MAINTENANCE MANUAL
SERVICE SECTION
FOR
TMX-84 AND TMX-86 SERIES
TRUNKED MOBILE RADIOS

TABLE OF CONTENTS

DESCRIPTION

The Service Section contains the information necessary for aligning and troubleshooting the radio. In addition, information is provided for removing and replacing chip components, disassembly procedures and module replacement procedures.

INITIAL ADJUSTMENT

After the radio has been installed as described in the Installation Manual, the following adjustments should be made by a certified electronics technician.

TRANSMITTER ADJUSTMENT

The transmitter is factory preset and should require no readjustment. However, the antenna length should be adjusted for optimum VSWR. Next, measure the frequency and modulation and record these measurements for future reference. For the complete transmitter adjustment, refer to the Alignment Procedure (See Table of Contents).

RECEIVER ADJUSTMENT

No initial adjustments to the receiver are required.

RE-INSTALLATION

These trunked mobile radios will operate in 12-Volt, negative ground vehicles only. If the mobile radio is moved to a different vehicle, always check the battery polarity of the new vehicle system.

MAINTENANCE

PREVENTIVE MAINTENANCE

To ensure high operating efficiency and to prevent mechanical and electrical

failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. Preventive maintenance should include the following checks:

Connections

Ground connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation. When ground connections are not made directly to the battery, the connection from the battery to vehicle chassis must be checked for low impedance. A high impedance may cause excessive voltage drops and alternator noise problems.

Electrical System

Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation. A weak battery will often cause excessive noise or faulty operation.

Mechanical Inspection

Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.

Antenna

The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antennas or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.

Alignment

The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to applicable Alignment Procedure and Troubleshooting sheet for typical voltage readings.

Frequency Check

Check transmitter frequency and deviation. Normally, these checks are made when the unit is first put into operation, after the first six months and once a year thereafter.

DISASSEMBLY

To gain access to the transmitter/receiver/synthesizer (TRS) or logic board for servicing, loosen the two screws A securing the top cover at the rear of the radio. Then pull the cover out from under the edge of the front panel and lift the cover off (See Figure 1).

To Remove Logic Board:

1. Remove the top cover.
2. Remove the four screws (B) securing the logic board to the system frame, and carefully lift up the board with the interconnecting cables attached.

To Remove the TRS Board:

1. Remove the top cover and the logic board. Then unscrew the two standoffs supporting the logic board.
2. Remove the 11 screws (C), (D) and E securing the RF shield, and remove the shield.
3. Remove the four screws F holding the front panel to the "U" frame. Disconnect speaker jack J24 and remove the front panel.
4. Remove the two screws (G) securing the antenna jack to the rear of the radio.
5. Remove the screw (H) in regulator A1, transistors Q7 and Q15.
6. Remove the two screws (J) in exciter module A9, driver/PA A11, and PA transistor Q12 in 30-Watt radios.
7. Remove the screws (K) securing the TRS board, and carefully lift the board up off the bottom of the "U" frame.

15-Watt PA Replacement

NOTE

The PA module (A11) is a very reliable device and will not normally need to be replaced. Always check out the associated circuitry carefully before replacing the PA module.

- To remove PA module A11:

1. Remove two screws securing A11 to printed wire board (See Figure 2).
2. Unsolder the five leads bridging A11 to the printed board while lifting each lead.

Note: These leads are soft and can be bent very easily.

3. Lift out the module, taking care not to injure the spacer under the module. The module may also stick to the printed board.

WARNING

The PA module contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, exercise caution since escaping dust may be hazardous if inhaled. Use care when replacing the module.

- To replace PA module A11:

1. Position the module properly, aligning the screw holes and the leads with the printed board. Trim leads as necessary.
2. Replace the two screws securing the PA to the printed board using a moderate torque of 0.5 ±0.1 Newton meter (4.5 inch-pounds).
3. Solder the five leads of PA module A11 to the printed board.

30-Watt Driver Replacement

NOTE

Always check out the associated circuitry carefully before replacing the driver module. The module is a very reliable device and will not normally need to be replaced.

- To remove Driver A11:

1. Remove the two screws securing A11 to the printed wire board (See Figure 3).
2. Unsolder the five leads bridging A11 to the printed board while lifting each lead.

   Note: These leads are soft and can be bent very easily.
3. Lift out the module, taking care not to injure the spacer under the module. The module may also stick to the printed board.

WARNING

The PA module contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care when replacing the module.

- To replace Driver A11:

1. Position the module properly, aligning the screw holes and leads with the printed board.

   Trim leads if necessary.
2. Replace the two screws securing the driver to the printed board, using a moderate torque of 0.5 ±0.1 Newton meter (4.5 inch-pounds).
3. Solder the five leads of driver A11 to the printed board.

30-Watt PA Transistor Replacement

1. Remove the two retaining screws securing PA transistor Q12 to chassis assembly.
2. Unsolder and remove capacitors C87, C88, C89 and C90. Use a desoldering tool as necessary while lifting the transistor leads with a small screwdriver or pick. Discard old capacitors.
3. Unsolder the emitter, base and collector leads of the transistor, and remove it from the printed board.
4. Remove all excess solder from the board, and clean the holes to allow the new transistor to be positioned properly and the capacitors to fit into proper locations. Refer to Figure 3 and trim leads of Q12 as shown.
5. Apply silicon grease to back of the replacement transistor.
6. Place the transistor into the mounting slot.
7. Replace the transistor mounting screws using a moderate torque of 0.5 Newton meter (4.5 inch-pounds).
8. Tack solder the four base leads to the printed board, using minimum solder.
9. Solder the emitter and collector connections.
10. Install C87, C88, C89, C90 into their proper mounting areas, flush to the board.
11. Solder the capacitor bodies to the printed board by first soldering the outside edge. Then, holding the iron to the outside edge, touch the solder to the inside edge of the capacitor. Be careful not to create solder bridges at the front and back of the capacitors.
12. Remove any flux left on board.

CAUTION

The PA transistor contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care when replacing the transistor.

REPLACING CHIP COMPONENTS

Replacement of chip capacitors should always be done with a temperature-controlled soldering iron, using a controlled temperature of 700°F (371°C). However, do NOT touch black metal film of the resistors or the ceramic body of capacitors with the soldering iron.

NOTE

The metalized end terminations of the parts may be touched with the soldering iron without causing damage.

To Remove Chip Components:

1. Grip the component with tweezers or needle nose pliers.
2. Alternately heat each end of the chip in rapid succession until solder flows, and then remove and discard the chip.
3. Remove excess solder with a vacuum de-soldering tool.
4. Carefully remove the epoxy adhesive and excess flux to prevent damage to the printed board.

