

PR860

Two-Way Portable Radio

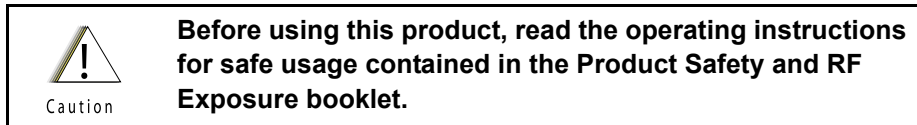
Basic Service Manual



Foreword

This manual provides sufficient information to enable qualified service technicians to troubleshoot and repair PR860 Series portable radios to the component level.

Product Safety and RF Exposure Compliance



ATTENTION!

This radio is restricted to occupational use only to satisfy FCC RF energy exposure requirements. Before using this product, read the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet (Motorola Publication part number 68P81095C98) to ensure compliance with RF energy exposure limits.

For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site which lists approved accessories: <http://www.motorola.com/governmentandenterprise/>.

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Document History

The following major changes have been implemented in this manual since the previous edition:

Edition	Description	Date
6881098C42-O	Original Release	Feb. 2005
6881098C42-P	Updated Part numbers and Descriptions in Exploded View section. Updated Service and Technical Support info.	Jun. 2007

Notes

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Chapter 1

Introduction

1.1 Scope of Manual

This manual is intended for use by service technicians familiar with similar types of equipment. It contains service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date may be incorporated by a complete Manual revision or alternatively as additions.

1.2 Warranty and Service Support

Motorola offers support which includes: full exchange and/or repair of the product during the warranty period; and service/repair or spare parts support out of warranty. Any “return for exchange” or “return for repair” to an authorized Motorola Dealer must be accompanied by a Warranty Claim Form. Warranty Claim Forms are obtained by contacting an Authorized Motorola Dealer. (See section 1.2.4 on page 1-3.)

1.2.1 Warranty Period and Return Instructions

The terms and conditions of warranty are defined fully in the Motorola Dealer or Distributor or Reseller contract. These conditions may change from time to time, and the following subsections are for guidance purposes only.

In instances where the product is covered under a “return for replacement” or “return for repair” warranty, a check of the product should be performed prior to shipping the unit back to Motorola. This is to ensure that the product has been correctly programmed or has not been subjected to damage outside the terms of the warranty.

Prior to shipping any radio back to the appropriate Motorola warranty depot, please contact Customer Resources (See page 1-2 and page 1-3.) All returns must be accompanied by a Warranty Claim Form, available from your Customer Resources representative. Products should be shipped back in the **original packaging**, or correctly packaged to ensure that no damage occurs in transit.

1.2.2 After Warranty Period

After the Warranty period, Motorola continues to support its products in two ways:

1. Motorola's Radio Parts and Service Group offers repair service to users and dealers at competitive prices.
2. The Motorola Radio Products and Solutions Organization (RPSO) supplies individual parts and modules that can be purchased by dealers who are capable of performing fault analysis and repair.

1.2.3 Piece Parts Availability

Some replacement parts, spare parts, and/or product information can be ordered directly.

If...	It Means That...
A complete Motorola part number is assigned to the part, and it is not identified as Depot ONLY	The part is available from the Radio Products and Solutions Organization (RPSO).*
No part number is assigned	The part is not normally available from Motorola.
The part number is appended with an asterisk	The part is serviceable by a Motorola Depot only.
A parts list is not included	Generally, no user-serviceable parts are available for that kit or assembly.

*Radio Products and Solutions Organization (RPSO) was formerly known as the Radio Products Services Division (RPSD) and/or the Customer Care and Services Division (CCSD) and/or the Accessories and Aftermarket Division (AAD).

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Radio Products and Solutions Organization*
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1-800-422-4210

Product Customer Service

Radio Products and Solutions Organization (United States and Canada)

1-800-927-2744

*The Radio Products and Solutions Organization (RPSO) was formerly known as the Radio Products Services Division (RPSD) and/or Customer Care and Services Division (CCSD) and/or Accessories and Aftermarket Division (AAD).

1.2.4 Technical Support

If a unit requires further complete testing, knowledge and/or details of component level troubleshooting or service than is customarily performed at the basic level, please send the radio to a Motorola Service Center as listed below.

Motorola Service Center

45D Butterfield Trail

El Paso, TX 79906

Tel: 1-800-227-6772

Motorola Federal Technical Center

4395 Nicole Drive

Lanham, MD 20706

Tel: 1-800-969-6680

Fax: 1-800-784-4133

Motorola Canadian Technical Logistics Center

Motorola Canada Ltd.

8133 Warden Avenue

Markham, Ontario, L6G 1B3

Tel: 1-800-543-3222

Fax: 1-888-331-9872 or 1-905-948-5970

1.3 Radio Model Information

The model number and serial number are located on a label attached to the back of your radio. You can determine the RF output power, frequency band, protocols, and physical packages. The example below shows one portable radio model number and its specific characteristics.

Table 1-1: Radio Model Number (Example: AAH25KDC9AA3AN)

	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level	Model Revision	Model Package
AA or LA = Motorola Internal Use — ↑	H ↑ H = Portable	25	K VHF (136-174 MHz)	D 4-5W	C PR860 (no display)	9 Programmable	AA Conventional	3 PR860 (non-keypad)	A	N
			R UHF1 (403-470 MHz)	E 5.1-6W		6 25 kHz				
			S UHF2 (450-512 MHz)			4 12.5 kHz				
			B Low Band, R1 (29.7-42.0 MHz)							
			C Low Band, R2 (35.0-50.0 MHz)							

Chapter 2

Maintenance

2.1 Introduction

This chapter provides details about the following:

- Preventive maintenance (inspection and cleaning)
- Safe handling of CMOS and LDMOS devices
- Disassembly and reassembly of the radio
- Installation of Option Boards

2.2 Preventive Maintenance

The radios do not require a scheduled preventive maintenance program; however, periodic visual inspection and cleaning is recommended.

2.2.1 Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. It is not recommended to inspect the interior electronic circuitry.

2.2.2 Cleaning Procedures

The following procedures describe the recommended cleaning agents and the methods to be used when cleaning the external and internal surfaces of the radio. External surfaces include the front cover, housing assembly, and battery case. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime.

NOTE: Internal surfaces should be cleaned only when the radio is disassembled for service or repair.

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent in water. The only factory recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (70% by volume).



CAUTION: Certain chemicals and their vapors can have harmful effects on certain plastics. Avoid using aerosol sprays, tuner cleaners, and other chemicals.

Cleaning External Plastic Surface

Apply the 0.5% detergent-water solution sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. Use a soft, absorbent, lintless cloth or tissue to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

Cleaning Internal Circuit Boards and Components

Isopropyl alcohol (70%) may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas.

The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. After completing of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

NOTE: Always use a fresh supply of alcohol and a clean container to prevent contamination by dissolved material (from previous usage).

2.3 Safe Handling of CMOS and LDMOS Devices

Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios, and are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions. DO NOT attempt to disassemble the radio without first referring to the following CAUTION statement.



CAUTION: This radio contains static-sensitive devices. Do not open the radio unless you are properly grounded. Take the following precautions when working on this unit:

- Store and transport all CMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS devices into conventional plastic “snow” trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service bench to protect the CMOS device. We recommend using the a wrist strap, two ground cords, a table mat, and a floor mat.
- Wear a conductive wrist strap in series with a 100k resistor to ground. (Replacement wrist straps that connect to the bench top covering are Motorola part number 4280385A59.)
- Do not wear nylon clothing while handling CMOS devices.
- Do not insert or remove CMOS devices with power applied. Check all power supplies used for testing CMOS devices to be certain that there are no voltage transients present.
- When straightening CMOS pins, provide ground straps for the apparatus used.
- When soldering, use a grounded soldering iron.
- If at all possible, handle CMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.

2.4 Repair Procedures and Techniques — General

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement part is not locally available, check the parts list for the proper Motorola part number and order the part from the nearest Motorola Radio Products and Solutions Organization listed in the “Piece Parts” section of this manual (See page 1-2).

Rigid Circuit Boards

This family of radios uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The printed-through holes may interconnect multiple layers of the printed circuit. Therefore, exercise care to avoid pulling the plated circuit out of the hole.

When soldering near the pin connectors:

- Avoid accidentally getting solder in the connector.
- Be careful not to form solder bridges between the connector pins.
- Examine your work closely for shorts due to solder bridges.

Flexible Circuits

The flexible circuits are made from a different material than the rigid boards, and require different soldering techniques. Excessive prolonged heat on a flexible circuit can damage the material. Therefore, avoid excessive heat and excessive bending.

For parts replacement, use the ST-1087 Temperature-Controlled Solder Station with a 600-700 degree tip, and use small diameter solder such as ST-633. The smaller size solder will melt faster and require less heat to be applied to the circuit.

To replace a component on a flexible circuit:

1. Grasp with seizers (hemostats) the edge of the flexible circuit near the part to be removed.
2. Pull gently.
3. Apply the tip of the soldering iron to the component connections while pulling with the seizers.

NOTE: Do not attempt to puddle-out components. Prolonged application of heat may damage the flexible circuit.

2.5 Disassembling and Reassembling the Radio — General

Since these radios may be disassembled and reassembled with the use of only four (board to casting) screws, it is important to pay particular attention to the snaps and tabs, and how parts align with each other.

The following tools are required for disassembling the radio:

- 3/16" flat blade screwdriver
- Penknife-size screwdriver
- TORX™ T6 screwdriver

If a unit requires more complete testing or service than is customarily performed at the basic level, send this unit to a Motorola Authorized Service Center. (See Chapter 1, section 1.2.4 Technical Support on page 1-3 for a list of authorized service centers.)

The following disassembly procedures should be performed only if necessary:

- section 2.6.2 Chassis Assembly/Disassembly on page 2-6
- section 2.6.3 Option Board Disassembly on page 2-6
- section 2.6.4 Speaker, Microphone, and Universal Connector Flex Disassembly on page 2-8
- section 2.6.5 Control Top Disassembly on page 2-9
- section 2.7.6 Option Board Installation on page 2-11

2.6 Detailed Radio Disassembly

2.6.1 Front Cover from Chassis Disassembly

1. Turn off the radio.
2. Remove the battery:
 - a. Pull down on the two battery-release buttons.
 - b. With the buttons pulled down, the top of the battery will fall from the radio.
 - c. Remove the battery completely from the radio.

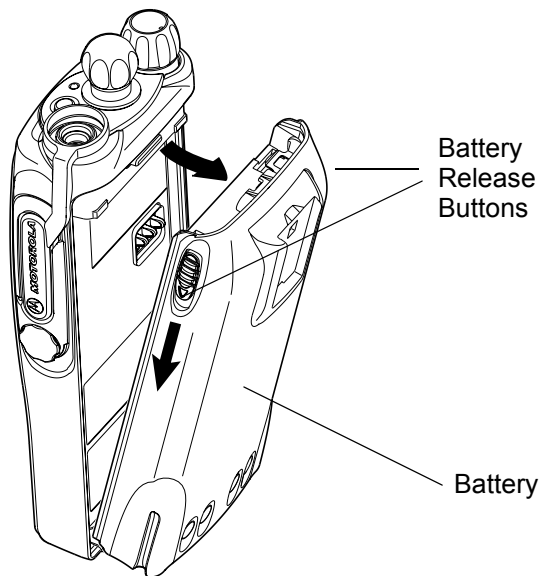


Figure 2-1: Battery Removal

3. Remove the antenna.
4. Pull the volume and channel selector knobs off their shafts.

NOTE: Both knobs slide on and off. However, they are supposed to fit very tightly on their shafts.

