**Models B2RC, B3RC and B4RC**

**IMPORTANT**

All service adjustments on Motorola Record Changers should be made with the instrument in a normal operating position.

Therefore, the instrument should be supported in such a fashion that parts underneath are accessible. A light consisting of four corner support posts would be helpful, a mirror would also permit the service man to make observations and adjustments without getting into awkward positions.

**CHECK THE RECORDS FIRST**

Before attempting to service or adjust this Record Changer, check the records first to make sure they are not causing the trouble. The instrument will handle most of the 10 or 12 inch records now available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition and should not be chipped, particularly around the center hole. Do not try to play automatically, records that are too thick, too thin, or that are wrinkled or marred, as regards diameter of record or center hole. Do not use 10 and 12 inch records on the changer.

Old records made before the days of automatic record changers may not change automatically, due to the differences in thickness, or to lack of a proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

**THEORY OF OPERATION**

As in modern phonograph turntables, power is derived from an electric motor. This power is transmitted to the turntable through a geared down pin drive of the friction type.

The turntable is keyed to a small drive pulley, which in turn drives a large (5 inch) pulley, through a spring belt, both of these units being located on top of the base plate. (See Fig. 1). The 3 inch pulley transmits power by direct drive to another small pulley located under the mounting plate. This second pulley in turn drives the large (4 inch) main drive wheel, also located under the mounting plate.

When the turntable revolves, all of these pulleys and wheels mentioned above also revolve—regardless of whether or not the changer is going through a cycle of changing a record. By means of this series of pulleys, a high ratio is obtained between the motor and the changing mechanism, which assures ample power.

---

**SETTING FOR 10 OR 12 INCH RECORDS**

The record support platform is adjustable for either 10 or 12 inch records, depending upon which "lip" is turned toward the center of the turntable. The platform may be swung in an arc of 360 degrees, so that either the 10 or 12 inch lip may point toward the spindles.

Underneath the mounting plate, and mounted rigidly to the record platform support shaft is an eccentric mechanism which moves the 10" - 12" selector lever when the platform is moved. The position of this selector lever determines the point where the needle will come down on the record at the end of a changing cycle. In other words, it adjusts the pick-up for playing automatically either 10 or 12 inch records, depending upon the position to which the record support platform is turned. The eccentric can and the selector lever are shown in Figs. 4 and 6.

**START-REJECT SWITCH**

The push switch mounted near one corner of the mounting plate is connected in parallel with the automatic change switch previously discussed. When this switch is closed, it energizes the electro magnet exactly in the same fashion as does the automatic change switch, thereby making it possible to start the changing cycle at any time, regardless of whether or not the record has been completely played. By this means a record can be "rejected". The wiring diagram showing switches and magnet can be seen in Fig. 5.

**TO ADJUST AUTOMATIC CHANGE SWITCH**

The Automatic Switch (See Fig. 7) starts the changing cycle after a record has been completely played. The switch is actuated by the oscillating arm of the time arm in the eccentric mechanism. The arm acts as a stop for the rising lip which grips the movable switch blade. If the switch fails to operate positively, it may be readily adjusted by means of the adjustment screw (S). (See Fig. 7).

To make the adjustment, place a record on the turntable, start it revolving, and move the pick-up over to the end of the record. Adjust screw (S) until switch closes the magnet circuit and starts the change cycle. Check points visually to make sure they do not remain closed after cycle is completed.

If the changer immediately starts another cycle, it is an indication that the points are remaining closed or that the clutch release spring (Fig. 4) does not have enough tension. This tension may be increased by tightening up another nut.
By referring to the various photographs and figures which will be found in this Service Manual, you can readily follow through the changing cycle from the continuity given hereinafter.

1. The needle in the pick-up finishes a record and enters the eccentric groove.

2. As the pick-up has slowly approached the eccentric groove, a phosphor bronze spring clip has gripped a fin of the automatic change switch.

3. When the needle enters the eccentric groove on the record, the pick-up oscillates slightly, which in turn causes the automatic change switch to make contact.

4. The first momentary contact of the automatic change switch is all that is necessary to start the changing cycle. When the switch closes, a small electro magnet is energised. The electro magnet pulls an armature back out of the way, permitting a drive pawl which is mounted on the cam wheel to fall down and engage in one of the notches which are provided on the upper surface of the main drive wheel. (See Fig. 2.)

5. Since the main drive wheel is already revolving, the engagement of the pawl now causes the cam wheel to revolve with it.

6. When the cam wheel starts to revolve, it causes several things to occur. In the first few degrees of revolution, it opens a circuit breaker switch (Fig. 3) which automatically opens the magnet circuit, thereby de-energising it, to prevent 'chattering'.

7. The next few degrees of rotation cause the pick-up elevating pin to ride up on an inclined section of the cam, thereby elevating the pick-up and lifting the needle from the record which has just been played. (See Fig. 5.)

8. A few more degrees of revolution cause the pick-up guide groove on top of the cam wheel. This part of the mechanism is not visible, since the cam wheel is mounted too close to the mounting plate. Fig. 4 shows a drawing of the upper surface of the cam wheel. As the wheel revolves with the pin in the groove, it causes the pick-up to swing out beyond the edge of the record so it will be out of the way when the next record falls on the turntable.

9. The cam wheel continues its revolution, and at another point on its circumference a roller on the end of the trip-lever rides up an inclined section on the cam. This trip-lever is the copper-plated rod which is hinged approximately in the center by running through a die cast fulcrum block. As the roller on one end of the trip-lever rolls up the incline on the cam, the other end of the trip-lever bears against the push rod which operates the record release, which is located near the top of the spindle, causing it to push the next record off its support, thereby dropping it on the turntable. (See Fig. 5.)

10. The cam continues to revolve, the groove in the top of the cam wheel. This part of the mechanism is not visible, since the cam wheel is mounted too close to the mounting plate. Fig. 4 shows a drawing of the upper surface of the cam wheel. As the wheel revolves with the pin in the groove, it causes the pick-up to swing out beyond the edge of the record so it will be out of the way when the next record falls on the turntable.

11. A few more degrees of revolution, and the pick-up elevating pin rides down another incline, permitting the needle to settle gently on the first groove of the record. (Fig. 3.)

12. At this point, the cam has completed one full revolution of 360 degrees. At the same time the groove touches the record, the drive pawl hits the magnet armature, which forces it up, thereby disengaging it from the notches in the drive wheel. The cam wheel therefore stops, the turntable continues to revolve, and the record is played.

13. During the last few degrees of revolution, the circuit breaker switch has again been closed, as its fibre stud rides up an incline on the lower surface of the cam. (Fig. 3.) This switch must be closed at all times except when the instrument is going through a changing cycle, otherwise, it would be impossible to start a new changing cycle automatically.
AUTOMATIC CHANGE SWITCH
CIRCUIT BREAKER
LOCKNUT C
ADJUSTMENT SCREW D
SCREW F
CASTING B
SPRING C
SET SCREWS A
MOTOR
MAGNET

TO ADJUST RECORD RELEASE
1. Place a stack of 10 inch records on the changer, after turning the record support platform to the "10 inch" position.
2. Start the turntable revolving.
3. Press the "Start-Reject" button.
4. If the first record does not drop to the turntable, double check the record to make sure that it is not too thick, or that the diameter of the center hole is not undersized, causing it to bind.
5. If the record proves to be normal, and is not causing the failure, loosen lock nut (C) which locks adjustment screw (D), as shown in Figs. 5, 6, or 7.
6. With a slab-head wrench, turn screw (B) a fraction of a turn clockwise, and press the "Start-Reject" button again, checking to see if record is released.
7. If the record fails to drop, tighten screw (C) a trifle at a time, testing after each adjustment, until setting is reached, which releases record.
8. Tighten lock nut (C), after which a few more records should be changed, to make sure that this did not alter adjustment of screw (D).
NOTE: If the Changer stalls during the adjustment procedure, it may be an indication that screw (D) is too tight. In which case it should be turned back (counter-clockwise).

TO ADJUST PICK-UP POSITION
This adjustment is made to cause the needle to drop in the first groove of the record, as the Changer completes a changing cycle. 1. Turn the record support to the 10 inch position. (See Fig. 1.)
2. Place a standard 10 inch record on the turntable and start it revolving.
3. Press the "Start-Reject" button. The Changer will now start a changing cycle.
4. Do not let the Changer complete the cycle, but stop it at the point where the pick-up starts to drop downward towards the outer rim of the record. If the cycle is stopped at the right point, the pick-up will still be "in cycle" and will not be free to swing back and forth. Check this gently. Do not exert too much sidewise pressure on the pick-up.
5. Now loosen the two slab-head set screws (A) in the bell crank casting (B), which you can see in Fig. 7.
6. With the set screw loose, the pick-up arm can now be moved back and forth. Move it to the point where the needle rests directly over the first groove in the record.

TURN SPINDLE CAP IN THIS POSITION TO LOAD RECORDS
Fig 8
TURN SPINDLE CAP IN THIS POSITION TO REMOVE RECORDS

The correct dimension for proper adjustment is 4-3/32" from the needle point to the center of the spindle.
7. Tighten one set screw securely so that the shaft does not vibrate while checking proper position of the pick-up arm. After proper position has been located tighten both set screws securely.
8. Now place a 10 inch record on the turntable; turn the record support to the 12 inch position.
9. Press the "Start-Reject" button and let the Changer go through another cycle, watching carefully to make sure the needle comes down on the record at the proper point. If necessary, make minor readjustment.

TO LINE UP RECORD PLATFORM
It is important that all points on the "lip" of the record support platform be equidistant from the center point of the spindle. This will assure that all points of the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly.

1. To check this alignment, turn the spindle-caps so it is in alignment with the rest of the spindle, which is the correct position for removing records. (See Fig. 8.)
2. Turn the record support platform to the "10 inch record" position, making sure it is turned all the way to the stop.
3. Slip a standard 10 inch record over the spindle and check to make sure it clears the lip of the platform at all points. (See Fig. 9.)
4. If one point on the lip extends farther than the other, the position of the record support may be adjusted after loosening the two boro set screws (B), located directly under the numeral "12" on the record support. (See Fig. 9.)

CAUTION: Make sure the eccentric selector cam, which is located under the base, is turned all the way to its stop. (See Fig. 4.)

TEXT: After tightening the set screws, test the adjustment by running a 10 inch record through a complete cycle and check the point where the needle falls. If the needle misses the record by one inch, the record platform is 180 degrees out of line with the eccentric cam, and should be turned one-half turn without turning the cam.
VOLTAGE
* Bias -3 V. from B stick.
** Bias -2.5 V. from B stick.
*** Bias -16 V. from B stick.
Current - 6.6 Amps. at 6.3 Volts.
Maximum power output - 6 Watts.
All readings from chassis ground with 1000 ohms per volt meter.

FOR ELEC. AUTOMATIC TUNER, SEE MODEL 66T TUNER ** VOL.X
Model 550
ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker and battery connected to it. Turn the volume control to maximum position and leave it there throughout the alignment. If the signal generator output is too low, reduce the signal generator output if necessary. Move the controls to the maximum position and adjust the trimmer in the R.F. coil can that is covered with Scotch tape. The original adjustment made in the factory should not be tampered with. Fig. 1 below, shows all trimmer positions.

I.F. ALIGNMENT
1. Connect the signal generator to the control grid of the 6AK5 (25N) used in the 1.5 K.C. amplifier. Using a 1.5 K.C. condenser, having no frequency control, remove the top from the tube and slide the condenser cap onto the top of the tube. Connect a 50,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser gas completely out of mesh. Connect an output meter across speaker voice coil.
2. Set the signal generator at 242 K.C. and carefully adjust the single trimmer in the diode coil can to the point showing the highest reading on the output meter.
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat steps 1, 2, and 3, for accuracy.

MODEL 22-S
ALIGNMENT PROCEDURE

Model 25-M

5. Remove the chassis from its housing and place it on the service bench. Connect the speaker and battery. Turn the volume control to maximum position and leave it there throughout the alignment. Reduce the signal generator output if necessary.

Figure 1-Trimmers

I.F. ALIGNMENT
1. Connect the signal generator to the antenna lead through a .1 mf condenser and to chassis ground. Connect an output meter across speaker voice coil.
2. Set the signal generator at 450 K.C. and carefully adjust the single trimmer in the diode coil can to the point showing the highest reading on the output meter. Advance the signal generator attenuator if necessary to pin up signal.
3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
4. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R.F. ALIGNMENT
1. Change to 40 M.F. condenser in signal generator lead. Set signal generator at 1500 K.C. and with the condenser gas completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.
2. Set the signal generator at 1600 K.C. and turn the condenser gas to the point showing the highest output reading.

SENSITIVITY AND STABILITY MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielad lead from the signal generator is connected to the grid terminal of the tube through a .1 mf condenser, with a 50 M. ohm resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a special dummy, part No. 111803B, in place of the I.F. generator. It must be remembered that the figures in the table are average and allowance must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

Model 550

AVERAGE MICROVOLT INPUT Generator Generator Dummy Antenna Leak OUTPUT METER READINGS

<table>
<thead>
<tr>
<th>INPUT</th>
<th>GENERATOR</th>
<th>FEEDER</th>
<th>CONNECTED TO</th>
<th>ANTENNA</th>
<th>CAPACITY</th>
<th>RESISTANCE</th>
<th>READINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>42,000</td>
<td>262 K.C.</td>
<td>I.F. Grid</td>
<td>.1</td>
<td>.6</td>
<td>.7</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>3600</td>
<td>262 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.6</td>
<td>.7</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>800 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.6</td>
<td>.7</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1</td>
<td>.6</td>
<td>.7</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>.2</td>
<td>None</td>
<td>None</td>
<td>1.76</td>
<td></td>
</tr>
</tbody>
</table>

* For one watt output.
** Meter connected across voice coil.
1.76 volts equals 1 watt output for 3 ohm voice coil.
*** (special dummy part No. 111803B)
NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 M.F. condenser for the Special Dummy.

Model 22-S

AVERAGE MICROVOLT Generator Generator Dummy Antenna Leak OUTPUT METER READINGS

<table>
<thead>
<tr>
<th>INPUT</th>
<th>GENERATOR</th>
<th>FEEDER</th>
<th>CONNECTED TO</th>
<th>ANTENNA</th>
<th>CAPACITY</th>
<th>RESISTANCE</th>
<th>READINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>456 K.C.</td>
<td>IF Grid</td>
<td>.1</td>
<td>.5</td>
<td>.7</td>
<td>1.74 watts</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>456 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5</td>
<td>.7</td>
<td>1.74 watts</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5</td>
<td>.7</td>
<td>1.74 watts</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>700 K.C.</td>
<td>RF Grid</td>
<td>.1</td>
<td>.5</td>
<td>.7</td>
<td>1.74 watts</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>.40 M.F.</td>
<td>None</td>
<td>None</td>
<td>1.74 watts</td>
<td></td>
</tr>
</tbody>
</table>

* For one watt output.
** Meter connected across voice coil.
1.74 volts equals 1 watt output.
**Model No. 27-D-6**

**VOLTAGE:**
- All measurements from chassis ground to socket terminal using 1000 ohms per volt meter.
- Current consumption—7 amps. Battery voltage—6.3.
- Maximum power output—3 watts.

**ALIGNMENT PROCEDURE:**
Same as Model 27-D.

**DIAL CORD INSTRUCTIONS:**
Same as Model 27-D.
Model 35-F
SPECIFICALLY DESIGNED TO INSTALL IN 1941 FORD AND MERCURY

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>GANG CONDENSER</th>
<th>DIAL GAIN</th>
<th>ADJUST</th>
<th>GENERATOR CONNECTED TO TUNER NO. SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN ORDER</td>
<td>SET AT</td>
<td>IN ORDER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>2</td>
<td>1800 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>560 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>*</td>
<td>Special Dummy</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>1400 K.C.</td>
<td>*</td>
<td>Special Dummy</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>Special Dummy</td>
<td>9</td>
</tr>
</tbody>
</table>

* Use special dummy Part No. 1X28769 or Booster Coil Part No. 24K26761 in series with a 35 Mfd. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<p>| AVERAGE MICROVOLT GENERATOR FUSIBLE RESISTOR OUTPUT |</p>
<table>
<thead>
<tr>
<th>INPUT SET AT</th>
<th>GENERATOR PUSHER CONNECTED TO</th>
<th>DUMMY ANTENNA CAPACITY</th>
<th>LEAK RESISTANCE READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,250</td>
<td>250 K.C.</td>
<td>.1 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>250 K.C.</td>
<td>.1 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>13</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum Tone Control Set At Voice
* 1 Watt = 1.74 Volts ** Output meter connected across voice coil.
*** Use Special Dummy Part No. 1X28769 or Booster Coil Part No. 24K26761 in series with a 35 Mfd. condenser.

DIAL CORD INSTRUCTIONS

TUNING CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
5. Thread one end of cord through hole (1) in drive pulley and with an ordinary paper clip fasten it to the tuner bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one half turn around drive pulley and up to tuning shaft. (See Fig. 2.)
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction, one full turn to hole (5).

(CONT. IN NEXT COL.)

POINTER CORD

1. Remove the chassis from the housing, and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully closed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (C) in condenser pulley and with an ordinary paper clip fasten it to the tuner bracket to hold in place. (See Fig. 3.)
6. In a clockwise direction run cord to idler pulley No. 1.
7. Route cord around idler pulley No. 1, as shown in Fig. 3, and then across chassis to idler pulley No. 2.
8. Continue around idler pulley No. 2 as shown in Fig. 3 and then across chassis to idler pulley No. 3.
9. Route cord around idler pulley No. 3 and in a clockwise direction around condenser pulley to hole (C).
10. Remove the paper clip from other end of cord and knot the two cord ends together inside of condenser pulley. Fasten one end of tension spring (Part No. 41A109L) to cord and other end to hole (D) in the condenser pulley. Place a drop of shellac on cord knot.
11. Cut off surplus cord and replace pointer.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten pointer to cord with a drop of shellac.
For 1941 PLYMOUTH, DODGE, DESOTO and CHRYSLER

SENSITIVITY AND STAGE GAIN MEASUREMENTS - MODEL 37D-1

<table>
<thead>
<tr>
<th>Average Microvolt Input *</th>
<th>Generator Set At</th>
<th>Dummy Generator Feeder</th>
<th>Dummy Antenna Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Sensitivity</th>
<th>Sensitivity Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>242 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>470</td>
<td>242 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mf.</td>
<td>.5 Mf.</td>
<td>1.74 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74 Volts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum Watt = 1.74 Volts

** Use special dummy part No. 1226767, or Booster Coil Part No. 2422567, in series with a 35 Mf. condenser.

TO RESTRING POINTER CORD - Models 37D-1 and 37D-2

Remove push-buttons, tone switch assembly, (tone switch on 37D-1 only) and control head from chassis. (This requires removal of three two on 37D-2) screws from the right side of the control head, one from the left hand side (37D-1 only) of the control head, and a "C" washer from the volume control shaft.)

Cut a 30 inch length of 18 lb. silk fish cord.

Lay control head on service bench and route cord through the two eyelet holes and around idler pulley, exactly as shown in Fig. 3.

Adjust cord so both ends are approximately of equal length, and clip to control head as shown in Fig. 3.

Set pointer at approximately 550 K.C. on dial scale and interface cord on pointer clips. Fasten to pointer with a drop of shellac or household cement.

Mount control head and tone switch (tone switch on 37D-1 only) back on chassis. Replace "C" washer on volume control shaft.

Turn gang to fully meshed position. This will place hole in condenser pulley at the top.

Remove paper clip from cord "A" and fish end of cord under brake shoe and around condenser pulley 1/8 turn to hole (C). Thread end of cord through hole (C) and clip to control head. (See Fig. 4.)

Remove paper clip from cord (B) and route cord the short distance from idler pulley to the hole (C) in condenser pulley. Tie both ends of cord together inside pulley; then tie in tension spring (Part No. 41A1001). Hook other end of spring in hole (D). Cut off surplus cord.

Place a drop of shellac or household cement on cord knot.

Tune in station of known frequency and adjust dial pointer to correct dial reading by loosening the screw (S) in the drive pulley. (See Fig. 5) and moving pointer pulley. Tighten screw securely for adjustment. Reassemble in housing.

TO RESTRING TUNING CORD - Model 37D-1 & 37D-2

Remove the chassis from the housing, and place on service bench with the tubes up. Remove the broken string.

Turn condenser gang to fully meshed position.

Cut a length of 30 lb. silk fish cord 25 inches long.

Thread one end of cord through hole (X) in drive pulley, and with an ordinary paper clip fasten to volume control bracket so that cord will stay in place. In a counter-clockwise direction, wind cord one full turn around drive pulley and down to tuning shaft. (See Fig. 6.) Wind cord in a clockwise direction seven turns around tuning shaft and up to drive pulley.

Continue in a counter-clockwise direction one half turn to hole (X).

Thread cord through hole (X) and then thread both ends through eyelet (Part No. 41A4754). Knot the two ends of cord together and fasten one end of spring (Part No.41A4753) to cord and other end to hole (Y) in drive pulley. Place a drop of shellac or household cement on cord knot.

Finch eyelets on cord with a pair of pliers.
TUNING CORD
1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30 lb silk fish cord 27 inches long.
5. Thread one end of cord through Slot (B) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2).
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through slot (B).
9. Slip the two cord ends through eyelet (Part No. 41A16789). Hook other end of spring to hole (C) in drive pulley.
10. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD
1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open position.
4. Cut a length of 18 lb silk fish cord 27 inches long.
5. Thread one end of cord through slot (A) in condenser pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord around condenser pulley, under brake shoe and over idle pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chassis to idle pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and down over idle pulley No. 1.
9. Route cord down and around condenser pulley one-half turn to slot (A).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No. 41A1691) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

ALIGNMENT CHART MODEL 38-0

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Fed.</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-2-3-4</td>
<td>250 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
<td>1000 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>545 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
<td>545 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
</tr>
</tbody>
</table>

* Use special dummy part No. 1X26767 or booster coil part No. 24K26751 in series with a 35 Mfd. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microvolt Input **</th>
<th>Generator Set At</th>
<th>Generator Fed. Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,750</td>
<td>282 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>282 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd</td>
<td>1.74</td>
</tr>
<tr>
<td>13</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>*</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

** Volume Control Set at Maximum. * 1 Watt = 1.74 Volts. ** Output meter connected across voice coil.
*** Use special dummy part No. 1X26767 or booster coil part No. 24K26751 in series with a 35 Mfd. condenser.
## Alignment Chart Models 40-42S, 40-E1, 40-EK, 40-EW

### Models 40-42S, 40-E1, 40-EK, 40-EW

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Set At</th>
<th>Generator Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Antenna</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 1220 K.C. .1 Mfd.</td>
<td>Osc.-Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td>5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1220 K.C. .1 Mfd.</td>
<td>Osc.-Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td>5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>3</td>
<td>1600 K.C. 200 Mfd. Antenna Lead</td>
<td>6</td>
<td>1600 K.C.</td>
<td></td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum.**

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Mivrovolts</th>
<th>Generator Set At</th>
<th>Generator Fedder Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Antenna</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>3400</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>40</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
<td>Antenna Terminal</td>
<td>200 Mfd.</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

**Volume Control at maximum.**

**Output meter connected across voice coil.**

**.05 watts .25 Volts.**

### Alignment Chart Models SE-58A1

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Set At</th>
<th>Generator Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Antenna</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 1220 K.C. .1 Mfd.</td>
<td>Osc.-Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td>5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1220 K.C. .1 Mfd.</td>
<td>Osc.-Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td>5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C. 200 Mfd. Antenna Lead</td>
<td>6</td>
<td>1600 K.C.</td>
<td></td>
<td>None</td>
<td>.38</td>
</tr>
<tr>
<td>4</td>
<td>1600 K.C. 200 Mfd. Antenna Lead</td>
<td>9</td>
<td>1600 K.C.</td>
<td></td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

**Volume Control set at maximum.**

**Output meter connected across voice coil.**

**.05 watts .25 Volts.**

### Alignment Chart Models B-150

<table>
<thead>
<tr>
<th>Operations</th>
<th>Tuning Dial Set At</th>
<th>Dummy Antenna Set At</th>
<th>Generator Connected To</th>
<th>Dummy Antenna</th>
<th>Leak Antenna</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 1220 K.C. .1 Mfd.</td>
<td>Osc.-Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
<td>5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>2</td>
<td>Minimum 1400 K.C. 50 Mfd. Terminal</td>
<td>4</td>
<td>1600 K.C.</td>
<td></td>
<td>None</td>
<td>.38</td>
</tr>
<tr>
<td>3</td>
<td>1200 K.C. 50 Mfd. Antenna</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

**Volume Control set at maximum.**

**Output meter connected across voice coil.**

**.05 watts .25 Volts.**
Model 40-P
SPECIFICALLY DESIGNED TO INSTALL IN 1941 PONTIAC

Model 43-H
SPECIFICALLY DESIGNED TO INSTALL IN 1941 HUDSON

Model 44-K
SPECIFICALLY DESIGNED TO INSTALL IN 1941 PACKARD

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator Trimmer No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>2</td>
<td>1600 R.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>545 R.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>1400 R.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>1400 R.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>600 R.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1X28767 or Booster Coil Part No. 24X28767 in series with a 35 Mfd. condenser.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,250</td>
<td>262 R.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>262 R.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>600 R.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>15</td>
<td>600 R.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
</tr>
<tr>
<td>3</td>
<td>600 R.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</td>
<td>1.74</td>
</tr>
</tbody>
</table>

Volume Control Set at Maximum: 1 Watt = 1.74 Volts
Tone Control Set at Voice Position: 2 Output meter connected across voice coil.
*** Use Special Dummy Part No. 1X28767.

MODEL 40-P

MODEL 43-H

MODEL 40-P DIAL CORD INSTRUCTIONS

POINTER CORD

Remove the chassis from housing and place on service bench.
Remove broken string.
Turn the gang to fully opened position.
Cut a length of 18 lb. silk fish cord 27 inches long.
Thread one end of cord thru hole (a) in pointer pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold it in place. See Fig. 2.
In a counter-clockwise direction route cord to idler pulley No. 3 and around it in a clock-wise direction.
Route cord across chassis to idler pulley No. 2 and around it in a clock-wise direction.
Route cord back across chassis and down over idler pulley No. 1.
Route cord down and around pointer pulley to hole (a).
Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley. Fasten one end of spring (Part No. 41A11091) to cord and the other end to hook in pointer pulley.
Cut off surplus cord. Place a drop of shellac on cord knot.
To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of shellac.

TUNING CORD

Remove the chassis from housing and place on service bench.
Remove the broken string.
Turn the gang to fully meshed position.
Cut a length of 30 lb. silk fish cord 25 inches long.
Thread one end of cord thru hole (a) in drive pulley and with an ordinary paper clip fasten it to tuning shaft bracket so that cord will stay in place.
In a counter-clockwise direction, wind cord one full turn around drive pulley and up to idler pulley No. 5.
Continue around idler pulley No. 5 and down to tuning shaft.
Wind cord four full turns in a counter-clockwise direction around tuning shaft and continue down to idler pulley No. 4.
Continue cord in a counter-clockwise direction around idler pulley No. 4 and to hole (b) in drive pulley.
Thread both ends of cord (inside pulley) thru eyehlet (Part No. 527664) and knot both ends together.
Fasten one end of spring (Part No. 41A14759) to cord and other end to hole in drive pulley. See Fig. 2.
Place a drop of shellac on cord knot.
OPERATIONS GANG CONDENSER IN ORDER  SET AT  DUMMY ANTENNA  BAND SWITCH  SET AT  GENERATOR CONNECTED TO  AJUST. TRIMMERS NO.  GENERATOR SET AT
1  Minimum 1600 K.C.  .1  B.C.  Osc-Mod. Grid  1-2-3-4  455 K.C.
2  Minimum 1600 K.C.  400 ohms  B.C.  External Antenna Terminal  5  1600 K.C.
3  1400 K.C.  400 ohms  B.C.  External Antenna Terminal  6  1400 K.C.
4  3.2 M.C.  400 ohms  S.W.  External Antenna Terminal  7  3.2 M.C.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>MICROVOLT INPUT</th>
<th>GENERATOR FEEDER CONNECTED TO</th>
<th>DUMMY ANTENNA</th>
<th>LEAK RESISTOR</th>
<th>OUTPUT METER READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200</td>
<td>455 I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>70</td>
<td>455 Mod. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>90</td>
<td>600 Mod. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>25</td>
<td>600 R.F. Grid</td>
<td>.1 &quot;</td>
<td>.5 Mag.</td>
<td>.38</td>
</tr>
<tr>
<td>3</td>
<td>600 Ant. Terminal</td>
<td>400 ohms</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

Volume Control set at Maximum
* .05 Watts = .38 Volts
** Output Meter connected across voice coil

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SPECIFICALLY DESIGNED TO INSTALL IN 1941 STUDEBAKER

TUNING CORD

1. Remove the chassis from the housing and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 22 inches long.
5. Thread one end of cord through Slot (3) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction, wind cord one full turn around drive pulley and up to tuning shaft. (See Fig. 2).
7. Route cord 7 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through slot (B).
9. Slip the two cord ends through eyelet (Part No. 5579324) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41414750). Hook other end of spring to hole (C) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully open position.
4. Cut a length of 16 lb. silk fish cord 27 inches long.
5. Thread one end of cord through slot (A) in condenser pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold in place. (See Fig. 3).
6. In a clockwise direction run cord around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chasiss to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chasis and down over idler pulley No. 1.
9. Route cord down and around condenser pulley one-half turn to slot (A).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley and fasten one end of spring (Part No. 41411091) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang</th>
<th>Condenser* Dummy</th>
<th>In Order</th>
<th>Set At</th>
<th>Generator</th>
<th>Connected To</th>
<th>Adjust</th>
<th>Generator</th>
<th>Trimmers No.</th>
<th>Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grd</td>
<td>1-2-3-4</td>
<td>282 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grd</td>
<td>5</td>
<td>1600 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>545 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grd</td>
<td>6</td>
<td>545 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
<td>1400 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
<td>600 K.C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 1X26767 or Booster coil Part No. 24526781 in series with a 36 Mfd. condenser.
MODEL 43H

1. Remove the chassis from the housing and place on service bench.
2. Remove the broken string.
3. Turn the gang to fully meshed position.
4. Cut a length of 30 lb. silk fish cord 28 inches long.
5. Thread one end of cord thru hole (A) in drive pulley and with an ordinary paper clip fasten to tuning shaft bracket so that cord will stay in place.
6. In a clockwise direction wind cord once around drive pulley and up to tuning shaft. See Fig. 2.
7. Route cord 6 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley to hole (A).
9. Thread both ends of cord (inside pulley) thru eyelet (Part No. 567804) and knot ends together.
10. Fasten one end of spring (Part No. 41A14768) to cord and other end to hole (B) in drive pulley.
11. Cut off surplus cord and place drop of shellac on cord knot.
12. Pinch eyelet on cord with a pair of pliers.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Turn the gang to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord thru hole (C) in pointer pulley and with an ordinary paper clip fasten to the tuning shaft bracket to hold it in place. See Fig. 3.
6. In a counter-clockwise direction route cord to idler pulley No. 1 and around it in a clockwise direction.
7. Route cord across chassis to idler pulley No. 2 and around it in a clockwise direction.
8. Route cord back across chassis and around idler pulley No. 3.
9. Route cord counter-clockwise around pointer pulley to hole (C).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of pointer pulley.
11. Fasten one end of spring (Part No. 41A11001) to cord and the other end to hole in pointer pulley.
12. Cut off surplus cord. Place a drop of shellac on cord knot.
13. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string. Fasten to string with a drop of shellac.

MODEL 44K

1. Remove the chassis from the housing, and place on service bench.
2. Remove the broken string.
3. Turn the condenser gang to fully meshed position.
5. Thread one end of cord through hole (X) in drive pulley and with an ordinary paper clip fasten to tuning control bracket so that cord will stay in place.
6. In a clockwise direction wind cord once around drive pulley and up to tuning shaft. (See Fig. 2.)
7. Route cord 6 turns around tuning shaft as shown in Fig. 2 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and to hole (X).
9. Slip the two cord ends through eyelet (Part No. 567804) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41A14768). Hook other end of spring to hole (T) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

POINTER CORD

1. Remove the chassis from housing and place on service bench.
2. Remove broken string.
3. Set condenser gang to fully meshed position.
4. Cut a length of 18 lb. silk fish cord 27 inches long.
5. Thread one end of cord through hole (C) in condenser pulley and with an ordinary paper clip fasten it to the tuning shaft bracket to hold in place. (See Fig. 3.)
6. Route cord from hole (C) around idler pulley No. 1 in a clockwise direction.
7. Route string across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and around idler pulley No. 3.
9. Route cord down and around condenser pulley to hole (C).
10. Remove the paper clip from end of cord and knot the two ends of cord together inside of drive pulley; fasten one end of spring (Part No. 41A11001) to cord and the other end to hook in condenser pulley.
11. Cut off surplus cord.
12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on string.
13. Fasten pointer to string with a drop of shellac. Place a drop of shellac on cord knot.
ALIGNMENT

1. Conn. the sig. gen. to the ant. lead thru a 200 MMF cond. and to chass. gnd. Turn the cond. gang completely out of mesh, o.p. meter across the spkr. voice coil. 2. Set sig. gen. at 455 KC; carefully adj. the two IF trims. and the two DIODE trims. to point show. highest read. on o.p. meter. Advance sig. gen. atten. if necessary. 3. Turn sig. gen. to 1750 KC, and with cond. gang completely out of mesh adj. OSC. trim. until 1750 KC sig. is heard. 4. Set sig. gen at 1400 Adj. ANT. trim. to point showing highest reading on o.p. meter.

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Model 4S-N
SPECIFICALLY DESIGNED TO INSTALL IN 1941 NASH

DIAL CORD INSTRUCTIONS

TUNING CORD
Remove the die cast escutcheon and the button cover from the receiver. The escutcheon is fastened by means of 9 screws and the button cover is fastened with two nuts and lockwashers.

Remove the broken string.

Turn the condenser gang to fully opened position.

Cut a length of 30 lb. silk fish cord 25 inches long.

Thread one end of cord thru hole (X) in drive pulley and with an ordinary paper clip fasten cord to tuner bracket so that cord will stay in place.

(cont. in next column)

SENSITIVITY AND STAGE GAIN MEASUREMENTS

Average Microwatt Generator Generator Dummy Leak Output
Input Set At Feeder Connected To Antenna Capacity Meter Resistance Reading

| 25,000 | 262 K.C. | L.F. Grid | .1 Mfd. | .5 Meg. | 1.74 |
| 250 | 262 K.C. | Mod. Grid | .1 Mfd. | .5 Meg. | 1.74 |
| 250 | 600 K.C. | Mod. Grid | .1 Mfd. | .5 Meg. | 1.74 |
| 3 | 600 K.C. | R.F. Grid | .1 Mfd. | .5 Meg. | 1.74 |

Volume Control Set At Maximum. Tone Control Set At Voice. *1 watt = 1.74 Volts. **output meter connected across voice coil. ***Use Special Dummy Part No. 1182676.

ALIGNMENT CHART

Operations Gang Condenser Dummy Generator Generator
In Order Set At Antenna Connected To Trimmers No. Set At

| 1 | Minimum | .1 Mfd. | Osc.-Mod. Grid | 1-2-3-4 | 262 K.C. |
| 2 | 1600 K.C. | .1 Mfd. | Osc.-Mod. Grid | 5 | 1600 K.C. |
| 3 | 545 K.C. | .1 Mfd. | Osc.-Mod. Grid | 6 | 545 K.C. |
| 4 | 1400 K.C. | * | To Special Dummy | 7 | 1400 K.C. |
| 5 | 1400 K.C. | * | To Special Dummy | 8 | 1400 K.C. |
| 6 | 600 K.C. | * | To Special Dummy | 9 | 600 K.C. |

* Use Special Dummy Part No. 1182676 or Booster Cell Part No. 14428751 in series with a 35 Mfd. Condenser.

In a counter-clockwise direction wind cord one turn on drive pulley and route to idler pulley No. 4. (See Fig. 2).

Route cord over idler pulley No. 4 and down to tuning shaft.

Wind four full turns in a clockwise direction on tuning shaft and continue down to idler pulley.

Route cord under idler pulley No. 5 and to hole (X) in drive pulley.

Knot cord ends together and fasten to one end of spring. (Part No. 41A12702). Hook other end of spring to hole (Y) in drive pulley.

With a pair ofpliers pinch eyepet on cord and place drop ofshellac on cord knot.

POINTER CORD

1. Remove the die cast escutcheon and the button cover from the receiver (see step 1 above).

2. Remove the broken string.

3. Turn gang to fully opened position.

4. Cut a length of 16 lb. silk fish cord 27 inches long.

5. Thread one end of cord thru hole (C) in condenser pulley. See Fig. 3. With an ordinary paper clip fasten to tuner bracket to hold it in place.

6. Route cord in a counter-clockwise direction from hole (C) to idler pulley No. 1.

7. Route cord clockwise around pulley No. 1 and across chassis to idler pulley No. 2.

8. Continue counter-clockwise around pulley No. 2 and back across the chassis to idler pulley No. 3.

9. Continue around idler pulley No. 3 and in a counter-clockwise direction around condenser pulley to hole (C).

10. Remove the paper clip and knot the two ends of cord together inside of pulley. Fasten one end of spring (Part No. 41A11601) to cord and hook other end to hole in condenser pulley. Place a drop of shellac on cord knot.

11. Cut off surplus cord and assemble pointer to cord.

12. To set pointer to correct frequency, tune in a station of known frequency and adjust pointer on cord. Fasten with a drop of shellac.

13. Minor calibration errors may be corrected by loosening set screw (S) in drive pulley and moving condenser pulley. Tighten set screw (S) after adjustment.

MODEL 4S-N
GALVIN MFG. CO.

CIRCUIT DIAGRAM MODELS 57BP1 & 2

MODELS 65BP1, 65BP2, 65BP3, 65BP4

MODELS 57BP1, 57BP2

FOR OTHER DATA, SEE INDEX

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**ALIGNMENT CHART MODELS 57BP1 & 2**

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GAIN CONDENSER</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMER NO.</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1</td>
<td>Osc-Mod. Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1200 K.C.</td>
<td>200 Ohms</td>
<td>External</td>
<td>5</td>
<td>1720 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>200 Ohms</td>
<td>External</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

<table>
<thead>
<tr>
<th>SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS 57BP1 &amp; 2</th>
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</thead>
<tbody>
<tr>
<td>Average Microwatt Input</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>4000</td>
</tr>
<tr>
<td>550</td>
</tr>
<tr>
<td>650</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

* .06 Watts = .36 Volts.

**ALIGNMENT CHART MODELS 68BP1-2-4-4**

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GAIN CONDENSER</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTED TO</th>
<th>ADJUST TRIMMER</th>
<th>GENERATOR SET AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1</td>
<td>Osc-Mod. Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1720 K.C.</td>
<td>200 Ohms</td>
<td>External</td>
<td>5</td>
<td>1720 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1600 K.C.</td>
<td>200 Ohms</td>
<td>External</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>200 Ohms</td>
<td>External</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

<table>
<thead>
<tr>
<th>SENSITIVITY AND STAGE GAIN MEASUREMENTS MODELS 68BP1-2-4-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Microwatt Input</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>7200</td>
</tr>
<tr>
<td>195</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

* .06 Watts = .36 Volts.

**ALIGNMENT CHART MODEL 681W**

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GAIN CONDENSER</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>Generator</th>
<th>Adjust</th>
<th>Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd.</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1600 K.C.</td>
<td>200 Ohms</td>
<td>B.C.</td>
<td>External</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>.8 M.C.</td>
<td>400 Ohms</td>
<td>S.W.</td>
<td>External</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F.</td>
<td>80V</td>
<td>80V</td>
<td>8.2</td>
</tr>
<tr>
<td>I.F.</td>
<td>80V</td>
<td>80V</td>
<td>8.0</td>
</tr>
<tr>
<td>Det.</td>
<td>60V</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>Output</td>
<td>70V</td>
<td>110V</td>
<td>-</td>
</tr>
</tbody>
</table>

**SENSITIVITY AND STAGE GAIN MEASUREMENTS**

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator</th>
<th>Feeder Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>460</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>460</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>460</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>360</td>
<td>600</td>
<td>Ant. Terminal 400 Ohms</td>
<td>None</td>
<td>.63</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

* .06 Watts = .63 Volts.

**ALIGNMENT CHART MODEL 681K1**

<table>
<thead>
<tr>
<th>OPERATIONS IN ORDER</th>
<th>GAIN CONDENSER</th>
<th>DUMMY ANTENNA</th>
<th>BAND SWITCH</th>
<th>Generator</th>
<th>Adjust</th>
<th>Generator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum 1720 K.C.</td>
<td>.1 Mfd.</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd.</td>
<td>B.C.</td>
<td>Osc-Mod. Grid</td>
<td>5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>Minimum 1400 K.C.</td>
<td>200 Ohms</td>
<td>B.C.</td>
<td>External</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>200 Ohms</td>
<td>B.C.</td>
<td>External</td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>.8 M.C.</td>
<td>400 Ohms</td>
<td>S.W.</td>
<td>External</td>
<td>11</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

<table>
<thead>
<tr>
<th>TONE Control Set in Treble Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSITIVITY AND STAGE GAIN MEASUREMENT MODEL 681K1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Microwatt Input</th>
<th>Generator</th>
<th>Feeder Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>460</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>450</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>450</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Mfd.</td>
<td>.63</td>
</tr>
<tr>
<td>360</td>
<td>600</td>
<td>Ant. Terminal 400 Ohms</td>
<td>None</td>
<td>.63</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

* .06 Watts = .63 Volts.
Sensitivity and Stage Gain Measurements

<table>
<thead>
<tr>
<th>Average Microvolts Input</th>
<th>Generator Set At</th>
<th>Feeder Connected To</th>
<th>Duty Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2800</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>30</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>35</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg</td>
<td>.38</td>
</tr>
<tr>
<td>7</td>
<td>600</td>
<td>Ant. Terminal</td>
<td>400 Ohms</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

Volume Control set at maximum. * .05 Watts = .38 Volts ** Output meter connected across voice coil.

VOLTAGE
Measurements from socket terminal to chassis ground using 1000 ohms per volt meter.
Line Voltage - 117 Volts.

FOR ALIGNMENT, SEE MODEL 61D (with loop) Vol. XI
POLICE CRUISER  Model P-69-14

ANTENNA ADJUSTMENT

Proceed as follows:

1. Turn the receiver to maximum volume.
2. Turn the dial to a spot near 1600 K.C. that is entirely free from stations.
3. With a screw driver, adjust the antenna trimmer screw for maximum noise level.
4. After first trimming on noise level, tune in a weak station near 1600 K.C. and check the accuracy of the adjustment by readjusting the trimmer for maximum volume.
5. The antenna trimmer screw may be reached through a small hole in the receiver housing. Replace the plug button after adjustment.

TO SET AUTOMATIC TUNER

NOTE: Before setting any station, set the set warm up for not less than ten minutes. If you wish you can "set" the automatic tuner on the service bench before installing the radio in the car. Use a short aerial and push the antenna trimmer to it. Then readjust the antenna trimmer after the installation in the car.

IMPORTANT: You will note that the 9-contact plug on the end of the control head cable has one pin that is shorter than the others. For the "setting up" procedure, this plug should be inserted in its receptacle on the receiver only half-way. This will cause all of the magnet terminals to be connected, but will not permit the tuning motor to run during the adjustment, since the short pin will not make contact, thereby holding the motor circuit open. The motor should not be run at any time during the "setting up" procedure.

1. Loosen the AUTOMATIC LOCKING SCREW which can be reached by removing a plug button in the receiver housing. This screw should be turned counter-clockwise four or five revolutions - far enough to assure plenty of looseness.
2. Turn the dial all the way to the low frequency end (1550 K.C.)
3. Press the first button and hold it down. A faint "click" should be heard, indicating that the tuning magnet has attracted the latch bar.
4. Holding the magnet energized, turn the dial manually all the way to the high frequency end (2900 K.C.) and then all the way back to the low frequency end (1550 K.C.).
5. Still pressing on the button, tune in the station to be set on that button.
6. Proceed to set the remaining five stations. For each station follow steps 2, 3, 4, and 5, as outlined above. AT NO TIME IN THE SETTING UP PROCEDURE SHOULD THE TUNING MOTOR BE PERMITTED TO RUN.

7. Tighten the automatic locking screw very securely. Do not hold the tuning knob while locking the automatic, but allow the mechanism to turn to its natural stop.
8. Replace the plug button, making sure the spring contact in it touches the locking screw. This is essential for motor noise reasons.
9. Push the plug all the way into the receptacle on the receiver housing. so the short motor pin will also make contact.

ALIGNMENT PROCEDURE

Place the radio on the service bench with the front cover removed, but with the speaker and battery connected to it.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

NOTE: Do not adjust the trimmer in the R.F. coil can that is covered with Scotch Tape. The original adjustment, made in the factory, should not be tampered with. (Fig. 2 below, shows all trimmer locations.)

1. Connect the signal generator to the control grid of the G.C. Mod. tube (6AK5) through a .1 HF condenser, having first removed the grid cap from the top of the tube. Connect a 500,000 ohm leak resistor from the grid of the tube to the grid cap just removed from the tube. (See Fig. 2.)
2. Turn the condenser gang completely out of mesh. Connect an output meter across speaker voice coil.
3. Set the signal generator at 262 K.C. and carefully adjust the single trimmer in the Diode coil can to the point showing the highest reading on the output meter.
4. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading.
5. Repeat the I.F. and Diode adjustment several times for maximum accuracy.

R.F. ALIGNMENT

1. Connect the signal generator to the antenna terminal through a 150 MF condenser.
2. Set the signal generator at 2900 K.C. and with the condenser gang completely out of mesh adjust the 2900 K.C. trimmer in the oscillator coil can to the point showing the highest output reading.

3. Set the signal generator at 1550 K.C. Turn the condenser gang completely in mesh and adjust the 1600 K.C. padier in the oscillator coil can for the highest output reading.

NOTE: The adjustment above set the range so the receiver will track with the calibrations in the control head.

4. Set the signal generator at 1600 K.C. and turn the condenser gang until the signal is heard. Adjust the 1600 K.C. padier on the antenna coil can for the maximum output reading.

5. Set the signal generator at 2800 K.C. Turn the condenser gang until the signal is heard. Adjust the 2800 K.C. trimmer in the antenna coil can, for maximum output reading.

6. Adjust the 2800 K.C. trimmer in the R.F. coil can for maximum output reading.
**Models 83K1**

**Fig. 1**

![Diagram of Model 83K1](image)

**Fig. 2**

![Diagram of Model 83K1](image)

**Fig. 3**

![Diagram of Model 103K1](image)

**Fig. 4**

![Diagram of Model 103K1](image)

**Voltage Chart Models 103K1 and 103CK2**

<table>
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<th>Position</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F. Amp.</td>
<td>235 V.</td>
<td>95 V.</td>
<td>0</td>
</tr>
<tr>
<td>Osc. Mod.</td>
<td>235 V.</td>
<td>95 V.</td>
<td>0</td>
</tr>
<tr>
<td>I.F. Amp.</td>
<td>235 V.</td>
<td>95 V.</td>
<td>0</td>
</tr>
<tr>
<td>Det. A.V.C. A.F.</td>
<td>135 V.</td>
<td>-</td>
<td>-5.5 V.</td>
</tr>
<tr>
<td>Phase Inv.</td>
<td>135 V.</td>
<td>--</td>
<td>-5.5 V.</td>
</tr>
<tr>
<td>Pwr. Amp.</td>
<td>235 V.</td>
<td>235 V.</td>
<td>9.0 V.</td>
</tr>
<tr>
<td>Rectifier</td>
<td>325 V.</td>
<td>AC</td>
<td>320 V. (from filament)</td>
</tr>
</tbody>
</table>

Measurements from socket terminal to chassis ground using 1000 Ohms per volt meter.

**Voltage Chart Models 83K1**

<table>
<thead>
<tr>
<th>Position</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F. Amp.</td>
<td>200 V.</td>
<td>80 V.</td>
<td>1.5 V.</td>
</tr>
<tr>
<td>Mixer</td>
<td>265 V.</td>
<td>80 V.</td>
<td>1.5 V.</td>
</tr>
<tr>
<td>Osc.</td>
<td>120 V.</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>I.F. Amp.</td>
<td>265 V.</td>
<td>80 V.</td>
<td>1.5 V.</td>
</tr>
<tr>
<td>Det. A.V.C. A.F.</td>
<td>135 V.</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Phase Inv.</td>
<td>100 V.</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Pwr. Amp.</td>
<td>320 V.</td>
<td>265 V.</td>
<td>10 V.</td>
</tr>
<tr>
<td>Rectifier</td>
<td>355 V.</td>
<td>A.C.</td>
<td>380 V. (from filament)</td>
</tr>
</tbody>
</table>

Measurements from socket terminal to chassis ground using 1000 Ohms per volt meter.

Line Voltage - 117 Volts.

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TO REPAIR DIAL DRIVE CORDS

**TUNING CORD**

1. Cut a length of No. 24 lb. test silk fish cord 40" long.
2. Turn gong to fully meshed position.
3. Thread end of cord through hole in Gong Drive Pulley and bring end up to Gong Drive Pulley
4. Thread end of cord through hole in Dial Cord Reel and bring end up to Gong Drive Pulley.
5. Wind 2 turns (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
6. Thread end of cord through hole in Dial Cord Reel and bring end up to Gong Drive Pulley.
7. Wind 2 turns (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.

**POINTER CORD**

1. Cut a length of No. 24 lb. test silk fish cord 60" long.
2. Thread end of cord through hole in Pointer Drive Pulley.
3. Place a drop of shellac on a good grade of household cement on all knots.
4. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
5. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
6. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
7. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
8. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
9. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
10. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
11. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
12. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
13. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
14. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
15. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.

**POINTER CORD**

1. Cut a length of No. 24 lb. test silk fish cord 60" long.
2. Thread end of cord through hole in Pointer Drive Pulley.
3. Place a drop of shellac on a good grade of household cement on all knots.
4. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
5. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
6. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
7. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
8. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
9. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
10. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
11. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
12. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
13. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
14. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
15. Wind a turn (clockwise) on Dial Cord Reel and bring end up to Gong Drive Pulley.
### ALIGNMENT CHART MODELS 103F1 - 103F2

#### Operation In Order

<table>
<thead>
<tr>
<th>Operation</th>
<th>Condenser</th>
<th>Dummy Antenna</th>
<th>Band Switch</th>
<th>Generator Set At</th>
<th>Adjust Trimmer No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>7</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>8</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>9</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>10</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>11</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>12</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>13</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>14</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>15</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>16</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>17</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>18</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>19</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>B.C.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>20</td>
<td>1000 K.C.</td>
<td>1 Mfd.</td>
<td>R.F. Grid.</td>
<td>1000 K.C.</td>
<td>1-2-3-4-5</td>
<td>455 K.C.</td>
</tr>
</tbody>
</table>

#### Volume Control Set at Maximum

- Voltage meter connected across voice coil.

#### Sensitivity and Stage Gain Measurements Models 103G1 and 103G2

<table>
<thead>
<tr>
<th>Average Microvolts Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna Connected to</th>
<th>Leak Resistance Capacity</th>
<th>Output Metating **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>450</td>
<td>I.F. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
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<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
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<td>1 Mfd.</td>
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</tr>
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<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
<tr>
<td>40</td>
<td>450</td>
<td>Mod. Grid</td>
<td>1 Mfd.</td>
<td>0.63</td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- Output meter connected across voice coil.

---

**TOUING CORD**

1. Remove the large plug.
2. Cut a length of 24 lb. test silk fish cord 29 inches long.
3. Turn the plug to fully retracted position.
4. Thread end of cord through hole in frame of small pulley.
5. With an ordinary paper clip fasten cord to pulley to hold in place.
6. Wind cord in a clockwise direction around the condenser pulley and down to the tuning condenser.
7. Wind cord in a clockwise direction around the condenser pulley.
8. Thread cord through hole in condenser pulley.
9. Slip both ends of cord through eyelet (Part No. M70494) and knot both ends of cord together securely.
10. Hook one end of tension spring (Part No. 41411005) to cord.
11. Connect outer end of spring to hook on pointer pulley.
12. Replace dial pointer.
13. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer pulley on string.
14. Clamp pointer on string with a pair of pliers and secure with a clip of celluloid or a good grade of household cement.

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www.americanradiohistory.com
All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

Current 7 ma at 6.3 volts  Maximum power output 3 watts.
ALIGNMENT PROCEDURE

Remove the chassis from its housing and place it on the service bench. Connect the speaker and battery.

Turn the volume control to maximum position and leave it there throughout the alignment, reducing the signal generator output if necessary.

1. Connect the signal generator to the antenna lead through a .1 uF condenser and to chassis ground. Turn the condenser gang completely out of mesh. Connect an output meter across the speaker voice coil.