To Replace Chip Components:

1. Using as little solder as possible, "tin" one end of the component and one of the pads on the printed wiring board.
2. Place the "tinned" end of the component on the "tinned" pad on the board and simultaneously touch the component and the pad with a well "tinned" soldering iron while pressing the component down on the board.
3. Place the "tinned" soldering iron on the other end of the component and the pad simultaneously. Apply solder to the top of the end of the component until the solder starts to flow. Use as little solder as possible while getting a good joint.
4. After the component has cooled, remove all flux from the component and printed wiring board area with alcohol.

REMOVING IC'S

Removing IC's (and all other soldered-in components) can be easily accomplished by using a vacuum de-soldering tool. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

TEST AND TROUBLESHOOTING PROCEDURES

Maintenance of radio is facilitated by using the Troubleshooting Procedures and servicing techniques unique to this radio. The Troubleshooting Procedures are designed to lead the serviceman rapidly to the defective component or circuit.

Troubleshooting Procedures are provided for most major problems that might arise in the Transmitter, Receiver, Logic and Synthesizer section of the radio.

SERVICING TECHNIQUES

The high density plug-in design of the modular radio lends itself well to rapid isolation of malfunctions in the voltage and signal paths. A majority of the signals and voltages pass through the connectors on the TRS board.

To isolate a signal or voltage path to determine loading effects, locate short circuits, etc. carefully insert an insulator (plastic wand, toothpick) between the appropriate pins of the related molex connector to create an open circuit. Signals paths that may be isolated include: MIC HI, DISC OUT, RX AUDIO, TX AUDIO, PTT, RX MUTE and SPKR HI.

A test handset is required for servicing the radio. The handset is equipped with a microprocessor to interface with the logic board to place the radio in the test mode to facilitate servicing.

TEST POINTS

The TRS board contains 12 test points for monitoring the operation of the radio. The test points provide DC voltage readings required for aligning and troubleshooting the radio see Table of Contents).

RECEIVER VOLTAGE READINGS

Bias voltages for the receiver transistors and integrated circuits are shown on the Receiver Bias Voltage section listed in the Table of Contents.

CAUTION

The CMOS Integrated Circuit devices used in this equipment can be destroyed by static discharges. Before handling one of these devices, the serviceman should discharge himself by touching the case of a bench test instrument that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or desoldering a CMOS device, the soldering iron should also have a 3-prong power cord connected to an outlet with a known good earth ground. A battery-operated soldering iron may be used in place of the regular soldering iron.

CAUTION

Before bench testing the radio, be sure of the output voltage characteristics of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed (50 ohm resistive load): 18 Volts
Transmitter keyed (no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limits shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.6 VDC for loads of 6 to 16 amperes: Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering may be usable when operated in parallel with a 12 Volt automotive storage battery.

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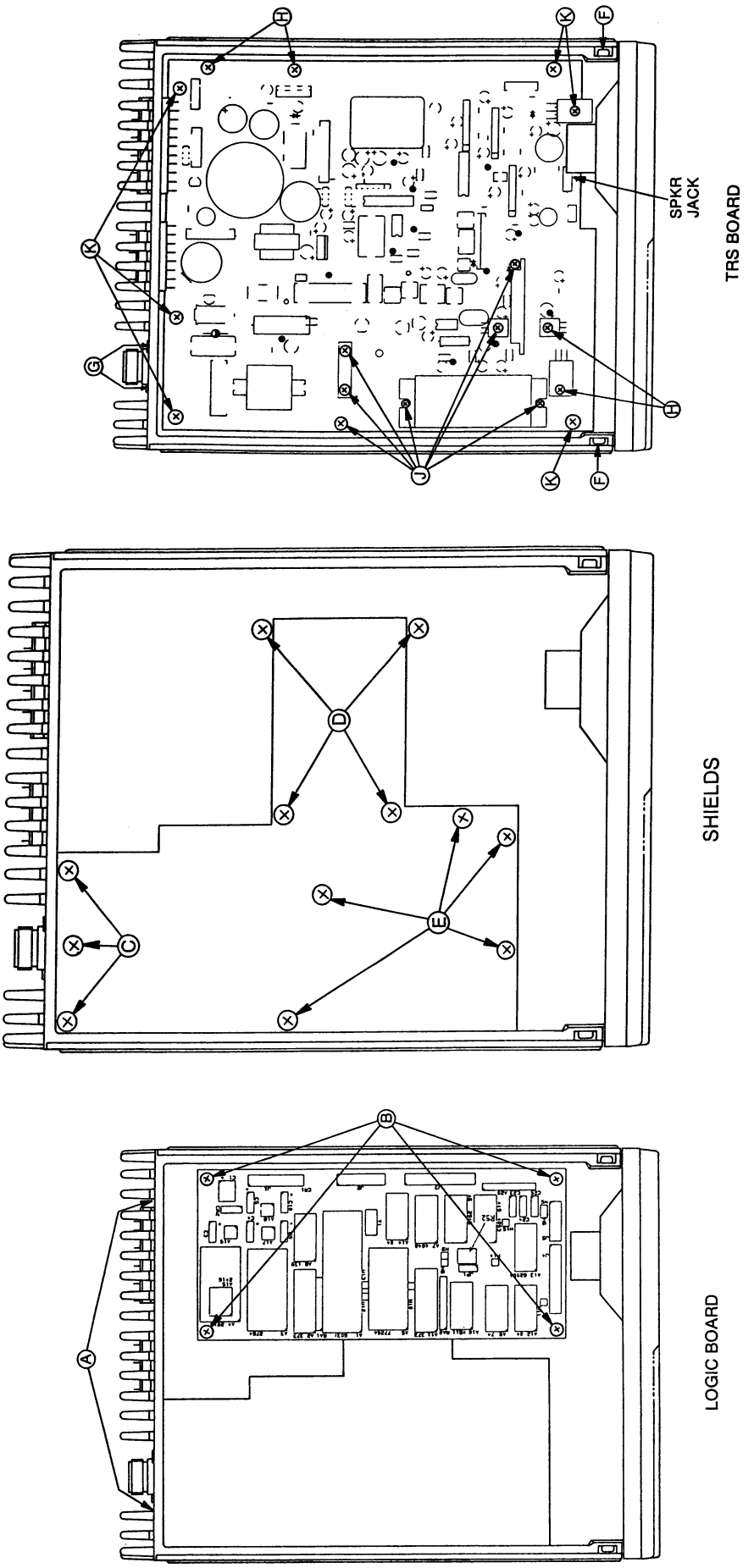


