

PROFESSIONAL DIGITAL TWO-WAY RADIO SYSTEM &
SMARTNET® AND PRIVACY PLUS™ TRUNKED MOBILE RADIOS



MOTOTRBO™ PORTABLE BASIC SERVICE MANUAL

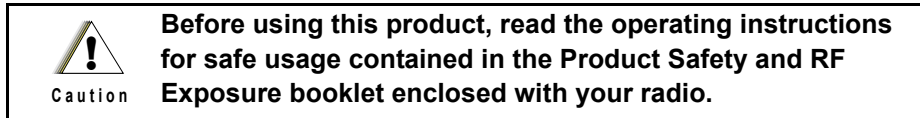
XPR™ 6580 DISPLAY PORTABLE
XPR™ 6380 NON-DISPLAY PORTABLE
XPR™ 6580 IS DISPLAY PORTABLE



Foreword

This manual covers all models of the XPR™ series Portable Radios, unless otherwise specified. It 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, self-maintained customers, and distributors.

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 enclosed with your radio (Motorola Publication part number 6881095C98) 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.motorolasolutions.com/governmentandenterprise>

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Notes

Document History

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

Edition	Description	Date
68009271001-A	Initial release	Dec. 2009
68009271001-B	Added IECEx/CSA 800/900 info	Jan. 2011
68009271001-C	Added CSA 157 800/900 info	Feb. 2012

Notes

Table of Contents

Foreword	i
Product Safety and RF Exposure Compliance	i
Computer Software Copyrights	i
Document Copyrights	i
Disclaimer	i
Trademarks	i
Document History	iii
Commercial Warranty	xiii
Limited Warranty	xiii
MOTOROLA COMMUNICATION PRODUCTS	xiii
I. What This Warranty Covers And For How Long	xiii
II. General Provisions	xiv
III. State Law Rights	xiv
IV. How To Get Warranty Service	xiv
V. What This Warranty Does Not Cover	xiv
VI. Patent And Software Provisions	xv
VII. Governing Law	xv
Battery and Charger Warranty	xvi
Workmanship Warranty	xvi
Capacity Warranty	xvi
Chapter 1 Introduction	1-1
1.1 Notations Used in This Manual	1-1
1.2 Radio Description	1-1
1.2.1 Display Model	1-2
1.2.2 Display Model	1-2
1.2.3 Non-Display Model	1-4
1.3 Portable Radio Model Numbering Scheme	1-4
1.4 Model Charts	1-5
1.4.1 800/900 Band Model Chart	1-5
1.5 Specifications	1-6
Chapter 2 Test Equipment and Service Aids	2-1
2.1 Recommended Test Equipment	2-1
2.2 Service Aids	2-2
2.3 Programming, Testing and Alignment Cable	2-3

Chapter 3	Transceiver Performance Testing	3-1
3.1	General	3-1
3.2	Setup.....	3-1
3.3	Display Model Test Mode	3-3
3.3.1	Entering Display Radio Test Mode	3-3
3.3.2	RF Test Mode	3-3
3.3.3	Display Test Mode	3-7
3.3.4	LED Test Mode.....	3-7
3.3.5	Backlight Test Mode	3-7
3.3.6	Speaker Tone Test Mode	3-7
3.3.7	Earpiece Tone Test Mode	3-7
3.3.8	Audio Loopback Earpiece Test Mode.....	3-7
3.3.9	Battery Check Test Mode	3-8
3.3.10	Button/Knob/PTT Test Mode	3-8
3.4	Non-Display Model Test Mode.....	3-10
3.4.1	Entering Non-Display Radio Test Mode	3-10
3.4.2	RF Test Mode	3-10
3.4.3	LED Test Mode.....	3-10
3.4.4	Speaker Tone Test Mode	3-10
3.4.5	Earpiece Tone Test Mode	3-11
3.4.6	Audio Loopback Earpiece Test Mode.....	3-11
3.4.7	Battery Check Test Mode	3-11
3.4.8	Button/Knob/PTT Test Mode	3-11
Chapter 4	Radio Programming and Tuning	4-1
4.1	Introduction	4-1
4.2	Customer Programming Software Setup	4-1
4.3	AirTracer Application Tool.....	4-1
4.4	Radio Tuning Setup	4-2
Chapter 5	Disassembly/Reassembly Procedures	5-1
5.1	Introduction	5-1
5.2	Preventive Maintenance	5-1
5.2.1	Inspection	5-1
5.2.2	Cleaning Procedures	5-1
5.3	Safe Handling of CMOS and LDMOS Devices	5-2
5.4	Repair Procedures and Techniques – General.....	5-4
5.5	Disassembling and Reassembling the Radio — General	5-5
5.6	Radio Disassembly – Detailed	5-5
5.6.1	Front Cover from Chassis Disassembly	5-5
5.6.2	Chassis Disassembly.....	5-8
5.6.3	Speaker Disassembly	5-10
5.7	Radio Reassembly – Detailed.....	5-11
5.7.1	Speaker Reassembly.....	5-11
5.7.2	Chassis Reassembly	5-12
5.7.3	Chassis and Front Cover Reassembly	5-15
5.8	Ensuring Radio Immersibility	5-16
5.8.1	Servicing.....	5-16
5.8.2	Accidental Immersion	5-17

5.8.3	Specialized Test Equipment	5-17
5.8.4	Vacuum Pump Kit NLN9839.....	5-17
5.8.5	Pressure Pump Kit NTN4265	5-17
5.8.6	Miscellaneous Hardware	5-17
5.8.7	Vacuum Test	5-18
5.8.8	Pressure Test	5-18
5.8.9	Troubleshooting Leak Areas.....	5-20
5.8.9.1	Front Housing	5-20
5.8.9.2	Chassis (Main Seal O-ring)	5-21
5.8.9.3	Battery Contact Seal.....	5-21
5.8.9.4	Breathing Vent Membrane and Breathing Vent Label	5-22
5.8.10	Troubleshooting Charts	5-23
5.9	Radio Exploded Mechanical Views and Parts Lists	5-26
5.9.1	Display Model Exploded View and Parts List	5-26
5.9.2	Non-Display Model Exploded View and Parts List	5-28
5.9.3	Torque Chart	5-30

Chapter 6 Basic Troubleshooting 6-1

6.1	Introduction	6-1
6.2	Replacement Back Cover Kit Procedures	6-1
6.3	Power-Up Error Codes (Display Model only).....	6-2
6.4	Operational Error Codes	6-4

Chapter 7 Accessories 7-1

7.1	Introduction	7-1
7.1.1	Audio	7-1
7.1.2	Batteries	7-2
7.1.3	Chargers.....	7-2
7.1.4	Cables	7-3
7.1.5	Antennas	7-3
7.1.6	Carry Devices	7-3
7.1.7	Service/Replacement Parts	7-4
7.1.8	CPS	7-4
7.1.9	Miscellaneous Accessories	7-4

Appendix A Replacement Parts Ordering.....A-1

A.1 Basic Ordering InformationA-1
A.2 Motorola Online.....A-1
A.3 Mail OrdersA-1
A.4 Telephone OrdersA-1
A.5 Fax OrdersA-1
A.6 Parts IdentificationA-2
A.7 Product Customer ServiceA-2

Appendix B Motorola Service Centers.....B-1

B.1 Servicing InformationB-1
B.2 Motorola Service CenterB-1
B.3 Motorola Canadian Technical Logistics CenterB-1
B.4 Motorola Federal Technical Center.....B-1

Glossary..... Glossary-1

List of Figures

Figure 1-1.	Display Model	1-2
Figure 1-2.	Non-Display Model.....	1-3
Figure 1-3.	Portable Radio Model Numbering Scheme.....	1-4
Figure 2-1.	Programming, Testing and Alignment Cable.....	2-3
Figure 2-2.	Pin Layout of Side Connector	2-4
Figure 3-1.	Battery Check Test Mode Display	3-8
Figure 4-1.	CPS Programming Setup.....	4-1
Figure 4-2.	Radio Tuning Equipment Setup	4-2
Figure 5-1.	Dust Cover removal.	5-5
Figure 5-2.	Battery and Antenna removal.	5-6
Figure 5-3.	Knob removal.....	5-6
Figure 5-4.	Chassis removal.	5-7
Figure 5-5.	LCD Module removal.	5-8
Figure 5-6.	LCD Retainer removal.....	5-8
Figure 5-7.	Transmission and Interface Board removal.	5-9
Figure 5-8.	O-ring and Battery Contact Seal removal.	5-9
Figure 5-9.	Speaker removal.....	5-10
Figure 5-10.	Speaker reassembly (Display Model).	5-11
Figure 5-11.	Speaker reassembly (Non-Display Model).....	5-12
Figure 5-12.	O-ring and Battery Contact Seal reassembly.....	5-13
Figure 5-13.	Secondary O-ring reassembly.....	5-13
Figure 5-14.	Transmission and Interface Board reassembly.....	5-14
Figure 5-15.	LCD Retainer and LCD Module reassembly.....	5-14
Figure 5-16.	Back Cover Kit reassembly.....	5-15
Figure 5-17.	Chassis to Front Cover reassembly.....	5-16
Figure 5-18.	Connector Fitting - Fitting Seal Pump Connector.....	5-17
Figure 5-19.	Display Model Exploded View.....	5-26
Figure 5-20.	Non-Display Model Exploded View	5-28

Notes

List of Tables

Table 1-1.	Radio Frequency Ranges and Power Levels.....	1-1
Table 2-1.	Recommended Test Equipment.....	2-1
Table 2-2.	Service Aids.....	2-2
Table 2-3.	Pin Configuration of Side Connector.....	2-4
Table 3-1.	Initial Equipment Control Settings.....	3-2
Table 3-2.	Front Panel Access Test Mode Displays.....	3-3
Table 3-3.	Test Environments.....	3-4
Table 3-4.	Test Frequencies.....	3-4
Table 3-5.	Transmitter Performance Checks.....	3-5
Table 3-6.	Receiver Performance Checks.....	3-6
Table 4-1.	Software Installation Kits Radio Tuning Setup.....	4-1
Table 5-1.	Lead Free Solder Wire Part Number List.....	5-4
Table 5-2.	Lead Free Solder Paste Part Number List.....	5-4
Table 5-3.	Display Model Exploded View Parts List.....	5-27
Table 5-4.	Non-Display Model Exploded View Parts List.....	5-29
Table 5-5.	Torque Specifications for Screws.....	5-30
Table 6-1.	Power-Up Error Codes.....	6-2
Table 6-2.	Operational Error Codes.....	6-4

Related Publications

IMPRES Adaptive Single-Unit Charger User Manual	6816787H01
IMPRES Adaptive Multi-Unit Charger User Manual.....	6816789H01
IMPRES Adaptive Multi-Unit Charger Service Manual	6871357L01
Remote Speaker Microphone User Manual	6871003L01
IMPRES Remote Speaker Microphone User Manual	6871004L01
Factory Mutual Approval Manual	6871532L01
*MOTOTRBO™ Portable User Guide CD	HKLN4282_

*CD consists of:

XPR™ 6300/6350 User Guide
 XPR™ 6300/6350 Quick Reference Card
 XPR™ 6500/6550 User Guide
 XPR™ 6500/6550 Quick Reference Card
 Safety Leaflet

**Portable User Guide CD Kit for SMARTNET® / Privacy Plus™	HKLN4409_
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**CD consists of:

XPR™ 6380/6580 User Guide in English and French Canadian
 XPR™ 6380/6580 Quick Reference Card in English and French Canadian
 Safety Leaflet

Commercial Warranty

Limited Warranty

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MOTOROLA INC. ("MOTOROLA") warrants the MOTOROLA manufactured Communication Products listed below ("Product") against defects in material and workmanship under normal use and service for a period of time from the date of purchase as scheduled below:

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Product Accessories (Excluding Batteries and Chargers)	One (1) Year

The portables additionally ship with a standard 1-year Repair Service Advantage (RSA) (for U.S. customers) or 1-year Extended Warranty (for Canada customers). However, at the time of order, you may choose to omit these warranties. For more RSA or Extended Warranty information, please refer to the portable price pages or Motorola Online (<https://businessonline.motorola.com>) > Resource Center > Services > Service Product Offerings > Repair Service Advantage or Extended Warranty.

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This warranty gives specific legal rights, and there may be other rights which may vary from state to state.

IV. How To Get Warranty Service

You must provide proof of purchase (bearing the date of purchase and Product item serial number) in order to receive warranty service and, also, deliver or send the Product item, transportation and insurance prepaid, to an authorized warranty service location. Warranty service will be provided by Motorola through one of its authorized warranty service locations. If you first contact the company which sold you the Product, it can facilitate your obtaining warranty service. You can also call Motorola at 1-800-927-2744 US/Canada.

V. What This Warranty Does Not Cover

- A. Defects or damage resulting from use of the Product in other than its normal and customary manner.
- B. Defects or damage from misuse, accident, water, or neglect.
- C. Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.
- D. Breakage or damage to antennas unless caused directly by defects in material workmanship.
- E. A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola supplied equipment) which adversely affect performance of the Product or interfere with Motorola's normal warranty inspection and testing of the Product to verify any warranty claim.
- F. Product which has had the serial number removed or made illegible.
- G. Rechargeable batteries if:
 - any of the seals on the battery enclosure or cells are broken or show evidence of tampering.
 - the damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.
- H. Freight costs to the repair depot.

- I. A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with MOTOROLA's published specifications or the FCC type acceptance labeling in effect for the Product at the time the Product was initially distributed from MOTOROLA.
- J. Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.
- K. Normal and customary wear and tear.

VI. Patent And Software Provisions

MOTOROLA will defend, at its own expense, any suit brought against the end user purchaser to the extent that it is based on a claim that the Product or parts infringe a United States patent, and MOTOROLA will pay those costs and damages finally awarded against the end user purchaser in any such suit which are attributable to any such claim, but such defense and payments are conditioned on the following:

- A. that MOTOROLA will be notified promptly in writing by such purchaser of any notice of such claim;
- B. that MOTOROLA will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and
- C. should the Product or parts become, or in MOTOROLA's opinion be likely to become, the subject of a claim of infringement of a United States patent, that such purchaser will permit MOTOROLA, at its option and expense, either to procure for such purchaser the right to continue using the Product or parts or to replace or modify the same so that it becomes non-infringing or to grant such purchaser a credit for the Product or parts as depreciated and accept its return. The depreciation will be an equal amount per year over the lifetime of the Product or parts as established by MOTOROLA.

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VII. Governing Law

This Warranty is governed by the laws of the State of Illinois, USA.

Battery and Charger Warranty

Workmanship Warranty

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

All MOTOTRBO Batteries	Two (2) Years
IMPRES Chargers (Single-Unit and Multi-Unit, Non-Display)	18 Months
IMPRES Chargers (Multi-Unit with Display)	One (1) Year

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 Notations Used in This Manual

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

NOTE An operational procedure, practice, or condition that is essential to emphasize.



Caution

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



WARNING

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

1.2 Radio Description

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

Table 1-1. Radio Frequency Ranges and Power Levels

Frequency Band	Bandwidth	Power Level
800/900 RX/TX Talk Around	851–870MHz 935–941MHz	1 Watt or 2.5 Watt
800/900 TX Trunking	806–825MHz 896–902MHz	1 Watt or 2.5 Watt
IECEX/CSA 800/900 RX/TX Talk Around	851–870MHz 935–941MHz	1 Watt
IECEX/CSA 800/900 TX Trunking	806–825MHz 896–902MHz	1 Watt
CSA 157 800/900 RX/TX Talk Around	851–870MHz 935–941MHz	1 Watt or 2 Watt
CSA 157 800/900 Tx Trunking	806–825MHz 896–902MHz	1 Watt or 2 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.

1.2.1 Display Model

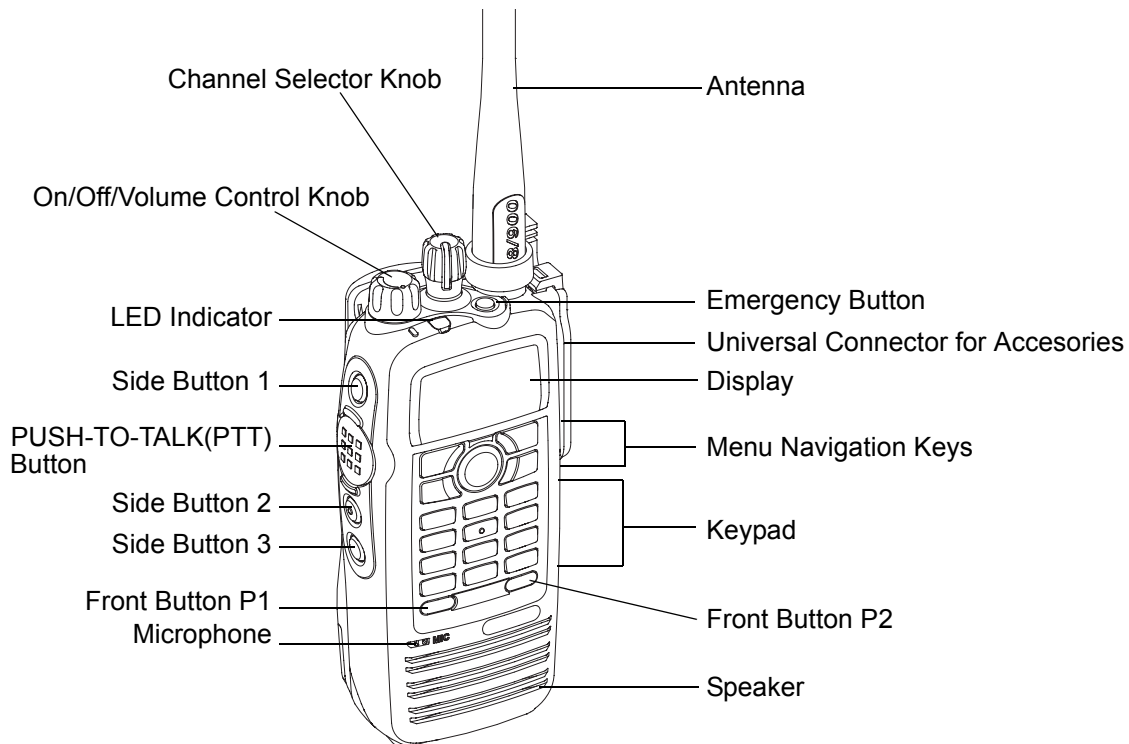


Figure 1-1. Display Model

- **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 orange light-emitting diodes indicate operating status.
- **LCD (Liquid Crystal Display)** – 132x34 full dot matrix display provides visual information about many radio features.
- **MENU NAVIGATION KEYS** – Five keys to provide menu navigation and selection interface.
- **KEYPAD** – Twelve keys that allows the user to input characters for various text based operations.
- **FRONT BUTTONS and SIDE BUTTONS** – These five 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 twelve points to which specific accessories will connect and be activated.

