MOTOTRBO™ PORTABLE
PROFESSIONAL DIGITAL TWO-WAY RADIO

MOTOTRBO™ PORTABLE XPR 3300 Series Basic Service Manual

DECEMBER 2017

68009513001-BA

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Foreword

This manual includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures.

This level of service goes down to the board replacement level and is typical of some local service centers, Motorola Solutions authorized dealers, self-maintained customers, and distributors.

CAUTION: These servicing instructions are for the use of qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Product Safety and RF Exposure Compliance

CAUTION: Before using this product, read the Product Safety and RF Exposure booklet enclosed with your radio which contains important operating instructions for safe usage and RF energy awareness and control for Compliance with applicable Standards and Regulations.

For a list of Motorola Solutions-approved antennas, batteries, and other accessories, visit the following web site:http://www.motorolasolutions.com

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Document History

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

Edition	Description	Date
68009513001-A	Initial Release	May 2012
68009513001-BA	Added battery information for PMNN4543_ and PMNN4544_ to General Specifications, Additional Parts List and Accessories sections.	December 2017

Notations Used in This Manual

Throughout the text in this publication, you will notice the use of warning, caution, and notice notations. These notations are used to emphasize that safety hazards exist, and due care must be taken and observed.

WARNING: WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or injury.

CAUTION: CAUTION indicates a potentially hazardous situation which, if not avoided, might result in equipment damage.

NOTICE: NOTICE indicates an operational procedure, practice, or condition that is essential to emphasize.

Battery and Charger Warranty

Workmanship Warranty

The workmanship warranty guarantees against defects in workmanship under normal use and service.

All MOTOTRBO Batteries	Two Years
IMPRES Chargers (Single-Unit and Multi-Unit, Non-Display)	Two Years
IMPRES Chargers (Multi-Unit with Display)	One Year
Core Chargers (Single-Unit and Multi-Unit, Non-Display)	Two Years

Capacity Warranty

The capacity warranty guarantees 80% of the rated capacity for the warranty duration.

Nickel Metal-Hydride (NiMH) or Lithium-Ion (Li-Ion) Batteries	12 Months
IMPRES Batteries, when used exclusively with IMPRES Chargers	18 Months

Chapter 1

Introduction

1.1 Radio Description

The DGP series portable radios are available in the following frequency ranges and power levels.

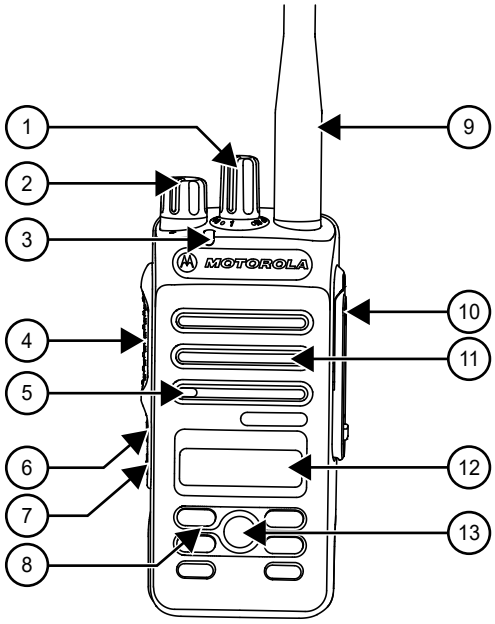
Table 1: Radio Frequency Ranges and Power Levels

VHF	136–174 MHz	1 Watt or 5 Watt
UHF	403–512 MHz	1 Watt or 4 Watt

These digital radios are among the most sophisticated two-way radios available. They have a robust design for radio users who need high performance, quality, and reliability in their daily communications. This architecture provides the capability of supporting a multitude of legacy and advanced features resulting in a more cost-effective two-way radio communications solution.

1.1.1 Limited Keypad Model

Figure 1: Limited Keypad Model



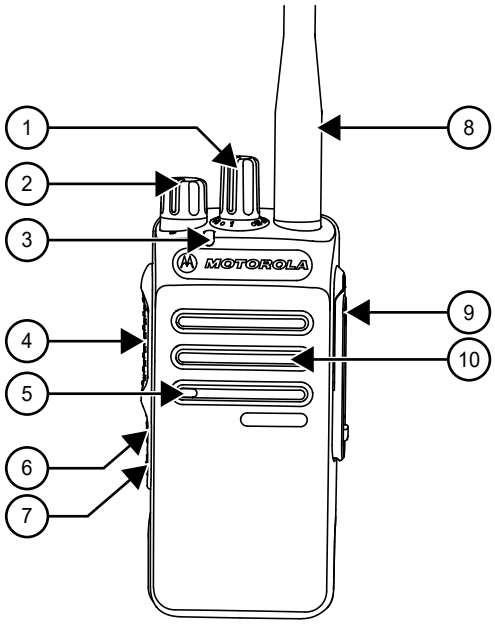
Label	Description
1	Channel Selector Knob
2	On/Off Volume Control Knob
3	LED Indicator
4	PTT Button

Label	Description
5	Microphone
6	Side Button 1
7	Side Button 2
8	Limited Keypad
9	Antenna
10	Universal Connector
11	Speaker
12	Display
13	OK Button

- ON/OFF/VOLUME KNOB – Rotate clockwise until click is heard to turn on radio; rotate counter-clockwise until click is heard to turn off radio. Rotate clockwise to increase volume level; rotate counter-clockwise to decrease volume level.
- LED INDICATORS – Red, green and amber light-emitting diodes indicate operating status.
- LCD (Liquid Crystal Display) – 65 x132 full dot matrix grayscale display provides visual information about many radio features..
- MENU NAVIGATION KEYS – Five keys to provide menu navigation and selection interface.
- FRONT BUTTONS and SIDE BUTTONS – These four buttons are field programmable using the CPS.
- CHANNEL SELECTOR KNOB – Rotate clockwise to increment and counter clockwise to decrement the channel.
- PUSH-TO-TALK (PTT) – Press to execute voice operations (e.g. Group call and Private Call).
- ANTENNA – Provides the needed RF amplification when transmitting or receiving.
- MICROPHONE – Allows the voice to be sent when PTT or voice operations are activated.
- UNIVERSAL CONNECTOR FOR ACCESSORIES – Interface point for all accessories to be used with the radio. It has eight points to which specific accessories will connect and be activated.
- SPEAKER – Outputs all tones and audio that are generated by the radio (e.g. features like keypad tones and voice audio).

1.1.2
Non-Keypad Model

Figure 2: Non Display Model



Label	Description
1	Channel Selector Knob
2	On/Off Volume Control Knob
3	LED Indicator
4	PTT Button
5	Microphone
6	Side Button 1
7	Side Button 2
8	Antenna
9	Universal Connector
10	Speaker

- ON/OFF/VOLUME KNOB – Rotate clockwise until click is heard to turn on radio; rotate counterclockwise until click is heard to turn off radio. Rotate clockwise to increase volume level; rotate counterclockwise to decrease volume level.
- LED INDICATORS – Red, green and orange light-emitting diodes indicate operating status.
- SIDE BUTTONS – These 2 buttons are field programmable using the CPS.
- CHANNEL SELECTOR KNOB – Rotate clockwise to increment and counter clockwise to decrement the channel.
- PUSH-TO-TALK (PTT) – Press to execute voice operations (e.g. Group call and Private Call).
- ANTENNA – Provides the needed RF amplification when transmitting or receiving.
- MICROPHONE – Allows the voice to be sent when PTT or voice operations are activated.

- UNIVERSAL CONNECTOR FOR ACCESSORIES – Interface point for all accessories to be used with the radio. It has eight points to which specific accessories will connect to and be activated.
- SPEAKER – Outputs all tones and audio that are generated by the radio (e.g. features like keypad tones and voice audio)

1.2

Table 2: Portable Radio Model Numbering Scheme

Position	1	2	3	4	5	6	7	8	9	10	11	12	13
Typical Model Number	AA	H	0	2	J	D	C	9	J	A	2	A	N

Table 3: Sales Models – Description of Symbols

Position	Description	Value
1	Region	AA = North America AZ = Asia/Australia LA = Latin America MD = Europe/Middle East/Africa
2	Type of Unit	H = Portable
3	Model Series	02 = XPR 3000 Model Series
4		
5	Band	J = 136–174 MHz R = 403–527 MHz
6	Power Level	C = 1.0, 2.0, 2.5, or 3.5 W D = 4.0–5.0 W
7	Physical Packages	C = Plain Model H = Monochrome Display Limited Keypad N = Color Display Full Keypad T = No Display - Limited Tier
8	Channel Information	8 = Variable/Programmable Channel Spacing with unique number of channels 9 = Variable/Programmable Channel Spacing
9	Primary Operation	J = Basic (No GPS, no Bluetooth, no embedded GOB) K = GPS and Bluetooth L = GPS Only M = Bluetooth Only N = Bluetooth with embedded GOB
10	Primary System Type	A = Conventional B = Trunking

Position	Description	Value
		C = Analog Only
11	Feature Level	1 = Standard with FM 2 = Non-FM 3 = CSA IECEx ATEX 4 = CQST
12	Version Letter	N/A
13	Unique Variation	N = Standard Package

1.3
Model Charts

NOTICE:
"X" = Part is compatible with checked model.

"_" = The latest version kit. When ordering a kit, refer to your specific kit for the suffix number.

1.3.1
VHF Model Chart

Table 4: XPR 3000, Series, VHF, 136–174 MHz

Model/Item			Description
AAH02JDH9JA2AN			**XPR 3500 136–174 MHz, 5W, MOTOTRBO Limited Keypad Portable**
	AAH02JDC9JA2AN		**XPR 3300 136–174 MHz, 5W, MOTOTRBO Non Keypad Portable**
X		PMLD4517_	Back Cover Kit, MOTOTRBO Limited Keypad Portable
	X	PMLD4519_	Back Cover Kit, MOTOTRBO Non Keypad Portable
X		PMLN5810_	Front Cover Kit Limited Keypad
	X	PMLN5811_	Front Cover Kit Non Keypad
X	X	PMAD4117_	VHF Helical Antenna (136–155 MHz)
X	X	PMAD4116_	VHF HelicalAntenna (144–165 MHz)

Model/Item			Description
AAH02JDH9JA2AN			XPR 3500 136–174 MHz, 5W, MOTOTRBO Limited Keypad Portable
	AAH02JDC9JA2AN		XPR 3300 136–174 MHz, 5W, MOTOTRBO Non Keypad Portable
X	X	PMAD4118_	VHF Helical Antenna (152–174 MHz)
X	X	PMAD4119_	VHF Stubby Antenna (136–148 MHz)
X	X	PMAD4120_	VHF Stubby Antenna (146–160 MHz)

1.3.2

UHF Model Chart

Table 5: XPR 3000 Series, UHF, 403–512 MHz

Model/Item			Description
AAH02RDH9JA2AN			XPR 3500 403-512 4W Limited Keypad
	AAH02RDC9JA2AN		XPR 3300 403-512 4W Non Keypad
X		PMLE4777_	Back Cover Kit, MOTOTRBO Limited Keypad Portable
	X	PMLE4779_	Back Cover Kit, MOTOTRBO Non Keypad Portable
X		PMLN5810_	Front Cover Kit Limited Keypad
	X	PMLN5811_	Front Cover Kit Non Keypad
X	X	PMAE4069_	UHF Stubby Antenna 403–450 MHz
X	X	PMAE4070_	UHF Stubby Antenna 440–490 MHz
X	X	PMAE4071_	UHF Stubby Antenna 470–527 MHz
X	X	PMAE4079_	Slim UHF Whip Antena 403–527 MHz

1.4 Specifications

Table 6: General Specifications

Parameter	Limited Keypad	Non-Keypad
Channel Capacity	128	16
Frequency	VHF: 136–174 MHz UHF: 403–512 MHz	
Dimensions (H x W x T) with NiMH battery	122.0 x 56.0 x 39.4 mm	122.0 x 56.0 x 39.4 mm
Weight with Core Slim Li-Ion battery Weight with IMPRES Li-Ion battery Weight with Li-Ion IP57 battery	281 g 281 g 299 g	264 g 264 g 282 g
Power Supply	7.5 V nominal	
FCC Description	UHF: ABZ99FT4089 VHF: ABZ99FT3088	
IC Description	UHF: 109AB-99FT4089 VHF: 109AB-99FT3088	
Average battery life at 5/5/90 duty cycle with battery saver enabled in carrier squelch and transmitter in high power.		
IMPRES Li-Ion (1500 mAh)	Analog: 8 hr Digital: 10 hr	Analog: 8 hr Digital: 10 hr
Core Slim Li-Ion Ah Battery (1500 mAh)	Analog: 8 hr Digital: 11.5 hr	Analog: 8 hr Digital: 11.5 hr
IMPRES Li-Ion Non-FM (2150mAh)	Analog: 11.5 hr Digital: 16.5 hr	Analog: 11.5 hr Digital: 16.5 hr
Core Li-Ion IP68 Battery (2450 mAh)	Analog: 12 hr Digital: 17 hr	Analog: 12 hr Digital: 17 hr
IMPRES Li-Ion IP68 Battery (2450 mAh)	Analog: 12 hr Digital: 17 hr	Analog: 12 hr Digital: 17 hr

NOTICE: Weight can have 5% margin of error

Table 7: Receiver Specifications

Parameter	Limited Keypad	Non-Keypad
Frequency	VHF: 136–174 MHz UHF: 403–512 MHz	

Parameter	Limited Keypad	Non-Keypad
Channel Spacing	12.5 kHz/20 kHz/25 kHz [1]	
Frequency Stability (-30 °C to +60 °C)	±0.5 ppm	
Analog Sensitivity (12 dB SINAD)	0.3 µV	
Digital Sensitivity (5% BER)	0.25 µV (0.19 µV typical)	
Intermodulation (TIA603D)	70 dB	
Adjacent Channel Selectivity	TIA603A: 60 dB @ 12.5 kHz, 70 dB @ 20/25 kHz[1] TIA603D: 45 dB @ 12.5 kHz, 70 dB @ 20/25 kHz[1]	
Spurious Rejection (TIA603D)	70 dB	
Rated Audio	500 mW	
Audio Distortion @ Rated Audio	5%	
Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz[1]	
Audio Response	TIA603D	
Conducted Spurious Emission (TIA603D)	-57 dBm	

Table 8: Transmitter Specifications

Parameter	Limited Keypad	Non-Keypad
Frequency	VHF: 136–174 MHz UHF: 403–512 MHz	
Channel Spacing	12.5/20/25 kHz [1]	
Frequency Stability (-30 °C to +60 °C)	±0.5 ppm	
Power Output (Low Power)	1 W	
Power Output (High Power)	VHF: 5 W UHF1/UHF2: 4 W	
Modulation Limiting	±2.5 kHz @ 12.5 kHz ±5.0 kHz @ 25 kHz[1]	
FM Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz [1]	
Conducted/Radiated Emission	-36 dBm < 1 GHz -30 dBm > 1 GHz	
Adjacent Channel Power	60 dB @ 12.5 kHz	

[1] 25 kHz is NOT available in the USA. FCC narrowbanding rules do not allow operation of this model on 25 kHz configuration in Part 90 VHF/UHF frequencies.

