td>
<td>9.55 mJ</td>
<td>9.55 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>11.71 mJ</td>
<td>11.71 mJ</td>
<td>400 ohms</td>
<td>Ant. Term</td>
</tr>
</tbody>
</table>

* If two peaks can be had, the correct one is with the trimmer screw further out: the other peak is the image.

PUSH BUTTON TUNING MECHANISM: MODELS R81, R101, R117

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plunger.

Stations are set up by unlocking the mechanism, tuning in the station, pushing in the plunger (being careful not to detune the station), releasing the plunger, then accurately locking the adjustment by holding the screwdriver lightly in the screwhead allowing the spring tension to hold the plunger against the screwdriver.

POWER SUPPLY:
All models available .105-125 volt AC: 50-60 cycle: 110 watts
All models available .105-125 volt AC: 25-60 cycle: 150 watts

FREQUENCY RANGES:
Band "A" 540-1650 kc
Band "B" 1475-3510 kc
ADDITION OF SUFFIX NUMBER -1 TO CHASSIS IDENTIFICATION NUMBER 101.614:

Chassis identified by 101.614-1 omit the low boost switch from the back of the chassis and incorporate its function in the tone push buttons.

The new Zone-Phono-Television-Frequency Modulation push button switch is part number 1013843862, selling price $1.02.

© John F. Rider, Publisher
ALIGNMENT IS
THE SAME AS FOR
MODEL R71 EXCEPT
FOR MICROVOLT DATA

ALIGNMENT FREQUENCIES:

Oscillator
Antenna-Trans.

Trimmer
Trimmer
160 kc
1400 kc
None

Padder
600 kc
2.4 mc
15 mc

None

Fixed

POWER OUTPUT:

Pentode
Undistorted
Maximum

2.5 watts
4.5 watts

POWER SUPPLY:

All models available
105-125 V., 50-60 cycles AC; 75 watts
All models available
105-125 V., 25-60 cycles AC; 80 watts

LOUDSPEAKER

Type
Dynamic

Size
8 inch

Approx. field coil resistance
1100 ohms

Approx. field coil voltage drop
.85 volts

FREQUENCY RANGES:

Band "A" 540-1610 kc
Band "B" 145-2564 mc
Band "C" 5.72-18.59 mc

INTERMEDIATE FREQUENCY

455 kc

The adjustment for each button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plunger. Stations are set up by unlocking the mechanism, tuning in the station, pushing in the plunger (being careful not to damage the tuning), unlocking the plunger, then slowly locking the adjustment.
**MODEL R1061**

**SEARS-ROEBUCK & CO.**

**CH. 110,400**

**ALIGNMENT PROCEDURE**

Output meter connections: 
Across primary output transformer
Output meter reading to indicate 0.050 watt for Weston type 571 output meter on 15 volt scale: 9 volts
Connection of generator ground: App. 500 to 6000 cycles
Generator modulation: Fully clockwise
Position of volume control: Fully clockwise

**POSITION OF DIAL**

<table>
<thead>
<tr>
<th>POSITION OF DIAL</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR MODULATION</th>
<th>TRIMMERS ADJUSTED FUNCTION</th>
<th>TRIMMER</th>
<th>I.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>455 kc</strong></td>
<td><strong>9kc</strong></td>
<td><strong>12K7GT, ORID</strong></td>
<td><strong>T5, T6</strong></td>
<td><strong>I.P.</strong></td>
<td><strong>L.P.</strong></td>
</tr>
<tr>
<td><strong>1500 kc</strong></td>
<td><strong>90 kc</strong></td>
<td><strong>12A807, ORID</strong></td>
<td><strong>T5, T6</strong></td>
<td><strong>L.P.</strong></td>
<td><strong>I.P.</strong></td>
</tr>
</tbody>
</table>

**Important Alignment Notes**

It is advisable to repeat the entire alignment procedure 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.

- Short oscillator section of variable condenser.
- Connect generator output to a separate radiating loop and pickup 1530 kc signal on receiver.

**JUNE 5, 1940**

**ALIGNMENT FREQUENCIES:**

- Oscill. 455 kc
- Trimmer 1500 kc
- Padder Fixed

**FREQUENCY RANGE:**

- Broadcast: 535-1700 kc
- Local: 55-108 kc
- Power Output: 1.0 watt

**POWER SUPPLY:**

- All models available
- 110-125 volts, 25-60 cycle AC or DC, 30 watts

This receiver has a self-contained antenna loop and does not require an additional antenna connection. If it is desired to improve reception of weak or distant stations, an additional outdoor antenna may be used. For this purpose an antenna connection is provided on the loop.
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.609

MAY 21, 1940

IF PEAK 455 KO

FOR TUNER SEE INDEX

CIRCUIT CHANGES FOR D.C. OPERATION 101.609

POWER SUPPLY:
All models available.....................................105-125 v, 5-60 cycle AC, 70 watts

ALIGNMENT FREQUENCIES:
 Oscillator  Translator  Padder
 Trimmer  Trimmer  1650 ko  1400 ko  500 ko

FREQUENCY RANGE: ........................................540-1650 ko

INTERMEDIATE FREQUENCY............................455 ko

POWER OUTPUT:
 Type ........................................Pentode
 Undistorted ........................................1.0 watts
 Maximum ........................................3.5 watts

LOUDSPEAKER:
 Type ........................................Dynamic
 Size ........................................5 inch
 Field coil resistance ..........................460 ohms

OPERATING FEATURES:
 Tone Control ................................Two position
 Automatic Volume Control
 Push Button Tuning (5 Button)

CHASSIS FEATURES:
 Number IF stages ................................Two
 Number condensers in gang ........................Two
 Antenna, built-in loop with provision for external antenna.
Preliminary:
Output meter connection..............Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts...............1.5 volts
Approximate microvolts input for 500 milliwatts output.......See chart below
Dummy antenna value to be in series with generator output....See chart below
Connection of generator output lead.........................External ground
Connection of generator ground lead.........................50G, 400 cycles
Generator modulation.........................Fully clockwise
Position of Volume Control.........................HI
Position of Tone Control.........................HI
Position of Dial Pointer with variable fully closed............On mark to left of 55G kc calibration mark.

<table>
<thead>
<tr>
<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>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>6X59 Grid</td>
<td>T2, T1</td>
<td>IF</td>
<td>--</td>
</tr>
<tr>
<td>600 kc</td>
<td>455 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Clip</td>
<td>Q5*</td>
<td>Wave Trap</td>
<td>--</td>
</tr>
<tr>
<td>Fully open</td>
<td>1500 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Clip</td>
<td>Q8</td>
<td>Oscillator</td>
<td>--</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Clip</td>
<td>Q1</td>
<td>Translator</td>
<td>140</td>
</tr>
<tr>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Clip</td>
<td>G9</td>
<td>Padder</td>
<td>75</td>
</tr>
</tbody>
</table>

Important Alignment Notes
* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

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.

PUSH BUTTON TUNING MECHANISM: Adj.
For each button is locked or unlocked by tightening or loosening slotted screwhead when button knob is pulled off plunger. Stations are set by unlocking mechanism, tuning in station, pushing in plunger (do not detune station), releasing plunger, locking adj. by holding screwdriver lightly in screwhead allowing spring tension to hold plunger against screwdriver.
**SEARS-ROEBUCK & CO.**

**MODEL R1161**

**Chassis 101611**

**WIRING DIAGRAM FOR SILVETONE CHASSIS 101.611**

**INTERMEDIATE FREQUENCY**... 455 kHz

**FREQUENCY RANGES:**
- Band 'A'... 540-1610 kHz
- Band 'B'... 1475-2510 kHz
- Band 'C'... 5.95-15.2 kHz
- Band 'D'... 9.5-9.85 kHz

**JUNE 5, 1940**

**POWER OUTPUT:**
- Type... Pentode
- Undistorted... 3.5 watts
- Maximum... 4.5 watts

**POWER SUPPLY:**
- All models available
  - 105-125 v., 50-60 cycles AC; 75 watts
  - 105-125 v., 25-30 cycles AC; 80 watts

**ALIGNMENT PROCEDURE**

- Output meter connection: Across loudspeaker voice coil
- Output meter reading to indicate 500 milliwatts
- Approximate microvoltage input to indicate 500 milliwatts output to chassis
- Generator ground lead connection: To chassis
- Dummy antenna value to be in series with generator output
- Connection of generator output lead: See chart below
- Generator modulation: 30%, 400 cycles
- Position of Volume Control: Fully clockwise
- Position of Tone Control: Off
- Position of Dial Pointer with variable fully closed: At mark to left of 550 kHz calibration mark

**FOR TUNER, SEE MODEL R101**

**WAVE BAND SWITCH**

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DIODE ANTENNA</th>
<th>GENERATOR CONNECTION SHOWN</th>
<th>TRIMMER ADJUSTED (IN ORDER)</th>
<th>TRIMMER APPROXIMATE FUNCTION</th>
<th>TRIMMER APPROXIMATE VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>'A'</td>
<td>Closed</td>
<td>455 kHz</td>
<td>.1 mfd.</td>
<td>6X8G Grid</td>
<td>TR, TI</td>
<td>IP</td>
</tr>
<tr>
<td>'A'</td>
<td>Open</td>
<td>455 kHz</td>
<td>.00005 mfd Ant. Term.</td>
<td>614# Wave Trap</td>
<td>C4, C5</td>
<td>121</td>
</tr>
<tr>
<td>'A'</td>
<td>1400 kHz</td>
<td>1400 kHz</td>
<td>.00005 mfd Ant. Term.</td>
<td>614# Wave Trap</td>
<td>C4, C5</td>
<td>121</td>
</tr>
<tr>
<td>'A'</td>
<td>800 kHz (rock)</td>
<td>800 kHz</td>
<td>.00005 mfd Ant. Term.</td>
<td>614# Wave Trap</td>
<td>C4, C5</td>
<td>121</td>
</tr>
<tr>
<td>'A'</td>
<td>9.55 kHz (rock)</td>
<td>9.55 kHz</td>
<td>.00005 mfd Ant. Term.</td>
<td>614# Wave Trap</td>
<td>C4, C5</td>
<td>121</td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

- The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kHz is known, the generator should be adjusted to the frequency of that station instead of to 455 kHz.

- **If two peaks can be had, the correct one is with the trimmer screw further out. The other peak is in the image.**

---

**LOCATIONS OF PARTS ON TOP OF CHASSIS 101611**

**LOCATIONS OF PARTS UNDER CHASSIS 101611**
**ALIGNMENT PROCEDURE**

Before starting the alignment procedure, the pointer should be set to the left division of the 600 KC and the dial scale with the meg ohmmeter C-F. Adjust the pointer manually to the pointer rest in this position and allow it to settle before moving.

### RECEIVER CONNECTIONS WITH SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>INPUT Jack</th>
<th>Connection of Signal Generator w/ Receiver</th>
<th>Signal Generator Frequency</th>
<th>Band Switch Position</th>
<th>Receiver Dial Setting</th>
<th>Tunes</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L F.M. COND.</td>
<td>CONTROL GRID</td>
<td>455 KC</td>
<td>AMERICAN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>1-2</td>
<td>1ST I.F.</td>
</tr>
<tr>
<td>300 MIPS COND.</td>
<td>ANTENNA TERMINAL</td>
<td>455 KC</td>
<td>AMERICAN</td>
<td>ANY POINT WHERE IT DOES NOT AFFECT THE SIGNAL</td>
<td>3-4</td>
<td>2ND I.F.</td>
</tr>
<tr>
<td>450 CON CARRIER</td>
<td>ANTENNA TERMINAL</td>
<td>16 KC</td>
<td>POSITION</td>
<td>16 MC</td>
<td>5</td>
<td>WAVE TRAP</td>
</tr>
<tr>
<td>450 CON CARRIER</td>
<td>ANTENNA TERMINAL</td>
<td>16 KC</td>
<td>FOREIGN</td>
<td>TIME TO 16 MC</td>
<td>6</td>
<td>FOREIGN OSCILLATOR</td>
</tr>
<tr>
<td>200 MIPS COND.</td>
<td>ANTENNA TERMINAL</td>
<td>1400 KC</td>
<td>AMERICAN</td>
<td>1400 KC</td>
<td>6</td>
<td>BROADCAST OSCILLATOR (910 KC)</td>
</tr>
<tr>
<td>200 MIPS COND.</td>
<td>ANTENNA TERMINAL</td>
<td>1400 KC</td>
<td>AMERICAN</td>
<td>TIME TO 1400 KC</td>
<td>7</td>
<td>BROADCAST ANTENNA</td>
</tr>
<tr>
<td>200 MIPS COND.</td>
<td>ANTENNA TERMINAL</td>
<td>600 KC</td>
<td>AMERICAN</td>
<td>TIME TO 600 KC</td>
<td>8</td>
<td>NO-BROADCAST OSCILLATOR</td>
</tr>
</tbody>
</table>

**NOTE:** The set should be placed in the cabinet before steps 9 & 10 are taken. The loop and its leads must be in their final position at this time. Make a final check after installation using a weak radiated 1400 KC signal.

---

**DIAGRAM**

[Diagram showing the alignment procedure steps]
### ALIGNMENT PROCEDURE

Before starting the alignment procedure check to see if the speaker is set to the last note on the 650 Hz. and of the dial scale with the gang selector in full mesh.

**Output meter connection**
- Output meter must be in series with generator output for accurate reading.
- Do not connect meter between receiver and generator.

**Connection of generator ground leads**
- To chassis ground.

**Position of volume control**
- At maximum position.

**Position of tone control**
- At maximum position.

**Position of dial pointer with gang fully closed**
- On mark to left of 650 Hz. calibration mark.

<table>
<thead>
<tr>
<th>DECK ANT. CONNECTION</th>
<th>SIGNAL GENERATOR OUTPUT TO RECEIVER</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>GRID INJECTOR POSITION</th>
<th>RECFREQUENCY</th>
<th>TUNER NUMBER</th>
<th>TUNER DESCRIPTION</th>
<th>TYPE OF ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 MFD. CONDENSER</td>
<td>CONTROL GRID OF 9500 TUBE</td>
<td>450 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>500 KHz</td>
<td>1 - 2</td>
<td>500 KHz</td>
<td>READ FOR MAXIMUM OUTPUT, THEN REDUCE TUNER.</td>
</tr>
<tr>
<td>30 MFD. CONDENSER</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>450 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>1400 KHz</td>
<td>6</td>
<td>WAVE TRAP</td>
<td>ADJUST FOR MINIMUM OUTPUT UNDER 1/4 WAVE GENERATOR SIGNAL.</td>
</tr>
<tr>
<td>20 MFD. CONDENSER</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>1400 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>1400 KHz</td>
<td>7</td>
<td>WAVE DETECTOR</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>20 MFD. CONDENSER</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>1400 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>500 KHz</td>
<td>9</td>
<td>WAVE TRAP</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>5 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>5 KHz</td>
<td>10</td>
<td>POLICE BAND ANTENNA</td>
<td>ADJUST FOR MAXIMUM OUTPUT, TRY TO INCORE Output by extending console and retuning receiver tune until maximum output is obtained.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>5 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>5 KHz</td>
<td>11</td>
<td>POLICE BAND ANTENNA</td>
<td>ADJUST FOR MAXIMUM OUTPUT, TRY TO INCREASE OUTPUT BY EXTENDING CONSOLE AND RETUNING RECEIVER TUNE UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>15 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>15 KHz</td>
<td>12</td>
<td>SHORT WAVE OSCILLATOR</td>
<td>ADJUST FOR MAXIMUM OUTPUT, CHECK TO SEE IF PROPER MAX WAVE IS OBTAINED BY TUNING IN AT APPROX. 15 KHz. IF WAVE IS NOT APPEAR, REALIZE AT 5 KHz AND TUNER CONSOLE FURTHER OUT.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>15 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>15 KHz</td>
<td>13</td>
<td>SHORT WAVE OSCILLATOR</td>
<td>ADJUST FOR MAXIMUM OUTPUT, TRY TO INCREASE OUTPUT BY EXTENDING CONSOLE AND RETUNING RECEIVER TUNE UNTIL MAXIMUM OUTPUT IS OBTAINED.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>9.5 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>9.5 KHz</td>
<td>14</td>
<td>BAND SPREAD OSCILLATOR</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
<tr>
<td>400 OHM RESISTOR</td>
<td>ANTENNA TERMINAL (BLUE WIRE)</td>
<td>9.5 KHz</td>
<td>&quot;A&quot; POSITION</td>
<td>9.5 KHz</td>
<td>15</td>
<td>BAND SPREAD OSCILLATOR</td>
<td>ADJUST FOR MAXIMUM OUTPUT.</td>
</tr>
</tbody>
</table>

* Replace chassis and cabinet back in cabinet and repeat adjustment #6 using a weak radiated signal.

**POWER SUPPLY**
- Model E-1591 is supplied for either 26 or 60 cycle power supplies
- 105-125 volts - 26 cycle - 85 watts
- 105-125 volts - 60 cycle - 85 watts

**FREQUENCY RANGES**
- Broadcast 540 to 1600 KHz
- Intermediate band 15 to 54 KHz
- Short wave 5.4 to 18.1 KHz
- Bandspread 9.2 to 9.9 KHz

**TUBE FUNCTION**
- R.F.: 63.6 AC
- 1st DET-OSC: 63.6 AC
- I.F.: 63.6 AC
- 2nd DET-2VX: 63.6 AC
- PHASE INVERTER: 63.6 AC
- OUTPUT: 63.6 AC
- EYE: 63.6 AC
- RECTIFIER: 50 AC

**PLATES-330 A.C. TO CHASSIS**

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OCTOBER 7, 1940

IF PEAK 455 KC

LOUD SPEAKER:
Type: Dynamic
Size: 5"

POWER OUTPUT
Type: Beam Power
Undistorted: 1.0
Maximum: 1.5

POWER SUPPLY
All models available...
110-125 volts, 25-60 cycle AC or DC, 30 watts

ALIGNMENT NOTES

* First time T5 is misaligned by loosing center screw one turn.
** Short oscillator section of variable condenser. Second I.F. alignment must be done twice to secure flat top tuning.
*** Connect generator output to a separate radiating loop and pickup 1500 KC signal on receiver.

PUSH BUTTON POSITION GENERATOR CONNECTION TRIMMER
OF DIAL OF GRID, GRID
POSITION CENTER, ADJUSTED, FUNCTION I.F.
Manual "IN" ** GENERATOR CONNECTION - ADJUSTED FUNCTION I.F.

TRIMMER ADJUSTMENT CARD

AUTOMATIC TUNING CONTROL ADJUSTMENT

From the diagram, after finding where the proper pair of adjustment screws are located, trace the dotted line connecting these screws to one of the push buttons. This is the button which after the adjustments are completed, will tune in the station.

Push this button "IN".

Turn the volume control knob on full (to the extreme right) and adjust screw marked "0" until the desired station is heard. If when making this adjustment, a number of stations can be brought in as the screw is turned and it is doubtful which station is the correct one, press button No. 5 (Manual Tuning) "IN" and turn the station selector knob to the number on the dial that corresponds to the frequency of the station. Listening to the program being broadcast will identify the station when adjusting the screw "0".

Adjust the screw marked "A" for maximum volume, retaining the volume control and re-adjusting if necessary. This completes the adjustments for this particular station.

Proceed in the same manner to adjust the tuning screws for the other stations on your list.
FREQUENCY RANGES:  
Band *AM* 550-1700 kc  
Band *FM* 5.95-18.3 mc

POWER OUTPUT:  
Type: Pentode  
Undistorted: 0.45 watts  
Maximum: 0.5 watts

INTERMEDIATE FREQUENCY:  
455 kc

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be set for minimum output meter reading instead of the usual maximum reading. If the frequency of the interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

Preliminary:
Output meter connection............ Across loudspeaker voice coil
Output meter reading to indicate 50 milliwatts............ 0.27 volts
Approximate microvolts input for 50 milliwatts 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 modulator output............ 200-400 cycles
Position of Volume Control............ Fully clockwise
Position of Tone Control............ MI
Position of Dial Pointer with variable fully closed............ Horizontal

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>POSITION OF VARIABLE FREQUENCY</th>
<th>GENERATOR DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION (IN ORDER SHOWN)</th>
<th>TRIMMER APPROXIMATE FUNCTION MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>AM</em></td>
<td>Closed 455 kc .1 mfd.</td>
<td>IC70 9 grid</td>
<td>T2, T1 IF Output</td>
<td>--</td>
</tr>
<tr>
<td><em>AM</em></td>
<td>600 kc 455 kc .0003 mfd.</td>
<td>Ant. Term. 01*</td>
<td>Wave Trap --</td>
<td>--</td>
</tr>
<tr>
<td><em>AM</em></td>
<td>1400 kc 1400 kc .0003 mfd.</td>
<td>Ant. Term. 06, 02 Geo., Trans.</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td><em>AM</em></td>
<td>600 kc (rock) 600 kc</td>
<td>Ant. Term. 07 Fader</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td><em>FM</em></td>
<td>16 mo (rock) 16 mo 400 ohms</td>
<td>Ant. Term. 04 Transl.</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

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ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connection ........................................ Across loud speaker voice coil
Output meter reading to indicate 50 milliwatts .......................... 0.5 volts
Approximate microvolts input for 50 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 ..................................................... 50%, 400 cycles
Position of Volume Control .............................................. Fully clockwise
Position of Tone Control .................................................. HI
Position of Dial Pointer with variable fully closed ......................... Horizontal

<table>
<thead>
<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</th>
<th>TRIMMER FUNCTION</th>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;AM&quot;</td>
<td>Closed</td>
<td></td>
<td>455 kc</td>
<td></td>
<td>1A7G Grid</td>
<td>T2, T1</td>
<td>IF Output</td>
<td>--</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>600 kc</td>
<td></td>
<td>455 kc</td>
<td>0.002 mfd.</td>
<td>Ant. Term.</td>
<td>03</td>
<td>Wave Trap</td>
<td>--</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>1400 kc</td>
<td></td>
<td>1750 kc</td>
<td>0.002 mfd.</td>
<td>Ant. Term.</td>
<td>04</td>
<td>Oscillator</td>
<td>45</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>800 kc (rock)</td>
<td></td>
<td>600 kc</td>
<td>0.003 mfd.</td>
<td>Ant. Term.</td>
<td>05</td>
<td>Translator</td>
<td>32</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>3.4 ma</td>
<td></td>
<td>3.4 ma</td>
<td>400 ohms</td>
<td>Ant. &quot;term.&quot;</td>
<td>06</td>
<td>Padder</td>
<td>25</td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>16 ma (rock)</td>
<td></td>
<td>16 ma</td>
<td>400 ohms</td>
<td>Ant. &quot;term.&quot;</td>
<td>07</td>
<td>Translator</td>
<td>30</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

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 AVC action of the receiver ineffective.
MODELS 2541, 2541, 2741
Chassis 101.603

PRELIMINARY:

ALIGNMENT PROCEDURE

Output meter connections.................. Across loud speaker voice coil
Output meter reading to indicate 50 milliwatts.................. 0.5 volts
Approximate average sensitivity in microvolts for 50 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.................. 50%, 400 cycles
Position of Volume Control.................. Fully on
Position of pointer with variable fully closed.................. Horizontal (to fall on block below 550 kc calibration mark.)

POSITIVE OF VARIABLE GENERATOR FREQUENCY DIMMY ANTENNA GENERATOR CONNECTION TRIMMER TRIMMER FUNCTION APPROXIMATE MICROVOLTS
Closed 455 kc .1 mfd. 1A70 Translator T2, T1 IF --
Open 1400 kc 1400 kc .0003 mfd. Ant. Term. C4 Oscillator --
600 kc (rock) 600 kc .0003 mfd. Ant. Term. C7 Padder 50

IMPORTANT ALIGNMENT NOTES

The variable should be rocked back and forth a degree or two while making the 600 kc 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 AVC of the receiver from interfering with accurate alignment.
ALIGNMENT PROCEDURE

PROCEDURE: MODELS 3551, 3551, 3551, Chassis 101, 604

Output meter connections: Across loud speaker voice coil

Output meter reading to indicate a full-scale deflecting movement.

.3 amp approximate current input to indicate 30 milliwatts output.

See chart below.

Voltage source: Laboratory power source.

Output meter: Amperage indicator.

To be in series with generator output for use when generator is not available.

Generator: 3000, 600 cycles.

Position of Tone Control:

Position of pointer with variable fully closed.

Position of pointer with variable fully opened:

Horizontal or 90 degrees below 600 ohm, resistance mark.

POSITION GENERATOR DUMP GENERATOR FREQUENCY ADJUSTMENT AMPLITUDE TONE TUM. FUNCTION APPROXIMATE OF VARIABLE PRODUCT RESISTANCE CONNECTOR UNIT ANTENNA FUNCTION RESISTANCE

Closed 455 kc .1 meg. IA2G-Translator 7T1 IF --

Fully open 2750 kc .0002 meg. IA2G-Translator 7T1 IF --

1400 kc 1400 kc .0002 meg. Ant. Tap 35 Oscillator 36

600 kT 500 kc 500 kc .0002 meg. Ant. Tap 35 Oscillator 36

If tone adjustments are made, the receiver should be replaced with the same unit to avoid any interference.

IMPORTANT ALIGNMENT NOTES

The variable should be checked back and forth a degree or two while making the 600 kc 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 audio output from interfering with accurate alignment.

THE LOOP ANTENNA: MODELS 3551, 3551, 3551, Chassis 101, 604

The loop antenna built into the receiver is directional in its reception characteristics. Therefore, reception and selectivity can be improved with a small antenna which can be placed on the top of the receiver. In this position the signal strength is too low to give satisfactory reception from the long-antenna alone, as outside noise may be considerable. The antenna should be able to be adjusted to the proper height for best reception.

To improve the loop antenna, an antenna which is capable of being placed near the receiver should be used. This antenna may be placed on the top of the receiver or on a small pole near the receiver.

ANTENNA CAPABILITY

If the loop antenna is to be used, the antenna should be placed on the top of the receiver. The loop antenna should be adjusted to the proper height for best reception.

ANTENNA CAPABILITY

If the loop antenna is to be used, the antenna should be placed on the top of the receiver. The loop antenna should be adjusted to the proper height for best reception.

STATION SELECTOR VOLUME SWITCH

OSCILLATOR VOICE COIL TERMINALS

2ND IF 455 KC

125 GT

125 GT

35 L6

35 L6

1ST IF 455 KC

125 GT

125 GT

OSCILLATOR POWER SUPPLY:

220 to 220 volts (1.0, 1.0, 1.0) 150 Hz

350 VDC 6.3 VDC 10 WATT BATTERY 10 WATT

LOUD SPEAKER:

15 WATT 8 OHM DYNAMITE" R8 5 INCH

LOCATION OF PARTS UNDER CHASSIS 101, 604

LOCATION OF PARTS ON TOP OF CHASSIS 101, 604
SEARS ROEBUCK & CO.

MODEL 2761
Chassis 101.50

ALIGNMENT PROCEDURE

Output meter connection: Across loudspeaker voice coil
Output meter reading to indicate 50 milliwatts: .036 volts
Approximate microvolts input for 50 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: 50%, 400 cycles
Position of Volume Control: Fully clockwise
Position of Tone Control: HI
Position of Dial Pointer with variable fully closed: On mark past 550 kc
Position of Battery Thrift Switch: Right

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH</th>
<th>POSITION</th>
<th>GENERATOR</th>
<th>DUMMY ANTENNA</th>
<th>TRIMMER ADJUSTED (IN ORDER)</th>
<th>TRIMMER FUNCTION</th>
<th>APPROXIMATE MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A7G Grid</td>
<td>T2, T1</td>
<td>IF</td>
<td>75</td>
</tr>
<tr>
<td>AM</td>
<td>800 kc</td>
<td>455 kc+</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>06</td>
<td>Wave Trap</td>
<td>--</td>
</tr>
<tr>
<td>AM</td>
<td>Fully open</td>
<td>1730 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>G8</td>
<td>Oscillator</td>
<td>--</td>
</tr>
<tr>
<td>AM</td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>C1</td>
<td>Transistor</td>
<td>20</td>
</tr>
<tr>
<td>AM</td>
<td>800 kc</td>
<td>600 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>G9</td>
<td>Padder</td>
<td>15</td>
</tr>
<tr>
<td>AM</td>
<td>400 kHz(rock)</td>
<td>600 kc</td>
<td>600 kc</td>
<td>.0003 mfd.</td>
<td>C10, C3</td>
<td>Osa, Transl.</td>
<td>20</td>
</tr>
<tr>
<td>AM</td>
<td>4.5 mc</td>
<td>4.5 mc</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>G6</td>
<td>Transistor</td>
<td>10</td>
</tr>
<tr>
<td>AM</td>
<td>16 mc</td>
<td>16 mc</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>G6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

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 AVC action of the receiver ineffective.

LOCATIONS OF PARTS UNDER CHASSIS 101.606

LOCATIONS OF PARTS ON TOP OF CHASSIS 101.606
### SCHEMATIC LOCATION PART NUMBER DESCRIPTION SELLING PRICE EACH

| L1 | 1326514446 | Antenna Rack | .15 |
| L1 | 1326818769 | Antenna Coll (includes blocking cond.) | .90 |
| L1 | 1324916378 | Bulb-Dial Light #47 (C-10) | .10 |
| L3A4 | 1326016943 | Cabinet Assembly (Black) | .25 |
| L3A4 | 1326016942 | Cabinet Assembly (Walnut) | .25 |
| L3A4 | 1326016943 | Cabinet Assembly (Ivory) | .25 |
| L2 | 1323216771 | Choke-Mode & Plate | .24 |
| L2 | 1323215303 | Grid Clip | .01 |
| L2 | 1322817009 | Coil-R.F. | .90 |
| C2 | 1322116787 | Condenser-Variable | 1.40 |
| C3 | 1322018888 | Condenser-Electrolytic | .16 |
| C4 | 1322018888 | Condenser .05 mfd. 400 V. | .10 |
| C5 | 1322018888 | Condenser .05 mfd. 200 V. | .09 |
| C6 | 1322018888 | Condenser .0025 mfd. 400 V. | .10 |
| C7 | 1322018888 | Condenser .002 mfd. 400 V. | .10 |
| C8 | 1322018888 | Condenser .04 mfd. 400 V. | .10 |
| C9 | 1322018888 | Condenser .002 mfd. 400 V. metal-clad | .17 |
| C11 | 132191458 | Condenser .000014 mfd. 600 V. | .08 |
| C12 | 132191458 | Condenser .01 mfd. 400 V. | .10 |
| R1 | 1322416763 | Control-Volume & Switch | .50 |
| R2 | 1325518605 | Cord-Power | .29 |
| R3 | 1324016765 | Dial Scale Plate (Maroon) | .55 |
| R4 | 1324016775 | Dial Scale Plate (Green) | .45 |
| R6 | 1325616631 | Knob (Black) | .07 |
| R7 | 1325616632 | Knob (Black) | .07 |
| R8 | 1325616630 | Knob (Ivory) | .07 |
| R9 | 1325616630 | Knob (Ivory) | .07 |
| R10 | 1322114372 | Resistor 2 megohm ½ watt | .12 |
| R11 | 1322114372 | Resistor 15 megohm ½ watt | .12 |
| R12 | 1322114372 | Resistor 500,000 ohm ½ watt | .12 |
| R13 | 1322114372 | Resistor 1940 ohm 0.5 watt | .15 |
| R14 | 1322114372 | Resistor 150 ohm ½ watt | .12 |
| R15 | 1322114372 | Resistor 100 ohm ½ watt | .12 |
| R16 | 1321816799 | Socket-Tube WafFer type | .09 |
| R17 | 1321816556 | Socket-Tube Light | .15 |
| R18 | 1325616725 | Speaker 4Ω | .25 |
| R19 | 1321216617 | Transformer-Speaker | .75 |
| R20 | 1326016766 | Fuses Lin Window | .15 |
| R21 | 1326033366 | Carton (Complete with fillers) | .20 |

### AUGUST 8, 1940

#### ELECTRICAL SPECIFICATIONS
- **TUBES AND FUNCTIONS:**
  - 12K7GT: R.F. Amp.
  - 12SQ7GT: Detector-AVC-AP
  - 35L6GT: Output
  - 35Z5GT: Rectifier

#### POWER SUPPLY:
All models available...
- 105-125 volts, AC-DC, 50 watts

#### ALIGNMENT FREQUENCIES:
- R.F.: 1400 kc
- Ant.: 1400 kc

#### LOUD SPEAKER:
- **Type:** Electro dynamic
- **Size:** 4 inch

#### FREQUENCY RANGE: 540 1725 kc

#### POWER OUTPUT:
- **Type:** Beam tube
- **Undistorted Output:** 800 'Watts'
- **Maximum:** 1.25 watts

#### OPERATING FEATURES:
- Automatic Volume Control AC-DC
- **CONTROL OPERATION:**
  - Turning Right: Up Volume increase.
  - Turning Left: Down Volume increase.
  - Tuning ratio: 3:1

### OPERATING CONTROLS:
- Left Knob: On-Off switch & Volume
- Right Knob: Tuning

### RETAIL SELLING PRICES PREPAID
- PRICES SUBJECT TO CHANGE WITHOUT NOTICE
PUSH BUTTON ADJUSTMENT: Each button is set up by loosening screw (under PB key),
tuning in station, depressing button, and then tightening screw.

ADD of SUPP-1 to CHASSIS NO. CIRCUIT DIAGRAM CHANGES - 7/19/40.

ADD of SUPP-2C, -2D, -2E to CHASSIS NO.

PARTS LIST CHANGES - 9/7/40.

ALIGNMENT.

LOCATION OF PARTS ON TOP OF CHASSIS.
MODELS 3321, 3421, 3521, 3721
Chassis 109.357,-A,-B,-C

SEARS ROEBUCK & CO.

POWER SUPPLY . . . . 105-125 volts 50-60 cycles or DC 30 Watts. 25 cycle models available

FREQUENCY RANGE . . . . . 540-1600 kc
5500-18500 kc

INTERMEDIATE FREQUENCY . . . 455 kc

ALIGNMENT FREQUENCIES: . . . . 1400-600 kc
1800 kc

POWER OUTPUT:
Type: Beam Tube
Undistorted: 0.8 Watt
Maximum: 1.4 Watt

LOUD SPEAKER:
Type: Permanent Magnet Dynamic
Size: 5 inch
Field: Permanent Magnet

Tube sockets are removed from under side of chassis.

FOR ALIGNMENT SEE INDEX

STATION SELECTOR

VOLUME CONTROL ON-OFF SWITCH

IF PEAK 455 KC

SEPTTEMBER 16, 1940

BAND SWITCH

POWER CORD

LOOP ANTENNA

TONE CONTROL SWITCH

BROADCAST (○) SHORT WAVE

MEDIUM

TREBLE

SHORT WAVE (○) BASS
To comply with the requirements of the Underwriters Laboratories, a .01 mfd., 400 V, paper tubular condenser (C-12), was added in the antenna circuit, as isolation between the antenna and floating ground.

Indicates ground to chassis base. Tube sockets are viewed from under side of chassis. Voltage readings shown at socket prongs are to floating ground and are taken with no signal. A.C. line voltage at 117 volts. Where no reading is given, the voltage is zero or too low to read.

35Z5GT

Location of parts under chassis

Tubes and Functions:
- 12K7GT: R.F. Amp.
- 35L6GT: Output
- 35Z5GT: Rectifier

Power Supply:
All models available
105-125 volts, A.C.-D.C., 30 watts

Power Output:
Type: Beam Tube
Undistorted: 600 milliwatts
Maximum: 1,500 watts

Frequency Range: 540 - 1725 kc.

Alignment Frequencies: R.F.: 1400 kHz
Ant.: 1400 kHz

Pointer at 55:
Loud Speaker:
Type: Size:

Location of parts on top of chassis

September 30, 1940
See tube layout diagram for location of trimmers. Alignment may be made without removing the set from the cabinet. Connect the output meter to the two terminals shown in the tube layout diagram. These terminals are mounted on an insulated terminal strip on top of the output transformer. These terminals connect to the voice coil.

Connect the signal generator ground to the receiver chassis through a 0.1 MFD condenser. Using a 0.05 to 0.25 MFD condenser in series with the high side of the generator output, apply a 455 KC signal to the grid of the 12S076 T.F. amplifier tube and align the 2nd IF transformer. Repeat for the first IF transformer, applying the signal to the antenna section of the tuning condenser. Using a 0.05 MFD condenser as a dummy antenna apply the RF signal to the antenna lead. Turn the tuning condenser to minimum capacity, set the generator to 1580 KC and trim the oscillator section. Set the generator to 1400 KC, tune in the signal and adjust the antenna trimmer. (The antenna and oscillator trimmers are located on top of the tuning condenser.) NOTE: Best alignment is obtained with the volume control at maximum and the applied signal only strong enough to give satisfactory indications on the output meter. Alignment with high signal input and retarded volume control setting is seldom accurate.

The loop antenna built into the receiver cabinet is directional in its reception characteristics. Therefore, reception may be improved or interference reduced by turning the set to a particular position. In locations where the signal strength is too low to give satisfactory reception from the loop antenna alone, an outside antenna may be connected to the wire projecting from the rear of the receiver. No attempt should be made to use a ground connection.
Output meter connection... Across loudspeaker voice coil
Output meter reading to indicate 500 millivolts... 1.6 volts
Approximate microvolts input for 500 millivolts 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... Both buttons out
Position of Tone Control... 30S, 400 cycles
Position of Dial Pointer with variable fully closed... On first mark to left

Wave Band Switch Position Generator Frequency Dummy Antenna Generator (in order shown) Trimmer Adjusted approximate function

* A* Closed 455 kc .1 mfd. 6K8G Grid T2, T1 IF --
* A* Fully open 1500 kc 1500 kc .00005 mfd. Ant. Term. C17 Oscillator --
* A* 800 kc (rock) 600 kc .00005 mfd. Ant. Term. C18 Padder 55
* B* 5.4 mo 3.4 mo 400 ohms Ant. Term. C9 Translator 150
* C* Open 18.3 mo 400 ohms Ant. Term. C36* Oscillator --
* D* 16 mo (rock) 16 mo 400 ohms Ant. Term. C11 Translator 35
* E* 9.55 mo 9.55 mo 400 ohms Ant. Term. C36 Oscillator --
* F* 9.55 mo (rock) 9.55 mo 400 ohms Ant. Term. C10 Translator 75
* G* 11.71 mo 11.71 mo 400 ohms Ant. Term. C22* Oscillator --
* H* 11.71 mo (rock) 11.71 mo 400 ohms Ant. Term. G9 Translator 75

Important Alignment Notes
* If two peaks can be had, the correct one is with the trimmer screw further out; the other peak is the image.
POWER SUPPLY:
All models available ........................................ 105-125 volts, 50-60 cycles; 150 watts
All models available ........................................ 105-125 volts, 25-60 cycles; 60 watts

ALIGNMENT FREQUENCIES:

<table>
<thead>
<tr>
<th>FREQUENCY RANGES</th>
<th>OSCILLATOR</th>
<th>TRANSMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;A&quot;</td>
<td>538-1620 kc</td>
<td>Trimmer</td>
</tr>
<tr>
<td>Band &quot;B&quot;</td>
<td>1620-1200 kc</td>
<td>Trimmer</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>1200-900 kc</td>
<td>Padder</td>
</tr>
<tr>
<td>Band &quot;D&quot;</td>
<td>900-600 kc</td>
<td>Fixed</td>
</tr>
<tr>
<td>Band &quot;E&quot;</td>
<td>600-450 kc</td>
<td>Fixed</td>
</tr>
<tr>
<td>Band &quot;F&quot;</td>
<td>450-300 kc</td>
<td>Fixed</td>
</tr>
</tbody>
</table>

INTERMEDIATE FREQUENCY .................................. 455 kc

LOUDSPEAKER:

| Type ................. | Dynamic |
| Size ................ | 12 inch |
| Approx. field coil resistance | 600 ohms |
| Approx. field coil voltage drop | 75 volts |

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plunger. Stations are set up by unlocking the mechanism, tuning in the station, pushing in the plunger (being careful not to dent the station), releasing the plunger, then securely locking the adjustment.
MODELS 5511, 5511-A
Chassis 101.619  101.619-A

SEARS ROEBUCK & CO.

LOCATIONS OF PARTS UNDER CHASSIS 101.619

LOCATIONS OF PARTS ON TOP OF CHASSIS 101.619

WAVE BAND

<table>
<thead>
<tr>
<th>POSITION</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>TRIMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>455 kc</td>
<td>1 mfd.</td>
<td>T2, T1</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>1600 kc</td>
<td>1 mfd.</td>
<td>C17</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>1400 kc</td>
<td>1 mfd.</td>
<td>C11, C15</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>600 kc (rock)</td>
<td>400 ohms</td>
<td>C18</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>5.2 mc</td>
<td>400 ohms</td>
<td>C19</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>4 mc</td>
<td>400 ohms</td>
<td>C2 Trans</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>13.3 mc</td>
<td>400 ohms</td>
<td>C3 Trans</td>
</tr>
<tr>
<td>&quot;D&quot;</td>
<td>15 mc (rock)</td>
<td>400 ohms</td>
<td>C5 Trans</td>
</tr>
<tr>
<td>&quot;P&quot;</td>
<td>9.55 mc (rock)</td>
<td>400 ohms</td>
<td>C6, C29</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>11.71 mc</td>
<td>400 ohms</td>
<td>C7 Trans</td>
</tr>
<tr>
<td>&quot;P&quot;</td>
<td>11.71 mc (rock)</td>
<td>400 ohms</td>
<td>C8 Trans</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>15.5 mc (rock)</td>
<td>400 ohms</td>
<td>C8 Trans</td>
</tr>
</tbody>
</table>

TRIMMERS ADJUSTED (IN ORDER ShOWN)

1. IF
2. Oscillator
3. Loop, Trans.
4. Padder
5. Oscillator
6. Oscillator
7. Oscillator
8. Oscillator
9. Oscillator
10. Oscillator
11. Oscillator
12. Oscillator
13. Oscillator
14. Oscillator
15. Oscillator
16. Oscillator
17. Oscillator
18. Oscillator
19. Oscillator
20. Oscillator
21. Oscillator
22. Oscillator
23. Oscillator
24. Oscillator
25. Oscillator
26. Oscillator
27. Oscillator
28. Oscillator
29. Oscillator
30. Oscillator
31. Oscillator
32. Oscillator
33. Oscillator
34. Oscillator
35. Oscillator
36. Oscillator
37. Oscillator
38. Oscillator
39. Oscillator
40. Oscillator

IMPORTANT ALIGNMENT NOTES

* If two peaks can be had, the correct one is with the trimmer screw further out; the other peak is

the image.
IF PEAK 455 KC

AUGUST 14, 1940

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>CONNECTION</th>
<th>TRIMMER (IN ORDER)</th>
<th>TRIMMER APPROXIMATE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kHz</td>
<td>0.1 mfd.</td>
<td>6K8G Grid</td>
<td>T3, T1</td>
<td>IF</td>
</tr>
<tr>
<td>600 kHz</td>
<td>455 kHz</td>
<td>0.00005 mfd.</td>
<td>Ant. Clip</td>
<td>G7</td>
<td>Wave Trap</td>
</tr>
<tr>
<td>Fully open</td>
<td>1630 kHz</td>
<td>0.00005 mfd.</td>
<td>Ant. Clip</td>
<td>G9</td>
<td>Oscillator</td>
</tr>
<tr>
<td>1400 kHz</td>
<td>1400 kHz</td>
<td>0.00005 mfd.</td>
<td>Ant. Clip</td>
<td>G1</td>
<td>Transmitter</td>
</tr>
<tr>
<td>600 kHz (rock)</td>
<td>600 kHz</td>
<td>0.00005 mfd.</td>
<td>Ant. Clip</td>
<td>G10</td>
<td>Padder</td>
</tr>
</tbody>
</table>

Output meter connection
Output meter reading to indicate 500 milliamps
Approximate microvolts input for 500 milliamps output
Position of Tone Control
Position of Dial Pointer with variable fully closed

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kHz is known, the generator should be adjusted to that frequency instead of 455 kHz.

PUSH BUTTON TUNING MECHANISM:

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screws made accessible when the push button knob is pulled off of its plunger. Stations are set up by unlocking the mechanism, tuning in the station, pushing the plunger (being careful not to detune the station), releasing the plunger, then securely locking the adjustment by holding the screwdriver lightly in the screwhead allowing the spring tension to hold the plunger against the screwdriver.

INTERMEDIATE FREQUENCY: 455 kHz

POWER SUPPLY:
All models available
105-125 v, 60 cycle A.C. 70 watts
105-125 v, 50 cycle A.C. 70 watts
105-125 v, 25 cycle A.C. 75 watts

POWER OUTPUT:
Type: Beam tube
Undistorted: 4 watt
Maximum: 6 watt

ALIGNMENT FREQUENCIES:
Oscillator Translator
Trimmer Trimmer Padder
1620 kHz 1400 kHz 600 kHz

FREQUENCY RANGE: 540-1620 kc

LOUDSPEAKER:
Type: Dynamic
Size: 10 inch
Field coil resistance: 950 ohms
Approx. field coil voltage drop: 90 V

OPERATING FEATURES:
Tone Control: Continuously variable
Automatic Volume Control
Push Button Tuning (6 Button)
Combined with Automatic Record Changer

CHASSIS FEATURES:
Number of IF stages: Two
Number condensers in gang: Two
Antenna: Built-in loop with provision for external antenna.
SEARS ROEBUCK & CO.

WIRING DIAGRAM FOR SILVERSTONE CHASSIS 101.634

MODEL 5581
Chassis 101.634

IF PEAK 455 KC

WAVE BAND

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>POSITION</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA CONNECTION</th>
<th>GENERATOR (IN ORDER SHOWN)</th>
<th>TRIMMER</th>
<th>APPROXIMATE FUNCTION MICROVOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mf</td>
<td>6K8G Grid</td>
<td>T2, T1</td>
<td>IF</td>
</tr>
<tr>
<td>AM</td>
<td>600 kc</td>
<td>455 kc</td>
<td>.00005 mf</td>
<td>Ant. Clip</td>
<td>C8</td>
<td>Wave Trap</td>
</tr>
<tr>
<td>AM</td>
<td>Fully open</td>
<td>1530 kc</td>
<td>0.00005 mf</td>
<td>Ant. Clip</td>
<td>C10</td>
<td>Converter</td>
</tr>
<tr>
<td>AM</td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>0.00005 mf</td>
<td>Ant. Clip</td>
<td>C1</td>
<td>Transistor 200</td>
</tr>
<tr>
<td>AM</td>
<td>900 kc open</td>
<td>600 kc</td>
<td>0.00005 mf</td>
<td>Ant. Clip</td>
<td>C11</td>
<td>Padder 100</td>
</tr>
<tr>
<td>FM</td>
<td>2.4 mc</td>
<td>3.4 mc</td>
<td>400 ohms</td>
<td>Ant. Clip</td>
<td>C12</td>
<td>Transistor 25</td>
</tr>
<tr>
<td>FM</td>
<td>15 mc open</td>
<td>15 mc</td>
<td>400 ohms</td>
<td>Ant. Clip</td>
<td>C15</td>
<td>Transistor 10</td>
</tr>
</tbody>
</table>

Output meter connection
Across loudspeaker voice coil
Output meter reading to indicate 500 milliwatts
1.1 volt
Approximate microvolt input to indicate 500 milliwatts output
Position of Tone Control
Treble
Position of Dial Pointer with variable fully closed
On mark to left of 500 kc calibration mark

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station on around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

SEPTEMBER 6, 1946

The adjustment for each push button is locked or unlocked by tightening or loosening the slotted screwhead made accessible when the push button knob is pulled off of its plunger.

Stations are set up by unlocking the mechanism, tuning the station, pushing in the plunger (being careful not to detune the station), releasing the plunger, then securely locking the adjustment.

INTERMEDIATE FREQUENCY ..... 455 kc

POWER SUPPLY: All models available
105-125 volt, 60 cycles AC: 115 watts
105-125 volt, 25 cycles AC: 115 watts
105-125 volt, 25 cycles AC: 120 watts

POWER OUTPUT:
Type: Pencelode
Undistorted: 4 watts
Maximum: 7 watts

FREQUENCY RANGES:
Band 1A: 540-1620 kc
Band 1B: 1450-2550 kc

ALIGNMENT FREQUENCIES:
Oscillator: 607 kc
Antenna-Transal: 607 kc

OPERATING FEATURES:
Automatic Volume Control
Push button Tuning (5 buttons)
Tone Control... Continuously Variable
Combined with Automatic Record Changer

LOUDSPEAKER:
Type: Dynamic
Size: 10 inch
Field coil resistance: 750 ohm
Approx. field coil voltage drop: 70

CHASSIS FEATURES:
Number IF stages: 2
Number condensers in gang: 2
Ubbelohde Approved
Built-in rotatable loop for Broadcast band and plate for Short Wave band (RADIONET Antenna System)
**SEARS ROEBUCK & CO.**

**Chassis 101,533**

**MODELS 5651 & 5652**

---

**IF PEAK 455 KC**

Position of Variable | Generator Frequency | Dummy Generator Frequency | Antenna Connection | Trimmer Adjusted (in Order Shown) | Trimmer Function | Approximate Frequency (Microcycles)
--- | --- | --- | --- | --- | --- | ---
Closed | 455 kc | .1 mfd. | 6K8G Grid | T2, T1 | IF | --
600 kc | 455 kc | .00005 mfd. | Ant. G11p | C4 | Wave Trap | --
Fully open | 1620 kc | .00005 mfd. | Ant. G11p | C6 | Oscillator | --
1400 kc | 1400 kc | .00005 mfd. | Ant. G11p | G1 | Translator | 125
600 kc (rock) | 600 kc | .00005 mfd. | Ant. G11p | C7 | Padder | 55

**IMPORTANT ALIGNMENT NOTES**

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

Output meter connection

Output meter reading to indicate 500 milliwatts across loudspeaker voice coil

Approximate microvolt input for 500 milliwatts output

Position of Volume Control

Position of Tone Control

Position of Dial Pointer with variable fully closed

**SEPTEMBER 17, 1940**

**INTERMEDIATE FREQUENCY**

**FREQUENCY RANGE:** 455 kc

**540-1620 kc**

**ALIGNMENT FREQUENCIES:**

Oscillator

Trimmer

Translated

Padder

**POWER SUPPLY:**

1400 kc

**POWER OUTPUT:**

Type

Undistorted

Maximum

8.5 watts

5 watts

**OPERATING FEATURES:**

Tone Control...Continuously variable

Automatic Volume Control

Combined with Automatic Record Changer

**LOUDSPEAKER:**

Type...Dynamic

Bite...10 inches

Field coil resistance...700 ohms

Approx. field coil voltage drop...65 v.

**CHASSIS FEATURES:**

Number of circuits...Two

Number of stages...Two

Antenna...Built-in loop with provision for external antenna
ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>POSITION</th>
<th>FREQUENCY</th>
<th>DUMMY</th>
<th>GENERATOR</th>
<th>GENERATOR</th>
<th>TRIMMERS ADJUSTED</th>
<th>TRIMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>1400 kc</td>
<td>.00005 mfd.</td>
<td>Ant. bank</td>
<td>Chassis base</td>
<td>C3, C4</td>
<td>R.F. Tank</td>
</tr>
<tr>
<td>Variable</td>
<td>600 kc</td>
<td>.00010 mfd.</td>
<td>Ant. bank</td>
<td>Chassis base</td>
<td>C5, C6</td>
<td>R.F. Tank</td>
</tr>
</tbody>
</table>

Output meter reading to indicate 50 milliwatts across loudspeaker voice coil
When properly set with the variable condenser closed, the pointer will point to the 50" calibration mark.

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 AVC action of the receiver ineffective.

Position of Volume Control: Fully clockwise
Position of Dial Pointer: with variable fully closed: See note

FREQUENCY RANGE: 540-1700 kc

POWER OUTPUT:
- Beam Tube: Undistorted: 1.0 watts
- Maximum: 2.5 watts

OPERATING FEATURES:
- Automatic Volume Control
- AC only: 60 cycles & 50 cycles

JUNE 18, 1940

TUBES AND FUNCTIONS:
- 12K7GT: RF
- 12SQ7GT: Detector-AVC-AP
- 35L6GT: Output
- 35Z4GT: Rectifier

POWER SUPPLY:
- All models available
- 105-125 volts, AC-only: 60 cycles, 45 watts

ALIGNMENT FREQUENCIES:
- Ant.: 1400 kc
- R.F.: 1400 kc

LOUD SPEAKER:
- Type: Permanent Magnet
- Size: 4 inch

CHASSIS FEATURES:
- Number TRF stages: two
ALIGNMENT PROCEDURE

Output meter conn. ... Across primary o.p. transf.  
Dummy art. in series with gen. o.p. ... 100 mufds.  
Conn. of gen. ground .................. B Minus Bus  
Gen. Modulation ................... App. 30% @ 400 cycles  
Pos. of vol. control ................ Fully clockwise  
Always keep o.p. from test oscillator at its lowest possible value. As sensitivity is increased by 
alignment, the gen. o.p. should be reduced correspondingly. **Short Oscillator section of variable  
condenser. **Connect gen. o.p. to a separate radiating 
loop and pickup 1500 KC signal on receiver.
ALIGNMENT PROCEDURE

Output meter connection: Address speaker wire coil.
Connection of generator ground: See chart below.
Duty antenna wire: See chart below.
Position of volume control: See chart below.
Position of Master Control switch: "Right" (Position No. 3.)

POSITION OF VOLUME CONTROL

1. Open 400 kΩ
2. Open 1760 kΩ
3. Closed

Output of generator: 1400 kc
Antenna lead: C2
Wave trap

ADJUSTMENT SCREW

Adjust for minimum response.

The alignment procedure should be repeated stage by stage in the original order for best results.

RECORDING ARM ADJUSTMENTS

The bottom of the recording arm should be exactly 1/4 inch from the surface of the record. This should be measured between the needle retaining screw on the end of the arm, the screw for noting the adjustment can be found when the arm is raised, on the small platform near the hinges. Turning the adjusting screw in the left raises the arm, turning to the right lowers it. In making an adjustment turn the screw only a small fraction of a turn at a time.

Make a cut of at least one turn to see whether or not the needle is starting the correct pressure on the record. This is correct when the grooves cut by the needle is of approximately the same width as the space between grooves. On top of the recording arm is a flat head screw. Turning this screw to the right increases the depth of cut, to the left decreases it. This adjustment is quite critical and the screw should be turned not more than 1/4 turn at a time.

The diagram below shows the location of these adjustments.

NEEDLE IN A NEEDLE RETAINING SCREW

NEEDLE PRESSURE

ADJUSTING SCREW

ARM HEIGHT

ADJUSTING SCREW

RECORDING ARM ADJUSTMENTS

In the recording positions (Positions 4, 5, and 6 of the Master Control switch) the volume from the speaker is reduced, this is done automatically by the switch for three reasons: 1. Some of the power from the output tube is used for operation of the recording arm. 2. A needle which has become dull through use or which has been otherwise damaged should be replaced.

The Master Control switch should always be turned to the No. 1 (Radio) position when listening to radio programs.
ALIGNMENT PROCEDURE

output meter connections: ................. Across primary output transformer
Connection of generator ground: ............. Chassis
Generator modulation: ...................... App. 30% @ 450 cycles
Position of volume control: .................. Fully clockwise

POSITION OF DIAL POINTER

- GENERATOR FREQUENCY  GENERATOR CONNECTION TRIMMERS ADJUSTED TRIMMER FUNCTION
- 1500 KC 455 KC 12A5 GT, Grid T6, T6 I.F.
- 1500 KC 455 KC 12A5 GT, Grid T3, T4 I.F.
- 1500 KC 1500 KC T6, T1 Osc., R.F.

IMPORTANT ALIGNMENT NOTES:

It is advisable to repeat the entire alignment procedure 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.

** Short oscillator section of variable condenser.

*** Connect generator output to a separate radiating loop and pickup 1500 KC signal on receiver.

LOCATION OF TUBES

Broadcast: .................. 540-1730 KC

POWER OUTPUT:
Type: .................. Beam Power
Undistorted: .................. 1.0
Maximum: .................. 1.5

POWER SUPPLY:
All models available
110-125 volts, 25-60 cycle AC or DC, 30 watts

ALIGNMENT FREQUENCIES:

- Oscill. Oscill.
- Broadcast 1500 KC Trimmer Fixed

LOUD SPEAKER:
Type: .................. Dynamic
Site: .................. 5
Field: .................. P.M.
**PARTS LIST**

**AUGUST 21, 1940**

<table>
<thead>
<tr>
<th>SCHEMATIC LOCATION</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>RETAIL SELLING PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10854417</td>
<td>Button, Snap (Dial mounting)</td>
<td>.02</td>
<td></td>
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<tr>
<td>109642165</td>
<td>Cable, Drive</td>
<td>.05</td>
<td></td>
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<tr>
<td>109643287</td>
<td>Cap, Grid</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Rr2</td>
<td>Control, Volume &amp; Switch</td>
<td>1.25</td>
<td></td>
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<tr>
<td>109641732</td>
<td>Cord, Line</td>
<td>.46</td>
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</tr>
<tr>
<td>F5</td>
<td>Clamp, Line Cord</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td>Coil, Oscillator</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Coil, Tracking</td>
<td>1.00</td>
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</tr>
<tr>
<td>C1</td>
<td>Condenser, Dual Trimmer</td>
<td>.20</td>
<td></td>
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<tr>
<td>C12</td>
<td>Condenser, Tuner (With pulley)</td>
<td>5.00</td>
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<td>C12a, b, c</td>
<td>Condenser, Electrolytic</td>
<td>1.60</td>
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<td>C10</td>
<td>Condenser, .06 mfd, 400 volt</td>
<td>.20</td>
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<tr>
<td>C9</td>
<td>Condenser, .001 mfd, 600 volt</td>
<td>.20</td>
<td></td>
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<tr>
<td>C8</td>
<td>Condenser, .1 mfd, 200 volt</td>
<td>.20</td>
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<tr>
<td>G61</td>
<td>Condenser, .01 mfd, 400 volt</td>
<td>.20</td>
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<tr>
<td>C6, 11</td>
<td>Condenser, .028 mfd, 600 volt</td>
<td>.20</td>
<td></td>
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<tr>
<td>C4</td>
<td>Condenser, .05 mfd, 200 volt</td>
<td>.20</td>
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<tr>
<td>G5</td>
<td>Condenser, 100 mfd, Mica</td>
<td>.25</td>
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</tr>
<tr>
<td>C5</td>
<td>Condenser, 250 mfd, Mica</td>
<td>.25</td>
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<tr>
<td>C5, 7</td>
<td>Dial Chart</td>
<td>.25</td>
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<tr>
<td>109408486</td>
<td>Grommet, Rubber (Dial bracket Mts.)</td>
<td>.05</td>
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<tr>
<td>109456244</td>
<td>Pulley, Idler</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>109416066</td>
<td>Pointer</td>
<td>.35</td>
<td></td>
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<tr>
<td>109641207</td>
<td>Retainer (&quot;C&quot; washer)</td>
<td>.01</td>
<td></td>
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<tr>
<td>H2</td>
<td>Resistor, 200 ohm 1/2 watt</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>H11</td>
<td>Resistor, 100 M ohm 1/2 watt</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>Resistor, 50 M ohm 1/2 watt</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>R4.7, 8, 10</td>
<td>Resistor, 200 M ohm 1/2 watt</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>R6</td>
<td>Resistor, 10 meg. 1/2 watt</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>H9</td>
<td>Resistor, 120 ohm flexohm 1 watt</td>
<td>.20</td>
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</tr>
<tr>
<td>H15</td>
<td>Resistor, 1000 ohm 1 watt</td>
<td>.25</td>
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<tr>
<td>109188440</td>
<td>Socket, Dual Dial Lamp</td>
<td>.20</td>
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<tr>
<td>109646468</td>
<td>Spring, Drive Cable</td>
<td>.10</td>
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<tr>
<td>109386428</td>
<td>Switch, Tone Control</td>
<td>.50</td>
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<tr>
<td>109386429</td>
<td>Switch, Radio/Phono</td>
<td>1.00</td>
<td></td>
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<tr>
<td>109186267</td>
<td>Socket, 1 prong (For phono pickup)</td>
<td>.10</td>
<td></td>
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<tr>
<td>109686442</td>
<td>Speaker, 6½ inch Dynamic</td>
<td>5.60</td>
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<tr>
<td>T4</td>
<td>Transformer, Power 60 cycle</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>Transformer, Power 50 cycle</td>
<td>5.15</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>Transformer, Power 25 cycle</td>
<td>7.50</td>
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</tr>
<tr>
<td>T1</td>
<td>Transformer, Output</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>T8</td>
<td>Transformer, 1st IP</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>T7</td>
<td>Transformer, End IP</td>
<td>2.75</td>
<td></td>
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<tr>
<td>10953461</td>
<td>Arm, Phono pickup (Complete) Crystal Cartridge only</td>
<td>5.00</td>
<td></td>
</tr>
</tbody>
</table>
MODEL 5771
Chassis 109-350

POWDER TUNING

Pull the button off its shaft, loosen the mechanism by turning the locking screw a turn or two counter-clockwise. Continue to press in firmly with the screwdriver holding the shaft in as far as it will go. Carefully turn the desired station while holding the shaft in. Continue to press in firmly with the screwdriver and lock the mechanism by turning the screw clockwise until it is tight. Tighten the screw just enough so that the adjustment is held firmly. If the screw is turned too tight the shaft may be forced out of line and make the buttons rub together.

ALIGNMENT PROCEDURE

See diagram at the bottom of this page for the location of all trimmers.

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN (Minimum capacity)</td>
<td>455 kHz</td>
<td>.1 MFD</td>
<td>Antenna section of variable</td>
</tr>
<tr>
<td>MINIMUM CAPACITY</td>
<td>1720 kHz</td>
<td>50 mmf</td>
<td>Antenna terminal</td>
</tr>
<tr>
<td>TUNE IN STEREO</td>
<td>1400 kHz</td>
<td>50 mmf</td>
<td>Antenna terminal</td>
</tr>
</tbody>
</table>

The alignment procedure should be repeated stage by stage, in the original order for greatest accuracy. Always keep the output from the generator at the lowest possible level so that the AVC action of the receiver is ineffective.

TUNES AND FUNCTIONS

- 12Q7GT: Oscillator-Transistor
- 1277GT: IF
- 12AX7GT: Detector-AVG-AP
- 12CG7GT: Phase Inverter
- 2-5616GT: Power Output
- 38Z6G: Rectifier

STATION SELECTOR TONE VOLUME CONTROL PHONO RADIO SWITCH
MANUAL CONTROL ON-OFF SWITCH

POWER TRANSFORMER

PHONO PICKUP SOCKET

PHONO MOTOR SOCKET

TO LOOP ANTENNA

POWER SUPPLY: 106-125 volts AC 65 watts

POWER OUTPUT:
- Type: Fixed "All Solid Tubes"
- Undistorted: 5.0 watts
- Maximum: 3.6 Watts

SPEAKER:
- Type: Dynamic
- Size: 6" inch
- Field Resistance: 500 Ohms

FREQUENCY RANGE: 540 to 1720 kc.

LOCATION OF PARTS UNDER CHASSIS

© John P. Rider Publisher
Either a broadcast signal of about 1500 kc or a test oscillator signal may be used.
If a broadcast signal is used, the antenna of the receiver should be extended as in a
normal installation. If a test oscillator signal is used, a wire should be connected
to the test oscillator output and run parallel to but isolated from the receiver's
antenna wire. The generator ground connection should be connected to ground.

Tune in the 1500 kc signal and adjust the trimmers for maximum loudspeaker
response. This can be done accurately if the volume control setting is reduced to
give a low volume level. The location of this trimmer is shown in the tube socket

FREQUENCY RANGE:
Broadcast..................535-1730 KC

POWER OUTPUT:
Type....................Beam Power
Undistorted................1.0 watt
Maximum..................1.5 watts

POWER SUPPLY:
All models available...........
105-125 Volts, 60-cycle A.C........50 watts

LOUD SPEAKER:
Type......................Dynamic
Size......................5" Field..................F.M.

ALIGNMENT FREQUENCY:
1500 KC

APRIL 30, 1940
MODEL 6491-A
Chassis 110.410

SEARS ROEBUCK & CO.

POWER SUPPLY:
All models available .................................. 105-125 volts, 60 cycle AC, 50 Watts
FREQUENCY RANGE:
Broadcast .................................................. 525 - 1700 KC

LOAD SPEAKER:
Type ........................................ Dynamic
Undistorted ........................................ 2.5
Maximum ........................................ 3.75

NOVEMBER 4, 1940

ADJUSTMENT PROCEDURE

Output may be connected through the volume control to the output transformer and generator ground.

Position of dial fuller ................................. 1500 kc

Generator modulation ................................. Fully clockwise

Connection of grid modulation ....................... To chassis

Across primary output transformer ................. 300 - 400 cycles

FREQUENCY 1500 kc ................................ 600 cycles

GRID MODULATION SENSIVITY ADJUSTED .... T3, T4, T5, T6

Short oscillator section of variable condenser near the receiver. However, no audible connection is made between the signal generator and the receiver.
FOR ALIGNMENT SEE INDEX

SUBJECT: ADDITION OF SUFFIX NUMBER -1 TO 101,621 CHASSIS:

Chassis identified as 101,621-1, -1A, -1B, or -1C use a different loop than the original 101,621 chassis. On these chassis, the antenna terminal connection is accessible by opening the hinged part of the back cover. Be sure to order the correct loop on replacement orders. There are also filament circuit differences as shown in the following Wiring Diagram.

AUGUST 21, 1940
MODEL 6751

FREQUENCY RANGE:
Broadcast ............ 550-1600 kc

POWER SUPPLY:
"A" Battery (6 volt) .... 1 - $5080
105-125 v., 60 cycle, AC, 20 watts
"A" Drain: 50 ma.

"B" Batteries .......... 3 - $5079
Service rating - 250 Hours
"B" Drain: 8.7 ma.

ALIGNMENT FREQUENCIES:
Oscillator ....... Antenna-Transl.
Trimmer .......... Trimmer
1400 kc ......... 1400 kc

LOUDSPEAKER:
Type ........ PM Dynamic
Size ........ .5 inch

INTERMEDIATE FREQUENCY

FREQUENCY RANGE:
Broadcast ............ 540-1630 kc

POWER SUPPLY:
"A" Battery (4-1/2 volt) ... 2 - $6085
Service rating - 250 Hours, with
thrift switch
105-125 volts AC or DC - 30 watts

"B" Batteries .......... 2 - $6090
Service rating - 250 Hours with
thrift switch

ALIGNMENT FREQUENCIES:
Oscillator ....... Antenna-Transl.
Trimmer .......... Trimmer
1400 kc ......... 1400 kc

LOUDSPEAKER:
Type ........ PM Dynamic
Size ........ .5 inch

MODELS 6521, 6561, 6661, 6961

LOCATIONS OF PARTS UNDER CHASSIS 101.623, -1
ADDITION OF SUFFIX NUMBER -1:

Chassis identified by the addition of suffix number -1 use a different loop. On these chassis, the antenna terminal connection is accessible by opening the hinged part of the back cover. Be sure to order the correct loop on replacement orders. There are also filament circuit differences as shown in the following Wiring Diagram.

JULY 30, 1940

WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.620-1
**PRELIMINARY:**

**MODEL 6551**
- Output meter connections across loudspeaker voice coil.
- Output meter reading to indicate 50 milliwatts, 0.30 volts.
- Generator ground lead connection to chassis through 0.1 mfd. cond.
- Connection of generator output lead, see chart below.
- Generator modulation 30%, 400 cycles.
- Position of Volume Control fully on.
- Position of pointer withvariable fully closed, on mark to left of 560 kc calibration mark.

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER ADJUSTMENTS (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>1A7GT Translator</td>
<td>T1, T2</td>
<td>IF</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>S1, S2</td>
<td>Oscillator</td>
</tr>
<tr>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0002 mfd.</td>
<td>Ant. Term.</td>
<td>G5, G6</td>
<td>Padder</td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

The chassis is removed from the case in order to align the IF but the loop antenna must be left connected.

The trimmer and paddle condensers are accessible by dropping the hinged part of the back cover.

The chassis must be in place in the cabinet during alignment. If battery supply is used, the batteries must be in place in the cabinet.

The variable should be rocked back and forth a degree or two while making the 600 kc 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 AVC of the receiver from interfering with accurate alignment.

Whenever batteries are replaced, C3 should be replaced using a weak signal at about 1400 kc.

**TUBES AND FUNCTIONS:**
- 1A7GT: Geo.-Transl.
- 1N50T: IF
- 1N50: Detector-AVC-AF
- 1A50: Output
- 5078: Rectifier

**FREQUENCY RANGE:**
- Broadcast: 540-1620 kc

**POWER SUPPLY:**
- "A" Battery (6 volt) 1 - $6080
  - Service rating - 250 Hours
  - 105-120v. AC or DC, 20 watts
- "B" Batteries: 3 - $6079
  - Service rating - 250 Hours

**ALIGNMENT FREQUENCIES:**
- Oscillator: Antenna-Trans.
- Trimmer: Trimmer
- Padder: 1400 kc 1400 kc 600 kc

**POWER OUTPUT:**
- Type: Pentode
  - Undistorted: 0.09 watts
  - Maximum: 0.3 watts

**OPERATING FEATURES:**
- Automatic Volume Control
- Battery or AC-DC Powered

**LOUDSPEAKER:**
- Type: FM Dynamic
- Size: 5 inch

**CHASSIS FEATURES:**
- Number IF stages: One
  - Self-contained loop antenna
  - Location of parts under chassis-101.620
  - Plug here for battery use, into electric outlet for 6 volt use
  - Battery cable

---

PAGE 12-38 SEARS
SEARS ROEBUCK & CO. MODEL 6551
Chassis 101.623-1
MODELS 6521, 6561, 6661, 6961
Chassis 101.621 (Early, Late)
ALIGNMENT PROCEDURE MODELS 6521, 6561, 6661, 6961
MODEL 6751
Alignment Notes

*** Short oscillator section of variable condenser.

*** Connect generator output to a separate radiating loop and pickup 1530 kc signal on receiver.

POSITION OF DIAL POINTER

| 455 kc | 1530 kc |

GENERATOR FREQUENCY

455 kc

1530 kc

TRIMMER ADJUSTED

75, 76

TRIMMER FUNCTION I.F.

POWER SUPPLY

12 v. "A" Battery

24 v. "B" Battery

"A" Drain 25 Amperes

"B" Drain 11.5 ma.
INTERMEDIATE FREQUENCY ... 455 kc

POWER SUPPLY:
"A" Battery (4-1/3-volt) ... 2 - 45085
Service rating - 200 Hours,
Drain: 50 ma.
10v-125 volts, AC-DC - 85 watts
"B" Batteries ... 2 - 45090
Service rating - 200 Hours,
Drain: 15.9 ma.

ALIGNMENT FREQUENCIES:
Oscillator Antenna-Transl.
Trimmer Trimmer Padder
1880 kc 1400 kc 800 kc

FREQUENCY RANGE:
Broadcast ... 540-1830 kc

LOUDSPEAKER:
Type .............. PM Dynamic
Size .............. 5 inch

POWER OUTPUT:
Type .............. Beam
Undistorted ........ 0.185 watts
Maximum ........... 0.3 watts

ALIGNMENT PROCEDURE

TRIMMER ADJUSTMENTS (IN ORDER SHOWN)

<table>
<thead>
<tr>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2, T1</td>
</tr>
<tr>
<td>IF</td>
</tr>
</tbody>
</table>

LOCATION OF PARTS UNDER CHASSIS-101.637

POS.

CLOSED

OPEN

1630 kc
1400 kc
800 kc (rest)

FREQUENCY

0.0002 mfd.
0.0002 mfd.
0.0003 mfd.

ANTENNA

ANT. TERM.
ANT. TERM.
ANT. TERM.

1A7GT TRANSLATOR GRID

©John F. Rider, Publisher
WIRING DIAGRAM FOR SILVERTONE CHASSIS 101.636

TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS GIVEN AT SOCKET PHONES ARE TO + B. AND ARE TAKEN WITH NO SIGNAL. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

- SEPTEMBER 30, 1940

INTERMEDIATE FREQUENCY...

465 Hz

FREQUENCY RANGE:

Broadcast 540-1680 kHz

POWER SUPPLY:

"A" Battery (6 volts) 1 - 6000 mAh

Service rating - 250 hours

"B" Battery 8.5 volts 4000 mAh

ALIGNMENT FREQUENCIES:

Oscillator Antenna-Trans.

Trimmer 1600 kHz

Padder 1600 kHz

POWER OUTPUT:

Type Plate 0.00 watts

Maximum 0.5 watts

LOUDSPEAKER:

Type FM Dynamic

Size 8 inch

OPERATING FEATURES:

Automatic Volume Control

Battery or 6-F-50 Povered

©John F. Rider, Publisher
Output meter connections....................Across primary output transformer
Connection of generator output lead................See Chart below
generator modulation..........................30%, 40C cycles
Position of volume control..................Fully on

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMER ADJUSTMENTS</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 KC</td>
<td>LANTG Grid</td>
<td>T3, T4, T5, T6</td>
<td>I.F.</td>
</tr>
<tr>
<td>1500 KC</td>
<td>1500 KC</td>
<td></td>
<td>*</td>
<td>Osc. R.F.</td>
</tr>
</tbody>
</table>

The complete assembly of loop mounting and chassis shelf should be removed as a unit in order to align the receiver.

The batteries should be in the proper position when aligning the receiver.

* Run a wire from the output terminal of the generator, having it come near the receiver. However, no electrical connection is made between the signal generator and the receiver.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate alignment.

NOVEMBER 12, 1940
NOVEMBER 4, 1940

INTERMEDIATE FREQUENCY . . . . . 455 kc

POWER SUPPLY . . . . . Battery, 105-125 Volts 50-60 cycles or DC 20 Volts.

TUBES AND FUNCTIONS:
1A76T . . . . . . . . . Oscillator-Translator
1N57T . . . . . . . . . First IF Amplifier
1N56T . . . . . . . . . Second IF Amplifier
1N55T . . . . . . . . . Detector-AVC-1st AP
3Q6GT . . . . . . . . . Output, Battery
117M76T . . . . . . . . Rectifier-Output, Power

TONE CONTROL STATION SELECTOR BAND SWITCH ON-OFF SWITCH VOLUME CONTROL

FREQUENCY RANGE . . .
. . . . . . 540-1820 kc
. . . . . . 3000-10,200 kc

POWER CORD

ALIGNMENT FREQUENCIES: 1400-600 kc
. . . . . . 17,000 kc
MODEL 7394 ALIGNMENT PROCEDURE

MARCH 28, 1940

OUTPUT VOLTAGE COMPENSATION

- An oscilloscope may be used to check the output voltage of the receiver at the position of the desired alignment frequency.

Output voltage adjustment

- A voltmeter or an electronic voltmeter may be used to measure the output voltage of the receiver at the position of the desired alignment frequency.

Alignment Procedure

1. Set the oscillator to the desired alignment frequency.
2. Adjust the trimmer potentiometers to obtain the desired output voltage.
3. Check the output voltage with a voltmeter or oscilloscope to ensure it is within specifications.
4. Repeat steps 2 and 3 until the desired output voltage is achieved.

Important Alignment Notes

- When adjusting the alignment, it is important to maintain a consistent output voltage to ensure accurate results.
- It is recommended to perform the alignment in a controlled environment with a stable power supply.
- Regular cleaning and maintenance of the receiver will help ensure reliable performance during alignment.