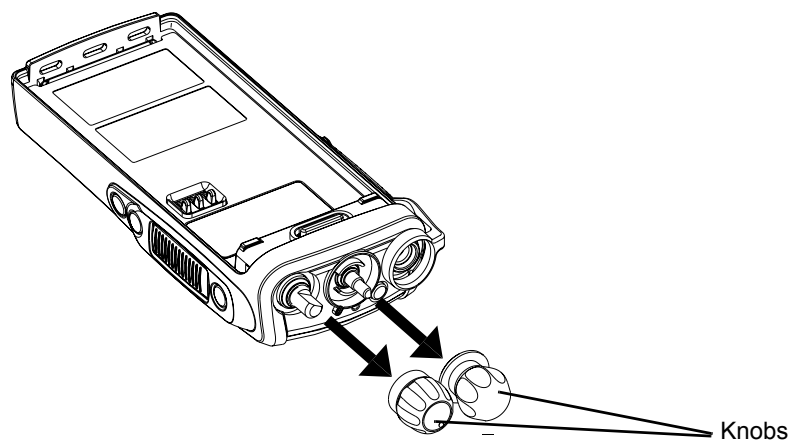


Figure 2-2: Knob Removal

5. Separate the chassis from the internal electronics front cover assembly as follows:
 - a. Insert a small, 3/16" flat-blade screwdriver, or similar instrument, in between the thin remaining wall and the chassis at the bottom of the radio. Do not mar the O-ring sealing area on the housing.
 - b. Slowly pry the bottom of the chassis from the cover by pushing the 3/16" flat-blade screwdriver down, and rotating the handle of the tool over and behind the base of the radio. This prying action forces the thin inner plastic wall toward the base of the radio, releasing the two chassis base tabs.

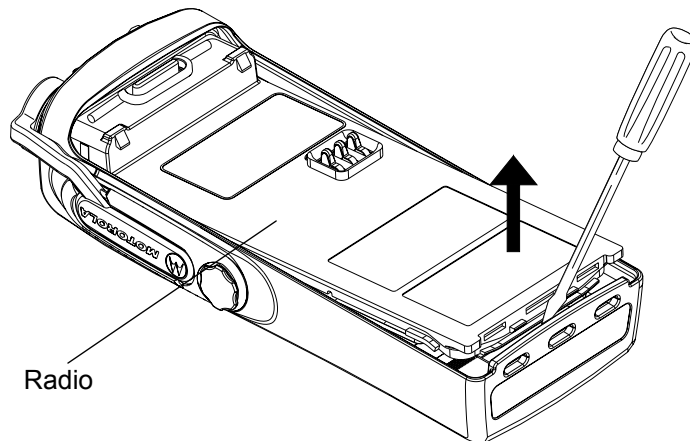


Figure 2-3: Chassis Removal



CAUTION: Marring the front cover O-ring sealing area will prevent the radio from sealing properly.

6. Lay the chassis down. Rotate the front cover backward and slightly away from the chassis.

NOTE: Flexible ribbon circuits (flexes) connecting the front cover assembly and the chassis prevent you from completely separating the two units.

7. Lift the latches on the main circuit board to release the flexes from their connectors.

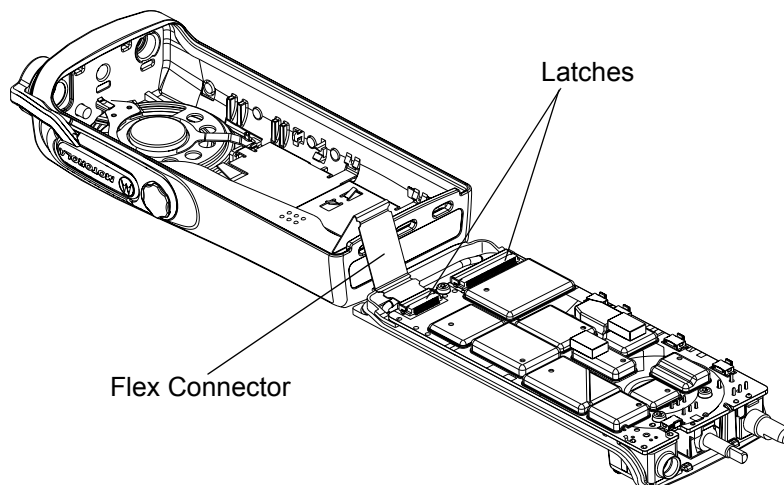


Figure 2-4: Unlatch Flex Connectors

2.6.2 Chassis Assembly/Disassembly

1. If disassembly of the chassis or the main board is required, then use a TORX™ screwdriver with a T6 head to remove the four screws holding the main board to the chassis.

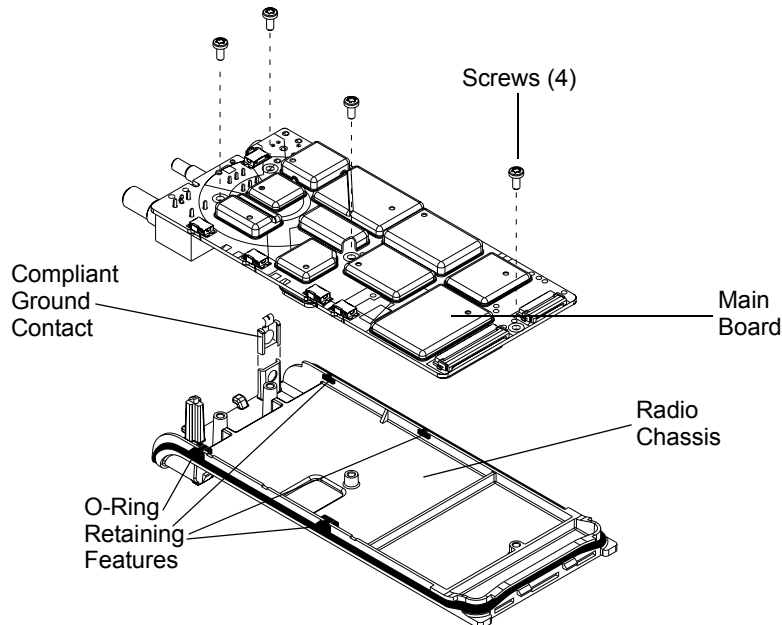


Figure 2-5: Remove Main Board from Chassis



Caution

CAUTION: Refer to the CMOS CAUTION in paragraph on page 2-2 before removing the main board. Be sure to use electrostatic discharge (ESD) protection when handling circuit boards.

2. Lift the main board from the chassis (refer to Figure 2-5).
3. Remove the small O-ring retainers from their slots in the chassis. Note the alignment of the retainers for reassembly.
4. Remove the O-ring.
5. If required in disassembly, slide off the ground contact from the top corner boss of the radio chassis.

2.6.3 Option Board Disassembly

1. If the disassembly of the keypad or the keypad printed circuit board, is required, lift the microphone flex circuit up, and carefully remove the microphone and its boot from the front cover pocket. (See Figure 2-6 on page 2-7).
2. Lay this flex circuit to one side.

3. To remove the keypad retainer shield:
 - a. Insert the tip of a “penknife size,” flat blade screwdriver in the opening at the end of the keypad retainer arm tab.
 - b. Pry the tab away from the side of the front cover until it moves past the ledges on the side wall. Repeat this procedure for the four remaining retainer arm tabs.

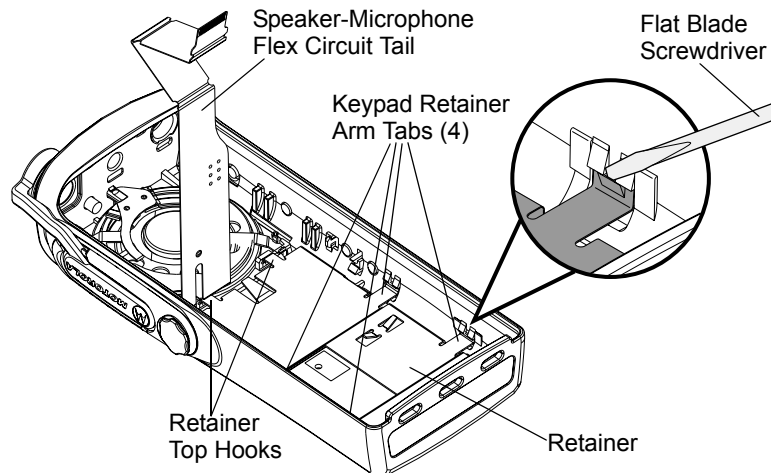


Figure 2-6: Remove Retainer

4. Note that the two “top hooks” are still held underneath the front cover—right below the speaker. Lift the keypad retainer out of the front cover, then lift and pivot the two hooks out of the front cover.

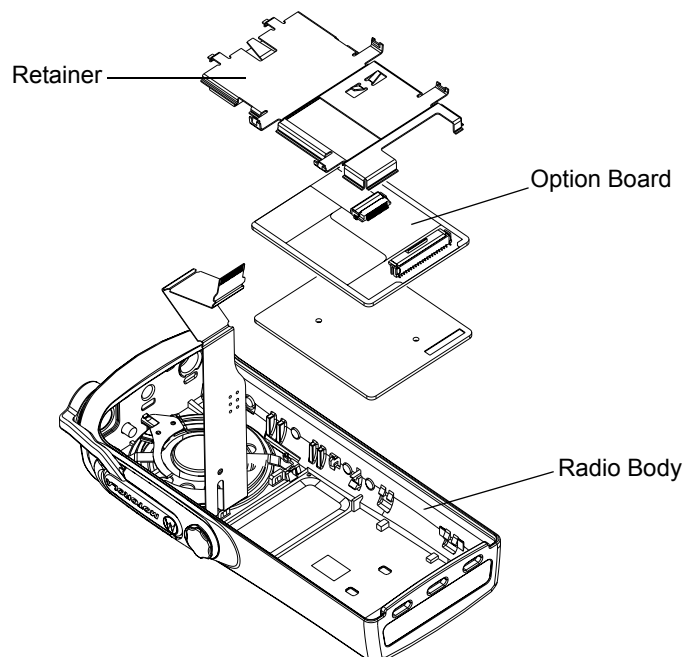


Figure 2-7: Removing the Retainer and Other Boards from the Radio

NOTE: At this point, the Option Board Installation Procedure should be performed, if necessary. (See page 2-11).

2.6.4 Speaker, Microphone, and Universal Connector Flex Disassembly

1. If disassembly of the speaker-microphone assembly is necessary, remove the dustcover by turning the screw at the bottom of the dustcover counterclockwise with your fingers. Lift the dustcover out of its pocket.

NOTE: The dustcover must be removed to remove the speaker-microphone assembly flex circuit. The speaker is held in place with a two-legged retainer bracket. The bracket legs are secured by the front cover slots. Be careful not to damage the speaker when removing the retainer bracket.

2. Using a screwdriver, push down on the portion of the speaker retainer bracket pointing toward the bottom of the radio. Then, remove the retainer by slightly pushing it toward the top of the radio until you slide it past the front cover slot.
3. Pull the rubber microphone boot from its seated position. Unless you are replacing the microphone, leave it in the boot.

NOTE: The speaker-microphone assembly flex circuit goes through the front cover wall to the outside wall. To replace this assembly, you must peel-off the universal connector escutcheon label. The existing escutcheon cannot be reassembled; a new part must be used. (See item number 10 on the exploded view drawing on page 2-13).

4. Peel-off the universal connector flex circuit escutcheon (label).
5. Pry the flex circuit (adhesive held) backer board away from the front cover, and remove the universal connector tail of the speaker-microphone assembly through its opening in the front cover.

