### SPECIFICATIONS

#### GENERAL

- **Dimensions:** 2 1/2" H x 10 1/4" W x 12 1/4" D (64 x 263 x 318 mm)
- **Weight:** 10 lbs. (4536g) less cables and charger
- **Attack Time:** 300 msec. maximum (Priority Unit)
- **Temperature Range:** -30°C to +60°C, +25°C reference
- **Power Input:** 13.8 V dc, ± 15%
- **Single-tone Encoder/Decoder:** Plug-in element
- **Time-Out Timer:** Two minutes ± 0.5 minute
- **Channel Capability:** C1R1

#### RECEIVER

- **Frequency Range:** 150.8-174 MHz
- **Frequency Stability:** ±0.0015%
- **Channel Spacing:** 30 kHz
- **Current Drain:** 225 mA
- **Sensitivity:**
  - 20 dB Quieting: 0.75 uV
  - 12 dB S/N: 0.50 uV
- **Squelch Sensitivity:** 1.0 uV (adjustable)
- **Modulation Acceptance:**
  - Intermodulation: -70 dB
  - Spurious and Image Response: -70/60 dB
- **PL Decoder:** Plug-in reed
- **Audio Response:** 5% (nominal)
- **Audio Level:** 1.0 V rms (nominal) into 100 ohms
- **Audio Distortion:** ≤±2, ≤8 dB referenced to 6 dB/octave pre-emphasis

#### TRANSMITTER

- **Frequency Range:** 150.8-174 MHz
- **RF Power Output:** 250 mW minimum
- **Modulation:** 16F3
- **Frequency Stability:**
  - ±0.002% standard
  - ±0.0005% optional
- **Current Drain:** 375 mA
- **Audio Response:**
  - Selectivity: 80 dB
  - Audio Level: 1.0 V rms (nominal) into 100 ohms
  - Audio Distortion: ≤±5, ≤3 dB referenced to 6 dB/octave pre-emphasis
  - Conducted Spurious: ≤40 dB
  - Deviation: Continuously adjustable to ±5 kHz

#### MONITOR RECEIVER (Optional)

- **Frequency Range:** 30-60 MHz / 450-512 MHz
- **Number of Channels:** 1 to 4
- **Modulation:** 7 kHz
- **Acceptance:**
  - Frequency Stability: ≤±0.005%
  - 30° to +60° C (25° C reference)
- **Spurious Response:** ≤-40 dB
- **Squelch Sensitivity:** 0.1 uV
- **Selectivity:** 40 dB

### Portable / Mobile Vehicular Repeater System

**MODEL**
- H13TTY3110A
- 150.8 - 174 MHz
- 250mW RF POWER OUTPUT

**SUPPLEMENT TO**
**INSTRUCTION MANUAL 68P81010C05**

---

Copyright 1976 by Motorola, Inc.
Printed in U.S.A.
8/16/76 - DG

68P81010C06-B

MOTOROLA
PORTABLE AREA COMMUNICATIONS • REPEATER

PAC•RT

Engineering Publications
8000 W. Sunrise Blvd.
Ft. Lauderdale, FL 33322
1. **CABLE ROUTING**

Determine convenient locations for the PACoRT vehicular repeater, the vehicular charger or holder, and the antenna. The vehicular repeater may be located in an out-of-the-way place close to the mobile unit (within six feet). The vehicular charger or holder mounts to the dash on a trunnion bracket and the antenna is a trunk lip mount type.

With the vehicular repeater, charger or holder, and antenna in place (not mounted) in their approximate positions, the cable should be routed between them. Allow enough slack cable to permit the plug to be easily connected or disconnected from the vehicular repeater, charger or holder, and antenna.

2. **"PACoRT" VEHICULAR REPEATER INSTALLATION**

Choose a location for the vehicular repeater where the mounting screws are not directly above the gas tank, gas line, brake line, electrical cable, or other vital parts if possible. If the unit must be mounted over a gas tank, gas line, brake line, or electrical cable, care must be taken that the mounting screws will not pierce nor interfere with these parts. NEVER MOUNT ABOVE A MUFFLER, CATALYTIC HEATER, OR OTHER HEAT PRODUCING DEVICE.

Always make a preliminary check to see how far the screws will extend below the vehicle floor. If it appears that they may interfere with parts mounted under the floor, thick spacers may be used.