1.2.2 Display Model (IECEX/CSA 800/900 & CSA 157 800/900)

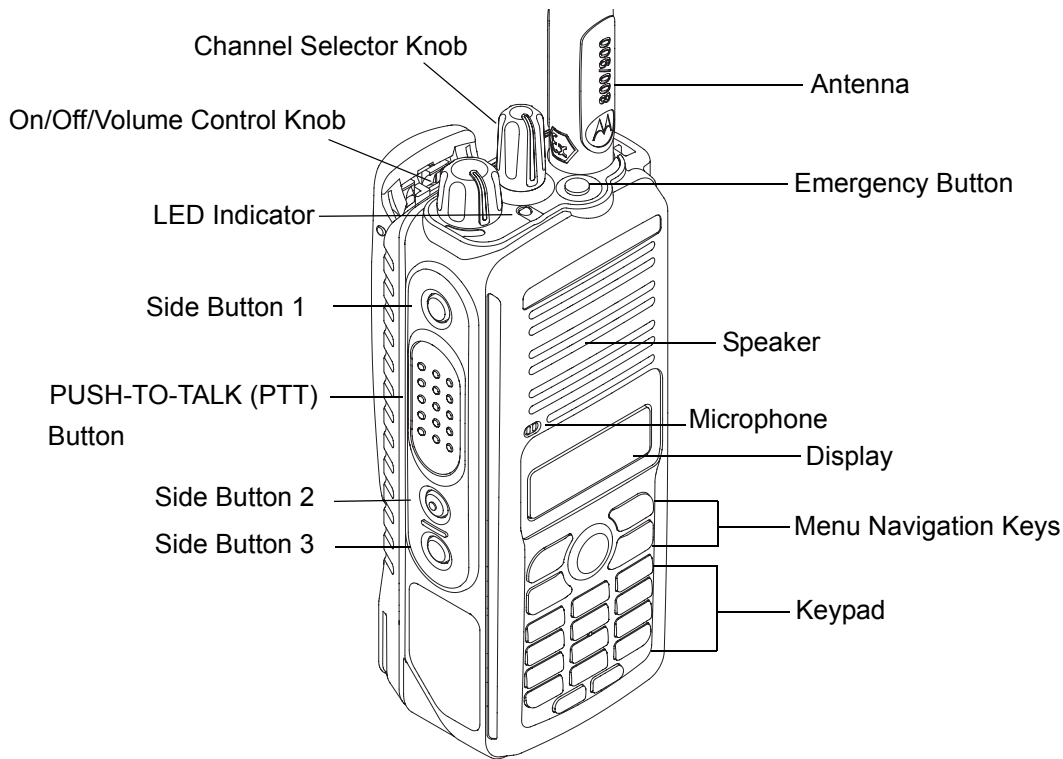


Figure 1-2. Display Model (IECEX/CSA 800/900 & CSA 157 800/900)

- **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 orange light-emitting diodes indicate operating status.
- **LCD (Liquid Crystal Display)** – 132x34 full dot matrix display provides visual information about many radio features.
- **MENU NAVIGATION KEYS** – Five keys to provide menu navigation and selection interface.
- **KEYPAD** – Twelve keys that allows the user to input characters for various text based operations.
- **FRONT BUTTONS and SIDE BUTTONS** – These five 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 twelve points to which specific accessories will connect and be activated.

- EMERGENCY BUTTON – Turns on and off the Emergency Operations.
- SPEAKER – Outputs all tones and audio that are generated by the radio (e.g. features like keypad tones and voice audio).

1.2.3 Non-Display Model

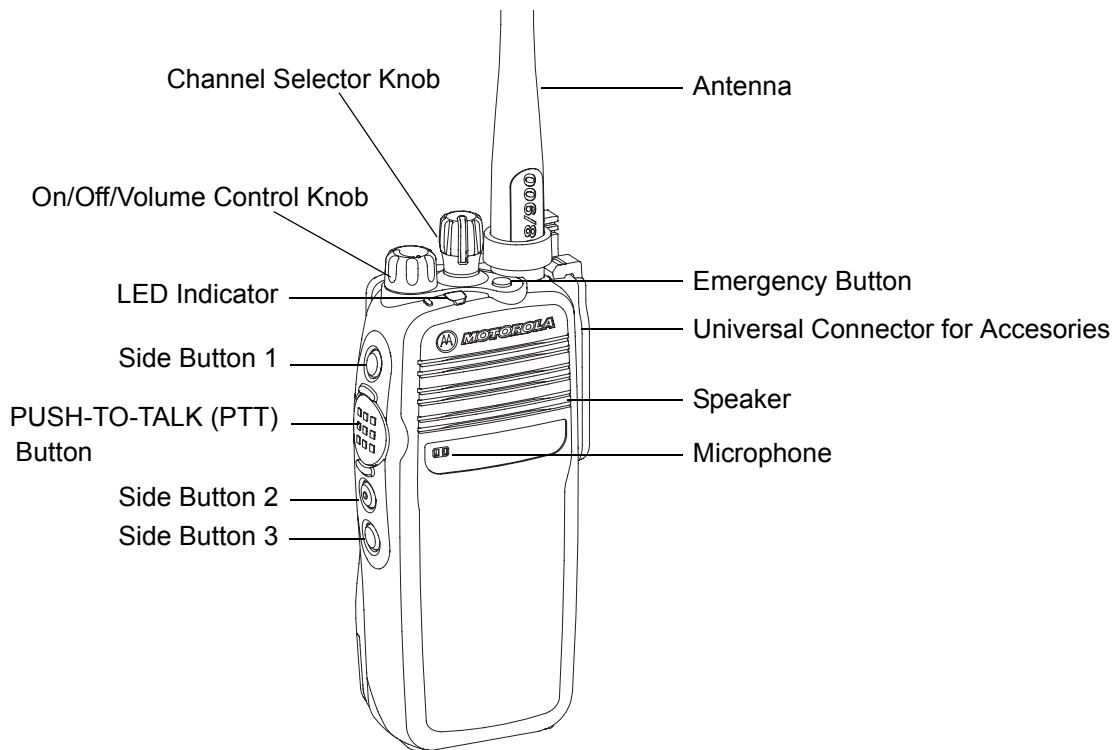


Figure 1-3. Non-Display Model

- 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 orange light-emitting diodes indicate operating status.
- SIDE BUTTONS – These 3 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 twelve points to which specific accessories will connect to and be activated.
- EMERGENCY BUTTON – Turns on and off the Emergency Operations.
- SPEAKER – Outputs all tones and audio that are generated by the radio (e.g. features like keypad tones and voice audio).

1.3 Portable Radio Model Numbering Scheme

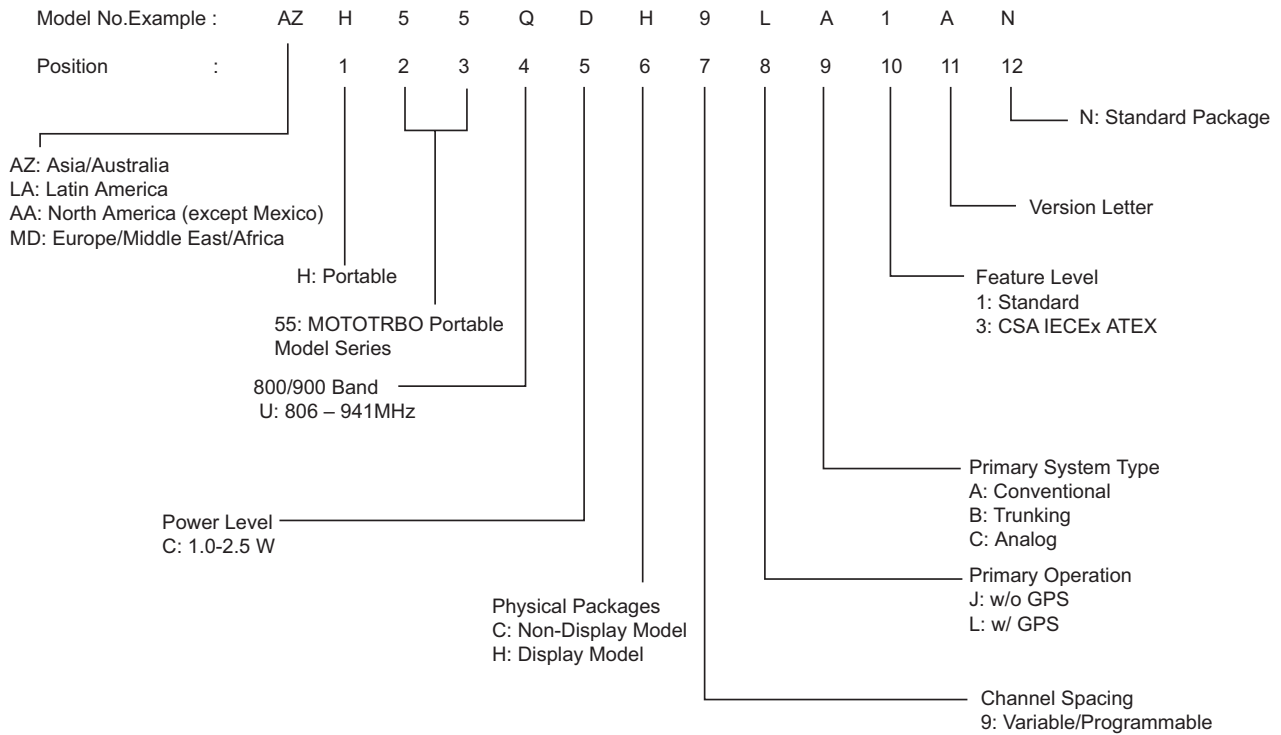


Figure 1-4. Portable Radio Model Numbering Scheme

1.4 Model Charts

1.4.1 800/900 Band Model Chart

XPR 6000 Series, 800/900 MHz			
Model		Description	
	AAH55UCH9LB1AN	806–941MHz 2.5W, Display Portable with GPS	
	AAH55UCC9LB1AN	806–941MHz 2.5W, Non-Display Portable with GPS	
	Item	Description	
X	PMLF4063_	Back Cover Kit, MOTOTRBO Display Portable with GPS, Digital	
	X PMLF4065_	Back Cover Kit, MOTOTRBO Non-Display Portable with GPS, Digital	
X	PMLF4063_	Back Cover Kit, MOTOTRBO Display Portable with GPS, Digital (GOB)	
	X PMLF4065_	Back Cover Kit, MOTOTRBO Non-Display Portable with GPS, Digital (GOB)	
X	X PMAF4003_	800/900 +GPS Helical Antenna (806–941MHz)	
X	X HKLN4409_	User Guide CD	

1.4.2 IECEX/CSA 800/900 & CSA 157 800/900 Band Model Chart

XPR 6000 Series, 800/900 MHz			
Model		Description	
	AAH55UCH9LB3AN	806–941MHz 1 W, Display Portable with GPS	
	AAH55UCH9LB3BN	806–941MHz 2 W, Display Portable with GPS	
	Item	Description	
X	PMLN5583_	Front Cover Kit, MOTOTRBO Display Portable ATEX CSA with GPS	
	X PMLF4081_	Back Cover Kit, MOTOTRBO Display Portable with GPS, Digital (GOB)	
X	PMAF4005_	800/900 +GPS Helical Antenna (806–941MHz)	
	X HKLN4883_	User Guide CD	

1.5 Specifications

General	Display XPR 6580/ XPR 6580 IS	Non-Display XPR 6380
Channel Capacity	160	32
Frequency	800 Band: 851 – 870 MHz 900 Band: 935 – 941 MHz	
Dimensions (HxWxT) w/ NiMH battery	5.18 x 2.40 x 1.38 in (131.5 x 61 x 35 mm) XPR 6580 IS 5.60 x 2.20 x 1.78 in (142.3x 56 x 45.3 mm)	
Weight (with Lilon FM battery) (with Lilon 2200 battery) (with Lilon 1750 battery) XPR 6580 IS	13 oz (370 g) 12.7 oz (360 g) 18.70 oz (530 g)	11.1 oz (315 g) 10.75 oz (305 g)
Power Supply	7.5V nominal 7.4V nominal (XPR 6580 IS)	
FCC Description	800/900 Band: ABZ99FT5011 IECEX/CSA 800/900: ABZ99FT5012 CSA 157 800/900: ABZ99FT5013	
IC Description	800/900 Band: 109AB-99FT5011 IECEX/CSA 800/900: 109AB-FT5012 CSA 157 800/900: 109AB-99FT5013	
Average battery life at 5/5/90 duty cycle without battery saver enabled in carrier squelch and transmitter in high power.		
IMPRES FM Lilon (FM battery approximate 7 hrs)	Analog: <8 hrs Digital: <8 hrs	
IMPRES Lilon 2150* (Conventional & Trunking)	Analog: 12 hrs Digital: 12 hrs	
IMPRES Lilon 1750 (Conventional and Trunking)	Analog: 11 hrs (IECEX/CSA 800/900)** Analog: 10 hrs (CSA 157 800/900)**	

* PMNN4077_, default battery shipped with Neo 800/900

** Average battery life with 5/5/90 duty cycle at room temperature with fully charged fresh battery

NNTN7789_ default battery shipped with only IECEX/CSA 800/900

NNTN8287_ default battery shipped with only CSA 157 800/900

Factory Mutual Approval

MOTOTRBO XPR Portable series radios meet FM (Factory Mutual) and standards for intrinsic safety used in Class I, II, III, Division 1, Groups C, D, E, F, and G when properly equipped with a Motorola FM approved battery option. They are also approved for nonincendive use in Class I, Division 2, Groups A, B, C, and D.

XPR6580IS radio models, when properly equipped with the battery NNTN7789A, are certified for permitted use for Ex ib IIC T4, Class II, Groups E, F, G, and Class III, and DIP A21 TA 110C

For more details, please refer to the Factory Mutual Approval Manual (6871532L01).

Receiver	Display XPR 6550/ XPR 6580 IS	Non-Display XPR 6350
Frequencies	800 Band: 851 – 870 MHz 900 Band: 935 – 941 MHz	
Channel Spacing	800 Band: 12.5 & 25 kHz 900 Band: 12.5 kHz	
Frequency Stability (-30 °C to +60 °C)	+/-0.5 ppm	
Analog Sensitivity (12 dB SINAD)	0.35 μ V 0.22 μ V (typical)	
Digital Sensitivity	5% BER: 0.3 μ V	
Intermodulation (TIA603C)	70 dB	
Adjacent Channel Selectivity TIA603 TIA603C	60 dB @ 12.5 kHz, 70 dB @ 25 kHz 45 dB @ 12.5 kHz, 70 dB @ 25 kHz	
Spurious Rejection (TIA603C)	70 dB	
Rated Audio	500 mW	
Audio Distortion @ Rated Audio	3% (typical)	
Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz	
Audio Response	+1, -3 dB	
Conducted Spurious Emission (TIA603C)	-57 dBm	

Transmitter	Display XPR 6550/ XPR 6580 IS	Non-Display XPR 6350
Frequencies	800 Band: 806-825 MHz (Trunking) 900 Band: 896-902 MHz (Trunking) 800 Band: 851-870 MHz (Talk Around) 900 Band: 935-941 MHz (Talk Around)	
Channel Spacing	800 Band: 12.5 & 25kHz 900 Band: 12.5kHz	
Frequency Stability (-30°C to +60°C)	+/-0.5 ppm	
Power Output (Low Power)	1 W	
Power Output (High Power)	2.5 W 1 W (IECEX/CSA 800/900) 2 W (CSA 157 800/900)	
Modulation Limiting	+/-2.5 kHz @ 12.5 kHz +/-5.0 kHz @ 25 kHz	
FM Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz	
Conducted / Radiated Emission	-36dBm < 1GHz -30dBm > 1GHz	
Adjacent Channel Power	60 dB @ 12.5 kHz 70 dB @ 25 kHz	
Audio Response	+1, -3 dB	
Audio Distortion	3%	
FM Modulation	12.5 kHz: 11K0F3E 25 kHz: 16K0F3E	
4FSK Digital Modulation (*Matrix Software 1.6 and above)	12.5 kHz Data Only: 7K60FXD 12.5 kHz Data & Voice: 7K60FXE	
Digital Vocoder Type	AMBE+2™	

800/900 Self-Quieter Frequencies	
GPS	Non-GPS
851.04 ± 10KHz	
851.188 ± 5KHz	–
852 ± 15KHz	
852.6 ± 5KHz	
852.98 ± 5KHz	
854.28 ± 10KHz	
855 ± 10KHz	
856.8 ± 15KHz	
857.075 ± 5KHz	
859.125 ± 5KHz	
860.16 ± 15KHz	
861.17 ± 5KHz	
863.22 ± 10KHz	
864 ± 15KHz	
865.27 ± 5KHz	
867.315 ± 5KHz	
867.557 ± 5KHz	–
869.365 ± 5KHz	
936 ± 15KHz	
937.97 ± 5KHz	
940 ± 10KHz	
940.8 ± 15KHz	

IECEX/CSA 800/900 & CSA 157 800/ 900 Self-Quieter Frequencies
GPS
851.04 MHz ± 15k
851.188 MHz ± 15k
852 MHz ± 10k
852.6 MHz ± 5k
852.98 MHz ± 10k
854.28 MHz ± 10k
855 MHz ± 10k
856.8 MHz ± 10k
857.075 MHz ± 10k
858.112 MHz ± 10k
859.125 MHz ± 10k
861.17 MHz ± 10k
861.3 MHz ± 10k
863.22 MHz ± 10k
864 MHz ± 10k
865.27 MHz ± 10k
867.315 MHz ± 10k
867.57 MHz ± 15k
869.365 MHz ± 15k
936 MHz ± 15k
937.984 MHz ± 15k
940 MHz ± 10k
940.8 MHz ± 15k

GPS	Display XPR 6550/ XPR 6580 IS	Non-Display XPR 6350
TTFF (Time To First Fix) Cold Start	< 1 minutes < 2 minutes (XPR 6580 IS)	
TTFF (Time To First Fix) Hot Start	< 10 seconds	
Horizontal Accuracy	< 10 meters	
Accuracy specs are for long-term tracking (95th percentile values > 5 satellites visible at a nominal -130 dBm signal strength)		

Military Standards				
Applicable MIL-STD	810E		810F	
	Methods	Procedures	Methods	Procedures
Low Pressure	500.3	II	500.4	II
High Temperature	501.3	I/A, II/A1	501.4	I/Hot, II/Hot
Low Temperature	502.3	I/C3, II/C1	502.4	I/C3, II/C1
Temperature Shock	503.3	I/A, 1C3	503.4	I
Solar Radiation	505.3	I	505.4	I
Rain	506.3	I,II	506.4	I, III
Humidity	507.3	II	507.4	-
Salt fog	509.3	I	509.4	I
Dust	510.3	I	510.4	I
Vibration	514.4	I/10,II/3	514.5	I/24
Shock	516.4	I, IV	516.5	I, IV

Environmental Specifications	
*Operating Temperature	-30 °C to +60 °C (XPR 6550/6350 & CSA 157 800/900) -20 °C to +50 °C (For IECEx/CSA 800/900 Only)
Storage Temperature	-40 °C to +85 °C (XPR 6550/6350 & CSA 157 800/900) 0 °C to +30 °C (For IECEx/CSA 800/900 Only)
Thermal Shock	Per MIL-STD
Humidity	Per MIL-STD
ESD	IEC-801-2KV
Water Intrusion	IEC 60529 -IP57 IEC 60529 -IP67 (XPR 6580 IS)
Packaging Test	MIL-STD 810D and E

- * –Operating temperature specification with Lilon battery is -10 °C to +60 °C.
 –Operating temperature specification with NiMH battery is -20 °C to +60 °C.