Parameter	Limited Keypad	Non-Keypad
	70 dB @ 25 kHz [1]	
Audio Response	TIA603D	
Audio Distortion	3%	
FM Modulation	12.5 kHz: 11K0F3E 25 kHz: 16K0F3E	
4FSK Digital Modulation	12.5kHz Data: 7K60F1D and 7K60FXD 12.5kHz Voice: 7K60F1E and 7K60FXE	
Digital Vocoder Type	AMBE+2™	
Digital Protocol	ETSI-TS102361-1 ETSI-TS102361-2 ETSI-TS102361-3	

Conforms to:

- ETSI TS 102 361 (Parts 1, 2, and 3) - ETSI DMR Standard
- ETSI EN 300 086 - ETSI RF Specifications (Analog)
- ETSI EN 300 113 - ETSI RF Specifications (Digital)
- 1999/5/EC (R&TTE - Radio and Telecommunications Terminal Equipment)
- 2011/65/EU (RoHS 2 - Banned Substances)
- 2012/19/EU (WEEE - Waste Electrical and Electronic Equipment)
- 94/62/EC (Packaging and Packaging Waste)
- Radio meets applicable regulatory requirements.

VHF Self-Quieter Frequencies
139.2 ± 5kHz
143.695 ± 5kHz
144 ± 5kHz
148.8 ± 5kHz
151.74 ± 5kHz
152.305 ± 5kHz
153.6 ± 5kHz
158.4 ± 5kHz
163.2 ± 5kHz
168 ± 5kHz
172.8 ± 5kHz

UHF Self-Quieter Frequencies
403.2

UHF Self-Quieter Frequencies
412.8
422.4
432 ± 10 kHz
441.6
449.55 ± 5 kHz
451.2
460.8
470.4
480 ± 15 kHz
499.2
508.8

Table 9: Military Standards

Applicable MIL–STD	810C		810D		810E		810F		810G	
	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1,II/A1	501.3	I-A1, II/A1	501.4	I/Hot, II/Hot	501.5	I-A1, II
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I-C3, II/C1	502.4	I-C3, II/C1	502.5	I-C3, II
Temperature Shock	503.1	-	503.2	I/A1/C3	503.3	I/A1/C3	503.4	I	503.5	I-C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I-A1
Rain	506.1	I, II	506.2	I, II	506.3	I,II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	–	507.5	II
Salt fog	509.1	-	509.2	-	509.3	–	509.4	–	509.5	–

Applicable MIL–STD	810C		810D		810E		810F		810G	
	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures
Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	II/5
Shock	516.2	I, II	516.3	I, IV	516.4	I, IV	516.5	I, IV	516.6	I, IV,VI

Environmental Specifications	
Operating Temperature	-30 °C to +60 °C
Storage Temperature	-40 °C to +85 °C
Thermal Shock	Per MIL-STD
Humidity	Per MIL-STD
ESD	IEC 61000-4-2 Level 3
Water Intrusion	IEC 60529 -IP55
Packaging Test	MIL-STD 810D and E

NOTICE: Operating temperature specification with NiMH battery is -20 °C to +60 °C.

[2] *Operating temperature specification with LiIon battery is -10 °C to +60 °C.

Chapter 2

Test Equipment and Service Aids

This chapter provides lists of recommended test equipment and service aids, as well as information on field programming equipment that can be used in servicing and programming Motorola Solutions radios.

2.1 Recommended Test Equipment

The list of equipment contained in the following table includes most of the standard test equipment required.

Table 10: Test Equipments

Equipment	Characteristics	Example	Application
Service Monitor	Can be used as a substitute.	Aeroflex 3920 (www.aeroflex.com) or equivalent	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment.
Digital RMS Multimeter[3]	100 µV to 300 V 5 Hz to 1 MHz 10 MΩ Impedance	Fluke 179 (www.fluke.com) or equivalent	AC/DC voltage and current measurements. Audio voltage measurements.
RF Signal Generator[3]	100 MHz to 1 GHz -130 dBm to +10 dBm FM Modulation: 0 kHz to 10 kHz Audio Frequency: 100 Hz to 10 kHz	Agilent N5181A (www.agilent.com), Ramsey RSG1000B (www.ramseyelectronics.com), or equivalent	Receiver measurements
Oscilloscope[3]	2 Channel 50 MHz Bandwidth 5 mV/div to 20 V/div	Leader LS8050 (www.leaderusa.com), Tektronix TDS1001b (www.tektronix.com) or equivalent	Waveform measurements
Power Meter and Sensor[3]	5% Accuracy 100 MHz to 500 MHz 50 W	Bird 43 Thruline Watt Meter (www.bird-electronic.com) or equivalent	Transmitter power output measurements
RF Millivoltmeter	100 mV to 3 V RF 10 kHz to 1 GHz	Boonton 92EA (www.boonton.com) or equivalent	RF level measurements

[3] Can use Service Monitor as substitute.

Equipment	Characteristics	Example	Application
Power Supply	0 V to 32 V	B&K Precision 1790 (www.bkprecision.com) or equivalent	Voltage supply
	0 A to 20 A		

2.1.1

Service Aids

The following table lists the service aids recommended for working on the radio. While all of these items are available from Motorola Solutions, most are standard workshop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 11: Service Aids

Motorola Solutions Part No.	Description	Application
RLN4460_	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
RVN5115_	CPS on CD-ROM	Allows servicer to program radio parameters, tune and troubleshoot radios.
PMKN4115_	Portable Programming Cable	This cable connects the radio to a USB port for radio programming and data applications.
PMKN4117_	Portable Programming, Testing, and Alignment Cable	This cable connects the radio to a USB port for radio programming, testing, and alignment. **NOTICE:** **1** This cable does not support external PTT using Testbox. **2** This cable does not auto route to external Audio path once the cable is attached. **3** All test instructions will require through software tool (for example, CPS, Tuner, and more.)
PMNN4428_	7.5 V Universal Battery Eliminator	Connects to radio by using battery eliminator cable.
PMLN6154_	RF Adaptor	Adapts radio's antenna port to BC cabling of test equipment.
PMLN6201_	RF Adaptor Holder	Holds RF adaptor in place.
PMLN6422_	SMA RF Cable	RF cable with SMA and N-type connector.
1185937A01	Grease	Acts to lubricate parts.
TL000013A01	Chassis and Knob Opener	Separates the chassis from the front housing.

2.1.2
Programming, Testing, and Alignment Cable

Programming, Testing, and Alignment Cable and Side Connector are required in servicing and programming radios.

Figure 3: Programming, Testing, and Alignment Cable

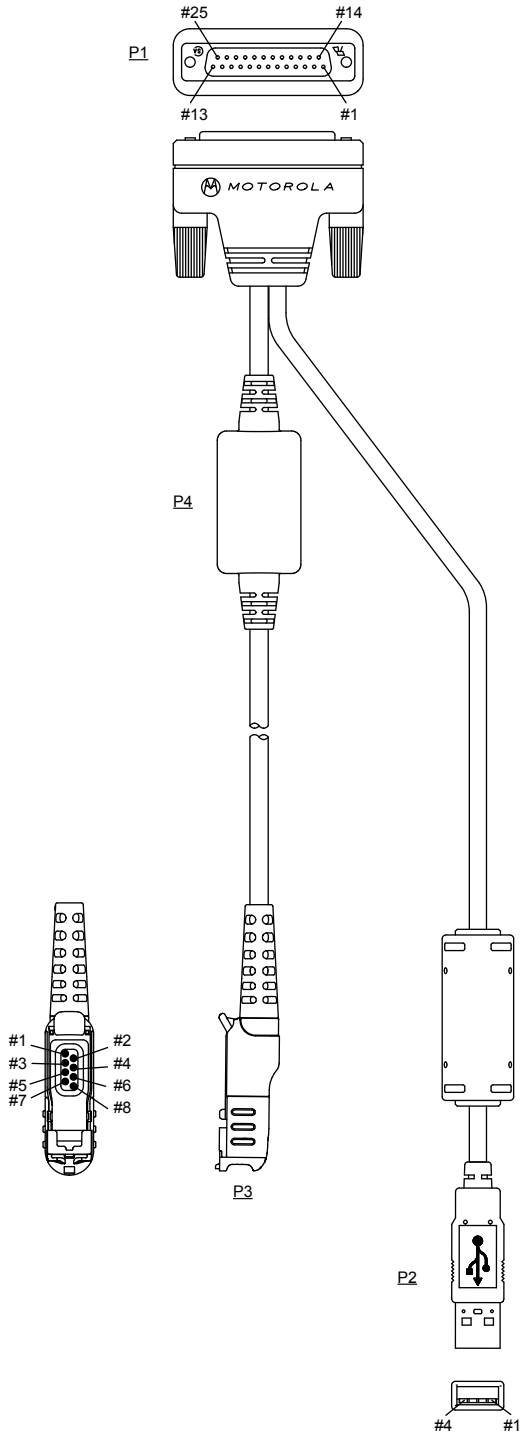
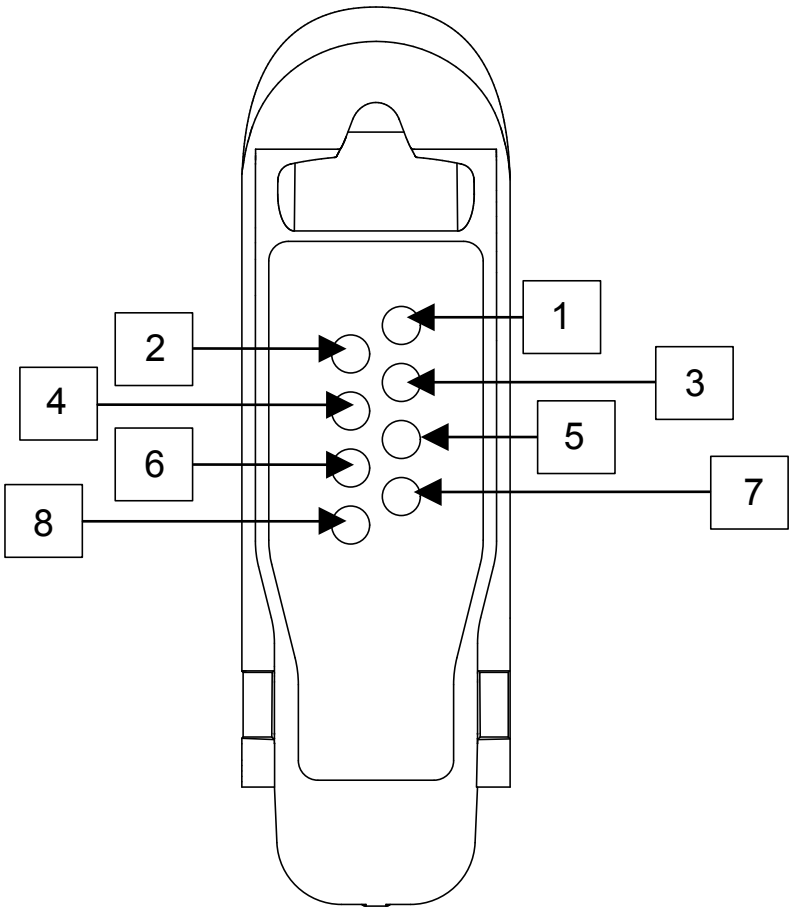


Table 12: Pin Configuration of Side Connector

CONNECTION			
P1	**P2**	**P3**	
Pin	**Pin**	**Pin**	**Function**
-	1	1	VCC (5 V)

CONNECTION			
P1	P2	P3	
Pin	Pin	Pin	Function
-	3	5	Data+
-	2	4	Data-
16	4	8	Ground
1 and 5	-	2	External Speaker+
2 and 7	-	3	External Speaker-
17	-	6	External Mic+
16	-	7	External Mic-

Figure 4: Pin Layout of Side Connector



Chapter 3

Transceiver Performance Testing

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 calibration schedule recommended by the manufacturer.

Although these radios function in digital and analog modes, all testing is done in analog mode.

3.1 Setup

Supply voltage is provided using a 7.5 VDC power supply. The equipment required for alignment procedures is connected as shown in the Radio Tuning Equipment Setup Diagram.

WARNING: Do NOT use any form of connector, for example wires, crocodile clips, and probes, to supply voltage to the radio, other than the Motorola Solutions approved battery eliminator.

Initial equipment control settings must be as indicated in the following table:

Table 13: Initial Equipment Control Settings

Service Monitor	Power Supply	Test Set
Monitor Mode: Power Monitor	Voltage: 7.5 Vdc	Speaker set: A
RF Attn: -70	DC on/standby: Standby	Speaker/load: Speaker
AM, CW, FM: FM	Volt Range: 10 V	PTT: OFF
Oscilloscope Source: Mod Oscilloscope Horizontal: 10 ms/Div Oscilloscope Vertical: 2.5 kHz/Div Oscilloscope Trigger: Auto Monitor Image: Hi Monitor Bandwidth: Narrow Monitor Squelch: Middle setting Monitor Vol: 1/4 setting	Current: 2.5 A	

3.2 Display Model Test Mode

3.2.1 Entering Display Radio Test Mode

Procedure:

1 Turn the radio on.

2 Within 10 seconds after Self-Test is complete, press **Side Button 2** five times in succession.

The radio beeps and shows a series of displays that gives information regarding various version numbers and subscriber-specific information. The displays are described in the following table.

Table 14: Front Panel Access Test Mode Displays

Name of Display	Description	Appears
Service Mode	The literal string indicates the radio has entered test mode.	Always
Host Version	The version of host firmware.	Always
DSP Version	The version of DSP firmware.	Always
Model Number	The radio model number as programmed in the codeplug.	Always
MSN	The radio serial number as programmed in the codeplug.	Always
FLASHCODE	The FLASH codes as programmed in the codeplug.	Always
RF Band	The radio band.	Always

NOTICE: The radio stops at each display for 2 seconds before moving to the next information display. If the information cannot fit into one line, the radio display scrolls automatically character by character after 1 second to view the whole information. If the **Left** button is pressed before the last information display, the radio suspends the information display until the user presses the **Right** button to resume the information display. The radio beeps for each button press. After the last display, `RF Test Mode` is displayed.