Figure 1 - Disassembly Procedure

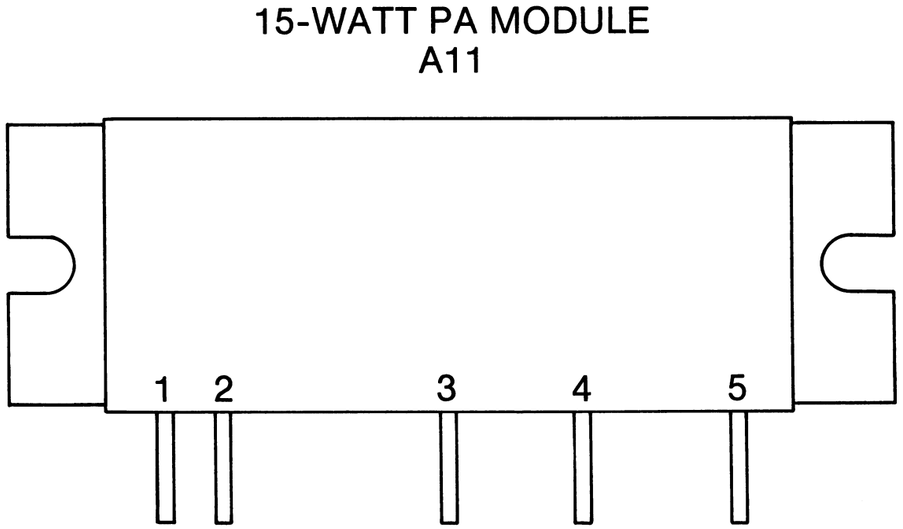
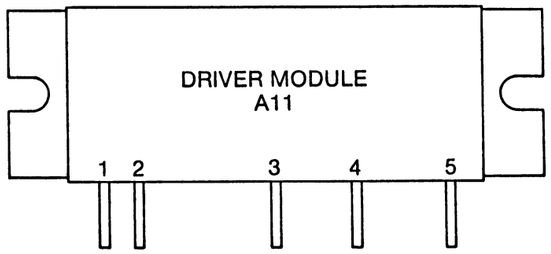


Figure 2 - Lead Forming & Identification



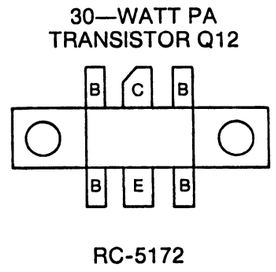


Figure 3 - Lead Forming and Identification

TEST POINTS

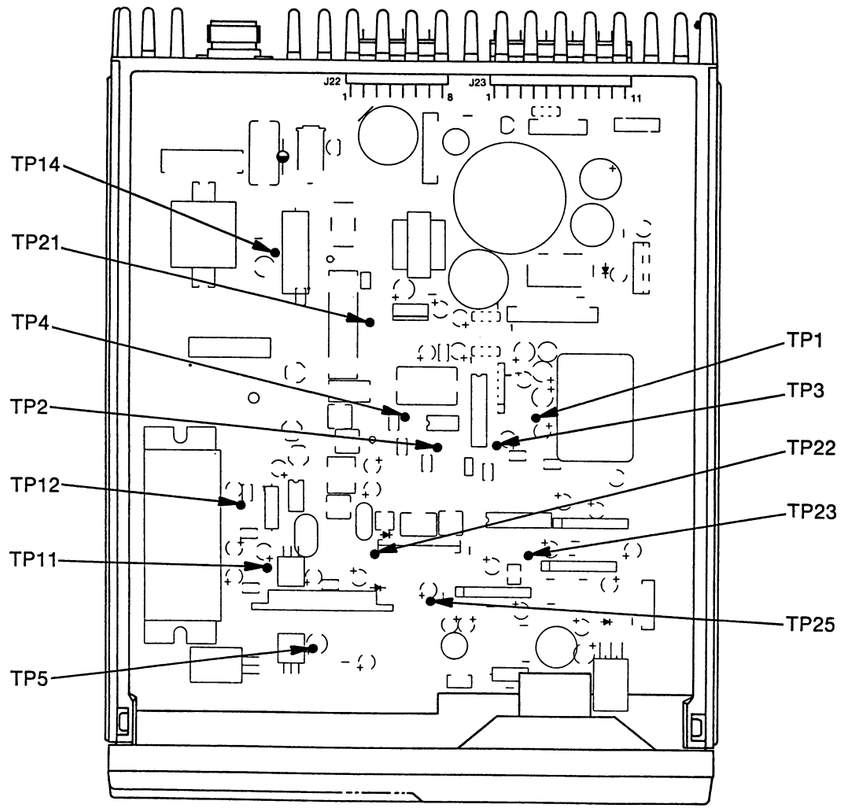
Test points are provided to aid in troubleshooting the radio and to facilitate alignment of the transmitter and receiver. The test points are located on the TRS board, and are identified in Table I. Voltage readings are typical readings measured with a 20,000-ohm-per-volt meter.

TABLE I - TYPICAL VOLTAGE READINGS

Test Point	Location	Function	Typical Reading
TP1	Synthesizer	Synthesizer Control	2.7-6.0 Volts
TP2	Synthesizer	+9 Volt regulator (A4)	+9 Volts
TP3	Synthesizer	Collector bias of Q4	+8.1 Volts
TP4	Synthesizer	Collector bias of Q9	+8.1 Volts
TP5	Tx	Vcc of A9	+7.6 Volts
TP11	Tx	APC Voltage	+8.5 Volts
TP12	Tx	Vc3 of Pa module	+12.8 Volts
TP14	Tx	Collector bias of Q12	+12.5 Volts
TP21	Rx	Vcc of receiver	+9 Volts
TP22	Rx	2nd local frequency	44.545 MHz
TP23	Rx	Disc Out	300 mVrms
TP25	Rx	RSSI	0.3-2.4 Volts

RECEIVER DC BIAS VOLTAGES (Receive Mode)

	Collector	Base	Emitter	Gate	Source	Drain
Q21	6.9V DC	1.4V DC	0.85V DC	---	---	---
Q22	---	---	---	GND	0.22V DC	4.9V DC
Q23	5.3V DC	0.6V DC	GND	---	---	---
Q24	8.7V DC	8.1V DC	9.0V DC	---	---	---



RECEIVER DC BIAS VOLTAGES (Receive Mode)

IC A21

A21-1	1.4V DC
A21-2	6.3V DC
A21-3	0.8V DC
A21-4	GND
A21-5	6.1V DC
A21-7	5.4V DC
A21-9	5.4V DC
A21-11	5.4V DC
A21-13	6.4V DC
A21-15	6.4V DC
A21-16	2.7V DC

IC A23

A23-1, 9	7.2V DC
A23-2, 8	3.6V DC
A23-3, 7	3.7V DC
A23-4, 6	3.6V DC
A23-5	GND

IC A25

A25-1, 9	7.2V DC
A25-2, 8	3.6V DC
A25-3, 7	3.6V DC
A25-4, 6	3.6V DC
A25-5	GND

IC A26

A26-1	0.7V DC
A26-2	0.7V DC (unmute), 1.5 DC (mute)
A26-3	GND
A26-4	6.2V DC (unmute), 0.7V (mute)
A26-5	13.4V DC

TEST POINT READINGS

TRANSMITTER ALIGNMENT

As the transmitter uses a broadband exciter and PA, and the VCO receiver LO injection frequency is the transmit frequency, no transmitter alignment procedure is required. However, some adjustments are required to optimize operation. The adjustments include:

