

COMMERCIAL DIGITAL TWO-WAY RADIOS



# MOTOTRBO SL SERIES SL300 PORTABLE BASIC SERVICE MANUAL





# Foreword

This manual covers all models of the SL300 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

<b>ATTENTION!</b> Before using this radio, read the guide enclosed with your radio which contains important operating instructions for safe usage and RF energy awareness and control for compliance with applicable standards and regulations.
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For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site:  
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## Notes



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## Document History

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

Edition	Description	Date
MN000922A01-AA	Initial Release	Sept. 2014

## Notes

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## Related Publications

MOTOTRBO SL300 Display User Guide (PDF Only).....	MN000895A01
MOTOTRBO SL300 Non-Display User Guide (PDF Only).....	MN000897A01
MOTOTRBO SL300 Portable Quick Reference Guide/Product Safety and RF Exposure .....	MN000902A01
Multi-Unit Charger User Guide .....	6866552D01

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**Notes**

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SL300 Portable Radios	24 Months
Product Accessories (Excluding Batteries and Chargers)	12 Months

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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. call Motorola at 1-800-927-2744 US/Canada.

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  - 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.

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- K. Normal and customary wear and tear.

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- B. that MOTOROLA will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and
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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.

Battery Lilon 2300mAh	12 Months
Chargers	12 Months

## Capacity Warranty

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

Battery Lilon 2300mAh	12 Months
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# 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** indicates a potentially hazardous situation which, if not avoided, might result in equipment damage.



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

## 1.2 Radio Description

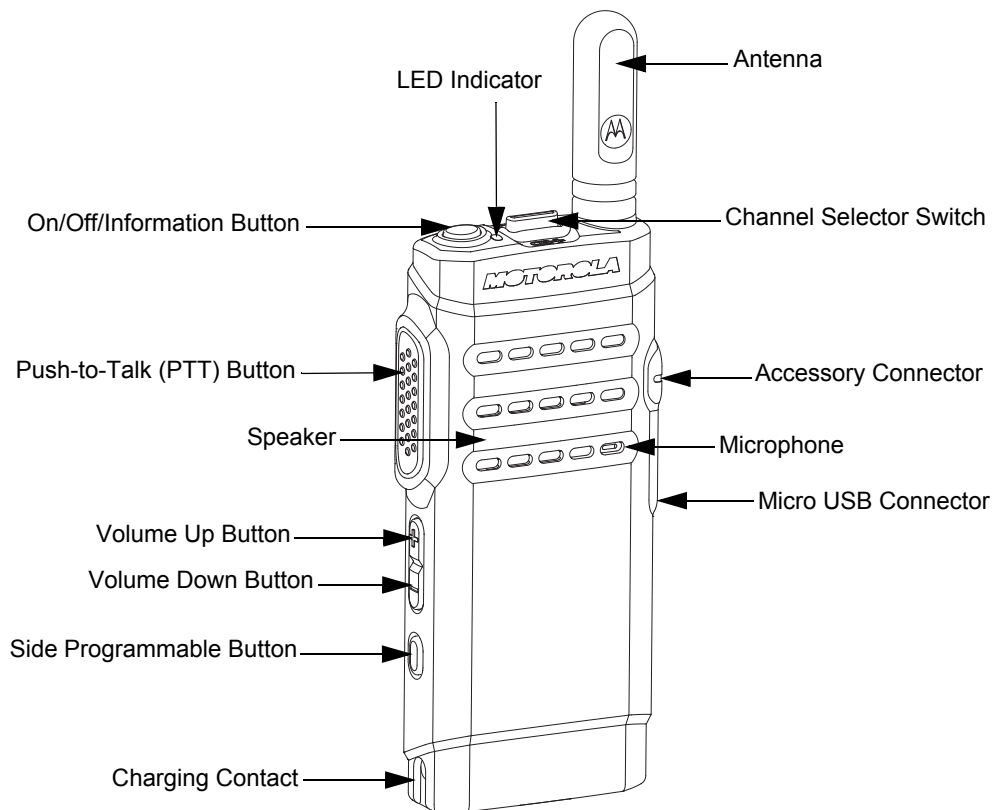
The SL300 portable radios are available in the following frequency ranges and power levels.

*Table 1-1. Radio Frequency Ranges and Power Levels*

Frequency Band	Bandwidth	Power Level
VHF	136 – 174 MHz	Analogue: 2 or 1 Watt, Digital: 3 or 1 Watt
UHF	403 – 470 MHz	Analogue: 2 or 1 Watt, Digital: 3 or 1 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 Radio Overview



*Figure 1-1. Display Model*

- **ON/OFF/INFORMATION BUTTON** – Long press to power down the radio when the radio is on, and to power up the radio when the radio is switched off and being charged. Short press to power up the radio when the radio is switched off, to show the Radio Signal Strength Index (RSSI), and to check the battery charging status while the charging cable is attached. Short press twice to show the radio name.
- **LED INDICATOR** – Red, Green and Orange light-emitting diodes indicate operating status.
- **SIDE PROGRAMMABLE BUTTON** – Field programmable button using the CPS.
- **CHANNEL SELECTOR SWITCH** – Toggle down to increase the channel and toggle up to decrease the channel.
- **VOLUME BUTTON** – To increase and decrease the volume, and to select the action list when the side programmable button is pressed to call out the action list selections.
- **PUSH-TO-TALK (PTT) BUTTON**– Press to execute voice operations (e.g. Group call and Private Call).
- **ANTENNA** – Provides the needed RF amplification when transmitting or receiving.
- **MICROPHONE** – Allows voice to be sent when PTT or voice operations are activated.
- **ACCESSORY CONNECTOR** – Interface point for audio accessories to be used with the radio.
- **USB** – Programs the radio through a computer, and charges the radio through a wall charger.
- **SPEAKER** – Outputs all tones and audio generated by the radio (e.g. features such as keypad tones and voice audio).
- **CHARGING CONTACT** – Contact point for the standard multi-unit and single unit charger.

### 1.3 Portable Radio Model Numbering Scheme

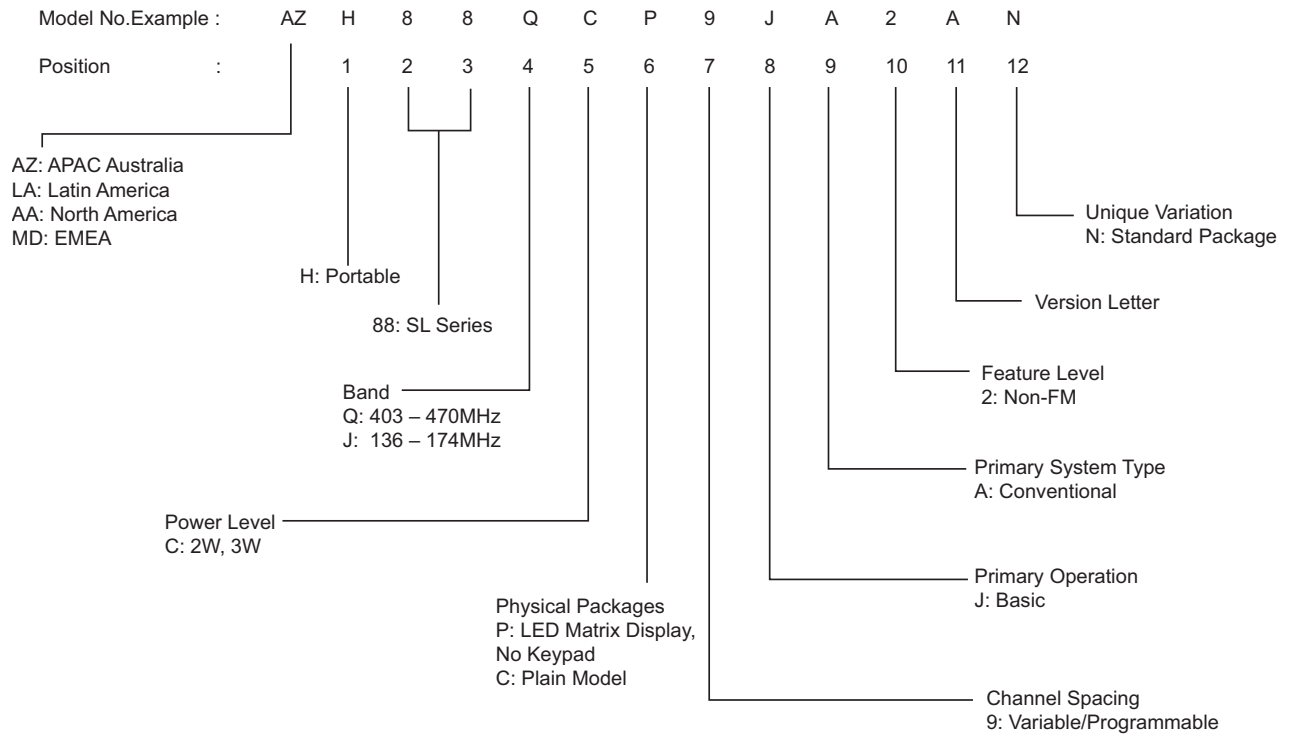


Figure 1-2. Portable Radio Model Numbering Scheme

## 1.4 Model Charts

### 1.4.1 VHF (136–174 MHz) 2–3W Model Chart

<b>SL300, VHF 136–174 MHz</b>		
<b>Model</b>		<b>Description</b>
	AAH88JCP9JA2_N	136–174 MHz, 2–3W, LED Matrix Display, Non Keypad
	AAH88JCC9JA2_N	136–174 MHz, 2–3W, No Display, Non Keypad
	<b>Item</b>	<b>Description</b>
X	PMUD3334_	MOTOTRBO™ LED Matrix Display Portable, Non Keypad
	X PMUD3335_	MOTOTRBO™ No Display Portable, Non Keypad
X	X PMLD4699_	Back Housing Kit Assembly
X	PMLD4697_	Display Front Kit Assembly
	X PMLD4698_	Plain Front Kit Assembly
X	X PMLD4696_S	Main Board Assembly Service Kit
X	X PMAD4144_	VHF Stubby Antenna (136–144 MHz)
X	X PMAD4145_	VHF Stubby Antenna (144–156 MHz)
X	X PMAD4146_	VHF Stubby Antenna (156–174 MHz)
X = Item Included		
_ = The latest version kit. When ordering a kit, refer to your specific kit for the suffix number.		

### 1.4.2 UHF (403–470 MHz) 2–3W Model Chart

<b>SL300, UHF 403–470 MHz</b>		
<b>Model</b>	<b>Description</b>	
AAH88QCP9JA2_N	403–470 MHz, 2–3W, LED Matrix Display, Non Keypad	
AAH88QCC9JA2_N	403–470 MHz, 2–3W, No Display, Non Keypad	
	<b>Item</b>	<b>Description</b>
X	PMUE4541_	MOTOTRBO™ LED Matrix Display Portable, Non Keypad
	X PMUE4542_	MOTOTRBO™ No Display Portable, Non Keypad
X	X PMLE5029_	Back Housing Kit Assembly
X	PMLE5027_	Display Front Kit Assembly
	X PMLE5028_	Plain Front Kit Assembly
X	X PMLE5020_S	Main Board Assembly Service Kit
X	X PMAE4093_	UHF Stubby Antenna (403–425 MHz)
X	X PMAE4094_	UHF Stubby Antenna (420–445 MHz)
X	X PMAE4095_	UHF Stubby Antenna (435–470 MHz)
X = Item Included _ = The latest version kit. When ordering a kit, refer to your specific kit for the suffix number.		

## 1.5 Specifications

General	SL300 Display	SL300 Plain
Channel Capacity	99	2
Frequency	VHF: 136–174 MHz UHF: 403–470 MHz	
Dimensions (HxWxT) with Lilon battery	125.7 x 55.0 x 22.0 mm	
Weight with Lilon battery	VHF: 168.9g UHF: 165.6g	
Power Supply	3.7 V nominal	
FCC Description	VHF: AZ489FT3835 UHF: AZ489FT4922	
IC Description	VHF: 109U-89FT3835 UHF: 109U-89FT4922	
Average battery life at 5/5/90 duty cycle with battery saver enabled		
Lilon battery	VHF / UHF: Analogue: (Typical) 13 hours, Digital: (Typical) 15 hours	

Receiver	SL300
Frequencies	VHF: 136–174 MHz UHF: 403–470 MHz
Channel Spacing	12.5 kHz/25kHz*
Frequency Stability (-30°C to +60°C, +25°C Ref)	+/-1.5 ppm
Analogue Sensitivity (12 dB SINAD)	0.3 $\mu$ V 0.22 $\mu$ V (typical)
Digital Sensitivity (5% BER)	0.25 $\mu$ V 0.19 $\mu$ V (typical)
Intermodulation (TIA603D)	70 dB
Adjacent Channel Selectivity (TIA603D)	45 dB @ 12.5 kHz, 70 dB @ 25 kHz*
Spurious Rejection (TIA603D)	70 dB
Rated Audio	0.5 W (internal)
Audio Distortion @ Rated Audio	5% (3% typical)
Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz*
Audio Response	TIA603D
Conducted Spurious Emission	-57 dBm
Speaker Impedance	4 Ohms (internal)
Voltage @ Rated Audio	1.414 V (internal)
<b>Note:</b> *25 kHz is not available in the U.S.	

Transmitter	SL300
Frequencies	VHF: 136–174 MHz UHF: 403–470 MHz
Channel Spacing	12.5 kHz/25 kHz*
Frequency Stability (-30°C to +60°C)	+/-1.5 ppm
Power Output (Low Power)	1W
Power Output (High Power)	Analogue: 2W Digital: 3W
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	-36 dBm < 1 GHz -30 dBm > 1 GHz
Adjacent Channel Power	60 dB @ 12.5 kHz 70 dB @ 25 kHz*
Audio Response	TIA603D
Audio Distortion	3% (typical)
4FSK Digital Modulation	12.5 kHz Data: 7K60F1D & 7K60FXD 12.5 kHz Voice: 7K60F1E & 7K60FXE Combination of 12.5 kHz Data & Voice: 7K60F1W
Digital Vocoder Type	AMBE+2™
Digital Protocol	ETSI-TS102361-1 ETSI-TS102361-2 ETSI-TS102361-3
<b>Note:</b> *25 kHz is not available in the U.S.	