2. Set the signal generator at 455 K.C. and carefully adjust the single trimmer in the diode coil to the point showing the highest reading on the output meter. (Advance the signal generator attenuator if necessary to pick up signal.) See Fig. 1.

3. Adjust the two trimmers in the I.F. coil to the point showing the highest output reading.

4. Repeat the I.F. and diode adjustment several times for maximum accuracy.

5. If the radio is to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola Part No. 1X1801B must be used in series with the lead from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

6. Set the signal generator at 1000 K.C. and with the condenser gang still completely out of mesh, adjust the oscillator trimmer to the point showing the highest output reading.

7. Set the signal generator at 1400 K.C. and turn the condenser gang to the signal at 1400 K.C. Adjust the antenna trimmer on the condenser gang to the point showing the highest output reading.

8. Set the signal generator at 600 K.C. and turn the condenser gang until the dial pointer reads 600 K.C. Rock the pointer at the 600 K.C. position on the dial scale, while adjusting the antenna pad-der, until a combination is found which gives highest output reading.

9. Recheck step No. 3.

NOTE: The antenna pad-der is reached through a hole in the bottom of the chassis base, directly under the antenna coil can.

POINTER CORD INSTRUCTIONS

1. Remove the chassis from the housing.

2. Remove the broken string.

3. Set the condenser gang to fully open position.

4. Cut a length of 24 lb. dial cord 24 inches long.

5. Thread one end of the cord through slot "A" in the condenser pulley, and with an ordinary paper clip fasten it to the idler pulley bracket to hold it in place. (See Fig. 2.)

6. Run the cord over to idler pulley No. 1, and around it in a clockwise direction.

NOTE: Minor corrections may be made by sliding the dial scale to the right or left by loosening the self-tapping screws which hold it in position.

SENSOR DATA - Model 250

Analog V. Generator

<table>
<thead>
<tr>
<th>Input</th>
<th>Generator connected to</th>
<th>Dummy Ant. Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000</td>
<td>I.F. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>1.76</td>
</tr>
<tr>
<td>105</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>1.76</td>
</tr>
<tr>
<td>220</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>1.76</td>
</tr>
<tr>
<td>850</td>
<td>R.F. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>1.76</td>
</tr>
<tr>
<td>7</td>
<td>Ant. Lead</td>
<td>40 MFF</td>
<td>None</td>
<td>1.76</td>
</tr>
</tbody>
</table>

* For one watt output
** Meter connected across voice coil
1.76 volts equals 1 watt output for 3 ohm voice coil

NOTE: If a Motorola Booster Antenna is used substitute a Special Motorola dummy part No. 1X1801B or M4348 Booster coil No. LP01 in series with a 25 MFF condenser in place of the 40 MFF condenser.

FIGURE 1
**MODEL 251**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>450 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>450 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 401**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>34,000</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>677</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 501**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 301**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,900</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>310</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 601**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>677</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 301**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
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<tbody>
<tr>
<td>2,900</td>
<td>262 K.C.</td>
<td>1.74</td>
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<td>1.74</td>
<td></td>
</tr>
<tr>
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<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
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<td></td>
</tr>
<tr>
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<td>600 K.C.</td>
<td>1.74</td>
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<td>.5 Meg.</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 501**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
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</tr>
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<td>640</td>
<td>262 K.C.</td>
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<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
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<tr>
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<td>600 K.C.</td>
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<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
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<td>600 K.C.</td>
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<td>.5 Meg.</td>
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<tr>
<td>3</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 501**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
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</thead>
<tbody>
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<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
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<td>640</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
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<td>1.74</td>
<td></td>
</tr>
<tr>
<td>677</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
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<td>1.74</td>
<td></td>
</tr>
<tr>
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<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**

**MODEL 501**

<table>
<thead>
<tr>
<th>Generator</th>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Dummy Antenna</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>262 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>677</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>600 K.C.</td>
<td>1.74</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

**Volume Control Set at Maximum**

- **1 Watt = 1.74 Volts**

**OUTPUT METER CONNECTED ACROSS VOLTAGE COIL.**
NOTE: Model 500 uses tuner E11T which is identical to the EST.
See Motorola Pages 10-12.
ALIGNMENT PROCEDURE

Place the chassis on the service bench with the speaker and battery connected to it. Turn the volume control to maximum position and leave it there throughout the alignment. Move the receiver to a location that will not interfere with reading output meter if necessary.

1. Adjust the trimmer in the RF coil can that is covered with Scotch tape. The trimmer adjustment, made to the factory should not be tampered with.

I.F. ALIGNMENT

1. Connect the signal generator to the control grid of the 6AK7 tube (E611) through a 0.1 MF condenser, having first removed the 50,000 ohm resistor from the grid of the tube. Connect a 500,000 ohm high loss resistor from the grid of the tube to chassis ground. (Fig. 1 below, shows all trimmer locations.)

2. Set the signal generator at 200 K.C. and turn the RF coil can to the point showing the highest output reading on the output meter.

3. Unlock the two trimmers in the RF coil can to the point showing the highest output reading.

4. Repeat the I.F. and Oscillo adjustment several times for maximum accuracy.

SETUP THE RAKE

1. Connect the signal generator to the control grid of the R.F. tube (6SH7) using the same 0.1 MF condenser.

2. Set the signal generator at 1500 K.C. and with the condenser gang completely out of mesh adjust the 1500 K.C. oscillator trimmer to the point showing the highest output reading.

3. Set the signal generator at 500 K.C. Turn the condenser gang completely out of mesh and adjust the 600 K.C. oscillator trimmer for the highest output reading.

NOTE: The adjustments above set the range so the receiver will track with the calibrated in the control head. R.F. AND ANTENNA ALIGNMENT

NOTE: If the radio is to be operated on a Motorola Booster antenna, a special antenna, Motorola Part No. 188665 must be used in series with the line from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the special dummy.

1. Connect the signal generator at 1000 K.C. Turn the condenser gang until the signal is heard. Lock the 1000 K.C. tuning trimmer in the antenna can for maximum output reading.

2. Adjust the 1400 K.C. MF trimmer in the RF coil can for maximum output reading.

3. Connect the signal generator through the antenna can and turn the condenser gang until the signal is heard. Adjust the RF coil can for the maximum output reading.

4. Recheck steps 1, 2, and 3, for accuracy.

SENSITIVITY AND STAGE GAIN MEASUREMENTS

All stage gain measurements must be made with the volume control set for full volume. The shielded lead from the signal generator is connected to the grid terminal of the tube through a 0.1 MF condenser, with a 500 Ohm resistor connected as a leak between the grid of the tube and the grid lead which has been removed.

When measuring over-all sensitivity at the antenna terminal, use a 40 MF condenser in place of the 0.1 MF condenser. It must be remembered that the figures in the table are average and allowances must be made for variations between two sets of the same general type, due to difference of tube characteristics, etc.

AVERAGE

<table>
<thead>
<tr>
<th>MICROVOLT</th>
<th>GENERATOR</th>
<th>GENERATOR</th>
<th>DUMMY</th>
<th>SEAT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT</td>
<td>GENERATOR</td>
<td>FINGERED TO</td>
<td>CAPACITY</td>
<td>RESISTANCE</td>
<td>METER</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20,000</td>
<td>200 K.C.</td>
<td>I.F. Grid</td>
<td>.1MF</td>
<td>.5Mf</td>
<td>1.76V</td>
</tr>
<tr>
<td>500</td>
<td>200 K.C.</td>
<td>Mod. Grid</td>
<td>.1MF</td>
<td>.5Mf</td>
<td>1.76V</td>
</tr>
<tr>
<td>500</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1MF</td>
<td>.5Mf</td>
<td>1.76V</td>
</tr>
<tr>
<td>30</td>
<td>600 K.C.</td>
<td>I.F. Grid</td>
<td>.1MF</td>
<td>.5Mf</td>
<td>1.76V</td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>40 MF</td>
<td>Note</td>
<td>1.76V</td>
</tr>
</tbody>
</table>

- For one watt output.
- Meter connected across voice coil.
- 1.76 volt equals 1 watt output for 5-ohm voice coil.
- Use special dummy part No. L13098 or NAC1 Booster Coil No. 273000 in series with a 25 MF condenser.

NOTE: If set is not used with a Motorola Booster antenna, substitute a 40 MF condenser for the Special Dummy.

VOLTAGE CHART - MODEL 500

<table>
<thead>
<tr>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF</td>
<td>196</td>
<td>72</td>
<td>2.7</td>
</tr>
<tr>
<td>Ge-Mod.</td>
<td>196</td>
<td>72</td>
<td>2.7</td>
</tr>
<tr>
<td>I.F.</td>
<td>196</td>
<td>72</td>
<td>2.7</td>
</tr>
<tr>
<td>Det. Ave. AP</td>
<td>210</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Output</td>
<td>205</td>
<td>200</td>
<td>13</td>
</tr>
<tr>
<td>Output</td>
<td>205</td>
<td>200</td>
<td>13</td>
</tr>
<tr>
<td>Rect.</td>
<td>210</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohm per voltage meter. Current 0.5 amps at 110 volt. Maximum power output 5 watts.

©John F. Rider, Publisher
NOTE: Model 700 uses tuner E12T which is identical to the E5T.
See Motorola Pages 10 - 1, 2.
ALIGNMENT PROCEDURE

Early, Late

Place the chassis on the service bench with the speaker and battery connected to it. The chassis is to be moved from the bench position and left there throughout the alignment. Reducing the signal generator output if necessary.

NOTE: Fig. 1 below shows all trimmer locations.

1. Connect the signal generator to the control grid of the grid-mod. tube (6AU7) through a 1.1 MF condenser, having first removed the grid cap from the top of the tube. Connect 600,000 MF leak resistor from the grid of the tube to the grid cap just removed from the tube. Turn the condenser grid completely out of mesh. Connect the output meter across the grid and output leads. Adjust the 600 K.C. oscillator trimmer for maximum output reading.

2. Set the signal generator at 620 K.C. and carefully turn the two trimmers in the signal generator to the point showing the highest output reading on the output meter.

3. Adjust the two trimmers in the I.F. coil can to the point showing the highest output reading. Recheck the I.F. and Diode adjustment several times for maximum accuracy.

SETTING THE BAND

1. Connect the signal generator to the control grid of the R.F. tube (880C) using the same 1.1 MF condenser. Connect the signal generator at 1500 K.C. and with the condenser gauk completely out of mesh, turn the 1500 K.C. oscillator trimmer to the point showing the highest output reading.

2. Set the signal generator at 620 K.C. Turn the condenser gauk completely in and adjust the 600 K.C. oscillator trimmer for the highest output reading. R. S. AND ANTENNA ALIGNMENT

NOTE: For the radio to be operated on a Motorola Booster Antenna, a special dummy antenna Motorola part No. 26919243 should be used in series with the load from the signal generator to the antenna receptacle. Change the signal generator connection to the antenna lead, using the dummy antenna. Adjust the signal generator at 1460 K.C. and turn the condenser gauk until the signal is heard. Adjust the 600 K.C. oscillator trimmer for the highest output reading.

3. Adjust the 1460 K.C. R.F. trimmer in the R.F. coil can for maximum output reading. 4. Set the signal generator at 600 K.C. and turn the condenser gauk until the signal is heard. Adjust the 600 K.C. oscillator trimmer for the highest output reading. Recheck steps 2, 3, and 4, for accuracy.

SENSITIVITY AND STAGE GAIN MEASUREMENT

All stage gain measurements must be made with the volume control set for full volume. The grid cap must be removed from the grid terminal of the tube through a 1.1 MF condenser, with a 600,000 MF leak resistor connected as a leak resistance between the grid of the tube and the grid lead which has been removed.

When measuring overall sensitivity at the antenna terminal, use a special dummy part #26919243 and adjust the condenser gauk completely in and turn the condenser gauk completely out of mesh. Connect an output meter across the grid and output leads. Adjust the 600 K.C. oscillator trimmer for maximum output reading. Set the signal generator at 1900 K.C. and with the condenser gauk completely out of mesh, turn the 1900 K.C. oscillator trimmer for maximum output reading.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>TUBE POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.F.</td>
<td>235</td>
<td>80</td>
<td>3.8</td>
</tr>
<tr>
<td>Sec. Mod.</td>
<td>235</td>
<td>80</td>
<td>3.8</td>
</tr>
<tr>
<td>I.F.</td>
<td>235</td>
<td>80</td>
<td>4</td>
</tr>
<tr>
<td>Det. AVC</td>
<td>235</td>
<td>80</td>
<td>1.9</td>
</tr>
<tr>
<td>A.F.</td>
<td>235</td>
<td>80</td>
<td>1.9</td>
</tr>
<tr>
<td>Output</td>
<td>235</td>
<td>80</td>
<td>1.9</td>
</tr>
<tr>
<td>Rect.</td>
<td>235</td>
<td>80</td>
<td>1.9</td>
</tr>
</tbody>
</table>

All voltages measured from socket terminal to chassis ground using 1000 ohm per volt meter.

Current 0 amps. at 6.3 volts.

Maximum power output 100 watts.

John F. Rider, Publisher
Fig. 5—Schematic Circuit Diagram

- **Power Consumption**: 6.8 Amperes at 6.3 Volts
- **Power Output**: 3 Watts Undistorted
- **Sensitivity**: 1.5 Microvolts at .5 Watt Output
- **Selectivity**: 39 KC Broad at 1000 Times Signal
- **Tuning Frequency Range**: 540 to 1560 KC
- **Intermediate Frequency**: 456 KC
- **Speaker**: 6" Electro-Dynamic

Fig. 6—Location of 1st I.F. Trimmer in Tuning Unit
Procedure for Setting the Station Buttons

To set the station buttons, first select the station number on your list. Then, using a flat-head screwdriver, remove the button on the tuning knob by turning it counterclockwise. The button should be replaced in the same manner as described. After all desired stations have been set, release any inactive buttons which are depressed. To keep the manual tuning depressed with one hand and, with the other hand, push the OFF button slightly, only enough to release any station button which is depressed. The OFF button should be pushed all the way into the depressed position, so that the dial will not be illuminated.

Alignment Procedure

Insert the antenna cable plug in the antenna socket on the tuning unit. The total capacity of the antenna cable and dummy antenna should be 60 mfd. If the cable, for example, has a capacity of 25 mfd, use a 25 mfd condenser for a dummy antenna. Connect the other end of the antenna cable through the dummy antenna to the output of the signal generator.

Set the signal generator for 1500 KC. Turn the tuning knob until the iron cores are far out of the tuning ends as they will go. Then adjust the oscillator trimmer (Fig. 1) until maximum output is obtained.

Types of High Capacity Antennas—Running board, over-the-rail types which are long and are mounted close to the metal roof of the car, ordinary built-in roof antennas (not metal roof).

Antenna Cable

The total capacity of antenna and shielded cable should be 35 to 60 mfd.

For the door hinge and over-the-rail type antennas, the antenna lead must be shielded the entire distance from the radio to the point where the lead goes through the car body to the outside. In the case of a running board antenna, the antenna lead shielding must extend all the way to the antenna.

When the antenna cable is connected to an antenna lead coming down the post, the shielded cable should be pushed several inches up into the pillar post.
GAMBLE SKOGMO, INC.

Setting the Pushbuttons MODES 509 and C800

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

Next pull one of the pushbuttons all the way out as far as it will come (with fingers on top and hand on bottom) and then, while holding it, push the button hard all the way in to lock the station on place. (Push directly on front of button). Continue setting each pushbutton in the same way, viewing the pushbutton until you have all stations you want. If it does not do so you did not push the button hard enough. Output Setting the Pushbuttons MODES 509 and C800

To change stations simply repeat the procedure above.

— Your control—Table
— Trim cart—Maximum all adjustments.
— Equal select—choose a group of equal gain with a short heavy load.
— Equal drive—choose audio input levels with gain and generator output—minimum output.
— Allow slight and natural variations in tone of several stations.

<BAND SIGNAL GENERATOR Connection Dial Function of Position of Band Switch Trimmer Function Adjustments

<table>
<thead>
<tr>
<th>BAND</th>
<th>Frequency Setting</th>
<th>Antenna Type</th>
<th>Connection to Radio</th>
<th>Function of Band Switch</th>
<th>Dial Transformer Setting</th>
<th>Trimmer Function Adjustments</th>
<th>Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Mc</td>
<td>455 Kc. 1 NFD.</td>
<td>Grid of M78 (1F.)</td>
<td>Breeder.</td>
<td>Two Transformers in Order</td>
<td>Top: I P.</td>
<td>Top: I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.1 Mc. 40 ohms</td>
<td>Antenna lead</td>
<td>31 M.</td>
<td>Set dial at 9.1 Mc.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc. 40 ohms</td>
<td>Antenna lead</td>
<td>49 M.</td>
<td>Set dial at 6.1 Mc.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.4 Mc. 40 ohms</td>
<td>Antenna lead</td>
<td>25 M.</td>
<td>Set dial at 11.4 Mc.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>15 METER BAND</td>
<td>15.2 Mc. 40 ohms</td>
<td>Antenna lead</td>
<td>15 M.</td>
<td>Set dial at 15.2 Mc.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>170 Kc. 300 ohms</td>
<td>Antenna lead</td>
<td>B.130 B.55</td>
<td>Man.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
</tr>
<tr>
<td>500 Kc. 6 NFD. Grid of M78 (1F.)</td>
<td>Breeder.</td>
<td>Two Transformers in Order</td>
<td>Top: M.</td>
<td>I P.</td>
<td>I P.</td>
<td>I P.</td>
<td></td>
</tr>
</tbody>
</table>

Power Consumption METER 509

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>A Battery</th>
<th>300 MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>B Battery</td>
<td>15.5 MA</td>
<td></td>
</tr>
</tbody>
</table>

Power Output METER C800

<table>
<thead>
<tr>
<th>Power Output</th>
<th>210 MW Undistorted</th>
</tr>
</thead>
</table>

Selectivity METER C800

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>50 Million Outputs 10 Microvolts Average</th>
</tr>
</thead>
</table>

Tuning Frequency Range Broadcast Band: 550 to 1750 KC

49 M. Band: 9.1 to 10.0 Mc

Selectivity: 38 KC Broad at 1000 Times Signal at 1000 KC

535 to 1750 KC

Intermediate Frequency: 455 KC

Speaker: 6 in. Electro Dynamic

TRIMMER VIEW

Front View Chassis

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www.americanradiohistory.com
Model 415 is a 5-tube superheterodyne radio receiver, for operation on
a 117 volt A.C., 60 cycle or 11 volt D.C. supply. This receiver covers a frequency range from 560 Kilocycles to 1750 Kilo-
cycles (KC.)

©John F. Rider, Publisher
### Broadcast Band A.C.-D.C.

Superheterodyne Receiver

Frequency Range 530-1720 Kilocycles

#### ALIGNMENT PROCEDURE

- **Volume control—Maximum all adjustments.**
- **Connect B- of radio chassis, to ground post of signal generator through 1 MFD. condenser.**
- **Connect dummy antenna value in series with generator output lead.**
- **Connect output meter across primary of output transformer.**
- **Allow chassis and signal generator to “heat-up” for several minutes.**

#### FREQUENCY RANGE

530 to 1720 K.C.

#### BAND | SIGNAL GENERATOR | Dummy Antenna | Connection to Radio | Variable Condenser Setting | Trimmers Adjusted (in Order Shown) | Trimmer Function | Adjustment
--- | --- | --- | --- | --- | --- | --- | ---
I.F. | 465kc | .1 MFD. Grid of 6A8 | Rotor full open (Plates out of mesh) | Two trimmers (See Fig. 3) | I.F. | Adjust to maximum output
BROADCAST | 1720 kc | 100 mfd. | Rotor full open (Plates out of mesh) | Trimmer—Top of rear section of gang (See Fig. 1) | Broadcast Antenna | Adjust to maximum output

### PARTS

- **C1, C10 and C11 in one unit, part no. 11972**
- **C2, C3, C4, C5, C6 and C8**
- **C7 and C6**
- **C9, C10 and C11 in one unit, part no. 11972**

### RESISTORS

- **R1 120138 250 ohm volume control**
- **R2 130130 250 ohm—30 W.**
- **R3 120134 510 ohm—30 W.**
- **R4 120135 250 ohm—30 W.**
- **R5 120136 2 megohm—5 W.**
- **R6 120137 250 ohm—5 W.**
- **R7 120138 300 ohm—5 W.**
- **R8 120139 250 ohm—5 W.**

### CONDENSERS

- **C1 120202 2, gang variable condenser**
- **C2 120203 3000 mica**
- **C3 120204 Oscillator Trimmer**
- **C4 120205 Oscillator Grid**
- **C5 120206 .5 x 200 v.**
- **C6 120207 500 mica**
- **C7 120208 250 mica**
- **C8 120209 500 mica**
- **C9 120210 1 x 500 v.**
- **C10 120211 300 mica**
- **C11 120212 500 mica**
- **C12 120213 250 mica**
- **C13 120214 500 mica**
- **C14 120215 250 mica**
- **C15 120216 500 mica**
- **C16 120217 500 mica**

### FOR TUNER ADJUSTMENTS

- **Model 527-A, Volume X
- **Page 10-8**
GAMBLE SKOGMO, INC.

MODEL 533, Series B  
Ser. No. OC371605B up,  
MODEL C533, Series C

Detector-oscillator  
I. F. Amplifier  
Second Det.  
A.V.C.  
First Audio  
Output

**IF. 465 KC**

![Diagram](image-url)

**FREQUENCY RANGE**

535 to 1690 K.C.

**Circuit Diagram**

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>130177</td>
<td>20M ohm—5 w.</td>
</tr>
<tr>
<td>R2</td>
<td>130118</td>
<td>60M ohm—5 w.</td>
</tr>
<tr>
<td>R3</td>
<td>130118</td>
<td>60M ohm—5 w.</td>
</tr>
<tr>
<td>R4</td>
<td>130356</td>
<td>100 ohm—5 w.</td>
</tr>
<tr>
<td>R5</td>
<td>130170</td>
<td>3 megohm—5 w.</td>
</tr>
<tr>
<td>R6</td>
<td>130112</td>
<td>56M ohm—5 w.</td>
</tr>
<tr>
<td>R7</td>
<td>130217</td>
<td>5 megohm—volume control</td>
</tr>
<tr>
<td>R8</td>
<td>130227</td>
<td>5 megohm—5 w.</td>
</tr>
<tr>
<td>R9</td>
<td>130215</td>
<td>25 ohm—5 w.</td>
</tr>
<tr>
<td>R10</td>
<td>1309</td>
<td>200M ohm—5 w.</td>
</tr>
<tr>
<td>R11</td>
<td>13037</td>
<td>750M ohm—5 w.</td>
</tr>
<tr>
<td>R12</td>
<td>130166</td>
<td>150 ohm—5 w.</td>
</tr>
<tr>
<td>R13</td>
<td>130173</td>
<td>200 ohm—5 w.</td>
</tr>
<tr>
<td>R14</td>
<td>130227</td>
<td>1200 ohm—4 watt</td>
</tr>
<tr>
<td>R15</td>
<td>1309</td>
<td>600M ohm—5 w.</td>
</tr>
<tr>
<td>R16</td>
<td>1309</td>
<td>200M—5 w.</td>
</tr>
</tbody>
</table>

**CONDENSERS**

| C1       | 1295     | .001 Mica Condenser |
| C2       | 129114   | .003 mfd. mica     |
| C3       | 124136   | Antenna Trimmer    |
| C4       | 124136   | Oscillator Trimmer |
| C5       | 1295     | .001 mica          |
| C6       | 1009     | .05 x 300 v.       |
| C7       | 1295     | .001 mica          |
| C8       | 10025    | .002 x 600 v.      |
| C9       | 10011    | .1 x 400 v.        |
| C10      | 1001     | .1 x 400 v.        |
| C11      | 12912    | 6002 mica          |
| C12      | 10019    | .066 x 600 v.      |
| C13      | 11904    | 40 mfd. lytic—150 w. v. |
| C14      | 11994    | 20 mfd. lytic—150 w. v. |
| C15      | 11994    | 20 mfd. lytic—150 w. v. |
| C16      | 10011    | .1H x 400 v.       |
| C17      | 129162   | .0008 Mica Condenser |
| C18      | 129163   | .000015 Ceramic Condenser |
| C3       | C4       | C3 and C4 in same unit |
| C13, C14 and C15 are in same unit |

**PARTS**

| T1       | 112767   | Antenna Coil—Pentehaay tuning assembly complete |
| T2       | 112967   | Oscillator Coil |
| T3       | 108404F  | Input l. F. Coil—465 kc. |
| T4       | 108454D  | Output l. F. Coil—465 kc. |
| T5       | 105108   | Output Transformer |
| T6       | 114193   | 5" P.M. Speaker |
| T7       | 104706   | Phone Motor |
| T8       | 122228   | Turntable |
| T9       | 11141944 | Phone pick up arm |
| S1       | 125113   | Phone Switch |
| S2       | 107249   | Switch on volume control |
| P1       | 107249   | Pilot Light T47 |

**MODEL 533 Series B**  (Serial No. OC371605B and up)

Power Consumption  
Radio Only 30 Watts

Power Output  
900 Milliwatts Undistorted, 1.7 Watts Maximum

**VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOMETER BETWEEN SOCKET TERMINALS AND B.**

**NOTE:** Switch should be in radio position and set connected to HT, A.C., D.C. supply source. No signal and volume control in minimum position.

**BOTTOM VIEW OF CHASSIS**

![Diagram](image-url)

**REAR OF CHASSIS**

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IMPORTANT: See Aligning Instructions

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments
- Connect B of radio chassis to ground post of signal generator through .1 Mfd. condenser
- Connect dummy antenna value in series with generator output lead
- Connect output meter across primary of output transformer
- Allow chassis and signal generator to "heat up" for several minutes

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed
- Output indicating meter
- Non-metallic screwdriver
- Dummy antennas—.1 Mfd., and 200 Mmf.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Iron Cores (Dial Setting)</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>160 Kc.</td>
<td>.1 MFD.</td>
<td>Connect to Terminal &quot;A&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C4) (See Fig. 1)</td>
<td>Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>160 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Iron Cores All the way out</td>
<td>Trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>140 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Turn Dial to 1400 Kc.</td>
<td>Adjust position of antenna coil right or left (See Fig. 3)</td>
<td>Antenna Coil Adjustment</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>160 Kc.</td>
<td>200 MMF.</td>
<td>Connect to Terminal &quot;B&quot; (See Fig. 1)</td>
<td>Turn Dial to 1600 Kc.</td>
<td>Adjust trimmer (C3) (See Fig. 1)</td>
<td>Antenna</td>
<td>Check for tracking (See Note &quot;B&quot;)</td>
</tr>
</tbody>
</table>

ALIGNING INSTRUCTIONS:

CAUTION:—No aligning adjustments should be attempted without first thoroughly checking over all other possible causes of trouble, such as poor installations, open or grounded antenna systems, low line voltage, defective tubes, condensers and resistors. In order to properly align this radio, the chassis should be removed from the cabinet.

SERVICE NOTES:

Voltages taken from different points of circuit to chassis are measured with volume control at minimum, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 117 volt 60 cycle A.C. line.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D. C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

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

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

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

FIG. 1.—TUNING ASSEMBLY
GAMBLE SKOGMO, INC.  
MODEL C640

R. F. Amp  
12SK7  

Mixer, First Detector-Oscillator  
12SA7  

I. F. Amp  
12SK7  

Second Detector, A. V. C.  
First Audio  
12SQ7

FREQUENCY RANGE  
540 to 1600 K.C.

Power Consumption  
35 Watts

Power Output  
1 Watt Undistorted, 1.5 Watts Maximum

RESISTORS

R1  13018  4M ohms—5 w.
R2  13019  1 megohm—5 w.
R3  13010  1000 ohms—5 w.
R4  13011  25 ohms—5 w.
R5  13013  25 OHMS—5 w.
R6  13014  5M ohms—5 w.
R7  13015  100M OHMS—5 w.
R8  13016  50M ohms—5 w.
R9  13017  200 ohms—1 w.
R10  13018  1200 ohms—1 w.
R11  13019  3 megohms—5 w.
R12  13020  400 ohms—5 w.
R13  13021  150 ohms—5 w.
R14  13022  50M ohms—5 w.
R15  101118  1 megohm volume control
R16  13023  50M OHMS—5 w.
R17  13024  300M OHMS—5 w.
R18  13025  5 megohms—5 w.

CONDENSERS

C1  102116  2 gang variable condenser
C2  102057  1000 x 600 v.
C3  B. C. Antenna Trimmer on Gang Con.
C4  13022  1000 Mica
C5  13001  .1 x 400 v.
C6  13002  .25 x 200 v.
C7  13025  .0001 mica
C8  B. C. Oscillator Trimmer on Gang Con.
C9  13026  .0001 mica
C10  11994  40 mfd. lyric x 150 w.
C11  11994  20 mfd. lyric x 150 w.
C12  11994  20 mfd. lyric x 150 w.
C13  11999  .05 x 200 v.
C14  130151  .0001 mica
C15  130161  .0001 mica
C16  103251  .002 x 600 v.
C17  10326  .02 x 400 v.
C18  10010  2 x 400 v.
C19  130151  .0001 mica
C20  C9, C10, C11 are in same unit
C21  C9, C16, C17 are in same unit

PARTS

T1  111190 Loop Antenna complete
T2  130152 Oscillator Coil
T3  101404H Input L. F. Coil—455 Kc.
T4  101445 Output L. F. Coil—455 Kc.
T5  101004 Output Transformer
T6  114197 5" P. M. Speaker
L1  12100 Loading Coil
S1  On-off switch on volume control
P1  103249 747 pilot light bulb

NOTE: "A" Lay the output lead from the generator in back of the loop antenna. Turn up the output of the generator, picking up the energy in the loop antenna without any electrical connection from the generator.

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**MODEL 678, Issue C**

**PROCEDURE FOR SETTING THE AUTOMATIC PUSHBUTTONS**

There are six pushbuttons on the Remote Tuner Unit by means of which six stations may be set up for automatic tuning. (See Il, Fig. 2.)

Make a list of local stations you tune in regularly; any number up to and including six.

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

---

**MODEL C640**

**PROCEDURE FOR SETTING THE AUTOMATIC TUNER PUSH BUTTONS**

**MODEL C640**

1. Make a list of six stations you tune in regularly. There are six push buttons on the front of the radio by means of which six stations may be tuned automatically. (See "B," Fig. 2.)

2. Punch out the call letters of the stations you have selected from the set of station call letter tabs supplied.

3. Stations may be set up in any sequence desired. Press any one of the automatic tuner push buttons down all the way.

4. Hold the push button down firmly, and tune set very carefully to station desired, until station is heard clearly and with maximum volume.

Release the push button.

5. Press down another automatic tuner push button. Hold it down firmly and carefully tune in next station desired. Release this push button.

Follow this procedure until you have selected all of your favorite stations.

6. Now rotate the tuning knob to the right (clockwise) as far as it will turn, and with a coin (quarter), tighten the special locking screw ("C") in the center of the tuning knob, (See Fig. 2.)

It is VERY IMPORTANT that this locking screw is turned until it is absolutely tight.

This screw will lock in place all the stations you have selected on the automatic tuning push buttons. (Note: Locking screw "C" is loose when radio is shipped from factory.)

---

**CHANGING STATIONS:**

If you should desire to change any station you have selected to another, loosen the locking screw "C" one or two turns. Hold in push button on which the station is to be changed and tune in new station desired. Release the push button.

(Note: If the dial mechanism works hard when setting up a new station for one of the automatic tuner buttons it is due to the locking screw being too tight. Loosen the locking screw "C," until the dial mechanism works freely with the tuner push button pressed in."

Be sure to retighten the locking screw, otherwise the stations you have previously selected will not stay adjusted to the push button.

The set is now set up for automatic tuning.
**TECHNICAL DATA—Model No. C671**

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>Radio Only</th>
<th>70 Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Only</td>
<td>20 Watts</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td>2.1 Watts Undistorted</td>
<td></td>
</tr>
<tr>
<td>Sensitivity for 500 Milliwart Output</td>
<td>15 Microvolts Average</td>
<td></td>
</tr>
<tr>
<td>Selectivity</td>
<td>51 KC Broad at 1000 Times Signal at 1000 KC</td>
<td></td>
</tr>
<tr>
<td>Tuning Frequency Range Broadcast Band</td>
<td>530 to 1600 KC</td>
<td></td>
</tr>
<tr>
<td>Shortwave Band</td>
<td>5.46 to 18.3 MC</td>
<td></td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>455 KC</td>
<td></td>
</tr>
<tr>
<td>Speaker</td>
<td>8 in. Electro Dynamic</td>
<td></td>
</tr>
</tbody>
</table>

**Band and Phono Switch**

This knob switches the tuning from the broadcast stations to the shortwave band, and also to the “Phono” position. Turn the knob to “Broadcast” for broadcast stations and to “Phono” to play records. The points marked 49M-31M-25M-20M-19M-16M on the dial scale are shortwave broadcast channels—The 49M and 31M channels are best during darkness—The other channels are best in daylight. Tune short waves very slowly.

---

**ALIGNMENT PROCEDURE**

- Volume control—Maximum all adjustments.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to “heat up” for several minutes.

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1—mm, 200 mm, 400 ohms.

---

### BAND SIGNAL GENERATOR

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 6SA7 Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmers on top</td>
</tr>
<tr>
<td>SHORT WAVE BAND (See Note A)</td>
<td>17 Mc.</td>
<td>400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4</td>
</tr>
<tr>
<td>BROADCAST BAND (See Note A)</td>
<td>1600 Kc.</td>
<td>200 mmf.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5</td>
</tr>
<tr>
<td>LOOP ALIGNMENT (See Note B)</td>
<td>1400 Kc.</td>
<td>200 mmf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc. (See Top View)</td>
<td>Trimmer C2</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>200 mmf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc. (See Top View)</td>
<td>Trimmer C6</td>
</tr>
</tbody>
</table>

**NOTE “A”**—The signal generator is connected to the “ANT.” and “GND” leads when aligning the Short Wave Band and to the grid of the 6SA7 tube and ground terminal when setting the Broadcast Band oscillator end frequencies, (1000 and 530 K C).

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

---

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

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

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

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

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

The following equipment is required for aligning:
- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas—1 ml, 125 mm.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Remote Tuner Dial Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6SK7</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer C21</td>
<td>Output I.F.</td>
<td>Adjust max output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>.1 MFD.</td>
<td>Grid of 6AGT</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer C14, C15</td>
<td>Input I.F.</td>
<td>Adjust max output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1555 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 1555 Kc.</td>
<td>Trimmer C5</td>
<td>Oscillator</td>
<td>Adjust max output</td>
</tr>
<tr>
<td></td>
<td>1400 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 Kc.</td>
<td>Trimmer C1, C3</td>
<td>Antenna and R.F.</td>
<td>Adjust max output</td>
</tr>
<tr>
<td></td>
<td>600 Kc.</td>
<td>125 mm.</td>
<td>Antenna lead</td>
<td>Set dial at 600 Kc.</td>
<td>Trimmer C2</td>
<td>See note &quot;C&quot;</td>
<td>See note &quot;C&quot;</td>
</tr>
</tbody>
</table>

NOTE "A" IMPORTANT: To align the output I.F. transformer without using a cathode ray oscillograph a 10M ohm resistor must be shunted across the diode tuned circuit. Connect the resistor as indicated by points "b" and "g" on the circuit diagram and the bottom view of the radio chassis Fig. 5. A red dot on top of output I.F. can designate location of trimmer "C19."

NOTE "B": Before adjusting trimmer C21 disconnect the 10M ohm resistor. Under no circumstances re-adjust trimmers C21 or C32 after the 10M ohm resistor has been removed.

For alignment of the output I.F. transformer using a cathode ray oscillograph the 10M ohm resistor is not used.

NOTE "C": Maximum gain for this adjustment depends on the capacity of the antenna system of the car in which the radio is installed. For proper alignment of this adjustment see "Adjusting Antenna Trimmer," page 3.

ALIGNMENT OF THE IRON CORES

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

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

IMPORTANT—ADJUSTING ANTENNA TRIMMER:

Tune in any weak station between 600 and 800 kc.

Make sure that the antenna shunt trimmer on the Bottom of the Remote Tuner is turned all the way out (counter clockwise), (see adjustment "C1," Fig. 4)

Adjust antenna series trimmer on the side of the remote Tuner Unit. For maximum output. (See adjustment "C2," Fig. 4, Page 7)

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

The above arrangement will cover any antenna capacity that is now in use.
### ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. F.</td>
<td>465 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6SK7 I. F.</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 6SA7 Mixer</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See Fig. 1)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>SHORT WAVE BAND</td>
<td>17 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 17 Mc.</td>
<td>Trimmer C4 (See Fig. 4)</td>
<td>Short Wave oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See Note A)</td>
<td>6 Mc. 400 Ohms</td>
<td>External Antenna and Ground</td>
<td>Short Wave</td>
<td>Set Dial at 6 Mc.</td>
<td>Trimmer C7 (See Fig. 4)</td>
<td>Short Wave oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1570 Kc. 200 mWf.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer C5 (See Fig. 4)</td>
<td>Broadcast oscillator</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See Note A)</td>
<td>532 Kc. 200 mWf.</td>
<td>Grid of 6SA7</td>
<td>Broadcast</td>
<td>Set Dial at 532 K.C.</td>
<td>Trimmer C6 (See Fig. 4)</td>
<td>Broadcast oscillator series pad</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>LOOP ALIGNMENT</td>
<td>1400 Kc. 200 mWf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 1400 Kc.</td>
<td>Trimmer C1 (See Fig. 5)</td>
<td>Broadcast antenna</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See Note B)</td>
<td>600 Kc. 200 mWf.</td>
<td>External Antenna and Ground</td>
<td>Broadcast</td>
<td>Set Dial at 600 Kc.</td>
<td>Trimmer T2 (See Fig. 5)</td>
<td>Iron Core</td>
<td>Tracking Coil</td>
</tr>
</tbody>
</table>

**NOTE "A"**—The signal generator is connected to the "ANT." and "GND." terminals on the rear of the chassis when aligning the **Short Wave Band** and to the grid of the 6SA7 tube and ground terminal when setting the **Broadcast Band** oscillator end frequencies, (1570 and 532 K. C.).

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

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

**NOTE "C"**—Turn the dial back and forth slightly (rock) and adjust trimmer until the peak of greatest intensity is obtained. Attenuate the signal from the signal generator to prevent the leveling off action of the AVC.

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

### SERVICE NOTES:

Voltagess taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt.

All voltages as indicated on the voltage chart are measured with 115 volts A. C. on the primary of the power transformer.

Resistances of coil windings are indicated in ohms on the schematic circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D. C. voltages is usually caused by a shorted electrolytic condenser; open by-pass condensers frequently cause oscillation and distorted tone.

### ALIGNING INSTRUCTIONS:

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

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

To remove the chassis from the cabinet, pull off the knobs and take out the 4 bolts holding the chassis flanges to the control panel.
Automatic Record Changer--Operating Instructions

**MODEL 671 and 901**

Setting for Size of Record

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

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

Loading

See that the selecting arm is at position 10" or 12" as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

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

Starting the Changer

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

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

How to Reject a Record

Merely press the switch knob on the Changer panel. You can do this anytime after the needle has come into contact with that record.

Playing Individual Records

Should be desired to play an individual record merely set up the machine as described above for the proper size (10" or 12") as indicated by the selecting arms, place the record on top of the arms as described under "Loading," and set the machine in operation by means of the switch knob described under "Starting the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

Unloading

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

Lift the player out of the turntable, then return the posts to the proper playing position as indicated by the arrows on the selecting arms.

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

Turning Off Changer

Throw switch knob to "OFF" position.

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

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

If Changer is Left Running

No damage will be done if you forget to turn off Changer after it has played its entire load of records. It will simply keep playing until stopped or released.

Phonograph Needles

In general there are two types of needles which can be satisfactorily used on an Automatic Record Changer: those which require changing after approximately 30 minutes of use and the so-called permanent type needles which are rated in terms of "hours of service." In no case is a permanent needle to be used for a record other than that for which it was designed.

Shaving

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

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

Do Not Use Too Much Volume

The most frequent cause of poor recordings is too much volume or overloading. If you have any question as to whether your needle is too loud or not, turn it down until the volume indicator lights are dim.

Shaving Too Much

To reduce the volume slightly and watch the volume indicator lights.

Too little volume will show up when you play the record back. The volume control on playback will have to be turned up quite high and needle scratch will be excessive.

Cutting Arm Adjustments

The cutting arm is adjusted at the factory for proper operation, however, with various types of blanks this adjustment sometimes have to be altered. With a blank record on the table, the cutting arm should be adjusted so that the needle rests on a blank record.

If the groove is too shallow, the playback needle will not stay in the groove. If it is too deep, it will be lifted out. Check the groove in the center and one track from the end. If it is too shallow, the play- back needle will not stay in the groove. If it is too deep, it will be lifted out. Check the groove in the center and one track from the end. A properly cut grooves will have a shaving just a little thicker than a human hair.
### RESISTORS

R1 1301 25 M ohm—1/2 w.
R2 1301 25 M ohm—1/2 w.
R3 13019 1 megohm—1/2 w.
R4 130229 250 ohm—1/2 w.
R5 130228 5 M ohm—1/2 w.
R6 13064 3500 ohm—1/2 w.
R7 10062 12,500 ohm—3 w.
R8 10019 1 megohm—1/2 w.
R9 130232 25 M ohm—1/2 w.
R10 130223 300 ohm—1 w.
R11 1301 500 M ohm—1/2 w.
R12 1301 500 M ohm—1/2 w.
R13 13063 100 M ohm—1/2 w.
R14 130218 5 M ohm—1/2 w.
R15 130143 500 M ohm—1/2 w.
R16 13019 1 megohm—1/2 w.
R17 13010 500 ohm—1/2 w.
R18 13049 15 M ohm—1/2 w.
R19 13011 250 M ohm—1/2 w.
R20 1301 250 M ohm—1/2 w.
R21 101233 1/2 megohm volume control and on off switch.
R22 13012 50 M ohm—1/2 w.
R23 1304 3 megohms—1/2 w.
R24 13017 15 M ohm—1/2 w.
R25 13017 50 ohm—1/2 w.
R26 130110 1 megohm—1/2 w. in tuning indicator cable.

### CONDENSERS

C1 1392 .0005 mica
C2 10047 .002 x 600 v.—10%
C3 124143 9 mm antenna trimmer
C4 124143 9 mm antenna trimmer
C5 1292 .0005 mica
C6 10630 1/3 x 200 v.
C7 129168 .0001 mica
C8 124138 9 mm R.F. trimmer
C9 124139 R.F. trimmer
C10 10007 .1 x 400 v.
C11 10051 .1 x 400 v.
C12 19109 10.0 x 350 w.v.
C13 1292 .0005 mica
C14 10631 15.0 x 450 v.
C15 19109 15.0 x 450 v.
C16 124144 9 mm oscillator trimmer
C17 124145 9 mm oscillator trimmer
C18 129167 .0001 mica
C19 12996 .0001 mica
C20 124145 9 mm oscillator trimmer
C21 124145 9 mm oscillator trimmer
C22 1009 .05 x 200 v.
C23 10025 .02 x 400 v.
C24 10020 .01 x 200 v.
C25 129161 .0003 mica
C26 10012 .03 x 400 v.
C27 10025 .02 x 400 v.
C28 12921 .002 mica
C29 10029 .006 x 600 v.
C30 19135 .05 x 400 v.
C31 121915 100 M ohm
C32 121915 .0005 mica
C33 10661 .02 x 600 v. bakelite
C34 10661 .02 x 600 v. bakelite
C35 124157 9 mm antenna trimmer
C36 124157 9 mm antenna trimmer
C12, C14 and C15 in same unit.
C31 and C32 in same unit.

### PARTS

- **Tuning Frequency Range**
  - **Broadcast Band**: 540 to 1600 KC
  - **49M Band**: 5.9 to 6.1 KC
  - **31M Band**: 9.1 to 10 MC
  - **25M Band**: 11.4 to 12.1 MC
  - **19M Band**: 14.9 to 15.4 MC

### CIRCUIT DIAGRAM OF MICROPHONE AMPLIFIER

- **BRC.** (991) Form No. 9028—1,750—9-40
- **Pro. 219**
Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

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

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

**Television and Fm. Jack**

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

The jack marked phono-pickup jack in the chassis view will accommodate either the Phono or a television or FM converter. **Speaker 10 in. Electro Dynamic**
**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Position of Band Switch</th>
<th>Trimmers Adjusted (in Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>465 Kc.</td>
<td>1 MFD</td>
<td>Grid of 6SK7 F. F.</td>
<td>Broadcast</td>
<td>Two trimmers on top</td>
<td>Output I. F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td></td>
<td>465 Kc.</td>
<td>1 MFD</td>
<td>Grid of 6AS/7</td>
<td>Broadcast</td>
<td>(Plates out of mesh)</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

| SHORT WAVE BAND (See Note A) | 17 Mc. | 600 Ohms | External Antenna and Ground | Short Wave | Setter Dial at 17 Mc. | Trimmer C1 (See Fig. 2) | Short Wave Oscillator | Adjust to maximum output |
|                             | 17 Mc. | 600 Ohms | External Antenna and Ground | Short Wave | Setter Dial at 17 Mc. | Trimmer C1 (See Fig. 2) | Short Wave Oscillator | Adjust to maximum output |
|                             | 6 Mc.  | 600 Ohms | External Antenna and Ground | Short Wave | Setter Dial at 6 Mc.  | Trimmer C1 (See Fig. 6) | Short Wave Oscillator | Adjust to maximum output |

| BROADCAST BAND (See Note A) | 1500 Kc. | 200 mmd. | Grid of 6SK7 R. F. Tube | Broadcast | Setter Dial at 150 Kc. | Trimmer C14 (See Fig. 4) | Broadcast Oscillator | Adjust to maximum output |
|                            | 540 Kc.  | 200 mmd. | Grid of 6SK7 R. F. Tube | Broadcast | Setter Dial at 150 Kc. | Trimmer C14 (See Fig. 4) | Broadcast Oscillator | Adjust to maximum output |
|                            | 1400 Kc. | 200 mmd. | Grid of 6SK7 R. F. Tube | Broadcast | Setter Dial at 150 Kc. | Trimmer C5 (See Fig. 2) | Broadcast R. F.      | Adjust to maximum output |

| LOOP ALIGNMENT (See Note B) | 1400 Kc. | 200 mmd. | External Antenna and Ground | Broadcast | Setter Dial at 160 Kc. | Trimmer C1 (See Fig. 2) | Broadcast Antenna | Adjust to maximum output |
|                            | 600 Kc.  | 200 mmd. | External Antenna and Ground | Broadcast | Setter Dial at 600 Kc. | Trimmer T2          | Tracking Coil       | Adjust to maximum output |

**ALIGNING INSTRUCTIONS:**

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

It is important during loop alignment that the loop antenna and the chassis be installed in the cabinet.

To remove the chassis from the cabinet, remove the two chassis mounting bolts which are used to hold the chassis to the cabinet shell; take the knobs off their shafts and disconnect the loop antenna.

**SERVICE NOTES:**

Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their all D. C. voltages are usually caused by a shorted electrolytic socket and speaker connected, with a volt meter having a condenser; open by-pass condensers frequently cause oscillation and distorted tone.

All voltages as indicated on the voltage chart are measured with 117 volts A. C. on the primary of the power transformer.

Resistances of coils and transformer windings are indicated in ohms on schematic circuit diagrams.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and on the front of the radio, the voltage rating, which is known to be good, until the defective unit is located.

**PHONOGRAPH CONNECTIONS:**

A phonograph connector and switch are provided on the rear of the chassis. To operate: Insert plug on end of phonograph pick-up lead into connector on chassis—and move phonograph switch to "Phono" position.

Volume and tone may be controlled by using the controls provided on rear of receiver chassis as shown in above illustration and snap switch to "Television" position.

**TELEVISION CONNECTIONS:**

Television will not be available for nation wide use for some time to come; however, Television audio connections are provided on this radio for the reception of Television sound. Connect audio output leads of television receiver to connector provided on rear of receiver chassis as shown in above illustration and snap switch to "Television" position.
**Tuning Frequency Range**

- **Broadcast Band** - 540 to 1600 KC
- **49M Band** - 5.9 to 6.1 MC
- **31M Band** - 9.1 to 10 MC
- **25M Band** - 11.4 to 12.1 MC
- **19M Band** - 14.9 to 15.4 MC

**Phonograph-Television and Fm. Jack**

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

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

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

---

**Power Consumption** - 120 Watts

**Power Output** - 10 Watts Undistorted

**Sensitivity for 500 Millivolt Output**: 10 Microvolts Average Selectivity - 27 KC Broad at 1000 Times Signal at 1000 KC Intermediate Frequency - 455 KC

**Speaker** - 12 in. Electro Dynamic

- Tone control-Treble
- Volume control-Maximum all adjustments
- Connect radio chassis to ground post of signal generator with a short heavy lead
- Connect dummy antenna value in series with generator output lead
- Connect output meter across primary of output transformer
- Dummy antennas - 1 mfd, 200 mfd, and 400 mfd

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**Table:**

<table>
<thead>
<tr>
<th><strong>BAND</strong></th>
<th><strong>SIGNAL GENERATOR</strong></th>
<th><strong>Dummy Antenna</strong></th>
<th><strong>Connection to Radio</strong></th>
<th><strong>Position of Band Switch</strong></th>
<th><strong>Dial Pointer Setting</strong></th>
<th><strong>Trimmers Adjusted In Order Shown</strong></th>
<th><strong>Trimmer Function</strong></th>
<th><strong>Adjustment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F.</td>
<td>455 Kc.</td>
<td>455 Kc.</td>
<td>Broadcast</td>
<td>Set Dial at 1000 Kc.</td>
<td>Two Trimmers on Top</td>
<td>Input I. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>31 METER BAND</td>
<td>9.6 Mc.</td>
<td>31M</td>
<td>Antenna lead</td>
<td>Set Dial at 9.6 Mc.</td>
<td>(See Trimmer View) C2</td>
<td>Osc.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>49 METER BAND</td>
<td>6.1 Mc.</td>
<td>49M</td>
<td>Antenna lead</td>
<td>Set Dial at 6.1 Mc.</td>
<td>(See Trimmer View) T4</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>25 METER BAND</td>
<td>11.8 Mc.</td>
<td>25M</td>
<td>Antenna lead</td>
<td>Set Dial at 11.8 Mc.</td>
<td>(See Trimmer View) T5</td>
<td>Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>19 METER BAND</td>
<td>15.2 Mc.</td>
<td>19M</td>
<td>Antenna lead</td>
<td>Set Dial at 15.2 Mc.</td>
<td>(See Trimmer View) T6</td>
<td>Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>BROADCAST BAND</td>
<td>1600 Kc.</td>
<td>Broadcast</td>
<td>Antenna lead</td>
<td>Set Dial at 1600 Kc.</td>
<td>(See Trimmer View) C16</td>
<td>R. F.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
<tr>
<td>1400 Kc.</td>
<td>200 mfd.</td>
<td>Broadcast</td>
<td>Antenna lead</td>
<td>Set Dial at 1400 Kc.</td>
<td>Rotate Core T11</td>
<td>Ant.</td>
<td>Adjust to maximum output</td>
<td></td>
</tr>
</tbody>
</table>

---

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

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

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

You are now ready to continue with the trimmer adjustments as shown on the alignment chart.
PHONOGRAPH COMBINATION RADIO
WITH PUSH BUTTON TUNING AND AUTOMATIC RECORD CHANGER

SPECIFICATIONS

Power Consumption
71 Watts (At 117 volts 60 cycles)
88 Watts (Phonograph Operating)

Power Output
- - - - - - - - 40 Watts Undistorted
- - - - - - - - 5.2 Watts Maximum

Selectivity
- - - - - - - - 30 KC Broad at 1000 times Signal

Intermediate Frequency
- - - - - - - - 456 KC

Tuning Frequency Range
B Range
C Range
D Range
Sensitivity (For 0.5 Watt output)
B Range
C Range
D Range

FOR OTHER DATA
SEE INDEX

Two loop antennas are incorporated in the speaker chamber and may be used for broadcast band and short wave reception. For the reception of local or nearby stations, an outside antenna is usually not required. The use of the loop antenna may, in some locations, provide best broadcast band operation.

In general, however, more stations will be heard and noise will sometimes be reduced by using an outside antenna.

For best reception of short wave stations, an outside antenna is recommended.

A white wire will be found coming out of the chassis. Connect this wire to the outside antenna lead.

On the back panel of the chassis base is a screw (marked GND) under which the ground wire should be fastened.

Important—A good antenna and ground are essential for best operation of this radio. Connections should be clean and tight. Do not use old outside antenna as in most cases it will be unsatisfactory.

