

MXP600 Basic Service Manual

FEBRUARY 2025

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MN006362A01-AN

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Legal and Compliance Statements

Intellectual Property and Regulatory Notices

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European Union (EU) and United Kingdom (UK) Waste of Electrical and Electronic Equipment (WEEE) Directive



The European Union's WEEE directive and the UK's WEEE regulation require that products sold into EU countries and the UK must have the crossed-out wheeled bin label on the product (or the package in some cases). As defined by the WEEE directive, this crossed-out wheeled bin label means that customers and end users in EU and UK countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end users in EU and UK countries should contact their local equipment supplier representative or service center for information about the waste collection system in their country.

Disclaimer

Please note that certain features, facilities, and capabilities described in this document may not be applicable to or licensed for use on a specific system, or may be dependent upon the characteristics of a specific mobile subscriber unit or configuration of certain parameters. Please refer to your Motorola Solutions contact for further information.

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Compliance with RF Exposure Standards

Your Motorola Solutions two-way radio is designed and tested to comply with various national and international standards and guidelines for human exposure to radio frequency electromagnetic energy.

Your Motorola Solutions two-way radio complies with the following RF energy exposure standards and guidelines:

- International Commission on Non-Ionizing Radiation Protection (ICNIRP)

In terms of measuring RF energy for compliance with these exposure guidelines, your radio generates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

Federal Communication Commission (FCC) Regulations

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for two-way radios before they can be marketed in the U.S.

When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. The use of a product label directing users to specific user awareness information can facilitate exposure awareness. Your Motorola Solutions two-way radio has Exposure Product Label. Do not remove this RF Exposure Label from the device. Also, your Motorola Solutions user manual, or separate safety booklet includes information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

RF Energy Exposure Awareness, Control Information, and Operational Instructions for Occupational Use



NOTE: This radio is intended for use in occupational or controlled conditions where users have full knowledge of their exposure and can exercise control over their exposure to meet the occupational limits in Federal Communication Commission (FCC) or International Commission on Non-Ionizing Radiation Protection (ICNIRP) and International standards. This radio device is not authorized for general population consumer use.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses radio frequency (RF) energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, sunlight and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which when used improperly, can cause biological damage. High levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for safe exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection.

All Motorola Solutions two-way radios are designed, manufactured, and tested to ensure that they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it.

Refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits:

<http://www.fcc.gov/oet/rfsafety/rf-faqs.html>

<http://www.osha.gov/SLTC/radiofrequencyradiation/index.html>

RF Exposure Compliance and Control Guidelines

Always adhere to the following procedures to control RF exposure to yourself and others and also to comply with the occupational/controlled environment exposure limits.

- Do not remove the RF Exposure Label from the device.
- User awareness instructions should accompany the device when transferred to other users.
- Do not use this device if it does not meet the operational requirements.

Operating Instructions

- Transmit no more than the rated duty factor of 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. It is important to transmit 50% of the time or less, because this radio generates measurable RF energy exposure only when transmitting.

Approved Accessories

Use only Motorola Solutions-approved supplied or replacement antennas, batteries, and accessories. Use of non-Motorola Solutions-approved antennas, batteries, and accessories may exceed Institute of Electrical and Electronic Engineers (IEEE) or International Commission on Non-Ionizing Radiation Protection (ICNIRP) radio frequency (RF) exposure guidelines.

For a list of Motorola Solutions-approved antennas, batteries, and other accessories, contact your dealer or local Motorola Solutions contact. Your nearest dealer can be found at <http://www.motorolasolutions.com>.

Additional Information

For additional information on exposure requirements or other training information, visit <http://responsibility.motorolasolutions.com/index.php/downloads/dow07-rfexposureassessmentstand/>.

Safety Information

This chapter is an extract of the multilingual safety booklet publication. For the latest safety information, refer to the separate safety booklet delivered with your radio.

RF Energy Exposure and Product Safety Guide



IMPORTANT: 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.

Electromagnetic Interference or Compatibility

If inadequately shielded, designed, or otherwise configured for electromagnetic compatibility, nearly every electronic device is susceptible to Electromagnetic Interference (EMI).

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.

Medical Devices

Pacemakers

The Advanced Medical Technology Association (AdvaMed) recommends that a minimum separation of 15 cm (6 in.) be maintained between a hand-held wireless radio and a pacemaker. These recommendations are consistent with those of the U.S. Food and Drug Administration. Persons with pacemakers should:

- ALWAYS keep the radio more than 15 cm from their pacemaker when the radio is turned ON.
- Not carry the radio in the breast pocket.
- Use the ear opposite the pacemaker to minimize the potential of interference.
- Turn the radio OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids

Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from RF energy. Your physician may be able to assist you in obtaining this information.

Conformance Statement

This product is in conformance with the TETRA (Terrestrial Trunked Radio) standard.

Use of Communication Devices While Driving

Always obey the laws and regulations on the use of radios in the area where you drive.

- Give full attention to driving and to the road.

- Use hands-free operation, if available.
- Pull off the road and park before making or answering a call if driving conditions or regulations so require.

Operational Warnings



WARNING:

For vehicles with an air bag, refer to the manual of the vehicle manufacturer before installation of electronic equipment to avoid interference with air bag wiring.

Do not mount or place a radio over an air bag or in the air bag deployment area. Air bags inflate with great force. If your radio is placed in the air bag deployment area and the air bag inflates, your radio propels with great force and cause serious injury to occupants of the vehicle.

Potentially Explosive Atmospheres (explosive atmospheres refers to hazard classified locations that may contain hazardous gas, vapors, or dusts)

Turn off your radio before entering any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas as "Intrinsically Safe" such as Factory Mutual, CSA, UL, CENELEC, or ATEX approved.

The areas with potentially explosive atmospheres include fueling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust, or metal powders. Areas with potentially explosive atmospheres are often but not always posted.

Blasting Caps And Blasting Areas

To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn Off Two-way Radio". Obey all signs and instructions.

Operational Cautions

Antennas

Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

Batteries

If a conductive material such as jewelry, keys, or beaded chains touch exposed battery terminals, it can cause property damage and/or bodily injury such as burns. The conductive material may complete an electrical circuit (short circuit) and become hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.

Document History

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

Table 1: Document History

Edition	Description	Date
MN006362A01-AA	Initial edition.	September 2020
MN006362A01-AB	• Service Flowchart updated for self-maintained customers. • Updated Replacement Parts List on page 61. • Updated Accessories Replacement Parts List. • Steps and video updated for Installing the Keypad and Mylar Assembly on page 124. • Steps updated for Installing the GORE membrane on page 143. • Updated steps for Performing Vacuum Leak Test on page 163. • Added Installing or Uninstalling the MicroSD Card. • Added Installing or Uninstalling the SIM Card. • Applicable service kits updated in Service Replacement Kit Matrix on page 177. • Duplication removed in Service Aids on page 181. • Updated the Singapore contact in Service Information for APAC.	December 2020
MN006362A01-AC	• Remove PMLN6101_ in Typical Test Setup table. • Added Medium Capacity Battery 2900 mAH (PMNN4582A)	March 2021
MN006362A01-AD	• Added RTC Setup on page 42. • Updated the Parts Replacement List section Replacement Parts List on page 61 • Updates the Accessories Replacement Parts List Accessories Replacement Parts List on page 70 • Updated the Vacuum Leak Test section Vacuum Leak Test on page 162 • Added Coin Cell Test in Testing in DALT Mode on page 45	August 2021

Edition	Description	Date
	- Added Removing the Keypad Flex Assembly on page 111. - Added Installing the Keypad Flex Assembly on page 132. - Added sales model MDH77PCN6TZ5ANSP02 to Model Information on page 18. - Added Removing the Coin Cell Battery on page 109 and Installing the Coin Cell Battery on page 136 topics. - Updated the Removing the Display Assembly on page 113 and Installing the Display Assembly on page 128 section. - Updated the PMUE5763_Z in the Replacement Parts List on page 61 section.	
MN006362A01-AE	Updated the information for writing in Programming the NFC Tag on page 167 .	January 2022
MN006362A01-AF	- Added new sales models in Model Information on page 18 - Added MXP600 Green Tanapa in Replacement Parts List on page 61 - Renamed Man Down to Man Down (Fall Alert) - Added new service kits in Service Replacement Kit Matrix on page 177 - Added battery weights in General Specifications on page 18.	February 2022
MN006362A01-AG	Updated GNSS information in GNSS Section on page 26 .	August 2022
MN006362A01-AH	- Updated PMHN4421_ and PMHN4457_ details in Replacement Parts List on page 61 - Updated Removing the Keypad Flex Assembly on page 111 section. - Updated Installing the Keypad Flex Assembly on page 132 section.	December 2022
MN006362A01-AJ	- Added SIM models to GNSS Section on page 26. - Added PMUE5763CZ in Service Replacement Kit Matrix on page 177.	March 2023
MN006362A01-AK	Removed Hand Pump Vacuum Leak Tester Kit.	April 2023
MN006362A01-AL	Updated Installing or Uninstalling the SIM Card on page 79 topic.	May 2023
MN006362A01-AM	Updated Replacement Parts List on page 61.	September 2024

Edition	Description	Date
MN006362A01-AN	Updated Replacement Parts List on page 61.	February 2025

Notations Used in This Manual

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



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



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



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

Chapter 1

Model Information

The model information applies to MXP600, Class 3, TETRA Handportable Terminal model.

Table 2: MXP600 Sales Models

Radio Model	Sales Model No.	Short Description
MXP600	MDH77PCN6TZ5AN	MXP600 350-470 MHZ PTW952HEB
	MDH77PCN6TZ5ANB	MXP600 350-470 MHZ BULK PTW952HEB
	MDH77PCN6TZ5ANSP01	MXP600 BSI 350-470 MHZ PTW952HEB
	MDH77PCN6TZ5ANSP02	MXP600 SECTRA 350-470MHZ PTW952HEB
	AZH77PCN6TZ5AN	MXP600 350-470 MHZ PTW952HEB
	ANH77PCN6TZ5AN	MXP600 350-470 MHZ PTW952HEB
	MDH77PCN6TZ5ANSP07	MXP600 GREEN 350-470MHZ PTW952HEB

1.1

Model Specifications



NOTE: Specifications are subject to change without notice.

1.1.1

General Specifications

Table 3: General Specifications

GENERAL	
ETSI:	ETS 300 019-1-7
Type Number:	PTW952HEB
Temperature Range for Transceiver:	
Operating (without battery)	-30 °C to +70 °C
	 NOTE: Performance may be limited when operating at extreme temperatures.
Storage	-40 °C to +85 °C

GENERAL	
Battery Types:	
Standard	Removable 1900 mAh Li-Ion, 61.0 g
Medium Capacity	Removable 2900 mAh Li-Ion, 92.5 g
High Capacity	Removable 3400 mAh Li-Ion, 90.5 g
Battery Voltage:	
Minimum	3.2 Vdc
Nominal	3.8 Vdc
Portable Dimensions: (HxWxD in mm)	
	120x54x25 mm with standard battery 1900 mAh
	120x54x30 mm with medium capacity battery 2900 mAh
	120x54x30 mm with high capacity bat- tery 3400 mAh
Weight:	
SD (with standard battery and 60 mm 380 MHz antenna)	212±1% g
SIM (with standard battery and 60 mm 380 MHz antenna)	212±1% g
Bluetooth:	
BT Compliance:	Bluetooth 5.0, Bluetooth 4.2, Bluetooth 4.1, Bluetooth 4.0, and Bluetooth 2.1 + EDR
Frequency Band Channels:	2.4 GHz ISM Spectrum 2402–2480 MHz Freq. hopping 79
Modulation:	GFSK, 8 DPSK, Pi/4 DQPSK
Transmission Rate:	Up to 3 Mbps
RF Power:	Class 2, 0–4 dBm
Receiver's Sensitivity:	-70 dBm at 0.1% BER
Operating Range:	Up to 10 m (line-of-sight)
Wi-Fi	
Supported IEEE Standards:	802.11 a, b, g, n, ac
Wi-Fi Bands:	2.4 GHz and 5 GHz
Authentication and Encryption:	WPA WPA2 WPA2 Enterprise (EAP-TLS)
Security:	TLS 1.2
NFC	

GENERAL

Tag Type:

ISO/IEC 15693



NOTE: Contains radio Bluetooth MAC address to assist fast pairing with smart device and radio serial number.

RFID

Tag Type:

866-868 MHz or 902-928 MHz

1.1.2

Receiver Specifications

Table 4: Receiver Specifications

RECEIVER

Receiver Type:	Class A and B
Frequency Range:	350.0–470.0 MHz
Channel Spacing:	25 kHz
Sensitivity (3.5%) BER:	
MXP600	-116 dBm (guaranteed)
MXP600 FuG	-118 dBm (typical)
Intermodulation:	(3.5%) BER
Interfering Signal Level	-47 dBm
Selectivity Blocking: (50–100 kHz)	(3.5%) BER
Interfering Signal Level	-40 dBm
Spurious Rejection:	(3.5%) BER
Interfering Signal Level	-45 dBm
Frequency Stability:	
Locked to Base	±100 Hz
Unlocked to Base	±1000 Hz
Audio Rated	2 W
Distortion at Rated Audio:	1% Max.

1.1.3

Transmitter Specifications

Table 5: Transmitter Specifications

TRANSMITTER

Modulation Type:	$\pi/4$ DQPSK
-------------------------	---------------

TRANSMITTER	
RF Power:	Class 4 Class 3L Class 3
Frequency Range:	
TMO	350.0–470.0 MHz
DMO	350.0–470.0 MHz
Frequency Stability:	
Locked to Base:	±100 Hz
Unlocked to Base:	±1000 Hz
Spurious Emissions:	
Conducted	
30 MHz–1 GHz:	-36 dBm
1 GHz–12.75 GHz:	-30 dBm
Radiated	
30 MHz–1 GHz:	-36 dBm
1 GHz–12.75 GHz:	-30 dBm
Adjacent Channel Power (at ±25 kHz):	
Class 4 (1 W)	-55 dBc
Class 3L (1.8 W)	-60 dBc
Class 3 (2.8 W)	-60 dBc

1.2

Sales Model Nomenclature

Table 6: Model Numbering Scheme

Position	0	1	2	3	4	5	6	7	8	9	10	11	12
Model Number	MD	H	7	7	P	C	N	6	T	Z	5	A	N

Table 7: Sales Models – Description of Positions

Position	Description	Value
0	Applicable Region	AZ = Asia/Latin America Central Region (APAC/LACR) AN = Australia & New Zealand (ANZ) MD = Europe, Middle East, and Africa (EMEA)
1	Type of Unit	H = Hand-Held Portable M = Mobile Product
2	Model Series	77 = Motorola Solutions MXP600
3		

Position	Description	Value
4	Frequency Band	P = 350–470 MHz  NOTE: Values given represent range only; they are not absolute.
5	Power Level	A = 0–0.7 W B = 0.7–0.9 W C = 1.0–3.9 W D = 4.0–5.0 W E = 5.1–6.0 W F = 6.1–10.0 W
6	Physical Packages	F = Limited Keypad – With Display H = Full Keypad – With Display K = Limited Controls – Basic Display N = Enhanced Controls – Enhanced Display
7	Channel Spacing	1 = 5 kHz 2 = 6.25 kHz 3 = 10 kHz 4 = 12.5 kHz 5 = 15 kHz 6 = 25 kHz 7 = 30 kHz
8	Primary Operation	N = Digital Front Q = Low Profile – Basic Display R = Digital Multi-Service T = TDMA Digital Dual Mode
9	Primary System Type	Z = Dimetra
10	Feature Level	1 = Basic 2 = Limited Pkg 3 = Limited Plus 4 = Intermediate 5 = Standard Pkg 6 = Standard Plus 7 = Expanded Pkg 8 = Expanded Plus 9 = Full Feature/Programmable
11	Version	Major Change to the radio will have an up-revision
12	Unique Model Variations	N = Standard Package R = Blue Housing Z = Black Housing

Chapter 2

Overview

To achieve a high spectrum efficiency, your radio uses digital modulation technology and a sophisticated voice-compression algorithm. The voice received by the microphone is converted into a digital bit stream consisting of zeros (0) and ones (1).

The digital bit stream is modulated into a radio frequency (RF) signal. The stream is transmitted over-the-air to another radio and the process is called digital modulation.

2.1

Digital Modulation Technology

Your radio operates in the following modes:

- Dispatch Mode
- Phone Mode
- Trunked Mode Operation (TMO)
- Direct Mode Operation (DMO)

Your radio uses the $\pi/4$ DQPSK and Time Division Multiple Access (TDMA) digital technologies.

$\pi/4$ DQPSK is a modulation technique that transmits information by altering the phase of the signal. Data is converted into complex symbols, which alter the Radio Frequency (RF) signal and transmit the information. When the signal is received, the change in phase is converted back into symbols and then into the original data.

The system can accommodate 4-voice channels in the standard 25 kHz channel as used in the two-way radio. Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into four slots, one for each unit.

Time allocation enables each unit to transmit data information without interference from other transmitting units. Transmission from a unit or base station is accommodated in 15 ms time-slot lengths and 60 ms frame lengths. The TDMA technique requires sophisticated algorithms and a Digital Signal Processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation.

2.2

Voice Compression Technology

Voice is converted into a digital bit stream. This conversion is done by sampling the voice at a high rate and converting the samples into numbers. The samples are represented by bits.

Voice compression reduces the number of bits per second while maintaining the voice at an acceptable quality level. Your radio uses a coding technique called Algebraic Code Excited Linear Prediction (ACELP). The compressed voice-data bits modulate the Radio Frequency (RF) signal.

2.3

Transceiver

All radio circuitry are contained in the Digital/RF board and the keypad board.

The Digital/RF board is divided into the following sections.

- Digital

- Transmitter
- Receiver
- Frequency Generating

2.3.1

Digital Section

The digital section is based on a Dual Core System On a Chip (SoC) processor. The Dual Core Processor SoC is a low-power applications processor with dual core architecture.

The dual core architecture is based on the following cores:

- Advanced RISC Machine (ARM) application core
- Digital Signal Processor (DSP) core with floating point

The dual-core architecture of the Dual Core Processor SoC provides benefits of both DSP and Reduced Instruction Set Computing (RISC) technologies.

The DSP performs modulation and de-modulation functions for the radio. It also performs Forward Error Correction and other correction algorithms for overcoming channel errors and Algebraic Code Excited Linear Prediction (ACELP) speech coding.

The DSP carries out the following functions:

- Linear 16-bit analog to digital conversions
- Audio filtering
- Level amplification for the microphone audio input and the received audio output

The power and audio section is based on the Power Management IC and includes power supplies, audio routing, microphone, and earpiece amplifiers. An external audio power amplifier is used for the loudspeaker.

2.3.2

Transmitter Path

The transmitter circuitry includes a linear class AB Power Amplifier (PA) for the linear modulation of the terminal. The transmitter includes a Cartesian Loop to enhance the transmitter linearity and reduce splattering power into adjacent channels.

The transmitter path consists of a Cartesian Loop that contains forward and feedback paths. The forward path includes the following items:

- Tx Power Control Integrated Circuit
- Balanced-Unbalanced Converter (BALUN)
- Forward Attenuator
- Power Amplifier
- Directional Coupler
- Antenna Switch

The loop feedback path includes the following items:

- Tx Power Control Integrated Circuit
- BALUN
- Feedback Attenuator
- Directional Coupler

2.3.3

Receiver Path

The receiver section in your radio is based on the Direct Conversion (DCR) technology. The main concept of this technology is down converting of the Radio Frequency (RF) signal directly into a base band signal, skipping the intermediate stage of the Intermediate Frequency (IF) signal.

The receiver path includes the following items:

- Duplexer
- Antenna Switch
- RF Switches
- Off Channel Detector and Inverting Schmitt Trigger
- Balanced-Unbalanced Converter (BALUN)
- Limiter
- 2-bit 6 dB Discrete Attenuator
- Discrete Front-End Filter
- Low Noise Amplifier (LNA) integrated with Discrete Attenuator and Automatic Gain Control (AGC) continuous attenuation
- 13 dB (350 MHz) or 12 dB (800 MHz) of Gain with LNA Bypass Option
- Discrete Post-Selector Filter (350 MHz) or SAW Post-Selector Filter (800 MHz)
- RFIC for mixing
- Baseband filtering and internal 55 dB AGC continuous attenuation (inclusive of the internal 10 dB step attenuator) which consists of all the baseband receive chain and mixer

2.3.4

Frequency Generating Section

The frequency generating section includes the following components:

- Low Band VCO (350–410 MHz)
- High Band VCO (410–470 MHz) Fractional-N Synthesizer
- Reference Oscillator
- Loop Filter
- Voltage Multiplier

2.4

Bluetooth/WLAN Section

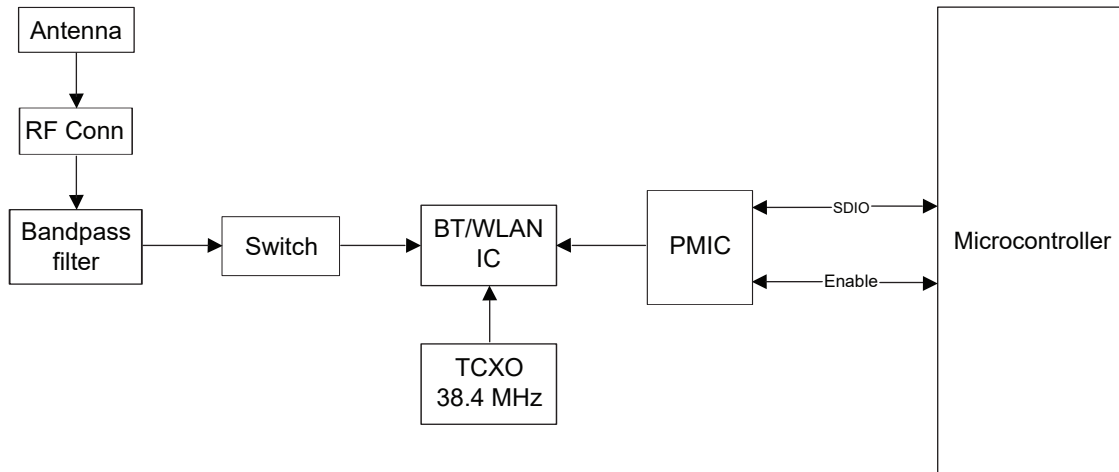
This section provides detailed description on Bluetooth/WLAN in the radio.

The Bluetooth section includes the following main components:

- BT/Wi-Fi Antenna
- Radio Frequency (RF) Connector
- Bandpass Filter
- Switch
- TCXO 38.4 MHz

- Bluetooth and Wi-Fi IC

Figure 1: Bluetooth/WLAN Block Diagram



The Bluetooth/WLAN path only consists of RF connector and bandpass filter that transfers the Bluetooth/WLAN signal from the antenna into the IC.

The IC receives a 38.4 MHz reference frequency from TCXO to pull up the signal of BT_EN/WIFI_EN from Dual Core Processor and subsequently enable Bluetooth/WLAN operation.

2.5

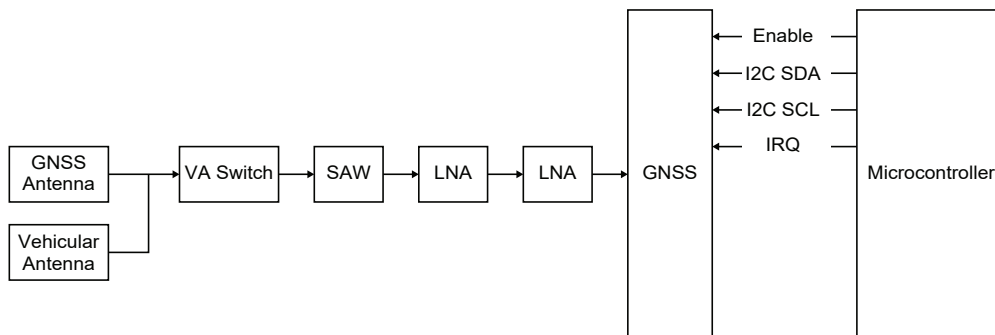
GNSS Section

This section provides description on Global Navigation Satellite System (GNSS) in the radio.

The GNSS section contains the following components:

- GNSS Antenna
- GNSS Front Filter
- GNSS Chipset

Figure 2: GNSS Block Diagram



The GNSS is based on GNSS IC, which comprises GNSS in a single chip QFN40 or QFN28. The GNSS consists of the Front Filter that transfers the GNSS signal from the antenna to the IC.



NOTE:

- QFN40 for PMLE5298A, PMLE5307A, PMLE5345A, PMLE5346A-BSI, and PMLE5347A
- QFN28 for PMLE5345B, PMLE5346B, and PMLE5347B

The IC receives a 19.5 MHz or 26 MHz reference frequency from the TCXO.



NOTE:

- 19.5 MHz for PMLE5298A, PMLE5307A, PMLE5345A, PMLE5346A-BSI, and PMLE5347A
- 26 MHz for PMLE5345B, PMLE5346B, and PMLE5347B

The purpose is to pull high signal of UBX Enable from Dual Core Processor and enable the GNSS operation.