Chapter 2 Test Equipment and Service Aids

2.1 Recommended Test Equipment

The list of equipment contained in Table 2-1 includes most of the standard test equipment required for servicing Motorola portable radios.

Table 2-1. Recommended Test Equipment

Equipment	Characteristics	Example	Application
Service Monitor	Can be used as a substitute for items marked with an asterisk (*)	Aeroflex 2975 (www.aeroflex.com), Motorola R2670, or equivalent	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
Digital RMS Multimeter *	100 μ V to 300 V 5 Hz to 1 MHz 10 Mega Ohm Impedance	Fluke 179 or equivalent (www.fluke.com)	AC/DC voltage and current measurements. Audio voltage measurements
RF Signal Generator *	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 *	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 *	5% Accuracy 100 MHz to 500 MHz 50 Watts	Bird 43 Thruline Watt Meter (www.bird-electronic.com) or equivalent	Transmitter power output measurements
RF Millivolt Meter	100 mV to 3 V RF 10 kHz to 1 GHz	Boonton 92EA (www.boonton.com) or equivalent	RF level measurements
Power Supply	0 V to 32 V 0 A to 20 A	B&K Precision 1790 (www.bkprecision.com) or equivalent	Voltage supply

2.2 Service Aids

Table 2-2 lists the service aids recommended for working on the radio. While all of these items are available from Motorola, most are standard workshop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 2-2. Service Aids

Motorola Part No.	Description	Application
RLN4460_	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
RVN5115_	Customer Programming Software on CD-ROM	Allows servicer to program radio parameters, tune and troubleshoot radios.
PMKN4012_	Portable Programming Cable	This cable connects the radio to a USB port for radio programming and data applications.
PMKN4013_	Portable Programming, Testing & Alignment Cable	This cable connects the radio to a USB port for radio programming, testing and alignment.
PMNN4076_	7.5V Universal Battery Eliminator	Connects to radio via battery eliminator cable.
5880348B33	DMR SMA to BNC RF Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
PMHN4085_	Bench Test Housing Eliminator	Interconnects radio to power supply. Provides for troubleshooting of the radio when the housing is removed.
NLN9839_	Vacuum Pump Kit	Allows servicer to test for leakages.
NTN4265_	Pressure Pump Kit	Allows servicer to locate leakages.
5871134M01	Connector Fitting	This connector allows the vacuum hose to be connected to the radio chassis.
3271133M01	Fitting Seal	This seal secures the connector fitting to the radio chassis.

2.3 Programming, Testing and Alignment Cable

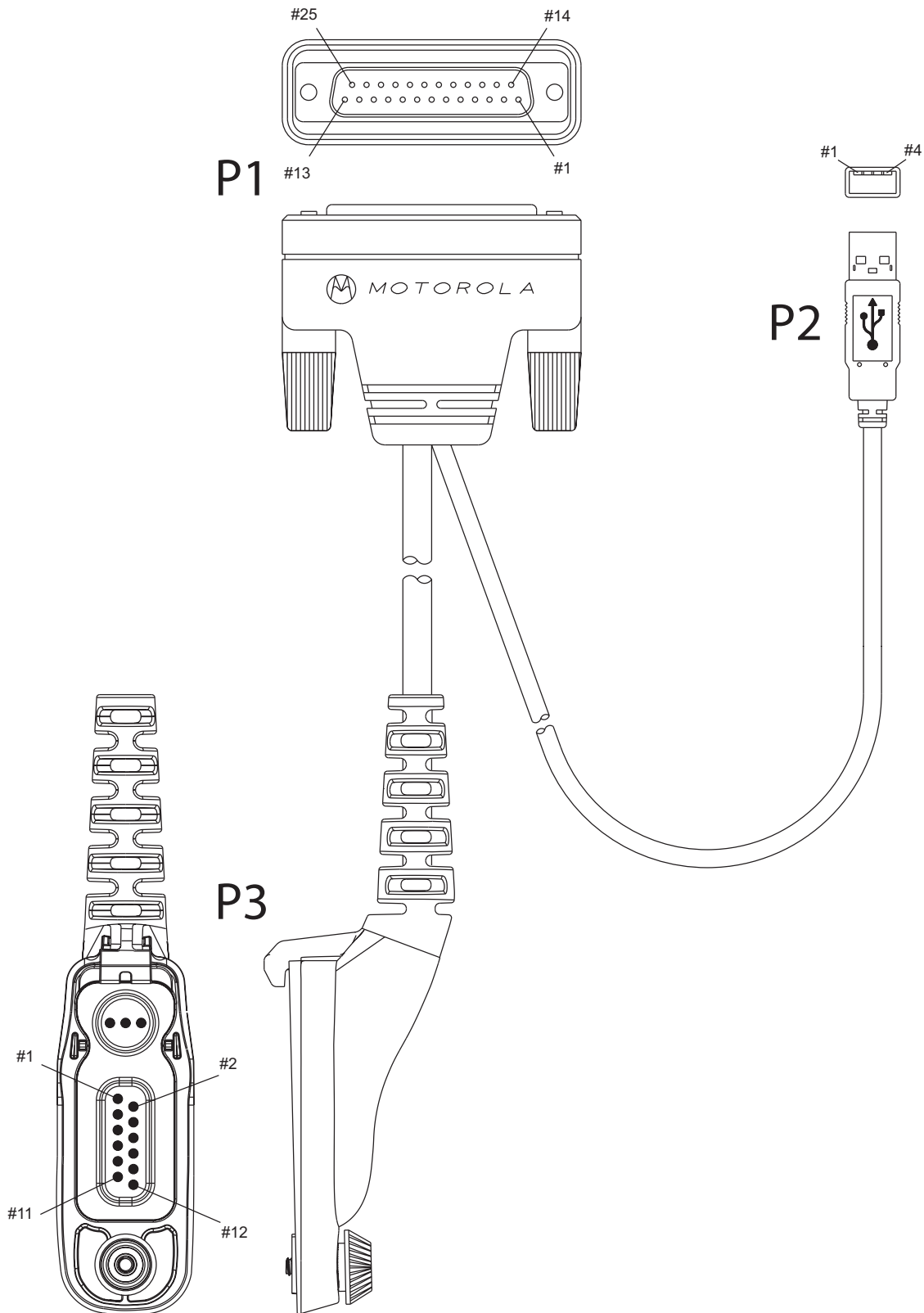


Figure 2-1. Programming, Testing and Alignment Cable

Table 2-3. Pin Configuration of Side Connector

CONNECTION			
P1	P2	P3	
Pin	Pin	Pin	Function
	1	3	VCC (5V)
	3	4	DATA +
	2	5	DATA -
16		6	GROUND
7		8	SPEAKER -
17		10	EXTERNAL MIC +
16		11	EXTERNAL MIC -
20		9	EXTERNAL PTT
1		7	SPEAKER +
	4	1 (Coax Connector)	GROUND

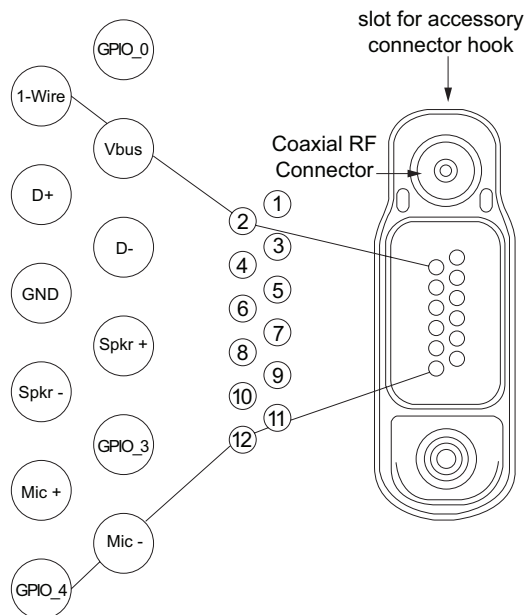


Figure 2-2. Pin Layout of Side Connector

Chapter 3 Transceiver Performance Testing

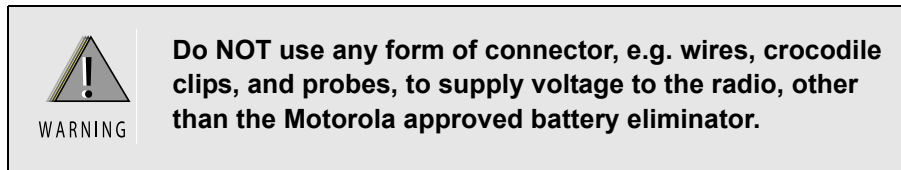
3.1 General

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.

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

3.2 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, Figure 4-2.



Initial equipment control settings should be as indicated in Table 3-1. The remaining tables in this chapter contain the following related technical data:

Table Number	Title
3-2	Front Panel Access Test Mode Displays
3-3	Test Environments
3-4	Test Frequencies
3-5	Transmitter Performance Checks
3-6	Receiver Performance Checks

Table 3-1. Initial Equipment Control Settings

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

3.3 Display Model Test Mode

3.3.1 Entering Display Radio Test Mode

1. Turn the radio on.
2. Within 10 seconds after Self Test is complete, press **Side Button 2** five times in succession.
3. The radio beeps and will show a series of displays that will give information regarding various version numbers and subscriber specific information. The displays are described in Table 3-2.

Table 3-2. 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's model number as programmed in the codeplug.	Always
MSN	The radio's serial number as programmed in the codeplug.	Always
FLASHCODE	The FLASH codes as programmed in the codeplug.	Always
RF Band	The radio's band.	Always

NOTE The radio stops at each display for 2 seconds before moving to the next information display. If the information cannot fit into 1 line, the radio display scrolls automatically character by character after 1 second to view the whole information. If the Left Navigation Key (◀) is pressed before the last information display, the radio shall suspend the information display until the user presses Right Navigation Key (▶) to resume the information display. The radio beeps for each button press. After the last display, RF Test Mode will be displayed.

3.3.2 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, 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 via a special routine, called **TEST MODE** or air test.

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. The default test environment is CSQ.

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.

NOTE DIG is digital mode and other test environments are analog mode as described in Table 3-3.

Table 3-3. 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

- Each short press of **Side Button 1** toggles the channel spacing between 25 kHz, 12.5 kHz. The radio beeps once for 25 kHz and beeps twice for 12.5 kHz.
- Turning of the **Channel Knob** changes the test channel from 1 to 14 as described in Table 3-4. The radio beeps in each position.

Table 3-4. Test Frequencies

Channel Selector Switch Position	Test Channel	800/900 MHz Band
1 Low Power 9 High Power	TX#1 or #9 RX#1 or #9	806.125 851.025
2 Low Power 10 High Power	TX#2 or #10 RX#2 or #10	824.975 855.225
3 Low Power 11 High Power	TX#3 or #11 RX#3 or #11	851.125 860.525
4 Low Power 12 High Power	TX#4 or #12 RX#4 or #12	869.975 865.025
5 Low Power 13 High Power	TX#5 or #13 RX#5 or #13	896.125 869.925
6 Low Power 14 High Power	TX#6 or #14 RX#6 or #14	901.975 935.025
7 Low Power 15 High Power	TX#7 or #15 RX#7 or #15	935.125 938.025
8 Low Power 16 High Power	TX#8 or #16 RX#8 or #16	940.975 940.925

Table 3-5. Transmitter Performance Checks

Test Name	Communications Analyzer	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 continuously transmit (during the performance check)	+/- 100 Hz for GPS models and non GPS models
Power RF	As above	As above	As above	Low Power: 1W (800/900) High Power: 2.5–2.8W (800/900)
Voice Modulation	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/Out Monitor: DVM: AC Volts Set 1kHz 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: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp).
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: ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp)
TPL Modulation	As above 4th channel test frequency* BW to narrow	TEST MODE, Test Channel 4 TPL	As above	Deviation: ≥ 500 Hz but ≤ 1000 Hz (25 kHz Ch Sp).

* See Table 3-4

Table 3-6. Receiver Performance Checks

Test Name	Communications Analyzer	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 output at antenna	PTT to continuously transmit (during the performance check)	+/- 100 Hz for GPS models and non GPS models
Rated Audio	Mode: GEN Output level: 1.0mV RF 4th channel test frequency* Mod: 1kHz tone at 3kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 4 carrier squelch	PTT to OFF (center), meter selector to Audio PA	Set volume control to 2.83Vrms Set volume control to 3.16 Vrms (IECEX/ CSA 800/900)
Distortion	As above, except to distortion	As above	As above	Distortion <3.0%
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be <0.35 μ V
Noise Squelch 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 2.83Vrms
	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 μ V. Preferred SINAD = 9 – 10dB

* See Table 3-4

3.3.3 Display Test Mode

1. Press and hold **Side Button 1** in RF Test Mode. The radio beeps once and momentarily displays "Display Test Mode".
2. Upon entering Display Test Mode, the radio displays a horizontal line on row 8 (center row).
3. With each button/key press, the radio fills the screen up with 2 horizontal lines from the center row (1 line each above and below the center row) until the top and bottom of the screen (row 7-0 and row 9-16) is completely full.
4. When the screen is filled up with the horizontal lines, any button/key press clears the screen and displays vertical lines at column 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60. Any button/key press fills the screen with vertical lines, (1 line to the right of any existing line) until the display is full.
5. When the screen is filled up with the vertical lines, any button/key press clears the screen and displays the first 10 available icons on the screen. Successive button/key press displays the remaining 4 icons.

3.3.4 LED Test Mode

1. Press and hold **Side Button 1** after Display Test Mode. The radio beeps once and displays "LED Test Mode".
2. Upon any button/key press, the radio lights the red LED and displays "Red LED On".
3. Consequently, upon any button/key press, the red LED is turned off and the radio lights the green LED and displays "Green LED On".
4. Upon any successive button/key press, the green LED is turned off, and the radio shall light both LEDs up while displaying "Both LEDs On". Since there is only one LED on the portable, the LED color will be orange when the radio lights both LEDs.

3.3.5 Backlight Test Mode

1. Press and hold **Side Button 1** after LED Test Mode. The radio beeps once and displays "Backlight Test Mode".
2. The radio turns on both LCD and keypad backlight together.

3.3.6 Speaker Tone Test Mode

1. Press and hold **Side Button 1** after Backlight Test Mode. The radio beeps once and displays "Speaker Tone Test Mode".
2. The radio generates a 1 KHz tone with the internal speaker.

3.3.7 Earpiece Tone Test Mode

1. Press and hold **Side Button 1** after Speaker Tone Test Mode. The radio beeps once and displays "Earpiece Tone Test Mode".
2. The radio generates a 1 KHz tone with the earpiece.

3.3.8 Audio Loopback Earpiece Test Mode

1. Press and hold **Side Button 1** after Earpiece Tone Test Mode. The radio beeps once and displays "Audio Loopback Earpiece Test Mode".
2. The radio shall route any audio on the external mic to the earpiece.

3.3.9 Battery Check Test Mode

1. Press and hold **Side Button 1** after Audio Loopback Earpiece Test Mode. The radio beeps once and momentarily displays “Battery Check Test Mode”.
2. The radio will display the following:

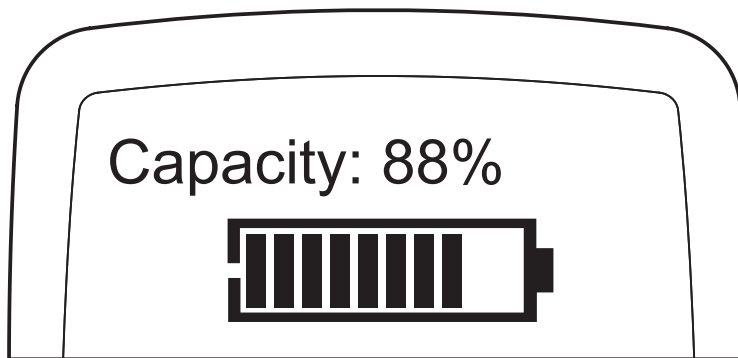


Figure 3-1. Battery Check Test Mode Display

3.3.10 Button/Knob/PTT Test Mode

1. Press and hold **Side Button 1** after Battery Check Test Mode. The radio beeps once and displays “Button Test”(line 1).
2. The radio also displays the button/knob/PTT button command opcode (BCO) and state (BCO/state) on the screen (line 2) upon any button state changes.
3. Rotate the **Volume Knob**; “2/0” through “2/255” appears. The radio beeps at each position.
4. Rotate the **Channel Knob**; “4/0” through “4/15” appears. The radio beeps at each position.
5. Press **Side Button 1**; “96/1” appears & radio beeps; release, “96/0” appears & radio beeps.
6. Press **Side Button 2**; “97/1” appears & radio beeps; release, “97/0” appears & radio beeps.
7. Press **Side Button 3**; “98/1” appears & radio beeps; release, “98/0” appears & radio beeps.
8. Press the **PTT Switch**; “1/1” appears & radio beeps; release, “1/0” appears & radio beeps.
9. Press **Top Button**; “148/1” appears & radio beeps; release, “148/0” appears & radio beeps.
10. Keypad Checks:
 - Press **0**, “48/1” appears & radio beeps; release, “48/0” appears & radio beeps.
 - Press **1**, “49/1” appears & radio beeps; release, “49/0” appears & radio beeps.
 - Press **2**, “50/1” appears & radio beeps; release, “50/0” appears & radio beeps.
 - Press **3**, “51/1” appears & radio beeps; release, “51/0” appears & radio beeps.
 - Press **4**, “52/1” appears & radio beeps; release, “52/0” appears & radio beeps.
 - Press **5**, “53/1” appears & radio beeps; release, “53/0” appears & radio beeps.
 - Press **6**, “54/1” appears & radio beeps; release, “54/0” appears & radio beeps.
 - Press **7**, “55/1” appears & radio beeps; release, “55/0” appears & radio beeps.
 - Press **8**, “56/1” appears & radio beeps; release, “56/0” appears & radio beeps.
 - Press **9**, “57/1” appears & radio beeps; release, “57/0” appears & radio beeps.
 - Press *****, “58/1” appears & radio beeps; release, “58/0” appears & radio beeps.
 - Press **#**, “59/1” appears & radio beeps; release, “59/0” appears & radio beeps.
 - Press **P1**, “160/1” appears & radio beeps; release, “160/0” appears & radio beeps.
 - Press **P2**, “161/1” appears & radio beeps; release, “161/0” appears & radio beeps.

