MAINTENANCE MANUAL

AEGIS™ EDACS™ M-PA™ 800 MHz SERVICE SECTION

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INTRODUCTION

This manual outlines service procedures for the Aegis EDACS M-PA 800 MHz portable radio. Information includes radio disassembly and reassembly procedures, RF alignment and RF component-level troubleshooting steps. Information is also included for tracking and channel data, surface mounted component replacement, weatherproofing procedures, and service data on the batteries. Module and integrated circuit data sheets for the RF Board components are listed at the end of this manual.

NOTE

See LBI-38828 for service information on the Control Board. See LBI-38644 or LBI-38834 for service information on the Front Cover Assembly. See LBI-38829 or 38830 for detailed service information on the Aegis Module.

In order to perform many of the following alignments, tests and troubleshooting checks, it will be necessary to (re)program the radio. Further programming information can be found in the EDACS Programming Manual and software TQ-3364.

It is suggested that an improperly operating radio be first bench tested thoroughly in conventional clear mode. This allows the technician, using standard test equipment, to verify the majority of the radio's circuitry is functional. Any necessary repairs can be completed and the radio can then be tested in trunked mode using an available site. Final testing should include Aegis mode tests using the appropriate test equipment and a second Aegis portable or mobile radio.

Conventional mode testing can (and will) verify proper operation of all of the radio's circuitry with the following exceptions:

- modem IC operation
- data modulation and demodulation circuity
- trunked mode and Aegis mode associated areas of the radio's memory
- Aegis Module

TEST EQUIPMENT

The following is a list of test equipment which may be required to troubleshoot and/or align the portable radio.

GENERAL

- RF Signal Generator
- RF Wattmeter with 5-Watt capability
- Audio Distortion Analyzer with Vu Meter
- Oscilloscope with x1 and x10 Probes
- Audio Oscillator
- Frequency Counter
- Modulation Analyzer
- SINAD Meter
- Regulated DC Power Supply, 5 - 9 Vdc adjustable, 5 amperes maximum
- Digital Multimeter

SPECIALIZED

• K19/A4WX01542	RF Test Cable (UDC mount)
• K19/A4WX01543	Battery Eliminator ("Dummy Battery")
• K19/A4WX01544	RF/Logic Extender Cable
• K19/A4WX01604	Discharge Analyzer (checks battery pack capacity and battery chargers)
• LBI-38518	Front Cover Test Accessory Kit Manual
• SPK9010	Front Cover Test Accessory Kit:
19D902562P5	Front Cover Test Cable
19D902562P1	LCD Extender Plate & Clamp
19D902562P2	LCD Test Cable
19D902562P6	Test Program Diskette
• SPK9011	Front Cover Test Accessory Kit:
19D902562P3	Adapter Board
19D902562P4	Control Board Extender
• ST3559P2	RF Antenna Adapter (top jack to BNC female)
• TQ-0609	Test Box (simulates all external UDC options)
• 19B219079P1	Alignment Tool, 0.1" slotted (metal) tips
• 19B801640P1	Alignment Tool, 0.1" slotted tips

In addition to the above listed equipment, access to a local trunked site and a second portable or mobile (trunked) radio will be necessary to test trunked mode operation. Also, Aegis operational tests will require the appropriate test equipment and a second Aegis portable or mobile radio.

PROGRAMMING

- IBM PC Compatible Computer
- TQ-3364 Programming Manual and Software (includes 5 1/4" and 3 1/2" disks)

- TQ-3310 PC Programming Adapter (Serial Adapter Box and PC-to-Adapter Box Interface Cable)
- TQ-3311 Radio Programming Cable (Adapter Box-to-Radio Cable)

FRONT COVER TEST ACCESSORY KIT

A Front Cover Test Accessory Kit is available for exercising and troubleshooting the circuits in the front cover. Connection to an IBM PC or compatible computer (parallel printer port) allows all of the circuits in the front cover, less Control Board, to be exercised via the PC computer.

An adapter and extender board in the kit allows the Control Board to be extended out of the case for troubleshooting access. See the **TEST EQUIPMENT** section of this manual for a breakdown of the kit.

The LCD Board and Keypad Flex can be exercised without the Control Board while still in the radio's case. All of the switches and the logic circuitry can be tested via the PC connection. Status of the switches is displayed on the PC. The LCD Board can be fully exercised by sending it various patterns to display from the PC. LCD/Keypad backlighting can also be toggled on and off.

Test points are provided for the volume control and microphone audio. A resistor network on the Front Cover Test Cable provides a dc bias to the mic in the absence of the Control Board's bias.

FUNCTIONAL TEST

The following test procedure outlines a functional bench test of the radio. It may be necessary to (re)program the radio before proceeding with this test.

1. Power the radio up.
2. Rotate the Control Knob and verify the display changes and indicates the proper programmed information. On Scan and System models, press the STEP key to scroll through various systems, groups or channels according to the radio's personality programming.
3. Connect a wattmeter and frequency counter to the radio and select a conventional (test) channel that has been programmed for clear voice (analog) operation. Press the PTT Button to key the transmitter and measure RF power and frequency. See Table 4 for transmitter power specs. See Table 3 for transmitter frequency error specs. The TX flag should appear in the display when the radio is transmitting.
4. Select a channel that has been programmed for receive only. Press the PTT Button. The radio should beep and the display should flash.
5. Select a conventional channel that has been programmed for Channel Guard decode operation and clear voice mode. The CG flag should appear. Press the Monitor Button to unsquelch the radio. Receiver noise should be heard from the internal speaker and the noise level should follow the rotation of the Volume Control. Hold the Monitor Button and verify that the CG flag disappears after two (2) seconds. Release the button and then press it again. Channel Guard operation should return after two (2) seconds as indicated by the CG flag.
6. Remove the wattmeter and connect the radio to an RF signal generator. Test several conventional channels. Verify receiver specifications.
7. Verify proper scan operation on Scan and System model radios. The SCN flag should appear when the radio is scanning. See the operator's manual for complete details.
8. Verify DTMF keypad operation on System model radios. Each character (0-9, * and #) should be display when the corresponding key is pressed. See the operator's manual for complete details.
9. Disconnect the signal generator and install an antenna. Select a local trunked system and group which is programmed into the radio for clear voice operation. From a second mobile or portable radio set to the same system and group, transmit a clear voice group call. At the radio under test, verify the BSY flag turns on, it unsquelches and receives the call. Now transmit a clear voice group call from the radio under test. Verify the TX and BSY flags turn on and the call is heard at the second mobile or portable radio.
10. Select a group which is programmed into the radio for Aegis digital operation. From the second mobile or portable radio set to the same group, transmit an Aegis digital group call. At the radio under test, verify the BSY flag turns on, it unsquelches and receives the call. Now transmit an Aegis digital group call from the radio under test. Verify the TX and BSY flags turn on and the call is heard at the second mobile or portable radio.
11. If the radio is equipped with an encrypt/decrypt option, select a group programmed for Aegis private

operation and transmit an Aegis private group call from the second mobile or portable radio set to the same group. Verify the BSY flag turns on, the PVT flag flashes and the call is heard in the speaker of the radio under test. Now transmit a private mode group call from the radio under test. Verify the TX and BSY flags turn on and the call is heard at the second mobile or portable radio.

DISASSEMBLY / REASSEMBLY

In the event internal service is required, disassemble the radio in accordance with the following outlined steps. See Figures 1 - 5.

Reassemble the unit by following the steps in reverse order. Observe screw lengths and do not over tighten the screws when reassembling the unit. Torque specifications are listed in Table 1.

TOOLS REQUIRED

- TORX® T6 Driver
- M1.5 Hex Driver or Wrench
- Needle-Nose Pliers
- Small Flat-Blade Screwdriver
- Spanner Wrench (top antenna jack)
- Spanner Wrench (UDC antenna jack)
- Spanner Wrench (volume control and group/channel switch)

TABLE 1 - TORQUE SPECIFICATIONS

LOCATION	LB-IN.
Rear/Front Cover Assembly Screws	5.0
Rear Cover Assembly	
Antenna Insert	10.0
UDC RF Connector	10.0
RF Board/Eggcrate Screws	4.0
PA Support Screws	10.0
Antenna Switch (SW1) Screw	1.5
Front Cover Assembly	
Knob Set Screws (earlier)	3.0
Knob Set Screws (later)	5.0
Group/Channel and Volume Nuts	8.0
UDC Ground Screw	4.0
All M1.6 and M2 Screws	3.0

CAUTION

Always remove the battery pack before disassembling the unit to avoid blowing the fuse or causing other component damage.

This radio contains CMOS ICs that can be damaged by static electricity. Observe static handling precautions.

FRONT AND REAR COVER SEPARATION

Lay the radio face down and loosen the four (4) Torx® screws (A) on the back of the radio; complete screw removal is not necessary. See Figure 1. Separate the covers by carefully lifting the Rear Cover Assembly straight-up to avoid bending the connector pins between the RF and Control Boards.

When reassembling the unit, verify the rubber gasket surrounding the perimeter of the cover is in good condition and it is in the groove. Also verify the connec-

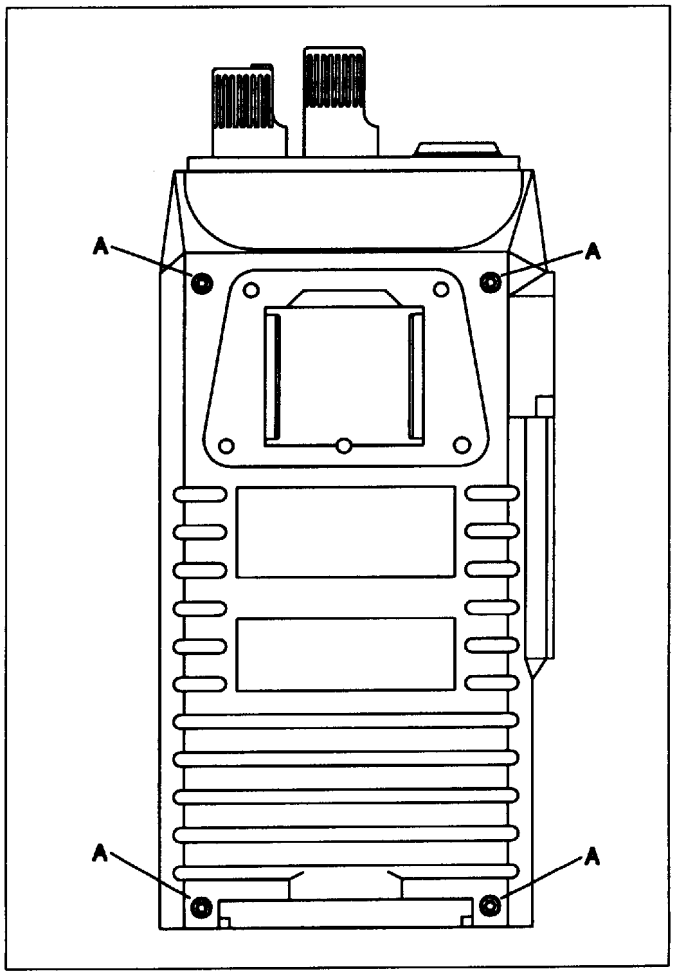


Figure 1 - Front and Rear Cover Separation

tor pins align properly. For proper operation, the screws should be tightened so there is no gap betweenthe covers. It is recommended that the top screws be tightened first while squeezing the radio together to ensure the gap is completely closed. The bottom screws can then be tightened.

RF BOARD ACCESS

If removal of the RF Board from the case is necessary, first remove the UDC antenna jack and the top RF antenna jack (**B**). Next, remove the eight (8) Torx® screws (**C**) that secure the RF Board to the Rear Cover. See Figure 2. The RF Board and the eggcrate casting can now be lifted from the rear cover. Two (2) PA mounting Torx® screws and five (5) Torx® screws on the under-side secure the board to the eggcrate casting.

NOTE

The RF shield used in the 800 MHz Aegis EDACS M-PA radio is a press-fit metallized elastomer design. This shield is not held in place with screws and it remains in the radio's Front Cover Assembly when the covers are separated. When reassembling the radio, make sure the metallized surface of the shield faces the RF assembly.

CONTROL BOARD ACCESS

To gain partial access to the Control Board, remove the five (5) screws (**D**) securing the shield and board. An earlier Front Cover Assembly has an additional screw located just below connectors J4/P4 (**DD**). See Figure 3. Remove the shield.