3.2.2
RF Test Mode

When the radio is operating in its normal environment, the radio microcontroller controls the RF channel selection, transmitter key-up, and receiver muting, according to the customer codeplug configuration.

However, when the unit is on the bench for testing, alignment, or repair, it must be removed from its normal environment with a special routine, called Test Mode or air test.

3.2.2.1
Testing RF Channel Selections

In RF Test Mode, the display upon the first line is `RF Test`, together with the power level icon at the right end of the first line. The display upon the second line is the test environment, the channel number, and channel spacing.

Prerequisites:

NOTICE: The default test environment is CSQ.

Procedure:

1 Each short press of **Side Button 2** changes the test environment (CSQ->TPL->DIG->USQ ->CSQ). The radio beeps once when radio toggles to CSQ, beeps twice for TPL, beeps three times for DIG, and beeps four times for USQ.

NOTICE: DIG is digital mode and other test environments are analog mode as described in Test Environments.

Table 15: Test Environments

No. of Beeps	Description	Function
1	Carrier Squelch (CSQ)	RX: if carrier detected TX: mic audio
2	Tone Private-Line (TPL)	RX: unsquelch if carrier and tone detected TX: mic audio + tone
3	Digital Mode (DIG)	RX: if carrier detected TX: mic audio
4	Unsquelch (USQ)	RX: constant unsquelch TX: mic audio

2 **NOTICE:** 25 kHz is not available in the USA. FCC narrowbanding rules do not allow operation of this model on 25 kHz configuration in Part 90 VHF/UHF frequencies.

Each short press of **Side Button 1** toggles the channel spacing between 25 kHz and 12.5 kHz. The radio beeps twice for 25 kHz and beeps three times for 12.5 kHz.

3 Turn **Channel Knob** to change the test channel from 1 to 14.

See Test Frequencies for test channel descriptions.

The radio beeps in each position.

Table 16: Test Frequencies

Channel Selector Switch Position	Test Channel	UHF	VHF
1 Low Power	TX#1 or #9	403.15	136.075
9 High Power	RX#1 or #9	403.15	136.075
2 Low Power	TX#2 or #10	423.25	142.575
10 High Power	RX#2 or #10	423.25	142.575
3 Low Power	TX#3 or #11	444.35	146.575
11 High Power	RX#3 or #11	444.35	146.575
4 Low Power	TX#4 or #12	465.45	155.575
12 High Power	RX#4 or #12	465.45	155.575
5 Low Power	TX#5 or #13	485.55	161.575
13 High Power	RX#5 or #13	485.55	161.575
6 Low Power	TX#6 or #14	506.65	167.575
14 High Power	RX#6 or #14	506.65	167.575
7 Low Power	TX#7 or #15	526.75	173.975

Channel Selector Switch Position	Test Channel	UHF	VHF
15 High Power	RX#7 or #15	526.75	173.975
8 Low Power	TX#8 or #16	527.00	174.000
16 High Power	RX#8 or #16	527.00	174.000

Table 17: Transmitter Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON Fourth channel test frequency [4] Monitor: Frequency error Input at RF In/Out	Test Mode, Test Channel 4 carrier squelch	PTT to continuously transmit.	Frequency error to be: ±604 Hz for UHF ±204 Hz for VHF
Power RF	As above	As above	As above	Low Power: 1.0–1.6 W (VHF/UHF) High Power: 4.0–4.8 W (UHF) 5.0–6.0 W (VHF)
Voice Modulation	Mode: PWR MON Fourth channel test frequency[4] atten to -70, input to RF In/Out Monitor: DVM: AC Volts Set 1 kHz Mod Out level for 0.025 Vrms at test set, 80 mVrms at AC/DC test set jack	As above	As above, meter selector to mic	Deviation: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp).
Internal Voice Modulation	Mode: PWR MON Fourth channel test frequency[4] 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: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp)
TPL Modulation	As above Fourth channel test frequency[4]	Test Mode, Test Channel	As above	Deviation: ≥500 Hz but ≤1000Hz (25 kHz Ch Sp).

[4] See Test Frequencies.

Test Name	Communications Analyzer	Radio	Test Set	Comments
	BW to narrow	4 TPL		

NOTICE: 25 kHz is not available in the USA. FCC narrowbanding rules do not allow operation of this model on 25 kHz configuration in Part 90 VHF/UHF frequencies.

Table 18: Receiver Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON Fourth channel test frequency[4] Monitor: Frequency error Input at RF In/Out	Test Mode, Test Channel 4 carrier squelch output at antenna.	PTT to continuously transmit.	Frequency error to be: ±604 Hz for UHF ±204 Hz for VHF
Rated Audio	Mode: GEN Output level: 1.0 mV RF Sixth channel test frequency[4] Mod: 1 kHz tone at 3 kHz deviation Monitor: DVM: AC Volts	Test Mode , Test Channel 6 carrier squelch	Meter selector to Audio PA	Set volume control to 2.83 Vrms
Distortion	As above, except distortion	As above	As above	Distortion <3.0%
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12 dB SINAD.	As above	Nil	RF input to be <0.35 µV
Noise Squelch Threshold (only radios with conventional system need to be tested.)	RF level set to 1 mV RF	As above	Meter selection to Audio PA, speaker/load to speaker	Set volume control to 2.83 Vrms
	As above, except change frequency to a conventional system. Raise RF level from zero until radio unsquelches.	Out of Test Mode; select a conventional system.	As above	Unsquelch to occur at <0.25 µV. Preferred SINAD = 9–10 dB

3.2.3
Display Test Mode

Procedure:

1 Press and hold **Side Button 1** to enter display test mode.

2 Upon any button or key press, the LCD displays the growing horizontal bars. Press any button until the LCD display turns black and change to vertical bars. Press any button until LCD display full screen black and change to icon display.

The LCD displays the following icons:

- RSSI (with full bar)
- Monitor
- Tone disabled
- Priority-two channel scan
- Unread message
- Emergency
- Talkaround
- Battery strength indicator (with full bar)

The LCD display become clear and consequently display the rest of the icons, high-power level icon (H), companding icon, option board icon, and secure operation icon upon any button/key press.

3.2.4
LED Test Mode

Procedure:

1 Press and hold **Side Button 1** after Display Test Mode.

The radio beeps once and displays `LED Test Mode`.

2 Press any button/key.

The red LED lights up and the radio displays `Red LED On`.

3 Press any button/key.

The red LED is turned off. The green LED lights up and the radio displays `Green LED On`.

4 Press any button/key.

The green LED is turned off. The radio lights up both LEDs up while displaying `Both LEDs On`. The orange LED lights up.

3.2.5
Backlight Test Mode

Procedure:

Press and hold **Side Button 1** after LED Test Mode.

The radio beeps once and displays `Backlight Test Mode`.

The radio turns on both LCD and keypad backlight together.

3.2.6
Speaker Tone Test Mode

Procedure:

Press and hold **Side Button 1** after Backlight Test Mode.

The radio beeps once and displays `Speaker Tone Test Mode`.

The radio generates a 1 kHz tone with the internal speaker.

3.2.7
Earpiece Tone Test Mode

Procedure:

1. Connect the external accessory to the radio.
2. Press and hold **Side Button 1** after Speaker Tone Test Mode.

   The radio beeps once and displays `Earpiece Tone Test Mode`.

The radio generates a 1 kHz tone from the earpiece.

3.2.8
Audio Loopback Earpiece Test Mode

Procedure:

Press and hold **Side Button 1** after the Audio Loopback Test Mode.

The radio beeps once and displays `Audio Loopback Earpiece Test Mode`.

The radio routes any audio on the external mic to the earpiece.

3.2.9
Battery Check Test Mode

Procedure:

Press and hold **Side Button 1** after Audio Loopback Earpiece Test Mode.

The radio beeps once.

The radio LED lights up as follows:

- Green LED for High Battery Level
- Orange LED for Mid Battery Level
- Blinking red LED for Low Battery Level

3.2.10
Button/Knob/PTT Test Mode

Any key press causes the test to advance from one step to the next.

Table 19: Button/Knob/PTT Checks

Action	Result
Press and hold **Side Button 1**.	The radio beeps once.
Rotate the **Volume Knob**.	The radio beeps at each position.
Rotate the **Channel Knob**.	The radio beeps at each position.
Press **Side Button 1**.	The radio beeps.
Release the button.	The radio beeps.
Press **Side Button 2**.	The radio beeps.
Release the button.	The radio beeps.
Press the **PTT** button.	The radio beeps.
Release the button.	The radio beeps.

3.3
Non-Display Model Test Mode

3.3.1
Entering Non-Display Radio Test Mode

Procedure:

1. Turn the radio on.
2. Within 10 seconds after Self-Test is complete, press **Side Button 2** five times in succession.

The radio beeps.

3.3.2
RF Test Mode

When the radio is operating in its normal environment, the microcontroller of the radio controls the RF channel selection, transmitter key-up, and receiver muting, according to the customer codeplug configuration.

When and where to use: However, when the unit is on the bench for testing, alignment, or repair, it must be removed from its normal environment via a special routine, called TEST MODE or “air test”.

Procedure:

1. Short press **Side Button 2** to change the test environment (CSQ->TPL->DIG->USQ ->CSQ).

   The radio beeps once when radio toggles to CSQ, beeps twice for TPL, beeps three times for DIG and beeps four times for USQ.

DIG is digital mode and other test environments are analog mode as described in Table 15: Test Environments on page 30.

2 Short press **Side Button 1** to toggle the channel spacing between 25 kHz, 12.5 kHz, and 20 kHz.

The radio beeps once when radio toggles to 20 kHz, beeps twice for 25 kHz and beeps three times for 12.5 kHz.

3 Turn the **Channel Knob** to change the test channel from 1 to 16.

The radio beeps in each position.
Refer to Table 16: Test Frequencies on page 30 for the test channel descriptions.

3.3.3
LED Test Mode

Procedure:

1 Press and hold **Side Button 1** after RF Test Mode.

The radio beeps once.

2 Press any button/key.

The red LED lights up.

3 Press any button/key.

The red LED turns off and the radio lights up the green LED.

4 Press any button/key.

The green LED turns off and the radio turns on both LEDs.

3.3.4
Speaker Tone Test Mode

Procedure:

Press and hold **Side Button 1** after LED Test Mode.

The radio beeps once.

The radio generates a 1 kHz tone with the internal speaker.

3.3.5
Earpiece Tone Test Mode

Procedure:

Press and hold **Side Button 1** after Speaker Tone Test Mode.

The radio beeps once.

The radio generates a 1 kHz tone with the earpiece.

3.3.6
Audio Loopback Earpiece Test Mode

Procedure:

Press and hold **Side Button 1** after Audio Loopback Test Mode.

The radio beeps once.

The radio routes any audio on the external mic to the earpiece.

3.3.7
Battery Check Test Mode

Procedure:

Press and hold **Side Button 1** after Audio Loopback Earpiece Test Mode.

The radio beeps once.

The radio LED lights up as follows:

- Green LED for High Battery Level
- Orange LED for Mid Battery Level
- Blinking red LED for Low Battery Level

3.3.8
Button/Knob/PTT Test Mode

Any key press causes the test to advance from one step to the next.

Table 20: Button/Knob/PTT Checks

Action	Result
Press and hold **Side Button 1**.	The radio beeps once.
Rotate the **Volume Knob**.	The radio beeps at each position.
Rotate the **Channel Knob**.	The radio beeps at each position.
Press **Side Button 1**.	The radio beeps.
Release the button.	The radio beeps.
Press **Side Button 2**.	The radio beeps.
Release the button.	The radio beeps.
Press the **PTT** button.	The radio beeps.
Release the button.	The radio beeps.

Chapter 4

Radio Programming and Tuning

This chapter provides an overview of the MOTOTRBO Customer Programming Software (CPS), Tuner, and AirTracer applications, which are all designed for use in a Windows 8/7/2000/XP/Vista environment.

NOTICE:
Refer to the appropriate program online help files for the programming procedures.

These programs are available in one kit as listed in the following table. An Installation Guide is also included with the kit.

Table 21: Software Installation Kits Radio Tuning Setup

Description	Part Number
MOTOTRBO CPS, Tuner, and AirTracer Applications CD	RVN5115_

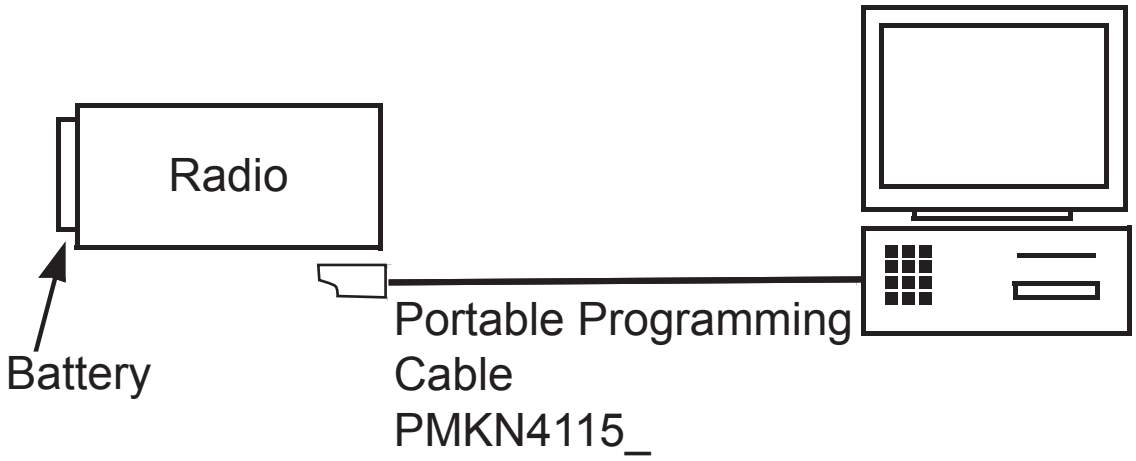
4.1 Customer Programming Software Setup

The CPS programming setup shown is used to program the radio.

CAUTION: Computer USB ports can be sensitive to Electrostatic Discharge. Do not touch exposed contacts on cable when connected to a computer.

NOTICE: Refer to appropriate program online help files for the programming procedures.

Figure 5: CPS Programming Setup



4.2 AirTracer Application Tool

The MOTOTRBO AirTracer application tool has the ability to capture over-the-air digital radio traffic and save the captured data into a file.

