ALIGNMENT PROCEDURE MODELS 253, 251, 258.

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

I.F.: Connect the generator ground to receiver chassis. Use .1 mfd. condenser in series with high side of generator, apply 456 kc signal to grid of 6D6 I.F. amplifier tube, and align transformer No. 2. Connect generator to grid of 6A7 tube and align transformer No. 1.

RF. (See above diagram for location of trimmers.)

Using a 200 MMF. condenser in series with the high side of the generator, turn band selector switch to left band position and the tuning condenser to about 600 kc. Feed a 456 kc signal to the antenna and adjust wave trap trimmer for minimum response. With the tuning condenser at minimum capacity feed 1660 kc. signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator frequency at about 1400 kc. Adjust broadcast antenna trimmer. Set generator for 600 kc. tune receiver to signal and adjust the pad. The tuning condenser should be locked back and forth through the signal while varying the pad in order to assure proper alignment.

Using 400 ohm resistor in series with generator, set band selector in center position, set generator to 5400 kc and adjust oscillator trimmer for top frequency. Set generator to 5000 kc, tune receiver to signal and adjust antenna trimmer.

Turn band selector to extreme clock-wise position. Using 400 ohm resistor in series with generator, set oscillator top frequency for 16,500 kc.—screw trimmer down tight, then unscrew to second peak. Set generator to 15,000 kc. tune receiver to signal and adjust antenna trimmer.—Screw trimmer down tight, then unscrew to first peak, rocking the tuning condenser back and forth through the signal while the adjustment is being made. Above procedure for alignment at 15,000 kc must be followed exactly to insure proper tracking. A dead spot at about 12,000 kc will result if antenna and oscillator circuits are not set in proper relation to each other.

Adjustment of Mechanical Automatic Tuning System

Any of your favorite stations may be set up on any button, but it is recommended that they be set up in the same sequence as they are listed on the dial. Loosen one of the knobs by turning it to the LEFT. A slot is provided in the button into which a coin may be inserted to facilitate turning. After turning the knob a few turns to the LEFT, press it in as far as it will go. While holding the button in this position, tune the station desired very carefully in the usual manner with the manual tuning knob. While still holding the button if, fix the adjustment by turning the button to the RIGHT. After the station is set up on this button will be received whenever this button is pressed in AS FAR AS IT WILL GO.
This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

**Do not connect a ground to this receiver.**

6A7-Oscillator, Translator
6D6—I.F. Amplifier
76—Detector

**Model 250**

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

**Model 257**

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.
This receiver is designed to operate on 105 to 125 volts AC or DC.

No orders for parts will be accepted unless PART NUMBER, DESCRIPTION and CHASSIS MODEL NUMBER are given.

Symbol Part No. Description
C-1 3272 30-140 mmf Trimmer
C-2, 5, 7 1611 3-35 mmf Trimmer
C-3, 4, 6 2597 1-10 mmf Trimmer
C-8, 11 572 .1 200 V.
C-9a, b 5724 Tuning Condenser
C-10 2780 50 mmf Mica
C-12 380 .05 200 V.
C-13 4810 IF Trimmer
C-14 9005 400 V.
C-15 1060 220-500 mmf Padder
C-16 1600 1330 mmf 5% Electrolytic
C-17 568 .01 400 V.
C-18 581 .02 400 V.
C-21 581 .05 600 V.
C-22, 23 2600 .02 600 V.
C-24 5272 8 MF, 150 V.
C-25 5420 8 MF, 150 V.
C-26 5419 8/8 MF, 250 V.
R-1, 10 631 50 MΩ 5/2 W.
R-2 631 20 MΩ 5/2 W.
R-3 2605 200 ohm 5/2 W.
R-4, 5 624 1 Meg. 5/2 W.
R-6 598 200 MΩ 5/2 W.
R-7 5332 500 MΩ Volume Control
R-8 2698 100 ohm 5/2 W.
R-9 2881 400 MΩ 5/2 W.
R-11 5395 500 ohm wire wound 10% Padder
R-12 603 100 MΩ 5/2 W.
R-13 615 500 MΩ 5/2 W.
R-14 4529 10 MΩ 5/2 W.
R-15A 5421 [30 ohm Wire Wound
B 5421 [10 ohm Wire Wound
C 3463-10 1st IF Transformer
3463-14 2nd IF Transformer
5096 Oscillator Coil
5392 Antenna Coil
540-1720KC 5700-18,200 KC
©John F. Rider, Publisher
This receiver is designed to operate on 220 volts, direct or alternating current.

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.
**MODELS 258, 259, 270.**

**ALIGNMENT PROCEDURE**

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator. Strong signals tend to cause improper adjustments.

**1.F.:** Connect the generator ground to receiver chassis. Using a mfd. condenser in series with high side of generator, apply 456 kc. signal to grid of 6D6 I.F. amplifier tube, and align transformer No. 2. Connect generator to grid of 6A7 tube and align transformer No. 1.

**R.F.** (See above diagram for location of trimmers.)

Using a 200 MF. condenser in series with the high side of the generator, turn band selector switch to center (B) position and the tuning condenser at minimum capacity feed 1720 kc. signal to the antenna and adjust broadcast oscillator trimmer for top frequency. Set generator to 600 kc. tone receiver to signal and adjust the paddder. The tuning condenser should be rocked back and forth through the signal while varying the paddder in order to assure perfect alignment.

Using 400 ohm resistor in series with generator, set band selector in right hand (R) position, set generator to 6300 kc. and adjust oscillator trimmer for top frequency. Set generator to 5000 kc. tune receiver to signal and adjust antenna trimmer.

**Setting Up the Push Button Station Selector**

First select six favorite local or strong nearby stations, listing them according to frequency or position on the dial. Setting up weak or distant stations is not recommended. Call the station nearest the left hand end of the dial (nearest 1600 kc.) the No. 1 station and number the other five stations consecutively as they are tuned in on the dial, tuning from left to right. For example assume your selected stations operate on frequencies of 1500 kc., 1300 kc., 1100 kc., 900 kc., 700 kc., and 600 kc. The 1500 kc. station should be listed as No. 1, the 1300 kc. station would be No. 2, and so on through the list with the 600 kc. station becoming No. 6. In setting up the buttons, the 1500 kc. station should be set up on No. 1 button, or the first button from the left. The 1300 kc. station on the second button from the left, and so on until the 600 kc. station is finally set up on the button farthest to the right.

With the band selector set at "B" or the second position from the left, tune in station No. 1. Observe the program in progress. Then turn the band selector knob to the extreme left position (A). Push the No. 1 button in as far as it will go, when the proper operating position is reached the button will lock in. Then insert the screw driver through the opening directly above the No. 1 button and turn the larger headed screw until the same program is heard. Do not force this screw. It should turn very easily and if the station is not heard when the screw is turned all the way in one direction, reverse the direction of rotation until the station is found. When the station is located, turn the screw back and forth through the station slowly and observe when the station is accurately tuned in indicated by a minimum of noise or hiss. or by watching the tuning eye on the models so equipped. Inserted in one side of the larger screw head is a smaller screw. This screw is for fine adjustment. and should be turned in and out until position of least hiss is found, or until the tuning eye, on models so equipped, shows the least shadow. It will not be necessary to turn this small screw more than one full turn from the factory adjusted position. At a definite check that the desired station has been tuned in. Listen for the station announcement. Set up the remaining buttons in the same manner, and after all stations have been set up, locate the call letters of the stations on the printed sheets supplied with the receiver. Remove the desired call letter blocks from the sheets and insert them in the escutcheon according to the directions on the envelope.

**On Sets Equipped with Phonograph**

*Phono Radio Switch:* The **Left Hand Position** is for **Radio Only.** The **Right Hand Position** connects the pick-up and turns on the power for the phonograph motor.
WARNING! DO NOT CONNECT A CHARGER TO THE BATTERY WHILE THE SET IS IN USE. DO NOT GROUND EITHER SIDE OF THE BATTERY.

IALINEMENT PROCEDURE

Connect a high impedance AC voltmeter across loud-speaker terminals. Volume control should be set a few degrees back of maximum volume position. Use a weak signal from generator, strong signals tend to cause improper adjustments.

IF. Connect generator ground to receiver ground. Using .1 mfd condenser in series with "high" side of generator, apply 456 kc signal to grid of 657G and adjust second IF transformer; same for first IF, applying signal to grid of 6D8G. (See above diagram for location of tubes and transformers.)

RF. (See circuit diagram for location of trimmers.) Using 200 mmf condenser in series with generator, feed 1725 kc signal to antenna lead and adjust oscillator top frequency. Set generator at 1400 kc, tune receiver to signal and adjust broadcast antenna trimmer. Set generator to 600 kc, tune receiver and adjust paddler. The tuning condenser should be rocked back and forth through the signal while the paddler is being adjusted in order to obtain perfect alinement.

Using 400 ohm resistor in series with generator, set band selector in short wave (right) position, feed 15,600 kc signal to antenna and adjust antenna trimmer—screw trimmer down tight and unscrew to SECOND peak. Set generator to 15,000 kc, tune receiver and adjust antenna trimmer—screw trimmer down tight and unscrew to FIRST peak, rocking the condenser back and forth through the signal while the adjustment is being made. Above procedure for alinement at 15,000 kc must be followed exactly to insure proper tracking. A "dead spot" at about 12,000 kc will result if antenna and oscillator are not set in proper relation to each other.
BATTERY INSTALLATION

Remove the batteries from the shipping carton, save the small piece of cardboard packing. Place the "B" pack in the cabinet as shown in the illustration. Then put in the "A" pack. Take the small piece of cardboard packing and fold to a size that will wedge the "A" pack between the shelf and bottom of case. (See illustration.) The packing is used to prevent the "A" pack from being loose in the case.

Connect the "A" and "B" plugs as shown in the illustration. It makes no difference which socket on the "B" pack the three prong "B" plug are inserted.

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This receiver is designed to operate on 105 to 125 volts, 60 cycle, alternating or direct current. Do not connect to any other source.

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MODEL 280, Jr. Pee-Wee

MODEL 283

MODEL 284, Super Pee-Wee

MODEL 2741

DO NOT CONNECT A GROUND TO THIS RECEIVER.

This receiver is designed to operate on 105 to 125 volts, direct or alternating current.

TUBE LOCATION CHART—MODEL 280

This receiver is designed to operate on 105 to 125 volts, direct or alternating current. Do not connect to any other source.

SCHEMATIC DIAGRAM—MODEL 280

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This is a battery operated superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. It is designed to function with an "A" supply of 1.5 volts and a "B" supply of 90 volts. The broadcast range coverage is 540-1600 kilocycles.

When used as LW model see "B"
The "PHONOSCOPE" is a combination audio and wireless playback. Disc recordings may be played directly through this unit, or may be reproduced through a remote radio receiver. A microphone may also be used instead of disc recordings. The unit has been designed to operate on 105-125 volts A.C. unless otherwise specified.

PHONOGRAPH: The phonograph motor and unit is turned "on" by rotating the knob labeled "OPERATION" in the clockwise direction. Further rotation in this direction increases the volume. Turn the knob on the left side to the clockwise position. Allow about a minute for the tubes to become sufficiently heated. Disc recordings may now be played through the speaker in the PHONOSCOPE.

MICROPHONE: A high impedance magnetic or crystal microphone may be used in place of the phonograph recordings. The two pin tips should be inserted in the microphone jack in the rear of the cabinet. The microphone may be used as well means of speaking or entertaining through the unit.

NOTE: ON DIRECT CURRENT IT MAY BE NECESSARY TO START THE MOTOR BY GIVING IT A SPIN.

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DEWALD RADIO MFG. CORP.

MODEL 531 Phon.
MODELS 532, 532LW
Schematics

MODEL 531 (Phono)

RANGES:
175 to 560 Meters
850 to 2000 Meters

MODEL 532-532 L.W.
RADIO- PHONOGRAPH COMBINATION

LIST PRICES OF REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot lamp</td>
<td>.15</td>
</tr>
<tr>
<td>Knob</td>
<td>.10</td>
</tr>
<tr>
<td>AC-DC switch</td>
<td>.75</td>
</tr>
<tr>
<td>Pointer knob</td>
<td>.15</td>
</tr>
<tr>
<td>Drum</td>
<td>.15</td>
</tr>
<tr>
<td>Drive shaft</td>
<td>.10</td>
</tr>
<tr>
<td>Pointer</td>
<td>.10</td>
</tr>
<tr>
<td>Cabinet</td>
<td>12.50</td>
</tr>
<tr>
<td>Phon. vol. cont.</td>
<td>1.00</td>
</tr>
<tr>
<td>Phon. pickup</td>
<td>11.50</td>
</tr>
<tr>
<td>Phon. motor</td>
<td>17.50</td>
</tr>
</tbody>
</table>

©John F. Rider, Publisher
These models are five-tube superheterodyne receivers with full automatic volume control and long wave coverage. The 537 has a long wave range of 150-250 mc., the 538 and 539 have a 1800 to 540 kc. range, and the 538 LW has a 1800 to 540 kc. range with an extra long wave band of 150-410 kc.

They have been designed to operate on 115 volt, 60 cycle AC or 105-125 volt, 40-60 cycle DC unless otherwise specified.

RANGES:
1800 to 540 KC
150 to 410 KC (LW)

MODEL 537 538 539
537 LW 538 LW 539 LW

MODEL 538 L is the same as model 538 except a loop antenna and a 35Z5GT as rectifier are used.

CONNECTIONS FOR ISSUES
OF MODELS 538 and 538 LW
using 25X6GT Rectifier

1514 antenna coil .75
1515 oscillator coil .45
1516 dual tuned i.f. 1.30
1517 second detector i.f. .50
2458 comb. electrolytic 1.50
2461 2 gang var. cond. 2.00
3454 comb. vol. cont. 1.00
4087 cabinet-walnut 2.75
6108 dial scale 3.50
6110 dial crystal .50
7243 speaker 4.50
8845 pilot lamp 1.00 net
8874A pilot lamp socket .25
8877 knob .15
9977 drive drum .50
9978 drive spring .15
9981 pointer .50

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www.americanradiohistory.com
Adjust the signal generator at 456 K.C. and peak the I.F. trimmers for maximum signal. Connect the "hot" lead from the signal generator to antenna of receiver and ground to ground of receiver. Adjust the generator and receiver to 1500 K.C. and peak the trimmers for maximum signal. Adjust generator and receiver to 600 K.C. and peak the padder for maximum signal. The model 655 should have the back attached to the cabinet when peaking 1500 K.C. and 600 K.C. The trimmers and padder on these models are shown in a sketch on the wiring diagram.
GENERAL FEATURES

These receivers are classed as "Electrostatic and Direct Vision." Electrostatic indicates that the entire deflection system is electrostatic and since the picture is viewed direct, without the use of a mirror, lens or other device referred to as Direct Vision. The latter ensures clarity, brilliance and the widest angle of vision. Steady, clear cut, block and white pictures that are large enough for all the family to enjoy at one time are secured by the use of a fourteen inch cathode-ray tube which furnishes a picture eight by ten inches. A separate high fidelity section brings superb reproduction of the sound channel which is associated with the picture. A single control tunes both the sight and the sound simultaneously.

CIRCUIT ARRANGEMENT

A single straight line layout is used in these receivers that should prove extremely helpful to the serviceman. Viewed from the front the video receiver is on the left side of the chassis and the sound receiver is on the right. Fig. No. 1 shows the front panels and the sound receiver while Fig. No. 2 shows the rear adjustments and the video receiver. The top portion of the chassis contains both sweeprotating along with the modulating circuits of the cathode-ray tube. To prevent confusion each side is considered separately, half appearing in Fig. No. 1 and the remainder in Fig. No. 2. The seven auxiliary controls shown in Fig. No. 2 are provided for the use of the installer and serviceman. These controls are necessary to make the final alignment of picture and positioning when the receiver is installed under the operating conditions imposed by the earth's magnetic field and the power supply line voltages. Once properly set these controls do not need adjustment and since they were not provided for the owner's use we suggest that the dealer or serviceman seal the back of the cabinet as it is not possible to tamper with the controls when the back is in place. The use of the parts and tubes shown in Fig. No. 1 and Fig. No. 2 can be checked by comparing the "V" numbers, etc., with the schematic drawings.

Operating Controls of the Receiver (Front)

First, become familiar with the controls on the front of the receiver. Since the receiver has been tested before shipment, probably only a few minor adjustments will be necessary. Therefore before touching the adjustments in the rear attempt to operate the set according to the instruction sheet supplied the purchaser and make only the adjustments required. These instructions are repeated here to cover the possible loss of this sheet. Figure No. 1 shows the face of the receiver with the controls numbered and the use and the purpose of these controls is as follows:

1. Marked CONTRAST, ON and OFF. This is a power switch for starting and stopping a set. It is also the volume control of the picture signal. It should be adjusted in conjunction with the intensity control (No. 4) to produce a picture of pleasing contrast to the user. If the location is such that the signal received is very small, it may be necessary to picture and since the full gain of this control, while in a good location it may have to be retained considerably. If the picture is not satisfactory the rear controls must be adjusted as covered in a following section.

2. Marked SELECTOR. This control is a four position switch provided for covering four television channels.

3. Marked TUNING. Only one setting is necessary to properly tune both the sight and sound channels. Simply adjust this control in the right best reception of the sound is secured and at this point the picture signal will be correctly tuned.

4. Marked INTENSITY. The intensity or brightness of the picture is controlled by this knob. It should be adjusted in conjunction with control No. 1 to get the best picture. Note: It is a good plan to record (to the left) this control when starting the set. If about 15 seconds is allowed to elapse before advancing this control it will prevent a small bright spot from appearing on the screen which might eventually darken the screen.

5. Marked FOCUS. This control is used to sharpen the individual lines of the picture and once set seldom requires further adjustment.