Voltages at Sockets
Line Voltage—117.
Volume Control—Maximum.
Antenna Shorted to Ground.
Readings taken with 1000 ohm-per-volt meter. Plate and screen voltages are read on 500 volt scale.
In case modulation hum (hum with signal) is encountered on the above model, the trouble may be due to the 6SK7 1st A.F. tube. Interchange this tube with the 6SK7 R.F. and 6SK7 I.F. tubes. Note the results. The 6SK7 1st A.F. tube may be left in either the R.F. or I.F. tube sockets if the arrangement reduces the hum.

If the hum is still appreciable after the above procedure try out several new 6SK7 1st A.F. tubes. Use the one which reduces the hum to a minimum.

Television Sound Connections

If Television programs ever become available in your community, the audio amplifier and speaker of the receiver may be used to reproduce Television sound in conjunction with any "Television Picture Receiver and Sound Converter." On the back panel of the chassis base is a socket to which is connected the phone cable shielded pin tip. Upon removal of this pin tip, the connector on the cable from a television receiver can be inserted in the socket. (The cable connection must be a single shielded pin tip type, part No. M83.)

When Television sound reproduction is desired, the knob located above the dial of the radio should be turned to the Phonograph (P) position. For radio reception, the knob should be in the Radio (R) position.

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Alignment: Peak i.f. transformers at 455 kc. Set generator to 1500 kc and tune in with OSC trimmer on gang, front section. Adjust ANT trimmer for maximum output.

Alignment: Peak i.f. at 455 kc. Adjust B-C OSC trimmer (under chassis on apron) to 1500 kc. Adjust B-C padder (rear apron) to 600 kc. Set generator to 15 mc. Tune in. Set s-w OSC trimmer so that dial points to this frequency. Align s-w ANT trimmer (top of chassis on s-w ANT coil to right of gang condenser.)

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ALIGNMENT

It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator; otherwise the A.V.C. action will tend to nullify the variations in output as the trimmers are adjusted.

I.F. Adjustment: The signal generator is set at 1065 KC and connected through a 0.5 mmfd condenser to the grid of the first detector (6X6). With the band switch set on "Broadcast," the pointer is set at 650 KC and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on tops of the I.F. transformer shield cans.

Band #1 Adjustment: Turn the dial control knob so that the condenser plates are entirely out of mesh. Set the band switch to band #1. The signal generator should be connected to the short-antenna binding post through the dummy antenna consisting of a 250 mmfd mica condenser and a 400 ohm non-inductive resistor. The oscillator trimmer condenser should be opened to minimum capacity and the signal generator then set to 25 megacycles. The oscillator trimmer is then increased in capacity until maximum response is obtained. Two responses are possible and it is important that the highest frequency response (oscillator trimmer low capacity) be used. The signal generator is then set to 159 MC and the variable condenser turned until a response is obtained. The pointer should coincide with the 159 MC mark on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named, for maximum output. The variable condenser should be rocked slightly during this last adjustment. The signal generator is now set at 7.6 MC and the signal tuned in on the dial. The padder condenser for this band is adjusted for maximum reading of the output meter while the generator tuning condenser is rocked slightly to right and left. The high frequency adjustment should then be rechecked.

Band #2: The band selector switch is set in position for operation on short wave band #2. The variable condenser is opened so that the plates are completely unmeshed and the oscillator trimmer is opened to minimum capacity. The signal generator is set to 7.3 MC and the oscillator trimmer condenser is increased in capacity until a response is heard. Two responses are possible and it is important that the higher frequency response (oscillator trimmer low capacity) be used. Set the signal generator at 7 MC and turn the tuning control until a response is indicated on the output meter. The pointer should now coincide with the 7 MC marker on the dial. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. After high frequency adjustments have been made set the signal generator at 2.5 MC and turn the variable gang condenser until a response is observed. Adjust the padding condenser for this band for maximum gain while rocking the tuning condenser slightly to the right and left. The higher frequency adjustment should then be rechecked.

Broadcast Band: The dummy antenna for this band should consist of a 250 mmfd condenser only. The signal generator is set at 1620 KC, the band switch set at broadcast position. The variable condenser should be opened so that the plates are entirely out of mesh. The oscillator trimmer is then adjusted for maximum response on that frequency (1620 KC). Set the signal generator at 1500 KC and tune the receiver until a response is indicated. The dial pointer should coincide with the 1500 KC mark on the dial.

The signal generator is then set at 600 KC and the receiver tuned until a response is indicated. The padder condenser is then adjusted for maximum gain while the tuning gang condenser is rocked slightly to the left and right. The 1500 KC adjustment should then be rechecked.

MODELS 1049, 1540, 4124, 4410 and 4990. (ONLY)

Long Wave Band: The band selector switch is set in position for operation on the long wave band. The receiver and generator are both tuned to 300 KC and the oscillator trimmer is adjusted for maximum response. The antenna and first detector trimmers are adjusted in the order named for maximum output.

The signal generator is then set at 1500 KC and the signal is turned in. The long wave padder condenser is adjusted for maximum response while the tuning gang condenser is rocked slightly to the right. The 300 KC adjustment should then be rechecked.

THIS NOTE REFERS TO MODELS 399, 4990; 1039, 1049; 1540; and 3109.

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REPLACEMENT PARTS LIST
MODEL JM-23

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<thead>
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<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
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<tr>
<td>RB-941</td>
<td>BOTTOM COVER—Cabinet bottom cover</td>
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<td>RC-023</td>
<td>CAPACITOR—600 mfd. #04 paper (C-4)</td>
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<td>RC-096</td>
<td>M-1</td>
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<td>RC-096</td>
<td>C-4</td>
<td>55</td>
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<td>RC-059</td>
<td>CAPACITOR—0.01 mfd. line capacitor (C-6)</td>
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<td>RC-2092</td>
<td>CLAMP—Crystal clamp</td>
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<tr>
<td>RC-2106</td>
<td>CLIP—Oscillator coil mounting clips (Pkg. 4)</td>
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<td>RC-2017</td>
<td>CATCH—Tone arm catch for securing rest</td>
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<td>RC-5150</td>
<td>CAPACITOR—10 mfd., 200 V. dry electrolytic (C-5)</td>
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<td>RC-5629</td>
<td>CAPACITOR—Trimmer capacitor (C-1)</td>
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<td>RC-5874</td>
<td>CORD—Power cord</td>
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<td>RC-016</td>
<td>FOOT—Rubber foot for cabinet (Pkg. 3)</td>
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<td>RC-016</td>
<td>GRID CAP—6A8G control grid cap (Pkg. 5)</td>
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<tr>
<td><strong>HAIRPIN GATTER—Swivel retaining</strong></td>
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<tr>
<td><strong>KNOB—Power switch control knob</strong></td>
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<tr>
<td><strong>COIL—Oscillator coil (L-1)</strong></td>
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<tr>
<td><strong>NUT—Speed nut for mounting motor assembly (Pkg. 3)</strong></td>
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<tr>
<td><strong>NUT—Power switch clamping nut (Pkg. 5)</strong></td>
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<tr>
<td><strong>COPPER CUP—Rubber needle cup</strong></td>
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<tr>
<td><strong>R-106</strong></td>
<td>PICK UP—Crystal pickup</td>
<td>4.75</td>
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<tr>
<td><strong>RP-801</strong></td>
<td>POST—Tone arm swivel post</td>
<td>1.50</td>
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<tr>
<td><strong>RQ-1261</strong></td>
<td>RESISTOR—100 ohms 1/2 W. carbon (R-2) (Pkg. 5)</td>
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<td><strong>RQ-1279</strong></td>
<td>RESISTOR—8000 ohms 1/2 W. carbon (R-6) (Pkg. 5)</td>
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<td><strong>RQ-1299</strong></td>
<td>RESISTOR—47,000 ohms 1/2 W. carbon (R-3, 4) (Pkg. 5)</td>
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<td><strong>RQ-1309</strong></td>
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<tr>
<td><strong>RQ-1313</strong></td>
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<td><strong>RR-940</strong></td>
<td>REST—Tone arm rest</td>
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<td><strong>RS-200</strong></td>
<td>SOCKET—6A8G tube socket (Pkg. 5)</td>
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<tr>
<td><strong>RS-224</strong></td>
<td>SOCKET—Type 84 tube socket (Pkg. 5)</td>
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<td><strong>RS-888</strong></td>
<td>SCREW—Needle clamping screw</td>
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<tr>
<td><strong>RS-886</strong></td>
<td>SCREW—Crystal clamp and catch screw (Pkg. 5)</td>
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<tr>
<td><strong>RS-938</strong></td>
<td>SWIVEL—Tone arm swivel assembly</td>
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<tr>
<td><strong>RS-3058</strong></td>
<td>SWITCH—Power control switch</td>
<td>0.50</td>
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<tr>
<td><strong>RT-020</strong></td>
<td>TRANSFORMER—Power transformer, 60 cycles (T-1)</td>
<td>2.20</td>
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<tr>
<td><strong>RT-021</strong></td>
<td>TRANSFORMER—Power transformer, 50 cycles</td>
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<tr>
<td><strong>RT-012</strong></td>
<td>TONE ARM—Crylo tone arm</td>
<td>0.65</td>
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<td><strong>RW-114</strong></td>
<td>WEIGHT—Tone arm weight</td>
<td>0.65</td>
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**Voltage Chart**

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid</th>
<th>Screen to Grid</th>
<th>Cathode to Grid</th>
<th>Filament Volts</th>
</tr>
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<tbody>
<tr>
<td>6SK7 (R.F.)</td>
<td>215</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6K8</td>
<td>Conv—23</td>
<td>98</td>
<td>4.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6SK7 (1.F.)</td>
<td>215</td>
<td>98</td>
<td>3</td>
<td>6.3</td>
</tr>
<tr>
<td>6H6</td>
<td></td>
<td></td>
<td></td>
<td>6.3</td>
</tr>
<tr>
<td>6SF5</td>
<td>110</td>
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<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>6SJ5</td>
<td>100</td>
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<td>4</td>
<td>6.3</td>
</tr>
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<td>6V6G</td>
<td>290</td>
<td>230</td>
<td>11.8</td>
<td>6.3</td>
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<td>5U4G</td>
<td>277</td>
<td>c</td>
<td>30</td>
<td>5.1</td>
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<tr>
<td>6U5</td>
<td>170</td>
<td></td>
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<td>6.3</td>
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Fig. 8. Schematic Diagram and Trimmer Location—Model HE-64L

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>C-1</td>
<td>Tuning Condenser</td>
<td>C-30</td>
<td>20 Mfd. 300 V. Dry Electrolytic</td>
</tr>
<tr>
<td>C-2</td>
<td>2-18 Mfd. &quot;B&quot; Ant. Trimmer</td>
<td>L-1</td>
<td>Antenna Transformer</td>
</tr>
<tr>
<td>C-3</td>
<td>2-18 Mfd. &quot;B&quot; Osc. Trimmer</td>
<td>L-2</td>
<td>Oscillator Transformer</td>
</tr>
<tr>
<td>C-4</td>
<td>2-20 Mfd. &quot;D&quot; Ant. Trimmer</td>
<td>L-3</td>
<td>1st I.F. Transformer</td>
</tr>
<tr>
<td>C-5</td>
<td>3-30 Mfd. &quot;A&quot; Osc. Trimmer</td>
<td>L-4</td>
<td>2nd I.F. Transformer</td>
</tr>
<tr>
<td>C-6</td>
<td>3-30 Mfd. &quot;D&quot; Osc. Trimmer</td>
<td>R-1</td>
<td>0.01 Mfd. 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-7</td>
<td>300-600 Mfd. &quot;B&quot; Osc. Padder</td>
<td>R-2</td>
<td>30 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-8</td>
<td>2-20 Mfd. &quot;A&quot; Ant. Trimmer</td>
<td>R-3</td>
<td>680,000 Ohms, 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-9</td>
<td>75-150 Mfd. &quot;A&quot; Osc. Padder</td>
<td>R-4</td>
<td>22,000 Ohms, 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-10</td>
<td>400 Mfd. Mica .005%</td>
<td>R-5</td>
<td>180,000 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-11</td>
<td>470 Mfd. Mica Capacitor</td>
<td>R-6</td>
<td>2.2 Meg., 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-12</td>
<td>50 Mfd. Mica Capacitor</td>
<td>R-7</td>
<td>330,000 Ohms, 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-13</td>
<td>100 Mfd. Mica Capacitor</td>
<td>R-8</td>
<td>4.7 Meg., 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-14</td>
<td>220 Mfd. Mica Capacitor</td>
<td>R-9</td>
<td>47,000 Ohms, 1/2-W. Carbon Resistor</td>
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<td>C-15</td>
<td>.01 Mfd. 600 V. Paper Capacitor</td>
<td>R-10</td>
<td>330,000 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-16</td>
<td>.01 Mfd. 600 V. Paper Capacitor</td>
<td>R-11</td>
<td>470,000 Ohms, 1/2-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-17</td>
<td>.01 Mfd. 600 V. Paper Capacitor</td>
<td>R-12</td>
<td>1000 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-18</td>
<td>.01 Mfd. 600 V. Paper Capacitor</td>
<td>R-13</td>
<td>5.6 Meg., 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-19</td>
<td>.01 Mfd. 200 V. Paper Capacitor</td>
<td>R-14</td>
<td>1500 Ohms, 1/2-W. Carbon Resistor</td>
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<td>.012 Mfd. 600 V. Paper Capacitor</td>
<td>R-15</td>
<td>270 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-21</td>
<td>.06 Mfd. 600 V. Paper Capacitor</td>
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<tr>
<td>C-22</td>
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<td>R-17</td>
<td>3900 Ohms, 1/2-W. Carbon Resistor</td>
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<td>C-23</td>
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<td>C-24</td>
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<td>R-19</td>
<td>270 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-25</td>
<td>40 Mfd. 1000 V. Paper Capacitor</td>
<td>R-20</td>
<td>2.5 Meg. Vol. Control, 1 Megohm Tap</td>
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<tr>
<td>C-26</td>
<td>0.1 Mfd. 200 V. Paper Capacitor</td>
<td>R-21</td>
<td>220 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-27</td>
<td>20 Mfd. 25 V. Dry Electrolytic</td>
<td>R-22</td>
<td>660,000 Ohms, 1/2-W. Carbon Resistor</td>
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<tr>
<td>C-28</td>
<td>20 Mfd. 300 V. Dry Electrolytic</td>
<td>P-1</td>
<td>Pilot Light Mazda No. 44</td>
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<tr>
<td>C-29</td>
<td>40 Mfd. 300 V. Dry Electrolytic</td>
<td>P-2</td>
<td>Pilot Light Mazda No. 44</td>
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</tbody>
</table>
Fig. 4. Schematic Diagram and Trimmer Location—Model HE-50

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GENERAL INFORMATION

Models HE-50, and HE-540 are three-band receivers employing five General Electric Pre-tested Tubes in a superhetodyne circuit. Features of design include "Alnic" magnet dynamic speaker, beampower output, iron core I.F. transformers, single-ended tubes, and degenerative feedback. Model HE-50 is an A-C receiver available in three classes of voltage and frequency rating. Model HE-540 is an AC-DC receiver using an improved rectifier circuit.

Models HE-64L and HE-640L are similar to the above models except for tuning frequency coverage and incorporation of a tuning indicator. Model HE-64L is an A-C receiver while Model HE-640L is an AC-DC receiver.

Coil Data

All antenna and oscillator transformer switch terminals are numbered in Figs. 6, 7, 10, and 11 to facilitate in locating these common points on the schematic diagrams Figs. 4, 5, 8 and 9.

The following tables show the coils in use for the various positions of the band-change switch.

Models HE-50 and HE-540

<table>
<thead>
<tr>
<th>Band Switch Position</th>
<th>Antenna Primary</th>
<th>Antenna Secondary</th>
<th>Oscillator Grid</th>
<th>Oscillator Cathode</th>
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<tr>
<td>Band &quot;A&quot;</td>
<td>Sections 16 to 17, 1 to 5 of L1</td>
<td>Section 2 to 5 of L1</td>
<td>Section 6 to 10 of L2</td>
<td>Section 9 to 10 of L2</td>
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<tr>
<td>Band &quot;B&quot;</td>
<td>Sections 16 to 17, 1 to 5 of L1</td>
<td>Section 2 to 5 of L1</td>
<td>Section 6 to 10 of L2</td>
<td>Section 9 to 10 of L2</td>
</tr>
<tr>
<td>Band &quot;C&quot;</td>
<td>Sections 2 to 5 of L1</td>
<td>Section 3 to 5 of L1</td>
<td>Section 7 to 10 of L2</td>
<td>Section 11 to 10 of L2</td>
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<tr>
<td>Band &quot;D&quot;</td>
<td>Sections 2 to 5 of L1</td>
<td>Section 3 to 5 of L1</td>
<td>Section 7 to 10 of L2</td>
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COIL RESISTANCE DATA

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<td>B Primary</td>
<td>1 and 5</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
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<td>HE-64L, 640L</td>
<td>A Primary</td>
<td>1 and 5</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Secondary</td>
<td>2 and 5</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Secondary</td>
<td>3 and 5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Primary</td>
<td>16 and 17</td>
<td>.2</td>
</tr>
<tr>
<td>Oscillator</td>
<td>HE-50, 540</td>
<td>B Band Coil</td>
<td>6 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Band Coil</td>
<td>7 and 10</td>
<td>.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.02</td>
</tr>
<tr>
<td>Oscillator</td>
<td>HE-64L, 640L</td>
<td>A Band Coil</td>
<td>6 and 10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Band Coil</td>
<td>7 and 10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Band Coil</td>
<td>8 and 10</td>
<td>.03</td>
</tr>
<tr>
<td>1st I.F. Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>9 to 12</td>
<td></td>
</tr>
<tr>
<td>2nd I.F. Transformer</td>
<td>All Models</td>
<td>Secondary</td>
<td>15 to 19</td>
<td></td>
</tr>
<tr>
<td>Output Transformer</td>
<td>All Models</td>
<td>Primary</td>
<td>14 to 18</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>7 to 9</td>
<td>265</td>
</tr>
<tr>
<td>Power Transformer</td>
<td>HE-50, 64L</td>
<td>Primary</td>
<td>110 V. Tap</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>125 V. Tap</td>
<td>7</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>290 V. Tap</td>
<td>8</td>
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<td>Secondary</td>
<td>225 V. Tap</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>250 V. Tap</td>
<td>20</td>
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<td>Secondary</td>
<td>Red to Red</td>
<td>24</td>
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<td>Secondary</td>
<td>Green to Yellow</td>
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<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>Yellow to Yellow</td>
<td></td>
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</table>

G.E. PAGE 12-3

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ALIGNMENT PROCEDURE (Continued)

R.F. ALIGNMENT—MODELS HE-50 AND HE-540

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Project</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band &quot;D&quot;</td>
<td>25 M.C. with Modulation</td>
<td>Post</td>
<td>I.R.E.</td>
<td>Oc. (C-6)</td>
<td>Ant. (C-4)</td>
</tr>
</tbody>
</table>

1. Band "B"
2. Band "B" 150 K.C. with Modulation Antenna Post I.R.E. Oc. (C-3) Ant. (C-2)
3. Band "B" 500 K.C. with Modulation Antenna Post I.R.E. Oc. pad (C-7)
4. Band "B" 100 K.C. with Modulation Antenna Post I.R.E. Oc. (C-3) Ant. (C-2)
7. Band "B" Repeat Operation 5
8. Band "B" 10 M.C. with Modulation Antenna Post I.R.E. Oc. (C-6) Ant. (C-4)

The image of "D" band signal should be heard 90.0 K.C. below the input signal when (C-6) is an improper peak. Example: 18 M.C. image is at 17.90 M.C. Peak (C-4) while rocking the gang condenser.

Physical Specifications:
- **Models HE-50, HE-540, HE-64L, HE-640L:**
  - **Height:** 175 inches
  - **Depth:** 8 inches

**Tuning Frequency Range**
- **Models HE-50 and HE-540:**
  - Band "B" 150-1700 K.C.
  - Band "D" 7000-22000 K.C.
- **Models HE-540L and HE-640L:**
  - Band "A" 40-400 K.C.
  - Band "B" 500-1700 K.C.
  - Band "D" 8800-18000 K.C.

**Intermediate Frequency**
- **Models HE-50, HE-540, HE-64L, HE-640L:**
  - **Uninterfered** 27 watts 3.5 watts 3.5 watts 7.0 watts
  - **Load-speaker"Auto" Magnet Dynamic**
    - **Coil Diameter:** 6 1/4 inches
    - **Voice Coil Impedance (600 cycles):** 3.5 ohms
**PARTS DESCRIPTION LIST**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2a</td>
<td>Antenna section of tuning condenser</td>
<td>C17b</td>
<td>40 mfd, 150 V. dry electrolytic</td>
</tr>
<tr>
<td>C2b</td>
<td>Oscillator section of tuning condenser</td>
<td>C18</td>
<td>0.2 mfd. paper capacitor</td>
</tr>
<tr>
<td>C1</td>
<td>470 mfd. mica capacitor</td>
<td>C19</td>
<td>0.1 mfd. paper capacitor</td>
</tr>
<tr>
<td>C10</td>
<td>0.05 mfd. paper capacitor</td>
<td>L1</td>
<td>Beam-a-Scope</td>
</tr>
<tr>
<td>C12</td>
<td>0.05 mfd. paper capacitor</td>
<td>L2</td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>C13</td>
<td>330 mfd. mica capacitor</td>
<td>L3</td>
<td>1st. I.F. Transformer</td>
</tr>
<tr>
<td>C15</td>
<td>0.01 mfd. paper capacitor</td>
<td>L4</td>
<td>2nd I.F. Transformer</td>
</tr>
<tr>
<td>C16</td>
<td>0.06 mfd. paper capacitor</td>
<td>P1</td>
<td>Dial lamp, Mazda No. 47</td>
</tr>
<tr>
<td>C17a</td>
<td>30 mfd, 180 V. dry electrolytic</td>
<td>R1</td>
<td>33,000 ohms carbon resistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R2</td>
<td>2.2 megohms carbon resistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R3</td>
<td>470,000 ohms carbon resistor</td>
</tr>
</tbody>
</table>

**REPLACEMENT PARTS LIST**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>RB-208</em></td>
<td>BOARD—Terminal board (2 lug)</td>
<td>$0.10</td>
</tr>
<tr>
<td><em>RB-209</em></td>
<td>BUSHING—Tuning shaft bushing</td>
<td>$0.10</td>
</tr>
<tr>
<td>RB-945</td>
<td>BACK COVER—Cabinet back cover for Model J-51</td>
<td>$0.15</td>
</tr>
<tr>
<td>RB-946</td>
<td>BACK COVER—Cabinet back cover for Model J-53</td>
<td>$0.15</td>
</tr>
<tr>
<td>RB-947</td>
<td>BACK COVER—Cabinet back cover for Models J-54 and J-54W</td>
<td>$0.15</td>
</tr>
<tr>
<td><em>RB-101</em></td>
<td>BOARD—Terminal board (1 lug)</td>
<td>$0.10</td>
</tr>
<tr>
<td><em>RB-112</em></td>
<td>BRACKET—Tuning condenser bracket</td>
<td>$0.10</td>
</tr>
<tr>
<td>RC-701</td>
<td>CAPACITOR—0.05 mfd. 600 V. paper (C-12, C-13)</td>
<td>$0.25</td>
</tr>
<tr>
<td>R C-039</td>
<td>CAPACITOR—0.01 mfd. 600 V. paper (C-15, 20)</td>
<td>$0.25</td>
</tr>
<tr>
<td><em>R C-040</em></td>
<td>CAPACITOR—0.05 mfd. 500 V. paper (C-20)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RC-102</td>
<td>CAPACITOR—0.05 mfd. 600 V. paper (C-16)</td>
<td>$0.25</td>
</tr>
<tr>
<td>RC-130</td>
<td>CAPACITOR—0.02 mfd. 400 V. paper (C-19)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RC-316</td>
<td>CAPACITOR—0.05 mfd. 600 V. paper (C-31)</td>
<td>$0.20</td>
</tr>
<tr>
<td><em>R C-317</em></td>
<td>CAPACITOR—0.02 mfd. 400 V. paper (C-32)</td>
<td>$0.20</td>
</tr>
<tr>
<td><em>R C-318</em></td>
<td>CAPACITOR—0.05 mfd. 100 V. paper (C-33)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RC-863</td>
<td>CORD—Power cord</td>
<td>$0.65</td>
</tr>
<tr>
<td>RC-319</td>
<td>CUSHION—Plastic guide plate spacer cushions (Pkg. 5)</td>
<td>$1.00</td>
</tr>
<tr>
<td>RC-320</td>
<td>CUSHION—Mounting cushion for dial scale (Pkg. 5)</td>
<td>$1.00</td>
</tr>
<tr>
<td>RC-3163</td>
<td>CAPACITOR—30 mfd. 150 V., 40 mfd. 150 V., dry electrolyte (C-17A, 17B)</td>
<td>$1.80</td>
</tr>
<tr>
<td>RC-7031</td>
<td>CONDENSER—Tuning condenser and drum assembly (Drum pressed on to condenser shaft) (C-2a, 2b)</td>
<td>$1.95</td>
</tr>
<tr>
<td>RC-7032</td>
<td>CONDENSER—Tuning condenser for use on Models with detachable drum (C-1a, 2a-b)</td>
<td>$1.80</td>
</tr>
<tr>
<td>RC-777</td>
<td>COR—Tuning drive cord</td>
<td>$0.20</td>
</tr>
<tr>
<td>RC-911</td>
<td>CONES—Black, yellow (3)</td>
<td>$0.50</td>
</tr>
<tr>
<td>RD-158</td>
<td>DIAL—Dial scale for Models J-51 and J-53</td>
<td>$0.60</td>
</tr>
<tr>
<td>RD-159</td>
<td>DIAL—Dial scale for Models J-54 and J-54W</td>
<td>$0.60</td>
</tr>
<tr>
<td>RD-421</td>
<td>DRUM—Drum, hub and set screw assembly</td>
<td>$0.30</td>
</tr>
<tr>
<td>RE-086</td>
<td>ESCUTCHEON—Dial escutcheon</td>
<td>$0.10</td>
</tr>
<tr>
<td>RF-205</td>
<td>FASTENER—Fastener for mounting cabinet back on Models J-54 and J-54W (Pkg. 10)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RF-206</td>
<td>FASTENER—Beam-a-Scope—bracket fastener (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RF-207</td>
<td>FASTENER—Cabinet back fastener for Models J-51 and J-53 (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td><em>RH-111</em></td>
<td>HAIRPIN COTTER—Tuning shaft retaining cotter (Pkg. 10)</td>
<td>$0.03</td>
</tr>
<tr>
<td>RK-090</td>
<td>KNOB—Control knob and spring (Model J-54)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RK-091</td>
<td>KNOB—Control knob and spring (Model J-51, J-53)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RK-092</td>
<td>KNOB—Control knob and spring (Model J-54W)</td>
<td>$0.20</td>
</tr>
<tr>
<td>RL-250</td>
<td>MICA—Beam-a-Scope assembly (1-1)</td>
<td>$0.50</td>
</tr>
<tr>
<td>RL-202</td>
<td>COIL—Oscillator coil (L-2)</td>
<td>$0.30</td>
</tr>
<tr>
<td>RM-511</td>
<td>DIAL—Dial plate reflector mask</td>
<td>$0.55</td>
</tr>
<tr>
<td>RN-009</td>
<td>NUT—Speed nut for mounting dial scale on Models J-54 and J-54W (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td>RN-010</td>
<td>NUT—Speed nut for mounting dial scale on Models J-51 and J-53 (Pkg. 5)</td>
<td>$0.10</td>
</tr>
<tr>
<td><em>RTN-000</em></td>
<td>NUT—Bushing retaining nut (Pkg. 5)</td>
<td>$0.10</td>
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<tr>
<td>RP-188</td>
<td>PLATE—Pointer guide plate assembly</td>
<td>$0.70</td>
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<tr>
<td>RP-199</td>
<td>POINTER—Dial scale pointer</td>
<td>$0.10</td>
</tr>
<tr>
<td>RP-322</td>
<td>PULLEY—Pointer cord pulley and stud (Pkg. 5)</td>
<td>$0.10</td>
</tr>
</tbody>
</table>

* Used on previous receivers.

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[Diagram of receiver front and bottom view]
MODELS J-51, J-53, J-54, and J-54W

GENERAL ELECTRIC CO.

MODELS J-51, J-53, J-54, and J-54W

SERVICE DATA

Over-all Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>J-51</th>
<th>J-53</th>
<th>J-54, J-54W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>8 1/2 inches</td>
<td>8 1/2 inches</td>
<td>7 1/4 inches</td>
</tr>
<tr>
<td>Width</td>
<td>12 1/4 inches</td>
<td>14 1/2 inches</td>
<td>10 3/4 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>6 1/4 inches</td>
<td>6 1/4 inches</td>
<td>6 1/4 inches</td>
</tr>
</tbody>
</table>

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>115 AC or DC</td>
<td>40-60</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>115 AC or DC</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Tuning Control Drive Ratio ........................................ 14:1
Tuning Frequency Range .............................................. 540-1000 KC
Intermediate Frequency .............................................. 455 KC
Electrical Power Output (117 line volts)

Undistorted Maximum 1.5 watts 2.5 watts

Loud-speaker—"Alnico" Magnet Dynamic
Outside Cone Diameter 5 inches
Voice Coil Impedance (400 cycles) 3.5 ohms

Tubes

Converter and Oscillator GE-128A7GT
I.F. Amplifier GE-128T
Det., Aud., A.V.C. GE-1280GT
Audio Output GE-50L6GT
Rectifier GE-3525GT
Dial Lamp MAZDA No. 47

GENERAL INFORMATION

Models J-51, J-53, J-54 and J-54W are compact, five-tube superhetodyne receivers which can be operated from either an AC or DC source of power. Model J-51 and J-53 cabinets are in matched walnut veneers. Model J-54 and J-54W cabinets are plastic in oak and gray-white respectively. All models incorporate the following design features: Built-in Beam-a-Scope, 5-inch dynaphase speaker, increased dial length, automatic volume control, and beam power output.

The glass tubes used in the converter and detector stages are interchangeable with metal tubes if the receiver is realigned following the change.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. ..................................................... 455 KC
R.F. .................................................. 1650 and 1500 KC

The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

To insert the R.F. signal use either a standard I.R.E. dummy antenna between the signal generator and the receiver antenna post, or loop-couple the generator signal to the receiver Beam-a-Scope. A distance of two feet between generator loop and receiver Beam-a-Scope will insure freedom from over-coupling. When using an I.R.E. dummy antenna for R.F. alignment, do not connect the signal generator ground to the receiver chassis.

With a gang condenser wide open, align oscillator trimmer (C-2b) to 1650 KC. Change generator signal to 1500 KC, tune receiver to the signal and peak antenna trimmer (C-2a) for maximum output.

Precaution

If the signal generator is AC operated use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains

Gain* Antenna Post to Converter Grid 40 to 1000 KC
R.F. on Converter Grid to I.F. on I.F. Amplifier Grid 40 to 1000 KC
I.F. on Converter Grid to I.F. on Amplifier Grid 50 to 455 KC
I.F. Amplifier Grid to Detector Plate 50 to 455 KC

2. 0.15-volt, 400-cycle signal across the volume control will give 3/4-watt speaker output.* (Volume control turned to maximum.)

3. Average DC voltage developed across oscillator grid resistor (R-1) 15 volts

* Variations of ± 20% permissible. All readings obtained with enough signal input to give 3/4-watt speaker output.

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Fig. 7. Chassis Parts Layout
Model JE-61L

Fig. 6. Chassis Parts Layout
Models JE-51, JE-510 and JE-61

**PHYSICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency (Cycles on A.C.)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE-51</td>
<td>50-60*</td>
<td>65</td>
</tr>
<tr>
<td>JE-510</td>
<td>25-100</td>
<td>100</td>
</tr>
<tr>
<td>JE-61</td>
<td>25-60</td>
<td>65</td>
</tr>
</tbody>
</table>

**Tubes**

Models JE-51, JE-510
- Converter and Oscillator: GE-6SA7
- I.F. Amplifier: GE-6SK7
- Det., Aud. AVC: GE-6SQ7
- Power Output: GE-25C6G
- Rectifier: GE-25Z6G
- Dial Lamp: (2) MAZDA No. 44

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage Supply</th>
<th>Power</th>
<th>Frequency (Cycles on A.C.)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE-51</td>
<td>110</td>
<td>125</td>
<td>118-133</td>
<td>134-156</td>
</tr>
<tr>
<td></td>
<td>145</td>
<td>200</td>
<td>188-212</td>
<td>235-262</td>
</tr>
<tr>
<td>JE-510</td>
<td>200-240</td>
<td>250</td>
<td>238-262</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A.C. or D.C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JE-61</td>
<td>110</td>
<td>125</td>
<td>118-133</td>
<td>134-155</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200</td>
<td>188-212</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>225</td>
<td>213-237</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>250</td>
<td>238-262</td>
<td>50-60*</td>
</tr>
</tbody>
</table>

**Drive Ratio**

22:1

**Electrical Power Output**

<table>
<thead>
<tr>
<th>Model</th>
<th>Undistorted</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>JE-51</td>
<td>2.7 watts</td>
<td>5.0 watts</td>
</tr>
<tr>
<td>JE-510</td>
<td>3.0 watts</td>
<td>6.0 watts</td>
</tr>
<tr>
<td>JE-61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tone Control**

3-position

**Load-speaker—"Alnico" Magnet Dynamic**

<table>
<thead>
<tr>
<th>Cone Diameter</th>
<th>JE-51, JE-510—6½ inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice Coil Impedance (400 cycles)</td>
<td>3.5 ohms</td>
</tr>
</tbody>
</table>

**"V" rated receivers may be operated on 40 cycles provided the power supply voltage is reduced so as not to exceed the following equivalents: 110 volts on the 125-volt tap or 200 volts on the 225-volt tap.**
GENERAL ELECTRIC CO.

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Gnd Volts</th>
<th>Screen to Gnd Volts</th>
<th>Cathode to Gnd Volts</th>
<th>Filament Volts</th>
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<td>6SA7</td>
<td>153</td>
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<td>153</td>
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<td>6SQ7</td>
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<td>25C6G</td>
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<td>153</td>
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<td>25Z6G</td>
<td>220 (A.C.)</td>
<td>236 (D.C.)</td>
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<td>6U5**</td>
<td>153</td>
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<td>6.3</td>
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</tbody>
</table>


* Use a high resistance voltmeter.

** Used only on Models JE-61 and JE-61L.

SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*

(a) Antenna Post to Converter Grid at
   250 K.C.  6.0
   1000 K.C. 4.0
   4000 K.C. 3.2
   18000 K.C. 2.4

(b) R.F. on Converter Grid to I.F. on 6SK7 Grid at
   250 K.C. 25
   1000 K.C. 36
   4000 K.C. 30
   18000 K.C. 28

(c) I.F. on Converter Grid to I.F. on 6SK7 Grid at
   455 K.C. 55

(2) Voltage across the diode load to give 1/2 watt speaker output at
   400 Cycles .066*

(3) DC voltage developed across oscillator grid resistor

   (R4) at

   250 K.C. 9.8*
   1000 K.C. 8.6*
   4000 K.C. 9.7*
   18000 K.C. 7.7*

* Variations of +10%, -20% are permissible.

Fig. 1. Pick-up Connections

Fig. 3. Over-all I.F. Curve Taken on G-E Oscilloscope OFM-1

COIL RESISTANCE DATA

<table>
<thead>
<tr>
<th>Coil</th>
<th>Model</th>
<th>Section</th>
<th>Resistance Measured Between Points</th>
<th>Resistance (Ohms)</th>
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<tr>
<td>Antenna</td>
<td>JE-51, 510, 61</td>
<td>B Primary</td>
<td>1 and 5</td>
<td>22</td>
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<td></td>
<td></td>
<td>B Secondary</td>
<td>2 and 5</td>
<td>5</td>
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<td>C Secondary</td>
<td>3 and 5</td>
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<td></td>
<td>A Primary</td>
<td>1 and 5</td>
<td>110</td>
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<tr>
<td></td>
<td></td>
<td>A Secondary</td>
<td>2 and 5</td>
<td>26</td>
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<td></td>
<td></td>
<td>B Secondary</td>
<td>3 and 5</td>
<td>5</td>
</tr>
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<td></td>
<td></td>
<td>D Secondary</td>
<td>4 and 5</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Primary</td>
<td>16 and 17</td>
<td>.2</td>
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<td>Oscillator</td>
<td>JE-51, 510, 61</td>
<td>B Band Coil</td>
<td>6 and 10</td>
<td>3</td>
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<td></td>
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<td>C Band Coil</td>
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<td>D Band Coil</td>
<td>8 and 10</td>
<td>.03</td>
</tr>
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<td>15 to 19</td>
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<td></td>
<td>Secondary</td>
<td>265</td>
<td>.4</td>
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<td>All Models</td>
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<td>265</td>
<td>.4</td>
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<td>265</td>
<td>.4</td>
</tr>
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<td>265</td>
<td>.4</td>
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<td>7</td>
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<td></td>
<td>Primary</td>
<td>125 V. Tap</td>
<td>8</td>
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<td></td>
<td></td>
<td>Primary</td>
<td>200 V. Tap</td>
<td>9</td>
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<td>Primary</td>
<td>225 V. Tap</td>
<td>20</td>
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<td></td>
<td>Primary</td>
<td>250 V. Tap</td>
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<td></td>
<td>Secondary</td>
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<td>250</td>
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<td>Green to Green</td>
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<tr>
<td></td>
<td></td>
<td>Yellow to Yellow</td>
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<td>.5</td>
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</tbody>
</table>

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### GENERAL INFORMATION

Models J.E-51 and J.E-510 are three band receivers employing five General Electric Pre-tested Tubes in a superhetorodyne type receiver. Tuning is accomplished by means of a new "Vosslas Dial" and luminous pointer which assures ease in tuning. Additional features include phonograph and television sound terminals. Tone Muter control, low volume control, automatic volume control, indicator or Trimmer, anti-scan design, and the new Dynapower speaker.

Note: J.E-51, J.E-510, and J.E-61L, are similar to the above models in design except for inclusion of a cathode ray tuning indicator, and substitution of an eight inch Dynapower speaker in place of the six and a half inch speaker provided with a long wave band (400 to 440 Kc) in place of the "C" band on Model J.E-51.

### CHASSIS REMOVAL

Before attempting to slide the chassis out of the cabinet on these models, free the drive cord from the diap pointer. A drop or two of cresol may have been used to hold the pointer securely to the cord. This can be loosened with the fingers or a pointed tool. Then press down on the cord until it can be moved to the rear underside the hook in the back of the cabinet.

### POWER SUPPLY

The receivers are equipped with the new plug-type power supply which permits practically instantaneous conversion to DC operation. Simply remove the power transformer and replace with a plug-in type bulb resistor. Refer to the data given under "Conversions for Special Line Voltages".

The new power transformer is provided with 6 volt taps. Instant tap switching is made by a simple push plug and jack device. For correct operation make sure the power supply voltage is correct. Note which voltage is used to reverse the transformer, and replace with a plug-in type bulb resistor. Refer to the data given under "Conversions for Special Line Voltages".

### CONVERSION FOR SPECIAL LINE VOLTAGES

The J.E-51, J.E-510, and J.E-61L can be converted for operation on the following line voltages. In all cases where the power transformer is replaced with a bulb resistor, the power transformer must be removed from the chassis as the bulb inserted in the bulb resistor is likely to injure the transformer.

### Phonograph or Television Sound Connections

A simple method for connecting a crystal or high impedance magnetic pickup to the receiver is to connect a crystal type radio tube, such as a 6CE1, in a transformer-tube circuit, or to use a crystal type radio tube in a tube circuit, such as a 6A8, in a tube circuit. The crystal type radio tube is then connected to the receiver as shown in Fig. 1. A television sound channel may be connected in place of the crystal pickup. No loading resistor is required.

### I.P. ALIGNMENT WITH OSCILLOSCOPE

All antennas and oscillator transformer switch terminals are marked on Fig. 2. Refer to Modulation Voltages in the common points on the schematic diagrams Figs. 4 and 5. These voltages should be used in setting the various positions of the band-change switch.

### ALIGNMENT PROCEDURE

Use a standard I.R.E. dummy antenna to make all necessary adjustments and telephone Class "A" and "B" dummy antennas to test for gain. Refer to the alignment procedure for vacuum tubes.

### I.F. ALIGNMENT WITH OUTPUT METER

**Model J.E-51, J.E-510, and J.E-61L**

**Band B'**

- **Antenna**
  - Modulation Post

- **Antenna**
  - Modulation Post

- **I.F. Grid**
  - 455 K.C. Sweep

- **Output**
  - 5 Mfd. or larger

- **Inductor or Trimmer**
  - 1st I.F.

- **Comments**
  - Gain condenser plates closed—connect output meter to upper plate of condenser. Use two insulating handle screwdrivers, for a single turn of maximum adjustment of maximum depth when receiver is in the 455 K.C. position. A 1st and 2nd I.F. transformers for tight adjustment.

### R.F. ALIGNMENT—MODELS J.E-51, J.E-510, AND J.E-61L

**Band B'**

- **Antenna**
  - Modulation Post

- **I.F. Grid**
  - 455 K.C. and above

- **Output**
  - 5 Mfd. or larger

- **Inductor or Trimmer**
  - 1st I.F.

- **Comments**
  - Gain condenser plates closed—connect output meter to upper plate of condenser. Use two insulating handle screwdrivers, for a single turn of maximum adjustment of maximum depth when receiver is in the 455 K.C. position. A 1st and 2nd I.F. transformers for tight adjustment.

### I.F. ALIGNMENT—with OSCILLOSCOPE

**Band B'**

- **Antenna**
  - Modulation Post

- **I.F. Grid**
  - 455 K.C. and above

- **Output**
  - 5 Mfd. or larger

- **Inductor or Trimmer**
  - 1st I.F.

- **Comments**
  - Gain condenser plates closed—connect output meter to upper plate of condenser. Use two insulating handle screwdrivers, for a single turn of maximum adjustment of maximum depth when receiver is in the 455 K.C. position. A 1st and 2nd I.F. transformers for tight adjustment.

### RF ALIGNMENT—MODELS J.E-51, J.E-510, AND J.E-61L

**Band B'**

- **Antenna**
  - Modulation Post

- **I.F. Grid**
  - 455 K.C. and above

- **Output**
  - 5 Mfd. or larger

- **Inductor or Trimmer**
  - 1st I.F.

- **Comments**
  - Gain condenser plates closed—connect output meter to upper plate of condenser. Use two insulating handle screwdrivers, for a single turn of maximum adjustment of maximum depth when receiver is in the 455 K.C. position. A 1st and 2nd I.F. transformers for tight adjustment.
Fig. 1. Schematic

Maeda No. 46

UNIVERSAL TRANSFORMER
120-240 V 50-60 Hz

MADE IN JAPAN

CONDITIONS OF TEST
POWER SWITCH OFF

APPROX RESISTANCE MEASUREMENTS
HUMS TO GROUND TUBE SOCKET PIN
1 26 MEG n 6A7 GRID CAP PRONG NUMBERS
2 26 MEG n 606 GRID CAP BOTTOM VIEWS
3 1.5 MEG n 75 GRID CAP
4 470000 n 75 4
5 470000 n 4 4

Tone Control
2-point

Loud-speaker—Electrodynamic
Cone
Voice Coil Impedance
.55 ohms at 400 cycles

Tuning Drive
The drive cable should be carefully threaded around the condenser drive drum and pulleys as shown in Fig. 3.

Tuning Frequency Range
Band "B"........... 540-1720 kc.
Band "C"........... 5,000-18,000 kc.

Intermediate Frequency........... 455 kc.

Electrical Output
Undistorted........... 2.3 watts
Maximum........... 3.5 watts

SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts—D.C.</th>
<th>Screen Grid to Ground Volts—D.C.</th>
<th>Cathode to Ground Volts—D.C.</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A.C.</th>
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<tbody>
<tr>
<td>6A7</td>
<td>176</td>
<td>105</td>
<td>0</td>
<td>14.8</td>
<td>6.3</td>
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<td>Converter</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6DG 1st I.F. Amp.</td>
<td>230</td>
<td>105</td>
<td>0</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>75 Det A.V.C. 1st audio</td>
<td>190 *</td>
<td>105</td>
<td>0</td>
<td>.16</td>
<td>6.3</td>
</tr>
<tr>
<td>41 Output</td>
<td>215</td>
<td>230</td>
<td>0</td>
<td>.29</td>
<td>6.3</td>
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<tr>
<td>80 Rectifier</td>
<td>300/600 KMS</td>
<td>315 to B.</td>
<td>54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A-C line voltage 120. No signal input; 1000 ohms per-volt meter. Dial pointer at 330 K.C. *Measured on 500-volt scale.

Fig. 3. Dial Mechanism
**Fig. 4. Chassis Parts Layout**

**GENERAL INFORMATION**

This two-band receiver employs five General Electric Pre-tested tubes in a superheterodyne circuit. The circuit incorporates a wave trap and a two-point tone control.

A signal from the antenna is coupled by the antenna transformer to the control grid of the 6A7 oscillator and converter tube. After conversion to 455 kc, the signal is amplified at this frequency by the intermediate frequency amplifier which employs two double tuned I.F. transformers.

The diode part of the 75 tube is used as a detector and provides the ac voltage. The 75 tube is resistance-coupled to the 41 pentode amplifier output tube.

Minimum bias is supplied for all tubes except the 75 by the voltage drop over the resistance R-8 and R-12. Bias for the 75 tube is supplied by the voltage drop over R-12.

Negative feedback is used to improve the tone of reproduction. In this circuit, voltage is fed back from the voice coil circuit to a tap on the volume control. This feedback voltage is out of phase with the input voltage to the audio amplifier. Engineers have shown that the resulting degeneration reduces distortion arising in the audio amplifier and extends the tone range.

**ALIGNMENT PROCEDURE**

**I.F. Alignment**

Connect an output meter across the voice coil. Set the volume control for maximum.

Set the test oscillator to 455 kc. and connect one output lead to the receiver chassis and the other through a .05 Mfd. condenser to the control grid of the 6A7. Do not remove the grid lead from the 6A7 as this would remove the minimum bias from this tube. Keep the test oscillator output as low as possible to give a readable output. The four I.F. trimmers (see Fig. 2.) should be adjusted in the following sequence for maximum output.

1. Secondary trimmer (C-9) on second I.F. transformer
2. Primary trimmer (C-8) former
3. Secondary trimmer (C-7) on first I.F. transformer
4. Primary trimmer (C-6)

**Wave Trap Alignment**

Leave the test oscillator set to 455 kc and connect one output lead to the receiver chassis and the other through a 250 Mmf. condenser in series with 400 ohms to the receiver antenna lead. Adjust C-10 for minimum output.

**R.F. Alignment**

A careful examination of the diagram, Fig. 1, will disclose that the "D" band, oscillator trimmer C-4 must first be set before any adjustment of the broadcast oscillator trimmer C-23 can be made. The image of any signal on the "D" band should be tuned in 910 kc. below the input signal when C-4 is on the correct peak. Example: 18 mc. image is at 17.09 mc.

Use the same dummy antenna (250 Mmf. and 400 ohms) as used for the wave-trap alignment.

Rock the gang condenser when peaking the trimmers (C-11 or C-5).

**Band Switch**

<table>
<thead>
<tr>
<th>Signal Frequency</th>
<th>Adjust Trimmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;D&quot;</td>
<td>18 mc.</td>
</tr>
<tr>
<td>2. &quot;B&quot;</td>
<td>1500 kc.</td>
</tr>
<tr>
<td>4. &quot;B&quot;</td>
<td>1500 kc.</td>
</tr>
<tr>
<td>5. &quot;D&quot;</td>
<td>18 mc.</td>
</tr>
</tbody>
</table>

**NOTE:** Be sure that the setting of C-4 made in No. 1 is not disturbed during any other part of the alignment. If it is changed the whole R.F. alignment procedure should be repeated.

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POWER CONSUMPTION (LABEL A) 65 WATTS, (LABEL V) 70 WATTS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>R. F. Trimmer Capacitor, &quot;D&quot; Band</td>
</tr>
<tr>
<td>C6</td>
<td>Osc. Trimmer Capacitor, &quot;D&quot; Band</td>
</tr>
<tr>
<td>C7</td>
<td>Mica Capacitor, 370 Mf.</td>
</tr>
<tr>
<td>C8</td>
<td>Mica Capacitor, 330 Mf.</td>
</tr>
<tr>
<td>C9</td>
<td>Mica Capacitor, 2900 Mf.</td>
</tr>
<tr>
<td>C10</td>
<td>Mica Capacitor, 37 Mf.</td>
</tr>
<tr>
<td>C11</td>
<td>Mica Capacitor, 37 Mf.</td>
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<tr>
<td>C12</td>
<td>Mica Capacitor, 158-450 Mf.</td>
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<tr>
<td>C13</td>
<td>Mica Capacitor, 85-345 Mf.</td>
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<tr>
<td>C14</td>
<td>Mica Capacitor, 85-345 Mf.</td>
</tr>
<tr>
<td>C15</td>
<td>Mica Capacitor, 35-175 Mf.</td>
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<tr>
<td>C16</td>
<td>Mica Capacitor, 35-175 Mf.</td>
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<tr>
<td>C17</td>
<td>Mica Capacitor, 30-115 Mf.</td>
</tr>
<tr>
<td>C18</td>
<td>Mica Capacitor, 30-115 Mf.</td>
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<tr>
<td>C19</td>
<td>Mica Capacitor, 11-60 Mf.</td>
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<td>C20</td>
<td>Mica Capacitor, 11-60 Mf.</td>
</tr>
<tr>
<td>C21</td>
<td>Mica Capacitor, 16-530 Mf.</td>
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<tr>
<td>C22</td>
<td>Mica Capacitor, 53-342 Mf.</td>
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<tr>
<td>C23</td>
<td>Mica Capacitor, 80-235 Mf.</td>
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<tr>
<td>C24</td>
<td>Mica Capacitor, 80-235 Mf.</td>
</tr>
<tr>
<td>C26</td>
<td>Mica Capacitor, 20-115 Mf.</td>
</tr>
</tbody>
</table>

SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current M.A. D.C.</th>
<th>Heater Volts A.C.</th>
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<tr>
<td>6A8G</td>
<td>Converter 236</td>
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<td>0</td>
<td>12.2</td>
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<td></td>
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<tr>
<td>6K7</td>
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<td>0</td>
<td>8.7</td>
<td>6.5</td>
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<td>0.4</td>
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<td>236</td>
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<td>320</td>
<td>51.4</td>
<td>5.3</td>
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A.C line voltage—120. No signal input. 1000 ohms per volt meter. Dial pointer at 530 kc. on "B" band.
* Measured on 500-volt scale.
Fig. 5. Schematic Diagram and Trimmer Location
Model JE-61L

Tuning Frequency Range
Model JE-61L
Band "A"............. 140-400 K.C.
Band "B"............. 540-1600 K.C.
Band "D"............. 5700-18000 K.C.