The AirTracer application tool can also retrieve and save internal error logs from MOTOTRBO radios. The saved files can be analyzed by trained Motorola Solutions personnel to suggest improvements in system configurations or to help isolate problems.

4.3 Radio Tuning Setup

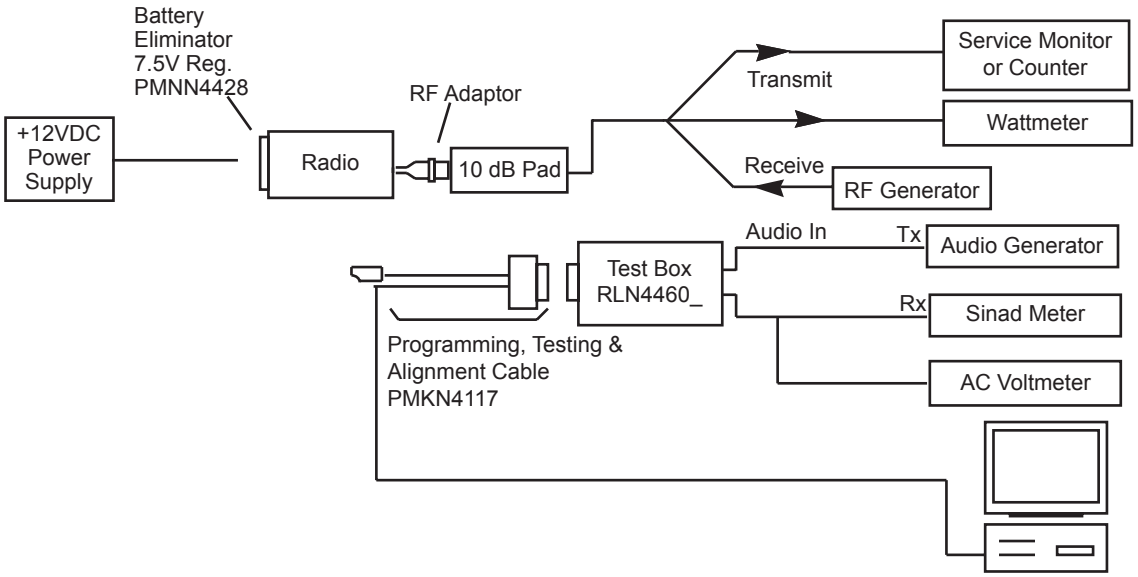
Retuning is not required if service kit has been replaced and factory tuned. However, check service kit for performance before use.

Before keying up the radio, set the Bias DAC for the appropriate final device bias current prior to keying up the radio. If the bias is not properly set, it may cause damage to the transmitter.

CAUTION: Only Motorola Solutions Service Centers or Authorized Motorola Solutions Service Dealers can perform this function.

A personal computer (PC) with Windows, Windows 2000/XP/Vista/Windows 7 and a tuner program are required to tune the radio. See Figure 6: Radio Tuning Equipment Setup on page 39 to perform tuning procedures.

Figure 6: Radio Tuning Equipment Setup



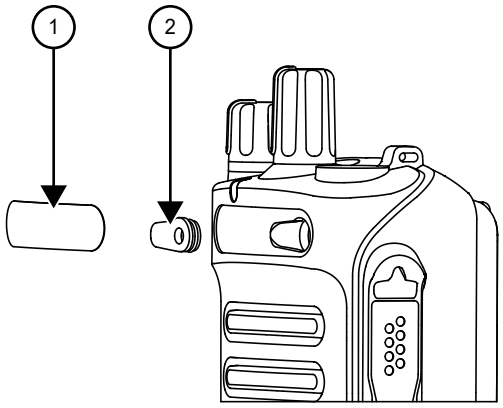
NOTICE: Refer to appropriate program online help files for the programming procedures.

4.3.1 RF Adapter Assembly

Procedure:

1 Use tweezers to lift up one end of the RF plug and pull it out.

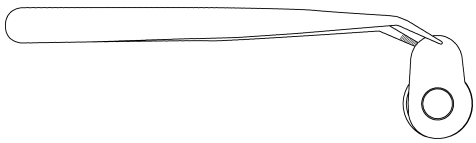
Figure 7: RF Plug disassembly



Label	Description
1	Nameplate
2	RF Plug

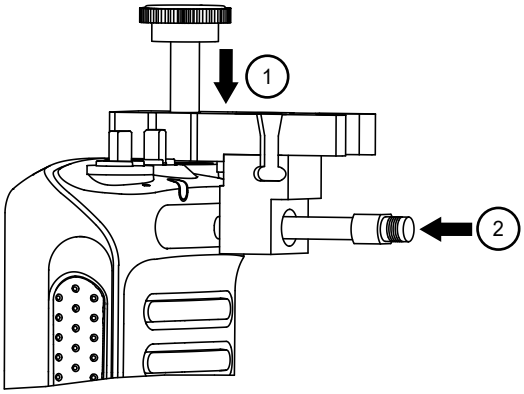
2 Use a tweezer to remove the RF plug by lifting the tab of the RF plug

Figure 8: RF Plug Tab



3 Insert the RF Adaptor into the front housing and screw in the RF adaptor to the front housing.

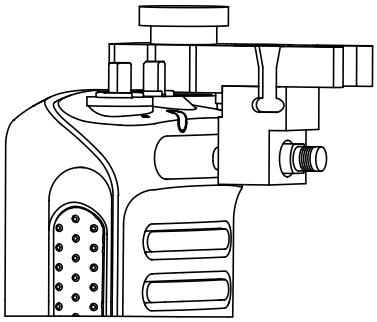
Figure 9: RF Adaptor insertion



4 Insert the RF connector.

CAUTION: Do not attach the RF Connector into the RF Adapter Holder before inserting the RF Adapter Holder into the housing.

Figure 10: RF Connector



Chapter 5

Disassembly/Reassembly Procedures

This chapter provides details about the following:

- Preventive maintenance (inspection and cleaning).
- Safe handling of CMOS and LDMOS devices.
- Repair procedures and techniques.
- Disassembly and reassembly of the radio.

5.1 Preventive Maintenance

Periodic visual inspection and cleaning are recommended.

Inspection

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

Cleaning Procedures

The following procedures describe the recommended cleaning agents and the methods to clean the external and internal surfaces of your 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.

CAUTION: Use all chemicals as prescribed by the manufacturer. Follow all safety precautions as defined on the label or material safety data sheet.

The effects of certain chemicals and their vapors can have harmful results on certain plastics. Avoid using aerosol sprays, tuner cleaners, and other chemicals.

NOTICE:
Only clean internal surfaces when your radio is disassembled for service or repair.

Cleaning External Plastic Surfaces

IMPORTANT: The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dish-washing detergent in water.

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

Cleaning Internal Circuit Boards and Components

IMPORTANT:
The only factory recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (100% by volume).

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

Apply Isopropyl alcohol (100%) 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 your 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 it can cause the liquid to collect in unwanted places. After completing of the cleaning process, use a soft, absorbent, lint-less cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

5.2 Safe Handling of CMOS and LDMOS Devices

Complementary Metal Oxide Semiconductor (CMOS) and Laterally Diffused Metal Oxide Semiconductor (LDMOS) 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/LDMOS circuits and are especially important in low humidity conditions. Do not attempt to disassemble your radio without referring to the following caution statement.

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

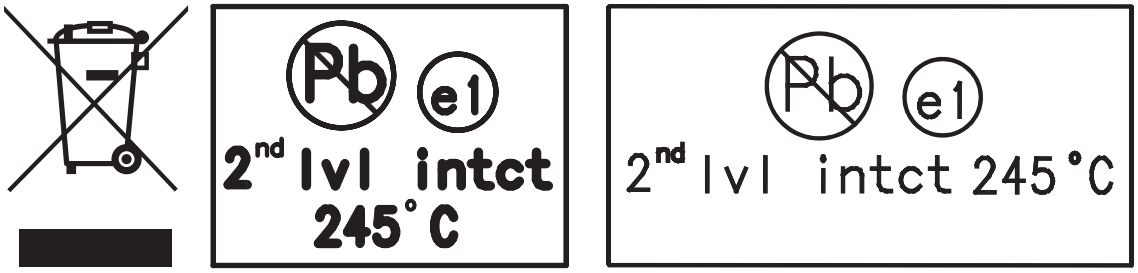
- Store and transport all CMOS/LDMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS/LDMOS devices into conventional plastic "snow" trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service bench to protect the CMOS/LDMOS device. It is recommended that you use a wrist strap, two ground cords, a table mat, a floor mat, electrostatic discharge (ESD) shoes, and an ESD chair.
- 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 Solutions part number 4280385A59.
- Do not wear nylon clothing while handling CMOS/LDMOS devices.
- Do not insert or remove CMOS/LDMOS devices with power applied. Check all power supplies used for testing CMOS/LDMOS devices to be certain that there are no voltage transients present.
- When straightening CMOS/LDMOS pins, provide ground straps for the apparatus used.
- When soldering, use a grounded soldering iron.
- Handle CMOS/LDMOS devices by the package and not by the leads. Before 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.

5.3

General Repair Procedures and Techniques

Environmentally Preferred Products (EPP) were developed and assembled using environmentally preferred components and solder assembly techniques to comply with the European Union's Restriction of Hazardous Substances (ROHS 2) Directive 2011/65/EU and Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU. To maintain product compliance and reliability, use only the Motorola Solutions specified parts in this manual.

For the identification of lead (Pb) free assemblies, all EPP products carry the EPP Marking, shown in the following examples, on the Printed Circuit Board (PCB). This marking provides information to those performing assembly, servicing, and recycling operation on this product, adhering to the JEDEC Standard No. 97. The EPP Marking takes the form of a label or marking on the PCB.



Any rework or repair on Environmentally Preferred Products must be done using the appropriate lead-free solder wire and lead-free solder paste as stated in the following tables:

Table 22: Lead Free Solder Wire Part Number List

Motorola Solutions Part Number	Alloy	Flux Type	Flux Content by Weight	Melting Point	Supplier Part number	Diameter	Weight
1088929Y01	95.5Sn/3.8Ag/0.7Cu	RMA Version	2.7–3.2%	217 °C	52171	0.015 in.	1 lb spool

Table 23: Lead Free Solder Paste Part Number List

Motorola Solutions Part Number	Manufacturer Part Number	Viscosity	Type	Composition and Percent Metal	Liquid Temperature
1085674C03	NC-SMQ230	900–1000KCPs Brookfield (5 rpm)	Type 3 (-325/+500)	(95.5%Sn-3.8%Ag-0.7%Cu) 89.3%	217 °C

Parts Replacement and Substitution

When damaged parts are replaced, identical parts must be used. If the identical replacement part is not locally available, check the parts list for the proper Motorola Solutions part number and order the part.

Rigid Circuit Boards

This family of radios use bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The plated-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 a connector:

- 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.

For soldering components with Hot-Air or infra red solder systems, check the user guide of your solder system to get information on solder temperature and time for the different housings of the integrated circuits and other components.

5.4 Disassembling and Reassembling the Radio

When disassembling and reassembling the radio, it is important to pay particular attention to the snaps and tabs, and how parts align with each other.

CAUTION: To assure the safety and regulatory compliance of your radio, repair your radio only at Motorola Solutions service facilities. Please contact your local dealer or Point of Sale for further instructions.

The following tools are required for disassembling the radio:

- TORX™ T screwdriver
- Chassis and Knob Opener (TL000013A01)

The following tools are required for reassembling the radio:

- Grease (1185937A01)
- TORX T screwdriver
- Vacuum Pump Kit (NLN9839) - Radio Immersibility Test
- Pressure Pump Kit (NTN4265) - Radio Immersibility Test
- Connector Fitting (5871134M01) - Radio Immersibility Test
- Fitting Seal (3271133M01) - Radio Immersibility Test
- Seal Port (3286058L01)
- Ventilation Label (LB000256A01)

NOTICE: If a unit requires further testing or service than is customarily performed at the basic level, send radio to Motorola Solutions Service Center.

5.5 Torque Chart

Torque Chart lists the various screws by part number and description, followed by the torque values in different units of measure.

NOTICE: Torque all screws to the recommended value when assembling the radio.

Table 24: Torque Specifications for Screws

Part Number	Description	Driver/ Socket	Torque	
			lbs-in	N-m
03012034001	Screw, Main Board (new chassis)	T6 Torx T6 Torx	3.1 to 3.5 2.0	3.1 to 3.5 0.22

Part Number	Description	Driver/ Socket	Torque	
			lbs-in	N-m
	Screw, Main Board (rework)			
0316281H01	Screw, Housing-Chassis	T6 Torx	2.1 to 2.3	0.24 to 0.26
0385273D06	Screw, Retainer	T6 Torx	1.5 to 1.7	0.17 to 0.19

5.6
Detailed Radio Disassembly

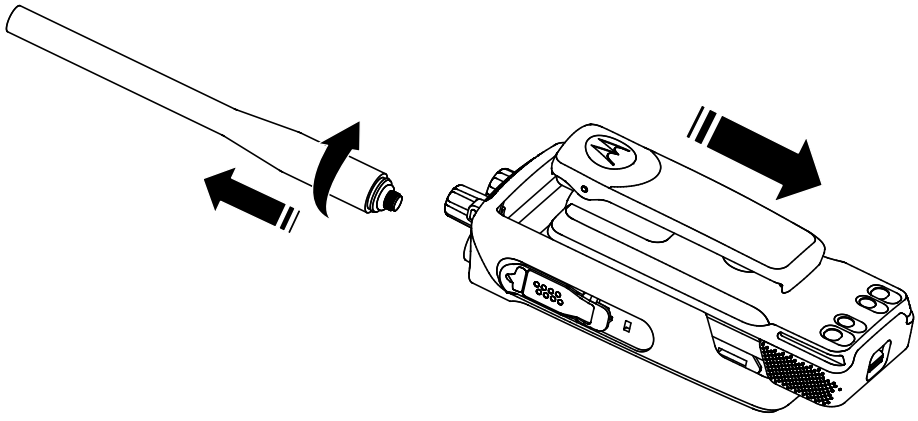
The following content describes the detailed disassembly procedure of your radio.

5.6.1
Front Cover from Chassis Disassembly

Procedure:

1. Turn off the radio.
2. Remove the battery:
   a. Release the battery latch by moving it into the unlock position.
   b. With the latch released, slide the battery downwards.
   c. Remove the battery from the radio.
3. Remove the antenna by turning it counterclockwise.