-
- Press **OK**, “85/1” appears & radio beeps; release, “85/0” appears & radio beeps.
 - Press **MENU**, “139/1” appears & radio beeps; release, “139/0” appears & radio beeps.
 - Press **BACK**, “129/1” appears & radio beeps; release, “129/0” appears & radio beeps.
 - Press **◀**, “128/1” appears & radio beeps; release, “128/0” appears & radio beeps.
 - Press **▶**, “130/1” appears & radio beeps; release, “130/0” appears & radio beeps.

3.4 Non-Display Model Test Mode

3.4.1 Entering Non-Display Radio Test Mode

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

3.4.2 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, 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 via a special routine, called **TEST MODE** or “air test”.

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.

NOTE: DIG is digital mode and other test environments are analog mode as described in Table 3-3.

2. Each short press of **Side Button 1** toggles the channel spacing between 25 KHz, 12.5 KHz and 20 KHz as. The radio beeps once when radio toggles to 20KHz, beeps twice for 25KHz and beeps three times for 12.5KHz.
3. Turning of the **Channel Knob** changes the test channel from 1 to 14 as described in Table 3-4. The radio beeps in each position.

3.4.3 LED Test Mode

1. Press and hold **Side Button 1** in RF Test Mode. The radio beeps once.
2. Upon any button/key press, the radio lights up the red LED.
3. Consequently, upon any button/key press, the red LED is turned off and the radio turns on the green LED.
4. Consequently, upon any button/key press, the green LED is turned off the radio shall turn on both LEDs.

3.4.4 Speaker Tone Test Mode

1. Press and hold **Side Button 1** after LED Test Mode. The radio beeps once.
2. The radio generates a 1 KHz tone with the internal speaker.

3.4.5 Earpiece Tone Test Mode

1. Press and hold **Side Button 1** after Speaker Tone Test Mode. The radio beeps once.
2. The radio generates a 1 KHz tone with the earpiece.

3.4.6 Audio Loopback Earpiece Test Mode

1. Press and hold **Side Button 1** after Earpiece Tone Test Mode. The radio beeps once.
2. The radio shall route any audio on the external mic to the earpiece.

3.4.7 Battery Check Test Mode

1. Press and hold **Side Button 1** after Audio Loopback Earpiece Test Mode. The radio beeps once.
2. The radio LED lights up accordingly; green LED for High Battery Level, orange LED for Mid Battery Level and blinking red LED for Low Battery Level.

3.4.8 Button/Knob/PTT Test Mode

1. Press and hold **Side Button 1** after Battery Check Test Mode. The radio beeps once.
2. Rotate the **Volume Knob**; the radio beeps at each position.
3. Rotate the **Channel Knob**; the radio beeps at each position.
4. Press **Side Button 1**; the radio beeps; release, the radio beeps.
5. Press **Side Button 2**; the radio beeps; release, the radio beeps.
6. Press **Side Button 3**; the radio beeps; release, the radio beeps.
7. Press the **PTT Switch**; the radio beeps; release, the radio beeps.
8. Press **Top Button**; the radio beeps; release, the radio beeps.

Notes

Chapter 4 Radio Programming and Tuning

4.1 Introduction

This chapter provides an overview of the MOTOTRBO Customer Programming Software (CPS), as well as the Tuner and AirTracer applications, which are all designed for use in a Windows 2000/XP environment. These programs are available in one kit as listed in Table 4-1. An Installation Guide is also included with the 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
MOTOTRBO CPS, Tuner and AirTracer Applications CD	RVN5115_

4.2 Customer Programming Software Setup

The CPS programming setup, shown in Figure 4-1 is used to program the radio.

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



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

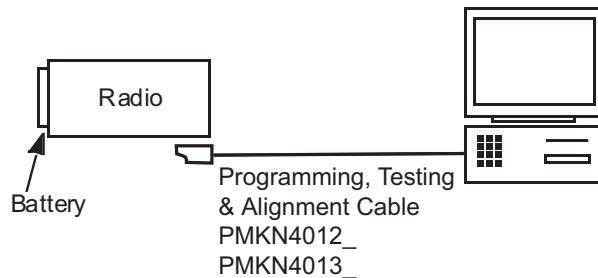


Figure 4-1. CPS Programming Setup

4.3 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 personnel to suggest improvements in system configurations or to help isolate problems.

4.4 Radio Tuning Setup

A personal computer (PC), Windows 2000/XP and a 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 setup as shown in Figure 4-2.

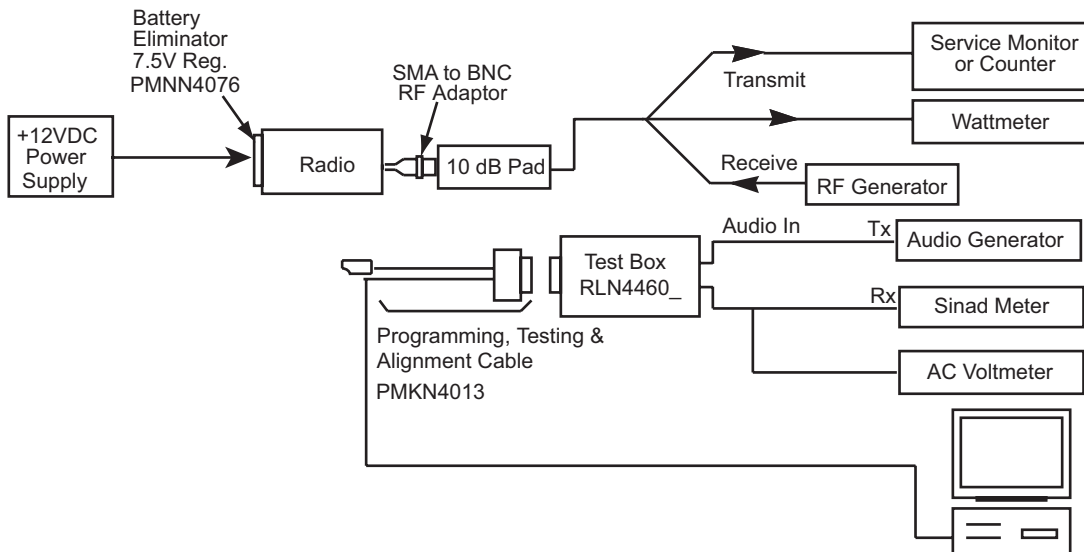


Figure 4-2. Radio Tuning Equipment Setup

Chapter 5 Disassembly/Reassembly Procedures

5.1 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.
- Repair procedures and techniques.

5.2 Preventive Maintenance

Periodic visual inspection and cleaning is recommended.

5.2.1 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.

5.2.2 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 (100% by volume).



Caution

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

Cleaning External Plastic Surfaces

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 (100%) 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).

5.3 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 CMOS CAUTION paragraph in the Disassembly and Reassembly section of the manual.

DO NOT attempt to disassemble the radio without first referring to the following CAUTION statement.



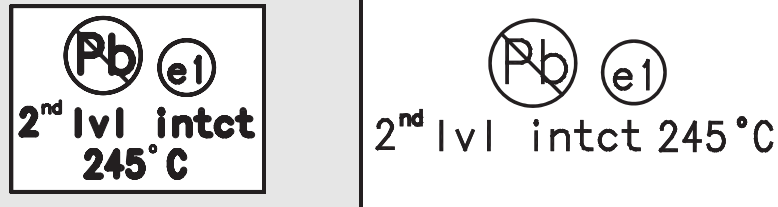
Caution

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 Motorola Static Protection Assembly (part number 0180386A82), which includes 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.

5.4 Repair Procedures and Techniques – General

NOTE Environmentally Preferred Products (EPP) (refer to the marking on the printed circuit boards — examples shown below) were developed and assembled using environmentally preferred components and solder assembly techniques to comply with the European Union's **Restriction of Hazardous Substances (ROHS) Directive 2002/95/EC** and **Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC**. To maintain product compliance and reliability, use only the Motorola specified parts in this manual.



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 table:

Table 5-1. Lead Free Solder Wire Part Number List

Motorola 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%	217C	52171	0.015"	1lb spool

Table 5-2. Lead Free Solder Paste Part Number List

Motorola Part Number	Manufacturer Part Number	Viscosity	Type	Composition & Percent Metal	Liquid Temperature
1085674C03	NC-SMQ230	900-1000KCPs Brookfield (5rpm)	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 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 (RPSO) listed in [Appendix A](#) of this manual.

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 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.

5.5 Disassembling and Reassembling the Radio — General

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.

The following tools are required for disassembling the radio:

- TORX™ T6 screwdriver
- Knob Removal Tool (6671789L02)

The following item and tools are required for reassembling the radio:

- Grease (1185937A01)
- TORX™ T6 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

If a unit requires further testing or service than is customarily performed at the basic level, please send the radio to a Motorola Service Center listed in Appendix B.



Caution

To assure the safety and regulatory compliance of the XPR 6580 IS (IECEX/ CSA 800/900 & CSA 157 800/900), the radio must be repaired only at Motorola service facilities. Please call Motorola at 800-422-4210 for the address and contact information of your nearest service center

5.6 Radio Disassembly – Detailed

5.6.1 Front Cover from Chassis Disassembly

1. Turn off the radio.
2. Unscrew the fastener screw.
3. Pull the dust cover upward to remove it.

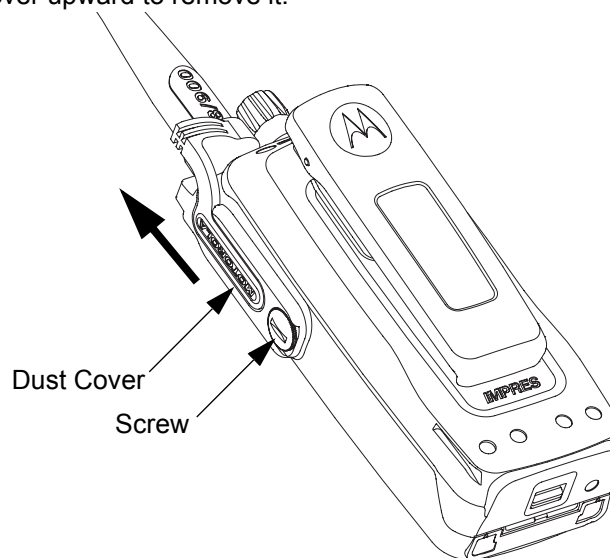


Figure 5-1. Dust Cover removal.

4. 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.

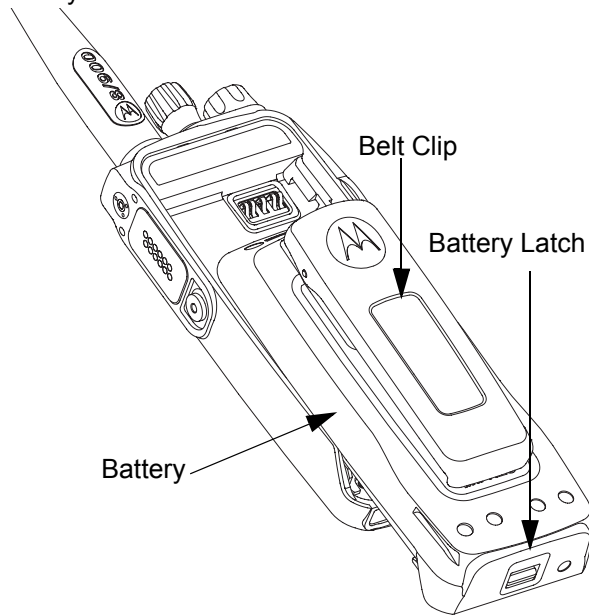


Figure 5-2. Battery and Antenna removal.

5. Remove the antenna by turning it counterclockwise.
6. Remove the volume and channel selector knobs off from their shafts using the knob removal tool.

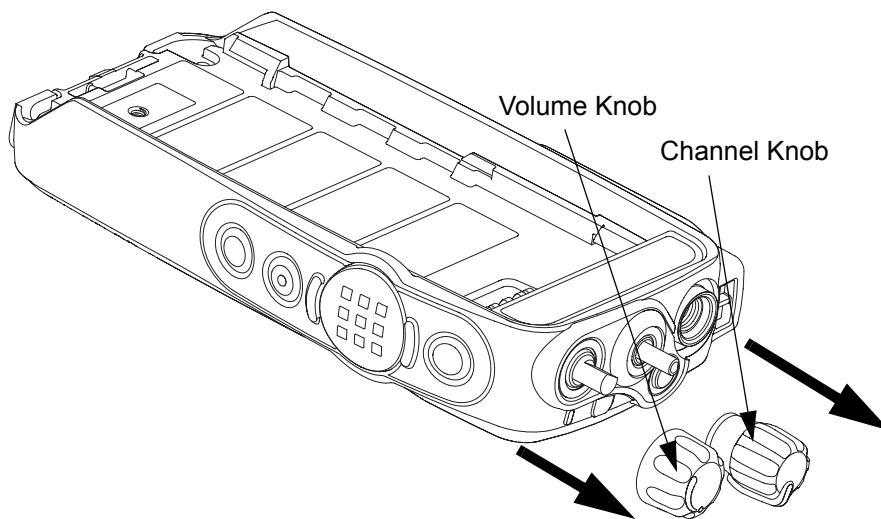


Figure 5-3. Knob removal.

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

7. Separate the chassis from the internal electronics front cover assembly as follows:
 - a. Unscrew the screws using the TORX™ T6 screwdriver.

- b. Release the chassis slightly upward and disconnect the board-to-board connector between the option board and the keypad flex.
- c. Remove the chassis from the front cover.

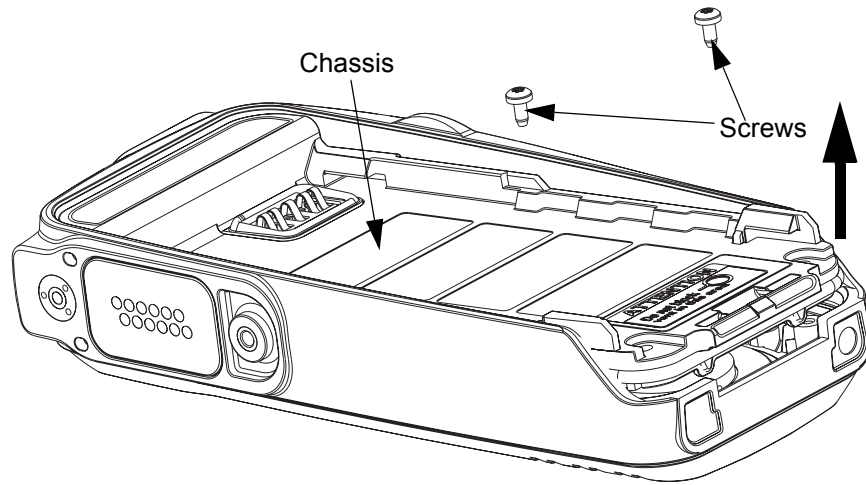


Figure 5-4. Chassis removal.

5.6.2 Chassis Disassembly

1. Display Module Disassembly
 - a. Release the display retainer catch and disconnect the board-to-board connector between the display flex and the transmission board, subsequently remove the display module.

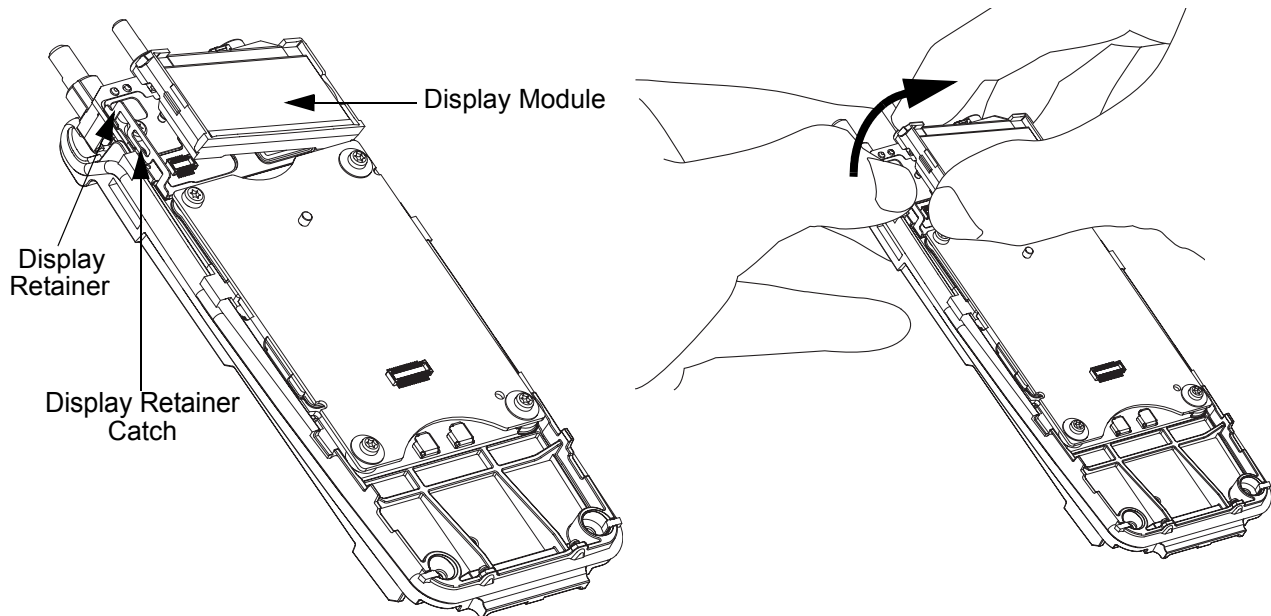


Figure 5-5. LCD Module removal.

- b. Remove the two screws using the TORX™ T6 screwdriver.
 - c. Remove the display retainer.