Intermediate Frequency........ 455 K.C.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tr>
<td>C-1</td>
<td>Tuning Condenser</td>
</tr>
<tr>
<td>C-2</td>
<td>2-18 Mf. B Antenna Trimmer</td>
</tr>
<tr>
<td>C-3</td>
<td>2-18 Mf. A Antenna Trimmer</td>
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<td>C-4</td>
<td>5-40 Mf. A Oscillator Trimmer</td>
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<td>5-40 Mf. B Oscillator Trimmer</td>
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<td>C-6</td>
<td>3-30 Mf. D Oscillator Trimmer</td>
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<td>C-7</td>
<td>3-30 Mf. B Oscillator Padder</td>
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<td>C-8</td>
<td>300-675 Mf. B Oscillator Padder</td>
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<td>C-9</td>
<td>20 Mf. D Antenna Trimmer</td>
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<td>C-10</td>
<td>200 Mf. D Oscillator Trimmer</td>
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<td>C-11</td>
<td>470 Mf. Mica Capacitor</td>
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<td>C-12</td>
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<td>C-15</td>
<td>.03 Mfd. 900 V. Paper Capacitor</td>
</tr>
<tr>
<td>C-16</td>
<td>.03 Mfd. 600 V. Paper Capacitor</td>
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<tr>
<td>C-17</td>
<td>.03 Mfd. 300 V. Paper Capacitor</td>
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<td>C-18</td>
<td>.03 Mfd. 200 V. Paper Capacitor</td>
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<tr>
<td>C-19</td>
<td>.03 Mfd. 150 V. Paper Capacitor</td>
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<td>.002 Mfd. 600 V. Paper Capacitor</td>
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<td>C-22</td>
<td>.002 Mfd. 800 V. Paper Capacitor</td>
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<td>C-23</td>
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<tr>
<td>C-24</td>
<td>.002 Mfd. 400 V. Paper Capacitor</td>
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<tr>
<td>C-25</td>
<td>.001 Mfd. 300 V. Paper Capacitor</td>
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<td>C-26</td>
<td>.001 Mfd. 200 V. Paper Capacitor</td>
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<tr>
<td>C-27</td>
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<td>.001 Mfd. 80 V. Paper Capacitor</td>
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<td>.001 Mfd. 40 V. Paper Capacitor</td>
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<td>.001 Mfd. 10 V. Paper Capacitor</td>
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<td>C-34</td>
<td>.001 Mfd. 6 V. Paper Capacitor</td>
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<td>C-35</td>
<td>.001 Mfd. 3 V. Paper Capacitor</td>
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<td>C-36</td>
<td>.001 Mfd. 1.5 V. Paper Capacitor</td>
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<td>C-37</td>
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<td>C-38</td>
<td>.001 Mfd. 0.5 V. Paper Capacitor</td>
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<td>C-40</td>
<td>.001 Mfd. 0.125 V. Paper Capacitor</td>
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<td>C-41</td>
<td>.001 Mfd. 0.0625 V. Paper Capacitor</td>
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<td>C-42</td>
<td>.001 Mfd. 0.03125 V. Paper Capacitor</td>
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<tr>
<td>C-43</td>
<td>.001 Mfd. 0.015625 V. Paper Capacitor</td>
</tr>
<tr>
<td>C-44</td>
<td>.001 Mfd. 0.0078125 V. Paper Capacitor</td>
</tr>
</tbody>
</table>

P-2    | Dial Light Mazda No. 44 |
P-3    | 3 Megohms 1/2 W. Carbon Resistor |
P-3    | 220 Ohms 1/2 W. Carbon Resistor |
P-3    | 680,000 Ohms 1/2 W. Carbon Resistor |
P-4    | 220,000 Ohms 1/2 W. Carbon Resistor |
P-5    | 330,000 Ohms 1/2 W. Carbon Resistor |
P-6    | 2.2 Megohms 1/2 W. Carbon Resistor |
P-7    | 330,000 Ohms 1/2 W. Carbon Resistor |
P-8    | 4.7 Megohms 1/2 W. Carbon Resistor |
P-9    | 47,000 Ohms 1/2 W. Carbon Resistor |
P-10   | 130,000 Ohms 1/2 W. Carbon Resistor |
P-11   | 470,000 Ohms 1/2 W. Carbon Resistor |
P-12   | 1000 Ohms 1/2 W. Carbon Resistor |
P-13   | 5.6 Megohms 1/2 W. Carbon Resistor |
P-14   | 1500 Ohms 1/2 W. Carbon Resistor |
P-15   | 270 Ohms 1/2 W. Carbon Resistor |
P-16   | 330 Ohms 1/2 W. Carbon Resistor |
P-17   | 3900 Ohms 1/2 W. Carbon Resistor |
P-18   | 3300 Ohms 1/2 W. Carbon Resistor |
P-19   | 270 Ohms 1/2 W. Carbon Resistor |
P-20   | 2 Megohms, 1 Megohm Tap, Volume Control |
R-1    | 220 Ohms 1/2 W. Carbon Resistor |
R-2    | 330 Ohms 1/2 W. Carbon Resistor |
R-3    | 330 Ohms 1/2 W. Carbon Resistor |
R-4    | 680,000 Ohms 1/2 W. Carbon Resistor |
R-5    | 330,000 Ohms 1/2 W. Carbon Resistor |
R-6    | 2.2 Megohms 1/2 W. Carbon Resistor |
R-7    | 330,000 Ohms 1/2 W. Carbon Resistor |
R-8    | 4.7 Megohms 1/2 W. Carbon Resistor |
R-9    | 47,000 Ohms 1/2 W. Carbon Resistor |
R-10   | 130,000 Ohms 1/2 W. Carbon Resistor |
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R-17   | 3900 Ohms 1/2 W. Carbon Resistor |
R-18   | 3300 Ohms 1/2 W. Carbon Resistor |
R-19   | 270 Ohms 1/2 W. Carbon Resistor |
R-20   | 2 Megohms, 1 Megohm Tap, Volume Control |
T-1    | Band Change Switch |
T-2    | Tone Control Switch |
T-3    | Power Switch |
T-4    | Output Transformer |
T-5    | Power Transformer
GENERAL INFORMATION

The Models J-62 and J-620 are compact six-tube AC superheterodyne receivers employing General Electric Pre-tested Tubes. Features of design include dual built-in Beam-a-Scope, visualux dial, voltage-doubling rectifier system, broadcast and short-wave coverage, and automatic volume control.

Both models are Underwriters' approved and use the same chassis. Model J-62 has a mahogany cabinet. Model J-620 uses a beech mahogany cabinet.

If an excessive amount of hum is noticed while the receiver is operating, reverse the power plug in the receptacle.

SPECIAL SERVICE INFORMATION

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

(1) Stage Gains

Antenna Post to Converter Grid at 1000 KC

Converter Grid to 6SK7 Grid at 1000 KC

Converter Grid to 6SK7 Grid at 455 KC

6SK7 Grid to 6SQ7 Diode Plate at 455 KC

SPECIFICATIONS

**Electrical Rating**

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 AC</td>
<td>25-60</td>
<td>55</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**

Band “B” : 540-1600 KC  
Band “D” : 580-18,000 KC  

**Intermediate Frequency**

455 KC

**Electrical Power Output (117 Line Volts)**

- Undistorted: 3 watts  
- Maximum: 4.5 watts

**Load-speaker—“Alvico” Magnet Dynamic**

- Outside Cone Diameter: 5 inches  
- Voice Coil Impedance (400 cycles): 3.5 ohms

* Variations of +10%, –20% permissible. All readings obtained with enough input signal to give ¼-watt speaker output.
CHASSIS REMOVAL
Note: Care must be exercised in removing either the cabinet back or the chassis to avoid changing the shape of either the short-wave or broadcast loops. These loops are factory-formed to give a certain inductance and any alteration in the loops in the field will throw the chassis out of alignment.
To remove the chassis proceed as follows: Pry loose the four fasteners which hold the cabinet back in position. Disconnect the speaker cords from the speaker terminals. Unscrew the two screws which secure the short-wave loop to the cabinet. Remove the three chassis bolts and knobs. The chassis is now free from the cabinet.

ALIGNMENT PROCEDURE

1. F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Completely close the gang condenser plates and set the dial pointer to the last dial mark at the low end of the scale. Turn the band switch to "B" band (counter-clockwise) and set the tuning control to a frequency near 550 KC. Connect the meter across the voice coil. Turn the tuning control to the point of maximum output. The meter should indicate maximum output. If not, move the pointer on the dial to the next mark. This edge of the clip as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until this edge of the clip is in line with 190° the receiver will be tuned to 1500 KC on the broadcast band. The alignment may now proceed as previously described.

R. F. Alignment

The use of a standard R. F. dummy antenna in making all R. F. alignments is recommended. R. F. alignment can be performed by loop coupling the signal to the receiver Beam-a-Scopes if care is exercised to overcouple the two circuits. Keep a distance of two feet or more between the signal generator and the receiver. A Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scopes to the chassis materially affects R. F. alignment; therefore, all R. F. alignments should be made with the chassis and Beam-a-Scopes mounted in the cabinet. In keeping with this recommendation all R. F. alignment trimmers are available through holes in the bottom deck and back of the cabinet. Metal objects such as meters, tools, etc., should not be placed near the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-topped tables, etc.

Set the signal generator to 1500 KC. Align (C-2B) to the signal while the dial pointer is on the 1500 KC mark. Peak (C-2A) for maximum output. Change signal to 1150 KC and tune receiver to signal. Peak (C-2D) on the 1150 KC signal by rocking the gang condenser. Return at 1500 KC.

Turn the band switch to "C" band. Align (C-2D) at 16 MC. Peak (C-2C) while rocking the gang condenser. The image of the 16 MC signal should be heard at 16.09 MC when (C-2D) is on the proper peak. Change signal to 6 MC and return the receiver. Check the receiver for increased output at the 16 MC point by pinch or separating slightly the turn of wire in the short-wave Beam-a-Scope mounted on the side of the chassis. Return at 16 MC.

If the chassis is to be aligned outside of the cabinet it will no longer be possible to use the dial scale as a tuning reference since the dial scale is fastened to the cabinet. Use must be made, therefore, of a 0-100 calibrated scale which is cemented to the back of the dial reflector plate. From the reference chart Fig. 3 the degree readings for corresponding frequency settings may be obtained by laying a straight edge across the chart perpendicular to the line of figures and sliding the straight edge along to the various frequency settings desired. The degree readings will be found on either of the degree scales. To use these degree readings, first completely close the gang condenser plates and then slide pointer along the cord until the inside edge of the right-hand pointer-guide clip is in line with the 0° mark. (See Fig. 2.) By using this...
**MODELS FE-82, FE-87**

### SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D-C</th>
<th>Screen Grid to Ground Volts D-C</th>
<th>Cathode to Ground Volts D-C</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F. Amplifier</td>
<td>222</td>
<td>97</td>
<td>0</td>
<td>7.5</td>
<td>6.3</td>
</tr>
<tr>
<td>6A8</td>
<td>222</td>
<td>97</td>
<td>0</td>
<td>10.5</td>
<td>6.3</td>
</tr>
<tr>
<td>6K8 Oscillator</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>10.4</td>
<td>6.3</td>
</tr>
<tr>
<td>6K8 1st F. Amp.</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>10.4</td>
<td>6.3</td>
</tr>
<tr>
<td>6K8 2nd F. Amp.</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>10.4</td>
<td>6.3</td>
</tr>
<tr>
<td>6F3 Audio Amplifier</td>
<td>110</td>
<td>110</td>
<td>0</td>
<td>4.0</td>
<td>6.3</td>
</tr>
<tr>
<td>42 Output</td>
<td>222</td>
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<td>11.5</td>
<td>6.3</td>
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<td>80 Power Rectifier</td>
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<td>342</td>
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<td>6.3</td>
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**VOLTAGE CHART (Model E-81)**

<table>
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<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Plate Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SK7 (R.F.)</td>
<td>135</td>
<td>95</td>
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<td>6.4</td>
</tr>
<tr>
<td>6K8 Conv. -135</td>
<td>95</td>
<td>2.5</td>
<td>6.4</td>
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<tr>
<td>6SK7 (I.F.)</td>
<td>135</td>
<td>95</td>
<td>2.5</td>
<td>6.4</td>
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<tr>
<td>6SK6/6J6GT</td>
<td>90</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6V6G</td>
<td>110</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
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<td>6F6</td>
<td>110</td>
<td>1.6</td>
<td>6.4</td>
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<td>6U6</td>
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<td>6.4</td>
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**VOLTAGE CHART (Model E-810)**

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<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Plate Volts</th>
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<tbody>
<tr>
<td>6SK7 (R.F.)</td>
<td>135</td>
<td>95</td>
<td>2.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6M8 Conv. -135</td>
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<td>6.4</td>
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<td>6SK7 (I.F.)</td>
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</tr>
<tr>
<td>6SK6/6J6GT</td>
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<td>1.6</td>
<td>6.4</td>
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<tr>
<td>6F6</td>
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**VOLTAGE CHART (Models HE-74 and HE-74L)**

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<th>Screen to Grid Volts</th>
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<th>Plate to Plate Volts</th>
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<tbody>
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<td>90</td>
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<tr>
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<td>6.5</td>
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<tr>
<td>6SK7</td>
<td>125</td>
<td>90</td>
<td>1.5</td>
<td>6.5</td>
</tr>
<tr>
<td>6SK6/6J6GT</td>
<td>90</td>
<td>1.5</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>6F6</td>
<td>110</td>
<td>1.5</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>6V6G</td>
<td>110</td>
<td>1.5</td>
<td>6.5</td>
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<tr>
<td>6U6</td>
<td>110</td>
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**VOLTAGE CHART (Models HE-740 and HE-740L)**

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<th>Plate to Plate Volts</th>
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<tr>
<td>6SK7</td>
<td>125</td>
<td>90</td>
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</tr>
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<td>6SK7</td>
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<td>6.5</td>
</tr>
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<td>6SK6/6J6GT</td>
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<td>6.5</td>
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<tr>
<td>6F6</td>
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<td>6.5</td>
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</tr>
<tr>
<td>6V6G</td>
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<td>1.5</td>
<td>6.5</td>
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<td>6U6</td>
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**NE-74, NE-74L, NE-740, NE-740L**

**Dial Drive Mechanism**

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**MODELS FE-112, FE-116, FE-119**

### SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D-C</th>
<th>Screen Grid to Ground Volts D-C</th>
<th>Cathode to Ground Volts D-C</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A-C</th>
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<tbody>
<tr>
<td>6K7 R.F. Amplifier</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>7.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6M5-G Oscillator</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>11.8</td>
<td>6.3</td>
</tr>
<tr>
<td>6L7 Converter</td>
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<tr>
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<td>95</td>
<td>0</td>
<td>7.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6K7 2nd F. Amp.</td>
<td>220</td>
<td>95</td>
<td>0</td>
<td>7.7</td>
<td>6.3</td>
</tr>
<tr>
<td>6F3 Audio Amplifier</td>
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<td>110</td>
<td>0</td>
<td>4.0</td>
<td>6.3</td>
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**VOLTAGE CHART**

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plate to Grid Volts</th>
<th>Screen to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Plate to Plate Volts</th>
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<tr>
<td>6SK7</td>
<td>135</td>
<td>95</td>
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<tr>
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<td>6V6G</td>
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<tr>
<td>6U6</td>
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**VOLTAGE CHART**

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<td>95</td>
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</tr>
<tr>
<td>6K8 Conv. -135</td>
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<td>6.4</td>
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<tr>
<td>6SK7</td>
<td>135</td>
<td>95</td>
<td>2.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6SK6/6J6GT</td>
<td>90</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6F6</td>
<td>110</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6V6G</td>
<td>110</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6U6</td>
<td>90</td>
<td>1.6</td>
<td>6.4</td>
<td></td>
</tr>
</tbody>
</table>

---

**NE-74, NE-74L, NE-740, NE-740L**

**Dial Drive Mechanism**

---

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**General Electric Co.**

**Model J63**

---

**Electrical Rating**

- 115 Volts, 25-60 cycles AC; or 115 volts DC.
- 55 watts

**Output Transformer**

- 455 kc
- 30 mfd. 250 volts
- 0.5 megohm volume control
- 1500 ohms carbon resistor
- 2500 volts
- 0.5 megohm volume control
- 1000 ohms carbon resistor
- 33,000 ohms carbon resistor
- 57 ohms carbon resistor

**Special Service Information**

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage gains**
   - Antenna Post to Converter Grid—in 4.3 at 1000 KC
   - Converter Grid to 6SK7 Grid—in 12 at 455 KC
   - 6SK7 Grid to 6SQ7 Diode Plate—in 100 at 455 KC

2. **Audio gain**
   - .06 volts, 400 cycles signal across volume control with control set to maximum will give approximately ½ watt speaker output.

3. **DC voltage developed across oscillator grid resistor (R4) averages 10.5 volts at 1000 KC or 8.0 volts at 10,000 KC.

* Variations of +10 or -20% permissible.

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**Page 12-24 G.F.**
### Electrical Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles per AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audio</strong></td>
<td>A</td>
<td>110-125</td>
<td>75</td>
</tr>
<tr>
<td><strong>1/2-Watt</strong></td>
<td>B</td>
<td>50-60</td>
<td>85</td>
</tr>
</tbody>
</table>

**Tuning Frequency Range**
- Broadcast Band: No. 1: 540–1600 KC
- Short-wave Band No. 1: 2300–7000 KC
- Short-wave Band No. 2: 7000–22,000 KC
- 455 KC

**Intermediate Frequency**
- Input Undistorted: 2.85 watts
- Output Undistorted: 4.5 watts
- Tone Control: 3-position

**Load-speaker—"Amita"—Magnet Dynamic**
- Diameter: 81/8 inches
- Voice Coil Impedance: 3.5 ohms

---

**Note:** The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout. Refer to Fig. 1 for the corresponding numbered points on the schematic. Transformer connections are shown as an aid in replacement.
GENERAL INFORMATION

Model 12-27 is a single tube, superheterodyne receiver designed to operate from an alternating current power supply. The receiver incorporates the latest developments in tube types which the General Electric Double Beam-A-Scopes are notable. Broadcast and short wave No. 1 band switches are selected by the Beam-A-Scope which is mounted on the cabinet back. Short-wave No. 2 signals are selected by the Beam-A-Scope which is mounted on the cabinet above the chassis. Additional features include single-ended tuned circuits, grounded-grid amplifiers, \( 6 

Phone-FM-Tel

This receiver is equipped with a pin jack on the rear panel of the chassis for connecting to the Phone-FM-Tel key for adapting it to use with record players, frequency modulation converters, and television programs. The pin jack takes General Electric plug. Book No. RP.165 fits the pin jack.

Setting up the Receiver

The following remarks will assist the serviceman in correctly setting up this receiver for use:

(1) In order to place the volume or tuning knobs at their correct way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear of the cabinet.
(2) The plain metal disc in the rear of the cabinet contains the speaker terminal which is grounded to the speaker frame.
(3) A method of setting up station keys which will assure desired alignment is to turn the unit over, the volume or tuning knobs at their correct way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear of the cabinet.

Chassis or Beam-A-Scope Removal

Note: Care must be exercised in removing either the chassis back or the cabinet to avoid damaging the shape of either the short-wave or broadcast loop. These loops are factory formed to give a certain inductance and any alteration in these loops in the field will change the circuits and alignment.

To remove the shield covering the loop from the chassis, be sure to support the loop while pulling off the connections. Failure to support the shield may cause the shield to bend and result in loop rattling in the cabinet.

Lead-speaker

The lead speaker is accurately and permanently centered at the factory and should seldom need attention. Be sure that the volume control is in the "0" position.

Special Service Information

The 45Kc crystal filter will be very useful in servicing receivers if a variable tube output or similar voltage measuring instrument is available.

ALIGNMENT CHART

I. Alignment Chart with Oscilloscope

<table>
<thead>
<tr>
<th>Band</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Distance Antenna</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>1350 kc</td>
<td>1 P. Grid</td>
<td>0.05 in.</td>
<td>2nd I. P. Trimmers C-2, 11</td>
</tr>
<tr>
<td>BC</td>
<td>45 kc</td>
<td>1 P. Grid</td>
<td>0.05 in.</td>
<td>1st I. P. Trimmers C-2, 9</td>
</tr>
</tbody>
</table>

II. Alignment Chart with Oscilloscope

<table>
<thead>
<tr>
<th>Band</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Distance Antenna</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>45 kc</td>
<td>45 kc Antenna</td>
<td>0.05 in.</td>
<td>2nd I. P. Trimmers C-2, 11</td>
</tr>
<tr>
<td>BC</td>
<td>45 kc</td>
<td>45 kc Antenna</td>
<td>0.05 in.</td>
<td>1st I. P. Trimmers C-2, 9</td>
</tr>
</tbody>
</table>

Ganged condenser plate closed. Depress any key other than Phone-FM-Tel key. Connect audio output terminals to a 1000 kc signal generator. With 1000 kc signal generator connected, turn volume control to "0." With volume control at "0," connect the signal generator to the receiver and check with the oscilloscope. Note: Adjust all trimmers for maximum output.

R.F. Alignment

With Chassis Mounted in Cabinet

1. "BC" Band
   - 1350 kc
   - 45 kc

2. "BC" Band
   - 1350 kc
   - 45 kc

3. "BC" Band
   - 45 kc
   - 45 kc

4. "BC" Band
   - 1350 kc
   - 45 kc

5. Repeat operation 3 if "BC" band trimmers are badly out of alignment.

6. "SW" Band
   - 5 mc
   - 5 mc
   - 0.05 in.

7. "SW" Band
   - 21 mc
   - 21 mc
   - 0.05 in.

8. "SW" Band
   - 8 mc
   - 8 mc

This operation may or may not be necessary depending on how much the short-wave Beam-A-Scope leads are moved from their correctly dimensioned positions. Resonation will be indicated if an increased output signal is obtained by moving the short-wave Beam-A-Scope phasing block away from the center of the cabinet. This alignment should be done with an insulated rod or stick.

R.F. Alignment with Chassis Mounted in Cabinet

1. "SW" Band
   - 21 mc
   - 21 mc

2. "SW" Band
   - 8 mc
   - 8 mc

This operation may or may not be necessary depending on how much the short-wave Beam-A-Scope leads are moved from their correctly dimensioned positions. Resonation will be indicated if an increased output signal is obtained by moving the short-wave Beam-A-Scope phasing block away from the center of the cabinet. This alignment should be done with an insulated rod or stick.

Note: After moving the phonograph cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after assembly in the cabinet for the ganged condenser trimmers to be closed and the pointer to be moved back along the cord so that it lines up with the first dial marking on the left.
Fig. 1. Schematic Diagram

Model J-71

Model J-71 is a seven-tube, superheterodyne receiver designed to operate from an alternating current power supply. The receiver incorporates the latest developments in radio, among which are the General Electric Dual Beam-a-Scoops. Broadcast and short-wave No. 1 signals are selected by the Beam-a-Scope which is mounted at the top of the cabinet. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet below the chassis. Additional features include single-ended tubes, iron-core oscillator station selector coils, five feathertouch tuning station keys, one Phono-Frequency Modulation-Television key, tone meter circuit and automatic volume control.

Phono-FM-Tel

This receiver is equipped with a pin jack on the rear apron of the chassis and a Phono-FM-Tel key for adapting it to use with record players, frequency modulation converters, and television picture receivers with sound converters. General Electric plug, Stock No. RP-145, fits the pin jack.

Fig. 3. Cabinet Holes for Trimmer Adjustment

Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>50-60</td>
<td>75</td>
</tr>
<tr>
<td>C</td>
<td>110-125</td>
<td>25</td>
<td>85</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

Broadcast Band: 540-1600 KC
Short-wave Band No. 1: 2300-9990 KC
Short-wave Band No. 2: 6990-22,000 KC

Intermediate Frequency: 155 KC

Electrical Power Output

Undistorted: 2.85 watts
Maximum: 4.5 watts

Tone Control

3-position

Load-speaker—"Alnico" Magnet Dynamic

Outside Cone Diameter: 6 1/4 inches
Voice Coil Impedance: 3.5 ohms

Fig. 4. Tube and Trimmer Location
ALIGNMENT PROCEDURE

The alignment procedure is given in table form below.

Model J-71

Chassis or Beam-a-Scope Removal

Note: Care must be exercised in removing the chassis to avoid changing the effect of either the short-wave or broadcast

loops. These loops are factors that can affect the alignment of the model and should not be altered in any way.

Load-speaker

The voice coil is accurately mounted and permanently centered at the factory and should always be removed. When a voice

coil is removed, it is necessary to replace the entire voice coil assembly.

R.F. Alignment

With Chassis Outside of Cabinet

If alignment is performed only on the 'BC' and 'SW' bands, the chassis should be mounted in the cabinet. If alignment is performed on all bands, the chassis should be mounted in the cabinet.

Special Service Information

The following information will be very useful in servicing receivers with a variety of tube combinations or similar voltage measuring instruments available.

1. Voltage Combinations
   - 'BC' Band
     - 455 KC with Modulation
   - 'SW' Band
     - 1500 KC with Modulation
   - 'BB' Band
     - 1500 KC with Modulation

2. Frequency Reference Chart
   - 'BC' Band
     - 455 KC
   - 'SW' Band
     - 1500 KC
   - 'BB' Band
     - 1500 KC

3. Frequency Reference Table
   - 'BC' Band
     - 455 KC
   - 'SW' Band
     - 1500 KC
   - 'BB' Band
     - 1500 KC

4. Frequency Reference Chart
   - 'BC' Band
     - 455 KC
   - 'SW' Band
     - 1500 KC
   - 'BB' Band
     - 1500 KC

5. Frequency Reference Table
   - 'BC' Band
     - 455 KC
   - 'SW' Band
     - 1500 KC
   - 'BB' Band
     - 1500 KC

I.F. Alignment with Oscilloscope

1. 'BC' Band
   - 455 KC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

2. 'BC' Band
   - 455 KC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

I.F. Alignment with Output Meter

1. 'BC' Band
   - 455 KC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

2. 'BC' Band
   - 455 KC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

R.F. Alignment

With Chassis Mounted in Cabinet

Close gang plates, adjust pointer to first line at left end of tuning circle. Connect output meter across voice coil. Tone control set to "Normal" position.

1. 'BC' Band
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

2. 'BC' Band
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

3. 'BC' Band
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

4. 'BC' Band
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

5. 'BC' Band
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

6. 'SW' Band
   - 6 MC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

7. 'SW' Band
   - 21 MC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

8. 'SW' Band
   - 8 MC
   - Green lead on Beam-a-Scope terminal board and chassis ground
   - 0.05 mfd or larger

9. Repeat operation 7 of the Beam-a-Scope leads are moved in operation 8.

10. Repeat operation 7 of the Beam-a-Scope leads are moved in operation 8.

G.E. MODEL J-71
MODELS J-71, JB-508, JB-513, JB514

GENERAL ELECTRIC CO.

IA7GT  IN5GT  IH5GT  IT5GT

FOR OTHER DATA SEE INDEX

MODEL J-71

Tubes
R.F. Amplifier, Converter and Oscillator, I.F. Amplifier, Det./Aud., AVC, Audio Driver, Audio Output, Rectifier, Dial Lamp

GE-6SK7, GE-6SA7, GE-6SK7, GE-6SQ7, GE-6J5GT, GE-6Y6G, GE-5Y3G, (2) MAZDA No. 44

Fig. 6. Chassis Parts Layout

Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 1. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

SETTING UP THE RECEIVER

The following remarks will assist the serviceman in correctly setting up this receiver for use:

(1) In order to press the volume or tuning knobs all the way on their respective shafts, the dial reflector plate should be held in place by pressure from the rear.

(2) The black speaker lead should be connected to the speaker terminal which is grounded to the speaker frame.

(3) A method of setting up station keys which will assure driftproof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.

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GENERAL ELECTRIC CO.

SERVICE DATA

Over-all Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>JB-508</th>
<th>JB-513, JB-514</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>9 1/2 inches</td>
<td>11 inches</td>
</tr>
<tr>
<td>Width</td>
<td>14 inches</td>
<td>14 1/2 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>15 inches</td>
<td>5 inches</td>
</tr>
<tr>
<td>Wt. with batteries</td>
<td>19 1/2 lbs.</td>
<td>13 1/4 lbs.</td>
</tr>
</tbody>
</table>

Tuning Control Drive Ratio

|                      | 6:1 |

Electrical Specifications

1. AC or DC Power Supply—105-125 Volts—40-60 cycles on AC
2. Battery Power Supply—6 Volt "A" Supply, 90 Volt "B" supply
   Recommended batteries for 275-hour life (Maximum daily operation—4 hours)
   (a) "A" Battery—one Eveready No. 747 or equivalent
   (b) "B" Batteries—two Eveready No. 482 or equivalent

Tuning Frequency Range

|                      | 540-1700 KC |

Intermediate Frequency

|                      | 455 KC     |

Maximum Power Output

|                      | 200 Milliwatts |

Loudspeaker—Alinco Magnet Dynamic

| Outside Cone Diameter | 5 inches |
| Voice Coil Impedance (400 cycles) | 3.5 ohms |

Tubes

| Converter and Oscillator | GE-1ATG |
| I.F. Amplifier | GE-1N5GT |
| Det., Aud., AVC | GE-1H5GT |
| Power Output | GE-1T5GT |

BATTERY AND TUBE INSTALLATION

Models JB-513 and JB-514

The batteries may be installed or replaced without removing the Beam-a-Scope antenna from the chassis. Place the two five wood screws which hold the motorboard in place, and raise the panel. (Note—The motor crank must be removed from the crank socket before the panel can be raised.) The panel can be freed if the two plug connectors are pulled out of the socket terminals in the chassis apron.

Access to the battery compartment having been made, loosen the battery block held by the wing nuts. Place the two "B" batteries in the bottom sections, terminals inward, and insert the two 3-prong plug connectors. The "A" battery is placed on top of the "B" batteries with terminal toward the removable block and the 2-prong plug connector attached. Replace the battery block and tighten the wing nuts.

Model JB-508

To install or replace batteries remove the five wood screws which hold the motorboard in place, and raise the panel. (Note—The motor crank must be removed from the crank socket before the panel can be raised.) The panel can be freed if the two plug connectors are pulled out of the socket terminals in the chassis apron.

Access to the battery compartment having been made, loosen the battery block held by the wing nuts. Place the two "B" batteries in the bottom sections, terminals inward, and insert the two 3-prong plug connectors. The "A" battery is placed on top of the "B" batteries with terminal toward the removable block and the 2-prong plug connector attached. Replace the battery block and tighten the wing nuts.

ALIGNMENT PROCEDURE

Alignment Frequencies

| I.F. | 455 KC | Broadcast—1700 and 1500 KC |

General Alignment Notes

This receiver must be removed from the carrying case in order to perform the alignment. Special care must be exercised to place the batteries, Beam-a-Scope and chassis in the same relative positions with respect to one another as these components occupied in the case; otherwise, alignment will not be satisfactory. When aligning Model JB-508 the radio and phono switch must be on "radio."

GENERAL INFORMATION

The Models JB-513 and JB-514 are portable, five-tube, superheterodyne receivers which are designed to operate on any one of three types of power supplies as listed under electrical specifications. Features of design include power selector switch, built-in Beam-a-Scope, 5-inch dynaphase speaker and automatic volume control. Model JB-508 and JB-513 have a dial light which operates when the receiver is connected to an AC or DC power supply.

The Model JB-508 is a portable radio-phonograph combination employing a radio chassis similar to JB-513. The phonograph consists of a spring-wound Swiss motor and crystal pickup. The Swiss motor will play two 10-inch records with one winding. A speed regulator controls the speed above and below 78 R.P.M.

Model JB-514 has full Underwriters’ approval.

To switch these models from battery to external power supply operation, open the small door in the side of the cabinet, slide the battery switch to "Line," which is to the right, and insert the cord plug in a power supply of the proper voltage and frequency. The button switch selects the battery or line power supply.

When these models are working on batteries, they will perform as soon as turned "on." However, when operating on an external power supply, sufficient time must be allowed for the tubes to become heated. When operating from a DC source of power, it is necessary to insert the power plug with the proper polarity; otherwise, the receiver will fail to function. If any hum is noticed when the receiver is used on AC, reverse the power plug in the receptacle.

Outside antenna connections may be made to two black leads available in the chassis compartment.

I.F. Alignment

With batteries, Beam-a-Scope and chassis in position for alignment as mentioned above, connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 KC. Attach the test oscillator output to the two flexible leads of the Beam-a-Scope antenna. Miminal sockets facing each other. Place the "A" battery on the top of the "B" batteries with its terminal socket toward the receiver. Change the signal to 1500 KC, turn the tuning condenser to this frequency and adjust the trimmer screw of the antenna section for maximum output.

VOLTAGE CHART

(Receiver connected to 120 Volt AC line)

<table>
<thead>
<tr>
<th>Tube</th>
<th>Plate to Gnd.</th>
<th>Screen to Gnd.</th>
<th>Filament to Gnd.</th>
<th>Filament Volt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A7GT</td>
<td>92</td>
<td>38</td>
<td>3.2</td>
<td>1.6</td>
</tr>
<tr>
<td>1N5GT</td>
<td>92</td>
<td>92</td>
<td>4.8</td>
<td>1.6</td>
</tr>
<tr>
<td>1H5GT</td>
<td>10</td>
<td>92</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>1T5GT</td>
<td>88</td>
<td>92</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>35Z4GT*</td>
<td>120 AC</td>
<td>120 AC</td>
<td>120 AC</td>
<td>120 AC</td>
</tr>
<tr>
<td>117Z6GT**</td>
<td>120 AC</td>
<td>120 AC</td>
<td>120 AC</td>
<td>120 AC</td>
</tr>
</tbody>
</table>

* Used only in Models JB-513 and JB-508.
** Used only in Model JB-514.

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ALIGNMENT PROCEDURE

As seen in below procedure carefully and in the order given—otherwise the receiver will be inoperative and the dial calibration incorrect. The alignment procedure should be performed on receiving end and last step is to connect driver end again. It never that one adjustment is required on any one circuit before starting alignment.

(a) Check trimmer adjustments by turning gang capacitors until plates touch maximum capacity stop (completely in depth) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not move exactly to last line with same trimmer, check trimmers. Note that any trimmer type of output measuring device.

(b) Have ground lead of test oscillator attached to chassis.

(c) Have lead from oscillator connected to chassis.

(d) Connect internal oscillator to chassis.

(e) Check trimmer adjustments by turning gang capacitors until plates touch maximum capacity stop (completely in depth) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not move exactly to last line with same trimmer, check trimmers. Note that any trimmer type of output measuring device.

The following data will be useful to service men equipped with vacuum tube voltimeters or similar voltage measuring instruments:

1. Voltmeters should be calibrated at the factory with a DC standard. Calibration should be made at the receiver and in the order given above.

2. Voltmeters should be calibrated at the factory with a DC standard. Calibration should be made at the receiver and in the order given above.
Model GDE-73
220-240 volts A.C., 40-100 cycles, 105 watts
220-240 volts D.C., 105 watts

-1940-
I.F. 455 KC

FOR OTHER DATA SEE INDEX
Models HM-80A and HM-85A

General Electric Frequency Modulation Receivers, Models HM-80A and HM-85A are designed for the reception of ultra-short-wave broadcasting as developed by Major Edward H. Armstrong. These receivers of the superheterodyne type using eight General Electric Pre-tested Tubes are similar to Models HM-80 and HM-85 respectively. Certain circuit changes have been incorporated in the Models HM-80A and HM-85A to increase sensitivity, improve limiter action, and assure greater stability. A revised schematic diagram and additional replacement parts list are incorporated in this sheet.

For specifications, general information and alignment procedure, refer to HM-80 Service Notes. The tube complement is altered by the substitution of a 6AC7/1852 in place of the 6SK7 1st I.F. amplifier tube.

OSCILLATOR DRIFT CORRECTION NETWORK

The placement of the parts comprising this network materially affects the amount of oscillator drift correction. For maximum performance the positions of the 47-ohm, 1-watt resistor (R-28) and the 5-mmf. compensating capacitor (C-39) should be adjusted until they are parallel and separated by exactly ½ inch.
"A" supply - one, General 4-F-1 or Eveready #742 or equivalent
"B" supply - two, General V-50-AA or Eveready #736 or equivalent

REPLACEMENT PARTS LIST - MODELS HB-402 AND HB-403

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RH-5502</td>
<td>BATTERY</td>
<td>.00</td>
</tr>
<tr>
<td>TG-011</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>TG-023</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>TG-071</td>
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<tr>
<td>TG-108</td>
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<tr>
<td>TG-120</td>
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<td>TG-150</td>
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<td>.25</td>
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<td>TG-264</td>
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<td>.25</td>
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<td>TC-274</td>
<td>CAPACITOR</td>
<td>.25</td>
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<tr>
<td>TC-745</td>
<td>CAPACITOR</td>
<td>.25</td>
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<tr>
<td>RH-913</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-6508</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-919</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-107</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-160</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-403</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-418</td>
<td>CAPACITOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-164</td>
<td>RESISTOR</td>
<td>.25</td>
</tr>
<tr>
<td>RH-169</td>
<td>RESISTOR</td>
<td>.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-1215</td>
<td>RESISTOR</td>
<td>.05</td>
</tr>
<tr>
<td>RC-1551</td>
<td>RESISTOR</td>
<td>.05</td>
</tr>
<tr>
<td>RC-1399</td>
<td>RESISTOR</td>
<td>.05</td>
</tr>
<tr>
<td>RC-1350</td>
<td>RESISTOR</td>
<td>.05</td>
</tr>
<tr>
<td>RH-264</td>
<td>SOCKET</td>
<td>.25</td>
</tr>
<tr>
<td>RH-916</td>
<td>SCREW</td>
<td>.25</td>
</tr>
<tr>
<td>RH-941</td>
<td>SCREW</td>
<td>.25</td>
</tr>
<tr>
<td>RS-1015</td>
<td>SHAFT</td>
<td>.25</td>
</tr>
<tr>
<td>RS-1010</td>
<td>SPEAKER</td>
<td>.25</td>
</tr>
<tr>
<td>RH-613</td>
<td>SPEAKER</td>
<td>.25</td>
</tr>
</tbody>
</table>

ALIGNMENT FREQUENCIES - IF - 455 KC
Broadcast - 1500 KC and 540 KC

NOTE: The chassis must be removed from the carrying case when aligning. Since the location of the oscillator loop, IF and battery affect alignment considerably, the position of these components when aligning should duplicate that found in the carrying case. A non-metallic object should be used to hold the loop antenna assembly in position during alignment.
SPECIAL SERVICE INFORMATION

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*

(a) Antenna Post to R.F. Amplifier Grid at
   - 1000 KC: 4.4
   - 4000 KC: 2.6
   - 18,000 KC: 2.2

(b) R.F. Amplifier Grid to Converter Grid at
   - 1000 KC: 6.0
   - 4000 KC: 12.0
   - 18,000 KC: 8.2**

(c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
   - 1000 KC ("B" Manual): 40.0
   - 4000 KC: 35.0
   - 18,000 KC: 35.0

(d) I.F. on Converter Grid to I.F. on 1st I.F. Grid at
   - 455 KC ("B" Manual—Gang Closed): 42.0

(e) I.F. Amplifier Grid to Detector Grid at
   - 455 KC: 117.0

(2) Voltage Across Volume Control to Give ½-watt Speaker Output at
   - 400 Cycles: 0.075*

(3) DC voltage developed across oscillator grid resistor (R-3) with the gang closed.
   - "B" Band: 7.6*
   - "C" Band: 6.2*
   - "D" Band: 5.1*

* Variations of +10%, -20% are permissible.
** On "D" band, stray oscillator voltage may upset reading.
### SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Plate to Ground Volts D.C.</th>
<th>Screen Grid to Ground Volts D.C.</th>
<th>Cathode to Ground Volts D.C.</th>
<th>Cathode Current M.A.</th>
<th>Heater Volts A.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K7 R.F.</td>
<td>225</td>
<td>105</td>
<td>5.8</td>
<td>3.6</td>
<td>6.4</td>
</tr>
<tr>
<td>6L7</td>
<td>235</td>
<td>105</td>
<td>5.8</td>
<td>5.2</td>
<td>6.4</td>
</tr>
<tr>
<td>6J8C</td>
<td>190</td>
<td>105</td>
<td>0</td>
<td>10.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6K7 I.F.</td>
<td>215</td>
<td>105</td>
<td>3.6</td>
<td>9.5</td>
<td>6.4</td>
</tr>
<tr>
<td>6F5</td>
<td>* 120</td>
<td>105</td>
<td>0.9</td>
<td>0.7</td>
<td>6.4</td>
</tr>
<tr>
<td>6L6G</td>
<td>220</td>
<td>235</td>
<td>12</td>
<td>70</td>
<td>6.4</td>
</tr>
<tr>
<td>6U5</td>
<td>Target 190</td>
<td>105</td>
<td>1.5</td>
<td></td>
<td>6.4</td>
</tr>
<tr>
<td>5U4G</td>
<td>280/280</td>
<td>105</td>
<td>298</td>
<td>110</td>
<td>5.1</td>
</tr>
</tbody>
</table>


*Measured on 600-volt scale.

---

**Fig. 4.** Trimmer Location
Models HE-100, HE-100H, HE-105

**Fig. 5.** Trimmer Location
Models HE-100L, HE-100LH, HE-105L

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Fig. 8. Chassis Parts Layout  
Models HE-100, HE-100H, HE-105

Fig. 9. Chassis Parts Layout  
Models HE-100L, HE-100LH, HE-105L

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ALIGNMENT PROCEDURE


Fig. 2. Sharp Overall I.F. Curve taken on G.E. Oscilloscope OFM-1.

Fig. 3. Broad Overall I.F. Curve taken on G.E. Oscilloscope OFM-1.

I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Inductor or Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Band &quot;B&quot;</td>
<td>455 K.C. Sweep</td>
<td>I.F. Grid</td>
<td>65 mfd. or larger</td>
<td>2nd I.F. grid and trimmer</td>
<td>Gang condenser plates closed—manual key depressed—contact audio input of waveform to ground and to junction of C44, R13, and R10. Adjust two iron core inductors of each I.F. transformer simultaneously using two insulated screwdrivers. The resultant curve should be single and symmetrical as shown in Fig. 2.</td>
</tr>
<tr>
<td>2. Band &quot;B&quot;</td>
<td>455 K.C. Sweep</td>
<td>Converter Grid</td>
<td>65 mfd. or larger</td>
<td>1st I.F. grid and trimmer</td>
<td></td>
</tr>
<tr>
<td>3. Band &quot;B&quot;</td>
<td>455 K.C. Sweep</td>
<td>Converter Grid</td>
<td>65 mfd. or larger</td>
<td>1st I.F. grid and trimmer</td>
<td>Check broad I.F. curve by pressing station key. If broad curve is not single and symmetrical (see Fig. 3) readjust I.F. trimmers slightly.</td>
</tr>
</tbody>
</table>

ALIGNMENT PROCEDURE

I.F. ALIGNMENT WITH OUTPUT METER

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Band &quot;B&quot;</td>
<td>455 K.C. Sweep</td>
<td>Converter Grid</td>
<td>65 mfd. or larger</td>
<td>2nd I.F. grid and trimmer</td>
<td></td>
</tr>
</tbody>
</table>

R.F. ALIGNMENT

1. Band "B"
- Close gang condenser plates. Adjust pointer to first line at left end of tuning scale. Degree manual key.

2. Band "D"
- 25 M.C. Sweep Antenna Post I.R.E. C-12
- Osc. (C-8) R.F. (C-5) Ant. (C-2)
- Connect output meter across voice coil—peak trimmers for maximum output. The image of any "D" band signal should be tuned to 510 K.C. below the input signal. Tuning peak C-8 and C-5 while rinsing the gang condensers.

3. Band "C"
- 500 K.C. Sweep Antenna Post I.R.E. C-12
- Osc. (C-10) R.F. (C-7) Ant. (C-4)
- Peak trimmers for maximum output with the input signal. Image—510 K.C. below signal.

4. Band "D"
- 150 K.C. Sweep Antenna Post I.R.E. C-12
- Osc. (C-10) R.F. (C-7) Ant. (C-4)
- Peak trimmers for maximum output with the input signal.

5. Band "C"
- 1500 K.C. Sweep Antenna Post I.R.E. C-12
- Osc. (C-11) C-12
- Adjust pad for maximum output in the vicinity of 500 K.C. while rocking the gang condenser.

6. Band "B"
- Repeat Operation 4

MODELS GE-85 and GE-86 Dial Drive Mechanism

SPECIAL SERVICE INFORMATION

MODELS JE-101, JE-107

The following information will be found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gain
   - (a) Alignment Post to R.F. Amplifier Grid at 1000 KC... 5.7
   - (b) R.F. Amplifier Grid to Converter Grid at 1000 KC... 10.0
   - (c) R.F. Amplifier Grid to 1st I.F. Grid at 1000 KC... 18.0
   - (d) R.F. 1st I.F. Grid to 2nd I.F. Grid at 1000 KC... 30.0
   - (e) 2nd I.F. Grid to Detector Grid at 1000 KC... 34.0

2. Voltage Across Various Controls to Give 1-watt Speaker Output at 400 Cycles 0.05

3. D.C. voltage developed across oscillator grid resistor (R8) with the gang closed.
   - "B" Band... 6.5
   - "C" Band... 5.4
   - "D" Band... 4.8

4. Variations of ±10% ±30% are permissible
   - (e) On "D" band, stray oscillator voltage may upset reading.

MODELS JE-101, JE-107

VOLTAGE CHART

<table>
<thead>
<tr>
<th>Tubes</th>
<th>Plates to Grid Volts</th>
<th>Screens to Grid Volts</th>
<th>Cathode to Grid Volts</th>
<th>Filament Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>8SK7 (R.F.)</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6K4</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>8SK7 (I.F.)</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6SG5 (Det.)</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6SG5 (Inverter)</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6SVG</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6UG</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
<tr>
<td>6US</td>
<td>225</td>
<td>95</td>
<td>4.7</td>
<td>8.3</td>
</tr>
</tbody>
</table>

* Voltages measured at rated tap voltage (110 volts on 110 tap, etc.). Receiver tuned to low end of "B" band.
Note: The oscillator coil and band-switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch is replaced. I.F. transformer connections are shown as an aid in replacement.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110–125</td>
<td>50–60</td>
<td>115</td>
</tr>
<tr>
<td>C</td>
<td>110–125</td>
<td>25–60</td>
<td>120</td>
</tr>
</tbody>
</table>

**Tubes**

- **R.F. AMPLIFIER**..... GE-6SK7
- **CONVERTER AND OSCILLATOR**..... GE-6SA7
- **I.F. AMPLIFIER**..... GE-6SK7
- **DETECTOR AND AVC**..... GE-6J5GT
- **1st AUDIO DRIVER**..... GE-6J5GT
- **2nd AUDIO DRIVER**..... GE-6J5GT
- **PHASE INVERTER**..... GE-6J5GT
- **POWER OUTPUT**..... (2) GE-6V6G
- **RECTIFIER**..... GE-5Y3G
- **DIAL LAMP**..... (2) Mazda No. 44

**Fig. 6.** Pointer-Guide Clip Setting with Gang Condenser Closed (See "R.F. Alignment with Chassis Outside of Cabinet")

**Fig. 7.** Dial Cord Stringing Diagram

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**Tuning Frequency Range**

<table>
<thead>
<tr>
<th>Broadcast Band</th>
<th>540-1700 KC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-wave Band No. 1</td>
<td>2400-7000 KC</td>
</tr>
<tr>
<td>Short-wave Band No. 2</td>
<td>7000-22,000 KC</td>
</tr>
</tbody>
</table>

**Electrical Power Output**

- Undistorted: 10 Watts
- Maximum: 12 Watts

**Tone Control**—“Alnic” Magnet Dynamic

| Speaker Diameters | .14 inches and 6½ inches |
| Voice Coil Impedances | .35 ohms .06 ohms |

**GENERAL INFORMATION**

Model J-105 is a ten tube superheterodyne receiver designed to operate from an alternating current power supply. The receiver incorporates the latest developments in radio among which are the General Electric Dual Beam-a-Scope and broadcast and short-wave No. 1 signals are selected by the cylindrical Beam-a-Scope. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet above the chassis. Additional features include single-ended tubes, iron-core oscillator station select coils, six Peachertouch tuning station keys, one Phono-Frequency Modulation Television set, an “Off” key, a “Manual key” dual Dynaphone speakers, tone monitor circuit and automatic volume control.

**Phono-FM-Tel**

This receiver is equipped with a pin jack on the rear apron of the chassis and a Phono-FM-Tel key for adapting it to use with record players, frequency modulation converters and television picture receivers with sound converters. General Electric plug, Stock No. RP-145, fits the pin jack.

**SETTING UP THE RECEIVER**

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way in their respective slots so that the dialectric plate should be held in place by pressure from the rear.
2. After releasing the shipping screws the position of the chassis should be checked to insure accurate tuning. Close the gang condenser plates and push the chassis one way or the other until the pointer lines up with the first markings on the left side of the dial.
3. The black speaker leads should be connected to the speaker terminals which are grounded to the speaker frame.
4. A method of setting up station keys which will assure driftproof adjustments is to screw the iron core all the way out and then turn slowly inward until the desired station is tuned in.

**CHASSIS OR BEAM-A-SCOPE REMOVAL**

Before either the chassis or Beam-a-Scope can be removed the leads behind them must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by pulling the pin plugs out of the Beam-a-Scope terminals. The short-wave Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals to the two phosphor-bronze straps and the screw which clamps the terminal of the yellow lead.

Figs. 8 and 9 show the correct location of the Beam-a-Scope leads when reconnecting. The cylindrical Beam-a-Scope leads must be threaded down through the slot in the cabinet shelf which is immediately below the antenna-ground terminal board. The leads can then be brought out to the position of the cutout in the back of the cabinet shelf where they can be connected to the Beam-a-Scope terminals.

To remove the cylindrical Beam-a-Scope the following procedure is recommended: Disconnect the four Beam-a-Scope leads. Unscrew the self-tapping screws which prevent the Beam-a-Scope from rotating continuously in one direction. This screw is located in the cabinet shelf. Pry loose the cardboard strap which is stapled to the bottom of the cabinet and which holds the bottom of the Beam-a-Scope in place. The Beam-a-Scope can now be rotated from right to left until it comes loose. Note: The upper pivot bolt by which the Beam-a-Scope is supported should never be loosened or removed.

When replacing the cylindrical Beam-a-Scope it should be screwed on approximately five turns from the position where the bolt takes hold. The self-tapping screw in the cabinet shelf should then be screwed down until it acts as a stop for the projection next to the terminals. The screw should not be run down so far that it contacts the projection on the opposite side from the terminals as this will limit rotation to only 180 degrees. The cardboard strap should be placed over the bottom Beam-a-Scope pivot and stapled to the cabinet in such a position that the Beam-a-Scope hangs vertically and is free to turn without rubbing on the strap.

**Load-speaker**

The voice coil is accurately and permanently centered at the factory and should seldom go out of tune. In case a voice coil needs recentering, it will be necessary to replace the entire cone and voice coil assembly.

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(a) Antenna Post to R.F. Grid at
   - 1000 KC: 6.5 V
   - 4000 KC: 3.0 V
   - 18,000 KC: 2.0 V

(b) R.F. Grid to Converter Grid at
   - 1000 KC: 5.0 V
   - 4000 KC: 3.0 V
   - 18,000 KC: 2.0 V

(c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
   - 1000 KC: 50 V
   - 4000 KC: 50 V
   - 18,000 KC: 40 V

(d) Converter Grid to 1st I.F. Grid at
   - 455 KC: 55 V

(e) I.F. Amplifier Grid to Detector Grid at
   - 455 KC: 75 V

Voltage across Volume Control to Give 1/4-watt Speaker Output at
   - 120 cycles: .04 volts

**Alignment Procedure**

The alignment procedure is given in table form. The use of a standard I.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the beam-a-scopes with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scopes mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are accessible through holes in the back apron of the chassis or from the top of the chassis (refer to the Trimmer Location diagram, Fig. 1). Metal objects such as meters, tools, etc. should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

**R.F. ALIGNMENT**

**WITH CHASSIS OUTSIDE OF CABINET**

R.F. alignment can be performed only on the "BC" and "SW-1" bands with the chassis outside the cabinet. Any alignment attempted on the "SW-2" band will not be satisfactory. The same relative position between the chassis and cylindrical Beam-a-Scope should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the back of the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of a 0-180° calibrated scale which is cemented to the back of the dial reflector plate. From the reference chart the degree readings for corresponding frequency settings may be ob-

---

*Variations of +20% permissible. All readings obtained with enough input signal to give 1/4-watt speaker output.*

---

**Fig. 1. Trimmer Location**

---

*Continued*
GENERAL ELECTRIC CO.

(CONTINUES)

Attachment by laying a straight edge across the chart perpendicular to the line of figures and sliding the straight edge along to the various frequency settings desired. The degree readings will be found on either of the degree scales above or below the dial scale. To use these degree readings, first completely close the gang condenser plates and then slide the pointer along the cord until the inside edge of the right-hand pointer-guide clip is in line with the 0° mark. (See Fig. 6.) By using this edge of the clip as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until this edge of the clip is in line with 15°, the receiver will be tuned to 1500 KC on the "BC" band. The "BC" and "SW-1" band alignment procedure is the same as outlined in steps 2 to 5 inclusive of the chart "R.F. Alignment with Chassis Mounted in Cabinet."

After the alignment has been performed on the "BC" and "SW-1" bands the chassis should be mounted in the cabinet and "SW-2" band alignment checked as described in steps 6 to 8 of the chart "R.F. Alignment with Chassis Mounted in Cabinet."