2.6

Bottom and GCAI Connectors

Mode Select (Option 1 and Option 2)

Table 8: Logic Levels

Use the following logic levels to select the requested bottom connector mode:

Accessory	Mode	USB Host/Device (configured by OTG ID)	OPT1	OPT2
No accessory	N/A	N/A	1	
Boot	Universal Asynchronous Receiver Transmitter (UART)	N/A	Don't Care	
AIE Keyload	UART	N/A	0	
IMT				
ITM	USB	Device	1	0
USB Travel Charger Power Supply				
USB to UART Converter		Host		
Another MTP Series Radio		Host/Device		
Hardwired Power Supply	PS Charger – USB	Device	0	1
TC/Vehicle Power Adapter				
Dual-Unit Charger				
Multi-Unit Charger				
Car Kit				

Accessory	Mode	USB Host/Device (configured by OTG ID)	OPT1	OPT2
Factory Test Fixture	Factory Mode	SWB+ driven	1	0



NOTE: Digital car kits use 1-WIRE for detection.

Table 9: Bottom to BTB Connector

Bottom Connector Pin	BTB Connector Pin, J1200_L	Signal
1	11	USB_DP_TXD
2	16	USB_5V
3	27	OPT2
4	25	OPT1
5	1, 3, 5, 7, 9, 15, 21	GND
6	13	USB_DM_RXD
7	19	SWB+_SUPPLY
8	22	Line_In-
9	20, 26, 29	AUDIO_GND
10	30	Line_Out+
11	17	OTG_ID
12	2, 4, 6, 8, 10, 12	EXT_B+
13	14	1-Wire
14	15	FMLB_GND
15	18	BOOT_MODE
16	23	PTT
17	24	Line_In+
18	28	Line_Out-

Mini GCAI Connector

Figure 3: Mini GCAI Connector

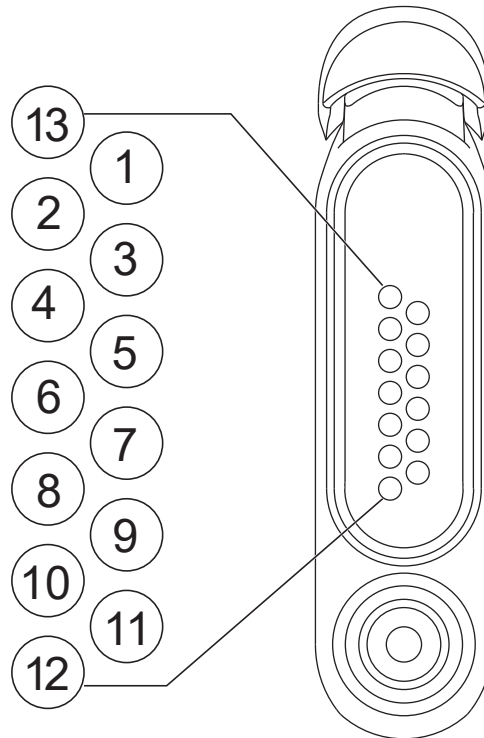


Table 10: Mini GCAI Connector Pins

Mini GCAI Connector Pin	Signal
1	PTT / GPIO3
2	GND
3	GPIO1 / USB D+
4	GPIO2 / USB D-
5	GND
6	GPIO4 / Keyfail
7	1-Wire / OWI
8	Mic+
9	AGND (Mic-)
10	Detect
11	SPKR+ / Lineout+
12	SPKR- / Lineout-
13	VBUS / OPT_5V

Chapter 3

Programming Your Radio

For programming your radio, refer to *Customer Programming Software (CPS) Plus User Guide, 6802974C10*.

Figure 4: Sample of the TETRA CPS Plus Initializing Interface



Chapter 4

Test Setup and Testing

This chapter provides a general overview for testing Motorola Solutions radios. There are some differences with the variety of software versions running on the testing equipment. Refer to the user guides of the respective testing equipment for more details.

4.1 Performing Typical Test Setup

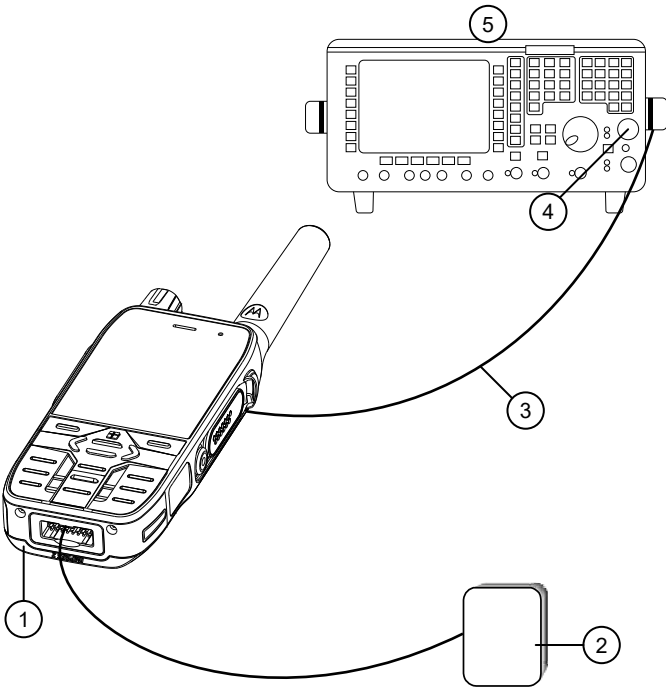
Prerequisites: Ensure that you have a battery eliminator (PS000430A01) and an RF adapter (TL000147A01).

Procedure:

1. Detach the antenna from your radio.
2. Connect the RF adapter (TL000147A01) at the rear side of your radio.
3. Secure the RF adapter with the retainer by tightening the thumb screw into the antenna nut.
4. Connect the other side of the cable to the N-type RF Connector of the IFR using an N-type-to-SMA-adapter.
5. Connect the power supply to the battery eliminator wires.

Example:

Figure 5: Typical Test Setup



Number	Description
1	Battery Eliminator

Number	Description
2	3.8 V Power Supply
3	RF Cable
4	N-Type RF Connector
5	IFR 39xx/IFR 2968



CAUTION: Connect the red (+) and black (–) wires of the battery eliminator to the respective positive and negative points of the power supply. Use the correct voltage that is 3.8 VDC, maximum 4.2 VDC. Failing to properly connect the wires can damage your radio and/or the power supply.

4.1.1

Assembling Procedures for Alternative Test Setup



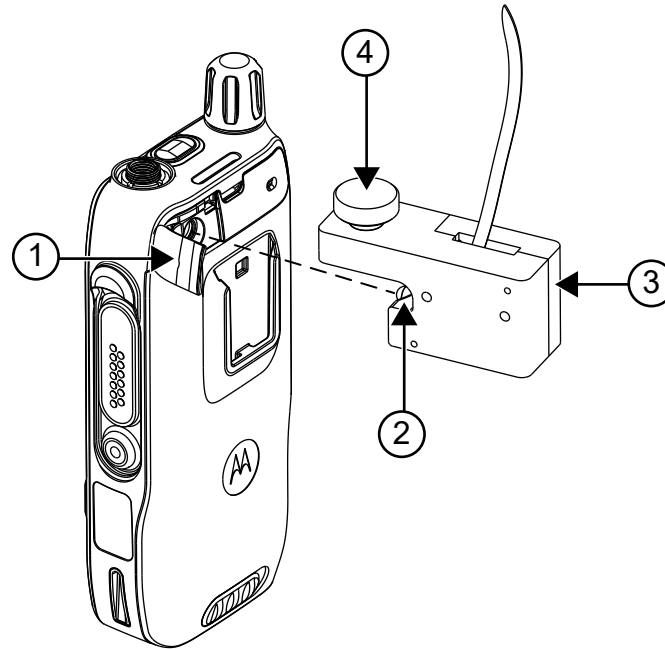
NOTE: Use the RF Block for testing purposes only.

Procedure:

1. Lift up to open the VA connector seal on the back cover.
2. Align the RF plug to the VA connector with back cover attached.
 **NOTE:** Lift the screw upwards so that the RF block can be inserted. Align the RF plug with RF adaptor connector and screw with the antenna tower.
3. Carefully insert the RF plug into the back cover slot on the radio.
There is a slight friction when the RF plug is mated to the RF adaptor connector located inside the back cover slot.
4. Gently push the RF plug deeper into the recess slot until the plug reaches the maximum level.
5. The screw on RF block is now aligned with the antenna tower. Tighten the screw by turning clockwise until the screw touches the plastic block on the RF block.

Example:

Figure 6: RF Block Insertion



Number	Description
1	VA connector seal
2	RF plug
3	RF block
4	Thumb screw

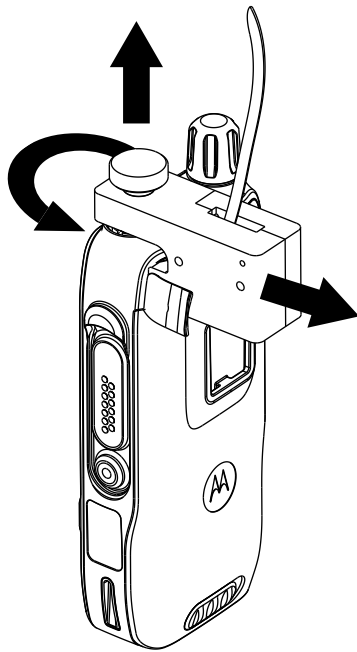
4.1.2

Disassembling Procedures for Alternative Test Setup

Procedure:

1. Loosen the screw completely by turning the screw counter-clockwise.
2. Press the RF block towards the back cover slot during the screw removal until the screw is fully loosened to avoid any damage to the RF plug.
3. Gently remove the RF block horizontally backwards.
Ensure not to exert any side force to the RF plug before the plug is fully removed from the chassis slot.

Example:
Figure 7: RF Block Removal



4.2
Transmitter or Receiver Test

Table 11: Test Setup for 350–470 MHz and 380–430 MHz Radio Models

Test Name	Test Setup	Radio Setup	Test Conditions	Limits
Base Station Registration	Control Channel	390.125 MHz	3605	TETRA 380+0MS
	Traffic Channel	390.125 MHz	3605	TETRA 380+0MS
	Time Slot	N/A	3	N/A
	Country Code	N/A	234	N/A
	Network Code	N/A	2392	N/A
	Base Color	N/A	1	N/A
	Location Area	N/A	06	N/A
	Min Receiver Level	N/A	N/A	–110 dBm
	Max Transmitter Level	N/A	N/A	30.0 dBm (Class 4) 32.5 dBm (Class 3L)

Test Name	Test Setup	Radio Setup	Test Conditions	Limits
				34.5 dBm (Class 3)
	Access Parameter	N/A	–53 dBm	N/A
	Mobile Power	30.0 dBm (Class 4) 32.5 dBm (Class 3L)	N/A	N/A
	Burst Type	N/A	Normal	N/A
Transmitter Burst Power	RF Gen Level Burst Power	N/A	–90 dBm	28–32 dBm (Class 4) 30.5–34.5 dBm (Class 3L) 33.0–37.0 dBm (Class 3)
	Timing Error	N/A	N/A	±0.25 Symbols
	Vector Error	N/A	N/A	Max 10% RMS, 30% Peak
	Frequency Error	N/A	N/A	±100 Hz
Call Processing Talk Back	1 kHz Test Signal Group Mode	N/A	–50 dBm	N/A
Call Processing Call to Mobile	Private	4-digit random number and Send	N/A	28.0–32.0 dBm (Class 4) 30.5–34.5 dBm (Class 3L) 33.0–37.0 dBm (Class 3)
	RF Gen Level Burst Power	N/A	–90 dBm	28.0–32.0 dBm (Class 4) 30.5–34.5 dBm (Class 3L) 33.0–37.0 dBm (Class 3)
	Timing Error	N/A	N/A	±0.25 Symbols
	Vector Error	N/A	N/A	Max 10% RMS, 30% Peak
	Frequency Error	N/A	N/A	±100 Hz

4.2.1

Transmitter Tests

1. Power Burst (Control Range)
2. Power Profiles

3. Transmitter Burst Timing Error
4. Vector Error Root Mean Square (RMS) and Peak
5. Transmitter Frequency Error

4.2.2

Call Processing Tests

1. Talk Back
2. Call to Mobile

4.2.3

Duplex Test

Digital Duplex Test (Transmitter)

Measurement Capabilities:

- Bar charts (Transmitter Power, Frequency Error, Vector Error Root Mean Square (RMS))
- Spectrum Analyzer
- Power Analyzer
- Vector Analyzer
- Vector Diagrams

4.3

Configuring IFR 3901/IFR 3902/IFR 3920 Setup

Procedure:

1. Turn on the IFR.
2. Press **CONFIG** → **CONFIG**.
3. Select **System** → **TETRA** → **MS**.
4. Press **CONFIG** → **CONFIG**.
5. Select **Configure** → **Channel Plan**.
6. Press **SELECT** → **TETRA 380+0MS**.
7. Press **CONFIG**.
8. Select **System ID & Access Params**.
9. Enter 234 for Mobile Country Code (MCC) and press **Enter**.
10. Enter 2392 for Mobile Network Code (MNC) and press **Enter**.
11. Enter 1 for Base Station Color Code (BCC) and press **Enter**.
12. Enter 06 for Location Area Code (LA) and press **Enter**.
13. Enter -110 for Min Receiver Level For Access and press **Enter**.
14. Enter 30 for Max Transmitter Level and press **Enter**.
15. Enter -53 for Access Parameter and press **Enter**.
16. Press **CONFIG**.

17. Select **Base Services**.



NOTE: You are entering base services setup. The displayed value are factory defaults and must remain unchanged.

Power On Registration: Required
Power Off De-registration: Required
Priority Cell: Yes
Minimum Mode Service: May Be Used
Migration: Supported
System Wide Services: Normal Mode
TETRA Voice Service: Supported
Circuit Mode Data Service: Supported
(Reserved): Available
TETRA Packet Data Service: Available
Air Interface Encryption: Not Available
Advanced Link: Not Supported

18. Press **CONFIG**.

19. Select **Neighbor Cell Info**.

20. Verify that the following NEIGHBOUR CELL INFO values are displayed:



NOTE: The displayed values are factory defaults and must remain unchanged.

BROADCAST: Not Supported
BROADCAST INTERVAL: 5 s
NEIGHBOUR CELL CHANNEL: 3500
NEIGHBOUR CELL LOCATION AREA: 0017
NEIGHBOUR CELL IDENTIFIER: 01
SLOW RE-SELECT THRESHOLD ABOVE FAST: 10 dB
FAST RE-SELECT THRESHOLD: 10 dB
SLOW RE-SELECT HYSTERESIS: 10 dB
FAST RE-SELECT HYSTERESIS: 10 dB

21. Press **CONFIG**.

22. Select **Call Timers & Trunking**.

23. Select **Transmission** for Trunking Type.

24. Select **Continuous** for Test Set Transmit Mode.

4.4

Configuring IFR 2968 Setup

Procedure:

1. Turn on the IFR.
2. Press **Systems** Mode Key and wait until the digital system is initialized.
3. Press **Tetra Mobile** → **Setup**. Enter the System Parameters Screen.
4. Press **Channel Plan**.
5. Press **Tetra 380+0MS**.

The Control Channel automatically changes to 3600, and Traffic Channel automatically changes to 3700.

6. Press **Traffic Channel** → **Traffic Channel**.

Check that the marker goes to Timeslot.

7. To change to Timeslot 3, press **3** → **Traffic Channel**.
8. Press **Country Code**. Enter 234 and press **Country Code**.

9. Press **Network Code**.
10. Enter 2392 and press **Network Code**.
11. Press **Base Color**.
12. Enter 1 and press **Base Color**.
13. Press **More**.
14. Press **Location Area**.
15. Enter 22 and press **Location Area**.
16. Press **More**.
17. Press **Min Receiver Level**.
18. Enter -110 dBm and press **Min Receiver Level**.
19. Press **Max Transmitter Level**. Enter 30 dBm and press **Max Transmitter Level**.
20. Press **Access Parameter**.
21. Enter -53 dBm and press **Access Parameter**.
22. Press **Test Mode** → **Enable**.
23. Press **Base Service**.



NOTE: You are entering base services setup. The displayed value are factory defaults and must remain unchanged.

```
Power On Registration: Required
Power Off De-registration: Required
Priority Cell: Yes
Minimum Mode Service: May Be Used
Migration: Supported
System Wide Services: Normal Mode
```

24. Press **More**.

```
TETRA Voice Service: Supported
Circuit Mode Data Service: Supported
(Reserved): Available
SND CP Service: Available
Air Interface Encryption: Not Available
Advanced Link: Not Supported
```

25. Press **Return**. Select **Neighbor Cell**.
26. Verify that the following NEIGHBOUR CELL INFO values are displayed:



NOTE: The displayed values are factory defaults and must remain unchanged.

```
BROADCAST: Not Required
BROADCAST INTERVAL: 5 s
NEIGHBOUR CELL CHANNEL: 3500
NEIGHBOUR CELL LOCATION AREA: 00017
NEIGHBOUR CELL IDENTIFIER: 01
SLOW RE-SELECT THRESHOLD ABOVE FAST: 10 dB
```

27. Press **More**.

```
FAST RE-SELECT THRESHOLD: 10 dB
SLOW RE-SELECT HYSTERESIS: 10 dB
FAST RE-SELECT HYSTERESIS: 10 dB
```

28. Press **Return**.
29. Press **Trunk Type** → **message Trunked** (Transmission).

30. Press **More**.



NOTE: The displayed values are factory defaults and must remain unchanged. You are not required to configure Call Types, Call Arial, and Messages.

31. Press **More**.

4.5

Configuring IFR 3901/IFR 3902/IFR 3920 Manual Screen Test

Procedure:

1. Press **TEST** → **TAB**.
2. Enter 3600 for Control Channel.
3. Enter 3700 for Traffic Channel.
4. Enter 3 for Slot.
5. Enter -75 for RF Gen Level.
6. Select **Expected** → **30.0 dBm/1 W** for Mobile Power.
7. To select Transmitter Measurements, press **TAB**.
8. Press **Normal** for Burst.

Result: The test equipment configuration setup is completed.



NOTE: The System Setup Configuration Data is saved even after the power is turned off. The Manual Test Setup is not saved.

4.6

Configuring IFR 2968 Manual Screen Test

Procedure:

1. Press **Manual** to enter the Manual Test screen.
2. Press **Control Channel**.
3. Enter 3605 and press **Control Channel**.
(IFR 3605 = Receiver 390.125000 MHz)
4. Press **Traffic Channel**.
5. Enter 3605 and press **Traffic Channel**.
The marker goes to Timeslot.

6. Enter 3 and press **Traffic Channel**.



NOTE: The Traffic Channel number changes automatically after entering the Control Channel number.

7. Press **RF Gen Level**.
8. Enter -75 and press **dBm** → **RF Gen Level**.
9. Press **Mobile Power**.
10. Enter 30 dBm/1 W.

11. Press **Burst Type** → **Normal**.

Result: The test equipment configuration setup is completed.



NOTE: The System Setup Configuration Data is saved even after the power is turned off. The Manual Test Setup is not saved.

4.7

RF Tests

This section lists the applicable Radio Frequency (RF) Tests and the applicable procedures for your radio.

4.7.1

Testing Receiver Using IFR 3901/IFR 3902/IFR 3920

Prerequisites: This test requires programming your radio. Refer to the TETRA Customer Programming Software (CPS) User Guide.

Procedure:

1. Turn on the radio.
2. Perform one of the following to enter the radio test page:
 - Use CPS.
 - Press **Left** → **Right** → **Left** → **Menu**.
3. Check that registration and ITSI ---/--- : xxxx is displayed on the **IFR Operations/Status** screen.

Result:

GROUP : XXXXXXXX SELECTED

4.7.2

Testing Transmitter Using IFR 3901/IFR 3902/IFR 3920

Procedure:

1. To select RF Settings, press **TAB**.
2. Enter -90 for RF Gen level.
3. Switch on the RF Gen.
4. Switch off the Pre Amp.
5. Press **PTT**.



NOTE: Press and hold the **PTT** to read the results.

Monitor the **Transmitter Measurement** Window that displays the results for the following:

- Power Profile
- Burst Timing
- Vector Peak
- Vector RMS
- Frequency Error
- Residual Carrier

```
Burst Power Required Results: 28.0–32.0 dBm (Class 4) or 30.5–34.5 dBm (Class 3L)
or 33–37 dBm (Class 3)
Power Profile: Passed
Burst Timing: ± 0.25 Symbols
Vector Error: Max 10% RMS, Max 30% Peak, Max 5% residual
Frequency Error: ± 100 Hz
```

6. Press **TAB** to select Operations/Status.
7. Press **Call Mobile** → **Group Call** → **Cleardown**.

4.7.3

Testing Receiver Using IFR 2968

Prerequisites: This test requires programming the radio. Refer to TETRA Customer Programming Software (CPS) User Guide.

Procedure:

1. Turn on the radio.
The screen is Idle.
2. Perform one of the following to enter the radio test page:
 - Use CPS.
 - Press **Left** → **Right** → **Left** → **Menu**.
3. Check that registration and ITSI ---/--- : xxxx is displayed on the **IFR Manual Test** screen.

Result:

```
STATUS: REGISTRATION (ITSI ATTCHED)
GSSI: XXXXXXXX SELECTED
```

4.7.4

Testing Transmitter Using IFR 2968

Procedure:

1. Press **RF Gen Level**.
 2. Enter -90 dBm and press **RF Gen Level**.
 3. Press **PTT**.
-  **NOTE:** Press and hold the **PTT** to read the results.

Monitor the **IFR Manual Test** screen that displays the results for the following:

- Power Profile
- Burst Timing
- Vector Peak
- Vector RMS
- Frequency Error
- Residual Carrier

```
Burst Power Required Results: 28.0–32.0 dBm (Class 4) or 30.5–34.5 dBm (Class 3L)
or 33–37 dBm (Class 3)
Power Profile: Passed
Burst Timing: ± 0.25 Symbols
```

Vector Error: Max 10% RMS, Max 30% Peak, Max 5% residual
Frequency Error: ± 100 Hz

4. Press **Clear Down** to proceed with other tests.

4.8

RTC Setup

The Real Time Clock (RTC) section consists of several counters and registers used to maintain the Time of Day (TOD) application on SIM model.

The following conditions apply to SECTRA Tanapa Only - PMUE5763_.

- The RTC retention time with fully charged coin cells can sustain for more than nine days.
- The operating temperature for the coin cell is from -20 °C to 60 °C. Performance can be limited when operating outside of this range. Examples of performances are charging and time retention performance.
- SECTRA Tanapa does not support the Battery Hot Swap feature.

Procedure:

1. Install the radio battery.
2. Turn on your radio for three hours.
3. Press **Menu** → **Main Menu** → **Setup** → **Time & Date**.
4. Select **Display** to set up display shown.
5. Select **Set** to setup time and date.

4.9

Call Processing Tests

This section lists the applicable Call Processing Tests and procedures.

4.9.1

Talk Back Using IFR 3901/IFR 3902/IFR 3920

Prerequisites: Ensure that the handset and test equipment are configured the same as given in the Transmitter Test.

Procedure:

1. Press **Call Mobile** → **Group Call**.
2. Press **TALKBACK**.
3. Press **PTT** and speak into the microphone of the radio.
The last three seconds of the speech frames is heard after **PTT** is released.
4. Press **Test Sound** to provide the 1 kHz signal to the radio speaker.
A 1 kHz tone is heard from the radio speaker for about three seconds.
5. Press the **Silence** to mute the 1 kHz Audio Signal of the speaker.
6. Press **Clear Down**.

4.9.2

Talk Back Using IFR 2968

Prerequisites: Ensure that handset and test equipment are configured the same as given in the Transmitter Test.

Procedure:

1. Press **PTT** and speak into the microphone of the radio.
The last three seconds of the speech frames is heard after **PTT** is released.
2. Press **Test Sound** to provide the 1 kHz signal to the radio speaker.
A 1 kHz tone from the radio speaker is heard for about three seconds.
3. Press the **Silence** to mute the 1 kHz Audio Signal of the speaker.
4. Press **Clear Down**.
5. Check that the Cleardown Complete status appears on the IFR Manual Test screen.

4.9.3

Performing Call to Mobile

Procedure:

1. Press **Call Mobile** on the IFR.
2. Press **Private**.
 **NOTE:** Select the type of call.
The handset beeps.
3. Press **Abort Call**.
4. Repeat [step 1](#) through [step 3](#) for Phone and Emergency calls.

4.10

Testing Digital Duplex (Transmitter) Using IFR 3901, IFR 3902, or IFR 3920

Procedure:

1. On your radio, press **Menu** → **Contact** → **Contact 1** → **Send**.
The following results are displayed on the **Transmitter Measurements** window.

Burst Power Required Results: 28.0–32.0 dBm (Class 4) or 30.5–34.5 dBm (Class 3L) or 33–37 dBm (Class 3)
Power Profile: Passed
Burst Timing: ± 0.25 Symbols
Vector Error: Max 10% RMS, Max 30% Peak, Max 5% residual
Frequency Error: ± 100 Hz

2. Press **Call Mobile** → **Group Call** → **TALKBACK**.

3. Speak into the microphone of the handset.
You hear your speech after a short delay from the internal earpiece of the handset.
4. If you need more details, select ▼ at the Receiver Measurement Window.

For...	Then...
Power Analyzer Graph	a. Select Power → Profile Full. b. To view the detail of Profile Full, select ☐ and press Select. c. To minimize the window, press Select. d. To view the rest of the power analyzer graphs, select any item under the Power drop-down list.
Vector Analyzer Diagram	a. Select Mod Accuracy → Vector Error. b. To view the detail of Vector Error, select ☐, and press Select. c. To minimize the window, press Select. d. To view the rest of the vector analyzer graphs, select any item under the Mod Accuracy drop-down list.