ELECTRICAL SPECIFICATIONS

- Voltage: 120-240 VAC
- Input Power: 150 W
- Output Power: 10 W
- Frequency Range: 60-20,000 Hz
- Bandwidth: 100 kHz
- Sensitivity: 0.1 μV
- Dynamic Range: 60 dB
- Signal-to-Noise Ratio: 50 dB
ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connected to... Across speaker voice coil
10 volt screen voltage to indicate 0.01 watt output
Approximate average sensitivity in millivolts for 0.01 watt output
See chart below
Dipping antenna... to be measured in series with generator output
See chart below
Connection of... to chassis
Connection of generator ground lead... to chassis
Dipmeter... 30%, 300 cycles
Position of Volume Control... to channel
Position of Tone Control... to channel

<table>
<thead>
<tr>
<th>Waveband</th>
<th>Position of Dip Meter</th>
<th>Generator Frequency</th>
<th>Dipper Antenna</th>
<th>Generator Connection</th>
<th>Trimmer Function</th>
<th>Trimmer Position</th>
<th>Approximate Microvolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Broadcast&quot; High End</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>IN55-1P Grid Cap</td>
<td>L11, L14</td>
<td>1st 1P</td>
<td>Trim.</td>
<td>4,000</td>
</tr>
<tr>
<td>&quot;Broadcast&quot; High End</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>LAV3-1P Grid Cap</td>
<td>L11, L14</td>
<td>1st 1P</td>
<td>Trim.</td>
<td>50</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>1,000 kc (12.5 kc)</td>
<td>1,000 kc</td>
<td>.0001 mfd.</td>
<td>Ant.</td>
<td>C11, C11</td>
<td>Oc.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>600 kc (33.1 kc)</td>
<td>600 kc</td>
<td>.0001 mfd.</td>
<td>Ant.</td>
<td>L6, C6</td>
<td>Oc.</td>
<td>6</td>
</tr>
<tr>
<td>&quot;Medium Wave&quot;</td>
<td>6.4 mc</td>
<td>6.4 mc</td>
<td>100 ohms</td>
<td>Ant.</td>
<td>C24, C24, C6</td>
<td>Oc.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Medium Wave&quot;</td>
<td>2.5 mc (12.5 kc)</td>
<td>2.5 mc</td>
<td>100 ohms</td>
<td>Ant.</td>
<td>L6, C6</td>
<td>Oc.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Short Wave&quot;</td>
<td>15.3 mc (12.5 kc)</td>
<td>15.3 mc</td>
<td>100 ohms</td>
<td>Ant.</td>
<td>L6, C6</td>
<td>Oc.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Short Wave&quot;</td>
<td>10.5 mc (12.5 kc)</td>
<td>10.5 mc</td>
<td>100 ohms</td>
<td>Ant.</td>
<td>C11, C11</td>
<td>Oc.</td>
<td>12</td>
</tr>
<tr>
<td>&quot;Broadcast&quot;</td>
<td>1,000 kc (12.5 kc)</td>
<td>1,000 kc</td>
<td>.0001 mfd.</td>
<td>Ant.</td>
<td>C11, C11</td>
<td>Oc.</td>
<td>12</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES

1. The minimum capacity peak if two peaks can be obtained.
2. The maximum capacity peak if two peaks can be obtained.
3. Where indicated by the word "Variety" the variable tuning condenser should be backed up to 500 cycles.
4. The adjustable section of the alignment should be removed from the generator of the lowest possible value in preventing the a-c. and d-c. of the set interfering with accurate alignment.
5. The adjustable section of the alignment should be removed from the generator of the lowest possible value in preventing the a-c. and d-c. of the set interfering with accurate alignment.
6. The adjustable section of the alignment should be removed from the generator of the lowest possible value in preventing the a-c. and d-c. of the set interfering with accurate alignment.
7. The adjustable section of the alignment should be removed from the generator of the lowest possible value in preventing the a-c. and d-c. of the set interfering with accurate alignment.
8. The adjustable section of the alignment should be removed from the generator of the lowest possible value in preventing the a-c. and d-c. of the set interfering with accurate alignment.

Calibration Scale
Natural Reproduction of Receiver with corresponding 0.166 Calibrator Scale

FIG. 4. CONDENSER AND INDICATOR DRIVE CORDS

FIG. 5. TUBE TRIMMER AND PARTS LOCATION—BOTTOM VIEW

FIG. 6. TUBE TRIMMER AND PARTS LOCATION—TOP VIEW
OCTOBER 7, 1940

IF PEAK 455 KC

FREQUENCY RANGE
Broadcast........535-1730

POWER SUPPLY:
All models available....

BATTERY AND 110-125 VOLTS AC-DC

LOUD SPEAKER:
Type...........Dynamic
Size.............5"
Field............P.M.

POWER OUTPUT
Type........ Beam Pentode
Undistorted........175 MW
Maximum...........350 MW

POSITION
Closed

GENERATOR
455 KC
FREQUENCY
1A7GT Grid

GENERATOR
CONNECTION
TE2,TE4

TRIMMER
ADJUSTMENTS
1500 KC

TRIMMER
FUNCTION
T2,T1
Osc. R.F.

The complete assembly of loop mounting and chassis shelf should be removed as a unit in order to align the receiver.

The batteries should be in the proper position when aligning the receiver.

* Run a wire from the output terminal of the generator, having it come near the receiver. However, no electrical connection is made between the signal generator and the receiver.

Always keep the output power from the generator at its lowest possible value to prevent the AVC of the receiver from interfering with accurate adjustment.
ALIGNMENT PROCEDURE

**Preliminary:**
- Output meter connections
- Output meter reading to indicate 1.0 watt output
- Apparent source impedance in microvolts for 1.0 watt output
- See chart below
- Output source impedance to be inserted in series with generator output
- See chart below
- Generator power output
- See chart below
- Output meter reading to indicate 1.0 watt output
- See chart below
- Apparent source impedance in microvolts for 1.0 watt output
- See chart below
- Output meter reading to indicate 1.0 watt output
- See chart below
- Generator power output
- See chart below
- Output meter reading to indicate 1.0 watt output
- Fully dc coupled
- Output meter reading to indicate 1.0 watt output
- Fully dc coupled

**Location of Parts and Alignment Adjustments on Top of Chassis**

<table>
<thead>
<tr>
<th>Wire-Band Switch Setup</th>
<th>Position of Dial Potentiometer</th>
<th>Generator Frequency</th>
<th>Dummy Load</th>
<th>Component Alignment (In order shown)</th>
<th>Trimmer</th>
<th>Approximate Microvolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>Low End</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>68K 1/2 W Grid</td>
<td>L12, L13</td>
<td>2nd IF Trunc.</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>Low End</td>
<td>455 kc</td>
<td>.001 mfd.</td>
<td>68K 1/2 W Grid</td>
<td>L16, L11</td>
<td>1st IF Trunc.</td>
</tr>
<tr>
<td>&quot;25 Meter&quot;</td>
<td>11.5 mC (1842)</td>
<td>11.5 kc</td>
<td>500 ohms</td>
<td>Ant. C11, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;25 Meter&quot;</td>
<td>11.5 mC (1842)</td>
<td>11.5 kc</td>
<td>500 ohms</td>
<td>Ant. C11, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;19-15 Meter&quot;</td>
<td>12.2 mC (1869)</td>
<td>12.2 kc</td>
<td>500 ohms</td>
<td>Ant. C11, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;11 Meter&quot;</td>
<td>9.5 mC (1355)</td>
<td>9.5 kc</td>
<td>500 ohms</td>
<td>Ant. C10, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;Medium Band&quot;</td>
<td>6.5 mC (1945)</td>
<td>6.5 kc</td>
<td>500 ohms</td>
<td>Ant. C10, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;Standard Band&quot;</td>
<td>2.0 mC (4578)</td>
<td>2.0 kc</td>
<td>500 ohms</td>
<td>Ant. C10, C12, C13</td>
<td>One, Ant.</td>
<td>7</td>
</tr>
<tr>
<td>&quot;Standard Band&quot;</td>
<td>600 Hz</td>
<td>600 kc</td>
<td>.0001 mfd.</td>
<td>Ant. L1</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Important Alignment Notes:**
- Use minimum capacity pots if non-pots can be obtained.
- When indicated by the word "Res," the variable tuning condensers should be backed off and fed a degree or two, while making this adjustment.
- Each step of the alignment should be repeated in its original order for greater accuracy. Always keep your output from this point to the lowest possible value to prevent the arc action of the set interfering with accurate alignment.
- Adjustment instructions are shown on the top and bottom part location views of chassis.
- Only the dummy panels indicated on the chart for any particular band should be used. Remove the dummy used for alignment in any other band.

**Calibration Scale**
- The corresponding position of the dual indicator for any setting of the calibration scales are as shown on the bottom calibration scale in the lower left corner of the diagram.
- The corresponding position of the dual indicator for any setting of the calibration scales are as shown on the bottom calibration scale in the lower left corner of the diagram.
- The corresponding position of the dual indicator for any setting of the calibration scales are as shown on the bottom calibration scale in the lower left corner of the diagram.

**Spreading-Band Alignment:** The most satisfactory method of aligning, or checking the spreading-band margins, is to use a constant deviation detector and variable generator output. The spreading-band margins are obtained by adjusting for maximum output on each band. See chart below.

1. Determine the exact dual settings of the spreading-band margins on each band. The exact dual settings should be made at a constant deviation detector and variable generator output. The spreading-band margins are obtained by adjusting for maximum output on each band. See chart below.

2. Use the harmonic of the standard spreader of a receiver or spectrum analyzer to measure the spreading-band margins, as shown in the diagram. The spreading-band margins may be obtained by adjusting for maximum output on each band. See chart below.

3. Use the harmonic of the standard spreader of a receiver or spectrum analyzer to measure the spreading-band margins, as shown in the diagram. The spreading-band margins may be obtained by adjusting for maximum output on each band. See chart below.
A. MAIN LEVER.—This lever is basically important in that it establishes the various individual mechanisms which control needle lever, tripping, record separation, etc. One adjustment is provided for each of the main and sub-lever positions. Note the centralizing of the trip point and the turntable base, and adjust rubber damper bracket (A) so that the roller clears the cone of the trip point by .005 inch.

B. FRICTION CLUTCH.—The position of the tone arm toward the center of the turntable is transmitted to the trip point “A” by the trip lever “L”. Proper adjustment of the friction clutch 4” from the button movement of the tone arm causes the turntable to revolve without any movement of the trip point “A”. When the tone arm is moved, the friction clutch is adjusted by means of screws “P” and if adjustment is too tight, the nut will release screws “P”, too loose, tripping will not occur at end of the record.

C. PICKUP LIFT CABLE.—The pickup lift cable is adjustable at the rear of the record player. To adjust, pull up the lever “L” so as to raise the needle to the top of the tone arm. This position is marked by a screw “P”. This adjustment is accomplished by turning the screw “P” until the needle point is raised to the top of the tone arm. The screw “P” is then tightened to secure the adjustment.

NOTE: Numbers refer to parts—letters refer to adjustments.

D. NEEDLE LANDING ON RECORD.—The distance of the needle from the center of the turntable varies from 0.005 inch to 0.010 inch. This variation is accomplished by the needle lever “L”.

E. TONE ARM SUPPORT BRACKET.—The tone arm support bracket is adjustable by means of screws “P”. The screws “P” are tightened to secure the adjustment.

F. TRIP PADDLE STOP PIN.—The stop pin “A” is adjustable by means of screws “P”. The screws “P” are tightened to secure the adjustment.

G. LIGHT INSTRUMENT.—The light instrument is adjustable by means of screws “P”. The screws “P” are tightened to secure the adjustment.

H. MISCELLANEOUS PARTS.—The miscellaneous parts are adjustable by means of screws “P”. The screws “P” are tightened to secure the adjustment.
DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned "on" and then attain normal brilliance — also on very loud signals the light may fluctuate.

Always use a 6.3 volt .15 amperes dial light.

OUTSIDE AERIAL

When the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of stations operating in the 540-1600 K.C. band may not be ample in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF THIS CHASSIS to obtain satisfactory results.
## Models IU-212UL, 214UL Alignment Procedure

For alignment procedure read tabulations from left to right. If more than one adjustment is required on any one band, make the adjustment marked first, next, third. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1800 kilocycle oscillator trimmer 600 K.C. pad, 455 K.C. R.F. trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 10 to 24 gauge 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.

### Follow This Procedure for Models IU-214UL, 214UL, For Trimmers See Page 12-14

<table>
<thead>
<tr>
<th>Band Range</th>
<th>Set Receiver Dial To</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>
<th>Refer to Parts Layout Diagram for Location of trimmers mentioned below</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF alignment set and band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 455 K.C.</td>
<td>6.2 Mfd. condenser</td>
<td>High side to blue Ant lead, Low side to frame of condenser through 600 mfd. condenser</td>
<td>Adjust each of the second IF transformer trimmers for maximum output. If desired, adjust each of the first IF transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>Band</td>
<td></td>
<td>2</td>
<td>Exact 1350 K.C.</td>
<td>None</td>
<td>Adjust 450 K.C. coil for maximum output.</td>
</tr>
<tr>
<td>3</td>
<td>Approx.</td>
<td>1400 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of condenser through 45 mfd. condenser</td>
<td>While seeking gain condenser adjust 1400 K.C. loop trimmer for maximum output.</td>
</tr>
<tr>
<td>4</td>
<td>Approx.</td>
<td>600 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of condenser through 45 mfd. condenser</td>
<td>While seeking gain condenser adjust 600 K.C. coil for maximum output.</td>
</tr>
<tr>
<td>R.F. to 18.3 M.C. Band</td>
<td>1</td>
<td>Exactly 18.3 M.C.</td>
<td>0.01 ohm carbon resistor</td>
<td>High side to Blue Ant Lead. Low side to frame of gain condenser through 0.01 ohm resistor.</td>
<td>Adjust 18.0 M.C. coil trimmer for maximum output. Note: If more than one peak is noted, back off trimmer a little at a time, then adjust up to correct point. If no peak is indicated, go back to trimmer and adjust up fully.</td>
</tr>
<tr>
<td>2</td>
<td>Approx.</td>
<td>15 M.C.</td>
<td>0.01 ohm</td>
<td>High side to Blue Ant Lead. Low side to frame of gain condenser through 0.01 ohm resistor.</td>
<td>While seeking gain condenser adjust 15 M.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>

---

**Note:** On some model parts 586, 579, and 686, are omitted. See wiring diagram.
ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. 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.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial No:</th>
<th>TEST OSCILLATOR</th>
<th>Refer to parts layout diagram for location of trimmers mentioned before:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment, use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Adjust test oscillator frequency to:</td>
<td>Use dummy antenna in series with output of test oscillator oscillating at:</td>
</tr>
<tr>
<td>1220 to 1400 K.C. Band</td>
<td>Exclusively 1730 K.C.</td>
<td>Exactly 1730 K.C.</td>
<td>0.3 Mfd. condenser</td>
</tr>
<tr>
<td>1220 to 400 K.C. Band</td>
<td>Approximately 1400 K.C.</td>
<td>Approximately 1400 K.C.</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Use small loop to couple test oscillator to receiver loop</td>
<td>Adjust 1730 K. C. oscillator trimmer for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

White marking brown condenser adjust 1400 K.C. loop trimmer for maximum output.

---

The diagram shows the layout of the internal components of a radio receiver, with various parts labeled such as '1730 K.C. OSC TRIMMER', '1400 K.C. ANT TRIMMER', '1450T', '1N54T', '1N95T', and 'CABINET BACK'. The diagram also includes a schematic showing the wiring connections and the placement of various components within the cabinet.
DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned "on" and then attain normal brilliance — also, on very loud signals the light may fluctuate.

Always use a 6.3 volt .15 ampere dial light.

VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

FOR OTHER DATA, SEE INDEX

OUTSIDE AERIAL

When the radio is used in shielded locations or when located a great distance from broadcast stations, the volume of stations operating in the 540-1600 K.C. band may not be ample in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF THIS CHASSIS to obtain satisfactory results.
ALIGNMENT PROCEDURE

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:
- 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.
- Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimmers mentioned below—mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exactly 1400 K. C.</td>
<td>Exactly 1400 K. C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop</td>
<td>Adjust 1400 K. C. Ant. and R. F. trimmers for maximum output.</td>
</tr>
</tbody>
</table>

Because of the directional effect of the loop aerial, it is important TO TUNE IN THE SIGNAL TO THE POINT OF LOUDEST VOLUME AND CLEARST TONE WITH THE TUNING KNOB AND THEN ROTATE THE RADIO TO THE POSITION OF GREATEST VOLUME.

THE DAYLIGHT RANGE OF THIS RADIO IS APPROXIMATELY 50 MILES—NIGHT TIME RANGE WILL BE GREATER THAN THIS. When the radio is used in a location a great distance from broadcast stations, or when the volume of the stations received is not ample, or when it is operated in boats, buildings, etc., constructed with a large amount of steel, IT MAY BE NECESSARY TO USE AN OUTSIDE AERIAL. The outside aerial should be 35 to 50 feet in length erected as high as possible and must be attached to the terminal post marked "A" mounted on the bottom of back cover.

WHEN USING AN EXTERNAL AERIAL A GROUND MUST BE ATTACHED TO OTHER POST ON BOTTOM OF BACK COVER MARKED "G." A wire attached to a metal stake driven two to four feet in moist ground or to a water pump or to a nail driven in a tree, or a bare wire thrown in any large body of water such as a stream, lake, brook, creek, well, etc., will provide a suitable ground.

NOTE:

VOLTAGE READINGS AT SOCKET PLUGS ARE TO BE SHOWN USING A 1000 OHM PER METER OR VOLTMETER.
WHERE NO READING IS GIVEN THE VOLTAGE IS ZERO OR TOO LOW TO READ.

1 1/2 V. BATT. DRAM—150 MA.
5 1/2 V. BATT. DRAM—5.5 MA.
WARNING—Do not attach a ground direct to the radio chassis—ANY EXTERNAL GROUND CONNECTION TO ANY METAL PART OF THE CHASSIS WILL CAUSE A SHORT AND POSSIBLE DAMAGE.

NOTE—NUMBERS SHOWN IN PARENTHESES ARE ILLUSTRATION NUMBERS.

VOLTAGE TABLE

IN IMPORTANT

35ZSTG RECT.

I.F. - 455 KC.

DIAL LIGHT

It is normal for the dial light to be dim for approximately 60 seconds after set is turned "on" and then attain normal brilliance—also, on very loud signals the light may fluctuate.

Always use a 6.3 volt .15 ampere dial light.
ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer, 600 K.C. padder and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. 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.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagrams for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 400 K.C.</td>
<td>600 K.C.</td>
<td>High side to grid of 12SL7 tube. Low side to frame of gang condenser through 0.1 MF condenser.</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>1730 to 560 K.C. Band</td>
<td>1</td>
<td>Exactly 1730 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of gang condenser through 0.1 MF condenser.</td>
<td>Adjust 1750 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Above 1400 K.C.</td>
<td>Above 1400 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of gang condenser through 0.1 MF condenser.</td>
<td>While rocking gang condenser adjust 1660 K.C. loop trimmer for maximum output.</td>
</tr>
<tr>
<td>3</td>
<td>Above 600 K.C.</td>
<td>Above 600 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop. Low side to frame of gang condenser through 0.1 MF condenser.</td>
<td>While rocking gang condenser adjust 600 K.C. oscillator padder for maximum output.</td>
</tr>
</tbody>
</table>
ALIGNMENT PROCEDURE

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 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 on 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.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimsers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. ALIGNMENT any band position</td>
<td>Any point where no interfering signal is received, EXACTLY 465 K.C.</td>
<td>.005 Mfd. condenser High side to grid cap of 6V6 tube. Do not remove cap</td>
<td>Adjust each of the second E.F. transformer trimsers for maximum output.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1725 500 K.C. BAND</td>
<td>1725 K.C.</td>
<td>.0025 Mfd. condenser Receiver antenna &quot;B&quot; post.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1460 K.C.</td>
<td>.0025 Mfd. condenser Receiver antenna &quot;A&quot; post.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 K.C.</td>
<td>.0025 Mfd. condenser Receiver antenna &quot;A&quot; post.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**MODEL 210B**

**TEST OSCILLATOR**

<table>
<thead>
<tr>
<th>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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF. Any point where no interfering signal is received</td>
<td>455 K. C.</td>
<td>.02 MFD. condenser</td>
<td>High side to grid terminal of 1A70 tube DO NOT REMOVE CAP.</td>
</tr>
</tbody>
</table>

- Adjust each of the second I. F. transformer trimmers for maximum output—then adjust each of the first I. F. trimmers for maximum output.

<table>
<thead>
<tr>
<th>Step</th>
<th>Frequency</th>
<th>Condenser</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exactly 1730 K. C.</td>
<td>.0025 MFD. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1400 K. C.</td>
<td>.0025 MFD. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td>3</td>
<td>Approx. 600 K. C.</td>
<td>.0025 MFD. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
</tbody>
</table>

**MODELS 207U, 207UE**

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ALIGNMENT PROCEDURE

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 tuning gang condenser until pointer on maximum capacity stop (180° 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 gang condenser frame through 0.1 MFD Condenser.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Set receiver dial to</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 for:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF</td>
<td>Any point where no interfering signal is received</td>
<td>455 K C</td>
<td>0.02 MFD condenser</td>
<td>High side to grid terminal of 12SA7 tube DO NOT REMOVE GAP</td>
<td>Adjust second I.F. transformer trimmer for maximum output. Then adjust each of the first I.F. trimmers for maximum output.</td>
</tr>
<tr>
<td>1</td>
<td>Exactly 1720 K C.</td>
<td>1720 K C</td>
<td>0.0025 MFD condenser</td>
<td>Post on metal back</td>
<td>While rocking gang condenser adjust 1400 K C antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1400 K C.</td>
<td>Approx. 1400 K C</td>
<td>0.0025 MFD condenser</td>
<td>Post on metal back</td>
<td></td>
</tr>
</tbody>
</table>

FOR ALIGNMENT SEE INDEX
VOLTAGE RATING

WHILE THE RADIO MAY BE OPERATED ON EITHER 50 OR 60 CYCLE 100-120 VOLT ALTERNATING CURRENT (A.C.), THE PHONOGRAPH MOTOR MUST BE USED ON THE FREQUENCY DESIGNATED ON THE PAPER LICENSE TAG, which will be found attached to the cabinet.

AERIAL

THE LOOP AERIAL SUPPLIED with the radio should provide

LOOP AERIALS ARE NOT SATISFACTORY FOR SHORT WAVE RECEPTION, AND BECAUSE OF THIS AN EXTERNAL AERIAL MUST BE ATTACHED TO THE RADIO WHEN TUNING FOR SHORT WAVE STATIONS. Also, if the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of the stations operating in the 560-1600 kilocycle band may not be ample, in which case it would be necessary to attach a 35 to 50 foot outdoor aerial to the receiver to obtain satisfactory results.

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "B" post.
### ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET, AND HAVE CHANGE OVER SWITCH KNOB IN “PLAY RADIO” POSITION.

When adjusting 1600 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect oscillator to loop. 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.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600 to 540 K.C. Band</td>
<td>1 2 3</td>
<td>Exactly 500 K.C. Exactly 1400 K.C. Exactly 600 K.C.</td>
<td>None None None</td>
<td>Use Small Loop to couple test oscillator to receiver loop Use Small Loop to couple test oscillator to receiver loop Use Small Loop to couple test oscillator to receiver loop</td>
</tr>
<tr>
<td>5.7 to 18.3 M.C. Band</td>
<td>1 2</td>
<td>Exactly 18.3 M.C. Exactly 13.3 M.C.</td>
<td>400 Ohm carbon resistor 100 Ohm</td>
<td>High side to grid of 5657 tube</td>
</tr>
</tbody>
</table>

Add 1600 K.C. oscillator trimmer for maximum output,

While rocking gang condenser adjust 1400 K.C. Pnp trimmer for maximum output,

While rocking gang condenser adjust 600 K.C. oscillator padder for maximum output.

Add 13.3 M.C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noted, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one to use—is found.

While rocking gang condenser adjust 13 M.C. antenna trimmer for maximum output.
RECORDING INSTRUCTIONS

Properly recorded recordings will supply many satisfactory volumes which will enable you to test the model commercial phonograph tone cabinets in your home. Remember there is only one right way to make recordings—three best results of all read all of the following instructions.

USE TUNING EYE IN DETERMINING CORRECT VOLUME LEVEL FOR RECORDING

As it is so important that neither too little nor too much volume be recorded, the following instructions are designed to help you avoid this error. The "TUNING EYE" can be used as a guide in selecting proper volume level for recordings.

1. PROPER TUNING LEVEL-BEFORE STARTING TO CUT DISC, ALWAYS ADJUST THE VOLUME CONTROL OR THE "MICROPHONE" KNOBS SO THAT THE TWO ENDS OF THE "TUNING EYE" APPEAR APPROXIMATELY TOUCH ON SIGNAL PEAKS. Do not set volume controls to the middle of the range for recording—never adjust controls to compensate for a dull sound when recording orchestras, other instruments in the recording, other instruments in the recording, other instruments in the recording, other instruments in the recording. Your record will have much more realism if the volume controls are set to the left and right of the "TUNING EYE".

2. TO RECORD RADIO PROGRAMS

FIRST ROTATE "TONE-ON-OFF" SWITCH KNOWN TO THE "MICROPHONE" MAXIMUM VOLUME POSITION AND "MICROPHONE" KNOBS TO THE "MICROPHONE" VOLUME CONTROL. "MICROPHONE" KNOBS TO MAXIMUM LEFT HAND VOLUME;

a. Place a blank disc on turntable to that small locating pin on turntable projects through small hole in black disc.
b. Place "CHANGE OVER SWITCH" knob to maximum left hand position—small indicator needle will point to "PLAY RADIO" printed on dial.
c. Carefully turn in the record program which is to be recorded.
d. Rotate "CHANGE OVER SWITCH" knob to the next to maximum right hand position—position used for final cut. The turntable will now start to revolve.

3. TO CUT DISC—Place "CHANGE OVER SWITCH" knob to maximum right hand position—"MIKROPHONE" KNOB TO "MICROPHONE" VOLUME CONTROL, "MICROPHONE" KNOB TO MAXIMUM LEFT HAND VOLUME; "MICROPHONE" KNOB TO "MICROPHONE" VOLUME CONTROL.

a. Place a blank disc on turntable to that small locating pin on turntable projects through small hole in black disc.
b. Place "CHANGE OVER SWITCH" knob to maximum left hand position—small indicator needle will point to "PLAY RADIO" printed on dial.
c. Carefully turn in the record program which is to be recorded.
d. Rotate "CHANGE OVER SWITCH" knob to the next to maximum right hand position—position used for final cut. The turntable will now start to revolve.

TO PLAY BACK RECORDS

Use only felt-tipped pen for marking your records—never use sharp metal needles. A needle that has been used to play a regular phonograph record cannot be used again.

CUTTING ARM AND HEAD ADJUSTMENT

The cutting arm and head are properly adjusted when the head of the cutting arm is exactly the same distance from the center of the disc as it is at the edge of the disc. The cutting arm head is properly adjusted when the needle head is exactly the same distance from the center of the disc as it is at the edge of the disc.

TO CUT DISC—Place "CHANGE OVER SWITCH" knob to maximum right hand position—"MICROPHONE" KNOB TO "MICROPHONE" VOLUME CONTROL, "MICROPHONE" KNOB TO MAXIMUM LEFT HAND VOLUME; "MICROPHONE" KNOB TO "MICROPHONE" VOLUME CONTROL.

a. Place a blank disc on turntable to that small locating pin on turntable projects through small hole in black disc.
b. Place "CHANGE OVER SWITCH" knob to maximum left hand position—small indicator needle will point to "PLAY RADIO" printed on dial.
c. Carefully turn in the record program which is to be recorded.
d. Rotate "CHANGE OVER SWITCH" knob to the next to maximum right hand position—position used for final cut. The turntable will now start to revolve.

MICROPHONE RECORDING

Voice or music that can be picked up by the microphone can be recorded. Remember when recording all excessive noises picked up by the microphone will be recorded on the disc.

Any conversation or interview—dialogue, news, description, data, title, etc. can be recorded as long as the microphone is in a recording position and the sound is not too loud.

TO MAKE A RECORD FROM ANOTHER RECORD

Several models of these series are equipped with automatic record changer turntable.

1. Place blank disc on turntable table.
2. Place the record which you wish to duplicate or automatic record changer turntable.
3. Continue cutting arm and place needle on black disc 1/2 of an inch from outer edge.
4. The recording and automatic record changer turn tables must start to revolve at the same time. Do this by simultaneously turn record changer and automatic record changer to "ON" position—then turn "MICROPHONE" switch to "OFF" position.
5. Adjust "VOLUME CONTROL" knob until the two ends of the "TUNING EYE" is at the same level approximately TOUCH ON SIGNAL PEAKS.

A record from another record cannot be made with the type recorder equipped with an automatic record changer turntable. Automatic combination radio and phonograph is available. To do this:

1. Place a black disc on turntable table.
2. Lift cutting head arm and place needle 1/2 of an inch from outer edge of black disc.
3. Place the record you wish to duplicate on the combination radio-phonograph turntable.
4. Place the combination radio-phonograph pickup needle outside groove of record to be duplicated.
5. Rotate "CHANGE OVER SWITCH" to second position from the left—indicated needle will point to "RECORD MICROPHONE" printed on the dial.
6. Microphone approximately one-half foot from other radio speaker.
7. Rotate "VOLUME CONTROL" knob to minimum position, and combination radio-phonograph volume control to approximately half volume position, and combination radio-phonograph volume control to approximately half volume position, and combination radio-phonograph volume control to approximately half volume position.
8. Adjust "MICROPHONE" control until the two ends of the "TUNING EYE" is at the same level approximately TOUCH ON SIGNAL PEAKS.
9. Turn recorder "MICROPHONE" switch and "MICROPHONE" switch of combination radio to "ON" position—combination radio-phonograph turn tables start to revolve at the same time.

TO PLAY BACK RECORDS

To play back recordings or records just:

a. Rotate "CHANGE OVER SWITCH" to the next to maximum right hand position—small indicator needle will point to "PLAY PHONO" printed on the dial.

b. Place record on turntable table.

c. Insert needle in pickup arm and place needle in the outside groove of record as near center as possible.

d. Turn "MICROPHONE" knob to "ON" position.

e. Adjust "VOLUME" knob for desired volume.

USING MICROPHONE AND RADIO AS PUBLIC ADDRESS SYSTEM

The radio and microphone may be used as a public address system by:

1. Turn the "CHANGE OVER SWITCH" knob to the maximum right hand position—needle will point to "PUBLIC ADDRESS" printed on the dial.

2. Speak into the microphone in a normal tone of voice and place microphone near ear or mouth and pick up voice, music, or other subject to be amplified.

3. Adjust "MICROPHONE" control knob for desired volume level.

4. If ACOUSTICAL FEEDBACK BETWEEN LOUD SPEAKER AND MICROPHONE IS HEARD, THE VOICE-RECORDING SOUND IS ENCOURAGED, place microphone as far from the microphone as possible—then repeat steps 2 and 3 as possible.

5. CAUTION—MICROPHONE VOLUME CONTROL KNJ MUST NEVER BE TURNED TO MINIMUM VOLUME LEFT HAND POSITION. MICROPHONE VOLUME CONTROL IS NOT BEING USED. FAILURE TO DO THIS WILL RESULT IN A HOWLING SOUND AND THE MICROPHONE WILL PICK UP EXTRA NOISES, UNWANTED VIBRATIONS, ETC., ALL OF WHICH WILL BE RECORDED ON THE DISC, COMING FROM THE ANOTHER SOURCE.

WHEN RECORDING ALWAYS HAVE THE "TUNE CONTROL" IN THE MAXIMUM RIGHT HAND "BRILING" POSITION.
ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. 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 near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

<table>
<thead>
<tr>
<th>Phase band switch for operation at:</th>
<th>Set receiver dial to:</th>
<th>TEST OSCILLATOR</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF. alignment use</td>
<td>Any point where no interfering signal is received.</td>
<td>1400 K.C.</td>
<td>6.3 Mfd. condenser.</td>
</tr>
<tr>
<td>Band</td>
<td>Frequency</td>
<td>TRIMMER</td>
<td>Attach output of test oscillator to:</td>
</tr>
<tr>
<td>1720 to 240 K.C.</td>
<td>Exactly 1720 K.C.</td>
<td>None</td>
<td>High side in grid cap of 1AT7. Do not remove cap.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Adjust 1400 K.C. oscillator trimmer for maximum output.</td>
</tr>
</tbody>
</table>

Refer to parts layout diagram for location of trimmers mentioned below:
**VOLTAGE RATING**

THIS RADIO IS DESIGNED FOR USE ON 110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT—unless the marking on the white paper license notice which will be found attached either to the bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

BE SURE THAT THE CURRENT RATING GIVEN ON THE LICENSE TAG IS THE SAME AS THE HOUSE CURRENT SUPPLY.

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**OUTSIDE AERIAL**

When the radio is used in shielded areas or when located a great distance from broadcast stations, the volume of stations operating in the 540-1600 K.C. band may not be ample in which case it would be necessary to ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE "A" TERMINAL ON THE REAR OF THIS CHASSIS to obtain satisfactory results.
ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1600 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to loop. 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.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Select receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator trimmer as:</th>
<th>Attatch output of test oscillator as:</th>
<th>Refer to parts layout diagram for location of trimmres mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment use any band position.</td>
<td>Any point where no interfering signal is received</td>
<td>1600 K.C.</td>
<td>S.S. Mfd. condenser</td>
<td>High side to grid of 160A7 tube, Low side to frame of gang condenser through 50 Mfd. condenser</td>
<td>Adjust each of the second i.p. transformer trimmers for maximum output; then adjust each of the first i.p. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>1600 to 540 K.C. Band</td>
<td>Exactly 1600 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop</td>
<td>Adjust 1600 K. C. oscillator trimmer for maximum output.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop</td>
<td>While making gang condenser adjust 1400 K. C. loop trimmer for maximum output.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>500 K.C.</td>
<td>None</td>
<td>Use small loop to couple test oscillator to receiver loop</td>
<td>While making gang condenser adjust 500 K. C. oscillator trimmer for maximum output.</td>
<td></td>
</tr>
<tr>
<td>5.7 to 15.2 M.C. Band</td>
<td>Exactly 18.3 M.C.</td>
<td>None</td>
<td>400 Ohm carbon resistor</td>
<td>High side to &quot;A&quot; Post. Lead. Low side to frame of gang condenser.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Approx. 15 M.C.</td>
<td>None</td>
<td>High side to &quot;A&quot; Post. Lead. Low side to frame of gang condenser.</td>
<td>Adjust 18.3 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 the second peak—which is the correct one to use—is located.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Approx. 15 M.C.</td>
<td>None</td>
<td>400 Ohm</td>
<td>While making gang condenser adjust 15 M. C. oscillator trimmer for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>
ELIMINATION OF INTERFERENCE CAUSED BY A 32-VOLT LIGHT PLANT

GENERAL

Two kinds of static-like noise may be heard when you operate your 32-volt radio at the same time the generating plant is charging the plant batteries. Static-like noise, due to the action of the brushes on the commutator, may reach the set through the supply lines. Such noise can generally be eliminated by the use of 5 Mfd. 200-volt condensers, as shown in Figs. 1 and 3.

Static-like noise, due to the operation of the high tension circuit, may radiate through the air to the antennas of the set. Radiations have been found to cause a hum noise in extreme cases. Proper placement of the antennas, along with the use of a spark plug suppressor and correct shielding will entirely eliminate this type of noise.

When eliminating these electrical disturbances always apply the remedies given in the order in which they appear.

USUAL INSTALLATIONS

Install spark plug suppressor on the spark plug and connect the high tension lead to the suppressor, as shown in Figure 3. For four-cylinder plants, use four spark plug suppressors, one attached to each spark plug.

CAUTION: Disconnect batteries from generator before attaching suppressor equipment.

Fig. 1

Connect one 5 Mfd. 200-volt condenser between one positive brush and the generator frame and one condenser between one negative brush and the generator frame as shown in Figure 1.

THEORY OF ACTION

Connect one 5 Mfd. 200-volt condenser between one positive brush and the generator frame and one condenser between one negative brush and the generator frame as shown in Figure 1. The condensers act as filters to reduce the high frequency noise components, thereby minimizing the interference to the radio receiver.

IGNITION NOISE ON BATTERY LEADS

Sometimes the ignition interference will travel up the battery leads. This condition can be corrected by attaching a 5 Mfd. condenser between the positive terminal at the top of the control box and the frame of the box. (Be sure the frame of the box is well grounded to the generator frame.) Attach a 5 Mfd. condenser between the negative terminal at the top of the control box and the control box frame.

GROUNDING

Some cases may require a thorough ground of the system. This may be accomplished by running a No. 12 B. & S. gauge wire from the generator frame to a good ground. Conduct and metal switch boxes should also be grounded.

If it is necessary to ground one side of the supply lines, first ground these temporarily, one at a time through a 32-volt lamp. One side of the line will light the lamp, the other will not. The side which WILL NOT light the lamp should be grounded.

DO NOT apply this remedy listed under "Extreme Cases," before trying the one listed under "Usual Cases."

IF RECEIVER SHOULD FAIL TO OPERATE, CHECK FOR:

1. Defective tubes.
2. Tubes not properly inserted in the sockets.
3. Grid caps not connected to grid terminal of tubes.
5. Supply cord plug reversed.
6. Defective fuse.

MODEL 221

PUSH BUTTON TUNING

Six-station operation in the L-165, K-290, B-990, B-155, B-200, V-430, L-328, W-328, and L-430 automatic push buttons tuned by properly setting the 5 terminal of trimmer tuning located throughout. Push button excitation on front of cabinet.

As the push buttons are not preset at the factory for any definite station, be sure to test them:

(a) To be sure that the set is operating at the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(b) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(c) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(d) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(e) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(f) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(g) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(h) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.

(i) To be sure that the set is tuned to the station which is to be tuned, connect a 300-ohm, 1-watt resistor across the speaker or the line to be tuned. The set should then be tuned to the station indicated.
AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G." When a straight aerial is used this wire should be left in this position and the aerial lead-in connected to the post marked "A."

When a doublet type antenna is used, remove the small piece of wire connecting "D" and "F" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON 110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT—unless the marking on the white paper license notice which will be found attached either to bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

BE SURE THAT THE CURRENT RATING GIVEN ON THE LICENSE TAG IS THE SAME AS THE HOUSE CURRENT SUPPLY.
ALIGNMENT PROCEDURE

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. IMPORTANT: BEFORE ALIGNING, PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

When adjusting 1600 kilocycle oscillator trimmer, 500 K.O. Padder and 1600 kilocycle antenna trimmer, do not connect test oscillator to loop. Couple test oscillator to receiver loop by: (a) Make a loop consisting of five to ten turns of No. 24 to 28 gauge 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 N RITHER MOVES WHILE ALIGNING.

### TEST OSCILLATOR

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. alignment use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 1600 K.C.</td>
<td>0.3 Mfd condenser</td>
<td>High side to grid cap of 880T tube. Do not remove cap.</td>
<td>Adjust each of the 600 X. C. transformer trimmers for maximum output.—then adjust each of the 600 X. C. transformer trimmers for maximum output.</td>
</tr>
<tr>
<td>3.5 to 7.5 M.C. Band</td>
<td>3.5 to 7.5 M.C. Band</td>
<td>Approximately 600 k.C.</td>
<td>Approximately 600 k.C.</td>
<td>None</td>
<td>Use Small Loop to couple test oscillator to receiver loop.</td>
</tr>
<tr>
<td>2.5 to 7.5 M.C. Band</td>
<td>2.5 to 7.5 M.C. Band</td>
<td>Exactly 7.5 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
<td>While rocking gang condenser adjust 1600 K.C. loop antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>2.5 to 7.5 M.C. Band</td>
<td>2.5 to 7.5 M.C. Band</td>
<td>Approximately 7.5 M.C.</td>
<td>Approximately 7.5 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
</tr>
<tr>
<td>7.5 to 28 M.C. Band</td>
<td>7.5 to 28 M.C. Band</td>
<td>Exactly 24 M.C.</td>
<td>600 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
<td>Adjust 24 M. C. oscillator trimmer for maximum output—be sure to use proper peak. If more than one peak is noticed, have off trimmer to maximum capacity, then screw down trimmer (402 points) until the second peak—which is the proper one to use—is tuned in.</td>
</tr>
<tr>
<td>7.5 to 28 M.C. Band</td>
<td>7.5 to 28 M.C. Band</td>
<td>Approximately 28 M.C.</td>
<td>Approximately 28 M.C.</td>
<td>600 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
</tr>
<tr>
<td>7.5 to 28 M.C. Band</td>
<td>7.5 to 28 M.C. Band</td>
<td>Approximately 28 M.C.</td>
<td>Approximately 28 M.C.</td>
<td>600 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
</tr>
<tr>
<td>7.5 to 28 M.C. Band</td>
<td>7.5 to 28 M.C. Band</td>
<td>Approximately 28 M.C.</td>
<td>Approximately 28 M.C.</td>
<td>600 Ohm carbon resistor</td>
<td>Receiver antenna “A” post</td>
</tr>
</tbody>
</table>

### Diagram

The diagram shows the layout of the antenna and oscillator trimmers. The specific trimmer locations and connections are indicated in the table above.
AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G."

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.

VOLTAGE TABLE

VOLTAGE RATING

Always use a 6-8 volt .2 ampere dial light.

THIS RECEIVER MAY BE OPERATED ON 100-120 VOLT DIRECT CURRENT (D.C.) and 100-120 volts, 50-60 cycle alternating current (A.C.) by using a No. 11222 line voltage regulator tube in regulator socket on top of radio chassis.

FOR 210-240 VOLT D.C. or 210-240 VOLT 50-60 CYCLE A.C. OPERATION, a No. 11223 line voltage regulator tube must be used in the regulator socket.
ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given; otherwise, the results will be unsatisfactory. If more than one adjustment is required on any one band, make the adjustments marked (1) first, (2) second, etc.

Before starting alignment:

(a) Have meter and all other receiving equipment disconnected and all connecting leads disconnected. Set polarity switch to normal and all other switches to normal position.
(b) Have ground lead of test oscillator attached to chassis.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Adjust coil</th>
<th>Adjust M.C.</th>
<th>Adjust K.C.</th>
<th>Adjust M.C.</th>
<th>Adjust M.C.</th>
<th>Adjust K.C.</th>
<th>Adjust M.C.</th>
<th>Adjust K.C.</th>
<th>Adjust M.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 Micron</td>
<td>1 Micron</td>
<td>1 Micron</td>
<td>1 Micron</td>
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<td>8 Micron</td>
<td>8 Micron</td>
</tr>
</tbody>
</table>

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AERIAL

THERE ARE THREE POSTS marked “A,” “D,” and “G” on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post “D” and “G.”

When a doublet type antenna is used, remove the small piece of wire connecting “G” and “D” posts together and attach one of the doublet antenna leads to “A” post and the other to “D” post.

VOLTAGE RATING

THIS RADIO IS DESIGNED FOR USE ON 110-120 VOLTS 50-60 CYCLES ALTERNATING CURRENT—unless the marking on the white paper license notice which will be found attached either to bottom or inside the cabinet is marked differently, in which case the radio must only be used on the type of current shown on this notice.

BE SURE THAT THE CURRENT RATING GIVEN ON THE LICENSE TAG IS THE SAME AS THE HOUSE CURRENT SUPPLY.
ALIGNMENT PROCEDURE

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 plate tank circuit is 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.

<table>
<thead>
<tr>
<th>Places band switch for operation on:</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If alignment using any band position.</td>
<td>Any point where no interfering signal is received.</td>
<td>Exactly 1270 K.C.</td>
<td>49 M.U. condenser</td>
<td>High side to grid 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>5. 554 to 7.3 M.C. Band</td>
<td>Exactly 1270 K.C.</td>
<td>490 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post.</td>
<td>Adjust 7.3 M.C. oscillator trimmer for maximum output.</td>
<td></td>
</tr>
<tr>
<td>6. Approximately 6 M.C.</td>
<td>Approximately 6 M.C.</td>
<td>490 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post.</td>
<td>While rocking gang condenser adjust 6 M.C. antenna trimmer for maximum output.</td>
<td></td>
</tr>
<tr>
<td>7. 7.5 to 18 M.C. Band</td>
<td>Exactly 24 M.C.</td>
<td>4900 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post.</td>
<td>Adjust 24 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 the second peak—which is the proper one—to be picked up.</td>
<td></td>
</tr>
<tr>
<td>8. Approximately 20 M.C.</td>
<td>Approximately 20 M.C.</td>
<td>4900 Ohm carbon resistor</td>
<td>Receiver antenna &quot;A&quot; post.</td>
<td>While rocking gang condenser adjust 20 M.C. antenna trimmer for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>
THE RECEPTACLE ON BACK of chassis is connected to the storage battery operating the radio. A single six volt 15 or 25 watt light may be run on the battery by inserting male plug on end of light into receptacle. Light cord wire must not be smaller than No. 18 nor longer than six feet, and only one six volt light should be used, otherwise the light will be dim.

AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory a flexible wire is connected to post "D" and "G."

When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna lead-ins to "A" post and the other to "D" post.
NEVER ATTEMPT TO OPERATE THE RECEIVER WITH A 12 VOLT STORAGE BATTERY OR ON 25 CYCLE CURRENT OR ON DIRECT CURRENT (D.C.) OR WITH THE METAL TIPPED LEAD IN THE WRONG TERMINAL SOCKET BECAUSE THE SET WILL BE DAMAGED.

VOLTAGE TABLE

FOR AC OPERATION obtain from the Electric Supply Company the voltage and current rating of the local Electric Service and — — remove top cover from power unit and insert metal tipped lead into proper terminal socket that will be found underneath top cover of power unit.

Place voltage selector switch knob in "115—230" position and plug set power cord plug into house lighting outlet.

WITH 6 VOLT STORAGE BATTERY:

Place voltage selector switch on back of the "B" unit and accessible from the rear of the chassis to position marked 6 V.
The power plug attached to the end of the power cord must be inserted correctly in the 12 VOLT POWER SUPPLY OUTLET OR RECEPTACLE, OTHERWISE THE SET WILL NOT OPERATE. If after inserting the plug and turning the receiver on, the set does not operate after approximately two minutes, remove this plug and turn it half-way around and reinsert it in the power receptacle. If the set still does not operate, examine the fuse on back of chassis.

FUSE: A 4 ampere fuse is located on the back of the chassis adjacent to the speaker plug and protects the receiver from damage should a defect occur in the set or if it is connected to the improper power supply.

AERIAL

THERE ARE THREE POSTS marked "A," "D," and "G" on the rear of the chassis. When the receiver is shipped from the factory, a flexible wire is connected to post "D" and "G." When a doublet type antenna is used, remove the small piece of wire connecting "G" and "D" posts together and attach one of the doublet antenna leads-ins to "A" post and the other to "D" post.

WARNING—Do not attach a ground direct to the radio chassis—ANY EXTERNAL GROUND CONNECTION TO ANY METAL PART OF THE CHASSIS MAY CAUSE A SHORT AND POS-
**Alignment Procedure Models 236, 237, 239**

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.

(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 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.

<table>
<thead>
<tr>
<th>Plate band switch for operation at:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator, consisting of:</th>
<th>Attack output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. F. alignment use any band position.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 1600 K.C.</td>
<td>640 M.C. condenser</td>
<td>2A* post</td>
<td>Adjust 1600 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Exactly 800 K.C.</td>
<td>320 M.C. condenser</td>
<td>2A* post</td>
<td>While rocking gang condenser adjust 1600 K.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>2.5 to 1.6 M.C. Band</td>
<td>1</td>
<td>Exactly 7.5 M.C.</td>
<td>406 Ohm carbon resistor</td>
<td>3A* post</td>
<td>Adjust 7.5 M.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 6.3 M.C.</td>
<td>406 Ohm carbon resistor</td>
<td>3A* post</td>
<td>While rocking gang condenser adjust 6.3 M.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>7.5 to 24 M.C. Band</td>
<td>1</td>
<td>Exactly 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>2A* post</td>
<td>Adjust 5.0 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 the second peak—which is the proper one to use—is tuned in.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 24 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>2A* post</td>
<td>While rocking gang condenser adjust 24 M.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>
'AB' BATTERY PACK
CONTAINS NECESSARY 1-1/2V.
DRY 'A' AND 90V.'B' BATTERIES
will provide approximately
750 to 1,000 hours of service

ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE
BLUE LEAD COMING OUT THE REAR OF CHASSIS.

GROUND
Connect the black lead coming out the rear of chassis to a wire
attached to a metal stake driven two to four feet in moist ground, or
to a cold water pipe.
ALIGNMENT PROCEDURE MODELS 240, 241, 242

Before starting alignment:
Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop 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 to last line move to correct position.

Use an accurately calibrated test oscillator with some type of output measuring device.
Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Use these settings to operate with output of test oscillator mentioned at.</th>
<th>Attack output of test oscillator to:</th>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 K.C.</td>
<td>20 MFD condenser</td>
<td>High side in grid terminal of 1A70 tube DO NOT REMOVE CAP</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output. Adjust each of the first I.F. transformers for maximum output.</td>
</tr>
<tr>
<td>1K00 K.C.</td>
<td>.00125 MFD trimmer</td>
<td>Receiver blue unused lead</td>
<td>Receiver blue unused lead</td>
</tr>
<tr>
<td>1K00 K.C.</td>
<td>.0005 MFD trimmer</td>
<td>Receiver blue unused lead</td>
<td>Receiver blue unused lead</td>
</tr>
</tbody>
</table>
ATTACH A 25-50 ft. OUTDOOR AERIAL TO THE BLUE LEAD COMING OUT THE REAR OF CHASSIS.

GROUND

Connect the black lead coming out the rear of chassis to a wire attached to a metal stake driven two to four feet in moist ground, or to a cold water pipe.

DIAL LIGHT

Some of this series of receivers have a pilot light which illuminates volt flash light bulb, type 710, is used, operated by TWO 1½ VOLT FLASH LIGHT BATTERIES which MUST BE PLACED IN THE METAL HOLDER THAT WILL BE FOUND INSIDE THE CABINET.

When manual tuning receiver—illuminate the dial by pushing inward on the tone control knob with the left hand and rotate the tuning knob with the right hand. After selected station has been correctly tuned in release knob and dial light will go out.

As the life of the 1½ volt flash light batteries would be shortened if the dial light were to remain lit at all times, the dial light is lit only
BATTERY LIFE

The life of the battery depends entirely on the average position of the "BATTERY ECONOMIZER" switch, the number of hours the set is operated daily and the quality and size of the battery.

The special "AB" Battery Pack, designed specifically for use with this radio, will provide approximately 600 to 800 hours of service under normal average operating conditions.

DIAL LIGHT

Some of this series of receivers have a pilot light which illuminates the dial when the tone control knob is pushed inward. A two cell 2.5 volt flashlight bulb, type 710, is used, operated by TWO 1½ VOLT FLASHLIGHT BATTERIES which MUST BE PLACED IN THE METAL HOLDER FOUND INSIDE THE CABINET.

When tuning receiver—illuminate the dial by pushing inward on the tone control knob with the left hand and rotate the tuning knob with the right hand. After selected station has been correctly tuned in release knob and dial light will go out.
ALIGNMENT PROCEDURE

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 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 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>Place band switch for desired set</th>
<th>Set receiver dial to:</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>
<th>Refer to parts layout diagram for location of trimmers mentioned below:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjust 1700 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>1730 to 540 K.C. Band</td>
<td>Exactly 1730 K.C.</td>
<td>600 K.C. condenser</td>
<td>High side to receiver blue antenna lead</td>
<td>High side to receiver blue antenna lead</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1440 K.C.</td>
<td></td>
<td></td>
<td>Adjust 1700 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>800 K.C.</td>
<td></td>
<td></td>
<td>While rocking gang condenser adjust 1440 K.C. antenna trimmer for maximum output.</td>
</tr>
<tr>
<td>5.76 to 18.3 M.C. Band</td>
<td>Exactly 18.3 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>High side to Blue Ant. Lead</td>
<td></td>
<td>While rocking gang condenser adjust 1440 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 15 M.C.</td>
<td></td>
<td></td>
<td>While rocking gang condenser adjust 15 M.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>

COLOR CODE
BLUE — 81.90 V
YELLOW — 8.1.90 V
RED — 4.5 V
BLACK — 8 V

BATTERY PLUS (POPS DOWN)

IN5GT 1st I.F.

IN5GT 2nd I.F.

SWITCH

GND 1477 TRANS. 850 K.C.

1st 1.F. TRIMMERS 85K.

IN5GT 3rd I.F.

IN5GT 4th I.F.

SWITCH

BATTERY PLUGS (POPS DOWN)

SOME MODELS USE SEPARATE BATTERIES REQUIRING CABLE SHOWN BELOW.

PART NO. 243

PART NO. 243
MODEL PA-13
MODEL PA-25

SETCHELL CARLSON, INC.

C1...006...800 Volts
R1...700 ohm...W, res.
R2...1200
R3...5000
R4...7000
R5...14,000 ohm
R6...25,000
R7...200,000
R8...400,000
R9...500,000
R10...1 meg.
VR1...1/2 meg. Potentiometer

MODEL PA-15

MODEL PA-25

C3...6 mfd-600
C4...10-5...50

R11...700 ohm...W, res.
R2...1200
R3...7000
R4...14,000 ohm
R5...25,000
R6...200,000
R7...400,000
R8...500,000
R9...1 meg.
R10...6636 0hm tapped 100 W.
VR1...1/4 meg. Potentiometer

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MODEL Globe Navigator
Chassis TSG-R
Chassis LD, LDU

SONORA RADIO & TELEV., CORP.

CHASSIS LD, LDU

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 500, 1400, 1720, 6000, 12500 and 18300 KC and an output meter to be connected across the primary or secondary of the output transformer. 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.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and packed, the broadcast and Short Wave bands in the order given, should 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 456 KC and connect the output to the grid of the first detector tube (12AT7) through a .05 or .1 mil. condenser. The ground on the test oscillator should be connected to the block lead of the electrolytic condenser. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. With the switch turned to the broadcast position, connect the antenna to the generator through a 220 MMF dummy and set the dial and generator at 1720 KC. Align the RC oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in signal with the dial. Adjust antenna trimmer for maximum output. Next set the generator at 6000 KC and tune in the signal with the dial. Adjust the RC pad by rocking the gang knob forth and back while adjusting the pad until maximum output is attained. Redecide the adjustment at 1400 KC as the pad adjustment may have caused misalignment.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S.W. position, connect the generator to the antenna with a 4050 MMF dummy. Adjust the S.W. oscillator to give a maximum output with the dial at 18300 KC (extreme end). Set the generator at 15000 KC and tune-in the signal with the dial. Adjust the oscillator trimmer for maximum output. With a strong signal input turn the dial to approximately 1 MHz lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 16000 KC to reduce the capacity in the oscillator trimmer until a second signal is required. Proceed as before with the alignment of the oscillator and recheck for image frequency. Check the sensitivity at 6000 KC to determine if the coils and resonant pad are not defective.

MODEL GLOBE NAVIGATOR
Chassis TSG-R

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 500, 1400 and 1720 KC and an output meter to be connected across the primary or secondary of the output transformer. 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.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and checked, the broadcast band should be adjusted.

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 (12AT7) through a .05 or .1 mil. condenser. The ground on the test oscillator should be connected to the chasis ground. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Remove chassis from the GLOBE and set it up on the bench. Core should be taken to have no iron or other metal near the loop. Do not move this setup on a metal bench.

Make a loop consisting of 10 to 20 turns of wire approximately 3 to 4 inches in diameter and connect across the generator terminals. Place this loop parallel to the loop antenna and about six inches away from it.

Set the dial and generator at 1720 KC (gang at minimum capacity). Adjust the oscillator trimmer for maximum output. Set the generator at 1400 KC and tune in the signal. Adjust the antenna trimmer for maximum output. Check the sensitivity at 6000 KC to determine if the gang or the coils have been damaged.

REMOVAL OF CHASSIS FOR SERVICING

To remove chassis for servicing and tube replacement, the following procedure should be used:
1. Sift the Equator bond around the GLOBE with a sharp knife or razor blade. (The GLOBE consists of two halves joined at the horizontal center line or Equator.)
2. Remove the helin pin, nut, washers and screw at the lower axial pivot on the meridian, the ring which encircles the GLOBE (South Pole).
3. Remove the set screw of the upper axial pivot on the meridian (North Pole).
4. Remove GLOBE from meridian ring mounting and separate upper half of GLOBE. The lower half of the GLOBE can be detached from the chassis assembly by removing two screws at the bottom.

The chassis and GLOBE should be assembled by reversing the procedure outlined above with the exception of the lower axial pivot fastening.

At this point the GLOBE tension should be adjusted. The hexagon nut serves this purpose and should be adjusted to a point whereby the GLOBE tension is sufficient to maintain an even balance of the GLOBE in any position and still permit the GLOBE to rotate smoothly. When the adjustment is correct, screw on the helin pin tightly against the adjusting nut. This serves as a lock nut.

Two Equator bond bands are furnished attached to the inner side of the GLOBE. After the GLOBE is completely assembled, the Equator bond tape should be cemented around the GLOBE where the upper and lower halves are joined.
Chassis KTU

Sonora Radio & Telev., Corp.

IF PEAK 456 KC

CHASIS KTU

5 TUBE AC-DC

SYNCHRONIZER
PHASE SHIFTER
DAMPING APPROX. 0.5 X 4.5

7-9 LB.

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 (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to the antenna of the set through a 200 mfd. (30002) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 K.C. and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the entrance trimmer (for 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

Chassis KF1, KF1

©John F. Rider, Publisher
MODEL TSB-47, 
Chassis TSB, TSBU 
MODEL TSU-105

SONORA RADIO & TELEV., CORP.

LAMP USED. Show case lamp 120 volt, 25 watts with medium screw base. (Never use a lamp larger than 25 watts.)

MODEL TSB-47 
Chassis TSB, TSBU 
Bed Lamp Receiver

VOLTAGE NOTES FOR BOTH SCHEMATICS 
Voltages shown on the circuit diagram are from socket terminals to chassis base. In measuring voltages use a voltmeter having a resistance of at least 1000 ohms per volt. Allowances should be made for variations in line voltage.

© John F. Rider, Publisher
MODEL TV-48, Chassis TV, TVU

IF ALIGNMENT. With the gqng condenser set at minimum, adjust test oscillator to 456 KC, and connect the oscillator output lead to the 1st detector tube (12A8-GT) through a .05 or .1 mfd. condenser. The test oscillator ground lead should be connected to the chassis base. Proceed by adjusting the two I.F. trimmers for maximum signal, or swing on output meter, if available. The two trimmers for the transformer I.F. will be found below the coil next to the base.

BROADCAST ALIGNMENT. Connect the test oscillator to the antenna of the set through a 100 mfd. (0001) condenser. With the gqng condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gqng condenser. Next — set the test oscillator at 1400 KC, and tune in the signal on the gqng condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

RADIO RECEIVER CONTROLS — Volume will be controlled by the volume control on the radio receiver as for radio reception. Other radio controls will affect record reproduction. Adjustment of the radio set’s fidelity and tone controls may add considerably to the enjoyment of your record selections.

ANTENNA — The single lead attached to the record player is the transmitting antenna. If the record player is located within a distance of ten feet from the receiving set no additional antenna will be required. An antenna not longer than ten feet may be added to operate over greater distances.

OPERATION — Turn on the power switch allowing about one minute for the tubes to warm up, place the selected record upon the turntable and start the motor. Lift pickup and lower the needle point gently to the outside record groove.

Next go to your radio and tune to approximately 600 KC, at which setting the phonograph signal will be received.

FREQUENCY ADJUSTMENT — If a local station is operating at a frequency of approximately 600 KC, interference will be encountered in the form of a continuous squeal or howl. To avoid this interference tune the radio receiver to a point at which no local station can be heard. With the unit in operation insert a screw driver in the hole located underneath the unit on the metal chassis and adjust the screw. If the radio receiver has been set at a point below 600 KC, (for example 550 KC) turn to the right until the phonograph signal is heard. If the receiver has been set above 600 KC turn the adjusting screw to the left.
I.F. ALIGNMENT. With the wave switch in the Broadcast Band and the gain condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6AG7) 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. With the switch turned to the broadcast position, connect the antenna to the generator through a 200 MFD dummy and set the dial to generator at 1720 KC. Align the I.F. oscillator trimmer for maximum output. Set the generator at 1400 KC and tune-in the signal with the dial. Adjust both antenna trimmers for maximum output. Next set the generator at 600 KC and tune-in the signal with the dial. Adjust the BC pad by rocking the gapping back and forth while adjusting the pad until maximum output is attained. Recheck the adjustment at 1400 KC as the pad adjustment may have caused misalignment. In making the BC alignment the loop should be located in the same position with respect to the chassis as it occupies in the cabinet. No metal should be near the loop.

POLICE BAND ALIGNMENT. With the band switch turned to the Pol. position, connect the generator to the antenna with a 400 ohm dummy. Adjust the Pol. oscillator to give a maximum output with the dial at 5600 KC (extreme end). Set the generator at 5300 KC and tune-in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial to approximately 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 5600 KC to reduce the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and recheck for image frequency. Check the sensitivity at 2000 KC to determine if the coils and pad are not defective.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S. W. position, connect the generator to the antenna with a 400 ohm dummy. Adjust the S. W. oscillator to give a maximum output with the dial at 18300 KC (extreme end). Set the generator at 15000 KC and tune-in the signal with the dial. Adjust the BC pad by rocking the gapping back and forth while adjusting the pad until maximum output is attained. Recheck the adjustment at 18300 KC as the pad adjustment may have caused misalignment. In making the BC alignment the loop should be located in the same position with respect to the chassis as it occupies in the cabinet. No metal should be near the loop.
ALIGNMENT PROCEDURE

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 and Short Wave bands in the order given, should be aligned.

L.F. ALIGNMENT. With the wave switch in the Broadcast Band and the gain condenser set at minimum, adjust the test oscillator to 404 Kc and connect the output to the grid of the first detector tube (6AQ5) through a .05 or .10 mfd condenser. The ground on the test oscillator should be connected to the chassis brace. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. With the switch turned to the broadcast position, connect the antenna to the generator through a 200 M.M.F. dummy and the ground of the set (black wire) to the generator ground. Set the dial and generator at 1725 Kc. Align the BC oscillator trimmer for maximum output. Next, set the generator at 802 Kc and tune in the signal with the dial. Adjust the BC pad by rocking the gang back and forth while adjusting the pad until maximum output is obtained. Recheck the adjustment at 1409 Kc as the pad adjust.

SHORT WAVE BAND ALIGNMENT. With the band switch turned to the S.W. position, connect the generator to the antenna with a 400 ohm dummy and the ground of the set (black wire) to the generator ground. Adjust the S.W. oscillator to give a maximum output with the dial at 1800 Kc (left scale). Set the generator at 1800 Kc and tune in the signal with the dial. Adjust the antenna trimmer for maximum output. With a strong signal input turn the dial about 1 M.C. lower in frequency and pick up the image frequency. If the image is not received, it will be necessary to return the dial to 1800 Kc to restore the capacity in the oscillator trimmer until a second signal is received. Proceed as before with the alignment of the antenna and receiver for image frequency. Check the sensitivity at 1600 Kc to determine if the coils and micro pad are not defective.

TELEVISION CONNECTOR

This receiver is designed to provide good reception when connected to a television receiver. To make this connection match the two leads from your television receiver to terminals "T" and "Q". The black lead or the outside shield (in case a shielded lead is used) should be connected to terminal "Q", and the other lead to terminal "T". For complete details consult the instruction sheet of your
AUTOMATIC TUNING

**Chassis TZ**

**SETTING-UP PROCEDURE.** To set up a list of stations on the automatic tuner proceed as follows:

1. Make a list of the stations you listen to most frequently.
2. Determine their frequencies from a station list or by adding a zero to their position on the dial; thus, 56 is 560 KC.
3. Arrange them in order, starting with the lowest frequency first; then the next highest and so on until not more than six of your favorite stations have been selected.
4. Select the proper button for each station, starting at the top of your list (the lowest frequency station) and determine if it is within the required range of button No. 7 as shown on the button diagram below. If it is in this range assign button No. 7 to this station. Take the second station on your list and determine if it can be assigned to the button to the left of the one already assigned. If it can be applied, assign the station to this button. If not, go to the next button to the left which has the proper range to accommodate the station. Proper assigning of stations to buttons will make it possible to set up the buttons to all principal stations in every locality.
5. Turn the band switch to the broadcast position and depress button No. 8 (manual button on extreme right); then tune in with the manual tuning control, the station on the top of your list (the lowest frequency station).
6. Remove the push button escutcheon by unscrewing the screw at each end. Depress the button assigned to this station and with a screwdriver carefully turn the large screw head above the depressed button until the desired station is tuned in. Tuning to the right lowers the frequency and turning to the left raises the frequency. Never try to turn the screw post the ends of its travel as you will damage the tuner. The screw has approximately three complete turns. The small screw head located below the large screw should not be disturbed as it is set at the factory.
7. When the station is picked up adjust the screw carefully for maximum volume and least noise. Push the manual button and the same station will be heard if you have tuned in the correct station.
8. After all six stations have been set up replace the escutcheon. Select a grommed tab with the proper call letters and insert in each slot above the button.

**PUSH BUTTON ARRANGEMENT**

**STATION ADJUSTMENT SCREWS**

- 1000
- 1500-1375 KC
- 550-900 KC
- MANUAL

**AUTOMATIC TUNER ALIGNMENT:** With the band switch turned to the broadcast position connect the generator to the antenna lead through a 200 MMF dummy. Depress button No. 2, set the generator to 1200 KC and tune in the signal by adjusting the large head screw located above the button. After the signal is carefully turned in adjust the small screw located below the large screw head for maximum output. This procedure should be repeated on the remaining buttons using the frequencies as listed below:

<table>
<thead>
<tr>
<th>Button</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq. (KC):</td>
<td>1200</td>
<td>950</td>
<td>950</td>
<td>650</td>
<td>650</td>
<td>650</td>
</tr>
</tbody>
</table>

In any specific locality where the customer has already set up his stations, the tuner alignment may be made at the actual frequency being used on each button.

**OPERATION.** With the set turned on to a moderate level of volume the automatic tuner is operated by merely pressing the button set to the desired station. The volume and tone are then adjusted to suit individual requirements.

To tune in stations with the manual control depress the manual button, select the band desired with the band switch and tune in your stations with the manual control. When using the automatic tuning the wave band selector switch must be turned to the broadcast position.

**TELEVISION AND PHONOGRAPH CONNECTOR.** This receiver is fully designed to provide sound reception when connected to a television receiver. To make this connection attach the two leads from your television receiver to terminals T' and G'. The black lead or the outside shield (in case a shielded lead is used) should be connected to terminal G', and the other lead to terminal T'. For complete directions consult the instruction sheet of your television receiver.

To use this attachment with a phonograph, connect the two terminals from the phonograph pickup to terminals T' and G'. If one of the pick-up leads is a shield connect it to the terminal G'. If both leads are unshielded, try reversing the terminals if the hum is excessive. If hum is still present reverse the power plug in the wall socket. Consult the instruction sheets on your phonograph for additional information.

With the connections made as described above simply turn the band change switch to the extreme left position and your television sound channel or phonograph pickup is connected.

**AUTOMATIC TUNING**

**MODEL TXF-67, Chassis TXF**

**ADJUSTMENT.** All adjustments are simply made from the top of the cabinet using an ordinary screwdriver.

To make adjustments remove all four buttons which pull off readily. The center buttons should be removed first since by depressing the adjacent buttons with thumb and finger a firm grip may be secured on either center button. The side buttons can then be easily removed.

Loosen the screw of the desired button and with the manual tuning knob turn to any desired station. Hold the manual tuning knob in position and depress the button shaft as far as possible. With the button fully depressed tighten up the screw firmly.

Be sure the push button knob is held down in position while being tightened.

After the stations are adjusted it is advisable to check each button to assure sufficient tightening.

To obtain accurate adjustment, the volume control should be set at a moderate level and the station tuned in slowly to a point of maximum volume and clarity.

It is not necessary to follow any particular sequence of stations since each button is adjustable to any station.

With each button definitely set and securely tightened to the selected stations, the tuner is ready for operation.

**OPERATION.** With the set turned on to a moderate level of volume, the automatic tuner is operated by merely pressing a button set to the desired station.

Station selection may be made automatically or manually at will since the manual tuning control operates free and independent of the automatic unit.

The station call letter tabs furnished should be inserted into the slot of the push buttons using designsations corresponding to the station selected for each button. After inserting call letter tabs the buttons may be replaced.
1. **OFF-ON SWITCH** — This is the only knob on the device. Turn to the right to switch on the power.

2. **PICKUP** — The pickup is the new crystal type. To insert a needle, raise the pickup arm to a vertical position, loosen the needle holder screw on the front, insert a needle to the full depth, tighten up the needle holder screw and lower pickup arm to its non-playing position outside the record and slip into the pickup rest holder. When commencing to play, remove pickup from holder, lift and place gently the point of needle in outside starting groove of record.

3. **MOTOR SWITCH** — On models in wooden cabinets which have the automatic stop, the motor switch is incorporated in the automatic stop. To start motor move the lever at the right side of the turntable. The automatic stop can be adjusted so that the pickup arm will strike it at the conclusion of a record and thus turn off the motor.

On models in metal cabinets the motor switch is located in the front panel on the right side.

4. **ANTENNA** — The single lead attached to the record player is the transmitting antenna. If the record player is located within a distance of ten feet from the receiving set no additional antenna will be required. An antenna not longer than ten feet may be added to operate over greater distances.

5. **OPERATION** — Turn on the power switch allowing about two minutes for the tube to warm up, place the selected record upon the turntable and start the motor. Lift pickup and lower the needle point gently to the outside record groove.

Next go to your radio and tune to approximately 600 K.C. At which set the phonograph signal will be received.

6. **FREQUENCY ADJUSTMENT** — If a local station is operating at a frequency of approximately 800 K.C., interference will be encountered in the form of a continuous squeal or howl. To avoid this interference tune the radio receiver to a point at which no local station can be heard. Pry out the button located between the turntable and the ON-OFF switch. With the unit in operation insert a screwdriver in the hole and adjust the screw.

If the radio receiver has been set at a point below 800 K.C. (for example 550 K.C.) turn to the right until the phonograph signal is heard. If the receiver has been set above 600 K.C. turn the adjusting screw to the left.

7. **RADIO RECEIVER CONTROLS** — Volume will be controlled by the volume control on the radio receiver as for radio reception. Other radio controls will affect record reproduction. Adjustment of the radio set's fidelity and tone controls may add considerably to the enjoyment of your record selections.

8. **HUM** — If hum is present it may be necessary to reverse the power plug in the wall socket.

**NEEDLES**

High quality needles are important to your enjoyment of recorded music. Use good full-tone size needles. If long playing needles are used, do not change the position of the needle in the pickup after it has once been played, as this will injure the record grooves.

Note: The needle point wears down gradually in use and wears down in conformity with the shape of the record groove. Changing the position of the needle in the pickup after it has been played will provide a new fit to the groove and will damage the record groove by changing the shape of the groove. The life of the record depends on maintaining the original record groove. To safeguard this important feature, never replace a used needle in the pickup, since this will do permanent injury to the record and shorten your record life materially.

On models in wood cabinets a jack is provided in the rear of the cabinet for using a microphone. Use only a low impedance (200 ohms or less) carbon button microphone. Most low-priced microphones are of this type. To attach

**MICROPHONE ATTACHMENT**

The microphone simply inserts the phone tip in the jack.

Warning! One of the terminals is directly connected to one terminal of the line cord. In using a microphone make certain all parts are fully insulated.

**SERVICE**

As the phonograph motor is the only moving part it is the only part of your record player that will require any attention.

A little oil applied to the motor, idler and turntable bearings about once every three months will suffice.
SPARTON SUPERHETERODYNE MODEL 500-C, 500-Y, 500-Z
INTERMEDIATE FREQUENCY 455 K.C.
TOP VIEWS OF ALL SOCKET CONNECTIONS

December 28, 1939

ALIGNMENT CHART

<table>
<thead>
<tr>
<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></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Set pointer 3/16 inch from right-hand end of guide plate opening with condenser plates fully meshed.

1.F.  12A7GT
Grid Cap  200 mfd  455KC  BC  Open  C9  ABB  2nd. I.F.
Rejection  200 mfd  455KC  BC  Closed  C8  ABB  1st. I.F.
Broadcast Band  200 mfd  1500 KC  BC  1500 KC  C10  OSC.  Peak at max.

(Check calibration and sensitivity at 1500 KC, 900 KC and 600 KC)
SCHEMATIC DIAGRAM
SPARTON SUPERHETERODYNE MODEL 51U & 51 (SEE NOTE)
INTERMEDIATE FREQUENCY 456 K.C.
BOTTOM VIEWS OF ALL SOCKET CONNECTIONS

NOTE:
FOR MODEL 51U MAKE THE FOLLOWING
CHANGES:
CONNECT ALL COMMON GROUNDS TO
CHASSIS GROUND
C2 5 K VOLTAGE COIL A-20638

C1A & B VARIABLE CONDENSER A-20158
C2A & B TRIMMERS ON VARIABLE
C3 0.01 MFD. 500 V C-3208-94C
C4 0.02 MFD. 200 V C-3208-92C
C5 0.1 MFD. 200 V C-3208-76C
C6 0.5 MFD. 200 V C-3208-64C

C9 NO. 1 I.F. TRIMMER
C10 250 MFD. MICA C-720-92A
C11 0.01 MFD. 400 V C-3208-84C
C12 0.02 MFD. 600 V C-3208-82C
C13 0.02 MFD. 800 V C-3208-81C
C14 0.01 MFD. 400 V C-3208-74C
C15 20-30 MFD ELECT. C-20-33
C16 0.05 MFD. 400 V C-3208-44C

R1 150,000 OHMS SW C-2798-24C
R2 20,000 OHMS SW C-2798-24C
R3 20,000 OHMS SW C-2798-24C
R4 20,000 OHMS SW C-2798-24C
R5 100,000 OHMS SW C-2798-24C
R6 100,000 OHMS SW C-2798-24C
R7 250,000 OHMS SW C-2798-24C
R8 500,000 OHMS SW C-2798-24C
R9 100,000 OHMS C-2798-24C
R10 100,000 OHMS C-2798-24C

L1 LOOP ANTENNA A-20158
L2 R.C. OSC. COIL A-20158-U
L3 NO. 1 L.F. COIL A-20158
L4 NO. 2 L.F. COIL A-20158
541-SX
VOLTAGE CHART

<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></td>
<td></td>
<td>No. 1</td>
</tr>
<tr>
<td>6J7G</td>
<td>Osc.-Conv.</td>
<td>0</td>
</tr>
<tr>
<td>6K7G</td>
<td>I-F Amp.</td>
<td>0</td>
</tr>
<tr>
<td>6F5G</td>
<td>Det. AM-AF</td>
<td>0</td>
</tr>
<tr>
<td>6F5G</td>
<td>Power Amp.</td>
<td>0</td>
</tr>
<tr>
<td>5Y5G</td>
<td>Rectifier</td>
<td>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 4 DC voltages.

*AC voltages:
- 0-5 volt scale.
- 0-100 volt scale.