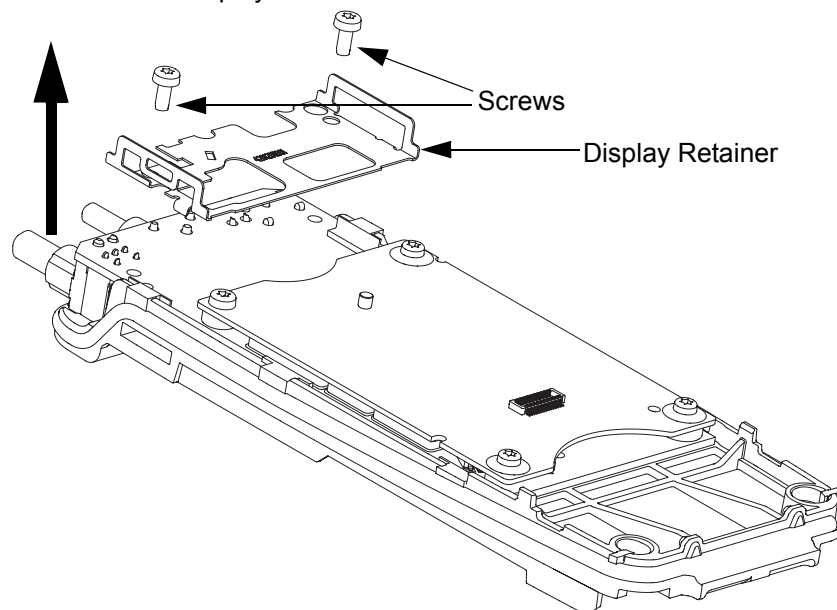


Figure 5-6. LCD Retainer removal.

2. Use the TORX™ T6 screwdriver to remove the four screws holding the transmission board and interface board.
3. Lift up the interface and transmission board to remove.

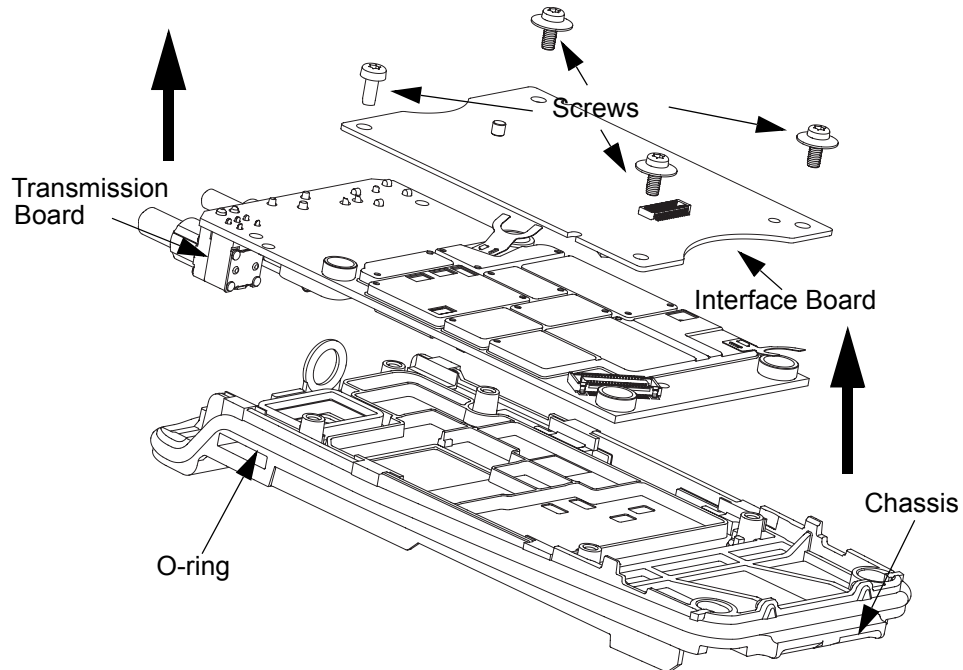


Figure 5-7. Transmission and Interface Board removal.

4. Release all the tabs from the catches.
5. Remove O-ring and battery contact seal.

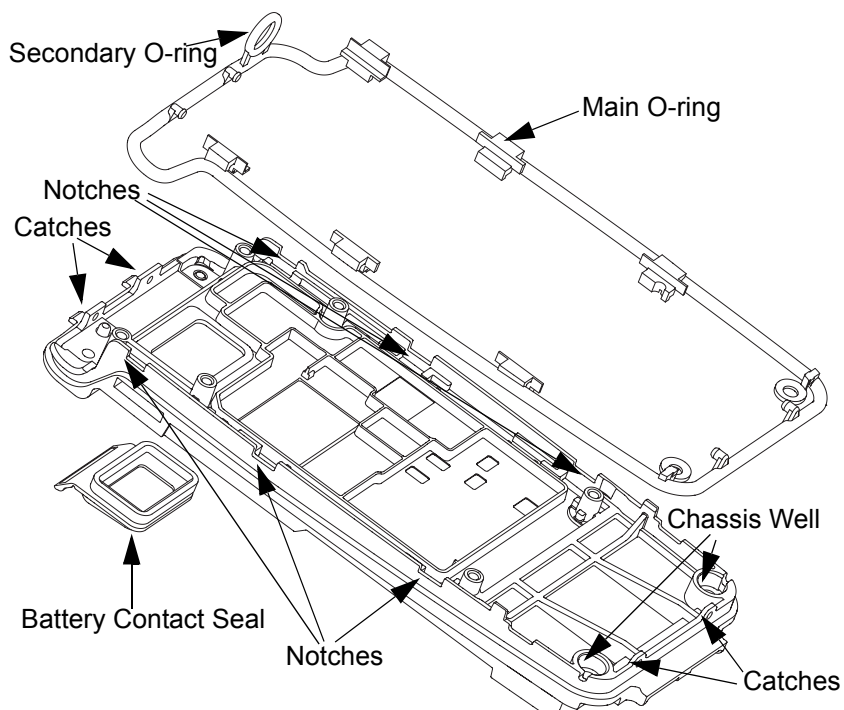


Figure 5-8. O-ring and Battery Contact Seal removal.

5.6.3 Speaker Disassembly

1. Remove the screws using the TORX™ T6 screwdriver.
2. Remove the speaker retainer and subsequently the speaker.

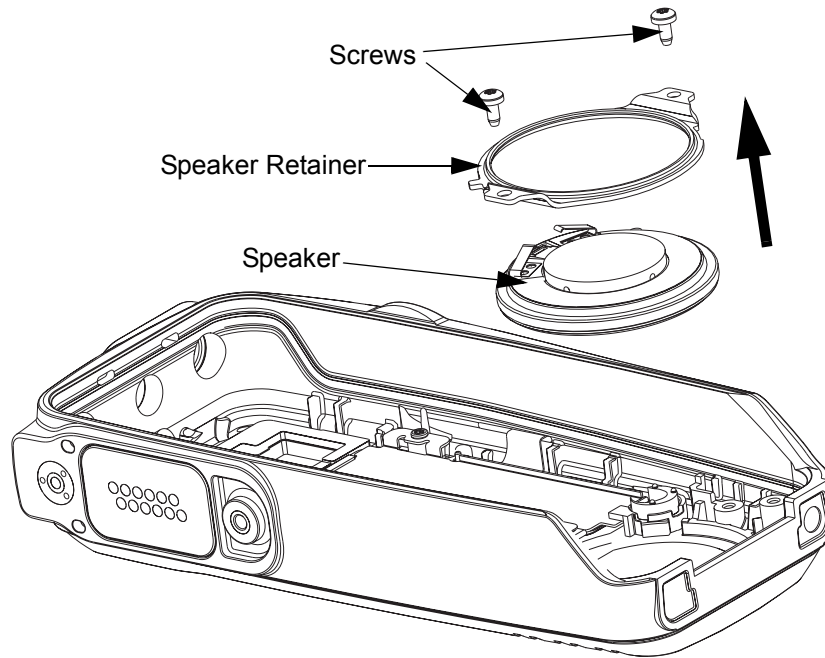


Figure 5-9. Speaker removal.

5.7 Radio Reassembly – Detailed



Caution

Adhere strictly to ALL reassembly procedures to ensure radio immersibility.

5.7.1 Speaker Reassembly

1. Place the speaker onto the front cover with the orientation tab aligned with the orientation slot on the front cover.
2. Place speaker retainer in the correct orientation.
3. Fasten the screws using TORX™ T6 screwdriver.

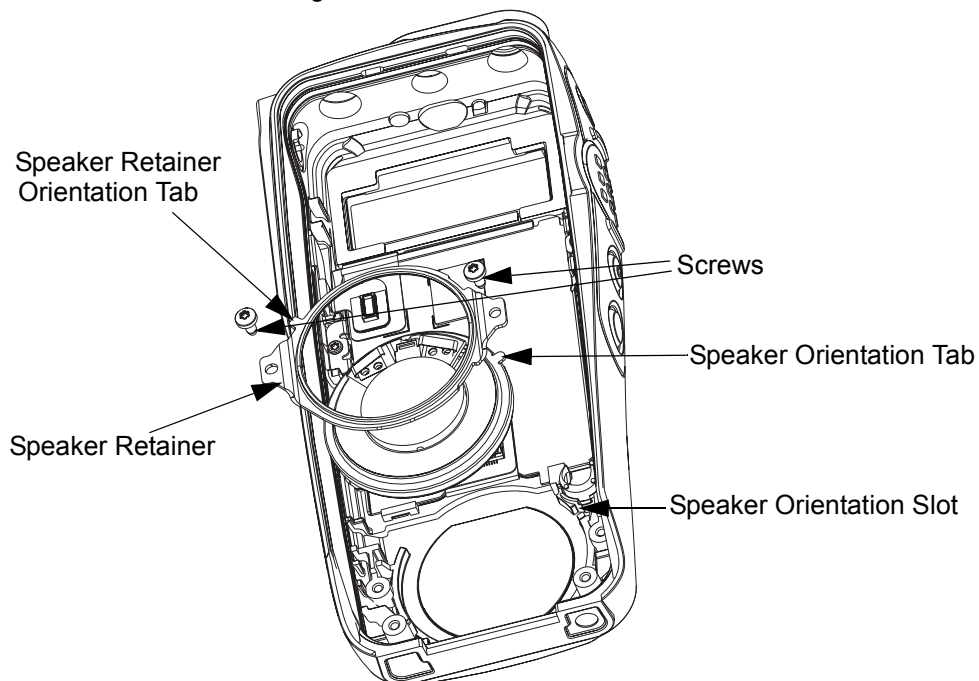


Figure 5-10. Speaker reassembly (Display Model).

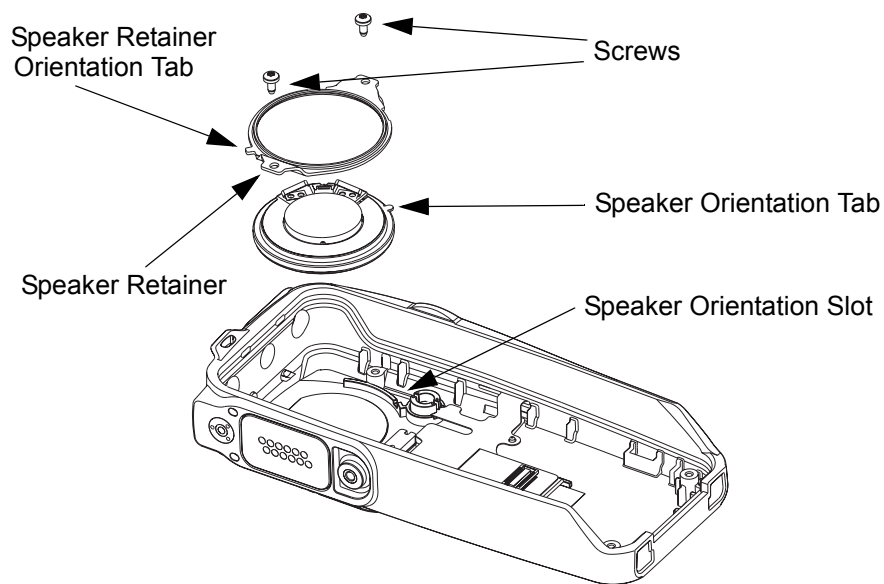


Figure 5-11. Speaker reassembly (Non-Display Model).

5.7.2 Chassis Reassembly

1. Fit the battery contact seal onto the battery contact slot.
2. Refer to Figure 5-12 to fit the main O-ring onto the chassis in the following sequence:
 - i. Ensure that the main O-ring is not twisted and untangle it to its actual form if needed before performing reassembly.
 - ii. Secure **A1** into the top two notches on the chassis.
 - iii. Fit the top section of the main O-ring by inserting it into the grooves at the top two corners formed by the black retainers.
 - iv. Insert **B1** into the top two catches on the chassis.
 - v. Fit the bottom section of the main O-ring around the bottom two corners of the chassis.
 - vi. Secure **A2** into the remaining four notches on the chassis.
 - vii. Insert **C** into the chassis well and push to the bottom of the well to secure it.
 - viii. Insert **B2** into the bottom two catches on the chassis.

NOTE To maintain radio immersibility, it is recommended that the main O-ring be replaced although the existing one may appear undamaged. Be sure to replace the battery contact seal also if necessary.

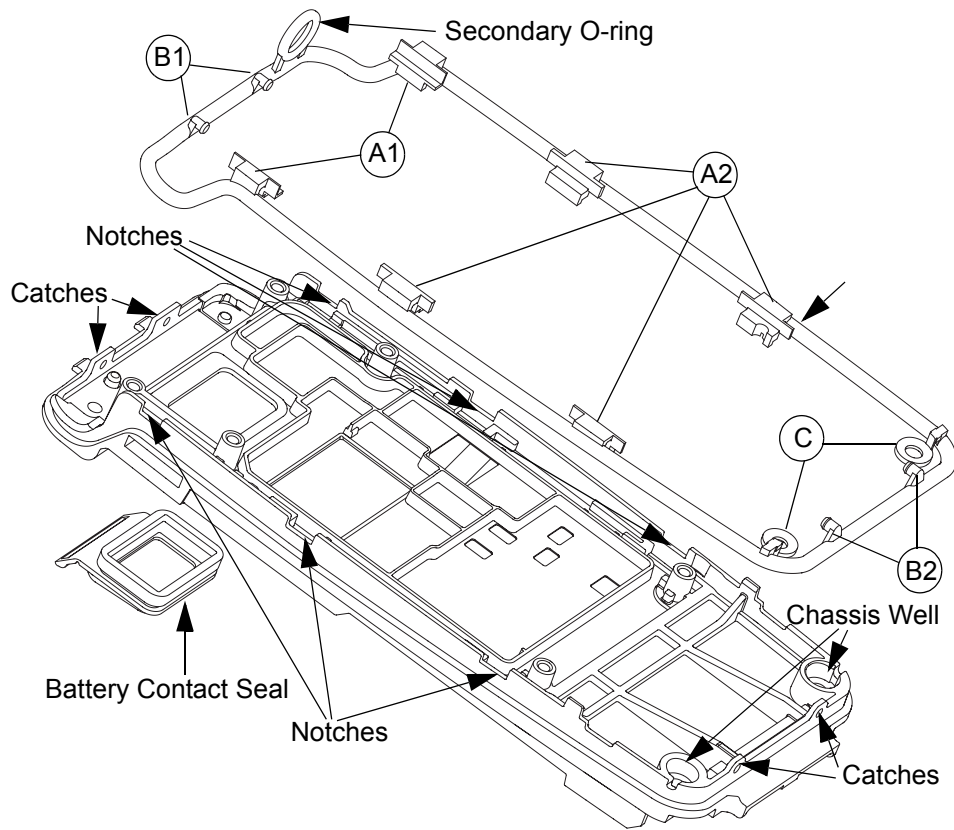


Figure 5-12. O-ring and Battery Contact Seal reassembly.

3. Fit the secondary O-ring onto the antenna nut securely.

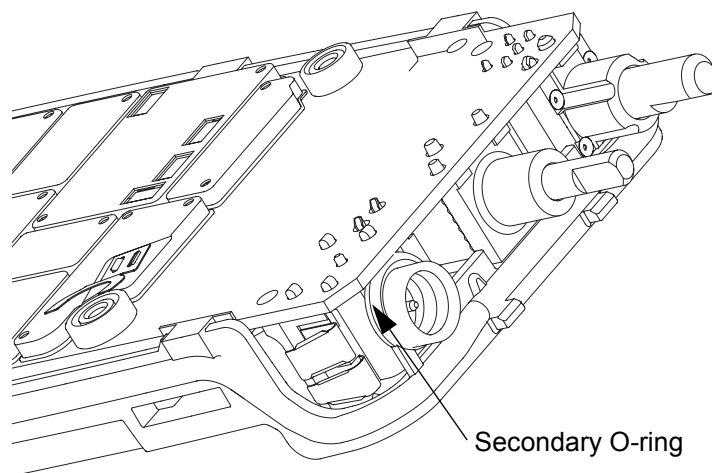


Figure 5-13. Secondary O-ring reassembly.

4. Place the transmission board onto the chassis.
5. Put on the interface board by connecting the board-to-board connectors between the interface and transmission board.
6. Fasten the screws using the TORX™ T6 screwdriver.

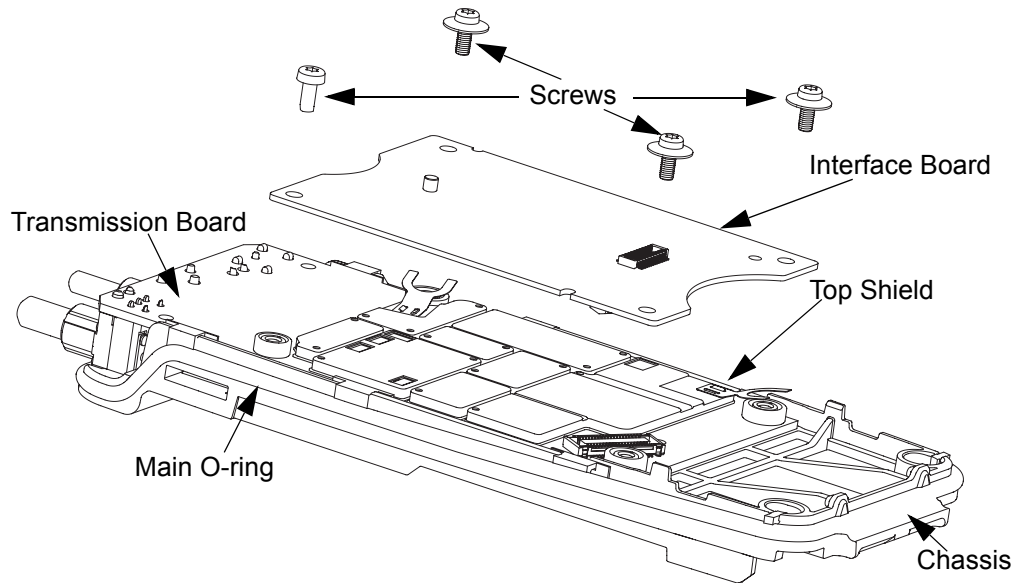


Figure 5-14. Transmission and Interface Board reassembly.