5. Press **End** on the handset.

4.11

Testing Digital Duplex (Transmitter) Using IFR 2968

Procedure:

1. On your radio, press **Menu** → **Contact** → **Contact 1** → **Send**.

The following results are displayed on the IFR Manual Test Screen.

```
Burst Power Required Results: 28.0–32.0 dBm (Class 4) or 30.5–34.5 dBm (Class 3L)
or 33–37 dBm (Class 3)
Power Profile: Passed
Burst Timing: ± 0.25 Symbols
Vector Error: Max 10% RMS, Max 30% Peak, Max 5% residual
Frequency Error: ± 100 Hz
```

2. Speak into the microphone of the handset.
You hear your speech after a short delay from the internal earpiece of the handset.



NOTE: If you need more details, press **Duplex Test**.

3. Press **Duplex Test (Transmitter)**.

The Digital Duplex test results are displayed on the IFR screen providing you with the following bar charts measurement capabilities:

- Power
- Vector RMS

- Frequency Error

4. Perform one of the following actions:

Option	Action
Power Analyzer Graph	a. Press power ana. b. Check that the power frame falls within the limits.
Spectrum Analyzer Diagram	a. Press spec ana. b. Monitor the Transmitter frequency.
Vector Analyzer Diagram	a. Press vector ana. b. Monitor the constellation diagram. c. Press vector diagram. d. Monitor the vector diagram. e. To zoom in on the constellation, press rotated vector.

5. Press **End** on the handset.

4.12

Assessing DALT Test

Procedure:

1. Verify that your radio is turned off.
2. Enter 3-button test by pressing **Power Button**, **One Touch Button 1**, and **One Touch Button 2** simultaneously for one minute and choose BP DALT mode.

4.12.1

Testing in DALT Mode



NOTE:

- Any key pressed causes the test to advance from one step to the next. Respond accordingly to the instructions on the screen.
- Press the side buttons to skip the detailed tests and go to the next or preview major test.
- For some tests, you are required to indicate the test result by pressing keys as shown on the display.
- For the SD card 3-button test, the test erases all existing SD card contents. Re-format the SD card in application mode after the test to ensure that the SD card is functional.

Prerequisites:

- Ensure that the SD card and SIM card are inserted to perform the SD Card Test and SIM Card Test.
- Ensure that CRYPTR card is inserted to perform the MACE test.¹
- Prepare a Remote Speaker Microphone (RSM) and a Personal Hands-Free (PHF) accessories for Accessory Connect Test.
- Prepare supported Bluetooth accessories for Bluetooth Test.

¹ Only applicable for MACE or U MACE model.

Procedure:

Display Test

1. The display shows:

Display
Test

2. Perform the following actions:

Action	The display shows:
Press any key.	Horizontal red lines.
Press any key consecutively.	Horizontal red lines become thicker with every key press, until fully red.
Press any key.	Four colored rectangles.
Press any key consecutively.	Vertical green lines that become thicker with every key press, until fully green.
Press any key.	White screen.
Press any key.	Black screen.
Press any key.	Blue screen and END LCD test!!!

3. Press the corresponding key to proceed to the next test.

Coin Cell Test

4. The display shows:

Coin Cell Test

5. Perform the following:

Action	Result
Press any key.	● If coin cell is detected, the display shows: Licell PASSED Press Any key ● If coin cell card is not detected, the display shows: Licell FAILED Press Any key

Time Retention Check (If Licell PASSED)

6. Record down the Current Date and Time.
7. Remove the battery from your radio for one minute.
8. Insert the battery into your radio.



NOTE: Ensure that your radio remains off.

9. Assess to the DALT mode.
10. Press **Side** button to skip the detailed test and go to the **COIN CELL** test.
11. Check that the date remains the same after one minute.
12. Press the corresponding key to proceed to the next test.

Battery Test

13. The display shows:

Battery
Test

14. Perform the following:

Action	The display shows:
Press any key.	Battery Interface Test PASSED

15. Press the corresponding key to proceed to the next test.

SD Card Test

16. The display shows:

SD card
Test

17. Perform the following:

Action	Result
Press any key.	- If SD card is detected in SD slot, the display shows: SD card PASSED Press Any key To Continue - If SD card is not detected in SD slot, the display shows: SD card FAILED Press Any key To Continue

18. Press the corresponding key to proceed to the next test.

SIM Card Test

19. The display shows:

SIM card
Test

20. Perform the following:

Action	Result
Press any key.	- If SIM card is detected in SIM slot, the display shows: SIM card PASSED Press Any key To Continue - If SIM card is not detected in SIM slot, the display shows: SIM card FAILED Press Any key To Continue

21. Press the corresponding key to proceed to the next test.

Vibrator Test

22. The display shows:

Vibrator
Test

23. Perform the following:

Action	Result
Press any key.	The display shows: Vibrator On The radio vibrates.

24. Press the corresponding key to proceed to the next test.

LEDs Test

25. The display shows:

LEDs
Test

26. Perform the following:

Action	Result
Press any key.	The display shows: Red LED on LED Status Indicator lights up red.
Press any key.	The display shows: Green LED on LED Status Indicator lights up green.
Press any key.	The display shows: Amber LED on LED Status Indicator lights up amber.

27. Press the corresponding key to proceed to the next test.

Backlight Test

28. The display shows:

Backlight
Test

29. Perform the following:

Action	Result
Press any key.	The display shows: Keypad Backlight On The radio keypad backlight lights up.
Press any key.	The display shows: Display Backlight On The radio display backlight lights up.

30. Press the corresponding key to proceed to the next test.

MACE Test¹

31. The display shows:

```
MACE
Press Any key
To Continue
```

32. Perform the following:

Action	Result
Press any key.	- If CRYPTR card is detected in SD slot, the display shows: <pre>MACE ping test PASSED Press Any key To Continue</pre> - If CRYPTR card is not detected in SD slot, the display shows: <pre>MACE ping test FAILED Press Any key To Continue</pre>

33. Press the corresponding key to proceed to the next test.

Accessory Connect Test

34. The display shows:

```
Accessory
Connect Test
```

35. Perform the following:

Action	Result
Press any key.	The display shows: <pre> Connect GCAI/BC: 1. Core Accy 2. IMPRES Accy to the radio and press any key</pre>
Attach Core or IMPRES accessory to the GCAI/Bottom connector.	The display shows: <pre> WAIT!!! GCAI/Bottom Connector Recognized Accessory xxxx connected Press any key to continue</pre>

36. Press the corresponding key to proceed to the next test.

Tones Test

37. The display shows:

```
Tones
Test
```

38. Perform the following:

Action	Result
Press any key.	The display shows: Internal Speaker Tone Test The speaker plays a continuous tone.
Press any key.	The display shows: Internal Earpiece Tone Test The internal earpiece plays a continuous tone.
Press any key.	The display shows: Connect RSM accessory to the radio (RSM connected)
Attach RSM accessory to the radio.	The display shows: RSM Tone Test (RSM connected) The RSM earpiece plays a continuous tone.

39. Press the corresponding key to proceed to the next test.

Loopback Test

40. The display shows:

Loopback
Test

41. Perform the following:

Action	Result
Press any key.	The display shows: INT MIC to INT EAR Loopback Test
Speak into the internal microphone.	You hear your voice from the internal earpiece.
Press any key to continue.	The display shows: Connect RSM accessory to the radio
Attach RSM accessory to the radio.	The display shows: TOP MIC 1 to RSM Loopback Test (RSM connected)
Speak into the top microphone.	You hear your voice from the RSM earpiece.
Press any key to continue.	The display shows: Connect RSM accessory to the radio

Action	Result
Attach RSM accessory to the radio.	The display shows: TOP MIC 2 to RSM Loopback Test (RSM connected)
Speak into the top microphone.	You hear your voice from the RSM earpiece.
Press any key to continue.	The display shows: Connect RSM accessory to the radio (RSM connected)
Attach RSM accessory to the radio.	The display shows: RSM MIC to INT EAR Loopback Test (RSM connected)
Speak into the RSM microphone.	You hear your voice from the internal earpiece.

42. Press the corresponding key to proceed to the next test.

Keypad Test

43. The display shows:

Keypad
Test

44. Perform the following:

Action	Result
Press any key.	The display shows: Emergency LeftMenuRight SendEnd Up123 Ptt456 Down789 *0# Rotary to Exit
Press the corresponding key to continue.	The respective display disappears every time you press a key. Continue until display is empty.

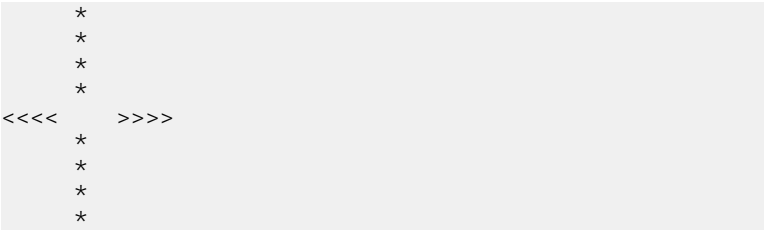
45. Press the corresponding key to proceed to the next test.

Navigation Button Test

46. The display shows:

Navigation
Test

47. Perform the following:

Action	Result
Press any key.	The display shows: 
Press the corresponding key to continue.	The respective display disappears every time you press a key. Continue until display is empty.

48. Press the corresponding key to proceed to the next test.

Rotary Knob Test

49. The display shows:

Rotary
Test

50. Perform the following:

Action	Result
Press any key.	The display shows: 
Turn the rotary knob clockwise. Each click removes the respective clockwise arrow until display is empty.	The display shows: 
Turn the rotary knob counter-clockwise. Each click removes the respective clockwise arrow until display is empty.	The display shows: Press the Rotary

51. Press the corresponding key to proceed to the next test.

Man Down (henceforth known as Fall Alert) Test

52. The display shows:

Mandown
Test

53. Perform the following:

Action	Result
Press any key.	The display shows: 45 Degree Angle Angle Detection Mandown Test
Place the radio horizontally on a flat surface.	A tone sounds after 10 seconds. Man Down (Fall Alert) angle detection feature is functional.
Press any key to continue.	The display shows: No-Movement Mandown Test
Place the radio in a stable position.	A tone sounds after 10 seconds. Man Down (Fall Alert) angle detection feature is functional.

54. Press the corresponding key to proceed to the next test.

Bluetooth Test

55. The display shows:

Bluetooth
Test

56. Perform the following:

Action	Result
Press any key.	The display shows: BT test - pairing WAIT !!!
Wait for result.	The display shows pairing test result.
Press any key to continue.	The display shows pairing connection test result.
Press any key to continue.	The display shows: BT microphone test - start
Speak into the internal microphone.	You hear yourself in the paired Bluetooth audio speaker.
Press any key to continue.	The display shows: BT speaker test - start
Speak into the paired Bluetooth microphone.	You hear yourself in the internal speaker.

57. Press the corresponding key to proceed to the next test.

Result: The display shows:

The test is
completed.
Press any key
to turn the
radio OFF.

Test is completed. Press any key to turn off your radio.

Postrequisites: For Wi-Fi, use the radio feature user guide for Wi-Fi setup and Wi-Fi communication test.



NOTE: Wi-Fi is not supported for customers.

4.12.2

Testing Charger Recognition

Procedure:

1. Turn on your radio.
2. Connect the Rapid Travel Charger accessory connector to the handset.
Ensure that your radio indicates the following:
 - LCD display shows `charger connected`.
 - A tone is sounds.
 - Keypad backlight illuminates.
 - The charging icon shows.
3. Connect the Vehicle Power Adapter (VPA) Charger accessory connector to the handset.
Ensure that your radio indicates the following:
 - LCD display shows `charger connected`.
 - Keypad backlight illuminates.
4. Connect the handset to the Desktop Charger.
Ensure that your radio indicates the following:
 - LCD display shows `charger connected`.
 - A tone sounds.
 - Keypad backlight illuminates.
 - The charging icon shows.
5. Connect the handset to the USB Charger.
Ensure that your radio indicates the following:
 - LCD display shows `charger connected`.
 - Three tone sounds.
 - Keypad backlight illuminates.
 - The charging icon shows.
6. Connect the handset to the MUC Charger.
Ensure that your radio indicates the following:
 - LCD display shows `charger connected`.
 - A tone sounds.
 - Keypad backlight illuminates.
 - The charging icon shows.
7. Verify that the battery charger is in progress.



NOTE: The process advance is indicated on the Battery Strength icon.

8. Press the **Power ON/OFF**.
Your radio turns off.

Chapter 5

Maintenance

This chapter provides information about the maintenance of your radio.

5.1

Preventive Maintenance

Periodic visual inspection and cleaning are recommended.

Your radio is submersible (compliant with the IP68 standard) – but only with the battery and the antenna attached.

To clean your radio and ensure that your radio is dust-free, use a moistened, antistatic, or lint-free cloth to clean the battery contact seal and battery surface.

Use a Universal Connector Dust Cover (PMHN4429_) if your radio is deployed near the seaside, in a saltwater area, or when no audio accessory is attached.

Inspection

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

Cleaning Procedures

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

External surfaces include the front cover, housing assembly, and battery. Clean the external surfaces whenever a periodic visual inspection reveals the presence of smudges, grease, or grime.



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

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



NOTE:

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

Before any programming procedure and to ensure optimum performance of the bottom connectors, use a lint-free cloth applied with isopropyl alcohol (100% by volume) to clean the contacts.

Cleaning Internal Circuit Boards and Components



IMPORTANT:

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

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

Apply isopropyl alcohol (100%) with a stiff, nonmetallic, short-bristled brush to dislodge embedded, or caked materials located in hard-to-reach areas. The brush stroke must direct the dislodged material out and away from the inside of your radio. Ensure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process because liquid can collect in unwanted places. After

completing the cleaning process, use a soft, absorbent, lint-less cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

Cleaning Bottom Connector Contacts



IMPORTANT:

The contact material technologies used in your radio are engineered to provide a reliable interconnection. For reliable performance, keeping the electrical contact interface clean and free of foreign material is important. To maintain optimal performance of the contact interface, Motorola Solutions recommends inspecting and cleaning the contacts every six months or before radio programming.

There are two options to clean the bottom connector contacts:

1. Using a lint-free swab applied with isopropyl alcohol (100% by volume), wipe and remove any dirt or foreign material from the contacts.
2. To maintain optimal performance of the contact interface, clean and protect the contacts with a DeoxIT®GOLD cleaner or lubricant pen (Supplier CAIG Labs, P/N G100P)². The pen-based package is recommended as the pen provides better cleaning action and access to the contacts. Before applying the lubricant or cleaner, wipe the contacts with lint-free swabs to remove any dirt or foreign material. Per the instructions from the manufacturer, shake the pen, and depress the pen tip until fluid begins to flow and saturates the felt tip. Apply the lubricant or cleaner to the contacts with short wiping strokes.

Vent Port Handling Precaution

The portable device has a vent port that allows for pressure equalization in the device. The pressure equalization vent is located at the battery compartment area. Never touch the equalization vent. Ensure that no oily substances come in contact with this vent. Never poke this vent with any objects, such as needles, tweezers, or screwdrivers. This creates a leak path into the device and lost the submersibility of the device.

5.2

Safe Handling of CMOS and LDMOS Devices

Complementary Metal Oxide Semiconductor (CMOS) and Laterally Diffused Metal Oxide Semiconductor (LDMOS) devices are used in this family of radios, and are susceptible to damage by electrostatic or high-voltage charges.

Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

² DeoxIT®GOLD cleaner or lubricant is available at numerous electronics suppliers and directly from the manufacturer.

Handling precautions are mandatory for CMOS and LDMOS circuits and are especially important in low humidity conditions. Refer to the following caution statements before disassembling your radio.



CAUTION:

This radio contains static-sensitive devices. Open your radio only when you are properly grounded. Take the following precautions when working on this unit:

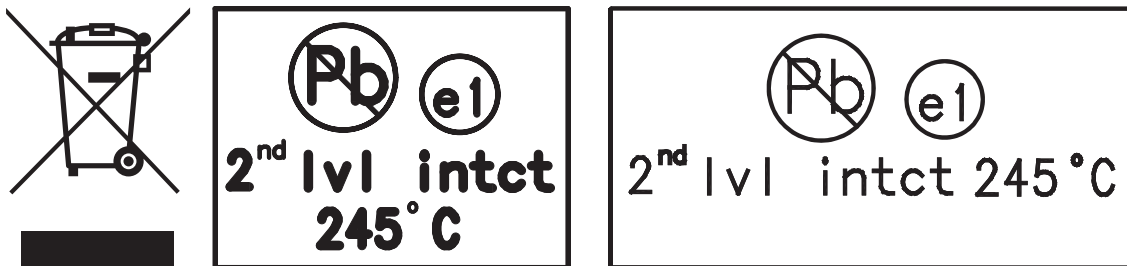
- Store and transport all CMOS and LDMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS and LDMOS devices into conventional plastic "snow" trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service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

5.3

General Repair Procedures and Techniques

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

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



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

Table 12: Lead Free Solder Wire Part Number List

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

Table 13: Lead Free Solder Paste Part Number List

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

Parts Replacement and Substitution

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

Rigid Circuit Boards

This family of radios uses bonded, multilayer, printed circuit boards. Special considerations are required when soldering and desoldering components as the inner layers are not accessible. The plated-through holes can 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 infrared solder systems, check the user guide of your solder system to get information on solder temperature and time for the different housings of the integrated circuits and other components.

Care After Submersion

Your radio (device with antenna and battery assembled) is IP68 compliant. It is fully protected from dust, and can withstand being submerged up to 2 hours in two meters of static water.

If the device has been submerged in water, shake the device to remove any water that is trapped inside the speaker grille and microphone port. Otherwise, the water decreases the audio quality and connectivity performance of the device.

Ensure that no water has penetrated the seal. Check the interface if any accessory or the Universal Connector Dust Cover is covering the Universal Connector and Bottom Connector. Water left in this interface can degrade the performance of the accessories.

5.4

Level 1 and Level 2 Maintenance

This manual covers Level 1 and Level 2 Maintenance.

At Level 1 maintenance, you can replace the terminal, accessories, or both, and send the faulty unified chassis, accessories, or both to a higher level of maintenance. At Level 2 maintenance, a faulty kit is replaced.

5.5

Protection of Static-Sensitive Devices

This unit contains static-sensitive devices. Protect static-sensitive devices in the following conditions:

- When you are opening the unit
- When storing any printed circuit board
- When transporting any printed circuit board

Create a Proper Ground

- Ground the working surface of your service bench. If possible, use the Motorola Solutions Static Protection Assembly (Part Number: 0180386A82) to ground your service bench. This assembly contains a wrist strap, two ground cords, a table mat, and a floor mat.
- Wear a conductive wrist strap in series with a 1M Ω resistor to the ground.
- Do not wear nylon clothing when handling any printed-circuit board.
- Before touching any printed-circuit board, touch an electrical ground to remove any static charge that has accumulated.

Store or Transport a Circuit Board

- Place the printed-circuit board in a conductive, antistatic material.
- Do not insert the printed-circuit board into conventional plastic “snow” trays used for transporting other devices.

Chapter 6

Replacement Parts

Replace damaged parts with identical replacement parts.

For complete information on ordering required parts and kits, contact your local customer service representative. The components in the exploded views are marked with call out numbers. These numbers correspond with the first column of the [Replacement Parts List](#) tables.

6.1

Replacement Parts List

The radio replacement parts list identifies all the serviceable components and part/kit numbers of the radio.

[Table 14: Replacement Part List 1 on page 63](#) provides the part/kit numbers of the components shown in the following exploded view diagrams.

Figure 8: MXP600 Exploded View 1

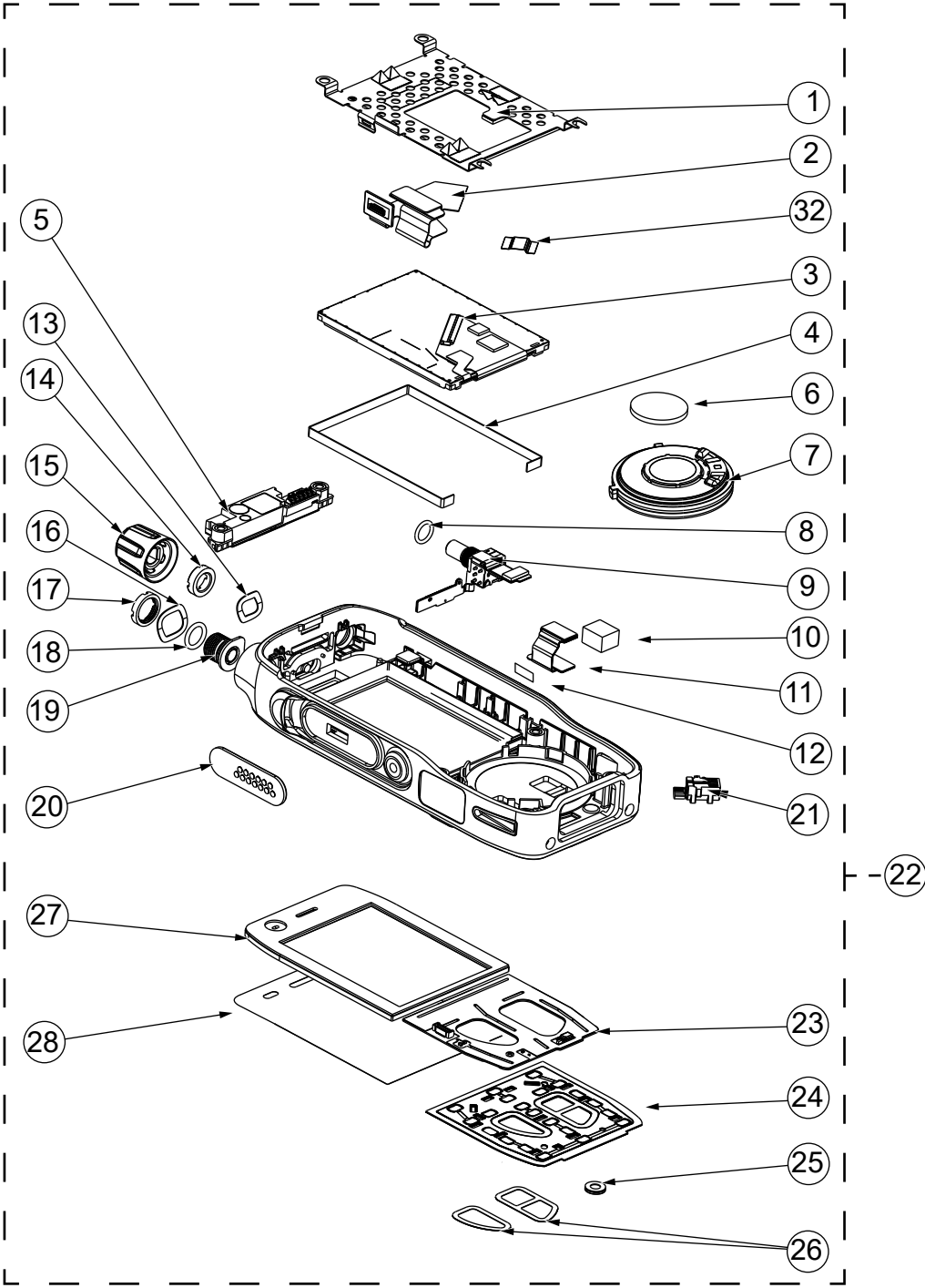


Figure 9: MXP600 Exploded View 1 (For PMHN4457_, PMHN4462_)

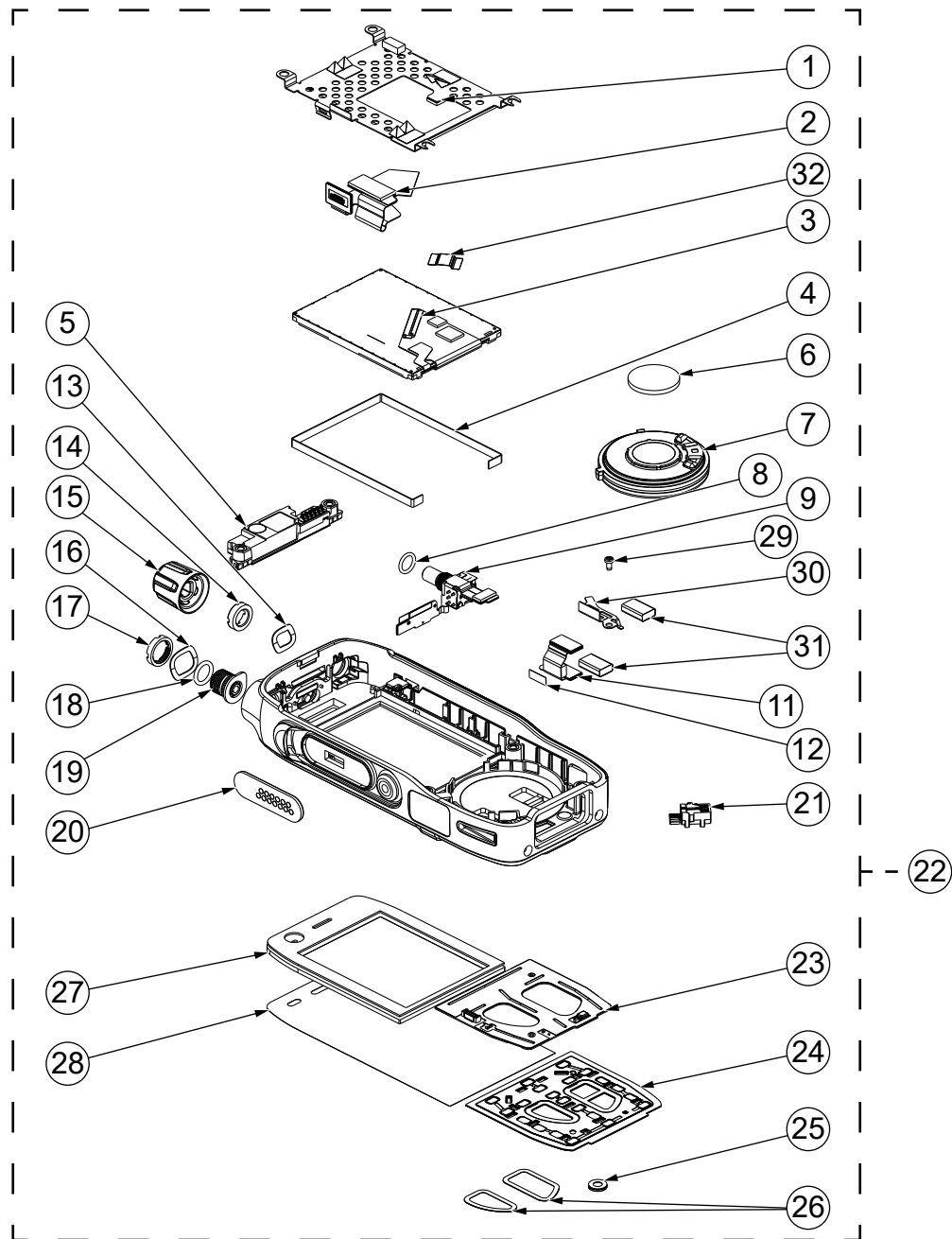


Table 14: Replacement Part List 1

No.	Part/Kit Number	Description	Remark
1	0104082J31	LCD metal retainer kit	Serviceable (For PMHN4421_).
	0104083J91	LCD metal retainer kit	Serviceable (For PMHN4457_, PMHN4462_).
2	PA002864A01	Display Interface Flex	Serviceable.