ALIGNMENT

<p>| OPER-   | ALIGN-   | GENERATOR | DEEMPH | GENERATOR | BAND | TUNING | TRIMMER | REMARKS |</p>
<table>
<thead>
<tr>
<th>ATION</th>
<th>MENENT</th>
<th>CONNECTED</th>
<th>ANTENNA</th>
<th>FREQUENCY</th>
<th>SWITCH</th>
<th>COND.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SET</td>
<td>1</td>
<td>456</td>
<td>BC</td>
<td>Open</td>
<td>CI8 A,B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I-F.</td>
<td>6F5G Grid</td>
<td>1 mf.</td>
<td>456</td>
<td>BC</td>
<td>C16 A,B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Releator</td>
<td>Ant.</td>
<td>200 mlf.</td>
<td>456</td>
<td>BC</td>
<td>Closed</td>
<td>C2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Broad-</td>
<td>Ant.</td>
<td>200 mlf.</td>
<td>1400</td>
<td>BC</td>
<td>C15 Osc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cast</td>
<td>Ant.</td>
<td>1400</td>
<td>BC</td>
<td>1400</td>
<td>C5 Ant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Band</td>
<td>Ant.</td>
<td>600</td>
<td>BC</td>
<td>600</td>
<td>C14 Pad</td>
<td>Rock dial for peak adj.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Repeat</td>
<td>operation 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1st SW</td>
<td>Ant.</td>
<td>*</td>
<td>7. MC</td>
<td>1 SW</td>
<td>7. MC</td>
<td>C10 Osc.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2nd SW</td>
<td>Ant.</td>
<td>*</td>
<td>22. MC</td>
<td>2 SW</td>
<td>22. MC</td>
<td>C11 Osc.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>End SW</td>
<td>Band</td>
<td>*</td>
<td>22. MC</td>
<td>22. MC</td>
<td>C5 Ant.</td>
<td>Rock dial for peak adj.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(Check calibration and sensitivity at 8, 15, 15 and 22 MC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use 200 mlf. condenser and 100 ohm non-inductive resistor in series.

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### Alignment Chart

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment</th>
<th>Generator Connected To</th>
<th>Demod Antenna</th>
<th>Generator Frequency</th>
<th>Timing Cond. Setting</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set phono arm with armrest at low frequency and dial with arm closed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>L.F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antenna</td>
<td>200 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band</td>
<td>200 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Diode Resistor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Second Order</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Second Order</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Second Order</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Second Order</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Set L.F. to 455 Kc.
- Set Broadcast Band to 1500 Kc.
- Set Diode Resistor to 0.
- Set Second Order to 0.

**Remarks:**
- Adjust for minimum noise.

---

### Button Tin of Contents

<table>
<thead>
<tr>
<th>Button Tin of Contents</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set dial from 0 to 1000 on VCR scale. See drawing below.</td>
</tr>
<tr>
<td>2</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>3</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>4</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>5</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>6</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>7</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>8</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>9</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>10</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
<tr>
<td>11</td>
<td>Connect cap 1 to 1 to 1.</td>
</tr>
</tbody>
</table>

**Remarks:**
- Connect to point "X" on variable Capacitor. See drawing below.
- 100 uF and 150 uF, as necessary.
Sparton Superheterodyne Model 661-RP

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of socket protest to Gnd.</th>
<th>No. 1 / 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>
</tr>
</thead>
<tbody>
<tr>
<td>6617OT</td>
<td>Dodistor-Converter</td>
<td></td>
<td>0</td>
<td>0</td>
<td>220</td>
<td>0</td>
<td>77</td>
<td>0</td>
<td>6.1</td>
</tr>
<tr>
<td>6081OT</td>
<td>J-1 Amplifier</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>77</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>6081OT</td>
<td>Grid-DC-Flat Audio</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>58</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>6966</td>
<td>Power Amplifier</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>6966</td>
<td>Microphone Amplifier</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>5665/6605</td>
<td>Record Level Indicator</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>5665/6605</td>
<td>Rectifier</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67</td>
<td>6.1</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic design or back of sheet. Allow 10% or - on all measurements. Always use meter scales which give greatest deflection within scale limits. All RC measurements made with 1000 ohm per volt voltmeter. All RC voltages made with rectifier type volt meter. Unless otherwise designated, voltages in table are RC voltages. AC voltages are measured with 1000 ohm/volt volt meter.

* AC volts
** Cannot be measured with 1000 ohm/volt volt meter.

Check cutting head voltage with cutting head connected using signal generator (1000 EC 200 modulated) connected to "Out" and "Gain". With Selector switch in "Record" position, advance gain until Level Indicator (6665/6605 tube) shows without overloading. AC voltage as measured from 6665 plate to ground (AC meter in series with 0.1 mfd. 400 volt condenser) should be approximately 50 volts.

HOW TO ADJUST THE CUTTING HEAD

The Model 661-RP features a combination cutting and play-back head on the same axis. The adjustment is controlled by the position of a small screw on the side of the neck, and the correct position of the neck is very important, otherwise record may not be correctly cut or played back.

Loosening the screw will allow it to be moved up or down — up for cutting and down for recording. The slot in which the neck travels is designed so that the neck may be tightened in several intermediate positions, as well as in the extreme up or extreme down positions. These intermediate positions latterly compensate for exceptionally hard or soft disks and for used needles.

In general, three positions of the neck will take care of all graces of record hardness and of the cutting needles:

1. With the screw midway between maximum up (out position) and maximum down (play position) for old records and new cutting needles.

2. With the screw approximately two-thirds of the way toward out position for average hardened records.

HOW TO ADJUST THE VOLUME FOR BEST RESULTS

By making good records, there must be just the right amount of volume whether it is a radio program that is being recorded, or whether the microphone is being used.

To make it easy to tell when the volume is "just right", SPARTON engineers have provided a Level Indicator on the face of the record player which acts something like a VU-meter. The needle moves within the range of volumes within which the "eye" has been placed. The needle is turned to the right or left, depending upon whether the volume is too high or too low. The needle will also tell when the level is just right.

When a recording is being made, do not attempt to tune the volume control up or down until normal room volume is heard through the loud speaker.

Model 761 ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Op- tion</th>
<th>Alignment</th>
<th>Selector Connected</th>
<th>Tube</th>
<th>Frequency</th>
<th>Switch Settings</th>
<th>Wire Etc.</th>
<th>Trim</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>I.F.</td>
<td>.1 mfd.</td>
<td>450 EC</td>
<td>BC</td>
<td>Opens</td>
<td>BC</td>
<td>Open</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>.1 mfd.</td>
<td>450 EC</td>
<td>BC</td>
<td>Closed</td>
<td>BC</td>
<td>Close</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>.1 mfd.</td>
<td>450 EC</td>
<td>BC</td>
<td>Closed</td>
<td>BC</td>
<td>Open</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>.1 mfd.</td>
<td>450 EC</td>
<td>BC</td>
<td>Closed</td>
<td>BC</td>
<td>Close</td>
<td>2.5</td>
</tr>
</tbody>
</table>

SPARTON Engineers designed the record makers so that if only a part of the music is to be heard through the loud speaker while a recording is in progress, and this enables the user to know exactly what is going on the record. This applies whether the selector switch is in the "Record" or "Playback" position.

When recordings are being made, the circuits are completely matched, except that the loud speaker is less than the loaded speaker. As a result, the line volume is lower for the recording, but the program will not sound unnatural through the loud speaker.

An important thing to remember is that the volume control should never be turned too high up so that the "eye" over-runs or goes to zero, and the program will be lost or not played at all.
ALIGNMENT CHART

<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 drive wheel so that pointer is over left hand stop line of alignment scale with condenser fully raised. See special note below.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>*</td>
<td>1 mF</td>
<td>456</td>
<td>BC</td>
<td>1600 KC</td>
<td>D1 &amp; B, 2nd I.F.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rejection</td>
<td>**</td>
<td>200 mF</td>
<td>456</td>
<td>BC</td>
<td>600 KC</td>
<td>C3</td>
<td>Adjust to minimum</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast</td>
<td>**</td>
<td>200 mF</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>C7 (osc.)</td>
<td>***</td>
</tr>
<tr>
<td>5</td>
<td>Band</td>
<td>**</td>
<td>200 mF</td>
<td>600 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>C8 (pad.)</td>
<td>***</td>
</tr>
<tr>
<td>6</td>
<td>(Repeat operation 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shortwave</td>
<td>**</td>
<td>18 mC</td>
<td>18 mC</td>
<td>SW</td>
<td>18 mC</td>
<td>C4 (osc.)</td>
<td>***</td>
</tr>
<tr>
<td>8</td>
<td>Shortwave</td>
<td>**</td>
<td>18 mC</td>
<td>18 mC</td>
<td>SW</td>
<td>18 mC</td>
<td>C4 (osc.)</td>
<td>***</td>
</tr>
<tr>
<td>9</td>
<td>Shortwave</td>
<td>**</td>
<td>18 mC</td>
<td>18 mC</td>
<td>SW</td>
<td>18 mC</td>
<td>C4 (osc.)</td>
<td>***</td>
</tr>
<tr>
<td>10</td>
<td>Shortwave</td>
<td>**</td>
<td>18 mC</td>
<td>18 mC</td>
<td>SW</td>
<td>18 mC</td>
<td>C4 (osc.)</td>
<td>***</td>
</tr>
</tbody>
</table>

Special Note: For accurate alignment, the special scale found on page 12-22 should be used.

Notes:
- Pin No. 8 of 6SA7GT Osc-Converter tube.
- Connect dummy antenna to "Antenna" of loop winding.
- Rock dial while adjusting for maximum output.
- 100 ohm resistor and 200 mF condenser in series.
Line Voltage: 117 Volts AC

Position of Volume Control: Full with Antenna Disconnected
Position of Band Switch: Broadcast

**AC volts.

**Cannot be measured with Model 665 Analyzer.

### TUBES

<table>
<thead>
<tr>
<th>TUBES</th>
<th>FUNCTION</th>
<th>Voltage of Socket Prongs to Gnd. (See Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6G7QT</td>
<td>R-F Amplifier</td>
<td>No. 1: 0  No. 2: 0  No. 3: 0  No. 4: **  No. 5: 90  No. 6: 6*  No. 7: 125</td>
</tr>
<tr>
<td>6S7QT</td>
<td>Oscillator &amp; Converter</td>
<td>No. 1: 0  No. 2: 230  No. 3: 90  No. 4: **  No. 5: 0  No. 6: 6*  No. 7: **</td>
</tr>
<tr>
<td>6G7KT</td>
<td>I.F. Amplifier</td>
<td>No. 1: **  No. 2: 0  No. 3: 0  No. 4: **  No. 5: 90  No. 6: 6*  No. 7: **</td>
</tr>
<tr>
<td>6S7GT</td>
<td>Det. AVC &amp; 1st Audio</td>
<td>No. 1: 0  No. 2: 230  No. 3: 230  No. 4: **  No. 5: 80  No. 6: 6*  No. 7: 14</td>
</tr>
<tr>
<td>6F6G</td>
<td>Power Amplifier</td>
<td>No. 1: 0  No. 2: 230  No. 3: 230  No. 4: **  No. 5: 80  No. 6: 6*  No. 7: 14</td>
</tr>
<tr>
<td>6R6G</td>
<td>Rectifier</td>
<td>No. 1: 0  No. 2: 200  No. 3: 235  No. 4: **  No. 5: 325  No. 6: --  No. 7: 325</td>
</tr>
</tbody>
</table>
# Sparton Superheterodyne Model 782-PA

## Alignment Chart

<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</th>
<th>Switch Setting</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Releater</td>
<td>Ant.</td>
<td>200 mfd.</td>
<td>456 KC</td>
<td>BC</td>
<td>Closed</td>
<td></td>
<td>C20 B</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>5</td>
<td>B. broad Cast</td>
<td>Ant.</td>
<td>200 mfd.</td>
<td>1500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td></td>
<td>C16 (osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C15 (pad.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
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<td>9</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Police</td>
<td>Ant.</td>
<td></td>
<td></td>
<td></td>
<td>Poll.</td>
<td></td>
<td>C16 (osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C3 (ant.)</td>
<td>*** ***</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Short</td>
<td>Ant.</td>
<td></td>
<td></td>
<td></td>
<td>18 MC</td>
<td></td>
<td>C18 (osc.)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C4 (ant.)</td>
<td>*** ***</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Connect to terminal No. 8 of type 55A70T Osc. - Conv. tube.
- Slightly move trimmer screw.
- Turn trimmer screw all the way down.
- Adjust to minimum output.
- Rock dial while adjusting for maximum output.

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VOLTAGE CHART

Line voltage: 117 volts
Position of Volume control: Full with Antenna disconnected
Position of Band Switch: Broadcast

FOR OTHER DATA, SEE INDEX

<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>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7GT</td>
<td>R-f Amplifier</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.6</td>
<td>76</td>
<td>6.2k</td>
<td>257</td>
</tr>
<tr>
<td>6SA7GT</td>
<td>Oscillator-Converter</td>
<td>0</td>
<td>0</td>
<td>245</td>
<td>76</td>
<td>6.2k</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6SJ7GT</td>
<td>I.F. Amplifier</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.6</td>
<td>76</td>
<td>6.2k</td>
<td>245</td>
</tr>
<tr>
<td>6J5GT</td>
<td>Detector-AVC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>155</td>
<td>6.2k</td>
<td>0</td>
</tr>
<tr>
<td>6AQ5GT</td>
<td>1st Audio Amplifier</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>60</td>
<td>6.2k</td>
<td>0</td>
</tr>
<tr>
<td>6AV5G</td>
<td>Audio Driver</td>
<td>0</td>
<td>0</td>
<td>255</td>
<td>77</td>
<td>0</td>
<td>6.2k</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>6AC5G</td>
<td>Power Amplifier</td>
<td>0</td>
<td>0</td>
<td>240</td>
<td>0</td>
<td>0</td>
<td>6.2k</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>77G</td>
<td>Rectifier ***</td>
<td>0</td>
<td>0</td>
<td>300</td>
<td>0</td>
<td>0</td>
<td>300k</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* AC volts
** Cannot be measured with 1000 ohm/volt voltmeter.
*** Tube removed from socket to enable test prods to reach socket progs.

August 1, 1940
### Sparton Superheterodyne Models

**1071-PA  1071-PAD  1071-RPA**

<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 drive wheel so that pointer is over left-hand stop line of alignment scale with condenser plates fully meshed. See special note below.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>*</td>
<td>.1 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>1600 KC</td>
<td>CL6</td>
<td>1st L.P.</td>
</tr>
<tr>
<td>3</td>
<td>Rejection</td>
<td>**</td>
<td>200 mf.</td>
<td>456 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>05</td>
<td>Adjust to minimum</td>
</tr>
<tr>
<td>4</td>
<td>Broadcast</td>
<td>**</td>
<td>200 mf.</td>
<td>3500 KC</td>
<td>BC</td>
<td>1500 KC</td>
<td>CL1 (enc.)</td>
<td>***</td>
</tr>
<tr>
<td>5</td>
<td>Band</td>
<td></td>
<td>600 mf.</td>
<td>600 KC</td>
<td>BC</td>
<td>600 KC</td>
<td>CL2 (pad.)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(Repeat operation 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>(Check calibration and sensitivity at 600 KC, 750 KC, 1000 KC and 1500 KC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Short-wave</td>
<td>**</td>
<td>***</td>
<td>18 MC</td>
<td>SW</td>
<td>18 MC</td>
<td>CL2 (enc.)</td>
<td>***</td>
</tr>
<tr>
<td>9</td>
<td>(Check calibration and sensitivity at 6, 9, 9, 9, and 18 MC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Check operations 1 to 9 inclusive.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- Pin No. 8 of 6SA7GT Oscillator-Converter tube
- Connect dummy antenna to "Antenna" of loop winding
- **Rock dial while adjusting for maximum output.**
- ***200 ohms and 200 mf. in series."
**VOLTAGE CHART**

Position of Volume Control: Pull with set tuned to quiet channel.
Position of Band Switch: Broadcast

Line Voltage: 117 volts AC

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>Voltage of Socket Prongs to Grid. (See Prong Nos. on Schematic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7K7</td>
<td>R-F Amplifier</td>
<td>6*  250  90  74  -1b  0  2a  --</td>
</tr>
<tr>
<td>6A87GT</td>
<td>Osc-Converter</td>
<td>--   --   --   155  65  0  250  6*  52</td>
</tr>
<tr>
<td>6K5GT</td>
<td>I-F Amplifier</td>
<td>--   --   --   --   --  78  6*  250</td>
</tr>
<tr>
<td>6A87GT</td>
<td>Det - AVC - 1st I-F</td>
<td>--   --   --   --   --  0  2a  --  --</td>
</tr>
<tr>
<td>6P5G</td>
<td>Inverter</td>
<td>--   --   --  155  65  0  250  6*  52</td>
</tr>
<tr>
<td>6F5G</td>
<td>Power Amplifier</td>
<td>--   --   --  265  250  0  0  6*  0</td>
</tr>
<tr>
<td>6F5G</td>
<td>Power Amplifier</td>
<td>--   --   --  265  250  0  130  6*  0</td>
</tr>
<tr>
<td>6P5G</td>
<td>AVC Amplifier</td>
<td>--   --   --  185  --  1b  -- --  6*  --</td>
</tr>
<tr>
<td>6A58G</td>
<td>Dual Vaso-Glo</td>
<td>--   --   --  6*  25  --  150  --  --</td>
</tr>
<tr>
<td>5330</td>
<td>Rectifier</td>
<td>--   370*  320  320*  260*  370*</td>
</tr>
</tbody>
</table>

---

**SPARTON SUPERHETERODYNE MODEL 1081**
**INTERMEDIATE FREQUENCY 455 K.C.**
**BOTTOM VIEWS OF ALL SOCKET CONNECTIONS**

- A-2.5 volt DC scale.
- B-1 volt DC scale.
- **-AC volts.**
- **-Cannot be measured with 1000 ohms per volt voltmeter.**
SPECIAL ALIGNMENT SCALE FOR SPARTON MODELS
1081, 1281, 1071-PA, 1071-PAD, 1071-RPA

BROADCAST BAND — KILOCYCLES
600 750 1000 1500 1600

SHORT WAVE BAND — MEGACYCLES
6 9 12 15 18

TO USE SCALE PROCEED AS FOLLOWS:

1. MAKE ACCURATE TRACING OF SCALE WITH CARBON PAPER ON CARDBOARD.

2. CUT OR PUNCH OUT THE HOLES AS INDICATED.

3. PLACE THE SCALE IN POSITION OVER THE CHASSIS DIAL PLATE SO THE SCALE HOLES AND PLATE HOLES COINCIDE. USE PINS OR SCREWS TO HOLD SCALE IN PLACE.

These SPARTON Models are designed with the dial scale as a part of the cabinet escutcheon for the dial. Since the actual dial scale is not a part of the chassis, accurate calibration and setting of the pointer become difficult unless a duplicate or auxiliary scale is used.

ALIGNMENT NOTES:

A. "Stop Lines" on scale indicate actual stopping points of pointer travel with complete 180 degrees rotation of variable tuning condenser. Therefore, the "STOP LINES" on the scale are reference points and allow correct positioning of the various parts associated with the dial indicating mechanism.

B. Pointer must always be at LEFT HAND Stop Line with condenser closed. Then if pointer is not at RIGHT HAND Stop Line with condenser fully open, make necessary adjustments.
Sparton Superheterodyne Model 1091

Voltage Chart

Line Voltage: 217 Volts

Position of Volume Control: Pull with Antenna Disconnect Switch Pouched

<table>
<thead>
<tr>
<th>TUNE</th>
<th>SERIES</th>
<th>FUNCTION</th>
<th>Voltage of Reactor Prongs to Gnd. (See Note on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. 1</td>
<td>No. 2</td>
<td>No. 3</td>
</tr>
<tr>
<td>GEMET</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AGES</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>ANO5</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>ANO7</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>AGS</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>AGS2</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>AGS3</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>AGS4</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>AF</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS1</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS2</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS3</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS4</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS5</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>YS6</td>
<td>0</td>
<td>0</td>
<td>300</td>
</tr>
</tbody>
</table>

Notes:
- Voltage readings are for schematic diagram in this bulletin. Allow ±5% or more on all measurements.
- Always use meter scale which will give greatest deflection with scale limits. All DC measurements made with 1000 ohms per volt voltmeter.
- 115 volt.
- **Cannot be measured with Weston meter #265.

Alignment Chart

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT</th>
<th>GENERATOR</th>
<th>BAND</th>
<th>TUNING</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Net drive visual so that pointer is over left hand stop line of alignment scale with condenser gaus fully sealed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1.0 mF</td>
<td>550 EC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>1000 EC</td>
<td>1500 EC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 (Normal Operation)</td>
<td>12 (Check calibration and sensitivity at 1500 EC, 1000 EC and 600 EC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>500 mF</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>500 mF</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- **Check trimmer screw all the way down
- **Check dial while adjusting for maximum output.
Sparton Superheterodyne Model 1291-RPA

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>:DUTY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>SWITCH SETTINGS</th>
<th>TUNING CORR. SETTINGS</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Set drive wheel so that pointer is over left hand stop line of alignment scale with condenser gang fully opened)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 2 = 0</td>
<td>honeymoon</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(Check calibration and sensitivity at 500, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(Check calibration and sensitivity at 750, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 1081

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ALIGNMENT OF</th>
<th>GENERATOR CONNECTED TO</th>
<th>DUTY ANTENNA</th>
<th>GENERATOR FREQUENCY</th>
<th>SWITCH SETTINGS</th>
<th>TUNING CORR. SETTINGS</th>
<th>TRIMMER</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>(Set drive wheel so that pointer is over left hand stop line of alignment scale with condenser gang fully opened)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 2 = 0</td>
<td>honeymoon</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
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<td>6</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
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<td>E7 3 = 0</td>
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</tr>
<tr>
<td>7</td>
<td>I.F.</td>
<td>Grid Cap of 600Ω</td>
<td>L2, L3, L4</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Check calibration and sensitivity at 500, 1000, 1500, and 2000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(Check calibration and sensitivity at 1000, 2000, 3000, and 4000 kHz)</td>
<td>D100</td>
<td>DC</td>
<td>Open</td>
<td>E7 3 = 0</td>
<td>Peak accurately</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES: **1.** Use No. 8 or 16 AWG disc-conversion leads.
**2.** Connect dummy antenna to antenna of loop winding.
**3.** Check diode resistance for maximum output.
**4.** 100 ohm resistor and 200 μF condenser in series.
Special Note: For accurate alignment, a series scale of the equipment must be used. The scale and full directions for using it will be found on page
MODELS W-130, Z-7008-9
(Late), Ch. P
MODEL Z-7008-9
(Late), Ch. TP

-operates on 110-120v, 50-60\textbackslash\textdegree\text{AC or DC
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.

**STATION SELECTOR**

The four button automatic tuner on this receiver can be adjusted to any station desired by the listener regardless of the frequency of the station. To adjust: Tune in the station desired with the manual control. Loosen the std automatic tuning button by turning the button counterclockwise. Press it in all the way while holding the manual control knob. Tuned to the desired station. Rotate button clockwise to lock it. The remaining three buttons are adjusted in the same way. The adjustments can be changed at any time desired.

**ALIGNMENT DATA**

INTERMEDIATE FREQUENCY: Set oscillator to 465 K.C. Feed this to the grid of the pentagrid (6A7) converter tube. Adjust trimmer 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 .0002 mfd condenser. Set the pointer on the dial to 1420 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 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 K.C to determine whether the circuits are properly aligned. Should the receiver lack sensitivity at this frequency check the .0005 mfd condenser for short circuit.
ALIGNMENT PROCEDURE

Output Meter Connections
Output Meter Reading to Indicate 1 Watt
Generator Ground Lead Connection
Dummy Antenna Value to Be In Series with Generator Output
Connection of Generator Output Lead
Generator Modulation
Position of Volume Control

Position of Volume Control

The variable condenser should be set at 600 kC for antenna adjustment. The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy. The final adjustment of antenna padder condenser C16 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.

THE AMMETER LEAD

The ammeter cable (See "H" in Fig. 1) has a spring clip at one end and a fuse receptacle at the other. Compress spring clip and slide it over the ammeter stud on the back of the car's ammeter. When the clip is released it will spring out and grip the stud securely. (See Fig. 1) The cable clip may be connected to either stud of the ammeter. If connected to the other stud, it will not register.)

Some terminals will be fastened to any available terminal behind the dash which is connected to the ungrounded side of the battery. If the terminals are turned "On", insert the fibre sleeve fuse (See "J" and "K" in Fig. 1) in the other end of the ammeter cable. The black wire coming from the radio receiver plug at its end which should be inserted into the fuse receptacle after the fuse sleeve and fuse have been inserted.

THE GENERATOR CONDENSER

The Generator Condenser should be mounted to the generator frame by means of any one of the generator assembly bolts. Scrape all dirt and paint away so that a clean metal to metal contact is made. The flexible lead from the Generator Condenser should be connected to the output terminal of the generator.
ANTENNA

Insert the single prong of the antenna cable (See "G" in Fig. 1) into its receptacle located on the bottom of the receiver case and near the front left hand corner. Note that the other end of this cable has a white covered wire protruding from its end and a bright metal pigtail. The white covered inner wire and the bright metal pigtail are to be connected to the car's antenna in the following manner:

If an antenna was located coming from the corner post of the car, it will probably have an inner wire covered with the metal braid. (If it has a plug at its end, cut off the plug). Scrape clean and solder the white wire of the receiver's antenna lead to the inner wire of the car antenna lead. Be certain these inner wires do not at any time touch the outer shield. (See Fig. 5.)

After the connection is cleaned and connected, cover the joint carefully with tape. (See Fig. 6.)

Connect the pigtail of the receiver's antenna wire to the pigtail braid of the car's antenna lead-in. Wrap pigtail and solder together using rosin core solder. IMPORTANT—Make certain when bolting soldered pigtail ends to car that the section is scraped clean and a good clean ground. (See Fig. 7.)

If the lead-in from the car antenna is not shielded, it is advisable to do so to overcome motor noise. Slip a shielded loom over the entire length of the car antenna lead-in. In the cases where a roof antenna is used, the lead-in is brought down through a corner post of the car frame at the end of the windshield (See Figure 2). If the antenna cable is long enough to be inserted several inches into the corner post, connect antenna lead-in and the radio antenna cable as shown in Figs. 5 a and b, and after tapping, insert the shield and all the unshielded portion of the lead-in up into the corner post. If this cannot be done, this type of lead-in should be covered with a shielded loom several inches into the corner post. Connect the lead-in and shielding as illustrated in Figures 5, 6 and 7. The other end of the shielding at the car antenna should be grounded. To eliminate cracking and noisy reception due to antenna lead-in pickup, the shielded antenna lead-in should be either insulated from chassis (or car body) or grounded at interval points, leading from the antenna cable to the car antenna. Be sure to use car chassis or grounded section of body only for grounding.

THE DISTRIBUTOR SUPPRESSOR

To install the distributor suppressor, cut the CENTER leaf from the distributor cap in two, as close as possible to the distributor cap. Screw the Distributor Suppressor to one end of the cut cable and then to the other end leading to the distributor cap.

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 in 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 five 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.

ANTENNA ADJUSTMENT

See diagram. To make the adjustment, first, remove plug button from bottom of case by inserting a screwdriver between case and plug button, then turn in a weak station with full volume at or very close to 600 kilocycles (50) on the dial. Second, insert small screwdriver into the antenna adjustment screw shown in Figure 2 and turn the screwdriver either to the left or right until the volume of the station is at its maximum point. While adjusting the antenna adjustment screw it is advisable to vary the station selector knob a degree or two to obtain the best adjustment. Now insert plug button into case. The receiver is now balanced and no further radio electrical adjustments are necessary.

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Tubes required are:
1—6A7 Oscillator-Translator
1—6D6 I. F. Amplifier
1—75 Detector-A. V. C. Audio Amplifier

I. F. ALIGNMENT

From a good signal generator connect the proper leads, one to the radio chassis and the other thru a .1 mfd condenser to the grid cap of the 1A7G tube, with the tube's grid lead still in place. Set the receiver dial to 1720 K. C. and the signal generator to 456 K. C. With the receiver's volume control full on, adjust the signal generator's output until the signal is heard in the speaker and the output meter reads approximately .3 volts. Adjust the I. F. trimmers for maximum output, decreasing the generator output as the receiver output increases, so the meter always reads approximately .3 volt.

R. F. ALIGNMENT

When aligning the antenna and oscillator circuits the loop antenna should be placed in its approximate position in relation to the radio chassis and speaker as it is placed in the cabinet. No leads are connected from the signal generator, but the generator leads are connected to a three or four turn loop about three inches in diameter, of ordinary insulated hookup wire. This loop is placed about four inches from the loop antenna and parallel to it. The radio dial and generator are set to 1720 K. C. and the oscillator trimmer set for maximum output, still using a .3 volt meter reading. The dial and generator are then set to 1400 K. C. so the signal comes thru, and the trimmer on the loop antenna is adjusted for maximum output. Check for alignment at 600 K. C.
### I.F. 456 K.C.

**TUNING RANGE**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.005 MFD</td>
<td>200V</td>
</tr>
<tr>
<td>C2</td>
<td>.01 MFD</td>
<td>200V</td>
</tr>
<tr>
<td>C3</td>
<td>.022 MFD</td>
<td>200V</td>
</tr>
<tr>
<td>C4</td>
<td>.047 MFD</td>
<td>200V</td>
</tr>
<tr>
<td>C5</td>
<td>.056 MFD</td>
<td>200V</td>
</tr>
<tr>
<td>C6</td>
<td>2.2 MFD</td>
<td>200V</td>
</tr>
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<tr>
<td>C9</td>
<td>1000 MFD</td>
<td>200V</td>
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<tr>
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<td>10 KΩ</td>
<td>10V</td>
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<tr>
<td>C11</td>
<td>100 KΩ</td>
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</tr>
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<td>1V</td>
</tr>
<tr>
<td>C15</td>
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<tr>
<td>C74</td>
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<td>1V</td>
</tr>
</tbody>
</table>

### MOTOR NOISE ELIMINATION

1. Ground the antenna lead-in shield at one or more points to the cowl or any other metal surface in contact with the lead-in.

2. Move the battery lead around to a point of least noise pickup and fasten in place with tying cord or tape.

3. Bond together the throttle rod, choke rod and any metal tubing with a piece of copper braid and ground to the firewall. This should be done on the engine side.

4. Bond steering post to firewall.

5. Bond hood, side panel and other protective covering on engine if it is not making a positive contact to the body.

In extreme cases, a distributor resistor and generator condenser will reduce noise interference to a minimum. These parts are available on your dealer.

From the standpoint of motor noise, the whip type antenna recommended has been found to be the most satisfactory. It is advisable to use this type antenna even if the car is equipped with a built-in antenna.

### 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 (6A8G) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Alight all three trimmers to peak or maximum reading on the output meter.

**AMT. AND OSC. ALIGNMENT.** Connect the antenna to the generator through a 65 MMF dummy and set the dial and generator at 1500 KC (gang at minimum capacity). Align the BC oscillator trimmer for maximum output. Set the test oscillator at 4500 KC and tune in the signal with the dial and adjust the antenna trimmer for maximum output. Next set the test oscillator at 6000 KC and tune in the signal with the dial to check the sensitivity at this point.

*If the antenna is supplied using a whip antenna shielded lead use a 30 MMF dummy antenna.*
ADJUSTING PUSH BUTTONS FOR MODELS A2026 CH. 10-70; Z-7002 CH. 0-51

Cut the call letters of your four selected stations from the list supplied with your receiver and slip them into the top of the Push-Buttons, with the clear celluloid on top of the call letters to protect them. Arrange the call letters in the buttons from left to right, having the lowest frequency station (that is, the station closest to 600 K.C. at the left) and work progressively towards the right, so that the highest frequency station is toward the right.

Follow the procedure outline below, in order to adjust the push-buttons properly:

1. By means of the tuning knob, tune in with the right hand as accurately as possible the desired station having the lowest frequency.

2. Continuing to hold the tuning control knob in its exact position with the right hand, loosen with the left hand the push-button to be set up for that station (the one farthest toward the left) by unscrewing the push-button about one turn to the left (counter-clockwise).

3. Push the push-button in all the way, and then 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.

Follow through with this same procedure, setting up the other three stations in the order of their frequency, that is, the second station set up will be second lowest in frequency, etc.
SPiegel, Inc.

Model A-2000, Ch. 821

Air Castle Superheterodyne Model 821
Intermediate Frequency 456 K.C.
Bottom Views of All Socket Connections

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube</th>
<th>Voltage of Socket From to Grid</th>
<th>Grid from 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>
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<tbody>
<tr>
<td>6AS7</td>
<td>0</td>
<td>210</td>
<td>70</td>
<td>-270</td>
<td>0</td>
<td>-5.8</td>
<td>200</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6AS7</td>
<td>0</td>
<td>0</td>
<td>70</td>
<td>200</td>
<td>0</td>
<td>-5.8</td>
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<tr>
<td>6AS7</td>
<td>0</td>
<td>0</td>
<td>70</td>
<td>200</td>
<td>0</td>
<td>-5.8</td>
<td>200</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Voltage readings are for schematic diagram. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohm per volt voltmeter. All AC voltages made with rectifier type voltmeter. Unless designated otherwise, voltages in table are DC voltages.

*AC voltages cannot be measured with 1000 ohm per volt voltmeter.

ALIGNMENT CHART

1. (Set dial drum so that last mark on BC scale is directly toward front of set when condenser plates are fully meshed.)

2. 1.F. * .1 MC. 450 K.C. BC Open 05 AMB 2nd 1-F

3. Rejection Ant. 200 K.C. 450 K.C. BC Closed 05 AMB 2nd 1-F


5. Band 600 K.C. BC 600 K.C. 07 Pad

6. (Reference operation 4)

7. (Check calibration and sensitivity at 600 K.C., 1000 K.C. and 1500 K.C.)
   b. AM Ant. 16 MC 16 MC 05 Dec. Rock dial while adjusting for maximum output

8. (Check calibration and sensitivity at 6 MC and 18 MC)

9. (Check calibration and sensitivity at 6 MC and 18 MC)

10. (Check operation 1 to 9 inclusive)

Notes: *Connect to point 4 on Variable Condenser. See drawing below.

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TUBES

Tubes required are:
1—6A7 Oscillator-translator
1—6D6 Intermediate Frequency Amplifier
1—75 Detector AVC—First Audio Amplifier
1—76 Driver—Phase Inverter
2—4Z Power Output
1—80 Rectifier
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.

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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 in accordance with the Master Selector's operation, and no adjustment may be made until the proper procedure is understood.

Model Selector: This includes the Selector Drum, the Selector Push and the Selector Light. These parts are mounted on the rear of the variable condenser, insulated from the receiver by brackets and wires.

The Master Selector: This assembly consists of a revolving drum having a mechanical drive with magnetic throw-out, and a tmachine gear operating directly onto the Manual Selector shafts, thus, the drive is necessary.

Push Drum Assembly: These buttons are located on the front of the chassis and extend through the surface below the drum. Stations are set in automatically when the button under the call letters of the desired station is pressed and held down until the sound reaches the ear. When the button is pushed down, an automatic selector moves the receiver until the desired station is exactly on tune.

SETTING UP THE MASTER SELECTOR

A set of dialing during the operation of the Master Selector, the closest to the right of your favorite or nearest stations according to frequency or position on the dial. Setting up weak or distant stations is not recommended. Call the station number of the band end of the dial (except 1400 kc) is not a station, and which stations coming from left to right across the dial but may vary as stations coming from left to right across the dial and stations coming from right to left across the dial. For example, station 1500 kc is 1500 kc; 1500 kc; 1200 kc; 1000 kc; 900 kc; 700 kc; and 600 kc.

The 1500 kc station would be the No. 1, 1400 kc station would be the No. 2, and so on down the list with the 600 kc station being designated No. 6. Reference to the push buttons is not necessary since they are not used until after the Master Selector has been set up.

On the Selector Drum, are two parts of Contact Roller. Note that there is a Paper Dot on the edge of the drum which will break in the ribbons on the upper half of the drum. The Paper Dot is for the purpose of locating the approximate position of those which are used to set the Selector Drum for a particular station.

It is very important that the following be followed exactly: any deviation may prevent tuning of the station.

1. Set the receiver for reception of Standard Broadcast Stations as outlined in the receiver's manual. Turn the receiver, for example: for at least one minute to allow the tubes to reach their desired operating temperature.

2. Using the Manual Station Selector (upper right) knob tone in the No. 1 Contact Dot on the Selector Drum is in the 500 to 600 kc end of the dial. Watch the tuning eye closely, making certain that the station is tuned in perfectly.

3. Press the ear of the chassis. Attach the lead from the Selectors Light to the No. 1 Contact Dot unless the pin happens to be set exactly, the lamp will glow when the lead is touched to the pin.

4. Observe the position of the Paper Dot on the edge of the drum and the No. 1 Contact Dot and slide it upward the Selector Light and the pin. When the pin is directly opposite the Paper Dot, the light will go out, indicating that the contact is properly set. To remove traces of inaccuracy in making this setting, slide the pin back and forth across the break between the ribbons, leaving it set half way between the points when the lamp goes out. Be very careful not to move the Selector Drum while the pin is being set. The pin should now be in the proper position. Disconnect the Selector Light Lead from the Pin.

5. Repeat the above procedure for the No. 2 station; tape in the No. 2 Contact Dot by sliding the Selector Light lead to the No. 2 Contact Dot, moving the pin opposite the Paper Dot so that the light goes out, then Disconnect the Selector Light Lead.

6. Using the Selector Drum, set up the other stations in each case using the Contact Pin bearing the same number as that assigned to the station being set up. Always Disconnect the Selector Light Lead from the Pin as soon as a station has been set. Failure to do so will cause the receiver to hum, and may result in the lamp being burnt out.

ALIMENTATION PROCEDURE

IF. Connect the generator ground to receiver chassis. Using a .1 mfd. condenser in series with high side of the generator, apply 456 kc. signal to the grid of the 6D6 IF amplifier tube and this side of IF transformers. Repeat for first IF transformer, applying signal to grid of the 6AT tube. (See above diagram for location of tubes and transformers.)

RF. (See circuit diagram for location of transformers.) Using a 200 mfd. condenser 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 1680 kc. signal to antenna terminal and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at point around 1400-1500 kc., and adjust broadcast antenna and RF trimmers. Set generator for 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 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 5400 kc., then aline 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 16000 kc., and aline the antenna trimmer at about 15000 kc. In order to make sure that the top end of the last band is properly set, it is best to screw the oscillator trimmer down tight, then unscrew to the second peak. The antenna trimmer 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 in the correct relation to each other, otherwise a "dead" spot at a lower frequency will result, and the 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.
PHONOGRAPH OPERATION
W-134 Ch. TF; Z-7124 Ch. TF

MOTOR. The motor is a spring-wound type. Insert the crank in the hole at the right. When the motor is fully wound the phonograph will play two full ten-inch records before rewinding is required.

TURN TABLE. To start turntable move the brake lever forward. To stop turntable pull lever toward you. Speed may be regulated by the control arm. For correct pitch adjust this speed to 78 revolutions per minute.

WARNING: Do not forget to turn off radio set when through playing records. Battery life is appreciably shortened by continuous operation over long periods of time.

PICKUP. The pickup is the new crystal type. To insert a needle, raise the pickup arm to a vertical position; loosen the needle holder screw on the front, insert a needle to its full depth, tighten up the needle holder screw and lower pickup arm to its non-playing position outside the record and slip into the pickup rest holder. When commencing to play, remove pickup from holder, lift and place gently the point of the needle on the smooth outer rim of the record and slide into the first groove of the record.

PLAYING RECORDS
(a) Turn on the volume control and "on-off" switch on the receiver.
(b) Turn the "Radio-phono" switch to the phone position.
(c) Place the selected record upon the turntable and move the starting lever forward. This will place the record in motion.
(d) Lift pickup and lower the needle point gently to the smooth outer rim of the record and slide into the first groove of the record.
(e) Adjust volume to proper level by rotation of the volume control knob. After the selection is completed, lift the pickup, swing the arm to the right beyond the edge of the record and lower and affix to the arm rest bracket.
(f) When you have finished playing, lift pickup and place it in its rest position and remove record from turntable. Never leave pickup with needle resting on record or on turntable.

RECORD HOLDER. Eight ten-inch records may be carried in the record holder in the cabinet lid. To remove record holding clamp turn it ninety degrees. Place records in lid, replace clamp, sliding it up tight against records before turning it.

SERVICE. The phonograph motor will require oiling once every three months. Apply 3 or 4 drops of Number 10 S. A. E. oil to the turntable bearings, to the bearings at each end of the governor shaft, to the felt pad on the governor brake, and to the gears and bearings on the gear shafts.

NEEDLES
High quality needles are important to your enjoyment of recorded music. Use good half-tone steel needles or plastic needles to prolong the life of the records. If long playing needles are used, do not change the position of the needle in the pickup after it has once been played, as this will injure the record grooves.

Note: The needle point wears down gradually in use and wears down in conformity with the shape of the record groove. Changing the position of the needle in the pickup after it has been played will provide a new fit to the groove and will damage the record groove by changing the shape of the groove. The life of the record depends upon maintaining the original record groove. To summarize this important message, never reinsert a used needle in the pickup, since this will do permanent injury to the record and shorten your record life materially.
MODEL A-2012, Ch. 194U
MODEL A-2056, Ch. 204
MODELS A-2154, Z7108 (Late)
CH Ch. 175B

ALIGNMENT PROCEDURE A-2154, Z7108 (Late)

Set receiver dial to:

<table>
<thead>
<tr>
<th>TEST OSCILLATOR</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy emitters 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. Any point where no interfering signal is received</td>
<td>455 K.C.</td>
<td>.02 MF condenser</td>
<td>High side to grid terminal of 12A7 tube DO NOT REMOVE CAP.</td>
<td>Adjust second I.F. transformer trimmer for maximum output. Then adjust each of the first I.F. trimmers for maximum output.</td>
</tr>
<tr>
<td>1</td>
<td>Exactly 1750 K.C.</td>
<td>.00025 MF condenser</td>
<td>Receiver filament positive</td>
<td>1750 K.C. oscillator trimmer for maximum output.</td>
</tr>
<tr>
<td>2</td>
<td>Approx. 1400 K.C.</td>
<td>.00025 MF condenser</td>
<td>Receiver filament negative</td>
<td>1400 K.C. antenna trimmer for maximum output.</td>
</tr>
</tbody>
</table>

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IF. ALIGNMENT

Adjust the signal generator to 455 KC and connect the output to the grid of the first detector tube (6A7) through a .05 or .1 mfd. condenser. Align all I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Adjust the signal generator to 1730 KC and connect the output to the antenna lead (blue) through a .0002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. The oscillator and antenna trimmers may be reached by removing the dial escutcheon. (See Fig. 3 for trimmer locations.)

The next step is to set the signal generator to 1400 KC and after tuning in the signal adjust the antenna trimmer to peak. Next, re-set the dial pointer on the receiver and the signal generator to 600 KC. Slowly increase or decrease the oscillator padding condenser and at the same time continuously tune back and forth across the signal with the receiver until the maximum reading is obtained on the output meter.

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.

D.C. voice coil resistance .......................... 1.9 ohms
Voice coil impedance at 400 cycles ................ 2.2 ohms

SHORT WAVE BAND ALIGNMENT

The short wave band is adjusted by setting the signal generator to 18100 KC and connecting the output of the antenna lead through a 400 ohm resistor. Set the gang at minimum and 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 oscillator coils, as well as the mix padding condenser, should be tested.
AUTOMATIC RECORD CHANGER

This Record Changer will automatically play a series of eight 10" or seven 12" records of the standard 78 R.P.M. type. Records of the last few years with the standard eccentric or spiral stepping groove on the inside and an eccentric on the outside will operate the automatic mechanism. However, records of any size up to 12" may be played.

OPERATION

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" may be repeated, until it can be performed. To do this, turn Turntable Switch "On". The turntable will begin to revolve and the cycle of action on the pickup arm will be repeated. When the pickup arm comes down turn all the Turntable Switches.

CAUTIONS

1. Never use force to start or stop the motors or any part of the record-changing mechanism or pickup arm.
2. All records which have become warped or damaged through improper care, may cause the mechanism to jam and damage the instrument. 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" and 12" records in sequence. If this service is desired, all records must be perfectly flat and free from warp. The index and record reject lever must be set at "10" and after playing the last indexed record on the pickup will come down in position for a 10" record and repeat the playing of the record on a 10" diameter unless the Turntable Switch is turned on. Any jamting 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 separator in dropping each record in sequence onto the turntable.
4. Do not leave records on the record holder posts, as they are liable to warp, particularly as wind changes. Keep records in a record file cabinet or drawer when not in use.
5. The needle must be installed according to directions under "Pickup and Top-Loading Needle Socket" for proper operation of this instrument.
6. The two red mounting bolts which hold the Automatic Record Player solid for shipping, must be removed before using the Automatic Record Player as it "floats" on the spring mounts.

LUBRICATION—A drop of good quality light machine oil should be applied weekly to every six months at the base of the needle below the metal needle plate and then the needle screw.

INDEX AND RECORD REJECT LEVER

This lever is located near the right front corner of the recordplayer and its index plate marked for four positions—"Manual", "10", "12", and "Reel". When the turntable is desired it can be changed to record selections manually, this lever should be moved to the "Manual" position. The lever in the "10" position, the mechanism is set to play a record of 10" records automatically. To play either a series of 10" records or 12" records sized, the lever should be set at the "12" position. To select a record being played, or to select the record playing cycle in case the record that played does not have the standard eccentric or spiral stepping groove, simply push the lever to the "select" position and let go. The pickup will rise and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "select" position. If a series of 12" records is to be played, assume the lever should be warmed to the "12" position after selecting a record. Keep the lever in its "Manual" position when not actually playing records automatically.

TURNABLE SWITCH

The Slide Switch located just in front of the Index and Record Select Lever controls the current to the variable motor. To start the turntable, push the switch in the "On" position. To stop the turntable, push the switch in the "Off" position.

NEEDLES

The use of homemade long playing needles is absolutely essential (for the proper operation of this instrument, as the needle must move at a uniform speed for one or at most two records. If any needle is used too long, distortion and poor quality will be obtained and the records will be damaged.

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 groove 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 of top so that it goes down under the needle plate and then tighten the needle screw.

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 shell, and swing open the sides. Afterwards lower the turntable and lower record holder post. The turntable is now accessible. Before loading the record for automatic operation, swing the record holder shelves back into position.

AUTOMATIC OPERATION

1. See that the pickup is over the needle groove plate with the needle properly in place. If not, complete a "cycle" as explained in the first paragraph under "Operation".

2. With the Index and Record Select Lever at "Manual" place the first of the series of records on the turntable and the remainder of the series up to 10" or 12" records will be played automatically.

3. Set the Index and Record Select Lever to the proper position (See Controls: Index and Record Select Lever.)

4. Push the turntable switch to the left—"On"—turntable should commence to revolve.

5. When the turntable has attained speed, lift pickup and lower gently onto the record so that the needle point enters the outside groove.

6. Adjust volume control to the desired intensity and tone control to the preferred setting.

7. Close the lid of the cabinet to eliminate all mechanical reproduction of sound by the needle.

SETTING UP PUSH BUTTONS

Loosen one of the push buttons by turning the push button knob counter clockwise a turn or less and push it in; while holding the button in, turn in a desired station by means of the station selector knob. Turn the selector very slowly back and forth until the signal is clearest. Now while holding the push button in, tighten it by turning clockwise. Release the push button and turn the station selector to one end of the dial, push the tuning knob to the right and then check the button by pushing it in and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

Release the push button and loosen another push button and repeat the above procedure, doing this for the remaining buttons.
BROADCAST BAND—540 to 1720 Kilocycles
SHORT-WAVE BAND—5.8 to 18 Megacycles

ALIGNMENT CHART

OPERATION | ALIGNMENT OF | GENERATOR CONNECTED TO | DUMMY ANTENNA | GENERATOR FREQUENCY | BAND SWITCH | TUNING CONTROL | TRIMMER | REMARKS
---|---|---|---|---|---|---|---|---
1 | (Set dial drum so that last mark is directly toward front of set with gang closed.)
2 | I.F. | 1.75 Grid | .1 mf | 456 KC | BC | Open | C16 ABB | C16 ABB
3 | I.F. Det. | Ant. | 200 mf | 456 KC | BC | Closed | C2 | Adjust to minimum
6 | (Repeat operation 4)
7 | (Check calibration and sensitivity at 1500 KC, 900 KC and 600 KC)
9 | (Check calibration and sensitivity at 0 KC and 18 KC)
10 | (Check operations 1 to 9 inclusive)

**VOLTAGE CHART**

**A** Battery voltage: 1.5 volts
**B** Battery voltage: 90 volts

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Prongs to Gnd. (See Notes on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7G</td>
<td>Osc. — Converter</td>
<td>No. 1</td>
</tr>
<tr>
<td>1A4C</td>
<td>1st I-F</td>
<td>No. 2</td>
</tr>
<tr>
<td>1A56</td>
<td>2nd I-F</td>
<td>No. 3</td>
</tr>
<tr>
<td>1B9G</td>
<td>Det. AVC-I/F</td>
<td>No. 4</td>
</tr>
<tr>
<td>1A5G</td>
<td>P.A.</td>
<td>No. 5</td>
</tr>
<tr>
<td>1A5C</td>
<td>P.A.</td>
<td>No. 6</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram, allow 15% 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.
A — Cannot be measured with 1000 ohms per volt voltmeter.
B — On 10 volt scale.
### Models A-2108, A-2112, A-2116

**Spiegel, Inc.**

**Ch. 561-561M**

---

**Intermediate Frequency 456 K.C.**

- **Bottom View of All Socket Connections**

---

**Broadcast Band—530 to 1700 Kilocycles (565 to 174 Meters)**

**Short-Wave Band—5.8 to 18 Megacycles (52 to 16.6 Meters)**

---

**Alignment Chart**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment of Generator Connected to Dummy Antenna</th>
<th>Generator Frequency</th>
<th>Band Switch Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Set pointer parallel with horizontal lines or dial with gap fully closed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F. Grid .1 mf. 456 Kc Bc Open</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>L-F Adj. Ant. 200 mf. 456 Kc Bc Closed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Broadcast Band 200 mf. 1500 Kc Bc 1500 Kc Bc (Gc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Broadcast Band 600 mf. 600 Kc Bc 600 Kc Bc (Fz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Repeat operation 6.

7. Check calibration and sensitivity at 1500 Kc, 300 Kc and 600 Kc.


9. (Check calibration and sensitivity at 5 kc and 15 kc.)

10. (Check operation 1 to 9 inclusive.)

---

**Voltage Chart**

- **A** Battery voltage: 6 volts
- **B** Battery voltage: 9 volts

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Voltage of Socket Probes to Grid (See Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>170G</td>
<td>Osc. - Converter</td>
<td>No. 1  No. 2  No. 3  No. 4  No. 5  No. 6  No. 7  No. 8  Grid Cap</td>
</tr>
<tr>
<td>176G</td>
<td>I.F. Amp.</td>
<td>-1.3  78  83  -  1  0  0  0</td>
</tr>
<tr>
<td>165G</td>
<td>Det. AVC-AF</td>
<td>-1.3  83  83  -  0  0  0  0</td>
</tr>
<tr>
<td>165G</td>
<td>P.A.</td>
<td>-1.3  83  83  -  0  0  0  0</td>
</tr>
</tbody>
</table>

Voltage readings are for schematic diagram. Allow 1% or - on all measurements. Always use meter scale which will give greatest deflection within scale limits. All AC measurements made with 1000 ohms per volt voltmeter.

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A-2120
1—1A7GT
Combined oscillator and 1st detector.
1—1N5GT
Intermediate frequency amplifier.
1—1D8GT
Combined second detector, Audio driver, and Power output.

**MODEL 130U**

<table>
<thead>
<tr>
<th>Schematic Location</th>
<th>Part No.</th>
<th>Description</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>R-105</td>
<td>Carbon res. 5K ohm</td>
<td>C1</td>
<td>Tubular cond. .05 mfd, 200V</td>
</tr>
<tr>
<td>R2</td>
<td>R-102</td>
<td>Carbon res. 1 meg.</td>
<td>C2, C3</td>
<td>Y-CV, 46  Variable Condenser</td>
</tr>
<tr>
<td>R3, R5, R7</td>
<td>R-101</td>
<td>Carbon res. 2 meg.</td>
<td>C4</td>
<td>CM-31     Mica cond. 100 mfd.</td>
</tr>
<tr>
<td>R8</td>
<td>R-99</td>
<td>Carbon res. 200K ohm</td>
<td>C5, C11</td>
<td>C-48      Tubular cond. .01 mfd, 400V</td>
</tr>
<tr>
<td>R9</td>
<td>R-103</td>
<td>Carbon res. 600 ohm</td>
<td>C6, C7</td>
<td>CT-12     Trimmer condenser</td>
</tr>
<tr>
<td>R10</td>
<td>1—451</td>
<td>General Battery 1.5V</td>
<td>C9, C14</td>
<td>CT-32     Trimmer condenser</td>
</tr>
<tr>
<td>R11</td>
<td>2—V10B</td>
<td>General Battery 45V</td>
<td>C10</td>
<td>CM-10     Mica cond. 250 mfd.</td>
</tr>
<tr>
<td>R12</td>
<td>C47</td>
<td></td>
<td>CE-50</td>
<td>4 mfd, 100V Electrolytic</td>
</tr>
</tbody>
</table>

**MODEL 130**

<table>
<thead>
<tr>
<th>Schematic Location</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>R-105</td>
<td>Carbon res. 5K ohm</td>
</tr>
<tr>
<td>R2</td>
<td>R-102</td>
<td>Carbon res. 1 meg.</td>
</tr>
<tr>
<td>R3, R5, R7</td>
<td>R-101</td>
<td>Carbon res. 2 meg.</td>
</tr>
<tr>
<td>R8</td>
<td>R-111</td>
<td>Carbon res. 100K ohm</td>
</tr>
<tr>
<td>R9</td>
<td>R-103</td>
<td>Carbon res. 60 ohm</td>
</tr>
<tr>
<td>B1</td>
<td>No.9</td>
<td>Air Castle Battery No. 9 1.5V</td>
</tr>
<tr>
<td>B2</td>
<td>No.3A40F</td>
<td>Air Castle Battery No. 3A40F 60V</td>
</tr>
</tbody>
</table>

**CONVENTIONAL ALIGNMENT**

**TUBE LAYOUT and CONNECTION DIAGRAM**

**184**

Range 540KC-1725KC

Tubes: Tubes required are:
- 1—8D8G Oscillator-Transistor.
- 1—6S7G Intermediate frequency amplifier.
- 1—8T7G Detector—automatic volume control—first audio amplifier.
- 1—1G5G Power output.

Do not use tubes of types different from those shown above.
ADJUSTING THE PUSH-BUTTON TUNER

MODELS W100, W110, W115, W160, W162; 1000, 1001, 1004, 1005, 1006, 1007, 1020, 1021, 1054, 1055, 1056, 1057, 1080, 1081; V1000, V1004, V1006, V1014, V1020, V1054, V1056, V1060, V1064; Ch. 629

1. Select six stations nearby broadcast stations and detach the corresponding call letter tabs from the station call letter tab sheets.

2. 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) will be at the low frequency and of the dial.

3. Using a small screwdriver or other tool that will fit the screw 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 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. Insert the proper tab in each button by pressing it in position.

7. Any of the six stations to which the push-button tuner has been adjusted may now be received simply by pushing the button for the desired station.

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![Diagram of a radio circuit with parts list](image-url)
ALIGNMENT PROCEDURE

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 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 input measuring device.
(c) Have ground lead of test oscillator attached to chassis.

<table>
<thead>
<tr>
<th>Place band switch for operation on:</th>
<th>Set receiver dial to:</th>
<th>Adjust test oscillator frequency to:</th>
<th>Use dummy antenna in series with output of test oscillator or developing 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>1. F. Alignment use any band position</td>
<td>Any point where no interfering signal is received</td>
<td>Exactly 455 K.C.</td>
<td>450 K.C.</td>
<td>High Side to grid cap of I.F. transformer (Do not remove cap)</td>
<td>Adjust each of the second I.F. transformer trimmers for maximum output</td>
</tr>
<tr>
<td>1700 to 560 K.C. Band</td>
<td>1</td>
<td>Exactly 1700 K.C.</td>
<td>1700 K.C.</td>
<td>00005 mfd. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Exactly 1800 K.C.</td>
<td>1800 K.C.</td>
<td>00005 mfd. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Exactly 600 K.C.</td>
<td>600 K.C.</td>
<td>00005 mfd. condenser</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td>1.4 to 18 M.C. Band</td>
<td>1</td>
<td>Exactly 18 M.C.</td>
<td>18 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Approx. 18 M.C.</td>
<td>18 M.C.</td>
<td>400 Ohm carbon resistor</td>
<td>Receiver blue antenna lead</td>
</tr>
</tbody>
</table>

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INTERMEDIATE FREQUENCY 456 K.C.

BROADCAST BAND—550 to 1600 Kilocycles (545 to 187 Meters)
SHORT-WAVE BAND—6 to 18 Megacycles (50 to 16.5 Meters)

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tube Function</th>
<th>Voltage of Socket Prongs to Gnd. (See Nos. on Schematic Diagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube</td>
<td>No. 1</td>
</tr>
<tr>
<td>744</td>
<td>6</td>
</tr>
<tr>
<td>756</td>
<td>6</td>
</tr>
<tr>
<td>706</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes: Voltage readings are for schematic diagram. Allow 1% or less on all measurements. Always use meter scale which will give greatest deflection within scale limits. All DC measurements made with 1000 ohm per volt millivolt.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment of Generator Connected to Dummy Antenna</th>
<th>Generator Frequency</th>
<th>Switch Setting</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Get dial drum so that indicator points to last dial mark when drum is fully closed.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I.F.</td>
<td>Ant.</td>
<td>456 KC</td>
<td>2nd I.F.</td>
<td>C4 1500</td>
<td>2nd I.F.</td>
</tr>
<tr>
<td>3</td>
<td>Broadcast</td>
<td>Ant.</td>
<td>2000 KC</td>
<td>1500 KC</td>
<td>C3 (Off)</td>
<td>Peak accurately</td>
</tr>
<tr>
<td>4</td>
<td>6th Audio</td>
<td>Ant.</td>
<td>6000 KC</td>
<td>6000 KC</td>
<td>C4 (Off)</td>
<td>Peak accurately</td>
</tr>
</tbody>
</table>

(Repeat operation 3)

<table>
<thead>
<tr>
<th>Operation</th>
<th>Alignment of Generator Connected to Dummy Antenna</th>
<th>Generator Frequency</th>
<th>Switch Setting</th>
<th>Tuning Cond. Setting</th>
<th>Trimmer</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>(Check calibration and sensitivity at 600 KC, 900 KC and 1500 KC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>SW</td>
<td>Ant.</td>
<td>18 MC</td>
<td>SW</td>
<td>C4 (Off)</td>
<td>SW</td>
</tr>
<tr>
<td>8</td>
<td>(Check calibration and sensitivity at 6 MC and 18 MC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1000 ohm non-inductive resistor and 200 ohm condenser in series.

*Both dial while making this adjustment. Make certain that adjustment is made on fundamental signal and not on noise. Peak accurately.
MODEL 610

Model 610 PUSH BUTTON ADJUSTMENT:
Any button may be set to any station desired. First, tune in the desired station by means of the thumb wheel. Second, turn the push button counter-clockwise two full turns. Then depress this button the full length of its stroke, and while depressed, tighten the button again by turning it clockwise. The button may now be released. To check the correct setting for this button, turn the thumb wheel to some other point and depress the push button. This will return the tuning mechanism to the station just set up. If it does not, repeat the foregoing sequence of operations more carefully. Each of the remaining buttons may be set to other stations in a like manner.

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>6A8 Grid</td>
<td>455</td>
<td>1, 2, 3 &amp; 4</td>
<td>5</td>
<td>50 uv</td>
</tr>
<tr>
<td>2</td>
<td>Ant. Coupler</td>
<td>1400</td>
<td></td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Through 50 uuf</td>
<td>1400</td>
<td>6</td>
<td>1000</td>
<td>10 uv</td>
</tr>
</tbody>
</table>

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ALIGNMENT - I.F. 465 KC THROUGH A .02 MFD. CONDENSER TO GRID CAP OF
BATO TUBE - DO NOT REMOVE GRID CAP - ADJUST IF TRIMMERS TO MAXIMUM OUTPUT
AT 1750 KC THRU .00025 MFD. CONDENSER TO RECEIVER ANTENNA (BLUE)
LEAD, ADJUST OSCILLATOR TRIMMER TO MAXIMUM. AT 1400 KC ANT. TRIMMER TO MAX.

COLOR CODE
RED - 15V.
BLACK - 15V.
ACRYL - 60V.
YELLOW - 5.

MODELS A2204, Z7208
Ch. 119B

MODELS Z7108 (Early)
Ch. 118B

"A" BATTERY
CABLE

GOTLED LINES SHOW
PARTS UNDERNEATH
SUB-BASE OF D
ELM. UNI.

5100 KC QSC TRIMMER
FOR 540-1750 KC BAND

4900 KC QSC TRIMMER
FOR 540-1750 KC BAND
CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII.

TRIM OSC- 1550 KC, TRIM ANT- 1400 KC
PAD- 600 KC

TUBE FUNCTIONS

1A7GT- MIXER-OSCILLATOR
IN5GT- I.F. AMPLIFIER
IN5GT- 2ND DET- A.C. 1ST A.F.
3Q6GT- OUTPUT
70L7GT- RECTIFIER

NOTE:-
C7 USED ON MODEL 5N1 ONLY.
ON MODEL 5N POINT 'A' IS CONNECTED TO CHASSIS.
SWITCH-1 IS ON-OFF.
SWITCH-2 IS A.C.-D.C. & BATTERY.
SWITCH-2 SHOWN FOR A.C.-D.C.
IF 455 K.C. ON MODEL 5N SWITCH, SWITCH 2A NOT USED.
115 volts AC or DC. Power consumption is 25 watts.
Sockets Voltages

Antenna grounded
Dial tuned to 540 KC

DIAGRAM NO. 50

PUSH BUTTON TUNER SWITCH

SECTION A
FRONT DECK

SECTION B
MIDDLE DECK

SECTION C
REAR DECK

TERMINALS OF THE ILLUSTRATIONS ABOVE CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE CIRCUIT DIAGRAM.

NOTE A: The bias on the control grid of the 6F6G tube is -16 volts measured across resisters No. 6 and 24.

NOTE B: The bias on control grids of the 6SK7 R.F., 6SK7 I.F., 6SA7 1st Det. tube and the diode plate of the 6SQ7 tube is -3.5 volts measured across resistor No. 27.

NOTE C: The bias on the control grid of the 8SQ7 tube is -1.5 volts measured across resistor No. 8.

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Connect the output meter across the voice coil of the 6F6G output tube and through a .1 mfd. condenser. The connection will depend on the type of meter. (The more sensitive should be connected across the voice coil.)

Connect the ground lead of the signal generator to the receiver chassis. Disconnect the blue wire coming from the antenna terminal strip and allow it to float free of the chassis. The loop wires should be connected to the terminal strip as shown in the circuit diagram when aligning.

On the phonograph terminal strip, ground the terminal nearest the center of chassis. Connect the remaining terminals together, using a short piece of wire.

Turn the volume control to the maximum volume position and keep it in this position throughout the alignment procedure.

With the gang condenser in full mesh, set the pointer at a point 1 3/4" from the left flange of the brown plate. This point corresponds to the last mark on the low frequency end of the dial scale. If the pointer is incorrectly set, it is only necessary to loosen the set screws on the dial drive drum and push the gang condenser in full mesh, with the pointer set properly, then retighten the set screws. See paragraph "Setting the Dial Pointer."

<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>Band Switch Position</th>
<th>Dial Pointer 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>Stator at front gang condenser</td>
<td>455 KC</td>
<td>Broadcast</td>
<td>Any Point Where It Does Not Affect the Signal</td>
<td>1-2</td>
<td>2nd I. F.</td>
<td>Adjust for Maximum Output then repeat adjustment.</td>
</tr>
<tr>
<td>250 MMFD. Mica Condenser</td>
<td>Black loop wire on terminal strip</td>
<td>1400 KC</td>
<td>Broadcast</td>
<td>1400 KC (3/4 from Right Dial Plate End)</td>
<td>3-4</td>
<td>1st I. F.</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>250 MMFD. Mica Condenser</td>
<td>Black loop wire on terminal strip</td>
<td>1400 KC</td>
<td>Broadcast</td>
<td>Tune to 1400 KC Generator Signal</td>
<td>5</td>
<td>Broadcast Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>250 MMFD. Mica Condenser</td>
<td>Black loop wire on terminal strip</td>
<td>600 KC</td>
<td>Broadcast</td>
<td>Tune to 600 KC Generator Signal</td>
<td>6</td>
<td>Broadcast Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Black loop wire on terminal strip</td>
<td>6.0 MC</td>
<td>Intermediate</td>
<td>6.0 MC (3/4 from Right Dial Plate Flange)</td>
<td>7</td>
<td>Intermediate Oscillator</td>
<td>Adjust for Maximum Output Check to see if proper peak is obtained by tuning in image approx. 5.1 MC. If image does not appear, realign at 6.9 with trimmer screw farther to rear side.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Black loop wire on terminal strip</td>
<td>6.0 MC</td>
<td>Intermediate</td>
<td>Tune to 6.0 MC Generator Signal</td>
<td>8</td>
<td>Intermediate Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Black loop wire on terminal strip</td>
<td>20 MC</td>
<td>Foreign</td>
<td>20 MC (3/4 from Right Dial Plate End)</td>
<td>9</td>
<td>Foreign Oscillator</td>
<td>Adjust for Maximum Output Check to see if proper peak is obtained by tuning in image approx. 10.1 MC. If image does not appear, realign at 20.1 with trimmer screw farther to rear side.</td>
</tr>
<tr>
<td>400 OHM Carbon Resistor</td>
<td>Black loop wire on terminal strip</td>
<td>20 MC</td>
<td>Foreign</td>
<td>Tune to 20 MC Generator Signal</td>
<td>10</td>
<td>Foreign Antenna</td>
<td>Adjust for Maximum Output.</td>
</tr>
</tbody>
</table>

After replacing the set in the cabinet, connect the blue wire coming from the terminal strip to the screw adjacent to this strip, in a weak signal near 1400 KC, and adjust trimmer No. 6 for maximum output.
HINTS ON REMOVING AND REPLACING CHASSIS

The suggestions given here will facilitate the servicing of this receiver.
To remove the chassis for service purposes, proceed as follows:
1. Pull off the volume control and range switch knobs at front of cabinet.
2. Pull the rubber bushing knockin top of cabinet. Take care not to lose the paper washers underneath the knobs.
3. Pull off the dial extension on the tuning shaft.
4. Use a 5 7/8" socket wrench to remove the three screws holding down the chassis. Two of these screws are located in recesses in the wooden blocks at the sides of the chassis. The third one is located near the bottom of the receiver chassis at the front of the cabinet. The chassis then rests on the rubber bushings which are on top of the three mounting blocks.
5. Slide chassis off blocks. The chassis will now drop down enough to permit getting it on a box or other support so it can be serviced with-out the necessity of removing any wires or cables.

When removing a chassis, put a few drops of speaker cement on each of the three rubber bushings and put them in their proper places on top of the mounting blocks. This will facilitate the replacement of the chassis, as the rubber bushings will be held in place by the cement.

If it becomes necessary to remove the chassis completely from the cabinet, in addition to the items mentioned above, the following procedure must also be used:

a. Remove the four wood screws holding the wooden panel at the front of the rear control compartment. This panel will then lift out, exposing the tone control switch, on/off switches for both motor and receiver, radio-phone switch, and the pilot light.

b. Disconnect the wire leads from the terminals on the chassis. Also disconnect the shield covering these wires. Remove the speaker and tone control plugs from their respective sockets. Remove the wood screw holding the pilot light bracket.

c. Disconnect the wires coming from the loop antenna.

d. Remove the wood screws holding the entire switch assembly. The thin wire frame and the black and red wire can now be unfastened from the on/off switch. Note in which terminal of the switch each wire goes, so that they can be replaced properly. Also remove the heavy black wire extending from the receiver chassis to the motor on/off switch. It is fastened to the cabinet and all three wire posts "a", "b", and "c" may be omitted. The chassis can now be removed from the cabinet.

e. When replacing either the tone control switch or the chassis into the cabinet, be sure the switch position may be changed by loosening the push buttons while the spring is pressed inwards. This slight difficulty can be overcome by lightly wrapping a toothpick or other fairly soft material between each push button and the escutcheon to hold the buttons out.

LOOP CONNECTIONS

BUILD-IN ANTENNA: The loop forms the antenna coil for the broadcast position and must therefore be connected at all times. The loop should be grounded in the broadcast position by connecting the blue wire coming from the terminal strip to the terminal provided on the chassis. On the antenna box and shield wave positions the shield serves as the antenna.

EXTERNAL ANTENNA: When an external antenna is to be used, connect it to the screw nearest the end of the chassis on the antenna terminal strip. The black wire should remain connected to this screw at all times.

When the external antenna is to be used on all bands, disconnect the blue wire from the chassis and tap it. When you wish to use the build-in antenna on broadcast and the external antenna on the intermedium and short wave positions, connect the blue wire to the chassis.

FOR AUTOMATIC RECORD CHANGER, SEE VOLUME XI, PAGES 11-9, 11-10, 11-11

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>List</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>17117</td>
<td>Cable—motor</td>
<td>50.30</td>
<td></td>
</tr>
<tr>
<td>17977</td>
<td>Coil hose and instructions</td>
<td>.45</td>
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<tr>
<td>11703</td>
<td>Cord—drive (supplied in ft. lengths)</td>
<td>.15</td>
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<tr>
<td>11705</td>
<td>Cord—drive (supplied in ft. lengths)</td>
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<tr>
<td>11707</td>
<td>Dial scale &amp; escutcheon</td>
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<tr>
<td>11709</td>
<td>Drive drum &amp; bushing</td>
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<tr>
<td>117498</td>
<td>Excelsior for push buttons</td>
<td>.20</td>
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<tr>
<td>87912</td>
<td>Eyebolt for center plate</td>
<td>.15</td>
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<tr>
<td>11111</td>
<td>Indicator button (bulb eye)</td>
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<td></td>
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<tr>
<td>11112</td>
<td>Indicator button (bulb eye)</td>
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<tr>
<td>11101</td>
<td>Light shield</td>
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<tr>
<td>88488</td>
<td>Pin for push buttons</td>
<td>.05</td>
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<tr>
<td>11113</td>
<td>Power switch (motor end)</td>
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<tr>
<td>11709</td>
<td>Power switch (motor end)</td>
<td>.50</td>
<td></td>
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<tr>
<td>11708</td>
<td>Pector assembly</td>
<td>.25</td>
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<tr>
<td>11122</td>
<td>Push buttons</td>
<td>.44.85</td>
<td></td>
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<tr>
<td>11790</td>
<td>Relay for push buttons</td>
<td>.64</td>
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<table>
<thead>
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<th>Part</th>
<th>Description</th>
<th>List</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>11145</td>
<td>Retaining ring for drive shaft</td>
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<td></td>
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<tr>
<td>11163</td>
<td>Rubber bushing chassis cap</td>
<td>.05</td>
<td></td>
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<tr>
<td>89204</td>
<td>Screw—set tapping 8 x 1/4</td>
<td>.01</td>
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<tr>
<td>89206</td>
<td>Screw—set tapping 8 x 1/4</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>91207</td>
<td>Set Screw—8 x 3/4 Square Head</td>
<td>.02</td>
<td></td>
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<tr>
<td>11189</td>
<td>Screw—special 9 x 3/4 x 1/2</td>
<td>.02</td>
<td></td>
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<tr>
<td>11164</td>
<td>Screw—special 9 x 3/4 x 1/2</td>
<td>.02</td>
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<td>81663</td>
<td>Socket—5 prong</td>
<td>.15</td>
<td></td>
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<td>11766</td>
<td>Socket—4 prong (for speaker)</td>
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<td>11669</td>
<td>Socket—small ornage hole</td>
<td>.15</td>
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<tr>
<td>11759</td>
<td>Socket—diot lamp</td>
<td>.15</td>
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<tr>
<td>11713</td>
<td>Socket—for pilot light</td>
<td>.15</td>
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<td>11280</td>
<td>Speaker—steel mechanism mfg. to chassis</td>
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<td>11377</td>
<td>Spring—diot cord tension</td>
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<td>11372</td>
<td>Spring for pointer</td>
<td>.09</td>
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<td>11748</td>
<td>Spring—push button</td>
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<td>11763</td>
<td>Terminal strip pointer</td>
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<td></td>
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<td>11710</td>
<td>Tuning shaft</td>
<td>.96</td>
<td></td>
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<td>11168</td>
<td>Washer—spring washers</td>
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<tr>
<td>11630</td>
<td>Washer (paper) for back of knob</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

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02-4B . 02-4C CHASSIS
ALIGNMENT PROCEDURE

FOR ALIGNMENT an output meter and an accurately calibrated signal generator are required.

Connect the output meter across the voice coil or between the plate of the 1A5GT 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.)

Connect the ground lead of the signal generator to the Ground Terminal or the chassis.

Turn the volume control to the maximum volume position and keep it in this position while aligning.

With the gang condenser in full mesh, set the dial pointer to the last mark on the left hand end of the dial scale.

<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 1A7GT</td>
<td>455 KC</td>
<td>Any Point Where It Does Not Affect Signal</td>
<td>1-2</td>
<td>2nd I.F.</td>
<td>Adjust for maximum output. Then repeat adjustment.</td>
</tr>
<tr>
<td>200 MMFD. Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>3-4</td>
<td>1st I.F.</td>
<td></td>
</tr>
<tr>
<td>200 MMFD. Condenser</td>
<td>Antenna Lead (Blue Wire)</td>
<td>1500 KC</td>
<td>Tune To 1500 KC Generator Signal</td>
<td>5</td>
<td>Broadcast Oscillator (Shunt)</td>
<td>Adjust for maximum output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Broadcast Antenna</td>
<td>Adjust for maximum output.</td>
</tr>
</tbody>
</table>

MODELS 02-4B1 TO 02-4B9

SINGLE UNIT BATTERIES

<table>
<thead>
<tr>
<th>FOR USE WITH 3 PLUG BATTERY CABLE</th>
<th>FOR USE WITH SINGLE PLUG BATTERY CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eversady No. 748</td>
<td>Eversady No. 748</td>
</tr>
<tr>
<td>Burgess 17G-D60 (with adapter)</td>
<td>Burgess 17G-D60</td>
</tr>
<tr>
<td>General 60DL-11L</td>
<td>General 60DL-11L</td>
</tr>
<tr>
<td>Ray-O-Vac AB28U</td>
<td>Ray-O-Vac AB82</td>
</tr>
</tbody>
</table>

POWER LINE OPERATION

To use this set on 110 volt 50-60 cycle A.C. power lines, use one of the following power packs:
Porta Power Model "G"  
Porta Power Model "U"
These units are manufactured by the General Transformer Corporation, 1250 W. Van Buren, Chicago, Ill.

SPECIAL BATTERY CABLE

A special battery cable assembly (Part No. 11658B) is available for use with sets using the single plug battery cable. This cable will allow the use of heavy duty batteries which are larger than those contained in the single unit battery packs and will give longer service. The special cable available is 30 inches in length and it will permit locating these batteries beneath the table or in the receiver cabinet. Complete instructions for use are packed with each cable, which may be purchased from the Stewart-Warner Corporation, Chicago, Illinois. It has a list price of 85c.
The first production release of the 02-4B chassis used a three plug type of battery cable so that it could be connected to separate A and B batteries. Most battery packs on the market are equipped with sockets for this three plug cable as well as for a single large plug so that they could be used with this set if desired. However, some battery manufacturers put out special battery packs that were equipped only with the single large socket. To use this special battery pack with the early production 02-4B chassis, obtain the correct adapter from the battery manufacturer.

Later production 02-4B as well as all 02-4C and 02-5T sets used the single large plug to connect to any battery pack, For those preferring to use separate A and B batteries, we provide our part #116566 battery cable and adapter. This cable is priced at $1.85 list.

