GALVIN MFG. CO.

IF PEAKS
AM - 455 KC
FM - 4.3 MC

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GALVIN MFG. CO.

MODEL 17PM61

ALIGNMENT CHART

F.R. SECTION

<table>
<thead>
<tr>
<th>Operation in Grid</th>
<th>Capacity Reading</th>
<th>Connected To</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Min.</td>
<td>Grid V-2 1 to Min.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>2 Min.</td>
<td>Grid V-2 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>3 Min.</td>
<td>Grid V-2 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. B</td>
</tr>
<tr>
<td>4 Min.</td>
<td>Grid V-3 1 to Min.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>5 Min.</td>
<td>Grid V-3 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>6 Min.</td>
<td>Grid V-3 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>7 Min.</td>
<td>Grid V-4 1 to Min.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>8 Min.</td>
<td>Grid V-4 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>9 Min.</td>
<td>Grid V-4 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>10 Min.</td>
<td>Grid V-5 1 to Min.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>11 Min.</td>
<td>Grid V-5 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>12 Min.</td>
<td>Grid V-5 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>13 Min.</td>
<td>Grid V-6 1 to Min.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>14 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>15 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>16 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. A</td>
</tr>
<tr>
<td>17 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. C</td>
</tr>
<tr>
<td>18 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. C</td>
</tr>
<tr>
<td>19 Min.</td>
<td>Grid V-6 1 to Max.</td>
<td>X 4.3 M.C.</td>
<td>X F.M. C</td>
</tr>
</tbody>
</table>

A.W. SECTION

<table>
<thead>
<tr>
<th>Operation in Grid</th>
<th>Frequency</th>
<th>Antenna Resistance Meter</th>
<th>Grid V-2</th>
<th>Grid V-3</th>
<th>Grid V-4</th>
<th>Grid V-5</th>
<th>Grid V-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>21 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>22 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>23 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>24 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>25 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>26 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>27 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>28 Min.</td>
<td>1455 K.C.</td>
<td>1.38</td>
<td>1.57</td>
<td>1.38</td>
<td>1.38</td>
<td>1.38</td>
<td></td>
</tr>
</tbody>
</table>

NOTE A: Detune by reducing trimmer capacity. Rotate trimmer adjusting screw counterclockwise one turn. NOTE B: Two peaks will be present; tune to the valley between them. NOTE C: If receiver does not cover frequency range, readjust all trimmers bearing Note D.
FREQUENCY RANGE
330 - 1750 KC
1F - 455 KC

NOTE: 1N56T AND 1H56T TUBES
MUST HAVE METAL SHELL BASE
### ALIGNMENT CHART MODEL 36C-1

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator 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>
</tr>
<tr>
<td>2</td>
<td>1600 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>545 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>To Special Dummy</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>1400 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>9</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 26767 or Booster Coil Part No. 24A26751 in series with a 35 Mfd. Condenser.

### ALIGNMENT CHART MODEL 36C-2

<table>
<thead>
<tr>
<th>Operations</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Generator 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>
</tr>
<tr>
<td>2</td>
<td>1400 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc.-Mod. Grid</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>*</td>
<td>Osc.-Mod. Grid</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>*</td>
<td>To Special Dummy</td>
<td>7</td>
</tr>
</tbody>
</table>

* Use Special Dummy Part No. 26767 or Booster Coil Part No. 24A26751 in series with a 35 Mfd. Condenser.

---

### SENSITIVITY AND STAGE GAIN MEASUREMENT MODEL 36C-1

<table>
<thead>
<tr>
<th>Average Microvolt Input *</th>
<th>Generator Feeder Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,250</td>
<td>262 K.C.</td>
<td>I.F. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>700</td>
<td>262 K.C.</td>
<td>I.F. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>710</td>
<td>600 K.C.</td>
<td>Mod. Grid</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>.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>
</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. 24A26751 in series with a 35 Mfd. Condenser.

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### SENSITIVITY AND STAGE GAIN MEASUREMENT MODEL 36C-2

<table>
<thead>
<tr>
<th>Average Microvolt Input *</th>
<th>Generator Feeder Set At</th>
<th>Dummy Antenna Connected To</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>360</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>628</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>90</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.5 Mfd.</td>
<td>1.74</td>
</tr>
<tr>
<td>12</td>
<td>600 K.C.</td>
<td>Ant. Lead</td>
<td>***</td>
<td>None</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. 24A26751 in series with a 35 Mfd. Condenser.

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MODELS 36-C1, 36-C2 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 (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 one full turn around drive pulley and up to tuning shaft. (See Fig. 3.)
7. Route cord 7 turns around tuning shaft as shown in Fig. 3 and down to drive pulley.
8. Continue in a clockwise direction around drive pulley and through hole (x).
9. Slip the two cord ends through eyelet (Part No. 557934) inside of pulley.
10. Knot the two cord ends together and fasten to one end of spring (Part No. 41A14759). Hook other end of spring to hole (y) in drive pulley.
11. With a pair of pliers pinch eyelet on cord and place drop of shellac on cord knot.

MODELS 36-C1, 36-C2 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. 4.)
6. In a clockwise direction run cord one turn around condenser pulley, under brake shoe and over to idler pulley No. 3 and around it in a counter-clockwise direction.
7. Route string across chassis to idler pulley No. 2, and around it in a counter-clockwise direction.
8. Route cord back across chassis and down over idler pulley No. 1.
9. Route cord down and around condenser pulley turn to hole (c).
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. 41A11061) 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.

MODEL 51 F 12 SENSITIVITY AND STAGE GAIN MEASUREMENTS

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2600</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>25</td>
<td>455 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>30</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>4.5</td>
<td>600 K.C.</td>
<td>Ant. Terminal</td>
<td>200 Mfd.</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

MODEL 51 F 12 ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc. - Mod.</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>1720 K.C.</td>
<td>.1 Mfd.</td>
<td>Osc. - Mod.</td>
<td>5</td>
<td>1720 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>200 Mfd.</td>
<td>Ant. Lead.</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>
MODELS 49BT1, 49BT2
MODEL 41H
MODELS 41D, 51D, 52D

GALVIN MFG. CO.

ALIGNMENT PROCEDURE

MODELS 49BT1 AND 49BT2

1. Connect signal generator to control grid of first detector tube (1A7G) through a .05 MF condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn condenser gang completely out of mesh.

2. Set signal generator to 455 KC and carefully adjust the two I.F. trimmers and the one diode trimmer to point showing highest reading on output meter.

3. Connect signal generator to antenna and ground leads using a .0002 MF condenser in antenna lead.

4. Set signal generator and receiver dial both at 1700 KC. Adjust osc. trimmer (on condenser gang) until 1700 KC signal is heard.

5. Set signal generator at 1400 KC and turn condenser gang to the signal at 1400 KC. Adjust antenna trimmer (on condenser gang) to point showing highest reading on output meter.

MODEL 41H

ALIGNMENT PROCEDURE

1. Connect signal generator to control grid of first detector tube (1A70F) through a .05 MF condenser, and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn condenser gang completely out of mesh. The loop must be connected to the chassis at all times.

2. Set signal generator at 455 K.C. and carefully adjust the two I.F. trimmers and the two Diode trimmers to point showing highest reading on output meter.

3. Turn signal generator to 1700 K.C. and, with condenser gang completely out of mesh adjust OSC. trimmer (on small section of condenser gang) until 1720 K.C. signal is heard.

4. Place chassis in cabinet, connect loop terminals, and fasten back on cabinet.

5. Remove plug from side of cabinet to expose ANT. trimmer.

6. Tune in a weak station near 1400 or 1500 K.C. and adjust ANT. trimmer through hole in cabinet for maximum volume.

There are no further adjustments.

MODELS 41D, 51D, AND 52D

POSITION AND CONNECT BATTERIES AS SHOWN BELOW
SENSITIVITY AND STAGE GAIN MEASUREMENTS

### MODELS 61L11, 61L12

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>5500</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>105</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>110</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>6</td>
<td>600</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

### MODELS 61X11, 61X12, 61X13, 61X15, 61X16, 61X17

<table>
<thead>
<tr>
<th>Average Microvolt Input</th>
<th>Generator Set At</th>
<th>Generator Feeder Connected To</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>4750</td>
<td>455 K.C.</td>
<td>I.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>110</td>
<td>455 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>55</td>
<td>600 K.C.</td>
<td>Mod. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>7</td>
<td>600 K.C.</td>
<td>R.F. Grid</td>
<td>.1 Mfd.</td>
<td>.5 Meg.</td>
<td>.38</td>
</tr>
<tr>
<td>6</td>
<td>600 K.C.</td>
<td>Ant.Terminal</td>
<td>200 Mfd.</td>
<td>None</td>
<td>.38</td>
</tr>
</tbody>
</table>

OUTPUT METER CONNECTED ACROSS SPEAKER VOICE COIL; .38 VOLT CORRESPONDS TO AN OUTPUT OF .05 WATT.

**MODELS 61L11 61L12**

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>Osc.Mod.Gr1d</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum*</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>5</td>
<td>1600 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1400 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>6</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>600 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>7**</td>
<td>600 K.C.</td>
</tr>
<tr>
<td>5</td>
<td>1400 K.C.</td>
<td>None</td>
<td></td>
<td>8</td>
<td>1400 K.C.</td>
</tr>
<tr>
<td>6</td>
<td>Repeat above steps for maximum accuracy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adjust pointer to zero.
** Rock condenser until greatest output is obtained.
*** Connect output of signal generator to a 5" diameter 3 turn loop. With volume on full and output meter connected across voice coil bring loop close enough to receiver loop (receiver loop should be in front up position) until an output of 50 Milliwatts is obtained. 50 Milliwatts = .38 Volts on output meter. Vary distance between generator and receiver loop to maintain this output during alignment.
NOTE: Trimmer No. 8 is adjusted with chassis in cabinet.

**MODELS 61X11 61X12 61X13 61X14 61X15 61X16 61X17**

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Operations In Order</th>
<th>Gang Condenser Set At</th>
<th>Dummy Antenna</th>
<th>Generator Connected To</th>
<th>Adjust Trimmers No.</th>
<th>Generator Set At</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>1-2-3-4</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>2</td>
<td>Minimum</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>5</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>3</td>
<td>1720 K.C.</td>
<td>.1 Mfd.</td>
<td>R.F. Gr1d</td>
<td>6</td>
<td>1720 K.C.</td>
</tr>
<tr>
<td>4</td>
<td>1400 K.C.</td>
<td>200 Mfd.</td>
<td>Ant.Terminal</td>
<td>7</td>
<td>1400 K.C.</td>
</tr>
</tbody>
</table>

* Adjust for Minimum Response (I.F. Wave Trap)

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MODEL 71-A

1. Connect signal generator to control grid of modulator tube through a 1 MFD condenser and to chassis ground. Do not remove grid cap. Connect output meter across speaker voice coil. Turn band switch to "Broadcast" position. Turn condenser gang completely out of mesh.

2. Set signal generator at 455 K.C. and carefully adjust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

3. Leave band switch in "Broadcast" position. Connect signal generator to antenna lead and chassis, using a 200 MFD condenser in antenna lead.

4. Set signal generator ant receiver dial both at 1750 K.C. Adjust B.C. Oscillator trimmer until 1750 K.C. signal is heard.

5. Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust B.C. Antenna trimmer to point showing highest reading on output meter.

6. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale while adjusting B.C. padder until combination is found which gives highest output reading.

7. Turn band switch to "Police" position. Connect antenna lead to signal generator through a 400 ohm resistor.

8. Set signal generator and receiver dial both at 5.7 M.C. Adjust police oscillator trimmer until 5.7 M.C. signal is heard.

9. Set signal generator at 5.5 M.C. and turn condenser gang to signal at 5.5 M.C. Adjust Police Antenna trimmer to point giving greatest output reading while slightly rocking condenser gang.

10. Turn band switch to "Short Wave" position, still using 400 ohm carbon resistor in antenna lead to signal generator.

11. Set signal generator and receiver dial both at 18.0 M.C. Adjust S.W. Oscillator trimmer until 18.0 M.C. signal is heard.

12. Set signal generator at 16 M.C. and turn condenser gang to the signal at 16 M.C. Adjust S.W. Ant. trimmer to point giving greatest output reading, while slightly rocking condenser gang.

13. Padders on "Police" and "Short Wave" bands are fixed.

Note: Under no circumstances should "Police" and "Short Wave" padders be adjusted.

MODEL 72-C

(SAME AS 71-A EXCEPT FOR THE FOLLOWING STEPS:)

1. Loop must be connected to chassis during alignment.

3. Connect signal generator to antenna lead through 400 ohm resistor.


5. Model 72C has no antenna trimmer. Continue alignment as for Model 71-A.

---

GALVIN MFG. CO.
SENSITIVITY AND STAGE GAIN MEASUREMENTS

MODEL 71-A AND 72-C

All stage gain measurements must be made with volume control set for full volume and tone control in treble position. The shielded lead from the signal generator is connected to the grid terminal of the tube through a .1 MF condenser with a 500 ohm resistor connected as a leak resistor between the grid of the tube and the grid lead which has been removed.

To measure overall sensitivity of the Model 72-C, connect the signal generator to the coupling turn in the loop, using a 400 ohm dummy. The lead, including the resistor, should be thoroughly shielded and the receiver must be at least 3 feet away from the signal generator.

MODEL 71-A

<table>
<thead>
<tr>
<th>Microvolt Input *</th>
<th>Generator Set at</th>
<th>Generator Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
<td>.36 Volt</td>
</tr>
<tr>
<td>35</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
<td>.36 Volt</td>
</tr>
<tr>
<td>40</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1 Mfd</td>
<td>.5 Meg</td>
<td>.36 Volt</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
<td>Ant. Lead</td>
<td>200 mfd</td>
<td>None</td>
<td>.36 Volt</td>
</tr>
</tbody>
</table>

* For .05 Watts output. ** Output meter connected across voice coil.

MODEL 72-C

<table>
<thead>
<tr>
<th>Microvolt Input *</th>
<th>Generator Set at</th>
<th>Generator Connected to</th>
<th>Dummy Antenna Capacity</th>
<th>Leak Resistance</th>
<th>Output Meter Reading **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2100</td>
<td>455</td>
<td>I.F. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>.36 volts</td>
</tr>
<tr>
<td>35</td>
<td>455</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>.36 volts</td>
</tr>
<tr>
<td>45</td>
<td>600</td>
<td>Mod. Grid</td>
<td>.1</td>
<td>.5 Meg</td>
<td>.36 volts</td>
</tr>
<tr>
<td>7</td>
<td>600</td>
<td>Ant. Lead</td>
<td>400 ohms</td>
<td>None</td>
<td>.36 volts</td>
</tr>
</tbody>
</table>

* For .05 Watts output
** Output meter connected across voice coil

VOLTAGE CHART 71-A

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>OSC. GRID</th>
<th>ANODE GRID</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A7</td>
<td>Mod.-Osc.</td>
<td>165</td>
<td>90</td>
<td>3</td>
<td>12</td>
<td>165</td>
</tr>
<tr>
<td>6D6</td>
<td>I.F.</td>
<td>165</td>
<td>90</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>Inverter</td>
<td>105</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>Driver</td>
<td>105</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25B6G</td>
<td>Output</td>
<td>210</td>
<td>170</td>
<td>31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25B6G</td>
<td>Output</td>
<td>210</td>
<td>170</td>
<td>31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25Z5</td>
<td>Rect.</td>
<td>117</td>
<td>-</td>
<td>200</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Line Voltage 117 AC 60 Cycle All Reading to B minus Volume control set at Maximum

VOLTAGE CHART 71-C

<table>
<thead>
<tr>
<th>TUBE</th>
<th>POSITION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6A8GT</td>
<td>Mod.-Osc.</td>
<td>185</td>
<td>80</td>
<td>1.3</td>
<td>110</td>
</tr>
<tr>
<td>6K7GT</td>
<td>I.F.</td>
<td>185</td>
<td>80</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>Det.-AVC-A.F.</td>
<td>95</td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>6SQ7GT</td>
<td>Phase Inv.</td>
<td>95</td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>6V6</td>
<td>Output</td>
<td>260</td>
<td>185</td>
<td>6.2</td>
<td>-</td>
</tr>
<tr>
<td>6V6</td>
<td>Output</td>
<td>260</td>
<td>185</td>
<td>6.3</td>
<td>-</td>
</tr>
<tr>
<td>5W4GT</td>
<td>Rect.</td>
<td>AC</td>
<td>-</td>
<td>260</td>
<td>-</td>
</tr>
</tbody>
</table>

Line Voltage 117 AC. 60 cycle Measurements are from socket terminal indicated to chassis ground using 1000 ohms per volt meter. Volume control set at maximum

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**MODEL 71A SCHEMATIC DIAGRAM PARTS LIST**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B.C. Antenna Coll (Violet &amp; Black Dots)</td>
<td>24A17043</td>
<td>Tubular Condenser (.006-.600V.)</td>
</tr>
<tr>
<td>2</td>
<td>Police Antenna Coll</td>
<td>24A17067</td>
<td>Tubular Condenser (.01-.100V.)</td>
</tr>
<tr>
<td>3</td>
<td>S. W. Antenna Coll</td>
<td>24A17088</td>
<td>21B6503 Soldered Mica Cond. (50 mmf) 20%</td>
</tr>
<tr>
<td>4</td>
<td>B.C. Osc. Coll (Violet &amp; Brown Dots)</td>
<td>24K17049</td>
<td>21B6511 Soldered Mica Cond. (100 mmf) 20%</td>
</tr>
<tr>
<td>5</td>
<td>Police Oscillator Coll</td>
<td>24A17069</td>
<td>21B6500 Soldered Mica Cond. (500 mmf) 20%</td>
</tr>
<tr>
<td>6</td>
<td>S. W. Oscillator Coll</td>
<td>24A17090</td>
<td>686171 Carbon Res. (1 meg-1/2-20) N.I.</td>
</tr>
<tr>
<td>7</td>
<td>I.F. Coll &amp; Shield Assembly</td>
<td>1X17014</td>
<td>686122 Carbon Res. (220,000-1/2-10) N.I.</td>
</tr>
<tr>
<td>8</td>
<td>Diode Coll &amp; Shield Assembly</td>
<td>1X17032</td>
<td>686150 Carbon Res. (150,000-1/2-10) N.I.</td>
</tr>
<tr>
<td>9</td>
<td>Output Transformer</td>
<td>2186501</td>
<td>686020 Carbon Res. (47,000-1/2-10) N.I.</td>
</tr>
<tr>
<td>10</td>
<td>Speaker (8&quot; Electro) &amp; Cable</td>
<td>50816806</td>
<td>686096 Carbon Res. (22,000-1/2-20) N.I.</td>
</tr>
<tr>
<td>11</td>
<td>Tuner, Gang &amp; Pulley</td>
<td>1X14887</td>
<td>686101 Carbon Res. (4700-1/2-20) N.I.</td>
</tr>
<tr>
<td>13</td>
<td>Trimmer &amp; L Brkt. (2-22) L.H.</td>
<td>20A16823</td>
<td>686227 Carbon Res. (10-1/2-10) N.I.</td>
</tr>
<tr>
<td>14</td>
<td>B.C. Trimmer &amp; Padder</td>
<td>20K16996</td>
<td>17X15296 W. W. Resistor (50-6-10)</td>
</tr>
<tr>
<td>15</td>
<td>S. W. Padder (4200 mmf)</td>
<td>20K17439</td>
<td>17X15295 W. W. Resistor (50-5-10)</td>
</tr>
<tr>
<td>16</td>
<td>Police Padder (2800 mmf)</td>
<td>20A17436</td>
<td>686153 Carbon Res. (10,000-1/3-10) N.I.</td>
</tr>
<tr>
<td>17</td>
<td>Electrolytic Condenser (3 Section)</td>
<td>23A16805</td>
<td>18A17941 Volume Control &amp; Switch (.5 meg)</td>
</tr>
<tr>
<td>18</td>
<td>Electrolytic Condenser (16-100V.)</td>
<td>23A16901</td>
<td>18A16065 Tone Control (1 meg)</td>
</tr>
<tr>
<td>19</td>
<td>Tubular Condenser (.02-.400V.)</td>
<td>899062</td>
<td>40A16796 Band Switch Section (Front)</td>
</tr>
<tr>
<td>20</td>
<td>Tubular Condenser (.1-100V.)</td>
<td>89914</td>
<td>40K16797 Band Switch Section (Rear)</td>
</tr>
<tr>
<td>21</td>
<td>Tubular Condenser (.05-100V.)</td>
<td>899065</td>
<td>20A11047 Capacitor Condenser</td>
</tr>
<tr>
<td>22</td>
<td>Tubular Condenser (.06-200V.)</td>
<td>899062</td>
<td>40X10069 Bias Cell</td>
</tr>
<tr>
<td>23</td>
<td>Tubular Condenser (.07-.400V.)</td>
<td>899067</td>
<td>26X10681 Tube Shield Shell</td>
</tr>
<tr>
<td>24</td>
<td>Tubular Condenser (.08-100V.)</td>
<td>899084</td>
<td>26X10682 Tube Shield Cap</td>
</tr>
<tr>
<td>25</td>
<td>Tubular Condenser (.01-.200V.)</td>
<td>899626</td>
<td>6X12028 Bulb (6.3V-.25 A Tub.Bay.) White</td>
</tr>
<tr>
<td>26</td>
<td>Tubular Condenser (.03-600V.)</td>
<td>50816806</td>
<td>30A161 Line Cord &amp; Plug (6 feet)</td>
</tr>
</tbody>
</table>

**MODEL 71A DIAL CORD INSTRUCTIONS**

1. Cut a length of 24# test dial drive cord 34 inches long.
2. Turn gang to fully meshed position.
3. Push dial drive shaft down.
4. Thread cord thru slot "G" in drive pulley.
5. With an ordinary paper clip fasted cord to drive disc "H" to hold in place.
6. Wind cord in a clock-wise direction one half turn around the drive pulley and up to the front idler pulley "B".
7. Run cord across dial to idler pulley "B" and around it in a clock-wise direction.
8. Continue cord back across chassis and over rear idler pulley "C".

9. Continue cord down to drive pulley "A" and clockwise around it one and one half turns to the slot "G".
10. Knot both ends of cord securely together inside the slot.
11. Tie in one end of tension spring.
12. Hook the other end of tension spring into hole in drive pulley "A".
13. Replace the dial pointer.
14. To set pointer to correct frequency, tune in a station of known frequency and adjust position of pointer on string.
15. Secure pointer to string with a drop of shellac or good grade household cement.

---

**Fig. 21**

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1. Connect signal generator to control grid of Osc.-Mod. tube (6D8G) through a .05 MF. condenser and to chassis. Do not remove grid cap. Also connect output meter across speaker voice coil. Turn band switch to "Broadcast" position. Turn condenser gang completely out of mesh.

2. Set signal generator at 455 K.C. and carefully adjust the four I.F. trimmers (located in top of I.F. coil cans) to point showing highest reading on output meter.

3. Leave band switch in "Broadcast" position. Connect signal generator to antenna and ground terminals, using a .0002 MF condenser in antenna lead.

4. Set signal generator and receiver dial both at 1700 K.C. Adjust B.C. OSC. trimmer until 1700 K.C. signal is heard.

5. Set signal generator at 1400 K.C. and turn condenser gang to the signal at 1400 K.C. Adjust BC ANT. trimmer to point showing highest reading on output meter.

6. Set signal generator at 600 K.C. and rock pointer at 600 K.C. position on dial scale, while adjusting BC padder, until combination is found which gives highest output reading. (NOTE: If there is noise level at 600 K.C., padder can be adjusted to maximum noise without rocking gang and without use of signal generator. Use short wire for pick-up if necessary.)

7. Turn band switch to "Short Wave" position. Replace .0002 MF condenser in signal generator lead with a 400 ohm carbon resistor.

8. Set signal generator and receiver dial both at 18.0 MC. Adjust S.W. OSC. trimmer until 18.0 MC signal is heard.

9. Set signal generator at 16.0 MC and turn condenser gang to signal at 16.0 MC. Adjust S.W. ANT. trimmer to point giving greatest output reading. (Use non-metallic screw driver.)

10. Set signal generator at 6.0 MC and rock pointer at 6.0 MC position on dial scale, while adjusting S.W. padder, until combination is found which gives highest output reading. (NOTE: May also be adjustable to maximum noise.)
Watts input at 117 V. line: 45 Watts output: 1.7 Undistorted 2.7 Maximum
Selectivity at 1000 times signal — 34kc band width Intermediate frequency 456kc
Speaker 5½" Electrodynamic, 750 ohm field
I. F. 456kc at 12SA7 grid (Stator of middle section of variable condenser) 50 to 60 Microvolts.
Tube Functions: 12SK7 R. F., 12SA7 first detector, 12SK7 oscillator, 12SK7 IF amplifier, 12SK7 second detector, 12SQ7 first audio, 35L6GT power output. 6X5GT rectifier. Voltage will be found on circuit diagram.

Tuning Ranges:
Broadcast Band 540 to 1650 kc
Short Wave Band 9.1 — 12.0 mc
Sensitivity: For .05 watt output: (Loop)
Broadcast Band 15 to 20 Microvolts
S W Band 40 to 60 "

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PRICES SUBJECT TO CHANGE
WITHOUT NOTICE

October 1941

ALIGNMENT PROCEDURE

- Volume control— Maximum all adjustments.
- Connect B— of radio chassis to ground post of signal generator through .1 Mfd. condenser.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I. F.</td>
<td></td>
<td>Grid of 12SK7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of Output I. F.</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>1 MFD.</td>
<td>2nd I. F.</td>
<td>(Plates out of mesh)</td>
<td>Two trimmers on top of Output I. F.</td>
</tr>
<tr>
<td></td>
<td>455 Kc.</td>
<td>1 MFD.</td>
<td>Grid of 1257A</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of Input I. F.</td>
</tr>
<tr>
<td>BROAD CAST</td>
<td>1278 Kc.</td>
<td>1 inmil.</td>
<td>Grid of 12SK7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>One trimmer C71</td>
</tr>
<tr>
<td>BAND</td>
<td>1400 Kc.</td>
<td>200 mnd.</td>
<td>External</td>
<td>Set Dial at 1400 K. C.</td>
<td>Ant. trimmer C30</td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio and in its proper position when making all adjustments.

BOTTOM VIEW OF CHASSIS

VOLTAGE CHART
ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B—of radio chassis to ground post of signal generator through .1 Mfd. condenser.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. F</td>
<td>455 Kc. 1 MFD.</td>
<td>.1 MFD.</td>
<td>Grid of 12SK7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of Grid of 12SK7 Converter</td>
</tr>
<tr>
<td>BROAD</td>
<td>1720 Kc. 1 mfd.</td>
<td>1 MFD.</td>
<td>Grid of 12SA7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Output I. F.</td>
</tr>
<tr>
<td>CST</td>
<td>1400 Kc. 1 MFD.</td>
<td>2 mfd.</td>
<td>External Antenna and B—</td>
<td>Set Dial at 1400 K. C.</td>
<td>Ant trimmer C30 See voltage chart view</td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio and in its proper position when making all adjustments.

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October 1941
CONDENSERS
10013 C1, C4, C20, C21 Two Gang Condenser Complete with
tuner assembly and Ant. and Dec.
trimmers
10026 C8, C17, C18 .02 x 400 Volt Tubular Condenser
10025 C11 .002 x 600 Volt Tubular Condenser
10029 C18 .05 x 200 Volt Tubular Condenser
10020 C6, C7 1 x 200 Volt Tubular Condenser
100118 C5 2 x 600 Volt Tubular Condenser
11014 C16 .1 x 600 Volt Tubular Condenser
110125 C9, C10, C11 Electrolytic Filter Condenser, 20 Mfd. x
150 V., 20 Mfd. x 150 V.; 40 Mfd. x
150 V., 20 Mfd. x 150 V.
125 C3, C7, C12, C13, C14 .0005 Mica Type Condenser—10% 5

RESISTORS
1212 R13, S1 Volume Control and Switch (1 Megohm)
1328 R5 10M Ohm—35 Watt Resistor—10%
1304 R10 3 Megohm—35 Watt Resistor—20%
1317 R3 20 M. Ohm—35 Watt Resistor—20%
13016 R18 150 Ohm—35 Watt Resistor—20%
13221 R15 25 Ohm—35 Watt Resistor—10%
13207 R17 1 Megohm—35 Watt Resistor—20%
13120 R14 5 Megohm—35 Watt Resistor—20%
13202 R2 100 M. Ohm—35 Watt Resistor—20%
1339 R16 250 M. Ohm—35 Watt Resistor—10%
13301 R16 400 Ohm—35 Watt Resistor—10%
13303 R2 500 M. Ohm—35 Watt Resistor—10%
13079 R9 252 Ohm—35 Watt Resistor—10%
13245 R1, R3 1 M. Ohm—35 Watt Resistor—10%
13029 R2, R5 150 M. Ohm—35 Watt Resistor—20%

COILS
100148 TP T3 Input I. F. Coil Complete in Can
100145 T4 Output I. F. Coil Complete in Can
110246 T2 Oscillator Coil
112260 T1 Loop Antenna Assembly—Specify Color
101540 L2 R. F. Filter Choke
101541 L2 Filter Choke

SPEAKER
11823 T6 4 x 6 Inch Oval Electrodynamic Speaker
101506C T5 Output Transformer for Speaker

MISCELLANEOUS
12749 F1 6.8 Volt Pilot Lite Bulb, Type T-47
107399 Socket Assembly for Pilot Light
12798 Line Cord and Plug
123210 8 Prong Molded Octal Sockets

Setting the Pushbuttons

Make a list of your 6 favorite stations—push out the call letters of these stations from the call letter sheets supplied. Next insert a long slim screw driver into the hole in front of one of the pushbuttons and unscrew the pushbutton locking screw (to the left) several turns. Now with the screw driver still engaged in the locking screw slot push it all the way in. Hold it in this position and turn in the station you want with the tuning knob. Now tighten up the pushbutton locking screw by turning it to the right. Tighten firmly. Continue setting each button in the same way. When you have set your stations insert the call letter of each station in the front of the proper button and put one of the celluloid tabs over the station call letter.

To change stations simply repeat the above procedure.

If you are unable to set a station on any particular button it is probably because the pushbutton locking screw has not been unloosened (turned to the left).
MODEL C6D16

ALIGNMENT PROCEDURE

- Volume control—Maximum all adjustments.
- Connect B—of radio chassis to ground post of signal generator through .1 Mfd. condenser.

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted to Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 12S A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top of Output I.F.</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 12S A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>One trimmer C21 See voltage chart view</td>
</tr>
</tbody>
</table>

The loop antenna should be connected to the radio and in its proper position when making all adjustments.

ALIGNMENT PROCEDURE

Slight adjustments to the oscillator and antenna circuits can be made without removing the chassis from the cabinet through two holes which are provided on the bottom of the cabinet.

- The two adjustments on the variable gang condenser can be reached with a long insulated type screwdriver through these two holes.

IMPORTANT—See alignment instructions

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

<table>
<thead>
<tr>
<th>BAND</th>
<th>SIGNAL GENERATOR Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F.</td>
<td>455 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 12S A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Four trimmers on Top (See Fig. 1)</td>
<td>Output and Input I.F.</td>
<td>Adjust to maximum output</td>
</tr>
<tr>
<td>BROAD-CAST BAND</td>
<td>1600 Kc.</td>
<td>.1 MFD</td>
<td>Grid of 12S A7</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer bottom of resonant section of gang (See bottom of radio)</td>
<td>Broadcast Oscillator</td>
<td>Adjust to maximum output</td>
</tr>
</tbody>
</table>

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

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

FREQUENCY RANGE

530 to 1600 K.C.

Power Output: 1 Watt Undistorted, 1.7 Watts Maximum
Intermediate Frequency .45 K.C.
NOTE: Some sets of this model were made for glass tubes only. Where glass tubes were used items C21–C22—R18 shown in dotted lines, were added to the circuit and the B + Line was opened between points X + 4.

On some sets R8 is replaced by a speaker field; R9 is also eliminated and C11 and C12 are connected in parallel.

BOTTOM VIEW OF CHASSIS
VOLTAGES MEASURED WITH 1000 OHM PER VOLT VOLTMETER
BETWEEN SEPARATE TERMINALS AND B—WITH A LINE VOLTAGE OF 11 VOLS.

35Z5GT
35L6GT

REAR OF CHASSIS

Circuit Diagram Ref. Part No. Description

RESISTORS
R1 130100 150M ohms—56 w.
R2 130148 100 ohms—56 w.
R3 130100 150M ohms—56 w.
R4 130108 5M ohms—56 w.
R5 130701 100M ohms—56 w.
R6 130701 50M ohms—56 w.
R7 130701 25 ohms—56 w.
R8 130296 700 ohms—56 w.
R9 130296 1300 ohms—56 w.
R10 130296 150M ohms—56 w.
R11 1304 4 megohm—56 w.
R12 1304 12.5 ohm—56 w.
R13 130296 500M ohm—56 w.
R14 1309 200M ohm—56 w.
R15 101011 1 megohm—volume control
R16 13037 50M ohm—56 w.
R17 13037 5 megohm—56 w.
R18 13037 300 ohm—56 w.

CONDENSERS
C1 10136 Two gang variable condenser
C2 10001 .02 x 400 v.
C3 10002 .02 x 400 v.
C4 10003 .02 x 400 v.
C5 10004 .02 x 400 v.
C6 10005 .005 mica
C7 10006 .0001 mica

PARTS
T1 11145 Loop Antenna Assembly
T2 11028 Oscillator Coil
T3 10145C Input I.F. Coil—455 ke.
T4 10145D Output I.F. Coil—455 ke.
T5 2033B Output Transformer
T6 11419 3 5 P.M. Speaker
T7 11426 5" Electrodynamic Speaker
S1 On off switch
P1 10249 T-47 Pilot Light

FIG. 1

FIG. 2
Setting the Pushbuttons

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

Next pull one of the pushbuttons all the way out(45,361),(975,992) as far as it will come. Now turn the knob back and forth until the station is clear and distinct. Now push the button hard all the way in to lock the station in place. Continue setting each pushbutton in the same way. Pressing the proper button will now tune the station you want. If it does not do so you did not push the button hard enough to lock it in place when setting up the station.
Do not realign the band spread scales unless you are positive they are out of adjustment. When adjustment is necessary proceed as follows.

1. Tune set to high frequency end of dial scale on any band.
2. Rotate each iron core until the fine score marks are even with the edge of the coil forms.
3. You are now ready to continue with the trimmer adjustments as shown on the alignment chart.

**Parts List for Model C11A54 Series A**

<table>
<thead>
<tr>
<th>Schematic Diagram</th>
<th>Description</th>
<th>No. Used In Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resistors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1201 R3, R5</td>
<td>1 Megohm—5 Watt Resistor—20%</td>
<td>2</td>
</tr>
<tr>
<td>1204 R8</td>
<td>50 Ohm—5 Watt Resistor—20%</td>
<td>1</td>
</tr>
<tr>
<td>1205 R4</td>
<td>1 Megohm—10 Watt Resistor—50%</td>
<td>1</td>
</tr>
<tr>
<td>1205 R7</td>
<td>Tone Control and Radio Switch</td>
<td>1</td>
</tr>
<tr>
<td>1207 R2</td>
<td>600 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1202 R13</td>
<td>250 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1202 R16</td>
<td>100 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R32, R46</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R33, R34</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R35, R36</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R38, R39</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R40, R42</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R41, R43</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td>1201 R44, R46</td>
<td>500 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Condensers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1202 C6, C7</td>
<td>1.2 x 200 Volt Tubular Condenser</td>
<td>1</td>
</tr>
<tr>
<td>1204 C8, C9</td>
<td>.002 x 600 Volt Tubular Condenser</td>
<td>1</td>
</tr>
<tr>
<td>1201 C10, C11</td>
<td>.0025 x 1250 Volt Tubular Condenser</td>
<td>1</td>
</tr>
<tr>
<td>1201 C15, C16</td>
<td>Electrolytic Filter Condenser 10 Mil. x 10 Mil.</td>
<td>1</td>
</tr>
<tr>
<td>1201 C17, C18</td>
<td>Electrolytic Filter Condenser 10 Mil. x 55 Mil.</td>
<td>1</td>
</tr>
</tbody>
</table>

**Coils**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>No. Used In Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>160 Ohm—5 Watt Resistor—10%</td>
<td>1</td>
</tr>
</tbody>
</table>

**Model C11A55 has an Oak RC/1 record changer. See Rider's "Automatic Record Changers and Recorders" book."
ALIGNMENT INSTRUCTIONS

The receiver and generator should be allowed to warm up for a few minutes. The volume control should be set at maximum. The following chart gives connections and operations in their order for proper alignment of this receiver.