<b>UHF Self-Quieter Frequencies</b>
403.20 MHz $\pm$ 15 kHz
408.00 MHz $\pm$ 10 kHz
412.80 MHz $\pm$ 10 kHz
417.60 MHz $\pm$ 10 kHz
422.40 MHz $\pm$ 15 kHz
427.20 MHz $\pm$ 10 kHz
432.00 MHz $\pm$ 20 kHz
436.80 MHz $\pm$ 10 kHz
441.60 MHz $\pm$ 20 kHz
446.40 MHz $\pm$ 10 kHz
451.20 MHz $\pm$ 20 kHz
456.00 MHz $\pm$ 10 kHz
460.80 MHz $\pm$ 20 kHz
465.60 MHz $\pm$ 10 kHz

<b>VHF Self-Quieter Frequencies</b>
139.20 MHz $\pm$ 10 kHz
144.00 MHz $\pm$ 10 kHz
148.80 MHz $\pm$ 10 kHz
153.60 MHz $\pm$ 10 kHz
158.40 MHz $\pm$ 10 kHz
163.20 MHz $\pm$ 10 kHz
168.00 MHz $\pm$ 15 kHz
172.80 MHz $\pm$ 10 kHz

Applicable MIL-STD	810C		810D		810E		810F		810G	
	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures	Methods	Procedures
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/AI, II/AI	501.3	I/A1, II/A1	501.4	I/HOT, II/HOT	501.5	I/A1, II
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II
Temperature Shock	503.1	–	503.2	I/AI/C3	503.3	I/A1/C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	–	507.5	II/ Aggravated
Salt fog	509.1	–	509.2	–	509.3	–	509.4	–	509.5	–
Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24, II/5
Shock	516.2	I, II	516.3	I, IV	516.4	I, IV	516.5	I, IV	516.6	I, IV, V, VI

Environmental Specifications	
*Operating Temperature	-30 °C to +60 °C
Storage Temperature	-40 °C to +85 °C
Thermal Shock	Per MIL-STD
Humidity	Per MIL-STD
ESD	IEC61000-4-2 Level 3
Dust and Water Intrusion	IEC60529 - IP54
Packaging test	MIL-STD 810D and E
* Operating temperature specification for a Lilon battery is -10 °C to +60 °C.	

## Chapter 2 Test Equipment and Service Aids

### 2.1 Recommended Test Equipment

The list of equipment contained in Table 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 Digital Radio Test Set Model 3920 with DMR option	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
Digital RMS Multimeter *	100 $\mu$ V to 300 V 5 Hz to 1 MHz 10 Mega Ohm Impedance	Fluke 179 or equivalent ( <a href="http://www.fluke.com">www.fluke.com</a> )	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 443X R&S Signal Generator	Receiver measurements
Oscilloscope*	2 Channel 50 MHz Bandwidth 5 mV/div to 20 V/div	Leader LS8050 ( <a href="http://www.leaderusa.com">www.leaderusa.com</a> ), Tektronix TDS1001b ( <a href="http://www.tektronix.com">www.tektronix.com</a> ), or equivalent	Waveform measurements
Power Meter and Sensor *	5% Accuracy 100 MHz to 500 MHz 50 Watts	Bird 43 Thruline Watt Meter ( <a href="http://www.bird-electronic.com">www.bird-electronic.com</a> ) or equivalent	Transmitter power output measurements
RF Millivolt Meter	100 mV to 3 V RF 10 kHz to 1 GHz	Boonton 92EA ( <a href="http://www.boonton.com">www.boonton.com</a> ) or equivalent	RF level measurements
Power Supply	0 V to 32 V 0 A to 20 A	B&K Precision 1790 ( <a href="http://www.bkprecision.com">www.bkprecision.com</a> ) or equivalent	Voltage supply

**NOTE** Service Monitor can be used as a substitute to the items marked with (\*).

## 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
CB000262A01	Micro USB Programming Cable	Cable connects the radio to a USB port for radio programming and data applications.
PMKN4128_	Portable Programming Cable with TTR	Cable connects the radio to a USB port for radio programming and data applications.
28012039001	RF Antenna Adaptor	Adapts radio's antenna port to test equipment.
HW000406A01	RF Antenna Adaptor Holder	Holds the RF antenna adaptor.
HW000405A01	Battery Eliminator	Connects to radio via battery eliminator cable.
RVN5115_	Customer Programming Software on DVD-ROM	Allows servicer to program radio parameters, tune and troubleshoot radios.
N/A	Flat Square Tip Plastic Tweezer	Removes components during disassembly
RLN4460_	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
CB000233A01	Audio Test Cable	This cable connects the radio to RLN4460_Portable Test Set for test and measurement.
6680702Z01	Opener Back Housing	To dismantle the back housing from front housing.

## 2.3 Portable Programming Cable with TTR

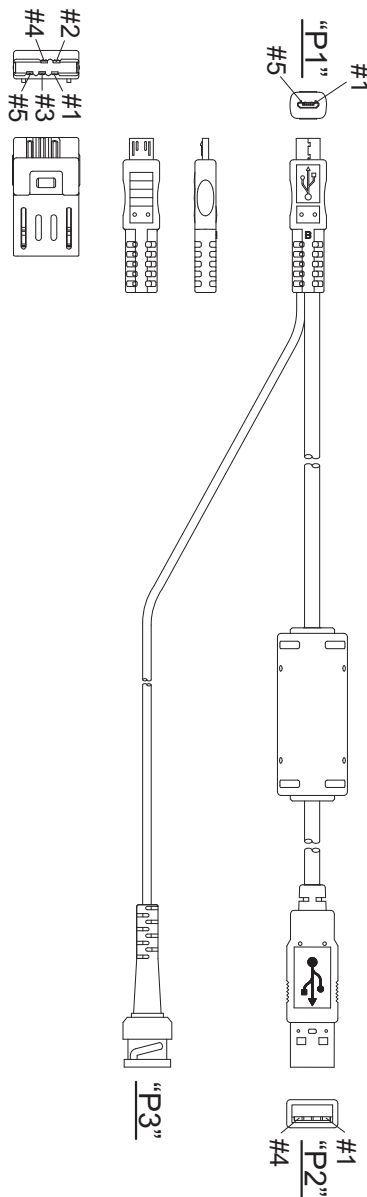


Figure 2-1. Portable Programming Cable with TTR (PMKN4128\_)

Table 2-3. Pin Configuration of Portable Programming Cable with TTR

CONNECTION			
P1	P2	P3	Function
1	1		VCC(5V)
2	2		DATA-
3	3		DATA+
4		BNC Center Pin	TTR
5	4	BNC Shell	GROUND

## 2.4 Micro USB Programming Cable

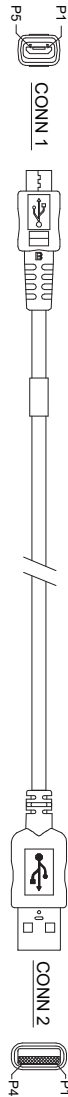


Figure 2-2. Micro USB Programming Cable (CB000262A01)

Table 2-4. Pin Configuration of Micro USB Programming Cable

CONNECTION		
CONN 1	CONN 2	Function
1	1	VBUS
2	2	DATA-
3	3	DATA+
5	4	GROUND

## 2.5 Audio Test Cable

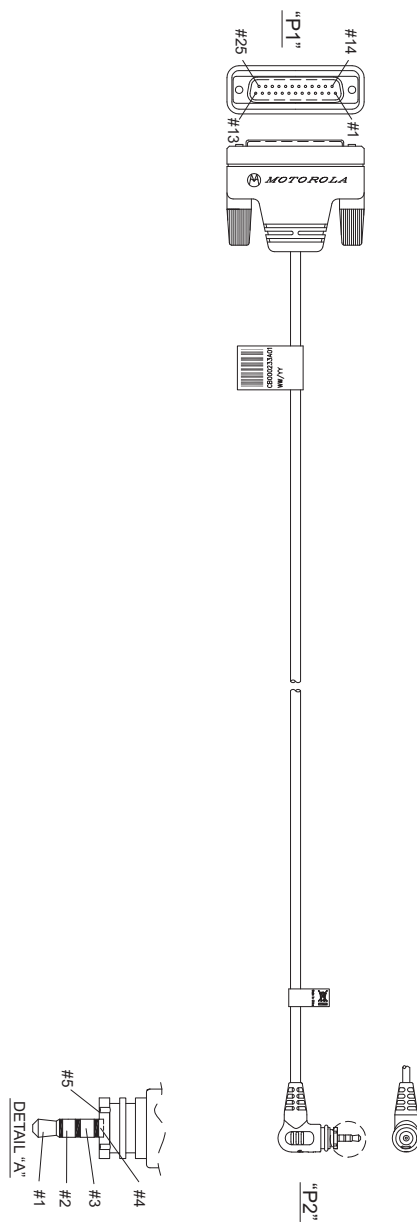


Figure 2-3. Audio Test Cable (CB000233A01)

Table 2-5. Pin Configuration of Audio Test Cable

CONNECTION		
P1	P2	Function
1,5	2	SPK+
17	1	MIC+
2,7,16	3	MIC-,SPK-
20	5	PTT

## Notes



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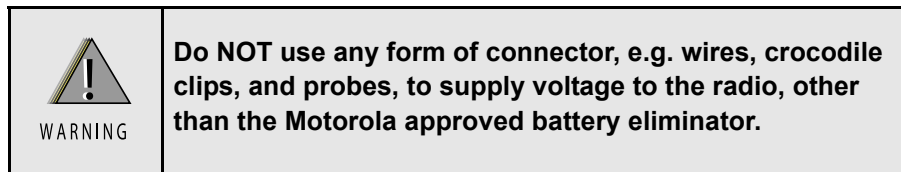
## Chapter 3 Transceiver Performance Testing

### 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.

### 3.2 Setup

Supply voltage is provided using a 3.7 VDC power supply. The equipment required for alignment procedures is connected as shown in the Radio Tuning Equipment Setup Diagram, Figure 4-4.



The initial equipment control settings is shown in Table 3-1. The remaining tables in this chapter contain the following related technical data:

Table Number	Title
Table 3-1	Initial Equipment Control Settings
Table 3-2	Test Environments
Table 3-3	Test Frequencies
Table 3-4	Transmitter Performance Checks
Table 3-5	Receiver Performance Checks

*Table 3-1. Initial Equipment Control Settings*

Service Monitor	Power Supply	Test Set
Monitor Mode: Power Monitor	Voltage: 3.7 Vdc	Speaker Set: A
RF Attn: -70	DC on/standby: Standby	Speaker/load: Speaker
AM, CW, FM: FM	Voltage Range: 4.44 V	PTT: OFF

Table 3-1. Initial Equipment Control Settings

Service Monitor	Power Supply	Test Set
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: 2.5 A	

### 3.3 Test Mode

#### 3.3.1 Power Up

##### 3.3.1.1 Display Model

1. Press and hold the **ON/OFF Button**. Audible sound is heard when the radio is powering up.
2. The radio will display the following:

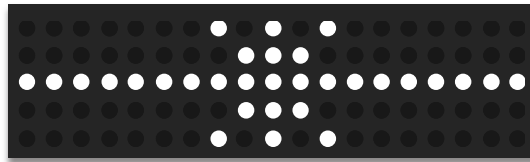


Figure 3-1. Power-Up Screen Icon

##### 3.3.1.2 Plain Model

1. Press and hold the **ON/OFF Button**. Audible sound is heard when the radio is powering up.

#### 3.3.2 Front Panel Access Test Mode

##### 3.3.2.1 Display and Plain Model

1. To enter test mode, press the **Side Programmable Button** five times within 10 seconds after the radio powers up.
2. The radio beeps once, when it enters test mode successfully.

#### 3.3.3 RF Test Mode

##### 3.3.3.1 Display Model

1. Upon entering RF Test Mode, the display shows RF for 2 seconds, and then shows the default channel profile.
2. The default channel profile is CSQ, CH1, and 12.5 kHz.
  - For an example, C010 is for CSQ, CH1, and 12.5 kHz.
  - First character indicates the Test Environment
  - Second and third character indicates the Channel Index

- Fourth character indicates the Channel Spacing

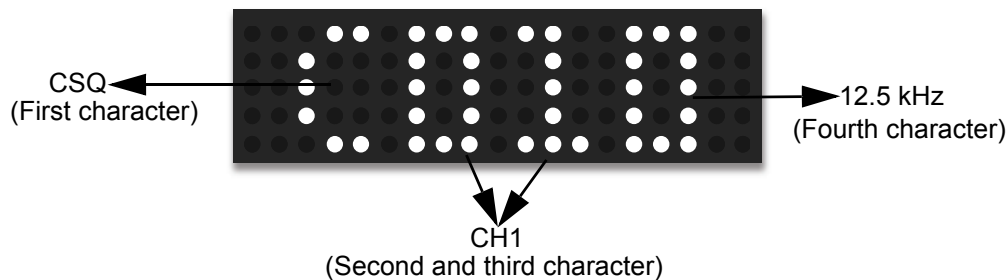


Figure 3-2. Channel Profile Screen Icon

3. A short press of the **Side Programmable Button** changes the Test Environment from CSQ → TPL → DIG → USQ → CSQ.
  - The radio beeps once for CSQ mode
  - The radio beeps twice for TPL mode
  - The radio beeps three times for DIG mode
  - The radio beeps four times for USQ mode
4. Press the **Volume +/- Button**, to select a channel. The radio beeps at each position during channel selection. Refer to Table 3-3 for Test Frequencies.
  - Channel 1 to channel 8 is for TX Low Power
  - Channel 9 to channel 16 is for TX High Power
5. Sway the **Rocker** to change between 12.5 kHz, 20 kHz and 25 kHz.
  - The radio beeps once for 20 kHz
  - The radio beeps twice for 25 kHz
  - The radio beeps three times for 12.5 kHz

### 3.3.3.2 Plain Model

1. Upon entering RF Test Mode, the default channel profile shown is CSQ, CH1, and 12.5 kHz channel spacing.
2. A short press of the **Side Programmable Button** changes the Test Environment from CSQ → TPL → DIG → USQ → CSQ.
  - The radio beeps once for CSQ mode
  - The radio beeps twice for TPL mode
  - The radio beeps three times for DIG mode
  - The radio beeps four times for USQ mode