---

**Figure 1. Bottom Plate Removal**

1. SET UNIT UPRIGHT ON FIRM SUPPORTING SURFACE.
2. INSERT KEY AND TURN CLOCKWISE. HANDLE WILL SPRING OPEN.
3. SWING HANDLE OUT TO FULL OPEN POSITION.
4. HOLDING CASE AND BOTTOM PLATE TOGETHER WITH LIGHT PRESSURE AND SIMULTANEOUSLY PRESSING DOWN ON MOUNTING HOLE BLISTER, PULL UNIT UP BY HANDLE. PLATE IS FREE TO FALL AWAY.
In some vehicles, the bottom of the handle will be pressed against the floor or floor cushioning when the unit is securely mounted to the floor. This will prevent opening the handle far enough to release the unit from its mounting. If this is the case, use thick spacers for mounting.

The unit should be mounted to a level surface to prevent the bottom plate from buckling. For uneven trunk or under-seat areas, a sheet of plywood may be used to mount the bottom plate. The raised shelf in some trunk compartments is a good mounting location. Leave at least three inches of clear space in front of the unit so that the handle can be opened and the main assembly can be removed from the bottom plate.

When the final position has been determined, remove the bottom plate from the unit as shown in Figure 1. Be sure to lift the unit straight up at least one inch before separating the plate to avoid bending the guide pins.

Place the plate in the desired position, and use it as a template to mark the location for drilling the three mounting holes. Drill the holes using a 3/16" drill. Mount the bottom plate, with or without thick spacers as desired; see Figure 2.

Once the bottom plate is mounted, replace the unit assembly onto the bottom plate following the procedure in Figure 3. For removing the unit, reverse the procedure.

1. SET OR SLIDE UNIT ONTO BOTTOM PLATE. WHEN PROPERLY SEATED, IT WILL SLIDE FREELY.

2. PUSH UNIT BACK AS FAR AS IT WILL GO. EXTRA PRESSURE WILL BE REQUIRED AS UNIT ENGAGES GUIDE PINS.

3. PUSH CABLE PLUG FIRMLY INTO PLACE.

4. TURN KEY COUNTERCLOCKWISE TO VERTICAL POSITION.
   - CLOSE HANDLE. LISTEN FOR LOCKING "CLICK."
   - TRY HANDLE TO BE SURE IT IS LOCKED AND UNIT IS LATCHED INTO PLACE.
   - REMOVE KEY.

Figure 2. Bottom Plate Installation Detail

Figure 3. Unit Reassembly
3. **ANTENNA INSTALLATION, TRUNK LIP TYPE**

Refer to Figure 4 and install the trunk lip mount antenna as follows:

a. Locate and insert two 10-32 UNF-3 x 3/8" set screws into the bracket of the antenna base.

b. Attach the antenna base to the rear lip of the trunk lid and tighten the set screws.

**NOTE**

Mount the repeater antenna as far from the mobile antenna as possible, never less than three feet.

c. Uncoil the supplied antenna cable and attach the pin plug connector to the antenna connector.

d. Connect the antenna cable uhf connector to the "PACoRT" vehicular repeater.

e. Cut the antenna to length in accordance with the antenna cutting chart in Figure 5, for the specific frequency of operation.

![Antenna Cutting Chart](image)

**Figure 5. Antenna Cutting Chart**

f. Loosen the antenna clutch nut (topmost nut) on the antenna base. Do not remove the nut (a small sleeve inside could be lost).

![Antenna Installation](image)

**Figure 4. Antenna Installation**

g. Insert the cut-to-length antenna rod through the clutch nut and clutch sleeve until it is firmly seated in position in the antenna base. Tighten the clutch nut.

4. **CONTROL UNIT INSTALLATION**

The PACoRT vehicular repeater control unit may be a control unit/vehicular charger, a control unit/holder, or a control unit only. Mounting hardware is supplied with each unit for mounting the control unit below the dashboard. Refer to Figure 6 for the control unit/vehicular charger or the control unit/holder mounting details. Refer to Figure 7 for the control unit mounting details.
5. FINAL CABLE INSTALLATION

Refer to Figure 8 or 9 for the interfacing of the cable assembly between the existing mobile radio and control head and the PAC-RIT vehicular repeater and charger. Note the different cable lengths of the cable assembly being added; they will be used as a means of identification. Perform the following procedure:

a. Disconnect the plug from the existing mobile radio and connect it to the male plug as shown in Figure 8 or Figure 9 for the specific mobile radio used. In Figure 8, the plug is on a two-foot piece of cable; in Figure 9, it is a feed-through connector.