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MODELS 02-4C1 TO 02-4C9

INSTALLATION OF BATTERIES

BATTERIES REQUIRED: This receiver is designed to operate from a single unit battery pack which fits into the receiver cabinet directly behind the chassis. The following battery packs will fit into the receiver cabinet in back of the chassis:

- Burgess 17G-D50
- General 60DL-11L
- Eversady No. 748
- Ray-O-Vac AB62
- or equivalent

The 4-prong plug on the end of the cable extending from the chassis is plugged into the 4-hole socket on top of the battery pack. No other battery connections are necessary.

HEAVY-DUTY BATTERIES: A special battery cable assembly (Part No. 116566) is available so that heavy duty batteries may be used with this receiver. These batteries are larger than those contained in the single unit power pack and will give considerably longer service, but due to their larger size, they will not fit into the cabinet. The special cable available is 30 inches in length and it will permit locating these batteries beneath the table, behind the receiver cabinet, or in the bottom portion of the console cabinet. Complete instructions for use are packed with each cable, which may be purchased from the Stewart-Warner Corporation, Chicago, Illinois.
### Models 02-5T1 to 02-5T9

**Diagram**

- **IA7G**: 1st DET
- **IN5G**: 1st DET
- **IH5G**: 2nd DET - AVC - AF
- **IQ5G**: OUTPUT

**SPECIAL CABLE**

- **Part No. 19664**
- **SPECIAL CABLE**
- **Part No. 19664**

**NOTICE**

- **19664**
- **SPECIAL CABLE**
- **Part No. 19664**

**Range Switch Shown**

- **1F. — 455 KC.**

**Models 02-5T1 to 02-5T9**

---

**Socket Voltages**

**Antenna Grounded**

- **Dial Tuned to 540 KC.**

**Antenna**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>89793 Condenser — mica, 110 mfd...</td>
<td>30.00</td>
</tr>
<tr>
<td>2-3/4</td>
<td>89501 Condenser — mica, 51 mfd...</td>
<td>15.00</td>
</tr>
<tr>
<td>5</td>
<td>89597 Condenser — mica 0042 mfd...</td>
<td>20.00</td>
</tr>
<tr>
<td>6</td>
<td>110532 Resistor — carbon 220,000 ohms...</td>
<td>12.00</td>
</tr>
<tr>
<td>7</td>
<td>11055 Resistor — carbon 1 megohm 1/4 watt...</td>
<td>12.00</td>
</tr>
<tr>
<td>8</td>
<td>110557 Resistor — carbon 4700 ohms 1/4 watt...</td>
<td>12.00</td>
</tr>
<tr>
<td>9</td>
<td>110565 Resistor — carbon 22,000 ohms 1/4 watt...</td>
<td>12.00</td>
</tr>
<tr>
<td>10</td>
<td>110566 Resistor — carbon 33,000 ohms 1/4 watt...</td>
<td>12.00</td>
</tr>
<tr>
<td>11</td>
<td>110569 Resistor — carbon 10,000 ohms 1/4 watt...</td>
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</tr>
<tr>
<td>12</td>
<td>110570 Resistor — carbon 2.5 meg. 1/4 watt...</td>
<td>10.00</td>
</tr>
<tr>
<td>13-14-15</td>
<td>110580 Resistor — carbon 5.3 meg. 1/4 watt...</td>
<td>10.00</td>
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<td>16</td>
<td>112799 Transformer — 2nd I.F.</td>
<td>36.00</td>
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<tr>
<td>17</td>
<td>112998 Condenser — electrolytic 16 mfd.</td>
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<tr>
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<td>112951 Resistor — carbon 400 ohms 1/4 watt...</td>
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<tr>
<td>19</td>
<td>112954 Resistor — carbon 220 ohms 1/4 watt...</td>
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<tr>
<td>20</td>
<td>114969 Condenser — mica 15 mfd...</td>
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</tr>
<tr>
<td>21</td>
<td>O-115099 Speaker — P. M. 8...</td>
<td>7.00</td>
</tr>
</tbody>
</table>

**All Prices Subject to Change Without Notice**
FOR ALIGNMENT an output meter and an accurately calibrated signal generator are required.

Connect the output meter across the voice coil or between the plate of the 105G 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.)

Connect the ground lead of the signal generator to the black wire or the chassis.

Turn the volume control to the maximum volume position and keep it in this position while aligning.

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.

### Dummy Ant. in Series with Sig. Gen. Connection of Sig. Generator Output To Receiver Signal Generator Frequency Band Switch Position Receiver Dial Setting Trimmer Number Trimmer Description Type of Adjustment

| 1 MFD. Condenser | Control Grid of 1ATC | 455 KC | Broadcast | Any Point Where It Does Not Affect the Signal | 1-2 | 2nd L.F. | Adjust for maximum output. Then repeat adjustment. |
| 200 MFD. Mica Condenser | Antenna Lead (Blue Wire) | 1500 KC | Broadcast | 1500 KC | 5 | | Adjust for maximum output. |
| 200 MFD. Mica Condenser | Antenna Lead (Blue Wire) | 1500 KC | Broadcast | Tune To 1500 KC Generator Signal | 6 | | Adjust for maximum output. |
| 250 MFD. Mica Condenser | Antenna Lead (Blue Wire) | 600 KC | Broadcast | Tune To 600 KC Generator Signal | 7 | | Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained. |
| 400 OHM Carbon Resistor | Antenna Lead (Blue Wire) | 15 MC | Foreign | 15 MC | 8 | Foreign Oscillator (Shunt) | Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 MC. If image does not appear realign at 15 MC with trimmer screw farther out. Recheck image. |
| 400 OHM Carbon Resistor | Antenna Lead (Blue Wire) | 15 MC | Foreign | Tune To 15 MC Generator Signal | 9 | | Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained. |

### MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>16550</td>
<td>Battery cable—for heavy duty batteries</td>
<td>$0.85</td>
</tr>
<tr>
<td>16549</td>
<td>Cable—battery</td>
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<tr>
<td>14995</td>
<td>Clamps—for dial cord</td>
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</tr>
<tr>
<td>112745</td>
<td>Clip—coil mounting</td>
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<tr>
<td>109140</td>
<td>Clip—grid</td>
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<td>110507</td>
<td>Cord—drive—supplied in 3 ft. lengths</td>
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<td>110830</td>
<td>Dial escutcheon</td>
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<tr>
<td>119800</td>
<td>Dial scale</td>
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<td>67228</td>
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<td>110510</td>
<td>Knob—tuning or volume</td>
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<td>24954</td>
<td>Nut—8-32 for gang mfg</td>
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<td>110820</td>
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<td>Pointer</td>
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<td>Retaining ring—for drive shaft</td>
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<td>119557</td>
<td>Screw—for escutcheon</td>
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<td>110501</td>
<td>Socket—4 prong (for speaker)</td>
<td>.16</td>
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<tr>
<td>85427</td>
<td>Socket—octal base (standard)</td>
<td>.15</td>
</tr>
<tr>
<td>110909</td>
<td>Spacer—steel mfg. (for gang condenser)</td>
<td>.02</td>
</tr>
<tr>
<td>114669</td>
<td>Spring—dial cord tension</td>
<td>.03</td>
</tr>
<tr>
<td>111095</td>
<td>Spring—for indicator lever</td>
<td>.01</td>
</tr>
<tr>
<td>116501</td>
<td>Spring—tuning shaft</td>
<td>.10</td>
</tr>
<tr>
<td>116530</td>
<td>Washer (paper) for back of knobs</td>
<td>.005</td>
</tr>
<tr>
<td>111458</td>
<td>Washer—spring washer</td>
<td>.01</td>
</tr>
</tbody>
</table>

BATTERIES REQUIRED: One of the following or its equivalent is required: Eveready No. 746, Burgess 17G-D50, General 66L11, Ray-O-Vac A8B2. A special battery cable assembly (Part No. 116368) is available so that heavy duty batteries may be used with this receiver.
ALIGNMENT PROEDURE FOR 11-7A CHASSIS

NOTE: This chassis may be completely aligned while in the cabinet.

1. Connect the output meter across the voice coil or from plate to plate of the EF86 output tube through a .1-mfd. capacitor.
2. Connect the output lead of the signal generator to the receiver chassis. Tune the volume control to position of maximum volume and minimum drive.
3. Connect the loop as shown in diagram on back page. The loop must remain in the circuit at all times.

**CHASSIS 11-7A**

REPLACING DIAL AND POINTER DRIVE CORD

1. Mark a reference point about 2 inches from the point where the dial cord was connected to the set.
2. Disconnect drive cord at point where it is connected to receiver.
3. Trace cord through harness and locate reference point.
4. Using a new drive cord, reconnect at reference point and tension the cord until it is tight.

TO SET POINTER

The pointer should be set to 600 Kc on the dial scale when the tuning condenser is in full clockwise position. Connect power to radio at this point and allow to warm up before adjusting.

**ALIGNMENT PROCEDURE**

1. Connect the output meter across the voice coil or from plate to plate of the EF86 output tube through a .1-mfd. capacitor.
2. Connect the output lead of the signal generator to the receiver chassis. Tune the volume control to position of maximum volume and minimum drive.
3. Connect the loop as shown in diagram on back page. The loop must remain in the circuit at all times.
ALIGNMENT PROCEDURE

FOR ALIGNMENT: A 1,000 ohm meter and an accurately calibrated signal generator are required.

1. Connect the output meter across the voice coil or, using a condenser in series, connect between the plate of the 12SA7 output tube and B—as shown on the voltage chart. The more sensitive type should be connected across the voice coil.

2. Connect the ground lead of the signal generator to the B—log (shown on the voltage chart) through a 55 milliamp (mA) condenser and keep it connected in this manner throughout the entire alignment procedure. Failure to use the series condenser may give unsatisfactory results; an oscilloscope should be used for this purpose.

3. Tune the volume control to the maximum volume position and leave it in this position throughout the entire alignment procedure.

4. Set the Scale Pointer to null mark after 55 on the dial with the gauge condenser in full mesh.

5. The loop must be connected at all times.

### ELECTRICAL PARTS

![Diagram of electrical parts](image)

### BOTTOM VIEW OF CHASSIS

![Bottom view of chassis](image)

### VOLTAGES MEASURED BETWEEN 5OL6GT AND 5OL6GT TERMINALS

- 5OL6GT: 2nd DET-AT-A.V.C.
- 3576GT: 2nd DET-AT-A.V.C.
- 12SQ7: 2nd DET-AT-A.V.C.
- 12SK7: 2nd DET-AT-A.V.C.
- 12SA7: 2nd DET-AT-A.V.C.

### USE A Voltmeter of 1,000 ohms per volt.

**Sept. 10, 1940**

CIRCUIT CHARGE—TOP OF PHOTO PICK-UP SOCKET HAS ONE OF ITS TERMINALS CONNECTED DIRECTLY TO "C" (BEARING LEAD) AS SHOWN ABOVE. ON LATER PRODUCTION, A $25.00 ohm 150 watt RESISTOR (ceramic) IS CONNECTED BETWEEN THIS SOCKET TERMINAL AND "C".
INTERMEDIATE FREQUENCY
455 KC.

FOR ALIGNMENT, SEE INDEX

ELECTRICAL PARTS

<table>
<thead>
<tr>
<th>Diagram Number</th>
<th>Part Number</th>
<th>Part Number</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>820532</td>
<td>9</td>
<td>Condenser—Mic. 26 mfd. 450 Volt</td>
<td>.29</td>
</tr>
<tr>
<td>2</td>
<td>83078</td>
<td>1</td>
<td>Condenser—Mic. 115 mfd. 25 Volt</td>
<td>.20</td>
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<tr>
<td>4</td>
<td>85061</td>
<td>5</td>
<td>Condenser—Mic. 51 mfd. 25 Volt</td>
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<td>5</td>
<td>95511</td>
<td>6</td>
<td>Condenser—Mic. 26 Mfd. 25 Volt</td>
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<tr>
<td>6</td>
<td>110583</td>
<td>7</td>
<td>Resistor—Carbon, 47,000 Ohms, 1/4 W.</td>
<td>.12</td>
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<tr>
<td>7</td>
<td>110553</td>
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<td>Resistor—Carbon, 220,000 Ohms, 1/4 W.</td>
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<tr>
<td>9</td>
<td>110580</td>
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<td>Resistor—Carbon 3.3 meg. 1/4 W.</td>
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<tr>
<td>10</td>
<td>110629</td>
<td>10</td>
<td>Dual Light—4-3 Volt (Maxon No. 44)</td>
<td>.15</td>
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<tr>
<td>11</td>
<td>112974</td>
<td>11</td>
<td>Resistor—Carbon 22,000 Ohms, 1 Watt</td>
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<tr>
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<td>Resistor—Carbon 10 Meg. 1/4 W.</td>
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<td>Resistor—Carbon 12,000 Ohms, 1 Watt</td>
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<tr>
<td>14</td>
<td>11425</td>
<td>14-15</td>
<td>Condensers—Electrolytic—8 mfd. 650 Volt</td>
<td>.98</td>
</tr>
<tr>
<td>16</td>
<td>115114</td>
<td>16</td>
<td>Speaker—Dynamic (6&quot;)</td>
<td>.50</td>
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<tr>
<td>17</td>
<td>116368</td>
<td>17</td>
<td>Resistor—580 Ohms, 1/4 W.</td>
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<tr>
<td>19-19</td>
<td>116235</td>
<td>19</td>
<td>Condenser—1 Mfd. 600 Volt</td>
<td>.25</td>
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<tr>
<td>21</td>
<td>116919</td>
<td>21</td>
<td>Condenser—0.05 Mfd. 600 Volt</td>
<td>.20</td>
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<tr>
<td>22</td>
<td>116978</td>
<td>22</td>
<td>Resistor—420 Ohm—1/2 Watt</td>
<td>.15</td>
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<tr>
<td>23</td>
<td>119024</td>
<td>23</td>
<td>Transformer—2nd I.F.</td>
<td>1.15</td>
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<tr>
<td>24-26</td>
<td>119043</td>
<td>24</td>
<td>Transformer—1st I.F.</td>
<td>1.10</td>
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<tr>
<td>26-28</td>
<td>119193</td>
<td>26</td>
<td>Condenser—0.01 Mfd. 600 Volt</td>
<td>.15</td>
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<tr>
<td>28-28</td>
<td>119029</td>
<td>28</td>
<td>Vol. Control—1 meg. &amp; Switch</td>
<td>1.00</td>
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<tr>
<td>29-30</td>
<td>119030</td>
<td>29-30</td>
<td>Tone Switch</td>
<td>.65</td>
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<tr>
<td>30-31</td>
<td>119031</td>
<td>30-31</td>
<td>Condenser—0.04 Mfd. 600 Volt</td>
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<td>31-31</td>
<td>119080</td>
<td>31-31</td>
<td>Condenser—0.04 Mfd. 600 Volt</td>
<td>.20</td>
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</tbody>
</table>

DIAGRAM NO. 20

SOCKET VOLTAGES
VOLTAGE ON FULL WITH NO SIGNAL DIAL TUNED TO 540 KC.
LINE VOLTAGE 47 VOLT
VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

USE A 1000 OHM PER VOLT—VOLTMETER

AFTER ALIGNMENT—Replace the set in the cabinet and using a weak
signal generator or station signal at 1500 KC., readjust trimmer No. 6.

Reduce to 9/16"
ALIGNMENT PROCEDURE FOR 11-BB & 11-BB-Z CHASSIS

1. Connect the output meter across the voice coil, or bridge plate to ground of the speaker outputs through a .1
   mfd condenser. (The more sensitive type should be connected across the voice coil.)
2. Connect the ground lead of the signal generator to the receiver chassis and connect the black wire from the
   output of the signal generator to the top of the loop circuit.
3. Turn the volume control to the maximum position and keep it in this position throughout the alignment
   procedure.
4. Push the Mute button and keep it depressed in.
5. The loop must be connected as indicated in overall diagrams at all times.
6. With some signal generators, it may be found that the signal cannot be reduced to a usable volume using
   the dummy antenna recommended below. On the Short Wave and Interference positions the black wire
   (black) may be disconnected from its jack and the output of the signal generator connected to the black wire
   terminal through a 100 ohm resistor.

<table>
<thead>
<tr>
<th>Dummy Ant. in Series with Loop</th>
<th>Connection of Signal Generator to Loop</th>
<th>Signal Generator Frequency</th>
<th>Bandwidth Setting</th>
<th>Receiver Mod Setting</th>
<th>Trimmer No.</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-BB-Z Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>455 Kc</td>
<td>Broadcast</td>
<td>1-3</td>
<td>1-3</td>
<td>Adjust for maximum output. Then on your receiver.</td>
<td></td>
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<tr>
<td>11-BB Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>1600 Kc</td>
<td>Broadcast</td>
<td>5</td>
<td>Foreign</td>
<td>16 MC</td>
<td>Foreign Decidator</td>
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<td>11-BB Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>6000 Kc</td>
<td>Broadcast</td>
<td>8</td>
<td>Foreign</td>
<td>16 MC</td>
<td>Foreign Decidator</td>
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<tr>
<td>11-BB-Z Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>5 MC</td>
<td>Interference</td>
<td>8</td>
<td>Foreign</td>
<td>16 MC</td>
<td>Foreign Decidator</td>
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<tr>
<td>11-BB Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>5 MC</td>
<td>Interference</td>
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<td>Foreign</td>
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<td>Foreign Decidator</td>
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<td>11-BB-Z Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>500 MC</td>
<td>Interference</td>
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<td>Foreign</td>
<td>16 MC</td>
<td>Foreign Decidator</td>
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<tr>
<td>11-BB Antenna</td>
<td>Primary Loop on Rear Terminal of Loop</td>
<td>1500 Kc</td>
<td>Interference</td>
<td>11</td>
<td>Foreign</td>
<td>16 MC</td>
<td>Foreign Decidator</td>
</tr>
</tbody>
</table>

ALIGNMENT PROCEDURE FOR 11-6T & 11-6T-S CHASSIS

IMPORTANT:
1. The loop must be connected to the receiver at all times.
2. Push in better marked "Radio.
3. Connect an output meter to the receiver. Connect the ground lead of the signal generator to the receiver
   chassis.
4. With dummy condenser in full mesh, set the dial pointer so that its position is horizontal.
5. Turn the volume control to maximum and keep it in this position throughout the alignment.

22 OHM MFD Micro Condenser
22 OHM MFD Micro Condenser
22 OHM MFD Micro Condenser
22 OHM MFD Micro Condenser
22 OHM MFD Micro Condenser
22 OHM MFD Micro Condenser

Install speaker, chassis and loop in the cabinet, then repeat adjustments of trimmers 8 and 9.

NOTE
1. Trimmers 1, 2, 3 & 4 are on top of the chassis. They are all the same size and are located on the top side of the chassis.
2. The Loop connection circuit below applies to chassis 11-BB.
3. The loop connection is identical to the chassis 11-BB.

Chassis 11-9B, 11-9B-S, 11-9B-Z

Cord Clamp
Ponte Voiletter

Chassis 11-9B, 11-9B-S

Chassis 11-312 to 11-9B-Z

1. CORRECTIONS SHOWN BELOW APPLY TO THE CHASSIS NOT STAMPED WITH A LETTER ON THE BACK.

2. GREEN & WHITE:
3. BLACK:
4. RED-WHITE:
5. B.C. ANT.
6. 1500 Kc:
7. INT. OSC.
8. 5 MC:
9. B.C. OSC.
10. 16 MC:
11. INT. ANT.
12. 5 MC:
13. B.C. ANT.
RECORER SERVICE DATA

PUSH BUTTONS

The six push buttons shown in this circuit control the various functions of this receiver. The "RADIO," "PHONO," "MICRO-
P.A." and "MICRO-RECOR." buttons are mechanically intercon-
ected so that when any one of them is pressed in, it releases any of the other three buttons which was pressed in.
The "RECOR. ON" and "RECOR. OFF" buttons are mechanically intercon-
ected so that when one of them is pressed in, it releases the other, the three buttons being independent of the other four but-
tons. Pushing in the "RECOR. ON" button releases the "RECOR.
OFF" button and vice versa.

ACTION OF VARIOUS PUSH BUTTONS

RADIO—Button in: Cathode circuits of 6SA7 and 6SK7 connected to ground through resistor No. 27. Volume control con-
ected across diode load resistor No. 16.

PHONOS Button in: Output of crystal pickup connected across Volume Control.

MICRO-P.A.—Buton in: Output of microphone amplifier connected across volume control. Loudspeaker connected to reproduce sound.

MICRO-RECOR.—Button in: Microphone amplifier connected as under "MICRO-P.A." In addition speaker is silenced by disconnecting the voice coil and connecting the output transformer secondary to resistor No. 54. This prevents acoustical feedback from speaker to microphone when recording.

RECOR-ON—Button in: This button connects the crystal recorder to the output of the receiver.

RECOR-OFF—Button in: This releases "RECOR-ON" button as it is mechanically coupled to it.

ADJUSTING THICKNESS OF SHAVING

The proper thickness of the shaving produced when a record is cut is about the thickness of a human hair. If the cutting needle is sharp and evenly spaced, and the needle is adjusted to give the correct depth of cut, the shaving should come off as a long continuous ribbon. With some types of recording blanks, the ribbon cut by the cutting needle will come off as a straight band, while with others it may produce a curly thread. This ribbon should not, however, be too fine or extremely crinkly as this indicates a dull cutting needle or insufficient pressure of the recording head.

When the cutting head is placed on a record blank, the needle locking screw should be halfway between the top and bottom of the hole in the head. The position of the cutting needle screw may be changed by raising the cutter arm and adjusting the screw and locknut under this arm. Turning this screw clockwise will raise the stylus screw—counter-clockwise rotation will lower it.

The depth of cut can be varied by means of the adjusting screw on the recorder arm. This screw is located on top of the arm and is readily accessible for adjustment. Turning this screw clockwise increases the thickness of the shaving, while turning it counter-clockwise decreases the thickness. However, if the cutting needle is dull or damaged, turning this adjusting screw will have very little effect on the depth of cut.

The proper depth of cut may be determined by cutting several grooves with no voltage impressed on the cutter head (RECOR-
OFF button pushed in). Then examine these blank grooves by reflecting light from the record and viewing the grooves through a low-power microscope. The width of the space between the grooves should be slightly less than the width of the grooves.

PROPER RECORDING LEVEL

When recording, the volume control should be adjusted to a setting somewhat higher than that required for good room volume, but below the point of overloading and distortion. If too high a volume level is used, an echo may be heard when playing back or "overcutting" of the grooves may result—that is, on loud pas-
sages one groove may actually cut into the adjacent groove, causing distortion when the record is being played. If this occurs the volume control setting should be decreased while recording, until the recorded level is normal.

On the other hand, if the level of the program being recorded is too low, it will necessitate increasing the volume control setting when playing back the recording, and the hiss and background noise will be excessive.

RECORER HEAD INOPERATIVE

A quick check of the recording head can be made by pushing in the "RECOR-ON" and "RECOR-OFF" buttons and then tuning in a station. If the recorder is operating, this fact is easily determined by holding the cutting stylus of the cutter between the thumb and forefinger. Any vibration of this stylus indicates that the cutter head is in operation.

If the recorder does not operate, check first to determine if an A.C. voltmeter exists across the terminals of the recorder socket. This can be measured using the 0.1 or 0.01 volt scale of a rectifier type A.C. Voltmeter. With proper recording volume the peaks of the voltage appearing across these terminals should be 60 to 120 volts. If no voltage exists under these conditions, check the contacts of the "RECOR-ON" switch, and the condenser No. 30 coupling the recorder to the B868 plate. If these circuits are found to be all right check the recorder crystal cartridge and replace if necessary.

CORRECT NEEDLE ANGLE

When making a recording, the cutting needle should be set at such an angle that the thread cut from the record will be thrown toward the center of the record. Otherwise the thread may be caught under the cutting needle, causing it to cut the grooves improperly.

If the thread is not thrown toward the center of the record, loosen the thumb screw holding the recording needle in the cutter head, then reposition it correctly. This will generally change the angle of the needle slightly, causing the thread to wind about the center pin of the turntable.

CAUTION: Never cut thin, cactus or wooden playback needles on home recordings. Their friction coefficient is high and they score the grooves.

DEFECTIVE CUTTING NEEDLE

A cutting needle is considered worn when the background hiss
becomes objectionable, or when the thread cut from the record becomes rough. A dull needle may also cause the depth of cut
to be incorrect.

The condition of the cutting needle can be determined by ex-
amining the thread by means of a powerful magnifying glass or
low power microscope, and comparing it with a good needle
viewed in a similar manner. Another good check on the condition
of the cutting needle is the appearance of a new cut record.

If the thread has a dull or grainy appearance instead of its usual
shiny appearance, the needle should be replaced.
MODEL 11-2A Chassis 11-2A
Wireless Record-Player

Diagram

ADJUSTMENTS

Diagram

STEWART-WARNER CORP.

ELECTRICAL PARTS

Part | List
--- | ---
1 | 61359 Condenser—mic. 250 mmfd. | .03
2 | 61793 Condenser—mic. 110 mmfd. | .20
3 | 110559 Resistor—carbon 470,000 ohms 1/4 watt | .12
4 | 110559 Resistor—carbon 10,000 ohms 1/4 watt | .12
5 | 110558 Resistor—carbon 68,000 ohms 1/4 watt | .12
6 | 110558 Resistor—carbon 5.3, 1/4 watt | .12
7 | 110551 Resistor—insulated 33,000 ohms 1/4 watt | .15
8A-8B | 116479 Condenser—electrolytic 20-20 mfd. 150 volt | .05
9-10 | 116823 Condenser—1 mfd. 600 volt | .25
11-12 | 116819 Condenser—15 mfd. 600 volt | .20
13 | 118823 Resistor—1000 ohms 1 watt Wire Wound | .15
14 | 160499 Coil—oscillator | .25
15 | 160501 Condenser—tuning | .25
16 | 160540 Ballast tube | .50
17A-17B | 160576 Volume control—250,000 ohms with switch | 1.45
18 | 160603 Motor—less turntable | 5.65
19 | 160617 Crystal cartridge | 4.50

MISCELLANEOUS PARTS

Part | List
--- | ---
119416 Automatic stop for phonograph | .80
119457 Base for mfg. electrolytic condenser | .04
117798 Clip—for mfg. oscillator cell | .01
160617 Crystal cartridge | 4.50
160558 Escutcheon plate & terminal strip | .32
161104 Idler wheel with rubber rim | .00
160219 Knob—push on | .06
160335 Needle cup | .08
160575 Phonon pickup arm complete | 3.00
161363 Rubber hushing—motor mfg. | .01
119731 Socket—9 prong | .12
119676 Socket—socket base | .15
119732 Turntable—3" | 1.50

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

SOCKET VOLTAGES

| 35L6GT | 35Z5GT | 160540 |
--- | --- | ---
| **MODULATOR-OSC.** | **Ballast** | **Ballast** |
| 35AC | 35DC | 115VAC |

NOTE A: Voltage on the screen of the 35L6GT cannot be measured with the ordinary voltmeter because of the high resistance of resistor No. 6. Use a voltmeter of at least 1000 ohms per volt.

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ALIGNMENT PROCEDURE FOR 11-6V CHASSIS

NOTE: THIS SET MAY BE COMPLETELY ALIGNED WITHOUT REMOVING FROM THE CABINET.

1. Connect the power cord to the radio and turn on the power. This will turn on the receiver.
2. Set the volume control to the maximum volume position and adjust the trimmers to the specified settings.
3. Set the dial to the center position and adjust the trimmers to the specified settings.
4. Turn the volume control to the minimum volume position and adjust the trimmers to the specified settings.
5. Set the dial to the center position and adjust the trimmers to the specified settings.
6. Repeat steps 3 and 4 to ensure that the receiver is completely aligned.

ALIGNMENT PROCEDURE FOR 11-6U AND 11-6U-Z CHASSIS RECEIVER MODELS 11-6U1 to 11-6U9 and 11-6U1-Z to 11-6U9-Z

1. Connect the ground lead of the signal generator to the chassis.
2. Connect the output meter to the receiver and the signal generator.
3. Set the dial to the center position and adjust the trimmers to the specified settings.
4. Connect the output meter to the receiver and the signal generator.
5. Set the dial to the center position and adjust the trimmers to the specified settings.
6. Repeat steps 3 and 4 to ensure that the receiver is completely aligned.

ALIGNMENT PROCEDURE FOR 11-6-10 CHASSIS

NOTE: This alignment procedure is for the 11-6-10 chassis.

1. Connect the power cord to the radio and turn on the power. This will turn on the receiver.
2. Connect the output meter to the receiver and the signal generator.
3. Set the dial to the center position and adjust the trimmers to the specified settings.
4. Connect the output meter to the receiver and the signal generator.
5. Set the dial to the center position and adjust the trimmers to the specified settings.
6. Repeat steps 3 and 4 to ensure that the receiver is completely aligned.

REPLACING THE DIAL CORDS

The process of replacing the dial cords may be accomplished by following these steps:

1. Remove the old dial cords from the cabinet.
2. Cut the new dial cords to the appropriate length.
3. Insert the new dial cords into the cabinet and connect them to the receiver.
4. Test the receiver to ensure that the dial cords are functioning properly.

NOTE: These instructions assume that the receiver is in the cabinet and has been aligned.

Reprint of the dial drive assembly diagram.
ALIGNMENT PROCEDURE FOR 11-10A & 11-10A-Z CHASSIS

1. Connect the output meter across the voice coil or from the plate of the IFGR output level is turned through a .1 mil condenser. The voice coil meter should be connected across the voice coil.

2. Connect the second lead of the output meter in the meter channel and change the black wire from the meter to the inner slip on top of the loop itself.

3. Tune the volume control to the maximum position and keep it in this position throughout the alignment procedure.

4. Push in the button on the front and keep it pushed in.

5. The loop should be connected as indicated in the circuit diagram at all times.

6. The loop must be connected as indicated in the circuit diagram at all times.

NOTE: The alignment procedure must be followed as indicated in the printed wiring schematic for best results.

ALIGNMENT PROCEDURE FOR 11-10A & 11-10A-Z CHASSIS

1. The output meter across the voice coil or from the plate of the IFGR output level is turned through a .1 mil condenser. The voice coil meter should be connected across the voice coil.

2. Connect the second lead of the output meter in the meter channel and change the black wire from the meter to the inner slip on top of the loop itself.

3. Tune the volume control to the maximum position and keep it in this position throughout the alignment procedure.

4. Push in the button on the front and keep it pushed in.

5. The loop must be connected as indicated in the circuit diagram at all times.

6. The loop should be connected as indicated in the circuit diagram at all times.

7. The alignment procedure must be followed as indicated in the printed wiring schematic for best results.
ALIGNMENT PROCEDURE FOR 11-8D & 11-8D-Z CHASSIS
RECEIVER MODELS 11-8D1 TO 11-8D9 & 11-8D1-Z TO 11-8D9-Z

1. Push the manual button in and keep it pushed in.

2. Connect the signal generator ground lead to the receiver chassis. Adjust the volume control to the maximum volume position and leave it in this position during entire alignment procedure.

3. Connect the output meter across the voice coil or from plate to plate of the IF output tubes through or.1 mfd. condenser.

<table>
<thead>
<tr>
<th>Dummy Load Before Box Gain</th>
<th>Conversion of Gain to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Gain Setting</th>
<th>Tuner Number</th>
<th>Tuner Description</th>
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<td>1-2</td>
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<td>Adjust for Minimum Output. Then reset Adjustment.</td>
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<td>455 OHM Carbon Resistor</td>
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<td>Adjust for Minimum Output. Then reset Adjustment.</td>
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<tr>
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<td>1-2</td>
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</table>

Place chassis in cabinet before making adjustments 8, 9 and 10.

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</tbody>
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ALIGNMENT PROCEDURE FOR 11-8R CHASSIS

NOTE: This receiver may be completely aligned without removing the chassis from the cabinet.
1. Connect the ground lead of the signal generator to the chassis, and the loop antenna to the proper terminals on the chassis back.
2. Push in the buttons marked "BAND" and "BAND-UP." Connect the output meter across the voice coil or from plate to plate of the IF output tubes through or.1 mfd. condenser.
3. Turn the volume and meter control to the maximum electron tube position and keep it in this position throughout the entire alignment procedure.
4. With the volume control at half scale, set the meter so it is in line with the graduation on the extreme left and at the full scale.

<table>
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<td>1-2</td>
<td>1st LF</td>
<td>Adjust for maximum output.</td>
<td></td>
</tr>
</tbody>
</table>

DRIVE ASSEMBLY DATA

CHASSIS 11-8D, 11-8D-Z

TO REPLACE DIAL DRIVE CORD
1. Make a loop in end of cord (Part No. 1174077) using a dial and slip cord (Part No. 1174059) to tie A and one end of the cord to the spring at point A.

2. From the other end of the dial cord through hole C on the rear of the drum.

3. Make two or more half turns of the cord around bushing shaft D.

4. Continue the cord to hole E in the rear of the drum.

5. The cord length should be adjusted so that the cord will be slightly extended. Fasten the cord to the spring at point A and then unfastening spring to pull G.

TO REPLACE POWERED DRIVE CORD
1. Place the meter in position (Part No. 1174054) on the meter side of the drum.

2. Place cord through hole B at the front of the drum.

3. Connect cord around drum and around pulley E.

4. From pulley E up over pulley F and around back of drum through hole C.

5. The length of meter should be extended until the spring is extended or approximately the length indicated. Fasten the cord to the spring at point A and then unfastening spring to pull G.

TO REPLACE POWERED DRIVE CORD
1. Make a loop in end of cord (Part No. 1174077) using a dial and slip cord (Part No. 1174059) to tie A and one end of the cord to the spring at point A.

2. From the other end of the dial cord through hole C on the rear of the drum.

3. Make two or more half turns of the cord around bushing shaft D.

4. Continue the cord to hole E in the rear of the drum.

5. The cord length should be adjusted so that the cord will be slightly extended. Fasten the cord to the spring at point A and then unfastening spring to pull G.

TO REPLACE POWERED DRIVE CORD
1. Make a loop in end of cord (Part No. 1174077) using a dial and slip cord (Part No. 1174059) to tie A and one end of the cord to the spring at point A.

2. From the other end of the dial cord through hole C on the rear of the drum.

3. Make two or more half turns of the cord around bushing shaft D.

4. Continue the cord to hole E in the rear of the drum.

5. The cord length should be adjusted so that the cord will be slightly extended. Fasten the cord to the spring at point A and then unfastening spring to pull G.
ADJUSTMENT OF CUTTING HEAD

Before attempting any adjustments of the cutting head, make certain that such adjustments are necessary by making a test recording using a new needle and a record blank of known quality.

DEFECTIVE CUTTING NEEDLE

A cutting needle is considered worn when the background hiss becomes objectionable, or when the thread cut from the record becomes ragged. A dull needle may also cause the depth of cut to be incorrect.

The condition of the cutting needle can be determined by examining the print by means of a powerful magnifying glass or low power microscope, and comparing it with a good needle viewed in a similar manner. Another good check on the condition of the cutting needle is the appearance of a freshly cut record. If the record has a dull or grayish appearance instead of its usual shiny appearance, the needle should be replaced.

ADJUSTING THICKNESS OF SHAVING

The proper thickness of the shaving produced when a record is cut is about the thickness of a human hair. If the cutting needle is sharp and in good condition, and the cutting head is adjusted to give the correct depth of cut, the shaving should come off as a long continuous ribbon. With some types of recording blanks, the ribbon cut by the cutting needle will come off as a straight band, while with others it may produce a curly thread. This ribbon should not, however, be too fine or extremely crinkly as this indicates a dull cutting needle or insufficient pressure of the recording head.

When the cutting head is placed on a record blank, the needle locking screw should be halfway between the top and bottom of the hole in the head. The position of the cutting needle screw may be checked on the Model 11-88B by raising the cutting arm and adjusting the screw and lock nut under this arm. On Model 11-88B it is only necessary to adjust the screw near the rear end of the recording arm, with a screwdriver.

The depth of cut can be varied on Model 11-88B by adjusting the screw at the center of the recording arm with a screwdriver. Clockwise rotation increases the thickness while counter-clockwise rotation decreases the thickness of the shaving. This adjustment will have little effect if the needle is dull or damaged.

On Model 11-88B this adjustment is made by varying the position of the knob on the top of the recording arm. This knob has engaged upon it the letters "L" "M" and "H" indicating light medium and heavy shavings. Adjustment should be made to compensate for different types of needles and record blanks if an examination of the record and showings indicates that an adjustment is necessary. BEFORE ADJUSTING FOR THICKNESS OF SHAVING MAKE CERTAIN THAT THE CUTTING NEEDLE IS PROPERLY MOUNTED. ALSO TRY A NEW CUTTING NEEDLE, SINCE THE OLD ONE MAY BE WORN OR DAMAGED.

RECORER HEAD INOPERATIVE

A quick check of the recorder head can be made by pushing in the "RECOR, ON" button and the "RADIO" button and then tuning in a station. If the recorder is operating, this fact is easily determined by holding the cutting needle of the cutter between the thumb and forefinger. Vibration of the needle indicates that the cutter head is in operating condition.

If the recorder does not operate, check first to determine if an A. voltage exists across the recorder socket. This can be measured using the 0-150 volt scale of a rectifier type A. C. Voltmeter. With proper recording volume the peaks of the voltage appearing across these terminals should be 50 to 120 volts. If no voltage exists under these conditions, check the contacts of the "RECOR, ON" switch, and the condenser No. 40 coupling the recorder to the 6V6 tube, and found to be all right check the recorder crystal cartridge and replace if necessary.

CORRECT NEEDLE ANGLE

When making a recording, the cutting needle should be set at such an angle that the thread can be thrown toward the center of the record. Otherwise the thread may be caught under the cutting needle, causing it to cut the grooves improperly.

The thread is not thrown toward the center of the record, loosen the thumb screw holding the recording needle in the cutting head, turn the needle VERY SLIGHTLY so that the flat side of the cutting tip faces more toward the center of the record and retighten thumb screw. This will change the angle of the needle sufficiently to cause the thread to wind about the center pin of the recordable.

Use care in making this adjustment as the needle will not cut properly if it is turned too far.
GENERAL INSTRUCTIONS

1. FUNCTION OF RECORD CHANGER WHEN IT IS GOING THROUGH A CHANGE CYCLE

The Model "J" Record Changer plays and automatically changes 14 or less ten-inch records or 10 or less 12-inch records.

The Record Changer is started by turning the switch control knob, (Item 60, Fig. 1) to "ON" this starts the motor and moves trip lever assembly (Item 59, Fig. 1), causing it to disengage from Engagement Clutch Cam, (Item 78, Fig. 1). The Engagement Clutch Cam will then rotate due to tension from spring, (Item 67, Fig. 1). This causes it to contact the pin on the top side of Drive Gear Assembly, (Item 4, Fig. 1). As it rotates, and in turn, moves the drive pin toward, (Item 31, Fig. 1) and the Selector Shaft Crank Assembly (A) and (B) to the position shown in Fig. 2. Also the tone arm reset link (Item 60, Fig. 2), has moved to where it has released the latch, (Item 19, Fig. 1), and carried the tone arm to its extreme outward position. The Tone Arm Lifter (Item 61, Fig. 2), has raised the tone arm to its extreme height, by means of the Lifter Plate Assembly, (Item 61, Fig. 1). The tone arm is kept from "floating" free by the friction of the Tone Arm Brake Spring which also compresses the tone arm booster spring, (Item 18, Fig. 1) due to its very light tension.

The Drive Gear Assembly (Item 4, Fig. 1), continues to rotate which causes the top pin to disengage from the Automatic Engagement Clutch Cam which is moved back to latch with the tone arm trip lever, and the lower pin to engage the drive link assembly, moving it back to its initial position. This swings the tone arm to either the 10-inch or 12-inch record playing position and lowers it to the record. At the same time it releases the Tone Arm Brake Spring allowing the Tone Arm Booster Spring to act.

2. PHONOGRAPH NEEDLES

Various types and kinds of needles are available for use in phonograph tone arms.

For playing ten or more records at one setup with this Record Changer, no attempt should be made to use ordinary needles with steel or fiber points since continued use of worn needle points will damage the records being played.

Any needle can be used that is designed to play 10 or more records.

It is well to keep in mind that even if the amplifying system, speaker and tone arm are of the best quality, a poor needle will result in poor reproduction of music.

There are a number of good semi-permanent types of needles on the market which in number of plays it is usually more economical to use one of these needles which is rated at 1000 plays or more.

It is very important to remember not to remove and then replace any needle that has been used.

3. CHASSIS MOUNTING

On the bottom surface of the panel are four mounting studs, each threaded to take a 1/4-20 machine screw. The mounting panel rests on four tapered coil springs, the small end of each spring is pressed over a mounting stud and the large end of each spring fits into a socket in the top surface of the mounting shelf in cabinet.

Four spacing blocks 1/16" thick and with a 3/8" hole are fastened to the lower side of the mounting shelf. The 3/8" hole in each is centered with the center of each opening of the lower side of the mounting shelf into which each of the lower mounting springs are to fit.

The 1/4"-20 machine screws are turned through the four wing nuts until the head of each wing nut bears against the bottom side of each wing nut.

The four lower springs which are of smaller diameter than the upper springs are slipped over the ends of each of the 1/4"-20 machine screws with the tapered end toward the head and resting on the wing nuts.

OPERATING INSTRUCTIONS

1. TO PREPARE CHANGER FOR OPERATION

(A) Setting Record Changer to Play Ten Inch Records:

Turn both knobs until the arrows are pointing toward the center of the turntable. When in this position any number up to and including fourteen 10-inch records can be played.

(B) Setting Record Changer to Play Twelve Inch Records:

Turn both knobs until the arrows marked "12" are pointing toward the center of the turntable. When in this position any number up to and including ten 12-inch records can be played.

2. LOADING

(A) If 10-inch records are to be played, set knobs as described in (A) above and place any number up to and including 14 records (ten inch only) over center pin so that they will rest on the selecting area.

(B) If 12-inch records are to be played, set knobs as described in (B) above and place any number up to and including 10 records (twelve inch only) over center pin so that they will rest on the arms.

3. STARTING THE RECORD CHANGER

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and throw the phonograph-radio knob or control to the phonograph position.

2. Turn the switch knob on the Record Changer panel to "ON". The motor will then start and the record changer will go into automatic operation of its own accord.

4. PLAYING AN INDIVIDUAL RECORD

An individual record can be played in the same manner as a stack of records would be played, i.e., if it is a 10-inch record, follow the instructions pertaining to 10-inch records. If it is a 12-inch record, follow the instructions pertaining to 12-inch records.

A 10-inch record may be played manually by turning the selecting arm knobs to the unloading position and leaving them in this position—records may then be put on or taken off the turntable by merely moving the tone arm outward until it catches, and placing the 10-inch records over the spindle and down onto the turntable. The "ON" and "OFF" switch knob is then pushed down and the 10-inch record will be played and repeated if left on the turntable. To remove the record it is only necessary to move the tone arm outward until it catches, and lift the record off of the turntable.

5. TURNING OFF RECORD CHANGER

Turn switch knob to "OFF" position while the tone arm is still on the record. If the selecting knob is turned off while record changer is going through a change cycle, it will be impossible to adjust the selector arms correctly for the automatic playing of 10-inch or 12-inch records.
6. UNLOADING RECORDS --

1. Turn switch knob to "OFF" position.
2. Remove any records remaining on the selector arm.
3. Move tone arm outward until it catches in outward position.
4. Turn selector arm so that records will clear them.
5. Remove records from turntable.

7. LUBRICATION --

(A) Motor: The motor is equipped with oilless bearing and requires no lubrication.

(B) Turntable Spindle Bearings: Are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with 1 or 2 drops of a light grade oil.

The top bearing can be oiled by lifting off turntable. Make sure when replacing turntable to see that pin in Turntable Spindle slips into slot on bottom surface of Turntable hub and also ears should be taken not to injure rubber idler Drive Wheel.

Never under any circumstance allow oil to come in contact with Rubber Turntable Rubber.

(C) Scrape Gum To Records Rubbing On Turntable Spindle: This can be eliminated by gently lining up the stack of records.

SERVICE NOTES

1. ADJUSTMENT FOR BEST POSITION OF TONE ARM --

(A) Swing tone arm outward until tone arm lever assembly, (item 19, Fig. 1) latches with tone arm latch lever, (item 18, Fig. 1) which is held to tone arm shaft, (item 17, Fig. 1) by two set screws.

(B) Make sure these set screws are tight and that there is a slight play between tone arm lever assembly and the panel, (item 8, Fig. 1). This will give proper clearance at ball race assembly, (item 76, Fig. 3).

The tone arm lever assembly, (item 19, Fig. 1) is held against tone arm latch lever, (item 18, Fig. 1) by the tension of tone arm locator lever spring, (item 16, Fig. 1).

(C) Next loosen the clamping screw in the Swivel Bracket Assembly (item 46, Fig. 8.)

(D) Now move tone arm, (item 60, Fig. 4) until its outside edge is 1/8" from the outside edge of the panel (item 5, Fig. 1) and retighten screw securely.

2. RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE AT END OF RECORD --

(A) Worn or Damaged Stop Groove: If the stop groove in the record is worn out or damaged, discard such a record.

(B) Cut-off Adjustment May Be Incorrect: The Record Changer should go into its changing cycle when the needle makes the stop groove and has traveled to within a distance of 1-7/8" from the center of the turntable.

3. RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE WHEN SWITCH KNOB IS TURNED ON --

When the switch is turned to "ON" the Record Changer should start its changing cycle. If it does not, the following points should be checked.

1. Make sure motor is running.

2. Check Trip Rod, (item 56, Fig. 1), to make sure it releases Trip Lever Assembly, (item 50, Fig. 1), from Engagement Clutch Cam Assembly, (item 75, Fig. 2), when Switch Knob is being turned on. If Trip Lever Assembly is not released, Trip Rod should be shortened by bending until Trip Lever clears Engagement Clutch Cam Assembly, when Switch Knob is turned.

3. Make sure that Clutch Release Plate, (item 40, Fig. 2), clears Drive Link Assembly, (item 31, Fig. 1).

4. RECORD CHANGER CONTINUES TO REPEAT ITS CHANGING CYCLE WITHOUT PLAYING RECORD --

(A) Trip Lever Assembly, (item 20, Fig. 1) does not latch in Engagement Clutch Cam Assembly, (item 70, Fig. 1), which may be due to causes listed below:

1. Trip Rod (item 25, Fig. 1), may be bent so that it is too short, holding Trip Lever Assembly from contacting Engagement Clutch Cam Assembly.

2. Springs (item 24 or 25, Fig. 1) may be disconnected.

5. NO SOUND WHEN NEEDLE IS ON MOVING RECORD --

1. Muting switch (item 26, Fig. 1), may be out of adjustment. The contacts of this switch should be open whenever its long blade is not resting on the base of the Engagement Clutch Cam Assembly (item 70, Fig. 2). If the contacts remain closed after the long blade has left the shoe, they should be adjusted by bending until there is a separation of approximately 1/32".

Switch should be checked to make sure contacts are closed when long blade is resting on the shoe of the Engagement Clutch Cam Assembly.

2. The lugs on the Muting switch may have been bent together.

3. Pickup cartridge in Tone Arm may have been damaged may be defective.

6. TONE ARM ADJUSTMENTS FOR 12" RECORDS --

1. Turn both Control Knobs until the arrows marked "12" are pointing toward the center of the turntable.
2. Place a twelve inch record on the turntable.

3. Start Record Changer and note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record.

4. Set rod (Item 58, Fig. 3) is operated by Selector Arm (Item 51, Fig. 4). The 10th Set Link (Item 10, Fig. 1) operates as a stop when Record Changer is set for 10" records. When Tone Arm Locator Assembly (Item 15, Fig. 1) contacts 12" Set Link the Tone Arm should be in the correct position to play a 12" record.

If at this point, the position of Tone Arm is incorrect, loosen the screw which holds the Tone Arm Locator Shoe 12" (Item 14, Fig. 1) and move in either direction as required and tighten screw.

7. TONE ARM ADJUSTMENTS FOR 10" RECORDS --

1. Place a 10" record on the turntable and start Record Changer.

3. Note where needle contacts record. Correct contacting is about 1/8" from the outside edge of record. If contacting of needle is not correct as mentioned, loosen the screw which holds Tone Arm Locator Shoe 12" (Item 15, Fig. 1) and slide shoe in or out as required, then tighten screw.

8. TONE ARM HEIGHT ADJUSTMENTS --

Set the Record Changer for ten-inch records, turn Switch to "ON" and allow Record Changer to go thru a changing cycle with no record on the Turntable. The clearance between Turntable and the bottom surface of the Tone Arm should be approximately 1/16". Normally this clearance can be obtained by adjusting the Tone Arm adjustment screw (Item 70, Fig. 8). It is well to check the following points before making any adjustment.

Check clearance between Roller (Item 53, Fig. 3) and Selector Shaft Assembly (Item 7, Fig. 1). There should be approximately 1/32" clearance at this point. If the clearance is greater, it would be due to the pressure on the Spring Washer (Item 50, Fig. 5) being too great. This will prevent the Tone Arm Lifter Reel Spring (Item 52, Fig. 3) from returning the Tone Arm Lifter Link Assembly (Item 51, Fig. 3) sufficiently to release the pressure on the Spring Washer, lower the Selector Shaft Collar (Item 6, Fig. 1) slightly.

9. TONE ARM LOWERS ON RECORD TOO SUDDENLY --

If the Tone Arm lowers too suddenly, the Spring Washer (Item 50, Fig. 3) which is located between the Tone Arm Lifter Link Assembly (Item 51, Fig. 2) and Selector Shaft Assembly Post (Item 7, Fig. 1) is not under sufficient pressure. The set screws in the Selector Shaft Collar (Item 6, Fig. 1) should be loosened and the Selector Shaft Collar pressed upward slightly and set screws tightened.

NEEDLE DRAG ACROSS RECORD:

If the needle drags across the record, the long portion of the Tone Arm Lever Assembly (Item 15, Fig. 1) is contacting the pin on the top side of the gear assembly (Item 4, Fig. 1) and is being moved by it. The remedy is to bend the long portion of the Tone Arm Lever Assembly upward so that it clears the pin.

In some radio models the lever may be reached without removing the record changer from the cabinet; however, if easy access is not possible, removal of the complete record changer is recommended.

TONE ARM LANDS IMPROPERLY ON BOTH 10" AND 12" RECORDS:

If the Tone Arm lands improperly on one size of record but properly on the other size, the adjustments described under 6 or 7 of "Service Notes" should be made. Improper landing on both 12" and 10" records is due to a misaligned Tone Arm. This may be remedied by loosening the screw located on the Tone Arm Swivel Bracket (Item 46, Fig. 3) and moving the Tone Arm to the proper position and then retightening the screw. A rough check as to the proper position is to place the Tone Arm in its rest position and see if the outside of the Tone Arm in flush with the edge of the Motorboard. The two set screws on the Tone Arm Shaft (Item 77, Fig. 2) should be checked to see if they are tight.

ALIGNMENT PROCEDURE MODELS 11-5W1 TO 11-5WS & 12-4DI TO 12-4DA

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 plates of the LANT output tube and ground through a 0.1 Milli-ohm. This should be connected across the voice coil.

2. Connect the ground lead of the signal generator to the Black Wire or the chassis.

3. Turn the volume control to the maximum output position and keep it in this position while aligning.

4. With the gain control set 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 gain control in a full mesh position.

<table>
<thead>
<tr>
<th>Dummy Att.</th>
<th>Controls with Reg.</th>
<th>Connection of Signal Generator</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
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</thead>
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<tr>
<td>11 5W1</td>
<td>Condenser</td>
<td>= General Grid of LANTG</td>
<td>455 EC</td>
<td>Any Point Where d</td>
<td>1-2</td>
<td>3-4</td>
<td>Adjust for maximum</td>
</tr>
<tr>
<td></td>
<td>Condenser</td>
<td>= General Grid of LANTG</td>
<td>455 EC</td>
<td>Same as LANTG</td>
<td>1-2</td>
<td>3-4</td>
<td>output of receiver</td>
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<td></td>
<td>Condenser</td>
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<td>5-8</td>
<td>10-15</td>
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<tr>
<td></td>
<td>Condenser</td>
<td>= Antenna Lead (Black Wire)</td>
<td>1500 EC</td>
<td>Bottom of Antenna</td>
<td>5-8</td>
<td>10-15</td>
<td>output of receiver</td>
</tr>
</tbody>
</table>

ON CHASSIS 11-6W -- -- CONNECT TO GAGES, GROUND FRONT SECTION 1230 -- 6P6G output tube
Important: Before proceeding, make sure the unit is in the correct frequency range and that all connections are secure.

1. Remove the bottom cover of the receiver and access the circuit board.
2. Connect the power supply to the receiver and turn it on.
3. Adjust the trimmer capacitors as needed to achieve the desired frequency range.
4. Check for proper operation by tuning to a known signal and verifying the output level.
5. Repeat the process as necessary to achieve the desired frequency range.

Please refer to the manufacturer's manual for further instructions.

ADJUSTMENT DATA FOR A-46 CHASSIS AND OTHER

NOTES BELOW APPLY ONLY TO MODEL 515

ADJUSTMENT DATA FOR A-46 CHASSIS AND OTHER

IV. Intermediate Frequency Adjustments

1. Tune the receiver to the desired frequency and adjust the trimmer capacitors as needed to achieve the desired output level.
2. Check the phase of the intermediate frequency signal using an oscilloscope and adjust the phase as needed.
3. Adjust the trimmer capacitors as needed to achieve the desired output level.
4. Check the operation of the receiver and adjust the trimmer capacitors as needed to achieve the desired output level.

V. Audio Frequency Adjustments

1. Tune the receiver to the desired frequency and adjust the trimmer capacitors as needed to achieve the desired output level.
2. Check the phase of the audio frequency signal using an oscilloscope and adjust the phase as needed.
3. Adjust the trimmer capacitors as needed to achieve the desired output level.
4. Check the operation of the receiver and adjust the trimmer capacitors as needed to achieve the desired output level.

VI. Volume Control Adjustments

1. Tune the receiver to the desired frequency and adjust the trimmer capacitors as needed to achieve the desired output level.
2. Check the phase of the volume control signal using an oscilloscope and adjust the phase as needed.
3. Adjust the trimmer capacitors as needed to achieve the desired output level.
4. Check the operation of the receiver and adjust the trimmer capacitors as needed to achieve the desired output level.
NORMAL VOLTAGE READINGS

Take all readings with chanels operating and tuned near full drive. Use a DC source of 10 volts or more for the

A C voltages are indicated by resistors.

Read from indicated terminals to chassis base.

To measure volatges of MINIC tubes remove the spade

CONTINUITY TEST

Remove all tubes and disconnect the receiver from the power source. Place a 5 megohm ohm in the

Test speaker without speaker lead out.

Leave speaker plug in socket for all other tests of the modulator circuits. Use a good meter capable of measuring up to several megohms.

See location chart on page 5 for presence and terminations of terminals.

AMPLITUDE MODULATION CHAIRM

TERMINALS OF SOCKETS

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Socket</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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FREQUENCY MODULATION CHART

TERMINALS OF SOCKETS

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Socket</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Speaker</td>
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<tr>
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<tr>
<td>Bias</td>
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<td></td>
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</tr>
<tr>
<td>Ground</td>
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<td></td>
</tr>
</tbody>
</table>

SYMBOLS USED ON CHART ARE AS FOLLOWS: 1—ohm; M—magnet; C— condenser; S—signal; O—open.
STROMBERG-CARLSON TEL. MFG. CO.

MODEL 5151
Ch. AM

Frequency Modulation 42 to 50 Mc.
Short Wave 5.8 to 18 Mc.
Standard Broadcast .54 to 1.7 Mc.

Tuning Ranges
Voltage Rating 105 to 125 Volts

MANUAL TUNING. Important. When tuning stations manually in the Standard Broadcast or Short Wave ranges be sure that the push button designated "Freq. Mod." is not pushed in.

Wiring and Schematic Diagram
Amplitude Modulation

©John F. Rider, Publisher
SPECIAL CIRCUITS. A tuning indicator having two apertures is used in this receiver. One aperture will operate when tuning stations in the standard broadcast and short-wave ranges and the other aperture will operate when tuning stations in the frequency modulation range. Stations should be tuned for maximum closing of the tuning indicator.

Input Power Rating

Intermediate Frequency

Speaker Voice Coil Impedance at 400 Cycles

Speaker Field Coil Resistance

PHONOGRAPH OPERATION. A jack is provided on the back of the chassis into which a record player may be plugged and a switch is provided next to it for switching from "Radio" to "Phonograph".

TELEVISION. Switching to phonograph also makes the audio amplifier and loud speaker available for use with television receivers designed for this type of sound reproduction.

140 Watts

455 Kilocycles (Amplitude Modulation)

4.3 Megacycles (Frequency Modulation)

Approximately 1.5 Ohms

Approximately 1000 Ohms

Wiring and Schematic Diagram

Frequency Modulation
This is a seventeen tube, three gang, three range receiver, designed for the reception of both amplitude and frequency modulated stations.

Eight button automatic tuning is provided. The tuner unit is composed of a group of coils which are adjusted by means of iron cores, so that seven favorite stations in the standard broadcast range may be set up. The eighth button is for switching from amplitude to frequency modulation. Tone is adjusted by a variable control and the dial is of the slide rule type edged for clear visibility without glare.

Provision is made for a record player to-be used with this receiver without additional wiring.

Iron core coils are used in the standard broadcast and short-wave ranges to provide greater accuracy of alignment. In addition a thermal drift compensator is included in the circuit. The audio system employs special inverter push-pull circuit designed to provide excellent fidelity. The power transformer has a electro-static shield to reduce line noises to a minimum and the chassis is thoroughly shielded throughout.

AUTOMATIC TUNING. An adjustable iron core coil type of automatic tuning is employed and the station may be easily located by properly utilizing the concentric adjusting screws provided. A special tool, identified as SD-78 Screwdriver will help materially in setting up the automatic tuning.

Location Chart (Amplitude Modulation)

Location Chart—(Frequency Modulation)
Schematic Diagram—No. 509-PT

The specifications are the same as the No. 410 Receivers except for:

- Power Frequency Rating: Std. 60 Cycle, also available 25 Cycle option
- Input Power Rating, 509-PF: 85 Watts
- Input Power Rating, 509-PT: 90 Watts

ALIGNMENT, VOLTAGE, LAYOUT AND ALL
OTHER DATA SAME AS MODEL 410, VOL. XI

These receivers employ the same circuits as the No. 410 except for improved tone and phonograph compatibility circuits which are designed to provide exceptionally good phonograph reproduction.

The No. 509-PT is equipped with a single record phonograph unit using a crystal pick-up. This phonograph unit is designed to play the standard 10 or 12 inch records.

The No. 509-PF Receivers are equipped with an automatic record changer using a crystal pick-up. This record changer shifts and plays the standard 10 or 12 inch records.

Replacement parts are the same as used on the No. 410 Receivers except for the following:

<table>
<thead>
<tr>
<th>Piece No.</th>
<th>Circuit Designation</th>
<th>Part Description</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25054</td>
<td>C-48</td>
<td>150 mmf. Capacitor, 509-PT</td>
<td></td>
</tr>
<tr>
<td>25150</td>
<td>C-52</td>
<td>.02 mf. Capacitor, 509-PF</td>
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<tr>
<td>25349</td>
<td>R-25</td>
<td>22,000 Ohm Resistor, 509-PT</td>
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<tr>
<td>24350</td>
<td>R-32, 33</td>
<td>27,000 Ohm Resistor, 509-PF</td>
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</tr>
<tr>
<td>24353</td>
<td>R-35</td>
<td>47,000 Ohm Resistor, 509-PF</td>
<td></td>
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<tr>
<td>26357</td>
<td>R-27</td>
<td>.1 Megohm Resistor, 509-PF</td>
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<tr>
<td>26361</td>
<td>R-26 (R-37, 599-PF)</td>
<td>.22 Megohm Resistor</td>
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<tr>
<td>26552</td>
<td>R-27</td>
<td>.27 Megohm Resistor, 509-PF</td>
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<tr>
<td>26365</td>
<td>R-29</td>
<td>.47 Megohm Resistor</td>
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<td>26369</td>
<td>R-28</td>
<td>1 Megohm Resistor, 509-PT</td>
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<tr>
<td>27313</td>
<td>C-48</td>
<td>Tone Control Switch, 509-PF</td>
<td></td>
</tr>
<tr>
<td>25558</td>
<td>C-48</td>
<td>100 mmf. Capacitor, 509-PF</td>
<td></td>
</tr>
<tr>
<td>29984</td>
<td>R-11</td>
<td>Knob for OFF-ON, Radio Phono. Switch</td>
<td></td>
</tr>
<tr>
<td>29589</td>
<td>R-11</td>
<td>Volume Control</td>
<td></td>
</tr>
<tr>
<td>30477</td>
<td>C-51</td>
<td>40 mf. 490 Volts, 509-PF</td>
<td></td>
</tr>
<tr>
<td>30566</td>
<td>Tone Control, 509-PF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31481</td>
<td>C-49, 50 (C-54, 509-PF)</td>
<td>.01 mf. Capacitor</td>
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<tr>
<td>32305</td>
<td>Speaker, 509-PF</td>
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<tr>
<td>32314</td>
<td>Switch OFF-ON Radio Phono.</td>
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</tr>
<tr>
<td>32319</td>
<td>R-38</td>
<td>500 Ohm Resistor, 509-PF</td>
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</tr>
<tr>
<td>32329</td>
<td>R-38</td>
<td>650 Ohm Resistor, 509-PF</td>
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</tr>
</tbody>
</table>
**TELEVISION.** A jack is provided on the back of the chassis for connecting the speaker, which may be plugged in at any time. Switching to phosphor makes the audio channel available for use with television receivers designed for this type of sound reproduction.

**ALIGNING INFORMATION.** Never align unless absolutely necessary.

- Use a good modulator signal generator (test oscillator) to inject available output voltage and a sensitive output meter across the voice coil of the speaker.
- Always align using the smallest possible input from the signal generator. A strong signal makes adjustments inaccurate.
- Always have the volume control "kill out.

**ALIGNING PROCEDURE.** (Follow this order exactly.)

1. Dial pointer adjustment.
   - With the drive gear in the neutral position, check to see that the dial pointer is in its neutral position.
   - Adjust the lamp position so that the dial pointer is exactly at the frequency at which the dial scale is set.

2. Intermediate frequency adjustments.
   - Set range switch to Standard Broadcast position.
   - Tune for the lowest frequency in the dial scale.
   - Connect the ground terminal of the signal generator to the ground terminal of the line center.

3. Introduce a modulated signal of 455 kilocycles in the grid of the 455 modulator and check the response in the dial scale. (RMS meter is applied to the modulator output to select the signal generator.)

4. Adjust the 455 C. iron core for maximum signal.

5. Adjust the 455 C. iron core for maximum signal.

6. Set the signal generator frequency and the receiver tuning dial to 455 kilocycles.

7. Adjust the 455 C. iron core for maximum signal.

8. Set the signal generator frequency and the receiver tuning dial to 455 kilocycles.

9. Adjust the 455 C. iron core for maximum signal.

10. Repeat operations 5, 6, 7, and 8.

11. Repeat operations 8 and 9.

**Standard Broadcast Range (A Band).**

1. Set the range switch to the "Loop" position.

2. Set the signal generator frequency and the receiver tuning dial to 455 kilocycles.

3. Adjust the 455 C. iron core for maximum signal.

4. Adjust the 455 C. iron core for maximum signal.

5. Adjust the 455 C. iron core for maximum signal.

6. Set the signal generator frequency and the receiver tuning dial to 455 kilocycles.

7. Adjust the 455 C. iron core for maximum signal.

8. Repeat operations 3 and 4.

9. Repeat operations 5 and 6.

**Wave Trap Adjustment (500 Table Models Only).**

1. Tune the receiver to 1000 kc.

2. Set the signal generator frequency to 455 kc. and introduce a strongly modulated signal in the 4557 tube.

3. Adjust the wave trap attenuator for maximum signal.

**UP PUSH BUTTONS.**

1. Turn the receiver "On".

2. Push the "Stop" button.

3. Set the Range Switch as follows:
   - a. If an external antenna is used, set knob to "X" position to designate "Antenna".
   - b. If the built-in loop antenna is used, set knob to "X" position to designate "Loop".

4. Tune to a channel that has reasonably good reception in your area.

5. Pull the six station push buttons on their levers.

6. The call letters of the six selected stations from the call letter sheets, which are in an emblazoned form, are on the back of the cabinet.

7. Insert the station call letters in the slots at the back of the cabinet, and turn the receiver "On".

8. Push both the receiver and the call letters on the indicated slot by starting with the call letters at the back of the cabinet and working in the reverse order.

9. Tighten the screw to adjust the call letters so that they align with the call letters in the slots at the back of the cabinet.

10. Place the proper button on the receiver.

11. Check the accuracy of the adjustment by detuning the receiver and then turning it back to its original position.

12. Set the six push buttons in the same manner.

**TUNING RANGES.**

<table>
<thead>
<tr>
<th>Range</th>
<th>2800 kc</th>
<th>3500 kc</th>
<th>4200 kc</th>
<th>4900 kc</th>
<th>5600 kc</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>3900</td>
<td>4600</td>
<td>5300</td>
<td>6000</td>
<td>6700</td>
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<tr>
<td>B</td>
<td>3700</td>
<td>4400</td>
<td>5100</td>
<td>5800</td>
<td>6500</td>
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<tr>
<td>C</td>
<td>3500</td>
<td>4200</td>
<td>4900</td>
<td>5600</td>
<td>6300</td>
</tr>
<tr>
<td>D</td>
<td>3300</td>
<td>4000</td>
<td>4700</td>
<td>5400</td>
<td>6100</td>
</tr>
<tr>
<td>E</td>
<td>3100</td>
<td>3800</td>
<td>4500</td>
<td>5200</td>
<td>5900</td>
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<td>F</td>
<td>2900</td>
<td>3600</td>
<td>4300</td>
<td>5000</td>
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**TERMINALS OF RECEPTORS.**

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<th>3</th>
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<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>4554</td>
<td>C. Amplifier</td>
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<td>0</td>
<td>0</td>
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<td>+15</td>
<td>+1</td>
<td>+15</td>
<td>0</td>
</tr>
<tr>
<td>4557</td>
<td>Modulator and Oscillator</td>
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<td>0</td>
<td>+125</td>
<td>+118</td>
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<tr>
<td>4570</td>
<td>L. F. Amplifier</td>
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<td>0</td>
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<tr>
<td>4590</td>
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<tr>
<td>4597</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

**CONTINUITY TEST.**

**CAUTION:** Do not use any tubes except those recommended by the manufacturer. To avoid damage to the receiver and other equipment, use only the designated tubes.

**Speaker Test:**

1. Connect the speaker leads to the speaker terminals.

2. Tune the receiver to a station being broadcast.

3. Increase the volume control until the desired volume is reached.

4. Observe the needle of the voltmeter. If it does not indicate zero, adjust the output of the receiver accordingly.

**TERMINALS OF PROJECTS.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tr>
<td>4570</td>
<td>Modulator and Oscillator</td>
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<td>0</td>
<td>+125</td>
<td>+118</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4572</td>
<td>Demodulator, A. C. Audio</td>
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<td>0</td>
<td>0</td>
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</tbody>
</table>

**Symbols used on chart are as follows:**


**Other tests not shown on chart:**

- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
- Test from the main chassis to the speaker.
GENERAL. The No. 530 Receivers are nine tube, three gang, three range receivers, designed for the reception of Amplitude Modulated stations. The No. 535 Receivers are fifteen tube receivers of the very latest design, providing reception of both Amplitude and Frequency Modulated stations. The "Armstrong Wide-Swing Frequency Modulation System" used in this receiver is outstanding in that substantially static-free reception is obtained, plus a degree of high fidelity which has heretofore been unobtainable in any radio system.

Six button automatic tuning is provided in these receivers, so that six favorite stations may be set up.

Separate continuously variable bass and treble controls are provided in these chassises.

Provision is made for a record player to be used with all models not already equipped with phonograph mechanism without additional wiring.

The No. 530-PL Receiver is equipped with a record player using a crystal pick-up in conjunction with a specially equalized circuit. This record player shifts and plays the standard 10" or 12" records.

The No. 535-PL, PL and PS Receivers are equipped with record players using a one-ounce sapphire pick-up in conjunction with specially equalized circuits. This type of pick-up eliminates the frequent changing of needles and reduces record wear to a minimum. This record player shifts and plays the standard 10" or 12" records. The records may be intermixed on the No. 535-PL and PS Receivers.

A loop antenna is provided in these receivers so that no antenna and ground connection whatsoever is required. However, antenna and-ground terminals are provided on the chassis so that an external antenna may be used for improved reception if desired.

PHONOGRAPH OPERATION. A jack is provided on the back of the chassis of all receivers not already equipped with a phonograph mechanism, into which a record player may be plugged, and a push button is provided on the front of the receiver for switching from "Radio" to " Phonograph".

ACCESSORIES

ANTENNA. The built-in loop antenna provided in these receivers will give satisfactory operation in most locations. However, for improved reception, a Stromberg-Carlson All-Wave Antenna is recommended. These antennas are supplied in kits containing all the necessary parts for mounting and installation, and are designed especially for use with all Stromberg-Carlson receivers.

HEADSET ATTACHMENT. Headphones can be very simply attached to this receiver. Ask for Pc-28303 Headset Package Assembly, which comes complete with headphones and installation instructions.

CARE OF THE CABINET. The finish of Stromberg-Carlson cabinets should be protected by using Stromberg-Carlson cabinet Polish regularly. It is available in pint cans designated as Pc-28601. Nicks and scratches of most kinds can be repaired quickly and easily by proper use of the Pc-28962 Touch-Up Kit. Complete instructions are provided with each kit.

ADJUSTING THE DIAL LAMP. To obtain the proper illumination of the dial, slide the two dial lamp sockets on their mounting brackets to the position where maximum illumination of the dial is obtained.
Schematic Circuit and Wiring Diagram (535 Freq. Mod.)

©John F. Rider, Publisher
INSTRUCTIONS FOR SETTING UP PUSH BUTTONS

IMPORTANT: The stations selected should be the local or favorite stations which give good reception at all times. If a Frequency Modulation station is available, it may be set up on one of the push buttons on the No. 535 Receivers.

Set up stations in the daytime to avoid unnecessary interference. Allow the set to run for about twenty minutes before setting up stations.

Always use the tuning indicator unit when setting up stations, in order to determine when the station is exactly in tune.

1. Turn the receiver “On”.
2. On the No. 530 Receivers, push in the “Radio” button. On the No. 535 Receivers, be sure the “Phono” and “P. M.” buttons are in the proper position to receive the desired stations.
3. Set the range switch to the “BC” position.
4. Turn volume control about three-quarters of the way on (in a clockwise direction).
5. Pull the six station push buttons off their levers.
6. Remove the call letters of the six selected stations from the call letter sheets, which are in an envelope stapled to the cabinet. Insert the station call letters part way in the slots at the sides of the buttons. Next, insert a transparent tab in each slot in front of the station letters. Then push both the transparent tabs and the call letters all the way into the slot. (A pencil eraser may be helpful.)
7. Loosen the set screw of the lever to be set up.
8. Push in the lever and manually tune in the desired station, observing the tuning indicator in order to obtain exact resonance.

IMPORTANT: For accurate set-up, be sure that the lever is pushed in, in the same manner and with the same amount of pressure as will be used when operating the push buttons.

9. Tighten the set screw. Be sure not to disturb the adjustment in any way while tightening the screw.
10. Place the proper button on the lever.
11. Check the accuracy of the adjustment by detuning the station and retuning with the button several times, pushing the button with an even pressure. Readjust if necessary.
12. Set up the other five stations in the same manner.
NORMAL VOLTAGE READINGS

Take all readings with chassis operating and tuned within specifications—no signal.
Use a high voltage of 250 volts or voltage allowable for the vacuum tube.
Use a good high resistance voltmeter having a resistance of at least 50,000 ohms per volt.

AMPLITUDE MODULATION AND POWER AMPLIFIER CHASIS, 550 AND 555 RECEIVERS

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<thead>
<tr>
<th>Terminals of Connectors</th>
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<tr>
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<td>Modulator and Oscillator</td>
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FREQUENCY MODULATION CHASIS, 550 RECEIVERS

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<td>Modulator and Oscillator</td>
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<td></td>
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</tr>
<tr>
<td>6A7</td>
<td>I. F. Amplifier</td>
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</tbody>
</table>

* Read all 550 volt scale of voltmeter.

Between terminals 2 and 5 of rectifier socket—5 volts A. C.

CONTINUITY TEST

Remove all tubes and disconnect all plugs from the chassis before checking continuity.
Use a good meter capable of measuring accurately up to several megohms.
The resistances given are approximate; owing to electronic changes in the circuit, exact values are not always certain, but the above values are given accurately up to several megohms. Be sure to reverse the test leads and read the highest resistance.
Read from indicated terminals to chassis base unless otherwise specified.
See wiring chart on Page 3 for position and numbering of terminals.

IMPORTANT: The continuity of each chassis may be checked as a separate unit; however, the power supply of the chassis to be checked should be shorted as follows:
1. A. M. chassis 550 and 555 Receivers: Short terminals 1, 2, and 3 of power supply plug together.
2. Power Amplifier chassis 550 and 555 Receivers: Short terminals 2 and 3 of power socket together.
3. F. M. chassis 655 Receivers: Short terminals 6, 7, and 8 of power supply plug together.

Be sure to remove the shorting wires when continuity is completed.

Symbols shown on chart are as follows: T-taste; M—megohm; S—short; O—open.

A. Push Button in normal position: 7200 Ohms
   Push Button pressed in: 5 Megahms
   Radio or F. M. Button pushed in: "Open"

B. Range Switch in "A" hand: 5 Megahms
   Range Switch in "B" hand: "Short"
   Range Switch in "C" hand: "Short"

C. Operate volume control from counterclockwise position to extreme clockwise position—should read 30,000 Ohms to 1 Megohm.
   * Remove shorting wire before making continuity test of power circuits.

Other Tests Not Shown on Chart:

- Amplitude Modulation Chassis:
  Between terminals 4 and 5 of the Power Supply Plug should read "Open" with A. C. switch open; "Short" with A. C. switch closed.

- Power Amplifier Chassis:
  Audio Input Jack to Chassis Base: "Open"

- Frequency Modulation Chassis:
  Audio Output Plug: Prong 5 Megahms—"Short".

Audio output plug: Prong 5 Megahms—"Short".
F. M. Jack: "Open"—A, B, and C Bands
Push in F. M. Button—1 Megohm.
Phone Jack: "Open"—A, B, and C Bands
Push in F. M. Button—1 Megohm.
Power Amplifier Chassis
Audio Input Jack to Chassis Base: "Open"

Audio Input Jack to Chassis Base: "Open"
Ground Terminal to Chassis Base: "Open"
Between Antennas and Ground Terminals: "Short"
ALIGNING PROCEDURE (AMP. MOD.)

I. Dial Pointer Adjustment. (A.M.)

With the plate of the grid tuning capacitor fully engaged, check to be sure that the dial pointer is in a vertical position directly over the calibration lines on the panel and is aligned with the zero deflection line of the dial. Adjust if necessary.

II. Intermediate Frequency Adjustments. (A.M.)

1. Set the range switch to the Medium Wave 1 Band.
2. Turn set to extreme low frequency end of dial.
3. Connect the ground terminal of the signal generator to the ground terminal of the chassis.
4. Adjust the intermediate frequency 3300 kHz. and select the maximum signal.
5. Set the range switch to the Short Wave Band (C Band).
6. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
7. Set the range switch to the Short Wave Range of Band.
8. Set the receiver tuning dial to 6 megacycles.
9. Adjust the 6 megacycle oscillator, R, F, and trimmer adjusting the maximum signal.
10. Add the 1 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
11. Reset operations three and four.
12. Set the range switch to the Medium Wave Band.