SEE CIRCUIT DIAGRAM FOR TRIMMER LOCATIONS

<table>
<thead>
<tr>
<th>Generator Frequency</th>
<th>Connection at Radio</th>
<th>Dummy Antenna</th>
<th>Range Switch Setting</th>
<th>Dial Setting</th>
<th>Trimmers to Tune</th>
<th>Approx. Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.6 m.c.</td>
<td>Ant.</td>
<td>400 Ohms</td>
<td>S. W.</td>
<td>11.6 m.c.</td>
<td>S. W. Osc</td>
<td>40 to 50 Mv.</td>
</tr>
<tr>
<td>9.6 m.c.</td>
<td>Ant.</td>
<td>400 Ohms</td>
<td>S. W.</td>
<td></td>
<td></td>
<td>Check Dial at 9.6 Mc.</td>
</tr>
</tbody>
</table>

Note "A" If the pointer is not at 1400 kc with a 1400 kc signal it may be loosened from the dial cord and moved to correct the calibration. This should be checked across the band to arrive at the optimum condition.

Note "B" Care should be taken not to align on the image frequency. This may be checked by rotating the dial of the signal generator. Another signal should be heard at dial frequency plus 912 kc. This signal should be checked carefully on all short wave bands, making sure the lowest frequency signal agrees with the dial setting in frequency and that it is the stronger of the two.
Realignment of this receiver should not be attempted unless all other causes of faulty operation have been carefully investigated. In any event it should be performed only by a competent serviceman. Under no circumstances should alignment be attempted without a generator.

The final results obtained from the receiver will be largely determined by the i.f. alignment. It is therefore essential that the recommended procedure be followed exactly and with the greatest care.

A 0.1 mfd dummy should be connected between the generator and the #8 (control) grid of the 6S47 converter tube. It will not be necessary to disconnect the coil and condenser leads unless the output of the generator is less than 0.1 volts. If this should be necessary a 0.1 meg resistor should be connected between the grid and ground, after the leads are removed, to provide a d.c. return.

With the power off, connect a 20,000 ohm-per-volt voltmeter across the 100,000 ohm diode load resistor or a 0-100 microammeter in series with the load at the point marked with an "X" on the schematic diagram.

With all connections made as described above, set the generator to 455 kc.

Turn the receiver on and allow the tubes to warm up. If the set requires alignment only, no major changes having been necessary, proceed with the alignment as before. Otherwise, align the set roughly to 455 kc with the selector switch in the "TUNING" position. Use low generator output and work back from the diode transformer to the input.

Now increase the generator output to 0.1 volts. About 10 volts will be developed across the load and the current through it will be close to 10 microamperes. Tighten the primary trimmer (marked with red paint) on the diode transformer and adjust the secondary trimmer for maximum response. Then return the primary trimmer for an exact peak.

Repeat this procedure on the interstage and input transformers in that order. Set the selector switch to "HIGH-FIDELITY" and carefully readjust the diode trimmers for maximum output. These adjustments will be broad and should be made with great care. This will complete the i.f. alignment. NO OTHER ADJUSTMENTS SHOULD BE MADE TO ANY I.F. TRIMMERS.

The i.f. amplifier should now be checked for symmetry by detuning the generator equal amounts each way from 455 kc and comparing the outputs. Up to 15 kc deviation the difference between comparative readings should be 5% or less. Greater differences indicate realignment and the procedure should be repeated.

R.F. ALIGNMENT

Connect the generator to the "LONG ANTENNA" binding post through a "standard" dummy antenna, or a 0.00025 mfd mica condenser in series with a 400 ohm carbon resistor. With the variable condenser set at minimum capacity and the generator at 1750 kc, adjust the oscillator trimmer until a response is obtained. Then set the generator to 1600 kc and tune in the signal. Adjust the r.f. and antennas trimmers for maximum response in the order given, keeping the generator output as low as possible.
FREQUENCY MODULATION, AMPLITUDE MODULATION, RADIO-PHONOGRAPH COMBINATION

ALIGNMENT PROCEDURE

Re-alignment of this receiver should not be attempted unless all other possible causes of faulty operation have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter and microammeter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1. Line Voltage as indicated on instruction sheet.
2. Volume, Treble and Bass controls at maximum volume positions.
3. Minimum Input from signal generator. (as required to give a sufficient reading on the indicating instrument).

If this procedure is not adhered to, all adjustments will appear very broad and incorrect alignment may result.

AMPLITUDE MODULATION (Broadcast and Short Wave)

I.F. ALIGNMENT - Set the Signal Generator to 450KC and connect to the grid of the 7F2 A.M. converter tube. Adjust trimmers #1, 2, 3 and 4 (see diagram) of the A.M. I.F. transformers for maximum output as indicated by an output meter connected across the speaker voice coil.

1500KC - Now connect the output of the Signal Generator to the L.A.-Broadcast Antenna terminal, rotate the tuning dial so that the condenser plates are entirely out of mesh. BAND SWITCH is in the BROADCAST position. Set the Signal Generator to 1500KC and adjust the oscillator trimmer (#5, see diagram) for maximum response.

600KC - Reset the generator to 1200KC and tune in this signal on the receiver. Adjust the B.C. antenna trimmer (#7) and the B.C. interstage trimmer (#8) for maximum output.

600KC - With the generator at 600KC, tune in the signal, then while rocking the dial, align the 600KC padder (#8, on front of chassis).

SHORT WAVE - Set the BAND SWITCH to SHORT WAVE. Signal Generator is still connected as for broadcast. The condenser is opened to minimum capacity and the Short Wave oscillator trimmer (#5) is adjusted so that at this position the receiver tunes to 18.3 Mcycles.

17 MC. ADJUSTMENT - Now set the generator to 17 MC., tune in the signal and adjust the antenna trimmer (#10) for maximum response.

FREQUENCY MODULATION - For the F.M. Band a Signal Generator which will cover the band (40 to 50 megacycles) and a 500 microamp D.C. meter are required.

To align the F.M.-I.F. with Modulation OFF, set the Signal Generator to 4.5 M.C., connect to the grid of the first F.M.-I.F. tube. (7A7). The microphone is connected with the Negative side to chassis and the Positive thru a 250,000 ohm resistor to the low side of the 500,000 ohm resistor in the grid return circuit of the 1st limiter tube (7C7-1). (See point "X" on the circuit diagram).

Adjust the primaries and secondaries of the 3rd and 2nd F.M.-I.F. transformers for the highest reading on the microammeter.

Now reconnect the output of the generator to the grid of the F.M. converter (7C7-1), and re-align the 1st, 2nd, and 3rd I.F.'s.

NOTE - Stop the Signal Generator. There should be no reading on the microammeter. If there is, the I.F. amplifier is oscillating. This should be eliminated by checking all bypasses, grounds, and grounding of I.F. shield cans.

DESMODULATOR ALIGNMENT - This is the most critical adjustment on the F.M. band. If improperly done, distortion will result, and general operation will be unsatisfactory. Leave the generator connected to the F.M. converter grid. The microammeter is connected ( thru the 250,000 ohm resistor) to the junction of the two 100,000 ohm load resistors of the discriminator diode (6H6). This point is connected to the #4 lug on this socket, which is not connected internally to the tube and is used as a dummy lug only. This is point "Y" on the circuit diagram. Rotate the primary trimmer marked "3" on the discriminator shield can, for maximum reading. Now reconnect the meter across the entire load (both resistors) at the cathode. This is lug #7 on the 6H6 socket. Without disturbing the generator, rotate the secondary trimmer "S" till the most negative reading is obtained, then slowly continue rotation till ZERO current reading is reached.

F.M.-I.F. ALIGNMENT - Connect the Signal Generator to the F.M. Ant terminal (A-2). Set the Generator to approximately 44 M.C. Adjust the antenna trimmer (#19; see trimmer layout diagrams) for maximum output as indicated by a microammeter connected in the limiter, as for the I.F. alignments; or the tuning eye may be used as an indicator. Then align the F.M. interstage trimmer for maximum. Should the F.M. calibration be off, due to aging or of components, the correction can be made by resetting the oscillator trimmer (#17).

NOTE - In the absence of a high frequency Signal Generator for F.M. alignment, where powerful local stations operating near this frequency are available, this adjustment can be made by connecting a large antenna to the receiver, and going thru the procedure outlined above.
ALIGNMENT FOR BOTH RECEIVERS

Should it become necessary to realign the receiver at any time, proceed in the usual manner by first adjusting the I.F. transformers, for maximum output as indicated by an output meter connected across the voice coil. Then turn the dial to 1500 KC. Set the signal generator (or 1500 KC local station) to this frequency and tune in the signal by means of the oscillator trimmer on the variable condenser, (Front section). Then adjust the antenna trimmer for maximum output. No other adjustments are necessary.
ALIGNMENT — Should it become necessary to re-align the receiver at any time, proceed in the usual manner by first adjusting the I.F. transformers, for maximum output as indicated by an output meter connected across the voice coil. Then turn the dial to approximately 1400KC. Set the signal generator (or 1400KC local station) to this frequency and tune in the signal by means of the oscillator trimmer on the variable condenser, (front section). Then adjust the antenna trimmer for maximum
Connections for Models 3B6 and 3B6-3

ANTENNA CONNECTION: Three antenna terminals are provided, marked G-A2-A1. If a doublet antenna is used, the two lead-in wires, or the two leads from the transformer are connected to A-1 and A-2 and a ground to the G terminal. (This ground may be unnecessary in certain cases.) If, however, the usual type of antenna with only one lead-in is used, this is connected to A-1. The G and A-2 are connected together and both to a ground connection.

I.F. PEAK 456 KC

Connections for Models 3B2 and 3B2-3
GAROD ELECTRONICS CORP.

CAUSES OF FAILURE TO OPERATE
1. First check all connections to batteries.
2. See that polarity is correct.
3. Check voltage of all batteries across their terminals. "B" batteries should measure more than 35 volts (for a 45-volt pack), the "C" battery over 4 volts. An Air Cell should be replaced when the voltage falls below 2 volts. This also applies to a 2 volt storage cell. A 6 volt storage battery should not drop below 5.8 volts. If a charger has been installed, check by means of a voltmeter as to whether the charger is delivering voltage and if an ammeter is available check the charging rate.
4. If all batteries are O.K., see if the fuse has been blown, as a result of a short circuit or excessive current due to a defective vibrator whose contacts are sticking. (For 6 volt operation). The vibrator may be reached by removing the screws holding the power pack can in place. Remove the vibrator from its socket and insert a new fuse. If when the vibrator is plugged in the fuse blows, it will be necessary to obtain a replacement vibrator from your dealer. Screw the cover back on again or noisy reception may result.
5. If the dial lights up with Pilot Light switch turned "ON," and the vibrator operates, as evidenced by a slight buzzing when the ear is placed close to the vibrator, it will be necessary to check all voltages, which should be approximately as indicated above. Exact voltages will be determined by the condition of the batteries.
6. If all voltages are approximately correct, check for alignment as described previously.
7. Short life of the Air Cell may be due to failure to turn the set OFF at night or continuous use of the pilot lights. The water level in the Air Cell must be maintained as indicated by the marker provided for that purpose.

INSTRUCTIONS FOR INSTALLATION AND OPERATION

CURRENT
This receiver may be operated from either of two types of Power Supply as follows:

1. A 6 volt storage battery, which may be an automobile battery, though a battery specially designed for radio use is to be preferred. If a 100 ampere hour battery is used, and the receiver is operated about three hours per day, it will require recharging after about three weeks of use. A preferred arrangement is to use a Wind-Driven generator which may be connected to the battery to automatically keep it fully charged. The only attention necessary in that case is to check the water level in the battery periodically, where the wind velocity is low, a small gasoline driven generator may be used which will operate about 15 hours on a gallon of gas, but since the charger is in constant use, the cost of operation of the radio is very low, and besides, one or two small lamps can be operated from the same power source.

2. An "Air Cell," 3 "B" Batteries and a "C" battery will, when used, have a life of approximately 9 months for the air cell and about one year for the "B" and "C" batteries. The air cell can not be recharged but must be replaced by a new one. The exact life will depend upon the discharge rate, thus if it is used less than 3 hours a day, a longer life may be expected, and if used for example 6 hours per day, the life may be reduced to 6 months. Whichever type of power is most suited may be used, although results will be about the same in all cases.

INSTALLATION - Fig. 1 shows the connections to be used when operated from a 6 volt storage battery (and wind driven or gas engine generator).

NOTE THAT 2 OF THE CLIPS CONNECT TO THE SAME TERMINAL. THIS MUST BE DONE EXACTLY AS SHOWN. DO NOT SNAP ONE CLIP ON THE BATTERY LUG AND THE OTHER CLIP ON TO THE FIRST ONE OR CONSIDERABLE BACKGROUND NOISE WILL RESULT. DO NOT CONNECT BOTH WIRES TO THE SAME CLIP, EVEN THOUGH BOTH GO TO THE SAME TERMINAL. DO NOT SHORTEN OR LENGTHEN ANY OF THE BATTERY WIRES.

BE SURE THAT THE POLARITY OF THE BATTERIES IS AS SHOWN, OR THE RECEIVER WILL NOT OPERATE, OR TUBES MAY BE BURNED OUT.

BE SURE THAT THE ON-OFF SWITCH ON THE VOLUME CONTROL IS TURNED TO THE "OFF" POSITION BEFORE MAKING ANY CONNECTIONS AND CHECK THOROUGHLY BEFORE THIS SWITCH IS TURNED ON.

AIR CELL OPERATION
Figure 2 shows the connection when an air cell is to be used with "B" and "C" batteries. The Power Pack is located in the receiver chassis by a flexible cord and plug. This is needed only for 6 volt operation. For use with batteries, this plug is removed from the socket on the rear of the chassis. A special cord is inserted and connected as shown in Fig. 2.

A separate switch is provided for the pilot light, which may be turned ON for tuning and turned OFF to save battery drain without, of course, impairing the receiver operation. On storage battery operation, the pilot lights should be left ON, since this equalizes the drain on all cells of the battery.

©John F. Rider
Realignment of this receiver should not be attempted unless all other possible causes of faulty operation have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands and an output meter for indicating the effect of adjustments are required.

It is important to remember that in receivers of this kind which are equipped with automatic volume control it is necessary to use the minimum possible signal from the signal generator to the input of the A.V.C. circuit 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 455 kHz and connected to the grid of the first detector (1076). With the oscillator section of the tuning condenser short-circuited and the receiver volume control at its maximum position, the I.F. trimmers are adjusted for maximum output. These trimmers may be found on tops of the I.F. transformer shield cans.

18 MEGACYCLE ADJUSTMENT—The high side of the signal generator is connected to the antenna lead of the receiver and the low side to the ground lead. The receiver and signal generator are both tuned to a frequency of 18 MHz with the selector switch in position for short-wave band no. 1. The oscillator trimmer condenser is adjusted so that the 18 MHz signal is tuned in exactly at the 18 MHz calibration point, with the volume control on full and the signal generator adjusted for minimum input. The antenna preselector and first detector trimmers are then adjusted in the order named for maximum output. These trimmers are located on the sides of the shield cans and are opposite the lower openings. This is the only adjustment on Band #1.

1500 K.C. ADJUSTMENT—With the band selector switch in position for operation on the Broadcast band and the receiver and signal generator both set at 1500 K.C., the procedure outlined above is repeated. The oscillator trimmer is found on the rear coil can, and is opposite the upper opening. The antenna preselector and interstage coil trimmers are located in the same positions on the corresponding shield cans.

The signal generator is set at 600 K.C. and the signal tuned in on the dial. The pad condenser for this band is adjusted for maximum gain while the gang tuning condenser is rocked slightly to the right and left. The 1500 K.C. adjustment should then be rechecked. The 600 K.C. pad is located on the right chassis apron and is towards the rear.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>FIL.</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>OSC. PL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>106G</td>
<td>R. F. Amp.</td>
<td>2.0</td>
<td>136</td>
<td>67.5</td>
<td></td>
</tr>
<tr>
<td>107C</td>
<td>Converter</td>
<td>2.0</td>
<td>136</td>
<td>67.5</td>
<td>80</td>
</tr>
<tr>
<td>106G</td>
<td>1st I.F. Amp.</td>
<td>2.0</td>
<td>136</td>
<td>67.5</td>
<td></td>
</tr>
<tr>
<td>106G</td>
<td>2nd I.F. Amp.</td>
<td>2.0</td>
<td>136</td>
<td>67.5</td>
<td></td>
</tr>
<tr>
<td>106G</td>
<td>Det. &amp; 1st Audio</td>
<td>2.0</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>106G</td>
<td>Driver</td>
<td>2.0</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>106G</td>
<td>Audio Output</td>
<td>2.0</td>
<td>115</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All voltages are measured from socket terminals to chassis and with a 1000 Ohm per volt voltmeter. The set must be in operation and the Wave Band Switch in broadcast position with battery fully charged and new 6V batteries.

Filament voltages are taken from filament prong to filament prong at tube socket.
ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes of unsatisfactory performance have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments, are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume & Tone controls at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I.F. Adjustment - Set the signal generator at 455 KC and connect to the grid of the 6SA7 converter tube thru a .1 MFD condenser. It is unnecessary to disconnect the grid from the rest of the circuit. Have the Band Switch in the #2 (Broadcast) position, and dial tuned to 1630 KC (condenser plates fully open). If hum modulation is encountered which is not cleared up by reversing the receiver's line plug, shunt a resistor of about 25000 ohms across the signal generator output.

The Input I.F. Transformer Trimmers - are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. Transformer trimmers - are adjusted for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

Short Wave Band
Set the band switch to the third position which is the Short Wave Band. Connect the signal generator thru a standard dummy antenna, or thru a 400 ohm resistor to the antenna and ground leads of the receiver. Set the generator at 17.MC. Tune the variable condenser to 17.MC on the dial. Adjust the S.W. osc. trimmer (marked #1 on diagram and on chassis sketch) for maximum response. If response is had at two points on this trimmer, choose the looser setting (higher frequency). Next adjust the S.W. antenna trimmer #2 (mounted on top of S.W. antenna coil) for maximum response, while rocking the tuning condenser slightly from left to right.

Overseas Band - Set the band switch to the fourth position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is left connected as for the short wave band. The generator is set at 12 MC and the corresponding osc. trimmer #3 is adjusted until a response is indicated at the lower capacity setting of the trimmer. Now adjust the antenna trimmer #4 for maximum response. Set the generator at 9.4 MC and turn the variable condenser until the signal is picked up. The padder for this band, trimmer #5, is now adjusted for maximum output while rocking the condenser gang from left to right. The 12 MC adjustment should then be rechecked.

Broadcast Band
It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop which is placed about a foot from the receiver's loop. Set the Band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1630 KC and adjust the broadcast oscillator trimmer #6 until a response is indicated on the output meter. The generator is now set at 1500 KC. Turn the variable condenser until a response is indicated. The dial pointer should now coincide with the 1500 KC mark on the dial. Set the generator at 600 KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser #7 for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.
GAROD ELECTRONICS CORP.

MODEL BP20

I.F. - 455 KC.

For use where no power is available, the following batteries are required:
1 - Eveready #457 (67 volt millet, battery) or equivalent
2 - Eveready #460 (3 volt alcaline light cell) or equivalent
3 - Eveready #890

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GAROD ELECTRONICS CORP.

ALIGNMENT FOR MODEL BP20

ALIGNMENT - Should it become necessary to align the receiver, the signal generator is connected thru a small condenser to the grid of the First Detector Tube 1R5. The I.F. frequency is 455KC and the I.F. transformers are adjusted for maximum output as indicated on an output meter connected across the voice coil. The signal generator is now set to 1400KC and coupled loosely to the loop antenna by a coupling coil of one or two turns. If the dial pointer does not indicate this frequency, reset the oscillator trimmer (lower section of the Gang Condenser) so that it does. Now adjust the antenna (upper trimmer on Gang Condenser) for maximum output. Change the signal generator frequency to 600KC and tune in the signal. Adjust the 600KC paddar to give maximum output while rocking the tuning condenser.

ALIGNMENT FOR MODEL C200

ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave band, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on instruction sheet.
2) Volume and Tone control at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I.F. Adjustment - The signal generator is set at 455KC and is connected to the grid of the converter tube 6SA7 through a .5 MPD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C. The Grid need not be disconnected from the rest of the circuit.

The Input I.F. - Transformer trimmers are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. - Transformer trimmers are adjusted for maximum output as indicated on the output meter. The Input I.F. should now be re-checked for maximum output.

It is desirable to align the RF section on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the switch to the RADIO position with condenser plates completely out of mesh. Set the signal generator at 1630KC and adjust the oscillator trimmer (front section of the variable condenser) until a response is indicated on the output meter. The generator is now set at 1500KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1500KC mark on the dial. Now adjust the loop trimmer (rear section of the variable condenser) for maximum response. There are no other adjustments required.

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MODELS 343G: This model is distinguished from Model #D-26 in that the Phono-Radio attachment is wired thru a cable directly to Phonograph unit. The Phono-Radio switch will therefore be found mounted to the motor board of the phonograph instead of to the radio chassis.
ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions:

1) Line Voltage as indicated on Instruction sheet.
2) Volume & Tone control at maximum volume positions.
3) Minimum Input from signal generator.

If this procedure is not adhered to, all adjustments will appear very broad. This is due to the action of the automatic volume control.

I. F. Adjustment - The signal generator is set at 455 KC and is connected to the grid of the converter tube 6SA7 through a .5 MFD condenser. Be sure to connect a resistor of approximately 25,000 OHMS between the converter grid and ground so that the grid circuit is at ground potential for D.C. It is unnecessary to disconnect the grid from the rest of the circuit.

The Input I. F. Transformer trimmers - are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loudspeaker.

The Output I. F. Transformer trimmers - are adjusted for maximum output as indicated on the output meter. The Input I. F. should now be re-checked for maximum output.

Short Wave Band Adjustment - Set the band switch to the third position which is short wave band #1. Connect the signal generator thru a standard dummy antenna to the antenna and ground leads of the receiver. Set the generator at 17 MC turn the condenser until a response is indicated. The pointer should coincide with the 17 MC mark on the dial. Adjust the antenna trimmer for the short wave band for maximum output while rocking the condenser gang from left to right.

OVERSEAS - Set the band switch to the fourth position. Turn the dial control knob to the extreme high frequency end so that the condenser plates are entirely out of mesh. The signal generator is set connected as for the short wave band. The generator is set at 12 MC and the corresponding osc. trimmer is opened until a response is indicated at the lower capacity setting of the trimmer. Now adjust the antenna trimmer for maximum. Set the generator at 9.4 MC and turn the variable condenser until the signal is picked up. The padder for this band (see sketch) is now adjusted for maximum output while rocking the condenser gang from left to right. The 12 MC adjustment should then be re-checked.

Broadcast Band

It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the band switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1600 KC and adjust the broadcast oscillator trimmer until a response is indicated on the output meter. The generator is now set at 1500 KC. Turn the variable condenser until a response is indicated. The dial pointer should now co-incide with the 1500 KC mark on the dial. Set the generator at 600 KC and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator padder condenser for maximum response while "rocking" the gang condenser. The high frequency adjustments should now be re-checked.
ALIGNMENT PROCEDURE

All adjustments except the IF should be made on Loop operation. A loop consisting of two turns of heavy wire about one foot in diameter and placed about two feet from the set loop should be connected to the signal generator. For IF adjustment the "hot" side of the signal generator may be connected to the front section of the Three Gang Variable condenser thru a blocking condenser (.05 mfd). The condenser is set with the plates fully open and the Band Switch in the Broadcast position.

IMPORTANT: In taking the chassis out of the cabinet for servicing, it becomes necessary to disconnect the SHORT WAVE loop. Do not unsolder the lugs from the rod, but instead unsolder the leads from the lugs. If these lugs are moved the Inductance of the loop will be changed and it will be impossible to align the SHORT WAVE Bands properly. Do not lengthen these leads or shorten them. To get at the trimmers for alignment, unsolder the loop leads, take out the chassis and with the chassis outside of the cabinet reconnect them.

In aligning the series padders at 600KC and 9.5 megacycles, the variable condenser should be rocked back and forth until maximum output is obtained as indicated on the output meter. It is also advisable to do this while making the 17MC adjustment since there is some reaction between circuits.

Proceed in accordance with the tabulation on the next page. For location of the trimmers SEE SKETCH. The position of the trimmers in the circuit is indicated in the circuit diagram by a corresponding number.

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>BAND</th>
<th>ADJUST TRIMMERS FOR MAXIMUM OUTPUT IN SEQUENCE INDICATED (SEE SKETCH)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 455 MC</td>
<td>I.F.</td>
<td>1--2--3--4</td>
<td>I. F. Trimmers</td>
</tr>
<tr>
<td>B 1500 KC</td>
<td>B.C.</td>
<td>5--6</td>
<td>Set dial to 1500 KC</td>
</tr>
<tr>
<td>C 600 KC</td>
<td>B.C.</td>
<td>7</td>
<td>Recheck adjustment &quot;B&quot;</td>
</tr>
<tr>
<td>D 17 MC</td>
<td>S.W.2</td>
<td>8--9--10</td>
<td>Set dial to 17 MC (rock condenser slightly)</td>
</tr>
<tr>
<td>E 9.5 MC</td>
<td>S.W.2</td>
<td>11</td>
<td>Recheck adjustment &quot;D&quot;</td>
</tr>
<tr>
<td>F 8.5 MC</td>
<td>S.W.1</td>
<td>12--13--14</td>
<td></td>
</tr>
</tbody>
</table>

SENSITIVITY

BROADCAST-LOOP OPERATION-75 MICROVOLTS PER METER (AVERAGE) FOR 50 MW OUTPUT
ANTENNA - 5 MICROVOLTS (AVERAGE)
SHORT WAVE-LOOP OPERATION 100 MICROVOLTS PER METER (AVERAGE)

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The signal generator is set at 455KC and is connected to the grid of the converter tube (6A7) through a .0 MF condenser. Be sure to connect a resistor of approximately 20,000 ohms between the converter grid and ground so that the grid circuit is at ground potential for D.C.

The input i.f. transformer trimmer are adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The output i.f. transformer trimmer is located underneath the chassis. Adjust the trimmer for maximum output as indicated on the output meter. The input i.f. should now be re-checked for maximum output.

Broadcast Band Alignment

Connect the output of the signal generator to a loop antenna consisting of about five turns of 'bell' wire making a circle a foot in diameter. This loop should be VERY LOOSELY coupled to the receiver loop and should not be less than one foot from the receiver.

Set the signal generator at 1500KC and tune the receiver until a response is indicated on the output meter with signal generator set at 1500KC. Rock the gang condenser while adjusting the oscillator trimmer condenser for maximum output.

The dial pointer should coincide with the 1500KC mark on the dial. If it does not, check other calibration points at both ends of the scale before re-setting the pointer.
MODEL 1210
ALIGNMENT INSTRUCTIONS

Re-alignment of this receiver should not be attempted unless all other possible causes have been thoroughly investigated. An accurately calibrated signal generator which will cover the necessary wave bands, and an output meter for indicating the effect of adjustments are required.

During the alignment procedure all adjustments should be made under the following conditions

---

MODEL 1040
ALIGNMENT PROCEDURE

1. Line Voltage as indicated on instruction sheet.
2. Volume & Tone control at maximum volume positions.
3. Minimum input from signal generator.

If this procedure is not adhered to, all adjustments will appear to be void. This is due to the action of the automatic volume control.

L.F. Adjustment - The signal generator is set at 455 Kc and is connected to the grid of the converter tube (5AB) through a .05 MF capacitor. Be sure to connect a resistor of approximately 25,000 ohms between the converter grid and ground so that the grid circuit is at ground potential for D.C.

The Input L.F. Transformer trimmers are both adjusted for maximum output as indicated by the output meter connected across either the voice coil or the primary coil of the loud speaker.

The Output I.F. Transformer trimmers are adjusted for maximum output as indicated on the output meter. The input I.F. should now be rechecked for maximum output.

Short Wave Band #1 Adjustment - Set the band switch to the third position which is short wave band #1. Connect the signal generator thru a standard dummy antenna to the transformer and ground leads of the receiver. Set the generator at 9MC and turn the variable condenser until a response is indicated. Adjust the antenna trimmer for the short wave band for maximum output while rocking the condenser cap from left to right.

Short Wave Band #2 - Set the band switch to the second position. Turn the dial control knob to the extreme high frequency end so that the variable condenser plates are entirely out of mesh. The signal generator is left connected as for Band #1. The generator is now set at 650KC and turn the variable condenser until a response is indicated. The pointer should now coincide with the 6.5Kc mark on the dial.

The antenna trimmer is then adjusted for maximum output while the variable condenser knob is rocked from left to right. The high frequency adjustments should then be rechecked.

Broadcast Band

It is desirable to align this band on the loop. The signal generator is coupled to the receiver by means of a 2 or 3 turn loop. Set the Band Switch in the Broadcast position and condenser plates completely out of mesh. Set the signal generator at 1600 KC and adjust the broadcast oscillator trimmer until a response is indicated on the output meter. The generator is now set at 1400 KC. Turn the variable condenser until a response is indicated. The dial pointer should now coincide with the 1400Kc mark on the dial.

The generator is set at 600Kc and turn the variable condenser control until a response is indicated. Adjust the broadcast oscillator trimmer for maximum response while "rocking" the condenser. The high frequency adjustments should now be rechecked.

5 MC. Adjustment - With the band selector switch in position for operation on band no. 5, the receiver and signal generator both set at 5 MC, the procedure outlined above is repeated.

The signal generator is set at 1.8 MC and the signal tuned in on the dial. The signal is left connected as for Band #1. The generator is now set at 1800 KC and adjust the broadcast oscillator trimmer until a response is indicated on the output meter. The generator is now set at 1500 KC and the procedure outlined above is repeated.

The signal generator is set at 300 Kc and the signal is tuned in on the dial. The broadcast oscillator is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 5 MC adjustment should then be rechecked.

300 Kc Adjustment - The band selector switch is set in position for operation on band no. 4. The receiver and generator are both tuned to 300 Kc and the procedure outlined above is repeated.

The signal generator is set at 180 Kc and the signal is tuned in on the dial. The long wave gang tuning condenser is adjusted for maximum response while the gang tuning condenser is rocked slightly to the right and left. The 300 Kc adjustment should then be rechecked.
All voltages except filament, are measured from socket terminals to chassis and with a 1000 Ohms per volt voltmeter. The set must be in operation and the sensitivity control in its maximum clockwise position.

Filament voltages are taken from filament prong to filament prong at tube socket and measured with a low impedance AC voltmeter.
GENERAL ELECTRIC CO.

I-F PEAK: AM-455 KC
FM-15 MC

BAND-SWITCH

Pos. No. 1 - FM
2 - BC
3 - SW
4 - PHONO

Drive Control Stringing

When replacing a drive cord, the stringing is accomplished as shown in Fig. 7. Before soldering the cord to the two drums as shown, check the pointer location as being at the last mark on the left-hand end of the scale when the gang condenser plates are completely closed; then solder.

CORD MAKES 1/2 TURNS AROUND PULLEY

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### GENERAL ELECTRIC CO.

#### Model 40 Model 4000

**FM CHANNEL ALIGNMENT**

Due to the small size and complexity of components and the wide band characteristics of the FM modulator, the RF modulator should be unnecessary under normal conditions. However, if alignment is necessary, the procedure is given in Table IV and page 3 with the All trimmers set to the center point as shown in Fig. 2.

**IF Alignment**

It is preferable to align the IF amplifier by means of a cathode-ray oscilloscope and a 4.5 megacycle signal generator with a superposed 100 kc sweep. Many makers of IF amplifiers and mechanical frequency calibrators are available and include the above basic equipment. The following procedure is for the general alignment of the G-E Medeview TM-7C Test Oscillator in conjunction with the G-E Dual Frequency Modulator TM-726A which is wired with the same connection in conjunction with the General Alignment Chart shown in Fig. 2. Test Oscillator used on the Test Oscillator and the Test Oscillator calibration is no longer possible without modifying the connections. The following procedure may be followed. With a factory alignment chart, the same results can be obtained. When attempting to make a correct oscilloscope test, be sure to give the IF amplifier an adequate signal, This is illustrated in the two curves shown in Fig. 2. To retune the receiver, the input for the frequency control is 4.3 MHz. The action for the tuning control is 4.3 X 10^6 and is determined by the cfb from the resonator modulator. This is illustrated in Fig. 2. To retune the receiver, the input for the frequency control is 4.3 MHz. The input for the tuning control is 4.3 X 10^6 and is determined by the cfb from the resonator modulator. This is illustrated in Fig. 2.

**AM CHANNEL ALIGNMENT**

The Amplitude Modulation Channel of the receiver is aligned by following the procedure outlined in Table IV. All RF alignment may be made with the chassis either installed or removed. The alignment process should be made with the chassis and loop antennas securely fastened in the cabinet, as shown in Fig. 2. The relative position in respect to each other affects the alignment. The RF alignment should be carried out at the location of the chassis and loops antennas being present in the cabinet.

**SERVICE HINTS**

Replacement of Components

When servicing the FM portion of this receiver and especially when replacing parts, it is important to return all components including wiring to the original position as outlined in the chart. Replacing parts and wiring is very critical. When replacing coils or IF transformers, make the leads long enough to reach the chassis. The use of the same terminals to which the original coil or transformer was connected is recommended.

**Pointing Focusing**

The focusing of the pointer on the dial scale is accomplished by increasing or decreasing the pointer distance from the data scale. This is a rather critical adjustment and can be varied by loosening the mounting bolts and moving the chassis either back or forward in the cabinet until properly focused and then tightening mounting bolts.
GENERAL ELECTRIC CO.

MODEL 60, 90

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Test-Out Connect to</th>
<th>Test-Out Setting</th>
<th>Pointer Setting</th>
<th>Tune Trimmer for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2SK7/FP Grid in Series with 40,000 Mfd.</td>
<td>455 KC</td>
<td>B7</td>
<td>C52 and C53</td>
</tr>
<tr>
<td>2</td>
<td>2SK7 Conv. Grid at 455 Mfd.</td>
<td>455 KC</td>
<td>B7</td>
<td>C52 and C53</td>
</tr>
<tr>
<td>3</td>
<td>Use Capacity Coupling</td>
<td>580 KC</td>
<td>C67</td>
<td>C68 **</td>
</tr>
<tr>
<td>4</td>
<td>Use Capacity Coupling</td>
<td>1360 KC</td>
<td>C75 and C82</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Use Capacity Coupling</td>
<td>580 KC</td>
<td>B7</td>
<td>C67 **</td>
</tr>
<tr>
<td>6</td>
<td>Use Capacity Coupling</td>
<td>6.0 MC</td>
<td>C74</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Use Capacity Coupling</td>
<td>21.0 MC</td>
<td>SW2</td>
<td>C67*</td>
</tr>
<tr>
<td>8</td>
<td>Use Capacity Coupling</td>
<td>21.0 MC</td>
<td>SW2</td>
<td>C61 **</td>
</tr>
</tbody>
</table>

Use minimum capacity peak

** Rock gang tuning condenser for optimum peak.

IF Alignment

Alignment of the I.F. transformers must be performed stage by stage and no over-all adjustments should be made after completing the stage by stage adjustments.

Connect the high side of the oscillator input through a 45,000 ohm carbon resistor to point "A" on the 1st limiter, 6Y5/7 tube (Fig. 2). The ground side of the oscillator input connects to the chassis. Progressively apply a wide band signal generator output of 4.3 mc to points "B", "C", "D", and "E" of the 2nd I.F., 1st I.F. and 2nd converter grids. Use a 10 mfd capacitor between the generator output and points "B" and "C". Use a 22 mfd capacitor between the generator output and points "B" and "D". Connect the ground lead of the wide band signal generator output to the chassis at the same point to which the oscilloscope ground is connected. Align the primary and secondary I.F. transformer trimmers for maximum vertical deflection of the oscilloscope. The third circuit trimmers (C14 and C17) of the 1st and 2nd I.F. transformers should be adjusted to give maximum brightness to the peak of the oscilloscope curve consistent with maximum vertical deflection. The I.F. curve should not be broadened beyond that point where the vertical deflection of the oscilloscope curve is reduced.

Discriminator Alignment

Remove the oscilloscope input connections from the limiter lead and connect the high lead directly to the audio output. Connect the ground lead to the chassis using the same point to which the generator ground is connected. Apply the wide band generator signal of 4.3 mc through a 22 mfd capacitor to point "D" on the 2nd converter trimmer. Adjust the discriminator transformer (T4) primary trimmer (C21) for maximum vertical deflection on the oscilloscope. Align the secondary trimmer (C38) for center crossover of the two curves. Retain the primary trimmer (C21) for straight crossover lines if necessary.