6. Marked VOLUME. This volume control adjusts the audio volume and has no effect whatever upon the picture.

7. Unmarked輔助 controls of the Receiver

As previously stated, the adjustment of these controls is necessary for the final alignment of picture size and positioning, as the earth's magnetic field and power supply line voltages vary with locations. The location of these controls is shown in Figure No. 2 and their use will be covered in numerical order. Proceed as follows: remove the wood screws holding in the back of the cabinet and pull out the back. The safety switch will open, turning the set off and since it is necessary to have the set in operation while making these adjustments the switch can be made temporarily inoperative (An large battery clip is convenient for this purpose.) Do not reach into the set with the voltages on. (See Cautions and Warnings.) There is one adjustment that cannot be made by these controls, that of rotating the Cathode-ray tube to cause the picture to properly line up with the viewing opening. To remedy this, turn the set off, remove the elastic band that grips the rear support and rotate the tube by hand in the correct direction.

The function of the seven rear controls are as follows:

1. Vertical Frequency Control. This control is placed directly in the center of the opening.

2. Vertical Size Control

If the picture is too narrow and out of proportion vertically this control will remedy the trouble.

3. Vertical Positioning Control

As its name indicates, this control will move the picture vertically, allowing the picture to be placed directly in the center of the opening.

4. &apos;&apos;Autographic Positioning Control

This is adjusted in conjunction with Control No. 5 to give the best possible focus on the corners of the picture.

5. Horizontal Positioning Control

This control positions the picture horizontally.

6. Horizontal Size Control

The width of the picture is adjusted by this control.

7. Horizontal Frequency Control

If no picture can be secured but modulation (dark and light spaces) can be seen on the screen, the setting of the horizontal frequency control is probably incorrect. Adjust this control until the picture forms.

With the adjustment of these controls the final set up should be satisfactory. However, if the signal is weak or if ghosts or noise is present, return to the diode antenna and make changes as previously suggested until the best position for it is secured.

LOCATION OF TROUBLE

POSSIBLE CAUSES

1. Power supply trouble in any or all three sources.

2. Too much bias on modulator electrode.

3. Defective cathode-ray tube.

4. No scanning.

1. Trouble in 150 volt power source.

2. Poor connections to deflection plates.

3. Defective scanning circuits.


5. No modulation.

1. Defective or shorted antenna.

2. Defect in video receiver.

3. Too much bias on modulator electrode.


6. Poor focus.

1. Improper voltages supplied cathode-ray tube.

2. Defective video receiver.

3. Poor adjustments.


7. Uneven brilliance.

1. Hum from power source.

2. Defective scanning circuits.

3. Scanning picked up by modulator circuits.

4. Screen burnt or discolored.

8. Distorted picture.

1. Poor synchronizing (circuit or adjustment).

2. Overloading (control set advanced too far).

3. Defective video receiver.

4. A.C. hum.

5. External interference.

9. Unsteady picture or flickers.

1. Poor synchronizing action.

2. Leakage.

3. Varying voltages to cathode-ray tube or receiver.

4. Unsteady receiver.

5. Antenna loose or shorting.

10. Double image.

1. Scanning circuits incorrectly adjusted.

2. Ghost images due to reflection of signals.

11. Cathode-ray tube controls effect the picture and scanning.

1. Cathode-ray tube defective, probably leaking and going soft.

2. Oscillation probably in the receiver.

12. Superimposed pattern on the picture.

1. Usually local interference such as ignition or diathermy.
Chassis Views

TUBE COMPLEMENT

<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1853</td>
<td>R.F. Amplifier</td>
</tr>
<tr>
<td>6JSM</td>
<td>R.F. Oscillator</td>
</tr>
<tr>
<td>1852</td>
<td>First Detector</td>
</tr>
<tr>
<td>1852</td>
<td>1st Video I.F. Amplifier</td>
</tr>
<tr>
<td>1852</td>
<td>2nd Video I.F. Amplifier</td>
</tr>
<tr>
<td>6H6M</td>
<td>2nd Sound I.F. Amplifier</td>
</tr>
<tr>
<td>1851</td>
<td>Sound 2nd Detector and Amplifier</td>
</tr>
<tr>
<td>6V6G</td>
<td>Video Power Amplifier</td>
</tr>
<tr>
<td>6X7G</td>
<td>1st Sound I.F. Amplifier</td>
</tr>
<tr>
<td>6J7G</td>
<td>2nd Sound I.F. Amplifier</td>
</tr>
<tr>
<td>6J7G</td>
<td>Vertical Synch Separator</td>
</tr>
<tr>
<td>6J7G</td>
<td>Horizontal Synch Separator</td>
</tr>
<tr>
<td>6A9G</td>
<td>Horizontal Sweep Oscillator</td>
</tr>
<tr>
<td>6B6G</td>
<td>Vertical Sweep Oscillator</td>
</tr>
<tr>
<td>2Y2</td>
<td>4100 Volt Rectifier</td>
</tr>
<tr>
<td>5X3</td>
<td>1600 Volt Rectifier</td>
</tr>
<tr>
<td>5Z2</td>
<td>500 Volt Rectifier</td>
</tr>
<tr>
<td>114-T</td>
<td>Cathode-ray Tube (14&quot;)</td>
</tr>
</tbody>
</table>

Frequency Ranges — Four Television Channels provided, present alignment as follows:

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>NB</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>49.75</td>
<td>55.75</td>
<td>49.75</td>
<td>49.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.25</td>
<td>51.25</td>
<td>45.25</td>
<td>46.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power Ratings

- Power supply 110 to 140 volts, 50 or 60 cycles, 250 watts.
- Audio output, maximum 4.25 watts.

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Early Production

It is better to shut the set completely off between adjustments than to suffer a painful or even a dangerous burn. The set is equipped with a safety switch which automatically opens upon the removal of the back of the cabinet. This protects the operator from dangerous high voltages which would otherwise be exposed.

Figure 5 — Schematic Diagram. Separator and Sweep Circuits

The serviceman that is engaged in installing or servicing television receivers is urged to take all precautions and run no unnecessary risks.

Figure 6 — Schematic Diagram. Voltage Divider and Socket Connections

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CAUTION AND WARNING

Large cathode-ray tubes operate at high voltages and hence are evacuated to a very high degree of vacuum. Therefore the atmospheric pressure on the glass can run into tens depending on the size of the tube. A collapse therefore is as bad as an explosion and all cathode-ray tubes should be handled with care.

The Du Mont Laboratories have gone to great expense to provide a cathode-ray tube that is safe for the home and the structural design results in its ability to stand tests nearly twice as severe as usually employed. The serviceman, however, should observe the following rules as he will probably be the only one to handle the average tube.

1. Be careful in handling the tube.
2. Watch the use of tools near the tube.
3. Don't scratch the surface of the glass.
4. Don't stand the tube on a metal surface or in any other way cause certain parts to be quickly heated or cooled.

TERMINAL VOLTAGES

Using Weston Model 772 20,000 Ohms per Voltmeter
(with Televeter)

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Grid (Control)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>V9</td>
<td>240</td>
<td>150</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>V10</td>
<td>240</td>
<td>155</td>
<td>- 4.3</td>
<td></td>
</tr>
<tr>
<td>V11</td>
<td>190</td>
<td></td>
<td>- 2.2</td>
<td></td>
</tr>
<tr>
<td>V12</td>
<td>275</td>
<td>290</td>
<td>- 11.5</td>
<td>Cathode to ground.</td>
</tr>
<tr>
<td>V13</td>
<td>115</td>
<td></td>
<td>- 2</td>
<td>Contrast on full.</td>
</tr>
<tr>
<td>V14</td>
<td>150</td>
<td></td>
<td>- 2.25</td>
<td></td>
</tr>
<tr>
<td>V15</td>
<td>120</td>
<td>170</td>
<td>- 3.5</td>
<td></td>
</tr>
<tr>
<td>V16</td>
<td>180</td>
<td>185</td>
<td>- 2.25</td>
<td></td>
</tr>
<tr>
<td>V17</td>
<td>5Z3</td>
<td></td>
<td>- 2.0 Cannot be measured at the grid of V6. Should read - 4 volts at center tap of 5Z3 high voltage winding to ground.</td>
<td></td>
</tr>
<tr>
<td>V18</td>
<td>140</td>
<td>225</td>
<td>- 7.5</td>
<td></td>
</tr>
</tbody>
</table>

V17 5Z3 filament to ground = 310 volts
V13 5X3 filament to ground = 1600 volts
(output after L7 = 1500)
V14 2Y2 output = 3950 to 4200 (ground is positive)
(output after R83 = 3900 to 4100 volts)
The above measurements were taken with respect to ground, the following are point to point.

V21 From cathode to grid - 60 to - 160
From cathode to first anode + 800 to + 1600
From cathode to second anode + 9000

Figure 7 — Schematic Diagram, Power Supplies
Antenna Installation

In the installation of television receivers the proper antenna is a necessity. Successful installations will result from attention to details, while slipshod and careless work will bring only poor customer satisfaction and repeat calls. There is nothing difficult about the installation of television aerials, a little patience and experience is all that is required. Regular broadcast aerials in the majority of cases will be found useless. Impress upon the owner and make a satisfactory installation regardless of what other equipment he already has. Satisfactory picture reception is what both of you require for the completion of the installation.

The Dipole Antenna

The Dipole form of aerial is generally satisfactory; it consists of two metal rods, each approximately five feet long and placed on a line with each other; extreme accuracy in the length of these rods is usually not necessary and if the receiver is located very close to the transmitting station it may be found advisable to cut down the length of each rod. The simple dipole aerial is shown in Fig. No. 3.

The Lead-In

The most popular lead-in from the dipole to the television receiver will be a twisted pair as it is inexpensive and generally satisfactory in locations where the signal is strong. The length of this lead is usually not of extreme importance. It is better to get the Dipole located in the clear and as far from electrical interference as possible than to limit its location by using a theoretical, exact length feeder. The twisted pair should be soldered to the lugs on the Dipole as a good connection is essential and necessary since several changes in the position of the antenna may be required for best results.

The other form of lead-in is the coaxial line such as the Amphenol No. 72. This form of feeder should be used in installations where the length of the lead-in is too long for satisfactory work with the twisted pair and again where the installation is at an extreme distance and every bit of energy picked up must be delivered to the receiver.

Polarization

If the dipole is mounted horizontally it is said to be horizontally polarized, and if vertically it is vertically polarized. Since the physical location materially affects the aerial no specific form can be advised and we can merely suggest that you start by using horizontal polarization and change if necessary to produce the best results.

Location of the Antenna

Whenever possible the Dipole should be erected so that it is in line of sight with the transmitter. This does not mean that no signals can be secured where a direct view of the transmitter cannot be obtained. Surprising results are often secured on these high frequencies and no concise rules can be assigned to this work. If the location is on a street having heavy traffic there may be considerable noise level due to automobile ignition systems. In this case, locate the Dipole to the rear of the building and away from the source of the noise as far as possible. In the case of electrical machinery over which you have no control, the same method can be employed along with the utilization of the directional effects of the aerial which will be covered later.

Room Illumination

If a receiver is possible the receiver should be so placed in the home that a direct glare from either natural or artificial light does not fall upon the face of the cathode-ray tube. The received pictures may be viewed under a variety of conditions where it is not always convenient to darken the room completely. Adjustments made to meet these conditions will not cause damage to the receiver. Viewing the pictures in as dark a room as possible is always at an advantage as it permits the retarding of the intensity and Contrast controls in a manner that will give picture tone values more correctly related to those actually used in the studio from which the picture is transmitted.

Installation Process

It is a good plan to proceed as follows with the installation:

1. Erect the Dipole antenna in the clear. Start by using horizontal polarization (mount the rods horizontally) and turn them until their plane is at right angles with the location of the transmitter.
2. Adjust the receiver to produce a picture.
3. Return to the antenna and make final adjustments for best signal strength and removal of ghosts, etc.

Ghost Effects

Where the picture appears to be duplicated and slightly displaced, the additional picture is referred to as a ghost. This effect is usually due to the reflection of the signal and can be cured by the slanting or rotating of the Dipole or the use of a reflector or reflectors. If, after all possible positions have been tried, the ghost still exists it will be necessary to change the location of the antenna and try again.

Directional Effects

In the simple dipole, directional effects are not very pronounced, but it does have a rather sharp no-signal radius and it is possible in some instances to materially reduce interference by placing the offending source in this area. If the installation of the receiver is being made at quite a distance from the transmitter or if the signal level is very low due to local conditions, it is well to consider the use of a reflector. This is done by placing a rod, about ten feet long, parallel with the Dipole and about five feet in back of it. The directional effect of the Dipole remains the same, namely at right angles to the plane. Signals coming from the front will be greatly increased. In using reflectors it is well to bear in mind, however, that any signal approaching from the rear (where the reflector is located) will be greatly attenuated. Fig. No. 4 shows the reflector added to the simple Dipole.
SWITCH SHOWN
POSITION NO. 2 - BROADCAST ACROSS
Frequency
Power consumption
POSITION
U
F.
O.
T1
TT-410 Two-band antenna coil $0.65
T2
TT-410 Two-band detector coil $0.65
R1
2VR-219E Volume control, 75,000 ohms, with line switch $0.90
R2
3CR-294 240 ohm, ½ watt wire-wound resistor $0.16
R3
L55-BG Plug-in ballast tube $0.55
R4
KR-63U 15,000 ohm, ½ watt carbon resistor $0.16
R5
HR-42U 2 meghms, ½ watt carbon resistor $0.16
R7
KR-68U 500,000 ohm, ½ watt carbon resistor $0.16
R8
3QR-297 110 ohm, ½ watt wire-wound resistor $0.16
C1
KC-58 0.01 mf, 400 volt tubular condenser $0.20
C2, C3
5MIC-399 Two-gang variable condenser $0.25
C4, C6
Trimmers, part of variable condenser, not supplied separately. $0.20
C5, C9
AC-6 0.1 mf, 200 volt tubular condenser $0.20
C7
5AC-384 0.0002 mf, 600 volt tubular or mica condenser $0.20
C8
6AC-388 0.25 mf, 100 volt tubular condenser $0.20
C10
LC-65 0.02 mf, 400 volt tubular condenser $0.20
C11
3AC-278 Trimmer for long-wave interstage coil $0.20
C12
LC-64 0.05 mf, 400 volt tubular condenser $0.20
C13, C14
4DC-345A Dual 16 mf, 150 volt dry electrolytic condenser $1.20
C15
EKC-152 0.1 mf, 400 volt tubular condenser $0.20
C16
NC-70A 0.0002 mf mica condenser $0.20
C17
6BS-333 5" dynamic speaker $3.90
C18
3TS-233A Wave-band switch $0.50
C20
4BL-94 Pilot light, 6.3 volt, 25 amp., Mazda No. 44 $0.20
C21
4XM-367 Drive pulley $0.10
C22
5MZ-229 Dial crystal $0.10
C23
5MZ-280 Drive shaft and pulley $0.10
C24
4MZ-588B Dial pointer $0.10
C25
4YZ-772 Drive cord $0.10
C26
5JZ-324 Drive cord spring $0.20
C27
6DD-63 Dial face $0.15

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned on full and no signal. The line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 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>6D6</td>
<td>100</td>
<td>100</td>
<td>2.3</td>
<td>6.3</td>
</tr>
<tr>
<td>6C6</td>
<td>20</td>
<td>15</td>
<td>2.1</td>
<td>6.3</td>
</tr>
<tr>
<td>26L6G</td>
<td>92</td>
<td>100</td>
<td>9</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage across speaker field—26 volts.
2525 cathode to ground—126 volts.

ALIGNMENT PROCEDURE

An oscillator with frequencies of 1500 kc and 350 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum response.

Rotate variable condenser to the maximum capacity position and set the pointer at the next calibration mark beyond 550. Rotate band-switch clockwise to broadcast (medium-wave) position. Then rotate the variable condenser until the pointer is at 200 and feed 1500 kc to the antenna through a 0.0001 mf mica condenser and adjust both trimmer condensers on the variable condenser for maximum response.

Turn wave-band switch counter-clockwise to long-wave position. Rotate variable condenser until pointer is at 350 and feed 350 kc to antenna. Adjust the long-wave interstage coil trimmer for maximum output. Return to broadcast and repeat entire procedure. The long-wave trimmer is located beneath the chassis and is reached from the right end of the chassis.

Tube Data

The tube complement is as follows:
1—6D6, r-f amplifier.
1—6C6, biased detector.
1—2S5G, beam power output.
1—2S6G, dual half-wave rectifier.
1—L55BG, ballast tube.
Note: Octal-base tubes may be replaced with either metal tubes or equivalent octal-base glass tubes.
TUBE DATA

The tube complement is as follows:

1-6D6, r-f amplifier.
1-6C6, biased detector.
1-25Z5, dual half-wave rectifier.
1-L55BG, ballast tube.

Note: Octal-base tubes may be replaced with either metal tubes or equivalent octal-base glass tubes.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned on full and no signal. The line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 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>6D6</td>
<td>100</td>
<td>100</td>
<td>2.3</td>
<td>6.3</td>
</tr>
<tr>
<td>6C6</td>
<td>20</td>
<td>15</td>
<td>2.1</td>
<td>6.3</td>
</tr>
<tr>
<td>25L6G</td>
<td>93</td>
<td>100</td>
<td>6.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage across speaker field—26 volts.
25Z5 cathode to ground—128 volts.
Voltage across ballast tube (pins 8, 7)—55 volts.
Voltage across pilot light section (pins 7, 8)—4 volts.

The ballast resistor (L55BG on schematic) is in a special tube at the rear of the chassis. In normal operation this tube will become quite hot. For voltage drop specifications, see "Voltage Analysis" above.

ALIGNMENT PROCEDURE

An oscillator with a frequency of 1400 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum response.