Many of the test points on the Control Board are accessible at this point; however, the Front Cover Assembly should not be powered-up without first reinstalling the screw into the lower right-hand hole to ground the board. Also, the three (3) screws securing the top flex connectors need to be reinstalled for good flex connections. USE CAUTION: Installation of screws that are

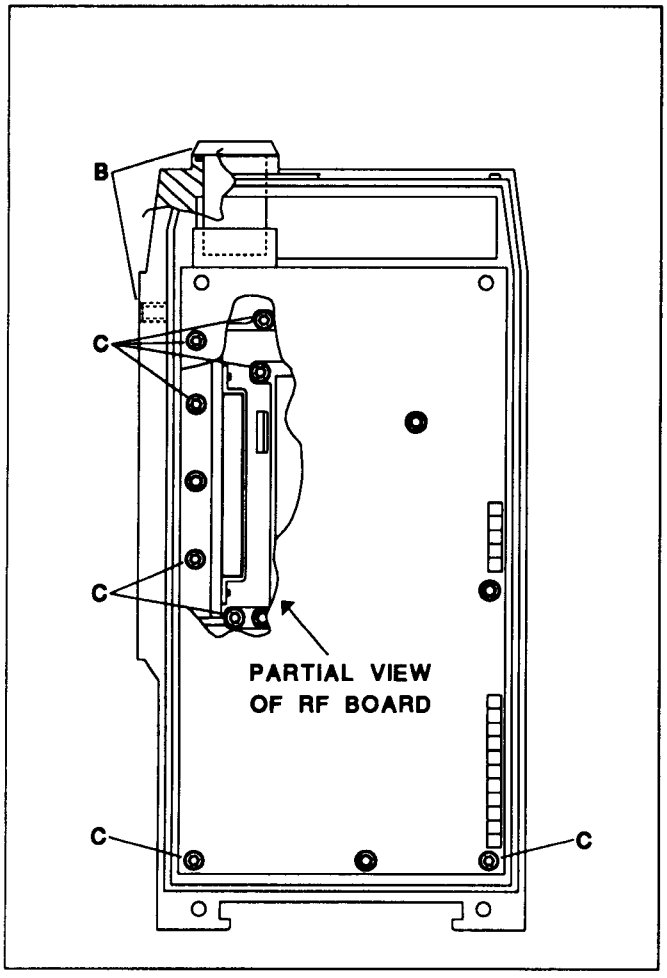


Figure 2 - RF Board Access

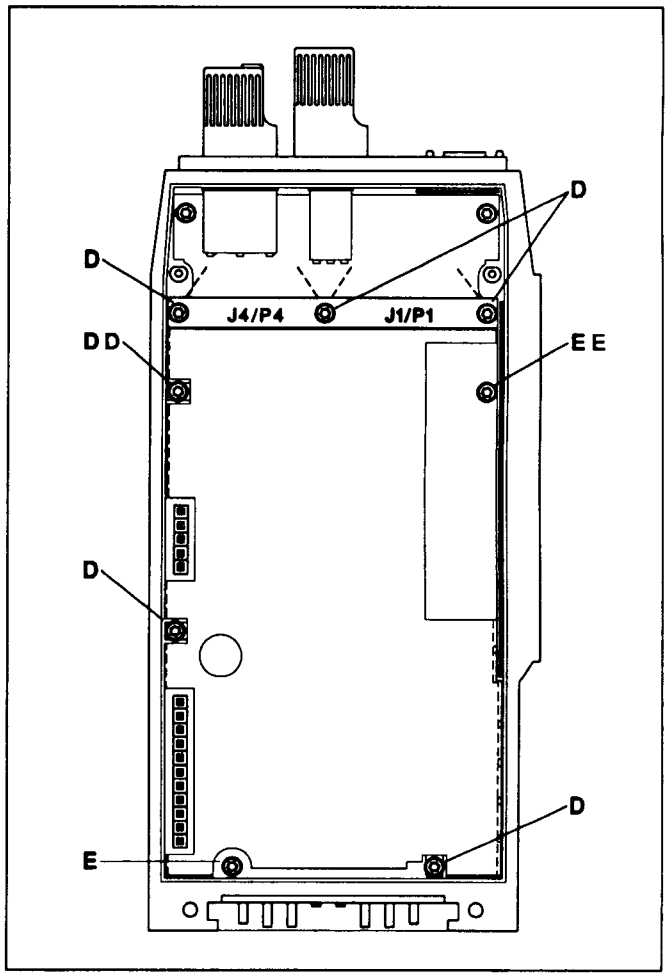


Figure 3 - Control Board Access

longer than the originals may damage the LCD Board, flex circuits or the threads.

To remove the Control Board, remove the Torx® screw (E) in the lower left-hand corner that supplies battery power to the board. An earlier Front Cover Assembly has an additional screw located just below connectors J1/P1 (EE). Lift the board and carefully unplug Speaker Flex plug P3 from J3 on the Control Board. Avoid bending this or any other flex circuits at sharp angles. The Control Board may now be removed. Note the battery power and ground connections at the bottom of the board where the screws have been removed.

SPEAKER, MICROPHONE AND FLEX CIRCUIT ACCESS

Remove the Control Board as previously stated and then remove the six (6) Torx® screws that secure the die-cast shield. Remove the die-cast shield by lifting the top end first and sliding it towards the top of the radio. The internal speaker, microphone, Keypad and UDC Flex circuits are now partially accessible. See Figure 4.

UDC Flex/UDC/Monitor Button/PTT Switch Assembly Removal

If UDC Flex/UDC/Monitor Button/PTT Switch assembly removal is necessary, first un-solder the microphone. With a spanner wrench, remove the UDC securing screw (the UDC ground pin). Remove the insulator (foam or plastic type) on the inside side-rail of the case. Lift the UDC/Monitor Button/PTT Switch assembly from the side of the case and slide the flex through the slot.

Earlier Front Cover Assembly Keypad Flex Removal

To remove the Keypad Flex, first remove the UDC Flex/UDC/Monitor Button/PTT Switch assembly as previously stated. Next remove the knobs using the hex

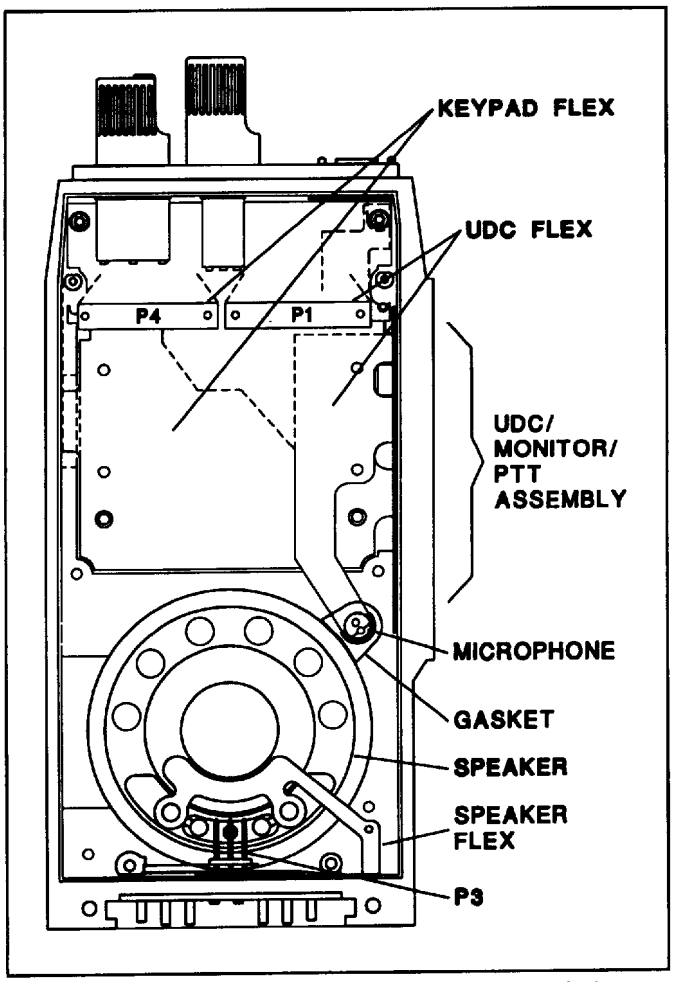


Figure 4 - Speaker, Microphone and Flex Circuit Access

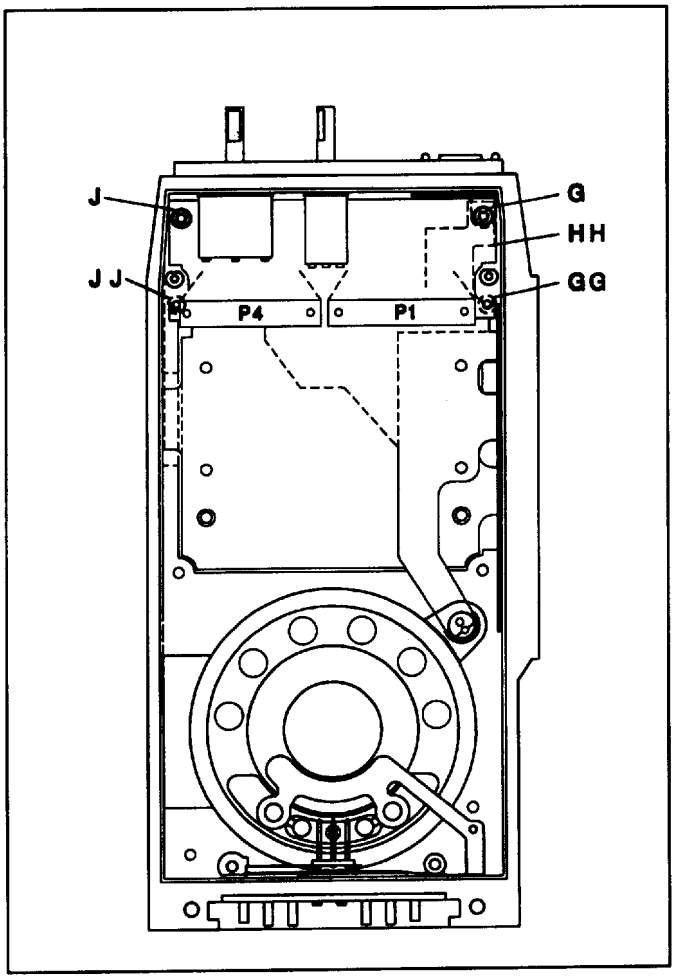


Figure 5 - Keypad Flex and LCD Board Access

driver. Unscrew the two (2) screws securing the top panel and lift and remove the panel. Lift the Emergency Button Board by carefully unplugging J6 from P6. With a spanner wrench, remove the nuts securing the volume and channel controls and carefully slide the controls inside the radio. Unscrew the two (2) screws (G and GG) and remove the J10/P10 Zebra strip securing plate (HH). See Figure 5. The Keypad Flex is now free for removal.

Later Front Cover Assembly Keypad Flex Removal

To remove the Keypad Flex, first remove the UDC Flex/UDC/Monitor Button/PTT Switch assembly as previously stated. Next remove the screw securing the emergency switch support (G) then remove the support. Remove the knobs using the hex driver. With a spanner wrench, remove the nuts securing the volume and channel controls and carefully slide the controls inside the radio. Unscrew the two (2) screws that secure the J10/P10 connection at the bottom of the LCD Board. Remove the screws, the plate and the rubber pad. The Keypad Flex is now free for removal.

Speaker Flex Removal

In order to replace the Speaker Flex, it must be un-soldered from the speaker and the Battery Plate.

LCD BOARD ACCESS

To remove the LCD Board, partial removal (actually repositioning of the top areas) of the Keypad Flex is required. UDC Flex/UDC/Monitor Button/PTT Switch assembly removal is not necessary.

After the top areas of the Keypad Flex have been freed as previously outlined, the LCD Board can be removed. At this point is the disassembly process an earlier Front Cover Assembly has two (2) screws on the left side as view from the back (J and JJ) and a later assembly has a single screw in the upper left-hand side (J). See Figure 5.

ALIGNMENT PROCEDURES

This section outlines alignment procedures for the 800 MHz RF Board located in the Rear Cover Assembly. Alignment procedures must be performed in the order presented to insure proper radio operation. Several test procedures are presented which will help isolate a problem if it exists. The circuits in the Front Cover Assembly contain no adjustments and therefore no alignment is necessary.

SERVICE NOTES

Throughout the service procedures presented in this manual, the following information should be observed:

- The bench power supply should be set for 7.5 ±0.1 Vdc (unless otherwise noted) during troubleshooting procedures presented in this manual. If a battery pack is used, it should be fully charged. Typical battery pack voltage will be 7.5 Vdc ±20% over its full discharge cycle.
- Logic Levels:
  Logic 1 = high = greater than 4.5 Vdc
  Logic 0 = low = less than 0.5 Vdc
- The modules are not field repairable. Schematics and outline diagrams for the modules are presented in this manual as a troubleshooting reference only.
- The Front Cover Test Accessory Kit allows the Control Board to be extended out of the case for troubleshooting access. The LCD and Keypad circuits can be tested in the case via a PC computer connection.
- The personality information stored in the radio should be backed-up on the PC computer before any service procedure is performed.

SET-UP PROCEDURE

1. Separate the Front and Rear Cover Assemblies and connect the RF/Logic Extender cable between the RF Board and the Control Board. See Figure 6.
2. Slide the Dummy Battery onto the Front Cover and connect the audio output leads to the distortion analyzer. Place the Dummy Battery's on/off switch in the OFF position to direct the speaker audio to its speakers leads and to the distortion analyzer. Connect the PC Programmer to the UDC.
3. Set the power supply to 7.5 ±0.1 Vdc and connect the Dummy Battery supply leads to the power supply.
4. Program the radio with the LOW, MIDDLE and HIGH-side test channels listed in Table 2. To fully

test the transmitter, program a channel pair for each frequency at high-power and one at low-power. It may be desirable to program more test channels into the unit.

5. Remove power from the radio and replace the PC programming cable with the TQ-0609 Test Box.

6. Connect the radio to the wattmeter using the RF Antenna Adapter. Couple a small amount of the RF signal to the frequency counter.