6. After the universal connector tail of the speaker-microphone assembly is removed, the assembly can be completely removed. If it is necessary to replace the speaker or microphone, or both, do it while the flex circuit is removed from the front cover. When reassembling the microphone in its boot, make sure the microphone port faces the round hole in the bottom of the boot.

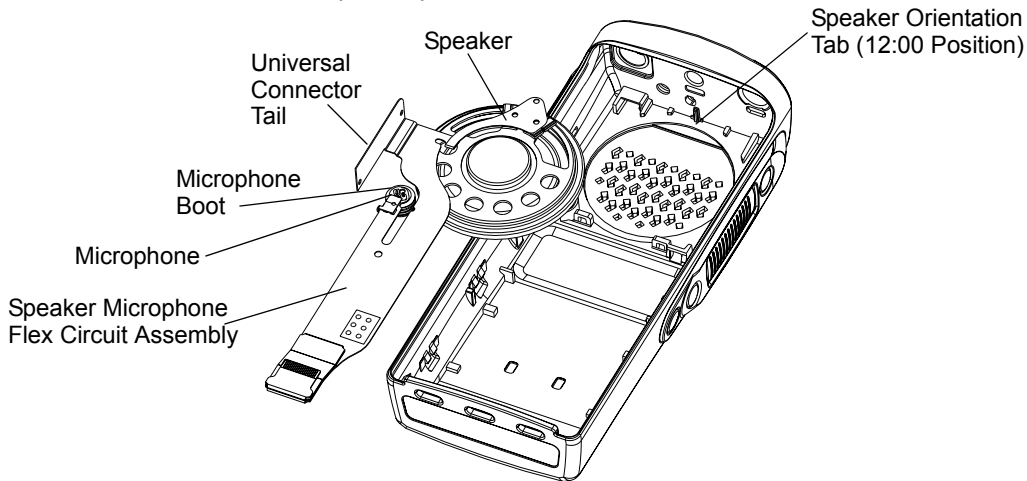


Figure 2-8: Removal Speaker-Microphone Assembly

2.6.5 Control Top Disassembly

1. To remove the control top assembly, place a screwdriver next to the antenna boss, then pry it against the control top escutcheon. This lifts the control top escutcheon away from its double-sided adhesive. Grab the double-sided adhesive near the volume potentiometer, then lift it away.
2. Remove the integrated control top seal, emergency button, and transmit light pipe.

2.7 Detailed Radio Reassembly

2.7.1 Control Top Reassembly

1. Replace transmit light pipe and control top seal.
2. Peel off the liners from a new control top escutcheon and place it in the recess in the front cover. Press the control top escutcheon firmly against the adhesive.

2.7.2 Speaker, Microphone, and Universal Connector Flex Reassembly

1. Feed the universal connector tail of the speaker-microphone flex assembly through the opening in the side wall of the front cover.
2. Peel-off the adhesive liner on the back of the universal connector tail of the flex circuit. Attach the flex tail to the front cover using the guide pins for correct alignment.
3. Replace the universal connector escutcheon. Make sure that all the connector openings align with the gold pads on the flex circuit.
4. Align the notch in the speaker at the twelve o'clock position with the tab on the front cover as shown in Figure 2-9.
5. Place the speaker retainer bracket into the hole on the top of the front cover, and bend the retainer down to fit underneath the boss below the speaker.

2.7.3 Option Board Reassembly

1. Replace the option board.
2. Insert the “top hooks” of the keypad retainer into the slots below the speaker (above the display) in the front cover. Snap all four of the retainer arm tabs in place in the front cover.

NOTE: Pull the speaker-microphone flex circuit out of the way during reassembly.

3. Reinsert the microphone and boot into the pocket in the front cover.
4. Lay the speaker-microphone flex on top of option board retainer.

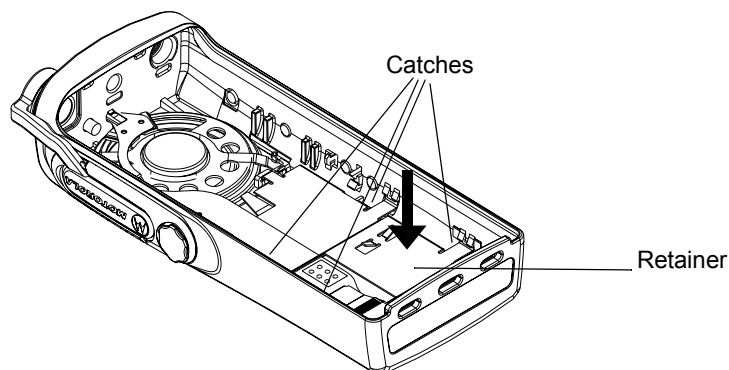


Figure 2-9: Lock Retainer Catches to the Radio's Body

2.7.4 Chassis Assembly Reassembly

1. Slide on the ground contact (if it was removed) on the top corner boss of the chassis.
2. Replace the O-ring. The tabs on the O-ring should reach into the chassis and point down.
3. Stretch the O-ring to place it into the retaining pocket at the bottom end of the chassis.

NOTE: When properly assembled, the retainers on the O-ring should align with the slots on the chassis. If this is not the case, remove and replace the O-ring until it is aligned with the chassis and completely seated in place around the perimeter.

4. Ensure that the antenna nut insulator is correctly replaced by pushing it all the way to the top of the antenna nut.
5. Replace the battery contact seal (if necessary) surrounding the battery contact.
6. Place the main circuit board straight down on top of the chassis.

NOTE: Be sure the battery contact seal protrudes through the chassis and is not pinched under the chassis.

7. Use the T6 TORX screwdriver to fasten the screws holding the main board to the chassis.

2.7.5 Chassis and Front Cover Reassembly

1. Align the chassis assembly end-to-end with the front cover assembly.
2. Insert the tails of the flex circuits into their respective connectors at the bottom of the front cover.
3. Push down the latches on the connectors to hold the flex circuits to the main board.
4. Slide the volume potentiometer and frequency switch shafts into their respective holes in the front cover.

5. Push the chassis assembly completely into the top of the front cover until it settles in place.
6. Be sure the O-ring is properly seated.
7. Snap the bottom of the chassis into the front cover.
8. Reassemble the knobs, dust cover, antenna, and battery.

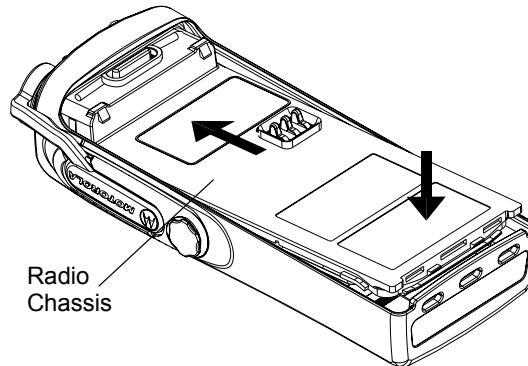


Figure 2-10: Fastening the Chassis

2.7.6 Option Board Installation

1. With the keypad retainer removed the keypad dummy board can be removed without the use of tools.
2. Discard the keypad dummy board.
3. The “breakaway” tab at the top of all option boards contains an extra row of keys and is used to accommodate other radio models.
4. Break-off and discard the option board tab, taking care not to damage the option board. Trim any tab fragments that may remain on the option board.

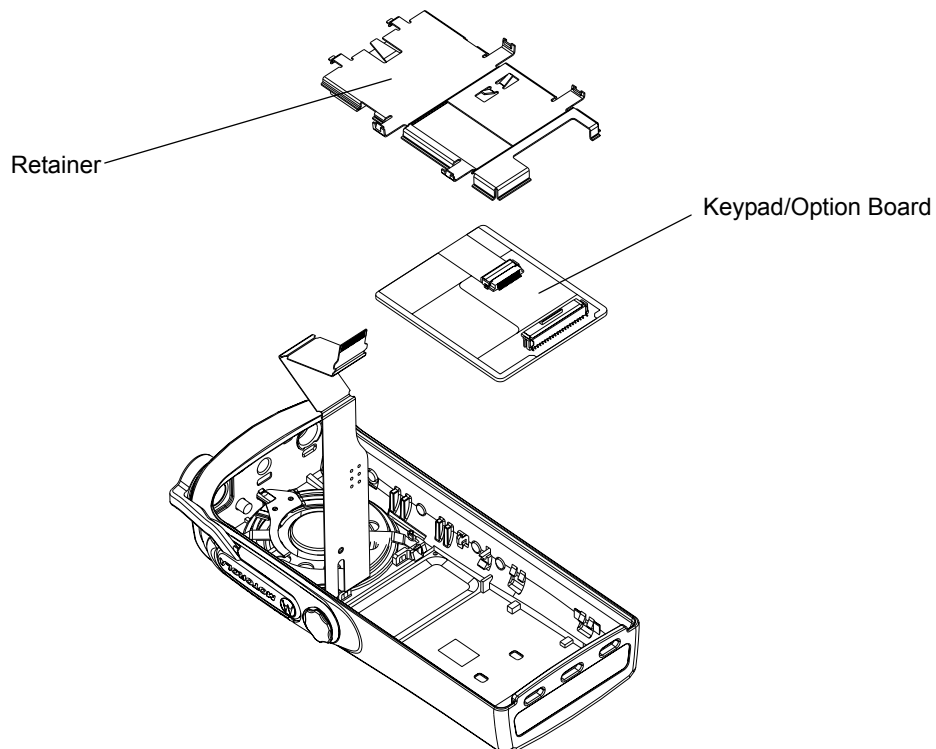
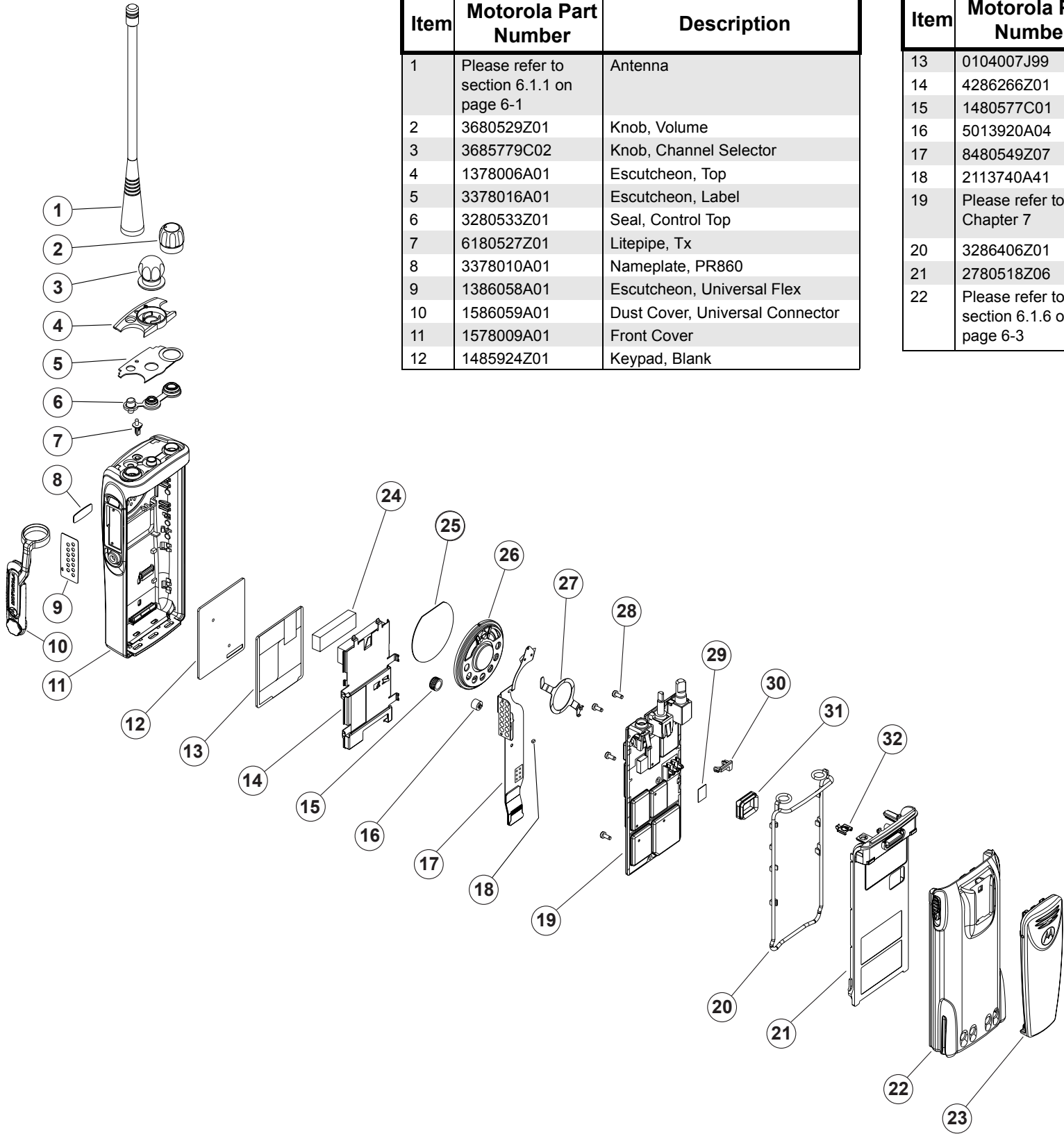