R.F. Alignment

Connect a 0-100 microammeter in series with a 47,000 ohm resistor between chassis and point "A" on the lead circuit of the 1st limiter tube, 6Y5/7. The resistor should be between the meter and point "A". Apply a 40 MC generator signal to the antenna input terminals of the Transmitter. Set dial pointers to 46 MC and align oscillator trimmers (C3 and C4). The image signal should be below 46 MC when the oscillator is properly set. Peak the converter trimmers (C3 and C4) for maximum output.

Phono-FM-Television Connection

If a television set receiver is provided with an audio input, a separate record player or a frequency modulation translator Model 60 is desired to be used either of these models, proceed as follows. On Model 80, remove the black shielded plug connection to the receiver rear chassis deck; on Model 60, remove the shielded lead to left of broadcast short wave receiver rear chassis deck, then make the plug connection to the auxiliary unit. General Electric plug, Stock No. RP-143, fits the plug. To switch the receiver from radio to auxiliary unit operation, merely depress the Phono-FM push button selector key.

Soldering

1. Audio cables are traceable usually to the 6Y6G audio driver tube. In making new tube replacements, it may be necessary to try several before a quiet tube is found.
2. The method of setting up broadcast automatic station selector buttons which will assure drift-proof adjustment is to take the radio apart and set all the way out and then turnslowly inward until the desired station is tuned in.
3. The input terminals of the receiver should be connected to the 0-inch speaker terminal which is grounded to the speaker frame. By replacing a speaker, make sure of the proper phasing. With the speaker terminal boards facing each other, the interconnecting leads should be crossed.

Reproducers

The voice coil is accurately centered at the factory and should seldom go out of tune. In case the voice coil needs retuning, loosen the three bass clamp screws which hold the voice coil spider assembly; remove the voice coil dust cap, and insert four centering shims in the air gap. Tighten the clamp screws, remove the shims and replace dust gasket. Note: In no case should the magnet be loosened or removed from the assembly.
GENERAL ELECTRIC CO.

IMPORTANT NOTE

COMBINATION TELEVISION AND RADIO RECEIVER MODEL HM-225B

CONSISTS OF THE TELEVISION RECEIVER MODEL HM-225B

REVISED FOR NEW STANDARDS AND RADIO RECEIVER MODEL HM226-7A.

ALIGNMENT REVISED FOR NEW STANDARDS

TV ALIGNMENT PROCEDURE

The problem of aligning the several circuits in a television receiver is most difficult in equipment that is not the alignment of conventional radio receivers. Fortunately, the use of stable components in carefully engineered circuits of wide band characteristics reduces to a minimum the necessity for alignment under normal operating conditions. Should alignment become necessary the following equipment will be needed.

(A) For Video I.F. Alignment

(1) Cathode ray oscilloscope

(2) Wide-band sweep oscillator capable of sweeping from 7.5 to 15 MC

(B) Marker system either provided in sweep oscillator or from separate generator signal for sweep of 7.57 and 7.95 MC points.

(C) If sweep signal is not available, use grid oscilloscope

(D) R.F. Alignment

(1) Cathode ray oscilloscope

(2) Wide-band sweep oscillator capable of sweeping the following bands.

(a) 30 to 66 MC

(b) 78 to 94 MC

(c) 96 to 72 MC

NOTE: If sweep oscillator has marker points internally supplied, step 3 and 4 may be omitted.

1. 7.5 - 15 MC Sweep

Input freq.

Point of Input

Adjustments

Comments


2. 7.5 - 15 MC Sweep

Control grid of 6AB7 (2nd video I.F.)

Connect low output tap of video I.F. sweep oscillator to control grid of 6AB7 (2nd video I.F.). Connect ground lead to chassis. Tune control (R 47) to about half of maximum or to a point which gives satisfactory vertical deflection without overlapping. Set horizontal centering and gain controls on oscilloscope to give suitable horizontal deflection. Adjust sweep phase to give curve as in Fig. 6, curve 2.

3. Same as in No. 2 plus 12.75 MC

Same as in No. 2

Superimpose an accurately calibrated 12.75 MC signal in parallel with sweep signal. Signal will appear on sweep curve in oscilloscope as a waggle, the center of which is a thin black line. With a pen or crayon mark this point on the screen of the oscilloscope. (Note: Hereafter the horizontal controls on the oscilloscope must not be touched.)

4. Same as in No. 2 plus 8.75 MC

Same as in No. 2

Superimpose an accurately calibrated 8.75 MC signal in parallel with sweep signal. Mark screen at point where signal appears on curve as in No. 3 above.

5. 7.5 - 15 MC Sweep

Control grid of detector (6ECA)

Iron cores of 4th video transformer T 3, T 4

Connect high tap of I.F. sweep oscillator to control grid of 6ECA (4th video I.F.). Do not touch horizontal controls of oscilloscope.) Tune control (R 49) to about half of maximum or to a point which gives satisfactory vertical deflection without overlapping. Adjust iron cores of 7.5 - 15 MC sweep curve similar to Fig. 6, curve 1. With relatively flat top, 12.75 MC may be adjusted down one side or iron cores. These conditions plus maximum amplitude insure correct alignment.

6. 7.5 - 15 MC Sweep

Control grid of 6AB7 (2nd video I.F.)


Connect low tap of video I.F. sweep oscillator to control grid of 6AB7 (2nd video I.F.). Adjust iron cores for maximum gain, flatness and proper centering. Adjust series iron core for sharp cut-off on 8.75 MC side of curve. See Fig. 6, curve 3.

7. 7.5 - 15 MC Sweep

Control grid of 6AB7 (2nd video I.F.)

Iron cores of 3rd video transformer T 2.

Connect low tap to grid. Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. Adjust series iron core for sharp cut-off on 7.95 MC side of curve. See Fig. 6, curve 3.

8. 7.5 - 15 MC Sweep

Control grid of 6ECA (4th video I.F.)

Connect low tap to grid. Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. 12.75 MC response must be equal to or slightly greater than 8.75 MC response as indicated in Fig. 6, curve 4.

9. 7.5 - 15 MC Sweep

Control grid of 6ECA (4th video I.F.)

Connect low tap to grid. Adjust iron cores for maximum gain flatness and proper centering. 12.75 MC response must be equal to or slightly greater than 8.75 MC response as indicated in Fig. 6, curve 4.

10. 14.5 MC Converter Grid, 6FG

Series iron cores of 6FG transformer T 5.

To check alignment of 14.5 MC tap proceed as follows: Connect low tap to grid. Reduce horizontal gain of oscilloscope to minimum. Adjust iron core for maximum line length.

11. 8.35 MC Converter Grid, 6FG

Series iron cores of 6FG transformer T 5.

To check alignment of 8.35 MC tap proceed as follows: Connect low tap to grid. Reduce horizontal gain of oscilloscope to minimum. Adjust iron core for minimum line length.

WAVE TRAP ALIGNMENT

1. 11.75 MC Sweep, 6AB7 (3rd audio modulator)

Analog terminal

Wave trap transformer, C 68

Adjust for maximum dip in oscilloscope curve, with oscilloscope connected to dode loaded emitter R 20.

2. 8.25 MC with 30% modulation

Grid of 6FG converter

Iron cores of all audio transformers

Align for maximum amplitude

3. 7.75 to 8.75 MC Sweep

Control grid of 688

Superimpose an accurately calibrated 8.15 MC signal in parallel with sweep signal and mark point on oscilloscope screen. The steep portion of the over-all audio IF response curve must extend beyond these limits.

4. 7.75 to 8.75 MC Sweep

Control grid of converter 6FG

Iron cores of audio 1F transformer T 2, T 3 and T 4.

Adjust iron core until curve has been shaped as shown by curve 6, Fig. 7. It is important that the steep side be straight and the gentle side be straight. Adjust iron core on the other side should extend from 8.35 MC to 9.75 MC. Very few turns of the core should be required to obtain the desired result. Now no more than 20% loss in peak over-all response should result from this process.

John F. Rider

John F. Rider
AUTOMATIC RECORD CHANGER

MODEL LRP-3

GENERAL

This record changer is designed for use on a 110-volt 60-cycle power supply, but can easily be converted for 110-volt 60-cycle use by following the instructions under "Operation on 50- or 60-cycle Power Supplies."

OPERATION

The record changer will play up to eight 12-inch or nine 10-inch records at one loading. It will not play 12-inch and 10-inch records intermixed. The last record will repeat playing until the mechanism is stopped.

To load the record changer, both lower shelf plates of the record supports must be turned inward. This is done by grasping the post just below the shelf plate and rotating until it falls into the proper position. The stack of records rests over the spindle, on the two lower shelf plates.

The turntable switch is located at the front left corner of the motor board. The Reject button is used to start the changer mechanism and to reject a particular record. To start the mechanism, or to reject a record being played, merely push the Reject button and release it. Rejecting can be done at any time after the needle has come in contact with the record, and will immediately start the mechanism on its change cycle.

The 10-12 button selects the position at which the pickup arm drops onto the record, i.e. for 10-inch or 12-inch records respectively. No repositioning of the support discs is necessary for changing to different record size.

The Auto-Manual button prepares the record changer for either automatic or manual operation. On Manual, the changer is used as an ordinary single-record player.

The mechanism should only be stopped while the needle is riding on the record. After the last record has been played, wait until the pickup arm has gone through the change cycle and has dropped on to the first grooves of the record, before throwing the power switch "off." Then lift the pickup arm and carry it to the pickup rest. Stopping the mechanism during the change cycle will lock the pickup arm. To avoid damage to the mechanism, the pickup arm should only be handled with the Auto-Manual button in the Manual position.

CAUTIONS

1. Never use force to start or stop the motor or any part of the record-changing mechanism.
2. The use of cracked or chipped records may damage the pickup and needle.
3. Do not leave the records on the record posts or on the turntable, as they may warp, particularly in warm climates. Warped records may slide upon one another and result in unsatisfactory reproduction. Warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
4. The use of warped records may also jam the mechanism. When the mechanism jams, turn off the power and rotate the turntable by hand in the reverse direction, for about ten turns.

CABINET LEVELING

For good operation, the record changer must be level. If the cabinet tilts to the left, the records may not drop smoothly and the pickup may drop and slide over the first grooves of the record. If the cabinet tilts to the right, the records may not drop smoothly, and the pickup may fail to enter the starting groove.

NEEDLE

This phonograph is equipped with a semi-permanent type needle and under normal operation should last for about four thousand playings. The needle should be inserted with the flat section to the screw and made secure. DO NOT CHANGE THE POSITION OF THE NEEDLE ONCE IT HAS BEEN IN USE. The needle screw should be tightened periodically.

TURNTABLE SPEED

The maximum allowable turntable speed is 81 rpm. The minimum allowable turntable speed, with the needle in the outside groove of a 12-inch record, is 76.6 rpm.

The number of records in the turntable makes practically no difference in the revolutions per minute (rpm).

OILING

All main moving parts of this record changer have oilless type bearings and should require no additional lubrication. However, a few drops of high-grade machine oil on the main bearings and friction surfaces, and to the oil wicks on both ends of the motor shaft may be applied at long intervals.

OPERATION ON 50- OR 60-CYCLE POWER SUPPLIES

The record changer is shipped from the factory adjusted for operation on a 50-cycle power supply. To change for 60-cycle operation, replace item (8) (Fig. 1) with the spare bushing supplied. (The spare bushing is shipped with each changer, tied to the frame with a piece of wire.) Sixty-cycle operation requires the smaller diameter bushing so as to reduce the turntable speed to 78 rpm. Note that if the mechanism is being operated on a 60-cycle power supply, and the turntable speed is too high, it means that too large a bushing is being used at (8) to drive the idler wheel (4), and that the smaller bushing should be used. Also, if the mechanism is being operated on a 50-cycle power supply, and the turntable speed is too low, it means that too small a bushing is being used at (8). Be sure the setscrew matches with the depression on the motor shaft and is securely tightened. When properly installed, the top of the bushing should be just a fraction below the top of the motor shaft.
MODEL LRP-3

GENERAL ELECTRIC CO.

Fig. 1
Top view of record changer with turntable removed

DESCRIPTION OF PRINCIPAL PARTS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Changer post</td>
</tr>
<tr>
<td>2</td>
<td>Lower blade</td>
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<tr>
<td>3</td>
<td>Upper blade</td>
</tr>
<tr>
<td>4</td>
<td>Idler wheel</td>
</tr>
<tr>
<td>5</td>
<td>Motor switch</td>
</tr>
<tr>
<td>6</td>
<td>Spring clip</td>
</tr>
<tr>
<td>7</td>
<td>Motor mounting grommet</td>
</tr>
<tr>
<td>8</td>
<td>Motor bushing</td>
</tr>
<tr>
<td>9</td>
<td>Turntable shaft</td>
</tr>
<tr>
<td>10</td>
<td>Auto-Manual button</td>
</tr>
<tr>
<td>11</td>
<td>10-12 button</td>
</tr>
<tr>
<td>12</td>
<td>Needle set screw</td>
</tr>
<tr>
<td>13</td>
<td>Start-Reject button</td>
</tr>
<tr>
<td>14</td>
<td>Pickup</td>
</tr>
<tr>
<td>15</td>
<td>Pickup rest</td>
</tr>
<tr>
<td>16</td>
<td>Pickup arm</td>
</tr>
<tr>
<td>17</td>
<td>Dropping point adjusting screw</td>
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<tr>
<td>18</td>
<td>Pickup lift adjusting screw</td>
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<td>19</td>
<td>Index link</td>
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<td>Reject return spring</td>
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<td>Reject link</td>
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<td>22</td>
<td>Control spring</td>
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<td>23</td>
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<td>Short changer blade shaft</td>
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<td>Driving crank</td>
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<td>38</td>
<td>Position trip screw</td>
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<td>46</td>
<td>Post nut</td>
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<td>59</td>
<td>Cam extension spring</td>
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<td>60</td>
<td>Cam extension</td>
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<td>61</td>
<td>Pawl latch spring</td>
</tr>
<tr>
<td>62</td>
<td>Cam rim</td>
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</tbody>
</table>

Fig. 2
Bottom view of record changer with mechanism about three fourths of the way through a change cycle

CYCLE OF OPERATION*

Pushing reject button (13) moves pawl latch (40) through reject link (21) and releases starting pawl (41) which is moved by starting pawl spring (42). The starting pawl (41) engages with lugs in pinion (58) and rotates the large gear (27) for approximately one revolution until the stop lever (28) rolls into the stop depression on the large gear. This entire movement is one complete turn of the large gear and is one complete change cycle of the record changer. When the large gear turns, the eccentric (39) pushes the eccentric arm (49) through the eccentric arm spring (44). This moves the driving crank (49) and turns the blades (2) and (3). The other set of blades are turned simultaneously through driving crank (47), tie bar (26), and driving crank (25).

Pickup Arm

The lateral movement of the pickup arm is controlled during a change cycle by the pickup crank roller (50) on the pickup crank (36), following the cam groove (57) in the large gear (27).

The vertical movement of the pickup arm during a change cycle is controlled by the pickup pin (51) riding on the cam rim (52) on top of the large gear. On records which do not have a starting groove, the needle is pushed into the first groove by pickup crank spring (35). The tension of this spring may be adjusted by bending the lug to which it is attached on the base.

Position Trip

When the needle travels to within 1 3/4 inches from the center post, the pickup crank (36) moves the position trip screw (38) which is fastened to the pawl latch (40), and releases the starting pawl (41), starting the change cycle.

Oscillating Trip

When the needle travels into the eccentric groove on the inside of a record, the ratchet pawl (53) on the pickup crank (36) moves the ratchet latch (54), and releases the ratchet trip (56) which is moved by the ratchet spring (55). The ratchet trip (56) moves the pawl latch (40) which releases the starting pawl (41), and starts the change cycle.

The ratchet pawl (53) has a spring (52) which tends to hold the ratchet pawl (53) straight out from the end of the pickup crank (36).

* The cycle of operation can be studied conveniently by pushing the Reject button, and revolving the turntable by hand.
Fig. 3
Bottom section view of record changer, with large gear removed

SERVICE ADJUSTMENTS

The turntable is driven by means of an eccentric friction drive wheel. The driving power is transferred from the motor through the idler wheel (4) and then to the rim of the turntable. It is important, therefore, that the motor be kept clean of grease, oil, dirt, or any foreign matter. Any quick drying solvent like naphtha is satisfactory for cleaning these parts. Only occasional lubrication is required—see OILING.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in a reverse direction.

Needle Drop Point

With the 10-12 button set for 10-inch records (number 10 showing), the needle should contact the record ¾ inches from the turntable shaft or about ¼ inch from the edge of the record. This dropping point is adjusted by the adjustment screw (17) on top of the record changer. Turning this screw clockwise causes the needle to drop farther from the turntable shaft, while turning this screw counterclockwise causes the needle to drop nearer the turntable shaft. Turn the screw only a fraction of a turn at one time, as about one-fourth turn of this adjustment screw changes the dropping point of the needle almost one-fourth of an inch. The over-all range of this adjustment is secured in one turn of the adjustment screw.

Pickup Arm Lift

The lift of the pickup arm is adjusted by the adjustment nut (18) underneath the pickup arm. The top of the pickup arm (16) should rise to within about one-fourth inch from the under side of the lower blade. To lower the elevation of the pickup arm, turn the nut clockwise, and to raise the elevation, turn the nut counterclockwise.

Position Trip

The position trip is adjusted by turning the position trip screw (38). The trip should operate when the needle is moved ¾ inch from the center post. To trip earlier, or farther from the center post, turn the screw clockwise, while to trip later, or nearer the center post, turn the screw counterclockwise.

REPLACEMENT PARTS LIST

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<th>Stock Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>RB-211</td>
<td>BRACKET—Motor mounting bracket assembly</td>
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<tr>
<td>RB-655</td>
<td>BUSHING—Motor bushing for 30 cycle operation</td>
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<tr>
<td>RB-656</td>
<td>BUSHING—Motor bushing for 60 cycle operation</td>
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<tr>
<td>RC-310</td>
<td>GROMMET—Motor mounting grommet</td>
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<tr>
<td>RM-102</td>
<td>MOTOR—60-60-cycle motor</td>
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<tr>
<td>RS-648</td>
<td>SHELF—Upper and lower shelf blades assembly</td>
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<tr>
<td>RB-654</td>
<td>BUTTON—Control button assembly; Reject, 1021- and Auto-Man. buttons</td>
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<tr>
<td>RP-427</td>
<td>POST—Changer post</td>
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<tr>
<td>RS-649</td>
<td>SHAFT—Turntable shaft</td>
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<td>RS-3152</td>
<td>SWITCH—Power switch</td>
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<tr>
<td>RT-948</td>
<td>TURNTABLE—Turntable</td>
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<tr>
<td>RA-439</td>
<td>ARM— Eccentric arm assembly</td>
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<tr>
<td>RA-440</td>
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<tr>
<td>RA-213</td>
<td>BAR—Changer shaft tie bar</td>
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<td>RA-213</td>
<td>BAR—Bar assembly</td>
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<td>RA-463</td>
<td>BEARING—Upper bearing assembly</td>
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<td>RC-2083</td>
<td>CRANK—Pickup crank</td>
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<tr>
<td>RC-2084</td>
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<td>RF-209</td>
<td>FRAME—Sub-frame</td>
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<td>RG-311</td>
<td>GEAR—Large gear assembly</td>
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<td>RL-991</td>
<td>LATCH—Pawl latch</td>
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<td>RL-992</td>
<td>LATCH—Ratchet latch</td>
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<td>RL-993</td>
<td>LEVER—Cam stock lever</td>
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<td>LINK—Manual link</td>
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<td>RL-906</td>
<td>LINK—Reject link</td>
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<td>RP-428</td>
<td>PAWL—Starting pawl</td>
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<td>RP-429</td>
<td>PAWL—Ratchet pawl</td>
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<td>RS-650</td>
<td>SHAFT—Changer blade driving shaft</td>
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<td>RS-651</td>
<td>SHAFT—Short changer blade shaft</td>
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<td>RS-6079</td>
<td>SPRING—Cam extension spring</td>
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<td>RS-6080</td>
<td>SPRING—Control spring</td>
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<td>RS-6081</td>
<td>SPRING—Cam stop spring</td>
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<td>SPRING—Eccentric arm side spring</td>
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<td>RS-6083</td>
<td>SPRING—Idler and tension spring</td>
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<td>RS-6084</td>
<td>SPRING—Mounting spring</td>
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<td>RS-6089</td>
<td>SPRING—Reject return spring assembly</td>
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<td>RS-6090</td>
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<td>RS-6091</td>
<td>STUD—Index bushing stud</td>
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<td>RS-6092</td>
<td>STUD—Lower bearing stud</td>
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<tr>
<td>RT-943</td>
<td>TRIP—Ratchet trip</td>
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<td>RW-926</td>
<td>WHEEL—Idler wheel and clip assembly</td>
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<td>RC-5016</td>
<td>PICKUP—Magnetic pickup head</td>
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<tr>
<td>RA-430</td>
<td>PICKUP—Magnetic pickup—complete</td>
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<td>RL-806</td>
<td>COIL—Pickup coil</td>
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<td>RS-4040</td>
<td>SCREW—Needle setscrew</td>
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<tr>
<td>RS-4096</td>
<td>SPRING—Pickup arm spring</td>
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GENERAL INFORMATION
When connecting this record player to an AC/DC receiver insert a .25 mfd. 400 V. paper capacitor between the black lead of the record player and the chassis ground, and a .005 or .01 mfd. 400 V. paper capacitor between the green lead of the record player and the circuit tapped in the radio.

Radio Receiver Connections
There are several different methods which may be used to connect the record player to the radio receiver depending upon the provisions incorporated in the radio for handling phonograph connections and upon the type of installation desired. Several methods are outlined below for superheterodyne receivers.

The process of changing from radio reception to record-player operation and vice versa requires either the manual insertion of the record-player leads in the radio circuit each time the process is performed or the use of a switch to automatically perform the operation. The convenience of a switching arrangement will so far outweigh the labor involved in manual operation that the slight additional cost of a switch will pass unnoticed.

There follow several general methods of installation which should not be assumed to be comprehensive or all-inclusive.

Method No. 1.—(For radios equipped with phono jack terminals.) These Models are equipped with a plug for connecting to radios equipped with a phono jack. The green lead of the record player is connected to the pin terminal and the black lead to the shield of the plug. Some radio models automatically switch to record-player operation when the plug is inserted in the terminal; other models require pushing or rotating a switch incorporated on the radio control panel.

Method No. 2.—(For radios equipped with phono terminals.) Consults the panel. Use a .005 mfd. 400 V. paper capacitor between the black lead of the record player and the chassis ground. The green lead is connected to the high side of the volume control. For radio operation, there will be a link connection between this volume-control terminal and the radio diode load terminal. On a three-terminal board, the remaining terminal will be chassis-ground. On a four-terminal board one of the remaining terminals will be chassis-ground and the other a diode return.

Using manual insertion of the record player into the radio circuits, it is only necessary to remove the link from between the diode load and volume-control terminals and reinsert it between the diode load and chassis-ground terminals (on a three-terminal board), or between diode load and return (on a four-terminal board). The green lead on the record player is then connected to the volume-control terminal and the black lead to the chassis-ground terminal.

To return to radio operation, merely remove the link and reinsert between the diode load and volume-control terminals. It may not be necessary to disconnect the record-player leads when returning to radio operation depending upon the circuit design in your radio receiver. If the tone quality and volume are impaired when the record player remains connected, then it will be necessary to remove the record-player leads from the radio terminals each time you turn from record-player performance to radio reception.

Using switch operation requires the use of a double-pole, double-throw toggle or rotary switch. The general method of connection is as shown in Fig. 1.
GENERAL INFORMATION

Chassis Removal
Note: Care must be exercised in removing either the cabinet back or chassis to avoid changing the shape of either the short-wave or broadcast loop antenna. Any alteration in the loop will change its inductance and throw the receiver out of alignment.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect Test-Osc. to</th>
<th>Test-Osc. Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;B&quot; Band 550 KC</td>
<td>C5A &amp; C5B</td>
</tr>
<tr>
<td>2</td>
<td>857 A Conv. grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;B&quot; Band 550 KC</td>
<td>C4A &amp; C4B</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Coupled</td>
<td>580 KC</td>
<td>&quot;B&quot; Band 500 KC</td>
<td>C3**</td>
</tr>
<tr>
<td>4</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;B&quot; Band 1500 KC</td>
<td>C2B (Osc.)</td>
</tr>
<tr>
<td>5</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;B&quot; Band 1500 KC</td>
<td>C2A (Ant.)</td>
</tr>
</tbody>
</table>

REPEAT STEP 3

6    | Capacity Coupled | 18 MC | "SW" Band 18 MC | C3A* (Osc.) |

7    | Capacity Coupled | 18 MC | "SW" Band 18 MC | C3A** (Ant.) |

* Use minimum peak output.
** Rock gang condenser when making alignment.

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—43 at 1000 KC
   Converter Grid to 6SK7 Grid—42 at 455 KC
   6SK7 Grid to 6SQ7 Diode Plate—100 at 455 KC

2. Audio gain
   80 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/2-watt speaker output.

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

Variations of +10 or ±20% permissible.

Fig. 1. Dial Stringing Diagram

Fig. 2. Trimmer Location
FOR DATA ON AUTOMATIC RECORD CHANGER MODEL LRP-170,
SEE RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDER"
The following data is taken with a vacuum-tube voltmeter or similar measuring device.

(1) Stage Gains
Antenna post to RF Grid........6.5 at 1000 KC
RF Grid to Converter Grid....10 at 1000 KC
Converter Grid to IF Grid.....45 at 1000 KC
Converter Grid to IF Grid.....60 at 455 KC
IF Grid to 6SF7 diode plate...110 at 455 KC

(2) Audio Gains
.09 volts, 400-cycle signal across volume control with control set to maximum will give approximately ½-watt output to speaker.

(3) D-C voltage developed across oscillator-grid resistor R6 averages 7 volts at 1000 KC, 9 volts at 4000 KC, or 6 volts at 10,000 KC.

Variations of ±20% permissible. All readings taken with minus 1½-volt fixed bias on AVC bus.

ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Test Osc. Connection</th>
<th>Test Osc. Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SF7 IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C17 and C16 for Maximum</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>C14 and C13 for Maximum</td>
</tr>
<tr>
<td>3</td>
<td>Capacity Coupled</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C11** for Maximum</td>
</tr>
<tr>
<td>4</td>
<td>Capacity Coupled</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C8** (Osc.) for Maximum</td>
</tr>
<tr>
<td>5</td>
<td>Capacity Coupled</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C11** for Maximum</td>
</tr>
<tr>
<td>6</td>
<td>Capacity Coupled</td>
<td>5 MC</td>
<td>&quot;SW1&quot; Band 5 MC</td>
<td>C7** (Osc.) for Maximum</td>
</tr>
<tr>
<td>7</td>
<td>Capacity Coupled</td>
<td>17.8 MC</td>
<td>&quot;SW2&quot; Band 17.8 MC</td>
<td>C6* (Osc.) to signal</td>
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<tr>
<td>8</td>
<td>Capacity Coupled</td>
<td>17.8 MC</td>
<td>&quot;SW2&quot; Band 17.8 MC</td>
<td>C11** (Ant.) for maximum</td>
</tr>
</tbody>
</table>

* Correct peak is at low capacity.
** Rock gang condenser when making alignment.

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MODEL LRP-32

AUTOMATIC RECORD CHANGER

GENERAL

This record changer is designed for use on a 115-volt 60-cycle power supply. It is of the fully automatic type, handling either 10- or 12-inch records. It will not, however, play 10- and 12-inch records intermixed.

Before checking a record changer in the cabinet, make sure the mounting bolts are released and the cardboard spacers removed; otherwise, the changer will not properly feed records from the magazine and the tone arm will not land correctly on the record. If adjustments are made with the changer bolted down and the mounting bolts then released, the adjustments will have to be remade.

During shipment the master gear may shift and become meshed out of time, so that if the changer is started under these circumstances, it will jam. To prevent this, be certain that the tone arm is free, that is, in the playing position before turning on the motor. If the changer is in "cycle" the motion of the tone arm will be restricted. The turntable should then be rotated backwards until the master gear (3) disengages from the drive shaft pinion gear (47). The foregoing operation is necessary only if out of time and should be an installation check.

AUTOMATIC OPERATION

Before operating the changer, be sure the tone arm is in the rest position, and can be moved freely by hand. If not, a "cycle" must be completed. To do this, push power switch to ON position, push control button to REJECT position and release. The mechanism will turn through the change cycle and after the tone arm is free the unit is ready for loading.

Insert spindle (69) in center post. Adjust record shelf (11) to the position of the size record to be played and flip the "Hold Down" arm (26) away from spindle. Load up to twelve 10-inch or ten 12-inch records. They should be supported by the record spindle at the center and the record shelf at the edge. Return the "Hold Down" arm to the top of the stack of records. Place the control button in "AUTOMATIC" position and turn the power on. Push the control button to "REJECT" if necessary. The mechanism will now operate and play automatically the records loaded on it. When the last record has dropped down, the mechanism will continue to repeat it.

Allow the mechanism to complete the changing cycle, that is, wait until the tone arm has just landed and starts playing the last record. Turn power OFF. Move tone arm off turntable. Remove record spindle and remove records.

MANUAL OPERATION

To operate the changer manually push the control button to the "MANUAL" position and allow it to remain there. When playing records manually do not use the spindle. It is advisable to rotate the record shelf to the 12-inch position and flip the hold down arm out of the way.

CAUTIONS

1. Never use force to stop or start the motor or any part of the record changer mechanism.
2. The use of cracked or chipped records may damage the crystal or sapphire.
3. Records should not be left on the record supports or on the turntable as they may warp, particularly in warm climates.
4. The use of warped records may result in unsatisfactory operation since they tend to slide on one another. Warped records may be flattened by placing them on a flat surface and loading them with a heavy article.
5. Handle the spindle (69) with care since a bent spindle may cause changer to "wow."
6. SEE LUBRICATION.

CABINET LEVELING

For good operation the record changer must be level. If not level the tone arm may land incorrectly and the records may not drop freely.

CRYSTAL AND NEEDLE

The crystal is of the low-pressure type and is equipped with a permanent sapphire stylus which is not replaceable in the field. Because of the low pressure the voltage output is approximately one-half volt. The cartridge is mounted between two viscoloid blocks to reduce noise and vibration.

TURNTABLE SPEED

The motor is of the fixed speed type and cannot be varied. The turntable is driven at the rim through the motor drive mechanism as shown in Fig. 8. Due to commercial tolerance it is impossible to secure motors which will run exactly 78.26 RPM. Limits are from 76.69 to 80.00 RPM.

REMOVAL OF TURNTABLE

The turntable is threaded onto the drive shaft and may be removed by blocking the gears and rotating the turntable in a counterclockwise direction.

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LUBRICATION

CAUTION: Do not lubricate any of the following parts:
1. Friction trip assembly "D." 
2. Tone arm support bracket tube (15).
3. Starting lever (50) and trip lever (54) at overlap.
4. Tone arm hinge pin (76).
5. Contact between trip finger (31) and trip lever (54).
6. Spring on end of trip lever (54).

Use light machine oil on the following parts:
1. Lift lever rivet (41).
2. Turntable drive shaft (48) at felt washer above motorboard and at felt washer (46).
3. Tone arm swing lever bushing (79).
4. Ejector cam bushing (19).
5. Starting lever at bearing pin (56) and at starting lever extension rivet.

Use light grease (Lubriplate or equivalent) on the following parts:
1. Record hold down spring rods upper (22) and lower (23).
2. At contact point between record shelf (11) and hold-down spring (10).
3. Interceptor shaft (4) at bearing point on motorboard.
4. Vertical cam (3A).
5. Horizontal cam (3B).
6. Master gear (5) and stud (42) (55).

CYCLE OF OPERATION

Fig. 9 shows the relative positions of the various levers, which contribute to the change cycle, at rest. Note that the back end of the trip lever (54) is over the back end of the starting lever (50). The distance the trip lever maintains over the starting lever determines to some degree the sensitivity of the tripping operation.

Assuming a record is to be playing, the operation is as follows (see Fig. 9): The tone arm (61) moving in on the record causes the friction lever (34) to continually "pull in." The friction between the tone arm and this lever is determined by adjustment "D." As the friction lever (34) "pulls in" it pushes the trip finger (31) causing it to push on the trip lever (54). In the meantime the small extension on the upper part of the rotating drive shaft pinion gear (47) continually strikes the spring on the end of the trip lever causing it to move back. As long as these two operations continue no tripping takes place. But a sudden motion of the tone arm, such as produced by the trip groove at the end of the record, causes the entire mechanism to move rapidly before the extension on the drive shaft pinion gear can push it back. Under this condition the trip lever moves off the back end of the starting lever allowing it to drop.

In its normal position the starting lever (50) has an extension at the gear end which lies between the starting pin (49) and the drive shaft gear extension (see Fig. 7). When the starting lever drops, as indicated above, the extension engages the starting pin (49) forcing the master cam and gear (3) to turn. The starting pin and starting lever extension engage long enough to allow the teeth to mesh and complete the rotation.

As the master cam and gear (3) rotates the vertical cam operates the lift lever (29) and through the lift rod (40) causes the tone arm to rise. At the same time the swing lever (2) follows the horizontal cam and, through the crank arm (27), causes the tone arm to move out beyond the edge of the record. In the meantime the ejector pin (52) on the master cam and gear has moved through about 100 degrees and engages the ejector cam. This motion transmitted through the rocker arm (9) causes the ejector (12) to move inward and push a record off its supports.

The swing lever (2), because of the tension spring (65), follows the horizontal cam and, through the crank arm (27), pulls the tone arm to its starting position. The vertical cam, in the meantime, lowers the tone arm, through the lift lever (29) and lift rod (40), onto the record. The feed-in spring (30) exerts a gentle pressure until the needle has reached the first record groove. This completes the cycle.

SERVICE ADJUSTMENTS

"A" Adjustment of 10-inch Landing Position. (See Fig. 6)

This adjustment is made by loosening the machine screw on the tone arm crank (27), positioning the tone arm (6)
and the crank (27) and retightening the screw. It will be noticed that the tone arm, on completing a cycle, does not come straight down on the record edge but curves inward as it comes down. This is due to the action of the feed-in spring (30). Therefore, the adjustment of the landing position is best made by a trial and error method. For example, if the tone arm lands inside the starting edge, estimate the distance and allow mechanism to complete changing cycle. Then holding the crank with one hand, push out on the arm with other. Try the landing by putting the mechanism through a cycle. If not correct, repeat until the correct position is found. The setscrew on the tone arm crank (27) must be loosened each time before adjustment and tightened afterward. Upon completion of the adjustment be sure the machine screw is very tight to avoid possibility of future slippage.

"B" Adjustment of 12-inch Landing Position. (See Figs. 3 and 6)

This adjustment is made by loosening the machine screw at the end of the swing lever (2) and positioning the link. When the support shell (11) is rotated to the 12-inch position, the interceptor rod (4) moves down and acts as a stop for the swing lever, preventing it from moving in to the base of the horizontal cam (38). Under this condition the swing lever cannot move the crank arm (27) as far as it did on the 10-inch position. The adjustment "B" should be made by the trial and error method until the arm lands correctly. If the 10-inch landing position must be readjusted for any reason the 12-inch landing position will also have to be readjusted.

"C" Vertical Lift Adjustment. (See Fig. 6)

The hex nut should be loosened and the screw adjusted until the tone arm just clears beneath a stack of records on the supports. The nut must then be tightened to maintain the position.

"D" Friction Trip Adjustment. (See Fig. 6)

A special Bristol setscrew wrench should be available (see parts list) to make this adjustment or a small screwdriver, the blade of which has been ground down, will suffice. The setscrew (37) on the upper collar (36) only need be loosened. The upper collar is threaded onto the lower collar (32) and the friction pressure, maintained by the spring washer (35), may be varied by rotating the upper collar with respect to the lower. Too much pressure on the friction lever may cause early tripping or may cause the tone arm to be pushed back. On the other hand, too little pressure may cause the mechanism to fail to trip. Care must be used in making this adjustment and the use of oil must be avoided.

"E" Feed-in Spring Adjustment. (See Fig. 6)

The feed-in spring (30) must be adjusted so that it exerts a slight pressure on the tone arm crank (27). If a very small increase or decrease in pressure is required the spring may be bent, being very careful not to break it. Otherwise, the screw holding the feed-in spring to the swing lever (2) should be loosened, the position of the spring changed and the screw tightened.