Note: After moving the pointer along the cord to use one of the guide clips as a reference pointer for the degree scale, it will be necessary after re-assembly in the cabinet for the gang condenser plates to be closed and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

ALIGNMENT CHART

I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>I.F. Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any station key other than Phono-FM-Tel key. Connect audio input of oscilloscope to chassis ground and junction of R-32 and R-33. Adjust trimmers in order mentioned for a single symmetrical curve of maximum amplitude. Finish by retrimming 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>1st I.F. trimmers, C-7, C-8</td>
<td></td>
</tr>
</tbody>
</table>

I.F. Alignment with Output Meter

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>455 KC Modulation</td>
<td>Converter Grid</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. trimmers, C-9, C-10</td>
<td>Gang condenser plates closed. Depress any key other than Phono-FM-Tel key. Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
</tbody>
</table>

R.F. Alignment With Chassis Mounted in Cabinet

1. "BC" Band

<table>
<thead>
<tr>
<th>Band Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. &quot;BC&quot; Band</td>
<td>580 KC Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. Padder (C-25)</td>
<td>Set dial pointer to 1500 KC and peak trimmer for maximum output while rocking the gang condenser.</td>
</tr>
<tr>
<td>5. &quot;SW-1&quot; Band</td>
<td>6 MC Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-19)</td>
<td>Realign for maximum output with a low input signal rocking the gang condenser.</td>
</tr>
<tr>
<td>7. &quot;SW-2&quot; Band</td>
<td>8 MC Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td></td>
<td>Set pointer to 21 MC and tune in signal with (C-19). Peak output with (C-2) while rocking gang condenser. When (C-19) is on proper peak, image of 21 MC signal should be heard 910 KC below or on 20.09 MC. This operation may or may not be necessary depending on how much the short-wave Beam-a-Scope leads have been moved from their correctly dressed positions. Repositioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-Scope strap leads closer or farther apart. The moving should be done with an insulated rod or stick.</td>
</tr>
</tbody>
</table>

8. Repeat Operation 6 if the short-wave Beam-a-Scope leads are moved appreciably in Operation 7.

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Physical Specifications

- **Model**: HB-408
- **Height**: 9 1/2 inches
- **Width**: 14 3/4 inches
- **Depth**: 18 1/2 inches
- **Weight**: 19 1/2 lbs.

Tuning Control Drive Ratio

- **Ratio**: 5.5 : 1

Battery Specifications

- **"A" Battery**
  - General 8-F-1 or Eveready No. 741
- **"B" Battery**
  - General V-30-B or Eveready No. 762

Battery Life

Using the above recommended batteries a battery life from 200 to 250 hours can be expected providing the daily operation does not exceed four hours. If the daily operation exceeds four hours the battery life will be reduced due to the fact that the batteries do not have sufficient time to revitalize themselves.

Tuning Frequency Range

- **Range**: 550-1600 K.C.

Intermediate Frequency

- **Frequency**: 455 K.C.

Loud-speaker—Permanent Magnet

- **Outside Cone Diameter**: 4 inches
- **Voice Coil Impedance (400 cycles)**: 3.5 ohms

Tubes

- **Converter and Oscillator**: 1A7G
- **I.F. Amplifier**: 1N5G
- **Detector-Amplifier**: 1H5G
- **Output**: 1Q5O

SERVICE INFORMATION

On later production models the 360-ohm output baring resistor (R-8) was changed to 430 ohms. This change reduced battery drain while not appreciably affecting power output.

ALIGNMENT PROCEDURE

**Alignment Frequencies**

- **I.F.-455 K.C. Broadcast—1500 K.C. and 580 K.C.
**

Alignment

- **I.F.-455 K.C.**

   In order to align this receiver for I.F. the four wood screws holding the motorboard to the cabinet will have to be removed. Raise the front edge of the motorboard being careful not to let the cabinet cover swing back and place a strain on the hinges. The phono-switch cable will limit the amount which the front edge of the motorboard can be opened. Prop the motorboard in the opened position and proceed with I.F. alignment. (Note—Do not let the phono-switch cable come near the 1N5G grid leads. Standard dressing is to force the cable down in the space between the 1H5G tube and the 2nd I.F. transformer.)

   - Set an output meter across the voice coil. Set the volume control for maximum. With the test oscillator set to 455 K.C. apply signal to the control grid of the 1A7G converter tube through a .05-mfd. capacitor. Do not remove the grid leads from the tubes. Keep the test oscillator output as low as possible to give a readable output. Adjust all four I.F. trimmers for maximum output.

**R.F. Alignment**

Return the motorboard to its normal cabinet position. (Note—Before R.F. alignment be sure that all parts are in their normal positions in the cabinet.) It is not necessary to screw the motorboard to the cabinet as it may be convenient to raise the motorboard slightly from time to time to locate the heads of the trimmer screws. It must be remembered however, that R.F. trimmer adjustments should only be made when the motorboard is down in position.

Access to the R.F. trimmers is made possible by removing the three snap fasteners on the right side of the cabinet. The upper left-hand trimmer is the 1500-K.C. oscillator trimmer. The upper right-hand trimmer is the 1500-K.C. antenna trimmer. The lower trimmer is the 580-K.C. paddler.

   - The test signal may be applied by connecting across the test oscillator terminals a loop of ten turns of wire approximately one foot in diameter. Place the loop parallel to the plane of the back panel of the cabinet and not closer than one foot. With 1500 K.C. input adjust the oscillator and antenna trimmers for maximum output. Change input signal to 580 K.C. and peak the 580-K.C. (C-10) paddler by rocking the gang condenser.

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GENERAL INFORMATION


These receivers incorporate the following features: Single-ended tubes, automatic volume control, plate antenna, dynapower speaker, beam power output and a dial lamp.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the converter grid through a 0.05 mfd capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

Apply the R.F. alignment signals through a standard I.R.E. dummy antenna to the receiver antenna post. With the gang condenser wide open, align the oscillator trimmer (C-7) to 1750 KC. Change the generator signal to 1500 KC, tune the receiver to the signal and peak antenna trimmer (C-5) for maximum output.

Precaution

If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating transformer is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Fig. 1. Trimmer Location

Over-all Dimensions

Height ... 6 inches
Width ... 9 1/4 inches
Depth ... 5 1/2 inches

Tuning Control Drive Ratio

6:1

Electrical Specifications

<table>
<thead>
<tr>
<th>Models</th>
<th>Voltage Rating (AC or DC)</th>
<th>Frequency (Cycles per Second)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-501, 501W</td>
<td>105-125</td>
<td>40-60</td>
<td>30</td>
</tr>
<tr>
<td>J-502, 502W</td>
<td>105-117</td>
<td>40-60</td>
<td>30</td>
</tr>
</tbody>
</table>

Tuning Frequency Range

550-1750 KC

Intermediate Frequency

155 KC

Maximum Power Output

1.5 Watts

Load-speaker—"Alnico" Magnet Dynamic

Outside cone diameter ... 4 inches
Voice coil impedance (400 cycles) ... 3.1 ohms
NOTE:
1. For 50-60 cycle receivers connect X to Y and short out R-11. For 25 cycle receivers connect X to Z and insert R-11 as shown in schematic.
2. Models J-501 and J-501W have B minus grounded to chassis, no wiring being required. Models J-502 and J-502W have a separately wired B minus system which is not grounded to chassis.
3. These Models were built using either a 12B7 or 12SK7 I.F. amplifier tube. The tubes are not interchangeable because of the different type socket requirements.

### POWER CONSUMPTON—30 WATTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>.05 mfd. paper capacitor (Used only in J-502 and J-502W)</td>
<td>C-1</td>
</tr>
<tr>
<td>.02 mfd. paper capacitor (Used only in J-502 and J-502W)</td>
<td>C-2</td>
</tr>
<tr>
<td>.01 mfd. paper capacitor</td>
<td>C-3</td>
</tr>
<tr>
<td>3 to 7 mfd. (part of L-3)</td>
<td>C-4</td>
</tr>
<tr>
<td>Antenna trimmer on gang</td>
<td>C-5</td>
</tr>
<tr>
<td>Antenna section of tuning condenser</td>
<td>C-6a</td>
</tr>
<tr>
<td>Oscillator section of tuning condenser</td>
<td>C-6b</td>
</tr>
<tr>
<td>Oscillator trimmer on gang</td>
<td>C-7</td>
</tr>
<tr>
<td>Antenna trimmer on gang</td>
<td>C-8</td>
</tr>
<tr>
<td>.05 mfd. paper capacitor</td>
<td>C-9</td>
</tr>
<tr>
<td>330 mfd. mica capacitor</td>
<td>C-10</td>
</tr>
<tr>
<td>330 mfd. mica capacitor</td>
<td>C-11</td>
</tr>
<tr>
<td>63 mfd. mica capacitor</td>
<td>C-12</td>
</tr>
<tr>
<td>22,000 ohms carbon resistor</td>
<td>R-1</td>
</tr>
<tr>
<td>2.5 megohms carbon resistor</td>
<td>R-2</td>
</tr>
<tr>
<td>3.0 megohms volume control</td>
<td>R-3</td>
</tr>
<tr>
<td>4.7 megohms carbon resistor</td>
<td>R-4</td>
</tr>
<tr>
<td>5.1 megohms carbon resistor</td>
<td>R-5</td>
</tr>
<tr>
<td>270,000 ohms carbon resistor</td>
<td>R-6</td>
</tr>
<tr>
<td>670,000 ohms carbon resistor</td>
<td>R-7</td>
</tr>
<tr>
<td>150 ohms carbon resistor</td>
<td>R-8</td>
</tr>
<tr>
<td>2700 ohms</td>
<td>R-9</td>
</tr>
<tr>
<td>10,000 ohms carbon resistor</td>
<td>R-10</td>
</tr>
<tr>
<td>13 ohms carbon resistor (Used on 25 cycle sets only)</td>
<td>R-11</td>
</tr>
<tr>
<td>Output transformer</td>
<td>T-1</td>
</tr>
</tbody>
</table>

### GENERAL ELECTRIC CO.

#### I.F. ALIGNMENT CONVENTIONAL

SEE SPECIAL SECTION VOL. VIII

### Alignment Frequencies

<table>
<thead>
<tr>
<th>I.F.</th>
<th>R.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>455 KC</td>
<td>1500 KC</td>
</tr>
</tbody>
</table>

### R.F. Alignment

Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver antenna post through a standard I.R.E. dummy antenna. Align the oscillation trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. I for trimmer locations.)

---

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NOTE: 1. For 60-60 cycle receivers connect X to Y and short out R-11. For 220 cycle receivers connect X to Z and insert R-11 as shown in schematic.

2. Models L500 and L530 have B minus grounded to chassis omitting R1 and C2; also a jumper is used in place of C1. Models L510 and L560 have a separately wired B minus system which is not grounded to chassis explicitly through R1 and C2.

Intermediate Frequency: 455 KC
Maximum Power Output: 1.5 watts
Load-speaker—PM Dynamic: Outside Cone Diameter, 4 inches
Voice Coil Impedance (400 Cycles): 3.5 ohms

I.F. Alignment
Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.
Apply signal to the converter grid through a 0.05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment
Close the gang condenser by rotating the tuning control. Slide the pointer along the cord until it lines up with the first dial marking on the left. Now rotate the tuning control until the pointer is over the 1500 KC dial mark. Apply a 1500 KC signal to the receiver antenna post through a standard I.F.E. dummy antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5). (See Fig. 1 for trimmer locations.)

Precaution
If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended as AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned-out signal generator attenuator.

Special Service Information
The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains
Antenna Post to Converter Grid: 4.0 at 1000 KC
I.F. on Converter Grid to I.F. on I.F. Amplifier Grid: 50 at 455 KC
I.F. Amplifier Grid to Diode Plate (W): 45 at 455 KC

2. 0.20-volt, 400-cycle signal across the volume control will give ½-watt speaker output.* (Volume control turned to maximum.)

3. Average DC voltage developed across oscillator grid leak: 6 volts

* Variations of ±20% permissible. All readings obtained with enough signal input to give ½-watt speaker output.
Fig. 9. Schematic Diagram and Trimmer Location—Model HE-640L

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>Tuning Condenser</td>
<td>C-38</td>
<td>.05 Mfd. 600 V. Paper Capacitor</td>
</tr>
<tr>
<td>C-2</td>
<td>2-18 Mfd. 'B' Ant. Trimmer</td>
<td>C-39</td>
<td>Antenna Transformer</td>
</tr>
<tr>
<td>C-3</td>
<td>2-18 Mfd. 'B' Osc. Trimmer</td>
<td>C-40</td>
<td>Oscillator Transformer</td>
</tr>
<tr>
<td>C-4</td>
<td>2-20 Mfd. 'D' Ant. Trimmer</td>
<td>C-41</td>
<td>1st I.F. Transformer</td>
</tr>
<tr>
<td>C-5</td>
<td>2-20 Mfd. 'D' Osc. Trimmer</td>
<td>C-42</td>
<td>2nd I.F. Transformer</td>
</tr>
<tr>
<td>C-6</td>
<td>3-30 Mfd. 'A' Osc. Trimmer</td>
<td>C-43</td>
<td>Pilot Light Mazda No. 44</td>
</tr>
<tr>
<td>C-7</td>
<td>300-675 Mfd. 'B' Osc. Padder</td>
<td>C-44</td>
<td>Pilot Lights Mazda No. 44</td>
</tr>
<tr>
<td>C-8</td>
<td>2-20 Mfd. 'A' Ant. Trimmer</td>
<td>C-45</td>
<td>1.0 Meg. 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-9</td>
<td>75-150 Mfd. 'A' Osc. Padder</td>
<td>C-46</td>
<td>30 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-10</td>
<td>4300 Mfd. Mica = 0.5%</td>
<td>C-47</td>
<td>22,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-11</td>
<td>470 Mfd. Mica Capacitor</td>
<td>C-48</td>
<td>180,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-12</td>
<td>100 Mfd. Mica Capacitor</td>
<td>C-49</td>
<td>2.2 Meg. 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-13</td>
<td>250 Mfd. Mica Capacitor</td>
<td>C-50</td>
<td>330,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-14</td>
<td>470 Mfd. Mica Capacitor</td>
<td>C-51</td>
<td>4.7 Meg. 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-15</td>
<td>.03 Mfd. 600 V. Paper Capacitor</td>
<td>C-52</td>
<td>47,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-16</td>
<td>.05 Mfd. 200 V. Paper Capacitor</td>
<td>C-53</td>
<td>130,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-17</td>
<td>.05 Mfd. 600 V. Paper Capacitor</td>
<td>C-54</td>
<td>470,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-18</td>
<td>.05 Mfd. 600 V. Paper Capacitor</td>
<td>C-55</td>
<td>1000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-19</td>
<td>.002 Mfd. 600 V. Paper Capacitor</td>
<td>C-56</td>
<td>5.0 Meg. 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-20</td>
<td>.005 Mfd. 600 V. Paper Capacitor</td>
<td>C-57</td>
<td>1500 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-21</td>
<td>.005 Mfd. 600 V. Paper Capacitor</td>
<td>C-58</td>
<td>270 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-22</td>
<td>.005 Mfd. 600 V. Paper Capacitor</td>
<td>C-59</td>
<td>330 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-23</td>
<td>.005 Mfd. 600 V. Paper Capacitor</td>
<td>C-60</td>
<td>1000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-24</td>
<td>.005 Mfd. 600 V. Paper Capacitor</td>
<td>C-61</td>
<td>3300 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-25</td>
<td>.008 Mfd. 1000 V. Paper Capacitor</td>
<td>C-62</td>
<td>270 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-26</td>
<td>.01 Mfd. 250 V. Dry Electrolytic</td>
<td>C-63</td>
<td>2.0 Meg. Vol. Control 1 Megohm Tap</td>
</tr>
<tr>
<td>C-27</td>
<td>.01 Mfd. 600 V. Paper Capacitor</td>
<td>C-64</td>
<td>220 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-28</td>
<td>20 Mfd. 25 V. Dry Electrolytic</td>
<td>C-65</td>
<td>420 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-29</td>
<td>50 Mfd. 250 V. Dry Electrolytic</td>
<td>C-66</td>
<td>110 Ohms 20-W. Ballast (K139001)</td>
</tr>
<tr>
<td>C-30</td>
<td>40 Mfd. 300 V. Dry Electrolytic</td>
<td>C-67</td>
<td>160 Ohms 20-W. Ballast (K139001)</td>
</tr>
<tr>
<td>C-31</td>
<td>25 Mfd. 400 V. Dry Electrolytic</td>
<td>C-68</td>
<td>370 Ohms 50-W. Ballast (K139000)</td>
</tr>
<tr>
<td>C-32</td>
<td>0.01 Mfd. 600 V. Paper Capacitor</td>
<td>C-69</td>
<td>680,000 Ohms 1/4-W. Carbon Resistor</td>
</tr>
<tr>
<td>C-33</td>
<td>0.01 Mfd. 600 V. Paper Capacitor</td>
<td>C-70</td>
<td>680,000 Ohms 1/4-W. Carbon Resistor</td>
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<tr>
<td>C-34</td>
<td>6U5 Rectifier</td>
<td>C-71</td>
<td>63A7 Converter</td>
</tr>
</tbody>
</table>
Fig. 2. Schematic Diagram
Model JB-513

Fig. 3. Schematic Diagram
Model JB-514
**GENERAL ELECTRIC CO.**

**MODELS JB-523 JB-524**

**MODELS JB-630 JB-631**

---

**VOLTAGE CHART**

**I.F. ALIGNMENT CONVENTIONAL**

SEE SPECIAL SECTION VOL. VIII

**R.F. Alignment**

Connect high side of signal generator to one of Beam-a-Scope primary leads and ground side to other primary lead. Turn tuning condenser completely out of mesh (open). Set generator to 1700 KC. Adjust oscillator trimmer (cut section of tuning condenser) until generator signal is heard through speaker. Then reset generator to 1500 KC and tune receiver to signal. Peak antenna trimmer on tuning condenser for maximum output.

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**FOR OTHER DATA SEE INDEX**

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G.E. PAGE 12-65

GENERAL ELECTRIC CO.
MODELS JE-530, JE-531, JE-531X

**ALIGNMENT PROCEDURE**

**Alignment Frequencies**

- I.F. align
- Broadcast R.F. 15000 and 6000 Kc.
- Short Wave JE530
- JE531X 17,000 Kc.
- 15,000 Kc.

**I.F. Alignment**

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 Kc. and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SK7 through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure applying the 455 Kc. signal to the control grid of the 12SA7 and aligning the 1st I.F. transformer. Do not remove the grid leads from the tubes. Finish alignment by over-all adjustments.

**R.F. Alignment**

Refer Sketch "Trimmer Location." Apply R.F. signals through a standard IRE dummy to the antenna terminal.

"C" Band (Model JE530—5500-18,500 Kc.)

Rotate band switch to clockwise position and set dial pointer and signal generator to 15 megacycles. Align by turning the S.W. oscillator trimmer located on the front section of variable condenser for maximum signal while rocking the gang condenser. The image of 17 Mc. should be heard at 16.09 Mc.

"C" Band (Models JE531, JE531X—4600-16,000 Kc.)

Same procedure as above, but align S.W. detector trimmer located on the front section of variable condenser for maximum signal while rocking the gang condenser. Set screw for maximum signal. Set receiver dial and signal generator to 6000 Kc. and adjust the broadcast padder for maximum signal while rocking the gang condenser. Retrim at 1500 Kc.
One side of the power line is connected directly to the chassis, therefore, caution should be exercised when servicing.

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Frequency (Cycles on A-C)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 AC</td>
<td>50-60</td>
<td>1.0 watt</td>
</tr>
<tr>
<td>105-125 DC</td>
<td></td>
<td>1.7 watts</td>
</tr>
</tbody>
</table>

**Electrical Power Output**
- Undistorted: 1.0 watt
- Maximum: 1.7 watts

**Load-speaker— Permanent Magnet Type**
- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3.8 ohms
- D.C. Coil Resistance: 3.4 ohms

**ALIGNMENT PROCEDURE**

The location of alignment trimmers is shown in Figs. 1 and 2.

**I.F. Alignment**

Connect an output meter across the voice coil. Turn the volume control to maximum. Set signal generator to 455 K.C. and keep the generator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SA7GT through a .05 capacitor. Adjust I.F. trimmers (C-14, 15 and 16) for a maximum meter reading.

**R.F. Alignment**

Set the signal generator to 1730 K.C. and connect the output to the blue antenna lead through a 100 mmf. mica capacitor. Rotate the gang condenser to wide open and align the oscillator trimmer. Readjust signal generator output to 1400 K.C. and after tuning in signal by rotating the gang condenser, peak the antenna trimmer. The alignment is now complete unless the gang condenser plates have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 K.C. and bend the plates into position of maximum output.

**SERVICE INFORMATION**

**Oscillator Coil**

Looking at connection end in clockwise direction starting at chassis the terminals are No. 1, end of winding: No. 2, start of winding: No. 3, tap.

- No. 1 to No. 2: 4.8 ohms
- No. 1 to No. 3: 4.2 ohms

**First I.F. Transformer**

- Primary—Blue, plate: red. B +: 32.1 ohms
- Secondary—White, grid: black, A.V.C.: 34.2 ohms

**MODELS**

- HP-556
- HP-560

**SOCKET VOLTAGES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plate To Gnd (Volts)</th>
<th>Screen To Gnd (Volts)</th>
<th>Cathode To Gnd (Volts)</th>
<th>Filament Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
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<tr>
<td>12K7GT</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
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<tr>
<td>12SG7T</td>
<td>80</td>
<td>82</td>
<td>0</td>
<td>11</td>
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<td>34L6GT</td>
<td>97</td>
<td>82</td>
<td>5.5</td>
<td>48</td>
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<tr>
<td>35Z5GT</td>
<td>115 AC</td>
<td>112</td>
<td>102</td>
<td>34</td>
</tr>
</tbody>
</table>

Line—115 Volts AC. Volume Control Maximum.

Antenna shorted to ground.

*Measured on 250 volt scale of 1000 ohms per volt voltmeter.

**Electrolytic Condenser**

Red, 30 mfd., 150 volts; green, 20 mfd., 150 volts; black, common terminal.

**Fig. 1. Trimmer Location**

Models HP-558 and HP-561

- 12SA7GT
- 35Z5GT
- 34L6GT
- 12SG7T
- 12K7GT
- 12SA7
- 35Z5GT
- 34L6GT

**Fig. 2. Trimmer Location**

Models HP-559 and HP-560

- 12SA7
- 35Z5GT
- 34L6GT
- 12SG7T
- 12K7GT
- 12SA7
- 35Z5GT
- 34L6GT
NOTE: ON 40-60 cycle receivers, omit R12 and connect A-B and X-Z. ON 25 cycle receivers, add R12 and connect X-Y. WHEN No. 51 dial lamp is used.

Intermediate Frequency 455 KC

Electrical Power Output (117 line volts)

Undistorted 1.0 watts
Maximum 1.5 watts

Loadspeaker — PM Dynamic

IF Alignment

Outside Cone Diameter 5 inches
Voice Coil Impedance (400 cycles) 3.5 ohms

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12SA7 converter grid through a .05 mfd. capacitor and align progressively the trimmers in the 2nd and 1st IF transformers.

RF Alignment

When making the following alignment, the loop antenna must be bolted to the chassis by the screw and spacer mounting. The RF signal should be capacity coupled to the receiver loop by placing a two-foot piece of wire for an antenna on the test oscillator output post (high side). Keep this antenna two feet or more from the receiver loop. Set the signal generator to 1500 KC. As (C-1b) to the signal while the pointer is on the 1500 KC, peak (C-1b) for maximum output.

Special Service Information

The following information will be very useful to service men equipped with vacuum tube voltmeters or similar voltage measuring instruments.

1) Stage Gains

Antenna post to RF grid — 3.8 at 1000 KC
RF grid to converter grid — 4.0 at 1000 KC
Converter grid to IF grid — 6 at 455 KC
IF grid to 12SA7 plate — 75 at 455 KC

2) Audio Gain

.14 volts, 400 cycles signal across volume control with control set at maximum, will give approximately 1/4 watt speaker output.

3) DC voltage developed across oscillator grid resistor (R4) averages 10.0 volts at 1000 KC.

Variations of ±20% permissible. All readings obtained with enough signal input to give 1/4 watt speaker output.

Models J602 and J603 are six-tube AC-DC superheterodyne receivers with Underwriters' Approval listing. The Model J602 is housed in a mahogany plastic cabinet, while the Model J603 has an ivory plastic cabinet.

Both the MAZDA No. 47 and No. 51 dial lamps were used during production. When lamp No. 51 is used, the resistor R16 should be omitted.

Either the metal or glass type 12B7 tube may be used in the RF or IF stage. However, when the glass tube is used in the IF stage, a tube shield must be used to prevent oscillation at the low frequency end of the broadcast band.
The alignment procedure is given in table form. All IF alignments may be made with the chassis removed from the cabinet. However, the RF alignments are made with the chassis and loop antennas securely bolted in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects it. The RF signal should be capacity coupled by placing a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more from the receiver loop will generally insure freedom from too much coupling. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet.

### ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect</th>
<th>Test-Osc. Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers for Max Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12B7 IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C6 &amp; C7 *</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 Conv. grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C4 &amp; C5 **</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Coupled</td>
<td>500 KC</td>
<td>&quot;BC&quot; Band 500 KC</td>
<td>C2 **</td>
</tr>
<tr>
<td>4</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C2 (Osc.)</td>
</tr>
<tr>
<td>5</td>
<td><strong>REPEAT STEP 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C2* (Osc.)</td>
</tr>
<tr>
<td>7</td>
<td>Capacity Coupled</td>
<td>18 MC</td>
<td>&quot;SW&quot; Band 18 MC</td>
<td>C2* (Ant.)</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak.
** Rock gang condenser when making alignment.

**A** rating—115 Volts AC or DC, 40-60 cycles, 35 watts
**C** rating—115 Volts AC or DC, 25 cycles, 35 watts

### Special Service Information

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage gains**
   - Antenna post to RF grid—3.0 at 1000 KC
   - RF grid to converter grid—6.0 at 1000 KC
   - Converter grid to IF grid—50 at 455 KC
   - IF grid to 12SQ7 diode plate—75 at 455 KC

2. **Audio gains**
   - 14 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/2-watt speaker output.

3. **DC voltage developed across oscillator grid resistor (R4) averages 9.0 volts at 1000 KC or 8.0 volts at 10,000 KC

* Variations of ±20% permissible. All readings obtained with enough signal input to give 1/2-watt speaker output.
**Model J-629**

**General Electric Co.**

**Phono-Radio-Recording Switch Position**

A—Radio

B—Phonograph

C—Radio Recording

D—Microphone Recording

---

**RADIO CHASSIS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Cone Diameter</td>
<td>Voice Coil Impedance</td>
<td>6.5 inches</td>
<td>3.5 ohms</td>
<td></td>
</tr>
</tbody>
</table>

**ALIGNMENT CONVENTIONAL**

**SEE SPECIAL SECTION VOL. VIII**

**TRIM ANT, OSC, 1500 KC; PAD 500 KC**

**POWER CONSUMPTION-75 WATTS**

**Special Service Information**

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

1. **Stage Gains**
   - Antenna Post to Converter Grid—6 at 1000 Kc.
   - Converter Grid to 6SK7GT Grid—30 at 455 Kc.
   - 6SK7GT Grid to 607GT Det. Plate—100 at 455 Kc.

2. **Audio Gains**
   - 0.924 volts, 400 cycles signal across volume control with control set to maximum will give approximately 0.60 watt speaker output.

3. **DC Voltage Developed Across Oscillator Grid Resistor (R-1) averages 12 volts.

Variations of +10%—20% permissible.

---

**RECORDING ADJUSTMENTS**

**Cutting Head Pressure**

The pressure is controlled by means of the adjustment screw located midway back on top of the recording arm.

The pressure should be adjusted so that when inspection with a magnifying glass, the uncut portion of the record between the grooves is the same width as the groove. At no time should pressure be great enough to cut through the acetate surface enough to show metal base of the record.

A clockwise rotation of the setscrew increases pressure.

**Cutting Arm Adjustment**

The adjustment at the rear and underneath the cutting arm, controls the height above the record blank at which the cutting arm rides. This should be adjusted so that when resting in the recording position on the record, the setscrew of the cutting head rides halfway down in the needle screw gap.

**Lead Screw Follower Arm Pressure Adjustment**

The pressure is varied by the phosphor bronze spring adjustment underneath the phono assembly on the follower arm. The pressure should be great enough so that when the recording head is in the recording position, this phosphor bronze spring should rest at the bottom of the lead screw groove. Too great pressure will cause binding, while too little pressure is liable to cause overlapping of the grooves.

---

Fig. 1. Trimmer Location

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FOR ALIGNMENT, VOLTAGES, PARTS, SEE INDEX
PARTS DESCRIPTION LIST

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.01 mfd. paper capacitor</td>
<td>C16a, 16b</td>
<td>50 mfd., 30 mfd. electrolytic</td>
<td>R9</td>
<td>470,000 ohm carbon resistor</td>
</tr>
<tr>
<td>C2</td>
<td>.05 mfd. paper capacitor</td>
<td>C17</td>
<td>.05 mfd. paper capacitor</td>
<td>R10</td>
<td>150 ohm carbon resistor</td>
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<tr>
<td>C3a, 3b</td>
<td>Tuning condenser</td>
<td>C18</td>
<td>.20 mfd. paper capacitor</td>
<td>R11</td>
<td>1000 ohm carbon resistor</td>
</tr>
<tr>
<td>C4</td>
<td>.01 mfd. paper capacitor</td>
<td>C12, 13</td>
<td>.005 mfd. paper capacitor</td>
<td>R12</td>
<td>Ballast resistor tube</td>
</tr>
<tr>
<td>C5, C6</td>
<td>.005 mfd. mica capacitor</td>
<td>C19</td>
<td>.05 mfd. paper capacitor</td>
<td>R13</td>
<td>470,000 ohm carbon resistor</td>
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<tr>
<td>C7</td>
<td>.02 mfd. paper capacitor</td>
<td>C20</td>
<td>.05 mfd. paper capacitor</td>
<td>R14</td>
<td>0.5 megohm volume control</td>
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<tr>
<td>C8</td>
<td>.025 mfd. paper capacitor</td>
<td>C21</td>
<td>1000 ohm carbon resistor</td>
<td>R15</td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>C9</td>
<td>.01 mfd. paper capacitor</td>
<td>C22</td>
<td>10,000 ohm carbon resistor</td>
<td>T1</td>
<td>1st I.F. transformer</td>
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<tr>
<td>C10</td>
<td>.005 mfd. paper capacitor</td>
<td>C23</td>
<td>3300 ohm carbon resistor</td>
<td>T2</td>
<td>2nd I.F. transformer</td>
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<tr>
<td>C11</td>
<td>.005 mfd. paper capacitor</td>
<td>R16</td>
<td>39,000 ohm carbon resistor</td>
<td>T3</td>
<td>Output transformer</td>
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<tr>
<td>C12</td>
<td>.005 mfd. paper capacitor</td>
<td>R17</td>
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<td></td>
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<tr>
<td>C13</td>
<td>.005 mfd. paper capacitor</td>
<td>R18</td>
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<tr>
<td>C14</td>
<td>.005 mfd. paper capacitor</td>
<td>R19</td>
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</tr>
<tr>
<td>C15</td>
<td>.005 mfd. paper capacitor</td>
<td>R20</td>
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I.F. 455 KC

<table>
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<tr>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>R9</td>
<td>470,000 ohm carbon resistor</td>
</tr>
<tr>
<td>R10</td>
<td>150 ohm carbon resistor</td>
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<tr>
<td>R11</td>
<td>1000 ohm carbon resistor</td>
</tr>
<tr>
<td>R12</td>
<td>Ballast resistor tube</td>
</tr>
<tr>
<td>R13</td>
<td>470,000 ohm carbon resistor</td>
</tr>
<tr>
<td>R14</td>
<td>0.5 megohm volume control</td>
</tr>
<tr>
<td>R15</td>
<td>Oscillator coil</td>
</tr>
<tr>
<td>T1</td>
<td>1st I.F. transformer</td>
</tr>
<tr>
<td>T2</td>
<td>2nd I.F. transformer</td>
</tr>
<tr>
<td>T3</td>
<td>Output transformer</td>
</tr>
</tbody>
</table>

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

1. Stage Gains
   - Antenna Post to Converter Grid : 40 at 1000 KC
   - I.F. on Converter Grid to I.F. on I.F. Amplifier Grid : 35 at 455 KC
   - I.F. Amplifier Grid to Diode Plate : 60 at 455 KC

2. 0.05-volt, 400-cycle signal across the volume control will give 1/2-watt speaker output.* (Volume control turned to maximum.)

3. Average RF voltage developed from oscillator cathode to B = 1.5 volts

*Variations of ± 20% permissible. All readings obtained with enough signal input to give 1/2 watt speaker output.

I.F. ALIGNMENT CONVENTIONAL

SEE SPECIAL SECTION VOL. VIII

TRIM OSC 1650 KC; ANT 1500 KC

Intermediate Frequency

-455 KC

Electrical Power Output (117 line volts)

Undistorted : 1.5 watts
Maximum : 2.5 watts

Loud-speakernAlnico Magnet Dynamic

Outside Cone Diameter : 5 inches
Voice Coil Impedance (400 cycles) : 3.5 ohms

Socket Voltages

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GENERAL ELECTRIC CO.

MODEL HP-657-A

MODEL HP-657-A

Over-all Dimensions
- Height: 8 inches
- Width: 12½ inches
- Depth: 7½ inches

Tuning Control Drive Ratio: 5:1

Electrical Specifications

<table>
<thead>
<tr>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-125 AC or DC</td>
<td>40-60</td>
<td>30</td>
</tr>
</tbody>
</table>

Tuning Frequency Range
- Broadcast Band: 540-1650 KC
- Police Band: 2600-7500 KC

Electrical Power Output
- Undistorted: 0.8 watts
- Maximum: 1.6 watts

Loud-speaker—Permanent Magnet
- Outside Cone Diameter: 5 inches
- Voice Coil Impedance (400 cycles): 3 ohms

Tubes
- Converter-Oscillator: GE-12SA7
- I.F. Amplifier: GE-12SK7
- Detector—AVC: GE-12SQ7
- 1st Audio Amplifier: GE-12SQ7
- Audio Output: GE-35L6GT
- Rectifier: GE-35Z6GT
- Dial Lamp: MAZDA No. 47

GENERAL INFORMATION

Model HP-657-A is a compact, six-tube, AC-DC, superheterodyne radio designed to receive programs on the broadcast and police-amateur-aircraft bands of frequency. Antenna and ground connections are not necessary as the built-in "Beam-a-Scope" provides adequate pick-up; however, terminals are provided on the cabinet back for connecting antenna and ground leads when signal strengths are low. The receiver is equipped with five mechanical "Feathertouch Tuning" keys adjustable by removing the keys and loosening the binding screws with a screwdriver. Additional design features include Underwriters' approval, full automatic volume control, continuously variable tone control, and single-ended tubes.

When operating from a DC source of power it is necessary to insert the power plug with the proper polarity. If the receiver fails to function with the power plug inserted one way, reverse the plug. If any hum is noticed when the receiver is used on AC, reverse the power plug as above.

ALIGNMENT PROCEDURE

Alignment Frequencies
- I.F.: 455 KC
- Broadcast R.F.: 1650, 1500, and 600 KC
- Police R.F.: 7000 KC

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 12SK7 through a .05 mf capacitor and align the 2nd I.F. transformer. Repeat the procedure applying the 455 KC signal to the control grid of the 12SA7 and aligning the 1st I.F. transformer. Do not remove the grid leads from the tubes. Finish alignment by over-all adjustments.

R.F. Alignment

Apply R.F. signals either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the signal generator output which can be magnetically coupled to the receiver Beam-a-Scope.

1. Rotate the gang condenser to maximum open and apply 1650 KC signal to Beam-a-Scope. Peak oscillator trimmer on right-hand section of gang condenser (as viewed from front) for maximum output.

2. Change generator signal to 1500 KC and set dial pointer to 1500 KC mark. Peak antenna trimmer on left-hand section of gang condenser.

3. Set pointer and generator signal to 800 KC. Peak broadcast padder while rocking the gang condenser. Broadcast padder is first from front on right side of chassis.

4. Rotate band switch to clockwise position and set dial pointer to the 7.0 MC mark. With 7.0 MC input signal align rear trimmer on right side of chassis and peak trimmer located on small antenna coil on top of chassis.
Alignment Frequencies

I.F. 455 KC
R.F. 1500 and 580 KC

The location of all trims is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the grid of the 6SK7GT through a 0.05-mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure, applying the 455-KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. Alignment

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy or through an additional loop connected to the generator output which can be magnetically coupled to the receiver. Adjust C-1 for maximum output. Peak C-3 on 580 KC while rocking the gang condenser. Retrim at 1500 KC.

Precaution

If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating transformer is recommended at AC current through the capacitor will introduce hum modulation and/or create the possibility of a burned out signal generator attenuator.

Special Service Information

The following data will be very useful to servicemen equipped with vacuum tube voltmeters or similar voltage measuring instruments.

(1) Stage Gains

Antenna-post to 6SA7GT grid 4 at 1000 KC
6SA7GT grid to 6SK7GT grid 30 at 455 KC
6SK7GT grid to 6G7GT det. plate 100 at 455 KC

(2) Audio Gains

.6 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/4 watt speaker output.

(3) DC voltage developed across oscillator grid resistor (R-1) averages 12.000 volts.

* Variations of ±10%. ±20% permissible.

Electrical Rating

A-6 Rating 115 volts, 60 cycles AC, 75 watts
A-5 Rating 115 volts, 50 cycles AC, 75 watts

Tuning Frequency Range 550-1600 KC

Intermediate Frequency 455 KC

Electrical Power Output

Undistorted 2.0 watts
Maximum 2.5 watts

Load-speaker—PM Dynamic

Outside cone diameter 6.5 inches
Voice coil impedance (400 cycles) 3.5 ohms

Phonograph Mechanism

Type mechanism Manual
Type pick-up Crystal
Turntable speed 78 r.p.m.

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND MINUS B
LINE VOLTAGE MEASURED VOLUME NO SIGNAL INPUT

WHEN OPERATED ON DC POWER SUPPLY, VOLTAGES ARE ABOUT 13% LOWER
A MEASURED ON 500 VOLT SCALE OF 1000 OHMS PER VOLT METER
W MEASURED ON 500 VOLT SCALE OF 1000 OHMS PER VOLT METER

TO SET-UP PUSH BUTTONS

1. Make a list of stations desired on push buttons and arrange in order, from low to highest frequency; insert tabs of the call letters of the stations in the keys in the order listed.
2. Allow the receiver to run five minutes before making the following adjustments. Manually tune in station, lift key upward and loosen adjusting bolt. Hold the tuning control to the exact tune position and with a screwdriver push in the adjusting bolt as far as it will go, then tighten the adjusting bolt.
3. Adjust for each of the five remaining stations in a similar manner.

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BAND SWITCH SHOWN
ON "B" BAND

---

Fig. 3. Schematic Diagram

MODEL J-709

TECHNICAL AND SERVICE INFORMATION

Model J-709 combination uses the same chassis and record-changer mechanism as the Model H-708, data for which will be found in Vol. XI. The schematic Fig. 3 above and parts view of the automatic changer, Fig. 5 below, are corrected to care for the Model J-709.

---

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MODELS J-718 AND J-728

OVER-ALL MECHANISM

**Tuning**

- **Middle Frequency:** 455 KC

**Electrical Rating**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (volts)</th>
<th>Frequency (cycles on AC)</th>
<th>Power Consumption (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>110-125</td>
<td>60</td>
<td>95</td>
</tr>
<tr>
<td>A5</td>
<td>110-125</td>
<td>60</td>
<td>95</td>
</tr>
<tr>
<td>C2</td>
<td>110-125</td>
<td>25</td>
<td>105</td>
</tr>
</tbody>
</table>

**Beam-a-Scope Removal**

Before either the chassis or Beam-a-Scope can be removed the leads between must be disconnected. The cylindrical Beam-a-Scope leads are disconnected by pulling the pin-plug connections out of the Beam-a-Scope terminals. The short-wave Beam-a-Scope leads are disconnected by unscrewing the nuts which clamp the terminals on the phosphor-bronze strap and green leads, and the screw which clamps the terminal of the yellow lead.

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available:

1. **Stage Gains**
   - (a) Antenna Post to R.F. Grid at
     - 1,000 KC: 5.5
     - 4,500 KC: 2.5
     - 18,000 KC: 2.0
   - (b) R.F. Grid to Converter Grid at
     - 1,000 KC: 5.5
     - 4,000 KC: 3.0
     - 18,000 KC: 2.0
   - (c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at
     - 4,000 KC: 5.0
     - 18,000 KC: 4.5
   - (d) I.P. on Converter Grid to I.F. on 1st I.F. Grid at
     - 455 KC: 7.5
   - (e) I.P. Amplifier Grid to Detector Plate at
     - 455 KC: 7.0

2. **Voltage across volume control to 1/4-watt speaker output at**
   - 400 cycles: 0.03 volts

3. **DC voltage developed across oscillator grid resistor (R-7) at**
   - 1,000 KC: 8.3
   - 4,000 KC: 7.8
   - 18,000 KC: 7.0

* Variations of ±20% permissible. All readings obtained with enough signal input to give 1/4-watt speaker output.

**Phonograph Mechanism**

**GENERAL INFORMATION**

Models J-718 and J-728 are radio-automatic phonograph combinations each incorporating: a seven-tube, three-band, A-C radio receiver. The only difference between these two models is in the cabinet.

![Dial Cord Stringing Diagram](https://www.americanradiohistory.com)
### Circuit Diagram

#### Switch and Coil Section of Chassis Underview

#### Table

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1A</td>
<td>Antenna Section of Tuning Condenser</td>
</tr>
<tr>
<td>C1B</td>
<td>Oscillator Section of Tuning Condenser</td>
</tr>
<tr>
<td>C2</td>
<td>'BC' Band Antenna Trimmer</td>
</tr>
<tr>
<td>C3</td>
<td>'SW2' Band Antenna Trimmer</td>
</tr>
<tr>
<td>C4</td>
<td>'SW1' Band Oscillator Trimmer</td>
</tr>
<tr>
<td>C5</td>
<td>Station Select Antenna Trimmer</td>
</tr>
<tr>
<td>C6</td>
<td>'BC' Band Padder</td>
</tr>
<tr>
<td>C7</td>
<td>'SW2' Band Oscillator coil</td>
</tr>
<tr>
<td>C8</td>
<td>'SW2' band oscillator coil</td>
</tr>
<tr>
<td>C9</td>
<td>'SW1' band oscillator coil</td>
</tr>
<tr>
<td>C10</td>
<td>'BC' band oscillator coil</td>
</tr>
<tr>
<td>C11</td>
<td>Station selector oscillator coil</td>
</tr>
<tr>
<td>C12</td>
<td>Pilot lamp, MAZDA No. 44</td>
</tr>
<tr>
<td>C13</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C14</td>
<td>100 mfd. mica</td>
</tr>
<tr>
<td>C15</td>
<td>47 mfd. mica</td>
</tr>
<tr>
<td>C16</td>
<td>.008 mfd. poly styrene</td>
</tr>
<tr>
<td>C17</td>
<td>220 mfd. mica</td>
</tr>
<tr>
<td>C18</td>
<td>150 mfd. mica</td>
</tr>
<tr>
<td>C19</td>
<td>.005 mfd. paper</td>
</tr>
<tr>
<td>C20</td>
<td>2400 mfd. mica</td>
</tr>
<tr>
<td>C21</td>
<td>750 mfd. silvered mica</td>
</tr>
<tr>
<td>C22</td>
<td>.02 mfd. paper</td>
</tr>
<tr>
<td>C23</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C24</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C25</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C26</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C27</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C28</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C29</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C30</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C31</td>
<td>.005 mfd. paper</td>
</tr>
<tr>
<td>C32</td>
<td>.005 mfd. paper</td>
</tr>
<tr>
<td>C33</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C34</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C35</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C36</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C37</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C38</td>
<td>.01 mfd. paper</td>
</tr>
<tr>
<td>C39</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C40</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C41</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C42</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C43</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C44</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C45</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C46</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C47</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C48</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C49</td>
<td>.05 mfd. paper</td>
</tr>
<tr>
<td>C50</td>
<td>.05 mfd. paper</td>
</tr>
</tbody>
</table>

---

**IF PEK 455 KC**

For record changer data, see index.
### ALIGNMENT PROCEDURE

The alignment procedure is given in table form below. The use of a standard I.R.E. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop-coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative position of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimmers are available either through holes in the back apron of the chassis or from the top of the chassis deck. See Fig. 1 for trimmer location. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

#### ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Frequency</th>
<th>Point of Input</th>
<th>Dummy Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>I.F. Grid and Chassis Ground</td>
<td>.05 Mfd. or larger</td>
<td>2nd I.F. Trimmers (C-10, 11)</td>
<td>Gang condenser plates open. Depress any key other than Phono key. Connect oscilloscope to chassis ground and top of volume control. Adjust trimmers as mentioned for a single horizontal curve of maximum amplitude. Finish by retuning 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>Green lead on &quot;BC&quot; Beam-a-Scope terminal board and chassis ground</td>
<td>.05 Mfd. or larger</td>
<td>1st I.F. Trimmers (C-8, 9)</td>
<td>Gang condenser plates open. Depress any key other than Phono key. Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
</tbody>
</table>

#### R.F. Alignment with Chassis Mounted in Cabinet

1. "BC" Band
2. "BC" Band
3. "BC" Band
4. "BC" Band
5. Repeat operation 3 if "BC" band trimmers are badly out of alignment.

#### R.F. Alignment with Chassis Mounted in Cabinet

6. "SW1" Band
7. "SW2" Band
8. "SW2" Band
9. Repeat operation 7 if the Beam-a-Scope leads are moved in operation 8.

#### R.F. ALIGNMENT

With Chassis Outside of Cabinet

R.F. alignment can be performed only on the "BC" and "SW1" bands with the chassis outside of the cabinet. Any alignment attempted on "SW2" band will not be satisfactory. The same relative position between the chassis and broadcast loop should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of the 0°–180° scale which is cemented to the back of the dial reflector plate. From the "frequency-degree reference chart" the degree readings for corresponding frequency settings may be obtained. To use these degree readings, first completely close the gang condenser plates and hold the pointer along the cord until the left-hand edge of the pointer-guide slide lines up with the 0° mark. By using this left-hand edge (as viewed from the rear) of the scale as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 158°, the receiver will be tuned to 1500 KC on the "BC" band.

The "BC" and "SW1" band alignment procedure is the same as outlined in steps 2 to 6 inclusive of the chart — R.F. Alignment with Chassis Mounted in Cabinet.

After the alignment has been performed on the "BC" and "SW1" bands, the chassis should be mounted in the cabinet and "SW2" band alignment checked as described in steps 7 to 9 of the chart — R.F. Alignment with Chassis Mounted in Cabinet.

Note: After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

---

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www.americanradiohistory.com
Fig. 2. Schematic Diagram
Model J-805

Electrical Power Output

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>110-125</td>
<td>50-60</td>
<td>85</td>
</tr>
<tr>
<td>C</td>
<td>110-125</td>
<td>25-60</td>
<td>85</td>
</tr>
</tbody>
</table>

Electrical Power Output

- Undistorted: 6.0 watts
- Maximum: 9.0 watts

Tone Control

- 3-position

Load-speaker—“Alnic®” Magnet Dynamic

- Outside Cones Diameter: 12 inches
- Voice Coil Impedance: 3.5 ohms

Intermediate Frequency

- 455 KC

Tuning Frequency Range

- Broadcast Band: 540-1700 KC
- Short-wave Band No. 1: 2400-7000 KC
- Short-wave Band No. 2: 7000-22000 KC

PARTS DESCRIPTION LIST

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>“D” band antenna trimmer</td>
<td>C28</td>
<td>47 mmf. mica capacitor</td>
</tr>
<tr>
<td>C2A</td>
<td>Antenna section of tuning condenser</td>
<td>C29</td>
<td>01 mfd. paper capacitor</td>
</tr>
<tr>
<td>C2B</td>
<td>Oscillator section of tuning condenser</td>
<td>C30</td>
<td>“B” and “C” band Braem-A-Scope</td>
</tr>
<tr>
<td>C4</td>
<td>Antenna station selector trimmer strip</td>
<td>L1</td>
<td>“B” and “C” band Braem-A-Scope</td>
</tr>
<tr>
<td>L2</td>
<td>01 mfd. paper capacitor</td>
<td>L3</td>
<td>“D” band Braem-A-Scope</td>
</tr>
<tr>
<td>L4</td>
<td>“D” band oscillator trimmer</td>
<td>L5</td>
<td>“D” band oscillator trimmer</td>
</tr>
<tr>
<td>L6</td>
<td>“C” band oscillator trimmer</td>
<td>L7</td>
<td>R.F. interstage coil</td>
</tr>
<tr>
<td>C9</td>
<td>008 mfd. paper capacitor</td>
<td>L12</td>
<td>Oscillator station selector coil strip</td>
</tr>
<tr>
<td>C10</td>
<td>2400 mmf. + 0.5% mica capacitor</td>
<td>P1</td>
<td>Dial lamp, Mazda No. 44</td>
</tr>
<tr>
<td>C11</td>
<td>“B” band padding trimmer</td>
<td>P2</td>
<td>Dial lamp, Mazda No. 44</td>
</tr>
<tr>
<td>C12</td>
<td>100 mmf. mica capacitor</td>
<td>P3</td>
<td>1000 ohms carbon resistor</td>
</tr>
<tr>
<td>C13</td>
<td>750 mmf. + 0.5% silvered mica</td>
<td>P4</td>
<td>1000 ohms carbon resistor</td>
</tr>
<tr>
<td>C14</td>
<td>220 mmf. mica capacitor</td>
<td>P5</td>
<td>27 ohms carbon resistor</td>
</tr>
<tr>
<td>C15</td>
<td>02 mfd. paper capacitor</td>
<td>R1</td>
<td>10,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C16</td>
<td>0.03 mfd. paper capacitor</td>
<td>R2</td>
<td>47 ohms carbon resistor</td>
</tr>
<tr>
<td>C17</td>
<td>000 mfd. paper capacitor</td>
<td>R3</td>
<td>10,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C18</td>
<td>02 mfd. paper capacitor</td>
<td>R4</td>
<td>33000 ohms carbon resistor</td>
</tr>
<tr>
<td>C19</td>
<td>003 mfd. paper capacitor</td>
<td>R5</td>
<td>68,000 ohms carbon resistor</td>
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<tr>
<td>C20</td>
<td>005 mfd. paper capacitor</td>
<td>R6</td>
<td>80,000 ohms carbon resistor</td>
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<tr>
<td>C21</td>
<td>006 mfd. paper capacitor</td>
<td>R7</td>
<td>22,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C22</td>
<td>001 mfd. paper capacitor</td>
<td>R8</td>
<td>2.2 megohms carbon resistor</td>
</tr>
<tr>
<td>C23</td>
<td>002 mfd. paper capacitor</td>
<td>R9</td>
<td>1.36 ohms carbon resistor</td>
</tr>
<tr>
<td>C24</td>
<td>003 mfd. paper capacitor</td>
<td>R10</td>
<td>47,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C25A</td>
<td>10 mfd. 300 V. dry electrolytic</td>
<td>R11</td>
<td>82,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C25B</td>
<td>15 mfd. 300 V. dry electrolytic</td>
<td>R12</td>
<td>2 megohms volume control (0.5-meg. ohm tap)</td>
</tr>
<tr>
<td>C26</td>
<td>20 mfd. paper capacitor</td>
<td>R13</td>
<td>4.2 megohms carbon resistor</td>
</tr>
<tr>
<td>C27</td>
<td>100 mfd. paper capacitor</td>
<td>R14</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>C28</td>
<td>01 mfd. paper capacitor</td>
<td>R15</td>
<td>333000 ohms carbon resistor</td>
</tr>
<tr>
<td>C29</td>
<td>“B” and “C” band Braem-A-Scope</td>
<td>R16</td>
<td>68,000 ohms carbon resistor</td>
</tr>
<tr>
<td>L1</td>
<td>“B” and “C” band Braem-A-Scope</td>
<td>R17</td>
<td>80,000 ohms carbon resistor</td>
</tr>
<tr>
<td>L3</td>
<td>“D” band Braem-A-Scope</td>
<td>R18</td>
<td>100000 ohms 3 W. carbon resistor</td>
</tr>
<tr>
<td>L4</td>
<td>“D” band oscillator trimmer</td>
<td>R19</td>
<td>100000 ohms 3 W. carbon resistor</td>
</tr>
<tr>
<td>L5</td>
<td>“D” band oscillator trimmer</td>
<td>R20</td>
<td>150,000 ohms carbon resistor</td>
</tr>
<tr>
<td>L7</td>
<td>R.F. interstage coil</td>
<td>R21</td>
<td>56,000 ohms carbon resistor</td>
</tr>
<tr>
<td>L12</td>
<td>Oscillator station selector coil strip</td>
<td>R22</td>
<td>270,000 ohms carbon resistor</td>
</tr>
<tr>
<td>P1</td>
<td>Dial lamp, Mazda No. 44</td>
<td>R23</td>
<td>100000 ohms carbon resistor</td>
</tr>
<tr>
<td>R1</td>
<td>1000 ohms carbon resistor</td>
<td>R24</td>
<td>50000 ohms carbon resistor</td>
</tr>
<tr>
<td>R2</td>
<td>47 ohms carbon resistor</td>
<td>R25</td>
<td>180,000 ohms 1 W. carbon resistor</td>
</tr>
<tr>
<td>R3</td>
<td>27 ohms carbon resistor</td>
<td>R26</td>
<td>470,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R4</td>
<td>10,000 ohms carbon resistor</td>
<td>R27</td>
<td>100000 ohms carbon resistor</td>
</tr>
<tr>
<td>R5</td>
<td>33000 ohms carbon resistor</td>
<td>S3A</td>
<td>Band switch</td>
</tr>
<tr>
<td>R6</td>
<td>68,000 ohms carbon resistor</td>
<td>S2</td>
<td>Tone control switch</td>
</tr>
<tr>
<td>R7</td>
<td>80,000 ohms carbon resistor</td>
<td>S3B</td>
<td>Station selector switch</td>
</tr>
<tr>
<td>R8</td>
<td>22,000 ohms carbon resistor</td>
<td>T1</td>
<td>1st I.P. transformer</td>
</tr>
<tr>
<td>R9</td>
<td>2.2 megohms carbon resistor</td>
<td>T2</td>
<td>2nd I.P. transformer</td>
</tr>
<tr>
<td>R10</td>
<td>47,000 ohms carbon resistor</td>
<td>T3</td>
<td>Output transformer</td>
</tr>
<tr>
<td>R11</td>
<td>82,000 ohms carbon resistor</td>
<td>T4</td>
<td>50-60 cycle-power transformer</td>
</tr>
<tr>
<td>R12</td>
<td>2 megohms volume control (0.5-meg. ohm tap)</td>
<td>T5</td>
<td>25 cycle power transformer</td>
</tr>
</tbody>
</table>

Fig. 1. Trimmer Location
Note: The oscillator coil and band switch terminals are numbered in the Chassis Parts Layout, Fig. 3, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 2. This numbering will also assist in rewiring if the coil or switch are replaced. I.F. transformer connections are shown as an aid in replacement.