Figure 2-11: Changing Option Board

-
5. Reassemble the option board to the front cover assembly.
 6. Insert the jumper flex circuit into the connector on the option board. Notice the orientation of the flex circuit. Arrows on the jumper flex point to the correct way of inserting the flex into the connector.
 7. Replace the retainer by placing the two top hooks into the slots below the speaker in the front cover; then, pivot the retainer into the front cover. Ensure that all four tab arms snap correctly into the front cover.
 8. With the option board and retainer correctly in place, the front cover assembly can now be reassembled per paragraph 2.7.5.

2.8 PR860 Radio Exploded Mechanical View and Parts List



Item	Motorola Part Number	Description
1	Please refer to section 6.1.1 on page 6-1	Antenna
2	3680529Z01	Knob, Volume
3	3685779C02	Knob, Channel Selector
4	1378006A01	Escutcheon, Top
5	3378016A01	Escutcheon, Label
6	3280533Z01	Seal, Control Top
7	6180527Z01	Litepipe, Tx
8	3378010A01	Nameplate, PR860
9	1386058A01	Escutcheon, Universal Flex
10	1586059A01	Dust Cover, Universal Connector
11	1578009A01	Front Cover
12	1485924Z01	Keypad, Blank

Item	Motorola Part Number	Description
13	0104007J99	Keypad Board Assembly
14	4286266Z01	Retainer, Keypad PCB
15	1480577C01	Boot, Microphone
16	5013920A04	Microphone
17	8480549Z07	Flex, Speaker-Microphone
18	2113740A41	Capacitor, 33pF
19	Please refer to Chapter 7	Ctrl/RF Board Assembly
20	3286406Z01	Gasket, O-Ring
21	2780518Z06	Chassis
22	Please refer to section 6.1.6 on page 6-3	Battery

Item	Motorola Part Number	Description
23	HLN9714	Beltclip
24	7586481Z01	Poron Pad
25	3586621Z05	Felt Speaker
26	5085738Z03	Speaker
27	4286410Z01	Retainer, Speaker
28	0304726J04	Screw
29	7580556Z01	Pad, Thermal
30	1480652Z01	Insulator, Antenna
31	3280534Z01	Seal, Contact
32	3980698Z01	Contact, Ground, Compliant, VHF

Notes

2.9 Service Aids

Table 2-1 lists service aids recommended for working on the radio.

NOTE: While all of these items are available from Motorola, most are standard shop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 2-1: Service Aids

Motorola Part No.	Description	Application
RLN4460_	Portable Test Set	Enables connection to audio/accessory jack. Allows switching for radio testing.
RVN5022_	Customer Programming Software (CPS) CD ROM.	Programs customer option and channel data. Tunes hardware parameters, front end, power, deviation, etc.
AARKN4075_	Programming Cable	Includes radio interface box (RIB) capability.
AARKN4074_	Programming Cable/Test Cable	Connects radio to RIB (RLN4008B).
AARKN4073_	Radio to Radio Cloning Cable	Allows radio to be duplicated from a master radio by transferring programmed data from the master radio to the other.
RLN4008_	Radio Interface Box	Enables communications between radio and computer's serial communications adapter.
HHLN4134_	BNC Adaptor	Adapts radio antenna port to BNC cabling of equipment.
RLN4510_	Battery Eliminator 7.5V Regulator	Works in combination with Shop Battery Block, 0180305G54.
AA0180305G54 AA8180384F68	Shop Battery Block Bench Test Housing Eliminator	Interconnects radio to power supply. Provides for troubleshooting of radio when housing is removed.
0180357A57	Wall-Mounted Power Supply (120 VAC)	Used to supply power to RIB.
0180358A56	Wall-Mounted Power Supply (220 VAC; 2-prong)	Used to supply power to RIB.
3080369B72	Computer Interface Cable	Connects computer's serial communications adapter to RIB (RLN4008B).

2.10 Test Equipment

Table 2-2 lists test equipment required to service the radio.

Table 2-2: Recommended Test Equipment

Motorola Part No.	Description	Characteristics	Application
R2000, R2600 R2400, or R2001 with trunking option	Service Monitor	This monitor will substitute for items listed below with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
*R1049	Digital Multimeter		Two meters recommended for AC/ DC voltage and current measurements
*S1100	Audio Oscillator	67 to 200Hz tones	Used with service monitor for injection of PL tones
*S1053, *SKN6009, *SKN6001	AC Voltmeter, Power Cable for meter, Test leads for meter	<ul style="list-style-type: none"> • 1 mV to 300 V • 10 MΩ input impedance 	Audio voltage measurements
R1053	Dual-trace Oscilloscope	20 MHz bandwidth, 5 mV/cm - 20 V/cm	Waveform measurements
*S1350, *ST1215 (VHF) *ST1223 (UHF) *T1013	Wattmeter, Plug-in Elements (VHF & UHF), RF Dummy Load	<ul style="list-style-type: none"> • 50 Ω • $\pm 5\%$ accuracy 10 W, max. 0-1000 MHz, 300 W 	Transmitter power output measurements
S1339	RF Millivolt Meter	100 μ V to 3 VRF, 10 kHz to 1.2 GHz	RF level measurements
*R1013	SINAD Meter		Receiver sensitivity measurements
S1347 or S1348 (prog)	DC Power Supply	0-20 Vdc, 0-5 Amps	Bench supply for 7.5Vdc

2.11 Configuring and Wiring the Programming/Test Cable

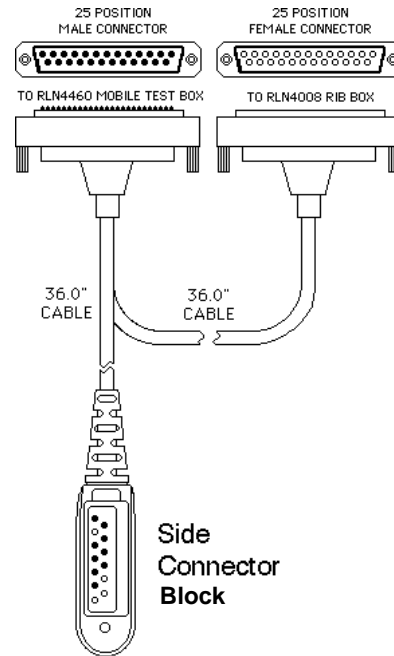


Figure 2-12: Programming/Test Cable AARKN4074

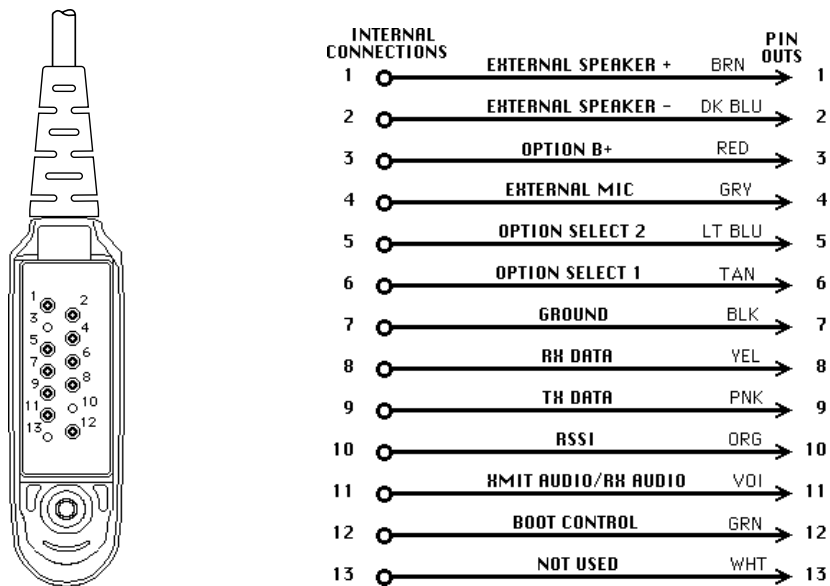


Figure 2-13: Pin Configuration of the Cable Side Connector

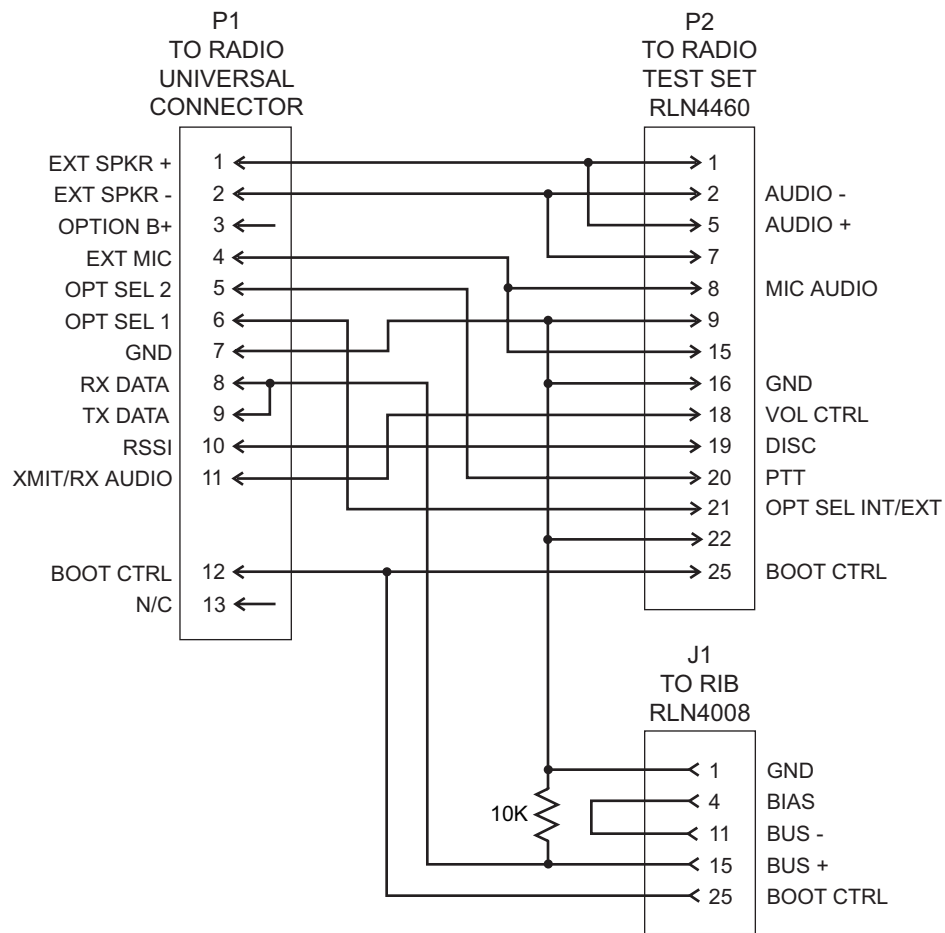


Figure 2-14: Programming/Test Cable Schematic

Chapter 3

Transceiver Performance Testing

3.1 General

These radios meet published specifications through their manufacturing process by utilizing high accuracy laboratory-quality test equipment. The recommended field service equipment approaches the accuracy of the manufacturing equipment with few exceptions. This accuracy must be maintained in compliance with the manufacturer's recommended calibration schedule.