Miscellaneous Adjustments. (See Fig. 9)

As mentioned under the cycle of operation, the tripping sensitivity is determined by the overlap of the trip lever (54) over the starting lever (50). The greater this overlap the more tripping action is required and conversely, the less this overlap the more sensitive the tripping action becomes. This overlap can be varied by bending the spring on the end of the trip lever (54). If the spring is bent away from the drive shaft pinion gear (47) the overlap will be decreased or if bent toward the drive shaft pinion gear the overlap will be increased. Great care must be exercised when bending this spring as it will break easily. It should be bent as near the outer end as practical, never close to the rivets.

The action of the ejector can be varied somewhat by changing the position of ejector pin (52) on the master cam and gear (3). This is accomplished by loosening the two screws holding the ejector pin to the master gear and positions the ejector pin as required.

The starting lever (50) should be in such a position in relation to the starting pin (48) that the teeth will mesh properly. In case they do not, the starting lever must be bent accordingly. The starting pin should protrude about 1/16 inch.
GENERAL ELECTRIC CO.

SERVICE HINTS

Mechanism Trips Early
Adjustment "D" may be too tight or there may be too little overlap between the trip lever (54) and the starting lever (50). Bend spring on end of trip lever (54).

Mechanism Fails to Trip
Adjustment "D" may be too loose or there may be oil on friction washer (33). Or there may be too much overlap between the trip lever (54) and the starting lever (50). Bend spring on end of starting lever (54).

Mechanism Continues to Cycle
The end of the starting lever (50) may not be rising above starting pin (49). Starting lever (50) or the trip lever (54) may be bent.

Irregular Landing on 10- and 12-inch Records
Check the feed-in Spring (30). May be bent or out of adjustment. The spring may get on the wrong side of the crank arm (27) pin and result in no feed-in action at all.

Mechanism Jams
The end of the starting lever (50) may be bent or the gears may be out of time. The end of the starting lever may rise too high and catch on the pinion gear extension. This could be caused by a bent starting lever or a bent trip lever (54). Any excessive friction or rubbing could cause meclanism to slow down.

Mechanism Fails to Eject Records
The rocker arm (9) may be bent or it may be binding at the motorboard. The ejector pin (32) may need adjustment. Chipped or warped record may also be responsible.

"Wow"
A bent record spindle (69) will usually cause this. It could also be caused by a flat on the motor drive wheel (60).

REPLACEMENT PARTS LIST

<table>
<thead>
<tr>
<th>Stock Number</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL-9011</td>
<td>1</td>
<td>LINK—12 in. landing adjustment link.</td>
</tr>
<tr>
<td>RL-9012</td>
<td>2</td>
<td>LEVER—Swing lever and adj. link.</td>
</tr>
<tr>
<td>RG-723</td>
<td>3A</td>
<td>CAM—Vertical cam (part of 3).</td>
</tr>
<tr>
<td>RG-723</td>
<td>3B</td>
<td>CAM—Horizontal cam (part of 3).</td>
</tr>
<tr>
<td>RS-9053</td>
<td>4</td>
<td>SHAFT—12 in. record indexer shaft.</td>
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<tr>
<td>RH-127</td>
<td>5</td>
<td>COTTER—H.P. cotter.</td>
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<td>RS-4101</td>
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<td>SPRING—Interchangeable spring.</td>
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<td>RP-436</td>
<td>7</td>
<td>PIN—Ejector rocker arm pin.</td>
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<tr>
<td>RS-4098</td>
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<td>SPRING—Ejector rocker arm spring.</td>
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<td>RA-441</td>
<td>9</td>
<td>ARM—Ejector rocker arm.</td>
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<tr>
<td>RS-4100</td>
<td>10</td>
<td>SPRING—Record support shelf.</td>
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<tr>
<td>RS-436</td>
<td>11</td>
<td>SHELF—Record support shelf.</td>
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<tr>
<td>RS-4000</td>
<td>12</td>
<td>ELECTOR—Record ejector.</td>
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<tr>
<td>RP-434</td>
<td>13</td>
<td>POST—Record support and tone arm post (plastic).</td>
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<tr>
<td>RT-9002</td>
<td>14</td>
<td>TURN TABLE—Tone arm bracket and tube assembly.</td>
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<tr>
<td>RB-214</td>
<td>15</td>
<td>BRACKET—Tone arm bracket and tube assembly.</td>
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<td>RP-435</td>
<td>16</td>
<td>PLATE—Back cover plate.</td>
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<td>RC-2089</td>
<td>17</td>
<td>CAM—Ejector cam.</td>
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<tr>
<td>RB-560</td>
<td>18</td>
<td>BUSHING—Ejector cam bushing.</td>
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<td>RS-4105</td>
<td>19</td>
<td>SPRING—Hold-down arm spring.</td>
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<tr>
<td>RP-437</td>
<td>20</td>
<td>PIN—Hold-down spring pin (upper).</td>
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<tr>
<td>RP-438</td>
<td>21</td>
<td>PIN—Hold-down spring pin (lower).</td>
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<tr>
<td>RC-2090</td>
<td>22</td>
<td>COVER—Record support cover (plastic).</td>
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<td>RB-703</td>
<td>23</td>
<td>BAND—Rubber band.</td>
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<td>RA-443</td>
<td>24</td>
<td>ARM—Record hold-down arm.</td>
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<tr>
<td>RA-444</td>
<td>25</td>
<td>ARM—Crank arm.</td>
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<tr>
<td>RS-4099</td>
<td>26</td>
<td>SPRING—Glue lever spring.</td>
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<tr>
<td>RL-9005</td>
<td>27</td>
<td>LEVER—Glue lever.</td>
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<td>RS-4106</td>
<td>28</td>
<td>SPRING—Feed-in spring.</td>
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<td>RP-709</td>
<td>29</td>
<td>PIN—Finger—Trip finger.</td>
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<td>RC-2092</td>
<td>30</td>
<td>COLLAR—Lower collar.</td>
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<td>RW-141</td>
<td>31</td>
<td>WASHER—Trip lever friction washer (cork).</td>
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<tr>
<td>RW-330</td>
<td>32</td>
<td>SPRING—Washers.</td>
</tr>
<tr>
<td>RC-2091</td>
<td>33</td>
<td>COLLAR—Upper collar.</td>
</tr>
<tr>
<td>RS-5041</td>
<td>34</td>
<td>SCREW—8/32 x 1/4 in. Bristol setscrew.</td>
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<tr>
<td>RS-4103</td>
<td>35</td>
<td>SPRING—Tone arm spring.</td>
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<tr>
<td>RS-854</td>
<td>36</td>
<td>PIN—Tone arm lift rod.</td>
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<tr>
<td>RS-555</td>
<td>37</td>
<td>RIVET—Tone lever rivet.</td>
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<tr>
<td>RS-577</td>
<td>38</td>
<td>SCREW—Master gear stud.</td>
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<tr>
<td>RP-849</td>
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<td>PLATE—Steel plate.</td>
</tr>
<tr>
<td>RB-218</td>
<td>40</td>
<td>BRACKET—Drive shaft support bracket.</td>
</tr>
</tbody>
</table>

*Used on previous changers.
†Purchase locally (not stocked).

G.E. PAGE 14-11

MODEL LRP-32

PARTS NOT ILLUSTRATED

<table>
<thead>
<tr>
<th>Stock Number</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW-144</td>
<td>41</td>
<td>WASHER—Slotted washer on drive shaft (top of motorboard).</td>
</tr>
<tr>
<td>RW-250</td>
<td>42</td>
<td>WRENCH—6/32 Bristol wrench.</td>
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<tr>
<td>RP-145</td>
<td>43</td>
<td>PLUG—Photo plug.</td>
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<tr>
<td>RS-4112</td>
<td>44</td>
<td>SPRING—Record spring.</td>
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<tr>
<td>RC-5010</td>
<td>45</td>
<td>CRYSTAL—Crystal cartridge.</td>
</tr>
<tr>
<td>RS-4124</td>
<td>46</td>
<td>SPRING—Conical Support Spring.</td>
</tr>
</tbody>
</table>

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SWITCH WIRING

The band switch terminals are numbered in the Switch Wiring Diagram, Fig. 6, to assist in locating the corresponding numbered points on the Schematic Diagram, Fig. 5. Switch section 1 in Fig. 6 is represented as S1, section 2 is represented as S2, etc., on the Schematic Diagram, Fig. 5.

Rotor Balance Spring

On the right-hand side of the tuning condenser assembly is a wire bracket from which a spring is suspended that connects to the drive drum of the tuning condenser. The proper adjustment of this spring counterbalances the weight of the condenser drive assembly and prevents backlash. For chassis mounted horizontally, the spring must be in the rear notch of wire bracket.
This deluxe automatic record changer and home recording unit is standard equipment in the above model recorders and is designed for operation on a 110-volt alternating-current source. The record changer will play up to fifteen 10-inch and 12-inch records intermixed, while the recording mechanism is designed to record on record blanks which have not been pre-grooved.

**OPERATING CONTROLS**

**Power Controls**

To turn power "on," press the red push button (AK) in Fig. 1 until the power switch clicks. To turn power "off," press down on tone arm rest (AH).

**Index and Record-reject Control**

This control consists of the switch knob (AI) pointer (AJ) and push button (AK). The selector knob provides for either manual or automatic operation of the mechanism. Turn pointer and knob assembly to "A" for automatic operation. Turn pointer and knob assembly to "M" for manual operation.

To reject a record being played, or to start the record changing cycle, push down on the red push button (AK) as far as it will go.

**Record Holder Shelf Plates**

These three assemblies consist of the selector plate (BA), center plate (BB) and shelf plate (BC). These plates are hinged so that they may be raised to a vertical position for clear access to the turntable.

**GENERAL DESCRIPTION OF PHONO CHANGE CYCLE**

An automatic record player for records of two sizes has three principal duties to perform. These duties are here performed by three mechanisms inter-connected and built together, but largely separate in their operation. The motion for each is originated in one central cam gear which has three different and individual cam surfaces. The cam gear (FK) is normally at rest while a record is being played, but is put into operation by contact of a latch lever (AD) (located in the cam gear) with the teeth of an intermediate drive gear (CI). This motion takes place only when the unit is put into a change cycle. The cam gear then turns one full revolution to complete the change cycle and stops in a neutral position.

1. **THE RECORD CHANGING MECHANISM** is brought into operation by a segment (CH) (or lever) with a roller (E) at one end which runs in a cam groove in the cam gear (FK) as it turns, which drives with an oscillating motion the three pulleys (FG) by means of a metal tape (DD). The pulleys are fastened to the lower ends of the changer shafts (DL), in which turn transmit their motion to the changer plates (BC) which are fastened with set-screws to the upper ends of the shafts. When the changer plate assembly is revolved, the record resting on the shelf plates (BC) is released to the turntable.

2. **THE PICK-UP OPERATING MECHANISM** is likewise brought into operation originally by a cam surface on the cam gear (FK) which operates a raising lever (CA) which receives a rocking motion from the cam gear (FK) through a roller (CD) which is part of the raising lever assembly. The flat spring on the opposite end of this lever (CA) is carried upward against a lifter pin (FW) which raises the pick-up (AG), thus lifting the needle from the record. This motion also moves the hollow pick-up shaft (FX) upward, pressing together the locating plate (ES), the cork friction disc, (EV) and swing bracket (FY). While the needle is raised from the record, the swing bracket (FY) receives an angular or swinging motion from the cam gear (FK) to a lever and link assembly (EK) and carries with it the locating plate (ES) which is directly connected to the pick-up. The pick-up (AG) is thus carried out beyond the turntable while the changer plates (BC) drop a record, and is brought back to the position indicated by "on," Fig. 1. If there is no record resting on changer plates (BC) when the cycle starts, the pick-up arm (AG) will then remain out beyond the turntable and changer plates (BC) will automatically shutting off the motor after the last record has been played.

3. **MECHANISM FOR BRINGING NEEDLE INTO CORRECT STARTING POSITION ON THE RECORD.** This mechanism must operate fairly accurately for both 10-inch and 12-inch records. Partly due to this requirement, the starting position is not dete rmining, action, as this cam surface on the cam gear (FK) is so designed that the movement of the lever and link assembly (EK) would normally carry the pick-up arm (AG) farther toward the turntable shaft (BF) than would ever be desirable as a starting adjustment. Therefore, the travel of the pick-up arm (AG) toward the turntable shaft (BF) is pivoted on a hinge pin (DH) in the pulley (FG). This brings the upper end of center plate lifter lever (EB) toward the pulley hub. When the pulley is oscillated or driven by the tape (DD), the upper end of this lever (EB) will travel on the inside of the crescent shaped cam (EC). This will move the setting lever (EQ) in such a position that stop lever will contact the 12-inch eccentric adjusting stud on the locating plate which accurately measures the starting point of the needle on a 12-inch record. A 10-inch record which is about to be played will not rest on the center plate (BB), therefore the center plate and center pin (EA) and lever (DF) will be held upward by a spring (DI) on the pulley. The upper end of the center plate lifter lever (EB) will therefore be further away from the pulley hub and will travel on the outside of the crescent shaped cam (EC) moving the setting lever and stop lever (EQ) in such a position that stop lever will touch the 10-inch eccentric adjusting stud (ES) also on the locating plate which accurately measures the starting point of the needle on a 10-inch record. After the last record has been dropped from the changer plates and played, the lower changer plate (BC) is pushed upward by the no-record contact pin. The second lever (EF) is carried up so that when pulley is oscillated the no-record lever sweeps the setting lever and stop position (EQ) to the proper position for the record. Thus the recording mechanism engages with a heel on the locating lever (ES) and holds pick-up (AG) out beyond the turntable. Then when the pick-up (AG) descends, it depresses the pick-up rest (AH), thereby tripping switch (CC) and turning off the motor.

**RECORDING MECHANISM DESCRIPTION**

The recording unit which mounts on the main phono motor board by the hex nut (11) and the mounting screw (12), is shown in Fig. 4. This unit is not shown mounted in Figs. 1, 2 and 3 for purposes of clarity. This gear (10) of the recording unit enmeshes with the main drive pinion gear (CJ). This pinion gear drives the recording arm through a friction clutch drive principle. Since this gearing mechanism is in operation continuously while the turntable is operating, it is important to place the recording arm on its rest when not in use.
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SERVICE NOTES AND ADJUSTMENTS

Oiling

The recorder and record changer mechanism should be lubricated once a year with a few drops of good light machine oil at each of the following points:

1. Three oil holes in motor gear housing.
2. Turntable spindle bearings.
3. Recorder pivot arm spindle.
4. All other bearing points.

Caution: Never oil the friction clutch at any time as it may cause slippage. If squeaks are heard, compare the squeak with and without a load of records, as any stack of records in motion is apt to squeak with a pin through their centers.

This can be corrected by rubbing a little wax on the turntable shaft. See that all three 1/4-inch round wicks in the motor frame are in position and are thoroughly saturated with oil (as it may not be if insufficient oil or too heavy oil has been used). Lift out all three motor wicks with tweezers. See if old oil has become "gummy" (commonly due to use of low-grade oil or low viscosity oil). If necessary, clean the motor wicks with kerosene. See that each is saturated with a fine oil, then before replacing them, drop a little fine oil into the holes. The gear box of the motor is packed with a semi-fluid grease at the factory, and it should never be necessary to take it apart for lubrication purposes.

RECORD CHANGER AND RECORDING UNIT ADJUSTMENTS

Adjustments Nos. 1, 2, 3, 15 and 16 can be made from the top of the record player. All adjustments are correctly made at the factory and ordinarily need never be altered. However, should it become necessary to re-adjust due to tampering or accident, proceed as indicated in the following chart.

1

ADJUSTING LANDING POSITION OF NEEDLE ON RECORD

The position at which the needle lowers to the record can be adjusted by inserting a screw driver through hole (B1) just in back of tone arm. For adjusting the 10-inch set-down, insert screw driver into the inside eccentric adjusting stud. For adjusting the 12-inch set-down, insert screw driver into the outside slotted stud. Turn very slightly clockwise or counterclockwise to move needle landing in or out. The proper adjustment for the needle landing is 1/16 inch from the outer edge of the record.

2

ADJUSTING TRIP CAM FOR CORRECT CLEARANCE BETWEEN TRIP LEVER AND TRIP ARM

Insert screw driver through hole (B1) in main plate and locate it into slotted stud. Adjust eccentric cam so that the distance between the trip lever (BG) and trip arm (BH) is approximately .005 in. This can best be done byfirst adjusting the trip eccentric cam at (B1) so that there is no clearance or gap, then back off very slightly until trip lever (BG) is free to pulsate with the clutch motion or action of the release lever (ET). If the clearance is not sufficient between the trip lever (BG) and trip arm (BH) the pulsating motion of the clutch release lever (ET) will gradually cause the trip lever to move the trip arm enough to trip the trigger (AD) and start a change cycle. If gap is too great the trip lever will not move far enough to start a change cycle at the end of a record.

3

ADJUSTMENT FOR CHANGER PLATES

To adjust the distance between the selector plate (BA) and the shelf plate (BC) for 10-inch records, first select a 10-inch record that is approximately .070 in. thick. Then position it on changer and start a change cycle to revolve changer plates. Stop the turntable by hand just as the selector plate (BA) is about to touch the record, and shut off the motor. Then slowly turn the turntable by hand, allowing selector plates to contact edge of record so that it just slides over record, touching the surface lightly. Check all three selector plates and if any adjustment is necessary, it can be done by inserting a No. 10 Allen wrench in the setscrew holes located in the sides of the changer posts. Turn setscrew slightly clockwise to raise the selector plate and counterclockwise to lower it. The setscrew for adjusting the 10-inch record setting, and the one for 12-inch record setting is shown in the adjacent drawing. To adjust for 12-inch records, select a 12-inch record that is approximately .090 in. thick, then follow same procedure as for adjusting 10-inch records.

4

NO-RECORD SELECTING LEVER ADJUSTMENT

First be sure that spring tension on spring (D1) is strong enough to lift the center blade raising pin (EA) properly and fully, but not so strong that one 10-inch record will not fully depress pin and lever. Then with setscrew loose in no-record selecting lever (EP) and pin held down by weight of one 10-inch record, slide no-record selecting lever (EP) into position so that it will just clear under lower edge of the lower cam setting lever (EQ) by approximately 1/64 in. clearance. Then tighten setscrew and check adjustment with and without a record, also be sure that without a record, the fin on no-record selecting lever (EP) swings above cam setting lever (EQ) and portion of lever (EP), indicated by arrow, sweeps stop lever (EQ) on cam setting lever into position shown in upper illustration of adjustments 12 and 13.

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ADJUSTMENTS

5 LIFTER LEVER DIFFERENTIAL ADJUSTMENT

Place a 12-inch record over the turntable spindle so that the record rests on the shelf plates. Then check the center plate lifter lever (EB) and see that point of this lever will just slide inside of center arm lifter cam (EC). Then place a 10-inch record under the 12-inch record so that the 10-inch record will rest on shelf plate (BC) and the 12-inch record will then touch center plate (BB) which presses down center pin (EA) and accordingly moves lifter plate (EB) closer to outside face of lifter cam (EC) than it would without the 12-inch record on top of the 10-inch record. The lever (EB) should then follow the outside of the center arm lifter cam (EC). If it is necessary to realign this, it can be done by means of adjusting screw (CE) and lock nut (CF) to balance out the contact of lever (EB) on both sides of cam (EC) in relation to starting point of cam.

6 LIFTER LEVER CLEARANCE ADJUSTMENT

Check the distance between the leading edges of the center plate lifter lever (EB) and center arm lifter cam (EC) with a 12-inch record resting on the shelf plates. It should be a minimum of \( \frac{1}{4} \) in. It should not be necessary to check this adjustment unless the tape clamp screws on the pulley (FG) have been loosened. To re-adjust after screws have been loosened, first set pulley so that when the slack in the tape line is taken up in the direction of forward motion of the tape segment (CH), there will be the necessary \( \frac{1}{4} \) in. clearance as mentioned above.

Note: If this adjustment is "OFF" most likely changer plate synchronization will also be off. Check adjustment No. 7.

7 CHANGER PLATE SYNCHRONIZATION

The synchronization of changer plates can be checked by placing one 10-inch record on the shelf plates. Then start a cycle allowing it to continue until plates are just about ready to release the record. It can then be determined which plate is either slow or fast. This plate can then be adjusted by loosening the screws on the tape clamp which hold the tape (DD) from slipping in the pulley (FG). Then slightly move changer plate whatever is necessary to synchronize it with the other two plates so that record will drop evenly. Then tighten tape clamp screws securely. (Also check adjustment No. 6.)

Note: Tape line should have a very slight amount of slack. Check by grasping tape line with thumb and index finger and moving it in and out approximately \( \frac{1}{2} \) in. with a moderate pressure.

8 CLUTCH RELEASE LEVER ADJUSTMENT

The fork on clutch release lever (ET) should be adjusted so that it only slightly moves the friction clutch with a sharp kick rather than a wavy movement. To get more or less movement of the clutch, bend the release lever (as shown in upper illustration). Also be sure that both prongs of fork on release lever (ET) contact the pressure release sleeve (EU) simultaneously. At no time should fork ride the pressure release sleeve between impulses, as the clutch would then be held open and changer would not trip.

9 SETTING CAM ADJUSTMENT

By means of the adjusting screw (ER) set stop lever (EQ) so that there will be \( \frac{1}{2} \) in. maximum overlap on eccentric studs (ES). If there is not enough overlap, the stop lever (EQ) will slide off instead of holding on eccentric studs (ES) on stop lug, while measuring set-down of tone arm (AG).

10 SLIDE-IN ADJUSTMENT

To adjust the power of the tone arm lead-in, bend the lug on lead-in spring to give it more or less tension; too much tension may cause needle to slide in on record. The knurled nut (EL) adjusts the distance tone arm will swing in, before clutch is disengaged. If clutch is still engaged after needle lands on record it may cause slide-in. Turning nut (EL) clockwise should correct slide-in if lead-in spring tension is correct.

11 TONE ARM HEIGHT ADJUSTMENT

This can be adjusted by means of an adjusting screw in the tone arm assembly (AG). The tone arm elevating pin (FW) presses against which should be adjusted so that the distance between the point of needle (in tone arm) and the turntable is \( \frac{3}{4} \) in. to \( \frac{3}{4} \) in., which is the equivalent of approximately seventeen 10-inch records. When correct height adjustment is made, tighten lock nut on adjusting screw securely.

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**RECORD CHANGER AND RECORDING UNIT ADJUSTMENTS (Cont'd)**

### 12 TONE ARM SWING ADJUSTMENT
First raise tone arm (AG) by hand and slightly loosen clamp screw on tone arm shaft head. Then start a change cycle and shut off power supply to motor when tone arm (AG) is being held in stop position above the tone arm rest (AH). Then adjust lever (EQ) (on setting cam assembly) to contact stop lug on locator plate (which is part of the tone arm shaft assembly). Then insert a \( \frac{1}{4} \) in. shim between tone arm shaft head and bearing race to set vertical clearance which must be approximately \( \frac{1}{16} \) in. so that clutch will be engaged for moving tone arm (AG) flush with tone arm rest (AH) as shown in upper illustration. Tighten clamp screw securely and remove \( \frac{1}{4} \) in. shim, then check action of tone arm and adjust needle landing as in adjustment No. 1, if necessary.

### 13 RAISING LEVER PRESSURE ADJUSTMENT
To make this adjustment first put unit into change cycle, then stop it when roller (CD) is at the highest point on the cam (FK), then loosen lock nut and turn screw under flat lifter spring clockwise until tone arm elevating pin (PW) and shaft (FX) are completely raised and flat spring contacts the tone arm shaft (FX) holding clutch assembly firmly in the high position against tone arm swing bracket (PY) and only slightly deflecting the flat spring. Then tighten lock nut securely.

### 14 SWITCH SHUT-OFF ADJUSTMENT
Start a change cycle by pressing push button (AK) so that roller (FP) holds switch latch (FQ) in a loaded position. Then stop turntable by hand when cam gear is in position (shown in illustration) and pin on rest shaft sliding down, then turn adjusting lever (FQ) screws (in position shown) so that rest shaft (FM) comes down gradually and when switch latch (FQ) trips, hold rest shaft in that position and adjust screw (CB) to within approximately \( \frac{1}{4} \) in. from end of shaft (FM), tighten lock nut (CC) securely and check operation.

### 15 ADJUSTING DEPTH OF RECORDING NEEDLE CUT
The adjustment for cut of needle pressure is thumbscrew (3) shown in illustration. This adjustment regulates the spring tension of pressure spring (4) on cam (FJ) in a loaded position. Then turn adjusting lever (FQ) clockwise to increase pressure and counterclockwise to decrease pressure.

The correct setting is determined by inspecting a cut record under a magnifying glass. The width of the groove should be approximately the same as the width of the uncut record surface between the grooves.

### 16 ADJUSTING HEIGHT OF RECORDING ARM
The adjusting height screw (1) and lock nut (2) are for adjusting the height of the recording arm above the turntable. The height of the tip of the needle is approximately \( \frac{3}{8} \) in. from the record surface when the cartridge (5) is held by the screw (7) in the "UP" position. If it is necessary to adjust the height of arm to provide a final adjustment of the cutting needle pressure, loosen lock nut (2) and with screw driver, turn adjusting screw (1) counterclockwise to raise the arm or clockwise to lower the arm. Then tighten the lock nut.

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**TROUBLE SHOOTING**

Cases of failure to operate satisfactorily will generally be found due to either neglect of proper lubrication, to tampering with the mechanism after it leaves the factory, or to injuries accidentally sustained as by external vibration or by impact of some heavy object. In addition, there is always the possibility that any kind of spring may "go dead" (cease to operate without any visible breakage), even though the utmost factory precautions are taken against it—or that setscrews may work loose due to external vibration. For tightening setscrews, an Allen (hexagon) wrench is required. Be sure that setscrews are properly seated on the holes or flats provided. Damage from tampering is likely to take the form of bent parts. Never bend any part during examination.

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## REPLACEMENT PARTS LIST—MODEL JM-1C RECORD PLAYER AND RECORDER

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<th>Symbol</th>
<th>Stock No.</th>
<th>Description</th>
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<tr>
<td>AD</td>
<td>RL-967</td>
<td>LATCH—Cam latch and trigger assembly</td>
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<td>AH</td>
<td>RR-854</td>
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<td>KNOB—Manual-automatic selector knob</td>
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**REPLACEMENT PARTS LIST—MODEL JM-1C RECORD PLAYER AND RECORDER (Cont'd)**

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<td>FH</td>
<td>RG-308</td>
<td>GROMMET—Motor plate mounting grommet</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FI</td>
<td>RP-2013</td>
<td>PLATE—Motor mounting plate</td>
<td>.90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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# General Electric Co.
## Trouble Shooting Reference Chart

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Check</th>
</tr>
</thead>
</table>
| 1. Mechanism is slow in starting, or motor overheats | a. Lubrication  
   b. For too high or low line voltage  
   c. For motor winding damage |
| 2. Motor is slow starting | a. Lubrication. Old or gummy oil  
   b. Changer may be in too cold place. Give chance to warm before trying other checks |
| 3. Changer is noisy when in cycle | a. Lubrication. Check if any part is loose or bent and is rubbing against moving part |
| 4. Changer fails to trip after playing record while set on "A" automatic | a. Adjustments Nos. 2, 8  
   b. Switch assembly (FL) for obstruction or a bent or loose part |
| 5. Changer fails to trip when push button is pressed (pointer set on "A") | a. Adjustment No. 2  
   b. For not enough clutch action. Bend forked release lever (ET) slightly to increase |
| 6. Trips too soon or before record has finished playing | a. Adjustment No. 2  
   b. For proper operation cam latch and trigger assembly (AD) |
| 7. Tone arm lifts immediately without playing record or continues cycling | a. Adjustment No. 13  
   b. For too much clearance between cork clutch disc and tone arm switch bracket (FY). Adjust by means of the thumb nut (EL), turn counterclockwise |
| 8. Tone arm lifts but does not swing out properly | a. Adjustments Nos. 1, 12  
   b. For too much warpage of motor mounting plate (FI)  
   c. For too much warpage or warpage in motor shaft (FX) |
| 9. Tone arm falls off record or misses record completely | a. Adjustment No. 13  
   b. For proper operation cam latch and trigger assembly (AD) |
| 10. Tone arm slides in several grooves on record | a. Adjustments Nos. 9, 10  
   b. For loose or bent parts |
| 11. Tone arm fails to pull in first groove on record properly | a. Adjustment No. 9  
   b. For loose or bent parts |
| 12. Tone arm lands too far in or out on record | a. Adjustments Nos. 9, 10  
   b. For loose or bent parts |
| 13. Tone arm lands in middle of record | a. Adjustments Nos. 5, 6  
   b. For loose or bent parts |
| 14. Tone arm fails to clear stack of sixteen 10-inch records | a. Adjustments Nos. 5, 6  
   b. For loose or bent parts |
| 15. Tone arm lands for 10-inch record when playing a 12-inch record | a. Adjustments Nos. 5, 6  
   b. For loose or bent parts |
| 16. Changer cycles with pointer set on "M" for manual operation | a. Adjustments Nos. 5, 6  
   b. For loose or bent parts |
| 17. Changer jams and stops | a. For off-size record or defective edge  
   b. Adjustment No. 3  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI)  
   e. For motor shaft out of alignment with turntable shaft |
| 18. Record jams | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 19. 12-inch record is not dropped by one of shelves | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 20. One or more shelves drop 2 records at a time | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 21. Changer fails to turn off automatically after last record is played | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 22. Records drop unevenly from shelf plates to turntable | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 23. Tone arm varies when set down on record | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 24. "WOW" in record reproduction | a. Adjustments Nos. 4, 9, 14  
   b. For loose or bent parts  
   c. For warped or defective records  
   d. For bent motor mounting plate (FI) |
| 25. Record is driven but not heard or not heard with proper volume | a. That pickup cord is plugged in  
   b. Amplifier and speaker connections  
   c. For open pickup crystal  
   d. For dust particles or grease on silencing switch contacts  
   e. This switch is mounted on the power switch assembly (FL)  
   f. For dust particles or grease on silencing switch contacts  
   g. This switch is mounted on the power switch assembly (FL) |
| 26. Noisy or intermittent noise from speaker during change cycle | a. That pickup cord is plugged in  
   b. Amplifier and speaker connections  
   c. For open pickup crystal  
   d. For dust particles or grease on silencing switch contacts  
   e. This switch is mounted on the power switch assembly (FL)  
   f. For dust particles or grease on silencing switch contacts  
   g. This switch is mounted on the power switch assembly (FL) |
Fig. 1. Schematic Diagram Models X-105A and X-105V

Fig. 2. Schematic Diagram Model X-105VB
### ALIGNMENT PROCEDURE

#### ALL MODELS

The alignment procedure, shown in table form, is made with the chassis removed from the cabinet.

Since the dial scale is not a part of the main chassis, it is necessary to use the special alignment scale glued to the back side of dial scale reflector plate. Use can then be made of the rear pointer guide as the tuning reference pointer. Before making the alignment, close the condenser plates completely. Then viewed from the rear, the pointer should be slid along the cord until the left hand edge of the pointer slide corresponds to the first mark on the right side of the rear scale. After making the alignment on this basis, it may be found after reassembly in the gang that closed position of the pointer does not correspond to the first mark on the dial. If this is the case, slide the pointer on the drive cord until it is directly behind the first mark on the dial. This will make the calibration correct without further alignment.

Output meter alignment is preferable and the meter may be connected across the audio coil leads, t.e., turn volume control partially up. Keep the signal input as low as possible to avoid AVC action.

The special band on the Model X-105VB does not require alignment.

### ALIGNMENT CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>Test- Osc. Connect to</th>
<th>Tuning Frequency</th>
<th>Pointer Setting</th>
<th>Tube Trimmer for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12SK7 IF Grid</td>
<td>420 KC</td>
<td>Standard Band 550 KC</td>
<td>CS-A, CS-B</td>
</tr>
<tr>
<td>2</td>
<td>12SA7 Grid in Series with .05 mfd.</td>
<td>450 KC</td>
<td>Standard Band 550 KC</td>
<td>CS-A, CS-B</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>18.0 MC</td>
<td>Short-wave Band 18.0 MC</td>
<td>C12, C13 (C2B Osc.) (C2A Ant.)</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>580 KC</td>
<td>Standard Band 580 KC</td>
<td>C12, C13, C14</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>1500 KC</td>
<td>Standard Band 1500 KC</td>
<td>C12, C13, C14</td>
</tr>
</tbody>
</table>

* Use minimum capacity peak.

** Rock gauge condenser for optimum peak.
SUPPLEMENTARY TECHNICAL INFORMATION

MANUAL TUNING ASSEMBLY

Lock-in Dial Drive

This assembly is added to late production receivers to facilitate easier tuning, particularly on the short-wave band. On early production receivers, in which a direct pressure drive was used, this drive may be installed, in most cases without removing the chassis from the cabinet. Fig. 1 shows the parts used in making up this assembly.

Fig. 1. Lock-in Dial Drive Assembly


When it is desired to add this assembly to an early receiver, it will be found helpful if the following steps are observed:

A—Remove Pt. 12 and original drive shaft (1).
B—Assemble parts shown, Fig. 1—Grease Pt. (4) and shaft where it passes through bushing and spring cotter.
C—Assemble short end cotter for clearance of wire welded to bracket.
D—Finger tighten nut (10) placing spring mounting lug (6) in vertical position.
E—Connect original spring between drive assembly (12) and new spring mounting lug (6).
F—Bend post (8) if necessary to allow approximately 3/4-inch clearance, between rubber drive and part (12)—Bend in direction of arrow to increase clearance.
G—Reassemble part (12) and end supporting bracket.
H—Solder nut (10) to screw (5) to prevent nut coming off after assembly or apply cement (Glyptol or equivalent) for same purpose. DO NOT TIGHTEN NUT (10) WITH A WRENCH. TIGHTEN ONLY LIGHTLY WITH FINGERS.

To engage the tuning control for manual tuning, press inward firmly while rotating the control counterclockwise, then clockwise until the holding clip releases which will be evidenced by a slight "click." The tuning control will now remain engaged and need merely be rotated in either direction until the desired station is tuned in.

To use the Touch Tuning keys the control is disengaged by pulling out on it until a "click" is heard signifying that the spring cotter has engaged. The Touch Tuning keys may now be used in the usual manner.

ELECTRICAL CIRCUIT CHANGES

The 8211-0011 resistor, R5, connected between terminal 7 on band change switch wiper 82 and junction of R20 and R31, has been removed.

Band change switch wiper 54 has been replaced by an entirely new wiper. Contact 6, on this wiper, is connected to the screen of the 6S57 1st limiter tube, instead of being grounded as originally shown. This serves the purpose of shorting out the screen during all FM reception. Contact 7 has been grounded instead of being connected to the 2nd 6S57 cathode. Contact 8 has been added and is connected to the 2nd 6S57 cathode.

If replacement of the switch is necessary, it is recommended that the changer indicated be made at the same time. Should it be found desirable to make these changes without replacing the entire switch assembly, a new wiper 54 may be ordered. (See parts list.)

Tubular capacitor C14 may be changed from 0.014 µfd. to 0.003 µfd. and capacitor C54 may be changed from 47 µfd. min. to 60 µfd. paper.

ALIGNMENT DATA

In Table III of the original service notes, it was indicated in step 6, that the input signal be fed directly to the "FM" antenna post. It is recommended that this be changed and that the signal generator be capacitively coupled to the built-in dipole. This is accomplished by connecting a lead to the output "high" part of the signal generator and tuning it near the built-in dipole. Trimmer CI should then be tuned for maximum output.

An "FM* broadcast station may be used for this adjustment providing its frequency is near 46 MC (not over 47 MC and not under 45 MC) and provided its signal input is so low that the limiter circuit remains inoperative.

Note: The squelch circuit must be inoperative while these adjustments are being made.
2. THE RESISTOR R123 IS CHANGED FROM 3900 TO 4700 OHMS.
4. A RESISTOR OF 220,000 OHMS IS CONNECTED BETWEEN THE JUNCTION OF R145 AND R146 AND GROUND.
5. A RESISTOR OF 330 OHMS IS INSERTED IN THE CONTROL GRID LEAD OF THE PICTURE TUBE.

REvised TELEVISION Alignment Procedure

The problem of aligning the several circuits in a television receiver is much more involved and requires more specialized equipment than the alignment of conventional radio receivers. Fortunately, the use of stable components in carefully engineered circuits of wide-band characteristic reduces to a minimum the necessity for alignment under normal operating conditions. Should alignment become necessary, the following equipment will be needed:

(A) For Video I.F. Alignment
   (1) Cathode ray oscilloscope.
   (2) Wide-band sweep oscillator capable of sweeping from 7.5 to 15 MC.
   (3) Marker system either provided in sweep oscillator or from separate signal generator for locating 12.75 and 10.75 MC points.