1. TXCO Frequency adjustment (FREQ ADJUST Z1)
2. Tone deviation (MOD ADJUST R52 on Logic Board)
3. Output power level (PWR LEVEL R87)
4. Temperature control adjustment (T-DET R97)
5. VSWR adjustment (ALC R83)

TEST EQUIPMENT

1. Test handset 19A704295 and Test Cable
2. Wattmeter (50-watts) with 50-ohm load
3. Deviation monitor
4. Directional coupler
5. Voltmeter (20,000 ohms-per-volt)
6. 13.8-Volt regulated power supply
7. Frequency counter
8. AC Voltmeter

TEST FREQUENCIES

- 806.0125 MHz
- 811.0125 MHz
- 816.0125 MHz
- 821.0125 MHz
- 825.9875 MHz

FREQUENCY ADJUSTMENT

1. Connect the wattmeter and frequency counter to antenna jack J21.
2. Connect the test handset to J22 and J23. Set the test mode for frequency 001 and tone 00 (no tone).
3. Key the transmitter and adjust FREQ control (Z1) for the correct frequency.

TONE DEVIATION ADJUSTMENT

Adjusting the busy tone for the proper deviation also sets the modulation and remaining tones for the proper deviation. Set the deviation as follows:

1. Set the test handset test mode for frequency 001, and for busy tone "41".
2. Key the transmitter into the 50-ohm load and adjust MOD ADJUST R52 on the Logic board for 1.0 kHz deviation.
3. Reset the select to 00 (no tone) and step through each tone present in the radio, checking for a deviation of 2.0 kHz to 5.0 kHz.

POWER CONTROL ADJUSTMENT

The Power Control Adjustments have been set at the factory and will normally not require re-adjustment. The controls are labeled on the synthesizer shield, and include:

1. Output power level R87 (PWR)
2. VSWR control R83 (ALC)
3. Temperature detect R97 (T-DET)

PRELIMINARY ADJUSTMENTS

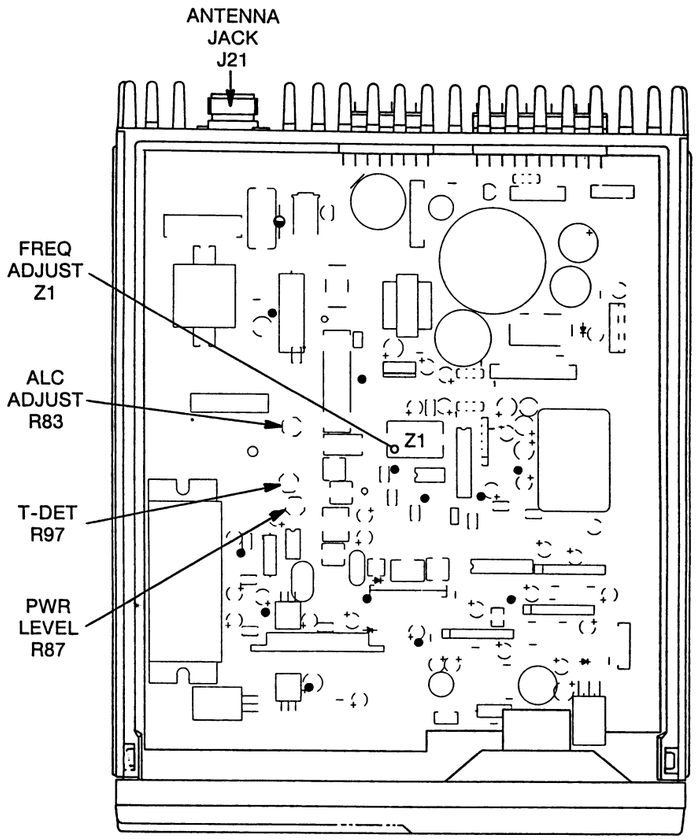
1. Connect the thru-line wattmeter and 50-ohm load to antenna jack J21.
2. Set PWR and ALC controls fully counterclockwise (minimum setting).
3. Connect the Test Handset to J22 and J23 on the radio. Select test frequency 001 and tone 00 (no tone).

NOTE

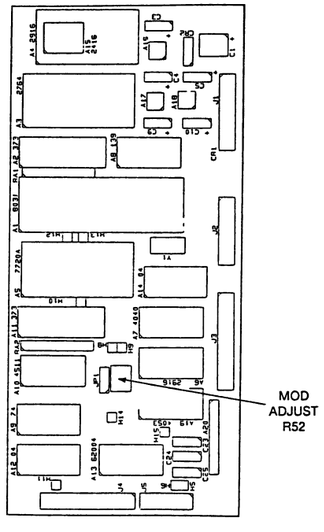
All adjustments made with the transmitter keyed.

PROCEDURE

Step	Test Point	Tuning Control	Indication	Procedure
Power Control				
1.	Wattmeter	R87 (PWR)	See Procedure	Key the transmitter and adjust R87 for rated power output.
2.	Wattmeter	R83 (ALC)	See Procedure	Disconnect the 50 ohm load from the thruline wattmeter. Key the transmitter and set R83 for 10 Watts forward power. Supply current should not exceed 5 amperes. Reconnect wattmeter.
3.	Wattmeter	R97 (T-DET)	See Procedure	Connect the both loads of Z13 with a short wire. Key the transmitter and set R97 for rated power output -2dB.
Final Frequency Adjustment				
4.	Frequency Counter	FREQ Adjust (ON TCXO)	Transmit Frequency and RF Injection Frequency	Select frequency 001 and tone 00. Key the transmitter and tune FREQ on the TXCO to correct transmitter frequency.



LOGIC BOARD



RECEIVER ALIGNMENT

Equipment Required

1. RF Signal Generator (45.0000 MHz and 851 MHz - 870 MHz)
2. Analog DC Voltmeter (with high input impedance and millivolt scale)
3. Frequency Counter (up to 1000 MHz with 0.05V sensitivity)
4. Test Handset
5. Audio Level Meter and Distortion Analyzer