b. On the same cable or feed-through connector, connect the female plug to the existing mobile radio.

c. Locate the female plug on the end of the six-foot section of cable, and connect it to the vehicular repeater.

d. The charger or holder and antenna cables should already be connected (see paragraphs 3, d, and 4, 3.).

e. To minimize pinching or crushing of the cables by boxes or equipment being set upon them, dress the cables in an out-of-the-way place.
**"PAC•RT" SYSTEM ALIGNMENT**

1. **GENERAL**

After the "PAC•RT" vehicular repeater has been completely interconnected into the existing mobile radio installation, several adjustments must be made in the repeater. The REPEATER DEV ADJ control and the MOBILE DEV ADJ control must be set. Also, the MOBILE PL ADJ control (if applicable) and the MOBILE SQ ADJ control must be set. These controls, located on the "PAC•RT" main circuit board, must be adjusted with the actual mobile radio being used with the repeater due to the variations between mobile radios.

The transmitter - receiver and the optional monitor receiver circuit boards are aligned at the factory and should not need realignment. Realignment may be required if components are replaced or have aged. If necessary, refer to the specific alignment procedures for the transmitter - receiver circuit board and the monitor receiver circuit board.

The vehicular repeater can be aligned more readily on the bench or it can be aligned in the vehicle. The only adjustments that MUST be made in the vehicle are the mobile squelch, mobile deviation, repeater deviation, and the mobile PL in the repeater.

**NOTE**

No adjustments are required to the existing mobile radio.

2. **"PAC•RT" VEHICULAR REPEATER ALIGNMENT**

a. Remove the vehicular repeater unit from its base; reverse the procedure in Figure 3.

b. If the vehicular repeater is to be aligned in the mobile unit, position the repeater so that the circuit board adjustments are exposed and connect the cables to the repeater. Refer to "Alignment Setup."

c. Perform the following alignment procedures:

**"PAC•RT" VEHICULAR REPEATER ALIGNMENT SETUP**

3. **TRANSMITTER-RECEIVER ALIGNMENT**

Alignment of the transmitter - receiver circuit board is not necessary unless components are replaced or have aged. If necessary, remove the vehicular repeater unit from its base; reverse the procedure in Figure 3 and perform the following procedures in the transmitter and receiver setup and alignment procedures.
RECEIVER ALIGNMENT SETUP