(B) Sound I.F. Alignment
   (1) Cathode ray oscilloscope.
   (2) Wide-band sweep oscillator capable of sweeping from 7.75 to 8.75 MC.
   (3) Marker system either provided in sweep oscillator or from separate signal generator for locating 8.15 and 8.35 MC points.

(C) R.F. Alignment
   (1) Cathode ray oscilloscope
   (2) Wide-band sweep oscillator capable of sweeping the following bands:
      (a) 50 to 56 MC
      (b) 60 to 66 MC
      (c) 66 to 72 MC
      (d) 78 to 84 MC

*Those receivers which were aligned at the factory for Band No. 4 must use this of sweep frequency.

---

### VIDEO I.F. ALIGNMENT

<table>
<thead>
<tr>
<th>Input Freq.</th>
<th>Point of Input</th>
<th>Adjustments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connect output tap of video I.F. sweep oscillator to control grid of 6A87 (2nd video I.F.). Connect ground lead to chassis. Turn contrast control (R-108) to about half of maximum or to a point which gives satisfactory vertical deflection without overloading. Set horizontal centering and gain controls on oscilloscope to give suitable horizontal deflection. Adjust sweep phase to give curve similar to Fig. 7, curve 1.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** If sweep oscillator has marker points internally supplied, steps 3 and 4 may be omitted.

<table>
<thead>
<tr>
<th>Signal Input</th>
<th>Point of Input</th>
<th>Adjustments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Same as in No. 2 plus 12.75 MC</td>
<td>Same as in No. 2</td>
<td>Superimpose an accurately calibrated 12.75 MC signal in parallel with sweep signal. Signal will appear on sweep curve in oscilloscope as a wiggle, the center of which is a thin black line. With a pen or crayon mark this point on the screen of the oscilloscope. (Note: Hereafter the horizontal controls on the oscilloscope must not be touched.)</td>
<td></td>
</tr>
<tr>
<td>4. Same as in No. 2 plus 10.75 MC</td>
<td>Same as in No. 2</td>
<td>Superimpose an accurately calibrated 10.75 MC signal in parallel with sweep signal. Mark screen at point where signal appears on curve as in No. 3 above.</td>
<td></td>
</tr>
<tr>
<td>5. 7.5-15 MC Sweep</td>
<td>Control grid 6A87 (4th video IF)</td>
<td>Iron cores of detector transformer T-6</td>
<td>Do not touch horizontal controls of oscilloscope. Adjust iron cores of T-6 until curve appears similar to Fig. 7, curve 1, with relatively flat top, 12.75 MC mark at corner of one side and 10.75 MC mark at corner of other side. These conditions plus maximum amplitude insure correct alignment.</td>
</tr>
<tr>
<td>6. 7.5-15 MC Sweep</td>
<td>Control grid 6A87-3rd video IF</td>
<td>Iron cores of 4th video transformer T-5</td>
<td>Adjust iron cores for maximum gain, flatness and proper centering between markers as described in step No. 5 and illustrated in Fig. 7, curve 1.</td>
</tr>
<tr>
<td>7. 7.5-15 MC Sweep</td>
<td>Control grid 6A87 (2nd video IF)</td>
<td>Iron cores of 3rd video transformer T-4</td>
<td>Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 7, curve 1.</td>
</tr>
<tr>
<td>8. 7.5-15 MC Sweep</td>
<td>Converter grid, 6F8G</td>
<td>Iron cores of 2nd video transformer T-3 &amp; 1st video transformer T-2</td>
<td>Connect low tap to grid (on top of tube). Adjust primary and secondary iron cores for maximum gain, flatness and proper centering. See Fig. 7, curve 1.</td>
</tr>
<tr>
<td>9. 14.25 MC</td>
<td>Converter grid, 6F8G</td>
<td>Connect low tap to grid. Reduce horizontal gain to minimum. Adjust iron core for minimum line length.</td>
<td></td>
</tr>
</tbody>
</table>
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REVISED TELEVISION ALIGNMENT PROCEDURE CONT.

AUDIO I.F. ALIGNMENT

Note: In order to obtain frequency modulation detection in the sound channel with good fidelity, the audio I.F. amplifiers must be aligned to give a satisfactory selectivity curve for slope detection. For this reason a sweep generator and oscilloscope are necessary to obtain the resultant curve shown in Fig. 7, curve 3.

<table>
<thead>
<tr>
<th>Signal Input</th>
<th>Point of Input</th>
<th>Adjustments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 8.25 MC with 30% tone modulation</td>
<td>6F8G converter grid</td>
<td>Tune all audio I.F. iron cores</td>
<td>Use an oscilloscope or high resistance voltmeter across audio output terminals of HM171 or volume control, R126, of the Model HM185. Set tone control for maximum high frequency response. Peak all trimmers for a maximum output.</td>
</tr>
<tr>
<td>2. 7.75 to 8.75 MC sweep</td>
<td>Grid of 2nd audio I.F., 6SK7</td>
<td>Connect oscilloscope input to chassis ground and junction of resistors (R204 and R125 in HM-171) (R125 and R196 in HM185) at diode load. Superimpose an accurately calibrated 8.15 MC signal in parallel with sweep signal. This signal will appear on sweep curve in oscilloscope as a wiggle at the center of which a mark should be made with pen or crayon on oscilloscope screen. (Hereafter the horizontal controls on the oscilloscope must not be adjusted.) Next an 8.35 MC signal mark should similarly be made.</td>
<td></td>
</tr>
<tr>
<td>3. 7.75 to 8.75 MC sweep</td>
<td>Converter grid 6F8G</td>
<td>Adjust iron cores of 1st audio I.F. coil L12 and the 2nd audio I.F. transformer T-9</td>
<td>With oscilloscope connected as in step 2, adjust cores until curve appears as in Fig. 7, curve 3 being sure that the steep side of curve lies between the 8.15 and 8.35 MC markers as indicated. NOTE: The shape of the curve between 8.15 and 8.35 MC must be straight, otherwise distortion will result in FM reception.</td>
</tr>
</tbody>
</table>

NOTE: If sweep oscillator has marker points internally supplied, omit step 2.

<table>
<thead>
<tr>
<th>Signal Input</th>
<th>Point of Input</th>
<th>Adjustments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 50 to 56 MC Sweep</td>
<td>Antenna terminals</td>
<td>Band width adjustment coupling condenser</td>
<td>Turn C-78 in until tight, then open approximately 1/16 of a turn.</td>
</tr>
<tr>
<td>2. 60 to 66 MC Sweep</td>
<td>Antenna terminals</td>
<td>(L9), (C71), (C68)</td>
<td>Connect oscilloscope to junction R124 and C25; open circuit R178, short R102 to ground. Depress No. 1 push button. Set tuning control to mid-rotation. Adjust L-8 until curve is centered between maximum horizontal sweep points. Adjust C-70 and C-67 for maximum amplitude. See Fig. 7, curve 2.</td>
</tr>
<tr>
<td>3. 66 to 72 MC Sweep*</td>
<td>Antenna terminals</td>
<td>(L10), (C72), (C69)</td>
<td>Depress No. 3 push button. Adjust L-10 for centering; C-69 for maximum amplitude. See Fig. 7, curve 2.</td>
</tr>
<tr>
<td>4. Calibrated signal generator 65.75 MC, 65.75 MC, 71.75 MC** with 30% tone modulation</td>
<td>Antenna terminals</td>
<td>(L8), (L9), (L10)</td>
<td>To align oscillator for various bands, set tuning control (C-3) at mid-rotation; then set brass slugs of coils L8, L9, L10 until maximum audio tone is heard.</td>
</tr>
</tbody>
</table>

Fig. 7. Television Alignment Curves

Television Alignment Procedure

R.F. Alignment

<table>
<thead>
<tr>
<th>Signal Input</th>
<th>Point of Input</th>
<th>Adjustments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 11.75 MC with 400 cycle modulation</td>
<td>Antenna terminals</td>
<td>Wave trap trimer, C-90</td>
<td>Adjust for minimum signal response as seen on oscilloscope after connections made in Step 2 are re-established; then connect oscilloscope across R182.</td>
</tr>
</tbody>
</table>

Other service data same as in early model.

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MODEL X-225A

Service Data for Both Models

Power Supply

Model X-225A transformer has two primary voltage taps which allow operation at the voltages shown on the label. This receiver is connected at the factory to operate on the 120-volt tap (black and red). In localities where the line voltage does not exceed 120 volts, the transformer may be connected to use the 120-volt tap (black and yellow).

The Model X-225V is designed for use with the 220-volt ballast resistor RR-797 so that it may be operated from either an AC or DC power supply. However, this receiver can be converted to operate on the following line voltages as follows:

150-volt AC/DC (range 135-165 volts)

Remove ballast tube RR-797 from socket and substitute ballast tube resistor RR-799.

110-volt DC (range 100-120 volts)

Remove ballast tube RR-797 from socket and substitute ballast tube resistor RR-798.

When operated with these special ballast resistors and lower power supplies than 220 volts, the audio power output and socket voltages will be reduced.

Alignment Procedure

The alignment procedure, shown in table form, is made with the chassis removed from the cabinet.

Since the dial scale is not a part of the main chassis, it is necessary to use the special alignment scale glued to the back side of dial scale reflector plate. Use can then be made of the rear pointer guide as the tuning reference pointer. Before making the alignment, close the condenser plates completely. Then viewed from the rear, the pointer should be slid along the cord until the left-hand edge of the pointer slide corresponds to the first mark on the right side of the rear scale. After making the alignment on this basis, it may be found after reassembly in the cabinet that the gang closed position of the pointer does not correspond to the first mark on the dial. If this is the case, slide the pointer on the drive cord until it is directly behind the first mark on the dial. This will make the calibration correct without further alignment.

Output meter alignment is preferable and the meter may be connected across the voice coil leads, then turn volume control partially up. Keep the signal input as low as possible to avoid AVC action.

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 Converter Grid at:
      1000 KC ........................................ 7.6
      3000 KC ....................................... 2.4
      18000 KC ..................................... 2.7
   (b) IF on Converter Grid to 1F on 12SK7 Grids:
      455 KC .......................................... 87
   (c) IF Amplifier Grid to Diode Grids:
      455 KC .......................................... 66

2. Voltage across the diode load to give 1/2-volt speaker output at 400 cycles—0.6 volts

3. DC voltage developed across oscillator grid resistor (R1) at:
   1000 KC ......................................... 6.8 volts
   3000 KC ......................................... 6.0 volts
   18000 KC ....................................... 8.0 volts

Alignment Chart

<table>
<thead>
<tr>
<th>Step</th>
<th>Test—Osc. Contact to</th>
<th>Osc. Output Frequency</th>
<th>Pointer Setting</th>
<th>Tube Trimmer for Max. Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12SK7 IF Grid in Series with 85 mfd.</td>
<td>455 KC</td>
<td>Standard Band 500 KC</td>
<td>C5A C5B</td>
</tr>
<tr>
<td>2</td>
<td>12SK7 Grid in Series with 85 mfd.</td>
<td>455 KC</td>
<td>Standard Band 500 KC</td>
<td>C4A C4B</td>
</tr>
<tr>
<td>3</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>18.0 MC</td>
<td>Short-wave Band 18.0 MC</td>
<td>(C2B) Osc. (C2A) Ant. **</td>
</tr>
<tr>
<td>4</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>580 KC</td>
<td>Standard Band 500 KC</td>
<td>C13*</td>
</tr>
<tr>
<td>5</td>
<td>Ant. Post in Series with 200 mfd. and 400 ohms</td>
<td>1500 KC</td>
<td>Standard Band 500 KC</td>
<td>C14**</td>
</tr>
</tbody>
</table>

*The minimum capacity peak.
**Rock gang condenser for optimum peak.
Fig. 3 Socket Voltages

Variations of ±20% permissible. All measurements taken with R-26 shorted across.

VOLTAGES INDICATED BY ASTERISK (*) ARE AC VOLTAGES.
VOLTAGES READ WITH 1000 OHMS/VOLT METER ON 250-VOLT SCALE
**MODEL X-226**

**BAND CHANGE SWITCHING**

The following charts show the switch points connected for any one position of the switch. The numbers shown in each box indicate the switch points connected together in the section of the switch for each position of the switch. As for example: the numbers 5-6-10 indicate these switch points are all connected together for this particular position of the switch.

<table>
<thead>
<tr>
<th>Switch Point 1</th>
<th>Switch Point 2</th>
<th>Switch Point 3</th>
<th>Switch Point 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

**BAND SWITCH CONNECTIONS**

**MODEL X-226**

**CONVERSION FOR SPECIAL LINE VOLTAGE**

The Model X-226 can be converted for operation on the following line voltages. In all cases, where the power transformer is replaced with a ballast resistor, the power transformer must be removed from the chassis as the ballast, start from the ballast resistor is likely to cause the transformer to burn out, when operated with these special resistors and power supplies. More than 220 volts, the radio power output and output voltages will be reduced.

<table>
<thead>
<tr>
<th>Voltage (Volts)</th>
<th>Model X-226 Conversion for Special Line Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>117 Volts AC</td>
<td>Change to X-226-160 for 117 Volts DC (Range 110-120 Volts)</td>
</tr>
<tr>
<td>220 Volts AC</td>
<td>Change to X-226-160 for 220 Volts DC (Range 200-240 Volts)</td>
</tr>
</tbody>
</table>

**MODEL X-228**

**PHONOGRAPh INSTALLATION**

1. Remove the lead from terminal 1 and 2, and replace it between terminals 2 and 3.
2. Connect the record player to terminals 1 and 3. If the record player does not have a high impedance pickup, a matching transformer may be required. This is very important that the high side pickup lead be shielded to prevent hum interference. The shield should be connected to terminal No. 1.
3. If operating the record player, there is appreciable hum interference, reverse the record player phonocord plug in the power supply outlet.

**TONE CONTROL SWITCH CONNECTIONS**

**MODEL X-228**

**CONVERSION FOR SPECIAL LINE VOLTAGE**

The Model X-228 can be converted for operation on the following line voltages. In all cases, where the power transformer is replaced with a ballast resistor, the power transformer must be removed from the chassis and the radiant heat from the ballast resistor is likely to damage the transformer. When operated with these special resistors and power supplies, more than 220 volts, the radio power output and output voltages will be reduced.

<table>
<thead>
<tr>
<th>Voltage (Volts)</th>
<th>Model X-228 Conversion for Special Line Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>117 Volts DC</td>
<td>Change to X-228-160 for 117 Volts DC (Range 110-120 Volts)</td>
</tr>
<tr>
<td>220 Volts DC</td>
<td>Change to X-228-160 for 220 Volts DC (Range 200-240 Volts)</td>
</tr>
</tbody>
</table>

**MODEL X-228**

**PHONOGRAPh INSTALLATION**

Connect the record player output leads to the terminals marked 1 and 2. The high side of the pickup is connected to terminal No. 1, while the low side or ground is connected to terminal No. 2. With some low impedance type of pickups, a matching transformer may have to be used. It is very important that the high side pickup lead be shielded to prevent hum interference. The shield should be connected to terminal No. 2.

If, in operating the record player, there is appreciable hum interference, reverse the motor power cord plug in the power supply outlet.

**MODEL X-228**

**GENERAL ELECTRIC CO.**

**C.E. PAGE 1443**
SERVICE NOTES

Intermediate Frequency .................................................. 455 K.C.
Tuning Frequency Range .................................................. 540-1720 K.C.
Audio, Power Output (Beam Power) ...................................... 2 Watts
P. M. Speaker .................................................................. Cone Diameter—3 3/4 inches
Voice Coil Impedance (400 cycles) ...................................... 3.5 Ohms

OPERATING VOLTAGES (Approximately)
(Measured with respect to chassis at 117 Volt Line)

<table>
<thead>
<tr>
<th>TUBES</th>
<th>SCREEN VOLTS*</th>
<th>PLATE VOLTS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>12SQ7</td>
<td>Detector—A.V.C.—1st Audio</td>
<td>—</td>
</tr>
<tr>
<td>50L6GT</td>
<td>Output</td>
<td>90</td>
</tr>
<tr>
<td>35Z5GT or 35Z4GT</td>
<td>Rectifier</td>
<td>Voltage at Anode 120</td>
</tr>
</tbody>
</table>

* 300 Volt Range of 1000 Ohm-per-Volt Meter

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal through a .05 Mfd. capacitor to lug on stator of gang condenser to which antenna coil is connected. Align the I. F. transformer trimmers, going over twice. Keep test oscillator output as low as a readable meter reading will permit.

R. F. Alignment

Stretch out antenna hank to its full length. Set the dial pointer and generator at 1500 K.C. Run a wire from the output terminal of the generator, having it come near the antenna wire on the receiver. However, no metallic connection is made between the signal generator and the receiver.

Peak the oscillator trimmer for maximum output and then the antenna trimmer.

If the variable condenser plates have become bent or damaged, it may be necessary to adjust them for tracking, at 600 K.C. The oscillator plates are adjusted first, then the antenna plates are adjusted for maximum output at 600 K.C.
These receivers are designed to operate with new longer life batteries of the following types:

- "A" battery - Eveready No. 45 or equivalent
- "B" batteries - two Eveready Ray-o-vac 452 or equivalent

These batteries fit easily into the compartment provided with the "A" battery on the bottom and the two "B" batteries resting on the "A" battery. Insert the battery plug firmly into their respective sockets.

Battery supplies of the following types may be used when the recommended batteries are not available:

- "A" supply - one General 4-70, or Eveready No. 42 or equivalent
- "B" supply - two General V-30-4A or Eveready No. 306 or equivalent

To replace the batteries: In the compartment beneath the chassis, if separate battery supplies are used, place the "A" battery on the right side and the two "B" batteries in the remaining space. Insert the battery plug firmly.

Alignment Frequencies: 1500 KC and 580 KC

**Note:** The chassis must be removed from the carrying case when aligning. Since the location of the back cover, loop, chassis and battery affect alignment considerably, the position of these components when adjusting should be used in the adjusting case. A non-metallic object should be used to hold the back cover during alignment.
ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. 455 K.C.
R.F. 1600 & 1400 K.C.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a 0.05 Mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

R.F. Alignment

Couple test oscillator output to loop in case cover. Adjust test oscillator and receiver dial to exactly 1600 K.C. Peak 1600 K.C. oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 K.C. Then while rocking gang condenser trim 1400 K.C. antenna trimmer for maximum output.
SERVICE NOTES
Tuning Control Drive Ratio.........................................................6:1
Battery Specifications............................................................Eveready No. 748 or equivalent
Intermediate Frequency.............................................................455 K.C.
Tuning Frequency Range........................................................540-1730 K.C.
Maximum Power Output..........................................................200 Milliwatts
Loud Speaker...........................................................................Cone Diameter—5 Inches
Voice Coil Impedance..............................................................(400 Cycles) 5 Ohms
Tubes: Converter-Oscillator 1A7GT, I.F. 1N5GT, Detector A.V.C. 1H5GT, Power Output 1A5G.

ALIGNMENT PROCEDURE
Alignment Frequencies I.F.:..................................................455 K.C.
R.F.:..........................................................1730 & 1400 K.C.
I.F. Alignment
Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 1A7GT tube through a .05 Mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Do not remove the grid leads from the tube when applying test oscillator signal—keep the test oscillator output as low as a readable meter reading will permit.

R.F. Alignment
Attach high side of test oscillator output to blue antenna receiver lead through a .00025 Mfd. condenser, and low side to black lead. Adjust test oscillator and receiver dial to exactly 1730 kilocycles. Peak 1730 kilocycle oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser trim 1400 kilocycle antenna trimmer for maximum output.
SERVICE NOTES

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning Control Drive Ratio</td>
<td>6:1</td>
</tr>
<tr>
<td>Battery Specification</td>
<td>1-1/2 Volt &quot;A&quot; Eveready No. 650 or Equivalent</td>
</tr>
<tr>
<td>Intermediate Frequency</td>
<td>455 K.C.</td>
</tr>
<tr>
<td>Tuning Frequency Range</td>
<td>450-1550 K.C.</td>
</tr>
<tr>
<td>Maximum Power Output</td>
<td>Battery-120 Milliwatts AC-DC 155 Milliwatts</td>
</tr>
<tr>
<td>Load Spee.d.</td>
<td>Cone Diameter-3 Inches</td>
</tr>
<tr>
<td>Voice Coil Impedance</td>
<td>(400 Cycles) 1.5 Ohms</td>
</tr>
</tbody>
</table>

ALIGNMENT PROCEDURE

Alignment Frequencies
- I.F.: 455 K.C.
- R.F.: 1550 & 1400 K.C.

I.F. Alignment
- Connect an output meter across the voice coil.
- Rotate the volume to maximum.
- Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a .06 Mfd. capacitor.
- Align the second I.F. transformer trimmers, next adjust the first I.F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

R.F. Alignment
- Couple test oscillator output to loop in case cover. Adjust test oscillator and receiver dial to exactly 1550 K.C. Peak 1550 K.C. oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 K.C. Then while rocking gang condenser trim 1400 K.C. antenna trimmer for maximum output.

NOTE:- Oscillator coil RL-2052EX and padder condenser RC-257EX replace part No. RL-2052E Oscillator coil and RC-257E mica .00024 Mfd. padder condenser which were used in first production. It is important to remember that the RL-2052E and RL-2052EX oscillator coils and the RC-257E .00024 Mfd. and RC-257EX .000275 Mfd. condensers cannot be interchanged. When RL-2052EX coil is used the .000275 Mfd. padder condenser RC-257EX must be used. With RL-2052E oscillator coil the .00024 Mfd. condenser RC-257E must be used.

Sets having part RL-2052EX oscillator coil and RC-257EX oscillator padder condenser can be identified by the letter "A" which will be found stamped on the back of the chassis.
GENERAL ELECTRIC CO.

VOLTAGE TABLE

ALIGNMENT PROCEDURE

Alignment Frequencies

I. F. 455 K.C............................................455 K.C.
R. F. 5.75-18.3 M. C. Band..................18.3 & 15 M.C.

1730-540 K.C. Band R.F. Alignment

Attach high side of test oscillator output to blue antenna receiver lead through a .00025 Mfd. condenser and low side to black lead. Adjust test oscillator and receiver dial to exactly 1730 kilocycles. Peak 1730 kilocycle oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser trim 1400 kilocycle antenna trimmer for maximum output.

Change test oscillator signal and receiver dial to 600 K.C. While rocking gang condenser trim 600 K.C. Osc. padder for maximum output.

5.75-18.3 M.C. Band R.F. Alignment

Change .00025 Mfd. condenser dummy load in series with blue antenna lead to 400 ohm carbon resistor.

Adjust test oscillator and receiver dial to exactly 18.3 M.C. Peak 18.3 M.C. oscillator trimmer for maximum output. Be sure to use proper peak. If more than one peak is noticed, back off trimmer to minimum capacity, then screw down trimmer (add capacity) until the second peak—which is the proper one—is tuned in. Then while rocking gang condenser adjust 15 M.C. antenna trimmer for maximum output.

I.F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 1A7GT tube through a .05 Mfd. capacitor.

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MODEL LB-530X

I-F PEAK 455 KC

POWER SELECTOR SWITCH
OPERATION

POSITION CONTACTS CONNECTED

"OFF" ALL CONTACTS OPEN

"BATTERY" #1 to #2; #4 to #5; #7 to #8

"AC" #1 to #3; #4 to #5; #8 to #9

"CHARGE" #5 to #3; #8 to #9

* #7 terminal is not connected to circuit

REPLACEMENT PARTS LIST—MODEL LB-530X

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-7054</td>
<td>C-1, 2</td>
<td>CONDENSER—Tuning condenser and trimmers</td>
</tr>
<tr>
<td>RC-216</td>
<td>C-7</td>
<td>CAPACITOR—07 mmf., mica</td>
</tr>
<tr>
<td>RC-245</td>
<td>C-9</td>
<td>CAPACITOR—160 mmf., mica</td>
</tr>
<tr>
<td>RC-072</td>
<td>C-10</td>
<td>CAPACITOR—05 Mfd., 200 V. paper</td>
</tr>
<tr>
<td>RC-079</td>
<td>C-12, 13</td>
<td>CAPACITOR—005 Mfd., 200 V. paper</td>
</tr>
<tr>
<td>RC-098</td>
<td>C-14</td>
<td>CAPACITOR—0.1 Mfd., 5000 V. paper</td>
</tr>
<tr>
<td>RC-072</td>
<td>C-15</td>
<td>CAPACITOR—0.1 Mfd., 200 V. paper</td>
</tr>
<tr>
<td>RC-072</td>
<td>C-16</td>
<td>CAPACITOR—005 Mfd., 100 V. paper</td>
</tr>
<tr>
<td>RC-027</td>
<td>C-17</td>
<td>CAPACITOR—0.001 Mfd., 500 V. paper</td>
</tr>
<tr>
<td>RC-235</td>
<td>C-18</td>
<td>CAPACITOR—0.1 Mfd., 50 V. paper</td>
</tr>
<tr>
<td>RC-156A</td>
<td>C-19, 20</td>
<td>CAPACITOR—0.1 Mfd., 120 V. paper</td>
</tr>
<tr>
<td>RC-51-98</td>
<td>C-21A, 21B</td>
<td>CAPACITOR—15 Mfd., 150 V. electrolytic</td>
</tr>
<tr>
<td>RC-156A</td>
<td>C-21C</td>
<td>CAPACITOR—1200 Mfd., 2 V. dry electrolytic</td>
</tr>
<tr>
<td>RC-042</td>
<td>C-22</td>
<td>CAPACITOR—0.05 Mfd., 100 V. paper</td>
</tr>
<tr>
<td>RC-159</td>
<td>R-1</td>
<td>VOLUME CONTROL—0.5 megohm volume control</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-2</td>
<td>RESISTOR—25,000 ohm, 1/4 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-3</td>
<td>RESISTOR—2500 ohm, 1/4 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-4</td>
<td>RESISTOR—250 ohm, 1/2 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-5</td>
<td>RESISTOR—25,000 ohm, 1/4 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-6</td>
<td>RESISTOR—2500 ohm, 1/2 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-7</td>
<td>RESISTOR—25,000 ohm, 1/4 W. carbon</td>
</tr>
<tr>
<td>RC-153</td>
<td>R-8</td>
<td>RESISTOR—250 ohm, 1/2 W. carbon</td>
</tr>
</tbody>
</table>

Fig. 1. Schematic Diagram

Fig. 3. Trimmer Location

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Socket Voltages

Fig. 2.
ALIGNMENT PROCEDURE

I.F. Alignment

Connect an output meter across the voice coil. Turn 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 1A7GT converter grid through 05 Mfd. capacitor and align progressively the trimmers in the 2nd and 1st I.F. transformer cans.

R.F. Alignment

With loop swung upright to its normal operating position, adjust the signal generator to 1750 Kc and loosely couple a wire from the output terminal of the signal generator so that the receiver loop will pick up the signal. Set the gang condenser to minimum capacity and adjust the oscillator trimmer (C2A) to receive the signal. After this has been done, set the signal generator to 1500 Kc and tune the receiver until this signal is tuned in. Adjust the R.F. trimmer (1A) for maximum output. In case of bent plates in the condenser, the signal generator and the receiver to 600 Kc and bend plates into the position for maximum output.

MODELS L-540, L-541, L-542, L-543, L-542M, L-543M, L-580

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MODELS L-540, L-541, L-542, L-543, L-542M, L-543M, L-580</strong></td>
</tr>
</tbody>
</table>

**Tuning Control Drive Ratio**

7:1

**SPECS**

**Physical Dimensions**

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>7&quot;</td>
<td>9½&quot;</td>
<td>5½&quot;</td>
</tr>
</tbody>
</table>

**Intermediate Frequency**

455 Kc

**Maximum Power Output**

1.5 watts

**Tubes**

Converter and oscillator: GE-12SA7 or GT
IF Amplifier: GE-12SK7 or GT
Detector, A.V. Audio: GE-12SQ7 or GT
Power output: GE-151LGT
Rectifier: GE-12ZGT
Dial Lamp: Mazda No. 47

**Alignment Frequencies**

IF: 455 Kc
RF: 1500 Kc

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

**ALIGNMENT PROCEDURE**

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 by means of a standard loop antenna. Align the oscillator trimmer (C-7) to bring in the signal and peak the signal by adjusting the antenna trimmer (C-5).
I-F PEAK 455 KC

Note:
1. For 50-60 cycle receivers connect X to Y and short out R11. For 25 cycle receivers connect X to Z and include R11, as shown in schematic.
2. Models L-540, L-542 and L-542 M have B minus grounded to chassis, and R1 and C2, and using a jumper in place of C1. Models L-541, L-543, L-543 M and L-580 have a separately wired B minus system which is not wired to the chassis except through R1 and C2.

REPLACEMENT PARTS LIST

Models L-540, L-541, L-542, L-543, L-542 M, L-543 M, L-580

<table>
<thead>
<tr>
<th>Stock Number</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC-672</td>
<td>C-1</td>
<td>CAPACITOR—05 mfd. 200-V paper</td>
</tr>
<tr>
<td>RC-393</td>
<td>C-2</td>
<td>CAPACITOR—02 mfd. 400-V paper</td>
</tr>
<tr>
<td>RC-293</td>
<td>C-3</td>
<td>CAPACITOR—10 mfstitica</td>
</tr>
<tr>
<td>RC-2009</td>
<td>C-6a</td>
<td>CONDENSER—Tuning condenser (includes trimmers C-5, C-7)</td>
</tr>
<tr>
<td>RC-274</td>
<td>C-8</td>
<td>CAPACITOR—05 mfd. 200-V paper</td>
</tr>
<tr>
<td>RC-274</td>
<td>C-14</td>
<td>CAPACITOR—330 mfd. mica</td>
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<tr>
<td>RC-274</td>
<td>C-15</td>
<td>CAPACITOR—005 mfd. 600-V paper</td>
</tr>
<tr>
<td>RC-274</td>
<td>C-16</td>
<td>CAPACITOR—330 mfd. mica</td>
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<tr>
<td>RC-274</td>
<td>C-17</td>
<td>CAPACITOR—01 mfd. 600-V paper</td>
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<td>RC-274</td>
<td>C-18</td>
<td>CAPACITOR—02 mfd. 600-V paper</td>
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<tr>
<td>RC-3003</td>
<td>C-19a</td>
<td>CAPACITOR—20 mfd. 150-V dry electrolytic</td>
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<tr>
<td>RC-3039</td>
<td>C-20</td>
<td>CAPACITOR—01 mfd. 500-V paper</td>
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<tr>
<td>RC-292</td>
<td>C-26</td>
<td>CAPACITOR—05 mfd. 500-V paper</td>
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<tr>
<td>RC-1919</td>
<td>R-1</td>
<td>RESISTOR—330,000 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1919</td>
<td>R-2</td>
<td>RESISTOR—22,000 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1919</td>
<td>R-3</td>
<td>RESISTOR—22,000 ohms, 1/4-W carbon</td>
</tr>
<tr>
<td>RV-105</td>
<td>R-4</td>
<td>VOL. CONTROL—0.5 megohm V-plume Control and power switch</td>
</tr>
<tr>
<td>RC-1911</td>
<td>R-5</td>
<td>RESISTOR—4.7 megohms, 1/4-W carbon</td>
</tr>
<tr>
<td>RC-1911</td>
<td>R-6</td>
<td>RESISTOR—190,000 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1911</td>
<td>R-7</td>
<td>RESISTOR—470,000 ohms, 1/4-W carbon</td>
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<td>RC-1911</td>
<td>R-8</td>
<td>RESISTOR—150,000 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1911</td>
<td>R-9</td>
<td>RESISTOR—680 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1911</td>
<td>R-10</td>
<td>RESISTOR—12 ohms, 1/4-W carbon</td>
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<td>RC-1911</td>
<td>R-11</td>
<td>RESISTOR—15 ohms, 1/4-W carbon</td>
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<tr>
<td>RC-1365</td>
<td>R-12</td>
<td>RESISTOR—15 ohms, 1/4-W carbon</td>
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<tr>
<td>RT-3015</td>
<td>L-1</td>
<td>TRANSFORMER—141, F. Transformer</td>
</tr>
<tr>
<td>RT-376</td>
<td>L-10</td>
<td>TRANSFORMER—Output speaker transformer</td>
</tr>
<tr>
<td>RL-304</td>
<td>L-3</td>
<td>BEAM-A-SCOPE—Loop antenna assembly</td>
</tr>
<tr>
<td>RL-2008</td>
<td>L-4</td>
<td>COIL—Oscillator coil</td>
</tr>
<tr>
<td>RS-1009</td>
<td>SPKR</td>
<td>SPEAKER—4 in. PM Speaker with transformer</td>
</tr>
<tr>
<td>RT-4004</td>
<td>T1</td>
<td>TRANSFORMER—Output speaker transformer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB-023</td>
<td>BOARD—4 lug terminal board</td>
</tr>
<tr>
<td>RB-023</td>
<td>BACK COVER—Cabinet back cover (Model L-540)</td>
</tr>
<tr>
<td>RB-093</td>
<td>BACK COVER—Cabinet back cover (Models L-541, L-542, L-542 M, L-543, L-543 M)</td>
</tr>
<tr>
<td>RB-128</td>
<td>BRACKET—Dia lamp bracket assembly</td>
</tr>
<tr>
<td>RC-134</td>
<td>CORD—Power cord</td>
</tr>
<tr>
<td>RC-203</td>
<td>FASTENER—Back cover fastener (Model L-540)</td>
</tr>
<tr>
<td>RC-203</td>
<td>FASTENER—Back cover fastener (Models L-541, L-542, L-542 M, L-543, L-543 M)</td>
</tr>
<tr>
<td>RC-206</td>
<td>FASTENER—Window fasteners</td>
</tr>
<tr>
<td>RC-125</td>
<td>HANDLE—Blue cabinet handle (Model L-543)</td>
</tr>
<tr>
<td>RC-168</td>
<td>NUT—Control mounting nut (Model L-541)</td>
</tr>
<tr>
<td>RTX-1003</td>
<td>NUT—Control mounting nut (Model L-543)</td>
</tr>
<tr>
<td>RS-705</td>
<td>SOCKET—Detail tube socket</td>
</tr>
<tr>
<td>RS-705</td>
<td>SOCKET—Dia lamp socket assembly</td>
</tr>
<tr>
<td>RS-465</td>
<td>SPRING—Knob spring</td>
</tr>
<tr>
<td>RS-705</td>
<td>SPRING—Drive cable tension spring</td>
</tr>
<tr>
<td>RS-9027</td>
<td>SHIELD—Solite tube shield</td>
</tr>
<tr>
<td>RW-053</td>
<td>SHIELD—Drive shaft</td>
</tr>
<tr>
<td>RS-101</td>
<td>WINDOW—Dia scale window</td>
</tr>
<tr>
<td>RS-9027</td>
<td>WASHER—Felt washer</td>
</tr>
<tr>
<td>RC-294</td>
<td>CABINET—Ivory Catalin cabinet less back (Model L-540)</td>
</tr>
</tbody>
</table>

* Used on previous receivers.

Fig. 1. Tube and Trimmer Location

Fig. 2. Socket Voltages

©John F. Rider
MODEL JCP-562

GENERAL ELECTRIC CO.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. 455 KC
R.F. 1050 and 1500 KC

The location of all trimmers is shown in Figure 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 of the 12SA7GT through a 0.06 mmf. capacitor and align progressively the trimmers in the 2nd and last I.F. transformer cans. Do not remove the grid lead from the 12SA7GT.

R.F. Alignment

To insert the R.F. signal use either a standard I.R.E. dummy between the signal generator and the receiver antenna post or a loop connected across the generator output which can be magnetically coupled to the receiver Beam-a-Scope. When using an I.R.E. dummy antenna for R.F. alignment, the ground lead from the signal generator to the receiver ground post should be omitted.

With the 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 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 found very useful in servicing receivers if a vacuum tube voltmeter or similar voltage measuring instrument is available.

(1) Stage Gains

Gain

Antenna to 12SA7GT grid... 3 to 3.5 at 1000 KC;
12SA7GT grid to 12SK7GT detector plate... 50 at 455 KC;
12SK7GT grid to 12SQ7GT detector plate... 50 at 455 KC;
Gain shown in the first two stages do not contain the conversion gain which amounts to 1.1 at 1000 KC.

(2) 0.15 volt, 400 cycle signal across the volume control will give 1/2 watt speaker output. (Volume control turned to maximum.)

(3) Average DC voltage developed across oscillator grid leak

15 volts

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

The glass tubes used in the I.F. amplifier and 2nd detector stages are interchangeable with metal tubes.