7. Place the display retainer.
8. Fasten the screws using the TORX™ T6 screwdriver.
9. Snap the display module onto the display retainer catch.

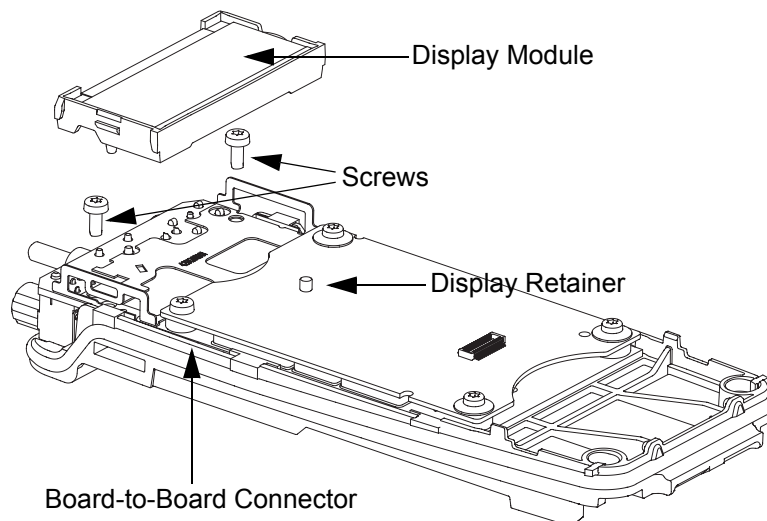


Figure 5-15. LCD Retainer and LCD Module reassembly.

5.7.3 Chassis and Front Cover Reassembly

1. Slide in the volume and channel shafts into the top slot.
2. Connect the board-to-board connector between the keypad flex and the transmission board.
3. Insert top chassis tabs into recesses on front cover and apply some force until tabs are fully inserted.
4. Apply some grease at the bottom portion of the main O-ring.
5. Gently push the chassis onto the front cover.

NOTE Take necessary precautions while performing step 5 of See Section 5.7.3: Chassis and Front Cover Reassembly to prevent visible outward pinches of the main O-ring.

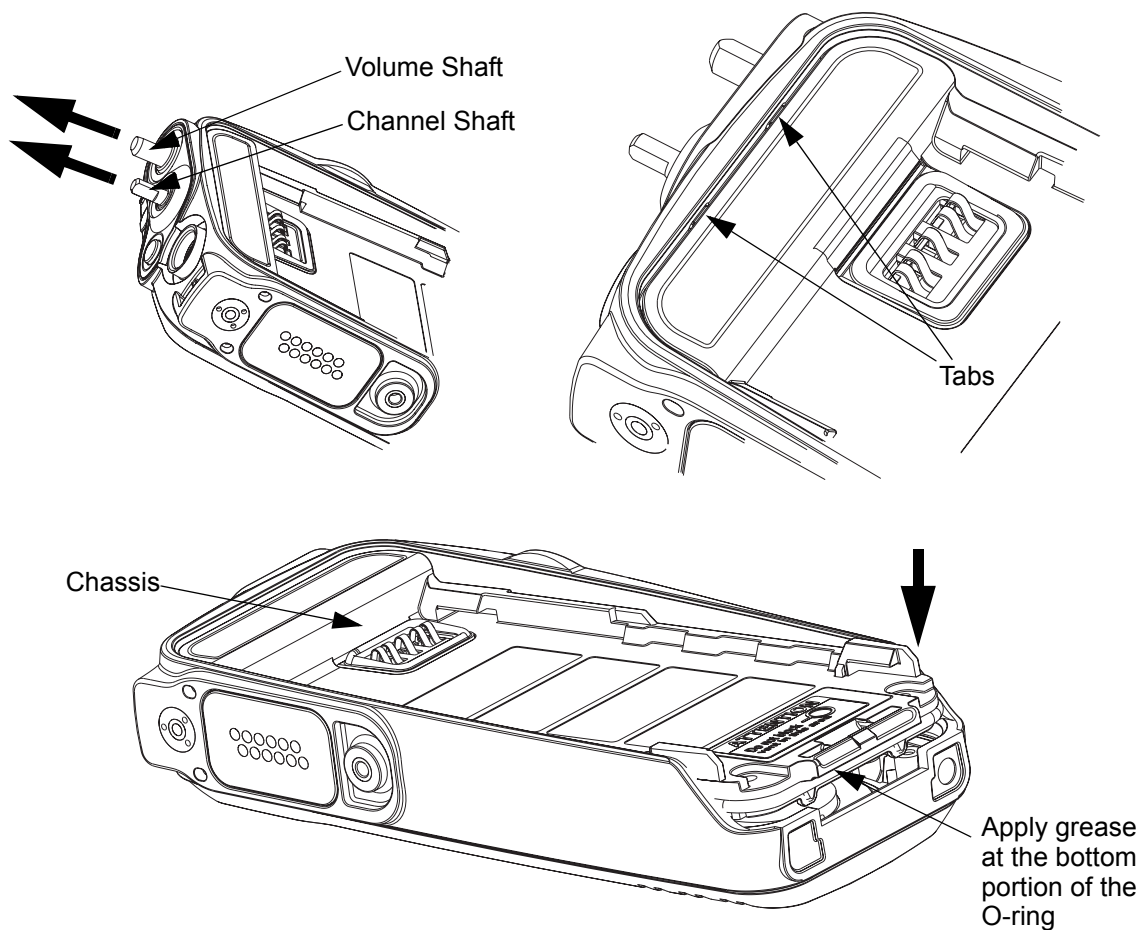


Figure 5-16. Back Cover Kit reassembly.

6. A visual inspection into the two screw holes will reveal blockage by a pinched O-ring in that area which requires the chassis to be re-inserted into the front cover. See "Chassis and Front Cover Reassembly" on page 5-15.

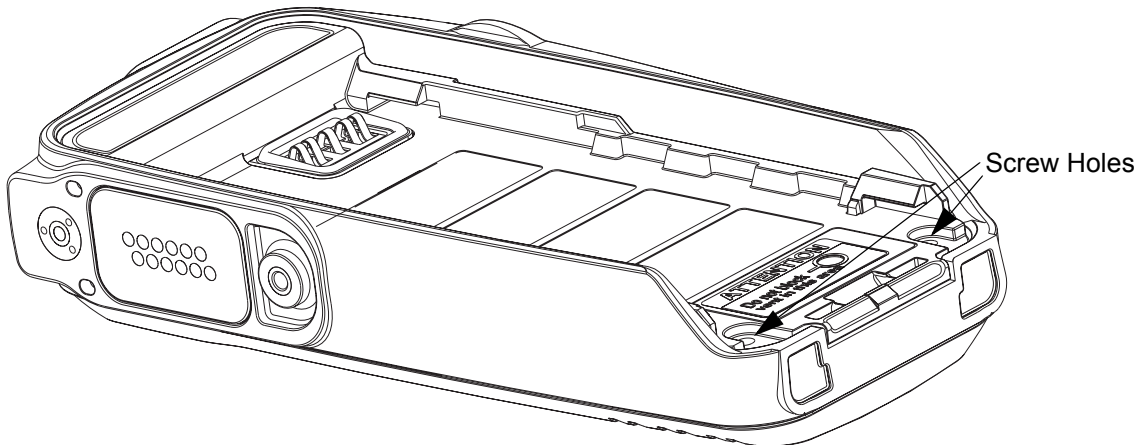


Figure 5-17. Chassis to Front Cover reassembly.

7. Fasten the screws using TORX™ T6 screwdriver.
8. Reassemble knobs.



Caution

If the antenna needs to be replaced, ensure that only MOTOTRBO antennas are used. Neglecting this would damage your radio. See Chapter 7: Accessories for a list of available antennas.

5.8 Ensuring Radio Immersibility

This section discusses radio immersibility concerns, tests, and disassembly and reassembly of the XPR series radios.

5.8.1 Servicing

The XPR series radios shipped from the Motorola factory have passed vacuum testing and should be capable of restoring the watertight integrity of the radio.



Caution

It is strongly recommended that the maintenance of the radio be deferred to qualified service personnel and service shops. This is of paramount importance as irreparable damage to the radio can result from service by unauthorized persons. If disassembly is necessary, unauthorized attempts to repair the radio may void any existing warranties or extended performance agreements with Motorola. It is also recommended that immersibility be checked annually by qualified service personnel/workshop that is authorized by Motorola.

5.8.2 Accidental Immersion

If the radio is accidentally dropped in water, shake the radio to remove the excess water from the speaker grille and microphone port area before operating; otherwise, the sound may be distorted until the water has evaporated, or is dislodged from these areas.

5.8.3 Specialized Test Equipment

This section summarizes the specialized test equipment necessary for testing the integrity of the XPR series radios.

To ensure that the radio is truly a watertight unit, special testing, test procedures, and specialized test equipment are required. The special testing involves a vacuum check of the radio and pressure testing (troubleshooting) for water leaks if the vacuum check fails. The specialized test equipment/instrument (Table 2-2 on page 2-2) is authorized by Motorola and needed to perform the vacuum check and pressure testing, if required. Any equipment/tools/instruments not mentioned in the table must not be used to perform these test.

5.8.4 Vacuum Pump Kit NLN9839

The vacuum pump kit includes a vacuum pump with gauge, and a vacuum hose. A connector fitting (part number 5871134M01) and fitting seal (part number 3271133M01) pump connector, which must be ordered separately, connects the vacuum hose to the radio's chassis.

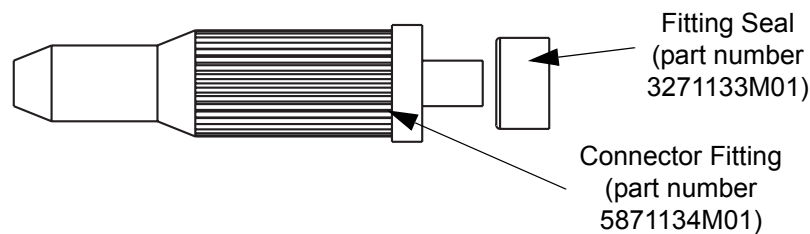


Figure 5-18. Connector Fitting - Fitting Seal Pump Connector

5.8.5 Pressure Pump Kit NTN4265

The pressure pump kit includes a pressure pump with gauge, and a pressure hose. As with the vacuum pump kit above, the connector fitting - fitting seal pair connects the pressure hose to the radio's chassis.

5.8.6 Miscellaneous Hardware

Other items needed for testing the immersibility radio include:

- Large water container
- Deionized (DI) water
- A supply of replacement parts: Main seal O-ring, Battery Contact Seal, Breathing Vent Label and Breathing Vent Membrane. (Refer to Section 5.9.1 "Display Model Exploded View and Parts List" on page 5-26 or Section 5.9.2 "Non-Display Model Exploded View and Parts List" on page 5-28.)

5.8.7 Vacuum Test

The vacuum test uses a vacuum pump and gauge. The pump creates a vacuum condition inside the radio, and the gauge monitors the radio for a stable vacuum reading; that is, checking for a properly sealed, watertight unit. Before starting the vacuum test:

- Remove the battery.
- Remove the universal connector dustcover to expose the universal connector.
- Remove the breathing vent label and breathing vent membrane.

To conduct the vacuum test:

1. Attach antenna firmly to the radio.
2. Attach the vacuum hose to the vacuum pump. Check the pump and hose for leaks by blocking off the open end of the hose and operating the pump a few times. The actual reading of the gauge at this point is not important; it is important that the gauge pointer remained steady, indicating no vacuum leaks in the pump.
3. Ensure that the fitting seal is attached to the hose-to-chassis pump connector. Screw the pump connector into the tapped hole in the chassis.
4. Attach the open end of the hose to the pointed end of the pump connector.
5. Place the radio on a flat surface with the chassis facing upward.
6. Operate the pump until the gauge indicates 6 in. Hg of vacuum on the radio. Observe the gauge for approximately 1 minute.
 - If the needle falls 0.5 in. Hg or less (one scale interval, for example, from 6 in. Hg to 5.5 in. Hg), then the radio has passed the vacuum test and is approved for immersibility. No additional testing will be required.
 - If the needle falls more than 0.5 in. Hg (one scale interval, for example, from 6 in. Hg to less than 5.5 in. Hg), then the radio has failed the vacuum test and the radio might leak if immersed. Additional troubleshooting of the radio will be required; complete this procedure, then go to Section 5.8.8 "Pressure Test".
7. Remove the vacuum hose and pump connector from the radio.

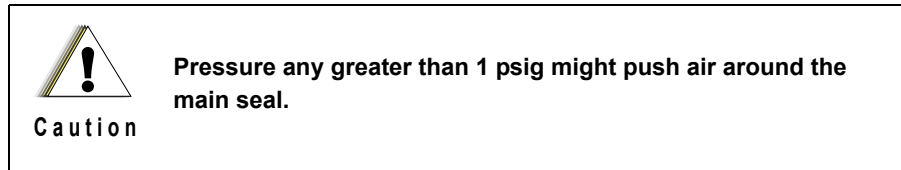
5.8.8 Pressure Test

Pressure testing the radio is necessary only if the radio has failed the vacuum test. Do not perform the pressure test until the vacuum test has been completed. Pressure testing involves creating a positive pressure condition inside the radio, immersing the radio in water, and observing the radio for a stream of bubbles (leak). Since all areas of the radio are being checked, observe the entire unit carefully for the possibility of multiple leaks before completing this test.

To conduct the pressure test:

1. Screw the pump connector (with fitting seal) into the tapped hole in the chassis.
2. Attach one end of the pressure hose to the pump connector and the other end to the pressure pump.
3. Attach antenna firmly to the radio.

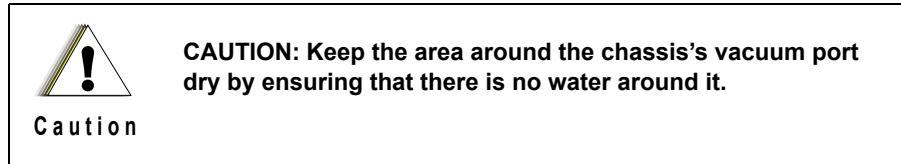
4. Operate the pump until the gauge reads approximately 1 psig.



5. Maintain the pressure at 1 psig and immerse the radio into a water-filled container.
6. Watch for any continuous series of bubbles. A stream of bubbles indicates a sign of leakage.

NOTE Some air entrapment may cause the accumulation of bubbles, especially in the grille area, but the bubbles should not be continuous.

7. Note all of the seal areas that show signs of leakage. Pinpoint the problem(s) to one (or more) of the following areas:
 - Front Housing
 - Chassis (Main Seal O-ring)
 - Battery Contact Seal
8. Remove the radio from the water container, and dry the radio thoroughly. Be especially careful to dry the area around the main seal to prevent contamination of the internal electronics while the unit is open.



9. Remove the pump connector from the chassis.
10. Radio after performing Pressure Test must undergo baking process in a temperature chamber for constant temperature soaking at 60°C for 1 hour. This is to ensure no moisture is trapped inside the radio and prevent contamination of the internal electronics after reassembling the radio.

5.8.9 Troubleshooting Leak Areas

Before repairing any leak, first read all of the steps within the applicable section. This will help to eliminate unnecessary disassembly and reassembly of a radio with multiple leaks. Troubleshoot only the faulty seal areas listed in Section 5.8.8 "Pressure Test" on page 5-18, and when multiple leaks exist, in the order listed.

NOTE Before reassembling the radio, always install a new Main seal O-ring, Battery Contact Seal in the defective area.

5.8.9.1 Front Housing

Do one or both of the following:

1. If a leak occurs at the Lens (Display Models only), Universal Connector, chassis/Housing

interface, PTT button area of the housing, replace the housing. Refer to Section 5.6 "Radio Disassembly – Detailed" on page 5-5.

- a. Remove the housing assembly from the radio.
 - b. Discard the housing assembly and main seal O-ring.
 - c. Install a new main seal O-ring around the chassis assembly according to Section 5.7.2 "Chassis Reassembly" on page 5-12.
 - d. Install a new housing assembly to the radio.
 - e. Inspect the main seal for proper seating.
 - f. Observe carefully to ensure that the main seal O-ring is not pinched between the housing and the chassis interface.
2. If the leak occurs at the control top area, remove the knobs in order to determine the leak location:
 - a. Conduct the Pressure Test.
 - b. Identify the leak location.

5.8.9.2 Chassis (Main Seal O-ring)

To replace the main seal O-ring:

1. Refer to Section 5.6.1 "Front Cover from Chassis Disassembly" on page 5-5, remove the chassis assembly from the radio.
2. Refer to Section 5.6.2 "Chassis Disassembly" on page 5-8, remove the Main Board from chassis.
3. Remove the main seal O-ring.
4. Inspect the seal area around the chassis for foreign material that might prevent the main seal O-ring from sealing properly.
5. Assemble a new O-ring; discard the old O-ring.
6. For detailed O-ring assembly sequence, refer to clause 2, step i. to step viii. of Section 5.7.2 "Chassis Reassembly" on page 5-12.
7. Reassemble the chassis assembly followed by installing into Front Cover. (Refer to Section 5.7 "Radio Reassembly – Detailed" on page 5-11).
8. Inspect the main seal O-ring for proper seating. Observe carefully to ensure that the main seal O-ring is not pinched between the housing and the chassis.

NOTE When installing the assembled chassis to the Front Cover, ensure the O-ring at the top two corners are not dislodged from the chassis groove.

5.8.9.3 Battery Contact Seal

To replace the Battery Contact Seal:

1. Refer to Section 5.6 "Radio Disassembly – Detailed" on page 5-5 to remove the Battery Contact Seal.
2. Remove the Battery Contact Seal from the Chassis.
3. Inspect the Battery Contact Seal, Chassis and surrounding areas for foreign material that might prevent the Battery Contact Seal from sealing properly.
4. Install a new Battery Contact Seal; discard the old Seal.

5. Replace a new main seal O-ring; discard the old O-ring.
6. Reassemble the chassis assembly followed by installing into Front Cover. (Refer to Section 5.7 "Radio Reassembly – Detailed" on page 5-11).
7. Inspect the main seal O-ring for proper seating. Observe carefully to ensure that the main seal O-ring is not pinched between the housing and the chassis.

IMPORTANT: Both Breathing Vent Label (3371478L01) and Breathing Vent Membrane (3286058L01) need to be replaced after vacuum test, pressure test or water leakage troubleshooting.