Rotate variable condenser to the maximum capacity position and set the pointer at the next calibration mark beyond 55. Then rotate the variable condenser until the pointer is at 149 and feed 1400 kc to the antenna through a .0001 mf mica condenser and adjust both trimmer condensers on the variable condenser for maximum response.
A.C.-D.C. Superheterodyne Receiver, with Miraclo Instamatic Tuning
Six Tubes, Including Ballast Tube

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully reassembled.

2. One side of the power line is directly grounded to the chassis base. Under no circumstances, therefore, should a ground wire be permitted to come in contact with any metal part of the receiver.

3. In operating the receiver on d.c. it may be necessary to reverse the line plug for correct polarity.

4. The color coding of the i-f transformer leads is as follows:
   - Grid—green
   - Plate—blue
   - Plate—red
   - Amplifier and other colors possibly used later.

5. In congested areas where the installation of a large antenna is not desirable we recommend the use of the Emerson Flexible Mast Antenna, Model W-42. Instructions for the installation of this compact and efficient antenna are supplied with each kit.

6. Where the Flexible Mast is installed permanently, it is urgently recommended that the receiver antenna wire be cut off just enough to reach from the receiver to the window strip connector.

7. The wave-trap in the receiver has been adjusted for maximum signal rejection at 455 kc. If, however, persistent interference is experienced from some particular telegraphic station, readjust the wave-trap trimmer until the response from the interfering station is at a minimum.

ADJUSTMENTS

An oscillator with frequencies of 485 and 1400 kc is required.

An output meter should be used across the voice coil or output transformer for observing maximum response. Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The two i-f transformers are in oblong coil cans located on top of the chassis deck. The i-f transformer is the one behind the variable condenser. The trimmers for these transformers are accessible through holes in the tops of the cans.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil on the top of the chassis behind the variable condenser. The trimmer for the 455 kc wave-trap is mounted on the can and is accessible from the side of the chassis. The oscillator coil is located underneath the chassis, beneath the i-f transformers.

I-F and Wave-Trap Alignment

Swing the variable condenser to the minimum capacity position. Feed 455 kc to the grid cup of the 6A7 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for maximum response. (See General Notes, paragraph No. 4.)

R-F Alignment

Set the dial pointer at 160. Feed 140 kc through a .0001 mf condenser to the antenna lead and adjust the oscillator trimmer (in rear section of variable condenser) for maximum response.
REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Part No.</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, T1</td>
<td>5YT-444</td>
<td>Antenna coil with adjustable 455 kc wave-trap</td>
<td>$ .90</td>
</tr>
<tr>
<td>T2</td>
<td>4XT-433</td>
<td>Oscillator coil</td>
<td>$.35</td>
</tr>
<tr>
<td>T3</td>
<td>3RT-320C</td>
<td>Double-tuned 455 kc first i-f transformer</td>
<td>$ 1.10</td>
</tr>
<tr>
<td>T4</td>
<td>3RT-321C</td>
<td>Double-tuned 455 kc second i-f transformer</td>
<td>$ 1.10</td>
</tr>
<tr>
<td>R1</td>
<td>ZZR-196</td>
<td>30,000 ohm ¼ watt carbon resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R2</td>
<td>KR-53</td>
<td>50,000 ohm ¼ watt carbon resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R3</td>
<td>3FR-293</td>
<td>140 ohm ¼ watt wire-wound resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R4</td>
<td>KR-57</td>
<td>1 megohm ¼ watt carbon resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R5</td>
<td>2NR-214F</td>
<td>Volume control .25 megohm with line switch</td>
<td>$.90</td>
</tr>
<tr>
<td>R6</td>
<td>4XR-327</td>
<td>15 megohm .1 watt carbon resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R7</td>
<td>KR-56</td>
<td>250,000 ohm ¼ watt carbon resistor</td>
<td>$.16</td>
</tr>
<tr>
<td>R8</td>
<td>L49-BG</td>
<td>Ballast resistor tube. (Interchangeable with L49B)</td>
<td>$.55</td>
</tr>
<tr>
<td>C1, C2</td>
<td>6AC-407</td>
<td>Two-gang variable condenser</td>
<td>$2.25</td>
</tr>
<tr>
<td>C3</td>
<td>NNC-199</td>
<td>0.001 mf, 600 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C4</td>
<td>Trimmer, part of wave-trap assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5, C11</td>
<td>Trimmers, part of variable condenser.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>BC-12</td>
<td>0.05 mf, 200 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C12</td>
<td>4XC-393A</td>
<td>0.00006 mf mica condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C13</td>
<td>AC-6</td>
<td>0.1 mf, 200 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C14</td>
<td>EBC-132</td>
<td>0.1 mf, 400 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C15, C18</td>
<td>5AC-384</td>
<td>0.0002 mf, 600 volt tubular or mica condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C16</td>
<td>3HC-274</td>
<td>0.002 mf, 600 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C17</td>
<td>LC-65</td>
<td>0.02 mf, 400 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C19</td>
<td>3FC-336</td>
<td>0.025 mf, 400 volt tubular condenser</td>
<td>$.20</td>
</tr>
<tr>
<td>C20, C21</td>
<td>4HC-348A</td>
<td>Dual 20 mf, 150 volt dry electrolytic condenser</td>
<td>$1.00</td>
</tr>
<tr>
<td></td>
<td>6BS-333</td>
<td>5&quot; dynamic speaker</td>
<td>$3.90</td>
</tr>
</tbody>
</table>

*Item number locates the article on the schematic diagram.

†These condensers cannot be supplied separately.

PREADJUSTMENT OF STATION BUTTONS

Select four nearby stations desired for automatic tuning. Choose one of these stations and any button to be adjusted for it. Follow the procedure outlined below.

1. Loosen the push-button to be adjusted by rotating it counter-clockwise from ¼ to ½ turn. See Fig. 2.

2. Push the button in as far as it will go and, holding it in firmly, tune in the desired station by means of the selector knob. See Fig. 3.

3. Hold button in with finger of one hand and tighten securely with the other hand. Release the button and tighten it further if possible. See Fig. 4.

4. Remove the tab bearing the station call letters from one of the cards supplied in a separate envelope with the receiver. Insert the tab in the button, pressing it firmly. Four celluloid caps are supplied in a separate envelope with the receiver. Snap one of these caps into the button over the station tab.

Check the adjustment of the button by detuning the station by means of the selector knob and then pressing the push-button in as far as it will go. The station should come back in clearly and with maximum volume.
GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. One side of the power line is directly grounded to the chassis base. Under no circumstances, therefore, should a ground wire be permitted to come in contact with any metal part of the receiver.
3. The selenium dropping resistor (R1) on some schematics is a resistance wire in the special line cord. The cord will therefore heat during normal operating conditions. To insure good heat radiation stretch out the line cord to its full length. Do not attempt to shorten it by cutting.
4. In operating the receiver, no d.c. may be necessary to reverse the line plug for correct polarity.
5. The color coding of the i-f transformer leads is as follows:
   - Grid-green
   - Grid return-black
6. In congested areas where the installation of a large antenna is not practical, we recommend the use of the Emerson Flexa-Mast Antenna, Model 9-92. Instructions for the installation of this compact and efficient antenna are supplied with each kit.
7. Where the Flexa-Mast is installed permanently, it is usually recommended that the receiver antenna wire be cut. Leave just enough of this wire to reach from the receiver to the window strip connector.
8. To remove the 6AS tube from its socket, push up on its centerpin from beneath the chassis.

TUBE DATA

All tubes are replaceable with either metal or equivalent hantam glass tubes. The letters "GT" at the end of the tube number indicate that the tube has a hantam glass envelope. In all other respects it is the same as the metal tube bearing the same number without the "GT."

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm-meter voltmeter. Voltages listed below are from point illustrated in ground chassis with the volume control turned on Full and no signal. Line voltage for these readings was 117.5 volts. 60 cycle, d.c. All readings except heaters and cathodes were taken on 200 volt scale. Measurements made with 117.5 volt d.c. will be lower than those given below.

| Tube | Plate | Screen | Cathode | Grid Plate | F.U.
|------|-------|--------|---------|------------|------
| 6AS  | 12.2  | 14.5   | 100     | 0          | 0.3  |
| 6AZ  | 12.2  | 14.5   | 12.2    | 0          | 0.3  |
| 255  | 12.2  | 14.5   | 255     | 0          | 0.3  |
| 25Z  | 12.2  | 14.5   | 100     | 5.5        | 0.3  |
| 335  | 12.2  | 14.5   | 100     | 5.5        | 0.3  |

Voltage at 225 volts—125 volts.
Voltage across speaker field—28 volts.

ADJUSTMENTS

An oscillator with frequencies of 455, 1600, 2500 and 175 kc required.
An output meter should be used across a voice coil or output transformer for observing maximum response.
Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.
The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.
The twist-bonded coil is located directly behind the speaker. The trimmer for the broadcast antenna coil is located on the front section of the variable condenser. The trimmer for the long wave antenna coil is mounted on the top of the variable condenser. The two-second trimmer coil is located underneath the chassis below the first i-f transformer. The trimmer for the broadcast coil is located on the rear section of the variable condenser. The trimmer and series padding (condensers C24 and C25) for the long wave antenna coil are located beneath the chassis and can be reached from the bottom only. The section toward the rear of the chassis is C24, the shunt trimmer. The section toward the front of the chassis is C25, the series padding coil.

i-f Alignment

Turn the band switch clockwise to broadcast position and swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-tip of the 6AS tube through a .001 mf condenser and adjust the four i-f trimmers for maximum response.
Broadcast Alignment

With the band switch in broadcast position set the dial pointer at 250. Feed 1600 kc through a .001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.
Long Wave Alignment

Turn the band switch counter-clockwise to the long wave position. With the dial pointer set at 850, feed 500 kc through a .001 mf condenser to the antenna and adjust first the oscillator trimmer (rear trimmer beneath the chassis), then the antenna trimmer (on antenna coil) for maximum response. Move the pointer to 1750, feed 72 kc, and adjust the series padding (front trimmer beneath the chassis), moving the variable condenser back and forth while adjusting for maximum response. Return to 850 kc and repeat alignment.
Five-Tube, A.C.-D.C., Superheterodyne Receiver

The tube complement is as follows:

1. 12A8 or 12A8GT, pentagrid oscillator modulator.
2. 12K7 or 12KGT, first i-f amplifier.
3. 12QT or 12QTGT, diode detector, a-f amplifier a.v.c.
4. 35L6 or 35L6GT, beam power output.
5. 35Z4 or 35Z4GT, half-wave rectifier.

The color coding of the i-f transformer leads is as follows:

Grid—green
Plate—blue
Grid return—black
B plus—red.

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

I-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cap of the 12A8 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 260 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>F1l.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12A8</td>
<td>94</td>
<td>50</td>
<td>0</td>
<td>94</td>
<td>12</td>
</tr>
<tr>
<td>12K7</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td>--</td>
<td>12</td>
</tr>
<tr>
<td>12Q7</td>
<td>40</td>
<td>--</td>
<td>0</td>
<td>--</td>
<td>12</td>
</tr>
<tr>
<td>35L6</td>
<td>94</td>
<td>94</td>
<td>5.2</td>
<td>--</td>
<td>86</td>
</tr>
</tbody>
</table>

Voltage at 35Z4 cathode—121 volts.
Voltage across speaker field—97 volts.
Voltage across pilot light section of ballast resistor (R9)—3.5.
Voltage drop across entire ballast resistor (R9 and R10)—13.5.
Location of Coils and Trimmer Adjustments

The two i-f transformers are located on top of the chassis deck. The first i-f transformer is the one directly behind the variable condenser. The trimmers for the two i-f transformers are available through holes in the tops of the cans.

The trimmers for the antenna and oscillator are located on the variable condenser. The trimmer on the front section is for the antenna.

The 455 kc wave-trap is mounted on the front chassis wall beneath the variable condenser. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the bottom of the chassis.

The color coding of the i-f transformer leads is as follows:

- Grid—green
- Grid return—black
- B plus—red

I-f and Wave-trap Alignment

Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 455 kc through a 0.02 mf paper condenser, to the grid cap of the 6A7 tube (do not remove the grid clip from the tube). Adjust the four i-f trimmers for maximum response. Feed 455 kc to the antenna through a standard dummy antenna (a 0.0002 mf condenser may be used as a substitute) and adjust the wave-trap trimmer for minimum response. (See General Note No. 7.)

R-f Alignment

With the wave-band switch in the broadcast position, clockwise, set the dial pointer at 140. Feed 1400 kc through a standard dummy antenna (a 0.0002 mf condenser may be used as a substitute) to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

The police band is self-tracking and does not require any adjustment.

NOTE: The Model BJ-200 should be aligned with the chassis bottom plate in place.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.6 volts, 60 cycles, a.c. All readings except cathodes and heaters were taken on 250 volt scale.

<table>
<thead>
<tr>
<th>MODELS BJ-218 and 220</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Heaters</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>46</td>
<td>2.0</td>
<td>84</td>
<td>6.3</td>
<td>Voltage at 25Z5 cathode—130 volts.</td>
</tr>
<tr>
<td>84</td>
<td>84</td>
<td>2.8</td>
<td>84</td>
<td>6.3</td>
<td>Voltage across speaker field (Models BJ-200, 210 and 214) — 28 volts.</td>
</tr>
<tr>
<td>35</td>
<td>—</td>
<td>1.0</td>
<td>—</td>
<td>6.3</td>
<td>Voltage drop across ballast tube L-49BG (pins nos. 3, 7) — 49 volts.</td>
</tr>
<tr>
<td>115</td>
<td>84</td>
<td>6.5</td>
<td>25</td>
<td>—</td>
<td>Voltage drop across pilot light section (pins nos. 7, 8) — 4 volts.</td>
</tr>
</tbody>
</table>

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EMERSON RADIO & PHONOGRAPH CORP.

**PRODUCTION CHANGES**

1. In receivers used in phonograph combinations:
   - R2 is 40,000 ohms 1 watt, part No. 2NR-217
2. Receivers bearing serial numbers below 1,002,875 used a 0.00006 mf mica condenser, part No. 4XR-309A, at C12.
3. Receivers bearing serial numbers below 1,080,200 used dial drive shaft and pulley, part No. 51Z-822.

Frequency ranges:
- 640 to 1580 kc and 1580 to 4200 kc.

**WIRING AND APPARATUS**

**POLICE BAND**

- Receivers used with the police band.

- The two i-f transformers are available through holes in the tops of the cans.

- The trimmers for the antenna and oscillator are located on the variable condenser. The trimmer on the front section is for the antenna.

- The grid voltage is 6.3 v. and the plate voltage is 50 v.

- The grid voltage is 6.3 v. and the plate voltage is 50 v.

**Location of Coils and Trimmer Adjustments**

The two i-f transformers are located on top of the chassis deck. The first i-f transformer is the one directly behind the variable condenser. The trimmers for the two i-f transformers are available through holes in the tops of the cans.

The trimmers for the antenna and oscillator are located on the variable condenser. The trimmer on the front section is for the antenna.

The 455 kc wave-trap is mounted on the front chassis wall beneath the variable condenser. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the bottom of the chassis.

**I-f and Wave-trap Alignment**

- Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity position and feed 455 kc through a 0.02 mf paper condenser, to the grid cap of the 6A7 tube (do not remove the grid clip from the tube). Adjust the four i-f trimmers for maximum response. Feed 455 kc to the antenna through a standard dummy antenna (a .0002 mf condenser may be used as a substitute) and adjust the wave-trap trimmer for maximum response. (See General Note No. 1.)

**R-f Alignment**

- With the wave-band switch in the broadcast position, clockwise, set the dial pointer at 140. Feed 1400 kc through a standard dummy antenna (a .0002 mf condenser may be used as a substitute) to the antenna lead and adjust the oscillator trimmer (rear section of variable condenser) then the antenna trimmer (front section of variable condenser) for maximum response.

**The police band is self-tracking and does not require any adjustment.**

**VOLTAGE ANALYSIS**

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters were taken on 250 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>182</td>
<td>70</td>
<td>0</td>
<td>182</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6D6</td>
<td>182</td>
<td>70</td>
<td>0</td>
<td>182</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6Q7</td>
<td>87</td>
<td>182</td>
<td>0</td>
<td>87</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>41</td>
<td>185</td>
<td>182</td>
<td>0</td>
<td>185</td>
<td>6.3 a.c.</td>
</tr>
</tbody>
</table>

Voltage across speaker field (Models 200, 210 and 214) - 70 volts.
Voltage from B minus to chassis (Models 200, 210 and 214) - 80 volts.
Voltage from B minus to chassis (Models 218 and 220) - 54 volts.

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Tube Data

The tube complement is as follows:
1. 6A8 or 6A8GT, pentagrid oscillator modulator.
2. 6K7 or 6K7GT, first i-f amplifier.
3. 6Q7 or 6Q7GT, diode detector, a-f amplifier, a.v.c.
4. 25L6 or 25L6GT, beam power output.
5. 25Z6 or 25Z6GT, dual half-wave rectifier.

All tubes are replaceable with either metal or equivalent bantam glass tubes.

PRODUCTION CHANGES

AX-221 and AX-222 chasses bearing serial numbers below 1,890,976 do not have R16, 100,000 ohm resistor, connected in series with the yellow lead to phono-radio switch.

AX-221 and AX-222 chasses bearing serial numbers below 1,914,451 do not contain resistor R17.

On model AX-222 a 0.01 mf, 400 volt condenser is connected from B plus to the speaker frame. Another 0.01 mf condenser is connected from the motor mounting plate to ground.