No.	Part/Kit Number	Description	Remark
3	DM000154A01	Display and flex assembly	Serviceable.
4	HW002450A01	Display pad (For X-Y Tolerance purpose)	Serviceable.
5	-	Low audio capsule assembly	Not serviceable. Included in Front housing assembly kit.
6	HW001327A01	Speaker Poron	Serviceable.
7	-	Speaker electromagnetic	Not serviceable. Included in Front housing assembly kit.
8	-	Encoder seal	Not serviceable. Included in Front housing assembly kit.
9	-	Top Control and Encoder Flex	Not serviceable. Included in Front housing assembly kit.
10	HW002088A01	Conductive Pad	Serviceable.
11	PA002767A01	Keypad Flex Assembly	Serviceable (For PMHN4421_).
	PA002767A02	Keypad Flex Assembly	Serviceable (For PMHN4457_, PMHN4462_).
12	LB001682A01	Keypad Flex Adhesive	Serviceable.  NOTE: Replace LB001682A01 when re-using PA002767A01/ PA002767A02
13	0402838X02	Encoder washer	Serviceable.
14	FN000503A01	Encoder nut	Serviceable.
15	HW001341A01	Knob	Serviceable.
16	HW001187A02	SMA washer	Serviceable.
17	FN000552A01	SMA Nut	Serviceable.
18	-	SMA o-ring	Not serviceable. Included in Front housing assembly kit.
19	-	SMA Connector	Not serviceable. Included in Front housing assembly kit.
20	-	Mini GCAI PCB	Not serviceable. Included in Front housing assembly kit.
21	0104082J25	Vibrator Assembly	Serviceable.
22	PMHN4421_	Front Kit	Serviceable.  NOTE: Repair or service with PMHN4457_ Order a new part of item number 29, 30 and 31 whenever replacing the PMHN4421_ to PMHN4457_

No.	Part/Kit Number	Description	Remark
	PMHN4457_	Front Kit	Serviceable.  NOTE: Repair or service with PMHN4457_
	PMHN4462_	Front Kit (Bronze Green)	Serviceable. (For Tanapa MXP600 Green, MXP600 Green Tanapa PMUE5764_, PMUE5786_, PMUE5787_)
23	-	Keypad PCB	Not serviceable. Included in the Front housing assembly kit
24	ST000396A01	Keypad mylar and dome array	Serviceable
25	35012055002 or SL000641A01	Mic membrane	Serviceable. 35012055002 and SL000641A01 are similar parts and replaceable.
26	HW001325A01	Speaker Mesh, Big	Serviceable.
	HW002451A01	Speaker Mesh, Small	Serviceable.
27	-	Lens assembly	Not serviceable. Included in Front housing assembly kit.
28	LB001398A01	Lens Liner	Serviceable
29	0378212A01	Keypad Flex Retainer Screw	Serviceable (For PMHN4457_, PMHN4462_).
30	BR000459A01	Keypad Flex Retainer	Serviceable (For PMHN4457_, PMHN4462_).
31	HW002920A01	Conductive Pad	Serviceable (For PMHN4457_, PMHN4462_).
32	35009254001	LCD Connector Kapton	Serviceable.

Figure 10: MXP600 Exploded View 2

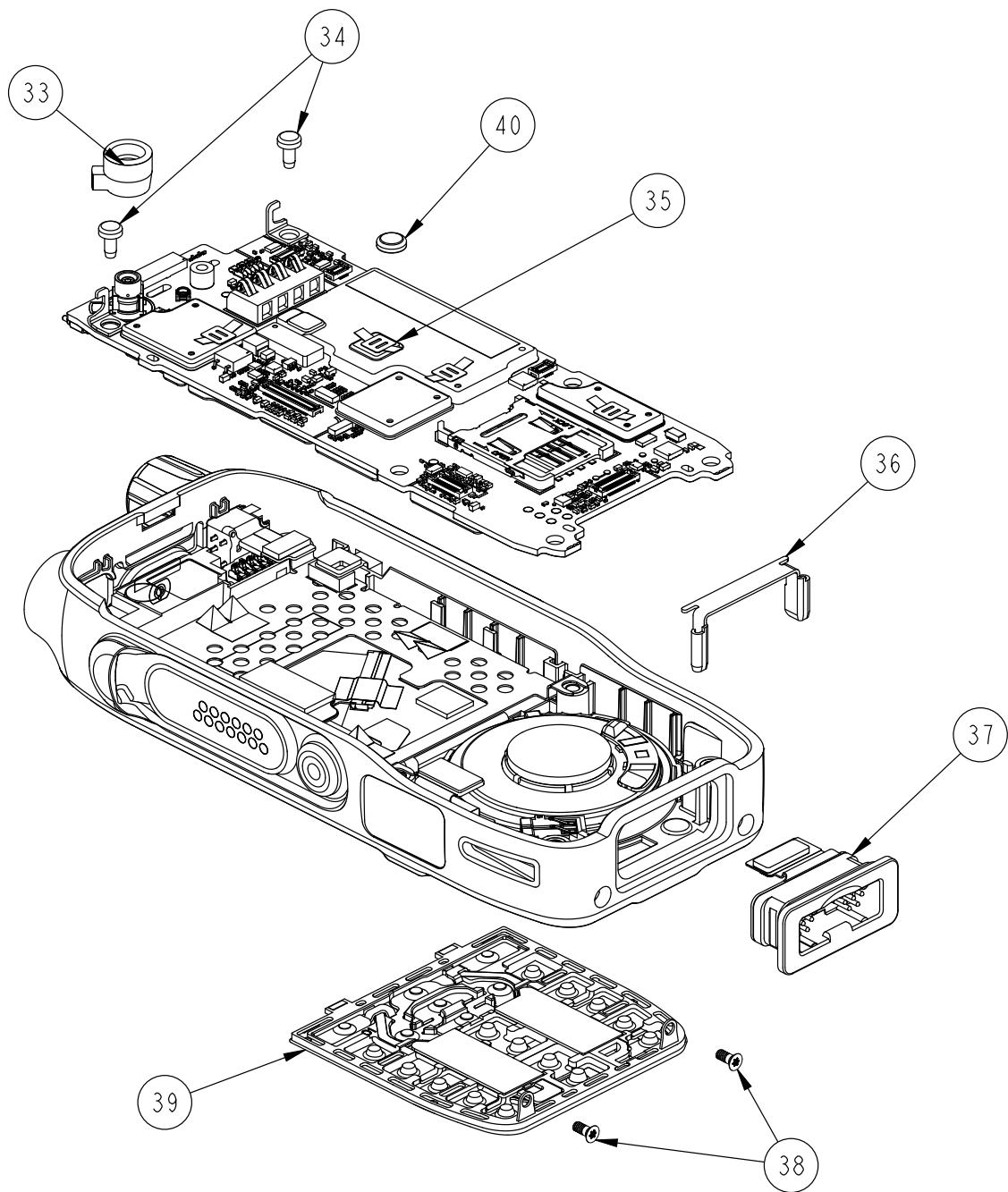


Table 15: Replacement Part List 2

No.	Part/Kit Number	Description	Remark
33	SL000792A01	VA connector Seal	Serviceable.
34	0304726J05	PCB Screw	Serviceable.
35	PMUE5551_Z	Main PCB, SD	Serviceable.
	PMUE5552_Z	Main PCB, SIM	Serviceable.

No.	Part/Kit Number	Description	Remark
	PMUE5763_Z	Main PCB, SIM, SPECTRA	Send the defective unit to the Service Center for repair.
36	BR000458A01	Bottom connector retainer	Serviceable.
37	PA002771A01	Bottom connector assembly	Serviceable.
38	FN000509A01	Keypad screw	Serviceable.
39	KP000275A01	Keypad assembly, Roman	Serviceable.
	KP000275A02	Keypad assembly, Cyrillic	
	KP000275A03	Keypad assembly, Arabic	
	KP000275A04	Keypad assembly, Hebrew	
	KP000275A05	Keypad assembly, Chinese (China)	
	KP000275A06	Keypad assembly, Chinese (Taiwan)	
	KP000275A07	Keypad assembly, Korean	
	KP000275A08	Keypad assembly, Japanese	
	KP000275A09	Keypad assembly, Roman (Bronze Green)	
	KP000275A10	Keypad assembly, Arabic (Bronze Green)	
40	60009265001	Coin Cell Battery (SPECTRA Model Only)	Serviceable (For PMUE5763_ only).

Figure 11: MXP600 Exploded View 3

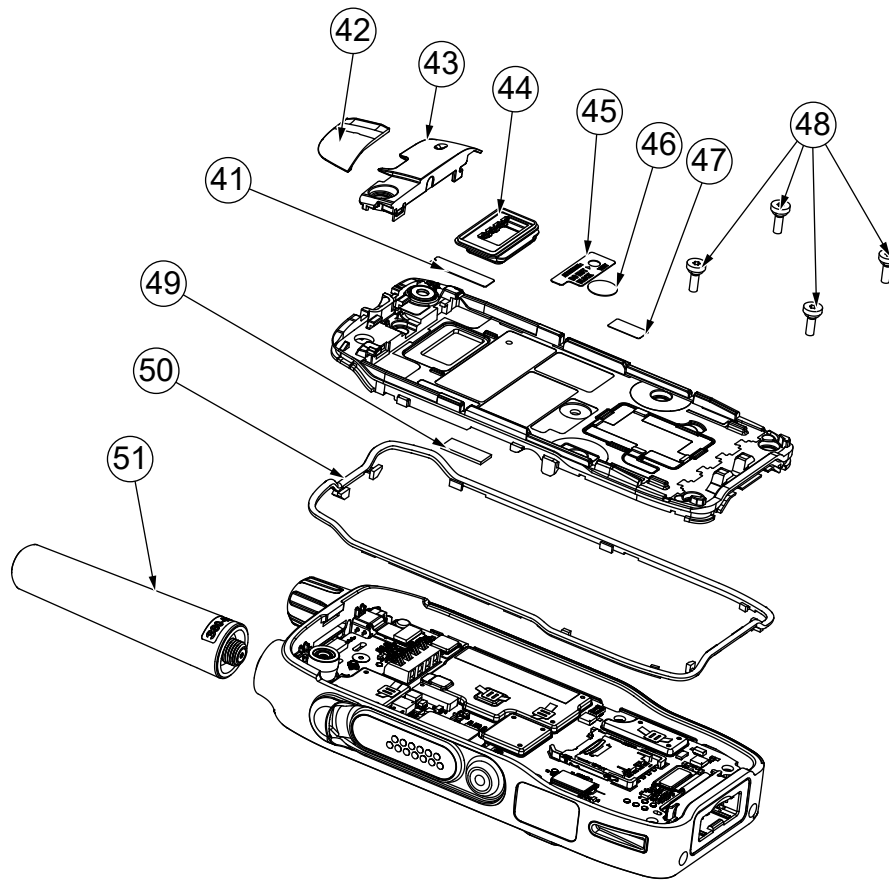


Table 16: Replacement Part List 3

No.	Part/Kit Number	Description	Remark
41	33012021019	Model Label	Serviceable.
42	SL000790A01	RF Dust cover	Serviceable.
43	HN009501A01	Back shroud	Serviceable.
44	SL000793A01	Battery contact seal	Serviceable.
45	LB001049A01	Ventilation label	Serviceable.
46	3286058L01	GORETrademark® membrane	Serviceable.
47	LB000714A01	Label	Serviceable.
48	FN000454A01	Chassis screw	Serviceable.
49	HW002744A01	Thermal pad	Serviceable.
50	SL000791A04	Main Seal	Serviceable.
51	AN000354A01	Antenna stubby, 380-430 MHz, 60 mm	Not serviceable. For replace- ments, see Replacement Parts List.
	PMAE4100_	Antenna stubby, 380-470 MHz, 90 mm	

No.	Part/Kit Number	Description	Remark
	PMAE4022_	Antenna whip, 403-470 MHz, 150 mm	
	AN000362A01	Antenna whip, 380-470MHz, 120mm	
	AN000401A01	Antenna stubby, 350-390MHz, 72mm	

Figure 12: MXP600 Exploded View 4

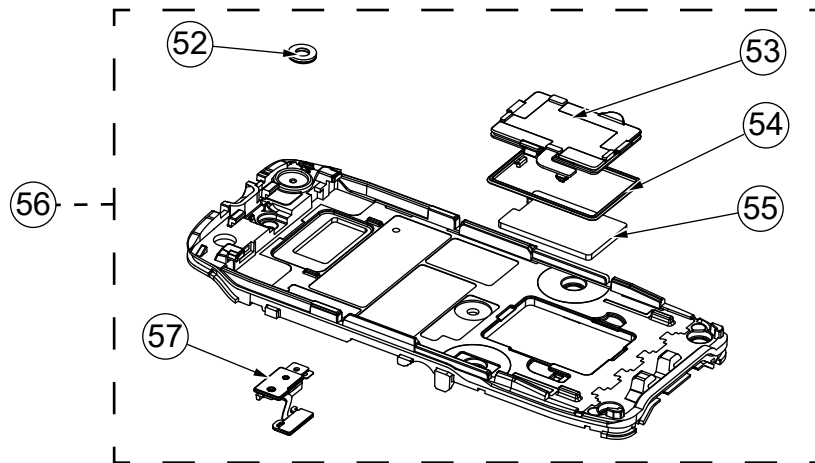


Table 17: Part Replacement List 4

No.	Part/Kit Number	Description	Remark
52	35012055001 or SL000641A02	Mic Membrane	Serviceable. 35012055001 and SL000641A02 are similar parts and replaceable.
53	-	SIM door	Not serviceable. Included in Back kit assembly.
54	SL000789A01	SIM door O-ring	Serviceable.
55	HW002400A01	SIM door pad	Serviceable.
56	PMHN4422_	Back kit Assembly	Serviceable (For Tanapa PMUEXXXXA).
	PMHN4458_	Back kit Assembly	Serviceable (For Tanapa PMUEXXXXB).
57	-	Back mic flex assembly	Not serviceable. Included in Back kit assembly.

 **NOTE:** Refer to [Model Plates on page 177](#) for Model Label.

6.2

Shelf Life Period

To provide optimum performance, all service jobs involving the replacement parts must comply with the shelf life requirement.

The following table provides the part or kit numbers of the components subjected to shelf life period. This is applicable to the radio models listed in this manual.

Table 18: Shelf Life Period

Description	Part/Kit	Quantity	Shelf Life	Storage Temperature
Thermal pad	HW002744A01	1	1 year from date of manufacturing	25±5°C, 40–50% RH

6.3

Accessories Replacement Parts List

Choose from a variety of accessories designed, tested, and certified to optimize the performance of this radio.

Table 19: Antennas

Part Number	Description
AN000354A01	Stubby 60 mm (380–430 MHz)
PMAE4022_	Whip, 150 mm (403–470 MHz)
PMAE4100_	Stubby 90 mm (380–470 MHz)
AN000401A01	Stubby, 72mm (350-390MHz)
AN000362A01	Whip, 120mm (380-470MHz)

Table 20: Batteries

Part Number	Description
PMNN4801_	IMPRES 2™ IP68 1900 mAh Lithium-Ion Battery
PMNN4802_	IMPRES 2™ IP68 3400 mAh Hi-Capacity Lithium-Ion Battery
PMNN4582_	IMPRES 2™ IP68 2900 mAh Mid-Capacity Lithium-Ion Battery

Table 21: Carry Accessories

Part Number	Description
GMDN0386_	Peter Jones (ILG) Klick Fast Sew On Dock
GMDN0445_A	Peter Jones (ILG) Klick Fast Snap On Tag Dock
GMDN0445_C	Peter Jones (ILG) Klick Fast Leather Belt Loop with Mounting Dock
GMDN0497_	Peter Jones (ILG) Klick Fast 38 mm Belt Dock
GMDN0547_	Peter Jones (ILG) Klick Fast Double-Tongue Tag Dock

Part Number	Description
GMDN0566_C	Peter Jones (ILG) Klick Fast Leather Belt Loop Dock
GMLN4488_	Peter Jones (ILG) Klick Fast 50 mm Belt Dock
HLN6602_	Universal Chest Pack
HLN9767_	Wrist Strap
NTN5243_	Shoulder Strap
PMLN5004_	Shoulder Wearing Device with Peter Jones (ILG) Klick Fast Stud
PMLN5580A	2.5 inch Replacement Leather Swivel Belt Loop
PMLN5610_	2.5 inch Leather Swivel Belt Loop
PMLN5611_	3.0 inch Leather Swivel Belt Loop
PMLN5616_	2 inch Short Belt Clip
PMLN8025_	Belt Clip with Peter Jones Klick Fast Stud version 2
PMLN8121_	Low Profile Swivel Clip
PMLN8181_	2.5 inch Belt Clip
PMLN8183_	Soft Leather Pouch with 3 inch Swivel Belt Loop
PMLN8184_	Soft Leather Pouch with 2.5 inch Swivel Belt Loop
PMLN8185_	Soft Leather Pouch for Peter Jones Klick Fast Stud
RLN4570_	Break-a-way Chest Pack with Radio Holder
RLN4815_	RadioPak Radio Utility Case
WALN4307_	Peter Jones (ILG) Klick Fast Retro Fitting Garment with Easy Screw-To-Fit Dock

Table 22: Audio Accessories

Part Number	Description
NNTN8191_	Operations Critical Wireless Push-To-Talk Pod. Power supply for charging this pod must be ordered separately.
NNTN8294_	Wireless Bluetooth Ear-bud with 11.5 inch Cable. Requires NNTN8191 Operations Critical Wireless Push-To-Talk Pod.
NNTN8295_	Wireless Bluetooth Ear-bud with 45 inch Cable. Requires NNTN8191 Operations Critical Wireless Push-To-Talk Pod.
NNTN8433_	Completely Discreet Wireless Surveillance Kit. Includes Wireless Neck Loop Y-Adapter and Retention Hook, Completely Discreet Earpiece Kit and Wireless Push-to-Talk Pod.
NTN2572_	Operations Critical Wireless Earpiece with 12 inch Cable. Requires NNTN8191 Operations Critical Wireless Push-To-Talk Pod.
PMLN7851_	Operations Critical Wireless Earpiece with Push-To-Talk
PMLN8082_	1-Wire Extra Large Clear Tube Earpiece, GCAI Mini
PMLN8083_	2-Wire Extra Large Clear Tube Earpiece, GCAI Mini
PMLN8084_	3-Wire Extra Large Clear Tube Earpiece, GCAI Mini

Part Number	Description
PMLN8085_	Behind-the-Head Headset, GCAI Mini
PMLN8086_	Over-the-Head Headset, GCAI Mini
PMLN8087_	Receive-Only 1-Wire Short Cord xL Clear Tube Earpiece, GCAI Mini
PMLN8092_	Acoustic Tube with Rubber Earbud, Replacement Kit
PMMN4128_	RM780 IMPRES™ Windporting Remote Speaker Microphone, Large (IP68), GCAI Mini

Table 23: Chargers and Charging Accessories

Part Number	Description
NNTN8038_	Personal Charger, Switch Mode Power Supply, 110–240 V, US plug
NNTN8039_	Personal Charger, Switch Mode Power Supply, 110–240 V, Brazil plug
NNTN8040_	Vehicular Power Adapter, 12–24 V
NNTN8132_	Personal Charger, Switch Mode Power Supply, 110–240 V, Argentina plug
NNTN8133_	Personal Charger, Switch Mode Power Supply, 110–240 V, Euro plug
NNTN8134_	Personal Charger, Switch Mode Power Supply, 110–240 V, UK plug
NNTN8135_	Personal Charger, Switch Mode Power Supply, 110–240 V, Australia/NZ plug
NNTN8136_	Personal Charger, Switch Mode Power Supply, 110–240 V, Japan plug
NNTN8137_	Personal Charger, Switch Mode Power Supply, 25012023003 Korea plug
NNTN8159_	Personal Charger, Switch Mode Power Supply, 110–240 V, China plug
NNTN8234_	Desktop Dual-Unit Charger Base Only
NNTN8244_	Desktop Dual-Unit Charger, US plug
NNTN8245_	Desktop Dual-Unit Charger, Euro plug
NNTN8246_	Desktop Dual-Unit Charger, UK plug
NNTN8247_	Desktop Dual-Unit Charger, Australia/NZ plug
NNTN8248_	Desktop Dual-Unit Charger, Argentina plug
NNTN8249_	Desktop Dual-Unit Charger, Korean plug
NNTN8250_	Desktop Dual-Unit Charger, Brazil plug
NNTN8251_	Desktop Dual-Unit Charger, China plug
PMLN6493_	Simultaneous Dual-Unit Charger, EXT US/NA/Japan/Taiwan
PMLN6494_	Simultaneous Dual-Unit Charger, EXT EU
PMLN6495_	Simultaneous Dual-Unit Charger, UK
PMLN6496_	Simultaneous Dual-Unit Charger, EXT China
PMLN6497_	Simultaneous Dual-Unit Charger, EXT Australia/NZ
PMLN6498_	Simultaneous Dual-Unit Charger, EXT Brazil
PMLN6499_	Simultaneous Dual-Unit Charger, EXT Argentina
PMLN6500_	Simultaneous Dual-Unit Charger, EXT Korea

Part Number	Description
PMPN4083_	Power Supply Internal Module,Vehicular Power Module and Battery Power Cable
PMPN4156_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Base
PMPN4216_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply US
PMPN4217_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply EURO
PMPN4218_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply UK/Hong Kong
PMPN4219_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Australia/NZ
PMPN4220_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Argentina
PMPN4221_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply China
PMPN4222_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Korea
PMPN4223_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Brazil
PMPN4282_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply Japan
PMPN4400_	Multi-Unit Charger, IMPRES 2™ Base, 6D/6B
PMPN4401_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC NA/LA/CA
PMPN4402_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC EURO
PMPN4403_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC UK
PMPN4404_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC Australia
PMPN4405_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC Argentina
PMPN4406_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC China
PMPN4407_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC Korea
PMPN4409_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC Japan
PMPN4494_	IMPRES 2™ Multi-Unit Charger 1 Display EXT Power Supply 100–240 VAC Brazil
PS000042A31	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, US/Japan
PS000042A32	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, EU
PS000042A33	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, UK/Hong Kong
PS000042A34	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, Australia/NZ
PS000042A35	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, Argentina

Part Number	Description
PS000042A36	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, China
PS000042A37	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, Korea
PS000042A38	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, Brazil
PS000042A39	Power Supply Adapter, Power-Wall Cube, AC, DC, Switch Mode, 5 W, 100–240 V, SINECO, BIS

Table 24: Programming Cable

Part Number	Description
PMKN4124_	E2EE KVL Cable
PMKN4127_	Bottom Connector Serial Data Cable
PMKN4129_	TETRA USB Data Cable
PMKN4122_	RS-232 Programming cable (set cable switch to FLASH)

Table 25: Miscellaneous

Part Number	Description
DLN6985_	TETRA CRYPTR MICRO AES128
DLN6986_	TETRA CRYPTR MICRO AES256
HW002461A01	Radio Frequency Identification (RFID) Knob, EU, 866–868 MHz
HW002462A01	Radio Frequency Identification (RFID) Knob, US, 902–928 MHz
PMHN4210_	Bottom Connector Dust Cover
PMHN4429_	GCAI Connector Dust Cover
PMKN4232_	Replacement Cable for RSM
PMLN6285_	5-Color Rings for Antenna (Blue)
PMLN6286_	5-Color Rings for Antenna (Pearl White)
PMLN6287_	5-Color Rings for Antenna (Neon Green)
PMLN6288_	5-Color Rings for Antenna (Neon Yellow)
PMLN6289_	5-Color Rings for Antenna (Neon Red)
PMLN8122_	Replacement Dust Cover for RSM

Chapter 7

Radio Disassembly and Reassembly

Mechanical checks and self-tests should be performed on the unit at the basic level of service.