**NOTE:** DIG is the digital mode, and other test environments are analogue mode, as shown in Table 3-2

Table 3-2. Test Environments

No. of Beeps	Description	Function
1	Carrier Squelch (CSQ)	RX: If Carrier is detected TX: Mic Audio
2	Tone Private-Line (TPL)	RX: Unsquelch if Carrier and Tone are detected TX: Mix Audio + Tone
3	Digital Mode (DIG)	RX: If Carrier is detected TX: Mic Audio
4	Unsquelch (USQ)	RX: Constant unsquelch TX: Mic Audio

3. When the slider is at channel 1, press the **Volume +/- Button**, to select a channel. The radio beeps at each position during channel selection. Refer to Table 3-3 for Test Frequencies.
  - Channel 1 to channel 8 is for TX Low Power
  - Channel 9 to channel 16 is for TX High Power
4. Press the **Volume +/- Button** when the slider is at CH2, to change between 12.5 kHz, 20 kHz and 25 kHz.
  - The radio beeps once for 20 kHz
  - The radio beeps twice for 25 kHz
  - The radio beeps three times for 12.5 kHz
5. The LED status, indicates the channel spacing.
  - GREEN is for 12.5 kHz
  - AMBER is for 20 kHz
  - RED is for 25 kHz

Table 3-3. Test Frequencies

Channel Selector Switch Position	Test Channel	UHF RX	UHF TX	VHF RX	VHF TX
1 Low Power 9 High Power	TX#1 or #9 RX#1 or #9	403.150	403.150	136.075	136.075
2 Low Power 10 High Power	TX#2 or #10 RX#2 or #10	414.150	414.150	142.575	142.575
3 Low Power 11 High Power	TX#3 or #11 RX#3 or #11	425.150	425.150	146.575	146.575
4 Low Power 12 High Power	TX#4 or #12 RX#4 or #12	436.450	436.450	155.575	155.575
5 Low Power 13 High Power	TX#5 or #13 RX#5 or #13	447.150	447.150	161.575	161.575
6 Low Power 14 High Power	TX#6 or #14 RX#6 or #14	458.150	458.150	167.575	167.575
7 Low Power 15 High Power	TX#7 or #15 RX#7 or #15	469.850	469.850	173.975	173.975
8 Low Power 16 High Power	TX#8 or #16 RX#8 or #16	470.000	470.000	174.000	174.000

Table 3-4. 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)	Frequency error to be $\pm 201\text{Hz}$ for UHF  $\pm 68\text{Hz}$ for VHF
Power RF	As above	As above	As above	Low Power: 1 W (VHF/UHF) High Power (Analog): 2 W (VHF/UHF) High Power (Digital): 3 W (VHF/UHF)
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: $\geq 4.0\text{ kHz}$ but $\leq 5.0\text{ kHz}$ (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: $\geq 4.0\text{ kHz}$ but $\leq 5.0\text{ kHz}$ (25 kHz Ch Sp)
TPL Modulation	As above 4th channel test frequency* BW to narrow	TEST MODE, Test Channel 4 TPL	As above	Deviation: $\geq 500\text{Hz}$ but $\leq 1000\text{Hz}$ (25 kHz Ch Sp).
RF Power	DMR mode. Slot 1 Power and Slot 2 Power	TEST MODE, Digital Mode, transmit without modulation	Key up radio without modulation using Tuner	TTR Enable is needed and IFR to be set to trigger mode with signal level $\sim 1.5\text{V}$
FSK Error	DMR Mode. FSK Error	TEST MODE, Digital Mode, transmit with 0.153 test pattern	Key up radio with 0.513 test pattern modulation using Tuner	Not Exceed 5%

Test Name	Communications Analyzer	Radio	Test Set	Comments
Magnitude Error	DMR Mode. Magnitude error	As above	As above	Not Exceed 1%
Symbol Deviation	DMR Mode. Symbol Deviation	As above	As above	Symbol Deviation should be within 648Hz +/- 10% and 1944Hz +/- 10%
Transmitter BER	DMR Mode	As above	As above	Transmitter BER should be 0%

\* See Table 3-3.

Table 3-5. 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)	Frequency error to be $\pm 201\text{Hz}$ for UHF $\pm 68\text{Hz}$ for VHF
Rated Audio	Mode: GEN Output level: 1.0mV RF 6th channel test frequency* Mod: 1kHz tone at 3kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 6 carrier squelch	PTT to OFF (center), meter selector to Audio PA	Set volume control to 0.4 Vrms (Through audio jack)
Distortion	As above, except to distortion	As above	As above	Distortion <5.0%
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be <0.3 $\mu\text{V}$
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 0.4 Vrms (Through audio jack)
	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 $\mu\text{V}$ . Preferred SINAD = 9 – 10dB
Receiver BER	IFR DMR mode. Signal generator with O.153 test pattern	TEST MODE, Digital Mode, transmit with O.153 test pattern	Read BER using Tuner. Adjust RF level to get 5% BER	RF level to be <0.25 $\mu\text{V}$ for 5% BER
Receiver Rated Audio	IFR DMR Mode. Signal generator with 1031 test pattern	Test Mode, Digital Mode, receive 1031 test pattern	RF level = -47dBm. Set audio analyzer to read Vrms. Adjust volume to get rated audio	Adjust volume until Vrms = 0.4 V (Through audio jack)
Receiver Audio Distortion	IFR DMR Mode. Signal generator with 1031 test pattern	As above	As above. Then set audio analyzer to measure distortion	Not exceed 5%

\* See Table 3-3



### 3.3.4 LED Status Test Mode

#### 3.3.4.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from RF Test Model to LED Status Test Mode.
2. The radio beeps once, and display shows LED.
3. Upon any button press (**Side Programmable Button** or **Volume +/- Button**), the radio's RED LED lights up.
4. Any button press following the RED LED check, turns on the GREEN LED.
5. Any button press following the GREEN LED check, turns on both the LEDs.

**NOTE:** Do not use the **ON/OFF Button**, to change the LED status.

#### 3.3.4.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch from RF Test Mode to LED Status Test Mode.
2. The radio beeps once.
3. Upon any button press (**Side Programmable Button** or **Volume +/- Button**), the radio's RED LED lights up.
4. Any button press following the RED LED check, turns on the GREEN LED.
5. Any button press following the GREEN LED check, turns on both the LEDs.

**NOTE:** Do not use the **ON/OFF Button**, to change the LED status.

### 3.3.5 LED Display Matrix Test Mode

#### 3.3.5.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from LED Status Test Mode, to LED Display Matrix Test Mode.
2. The radio beeps once.
3. Upon any button press at first time, LEDs will be turned on and displayed in a column format. There are total of 19 columns, moving from Left to Right.
4. Upon any following button press, LEDs will be turned on and displayed in a row format. There are total of 5 rows, moving from Top to Bottom.

### 3.3.6 Speaker Tone Test Mode

#### 3.3.6.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch the radio from LED Display Matrix Test Mode to Speaker Tone Test Mode.
2. The radio beeps once, and 1 kHz tone is heard from the internal speaker.
3. The radio display shows SKPR.

### 3.3.6.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch the radio from LED Status Test Mode to Speaker Tone Test Mode.
2. Radio shall beep once, and 1 kHz tone is heard from the internal speaker.

## 3.3.7 Earpiece Tone Test Mode

### 3.3.7.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from Speaker Tone Test Mode to External Earpiece Tone Test Mode.
2. The radio beeps once, and 1 kHz tone is heard from the earpiece.
3. The radio display shows EAR.

### 3.3.7.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch from Speaker Tone Test Mode to External Earpiece Tone Test Mode.
2. The radio beeps once, and 1 kHz tone is heard from the earpiece.

## 3.3.8 Audio Loopback Earpiece Test

### 3.3.8.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from Earpiece Tone Test Mode, to Audio Loopback Earpiece Test Mode.
2. The radio beeps once.
3. The radio shall route any audio on the external mic to the earpiece.
4. The radio display shows LOOP.

### 3.3.8.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch from Earpiece Tone Test Mode, to Audio Loopback Earpiece Test Mode.
2. The radio beeps once.
3. The radio shall route any audio on the external mic to the earpiece.

## 3.3.9 Battery Check Test Mode

### 3.3.9.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from Audio Loopback Earpiece Test Mode to Battery Check Test Mode.
2. The radio beeps once.
3. The radio's LED indicator shows GREEN for High battery level, AMBER for Mid battery level, and RED for Low battery level.
4. The radio display shows BATT.

### 3.3.9.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch from Audio Loopback Earpiece Test Mode to Battery Check Test Mode.
2. The radio beeps once.
3. The radio's LED indicator shows GREEN for High battery level, AMBER for Mid battery level, and RED for Low battery level.

## 3.3.10 Button Test Mode

### 3.3.10.1 Display Model

1. Press and hold the **Side Programmable Button**, to switch from Battery Check Test Mode to Button Test Mode.
2. Upon any button press, the radio beeps once.
3. The radio display shows BTN.

### 3.3.10.2 Plain Model

1. Press and hold the **Side Programmable Button**, to switch from Battery Check Test Mode to Button Test Mode.

Upon any button press, the radio beeps once.

**NOTE:** Upon completion of the final Button Test, press the **ON/OFF Button**, to power down the radio.

## Notes

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# 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 Windows 7 and Windows 8 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 For Radio Tuning Setup

Description	Kit Number
Customer Programming Software on DVD-ROM	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 the 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.

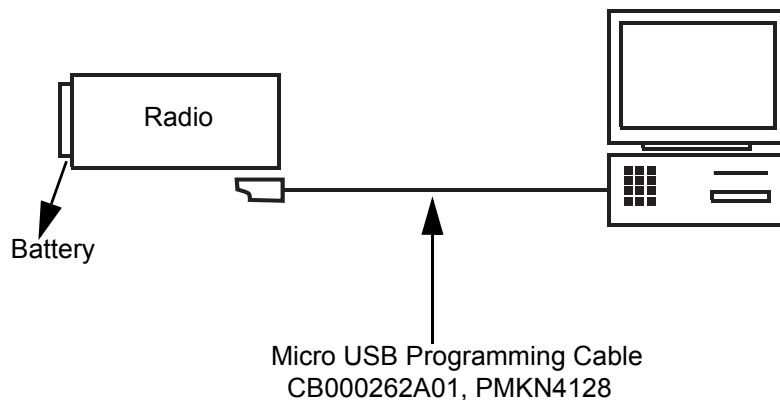


Figure 4-1. CPS Programming Setup

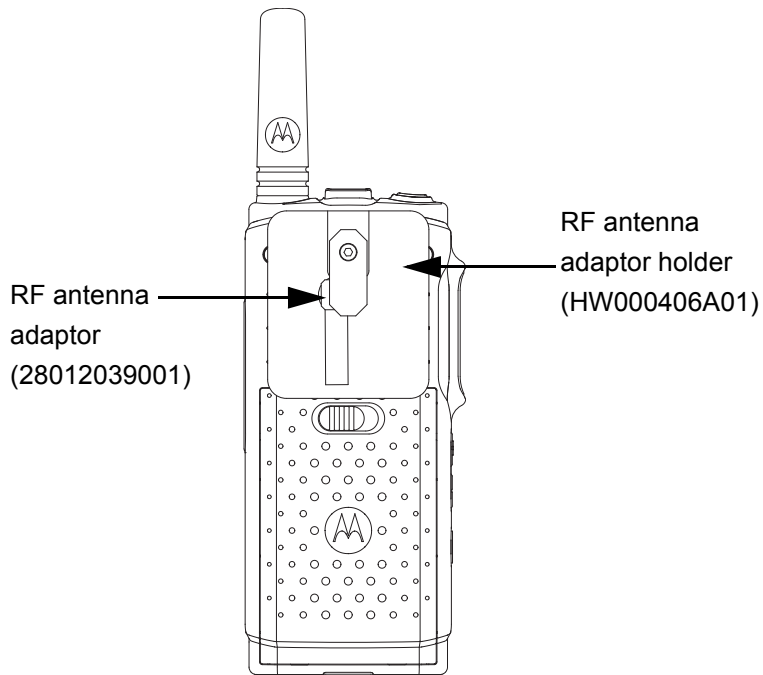


Figure 4-2. Connecting RF Antenna Adaptor To Radio RF Input/Output Port

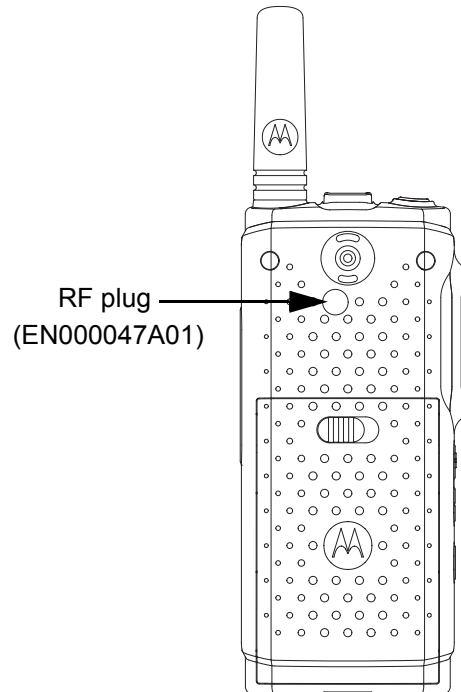


Figure 4-3. RF Plug

## 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

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



**Caution**

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

**NOTE:** Refer to the appropriate program online help files for the tuning procedures.

A personal computer (PC), Windows 7 or Windows 8 and a tuner program are required to tune the radio. To perform the tuning procedures, the radio must be connected to the PC and test equipment setup as shown in Figure 4-4.