Parts Description List

<table>
<thead>
<tr>
<th>Sym.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2a</td>
<td>Antenna Section Tuning Condenser</td>
</tr>
<tr>
<td>C-2b</td>
<td>Oscillator Section Tuning Condenser</td>
</tr>
<tr>
<td>C-4</td>
<td>47 mmf. mica capacitor</td>
</tr>
<tr>
<td>C-5</td>
<td>25-140 mmf. I.F. trimmer</td>
</tr>
<tr>
<td>C-6</td>
<td>25-140 mmf. I.F. trimmer</td>
</tr>
<tr>
<td>C-7</td>
<td>25-140 mmf. I.F. trimmer</td>
</tr>
<tr>
<td>C-9</td>
<td>570 mmf. mica capacitor</td>
</tr>
<tr>
<td>C-10</td>
<td>0.03 mmf. paper capacitor</td>
</tr>
<tr>
<td>C-11</td>
<td>0.065 mmf. paper capacitor</td>
</tr>
<tr>
<td>C-12</td>
<td>0.03 mmf. paper capacitor</td>
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<tr>
<td>C-13</td>
<td>0.01 mmf. paper capacitor</td>
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<td>C-14</td>
<td>0.05 mmf. paper capacitor</td>
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<tr>
<td>C-15</td>
<td>0.1 mmf. paper capacitor</td>
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<tr>
<td>C-16</td>
<td>0.05 mmf. paper capacitor</td>
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<tr>
<td>C-17a</td>
<td>0.065 mmf. paper capacitor</td>
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<tr>
<td>C-17b</td>
<td>0.01 mmf. paper capacitor</td>
</tr>
<tr>
<td>C-18</td>
<td>0.05 mmf. paper capacitor</td>
</tr>
<tr>
<td>C-19</td>
<td>0.01 mmf. paper capacitor</td>
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<tr>
<td>C-20</td>
<td>0.05 mmf. paper capacitor</td>
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<tr>
<td>C-21</td>
<td>0.03 mmf. paper capacitor</td>
</tr>
<tr>
<td>C-22</td>
<td>0.01 mmf. paper capacitor</td>
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<tr>
<td>R-1</td>
<td>22,000 ohms carbon resistor</td>
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<tr>
<td>R-2</td>
<td>0.1 mmf. volume control</td>
</tr>
<tr>
<td>R-3</td>
<td>22,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-4</td>
<td>0.1 mmf. volume control</td>
</tr>
<tr>
<td>R-5</td>
<td>22,000 ohms carbon resistor</td>
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<tr>
<td>R-6</td>
<td>100,000 ohms carbon resistor</td>
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<td>R-7</td>
<td>100,000 ohms carbon resistor</td>
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<tr>
<td>R-8</td>
<td>100,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-9</td>
<td>100,000 ohms carbon resistor</td>
</tr>
<tr>
<td>R-10</td>
<td>100,000 ohms carbon resistor</td>
</tr>
</tbody>
</table>

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GENERAL ELECTRIC CO.

MODEL JCP-596

SERVICe INFORMATION


<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>210,000</td>
<td>1/4</td>
<td>R8</td>
<td>500,000</td>
<td>V.C.</td>
</tr>
<tr>
<td>R2</td>
<td>250,000</td>
<td>1/4</td>
<td>R9</td>
<td>5,000,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R3</td>
<td>10,000,000</td>
<td>1/4</td>
<td>R10</td>
<td>250,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R4</td>
<td>15,500</td>
<td>1/4</td>
<td>R11</td>
<td>500,000</td>
<td>1/4</td>
</tr>
<tr>
<td>R5</td>
<td>2,000,000</td>
<td>1/4</td>
<td>R12</td>
<td>150—10%</td>
<td>1/4</td>
</tr>
</tbody>
</table>

All common grounds become chassis grounds. C1, C3, C5, R2, and R6 are omitted.

Point “A” is connected to point “B” and point “C” to point “D.”

ALIGNMENT PROCEDURE

General Data

The alignment of this receiver requires the use of a signal generator that will cover the frequencies of 455, 600, 1400, 1630, 3000, and 6000 K.C., and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the signal generator output as low as possible, to prevent the AVC from operating and giving false readings.

I.F. Alignment

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

Broadcast Band Alignment

Adjust the signal generator to 1630 K.C. and connect the output to the antenna lead, through a .002 mfd. mica condenser. Set the gang condenser to minimum capacity and adjust the oscillator trimmer to receive this signal. After this has been carefully done, the next step is to set the signal generator to 1400 K.C. and after tuning in the signal adjust the B.C. antenna trimmer to peak. In case of bent plates, set the signal generator to 600 K.C. and bend the plates into the position for maximum output.

Short Wave Band Alignment

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

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Service Notes

Intermediate Frequency................................. 455 K.C.
Tuning Frequency Range.................................. 540-1700 K.C.
Maximum Power Output.................................. 250 Milliwatts
Load Speaker.............................................. Cone Diameter 8 inches
Voice Coil Impedance............................ (600 cycles) 3 ohms

Tubes: R.F. 1BO, Converter - Oscillator 3BO, I.F. 1F5,
Detector, A.V.C. 135, Power Output 354, Rectifier 4523

ALIGNMENT PROCEDURE

Alignment Frequencies
R.F. 1500-1700 K.C.
I.F. 455 K.C.

I.F. Alignment
Connect an output meter across the voice coil. Rotate the tuning control to maximum. Set test oscillator to 465 kilocycles and apply signal to control grid of IF r.f. tube through a .001 mfd. capacitor. Align the second I.F. transformer trimmers, next adjust the first I.F. trimmer. Keep the test output to a level that will give a good meter reading.

R.F. Alignment
* Place a one turn coupling not closer than six inches from the receiver Beam-scope which is placed in the front cover. Apply a 1700 kilocycles signal to the coupling loop. Adjust the receiver to 1960 kilocycles by turning the variable condenser until it is in the extreme clockwise position. Align the oscillator trimmer (C-1A). Set the signal generator to 1960 kilocycles. Turn the receiver tuning condenser until the generator signal is picked up. Peak (C-1B) for maximum output.

The Beam-scope leads should be damped the same after the components are mounted in the cabinet as during alignment.

VOLTAGE TABLE

BOTTOM VIEW OF CHASSIS

All filament voltages measured across socket terminals. Other voltages measured from socket terminal to ground with a 1000 ohm 10 volt meter.

BOTTOM VIEW OF CHASSIS

Parts 15, 29, 34, 37 located on top of chassis.
GENERAL ELECTRIC CO.

MODELS LC-628, LC-629
LC-638

SERVICE INFORMATION

Plate (8) of 12SK7 R. F. tube to common ground 17 volts
Screen (6) of 12SK7 R. F. tube to common ground 39 volts
Plate (3) of 12SA7 tube to common ground . . . . 88 volts
Screen (4) of 12SA7 tube to common ground . . . . 88 volts
Plate (8) of 12SK7 I. F. tube to common ground 88 volts
Screen (6) of 12SK7 I. F. tube to common ground 88 volts
Plate (3) of 35L6GT tube to common ground . . . .80 volts
Screen (4) 35L6GT tube to common ground . . . . 85 volts
Cathode (8) of 35L6GT tube to common ground . . . . 6.0 volts
Cathode (8) of 35Z5GT tube to common ground 120 volts
Heater (2) and (7) of 12SA7 tube 12.4 volts AC
Heater (2) and (7) of 12SK7 R. F. tube 12.4 volts AC
Heater (2) and (7) of 12SK7 I. F. tube 12.4 volts AC
Heater (8) and (7) of 12SQ7 tube 12.4 volts AC
Heater (2) and (7) of 35L6GT tube 35.0 volts AC
Heater (2) and (7) of 35Z5GT tube 35.0 volts AC

ALIGNMENT PROCEDURE

I. F. .................................. 455 K. C.
Alignment Frequencies R. F. .............. 1700 & 1400 K. C.
I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume control to maximum. Set test oscillator to 455 kilocycles and apply signal to control grid of 12SK7 R. F. through a .05 mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep the test oscillator output to a level that will give a good meter reading.

R. F. Alignment

Attach high side of test oscillator to flexible lead extending from rear of chassis through a .00025 mfd. condenser. Connect the low side to the receiver chassis. Adjust the test oscillator and receiver to 1700 kilocycles. Peak 1700 kilocycles oscillator trimmer for maximum output. Change test oscillator signal and receiver dial to approximately 1400 kilocycles. Then while rocking gang condenser, trim 1400 kilocycles antenna trimmer for maximum output.

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Fig. 1. Trimmer Location

Fig. 2. Socket Voltages

Fig. 3. Schematic Diagram

I-F PEAK 455 KC

Note:
On 40-60 cycle receivers, omit R12 and connect A to B and X to Z.
On 25-cycle receivers, add R12 and connect X to Y.

Stock No. | Symbol | Description
--- | --- | ---
RC-7067 | C1a, b | CONDENSER—Tuning condenser
RT-892 | C2, 24 | TRIMMER—B" band oscillator and D" band ant. trimmers
RC-235 | C3 | CAPACITOR—100 mfd., mica
RC-274 | C4 | CAPACITOR—33 mfd., mica
RC-242 | C9 | CAPACITOR—150 mfd., mica
RC-620 | C10, 15, 29, 29 | CAPACITOR—03 mfd., 600-V paper
RC-692 | C11, 16 | CAPACITOR—05 mfd., 600-V paper
RC-104 | C12 | CAPACITOR—1 mfd., 600-V paper
RC-216 | C13 | CAPACITOR—47 mfd., mica
RC-623 | C14 | CAPACITOR—005 mfd., 600-V paper
RC-506 | C17a, C17b | CAPACITOR—30 mfd., 30 mfd., 150-V electrolytic
RC-259 | C18 | CAPACITOR—250 mfd., mica
RC-6509 | C19 | CAPACITOR—Wave trap trimmer
RC-299 | C20 | CAPACITOR—39 mfd., mica
RC-235 | C21 | CAPACITOR—100 mfd., mica
RC-648 | C22 | CAPACITOR—02 mfd., 600-V paper
RC-6509 | C23 | CAPACITOR—D" Band oscillator trimmer
RC-503 | C25 | CAPACITOR—0032 mfd., 600-V paper
RC-5183 | C27a, C27b | CAPACITOR—60 mfd., 30 mfd., 150-V electrolytic (25-cycle only)
RC-525 | C36 | RESISTOR—15 megohm, 1/2-W carbon
RC-758 | R2 | RESISTOR—4700 ohm, 1/4-W carbon
RC-1299 | R3, 18 | RESISTOR—47,000 ohm, 1/2-W carbon
RC-1255 | R4 | RESISTOR—53,000 ohm, 1/4-W carbon
RC-1281 | R5 | RESISTOR—470 ohm, 1/4-W carbon
RC-6339 | R6 | RESISTOR—2.2 megohm, 1/4-W carbon
RC-120 | R7, S1 | VOL. CONTROL—0.5 megohm with power switch (Model L-674)
RC-1349 | R8 | RESISTOR—5 megohm, 1/4-W carbon
RC-1315 | R9 | RESISTOR—220,000 ohm, 1/4-W carbon
RC-1323 | R10, 11 | RESISTOR—470,000 ohm, 1/4-W carbon
RC-1213 | R12 | RESISTOR—12 ohm, 1/4-W carbon
RC-1237 | R13 | RESISTOR—120 ohm, 1/4-W carbon
RC-1255 | R14 | RESISTOR—470 ohm, 1/4-W carbon
RC-1215 | R15 | RESISTOR—15 ohm, 1/4-W carbon
RC-1307 | R19 | RESISTOR—100,000 ohm, 1/4-W carbon
RC-608 | L2 | COIL—Wave trap coil
RL-177 | L3 | COIL—Choke coil
RL-5000 | T1 | LOOP—"B" band loop and cabinet back assembly
RL-2077 | T2 | COIL—"B" band oscillator coil
RL-2078 | T2A | COIL—"D" band oscillator coil
RT-385 | T3 | TRANSFORMER—1st IF transformer
RT-3022 | T4 | TRANSFORMER—2nd IF transformer
RT-420 | T5 | TRANSFORMER—Output transformer
RL-5003 | T6 | LOOP—"5W" band loop antenna (Model L-674)
RS-1090 | SPKR | SPEAKER—Electro-dynamic speaker (450 ohm field)
RS-3151 | S2 | SWITCH—Band change switch
RS-3108 | S4 | SWITCH—Tone control switch

* Used on previous receivers.

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MODEL L-641

GENERAL ELECTRIC CO.

I-F PEAK 455 Kc

Fig. 3. Schematic

Fig. 4. Switch Wiring Diagram

Stock No. Symbol Description

RT-726 R10, S1 TONE CONTROL—0.5 meg. control and power switch.
*RQ-1247 R13 RESISTOR—330 ohm, 1/4 W. Carbon
*RQ-1299 R15 RESISTOR—47,000 ohm, 1/4 W. Carbon.
*RQ-1269 R17 RESISTOR—100,000 ohm, 1/4 W. Carbon.
*RQ-1299 R18 RESISTOR—47,000 ohm, 1/4 W. Carbon.
*RQ-1229 R19 RESISTOR—100,000 ohm, 1/4 W. Carbon.
*RQ-687 R20 RESISTOR—15,000 ohm, 2 W. Carbon.
*RQ-1315 R21 RESISTOR—220,000 ohm, 1/4 W. Carbon.
*RQ-1308 R22 RESISTOR—100,000 ohm, 1/4 W. Carbon.
*RQ-1251 R24 RESISTOR—47 ohm, 1/4 W. Carbon.
*RQ-1243 R25 RESISTOR—1,000 ohm, 1/4 W. Carbon.
RL-176 L3 COIL—Peaking coil.
RL-636 L4 COIL—Wave trap.
RL-577 T1 BEAM-ASCOPE—"B" band loop and cabinet back assembly.
*RL-2062 T2 COIL—Osc. coil hand "B".
*RL-2075 T3, T2 COIL—Osc. coil "D" band.
*RQ-3005 T4 TRANSFORMER—1st I.F. Transformer.
*RT-3006 T5 TRANSFORMER—2nd I.F. Transformer.
*RQ-4024 T6 TRANSFORMER—Output transformer.
RL-588 T7 BEAM-ASCOPE—"D" band loop.
*RL-682 T8 TRANSFORMER—65 cycle power transformer.
RT-3827 T9 TRANSFORMER—25 cycle power transformer.
RS-3148 S2, S3 SWITCH—Band change switch.
RS-1096 SPEAKER—5 in. dynamic speaker.

MISCELLANEOUS PARTS

*RB-099 BOARD—Single lug terminal board.
*RB-213 BOARD—Two lug terminal board.
*RB-026 BOARD—Six lug terminal board.
*RB-031 BOARD—Dynamic speaker.
*RB-299 BRACKET—Lamp bracket.
*RB-1030 BOARD—Lamp jack board.
*RC-205 BOARD—Speaker cord.
*RC-1989 CUSHION—Condenser button cushion.
*RQ-2316 CORD—90-foot drive cord.
*RC-2136 CABLE—Speaker cable and plug.
*RS-4049 CONE—Speaker cone and voice coil assembly.
*RD-429 DRUM—Condenser drive drum.
*RD-780 DIAL—Dial scale.
*RF-307 FASTENER—Back cover fastener.
*RG-1460 GRILLE—Cabinet grille cloth.
*RQ-081 VOL—Volume control knob.
*RQ-092 KNOB—Volume control knob.
*RL-784 LAMP—Glass lamp.
*RP-1027 POINT—Radio point assembly.
*RS-2023 SOCKET—Radio tube socket.
*RS-239 SOCKET—Electrolytic mica socket.
*RS-444 SPRING—Spring or band knob spring.
*RS-445 SPRING—Drive cord tension spring.
*RS-511 SPACER—Spring condenser mfg. spacer.
*RS-285 SOCKET—Lamp socket.
*RS-4012 SPRING—Tone on band knob spring.
*RS-9137 SHAFT—Tuning shaft and clip.
*RT-922 TERMINAL—SW loop tap terminal.
*RW-101 WASHER—Pelt washer for knobs.

* Used on previous receivers.

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**GENERAL ELECTRIC CO.**

MODELS L-643, L-653, L-663, L-673

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**I-F PEAK 455 KC**

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### Stock No. | Symbol | Description
---|---|---
*RC-7039 | C1a, C1b, C2a, C2b | CONDENSER—Tuning condenser
*RC-226 | C3 | CAPACITOR—100 mmf., mica
*RC-242 | C8 | CAPACITOR—330 mmf., mica
*RC-274 | C9 | CAPACITOR—150 mmf., mica
*RC-039 | C10, C20 | CAPACITOR—01 mmf., 600 V, paper
*RC-072 | C11 | CAPACITOR—03 mmf., 600 V, paper
*RC-078 | C12 | CAPACITOR—01 mmf., 600 V, paper
*RC-176 | C13 | CAPACITOR—47 mmf., mica
*RC-023 | C14 | CAPACITOR—005 mmf., 600 V, paper
*RC-048 | C15 | CAPACITOR—02 mmf., 600 V, paper
RC-092 | C16 | CONDENSER—Tuning condenser
RC-318S | C17a, C17b | CONDENSER—100 mmf., mica
RC-323 | C18 | CAPACITOR—Wave trap trimmer
RC-657S | C19 | CAPACITOR—Wave trap trimmer
*RC-1215 | R1 | RESISTOR—42 ohm, 1/4 Watt carbon
*RC-1275 | R2 | RESISTOR—4,700 ohm, 1/4 Watt carbon
*RC-1299 | R3 | RESISTOR—47,000 ohm, 1/4 Watt carbon
*RC-1295 | R4 | RESISTOR—33,000 ohm, 1/4 Watt carbon
*RC-1235 | R5 | RESISTOR—100 ohm, 1/4 Watt carbon
*RC-1339 | R6 | RESISTOR—2.2 megohm, 1/4 Watt carbon
RV-120 | R7, S1 | VOLUME CONTROL—0.5 megohm, combine with power switch
*RC-1349 | R8 | RESISTOR—5.6 megohm, 1/4 Watt carbon
*RC-1823 | R9, R10, R11 | RESISTOR—470,000 ohm, 1/4 Watt carbon
*RC-1213 | R12 | RESISTOR—12 ohms, 1/4 Watt carbon
*RC-1239 | R13, R17 | RESISTOR—150 ohms, 1/4 Watt carbon
*RC-561 | R14 | RESISTOR—1,000 ohms, 2 Watt carbon
*RC-1299 | R15 | RESISTOR—47,000 ohm, 1/4 Watt carbon
*RC-1251 | R16 | RESISTOR—470 ohms, 1/4 Watt carbon

*Used in previous receivers.

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Note: (1) For 40-60-cycle sets use No. 51 Mazda only. Omit R-12 and connect A to B and X to Z. (2) For 25-cycle sets use No. 47 Mazda only. Add R-12 and connect X to Y.

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### Stock No. | Symbol | Description
---|---|---
RQ-1317 | R18 | RESISTOR—270,000 ohm, 1/4 Watt carbon
RL-178 | L1 | COIL—Plate choke coil
RL-179 | L2 | COIL—Series choke coil
RL-609 | L3 | COIL—Wave trap coil
RL-597 | T1 | LOOP ANTENNA—BC loop and cabinet back assembly
*RJ-2048 | T2 | COIL—Oscillator coil
*RJ-385 | T3 | TRANSFORMER—1st I.F. transformer
*RJ-386 | T4 | TRANSFORMER—2nd I.F. transformer
*RJ-4015 | T5 | TRANSFORMER—Output transformer
RS-1087 | SPKR | SPEAKER—5-in. FM dynamic speaker

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### MISCELLANEOUS PARTS

- **RB-008** | BOARD—2-lug terminal
- **RB-013** | BOARD—2-lug terminal
- **RB-084** | BACK—Cabinet back
- **RC-8081** | CORD—Power cord
- **RC-8224** | CORD—Drive cord assembly (39-in.)
- **RC-9657** | CORD—Drive cord assembly (39-in.)
- **RD-761** | SCALE—Dial scale
- **RF-207** | FASTENER—Cabinet back fastener
- **RK-919** | KNOB—Control knob and spring
- **RF-324** | PULLEY—Dial cord pulley on speaker frame
- **RP-1026** | POINTER—Dial pointer
- **RS-234** | SOCKET—Glow lamp socket
- **RS-258** | SOCKET—I.F. transformer
- **RS-270** | SOCKET—Drive cord tension spring
- **RS-631** | SPRING—Drive cord tension spring
- **RS-9039** | SPRING—Knobs springs
- **RS-9029** | SHAFT—Drive cord tension spring
- **RW-101** | WASHER—Felt washer for knobs

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**Fig. 1. Dial Stringing Diagram**

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**Fig. 3. Socket Voltages**

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GENERAL ELECTRIC CO.

MODELS L-643, L-653, L-663, L-673

MODEL L-651

Models L-643, L-653, L-663, L-673

SPECIFICATIONS

Over-all Dimensions

Model L-643 or L-663 L-653 or L-673
Height. 13 inches 12% inches
Width. 7% inches 7 inches
Depth. 71% inches 7 inches

Electrical Rating

Rating "A"—105-125 volts AC/DC, 40-60 cycles AC. 35 watts
Rating "C"—105-125 volts AC/DC, 25 cycles AC, 35 watts

Tuning Frequency Range

540-1720 KC.

Intermediate Frequency

455 KC.

Power Electric Output (117 volts line)

Undistorted. Maximum Output. 1 watt

Loadspeaker—PM Dynamic

Outside cone diameter. 5 inches
Voice coil impedance (400 cycles). 3.5 ohms

Tubes

RF Amplifier GE-12B7/11A7
Converter-Oscillator GE-12B5A
IF Amplifier GE-12B7/11AT
Demodulator, Audio, and AVC GE-12GQ7
Power Output GE-35L6GT
Rectifier GE-352QT
Dial Lamp (see paragraph below) GE-67 or 61.

GENERAL INFORMATION

Models L-643, L-653, L-663 and L-673 are six-tube, table model superheterodyne receivers, which are designed to operate from either in AC or DC power supply as specified on the label. Models L-643 and L-673 are fully approved by Underwriters Laboratories. Use Mazda No. 47 lamp only on 25-cycle receiver. Mazda No. 51 in the 40-60-cycle range.

ALIGNMENT PROCEDURE

Alignment Frequencies

RF 1500 KC
IF 455 KC

The chassis must be removed from the cabinet to make the following alignment. The location of all trimmers is shown in Fig. 2.

IF Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 450 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the 12B7A converter grid through a 0.06 mfd. capacitor and align progressively the trimmers in the 2nd and 3rd IF transformers.

Wave-trap Alignment

Apply the 655 KC signal to the grid of the 12B7A IF amplifier through a 0.001 mfd. capacitor. Adjust the wave-trap trimmer C-19 for minimum output.

RF Alignment

While making the following alignment the loop antenna must be bolted to the chassis by the screw and spacer mountings. 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). 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 in close proximity to the loop when making this alignment.

With the gang condenser plates completely closed, the pointer should line up with the first mark on the left of the scale. Set the signal generator to 1500 KC. Align (C-18) to the signal while the pointer is on the 1500 KC mark.

Special Service Information

Alignment Frequencies

RF 1500 KC
IF 455 KC

The chassis must be removed from the cabinet as described above to make the following alignments. The locations of all trimmers are shown in Fig. 1.

IF Alignment

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

Apply signal to the 12547 converter grid through a 0.06 mfd. capacitor and align progressively the trimmers in the 2nd and 3rd IF transformers.

Wave Trap

Apply 655 KC signal to the grid of the 12547 IF Amplifier through a 0.06 mfd. capacitor. Adjust trimmer C-29 for minimum output.

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). 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 in close proximity to the loop when making the alignment.

With the gang condenser plates completely closed, the end of the pointer should line up with the first mark to the left of the scale. Set the signal generator to 1500 KC. Align (C-18) to the signal while the pointer is on the 1500 KC mark.

Special Service Information

Alignment Frequencies

RF 1500 KC
IF 455 KC

The chassis must be removed from the cabinet as described above to make the following alignments. The locations of all trimmers are shown in Fig. 1.

IF Alignment

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

Apply signal to the 12547 converter grid through a 0.06 mfd. capacitor and align progressively the trimmers in the 2nd and 3rd IF transformers.

Wave Trap

Apply 655 KC signal to the grid of the 12547 IF Amplifier through a 0.06 mfd. capacitor. Adjust trimmer C-29 for minimum output.

Fig. 2. Trimmer Location

MODELS L-643, L-653, L-663, L-673

Fig. 1. Trimmer Location

MODEL L-651

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**R.F. Alignment**

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrим at 1500 KC.

**Precaution**

If the signal generator is A-C 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 A-C 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 607GT det. plate ... 100 at 455 KC

2. **Audio Gain**
   - 0.6 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/2 watt speaker output.

3. **D-C voltage developed across oscillator grid resistor (R-1) averages 12 volts.**

**Variations of ±20% permissible.**

**Loud-speaker**

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering it will be necessary to replace the entire cone and voice-coil assembly.

Note.—In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.

**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

**Loud-speaker—PM Dynamic**

- Outside cone diameter: 6.5 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 grid of the 6SK7GT 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 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.
**GENERAL INFORMATION**

These service notes contain data on both early (†) and late (‡) productions of this receiver, replacing and correcting any preceding data. The main difference is that the late production contains a wave trap and peaking coil between the RF and converter stages. For early production receivers eliminate step 3 in alignment chart and use Fig. 1. For alignment of late production receivers, use Fig. 2. In all cases the symbol designations remain the same but the physical locations of trimmers are changed.

**ALIGNMENT PROCEDURE**

The location of trimmers is shown below. All oscillator and RF trimmers are accessible through a slot through the back cover of the cabinet.

---

**SPECIFICATIONS**

**Over-all Dimensions**
- Height: 11 ¾ inches
- Width: 17 inches
- Depth: 11 inches

**Electrical Rating**
- "A" rating, 110–125 volts, 50–60 cycles, 70 watts.
- "C" rating, 110–125 volts, 25 cycles, 70 watts.

**Tuning Frequency Range**
- "BC" Band: 550–1720 KC
- "SW1" Band: 1.7–5.2 MC
- "SW2" Band: 8.2–18.1 MC

**Intermediate Frequency**
- 455 KC

**Electrical Power Output**
- Undistorted: 3.5 watts
- Maximum: 3.5 watts

**Load-speaker—PM Dynamic**
- Outside Cone Diameter: 6 ¼ inches
- Voice Coil Impedance (400 cycles): 3.5 ohms

**Tubes**
- RF Amplifier: GE-6SG7
- Converter, Oscillator: GE-6SA7
- IF Amplifier, Detector, AVC: GE-6SF7
- Audio Amplifier, Phase Inverter: GE-6SC7
- Power Output: (2) GE-6K6GT
- Rectifier: GE-5W4GT
- Dial Lamps: (2) MAZDA No. 44

**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>Step</th>
<th>Test-Osc. Connection</th>
<th>Test-Osc. Setting</th>
<th>Pointer Setting</th>
<th>Adjust Trimmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6SK7 IF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C17 and C16 for maximum</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>C14 and C13 for maximum</td>
</tr>
<tr>
<td>3</td>
<td>6SG7 RF Grid in series with .05 mfd.</td>
<td>455 KC</td>
<td>&quot;BC&quot; Band 550 KC</td>
<td>C19 Wave trap for minimum</td>
</tr>
<tr>
<td>4</td>
<td>Capacity coupled</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C8 ** (Osc.) for maximum</td>
</tr>
<tr>
<td>5</td>
<td>Capacity coupled</td>
<td>1500 KC</td>
<td>&quot;BC&quot; Band 1500 KC</td>
<td>C11 ** for maximum</td>
</tr>
<tr>
<td>6</td>
<td>Capacity coupled</td>
<td>580 KC</td>
<td>&quot;BC&quot; Band 580 KC</td>
<td>C11 ** for maximum</td>
</tr>
<tr>
<td>7</td>
<td>Capacity coupled</td>
<td>5 MC</td>
<td>&quot;SW1&quot; Band 5MC</td>
<td>C7 ** (Osc.) for maximum</td>
</tr>
<tr>
<td>8</td>
<td>Capacity coupled</td>
<td>18 MC</td>
<td>&quot;SW2&quot; Band 18 MC</td>
<td>C6 * (Osc.) to signal</td>
</tr>
<tr>
<td>9</td>
<td>Capacity coupled</td>
<td>18 MC</td>
<td>&quot;SW2&quot; Band 18 MC</td>
<td>C11 ** (Ant.) for maximum</td>
</tr>
</tbody>
</table>

*Use minimum capacity peak.
**Rock gang condenser when making alignment.

**Special Service Information**

The following data are taken with a vacuum-tube voltmeter or similar voltage-measuring device.

1. **Stage Gains**
   - Antenna Post to RF Grid: 6.5 at 1000 KC
   - RF Grid to Converter Grid: 10 at 1000 KC
   - Converter Grid to IF Grid: 45 at 1000 KC
   - IF Grid to 6SF7 diode plates: 60 at 455 KC

2. **Audio Gains**
   - .16 volts, 400 cycles signal across volume control with control set to maximum will give approximately 13/4-watt speaker output.

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

Variations of ±20 ¾ permissible. All readings taken with 1 ¼-volt fixed bias on AVC bus.
GENERAL ELECTRIC CO. MODELS LC-759, LC-759B LC-768

GENERAL INFORMATION
These models are seven-tube three-band super-heterodyne receivers of conventional design using in combination an Automatic Record Changer. The service data on the Record Changer is contained in service notes LRPS-170.

Phono gram Tone Compensation
The schematic diagram as shown in Fig. 1, is as used in Model LC-768, with the tone compensation built into the changer. Models LC-759 and LC-759B have no compensation on the changer but it is built into the chassis as indicated in Fig. 3, otherwise the schematic is identical for all three receivers.

ALIGNMENT PROCEDURE
The location of trimmers is shown in Fig. 5. All oscillator and RF trimmers are accessible from the rear of the cabinet. The alignment procedure is given in table form. All IF adjustments may be made with the chassis removed from the cabinet. However, the RF adjustments should be made with the chassis and loop antennas securely fastened in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects alignment. The RF signal should be capacity-coupled to the receiver loop by connecting a two-foot wire for an antenna on the test-oscillator output post (high side). Keeping this antenna two feet or more away 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.

Special Service Information
The following data is taken with a vacuum-tube volt-ohm-meter or similar measuring device.

(1) Stage Gains
Antenna post to RF Grid... 65 at 1000 KC
RF Grid to Converter Grid... 45 at 1000 KC
Converter Grid to IF Grid... 60 at 455 KC
IF Grid to 6SK7 diode plate... 110 at 455 KC

(2) Audio Gains
09 volts, 400-cycle signal across volume control with control set to maximum will give approximately ½-watt output to speaker.

FOR DATA ON AUTOMATIC RECORD CHANGER MODEL LC-170, SEE RIDER’S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

Cabinet Specifications
<table>
<thead>
<tr>
<th>Model</th>
<th>Cabinet</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC-759</td>
<td>Mahogany</td>
<td>16&quot;</td>
<td>21&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>LC-759B</td>
<td>Blonde</td>
<td>16&quot;</td>
<td>21&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>LC-768</td>
<td>Walnut</td>
<td>16&quot;</td>
<td>21&quot;</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

Electrical Rating
Rating “A6” 105-125 volts, 60 cycles, 130 watts.
Rating “A8” 110-125 volts, 60 cycles, 130 watts.

Tuning Frequency Range
“BC” Band 5.2-18.1 MC
“SW1” Band 580 KC
“SW2” Band 1500 KC

Intermediate Frequency 455 KC

Electrical Power Output
Undistorted 7.5 watts
Maximum 12 watts

Load-speaker—Electrodynamic
Outside cone diameter 114 inches
Voice coil impedance (400 cycles) 5 ohms
Field resistance 400 ohms

Phono gram Mechanism
Type changer Model LRP-170
Type pick-up Crystal
Turntable speed 78 RPM

Tubes
RF Amplifier GE-6G7
Converter-Oscillator GE-6SK7
IF Amplifier, Demodulator, AVC GE-6SK7
Audio Amplifier, Phase Inverter GE-6SC7
Audio Output (2) GE-6MVGT
Rectifier GE-6X3G
Dial Lamps MAZDA No. 44

Fig. 3 Phonograph Tone Compensation (LC-759 and LC-759B)
GENERAL ELECTRIC CO.

TECHNICAL AND SERVICE INFORMATION

Since the Model JFM-165 consists of the Model J-718 radio chassis used in conjunction with the Model JFM-90 Frequency Modulation Translator, reference should be made to the service notes (RJS-718 and RJFMS-90) on these receivers for all technical and service information. When ordering replacement parts, for the standard radio chassis, refer to the parts list on the J-718 receiver and make the removals as shown under the J-718 parts list below. When ordering parts for the FM chassis, refer to the parts list on the JFM-90 receiver and make additions and removals as in the JFM-90 parts list below. The additional parts listed are only common to the Model JFM-165 receiver.

### Electrical Rating

<table>
<thead>
<tr>
<th>Rating</th>
<th>Power Supply (Volts)</th>
<th>Frequency (Cycles on AC)</th>
<th>Power Consumption AM and FM Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-6</td>
<td>105-125</td>
<td>60</td>
<td>145</td>
</tr>
<tr>
<td>A-5</td>
<td>105-125</td>
<td>50</td>
<td>145</td>
</tr>
<tr>
<td>C-2</td>
<td>105-125</td>
<td>25</td>
<td>155</td>
</tr>
</tbody>
</table>

### Tuning Frequency Range

- **Broadcast Band**: 540-1600 KC
- **Short-wave Band No. 1**: 2300-6900 KC
- **Short-wave Band No. 2**: 6900-22000 KC
- **Frequency Modulation Band**: 42.0-50.0 MC

### Intermediate Frequency

- **Broadcast and Short-wave Receiver**: 455 KC
- **Frequency Modulation Receiver**: 4.3 MC

### Electrical Power Output

- Undistorted: 4 watts
- Maximum: 5.5 watts

### Loud-speaker—"Alnico" Magnet Dynamic

- Outside Speaker Diameter: 14 inches
- Voice Coil Impedance: 3.5 ohms

### Tubes

- **Frequency Modulation Chassis**: 1st Converter GE-6AB7, 2nd Converter GE-6AB7, Oscillator GE-7A4, I.F. Amplifier GE-6SK7, 1st Limiter GE-6SK7, 2nd Limiter GE-6SK7, Discriminator GE-6H6, Rectifier GE-5YG
- **Broadcast and Short-wave Chassis**: R.F. Amplifier GE-6SK7, Converter and Oscillator GE-6SA7, I.F. Amplifier GE-6SK7, Det. Audio and AVC GE-6SO7, Audio Driver GE-6JS9 or GT, Audio Output GE-6Y6G, Rectifier GE-5YG, Pilot Lamps MAZDA No. 44

### REPLACEMENT PARTS LIST

(For complete list of replacements refer to J-718 and JFM-90 service notes)

### MODEL JFM-165

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ-1307</td>
<td>RESISTOR—100,000 ohm, ½ W. carbon (R-2) (Pkg. 5)</td>
<td>$0.70</td>
<td>*RQ-1307</td>
<td>RESISTOR—100,000 ohm, ½ W. carbon (R-22) (Pkg. 5)</td>
<td>$0.70</td>
</tr>
<tr>
<td>RQ-1317</td>
<td>RESISTOR—270,000 ohm, ½ W. carbon (R-28) (Pkg. 5)</td>
<td>.70</td>
<td>*RQ-1299</td>
<td>RESISTOR—47,000 ohm, ½ W. carbon (R-22) (Pkg. 5)</td>
<td>.70</td>
</tr>
<tr>
<td>RQ-1327</td>
<td>RESISTOR—680,000 ohm, ½ W. carbon (R-27) (Pkg. 5)</td>
<td>.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC-039</td>
<td>CAPACITOR—01 mf., 600 V. paper (C-27)</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC-7044</td>
<td>CONDENSER—Tung condenser and station selector assembly (C-1a, 1b, 1c)</td>
<td>5.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC-7044</td>
<td>CONDENSER—Tung condenser assembly (C-1a, 1b, 1c)</td>
<td>5.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock No.</th>
<th>Description</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB-290</td>
<td>BOARD—FM chassis mounting boards</td>
<td>1.00</td>
</tr>
<tr>
<td>RB-1037</td>
<td>BOARD—FM antenna terminal board</td>
<td>1.00</td>
</tr>
<tr>
<td>GR-123</td>
<td>GRILLE CLOTH—Cabinet grille cloth</td>
<td>1.10</td>
</tr>
<tr>
<td>RC-8204</td>
<td>CABLE—FM output connector cable and plug assembly</td>
<td>3.5</td>
</tr>
<tr>
<td>RC-8627</td>
<td>CARD—FM key tab card</td>
<td>85.6</td>
</tr>
<tr>
<td>RD-173</td>
<td>DIAL—Dial scale and escutcheon assembly—FM</td>
<td>7.00</td>
</tr>
<tr>
<td>RL-550</td>
<td>BEAM-A-SCOPE—Cylindrical Beam-a-Scope assembly</td>
<td>2.10</td>
</tr>
<tr>
<td>RS-629</td>
<td>SUPPORT—Cylindrical Beam-a-Scope bottom support</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Used on previous production receivers.