RECEIVER ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>STEP</th>
<th>EQUIPMENT</th>
<th>METER POINT</th>
<th>ADJUSTMENT</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Cable NNR6268A</td>
<td></td>
<td></td>
<td>Remove transmitter-receiver circuit board from main circuit board and chassis. Connect test cable between P303 on transmitter-receiver circuit board and J303 on main circuit board. If used, the monitor receiver circuit board must be in position on the main circuit board.</td>
</tr>
<tr>
<td>2</td>
<td>AC Voltmeter, Signal Generator (455 kHz crystal-controlled)</td>
<td>M2 -40 dB scale, T2 -40 dB scale</td>
<td>T1, T4</td>
<td>LOW I-F FREQUENCY -- Connect the 455 kHz signal generator to 2nd mixer base (use a 2 pF isolation capacitor). Increase and maintain a signal level of about +40 dBm on meter point M2. Tune for peak. Peak T4, T1, and repeat T4. Do not repeat.</td>
</tr>
<tr>
<td>3</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M5 3 V dc scale &amp; -40 dB scale</td>
<td>T5</td>
<td>LIMITER -- Adjust the signal generator output for an indication of -40 dBm on meter point M2. If T5 has been completely misaligned, position T5 slug so that it is 1/16&quot;' above the solder side of the board. Adjust T5 for maximum positive voltage (approximately 1.4 V dc) at M5.</td>
</tr>
<tr>
<td>4</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M4 0.3 V dc scale &amp; -40 dB scale</td>
<td>T6</td>
<td>DISCRIMINATOR -- Adjust the signal generator output for an indication of +40 dBm on meter point M2. If T6 has been completely misaligned, position T6 slug so that it is 1/16&quot;' above the solder side of the board. Adjust T6 for discriminator zero (0 ± 0.5 V). Adjust for the first zero at M4.</td>
</tr>
<tr>
<td>5</td>
<td>TP1</td>
<td>L6, L14</td>
<td></td>
<td>Repeat T5 at M5 (step 4). Then rezero T6 at M4 (step 5).</td>
</tr>
<tr>
<td>6</td>
<td>TP1</td>
<td>L6, L14</td>
<td></td>
<td>HIGH I-F FILTER -- If the I-F filter has been completely misaligned or the frequency is being changed, position the slugs so that they are 1/16&quot;' above the solder side of the board. With no signal input tune L6 &amp; L14 for maximum audio noise at TP1.</td>
</tr>
<tr>
<td>7</td>
<td>DC Multimeter</td>
<td>M3 10 V dc scale</td>
<td>T2, L13</td>
<td>OSCILLATOR OUTPUT -- Tune T2 and L13 for a dip at M3.</td>
</tr>
<tr>
<td>8</td>
<td>DC Multimeter .002 uF Cap.</td>
<td>M1 3 V dc scale</td>
<td>T2, L13, T3</td>
<td>INJECTION -- Tune T3 for a peak at M1. Retune T2, L13 and T3 for a peak at M1. Short oscillator transistor base to ground with a .002 uF capacitor. The change in voltage at M1 should be greater than 0.1 V dc.</td>
</tr>
<tr>
<td>9</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>L2, L3, L4, L5</td>
<td>RF AMPLIFIER -- Connect the signal generator to the &quot;PAC-R&quot; antenna jack. Adjust signal generator output for -35 dBm at M2. Adjust signal generator frequency for M4 reading within ±.05 V dc. Tune L2, L3, L4, and L5 for a peak at M2. Keep the reading below -30 dBm by reducing generator output.</td>
</tr>
<tr>
<td>10</td>
<td>DC Multimeter</td>
<td>M4 0.3 V dc scale</td>
<td>L7</td>
<td>RECEIVE FREQUENCY -- Use the base station transmitter or a frequency standard as a signal source and adjust L7 for zero at M4 (±0.05 V dc).</td>
</tr>
<tr>
<td>11</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>L2, L3, L4, L5, L6, L13, L14, T1, T2, T4</td>
<td>RF AMP &amp; HIGH I-F FILTER -- Retune L2, L3, L4, L5, T2, L13, T3, L6, L14, T4 and T4 in that order to ensure a peak at M2. Keep the reading below -30 dBm at M2 and at zero ±0.05 V dc at M4.</td>
</tr>
<tr>
<td>12</td>
<td>AC Voltmeter, Signal Generator (Modulate with 1000 Hz Tone ±5kHz deviation)</td>
<td>M2, M4 -30 dB scale</td>
<td>L6, L14</td>
<td>Check for ±0.05 V dc discriminator zero at M4, then carefully peak L6 and L14 at M2. Do not retune.</td>
</tr>
<tr>
<td>13</td>
<td>TP1</td>
<td></td>
<td></td>
<td>Remove test cable. Reassemble transmitter-receiver circuit board onto main circuit board.</td>
</tr>
<tr>
<td>14</td>
<td>TP1</td>
<td></td>
<td></td>
<td>Repeat Step 9.</td>
</tr>
<tr>
<td>15</td>
<td>AC Voltmeter Signal Generator</td>
<td>TP1</td>
<td></td>
<td>20 dB QUIETING SENSITIVITY -- Perform 20 dB quieting sensitivity measurement as a check of alignment.</td>
</tr>
</tbody>
</table>

EFP-6879-A
TRANSMITTER ALIGNMENT SETUP

![Diagram of transmitter alignment setup]

TRANSMITTER ALIGNMENT PROCEDURE

<table>
<thead>
<tr>
<th>STEP</th>
<th>TEST EQUIPMENT</th>
<th>METER POINT</th>
<th>ADJUSTMENT</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>Adjust power supply voltage for 13.8 V dc.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Ground collector of Q309 and Q421.</td>
</tr>
<tr>
<td>3</td>
<td>DC Multimeter, Ammeter</td>
<td>M101, L101, L102</td>
<td>OSCILLATOR - Y101 is preset to assigned frequency at the factory. Do not readjust unless the crystals are replaced or the setting was accidentally changed. If it is necessary to readjust Y101, (a) Complete steps 4 thru 6, (b) Set up the frequency monitor for frequency measurement and adjust warp coil Y101 to assigned frequency, (c) Complete step 7. <strong>NOTE</strong> If Y101 does not need to be adjusted, continue with steps 4 through 7.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>DC Multimeter, Ammeter</td>
<td>M101, L102</td>
<td>Tune L102 for maximum current (500 mA range). Tune L101 and L102 for maximum negative voltage on M101 (-1.2 V dc, typical).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DC Multimeter, Ammeter</td>
<td>M102, L103, L105, L101, L102</td>
<td>Preset L103 to center of coil. Tune L105 for maximum current. Tune L101, L102, L105, L103 in that order for minimum positive voltage on M102. Repeat once to ensure dip (+0.05 V dc, typical).</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ammeter, RF Wattmeter</td>
<td>L106, L109, L130</td>
<td>Preset all coils flush with solder side of board. Tune L106, L109, L110 in that order towards center of coil for maximum current until power can be read on wattmeter; then repeat all coils above for maximum power (0.25 watt minimum).</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>DEVIATION CHECK - See Single-Tone Deviation adjustment in the &quot;PAC-RT Vehicular Repeater Alignment Procedure&quot; for adjustment of R116.</td>
</tr>
</tbody>
</table>