3.2 RF Test Mode

When the radio is operating in its normal environment, the radio's microcontroller controls the RF channel selection, transmitter key-up, and receiver muting. However, when the unit is on the bench for testing, alignment, or repair, it is removed from its normal environment and cannot receive commands from its system. Therefore, the internal microcontroller does not key the transmitter or unmute the receiver. This prevents the use of a normal tuning procedure. To solve this problem, a special "test mode" is incorporated into the radio.

Note 1: On VHF/UHF models, the radio must be in conventional mode.

Note 2: The test mode procedure that follows assumes that the Customer Programming Software Front Panel Access screen has both the FPA and RF TEST boxes selected. Select from the programming screen to enable or disable certain features of the radio RF test mode.

- FPA entry not selected blocks all test modes.
- FPA entry selected and RF TEST not selected blocks RF test mode.
- FPA entry selected and RF TEST selected enables all test modes.

To enter the test mode of radio:

1. Turn the radio on.
2. Within ten seconds after the self test is complete, press 'side button 2' (Figure 3-1) five times in succession.
3. Press 'side button 1' the number of times listed in Table 3-1 to get the number of corresponding beeps.
4. Turn radio off to exit test mode.
5. To access all 14 test modes on a 4-channel radio, the frequency knob and mechanical stop sleeve must be removed (see paragraph 3-8 exploded view diagram).

Button Test (For models with "G" in location 10 of model number Example: AAH25RCH6**G**B6AN)

1. Press the orange button; "3/1" appears which indicates that switch 3 is in the closed condition.
2. Release the orange button; "3/0" appears which indicates that switch 3 is in the open condition.
3. Rotate the mode selector knob; "4/0" through "4/15" appears which indicates that knob 4 is in mode position 1 through 15.
4. Rotate the volume control; "2/0" through "2/255" appears.
5. Press SB1, view "96/1"; release, view "96/0".
6. Press SB2, view "97/1"; release, view "97/0".

7. Press SB3, view “98/1”; release view “98/0”.
8. Press PTT button, view “1/1”; release view “1/0”.

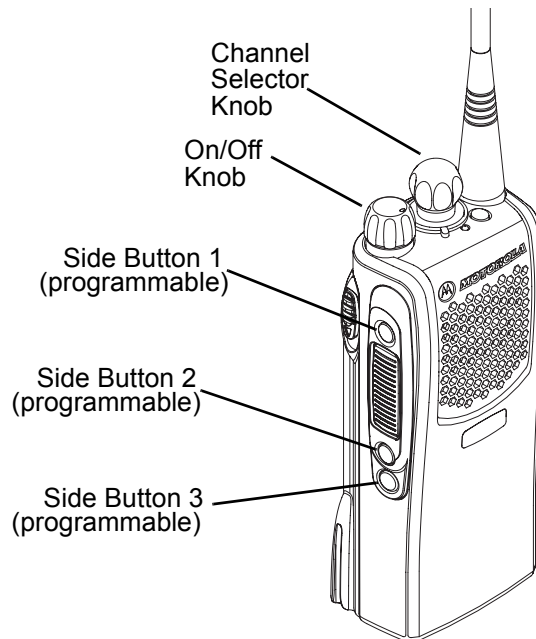


Figure 3-1: Radio Side Button Location

Table 3-1: Test Environments (Side Button 1)

Number of Side Button 1 Presses	No. of Beeps	Display Shows	Description	Function
Initial (No button presses required)	0	CSQ	Carrier Squelch	RX: if carrier detected TX: mic audio
1	1	TPL	Tone Private-Line	RX: unsquelch if carrier and tone (192.8Hz) detected TX: mic audio + tone (192.8Hz)
2	2	DPL	Digital Private-Line	RX: unsquelch if carrier and digital code (131) detected TX: mic audio + digital code (131)
3	3	DTMF	Dual-Tone Multiple Frequency	RX: unsquelch if carrier detected TX: selected DTMF tone pair
4	5	Open	Unsquelch	RX: constant unsquelch TX: mic audio
5	9	HSS	MDC1200	RX: unsquelch if carrier detected TX: 1500Hz tone
6	11	CMP	Compander	RX: if carrier detected TX: mic audio
7	12	LLE	Low-Level Expand	RX: if detected TX: mic audio

Table 3-2: Test Channel Spacing (Side Button 2)

Number of Low Tones	Channel Spacing
1	25/30 kHz
2	12.5 kHz
3	20 kHz

3.3 Test Frequencies

The radio channels and test frequencies are listed in Table 3-3. The channels are selected using the channel selector switch located on top of the radio, as shown in Figure 3-1 on page 3-2. The test environment and channel spacing for any particular frequency is selected using 'side buttons 1 and 2', as listed in Table 3-1 on page 3-3 and Table 3-2 on page 3-3. The display radio shows the selected parameters on the radio display, and sounds the corresponding number of beeps and tones listed in Table 3-1 and Table 3-2. The non-display radio only sounds the beeps and tones.

Table 3-3: Test Frequencies (Using the Channel Selector Switch)

Channel Selector Switch Position	Test Channel	Low 1	Low 2	VHF	UHF 1	UHF 2
1 Low Power 8 High Power	TX #1 or #8 RX #1 or #8	29.740 29.740	35.040 35.040	136.025 136.025	403.025 403.025	450.025 450.025
2 Low Power 9 High Power	TX #2 or #9 RX #2 or #9	32.040 32.020	37.040 37.020	142.325 142.325	415.025 415.025	462.850 462.850
3 Low Power 10 High Power	TX #3 or #10 RX #3 or #10	34.040 34.020	39.040 39.020	148.625 148.625	425.025 425.025	475.675 475.675
4 Low Power 11 High Power	TX #4 or #11 RX #4 or #11	36.040 36.020	42.040 42.020	154.925 154.925	436.025 436.025	488.500 488.500
5 Low Power 12 High Power	TX #5 or #12 RX #5 or #12	38.040 38.020	45.040 45.020	161.225 161.225	449.025 449.025	501.325 501.325
6 Low Power 13 High Power	TX #6 or #13 RX #6 or #13	40.040 40.020	48.040 48.020	167.525 167.525	460.025 460.025	514.150 514.150
7 Low Power 14 High Power	TX #7 or #14 RX #7 or #14	42.040 42.020	50.040 50.020	173.825 173.825	469.975 469.975	526.975 526.975

3.4 Receiver Performance Tests

The receiver and transmitter performance tests are contained in Table 3-4 and Table 3-5 respectively. Refer to Chapter 4, Figure 4-1 on page 4-2, for test equipment setup. Note that all test measurements are taken at 77°F(25°C) and in conventional or trunked models.

Table 3-4: Receiver Performance Checks

Test Name	Service Monitor	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squench output at antenna	PTT to continuous (during the performance check)	Frequency error to be ±200 Hz VHF ±600 Hz UHF ±60 Hz Low Band
Rated Audio	Mode: GEN Output level: 1.0mV RF 4th channel test frequency* Mod: 1 kHz tone at 3 kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 4 carrier squench	PTT to OFF (center), meter selector to Audio PA	Set volume control to 3.16Vrms
Distortion	As above, except to distortion	As above	As above	Distortion 3.0% Typical
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be 0.25μV
Noise Squench Threshold (only radios with conventional system need to be tested)	RF level set to 1mV RF	As above	PTT to OFF (center), meter selection to Audio PA, speaker/load to speaker	Set volume control to 3.16Vrms
	As above, except change frequency to a conventional system. Raise RF level from zero until radio unsquench.	out of TEST MODE; select a conventional system	As above	Unsquench to occur at <0.25μV. Preferred SINAD = 9-10dB

* see Table 3-3

Table 3-5: Transmitter Performance Checks
 (Models with "G" in location 10 of model number EX:AAH25RDH9**G**B6AN)

Test Name	Service Monitor	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squelch	PTT to continuous (during the performance check)	Frequency error ±200 Hz VHF ±600 Hz UHF ±60 Hz Low Band
Power RF	As above	As above	As above	Refer to Specifications
Voice Modulation (internal)	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/Out	TEST MODE, Test Channel 4 carrier squelch output at antenna	Remove modulation input	Press PTT switch on radio. Say "four" loudly into the radio mic. Measure deviation: VHF, UHF, Low 1 and Low 2: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp)
Voice Modulation	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/Out Monitor: DVM, AC Volts Set 1 kHz Mod Out level for 0.025Vrms at test set, 80mVrms at AC/DC test set jack	As above	As above, meter selector to mic	Deviation: VHF, UHF, Low 1 and Low 2: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp) Global. 5 kHz (20 kHz Ch Sp) U.S. and Canada.
High-Speed Data Modulation* **	As above	TEST MODE, Test Channel 4 high speed output at antenna	PTT to continuous (during the performance check)	Deviation: VHF, UHF, Low 1 and Low 2: ≥ 2.5 kHz but ≤ 3.5 kHz (25 kHz Ch Sp)
Low-Speed Data Modulation UHF	As above	TEST MODE, Test Channel 4 TLS output at antenna	PTT to continuous (during the performance check)	Deviation: VHF, UHF: ≥500Hz but ≤ 1000Hz (25 kHz Ch Sp)
DTMF Modulation	As above, 4th channel test frequency*	TEST MODE, Test Channel 4 DTMF output at antenna	As above	Deviation: VHF, UHF, Low 1 and Low 2: ≥ 3.05 kHz but ≤ 3.45 kHz (25 kHz Ch Sp)
PL/DPL Modulation	As above 4th channel test frequency* BW to narrow	TEST MODE, Test Channel 4 TPL DPL	As above	Deviation: VHF, UHF, Low 1 and Low 2: ≥500Hz but ≤ 1000Hz (25 kHz Ch Sp)

*** MDC

* See Table 3-3

Chapter 4

Radio Tuning, Programming, Cloning, and Lowband Antenna Cutting Procedure

4.1 Introduction

This chapter provides an overview of the Customer Programming Software (CPS) and tuner program designed for use in a Windows® NT, Windows® 95, Windows® 98, Windows® 2000, and Windows® Millennium (ME), environment. These programs are available in separate kits as listed in the Table 4-1. An installation instruction manual is also included with each kit.

NOTE: Refer to the appropriate program on-line help files for the programming procedures.