NOTE: Read each procedure thoroughly before performing the actual task.

7.1

Torque Specification Chart

Use the recommended torque value in this chart when fastening different parts of the radio.

Table 26: Torque Specification Chart

Description	Part/Kit	Torque
Main Board Screw to capsule insert.	0304726J05	2.2±0.1 lb-in
Chassis Screw to front housing insert.	FN000454A01	3.6±0.1 lb-in
Keypad Screw to front housing insert.	FN000509A01	1.1±0.1 lb-in
Encoder Nut	FN000503A01	5.0±0.1 lb-in
Antenna Nut	FN000552A01	12±0.1 lb-in
Keypad Flex Retainer Screw	0378212A01	1±0.1 lb-in

7.2

Installing or Uninstalling the MicroSD Card



NOTE: Applicable only for SD Card model.

Prerequisites: The micro-SD card slot has a delicate construction. Avoid installing or uninstalling the micro-SD card unnecessarily as this action can damage the mechanism of the reader. For copying files from your radio, you can use the USB Mass Storage Mode.

Installing the MicroSD Card

Prerequisites:

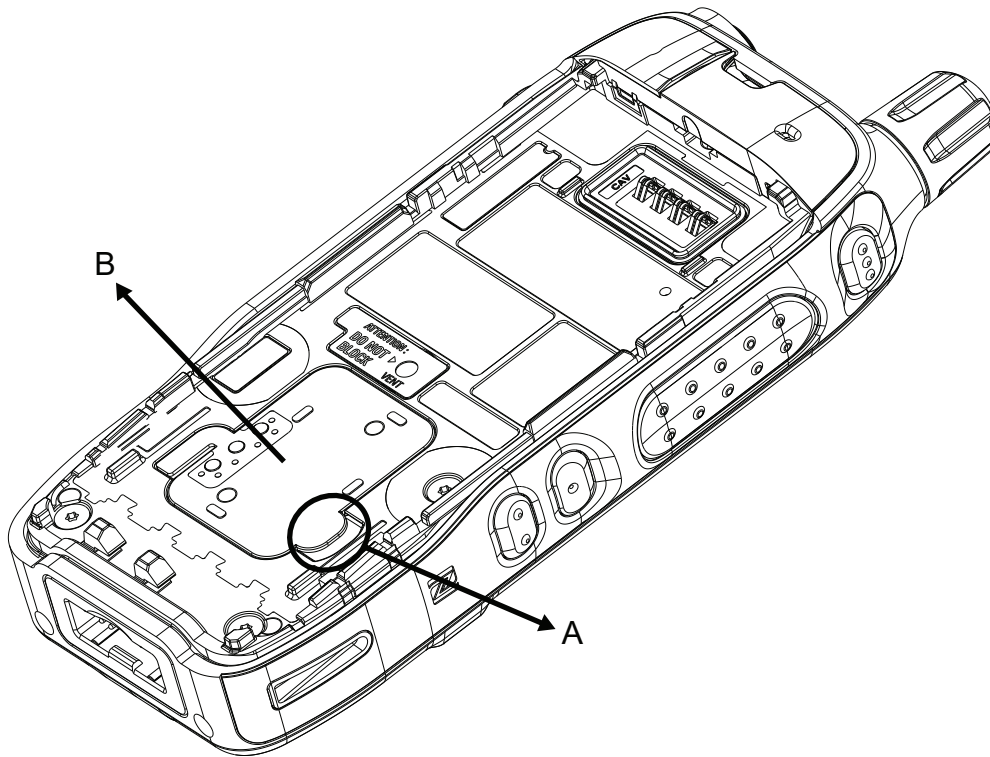
Your radio is equipped with a microSD card slot.

Procedure:

1. Remove the battery.
2. Flip open the plastic door from the finger scoop area.

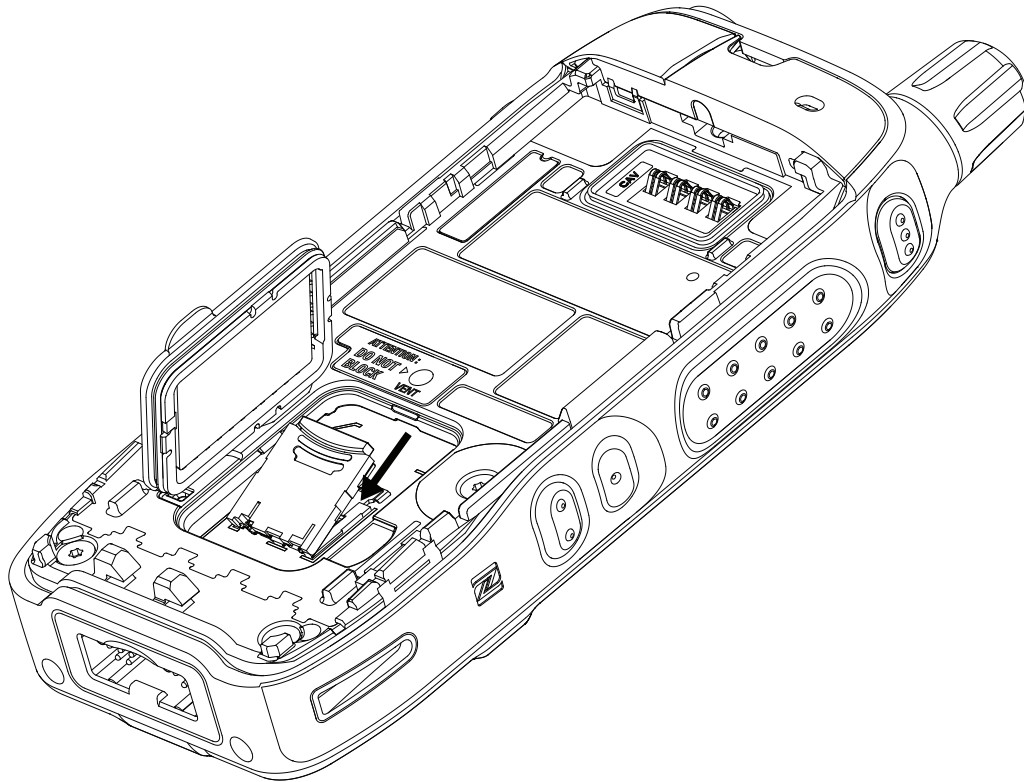


NOTE: Avoid pressing on the plastic door.

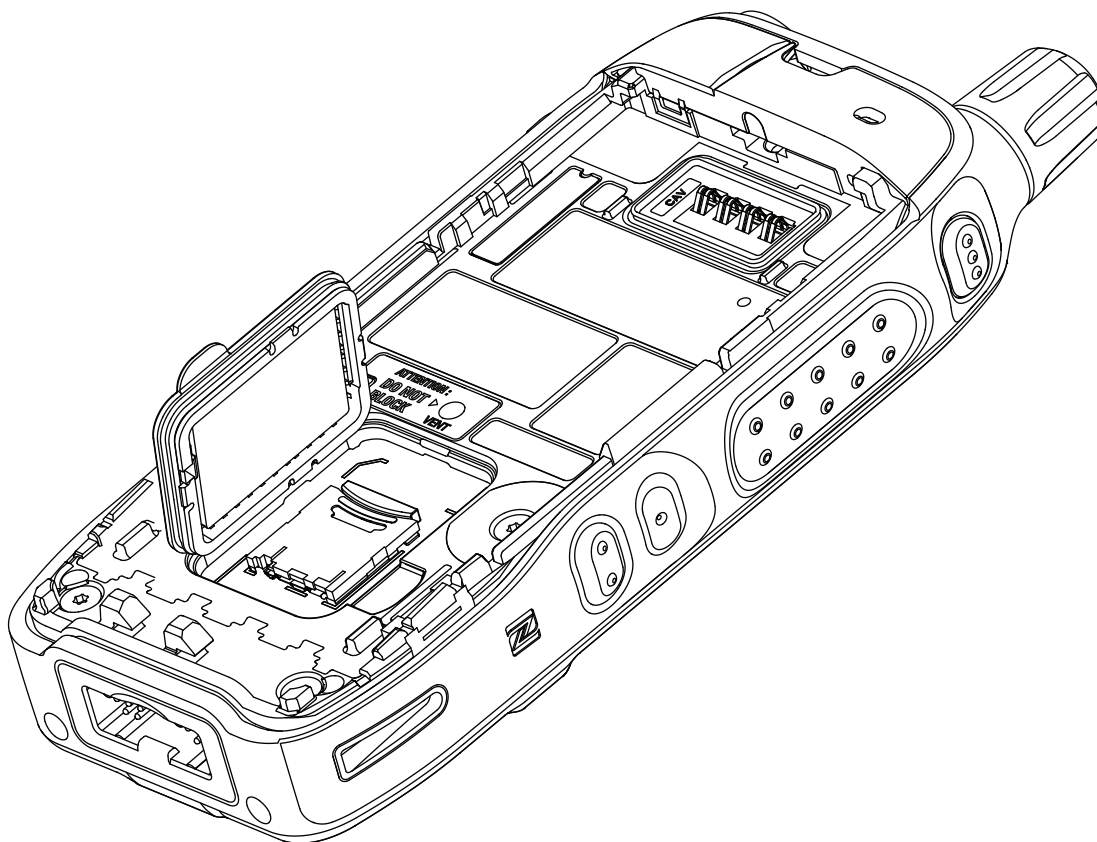


Annotation	Description
A	Finger Scoop Area
B	Plastic door

3. Flip open the microSD card holder.
4. Insert the microSD card into the microSD card holder ensuring that the gold contact area is facing down.



5. Close the microSD card holder and slide it to the lock position.

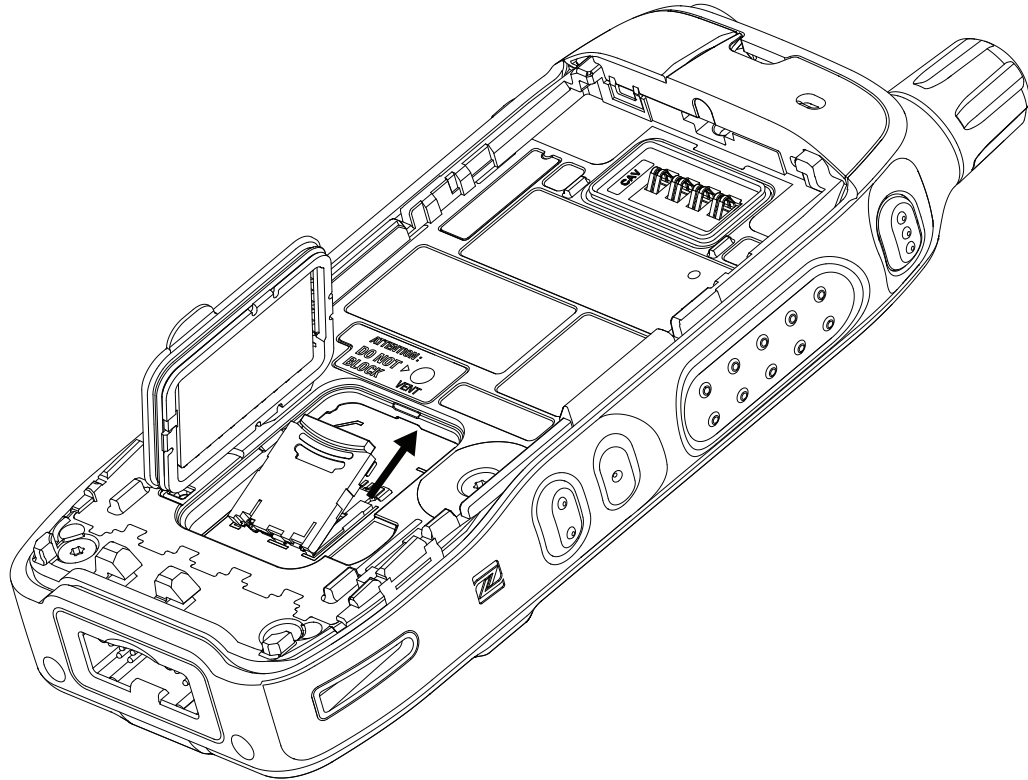


6. Close the plastic door.
7. Install the battery.

Uninstalling the MicroSD Card

Procedure:

1. Remove the battery.
2. Flip open the plastic door from the finger scoop area.
 **NOTE:** Avoid pressing on the plastic door.
3. Flip open the microSD card holder.
4. Remove the microSD card from the microSD card holder.



5. Close the microSD card holder and slide it to the lock position.
6. Close the plastic door.
7. Install the battery.

7.3

Installing or Uninstalling the SIM Card

 **NOTE:** Applicable only for SIM Card model.

Prerequisites: The SIM card slot has a delicate construction. You must avoid installing or uninstalling the SIM card unnecessarily as this action can damage the mechanism of the reader. For copying files from your radio, you can use the USB Mass Storage Mode.

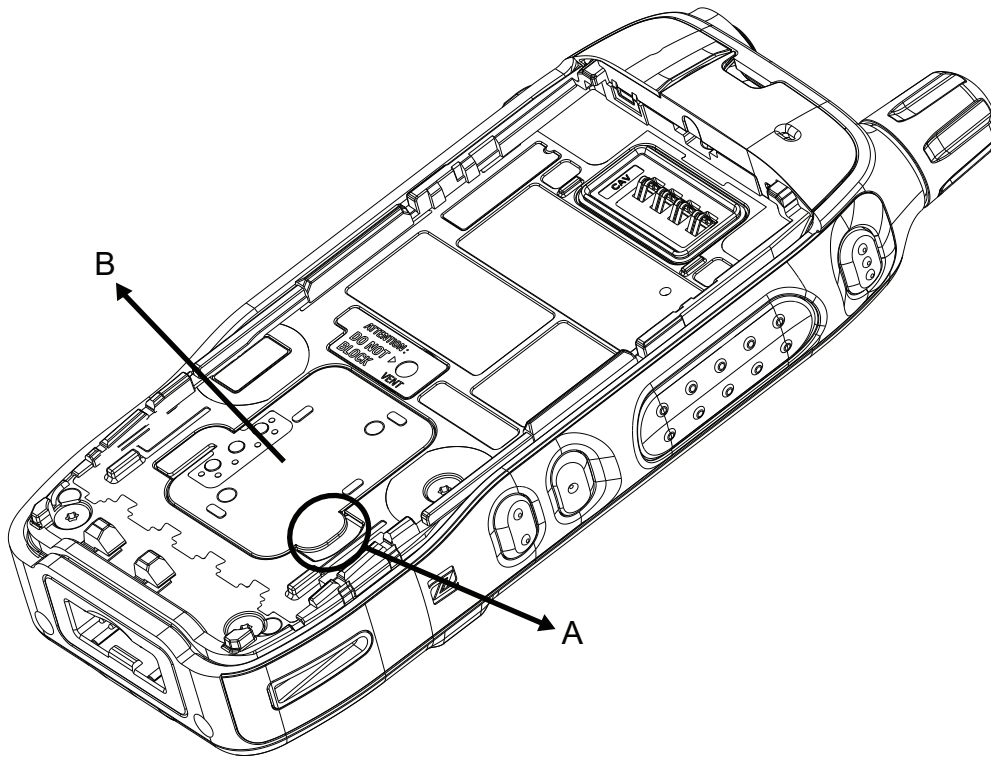
Installing the SIM Card

Prerequisites: Your radio is equipped with a SIM card slot.

Procedure:

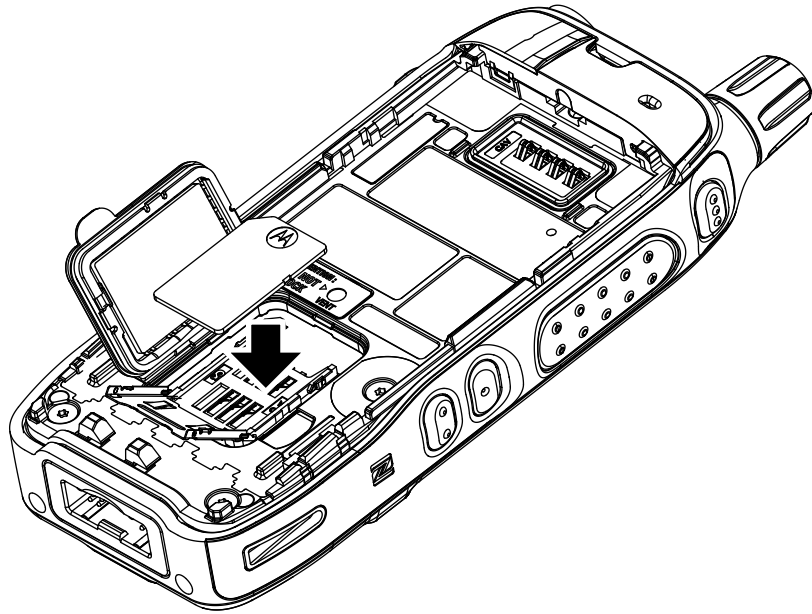
1. Remove the battery.
2. Flip open the plastic door from the finger scoop area.

 **NOTE:** Avoid pressing on the plastic door.

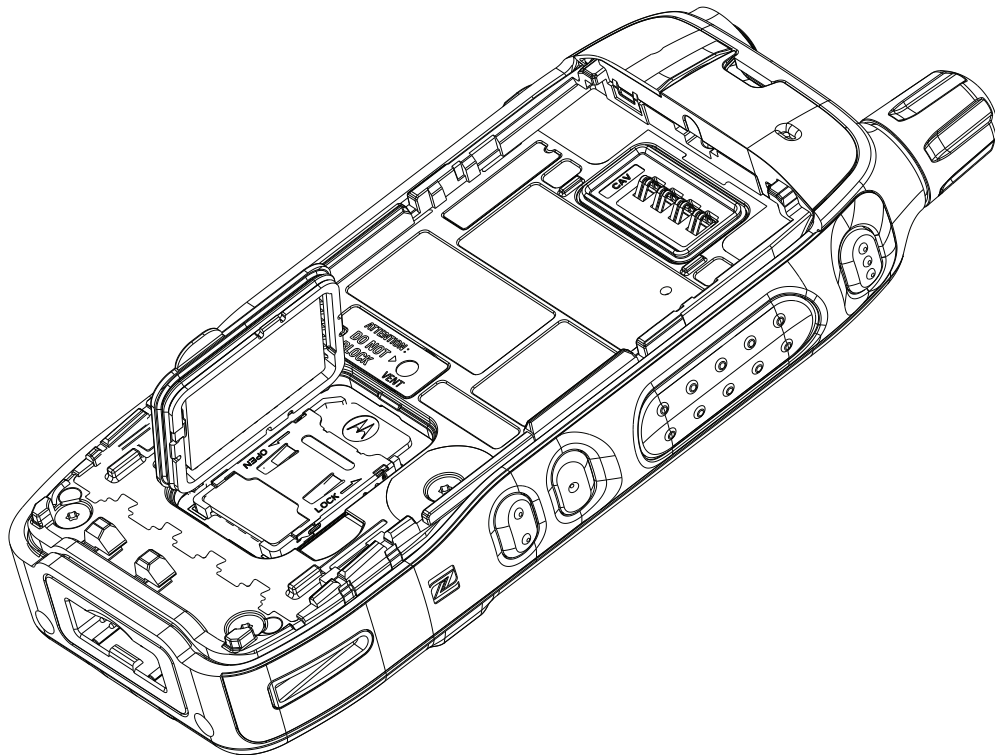


Annotation	Description
A	Finger Scoop Area
B	Plastic door

3. Flip open the SIM card holder.
4. Place the SIM card into the SIM card holder ensuring that the gold contact area is facing down.



5. Close the SIM card holder and slide it to the lock position.



6. Close the plastic door.

7. Install the battery.

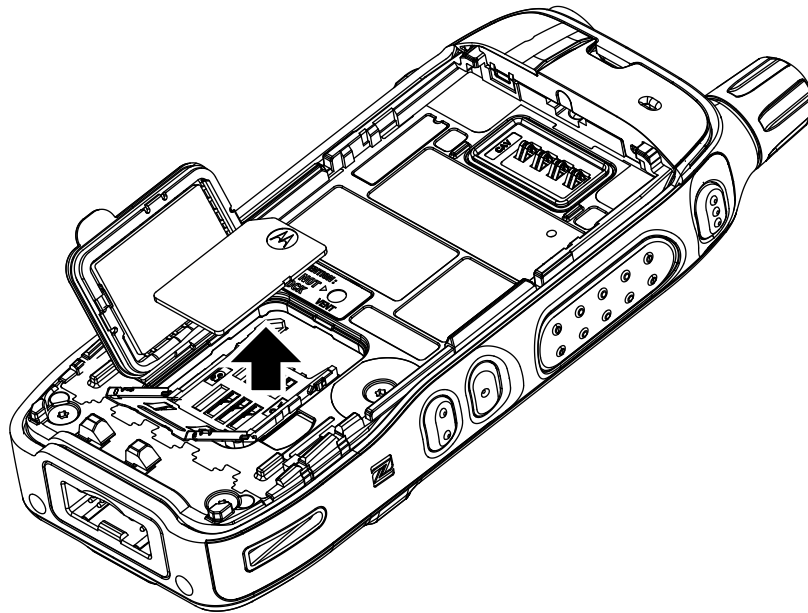
Uninstalling the SIM Card

Procedure:

1. Remove the battery.
2. Flip open the plastic door from the finger scoop area.

 **NOTE:** Avoid pressing on the plastic door.

3. Flip open the SIM card holder.
4. Remove the SIM card from the SIM card holder.



5. Close the SIM card holder and slide it to the lock position.
6. Close the plastic door.
7. Install the battery.

7.4

Disassembling the Radio

Only Motorola Solutions Service Centers or Authorized Motorola Solutions Service Dealers can disassemble the radio for repair or maintenance.

 **NOTE:** Only the repair team is authorized to perform board swap.

7.4.1

Removing the Antenna

Procedure:

Turn the antenna counter clockwise until it is detached from the radio.



To view the video for removing antenna, click [Removing the Antenna](#)

7.4.2

Removing the Battery

Procedure:

1. Place the radio facing down on the work area.



2. Slide the battery latch to the right to release the battery from the catch.
The battery is detached from the radio.



3. Lift the battery and remove it from the radio.



To view the video for removing battery, click [Removing the battery](#)

7.4.3

Removing the Lens Liner

Procedure:

Pull the lens liner away from the display.



To view the video for removing lens liner, click [Removing the lens liner](#).

7.4.4

Removing the Encoder Knob

Prerequisites: Recommended tools:

- Knob and Back Shroud Opener (part number: TL000146A01)

Procedure:

1. Hold the radio in one hand with the top of the radio facing upwards.



2. Grip the Knob and Back Shroud Opener onto the Encoder knob.



3. With the Knob and Back Shroud Opener firmly latching onto the Encoder knob, push the knob upwards away until the knob is free from the radio.