III. Radio Frequency Adjustments. (A.M.)

1. Set the range switch to the Broadcast Band.
2. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 0.6 microfarad capacitor and connect the coaxial cable to the chassis.
3. Set the range switch to the Short Wave Band (C Band).
4. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
5. Connect the output lead of the short wave signal generator to the center terminal of the antenna connector terminals.
6. Set the range switch to the Short Wave Band.
7. Set the receiver tuning dial to 3.5 megacycles.
8. Adjust the 3.5 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
9. Reset operations three and four.
10. Set the range switch to the Medium Wave Band.

II. Intermediate Frequency Adjustments. (F.M.)

A. Set the intermediate frequency 100 kHz. and select the maximum signal.
B. Set the range switch to the Short Wave Band (C Band).
C. Set the range switch to the Short Wave Range of Band.
D. Set the receiver tuning dial to 6 megacycles.
E. Adjust the 6 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
F. Reset operations three and four.
G. Set the range switch to the Medium Wave Band.

III. Radio Frequency Adjustments. (F.M.)

A. Set the range switch to the Broadcast Band.
B. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 0.6 microfarad capacitor and connect the coaxial cable to the chassis.
C. Set the range switch to the Short Wave Band (C Band).
D. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
E. Connect the output lead of the short wave signal generator to the center terminal of the antenna connector terminals.
F. Set the range switch to the Short Wave Band.
G. Set the receiver tuning dial to 3.5 megacycles.
H. Adjust the 3.5 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
I. Reset operations three and four.
J. Set the range switch to the Medium Wave Band.

IV. Miscellaneous Adjustments.

A. Set the range switch to the Broadcast Band.
B. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 0.6 microfarad capacitor and connect the coaxial cable to the chassis.
C. Set the range switch to the Short Wave Band (C Band).
D. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
E. Connect the output lead of the short wave signal generator to the center terminal of the antenna connector terminals.
F. Set the range switch to the Short Wave Band.
G. Set the receiver tuning dial to 3.5 megacycles.
H. Adjust the 3.5 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
I. Reset operations three and four.
J. Set the range switch to the Medium Wave Band.

V. Miscellaneous Adjustments.

A. Set the range switch to the Broadcast Band.
B. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 0.6 microfarad capacitor and connect the coaxial cable to the chassis.
C. Set the range switch to the Short Wave Band (C Band).
D. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
E. Connect the output lead of the short wave signal generator to the center terminal of the antenna connector terminals.
F. Set the range switch to the Short Wave Band.
G. Set the receiver tuning dial to 3.5 megacycles.
H. Adjust the 3.5 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
I. Reset operations three and four.
J. Set the range switch to the Medium Wave Band.

VI. Miscellaneous Adjustments.

A. Set the range switch to the Broadcast Band.
B. Replace the 0.1 microfarad capacitor in series with the output lead from the signal generator with a 0.6 microfarad capacitor and connect the coaxial cable to the chassis.
C. Set the range switch to the Short Wave Band (C Band).
D. Locate the signal generator connected in the same manner as described in the previous procedure, and connect the coaxial cable to it.
E. Connect the output lead of the short wave signal generator to the center terminal of the antenna connector terminals.
F. Set the range switch to the Short Wave Band.
G. Set the receiver tuning dial to 3.5 megacycles.
H. Adjust the 3.5 megacycle oscillator, R, F, and trimmer adjusting for maximum signal.
I. Reset operations three and four.
J. Set the range switch to the Medium Wave Band.
SPECIAL CIRCUITS. A tuning indicator having two apertures is used with this receiver. For tuning stations on the standard broadcast and short-wave range, one aperture is for strong signals and the other for weak signals. One aperture will close with a signal of approximately 100,000 microvolts and the other will not close even with a two volt signal. Stations on the frequency modulation range should be tuned for maximum closing of both apertures.

Iron core coils are used in the broadcast and short-wave ranges to provide greater accuracy of alignment. The audio system employs a special inverter push-pull circuit designed to provide excellent fidelity, and the chassis is thoroughly shielded throughout with an electro-statically shielded power transformer.

FREQUENCY MODULATION: The "Armstrong Wide-Swing Frequency Modulation System" used in this receiver is an outstanding development in radio. It makes possible:

1. Static-Free Reception;
   Both natural and man-made static is virtually eliminated.

2. Noise free reception;
   The tube and set noises present in ordinary amplitude modulation receivers are virtually eliminated.

3. Extreme high fidelity reception;
   Noise free reproduction of an audio range limited only by the capacity of the human ear or the audio system of the receiver is possible without interference.

4. Interference free reception;
   Two stations cannot be received at the same time.
GENERAL. This is a nineteen-tube, three stage, three range receiver designed for the reception of both amplitude and frequency modulated stations and is equipped with a dual coaxial speaker system. It is capable of reproducing without distortion an audio frequency range of at least 10,000 cycles.

The chassis is of the fortified type with built-in ventilation for ease in handling and servicing. Automatic tuning is accomplished by means of a motor drive controlled by a commutator and brush assembly and the dial is of the slide rule type, edge-lighted for clear visibility without glare. Separate treble and bass controls are provided to make accurate adjustment of the tone possible.

A remote control unit is provided with this receiver which enables the user to operate the receiver at a remote point.

The power output of this receiver is excellent and the tone quality and fidelity of reproduction is finer than anything produced commercially to date.

Input Power Rating: 225 Watts

Intermediate Frequency: 455 Kilocycles (Amplitude Modulation)

4.3 Megacycles (Frequency Modulation)

Speaker Field Coil Resistance: 1125 Ohms (Bass)

200 Ohms (Treble)

Speaker Voice Coil Impedance at 400 Cycles: 11 Ohms (Treble)
### ADJUSTING DIAL LAMP

The dial on this receiver is edge-lighted, and for proper illumination it is very important that the dial light be adjusted so that the glare is exactly opposite the edge of the glass.

To make this adjustment simply slide the built-in light socket back and forth on its mounting bracket until maximum illumination is obtained.

### NORMAL VOLTAGE READINGS

Take all voltage readings with change being made and tuned manually to 1000 kilocycles or of 45 megacycles—no signal.

The upper figures shown in the table are with the range switch set to the standard broadcast range and tuned to approximately 1000 kilocycles—no signal.

The lower figures shown in the table are with the range switch set to the frequency modulation position and tuned to approximately 45 megacycles—no signal.

A.C. voltages are indicated by italics.

### TERMINALS OF SOCKETS

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<thead>
<tr>
<th>Terminals</th>
<th>Range Switch</th>
<th>Cap</th>
<th>1</th>
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### CONTINUITY TEST

Remove all tubes and disconnect the receiver from the power source before making continuity test. Use a good meter capable of measuring up to several megohms. The resistances given are often approximate owing to electrolytic capacitors in the circuit. When this is the case, set the meter to reverse the test leads and read the highest resistance.

Read from indicated terminals to chassis base unless otherwise specified. See location chart on Page 3 for position and number of terminals.

### TERMINALS OF SOCKETS

<table>
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<tr>
<td>627 Limiter (F. M.)</td>
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<td>5</td>
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<td>15</td>
<td>20</td>
<td>25</td>
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<td>588 Demod. (A. M.)</td>
<td>5</td>
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<td>10</td>
<td>15</td>
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<td>588 Tun. Ind. Rect. (F. M.)</td>
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<td>10</td>
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<td>20</td>
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<tr>
<td>588 Tun. Ind. Ampl. (F. M.)</td>
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<td>5</td>
<td>10</td>
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<td>6317 R. F. Ampl. (A. M.)</td>
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<td>25</td>
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<td>557 Mod. and Osc. (F. M.)</td>
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<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
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<td>657 L. F. Ampl. (A. M.)</td>
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<td>514 Audio Amp.</td>
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<td>15</td>
<td>20</td>
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<td>6R6 Power Amp.</td>
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<td>5</td>
<td>10</td>
<td>15</td>
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<td>25</td>
<td>30</td>
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<tr>
<td>525 Rectifier</td>
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<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
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<td>40</td>
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<tr>
<td>5A3F Speaker Sockets</td>
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<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
</tr>
</tbody>
</table>

### SYMBOLS USED ON CHART ARE AS FOLLOWS:

- E: ohms
- M: megohms
- O: ohms

A. Push in any "Pre-set Station" Button

<table>
<thead>
<tr>
<th>Button</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000 Ohms</td>
<td>15,000 Ohms</td>
</tr>
</tbody>
</table>

B. Push in "Phone" Button

<table>
<thead>
<tr>
<th>Socket</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>300,000 Ohms</td>
<td>400,000 Ohms</td>
</tr>
</tbody>
</table>

C. Push in "Television" Button

<table>
<thead>
<tr>
<th>Socket</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>500,000 Ohms</td>
<td>600,000 Ohms</td>
</tr>
</tbody>
</table>

D. Push in standard broadcast position

<table>
<thead>
<tr>
<th>Socket</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000 Ohms</td>
<td>40,000 Ohms</td>
</tr>
</tbody>
</table>

E. "Q" Switch Off

<table>
<thead>
<tr>
<th>Socket</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Megohm</td>
<td>2 Megohm</td>
</tr>
</tbody>
</table>

F. Range switch in standard broadcast position

<table>
<thead>
<tr>
<th>Socket</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Megohms</td>
<td>4 Megohms</td>
</tr>
</tbody>
</table>
G. Push in any "Pre-set Station" button
  
H. Range switch in standard broadcast position
  
I. Range switch in standard broadcast position
  
J. Range switch in standard broadcast position
  
K. Range switch in standard broadcast position

ALIGNING INSTRUCTIONS

NEVER REALIGN ABSOLUTELY NECESSARY

GENERAL
All aligning adjustments are carefully made at the factory with standard equipment and set for selecting frequency modulation receivers. The limitations of the equipment do not permit other than those specified. The alignment adjustments are such that alignment and setting of the filters are attempted in the field under necessary

If alignment is attempted, it will be done by those adjustments which follow are adhered to exactly.

The following equipment will be required:

1. Wide band sweep signal generator.
2. Microscope 0.20 Megohm.
3. Center V. Microscope with 100 divisions.

See location chart above for location of all aligning screws.

ALIGNING PROCEDURE (follow this order exactly)

I. Dial scale adjustment. With the dial set at any station, turn the dial scale "off" adjustment clockwise through one full revolution. (To trim the low frequency end of the dial)

II. Intermediate frequency adjustments (Frequency Modulation)

A. Set the range switch to Frequency Modulation position.
B. Connect the ground lead to the ground terminal of the 6SK7 third IF. Tube.
C. Connect the ground lead to terminal No. 3 of the 6SK7 third IF. Tube.

III. Discriminator adjustment (Frequency Modulation)

A. Connect the signal generator, the 6S16 switch plate connected to the output terminals of the 6SK7 third IF. tube.
B. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
C. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.

IV. Radio frequency adjustments (Amplitude Modulation)

A. Set the receiver to the AM broadcast position.
B. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
C. Adjust the discriminator to maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator to minimum reading on the grid of the 6SK7 third IF. tube.

V. Intermodulation frequency adjustments (Amplitude Modulation)

A. Adjust the second IF. transformer.
B. Connect the test generator to standard broadcast position.
C. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
D. Adjust the discriminator to maximum reading on the grid of the 6SK7 third IF. tube.
E. Adjust the discriminator to minimum reading on the grid of the 6SK7 third IF. tube.

VI. Wave shape adjustments (Amplitude Modulation)

A. Connect the signal generator to the AM broadcast position.
B. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
C. Adjust the discriminator to maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator to minimum reading on the grid of the 6SK7 third IF. tube.

VII. Receiver tuning adjustments (Amplitude Modulation)

A. Connect the signal generator to the AM broadcast position.
B. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
C. Adjust the discriminator to maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator to minimum reading on the grid of the 6SK7 third IF. tube.

VIII. General adjustments (Amplitude Modulation)

A. Connect the signal generator to the AM broadcast position.
B. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
C. Adjust the discriminator to maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator to minimum reading on the grid of the 6SK7 third IF. tube.

IX. Other notes

A. Check the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
B. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
C. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
E. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
F. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
G. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
H. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.

X. Miscellaneous adjustments

A. Connect the signal generator to the AM broadcast position.
B. Connect the audio output lead of the AM signal generator to the input terminals of the receiver.
C. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
D. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
E. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
F. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
G. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
H. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
I. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
J. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
K. Adjust the discriminator adjustment for maximum reading on the grid of the 6SK7 third IF. tube.
L. Adjust the discriminator adjustment for minimum reading on the grid of the 6SK7 third IF. tube.
### SETTING UP PUSH BUTTONS

<table>
<thead>
<tr>
<th>Button No.</th>
<th>Purpose</th>
<th>Color of wire on brush</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manual</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Remote</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Highest frequency station</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td>Next lower frequency station</td>
<td>Orange</td>
</tr>
<tr>
<td>5</td>
<td>Next lower frequency station</td>
<td>Green</td>
</tr>
<tr>
<td>6</td>
<td>Next lower frequency station</td>
<td>Brown</td>
</tr>
<tr>
<td>7</td>
<td>Next lower frequency station</td>
<td>Slate</td>
</tr>
<tr>
<td>8</td>
<td>Next lower frequency station</td>
<td>Red</td>
</tr>
<tr>
<td>9</td>
<td>Lowest frequency station on receiver</td>
<td>Black</td>
</tr>
<tr>
<td>10</td>
<td>Telev. button on receiver</td>
<td>Blue White</td>
</tr>
<tr>
<td>11</td>
<td>Phonograph</td>
<td>See diagram of adjustable brushes and set-up switch</td>
</tr>
<tr>
<td>12</td>
<td>Off</td>
<td></td>
</tr>
</tbody>
</table>

**Location Chart**

**ADJUSTABLE STATION BRUSH**

**SET UP SWITCH**

**Adjustable Station Brushes and Set Up Switch**

**IMPORTANT:** The stations selected should be local or favorite stations which give good reception at all times. Frequency Modulated Stations, as well as Amplitude Modulation Stations, may be set up on the push buttons by simply using the appropriate button determined by the position of the Frequency Modulated Station on the dial. Always use the tuning indicator unit when setting up stations in order to determine when the station is exactly in tune.

Seven stations may be set up for push buttons located on the front of the receiver and eight stations may be set up on the remote control unit. The same seven stations which were set up for the buttons on the front of the receiver must also be used on the remote control unit and the eighth station which is chosen for the remote control unit must be of a lower frequency than any of the other stations which have been set up.

Put the call letters of the selected stations in place above the push buttons. The stations should be arranged according to frequency with the highest frequency at the right and the lowest frequency at the left, just as on the dial. (The call letters will be found inside the envelope taped inside or underneath the cabinet.)

Set the "Treble" control in normal position.

Turn the set-up switch (located on the base just back of the brush and commutator assembly) to the set-up position. (The slot in the screw should point toward "set-up").

Push the button of the highest frequency station to be set up (button No. 3) and then tune in that station manually. Be sure the station is exactly "in tune" by tuning carefully and watching the cathode ray indicator.

Slide the brush to which the blue wire is connected until it is over the slot in the commutator. Then adjust it very carefully until the pilot light goes out. This indicates exact adjustment.

Repeat operations 4 and 5 for each station. Work from right to left or from the higher to the lower frequencies in accordance with the table above.

Turn the set-up switch back to the "Operate" position.

Check the operation of all the push buttons to be sure that each has been accurately set up. If it is necessary to readjust any of the buttons, follow the procedure given above.
ALIGNMENT -- MODELS B70, B71, B712

Set receiver dial at 1780 KC, or with tuning condenser open.

Set signal generator at 456 KC with generator coupled to receiver through a 1 mfd. condenser in each lead (ground side to chassis and other lead to 1A7GT grid cap). Allow just enough signal to produce a reading in an output indicating device such as a.c. meter connected to voice leads of speaker. Meter must be able to indicate as low as one or two volts a.c.

Adjust each I.F. trimmer to maximum output while reducing input a. w. to a minimum, thus avoiding a.c. effects and assuring perfect resonance.

Connect signal generator to a single turn loop of wire five or six inches in diameter facing receiver loop and spaced about eight inches away. This is to simulate actual receiving conditions.

Set receiver dial to 1600 KC and signal generator dial to 1500 KC. Adjust oscillator trimmer until signal is heard. Start this procedure with considerable signal from generator and reduce as previously instructed until signal is set at 1500 KC on receiver. Adjust antenna trimmer at same point and to the greatest output with minimum signal from generator.
I. F. ALIGNMENT

From a good signal generator, connect the proper leads, one to the chassis (make sure polarity is the same first), and the other thru a .1 mfd. condenser to the grid cap of the 6K8, 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 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 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. ANT. trimmer 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 padding for maximum output by adjusting dial and pad together.
   Check the alignment again at 1400 K.C.
   Adjust the wave trap at 456 K.C. for MINIMUM output.

INTERMEDIATE BAND ALIGNMENT

Using a 400 ohm resistor as dummy antenna, adjust the Intermediate Band oscillator trimmer at 6.7 M.C. and the Antenna trimmer 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 S.W. oscillator trimmer at 24.5 M.C. and the Antenna trimmer at 22 M.C.
   Check for alignment at 8 M.C.

The ranges of the three wave bands are as follows:
Standard Broadcast Band 538 to 1,720 K.C.
Intermediate (Police) Band 1,930 to 6,500 K.C.
Short Wave (Foreign) Band 7,650 to 24,500 K.C.

Each push button may be adjusted to select any station in the broadcast band.
1. Tune in desired station with the Selector knob.
2. Twist the push button you are going to set up for this station one full turn to the left.
3. Push this button in all the way, holding the Selector knob so station will stay tuned in.
4. With button pressed in, twist it to the right until tight and then release it.

Follow this procedure with the remaining buttons, setting each for a different station.
Insert call-letter tabs.
I. F. ALIGNMENT

Set the variable condenser at minimum capacity, (dial pointer at 1550 K.C.). Connect the two leads from a good, modulated signal generator, the ground lead to the radio chassis and the other lead through a .1 mfd. condenser, to the grid cap of the 6A8GT with the tube's grid lead still in place.

Connect the leads from a fully charged 6 volt storage battery to the receiver chassis and battery lead, the polarity being reversible.

With the set in operation and the volume control full on, set the signal generator to 456 K.C. and increase its output until the signal is heard in the set's speaker. Starting with the second I. F., adjust the I. F. trimmers for maximum output, decreasing the signal generator output as the receiver output increases.

The generator output in all the alignment adjustments should be adjusted so the meter will read approximately .4 volts continually.

R. F. ALIGNMENT

With the variable condenser still full open, set the generator to 1550 K.C. Connect the generator lead to the antenna lead through a .0001 mfd. condenser as dummy antenna. Adjust the oscillator trimmer for maximum output. Set the receiver dial and the generator to 1400 K.C. so the signal comes through, and adjust the antenna trimmer for maximum output.

Set the receiver dial and generator to 600 K.C. and adjust the oscillator padder for maximum output by rocking the variable condenser (with the tuning knob) as the padder is adjusted.

Return the dial and generator setting to 1400 K.C. and check for alignment.

PUSH BUTTON ADJUSTMENT

Six push button station selectors are incorporated in this receiver, and each may be set to select any frequency or station within the range of the set.

To adjust each button, follow these instructions.

1. With the set in operation, tune in any station the push button is to be set for, with the right hand tuning knob.

2. Keep a firm grip on the tuning knob so the station will not be detuned, and turn the push button about one turn to the left to loosen the mechanism. Press the button all the way in and turn it to the right until it is tight.

Repeat these operations with the other five buttons, setting each for a different station. Insert the correct call letter tab into the space provided in the panel just above the push buttons.
Tuning is accomplished with the conventional manual tuning control or by means of five push buttons which mechanically adjust the position of the iron cores in the tuning coils, tuning the radio to preselected stations.

**SETTING STATIONS ON PUSH BUTTONS**

1. Remove the push-button trim plate by prying gently with a small screwdriver or knife blade in the slots provided at the bottom of plate.
2. Press the manual station selector knob and tune across the dial. Select the five stations which will give the best all around reception.
3. Stations may be set up in any sequence desired; however, it is best from a speed-of-operation standpoint to set them up on the buttons in the order of their frequencies.
4. Press a button on which a station is to be set-up. Insert screwdriver supplied in receiver package in hole located to the right of the button and loosen set screw. DO NOT REUSE PUSH BUTTON. MUST BE HELD IN HEAD LOCKING OR TIGHTENING SET SCREW.
5. Tune set manually (with station button held down FIRMLY) until station desired to be set up is tuned in. In order to ensure an accurate set-up, rock manual tuning knob back and forth slightly until station is tuned in CLEARLY and WITH MAXIMUM VOLUME. DO NOT REUSE PUSH BUTTON.
6. With push button still held down firmly and station accurately tuned in, tighten adjustment screws securely and remove screwdriver before releasing button.
7. Insert station call letter tab in slot provided at top of button.
8. Repeat this same procedure in setting up the remaining buttons and then replace the button snap-on plate.

**CIRCUIT ALIGNMENT**

This is a complete check of the electronic circuits to ensure that the receiver is operating at its best frequency and that it is free from hum and other interference. If necessary, the circuits can be properly aligned only with the aid of a calibrated Test Oscillator or Signal Generator, and an output meter. External care should be exercised in following the alignment instructions in order to obtain the best performance possible. 

In order to prevent the A.V.C. from affecting the alignment adjustment, the lowest signal generator output which will give a readable indication on the output meter should be used. Tuning and button forces must be removed in order to properly align the set. However, the chassis should not be removed from the case.

**ALIGNMENT PROCEDURE**

The separate alignment procedures are included in these instructions. The first is to be considered the usual alignment procedure, and the second to be used only when a tuning coil has been changed, or when some major change has been made in the tuning apparatus.

**CAPACITY ALIGNMENT**

1. Aligning I.F. Stages at 455 Kilocycles
   (a) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a .0001 mfd. condenser.
   (b) Set frequency of the Signal Generator to 1500 Kilocycles and adjust the oscillator shut trimmer "Q" for maximum output (Fig. 9).
   (c) Set frequency of the Signal Generator to 1500 Kilocycles and adjust the oscillator shut trimmer "Q" for maximum output (Fig. 9).
2. Alignment at 300 Kilocycles
   (a) Leave Signal Generator connected the same as for alignment at 1500 Kilocycles.
   (b) Set the Signal Generator to 600 Kilocycles.
   (c) Tune the set (manual tuning control) to this signal.
   (d) Adjust the antenna trimmer "P" (Fig. 9) for maximum output.
3. Checking I.F. Band Spread
   (a) A Cathode Ray Oscillograph should be used to check 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 Oscillograph as shown in Fig. 4.

**CAPACITIVE AND INDUCTIVE ALIGNMENT**

To be used only when a major change such as changing a tuning coil has been made in the tuning apparatus and there is definite evidence of tuning coils not "tuning."
SERVICE HINTS

Removing Tuner Assembly

In order to make the parts located under the tuner assembly accessible for service tests, the tuner assembly can be lifted out of the way as follows.

1. Unscrew single "A" lead to switch.
2. Unscrew green lead connected to oscillator trimmer condenser at condenser (Illus. #44, Fig. 5).
3. Remove the four hex head slotted screws (two on each side of case) used for mounting tuner assembly to case.
4. Remove the two screws in antenna lead support bracket.
5. Lift front end of tuner out of case, pivoting at the back end, being careful not to break other leads connected to tuner.

Dial Cord Replacement

1. Loosen shaft (Illus. #77, Fig. 6) in cord drive gear assembly.
2. Pull spring clip from shaft and disassemble cord drive gear assembly.
3. Thread doubled end of cord through cord drive pulley until the spring lies inside the pulley.
4. Looking in the end of the drive pulley, take the spring counter-clockwise around the shaft from the dial cord hole, placing the hook end in the hole provided in the side of the pulley.
5. Wrap one half the cord clockwise approximately one turn around the outside of the drum and the other half counter-clockwise and hold the cord in place with a piece of Scotch tape on the side of the pulley opposite the cord hole.
6. Fasten cord drive gear assembly back into place lightly, not meshing gears until cord is threaded into place.
7. Thread cord around the two pulleys at the manual tuning control and of the dial and across the front and over the single pulley at the volume control end of the dial.
8. Mesh gears carefully by tightening cord drive gear shaft. Too tight a mesh will result in hard push button operation or rough or tight manual tuning drive.
9. Tune set to a station of known frequency or to Signal Generator. Get to a good calibration point (700 K.C.). Set pointer to that frequency on dial and trim pointer to zero over dial cord.

Lubrication

The mechanical parts of the push button tuner should be carefully lubricated as a part of every service job, using a special lubricant supplied under part #7935515. NOTE: Do not use ordinary oils and greases on the automatic tuner.

Grease the following points:

(a) Dial pulleys and pins
(b) Plunger Guides
(c) All gears
(d) Core bracket guides
(e) Switch

Do not allow brake surface to become greasy.

Volume Control Replacement

1. Unscrew all volume control leads at the volume control.
2. Remove volume control nut from front end of chassis.
3. Remove volume control by lifting switch end of volume control up and back.
4. To replace reverse the procedure.

Oscillator Series Coil Replacement (Illus. #44, Fig. 5)

1. This coil (Illus. #6, Fig. 5) is glued to terminal strip in the original assembly. Replacement coils will be furnished with a piece of tape to hold them to the terminal strip.

Oscillator Trimmer Condenser Replacement (Illus. #44, Fig. 5)

1. Unscrew leads from trimmer condenser.
2. Unscrew trimmer ground connection from chassis.
3. Straighten tange through terminal strip and remove trimmer.
4. To replace reverse the procedure.

Antenna Coil Replacement

1. Unscrew leads from antenna coil terminals located on terminal strip at rear of tuner.
2. Remove iron core by removing nut, Illus. #67, and washers. Illus. #48 and 50 (Fig. 5). Pull out of coil toward tuner unit. NOTE: Extra core should be used in handling the iron cores as they are brittle and very easily broken.
3. To remove shield, Illus. #44 (Fig. 5), unscrew from chassis and straighten the three ears.
4. To remove coil, loosen the three screws holding its base to chassis.
5. To replace the antenna coil reverse this procedure.

Oscillator Coil Replacement (Tuning Coil)

1. Remove iron core in same manner as recommended under antenna coil replacement.
2. Remove three nuts holding coil to chassis and unscrew coil leads from terminal strip.
3. To replace reverse procedure.
1. **Aligning I-F Stages at 262 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 6AQ8 tube through a .1 mf condenser, leaving the tube grid clip in place.
   
   (c) Connect the output meter from the plate of the 6AQ8 tube to ground.
   
   (d) Set the Signal Generator to exactly 262 kilocycles and turn the volume control on full.
   
   (e) Turn the condenser gang to a position where no squeals or beat notes are heard and so that when the tuning condenser is rotated within narrow limits, there is no appreciable change in output.
   
   (f) Adjust trimmers A-B-C-D through the cutouts on the side of the chassis opposite the antenna and "A" receptacles (Illus. 12 & 13, Figure 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. **Aligning at 1550 Kilocycles**
   
   (a) Leave Signal Generator leads connected the same as for I-F adjustments.
   
   (b) Turn the rotor plates of the gang condenser all the way out of mesh and against the high frequency stop.
   
   (c) Set the Signal Generator to exactly 1550 Kilocycles.
   
   (d) Adjust the oscillator parallel trimmer "G" on the center section of the gang condenser carefully for maximum output (Figure 3).

3. **Aligning at 1400 Kilocycles**
   
   (a) Remove the signal lead of the Signal Generator from the grid cap of the 6AQ8 and connect to the antenna terminal of the receiver through a .0002 mf condenser.
   
   (b) Set the Signal Generator to 1400 kilocycles and tune the receiver to this signal.
   
   (c) Adjust the parallel trimmers "P" and "R" (Figure 3) on the condenser gang carefully for maximum output.

4. **Aligning at 600 Kilocycles**
   
   (a) Set the Signal Generator to approximately 600 Kilocycles.
   
   (b) Turn the rotor plates of the gang condenser until this signal is tuned in with maximum output.
   
   (c) Adjust trimmer "N" (Illus. 31, Figure 4) while rocking the rotor plates of the gang condenser back and forth through the signal until maximum output is obtained.

   It will be necessary to readjust this condenser to the car antenna upon installation of the set.

   (d) Repeat adjustments made under "Alignment at 1400 Kilocycles".

5. **Checking I-F Band Spread**
   
   A Cathode Ray Oscillograph should be used to check the I-F band spread after completing the alignment procedure. Connect the oscillograph from connection "I" (Figure 4) to ground.
In order to prevent the A.V.C. from affecting the alignment adjustment, the lower signal generator output which will give a readable indication on the output meter should be used. Top and bottom covers must be removed in order to properly align the set, however, the chassis should not be removed from the case.

**ALIGNMENT PROCEDURE**

The separate alignment procedures are included in these instructions. The first is to be considered the initial alignment procedure, and the second to be used only when a tuning coil has been changed, or when some major change has been made to the tuning apparatus.

### CAPACITY ALIGNMENT

1. **Aligning I.F. Stages at 455 Kilocycles**
   
   (a) Connect the ground lead of the Signal Generator to chassis frames. Connect the signal lead through an 0.5 mf. condenser to the terminal "F" (Fig. 5).
   
   (b) Connect output meter from the plug of the 6SN7 tube to ground.
   
   (c) Set signal to exactly 455 kilocycles and turn volume control on full.
   
   (d) Tune the set by means of the manual tuning control knob to a position where no seconds or beat noise can be heard, also so that the tuning control knob is rotated within very narrow limits there is no appreciable change in output.
   
   (e) Adjust trimmer A-F-C-O (Fig. 5) and I.F. core adjustments (Z) (Fig. 6) in the sequence named, until maximum output is obtained.
   
   (f) Repeat adjustments with no loss in output from the Signal Generator as possible, for more accurate alignment.

2. **Alignment at 1560 Kilocycles**
   
   (a) Turn the set by means of the manual tuning control knob to the extreme high frequency position against stop.
   
   (b) Connect the signal lead of the Signal Generator to the antenna terminal of the set through a 0.005 mf. condenser.
   
   (c) Set frequency of the Signal Generator to 1560 kilocycles and adjust the oscillator shunt trimmer condenser "F" (Fig. 5) for maximum output.

3. **Alignment at 600 Kilocycles**
   
   (a) Leave Signal Generator connected the same as for alignment at 1560 kilocycles.
   
   (b) Set the signal from the Signal Generator to 600 kilocycles.
   
   (c) Tune the set (manual tuning control) to this signal.
   
   (d) Adjust the I.F. trimmer condenser "E" (Fig. 5) for maximum output.
   
   (e) Adjust the antenna trimmer condenser "A" (Fig. 5) for maximum output. (This trimmer is readjusted at 1460 kilocycles when set is installed in car.)

4. **Checking I.F. Bandspread**
   
   (a) A Cathode Ray Oscillograph should be used to check the I.F. bandspread 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 Oscillograph as shown in Fig. 5.

### CAPACITY AND INDUCTANCE ALIGNMENT

To be used only when a major change such as changing a tuning coil has been made in the tuning apparatus and there is definite evidence of tuning coils not tracking.

1. **I.F. Alignment**
   
   Align the I.F. stages as outlined under the capacity alignment procedure.

2. **Mechanical Alignment of B.F. Stages**
   
   (a) Turn the set by means of the tuning control knob to extreme high frequency position, against stop (cores will be almost withdrawn from coil forms.)
CAPACITY ALIGNMENT

1. Aligning I.F. Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the signal lead through a 0.1 mfd. condenser to the bottom
   right hand connections of the tuner socket as shown in Fig. 2.
   (c) Connect output meter from the plate of the 6V6 tube to ground.
   (d) Set signal generator to exactly 455 kilocycles and turn volume
   control on full.
   (e) Tune the set by means of the manual tuning control knob to a posi-
   tion where no squeals or beat notes can be noticed, also, so that
   when the tuning knob is rotated within narrow limits there is no
   appreciable change in output.
   (f) Adjust trimmers A-B-C-D (Fig. 3) and I.F. core adjustment "E"
   (Fig. 4) in the sequence named, until maximum output is obtained.
   (g) Repeat adjustments with as low an output from the signal generator
   as possible, for more accurate alignment.
   (h) Connect the signal lead of the signal generator to the antenna ter-
   minal of the receiver through a .1 mfd. condenser.
   (i) Adjust the I.F. Trap adjustment "J" for maximum output.

2. Alignment at 1560 Kilocycles
   (a) Tune the set by means of the manual tuning control knob to the
   extreme high frequency position, against stop.
   (b) Connect the signal lead of the signal generator to the antenna
   terminal of the set through a .0001 mfd. condenser.
   (c) Set frequency of the signal generator to exactly 1560 kilocycles
   and adjust the oscillator shunt trimmer condenser "F" (Fig. 5)
   for a maximum output.

3. Alignment at 600 Kilocycles
   (a) Leave the signal generator connected the same as for alignment
   at 1560 Kilocycles.
   (b) Set the signal generator to 600 Kilocycles.
   (c) Tune the set (manual tuning control) to this signal.
   (d) Adjust the I.F. trimmer condenser "C" (Fig. 5) for maximum output.

4. Checking I.F. Band Spread
   A 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 select-
   tivity curve. Connect Cathode Ray Oscillograph as shown in Fig. 4.

CAPACITANCE AND INDUCTANCE ALIGNMENT

To be used only when a major change such as changing a tuning coil has been
made in the tuning apparatus and there is definite evidence of the coil not
"tracking."
FIG. 1—TUBE SOCKET VOLTAGES

GENERAL: The Delco Model S-685 is a five tube, single unit superheterodyne receiver with a 5" dynamic speaker, designed for universal mounting on all cars.

TUNING CONTROLS: Tuning is accomplished by means of a manual tuning control or by means of five push-buttons each of which drives the permeability tuning cores to preselected frequencies.

Setting up the push-buttons for any desired station is accomplished by pressing the button into its latched position and rotating it in the manner of a manual tuning control until the desired station is tuned in. No locking device is required to retain this setting.

Note: Do not hold the button in beyond its normal latching position when setting up stations.

The manual tuning control operates by pressing the tuning knob into its latched position and tuning in the conventional manner.

VOLTAGE READINGS TAKEN BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTmeter HAVING RESISTANCE OF 1000 OHMS PER VOLT. ALL READINGS TAKEN WITH 5B FILAMENT VOLTAGE AT TUBES.

CURRENT DRAIN WITH SPEAKER AND DIAL LIGHT 5.0 AMPS.

"B" SUPPLY DRAIN 44 MA

GRID VOLTAGES MEASURED WITH VOLTmeter HAVING RESISTANCE OF 20,000 OHMS PER VOLT.
CAPACITY ALIGNMENT

Aligning I-F Stages at 450 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 terminal "T" (Fig. 4) through a .1 mfd. condenser.
(c) Connect the output meter from the plate of the GENST tube to ground.
(d) Set the signal generator to exactly 455 K.C.
(e) Turn the volume control on full and tune the set to a position where no squeals or beat notes are noticed, also so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output.
(f) Adjust the I-F trimmers A, B, C, D (Fig. 5) in the order mentioned until maximum output is obtained.
(g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.

3. Aligning at 1660 Kilocycles
(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0001 mfd. mica condenser.
(b) Tune the set to the extreme high frequency position against the stop.
(c) Set the signal generator to exactly 1660 K.C.
(d) Adjust the oscillator shunt trimmer "F" (Fig. 5) for maximum output.

4. Aligning at 800 Kilocycles
(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 600 K.C.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the antenna trimmer "F" (Fig. 6) for maximum output.

CAPACITY AND INDUCTANCE ALIGNMENT

1. Aligning I-F Stages at 450 Kilocycles
Align the I-F stages as outlined under paragraph 1 under CAPACITY ALIGNMENT.

2. Mechanical Alignment of Cores
(a) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against stop. (Cores will be almost withdrawn from coil forms.)
(b) Remove the pointer plate (note insulating washers under left hand screw) without disturbing the tuning mechanism.
(c) Using a spare core (part #240022) as a gauge, adjust the oscillator core so that with the front surfaces of the spare core and the oscillator core exactly flush, the rear surface of the test core is flush with the front end of the oscillator coil winding. This adjustment may be made using adjustment tool #8240150 inserted through the hole at the rear of the coil mounting bracket. The tool should be fitted into the hole at the rear of the core and rotated without applying any thrust to the core which would move it out of its normal resting position.
(d) Manually tune the set to a point where the front surface of the oscillator core is flush with the front end of the oscillator coil fibre mounting bushing.
(e) Adjust the antenna coil core position so that the front surface of the core is flush with the front end of the antenna coil fibre mounting bushing.
(f) Replace the pointer plate assembly.

5. Aligning at 1660 Kilocycles
(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0001 mfd. mica condenser.
(b) Tune the set by means of the manual tuning control to the extreme high frequency end of the dial and against stop.
(c) Set the signal generator to exactly 1660 K.C.
(d) Adjust the oscillator shunt trimmer "F" (Fig. 5) for maximum output.

6. Aligning at 800 Kilocycles
(a) Leave the signal generator connected the same as before.
(b) Set the signal generator to 800 K.C.
(c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
(d) Adjust the antenna trimmer "F" (Fig. 6) for maximum output.

7. Aligning at 1400 Kilocycles
(a) Set the signal generator to 1400 K.C.
(b) Tune the set manually until this signal is tuned in with maximum output.
(c) Adjust the core of the antenna coil (using tool #2400150) for maximum output.
(d) Repeat the alignment with as low an output from the signal generator as possible for more accurate alignment.
(e) Apply cement to the core screws to prevent their changing adjustments.

6. Adjusting Receiver to Car Antenna
After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer on a weak station at about 600 K.C.
IF PEAK 252 KC

Note: Condenser #22 was changed from plate to grid of the 6SK7 tube starting with serial #955000.

4-12-40
1. Aligning I-F Stages at 260 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 end section (W) of the gang condenser (adjacent to trimmer 'V', Fig. 3) through a 1.3 mfd. condenser.
(c) Connect the output meter from the plate of the 6SK7 tube to ground.
(d) Set the signal generator to exactly 260 kilocycles and turn the volume control on full.
(e) Turn the condenser gang to a position where no squeals or hunt notes are heard and on that when the tuning condenser is rotated within narrow limits, there is no appreciable change in output.
(f) Adjust trimmers A, B, C, D through the cut-outs on the side of the chassis opposite the antenna and "F" recepiacles (Fig. 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. Aligning at 1550 Kilocycles
(a) Leave signal generator leads connected the same as for I-F adjustments.
(b) Turn the rotor plates of the gang condenser all the way out of mesh and against the high frequency stop.
(c) Set the signal generator to exactly 1550 Kilocycles.
(d) Adjust the oscillator parallel trimmer "O" on the center section of the gang condenser carefully for maximum output (Fig. 3).
(e) Trimmer "G" (Fig. 3) is adjusted and sealed at the factory and should require no further adjustment.
In the event that its setting has been changed, back out trimmers "G" and "F" to minimum capacity and readjust simultaneously until maximum output is obtained.

3. Aligning at 1400 Kilocycles
(a) Remove the signal lead of the signal generator and connect to the antenna terminal of the receiver through a 0.0002 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 "G" (Fig. 3) on the condenser gang carefully for maximum output.

4. Aligning at 600 Kilocycles
(a) Set the signal generator to approximately 600 Kilocycles.
(b) Turn the rotor plates of the gang condenser until this signal is tuned in with maximum output.
(c) Adjust trimmer "G" (Fig. 4) while rocking the rotor plates of the gang condenser back and forth through the signal until maximum output is obtained. It will be necessary to readjust this condenser to the ear antenna upon installation of the set.
(d) Repeat adjustments made under "Alignment at 1400 Kilocycles".

VOLTAGE READINGS BETWEEN SOCKET TERMINALS AND GROUND WITH DC VOLTMEETER HAVING RESISTANCE OF 1000 OHMS PER VOLT. ALL READINGS TAKEN WITH 6.0 VOLTS AT HEATER S.
CURRENT DRAIN WITHOUT SPEAKER 5.5 AMPERES "O" SUPPLY DRAIN APPROX. 50 MA.

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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 bottom right hand connection of the tuner socket (Fig. 1) through a .1 mfd. condenser.
   (c) Connect the output meter from the plate of the 6Y5GT tube to ground.
   (d) Set the signal generator to exactly 455 K.C.
   (e) Turn the volume control on full and tune the set to a point where no squalls or beat notes are noticed, also so that when the tuning control knob is rotated within narrow limits, there is no appreciable change in output.
   (f) Adjust the I-F trimmers "A, B, C, D" (Fig. 3) and the I-F core adjustment "E" (Fig. 4) until maximum output is obtained.
   (g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.
   (h) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .1 mfd. condenser.
   (i) Adjust the I-F wave trap "F" (Fig. 3) for minimum output.

2. Aligning at 1660 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .0001 mfd. mica condenser.
   (b) Tune the set to the extreme high frequency position against the stop.
   (c) Set the signal generator to exactly 1660 K.C.
   (d) Adjust the oscillator shunt trimmer "F" (Fig. 6) for maximum output.

3. Aligning at 600 Kilocycles
   (a) Leave the signal generator connected the same as before.
   (b) Set the signal generator to 600 K.C.
   (c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
   (d) Adjust the R.F. trimmer "G" (Fig. 3) for maximum output.
   (e) Adjust the antenna trimmer "H" (Fig. 3) for maximum output.

4. Aligning at 600 Kilocycles
   (a) Leave the signal generator connected the same as before.
   (b) Set the signal generator to 600 K.C.
   (c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
   (d) Adjust the R.F. trimmer "G" (Fig. 3) for maximum output.
   (e) Adjust the antenna trimmer "H" (Fig. 3) for maximum output.

5. Aligning at 1400 Kilocycles
   (a) Set the signal generator to 1400 K.C.
   (b) Tune the set manually until this signal is tuned in with maximum output.
   (c) Adjust the antenna and R.F. cores for maximum output.
   (d) Repeat the alignment with as low an output from the signal generator as possible for more accurate alignment.
   (e) Apply cement to the core screws to prevent their changing alignment.

6. Adjusting Receiver to Car Antenna
   After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer on a weak station at about 600 K.C.
Setting up the push-buttons for any desired station is accomplished by pressing the button into its latched position and rotating it in the manner of a manual tuning control until the desired station is tuned in. No locking device is required to retain this setting.

Note: Do not hold the button in beyond its normal latched position when setting up stations.
VOLTAGE READINGS TAKEN BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTOMETER HAVING RESISTANCE OF 1000 OHMS PER VOLT ALL READINGS TAKEN WITH 5.9 FILAMENT VOLTAGE AT TUBES

CURRENT DRAIN WITH SPEAKER 8 DIODE LIGHT 6.7 AMPS
"B" SUPPLY DRAIN 50 MA

FIG. 1--TUBE SOCKET Voltages

FIG. 2--PARTS LAYOUT--DASH UNIT Top View

FIG. 3--PARTS LAYOUT--DASH UNIT Bottom View

FIG. 4--PARTS LAYOUT--DASH UNIT--Bottom View

FIG. 5--PARTS LAYOUT--I.P. UNIT

FIG. 6--PARTS LAYOUT POINTED PLATE ASSEMBLY
FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
SUBJECT--SERVICE INSTRUCTIONS--DELOCO MODEL E-695 AUTO RADIO

GENERAL: The Delco Model E-695 is a six tube, single unit, superheterodyne receiver with a 5" dynamic speaker, designed for universal mounting on all cars.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated test oscillator or signal generator and an output meter.

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 end of condenser (Illus. B, Fig. 4) through a .1 mfd. condenser.
   (c) Connect the output lead from the plate of the 6865T tube to ground through a .1 mfd. condenser.
   (d) Set the signal generator to exactly 455 Kilocycles.
   (e) Turn the volume control on full and tune the set to a position where no swells or beat notes are noticed, also so that when the tuning control knob is rotated within normal limits, there is no appreciable change in output.
   (f) Adjust the I-F trimmers (Illus. A, B, C, D, Fig. 3) in the order mentioned until maximum output is obtained.
   (g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.

2. **Aligning at 1550 Kilocycles**
   (a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .000070 mfd. mica condenser.
   (b) Tune the set to the extreme high frequency position against the stop.
   (c) Set the signal generator to exactly 1550 Kilocycles.
   (g) Adjust the oscillator shunt trimmer (Illus. E, Fig. 3) for maximum output.

3. **Aligning at 1400 Kilocycles**
   (a) Leave the signal lead of the signal generator connected the same as before.
   (b) Set the signal generator to 1400 Kilocycles.
   (c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
   (d) Adjust the trimmer (Illus. F, Fig. 3) for maximum output.

4. **Aligning at 600 Kilocycles**
   (a) Leave the signal lead of the signal generator connected the same as before.
   (b) Set the signal generator to 600 Kilocycles.
   (c) Tune the set by means of the manual control until this signal is tuned in with maximum output.
   (d) Adjust the trimmer (Illus. G, Fig. 4) for maximum output.
   (e) Repeat adjustment made under 3 and 4.

5. **Adjustment of Radio to Car Antenna**
   The radio should be adjusted to the car antenna after mounting in the car. The following adjustment should be made:
   (a) Tune in a weak station near the low frequency end of the dial (approximately 600 Kilocycles.)
   (b) Adjust the antenna trimmer (Illus. G, Fig. 4) for maximum volume.

**VOLTAGE READINGS BETWEEN SOCKET TERMINALS AND GROUND WITH D.C. VOLTOMETER HAVING RESISTANCE OF 1000 OHMS PER VOLT. ALL READINGS TAKEN WITH 6.0 VOLTS ACROSS HEATERS. CURRENT DRAIN WITH SPEAKER 6.6 AMPERES. "B" SUPPLY DRAIN 51 M.A. TOLERANCE ON VOLATGES 10%**
SUBJECT--SERVICE INSTRUCTIONS--DELCO MODEL R-996 AUTO RADIO

GENERAL: The Delco Model R-996 is a six tube, single unit Auto Radio with a 6" dynamic speaker, variable tone control, non-synchronous vibrator and type 5K57T power tube.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated test oscillator or signal generator and an output meter.

In order to prevent the A.V.O. circuit from affecting the alignment adjustment, the lowest signal generator output should be used, which will give a readable indication on the output meter. Do not remove the bottom half of the case during alignment.

1. Aligning I-F Stages at 260 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 terminal of trimmer (Illus. H, Fig. 3) through a .1 mfd. condenser.
   (c) Connect the output meter from the plate of the 6K57T tube to ground through a .1 mfd. condenser.
   (d) Set the signal generator to 260 Kilocycles.
   (e) Tune the volume control on full and turn the gang condenser to a position where no squaws or beat notes are heard and so that when the tuning condenser is rotated within narrow limits, there is no appreciable change in output.
   (f) Adjust the trimmers (Illus. A, B, C, D, Fig. 4) for maximum output. Repeat with lowest possible output from the signal generator for more accurate alignment.

2. Aligning at 1050 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .00007 mfd. mica condenser.
   (b) Tune the set to the extreme high frequency position against the stop.
   (c) Set the signal generator to 1050 Kilocycles.
   (d) Adjust the oscillator trimmer (Illus. G, Fig. 3) for maximum output.

3. Aligning at 1400 Kilocycles
   (a) Leave the signal generator connected the same as before.
   (b) Set the signal generator to 1400 Kilocycles.

4. Aligning at 600 Kilocycles
   (a) Leave the signal generator connected the same as before.
   (b) Set the signal generator to 600 Kilocycles.
   (c) Tune the set by means of the tuning control until this signal is tuned in with maximum output.
   (d) Adjust the trimmer (Illus. E, Fig. 4) for maximum output.
   (e) Repeat alignment under 3.

5. Adjustment of Radio to Car Antenna
   The radio should be adjusted to the car antenna after mounting in the car. The following adjustment should be made:
   (a) Tune in a weak station near the low frequency end of the dial (approximately 600 kilocycles.)
   (b) Adjust the trimmer (Illus. E, Fig. 4) for maximum volume.
FIG. 2--DELCO MODEL R-697 CIRCUIT DIAGRAM
GENERAL: The Delco Model R-697 is a six tube single unit Superheterodyne receiver with an 7” dynamic speaker and is designed specifically for instrument panel mounting on 1941-1940 General Motors cars.

TUNING CONTROLS: Tuning is accomplished by means of a manual tuning control or by means of five push buttons each of which drives the permeability tuning cores to preselected frequencies.

SETTING UP THE PUSH BUTTONS for any desired station is accomplished by pressing the button into its latched position and rotating in the manner of a manual tuning control until the desired station is tuned in. No locking device is required to obtain this setting.

NOTE: Do not hold the button in beyond its normal latching position when setting up stations. The manual tuning control operates by pressing the tuning knob into its latched position and tuning in the conventional manner.

FIG. 3--PARTS LAYOUT--Top View

FIG. 4--PARTS LAYOUT--Bottom View
CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly aligned only with the use of a calibrated test oscillator or signal generator and an output meter. Extreme care should be exercised in following the alignment instructions in order to obtain the best performance possible. It will be necessary to use an insulated screwdriver in making alignment adjustments.

ALIGNMENT PROCEDURE

Two separate alignment procedures are included in these instructions. The first, or CAPACITY ALIGNMENT, is to be considered as the usual alignment procedure and the second or CAPACITY AND INDUCTANCE ALIGNMENT is to be used only when a tuning coil has been replaced or a major change has been made in the tuning circuits.

CAPACITY ALIGNMENT

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 of the 6SK7 tube (grid side of resistor #36, Fig. 3) through a .1 mfd.
   
   (c) Connect the output meter from the plate of the 6SK7 tube to ground through a .1 mfd. condenser.

2. Aligning I-F Stages at 400 Kilocycles

   (d) Set the signal generator to 400 kilocycles.
   
   (e) Turn the voltmeter control full and tune the set to a point where no squeals or beat notes are noticed, also so that when the tuning control knob is rotated within narrow limits there is no appreciable change in output.
   
   (f) Adjust the I-F trimmers (Illus. A, B, C, D, Fig. 3) and the I-F core adjustment (Illus. E, Fig. 4) until maximum output is obtained.
   
   (g) Repeat these adjustments with as low an output from the signal generator as possible for more accurate alignment.

3. Aligning at 1560 Kilocycles

   (a) Connect the signal lead of the signal generator to the antenna terminal of the receiver through a .00007 mfd. nica condenser.
   
   (b) Tune the set by means of the manual tuning control to the extreme high-frequency end of the dial and against the stop.
   
   (c) Set the signal generator to 1560 kilocycles.
   
   (d) Adjust the oscillator shunt trimmer (Illus. F, Fig. 3) for maximum output.

4. Aligning at 600 Kilocycles

   (a) Leave the signal generator connected the same as before.
   
   (b) Set the signal generator to 600 kilocycles.
   
   (c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
   
   (d) Adjust the trimmers (Illus. G, H, Fig. 3) for maximum output.

5. Aligning at 600 Kilocycles

   (a) Leave the signal generator connected the same as before.
   
   (b) Set the signal generator to 600 kilocycles.
   
   (c) Tune the set by means of the manual tuning control until this signal is tuned in with maximum output.
   
   (d) Adjust the trimmers (Illus. G, H, Fig. 3) for maximum output.

6. Adjusting receiver to car antenna

   After the receiver is reinstalled in the car, it will be necessary to readjust the antenna trimmer (Illus. H, Fig. 3), on a weak station at or near 600 kilocycles, for maximum output.
If realignment is found necessary, the circuits can be properly adjusted only with the use of a calibrator test oscillator or signal generator and an output meter.

1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 K.C.
   (e) Tune the receiver to quiet point at 1600 K.C. end of dial, set Volume Control full on, adjust the trimmer on the second I-F transformer (Illus. E, Fig. 3) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 12SA7 tube.
   (g) Adjust the trimmer on the first I-F transformer (Illus. C, D, Fig. 3) for maximum output.

2. Aligning at 1720 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the loop through .0001 mfd. condenser.
   (b) Set signal generator to exactly 1720 K.C.
   (c) Tune receiver to 1720 K.C., condenser plates full clockwise (out of mesh).
   (d) Adjust oscillator trimmer condenser (Illus. A, Fig. 3) for maximum output.

3. Aligning at 1500 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 1500 K.C.
   (c) Rotate the tuning control knob until this signal is tuned in with maximum output.
   (d) Adjust the antenna trimmer (Illus. B, Fig. 3) for maximum output.
1. Aligning I-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. capacitor.

(b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.

(c) Connect the output meter across the primary of the output transformer.

(d) Set the signal generator to exactly 455 KC.

(e) Tune receiver to quiet point at 1,600 KC end of dial, set volume control full on, adjust the trimmers on the second I-F transformer (Illus. B & F Fig. 3) for maximum output.

(f) Connect the signal lead of the signal generator to the grid of the 12BA7 tube.

(g) Adjust the trimmers on the first I-F transformer (Illus. C & D Fig. 3) for maximum output.

2. Aligning at 1600 Kilocycles

(a) Connect the signal lead of the signal generator to the antenna terminal of the loop through 100 mfd. capacitor.

(b) Set signal generator to exactly 1600 KC.

(c) Tune receiver to 1600 KC, condenser plates full clockwise (out of mesh).

(d) Adjust oscillator trimmer condenser (Illus. B, Fig. #3) for maximum output.

3. Aligning at 1400 Kilocycles

(a) Leave the signal lead of the signal generator connected as above.

(b) Set the signal generator to 1400 KC.

(c) Rotate the tuning control knob until this signal is tuned in with maximum output.

(d) Adjust the antenna trimmer (Illus. A, Fig. #3) for maximum output.
BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTOMETER BETWEEN SOCKET TERMINALS AND B-
A.C. LINE VOLTAGE 117 VOLTS
POWER CONSUMPTION 30 WATTS
VOLUME CONTROL AT MINIMUM VOLUME.

A. CANNOT BE READ WITH VOLTOMETER
B. 12 VOLTS A.C. MEASURED ACROSS PINS H & H
C. 30 VOLTS A.C. MEASURED ACROSS PINS H & H
D. 117 VOLTS A.C. MEASURED ACROSS PINS D & D
E. 45 VOLTS A.C. MEASURED ACROSS PINS H & H

![Diagram of a radio circuit with labels and notes.]

FIG. 2--DELCO MODEL R-1174

12SQ7  50L6GT  12SK7  12SA7  35Z5GT

REAR OF CHASSIS
1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis through a .01 mf capacitor.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mf condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 KC.
   (e) Tune receiver to quiet point at 1,600 KC end of dial, set volume control full on, adjust the trimmers on the second I-F transformer (Illus. E & F, Fig. 3) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 12847 tube.
   (g) Adjust the trimmers on the first I-F transformer (Illus. C & D, Fig. 3) for maximum output.

2. Aligning at 1500 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the loop through 100 mf capacitor.
   (b) Set signal generator to exactly 1600 KC.
   (c) Tune receiver to 1600 KC, condenser plates full clockwise (out of mesh).
   (d) Adjust oscillator trimmer condenser (Illus. B, Fig. #3) for maximum output.

3. Aligning at 1400 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 1400 KC.
   (c) Rotate the tuning control knob until this signal is tuned in with maximum output.
   (d) Adjust the antenna trimmer (Illus. A, Fig. #5) for maximum output.

GENERAL: The Delco Model B-1174 is a five-tube, AC-DC superheterodyne receiver with 5" electrodynamic speaker.

ANTENNA: A long antenna is built inside the back cover of this radio and attached to the chassis. This type of antenna is somewhat directional therefore, the radio should be tried in different positions to determine the position which will produce the best reception. An antenna terminal is provided for connecting an outside antenna to the receiver.
FIG. 2—DELECO MODEL R-1775.

A.C. LINE VOLTAGE 117 VOLS.
POWER CONSUMPTION 30 WATTS.
12 VAC BETWEEN PINS H & H
12 VAC BETWEEN PINS H & H
8 VAC BETWEEN PINS 3 & 4

BOTTOM VIEW OF CHASSIS

VOLTAGE MEASURED WITH 1000 OHM PER
TERMINALS AND 6 "VOLTMETER"

© John F. Riden Buckhout
Aligning L-F Stages at 455 Kilocycles

(a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser.

(b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.

(c) Connect the output meter across the primary of the output transformer.

(d) Set the signal generator to exactly 455 KC.

(e) Tune the receiver to quiet point at 1600 KC and dial, set Volume Control full on. Adjust the trimmer on the second L-F transformer (Illus. B, F, Fig. 5) for maximum output.

(f) Connect the signal lead of the signal generator to the grid of the 12SA7 tube.

(g) Adjust the trimmer on the first L-F transformer (Illus. C, D, Fig. 5) for maximum output.

Aligning at 1500 Kilocycles

(a) Connect the signal lead of the signal generator at the antenna terminal of the loop through .0001 mfd. condenser.

(b) Set the signal generator to exactly 1500 KC.

(c) Tune receiver to 1500 KC, condenser plate full clockwise (out of mesh)

(d) Adjust oscillator trimmer condenser (Illus. A, Fig. 3) for maximum output.

Aligning at 1400 Kilocycles

(a) Leave the signal lead of the signal generator connected as above.

(b) Set the signal generator to 1400 KC.

(c) Rotate the tuning control knob until this signal is tuned in with maximum output.

(d) Adjust the antenna trimmer (Illus. B, Fig. 5) for maximum output.
ADJUSTMENTS FOR PUSH-BUTTON TUNING:

1. Press down on the first push button and hold it down. The screw in back of the push button is now accessible and should be loosened one or two turns with a screwdriver.

2. While still holding down the push button, tune in the station with the tuning knob. When the station is heard at its best, tighten the screw in back of the push button. Now let go of the push button, turn the tuning knob in order to detune and again press down the button and let go. To check, repeat action.

3. Proceed to set up the other five push buttons in a similar

11-29-40
FIG. 2--DELCO MODEL R-1177

ANTENNA: A loop antenna is built inside the back of the radio. This type of antenna is somewhat directional, therefore, the radio should be tried in different positions to determine the position which will produce the best reception.

Terminals are provided for connecting an outside antenna and ground where needed.

12-16-40
TUNING CONTROLS: Tuning is accomplished by means of a manual control or by means of six push buttons for electric tuning. The 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. Allow at least five minutes warm-up period before making adjustments. The procedure is as follows:

1. Turn Range Control knob to "A" position, and manually tune in the station. Turn the Loop Antenna to give minimum pickup of signal, no outside antenna should be used and link-on antenna board should be closed.

2. Turn Range Control knob to "PB" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.

3. Adjust No. 1 antenna trimmer for maximum output on this station. Owing to the relatively high B-F gain, it may be found that there are several settings of each push-button magnetite core that will bring in any particular station. In such cases it is advisable to unscrew the push button antenna trimmer to minimum capacity before adjusting the oscillator cores. Clockwise adjustment of cores and trimmers tunes the circuits to lower frequencies.

4. Adjust for each station in the same manner.

5. After all six stations are tuned in on the buttons, turn the loop antenna to a position giving the best signal pickup and make a fine control adjustment of all cores only until best reception is obtained for each outdoor antenna should now be reconnected if used.

During alignment the chassis must be removed from the cabinet along with the loop antenna. Keep the signal generator and signal generator leads as far from the loop as possible, also 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 indicator-drive-cord drum which is mounted on the 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 Fig. 5.

As the first step in B-F alignment, check the position of the drum. The "0°" mark on the drum scale must be vertical, and directly under 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.

To determine the corresponding frequency for any setting of the calibration scale, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

POINTER FOR CALIBRATION SCALE: Improves 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 550 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 6SK7 tube through a 0.1 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 kc.
   (e) Tune receiver to quiet point at 1500 kc and dial set volume control full on, range switch to broadcast position, and adjust the trimmers on the second I-F transformer (Illus. H. J., Fig. 3 & 4) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 6SK7 tube.
   (g) Adjust the trimmers, on the first I-F transformer (Illus. F. 6., Fig. 3 & 4) for maximum output.

2. Aligning Broadcast Band at 1500 Kilocycles
   (a) Connect signal lead of signal generator to antenna "A" terminal on loop, link open, through .0005 condenser. Connect a 25,000 ohm load resistor across secondary of 1st I-F transformer.
   (b) Set signal generator to 1500 kc.
   (c) Rotate the tuning condenser to 150° on drum calibration scale.
   (d) Adjust the broadcast oscillator trimmer (Illus. A., Fig. 4) to maximum output.
   (e) Adjust the broadcast antenna trimmer (Illus. B., Fig. 3) to maximum output.

3. Aligning Broadcast Band at 800 Kilocycles
   (a) Set signal generator to 600.
   (b) Rotate the tuning condenser to 30.5° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. C., Fig. 3) while rocking the condenser-gang back and forth until maximum output is obtained.

4. Repeat steps 2 and 3 above for maximum output.

5. Aligning Shortwave Band at 15 M.C.
   (a) Connect signal lead of signal generator to antenna "A" terminal on loop, link open, through .0005 mfd. condenser.
   (b) Remove 25,000 ohm load resistor.
   (c) Set signal generator to 15 M.C.
   (d) Rotate tuning condenser to 145° on drum calibration scale.
   (e) Adjust the short wave oscillator trimmer (Illus. D., Fig. 4) for maximum output. Use MINIMUM capacity peak if two peaks can be obtained.
   (f) Adjust the short wave antenna trimmer (Illus. E., Fig. 4) for maximum output.
PRECAUTIONARY LEAD DRESS

1. Dress 2nd I. F. leads close to chassis.
2. Dress leads from volume control and tone switch away from filaments.
3. Diode and power leads. Dress .005 mfd. (C33) volume control condenser away from electrolytic.

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As the first step in R-F alignment, check the position of the drum. The "90°" mark on the drum scale must be vertical, and directly under 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.

To determine the corresponding frequency for any setting of the calibration scales, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

**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 "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 560 Kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

1. **Aligning 1-F Stages at 455 Kilocycles**
   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the output meter from plate to plate of the G46 output tubes.
   (c) Connect the signal lead of the signal generator to the control grid of the G6A7 tube through a .01 uf condenser.
   (d) Turn the band switch to the broadcast position, the tone control on high and the volume control full on.
   (e) Set the signal generator to exactly 455 kilocycles.
   (f) Adjust the trimer on the 1-F coils (Illus. G.H.J.K, Figs. 3 & 4) for maximum output.

2. **Aligning short wave band at 16 M.C.**
   (a) Connect signal lead of signal generator to antenna terminal "A" on rear of chassis through a .00005 uf condenser. Leave ground lead connected to receiver chassis.
   (b) Change the band switch to the short wave (C) position.
   (c) Set the signal generator to 16 M.C.
   (d) Rotate the tuning condenser plate to 158° on drum calibration scale.
   (e) Adjust the short wave oscillator trimmer (Illus. B, Fig. 4) for maximum output.
   (f) Adjust the short wave antenna trimmer (Illus. A, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

3. **Aligning Middle wave Band at 2.44 Mcycles**
   (a) Connect signal lead of signal generator to antenna section of gang condenser through 300 ohm resistor. Leave ground lead connected to receiver chassis.
   (b) Change the band switch to the middle wave position (B).
   (c) Set the signal generator to 2.44 megacycles.
   (d) Rotate the tuning condenser plate to 97° on drum calibration scale.
   (e) Adjust the middle wave oscillator trimmer (Illus. D, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

4. **Aligning Broadcast Band at 1,500 Kilocycles**
   (a) Set band switch to the broadcast position.
   (b) Rotate the tuning condenser plates to 160° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. E, Fig. 4) for maximum output. Use minimum capacity peak if two peaks can be obtained.

5. **Aligning Broadcast Band at 600 Kilocycles**
   (a) Set signal generator to 600 Kilocycles.
   (b) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. F, Fig. 3) (rocking gang) until maximum output is obtained.

Note: Fasten chassis in cabinet. Connect loop, see that link is closed on the antenna board, attach dial indicator to drive cord, with indicator at 360 Kc mark and gang at maximum capacity.

6. **Aligning Broadcast Band at 1,500 Kilocycles**
   (a) Connect a radiation loop to signal generator consisting of two turns of wire 18 inches in diameter and locate the generator and loop 4 to 6 ft. from receiver.
   (b) Set signal generator to 1,500 Kc.
   (c) Rotate the tuning condenser plates to 160° on drum calibration scale.
   (d) Adjust the broadcast antenna trimmer on loop to maximum output.

7. **Aligning Broadcast Band at 600 Kilocycles**
   (a) Set signal generator to 600 Kc.
   (b) Rotate the tuning condenser plates to 30° on drum calibration scale.
   (c) Adjust the broadcast oscillator trimmer (Illus. F, Fig. 3) to maximum output. BOTTOM VIEW OF CHASSIS...
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 indicator-drive-cord drum which is mounted on the 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 Fig. 5.

1. Turn Range Control knob to "A" position, and manually tune in the station. Turn the Loop Antenna to give minimum pickup of signal, no outside antenna should be used and link on antenna board should be closed.

2. Turn Range Control knob to "FB" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.

3. Adjust No. 1 antenna trimmer for maximum output on this station. Owing to the relatively high B-F gain, it may be found that there are several settings of each push-button magnetite core that will bring in any particular station. In such cases it is advisable to unscrew the push button antenna trimmers to minimum capacity before adjusting the oscillator cores. Clockwise adjustment of cores and trimmers tunes the circuit to lower frequencies.

4. Adjust for each station in the same manner.

5. After all six stations are tuned-in on the buttons, turn the Loop Antenna to a position giving the best signal pickup and make a final careful adjustment of all core rods until best reception is obtained for each. Outdoor antenna should now be reconnected if used.
MODEL 8180 Delux
UNITED MOTORS SERVICE

TUNING CONTROLS: Tuning is accomplished by means of a manual control or by means of six push buttons for automatic tuning. The control consists of separate magnetic-core oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. Allow at least five minutes warm-up period before making adjustments. The procedure is as follows:

1. Turn Range Control knob to "A" position, and manually tune in the station. Turn the loop antenna to give the best pickup of signal. No outside antennas should be used and link on antenna board should be closed.

2. Turn Range Control knob to "B" and press push button No. 1 and adjust No. 1 oscillator control to receive this station. Tuner the crystal coil in the loop, to lowest frequency, and then tune down slowly until station is received.

3. Adjust No. 1 antenna trimmer for maximum output on this station. Owing to the relatively high r.f. gain, it may be found that there are several settings of each push-button oscillator coil that will bring in any particular station. In such cases it is advisable to increase the push-button antenna trimmers to maximum capacity before adjusting the oscillator coils. Complete adjustment of cores and trimmers tunes the circuits to lower frequencies.

4. Adjust for each station in the same manner.

5. After all six stations are tuned in on the buttons, turn the control to "C" position giving the best signal pickup and make a final careful adjustment of all core cores until best reception is obtained for each outside antenna should not be recommended if used.

During alignment the chassis must be removed from the cabinet but the loop antenna may be connected and must be connected to the receiver. Keep the signal generator and signal generator leads as far as possible from the antenna circuit. Keep the signal generator and signal generator leads as far as possible from the antenna circuit. A calibration scale is attached to the drive-core drum which is mounted on the shaft of the condenser. The setting of the gang condenser is read on the scale, which is calibrated in degrees. The correct setting of the gang in degrees, for each alignment frequency, is given in the alignment procedure.

As the first step in B alignment check the position of the drive drum. The "A" mark on the drum slide must be vertical, and directly under the center of the knob. The condenser must be fully seated. 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.

To determine the corresponding frequency for any setting of the calibration scales, refer to Fig. 1, which shows the dial with 0-100 calibration scales drawn at top and bottom.

POSITION FOR CALIBRATION SCALE: Improperly because of the calibration scales by freezing a piece of wire to the condenser frame, and bend the wire so that it points to the "A" mark on the calibration scales when the points of the muscle are fully seated.

DIAL-INDICATOR ADJUSTMENT: After fastening the chassis in the cabinet, attach the dial indicator to the drive core with indicator at the 900 degree mark, and the gang condenser fully seated. The indicator has a spring clip for attachment to the cable.

SPREAD-BAND ALIGNMENT: Make final adjustment of "B", "C", and ultrawide "D" trimmers during actual reception of a station of known frequency near 54 megacycles.

1. Aligning at 54 Mc.

(a) Connect the signal lead of the signal generator to the antenna terminal of the receiver (link on terminal closed) in series with a 0.0005 meg. condenser.

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

(c) Set the signal generator to 15 Mc.

(d) With the band switch in the "C" position, rotate the tuning condenser plates to 150° on drum calibration scale.

(e) Adjust "D" band oscillator trimmer (Illus. A, Fig. 2) for output. These minimum capacity peak if two peaks can be obtained.

(f) Adjust "F" band detector trimmer (Illus. B, Fig. 3) for maximum output. These minimum capacity peak if two peaks can be obtained.

(g) Adjust "G" band antenna trimmer (Illus. C, Fig. 4) for maximum output. These minimum capacity peak if two peaks can be obtained.

2. Aligning at 24 Mc.

(a) Connect signal lead of signal generator as above.

(b) Change the band switch to "B" meter band position.

(c) Set signal generator to 6.0 Mc.

(d) Rotate the tuning condenser plates to 60° on drum calibration scale.

(e) Adjust "D" meter oscillator trimmer (Illus. D, Fig. 2) for maximum output. Use minimum capacity peak if two peaks can be obtained.

(f) Adjust "F" meter detector trimmer (Illus. E, Fig. 4) for maximum output.

(g) Adjust "G" meter antenna trimmer (Illus. F, Fig. 4) for maximum output. Rock in trimmers 8 and 9.

3. Aligning at 600 Kc.

(a) Connect signal lead of signal generator to CHASSIS lead of loop antenna plug in series with 300 ohm resistor.

(b) Change band switch to "A" position.

(c) Set signal generator to 2.46 Mc.

(d) Rotate the tuning condenser plates to 90° on drum calibration scale.

(e) Adjust "F" band oscillator trimmer (Illus. G, Fig. 4) for maximum output.

(f) Adjust "G" band detector trimmer (Illus. H, Fig. 4) for maximum output.

(g) Adjust "H" band condenser plug to 00° on drum calibration scale.

(h) Adjust the broadcast oscillator trimmer (Ilius. I, Fig. 4) for maximum output.

(h) Adjust the broadcast oscillator trimmer (Ilius. J, Fig. 4) for maximum output.

(h) Adjust the broadcast oscillator trimmer (Ilius. K, Fig. 4) for maximum output.

(h) Adjust the broadcast oscillator trimmer (Ilius. L, Fig. 4) for maximum output.

4. Aligning at 3000 Kc.

(a) Connect signal lead of signal generator as above.

(b) Change band switch to "A" position.

(c) Set signal generator to 1800 kc.

(d) Rotate the tuning condenser plates to 180° on drum calibration scale.

(e) Adjust broadcast antenna trimmer (Ilius. M, Fig. 6) for maximum output.

(f) Adjust the broadcast antenna trimmer (Ilius. N, Fig. 6) for maximum output.

(g) Adjust the broadcast antenna trimmer (Ilius. O, Fig. 6) for maximum output.

5. Repeat operations 6 and 7.

NOTE: Faster chassis in cabinet, close antenna link, adjust indicator to dial scale.

6. Aligning at 5000 Kc.

(a) Connect an adjustable loop to signal generator consisting of two turns of wire 18 inches in diameter and locate the generator and loop 4 to 6 feet from receiver.

(b) Set signal generator to 1800 kc.

(c) Rotate the tuning condenser plates to 180° on drum calibration scale.

(d) Adjust the broadcast antenna trimmer "L" (0°) on loop) to maximum output.

7. Aligning at 8000 Kc.

(a) Set signal generator to 8000 kc. connection as above.

(b) Rotate the tuning condenser plates to 80° on drum calibration scale.

(c) Adjust the broadcast antenna trimmer (Ilius. N, Fig. 6) for maximum output.

8. Repeat operations 8 and 9.
PHOTOGRAPH MOTOR: The phonograph motor is of the self starting synchronous type and operates the turntable through friction drive between the motor drive spindle and the rubber-tired idler on the rim of the turntable.

The motor should be lubricated once or twice a year by placing a few drops of S.A.E. 20 oil on the turntable spindle and saturating the felt oil retainer pads on the motor shafts.

CAUTION: The motor drive spindle and the rubber tire on the idler must be kept clean and entirely free from oil and grease at all times.

POWER SUPPLY: Although this model employs an AC-DC chassis, it is not suitable for use on DC; as this would damage the motor.

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuits can be properly adjusted only with the use of a test oscillator or signal generator and an output meter.

1. Aligning I-F Stages at 455 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser, and keep the output as low as possible.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 12SK7 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 KC.
   (e) Tune the receiver to quiet point at 1600 KC end of dial, set Volume Control full on, adjust the trimmers on the second I-F transformer (Illus. B, E, Fig. 5) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 12SK7 tube.
   (g) Adjust the trimmers on the first I-F transformer (Illus. C, D, Fig. 3) for maximum output.

2. Aligning at 1560 Kilocycles
   (a) Connect the signal lead of the signal generator to the antenna terminal of the loop through .0001 mfd. condenser.
   (b) Set signal generator to exactly 1560 KC.
   (c) Tune receiver to 1560 KC, adjust oscillator trimmer condenser (Illus. A, Fig. 5) for maximum output.

3. Aligning at 3000 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 3000 KC.
   (c) Rotate the tuning control knob until this signal is tuned in with maximum output.

4. Repeat Operations 2 and 3 for maximum output.
CALIBRATION SCALE: The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment.

CIRCUIT ALIGNMENT: If realignment is found necessary, the circuits can be properly adjusted only with the use of a calibrated test oscillator or signal generator and an output meter.

During alignment the chassis may be removed from the cabinet along with the loop antenna. Keep the signal generator and signal generator leads as far from the loop as possible, also keep the output as low as possible to avoid a.y.c. action.
1. **Aligning I-F Stages at 455 Kilocycles**

   (a) Connect the ground lead of the signal generator to the chassis.
   (b) Connect the signal lead of the signal generator to the grid terminal of the 6SK7 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 455 KC.
   (e) Tune receiver to quiet point at 1500 KC end of dial, set volume control full on, range switch to broadcast position, and adjust the trimmers on the second I-F transformer (Illus. H. J., Fig. 3 & 4) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid of the 6SA7 tube.
   (g) Adjust the trimmers, on the first I-F transformer (Illus. F. G., Fig. 3 & 4) for maximum output.

2. **Aligning Broadcast Band at 1500 Kilocycles**

   (a) Connect signal lead of signal generator to antenna "A" terminal on the chassis, link open, through .0002 condenser.
   (b) Connect the ground lead of the signal generator to the "G2" terminal of the chassis.
   (c) Set signal generator to 1500 KC.
   (d) With band switch in broadcast position, tune receiver to the 1500 KC position.
   (e) Adjust Broadcast Oscillator Trimmer (Illus. A, Fig. 3 & 4) for maximum output.
   (f) Adjust Broadcast Antenna Trimmer (Illus. B, Fig. 3) for maximum output.

3. **Aligning Broadcast Band at 600 Kilocycles**

   (a) Set signal generator to 600 KC.
   (b) Tune radio to 600 KC position.
   (c) Adjust Broadcast Oscillator Trimmer (Illus. C., Fig. 3 & 4) while rocking gang condenser back and forth through the signal until maximum output is obtained.

4. **Repeat operations 2 and 3 for maximum output**

5. **Aligning Shortwave Band at 15 W.C.**

   (a) Connect the signal lead of the signal generator to the "A" terminal in series with .00005 mfd. condenser.
   (b) Set the signal generator to exactly 15 W.C.
   (c) With the band switch in the short wave position, tune the receiver to the 15 W.C. position.
   (d) Adjust the short wave oscillator trimmer (Illus. D., Fig. 3 & 4) for maximum output. If two peaks are obtained use high frequency (minimum capacity) peak.
   (e) Adjust short wave antenna trimmer (Illus. E., Fig. 3 & 4) while rocking gang condenser back and forth through the signal until maximum output is obtained. If two peaks can be obtained use low frequency (maximum capacity) peak.
UNITED MOTORS SERVICE
MODEL R186
Record Change

RUDMANT-SERVICE INSTRUCTIONS-DEAGO AUTOMATIC RECORD CHANGER

GENERAL: The DEAGO Record Changer is a mechanical device for playing Victorola records in sequence. It has a capacity of seven 12-inch, or eight 10-inch, records in sequence. If the mechanism is not for 10-inch records, it will play both 10 and 12-inch records in mixed sequence, but it is strongly recommended that one also be used as a loading unit.