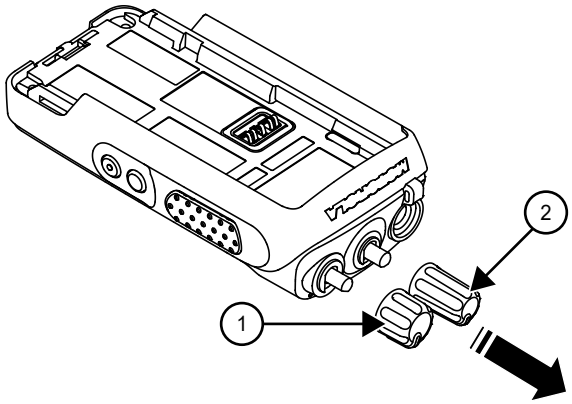
Figure 11: Antenna and Battery removal.



4. Remove the volume and channel selector knobs off from their shafts using the knob removal tool.

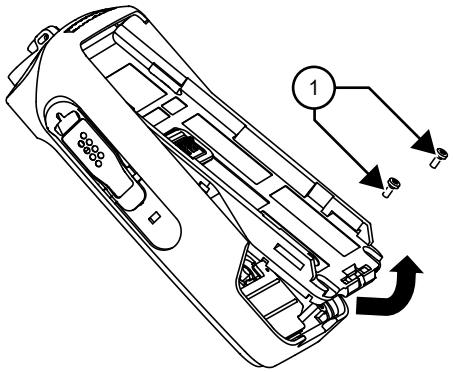
NOTICE: Both knobs slide on and off. However, they are supposed to fit very tightly on their shafts.

Figure 12: Channel Selector and Volume Knob removal.



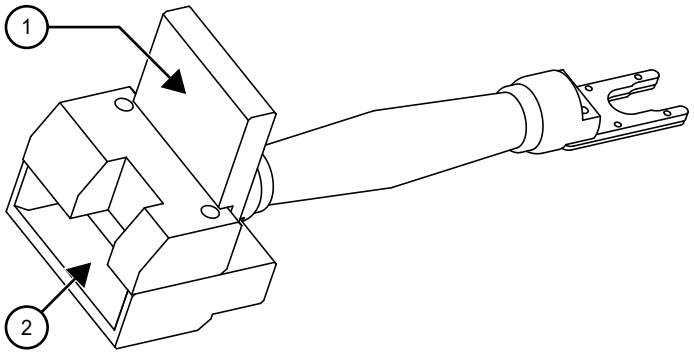
Label	Description
1	Volume Knob
2	Channel Knob

Figure 13: Chassis Screw removal

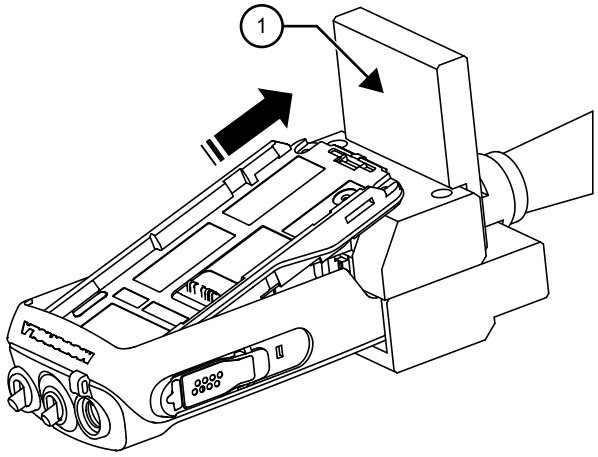


Label	Description
1	Chassis Screws

Figure 14: Chassis removal



Label	Description
1	Stopper Wall
2	Chassis Opener Opening



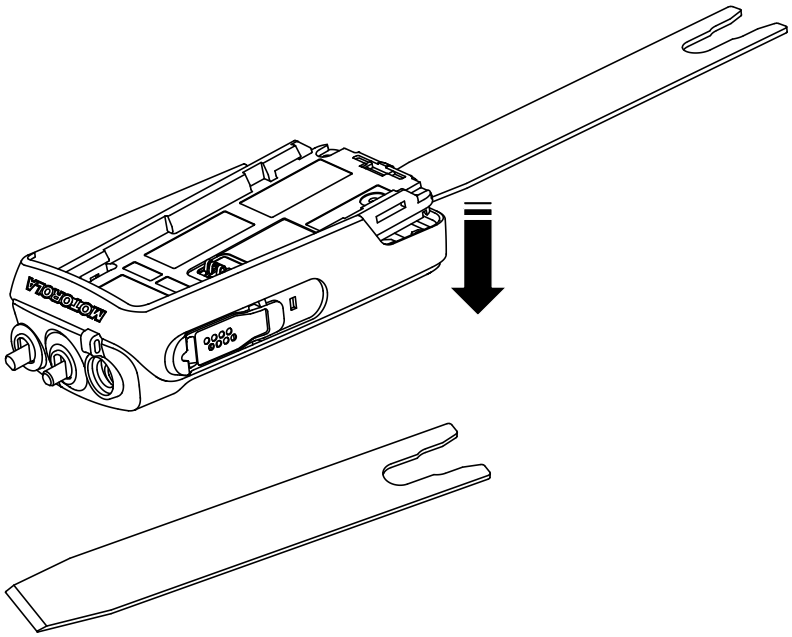
Label	Description
1	Stopper Wall

5 Unscrew the screw using TORX T6 screwdriver as shown in Figure 13: Chassis Screw removal on page 47.

6 Lift the chassis up slightly.

7 Insert housing into the chassis opener opening

Figure 15: Alternative Chassis removal



This will lift the chassis to its maximum height.

8 Slide out the chassis slowly until the stopper wall.

9 Remove the chassis opener.

CAUTION: Do not force the chassis out if it gets stuck by pulling it. This will cause damage to the front kit.
Do not pull out the chassis forcefully as this will cause damage to the flex connector.

10 Slide out the chassis slowly from the housing as in Figure 14: Chassis removal on page 47.

11 Separate the chassis from internal electronics front cover assembly as follows:

a Unscrew the screw using TORX T6 screwdriver as shown in Figure 13: Chassis Screw removal on page 47.

b Lift the chassis up slightly.

c Insert housing into the chassis opener opening.

d Lift the chassis to its maximum height. Slide out the chassis slowly until the stopper wall.

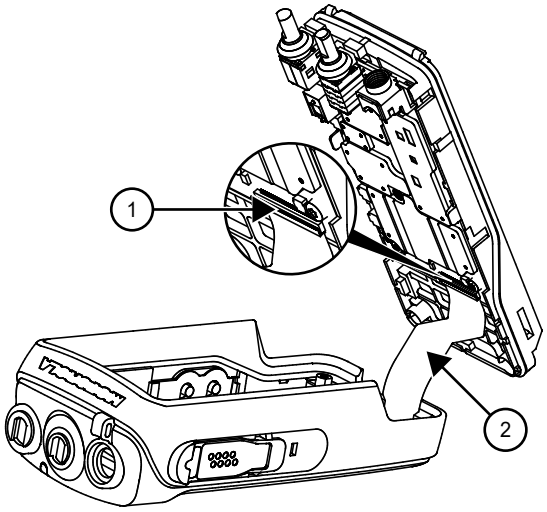
e Remove the chassis opener.

WARNING: Do not force the chassis out if it gets stuck by pulling it. This will cause damage to the front kit.
Do not pull out the chassis forcefully as this will cause damage to the flex connector.

f Slide out the chassis slowly from the housing

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

Figure 16: Disconnecting the board to board connector



Label	Description
1	Flex Connector
2	Flex

13 Peel out the poron pad carefully.

14 Lift the connector latch of the main board to release the flex.

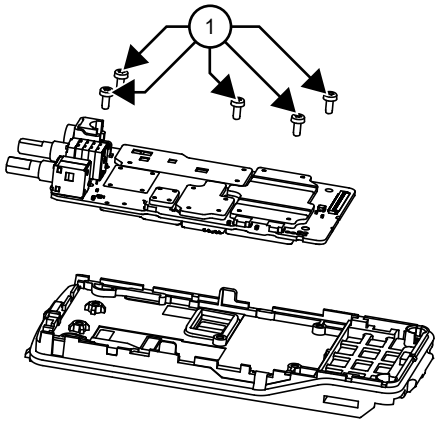
5.6.2
Chassis Disassembly

Use a TORX screwdriver with a T6 head to remove the five screws holding the main board to the chassis.

Procedure:

1 Lift the main board from the chassis.

Figure 17: Chassis disassembly

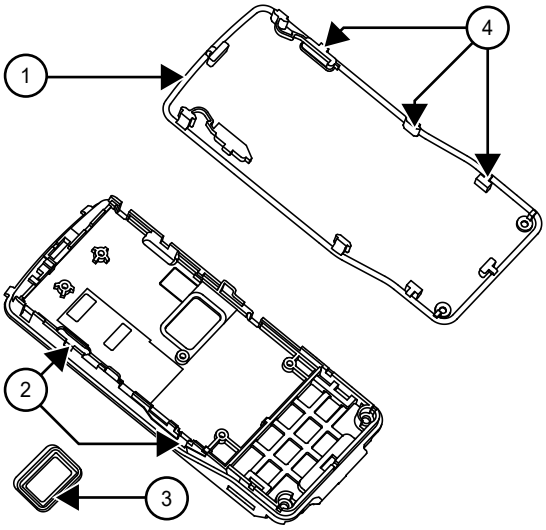


Label	Description
1	Mainboard Screws

2 Release all the tabs from the catches.

3 Remove the O-ring and battery contact seal.

Figure 18: O-ring removal



Label	Description
1	O-ring
2	Catch

Label	Description
3	Battery Contact Seal
4	Tab

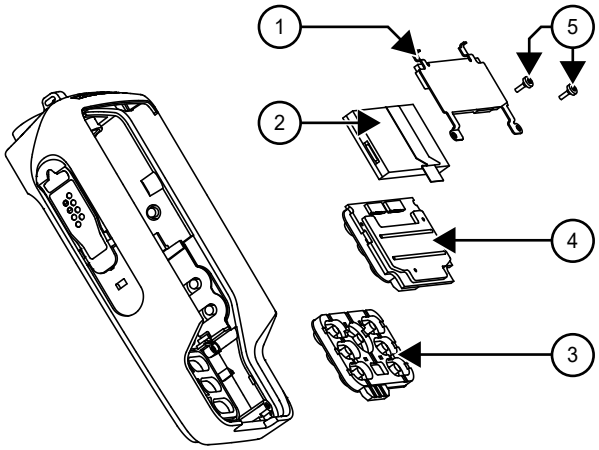
5.6.3
Keypad, Display, and Keypad Board Disassembly

Procedure:

1. If the disassembly of the keypad, the keypad printed circuit board, or the display is required, remove the retainer by using a TORX screwdriver with a T6 head to remove the 2 screws.
2. Disconnect the speaker flex and LCD flex from the keypad board.
3. Remove the display retainer followed by display module, keypad board and keypad respectively.

NOTICE: The LCD, keypad board and keypad can be removed without the use of tools.

Figure 19: Keypad, Display, and Keypad Board disassembly for Limited Keypad



Label	Description
1	Retainer
2	LCD
3	Keypad
4	Keypad Board Assembly
5	Screw

5.6.4
Speaker, Microphone, and Universal Connector Flex Disassembly

Procedure:

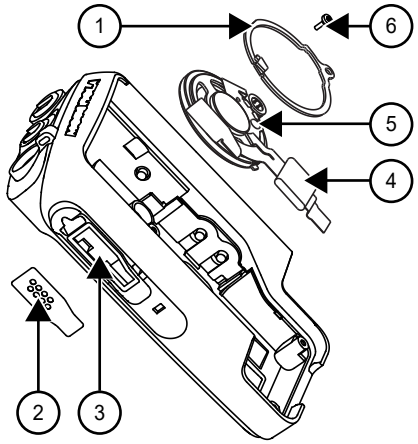
1. Pull the rubber microphone boot from its seated position.
2. Remove the screw using the TORX T6 screwdriver.
3. Peel-off the universal connector flex circuit escutcheon.

4 Pull the UC flex circuit (adhesive held) backer board from the font cover. Push the universal connector flex through the UC slot into the housing.

5 Remove the assembly from the front housing.

6 Remove the speaker retainer from the speaker assembly.

Figure 20: Speaker removal



Label	Description
1	Speaker Retainer
2	UC Escutcheon
3	UC Slot
4	Conductive Pad
5	Speaker, Mic and Flex
6	Screw

5.7 Detailed Radio Reassembly

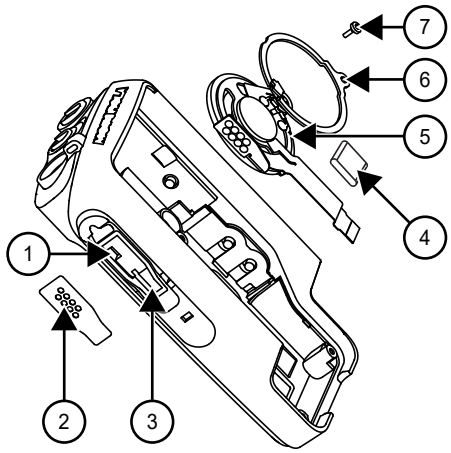
The following content describes the detailed reassembly procedure of your radio.

5.7.1 Speaker Reassembly

Procedure:

1 Insert the flexes through the speaker retainer so that the speaker retainer is placed directly on the speaker assembly.

Figure 21: Speaker reassembly



Label	Description
1	Speaker Retainer
2	UC Escutcheon
3	UC Slot
4	Conductive Pad
5	Speaker, Mic and Flex
6	Screw

2 Replace new conductive pad.

3 Hook in the speaker retainer with speaker assembly through slot A on the housing as shown in Figure 21: Speaker reassembly on page 53.

4 Align and place the speaker into the housing recess.

5 Screw the speaker retainer to the housing by using TORX screwdriver with a T6 head.

6 Place mic with micboot on its slot.

7 Slot in the UC flex circuit through the UC slot.

8 Remove UC flex circuit adhesive protective layer and affix it to the housing.

9 Replace new UC escutcheon.

5.7.2
Keypad, Display and Keypad Board Reassembly

Procedure:

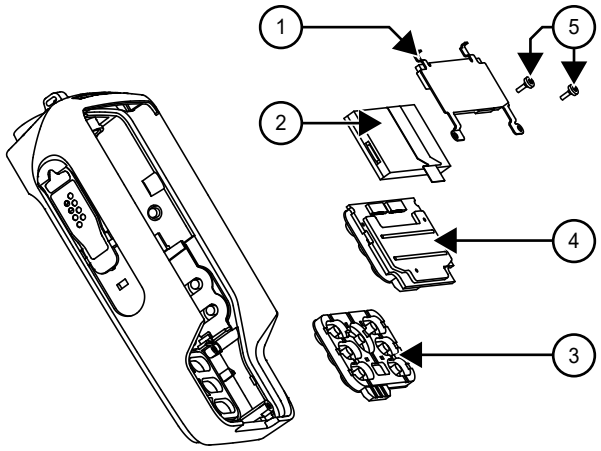
1 Place keypad on the housing slot followed by LCD module and keypad board respectively.