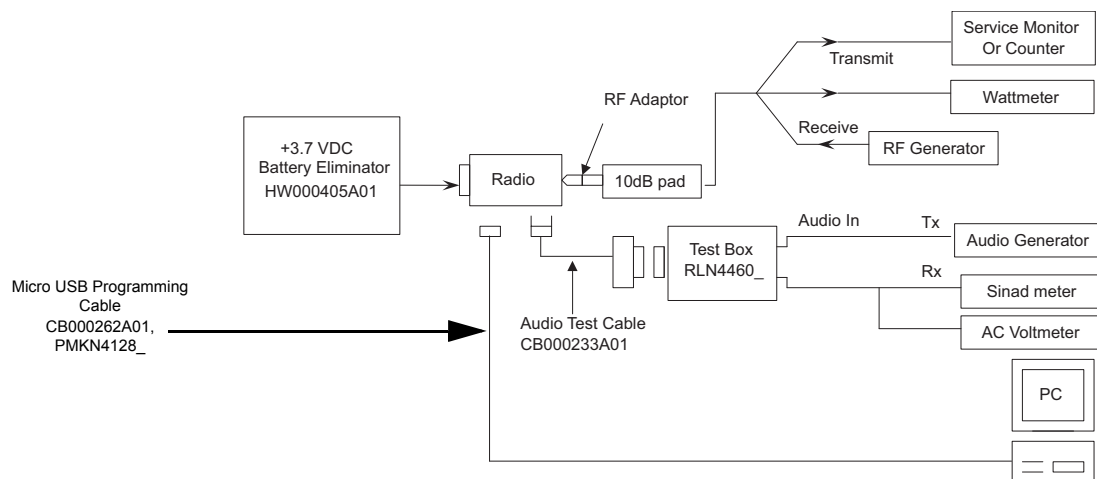


Figure 4-4. Radio Tuning Equipment Setup

## Notes



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# Chapter 5 Disassembly And Reassembly Procedures

## 5.1 Introduction

This chapter provides details about the following:

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

## 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 housing, 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**

Use all chemicals as prescribed by the manufacturer. Be sure to follow all safety precautions as defined on the label or material safety data sheet.

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

#### 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 housing or back housing.

**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) and Laterally Diffused Metal Oxide Semiconductor (LDMOS) devices are used in this family of radios, and are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

Handling precautions are mandatory for CMOS/LDMOS circuits and are especially important in low humidity conditions. DO NOT attempt to disassemble the radio without first referring to the CMOS CAUTION paragraph in the Disassembly and Re-assembly section of the manual.

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



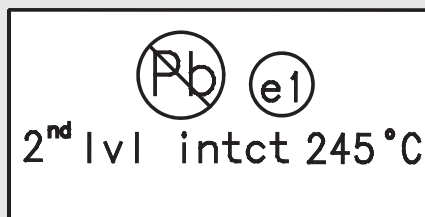
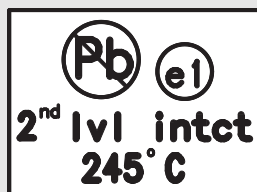
Caution

**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/LDMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS/LDMOS devices into conventional plastic “snow” trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service bench to protect the CMOS/LDMOS device. 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/LDMOS devices.
- Do not insert or remove CMOS/LDMOS devices with power applied. Check all power supplies used for testing CMOS/LDMOS devices to be certain that there are no voltage transients present.
- When straightening CMOS/LDMOS pins, provide ground straps for the apparatus used.
- When soldering, use a grounded soldering iron.
- If at all possible, handle CMOS/LDMOS 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 2) Directive 2011/65/EU** and **(Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU**. To maintain product compliance and reliability, use only the Motorola 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%	217°C	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.

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

## 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 and reassembling the radio:

- T06 Torx Plus
- Torque wrench
- Tweezer

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 SL300, the radio must be repaired only at Motorola service facilities. Please contact your local dealer or Point of sale for further instructions.

## 5.6 Radio Disassembly – Detailed

### 5.6.1 Holster Disassembly

1. Remove the holster from radio as shown in Figure 5-1.

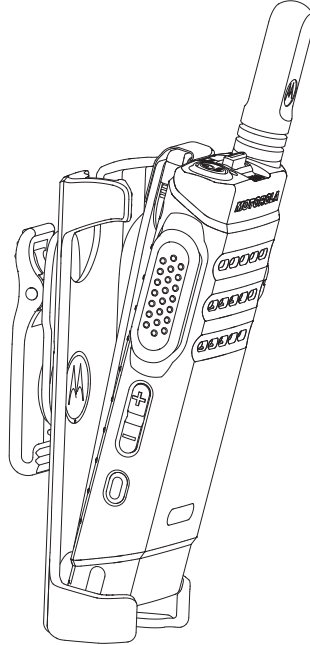


Figure 5-1. Holster Removal

### 5.6.2 External Antenna Disassembly

1. Turn off the radio.
2. Turn the antenna counterclockwise to remove it, as shown in Figure 5-2.

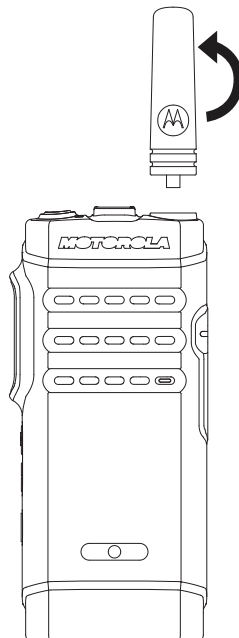
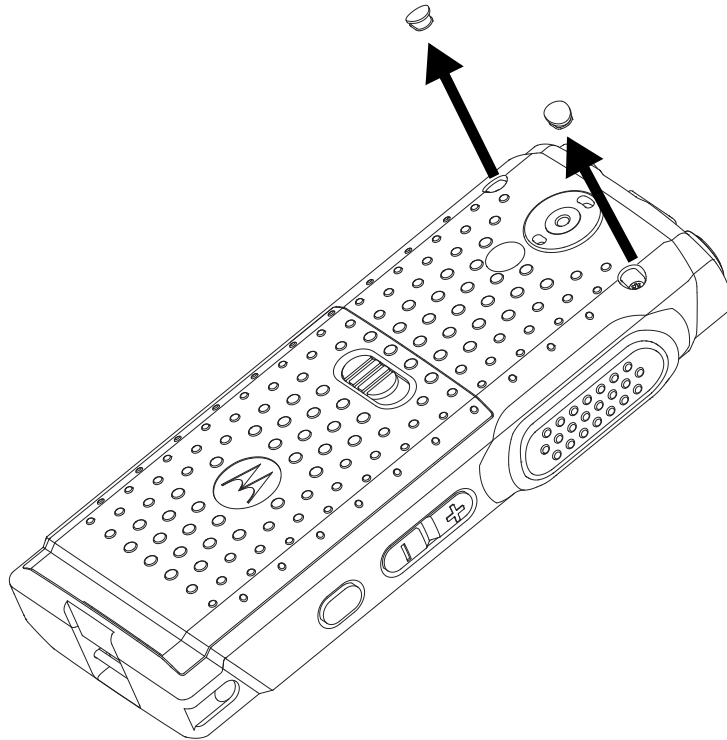


Figure 5-2. External Antenna Removal

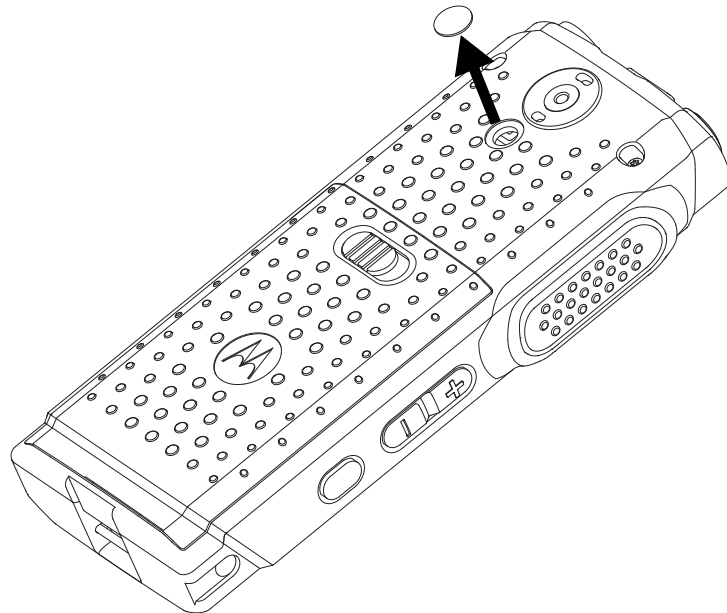
### 5.6.3 Back Housing Disassembly

1. Remove the 2 screw plugs from the back housing as shown in Figure 5-3.  
**NOTE:**Remove the screw plug with plastic tweezers.



*Figure 5-3. Screw Plug Removal*

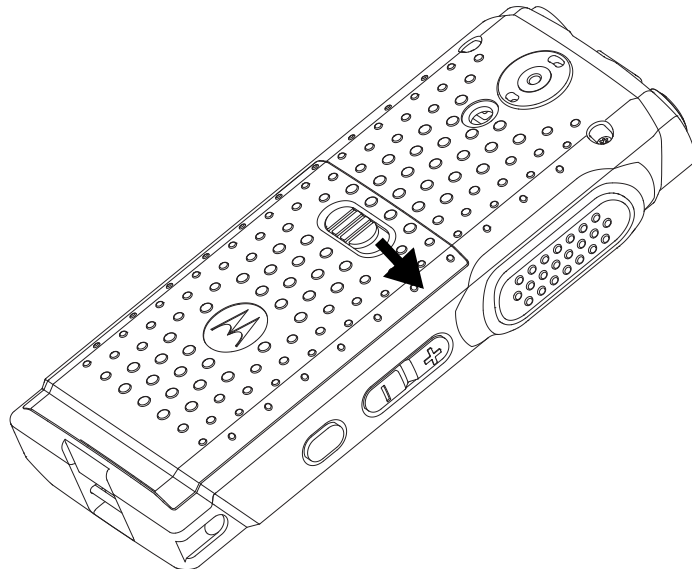
2. Remove the RF plug from the back housing as shown in Figure 5-4.



*Figure 5-4. RF Plug Removal*

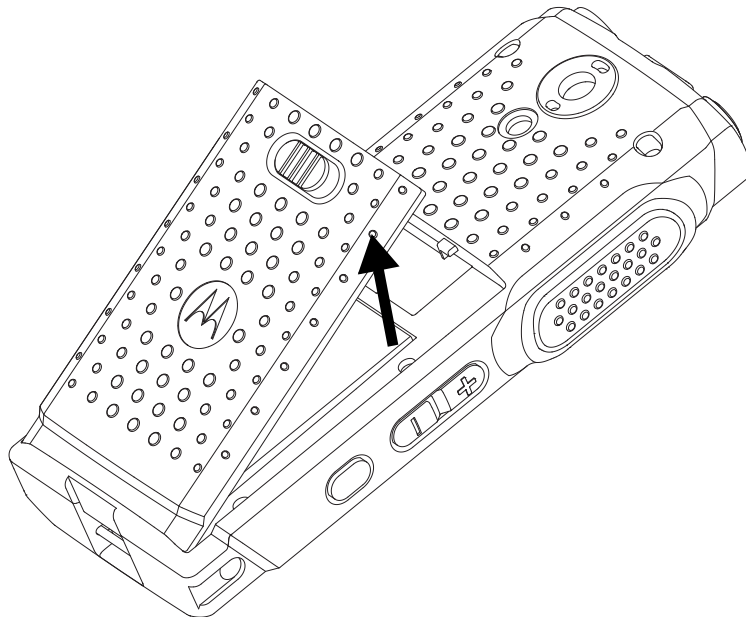
**NOTE:** Remove the RF plug with plastic tweezer.

3. Unlock the battery door by sliding the latch to the right as shown in Figure 5-5.



*Figure 5-5. Unlock The Battery Door*

4. Remove the battery door, by lifting it upwards as shown in Figure 5-6.

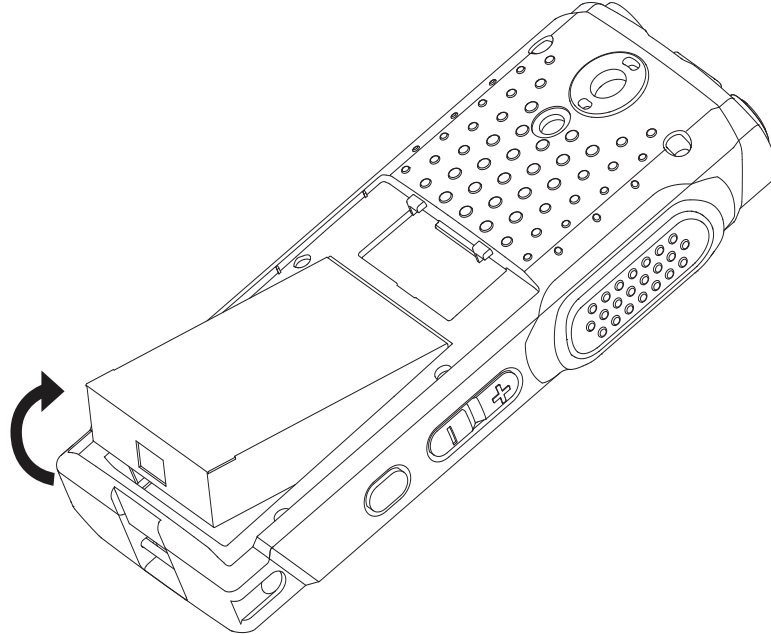


*Figure 5-6. Battery Door Removal*



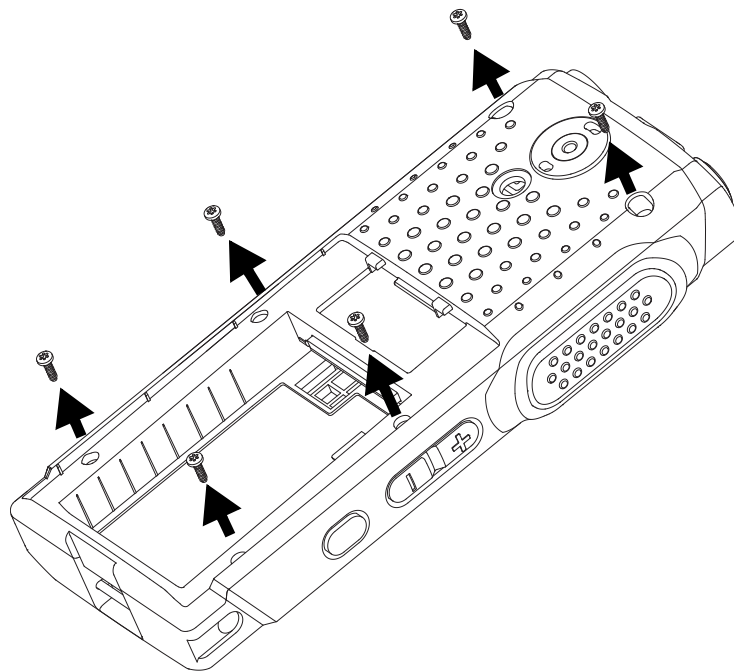
5. Once the battery door is removed, remove the battery from its battery compartment as shown in Figure 5-7. To remove the battery, grasp the battery groove as the bottom of the battery and lift it up.