5.8.9.4 Breathing Vent Membrane and Breathing Vent Label

To replace the Breathing Vent Membrane and Breathing Vent Label:

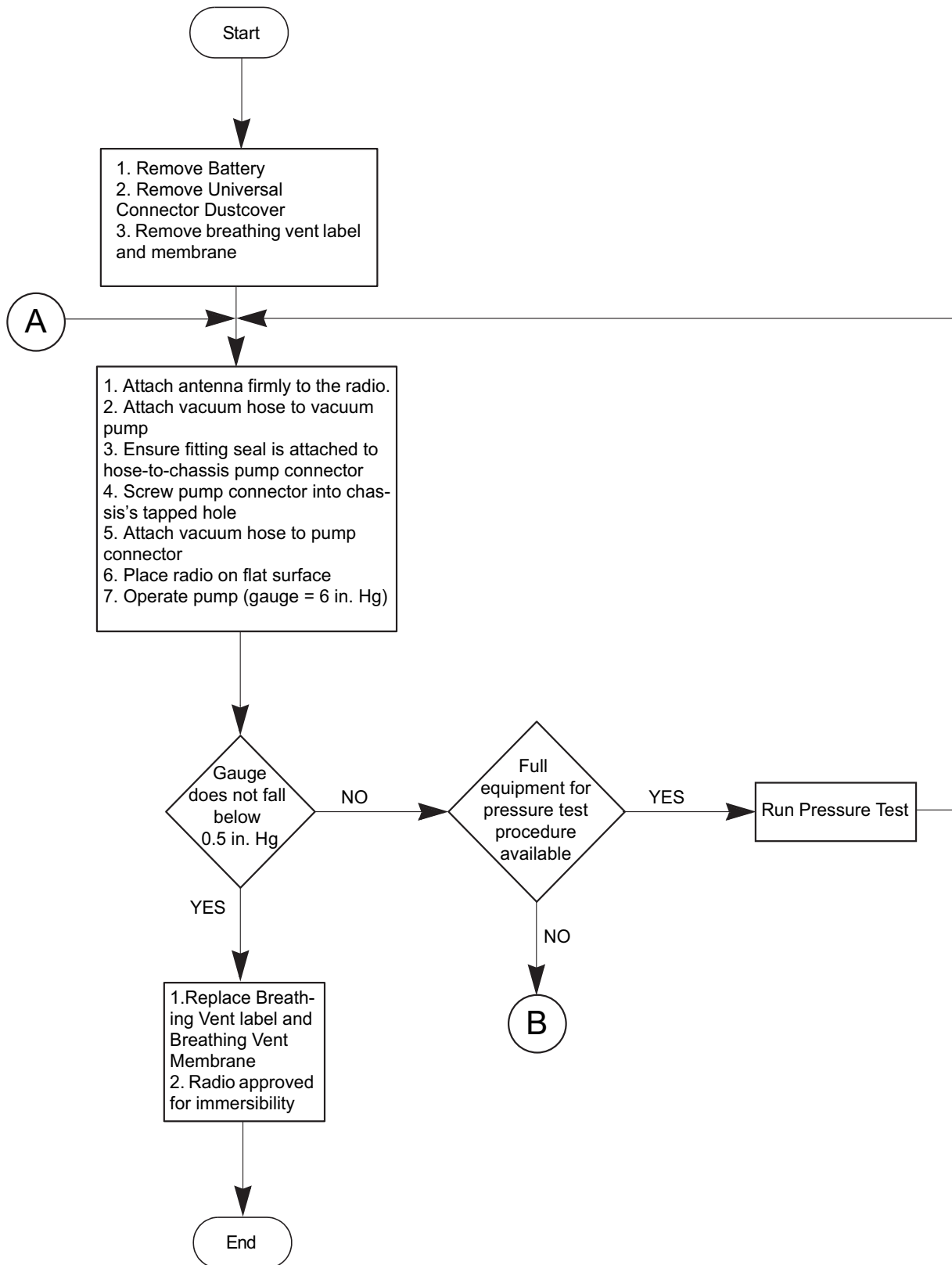
1. Remove the Breathing Vent Label that covers the Breathing Vent Membrane from the chassis.
2. Remove the Breathing Vent Membrane.
3. Ensure that the chassis's surface (at the Breathing Vent Label & Breathing Vent Membrane recessed) is clean, no/minimum scratches and free from any adhesive or other foreign materials.
4. Install a new Breathing Vent Membrane, covering the vent port hole, in the small recessed area in the chassis. Ensure that no oily substance come in contact with the seal.
5. Install a new Breathing Vent Label over the Breathing Vent Membrane in the larger recessed area in the chassis. Press down evenly over the label's surface to ensure good adhesion.

5.8.9.5 Battery Maintenance

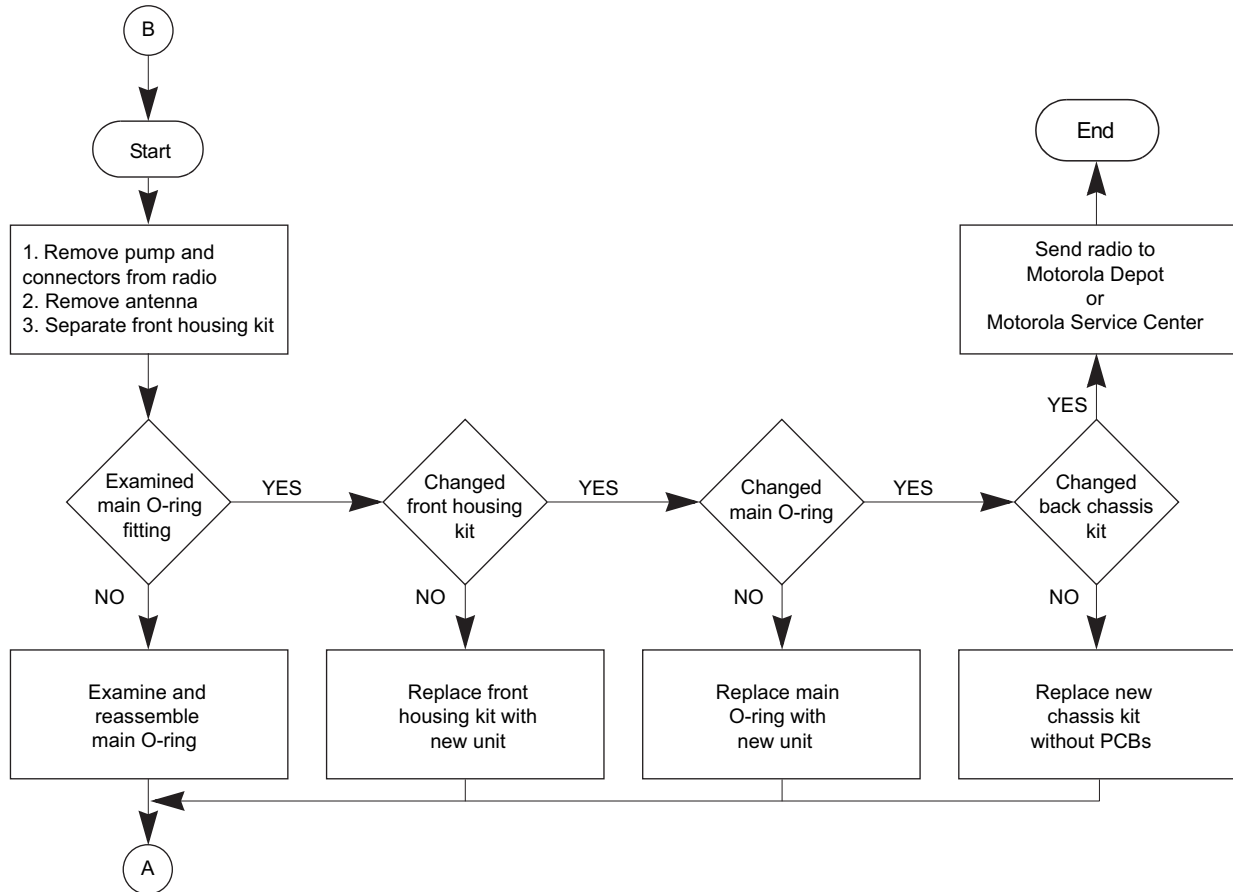
1. As part of an Annual Battery Maintenance Program or as required (when the battery contacts are dirty or show signs of wear) it is recommended that the Battery's Radio-side and Charger-side contacts are cleaned with DeoxIT®GOLD cleaner/lubricant.
2. DeoxIT®GOLD (Supplier CAIG Labs, P/N G100P) cleaner/lubricant pen has been found to be very effective at cleaning and extending the life of the battery's contacts. DeoxIT®GOLD cleaner/lubricant is available at numerous electronics suppliers (Radio Shack, McMaster Carr, Fry's, etc.) and directly from manufacturer, CAIG Labs, at <http://www.caig.com>.
3. This pen based package is recommended as it provides better access to the recessed contacts of the battery. The pen's tip may need to be modified (trimmed on the sides) to improve penetration into the battery contact slots. Per the manufacturer's instructions, shake the pen until the fluid begins to flow and wipe the battery's contact surface with the felt tip. After cleaning, inspect the contact surfaces for signs of advanced wear.
4. Advanced contact wear is defined as wear through either the contact platings (gold and nickel) to the base metal (copper). Copper exposure is characterized by a distinctive orange-brown metal appearance surrounded by the silvery nickel underplate and gold top coat.
5. In some cases, a magnified (10x 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 a need for replacement. In instances where advanced wear is evident, the battery should be replaced.
6. After cleaning the contact areas of any foreign material, let the lubricant/cleaner dry for 2 minutes. Replace the battery on the radio and test for intermittency by moving the battery relative to the radio as might occur in regular use.

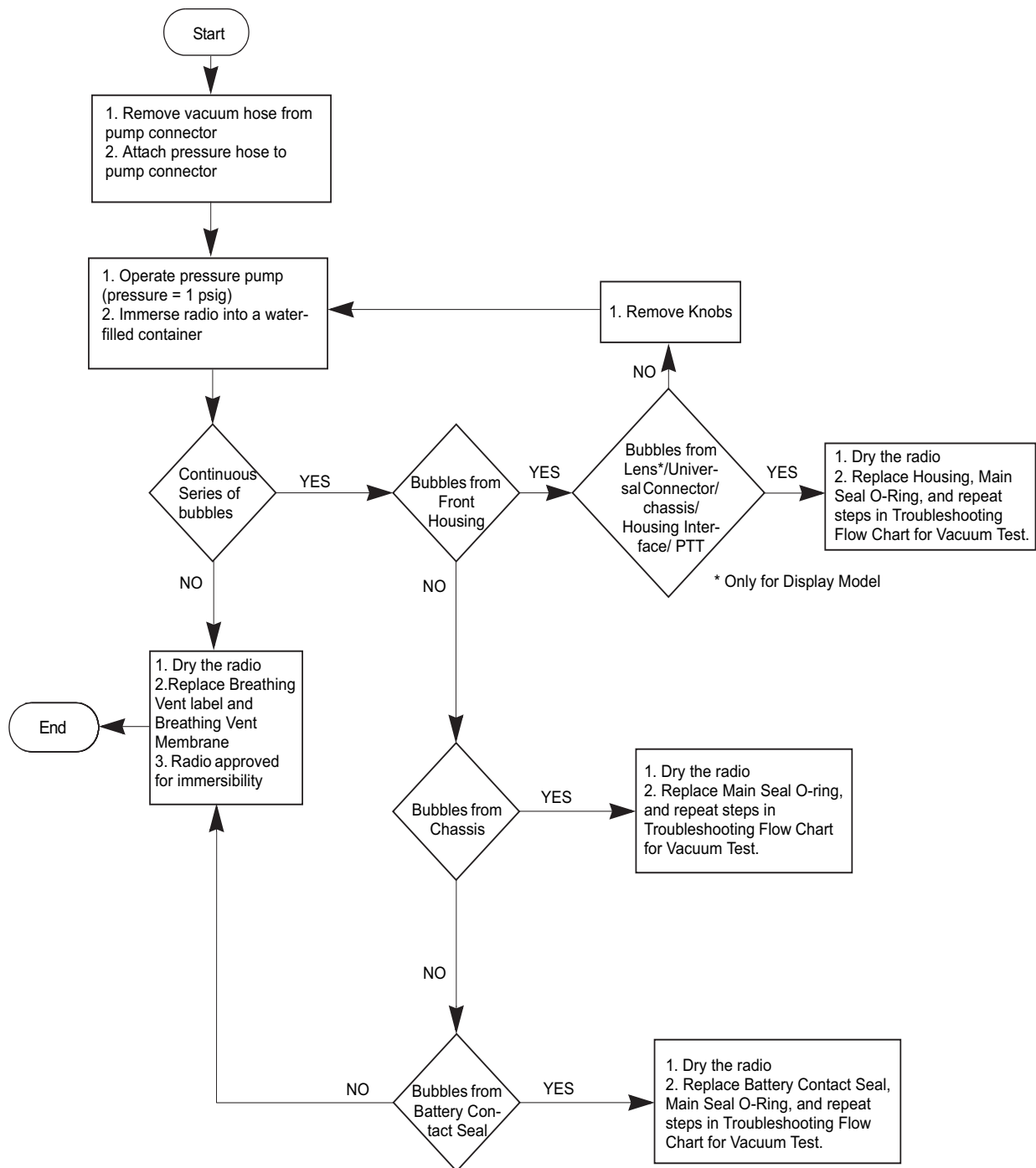
NOTE Regular maintenance (at least annually) of this area is recommended to ensure contamination free interface and to prolong the life of the battery contacts.

5.8.10 Troubleshooting Charts



Troubleshooting Flow Chart for Vacuum Test (Sheet 1 of 2)





Troubleshooting Flow Chart for Pressure Test & Leakage Areas

5.9 Radio Exploded Mechanical Views and Parts Lists

5.9.1 Display Model Exploded View and Parts List

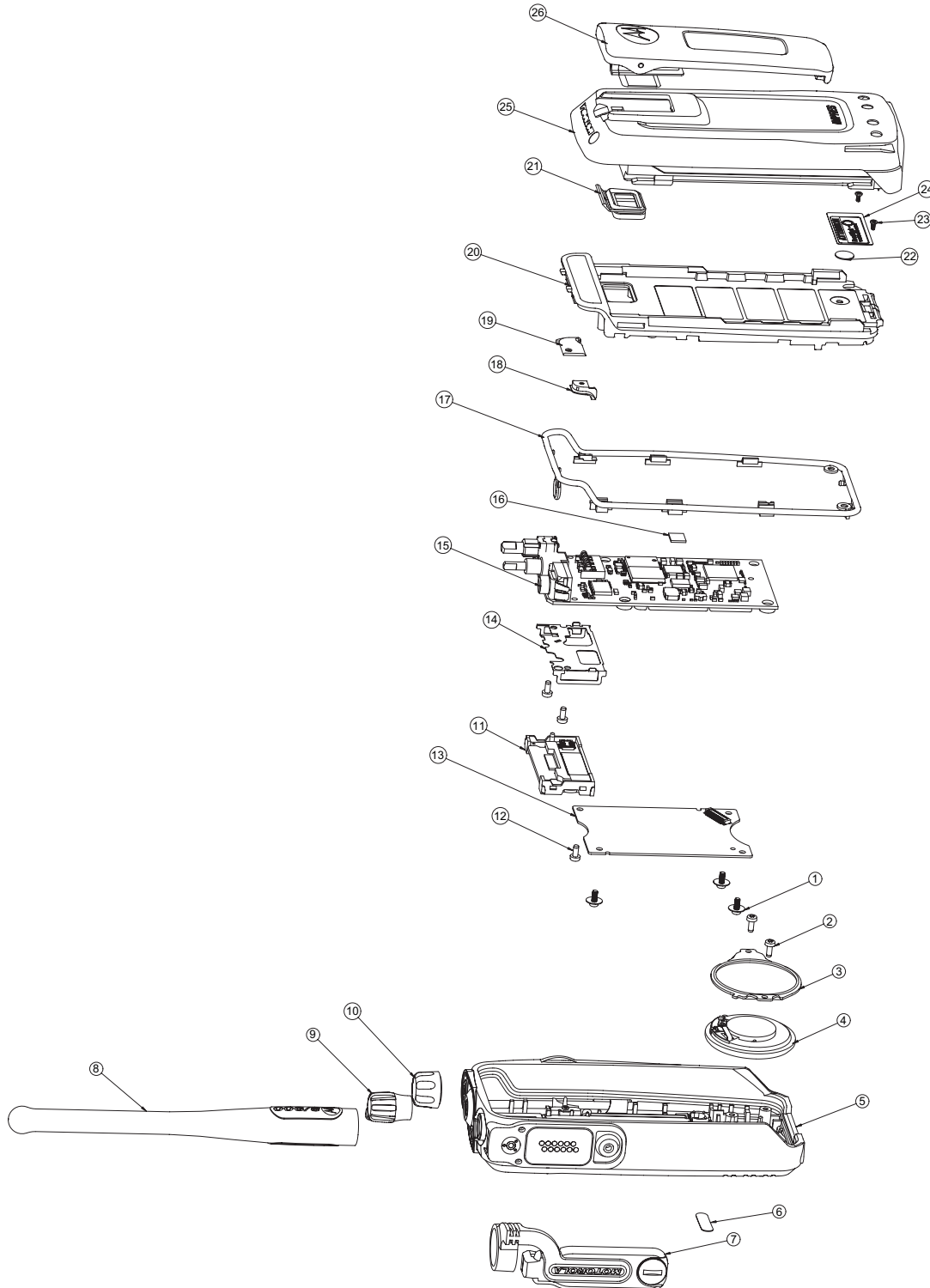


Figure 5-19. Display Model Exploded View

Table 5-3. Display Model Exploded View Parts List

Item	Description	Part Number
1	Screw with Washer	0371981L01
2	Screw, Speaker Retainer	0386434Z02
3	Retainer, Speaker	4271352L02
4	Speaker	5085798F09
5	Assembly, Front Housing	PMLN4646_
6	Nameplate for XPR 6580	3371390L13
7	Cover, Dust	1571477L01
8	Antenna	See Chapter 7: Accessories
9	Knob, Frequency	3615204H01
10	Knob, Volume	3615205H01
11	Module, Display	7215182H02
12	Screw	0386104Z04
13	Board, Interface: i) Secondary Board Assembly ii) Generic Option Board	0104032J18 PMLN5496_S
14	Retainer, Display	42012011001
15	Back Cover Kit	See Section 1.4: Model Charts
16	Pad, Thermal	75007104001
17	O-ring, Chassis	3215181H01
18	Retainer, O-ring	4216293H01
19	Retainer, O-ring	4216292H01
20	Assembly, Chassis Molded w/ MIP Shield	0104031J98
21	Seal, Battery Contact	3215177H02
22	Seal, Pot	32860581L01
23	Screw	0316281H01
24	Label, Pot Seal	3371478L01
25	Battery	See Chapter 7: Accessories
26	Belt Clip	See Chapter 7: Accessories