TABLE 2 - RF TEST CHANNELS

	TEST FREQUENCY (MHz)		
RF BAND	LOW	MIDDLE	HIGH
806-824 MHz*	806.0125	815.5125	824.0000
851-869 MHz	851.0125	860.5125	869.0000

* Transmit only (RX channels are 45 MHz higher)

TRANSMITTER ALIGNMENT

The following infomation can be used to test and align the transmitter's output and its modulation characteristics. Completion of these tests/alignments will verify a near 100% operating synthesizer and transmitter stages.

Reference Oscillator

1. On the TQ-0609 Test Box, select UDC switch position 6 and apply power to the radio. This enables the radio's control circuits for an external microphone and its internal speaker amplifier.

NOTE

LBI-38203 contains detailed information on the TQ-0609 Test Box.

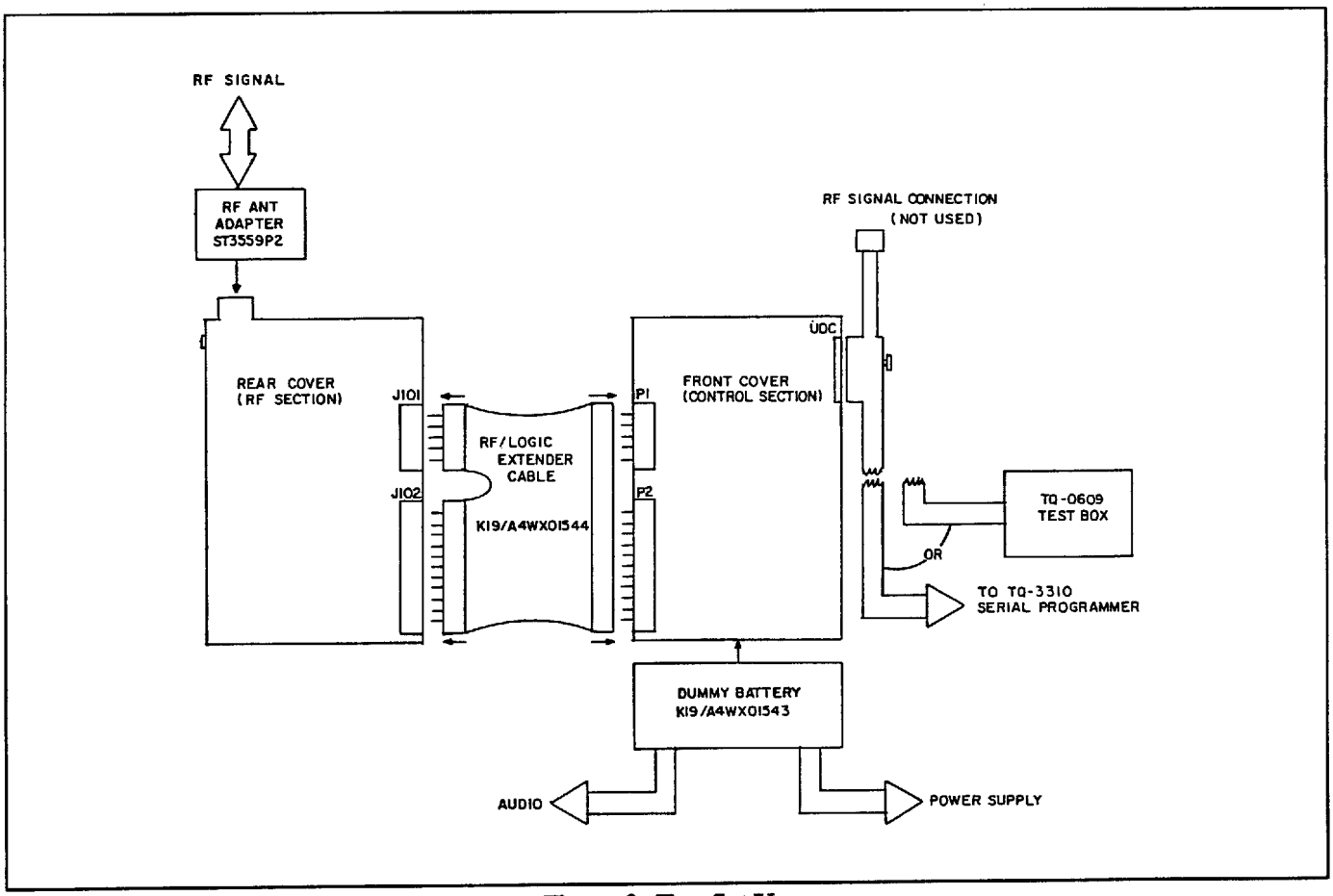


Figure 6 - Test Set-Up

NOTE

Reference Oscillator U4 is factory adjusted and should not normally need readjustment. **Use a recently calibrated and stable frequency counter to determine if oscillator alignment is needed.** This test/alignment should be done at a room temperature of 25°C ±5°C.

2. Channel the unit to 860.5125 MHz (low-power) and key the transmitter using the TQ-0609. DO NOT apply any modulation at this time.

3. Monitor the transmitter's frequency and adjust Reference Oscillator U4 to a frequency reading of 860.5125 MHz ±100 Hz (a small trimmer hole is located on top of module). If the ±100 Hz maximum error (at room temperature) cannot be secured, Reference Oscillator replacement may be necessary. Table 3 list maximum transmitter errors for the specified temperature range.

4. Check all TX test channels for an error of less than ±100 Hz.

VCO Modulation

1. To align R5 it will be necessary to modify the RF/Logic Extender cable as follows:

NOTE

VCO Modulation adjustment should only be necessary if changes in the Tracking Data values will not compensate deviation levels to within specifications. Adjustment of R5 will obsolete all Tracking and Channel Data modulation values. See the TRACKING AND CHANNEL DATA section in this manual for further details.

R5 "course aligns" the VCO modulation level. The Audio Processor IC will perform "fine level adjustment" of TX deviation via the Tracking and Channel Data.

- Add two 10K ohm resistors in series from 5.4 Vdc (J102 pin 6) to ground (J102 pin 7).
- Break the connection at TX AUDIO, J102/P2 pin 1.
- Bias TX AUDIO into the RF Board to 2.7 Vdc by connecting the junction of the 10K resistors to J102 pin 1.

2. Using a 100 μF (or greater) capacitor, couple a 1 kHz, 600 mV rms audio signal into TX AUDIO, J102 pin 1.

3. Connect the radio to the modulation analyzer and key the transmitter at 815.5125 MHz.

TABLE 3 - MAXIMUM TRANSMITTER FREQUENCY ERRORS* AND TYPICAL VCO (TP2) TX TUNING VOLTAGES

CHANNEL (MHz)	TOLERANCE* (Hz)	LOWEST (MHz)	HIGHEST (MHz)	VCO TUNING VOLTAGE	BAND SWITCH (J102 pin 3)
806.012500	±1209	806.011291	806.013709	1.5 Vdc	low
815.512500	±1223	815.511277	815.513723	2.9 Vdc	low
824.000000	±1236	823.998764	824.001236	4.2 Vdc	low
851.012500	±1277	851.011223	851.013777	1.9 Vdc	high
860.512500	±1291	860.511209	860.513791	3.1 Vdc	high
869.000000	±1304	868.998696	869.001304	4.2 Vdc	high

* Based on specified ±1.5 ppm over the entire operating temperature range.

4. Adjust the R5 for a deviation of ±4.3 kHz ±100 Hz. Unkey the radio.

5. Check low-frequency modulation as follows:

   - Remove the 1 kHz signal and apply a 20 Hz, 1 Vp-p square wave. NOTE: The modulation analyzer should have a low-frequency response of less than 1 Hz for this test.
   - Key the transmitter and monitor the demodulated output from the modulation analyzer. Check for a good square wave response at 860.5125 MHz. If the modulation peaks are not flat, slightly readjust R5 for a good demodulated square wave. If this readjustment causes the 1 kHz modulation set in step 4 to go outside of the specified window, U4 may need to be replaced.

Distortion Test

Measure transmitter audio distortion on the LOW, MIDDLE and HIGH-side test channels. Distortion readings should be less than 3% at ±3 kHz deviation with a 1000 Hz tone.

RECEIVER ALIGNMENT

The following information can be used to check and align the receiver circuits. Successful completion of these alignment procedures will verify a near 100% operating synthesizer and receiver stages.

NOTE

There are no front-end filter, mixer or high-IF adjustments.

2nd Local Oscillator

1. Check the Reference Oscillator alignment as outlined in the **TRANSMITTER ALIGNMENT** section.

2. Channel the unit to 860.5125 MHz.

3. Set the RF signal generator to 860.5125 MHz, -20 dBm and no modulation. Apply this signal to the radio.

4. To measure the IF signal, connect the frequency counter to TP1 on the RF Board or to the collector of Q1 on Back-End Module U14. Use an appropriate high impedance probe (or amp).

5. Adjust the signal generator level to achieve accurate counting of the IF signal; the RF signal generator should be set 10 dBm above the lowest level which gives accurate counting.

6. Adjust the 2nd local oscillator via L13 for 455.000 kHz ±90 Hz.

Quadrature Detector

1. Modulate the signal generator with a 1 kHz tone, ±3 kHz deviation at 860.5125 MHz. Set the RF level to -50 dBm.

2. Adjust L14 for maximum audio level at J101/P1 pin 4.

12 db SINAD and Distortion Tests

1. Connect the distortion analyzer or SINAD meter to the speaker load (in Dummy Battery).

2. With the RF signal generator and radio set to 860.5125 MHz, modulate the generator with a 1 kHz tone at ±3 kHz deviation. Measure the 12 dB SINAD sensitivity. This reading should be equal to or better than -116 dBm (0.35 UV).

3. Return the signal level to -50 dBm.

4. Check audio distortion. Readings should be less than 5% at rated audio output. Audio amplitude should be 100 - 150 mV rms (~350 mVp-p) at J101/P1 pin 4.

5. Repeat the 12 dB SINAD sensitivity and distortion check for the LOW and HIGH-side test channels. See Table 2.

TRACKING AND CHANNEL DATA

The personality memory in the radio includes distinct areas which are reserved for Tracking and Channel Data.

Tracking Data establishes individual radio parameters and tailors the operation of the unit across the band. The parameters are: high RF power, low RF power, modulation level and receiver squelch opening. This data is programmed into the EEPROM on the Control Board at the factory after the front and rear covers are "married".

The PC Programmer allows alteration of this data if necessary.

Channel Data is the individual channel information such as TX and RX frequencies, CG information, CCT information, and the four previously mentioned parameters. This data is stored in the EEPROM on a per channel basis as each channel is programmed. The PC Programmer allows alteration of this data (on a per channel basis) if necessary.

Low, middle and high-side of the band values are programmed into the radio for each Tracking parameter per band (806-825 and 851-870). When a channel is added to the radio, the Programmer reads the Tracking Data stored in the radio and calculates necessary values for each parameter using a linear interpolation technique. The Programmer then stores the newly calculated values in the Channel Data area of memory along with the associated channel information. Changing the Tracking Data in the radio will not alter Channel Data of previously programmed channels.

Tracking Data should not normally be altered; however, it may be necessary to reprogram some of the values after aligning circuitry, or replacing modules or other components which obsolete the previously programmed values. Settings for each parameter are listed in Table 4. If Tracking Data is altered for the above reason, it will be necessary to reprogram all channels to establish the new default data for each channel. See the Programming Manual for further information on altering Tracking and Channel Data.

Digital values stored for the POWER SET analog voltage are one example of tracking information. As no two transmitter stages are exactly matched, the POWER SET dc voltage will be slightly different with any two radios to produce the same power output. Tracking and Channel Data allows the microprocessor to tailor the POWER SET line for RF stage gain differences from unit-to-unit and across the band

TABLE 4 - TRACKING DATA PARAMETERS

PARAMETER	FACTORY SETTING	HEX VALUE*
High-Power	3.0 Watts	85
Low-Power	1.0 Watt	50
Modulation	±4.3 kHz **	0A
Squelch Opening	8 dB SINAD	A0

* Listed hex values are approximate; final programmed values will vary from unit-to-unit and will need to be adjusted as such.

** EXT MIC HI = 1 kHz, 110 mV rms

TROUBLESHOOTING

Troubleshooting procedures for the Rear Cover Assembly are located in this manual. See the manuals specific to the Front Cover Assembly, the Control Board or the Aegis Module for detailed troubleshooting procedures on these assemblies. The troubleshooting tests set-up should be identical to the set-up used in the **ALIGNMENT PROCEDURES** section of this manual. Table 5 lists common problems and most likely problem areas.

SERVICE NOTES

Throughout the service procedures presented in this manual, the following information should be observed:

- The bench power supply should be set for 7.5 ±0.1 Vdc (unless otherwise noted) during troubleshooting procedures presented in this manual. If a battery pack is used, it should be fully charged. Typical battery pack voltage will be 7.5 Vdc ±20% over its full discharge cycle.
- Logic Levels:
  Logic 1 = high = greater than 4.5 Vdc
  Logic 0 = low = less than 0.5 Vdc
- The modules are not field repairable. Schematics and outline diagrams for the modules are presented in this manual as a troubleshooting reference only.
- The Front Cover Test Accessory Kit allows the Control Board to be extended out of the case for troubleshooting access. The LCD and Keypad circuits can be tested in the case via a PC computer connection.
- The personality information stored in the radio should be backed-up on the PC computer before any service procedure is performed.