Table 4-1: Software Installation Kits Radio Tuning Setup

Description	Kit Number
Customer Programming Software (CPS)	RVN5022_

4.2 Global Radio Tuning Setup

A personal computer (PC), Windows® 95/98, and a global tuner program are required to tune the radio. To perform the tuning procedures, the radio must be connected to the PC, radio interface box (RIB), and test equipment shown in Figure 4-1.

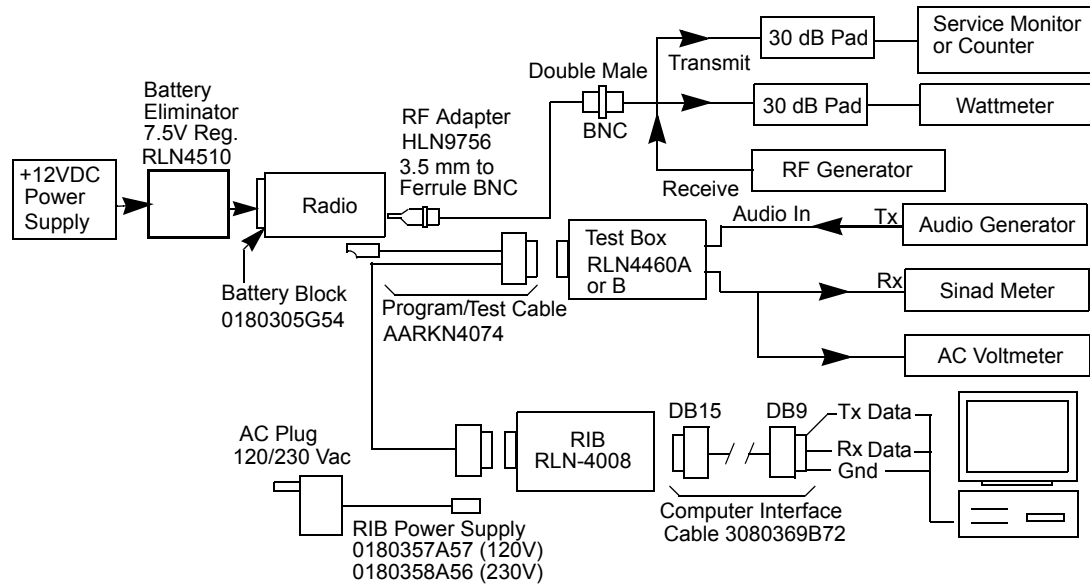


Figure 4-1: Radio Tuning Test Equipment Setup

4.2.1 Initial Test Equipment Setup

The supply voltage is connected to the radio using a Motorola battery eliminator, P/N AA0180305G54. The initial test equipment (Figure 4-1) control settings are listed in Table 4-2.

NOTE: Refer to appropriate program on-line help files for the tuning procedures.

Table 4-2: Initial Equipment Control Settings

Service Monitor	Test Set	Power Supply
Monitor Mode: Power Monitor	Speaker set: A	Voltage: 7.5Vdc
RF Attenuation: -70	Speaker/load: Speaker	DC on/standby: Standby
AM, CW, FM: FM	PTT: OFF	Volt Range: 10V
Oscilloscope Source: Mod Oscilloscope Horizontal: 10mSec/Div Oscilloscope Vertical: 2.5 kHz/Div Oscilloscope Trigger: Auto Monitor Image: Hi Monitor BW: Nar Monitor Squelch: mid CW Monitor Volume: 1/4 CW		Current: 2.5A

4.3 CPS Programming Setup

The CPS programming setup, shown in Figure 4-2, is used to program the radio codeplug.

NOTE: Refer to appropriate program on-line help files for the codeplug programming procedures.

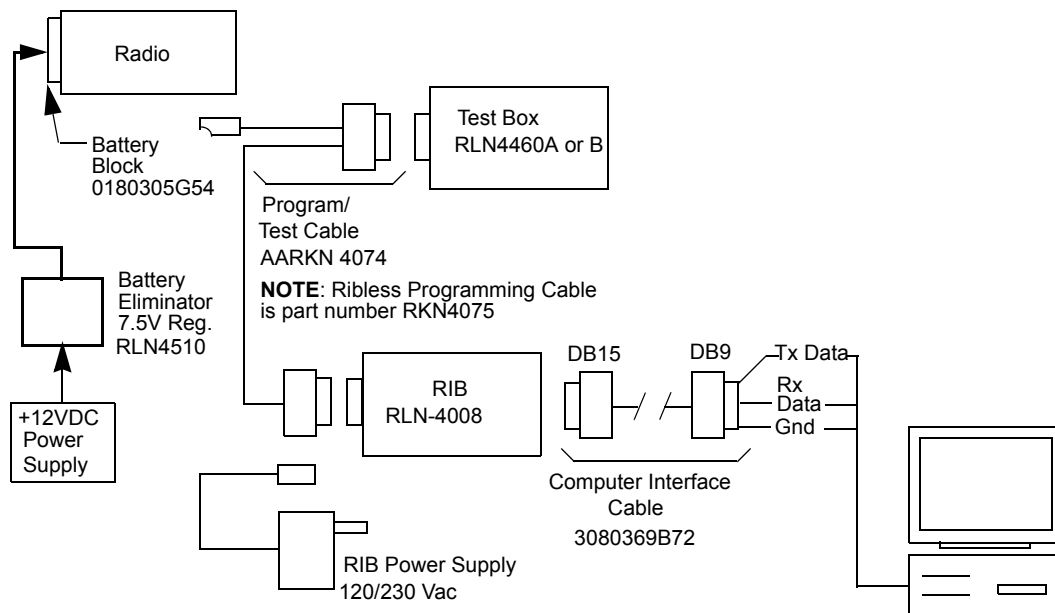


Figure 4-2: CPS Programming Setup

4.4 Cloning (Conventional)

Cloning is the process of copying the content of one radio (source radio) into another radio (target radio). Radio content refers to system-type features such as frequency, squelch type options, trunking, etc.

NOTE: Cloning can be performed only on radios with identical model numbers and software options.

Radio functionality inherent in one radio cannot be cloned to another radio that does not contain the same functionality. Tuning and alignment information are not transferable and are not affected by cloning.

Signaling Identification Numbers (IDs) are duplicated in the cloning process. Unique IDs may be assigned with the CPS.

NOTE: Unsuccessful cloning attempts will not damage the radio.

Procedure:

1. Turn source and target radios off.
2. Connect cloning cable to side connector of both radios.
3. Turn on target radio.
4. On source radio, simultaneously press 'side buttons 1 and 2', shown in Figure 4-3, then turn radio on. Both radios produce a "clone-entry" tone and turn on their green LEDs. Display radios show "Cloning To" (source radio) and "Program" (target radio).
5. Release both side buttons. The electronic transfer process begins and will take approximately one to three minutes.

6. When cloning is completed, both radios reset themselves and turn their green LEDs off. The source radio produces a “clone-exit” tone and displays “**Clone Complete**”.
7. Turn both radios off.
8. Disconnect the cloning cable from both radios and turn them on for normal operation.

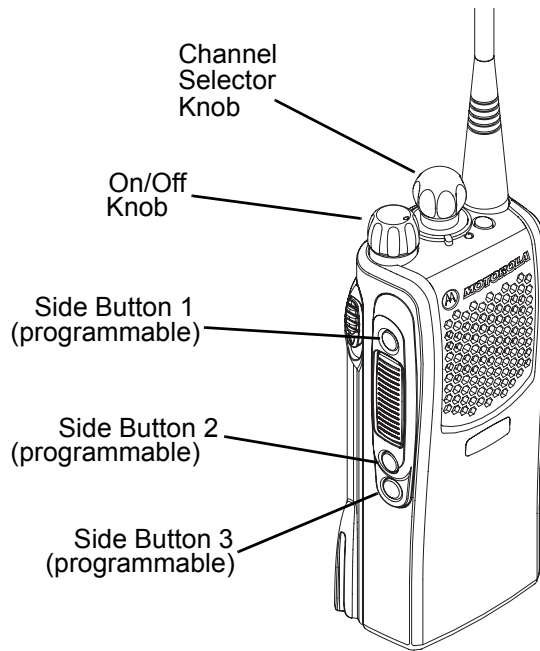
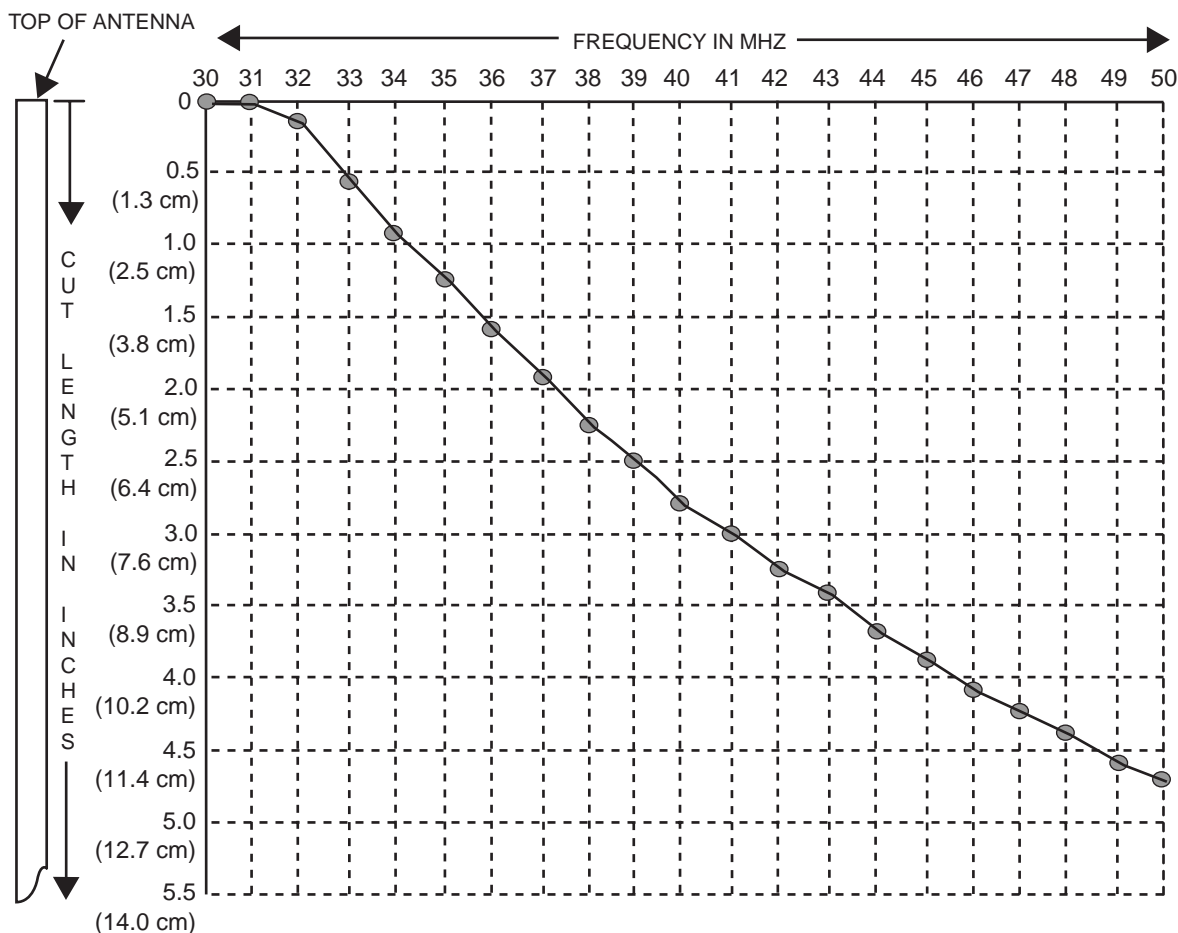


Figure 4-3: Radio Side Button Locations

4.5 Lowband Molded Antenna Cut Chart

This chart is for antenna NAB6064 used with professional radio series.