To view the video for removing encoder knob, click [Removing the encoder knob](#)

7.4.5

Removing the Encoder Washer

Prerequisites: Recommended tools:

- Encoder Nut Bit (part number: TL000148A01)
- Plastic tweezers

Procedure:

1. Using the Encoder Nut Bit, unscrew the nut from the encoder as shown.



2. Use the tweezers to lift up the washer from the encoder.



To view the video for removing encoder washer, click [Removing the encoder washer](#)

7.4.6

Removing the Back Kit Assembly

Prerequisites: Recommended tools:

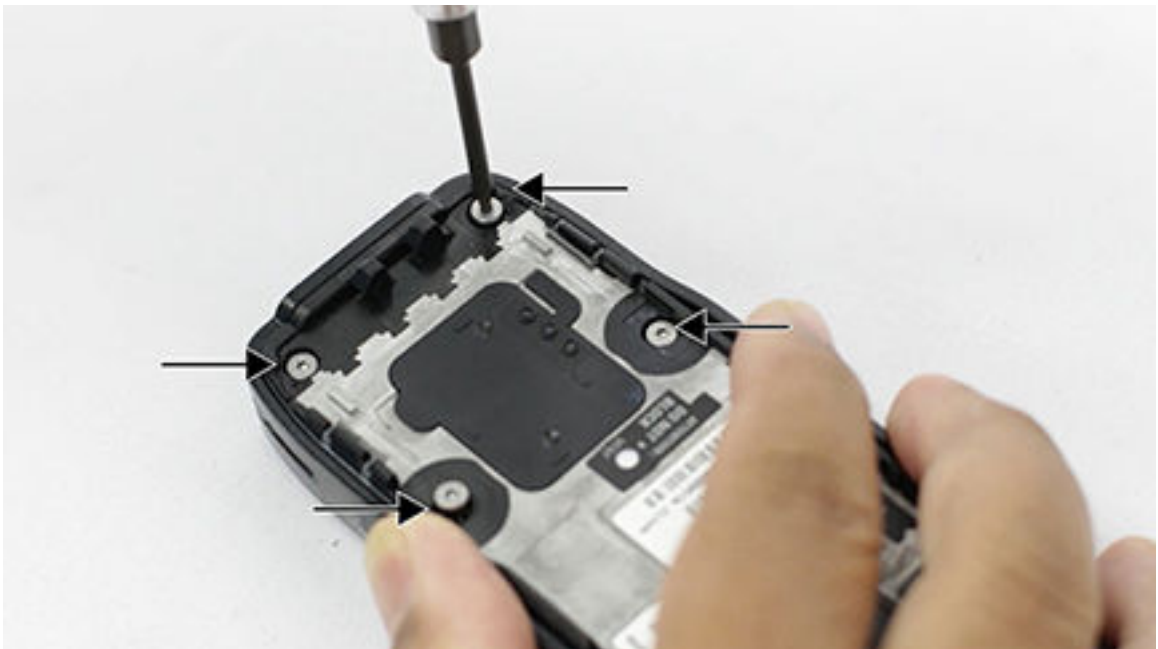
- T-6 Screw Bit
- Torx Driver

Procedure:

1. Peel off the tamper label on the back chassis as shown.



2. Using a Torx driver with T-6 Torx bit, unscrew the four screws on the back chassis.



3. Using fingers, carefully remove the back housing from the radio using the battery latch hook.



To view the video for removing back kit, click [Removing the back kit assembly](#)

7.4.7

Removing the Back Shroud

Prerequisites: Recommended tools:

- Knob and Back Shroud Opener (part number: TL000146A01)

Procedure:

1. Place the Knob and Back Shroud Opener in between the back chassis and the back shroud.



2. Push down the tool to disengage the back shroud from the back cover.





To view the video for removing back shroud, click [Removing the back shroud](#)

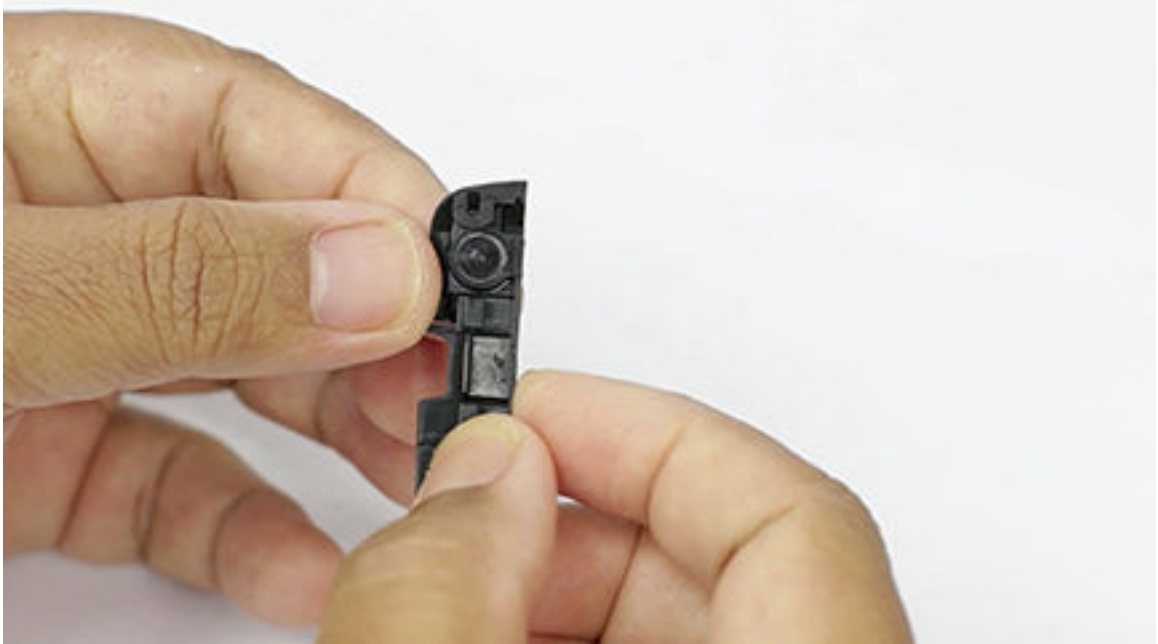
7.4.8

Removing the VA Connector Dust Cover

Prerequisites: The Back Shroud is removed.

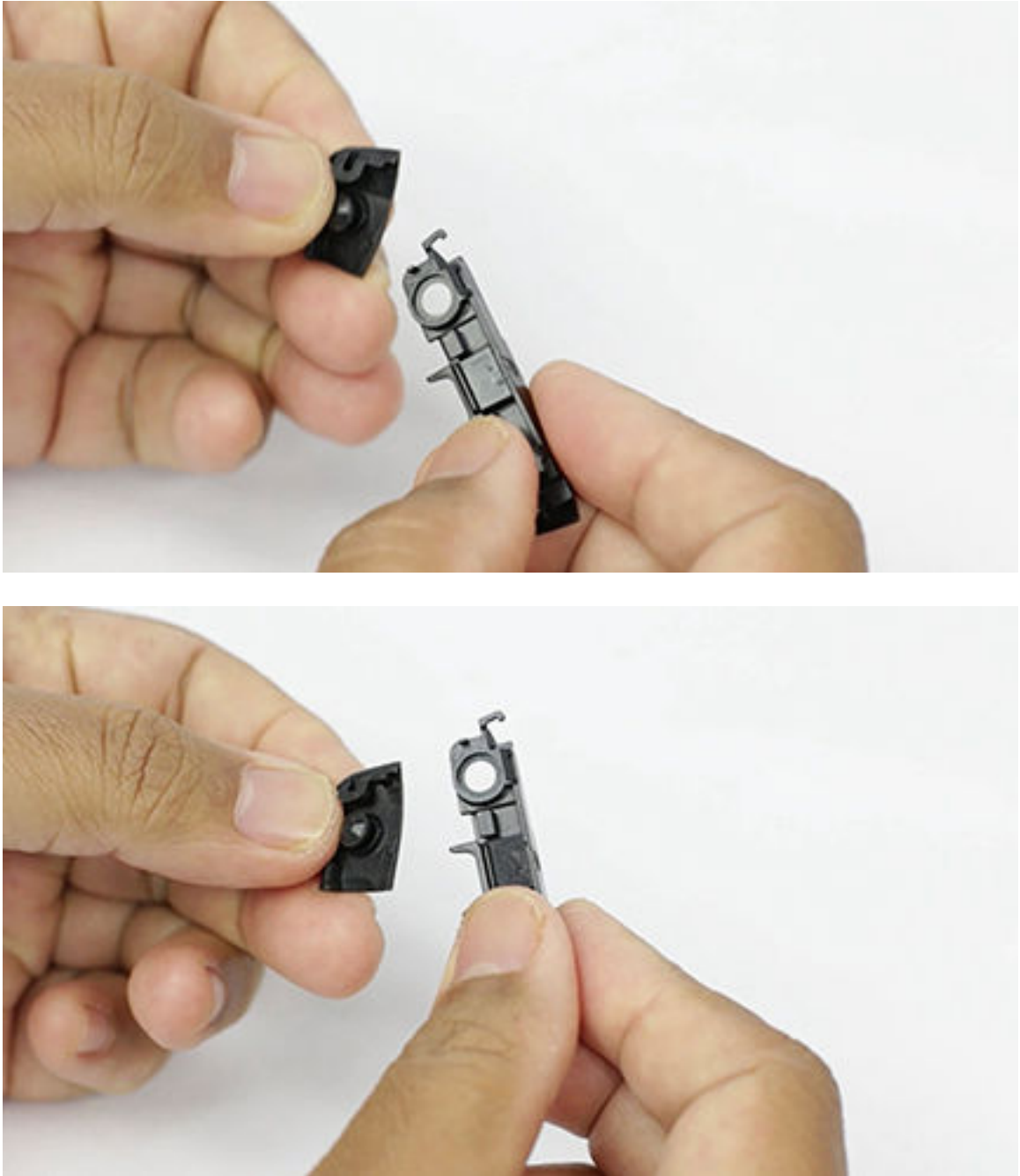
Procedure:

1. Pull out the VA Connector Dust Cover from the side.



2. Pull out the tab/hinge from VA Connector Dust Cover that was inserted into the tab of the Back Shroud.





To view the video for removing VA connector dust cover, click [Removing the VA connector dust cover](#)

7.4.9

Removing the Microphone Membrane on the Back Kit Assembly

Prerequisites: Recommended tools:

- Plastic tweezers

Procedure:

1. Use the plastic tweezers to remove the mic membrane on the back kit assembly.



2. Clean the adhesive residue from the recess.





To view the video for removing microphone membrane from back kit assembly, click [Removing the microphone membrane from back kit assembly](#)

7.4.10

Removing the Main Seal

Prerequisites: The Back Shroud is removed.

Procedure:

Pull away the tab of the main seal out from the back chassis.







To view the video for removing the main seal, click [Removing the main seal](#)

7.4.11

Removing the Battery Contact Seal

Procedure:

Pull the battery seal from the back of the chassis out from the Back Chassis.



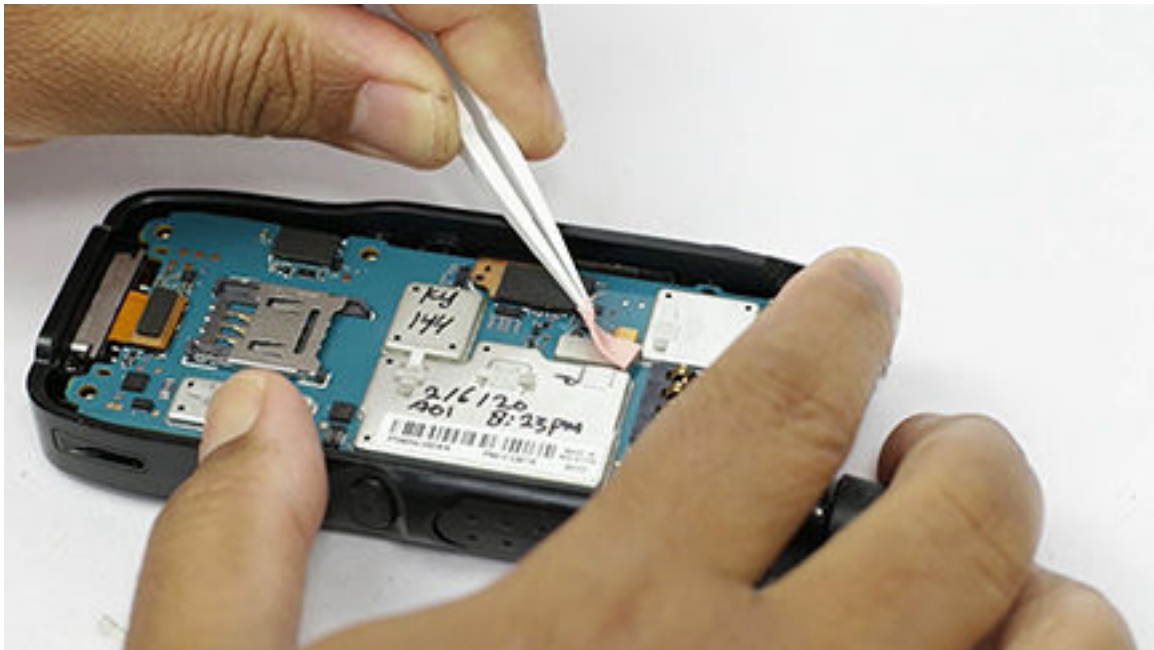
To view the video for removing battery contact seal, click [Removing the battery contact seal](#)

7.4.12

Removing the Thermal Pad

Procedure:

Remove the thermal pad from the heat spreader.



To view the video for removing thermal pad, click [Removing the thermal pad](#)

7.4.13

Removing the SIM Door O-Ring

Procedure:

Pull the tab of the o-ring out from the SIM door.



To view the video for removing SIM door O-Ring, click [Removing the SIM door O-Ring](#)

7.4.14

Removing the SIM Door Poron

Prerequisites: Recommended tools:

- Plastic tweezers

Procedure:

Use the plastic tweezers to peel off the poron from the SIM door.



To view the video for removing SIM door poron, click [Removing the SIM door poron](#)

7.4.15

Removing the GORE® Membrane

Procedure:

1. Peel off the ventilation label.



2. Peel off the GORE membrane.



3. Clean the adhesive residue from the recess.

To view the video for removing GORE membrane, click [Removing the GORE membrane](#)

7.4.16

Removing the Model Label

Procedure:

Peel off the model label.





To view the video for removing the model label, click [Removing the model label](#)

7.4.17

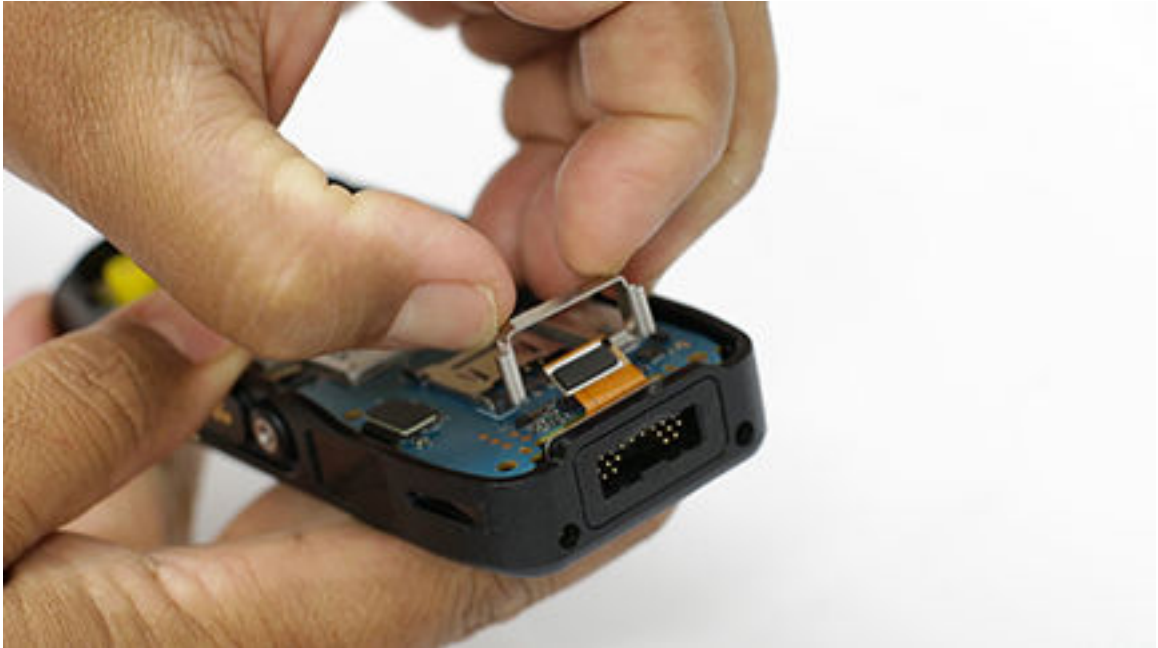
Removing the Bottom Connector Assembly

Procedure:

1. Disengage the bottom connector flex from the main PCB.



2. Lift up the bottom connector retainer while ensuring that the bottom connector remains in place.



3. Push out the bottom connector from the front kit. Be careful with the bottom connector flex while removing the bottom connector.



To view the video for removing bottom connector assembly, click [Removing the bottom connector assembly](#)

7.4.18

Removing the Main PCB

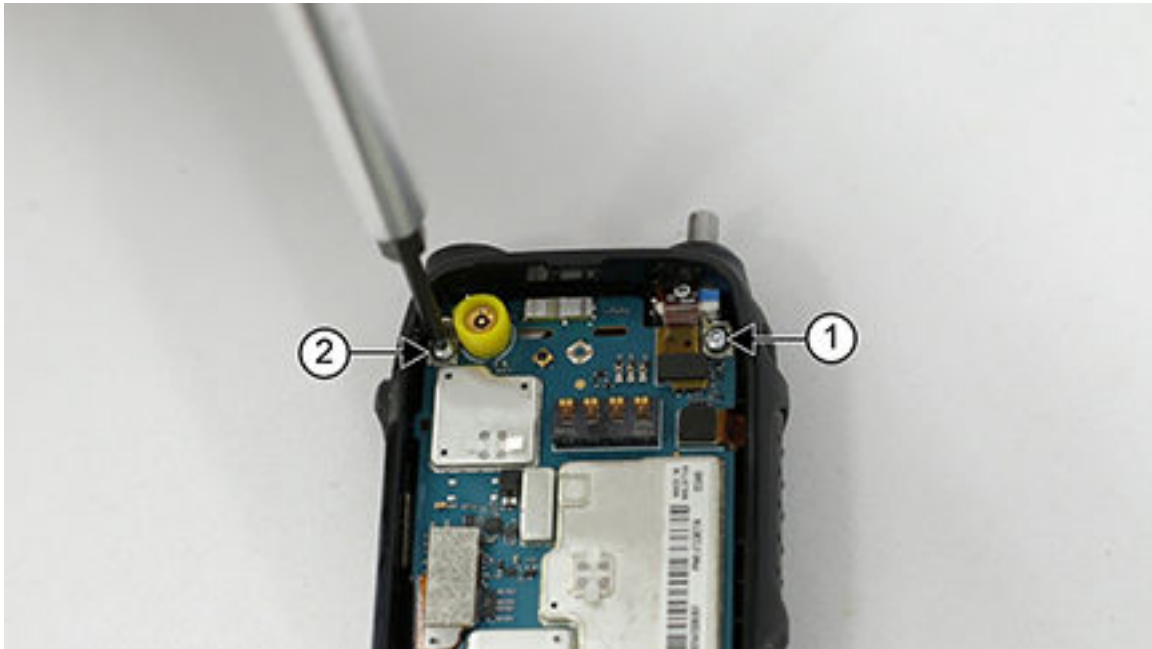
Prerequisites: Recommended tools:

- T-6 Screw bit
- Torx driver

- Plastic tweezers

Procedure:

1. Using the Torx driver with the T-6 Torx bit, unscrew the two screws at the top portion of the Main PCB.

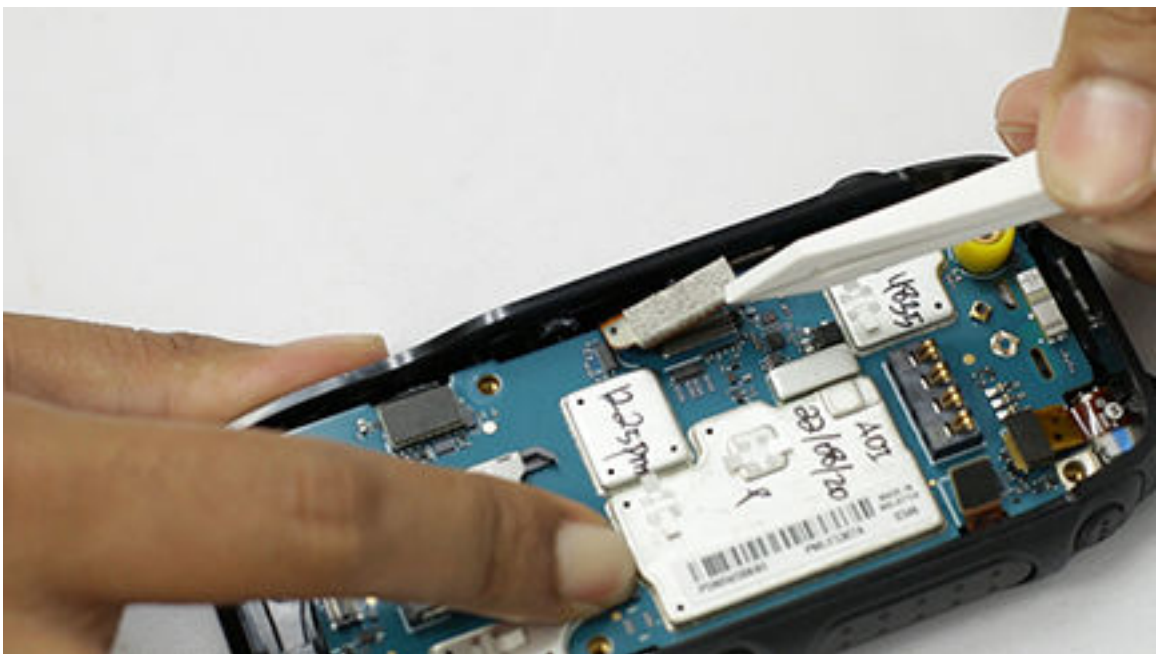


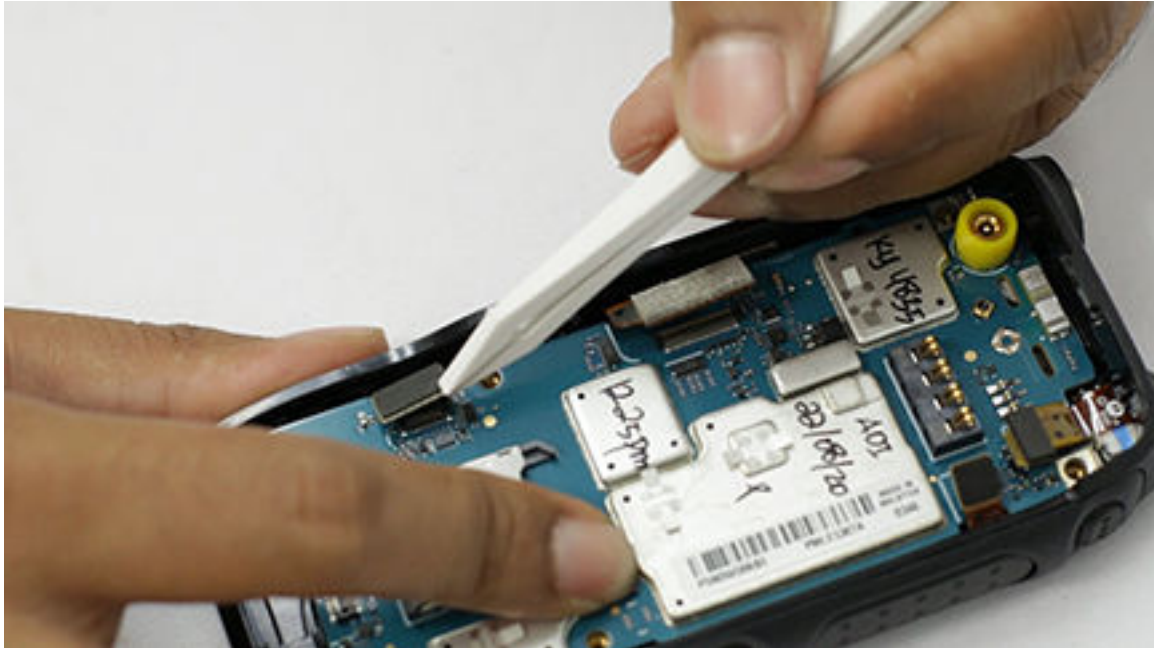
2. Disengage the encoder flex, sides button flex, display flex, and keypad flex from the main PCB.



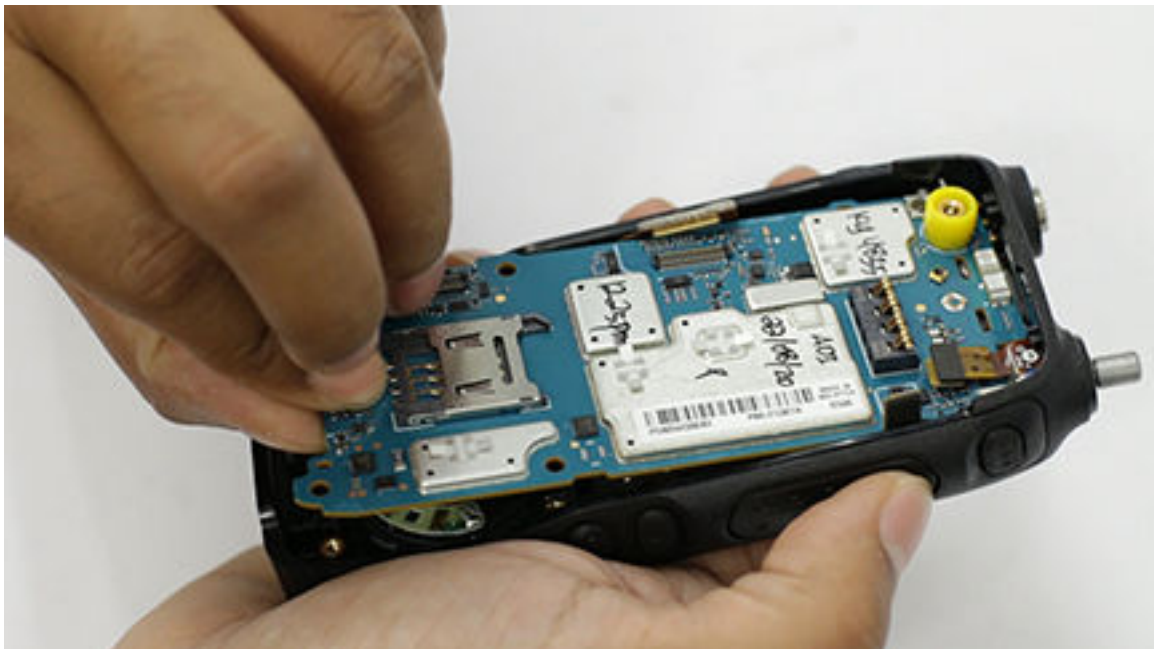
CAUTION: Ensure that other components are not lifted up, and use plastic tweezers to disengage the flex.







3. Gently tilt the bottom portion of the Main PCB upwards to release the Main PCB from the guiding pins.



4. Carefully pull the Main PCB away in the direction as shown. Be aware of the pogo pin on the top left portion on the Main PCB. Ensure that it is not stuck inside the front kit before pulling it away from the housing.



CAUTION: Ensure the component of the board do not scratch the flex or the housing.