REAR COVER ASSEMBLY

The troubleshooting procedures that follow primarily assume a problem has been narrowed to a problem on the RF Board. Transmitter, receiver and synthesizer symptoms/causes are outlined.

TABLE 5 - GENERAL TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSES
Completely inoperative (no audio and no LCD indication)	1. Dead Battery Pack. 2. Fuse blown: Check radio fuse in Battery Plate. 3. Control Board problem: See LBI-38828.
At power-up, radio beeps: a. twice (once in addition to power-up beep) b. continuously at an ~2 Hz rate c. continuously at an ~2 Hz rate and "NO LOCK" is displayed	1a. Weak Battery Pack. 1b. Unit is not programmed: Program radio - See TQ-3364. 1c. Synthesizer is not locked: Check LOCK detect line, synthesizer loading and VCO tuning voltage.
At power-up, display: a. flashes "PERS ERR" b. flashes all segments and the radio beeps.	1a. EEPROM problem on Control Board: See LBI-38828. 1b. Interprocessor communication failure on Control Board: See LBI-38828.
Receiver inoperative or weak (clear mode).	1. Squelch levels programmed too high: Press Monitor Button to disable squelch. 2. Channel Guard or Type 99 Enabled: See Operator's Manual. 3. Defective antenna. 4. RF Board problem: Troubleshoot Rear Cover Assembly.
Transmitter inoperative or low range.	1. Power levels programmed low: Check RF output and reprogram unit if necessary. 2. Weak battery. Note "BAT" flag. 3. Defective antenna. 4. RF Board problem: Troubleshoot Rear Cover Assembly.
TX and RX inoperative on some channels only	1. Programming incorrect: Reprogram unit - See TQ-3364. 2. Synthesizer problem (VCO or prescaler): Check LOCK detect (high = lock), VCO tuning voltage and modulas control line. 3. EEPROM Problem: Troubleshoot Control Board.
TX and RX inoperative on all channels	1. Programming incorrect: Reprogram unit - See TQ-3364. 2. Synthesizer problem: Check LOCK detect (high = lock), VCO tuning voltage and modulas control line. 3. Control Board problem: See LBI-38828. 4. Check SW1, U2 and U5 on RF Board.
Trunk Mode Problems	1. Modem circuitry problem: Check U19 and associated circuitry on Control Board. 2. Low-speed data problem: Troubleshoot the related encode or decode circuitry on the Control Board.
Aegis Mode Problems (trunked mode OK)	1. Verify outside addresses and data polarity. 2. If optionally equipped for encryption, verify correct keys are loaded and selected. 3. Option PAVE units only: Verify CUE codes. 4. Aegis Module problem. 5. Problem on Control Board with Aegis Module control circuitry.

Transmitter Troubleshooting

Inoperative Or Low Power

Power sources and regulated power supplies should be one of the first areas to check before troubleshooting any transmitter problem. The radio's power source, whether it is a battery or a bench power supply, is especially critical when troubleshooting a portable radio. Current consumption is an excellent troubleshooting tip when troubleshooting a dead or weak transmitter. See the Control Board maintenance manual for complete radio current consumption data.

When the synthesizer is not locked the radio will beep and flash "NO LOCK" in the display. If the synthesizer does not lock or stay locked at the start of or during a transmission, I/O Microcontroller will not enable or continue the transmission. Check LOCK detect at J102/P2 pin 8 for a low or pulsing (not locked) condition. See **Synthesizer Troubleshooting** for further details.

1. Check for battery power on J102/P2 pin 2.

2. Check for 5.4 Vdc ±0.1 Vdc at J102/P2 pin 6 with the transmitter enabled. Also check the operation of the TX 5.4V switch to insure 5.4 Vdc is being delivered to the RF Board at J101/P1 pin 5 when the PTT button is pressed.

3. Battery power should be present at the Power Amplifier module pins 3 and 4. If current consumption appears normal for both high and low-power modes, the problem may be Antenna T/R Switch module U2, the Low-pass Filter module U5 or antenna switch SW1. If the Low-pass Filter module or the antenna switch have a problem, generally the receiver will also be weak. A defective pin diode inside the Antenna T/R Switch module may cause transmitter and/or receiver problems.

4. If low RF power is a symptom, check the operation of Power Controller A2 and Q4. POWER SET on J101/P1 pin 1 should be approximately 1.8 Vdc in low-power mode and 2.9 Vdc in high-power mode. If Q4 is saturated (collector voltage is approximately 7.5 Vdc), troubleshoot the PA U1 and Exciter U9 for a gain problem. Also check the VCO and Q6 for low RF drive. Buffer Q6 supplies approximately 0 dBm to U9. Exciter U9 has an approximate gain of 23 dB and PA U1 has an approximate gain of 16 dB.

5. Check Tracking and Channel Data. Reprogram if necessary.

Excessive Power Output

Short battery life and possible damage to the PA module may result if this problem occurs in the power controlling circuitry.

1. Check POWER SET from the Control Board. POWER SET on J101/P1 pin 1 should be approximately 1.8 Vdc in low-power (1 Watt) mode and 2.9 Vdc in high-power (3 Watts) mode. If incorrect, troubleshoot the D/A converter circuits (in Audio Processor U8) on the Control Board. Check Tracking and Channel Data. Reprogram if necessary.

2. The collector of Q4 should be approximately 3.5 Vdc in low-power mode and 5.5 Vdc in high-power mode. If Q4's collector stays near 7.5 Vdc in receive mode, it is most likely shorted. Temporarily short the emitter and base while monitoring the collector voltage. If the collector voltage falls, there is a problem in Power Controller A2.

Frequency Error

If transmit frequency error exists (greater than 1.5 ppm) when the synthesizer is locked, Reference Oscillator U4 alignment or replacement is necessary. See **ALIGNMENT PROCEDURES** for details. The I/O Microcontroller will not enable a transmission if the synthesizer is not locked.

Modulation Problems

Modulation problems can be caused by a failures in the audio circuits in the front cover or the modulating circuitry of the RF Board.

1. Verify modulating audio is present on J102/P2 pin 1. A 1 kHz, 600 mV rms TX AUDIO signal at this point should produce ±4.3 kHz deviation. Improper modulation from 300 - 3000 Hz points to a VCO modulation problem. Check the VCO pin 2 for the TX AUDIO signal. Suspect the VCO if the signal is present and incorrect modulation exists.

2. If improper low-frequency modulation exists (Channel Guard and trunked mode low-speed data), first check J102 pin 1 for the proper tone. Next check U4 pin 3 for the tone; suspect C11 if the tone is not present. Replace U4 if the tone is present on pin 3 and incorrect low-frequency modulation exists. See the **ALIGNMENT PROCEDURES** for details.

3. Check Tracking and Channel Data. Reprogram if necessary.

4. See the service information in LBI-38828 on troubleshooting the Control Board.

Distorted Modulation

Check TX AUDIO for an undistorted signal to the RF Board. The audio signal on J102/P2 pin 1 should appear undistorted at maximum deviation and it should be riding on a 2.7 Vdc bias developed on the Control Board.

1. If TX AUDIO distortion is minimal and transmitter distortion is excessive, suspect the VCO or the Reference Oscillator on the RF Board.

2. If TX AUDIO is distorted, suspect a defective microphone, mic amps, modulation limiting, or pre-emphasis circuity.

If audio sensitivity is good, the microphone, amplifiers and limiters are probably OK. Regeneration from an open decoupling capacitor may make the unit appear to be too sensitive. See the service information in LBI-38828 on troubleshooting the Control Board.

Receiver Troubleshooting

Inoperative

1. If the synthesizer is not locked the radio should be beeping and flashing "NO LOCK" in the LCD. See Synthesizer Troubleshooting.

2. Check RX AUDIO on J101/P1 pin 4 for signal and/or noise. With an RF input modulated at 1 kHz, ±3 kHz deviation, RX AUDIO should be 100 - 150 mV rms (approximately 350 mV p-p). If the 1 kHz audio is present, troubleshoot the audio circuits in the Front Cover Assembly. Noise levels on RX AUDIO with no RF input should be approximately 700 mV p-p.

3. Check for 7.5 Vdc at RF Amp U10 pin 5 and IF Amp U11 pin 1. Check U14 pin 7 for 5.8 Vdc (±0.2 Vdc) from A1 pin 10. Verify TX 5.4V is low in receive mode.

4. Verify mixer injection through Q2 from the VCO is present at TP7. Check the VCO output with a frequency counter at TP7. The VCO should be running 45.0125 MHz below the RX frequency. VCO output power level is typically +4 dBm at TP7 into 50 ohms (mixer impedance).

5. To test the back-end circuits, follow this procedure:

   - Verify 5.8 Vdc (±0.2 Vdc) is present on U14 pin 1 and 7.
   - Connect a frequency counter to TP1 to monitor the IF. Use a high-impedance probe (or amp).
   - Couple a 45.0125 MHz signal (no modulation) from an HF signal generator to TP4. Adjust the signal generator level to achieve accurate counting of the IF; the signal generator should be set 10 dBm above the lowest level which provides stable counting of the 455 kHz IF. See **ALIGNMENT PROCEDURES** if the 2nd IF is in error by more than 90 Hz.
   - Modulate the HF signal generator and observe the recovered audio on U14 pin 2 and J101 pin 4.

Low Sensitivity

Low receiver sensitivity and/or failure of a modulation acceptance bandwidth test indicates a receiver gain or selectivity problem in the IF stages. An excessively wide bandwidth will cause unnecessary noise, detracting from the receiver quieting. If the bandwidth is too narrow squelching could occur at the modulation peaks. Suspect a defective IF filter if one of the above symptoms occurs.

A 12 dB SINAD sensitivity of around -90 dBm indicates a problem with High-IF Amp U11. The module provides a nominal gain of around 17 dB.

A 12 dB SINAD sensitivity of around -100 dBm could be caused by a problem with RF Amp U10. This module provides 10 dB of gain.

Squelch Problem

A squelch circuit problem (assuming good signal and/or noise is present at J101 pin 4) indicates a problem with the Audio Processor chip on the Control Board. Troubleshooting should begin at the discriminator output. Signal trace through the discriminator amp to the Audio Processor. Check the operation of the noise rectifier to verify the noise is being converted into the proper dc voltage. See LBI-38828 for details.

Excessive Distortion

If the measured distortion exceeds the rated specification signal trace starting at the discriminator output and through the audio stages until the fault is isolated.

TEST POINTS

TP1 = 455 kHz IF Output From Receiver Back-End U14

TP2 = VCO Tuning Voltage From PLL Filter A1

TP3 = 45.0125 MHz IF Input To Receiver Back-End U14

TP4 = 45.0125 MHz Output From IF Filter FLB1

TP5 = 45.0125 MHz Input To IF Filter FLB1

TP6 = Band-Switch Input To VCO
(High = TX 806 - 825 MHz)
(Low = TX 851 - 870 MHz)
(High = RX 851 - 870 MHz)

TP7 = LO Injection To Mixer U7

TP8 = 13.2 MHz Output From Reference Oscillator U4

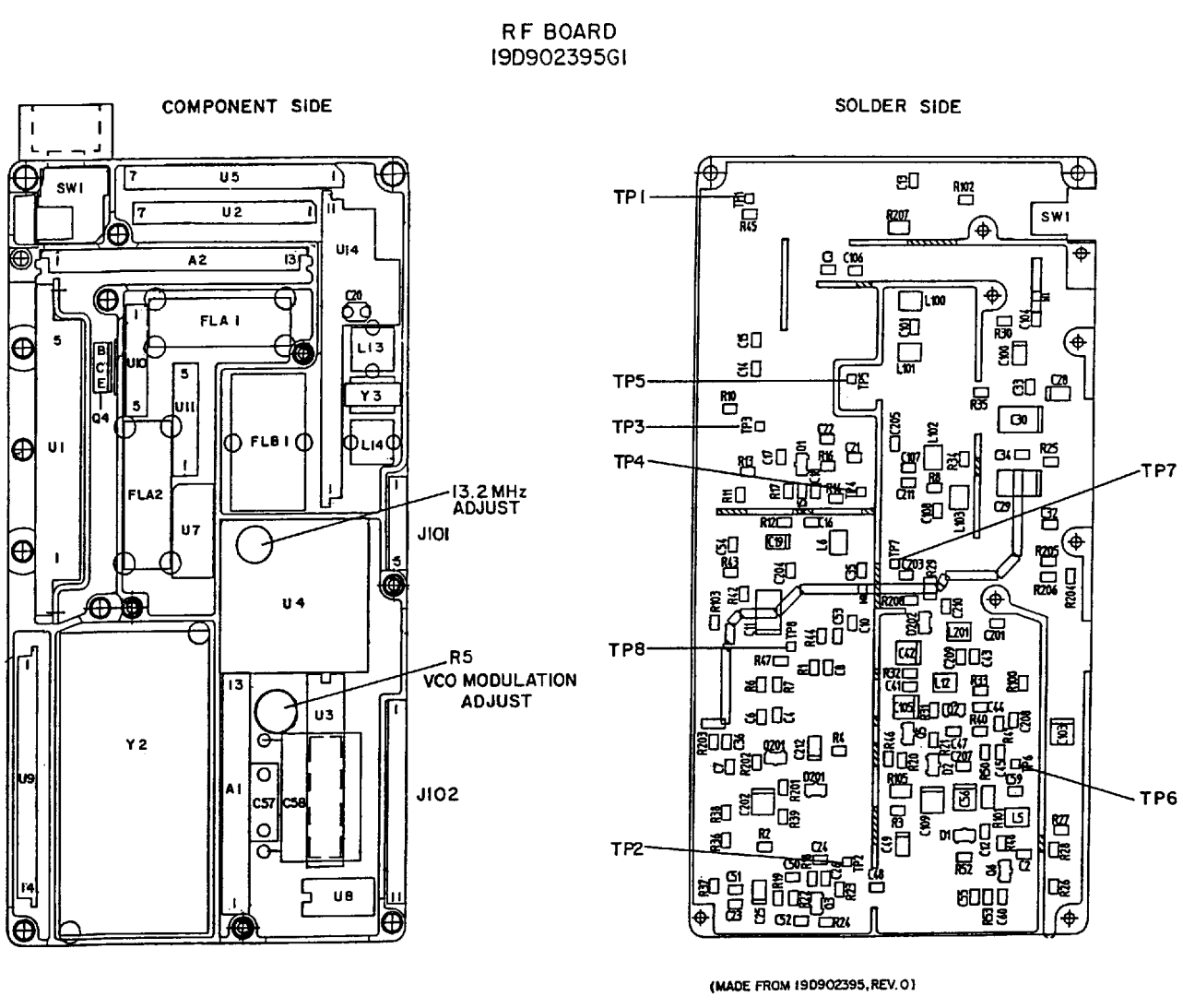


Figure 7 - RF Board Test Point Locations

Signal tracing with an oscilloscope proves very useful in locating the trouble areas.