5.9.2 Non-Display Model Exploded View and Parts List

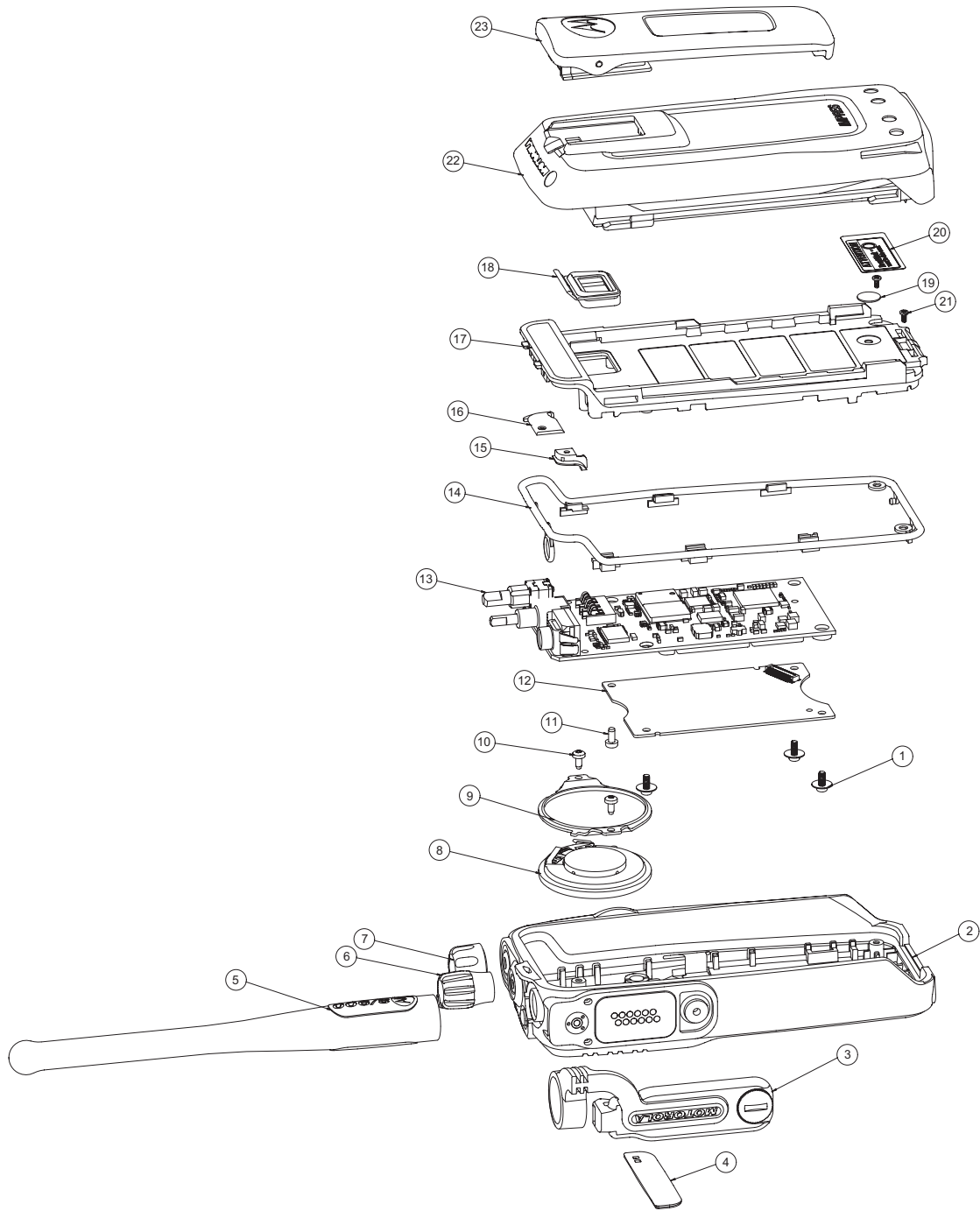


Figure 5-20. Non-Display Model Exploded View

Table 5-4. Non-Display Model Exploded View Parts List

Item	Description	Part Number
1	Screw with Washer	0371981L01
2	Assembly, Front Housing	PMLN4922_
3	Cover, Dust	1571477L01
4	Nameplate for XPR 6380	3371391L09
5	Antenna	See Chapter 7: Accessories
6	Knob, Frequency	3615204H01
7	Knob, Volume	3615205H01
8	Speaker	5085798F09
9	Retainer, Speaker	4271352L02
10	Screw, Speaker Retainer	0386434Z02
11	Screw	0386104Z04
12	Board, Interface: i) Secondary Board Assembly ii) Generic Option Board	0104032J18 PMLN5496_S
13	Back Cover Kits	Section 1.4: Model Charts
14	O-ring, Chassis	3215181H01
15	Retainer, O-ring	4216293H01
16	Retainer, O-ring	4216292H01
17	Assembly, Chassis Molded w/ MIP Shield	0104031J98
18	Seal, Battery Contact	3215177H02
19	Seal, Pot	32860581L01
20	Label, Pot Seal	3371478L01
21	Screw	0316281H01
22	Battery	See Chapter 7: Accessories
23	Belt Clip	See Chapter 7: Accessories

5.9.3 Torque Chart

Table 5-5 lists the various screws by part number and description, followed by the torque values in different units of measure. Torque all screws to the recommended value when assembling the radio.

Table 5-5. Torque Specifications for Screws

Part Number	Description	Driver/ Socket	Torque		
			N-m	lbs-in	kgf-cm
0386434Z02	Screw, M1.91 x 0.79 x 5.8 mm	T6 Torx	0.25	2.2	2.54
0316281H01	Screw, M2 x 0.8 x 6.3 mm	T6 Torx	0.25	2.2	2.54
0386104Z04	Screw, M2 x 0.4 x 4.5 mm	T6 Torx	0.25	2.2	2.54
0371981L01	Screw, M2 x 0.4 x 5.0 mm	T6 Torx	0.25	2.2	2.54

Chapter 6 Basic Troubleshooting

6.1 Introduction

This chapter contains error codes and board replacement procedures. If the board does not pass all the performance checks in Chapter 3 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 radio to a Motorola Service Center listed in Appendix B.

NOTE To access the various connector pins, use the housing eliminator/test fixture along with the diagrams found in this section of the manual. (See the section, "Service Aids" on page 2-2, for the appropriate Motorola service aids and tools parts numbers.)

6.2 Replacement Back Cover Kit Procedures

Once a problem has been isolated to a specific board, install the appropriate service kit (See Model Charts on page 1-5), which is orderable. from Motorola Radio Products and Solutions Organization at 1-800-422-4210.

- 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.

6.3 Power-Up Error Codes (Display Model only)

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. 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.

There are two classes of detectable errors, fatal and non-fatal. If it is considered as a fatal error, then the normal radio operation will be inhibited. 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 the user with a false sense of security that others are receiving his messages. Corrupted codeplug blocks of call IDs, or their associated aliases are considered non-fatal errors. While the user may be inconvenienced, normal communication is still possible.

Table 6-1. Power-Up Error Codes

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. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 01/88	Radio RAM Test Failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 01/90 or FAIL 02/90	General hardware test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/81	DSP ROM Checksum is wrong.	Fatal	Reprogram FLASH Memory, then retest. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/82	DSP RAM1 test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.

Table 6-1. Power-Up Error Codes (Continued)

Error Code	Description	Error Type	Corrective Action
FAIL 02/84	DSP RAM2 test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/88	DSP RAM test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/C0	DSP ROM Checksum is wrong.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
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.

NOTE A non-display radio emits only the Self Test Fail Tone if it fails the self-test.

6.4 Operational Error Codes

During radio operation, the radio performs dynamic tests to determine if the radio is working properly. Problems detected during these tests are presented as error codes on the radio's display. The presence of an error code should prompt a user that a problem exists and that a Motorola Authorized MOTOTRBO dealer should be contacted. Use Table 6-2 to aid in understanding particular operational error codes.

Table 6-2. Operational Error Codes

Error Code	Description	Error Type	Corrective Action
FAIL 001	Synthesizer Out-of-Lock	NON-FATAL	1. Reprogram the codeplug. 2. Refer to Detailed Service Manual.
FAIL 002	Personality checksum or system block error	NON-FATAL	Reprogram the codeplug.

Chapter 7 Accessories

7.1 Introduction

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

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

7.1.1 Audio

Part No.	Description
PMMN4025_	Remote Speaker Microphone with Enhanced Audio
RLN6075_	Remote Speaker Microphone Coil Cord Kit (for use with PMMN4025_)
PMMN4024_	Remote Speaker Microphone
PMMN4040_	Remote Speaker Microphone - Submersible (IP57)
RLN6074_	Remote Speaker Microphone Coil Cord Kit (for use with PMMN4024_ and PMMN4040_)
*PMMN4041_	Public Safety Microphone with Enhanced Audio - 30" Cable
*PMMN4042_	Public Safety Microphone with Enhanced Audio - 24" Cable
*PMMN4043_	Public Safety Microphone with Enhanced Audio - 18" Cable
RMN5058_	Lightweight Headset
PMLN5275_	Heavy Duty Noise Cancelling Headset (also for use with CSA 157 800/900)
RLN5878_	Receive Only Surveillance Kit, Black
RLN5879_	Receive Only Surveillance Kit, Beige
RLN5880_	2-Wire Surveillance Kit, Black with Enhanced Audio
RLN5881_	2-Wire Surveillance Kit, Beige with Enhanced Audio
RLN5882_	2-Wire Surveillance Kit with Clear, Comfortable Acoustic Tube, Black with Enhanced Audio
RLN5883_	2-Wire Surveillance Kit with Clear, Comfortable Acoustic Tube, Beige with Enhanced Audio
RLN4760_	Small Custom Earpiece, Right Ear, for Surveillance Kits
RLN4761_	Medium Custom Earpiece, Right Ear, for Surveillance Kits
RLN4762_	Large Custom Earpiece, Right Ear, for Surveillance Kits
RLN4763_	Small Custom Earpiece, Left Ear, for Surveillance Kits
RLN4764_	Medium Custom Earpiece, Left Ear, for Surveillance Kits
RLN4765_	Large Custom Earpiece, Left Ear, for Surveillance Kits

RLN5886_	Surveillance Low Noise Kit
PMMN4050_	IMPRES Noise Cancelling RSM with audio jack (for use with CSA157 800/900)
PMMN4067_	IMPRES ATEX CSA RSM (for use with XPR 6580 IS)
RLN6282_	Replacement Ear Tips, Clear - Pack of 25 (for use with RLN5886_)
RLN5887_	Surveillance High Noise Kit
5080384F72	Replacement Foam Plugs - Pack of 50 (for use with RLN5887_)
RLN4941_	Receive Only Earpiece (also for use with CSA 157 800/900)
AARLN4885_	Receive Only Earbud
WADN4190_	Over the Ear Receiver (for use with PMMN4024_ and PMMN4025_)
PMLN4620_	D-Shell Receive Only Earpiece
RLN6288_	Earpiece with High Noise Kit, Beige
RLN6289_	Earpiece with High Noise Kit, Black
RLN6279_	Standard Earpiece, Black
RLN6280_	Standard Earpiece, Beige
RLN6284_	Earpiece with Acoustic Tube Assembly, Beige
RLN6285_	Earpiece with Acoustic Tube Assembly, Black
RLN6283_	Replacement Foam Ear Pad and Windscreen
1571477L01	Accessory Dust Cover

7.1.2 Batteries

Part No.	Description
PMNN4069_	IMPRES Li-Ion 1400 mAh Submersible (IP57) Battery - Intrinsically Safe (FM)
PMNN4077_	IMPRES Li-Ion 2200 mAh Submersible (IP57) Battery
NNTN7789_	IMPRES Li-Ion 1750 mAh Submersible (IP67) Battery - Intrinsically Safe*
NNTN8287_	IMPRES Li-Ion 1750 mAh Submersible (IP67) Battery - Intrinsically Safe**

* For use with IECEx/CSA 800/900 only

** For use with CSA 157 800/900 only

7.1.3 Chargers

Part No.	Description
WPLN4232_	IMPRES Single Unit Charger
WPLN4212_	IMPRES Multi Unit Charger
WPLN4219_	IMPRES Multi Unit Charger with Displays

WPLN4226_	Single Unit Charger*
WPLN4211_	Multi Unit Charger, Non Display MUC*
WPLN4218_	Multi Unit Charger, Display MUC*

* For use with XPR 6580 IS only

7.1.4 Cables

Part No.	Description
PMKN4040_	Telemetry Cable
PMKN4012_	DMR Port PROG Cable
PMKN4013_	DMR Port Pro TST & Align Cable

7.1.5 Antennas

Part No.	Description
PMAF4003A_	800/900+ GPS Helical Antenna (806–941MHz)
PMAF4005_	800/900 + GPS Helical Antenna (806 - 941MHz) (IECEX/CSA 800/900 & CSA 157 800/900)

7.1.6 Carry Devices

Part No.	Description
PMLN4651_	Belt Clip for 2" Belt Width
PMLN4652_	Belt Clip for 2.5" Belt Width
PMLN5015_	Nylon Carry Case with 3" Fixed Belt Loop for Display Radio
PMLN5021_	Hard Leather Carry Case with 3" Fixed Belt Loop for Display Radio
PMLN5019_	Hard Leather Carry Case with 2.5" Swivel Belt Loop for Display Radio
PMLN5020_	Hard Leather Carry Case with 3" Swivel Belt Loop for Display Radio
PMLN5024_	Nylon Carry Case with 3" Fixed Belt Loop for Non-Display Radio
PMLN5030_	Hard Leather Carry Case with 3" Fixed Belt Loop for Non-Display Radio
PMLN5028_	Hard Leather Carry Case with 2.5" Swivel Belt Loop for Non-Display Radio
PMLN5029_	Hard Leather Carry Case with 3" Swivel Belt Loop for Non-Display Radio
PMLN5022_	2.5" Replacement Swivel Belt Loop
PMLN5023_	3" Replacement Swivel Belt Loop
HLN6602_	Universal Chest Pack
RLN4570_	Break-A-Way Chest Pack
1505596Z02	Replacement Strap for RLN4570 and HLN6602 Chest Packs
RLN4815_	Universal RadioPAK and Utility Case (fanny pack)

4280384F89	Universal RadioPAK Extension Belt
NTN5243_	Shoulder Strap (attaches to D-rings on carry case)
HLN9985_	Waterproof bag, includes large carry strap
RLN4295_	Small Clip, Epaulet Strap
4200865599	1.75" Wide Black Leather Belt
PMLN5606_	Display Hard Leather 3" Swivel BL*
PMLN5607_	Display Soft Leather 3" Swivel BL*
PMLN5610_	2.5" Replacement Swivel Belt Loop*
PMLN5611_	3.0" Replacement Swivel Belt Loop*
PMLN5134_	ATEX Belt Clip 2.5"*

* For use with XPR 6580 IS only

7.1.7 Service/Replacement Parts

Part No.	Description
PMNN4076_	Battery Eliminator
PMHN4085_	DMR Housing Eliminator
6671789L01	Knob Opener
6671789L02	Tool Knob Opener

7.1.8 CPS

Part No.	Description
RVN5115_	CPS MOTOTRBO

7.1.9 Miscellaneous Accessories

Part No.	Description
PMLN5496_S	Generic Option Board
PMLN5651_	Generic Option Board (XPR 6580 IS)
PMLN5649_	UC Dust Cover, MOTOTRBO ATEX CSA

Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

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.

A.2 Motorola Online

Motorola Online users can access our online catalog at

<https://www.motorola.com/businessonline>

To register for online access, please call 800-422-4210 (for U.S. and Canada Service Centers only). International customers can obtain assistance at <https://www.motorola.com/businessonline>

A.3 Mail Orders

Mail orders are only accepted by the US Federal Government Markets Division (USFGMD).

Motorola
7031 Columbia Gateway Drive
3rd Floor - Order Processing
Columbia, MD 21046
U.S.A.

A.4 Telephone Orders

The Radio Products and Solutions Organization*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (United States and Canada)

U.S. Federal Government Markets Division (USFGMD)
1-800-826-1913 Federal Government Parts - Credit Cards Only
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

The Radio Products and Solutions Organization*
(United States and Canada)
1-800-622-6210
847-576-3023 (United States and Canada)

USFGMD
(Federal Government Orders)
1-800-526-8641 (For Parts and Equipment Purchase Orders)

A.6 Parts Identification

The Radio Products and Solutions Organization*
(United States and Canada)
1-800-422-4210

A.7 Product Customer Service

Radio Products and Solutions Organization (United States and Canada)
1-800-927-2744

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

Appendix B Motorola Service Centers

B.1 Servicing Information

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 Service Center as listed below.

B.2 Motorola Service Center

45D Butterfield Trail
El Paso, TX 79906

Tel: 1-800-227-6772

B.3 Motorola Canadian Technical Logistics Center

Motorola Canada Ltd.
8133 Warden Avenue
Markham, Ontario, L6G 1B3

Tel: 800-543-3222

Fax: 888-331-9872 / 905-948-5970

B.4 Motorola Federal Technical Center

4395 Nicole Drive
Lanham, MD 20706

Tel: 800-969-6680

Fax: 800-784-4113

Notes

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.

Term	Definition
Analog	Refers to a continuously variable signal or a circuit or device designed to handle such signals.
Band	Frequencies allowed for a specific purpose.
CPS	Customer Programming Software: 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.
DPL	Digital Private-Line: A type of digital communications that utilizes privacy call, as well as memory channel and busy channel lock out to enhance communication efficiency.
FCC	Federal Communications Commission.
Frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
GPIO	General-Purpose Input/Output: Pins whose function is programmable.
GPS	Global Positioning System.
IC	Integrated Circuit: 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.
IF	Intermediate Frequency.
kHz	kilohertz: One thousand cycles per second. Used especially as a radio-frequency unit.
LCD	Liquid-Crystal Display: 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.
LED	Light Emitting Diode: An electronic device that lights up when electricity is passed through it.
MDC	Motorola Digital Communications.

Term	Definition
MHz	Megahertz: One million cycles per second. Used especially as a radio-frequency unit.
Paging	One-way communication that alerts the receiver to retrieve a message.
PC Board	Printed Circuit Board. Also referred to as a PCB.
PL	Private-Line Tone Squelch: 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).
RF	Radio Frequency: The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
RX	Receive.
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.
TOT	Time-out Timer: A timer that limits the length of a transmission.
TPL	Tone Private Line.
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.
TX	Transmit.
UHF	Ultra-High Frequency.
USB	Universal Serial Bus: An external bus standard that supports data transfer rates of 12 Mbps.
VIP	Vehicle Interface Port.
XPR	Refers to Digital Professional Radio model names in the MOTOTRBO Professional Digital Two-Way Radio System.



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