Preliminary Adjustments

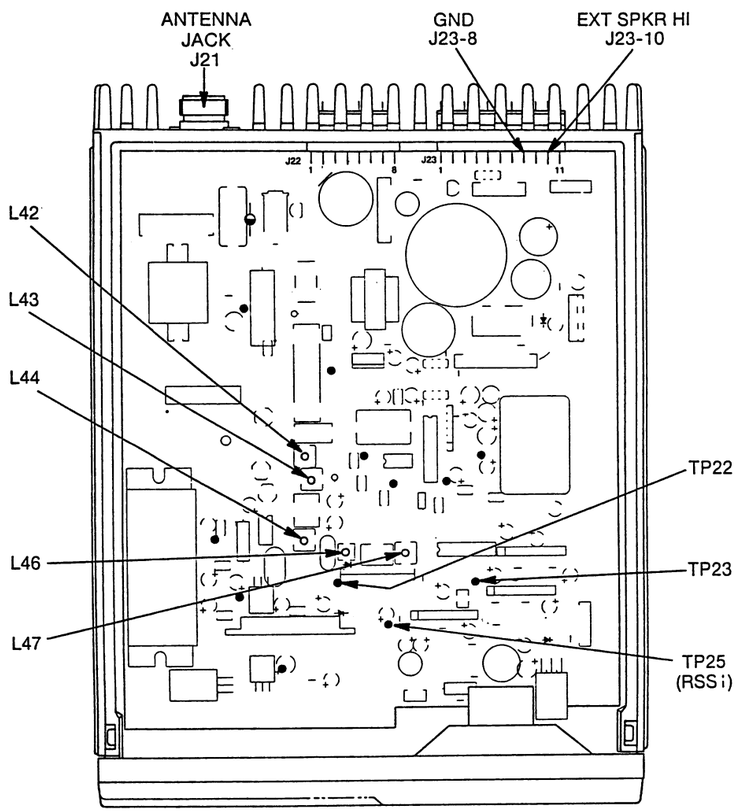
1. Connect the DC Voltmeter to TP25.
2. Connect RF Signal Generator to antenna jack J21.
3. Set the Signal Generator on the receive frequency with ±4 kHz deviation and 1 kHz modulation.
4. Set the handset to frequency 001 and tone to 00.

NOTES

1. Adjust the Signal Generator to keep the DC voltage readings between 1.0V to 1.5V (below saturation) during the alignment procedure.
2. Make sure that the transmitter is properly aligned before aligning the receiver.

Alignment Procedure

Step	Test Point	Tuning Control	Meter Reading	Procedure
1.	TP22	L46	See Procedure	Connect RF signal probe from the frequency counter to TP22. Tune L46 for a reading of 44.545 MHz ±50 Hz.
2.	TP25	L42	Maximum	Set the Signal Generator output for a meter reading of 1.0V DC. Tune L42 for maximum meter reading.
3.	TP23	L43 L44	See Procedure	Connect the audio distortion meter to TP23 (use a high impedance meter). Alternately tune L43, L44 for minimum meter reading on distortion, and maximum meter reading on DC voltage.
4.	TP23	L47	Maximum	Set the RF signal level to 1 millivolt. Tune L47 for maximum audio output level, and check the meter reading is about 250 millivolts RMS.
5.	TP25	L43 L44	See Procedure	Set the Signal Generator for ± 3 kHz deviation and 1 kHz modulation and repeat Step 3.
6.	J23-10		See Procedure	Disconnect P24 and connect the audio level meter to J23-10. Adjust VOLUME control for 3 watts (3.46V RMS across 4 ohm load).
7.				Measure audio distortion. (See Receiver Test Procedure). Distortion should be less than 5%. Disconnect all test equipment. Re-connect Speaker Plug P24 to J24.



RECEIVER TEST PROCEDURES

Test Procedures

These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency and the transmitter is operating properly.

Test Equipment Required

1. Distortion Analyzer
2. Signal Generator
3. 6-dB Attenuation Pad, and 4.0-ohm, 5-Watt Resistor
4. Test Handset

Preliminary Adjustments

1. Plug in the handset and select RF frequency for test. There are five test frequencies programmed in the radio.

NOTE

The receive frequency is always 45 MHz above the transmit frequency.

TEST FREQUENCIES

- 806.0125 MHz
- 811.0125 MHz
- 816.0125 MHz
- 821.0125 Mhz
- 825.9875 MHz

TEST PROCEDURE

STEP 1: Audio Output and Distortion

Measure Audio Power Output as follows:

A. Apply a 1000 microvolt, on-frequency test signal modulated by 1,000 Hz with ±3.5 kHz deviation to antenna jack J21.

B. With 3 Watt Speaker

Disconnect speaker plug if present.

Connect a 4.0 ohm, 5-Watt load resistor across the external speaker loads.

Connect the Distortion Analyzer input across the resistor.

C. Adjust the VOLUME control for rated power output of 3 Watts (3.46 VRMS across the 4-ohm load) using the Distortion Analyzer as a voltmeter.

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5%. If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 5%, or maximum audio output is less than 3 Watts, make the following checks:

E. Battery and regulator voltage---low voltage will cause distortion.

F. Audio Gain (Refer to Receiver Troubleshooting Procedure).

G. FM Detector Alignment (Refer to Receiver Alignment).

STEP 2: Usable Sensitivity (12 dB SINAD)

If Step 1 checks out properly, measure the receiver sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3 kHz deviation to J21.

B. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000 Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

C. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).

D. Set signal generator output to 0.3 V. Switch the RANGE control from SET LEVEL to the distortion range. Readjust Distortion Analyzer SET LEVEL as required until a 12 dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

E. The 12 dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least 1.5 Watts (0.56V RMS across the 4-ohm receiver load using the Distortion Analyzer as a Voltmeter).

F. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, check the alignment of the RF stages as directed in the Alignment Procedure.

STEP 3: Modulation Acceptance (Bandwidth or IF Bandwidth)

If Steps 1 and 2 check out properly, measure the bandwidth as follows:

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12 dB SINAD measurement.

B. Set the Range control on the Distortion Analyzer in the SET LEVEL position (1000 Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

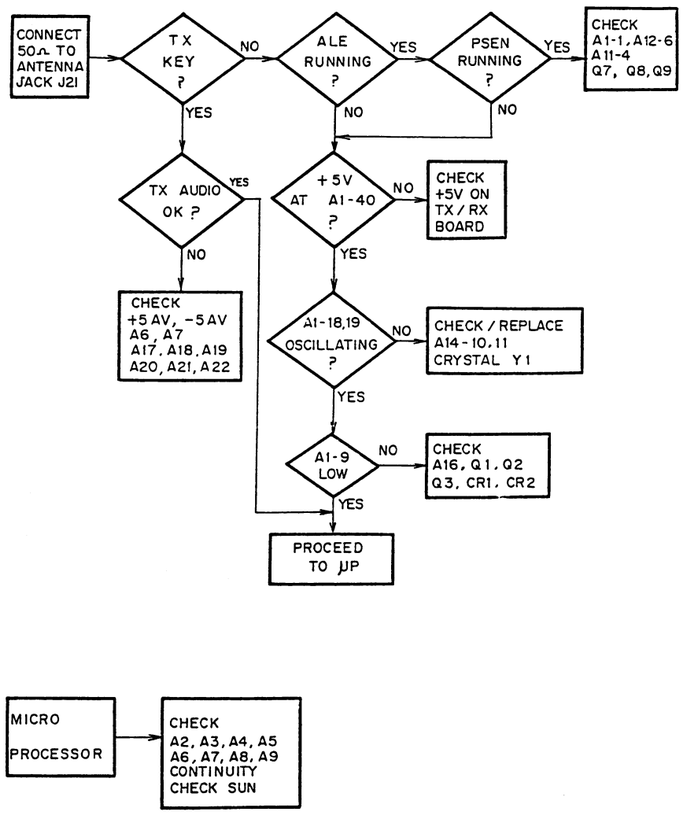
C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12 dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12 dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±6.5 kHz.