2 Connect the LCD flex to the keypad board and press the connector until it snaps shut.

3 Tongue in the display retainer into the the slot on the housing then place 2 screws to secure the retainer. Use a TORX screwdriver with T6 head to affix the screw.

4 Connect the UC flex to keypad board and press the connector until it snaps shut.

Figure 22: Keypad, Display, and Keypad Board reassembly for Limited Keypad



Label	Description
1	Retainer
2	LCD
3	Keypad
4	Keypad Board Assembly
5	Screw

5.7.3 Chassis Reassembly

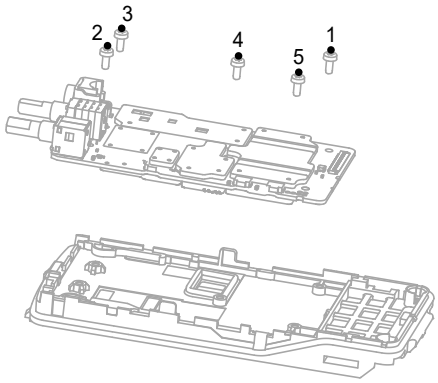
Procedure:

1. Place the motherboard onto the chassis.

   CAUTION: Make sure the battery contact seal is not twisted or lifted when the main board is place on the chassis.

2. Tighten the mainboard screws in the sequence shown in Figure 23: Chassis reassembly on page 54.

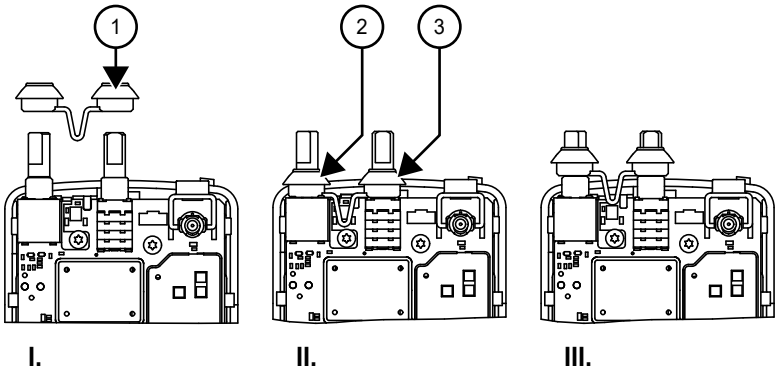
   Figure 23: Chassis reassembly



3 Insert the top control seal into the volume potentiometer and frequency shaft. Push on the wing of the top control seal as shown in Figure 24: Top Control Seal reassembly on page 55, until it is seated on the base of the switches.

CAUTION: Do not press on the top of the top control seal while slotting it into both shaft.

Figure 24: Top Control Seal reassembly



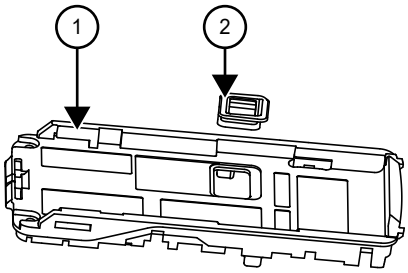
Label	Description
1	Top Control Seal
2	Top
3	Wing

4 Battery contact seal and O-ring assembly:

a Fit the battery contact seal into the chassis at K, refer Figure 26: O-ring reassembly on page 56.

CAUTION: Make sure the battery contact seal in inserted in the correct orientation refer Figure 25: Battery Contact Seal reassembly on page 55.

Figure 25: Battery Contact Seal reassembly



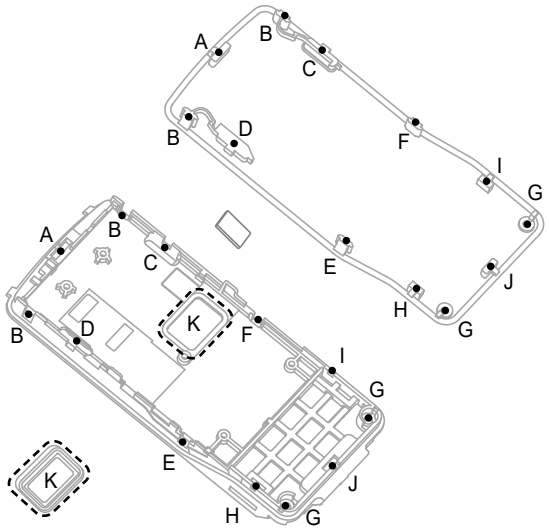
Label	Description
1	Chassis
2	Battery Contact Seal

b Ensure that the main O-ring is not twisted and untangle it to its actual form if needed before performing reassembly.

c Insert all the O-ring tab to the chassis following the sequence of A to J to its paired notches on the chassis as shown in Figure 26: O-ring reassembly on page 56.

CAUTION: Make sure tab C and D has been inserted fully and not over push.

Figure 26: O-ring reassembly



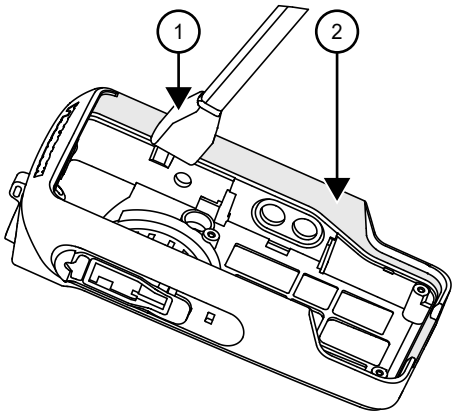
5.7.4

Chassis and Front Cover Reassembly

Procedure:

1 Apply a thin layer of grease around the side wall of the front cover as by using sponge as shown in Figure 27: Front cover reassembly on page 56.

Figure 27: Front cover reassembly

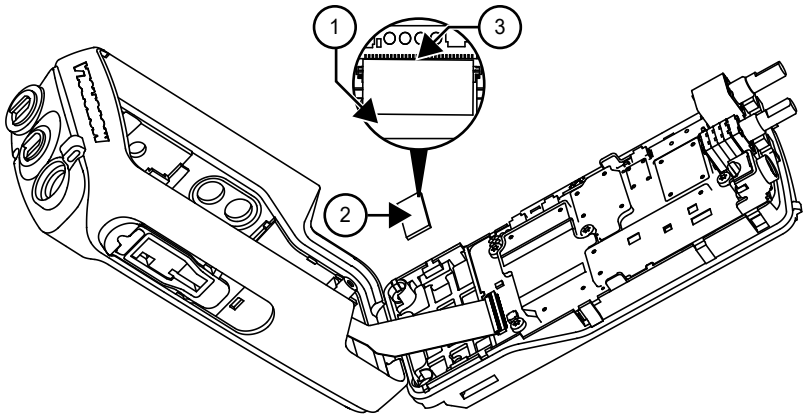


Label	Description
1	Sponge
2	Front Cover Side Wall

2 Connect the keypad board flex and UC flex for limited keypad model and no keypad model respectively to the main board. Place new flex poron pad on top of the ZIF connector and flex as shown in Figure 28: Flex reassembly on page 57 . Align the poron pad with the ZIF connector edge.

CAUTION: Make sure the poron pad is stick properly on the ZIF connector and flex.

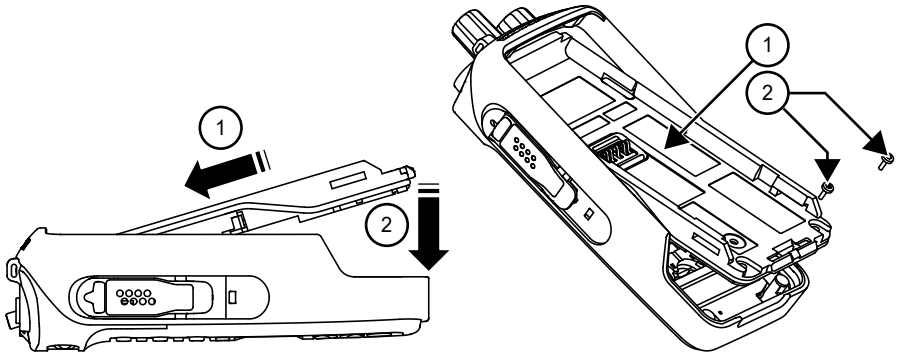
Figure 28: Flex reassembly



Label	Description
1	Flex
2	Poron Pad
3	Poron Pad Edge

3 Slide in the volume and channel shafts fully into the top slot of the housing as in the position shown in Figure 29: Chassis reassembly on page 57.

Figure 29: Chassis reassembly



Label	Description
1	Chassis
2	Screw

4 Gently push down the chassis into the front cover.

5 A visual inspection into the screw holes and interface of chassis and front cover will reveal blockage by a pinched O-ring which required the chassis to be re-inserted to the front cover.

6 Fasten the screw by using TORX™ T6 screwdriver.

7 Reassemble the knobs and antenna.

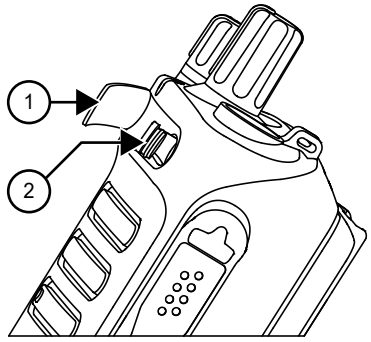
5.7.5

RF Plug Reassembly

Procedure:

1 Install the RF plug.

Figure 30: RF Plug reassembly

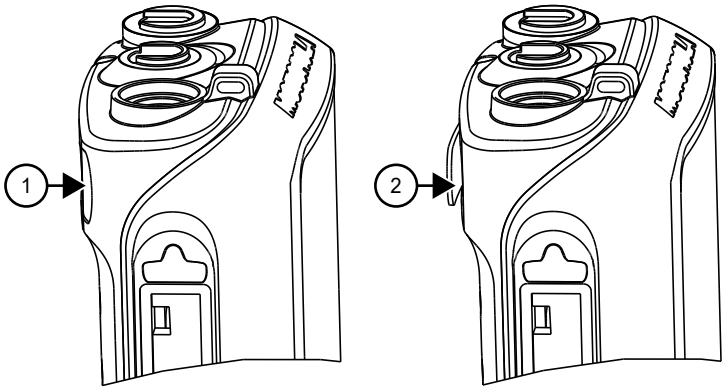


Label	Description
1	Nameplate
2	RF Plug

2 Place new nameplate on the front cover.

3 Make sure the RF plug and nameplate is flush to the housing and not bulging up. If its bulging up disassemble and reassemble back.

Figure 31: RF Plug and Nameplate reassembly



Label	Description
1	Correct
2	Wrong

5.8
Battery Maintenance

Maintain your radio battery annually or as required; when battery contacts are dirty or show signs of wear. Battery Maintenance prolongs battery contacts life and free battery interface from contamination.

It is recommended that the Battery Radio-side and Charger-side contacts are cleaned with DeoxIT GOLD cleaner/lubricant.

DeoxIT GOLD (Supplier CAIG Labs, part number: G100P) cleaner/lubricant pen is very effective at cleaning and extending the life of the battery contacts. DeoxIT GOLD cleaner/lubricant pen is available at numerous electronics suppliers (Radio Shack, McMaster Carr, Fry's, and more) and directly from manufacturer, CAIG Labs, at http://www.caig.com.

This pen-based package is recommended as it provides better access to the recessed contacts of the battery. The pen tip may need to be modified (trimmed on the sides) to improve penetration into the battery contact slots.

Advanced contact wear is defined as wear through the contact platings (gold and nickel) to the base metal (copper). Copper exposure is characterized by a distinctive
orange-brown metal appearance surrounded by silvery nickel underplate and gold top coat.

In some cases, a magnified (10 times minimum) inspection may be required to verify wear through to the base material. Polishing of the gold or nickel surface is common and is not considered as a need for replacement. Replace battery when advanced wear is evident.

5.8.1
Maintaining the Battery

Procedure:

1. Shake the lubricant pen until the fluid begins to flow.
2. Wipe battery contact surface with felt tip.
3. After cleaning the contact areas of any foreign material, let the lubricant/cleaner dry for 2 minutes.
4. Replace the battery on the radio
5. Move battery relative to the radio to test for intermittency.

Postrequisites: After cleaning, inspect the contact surfaces for signs of advanced contact wear. See Battery Maintenance on page 59 for advanced contact wear.