**NOTE:** Only battery PMNN4468 can be used for this radio.



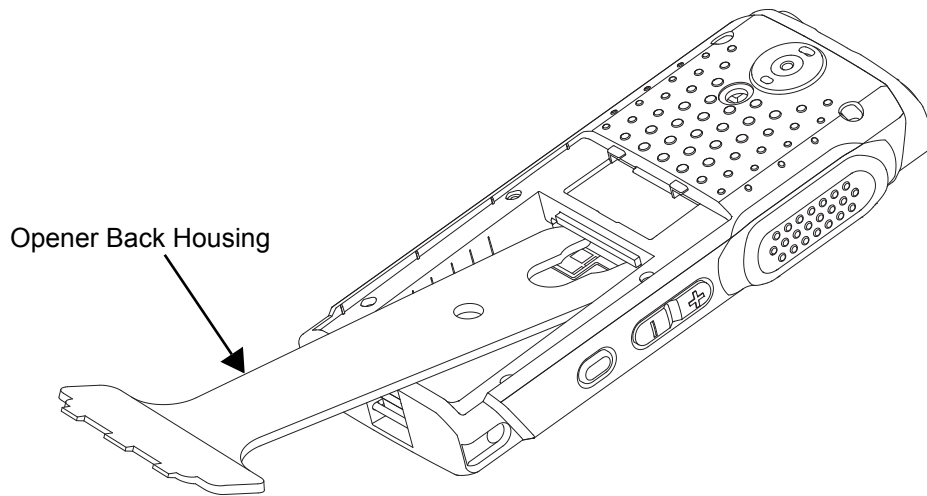
*Figure 5-7. Battery Removal*

6. Remove the screws by using T06 Torx Plus screwdriver as shown in Figure 5-8.

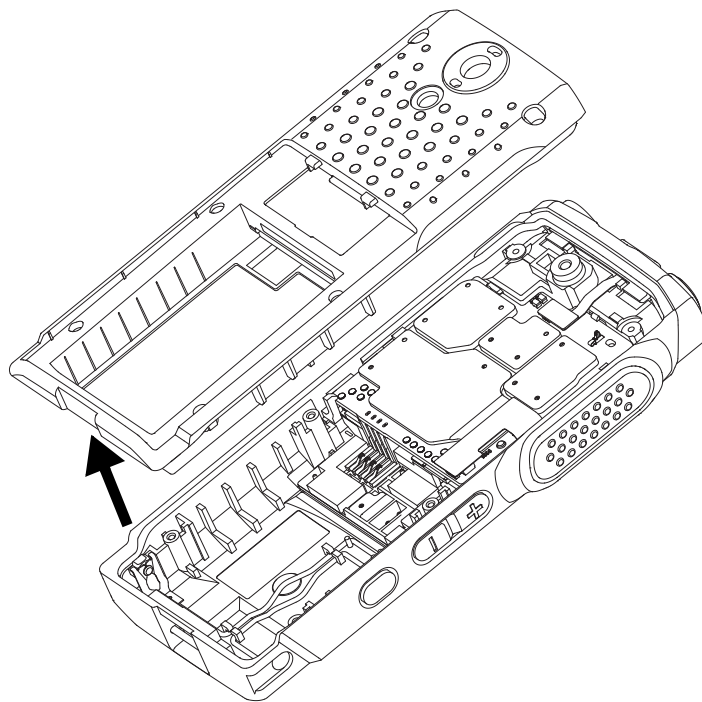


*Figure 5-8. Screw Removal*

7. Detach the back housing using the Opener Back Housing as shown in Figure 5-9. Lift the back housing from the front housing as shown in Figure 5-10.



*Figure 5-9. Back Housing Removal*



*Figure 5-10. Back Housing Removal*

### 5.6.4 Main PCB Disassembly

1. Detach the Top Control Flex, PTT Flex, and Display Flex from the main PCB, using plastic tweezers in the direction indicated in Figure 5-11.
2. Pull the PCB catch backwards as shown in Figure 5-11, and lift the main PCB upwards as shown in Figure 5-12.

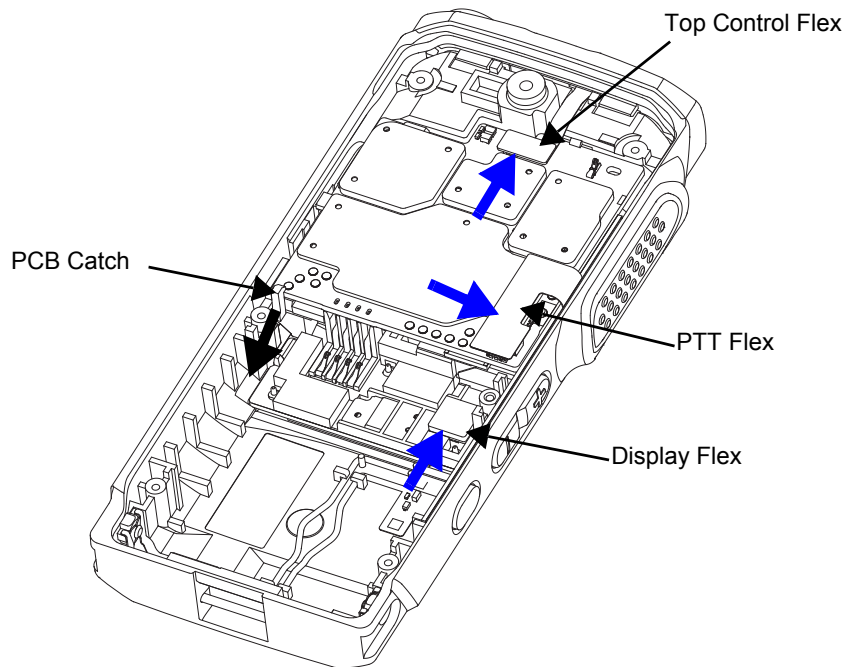


Figure 5-11. PCB Catch Disassembly

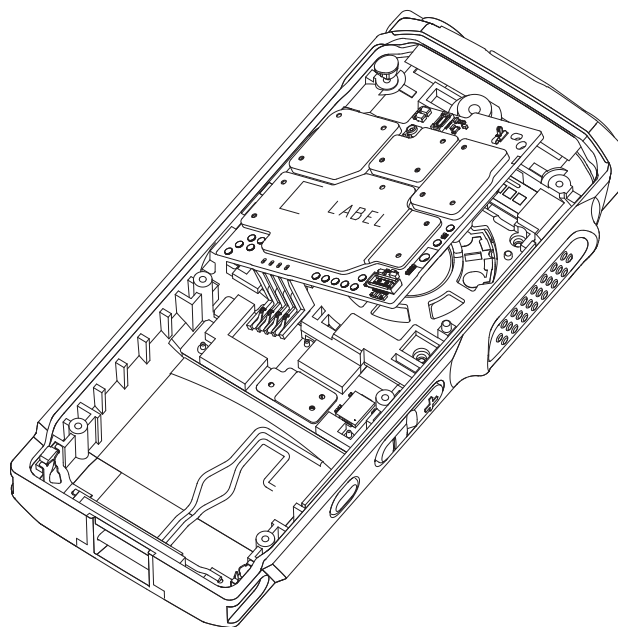


Figure 5-12. Uplifting Of The Main PCB

3. Detach the Audio Jack, Speaker, Micro USB, Microphone Flex and Display Flex from the main PCB, using plastic tweezers in the direction indicated in Figure 5-13.

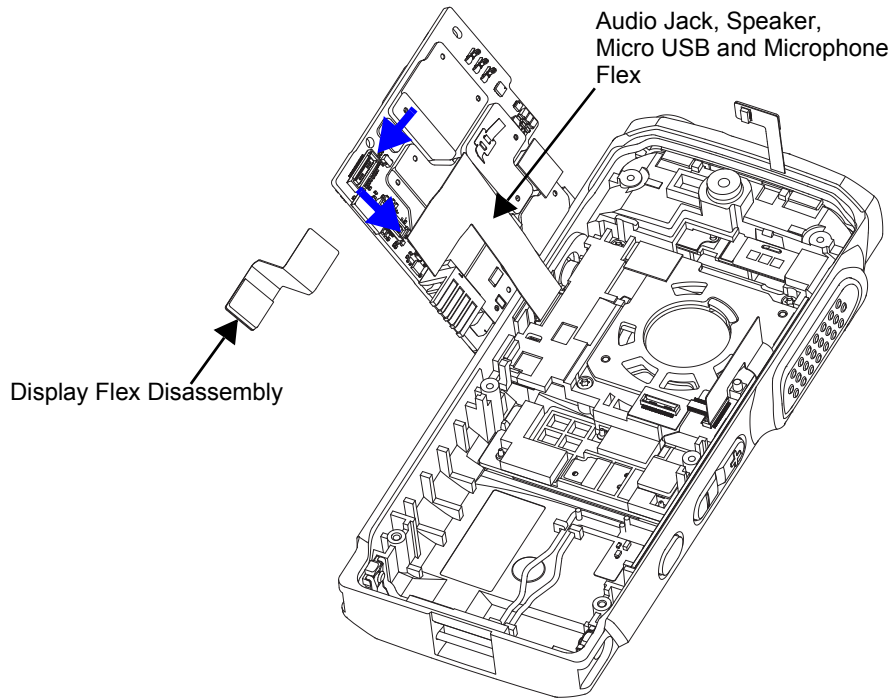


Figure 5-13. Audio Jack, Speaker, Micro USB, Microphone Flex, and Display Flex Disassembly

### 5.6.5 Audio Jack Flex, Micro USB Flex, Microphone (MIC), Speaker Flex, LCD Display, and Internal Antenna Disassembly

1. Remove the internal frame screws by using T06 Torx Plus screwdriver as shown in Figure 5-14.

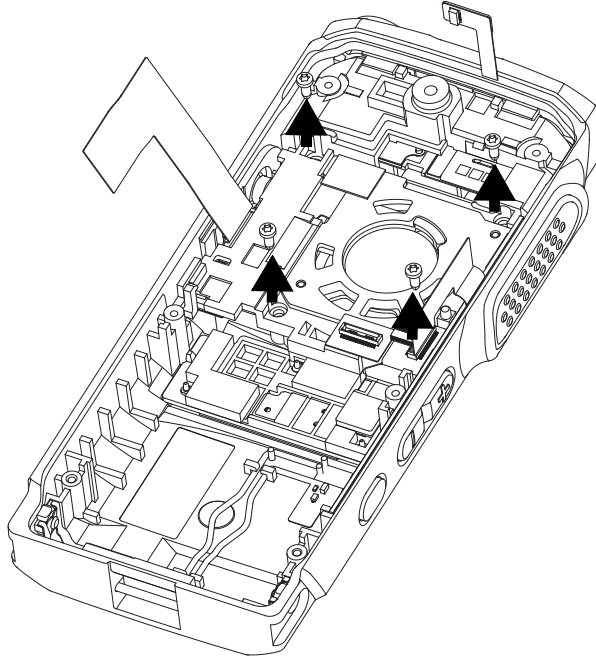


Figure 5-14. Internal Frame Screws Disassembly

2. Lift the internal frame as shown in Figure 5-15. Pull the internal frame out from the front housing as shown in Figure 5-15.

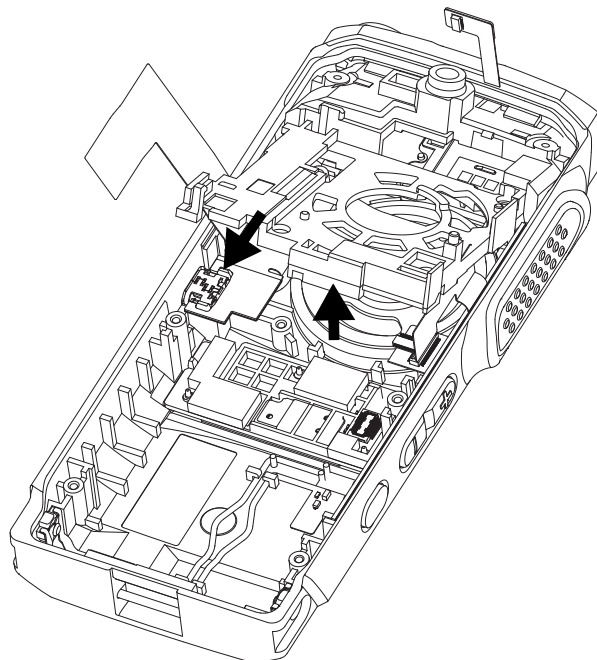
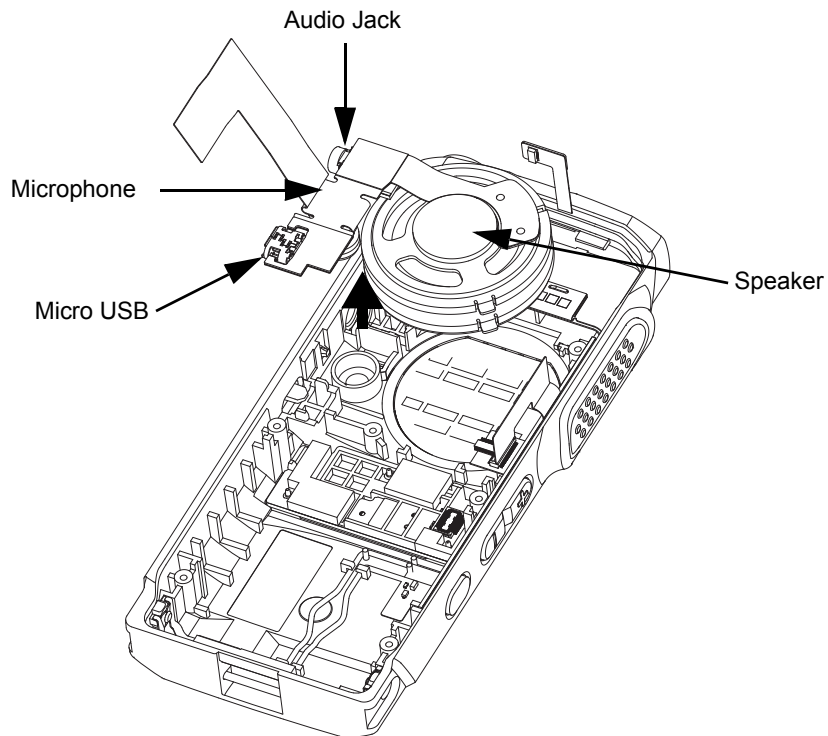


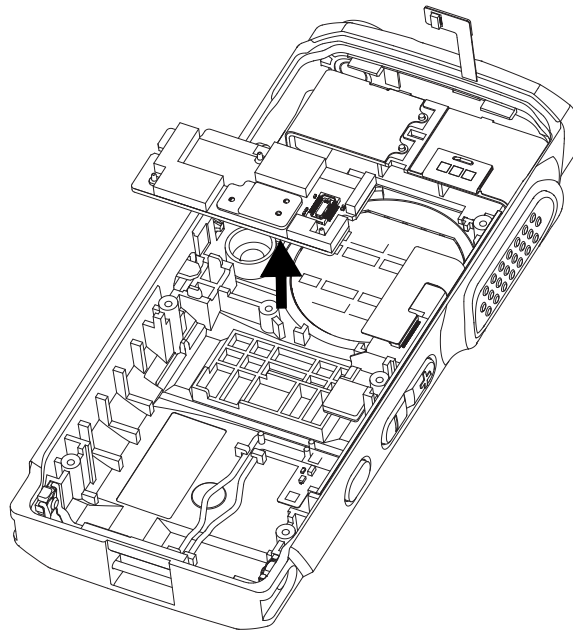
Figure 5-15. Internal Frame Disassembly

3. Firstly remove the micro USB carefully, followed by the microphone, the audio jack, and the speaker as shown in Figure 5-16.