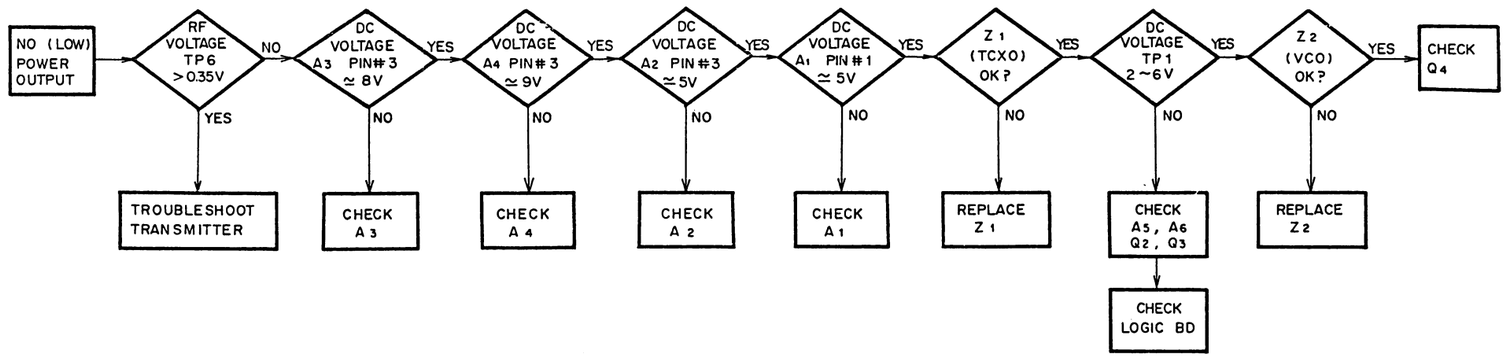
SERVICE CHECK

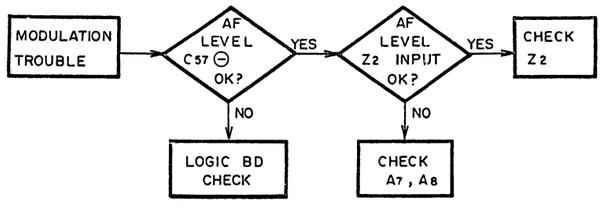
If the Modulation Acceptance Bandwidth test does not indicate the proper width, refer to the Receiver Troubleshooting Procedure.

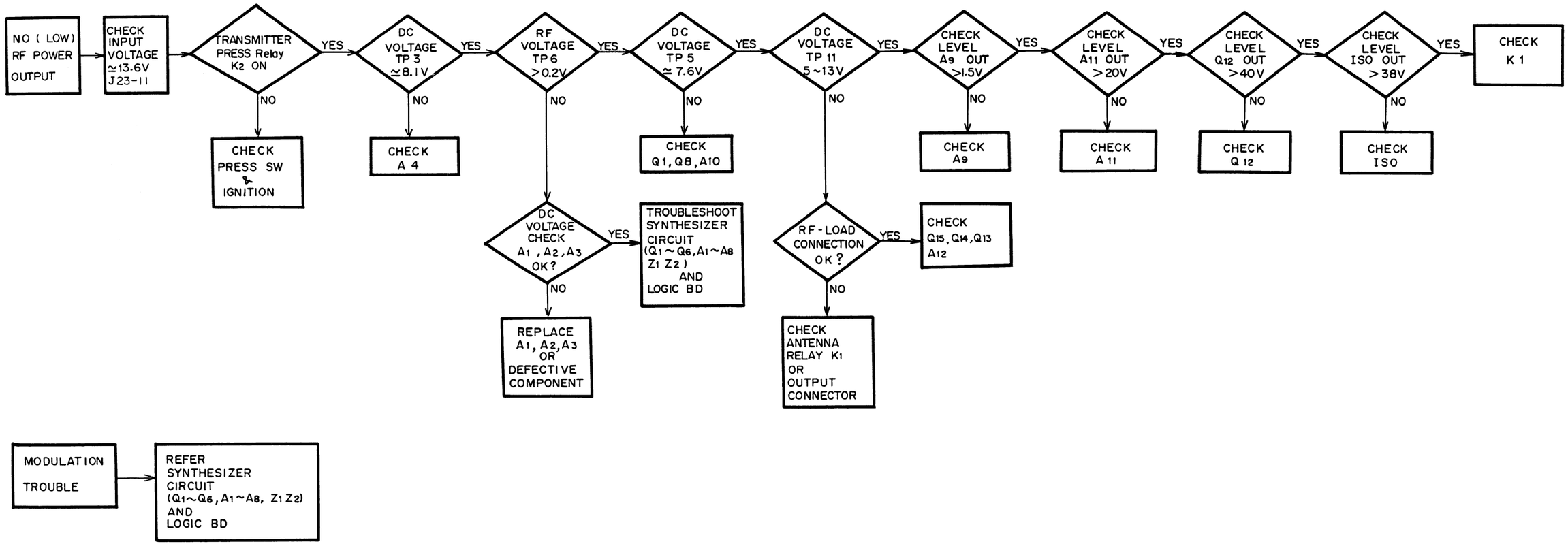
TROUBLESHOOTING PROCEDURE
LOGIC
FLOW CHART