4. MONITOR RECEIVER ALIGNMENT (OPTIONAL CIRCUIT BOARD)

Alignment of the monitor receiver circuit boards is not necessary unless components are replaced or have aged. If alignment is necessary, remove the vehicular repeater unit from its base; reverse procedure in Figure 3, and perform the following procedures found in the monitor receiver setup and alignment procedures for either the 30-50 MHz monitor receiver or the 450-512 MHz monitor receiver.
## 30-50 MHz Monitor Receiver Alignment Setup

### 30-50 MHz Monitor Receiver Alignment Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Test Equipment</th>
<th>Meter Point</th>
<th>Adjustment</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Cable RKN6428A</td>
<td></td>
<td></td>
<td>Remove monitor receiver circuit board from main circuit board and chassis. Connect test cable between J302 on monitor receiver circuit board and J302 on main circuit board. The transmitter-receiver circuit board must be in position on the main circuit board.</td>
</tr>
<tr>
<td>2</td>
<td>AC Voltmeter, Signal Generator (455 kHz crystal-controlled)</td>
<td>M2 -40 dB scale</td>
<td>T2, T3</td>
<td>Locate TP1, TP2, TP3, TP4, and TP5 on the monitor receiver circuit board. Ground TP1 to activate the F1 oscillator. (If F2 for F2, TP3 for F3, etc.)</td>
</tr>
<tr>
<td>3</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M4 3 V dc scale &amp; -40 dB scale</td>
<td>T4</td>
<td>LOW I-F FREQUENCY -- Connect the 455 kHz signal generator to 2nd mixer base (use a 2 PZ isolation capacitor). Increase and maintain a signal level of about -40 dBm on meter point M2. Tune for peak. Peak T3, T2, and repeat T3. Do not repeat.</td>
</tr>
<tr>
<td>4</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M3 0.3 V dc scale &amp; -40 dB scale</td>
<td>T5</td>
<td>LIMITER -- Adjust the signal generator output for an indication of -40 dBm on meter point M2. If T4 has been completely misaligned, position the slug so that it is 1/16&quot; above the solder side of the board. Adjust T4 for maximum positive voltage (approximately 2.2 V dc).</td>
</tr>
<tr>
<td>5</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M3 0.3 V dc scale &amp; -40 dB scale</td>
<td>T5</td>
<td>DISCRIMINATOR -- Adjust the signal generator output for an indication of -40 dBm on meter point M2. If T5 has been completely misaligned, position the slug so that it is 1/16&quot; above the solder side of the board. Adjust T5 for discriminator zero (0 ± .05 V). Adjust for the first zero.</td>
</tr>
<tr>
<td>6</td>
<td>DC Multimeter, .002 UF Cap.</td>
<td>M3 3 V dc scale</td>
<td>L7, L8</td>
<td>HIGH I-F FILTER -- If the I-F filter has been completely misaligned or the frequency is being changed, position the slugs so that they are 1/16&quot; above the solder side of the board. With no signal input tune L7 &amp; L8 for maximum audio noise at M3.</td>
</tr>
<tr>
<td>7</td>
<td>DC Multimeter, .002 UF Cap.</td>
<td>M1 3 V dc scale</td>
<td>T1</td>
<td>INJECTION -- Tune T1 for a peak at M1. Short oscillator transistor base to ground with a .002 UF capacitor. The change in voltage at M1 should be greater than .02 V dc.</td>
</tr>
<tr>
<td>8</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>L1, L2, L3</td>
<td>RF SELECTIVITY -- Adjust signal generator output for -35 dBm at M2. Adjust signal generator frequency for M3 reading within ± .05 V dc. Tune L1, L2, and L3 for a peak at M2. Keep the reading below -30 dBm by reducing generator output.</td>
</tr>
<tr>
<td>9</td>
<td>DC Multimeter</td>
<td>M3 0.3 V dc scale</td>