**Tubes**

R. F. Amplifier: GE-6SK7  
Converter and Oscillator: GE-6SA7  
I. F. Amplifier: GE-6SQ7  
Det., Aud., AVC: GE-615G or GT  
Phase Inverter: GE-6V6G or GT  
Audio Output: (2) GE-6V6G or GT  
Rectifier: GE-5Y3G  
Dial Lamp: GE-5Y3G  
(2) MAZDA No. 44

**Special Service Information**

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains*

(a) Antenna Post to R. F. Grid at  
1000 KC 6.5  
4000 KC 3.0  
18000 KC 2.3

(b) R. F. Grid to Converter Grid at  
1000 KC 5.0  
4000 KC 3.0  
18000 KC 2.0

(c) R. F. on Converter Grid to I. F. on 1st I. F. Grid at  
1000 KC 47  
4000 KC 47  
18000 KC 39

(d) I. F. on Converter Grid to I. F. on 1st I. F. Grid at  
455 KC 55

(e) I. F. Amplifier Grid to Detector Plate at  
455 KC 77

(2) Voltage across Volume Control to Give ½-watt Speaker Output at  
400 cycles 0.05 volts

(3) DC Voltage Developed Across Oscillator Grid Resistor  
(R-7) at  
1000 KC 6.0  
4000 KC 5.5  
18000 KC 3.9

*Variations of ±20% are permissible. All readings obtained with enough input signal to give ½-watt speaker output.
GENERAL INFORMATION

Model J-805 is an eight-tube superheterodyne receiver designed to operate on an alternating-current power supply. The receiver incorporates the latest developments in fields of which the General Electric Dual Beam-Beams are notable. Broadcast and short-wave No. 1 signals are selected by the cylindrical Beam-Beams which are in the speaker mechanism. Short-wave No. 2 signals are selected by the cylindrical Beam-Beams which are in the chassis. Additional features include single-ended tubes, positive-coupled operation, and built-in ferro-coupling tuning system, key, Phonograph Record, Vibration, Alignment Chart, Trimmer, Circuit, and Off-Carrier Reception.

Setting Up the Receiver

The following remarks will assist in setting the receiver in correct position:
1. In order to press the volume of the units depends on the position of the speaker, do not press the or the volume control too far. The speaker can be adjusted to the point where it is just right for your ear.
2. Never release the volume control too far. The speaker can be adjusted to the point where it is just right for your ear.
3. Never release the volume control too far. The speaker can be adjusted to the point where it is just right for your ear.
4. A method of setting up speaker which will assist in setting the receiver in correct position:

Chassis or Beam-Beams Removal

Before removing the chassis or Beam-Beams, be sure to remove the receiver from the cabinet. The cylindrical Beam-Beams are in the chassis, which is a separate unit from the cabinet. To remove the chassis, lay the receiver on its back and lift the cabinet off the chassis. To remove the Beam-Beams, lay the receiver on its back and lift the cabinet off the Beam-Beams. The Beam-Beams are located on the bottom of the cabinet, which should be lifted off the chassis. To remove the Beam-Beams, lay the receiver on its back and lift the cabinet off the Beam-Beams.

Alignment Procedure

The alignment procedure is given in table form below. All alignment procedures should be performed with the receiver in operation. The alignment for the receiver should be performed with the receiver in operation. The alignment should be performed with the receiver in operation.

Alignment Chart

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dynamic Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 'BC' Base 1500 KC</td>
<td>I.F. Grid</td>
<td>0.5 mfd or larger</td>
<td>2nd I.F.</td>
<td>Trimmer, C-16, 10.7</td>
<td>Gang condenser plate open, Depress any static key other than Phone-F.M. Tel key, Connect audio output to microphone to chassis ground and connect R 90.2 and 120 ohm, Adjust trimmer in order mentioned for a smooth, symmetrical curve of maximum sensitivity. Fullness is obtained by minimum 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. 'BC' Base 4550 KC</td>
<td>I.F. Grid</td>
<td>0.5 mfd or larger</td>
<td>1st I.F.</td>
<td>Trimmer, C-13, 14.</td>
<td>Gang condenser plate open, Depress any static key other than Phone-F.M. Tel key, Connect audio output to microphone to chassis ground and connect R 90.2 and 120 ohm, Adjust trimmer in order mentioned for a smooth, symmetrical curve of maximum sensitivity. Fullness is obtained by minimum 2nd I.F. trimmers.</td>
</tr>
</tbody>
</table>

R.F. Alignment

With Chassis Mounted in Cabinet

The 'BC' and 'SW' bands should be selected by turning the tuning control until the desired signal is heard. The 'BC' band should be selected by turning the tuning control until the desired signal is heard. The 'SW' band should be selected by turning the tuning control until the desired signal is heard.

Alignment Chart

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dynamic Antenna</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 'BC' Base 1500 KC</td>
<td>I.F. Grid</td>
<td>0.5 mfd or larger</td>
<td>2nd I.F.</td>
<td>Trimmer, C-16, 10.7</td>
<td>Gang condenser plate open, Depress any static key other than Phone-F.M. Tel key, Connect audio output to microphone to chassis ground and connect R 90.2 and 120 ohm, Adjust trimmer in order mentioned for a smooth, symmetrical curve of maximum sensitivity. Fullness is obtained by minimum 2nd I.F. trimmers.</td>
</tr>
<tr>
<td>2. 'BC' Base 4550 KC</td>
<td>I.F. Grid</td>
<td>0.5 mfd or larger</td>
<td>1st I.F.</td>
<td>Trimmer, C-13, 14.</td>
<td>Gang condenser plate open, Depress any static key other than Phone-F.M. Tel key, Connect audio output to microphone to chassis ground and connect R 90.2 and 120 ohm, Adjust trimmer in order mentioned for a smooth, symmetrical curve of maximum sensitivity. Fullness is obtained by minimum 2nd I.F. trimmers.</td>
</tr>
</tbody>
</table>

Load-speaker

The load-speaker should be installed as accurately as possible and have as low an output as possible. It is a voice coil transformer. The voice coil transformer is a low output device. It is a voice coil transformer. It is a voice coil transformer.
GENERAL ELECTRIC CO.

SPECIFICATIONS

Tone Control


Load-speakers—'Alnoic' Magnet Dynamic

Outside Cone Diameters: 6 1/2 and 14 inches
Voice Coil Impedances: 3.5 ohms each

Phonograph Mechanism

Type: Automatic Record Changer
Record Capacity: 10-inch, 12-inch
Type Pickup: Crystal
Turntable Speed: 78 Rpm

Tubes

R.F. Amplifier: GE-6SK7
Converter and Oscillator: GE-6SK7
I.F. Amplifier: GE-6SK7
Det., Aud. AVC: GE-6SJ7
Phase Inverter: GE-6J6G or GT
Audio Output: (2) GE-6Y6G or GT
Recifier: GE-5Y3G
Dial Lamps: (3) MAZDA No. 44

GENERAL INFORMATION

These models each contain an eight tube, superheterodyne receiver which is designed to assist from an alternating current power supply. Dual Beam-a-Scoops ensure satisfactory performance at all frequencies within the tuning ranges of the receiver. Broadcast and short-wave No. 1 signals are selected by the cylindrical Beam-a-Scope. Short-wave No. 2 signals are selected by the Beam-a-Scope which is mounted on the cabinet. Additional features include a line circuit, iron core oscillator station selector coils, five feeler-touch tuning station keys, and automatic volume control.

Models J-809, J-818 and J-828 are equipped with dual controls for volume and tone. One set of volume and tone controls permit adjustment of the radio output only while the remaining set of controls permit adjustment of the phonograph output. The phonograph volume and tone controls are mounted on a plate separate from the chassis. Fig. 2 shows the interconnections between the phonograph controls, chassis and phonospeaker motor, chassis and speakers, and chassis and Beam-a-Scoops.

Phono-FM-Tel

All models are designed to allow the ready connection of separate record players, frequency modulation converters, and television picture receivers with sound converters. Models J-808, J-818 and J-828 are equipped with a pin jack immediately in back of the plug connection on the bottom apron of the chassis. Model J-809 is equipped with a pin jack on the back apron of the chassis into which a plug connection is made from the tone arm of the automatic record changer. Models J-818 and J-828 are equipped with a separate record player, frequency modulation converter, or television picture receiver with sound converter to be used with the Model J-809. The record changer plug connection can be removed and the auxiliary plug connection made. General Electric plug, Stock No. J-154, is recommended. Models J-818 and J-828 are equipped with a pin jack. The left-hand feeler-touch tuning key, marked "Tel-FM" on Models J-808, J-818 and J-828, and "Phono" on Model J-809, when depressed switches the receiver from radio to operation with the auxiliary equipment.

Setting Up the Receiver

The following remarks will assist the serviceman in correctly setting up this receiver for use:

1. In order to press the volume or tuning knobs all the way on their respective shafts, the dial plate should be held in place by pressure from the rear.
2. The black speaker lead should be connected to the 14-inch speaker terminal which is grounded to the speaker frame and to the 6 1/2-inch speaker terminal which is not grounded. This will assure proper phasing of the speakers.
3. A method of setting up station keys which will assure drift-proof adjustments is to split the iron core all the way out and then turn slowly inward until the desired station is tuned in.

Chassis or Beam-a-Scope Removal

Models J-808, J-818 and J-828

The chassis is anchored to the chassis board which in turn is held in place by three wood screws located along the bottom edge. Removal of these wood screws will allow the chassis to be dropped down and taken out. Three felt pads are stapled to the upper edge of the chassis board to firmly cushion the board in the cabinet slot.

To remove the cylindrical Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads and the Beam-a-Scope drive cord. Remove the two wood screws which allow the chassis to be dropped down and take out. These felt pads are stapled to the upper edge of the chassis board to firmly cushion the board in the cabinet slot.

To remove the cylindrical Beam-a-Scope proceed as follows: Disconnect the four Beam-a-Scope leads. Remove the Beam-a-Scope drive cord. With a screwdriver remove the two wood screws which hold the bottom Beam-a-Scope support to the cabinet. These screws are accessible from the top side of the support next to the lower rear cross-member of the cabinet. The Beam-a-Scope can now be rotated from right to left until it comes loose from the upper pivot.

The Beam-a-Scope drive mechanism is held in place by two bolt-and-nut anchorage. The nuts are accessible from the bottom side of the plate. If in attempting to remove these nuts, the bolt is found to be frozen then it will be necessary to remove the chassis to get at the bolt heads. This mechanism will have to be removed to replace either the control drum or the drive cord. When replacing the drive cord, it will be best to take out the Beam-a-Scope and drive unit as one assembly allowing the cord to be completely restrung before remounting the assembly.

Load-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs resetting, it will be necessary to replace the entire cone and voice coil assembly.

Notes—In no case should the magnet be removed from the assembled position.

Special Service Information

The following information will be very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains
(a) Antenna Post to R.F. Grid at 1000 KC 5.5
     4000 KC 2.5
     18000 KC 2.5
(b) R.F. Grid to Converter Grid at 1000 KC 2.5
     4000 KC 3.0
     18000 KC 2.0
(c) R.F. on Converter Grid to I.F. on 1st I.F. Grid at 1000 KC 50
     4000 KC 50
     18000 KC 45
(d) I.F. on Converter Grid to I.P. on 1st I.P. Grid at 435 KC 60
     18000 KC 55
(e) I.P. Amplifier Grid to Detector Plate at 435 KC 55
(2) Voltage across volume control to give 1/2-watt speaker output at 400 cycles
(3) DC voltage developed across oscillator grid resistor (R-7) at 1000 KC 8.3
     4000 KC 7.8
     18000 KC 4.6

* Variations of +20% permissible. All readings obtained with enough signal input to give 1/2-watt speaker output.

Fig. 8. Dial Cord Stringing Diagram

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ALIGNMENT PROCEDURE

The alignment procedure is given in table form below. The use of a standard R.F. dummy antenna in making all R.F. alignments is recommended. R.F. alignment can be performed by loop coupling the generator signal to the receiver Beam-a-Scope if care is exercised not to overcouple the two circuits. Keeping a distance of two feet or more between the generator loop and the receiver Beam-a-Scope will generally insure freedom from overcoupling. The relative positions of the Beam-a-Scope with respect to the chassis materially affects R.F. alignment; therefore, all R.F. alignments should be made with the chassis and Beam-a-Scope mounted in the cabinet. In keeping with this recommendation all R.F. alignment trimpots are available either on top of the chassis or through holes in the back apron as shown in Fig. 1. Metal objects such as meters, tools, etc., should not be placed on top of the receiver cabinet. Also the receiver should be kept away from large metal objects such as radiators, metal-top tables, etc.

R.F. ALIGNMENT

WITH CHASSIS OUTSIDE OF CABINET

R.F. alignment can be performed only on the "BC" and "SWI" bands with the chassis outside of the cabinet. Any alignment attempted on "SW2" band will not be satisfactory. The same relative position between the broadcast loops should be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of a 0-180° calibrated scale which is cemented to the back of the dial reflector plate. From the reference chart Fig. 7 the degree readings for corresponding frequency settings may be obtained by laying a straight edge across the chart perpendicular to the line of figures and sliding the straight edge along to the various frequency settings desired. The degree readings will be found on either of the degree scales. To use degree readings, first completely close the gang condenser plates and then slide the pointer along the cord until the left-hand edge of the pointer-guide slide line up with the 0° mark. By using the left-hand edge (as viewed from the rear) of the slide as the degree-scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 158° the receiver will be tuned to 1500 KC on the "BC" band. The "BC" and "SWI" band alignment procedure is the same as outlined in steps 2 to 6 inclusive of the chart "R.F. Alignment with Chassis Mounted in Cabinet.

R.F. ALIGNMENT WITH CHASSIS MOUNTED IN CABINET

Note: After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet for the gang condenser plates to be closed and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

ALIGNMENT CHART

I.F. ALIGNMENT WITH OSCILLOSCOPE

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antennas</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. &quot;BC&quot; Band</td>
<td>455 KC Sweep</td>
<td>Green lead on cylindrical Beam-a-Scope</td>
<td>.05 mfd. or larger</td>
<td>1st I.F. Trimmers C-13, 14</td>
<td>Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
</tbody>
</table>

I.F. ALIGNMENT WITH OUTPUT METER

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antennas</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. &quot;BC&quot; Band</td>
<td>455 KC with Modulation</td>
<td>Beam-a-Scope</td>
<td>.05 mfd. or larger</td>
<td>2nd I.F. Trimmers C-10, 17</td>
<td>Connect output meter across voice coil. Keep input signal low and volume control on as far as possible. Adjust all trimmers for maximum output.</td>
</tr>
</tbody>
</table>

R.F. ALIGNMENT

WITH CHASSIS MOUNTED IN CABINET

<table>
<thead>
<tr>
<th>Band Switch Setting</th>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Dummy Antennas</th>
<th>Trimmer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. &quot;BC&quot; Band</td>
<td>1500 KC with Modulation</td>
<td>Antenna Post</td>
<td>I.R.E.</td>
<td>Osc. (C-8) Ant. (C-34)</td>
<td>Close gang plates. Adjust pointer to first line at left end of tuning scale. Connect output meter across voice coil. Tune control set to &quot;Normal&quot; position. Set pointer to 1500 KC and tune in signal with (C-8). Peak output with (C-34).</td>
</tr>
</tbody>
</table>

5. Repeat operation 3 if "BC" band trimmers are badly out of alignment.

6. "SW 1" Band       | 6 MC with Modulation | Antenna Post | I.R.E. | Osc. (C-7) | Set pointer to 6 MC and peak signal while rocking gang condenser. |

7. "SW 2" Band       | 21 MC with Modulation | Antenna Post | I.R.E. | Osc. (C-6) Ant. (C-1) | Set pointer to 21 MC and tune in signal with (C-6). Peak output with (C-1). |

8. "SW 2" Band       | 8 MC with Modulation | Antenna Post | I.R.E. | Osc. (C-6) Ant. (C-1) | This operation may or may not be necessary depending on how much the shortwave Beam-a-Scope leads have been moved from their correctly dressed positions. Repositioning will be indicated if an increased output meter reading can be obtained by moving the short-wave Beam-a-Scope leads closer or farther apart. Repeat with the Beam-a-Scope leads moved in operation 9.

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GENERAL ELECTRIC CO.

MODELS J-808, J-809, J-818, J-828

Fig. 5. Chassis Parts Layout (All Models)

Fig. 6. Socket Voltages (All Models)

Fig. 7. Frequency-degree Reference Chart

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This automatic Record Changer is a standard assembly in all of our record machines, designed for operation on 120 volts, 60 cycles only and will automatically play a series of records of any kind-by simply pushing the lever and turning it to the "Pick-Up" position. Manual operation is also provided. Records of the same size and type are positioned by the same means. When the pick-up arm comes down, turn the turntable switch to "Off." The turntable will start to revolve and the cycle of motion on the pick-up arm will be repeated. When the pick-up arm is ready to play, the pick-up needle is then lowered to the record, or for manual operation.

OPERATING INSTRUCTIONS

Before operating the phonograph, either automatically or manually, be sure the pick-up arm is down and can be moved by hand. If not a "cycle" must be completed to bring it down. When the turntable switch is "On," the turntable will start to "Austomatic" operation and when turntable has attained speed, lift pick-up and lower gently into the record so that needle point enters. If you have finished playing, see that the needle has been raised and properly "Set." Never leave pick-up with needle resting on a record or in the "Manual" position.

CONTROLS AND MOVING MECHANISM

Index and Record-reject Lever

This lever is located near the front corner of the motorboard with its index plate marked for the following positions: "Manual," "Reject," "A," "B," and "C." When you desire to change records manually, the lever should be set at the "Manual." Manual operation is set by the index plate. The index mechanism is set to play a series of 12-inch records automatically. The Index mechanism is set by the Index plate in the "Manual" position.

Needle Ejector

Needle ejector is operated by lever "16." Adjustment of the needle ejector may be made by turning in the "Reject" position and the lever is pulled.
Fig. 4. Schematic Diagram—Model J-809

![Schematic Diagram of Model J-809](image)

Fig. 9. Shortwave Beam-a-Scope Connections (Model J-809)

![Connections Diagram](image)

Fig. 11. Beam-a-Scope Drive Cord Stringing Diagram (Model J-809)

![Drive Cord Stringing Diagram](image)
**ALIGNMENT PROCEDURE**

The alignment procedure, performed with the chassis in the cabinet, is given in table form below. All R.F. alignment is performed by capacity coupling the test oscillator to the receiver input. This is accomplished by using a three-foot piece of wire as an antenna connected to the high side of the test oscillator output and brought to within three feet of the Beam-a-Scope input when making the alignment. Metal objects such as tools, meters, etc. should not be placed on top of the cabinet.

Before making the R.F. alignment make sure the pointer is set to the line at the left-hand edge of the dial scale when the gang condenser plates are closed. Output meter alignment is preferable, and the meter may be connected across the voice coil; then turn volume control to maximum. Keep the signal input as low as possible to avoid AVC action.

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Step</th>
<th>Test-Osc. Connect to</th>
<th>Osc. Output Frequency</th>
<th>Pointer Setting</th>
<th>Tune Transformer for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 I.F. grid in series with .05 mfd</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C16 &amp; C17</td>
</tr>
<tr>
<td>2</td>
<td>6SA7 grid in series with .05 455 KC mfd</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C13 &amp; C14</td>
</tr>
<tr>
<td>3</td>
<td>Use Capacity Coupling 455 KC</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td><strong>C11</strong></td>
</tr>
<tr>
<td>4</td>
<td>Use Capacity Coupling 455 KC</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C8</td>
</tr>
<tr>
<td>5</td>
<td>Repeat step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Use Capacity Coupling 6.0 MC</td>
<td>6000 KC</td>
<td>&quot;SW1&quot; Band 6 MC</td>
<td>C7</td>
</tr>
<tr>
<td>7</td>
<td>Use Capacity Coupling 6000 MC</td>
<td>21 MC</td>
<td>&quot;SW2&quot; Band 21 MC</td>
<td>C6*</td>
</tr>
<tr>
<td>8</td>
<td>Use Capacity Coupling 21.0 MC</td>
<td>21 MC</td>
<td>&quot;SW2&quot; Band 21 MC</td>
<td><strong>C11</strong></td>
</tr>
</tbody>
</table>

* Use minimum capacity peak.
** Rock gang condenser for optimum peak.

**R.F. Alignment with Chassis Outside of Cabinet**

R.F. alignment can be performed only on the "BC" and "SW1" bands with the chassis outside of the cabinet. Any alignment attempted on "SW2" band will not be satisfactory. The same relative position between the chassis and broadcast loop must be maintained when aligning outside the cabinet as these components occupy in the cabinet. Since the glass dial scale is fastened to the cabinet it cannot be used for reference during alignment of the chassis outside of the cabinet. Use must be made, therefore, of 0–180° calibrated scale which is cemented to the back of the dial-reflect mirror. From the "frequency-degree reference chart" the degree readings for corresponding frequency settings may be obtained. To use these degree readings, first completely close the gang condenser plates and then slide the pointer along the cord until the left-hand edge of the pointer-guide slide lines up with the 0° mark. By using this left-hand edge (as viewed from the rear) of the slide as the degree scale pointer the receiver may be tuned to any frequency. Example: By rotating the tuning control until the left-hand edge of the slide is in line with 154° the receiver will be tuned to 1500 KC on the "BC" band.

The "BC" and "SW1" band alignment procedure is the same as outlined in steps 3 to 6 inclusive of the chart—R.F. Alignment with Chassis Mounted in Cabinet.

The chassis should be mounted in the cabinet and "SW2" band alignment checked as described in steps 7 and 8 of the chart.

**NOTE:** After moving the pointer along the cord to use the left-hand edge as a reference pointer for the degree scale, it will be necessary after reassembly in the cabinet to move the condenser plates to close and the pointer to be moved back along the cord so that it lines up with the first dial markings on the left.

**FREQUENCY-DEGREE REFERENCE CHART**

<table>
<thead>
<tr>
<th>&quot;BC&quot; Band</th>
<th>&quot;SW1&quot; Band</th>
<th>&quot;SW2&quot; Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 KC</td>
<td>154°</td>
<td>6.0 MC</td>
</tr>
<tr>
<td>1900 KC</td>
<td>104°</td>
<td>4.0 MC</td>
</tr>
<tr>
<td>580 KC</td>
<td>20°</td>
<td>2.5 MC</td>
</tr>
</tbody>
</table>

© John F. Rider, Publisher
Plug in AC cord, turn "Off Volume" knob on, push in "Broadcast" button, and select stations as desired by using tuning knob.

Use same procedure, though push in "Intermediate Short Wave" or "Short Wave" buttons for tuning these bands.

To set broadcast band stations to buttons for instantaneous tuning:

Remove decorated cover above long row of knobs (with fingernail or screwdriver). This will expose six pairs of screws. These are the iron-core tuners and padders. From left to right these iron cores tune stations for buttons number two to seven, inclusive. Select the six stations desired, remove the call letters from the station tab sheet, insert the tabs in the buttons, assigning the station with the lowest KC frequency to button No. 2 and, in order, to the station with the highest KC frequency to button No. 7.

To actually set stations to the buttons:

By means of manual tuning, play the station to be set; then push the button at which the station is to be set; then with a screwdriver turn iron-core (long screw) till station is located. Adjust station to loudest volume, using paddler screw (short screw); then readjust long screw till station is set to a point where the tuning eye is at its most closed position. The station is then "set" to the button.

This procedure must be repeated for each station to be set to each button, and it is suggested that, after the stations are all once set to their buttons, they be rechecked before replacing the cover.

Standard broadcast antenna is mounted on a swivel in rear of cabinet. For tuning some more distant stations, it may be desirable to rotate antenna to position of loudest volume or, if necessary, an outside antenna may be connected to a green wire lead coming from this broadcast loop. For short wave tuning, some locations will require an outside antenna. This outside antenna should be connected to the green wire coming from the short wave loop, which is located directly above the chassis. If extra antenna is desired for both short wave and standard broadcast performance, both green antenna leads can be joined together satisfactorily to one outside antenna.

If a phonograph or microphone is to be used, they should be plugged into the rear of the chassis in place provided and so marked. To use as a phonograph or with microphone, push in "Phono" button. In the rear of the chassis is provided a 110 volt plug. This is for your convenience for using this radio with a phonograph attachment or with a lamp.

A six-prong outlet is provided in the chassis pan. This outlet is wired into the circuit and can be used only in conjunction with a special microphone pre-amplifier and control that has been designed especially for recording purposes. The consumer owning this receiver may purchase a portable recorder and, by connecting it to our microphone pre-amplifier, it is possible to make recordings of the highest quality.

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B. F. GOODRICH

MODELS R-399, R-405

CONVENTIONAL ALIGNMENT  SEE SPECIAL SECT.  VOL. VIII

FOR OTHER DATA SEE INDEX

MODEL R-399

Schematic Diagram  17-399 KC

TRIM 1400 KC
PAD 600 KC
FREQUENCY RANGE - 535 to 1720 KC

MODEL R-405

FOR OTHER DATA SEE INDEX

FREQUENCY RANGE -
550 to 1700 KC
1700 to 5400 KC
5600 to 18000 KC

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MIXER SCHEMATIC DIAGRAM

FOR OTHER DATA SEE INDEX
MODEL R-400

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

In some sets C3, C4, C18, R13 and the R.F. choke (RFC) are not used and points "A" are connected to chassis.

I.F. ALIGNMENT CONVENTIONAL (SEE VOL.VIII).

FOR OTHER DATA SEE INDEX
MODEL R-424

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FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL.VIII

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ALIGNMENT CONVENTIONAL—SEE SPECIAL SECTION VOL. VIII

R 1 1,000,000 ohm ½ watt
R 2 2,000,000 ohm ½ watt
R 3 250 ohm ½ watt
R 4 50,000 ohm ½ watt
R 5 5,000 ohm ½ watt
R 6 100,000 ohm ½ watt
R 7 150,000 ohm ½ watt
R 8 5,000,000 ohm ½ watt
R 9 15,000 ohm 2 watt
R 10 25,000 ohm 1 watt
R 11 30,000 ohm ½ watt
R 12 100 ohm ½ watt
R 13 50 ohm ½ watt
R 14 200 ohm ½ watt
R 15 200 ohm ½ watt
R 16 1,000,000 ohm ½ watt
R 17 50,000 ohm ½ watt
R 18 30,000 ohm ½ watt
R 19 30,000 ohm ½ watt
R 20 500,000 ohm V.C.
R 21 1,000,000 ohm ½ watt
C 1 00002 10% Mica
C 2 00001 Mica
C 3 05 300 V.
C 4 05 400 V.
C 5 05 500 V.
C 6 00006 5% Mica
C 7 05 400 V.
C 8 05 500 V.
C 9 05 600 V.
C 10 1 400 V.
C 11 00001 Mica
C 12 00001 Mica
C 13 02 200 V.
C 14 02 500 V.
C 15 05 600 V.
C 16 00001 Mica
C 17 00025 Mica
C 18 001 600 V.
C 19 005 400 V.
C 20 05 400 V.
C 21 05 400 V.
C 22 01 400 V.
C 23 02 400 V.
C 24 02 400 V.
C 25 005 600 V.
C 26 005 600 V.
C 27 00005 2½% Mica
C 28 00003 5% Mica
C 29 00003 2½% Mica
C 30 00005 2½% Mica
C 31 00002 2½% Mica
C 32 00003 5% Mica
C 33 00003 10% Mica
C 34 00006 Mica
C 35a 16 Mfd. 450 V.
C 35b 20 Mfd. 450 V.
C 36 25 Mfd. 450 V.
C 37 25 400 V.
The **ECONOMIZER switch** is located on the top left of chassis. Always have this switch in the "NEW" battery position when first placing the radio in operation or when installing a new battery.
GOODYEAR TIRE & RUBBER CO., INC.

MODEL 01006

TUBE TYPES AND POSITIONS

530 to 1720 kilocycles
5.8 to 18.0 megacycles

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www.americanradiohistory.com
Automatic Unit
Principle of Operation

The basic circuit of any radio receiver is the inductance coil and tuning condenser which determines the frequency to which the system is tuned. The frequency at which this circuit resonates can be varied in two ways: either by holding the inductance coil at a fixed value of inductance and changing the capacity of the condenser, or by holding the condenser at a fixed value of capacity and changing the inductance of the coil. This is so because the frequency is proportional to the inductance times the capacity and changing one or the other will change their product.

Previous push-button systems accomplished their purpose in one of two ways. They either rotated the tuning condenser mechanically with an electric motor, or disconnected the tuning condenser by means of a switch and substituted pre-set padding condensers in the antenna and oscillator circuits.

In the push-button system the entire oscillator circuit (coil and gang condenser) is disconnected and in its place is put a silvered mica condenser of fixed capacity and a coil, the inductance of which can be varied by means of an iron slug that moves with a screw adjustment, inside the coil. This is the second system of tuning mentioned above and has the following advantages in this case. The condenser is made by electroplating a small deposit of silver on each side of a piece of mica and encasing the whole unit in a weatherproof compound. The silver, having a low temperature coefficient has a negligible expansion with changes in temperature, and humidity has no effect because of the weatherproof compound. Therefore, changes in the condenser capacity are controlled. The coil is impregnated with a moisture-proof wax and the whole circuit is tuned by varying the inductance of the coil. The only uncontrollable factor in the system is the variation in capacity of the wiring and other parts. But this variation is so small that its detuning effect is not noticeable to the ear.

In the system the silvered mica condenser which tunes all six of the push button coils is in the main part of the receiver and connected on the wave switch. The push-button coils are mounted on the push-button unit and are adjusted from the back by slotted screws. The adjustable padding condensers directly above the slotted screws are used to align the antenna coil in the receiver to each of the push-button coils depend on which button is pushed. Variation in capacity of this padder has no effect on the tuning of the system. It simply drops the sensitivity slightly.

Instructions for Pre-setting “Fingertip Control”
Circuits for Six Stations in the Broadcast Tuning Range

The automatic tuning unit is located immediately above the receiver chassis, the circuits being adjustable from the rear of this unit. Although it is possible to adjust the circuits without the aid of a signal generator, for best results it is recommended that a serviceman be allowed to pre-set the tuning circuits in the following manner.

Turn the wavechange switch to the left. Six stations in the broadcast band may be chosen, and the tabs on which are printed the call letters of these stations should be selected from the sheet provided and inserted in the cutout slots. It is preferable to place the tabs in the slots according to frequency; that is to say, the low frequency stations should appear at the left as the unit is faced and the high frequency stations at the right.

The tuning circuits corresponding to a given station will be found at the rear of the automatic unit housing, immediately behind the station call letter tab slot. Assuming that you are facing the rear of the receiver and it is desired to set up WJZ at 760 kilocycles on the third circuit from the right, the following is the recommended procedure. Adjust the signal generator, modulated with an audio frequency, to 760 kilocycles. Using a small screwdriver adjust the converter oscillator circuit, third hole from right in the lower row, until signal is loudest. Then adjust antenna circuit, third hole in upper row, until signal is at a maximum.

Readjust converter circuit carefully for maximum signal strength. Other frequencies may be set up in a similar manner on the remaining circuits.

If a signal generator is not available turn the wave switch to the middle position for manual tuning and tune the receiver to the desired station. Then turn the switch to the left ("fingertip-control" automatic position) and adjust the automatic unit oscillator and antenna circuits exactly as described above. Repeat procedure until all desired stations are set up. When all desired stations are set up recheck all oscillator adjustments for calibration accuracy.

The frequency range of the automatic tuning circuits is as follows:

<table>
<thead>
<tr>
<th>Circuits</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>1550-970 Kilocycles</td>
</tr>
<tr>
<td>3 and 4</td>
<td>250-750 Kilocycles</td>
</tr>
<tr>
<td>5 and 6</td>
<td>970-540 Kilocycles</td>
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Replacement Parts

<table>
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<tr>
<th>Item No.</th>
<th>Description</th>
<th>Part No.</th>
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<tr>
<td>83</td>
<td>Padder</td>
<td>34137</td>
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<tr>
<td>84</td>
<td>Oscillator Trans. Assy.</td>
<td>40141</td>
</tr>
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<td>Padder</td>
<td>34136</td>
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<tr>
<td>86</td>
<td>Oscillator Trans. Assy.</td>
<td>4014</td>
</tr>
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<td>34135</td>
</tr>
<tr>
<td>88</td>
<td>Oscillator Trans. Assy.</td>
<td>40118</td>
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</table>
MODELS R-450, R-47C

CONVENTIONAL ALIGNMENT

I.F. PEAK - 455 KC
TRIM OSC. - 1730 KC
TRIM ANT. - 1400 KC

VOLTAGES: Line 115 v. AC. Power consumption, 30 watts.
Volume control maximum. Water 1000 ohms per volt. Read from point indicated to common ground.

MODEL R-450

ISSUE A
MARCH 1940

MODEL R-470

ISSUE A
MARCH 1940

©John F. Rider, Publisher
MODELS R-452, R-453

B. F. GOODRICH

CONVENTIONAL ALIGNMENT

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
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<tr>
<td>R1</td>
<td>250,000</td>
<td>1/4</td>
<td>R7</td>
<td>2,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>100,000</td>
<td>1/4</td>
<td>R8</td>
<td>500,000</td>
<td>1/4</td>
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<td>R3</td>
<td>250,000</td>
<td>1/4</td>
<td>R9</td>
<td>5,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>10,000</td>
<td>1/4</td>
<td>R10</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R5</td>
<td>25,000</td>
<td>1/4</td>
<td>R11</td>
<td>500,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R6</td>
<td>150,000</td>
<td>1/4</td>
<td>R12</td>
<td>150-10%</td>
<td>1/4</td>
</tr>
</tbody>
</table>

CONVENTIONAL ALIGNMENT

CONVENTIONAL ALIGNMENT

BAND SWITCH

REAR VIEW

MODEL R-452

In model 16 all common grounds become chassis grounds. C1, C9, C10, R2 and R6 are omitted. Point "A" is connected to point "B" and point "C" to point "D."

CONVENTIONAL ALIGNMENT

For other data see index

CONVENTIONAL ALIGNMENT

FOR OTHER DATA SEE INDEX

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

©John F. Rider, Publisher
Band switch shown in broadcast position in schematic and in short wave position in pictorial view in lower left corner.

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
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<tbody>
<tr>
<td>R1</td>
<td>500,000</td>
<td>5/4</td>
<td>R10</td>
<td>500,000</td>
<td>5/4</td>
</tr>
<tr>
<td>R2</td>
<td>4,000</td>
<td>5/4</td>
<td>R11</td>
<td>20,000</td>
<td>5/4</td>
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<tr>
<td>R3</td>
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<td>R4</td>
<td>25,000</td>
<td>5/4</td>
<td>R13</td>
<td>2,000,000</td>
<td>5/4</td>
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<td>R14</td>
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<td>R8</td>
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<td>5/4</td>
<td>R17</td>
<td>600-10%</td>
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<tr>
<td>R9</td>
<td>1,000,000</td>
<td>5/4</td>
<td></td>
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FOR OTHER DATA SEE INDEX

MODEL R-454

RESISTORS

<table>
<thead>
<tr>
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<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
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</thead>
<tbody>
<tr>
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<td>5/4</td>
<td>R10</td>
<td>500,000</td>
<td>5/4</td>
</tr>
<tr>
<td>R2</td>
<td>4,000</td>
<td>5/4</td>
<td>R11</td>
<td>10,000</td>
<td>5/4</td>
</tr>
<tr>
<td>R3</td>
<td>10,000</td>
<td>5/4</td>
<td>R12</td>
<td>2,000,000</td>
<td>5/4</td>
</tr>
<tr>
<td>R4</td>
<td>25,000</td>
<td>5/4</td>
<td>R13</td>
<td>2,000,000</td>
<td>5/4</td>
</tr>
<tr>
<td>R5</td>
<td>1,000,000</td>
<td>5/4</td>
<td>R14</td>
<td>250,000</td>
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<tr>
<td>R6</td>
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<td>5/4</td>
<td>R15</td>
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<td>R8</td>
<td>500,000</td>
<td>5/4</td>
<td>R17</td>
<td>600-10%</td>
<td>5/4</td>
</tr>
<tr>
<td>R9</td>
<td>1,000,000</td>
<td>5/4</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

FOR OTHER DATA SEE INDEX

MODEL R-458
**GOODYEAR TIRE & RUBBER CO., INC.** MODELS 015150, 016151

**Preliminary**

**Output Meter Connections**

- Generator Ground Lead Connection
- Dummy Antenna Value to Be in Series with Generator Output
- Connection of Generator Output Lead
- Generator Modulation
- Position of Volume Control

**Alignment Frequencies**

- Antenna Trimmer
- Oscillator Trimmer
- 1450 KC
- 1760 KC

**Intermediate Frequency**

- 455 K.C.

**Alignment Procedure**

**Alignment is to be made at the frequency shown at each trimmer connection. Where no voltage reading is shown, it indicates zero voltage or a very low reading.**

**Pilot Lamp:**

The pilot lamp is a 6.3 volt 150 mill type (No. 47) and should be replaced with such, in order that the filament voltages across the radio tubes do not change.

**Frequency Range:**

- Broadcast: 538 K.C. to 1760 K.C.

**Alignment Frequencies:**

- Antenna Trimmer
- Oscillator Trimmer
- 1450 K.C.
- 1760 K.C.

**Intermediate Frequency:** 455 K.C.

**Power Supply:**

- Power Main: 105-130 Volts AC/DC
- Power Consumption: 30 Watts

**Power Output:**

- Type: Single Class A
- Undistorted: 1.4 Watts
- Maximum: 2 Watts

**Illustration:**

- A schematic diagram of the radio circuit, showing the positions of the trimmers and connections for alignment.

**Alignment Procedure:**

- The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy.

**Alignment Measurements:**

- Across Loud Speaker Voice Coil: 195 Volts
- Receiver Chassis: See Chart Below
- See Chart Below: 30%, 400 Cycles
- Fully On: Fully On

- **Trimmer Positions:**
  - Closed: 453 K.C., .1 mfd., 12A8GT, T4-T5, I.F.
  - Closed: 453 K.C., .0002 mfd., Antenna Conn., T1 (Min. Output), Wave Trap
  - Fully Open: 1760 K.C., .0002 mfd., Antenna Conn., C13, Osc. Trimmer
  - Fully Open: 1450 K.C., .0002 mfd., Antenna Conn., C12, Ant. Trimmer

**Alignment notes:**

- Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.

- When adjusting T1, Antenna Wave Trap, Trimmer, increase generator output. To obtain clearly defined trimmer setting for a minimum output.

**MAR. 21, 1939**

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How the Automatic Push-Button Tuner Functions:

This unit is mechanically operated by means of a proven cam and lever action, designed to rotate a shaft 90 degrees. Since the variable gang condenser shaft must rotate 180 degrees, a 2 to 1 step up mechanical lever action is incorporated to give full rotation to the gang condenser. Three links are used to transmit the operation of the push-button to the variable gang condenser; first, a driver lever or link connected to the tuner lever bar, (see Pictorial); second, a driven lever arm connected to the gang condenser shaft; and third, a connecting link, connecting the two lever arms together mechanically.

The plunger bar that retains the screw type push-buttons, also holds a cam to itself by a shoulder rivet. This cam floats on the rivet proper and is locked into position with a small square plate, floating in the plunger bar. To lock cam into position, screw the push-button knob toward the right (clock-wise). The end of the push-button screw will then force a small square plate known as a brake shoe against the periphery of the cam. The push-button must be tightened firmly after the position of the station selection is determined. To change the setting of the cam, the push-button knob must be loosened by rotating it toward the left (counter-clockwise). When this push-button screw is loosened, it will automatically release the brake shoe from the cam, leaving the cam free to rotate and set its new position to the setting of the lever bar.

If it becomes necessary to realign the tuner in relation to the gang condenser, the following procedure should be followed to assure perfect tuning operation:

1. Attach driver arm to the lever bar by means of two machine screws, making sure that they are assembled with lockwashers and tightened securely.

2. Slip the drum assembly, which consists of the drum, drum hub, and the driven arm, over the variable condenser shaft but do not tighten set screws.

3. Connect these two lever arms by slipping the connecting link over the heads of the shoulder rivets. This link has a slight bend (offset) about 1/3 of its length and is to be installed with the shorter end towards the top and the offset towards the rear when looking at it from the drum end. Attach the tension spring between the two shoulder rivets. This spring is incorporated to take up all the unnecessary slack in the drive.

4. In making the final adjustment, that of setting the condenser in relation to the tuner, close the condenser completely to maximum capacity and rotate drum with the left hand in a clock-wise rotation, until the driver arm comes gradually down to within 1/4 of an inch of the variable condenser shaft. When in this position, tighten set screws in the drum hub with the right hand.

It is essential that all set screws be tightened securely so as to prevent a variation from original setting.

If, for some reason, a replacement is necessary for some particular item on the tuner proper, such as a lever bar, cam, plunger bar or brake shoe, it would be advisable to return the complete tuner proper for replacement.
Band 1 - 110 Kc to 410 Kc  
(2730 to 733 meters)  
Band 2 - 400 Kc to 1500 Kc  
(750 to 200 meters)  
Band 3 - 1.7 Mc to 5.9 Mc  
(177 to 51 meters)  
Band 4 - 5.3 Mc to 18 Mc  
(56 to 16.7 meters)  

NOTE: The SKYRIDER MARINE Model S22R is an AC-DC receiver which operates on 110/125 volts only. Should operation be desired from a lower voltage DC source, an external converter delivering 110/125 volts should be used. A 220 volt DC Model S22R is available on order and uses a special line cord with dropping resistor.

If an inverted "L" antenna is used, connect lead-in to A₁ and leave the jumper between A₂ and G₁. If an "all wave" doubler is used, connect the transmission line to A₁ and A₂ with the jumper removed from A₂ and G₁. A separate antenna may be used for one s-w band; use a half-wave antenna whose length can be calculated from 463

Length in feet = --------------------------  
Frequency in megacycles
ALIGNMENT PROCEDURE

1600 Kc IF ALIGNMENT

Set receiver to 5,000 Kc with the band switch in 'S' position.

Connect hot side of signal generator to an unused grid cap through a 3 MFD condenser - ground of generator to chassis. Signal generator output is 1,600 Kc.

Adjust screws S1 to S6 inclusive on IF transformers T 1-2-3 for maximum gain.

BFO ADJUSTMENT - With a 1600 Kc signal being fed into the IF amplifier, and the BFO switch ON, place the Pitch Control on the white dot UP. Now adjust the screw SP on the top of TZ for zero best. Further adjustment of the pitch control from the front of the panel will enable you to vary the frequency of the best note to your satisfaction.

Connect hot lead of signal generator to A4 through dummy antenna shown in Table. Leave jumper connected between A3 and A. Ground of Generator to Chassis.

<table>
<thead>
<tr>
<th>BAND</th>
<th>RECEIVER SETTING</th>
<th>SIGNAL FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>HIGH FREQUENCY END</th>
<th>LOW FREQUENCY END</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>125 Kc</td>
<td>330 Kc</td>
<td>450 Kc</td>
<td>1400 Kc</td>
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<td>2</td>
<td>2 M0</td>
<td>4.5 M0</td>
<td>7 M0</td>
<td>15 M0</td>
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<table>
<thead>
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<th>VOLTAGE OR PURPOSE</th>
<th>TYPE</th>
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<td>Paper</td>
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<tr>
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<td>Paper</td>
</tr>
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<td>400  V.</td>
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</tr>
<tr>
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<td>Ceramic</td>
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</tr>
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<td>400  V.</td>
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<td>400  V.</td>
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<tr>
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<td>400  V.</td>
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<td>.05 mfd</td>
<td>400  V.</td>
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R.F. ALIGNMENT

Connect hot lead of signal generator to A4 through dummy antenna shown in Table. Leave jumper connected between A3 and A. Ground of Generator to Chassis.

ELECTROLYTIC

<table>
<thead>
<tr>
<th>CONDENSER</th>
<th>PLUS-IN BALLAST</th>
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<tr>
<td>G4 25 C</td>
<td>G5 25 C 440 V</td>
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</table>

ANTENNA

R.F.

OSCIILLATOR

MODEL S-22R

SKYFISHER MARINE

THE HALLICRAFTERS INC.
Aligning I. F. System

Connect a 470KC signal Generator to the grid of the 6A7 converter tube through a .002MFD condenser. Connect an output meter across the speaker voice coil. Turn receiver volume control on full and with wave switch in broadcast position, adjust trimmers (74) and (75) (See Fig. 2) for maximum output. Then adjust (71) and (73) for maximum reading. Repeat adjustments on (74) and (75).

Broadcast and Short Wave Band Adjustments

Note: The following adjustments must proceed in the order specified
(1) Turn variable condenser to maximum capacity and set pointer as indicated in Fig. 3. Turn band selector switch to left or broadcast position. Tune set to a scale frequency of 1550KC and connect a 1550KC signal generator to the antenna post through a 200MMFD condenser. Loosen trimmer screw (66) and adjust trimmer (77) until signal is tuned in. Adjust trimmer (65) for maximum output.

(2) Then set band selector switch to extreme right or short wave position. Set signal generator to 18 megacycles and substitute a 400 ohm resistor for the 200MMFD condenser. Adjust trimmer (66) until signal is tuned in. At this point check the dial at 17.1 megacycles for the 18 megacycle image.

(3) Turn band selector switch to broadcast position and reset the signal generator to 1550KC. Substitute the 200MMFD condenser for the 400 ohm resistor in the generator lead and adjust trimmer screw (77) until signal is tuned in. Then tune receiver to 600KC on dial and with the signal generator, set to 600KC, rock the gang while adjusting trimmer (76) for maximum 1550KC and if incorrect, repeat 1550KC adjustment procedure outlined in Section (1).

All of the above adjustments must be made before pre-setting the "fingertip control" circuits.
Connect an output meter across the speaker voice coil and tune receiver volume control on full. Tune wire switch to manual position and variable condenser to extreme high frequency end of scale. Connect a 470 K.C. signal generator to the grid of the 6A7 tube through a condenser in the order of 100-200 Mfd capacity. Keep the signal to a low audible value and adjust trimmer (C4) (See Fig. 2) for maximum output. Then adjust trimmers (C) and (C1) (See Fig. 1) for maximum output. Finally repeat (C4) adjustment.

**Broadcast and Shortwave Band Adjustments**

Note: The following adjustments must proceed in order specified.

1. Turn variable condenser to maximum capacity and set pointer on small dot appropriately 1-2° above top horizontal scale division line. Tune to a scale frequency of 1550 K.C. and connect a 150 K.C. generator to antenna lead through a 100 Mfd condenser. Turn center knob to manual position. Volume control should be on full.

2. Loosen trimmer (C2) and adjust trimmer (C5) until signal is tuned in. Then adjust (C3) for maximum output.

3. Turn center knob to shortwave position, substitute a 200 ohm resistor for the condenser in the signal generator lead and set generator to a frequency of 18 megacycles. Tune set to 18 megacycles and adjust trimmer (C2) until signal is tuned in.

4. Turn center knob back to manual and substitute the 100 Mfd condenser for the 200 ohm resistor in the generator lead. Set signal generator to 1550 K.C. Tune set to 1550 K.C. and adjust trimmer (C5) until signal is tuned in. Set signal generator to 750 K.C. With the set tuned close to 750 K.C. on the dial, vary the gang condenser slowly back and forth, adjusting (C6) at the same time until maximum output is indicated. Finally, set dial for calibration accuracy against signal generator at the 1550 K.C. point. If found to be incorrect, repeat the 150 K.C. adjustment procedure outlined in step number (1).

All of the above adjustments must be made before pre-setting the automatic circuits.

---

**Fig. 1**

**Fig. 2**

---

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SETTING PUSH-BUTTONS:

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the top of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

   The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

   Follow through with this same procedure, setting up the other 3 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

   Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

   No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

   To receive all other stations in the regular manner turn the tuning knob to the frequency of the station desired.

F. Rider, Publisher
MODEL 690
GOODYEAR TIRE & RUBBER CO., INC.

NOTE:
C.4 and C.9 are in one unit P-118-1
C.7 and C.8 are in one unit P-116-1
C.22 and C.25 are in one unit P-118-17
R.16 and R.15 are in one unit P-106-6
Numbers prefixed by letter "P" are part numbers.

Volatges taken from points indicated to
chassis ground. Vol. control on full. no
signal.

Serial No. 40001 up.

DESCRIPTION:
Model 690 is a six tube superheterodyne receiver,
with an intermediate frequency of 175 K.C. and a tuning range of from
520 to 1550 K.C. This receiver has been carefully designed to
facilitate servicing. The top and bottom covers are both removable
and are fastened in place by spring clips. All adjustments
are accessible and any part replaceable without removing the chassis
from the cabinet.

SERVICE NOTES:
Voltages taken from different points of circuit to chassis are measured
with volume control full on, all tubes in their sockets and
speaker connected, with a voltmeter having a resistance of 1000
ohms per volt. These voltages are clearly indicated on the circuit
diagram.

In order to prevent signal from acting upon A.V.C. and affecting
accuracy of voltage measurements, aerial and ground leads
could be short circuited while making measurements.

All voltages are to be measured with 0.3 volts input to receiver.
Resistance of coils and transformer windings are indicated in
ohmic circuit diagram.

To check for open by-pass condensers, shunt each condenser with
another condenser of the same capacity and voltage rating, which
is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to
defective tubes or the tubes making poor contact with sockets or grid
caps making poor contact with the caps of the tubes. Tubes may
be checked very easily by replacing with other tubes which are
known to be good. If fuse blows out frequently and insulating
sleeve has been properly placed over fuse, the trouble is probably
in the diode and it should be replaced. Do not attempt to make
any adjustments on the transformers.

ANTENNA CONNECTION:
The antenna is connected to the receiver by means of the antenna
cable. The antenna wire is the single black wire projecting from
the driver of the cable. Splice this wire to the roof antenna lead and
ground the pig-tail shielding as close as to the corner post of
the car as possible.

On open and convertible models where underslung strap or
plate antennas are used it is necessary to ground the exhaust
pipe and muffler to the frame at both ends with heavy copper
braid.

CONNECTIONS TO BATTERY:
The battery cable, number 152-2, (red wire with fuse receptacle
at one end and terminal lug at other end) must be connected to
battery terminal of ammeter. At the same time connect ammeter
capacitor, number 148-3, to battery terminal of ammeter, other
end of condenser to any convenient grounded screw on back of
instrument panel. Make certain that insulating sleeve is slipped
over fuse, fuse is placed in receptacle, before connecting to
short battery cable from receiver.

When connected properly, the discharge due to current drawn by
the receiver should not indicate on the ammeter. This is important,
since if improperly connected, as shown by the deflection of
ammeter, additional motor interference may be encountered.

GENERATOR INTERFERENCE:
Remove the generator cutout mounting screw and fasten the
condenser (148-1) bracket on the generator cutout mounting lug.
Replace the cutout mounting screw and tighten down securely.
Connect the condenser lead to the battery terminal of the cutout.
The generator condenser is absolutely necessary as it is used to
eliminate a high pitched whining noise which would otherwise be
heard as the motor is accelerated.

RESISTORS
DUMMY ANTENNAS.
IF . . . . A 1 mmfd. condenser connected in series with the test oscillator output lead.
Broadcast . . A 200 mmfd. condenser connected in series with the output lead of the test oscillator.

CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL. VIII

©John F. Rider, Publisher
MODELS R-450, R-47C

I.F. PEAK - 455 KC
TRIM OSC. - 1730 KC
TRIM ANT. - 1400 KC

I.F. PEAK - 455 KC
TRIM OSC. - 1730 KC
TRIM ANT. - 1400 KC

ISSUE A
MARCH 1940

For SOCKET LAYOUT
See INDEX
MODELS R-452, R-453

B. F. GOODRICH

MODEL R-452

RESISTORS

<table>
<thead>
<tr>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
<th>No.</th>
<th>Ohms</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>250,000</td>
<td>1/4</td>
<td>R7</td>
<td>2,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R2</td>
<td>100,000</td>
<td>1/4</td>
<td>R8</td>
<td>500,000</td>
<td>1/4</td>
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<td>R3</td>
<td>250,000</td>
<td>1/4</td>
<td>R9</td>
<td>5,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>10,000,000</td>
<td>1/4</td>
<td>R10</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R5</td>
<td>25,000</td>
<td>1/4</td>
<td>R11</td>
<td>500,000</td>
<td>1/4</td>
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<tr>
<td>R6</td>
<td>150,000</td>
<td>1/4</td>
<td>R12</td>
<td>150-10%</td>
<td>1/4</td>
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</table>

No. | Capacity (Mfd.) | Volts |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>.05</td>
<td>200</td>
</tr>
<tr>
<td>C2</td>
<td>.001</td>
<td>200</td>
</tr>
<tr>
<td>C3</td>
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<td>400</td>
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<tr>
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<td>.0005</td>
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<td>400</td>
</tr>
<tr>
<td>C6</td>
<td>.01</td>
<td>400</td>
</tr>
</tbody>
</table>

CONVENTIONAL ALIGNMENT

In model 16 all common grounds become chassis, C1, C9, C10, R2 and R6 are omitted.

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

MONOL R-453

CONVENTIONAL ALIGNMENT

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

©John F. Rider, Publisher
The ECONOMIZER switch is located on the top left of chassis. Always have this switch in the "NEW" battery position when first placing the radio in operation or when installing a new battery.
Automatic Unit
Principle of Operation
The basic circuit of any radio receiver is the inductance coil and tuning condenser which determines the frequency to which the system is tuned. The frequency at which this circuit resonates can be varied in two ways; either by holding the inductance coil at a fixed value of inductance and changing the capacity of the condenser, or by holding the condenser at a fixed value of capacity and changing the inductance of the coil. This is so because the frequency is proportional to the inductance times the capacity and changing one or the other will change their product.

Previous push-button systems accomplished their purpose in one of two ways. They either rotated the tuning condenser mechanically with an electric motor, or disconnected the tuning condenser by means of a switch and substituted pre-set pads condensers in the antenna and oscillator circuits.

In the push-button system the entire oscillator circuit (coil and gang condenser) is disconnected and in its place is put a silvered mica condenser of fixed capacity and a coil, the inductance of which can be varied by means of an iron slug that moves with a screw adjustment, inside the coil. This is the second system of tuning mentioned above and has the following advantages in this case. The condenser is made by electroplating a small deposit of silver on each side of a piece of mica and encasing the whole unit in a weatherproof compound. The silver, having a low temperature coefficient has a negligible expansion with changes in temperature, and humidity has no effect because of the weatherproof compound. Therefore, changes in the condenser capacity are controlled. The coil is impregnated with a moisture-proof wax and the whole circuit is tuned by varying the inductance of the coil. The only uncontrollable factor in the system is the variation in capacity of the wiring and other parts. But this variation is so small that its detuning effect is not noticeable to the ear.

In the system the silvered mica condenser which tunes all six of the push-button coils is in the main part of the receiver and connected on the wave switch. The push-button coil is mounted on the push-button unit and are adjusted from the back by slotted screws. The adjustable padding condensers directly above the slotted screws are used to align the antenna coil in the receiver to each of the push button coils depending on which button is pushed. Variation in capacity of this padder has no effect on the tuning of the system. It simply drops the sensitivity slightly.

Instructions for Pre-setting “Fingertip Control”
Circuits for Six Stations in the Broadcast Tuning Range
The automatic tuning unit is located immediately above the receiver chassis, the circuits being adjustable from the rear of this unit. Although it is possible to adjust the circuits without the aid of a signal generator, for best results it is recommended that a serviceman be allowed to pre-set the tuning circuits in the following manner.

Turn the wave change switch to the left. Six stations in the broadcast band may be chosen, and the tabs on which are printed the call letters of these stations should be selected from the sheet provided and inserted in the engraved slots. It is preferable to place the tabs in the slots according to frequency; that is to say, the low frequency stations should appear at the left as the unit is faced and the high frequency stations at the right.

The frequency range of the automatic tuning circuits is as follows:

<table>
<thead>
<tr>
<th>Circuits</th>
<th>Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>1550-970 Kilocycles</td>
</tr>
<tr>
<td>3 and 4</td>
<td>250-750 Kilocycles</td>
</tr>
<tr>
<td>5 and 6</td>
<td>970-540 Kilocycles</td>
</tr>
</tbody>
</table>

Replacement Parts

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>Padder</td>
<td>34137</td>
</tr>
<tr>
<td>84</td>
<td>Oscillator Trans. Assy.</td>
<td>40141</td>
</tr>
<tr>
<td>85</td>
<td>Padder</td>
<td>34135</td>
</tr>
<tr>
<td>86</td>
<td>Oscillator Trans. Assy.</td>
<td>40135</td>
</tr>
<tr>
<td>87</td>
<td>Padder</td>
<td>34136</td>
</tr>
<tr>
<td>88</td>
<td>Oscillator Trans. Assy.</td>
<td>40138</td>
</tr>
</tbody>
</table>
530 to 1720 kilocycles
5.8 to 18.0 megacycles

Aligning I. F. System
Connect a 470KC signal generator to the grid of the 6A7 converter tube through a .002MFD condenser. Connect an output meter across the speaker voice coil. Turn receiver volume control on full and with wave switch in broadcast position, adjust trimmers (74) and (75) (See Fig. 2) for maximum output. Then adjust (71) and (73) for maximum reading. Repeat adjustments on (74) and (75).

Broadcast and Short Wave Band Adjustments
Note: The following adjustments must proceed in the order specified
(1) Turn variable condenser to maximum capacity and set pointer as indicated in Fig. 3. Turn band selector switch to left or broadcast position. Tune set to a scale frequency of 1550KC and connect a 1550KC signal generator to the antenna post through a 200MMFD condenser. Loosen trimmer screw (66) and adjust trimmer (77) until signal is tuned in. Adjust trimmer (65) for maximum output.

(2) Then set band selector switch to extreme right or short wave position. Set signal generator to 18 megacycles and substitute a 400 ohm resistor for the 200MMFD condenser. Adjust trimmer (66) until signal is tuned in. At this point check the dial at 17.1 megacycles for the 18 megacycle image.

(3) Turn band selector switch to broadcast position and reset the signal generator to 1550KC. Substitute the 200MMFD condenser for the 400 ohm resistor in the generator lead and adjust trimmer screw (77) until signal is tuned in. Then tune receiver to 600KC on dial and with the signal generator, set to 600KC, rock the gang while adjusting trimmer (76) for maximum 1550KC and if incorrect, repeat 1550KC adjustment procedure outlined in Section (1).

All of the above adjustments must be made before pre-setting the "fingertip control" circuits.
Fig. 1

Model 01006, 01007
GOODYEAR TIRE & RUBBER CO., INC.

Fig. 2

Aligning I. F.

Connect an output meter across the speaker voice coil and turn receiver volume control on full. Turn wave switch to manual position and variable condenser to extreme high frequency end of scale. Connect a 470 K.C. signal generator to the grid of the 6A7 tube through a condenser in the order of 0.002 mfd. capacity. Keep signal on a line audible range and adjust trimmers (C3) (See Fig. 2) for maximum output. Then adjust trimmers (C1) and (C2) (See Fig. 1) for maximum output. Finally repeat (C4) adjustment.

Broadcast and Shortwave Band Adjustments

Note: The following adjustments must be made in order specified:

(1) Turn variable condenser to maximum capacity and set pointer on small dot (no. 16) inch above top horizontal scale dividing line. Tune set to a frequency of 1550 K.C. and connect a 1550 K.C. generator to antenna lead through a 100 mfd. condenser. Turn center knob to manual position. Volume control should be on full.

(2) Loosen trimmer (C2) and adjust trimmer (C5), until signal is tuned in. Then adjust (C3) for maximum output.

(3) Turn center knob to shortwave position, substitute a 400 ohm resistor for the condenser in the grid generator lead and set generator to a frequency of 18 megacycles. Tune set to 18 megacycles and adjust trimmer (C2) until signal is tuned in.

(4) Turn center knob back to manual and substitute the 100 mfd. condenser for the 400 ohm resistor in the grid generator lead. Set signal generator to 1550 K.C. Tune set to 1550 K.C. and adjust trimmer (C5) until signal is tuned in. Set the grid generator to 600 K.C. and the set tuned close to 600 K.C. on the dial, vary the grid condenser slowly back and forth, adjusting (C5) at the same time until maximum output is indicated. Finally recheck dial for calibration accuracy against signal generator at the 1550 K.C. note. If found to be incorrect, repeat the 1550 K.C. adjustment procedure outlined in step number (1).

All of the above adjustments must be made before pre-setting the automatic circuits.

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SETTLING PUSH-BUTTONS:

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the top of the dial.

2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).

3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.

4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

Follow through with this same procedure, setting up the other 3 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

To receive all other stations in the regular manner turn the tuning knob to the frequency of the station desired.
**MODEL 690 GOODYEAR TIRE & RUBBER CO., INC.**

### NOTE:
- C.4 and C.9 are in one unit P-118-1
- C.7 and C.8 are in one unit P-118-1
- C.22 and C.25 are in one unit P-119-17
- C.10 and R.18 are in one unit P-100-6

Numbers prefixed by letter "P" are part numbers.

Voltages taken from points indicated to chassis ground. Vol. control on full, no signal.

**Serial No. 40001 up.**

**DESCRIPTION:**
- Model 690 is a six tube superheterodyne receiver, with an intermediate frequency of 175 K.C. and a tuning range of from 520 to 1550 K.C. This receiver has been carefully designed to facilitate servicing, the top and bottom covers are both removable and are fastened in place by spring clips. All adjustments are accessible and any part replaceable without removing the chassis from the cabinet.

**SERVICE NOTES:**
- Voltages taken from different points of circuit to chassis are measured with volume control full on, all tubes in their sockets and speaker connected, with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the circuit diagram.

In order to prevent signal from acting upon A.V.C. and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages are to be measured with 6.3 volts input to receiver.

**Resistance of coils and transformer windings are indicated in ohms on schematic circuit diagram.**

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Failure to operate, noisy or weak reception is usually due to defective tubes or the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tubes. Tubes may be checked very easily by replacing with other tubes which are known to be good. If fuse blows out frequently and insulating sleeve has been properly placed over fuse, the trouble is probably in the vibrator. It should be replaced. Do not attempt to make any adjustments on the vibrators.

**ANTENNA CONNECTION:**
- The antenna is connected to the receiver by means of the antenna cable. The antenna wire is the single black wire projecting from the end of the cable. Splice this wire to the roof antenna lead and ground the pig-tail shielding as close to the corner post of the car as possible.

On open and convertible models where underslung strap or plate antennas are used it may be necessary to ground the exhaust pipe and muffler to the frame at both ends with heavy copper braid.

**CONNECTIONS TO BATTERY:**
- The battery cable, number 152-2, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 148-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before connecting to short battery cable from receiver.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.

**GENERATOR INTERFERENCE:**
- Remove the generator cutout mounting screw and fasten the condenser (148-1) bracket on the generator cutout mounting lug. Replace the cutout mounting screw and tighten down securely. Connect the condenser lead to the battery terminal of the cutout. The generator condenser is absolutely necessary as it is used to eliminate a high pitched whining noise which would otherwise be heard as the motor is accelerated.

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PILOT LAMP:
The pilot lamp is a 6.3 volt 150 Mill. type (No. 47) and should be replaced with such, in order that the filament voltages across the radio tubes do not change.

FREQUENCY RANGE:
Broadcast ........................................ 538 K.C. to 1760 K.C.

ALIGNMENT FREQUENCIES:
Antenna ........................................ Oscillator
Trimmer ........................................ 1450 K.C.
Trimmer ........................................ 1760 K.C.

INTERMEDIATE FREQUENCY ............ 455 K.C.

POWER SUPPLY:
Power Main .................................. 105-130 Volts AC/DC
Power Consumption .......................... 30 Watts

POWER OUTPUT:
Type ........................................ Single Class A
Undistorted .................................. 1.4 Watts
Maximum ..................................... 2 Watts

ALIGNMENT PROCEDURE
Across Loud Speaker Voice Coil
155 Volts
Receiver Chassis
See Chart Below
See Chart Below
30%, 400 Cycles
Fully On

The alignment procedure should be repeated in the original order, step by step, to insure greater accuracy. Always keep the output power from the generator at its lowest possible value to prevent the A.V.C. of the receiver from interfering with accurate alignment.

When adjusting T1, Antenna Wave Trap, Trimmer, increase generator output. To obtain clearly defined trimmer setting for a minimum output.

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HOW THE AUTOMATIC PUSH-BUTTON TUNER FUNCTIONS:

This unit is mechanically operated by means of a proven cam and lever action, designed to rotate a shaft 90 degrees. Since the variable gang condenser shaft must rotate 180 degrees, a 2 to 1 step up mechanical lever action is incorporated to give full rotation to the gang condenser. Three links are used to transmit the operation of the push-button to the variable gang condenser: first, a driver lever or link connected to the tuner lever bar, (see Pictorial); second, a driven lever arm connected to the gang condenser shaft; and third, a connecting link, connecting the two lever arms together mechanically.

The plunger bar that retains the screw type push-buttons, also holds a cam to itself by a shoulder rivet. This cam floats on the rivet proper and is locked into position with a small square plate, floating in the plunger bar. To lock cam into position, screw the push-button knob toward the right (clock-wise). The end of the push-button screw will then force a small square plate known as a brake shoe against the periphery of the cam. The push-button must be tightened firmly after the position of the station selection is determined. To change the setting of the cam, the push-button knob must be loosened by rotating it toward the left (counter-clockwise). When this push-button screw is loosened, it will automatically release the brake shoe from the cam, leaving the cam free to rotate and set its new position to the setting of the lever bar.

If it becomes necessary to realign the tuner in relation to the gang condenser, the following procedure should be followed to assure perfect tuning operation:

1. Attach driver arm to the lever bar by means of two machine screws, making sure that they are assembled with lockwashers and tightened securely.

2. Slip the drum assembly, which consists of the drum, drum hub, and the driven arm, over the variable condenser shaft but do not tighten set screws.

3. Connect these two lever arms by slipping the connecting link over the heads of the shoulder rivets. This link has a slight bend (offset) about 1/3 of its length and is to be installed with the shorter end towards the top and the offset towards the rear when looking at it from the drum end. Attach the tension spring between the two shoulder rivets. This spring is incorporated to take up all the unnecessary slack in the drive.

4. In making the final adjustment, that of setting the condenser in relation to the tuner, close the condenser completely to maximum capacity and rotate drum with the left hand in a clock-wise rotation, until the driver arm comes gradually down to within ½ of an inch of the variable condenser shaft. When in this position, tighten set screws in the drum hub with the right hand.

It is essential that all set screws be tightened securely so as to prevent a variation from original setting.

If, for some reason, a replacement is necessary for some particular item on the tuner proper, such as a lever bar, cam, plunger bar or brake shoe, it would be advisable to return the complete tuner proper for replacement.
Band 1 - 110 Kc to 410 Kc
(2730 to 733 meters)
Band 2 - 400 Kc to 1500 Kc
(750 to 200 meters)
Band 3 - 1.7 Mc to 5.9 Mc
(177 to 51 meters)
Band 4 - 5.3 Mc to 18 Mc
(56 to 16.7 meters)

If an inverted "L" antenna is used, connect lead-in to A1 and leave the jumper between A2 and G. If an "all wave" doubler is used, connect the transmission line to A1 and A2 with the jumper removed from A2 and G. A separate antenna may be used for one s-w band; use a half-wave antenna whose length can be calculated from 463

Length in feet = ---------------------
Frequency in megacycles
ALIGNMENT

PROCEDURE

ALIGNMENT INSTRUCTIONS:
1. Equipment needed for aligning:
   1 - An all-wave signal generator which will provide an accurately calibrated signal at the test frequencies indicated.
   2 - Output indicating meter connected to a headphone jack, and inserted in the headphone jack.
   3 - Non-metallic screw driver.
   4 - Dummy antenna of .002 mfd, condenser and 400 ohm resistor.

SETTING OF CONTROLS PRIOR TO ALIGNMENT - IF AND RF.
1 - Tune control at maximum high frequency position.
2 - A.V.C. switch OFF.
3 - BFO switch OFF.
4 - AF Gain at maximum.
5 - RF Gain at maximum.

R.F. ALIGNMENT

Connect hot lead of signal generator to A1 through dummy antenna shown in Table. Leave jumper connected between A2 and O. Ground of Generator to Chassis.

<table>
<thead>
<tr>
<th>BAND</th>
<th>REG. DIAL</th>
<th>SIG. GEN.</th>
<th>DUMMY</th>
<th>HIGH FREQUENCY END</th>
<th>LOW FREQUENCY END</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FREQ.</td>
<td>FREQ.</td>
<td>ANTENNA</td>
<td>ADJUST OSC. WITH</td>
<td>ADJUST TRIMMERS WITH</td>
</tr>
<tr>
<td>1</td>
<td>125 Kc</td>
<td>125 Kc</td>
<td>.002 mfd</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td></td>
<td>300 Kc</td>
<td>300 Kc</td>
<td>.002 mfd</td>
<td>C1</td>
<td>C1-C1</td>
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<tr>
<td></td>
<td>400 Kc</td>
<td>400 Kc</td>
<td>.002 mfd</td>
<td>C2</td>
<td>C2-C2</td>
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<tr>
<td></td>
<td>1600 Kc</td>
<td>1600 Kc</td>
<td>.002 mfd</td>
<td>C3</td>
<td>C3-C3</td>
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<tr>
<td>2</td>
<td>2 Mc</td>
<td>2 Mc</td>
<td>400 Ohm</td>
<td>————</td>
<td>————</td>
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<tr>
<td></td>
<td>4.5 Mc</td>
<td>4.5 Mc</td>
<td>400 Ohm</td>
<td>C4</td>
<td>C4-C4</td>
</tr>
<tr>
<td>3</td>
<td>7 Mc</td>
<td>7 Mc</td>
<td>400 Ohm</td>
<td>————</td>
<td>————</td>
</tr>
<tr>
<td></td>
<td>15 Mc</td>
<td>15 Mc</td>
<td>400 Ohm</td>
<td>C5</td>
<td>C5-C5</td>
</tr>
</tbody>
</table>

NOTE: Value in Ohms Wattage or Purpose

| R1   | 100,000   | 1/2 | R7   | 250,000   | 1/2 |
| R2   | 300       | 1/2 | R8   | 1 Meg.   | 1/2 |
| R3   | 25,000    | 1/2 | R9   | 500,000   | 1/2 |
| R4   | 1,000     | 1/2 | R10  | 50,000    | 1/2 |
| R5   | 100,000   | 1/2 | R11  | 140       | 1/2 |
| R6   | 100,000   | 1/2 | R12  | 5,000     | 1/2 |
| R7   | 500       | 1/2 | R13  | 250,000   | 1/2 |
| R8   | 1,000     | 1/2 | R14  | Plug-in Ballast Tube Water-Type 12K290 |
| R9   | 1,000     | 1/2 | R15  | Plug-in Ballast Tube Water-Type 12K290 |
| R10  | 100,000   | 1/2 | R16  | 1,000     | 1/2 |

ELECTROLYTIC CONDENSERS: Plug-in Ballast 12K290
THE HALLICRAFTERS INC.

MODEL SX28
Super Skyrider

Power Consumption—at 117 volts—60 cycles—138 watts
Power Consumption—DC operation—18 amp. at 6 volts or 108 watts
Power Output—8 watts undistorted
Sensitivity—for 0.5 watts output—Bands 1 to 5—2 MV
and under, 6th band 4 MV
Selectivity—IF broad (high fidelity) 12 kc
IF Sharp 4.1 kc
Frequency Range RF—Note: These are the actual frequencys corresponding to nominal figures indicated on the front panel.

550 to 1,620 kilocycles
1.5 to 3.1 megacycles
2.9 to 5.9 megacycles
5.75 to 11.5 megacycles
10.3 to 21.5 megacycles
20.4 to 42 megacycles

Frequency response AF: audio filter out broad IF—tone control high-70 to 3000 cycles = 25 db
Speaker Output Impedances—5000 and 500 ohms
Intermediate Frequency—455 kc

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The following measurements made with a 20,000 ohms per volt meter and taken from the socket terminal indicated to ground or receiver chassis. Antenna and ground were disconnected from the receiver when these measurements were taken and the RF and AF gain controls set at maximum. "DL" means Dead Lug but will indicate voltage when used as a tie. Normal tolerance allows a variation of +10% from the indicated values.

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**Alignment Procedures**

Alignment is a process of setting up the receiver's components to their optimum performance. Generally speaking, alignment means to set the frequency counters to the proper frequency and then adjust the receiver's components to ensure that they are functioning correctly. This process is important because it ensures that the receiver is working at its best and that it is responsive to the signals it receives. Proper alignment can also help to extend the life of the receiver and prevent damage to its components. The procedures for aligning the receiver vary depending on the manufacturer and model of the receiver, but generally involve the use of a frequency counter and some simple tools like a screwdriver and a set of resistors.

**Alignment of the Model SX28 Super Skyrider**

The alignment of the Model SX28 Super Skyrider involves setting the frequency counters to the proper frequency and then adjusting the receiver's components to ensure that they are functioning correctly. This process is important because it ensures that the receiver is working at its best and that it is responsive to the signals it receives. Proper alignment can also help to extend the life of the receiver and prevent damage to its components. The procedures for aligning the receiver vary depending on the manufacturer and model of the receiver, but generally involve the use of a frequency counter and some simple tools like a screwdriver and a set of resistors.
Without changing the frequency of the generator after completing I.F. alignment—turn BFO switch "OFF" and remove modulation from the signal generator. Adjust arrow b to the desired tone, (approximately 1000 cycles).

NOTE: 1. It is also possible to adjust the BFO without the aid of the signal generator by turning the knob and nearest resonance with the BFO switch "OFF"—with BFO "ON" adjust arrow b to desired tone.

Connect both leads of signal generator to BLUE wire of antenna plug and not side of generator to BLACK wire. A dummy antenna is unnecessary.

Insert "long-antenna" plug, furnished with receiver, into antenna socket and connect generator as indicated in chart below. A condenser in the receiver in series with the blue lead comes necessary for the receiver to operate at a frequency higher than the antenna is folded and the cover removed thus.

NOTE: On #2 and #4 Bands, it may be necessary to "tune" the main tuning condenser to compensate for slight shift in oscillator frequency when adjusting the trimmers and align for maximum gain. Less than the signal frequency on #4 band.

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<td>29</td>
<td>0.05 mfd</td>
<td>600 Paper</td>
</tr>
<tr>
<td>30</td>
<td>0.05 mfd</td>
<td>600 Paper</td>
</tr>
<tr>
<td>31</td>
<td>0.0001 mfd</td>
<td>Mica</td>
</tr>
<tr>
<td>32</td>
<td>0.0001 mfd</td>
<td>Mica</td>
</tr>
<tr>
<td>33</td>
<td>0.0001 mfd</td>
<td>Mica</td>
</tr>
<tr>
<td>34</td>
<td>No. 4066 800 mfd</td>
<td>Variable Pad</td>
</tr>
<tr>
<td>35</td>
<td>0.0019 mfd</td>
<td>25 Mica</td>
</tr>
<tr>
<td>36</td>
<td>0.0007 mfd</td>
<td>25 Mica</td>
</tr>
</tbody>
</table>

ERRORS TO BE CONSIDERED

1. THE OPERATOR - Errors of the operator which depend entirely on his experience, may be difficult to predict. After the operator has familiarized himself with the adjustment of the "SHARPNESS" control, he need only allow about 1/2 degree on strong static-free signals that produce a NULL of about 0 degrees width. If the NULL should cover 10 degrees after the adjustment, the same can be reduced by less than 2 degrees.

2. MOTION OF THE VESSEL - Yawing and pitching usually affect the ship's course. The operator must apply the correct magnetic deviations to the compass indication and must sometimes estimate possible errors at the time readings are taken.

3. MAGNETIC ERROR - occurs in plotting the earth's magnetic field on the conventional MAGNETIC CHART. Since the NULL correction is necessary only on rare occasions, as shown by Figure 7, it will not be treated in detail.

4. LAND EFFECT - occurs when the signal passes over land before its course over water. In this respect, radio waves are comparable to light passing through materials of various densities. (Figure 8 illustrates the error).

CAUTION - Do not rely on readings taken over land or along a shoreline.

5. NIGHT EFFECT - is most noticeable at sunrise and sunset. Radio waves are reflected back to earth at night than during daylight. It is evident by the broadening of the NULL and possible shifts in apparent bearings taken at distances greater than 250 miles. Over short ranges the effect is negligible.

6. RADIO COMPASS DEVIATION - must be determined and accounted for as in the magnetic compass. A calibration curve (Figure 10) determined as indicated by the self-explanatory Figure 9, must be made with the aid of the HELMERS, immediately after installation.

If the RADIO COMPASS is not in line with the LOMBER LINE, the CALIBRATION curve will be similar to that shown by the dotted line.
H.F. OSCILLATOR AND R.F. ALIGNMENT

Connect the equipment as shown in the layout. Don't forget to remove the speaker cover and reinstall it after the alignment procedure is completed.

To check the alignment, follow these steps:
1. Adjust the antenna trimmer (T) until a sharp break is heard in the speaker. This is the resonant frequency of the antenna coil.
2. Adjust the antenna trimmer (T) until the speaker is loudest. This is the resonant frequency of the speaker coil.
3. Adjust the antenna trimmer (T) until the speaker is loudest again. This is the resonant frequency of the speaker and antenna coils.
4. Adjust the antenna trimmer (T) until the speaker is loudest again. This is the resonant frequency of the speaker and antenna coils.

5. Check the alignment by comparing the output of the alignment receiver with the alignment chart supplied with the equipment.

6. If the alignment is incorrect, adjust the antenna trimmer (T) until the speaker is loudest again. This is the resonant frequency of the speaker and antenna coils.

7. Check the alignment again by comparing the output of the alignment receiver with the alignment chart supplied with the equipment.

8. If the alignment is still incorrect, repeat steps 5 through 7.

9. When the alignment is correct, install the speaker cover and reconnect the leads to the speaker and antenna coils.

10. Check the alignment again by comparing the output of the alignment receiver with the alignment chart supplied with the equipment.

11. If the alignment is still correct, the equipment is aligned and ready for use.

POWER SUPPLY

1. Power transformer 110 volts 60 cycle A.C.
2. Filter choke (X)
3. C.C. filter condensers (Y)
4. Power block for 250, 500, 750, 1000, 1500, 2000 cycles
5. Speaker filter terminals
6. Power supply for 250, 500, 750, 1000, 1500, 2000 cycles

VOLTAGE CHART

The "Super-OO" is available in four different frequencies. Such information as given in this book will pertain to all models. The two standard models have the following tuning ranges:

SP-200 - 1500 cycles
SP-200A - 2500 cycles

Below is a photo of the equipment with the tuning range adjustments as described above.

SELECTIVITY

The selectivity curve shown on page 29 are representative curves made on a sample receiver and will hold reasonably true for all models. These curves were taken with the external speaker operating at the intermediate frequency and these curves will vary within the entire range of the receiver, except at the very low frequencies. The selectivity curve on page 29 is a typical curve and the selectivity curve on page 29 is a typical curve and the upper curve is representative of the above graph.

The selectivity curve on page 29 is a typical curve and the selectivity curve on page 29 is a typical curve and the upper curve is representative of the above graph.

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NOTE:

The equipment described in this manual is designed and manufactured by HAMMARLING MFG. CO., INC. for use with FM radio receivers only. The equipment is shipped with the equipment in the box. The equipment is not designed for use with AM radio receivers or with televisions. The equipment is not designed for use with FM radio transmitters or for use with FM radio broadcasting. The equipment is not designed for use with FM radio broadcasting. The equipment is not designed for use with FM radio broadcasting.
OPERATION

"SUPER-PRO" MODEL SP-200-1X

Although the "Super-Pro" is a highly technical piece of equipment, with quite a few features and functions, it is not difficult to operate. There are 15 controls on the panel. However, they are not all used at the same time. The number of controls necessary for operation is determined by the type of service in which the receiver is being used. The major controls are the band switch, main tuning, band spread, and audio gain. The seven main tuning, band spread, and audio gain controls are brought into play as necessary during the course of the operation. One assumes that the speaker, power supply and antenna have been connected correctly and functioning.
SOLOVOX TUBE SOCKET VOLTAGES

These readings are taken with a 1000 ohms-per-volt meter, having three scales of 15, 150 and 600 volts. All voltages are taken with a line voltage of 117 and deviations of as much as 20% may be caused by line voltage variations. All controls are off, the volume control is in its softest position, and no key is depressed unless specified. The negative lead of the voltmeter is connected to chassis ground.

FIGURE 6

FIGURE 7

TERMINAL VOLTAGES

Tubes V1 and V12 cathodes (any key depressed) 50 volts Control tube cathodes (tubes operating)

Tubes V13 and V14 plates 305 volts Output tube plates

Tubes V13 and V14 screens 290 volts Output tube screens

Terminal D (volume control in softest position) 24 volts Output tube bias

Terminal D (volume control in loudest position) 8 volts Control tube grids

Terminal E (positive lead connected to ground) 76 volts Speaker field

A.C. VOLTAGES

Heater voltage in all tubes except V8 6.3 volts R.M.S.

Rectifier tube V9 filament voltage 5.0 volts R.M.S.

Ground to either plate of rectifier tube 400 volts R.M.S.

A.C. Ripple voltage across speaker field 3.5 volts R.M.S.
Hammott INSTRUMENT CO.

Tuning

The Solovox remains in tune indefinitely. However, because of the variation in pitch of the piano or other instrument with which the Solovox is to be played, a tuning adjustment knob has been provided. (The tuning knob, about the size of the end of a pencil, projects through the curved surface of the woodwork near one corner of the tone cabinet.)

Tuning the Solovox is a very simple matter as all of the tones are simultaneously tuned by making this single adjustment. Clockwise turning of the knob lowers the pitch and counter-clockwise turning raises it. For greatest accuracy, only the "CONTRALTO," "VIBRATO OFF," and "DEEP TONE" control knobs should be "in" and the middle octave F, F# or G keys of the Solovox tuned to the corresponding piano notes. (A control tab is "in" when the top of the tab is pushed in.)

Some favor tuning the Solovox a little sharper than the piano. We do not recommend too much of this, but in no case should it be at all flat to the piano.

There is another so-called "true tuning adjustment" in the form of a control on the back of the tone cabinet. We suggest that you leave this alone, unless you want to get into something considerably more complicated, which is described further on in the technical section of this leaflet.

Limit of Tuning

Whereas the tuning of the single tuning knob tunes all notes of the Solovox, there is a limit which cannot be exceeded before something starts to go wrong with the notes in some octaves. (Notes "GARBLE" or play exactly one octave up, or an exact musical fifth down.)

A second very simple adjustment will then fix these notes as well, and you will find it easy to make this adjustment, if the occasion should arise, by following the procedure given below, called "Adjustment of Oscillators".

Of course you need not bother with these adjustments unless you hear the "GARBLE" or wrong octave effect.

Adjustment of Oscillators

If some notes are noisy or play the wrong pitch, adjust the oscillator as follows: Push in the "SOPRANO," and "DEEP TONE" controls with all others off. Tune highest F# or corresponding F# on piano with tuning knob, paying no attention to what other notes do. Notes in the highest octave of the Solovox will now have the same pitch as the top octave of the piano.

Holding down the F# key in the middle octave of the Solovox, place a screwdriver in the "second oscillator adjustment" slot (See page 1 on backside of this leaflet) and turn it, first one way and then the other. The instrument will play higher than the right pitch in one direction, and lower in the other, while in the range between it will play an F# note of the same pitch as the second highest F# key on the piano. The pitch can be checked by making sure that there is no sudden jump in pitch between the Solovox middle octave B and the highest octave C. When the proper pitch is determined, find the farthest point in each direction where it will play this note, and place the slot exactly midway between these limits.

Holding down the lowest octave Solovox F# key, repeat this procedure with the "third oscillator adjustment." As before, there should be a smooth transition in pitch between the B note of the octave being adjusted, and the C note of the next octave above, which has already been adjusted.

To adjust the fourth oscillator, hold down the lowest octave F# key with only the "CONTRALTO," and "DEEP TONE" controls up. For the fifth oscillator use "TENOR," and "DEEP TONE," and for the sixth oscillator adjustment, use "BASS," and "DEEP TONE," holding the lowest F# key in each case.

Adjustment of Maximum Volume Control Knob

The maximum volume obtainable is controlled by a knob located under the keyboard to the left of the volume control, and regulates the maximum loudness when the key-operated lever is all the way to the right. With the lever in this position the knob may be turned by the player to suit himself.

To determine where to set this knob, first set the controls to some useful setting such as "TENOR" and "DEEP TONE." Now move the key-operated volume control as far as it will go to the right, hold down some key such as middle C, and turn the maximum volume control knob to the right until the volume becomes as loud as is useful. Do not turn the knob to the right any further as to do so will only mean that the key-operated volume control will become unnecessarily sensitive which is particularly undesirable for the novice and beginner.

When playing in large halls, or with other instruments, it may be found advantageous to increase this maximum volume very materially. Under these conditions, when a very loud tone is played, the quality will become very bright. This increase in brilliance produces many novel tone qualities which are useful under conditions where a loud piercing tone is desirable.

HOW THE SOLOVOX WORKS

All of the notes of the Solovox are controlled by a single radio vacuum tube master oscillator operating at the audio frequencies of the highest octave of the instrument (2933.961 c.p.s.). Each time a key is depressed, a switch under it tunes this master oscillator to the pitch associated with the key in its highest octave range. Thus, whatever a "C" key is depressed (the tuning key contacts for all the "C"s are in parallel), this oscillator is tuned to 2933.961 c.p.s., which is its lowest frequency. If a "B" note is depressed the frequency will be 3951 c.p.s., which is its highest frequency.

The output of this master oscillator controls the frequency of a first controlled oscillator (called the "buffer oscillator") which is adjusted to operate at the same frequency as the master oscillator. The output of this buffer oscillator, in turn, controls the frequency of the second controlled oscillator so adjusted to oscillate at one-half the frequency of the first oscillator. This new frequency corresponds to a note of one octave lower than the buffer oscillator.

Similar cascaded oscillators provide pitches of two, three, four and five octaves below that of the buffer oscillator. In this way, each time the master oscillator is tuned to some given note, each of these six controlled oscillators produces a note which is in exact octave relation to the master, thus forming a series of six notes in exact octave relationships. The particular oscillator selected for sounding through an amplifier and speaker depends upon the particular playing key depressed, and upon which of the BASS, TENOR, CONTRALTO or SOPRANO controls are used. A second contact under each key operates an electrical relay, having contacts to select the desired oscillator.

There are three relays—one for each of the three octaves of keys. A further function of the second key contact is to transmit the signal to the speaker with a controlled rate of attack so as to be musically abrupt. Tuned electrical circuits and tone controls similar to radio tone controls alter the quality of tone over a wide range.
The Oscillators

All the tones of the Solovox are controlled by a single vacuum tube oscillator called the "MASTER OSCILLATOR" (V1, Figure 1). This oscillator operates at any one of the twelve audio frequencies comprising the twelve notes of the highest octave range of the instrument (2093 cycles to 9521 cycles). Each key is depressed, a contact under it closes to tune this oscillator to the pitch associated with that key. For instance, whenever any C key is depressed (there are three C keys on the keyboard), this master oscillator is tuned to 2093 cycles, its lowest frequency. If, on the other hand, any one of the three B keys is depressed, the master oscillator will operate at 9521 cycles, its highest frequency. If, on the other hand, any one of the three B keys is depressed, the master oscillator will operate at 9521 cycles, its highest frequency.

The three relays which tune the master oscillator are shown at the left of Figure 1, and are located in the vibrator boxes fastened to the Solovox keyboard.

The output of this master oscillator controls the frequency of the first controlled oscillator, called the "BUFFER OSCILLATOR" (V2, Figure 1), which operates at the same frequency as the master oscillator.

Following this buffer oscillator is the SECOND CONTROLLED OSCILLATOR, whose frequency is tuned to approximately one-half that of the frequency of the buffer oscillator. Furthermore, its frequency is stabilized to be exactly one-half that of the buffer oscillator by applying a "locking" signal to the buffer oscillator in the grid circuit. The amount of this locking signal is regulated by a potentiometer. Thus, the output frequency of the second controlled oscillator is an octave lower in pitch than the master oscillator.

Similarly, the third, fourth, sixth, and ninth CONTROLLED OSCILLATORS provide respective outputs of exactly one, three, four, and five octaves lower in pitch than that of the master oscillator. A potentiometer associated with each provides the correct amount of locking signal. It is to be noted that these controlled oscillators (being of the relaxation type), are readily tuned by altering their grid bias. It is a function of the tuning resistors in parallel with the tuning condensers to apply the appropriate grid bias to tune all of the controlled oscillators simultaneously to their approximate sub-octave frequencies. The amount of bias varies, depending upon which tuning contact is connected by a playing key, and the frequencies of the controlled oscillators will correspondingly.

When no key is depressed, all the oscillators operate at their highest pitches ("B" notes). Thus, whenever a key other than "B" is depressed, all oscillators shift simultaneously from their "B" frequencies to the frequencies corresponding to the key depressed. The tuning condensers accurately tune the master oscillator, and the tuning resistors tune the controlled oscillators. By interconnecting the controlled oscillators in series, the resulting composite tone will be heard, consisting of the output of several oscillators simultaneously sounding in their octave relations to each other.

Other contacts associated with each of the relays serve to prevent undesirable tones from occurring when two keys are simultaneously depressed in adjacent octave groups through a legato style of playing on the part of the musician. If two keys are depressed within one of the three octave groups, the lowest pitch of the two will be automatically selected for sounding through the speaker.

The "Mute"

The signal from the plate of the preamplifier tube V9 is fed to the grid of the "MUTE" tube. This tube operates nearly linearly to suppress the sharp overshoot of the input signal wave form, and thus reduces the tone more mellows. When this muted effect is not desired, the mute switch is used to by-pass this portion of the circuit.


Following the "mute" is a series of tone controlling circuits arranged to alter the frequency characteristic of the amplifier in a manner similar to radio tone controls. For instance, with "DEEP TONE" the tone signal develops across a condenser which emphasizes the low frequencies; with "FULL TONE" the signal develops across a resistor with a small condenser in shunt, which leaves the frequency characteristic essentially flat except for the very high frequencies; "FIRST VOICE" puts a resistance in the 500 cycle tone; "SECOND VOICE" puts a resonance near 1000 cycles; and with "BRILLIANT" the signal develops across an inductance, L16, emphasizing the higher frequencies. It is to be noted that these tone control circuits are connected in series, and may be used singly or in groups.

Control Tubes V11 and V12

As mentioned before, the control contacts are connected to the playing keys serve to remove the cutoff bias from control tubes V11 and V12, as well as to operate one of the three relays. This is explained by considering that the cathodes of tubes V11 and V12 are connected to the mid-point of the voltage divider shown to the left of the control tubes in Figure 1. When no playing key is down, the voltage is about 165 volts positive with respect to ground, and, therefore, these tubes are cut off. When any playing key control contact is closed, the resistance of the relay coil is put in parallel with the 6000 ohm resistor and this causes the cathode voltage to drop to 50 volts. This removes the cutoff bias from tubes V11 and V12, which are the cathodes of the control tubes. For all knee-operated rheostats the 16 mfd. condenser across the 6000 ohm resistor serves to make the normal attack and decay rate smooth. A 1 mfd. condenser connected between the control tube cathodes and the center tap of transformer T9 produces a slow rate of attack but can be disconnected if desired by operating the "fast attack" switch.

Volume Control

The volume of the Solovox is controlled by a knee-operated rheostat. This rheostat is actually a switch connected to seven fixed resistors, and is, therefore, not subject to wear as is the usual type of volume control. This rheostat forms part of a voltage divider circuit which varies the grid bias to the remote cutoff control tubes V11 and V12, and, therefore, changes the gain of these tubes to produce a corresponding change of volume in sound from the speaker. The grid nonlinearity varies from approximately ±45 volts at the maximum volume position (depending on setting of maximum volume control), to ground potential at the minimum position.

The Vibrato

The vibrato effect is produced by means of a magnetically driven reed having a small piece of powdered iron attached to it in such a way as to vibrate in and out of a coil placed beside the reed. Thus, the inductance of the coil varies periodically as the powdered iron core swings in and out of it. This coil is connected to a tap on the master oscillator tuning coil, and causes the oscillator frequency to vary, producing a vibrato effect. This effect is caused to swing when the volume control lever is pulled forward in starting the instrument. After the reed is once started, the magnetic drive keeps it in motion as long as the instrument is on.

Tuning

The Solovox, as a whole, is tuned by adjusting the frequency of the master oscillator. The tuning knob accomplishes this by moving a powdered iron core in and out of resonance L1.

Power Output Tubes

V13 and V14 are power output pentodes connected in the usual push-pull manner to drive the loud speaker. The speaker field functions as a voice coil in the power supply system.

Power Supply

The power supply of the Solovox uses a single rectifier tube V8.

Note that control tubes V11 and V12 have a separate heater winding on power transformer T9. This prevents an appreciable difference in potential from arising between the heaters and cathodes of control tubes V11 and V12.

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PRACTICAL SERVICE SUGGESTIONS

The materials and electrical parts in the Hammond Solovox are of the highest quality available. Aside from occasional replacements of a vacuum tube, no service problems need be expected to arise. A few conditions which might possibly be encountered are listed below which will enable a radio service technician to correct them without difficulty. Some additional information useful to the service technician in tuning, is given in the first section entitled "TUNING AND SIMPLE ADJUSTMENTS."

If any of the following conditions appear, first make sure that the three cable connectors in the left end of the keyboard under the paper are secure. The faces of the plugs and their receptacles should be together. If the Solovox does not play properly, this is the most likely cause.

1. Changing tubes—There are fourteen tubes in the Solovox: Six type 7A4, four type 7A7, two type 785, one type 718, and one type 5Y3G. These are all standard radio tubes, and can be tested and replaced, if necessary, by any radio dealer. All tubes can be reached from the back of the tone cabinet. A metal guard covering the lower row of tubes is easily removed by taking out two screws—see Fig. 4. Be sure in replacing all tubes in the exact sockets from which they came.

If any of the 7A4 tubes are replaced, the oscillators should be realigned as described under "Adjustment of Oscillators," Page 2.

The two type 7A7 control tubes (V11 and V12, located in the amplifier channel, Fig. 1) should be matched to avoid undesirable thumps when keying. It is therefore recommended that both be replaced at the same time with new tubes of the same make.

2. Some notes are noisy or play the wrong pitch. If a note is noisy, it may be due to (A) a faulty oscillator adjustment, (B) a faulty relay contact, or (C) a faulty key contact. To ascertain which of these is the cause, follow this procedure:
   (A) If the trouble lies in a faulty oscillator adjustment, the corresponding note octave lower in pitch will also be noisy because it is controlled by the higher oscillator. If, on the other hand, the lower note is noisy, it indicates that the oscillator adjustment is satisfactory. In the event that readjustment is necessary, check as described in "TUNING AND SIMPLE ADJUSTMENTS." If any notes still do not play correctly, replace the 7A7 tube associated with the higher pitched oscillator that fails to operate properly on any note. The following chart will be helpful in finding the oscillator associated with notes of any particular octave.

<table>
<thead>
<tr>
<th>Location</th>
<th>Notes 1st Octave</th>
<th>Notes 2nd Octave</th>
<th>Notes 3rd Octave</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th Ose.</td>
<td>6th Ose.</td>
<td>5th Ose.</td>
<td>5th Ose.</td>
</tr>
<tr>
<td>5th Ose.</td>
<td>6th Ose.</td>
<td>5th Ose.</td>
<td>5th Ose.</td>
</tr>
<tr>
<td>4th Ose.</td>
<td>5th Ose.</td>
<td>4th Ose.</td>
<td>4th Ose.</td>
</tr>
<tr>
<td>3rd Ose.</td>
<td>4th Ose.</td>
<td>3rd Ose.</td>
<td>3rd Ose.</td>
</tr>
<tr>
<td>2nd Ose.</td>
<td>3rd Ose.</td>
<td>2nd Ose.</td>
<td>2nd Ose.</td>
</tr>
</tbody>
</table>

   (B) If the trouble lies in a faulty relay contact, it will be present on all 12 keys of one of the octave groups and will persist on these 12 keys regardless of the combination of playing controls used. All contacts used are of precision material so that in all probability a particle of dust has lodged between the contacts which may be easily cleared by lifting and wiping the contact. Note that the relays are accessible without disconnecting any wires, merely being necessary to first remove the two large nuts which hold the relay assembly to the tone cabinet frame. After removing these two nuts, turn over the assembly and remove the four screws which hold the cover plate. After removing the cover plate, all contacts will be readily accessible.

   (C) If the trouble lies in a faulty key contact, trouble will be present, of course, only on one note. In this case, move the hi-bar shifters as described in the following suggestions numbered "6" and "7".

3. Instrument fails to play. Ordinarily the first thing to do in this case is to test all the tubes. If the tubes are lighted, the cable plugs are making proper connection, and the controls are in proper position, the most likely source of trouble is in the amplifier circuit. In most respects this is a conventional amplifier circuit, and the voltage measurements given on page 13 will enable a radio service technician to locate the trouble.

   4. Key thumps or clicks. If a transient effect in the form of an annoying thump appears at the type 7A7 control tubes (V11 and V12) are probably not matched properly. In this case, install two new tubes of the same make. A loud click each time a key is released indicates that the control contact has closed or opened in probably noisy, or partially open.

5. Harmony. An excessive 120 cycle hum in the speaker indicates that the filter choke (19) is defective, or one of the filter condensers is open.

6. One key does not sound. If certain key fails to play on any of the register controls, it probably has a dirty contact which can be cleared easily by shifting the contact contact hi-bar whose adjustment is to the right side of the keyboard. To reach the hi-bar shifters, first remove the two unslotted bakelite end pieces. A drawing accompanying the keyboard (Figure 5), shows how the contact shifters are arranged. Insert the clamping screw, and shift the hi-bar about 90°. It may be necessary to tighten the clamping screw carefully.

7. One key plays note "B" instead of correct pitch (with adjacent keys playing correctly). It is certain that this question has a dirty tuning contact which can be cleared easily by shifting the tuning contact hi-bar having adjustment at the left end of keyboard. This is treated as described in the preceding paragraph.

8. One octave of notes fails to play. If a single octave of the Solovox keyboard fails to play for any combination of the register controls, the trouble is probably in the relay associated with that octave of the relay coil and the control tube cathodes (V10 and V11).

9. Adjustment of Master Oscillator Fine Tuning Condenser. An additional tuning adjustment is provided in the form of a wave driver operated trimming condenser at the back of the tone cabinet. A meter should be connected across the plate of the first driver tube and the meter needle driven against this coil. After several years of use under very adverse conditions of humidity, or if an exceedingly accurate tuning is required, this adjustment may need to be made. First, however, always tune as described on page 11, after tuning F3 or G3. It is found that other notes (most likely C or G) are off tune. The molding of the octave may be readjusted as follows:
   (a) Depress the middle "C" key with the "VIBRATO OFF," "CONTRALTO," and "DEEP TONE" controls pulled in. Tune to zero beat, preferably with a Hammond Organ, or piano which has just been tuned. In tuning this "C," use the tuning knob of the tone cabinet. If it is found impossible to tune the "C" with the tuning knob, the two wood screws at the top of the cabinet may be loosened, and the bakelite tube holder moved to a position in the tuning coil such that the range of the tuning knob covers the correct "C" pitch. Before making this adjustment, be sure the "VIBRATO" switch is out of its on and off positions. For tuning purposes, the "VIBRATO" knob should be pushed in at the top of the cabinet.
   (b) After tuning the "C" key with the tuning knob, depress a "F" key and tune to zero beat with the screw driver operated trimming condenser located in back of the tone cabinet, see Fig. 4. The instrument will now be exceedingly accurately tuned.

DIRECTIONS FOR CONNECTING ADDITIONAL AMPLIFIERS TO SOLOVOX

When the Solovox is used in large auditoriums or with a large orchestra, additional amplifiers may be connected across the Solovox voice coil terminals which are accessible for this purpose on the speaker framework. Standard Hammond Organ Tone Cabinets are recommended as they may be connected with no changes necessary other than securing a push-pull ground with two 200 ohm resistors connected to the Solovox voice coil terminals, and their junction point used as a ground for the Hammond Organ Tone Cabinet. By locating the resistors in the Hammond Organ Tone Cabinet, it is only necessary to run two wires (they need not be shielded and may be as long as 200 feet) to the extra tone cabinet.
ANTENNA SYSTEM = Built-in loop with available connection from outside antenna. On short wave band, outside antenna required. BROWN lead to antenna, and BLACK lead to ground.

TYPE = Conventional
POWER OUTPUT = (MAX.) = 6 Watts; UPO = 4 Watts

CONSUMPTION = Receiver, 70 WATTS; Recorder, 30 WATTS; Changer, 30 WATTS.

POWER SUPPLY = (Standard Models) = 105-125 V, 60 Cycles

TUNING RANGES = 540 to 1700 KC, 5.5 to 18 MC.

I, F. = 465 KC

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I, F. trimmers are reached through the two holes on the top of each I, F. can. When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the alignment is correctly made at 16 MC, then a weaker image will be heard at 15,070 KC, in other words 300 KC less on the dial.

B- When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the alignment is correctly made at 16 MC, then a weaker image will be heard at 15,070 KC, in other words 300 KC less on the dial.

C- When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.

D- See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

E- Check for oscillator cross-over between 16 and 18 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

TUBE FUNCTION CATHODE SCR. GRID PLATE OSC. PLATE
6A8GT Mixer 3 95 225 140
6SK7GT I.F. Amp 3 95 225
6Q7GT Diode & Mic. Gain 90
6Q7GT Audio 75

TUBE FUNCTION CATHODE SCR. GRID PLATE
6U5 Tunning & level cont. 220
6V6GT Output 12 230 220
5W4GT Rect.

©John F. Rider, Publisher
MODELS 302R, 302RA
302RT (Late)
MODELS 568R, 568RA

HOWARD RADIO CO.

HOWARD 'D7GT MODELS 302R, 302RA
302RT (Late)
MODELS 568R, 568RA

FRONT OF FRONT SECTION

BACK OF FRONT SECTION

FRONT OF BACK SECTION

BACK OF BACK SECTION

MIXER CIRCUIT GROUNDED

CONTROL LAYOUT FOR 568R (RA) SERIES

THE MASTER SWITCH with which these features are selected, has seven positions as follows:

1. Radio
2. Record Radio & Microphone
3. Record Mic.
4. Microphone for P.A. System
5. Play-back
6. Automatic Phono
7. Duplicate Record

AUTOMATIC RECORD CHANGER WITH RA SERIES: USE ALSO FOR PLAYING RECORDS WHILE THEY ARE BEING DUPLICATED BY CUTTING ARM

In the "Duplicate Record" position, the tuning-eye is again in the circuit, for indication of proper cutting level, the cutting head circuit is complete, and the duplication is made from the original blank in position on the automatic turntable. The microphone is in use for another superimposed registration if desired.

With our automatic record changer models when duplicating from a small 64" record, due to the fact that this record, having a small surface, is liable to slip on the turntable, we have provided a spring finger that slips over the spindle that locks this record in place.

All chassis models have the input socket for the automatic changer pick-up, or if the model is not equipped with the automatic changer, a conventional turntable and crystal pick-up may be plugged into this socket and the duplication of the record can be accomplished.

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In the "Record Radio & Mic." position, the radio circuit remains the same as in "Radio" position. The microphone circuit becomes effective as the short is removed from the Mic. Gain Control. The percentage of radio and/or microphone is then controlled with the dual control feeding the 6Q7GT Audio and the Mic. Gain Control. The percentage of radio and microphone is then controlled with the dual control feeding the 6Q7GT Audio and the Mic. Gain Control. The 6U5 now becomes the visual amplitude indicator of the recording voltage. The voltage is taken from the output plate (6V6), rectified and applied to the grid of the 6U5. The cutter head circuit is completed.