TROUBLESHOOTING PROCEDURE
SYNTHESIZER
FLOW CHART







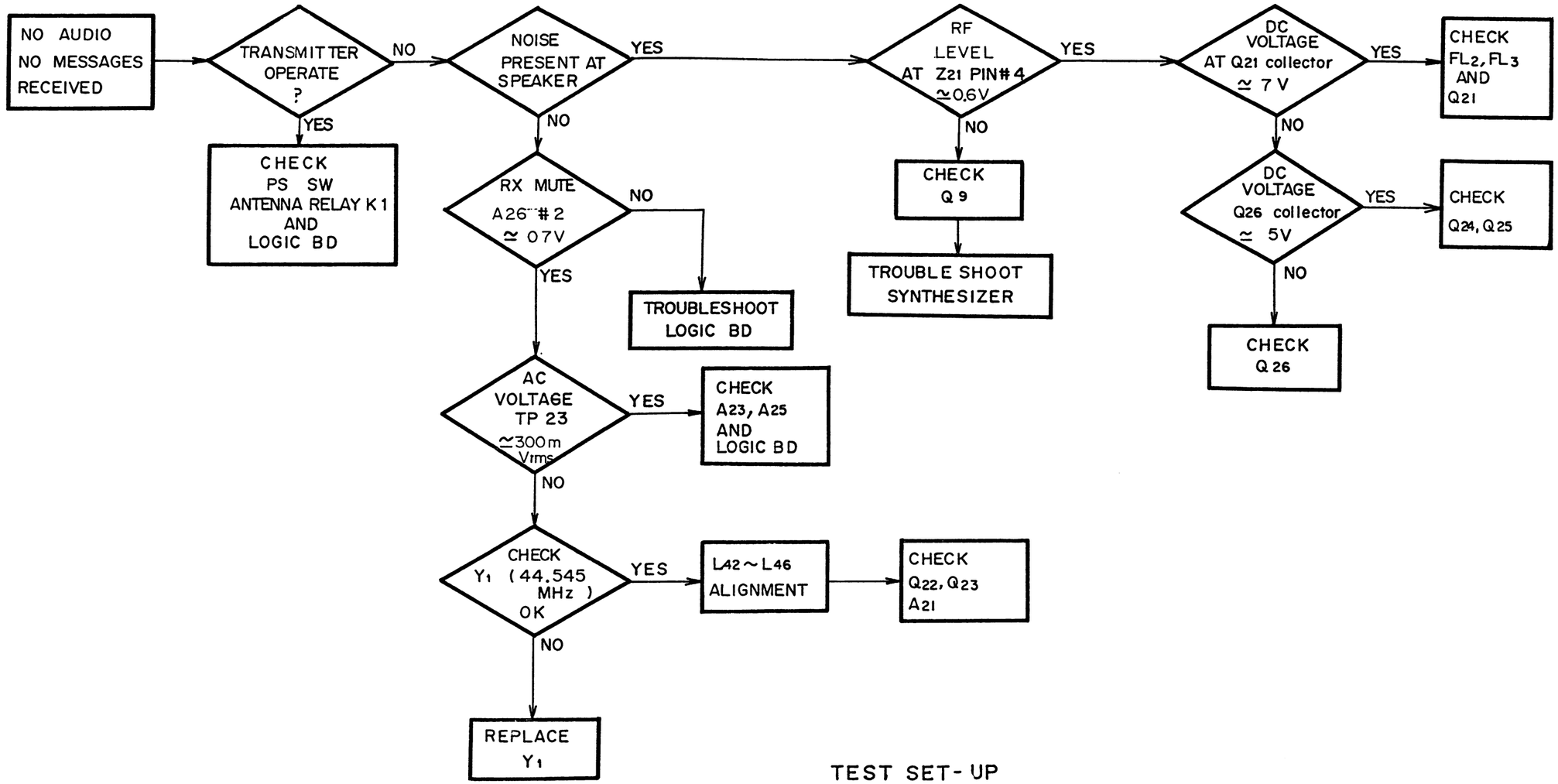
TEST PROCEDURE

1. CONNECT AUDIO OSCILLATOR ACROSS J 22-4 (MIC HI) AND J22-3 (MIC LO).
2. SET OSCILLATOR FOR 1000 HZ AT 1.0 V RMS AND DEVIATION TO 3.5 kHz.