<td>L4 (L9, L10, L11, &amp; L16 if used)</td>
<td>RECEIVE FREQUENCY -- Use the base station transmitter or a frequency standard as a signal source and adjust L4 for zero at M3 (± .05 V dc).</td>
</tr>
<tr>
<td>10</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>L1, L2, L3, T1, T2, L7, L8, T2, T3</td>
<td>RF SELECTIVITY &amp; HIGH I-F FILTER -- Ground TP1, TP2, TP3, TP4, or TP5 that is associated with the lowest frequency channel. Return L1, L2, L3, T1, L7, L8, T2, and T3 in that order to ensure a peak at M2. Keep the reading below -30 dBm at M2 and at zero ± .05 V dc at M3.</td>
</tr>
<tr>
<td>11</td>
<td>DC Multimeter, Signal Generator</td>
<td>M5 15 V scale</td>
<td>R18</td>
<td>SQUELCH SETTING -- Set R18 fully counterclockwise. Set signal generator at the level set in step 13. Slowly turn R18 clockwise until M7 just switches to approximately 9.5 volts.</td>
</tr>
<tr>
<td>12</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>L1, L2, L3</td>
<td>RF SELECTIVITY -- Adjust signal generator output for -35 dBm at M2. Adjust signal generator frequency for M3 reading within ± .05 V dc. Tune L1, L2, and L3 for a peak at M2. Keep the reading below -30 dBm by reducing generator output.</td>
</tr>
<tr>
<td>13</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M5</td>
<td>R18</td>
<td>20 dB QUIETING SENSITIVITY -- Perform 20 dB quieting sensitivity measurement as a check of alignment (13.75 V maximum at the antenna input corresponds to 1 uV at the rf input to the monitor-receiver).</td>
</tr>
<tr>
<td>14</td>
<td>DC Multimeter, Signal Generator</td>
<td>M7 15 V scale</td>
<td>R18</td>
<td>20 dB QUIETING SENSITIVITY -- Perform 20 dB quieting sensitivity measurement as a check of alignment (13.75 V maximum at the antenna input corresponds to 1 uV at the rf input to the monitor-receiver).</td>
</tr>
</tbody>
</table>
### 450-512 MHz Monitor Receiver Alignment Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Test Equipment</th>
<th>Meter Point</th>
<th>Adjustment</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Cable</td>
<td>NKN6228A</td>
<td></td>
<td>Remove monitor receiver circuit board from main circuit board and chassis. Connect test cable between P302 on monitor receiver circuit board and J302 on main circuit board. The transmitter-receiver circuit board must be in position on the main circuit board.</td>
</tr>
<tr>
<td>2</td>
<td>AC Voltmeter,</td>
<td>M2, -40 db</td>
<td>T1, T2</td>
<td>Locate TP1, TP2, TP3, and TP4 on the monitor receiver circuit board. Ground TP1 to activate the F1 oscillator (TP2 for F2, TP3 for F3, etc.).</td>
</tr>
<tr>
<td>3</td>
<td>Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M5 +3 V dc scale &amp; +60 db scale</td>
<td>T3</td>
<td>LOW 1-F FREQUENCY -- Connect the 455 kHz signal generator to 2nd mixer base (use a 2 pF isolation capacitor). Increase and maintain a signal level of about -40 dBm on meter point M2. Tune for peak. Peak T2, T1, and repeat T2. Do not repeat.</td>
</tr>
<tr>
<td>4</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M4, 0.3 V dc scale &amp; -40 db scale</td>
<td>T4</td>
<td>LIMITER -- Adjust the signal generator output for an indication of -40 dBm on meter point M2. If T3 has been completely misaligned, position the slug so that it is 1/16&quot; above the solder side of the board. Adjust T3 for maximum positive voltage (approximately 2.2 V dc).</td>
</tr>
<tr>
<td>5</td>
<td>DC Multimeter, Signal Generator (455 kHz crystal-controlled), AC Voltmeter</td>
<td>M4, 0.3 V dc scale &amp; -40 db scale</td>