AX-221 and AX-222 chasses below serial number 1,921,165 have a 210 ohm, ½ watt wire-wound resistor at R15.
### ADDITIONAL PARTS USED ON AX-219

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR-65</td>
<td>500,000 ohm 1/2 watt carbon resistor</td>
<td>.16</td>
</tr>
<tr>
<td>4X-P-15 or PM-100</td>
<td>A.C. self-starting motor</td>
<td>12.60</td>
</tr>
<tr>
<td>4X-230</td>
<td>Crystal pick-up (metal tone arm)</td>
<td>9.50</td>
</tr>
<tr>
<td>4X-231A</td>
<td>Crystal pick-up (wooden tone arm)</td>
<td>4.70</td>
</tr>
<tr>
<td>4X-1</td>
<td>Dial crystal</td>
<td>.10</td>
</tr>
<tr>
<td>4X-10B</td>
<td>Dial idler</td>
<td>.00</td>
</tr>
</tbody>
</table>

### ADDITIONAL PARTS USED ON AX-221 and AX-222

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR-57</td>
<td>1 megohm 1/2 watt carbon resistor</td>
<td>.50</td>
</tr>
<tr>
<td>3T-PM-3</td>
<td>100 volt, a.c. motor (for 251-AC)</td>
<td>25.30</td>
</tr>
<tr>
<td>3T-37A</td>
<td>100 volt, a.c. motor (for 251-AC-222)</td>
<td>11.80</td>
</tr>
<tr>
<td>4XZ-33A</td>
<td>Crystal pick-up</td>
<td>.10</td>
</tr>
</tbody>
</table>

### ADDITIONAL PARTS USED ON MODEL AX-222

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR-56</td>
<td>5 megohm 1/2 watt carbon resistor</td>
<td>.50</td>
</tr>
<tr>
<td>4X-P-19A</td>
<td>4L volt, a.c. phonograph motor (for AX-322, AC-DC)</td>
<td>42.60</td>
</tr>
<tr>
<td>4XP-19</td>
<td>4L volt, a.c. phonograph motor (for AX-232, AC)</td>
<td>42.60</td>
</tr>
<tr>
<td>4X-130</td>
<td>Record holder block</td>
<td>.40</td>
</tr>
</tbody>
</table>

---

**Combination Phonograph and Five-Tube Superheterodyne**

**MODEL AX-221AC (For Operation on AC Only)**

**MODEL AX-221AC-DC (For Operation on Either AC or DC)**

**MODEL AX-222 (AC-DC Portable)**

**MODEL AX-232AC (Automatic Record Changer—For AC Only)**

**MODEL AX-232AC-DC (Automatic Record Changer—For AC or DC)**

**When ordering replacement parts specify part number.**

*Item number located on the schematic diagram.*

*Not supplied separately.*

---

**Location of Calls and Trimmer Adjustment**

1. This line should be pulled to a point where the voice coil of the receiver is at a null response.

2. The trimmer is used to null the voice coil of the receiver.

3. The trimmer is used to null the voice coil of the receiver.

4. The trimmer is used to null the voice coil of the receiver.

5. The trimmer is used to null the voice coil of the receiver.

6. The trimmer is used to null the voice coil of the receiver.
**Model BQ223**

**Chassis BQ**

**Schematic, Voltage Changes, Alignment**

**Emerson Radio & Phonograph Corp**

**EMERSON PAGE 10-11**

**Production Change**

The colors of red, black, and blue in the schematic are color-coded to help the user distinguish between the wires. The following are the color codes used:

- Red: Power wires
- Black: Ground wires
- Blue: Signal wires

**Wiring**

The wires are color-coded as follows:

- Red: Power wires
- Black: Ground wires
- Blue: Signal wires

**Voltage Change**

The schematic shows the voltage changes as follows:

- Red: Power wires
- Black: Ground wires
- Blue: Signal wires

**Schematic**

The schematic shows the alignment changes as follows:

- Red: Power wires
- Black: Ground wires
- Blue: Signal wires

**Specifications**

**Voltage Ranges**

- 110-125 volts, 60 cycle, a.c.
- 6.8 to 18,500 cycles

**Power Consumption**

- 60 watts

**Frequency Range**

- 640 to 1780 kc

**Transformer**

- Field coils:
  - 4000 ohms
  - 4000 ohms

**Speaker**

- 4 ohms

**Speaker Plug Looking at Pins**

- Encircled numbers on schematic for connections

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VOLTAGE ANALYSIS

CHASSIS BR

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control full on, band-switch in short-wave position (counter-clockwise) and no signal. Line voltage for these readings was 115.3 volts, 60 cycles, a.c. All readings below 250 volts, except heaters and cathodes, were taken on 250 volt scale.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>O/e Plate</th>
<th>Cathode</th>
<th>FV.</th>
</tr>
</thead>
<tbody>
<tr>
<td>687-1.f amplifier</td>
<td>230</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6E8 oscillator-modulator</td>
<td>225</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6A6</td>
<td>318</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6B6 diode detector, a.e. first audio</td>
<td>170</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>692</td>
<td>420</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6Q2 first audio driver</td>
<td>280</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>6V6 inverted audio driver</td>
<td>280</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
<tr>
<td>4-6AC76's output</td>
<td>975</td>
<td>1100</td>
<td>10</td>
<td>2</td>
<td>6.3 a.c.</td>
</tr>
</tbody>
</table>

Voltage on speaker field—66 volts.

Voltage at 80 filament—350.

Model BR. BR224-237 speaker will have voltages approximately 10 percent lower. Voltage across this speaker field is 80 volts.

When band is on broadcast and police positions the screen voltages will read 65 volts. Bias readings on these tubes will be slightly lower.

Location of Coils and Trimmer Adjustments

The i-f transformers are located at the back of the chassis. The first i-f transformer is in the one near the electrolytic condenser. The six trimmers for i-f alignment are available through holes in the top of the case.

The trimmer coils for the three bands are wound on one form located on the front wall of the chassis with the trimmers accessible through holes in the chassis. The right-hand trimmer is for the broadcast band, the left-hand trimmer is for the short-wave band and the central trimmer is for the police band.

The r-f interstage coils are wound on one form and are mounted underneath the chassis to the left of the wave-band switch. The trimmers are available through holes in the top of the chassis. The trimmer closest to the front of the chassis is for the broadcast band. The trimmer farthest from the front is for the short-wave band. The central trimmer is for compensating the short-wave band at 6 kc.

The oscillator coils are wound on one form and mounted underneath the chassis directly behind the wave-band switch. The trimmers are accessible through holes in the top of the chassis. The trimmer closest to the front of the chassis is for the police band. The trimmer for the broadcast band, the trimmer farthest from the band-switch is for the short-wave band and the central trimmer is for the police band.

The oscillator series pad is for the broadcast and police bands are mounted underneath the chassis near the interstage coils. The adjujusting screws are available through holes in the top of the chassis. The padres nearest the front of the chassis is for the police band. The padres for the broadcast and short-wave band is listed on a schematic diagram. If this condenser is to be replaced use one condenser with a value within 2% of that specified.

I-f Alignment

Set the wave-band switch at the broadcast (clockwise) position, and the variable condenser at minimum capacity. Feed 455 kcp to the grid of the 687 i-f amplifier tube through a 0.02 mf condenser. (Do not remove the grid clip from the tube.) Examine the trimmer screws and locate the screw which is pointed red. Screw this trimmer down as far as it will go. Adjust the other two trimmers for maximum response and then adjust the red trimmer for maximum response. Do not adjust the trimmer coils for maximum response. Now feed 0.02 kcp to the grid of the 687 tube and repeat the procedure on the first i-f transformer. Do not touch the adjustment of the second i-f transformer. Failure to follow this procedure may result in impairment of the fidelity of the receiver.

Broadcast Alignment

Since the indicator is fastened to the cabinet, a piece of stiff wire should be fastened to the dial drive assembly-plate and lead to the pointer on the indicator when the chassis is removed from the cabinet. Set the wave-band switch at the broadcast (clockwise) position, and the dial at 60. Feed 600 kcp to the antenna (using a standard dummy condenser) and adjust the broadcast-band series pad for maximum response. Move the dial to 150, feed 600 kcp to the antenna and adjust the oscillator coil trimmer for maximum response. Reset the dial to 60, feed 600 kcp and rock the variable condenser while adjusting the series pad for maximum response. Return to 150 and check alignment. If readjustment is necessary return to 600 and repeat entire procedure.

Police Alignment

Set the wave-band switch at the broadcast (center) and the dial at 1.8. Feed 1800 kcp to the antenna (using a 0.001 mf dummy condenser) and adjust the police band series pad for maximum response. Move the dial to 60, and feed 600 kcp to the antenna and adjust the oscillator coil trimmer for maximum response. Return the dial to 1.8, feed 1800 kcp to the antenna and adjust the series pad for maximum response. Return to 1.8 and check alignment. If readjustment is necessary return to 1800 kcp and repeat entire procedure.

Short-Wave Alignment

Set the wave-band switch at the short-wave (counter-clockwise) position. Move the dial to 20 and feed 20,000 kcp to the antenna (using a 0.001 mf dummy condenser) and adjust the short-wave oscillator coil trimmer for maximum response. If two peaks are obtained choose the minimum capacity peak. Then adjust the interstage and oscillator coil trimmers for maximum response. If two peaks are obtained choose the 60 to 600 kcp, feed 600 kcp to the antenna and adjust the r-f interstage trimmer (central trimmer at left band-switch for maximum response.

MIRACLE INSTAMATIC TUNING

Preadjustment of Station Push-buttons

For CHASSIS Br

The six push-buttons provide a choice of six favorite broadcast stations for Miracle Instamatic Tuning. Adjustments for any particular station must be made by means of the small cross-slotted button immediately below the chosen push-button. The following procedure must be carefully observed in making these adjustments:

1. Insert the pin plug in the electrical outlet. Turn the push button by rotating the tone control clockwise until the switch is in position to be used. Then turn this knob to the extreme clockwise position. Wait about a minute for the valve to warm up. Turn the wave-band switch to the broadcast position, clockwise. Turn the volume control clockwise to about half of its full rotation.

2. Select six nearby stations desired for automatic tuning. Leave one of these stations and any button to be adjusted for it. Feed the station call letters on one of the four cards supported in envelopes with the receiver. Print out the call letters on paper and these will occupy the proper position of the station in the button. Press this button in strongly. See Fig. 4.

3. Push in the manual selector knob (second rime right). When pushing in the second knob on one of the push-button tests, results are obtained by using a firm rapid motion.

4. With the selector knob depressed tune in the desired station. Rotate the selector knob until the mark on the dial corresponds approximately to the frequency of the station desired. The selector knob may be adjusted to three different positions. Each position corresponds to capacitance elements in the input section. Identify the station and note the approximate position of the dial face.

5. Push in the button to be adjusted for this station. See Fig. 1.

6. Check the results by moving the dial face, using the selector knob, to a different position and then pushing in the button. The station should be received clearly and with maximum accuracy. See Fig. 2.

7. It is very important, when tuning in a station by means of the adjusting button, that the last button on the left side be used while adjusting the station on the button. Do not make the mistake of changing the station on the button in the counter-clockwise direction, as indicated in Fig. 3.

8. Adjust the remaining buttons, one at a time, following the procedure outlined above.
**EMERSON PAGE 10-13**

**EMERSON RADIO & PHONOGRAPH CORP.**

**MODELS BR224 BR224A**

**Chassis BR**

**Schematic, Notes**

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**GENERAL NOTES**

1. In replacing chassis in cabinet do not tighten mounting screws so much that chassis will not float freely, and do not allow any part of the dial assembly to touch the cabinet. Do not push control knobs on so far that they touch the chassis from front panel. The above instructions are not classiﬁcations.

2. Low voltage secondary center tap red and yellow leads. High voltage secondary center tap red and yellow leads. Primary—two black leads, two red leads. Three primary leads are not classiﬁcations.

3. The phonograph transformer is an E.M. The speed may be checked by counting the turns per minute or by using a stroboscope, disc, and a neon light. The stroboscope method will work only when the speed is 100 to 400. To readjust the turns per minute, start the speed at 100 and adjust for the turntable (by moving the screwdriver, turntable, front panel, and set the turntable position). Adjust the speed regulator screw through the turntable in the same manner as BR-224. 5. Watts for phonograph motor.

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**TUBE DATA**

- **Voltage rating**: 105-125 volts, 60 cycles, a.c.
- **Power consumption**: 135 watts at 117.5 volts.
- **Frequency ranges**: 540 to 1800 kc, 1800 to 6,250 kc and 6.8 to 220 megacycles.

1—6K7, R-f amplifier (behind right-hand section of variable condenser).
1—6KS, Triode, hexode, oscillator-modulator (behind left-hand section of variable condenser).
1—6K7, T-f amplifier (between the two i-f transformers).
1—6Q7, Diode detector, audio ampliﬁer, a.v.c. (left rear corner of chassis).
1—6J5, Phase inverter (left side of chassis, third from rear).
2—6J5, Second audio ampliﬁers (left side of chassis, second from rear, and right side of chassis beside electrolytic condensers).
4—6AC5G, Dynamic coupled, power output (two are in front of power transformer; other two are alongside power transformer near variable condenser).
2—80, Rectiﬁers (beside power transformer, at rear of chassis).

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1. Turn the receiver "on" in the usual way.
2. Rotate the phono-radio switch knob counter-clockwise to the phonograph position. Wait about a half-minute for the tubes in the receiver to warm up.
3. See that the pick-up is over the needle gauge plate with needle properly in place. If not, complete a cycle as follows: Throw the turntable switch "on." The turntable will start to revolve and the cycle of motion on the pick-up arm will follow through. When the pick-up arm comes down (and it can be moved by hand) the cycle is completed. Turn off the turntable switch.
4. The Index and Record Reject Lever are located near the right front corner of the motor board. With this lever at "Manual" position place the records on the record holder shelves. The records should be arranged in the desired order with the desired selection face up and the last selection on top. The first record to be played will rest directly on the shelves. The turntable should be empty.
5. Throw the turntable switch to the "on" position. The turntable should start to revolve.
6. While the turntable is revolving, push the Index and Record Reject Lever to the "Reject" position and let go. When the lever is released, after it has been pushed to "Reject," it will return automatically to the "10" position. If all the records to be played are 12 inch, return the lever to the "12" position. The changer will then begin to go through its cycle and the first record will drop on the turntable. The entire series of records will then be played automatically in sequence.
7. Adjust to the desired volume by means of the regular receiver volume control.
8. Close the cabinet lid to eliminate normal mechanical noises due to needle vibration.

The whole series of records will now play without further attention, and the last record will repeat until the turntable switch is turned off. Allow the record-changing mechanism to complete its cycle before the turntable is stopped. Then lift the pick-up, swing the arm to the right beyond the edge of the record and lower it onto the pick-up rest with pick-up over needle gauge plate. The record player is then ready for reloading, or for manual operation.

MANUAL OPERATION

1. Proceed as in steps 1, 2 and 3 under Automatic Operation.
2. Place record on turntable with desired selection upwards.
3. Set Index and Record Reject Lever to "Manual" position. The lever should be kept in this position when not actually playing records automatically.
4. Throw the turntable switch and when turntable has attained speed, lift pick-up and gently lower onto the record, so that the needle point enters the outside groove.
5. Proceed as in steps 7 and 8 under Automatic Operation.

SPECIAL PRECAUTIONS

1. This instrument is not recommended for playing 10 inch and 12 inch records in mixed sequence. If the user desires this service he must be positive that all records are perfectly flat and free from warp. The Index and Record Reject Lever must be set at "10" and after playing the last selection the pick-up will come down in position for a 10 inch record and repeat the playing of the record on a 10 inch diameter unless the turntable switch is turned off. Any jarring of the mechanism under these conditions indicates that the records used are not perfectly flat or that their edges are not sufficiently smooth to permit normal operation of the separators in dropping each record in sequence onto the turntable.
2. Do not handle or move manually the pick-up or any part of the mechanism while it is going through the record-changing operation.
3. Do not use force in handling the mechanism at any time.
4. Warped or thick records should not be used for automatic operation.
5. Do not leave records on record holder posts except when needed for immediate operation, as they will warp and sag if left in this manner for a long period of time. Records can be straightened, however, by placing them on a flat surface and resting heavy flat articles, such as books, over them.
6. During automatic operation, the needle is fed automatically into the starting groove of the next record. If the needle fails to enter the starting groove, this is an indication that the cabinet is not level. Raise the right hand side of the cabinet, by inserting several thin spacers beneath it on that side. If the needle slides over a few grooves, raise the left hand side of the cabinet in a similar manner.
7. Never leave pick-up with needle resting on a record or on the turntable. When finished playing, be sure that the turntable has stopped and the pick-up is in the rest position over needle gauge plate.

Replacements should be made with genuine Emerson parts for best results.
ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlinks 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 in the cycle, and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction adjustment.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "22" by the trip lever "17" through a friction clutch "5." If the motion of the pickup is abruptly accelerated or becomes irregular due to the presence of an eccentric groove, the finger "7" moves the trip pawl "22" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and it is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "16" is actuated by the main lever "15" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "in-cycle" at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this position, adjust locknuts "C" to obtain 1 inch spacing between needle point and turntable top surface.

D. & E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle on a 10 inch record. Position of eccentric stud "E" governs the landing of the needle on a 12 inch record; thus, this position is important on the proper 10 inch adjustment.

To adjust needle landing, place 10 inch record on turntable, push needle to lever "20," and return to 10 inch position; see that pickup locating lever "17" is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin "V" on lever "14" is in contact with "Step T" on lever "17." The correct point of landing is 4-11/16 inches from the nearest side of the turntable spindle, loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers "14" and "17." Leave approximately 1/32 inch end play between hub of lever "20" and pickup base bearing, and tighten the blunt nose screw "D": run mechanism through several cycles as a check, then tighten cone pointed screw "D." After adjustment has been made, place 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 5-5/16 inches from nearest side of spindle. If the needle is incorrect, turn stud "E" until the eccentric stud adjusts lever "14" to correct needle landing. The eccentric end of the stud must always be toward the rear of the motor base, otherwise incorrect landing may occur with 10 inch records.