Synthesizer Troubleshooting

Will Not Lock Or Stay Locked

Each time the channel is changed, the PTT Button is pressed or the PTT Button is released, Synthesizer IC U3 is serially loaded with new TX or RX data. If the synthesizer does not lock or stay locked, the following will be observed:

- the radio continuously or intermittently beeps
- "NO LOCK" will flash in the display
- LOCK detect (J102 pin 8) will be low or pulsing to flag the I/O Microcontroller of the unlocked condition

If this condition occurs, the I/O Microcontroller will continue to try to reload U3 with channel data until the synthesizer locks.

1. Verify the 5.4 Vdc supply to the RF Board is within ±0.1 Vdc, 7.5V BATT is present, and TX 5.4 V is low (receive mode only).

2. Monitor CLOCK, DATA and ENABLE (on J102 pins 11, 10 and 9 respectively) for pulse activity when the channel is changed. See the service information on the Control Board for specific waveform details.

3. Check A1 pin 9 for 5.8 Vdc (±0.2 Vdc) to U3, U4, U8 and the VCO. If this power source is not present, check A1 pin 7 for 5.8 Vdc (±0.2 Vdc) from Q201 and check A1 pin 11 for 7.5 Vdc. Replace A1 if the inputs are good and the output is not.

4. Using a frequency counter with a high impedance probe or amp, check TP8 for the 13.2 MHz (±20 Hz at 25°C) signal from Reference Oscillator U4. Replace U4 if this signal is not present and pin 1 is 5.4 Vdc. Also verify the signal is present on U3 pin 2. See **ALIGNMENT PROCEDURES** for oscillator alignment details.

5. Verify BAND SWITCH (J102 pin 3) is at the correct logic level. It should be low for transmit frequencies of 806 - 825 MHz and high for transmit frequencies of 851 - 870 MHz. BAND SWITCH should remain low for all receive frequencies. (The VCO operates 45.0125 MHz below the 851 - 870 MHz receive frequencies.) Suspect the I/O Microcontroller on the Control Board if there is a problem with the BAND SWITCH line. Check Y3 pin 5 for an inversion of this logic level via Q5. If the correct inverted level is present on both bands and the synthesizer will not lock on one band only, replace the VCO.

6. If LOCK detect is low and not pulsing, temporarily pull it high by connecting J102 pin 6 to J102 pin 8. If the radio now operates normally on all test TX and RX channels, replace U3 - the output on pin 9 is defective.

7. Check the VCO output with a frequency counter at TP7 or by tuning a service monitor to the radio's local oscillator (VCO) signal and loosely coupling the VCO signal into the service monitor. The VCO should be running 45.0125 MHz below the RX frequency. VCO output power level is typically +4 dBm at TP7 into 50 ohms (mixer impedance). VCO tuning voltage can be monitored at TP2 or the VCO pin 1. See Table 3 for details.

8. If a synthesizer lock problem cannot be narrowed to a problem in the Rear Cover Assembly, reprogram the inoperative channels and test the unit again. Also see the service information on the Control Board for further details.

Excessive Switching Time

The synthesizer should generally lock within 10 milliseconds after a frequency change.

1. Suspect leaky low-pass filter capacitors C57 or C58 if slow switching time is a symptom. Replace these components with original equipment parts only. See the RF Board parts list for part numbers.

2. Module A1 also influences switching time. Verify the ENABLE pulse is present at A1 pin 4.

FRONT COVER ASSEMBLY

See maintenance manual LBI-38828 for component-level troubleshooting information on the Control Board.

Troubleshooting details on the other assemblies located in the Front Cover Assembly can be found in LBI-38644 (earlier Front Cover) or LBI-38834 (later Front Cover). These assemblies include the LCD Board and the various flex circuits used in the radio.

Aegis Module 344A3659P3 is used in radios equipped with encrypt/decrypt option PAVS. Detailed service information on this module is contained in LBI-38829.

Aegis Module 344A3659P4 is used in both the non-encrypting Aegis radios (option PAV0) and the radios

equipped with encrypt/decrypt option PAVE. Detailed service information on this module is contained in LBI-38830.

COMPONENT REPLACEMENT

SURFACE MOUNTED COMPONENTS

Surface mounted "chip" components should always be replaced using a temperature-controlled soldering system. The soldering tools may be either a temperature-controlled soldering iron or a temperature-controlled hot-air soldering station. A hot-air system is recommended for the removal of components on the multilayer boards utilized throughout the radio. With either soldering system, a temperature of 700°F (371°C) should be maintained.

The following procedures outline the removal and replacement of surface mounted components. If a hot-air soldering system is employed, see the manufacture's operating instructions for detailed information on the use of your system.

CAUTION

Avoid applying heat to the body of any chip component when using standard soldering methods. Heat should be applied only to the metallized terminals of the components. Hot-air systems do not damage the components since the heat is quickly and evenly distributed to the external surface of the component.

CAUTION

As the radio contains many static sensitive components, observe static handling precautions during all service procedures.

SURFACE MOUNTED COMPONENT REMOVAL

1. Grip the component with tweezers or small needle-nose pliers.
2. Alternately heat the metallized terminal ends of the component with the soldering iron. If a hot-air system is used, direct the heat to the terminals of the component. Use extreme care with the soldering equipment to prevent damage to the printed wire board (PWB) and the surrounding components.
3. When the solder on all terminals is liquefied, gently remove the component. Excessive force may cause the PWB pads to separate from the board if all solder is not completely liquefied.
4. It may be necessary to remove excess solder using a vacuum de-soldering tool or Solderwick®. Again, use great care when de-soldering or soldering on the printed wire boards. It may also be necessary to remove the epoxy adhesive that was under the component.

SURFACE MOUNTED COMPONENT REPLACEMENT

1. "Tin" one terminal end of the new component and the corresponding pad on the PWB. Use as little solder as possible.
2. Place the component on the PWB pads, observing proper orientation for capacitors, diodes, transistors, etc.
3. Simultaneously touch the "tinned" terminal end and the "tinned" pad with the soldering iron. Slightly press the component down on the board as the solder is liquefied. Solder all terminals, allowing the component time to cool between each application of heat. Do not apply heat for an excessive length of time and do not use excessive solder.

   With a hot-air system, "tin" all terminals and apply heat until all "tinned" areas are melted and the component is seated in place. It may be necessary to slightly press the component down on the board. Touch-up the soldered connections with a standard soldering iron if needed. Do not use excessive solder.
4. Allow the component and the board time to cool and then remove all flux from the area using alcohol or another approved flux remover.

CAUTION

Some chemicals may damage the internal and external plastic and rubber parts of the radio.

SURFACE MOUNTED INTEGRATED CIRCUIT REPLACEMENT

Surface mounted IC soldering and de-soldering techniques are similar to the above outlined procedures for the surface mounted chip components. Use extreme care and observe static precautions when removing or replacing a defective (or suspect) IC. This will prevent any damage to the printed wire board or the surrounding circuitry.

Replacement of a surface mounted IC is best completed using a hot-air soldering system. The IC can easily be removed and installed using hot air. See the manufacturers instructions for complete details on tip selection and other operating instructions unique to your system.

If a hot-air system is not available, the service technician may wish to clip the pins near the body of the defective IC and remove it. The pins can then be removed from the PWB with a standard soldering iron and tweezers and then the new IC can be installed. It should not be necessary to "tin" any of the IC pins before the installation process.

The "chip-on-board" ICs used in the radio cannot be replaced. Failure of this type of IC will require board replacement.

MODULE REPLACEMENT

The modules, all of which are located on the RF Board, are very reliable devices. Before replacing any of the modules, check the associated circuitry thoroughly to insure there is not a problem elsewhere. If replacement is necessary, follow the below procedures.

All of the component lead holes for the modules on the RF Board are plated through from the top to the bottom of the board. This allows for easy removal and replacement of the modules as long as appropriate soldering techniques are observed. Always observe static precautions when handling the board.

To remove the PA module, it is first necessary to remove the hardware which supports it. Two (2) Torx® screws and a support bracket secure the module to the eggcrate casting.

To remove a module, position the RF Board in a work (face down, chip components up) and remove the solder from the plated-through points at the appropriate pins. If a hot-air system is employed, use an appropriate tip that will localize the heat on the pins and not on surrounding chip components. Solderwick® or a vacuum de-soldering iron will also remove the solder if a hot-air station is not available. When all solder has been removed or liquefied, the module should drop out of the eggcrate casting.

To install a module, clean any solder from the plated-through holes and clean all flux from the board. Next, install the replacement module making sure that all pins align in the proper holes. Resolder the pins to the board. Clean the flux from the board using an approved solvent. Clip any excess lead length.

WEATHERPROOF INTEGRITY

The M-PA radio is designed to meet the MIL-810C & D environmental specifications. The internal circuitry is protected from moisture by appropriate seals. Rear Cover Assembly seals include the Front/Rear Cover Assembly gasket and the antenna insert gaskets. Front Cover Assembly seals include the speaker/microphone seal, the battery plate seal, and the volume and channel control seals. The UDC/Monitor Button/PTT Assembly is also designed to seal out moisture.

These seals should be inspected during any disassembly/reassembly process for cracks and tears. A defective seal warrants replacement. See the Mechanical Parts breakdown drawings and the Parts Lists for locations and part numbers for these seals. When installing a new seal, make sure it is seated properly before reassembly.

BATTERY PACKS

Battery packs available for use with the radio include high and extra high capacity rechargeable units. All of the rechargeable battery packs are factory sealed and are not field serviceable other than properly charging them and cleaning the contacts. Figure 8 outlines a typical battery pack.

Radio contacts located on the top of the pack include switched power, ground, the speaker enabling (shorting) contacts and a continuous power contact. Four (4) charging contacts are located on the rear side of the battery pack. These contacts provide connections to the slip-in type chargers or vehicular chargers/repeaters while the battery pack is still connected to the unit. The battery charging contacts are diode protected from external shorts.

CHARGING THE BATTERY PACKS

After receiving a new battery pack from the factory, it should be fully charged before it is placed into service. This also applies to batteries that have been stored for long periods.

Chargers are available with nominal charge times of 1 hour (rapid) and 14 (standard) hours. Combinations include single and multi position standard and rapid charge units. The rapid chargers utilize an internal thermistor in the battery pack to sense temperature and automatically control charge rate of the battery. This allows a rapid charger to charge at a maximum rate without overheating the battery. All battery packs can be charged in less than 1 1/2 hours in a rapid charger. Nominal full charge time in a standard charger is 14 hours. For specific instructions for the particular charger, refer to the applicable charger's Operating Manual.

A fully charged battery pack should provide an open terminal voltage greater than 7.5 Vdc (typically 9 Vdc). A fully discharged battery pack should be no less than 6 Vdc. When the battery pack drops below approximately 6.8 Vdc the radio will warn the operator with an alert tone and the "BAT" flag will turn on.

REDUCED CAPACITY CONDITION

Rechargeable batteries can develop a condition of reduced capacity sometimes called "Memory Effect". This condition can occur when a battery is continuously charged for long periods of time or when a regularly performed duty cycle allows the battery to expend only a limited portion of its capacity.