NOTE: The chart below is not drawn to scale. Obtain and use a standard ruler for marking of cutting measurements.



Frequency Verification Chart

This chart can be used to verify the length or frequency of an antenna already cut. DO NOT use it to make the actual cut.

Freq (MHz)	Final Antenna Length (Inches)
30	11 9/16 (29.369 cm)
32	11 7/16 (29.052 cm)
34	10 5/8 (26.988 cm)
36	10 (25.400 cm)
38	9 3/8 (23.813 cm)
40	8 7/8 (22.543 cm)
42	8 5/16 (21.114 cm)
44	7 7/8 (20.003 cm)
46	7 1/2 (19.050 cm)
48	7 3/16 (18.256 cm)
50	6 7/8 (17.463 cm)

NOTE:

Antenna length measured from top of antenna to bottom of rubber skirt.

Cutting Instructions

1. Remove cap from antenna.
2. Measure from top of antenna down to the desired length corresponding with the desired frequency.
3. Mark the antenna, then cut at that mark.
4. To replace the antenna cap, put a small bead of #414 Loctite™ (Motorola part number 1110019B59) around the inside walls of the antenna cap. Place the cap on top of the antenna and seat fully.

Notes

Chapter 5

Power Up Self-Test

5.1 Error Codes - Conventional Radios

Turning on the radio starts a self-test routine that checks the RAM, ROM checksum, EEPROM hardware, and EEPROM checksum. If these checks are successful, the radio generates two high-pitched self-test pass tones, or a musical tone (selected in CPS). If the self-test is not successful, one low-pitched tone is heard. Radios with displays are able to display the error codes. The displayed error codes and related corrections are listed as follows:

Table 5-1: Power-up Display Codes - (Conventional Radios)

If the error code displayed is...	then, there is a...	To correct the problem...
"RAM TST ERROR"	RAM test failure.	Retest the radio by turning it off and turning it on again. If message reoccurs, replace RAM (U405).
"ROM CS ERROR"	Wrong ROM checksum.	Reprogram FLASH memory, then retest. If message reoccurs, replace ROM (U406).
"EEPRM HW ERROR"	Codeplug structure mismatch or non existence of codeplug.	Reprogram codeplug with correct version and retest radio. If message reoccurs, replace EEPROM (U407).
"EEPRM CS ERROR"	Wrong codeplug checksum.	Reprogram codeplug.
No Display	Bad display module connection or damaged display module.	Check connection between main board and display module or replace with new display module.

Notes

Chapter 6

Accessories

6.1 PR860 Accessories

6.1.1 Antennas

NAB6064	Low Band 30-50 MHz, Heliflex
NAD6502_R	VHF 146-174 MHz, Heliflex
PMAD4012	VHF 136-155 MHz 9 cm, Stubby
PMAD4025	VHF 150-161 MHz, Stubby
PMAD4013	VHF 155-174 MHz 9 cm, Stubby
8504762J01	VHF 136-155 MHz 14 cm, Whip
NAD6579	VHF 148-161 MHz, Whip
PMAD4023	VHF 150-161 MHz, Whip
8504762J02	VHF 155-174 MHz 14 cm, Whip
PMAE4002	UHF 403-433 MHz, Stubby
8504762J08	UHF 430-470 MHz, Stubby
NAE6483_R	UHF 403-520 MHz, Whip

6.1.2 Batteries

HNN4001	impres™ NiMH, 1900 mAh, 7.5 V
HNN4002	impres™ NiMH, 1800 mAh, 7.5 V, Intrinsically Safe
HNN4003	impres™ Li-Ion, 2000 mAh, 7.5 V
HNN9008_R	Premium NiMH, 1500 mAh, 7.5 V (not compatible with LowBand models)
HNN9009_R	Premium NiMH, 1900 mAh, 7.5 V
HNN9010_R	Premium NiMH, 1800 mAh, 7.5 V - Intrinsically Safe
HNN9011_R	Premium NiCd, 1200 mAh, 7.5 V - Intrinsically Safe
HNN9012_R	Premium NiCd, 1300 mAh, 7.5 V
HNN9013_R	Premium Li-ion, 1200 mAh, 7.5 V
WPNN4045_R	Powerline NiMH, 1200 mAh, 7.5 V

6.1.3 Chargers & Charger Accessories

WPLN4182	impres™ 120 Volt Single-Unit Charger
WPLN4187	impres™ 120 Volt Multi-Unit Charger
WPLN4192	impres™ 120 Volt Multi-Unit Charger with Display
AAHTN3000	120 Volt Single-Unit Rapid Rate Intelli-Charger
AAHTN3003	120 Volt 6 Unit Rapid Rate Intelli-Charger
NLN7967	Wall Mount Kit for Multi-Unit Charger
WPLN4124_R	Battery Optimizing System II (BOS II)
RL-76345	Battery Optimizing System (BOS II) Adapter Plate
RLN5233	Hard Wire Vehicular Charger
RLN4883	Travel Charger
NDN4005	Battery Maintenance System Plus (BMS ^{PLUS}), Three Station
WPLN4079_R	Battery Maintenance System Plus (BMS ^{PLUS}), Six Station
WPLN4107_R	Motorola Conditioning Charger (MCC) Single-Unit with Adapter Plate
WPPN4065_R	Motorola Conditioning Charger (MCC) Four Station
WPPN4082_R	Adapter Plate Only (use with MCC)
RLN4814	Vehicular Mounting Bracket For Single-Unit MCC
WPPN4079_R	BMS Battery Adapter (for use with NiCd & NiMH batteries)
WPPN4080_R	BMS Battery Adapter (for use with NiCd, NiMH & Li-ion batteries)
AAEN1006	Vehicular Adapter - VHF
AAEN1007	Vehicular Adapter - UHF
ENKN4002	Programming Cable for VHF and UHF Vehicular Adapters
GKN6270	Power Cable with 10A Fuse
GSN6059	13 W External Speaker

6.1.4 Carry Accessories

HLN9714	2 1/2" Spring Action Belt Clip
HLN9844	2" Spring Action Belt Clip
HLN9952	Carry Holder Belt Clip
HLN9652	Leather Case with Belt Loop, Li-Ion
HLN9665	Leather Case with Belt Loop, NiMH & NiCd
HLN9670	Leather Case with Swivel, Li-Ion
HLN9676	Leather Case with Swivel, NiMH & NiCd
HLN9701	Nylon Case with Belt Loop
NTN8039	2.5" High Activity Swivel Belt Loop
NTN8040	3" High Activity Swivel Belt Loop
HLN6602	Universal Chest Pack
RLN4570	Break-A-way Chest Pack
RLN4815	RadioPak Radio/Utility Case
TDN9327	Portable Radio Hanger (for door panels up to 2.75")
TDN9373	Portable Radio Hanger (for door panels from 2.75" to 3.25")
HLN9985	Waterproof Bag
NTN5243	Shoulder Strap

6.1.5 Audio Accessory - Microphones

AAHMN9052	Remote Speaker Microphone
AAHMN9053	Noise-Canceling Remote Speaker Microphone
AAHMN9054	UHF Public Safety Speaker Microphone
AAHMN9057	VHF Public Safety Speaker Microphone
RMN5055	Heavy Duty Remote Speaker Microphone

6.1.6 Audio Accessory - Headsets

AARMN4018	Lightweight Single Muff Headset with Swivel Boom Mic & Inline PTT
AARMN4031	Lightweight Single Muff Adjustable Headset with Swivel Boom Mic
ENMN4012	Ultra-Light Headset, Behind the Head
AARMN4017	Ultra-Light Headset, Earbud Style Receiver
RMN4048	Temple Transducer
RMN5048	Rugged Temple Transducer
ENMN4016	Medium Duty Headset, Behind the Head

AARMN4019	Medium Weight Over-the-Head Headset with Noise Cancelling Mic & Inline
AARMN4032	Medium Weight Over-the-Head Headset with Noise Cancelling Mic
RMN5047	NFL Style Heavy Duty Headset (requires AAHLN9716 Adapter)
RMN5015	Racing Headset (RKN4091 adapter cable required)
AARMN4020	Push-to-Talk or VOX Heavy Duty Headset
RMN4051	2-Way Hard-Hat Mount Headset, Black (requires RKN4097 adapter cable)
RMN4052	Tactical Headband Style Headset, Gray (requires RKN4097 adapter cable)
RMN4053	Tactical Hard-Hat Mount Headset, Gray (requires RKN4097 adapter cable)
RMN4054	Receive Only Hard-Hat Mount Headset
RMN4055	Receive Only Headband Style Headset
AAHLN9716	Adapter for Audio Accessories
RKN4097	In-Line PTT Adapter Cable
RKN4091	Adapter cable (for use with RMN5015)

6.1.7 Audio Accessory - Earpieces

AARMN4021	Receive Only Earpiece, 1-Wire, Beige
AARMN4028	Receive Only Earpiece, 1-Wire, Black
AARMN4022	Earpiece with Microphone and Push-to-Talk Combined, 2-Wire, Beige
AARMN4029	Earpiece with Microphone and Push-to-Talk Combined, 2-Wire, Black
ENMN4017	Earpiece with Microphone and Push-to-Talk Combined, 3-Wire, Beige
ENMN4014	Earpiece with Microphone and Push-to-Talk Combined, 3-Wire, Black
NTN8370	Extreme Noise Kit
NTN8371	Low Noise Kit
RLN5316	Comfort Earpiece with Microphone and PTT Combined, 2-Wire, Beige
RLN5315	Comfort Earpiece with Microphone and PTT Combined, 2-Wire, Black
RLN4922	Completely Discreet Earpiece Kit
ENMN4013	Flexible Ear Receiver

6.1.8 Audio Accessory - Ear Mics

BDN6677	Ear Microphone for Standard Noise Levels, Black
BDN6678	Ear Microphone for Standard Noise Levels, Beige
BDN6641	Ear Microphone for High Noise Levels, Gray
AARMN4044	Push-to-Talk Only Interface Module
AARMN4045	Push-to-Talk or Voice Activated Interface Module
0180358B38	Push-to-Talk Ring Switch
0180300E83	Push-to-Talk Body Switch
0180300E25	Earguard with Adjustable Loop

6.1.9 Audio Accessory - CommPort

NTN1722	Integrated Ear Microphone/Receiver System with PTT on Radio Adapter
NTN1723	Integrated Ear Microphone/Receiver System with Palm PTT
NTN1724	Integrated Ear Microphone/Receiver System with Ring PTT
NTN1737	Integrated Ear Microphone/Receiver System with Snap-on-Side PTT
NNTN4187	Integrated Ear Microphone/Receiver System with Body PTT

6.1.10 Miscellaneous

HLN9793	Charger Insert Spacer - Compatible with "A" version chargers only
HLN9794	Charger Insert Spacer - Compatible with "B" and "C" version chargers only
RLN4890	Assistive Turning Knobs

6.1.11 Service

AARKN4074	Programming and Test Cable/PR860
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6.1.12 Manuals

HKLN4229	PR860 Users Guide (CD)
6881098C42	PR860 Basic Service Manual
6881098C43	PR860 Detailed Service Manual
6881095C98	Safety Manual
6881089C15	FM Supplement Manual

Notes

Chapter 7

Model Chart and Test Specifications

7.1 VHF 136–174 MHz (Conventional)

PR860, VHF, 136–174 MHz		
Model		Description
AAH45KDC9AA3_N		PR860, 136-174 MHz, 5W, Conv 16-Ch
	Item	Description
X	PMUD2035_	PR860 Super Tanapa 136-174 MHz, 5W, 16CH
X	PMUD2034_	PR860 Tanapa 136-174 MHz, 5W, 16CH
X	PMHD4022_	PR860 Back Cover Kit 136-174 MHz, 5W, 16CH
X	PMHN4058_	PR860 Front Cover Kit
X	NAE6483	Whip Antenna (403-520 MHz)
X	6881098C02	PR860 User Guide

x = Indicates one of each is required.