F. & G. Record Shelf.—The upper plate (knife) "25" on each of the record posts serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that there be a spacing between the knife and the rotating record shelf "27" to be accurately maintained. The spacing for the 10 inch record is nominally 0.05 inch, and for the 12 inch record is 0.075 inch. To adjust, rotate the knife to the point of minimum

vertical separation from the record shelf and turn screw and locknut "F" to give 0.05—0.036 inch separation. Screw "G" must not be depressed or damaged. After setting screw "F" adjust screw "G" so that when its tip is depressed flush with top of record shelf, the vertical spacing between the knife, in its lowest rotational position, and the shelf, is 0.072—0.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Support posts are rotated simultaneously by a gear and rack coupled to the main lever "15," and it is necessary that adjustments be such that the record is released from both shelves at the same instant. If a 12 inch record on the turntable, rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable. Lift record upward until it is in contact with both separating knives, then loosen screws "H" and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Tighten the blunt nose screw "H" run mechanism through cycle several times to check action, then tighten cone pointed screw "H." If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

I. Tone Arm Rest Support (not shown).—When the change is out-of-cycle, the front lower edge of the pickup head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" in relation to the main lever "15" governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

L. Lubrication.—Petrolatum or petroleum jelly should be applied to cam, main gear, needle pinion gears, and gears of record posts.

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. The felt washer between the turntable and spindle bearing should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual mis-adjustments will enable ready adjustments in most cases.

1. For any irregularity of operation, the adjustment of the fixed main lever should be checked. As lever "A" moves, so should lever "E." Record must not bounce and "E" must clear lever "A".

2. Needle does not land properly on both 10 and 12 inch records.—Make complete adjustments "D" and "E." Needle does not land properly on 12 inch record but correct on 10 inch.—Effect adjustment "E."" 3. Noise. Failure to trip at end of record.—Increase clutch "5." 4. Needle does not track after landing.—Friction clutch "5" adjusted too tightly. Needle does not track too tightly. 5. Needle track wont come up properly. 6. Cycle commences before record is complete.—Record is defective, or adjustment "B" of friction clutch "5" is too tight.

7. Wow in record reproduction—Record is defective: flexible coupling between motor and changer mechanism not correctly assembled; or instrument is not being operated at normal room temperature (65°F).

8. Record knives are erratic; Record edges are warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.

9. Record not released properly.—Adjust record shelf assembly in respect to shaft by means of adjustment B." 10. Needle lands in 10 inch position on 12 inch record or misses record when playing both types mixed.—Increase tension of pickup locating lever "spring 10."
AUTOMATIC RECORD CHANGER

CONTROLS AND MOVING MECHANISM

1. The pick-up must be over the needle guide plane to insert or change needles. To insert a needle, initially, loosen the needle carrier set or in the hole at the top so that it drops down against the needle guide. Move the needle carrier up to the top of the needle guide. Move the record changer to the head of the record changer. Insert the needle into the needle guides and pull it up until it is in place. Then, press the needle carrier down to the bottom of the needle guide to secure the needle in place.

2. A few drops of good quality light machine oil should be applied in the oil holes at regular intervals, about once a week, to prevent the needle carrier from sticking. This will prevent the needle from jamming in the record changer.

3. Move the needle carrier up to the top of the needle guide to remove the needle. Press the needle carrier down to the bottom of the needle guide to secure the needle in place and pull it up until it is in place.

4. The needle carrier set or in the hole at the top so that it drops down against the needle guide. Move the record changer to the head of the record changer. Insert the needle into the needle guides and pull it up until it is in place. Then, press the needle carrier down to the bottom of the needle guide to secure the needle in place.

Note: Numbers refer to parts—letters refer to adjustments.
VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 260 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
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<th>Osc. Plate</th>
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<td>6A8</td>
<td>100</td>
<td>55</td>
<td>100</td>
<td>100</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>100</td>
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<td>607</td>
<td>43</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>25L6</td>
<td>92</td>
<td>100</td>
<td>5.5</td>
<td></td>
<td>25.0</td>
</tr>
</tbody>
</table>

Voltage at 2526 cathode—128 volts.
Voltage across speaker field—28 volts.

The color coding of the i-f transformer leads is as follows:
- Grid—green
- Plate—blue
- Grid return—black

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

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MODEL S CH-243, CH-246 and CH-256

CHASSIS MODEL CH

Voltage rating .................................................. 105-125 volts, a.c. or d.c.
Power consumption ............................................. 45 watts
Frequency range .................................................. 540 to 1730 kc.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) when the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fill</th>
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<tr>
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<tr>
<td>6K7</td>
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<tr>
<td>6Q7</td>
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<td>—</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>25L6</td>
<td>92</td>
<td>100</td>
<td>5.5</td>
<td>—</td>
<td>28.0</td>
</tr>
</tbody>
</table>

Voltage at 2526 cathode—125 volts. Voltage across speaker field—28 volts.

ADJUSTMENTS

An oscillator with frequencies of 455 and 1400 kc is required.
An output meter should be used across the voice coil or output transformer for observing maximum response.
Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 456 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 456 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

i-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cap of the 6A4 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes, paragraph No. 7.)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.
GENERAL NOTES

1. The receiver should never be turned on with either the speaker plug or the 6AC7G tube out of their respective sockets, since the rapid rise in rectifier voltage will damage the electrolytic condenser.

2. When replacing the chassis in the cabinet take precautions to keep any part of the dial and condenser assembly from touching the cabinet, otherwise microphonism will result.

3. The color coding of the i-f transformers is as follows:
   - Grid—green
   - Plate—black
   - Plate—blue
   - Grid return—black

4. 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
   - 6 volt secondary—two yellow leads.

5. The adjustable padding condensers for the broadcast and police bands are mounted on the rear chassis wall with the screw adjustment accessible through holes in the rear of the chassis. The short-wave band has a fixed padder, C10, where the adjustment is accessible through a cutout in the back wall of the chassis. When replacing this fixed padder be careful to use a condenser which has a capacity within 2% of the specified value, otherwise the short-wave coils may not track.

6. An efficient antenna system is necessary to enable a full realization of the merits of the receiver. For reduction of noise and achievement of high efficiency on all frequency ranges the Emerson All-Wave High-Fidelity Antenna, Model W-10, and the Emerson All-Wave Antenna System, Model W-20, are recommended. Instructions for the installation of these antennas are supplied with each kit.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with the volume control turned on full and no signal. Line voltage for these readings was 115 volts, 60 cycle, d.c. All readings except B plus at rectifiers, heaters, and cathode voltages were taken on 250 volt scale.

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<thead>
<tr>
<th>Tube</th>
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<th>Screen</th>
<th>Cathode</th>
<th>Ove. Plate</th>
<th>F.L.</th>
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</thead>
<tbody>
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<td>206</td>
<td>85</td>
<td>0</td>
<td>11</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 (i-f)</td>
<td>206</td>
<td>85</td>
<td>0</td>
<td>11</td>
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<tr>
<td>6G7G</td>
<td>190</td>
<td>0</td>
<td>10.8</td>
<td>1</td>
<td>6.3</td>
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<tr>
<td>7E</td>
<td>206</td>
<td>0</td>
<td>11.5</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>6AC7G</td>
<td>150</td>
<td></td>
<td></td>
<td>10.5</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Voltage at B minus (center tap on high voltage winding)—300 volts.
Voltage across speaker field—56 volts.
The grid bias for all tubes is developed across resistors R17 and R18. This voltage should measure 10.5 volts.

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### Adjustments

An oscillator with frequencies of 445, 600, 1400, 1600, 1800, 6900 and 20,000 kc should be used.

An output meter should be used across the voice coil or speaker output transformer for observing maximum response.

Use a dummy antenna for aligning any of the three bands. A .0001 mf condenser may be used for broadcast band dummy antenna. A .0001 mf condenser for the police band dummy antenna and a 400 ssm non-inductive resistor for the short-wave band dummy antenna.

Use a test signal as described previously for aligning.

The set's oscillator is considerably higher in frequency than the signal on all three bands, so image should be observed on the lower frequency side of the signal.

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 a trimmer with the outside plate so loose that there is no tension on the screw. Either bend the plate up or remove the screw entirely. Loose screws are a source of noise, drifting, and intermodulation.

In aligning the antenna trimmers on the high-frequency signals there is always a tendency for the oscillator to drift, due to inter-drifting. To compensate for this always keep the variable condenser as the trimmers are being adjusted.

### I-F Alignment

Rotate the wave-band switch to the broadcast (clockwise) position. Set the variable condenser at the minimum capacity peak on a 4 mb coil through a 0.0001 mf paper condenser, to the grid cap of the 6K8 tube (do not remove the grid clip from the tube). Adjust the four i-f trimmers for maximum response.

### Broadcast Alignment

Set the wave-band switch to the broadcast (clockwise) position, and the dial at 60. Feed 500 kc to the antenna (using a standard dummy antenna) and adjust the broadcast-band series pad for maximum response. Move the dial to 155, feed 1550 kc and adjust the oscillator coil trimmer for maximum response, then adjust the interstage and antenna coil trimmers for maximum response. Reset the dial to 60, feed 600 kc and rock the variable condenser while adjusting the series pad for maximum response. Return to 1600 and check alignment. If readjustment is necessary return to 600 and repeat entire procedure.

### Police Alignment

Set the wave-band switch to the police-band (central) position and the dial at 1.8. Feed 1800 kc to the antenna (using a 0.0001 mf dummy antenna) and adjust the police-band series pad for maximum response. Adjust the dial to 1.6, feed 1600 kc to the antenna while adjusting the variable condenser while readjusting the series pad for maximum response. Return to 1600 kc and check alignment. If readjustment is necessary return to 1600 kc and repeat entire procedure.

### Short-Wave Alignment

Set the wave-band switch to the short-wave (counter-clockwise) position. Move the dial to 20 and feed 20,000 kc to the antenna (using a 4 mb dummy antenna) and adjust the short-wave oscillator trimmer for maximum response. If two peaks are obtained choose the minimum capacity peak. Then adjust the interstage and antenna coil trimmers for maximum response. If two peaks are obtained choose the maximum capacity peak. Move the dial to 5 mb, feed 6000 kc to the antenna and adjust the r-f interstage trimmer for maximum response.

### Replacements should be made with genuine Emerson parts for best results.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2, C3</td>
<td>6BC-415 3500,v, variable condenser</td>
<td>$0.55</td>
</tr>
<tr>
<td>C4, C5, C6</td>
<td>43C-403A 0.00005 mf, mica condenser</td>
<td>$0.20</td>
</tr>
<tr>
<td>C7, C8, C9</td>
<td>KC-81 0.01 mf, 600 volt tubular condenser</td>
<td>$0.20</td>
</tr>
<tr>
<td>C10</td>
<td>BC-01 0.005 mf, 600 volt tubular condenser</td>
<td>$0.20</td>
</tr>
<tr>
<td>C11</td>
<td>3EC-267 0.004 mf, mica condenser</td>
<td>$0.40</td>
</tr>
<tr>
<td>C12</td>
<td>2NC-231A Single adjustable padding condenser, range: 750-1800 mmf</td>
<td>$0.40</td>
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<tr>
<td>C13</td>
<td>2NC-231A Single adjustable padding condenser, range: 390-500 mmf</td>
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<tr>
<td>S3C-409</td>
<td>Dual adjustable padding condenser is used, order S3C-409</td>
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<td>Trimmers, part of oscillator coil assembly</td>
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</tr>
<tr>
<td>C17, C18</td>
<td>Trimmers, part of interstage coil assembly</td>
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</tr>
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<td>C19, C20</td>
<td>4EC-396A 0.00005 mf, mica condenser</td>
<td>$0.20</td>
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<td>C21</td>
<td>BC-13 0.05 mf, 200 volt tubular condenser</td>
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<td>C22</td>
<td>3EC-267 0.004 mf, 600 volt tubular or mica condenser</td>
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</tr>
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<td>C23</td>
<td>3RC-373 0.0004 mf, 600 volt tubular or mica condenser</td>
<td>$0.20</td>
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<td>2NC-231A 0.010 mf, 600 volt tubular condenser</td>
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<td>EC-23 0.03 mf, 600 volt tubular condenser</td>
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</tr>
<tr>
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<td>AC-95 0.1 mf, 200 volt tubular condenser</td>
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<tr>
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<td>3LC-297A 0.01 mf, 600 volt molded condenser</td>
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<td>4EC-396A 0.01 mf, 600 volt wet electrolytic condenser</td>
<td>$0.20</td>
</tr>
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<td>C29</td>
<td>4EC-396A 0.01 mf, 600 volt wet electrolytic condenser</td>
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</tr>
<tr>
<td>C30</td>
<td>EBC-132 0.1 mf, 400 volt tubular condenser</td>
<td>$0.20</td>
</tr>
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</table>

Item numbers locate the article on the schematic diagram.

These trimmer condensers are part of the coil assemblies and cannot be supplied separately.
MODEL BT-245
Chassis B7
Schematic, Voltage Alignment, Parts

**TUBE DATA**

The tube complement is as follows:

1. 6A7, pentode interstage amplifier.
2. 6SN7, first RF amplifier.
3. 607T, phase inverter, A.F. and P.F. stage.
4. 6AU6, phase output.
5. 6H26, dual half-wave rectifier.

All metal-base tubes are replaceable with either metal or equivalent metal-base glass tubes. The letter "G" at the end of the tube number indicates that the tube has a glass envelope. In all other respects it is the same as the metal tube bearing the same number without the "G".

**REPLACEMENT PARTS LIST**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, T1</td>
<td>6TY-444</td>
<td>Antenna coil with adjustable 455 ke trap</td>
<td>$3.00</td>
</tr>
<tr>
<td>T2</td>
<td>6XT-468</td>
<td>Oscillator coil</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>6TY-462</td>
<td>Double-tuned 455 ke first i.f. transformer</td>
<td>$9.00</td>
</tr>
<tr>
<td>T4</td>
<td>6XT-418A</td>
<td>Double-tuned 466 ke second i.f. transformer</td>
<td>$20.00</td>
</tr>
<tr>
<td>R1</td>
<td>ZEB-126</td>
<td>10,000 ohm 1/4 watt carbon resistor</td>
<td>$1.20</td>
</tr>
<tr>
<td>R2</td>
<td>TCR-33</td>
<td>6,000 ohm 1/4 watt carbon resistor</td>
<td>$2.50</td>
</tr>
<tr>
<td>R3</td>
<td>£FR-290</td>
<td>140 ohm 1/4 watt wire-wound resistor</td>
<td>$1.50</td>
</tr>
<tr>
<td>R4</td>
<td>£R-80</td>
<td>1 megohm 1/4 watt carbon resistor</td>
<td>$4.00</td>
</tr>
<tr>
<td>R5</td>
<td>JR-214</td>
<td>Volume control 3 megohm with line switch</td>
<td>$4.00</td>
</tr>
<tr>
<td>R6</td>
<td>£R-217</td>
<td>15 megohm 1/4 watt carbon resistor</td>
<td>$2.00</td>
</tr>
<tr>
<td>R7</td>
<td>£K-66</td>
<td>150,000 ohm 1/4 watt carbon resistor</td>
<td>$4.00</td>
</tr>
<tr>
<td>R8</td>
<td>£R-66</td>
<td>500,000 ohm 1/4 watt carbon resistor</td>
<td>$8.00</td>
</tr>
<tr>
<td>L198B</td>
<td>Plug-in ballast resistor. (Interchangeable with L-49B)</td>
<td>$1.50</td>
<td></td>
</tr>
<tr>
<td>C1, C2</td>
<td>STC-433</td>
<td>Two-gap variable condenser</td>
<td>2.40</td>
</tr>
<tr>
<td>C3</td>
<td>4C-401</td>
<td>0.0005 uf mica condenser</td>
<td>1.00</td>
</tr>
<tr>
<td>C4</td>
<td>421, C11</td>
<td>Trimmer, part of wave-trap assembly</td>
<td>2.00</td>
</tr>
<tr>
<td>C5, C11</td>
<td>Trimmers, part of variable condenser</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>C6, C7, C8, C9</td>
<td>Trimmers, part of i.f. transformers</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>8C-12</td>
<td>0.05 mf, 200 volt tubular condenser</td>
<td>1.50</td>
</tr>
<tr>
<td>C12, C14</td>
<td>6C-24G</td>
<td>0.05 mf, 200 volt tubular condenser</td>
<td>2.00</td>
</tr>
<tr>
<td>C15</td>
<td>6C-24G</td>
<td>0.05 mf, 200 volt tubular condenser</td>
<td>2.00</td>
</tr>
<tr>
<td>C16</td>
<td>4C-401</td>
<td>0.5 ohm, 600 volt tubular condenser</td>
<td>1.00</td>
</tr>
<tr>
<td>C17</td>
<td>4C-401</td>
<td>0.92 ohm, 600 volt tubular condenser</td>
<td>1.50</td>
</tr>
<tr>
<td>C19</td>
<td>4C-401</td>
<td>0.95 uf, 400 volt tubular condenser</td>
<td>3.00</td>
</tr>
<tr>
<td>C20, C21</td>
<td>HHC-344D</td>
<td>Dual 20 uf, 150 volt dry electrolytic condenser</td>
<td>0.20</td>
</tr>
<tr>
<td>L4, L5</td>
<td>94-315B</td>
<td>5 dynamic speaker</td>
<td>5.00</td>
</tr>
<tr>
<td>C111</td>
<td>C36A</td>
<td>Tone control switch</td>
<td>1.50</td>
</tr>
<tr>
<td>C12</td>
<td>8L-84</td>
<td>Pilot light, 6.8 volt, 35 amp, Mazda No. 44</td>
<td>5.00</td>
</tr>
<tr>
<td>C13</td>
<td>8D-84</td>
<td>Dial face</td>
<td>1.00</td>
</tr>
<tr>
<td>C14, C15</td>
<td>4Z-315</td>
<td>Drive cord</td>
<td>1.00</td>
</tr>
<tr>
<td>C16</td>
<td>4Z-315</td>
<td>Drive cord spring</td>
<td>1.00</td>
</tr>
<tr>
<td>C17</td>
<td>4Z-70A</td>
<td>Dial pointer</td>
<td>1.00</td>
</tr>
<tr>
<td>C18</td>
<td>4Z-842</td>
<td>Dial crystal</td>
<td>1.00</td>
</tr>
</tbody>
</table>

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Location of Coils and Trimmer Adjustments

The first i-f transformer is mounted on top of the chassis deck beside the speaker. The trimmers are accessible through holes in the top of the can.