5.9
Radio Exploded Mechanical View and Parts List

5.9.1
Limited Keypad Model Exploded View and Parts List

Figure 32: Limited Keypad Model Exploded View

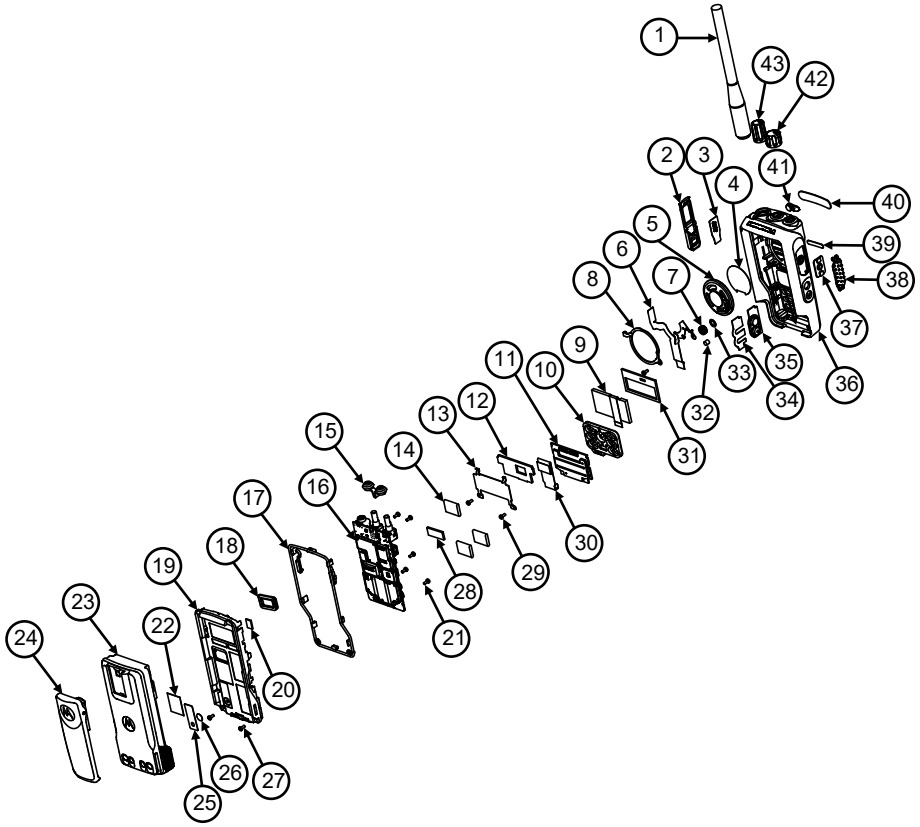


Table 25: Limited Keypad Model Exploded View Parts List

Item	Description	Part Number
1	VHF Antenna UHF Antenna	For VHF, see VHF Model Chart on page 16. For UHF, see UHF Model Chart on page 17.
2	Aesthetic Cover	PMLN6066_
3*	UC Escutcheon	33012020001
4*	Speaker Mesh	35012060001
5*	Speaker	50012013001
6*	Flex, UC to Keypad Board	84012285002
7*	Mic Boot	32012099001
8*	Retainer, Speaker	42012044001

Item	Description	Part Number
9*	Display, 2-Line Monochrome	72012014001
10*	Limited Keypad	75012080001
11*	Keypad Controller	0104040J04
12*	Poron Display, Back	75012079001
13*	Retainer, Display	42012034001
14*	Conductive Pad	75012147001
15	Top Control Seal	32012089001
16**	Main Board Assembly (UHF) Main Board Assembly (VHF)	Part of Back Cover Kit Part of Back Cover Kit
17**	O-Ring	32012111001
18**	Battery Contact Seal	32012110001
19**	Chassis	27012011001
20**	Thermal Pad	7515526H01
21**	Screw, Mainboard	03012034001
22	RF Label	54012133001
23	Batteries	Batteries on page 68
24	Belt Clip	See Table 27: Additional Parts List on page 64
25	Gore Pot Label	5478220A01
26	Gore Pot	3286058L01
27	Screw, Housing-Chassis	0316281H01
28*	UC Flex Poron	75012132001
29*	Screw, Retainer	0385273D06
30*	Flex, Keypadboard to Mainboard	84012300003
31*	Poron Display, Front	75012078001
32*	Microphone, EMI, Electric Condenser	50012012001
33*	Mic Membrane with Stiffener	3578241A02
34*	PTT Retainer	42012035001
35*	Programming Keypad	75012087001
36*	Front Housing Assembly	0104041J14
37*	PTT Rubber	75012081001

Item	Description	Part Number
38*	PTT Paddle	38012011001
39	XPR 3500 Name-plate	33102039006
40	Front Nameplate	33012026001
41	RF Plug	38012018001
42	Volume Knob	36012016001
43	Frequency Knob	36012017001

NOTICE: * *Included in the Assembly, Front Cover Kit -PMLN5809(LKP). Refer to the Table 27: Additional Parts List on page 64.
** Included in the Assembly, Back Cover-Kit -PMLE4775_S UHF, PMLD4515_S VHF (LKP), PMLD4642_S (LKP), PMLD4789_S (LKP) DE-MOTO. Refer to the Table 27: Additional Parts List on page 64.

5.9.2

Non-Keypad Model Exploded View and Parts List

Figure 33: Non-Keypad Model Exploded View

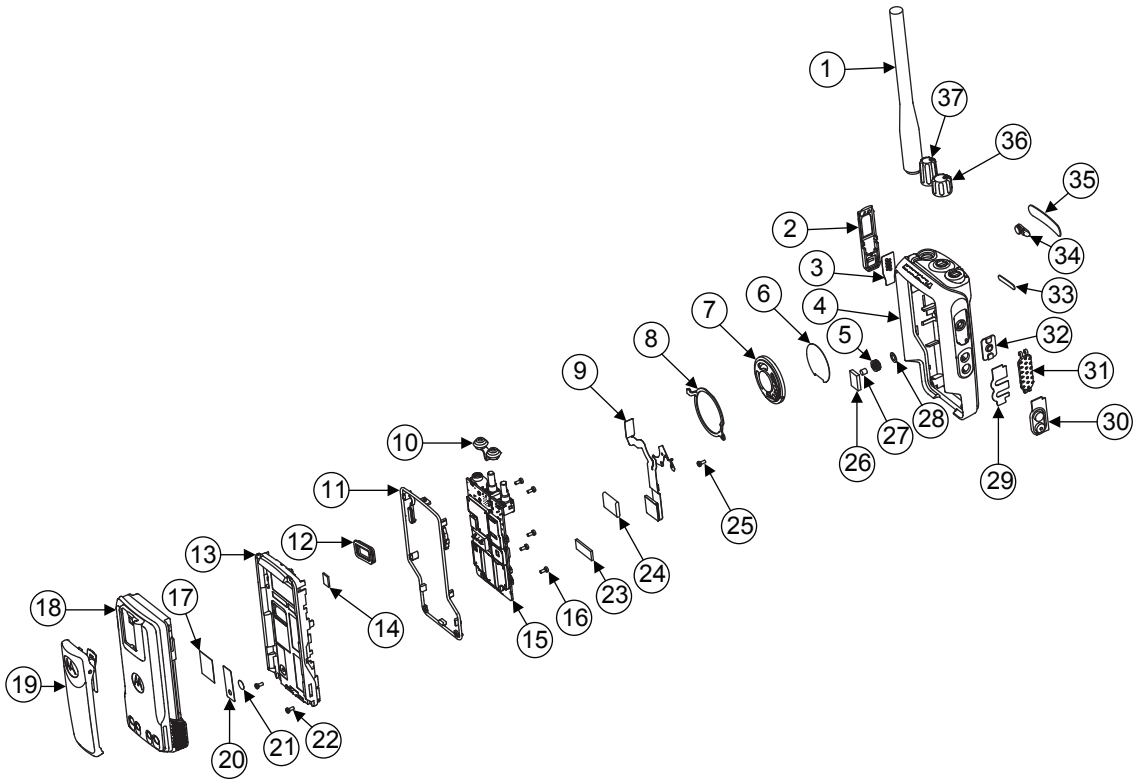


Table 26: Non-Keypad Model Exploded View Parts List

Item	Description	Part Number
1	VHF Antenna	For VHF, see VHF Model Chart on page 16. For UHF, see UHF Model Chart on page 17.

Item	Description	Part Number
	UHF Antenna	
2	Aesthetic Cover	PMLN6066_
3*	UC Escutcheon	
4*	Front Housing Assembly	0104042J61
5*	Mic Boot	32012099001
6*	Speaker Mesh	35012060001
7*	Speaker	50012013001
8*	Retainer, Speaker	42012044001
9*	UC Flex Assembly	0104045J62
10	Top Control Seal	32012089001
11**	Main O-Ring	32012111001
12**	Battery Contact Seal	32012110001
13**	Chassis	27012011001
14**	Thermal Pad	7515526H01
15**	Main PCB Assembly (UHF) Main PCB Assembly (VHF)	Part of Back Cover Kit Part of Back Cover Kit
16**	Screw, Main Board	03012034001
17	RF Label	54012133001
18	Batteries	Batteries on page 68
19	Belt Clip	See Table 27: Additional Parts List on page 64
20	Gore Pot Label	5478220A01
21	Gore Pot	3286058L01
22	Screw, Housing-Chassis	0316281H01
23	UC Flex Poron	75012132001
24*	Conductive Pad	75012147001
25*	Screw, Retainer	0385273D06
26*	Plain Front Housing Poron	75012150001
27*	Microphone, EMI, Electret Condenser	50012012001
28*	Mic Membrane with Stiffener	3578241A02
29*	PTT Retainer	42012035001

Item	Description	Part Number
30*	Programming Key-pad	75012087001
31*	PTT Paddle	38012011001
32*	PTT Rubber	75012081001
33	XPR 3300 Name-plate	33012039008
34	RF Plug	38012018001
35	Front Nameplate	33012026001
36	Volume Knob	36012016001
37	Frequency Knob	36012017001

NOTICE: * Included in the Assembly, Front Cover Kit -PMLN5811A (NKP). Refer to the Table 27: Additional Parts List on page 64.
** Included in the Assembly, Back Cover-Kit -PMLE4779_S UHF, PMLD4519_S VHF (NKP), PMLD4640_S (NKP), Refer to the Table 27: Additional Parts List on page 64.(NKP)

Table 27: Additional Parts List

Item	Description	Part Number
Battery	Core NIMH 1300mAH	PMNN4415_
	Core Slim LiIon 1500 mAH	PMNN4418_
	IMPRES LiIon 1500 mAH	PMNN4416_
	IMPRES LiIon Non-FM 2150 mAH	PMNN4117_
	Core LiIon, 2450 mAH IP68	PMNN4543_
	IMPRES LiIon 2450 mAH IP68	PMNN4544_
Front Cover Kit	Front Cover Kit LKP, STP Front Cover Kit NKP	PMLN5810_ PMLN5811_
Back Kit	Back Cover Kit Limited Key-pad (UHF)	PMLE4777_
	Back Cover Kit Non Keypad (UHF)	PMLE4779_S
	Back Cover Kit Limited Key-pad (VHF)	PMLD4517_
	Back Cover Kit Non Keypad (VHF)	PMLD4519_S
	Back Cover Kit Limited Key-pad (350–400 MHz, 4W, LKP DE-MOTO)	PMLD4789_S
Belt Clips	Belt Clip 2”	PMLN4651_
	Belt Clip 2.5"	PMLN7008_

Chapter 6

Basic Troubleshooting

This chapter contains error codes and board replacement procedures.

If the board does not pass all the performance checks in Transceiver Performance Testing on page 28 or exhibits an error code listed below, then the circuit board should be replaced. If repair requires knowledge of details of component level troubleshooting, please send the radio to a Motorola Solutions Service Center.

To access the various connector pins, use the housing eliminator/test fixture along with the diagrams found in this section of the manual. See "Service Aids" for the appropriate Motorola Solutions service aids and tools part numbers.

6.1 Replacement Back Cover Kit Procedures

Once a problem has been isolated to a specific board, install the appropriate back cover kit (Refer to "Model Charts"), which is orderable from Motorola Solutions Radio Products and Solutions Organization.

If a board is replaced, it does not necessarily need to be retuned if it has been factory tuned. It should however be checked for performance before being placed into service. Of particular concern is the Bias DAC, which will need to be set for the appropriate final device bias current prior to keying up the radio. If the bias is not properly set it may be possible to cause damage to the transmitter.

CAUTION:
The Tuner Tool only allows the serial number of the blank board to be entered once. Be very attentive during this procedure.

6.2 Power-Up Error Codes

Upon powering up, the radio performs certain tests to determine if its basic electronics and software are in working order. Any error detected has an associated error code that is presented on the radio display.

NOTICE: Power-Up error codes are only applicable to Display Models only.

These error codes are intended to be used by a service technician when the radio generates the Self-Test Fail Tone. If these tests are successfully completed, the radio will generate the Self-Test Tone.

NOTICE: Non-display radios emit only the Self-Test Fail Tone if it fails the self-test.

There are two classes of detectable errors: fatal and non-fatal.

Fatal errors

Normal radio operation is inhibited when your radio encounters fatal errors.

Fatal errors include hardware errors detected by the microprocessor and certain memory errors.

These memory errors include incorrect ROM checksum, incorrect RAM checksum, and incorrect checksums of codeplug (Persistent Storage) blocks that contain operating parameters.

If the codeplug block operating parameters are corrupted, operation of the unit on the proper frequency, system, and group are in question.

Attempts to use this information could provide a false sense of security that others are receiving your messages.

Non-fatal errors

Corrupted codeplug blocks of call IDs, or their associated aliases are considered non-fatal errors.

Normal communication is still possible, but the user may be inconvenienced.

Table 28: Types of Error Code

Error Code	Description	Error Type	Corrective Action
ERROR 01/02	Call ID or associated aliases codeplug block checksum is wrong.	Non-Fatal	Normal communication is still possible, but the user may be inconvenienced. Reprogram codeplug.
ERROR 01/22	Tuning Codeplug block checksum is wrong.	Non-Fatal	Normal communication is still possible.
FAIL 01/82	External Codeplug block checksum is wrong.	Fatal	Reprogram codeplug.
FAIL 01/92	Secure Codeplug checksum error.	Fatal	Reprogram codeplug.
FAIL 01/A2	Tuning Codeplug block checksum is wrong.	Fatal	Reprogram codeplug.
FAIL 01/81	ROM Checksum is wrong.	Fatal	Reprogram FLASH Memory, then retest.
FAIL 01/88	Radio RAM test failure.	Fatal	Retest radio by turning it off and turning it on again.
FAIL 01/90 or FAIL 02/90	General hardware test failure.	Fatal	Retest radio by turning it off and turning it on again.
FAIL 02/81	DSP ROM Checksum is wrong.	Fatal	Reprogram FLASH Memory, then retest.
FAIL 02/82	DSP RAM1 test failure.	Fatal	Retest radio by turning it off and turning it on again.
FAIL 02/84	DSP RAM2 test failure.	Fatal	Retest radio by turning it off and turning it on again.
FAIL 02/88	DSP RAM test failure.	Fatal	Retest radio by turning it off and turning it on again.
FAIL 02/C0	DSP ROM Checksum is wrong.	Fatal	Retest radio by turning it off and turning it on again.
No Display	Display module is not connected properly. Display module is damaged.	Fatal	Check connection between main board and display module. Replace with new display module.

NOTICE:
If error message reoccurs, replace main board or send radio to nearest Motorola Solutions Depot.

6.3

Operational Error Codes

During radio operation, your radio performs dynamic tests to determine if your radio is working properly. Problems detected during these tests are presented as error codes on your radio display. Use the following table to aid in understanding particular operational error codes.

Table 29: Types of Error Code

Error Code	Description	Error Type	Corrective Action
FAIL 001	Synthesizer Out-of-Lock.	Non-fatal	Reprogram the codeplug. Refer to *Detailed Service Manual*.
FAIL 002	Personality checksum or system block error.	Non-fatal	Reprogram the codeplug.

NOTICE: If error message reoccurs, send radio to nearest Motorola Solutions Service Centers or Authorized Motorola Solutions Service Dealers.

Chapter 7

Accessories

Motorola Solutions provides the following approved accessories to improve the productivity of your digital portable two-way radio.