To view the video for removing main PCB, click [Removing the main PCB](#)

7.4.19

Removing the Coin Cell Battery

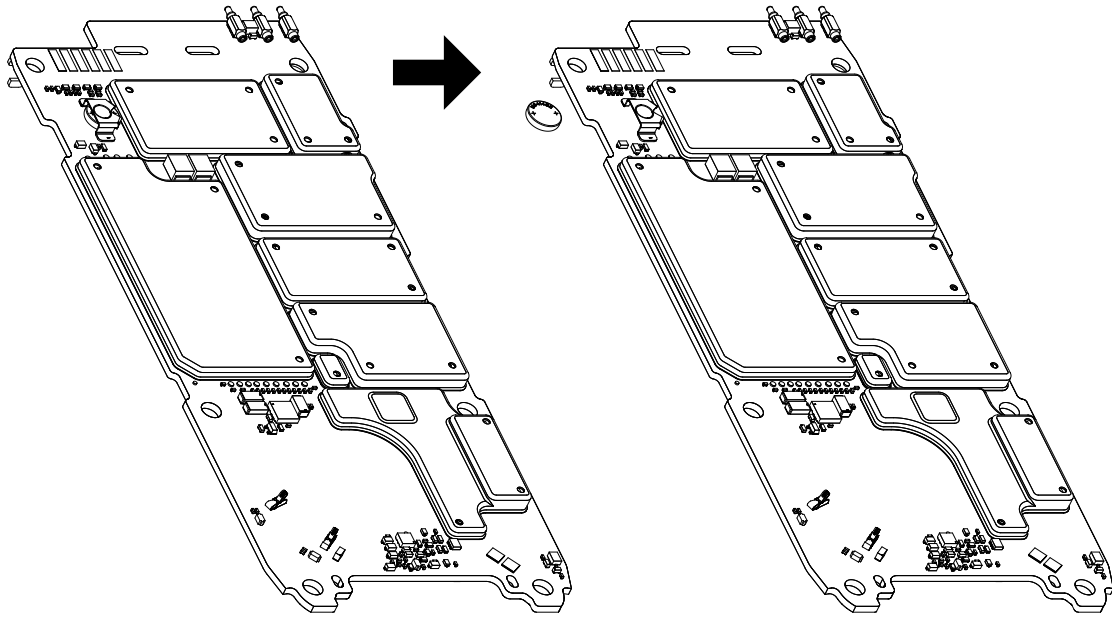
Prerequisites: Recommended tools:

- Plastic tweezers.

 **NOTE:** Only for SECTRA model (PMUE5763_)

Procedure:

Disengage the coin cell battery by carefully pushing it out from the coin cell holder.



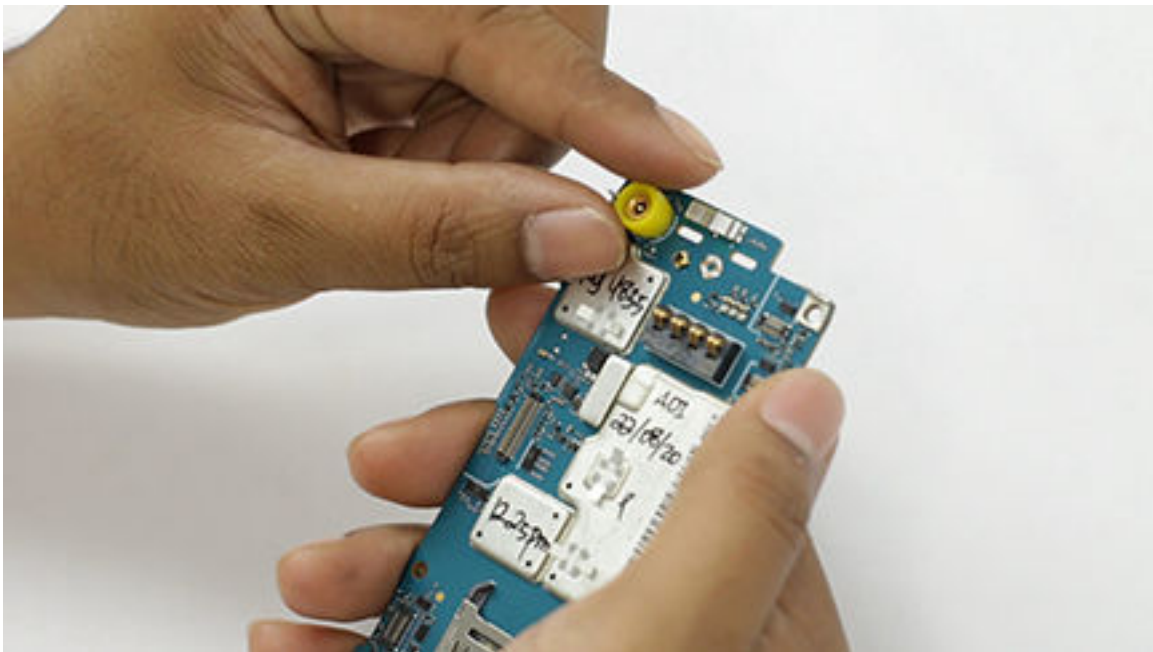
 **NOTE:** Use plastic tweezers to disengage the coin cell battery, ensure coin cell holder is not dented or lifted-up.

7.4.20

Removing the VA Connector Seal

Procedure:

Remove the seal from the main PCB.



To view the video for removing VA connector seal, click [Removing the VA connector seal](#)

7.4.21

Removing the Vibrator Assembly

Procedure:

Remove the vibrator assembly from the front housing.



To view the video for removing vibrator assembly, click [Removing the vibrator assembly](#)

7.4.22

Removing the Keypad Flex Assembly

Prerequisites: Recommended tools:

- Plastic tweezers

Procedure:

1. Remove the conductive pad on the keypad flex.



2. Use the plastic tweezers to disengage the BTB connector by lifting up the BTB from the front housing.



3. Clean the adhesive residue on the housing and keypad flex.

To view the video for removing keypad flex assembly, click [Removing the keypad flex assembly](#)

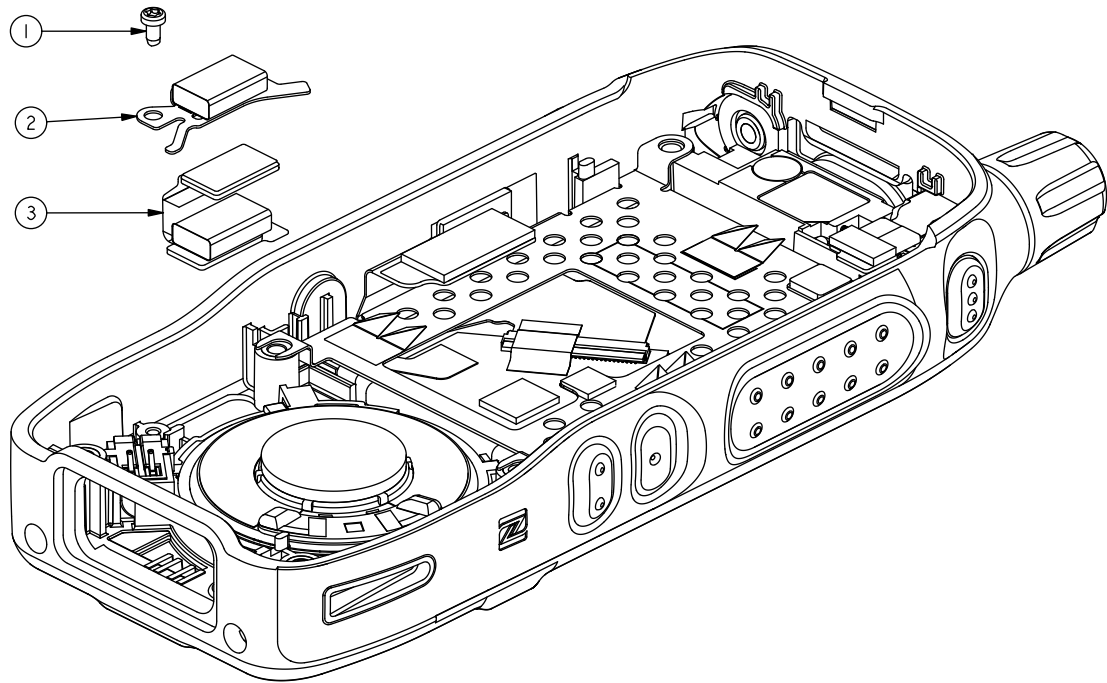
Removing the Keypad Flex Assembly (For PMHN4457_, PMHN4462_)

Prerequisites: Recommended tools:

- Plastic tweezers
- T-6 Screw Bit
- Torx Driver

Procedure:

1. Using the Torx driver and T-6 Torx bit, loosen the Keypad Flex retainer screw.
2. Remove Keypad Flex retainer.
3. Disengage Keypad Flex Board-to-Board connector from Keypad PCB Board-to-Board connector.



7.4.23

Removing the Display Assembly

Prerequisites: Recommended tools:

- Flat Head Black Stick
- Metal tweezers

Procedure:

1. By using the Flat Head Black Stick, unsnap LCD metal retainer from the housing.



2. Use the metal tweezers to disengage the retainer on the other side of the snapping feature.



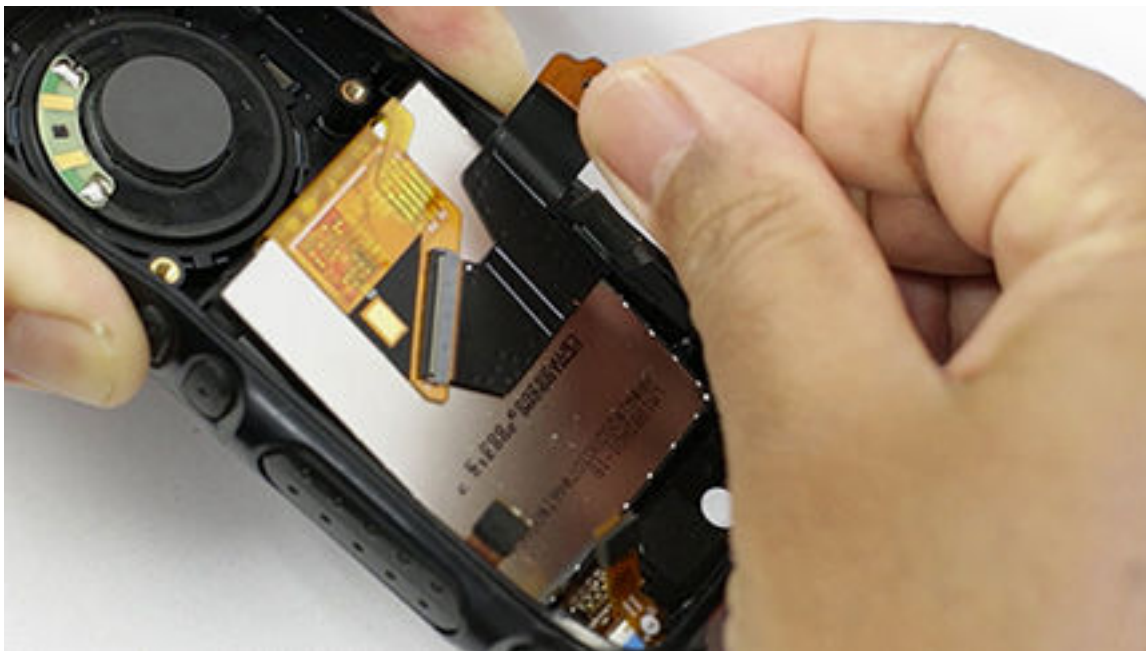
3. Lift the retainer up from the front housing kit.



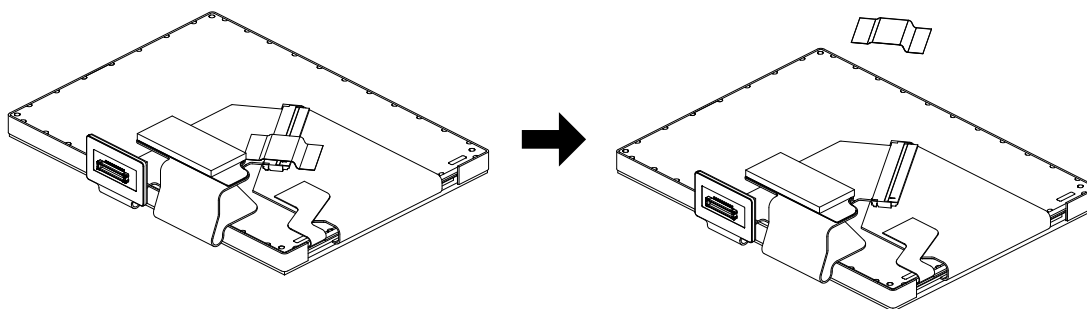
4. Disengage the GCAI BTB connector by lifting the BTB from the front housing.



5. Gently pull the display interface flex up to lift the display from the front housing.

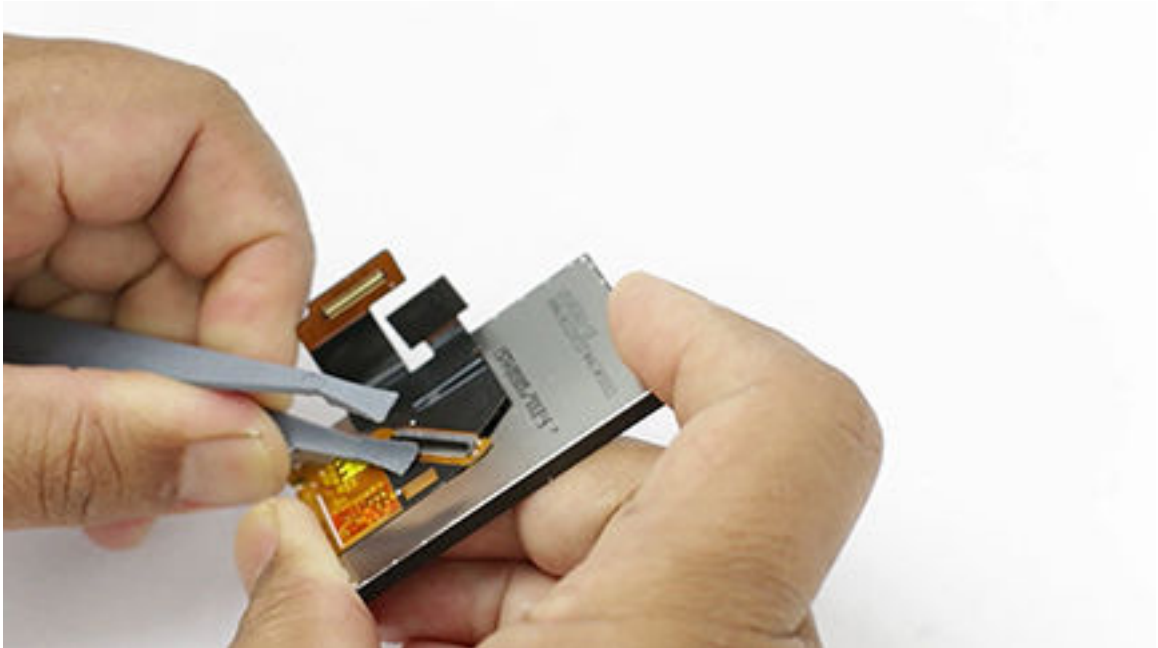


6. Remove the LCD Connector Kapton.



 **NOTE:** Do not remove the tape if service/repair work is not needed.

7. Lift up the tab on the ZIF connector to remove the display interface flex from the display flex.



8. Clean the adhesive residue on the display.
9. Remove the display pad.



10. Clean the adhesive residue from the recess.

To view the video for removing display assembly, click [Removing the display assembly \(Part1\)](#) and [Removing the display assembly \(Part2\)](#)

7.4.24

Removing the Keypad and Mylar Assembly

Prerequisites: Recommended tools:

- T-5 Screw Bit
- Plastic tweezers

Procedure:

1. Unscrew the screws to remove the keypad assembly from the front housing.

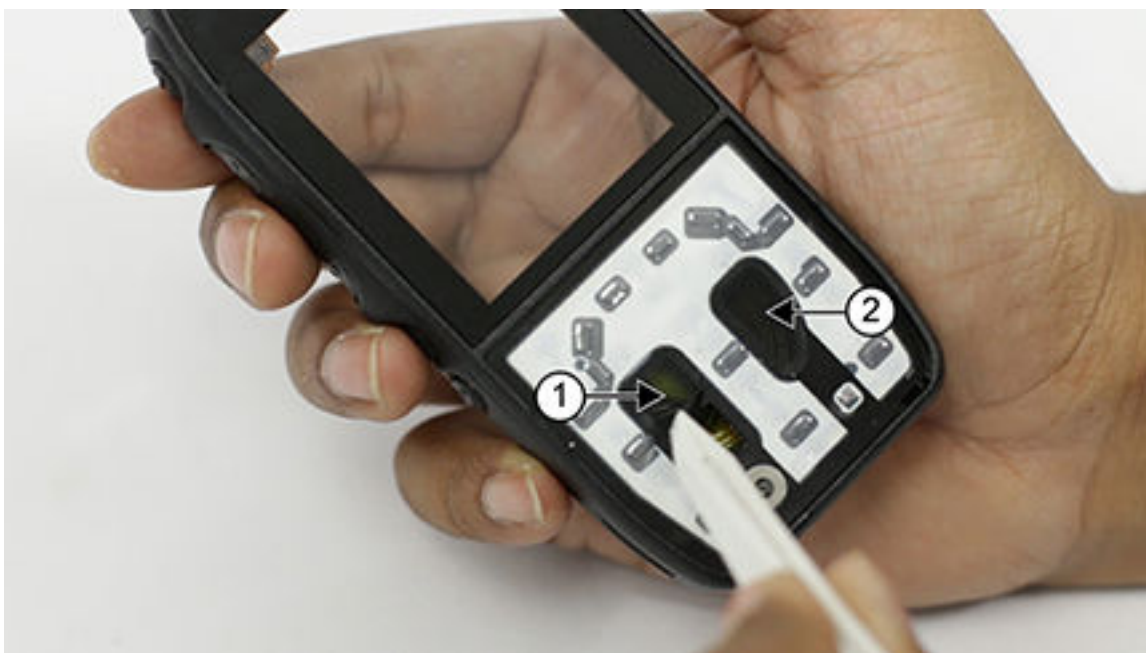


2. Lift the rubber keypad.





3. Remove the speaker mesh.



4. Remove the mic membrane.



5. Remove the keypad mylar.



6. Clean the adhesive residue from the recess.
To view the video for removing keypad and mylar assembly, click [Removing the keypad and mylar assembly](#)

7.4.25

Removing the Speaker Poron

Procedure:

Remove the speaker poron as shown.



To view the video for removing speaker poron, click [Removing the speaker poron](#)

7.5

Reassembling the Radio

Only Motorola Solutions Service Centers or Authorized Motorola Solutions Service Dealers can disassemble the radio for repair or maintenance.

7.5.1

Installing the Speaker Poron

Procedure:

1. Carefully assemble the speaker poron.



2. Ensure the speaker poron is assembled within the area shown.



To view the video for installing speaker poron, click [Installing the speaker poron](#)

7.5.2

Installing the Keypad and Mylar Assembly

Prerequisites: Recommended tools:

- T-5 Screw Bit
- Torx Driver
- Plastic tweezers

Procedure:

1. Carefully place the keypad mylar and dome on top of the keypad PCB. Ensure that the keypad mylar and dome does not cover the two speaker holes.



2. Press the mylar perimeter adhesive and around the mic port area to activate the Keypad Mylar adhesive. This is done for water and dust sealing and acoustics sealing purposes.



3. Assemble the mic membrane within the legend provided on the keypad mylar and dome.



4. Assemble the speaker mesh.



5. Slide in the keypad assembly into the housing.



6. Using the Torx driver with the T-5 Torx bit, tighten the two screws on the Front Housing.



To view the video for installing keypad and mylar assembly, click [Installing the keypad and mylar assembly](#)

7.5.3

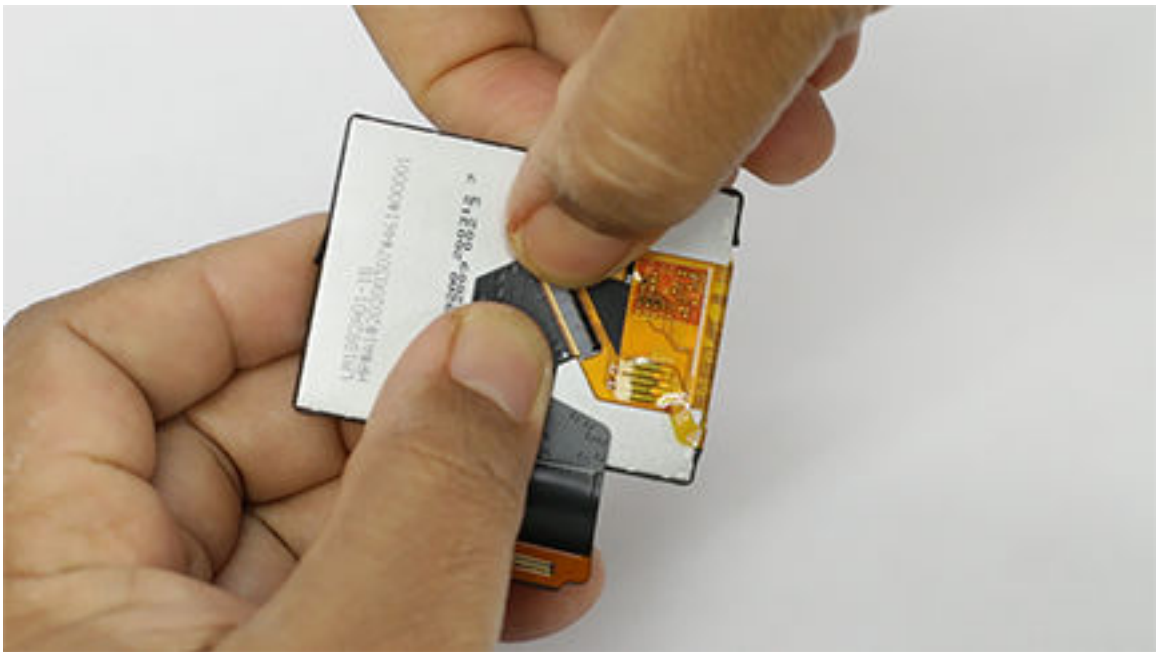
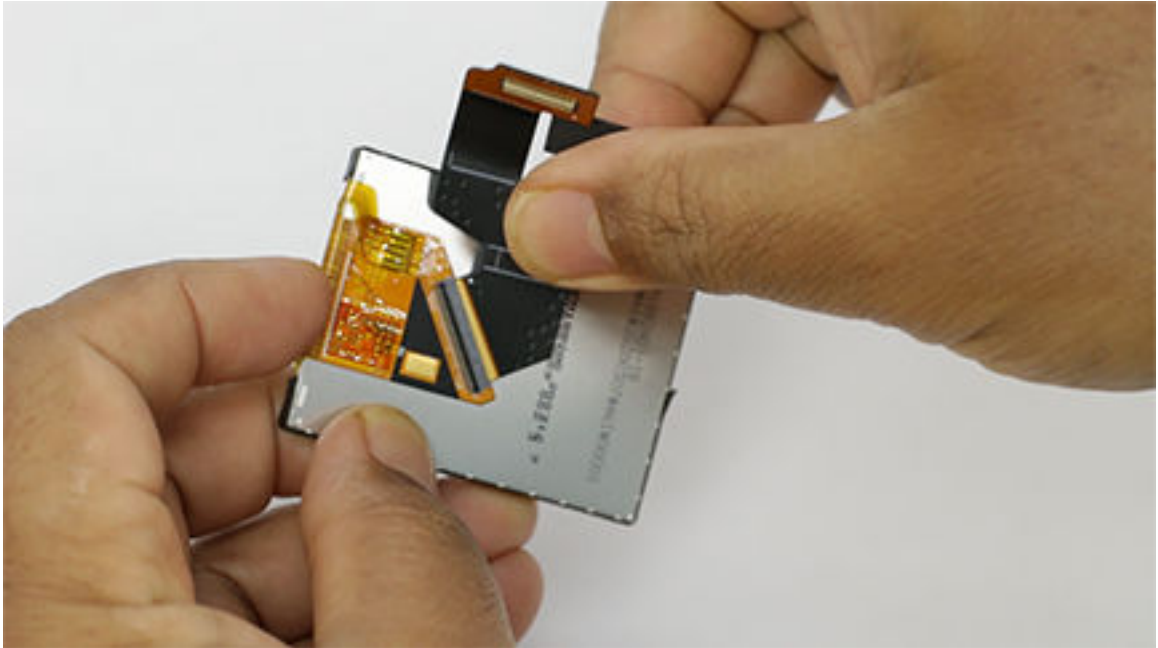
Installing the Display Assembly

Procedure:

1. Assemble the display pad.



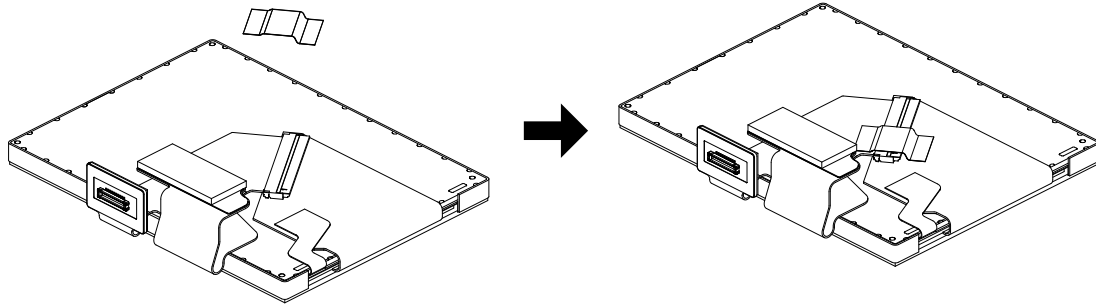
2. Connect the GCAI interface flex to the ZIF connector on the display assembly.