The second i-f transformer is mounted underneath the chassis beneath the variable condenser. The trimmers are accessible through holes in the top of the chassis directly beneath the variable condenser.

The trimmers for the antenna and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The 455 kc wave-trap is mounted on the same form as the antenna coil directly behind the speaker. The trimmer for the 455 kc wave-trap is mounted on the coil and is accessible from the rear of the chassis. The oscillator coil is located underneath the chassis, beneath the first i-f transformer.

I-f and Wave-Trap Alignment

Swing the variable condenser to the maximum capacity position. Feed 455 kc to the grid-cap of the 12A8 tube through a .01 mf condenser and adjust the four i-f trimmers for maximum response. Feed 455 kc through a .0001 mf condenser to the antenna lead and adjust the wave-trap for minimum response. (See General Notes, paragraph No. 5.)

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna lead and adjust first the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus with the volume control turned on full and no signal. Line voltage for these readings was 117.6 volts, 60 cycles, a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c. will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12A8</td>
<td>94</td>
<td>50</td>
<td>0</td>
<td>94</td>
<td>12</td>
</tr>
<tr>
<td>12K7</td>
<td>94</td>
<td>94</td>
<td>0</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>12Q7</td>
<td>40</td>
<td>42</td>
<td></td>
<td>12</td>
<td>5.2</td>
</tr>
<tr>
<td>35L6</td>
<td>87</td>
<td>94</td>
<td>5.2</td>
<td></td>
<td>85</td>
</tr>
</tbody>
</table>

Voltage at 35Z4 cathode—121 volts.
Voltage across pilot light section of ballast resistor (R9)—3.5.
Voltage across speaker field—27 volts.
Voltage drop across entire ballast resistor (R9 and R10)—13.5.
**TABLE OF PARTS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Effective as of March 1st, 1939</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>6FT-461</td>
<td>Broadcast antenna coil</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>6FT-462</td>
<td>Broadcast detector coil</td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>6F-346</td>
<td>Volume control 75,000 ohms with 200 ohm bias stop and line switch</td>
<td>.50</td>
</tr>
<tr>
<td>R2</td>
<td>3EF-275</td>
<td>10 megohm 1/4 watt resistor</td>
<td>.10</td>
</tr>
<tr>
<td>R3</td>
<td>R4</td>
<td>500,000 ohm 1/4 watt carbon resistor</td>
<td>.16</td>
</tr>
<tr>
<td>R5</td>
<td>3FR-252</td>
<td>140 ohm 1/4 watt wire-wound resistor</td>
<td>.16</td>
</tr>
<tr>
<td>R6</td>
<td>6FR-348</td>
<td>2,400 ohm 1/4 watt carbon resistor</td>
<td>.16</td>
</tr>
<tr>
<td>R7</td>
<td>R8</td>
<td>Resistance line cord with pilot light section</td>
<td>.80</td>
</tr>
<tr>
<td>C1, C2</td>
<td>6FC-416</td>
<td>Two-gang variable condenser</td>
<td>2.30</td>
</tr>
<tr>
<td>F3, F4</td>
<td>R7C</td>
<td>Trimmers, part of variable condenser.</td>
<td></td>
</tr>
</tbody>
</table>

*Item number locates the article on the schematic diagram.*

**VOLTAGE ANALYSIS**

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to ground (chassis) with volume control turned on full and no signal. The line voltage for these readings was 117.5 volts, 60 cycles, a.c. All readings except cathodes and heaters were taken on 250 volt scale. Readings taken on d.c. will be slightly lower.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12BBG</td>
<td>95 (pin no. 3)</td>
<td>95 (pin no. 4)</td>
<td>2.1 (pin no. 1)</td>
<td>12</td>
</tr>
<tr>
<td>60</td>
<td>40 (pin no. 5)</td>
<td>4.0 (pin no. 6)</td>
<td>4.5 (pin no. 8)</td>
<td>32</td>
</tr>
</tbody>
</table>

Voltage at rectifier cathode—130 (pin no. 1)

The socket connections of the tubes used in the CF chassis are as follows, the numbering following standard designation R.M.A.

**ALIGNMENT PROCEDURE**

An oscillator with a frequency of 1600 kc is required.

Use as weak a test signal as possible. An output meter should be used across the voice coil or output transformer for observing maximum response.

Examine the condenser drive assembly bracket and locate five dots embossed along the front. Rotate the variable condenser to maximum capacity and set the pointer just below the bottom dot. Then rotate the condenser until the pointer is just below the second dot from the top. Feed 1600 kc to the antenna through a .0001 mf condenser and adjust both trimming condensers for maximum response.

**A.C.-D.C. T.R.F. Receiver—Two Tubes**

Voltage rating: 105 to 125 volts, a.c. or d.c.

Power consumption: 40 watts.

Frequency range: 540 to 1730 kc.
**GENERAL NOTES**

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. In operating the receiver on d.c. it may be necessary to reverse the line plug for correct polarity.

3. The color coding of the i-f transformer leads is as follows:
   - Grid—green
   - Plate—blue

4. Models CM-269, 268 and 267 have self-contained antennas and do not require additional antenna connections. For permanent home installation, a large model, however, if it is desired to improve reception of weak stations, an additional outdoor antenna should be used. For this purpose a terminal is provided in the cabinet for antenna connection. It is not necessary to remove the chassis from the cabinet to make this connection. The screw is easily reached through a hole in the bottom of the cabinet.

5. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcast ing source. It is important, therefore, once the station is tuned, rotate the cabinet back and forth through a quarter of a cycle (90 degrees), locating it at the position where the station is received with maximum volume.

6. On some models the bottom of the chassis is covered with a metal bottom plate. To reach the internal chassis parts, this plate must be unscrewed and removed.

**ADJUSTMENTS**

An oscillator with frequencies of 455 and 100 kHz is required.

An output meter should be used across the voice coil or output transformer for observing maximum response. Always use as weak a test signal as possible when aligning the receiver.

**Location of Coils and Trimmer Adjustments**

The first i-f transformer is mounted on top of the chassis deck to the right of the speaker. The trimmers are accessible through holes in the top of the case.

The second i-f transformer is mounted on top of the chassis behind the speaker. The trimmers are accessible through holes in the top of the case.

The trimmers for the trimmer and oscillator coils are located on the variable condenser. The trimmer on the front section is for the antenna coil.

The oscillator coil is located underneath the chassis, beneath the speaker. The loop antenna acts as the antenna coil.

**1-f and Wave-Trap Alignment**

Swing the variable condenser to the minimum capacity position. Feed 455 kHz to the grid of the 12AT7 tube through a .001 mf capacitor and adjust the four i-f trimmers for maximum response.

**R-f Alignment**

Set the dial pointer at 406. Feed 1440 kHz through a .001 mf capacitor to the antenna connection and adjust first the oscillator trimmer (on rear section of variable condenser). Then the antenna trimmer (on front section of variable condenser) for maximum response.

**Distribution of Parts**

**For serial numbers below 2,690,200:**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Value</th>
<th>Part No.</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT8</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT9</td>
<td>87</td>
<td>84</td>
<td>84</td>
<td>84</td>
</tr>
</tbody>
</table>

**For serial numbers above 2,690,200:**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Value</th>
<th>Part No.</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT8</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT9</td>
<td>87</td>
<td>84</td>
<td>84</td>
<td>84</td>
</tr>
</tbody>
</table>

**VOLTAGE ANALYSIS**

Readings should be taken with a 1000 ohm-per-volt meter. Voltages listed below are from point indicated to B minus (wrt) with the volume control turned all the way clockwise. Voltages for these readings are 117.3 volts, 90 cy, and 60 cyc respectively. All readings except heaters and grid leaks were taken with 250 volt scale. Measurements made with 117.3 volts d.c. will be lower than those given above.

**For serial numbers below 2,690,200:**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Value</th>
<th>Part No.</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT8</td>
<td>94</td>
<td>94</td>
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<td>94</td>
</tr>
<tr>
<td>12AT9</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
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</tbody>
</table>

**For serial numbers above 2,690,200:**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Value</th>
<th>Part No.</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7</td>
<td>94</td>
<td>94</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>12AT8</td>
<td>94</td>
<td>94</td>
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</tr>
<tr>
<td>12AT9</td>
<td>94</td>
<td>94</td>
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<td>94</td>
</tr>
</tbody>
</table>

**Alignment, Changes and Parts List:**

M067 Early, Late

**Models 2690-C, C2690**

Chassis CM-2690... Cue and Below Serial 2690000

www.americanradiohistory.com
Schematic, Voltage
Batt, Wiring, Changes

EMERSON RADIO & PHONOGRAPH CORP.

MODELS CE-259, CE-260
Chassis CE

TUBE DATA

The tube complement is as follows:

1—1A7G, oscillator-modulator
1—1N8G, 1st i-f amplifier
1—1N8G, 2nd i-f amplifier
1—1H5G, 2nd detector, a.v.c., a-f amplifier
1—1C5G, pentode output

Five-Tube Battery-Operated Superheterodyne

MODELS CE-259 and CE-260

CHASSIS MODEL CE

Current drain
"A" battery—0.3 amps.
"B" battery—0.010 amps. with no signal

Frequency range
540 to 1730 kc on early Model CE-259
530 to 1600 kc on all Model CE-260
and later Model CE-259

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohm/detector voltmeter. Voltages listed are from points indicated to chassis. With volume control turned on full and no signal. The battery voltages for these readings were: "A" 5.6 volts, "B" 90 volts.

Bias for the LCG tube is obtained across the resistor R11. The voltage drop across this resistor should be 7.8 volts.

PRODUCTION CHANGES

1. Chassis bearing serial numbers below 2407500, condenser C15 is connected from high side of the volume control to chassis ground. Condenser C15 is mounted on the right hand side of the front panel. No R26 is used.

2. On models CE-259, the antenna trimmer condenser C17 is mounted on the front panel of the chassis. Serial numbers above 2407500, condenser C15 is connected from high side of the volume control to chassis ground.
MODELS CE259, CE260
Chassis CE
EMERSON RADIO & PHONOGRAPH CORP.
Socket, Trimmers, Alignment, Parts

MODELS CE-250 AND CE-260

GENERAL NOTES

1. Batteries: The Models CE-259 and CE-260 are designed to house the complete set of batteries within the cabinet.

   The battery complement should be as follows:

   FOR MODEL CE-259 (Portable)
   Type Battery No. Req. Everyday Part No. Ray-o-vac Part No.
   45 volt "B" 2 P-44A (plug-in type) P-44A (plug-in type)

   FOR MODEL CE-260
   Combined "A" and "B" Pack 1 748 (plug-in type) AB9S (plug-in type) (Also Burgess No. 11G-350)

2. The color coding of the i-f transformer leads is as follows:

   Grid — green
   Plate — blue
   B plus — red
   Black — minus

3. The color coding of the battery cable is as follows:

   Red — B plus, 90 volts
   Blue — B minus
   Yellow — A plus, 15 volts
   Black — A minus

4. If replacements are made in the r-f section of the circuit, the receiver should be carefully re-aligned.

5. Models CE-259 and CE-260 have self-contained antennas and do not require additional antenna or ground connections. For permanent home installations of either model, however, it is desired to improve reception of weak stations an additional outdoor antenna should be used. For this purpose a terminal strip is provided in the cabinet for antenna and ground connections. (See diagram on next page.)

6. The self-contained loop antenna operates at maximum efficiency when its position is at right angles to the broadcast ing transmitter's trimmer, therefore, once 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 station is received with maximum volume. This procedure is not necessary for receivers with outside antennas.

ADJUSTMENTS

An oscillator with frequencies of 455 and 1400 kc is required.

An output meter should be used across the voice coil or output transformer for observing maximum response. Always use as weak a test signal as possible when aligning the receiver.

Location of Coils and Trimmer Adjustments

The oscillator coil is located beneath the chassis. The trimmer for the oscillator is on the rear section of the variable condenser. The loop antenna acts as the antenna coil. This coil is for the loop, when provided, or on the front section of the variable condenser. (See Production Change No. 3)

I-f Alignment

Model CE-259 (below serial number 2,219, 600). Swing variable condenser to maximum capacity position.

Model CE-260 (above serial number 2,219, 600) and CE-260. Swing variable condenser to maximum capacity position.

Feed 455 kc to the grid of the 1A7G tube through a 0.01 mf condenser. Adjust the i-f trimmers for maximum response.

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a 5000 mf condenser to the antenna connecting and adjust the oscillator trimmer (on rear section of variable condenser) then the antenna trimmer (on front section of variable condenser) for maximum response.

Battery Installation for Model CE-259

To install and connect the batteries in the portable cabinet observe the following procedure:

1. Open the end side of the cabinet (side with speaker grille) by removing the two wood screws in the top corners of the panel. The panel is hinged at the bottom. Open the panel by pulling the small leather tab at the top edge.

2. A small wood cleat is fastened to the bottom of the cover directly below the two large wood rails. Remove this cleat by taking out the small wood screws.

3. The three-prong plugs on the battery cable from the receiver should be plugged into the two "B" batteries.

4. Slide the "B" batteries, one at a time, in an upright position between the two wood rails in the cabinet, as indicated in the diagram.

5. Replace the small wood cleat in front of the battery and fasten it securely with the wood screws.

6. The small two-prong plug in the battery cable should be plugged into the "A" battery. Place the "A" battery in the front cover of the cabinet, as shown in the diagram.

7. Be sure that all of the cable wires are free and clear of the receiver. Care should be taken also to keep the wires from jamming between the wood rails and the batteries.

8. Close the end panel and replace the wood screws, fastening them securely.

Battery Installation for Model CE-260

The cabinet for this model is designed to house completely the combined "A" and "B" pack. Place the battery pack in the cabinet at the rear of the receiver and insert the four-prong plug of the battery cable into the socket on the top of the battery.

If it is desired to use separate "A" and "B" plug-in type batteries, a special cable harness is available for connecting the batteries together. The receiver battery cable then may be plugged into the socket on the special cable harness.

When ordering replacement parts specify part numbers.

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MODELS CR-261, CR-262 and CR-274

CHASSIS MODEL CR

ALIGNMENT AND LOCATION OF TRIMMERS

IF, 455kc through .01 mf. cond. to grid of 12A8G
1st IF, top of chassis right of speaker; 2nd IF
under chassis beneath variable, holes provided in
top of chassis. Variable max. o.s. Adjust trimmers
to max. response.

Wave Trap (see GENERAL NOTES) Feed 455kc through
.0001 mf. cond. to ant. lead. Adjust for maximum
response.

RF, Dial at 140. Feed 1400kc through .0001 mf. cond.
to ant. lead. Adjust o.s. trimmer (rear section of
variable), then ant. trimmer (front section of vari-
able) for maximum response.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully
re-aligned.

2. In operating the receiver on d.c. it may be necessary to reverse the line plug for correct polarity.

3. The color coding of the i-f transformer leads is as follows:
   Grid—green   Plate—blue
   Grid return—black   B plus—red

4. The wave-trap in the receiver has been adjusted for maximum signal rejection at 455 kc. If, however, persistent
interference is experienced from some particular telegraphic station, readjust the wave-trap trimmer until the response
from the interfering station is at a minimum.

VOLTAGE ANALYSIS

Readings should be taken with a 1000 ohms-per-volt meter. Voltages listed below are from point indicated to B minus
(switch) with the volume control turned on full and no signal. Line voltage for these readings was 117.5 volts, 60 cycles,
a.c. All readings except heaters and cathodes were taken on 250 volt scale. Measurements made with 117.5 volts d.c.
will be lower than those given below.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Osc. Plate</th>
<th>Fil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12A8G</td>
<td>88</td>
<td>45</td>
<td>0</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>12K7GT</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>—</td>
<td>12</td>
</tr>
<tr>
<td>12S27GT</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>12</td>
</tr>
<tr>
<td>50L6GT</td>
<td>82</td>
<td>88</td>
<td>5.7</td>
<td>—</td>
<td>60</td>
</tr>
</tbody>
</table>

EMERSON RADIO & PHONOGRAPH CORP.

Current drain ... “A” battery—0.3 amps.
“B” battery—0.010 amps. with no signal
Frequency range ... 330 to 1350 kc

Alignment

The color coding of the battery cable is as follows:
Red—B plus, 90 volts
Blue—B minus
Yellow—A plus, 1.5 volts
Black—A minus

Batteries: The Model CT-275 is designed to house the complete set of batteries within the cabinet. The battery complement should be as follows:

<table>
<thead>
<tr>
<th>Type Battery</th>
<th>No. Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2 volt “A”</td>
<td>1</td>
</tr>
<tr>
<td>45 volt “B”</td>
<td>2</td>
</tr>
</tbody>
</table>

The color coding of the i-f transformer leads is as follows:
Grid—green
Grid return—black
The color coding of the battery cable is as follows:
Plate—blue
B plus—red

The i-f transformers are located in cans mounted on top of the chassis. The first i-f transformer is the one between the speaker and the variable condenser. The diode i-f transformer is the one behind the speaker. The trimming condensers for both transformers can be reached through holes in the tops of the cans.

I-f Alignment

The oscillator coil is located beneath the chassis. The trimmer for the oscillator is on the rear section of the variable condenser.

Swing variable condenser to minimum capacity position.
Feed 455 kc to the grid of the 1A7G tube through a 0.01 mf condenser. Adjust the four i-f trimmers for maximum response.