*Figure 5-16. Speaker Disassembly*

4. Remove the display module, by lifting upwards as shown in Figure 5-17.



*Figure 5-17. Display Module Disassembly*

5. Remove the internal antenna by lifting upwards as shown in Figure 5-18.

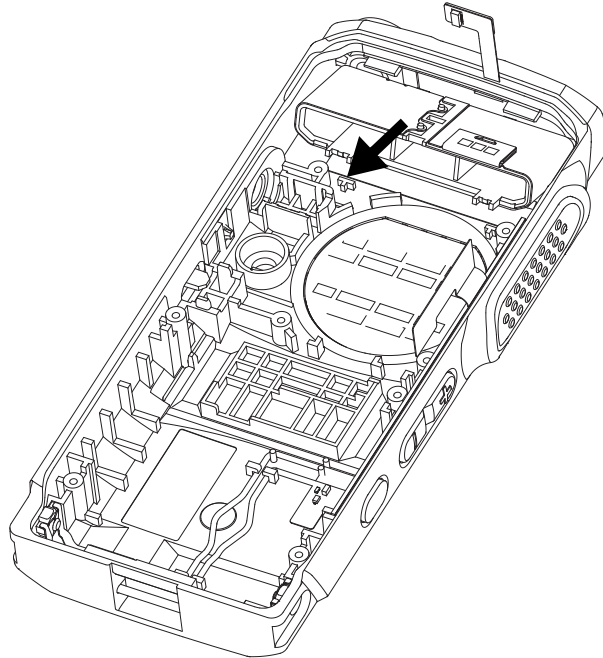


Figure 5-18. Internal Antenna Disassembly

### 5.6.6 Dust Cover Disassembly

1. Cut off the dust cover head.

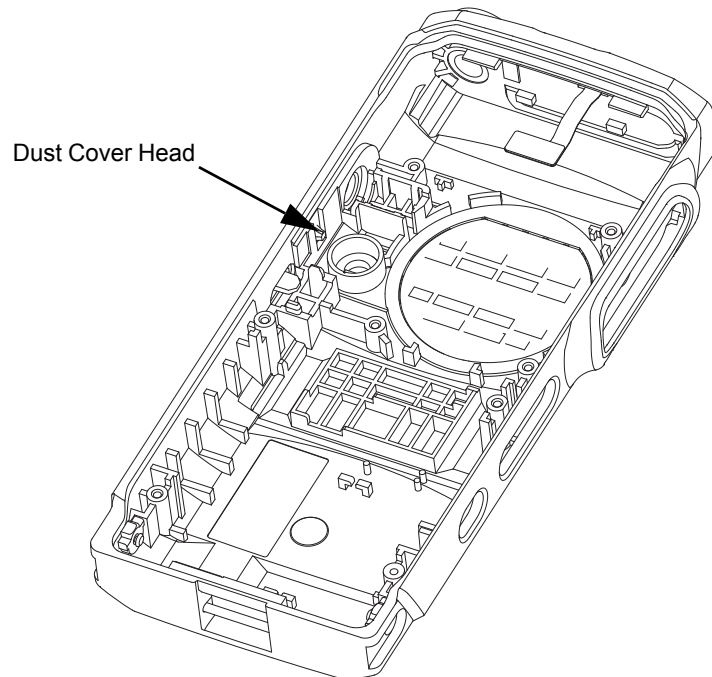


Figure 5-19. Dust Cover Head Removal

2. Pull the dust cover out from the front housing as shown in Figure 5-20.

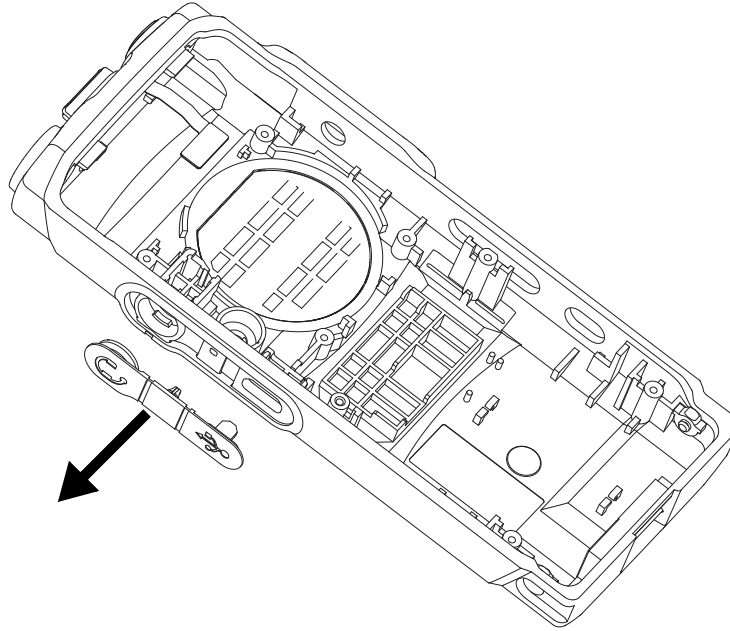


Figure 5-20. Dust Cover Removal

## 5.7 Radio Reassembly – Detailed

### 5.7.1 Dust Cover Reassembly

1. Insert the dust cover tail into the front housing middle hole openings as shown in Figure 5-21.

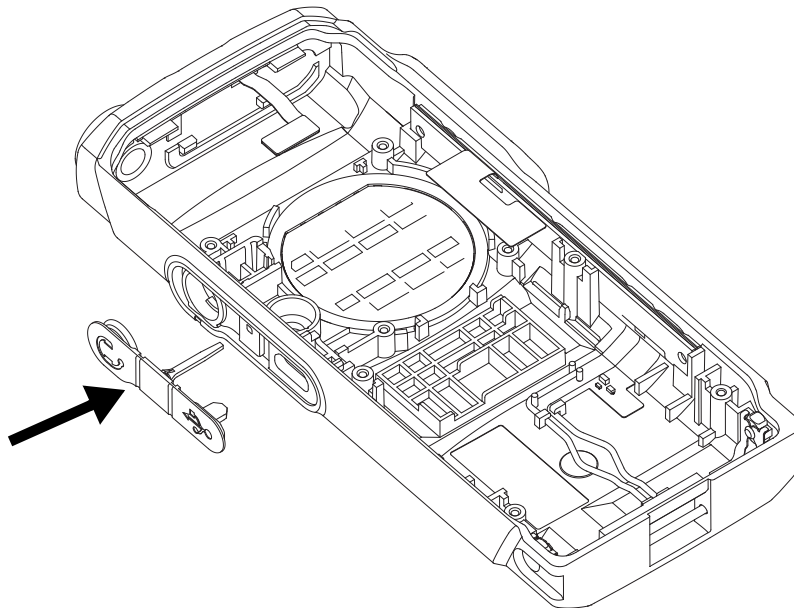
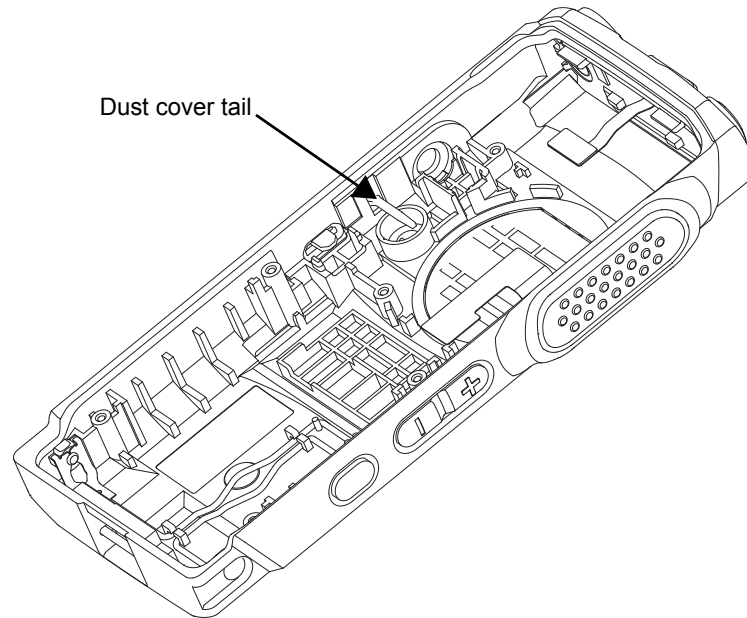


Figure 5-21. Dust Cover Tail Insertion



2. Use a long nose plier and pull the tail inward, from inner part of the housing until the head is fully inserted as shown in Figure 5-22.

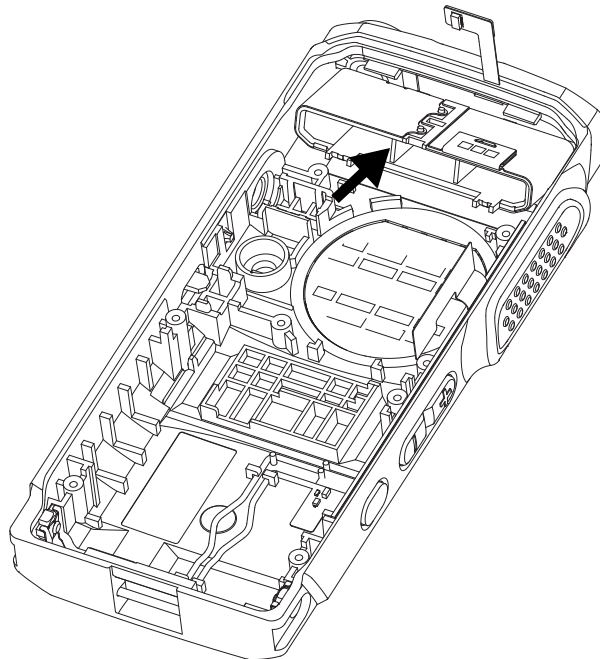


*Figure 5-22. Dust Cover Tail Full Insertion Into Housing*

3. Cut off the tail with a cutter.

## **5.7.2 Internal Antenna Reassembly**

1. Insert the internal antenna into the front housing in direction shown in Figure 5-23.



*Figure 5-23. Internal Antenna Reassembly*

### 5.7.3 LCD Display Reassembly

1. Insert the display module into front housing as shown in Figure 5-24.

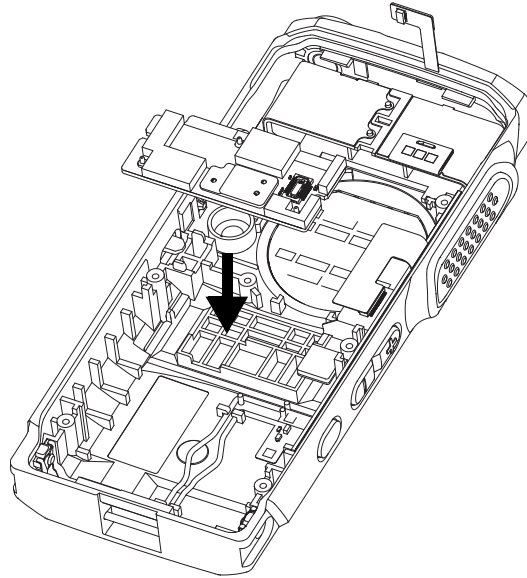


Figure 5-24. Display Module Reassembly

### 5.7.4 Audio Jack Flex, Micro USB Flex, Microphone (MIC), Speaker Flex, LCD Display, and Internal Antenna Reassembly

1. Insert the Microphone Flex into its recess on the front housing.
2. Insert the speaker into the front housing.
3. Insert Micro USB Flex into the front housing.
4. Insert Audio Jack Flex into the front housing.

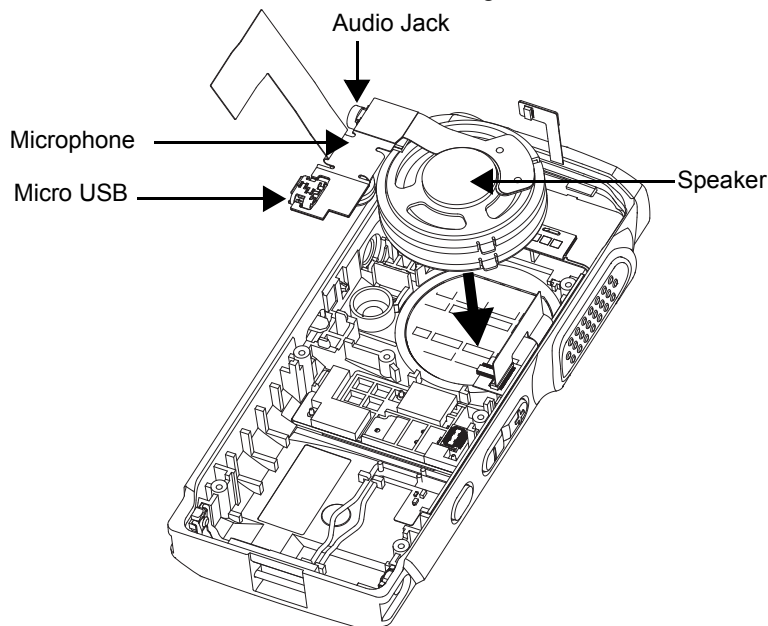


Figure 5-25. Speaker Reassembly

### 5.7.5 Internal Frame Reassembly

1. Insert the internal frame into the front housing, with a little slanting to ensure the internal frame is properly sits on the front housing ribs as shown in Figure 5-26.