<td>T4</td>
<td>DISCRIMINATOR -- Adjust the signal generator output for an indication of -40 dBm on meter point M2. If T4 has been completely misaligned, position the slug so that it is 1/16&quot; above the solder side of the board. Adjust T4 for discriminator zero (0 ± 0.5 V). Adjust for the first zero.</td>
</tr>
<tr>
<td>6</td>
<td>AC Voltmeter</td>
<td>M4</td>
<td>L11, L12</td>
<td>HIGH 1-F FILTER -- If the 1-F filter has been completely misaligned or the frequency is being changed, position the slugs so that they are 1/16&quot; above the solder side of the board. With no signal input tune L11 &amp; L12 for maximum audio noise at M4.</td>
</tr>
<tr>
<td>7</td>
<td>DC Multimeter</td>
<td>M1 3 V dc</td>
<td>L6</td>
<td>INJECTION -- Tune L6 for a dip at M1.</td>
</tr>
<tr>
<td>8</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2, M4 -30 dB scale</td>
<td>F11, (Z1, Z2, Z3, Z4), L8, &amp; L9</td>
<td>RF SELECTIVITY -- Set signal generator at carrier frequency and inject into RF input. Adjust signal generator output level for -35 dBm reading at M2. Tune preselector cavities Z1, Z2, Z3, and Z4 for a peak at M2. Tune L8 and L9 one turn at a time for a dip at M8. Keep the reading below -30 dBm by reducing generator output.</td>
</tr>
<tr>
<td>9</td>
<td>AC Voltmeter, DC Multimeter, Signal Generator</td>
<td>M2, M4 -30 dB scale</td>
<td>L6, L4</td>
<td>RF SELECTIVITY -- With an on-channel signal, adjust signal generator output for -40 dBm at M2. Inject the signal at the RF input. Tune L6 for a peak reading at M4. Slowly tune L4 for a reading of 40 ± 5 Vdc at M4. Return L6 back.</td>
</tr>
<tr>
<td>10</td>
<td>AC Voltmeter, DC Multimeter, Signal Generator</td>
<td>M2, M4 -40 dBm scale</td>
<td>L3, L2, L1</td>
<td>RECEIVE FREQUENCY -- MULTIPLE FREQUENCY MODELS -- Remove ground from TP1 and repeat step 9 for each of the remaining points noted in step 2. Adjust the appropriate coil for each channel for zero reading at M4: F2-L3, F3-L2, and F4-L1.</td>
</tr>
<tr>
<td>11</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>F11 (Z1, Z2, Z3, &amp; Z4), L6, L8, L9, L11, L12, T1, &amp; T2</td>
<td>RF SELECTIVITY &amp; HIGH 1-F FILTER -- GROUND TP1. Return FL1 (Z1, Z2, Z3, &amp; Z4), L6, L8, L9, L11, L12, T1, &amp; T2 in order to ensure a peak at M2. Keep the reading below -30 dBm at M2 and at zero ±0.5 V dc at M4.</td>
</tr>
<tr>
<td>12</td>
<td>Remove test cable. Reassemble monitor receiver circuit board onto main circuit board.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M2 -30 dB scale</td>
<td>F11 (Z1, Z2, Z3, &amp; Z4)</td>
<td>RF SELECTIVITY -- Adjust signal generator output for -35 dBm at M2. Adjust signal generator frequency for M4 reading within ±0.5 V dc. Tune F11 (Z1, Z2, Z3, &amp; Z4) for a peak at M2. Keep the reading below -30 dBm by reducing generator output.</td>
</tr>
<tr>
<td>14</td>
<td>AC Voltmeter, Signal Generator</td>
<td>M6</td>
<td></td>
<td>20 dB QUIETING SENSITIVITY -- Perform 20 dB quieting sensitivity measurement as a check of alignment (13.75 Vm maximum at the antennas input corresponds to 1 uV at the RF input to the monitor-receiver).</td>
</tr>
<tr>
<td>15</td>
<td>DC Multimeter, Signal Generator</td>
<td>M7 350 V scale</td>
<td>R56</td>
<td>SQUELCH SETTING -- Set R56 fully counterclockwise. Set signal generator at the level set in step 14. Slowly turn R56 clockwise until M7 just switches to approximately 9.5 volts.</td>
</tr>
</tbody>
</table>
30-50 MHz MONITOR RECEIVER CIRCUIT BOARD DETAIL AND PARTS LIST
STAGE GAIN MEASUREMENT NOTES