R-f Alignment

Set the dial pointer at 140. Feed 1400 kc through a .0001 mf condenser to the antenna connection and adjust the oscillator trimmer (on rear section of variable condenser) for maximum response. No alignment necessary on antenna circuit.

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Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked. Tune as follows:—Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Connect modulated oscillator to grid of 640 tube in series with a .0002 condenser. Connect oscillator to antenna lead using a .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 to give maximum output. Check sensitivity at 100 and 600 K.C. with magic wand.

Model 460

These readings taken with Line Voltage 120 A.C.

<table>
<thead>
<tr>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Anode</th>
</tr>
</thead>
<tbody>
<tr>
<td>6460T</td>
<td>105</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>6X707</td>
<td>104</td>
<td>104</td>
<td>7</td>
</tr>
<tr>
<td>6X707</td>
<td>105</td>
<td>106</td>
<td>7</td>
</tr>
<tr>
<td>625GT</td>
<td>95</td>
<td>106</td>
<td>7</td>
</tr>
<tr>
<td>625GT</td>
<td>95</td>
<td>106</td>
<td>7</td>
</tr>
</tbody>
</table>

Alignment Layout

- T-1 (456 Kc) - T-2 (456 Kc) - T-3 (456 Kc)
- T-4 (456 Kc) - T-5 (500 Kc)
- T-6 (500 Kc) - T-7 (500 Kc)
- T-8 (600 Kc) - T-9 (600 Kc)

Model 461

These readings taken with Line Voltage 120 A.C.

<table>
<thead>
<tr>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>Anode</th>
</tr>
</thead>
<tbody>
<tr>
<td>647</td>
<td>104</td>
<td>58</td>
<td>2.1</td>
</tr>
<tr>
<td>626</td>
<td>104</td>
<td>104</td>
<td>3.0</td>
</tr>
<tr>
<td>6X707</td>
<td>45</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>6256</td>
<td>98</td>
<td>104</td>
<td>6.7</td>
</tr>
<tr>
<td>2525</td>
<td>120 A.C.</td>
<td>133</td>
<td></td>
</tr>
</tbody>
</table>
Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows: Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Tone control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 6AS6 tube in series with a 2 condenser and adjust trimmers 1-2-3-4 for maximum output at 456 K.C. reducing input signal of oscillator as required. Check pointer with condenser fully switched. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 for maximum output. Turn dial pointer to 600 K.C. Adjust paddder T8 rocking gong condenser for maximum output. Rochock alignment at 1500 K.C. Shift oscillator to 456 K.C. and rock trimmer on wave trap for minimum signal. Check sensitivity at 1000 K.C. using magic wand. Turn band switch to Short Wave position. Set dial at 15 M.C. Use a 400 ohm carbon resistor for dummy antenna. With a 15 M.C. signal adjust T-5 for maximum output. Check image at 14.1 M.C. increasing input signal if necessary. Check sensitivity at 10 M.C. and 6 M.C.

<table>
<thead>
<tr>
<th>Part</th>
<th>List</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.53</td>
<td>5.98</td>
<td>Volume Control</td>
<td>40.78</td>
</tr>
<tr>
<td>45.84</td>
<td>.65</td>
<td>Tone Switch</td>
<td>45.121</td>
</tr>
<tr>
<td>45.87A</td>
<td>.70</td>
<td>Band Switch</td>
<td>3.90</td>
</tr>
<tr>
<td>40.73</td>
<td>3.50</td>
<td>Power Transformer</td>
<td>23.306</td>
</tr>
<tr>
<td>35.119A</td>
<td>1.35</td>
<td>Antenna Coil</td>
<td>106.123</td>
</tr>
<tr>
<td>35.133</td>
<td>.80</td>
<td>Oscillator Coil</td>
<td>106.119</td>
</tr>
</tbody>
</table>

Prices subject to change without notice.
FADA RADIO & ELECTRIC CO

MODEL 6A80

Schematic, Socket, Voltage

Diagram:

Model 6A80

- Model 6A80 schematic diagram

Components:
- 6K7G, 6A8G, 6K7G, 6K7G
- Plate: 265, 266, 265, 265
- Screen: 95, 95, 95, 95
- Cathode: 3.8, 5.2, 7.2, 9
- Anode: 136

Model 646G

- Plate: 83, 225 (710A plate)
- Screen: 265 to late
- Cathode: 1.9, 13 (356C fil. to)
- Anode: ground

Notes:
- These readings taken with line voltage 120 A.C. 1000 ohm per volt meter.

---

Thesis Readings:
- Plate, Screen, Cathode, and Anode measurements.
FADA FLASH-O-MATIC SIX

INTRODUCTION: FADA Flash-O-Matic Six is an electrical type automatic tuning system that, once adjusted, will automatically "tune in" any one of six local broadcast stations operating between 540 and 1500 kilocycles (K.C.). While the Flash-O-Matic is not confined to local reception, it should be adjusted for stations affairs the best reception and most frequently "tuned in."

ALIGNING PROCEDURE: It is advisable that the receiver remain in operation for Fifteen minutes or more before attempting any adjustments. Now that the receiver has reached constant temperature the following adjustments are to be made to the trimmer condenser set screws located on the Flash-O-Matic tuning panel at the rear of the receiver.

(a) Select six local broadcast stations whose programs are preferred, then, detach the station call letters from the station call letter tab sheets, which are supplied with each receiver.

(b) The six Flash-O-Matic positions are numbered and arranged according to frequency limits.

There are number tabs (1 to 6) in the Flash-O-Matic escutcheon as shipped from the factory. These tabs show the relation between the Flash-O-Matic escutcheon and the Flash-O-Matic tuning panel positions and are to be removed, one at a time (with the aid of a pin) when inserting the station call letters.

The six call letter tabs corresponding to the six broadcast stations which have been chosen, must be arranged in the Flash-O-Matic escutcheon so that the frequency in kilocycles of each station will fall within the frequency limits of the proper group.

If one of the chosen stations has an operating frequency of 550 K.C., it should be placed in the No. 1 (530 to 710 K.C.) group, a station of 600 K.C. should be placed in the No. 2 group, etc.

Each group has considerable overlap to allow for the selection of six stations which may have frequency assignments comparatively close together.

Having inserted the call letter tabs, cover each tab with a celluloid disc furnished with your receiver.

(c) Two trimmer condenser set screws are provided for each one of the six station positions and are accessible at the rear of the receiver. All trimmer condenser set screw adjustments are marked as to their group number and frequency range coverage.

(d) Tune in the station in the usual manner, using manual tuning, and determine the program.

(e) Turn the wave band switch completely to the right (clockwise).

(f) Turn the Flash-O-Matic selector switch to the position that corresponds to the group in which the desired station falls. This can be readily determined, for as the Flash-O-Matic selector switch is turned the various call letters will light up.

(g) The toggle switch (SEE ILLUSTRATION) near the center of the Flash-O-Matic tuning panel should be thrown to the "UP" position during the following adjustments.

(h) With the aid of a screwdriver adjust (by turning clockwise or counter-clockwise) the OSC. trimmer condenser set screw (SEE ILLUSTRATION) corresponding to the proper station, until the same station that was tuned in manually down so that any variation in sound output can be noted and readjust set screw for maximum sound output. A LIKE PARTICULAR CARE IS TO BE MENTIONED HERE. ADJUSTMENT THAT THE SAME STATION IS HEARD AND NOT ONE NETWORK STATION BROADCASTING THE SAME PROGRAM.

(i) Now adjust the ANT. trimmer condenser set screw (SEE ILLUSTRATION) having the same position number, for maximum sound output.

(j) Repeat the same procedure as outlined above for each of the remaining five stations.

(k) To insure accurate adjustment, it may be found advisable to repeat the operations outlined in paragraphs (h), (i) and (j).

Having completed the adjustments for the desired stations the toggle switch (SEE ILLUSTRATION) is thrown to "DOWN" position. The receiver is now ready for Flash-O-Matic operation and any one of the six stations to which the Flash-O-Matic has been adjusted, may be instantly "tuned in" by merely rotating the Flash-O-Matic selector knob to the desired station position.

(m) In order to reset one or more positions of the Flash-O-Matic tuning to other stations, it is merely necessary to follow the instructions outlined above; additional celluloid discs are supplied for this purpose.

OPERATING PROCEDURE: For Flash-O-Matic tuning turn the wave band switch completely to the right (clockwise); this will reduce the illumination of the station selector dial. Then, turn the Flash-O-Matic selector switch until the call letters of the desired station are illuminated. To return to standard or manual tuning simply turn the wave band selector switch toward the left (counter-clockwise) to the desired wave band.

ALIGNMENT MODELS 6480

Tuning ranges 533-1730 K.C., 1,7157 M.C. and 5.67 and 18.1 M.C. Tubes 3869 with 5666-5665-60-80. Remove chassis and connect output meter across coil of speaker. Set dial pointer at 1000 K.C. Turn volume control to maximum. Tone switch to high end. Band switch to broadcast. Connect modulated oscillator to grid of 6480 in series with .1 condenser and adjust trimmers 1-2-3-4-5-6 for maximum output at 456 K.C. reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a 1000 condenser as dummy antenna. With a 1500 signal adjust trimmers 7-8-9 for maximum output, reducing input signal as required. Turn pointer to 600 K.C. Shift oscillator to 600 K.C. and adjust paddler 16 for maximum while rocking gain, condenser. Check alignment at 1000 K.C. Turn band switch to position 5- turn pointer to 5 M.C. Use a 400 ohm carbon resistor for dummy antenna. Adjust trimmers 10-11-12 for maximum output. Check output at 8 and 24. Take sure 6 M.C. was aligned and readjust any image. Turn band switch to position 6- turn pointer to 15 M.C. Adjust trimmers 13-14-15 for maximum. Check image at 14.1. Check sensitivity at 6 M.C.©John F. Rider, Publisher
Alignment Instructions:

--- Turn volume control to maximum position. Connect a modulated oscillator to antenna coax using an 0002 condenser as a dummy antenna. Turn condenser to minimum position. Roughly adjust to 1750 Kc. Set oscillator at 1000 Kc. Turn condenser until signal is loudest. Then adjust trimmers 1 & 2 for maximum signal reducing output of oscillator as required. Check alignment at 600 & 1000 Kc. using magic wand. Slight adjustments can be made at 600 Kc. by adjusting rotor plates.

For other data on these models, see index.

--- Remove chokes and connect output meter across voice coil of speaker. Set dial pointer at 1000 Kc. and turn volume control to maximum position. Tone control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 6A7 tube in series with a .1 condenser and adjust trimmers 1-2-3-4 for maximum output at 456 Kc. Reducing input signal of oscillator as required. Connect condenser fully meshed. Turn pointer to 1500 Kc. Connect oscillator to antenna using a .0002 condenser as dummy antenna. With a 1500 Kc. signal adjust trimmers 5 & 6 for maximum output. Turn dial pointer to 600 Kc. Adjust pad for maximum output. Connect oscillator to antenna using a .0002 condenser as dummy antenna. With a 1500 Kc. signal adjust trimmers 5 & 6 for maximum output. Check sensitivity at 1000 Kc. using magic wand. Turn band switch to Short Wave position. Set dial at 15 Kc. Use a 400 ohm carbon resistor for dummy antenna. With a 15 Kc. signal adjust 5 & 6 for maximum output. Check sensitivity at 10 Kc. increasing input signal if necessary. Check sensitivity at 10 Kc. and 6 Mpc.

--- Remove chokes and connect output meter across voice coil of speaker. Set dial pointer at 1000 Kc. and turn volume control to maximum position. Connect modulated oscillator to grid of 6A7 tube in series with a .1 condenser and adjust trimmers 1-2-3-4 for maximum output at 456 Kc. Reducing input signal of oscillator as required. Connect condenser fully meshed. Turn pointer to 1500 Kc. Connect oscillator to antenna using a .0002 condenser as dummy antenna. With a 1500 Kc. signal adjust trimmers 5 & 6 for maximum output. Check sensitivity at 1000 Kc. and 600 Kc. using magic wand.
FADA RADIO & ELECTRIC CO

MODEL S46
Schematic, Voltage
Alignment, Trimmers
Socket, Coils

Schematic Diagram

**NOTE:**
- = Chassis
$ = Thousand

**Alignment Instructions:** Do not attempt to align receiver until all other causes of trouble are checked then proceed as follows:

1. Remove chassis from case and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Connect modulated oscillator to grid of 6A86 tube in series with .01 condenser. Adjust trimmers 1-2-3-4 for maximum reading at 456 K.C., reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna load using .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 to give maximum output. Check sensitivity at 1000 and 600 K.C. with magic wand.

***USE ONLY GENUINE FACTORY REPLACEMENT PARTS***

<table>
<thead>
<tr>
<th>Part</th>
<th>List</th>
</tr>
</thead>
<tbody>
<tr>
<td>75.207</td>
<td>Dial Assembly</td>
</tr>
<tr>
<td>50.45</td>
<td>Volume Control</td>
</tr>
<tr>
<td>35.3</td>
<td>Antenna Coil</td>
</tr>
<tr>
<td>35.72</td>
<td>Input I.F.</td>
</tr>
<tr>
<td>35.113</td>
<td>Output I.F.</td>
</tr>
<tr>
<td>25.92A</td>
<td>Variable Condenser</td>
</tr>
<tr>
<td>6A86</td>
<td>Electrolytic Condenser</td>
</tr>
<tr>
<td>6K7</td>
<td>Speaker</td>
</tr>
<tr>
<td>6Q7G</td>
<td>Pilot Light Socket</td>
</tr>
<tr>
<td>30.26</td>
<td>Knobs (ivory)</td>
</tr>
<tr>
<td>75.245</td>
<td>Crystal</td>
</tr>
</tbody>
</table>

Prices subject to change without notice.

© John F. Rider, Publisher
Alignment, Trimmers

Socket

FADA RADIO MODEL 54 - 115 VOLTS - 50-60 CYCLES A.C. - Tuning Range 540-1720 and 1550-4000 K.C. - 5 Tube Superheterodyne. Tubes required-6A7-6D6-6Q7G-6Y6G-80.

Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows:-

1. Remove chassis and connect output meter across voice coil of speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Band switch in broadcast position. Connect modulated oscillator to grid of 6A7 tube in series with a .1 condenser. Adjust trimmers 1-2-3-4 for maximum reading at 456 K.C. reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 to give maximum output. Check sensitivity at 1000 and 600 K.C. using magic wand. Set band switch in police band position and check sensitivity at 2800 K.C. Do not disturb trimmers for this operation.

Prices subject to change without notice.

<table>
<thead>
<tr>
<th>Part</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.47A</td>
<td>Volume Control</td>
</tr>
<tr>
<td>45.44</td>
<td>Band Switch</td>
</tr>
<tr>
<td>75.229</td>
<td>Vomitor Drive</td>
</tr>
<tr>
<td>35.122</td>
<td>Antenna Coil</td>
</tr>
<tr>
<td>35.132</td>
<td>Oscillator Coil</td>
</tr>
<tr>
<td>35.72</td>
<td>Input I.F.</td>
</tr>
<tr>
<td>35.73</td>
<td>Output I.F.</td>
</tr>
<tr>
<td>40.72A</td>
<td>Power Transformer</td>
</tr>
</tbody>
</table>

These readings taken with line voltage 120 A.C.

©John F. Rider, Publisher
**ALIGNMENT**

1. VOLUME CONTROL .... MAXIMUM.
2. ATTENUATE SIGNAL TO CONTROL SIGNAL OUTPUT.
3. CONNECT PROPER DUMMY ANTENNA, FOR EACH ADJUSTMENT, IN SERIES WITH HIGH POTENTIAL SIDE OF SIGNAL GENERATOR. FOR .001 MFD. CONDENSER, USE PAPER TUBULAR TYPE (400V); FOR 800 MFD., WIGA; 400 AND 50,000 ohm RESISTORS, CARBOR 1/3 WATT.
4. GROUND LOW POTENTIAL SIDE OF SIGNAL GENERATOR.
5. FOR ADJUSTING THE I.F. TRIMMER CONDENSERS, THE CONTROL GRID SHOULD BE REMOVED AND A 50,000 OHM RESISTOR INSERTED IN SERIES WITH SAME. THEN CONNECT THE HIGH POTENTIAL LEAD OF THE SIGNAL GENERATOR THROUGH THE .001 MFD. CONDENSER DIRECTLY TO THE CONTROL GRID CAP OF THE TUBE.
6. REPEAT ALL ADJUSTMENTS.
7. TO DETERMINE THAT THE SHORT WAVE BAND SHUNT TRIMMER HAS NOT BEEN ADJUSTED TO THE IMAGE FREQUENCY, TURN THE DIAL TO THE FREQUENCY LISTED UNDER IMAGE FREQUENCY WHERE A SIGNAL WEAKER THAN THE FUNDAMENTAL SHOULD BE NOTED. HOWEVER, IF NO SIGNAL CAN BE HEARD AT THIS SETTING EVEN WITH GREATER SIGNAL GENERATOR OUTPUT, THE TRIMMER HAS BEEN IMPROPERLY ADJUSTED AND IT WILL BE NECESSARY TO READJUST TO THE PROPER PEAK.