The motor employed is a starting synchronous available only in 60 cycle 115 V. A.C.

SERVICE: It is important that the driving motor and rubber tires on main driving dials and idle pulley be kept clean and free from oils, grease, dust or other foreign material at all times. The surface of the mechanism should be removed to prevent dusting of these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field.

The rubber-tired driving dials are not replaceable from the end of the turntable. The turntable is fastened to the driving dials by three bolts. If necessary to replace the疫情, flexible drive gear sets, four should be replaced. The driving dials, turntable and spindle assembly can be lifted upward from the motor base. If this is done, great care should be taken not to bend the spindle.

Before servicing the automatic record changer, inspect the assembly to see that all covers, parts, gears, springs, etc., are in good order and correctly assembled.

A belt or jaw in 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 pushing the "Stop" button and releasing the mechanism to rotate in the direction of the turntable revolutions are required for one change cycle.

When a record has been played the pickup moves out, another record is brought to the front, the pickup is moved in the starting groove of the record. If the mechanism fails to start the starting groove, raise the right-hand side of the cabinet by inserting a spacer under the feet on either side. If the mechanism slides over a few grooves, raise the left-hand side of the cabinet to enlarge a smaller movement.

The 10 and 12-inch records must be absolutely flat for smooth operation.

A pickup mounting screw, located underneath the motorboard, operates when the pickup is not in position to the pickup cover.

SERVICING SERVICE ENDS: Inaccurate adjustment of a particular mechanism of the changer is generally caused by various modes of improper operation. The following limitations between operations under the normal functioning will enable ready adjustment in most cases.

1. For any irregularity of operation, the appropriate adjustment of the main lever "15" should be checked first as in the assembly.
2. Provide records properly on both 10 and 12 inch records-make complete adjustments "J" and "9".
3. Provide does not load on 12 inch record but correct on 10 inch-effect adjustment "j7.
4. Failure to trip at end of record-increases lower "17" friction by means of screw "27.
5. Leve does not load properly on 12 inch record but correct on 10 inch-effect adjustment "77.
6. Low in record reproduction-record is defective; or associated pickup friction "87" at light.
7. Low in record reproduction-record is defective; or associated pickup friction "87" at light.
8. Record does not load properly on 12 inch record but correct on 10 inch-effect adjustment "j7.
9. Qualifies coming before record is completed-record is defective; or associated pickup friction "87" at light.
10. Record not released properly-adjust record shall be assembled in respect to shaft by means of adjustment "87".
11. When record does not load properly on 12 inch record or misses record entirely-increase amount of record reproduction all the way up to approximately 1/6-1/8 inch.

ADJUSTMENTS

A. MAIN LEVER: This lever is basically in position that it interlocks the various individual mechanisms which control record loading, tripping, record stop, etc. Rotate the turntable until the changer is out-of-cycle, and check rubber bushing (A). The roller should close the nose of the pick-ups by approximately 1/8-1/6 inch.

B. PICKUP CLUTCH: The motion of the nose is toward the center of the record. If the nose is set for the trip part "22" by the trip lever "27" through a friction clutch "87". If the motion of the pickup is strongly accelerated or being due to velocity in the eccentric groove, the trip finger "22" serves the trip part NC less engagement with the pick on the main lever, and the cycle is started. Proper adjustment of the friction clutches "87" causes slowing of movement of the turntable is caused by a variable positive movement of the trip part "22". Without friction of the change cycle to slip, the friction should be just enough to prevent slipping, and is adjustable by means of screw "27." If adjustment is too, the friction should be increased, if the turn, will not operate at the end of the record.

C. PICKUP LIFT SAFETY CABLE: During the record change cycle, lever "15" is actuated, the main lever "12" so as to raise the nose are clear or record by means of the pickup lift cable. To adjust pickup for proper operation, slip the changer "in-cycle" at the point where

pickup is raised to the maximum height above turntable plate, and has not moved upward; at this point, adjust the pickup to obtain 1/2 inch spacing between nose points and turntable top surface.

C. PICKUP SAFETY CABLE: The relation of the turntable and lever "15" determines the landing position of the needle on the 10 inch record. Proper position of lever "15" governs the landing of the needle on a 10 inch record. This position is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push idle lever to reject position and push on 10 inch position; see that record discriminators lever "11" is tilted fully upward. Also rotate pick-up gear set, and slider idler is on record. This is ready to land on the record; see that pin "14" on lever "15" is in contact with step "14" on lever "12". The correct point of landing is 1/2 inch from the nearest side of the turntable pin; thus the nose of needle and adjacent portion of turntable is in proper dimension, being careful not to disturb lever "14" and "19". Move approximately 1/8 inch and play the 10 inch record through several cycles as a check, then tighten the pedestal screw "25" and record through several cycles. If the movement of the turntable is not correct, turn screw "27" until the eccentric and adjust lever "19" to give correct needle landing. The eccentricend of the screw is used to adjust the turntable to the rear of the motorboard. Otherwise incorrect landing may occur with 10 inch records.

D. RECORD ARM EASEMENT: The trip on each of the record post serves to secure the record from the arm so that the remaining records during the change cycle. It is essential that the record pass between the knife and the rotating record pick-up "27" is accurately maintained. The spacing for the 10 inch record is nominally 0.065 inch, and for the 12 inch record length 0.070 inch.

To adjust, rotate the knife to the points of minimum vertical separation from the record pick-up and invert screw "27" to give 0.005-0.001 inch separation. Screw "27" must not be depressed during this adjustment. After setting screw "27", so that when the tip is depressed flush with top of record section, the vertical spacing between the knife, in the lowest rotational position, and the knife, is 0.070-0.065 inch.

E. SECOND ARM EASEMENT-The record shortening during the change cycle to allow the lower record to drop onto the turntable. Both points are repositioned simultaneously a gear or so, or each, so that the lower center of the groove is closer to the turntable to the main lever "15", and it is necessary then adjustment be such that the record in contact from the nose which to the limits. At the proper position of the turntable to conform for the approximate 1/2 inch specified above. Tightens the knob pedestal screw "25" and record through several times of change action, then tighten both pedestal screw "25". If record should be or in either, not perfectly horizontal, improper operation and jamming of mechanism will occur.

F. TURNOVER BUTTON (NOT SHOWN): When the changer is in out-of-cycle, the front edge of the pick-up gear is under the surface of motorboard. This may be adjusted by bending the same, with the arm on support brackets, which in association with the nose are mounting there, in the required direction.

G. TRIP PICK-UP STOP: The position of the trip part is set with the hand of the pick-up gear is under the surface of motorboard. This may be adjusted by bending the same, with the arm on support brackets, which in association with the nose are mounting there, in the required direction.

LUBRICATION—Petroleum or petroleum jelly is applied to arm, main gear, spindle pinion gear, and gear of record posts.

Light machine oil should be used in the nose and vertical bearing, record post bearings, and all other bearings of various levers and pulleys on undersides of motorboard.

DO NOT ALLOW RUBBER OR MATERIAL TO COME IN CONTACT WITH RUBBER BEAM OR RUBBER PARTS OF THE MECHANISM.

WATER SERVICE DATA

On the drive motor a 0.034 inch feeler gauge is recommended for covering the cover or the motor frame.

The field coils can be disassembled andreassembled or if care is used in the field. Otherwise, the motor frame will not be damaged.

When disassembling the rotor or rotor shaft being done, the field should be held in a clamp to prevent the field springing when the bolts which hold the assembly together are loosened.
FIG. 3—PARTS LAYOUT—Top View

CIRCUIT ALIGNMENT

If realignment is found necessary, the circuit can be properly adjusted only with the use of a calibrated test oscillator or signal generator and an output meter.

1. Aligning I-F Stages at 450 Kilocycles
   (a) Connect the ground lead of the signal generator to the chassis through a .01 mfd. condenser.
   (b) Connect the signal lead of the signal generator to the grid cap of the 1R08 tube through a .01 mfd. condenser.
   (c) Connect the output meter across the primary of the output transformer.
   (d) Set the signal generator to exactly 450 KC.
   (e) Tune the receiver to quiet point at 1600 KC end of dial; set volume control full on, adjust the trimmers on the second I-F transformer (Illus. F, G, Fig. 3 & 4) for maximum output.
   (f) Connect the signal lead of the signal generator to the grid cap of the 1A7T tube.
   (g) Adjust the trimmers on the first I-F transformer (Illus. D, E, Fig. 3 & 4) for maximum output.

2. Aligning at 1720 Kilocycles.
   (a) Connect the signal lead of the signal generator to the antenna lead of the loop through a .0001 mfd. condenser.
   (b) Set signal generator to exactly 1720 KC.
   (c) Tune receiver to 1720 KC, condenser plates full clockwise (out of mesh).

3. Aligning at 1600 Kilocycles
   (a) Leave the signal lead of the signal generator connected as above.
   (b) Set the signal generator to 1600 KC.
   (c) Rotate the tuning control knob until this signal is tuned in with maximum output.
   (d) Adjust the antenna trimmer (Illus. B, Fig. 3) for maximum output.

4. Aligning at 600 Kilocycles
   (a) Set signal generator to 600 KC.
   (b) Rotate the tuning control knob until this signal is tuned in with maximum output.
   (c) Adjust oscillator trimmer (Illus. C, Fig. 3) while rocking group condenser back and forth through the signal until maximum output is obtained.

NOTE: Repeat operations 3, 3, and 4.

Current Consumption:

- A 0.25 amperes 105-125 volt 50-60 cycle
- B 11.6 milliamperes 105-125 volt D.C.
Tuner:

Mechanical tuning is accomplished by five push buttons which rotate the tuning condenser to pre-selected frequencies.

1. Rotate the button to be set in a counter-clockwise direction until it turns freely.
2. Push the button in as far as it will go and hold it in this position while tuning in the desired station by means of the manual knob.
3. When the station has been carefully tuned in, release the button and turn it in a clockwise direction until it becomes tight. Tighten with the fingers, do NOT use any kind of tool.
Adjusting receiver to car antenna

When the receiver leaves the factory the antenna circuit is closely aligned to match the capacity of the car antenna. However, due to variations in antenna capacity it may be necessary to adjust the antenna trimmer to match the car antenna. This should be done as follows:

(a) Turn set on and tune in a very weak station between 120 and 150 (near 150) on the dial. Adjust the antenna trimmer (F) for maximum volume.

Do not disturb the oscillator or the R.F. trimmers in making this adjustment.

SERVICE HINTS

Dial cord (or pointer) replacement:

1. Unhook the cord eyelets from drive pulley.

2. Move pointer by hand toward the 150 end of the dial until the pointer pivot pin drops through the enlarged end of the pointer guide slot.

3. Lift the pointer and pointer cord out of the tuner from the dial side.

4. File off the lower tip of the pointer guide pin, releasing the retaining washer and the cord pivot arms.

5. With the pointer upside down and pointing away from the operator, put the longer cord pivot arm on the left. Cord side up.

6. Place the short pivot arm (spring assembly) on the right. Cord side up.

7. Replace the retaining washer and solder it to the guide pin.

8. Replace the pointer. Place pivot pin in the enlarged end of the guide slot and then slide the rear end of the pointer into the rear support bearing.

9. Place the long cord behind the pointer and over pulleys (Fig. 5 & 6). Hook the cord eyelet over the drive pulley hook nearest the back of the tuner and push the cord into position around the pulley rim.

10. Put the spring loaded cord over pulley and between the longer string and the tuner frame before hooking the cord eyelet to the drive pulley.
ALIGNMENT FOR MODELS 788LS, 888LS, 988LS, 998LS

LOCATION OF PARTS ON TOP OF CHASSIS

MODEL 880

Follow the procedure outlined below, in order to adjust the push-buttons properly.

1. By means of the Station Selector Knob turn in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in 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. Continue 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.

In 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.

Follow through with same procedure, setting up the other 3 stations. Carefully check each Push-Button for the accuracy of the 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 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 four selected stations for automatic operation, merely push IN ALL THE WAY the Button set up for that station.

Intermediate Alignment

Attach the output motor to the receiver. Set the signal generator to 455 KC and attach the output of the generator to the control grid cap of the 6CT7 I.F. amplifier tube. Adjust the trimmers on the 2nd I.F. transformer for max. gain. Keep the volume control of the receiver at max. and the attenuator of the signal generator as low as possible.

Transfer the output connection of the signal generator from the 6CT7 I.F. tube to the control grid of the 6X5 tube and adjust the trimmers on the 1st I.F. transformer. Now go back over the adjustments of both I.F. transformers.

Tuning Circuit Alignment

Long Wave—Set signal generator at 1000 KC. Attach output of generator to ant. of receiver using a 200 ohm dummy. Throw band switch to the extreme left, counter clockwise, to band 3. Make sure dial pointer is set properly and then tune dial to approx. 1000 KC. Adjust long wave paddler for max. gain while "rocking" the gang back and forth with each adjustment. The long wave paddler is nearest the front edge of chassis.

Set signal generator to 3500 KC, tune dial to 3500 KC and adjust osc. trimmer. Adjust ant. and R.F. stage trimmers for max. output.

Broadcast Band—Set signal generator to 600 KC, adjust band switch to broadcast band. Tune dial to 600 KC and adjust the other paddler condenser for max. gain while "rocking" the gang back and forth with each adjustment.

Set signal generator to 1500 KC and tune dial to 1500 KC. Adjust osc. trimmer to bring in signal and adjust ant. and R.F. trimmers for max. gain.

Short Wave Band—Change dummy ant. to 400 ohm resistor. Set signal generator to 15 KC. Turn band switch to short wave band and tune dial to 15 KC. Adjust osc. trimmer to bring in signal and adjust ant. and R.F. trimmers for max. gain.

Make the usual tests for image. Take care not to peak set on image when adjusting the short wave band.

The positions of the various trimmers are as follows:

On the trimmer strip nearest the front edge of the chassis are the three antenna trimmers. The one nearest the band switch is for band 2 trimmer, the next trimmer is for Band 1 and the trimmer out towards the side of chassis in the same strip is for band 2.

The center trimmer strip on 3 trimmers is for osc. adjustments.

The trimmer strip of 3 trimmers just back of the band switch is for R.F. interstage adjustments.

The trimmers for each band are in the same respective positions on all three trimmer strips.
This receiver is made to cover from 1750 KC. to 535 KC., which covers the standard broadcast band and the first police band.

The 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.
BOTH ARE EARLY TYPES OF MODEL 660

6 TUBE AUTO RADIO MODEL 660
MODELS 1-621, 1-622, 9-62, 910

Follow the procedure outlined below in order to adjust the push buttons properly:

1. By means of the tuning knob, tune in as accurately as possible your first desired station.

2. Lift up the button for that station and with a small screw-driver loosen set screw about two turns (counter-clockwise).

3. Push the set screw in as far as it can go with the screw-driver, and while holding the set screw in this position, make sure that your desired station is tuned in properly. It may be necessary to re-tune your station.

4. While holding set screw in as far as possible, and after your station is adjusted properly, tighten set screw firmly.

The push-button tuning system is now correctly set up for your first selected station.

Follow through with this same procedure in setting up the other three stations.
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 lead 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 extreme high frequency end. Feed a 1730 K.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Adjust the 1730 K.C. broadcast 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. broadcast antenna trimmer to maximum output. Set the generator to 600 K.C. and adjust the 600 K.C. broadcast 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 short wave band is aligned while feeding a 6.0 M.C. signal to the receiver antenna lead through a .00025 M.F. mica condenser. Turn the wave switch to short wave position and tune in the 6.0 M.C. signal. Adjust the 6.0 M.C. short wave trimmer to maximum output.
INSTAMATIC TUNING

The purpose of Instamatic 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 Instamatic tuning feature has been properly adjusted, this will instantly and automatically tune in the station selected by this button.

Before attempting to adjust or use Instamatic 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 Instamatic feature may be easily adjusted by carefully following these instructions.

Located on the back of the chassis is a row of five pair of small bakelite adjustment knobs. Each pair of these knobs controls the tuning of the station for the Instamatic button which is in the same relative position.

With the receiver operating with the “Dial Tuning” button in and the wave switch in broadcast position, turn the tuning knob to the left until the 540 KC end of the band has been reached. Then turn the tuning knob to the right until a station, for which it is desired to have Instamatic tuning, is heard. Press in the Button No. 1. This is the button at the left hand end of the row. Reach around to the back of the receiver and turn upper knob of the Pair No. 1 until the same program is heard. Unless the wrong knob is being turned, several different stations will be heard during this procedure. If necessary to check that the same program is 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 Instamatic 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 bottom 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 exact tuning by watching the magic eye and adjusting until the two edges of the green section are as close together as it is possible to get them.

The first Instamatic button is now properly adjusted for the station which was tuned in on the dial and the station’s call letters may be pushed out of the station list, moistened on the back, and pressed into the hollow end of the button.

With the “Dial Tuning” button pressed in, the tuning knob is again turned to the right until the next station for which Instamatic tuning is wanted, is tuned in. The adjustment process for this station is the same as before, except that Button 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 Instamatic tuning is being used.

The approximate frequency coverage of each of the “Instamatic” 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 1500 KC

If desired the tuning dial may be left set to a station which is not set up on one of the buttons. The “Dial Tuning” button will then tune in this station when it is pressed. This will give an extra Instamatic tuned station, making a total of six different stations which can be instantly tuned in by simply pressing a button.
ALL MODELS
CONVENTIONAL
ALIGNMENT
SEE
SPECIAL
SECTION
VOL. VIII

I.F. PEAK 456 KC

MODEL 6V-600
SPECIFICATIONS

Power Consumption 57 Watts (At 117 volts 60 cycles)
Power Output ................... 1.2 Watts Undistorted...
Selectivity .......... 40 KC Broad at 1000 times Signal
Intermediate Frequency ......... 456 KC
Speaker ......................... 8” Electro-Dynamic

Tuning Frequency Range
B Range ...................... 528 to 1600 KC
D Range ...................... 5750 to 18300 KC

Sensitivity - External Antenna - For 0.5 Watt output
B Range ....................... 7 Microvolts Average
D Range ....................... 5 Microvolts Average

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 Antennas - 2 ft., 100 mmf., and 400 ohms.

Condi Model - It is not necessary to remove chassis from cabinet. Merely remove chassis mounting screws so that chassis may be turned to reach oscillator trimmer on gang condenser.

L.F.
456 KC Grid of 1st Det. .1 mf. B Range Turn Rotor to Full Open 1st L.F. (C12) & (C14)
3rd L.F. (C18) & (C19)

Range B
1600 KC External Antenna Clip or Lead 100 mmf. B Range Turn Rotor to Full Open Oscillator Range B (C11)
1400 KC External Antenna Clip or Lead 100 mmf. B Range Turn Rotor to Max. Output Set Indicator to 1400 KC See Note A Ant. Range B (C8)
600 KC External Antenna Clip or Lead See Note B 100 mmf. B Range Turn Rotor to Max. Output 600 KC (C7) Rock Rotor - See Note C

Range D
18,300 KC External Antenna Clip or Lead 400 Ohm D Range Turn Rotor to Full Open Oscillator Range D (C4)
17,000 KC External Antenna Clip or Lead 400 Ohm D Range Turn Rotor to Max. Output Ant. Range D (C1) Rock Rotor - See Note C

Loop Range B
1400 KC External Antenna Clip or Lead See Note D 100 mmf. B Range Turn Rotor to Max. Output Ant. Range B (C8)

Attenuate the signal from the signal generator to prevent the leveling-off action of the A.V.C.
After each range is completed, repeat the procedure as a final check.
NOTE A - If the pointer is not at 1400 KC on the dial, remove pointer from drive cord.
Tune in a 1400 KC signal. Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.
NOTE B - (Table Model) By means of wooden blocks, stand the loop aerial assembly upright exactly 4 inches from the back of the chassis.
NOTE C - Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

On later models, two resistors were added to the phono circuit.
One, a 1.5 Megohm resistor, was connected in series with No. 2 terminal on the band switch (Section No. 1) and the ungrounded terminal of the phono socket. The other resistor, .5 Megohm, was connected between the ungrounded terminal of the phono socket and ground.
SPECIFICATIONS

Input Voltages and Currents—Battery Operation
"A" Batteries .................................................. 9 Volts—50 Ma.
"B" Batteries .................................................. 9 Volts—11.5 Ma.

Power Consumption (At 117 volt AC Supply) 28 Watts

Power Output

<table>
<thead>
<tr>
<th>Operation</th>
<th>150 mW Undistorted</th>
<th>350 mW Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Selectivity - 50 KC Broad at 1000 Times Signal
Intermediate Frequency - 456 KC
Speaker - 6" P.M. Dynamic
Tuning Frequency Range - 540 to 1600 KC
Sensitivity (For .05 Watt Output) External Antenna - 10 Microvolts Average

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.
Allow Chassis and Signal Generator to "Heat Up" for several minutes.

SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETTING</td>
</tr>
<tr>
<td>456 KC</td>
</tr>
<tr>
<td>1600 KC</td>
</tr>
<tr>
<td>1400 KC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Antenna Clip on Loop</td>
<td>External Ground Clip on Loop</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>1st L.F. (G6) &amp; (C7)</td>
</tr>
<tr>
<td>External Antenna Clip</td>
<td>External Ground Clip</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>3rd L.F. (G13) &amp; (C14)</td>
</tr>
<tr>
<td>External Antenna Clip</td>
<td>External Ground Clip</td>
<td>.1 mf.</td>
<td>Turn Rotor to full open</td>
<td>Oscillator (C3)</td>
</tr>
</tbody>
</table>

NOTE A—Re-assemble chassis in cabinet.
Close back on cabinet.

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 pointer set screw and set the pointer at the 800 KC mark. Retighten set screw.

CAUTION

The metal chassis is connected to one side of the line through .20 mfd. Both AC and DC power lines are generally grounded on one side. If the side of the line not connected to the metal chassis through this capacity is grounded and the metal chassis comes in contact with an external ground, this capacity will be connected across the line and there will be an increase in hum.
ALIGNMENT PROCEDURE

Remove Grille, Speaker, Trimmer Caps and Rear Cover From Chassis Case—(See Figs. 3 and 5).

Volume Control—Maximum All Adjustments.

Local-Distance Switch—"Distance" Position.

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:

A Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-Metallic Screwdriver.

Dummy Antenna—.05 mf., See Note A.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>FREQUENCY</th>
<th>CONNECTION AT RADIO</th>
<th>DUMMY ANTENNA</th>
<th>IRON CORE SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM (See Figs. 3 and 5)</th>
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<tr>
<td></td>
<td>496 KC</td>
<td>Control Grid (prods No. 6)</td>
<td>.05 mf.</td>
<td>1st I.F. (C11) &amp; (C12)</td>
<td>2nd I.F. (C15) &amp; (C16)</td>
</tr>
</tbody>
</table>

OSCILLATOR

| 1540 KC | Antenna Cable | See Note A | Ext. Position out of Coil | Oscillator (C4) |

1000 KC ADJUSTMENT

| 1000 KC | Antenna Cable | See Note A | Tune to Max. Output with Tuning Knob | Int. (C9) | Ant. (C4) |

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1000 KC—Readjust Antenna Trimmer C4 for maximum output.

NOTE A—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mmf. If the cable, for example, has a capacity of 30 mmf, use a 30 mmf. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—To calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Hold the tuning knob. Insert a fine bladed screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.

A 36 inch shielded antenna cable (30 mmf. capacity) with bayonet connector plug is furnished. Whenever possible, this cable should be used rather than the one which may be supplied with the antenna.

The plug on the antenna cable is inserted in the socket at the side of the chassis case as shown in Fig. 3. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 35 to 60 mmf.

HIGH CAPACITY ANTENNA

If this radio is to be installed with a high capacity car antenna (70 to 500 mmf. total capacity of antenna and shielded cable), a 24 inch shielded adapter extension cable is necessary. The adapter is inserted in the socket at the side of the chassis. Then the antenna cable plug is inserted in the socket at the other end of the adapter.

ANTENNA CABLE

CAUTION—Be careful not to bend the antenna cable too sharply or to clamp it tightly as the small wire inside the cable may be broken.
Power Consumption 55 Watts (At 117 volts 60 cycles)
Power Output .......................... 3.0 Watts Undistorted
4.5 Watts Maximum
Selectivity ............................... 38 KC Broad at 1000 times Signal
Intermediate Frequency .......................... 456 KC
Speaker ................................... 10" P.M. Dynamic

Tuning Frequency Range
B Range .................................. 528 to 1550 KC
D Range .................................. 5750 to 18300 KC

Sensitivity — External Antenna — (For 0.5 Watt output)
B Range .................................. 25 Microvolts Average
D Range .................................. 45 Microvolts Average

WELLS-GARDNER & CO.
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WELLS-GARDNER, PAGE 12
Television Sound or Phonograph Connections

If television programs ever become available in your community, the radio receiver and speaker at each desk should be moved to the "Television Sound or Phonograph" position for radio reception. The phonograph should be in the "Radio" position.

ATTENTION—Do not touch the tuning knobs while the mechanism is unlocked as the setting may be altered. Carefully tune in the second station on your list. Then hold the tuning knob and push the second button slowly and firmly all the way in. Check for accurate tuning.

Procedures for Setting the Station Buttons

Any button may be used for any station you can receive, although it will be more convenient to set the stations in the order that the broadcast numbers appear in the list.

Drive Cord Replacement

The car cord of the new drive cord is shipped rolled up to prevent tangling. Replace the old cord to the left of the new cord before using. Connect the car cord to the left of the new cord. Place the roll in the box. The drive cord to the left of the new cord is new and will not damage the current cord. The drive cord should be replaced if it is damaged or is not working properly.

Television Sound or Phonograph Connections

If television programs ever become available in your community, the radio receiver and speaker at each desk should be moved to the "Television Sound or Phonograph" position for radio reception. The phonograph should be in the "Radio" position.
**Television-Frequency Modulation - Home Recorder**

**Television Sound Connections**

If television programs ever become available in your community, the audio amplifier and speaker of this radio may be used to reproduce television sound in conjunction with any "Television Picture Receiver and Sound Converter." The two phono-microphone jacks are available for use with the converter. Connect the converter to the picture receiver and sound converter, then turn the receiver on and adjust the volume control to the desired level. The audio amplifier and speaker of this radio may be used to reproduce the programs to accompany any Frequency Modulation Converter.

The connection to the chasis is exactly the same as explained in the preceding article "Television Sound Connections.

When Frequency Modulated programs are desired, the Phonograph-Radio knob should be turned to the Phonograph (P) position. For radio reception, the knob should be in one of the two radio positions.

**Frequency Modulation Connections**

If Frequency Modulated programs ever become available in your community, the audio amplifier and speaker of this radio may be used to reproduce these programs in conjunction with any Frequency Modulation Converter.

---

**Operating the Automatic Phonograph**

To Turn the Phonograph On

1. Turn the on-off switch knob to the right. (See Illustration - Page 2.) A click will be heard and the dial will light. Wait 30 seconds for the tubes to heat.
2. Turn the Phonograph knob to the phonograph (P) position—see illustration.
3. For detailed instructions regarding the operation of the automatic record changer, see the phonograph instruction folder.

To Turn the Phonograph Off

The instructions for turning off the automatic record changer are given in the phonograph instruction folder. To turn the radio on, switch knob to the left. A click will be heard and the dial lamps will be off.

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Battery Cable and Fuse

The battery connection is made at the generator. The end of the cable is spliced to the battery cable with the free end of the cable going to the fuse box. After the fuse box is closed, a 15 amp fuse is used.

Suppression of Motor Noise

The following procedure has been found to be effective in reducing motor noise to a satisfactory level in most cars. Follow the steps in the order given. Additional procedures, which may be required in exceptional cases of severe noise, is not covered here and will be referred to current literature on this subject.

Generator Condenser — A generator condenser is required in all cases. Connect the condenser lead to the battery terminal of the generator. The condenser mount strap connect the side plate of the condenser to ground. This unit must, therefore, be well grounded at its mounting.

CAUTION — In cases with automatic regulation, it is important to connect the condenser across the field terminal. Most manufacturers in the present time have a recommendation for the proper point at which the condenser should be attached.

Distributor Suppressor — A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor insert a suppressor between the lead and the distributor. Connect the suppressor to the other end of the condenser (See Fig. 7). If the noise is not reduced, cut the high tension lead to the distributor to the distributor and connect it to a wood screw type distributor suppressor in this line.

Drawout Antenna Cable Plug

Turn on the radio and start the motor.

If motor noise is heard, proceed as follows:

BIRDING CABLES — Try grounding the feed wire to the battery terminal by using a ground point on the engine block which is directly connected to the ground. Turn on the radio and start the motor. If the noise is still present, switch back to the original ground point and proceed as follows.

BIRDING STIRLING COLUMN — It is possible to ground the stirring column, fuel pump and brake lever to carry interference to the back of the feed wire at a point where it may affect the radio. Use each of these wires in order to ground the complete circuit. By means of a file or a brush, bend the stirring column, fuel pump and brake lever to carry interference to the back of the feed wire at a point where it may affect the radio.

Distributor Antenna Cable Plug

If motor noise is heard when the antenna cable is removed, proceed as follows until the noise is satisfactorily reduced.

BIRDING LEAD — Noise due to radiation from the feed wire is minimized. If the noise is not reduced, the earth station will be automatically turned in when the automatic station begins to operate.

The different positions are reached by pushing the Automatic Station Knob firmly and gently all the way to the left in the usual manner. If the knob is turned past the Automatic Knob to the right, the Automatic Station Knob is illusory. If the Automatic Station Knob is turned to the left, the Automatic Station Knob is illusory. If the Automatic Station Knob is turned to the left, the feed wire is automatically turned in when the Automatic Station Knob is turned in.

Select the first station from the list you have made and carefully tune in the station. Select the Manual Tuning Knob, and then move the feed wire as necessary to reduce the noise. When the noise is reduced, move the feed wire to the Automatic Station Knob position. If the noise is still present, try different positions or consult the manufacturer of the automatic station equipment. If the noise is still present, try different positions or consult the manufacturer of the automatic station equipment.

Distributor Suppressor — A distributor suppressor will be required in most cases. Remove the high tension lead to the distributor insert a suppressor between the lead and the distributor. Connect the suppressor to the other end of the condenser (See Fig. 7). If the noise is not reduced, cut the high tension lead to the distributor to the distributor and connect it to a wood screw type distributor suppressor in this line.

When the noise is automatic, proceed as follows:

BIRDING CABLES — Try grounding the feed wire to the battery terminal by using a ground point on the engine block which is directly connected to the ground. Turn on the radio and start the motor. If the noise is still present, switch back to the original ground point and proceed as follows.

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Antenna

Practically all car antennas at the present time are supplied with a shielded lead-in wire. The total capacity of these leads used in any one antenna should be 25 to 50 mmF. It is recommended that the shield and lead-in be a type approved by the factory.

The plug on the antenna cable is inserted in the socket at the side of the chassis case as shown in Fig. 1. The wire at the other end of the cable is connected to the antenna.

LOW CAPACITY ANTENNA

This radio is designed for a low capacity car antenna. The total capacity of antenna and shielded cable should be 25 to 50 mmF.

Types of Low Capacity Antennas

— "Fan" type, such as shown in Fig. 1.
— Ribbon type, as shown in Fig. 1.

High Capacity Antenna

If this radio is to be installed with a high capacity car antenna (100 to 200 mmF), total capacity of antenna and shielded cable should be 25 to 40 mmF.

Inserting Vibrator Unit

The buzzer unit can be inserted in two ways.

The proper method of insertion will depend on which terminal of the battery is grounded. If the positive (+) terminal of the battery is grounded, line up the + mark on the buzzer with the arrow on the chassis base. If the negative (-) terminal of the battery is grounded, the - mark should be lined up with the arrow on the chassis base.

Adjusting Antenna Trimmer

After the antenna is connected, tune in a weak signal at approximately 1000 KC with the volume control set to Moderate. Tune the adjusting screw of the antenna trimmer (If) up or down until maximum output is obtained. See Fig. 3 for location of trimmer.

Mounting Speaker in Back of Instrument Panel Grille

When the antenna cable is connected to an antenna lead connected to the panel grille, the shielded cable should be taped near the corner of the grille in such a manner as to avoid interference with the grille's operation.

ALIGNMENT PROCEDURE

Remove Grille, Speaker, Trimmer Caps and Rear Cover From Chassis Case.—(See Figs. 3 and 4.)

Volume Control—Minimum All Adjustments.

Local-Distance Switch—Distance Position.

Connect Radio to Ground Post of Signal Generator with a Short Heavy Lead.

NOTE—Insert the antenna cable plug in the socket below the switch. The total capacity of the antenna cable and trimmer should be at least 25 mmF. The cable, for example, has a capacity of 20 mmF, see Fig. 1.

In the mounting shown in Fig. 4, a 25 inch lead-in cable has been cut in two pieces and attached to the lower side of the chassis case. If it is desirable to use the radio with the antenna in a car, this lead-in cable may be used. However, if the antenna is to be used in a car, the lead-in cable should be 25 inches long and the outer sheath should be supported at two points on the rim of the car.
ALIGNMENT PROCEDURE

The following equipment is required for aligning:

- A 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 ft., 100 mm., and 500 mm.

<table>
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<th>SIGNAL GENERATOR</th>
<th>FREQUENCY SETTING</th>
<th>CONNECTION AT RADIO</th>
<th>SWITCH</th>
<th>BAND</th>
<th>CONDENSER SETTING</th>
<th>ADJUST TUNER TO MATCHING</th>
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<tr>
<td>1.5 MHz</td>
<td>450 KC</td>
<td>Grid of the Set</td>
<td>B Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>2200 KC</td>
<td>Antenna Lead</td>
<td>100 mm.</td>
<td>B Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
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<tr>
<td>4500 KC</td>
<td>Antenna Lead</td>
<td>100 mm.</td>
<td>B Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>6000 KC</td>
<td>Antenna Lead</td>
<td>100 mm.</td>
<td>B Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
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<tr>
<td>7200 KC</td>
<td>Antenna Lead</td>
<td>600 ohm.</td>
<td>C Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>9200 KC</td>
<td>Antenna Lead</td>
<td>600 ohm.</td>
<td>C Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>12300 KC</td>
<td>Antenna Lead</td>
<td>120 ohm.</td>
<td>D Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>15900 KC</td>
<td>Antenna Lead</td>
<td>600 ohm.</td>
<td>D Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>15000 KC</td>
<td>Antenna Lead</td>
<td>600 ohm.</td>
<td>D Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>21300 KC</td>
<td>Antenna Lead</td>
<td>120 ohm.</td>
<td>D Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
<tr>
<td>LOOP RANGE B</td>
<td>Antenna Lead</td>
<td>1000 ohm.</td>
<td>B Range</td>
<td>Turn to Full Open</td>
<td>0.01PF, 0.015UF, 0.03UF</td>
<td></td>
</tr>
</tbody>
</table>

PROCEDURE FOR SETTING THE STATION BUTTONS

SELECTING THE STATIONS TO BE SET

There are 4 buttons on the automatic tuning dial by means of which 6 stations may be set for quick tuning.

- Make a list of your favorite stations so the order in which you listen will be logical. There may be any number up to and including 4 in the list.

To set stations accurately, DO NOT JAR THE RADIO OR BUTTONS WHILE THE MECHANISM IS UNLOCKED.

- Select the first station from the line you have prepared, and carefully turn one of the station buttons by means of the manual tuning knob, using the tuning eye as a guide.

- With one hand, hold the manual tuning knob to prevent it from turning, and with the other hand, push one of the station buttons shown on the instructions all the way in. It is better to start with the left hand button.

- Hold the button all the way in.

- Hold this button all the way in.

- With the other hand, push whether or not this station is still accurately tuned in by moving the tuning knob a slight amount back and forth while observing the tuning eye. Be sure to hold the buttons all the way in.

- Slowly release the button after the station is tuned in.

- CAUTION—Do not touch this button again while the mechanism is setting, as the setting may be altered.

- Carefully turn the station to the second station on your list. Then hold the station all the way in, slowly and firmly all the way in.

- Check for accurate tuning.

In Models With Brown Opalescent Buttons — From the tab all the way to the bottom of the space provided in the knob. Cover the call letter tab with a collodium tab, pressing this in until it snaps into place.
"A" Battery and Regulator

This receiver is designed to operate with a 1 volt storage cell, but may be operated with a 3 volt dry "A" battery if used with a voltage regulator. The receiver may also be used with an air cell "A" battery provided a series resistor is used.

Voltage "A" Battery—The voltage regulator required with this type of battery is as illustrated in Fig. 4. The receiver is supplied with the regulator as specified. The regulator consists of a resistor which controls the voltage, a voltmeter for measuring its value as supplied to the receiver and a small push button switch for cutting the voltmeter in and out of the circuit. It has two prongs at the front which plug into the socket on the rear left corner of the chassis. The circuit diagram of the regulator is shown in Fig. 5.

---

Replacing Drive Cord

Remove chasis from cabinet.

Take out the drive cord by removing the screw at the center of the cord.

Remove the drive cord by taking out the six rivets from the coil assembly.

Remove the on-off indicator dial by pulling it forward.

With the condenser plate in a completely open position, plug in the drive cord thru hole "A" (from the front) thru the drive drum. See Fig. 9.

Pull the cord thru this hole far enough to lie a knot near the end. Make this knot large enough so that it will not pull back thru the hole.

Stop the opposite end of the drive cord thru hole "B" of the drive drum.

Now slip the piece of thin tubing (about 3/4" long) 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 shaft and wrap the cord in a clockwise direction about two and one-half turns around this shaft, progressing toward the front.

Bring the cord up from the drive shaft and wrap it around the drive drum approximately one and one-half turns in a clockwise direction, progressing toward the front until the cord is up to the turned-in portion of the flange G. See Fig. 9.

Pull the cord tight and tie the end of the cord to the top of the coil, as shown in the illustration. This is important to prevent the cord from being cut.

Now, by applying a little tension on the spring, hook the other end of the spring into hole "D" on the opposite side of the drum. Hold the spring from the inside (in later models hole "D" is replaced by a hook on the inside of the drum). Then turn the drive shaft back and forth several times to take out the slack and see if the drive is operating properly. If the condenser plate on the drive shaft is not correctly tensioned, put the spring on the plate and add an additional tension in the spring in order to get proper tension on the spring.

Replace the on-off indicator dial, care being taken that the indicator is in place and that it will properly show the on-off positions.

Re-assemble the pointer and dial to the drive assembly. If the rivets are broken, use No. 38 by 3/4" long round head machine screws and nuts.

Testing Batteries

If the receiver does not operate satisfactorily test the batteries under load. A high resistance meter is required for the "B" and "C" voltages. Any of the batteries are considerably below their rated voltage, new ones should be used. When the "B" batteries are replaced the "C" batteries should also be replaced. The reason for this is that the "C" drain is so high that the "B" batteries are run down in about the same time as the "B" batteries.

Alignment Procedure and Dial Calibration

Misalignment or mischancing of condensers generally manifests itself as an unusual tuning and lack of volume at positions or all of the standard wave band. The receiver is properly aligned at the factory with precision instruments and realignment should not be attempted unless all other causes of the faulty operation have been investigated and the service technique has been practiced. 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 the effect of alignment. Use of a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

1. F. Adjustment

Set the signal generator for a signal of 150 KC. Select the antenna lead of the signal generator thus a 1/2 amp meter to the coil end of the grid leak resistor R1. There is a lead which runs from the meter and condenser plate to the terminal of the R. C. coil assembly. This connection can be made at the terminal, and in this lead is connected. These ground leads to the ground point of the signal generator.

Connect the volume control to the maximum position. Then adjust the three 1/8 turn trimmers until maximum output is obtained. The adjustment should be for these condensers are reached from the top of the chassis, and the location is shown in Fig. 8.

As stated above, use a non-metallic screwdriver to make the adjustment.

1750 KC Adjustment

Set the signal generator for 1750 KC. Turn the motor of the tuning condenser to the full open position. Connect the antenna lead of the receiver thru a 150 ma condenser to the output of the signal generator. Keep the volume control at maximum position. Adjust the trimmer of the oscillator section of the tuning 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 1/8 turn detector and antenna trimmers for maximum output. Do not change the setting of the oscillator trimmer. Dial Calibration

To obtain dial scale calibration tune in an 800 KC signal and set the dial pointer at that mark on the dial scale. When calibrated in this manner, the setting will be approximately correct at both ends of the scale.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>15 Microvolts Absolute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning Range</td>
<td>520 to 1750 KC</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>175 KC</td>
</tr>
<tr>
<td>Speaker</td>
<td>6&quot; Magnetic</td>
</tr>
</tbody>
</table>
Fig. 1—Arrangement of Trimmers

Fig. 2—Abridged Wiring Diagram showing Filament Wiring System and Points at which No-Signal Bias Voltages are obtained.

Fig. 4—Tube Arrangement and Battery Connections

VOLTAGES AT SOCKETS
Antenna Shorted to Ground—Battery 6 Volts under load
Volume Control at Maximum

<table>
<thead>
<tr>
<th>Type of Tube</th>
<th>Function</th>
<th>Across Filament</th>
<th>Plate to Ground</th>
<th>Screen to Ground</th>
<th>Bias Voltage (see Notes)</th>
<th>Normal Plate M.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>R. F.</td>
<td>2.0</td>
<td>135</td>
<td>45</td>
<td>1.5(1)</td>
<td>1.7</td>
</tr>
<tr>
<td>1C6</td>
<td>1st Det.</td>
<td>2.0</td>
<td>80</td>
<td>70</td>
<td>2.0(3)</td>
<td>3.2(2)</td>
</tr>
<tr>
<td>34</td>
<td>1st I. F.</td>
<td>2.0</td>
<td>135</td>
<td>45</td>
<td>1.5(1)</td>
<td>1.7</td>
</tr>
<tr>
<td>34</td>
<td>2nd I. F.</td>
<td>2.0</td>
<td>135</td>
<td>80</td>
<td>4.0(3)</td>
<td>3.2</td>
</tr>
<tr>
<td>30</td>
<td>2nd Det.</td>
<td>2.0</td>
<td>135</td>
<td>45</td>
<td>8.0(4)</td>
<td>2.3</td>
</tr>
<tr>
<td>30</td>
<td>1st A. F.</td>
<td>2.0</td>
<td>135</td>
<td>80</td>
<td>3.0(5)</td>
<td>2.3</td>
</tr>
<tr>
<td>19</td>
<td>Power</td>
<td>2.0</td>
<td>135</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) As read from negative filament leg to low potential end of resistor R12.
(2) Anode Grid.
(3) As read from negative filament leg to ground.
(4) Total voltage drop from negative filament leg to ground and across R18.
(5) As read across R18.

Battery Connections—CAUTION

CAUTION: Do not turn the switch on unless ALL the tubes are in the sockets.

CAUTION: Be sure that the battery clips are properly connected to the battery. If the connections are reversed, the receiver may be damaged.
A signal generator that will provide an accurately calibrated signal at 466, 1750, 1800, 2000, 2300, 3000, 5000, 10,000, and 15,000 Hz and an output indicating the frequency of the signal. 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 to 466 Hz.

Connect the output of the signal generator through a 0.1 mH condenser to the coil end of the condenser 92—see Fig. 2. There is a lead which goes to the lug on the top of the center section of the tuning condenser—see Fig. 4. The connection can be made at this lug.

Connect the ground lead to the ground post of the signal generator. Turn the two screws to the desired position.

Turn the volume control to the maximum position.

While rotating the trimmer, the signal generator should not change the frequency of the output of the signal generator.

Adjust the trimmer carefully until maximum output is obtained. The trimmer is shown in Fig. 8.

**RANGE B ALIGNMENT**

1750 Hz Adjustment

Set the signal generator to 1750 Hz.

Connect the antenna lead of the receiver through a 0.05 mH condenser to the output of the signal generator. For this and all subsequent adjustments, keep the volume control at the maximum position and make sure that the signal generator is not connected to the antenna lead.

Adjust the trimmer Range C Trimmer (Q4) until maximum output is obtained. The location of this trimmer is shown in Fig. 9.

1500 Hz Adjustment

Set the signal generator to 1500 Hz.

Adjust the trimmer Range B Trimmer (Q6) until maximum output is obtained. The location of this trimmer is shown in Fig. 3. See Fig. 3 for location of this trimmer.

5000 Hz Adjustment

Set the signal generator to 5000 Hz.

Connect the antenna lead of the receiver through a 0.05 mH condenser to the output of the signal generator. For this and all subsequent adjustments, keep the volume control at the maximum position and make sure that the signal generator is not connected to the antenna lead.

Adjust the trimmer Range B Trimmer (Q6) until maximum output is obtained. The location of this trimmer is shown in Fig. 3. See Fig. 3 for location of this trimmer.

4000 Hz Adjustment

Set the signal generator to 4000 Hz.

Connect the antenna lead of the receiver through a 0.05 mH condenser to the output of the signal generator. For this and all subsequent adjustments, keep the volume control at the maximum position and make sure that the signal generator is not connected to the antenna lead.

Adjust the trimmer Range B Trimmer (Q6) until maximum output is obtained. The location of this trimmer is shown in Fig. 3. See Fig. 3 for location of this trimmer.

10,000 Hz Adjustment

Set the signal generator to 10,000 Hz.

Connect the antenna lead of the receiver through a 0.05 mH condenser to the output of the signal generator. For this and all subsequent adjustments, keep the volume control at the maximum position and make sure that the signal generator is not connected to the antenna lead.

Adjust the trimmer Range B Trimmer (Q6) until maximum output is obtained. The location of this trimmer is shown in Fig. 3. See Fig. 3 for location of this trimmer.

**REPLACING DRIVE CORD**

Move the chassis from the cabinet. Take off the station selector by removing the screws at the back of the chasis. Insert the two set screws in the chassis on the back of the selector switch. Push the chassis back into the cabinet by taking out the two screws which secure the bottom of the chassis to the case and one screw at the top which secures the back. Pull the dial assembly forward until the disk is free of the band selector shafts and lay the assembly face downward in front of the chassis.

Turn the dial drum until the opening in this drum is approximately vertical and with the hole at the top. Remove the tension spring and the old drive cord. Then replace this drive cord a 50 pound test cord as supplied by the factory should be used.

See that the synch is in the slot in the drum. Insert one end of the new drive cord from the outside. Insert the new drive cord through the hole in the synch and drive drum. Turn the end of the cord, which has been inserted through the holes, one end of the tension spring. Now wrap the cable in a circle one time. Wrap the other end of the drum and insert the drive cord for approximately one and one half turns, progressing toward the front. Then tilt the synch up on the back panel and bring the cord into the cabinet, allowing the cord to pass through the hole in the cabinet. Insert the other end of the drive cord into the slot in the synch and drive drum, then bring the cord over to the drive cord until it is up to the synch in the drum.

Insert the drive cord in the synch and drive drum. Turn the drive cord enough to bring the drive cord into the synch, then pull the drive cord back into the cabinet.

Replace the dial assembly and selector.

Replace the chassis in the cabinet.
ALIGNMENT

Peak I.F. trimmers at 500 KC.
Range B-
Peak osc. trimmer (C21) at 1730 KC. Peak C11 and C4 at 1500 KC. Pad C22 at 600 KC.
Range C-
Peak C18 at 6700 KC.
Peak C5 and C10 at 6000 KC.
Pad C19 at 2400 KC.
Range D-
Peak C15 at 18,400 KC.
Peak C9 and C2 at 15,000 KC.
Pad C16 at 6800 KC.

NOTE
When adjusting interstage and antenna trimmers, rock gang condenser rotor until peak is obtained.
**AVC Alignment Procedure for Block 708**

**VOLUME CONTROL—Maximum All Adjustments**

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

**ALIGNMENT PROCEDURE**

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

**STEP**

- **BAND-SELECTIVE SWITCH**
- **DUMMIES ANTENNA**
- **FREQUENCY OF SIGNAL GENERATOR**
- **ADJUSTMENTS OF SIGNAL GENERATOR**
- **PROCEDURE**

<table>
<thead>
<tr>
<th>STEP</th>
<th>BAND-SELECTIVE SWITCH</th>
<th>DUMMIES ANTENNA</th>
<th>FREQUENCY OF SIGNAL GENERATOR</th>
<th>ADJUSTMENTS OF SIGNAL GENERATOR</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 KC</td>
<td>Range B</td>
<td>200 mfd.</td>
<td>500 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (C6)</td>
</tr>
<tr>
<td>1000 KC</td>
<td>Range C</td>
<td>400 mfd.</td>
<td>1000 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range C (C6)</td>
</tr>
<tr>
<td>750 KC</td>
<td>Range A</td>
<td>600 mfd.</td>
<td>750 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range A (C6)</td>
</tr>
<tr>
<td>2000 KC</td>
<td>Range B</td>
<td>200 mfd.</td>
<td>2000 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range B (C6)</td>
</tr>
<tr>
<td>5000 KC</td>
<td>Range C</td>
<td>400 mfd.</td>
<td>5000 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range C (C6)</td>
</tr>
<tr>
<td>10000 KC</td>
<td>Range D</td>
<td>400 mfd.</td>
<td>10000 KC</td>
<td>Antenna Lead</td>
<td>Oscillator Range D (C6)</td>
</tr>
</tbody>
</table>

**Initial Steps**

- **PROCEDURE**
- **ADJUSTMENT**

<table>
<thead>
<tr>
<th>Initial Steps</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Ant, Range B</td>
<td>See Note A</td>
</tr>
<tr>
<td>2nd Ant, Range C</td>
<td>See Note A</td>
</tr>
<tr>
<td>3rd Ant, Range D</td>
<td>See Note A</td>
</tr>
</tbody>
</table>

**CAUTION**—When aligning the short wave band, be sure NOT to adjust the AVC frequency. This can be checked as follows. Set the AVC stabilizer knob at zero and then adjust the AVC control until the AVC meter reads 0.5, 1.0, or 1.5 volts as specified for each station. Then adjust the AVC control to the minimum value which will allow the AVC indicator to read 0.5, 1.0, or 1.5 volts as specified for each station. If the AVC indicator does not reach this value, it may be necessary to increase the AVC control to increase the AVC signal to its maximum value.

**Notes**

- **Note A**—Loosen the AVC pot screw and set the AVC pot at the 1000 KC mark and then adjust the AVC control until the AVC meter reads 0.5, 1.0, or 1.5 volts as specified for each station.
- **Note B**—Turn the AVC control and adjust the AVC control until the AVC meter reads 0.5, 1.0, or 1.5 volts as specified for each station.
Broadcast Band 6-Volt Storage Battery Operated
Superheterodyne Receiver
WITH FOUR BUTTON AUTO-TUNER
Frequency Range—535 - 1735 Kilocycles

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PROCEDURE FOR SETTING THE AUTOMATIC LEVERS:

There are four levers on the dial by means of which four stations may be selected, (See “B” Fig. 2).

Above each automatic tuner lever an opening in the escutcheon is provided for inserting the call letter tabs, (See “A” Fig. 2).

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.

Now 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. 2).

It is VERY IMPORTANT that this locking screw is turned until it is ABSOLUTELY TIGHT.

- 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.

---

**Model D-723 ALIGNMENT PROCEDURE**

<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>Trimmer(s) Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency Setting</td>
<td>MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grid of 687 G L.F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>L.F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 687 G L.F. Tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output L.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1735 Kc.</td>
<td>200 mfd.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Top of rear section of gang (See Fig. 1)</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc.</td>
<td>200 mfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer—Top of input section of gang (See Fig. 1)</td>
<td>Antenna Broadcast</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

Attenuate 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.

**FREQUENCY RANGE**

315 to 1750 KC.

- Power Consumption: 2.1 Amperes at 6.3 Volts
- Power Output: 800 Milliwatts Maximum
- Intermediate Frequency: 460 Kc.
DUMMY ANTENNAS:
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 200 mfd. condenser connected in series with the output lead of the test oscillator.

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 plates of the type 6A6 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.

I.F. ALIGNMENT: Series A & B
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 175 K.C. in series with I.F. dummy antenna, to the grid cap of the type 6A7 tube.
2. Adjust trimmer condensers of both input (108-33) and output (106-34) 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 1550 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.

I.F. ALIGNMENT: Series C
1. With variable condenser in its minimum capacity position (plates entirely out of mesh) and with variable control full on, connect test oscillator set at 465 K.C. in series with I.F. dummy antenna, to the grid cap of the type 6A7 tube.
2. Adjust trimmer condensers of both input (108-56) and output (106-57) 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 1550 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).

SERVICE NOTES:
Voltages taken from different points of circuits to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance value of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

In order to prevent signal from acting upon A.V.C. and affecting accuracy of voltage measurements, serial and ground leads should be short circuit 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 schematic circuit diagram.

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 plate only if absolutely necessary.
Arrangement of Series A & C is similar to Series B, except that Series A & C have no Sensitivity Control Switch.
### 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 Pressed “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 6K7 LF 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></td>
<td>465 Kc. 1 MFD.</td>
<td>Grid of 6K8G</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>SHORT WAVE BAND</td>
<td>17 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave</td>
<td>Set dial at 17 Mc</td>
<td>Trimmer (C23)</td>
<td>Short wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave</td>
<td>Set dial at 17 Mc</td>
<td>Trimmer (C20)</td>
<td>Short wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>MEDIUM WAVE BAND</td>
<td>5 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Med. Wave</td>
<td>Set dial at 5 Mc</td>
<td>Trimmer (C23)</td>
<td>Medium wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Med. Wave</td>
<td>Dial at 5 Mc</td>
<td>Trimmer (C11)</td>
<td>Medium wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BAND BROADCAST</td>
<td>1600 Kc. 200 mil.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C20)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400 Kc. 200 mil.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 1400 Kc</td>
<td>Trimmer (C13)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Kc. 200 mil.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Set dial at 600 Kc</td>
<td>Trimmer (C13)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>IMAGE REJECTION ADJUSTMENTS</td>
<td>1930 Kc. 200 mil.</td>
<td>Antenna lead</td>
<td>Broadcast</td>
<td>Pick up signal at 1000 Kc on dial</td>
<td>Trimmer (C9)</td>
<td>Image rejection</td>
<td>Adjust for minimum output</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”**: 100 Mc is the image frequency of 100 Mc. Adjust Trimmer (C9) until a minimum output is obtained. Attenuate 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.

---

**Fig. 3—Showing Station Adjustment Screws**

**Procedure for Setting the Automatic Station 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. 3 and are accessible through the station call letter tab holes. The only equipment needed is a small screwdriver to make the adjustments.

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. 3). 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.

---

7 Tube Including Cathode-Ray Tuning Indicator

2-Band A.C. Superheterodyne Receiver
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

TUBES:
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:
1-Type 6K8G Converter (Oscillator and First Detector).
2-Type 6K7 Remote Cut-Off Pentode, I. F. Amplifier.
3-Type 6J5G Second Detector and A. V. C.
4-Type 607G First Audio Amplifier.
5-Type 615G Phase Inverter
6-Type 6K6G Pentode Push-Pull Output Amplifiers.
7-Type 5Y3G High Vacuum Rectifier.
8-Type 6U5 Cathode-Ray Tuning Indicator.

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 mfd., 200 mfd., and 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmer or Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>461 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6X7</td>
<td>Broadcast (Extreme left rotation)</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>461 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6X8G</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

| BROADCAST BAND      | 1750 Kc.         | 200 mfd.     | Antenna lead        | Broadcast (Extreme left rotation) | Rotor full open (Plates out of mesh) | Trimmer (C10) (See Fig. 1) | Broadcast oscillator | Adjust to maximum output |
|                     | 1500 Kc.         | 200 mfd.     | Antenna lead        | Broadcast (Extreme left rotation) | Set Dial at 1500 Kc. | Trimmer (C11) (See Fig. 1) | Broadcast oscillator | Adjust to maximum output |
|                     | 600 Kc.          | 200 mfd.     | Antenna lead        | Broadcast (Extreme left rotation) | Dial at 600 Kc. | Trimmer (C12) (See Fig. 1) | Broadcast oscillator series pad | Adjust to maximum output |
|                     | 461 Kc.          | 200 mfd.     | Antenna lead        | Broadcast (Extreme left rotation) | Set Dial at 461 Kc. | Trimmer (C13) (See Fig. 4) | I. F. Wave Trap | Adjust for minimum output |

| IMAGE REJECTION ADJUSTMENTS | 340 Kc. | 200 mfd. | Antenna lead | Broadcast (Extreme left rotation) | Pick up signal at 1350 Kc. on dial | Trimmer (C0) (See Fig. 1) | Image rejection | Adjust for minimum output (See note "B") |

| SHORT WAVE BAND       | 17 Mc.          | 400 ohms     | Antenna lead      | Short Wave (Extreme right rotation) | Set Dial at 17 MC. | Top of chassis (See Fig. 1) | Short Wave oscillator | Adjust to maximum output |
|                       | 17 Mc.          | 400 ohms     | Antenna lead      | Short Wave (Extreme right rotation) | Dial Set at 17 MC. | Trimmer (C2) (See Fig. 1) | Short Wave antenna | Adjust to maximum output |
|                       | 6 Mc.           | 400 ohms     | Antenna lead      | Short Wave (Extreme right rotation) | Set Dial at 6 MC. | Trimmer (C3) (See Fig. 4) | Short Wave oscillator series pad | Adjust to maximum output |

Note: A. Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained.

Note: B. 2430 Kc. is the image frequency of 1500 Kc. Adjust Trimmer (C0) until a minimum output is obtained.

ATTENUATE 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.

<table>
<thead>
<tr>
<th>BAND SWITCH</th>
<th>BAND</th>
<th>FREQUENCY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme right rotation</td>
<td>Short Wave</td>
<td>5 to 18.3 MC.</td>
</tr>
<tr>
<td>Extreme left rotation</td>
<td>Broadcast</td>
<td>1480 to 1750 KC.</td>
</tr>
</tbody>
</table>

Power Consumption: 85 Watts (At 115 volts 50-60 cycles)
Power Output: 5 Watts Undistorted, 7 Watts Maximum
7 Tube Including Cathode-Ray Tuning Indicator

2-Band A.C. Superheterodyne Receiver

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.

TUBES:
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:
1.—Type 6K8G Triode Hexode, First Detector-oscillator.
2.—Type 6K7 Remote Cut-Off Pentode, I. F. Amplifier (4.65 K. C.).
3.—Type 607G Double Diode Triode Second Detector, A. V. C. and First Audio.
4.—Type 615G Driver Stage.
5.—Type 6AC5G Positive Grid Triode Output Amplifier.
6.—Type 5Y3G High Vacuum Rectifier.
7.—Type 6U5 Cathode-Ray Tuning Eye.

I. F. FREQUENCY 465 KC.
**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.**

**SIGNAL GENERATOR**

<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>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F.</td>
<td>465 Kc. 1 MFD</td>
<td>Grid of 6K7</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>L.F.</td>
<td>465 Kc. 1 MFD</td>
<td>Grid of 6K8</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>S.H.</td>
<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>Top of Chassis (See Fig. 1)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>S.H.</td>
<td>17 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Dial Set at 17 MC.</td>
<td>Trimmer (C3)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>S.H.</td>
<td>6 Mc. 400 ohms</td>
<td>Antenna lead</td>
<td>Short Wave (Extreme right rotation)</td>
<td>Set dial at 4 MC.</td>
<td>Trimmer (C3)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>S.H.</td>
<td>1735 Kc. 200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer (C3)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD.</td>
<td>1460 Kc. 200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 1460 Kc.</td>
<td>Trimmer (C3)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD.</td>
<td>600 Kc. 200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer (C3)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD.</td>
<td>465 Kc. 200 mmf.</td>
<td>Antenna lead</td>
<td>Broadcast (Extreme left rotation)</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer (C3)</td>
<td>F.M. Wave Trap</td>
<td>Minimum output</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: Prompt signal intensity is obtained.

After each range is completed, repeat the procedure as a final check.

**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 the voltage chart 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.

**BAND SWITCH**

- **FREQUENCY RANGE**
  - **Broadcast:** 5.6 to 18.3 Kc.
  - **Short Wave:** 5.6 to 18.3 M.C.

**Power Consumption:** 70 Watts (At 115 volts 50-60 cycles)

**Output:** 3 Watts Undistorted, 5 Watts Maximum

**INTERMEDIATE FREQUENCY**

**BAND**

- **FREQUENCY RANGE**
  - **Broadcast:** 540 to 1735 Kc. (Kilocycles)
  - **Short Wave:** 5.6 to 18.3 M.C. (Megacycles)

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 70 watts.

**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.
SETTING UP THE PUSH BUTTON STATION SELECTOR

Call station nearest 1600 KC end of dial the No. 1 station and number five other stations consecutively as they are tuned in on the dial, tuning from left to right. Set band selector at "B", or second position from left, and tune in station No. 1. Observe program. Turn band selector knob to extreme left position. Push No. 1 button in as far as it will go. Insert screwdriver thru opening directly above No. 1 button and turn screwdriver until same station is heard. If station is not heard reverse direction of rotation.

Tubes required are:
1—6A7 Oscillator-translator
1—6D6 Intermediate Frequency Amplifier
1—6G5 Cathode Ray Tuning Tube (on models equipped with "eye" tuning indicator)
1—6Q7Q Detector AVC—First Audio Amplifier

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Part No.</th>
<th>Description</th>
<th>Symbol</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>5092</td>
<td>Trimmer on variable</td>
<td>R4</td>
<td>4529</td>
<td>10M 1 1/3 W.</td>
</tr>
<tr>
<td>C2, 3, 4</td>
<td>1611</td>
<td>3-35 mmf. trimmer</td>
<td>R5</td>
<td>636</td>
<td>40M 1 1/3 W.</td>
</tr>
<tr>
<td>C5, 20, 22</td>
<td>2597</td>
<td>1-10 mmf. trimmer</td>
<td>R6</td>
<td>2605</td>
<td>200 ohms 1/3 W.</td>
</tr>
<tr>
<td>C6, 7, 21</td>
<td>2597</td>
<td>1-10 mmf. trimmer</td>
<td>R8</td>
<td>508</td>
<td>2 meg. tone control</td>
</tr>
<tr>
<td>C8, 9, 10, 11</td>
<td>576</td>
<td>20000 V.</td>
<td>R9</td>
<td>5100</td>
<td>500M Volume Control</td>
</tr>
<tr>
<td>C12, 30, 37</td>
<td>4810</td>
<td>1/2 mmf. trimmer</td>
<td>R10</td>
<td>2647</td>
<td>50 ohms 1/3 W. on models</td>
</tr>
<tr>
<td>C13</td>
<td>5193</td>
<td>02 Special 5%</td>
<td>R12</td>
<td>2730</td>
<td>200M 1 1/3 W.</td>
</tr>
<tr>
<td>C14, 28</td>
<td>572</td>
<td>1 200 V.</td>
<td>R13</td>
<td>2881</td>
<td>400M 1 1/3 W. 15%</td>
</tr>
<tr>
<td>C15</td>
<td>3272</td>
<td>30 400 mmf. trimmer</td>
<td>R14</td>
<td>2880</td>
<td>100M 1 1/3 W. 10%</td>
</tr>
<tr>
<td>C16, 31, 33</td>
<td>576</td>
<td>02 400 V.</td>
<td>R15</td>
<td>2883</td>
<td>50M 1 1/3 W. 15%</td>
</tr>
<tr>
<td>C17, 18</td>
<td>563</td>
<td>370 mmf. Special 3%</td>
<td>R17</td>
<td>2731</td>
<td>500M 1 1/3 W.</td>
</tr>
<tr>
<td>C19</td>
<td>570</td>
<td>370 mmf. Special 3%</td>
<td>R18</td>
<td>5184</td>
<td>310 ohm 5% Flexohm</td>
</tr>
<tr>
<td>C22</td>
<td>562</td>
<td>370 mmf. Special 3%</td>
<td>5091</td>
<td>Power Transformer</td>
<td></td>
</tr>
<tr>
<td>C23</td>
<td>2560</td>
<td>350 mmf. Var. Paddler</td>
<td>3463-5</td>
<td>1st I.F. Transformer</td>
<td></td>
</tr>
<tr>
<td>C24</td>
<td>2741</td>
<td>1330 mmf. Paddler</td>
<td>3463-6</td>
<td>2nd I.F. Transformer</td>
<td></td>
</tr>
<tr>
<td>C25</td>
<td>2793</td>
<td>400 200 V.</td>
<td>5096</td>
<td>Oscillator Coils</td>
<td></td>
</tr>
<tr>
<td>C26</td>
<td>2780</td>
<td>50 mmf. Mica</td>
<td>5095</td>
<td>Antenna Coils</td>
<td></td>
</tr>
<tr>
<td>C27</td>
<td>2792</td>
<td>2 200 V.</td>
<td>2845</td>
<td>B.C. Antenna Coil</td>
<td></td>
</tr>
<tr>
<td>C29</td>
<td>2695</td>
<td>400 200 V.</td>
<td>2163</td>
<td>Drive Cable</td>
<td></td>
</tr>
<tr>
<td>C30</td>
<td>568</td>
<td>400 200 V.</td>
<td>5189</td>
<td>Speaker 8&quot;</td>
<td></td>
</tr>
<tr>
<td>C34</td>
<td>824</td>
<td>400 200 V.</td>
<td>5832</td>
<td>Push Button Tuning Assembly</td>
<td></td>
</tr>
<tr>
<td>C35</td>
<td>3285</td>
<td>15 mil. 350 W.V. Elect.</td>
<td>5810</td>
<td>Class Indicator</td>
<td></td>
</tr>
<tr>
<td>C36</td>
<td>5101</td>
<td>15 mil. 225 W.V. Reg. Elect.</td>
<td></td>
<td>(Replacement of individual component parts not recommended.)</td>
<td></td>
</tr>
</tbody>
</table>

Assembly Complete.

R1, 7, 11 | 617 | 20M 1 1/3 W.          |
R2, 7, 11 | 624 | 1 Meg. 1 1/3 W.       |
R3, 16 | 631 | 50M 1 1/3 W.          |
Caution

On models having an On-Off indicator disk behind the front of the cabinet, it is necessary to take the following precautions, when removing the chassis: Pull the chassis away from the front of the cabinet until the control shafts are clear of the cabinet. Then tilt the rear of the chassis upward. At the same time, keep the front of the chassis base clear of the bottom of the cabinet to prevent breaking the On-Off indicator disk on the volume control shaft. Now carefully pull the chassis out of the cabinet.

FEB. 1939
**SPECIFICATIONS**

- **Power Consumption**: 103 Watts (At 117 volts 60 cycles)
- **Power Output**: 8 Watts Undistorted, 9 Watts Maximum
- **Selectivity**: 29.5 KC Broad at 1000 times Signal (Sharp)
- **Intermediate Frequency**: 458 KC
- **Speaker**: 12" Electro-Dynamic

**Tuning Frequency Range**
- **B Range**: 520 to 1700
- **C Range**: 2200 to 7000
- **D Range**: 7000 to 22000

**Sensitivity** — External Antenna — (For 0.5 Watt output)
- **B Range**: 1.0 Microvolt Average
- **C Range**: 1.0 Microvolt Average
- **D Range**: 3.0 Microvolts Average

**ISSUE A**
MARCH 1940  6 STATION BUTTONS  TRUETONE CHROMATIC
SERIAL NO 11 TUBES  CONTROL
575,001 UP 3 BANDS

---

**6AD6G TUNING INDICATOR**

**VOLTAGES AT SOCKETS**

<table>
<thead>
<tr>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>END OF CABLE</td>
</tr>
<tr>
<td>RED</td>
</tr>
<tr>
<td>BLUE</td>
</tr>
<tr>
<td>BROWN</td>
</tr>
<tr>
<td>BLACK</td>
</tr>
</tbody>
</table>

**SUBJECT TO VARIATION**

- 6SK7
- 6SA7
- 6V6GT

**6V6GT OUTPUT**

**6V6GT OUTPUT**

---

**BOTTOM VIEW OF CHASSIS**
Antenna and Ground

Two built-in antennas are incorporated in the speaker compartment.

One of these, the Tru-tone Stratoscope loop antenna may be used for broadcast band reception. For reception of local or nearby stations, an outside antenna and ground is usually not required. The use of Stratoscope antenna may, in some locations, provide best broadcast band operation.

The other, a counterpoise foil antenna, is used for reception on short wave bands.

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ALIGNMENT PROCEDURE

The following equipment is required for aligning:
An All Wave Signal Generator which will provide an
Analog signal at the frequency to be tested as the
Analog signal at the frequency to be tested as the

Procedure for Setting the Station Buttons

Selecting the Stations

The following 8 buttons on the automatic tuning dial by means of which stations may be set for quick tuning.

Make a list of your favorite stations, those which you tune in regularly. These may be any number of stations.

It is better to list the stations in the order of their knob number first and then in the order of the knob number second, and so on.

Any button may be used for any station which you can receive, although it will be more convenient to set the stations in the order of their knob number.

Setting a Station Button

Pull the chromatic control buttons No. 2 to set the 270 tuning position.

Now unlock the push button and move the channel on the dial to the first station. The push button button on the dial to the first station. The push button button on the dial to the first station.

Turn the manual tuning knob until the station is reached.

Using a small, handheld screwdriver, turn the knobs by turning the screwdriver around until they are tight. Tighten the knobs firmly but not so tightly as to prevent accidental tuning.

Insert the steel plate behind the push button on the dial to the first station.

Remove the set from the cabinet and place the buttons on the front panel. Then replace the cabinet.

NOTE: Turn the rear panel with the cabinet on the line.

CAUTION—When using the short wave bands, be sure to adjust the dial to the correct station.

Turning the set in the reverse direction, be sure to adjust the dial to the correct station.

To SET STATIONS ACCURATELY, DO NOT JAM THE DIAL OF BUTTONS WHILE THE MACHINE IS IN USE.

Select the first station from the list you have prepared, and carefully select the buttons by means of the manual tuning knob, using the tuning cycle as a guide.

Locking Screen

With one hand, hold the manual tuning knob in position. With the other hand, turn the tuning knob clockwise until the station is reached.

With the other hand, move the tuning knob to the next station. The station will be changed automatically.

Television Sound or Phonograph Connections

Should TV programs become available in your community, the excellent audio amplifier and associated equipment should be used for reproduction. Television sound and phonograph connections should be made as shown on the "Television Sound or Phonograph" connection diagram. The leads from the television receiver or from a phonograph pickup can be inserted in the socket.

With the other hand, see whether or not this station is still accurately tuned by moving the tuning knob a slight amount backward and forward while observing the tuning needle. Be sure to hold the buttons all the way in.

Slowly release the button after the station is tuned.

CAUTION—Do not touch the button again while the mechanism is in motion. Be sure to hold the buttons all the way in.

Carefully turn the second station on your list. Then hold the tuning knob and push the second button slowly and firmly all the way in. Check for accurate tuning.

To proceed in the same manner to set any additional stations on your list and on the remaining station buttons.

After all the stations are set, it will be necessary to hold the microphone so that the settings will not change. Turn off the manual tuning knob until the microphone can be easily reached with a screwdriver.

Then, with the SMALL HANDHELD SCREWDRIVER, turn the knobs by turning the screwdriver around until they are tight. Tighten the knobs firmly but not so tightly as to prevent accidental tuning.

Insert the steel plate behind the push button on the dial to the first station.

Remove the set from the cabinet and place the buttons on the front panel. Then replace the cabinet.

NOTE: Turn the rear panel with the cabinet on the line.

CAUTION—When using the short wave bands, be sure to adjust the dial to the correct station.

To SET STATIONS ACCURATELY, DO NOT JAM THE DIAL OF BUTTONS WHILE THE MACHINE IS IN USE.

Select the first station from the list you have prepared, and carefully select the buttons by means of the manual tuning knob, using the tuning cycle as a guide.

Locking Screen

With one hand, hold the manual tuning knob in position. With the other hand, turn the tuning knob clockwise until the station is reached.

With the other hand, move the tuning knob to the next station. The station will be changed automatically.
IMPORTANT: See Aligning Instructions on Page 4

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 idling meter.
- Non-metallic screwdriver.
- Dummy antennas—1. Mfd., and 200 Mfd.

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Disc Setting)</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Terminal “A” (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C1) (See Fig. 4)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>I. F.</td>
<td></td>
<td></td>
<td>Connect to</td>
<td></td>
<td>Trimmer (C1) (See Fig. 4)</td>
<td>Input I. F.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Terminal “A” (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C1) (See Fig. 4)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>.1 MFD.</td>
<td>Terminal “A” (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C2) (See Fig. 4)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1690 Kc.</td>
<td>200 MFD.</td>
<td>Terminal “B” (See Fig. 4)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 4)</td>
<td>Input I. F.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>200 MFD.</td>
<td>Terminal “B” (See Fig. 4)</td>
<td>Turn Dial to 1400 Kc.</td>
<td>Antenna Coil (C1) Adjust to maximum output</td>
<td>Antenna</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1690 Kc.</td>
<td>200 MFD.</td>
<td>Terminal “B” (See Fig. 4)</td>
<td>Turn Dial to 1690 Kc.</td>
<td>Adjust position of antenna</td>
<td>Antenna</td>
<td></td>
</tr>
</tbody>
</table>

NOTE “A” — The antenna coil assembly is made so that it is movable right or left. When making the adjustment as given in the alignment procedure move the coil assembly very slowly. It can be moved by hand or by rocking the edge of the blade of a screwdriver in the hole and engaging the blade in the gear teeth of the coil form.

NOTE "B" — After the antenna coil has been aligned at 1600 Kc., it is necessary to check the antenna trimmer (C3) adjustment again at 1690 Kc. If no appreciable change in trimmer adjustment is made the coil is in track, if the trimmer requires considerable change it will be necessary to again adjust the position of the antenna coil at 1600 Kc. These two adjustments should be tried several times until no change of trimmer adjustment is required.

FREQUENCY RANGE
555 to 1900 K.C.

Power Consumption
Radio Only 30 Watts
Power Output
900 Milliwatts Undistorted, 17 Watts Maximum
Intermediate Frequency
12SA7

FIG. 3—TUNING ASSEMBLY

TO ADJUST COIL ASSEMBLY MOVE LEFT OR RIGHT

FIG. 4—TRIMMERS

1—Type 12SQ7 Second Detector, A.V.C. and First Audio.
1—Type 50L6GT Beam Output Amplifier.
1—Type 35Z5GT Rectifier.

TUBES:

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.
1—Type 12SA7 Mixer, First Detector-oscillator.
1—Type 12SK7 I. F. Amplifier.
**SPECIFICATIONS - MOD. D-934**

**Input Voltages and Currents**
- 12 volt, 0.2 amp
- 12 volt, 0.15 amp

**Selectivity**
- 600 ohms, 300 ohms

**Intermodulation Frequency**
- 450 KC

**Speaker**
- 8" PDM Dynamic

**Tuning Frequency Range**
- 280 to 370 KC
- 340 to 500 KC
- 370 to 570 KC

**Power Output**
- 500 milliwatts
- 250 milliwatts
- 100 milliwatts

**Sensitivity (for 330 kHz Output)**
- 0.1 microvolt

**Alignment Procedure**

**Dummy Antennas**
- 0.5 in.
- 200 mm
- 500 ohms

**ANTENNA**
- Grid of 1st Del.
- 1.5 in.
- 400 ohms

**CONDUCTOR**
- Condenser or Dial Settings
- Adjust trimmers to maximum

**RANGE B**
- 500 ohms
- 400 ohms

**RANGE C**
- 500 ohms
- 400 ohms

**RANGE D**
- 500 ohms
- 400 ohms

**Drive Cord Replacement**

The one end of the new drive cord to the tension spring.

**Procedure for Setting the Station Buttons - MOD. D-934**

**Setting the Station Button**

Pull the button at the left (No. 1) off the shelf. When this is done, the hook opens, and the stylus will be exposed.

Loosen the screw with a small screwdriver and turn several turns in a counterclockwise direction.

The stylus points to the nearest button on the shelf and the stylus moves to the nearest button on the shelf.