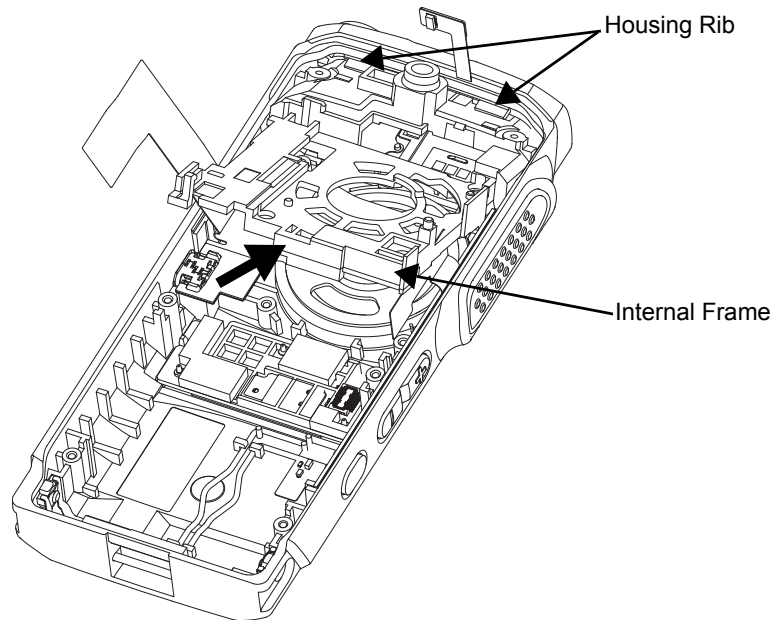


Figure 5-26. Internal Frame Reassembly

2. Screw in the internal frame as shown in Figure 5-27, using T06 Torx Plus screwdriver.

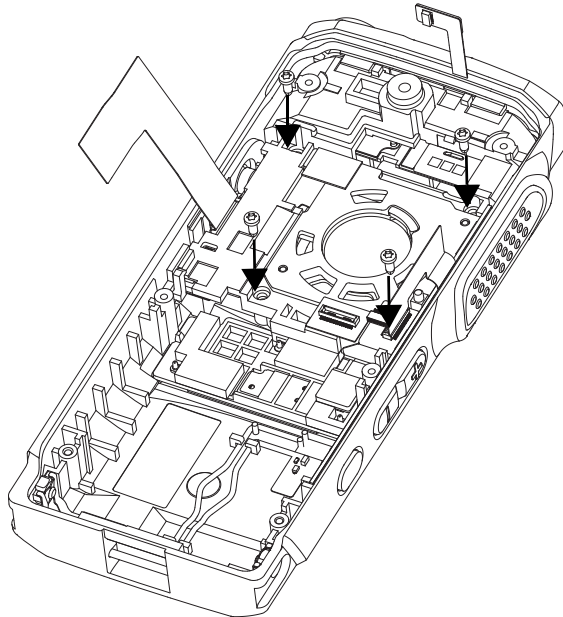


Figure 5-27. Internal Frame Screws Reassembly



Caution

Do not over torque the screws. Please refer to Table 5-4 for screws torque specifications.

### 5.7.6 Main PCB Reassembly

1. Attach the Audio Jack, Speaker, Micro USB, and Microphone Flex to the connector located at the bottom side of the main PCB as shown in Figure 5-28.
2. Attach the Display Flex to the connector located at the bottom of the main PCB.

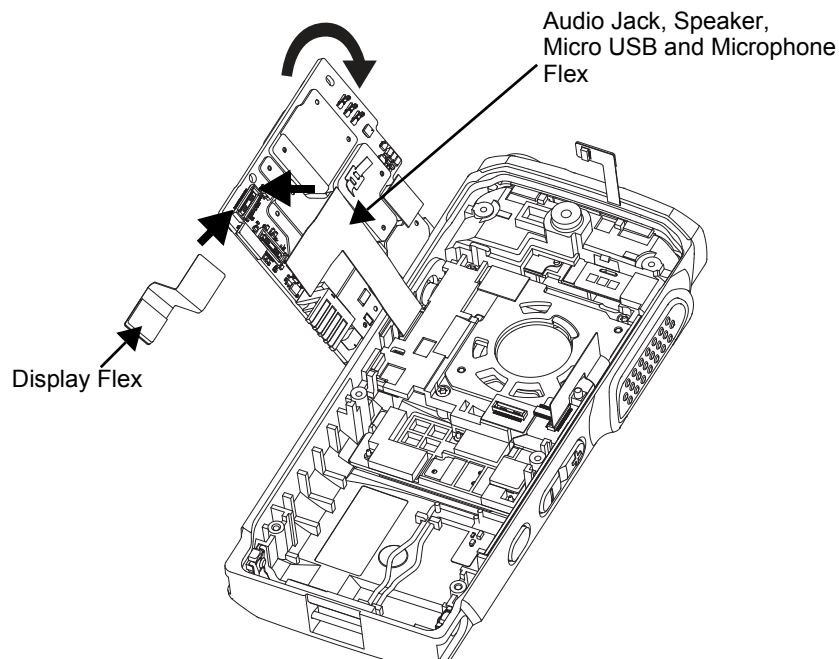


Figure 5-28. Audio Jack, Speaker, Micro USB, Microphone Flex, and Display Flex Reassembly

3. Insert the main PCB onto the internal frame.
4. Attach the Top Control Flex to the connector located at the upper side of the main PCB.



**Caution**

Only press on Poron Pad on Top Control Flex, while attaching the flex to the connector.

5. Attach the PTT Flex to the connector located at upper side of the main PCB.
6. Attach the Display Flex to the connector located at the LCD display module.

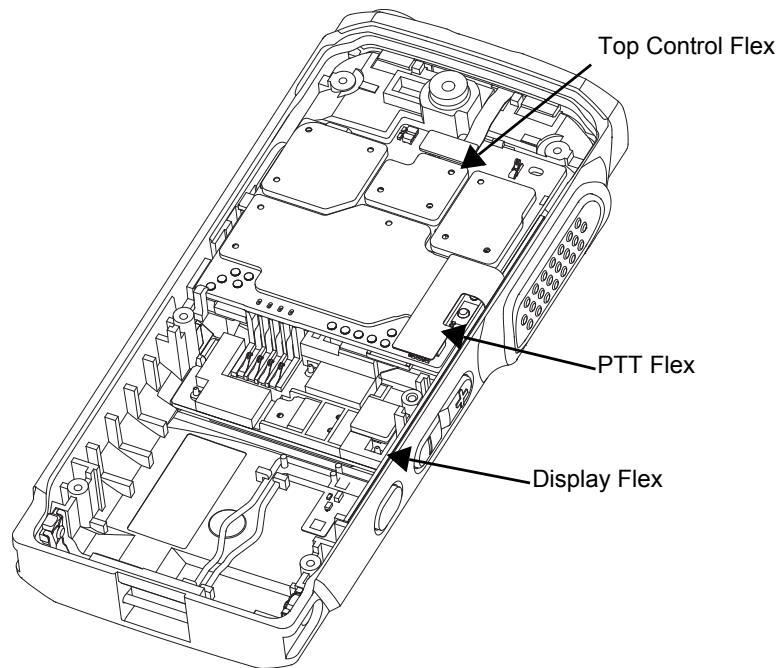


Figure 5-29. Main PCB Reassembly

### 5.7.7 Back Housing Reassembly

1. Place the back housing onto the front housing as shown in Figure 5-30, and press the back housing towards the front housing.

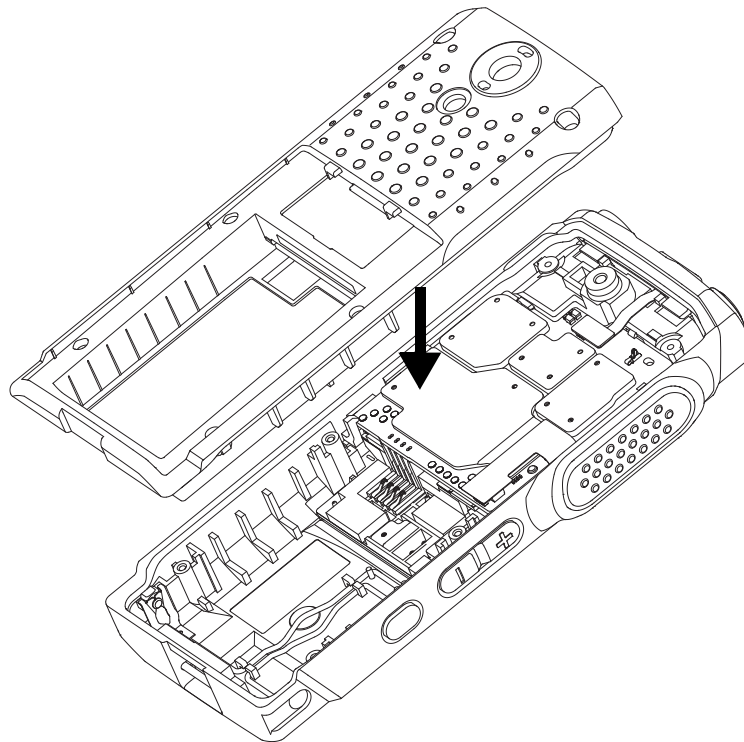


Figure 5-30. Back Housing Reassembly

2. Screw in all 6 screws to the back housing using T06 Torx Plus screwdriver as shown in Figure 5-31.

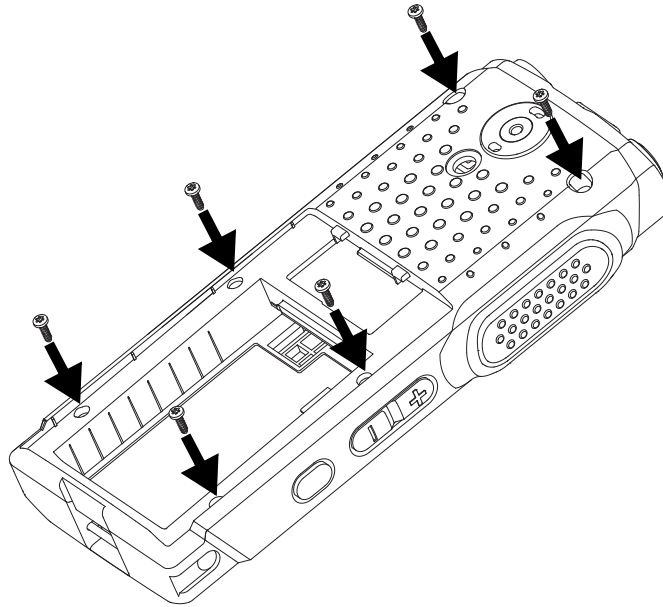
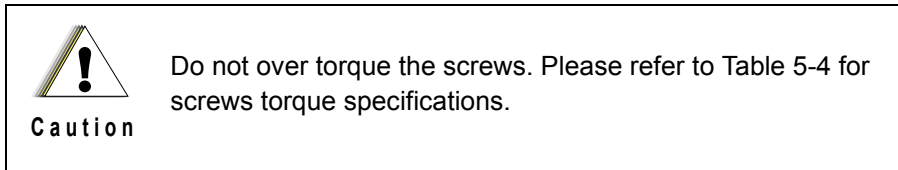


Figure 5-31. Screw Reassembly

3. Insert the battery as shown in Figure 5-32.

**NOTE:** Only battery PMNN4468 can be used for this radio.

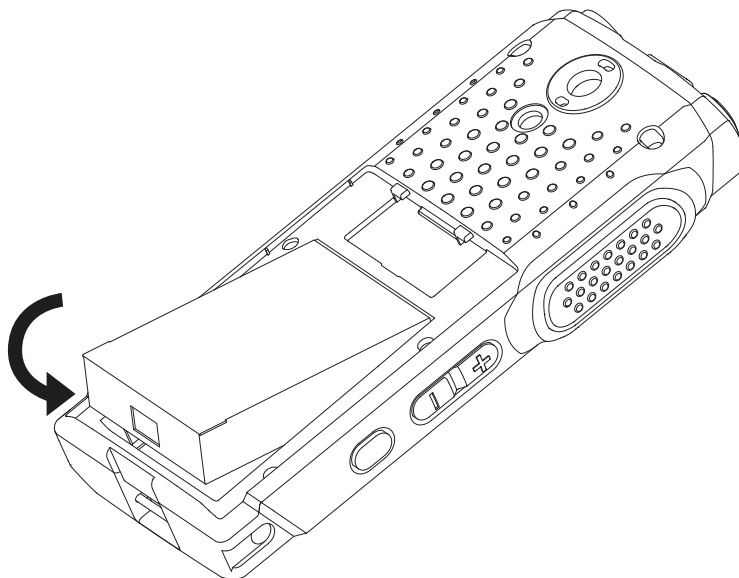
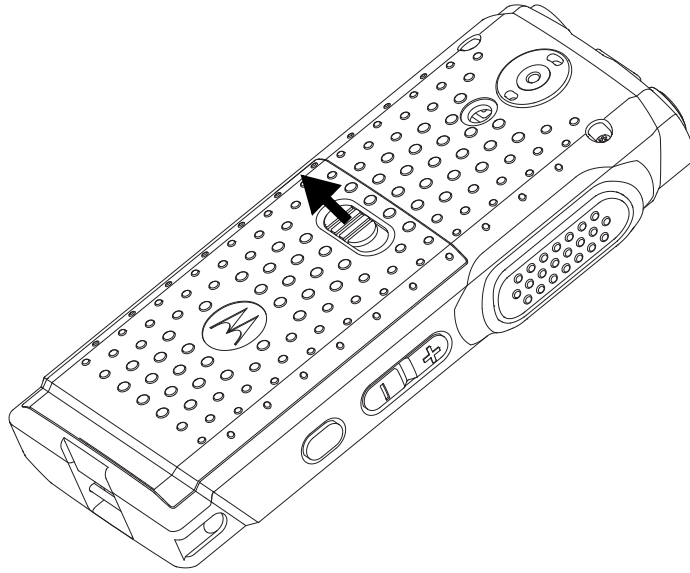