If the battery pack is seldom used and left on a continuous charge for long periods it may develop reduced capacity. On the first discharge cycle, the capacity

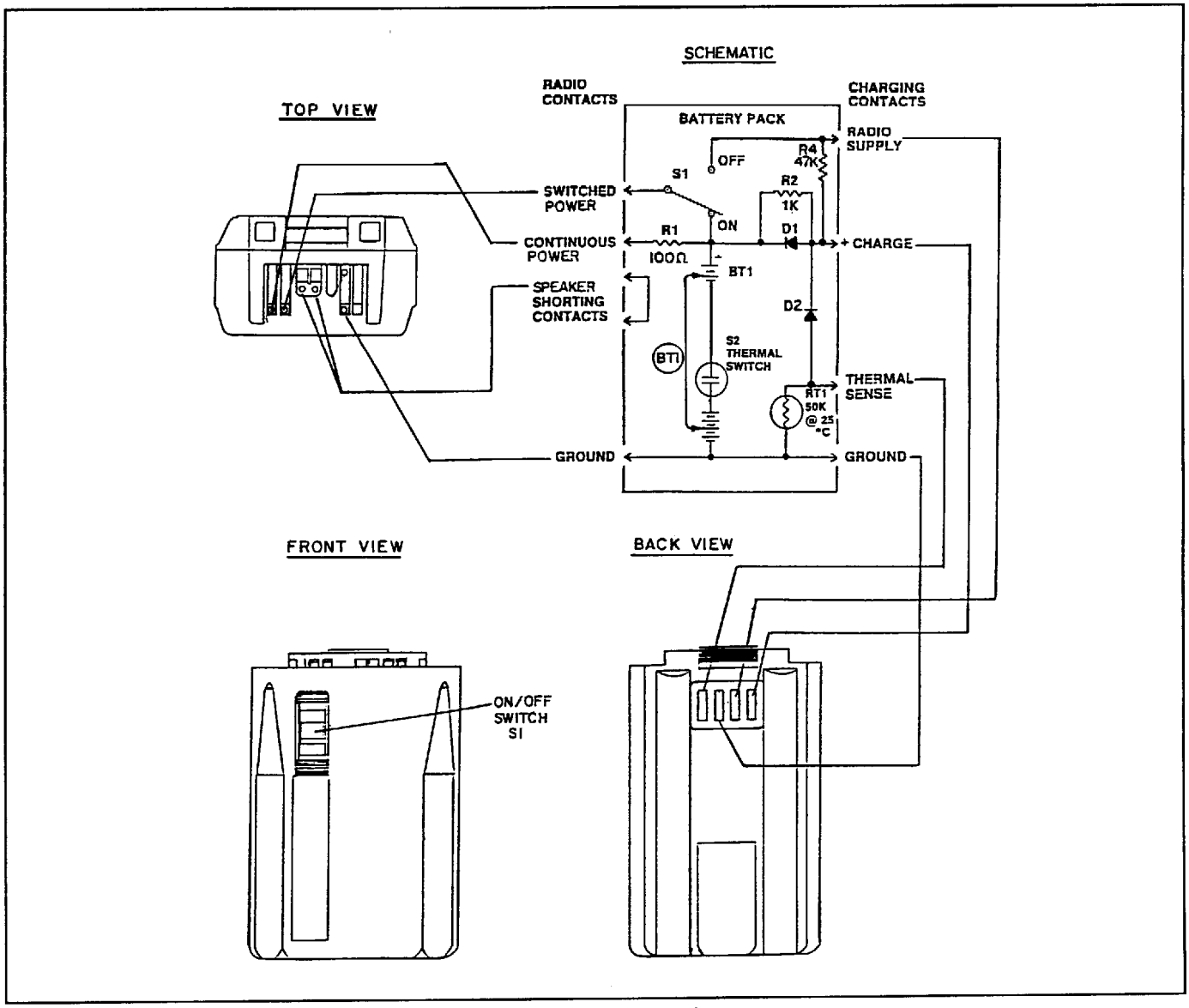


Figure 8 - Battery Packs

may be significantly lowered, reducing useful service hours.

The reduced capacity condition should be suspected on any rechargeable battery pack showing signs of reduced capacity. If reduced capacity is in fact a problem, the following procedure may restore useful capacity:

1. Discharge the battery pack at a normal discharge rate until the output voltage is approximately 1 Volt per cell. This equals 6 Volts output for the battery packs. Refer to Figure 9. Note the flatness of the discharge curve from 0% - 90%. Experience shows discharging below the "knee" is not necessary.

2. Complete a full charge cycle using an Ericsson GE charger.

3. Repeat steps 1 and 2. Performing this deep cycle at least twice should be sufficient to restore battery pack capacity.

NOTE

The above procedure is easily completed using Discharge Analyzer 19B801506P9 and Rapid Multi-Charger 19B801506P16 or P18.

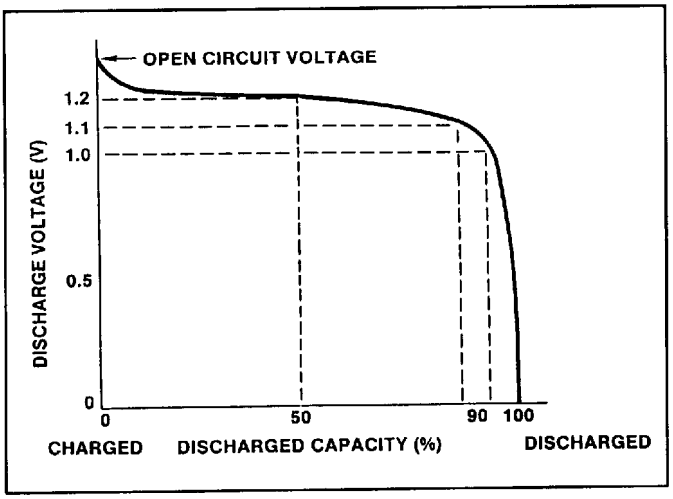


Figure 9 - Typical Cell Discharge Curve

RECHARGEABLE BATTERY PACK DISPOSAL

Under specific state laws, it may be illegal to dispose of rechargeable batteries, rechargeable batteries packs and/or products powered by rechargeable batteries except in accordance with specific procedures. Special collection systems are in place in certain states. Call Toll Free 1-800-822-9363 for specific procedures for returning rechargeable batteries in your state.

CONTROL KNOB STOP PLATE

A stop plate is normally installed under the Control Knob of the radio at the factory. It is used to limit the maximum number of unique Control Knob positions to less than sixteen (16). The stop plate is normally factory placed for fifteen (15) positions unless sixteen unique factory programmed positions are ordered. This stop plate can be repositioned to limit the maximum number of unique Control Knob positions to match personality programming.

STOP PLATE REPOSITIONING

1. Remove the Control Knob using an M1.5 hex wrench.

2. Lift the stop plate using small needle-nose pliers.

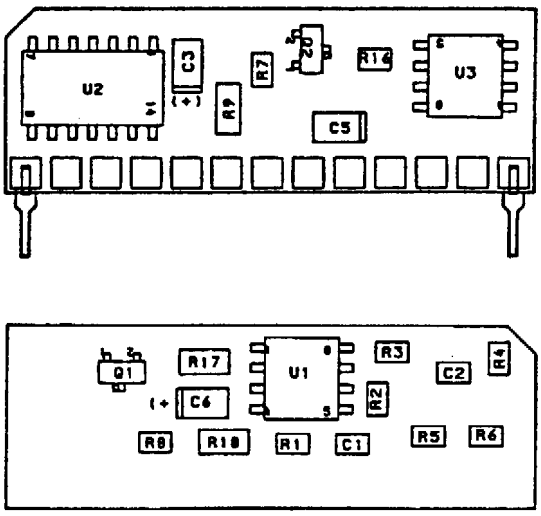
3. Reposition the stop plate by aligning the raised bar to the channel marking one (1) number higher than the number of positions required. For example, if eight (8) unique positions are required, align the raised bar to the "9". If sixteen (16) positions are required, do not reinstall the stop plate.

4. Replace the Control Knob and torque the set screw per Table 1. The set screw must align on the flat area of the switch shaft. Rotate the knob to test for proper operation.

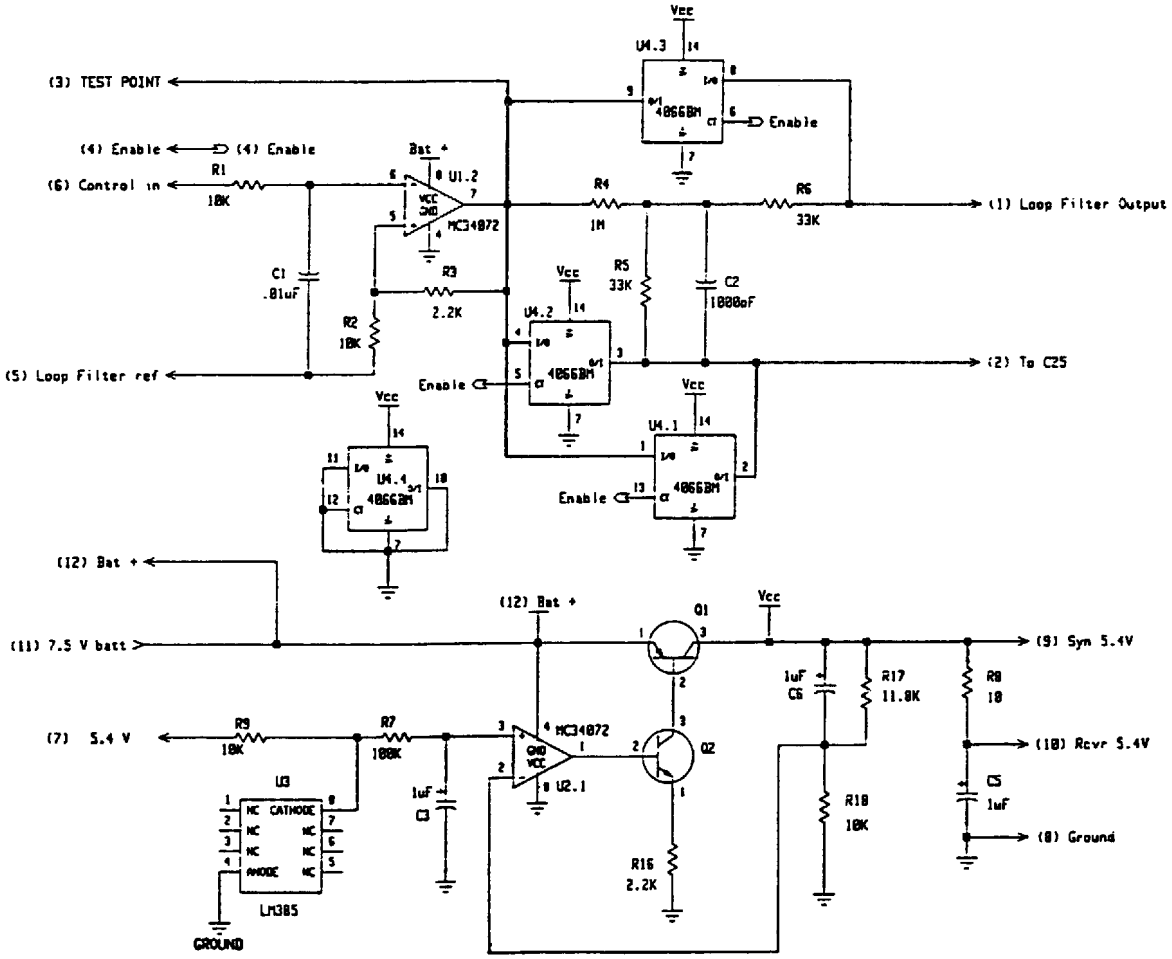
ERICSSON GE
Ericsson GE Mobile Communications Inc.
Mountain View Road•Lynchburg, Virginia 24502

Printed in U.S.A.