CRYSTAL FREQUENCY TABLE

GENERAL:
1. 0.1 dB to 1 W. Into 500-ohms.
2. 0 to 1-Watts, Monitor Receiver Oscillator and Monitor Receiver Gain Measurements Section. The manufacturer's test equipment and additional information.
3. Make the following measurements:
   A. Connect the signal generator to the input and read
      connected for all receiver measurements.
   B. Set the oscillator generator level to 1 W for this reading.
   C. Reading with the oscillator harmonics, harmonics, and frequencies.
   D. Set the oscillator generator level to 1 W for this reading.
   E. Set the oscillator generator level to 1 W for this reading.

EARRIOR FREQUENCY (Hz/μV)

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Oscillator Frequency (MHz)</th>
<th>Oscillator Frequency (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.800.000</td>
<td>19.380.000</td>
<td>19.380.000</td>
</tr>
<tr>
<td>1.800.050</td>
<td>19.380.050</td>
<td>19.380.050</td>
</tr>
<tr>
<td>1.800.075</td>
<td>19.380.075</td>
<td>19.380.075</td>
</tr>
<tr>
<td>1.800.100</td>
<td>19.380.100</td>
<td>19.380.100</td>
</tr>
</tbody>
</table>

EPF-79890

450-612 MHz MONITOR RECEIVER
SCHEMATIC DIAGRAM
SCHEMATIC AND CIRCUIT BOARD NOTES

1. VOLTAGE VALUES ARE FREQUENCY AND DRIVE.
2. DISSIPATION VALUES (500 to 150 W) MODELS, REMOVED ON 500 TO 1500 W MODELS.
3. DISSIPATION VALUES (500 to 1500 W) MODELS, REMOVED ON 500 TO 1500 W MODELS.
4. PRINTED WIRING BETWEEN CIRCUITS IS CONNECTED (ARMATURE ENDISTRY). (HEAT-SHIELD MOUNTED ON SOLID SOURCE.)
5. FREQUENCY LEGEND:
   - CARRIER FREQUENCY (5 MHZ-14 MHZ)
   - TRANSMITTER:
     - RF Filter: 5000-10000 MHz
     - Vo, Vb: 500-1000 MHz
     - Mixer:
       - RF Oscillator: 5000-10000 MHz
       - Audio Oscillator: 5000-10000 MHz
   - RECEIVER:
     - IF Oscillator: 5000-10000 MHz
     - Audio Oscillator: 5000-10000 MHz
6. CRYSTAL FREQUENCY TABLE

<table>
<thead>
<tr>
<th>CARRIER FREQUENCY</th>
<th>1ST OSC CRYSTAL</th>
<th>2ND OSC CRYSTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 kHz</td>
<td>250 kHz</td>
<td>250 kHz</td>
</tr>
<tr>
<td>500 kHz</td>
<td>500 kHz</td>
<td>500 kHz</td>
</tr>
<tr>
<td>750 kHz</td>
<td>750 kHz</td>
<td>750 kHz</td>
</tr>
<tr>
<td>1000 kHz</td>
<td>1000 kHz</td>
<td>1000 kHz</td>
</tr>
<tr>
<td>1250 kHz</td>
<td>1250 kHz</td>
<td>1250 kHz</td>
</tr>
<tr>
<td>1500 kHz</td>
<td>1500 kHz</td>
<td>1500 kHz</td>
</tr>
<tr>
<td>1750 kHz</td>
<td>1750 kHz</td>
<td>1750 kHz</td>
</tr>
<tr>
<td>2000 kHz</td>
<td>2000 kHz</td>
<td>2000 kHz</td>
</tr>
</tbody>
</table>

STAGE GAIN MEASUREMENT NOTES

1. Set one watt into receiver.
2. Circuit board/panel (60 VDC) DISSIPATION THE COMPONENTS.
3. TRANSMITTER MEASUREMENTS TAKEN WITH BUFFERED SWITCH ON.
4. MEASUREMENTS TO BE TAKEN ON TRANSCEIVER, AND SENSORS GAIN MEASURED.
   - POWER SUPPLY RECOMMENDED FOR SENSORS TEST POINT.
   - SENSORS TO BE TESTED.
5. TRANSMITTER:
   - ADJUST SIGNAL GENERATOR TO EXTERNAL ANTENNA.
   - ADJUST SIGNAL LEVEL AT 5 W FOR MEASUREMENT.
   - SHORT CIRCUIT GENERATOR LEVEL TO 10 W.
6. RECEIVER:
   - ADJUST SIGNAL GENERATOR LEVEL TO 5 W.
   - ADJUST SIGNAL LEVEL TO 10 W.
   - ADJUST SIGNAL GENERATOR LEVEL TO 5 W.