The proper voltage level for the cutting operation is very important. Too high a level as indicated by the continuously overlapping of the tuning-eye results not only in feed-back, but actual overcutting of the record, resulting in distortion. However, it seems that the general practice is for the operator to more often "undercut" the recording by not providing sufficient cutting voltage. This results in a high background level and poor quality.

In the "Record Mic." position, the radio diode circuit is opened, the bias circuit is opened at the mixer tube, cutting out the radio, and cutting head circuit is closed.

In the "Mic. P.A." position, only the microphone is in the circuit. An additional microphone extension is usually used with the microphone at a remote point, using the receiver as a public address system.

As shown in the above diagram, the tuning-eye becomes inactive.

In the "Play-Back" position the pick-up connects to one section of the dual volume control from which the audio output is regulated in the conventional manner.

The resistor directly in shunt with the play-back or pick-up circuit is a compensator controlling the low frequency response at "Play-Back" position. Decreasing this value will decrease the low response.
The cutting head position has been adjusted properly at the factory, using HOWARD Home Recording Blanks. However, check this adjustment by noticing if the cutting needle locking screw will locate itself in the vertical center of the clearance slot (See Fig. 1), when the record is being cut. When necessary to change the position of this screw in the slot, loosen locking nut (See Fig. 2) and turn screw “A” to RIGHT to raise needle locking screw, or turn to LEFT to lower. After any adjustment is completed, be sure to tighten locking nut.

**CUTTING NEEDLE PRESSURE ADJUSTMENT**

For quality recordings, it is of vital importance that the right amount of pressure is obtained with the cutting needle. Observe the character of the shaving as the record is being cut. The size of the shaving should be about the size of a human hair (approx. .003”). If it is too heavy, the groove in the record may be too close to the adjacent groove which would cause distortion. If the shaving appears to be too fine and “kinky”, an insufficient pattern will be cut with distortion as a result.

Before making any change in the amount of pressure, FIRST BE SURE THE CUTTING NEEDLE ITSELF IS NOT DEFECTIVE, LOOSE OR MOUNTED WRONG, since the conditions as mentioned above due to improper pressure can also be caused by a defective needle. Check needle first.

When necessary to INCREASE thickness of shaving thread (See Fig. 3) TURN CUTTING PRESSURE adjustment “B” to the right. TO DECREASE thickness of shaving thread, turn adjustment to the left.

**THE CORRECT HEIGHT OF FOLLOWER ARM IN RELATION TO THE CUTTER ARM** is obtained by seeing that the pivot post (which is a fixed part of the follower arm) is flush with the bushing on the top side of the arm platform. See Fig. 4. Also see that there is a small clearance between the pivot post bushings “C” and “D” when the cutting arm is lowered to the cutting position. The two hex. head screws “E” — “F” permits both this adjustment and at the same time the very important FOLLOWER ARM ADJUSTMENT IN RELATION TO THE SWING OF THE CUTTER ARM as follows: When the follower arm touches the follower arm stop, the cutting stylus should be just outside the edge of the paper label on the Howard record blanks.

**THE BRONZE SPRING ADJUSTMENT ON THE FOLLOWER ARM.** When the cutting arm is in cutting position, the bronze spring should seat firmly into the bottom of the spiral groove of the lateral feed screw. This pressure should be great enough so that there will be no tendency of the knife edge tongue to climb out of the thread causing uneven grooves and distortion. However, too much pressure is to be avoided. The screw “F” controls this tension, and if the spring lifts itself away from the tip of this screw in the cutting position, it indicates too much pressure. This may also be caused by the follower arm being too low or bent downward for some reason.

**END PLAY ADJUSTMENT OF LATERAL FEED SCREW.** Loosen locking nut for screw “G”; turn screw slowly to right until the end play cannot be felt; reverse screw slightly to left to allow running clearance, and tighten lock nut.

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AUDIO FEED-BACK is controlled by placing Selector Switch in position for a recording. Turn fader to extreme left and adjust Mic. Gain Control just below the feed-back point.

THE CRYSTAL TYPE CUTTING HEAD is energized by a special 70,000 ohm secondary winding (a part of the output transformer) that matches the impedance of the cutting head.

THE CUTTING HEAD CRYSTAL MICROPHONE and CRYSTAL PLAY-BACK units are so designed and compensated to provide uniform frequency response for recording and play-back.

In the "Radio" position, the ground circuit return for the mixer tube bias is completed through the switch. Radio silencing is accomplished by opening the mixer tube cathode.

The S.S. becomes the conventional tuning eye tube since the grid is connected through the switch directly to the A.V.C. line.

The Microphone output circuit is shorted out.

Before we consider the cause and remedy of some of the troubles that may be encountered with any recording device, it is necessary to review the fundamental purpose of the records and needles themselves.

RECORD BLANKS

The ideal record material is that substance that has the right quality of material to respond to the variations of the cut needle, stylus and yet have the right amount of "GRANULIN" so when used with the play-back needle, the needle takes most of the wear and not the record pattern.

Needle scratch will be objectionable with records having too coarse a grain material base. However, we do not recommend the use of non-metallic needles to reduce this needle scratch condition. For practical use, the loss of volume with this type needle requires increase of audio volume and the background increases likewise.

NEEDLES

The function of a play-back needle is to act as a transmission medium between the modulated record groove and the reproducing unit. Therefore, the frequency characteristic of a needle depends upon its shape, material, and size. The metallic needles are superior to non-metallic for a greater range of response; likewise the heavier Shank needles will naturally have a greater range.

Regarding the playing life of a needle, generally speaking the metallic type may be grouped into about three classes: (1) The soft metallic one-play type; (2) Hard steel types, 10 or 25 plays; (3) Semi-permanent and permanent types, 1000 or 2000 plays.

It must be remembered that the causes of faulty reproduction and the quick wearing out of records can more often be due to dull or rough edge needles than from the type of needle or record blank.

This also applies to the cutting needle which, although it may be in the permanent life class, can become chipped by rough handling or damaged when used with inferior grade blanks on which the coating is insufficient, and the cutting needle may cut through to the hard core of the blank.

Since the actual depth of the groove is nearly three thousandths of an inch (.003") for safety the coating should be at least twice that thickness.

Getting back to the reproducing needle, since the variations that the needle is to follow are lateral in nature, it is obvious that the needle is not supposed to be extremely pointed so as to ride in the bottom of the groove, and at the other extreme it is obvious that the needle should not be too blunt (like a dull needle) so as to ride near the top edge of the groove, losing all of the higher frequencies. Since the bearing surface, or radius point, of the needle should be slightly over two thousandths of an inch (.002") it becomes apparent as to what happens to the quality when the point becomes blunt so that the diameter is greater than what we can call the "Wave Length" of the higher frequency pattern in which the blunt needle could not follow the small curve variation for the high frequency reproduction. Never rotate the needle in the socket once it has been used.

SERVICE NOTES

This crystal unit similar in structure to the regular reproducing head, is likewise subject to extreme temperatures both hot and cold.

Heat at about 125° Fahrenheit will begin to soften the crystals and permanently damage the unit. Average temperatures encountered in the home, a distance from the radiator should not cause trouble.

Coldness does not cause permanent damage, the effect being to "Stiffen" the unit resulting in an increase of background "rumble" if a recording is made during that period.

ROUGH HANDLING

To bounce either the play-back or the cutter head around carelessly will invite trouble. Severe shock against the end of the needle may not fracture the crystal, but at least the needle (or stylus) mounting will be damaged or the edge of the needle may be roughened which would ruin the next record.

Cutting the cutting arm by hand when it is not raised enough for the follow arm to become disengaged may throw arms out of alignment with each other.

CUTTING SHAVING TOO HEAVY

Under a magnifying glass, the grooves should appear as about the width as the spaces between them for proper cut. If the thread is coarse and stiff, try new cutting needle, then if necessary, refer to procedure of adjustments given herein.

When the record is being cut, watch the shavings as it leaves the needle and note that it winds toward the center of the record and does not work back underneath the cutting needle causing it to bounce over the shavings.

If the thread is light, fluffy, or not continuous, after trying new cutting needle, refer to procedure of adjustment given herein.
This condition is the normal result of improper use of the "Mic.
Gain Control" with the visual indicator for proper cutting voltage.
Overcutting of the record is also possible with too high an input.
At the other extreme, lack of sufficient input results not only
in poor quality, but also raises the background level.
Any recording system as sensitive as the Howard Recorder, is capa-
bile of picking up the mechanical vibrations of the motor. The
sacrificing of this sensitivity to eliminate any possibility of
motor rumble is not the cure or if it necessary. Under normal
conditions of operation in which both the motor frame and turn-
table unit are suspended on soft rubber cushions, the rumble will
not be recorded if:

1. The amplitude of the signal is sufficient when the blank is
   being cut.
2. The Tone Control is in the treble position at the time of rec-
   ording.
3. The cutting stylus is in good condition and is MOUNTED TIGHT.
4. The crystal is at room temperature at the time of recording.
5. The play-back needle is not dull or has become "shouldered".

By "rumble" we mean the sing-song effect with the low frequencies
predominating. We first consider the possibility that something
has happened to vary the motor speed during recording. (See
Speed Regulation below).

Although the recorder base is mounted on rubber feet at each cor-
ner, it is essential that the wing screws remain drawn tight
against the washers. When the base floats too freely, vibrations
are introduced from the drive mechanism causing a rumble effect
when played back. Examine the grooves closely if there appears to
be a shaded spiral effect across the blank, you can be sure
that the vibrations have created a regular pattern of their own
due to the wing screws being too loose at each corner of the base.
Tighten them.

Consider the possibility that the cutting needle might have been
loose.

After the customary trial of a new play-back needle, check the
mounting of the play-back arm. It is held in place with a "Y"
shaped hand that could lose its tension causing the arm to
vibrate. It can be tightened by removing arm and spreading out
fingers for more tension.

"Rumble" effect can be caused if the original cutting was made
too heavy and which might be reproduced satisfactorily with one
type needle having a wide point, but another type needle having
an extremely fine point will wobble around the bottom of the
groove with incomplete, uneven registration.

SPEED REGULATION

The motor being of a constant speed synchronous type, operating at
its rated frequency, should not vary. However, we must check the
frequency marking as shown on the Motor Frame with the power line.

It is suggested that the speed of the motor be checked in the con-
ventional manner by the use of a cardboard stroboscope disc using
a gas illuminated electric light.

The correct speed with the play-back arm in place on the record is
78 R.P.M.

The speed of the motor when used in a district requiring a con-
verter cannot be depended upon.

Irregularities of speed can be caused by excessive shavings wound
around the motor spindle and rubber drive mechanism beneath the
turntable.

There is a compensating resistor in the cutter circuit that will
tend to make the play-back apparently to have a lower frequency
response.

In recordings where the high frequencies seem to be missing, be
sure to ascertain if the original recording was incorrectly made
with the Tone Control in the "Bass" position.

Another reason for lack of "highs" is of course either a blunt
play-back needle, or the rotation of the record during a previous
play-back by a damaged needle that has trimmed the groove of its
pattern for "highs".

The elements affecting the cutting and reproducing of a blank have
been outlined above. We are making no mention of the audio system
of the radio since it is conventional and requires no special
service attention other than the usual check of tubes, operating
voltages and master switch contact points.
TUNING RANGES -
540 to 1700 KC,
2.2 to 7 MC, 7 to 22 MC,
(555-175, 140-47,
47-13 Meters)
POWER OUTPUT - (MAX.) -
2.7 Watts; UP 1.5 W.
ANTENNA SYSTEM =
Connect Antenna to BROWN lead -
Connect Ground to BLACK lead.
CONSUMPTION 50 WATTS
Plus 15 Watts for TP Model.
Phone Circuit
307TP ONLY
Otherwise same as
Model 307. See Index

For schematic see Index

POWER SUPPLY - (Standard Models) = 105-125 V. 60 Cycles AC

ALIGNMENT PROCEDURE

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<th>Wave-Band Switch</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (in order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
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<tr>
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<td>Min.Cap.</td>
<td>465 KC</td>
<td>6A8 Grid</td>
<td>A</td>
<td>11,12,13,14</td>
<td>IF</td>
</tr>
<tr>
<td>SW</td>
<td>18 MC</td>
<td>18 MC</td>
<td>Brown lead</td>
<td>B,D,E</td>
<td>05,06</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>Int.</td>
<td>6.5 MC</td>
<td>6.5 MC</td>
<td>Brown lead</td>
<td></td>
<td>07,08</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>BC</td>
<td>1400 KC</td>
<td>1400 KC</td>
<td>Brown lead</td>
<td></td>
<td>09,10</td>
<td>Osc. Ant.</td>
</tr>
<tr>
<td>BC</td>
<td>600 KC</td>
<td>600 KC</td>
<td>Brown lead</td>
<td>C</td>
<td>01</td>
<td>Osc. Pad.</td>
</tr>
</tbody>
</table>

NOTES
A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 18 MC, then a weaker image will be heard at 17,070 KC, in other words 930 KC less on the dial.
C - When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D - See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.
E - Check for oscillator cross-over between 18 and 22 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

SPAKER = Electro-Dynamic SIZE = 6" V.C.I.MF. (400CPS) = 4 Ohms FIELD = 1200 Ohms

SOCKET VOLTAGE READINGS:
Voltage taken from ground with line voltage at - 117 AC.
High voltage reading off rectifier - 275 V.
Drop across speaker field = 75 V.
Voltage taken with 1,000 Ohm per volt meter.

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NOTE 1: When aligning the I.F. channel, a condenser of .05 MFD may be used in series with the generator lead.

NOTE 2: When aligning the broadcast band, a 250 MFD condenser may be used in series with the signal generator.

NOTE 3: When aligning the short wave bands, a 400 ohm resistor may be used in series with the signal generator.

NOTE 4: After the chassis has been removed from the cabinet, be sure when it is again assembled that the speaker plug is in place in the socket on top of the chassis and that the speaker cable wires do not lay back near the RF circuit, thus causing howling.

NOTE 5: Check for an image signal about 5 mc. lower in frequency. For example: If a peak has been made at 6 mc. an image should be heard at about 5.1 mc. Otherwise the original setting was not correct.

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MODELS—435-436-437 "PROGRESSIVE SERIES"

TYPE 3-820 EXTERNAL SPEAKER is designed especially for use with Howard Communications Receivers. The input impedance is of the correct value to perfectly match the output transformer of Models 435, 436, 437, and 460. The speaker unit consists of a heavy duty high efficiency permanent magnet, 8" dynamic speaker mounted in an acoustically treated (felt lined) welded steel cabinet finished in fine suede wrinkle, supplied with a 5 ft. spade terminal cable.

TYPE 610 "B" POWER PACK. For conversion of 6 Volts d.c. to 300 Volts d.c. for operation of Howard Models 435, 436, and 437 Communications Receivers from 6 Volt Storage Battery, the Type 610 Power Pack is a convenient and practical converter. A four prong plug fits the socket on Model 435, 436, and 437 Receivers, carrying both A and B power to the set. Only two connections from the Power Pack to the storage battery are required. Ample length of cable is provided. Battery current drawn for Model 435 is 6.6 amps; for Model 436 is 6.9 amps; and Model 437 is 7.75 amps. ON and OFF Switch on Power Unit.

(NOTE: - The Progressive Series 435, 436, 437, is based on the Model 435 receiver. The 436 is the 435 circuit with the addition of the noise silencer and additional features. The progressive additions to the original 435 circuit may include: 605 Carrier Level Meter, 3-820 External Speaker, 650 Pre-Selector, 660 Frequency Monitor, 665 Loop Kit, and 610 Power Pack. For data on these, SEE INDEX.)

EXTERNAL CONNECTIONS

As we face the back of the receiver, the first three screw terminals coded V3, V2, and V1, terminal strip at the right coded G, D, A are of which V3 and V2 must be shorted when using the Antenna and Ground connections. The built-in speaker, can be adapted for the conventional type of flat-top antenna systems use of the Howard external speaker No. 3-820, leave the shorting wire between "G" and "B" and by removing the shorting wire and connecting connect Antenna to "A". Connect ground to "G". Leads from the external permanent dynamic speaker to lugs V3 and V1.

If a doublet antenna is used, remove the jumper between G and D and attach doublet wires to D. The socket coded for use with the Howard 610 Power Pack must have the jumper in place between the two socket terminals as shown in the diagram below. See description of this Model 610, 6 Volt Power Supply.

The single terminal next to the antenna-ground strip is coded for use with the Howard Model 650 Pre-Amplifier.

ADAPTATION FOR BATTERY SUPPLY

When it is desired to use "A" and "B" battery the "B" current required for Models 435 and 436 is 60 Mills. The "A" current requirement is 2.9 Amps. This includes the 605 Carrier Level Meter.

Remove the jumper from the battery power socket. Connect "B +1" 250 Volts to terminal marked "B +1" in diagram. Connect one side of the 6 Volt "A" supply to terminal marked "A". Connect the other side of the "A" supply and "B -" to the chassis ground terminal.

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The following are the Engineering Specifications for Model 435, 436.

**POWER CONSUMPTION**

.50 Watts, 105-125 Volts, A.C. 60 Cycle

**INTERMEDIATE FREQUENCY**

.465 KC

**FREQUENCY RANGE** - Divided into four bands as follows:

- .55 to 1.7 mc (545-176 meters)
- 1.7 to 5.6 mc (176-54 meters)
- 5.6 to 18 mc (54-16.6 meters)
- 17 to 43 mc (17-7 meters)

**SPEAKER SYSTEM**

Built-in 6½" Electro Dynamic

Connections provided for External Speaker (Howard Type 3-820)

**POWER OUTPUT**

Type: Single 6K6G

Maximum: 2½ Watts
**FREQUENCY RANGE** - Divided into four bands as follows:

- .55 to 1.7 mc (645-176 meters)
- 1.7 to 5.6 mc (176-54 meters)
- 5.6 to 18 mc (54-16.6 meters)
- 17 to 43 mc (17-7. meters)

**POWER CONSUMPTION**
- .60 Watts, 105-125 Volts, A.C. 60 Cycle

**INTERMEDIATE FREQUENCY**
- .465 KC

**SPEAKER SYSTEM**
- Type: Single 6K6G
- Maximum: .4 Watts

**TYPE 660 FREQUENCY MONITOR**

The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 850 to 1030 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R.F. Output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 20, 40, 80 and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.

The Power Supply for this unit is self-contained, and is for use on 105-125 Volts, A.C. 40-60 Cycle. Available at other voltages and frequencies on special order.

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The alignment is made with the BFO Off, the AVC Off, and the Band Spread set to 100.

The main dial hand must stop EXACTLY ON the last line at the end of the scale when the condenser is fully closed without force on the tuning control.

There should be an overload effect on powerful broadcast stations when the AVC is OFF.

NOTE 1: After the alignment of the I.F. stages is completed, align the BFO system as follows:

1. Set pitch control 3 turns back from the 'IN' position and turn on the BFO Switch.
2. Adjust the trimmer in the BFO to obtain maximum sound which will be a hissing noise. Turn tuning knob to be sure this sound is not some tunable frequency that is causing it.
3. Check beats against some broadcast station to determine if the strength of the beat is normal.

NOTE 2: In this band (17 to 45 MC) only the oscillator follows the received signal 465 KC lower in frequency. Therefore, when checking for the Image, if the alignment has been made at 36 MC, it will be found at about 37 MC. This will determine if the alignment was correctly made at 36 MC.

NOTE 3: Check for Image on all bands except the 17 to 45 MC band at a point 930 KC lower on the dial.

NOTE 4: Rock main dial slightly for point of maximum signal as the padding condenser is being adjusted.

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THE HOWARD CARRIER LEVEL METER gives an indication of the strength of the signal carrier in microvolts as delivered at the receiver.

The meter scale is calibrated from 0 to 50. When the meter set control (R. F. Gain) located directly below meter, is set exactly on the 50 division, the reading on the meter will be the actual microvolts delivered to the receiver.

Before using the carrier level meter, tune the signal to exact resonance with the meter switch in the OFF position, and adjust the R. F. GAIN CONTROL to a point where the signal is just audible. This will not throw the meter off scale when the meter switch is thrown to the ON position. Follow instructions given below.

The AVC Switch must be ON.
The Meter Switch must be ON.
The BFO Switch must be OFF.

To avoid the possibility of introduced error, the BFO Switch is so connected that the meter is not in the circuit when the BFO Switch is in the ON position. Therefore the meter can be used only when the BFO Switch is in the OFF position.

The maximum deflection of meter pointer is the true indication of resonance in tuning. With a strong signal the meter will naturally be thrown off scale until the R. F. Control is rotated counterclockwise. A point will be reached during this rotation where the meter hand is at 50. Then the input value in microvolts is read direct at the position of the pointer knob. For better accuracy this reading is multiplied by a correction factor as given on a separate chart to cover the various bands calibrated for each receiver.

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**FOR OTHER DATA SEE INDEX**

**ALIGNMENT PROCEDURE**

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<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
<th>Check for Image at</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>Min.Cap.</td>
<td>465 KC</td>
<td>Grid of 6ABGT</td>
<td>A,B,D</td>
<td>l1,l2,l3,l4,i4</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>SW</td>
<td>18 MC</td>
<td>18 MC</td>
<td>Ant.Brown lead</td>
<td>B,E</td>
<td>R6R7,A7</td>
<td>Osc.RF,Ant. 17</td>
<td></td>
</tr>
<tr>
<td>FB</td>
<td>6.5 MC</td>
<td>6.5 MC</td>
<td>Ant.Brown lead</td>
<td>O8R9,A10</td>
<td>Osc.RF,Ant.</td>
<td></td>
<td></td>
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<tr>
<td>BC</td>
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<td>Ant.Brown lead</td>
<td>O11R12</td>
<td>Osc.RF</td>
<td></td>
<td></td>
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</table>

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The i.f. trimmers are reached through the two holes on the top of each I.F. can.
B- When aligning the short wave bands, do not adjust to the image frequency.
C- When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D- See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.
E- Check for oscillator cross-over between 18 and 22 MC. If necessary for stability, turn the mixer trimmer "IN" slightly.

**SOCKET VOLTAGE READINGS:**

Voltage taken from ground with line voltage at -117 V.
High voltage reading off rectifier - 340 V.
Drop across speaker field - 95 V.
Voltage taken with 1,000 Qm per volt meter.

<table>
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<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR.</th>
<th>GRID</th>
<th>PLATE</th>
<th>OSC.</th>
<th>PLATE</th>
<th>CHECK FOR IMAGE AT</th>
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<td>5SK7</td>
<td>RP</td>
<td>2</td>
<td>100</td>
<td>245</td>
<td>6S6GT</td>
<td>Inverter</td>
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<td>125</td>
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<td>6ABGT</td>
<td>Mixer</td>
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<td>100</td>
<td>245</td>
<td>140</td>
<td>Output</td>
<td>16</td>
<td>245</td>
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<td>6557</td>
<td>I.F. Amp.</td>
<td>56</td>
<td>100</td>
<td>245</td>
<td>6V6GT</td>
<td>Output</td>
<td>16</td>
<td>245</td>
</tr>
<tr>
<td>6Q7GT</td>
<td>Diode</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>6U5</td>
<td>Tuning &amp; level cont.</td>
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<td></td>
</tr>
<tr>
<td>6Q7GT</td>
<td>Audio</td>
<td>70</td>
<td>80</td>
<td>80</td>
<td>Rect.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CONSUMPTION**

- Receiver, 90 WATTS;
- POWER SUPPLY - (Standard Models)
  - 106-125 V, 60 Cycles
  - Changer, 30 WATTS, Recorder, 30 WATTS;
  - I.F. = 465 KC TYPE = Iron Core
  - POWER OUTPUT - MAX.
  - 11 Watts; UPO = 8 Watts
  - TUNING RANGES = 540 to 1700 KC, 2.2 to 7.5 MC and 7 to 22 MC.
  - MODEL = 568-R
  - 10 tube console Recorder 568-RA
  - Recorder with Automatic Record Changer
Howard Radio Co.

Model 585

Power Supply - (Standard Models) = AC-DC 3 Range 118V, 135V, 230V.

Consumption 25-50 Watts

Power Output - (Max.) = 2.7W. up to 1.3

Speaker = Permanent Magnet SIZE = 6" x 6"

V.C.Imp. (400CPH) = 4 Ohms

Tubes:

12AT8T Converter
12K7GT I F Amp.
12S7GT Det. - Audio
35L6GT Output
6NS Tuning Eye
35Z25GT Rectifier

Socket Voltage Readings:
Voltage taken from ground with line voltage at -117 AC.
High voltage reading off rectifier = 107 V.
Drop across speaker field = X
Voltage taken with 1,000 Ohm meter...

The Adaptation of the Set for Use with Phonograph

Wave-Band Position of Dial Pointer

750-900 Kc - 105 to 150
150-210 Kc - 210 to 280

Transformer Function

Mixer - 3 72 105
IF - 3 105 105
Det. - X 65 65
Output - 105 105

Alignment Procedure

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from signal generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B- When aligning the short wave bands, keep the tuning band set exactly on the last line above 450 when the condenser is at maximum capacity.
C- When adjusting this pad, move the tuning band back and forth and adjust ladder until the peak of greatest intensity is obtained.
D- See that the tuning band is set exactly on the last line above 450 when the condenser is at maximum capacity.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid tap should remain in place during alignment.

Notes:

A- Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from signal generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B- When aligning the short wave bands, keep the tuning band set exactly on the last line above 450 when the condenser is at maximum capacity.
C- When adjusting this pad, move the tuning band back and forth and adjust ladder until the peak of greatest intensity is obtained.
D- See that the tuning band is set exactly on the last line above 450 when the condenser is at maximum capacity.
E- The following dummy antenna circuit is recommended, since it is adaptable for any frequency range. The grid tap should remain in place during alignment.

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HOWARD RADIO CO.

POWER SUPPLY - (Standard Models) = 105-125 V. AC-DC
POWER OUTPUT - (MAX.) = 1 Watt  UP O .5 W.
CONSUMPTION 30 WATTS

MODEL 702

HOWARD RADIO CO.

D78-715  4-5-40

DWN BY  CHKG. BY  APPVD. BY

VOLUME CONTROL AND SWITCH-NO. 69-281
V.C. IMP. (400CPS) = 5 Ohms  FIELD = 450 Ohms

MODEL 702

C, C, 30 MFD-150, 150 V-NO. 47-266.
C, C = VARIABLE CONDENSER-NO. 63-270.

POWER SUPPLY - (Standard Models)
= 105-125 V. AC-DC

POWER OUTPUT - (MAX.) = 1 Watt  UP O .5 W.
CONSUMPTION 30 WATTS

CONSUMPTION 30 WATTS

125A7  125K7  12SQ7  50L6GT

MODEL 702

SPEAKER = Electro-dynamic
SIZE = 5"

C, C, C, C, 20, 30 MFD.-150, 150 V-
NO. 47-266.
C, C. - VARIABLE CONDENSER-NO.
63-270.

C, C. - VARIABLE CONDENSER-NO.
63-270.

TUNING RANGES = 540 to 1720 KC and 4.6 to 16 MC (178-550 and 18-65 Meters)

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
<th>Check for Image at</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC</td>
<td>540</td>
<td>456</td>
<td>Grid of 12SA7</td>
<td>A</td>
<td>1, 1, 1, 1</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>14 MC</td>
<td>14 MC</td>
<td>Ant. (Brown)</td>
<td>B</td>
<td>0, 0, 0, 0</td>
<td>Osc. Ant.</td>
<td>13 MC</td>
</tr>
<tr>
<td>KC</td>
<td>14 KC</td>
<td>14 KC</td>
<td>Ant. (Brown)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 14 MC, then a weaker image will be heard at 13,070 KC, in other words 930 KC less on the dial.

The tubes are connected in series in the order shown by the schematic diagram.

The dual section filter condenser has a common negative, but note that it does not return to ground as the can is insulated from the chassis.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>Mixer</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>12SK7</td>
<td>I.F. Amp.</td>
<td>3.5</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>12SQ7</td>
<td>Det.</td>
<td></td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>50L6GT</td>
<td>Output</td>
<td>6</td>
<td>9</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

Voltage taken from ground with line voltage at 117 V. AC.
High voltage reading off rectifier = 115 V.
Drop across speaker field = 20 V.
Voltage taken with 1,000 Ohm per volt meter, from cathode return to points as given.

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HOWARD PAGE

D. O. G. Q.

12-17

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HARARI)
RAllIO

CO.

VAR CONO'S 9-270
/S00-.

100900-

005

3
d/i
00/

64,7UND A
V C
WHEN

NOT
CONNECTED

00
RECE/V,

SW/rc,
/5
SET
TO
LOWER FREQUENCY
89ND
LOWER FREQUENCY
BANDS
RE
SNORTED
OUT
SW/rc
SMOWN
ON LOW
REQUENCY
ß.9N0.

63V
60'

117V.
60^'

-Power
/9-9/7
Available
at
other voltages
and frequencies.

HOWARD RADIO GO.

MODEL: 650
PRE. AMP.

DWG. NO. D70-715
I
-31
-40
DV/N. BY. CHCISD.
BY.
APPVD.
BY
R B M
KW
141

The Howard Type 650 Pre-Amplifier is designed to be used with ANY RECEIVBR and covers a frequency range of .55 mc. to 43 mc. The Pre-Amplifier is constructed for the use with an antenna having either single wire or doublet lead-in or the Howard Type 655 Loop Antenna Kit.

The use of the Loop Kit, Type 655, with this Pre-Amplifier will be indispensable in separating interfering signals and reducing certain noise conditions.

The Antenna-Loop Switch provides a convenient shift from either the loop or an external antenna system.

This unit is coupled at the back to the regular receiver without changing the receiver in any way.

The "IN-OUT" Switch allows the unit to be switched out of the input system allowing the regular antenna to be coupled direct to the receiver.

**TYPE 655 LOOP KIT**

The Kit consists of four separate loops having band coverage as follows:

<table>
<thead>
<tr>
<th>NO. OF LOOP</th>
<th>COVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L14</td>
<td>1700 KC to 550 KC</td>
</tr>
<tr>
<td>L13</td>
<td>5.6 MC to 1.7 MC</td>
</tr>
<tr>
<td>L12</td>
<td>16 MC to 5.6 MC</td>
</tr>
<tr>
<td>L11</td>
<td>34 MC to 22 MC</td>
</tr>
</tbody>
</table>

The Pre-Amplifier has a special switch position for the 30 MC LOOP (L11). When the switch is on this position, the Loop Trimmer is connected directly to the Loop, and the main variable condenser disconnected from the Loop. This is done to secure a loop of more effective height on the 30 MC BAND.

When using loops covering the three lower frequency ranges and with switch at Loop, the Loop Trimmer is used to bring the Loop into exact resonance with the incoming signal to secure greater loop performance. The High Frequency end range of the three lower frequency loops can be extended by having loop switch on 30 MC LOOP. In this position the Loop Trimmer will cover the following ranges:

| L14 1400-1990 KC |
| L13 4.4-6 MC    |
| L12 15.5-22 MC  |

©John F. Rider, Publisher
The Howard Frequency Monitor Model 660 consists of a highly stabilized oscillator covering the fundamental frequency range of 850 to 1030 kilocycles, harmonics of which are used as reference or measurement points on the higher bands. The R.F. output of this oscillator is loosely coupled to the antenna circuit of the receiver, and the voltage applied to the receiver is controlled by a variable resistance attenuator.

The oscillator is tuned by a precision ceramic insulated variable condenser carrying an extremely accurate frequency scale covering the 10, 30, 60, 80 and 160 meter amateur bands as well as the fundamental range. The range is so selected that harmonics cover the entire length of all amateur bands, and these are calibrated so that frequency can be read within one kilocycle on the lower frequency bands and five kilocycles on the highest band.

NOTE 5: Align regular receiver first. Set "Ant. Loop" to "Ant." position.
AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS OF THE LOWER FREQUENCY BANDS ARE SHORTED OUT.

I.F. - 465 KC

ALIGNMENT PROCEDURE

Wave-Band Switch Position | Position of Dial Pointer | Generator Frequency | Generator Connection | See | Trimmers Adjusted (In order shown) | Trimmer Function |
--- | --- | --- | --- | --- | --- | --- |
BC | Max.Cap. | 465 KC | Converter A,E 1,1,2,13,14 | IF | |
7-22 | 18 | 18 MC | Ant. Lead B,D 1,5,A3 | Osc.,Ant. |
2.2-7 | 6.5 | 6.5 MC | Ant. Lead 1,7,A3 | Osc.,Ant. |
BC | 1400 | 1400 KC | Ant. Lead 1,0,10,11 | Osc., RF |
BC | 600 | 600 KC | Ant. Lead C 11,11 | Osc.,Pad. |

Voltage taken from ground with line voltage at - 115 V.Ac.

High voltage reading off rectifier - 320 V.
Droop across speaker field - 100 V.
Voltage taken with 1,000 Ohm per volt meter.
Tune set off station

A - Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.

B - When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the adjustment is correctly made at 21 MC, then a weaker image will be heard at 21,000 KC less 930 KC, or about 20,070 KC on the dial.

C - When adjusting this pad, move the tuning hand back and forth and adjust the tuning hand until the peak of greatest intensity is obtained.

D - See that the tuning hand is set exactly on the last line - above 340 when the condenser is at maximum capacity.

E - The Interstage resistance coupled I.F. stage is coupled by a trimmer. Adjust to maximum capacity for maximum gain.

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AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS OF THE LOWER FREQUENCY BANDS ARE SHORTED OUT

1. F. 465 R.C.

For other data, see Index.

AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS OF THE LOWER FREQUENCY BANDS ARE SHORTED OUT

1. F. 465 R.C.
AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS OF THE LOW FREQUENCY BANDS ARE SHORTED OUT.

Wave-Band Switch Position | Position of Dial Pointer | Generator Frequency | Generator Connection | See Note | Trimmers Adjusted (In order shown) | Trimmer Function
--- | --- | --- | --- | --- | --- | ---
Broadcast | Max. Cap. | 466 KC | Converter Grid A,D | I₁, I₂, I₃, I₄ | IF
7-22 MC | 21 | 21 MC | Ant. (Brown) B | O₆, A₆ | Osc., Ant.
2.2-7 MC | 6 | 6 MC | | O₇, A₇ | Osc., Ant.
2.2-7 MC | 2.2 | 2.2 MC | | P₉ | Osc. Pad.
Broadcast | 1400 | 1400 KC | | C₁₀, A₁ | Osc., Ant.
Broadcast | 600 | 600 KC | | P₁₂ | Osc. Pad.

A—Each step of the alignment should be repeated in the original order for greater accuracy. Keep output from Signal Generator low. The I.F. trimmers are reached through the two holes on the top of each I.F. can.
B—When aligning the short wave bands, do not adjust to the IMAGE frequency. For example, if the alignment is correctly made at 21 MC, then a weaker image will be heard at 21,000 KC less 930 KC, or about 20,070 KC on the dial.
C—When adjusting this pad, move the tuning hand back and forth and adjust padder until the peak of greatest intensity is obtained.
D—See that the tuning hand is set exactly on the last line above 540 when the condenser is at maximum capacity.

Voltage taken from ground with line voltage at -120 V. High voltage reading off rectifier - 325 V. Drop across speaker field - 50 V. Voltage taken with 1,000 Ohm per volt meter. Band Switch in BC position except R.F. Stage measurements.

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This sheet is a part of Form 76-450, 76-460, or 77-460 for International Models 760, 766, 7766, etc.

The below layout shows the order of the drive cord for the tuning and band spread mechanisms should any servicing or replacement be necessary.

**STRING LAYOUT INTERNATIONAL SERIES**

**Trimmer Location for Models 766 and 7666**

**TABLE 1**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>GRID</th>
<th>PLATE</th>
<th>GRID</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6108</td>
<td>Mixer</td>
<td>9</td>
<td>93</td>
<td>146</td>
<td>94</td>
<td>146</td>
</tr>
<tr>
<td>6277</td>
<td>IF</td>
<td>93</td>
<td>228</td>
<td>228</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>6387</td>
<td>F, AFC</td>
<td>47</td>
<td>195</td>
<td>215</td>
<td>191</td>
<td>215</td>
</tr>
<tr>
<td>6187</td>
<td>D-AFC</td>
<td>93</td>
<td>215</td>
<td>215</td>
<td>95</td>
<td>95</td>
</tr>
</tbody>
</table>

Voltage taken from ground with line voltage at 120 V. Max voltage reading off rectifier - 200 V. Drop across speaker field - 40 V. Voltage taken with 1,000 ohm per millimeter.

**SICRET VOLTAGE READINGS**

**MODEL 766 ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>Wave band</th>
<th>Switch Position</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>Sensitivity</th>
<th>Triastrs Adjusted (In other words)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>Max. Op. gen.</td>
<td>465/605 MHz</td>
<td>Converter Or/38 A, B</td>
<td>15/25/15/41</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>7-02-MC</td>
<td>2.8</td>
<td>2.8 MHz</td>
<td>*</td>
<td>*</td>
<td>P1</td>
<td>*</td>
</tr>
<tr>
<td>8-05-MC</td>
<td>3.2</td>
<td>3.2 MHz</td>
<td>*</td>
<td>*</td>
<td>P1</td>
<td>*</td>
</tr>
<tr>
<td>Broadcast</td>
<td>1400</td>
<td>1400 MHz</td>
<td>*</td>
<td>*</td>
<td>P1</td>
<td>*</td>
</tr>
<tr>
<td>Broadcast</td>
<td>600</td>
<td>600 MHz</td>
<td>*</td>
<td>*</td>
<td>P1</td>
<td>*</td>
</tr>
</tbody>
</table>

- *mark the tuning band is set exactly on the last line shown 660 when the condenser is at maximum capacity.

**MODEL 7666 ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>Wave band</th>
<th>Switch Position</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>Sensitivity</th>
<th>Triastrs Adjusted (In other words)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast</td>
<td>Max. Op. gen.</td>
<td>465/605 MHz</td>
<td>Converter Or/38 A, B</td>
<td>15/25/15/41</td>
<td>IF</td>
<td></td>
</tr>
<tr>
<td>7-02-MC</td>
<td>2.8</td>
<td>2.8 MHz</td>
<td>*</td>
<td>*</td>
<td>P1</td>
<td></td>
</tr>
</tbody>
</table>
ELECTRICAL SPECIFICATIONS

I.F. Frequency 455 K.C.
I.F. Sensitivity (from 6K8 Grid) = 60 Microvolts for ½ Watt Output
Power Output, Max. 5 Watts; Undistorted 2.3 Watts

SPEAKER

5 inch P. M. Dynamic
Voice Coil Impedance 3.5 Ohms at 400 cycles

TUBE COMPLEMENT

6K8GT Mixer
6K7GT I.F. Amplifier
6SQ7 2nd Detector AVC Audio
6V6GT Output

TUNING RANGE

540 K.C. to 1580 K.C.

VOLTAGE READINGS-
6 volts at the set
0Z4 cathode to chassis = 225 volts.
Output of filter = 205 volts (set B+).
0Z4 Rectifier
Plate to cathode of 6V6 output tube pins = 3 (+) and 8 (−) = 205 volts.
Cathode of 6V6 output (pin #8) to chassis 10 volts.
VIBRATOR
Screen of 6K7—6K8 (pin #4) to chassis 95 volts.
Screen of 6V6 to chassis (pin #4) 205 volts.

MODEL #160808 JA-40
Current Drain 5.25 Amps at 6.3 Volts

1940—Hudson

NOTE. Receivers with serial numbers above 14000 have a 1/10 MF condenser across vibrator points and a 200 ohm resistor in the cathode of the 6K8GT tube.

TO ALIGN I.F.

Attach signal generator “hot” lead to grid of 6K7 through a 1/10 MF condenser, connect ground side of generator to case. Set signal generator at 455 K.C., turn volume control to maximum, attach an output meter or resonance indicator, either the plate circuit of the 6V6 tube or across the voice coil terminals of the speaker. Adjust 2nd I.F. transformer for maximum output. Shift hot generator lead to 6K8 grid and adjust 1st I.F. transformer for maximum output. Recheck 2nd I.F. adjustment, with generator connected to 6K8 grid. Do not use greater generator signal than is necessary to obtain good output meter reading. For location of 1st and 2nd I.F. transformers, see tube layout diagram. I.F. sensitivity = approximately 60 microvolts for ½ watt output, measured from 6K8 grid.

TO ALIGN R.F.

Use standard cowl antenna cable to connect signal generator to set. Connect a 35 microfarad condenser to the signal generator “hot” terminal and the other side of the condenser to the antenna cable. Connect the ground side of the signal generator to the shield side of the cable. Turn variable condenser to zero capacity. Set signal generator to 1580 K.C. Adjust trimmer on oscillator section (front section of condenser) until signal is heard. Tune set to approximately 1400 K.C., set signal generator to this frequency, and adjust antenna compensator for maximum output. R.F. sensitivity 6 micro volts at 1400 K.C. and 10 micro volts at 600 K.C. for ½ watt output.
ALIGNMENT PROCEDURE FOR MODEL JA-41 ONLY

IMPORTANT: The "Simplified Alignment Procedure" should always be used unless the adjustments on the lower case have been removed or in it someone has tampered with them.

Use the "General Alignment Procedure" only in cases of poor calibration, and poor sensitivity at the low frequencies. Can also be used when the "Simplified Procedure" has been completed. The General Alignment Procedure is also necessary if the antenna or oscillator coil or core are replaced.

### SIMPLIFIED ALIGNMENT PROCEDURE

**REMOVE TOP COVER OF RECEIVER TO ACCESS SPEAKER SECTION AND CONTROL COVER.

<table>
<thead>
<tr>
<th>Oscillator/Mix</th>
<th>Connection of Osc./Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MFD Condenser</td>
<td>Antenna Connection on Set</td>
<td>455 KC</td>
<td>Any point where it does not affect the signal.</td>
<td>1-2</td>
<td>2ND I.F.</td>
<td>Adjust for maximum output</td>
</tr>
<tr>
<td>50 MFD Mix Condenser</td>
<td>Antenna Connection on Set</td>
<td>1650 KC</td>
<td>Tuning knobs to max. clockwise position</td>
<td>3</td>
<td>1ST I.F.</td>
<td></td>
</tr>
<tr>
<td>50 MFD Mix Condenser</td>
<td>Antenna Connection on Set</td>
<td>1670 KC</td>
<td>Automatically tune to 1600 KC pre-driver Signal</td>
<td>6</td>
<td>Antenna</td>
<td>Adjust for maximum output</td>
</tr>
</tbody>
</table>

CALIBRATE DIAL AS SHOWN UNDER HEADING "DIAL CALIBRATION" OVER FIG. 2 BELOW.

After the set has been installed in the car, tune in a fairly weak station over 1450 KC and adjust trimmer No. 8 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the set.

### GENERAL ALIGNMENT PROCEDURE

**TO PERFORM THIS ALIGNMENT PROCEDURE THE RECEIVER CHASIS MUST BE REMOVED FROM THE CASE.

<table>
<thead>
<tr>
<th>Oscillator/Mix</th>
<th>Connection of Osc./Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MFD Condenser</td>
<td>Antenna Connection on Set</td>
<td>455 KC</td>
<td>Any point where it does not affect the signal.</td>
<td>1-2</td>
<td>2ND I.F.</td>
<td>Adjust for maximum output</td>
</tr>
<tr>
<td>50 MFD Mix Condenser</td>
<td>Antenna Connection on Set</td>
<td>1650 KC</td>
<td>Tuning knobs to max. clockwise position</td>
<td>3-4</td>
<td>1ST I.F.</td>
<td></td>
</tr>
</tbody>
</table>

ADJUSTMENT OF TUNING CORES IN ANTENNA AND OSCILLATOR COILS:

1. Loosen the lock screw at the back of the threaded tuning core shaft (see Fig. 2 below).
2. Rotate the tuning knob on the receiver to the maximum clockwise position so that tuning cores are not as far as possible.
3. Turn each tuning core to the left side until the edge shown in Fig. 2, below. Hold the core stationary, tighten the lock nut on the oscillator core (top coil) (see Fig. 2), below. Use a small amount of speaker cream on the lock nut to ensure against jamming in setting. Do the lock nut on the antenna core as further adjustment is necessary.

Now repeat adjustments made on trimmers 5, 6, 7 and 7.

After the set has been installed in the car, tune in a fairly weak station over 1450 KC and adjust trimmer No. 8 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the case.

### DIAL CALIBRATION

Here the case must be on the receiver case. Check the calibration by turning in a station of known frequency on the high frequency dial. Then dial calibration is correct, then turn in another station of the same frequency, then turn in another station of the same frequency. If the dial does not move, then the frequency is correct. If the dial does not move, then the receiver is balanced.

### ALIGNMENT PROCEDURE FOR MODELS DB-41 OR SA-41

For alignment an output meter and accurately calibrated signal generator are required.

1. Remove the top and bottom covers of the receiver case.
2. Connect output meter across core and between the plates of the 6V6GT output tubes.
3. Connect output meter across core and between the plates of the 6V6GT output tubes.
4. Turn volume control to maximum volume position.
5. Check to see that pointer is 90° from rear of dial window (Vol. Control) when normally in use.

### ALIGNMENT FOR MODEL DB-41 ONLY (6 tube Set)

Before aligning this set, TRANSFORMER BETWEEN TERMINALS c AND g AS SHOWN IN FIGURE 4.

<table>
<thead>
<tr>
<th>Oscillator/Mix</th>
<th>Connection of Osc./Generator to Receiver</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Trimmer Number</th>
<th>Trimmer Description</th>
<th>Type of Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MFD Condenser</td>
<td>Antenna Connection on Set</td>
<td>1600 KC</td>
<td>Any point where it does not affect the signal.</td>
<td>1-2</td>
<td>2ND I.F.</td>
<td>Adjust for maximum output</td>
</tr>
<tr>
<td>50 MFD Mix Condenser</td>
<td>Antenna Connection on Set</td>
<td>1650 KC</td>
<td>Carefully tune to 1600 KC, pre-driver at right as possible.</td>
<td>3-4</td>
<td>1ST I.F.</td>
<td></td>
</tr>
<tr>
<td>50 MFD Mix Condenser</td>
<td>Antenna Connection on Set</td>
<td>1670 KC</td>
<td>Automatically tune to 1600 KC pre-driver Signal</td>
<td>3</td>
<td>Antenna</td>
<td>Adjust for maximum output</td>
</tr>
</tbody>
</table>

Now repeat adjustments made on trimmers 5, 6, 7 and 7.

After the set has been installed in the car, tune in a fairly weak station over 1450 KC and adjust trimmer No. 8 until maximum volume is obtained. This trimmer can be reached by removing the plug button at the left front corner of the bottom of the case.
Hudson Automobile Radio Receiver—Deluxe Model SA-41

6SK7
RF
6SA7
1st DET.-OSC.
6SK7
1F
6SQ7
2nd DET.-AVC-AUDIO
6V6GT
OUTPUT

IF 455 KC
VIBRATOR
6X5GT
RECT.

TO FUSE BLOCK
FUSE

PARTS LIST—For Parts Not Shown Below See List on Page 11

<table>
<thead>
<tr>
<th>Stewart Diagram</th>
<th>Warner Number</th>
<th>Hudson Part Number</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63539</td>
<td>BO-158447</td>
<td>Condenser—mica 260 mfd.</td>
<td>10.00</td>
</tr>
<tr>
<td>2.3</td>
<td>33783</td>
<td>BO-158448</td>
<td>Condenser—mica 110 mfd.</td>
<td>10.00</td>
</tr>
<tr>
<td>8</td>
<td>85883</td>
<td>BO-200233</td>
<td>Resistor—25 ohm 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>9</td>
<td>88054</td>
<td>BO-200570</td>
<td>Switch—set-up</td>
<td>10.00</td>
</tr>
<tr>
<td>6</td>
<td>88250</td>
<td>BO-158455</td>
<td>Condenser—mica 500 mfd.</td>
<td>10.00</td>
</tr>
<tr>
<td>7</td>
<td>110629</td>
<td>BO-200571</td>
<td>Diode—6.3 volt</td>
<td>10.00</td>
</tr>
<tr>
<td>8.9</td>
<td>110631</td>
<td>BO-158477</td>
<td>Resistor—insulated 470,000 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>10</td>
<td>112971</td>
<td>BO-158477</td>
<td>Resistor—insulated 470,000 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>11.12</td>
<td>112978</td>
<td>BO-158478</td>
<td>Resistor—wire wound 220 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>13</td>
<td>112980</td>
<td>BO-158483</td>
<td>Resistor—insulated 1000 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>14-15</td>
<td>112987</td>
<td>BO-158488</td>
<td>Resistor—insulated 220,000 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>16</td>
<td>112993</td>
<td>BO-161477</td>
<td>Resistor—carbon 470,000 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>17</td>
<td>112978</td>
<td>BO-200520</td>
<td>Resistor—insulated 22,000 ohms 2 watts</td>
<td>10.00</td>
</tr>
<tr>
<td>18 M</td>
<td>125122</td>
<td>BO-200562</td>
<td>Speaker—dynamic 6 inch</td>
<td>10.00</td>
</tr>
<tr>
<td>19 M</td>
<td>125424</td>
<td>BO-152020</td>
<td>Fuse—20 amp 25 volt</td>
<td>10.00</td>
</tr>
<tr>
<td>20 M</td>
<td>110565</td>
<td>BO-161478</td>
<td>Resistor—insulated 33,000 ohms 1/10 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>21</td>
<td>110666</td>
<td>BO-200523</td>
<td>Resistor—insulated 68,000 ohms 1/10 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>22</td>
<td>110673</td>
<td>BO-161480</td>
<td>Resistor—insulated 10,000 ohms 1/10 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>23</td>
<td>110675</td>
<td>BO-200234</td>
<td>Resistor—27,000 ohms 1 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>24 M</td>
<td>110680</td>
<td>BO-200220</td>
<td>Resistor—insulated 650 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>25 M</td>
<td>110683</td>
<td>BO-200225</td>
<td>Resistor—insulated 300 ohms 2 watts wire wound</td>
<td>10.00</td>
</tr>
<tr>
<td>26</td>
<td>110691</td>
<td>BO-161496</td>
<td>Resistor—insulated 6800 ohms 1/4 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>27</td>
<td>110696</td>
<td>BO-200238</td>
<td>Resistor—22,000 ohms 1/10 watt</td>
<td>10.00</td>
</tr>
<tr>
<td>38.29.30</td>
<td>110625</td>
<td>BO-158461</td>
<td>Condenser—1 mfd. 600 volt</td>
<td>10.00</td>
</tr>
<tr>
<td>33-34</td>
<td>110619</td>
<td>BO-161465</td>
<td>Condenser—0.5 mfd. 600 volt</td>
<td>10.00</td>
</tr>
<tr>
<td>35.36</td>
<td>110632</td>
<td>BO-161495</td>
<td>Choke coil—A type</td>
<td>1.00</td>
</tr>
<tr>
<td>37.38</td>
<td>110825</td>
<td>BO-161473</td>
<td>Condenser—5 mfd. 150 volt</td>
<td>1.00</td>
</tr>
<tr>
<td>39</td>
<td>110831</td>
<td>BO-200526</td>
<td>Condenser—25 mfd. 150 volt</td>
<td>1.00</td>
</tr>
</tbody>
</table>

SOCKET VOLTAGES

| 6.5 V Battery | Total Drain 64 Amp |

VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS

6SK7 RF 6SA7 OSC-1ST DET. 6SK7 IF 6SQ7 2ND DET-AVC-AF 6V6GT OUTPUT

BOTTOM VIEW OF CHASSIS

VIBRATOR 6X5GT RECTIFIER WESTON 6X5GT REPLACEMENT 6V6GT OUTPUT

IMPORTANT: Use a high resistance voltmeter of at least 1000 ohms per volt.

NOTE A: The bias for the control grid of the 6V6GT tube is about 12.5 volts measured across resistor No. 25.
THIS SOCKET MOUNTED WITH KEYWAY IN OPPOSITE DIRECTION IN LATE SETS

CHASSIS WIRING DIAGRAM FOR MODEL DB-41

HOW TO SET UP PUSH BUTTONS ON MODELS SA-41 AND DB-41

1. Operate set for 10 minutes before set-up.
2. TO UNLOCK MECHANISM
   (a) Rotate tuning control downward until dial pointer is at "RESET.
   (b) Move black set-up switch to right.
   (c) Push up locking knob and turn counter-clockwise approximately 2 turns or until slight resistance is felt. Pull locking knob down to disengage.
3. Push in selected button as far as it will go and tune manually to desired station, while holding button in.
4. Follow same procedure for other buttons. After setting any button, do not touch it again until switch is locked as in 5.
5. TO LOCK MECHANISM
   (a) Rotate tuning control downward until dial pointer is at "RESET.
   (b) Push up locking knob and turn clockwise as tightly as possible by hand. Pull locking knob down to disengage.
   (c) Push set-up switch to the left.

MODEL SA-41 TUBE LOCATIONS

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