A1



(19C852056, Sh. 1, Rev. 0)



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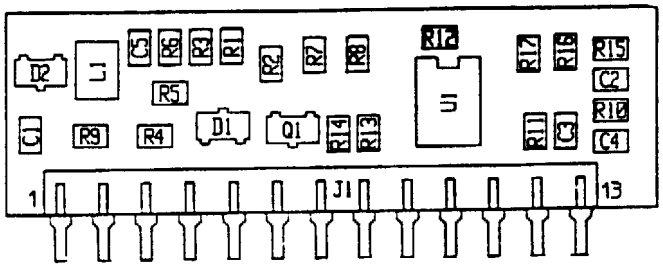
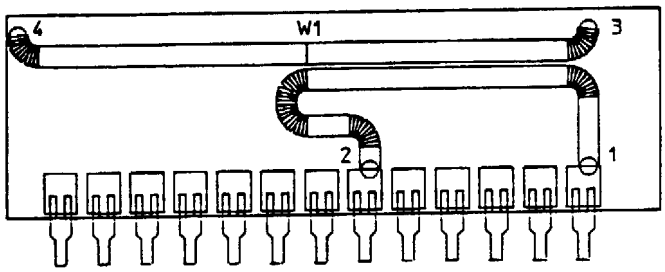
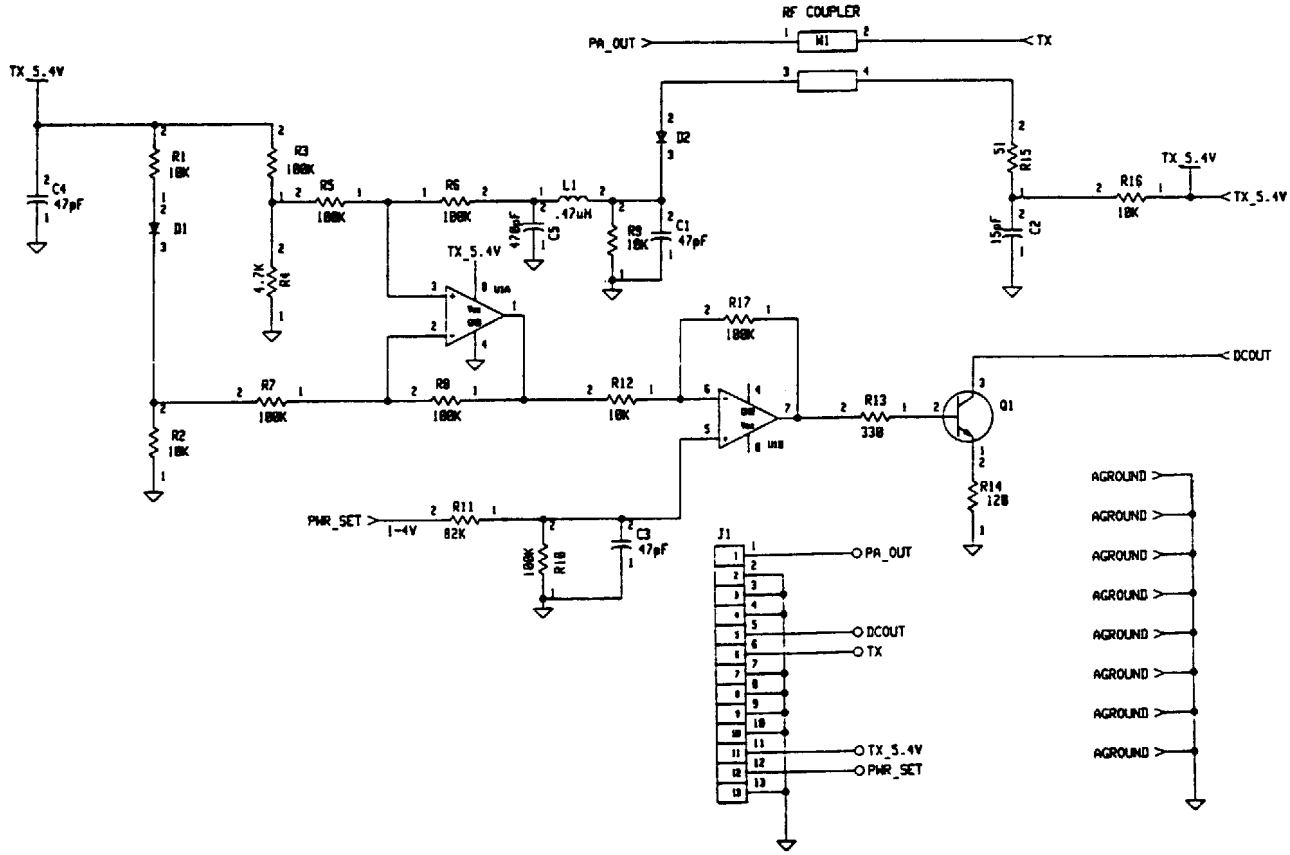
PLL FILTER/REGULATOR
19C852056G1

A2





(19C851922, Rev. 2)

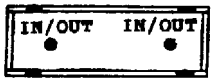


POWER CONTROLLER
19C851922G1

(19C851920, Rev. 0)

FLA1, FLA2

```
PASSBAND LOSS   =   2.0 - 2.5 dB (Max.)
STOPBAND LOSS   =   35 dB (Min.)
INPUT  Z        =   50 ohms
OUTPUT  Z       =   50 ohms
```

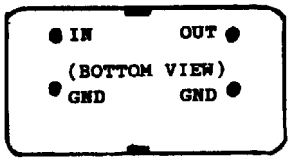


PART #	PASSBAND
P1	851 - 871 MHz
P2	933 - 942 MHz
P3	754 - 781 MHz
P4	824 - 851 MHz

RF BANDPASS FILTER
19A704888P1

FLB1

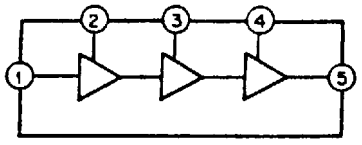
```
PASSBAND LOSS   =   4.0 dB (Max.)
3 dB BANDWIDTH  =   ±7.5 kHz (Min.)
3 dB BANDWIDTH  =   ±5.0 kHz (Min.),(P4)
35 dB SELECT.   =   ±25 kHz (Max.)
35 dB SELECT.   =   ±20 kHz (Max.),(P4)
INPUT  Z        =   50 ohms
OUTPUT  Z       =   50 ohms
```

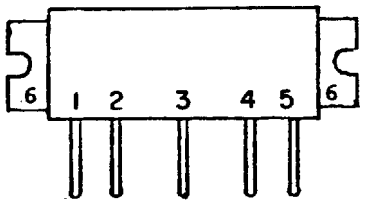


PART #	CENTER FREQ.
P3	45.0000 MHz
P4	39.5000 MHz
P5	45.0125 MHz
P6	45.0000 MHz

IF MONOLITHIC CRYSTAL FILTER
19A705328P5

U1

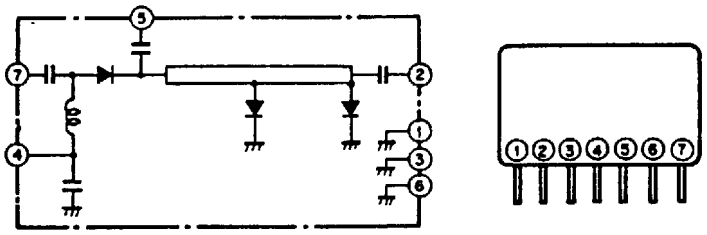




PIN	FUNCTION
1	RF INPUT
2	V_{cc1}
3	V_{cc2}
4	V_{cc3}
5	RF OUTPUT
6	FLANGE (Ground)

806 - 870 MHz POWER AMPLIFIER
19A705962P1

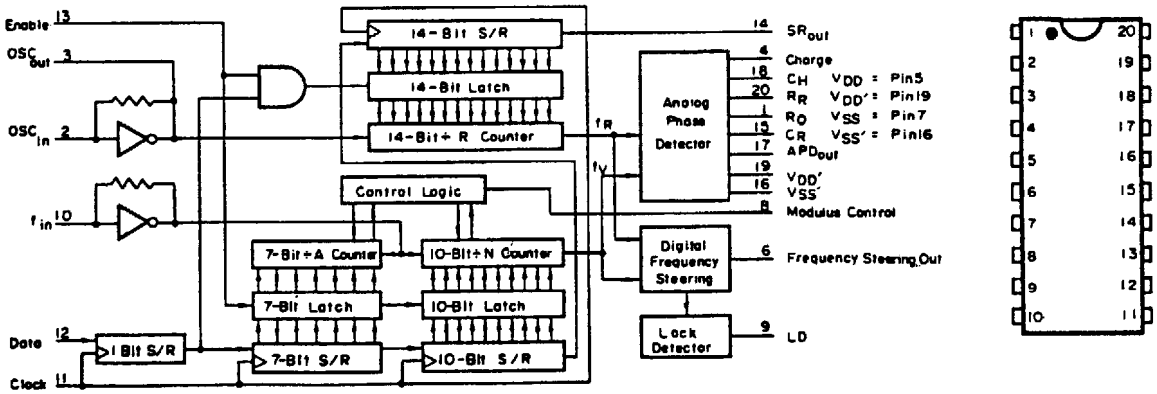
U2



PIN	FUNCTION
1	GROUND
2	RECEIVER
3	GROUND
4	T/R BIAS
5	ANTENNA
6	GROUND
7	TRANSMITTER

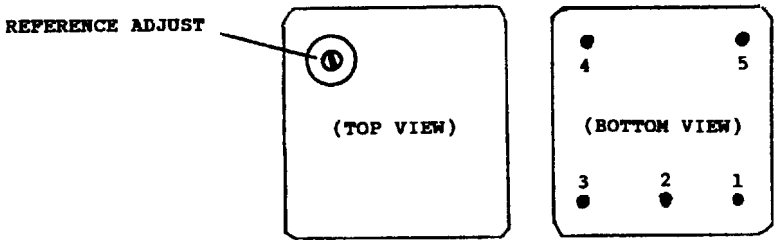
ANTENNA T/R SWITCH
19A149809P1

U3



SYNTHESIZER
19B800902P4

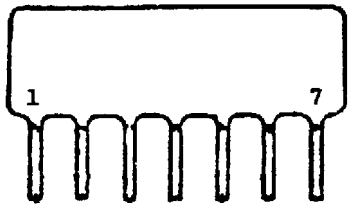
U4



PIN	FUNCTION
1	Vcc (5.4 Vdc)
2	OUT (1 Vp-p Min.)
3	MOD. AUDIO IN
4	GROUND (Case)
5	GROUND (Case)

13.2 MHz REFERENCE OSCILLATOR
19B235948G1

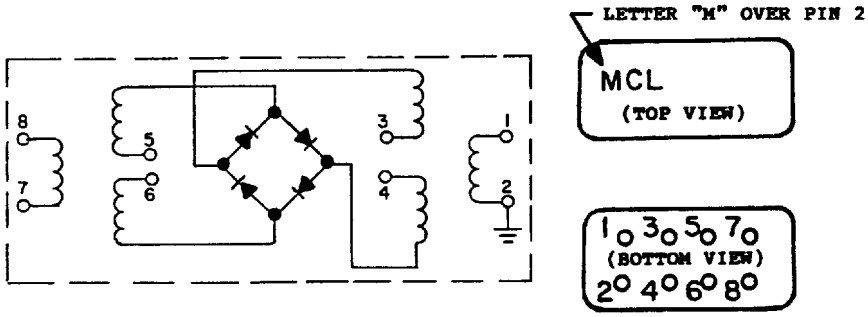
U5



PIN	FUNCTION
1	INPUT/OUTPUT
2	GROUND
3	GROUND
4	GROUND
5	GROUND
6	GROUND
7	INPUT/OUTPUT

LOW-PASS FILTER
19A149810P1

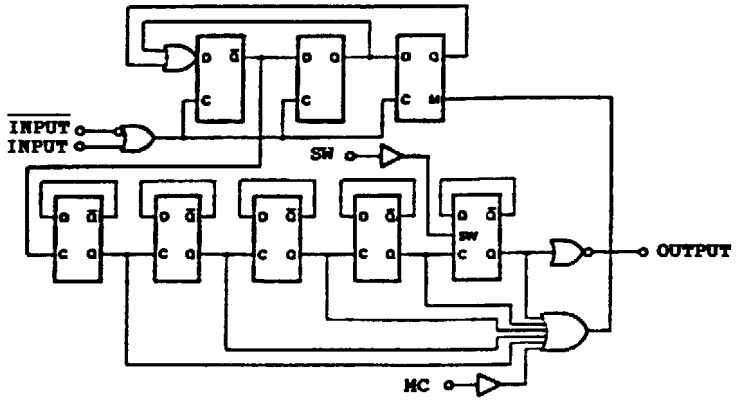
U7

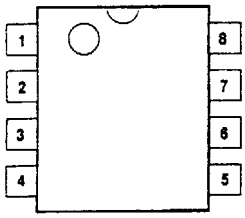


PIN	FUNCTION
1	RF INPUT
2	GROUND (Case)
3	IF OUTPUT
4	IF OUTPUT
5	GROUND
6	GROUND
7	GROUND
8	LO INPUT

800 MHz MIXER
19A705706P3

U8





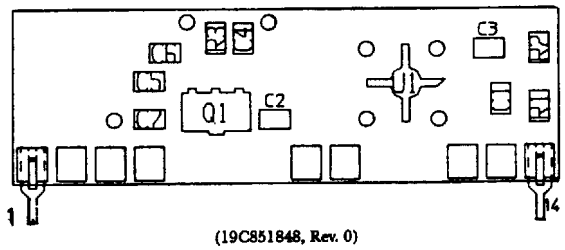
TRUTH TABLE

SW	MC	DIVIDE RATIO
H	H	1/64
H	L	1/65
L	H	1/128
L	L	1/129

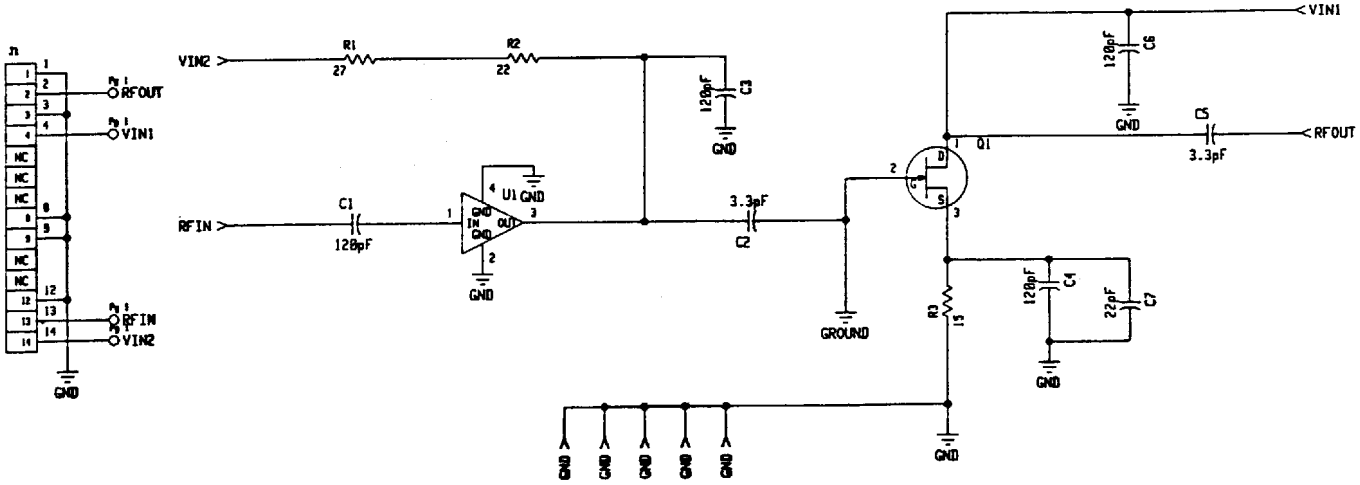
PIN	FUNCTION
1	INPUT
2	Vcc
3	SW INPUT
4	OUTPUT
5	GROUND
6	MC INPUT
7	N/C
8	INPUT