**ALIGNMENT TABLE**

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>DIAL FREQUENCY</th>
<th>GENERATOR FREQUENCY</th>
<th>IMAGE FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.</td>
<td>1000 KC</td>
<td>456 KC</td>
<td>---</td>
<td>.001 mfd, 50,000 ohms</td>
<td>Control grid of 656 tube</td>
<td>T-1, T-2</td>
</tr>
<tr>
<td>B.C.</td>
<td>1000 KC</td>
<td>456 KC</td>
<td>---</td>
<td>.001 mfd, 50,000 ohms</td>
<td>Control grid of 6A8G tube</td>
<td>T-3, T-4</td>
</tr>
<tr>
<td>S.W.</td>
<td>15.0 KC</td>
<td>15.0 KC</td>
<td>15.9 KC</td>
<td>400 ohm resistor</td>
<td>Yellow antenna lead</td>
<td>T-5, T-6</td>
</tr>
<tr>
<td>S.W.</td>
<td>6.0 KC</td>
<td>6.0 KC</td>
<td>---</td>
<td>400 ohm resistor</td>
<td>Yellow antenna lead</td>
<td>T-5, T-6</td>
</tr>
<tr>
<td>N.C.</td>
<td>1500 KC</td>
<td>1500 KC</td>
<td>---</td>
<td>200 mfd condenser</td>
<td>Yellow antenna lead</td>
<td>T-7, T-8</td>
</tr>
<tr>
<td>B.S.</td>
<td>600 KC</td>
<td>600 KC</td>
<td>---</td>
<td>200 mfd condenser</td>
<td>Yellow antenna lead</td>
<td>T-9*</td>
</tr>
</tbody>
</table>

*To insure perfect alignment, it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output.

**VOLTAGE ACROSS ELECTROLYTIC CONDENSERS**

<table>
<thead>
<tr>
<th>1st Section</th>
<th>2nd Section</th>
<th>3rd Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>312</td>
<td>240</td>
<td>105</td>
</tr>
</tbody>
</table>

Voltage across speaker field = 73 volts

**MODEL 365 & 366 SERIES**

**CONTINUITY AND VOLTAGE READINGS ON**

<table>
<thead>
<tr>
<th>TUBE NUMBER</th>
<th>POSITION</th>
<th>PLATE PLATE</th>
<th>CATHODE SCREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A83</td>
<td>1st Detector</td>
<td>235</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Oscillator</td>
<td>86</td>
<td>6.2</td>
</tr>
<tr>
<td>626</td>
<td>Int. Freq.</td>
<td>235</td>
<td>9.4</td>
</tr>
<tr>
<td>76</td>
<td>2nd Detector</td>
<td>127</td>
<td>.1</td>
</tr>
<tr>
<td>6V6</td>
<td>A.C.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6270</td>
<td>1st Audio</td>
<td>67</td>
<td>.1</td>
</tr>
<tr>
<td>6V50</td>
<td>Pwr. Secto</td>
<td>220</td>
<td>42.0</td>
</tr>
<tr>
<td>80</td>
<td>Rectifier</td>
<td>---</td>
<td>56.0 TOTAL</td>
</tr>
</tbody>
</table>

The readings were taken with a 1,000 ohm per watt meter and are not indicative of effective voltages. Above readings taken with a 105,89 speaker in circuit.

**SPEAKER MA. RESISTANCE VALUES**

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>FIELD COIL</th>
<th>AUDIO TRANS. TRI.</th>
<th>AUDIO TRANS. SEC.</th>
<th>V.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>105,89</td>
<td>1,100*</td>
<td>210*</td>
<td>.5**</td>
<td>3.0</td>
</tr>
<tr>
<td>105,89A</td>
<td>1,100*</td>
<td>220*</td>
<td>.9**</td>
<td>3.0</td>
</tr>
</tbody>
</table>

* These are cold D.C. resistance values.
** This reading includes resistance of hum bucking coil.
Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows:---Remove chassis and connect output motor across voice coil for speaker. Set dial pointer at 1000 K.C. and turn volume control to maximum position. Tone control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 5485 tube in series with all condenser and adjust trimmers 1-2-3-4 for maximum output at 456 K.C. reducing input signal of oscillator as required. Check pointer with condensor fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a .0008 condensor as dummy antenna. With a 1500 K.C. signal adjust trimmers 5 & 6 for maximum output. Turn dial pointer to 600 K.C. Adjust sidereal T6 rocking gang condensor for maximum output. Rcheck alignment at 1500 K.C. Shift oscillator to 456 K.C. and set trimmer on wave trap for minimum signal. Check sensitivity at 1000 K.C. using magic wand. Turn band switch to Short Wave position. Set dial at 15 M.C. Use a 400 ohm carbon resistor for dummy antenana. With a 15 M.C. signal adjust T-5 for maximum output. Check image at 14.1 M.C. increasing input signal if necessary. Check sensitivity at 10 M.C. and 6 M.C.
Alignment Instructions: Do not attempt to align receiver until all other causes of trouble are checked, then proceed as follows—Remove chassis and connect output meter across voice coil of speaker. Set dial pointer to 1000 K.C. and turn volume control to maximum position. Tune control to high end. Band switch to broadcast position. Connect modulated oscillator to grid of 6AF6 tube in series with a 1 condenser and adjust trimmer 1-2-3-4 for maximum output at 456 K.C. Reducing input signal of oscillator as required. Check pointer with condenser fully meshed. Turn pointer to 1500 K.C. Connect oscillator to antenna lead using a .0002 condenser as dummy antenna. With a 1500 K.C. signal adjust trimmer 5 & 6 for maximum output. Turn dial pointer to 600 K.C. Adjust pador T6 rocking gain condenser for maximum output. Recheck alignment at 1500 K.C. Shift oscillator to 456 K.C. and set trimmer on wave trap for minimum signal. Check sensitivity at 1000 K.C. using radio wave. Turn band switch to Short Wave position. Set dial at 15 M.C. Use a 400 ohm carbon resistor for dummy antenna. With a 15 M.C. signal adjust T-5 for maximum output. Check image at 14.1 M.C. increasing input signal if necessary. Check sensitivity at 10 M.C. and 6 M.C.
SCHEMATIC WIRING DIAGRAM OF THE MODEL 7A CHASSIS.

FRONT, SIDE, AND TOP VIEWS OF THE CHASSIS SHOWING TRIMMER LOCATIONS, TUBE LOCATIONS AND COMPONENT PARTS.
The Model 7A chassis is an AC operated superheterodyne with automatic volume control. It has extra feedback, permeability push button tuning and tuning by means of a variable condenser. It incorporates three wave bands, broadcast, police-weather and short wave. It is also equipped with a phone connection which permits the use of an external phonograph pickup.

The Push Button Tuner

It will be noted that only one operation is required for the setting of each push button. This simplicity of operation is made possible by the use of permeability tuned coils which have been accurately tracked at the factory so that it is not necessary to adjust external tuning condensers in order to set the station. Tracking is accomplished by the careful spacing of the iron cores on the common shaft so that for all settings of the adjusting screws the coils are in perfect alignment. The capacitance in the oscillator circuit is fixed and may not be adjusted. This condenser (corresponding to the tuning condenser in a manually tuned receiver) is shown as number 42 on the schematic diagram and has a value of 150 micro-microfarads. The capacitance in the antenna circuit consists of two condensers, number 50 and number 45. Condenser number 30 must be adjusted when the initial alignment is made, but does not have to be touched at the time the buttons are "set" for their individual stations. Its use is covered in the alignment instructions.

Instructions for setting the push buttons are covered in detail in the instruction book which accompanies each receiver.

The Audio Circuit

The audio circuit is of conventional design with the exception of the inverse feedback circuit consisting of resistors number 86 and number 57 and condenser number 36. By means of this network a certain amount of the voltage present at the plate of the 6860 tube is fed back to the grid circuit of that tube. This voltage is, of course, out of phase with the voltage being amplified. The result is that the audio amplifier employing a loud speaker as the load will have a certain amount of distortion introduced due to the fact that the immediate variations in the audio frequency changes the plate circuit of the output tube. This condition is more pronounced in amplifiers using an output tube of the high impedance type such as the hexagonal type. Inverse feedback effectively reduces the plate impedance of the tube and helps to smooth out these variations thus reducing distortion to a measured degree.

The subject cannot be treated more fully here due to space limitations and has been mentioned merely to give the serviceman a brief explanation of the feedback circuit.

VOLTAGE AND RESISTANCE DATA ALIGNMENT PROCEDURE CHART

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The audio circuit is of conventional design with the exception of the inverse feedback circuit consisting of resistors 81 and 82, and capacitors 79 and 83. Operation of this network a certain amount of the voltage present at the plate of each 6V6 tube is fed back to the grid circuits of that tube. This voltage, of course, out of phase with the input voltage and degeneration in the result.

Any audio amplifier employing a loud speaker as the load will have a certain amount of distortion introduced due to the fact that the impedance varies with the audio frequency. In the plate circuit of the output tube or tube, this condition is more pronounced in amplifiers using an output tube of the high impedance type such as the 6C5. Inverse feedback effectively reduces the plate impedance of the tube and helps to smooth out these variations thus reducing distortion to a marked degree.

The subject cannot be treated here fully due to space limitations but suffice to give you the services a brief explanation of the feedback circuit.

**PHONO CONNECTIONS**

The input circuit for the phonograph section of this receiver is designed for the use of a pickup of the high impedance type, although low impedance type may be employed by the use of a unit of fairly low impedance. Should any difficulty be encountered with hum in the set when a pickup is being used, it is probably due to the fact that the shield side of the lead is not connected to the ground side of the terminal strip. Reversing the leads (after making sure that one side of the phono jack is in a shield) should remedy complication of this kind.

**ALIGNMENT PROCEDURE**

Alignment procedure is given diagrammatically and chart form. Make adjustments in the order given. Any reliable low range AC voltmeter, preferably about 0-5 volts may be used as an output meter. It should be connected across the speaker voice coil for best results. The voltage control should be set at maximum during the alignment and the output from the amplifier should be decreased till the meter pointer tends to go off scale. If too strong a signal is used and the volume control is used to keep the pointer on scale, the AVC will operate and inaccurate alignment will result.

When aligning the volume and tone controls, care must be taken to see than the trimmers are not set on the proper frequency and not on the image. The image falls 210 kilocycles below the fundamental signal on the dial, so at 20 megacycles the image should be heard at 20 megacycles minus 910 megacycles or 10,1 megacycles approximately.

After setting the oscillator trimmer, increase the input from the signal generator and make sure that the image comes in at the proper point. When you can hear one signal at the frequency to which your generator is set, and one at about 1 megacycle below it, you are ready to finish the alignment. Go back to the fundamental frequency and start peaking the VP trimmer,rocking the tuning condenser slightly as you do so. When you reach a peak, compare the strength of the fundamental signal and the image. If the image is stronger, you have the wrong peak on the VP trimmer. Find the other peak and again compare the two signals. You will probably find it necessary to increase the generator output greatly in order to hear the image when you have found the right peak.

Repeat this operation for the antenna trimmer.
### FAIRBANKS, MORSE & CO.

**MODEL 128 ALIGNMENT PROCEDURE**

Alignment procedure is given in diagrams and chart form (see figure 1). Before adjustments are made, open the set. Use a 20 MHz signal generator and an oscilloscope to check the frequency of the fundamental signal as you do the adjustments. If the fundamental signal is used and the volume control is used to keep the output on scale, the AFC will operate and immediately adjust the receiver to the correct frequency.

When the alignment is completed, turn on the power, and note the fundamental signal on the oscilloscope. The AFC will adjust itself to the correct frequency. If the alignment is not correct, repeat it until the fundamental signal is stable. Then, turn off the power and check the frequency on the oscilloscope. The AFC will then be at the correct frequency.

**FAQ**

1. **What is the purpose of the alignment procedure?**
   - To ensure that the receiver functions correctly and is tuned to the correct frequency.

2. **What equipment is needed for the alignment procedure?**
   - A 20 MHz signal generator, an oscilloscope, and a fundamental signal generator.

3. **How do I adjust the receiver?**
   - Open the set, use a 20 MHz signal generator, and adjust the receiver to the correct frequency. Repeat until the fundamental signal is stable. Then, turn off the power and check the frequency on the oscilloscope.

4. **What happens if the alignment is not correct?**
   - The AFC will not adjust itself correctly, and the fundamental signal will not be stable. Repeat the alignment until the fundamental signal is stable.

---

### Tuner Data, Parts, and Naturalizer Notes

The performance obtained with this alignment when push button tuning is employed is suitable, as a rule, only when a conventional antenna system is used. A conventional antenna system is one in which the broadcast stations are transmitted with a signal that is not distorted by any form of modulation or frequency modulation.

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**Parts and Price List, Model 128**

All prices are subject to change without notice.

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**Naturalizer Notes**

The naturalizer is designed to improve the natural sound of music. It can be set to provide a natural sound similar to that of a live performance, or it can be set to provide a more natural sound. The naturalizer can be set to provide a natural sound with a slight increase in volume, or it can be set to provide a more natural sound with a slight decrease in volume.

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**Alignment Procedure Chart**

[Figure 6]

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NOTE: VOLTAGE READING TAKEN FROM TUBE SOCKET CONTACTS TO GROUND WITH A D.C. VOLTMETER HAVING A RESISTANCE OF 1000 OHMS PER VOLT.

ANTENNA CIRCUIT: The antenna circuit is directly coupled to the antenna in contrast with the capacity coupled circuit used in some previous Firestone auto receivers. A small adjustable condenser is provided for adjusting the antenna circuit to the antenna. This adjustment is made near the high frequency end of the dial (1400 K.C.) instead of at the low frequency end, as with the capacity coupled sets. There are two taps provided on the antenna coil. One for use with whip or low capacity type antenna, and the other for running board or high capacity type antenna. The antenna coil is set at the low capacity tap at the factory and must be changed (by means of the small tip jack located in the receiver at the antenna coil) if a high capacity antenna is used. This is done by merely removing the small tip jack from its present tap on the antenna coil and inserting the jack in the other receptacle provided.

This document contains a schematic diagram of an antenna circuit for the Model 7407-3 Firestone auto receiver. The diagram includes various components and their locations, with notes on the adjustment of the antenna circuit. The diagram is detailed, showing the connection points and the flow of current through the circuit. The text provides additional information about the circuit's operation and the necessary adjustments for different types of antennas.
MODEL S7407-5
Schematic, Voltage, Socket, Trimmers, FIRESTONE TIRE & RUBBER CO.

Alignment, Tuner

Matching the Antenna:
- An adjusting screw accessible to a screw-driver through a hole in the side of the case is provided to match the receiver to the car antenna. Using the station selection knob, tune in a very weak station about 600 kilocycles. Then turn the adjusting screw to the point affording maximum volume.

Setting up the Monomatic Tuning Mechanism:
- Remove the plate that covers the Monomatic tuning adjustments on the receiver case.
- Operate the Monomatic button (marked "Push") until the dial becomes illuminated, indicating that the receiver is adjusted for Dial Tuning. Then tune in your #1 station, using the Station Selector knob.
- Operate the Monomatic button until the #1 station indicator (furthest left of the five indicators) becomes illuminated.
- Turn the #1 station screw marked "OSC" (see Fig. 3) until your #1 station is tuned in. Other stations may be heard during this operation. If in doubt whether you have your desired #1 station, compare it with the original station by operating the Monomatic button until the Dial Tuning position is reached.

After... adjusting the "OSC" screw as carefully as possible, adjust the "ANT" screw for maximum volume and best reproduction. After having done so, it is advisable to re-check the adjustment of the "OSC" screw and then the "ANT" one again to insure greatest accuracy.

Tune in your #2 station and operate the Monomatic button until the #2 indicator becomes illuminated. Then proceed to adjust the two screws for this station in the same manner as was just done for the #1 station. Always adjust the "OSC" screw before adjusting the "ANT" one, and then repeat the adjustments for greater accuracy.

Proceed in the same manner for the remaining stations on your list. Then replace the cover in the receiver case. Insert the proper call letters, cut from the sheets supplied, in the indicator button slots.

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POWER SUPPLY. This receiver is designed to operate on any alternating current supply (A.C.) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (D.C.) ranging from 110 to 120 volts.

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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 (1A7G) through a 0.5 or .1 mfd. condenser. The ground on the test oscillator should be connected to the chassis ground. Align all four I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the antenna terminal to the generator through a 200 MMF dummy and the ground terminal to the generator ground. Set the dial and generator at 1720 KC (gang at minimum capacity). Align the BC oscillator trimmer for maximum output. Set the test oscillator at 1400 KC and tune in the signal with the dial and adjust the antenna trimmer for maximum output. Check the sensitivity at 600 to determine if the gang or the coils have been damaged.
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 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.
BEFORE ALIGNING, PLACE LOOP ANTENNA AND THE "A" AND "B" BATTERY-PACK IN THE SAME APPROXIMATE POSITION IN THE BACK OF CHASSIS THAT THEY WILL BE IN WHEN THE SET IS IN THE CABINET AND THE CABINET BACK CLOSED.

When adjusting 1650 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to terminals on bottom of cabinet back.

Couple test oscillator to receiver loop by:

a) Make a loop consisting of five to ten turns of No. 20 to 30 size wire wound on a three inch form and attach across output of test oscillator.

b) Place test oscillator loop near set loop—BE SURE THAT NEITHER MOVES WHILE ALIGNING.

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**Before Aligning Place Loop Antenna and Battery in the Back of Cabinet:**

When adjusting 1730 kilocycle oscillator trimmer and 1400 kilocycle antenna trimmer, do not connect test oscillator to receiver loop. 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—and:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 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 1A7G tube Low side to chassis DO NOT REMOVE CAP. Use small loop to couple test oscillator to receiver loop</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>
</tbody>
</table>

1. **Exactly 1730 K.C.**

2. **Approx. 1400 K.C.**

Adjust 1730 K.C. oscillator trimmer for maximum output.

Adjust 1400 K.C. antenna trimmer for maximum output.
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600 and 1400 KC and an output meter to be connected across the primary or secondary of the output transformers. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible, to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stage should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the Broadcast Band should be aligned.

I.F. ALIGNMENT. With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (6B9G) 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 antenna to the generator through a 200 MMF dummy and set the dial and generator at 1400 KC. Align the BC oscillator trimmer and BC antenna trimmer. Set the generator at 600 KC and tune in the signal to check sensitivity at this point to determine if coils or gang condenser have not been damaged.