7.2 UHF1 403-470 MHz (Conventional)

PR860, UHF1, 403–470 MHz		
Model		Description
AAH45RDC9AA3_N		PR860, 403-470 MHz, 4W, Conv 16-Ch
	Item	Description
X	PMUE2336_	PR860 Super Tanapa 403-470 MHz, 4W, 16CH
X	PMUE2334_	PR860 Tanapa 403-470 MHz, 4W, 16CH
X	PMHE4032_	PR860 Back Cover Kit 403-470 MHz, 4W, 16CH
X	PMHN4058_	PR860 Front Cover Kit
X	NAE6483	Whip Antenna (403-520 MHz)
X	6881098C02	PR860 User Guide

x = Indicates one of each is required.

7.3 UHF2 450-512 MHz (Conventional)

PR860, UHF2, 450–512 MHz		
Model		Description
AAH45SDC9AA3_N		PR860, 450-512 MHz, 4W, Conv 16-Ch
	Item	Description
X	PMUE2337_	PR860 Super Tanapa 450-512 MHz, 4W, 16CH
X	PMUE2335_	PR860 Tanapa 450-512 MHz, 4W, 16CH
X	PMHE4033_	PR860 Back Cover Kit 450-512 MHz, 4W, 16CH
X	PMHN4058_	PR860 Front Cover Kit
X	NAE6483	Whip Antenna (403-520 MHz)
X	6881098C02	PR860 User Guide

x = Indicates one of each is required.

7.4 LowBand1 29.7-42 MHz (Conventional)

PR860, LB1, 29.7-42 MHz		
Model		Description
AAH45BEC9AA3_N		PR860, 29.7-42 MHz, 6W, Conv 16-Ch
	Item	Description
X	PMUB1055_	PR860 Super Tanapa 29.7-42 MHz, 6W, 16CH
X	PMUB1053_	PR860 Tanapa 29.7-42 MHz, 6W, 16CH
X	PMHB4000_	PR860 Back Cover Kit 29.7-42 MHz, 6W, 16CH
X	PMHN4058_	PR860 Front Cover Kit
X	NAB6064_	Heliflex Antenna (29.7-50 MHz)
X	6881098C02	PR860 User Guide

x = Indicates one of each is required.

7.5 LowBand2 35-50 MHz (Conventional)

PR860, LB2, 35-50 MHz		
Model		Description
AAH45CEC9AA3_N		PR860, 35-50 MHz, 6W, Conv 16-Ch
	Item	Description
X	PMUB1056_	PR860 Super Tanapa 35-50 MHz, 6W, 16CH
X	PMUB1054_	PR860 Tanapa 35-50 MHz, 6W, 16CH
X	PMHB4001_	PR860 Back Cover Kit 35-50 MHz, 6W, 16CH
X	PMHN4058_	PR860 Front Cover Kit
X	NAB6064_	Heliflex Antenna (29.7-50 MHz)
X	6881098C02	PR860 User Guide

x = Indicates one of each is required.

7.6 Specifications, PR860 Radio

General				
Specification	Lowband		VHF	UHF
Model Numbers:	AAH45BEC AAH45CEC		AAH45KDC	AAH45RDC AAH45SDC
Frequency Range:	29.7 - 42.0 MHz 35.0- 50.0 MHz		136-174 MHz	403-470 MHz 450-512 MHz
Frequency Stability: (-30°C to +60°C, 25°C Ref.)	±10 PPM		±5 PPM @ 25 kHz ±2.5 PPM @ 12.5 kHz	
Channel Capacity:	16 Channels			
Channel Spacing:	20/25 kHz		12.5/20/25 kHz	
Power Supply:	7.5 volts rechargeable battery			
Dimensions: H x W x D With Impres NiMH Battery: With Impres NiMH FM Battery: With Impres LilonBattery:	5.40 in. x 2.26 in. x 1.60 in. (137mm x 57.5 mm x 40mm) 5.40 in. x 2.26 in. x 1.60 in. (137mm x 57.5 mm x 40mm) 5.40 in. x 2.26 in. x 1.60 in. (137mm x 57.5 mm x 40mm)			
Weight: With Impres NiMH Battery: With Impres NiMH FM Battery: With Impres Lilon Battery:	17.5 ounces (488 grams) 17.5 ounces (488 grams) 12.8 ounces (358 grams)			
Average Battery Life @ 5-5-90 Duty Cycle*: With Impres NiMH Battery: With Impres NiMH FM Battery: With Impres Lilon Battery:	Low Power 17 hours 16 hours 18 hours	High Power 11 hours 10 hours 11 hours	Low Power 17 hours 16 hours 18 hours	High Power 13 hours 13 hours 14 hours
Sealing:	Passes rain testing per IP54 and MIL-STD 810E			
Shock:	Meets MIL-STD-810-C,D & E and TIA/EIA 603			
Vibration:	Meets MIL-STD-810-C,D & E and TIA/EIA 603			
Dust:	Meets MIL-STD-810-C,D & E and IP54			
Humidity:	Meets MIL-STD-810-C,D & E and TIA/EIA 603			

* 5% receive, 5% transmit, 90% standby

Transmitter			
Specification	Lowband	VHF	UHF
Power Output NiMH @ 7.5V:	1-6 W	1-5 W	1-4 W
Spurs/Harmonics:	-36 dBm < 1GHz -30 dBm > 1 GHz		
Audio Response: (from 6 dB/oct. Pre-Emphasis, 300 to 3000Hz)	+1 to -3 dB		
Audio Distortion: @ 1000 Hz, 60% Rated Max. Dev.	3% Typical		
Modulation Limiting:	±5.0 kHz @ 20 kHz	±2.5 kHz @ 12.5 kHz ±4.0 kHz @ 20 kHz ±5.0 kHz @ 25 kHz	
Conducted/Radiated Emissions:	66 dBw		
FM Hum and Noise:	-40 dB		

Receiver			
Specification	Lowband	VHF	UHF
Sensitivity (12 dB SINAD) EIA:	0.30 μ V Typical	0.35 μ V Typical	
Sensitivity (20 dB SINAD) ETS:	0.5 μ V Typical		
Intermodulation per EIA:	-65 dB		
Adjacent Channel Selectivity ETS:	60 dB @ 12.5 kHz 70 dB @ 25 kHz		
Spurious Rejection:	70 dB		
Rated Audio:	0.5 W		
Audio Distortion @ Rated Audio:	3% Typical		
Hum and Noise (with LLE enabled):	-45 dB @ 20/ 25 kHz	-45 dB @ 12.5 kHz/-50 dB @ 25 kHz	
Audio Response (0.3 - 3 kHz):	+1 to -3 dB		
Conducted Spurious Emission per FCC Part 15:	-57 dBm <1 Ghz -47 dBm >1 Ghz		

Specifications subject to change without notice. All electrical specifications and methods refer to EIA/TIA 603 standards. Professional Series radios meet or exceed requirements of MIL STD 810 C, D, E.

Notes

Glossary

Term	Definition
ALC	Automatic Level Control: a circuit in the transmit RF path that controls RF power amplifier output, provides leveling over frequency and voltage, and protects against high VSWR (Voltage Standing Wave Ratio).
ASF IC	Audio Signaling Filter Integrated Circuit with voice compander.
CD	Compact Disk.
CMP	Compression.
CPS	Customer Programming Software.
CSQ	Carrier Squelch.
DTMF	Dual-Tone Multifrequency.
DPL	Digital Private-Line.
EEPROM	Electrically Erasable/Programmable Read-Only Memory: used by the radio to store its personality.
Firmware	Software, or a software/hardware combination of computer programs and data, with a fixed logic configuration stored in a read-only memory. Information cannot be altered or reprogrammed.
FGU	Frequency Generation Unit.
GaAs	Gallium Arsenide: a type of crystalline material used in some semiconductors.
ISW	Inbound Signalling Word: data transmitted on the control channel from a subscriber unit to the central control unit.
LCD	Liquid Crystal Display: a module used to display the radio's current operating channel or system and scan status.
LDMOS	Lateral Diffusion MOS.
LH DATA	Longhorn Data: a bidirectional 0-5V, RS-232 line that uses the microcontroller's integrated RS-232 asynchronous serial communications interface (SCI) peripheral.
LLE	Low Level Expander: slight amount of volume expansion; used to improve the signal to noise ratio.
LSH	Low-Speed Handshake: 150 baud digital data sent to the radio during trunked operation while receiving audio.
LTR	Trunked signaling protocol using low speed data. Registered trademark of E.F. Johnson Company.
MDC	Motorola Digital Communication.

MRTI	Motorola Radio-Telephone Interconnect: a system that provides a repeater connection to the Public Switched Telephone Network (PSTN). The MRTI allows the radio to access the telephone network when the proper access code is received.
MSK	Minimum-Shift Keying.
OMPAC	Over-Molded Pad-Array Carrier: a Motorola custom package, distinguished by the presence of solder balls on the bottom pads.
OSW	Outbound Signalling Word: data transmitted on the control channel from the central controller to the subscriber unit.
PassPort™	Enhanced trunking protocol developed by Trident Micro Systems that links wide area dispatch networking.
PC Board	Printed Circuit Board.
PL	Private-Line® tone squelch: a continuous sub-audible tone that is transmitted along with the carrier.
PLL	Phase-Locked Loop: a circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.
PPM	Parts Per Million.
PTT	Push-To-Talk: the switch located on the left side of the radio which, when pressed, causes the radio to transmit.
RAM	Random Access Memory: the radio's RAM is loaded with a copy of the EEPROM data.
Registers	Short-term data-storage circuits within the microcontroller.
Repeater	Remote transmit/receive facility that retransmits received signals to improve communications coverage.
RESET	Reset line: an input to the microcontroller that restarts execution.
RF PA	Radio Frequency Power Amplifier.
RIB	Radio Interface Box.
ROM	Read Only Memory.
RSSI	Received Signal-Strength Indicator: a dc voltage proportional to the received RF signal strength.
RPT/TA	Repeater/Talk-Around.
Softpot	Software Potentiometer: a computer-adjustable electronic attenuator.
Software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
SPI (clock and data lines)	Serial Peripheral Interface: how the microcontroller communicates to modules and ICs through the CLOCK and DATA lines.
Squelch	Muting of audio circuits when received signal levels fall below a pre-determined value.

Standby Mode	An operating mode whereby the radio is muted but still continues to receive data.
System Central Controller	Main control unit of the trunked dispatch system; handles ISW and OSW messages to and from subscriber units (see ISW and OSW).
System Select	The act of selecting the desired operating system with the system-select switch (also, the name given to this switch).
TOT	Time-Out Timer: a timer that limits the length of a transmission.
TPL	Tone Private-line.
μC	Microcontroller.
UHF	Ultra High Frequency.
μP	Microprocessor.
VCO	Voltage-Controlled Oscillator: an oscillator whereby the frequency of oscillation can be varied by changing a control voltage.
VCOBIC	Voltage-Controlled Oscillator Buffer Integrated Circuit.
VHF	Very High Frequency.
VSWR	Voltage Standing Wave Ratio.

Notes



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