(Prices subject to change without notice)

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Single End Tubes

GENERAL TELEVISION & RADIO CO. MODELS 19, 51, 57
MODELS 26, 34, 47, 49, 57, 88, 91.

5 TUBE AC-DC SUPERHETERODYNE CIRCUIT

MODELS 19, 51 and 57

MODELS 26, 34, 47, 49, 57, 88 and 91

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**MODELS 19 and 51**

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>00025 MFD 800V TUBULAR CONDENSER</td>
</tr>
<tr>
<td>C2</td>
<td>0005 MFD 200V TUBULAR CONDENSER</td>
</tr>
<tr>
<td>C3</td>
<td>01 MFD 400V TUBULAR CONDENSER</td>
</tr>
<tr>
<td>C4</td>
<td>05 MFD 400V TUBULAR CONDENSER</td>
</tr>
<tr>
<td>C5</td>
<td>1 MFD 400V TUBULAR CONDENSER</td>
</tr>
<tr>
<td>C6</td>
<td>2 X 100W 150V CARBON RESISTOR</td>
</tr>
<tr>
<td>C7</td>
<td>2 X 150W 200V CARBON RESISTOR</td>
</tr>
<tr>
<td>C8</td>
<td>3126 AO VAR. COND</td>
</tr>
<tr>
<td>C9</td>
<td>3 200W 1500V SPEAKER</td>
</tr>
<tr>
<td>L1</td>
<td>1200H 1200V AC-DC BACK VIEW OF CABINET</td>
</tr>
<tr>
<td>R1</td>
<td>10000 OHM 800W VOLUME CONTROL</td>
</tr>
<tr>
<td>R2</td>
<td>150 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R3</td>
<td>10000 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R4</td>
<td>10000 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R5</td>
<td>50000 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R6</td>
<td>2 MEGOHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R7</td>
<td>6 MEGOHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R8</td>
<td>100 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R9</td>
<td>15M OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R10</td>
<td>8 MEGOHM 1/2 WATT CARBON RESISTOR</td>
</tr>
<tr>
<td>R11</td>
<td>10 OHM 1/2 WATT CARBON RESISTOR</td>
</tr>
</tbody>
</table>

**TUBE LOCATION & CHASSIS LAYOUT**

**MODEL 530**

**BATTERY REPLACEMENT**

If, when these batteries are to be replaced, longer service (200 hours or more) is desired, you may replace this pack with one (1) 4F4 "A" battery and two (2) V30B "B" batteries made by the same company, or their equivalent in another make.
SERVICE NOTES

Voltages taken from the different points of the circuit to chassis are measured with volume control in maximum position, all tubes in their sockets and with a volt meter having a resistance of 1000 ohms per volt. These voltages are clearly indicated on the voltage chart.

In order to prevent the signal from acting upon the AVC and affecting accuracy of voltage measurements, aerial and ground leads should be short circuited while making measurements.

All voltages should be measured with a new battery or one that gives 94½ volts under load. Resistance and actual connections of coils and transformers and speaker data are given under Service Information.

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

Failure to operate, noisy or weak reception is usually due to defective tubes, the tubes making poor contact with sockets or grid clips making poor contact with the caps of the tube. Tubes may be checked very easily by replacing with other tubes which are known to be good.

ALIGNING INSTRUCTIONS

All of the adjustments have been very carefully set with signal generators at the factory and require no further adjustment unless it becomes necessary to replace a coil or transformer, or if the adjustments have been tampered with in the field. Under no circumstances attempt any adjustments without first making certain that adjustment is necessary and only after voltages, tubes and condensers have been checked and found to be normal. To properly re-align this receiver, a signal generator as well as an output meter, must be used.

ALIGNMENT PROCEDURE

The following equipment is required for aligning:

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

<table>
<thead>
<tr>
<th>SIGNAL GENERATOR</th>
<th>Frequency Setting</th>
<th>Dummy Antenna</th>
<th>Connection to Radio</th>
<th>Variable Condenser Setting</th>
<th>Trimmers Adjusted (In Order Shown)</th>
<th>Trimmer Function</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.F. 456 KC.</td>
<td>.1 MFD.</td>
<td>Grid of 1N5G tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See 13 Fig. 1)</td>
<td>Output I.F.</td>
<td>Adjust to Maximum output</td>
<td></td>
</tr>
<tr>
<td>I.F. 456 KC.</td>
<td>.1 MFD.</td>
<td>Grid of 1A7G tube</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Two trimmers on top (See 13 Fig. 1)</td>
<td>Input I.F.</td>
<td>Adjust to Maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD-CAST 1600 KC.</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Rotor full open (Plates out of mesh)</td>
<td>Trimmer— (See Fig. 1)</td>
<td></td>
<td>Adjust to Maximum output</td>
<td></td>
</tr>
<tr>
<td>BROAD-CAST 1400 KC.</td>
<td>200 mmf.</td>
<td>Antenna lead</td>
<td>Set dial at 1400 KC.</td>
<td>Trimmer— (See Fig. 1)</td>
<td></td>
<td>Adjust to Maximum output</td>
<td></td>
</tr>
</tbody>
</table>

This is all that is necessary for the alignment unless the plates of the gang have been bent out of shape. In case of bent plates, set the signal generator and receiver to 600 KC and bend the plates into the position for maximum output. Attenuate the signal from the signal generator to prevent the leveling off-action of the AVC. After each band is completed, repeat the procedure as a final check.

Frequency Range: 535 to 1730 K.C.
Power output: .27 watt undistorted—.35 watt maximum
Intermediate Frequency 456 K.C.
When the 45 volt B-batteries are tested and measure 30 volts or less, they should be replaced. The 4 1/2 volt A-batteries should be replaced when the reading is 3 volts or less.

The following kits of batteries can be used for replacement:

2 RAY-O-VAC 45 volt "B" No. 7830.
2 USALITE 45 volt "B" No. 640
2 RAY-O-VAC 4 1/2 volt "A" No. P83A. 2 USALITE 4 1/2 volt "A" No. 683.

2 BURGESS 45 volt "B" No. M30.
2 EVEREADY MINIMAX No. 482
2 BURGESS 4 1/2 volt "A" No. G3. 2 EVEREADY MINIMAX 4 1/2 volt "A" No. 746.
Figures at cathodes are cathode current in milliamperes.
Capacity values are in microfarads.

Tube sockets are viewed from under side of chassis.
Voltage readings at indicated socket prongs are to zero voltage point on circuit which is \( \ominus \) on 25L6G tube.
Voltages must be measured with no signal.
Alignment is to be made at the frequencies shown at the trimmer condensers.
Wave trap adjustment at 456 KC input is made to provide maximum reduction of signal.
Where no voltage reading is shown at socket prong, it indicates zero voltage or a very low reading.

FOR CONVENTIONAL ALIGNMENT
SEE SPECIAL SECTION VOL.VII

SETTING PUSH-BUTTONS

1. By means of the Station Selector Knob, tune in WITH THE RIGHT HAND AS ACCURATELY AS POSSIBLE the station having the lowest frequency—that is, your selected station which is tuned in nearest the right-hand side of the dial.
2. After the station has been tuned in accurately with the right hand, continue to hold it in its exact position firmly, and with the left hand loosen the Push-Button to be set up for that station by unscrewing the Push-Button about one turn to the left (counter-clockwise).
3. Continuing to hold the Station Selector Knob in its exact position, PUSH THE PUSH-BUTTON IN ALL THE WAY with the left hand.
4. After the Push-Button has been depressed all the way, tighten it gently toward the right (clockwise). Release Push-Button slowly and when in normal position grip button and tighten firmly.

The Push-Button tuning system is now correctly set up for your first selected station of lowest frequency and the Call Letter Tab for this station should be at the extreme right of the Call Letter Holder.

Follow through with this same procedure, setting up the other 5 stations in the order of their frequency—that is, the second station set up will be second lowest in frequency and the third station set up will be third lowest in frequency.

Carefully check each Push-Button for the accuracy of its setting. If, when tuning in any station with its Automatic Push-Button it does not have equal volume or clarity to that obtained with manual tuning, this may indicate the automatic adjustment for that station was not made accurately. Should there be any inaccuracy in any one of the Push-Button adjustments, correction can be made by repeating the above procedure for that button only. Do not reset those Push-Buttons that are accurately adjusted.

No further adjustments are necessary to operate your radio automatically or manually. To receive any one of your six selected stations for automatic operation, merely push in ALL THE WAY the Button set up for that station.

To receive all other stations in the regular manner, push in the Station Selector Knob and turn it to the frequency of the station desired.
GOODYEAR TIRE & RUBBER CO., INC.

WIRING DIAGRAM FOR GOODYEAR CHASSIS 102506

PRELIMINARY:
Output meter connection: Across loud speaker voice coil.
Output meter reading to indicate 500 milliamps: 1.18 volts.
Dummy antenna value to be in series with generator output: See chart below.
Connection of generator output lead: See chart below.
Generator modulation: 30%, 400 cycles.
Position of Volume Control: Fully clockwise.
Position of Tone Control: RI.
Position of Dial Pointer with variable fully closed: To fall on dot below 860 kc calibration mark.

POSITION OF VARIVABLE

<table>
<thead>
<tr>
<th>POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMERs ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>6/80 Grid</td>
<td>T2, T1</td>
<td>IF Output</td>
</tr>
<tr>
<td>1400 kc</td>
<td>1400 ko</td>
<td>.0002 mfd.</td>
<td>Ant. Clip</td>
<td>C2</td>
<td>Translator</td>
</tr>
<tr>
<td>600 kc (hook)</td>
<td>600 ko</td>
<td>.0003 mfd.</td>
<td>Ant. Clip</td>
<td>C7</td>
<td>Padder</td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES:
Where indicated by the word, "Hook," the variable should be backed out and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AFC action of the receiver ineffective.

PUSH BUTTON TUNING

SETTING UP:
Ensure (turn counter-clockwise) the push button two or three turns. [Use a token or screwdriver in the button slot to unscrew it, if necessary.] Push the button all the way in. Hold it firmly and at the same time tune in your desired station. With your station tuned in, look the adjustment by successively tightening (turn clockwise) the push button knob, using token or screwdriver. Hold the button while tightening it. Unless the button is tightened securely, the adjustments may slip. Punch out the station call letters from the sheet and insert the call letters in the recess in the button. Then cover the call letters with one of the clear celluloid slips supplied.

Proceed in the same manner for the remaining buttons. If a change in selection of stations is desired, the old call letters can be removed with a pin inserted in the slot under the call letters.

OPERATION:
"Push button stations" will be tuned in by pushing the button all the way in.
**ALIGNMENT PROCEDURE**

**PRELIMINARY:**

- Output meter connection: Across loud speaker voice coil
- Output meter reading to indicate 500 milliwatts: Ch. 102508 (0.98 volts)
- Output meter reading to indicate 500 milliwatts: Ch. 102507 (1.32 volts)
- Generator ground lead connection: Receiver chassis
- Dummy antenna value to be in series with generator output: See chart below
- Connection of generator output lead: See chart below
- Generator modulation: 30%, 400 cycles
- Position of Volume Control: Fully clockwise
- Position of Tone Control: HI

Position of Dial Pointer with variable fully closed: Ch. 102508 Center of block to left of 550 kc calibration mark.

Position of Dial Pointer with variable fully closed: Ch. 102507 Center of first mark to left of 550 kc calibration mark.

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AM</strong></td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>5A89 Grid</td>
<td>T3, T1</td>
<td>IF Output</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>300 kc</td>
<td>455 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C1*</td>
<td>Wave Trap</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>Fully open</td>
<td>1720 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C7</td>
<td>Oscillator</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C2</td>
<td>Translator</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>800 kc (rock)</td>
<td>800 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C8</td>
<td>Padder</td>
</tr>
<tr>
<td><strong>SW</strong></td>
<td>15 mo (rock)</td>
<td>15 mo</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C3</td>
<td>Translator</td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

- The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVCO action of the receiver ineffective.

**ALIGNMENT PROCEDURE**

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION OF VARIABLE</th>
<th>GENERATOR FREQUENCY</th>
<th>DUMMY ANTENNA</th>
<th>GENERATOR CONNECTION</th>
<th>TRIMMERS ADJUSTED (IN ORDER SHOWN)</th>
<th>TRIMMER FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AM</strong></td>
<td>Closed</td>
<td>455 kc</td>
<td>.1 mfd.</td>
<td>5A89 Grid</td>
<td>T3, T1</td>
<td>IF Output</td>
</tr>
<tr>
<td><strong>SW</strong></td>
<td>15 mo (rock)</td>
<td>15 mo</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C5</td>
<td>Translator</td>
</tr>
<tr>
<td><strong>VOC</strong></td>
<td>9.55 mo</td>
<td>9.55 mo</td>
<td>400 ohms</td>
<td>Ant. Term.</td>
<td>C7*</td>
<td>Oscillator</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>1400 kc</td>
<td>1400 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C8, C3, C8</td>
<td>Osc, Trans, Ant.</td>
</tr>
<tr>
<td><strong>AM</strong></td>
<td>600 kc (rock)</td>
<td>600 kc</td>
<td>.0003 mfd.</td>
<td>Ant. Term.</td>
<td>C9</td>
<td>Padder</td>
</tr>
</tbody>
</table>

**IMPORTANT ALIGNMENT NOTES**

The alignment must be done in the order given.

- Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peak is the image.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVCO action of the receiver ineffective.

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MODEL 102507
PUSH BUTTON TUNING

SNAP-IN BUTTON
O

RIGHT END OF CABINET

KEY FOR LOCKING AND UNLOCKING PUSH-BUTTON MECHANISM.

FIG. 1

FIG. 2

SETTING UP:

1. Leave the radio turned on for about 15 minutes before adjusting the push buttons. This...
...

2. Make a list of the stations that you want to set up for push button tuning. It is advisable...
...

3. The top left push button can be used for station 1, the lower left one for station 2, the upper...
...

4. If you wish, short wave stations can be set up for approximate push button tuning and then tuned...
...

5. If your radio is a table model (not a console), remove the snap-in button at the right side of the...
...

6. If yours is a console model, the mechanism can be unlocked by reaching in from the back...
...

7. Push the tuning knob in and turn it so that the dial pointer comes to the right end of the...
...

8. After the last station has been set up, lock the mechanism by pushing the slotted shaft in and...
...

9. If you find any stations that have not been correctly set up, unlock the mechanism, as described...
...

10. You may change your choice of stations at any time by unlocking the mechanism as described...
...

Chassis 102508, 102509
PUSH BUTTON TUNING

SETTING UP:

Leave the radio turned on for about 15 minutes before adjusting the push buttons. This...
...

1. Make a list of the stations that you want to set up for push button tuning. It is helpful...
...

2. The top left push button can be used for station 1, the lower left one for station 2, the upper...
...

3. If you wish, short wave stations can be set up in an approximate manner and then tuned...
...

4. Push the tuning knob in and turn it so that the dial pointer comes to the left end of the...
...

5. Then remove the screwdriver.
...

6. If yours is a console model, the mechanism can be unlocked by reaching in from the back...
...

7. Push the tuning knob in and turn it so that the dial pointer comes to the left end of the dial. Then...
...

8. After the last station has been set up, lock the mechanism by pushing the slotted shaft in...
...

9. If you find any stations that have not been correctly set up, unlock the mechanism, as described...
...

10. You may change your choice of stations at any time by unlocking the mechanism as described...
...
PHONOGRAPH OPERATION

Provision is made so that your radio can be used to give high quality reproduction from phonograph records. The phonograph "pick up" must be of modern high impedance electric type. The Goodyear catalog 401110 record player is especially recommended.

Push the two pin plugs, that will be found at the end of the cord attached to the record player, into the holes in the connection board provided at the rear of the radio. Try the plugs in both possible positions in the connection board, and leave them in the position giving better reproduction.

The knob at the back of the radio must be in the position marked "PHONO" for phonograph operation and in the position marked "RADIO" for radio reception. The radio volume and tone controls will also function for phono reproduction.
ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connection .................................................. Across loud speaker voice coil
Output meter reading to indicate 500 milliwatts .......................... 1.06 volts
Generator ground lead connection ......................................... Receiver chassis
Dummy antenna value to be in series with generator output .... See chart below
Connection of generator output lead .................................... See chart below
Generator modulation ......................................................... 30%, 400 cycles
Position of Volume Control ................................................ Fully clockwise
Position of Tone Control .................................................... HI
Position of Dial Pointer with variable fully closed ................ Center of block to left of 550 kc calibration mark.

WAVE BAND
SWITCH
POSITION
"AM" Closed 455 kc .1 mfd. 6A06 Grid T3, T2, T1 IF Output, IF Interstage, IF Input
"SW" 18 mc 18 mc 400 ohms Ant. Term. C39* Oscillator
"SW" 15 mc (rock) 15 mc 400 ohms Ant. Term. C11, C4 Translator, RF
"G" 9.55 mc 9.55 mc 400 ohms Ant. Term. C26* Oscillator C13 Translator C3 RF
"11" 11.7 mc 11.7 mc 400 ohms Ant. Term. C27* Oscillator C13 Translator C2 RF
"15" 14.9 mc 14.9 mc 400 ohms Ant. Term. C28* Oscillator C14 Translator C1 RF
"AM" 1400 kc 1400 kc .0003 mfd. Ant. Term. C20 Oscillator C10 Translator C5 RF
"AM" 800 kc (rock) 800 kc .0003 mfd. Ant. Term. C21 Padder

TRIMMERS
ADJUSTED
FUNCTION
T3, T2, T1 IF Output, IF Interstage, IF Input
C39* Oscillator
C11, C4 Translator, RF
C26* Oscillator C13 Translator C3 RF
C27* Oscillator C13 Translator C2 RF
C28* Oscillator C14 Translator C1 RF
C20 Oscillator C10 Translator C5 RF
C21 Padder

IMPORTANT ALIGNMENT NOTES

The alignment must be done in the order given.

*Two peaks can be had, one with the trimmer screwed further out than the other. The correct adjustment is with the trimmer screwed further out. The other peak is the image.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

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WIRING DIAGRAM FOR GOODYEAR CHASSIS 102512

SETTING UP:

Ch. 102512, 102513

Unscrew the push button two or three turns. (Use a penny in the button slot to unscrew it, if necessary.) Push the button all the way in. Hold it in firmly and at the same time tune in your desired station. With your station tuned in, lock the adjustment by tightening the push button knob (turn clockwise). Hold the button in while tightening it. Punch out the station's call letters from the sheet supplied and insert the call letters in the recess in the button. Then cover the call letters with one of the clear celluloid discs supplied.

Proceed in the same manner for the remaining buttons. If a change in selection of stations is desired, the old call letters can be removed with a pin inserted in the slot under the call letters.
ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection .................................................. Across loud speaker voice coil
Output meter reading to indicate 50 milliwatts .......................... 0.37 volts
Generator ground lead connection ........................................ Receiver chassis
Dummy antenna value to be in series with generator output .......... See chart below
Connection of generator output lead ..................................... See chart below
Generator modulation ....................................................... 30%, 400 cycles
Position of Volume Control .................................................. Fully clockwise
Position of Tone Control ..................................................... HI
Position of Dial Pointer with variable fully closed ..................... Horizontal

WAVE BAND  POSITION OF VARIABLE  GENERATOR  DUMMY  TRIMMERS  TRIMMER
SWITCH  OF VARIABLE  FREQUENCY  ANTENNA  CONNECTION  FUNCTION

"AM"  Closed  455 kc  .1 mfd.  1C7G Grid  T2, T1  IF Outpt
"AM"  600 kc  455 kc*  .0003 mfd. Ant. Term.  C1  Wave Trap
"AM"  600 kc (rock)  600 kc  .0002 mfd. Ant. Term.  C7  Padder
"SW"  16 mc (rock)  16 mc  400 ohms Ant. Term.  C4  Transl.

IMPORTANT ALIGNMENT NOTES

* The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of to 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.
©John F. Rider

GOODYEAR TIRE & RUBBER CO., INC.

MODEL 102513

WIRING DIAGRAM FOR
GOODYEAR CHASSIS 102513

Either a 9 volt storage battery or a 115 volt, 50-60 cycle alternating current (AC) power supply may be used.

If a 9 volt storage battery is used, connect the alligator clip at the end of the flexible wire to the terminals of the storage battery, either clip may be connected to either terminal of the battery. The flexible wire is inserted into a power cord and plugged into a 115 volt outlet. The power cord will be turned to the "9 volt" position when the 9 volt battery is used. If a 115 volt power supply is to be used, the knob is turned to the "115 volt" position and the power cord is plugged into the outlet.

Depending upon the type of power supply used, it is necessary to make sure that the variable resistor is turned to the "0" position when using a 9 volt battery, and that it is turned to the "115 volt" position when using an AC power supply. Always make sure that the 9 volt battery is turned to the "9 volt" position and the AC power supply is turned to the "115 volt" position, when connecting the battery or power supply to the receiver. This is necessary to prevent any damage to the receiver.

GOODYEAR PAGE 14-11

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ALIGNMENT PROCEDURE

PRELIMINARY:
Output meter connection .................................. Across Loud speaker voice coil
Output meter reading to indicate 50 milliwatts ......................... 0.33 volts
Generator ground lead connection ................................... Receiver chassis
Dummy antenna value to be in series with generator output ........ See chart below
Connection of generator output lead .................................. See chart below
Generator modulation .............................................. 30%, 400 cycles
Position of Volume Control ........................................ Fully clockwise
Position of Tone Control ........................................... HI
Position of Dial Pointer with variable fully closed ............. Horizontal. To be along first heavy line below 550 kc

<table>
<thead>
<tr>
<th>WAVE BAND</th>
<th>SWITCH POSITION OF VARIABLE FREQUENCY</th>
<th>GENERATOR DUMMY ANTENNA</th>
<th>TRIMMERS ADJUSTED FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;AM&quot;</td>
<td>Closed 455 kc .1 mfd. 5DG Grid T3, T1</td>
<td>IF Output IF Input</td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>600 kc 455 kc* .0002 mfd. Ant. Term. C1 Wave Trap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>1500 kc 1500 kc .0002 mfd. Ant. Term. C5, C3 Ca.,Transl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;AM&quot;</td>
<td>800 kc(rock) 500 kc .0003 mfd. Ant. Term. C5 Padder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;SW&quot;</td>
<td>15 mc(rock) 15 mc 400 ohms Ant. Term. C3 Transl.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMPORTANT ALIGNMENT NOTES
*The generator should be adjusted for high output. The trimmer should be adjusted for minimum output meter reading instead of the usual maximum reading. If the frequency of an interfering station around 455 kc is known, the generator should be adjusted to the frequency of that station instead of 455 kc.

Where indicated by the word, "Rock", the variable should be rocked back and forth a degree or two while making the adjustment.

The alignment procedure should be repeated stage by stage, in the original order, for greatest accuracy. Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.
The Send-Receive switch enables the operator to make the receiver in-operate temporarily during stand-by periods. Should the receiver be used in conjunction with a transmitter this feature will prove valuable.

Antenna: On the back of the chassis will be found the antenna, doubler and ground terminal strip. A conventional single wire antenna should be connected to A1 and the jumper between A2 and G left connected. A 70-foot piece of #14 enameled wire insulated and suspended in the clear is recommended for this type of antenna. If a doublet antenna is used the two wires of the lead-in are connected to A1 and A2 and the jumper between A2 and G removed. A ground can be connected to the terminal with either type of antenna. It is suggested that a ground be left off the receiver only if in 60 doing the performance of the receiver is improved. There are many different versions of antenna systems that we suggest to the user who wishes to experiment with the various types that he first familiarize himself with the antenna section of the A.R.R.L. Handbook.

The A.V.C. or Automatic Volume Control switch provides optional use of A.V.C. When receiving music or voice signals it is advisable that the switch be in the "On" position. When receiving code transmissions the switch should always be in the "Off" position.

The B.F.O. switch must be in the "On" position to obtain the necessary beat note for the reception of code signals. Using the B.F.O. will be helpful in locating the carriers of distant and possibly weak broadcasting stations. Once located, the B.F.O. should be turned off or the whistle will interfere with reception.

The pitch control - when the B.F.O. is "on" will allow you to vary the frequency of the resultant beat note to one that is most pleasing to you. A head-phone jack is mounted in an accessible position on the front panel of the Sky-Champion. Any type of headphones can be used because no direct current flows in the headphone circuit. When the phones are plugged in the loud speaker is automatically disconnected.

On the back of the chassis you will find a socket into which you can plug a type SM-10 carrier level indicator. When this meter is used it will be necessary to advance the R.F. gain control on the receiver as far as it will go to the left. Doing this will operate the switch which is mounted on the back of this control. Additionally the A.V.C. switch should be in the "On" position to properly connect the meter in the circuit. This meter is available through the dealer from whom you purchased your receiver.

The tube-line-up of the S-20 Sky-Champion is as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>OHMS</th>
<th>VOLTAGE</th>
<th>Parts No.</th>
<th>No. CAPACITY</th>
<th>Type</th>
<th>Parts No. Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>10,000</td>
<td>R.F. Gain</td>
<td>25-029</td>
<td>C1 1 408 MWFD</td>
<td>TUNING</td>
<td>48-022</td>
</tr>
<tr>
<td>2</td>
<td>100,000</td>
<td>1/3</td>
<td>20-093</td>
<td>2 200</td>
<td>41-004</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>350</td>
<td>1/3</td>
<td>20-120</td>
<td>3 200</td>
<td>41-004</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>100,000</td>
<td>2-225</td>
<td>20-094</td>
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The Sky-Champion is an 8 tube 4 Band Superheterodyne receiver covering the following frequencies:

<table>
<thead>
<tr>
<th>Band</th>
<th>Coverage</th>
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<tbody>
<tr>
<td>1</td>
<td>540 KC to 1,800 KC</td>
</tr>
<tr>
<td>2</td>
<td>1,700 MC to 5,750 MC</td>
</tr>
<tr>
<td>3</td>
<td>5,62 MC to 18,40 MC</td>
</tr>
<tr>
<td>4</td>
<td>17,000 MC to 44,000 MC</td>
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</table>

Separate coils are used to cover each band. Inductive coupling to the antenna permits the maximum transfer of signal energy from each separate primary to the particular secondary coil in the unit. The unbaked coils are shorted. The calibration on the main dial is in kilocycles on Band #1 and in megacycles on Bands #2, 3 and 4.
The Hallcrafters Co.

Alignment

Set the controls as follows:
AVC and BFO switches to "OFF"; A-F and R-F gain controls to maximum volume; band switch on No. 1 band; main dial at 1800 kc or minimum capacity position.

Remove 6L7 grid cap. Connect signal generator through 0.1-mf condenser to grid of 6L7, and signal generator ground to chassis of set. Set signal generator to 455 kc. Adjust trimmers on T1 and T2 for exact resonance.

R-F Alignment

Replace the condenser in the signal generator lead with a 400-ohm resistor, connecting it to the A1 terminal on the rear of the chassis. Leave jumper between A2 and G terminals connected.

Band No. 1

Place band switch on No. 1 or broadcast band.
Set generator to 1400 kc and adjust main dial to that frequency.
Adjust the following trimmers for maximum signal:
- Oscillator: CA
- Mixer: CB
- Antenna: CC

Reset generator and receiver to 500 kc and adjust the following paddler for maximum signal: C37

Band No. 2

Place band switch on No. 2 band.
Set generator and receiver to 4 mc and adjust the following trimmers for maximum signal:
- CJ
- CK
- CL

Reset generator and receiver to 1.8 mc and resonate paddler C38 for maximum signal.

Band No. 3

Place band switch on No. 3 band.
Adjust generator and receiver to 14 mc and trim with CG, CH, and CL.
Reset generator and receiver to 7 mc and adjust paddler C39.

Band No. 4

Place band switch on No. 4 band.
Set generator and receiver to 40 mc and adjust CD, CE, and CF.
Reset generator and receiver to 18 mc. There is no paddler on the 4th band, but 18 mc should fall within 1 division with no other adjustments.

While making the above adjustments, rock the main condenser.

©John F. Rider
The diagram shows a schematic of a radio receiver manufactured by Hallicrafters, specifically model S-31. It includes various components such as capacitors, inductors, and resistors, along with connections for antenna, power supply, and modulation. The diagram also notes that the "S" meter connects to the green, and orange leads - green connecting to the plus terminal. With the meter turned off, the meter should read zero on the red scale. If not, the meter is adjusted with the band switch on band 1. Disconnect the antenna and rotate the "S" meter adjustments on the rear of the chassis until the meter reads zero on the left side of the scale.

Note: Unground A2 when using a double antenna. Antennas should be erected as high as possible.
ALIGNMENT PROCEDURE

Equipment needed and preliminary adjustments:

- All wave signal generator which will provide an accurately calibrated signal at test frequencies listed.
- Output indicating meter.
- Non-metallic screwdriver.
- Dummy antennas 100 ohm and 0.1 mfd.

Vol. 1 - Control - Maximum all adjustments.

10 - Connect output meter across primary of output transformer.
20 - Allow chassis and signal generator to "heat up" for several minutes.
30 - Connect low side of generator to chassis (ground)
40 - Set gang condenser to maximum capacity for all I.F. adjustments.
50 - 1000,000 ohm resistor.
60 - 002 mfd condenser.
70 - 100 mfd condenser.

A.M. BROADCAST (Band #1) ALIGNMENT.

1 - Tune signal generator to 450 kc.
2 - Connect signal generator to 100 ohms to A; Ground A.
3 - Adjust 
4 - Adjust 
5 - Align 
6 - Adjust 
7 - Adjust 
8 - Disconnect lead from 1000 ohms to A; Ground A.
9 - Disconnect lead from 4000 ohms to C.
10 - Disconnect lead from 1000 ohms to C.
11 - Disconnect lead from 4000 ohms to C.
12 - Disconnect lead from 1000 ohms to C.
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77 - Disconnect lead from 4000 ohms to C.
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79 - Disconnect lead from 4000 ohms to C.
80 - Disconnect lead from 1000 ohms to C.
81 - Disconnect lead from 4000 ohms to C.
A.F. AMPLIFIER RESPONSE - MODEL S-31A

R1 - 500,000-1000,000 vol. control
425-004
R2 - 500,000 1/2 watt
R3 - 1 meg.
R4 - 3000 ohm
R5 - 250,000
R6 - 500,000 vol. control #25-003
R7 - 500,000 1/2 watt
R8 - 500,000 1/2 watt
R9 - 2000 ohm
R10 - 10,000 ohm
R11 - 500,000-500,000 Bass Control #25-006
R12 - 500,000-500,000 Treble Control #25-006
R17 - 50,000 ohm 1 watt
C1 - 30 Mfd. - 25 volt
C2 - 0.1 Mfd. - 600 V.
C3 - 0.01 Mfd. - 600 V.
C4 - 30 Mfd. - 25 V.
C5 - 1.0 Mfd. - 200 V.
C6 - 0.01 Mfd. - 600 V.
C7 - 0.1 Mfd. - 600 V.
C8-C9 - 6-8 Mfd. - 475 V.
C10-C11 - 8-8 Mfd. - 475 V.
C12 - 8-8 Mfd. - 475 V.
C13 - 30 Mfd. - 25 V.
C14 - 0.1 Mfd. - 600 V.
C15 - 0.1 Mfd. - 600 V.
C16 - 0.01 Mfd. - 600 V.
C17 - 0.01 Mfd. - 600 V.
T1 - Output transformer AS349
T2 - Power PS029
CH1 - Bass Choke #02-010
CH2 - Filter Choke C1003
PL - 6.3 V - 0.15 amp. pilot lite
F - 2 amp. fuse

IMPORTANT: This amplifier, unless otherwise marked, must be operated from 115-125 volts, 60 cycles, alternating current. If you are in doubt, phone your electric light company. Be sure all tubes are in their sockets before inserting plug in receptacle.

RADIO: Although the S31A is designated as a companion unit to our MODEL S-31 Tuner for Frequency Modulated and Amplitude Modulated Broadcast Reception, any suitable tuner having an output impedance of 500 ohms may be connected to the RADIO input strip. The upper terminal is grounded.

PHONO: Any high impedance phonograph pickup may be used in conjunction with the S31A by connecting it to the PHONO strip. Again, the top terminal is grounded.

MICROPHONE: The microphone circuit is designed for high impedance microphones such as the crystal and dynamic types. The microphone receptacle is located on the rear apron of the chassis.

SPEAKER: The full high fidelity capabilities of the S31A amplifier will not be realized unless a speaker system is used which is capable of reproducing the full range of the amplifier. The frequency range offered by high fidelity FM extends from 40 to 10,000 cycles per second.

GROUND CONNECTION: To reduce the possibility of hum and noise pickup in the high gain input stage from extraneous sources the S31A chassis should be connected to a good ground.

When the speaker is located remotely from the amplifier the output line between it and the amplifier should be of sufficient cross section to minimize power loss. If speakers are to be located much more than 100 feet from the amplifier, the 500 ohm winding should be used with a matching transformer at the speaker end.

All speakers should have ample baffling both for fidelity and as a protection to the speaker cone.

A WORD OF CAUTION - Do not operate the amplifier without a speaker load, otherwise the output tubes may be damaged.

100 watts

POWER SOURCE:
115 volts 60 cycle A.C.

MODEL S-31-A
19" x 8-3/4"

CHASSIS DIMENSIONS:
16-3/4" long - 9 1/4" wide

OUTPUT:
500 ohms
8 ohms and 4 ohms

POWER CONSUMPTION:

Additional speakers may either be connected in series or in parallel, depending upon their impedances - parallel connection being preferred when possible. Since the available output impedances are 4, 8, and 500 ohms, it will be necessary to find a combination matching these values as closely as possible. Ohm's law follows in that 2-8 ohm speakers in parallel gives 4 ohms, 4- 4 ohm speakers in series gives 8 ohms, 4-8 ohm speakers in series parallel gives 8 ohms, etc.
EXTENDING CABLES

Tell the customer "So" who asks you to extend the three cables connecting keyboard to tone cabinet. Extension cables are not available from the factory. We definitely advise against splicing on longer wires. Critical tuning circuits are completed by these wires and a change in length may upset note-to-note tuning.

If it is desirable to move tone source farther from the keyboard than cables from tone cabinet permit, remove the loud speaker and extend its wires. Five wires are required. Make connections as shown in sketch. Be sure to mount the speaker in a baffle approximately size of Solovox case.

Maximum length 50'

TUBE REPLACEMENTS

Solovox tubes are excluded from 1 year guarantee which goes with each instrument. Tub manufacturer's regular guarantee applies. Tubes may be returned for replacement thru jobber or to us.

Free replacements are allowed only if tubes are not broken or damaged, actually tested bad, and code marking shows them in guarantee. Obsolescence schedule is shown here for your guidance. Tubes with code dates other than those shown are obsolete and not subject to adjustment.

ADJUSTMENT OF OSCILLATORS

The service man should have a thorough knowledge of oscillator adjustment because he will most likely be called upon to perform this service more frequently than any other. A change in setting of the master tuning knob, a change of keyboards or installation of a new oscillator tube will necessitate readjustment of the oscillators. It is often advisable for the service man to give instructions on oscillator adjustment to the Solovox owner. The following is a detailed explanation of oscillator adjustment.

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### ASSUMING THAT THE MASTER AND PRECEDING OSCILLATOR ARE OPERATING CORRECTLY

The master oscillator is tuned by the condensers in the key- board and supplies frequencies for the highest octave of the six octave tonal range. The buffer oscillator, which is con- sidered as a controlled oscillator although it has no adjust- ment potentiometer, is used as an electronic link between the master oscillator and the rest of the controlled oscillators and has its circuit constants predetermined so as to oscillate at the same frequency as the master oscillator. Each of the remaining controlled oscillators when supplied with the proper amount of locking signal should oscillate at one half the fre- quency of the preceding oscillator. This locking signal is the same signal that is generated by the preceding oscillator but the amplitude is regulated by the adjustment potentiometer.

The master oscillator is tuned by the condensers in the key- board and supplies frequencies for the highest octave of the six octave tonal range. The buffer oscillator, which is con- sidered as a controlled oscillator although it has no adjust- ment potentiometer, is used as an electronic link between the master oscillator and the rest of the controlled oscillators and has its circuit constants predetermined so as to oscillate at the same frequency as the master oscillator. Each of the remaining controlled oscillators when supplied with the proper amount of locking signal should oscillate at one half the fre- quency of the preceding oscillator. This locking signal is the same signal that is generated by the preceding oscillator but the amplitude is regulated by the adjustment potentiometer.