For a list of Motorola Solutions-approved antennas, batteries, and other accessories, visit the following web site: http://www.motorolasolutions.com/governmentandenterprise

7.1 Batteries

Part No.	Description
PMNN4406_R	Core Slim LiIon 1500 mAH
PMNN4407_R	IMPRES LiIon 1500 mAH
PMNN4409_R	IMPRES LiIon Non-FM 2150 mAH
PMNN4543_	Core LiIon 2450 mAH IP68
PMNN4544_	IMPRES LiIon 2450 mAH IP68

7.2 Carry Devices

Part No.	Description
PMLN5863_	Hard Leather CC 3in Fixed Limited Keypad
PMLN5864_	Hard Leather CC 3in Fixed Non Display
PMLN5865_	Hard Leather CC 3in Swl Limited Keypad
PMLN5866_	Hard Leather CC 3in Swl Non Display
PMLN5867_	Hard Leather CC 2.5in Swl Limited Keypad
PMLN5868_	Hard Leather CC 2.5in Swl Non Display
PMLN5869_	Nylon Case 3in Fixed Limited Keypad
PMLN5870_	Nylon Case 3in Fixed Non Display

7.3 Antennas

Part No.	Description
PMAD4117_	VHF Helical Antenna (136–155 MHz)
PMAD4116_	VHF HelicalAntenna (144–165 MHz)
PMAD4118_	VHF Helical Antenna (152–174 MHz)
PMAD4119_	VHF Stubby Antenna (136–148 MHz)

Part No.	Description
PMAD4120_	VHF Stubby Antenna (146–160 MHz)
PMAD4121_	VHF stubby antenna (152–174 MHz)
PMAE4069_	UHF Stubby Antenna 403–450 MHz
PMAE4070_	UHF Stubby Antenna 440–490 MHz
PMAE4071_	UHF Stubby Antenna 470–512 MHz
PMAE4079_	Slim UHF Whip Antena 403–527 MHz

7.4 Service/Replacement Parts

Part No.	Description
66012034001	Chassis and Knob Opener

7.5 CPS

Part No.	Description
RVN5115_	CPS MOTOTRBO

Chapter 8

Replacement Parts Ordering

Basic Ordering Information

Some replacement parts, spare parts, and/or product information can be ordered directly on Motorola Solutions local distribution organization or through Motorola Online. While parts may be assigned with a Motorola Solutions part number, this does not guarantee that they are available from Motorola Solutions Radio Products and Solutions Organization (RPSO). Some parts may have become obsolete and no longer available in the market due to cancelations by the supplier. If no Motorola Solutions part number is assigned, the part is normally not available from Motorola Solutions, or is not a user-serviceable part. Part numbers appended with an asterisk are serviceable by Motorola Solutions Depot only.

Orders for replacement parts, kits, and assemblies should be placed directly on Motorola Solutions local distribution organization or through Motorola Online. When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Request for help in identification if non-referenced spare parts should be directed to the Customer Care organization of Motorola Solutions local area representation. Orders for replacement parts, kits, and assemblies should be placed directly on Motorola Solutions local distribution organization or by using Motorola Online.

Motorola Online

Motorola Online users can access our online catalog at https://businessonline.motorolasolutions.com.

To register for online access:

Please call 1-800-422-4210 (for U.S. and Canada Service Centers only). International customers can obtain assistance at https://businessonline.motorolasolutions.com.

Types of Orders	
Mail Orders	Mail orders are only accepted by the U.S. Federal Government Markets Division (USFGMD). Motorola Solutions 7031 Columbia Gateway Drive 3rd Floor - Order Processing Columbia, MD 21046 U.S.A.
Telephone Orders and Parts Identification	• RPSO (United States and Canada) 7:00 AM to 7:00 PM (Central Standard Time)

Types of Orders	
	Monday through Friday (Chicago, U.S.A.) 1-800-422-4210 1-847-538-8023 (United States and Canada) • USFGMD 1-800-826-1913 Federal Government Parts - Credit Cards Only 8:30 AM to 5:00 PM (Eastern Standard Time)
Fax Orders	RPSO (United States and Canada) 1-800-622-6210 1-847-576-3023 (United States and Canada) USFGMD (Federal Government Orders) 1-800-526-8641 (For Parts and Equipment Purchase Orders)

Product Customer Service

RPSO (United States and Canada)

1-800-927-2744

NOTICE: The Motorola Solutions RPSO was formerly known as the Radio Products Services Division (RPSD) and/or the Accessories and Aftermarket Division (AAD).

Chapter 9

Motorola Solutions Service Centers

If a unit requires further 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 Solutions Service Center as listed below.

Types of Center	Address	Telephone Number
Motorola Solutions Service Centers	1220 Don Haskins Drive Suite A El Paso, TX 79936	915-872-8200
Motorola Solutions Federal Technical Center	10105 Senate Drive Lanham, MD 20706	1800-969-6680 Fax: 1800-784-4113
Motorola Solutions Canadian Technical Logistics Center	181 Whitehall Drive Markham, Ontario L3R 9T1	Toll Free: 1-800-543-3222

Chapter 10

Limited Level 3 Servicing

Only Motorola Solutions Service Center or Motorola Solutions Authorized Dealers can perform Limited Level 3 Servicing.

Refer to "Disassembly/Reassembly Procedures" chapter for details of the following:

- Preventive maintenance (inspection and cleaning).
- Safe handling of CMOS and LDMOS devices.
- Repair procedures and techniques.

For soldering components with Hot-Air or infra red solder systems, check the *User Guide* of your solder system to get information on solder temperature and time for the different housings of the integrated circuits and other components.

10.1

Component and Parts List

Figure 34: PCB Top View

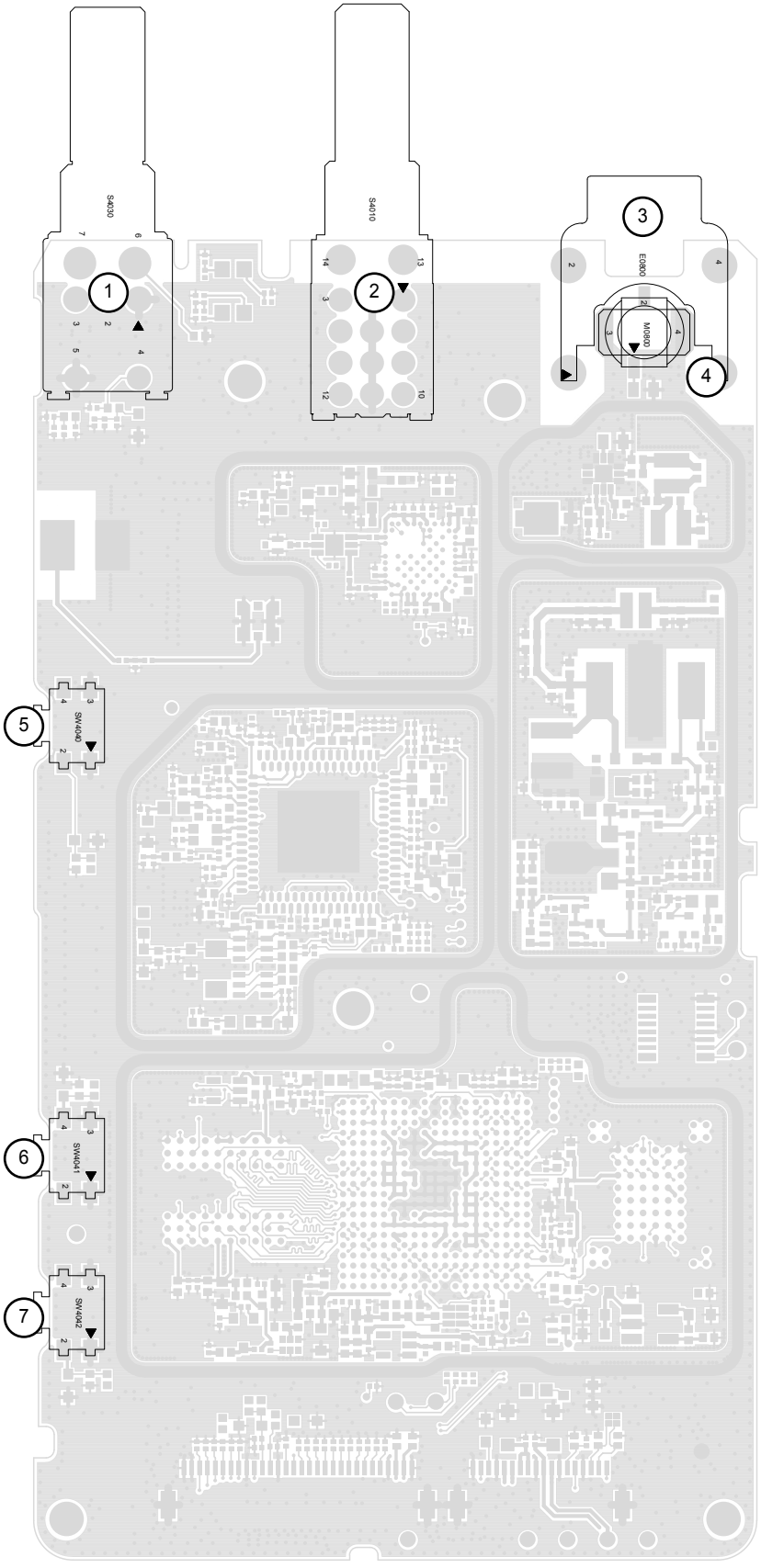


Figure 35: PCB Bottom View

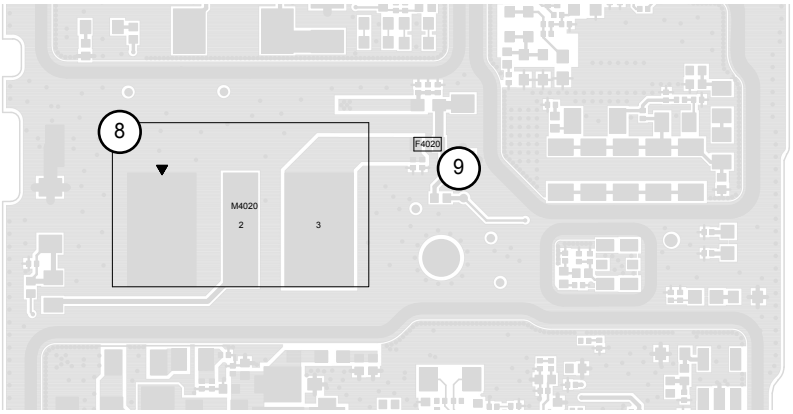


Table 30: Component Parts List

No.	Circuit Ref	Motorola Solutions Part Number	Description
1	S4030	1875103C04	Potentiometer, Rotary On/Off Switch
2[5]	S4010	40012023001	Frequency Switch (Endless)
		40012029001	Frequency Switch (Stopper)
3	E0800	02012010003	Connector RF
4	M0800	0987378K01	Conn RF Mod3
5	SW4040	4070354A01	SW:SM, SPST50, 12, Push-On Type*
6	SW4041	4070354A01	SW:SM, SPST50, 12, Push-On Type*
7	SW4042	4070354A01	SW:SM, SPST50, 12, Push-On Type*
8	M4020	0915184H01	Connector Battery Contact
9	F4020	65012019001	Fuse Chip SMT 3A

[5] There are two models for the frequency switch, Endless and Stopper. Follow the correct switch during servicing.

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to portable and mobile subscriber radio products. All terms do not necessarily apply to all radios, and some terms are merely generic in nature.

Analog Refers to a continuously variable signal or a circuit or device designed to handle such signals.

Band Frequencies allowed for a specific purpose.

Bluetooth (BT) A wireless protocol utilizing short-range communications over short distances.

Customer Programming Software (CPS) Software with a graphical user interface containing the feature set of a radio.

Default A pre-defined set of parameters.

Digital Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals.

Digital Private-Line (DPL) A type of digital communications that utilizes privacy call, as well as memory channel and busy channel lock out to enhance communication efficiency.

Federal Communications Commission (FCC) Regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia, and U.S. territories. It was established by the Communications Act of 1934 and operates as an independent U.S. government agency overseen by Congress. The commission is committed to being a responsive, efficient and effective agency capable of facing the technological and economic opportunities of the new millennium.

Frequency Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).

General-Purpose Input/Output (GPIO) Pins whose function is programmable.

Integrated Circuit (IC) An assembly of interconnected components on a small semiconductor chip, usually made of silicon. One chip can contain millions of microscopic components and perform many functions.

kilohertz (kHz) One thousand cycles per second. Used especially as a radio-frequency unit.

Liquid-Crystal Display (LCD) An LCD uses two sheets of polarizing material with a liquid-crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.

Light Emitting Diode (LED) An electronic device that lights up when electricity is passed through it.

Motorola Digital Communications (MDC) A Motorola Solutions proprietary signaling scheme permitting the transfer of data communications at the rate of 1200 bits per second. Designed specifically for high reliability in the land-mobile radio environment. Digital encoding allows a much greater amount of information to pass over the channel with each message than with alternative tone encoding methods. Some features include: PTT ID, Emergency, Call Alert, Emergency Alarm, Voice Selection Call (SelCall), Radio Check, and Monitor.

Megahertz (MHz) One million cycles per second. Used especially as a radio-frequency unit.

Paging One-way communication that alerts the receiver to retrieve a message.

Printed Circuit Board (PC Board) A circuit manufactured so that many or all of the components are attached to a non-conductive circuit board with copper strips on one or both sides to replace wires.

Private-Line Tone Squelch (PL) A continuous sub-audible tone that is transmitted along with the carrier.

Programming Cable A cable that allows the CPS to communicate directly with the radio using USB.

Receiver Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.

Repeater Remote transmit/receive facility that re-transmits received signals in order to improve communications range and coverage (conventional operation).

Radio Frequency (RF) The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).

Signal An electrically transmitted electromagnetic wave.

Spectrum Frequency range within which radiation has specific characteristics.

Squelch Muting of audio circuits when received signal levels fall below a pre-determined value. With carrier squelch, all channel activity that exceeds the radio’s preset squelch level can be heard.

Time-out Timer (TOT) A timer that limits the length of a transmission.

Tone Private Line (TPL) A continuous tone-coded squelch, which contains 29 codes. It is not compatible with DPL, and is common among all radio manufacturers.

Transceiver Transmitter-receiver: A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.

Transmitter Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.

Ultra-High Frequency (UHF) The term for the International Telecommunication Union (ITU) Radio Band with a frequency range of 300 to 3000 MHz.

Universal Serial Bus (USB) An external bus standard that supports data transfer rates of 12 Mbps.