NOTE

AN RMS OR PEAK READING VOLTMETER WILL READ 1/2 TO 1/3 OF PEAK-TO-PEAK READING

3. SET TEST HANDSET CONTROLS TO CENTER FREQ., AND TONE TO GO.



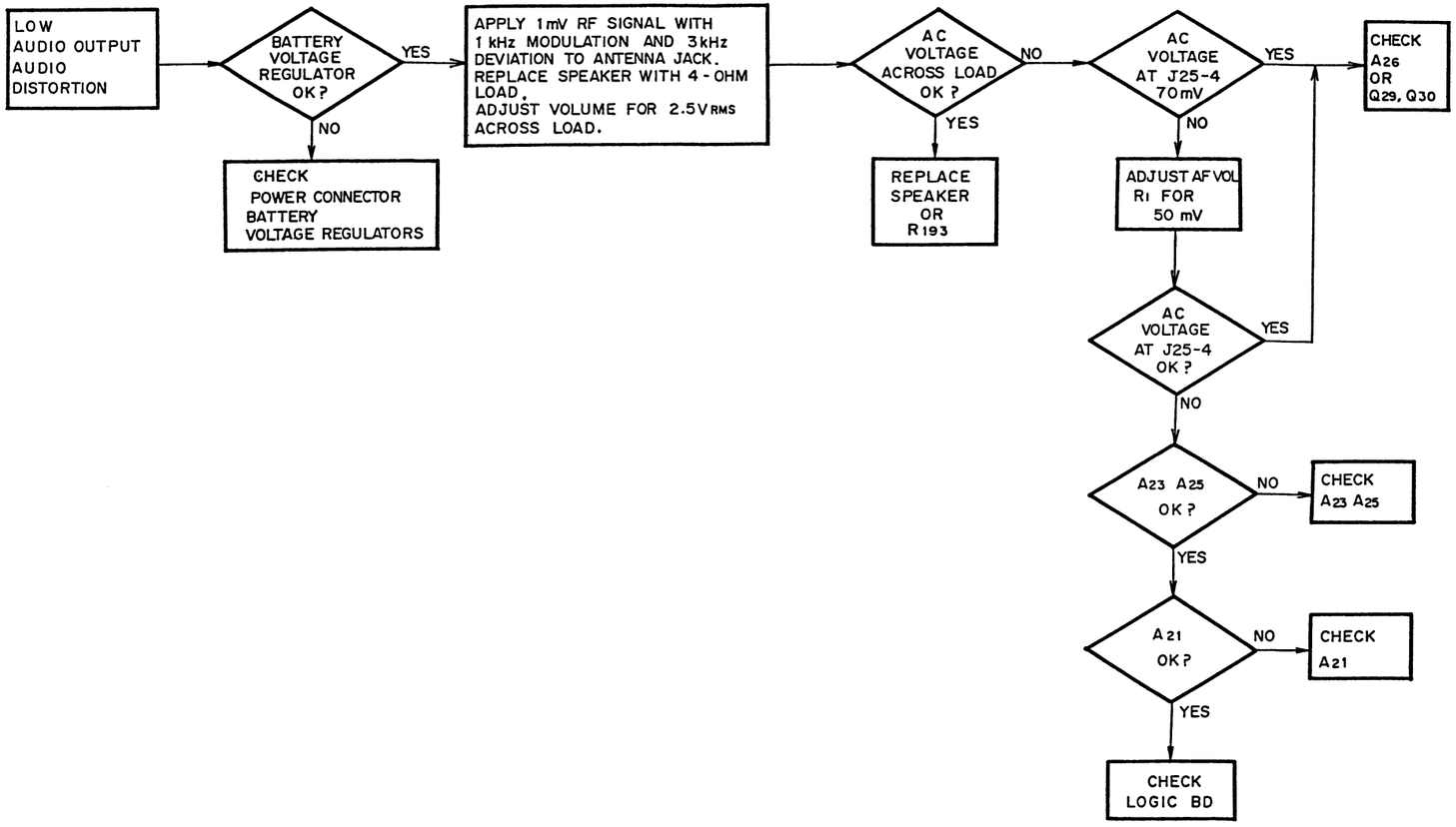
TEST SET-UP

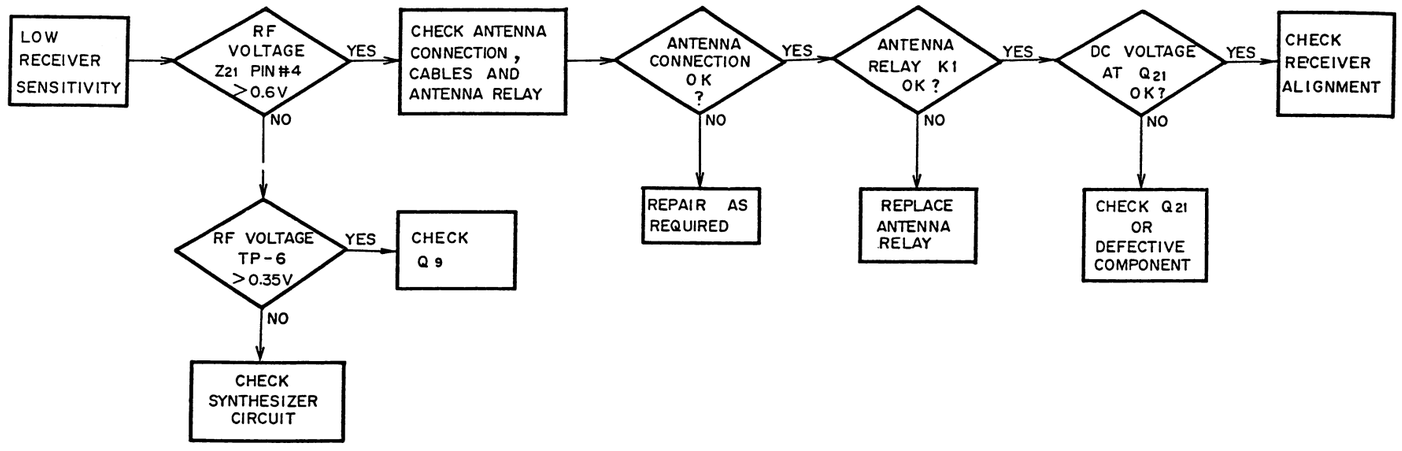
1 SELECT RF FREQUENCY BY ADVANCING
TEST HAND SET TO THE MIDDLE TEST FREQVENCY

2 SELECT TONE 00

TROUBLESHOOTING PROCEDURE

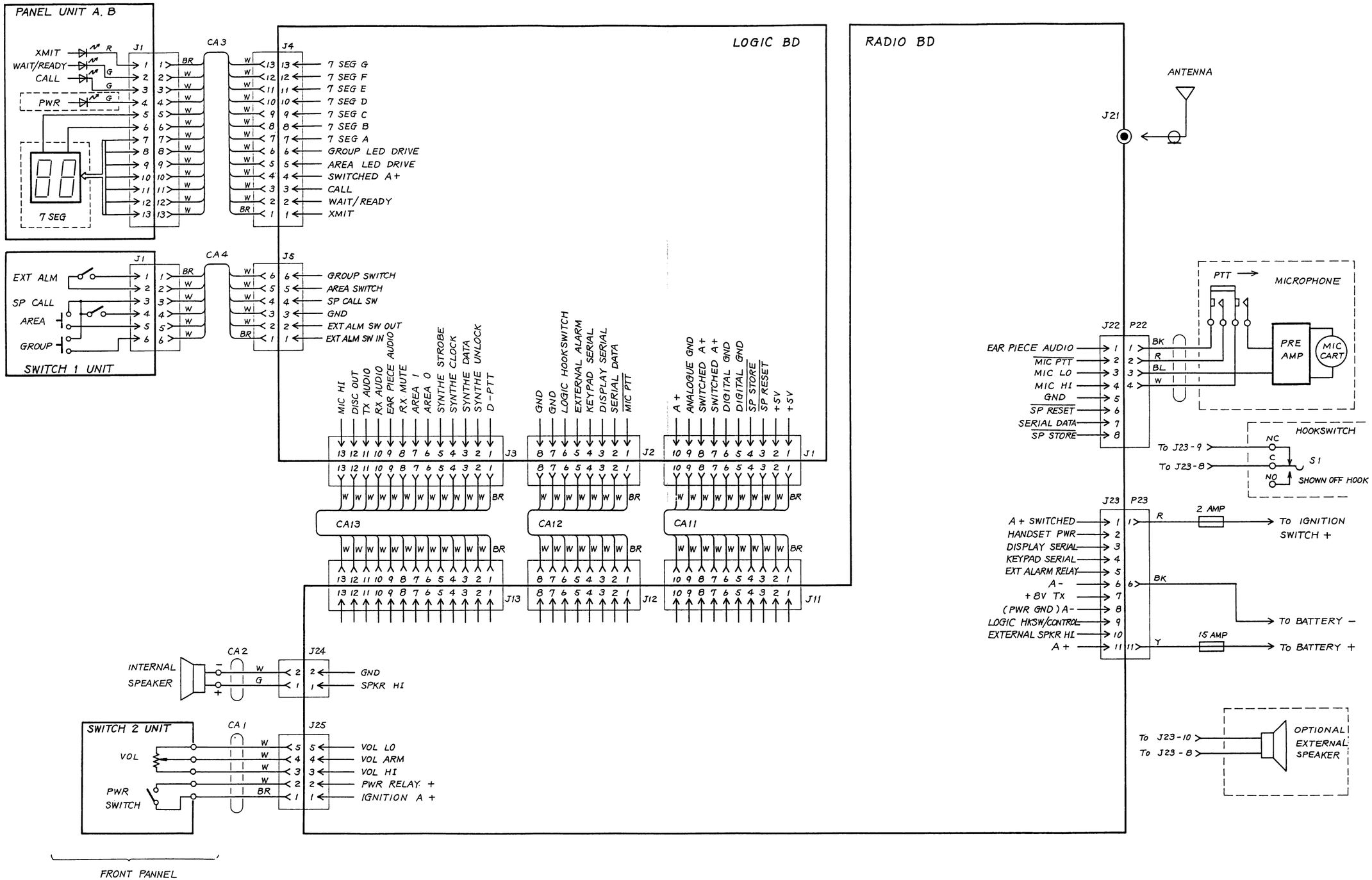
Receiver
(Sheet 1 of 2)





TROUBLESHOOTING PROCEDURE

Receiver
(Sheet 2 of 2)



INTERCONNECTION DIAGRAM

TMX-84 & TMX-86 Series