### FIG. 1 COMPLETE ROTATION OF OSCILLATOR ADJUSTMENT POTENTIOMETER ARM

**NOTES**

- Position of slot shown here does not necessarily mean that every slot will assume this position when correctly adjusted.

Assuming that the master and preceding oscillator are operating correctly, the following is an explanation of what happens in a complete rotation of an adjustment potentiometer. See figure #1. Turning the potentiometer to its extreme counter clockwise position the oscillator will operate at the same frequency as the preceding oscillator because the amplitude of the locking signal is too great. Now, turning the potentiometer clockwise, a point is reached where the oscillator locks-in at one-half the frequency of the preceding oscillator because the amplitude of the locking signal is of proper intensity to cause this condition. It is then operating exactly one octave below the preceding oscillator and for correct adjustment the potentiometer arm should be set midway between the top and bottom limits of this 1/2 frequency range. Turning the potentiometer further clockwise, a point will be reached where it will either lock-in at one-third the frequency (this is an octave and a fifth below musically speaking) or it may refuse to lock-in and will start to hunt a frequency of its own which bears no definite mathematical relation to the frequency of the preceding oscillator. A "gurgle" is usually present at this point where the oscillator starts to change to a different frequency.

### CONDITIONS THAT MAY MAKE OSCILLATOR ADJUSTMENT DIFFICULT OR IMPOSSIBLE ARE THE FOLLOWING:

1. Improper operating voltages at the grid, plate or cathode of an oscillator tube.
2. Defective oscillator tube.
3. Inoperative master or buffer oscillator.
4. Defective parts associated with the oscillator circuits.
PROCEDURE FOR ADJUSTMENT OF OSCILLATORS. The primary requisites for adjusting oscillators are that the master and buffer are operating correctly and that you must start by adjusting the 2nd oscillator and then progressively adjust each succeeding oscillator. After you have become familiar with the method of adjustment as described in "To the Solovox Owner" you may try the following method which is somewhat quicker. Push "on" the "Soprano" only and adjust the 2nd and 3rd oscillator by depressing the F key in the middle and lowest octave respectively. Then, push "on" the "Bass" only and adjust the 4th, 5th and 6th oscillator by depressing F key in the highest, middle and lowest octave respectively. Then, by running down the scale, first with the "Soprano" only "on" and then with the "Bass" only "on". Of course, in this check the low C key with the "Soprano" "on" should be chromatically related to the high G key with the "Bass" "on".

If the adjustment potentiometers should get so far out of adjustment that you become confused, the following hint may prove helpful. Turn all potentiometers to their extreme counter clockwise positions and then follow the normal oscillator adjustment procedure.

IMPROVEMENTS WHICH CAN BE ADDED TO EARLY MODELS.

KEY TENSION
Lower key springs (control contacts) were increased in thickness effective with keyboard #18936. This change eliminates contact tip breakage and slightly increases key tension.

We suggest this improvement be added to early keyboards if trouble is experienced with broken contacts or customer complaints of light key tension. Material required: 12 AR-18936-0 contact spring assemblies (furnished with small tin of rooker arm grease) - $1.20 per set, list. Time required: 1 hour. Replacement procedure is as follows:

1. Remove keyboard cover plate by taking out screws underneath and in back of key action. Slide metal screw strip at bottom of keyboard out and remove contact springs with a small screwdriver.

2. Set keyboard on blocks to relieve pressure on keys and install new contact springs by manipulating bakelite key actuator into proper position. Make sure small anti-rattle spring is also threaded thru hole.

3. Apply a small amount of rooker arm grease at junction of actuator and contact arm. This will eliminate key squeaks sometimes noticeable. Be sure to use lubricant sparingly so none of it touches contacts.

4. Test to make sure contact is made when each key is depressed. If some contacts seem to make too lightly, bend tip down slightly - don't kink.

5. Now reassemble and test for normal operation.

VIBRATO OPERATION

The vibrato effect is produced by a magnetically driven reed having a piece of powdered iron core attached to it in such a way as to move in and out of an inductance coil mounted near the reed thereby causing the inductance of the coil to vary periodically. This coil is connected to a tap on the master oscillator tuning coil and causes the oscillator frequency to vary. When the reed, which has to be started mechanically, is given a "kick" by the vibrato starter spring when the volume control lever is pulled forward in turning "on" the instrument. After the reed is once started, the magnetic drive keeps it in motion as long as the instrument is "on" regardless of whether the vibrato tablet is "on" or "off".

The action of the reed may be described as follows: When the reed is moving towards the driving coil, i.e., the reed driving contact is closed thus producing a strong magnetic field which pulls the reed towards the driving coil. When the reed reaches the end of its swing and starts to move away from the driving coil, the vibrato driving contact is open thus causing a collapse of the magnetic field. Then, when the reed reaches the end of its swing in this direction and starts moving towards the driving coil again, the cycle of action is repeated. The 175 ohm resistor is in series with the coil to prevent sparking of the contacts.

VIBRATO CHANGES - Several changes have been made in the vibrato assembly pertaining to the size and amount of the reed weight washers and the spacing between the reed and the driving magnet coil. The changes, with the serial number of the keyboard in which the change was made, are the following:

KBD Serial #15612 - The original 3 weight washers of 5/8" diameter were replaced with 3 weight washers of 3/4" diameter in order to decrease the vibrato speed. See Service letter #2.

KBD Serial #14400 - The vibrato driving coil mounting bracket was moved back away from the reed 9/64" and only one 3/4" weight washer was used. This was done to reduce the vibrato mechanical noise to a minimum.

KBD Serial #5225 - The vibrato driving coil mounting bracket was moved 1/16" closer to the reed and two 3/4" weight washers were used. This was done to insure reliable operation with an unobjectionable amount of noise and is the happy medium between the two previous changes.

VIBRATO TROUBLES

VIBRATO NOISE - If a customer objects strongly to the vibrato mechanical noise in keyboards with serial numbers below 44000 it may be reduced by incorporating the following change: Move the driving coil back 1/16" and use only two 3/4" weight washers. By removing the coil from the mounting bracket and using long nose pliers the mounting bracket can be bent back to the required 1/16". A convenient way to assure the proper position of the driving coil is to measure the distance from the end of the brace coil mounting bracket to the inside edge of the brace.
at the back of the chassis. For a two weight washer vibrato assembly, the distance should be 5/16" as shown in figure #1. Then readjust the position of the reed to the mid-point of the felt cushions as outlined in section 3 of Service Letter 8-2. It should be noted that in certain installations the vibrato noise may be accentuated by the keyboard construction of the piano.

**VIBRATO STOPPING** — A few cases of unreliable vibrato operation have been reported in keyboards using the single weight washers (Keyboard serial numbers between 44000 and 52284). The vibrato in this serial number group, while being very quiet, are more susceptible to stopping on account of low line voltage and slight imperfections of parts. Any slight drag on the vibrato driving contact will be transmitted to the reed and may cause slowing down or stopping of the reed. Driving contact drag may be caused by the following: 1- A Burr on the light colored bakelite washer which causes friction between the washer and the brass stud. 2- Solder rosin deposits on the bakelite washers. 3- Spring tension on the bakelite washers too great.

If the vibrato in one of the keyboards listed in the above serial number group shows signs of being unreliable, we suggest the following remedy: Move the driving coil 1/16" nearer the reed and use two 3/4" weight washers instead of one. As mentioned previously, a convenient way to assure the proper position of the driving coil is to measure the distance from the end of the brass coil mounting bracket to the inside edge of the flange at the back of the chassis. For a two weight washer vibrato assembly the distance should be 5/16" as shown in figure #1. Adjust the reed to the mid-point between the stop felt cushions.

Solovox Keyboard starting with serial #5225. This change may be incorporated in any keyboard to insure reliable operation of the reed and to reduce mechanical noise.

Another cause of vibrato stopping which applies to all keyboards regardless of serial number is grounding of the driving contact by a piece of foreign metal lodging between the contact arm and the chassis.

Also in shipment, the spring coil, which is used only as a flexible lead between the driving contact and the terminal lug, may change position and ground out against the chassis. This may result in intermittent operation.

**KEYBOARD SPACERS**

The Solovox keyboard should be so located that the distance between the surfaces of the piano white keys and the Solovox white keys is more than one and less than two inches. Occasionally the dimensions of a piano are such that the Solovox keyboard will not naturally fit within this range. For such instances special bakelite bracket spacers which will raise the keyboard 3/8 inch are available at the factory. As many as three sets may be attached to the instrument, raising the keyboard 3/8, 3/4 or 1-1/8 inches as desired. The sketch below illustrates an installation requiring two sets of spacers.

It is important however, to pre-determine exactly how many spacers are to be used and to order exactly that amount so that the proper length screws will be received. Screws must not enter the bottom surface of the instrument more than 1/8 inch otherwise serious damage will result. When ordering please specify FO-1868-1 and FO-1869-1 spacers. Available in black only.

---

**Fig. 1.** Showing position of vibrato driving coil and vibrato reed using two weight washers - first used in

---

**Fig. 2.** Each spacer 9/16" thick
SPECIAL SOLOVOX SERVICE NOTES

TRROULE: - Difficult or impossible to adjust oscillators--some tones "gargle" or play wrong notes.

A survey in the field shows that 80% of all the Solovox service problems are confined to trouble experienced with a single fixed carbon resistor of critical value which makes it impossible to properly adjust the oscillators and causes the tones to "gargle" or play wrong notes when this resistor changes in value due to dampness.

This resistor is of the fixed carbon type having a value of 200,000 ohms (250,000 ohms for some models) and is connected in the voltage divider circuit for the bias on the controlled oscillators (shown at the upper left in the figure 1 wiring diagram supplied with each instrument). The physical location of this resistor in the Solovox tone cabinet is shown on the reverse side of this sheet. If the tones "gargle" or play wrong notes, connect a DC meter across the 8000 ohm wire wound resistor also shown on the reverse side of this sheet using a 1000 ohms per volt meter on the 10 volt scale. The meter should read approximately 2 volts with no keys depressed, and smoothly drops to zero and then to a slightly positive voltage as the top seven white keys are progressively played starting from the top key (key farthest to the right). If this voltage is low, remove the resistor and replace with a new one (such as an I.R.C. metallized resistor or CentraLAB resistor). If possible, use a 2 watt resistor as they are more stable than the 1 watt size. After replacing this resistor, be sure to readjust the oscillators as described on page 2 in "To Solovox Owners".

TRROULE: - Volume low.

Ten percent of all Solovox service trouble lies with another fixed carbon resistor which increases in resistance due to humidity and thereby causes the maximum volume attainable to go down.

This resistor is also of the fixed carbon type, having a value of 350,000 ohms (250,000 ohms in some models) and is connected in the volume control voltage divider circuit shown at the lower right in the figure 1 wiring diagram. The physical location of this resistor is also shown on the reverse side of this sheet. If the volume is low even when the "maximum volume control" is turned for maximum volume, remove it and replace with a new 300,000 or 250,000 ohm resistor (such as an I.R.C. metallized resistor or CentraLAB resistor). If possible, use a 2 watt resistor as they are more stable than the 1 watt size.

D.C. VOLTAGE ACROSS THE 8000 OHM RESISTOR SHOULD BE APPROX. 1.6 V. USING THE 10 V. SCALE ON A 1000 OMEGAS PER VOLT METER WITH NO PLAYING KEYS DEPRESSED. IF VOLTAGE IS LESS THAN 1.4 V. OR OVER 1.9 V. REPLACE THE .2 MEGOHM RESISTOR AS NOTED BELOW.

SOME MODELS USE .25 MEG. RESISTOR

REPLACE THIS RESISTOR IF OSCILLATORS ARE DIFFICULT TO ADJUST AND TONES "GARGLE" OR SOUND WRONG NOTES.

REPLACE THIS RESISTOR IF MAXIMUM VOLUME IS LOW

SOME MODELS USE .35 OR .37 MEG. RESISTOR
HOWARD RADIO CO.

Dial Cord Layout - 300 Series

The STRING TENSION of the drive string is maintained by the coil spring mounted on the large drive pulley. Too much tension will cause an extra load in tuning. Lack of tension will naturally cause backlash.

See that dial light sockets do not touch top edge of tuning hand as it moves across dial plate.

Since the pull against the large pulley is quite great, see that the set screws in the pulley hub to the condenser shaft are tight to avoid slipping.

The above diagram is shown for use should the loop ever be replaced or the connections broken.

The layout is shown with the variable condenser all the way in at maximum capacity and the tuning hand at the last line above 550.

CONSUMPTION 50 WATTS

TUNING RANGES - 540 to 1700 KC, 2.2 to 7 MC, 7 to 22 MC, (566-175, 140-47, 47-13 Meters)

I. F. = 465 KC TYPE = Conventional POWER OUTPUT - (MAX.) = 2.7 WATTS; UP 1.5 W.

CONTROLS - Upper left - Volume; Upper right - TUNING; Lower left - TONE and POWER SWITCH;

Lower right - BAND SWITCH, Clockwise movement shifts to higher frequency bands.

TUNING SYSTEM: String driven horizontal movement hand, rubber tip friction tuning shaft -- Ratio 7 to 1.

SPEAKER = Electro-Dynamic SIZE = 6" V.C.IMP.(400CPs) = 4 Ohms FIELD = 1300 Ohms
SOCKET VOLTAGE READINGS:

Voltage taken from ground with line voltage at -117 AC.
High Voltage reading off rectifier - 300 V.
Drop across speaker field - 65 V.
Voltage taken with 1,000 Ohm per volt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SA7</td>
<td>Mixer</td>
<td>105</td>
<td>246</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>IF</td>
<td>105</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6S57</td>
<td>Det.</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9K00T</td>
<td>Output</td>
<td>16</td>
<td>245</td>
<td>235</td>
<td></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 crossover between 18 and 22 MC. If necessary for stability, turn the antenna trimmer "IN" slightly.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Position of Dial Pointer</th>
<th>Signal Generator Frequency</th>
<th>Signal Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>Min, Cap.</td>
<td>465 KC</td>
<td>6SA7 Grid</td>
<td>A</td>
<td>l1, l2, l3, l4</td>
<td>IF</td>
</tr>
<tr>
<td>SW</td>
<td>18 MC</td>
<td>18 MC</td>
<td>Brown lead</td>
<td>B, D, K</td>
<td>06, 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>07, 08</td>
<td>Osc. Ant.</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>1400 KC</td>
<td>1400 KC</td>
<td>Brown lead</td>
<td>09, 10</td>
<td>Osc. Ant.</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>600 KC</td>
<td>600 KC</td>
<td>Brown lead</td>
<td>C</td>
<td>P11</td>
<td>Osc. Pad.</td>
</tr>
</tbody>
</table>

©John F. Rider
To change switch position, remove screw at "X" and slide guide plate until the black sections of the switch are opposite the required voltage range as shown by the arrow.
THE BEAT FREQUENCY OSCILLATOR

The adjacent figure shows an underneath view of the socket for the BP3 6J5 tube and its associated coil unit. The means of coupling this oscillator with the incoming signal is the conventional method of allowing small capacity between the BFO grid lead and the diode circuit. The shielded lead shown comes from the diode of the 2nd detector and is anchored on a dummy terminal of the BFO socket. The oscillator grid (green) lead is capacity coupled to this lead by one or more turns wrapped around the unshielded portion of the diode lead. THE AMOUNT OF THIS COUPLING IS CRITICAL.

INSUFFICIENT CAPACITY results in a weak beat oscillator or no apparent oscillator at all with weak incoming signals.

TOO MUCH CAPACITY COUPLING causes severe repeat BFO harmonics which appear all over the bands.

To increase or decrease the BFO action, remove the bottom from the cabinet and vary this coupling to suit. Keep in mind that should the turns be increased, there may be too much coupling if the turns are wound too tight around the diode lead.

FOR TRIMMER LOCATIONS, SEE CHART BELOW

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.

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 can to obtain maximum sound which will be a hissing noise. Turn tuning knob to be sure this sound is not some tunable frequency that is causing it.
3. Check beats against some broadcast station to determine if the strength of the beat is normal.

NOTE 2: In this band (17 to 43 MC) only the oscillator follows the received signal 485 KC lower in frequency. Therefore when checking for the image, if the alignment has been made at 56 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 that 17 to 43 MC band at a point 900 KC lower on the dial.

NOTE 4: Rock main dial slightly for point of maximum signal as the padding condenser is being adjusted.

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>DUMMY ANTENNA</th>
<th>Sig. Gen. Connection To</th>
<th>Gen. Freq.</th>
<th>Band Inv. Position</th>
<th>Dial Setting</th>
<th>See Note</th>
<th>Order of Trimmer Adjustments</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>.05 mfd. Grid of 12BA7</td>
<td>465 KC</td>
<td>1.7-55</td>
<td>Off Station</td>
<td>1</td>
<td>C1, C2, C3, C4</td>
<td>I.F.-peak</td>
<td></td>
</tr>
<tr>
<td>400 Res.</td>
<td>A &amp; D</td>
<td>1400 KC</td>
<td>1.7-55</td>
<td>1.4</td>
<td>T11, T12, T13</td>
<td>Osc-RF-Ant.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>600 KC</td>
<td>.60</td>
<td>4</td>
<td>P14</td>
<td>Osc. Pad.</td>
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<td></td>
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<td>5 MC</td>
<td>5</td>
<td>3</td>
<td>T7, T8, T9</td>
<td>Osc-RF-Ant.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1.8 MC</td>
<td>1.8</td>
<td>4</td>
<td>P10</td>
<td>Osc. Pad.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>16 MC</td>
<td>16 MC</td>
<td>3</td>
<td>T4, T5, T6</td>
<td>Osc-RF-Ant.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>36 MC</td>
<td>36 MC</td>
<td>2</td>
<td>T1, T2, T3</td>
<td>Osc-RF-Ant.</td>
<td></td>
</tr>
</tbody>
</table>
HOWARD RADIO CO.

MODEL 718-X RADIO PHONO COMBINATION - NEW PRODUCTS MODEL 200 RECORD CHANGER

DESCRIPTION OF OPERATION

To load the instrument with records, turn the changer blades AJ to the position as shown in the top view (counter-clockwise) and place a stack of ten 12" or twelve 10" records on the center spindle, allowing them to rest upon the lower changer blades.

The operation of the changer mechanism is controlled by means of the single button AG on the base plate AK. Turn the button to point to automatic. Then press down, to start cycle. The changer will then automatically play all records in the order stacked.

To remove records, after all have been played, lift slightly each set of changer blades AJ, and pivot clockwise approximately a half of a complete turn. (180°). There will then be no obstructions to prevent removing the records.

To change records any time when the needle is on the record, merely press down momentarily on the control button.

To play records singly, turn changer blades AJ away from center of table (clockwise), and turn the control button to Manual.

DESCRIPTION OF CHANGE CYCLE

The change cycle consists of automatically removing the pickup arm from last played record, releasing the next record, and placing the pickup arm in the playing position. There are three conditions which cause the mechanism of the instrument to start and proceed through the change cycle.

1. Pressing down control button AG rotates reject rod BD. The bent end of BD (which is same as DC) strikes the ratchet casting DF, which is fastened to trip rod DE (BE in bottom view), rotating rod BE. This pivots the bent end of BE away from the end of follower CL, allowing the heavy end of follower CL to drop, pivoting about its axis (which extends through follower arm BJ and drive arm CJ), and engaging it in the worm CN. The worm CN has a left and right thread which carries the follower CL to the opposite end of CN and returns it. This action through the axis pin of follower CL causes the pivoting of drive arm CJ and clutch arm CK about their common axis.

2. The construction of drive arm CJ and clutch arm CK together with the clutch springs CG, provides protection against breakage of the instrument or records in case of jamming.

The clutch arm CK thrusts the drive link BL, actuating the blade bell crank BM, and in turn the blade crank CE through tie bar CF which is riveted to the blade bell crank BM. This action operates the changer blades AJ.

3. When a record has been played and the pickup arm has reached a definite distance from the center spindle following the spiral groove towards the center of the record, the stop adjusting screw DV in the pickup crank strikes the ratchet casting DF, which in turn rotates the trip rod DE, causing the engagement of the follower CL, etc.

3. Records that have an eccentrcic groove inside of the playing or modulated grooves will give the pickup arm AC an oscillatory movement. This oscillation is transmitted to the pickup crank DT, which, when in the playing position, drags the pawl DU across the ratchet DF, with the pawl spring DS tending to hold the pawl DU straight out and any back movement of the arm DA and crank DT causes the pawl DU to catch on the ratchet DF, pushing it away against the tension of ratchet spring DG and rotating trip rod DE. DE in turn releases follower CL, engaging it in worm CN, etc.

The operation of the pickup arm DA (AC in top view) is controlled by the cam DW which is synchronized with the changer blades AJ. The rack link BH transmits action from the blade bell crank BM, through the rack DD (BC in bottom view), to cam pinion DH.

The determination of the set down position of the pickup arm AC originates at the selector AA. As the changer blades AJ pivot in operation, the selector AA is intercepted by the edge of a record. This stops the rotation of the selector crank CC fastened to the selector (CD in bottom view), and in turn the axial movement of selector rod CB (same as DP), said axial movement being caused by selector spring DM.

The rod CB interferes with the axial movement of the pickup crank DT, in accordance with the size of the record played through the blades AJ, causing the cam follower DR to follow the outer groove or to be allowed to ride into the inner groove in the face of cam DW. The outer groove controls the set down position for 12" records, and the inner controls the 10" records.

ADJUSTMENTS

Should the changer blades AJ be forcefully turned out of proper adjustment, loosen the clamping screws in the blade crank CE and or the blade bell crank BM, and with the machine in neutral at the end of a cycle or in the playing position, turn the blades so that the upper blades are equi-distant and within 1/6 of the edge of a 12" record. Then clamp screws securely.

To adjust the set down position of tone arm, turn off the machine during cycle just before the pickup arm descends to a record, loosen the set screw in crank DT, and while holding the crank DT in place, turn the pickup arm AC until it is straight above the outside groove of the record. Then retighten the set screw.

The adjustment of the ratchet DF on rod DE (BE in bottom view); the selector crank CC on the switch button shaft; the small casting on the straight end of DC (BD in bottom view); and the selector crank CC on the selector CD are limited and obvious to the authorized repair man, from the description of cycle.

REPLACING MOTOR

Remove idler wheel and the three motor mounting screws. Be sure to save metal bushing spacers, which slip inside of rubber grommets. These prevent rubber from being squeezed out of shape with the weight of motor and prevent proper cushioning of motor. Place motor of proper rating in same position as present motor and replace spacers, washers and screws as before.

LUBRICATION

No lubrication should be necessary. However, in case of squeaks or stiffness of operation a drop of any good light machine oil on each of the bearings on the spindle worm, motor, and at other pivot points should be applied. Also, a light application of grease to the worm itself might help.
**SOCKET VOLTAGE READINGS FOR MODEL 810**

*Socket Terminal Number*

Voltage taken from ground with voltage at 117 Volts AC. Drop across speaker field 85 V. Use at least a 1000 Ohm per Volt Meter. High voltage reading off rectifier 315 V.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATH.</th>
<th>SG.</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6S170T</td>
<td>R.F. 1 &amp; 4</td>
<td>5</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>6SA7OT</td>
<td>converter</td>
<td>100</td>
<td>4</td>
<td>260</td>
</tr>
<tr>
<td>6SK7F</td>
<td>I.F.</td>
<td>3</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>6S67</td>
<td>Det.</td>
<td></td>
<td>85</td>
<td>6</td>
</tr>
<tr>
<td>6S27</td>
<td>Mic.Amp.</td>
<td></td>
<td>75</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATH.</th>
<th>SG.</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6U6</td>
<td>Tuning eye</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6SL7</td>
<td>Inverter</td>
<td>1.5</td>
<td>6</td>
<td></td>
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<tr>
<td>6A7</td>
<td>A.F.</td>
<td>1.5</td>
<td>6</td>
<td></td>
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<tr>
<td>6K20T</td>
<td>Output</td>
<td>18</td>
<td>8</td>
<td>260</td>
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<tr>
<td>6N30T</td>
<td>Output</td>
<td>18</td>
<td>8</td>
<td>260</td>
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</tbody>
</table>

**ALIGNMENT PROCEDURE FOR MODEL 810**

<table>
<thead>
<tr>
<th>DUMMY ANTENNA</th>
<th>SIG. GEN. CONNECTION TO</th>
<th>GEN. FREQ.</th>
<th>BAND SW. POSITION</th>
<th>DIAL SETTING</th>
<th>ORDER OF TRIMMER ADJUSTMENTS</th>
<th>TRIMMER FUNCTION</th>
<th>SEE NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>.05 Mfd. Grid of 6SA7</td>
<td>465 KC</td>
<td>&quot;A&quot; Band</td>
<td>Off Station</td>
<td>See Pictorial 1 &amp; 2</td>
<td>I.F. peak to max. output</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>400 Ohm Resistor Ant.</td>
<td>1400 KC</td>
<td>&quot;A&quot; Band</td>
<td>1400 KC</td>
<td>See Pictorial 5</td>
<td>BC Osc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>600 KC</td>
<td>&quot;A&quot; Band</td>
<td>600 KC</td>
<td>Rock Dial</td>
<td>BC Osc. Pad.</td>
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<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>5 MC</td>
<td>&quot;B&quot; Band</td>
<td>5 MC</td>
<td>Then 7</td>
<td>Pol. Band Osc. - Ant. Check Image at 4.1</td>
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<tr>
<td>&quot;</td>
<td>10 MC</td>
<td>&quot;C&quot; Band</td>
<td>15.6 MC on &quot;D&quot; Band</td>
<td>Then 10</td>
<td>Osc. Pad.</td>
<td>2</td>
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<tr>
<td>&quot;</td>
<td>12 MC</td>
<td>&quot;C&quot; Band</td>
<td>12 MC</td>
<td>Then 12</td>
<td>Osc. Trimmer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>16 MC</td>
<td>&quot;D&quot; Band</td>
<td>2.4 MC on &quot;B&quot; Band</td>
<td>Then 14</td>
<td>Osc. Pad.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>20 MC</td>
<td>&quot;D&quot; Band</td>
<td>20 MC</td>
<td>Then 16</td>
<td>Osc. Trimmer</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**EQUIPMENT REQUIRED:**

1. Signal generator to accurately cover the alignment frequencies shown in the table.
2. Output Meter (0 to 3 V. AC, if used in voice coil circuit).
3. Dummy Antenna. Although the values as shown in the table for antenna load may be satisfactory, we urgently recommend the circuit below to properly take care of the frequencies for correct alignment.

**START ALIGNMENT WITH:**

Volume control full "ON" to right and Band Switch in "A" Band position. After checking for pointer travel to last line above 550, set dial to point where there is no interference with generator signal and proceed with I.F. alignment.

**NOTE THAT THIS IS A SPREAD BAND RECEIVER AND THE ALIGNMENT PROCEDURE IS NOT CONVENTIONAL. ONE SET OF COILS COVERS TWO SHORT WAVE BANDS WHICH ARE SPREAD BY MEANS OF PADDANG CIRCUITS.**

**NOTE ALSO THAT A SETTING POINT FOR THE DIAL HAND POSITION IS GIVEN ON A DIFFERENT BAND OTHER THAN THE BAND BEING ALIGNED AND THE FREQUENCY SETTING OF THE GENERATOR. THIS IS NECESSARY TO OBTAIN THE PROPER BAND-SPREAD.**

---

**Diagram:**

1. Generator.
2. Recorder Ant.
3. IF Lead.
5. Layout showing how to assemble dial cable on, model 806-808 etc., vertical mounting.
**Howard Radio Co.**

**Model 802**

**Tuning Ranges**
- 540 to 1720 KC and 4.6 to 16 MC (178-550 and 18-65 Meters)

**Speaker**
- Electro-dynamic

**Size**
- 5"

**V.C.I.M.P. (4000 CPS)**
- 5 Ohms

**Field**
- 450 Ohms

**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>640</td>
<td>465</td>
<td>Grid of 12SA7</td>
<td>A</td>
<td>I₁, I₂, I₃, I₄</td>
<td>IF</td>
<td>13 MC</td>
</tr>
<tr>
<td>MC</td>
<td>14 MC</td>
<td>14 MC</td>
<td>Ant. (Brown)</td>
<td>B</td>
<td>O₅, O₆</td>
<td>Osc. Ant.</td>
<td>13 MC</td>
</tr>
<tr>
<td>KC</td>
<td>1400 KC</td>
<td>1400 KC</td>
<td>Ant. (Brown)</td>
<td></td>
<td>O₇</td>
<td>Osc.</td>
<td></td>
</tr>
</tbody>
</table>

- 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 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 as shown by the schematic diagram.
- The dual section filter condenser has a common negative, but note that it does not return to ground as the can is insulated from the chassis.

**Tube Function**

<table>
<thead>
<tr>
<th>Tube</th>
<th>Function</th>
<th>Cath.</th>
<th>SG.</th>
<th>Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>12SA7</td>
<td>Mixer</td>
<td>*</td>
<td>92 4</td>
<td>92 3</td>
</tr>
<tr>
<td>12SK7</td>
<td>I.F. Amp</td>
<td>2.1 5</td>
<td>92 6</td>
<td>92 8</td>
</tr>
<tr>
<td>12SQ7</td>
<td>Det.</td>
<td></td>
<td>42 6</td>
<td></td>
</tr>
<tr>
<td>50L6GT</td>
<td>Output</td>
<td>6 8</td>
<td>92 4</td>
<td>82 3</td>
</tr>
<tr>
<td>35Z5GT</td>
<td>Rectifier</td>
<td>121 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Socket Terminal Number.

**Socket Voltage Readings**

 Voltage taken from B- with line voltage at 117 V. A.C.
- High voltage reading off rectifier = 115V.
- Drop across speaker field = 29V.
- Use at least a 1000 Ohm per volt meter.
- High voltage reading off rectifier = 121V.

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AS SWITCH IS SET TO HIGHER FREQUENCY BANDS THE SECONDARY COILS
OF THE LOW FREQUENCY BANDS ARE SHORTED OUT

I. F. 465 K.C.

I. F. PEAK 465 KC

Note: Model 865 Series 1 Uses Electro-
Dynamic Speaker #15-808 for 6 Volt
D.C. Operation.
HOWARD RADIO CO.

POWER SUPPLY = 6 Volt Battery Supply
MODEL 865
DRAIN = 2.6 Amps.

MODEL 868

ANTENNA SYSTEM = Conventional. Connect Antenna to BROWN lead. Connect Ground to BLACK lead.

TUNING RANGES = 540 to 1700 KC, 2.2 to 7 MC, 7 to 22 MC.

I.F. = 465 KC. TYPE = Iron Core POWER OUTPUT (MAX.) = 2 WATTS.

CONTROLS: Lower Left, Volume; Middle left, Tone; Upper left, On-Off;
Lower Right, Band Switch; Middle Right, Tuning; Upper right, Band Spread.

TUNING SYSTEM:
Horizontal dial, string drive, fly wheel tuning. Band Spread with 320 degree disc indicator.

SPEAKER = Electro dynamic SIZE = 8" VOICE COIL = 3 OHMS (400 CPS) FIELD = 15 OHMS

STRING LAYOUT INTERNATIONAL SERIES

MODEL 865, MODEL 868

MODEL 865 ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band</th>
<th>Position</th>
<th>Frequency</th>
<th>Generator</th>
<th>Generator Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch Position</td>
<td>of Dial</td>
<td>Pointer</td>
<td>Connection</td>
<td>See Note</td>
</tr>
<tr>
<td>Broadcast</td>
<td>Max. Cap.</td>
<td>465 KC</td>
<td>Converter Grid</td>
<td>A, D</td>
</tr>
<tr>
<td>7-22 MC</td>
<td>21</td>
<td>21 MC</td>
<td>Ant. (Brown)</td>
<td>B</td>
</tr>
<tr>
<td>2.2-7 MC</td>
<td>6</td>
<td>6 MC</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>2.2-7 MC</td>
<td>2.2</td>
<td>2.2 MC</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Broadcast</td>
<td>1400</td>
<td>1400 KC</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Broadcast</td>
<td>600</td>
<td>600 KC</td>
<td>&quot;</td>
<td>&quot;</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 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 pad 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.

SOCKET VOLTAGES

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>BCR. GRID</th>
<th>PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6H8A7</td>
<td>Mixer</td>
<td>3</td>
<td>90</td>
<td>145</td>
</tr>
<tr>
<td>6H70</td>
<td>IF</td>
<td>3</td>
<td>70</td>
<td>145</td>
</tr>
<tr>
<td>6T70</td>
<td>Det.</td>
<td>x</td>
<td>x</td>
<td>50</td>
</tr>
<tr>
<td>6L5G</td>
<td>Audio</td>
<td>6 V. Bias</td>
<td>x</td>
<td>145</td>
</tr>
<tr>
<td>6279</td>
<td>PP Output</td>
<td>x</td>
<td>x</td>
<td>140</td>
</tr>
</tbody>
</table>
HOWARD RADIO CO.

POWER SUPPLY—(Standard Models) = 105-125 V. 60 Cycle

CONSUMPTION = 95 WATTS

ANTENNA SYSTEM = Conventional. Connect Antenna to BROWN lead. Connect Ground to BLACK lead.

TUNING RANGES = 540 to 1700 KC; 2.2 to 7 MC, 7 to 22 MC.

I. F. = 465 KC. Two tuned stages and one resistance coupled stage.

POWER OUTPUT = (MAX.) 6 WATTS UPO = 4 W.

CONTROLS: Lower Left: Volume; Middle Left: Tone; Upper Left: Power Off-On; Lower Right: Band Switch; Middle Right: Tuning; Upper Right: Band Spread.

TUNING SYSTEM: Horizontal dial, string drive, fly wheel tuning. Band Spread with 320 degree disc indicator.

SPEAKER = Electro dynamic SIZE = 8" VOICE COIL = 3 OHMS (400 CPS) FIELD = 500 OHMS

MODEL 868

ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>Wave-Band Switch Position</th>
<th>Generator Frequency</th>
<th>Generator Connection</th>
<th>See Note</th>
<th>Trimmers Adjusted (In order shown)</th>
<th>Trimmer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast Max. Cap.</td>
<td>465 KC</td>
<td>Converter Grid</td>
<td>A,D</td>
<td>11,12,13,14</td>
<td>IF</td>
</tr>
<tr>
<td>7-22 MC Max. Cap.</td>
<td>21</td>
<td>Ant. (Brown)</td>
<td>B</td>
<td>05, 06, A7</td>
<td>Osc, RF, Ant.</td>
</tr>
<tr>
<td>2.2-7 MC</td>
<td>6</td>
<td>6 MC</td>
<td>C</td>
<td>08, G9, A10</td>
<td>Osc, RF, Ant.</td>
</tr>
<tr>
<td>2.2-7 MC</td>
<td>2.2</td>
<td>2.2 MC</td>
<td>C</td>
<td>012, G13, A14</td>
<td>Osc, RF, Ant.</td>
</tr>
<tr>
<td>Broadcast 1400</td>
<td>1400 KC</td>
<td>&quot;</td>
<td>C</td>
<td>P15</td>
<td>Osc, Pad.</td>
</tr>
<tr>
<td>Broadcast 600</td>
<td>600</td>
<td>&quot;</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 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.

MODEL 868 SOCKET VOLTAGE READINGS

Voltage taken from ground with line voltage at -120 V.
High voltage reading off rectifier -330 V.
Drop across speaker field -85 V.
Voltage taken with 1,000 Ohm per volt meter.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6SD7GT</td>
<td>R.F.</td>
<td>2.5</td>
<td>95</td>
<td>235</td>
<td>95</td>
</tr>
<tr>
<td>6SA7</td>
<td>Mixer</td>
<td>96</td>
<td>235</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F.Amp.</td>
<td>3</td>
<td>96</td>
<td>196</td>
<td>96</td>
</tr>
<tr>
<td>6SK7</td>
<td>I.F.Amp.</td>
<td>3</td>
<td>96</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td>6SQ7</td>
<td>Diode-AVC</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>CATHODE</th>
<th>SCR. GRID</th>
<th>PLATE</th>
<th>OSC. PLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6K6GT</td>
<td>Output</td>
<td>17</td>
<td>235</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>6K6GT</td>
<td>Output</td>
<td>17</td>
<td>235</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>6J5GT</td>
<td>Inverter</td>
<td>7.5</td>
<td>145</td>
<td>80</td>
<td>Rect.</td>
</tr>
<tr>
<td>6U5</td>
<td>Tuning Eye</td>
<td>235</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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