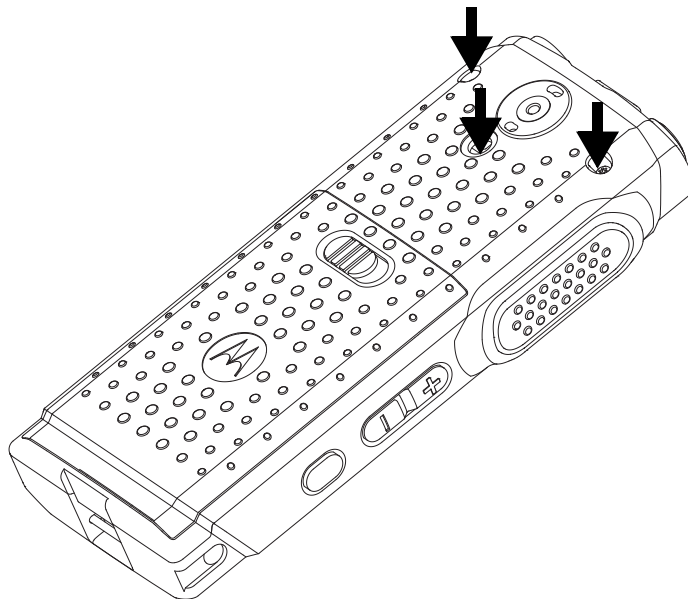
Figure 5-32. Battery Reassembly

4. Attach and lock battery door by sliding the latch to the left as shown in Figure 5-33.



*Figure 5-33. Lock The Battery Door*

5. Insert one RF plug, and two new screw plugs at the back housing as shown in Figure 5-34.



*Figure 5-34. Attaching One RF Plug And Two Screw Plugs*

### 5.7.8 External Antenna Reassembly

1. Turn the antenna clockwise to engage the antenna to the front housing.

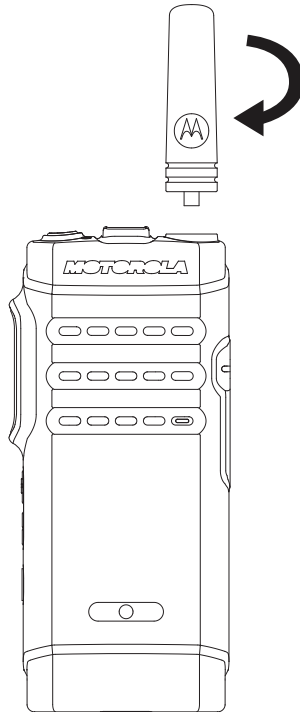


Figure 5-35. External Antenna Reassembly

### 5.7.9 Holster Reassembly

1. Attach the holster to radio as shown in Figure 5-36.

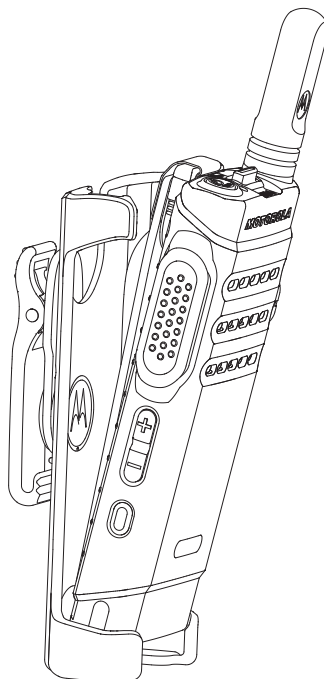


Figure 5-36. External Antenna Reassembly



## 5.8 Radio Exploded Mechanical Views and Parts Lists

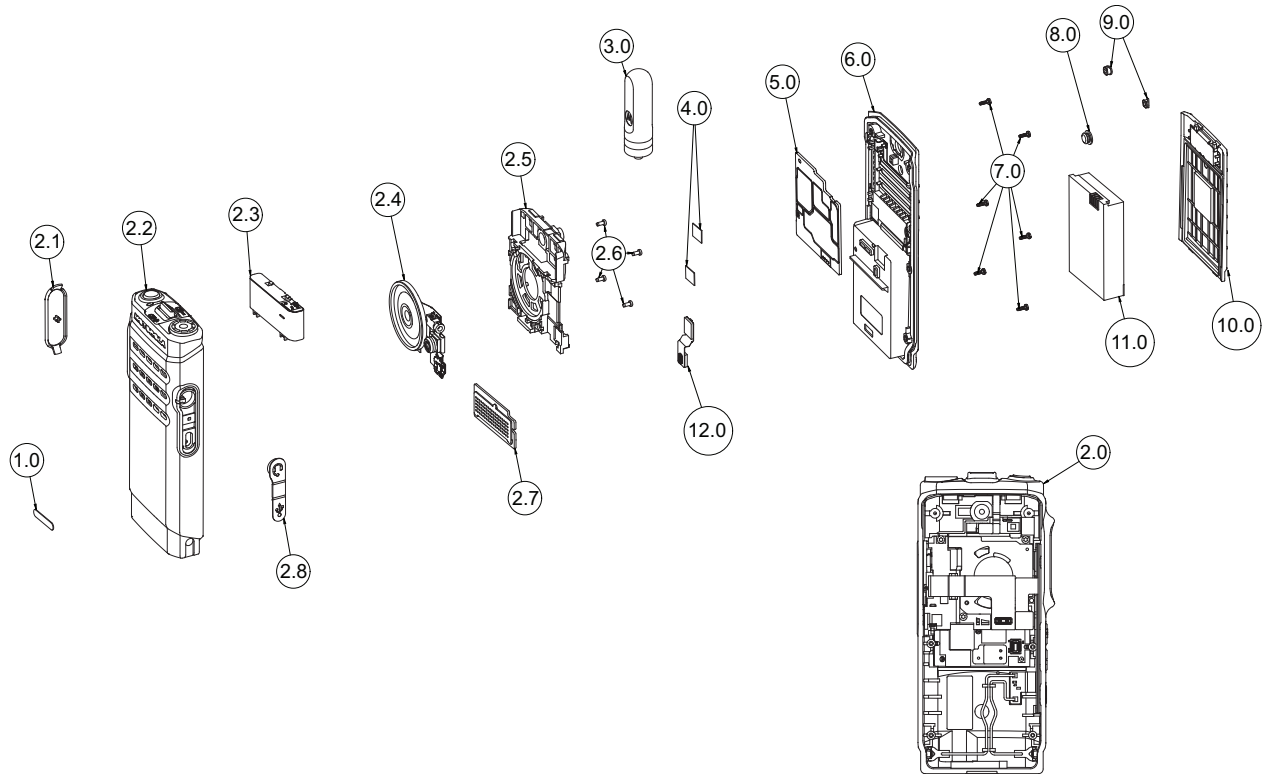


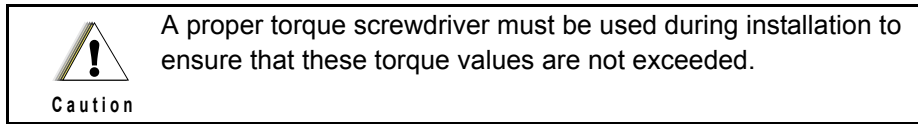
Figure 5-37. SL300 Exploded View

Item	Description	Part Number
1.0	Product Nameplate, SL300	33012015034
2.0	Front Kit, Assembly	Display, UHF: PMLE5027_ Display, VHF: PMLD4697_ Plain, UHF: PMLE5028_ Plain, VHF: PMLD4698_
2.1	PTT Paddle	Display: HN000352A01 Plain: HN000352A02
2.2	Front Housing, Assembly	Display: PMLN7197_ Plain: PMLN7198_
2.3	Internal Antenna Frame, Assembly	UHF: 0104064J35 VHF: 0104064J36
2.4	Audio Jack, Speaker, Micro USB, and Microphone Flex, Assembly	0104063J28
2.5	Internal Frame Assembly	0104064J28
2.6	Screw, Internal Frame	0378212A02
2.7*	Display, Assembly	UHF: 0104064J38 VHF: 0104064J97
2.8	Dust Cover, Audio Jack and Micro USB	SL000095A01
3.0	Antenna	See Accessory Table
4.0	Thermal Pad	7515526H01
5.0	Main PCB, Assembly	Display, UHF: PMLE5020_S Display, VHF: PMLD4696_S Plain, UHF: PMLE5036_S Plain, VHF: PMLD4703_S
6.0	Back Housing Assembly	UHF: PMLE5029_ VHF: PMLD4699_
7.0	Screw, Back Housing	FN000069A01
8.0	RF Plug	EN000047A01
9.0	Screw Plug	EN000037A01
10.0	Battery Door Kit Assembly	PMLN7074_
11.0	Battery	See Accessory Table
12.0*	Display Flex, Assembly	0104063J29
<b>Note: * Item for Display Model only</b>		

Table 5-3. SL300 Exploded View Parts List

## 5.9 Torque Chart

Table 5-4 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 5-4. Torque Specifications for Screws*

Part Number	Description	Qty	Driver/ Socket	Torque		
				N-m	lbs-in	kgf-cm
FN000069A01	Main Screw	6	T06 Torx Plus	0.11–0.14	1.0–1.2	1.2–1.4
0378212A02	Screw, Internal Frame	4	T06 Torx Plus	0.12–0.15	1.1–1.3	1.3–1.5

**Notes**

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# 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 or listed in Motorola Authorised Dealers 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 Power-Up Error Codes

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

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

Error Code	Description	Error Type	Corrective Action
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	Send radio to Motorola Depot to reprogram Flash Memory
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.
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.

## 6.3 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 any particular operational error codes.

*Table 6-2. Operational Error Codes*

<b>Error Code</b>	<b>Description</b>	<b>Error Type</b>	<b>Corrective Action</b>
FAIL 001	Synthesizer Out-of-Lock.	Non-Fatal	Reprogram the codeplug.
FAIL 002	Personality checksum or system block error.	Non-Fatal	Reprogram the codeplug.

## Notes



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# Chapter 7 Accessories

## 7.1 Introduction

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

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

### 7.1.1 Antennas

Part No.	Description
PMAE4093_	UHF Stubby Antenna (403–425 MHz), 4.5cm
PMAE4094_	UHF Stubby Antenna (420–445 MHz), 4.5cm
PMAE4095_	UHF Stubby Antenna (435–470 MHz), 4.5cm
PMAD4144_	VHF Stubby Antenna (136–144 MHz), 5cm
PMAD4145_	VHF Stubby Antenna (144–156 MHz), 5cm
PMAD4146_	VHF Stubby Antenna (156–174 MHz), 5cm

### 7.1.2 Batteries

Part No.	Description
PMNN4468_	Battery Lilon 2300mAh

### 7.1.3 Cables

Part No.	Description
CB000262A01	Micro USB Programming Cable
PMKN4128_	Portable Programming Cable with TTR

### 7.1.4 Carry Devices

Part No.	Description
PMLN7076_	Flexible Quick Release Hand Strap
PMLN7128_	Heavy-Duty Swivel Belt Clip
PMLN6074_	Nylon Wrist Strap
PMLN7190_	Swivel Carry Holster

### 7.1.5 Chargers

Part No.	Description
25009298001	Micro USB Power Supply, 5V/1A, US/NA Plug
PMLN7101_	Standard Multi-Unit Charger, US/NA Plug
PMLN7109_	Standard Single Unit Charger, US/NA Plug

### 7.1.6 Miscellaneous Accessories

Part No.	Description
PMLN7074_	Battery Door

### 7.1.7 Audio

Part No.	Description
PMLN7189_	Swivel Earpiece, In-Line MIC & PTT
PMLN7156_	Earbud with In-Line MIC/PTT, MagOne
PMLN7157_	2-Wire with Transparent Tube, Black
PMLN7158_	1-Wire Surveillance Earpiece, In-Line MIC & PTT
RLN6242_	Transport Acoustic Tube
5080384F72	High Noise Yellow Foam Earpieces

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# 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 <http://motorolasolutions.com>.

To register for online access:

- Have your Motorola Customer number available.
- Please go to <http://motorolasolutions.com> and click on "Sign Up Now."
- Complete form and submit it.
- Contact your BDM to complete set-up and it will be done within 24 to 48 hours.

## Notes

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## **Appendix B Motorola Service Centers**

### **B.1 Servicing Information**

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

### **B.2 Motorola Service Center**

1220 Don Haskins Drive  
Suite A  
El Paso, TX 79936  
Tel: 915-872-8200

### **B.3 Motorola Federal Technical Center**

10105 Senate Drive  
Lanham, MD 20706  
Tel: 1-800-969-6680  
Fax: 1-800-784-4133

### **B.4 Motorola Canadian Technical Logistics Center**

Motorola Canada Ltd.  
8133 Warden Avenue  
Markham, Ontario, L6G 1B3  
Tel: 1-800-543-3222  
Fax: 1-888-331-9872 or 1-905-948-5970

## Notes

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# Glossary

Term	Definition
<b>Band</b>	Frequencies allowed for a specific purpose.
<b>CPS</b>	Customer Programming Software: Software with a graphical user interface containing the feature set of a radio.
<b>Default</b>	A pre-defined set of parameters.
<b>Digital</b>	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.
<b>FCC</b>	Federal Communications Commission.
<b>Frequency</b>	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
<b>kHz</b>	kilohertz: One thousand cycles per second. Used especially as a radio-frequency unit.
<b>LCD</b>	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.
<b>LED</b>	Light Emitting Diode: An electronic device that lights up when electricity is passed through it.
<b>MHz</b>	Megahertz: One million cycles per second. Used especially as a radio-frequency unit.
<b>PC Board</b>	Printed Circuit Board. Also referred to as a PCB.
<b>Programming Cable</b>	A cable that allows the CPS to communicate directly with the radio using USB.
<b>Receiver</b>	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.
<b>RF</b>	Radio Frequency: The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
<b>RX</b>	Receive.
<b>Signal</b>	An electrically transmitted electromagnetic wave.
<b>Spectrum</b>	Frequency range within which radiation has specific characteristics.

Term	Definition
<b>Squelch</b>	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.
<b>Transceiver</b>	Transmitter-receiver. A device that both transmits and receives digital signals. Also abbreviated as XCVR.
<b>Transmitter</b>	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
<b>TX</b>	Transmit.
<b>UHF</b>	Ultra-High Frequency.
<b>USB</b>	Universal Serial Bus: An external bus standard that supports data transfer rates of 12 Mbps.







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