After the station is set, and the mechanism is locked, turn each in turn by depressing the proper button. If any of them does not appear to be properly tuned in after the

**SPECIFICATIONS - MOD. D-937**

**Input Voltages and Currents**
- 12 volt, 0.2 amp
- 12 volt, 0.15 amp

**Selectivity**
- 450 KC

**Speaker**
- 8" PDM Dynamic

**Tuning Frequency Range**
- 280 to 370 KC
- 340 to 500 KC
- 370 to 570 KC

**Power Output**
- 500 milliwatts
- 250 milliwatts
- 100 milliwatts

**Sensitivity (for 330 kHz Output)**
- 0.1 microvolt

**Alignment Procedure - MOD. D-937 & D-938**

**DIAL STANDS**
- Condenser or Dial Settings
- Adjust trimmers to maximum

**RANGE B**
- 500 ohms
- 400 ohms

**RANGE C**
- 500 ohms
- 400 ohms

**RANGE D**
- 500 ohms
- 400 ohms

**Drive Cord Replacement**

The one end of the new drive cord to the tension spring.

**Procedure for Setting the Station Buttons - MOD. D-934**

**Setting the Station Button**

Pull the button at the left (No. 1) off the shelf. When this is done, the hook opens, and the stylus will be exposed.

Loosen the screw with a small screwdriver and turn several turns in a counterclockwise direction.

The stylus points to the nearest button on the shelf and the stylus moves to the nearest button on the shelf.

After the station is set, and the mechanism is locked, turn each in turn by depressing the proper button. If any of them does not appear to be properly tuned in after the

**Adjusting Antenna Tuner**

After the batteries are installed and the back of the cabinet is in place, adjust the antenna trimmer.

Adjust the trimmer, when the switch signal between 1600 and 1800 KC on the cabinet. A screwdriver turn on the adjusting screw of the antenna trimmer

**Procedure for Setting the Station Buttons - MOD. D-934**

**Setting the Station Button**

Pull the button at the left (No. 1) off the shelf. When this is done, the hook opens, and the stylus will be exposed.

Loosen the screw with a small screwdriver and turn several turns in a counterclockwise direction.

The stylus points to the nearest button on the shelf and the stylus moves to the nearest button on the shelf.

After the station is set, and the mechanism is locked, turn each in turn by depressing the proper button. If any of them does not appear to be properly tuned in after the

**Adjusting Antenna Tuner**

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Adjust the trimmer, when the switch signal between 1600 and 1800 KC on the cabinet. A screwdriver turn on the adjusting screw of the antenna trimmer

**Procedure for Setting the Station Buttons - MOD. D-934**

**Setting the Station Button**

Pull the button at the left (No. 1) off the shelf. When this is done, the hook opens, and the stylus will be exposed.

Loosen the screw with a small screwdriver and turn several turns in a counterclockwise direction.

The stylus points to the nearest button on the shelf and the stylus moves to the nearest button on the shelf.

After the station is set, and the mechanism is locked, turn each in turn by depressing the proper button. If any of them does not appear to be properly tuned in after the
Calibrating the Radio

To calibrate the radio, tune in a station of known frequency. At the back of the control head, insert a fine blade screwdriver and loosen the pointer screw. The knob must be held during this adjustment. If the control head is inaccessible, it may be calibrated by inserting a knife blade under the lower edge of the control head. Loosen the pointer screw, set the pointer and reposition.

Roof Speaker and Dual Speaker Connections

Inserting Vibrator Unit

Note that the vibrator unit can be inserted in two different ways. The proper method of insertion will depend on which side of the car battery is grounded. Complete information is shown on the label.
CHANGES IN LATER MODELS

Later models of the Series have changes incorporated in them which are explained below. The models which have these changes may be identified by the issue letter which is a large letter stamped on top of the chassis base. The tube arrangement label on the chassis case cover also shows this issue letter.

When ordering parts, it is important that the issue letter be noted and the correct part number, as shown in the parts list, be specified.

The "P" issue series is different from the "R" and "G". The gang condenser used in the "P" issue radios does not have the cut plate oscillator section. A padding condenser (800 KC) was added in series with the oscillator section of this gang condenser and the oscillator coil. The padding condenser is a part of the 2nd I.F. trimmer unit and is mounted in the modification of basic coil can.

The capacity (C17) shown within a dotted circle in the 2nd I.F. coil assembly on the schematic has been changed to an actual part as shown in the supplementary parts list.

The antenna, R.F. Interstage, oscillator, and 2nd I.F. coil assemblies have been changed and have been given new part numbers as shown in the supplementary parts list.

SUPPLEMENTARY REPLACEMENT PARTS

The PARTS of the Series are used on the Series "P" issue radio with the following EXCEPTIONS: PARTS ARE SUBJECT TO CHANGE WITHOUT NOTICE

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A869</td>
<td>T1</td>
<td>Antenna Transformer and Can Assembly</td>
<td>0.18</td>
</tr>
<tr>
<td>9A861</td>
<td>T2</td>
<td>R.F. Interstage Transformer and Can Assembly</td>
<td>1.25</td>
</tr>
<tr>
<td>9A868</td>
<td>T3</td>
<td>Oscillator Coil and Can Assembly</td>
<td>0.95</td>
</tr>
<tr>
<td>9A866</td>
<td>T6</td>
<td>2nd I.F. Transformer and Can Assembly</td>
<td>2.26</td>
</tr>
<tr>
<td>47X97</td>
<td>C17</td>
<td>100 mmf. Molded Condenser</td>
<td>0.10</td>
</tr>
<tr>
<td>17A79</td>
<td>C16</td>
<td>300-1000 mmf. 2nd I.F. Trimmer</td>
<td>0.45</td>
</tr>
<tr>
<td>17B77</td>
<td>C16</td>
<td>900-1300 mmf. Oscillator 650 KC Pad</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Alignment Procedure

Set the signal generator for 171 KC and connect the output of the signal generator to the 2nd I.F. trimmer section. Set the volume control at the maximum position and attenuate the signal from the signal generator to prevent the overload of action of the AVC. Then adjust the three I.F. trimmers until maximum output is obtained.

Set the signal generator for 1581 KC. Turn the rotor of the tuning condenser to the full open position. Insert the antenna plug with the mark on the high capacity (HC) side. Connect the shielded lead from the chassis through a 120 mmf. condenser to the antenna post of the signal generator. Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained.

Adjusting Antenna 600 KC Trimmer

Tune in a weak signal at approximately 600 KC with the volume control at three-fourths on. Turn the adjusting screw of the antenna 600 KC trimmer up or down until maximum output is obtained. See Fig. 9 for location of this trimmer.

Antenna Plug Installation

IMPORTANT—The antenna plug can be installed in two ways depending on whether the antenna is of high or low capacity.

If the total capacity of the antenna and shielded lead is approximately 200 mmf., which would be the case in a running board or ordinary roof antenna (metal mast), insert the antenna plug with the mark on the HC side—See Fig. 9.

If the total capacity of the antenna and shielded lead is approximately 78 mmf., such as in the case of a "fish pole" antenna used, insert the antenna plug with the mark on the LC side.
BAND SWITCH SHOWS IN BROADCAST POSITION IN SCHEMATIC AND IN SHORT WAVE POSITION IN PICTORIAL VIEW IN LOWER LEFT CORNER.

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>500,000</td>
<td>1/4</td>
<td>R10</td>
<td>500,000</td>
<td>T.C.</td>
</tr>
<tr>
<td>R2</td>
<td>1,000</td>
<td>1/4</td>
<td>R11</td>
<td>10,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>100,000</td>
<td>1/4</td>
<td>R12</td>
<td>500,000</td>
<td>W.C.</td>
</tr>
<tr>
<td>R4</td>
<td>25,000</td>
<td>1/4</td>
<td>R13</td>
<td>2,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R5</td>
<td>5,000,000</td>
<td>1/4</td>
<td>R14</td>
<td>2,500,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R6</td>
<td>100</td>
<td>1/4</td>
<td>R15</td>
<td>50,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R7</td>
<td>15,000</td>
<td>1/4</td>
<td>R16</td>
<td>500,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R8</td>
<td>50,000</td>
<td>1/4</td>
<td>R17</td>
<td>800—10%</td>
<td>1/2</td>
</tr>
<tr>
<td>R9</td>
<td>1,000,000</td>
<td>1/4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SERVICE NOTES

Voltsages taken from the different points of the circuit to chassis are measured with volume control in maximum position; all tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt, on the 300 volt scale. These voltages is clearly indicated on the volt chart.

SERVICE INFORMATION

Speaker (Part No. P4205) 6½” PM.
D.C. voice coil resistance ........................................... 3.6 ohms
Voice coil impedance at 400 cycles ................................ 6.0 ohms

S. W. Antenna Coll (Part No. P3126)
Looking at the connection and the chassis in a clockwise direction the terminals are: No. 1, plate; No. 2, B+; No. 3, grid; No. 4, pad.
Primary—No. 3 and No. 4—Resistance .............................. .06 ohm
Secondary—No. 1 and No. 2—Resistance ............................ .47 ohm

Oscillator Coll (Part No. P4194)
Looking at the mounting strip at a clockwise direction starting at the chasis, the terminals are: No. 1, ground; No. 2, cathode; No. 3, open; No. 4, pad; No. 5, switch; No. 6, grid; No. 7, grid; No. 8, open, B.C. Primary—No. 1 and No. 2—Resistance .......................... .29 ohm
B.C. Secondary—No. 4 and No. 5—Resistance ........................ .06 ohm
S.W. Secondary—No. 2 and No. 7—Resistance......................... .86 ohm

First LF Transformer (Part No. P4108)
Primary—Blue, plate: red, B+—Resistance .......................... 18.2 ohms
Secondary—White, grid, black, AVC—Resistance ..................... 12.1 ohms

Second LF Transformer (Part No. P4109)
Primary—Blue, plate: red B+—Resistance ............................ 20.8 ohms
Secondary—White, diode, black, AVC—Resistance .................... 17.4 ohms

CONDENSERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Capacity (Mfd.)</th>
<th>Volts</th>
<th>No.</th>
<th>Capacity (Mfd.)</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.0011</td>
<td>Mic.</td>
<td>C10</td>
<td>.002</td>
<td>600</td>
</tr>
<tr>
<td>C2</td>
<td>.05</td>
<td>400</td>
<td>C11</td>
<td>.05</td>
<td>500</td>
</tr>
<tr>
<td>C3</td>
<td>.0005</td>
<td>Mic.</td>
<td>C12</td>
<td>.35</td>
<td>400</td>
</tr>
<tr>
<td>C4</td>
<td>.00006—5%</td>
<td>Mic.</td>
<td>C13</td>
<td>.91</td>
<td>400</td>
</tr>
<tr>
<td>C5</td>
<td>.001</td>
<td>Mic.</td>
<td>C14</td>
<td>.25</td>
<td>400</td>
</tr>
<tr>
<td>C6</td>
<td>.003—5%</td>
<td>Mic.</td>
<td>C15</td>
<td>.55</td>
<td>600</td>
</tr>
<tr>
<td>C7</td>
<td>.05</td>
<td>200</td>
<td>C16</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>C8</td>
<td>.0011</td>
<td>Mic.</td>
<td>C18</td>
<td>20</td>
<td>350</td>
</tr>
<tr>
<td>C9</td>
<td>.00025</td>
<td>Mic.</td>
<td>C19</td>
<td>25</td>
<td>850</td>
</tr>
</tbody>
</table>

All voltages should be measured with 117 volts A.C. input to receiver. Resistances and actual connections of coils and transformers, electrolytic condenser information and speaker data are given under Service Information.

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.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 300 volt scale. Line voltage 117 volts A.C. Volume control maximum and no signal tuned in.

8SK7 (HF) TUBE
Plate (8) to ground .................................................. 208
Screen (8) to ground .................................................. 93

8AY7 TUBE
Plate (3) to ground .................................................. 255
Screen (4) to ground .................................................. 93

6SK7 (UP) TUBE
Plate (8) to ground .................................................. 255
Screen (6) to ground .................................................. 93

6SK7 (AP) TUBE
Plate (8) to ground .................................................. 20
Screen (6) to ground .................................................. 10

6XG Tube
Plate (3) to ground .................................................. 240
Screen (4) to ground .................................................. 258
Cathode (8) to ground ................................................. 12

5Y3G TUBE
Filament (8) to ground .............................................. 268
WEATHER AUTO SUPPLY CO.

SEVEN TUBE AC SUPERHETERODYNE RECEIVER

Broadcast and Short Wave Bands

Frequency Range 535-1830 Kilocycles and 5,700-18,100 Kilocycles

TUBE COMPLEMENT

The tube complement of this receiver consists of the following tubes:

1. Type 6K7—Remote cut-off Pentode as RF Amplifier.
2. Type 6SA7—Hexagrid Converter as First Detector and Oscillator.
3. Type 6SK7—Remote cut-off Pentode as an IF amplifier (455 KC).
4. Type 5UG7—Duplex Diode Triode Second Detector and A.V.C.
5. Type 6SK7—Remote cut-off Pentode as First Audio.
7. Type 5Y3G—Rectifier.

PROCEDURE FOR SETTING UP PUSH BUTTONS

There are six push buttons by means of which six stations may be selected. Marks a list of six stations tuned in regularly. Loosen one of the push buttons by inserting a screwdriver thru the center hole in the push button to the locking screw and turn the locking screw counterclockwise one full turn and push in; while holding this screw in turn the desired station by means of the station selector.

Turn the selector very slowly back and forth until the signal is clearest. Now while still holding the above screw in, tighten it by turning clockwise. Release and turn the station selector to one end of the dial. Then check the button by pushing it down and if the station is tuned to the center of the area on the dial covered by the station the adjustment is correct.

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 meter.
- Non-metallic screwdriver.
- Dummy antennas—1 mil., 200 mil., 400 ohms.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Connection to Grid</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>.22 Mfd.</td>
<td>Grid of 6SK7 1.5 F, tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output</td>
<td>I.F.</td>
</tr>
<tr>
<td>455 KC</td>
<td>.1 Mfd.</td>
<td>Grid of 6SA7 tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input</td>
<td>I.F.</td>
</tr>
<tr>
<td>1,830 KC</td>
<td>.2 Mfd.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Upper left, front of chassis</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>1,400 KC</td>
<td>.2 Mfd.</td>
<td>Antenna lead</td>
<td>Set dial at 1,400 KC</td>
<td>Trimmer—Lower right, front of chassis</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>600 KC</td>
<td>.2 Mfd.</td>
<td>Antenna lead</td>
<td>Set dial at 600 KC</td>
<td>Trimmer—Underside of chassis, center</td>
<td>Oscillator Series Pod.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

Note: Turn the dial back and forth slightly (rock) and adjust trimmer until the level of intensity is obtained. Do not bend variable condenser to correct tracking.

FREQUENCY RANGE — 535 to 1830 and 5,700 to 18,100 K.C.
Power output 2.6 watts undistorted — 4.1 watts maximum.
Intermediate Frequency 455 K.C.
Power Consumption—40 watts.
## TECHNICAL DATA

- **Power Consumption**: Radio Only - 70 Watts
- **Motor Only** - 20 Watts
- **Power Output**: 2.1 Watts Undistorted
- **Sensitivity for 500 Milliwatt Output**: 15 Microvolts Average
- **Selectivity**: 51 KC Broad at 100 Times Signal at 1000 KC
- **Tuning Frequency Range**
  - Broadcast Band: 530 to 1600 KC
  - Shortwave Band: 5.45 to 18.3 MC
- **Intermediate Frequency**: 455 KC
- **Speaker**: 8 in. Electro Dynamic

## ALIGNMENT PROCEDURE

**NOTE**: The following equipment is required for aligning:
- 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—cylindrical, 200 mm., 400 ohms.

### SIGNAL GENERATOR

<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>Trimmer Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFN</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmers on top</td>
<td>Input and Output</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C1</td>
<td>Short Wave antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>6 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>1600 Kc.</td>
<td>200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open</td>
<td>Trimmer C3</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND (See Note A)</td>
<td>530 Kc.</td>
<td>200 mml.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full closed</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1400 Kc.</td>
<td>200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C2</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>LOOP ALIGNMENT (See Note B)</td>
<td>600 Kc.</td>
<td>200 mml.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer C6</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

**NOTE**: The signal generator is connected to the "ANT." and "GND." leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1600 and 530 K C).

**NOTE**: The loop antenna should be connected to the radio when making these adjustments.

**NOTE**: Loop alignment is made with the chassis mounted in the cabinet and the loop antenna connected. The signal generator is connected to the "ANT." and "GND." leads.

**NOTE**: Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate 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.
Automatic Record Changer—Operating Instructions

Setting for Size of Record

The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selecting arms. The position of these arms determines the setting for different size records. To set for 10 or 12 inch records, it is merely necessary to grasp the post on the knob at the top, 1/8", and turn until the 10" or 12" arrows are pointed toward the center of the turntable. When in either the 10" or 12" position, the posts will snap into place except when they are lifted by hand. Be sure to set both posts for the same size record.

Loading

See that the selecting arms of both posts are turned toward the center of the turntable as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

Starting the Changer

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and turn the phonograph-radio knob to the phonograph position.

2. Turn the switch knob on the Record Changer past to "ON". The motor will then start and the record changer will go into automatic operation of its own accord.

How to Reject a Record

Merely turn the switch knob on the Changer panel. You can do it any time after the needle has come into contact with that record.

Playing Individual Records

Should it be desired to play an individual record, merely set up the machine as described above for the proper size (10" or 12" as indicated on the selecting arms), place the record on top of the arms as described under "Loading", and set the machine in operation by means of the switch knob described under "Starting the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

Unloading

First switch off the motor. Grasp each post by its knob at the top and turn them out of the way.

Lift the played records from the turntable. Then return the posts to the proper playing position as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

Turning Off Changer

Throw Changer switch knob to "OFF" position.

Lift tone arm and place it in the rest position. (If you happen to turn off the Changer switch while the mechanism is in motion before the change cycle is completed, the needles will remain in their playing position, at which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch on, be sure to turn it off while needle is resting upon a record; otherwise, the selecting arms cannot be correctly reset.

To avoid warping of records, never leave records resting on posts.

If Changer is Left Running

No damage will be done if you forget to turn off Changer after it has played its entire load of records. It will simply repeat the last record until stopped or released.

Phonograph Needles

Various types and kinds of needles are available for use in phonograph tone arms. All have their virtues, as well as their faults, for use in ordinary phonographs, where needles can be changed after each record. For playing ten or more records at once, as with this Changer, no attempt should be made to use ordinary steel or fibre points, since continued use of worn points will be likely to ruin both quality of reproduction and the records as well.

Any kind of needle can be used which has a point durable enough to play ten records or more without damaging them.

It should be remembered that, no matter what the quality of the tone arm, amplifying system and speaker, all of the recorded music must pass through the needle. For this reason, it is absolutely essential that particular care be taken to use good needles and to see that they are changed often enough so that the records are not damaged and the quality of the music is not impaired.

In general there are two types of needles which can be satisfactorily used on an Automatic Record Changer: those which require changing after approximately 12 records, and the so-called permanent type needles which are rated in terms of "hours of service." In no case should the manufacturer's claims for these needles be exceeded, since in all probability the needles are rated in terms of their maximum life. If at any time short of the rated life, particularly in the case of the semi-permanent type needles, there is any reason to suspect that the needle has become unduly worn, it would probably be advisable to replace it with a new one. Never under any conditions should a needle be removed from the tone arm head and then replaced—needle manufacturers' claims notwithstanding.

For convenience, the tone arm on your changer may be raised to a nearly vertical position, so that the needle may be easily inserted; the needle screw should be tightened firmly.

Care of Records

To insure long life for your records requires only slight effort. Do not expose them to heat from the sun, nor to heat from nearby stoves or radiators. Store them preferably in albums, but in any case keep them always in a cool, dry place, resting vertically or horizontally. Remove dust and dirt, using soft cloth and light circular motion. If fluids are used for lubricating record surfaces, keep in mind that these often tend to attract dust and extra effort is necessary to clean it off. Even a slight film of dust very often contains abrasive particles which, when grounded against the record surface by the steel needle, can cause very rapid wear of the recorded music.
CONVENTIONAL ALIGNMENT - SEE THE SPECIAL SECTION VOLL. 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 600 KC while rocking gang condenser.

SHORTWAVE - 5800 to 16200 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.


**SPECIFICATIONS**

- **Power Consumption**: 28 Watts (At 117 volts AC Supply)
- **Power Output**: .75 Watt Undistorted
- **Selectivity**: 49 KC Broad at 1000 times Signal
- **Intermediate Frequency**: 456 KC
- **Speaker**: 5” Electro-Dynamic
- **Tuning Frequency Range**
  - **B Range**: 328 to 1600 KC
  - **D Range**: 5750 to 18,500 KC
- **Sensitivity** (For .05 watt output)—External Antenna
  - **B Range**: 5 Microvolts Average
  - **D Range**: 40 Microvolts Average

**ALIGNMENT PROCEDURE**

**Volume Control**—Maximum All Adjustments.

**Allow Chassis and Signal Generator to “Heat Up”** for several minutes.

The equipment in column at right is required for aligning:

**Signal Generator** which will provide an accurately calibrated signal at test frequencies as listed.

- Dummy Antenna—1 mf., 200 mmf., and 400 ohm.
- Output Indicating Meter: Non-Metallic Screwdriver.

**SIGNAL GENERATOR**

<table>
<thead>
<tr>
<th>FREQUENCY SETTING</th>
<th>ANTENNA CONNECTION</th>
<th>GROUND CONNECTION</th>
<th>DUMMY ANTENNA Setting</th>
<th>BAND SWITCH Setting</th>
<th>CONDENSER TO MAXIMUM SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>456 KC</td>
<td>Signal Grid of 1st Det.</td>
<td>Point “X”</td>
<td>1 mf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>1st I.F. (C10) &amp; (C11)</td>
</tr>
<tr>
<td>1400 KC</td>
<td>External Antenna Lead</td>
<td>Point “X”</td>
<td>200 mmf.</td>
<td>B Range</td>
<td>Turn Rotor to Full Open</td>
<td>See Note B &amp; See Note C</td>
</tr>
<tr>
<td>18,100 KC</td>
<td>External Antenna Lead</td>
<td>Point “X”</td>
<td>400 Ohm</td>
<td>D Range</td>
<td>Turn Rotor to Full Open</td>
<td>Oscillator Range D (C4)</td>
</tr>
</tbody>
</table>

**RANGE B**

- 1400 KC
- Signal Grid of 1st Det. Point “X” 1 mf. B Range Turn Rotor to Full Open

**RANGE D**

- 18,100 KC
- External Antenna Lead Point “X” 400 Ohm D Range Turn Rotor to Full Open

**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.

**NOTE C**—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

**ATTENUATE THE SIGNAL FROM THE SIGNAL GENERATOR TO PREVENT THE LEVELING-OFF ACTION OF THE AVC.**

**DECREASE OR INCREASE ACCORDINGLY**

**Turn gang condenser to completely closed position—see illustration.**

Using a new drive cord approximately 30 inches in length, tie one end to tension spring. Pass other end of cord down through hole in groove of drive pulley. Pull spring flush against inside of pulley rim. Wind cord 3/4 turn clockwise (from front of chassis) around drive pulley. Then pass over idler pulleys A, B, and C as shown.

Wind cord 4 1/4 turns counter-clockwise (from front of chassis) around tuning control shaft. These turns should progress away from the chassis. Then wind cord 3/4 turn clockwise (from front of chassis) around drive pulley. This turn should be on the left side (from gang condenser side of chassis) of pulley groove. Pass cord through hole in pulley groove. Tie cord to tension spring. Stretch tension spring and secure free end to hook on pulley.

**Dial Pointer Attachment**—Tune in a signal of known frequency. Set pointer at this frequency mark on dial scale. Fasten pointer to cord—See illustration.
SERVICE INFORMATION

When removing the chassis it is first necessary to remove the "Protector Switch" located on the left side of the cabinet. When checking the chassis on AC or DC it is necessary to insert a piece of metal, similar to the one on the cardboard back, into the "Protector Switch" to close the line circuit.

Speaker (Part No. P-4572) 6" PM Type.

D.C. voice coil resistance .............................................. 7.3 ohms
Voice coil impedance at 400 cycles .................................... 8.0 ohms

B.C. and S.W. Antenna Coil (Part No. P4582)

Starting with the lug that is connected to ground lead in a clockwise direction, the terminals are: No. 1, ground; No. 2, cond; No. 3, pad; No. 4, grid; No. 5, grid; No. 6, ant.
S.W. Primary—No. 6 and No. 2—Resistance ....................... 35 ohm
B.C. Primary—No. 1 and No. 2—Resistance ................... 24.1 ohms
S.W. Secondary—No. 3 and No. 4—Resistance ............. 0.07 ohm
B.C. Secondary—No. 3 and No. 5—Resistance .............. 2.9 ohms

B.C. and S.W. Oscillator Coil (Part No. P4566)

In a clockwise direction starting at the mounting lug on same side as single lug on other end, the connections are: No. 1, plate; No. 2, grid; No. 3, S.W. pad; No. 4, B.C. pad; No. 5, grid; No. 6, cond; other end, No. 7, B+.
S.W. Primary—No. 1 and No. 6—Resistance ............... 0.8 ohm
B.C. Primary—No. 7 and No. 6—Resistance ............... 3.8 ohms
S.W. Secondary—No. 2 and No. 3—Resistance .......... 0.05 ohm
B.C. Secondary—No. 5 and No. 4—Resistance .......... 4.5 ohms

First I.F. Transformer (Part No. P-4569)
Primary—Blue white, plate; red white B+—Resistance 12.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 24.9 ohms.

Second I.F. Transformer (Part No. P-4420)
Primary—Blue white, plate; red white B+—Resistance 15.1 ohms.
Secondary—White, grid; black white, AVC—Resistance 11.8 ohms.

VOLTAGE CHART

All voltages measured with a 1,000 ohm per volt meter on the 150 volt scale (except AC readings). Line voltage 117 volts AC. Volume control maximum and no signal tuned in.

1A7GT TUBE
Plate (3) to ground .................................................. 98
Screen (4) to ground .................................................. 50
Grid (6) to ground .................................................... 99

1N5GT (1st I.F.) TUBE
Plate (3) to ground .................................................. 76
Screen (4) to ground .................................................. 100

1N5GT (2nd I.F.) TUBE
Plate (3) to ground .................................................. 91
Screen (4) to ground .................................................. 93

3S5GT TUBE
Plate (3) to ground .................................................. 97
Screen (4) to ground .................................................. 100

3E27GT TUBE
Plate (5) to ground .................................................. 117 (AC)
Cathode (8) to ground ................................................. 120
SERVICE NOTES
Voltages taken from the different points of the circuit to chassis are measured with the volume control in maximum position. All tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

In order to prevent the signal from acting upon the A.V.C. and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages should be measured with 117 volts AC input to receiver. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

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.

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good.

ALIGNING INSTRUCTIONS
All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment, unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antennas</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.</td>
<td>455 KC. .1 Mfd.</td>
<td>Grid of 1NSGT I.F. 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>
<td></td>
</tr>
<tr>
<td></td>
<td>455 KC. .1 Mfd.</td>
<td>Grid of 1A7GT tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I.F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>SHORT WAVE</td>
<td>18,100 KC. 400 ohms</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Upper left, front of chassis</td>
<td>Short Wave Oscillator</td>
<td>Adjust to receive signal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16,100 KC. 400 ohms</td>
<td>Antenna lead</td>
<td>Tune Signal</td>
<td>Trimmer—Center, front of chassis</td>
<td>Short Wave Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1730 KC. 200 Mmf.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer—Lower left, front of chassis</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST</td>
<td>1400 KC. 200 Mmf.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 KC.</td>
<td>Trimmer—Right, front of chassis</td>
<td>Broadcast Antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 KC. 200 Mmf.</td>
<td>Antenna lead</td>
<td>Set dial at 600 KC.</td>
<td>Trimmer—Top of chassis (See Fig. 1)</td>
<td>Oscillator Series Pad</td>
<td>Adjust to maximum rock dial</td>
<td></td>
</tr>
</tbody>
</table>

Note "A":—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling-off action of the A.V.C. Do not bend variable condenser to correct tracking.

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 mfd., 200 mfd., 400 ohms.

TUBE COMPLEMENT
The tube complement of this receiver consists of the following tubes:

1. Type 1A7GT—Pentagrid Converter (Composite first detector and oscillator).
2. Type 1NSGT—Sharp cut-off Pentode as 1st IF Amplifier (455 KC).
3. Type 1NSGT—Sharp cut-off Pentode as 2nd IF Amplifier (455 KC).
4. Type 1HSGT—Duplex Diode Triode Second Detector, AVC and First Audio.
5. Type 3Q5GT—Beam Power Amplifier.
6. Type 3535—Rectifier.

Frequency Range—535 to 1730 and 5,750 to 18,100 K.C.
Power output .27 watt undistorted—.35 watt maximum.
Intermediate Frequency 455 K.C.
Adjusting Antenna Trimmer

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 trimmer (C4) up or down until maximum output is obtained. See Fig. 3 for location of this trimmer.

Calibrating the Radio

To calibrate the radio, tune in a station of known frequency. Remove the dial lamp assembly from the back of the control unit. The calibration screw is at the bottom of the dial lamp tube. Insert a fine bladed screwdriver and turn this screw until the pointer is at the frequency of the station being received.

A short insulated screwdriver will be helpful.

Fig. 4—Location of Tubes and Vibrator

ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments. The following equipment is required for aligning:

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>CONNECTION TO RADIO</th>
<th>DUMMY ANTENNA</th>
<th>IRON CORE SETTING</th>
<th>ADJUST TRIMMERS TO MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.F. 456 KC</td>
<td>Control Grid (point No. 9)</td>
<td>.05 m.</td>
<td>Extreme Position out of Coi</td>
<td>1st L.F. (C11) &amp; (C12)</td>
</tr>
<tr>
<td>OSCILLATOR 1600 KC</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td>Out of Coil</td>
<td>2nd L.F. (C13) &amp; (C16)</td>
</tr>
<tr>
<td>1400 KC ADJUSTMENT</td>
<td>Antenna Cable</td>
<td>See Note A</td>
<td>Tune to Max. Output with Tuning Knob</td>
<td>Int. (C5)</td>
</tr>
</tbody>
</table>

Reassemble Radio—Install in Car—Connect Car Antenna to Radio.

Car Antenna Readjustment—Tune in weak signal near 1400 KC—Readjust Antenna Trimmer C4 for maximum output.

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—Insert the antenna cable plug in the antenna socket on the chassis. The total capacity of the antenna cable and dummy antenna should be 60 mfd. If the cable, for example, has a capacity of 30 mfd., use a 30 mfd. condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna capacity to the output of the signal generator.

CALIBRATION—to calibrate the radio, tune in a station of known frequency. At the back of the control unit is the calibration screw. Remove the dial lamp assembly. Insert a fine bladed screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received.

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Bottom View of Chassis Showing Socket Voltages, Parts Location, and R-F Wiring

*NOTE: Values with star (*) are operating voltages in circuits with high-series-resistance. These voltages will be lower when measured with a volt-meter reading current through the circuit. Exact voltage may be measured with a vacuum-tube voltmeter if desired. The other values will not be affected by measuring with an ordinary high-resistance voltmeter.

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.
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 black lead and keep the output as low as possible to avoid a-v-c action.

Calibration Marks.—The tuning dial is fastened in the cabinet and cannot be used for reference during alignment. These calibration marks correspond 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 as shown in the drawing. 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, loosen the drum set-screw (which is accessible through a slot in the bottom of the cabinet), turn the drum slightly so that the indicator is at this mark, and then tighten the set-screw.

After completion of alignment, seal the r-f core-adjustment screws with household cement.

The dial tuning (right hand) push-button must be pushed in for steps 1 to 3, inclusive.

<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 I-F grid cap, in series with .01 mf.</td>
<td>456 kc</td>
<td>Quiet point between 600-750 kc</td>
<td>L7 and L8 (2nd I-F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6A8-G grid cap, in series with .01 mf.</td>
<td>456 kc</td>
<td></td>
<td>L8 and L6 (1st I-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.)</td>
</tr>
<tr>
<td>4</td>
<td>Follow “Adjustments for Electric Tuning”</td>
<td></td>
<td></td>
<td>C3 (ant.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two peaks can be obtained.

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 on 1,500 kc.

Push-Button Adjustments

DRUM SHOWN WITH GANG AT MAXIMUM CAPACITY

Dial Indicator and Drive Mechanism

Refer to “Alignment Procedure” for explanation of the “calibration marks” shown in this drawing.

Adjustments for Electric Tuning

These models have six push-buttons. The right-hand button connects the gang condenser for 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 magnetically-tuned oscillator coils and separate antenna trimmers which must be adjusted for the desired stations. Use an insulated screwdriver or alignment tool. 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. Push in the dial-tuning (right-hand) button, and manually tune in the first station on the list.
3. Push in station-button No. 1 (left-hand) and 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 (C10) for maximum output on this station.
5. Adjust for each of the remaining four stations in the same manner.
(Clockwise adjustment of oscillator cores and antenna trimmers tunes the circuits to lower frequencies.)
6. Make a final careful adjustment of the oscillator cores and antenna trimmers, using one or two feet of wire as an antenna to ensure sharp peaking.
WR-172 is a table model with a six inch speaker; WR-373Y is a console model with a twelve inch speaker. Both models have six tubes, are AC-DC operated, have six push buttons for tuning, a horizontal Slide Rule dial, and a Precision Eye for precise manual tuning.

**Power Output** (125 volts, 60 cycle supply)
- Undistorted: 0.8 watts
- Maximum: 1.4 watts

**Power Supply Ratings**
- A-C Rating: 105-125 volts, 50-60 cycles, 35 watts
- D-C Rating: 105-125 volts, direct current, 35 watts

**Loudspeaker**
- Permanent Magnet Dynamic
  - Type: Model WR-172
  - Diameter: 6-inch
  - Voice Coil Impedance at 400 cycles: 3.5 ohms
  - Model WR-373Y
  - Diameter: 12-inch
  - Voice Coil Impedance at 400 cycles: 4 ohms

**Phonograph Terminal Board.** A 3-terminal board is located on the rear of the chassis for connecting a phonograph pickup, or Record Player, into the audio amplifier of the receiver. The accompanying schematic shows connections for a high-impedance pickup with a switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phono switch.

**Record Player Connections, Using a Double-Pole, Double-Throw Toggle Switch**
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscilloscope are shown in the schematic 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 binding post, and keep the output as low as possible to avoid A.V.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, 61 mc, and 20 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 3/4 inch to the left of the mark at the extreme left (low frequency) end of the dial scale.

Steps |
--- |
1 | Connect the high side of the test osc. to |
2 | Tune test osc. to |
3 | Turn radio dial to |
4 | Adjust the following for maximum peak output |
5 | |
6 | Repeat step 4 |

--- |
1 | Antenna terminal |
2 | 460 kc |
3 | “A” Band Quiet point between 550-750 kc |
4 | C5 and C6 (2nd I.F. trans.) |
5 | C1 and C9 (1st I.F. trans.) |
6 | |

* Use minimum peak if two can be obtained. Check to determine that C5 has been adjusted properly by tuning receiver to approximately 19.09 mc where a weaker signal should be received.

Note: Oscillator tracks above signal on both bands.

Alignment Procedure

WR-175 and WR-176

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.

Steps |
--- |
1 | Connect the high side of test-oscillator to |
2 | Tune test osc. to |
3 | Turn radio dial to |
4 | Adjust the following for max. peak output |
5 | |
6 | |

--- |
1 | Tuning condenser (sec.) in series with .01 mfd |
2 | 455 kc |
3 | Quiet point at 1,000 kc |
4 | C1, C2, C3, C4 (1st and 2nd I.F. transformers) |
5 | C5 (oscillator) |
6 | |

On Models WR-272 and WR-372 the cable from the attachment should be connected to terminals 1 and 3. The shielded or ground lead going to terminal 1. When using the attachment the connection link is disconnected and volume is controlled by the control on the phonograph or television attachment.

The accompanying schematic shows connections for a high-impedance pickup with switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phonograph switch.

The Model WR-373 has the Radio-Phono-Television switch built into the chassis, allowing switching to be accomplished thru the “Tone-Radio-Phono-Television” Control on the front of cabinet.

RECORD PLAYER CONNECTIONS, WR-272, WR-372

Phonograph or Television Attachment.—A terminal board is provided on the rear of the chassis for connecting a record player or television attachment into the audio-amplifying circuit.
Precautionary Lead Dress

1. Dress 1-F plate and grid leads against chassis and away from each other. Dress plate lead from 12SK7 close to chassis.
2. Dress leads from terminal board on loop support away from loop.

Power Supply Ratings

- 105-125 volts, 50-60 cycles, 30 watts
- 105-125 volts, direct current, 30 watts

For other data see index
Figure No. 2

I-F ALIGNMENT: Volume control, maximum, tone control treble, wave switch, broadcast dial set to 800 kHz. Apply 465 kHz to grid of 6K7 1-f tube. Adjust trimmer 25 for maximum output. Apply 465 kHz to grid of 6A8 and adjust trimmers 17 and 18 for maximum output.

BROADCAST BAND ALIGNMENT: Apply 465 kHz to antenna and adjust wavetray trimmer 4 for minimum output.

Apply 1700 kHz through 0.0032 µf dummy; adjust trimmer 11 until signal is received. Adjust trimmer 3 (middle). Set dial and generator to 800 kHz, adjust trimmer 12.

SW BAND ALIGNMENT: Wave switch to SW position. Set dial and generator to 8000 kHz, adjust trimmer 10 until signal is received. Adjust trimmer 2 (top) for maximum output.
Frequency Range
Standard Broadcast (A) .......................... 540-1,560 kc
Short Wave (C) ................................. 5.8-16 mc
Intermediate Frequency .......................... 455 kc

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. 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 by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the link connection on back of chassis is in "Radio" position (connected between terminals 2 and 3).

3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, tune station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than ½ turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.

VOLTAGES SHOULD HOLD WITHIN ±20 %
WITH 117 V. A.C. SUPPLY.

On some models a 150 mmfd. capacitor is con-
ected across Phono. Termini 1 & 3.

Adjustments for Push-Button Tuning

Western Electric Supply Co., Inc.
WESTINGHOUSE PAGE 12

W. 872 L. RC 472 E

Tube and Trimmer Location
Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked:

1. Dress loop lead (1) away from tap lead (4) and chassis.
2. Dress AC power leads away from sockets.
3. Dress leads from band switch to trimmers away from each other and away from chassis.
4. Dress blue lead and two green leads from terminal board away from chassis and away from each other.
5. Dress green lead from volume control to rear terminal away from all parts and against chassis.

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic 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 tuning drum. 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.

Pointer for Calibration Scale.—Improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, 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 1/8 inch to the left of the mark at the extreme left (140 kc) end of the dial scale, with gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect test-osc. output to—</th>
<th>Turn test osc. id—</th>
<th>Turn radio dial to—</th>
<th>Adjust the following for max. peak output—</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L-F grid through 0.1 mfd. capacitor and ground</td>
<td>468 kc</td>
<td>Quiet point between 386-780 kc</td>
<td>L-3 and L-4 (Low L-F trunn.)</td>
</tr>
<tr>
<td>2</td>
<td>1st dial grid through 0.1 mfd. capacitor and ground</td>
<td>468 kc</td>
<td></td>
<td>L-1 and L-3 (1st L-F trunn.)</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal (open link between &quot;A&quot; and &quot;O&quot;) in series with 300 ohms</td>
<td>16.3 mc</td>
<td>18.8 mc (134')</td>
<td>C-1 oscillator*</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal (open link between &quot;A&quot; and &quot;O&quot;) in series with 300 ohms</td>
<td>15.8 mc</td>
<td>Rack at 18.8 mc (134')</td>
<td>C-3 antenna while rocking</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal (open link between &quot;A&quot; and &quot;O&quot;) in series with 300 ohms</td>
<td>1,500 kc</td>
<td>1,400 kc (158')</td>
<td>C-3 oscillator</td>
</tr>
<tr>
<td>6</td>
<td>Antenna terminal (open link between &quot;A&quot; and &quot;O&quot;) in series with 300 ohms</td>
<td>600 kc</td>
<td>Rack at 600 kc (24')</td>
<td>C-6 antenna</td>
</tr>
<tr>
<td>7</td>
<td>Antenna terminal (open link between &quot;A&quot; and &quot;O&quot;) in series with 300 ohms</td>
<td>1,500 kc</td>
<td>1,400 kc (158')</td>
<td>C-3 oscillator</td>
</tr>
</tbody>
</table>

* Oscillator should track on high frequency side of signal. If two peaks are obtained use high frequency (minimum capacity) peak.
1 If two peaks can be obtained use low frequency (maximum capacity) peak.

Receiver Dial Scales, 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 the point on the bottom calibration scale to the same point on the top calibration scale. For example, 24° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."

Record Player Connections, Using a Double-Pole Double-Throw Toggle Switch

The accompanying schematic shows connections for a high-impedance pickup, with switch for changing from radio to records. For low-impedance pickups, a suitable step-up transformer should be used to provide proper impedance matching, and should be connected between the pickup and radio-phono switch.

Current Transformer.—To center the loudspeaker voice coil, first remove the front dust cover, then loosen the screws, holding the spider assembly. Insert three narrow feelers into the air gap, and tighten the spider screws. Remove the feelers and fasten a dust cover in place with loudspeaker cement.

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<table>
<thead>
<tr>
<th>No.</th>
<th>Part #</th>
<th>Description of Parts</th>
<th>MODEL WR-354</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>960931</td>
<td>Short-wave antenna coil</td>
<td>960931</td>
</tr>
<tr>
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<td>960931</td>
<td>1.56 mm trimmer - part of 960931</td>
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<tr>
<td>3</td>
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<td>0.9 mm trimmer - part of 960931</td>
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<td>0.9 mm trimmer - part of 960931</td>
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<td>5</td>
<td>960931</td>
<td>Wave change assembly</td>
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<td>Variable condenser</td>
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To properly align the circuits of the receiver, it is essential to use a high-grade, modulated test oscillator, the output of which can be continuously varied when used as a signal source to bring the receiver into alignment. A conventional output meter should be connected across the speaker voice coil terminals to indicate proper alignment of the receiver. The sensitivity of the output meter must be sufficient to give a satisfactory reading with a low input signal.

A zero center microammeter with an approximate 10-200 scale is absolutely essential for the proper alignment of the discriminator circuits.

Before attempting to align the receiver, the circuit, position of alignment adjustments and chassis layout should be familiarized. The top and bottom views of the chassis are shown in Figures 1 and 2.

ADJUSTMENT OF THE L.P.F. Discriminator coil 650 Kc.
1. Refer to bottom view of chassis and connect a 10,000 ohm resistor between points "C" and "D" under L.P.F. coil #1.
2. Tune the receiver for 250 kc in position immediately after slot "I" is turned on, or trim to 250 kc on full key. Set switch in "OFF" position. Set high fidelity meter to a left-hand or R.M.E.M. position. Set zero-center meter switch to broadcast position.
3. Connect the output meter across the speaker voice coil.
4. Set the test oscillator to 600 kc and adjust the output to give a readable deflection of the output meter. The output meter when the signal is applied to the grid of the 835 L.F. tube will indicate dia. dl1-2 or dl1-3. Set trimmer condenser.
5. Adjust the bottom adjustment screw on coil #4 for maximum output.
6. Remove the 10,000 ohm resistor from points "A" and "B" and connect between points "A" and "D".
7. Adjust the top adjustment screw on coil #4 for maximum output.

This model is an eight-tube, alternating-current, superheterodyne, super-turnstile, designed to operate over the standard broadcast band, extending from 520 to 1800 kc. The first short-wave band includes frequencies between 1720 and 6000 kc, and the second short-wave band includes frequencies between 8700 and 12,900 kc.

LINI-07 CAPACITOR ADJUSTMENTS
To properly 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 and removed. It is extremely important to prevent turnover to the individual circuits of the receiver when the output is applied. A conventional output meter should be connected across the speaker voice coil terminals to indicate when the individual circuits are correctly aligned. The sensitivity of the meter must be sufficient to give satisfactory readings on live input signals.

ALIGNMENT OF L.P.F. (465 Kc).
1. Set the volume control to maximum position, the wave-change switch to the standard broadcast band and the dial pointer to approximately 600 kc.
2. Connect the output meter across the voice coil terminals of the speaker.
3. Set the test oscillator to 650 kc., and adjust its output to produce a measurable signal in the receiver. The test signal is applied to the grid of the first discriminator-oscillator tube through a 0.050 mf condenser, and the R.P.F. and antenna trimmers #11 and #13.
4. Adjust the four L.P.F. trimmer condensers, #11, #13, #14 and #15 to maximum output.
5. Connect the receiver and antenna terminals through a .0005 mf condenser, and the R.P.F. and antenna trimmers #11 and #12.
6. Connect the test oscillator and gang condenser to 1800 kc., and recheck operation #6.
7. Connect the test oscillator and gang condenser to 1800 kc., and recheck operation #6.
8. Connect the test oscillator and gang condenser to 1800 kc., and recheck operation #6.
9. Check sensitivity and calibration on the scale.

NOTE: In adjusting the two remaining trimmers in series should be inserted between the test oscillator and the antenna terminal of the receiver. This combination is the approximate equivalent of a short-wave antenna.

ADJUSTMENT OF THE DISCRIMINATOR COIL
1. Connect the microammeter between the grid terminal of the 6J2 discriminator rectifier tube and ground.
2. With zero signal applied to the L.F. tube increase the signal output of the discriminator.
3. Adjust the bottom screw on the discriminator coil until a zero reading on the microammeter is reached. To this alignment, vary the L.F. signal slightly to each side of the grid setting and the microammeter should show a deflection first on one side then the other of the zero point.

ADJUSTMENT OF THE BROADCAST BAND
1. With the gang condenser completely in mesh, check the position of the dial pointer which should be at the mid-point on the scale.
2. Set the test oscillator and dial pointer to 1800 kc.
3. Adjust the oscillator trimmer #14.
4. Connect the test oscillator to the antenna terminal of the receiver through a .0005 mf condenser.
5. Adjust the R.P.F. and antenna trimmers #11 and #12 for maximum output.
6. Set the test oscillator and dial pointer to 1800 kc.
7. Adjust the oscillator series (lag) condenser #18 at the same time turning the gang condenser slightly back and forth until a maximum is reached.
8. Return the test oscillator and dial pointer to 1800 kc, setting and recheck trimmers #14, #15 and #16.
9. Check sensitivity and calibration on the scale.

NOTE: In adjusting the two remaining trimmers in series should be inserted between the test oscillator and the antenna terminal of the receiver. This combination is the approximate equivalent of a short-wave antenna.

ADJUSTMENT OF THE SHORT BAND
1. Turn the wave-change switch to the short wave band position.
2. Set the test oscillator and dial pointer at 10,000 kc.
3. Adjust the oscillator trimmer #14.
4. Check sensitivity and calibration on the scale.

ADJUSTMENT OF THE RED BAND
1. Turn the wave-change switch to the red band position.
2. Set the test oscillator and dial pointer at 10,000 kc.
3. Adjust the oscillator trimmer #14.
4. Adjust the R.P.F. and antenna trimmers #11 and #12 for maximum output.
5. Check calibration and sensitivity on the scale.

ADJUSTMENT OF THE SHORT BAND
1. Turn the wave-change switch to the short wave band position.
2. Set the test oscillator and dial pointer at 18,000 kc.
3. Adjust the oscillator trimmer #14.
4. Check sensitivity and calibration on the scale.

ADJUSTMENT OF THE RED BAND
1. Turn the wave-change switch to the red band position.
2. Set the test oscillator and dial pointer at 18,000 kc.
3. Adjust the oscillator trimmer #14.
4. Check sensitivity and calibration on the scale.
DIAL LAMP: Mazda 44, 6.3 volts, 25 amp.

POWER SUPPLY RATINGS:

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Model WR-274</th>
<th>Model WR-374</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating A: 105-125 volts, 50-60 cycles</td>
<td>65 watts</td>
<td>75 watts</td>
</tr>
<tr>
<td>Rating B: 125-140 volts, 12-inch</td>
<td>62 watts</td>
<td>73 watts</td>
</tr>
<tr>
<td>Rating C: 100-130 volts, 150-250 cycles</td>
<td>63 watts</td>
<td>75 watts</td>
</tr>
</tbody>
</table>

POWER OUTPUT (125 volts, 60 cycle supply):

- Undistorted: 2.3 watts, 5.0 watts
- Maximum: 4.3 watts, 5.5 watts
- LOUDSPEAKER (Electrostatic): 6-inch, 12-inch
- V.C. Impedance at 400 cycles: 3.4 ohms, 2.2 ohms

F. E. M.: 260 volts, 20 A.M.

FOR ALIGNMENT, PUSH-BUTTON DATA, DRIVE CABLE, SEE INDEX.
<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of the test-ooc. to:</th>
<th>Tune test-ooc. to:</th>
<th>Turn radio dial to:</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 grid in series with .01 mfd.</td>
<td>455 kc</td>
<td>“A” band Quiet point between 500-750 kc</td>
<td>LS and L4 (2nd I-F trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 grid in series with .01 mfd.</td>
<td></td>
<td>“A” band Quiet point between 500-750 kc</td>
<td>L1 and L2 (1st I-F trans.)</td>
</tr>
<tr>
<td>3</td>
<td>Ant. terminal in series with 300 ohms</td>
<td>20 mc</td>
<td>20 mc (200”) “C” band</td>
<td>C1 (osc.)*</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>6 mc</td>
<td>6 mc (187.5”) “B” band</td>
<td>C2 (ant.)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1,500 kc</td>
<td>1,500 kc (193.75”) “A” band</td>
<td>C3 (osc.)**</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>800 kc</td>
<td>600 kc (287.5”) “A” band</td>
<td>L6 (osc.) Rock gang</td>
</tr>
<tr>
<td>7</td>
<td>Repeat step 6.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak if two can be obtained. Check to determine that C1 has been adjusted to correct peak by tuning receiver to approximately 19.09 mc where a weaker signal should be received.

** Use minimum capacity peak if two can be obtained. Check to determine that C3 has been adjusted to correct peak by tuning receiver to approximately 5.09 mc where a weaker signal should be received.

Note—Oscillators tracks above signal on all bands.

Loudspeaker.—To center the loudspeaker voice coil, first remove the front dust cover; then loosen the screws holding the spider assembly. Insert three narrow feelers into the air gap, and tighten the spider screws. Remove the feelers and fasten a dust cover in place with loudspeaker cement.

Phonograph or Television Attachment.—A terminal board is provided on the rear of the chassis for connecting a record player or Television attachment into the audio-amplifying circuit. The cable from the record player should be connected to terminals 1 and 2, the cable from the Television attachment going to terminals 2 and 3. Terminal 2 is chassis ground and the shield or ground lead from either of the attachments should be connected to this terminal.

Precautionary Lead Dress.—On Model WR-274, the lead from 6SP5 plate to 6F6G should be dressed close to chassis.

Power cord should be dressed away from power transformer.

Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. 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 by turning counter-clockwise about one turn from their tight position so they turn freely.

2. Check to be sure the Phono-Radio switch is in "Radio" position.

3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, retune station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than 1/4 turn after the screw begins to grip or damage to the mechanism may result.

4. Proceed in a similar manner for the remainder of the push-buttons.

5. Insert the station marker tabs in the recesses above the push-buttons.
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, 37.5° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."

Adjustments for Push-Button Tuning

1. Loosen the push-buttons by turning counter-clockwise about one turn from their tight position so they turn freely.

2. Check to be sure the Phono-Radio switch is in "Radio" position.

3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, and rotate the pointer with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than 1/4 turn after the screw begins to grip or damage to the mechanism may result.

4. Proceed in a similar manner for the remainder of the push-buttons.

5. Insert the station marker tabs in the recesses above the push-buttons.

Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked:

1. Dress AC switch leads away from tube sockets.

2. Do not twist loop leads together or around each other. Spacing between leads from "C" band loop to chassis is important — see alignment step "7" below.

3. "High side" leads from loop sockets, range switch, oscillator coil, and trimmers must be dressed away from chassis and each other.

4. Dress the 470 mf and 36 mf condensers going to the grid and osc. grid of the 6SAY/ tube away from each other.

Calibration Scale on Indicator-Drive-Cord Drum — The tuning dial is fastened in the cabinet and cannot be used for reference during adjustment; therefore, a calibration scale is attached to the tuning drum. 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 120° mark on the drum scale must be vertical and directly under the center of the shaft of the tuning drum 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.

On the inner side of the tuning drum are two projections which serve as stops to prevent extreme rotation of the gang condenser. The tuning drum should be set so that the stop limiting clockwise movement of the drum takes effect just as the gang condenser plates are becoming fully meshed, thus preventing stress on the gang due to extreme rotation.

Pointer for Calibration Scale — Improvise a pointer for the calibration scale by fastening a piece of wire to the chassis, 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 set 1/4 inch to the left of the 540 kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.
Intermediate Frequency: 455 kc.

Power Supply Ratings:
- 105-125 volts, 50-60 cycles: 60 watts
- 105-125 volts, 25-50 cycles: 60 watts

Precautionary Lead Dress:
1. Dress lead I.F. leads close to chassis.
2. Dress leads from volume control and tone switch away from filaments, diodes, and power leads.
3. Dress .062 mfd. volume control condenser away from electrolytic.
**Push Button Adjustments**

Calibration Scale on Indicator-Driver 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 indicator-driver cord drum which is mounted on the 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 "0°" mark on the drum scale must be vertical, and directly under 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.

To determine the corresponding frequency for any setting of the calibration scale, refer to the accompanying drawing which shows the dial with 0-180° calibration scales drawn at top and bottom.

**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 540-kc mark, and gang condenser fully meshed. The indicator has a spring clip for attachment to the cable.

**Precautionary Lead Dress.**—
1. Dress 1nd. 1 F leads close to chassis.
2. Dress leads from volume control and tone switch away from chassis, doode and power leads.
3. Dress .005-mil. volume control condenser away from electrolytic.

**Calibration Scale**

- **Connect the high side of test-osc. to—**
- **Tune test-osc. to—**
- **Range switch**
- **Turn radio dial to—**
- **Adjust the following for max. peak output**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect the high side of test-osc. to—</th>
<th>Tune test-osc. to—</th>
<th>Range switch</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 in series with .01 mf.</td>
<td>450 kc</td>
<td>&quot;A&quot;</td>
<td>L5 and L6</td>
<td>L4 and L5 (2nd 1 F Trans.)</td>
</tr>
<tr>
<td>2</td>
<td>6SK7 1st Detector in series with .01 mf.</td>
<td>14.64 mc</td>
<td>&quot;B&quot;</td>
<td>L4 and L5</td>
<td>C4 (osc.)</td>
</tr>
<tr>
<td>3</td>
<td>Ant. terminal &quot;A&quot; in series with .01 mf.</td>
<td>15.3 mc</td>
<td>&quot;C&quot;</td>
<td>L5 and L6</td>
<td>C4 (osc.)</td>
</tr>
<tr>
<td>4</td>
<td>Ant. section of gang condenser in series with .001 mf.</td>
<td>14.64 mc</td>
<td>&quot;B&quot;</td>
<td>L4 and L5</td>
<td>C5 (osc.)</td>
</tr>
<tr>
<td>5</td>
<td>1600 kc</td>
<td>1600 kc</td>
<td>&quot;A&quot;</td>
<td>C5 (osc.)</td>
<td>L5 (osc.) (Rock gang)</td>
</tr>
<tr>
<td>6</td>
<td>8000 ohms</td>
<td>8000 ohms</td>
<td>&quot;A&quot;</td>
<td>C5 (osc.)</td>
<td>L5 (osc.) (Rock gang)</td>
</tr>
</tbody>
</table>

**Fasen chassis in cabinet. Connect loop, see that link is closed on the antenna board, attach dial indicator to drive cord, with indicator at 540 kc mark and gang at maximum capacity.**

**Receiver Dial Scales, 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, 90° on the calibration scale corresponds to 600 kc on "A" band. Read instructions under "Alignment Procedure."
MODELS WR-473
WR-474
WR-474L

WESTINGHOUSE ELEC. SUPPLY CO. INC.

AUTOMATIC RECORD CHANGER

Before servicing the automatic record changer, inspect the assembly to see that all parts, gears, springs, etc. are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the main motor. If the jam persists, take the assembly apart and examine it carefully.

The changer can be conveniently tested through its change cycle by pushing the index lever to "Reset" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlocks various mechanical devices to separate the record needle, accompanying mechanism, record cracking, record separation, etc. One adjustment is provided for the main lever. It is adjustable only until the lever is reset, and the motor must be reset after the change cycle is started. Proper adjustment of the lever is determined by clamping the turntable clutch "G" occurs when movement of the turntable arm causes lever rotation, which in turn releases pressure on the trip pawl 22, without tending to pull the clutch up. The friction should be just enough to prevent slippage, and is adjustable by means of screw 24. If the adjustment is too tight, the needle will repeat grooves; if too loose, wrong record will not occur at the end of the record.

B. Pickup Lift Cable Screw.—During the record change cycle, lever 22 is actuated by the main lever "15" so as to raise the tone arm. The adjustment is made by means of the pickup lift cable, to be adjusted properly for elevation of the pickup and return to the 15-inch position; see that pickup locating lever 22 is not in contact with step 20 on lever 15. Proper adjustment is determined by clamping the pickup locating lever 22 to the step 20 on lever 15. Proper adjustment is determined by clamping the pickup locating lever 22 to the step 20 on lever 15.

C. Tone Arm Mounting.—The points of the needle on a 12-inch record, although dependent on the proper 10 inch adjustment, is dependent on the proper 10 inch adjustment. To adjust for needle landing, place 12-inch record on turntable, push needle lever to retract and return to the 10 inch position; see that pickup locating lever 22 is tilted fully toward the turntable mechanism through cycle until needle is just ready to land on the record; repeat, but without touching the other, and tighten the blun nose screw "D", run mechanism through several cycles as a check, then tighten the corner pointed screw "D".

D. Lubrication.—Lubricant should be applied to all moving parts of the tone arm, the motor, etc.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following indications are 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 12 and 12 inch records.—Make complete adjustments "D" and "E".
3. Needle does not land properly on 12 inch record but correct on all other records.—Make complete adjustments "D" and "E".
4. Failure to trip at end of record.—Increase clutch "G" friction by means of screw "E", talk, see that levers 17 and 13 are free to move without touching each other.
5. Pickup strikes lower record of stack or drags across top record.—Turntable-adjust lift cable per adjustment "C".
6. Needle does not track after landing.—Friction clutch "G", adjustment "B" may be too tight; bind in tone arm vertical bearing; levers "J" and 13 bent; or pickup output cable twisted.
7. Cycle commences before record is complete.—Record is defective, or adjustment "B" of friction clutch "G" is too tight.
8. Wow in record reproduction.—Record is defective; or instrument is not being operated at normal room temperature (60°F).
9. Record knives strike edge of records.—Records warped; record edges are rough; knife adjustments "F" and "G" are incorrect.
10. Record not released properly.—Record is not in proper release area; mechanism is not released properly.
11. Needle lands in 10 inch position on 12 inch record or misses record when playing both types mixed.—Increase tension of pickup bracket lever spring "B."
**Automatic Record Changer**

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:—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 on Model WR-474 is covered with a screw plug.

The automatic stop (Model WR-473) should be adjusted so that the lever will snap to the “off” position when the pickup needle is 1/4 inches from the center line of the spindle.

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**Adjustments for Push-Button Tuning**

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. 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 by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the Phono-Radio switch is in “Radio” position.
3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, rotate station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than 1/4 turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.
Alignment Procedure

Before proceeding with alignment the following lead dress should be carefully checked.

1. Dress AC switch leads away from 6SQ7 tube socket.
2. Do not twist loop leads together or around each other. Spacing between leads from "C" band loop to chassis is important—see alignment step "5" below.
3. "High side" leads from loop sockets, range switch, oscillator coil, and trimmers must be dressed away from chassis and each other.
4. Dress the two 100 mfd. capacitors going to the grid and osc. grid of the 6SA7 tube away from each other.
5. Dress the .01 mfd. 6F6-G grid condenser away from power switch.

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown on the chassis schematics.

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, keep the oscillator output as low as possible to avoid x-r-o action.

Calibration Marks.—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore, calibration marks 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.

---

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect test-osc. output to</th>
<th>Tune test-osc. to</th>
<th>Turn radio dial to</th>
<th>Adjust the following for maximum peak output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-P grid through .01 mfd. capacitor and ground</td>
<td>465 kc</td>
<td>&quot;C&quot; band Quiet point</td>
<td>L-3 and L-4 (2nd 1-P tran.)</td>
</tr>
<tr>
<td>2</td>
<td>1st det. grid through .01 mfd. capacitor and ground</td>
<td>15.2 mc</td>
<td>15.2 mc</td>
<td>L-1 and L-3 (1st 1-P tran.)</td>
</tr>
<tr>
<td>3</td>
<td>15.2 mc</td>
<td>Rock at 15.2 mc</td>
<td>C-1 oscillator†</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9.1 mc</td>
<td>9.1 mc</td>
<td>Spacing between leads from &quot;C&quot; band loop to chassis</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>15.5 mc</td>
<td>Rock at 15.5 mc</td>
<td>C-2 antenna† while rocking</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C-3 antenna while rocking</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>600 kc</td>
<td>600 kc</td>
<td>C-4 antenna while rocking</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C-5 oscillator</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1,500 kc</td>
<td>1,500 kc</td>
<td>C-6 oscillator</td>
<td></td>
</tr>
</tbody>
</table>

When making adjustments 4 to 9 inclusive the chassis must be in the cabinet, both loops connected, and all leads in their normal positions. When mounting chassis in cabinet if calibration marks on dial plate do not line up with dial scale mounted on cabinet move pointer to agree with dial scale on cabinet.

† Oscillator should track on high frequency side of signal. If two peaks are obtained use high frequency (minimum capacity) peak.
† If two peaks can be obtained use low frequency (maximum capacity) peak.

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Speaker and Cable Connections

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POWER CONSUMPTION 110 WATTS FOR OTHER DATA SEE INDEX

Schematic Circuit Diagram—Model WR-482

POWER CONSUMPTION 110 WATTS FOR OTHER DATA SEE INDEX

Schematic Circuit Diagram—Model WR-484
Alignment Procedure

Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown in the schematic diagram.

Output Meter Alignment—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Text-Oscillator—For all alignment operations, connect the low side of the text-oscillator to the receiver chassis, and keep the output as low as possible to avoid A-C action.

Calibration Scale—The glass tuning dial may be easily removed from the cabinet and temporarily attached to the chassis for quick reference during alignment. In the event that only the chassis is returned for service, and the cabinet with its tuning dial is left in the customer's home, the calibration scale printed in this service note can be used in conjunction with an ordinary 12-inch ruler as an accurate and convenient substitute for the regular dial.

Calibration Scale

Each method is described below.

Using Tuning Dial—
1. Slide out the flat spring clamp at each end of the dial, and remove the glass dial from the cabinet.
2. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
3. Place the glass dial under the pointer so that the extreme left scale graduation coincides with the pointer. Use scribe tape to hold the glass dial in this position.

Using Calibration Scale—
1. With gang in full mesh, move the dial pointer to the reference mark at the left-hand end of the dial backing plate.
2. Place a flat 12-inch ruler on the dial backing plate so that the left-hand end of the ruler is at the reference mark at left-hand end of backing plate. Temporarily fasten the ruler with scribe tape to the backing plate.
3. Refer to calibration scale printed in this service note. This is a reduced reproduction of the dial with an inch-scale drawn at top and bottom. To find the correct pointer position in inches for any desired frequency, draw a vertical line through this frequency on the calibration scale.

Dial Indicator and Drive Mechanism

Dial-Pointer adjustment—After the chassis is replaced in cabinet, move the dial pointer (if necessary) so that it is at the left-hand graduation on the dial with the gang in full mesh.

Tube and Trimmer Locations—Model WK-482

Tube and Trimmer Locations—Model WK-484

Adjustments for Push-Button Tuning

The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:
1. Pull off the push-buttons and loosen the push-button screw with a small screwdriver.
2. Set the radio-phone switch to "radio" position and the range switch to "broadcast" position, now accurately tune in the station for which the first button is to be set.
3. Press in push-button rod No. 1 as far as it will go without undue pressure, hold in, retune station with manual control if necessary for best reception, and then carefully tighten the screw. Do not tighten more than ¼ turn after the screw begins to grip or damage to the mechanism may result.
4. Replace the push-button on its shaft.
5. Proceed in a similar manner for the remainder of the push buttons.
6. Maintain and insert the station marker tabs in the recesses in the push-buttons.

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Alignment Procedure

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-c action.

Pre-setting Dial.—With gang condenser in full mesh, the pointer should be horizontal.

Precautionary Lead Drops.
1. Dress speaker leads down to chassis.
2. The green lead from the loop in 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 1st-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 total length of antenna and lead in is more than 150 feet, connect a 300 mfd capacitor in series with lead in.

Use bottom of “T” in “1500” for 1500 kc calibration point, and use center of the last “G” in “600” for 600 kc calibration point.
Alignment Procedure

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to minimum.

Test-Oscillator.—For all alignment operations, keep the output as low as possible to avoid a-c action.

Replacing Lid or Front Panel:
When the model lid (which contains the loop antenna), or the chrome front panel requires replacement, it is not necessary to replace the complete assembly of lid and front panel, as either one may be replaced separately in a few minutes by taking out the hinge pins as described below.

The following parts are available for this purpose:

PART No. Description
37600 Lid and antenna (type without lid support)
37612 Chrome front panel (type without lid support)
37690 Lid and antenna (type with lid support)
37613 Front chrome panel, (type with lid support)
37687 Two hinge pins and two hinge springs

Installation Instructions:
First remove the three self-tapping screws that hold the chassis in the center case, and remove the case. Unsolder the leads from the loop loops.

(a) With lid closed, cut hinge pins at point "A" with sharp cutters.
(b) Start removal of pin sections as shown, using long-nose pliers.
(c) Grasped end of pin section with long-nose pliers and pull out of hinge.
(d) Install new lid, or new front panel, using the replacement hinge pins and springs that are provided with replacement lids and panels. Arrange springs as shown. Apply a small amount of "Thermoplastic Cement" (C.R. 720587) near outer end of each pin to ensure tight and permanent fit.

Loose Control Knobs:
If for any reason either the tuning or volume control knob should become loose on its shaft, it may be rigidly mounted in the following manner:

(a) Remove the loose control knob from its shaft and scrape off the old cement from both shaft and control knob.
(b) Apply a generous even coating of a good cement to the shaft region which is to contact the knob. C.R. Thermoplastic cement 72-5057 is excellent for this purpose; it is a green fluid, easily thinned with acetone if necessary.
(c) Allow the cement on the shaft to air-dry, to evaporate any acetone present.
(d) Apply a small amount of heat to the shaft, sufficient to soften the cement.
(e) Mount knob on shaft while cement is still soft, and allow a few minutes for drying.

Replacing Lid or Chrome Panel

Schematic Circuit Diagram
VOICE COIL IMPEDANCE 3.4 OHMS

POWER CONSUMPTION 90 WATTS

I.F. 455 KC

FOR OTHER DATA SEE INDEX
Alignment Procedure

<table>
<thead>
<tr>
<th>Steps</th>
<th>Connect high side of test oscillator:</th>
<th>Tune test osc. (C)</th>
<th>Turn radio dial to:</th>
<th>Adjust the following for maximum output:</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diode 7-F grid in series with 0.01 mfd.</td>
<td>645 kC</td>
<td>&quot;A&quot; band Q. Plt.</td>
<td>L-1 and L-28 (1st L.T.)</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>2</td>
<td>Diode 7-F grid in series with 0.01 mfd.</td>
<td>645 kC</td>
<td>Quiet Plt.</td>
<td>L-18 and L-40 (1st L.T.)</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>3</td>
<td>Antenna terminal in series with 500 ohms.</td>
<td>1500 kC</td>
<td>C-26 (2nd D.)</td>
<td>C-1, C-4 Rock gang</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>4</td>
<td>Antenna terminal in series with 500 ohms.</td>
<td>1500 kC</td>
<td>C-20 (2nd D.)</td>
<td>C-1 Rock gang</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>5</td>
<td>Antenna terminal in series with 500 ohms.</td>
<td>800 kC</td>
<td>C-18 (3rd D.)</td>
<td>C-1, C-4 Rock gang</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>6</td>
<td>Antenna terminal in series with 500 ohms.</td>
<td>1500 kC</td>
<td>C-26 (2nd D.)</td>
<td>C-1, C-4 Rock gang</td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
<tr>
<td>7</td>
<td>Repeat step 5, then 6</td>
<td></td>
<td></td>
<td></td>
<td>105-125 volts, 60 cycles, 60 watts</td>
</tr>
</tbody>
</table>

To reduce sensitivity during RF alignment, connect a 12,000 ohm, 1 watt resistor across secondary of last IF transformer.

Push Button Adjustment
The push buttons connect to separate magnetos core oscillator coils and separate antenna trimmers which must be adjusted for the desired station. Use an insulated screwdriver or alignment tool. Allow at least 5 minutes warm-up period before making adjustments.

To make a list of the desired stations, arranged in order from low to high frequencies.

1. Turn range selector to "A" band, and manually tune in the first station on the list.
2. Turn Range Control knob to "PS" and press push button No. 1 and adjust No. 1 oscillator core to receive this station. Screw the core all the way in, to lowest frequency, and then unscrew slowly until station is received.
3. Adjust No. 1 antenna trimmer for maximum output on this station.
4. Gaining to the relatively high RF gain, it may be found that there are several settings of each push button magnetos core that will bring in any particular station. In each case it is advisable to unscrew the push button antenna trimmers to minimum capacity before adjusting the oscillator cores.
5. Clockwise adjustment of cores and trimmers tightens the circuits to lower frequencies.
6. Adjust for each of the remaining stations in the same manner.
7. After all stations are tuned-in on the buttons, make a final careful adjustment of all core rods until best reception is obtained for each. Outer antenna should not be reconnected if used.

Loop Connections and Trimmers

Dial Indicator and Drive Mechanism

Location of Controls

Frequency Range

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>540-1590 kHz</td>
</tr>
<tr>
<td>Medium Wave</td>
<td>1560-2500 kHz</td>
</tr>
<tr>
<td>Short Wave</td>
<td>2500-3400 kHz</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>455 kHz</td>
</tr>
</tbody>
</table>

Power Output Ratings

<table>
<thead>
<tr>
<th>Unloaded</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 watts</td>
<td>5.5 watts</td>
</tr>
</tbody>
</table>

Loaders: Type 15-16. 6-inch Electrodynamic V.C. Impedance 5.4 ohms at 400 cycles

Power Supply Ratings

105-125 volts, 60 cycles, 60 watts
<table>
<thead>
<tr>
<th>ALIGNMENT MODEL 634</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL GENERATOR</td>
</tr>
<tr>
<td>CONN.</td>
</tr>
<tr>
<td>REMOVE GRID CLIP FROM 634</td>
</tr>
<tr>
<td>CONTROL GND OF 634</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>CONNECT GRID CLIP TO 634</td>
</tr>
<tr>
<td>DIAL &amp; GROUND PLATE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

Volume Control in "Pull-Out" position at all times.
(=) Connect a standard dummy antenna between signal generator and receiver.
Note 1: Signal across primary of output transformer to be maintained at approximately 10 volts by adjusting signal generator.

<table>
<thead>
<tr>
<th>ALIGNMENT MODEL 636</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL GENERATOR</td>
</tr>
<tr>
<td>CONN.</td>
</tr>
<tr>
<td>REMOVE GRID CLIP FROM 636</td>
</tr>
<tr>
<td>CONTROL GND OF 636</td>
</tr>
<tr>
<td></td>
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<tr>
<td>CONNECT GRID CLIP TO 636</td>
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<tr>
<td>DIAL &amp; GROUND PLATE</td>
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<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

Volume Control in "Pull-Out" position at all times.
(=) Connect a standard dummy antenna between signal generator and receiver.
Note 1: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 2: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 3: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 4: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 5: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 6: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 7: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
Note 8: Signal across primary of the output transformer to be maintained at 5 volts by adjusting signal generator.
<table>
<thead>
<tr>
<th>PART NO.</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-1056</td>
<td>28,000 Ohm Taper J.D. Plate Resistor</td>
</tr>
<tr>
<td>6-1057</td>
<td>50,000 Ohm Taper J.D. Plate Resistor</td>
</tr>
<tr>
<td>6-1058</td>
<td>4,000 Ohm R.F. Amp. Cathode Resistor</td>
</tr>
<tr>
<td>6-1060</td>
<td>22,000 Ohm Type J.D. Plate Resistor</td>
</tr>
<tr>
<td>6-1062</td>
<td>600 Ohm A.F. Cathode Resistor</td>
</tr>
<tr>
<td>6-1064</td>
<td>22,000 Ohm Type J.D. Plate Resistor</td>
</tr>
<tr>
<td>6-1066</td>
<td>88,000 Ohm Type J.D. Plate Isolation Resistor</td>
</tr>
<tr>
<td>6-1068</td>
<td>600 Ohm First J.D. Plate Isolation Resistor</td>
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<tr>
<td>6-1072</td>
<td>8,000 Ohm Taper J.D. Plate Resistor</td>
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<td>6-1074</td>
<td>8,000 Ohm Type J.D. Plate Resistor</td>
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<td>6-1078</td>
<td>22,000 Ohm Type J.D. Plate Resistor</td>
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<td>6-1080</td>
<td>8,000 Ohm Type J.D. Plate Resistor</td>
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<td>6-1084</td>
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<td>6-1086</td>
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<td>6-1100</td>
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<td>8,000 Ohm Type J.D. Plate Resistor</td>
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<td>6-1168</td>
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<td>6-1170</td>
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<td>6-1174</td>
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<td>6-1200</td>
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<td>8,000 Ohm Type J.D. Plate Resistor</td>
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</tr>
<tr>
<td>6-1252</td>
<td>8,000 Ohm Type J.D. Plate Resistor</td>
</tr>
</tbody>
</table>
GANGING INSTRUCTIONS

An OUTPUT meter or other indicating device should be used for accuracy in making gangning adjustments.

If an output meter is not available, the magic eye (648) may be used as an output indicator as follows:

(a) Depress push-button No. 6, "To Record Radio".

(b) Disconnect cutting-board from chassis.

(c) Adjust volume control to near maximum.

Connect signal generator to control grid of the 648 tube.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>DIAL POSITION</th>
<th>WATER HEND SWITCH POSITION</th>
<th>TRIMMER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>468 kHz</td>
<td>1500 kHz</td>
<td>Broadcast</td>
<td>0-35</td>
</tr>
</tbody>
</table>

Connect signal generator to ANT. and GND. leads.

Turn condenser gauge to full maximum capacity and check position of dial pointer with reference line on the scale, which is the last graduation below the 550 kHz calibration.

600 kHz                      | 550 kHz      | Broadcast                   | L.F. Adj (0-3)  |
1400 kHz                     | 1400 kHz     | *                            | Opt (0-3)       |

Not used ** 15-25 kHz       | Short Wave   | Ants (0-3)                   |

The entire alignment procedure should be repeated to obtain greatest accuracy in the adjustment of the trimming condensers.

* Adjust 0-35 trimmer for MINIMUM signal.

** Connect antenna to receiver, and adjust dial so that no station is received.

Advance volume control until a fair volume of noise is received. Adjust trimmer for greatest noise.