PRESCALER
19A705985P1

U9



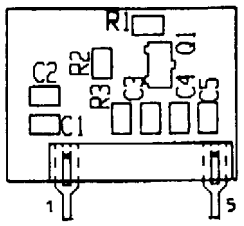
(19C851848, Rev. 0)



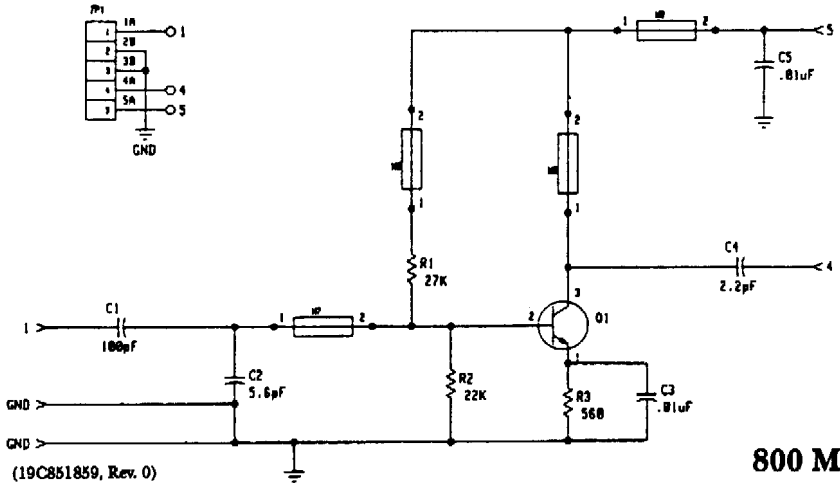
(19C337499, Rev. 0)

800 MHz EXCITER
19C851848G1

U10



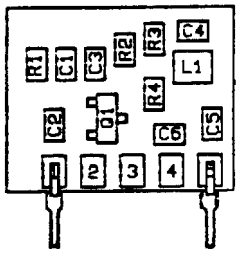
(19C851857, Rev. 0)



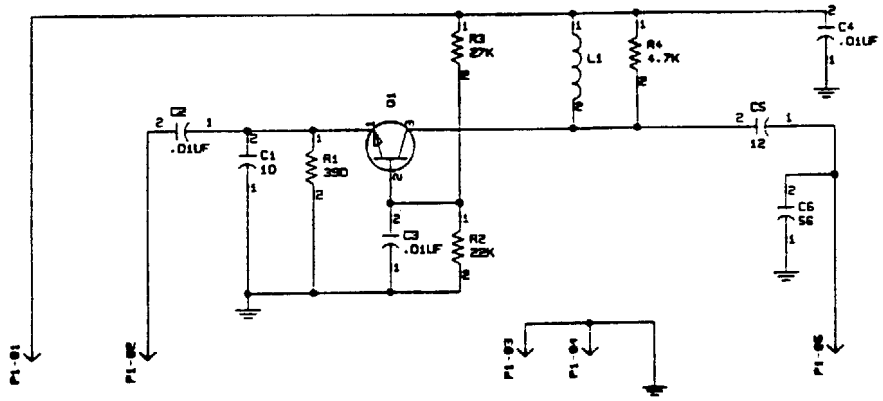
(19C851859, Rev. 0)

800 MHz RF AMPLIFIER
19C851857G1

U11



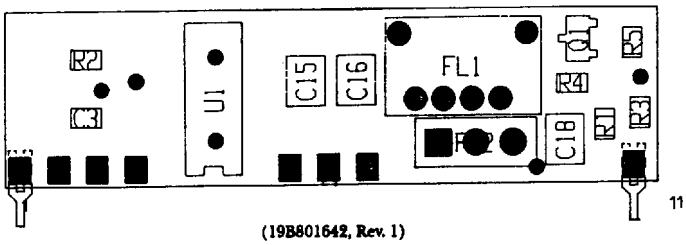
(19C336876, Rev. 0)



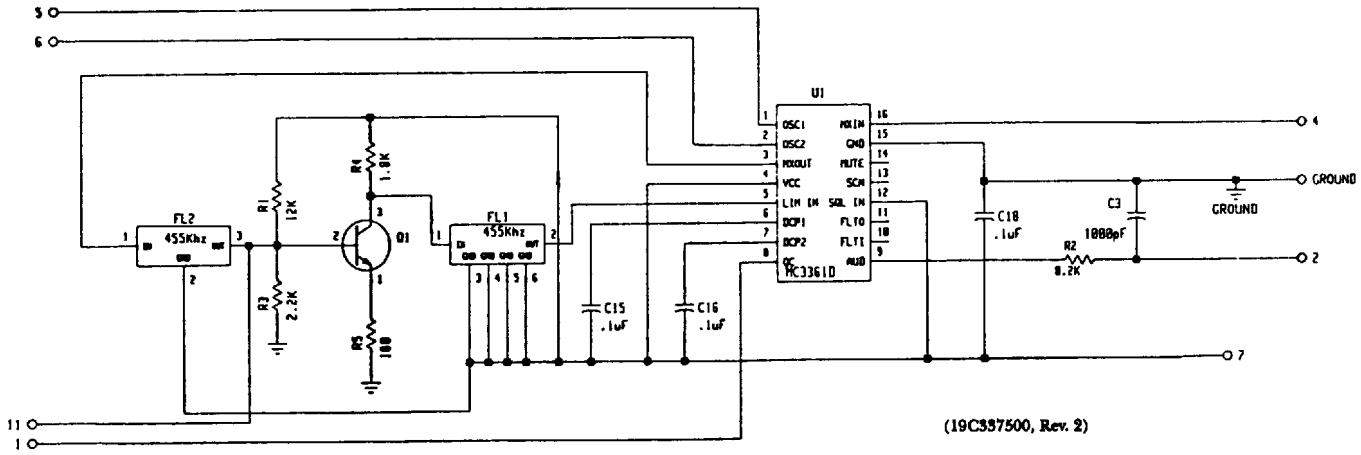
(19C337062, Rev. 0)

45.0125 MHz IF AMPLIFIER
19C336876G1

U14



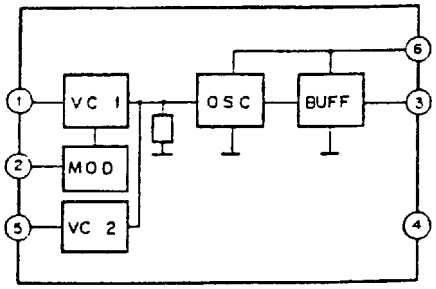
(19B801642, Rev. 1)

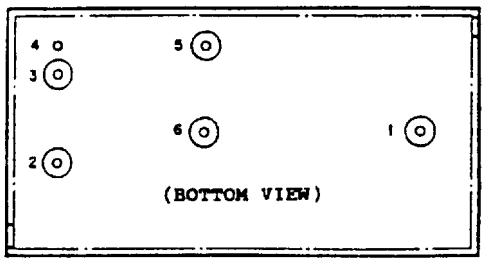


(19C357500, Rev. 2)

RECEIVER BACK-END
19B801642G1

Y2

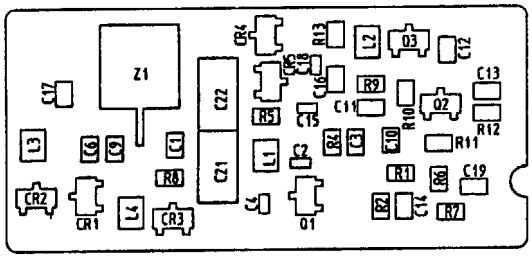


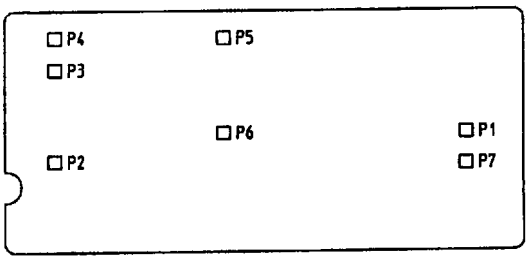


PIN	FUNCTION
1	CONTROL VOLTAGE
2	MOD. INPUT
3	RF OUTPUT
4	GROUND
5	BAND SWITCH
6	Vcc (5.4 Vdc)

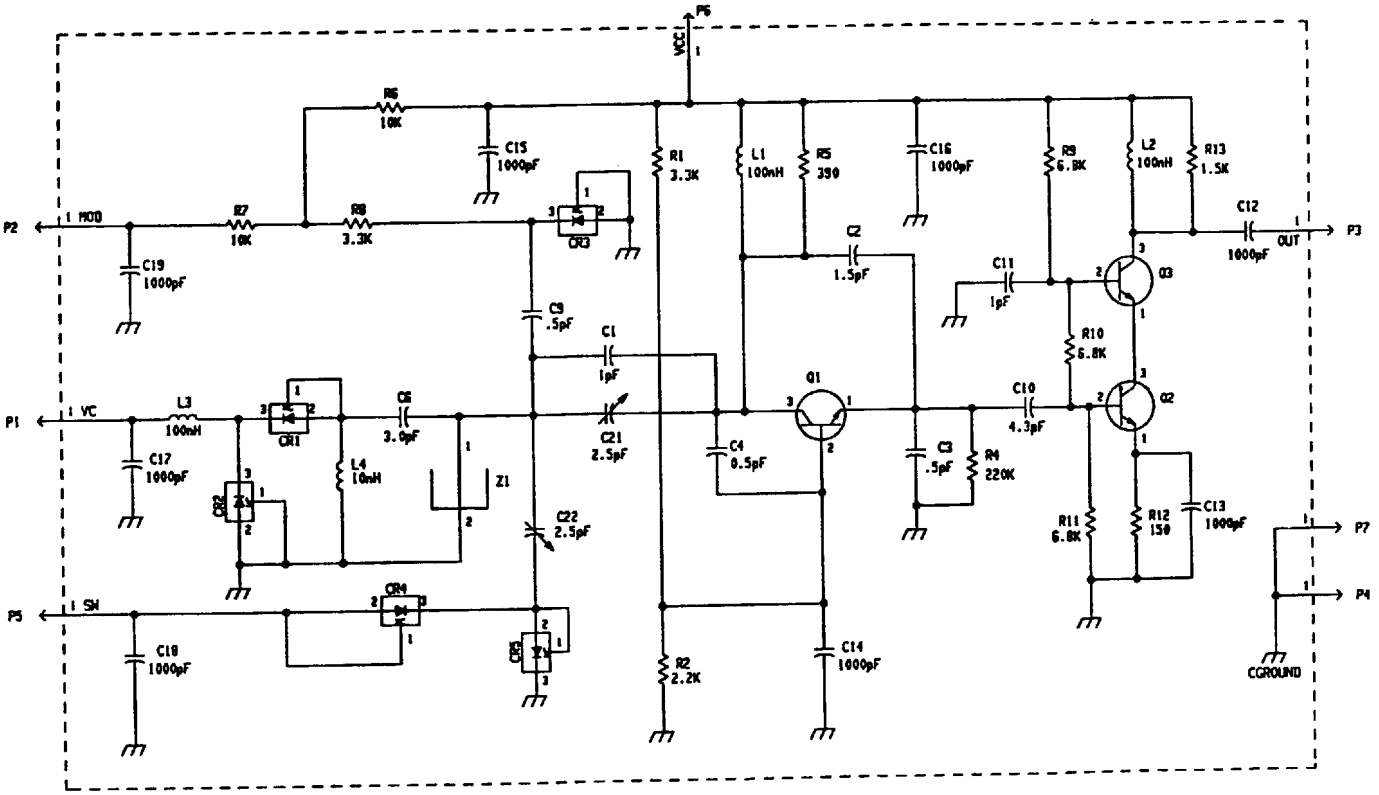
VCO (earlier)
19B235947G1

Y4





(19C852149, Sh. 1, Rev. 6)



(19C852147, Sh. 1, Rev. 0)

VCO (later)
19C852149G1