** Voltage

<table>
<thead>
<tr>
<th>Tube</th>
<th>Position</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8</td>
<td>Int. Det.</td>
<td>230</td>
<td>75</td>
<td>2.6</td>
</tr>
<tr>
<td>6X7</td>
<td>I.F.</td>
<td>220</td>
<td>75</td>
<td>1.0</td>
</tr>
<tr>
<td>6G7</td>
<td>2nd. Det.</td>
<td>90+</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>6J7</td>
<td>Mid-Ampl.</td>
<td>46 to 60+</td>
<td>50+</td>
<td>5.0</td>
</tr>
<tr>
<td>6X6</td>
<td>Output</td>
<td>215</td>
<td>238</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Notes: This is a typical voltage analysis made by use of standard 1000 ohm per volt voltmeter, using the 300 volt scale for plate and screen voltage readings.

Set actual voltages due to large values of resistance in circuit between supply voltage and point of measurement. These voltage values may vary considerably, depending upon the resistance of voltmeter used.

The above voltages should be considered as being approximate, as difference in line voltage, type of testing equipment used, normal tolerances limits of component parts in the chassis, all have an effect upon these readings. A tolerance of 10% is usually considered permissible.
**NOTE:** This is a typical voltage analysis made by use of standard 1000 ohm per volt voltmeter, using the 30V volt scale for plate and screen voltage readings.

- Not actual voltages due to large values of resistance in circuit between supply voltage and point of measurement. These voltage values may vary considerably, depending upon the resistance of voltmeter used.

The above voltages should be considered as being approximate, as difference in line voltage, type of testing equipment used, normal tolerances limits of component parts in the chassis, all have an effect upon these readings. A tolerance of 10% is usually considered permissible.

---

**MODEL No. A90, A91, A92.**

**DATE:** 11-27-40. A93, A94, A95.

**PARTS LAYOUT**

---

2. Remove the wire placed through the rubber grommet in the vertical shield flange, which connects the ground terminal of the volume control to chassis.

3. Run a wire from the ground terminal of the volume control through the fibre grommet in the chassis base directly below the volume control, to the ground lug located near the electrolytic capacitor in the approximate center of the underside of the chassis. (Note: X35 and C30 are already connected to this lug.) Do not permit the volume control ground terminal to contact the chassis through any other medium.

4. Move the ground connection of the 0X7 cathode bypass capacitor, C19, from its present location on the assembly lug of the electrolytic capacitor, to the chassis ground lug to which the volume control has been grounded.

---

In the operation of Recordor Models A-90, A-91, A-92, A-93, A-94, A-95, A-96 and A-101, bearing serial numbers prior to No. 626600, if the residual hum, noted with the volume control turned to minimum position, appears to be abnormally high or objectionable, a correction may be affected by a rearrangement of the ground connections to the volume control and cathode bypass condenser C16.

These connections should be changed as follows:

1. Disconnect the spiral shield covering of the volume control (leave from the volume control terminal and solder the shielding directly to the volume control switch cover.)
This receiver is designed for operation on 110-120 volts AC or DC

Model
8C4 A51

TUBE CIRCUIT PLATE TO SCREEN TO CATHODE TO
GROUND GROUND GROUND

6K7 R. F. Amplifier 108 108 2.8
6J7 Detector 24 .2 0
25L6 Power Output 100 108 6.2

Speaker Field Drop 22 B + Voltage 108

Line Voltage Was 120 V. 60 cycle Meter 1000 ohms per volt
Variation Synchronization With Turntable Rotation

If "wow" resulting from variation in the speed of the turntable is evidenced to be in the order of four times per turntable revolution, this would indicate a defect in the rubber-reamed drive wheel. The wheel may be out of round, or warped, or may have a flat spot or burr on the rubber rim.

If the "wow" is noticed to be once per turntable revolution, however, this would indicate some irregularity in the rim of the turntable. In handling, avoid bumping or dropping the turntable, as any pronounced dent in the rim of the table to throw it out of round will result in a very noticeable variation in turntable speed.

Running the finger tips lightly over the inside surface of the turntable rim will show any irregularity insufficiently pronounced to produce "wow" in the recording or record reproduction. The rounding surface of the turntable rim does not necessarily have to be perfectly smooth, so the effect of minute irregularities of the surface are absorbed by the rubber rim of the drive wheel.

A badly warped record, either a home recording or commercial record, or one in which the center hole is worn or oversize, will tend to produce "wow" during its reproduction, and it is suggested that this be taken into consideration in investigating a complaint pertaining to warmed or "wow" in record reproduction.

Ordinarily, recordings made on record blanks which are only slightly warped, will prove to be satisfactory. However, "wow" may be cut into the recording if the cutting head damper is incorrectly adjusted so that the felt damper bears against the cutting head with too much pressure.

To correctly adjust the Cutting Head Damper, proceed as follows:
1. Turn the adjusting screw to the RIGHT so that no pressure is exerted on the cutting head by the felt damper.
2. Scales the recording arm to a narrow vertical position so that the stylus is in the slot in the front end of the arm. Observe that when the stylus moves to one end of the slot and released, it will move back and forth a few times, before coming to rest in the center of the slot.
3. Turn the damper adjusting screw to the LEFT until, when the stylus moves to one end of the slot and released, it will return to the midway position and stop. The tendency to resume moving back and forth has been eliminated.

In order to determine if "wow" is actually "wow" into a home recording, or if a variation in turntable speed exists during all functions of the turntable, first play an especially selected regular phonograph record. When the record plays satisfactorily, but "wow" is noticed in playing home recordings made on the sound instrument, this gives evidence of the existence of some mechanical fault in the recording mechanism. As previously pointed out, the cutting head damper may be dragged on the rubber rim of the turntable.

In order to provide varying speed of the turntable during the playing of records, the greater power demand placed upon the motor during recording, due to the work involved in cutting the record groove, may cause the drive wheel to slip.

Dynamic Balance

All Recordio motors employed in dual-speed models are now dynamically balanced by the motor manufacturer, and such motors have an identifying red dot on the bottom of the motor shaft. Through investigation indicates that the use of dynamically balanced motors eliminates all possibility of recorded chatter due to motor vibration. Prior to the use of dynamically balanced motors, all motors were passed through a very rigid vibration test to insure satisfactory performance from this standpoint.

Motor Shaft Sticks

In some of the early production units, insufficient vertical and play in the motor shaft existed to allow the lower end of the shaft to enter the motor bearing. If the unit were subjected to rough handling during transportation, this sometimes caused the shaft to stick in the bearing, resulting in failure of the motor to operate when turned on. In the event a tight shaft is encountered, it may be freed in the bearing by lightly tapping the end of the motor shaft.

In motors of more recent production, a fiber washer is placed on the motor shaft to take up a sufficient amount of end play, so that the shaft cannot become stuck in the bearing.

Oilers

When the Recordio leaves the factory, the equipment is properly lubricated and requires no attention. Frequent oiling of the recording mechanism is not required, although the use of a small amount of oil judiciously applied about once a year, in accord with the following directions, will suffice to maintain the equipment in good order.

Remove the turntable by applying upward pressure at the rim of the table. At the same time lightly tapping the top of the turntable spindle with a small tool.

Lift the dual drive wheel assembly from its mounting.

Lubricate the oiling positions indicated in the accompanying drawings, using only two or three drops of electric motor oil at each position, unless otherwise specified.

1. Turntable shaft bearing.
2. Upper motor bearing.
3. Between drive wheel mounting disc and bed plate.
4. Place a coating of petroleum jelly on the lip of the motor arm.
5. Recording arm pivot post.
6. Pivot post saddle plate slot.

Carefully apply one or two drops of oil to each drive wheel bearing, so that the oil will not run out on to the rubber rails of the wheel.

The lower motor bearing may be lubricated by application of oil to the felt wick surrounding the lower end of the motor shaft.

Replace dual drive wheel and turntable assembly as follows:

Place the dual drive wheel assembly (A) on the pin in the center of the movable mounting plate (B). The shift lever (E) at the motor assembly should be positioned against the stop pin (G) as shown in the drawing. Likewise, the switch actuating finger (H) will engage in the wide slot of the switch arm (I) at the shift lever (E) is moved between the stop pins (J) and (K).

Carefully lower the turntable on the spindle. It will be observed that one of the rubber-reamed drive wheel protrudes beyond the rim of the turntable. With the finger tips, press the drive wheel into position so that the rubber rim of the wheel bears against the inside surface of the turntable rim.

Rotate the turntable by hand, permitting the key pin of the turntable spindle to engage the key slot in the turntable hub.
AUTOMATIC RECORD CHANGER ADJUSTMENTS

DESCRIPTION OF MECHANISM

In order to automatically change records, the record changer mechanism must first be put in motion. The trigger which accomplishes this purpose is the trip mechanism. The trip mechanism is actuated by the trip grooves at the end of the main grooves in all standard records.

All commercial records manufactured in recent years have either an eccentric (oscillating), or spiral (run-in) type of trip groove.

This record changer will trip on any standard eccentric trip groove. It will also trip on any spiral trip groove provided that the spiral does not terminate at a larger diameter than that for which the trip mechanism is adjusted.

To observe the operation of the trip mechanism, it is necessary to first remove the turntable and then move lever (A) to either the 10 or 12 inch position.

To follow the action of the trip mechanism on eccentric trip groove records, it will be seen that as the pickup arm (K) swings inwardly, the trip rod (X) moves toward the pickup base until the serrations on the trip rod seen at (X) are in contact with the knife edge of the trip lever (F). If the pickup arm (K) is now moved outwardly, the serrations at (X) will engage with the trip lever (F), permitting the trip arm (K) to be released so that it will drop in and engage the trip arm (K).

To observe the action of the trip mechanism on spiral trip groove records, swing the pickup arm (K) inwardly until the trip dog (G) comes in contact with the trip latch (A) and releases trip arm lever (C).

The reset button (B) will be noted also operates to trip the mechanism by imparting motion to latch (F).

After trip arm lever (C) has been released so that it can engage trip arm (F), the force required to operate the balance of the trip mechanism are derived from the motor.

As trip arm (F) engages trip arm lever (C), arm (F) is hinged upwards so that it engages the chuck mechanism drive wheel control lever (F) and forces the drive wheel (L) into positive frictional engagement with the inside of the turntable rim.

To keep wheel (L) in engagement with the turntable rim after lever (F) carries part of arm (F), lever (I) is engaged by latch (7) and the tripking operation is complete.

DESCRIPTION OF SPEED REDUCER AND CAM SHAFT

Driven by the wheel (L) through a double worm and gear reduction, the cam shaft (5) carries sprocket which carries the pick-up arm mechanism, the droping of records, and the completion of the change cycle, the release of latch (T).

Cam (5) which is mounted on the lower end of cam shaft (5) raises and lowers the pickup arm (M) through a rocker arm and push rod.

The positioning of the pickup arm (M) for the 10 or 12 inch records is controlled by two cam shafts, each above the lower cam shaft bearing. The lower of these cam shafts is thrust on two cam shafts and the upper arm (le) and is controlled by the turntable position.

An examination of the pickup positioning mechanism will reveal that the fingers are fixed at the starting groove on which the needle are not held in grooves.

When lever (A) is set in the 10 or 12 inch position, the pickup positioning mechanism becomes shifted up or down so as to engage the proper cam. The pickup positioning mechanism will be released by the turntable position.

Just above the pickup positioning mechanism the pickup arm (K) becomes the function of swinging the pickup arm (K) outwardly when the mechanism has been tripped.

The last and uppermost cam operate through cam follower (1) to release the wheel latch (T) thus disengaging wheel (L) from the turntable rim at the completion of the change cycle.

On the upper side of the latch control cam is mounted a roller which engages lever (I) and actuates the record handling fingers (D) through the connecting links provided.

ADJUSTMENT OF SPIRAL TRIP MECHANISM

To adjust the spiral trip to operate farther from the center of the record, loosen the set screw holding dog (G) and move the dog (G) away from the end of the trip rod (X). (End paragraph 20 before making adjustments.)

Dog (G) is set at the factory to trip when the pickup needle is 1 3/4" from the edge of the hole in the record center. This standard setting is correct for all late recordings and all but a very few of the older ones. To facilitate the location of dog (G) it is best to hold a scale against the turntable rim (G) and in such a manner that the pickup needle will swing directly above the scale graduations. As noted above, the trip should release when the pickup needle reaches the 1 3/4" graduation. NOTE: If for any reason the position of the pickup arm (K) with relation to the trip base becomes changed, the trip dog (G) may require resetting. For this reason always check to see that the pickup needle is being lowered correctly onto the edge of the record before adjusting dog (G). (This pickup adjustment is covered in paragraph 34.)

MECHANISM PAIL TO TRIP

If the mechanism fails to trip, always examine the trip grooves on the record first before attempting to make any adjustments. The records may be worn or scratched in such a manner as to cause the pickup needle to jump the grooves. Also try a new pickup needle as the needle may have been damaged.

The trip rod (K) is held in contact with the trip latch (A) by the trip rod tension spring (P). The spring tends to keep the trip rod in contact with the record, it may be necessary to increase the pressure of spring (P) against trip rod (K) before changing the adjustment, observe the following:

1. Make sure that the trip rod does not bind in the bearing where it is linked to the pickup base.

2. Be sure that the trip rod fits freely.

3. Examine the serrations at (E) to be certain that the sharp edges have not been damaged.

4. Remove any dirt which may be embedded in the serrations and which would prevent the trip latch (A) from being engaged.

5. Examine the knife edge of trip latch (A) to see if it has been damaged.

NOTE: Do not increase the pressure of spring (P) against trip rod (K) any more than necessary to insure proper operation of the eccentric trip mechanism because excessive spring pressure will cause:

1. Jumping of the pickup needle out of spiral trip grooves at the tripping point.

2. The eccentric tripping action will require more power and the needle may jump the grooves and fail to trip altogether.

If the mechanism still works in a faulty manner after the foregoing precautions have been taken, check the trip latch (A) and the trip arm lever (C) to make sure that they work freely and do not bind on the stud which are mounted. If either of these levers are scraping on the base plate, make sure that the studs which carry them are not worn loose.

If the lever (G) moves freely when it clears the trip latch (A) but does not swing into the path of the trip arm (F) then the spring which connects to lever (G) is either stretched or missing. If lever (G) makes a loud click when it drops in, the rubber bumper, against which it should strike, has worked up and should be pressed back into place.
(26) If the trip mechanism functions in a satisfactory manner and wheel (L) is latched in position to engage the turntable rim but does not contact the turntable rim with sufficient pressure to cause the wheel control lever extension outwardly a distance which will bring wheel (L) into positive contact with the turntable rim. CAUTION: This adjustment is very critical and should be carefully made. If wheel (L) is forced too tightly against the turntable rim, the latch (T) will stick at the completion of the change cycle and prevent re-centering of the wheel. CAUTION: Adjustment of the latch (T) is made at the turntable rim at the end of the wheel control lever extension, so that it can be seen how far the extension is being moved each time. Before making any adjustment, it is also advisable to check the set screw in wheel (L) to be sure that wheel (L) is tight and not turning on the shaft which carries it.

(26) If latch (T) fails to hold wheel (L) in position:
(1) Lever (I) may not be following through completely on one end (P), due to either lever (O) being bent down, or lever (I) bent up too far.
(2) At the end of lever (I) in vicinity of wheel (L) is notched a dog (W) which is meant to engage in latch (T). This dog may have bent outward so that it does not completely enter latch (T), when lever (I) has completed its travel on one end (P).
(3) The adjustment of fingers on latch lever (T) is such that the clearance for the dog (W) should be approximately .005". This can be determined by moving lever (I) outward from the center so that the dog (W) will move into latch (T) and a feeler gauge inserted between the dog and finger to establish this clearance. To adjust for proper clearance, the finger on latch (T) may be bent in or out.
(4) Check the spring on lever (I) to make sure that the spring is not defective or missing.

MECHANISM EXPLODE

(27) If the mechanism repeats (continues to change records without playing them), the wheel (L) may not be disengaging from the turntable rim. This failure to disengage may be due to the following:
(1) Faulty motion of the latch (T). (See "Caution" in paragraph 26.)
(2) A defective or missing return spring on wheel control lever (I).
(3) A defective or missing spring on lever (I).
(4) Lever (I) may be bent so that it is not contacting the wheel release cam. (See paragraph 27.)

(28) If wheel (L) disengages at the completion of the change cycle and immediately re-engages, the trip mechanism is at fault and it is suggested that the following be checked:
(1) Reject bottom (K) may be sticking in the depressed position.
(2) The trip cam (P) may be sticking in the raised position.
(3) The reset spring on trip lever (L) may be defective or missing.
(4) The stud on which wheel control lever (I) is mounted may have worked loose and should be tightened.

MECHANISM TRIP DURING PLAYING CYCLE

(29) If the mechanism trips during the playing of a record and before the pickup arm has swung inwardly to the point where the trip is adjusted to operate on spiral trip groove records, the following conditions should be checked:
(1) Weak or missing reset spring on latch (T). Tension of spring may be increased by turning the spring another lug.
(2) Defective shoulder or trip latch (X) or rounded corner on arm lift lever (C), permitting lever (O) to slip off of the shoulder on trip latch (X).
(3) Rubber bumper (S), against which wheel control lever (I) strikes, may have worked upper away from plate, permitting lever (I) to over-travel and lock trip rod (G) against trip latch (X). REM: Where over-travel of lever (I) due to lever (I) not striking bumper (S) causes tripping during the playing cycle, it is possible that either a weak reset spring on latch (T) or a damaged shoulder on latch (X) is a contributing factor.

FIXING AND TIGHTENING LATCH

If during normal operation of the unit the pickup arm acts as though it were jammed in any manner, the following procedures should be attempted:
First, stop the motor, next remove the turntable, and trip the mechanism. The pickup arm (A) should now be capable of free motion between the normal limits of its travel. (From edge of base plate to within approximately 1" of the center pin (B) depending on the adjustment of trip rod (G).)

If trip rod (G) will not slip by the lug against which it strikes on trip latch (X), or the serrations at (T) on rubber bumper (S) hang up on trip latch (X) and prevent trip rod (I) from sliding by trip latch (X) then investigate the following:
(1) Use new bumper (S) pushed upward away from base plate and permitting lever (I) to over-travel.
(2) Excessive pressure exerted against trip rod (G) by spring (P).
(3) Trip rod (G) bent.
(4) An extension on trip latch (X), which extends rearwardly along trip rod (G), may be bent or broken. The function of this extension is to swing trip rod (G) clear of trip latch (X) as soon as tripping takes place.

RECORD SUPPORT ADJUSTMENT

(30) An examination of the unit will disclose the rear record support (front support on A-29) has fixed positions determined by defects which are located by lever (A). The opposite record support (front support on A-29) is adjustable by means of an overlapping connecting link between the two support bases, underneath the change unit.

The record support posts are equidistant from the center of the turntable, so that the opposite side of the record will be released at nearly the same instant, and so that one record at a time will be dropped on the turntable. The accuracy of adjustment may best be determined by placing a 10 inch record on the supports, with the support posts in the 10 to 12 position. Adjusting the lever by loosening the screw (7) and moving the record support post (6) to a position so that the centering edge of the record is parallel to the edge of the record post (6). (NOTE: The record selected for setting is slightly located in the proper defect, or the three feed screw assembly mounting screws are tight. (Vertical alignment of the record centering pin (D) is dependent upon correct feed screw mounting.)

After the adjustment has been made, and the two screws tightened, turn the motor and observe that the record is released from both support fingers at nearly the same instant. Then place a full stack of records on the supports and observe the dropping of each record. It will be observed that the combined weight of ten or twelve records resting on the supports, will cause the supports posts to swing outward slightly as the change mechanism goes through cycle; and the degree to which the posts swing outward is lessened with a decrease of total record weight. It will also be observed that one week may spring out more than the other during the change cycle, and this should be taken into consideration in making an adjustment of the support posts, so that the degree of unevenness with which the records are released from the support fingers will be "averaged" for the entire stack of records.

RECORD SUPPORT AND REPEATING FINGER

As there is a difference in tenickness between 10 inch and 12 inch records, and the equipment is designed to accommodate both sizes, the repeating fingers (F) must be in correct adjustment so that they will slide in between the two lower records of the stack and have no tendency to strike the edge of either record. The record supports (K) and the record
separating fingers (F) are so designed that, when in proper alignment, no chipping of standard records will take place. If, however, the separating fingers should strike the edge of a record, due to a warped record, or one having chipped edges, fingers (F) may be sprung out of alignment. For proper operation, the fingers (F) must be perfectly flat. As the fingers are usually found to be bent upwards, rather than downwards, when out of correct alignment, it is necessary to remove the fingers from the support posts to straighten them. Any heavy screwdriver will be required to loosen the large screws at the top of the post, and the order of placement of the fingers and spacers should be noted in removing these parts so that they may be replaced in correct order. Ordinarily, this will be accomplished by holding the main part of the finger (F) through which the clamping screw passes, with one hand, and then taking hold of the single shaped part of (F) with the fingers of the other hand, bending the single shaped part until it is lined up with the main body. Do not use fingers nor attempt to straighten the fingers (F) by a vice. After bending, lay the finger (F) on a flat surface to make sure the straightening has been properly done.

**Finger Arm Lift Adjustment**

(56) The height to which pickup arm (N) is lifted during the change cycle may be adjusted by the screw (C). In making this adjustment, make sure that the pickup arm will not lift high enough to strike the bottom record on the record supports, also make sure that the pickup needle drops low enough to rest properly on one record on the turntable. (Recommended needle length 5/8") If the timing of the pickup lift is not correct, loosen the set screw holding lift arm (C) on shaft (S) and relocate this arm. (The relative position of the remaining arms is fixed.)

**Adjustment of Pickup Loading Point**

(57) To adjust the pickup arm (N) so that it will be centered to the correct center point of the inside of the record, first shift the lever (A) to the 10" position, and then stop the mechanism with the pickup positioning cam follower at the point of maximum rise of the pickup positioning cam. (See paragraphs 16, 15, and 13.) Now raise the pickup arm to the vertical position and loosen screws at (J) so that the arm (N) can be moved with relation to the pickup base but not too freely. Next hold the pickup base so that it will not turn, force the pickup arm (N) toward the record centering pin (P). Rest the pickup arm (N) outwardly until the pickup needle is 4-6/8" from the pin (P). Raise the pickup arm (N) and tighten the loading screws at (J) being careful not to move arm (N) outwardly past the correct setting. This adjustment will not materially take ear of 10" records as well as 10" as will be seen by moving lever (A) to the 12" position and running the unit through its cycle. If the pickup arm (N) always centers in the 12" position regardless of the position of the lever (A) the pickup positioning cam follower is sticking in the down position.

**Converting Records "PROW"**

If records "PROW" is encountered in dual-speed turntable units of the automatic record changer type used in equipment bearing serial numbers prior to 326600, a correction may usually be affected by increasing the tension of the intermediate drive wheel spring.

To accomplish this, proceed as follows:

1. Remove turntable and intermediate drive wheel assembly. (See Operating Instructions.)
2. Remove recorder-hanger unit by removing the four mounting screws, and disconnecting cables with plugs, from record cabinet.
3. Place recorder-hanger unit in the work bench, tilted to a position that provides easy access to the underside of the unit. DO NOT PLACE UNIT IN AN UPRIGHT POSITION, as the record spindles may be sprung or bent.
4. Remove the intermediate drive wheel spring, and make alterations to the spring in accord with the specifications given below.
5. Remove twelve turns at the hook end of the spring.
6. Form new hook so that the head in the hook is only 1/8" from the loaded spring. DO NOT MAKE A SHARP BEND IN WHEEL FIRM. Instead, form a 1/8" radius as shown in the drawing.
7. Before replacing the spring in the unit, remove the burr or ragged edge of the hole in the base plate, through which the pin protrudes for attachment of the loop end of the spring.
8. After the spring has been installed, and the unit restored to the cabinet, the intermediate drive wheel assembly and turntable should be replaced in accord with the directions given on Page 6 of the Operating Instructions.
An OUTPUT GRID, connected to the anode directly, should be used for accuracy in making tuning adjustments.

The speaker coil terminals, as well as the I.F. trimmer, may be made accessible by removing the screws by which the motor panel is mounted in the cabinet. Before lifting off the phonograph unit, move the PHONO. A.S. TO THE CENTER OF THE PHONOB, and permittions are to maintain this position until after the motor has been returned to the cabinet. In this way, the motor will be removed from the motor panel, and it may be replaced in the cabinet. In this way, the motor will be removed from the motor panel, and it may be replaced in the cabinet.

The I.F. trimmer may be removed through the opening provided in the bottom of the cabinet.

Connect signal generator to control grid of 6AQ tube.

**SIGNAL GENERATOR FREQUENCY**

<table>
<thead>
<tr>
<th>Dial Position</th>
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</tr>
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<tbody>
<tr>
<td>6 Print.</td>
<td>1400 L.f.</td>
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<tr>
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<td>1600 L.f.</td>
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<tr>
<td>6 Print.</td>
<td>1650 L.f.</td>
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Connect signal generator to A.M. and S.B. terminals.

1400 L.f. to 1400 L.f. 6 Print. to 6 Print.

* Check the alignment of the reference line below 650 L.f. on the scale. The pointer may be alined with the shaft to correct for misalignment.

* In tuning or balancing the I.F. amplifier, use a low signal input to avoid setting up of oscillation in the amplifier.

**NOTE:** In the event of loop system replacement, the I.F. amplifier should be checked at 600 L.f., and if necessary, the loops may be adjusted to bring about correct alignment of the dial at 600 L.f., by dressing the ends of the inside loop bars to provide more or less inductance as required.

An adjustment of loop inductance should be followed by re-alignment of the I.F. trimmer at 1600 L.f.

**WIRE DATA**

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<thead>
<tr>
<th>Tube</th>
<th>Setting</th>
<th>Plate</th>
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<th>Cathode</th>
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<td>150</td>
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</table>

* Not actual voltage due to large value of resistance in circuit between supply voltage and point of measurement.

**MODEL A-100**

**CONNECTOR LIST**

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<tr>
<th>Number</th>
<th>Description</th>
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<td>62-326</td>
<td>PIVOT FOOT SHAFT ASSEMBLY</td>
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<tr>
<td>6-3274</td>
<td>PIVOT FOOT SPRING ASSEMBLY</td>
</tr>
<tr>
<td>6-3276</td>
<td>PIVOT FOOT BUSHING</td>
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<td>72-3260</td>
<td>PIVOT FOOT BUSHING M6 WASHER 2 1/8&quot; DIA. ST. BRASS</td>
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<tr>
<td>72-3266</td>
<td>PIVOT FOOT BUSHING M6 WASHER 2 1/8&quot; DIA. FLAT</td>
</tr>
<tr>
<td>72-3266</td>
<td>PIVOT FOOT BUSHING M6 LOCATOR</td>
</tr>
</tbody>
</table>

**DATE 1-10-41**

**PIVOT ARM BUSH**

**12-30-40**

**PIVOT ARM BUSH**

**12-24-40**

**PIVOT ARM BUSH**

**12-24-40**
CONVENTIONAL I.F. ALIGNMENT

DENOTES CHASSIS "GROUND"

IA7G
CONVERTER

IN5G
I.F.

IH5G
DET-AMP

IQ5G
PWR. AMP.

SPEAKER

Tuning range—540 Kc.—1740 Kc.

All voltages measured with a 1000 ohm per volt meter from chassis to socket contacts.

VOLTAGE READINGS ARE ALL POSITIVE

D.C. UNLESS OTHERWISE INDICATED.

ANTENNA DISCONNECTED VOLUME CONTROL FULL ON.

BATTERY VOLTAGE 6 VOLT.

BATTERY CONSUMPTION—.4 AMPERE.

POWER OUTPUT—370 MILLIWATTS.

Stage Gains:
Ant. to conv. grid—4.9 X at 1000 Kc.
Conv. grid to I. F. grid—50 X at 455 Kc.
Overall audio—448 X at .050 watt—400 cycles.

Speaker: Chassis 4A03 has remote speaker.

Chassis: 4A03 has attached speaker.

NOTE

All voltages measured with a 1000 ohm per volt meter from chassis to socket contacts.

VOLTAGE READINGS ARE ALL POSITIVE

D.C. UNLESS OTHERWISE INDICATED.

ANTENNA DISCONNECTED VOLUME CONTROL FULL ON.

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Speaker: Chassis 4A03 has remote speaker.

Chassis: 4A03 has attached speaker.

NOTE

All voltages measured with a 1000 ohm per volt meter from chassis to socket contacts.

VOLTAGE READINGS ARE ALL POSITIVE

D.C. UNLESS OTHERWISE INDICATED.

ANTENNA DISCONNECTED VOLUME CONTROL FULL ON.

BATTERY VOLTAGE 6 VOLT.

BATTERY CONSUMPTION—.4 AMPERE.

POWER OUTPUT—370 MILLIWATTS.

Stage Gains:
Ant. to conv. grid—4.9 X at 1000 Kc.
Conv. grid to I. F. grid—50 X at 455 Kc.
Overall audio—448 X at .050 watt—400 cycles.
NOTE
Chassis 4A02—attached speaker.
Chassis 4A04—remote speaker.

All voltages measured with a 1000 ohm per volt meter from chassis to socket contacts using a fresh Z28 battery pack.
Stage Gains:
Ant. to conv. grid—5.2 × at 1000 Kc.
Conv. grid to I.F. grid—86 × at 455 Kc.
Overall audio—224 × at .050 watt.
400 cycles.
Tuning Range—540 Kc.—1570 Kc.

Adjust A, B, C, D, at 455 Kc
Trim G, F, at 1400 Kc RF signal loosely coupled to loop

All voltages measured from point indicated to Neg. B using 20000 ohm per volt meter.

Line voltage—117 v. A.C.
Power consumption—117 v.—20 watts.
Power consumption, battery—1.02 watts.

Model 9S500 49-368 5½”
Model 9S500L 49-386 5½”
Stage Gains:

Ant. to conv. grid—4.9 x at 1000 Kc.
Conv. grid to I.F. grid—53 x at 455 Kc.
Overall audio—280 x at 0.50 watt. 400 cycles.
Tuning Range—540 Kc.—1600 Kc.

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII

I.F. TRIMMER A, B, C, D
For R.F. Alignment
Couple test oscillator
thru single turn loop
to Wavemagnet
TRIM OSC, ANT (F, G) 1400 Kc
All voltages measured from point indicated to Neq. B. using 20000 ohm per volt meter.

Antenna disconnected — volume control at minimum and condenser plates in full mesh.

Line voltage—117 v. A.C.

Power consumption—117 v.—18.5 watts.

Power consumption, battery—1.02 watts.

Power output—160 milliwatts.

Stage Gains:
Ant. to conv. grid—3.8 × at 1000 Kc.
Conv. grid to I.F. grid—65 × at 455 Kc.
Overall audio—260 × at .050 watt. 400 cycles.
Tuning Range—540 Kc.—1600 Kc.
-13 40-
I.F. 455 KC
Tuning range—540 Kc.—1600 Kc.

DENOTES CHASSIS "GROUND"

12J7G
R.F.

12S47GT
I.F.

12K7GT
DET.

12S47GT
DE-Amp.

35L66G
PWR. AMP.

DENOTES CHASSIS "GROUND"

12SA7G
CONVERTER

35L66G
RECT.

35Z5G
RECT.

35L66G
PWR. AMP.

FOR OTHER DATA SEE INDEX
6A01 uses dynamic speaker.
6A08 has phono connections
6A08 and 6A10 use P.M. speaker
with choke to replace field winding.
Power consumption—6A01—6A10—
25.5 watts.
Power consumption—6A08—40.5
watts.
Power output—1 watt.

Stage Gains:
Ant. to R.F. grid—5.5 X at 1000 Kc.
R.F. grid to conv. grid—8.2 X at
1000 Kc.
Conv. grid to I.F. grid—11 X at
455 Kc.
Overall audio—289 X at 25 watt.
400 cycles.

All voltages measured with a
20,000 ohm per volt meter from Neg.
B to socket contact indicated.
All voltages are positive D.C. un-
less marked otherwise.
Volume control on full.
Line voltage 117 v. A.C.
SERVICE NOTES

All chassis

Weak short wave—Open B.F. choke in plate circuit of 1232 tube.
Noise—Dial rubbing against escutcheon. Sister lug on braid of
gang condenser rubbing against side of opening in chassis. Make
sure all local type tubes are firmly seated in sockets.

Cannot be aligned—Check for open or resin connection on pri-
mary winding of wavemagnet.

Overloads—Usually due to open resistor in A.V.C. circuit of
first detector.

Phono Models

Distortion—Check for broken crystal in pickup.
Low Volume—Check for poor contact in phono switch and plug
contacts—check shield on lead from crystal for poor ground.

6A02-6A04

Noisy—Right hand pilot light wiring may be pinched by au-

tomatic bracket.

Check for poor contact on manual push button.

Check for loose or poor contacts on pilot lights.

Oscillation on short wave band—Push black lead of automatic
away from automatic adjustments. Keep white and green leads
of automatic away from 717-7187 socket.

7A02-7A04

Dead—480 mfd. condenser on automatic may be grounded
against automatic frame or latch bar.

Oscillation—Push leads of wave trap close to chassis keeping
them away from antenna coil.

12A3

Hum—Change 615 in first audio socket.

ALIGNMENT—CHASSIS 5A03

PEAK I.F. TRIMMERS A B C D
AT 455 KC. COUPLE TEST OSC-
ILLATOR VIA SINGLE TURN
LOOP LOOSELY TO WAVEMAGNET
AND TRIM F AND G AT 1400 KC

ALIGNMENT—CHASSIS 6A01-6A10

PEAK I.F. TRIMMERS A B C D
AT 455 KC. FEED 455-KC SIGNAL
TO R-F GRID AND ADJUST TRAP TRIMMER E FOR MINIMUM
RESPONSE.

TRIM F AT 1600 KC
TRIM G AT 1400 KC

117Z6G Ch. 5A03

ZENITH RADIO CORP.

ZENITH PAGE 12

Ch. 6A01, 6A10 Ch. 7A02
Ch. 7A02, 7A04
Power consumption—60 watts.

Power output—6 watts.

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

Volume control full on.

Line voltage 117 VAC.
**ALIGNMENT**

**CHASSIS 6A05**

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL VIII

**CHASSIS 10A3**

I.F. TRIMMERS A B C D
PEAK AT 455 KC
WITH 455-KC SIGNAL AT R-F GRID. ADJUST S FOR MINIMUM RESPONSE.
TRIM K AT 18 MC
TRIM M AT 16 MC
TRIM F, G AT 1500 KC
PAD J AT 600 KC

---

**ALIGNMENT PROCEDURE**

**CHASSIS 10A3**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connectors Test Frequency</th>
<th>Primary Amplitude</th>
<th>Output Setting Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Connectors Output Meter to</th>
<th>Trimmings</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coax. Grid</td>
<td>0.5 Mfd.</td>
<td>455 Kc.</td>
<td>B.C.</td>
<td>600 Kc.</td>
<td>EVGC Output</td>
<td>A B C D</td>
<td>Align I.F.</td>
</tr>
<tr>
<td>2</td>
<td>R.F. Grid</td>
<td>0.5 Mfd.</td>
<td>455 Kc.</td>
<td>B.C.</td>
<td>600 Kc.</td>
<td>EVGC Output</td>
<td>E</td>
<td>I.F. Trap</td>
</tr>
<tr>
<td>3</td>
<td>Ant. terminals marked I and G</td>
<td>600 Ohms</td>
<td>18 Mc.</td>
<td>S.W.</td>
<td>18 Mc.</td>
<td>E</td>
<td>M</td>
<td>Adjust for Minimal</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>18 Mc.</td>
<td>S.W.</td>
<td>18 Mc.</td>
<td></td>
<td>N</td>
<td>Set to Scale</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>5.0 Mc.</td>
<td>Med.</td>
<td>5.0 Mc.</td>
<td></td>
<td>O</td>
<td>Align Ant.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>4.5 Mc.</td>
<td>Med.</td>
<td>4.3 Mc.</td>
<td></td>
<td>F</td>
<td>Set to Scale</td>
</tr>
<tr>
<td>7</td>
<td>Simple turn Loop coupled to loop</td>
<td>1400 Kc.</td>
<td></td>
<td>B.C.</td>
<td>1400 Kc.</td>
<td></td>
<td>G</td>
<td>Align Ant.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>1400 Kc.</td>
<td>B.C.</td>
<td>1400 Kc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>600 Kc.</td>
<td>B.C.</td>
<td>600 Kc.</td>
<td>Broadcast Padder</td>
<td>J (Rock Group)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1852 Grid</td>
<td>0.3 Mfd.</td>
<td>4.3 Mc.</td>
<td>F.M.</td>
<td>4.3 Mc.</td>
<td>F.M. Output Meter Across Full Disc Load</td>
<td>A4</td>
<td>Align for Zero Deflection</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>F.M.</td>
<td>4.3 Mc.</td>
<td>F.M. Output Meter Across Half Disc Load</td>
<td>A4</td>
<td>Max. Deflector</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>757 / 1222 Grid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A292</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>777 Grid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>F.M. Ant. Terminals</td>
<td>100 Ohms</td>
<td>46.0 Mc.</td>
<td></td>
<td>46.0 Mc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td>42.5 Mc.</td>
<td></td>
<td>42.5 Mc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td>49 Mc.</td>
<td></td>
<td>49 Mc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td>46 Mc.</td>
<td></td>
<td>46 Mc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During F.M. Alignment keep input low. to obtain max. sensitivity for alignment. This is necessary because with large inputs the limiting action of the limiter masks alignment operations.

**NOTE:** A 10M ohm per volt or higher voltameter may be used as an F.M. output meter.

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Stage Gains:
Ant. to R.F. grid—5.2 x at 1000 Kc.
R.F. grid to conv. grid—5.9 x at 1000 Kc.
Conv. grid to I.F. grid—57.5 x at 455 Kc.
Overall audio—735 x at 1 watt, 400 cycles.

All voltages measured with a model 65596 meter from chasis to socket contact indicated.
Volume control on full. Line voltage 117 v. A.C.
Stage Gains

Ant. to R.F. grid—7 × at 1000 Kc.
R.F. grid to conv. grid—10.7 × at 1000 Kc.
Conv. grid to I.F. grid—66 × at 455 Kc.
Overall audio—923 × at 1 watt
400 cycles.

I.F. FREQUENCY 455 K.C.
Power consumption—7A02—60 watts.
Power consumption—7A04—80 watts.
Power output—8.5 watts.
SOCKET VOLTAGES AND ALIGNMENT
CHASSIS 7A02-7A04

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.

Line voltage 117 A.C.

I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII
I.F. 455 KC - ADJUST A B C D
ADJUST WAVE TRAP E FOR MINIMUM SIGNAL AT 455 KC; SIGNAL PED TO RF GRID
TRIM K AT 18 MC; M AT 16 MC
TRIM L AT 4.5 MC
TRIM N AT 500 MC
TRIM G AT 1400 KC
PAD J AT 600 KC

ALIGNMENT-CHASSIS 8A02 8A03
I.F. ALIGNMENT CONVENTIONAL
SEE SPECIAL SECTION VOL. VIII
I.F. 455 KC - ADJUST A B C D
WAVE TRAP E - ADJUST FOR MINIMUM SIGNAL AT 455 KC
TRIM K AT 18 MC
TRIM M AT 15 MC
TRIM N AT 4.5 MC
TRIM G AT 1500 KC
PAD J AT 600 KC

Models 12S550-12S568-12S569-12S595

Chassis 12A3-12A4

All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.

Line voltage 117 v.
Model 85586
Chassis 8A01
All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Sensitivity switch in distance position.
Volume control full on.
Line voltage 112 A.C.
Power consumption—85 watts.
Power output—6 watts.
Tuning ranges—540 Kc.—1600 Kc.
1505 Kc.—5200 Kc.
5600 Kc.—18500 Kc.

ALIGNMENT—CHASSIS 8A01
I.F. 455 KC-PEAK A,B,C,D
SW-TRIM K 18 MC
TRIM M 18 MC
POLICE-TRIM N,Q 4.5 MC
BROADCAST
TRIM F 1400 KC
TRIM G (on loop)
AT 1400 KC WITH WAVEMAGNET SWITCH FOR LOOP OPERATION

Model 7S585
Socket Layout
Voltage Data
Chassis 7A01
All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.
Volume control full on.
Line voltage 112 A.C.
All voltages measured with a 1000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control on full.

Line voltage 117 v.

Power consumption—100 watts.

Power output—14 watts.

Stage Gains:

Ant. to R.F. grid—10.7× at 1000 Kc.

R.F. grid to conv. grid—6.75× at 1000 Kc.

Conv. grid to I.F. grid—31.3× at 455 Kc.

Overall audio—1640× at 1 watt 400 cycles.

NOTE—The letter E after model number designates the use of a 14 inch speaker.
ALIGNMENT - CHASSIS 6A02
I.F. ALIGNMENT CONVENTIONAL
ADJUST TRIMMERS A B C D-455 KC
TRIM K 18 MC
TRIM F, G 1700 KC
PAD J AT 600 KC
TRIM M AT 18 MC

ALIGNMENT - CHASSIS 6A20
I.F. SAME AS CHASSIS 5A02
TRIM K AT 18 MC
TRIM M AT 16 MC
TRIM F, G AT 1600 KC
PAD J AT 600 KC
WITH 455-KC SIGNAL
FED TO RF GRID. ADJUST WAVE TRAP E FOR MINIMUM RESPONSE.

ALIGNMENT - CHASSIS 8A04
SAME AS FOR CHASSIS 6A20

VOLTAGE DATA
CHASSIS 10A1-10A2
ALL VOLTAGES MEASURED WITH 20,000 OHMS-PER-VOLT METER
FROM CHASSIS TO POINT INDICATED.
Stage Gains:
Bc. grid 455 Kc. LF.
Loop to Conv. grid down 1/3 x at
1000 Kc.
Conv. grid to L.F. grid 49 x at 455
Kc.
Overall audio 317 x at .05 watt.
400 cycles.

MODEL SPEAKER
4K600 49-433 3½"  
4 TUBE SUPERHETEROODYNE
½V-BATTERY-PORTABLE
CHASSIS NO 4B01

I.F. FREQUENCY 455 KC.

12/9/40

TRIMMER LOCATIONS

Volume control full on.
ZENITH RADIO CORP.

Models 5D610, 5D610W
5D625, Chassis S801

12SA7G CONVERTER
12K7GT LF
12SQ7GT DET-AMP
50L6GT PWR. AMP

DENOTES CHASSIS "GROUND"

Power output 1.3 watts.
Tuning Ranges 540 Kc. to 1620 Kc.

MODEL S801
5D 610 49-439 4" 5 TUBE SUPERHETERODYNE
CHASSIS S801 A.C.-D.C.

Stage Gains:
Bc. and 455 Kc. L.F.
Ant. to Conv. grid 7X at 1000 Kc.
Conv. grid to L.F. grid 74X at 455 Kc.
Overall audio 225X at .05 watt.
400 cycles.

12SQ7GT DET-AMP

50L6GT PWR. AMP

TRIMMER LOCATIONS

SOCKET VOLTAGES
All voltages measured with a
20,000 ohm per volt meter from
chassis to socket contact indicated.
All voltages are positive D.C. unless
marked otherwise.
Volume control full on.
Line voltage 117 A.C.
Power consumption 25 watts.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antennas</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.1 mfd.</td>
<td>455 Kc.</td>
<td>—</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I. F.</td>
</tr>
<tr>
<td>2</td>
<td>1 Turn Loop Made from Generator</td>
<td>—</td>
<td>1500 Kc.</td>
<td>—</td>
<td>1500 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>3</td>
<td>Leads.</td>
<td>—</td>
<td>1500 Kc.</td>
<td>—</td>
<td>1500 Kc.</td>
<td>G</td>
<td>Adjust for Maximum</td>
</tr>
</tbody>
</table>
Stage Gains:
Bc. and 455 Kc. 15
Ant. to R.F. grid 5.5× at 1000 Kc.
R.F. grid to conv. grid 8.2× at 1000 Kc.
Conv. grid to L.F. grid 51× at 455 Kc.
Overall audio 289× at .25 watt, 400 cycles.

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.

All voltages are positive D.C. unless marked otherwise.

Volume control full on.

Line voltage 117 A.C.
Power consumption 25.5 watts.
Power output 1. watt.
Tuning Ranges 540 Kc. to 1600 Kc.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A. B. C. D</td>
<td>Align L. F.</td>
</tr>
<tr>
<td>2</td>
<td>R. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td></td>
<td>600 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>1 Turn Loop Made from Generator</td>
<td>———</td>
<td>1600 Kc.</td>
<td>———</td>
<td>1600 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>See Notes!</td>
<td>———</td>
<td>1400 Kc.</td>
<td>———</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
</tbody>
</table>

Model 6D516 Speaker 6Tube Superheterodyne Chassis No. 6A24 A.C.-D.C.

IF Frequency 455 Kc.

R.F. 12J7G 12K7GT
I.F. 12SQ7GT 35L6G

Converter 12SA7G
Pwr.Amp 35Z5G

Socket Voltages

12SQ7GT 12K7GT 35L6G 35Z5G

12J7G 12SA7G

Dial Light
Power output 1 watt.
Tuning Ranges 540 Kc to 1600 Kc.

DEMONS CHASSIS "GROUND"

All voltages measured with a 20,000 ohm per volt meter from chassis to socket contact indicated.
All voltages are positive D.C. unless marked otherwise.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator to</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I.F.</td>
</tr>
<tr>
<td>2</td>
<td>R. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Addi. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td>1 Turn Loop Made</td>
<td></td>
<td>1600 Kc.</td>
<td>BC</td>
<td>1600 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>Leads</td>
<td></td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
</tbody>
</table>

See Note!
### ZENITH RADIO CORP.

**MODELS 6S546, 6S556, 6S532, 10H571R, 10H573**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Cased Test Oscillator No.</th>
<th>Dummy Antenna</th>
<th>Input Band Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align L.F.</td>
</tr>
<tr>
<td>2</td>
<td>R.F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>18 Mc.</td>
<td>SW</td>
<td>18 Mc.</td>
<td>E</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td>1 Turn Loop Made</td>
<td></td>
<td>1800 Kc.</td>
<td>BC</td>
<td>1800 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>5</td>
<td>Leads.</td>
<td></td>
<td>1500 Kc.</td>
<td>BC</td>
<td>1500</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>6</td>
<td>See Note!</td>
<td></td>
<td>600 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>I</td>
<td>Rock Gang and Adjust for Mox.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>18 Mc.</td>
<td>SW</td>
<td>18 Mc.</td>
<td>M</td>
<td>Align Antenna</td>
</tr>
</tbody>
</table>

---

### AUTOMATIC

It will be necessary to first set the automatic tuning adjustments to six preslected stations before the automatic tuning can be used.

Each button and its associated tuning adjustment will tune over a portion of the broadcast band, and any station within its tuning range may be selected for automatic tuning on that button. The tuning ranges are as follows: (See Fig. 2)

- No. 1 button—upper left: 560 Kc. to 960 Kc.
- No. 2 button—upper left: 740 Kc. to 1300 Kc.
- No. 3 button—upper center: 800 Kc. to 1500 Kc.
- No. 4 button—upper center: 940 Kc. to 1900 Kc.
- No. 5 button—upper right: 1040 Kc. to 1500 Kc.
- No. 6 button—upper right: 1140 Kc. to 1500 Kc.

To adjust the automatic tuning proceed as follows:

A. Remove the automatic cover plate by pressing on latch pin and lifting away from escutcheon.
B. Select a station within the range of the No. 1 button.
C. Turn the band switch to Broadcast and then tune in the selected station on the dial—then turn band switch to Automatic position.
D. Press the No. 1 button and tune in the same station on the automatic adjustment adjustments by using the special wrench furnished with the receiver. (See Fig. 4) First, adjust the screw and then the hexagonal nut to the setting which gives the loudest and clearest reception on the desired station. Repeat the operation for greatest accuracy.

### AUTOMATIC-FREQUENCY MODULATION BAND

The six push buttons across the lower part of the control panel (See Figure 2) provide means of tuning F.M. stations either manually or automatically. Five of these push buttons may be preset for five F.M. stations as follows:

1. Select station within range of No. 1 button.
2. Remove covers from adjusting screws by pulling latch pin and lifting covers.
3. Turn band switch to F.M., press No. 1 button and tune in desired station on automatic adjustment, using adjustment wrench.
4. Follow the same procedure on remaining 4 buttons.
5. Replace covers.

The tuning range covered by each adjusting screw is as follows:

- No. 1 Button: 45.5 M.C. to 50.5 M.C.
- No. 2 Button: 45 M.C. to 50.5 M.C.
- No. 3 Button: 45 M.C. to 50.5 M.C.
- No. 4 Button: 45 M.C. to 50.5 M.C.
- No. 5 Button: 45 M.C. to 50.5 M.C.

**Manual Tuning:**

- No. 4 Button: 41.5 M.C. to 49.5 M.C.
- No. 5 Button: 41.5 M.C. to 49.5 M.C.
Model 7S598

ALIGNMENT PROCEDURE

Channels No. 7411

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator in</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>A, B, C, D</td>
<td>Align I.F.</td>
</tr>
<tr>
<td>2</td>
<td>B. F. Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>18 Mc.</td>
<td>SW</td>
<td>18 Mc.</td>
<td>K</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>18 Mc.</td>
<td>SW</td>
<td>18 Mc.</td>
<td>M</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>4.5 Mc.</td>
<td>Med.</td>
<td>4.5 Mc.</td>
<td>Q</td>
<td>Rock Gage and Adjust for Max.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1500 Kc.</td>
<td>BC</td>
<td>1500 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>800 Kc.</td>
<td>BC</td>
<td>600 Kc.</td>
<td>I</td>
<td>Rock Gage and Adjust for Max.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Repeat operations 6-7 and 3-4</td>
</tr>
</tbody>
</table>

Models 10H571R, 10H573

Channels No. 10A3B

Note: Adjust FM L.F. frequency to values designated on L.F. transformer.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator in</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Converter Grid</td>
<td>.5 mfd.</td>
<td>455 Kc.</td>
<td>BC</td>
<td>900 Kc.</td>
<td>A, B, C, D</td>
<td>Align I.F.</td>
</tr>
<tr>
<td>2</td>
<td>B. F. Grid</td>
<td></td>
<td>455 Kc.</td>
<td>BC</td>
<td>900 Kc.</td>
<td>E</td>
<td>Adj. Wave Trap for Minimum</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>10 Mc.</td>
<td>SW</td>
<td>10 Mc.</td>
<td>K</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>4.5 Mc.</td>
<td>Med.</td>
<td>4.5 Mc.</td>
<td>Q</td>
<td>Rock Gage and Adjust for Max.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>1500 Kc.</td>
<td>BC</td>
<td>1500 Kc.</td>
<td>F</td>
<td>Set Oscillator to Scale</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1400 Kc.</td>
<td>BC</td>
<td>1400 Kc.</td>
<td>G</td>
<td>Align Antenna</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>1000 Kc.</td>
<td>BC</td>
<td>900 Kc.</td>
<td>I</td>
<td>Rock Gage and Rock 3C Pedal</td>
</tr>
</tbody>
</table>

Y. M. ALIGNMENT — See Pages 108-119.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Connect Test Oscillator in</th>
<th>Dummy Antenna</th>
<th>Input Signal Frequency</th>
<th>Band</th>
<th>Set Dial At</th>
<th>Trimmers</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PTT Grid</td>
<td>5 mfd.</td>
<td>5.3 Mc.</td>
<td>SW</td>
<td>5.3 Mc.</td>
<td>E</td>
<td>Align for 5.3 Mc.</td>
</tr>
<tr>
<td>10</td>
<td>PTT 1st L.F. Grid</td>
<td>5 mfd.</td>
<td>5.3 Mc.</td>
<td>SW</td>
<td>5.3 Mc.</td>
<td>A - B - 1</td>
<td>Align for Maximum Sensitivity - T</td>
</tr>
<tr>
<td>14</td>
<td>Converter Grid</td>
<td>5 mfd.</td>
<td>5.3 Mc.</td>
<td>SW</td>
<td>5.3 Mc.</td>
<td>A - B - 1</td>
<td>Align for Maximum Sensitivity - T</td>
</tr>
<tr>
<td>15</td>
<td>FM Ant. Trimpad 300 ohms</td>
<td>5 mfd.</td>
<td>5 mfd.</td>
<td>SW</td>
<td>5.3 Mc.</td>
<td>T</td>
<td>Align for 5.3 Mc.</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td>40 Mc.</td>
<td>SW</td>
<td>40 Mc.</td>
<td>P</td>
<td>Align for 40 Mc.</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td>40 Mc.</td>
<td>SW</td>
<td>40 Mc.</td>
<td>T</td>
<td>Align for 40 Mc.</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td>40 Mc.</td>
<td>SW</td>
<td>40 Mc.</td>
<td>T</td>
<td>Align for 40 Mc.</td>
</tr>
</tbody>
</table>
FREQUENCY MODULATION

Broadcasting by the Frequency Modulation method has already proved to be the most satisfactory means of "Local" radio transmission with reduced noise and high fidelity. It is not generally understood how large percentages of FM are due to the wide frequency band which varies in this method of modulation employs. The FM receiver must be accurately aligned because much of the FM system's noise reducing ability is lost if the FM IF and discriminator circuits are misaligned.

The alignment of FM receivers differs from the familiar AM receiver alignment procedure where the modulated signal from the generator is used and the output is measured with an A.C. voltmeter across the voice coil. The signal generator for FM alignment must be capable of supplying an unmodulated signal of at least 45 Mc. Frequency 80 Mc. to 50 Mc. and a moderate unmodulated signal at the FM frequencies (4.5 to 50.5 Mc.) A 50-900 microammeter, such as Triplet #321 or #52, makes an excellent output meter when used with our 85061 four prong plug and cable assembly and a S.P.D.T. switch (see Fig. 1).

The output meter is connected across HALF the diode load resistor for gain alignment and is connected across the FULL diode load resistor for frequency settings. A polarized socket is provided near the VAS tube which accommodates the output meter plug to facilitate switching the meter across either FULL or HALF the diode load resistor.

IMPORTANT—The FM IF and discriminator alignment must be followed in a step-by-step sequence beginning with the discriminator and working forward to the converter stage. This differs from the conventional AM IF alignment procedure where the signal is applied to the converter grid and all the IFs are aligned simultaneously.

The signal from the generator must be kept just below the point where the limiting action of the receiver begins. To explain further we should consider the purpose of the limiter. It does what its name implies: it limits the amount of signal applied to the discriminator circuit. When the input signal is strong the limiter cuts off, allowing only a portion of the signal to pass, while at low signal levels the limiter acts as an IF amplifier. Therefore, it is necessary to set the limiter so that the signal input to the receiver and IFs are held below the limiter operating range during alignment. The most practical way of determining the proper amount of input signal is to watch the output meter connected across HALF the diode load while the signal from the generator is increased. The meter will indicate the increase in signal until limiting action begins from which point on no appreciable increase can be noted on the meter even though the generator signal has been increased considerably. The desired signal input level (from the generator) is just below the limiting point which may be determined by increasing the generator output while watching the output meter, and then reducing the generator output slightly when the limiting point is reached.

IF AND DISCRIMINATOR ALIGNMENT

Noise has been placed at the top of all the FM IF transformer shields so that a signal generator may be connected across the transformer secondaries to facilitate alignment. (See Fig. 2) A very high input signal will be necessary to get an output indication for the discriminator alignment. Should the generator be unable to supply sufficient signal, the Discriminator input meter may be adjusted first in order that its gain may be utilized to raise the input signal to the discriminator.

1. Connect the output meter across the FULL discriminator load. (Fig. 1)

2. Feed an unmodulated signal at the IF frequency, through the dummy antenna (Fig. 2) to the 3rd IF transformer secondary. (The IF frequency is stamped on the IF transformer shields) Adjust the slug 84 for maximum reading. Rotating the slug 84 through the response point will cause the output meter to swing through zero from positive to negative or vice versa. A zero reading on the meter indicates the desired response point.

3. Switch the output meter to HALF discriminator load (Fig. 1). Adjust trimmer A7 for maximum output.

4. (Meter at FULL load) Connect the generator to the 3rd IF transformer secondary and adjust the 3rd IF transformers A2 B2 for maximum output.

5. (Meter at HALF load) Connect the generator across the 1st IF transformer secondary and adjust the 1st IF transformer trimmers A4 B4 for maximum output.

6. (Meter at FULL load) Connect the generator to converter grid. A small socket is provided near the converter tube which accommodates the side pin of the 5884F Dummy Antenna assembly (Fig. 2) to facilitate this generator connection. Adjust the 1st IF transformer trimmers A1 B1 for maximum output.

FM OSCILLATOR AND RF ALIGNMENT

7a. (Meter at FULL load) Connect the generator through a 100 ohm dummy antenna, to the FM antenna terminals. Set the generator at 50 Mc. and tune in the signal on the receiver. As the pointer passes the 50 Mc. calibration the output meter will swing from negative through zero to a positive reading or vice versa. The response point is again at the zero setting. Should the pointer fail to swing more than plus or minus 5 Mc., which is undesirable, the oscillator may be set by adjusting the two trimmable points between the manual tuning oscillator coil and the band switch. If the pointer is below 50 Mc. it can be raised by bringing the two green leads together and in the same manner the pointer can be lowered by separating the leads.

7b. (Meter still at FULL load) Set the generator at 45 Mc. and check the dial calibration (zero on meter). 45 Mc. should be on scale unless the cam on the condenser shaft has been loosened. If the cam has to be adjusted to scale the oscillator at 45 Mc. the 50 Mc. oscillator adjustment must be rechecked. The converter stage is aligned when the receiver has been adjusted to scale within the 5 Mc. limits.

8a. (Meter at FULL load) With generator connected to the FM antenna terminals through 100 ohm dummy, set the generator at 45 Mc. and tune in signal on receiver to get a zero output meter reading. Switch the meter to HALF load and adjust the generator to drive out an output just below the limiter action point. Adjust slug 81 for maximum output.

8b. (Meter at FULL load) Set generator at 44.5 Mc. and tune in on receiver. Switch meter to HALF load and adjust 82 for maximum output.

There are no RF adjustments for the FM IF gain and sensitivity switches when the push buttons are used on automatic. Button #1 is checked at 50 Mc., buttons #2 and #3 checked at 45 Mc., buttons #5 and #6 checked at 42.5 Mc. and button #4 is the manual switch.

In conclusion we again wish to emphasize the importance of keeping the signal from the generator below the point where limiting action begins. The output meter is connected across the FULL diode load resistor for frequency and calibration operations, and that the output meter is connected across HALF the diode load resistor for gain checks.

Fig. 2

Fig. 1
ALIGNMENT

The alignment of a receiver is one of the most important functions that a service man performs, and the instructions must be carefully followed.

CAUTION

Care should be taken while making all adjustments on the receiver to have the volume control turned full on. The intensity of the signal should be reduced only at the signal generator.

The signal for the entire alignment procedure, both I.F. and R.F., is fed through a special Zenith dummy which can be purchased from your Zenith distributor. Part No. SM9187. The capacities in the Zenith dummy antenna as shown in Fig. 2 are identical with the Ford antenna.

I.F.—

1. The receiver must be in one of the automatic positions.

2. The signal generator is set at 105 K.C. and fed through the special Zenith dummy to the receiver.

3. The R.F. and code trap adjustment screw A (see Fig. 2) is adjusted for maximum response.

4. The adjustment screws B, C, D and E (see Fig. 2) are then adjusted for maximum response.

5. The code trap A is then adjusted for minimum response.

R.F.—

1. The receiver is returned to manual tuning.

2. The tuning control is rotated until the condenser plates are out of mesh (180° K.C.)

3. The signal generator is set to 1200 K.C.

4. Adjust the 1000 K.C. oscillator trimmer F (see Fig. 4) for maximum response.

5. Set signal generator to 1400 K.C. and rotate the tuning control until a signal is heard.

6. Adjust the R.F. trimmer G (see Fig. 4) and the antenna trimmer H (see Fig. 5) for maximum response.

7. Set the signal generator to 600 K.C. and rotate the tuning control until signal is heard.

8. The condenser gang is then rocked slightly, while adjusting the 600 K.C. pad 1 (see Fig. 4).

The eye may also be used when aligning the receiver instead of an output meter. The eye with a special cable and plug is available at your Zenith distributor.

GANG MESHED, POINTER AT 540 K.C.

1. Select a station within the range of ad shows the proper way to string the cord. The jumper shown on the test socket in Fig. 1 is provided so that an output meter may be connected to the voice coil side of the output transformer.

2. Set Roto-Selector in position No. 1.

3. Adjust the No. 1 screw (see Fig. 5) with wrench provided until the desired station is tuned to the loudest point.

4. Adjust No. 2 screw (see Fig. 5) for maximum signal.

5. Repeat the last two above operations to make sure the adjustments are accurate.

NOTE

This receiver is equipped with an adjustable sensitivity control located on the bottom of the chassis as shown in Fig. 1. The control is set at the factory to a position which gives sensitivity of 7 microvolts at 1 watt output. It is found advisable to hold the receiver at this level as any higher sensitivity may result in excessive background noise and unless laboratory equipment is available for measuring sensitivity it is best advisable to change the setting.
TUBE COMPLEMENT

7A7 R.F.
7B8 Oscillator and Modulator;
7A7 I.F.;
7B6 Second Detector and A.V.C.;
7B5 Pentode power output;
6X5GT Rectifier.

CURRENT CONSUMPTION - 6 amp.
TUNING RANGE 540 - 1600 K.C.

SENSITIVITY - 9 microvolts at one watt output.
POWER OUTPUT - 3 watts measured at the voice coil.
ALIGNMENT:

The alignment of a receiver is one of the most important functions that a service man performs, and the instructions must be carefully followed.

CAUTION:

Care should be taken while making all adjustments on the receiver to have the volume control turned full ccw. The intensity of the signal should be reduced only at the signal generator.

The signal for the entire alignment procedure, both I.F. and R.F. is fed through a special Zenith dummy which can be purchased from your Zenith distributor, Part No. 201297. The capacities in the Zenith dummy antenna as shown in Fig. 2 are identical with the Ford antenna.

NOTE:

The receiver is equipped with an adjustable sensitivity control located on the bottom of the chassis as shown in Fig. 1. The control is set at the factory to a position which gives sensitivity of 8 micromhos at 1 watt output. It is found advisable to hold the receiver at this level as any higher sensitivity may result in excessive hum and noise and unless laboratory equipment is available for measuring sensitivity it is not advisable to change the setting.

I.F. -

1. The tuning control is rotated until the condenser plates are fully meshed (640 k.c.)

2. The signal generator is set at 450 k.c. and fed through the special Zenith dummy to the receiver.

3. The adjustment sets A, B, C and D (see Fig. 3) are then adjusted in order for maximum response.

4. Set signal generator to 1400 k.c. and rotate the tuning control until a signal is heard.

5. Adjust the 1800 antenna trimmer E (see Fig. 8) for maximum response.

6. Set the signal generator to 600 k.c. and rotate the tuning control until the signal is heard.

7. The condenser gang is then rocked slightly while adjusting the 600 k.c. core G (see Fig. 3)

8. Repeat operations 4 and 5.

R.F. -

1. The tuning control is rotated until the condenser plates are out of mesh (1000 k.c.)

2. The signal generator is set to 1000 k.c.

3. Adjust the 1000 k.c. oscillator trimmer F (see Fig. 4) for maximum response

4. Set signal generator to 1600 k.c. and rotate the tuning control until a signal is heard.

5. Adjust the 1800 antenna trimmer E (see Fig. 8) for maximum response.

6. Set the signal generator to 600 k.c. and rotate the tuning control until the signal is heard.

7. The condenser gang is then rocked slightly while adjusting the 600 k.c. core G (see Fig. 3)

8. Repeat operations 4 and 5.

The Zenith Radio Corporation furnishes the antenna for 1941 Ford and Mercury models only.

Parts for this antenna will be available at your Zenith distributor.

The jumper shown on the test socket in Fig. 1 is provided so that an output meter may be connected to the voice coil side of the output transformer.

If you have the type of output meter which is usually connected to the plate of the output tube, it may be adapted for this type of connection by following the instructions shown in Fig. 7.
SETTING THE SUPER-MATIC TUNING

Adjustment should not be made until receiver has warmed up 15 minutes.

(A) Select a desired station at right side of dial scale.
(B) Loosen screw on right hand push button bar. (See Fig. 4)
(C) Push Super-Matic button bar in as far as possible and tighten screw while bar is in this position.
(D) Repeat the above for remaining bars, choosing three other desired stations.
(E) Insert push buttons on push button bars.

6MN595 AC 6011 SPECIAL

LF: The tuning condenser is fully meshed (540 K.C.) The signal generator is set at 455 K.C. and fed through the special Zenith antenna dummy to the receiver. The wave trap adjustment screw A, (see Fig. 3) is adjusted for maximum response. The adjusting screws B, C, D and E (see Fig. 3) are then adjusted in order for maximum response on the output meter.

The wave trap A is then adjusted for minimum response.

R.F.: The tuning control is rotated until the condenser plates are completely out of mesh (1600 K.C.) Set the signal generator to 1600 K.C. Adjust the 1600 K.C. oscillator trimmer F shown in Fig. 3 for maximum response.

Set the signal generator to 1400 K.C. Rotate the tuning control until the signal is heard and adjust the 1400 antenna trimmer G (See Fig. 3) for maximum response.

Reset the signal generator to 600 K.C. and rotate the tuning control until a signal is heard, and adjust the core H (See Fig. 1) in the antenna coil for maximum response.

If core H is found to be off a great deal, the 1400 antenna trimmer G should be readjusted.
Sensitivity—6 microvolts at one watt output. Power Output—6 watts measured at the voice coil. Tuning Range—540 to 1600 K.C. Speaker—full size electrodynamic. I.F.—455 K.C. Roto-Selector tuning with foot control switch—Selection of any five desired stations automatically by using the foot control or Roto-Selector on instrument panel.

Tube Complement—7A7 R.F. — 7B8 oscillator and modulator — 7A7 I.F. — 7B6 2nd detector and A.V.C. — two 7C5 beam power push pull output — 6X5GT or 0Z4 rectifier—Current consumption 8 amperes.
ALIGNMENT:
The alignment of the receiver is one of the most important functions that a service man performs, and the instructions must be carefully followed.

CAUTION:
Great care should be taken while making all adjustments on the receiver to have the volume control turned full on. The intensity of the signal should be reduced only at the signal generator.

The signal for the entire alignment procedure, both I.F. and R.F., is fed through a special Zenith dummy which can be purchased from your Zenith distributor—Part No. 59189.

The capacities in the Zenith dummy as shown in Fig. 2 are identical with the Lincoln antenna, and if the receiver is adjusted accordingly, the instrument will operate properly when installed in the car.

NOTE:
This receiver is equipped with an adjustable sensitivity control located on the side of the chassis as shown in Fig. 1. The control is set at the factory to a position which gives sensitivity at 1 microvolt at I watt output. It is found advisable to hold the receiver at this level as any higher sensitivity may result in excessive background noise, and unless laboratory equipment is available for measuring sensitivity, it is not advisable to change the setting.

3. The R.F. and code trap adjustment screw A (see Fig. 3) is adjusted for maximum response.
4. The adjustment screws B, C, D, and E (see Fig. 3) are then adjusted in order for maximum response.
5. The code trap A is then adjusted for minimum response.

TUBE LAYOUT—MODEL 7ML 592

R.F.:
1. The receiver is returned to manual tuning.
2. The tuning control is rotated until the condenser plates are out of mesh (1800 Kc).
3. The signal generator is set to 1600 Kc.
4. Adjust the 1500 Kc oscillator trimmer F (see Fig. 4) for maximum response.
5. Set signal generator to 1400 Kc, and rotate the tuning control until the signal is heard.
6. Adjust the R.F. trimmer G (see Fig. 6) and the antenna trimmer H (see Fig. 5) for maximum response.
7. Set the signal generator to 600 Kc and rotate the tuning control until signal is heard.
8. The condenser gang is then rocked slightly while adjusting the 600 Kc. padder I (see Fig. 4) for maximum response.

OSC TRIMMER
500
RF TRIMMER
400
100,100,100,100,100

TRIMMER LAYOUT FIG. 1 MODEL 7ML 592
3. Adjust the No. 1 screw (see Fig. 5) with the wrench provided until the desired station is tuned to the loudest point.
4. Adjust No. 1 nut (see Fig. 5) for maximum signal.

A station adjusting eye is available at your Zenith distributor. It is especially essential when setting the Roto-Selector on a strong signal. The eye may also be used for alignment work instead of an output meter.

A jumper is provided on the test socket (see Fig. 1) located on the bottom of the receiver. Removing of this jumper will open the voice coil and allow you to connect your output meter to the voice coil side of the output transformer.

If you have the type of output meter which is usually connected to the plate of the output tube, it may be adapted for this type of connection by following the instructions shown in Fig. 7.

The strunging of the dial cord is most important for unless properly strung the cord will jump off the pulley. Fig. 8 shows the proper way to string the dial cord.
This receiver comprises a five tube superheterodyne receiver, employing the new 1.4 volt battery tubes. This receiver operates on either batteries, or 110-125 volts A.C.-D.C.

The frequency range covered is standard broadcast, 530 to 1730 kc and some of the low frequency police transmitters.

ELECTRIC OPERATION:
A power cord and plug is provided in a compartment at the rear of the cabinet. To place the set in operation, open the flap cover which is secured by the snap fastener and remove the power cord plug from its receptacle in the chassis. Stretch the line cord to its full length and plug it into the electric outlet. Finally, the set may be switched on by turning the volume control knob in a clockwise direction. A pilot light is provided which illuminates the dial when the set is operated on the power lines.

Do not attempt to close the flap when the line cord is plugged into the electric outlet.
Model 31X5

Model 36Y12
The diagrams on the yellow sheets in this section indicate the breakdown of the individual bands of the multi-wave band receivers specified in the corner cards and shown in the respective manufacturers' sections in the main part of this Manual. Those schematics for which breakdowns have been made bear a designation (---) in the upper margin.

The purpose of these breakdowns is to show how the components, that is the coils, condensers and switch contacts, are used when the receiver is set to different bands. In the majority of cases the circuits shown are the r-f and oscillator systems; however, in a few instances, a-f breakdowns are given.

The switch contacts which are associated with the various circuits, are represented as small circles, bearing either numerical or alphabetical designations corresponding to those designations shown upon the complete diagram contained in the respective manufacturers' sections in the main part of the Manual. The connections between the switch points are shown by dotted lines.

Each of the main diagrams, that is complete schematics, shows the wave-band switch in a certain position; usually this is the broadcast-band position. This same position is shown as the first position in the breakdown diagram unless the contrary is specified. Reference in the breakdown diagrams to the fact that the switch is shown as having been moved from one position, indicates the first position immediately following either the broadcast band, if that is the first shown, or whatever the band may be which is the first shown. Expressed differently this is, if the designation is "switch moved one position", this means that the wave-band switch has been turned one position from the reference point designated as "switch as shown".
When all switches associated with the movement turn in the same direction, this is specified as "clockwise" or "counter-clockwise" as the case may be.

You will note that corner cards on some of the "Clarified Schematic" breakdowns indicate several receivers. This means that the r-f and oscillator sections, as shown in the breakdown, apply to those receivers. However, this should not be construed as signifying that all these receivers are the same throughout. It simply means that the wave-band positions and associated circuits are the same for each model or chassis listed under the same "Clarified Schematic".

In some cases sections of the wave-band switch are used to short-circuit coils which are not in operation on the particular band shown in the schematic. In cases where inclusion of these shorted coils unnecessarily complicates the breakdown, they have been omitted, since they are not essential to the operation of the signal-carrying circuits.

In the case of audio-frequency circuit breakdowns, the designations shown upon the breakdown schematics correspond with the designations shown upon the complete schematics.

For your convenience the pin terminals for each tube represented in the breakdown diagrams have been numbered according to the RMA system.

You will note that in some cases the bands are identified in accordance with the frequency range covered. Then again in some instances these frequency ranges are omitted. The reason for the omission is that we were unable to identify the specific ranges covered by the various bands and it was felt that, since all receivers do not employ switch arrangements which increase the frequency range in exact sequence as the range switch is advanced, it was deemed advisable to speak simply in terms of the switch positions, rather than the frequency ranges. Of course, where the frequency range was known it has been identified.
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION

SWITCH MOVED 2 POSITIONS
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION CLOCKWISE

SWITCH MOVED 2 POSITIONS CLOCKWISE
SWITCH MOVED 3 POSITIONS CLOCKWISE

SWITCH MOVED 4 POSITIONS CLOCKWISE

SWITCH MOVED 5 POSITIONS CLOCKWISE
"CLARIFIED SCHEMATICS" EMERSON PAGE 12-1

EMERSON RADIO & PHONOGRAPH CORP.

MODELS

DV-364, DZ-371

See Emerson Page 12-17
MODEL S-7404-3
See Firestone
Page 12-7, 8

FIESTONE TIRE & RUBBER CO.
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION CLOCKWISE

SWITCH MOVED 2 POSITIONS CLOCKWISE
BC BAND

6 MC BAND

9 MC BAND
MODEL J-71

MODELS J-718 AND J-728

BAND A
PUSH BUTTON OPERATION

BAND B
MODELS FE-112, FE-116, FE-119
GENERAL ELECTRIC CO.
See G.E. Page 12-57

BAND D1
INSIDE CONTACTS TURNED
1 POSITION CLOCKWISE

BAND D2
SWITCH SETTING SHOWN
ON SCHEMATIC

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MODEL J-805 (CONTINUED)

BAND C

BAND D
SWITCH AS SHOWN

SWITCH MOVED
ONE POSITION
CLOCKWISE

SWITCH MOVED
2 POSITIONS
CLOCKWISE
SWITCH MOVED 3 POSITIONS CLOCKWISE

SWITCH MOVED 4 POSITIONS CLOCKWISE

PUSH BUTTON OPERATION
SWITCH MOVED 5 POSITIONS CLOCKWISE
CHASSIS CR-154
See Magnavox Page 12-7, 8
CHASSIS CR-155
See Magnavox Page 12-9, 10

POLICE BAND

SHORT WAVE BAND
SWITCH AS SHOWN
PUSH BUTTON OPERATION

BROADCAST BAND
PUSH BUTTON BAND

BROADCAST BAND
MODELS 41-295, 41-300 PHILCO RADIO & TELEV. CORP.
See Philco Page 12-65

2.3 TO 7 MC BAND

9 TO 12 MC BAND

13.5 TO 18 MC BAND
MODELS 41-616P, 41-616PW
See Philco
Page 12-79, 80

BAND
2.3 - 7 MC

BAND
9 - 12 MC

BAND
13.5 - 18 MC
MODEL Q24
See RCA Page 12-33

BAND A

BAND B

1ST DET - OSC.

19-13 METER
SPREAD BAND
PUSH BUTTON OPERATION
SWITCH AS SHOWN

SWITCH MOVED 1 POSITION COUNTERCLOCKWISE

SWITCH MOVED 2 POSITIONS COUNTERCLOCKWISE
BROADCAST BAND

BAND B

BAND C
SWITCH AS SHOWN

SWITCH MOVED
1 POSITION
CLOCKWISE
ZENITH RADIO CORP.

MODELS 105-531, 105-549,
105-566, 105-589,
105-590

See Zenith Page 12-23

SWITCH AS SHOWN

SWITCH MOVED COUNTERCLOCKWISE

1 POSITION
SWITCH AS SHOWN
POLICE BAND

SWITCH MOVED
1 POSITION
CLOCKWISE
SHORT WAVE BAND
MODELS 12S-550Z, 12S-568E, ZENITH RADIO CORP.
12S-568Z, 12S-569E,
12S-569Z, 12S-595Z
See Zenith Page 12-25

TO LOOP
CIRCUIT

12S2
R.F.

TO LOOP
CIRCUIT

12S2
R.F.

PUSH BUTTON
OPERATION
PUSH BUTTON
BROADCAST BAND

SWITCH MOVED
2 POSITIONS
CLOCKWISE

POLICE BAND
SWITCH AS SHOWN
POLICE BAND

SHORT WAVE BAND
PUSH BUTTON OPERATION

BROADCAST BAND

SHORT WAVE BAND