3. Put in the LCD Connector Kapton tape securely.



NOTE: Ensure the connector latch is secured properly by the kapton tape.



4. Assemble the display assembly.



5. Connect the BTB connector on the GCAI interface flex to the GCAI BTB connector.



6. Assemble the LCD metal retainer.



7. Press on the snap area.



To view the video for installing display assembly, click [Installing the display assembly](#)

7.5.4

Installing the Keypad Flex Assembly

Procedure:

1. Assemble the keypad flex assembly by attaching the BTB connector on the front housing.



NOTE: Ensure you hear a click when assembling the keypad flex.





2. Press and activate the keypad flex adhesive against the housing side wall.
3. Place the keypad flex conductive pad.



To view the video for installing keypad flex assembly, click [Installing the keypad flex assembly](#)

Installing the Keypad Flex Assembly (For PMHN4457_, PMHN4462_)

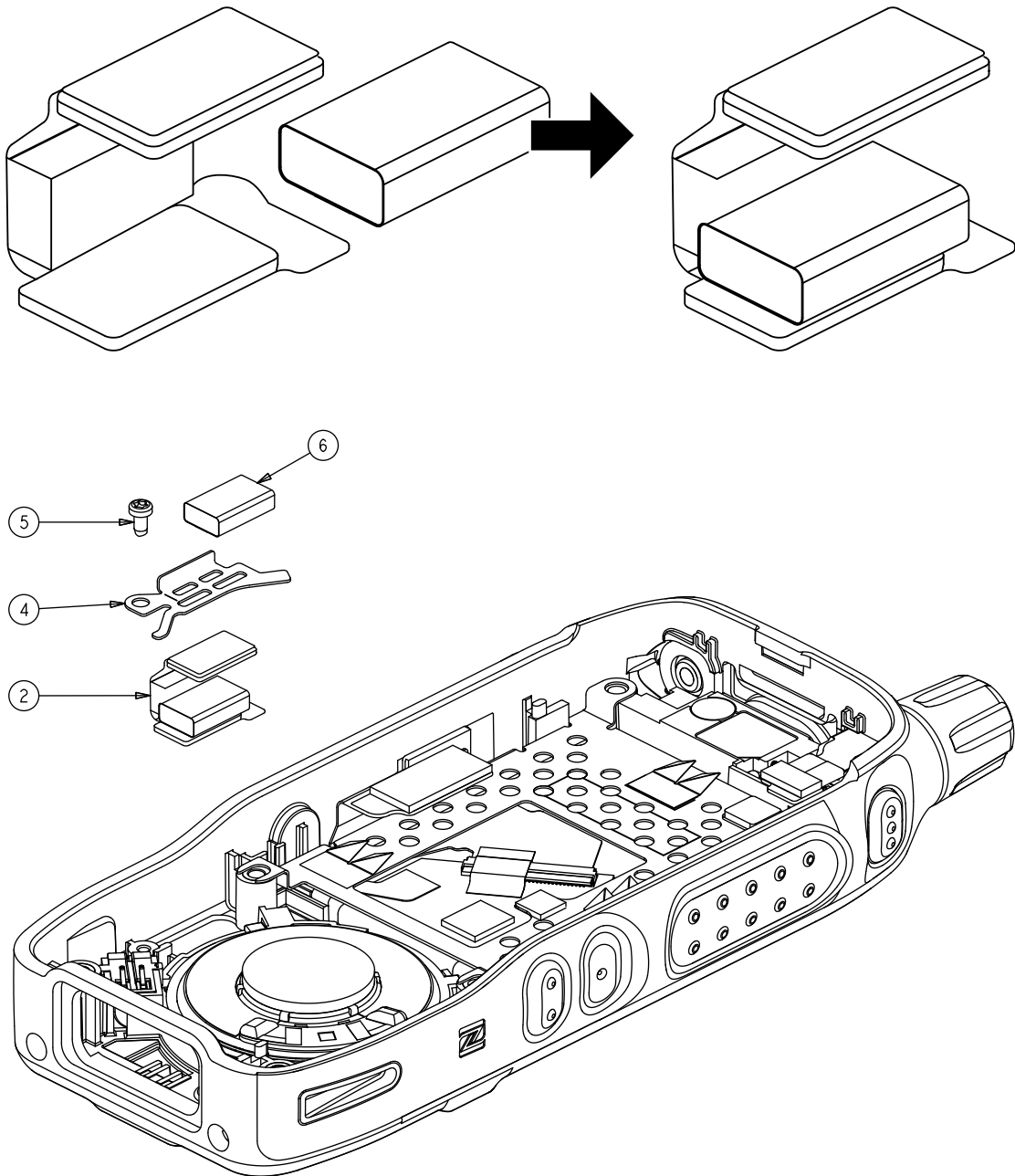
Prerequisites: Recommended tools:

- Plastic Tweezers
- T-6 Screw Bit
- Torx Driver

Procedure:

1. Stick 1pc Keypad Flex Retainer conductive pad on the Keypad Flex metal stiffener, follow the legend drawn on metal stiffener.
2. Engage Keypad Flex Board-to-Board connector onto the Keypad PCB Board-to-Board connector. Make sure click sound is heard to make sure it is fully engage.
3. Activate Keypad Flex adhesive to Front Housing side wall by pressing on it for 10 seconds.
4. Tongue in Keypad Flex Retainer.

5. Using the Torx driver with the T-6 screw bit, tighten the Keypad Flex Retainer screw.
6. Stick 1pc Keypad Flex Retainer conductive pad on the Keypad Flex Retainer, follow the legend drawn on the Keypad Flex Retainer.



7.5.5

Installing the Vibrator Assembly

Procedure:

1. Assemble the vibrator assembly into the front housing.



2. Press the vibrator assembly all the way down to the front housing, ensure that you do not press on the spring contact area.



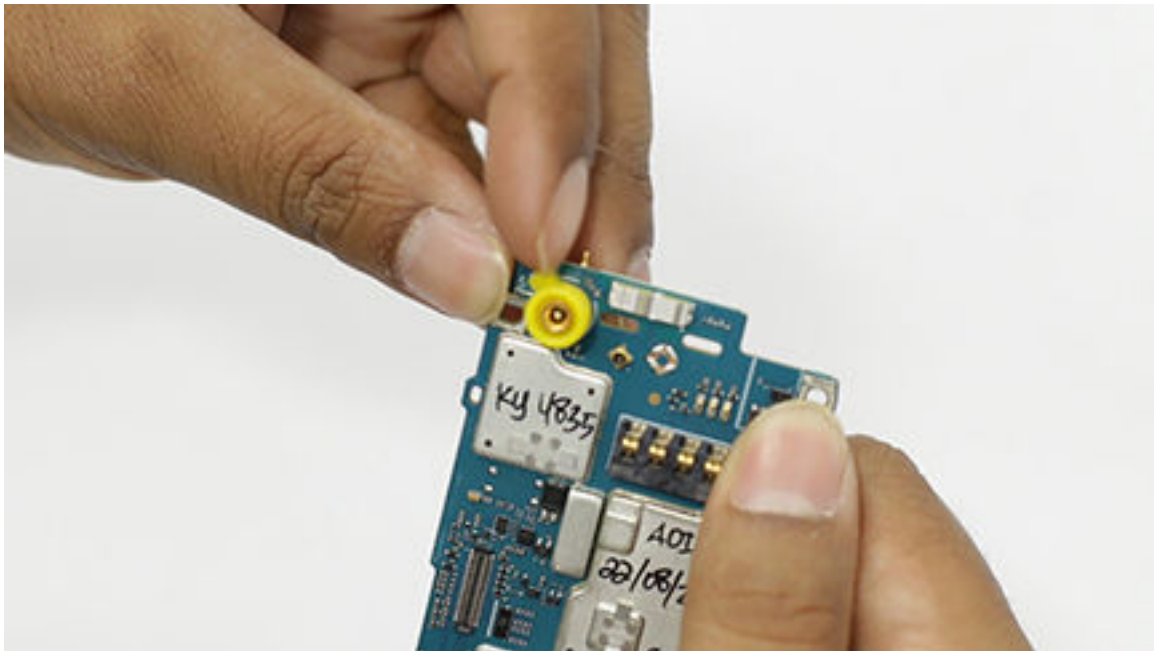
To view the video for installing vibrator assembly, click [Installing the vibrator assembly](#)

7.5.6

Installing the VA Connector Seal

Procedure:

Assemble the VA connector seal by following the white line legend.



To view the video for installing VA connector seal, click [Installing the VA connector seal](#)

7.5.7

Installing the Coin Cell Battery

Prerequisites: Recommended tools:

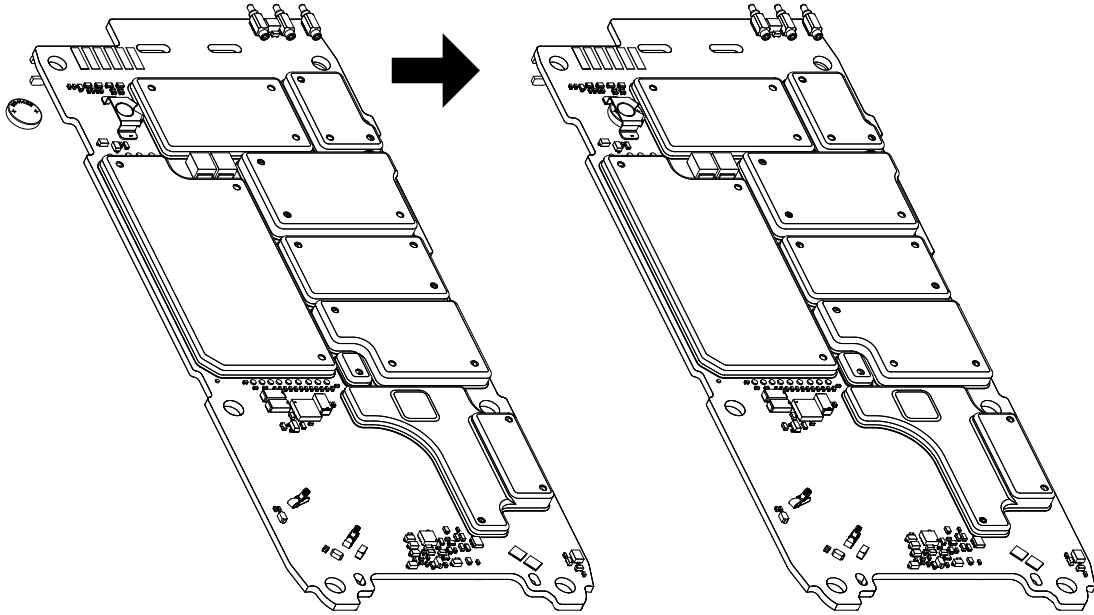
- Plastic tweezers.



NOTE: Only for SPECTRA model (PMUE5763_).

Procedure:

Carefully slot-in the coin cell battery to the coin cell holder, ensure it is secured and fully snapped in place



 **NOTE:** Ensure the positive terminal (with "+" marked on top) is facing upwards. Ensure coin cell holder is not dented or lifted-up during assembly.

7.5.8

Installing the Main PCB

Prerequisites: Recommended tools:

- T-6 Screw Bit
- Torx Driver

Procedure:

1. Carefully slide in the PCB. Ensure that the spring contact quantity and condition on the main PCB and front housing are not deformed or bent.



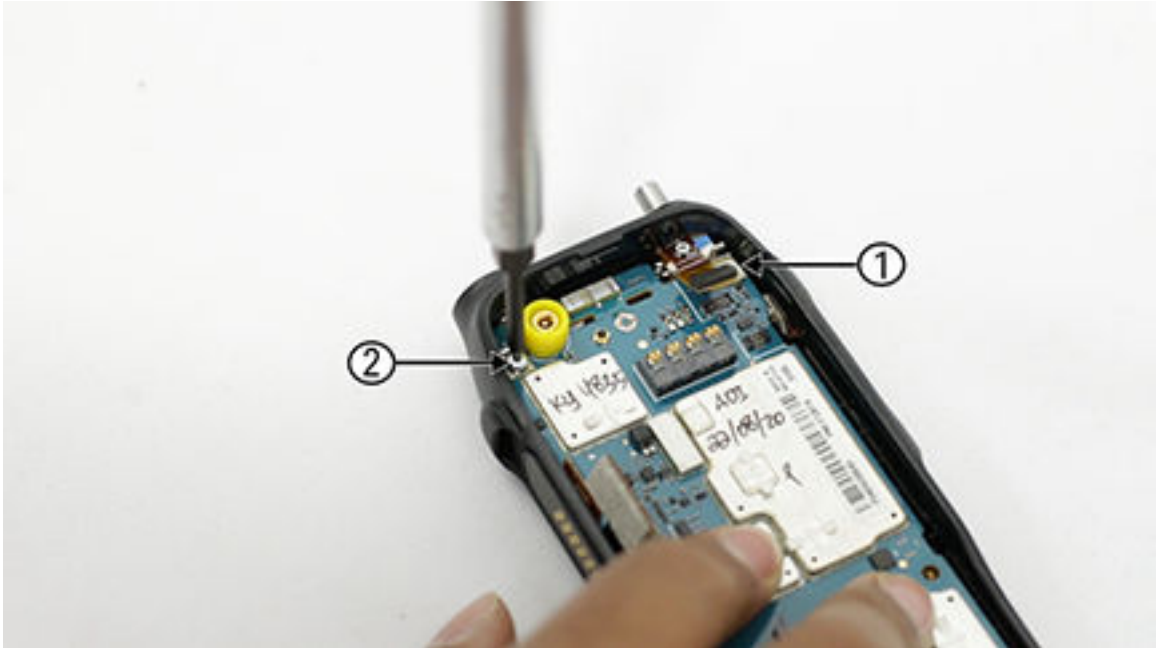
2. Ensure the connector on the display flex, encoder flex, and side control flex are not damaged during the assembly.



3. Align the main PCB to the front housing by using the two pin guide on the front housing. Use the Torx Driver to screw the main PCB to the front housing.



CAUTION: Ensure the pogo pin is not deformed during assembly.



4. Engage the BTB of the display flex, side flex, and encoder flex to the respective BTB mating connector on the main PCB.







5. Using a Torx driver with the T-6 Screw bit, tighten the two screws.

To view the video for installing main PCB, click [Installing the main PCB](#)

7.5.9

Installing the Bottom Connector

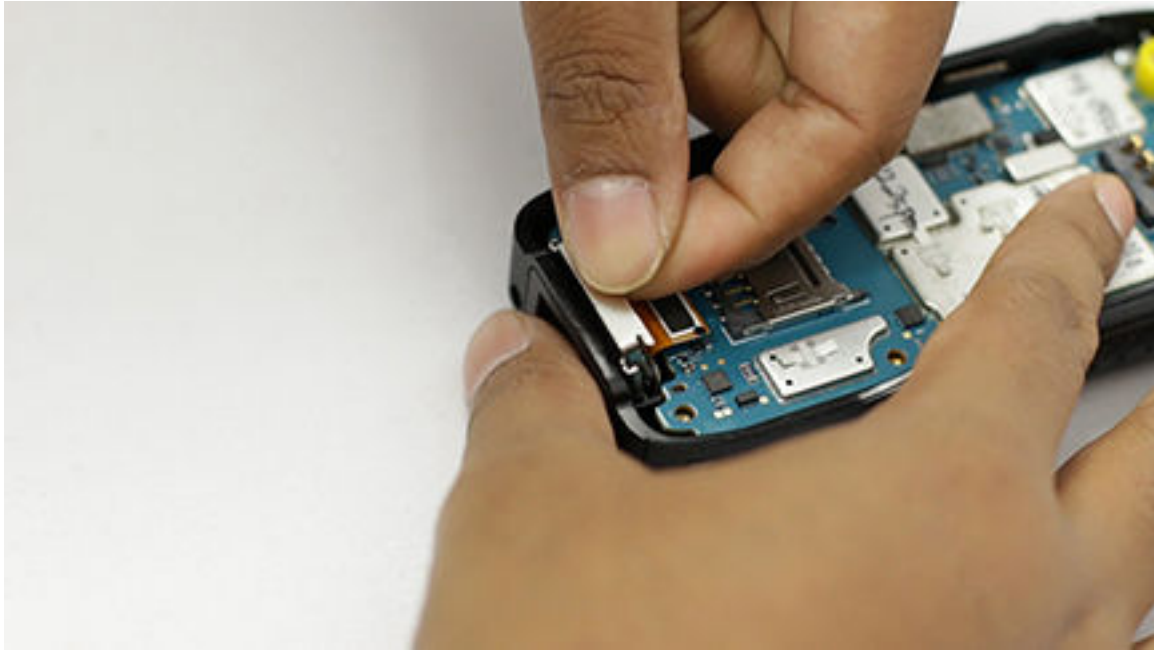
Procedure:

1. Install the bottom connector to the front housing. Ensure that the flex connector is always on top and guide the flex connector through the housing gap.

Be careful not to damage the bottom connector and the keypad flex connectors during the process.



2. Push and hold the bottom connector firmly against the housing and slide the retainer into its proper position on the housing.



To view the video for installing bottom connector, click [Installing the bottom connector](#)

7.5.10

Installing the Model Label

Prerequisites: Recommended tools:

- Plastic tweezers

Procedure:

Assemble the model label by using tweezers to place it.



To view the video for installing model label, click [Installing the model label](#)

7.5.11

Installing the GORE® membrane

Procedure:

1. Press on the membrane to activate the GORE membrane adhesive.



2. Assemble the ventilation label. Ensure no contamination on the surface of the back kit.



To view the video for installing GORE membrane, click [Installing the GORE membrane](#)

7.5.12 Installing the SIM Door Poron

Procedure:

Assemble the SIM door poron.



To view the video for installing SIM door poron, click [Installing the SIM door poron](#)

7.5.13

Installing the SIM Door O-Ring

Procedure:

1. Assemble the o-ring tab into the SIM door.



2. Ensure the o-ring is securely attached to the SIM door.



To view the video for installing SIM door O-Ring, click [Installing the SIM door O-Ring](#)

7.5.14

Installing the Thermal Pad

Procedure:

Assemble the thermal pad to the main PCB.



To view the video for installing thermal pad, click [Installing the thermal pad](#)

7.5.15

Installing the Battery Contact Seal

Procedure:

1. Assemble the battery seal to the back chassis.



2. Ensure it sits properly on the recess area of the back kit assembly.



To view the video for installing battery contact seal, click [Installing the battery contact seal](#)

7.5.16

Installing the Main Seal

Procedure:

1. Place the main seal onto the back chassis. Ensure all tabs fit well in the back chassis and the seal rests on the recess area that goes around the back chassis.





2. Ensure that the sealing grooves are free from contamination.



To view the video for installing main seal, click [Installing the main seal](#)

7.5.17

Installing the Back Kit Assembly

Prerequisites: Recommended tools:

- T-6 Screw Bit
- Torx Driver

Procedure:

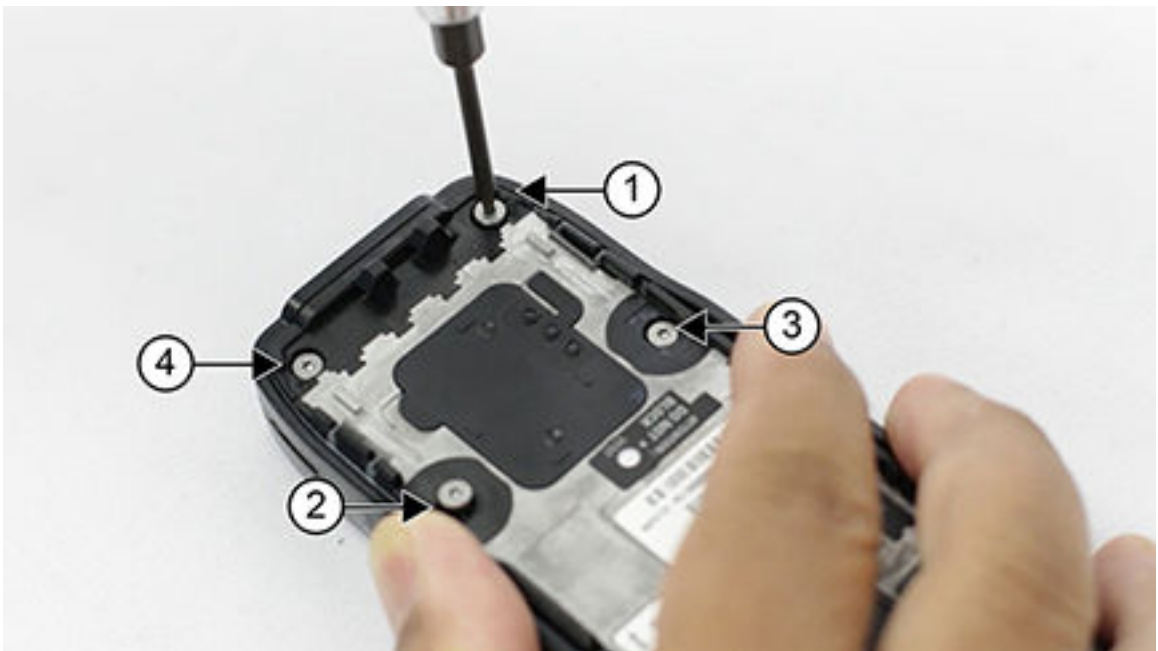
1. Carefully insert the top part of the back kit assembly under the front housing tab. Push the bottom part of the back kit assembly to the front housing.



2. Ensure the following:
 - The main seal stays on the back kit assembly.
 - The battery seal remains in place and around the battery connector.



3. Align the screw holes to the threads of the front housing. Ensure the back kit assembly is sitting in the correct position.
4. Using the Torx driver with T-6 screw bit, tighten with a torque driver in the sequence shown. Ensure the screw o-ring is attached together with the screw.



5. Stick the tamper label on the back chassis.



To view the video for installing back kit assembly, click [Installing the back kit assembly](#)

7.5.18

Installing the Microphone Membrane on the Back Kit Assembly

Procedure:

1. Assemble the mic membrane on the back kit assembly.



2. Ensure the mic membrane are assembled within the area shown.

Ensure the mic membrane is free from contamination.



To view the video for installing microphone membrane on the back kit assembly, click [Installing the microphone membrane on the back kit assembly](#)

7.5.19

Installing the VA Connector Dust Cover

Procedure:

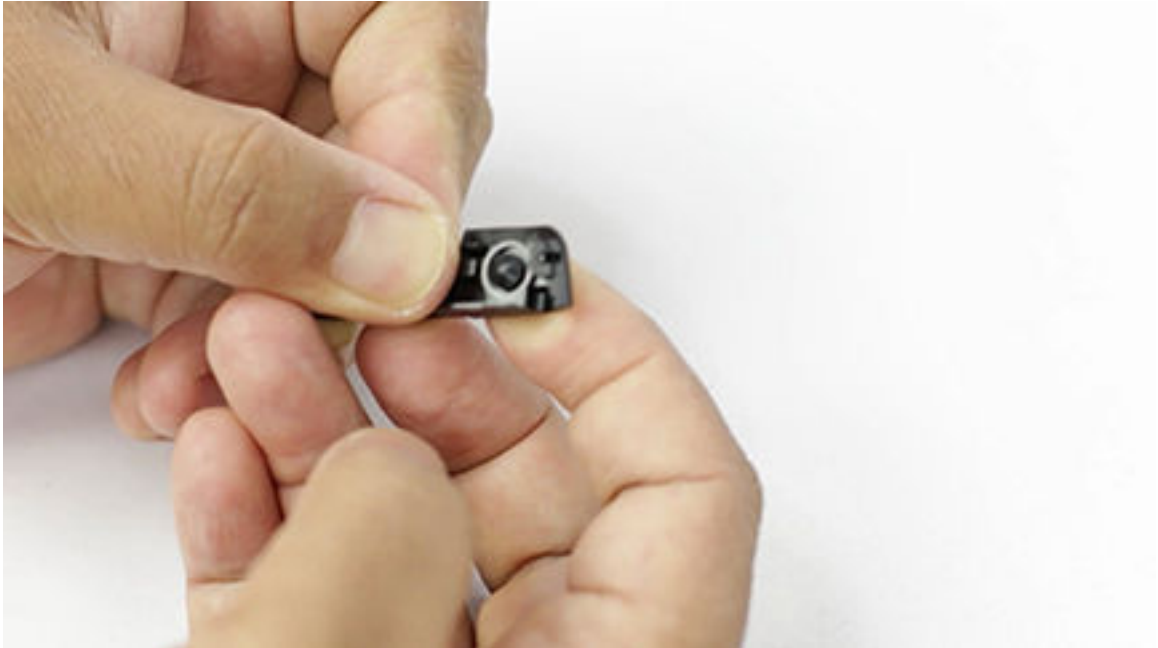
1. Attach the VA connector dust cover on the back shroud by aligning it with the guide pin and the hinge.





2. Press the mushroom head of the VA connector dust cover into the back shroud.





To view the video for installing VA connector dust cover, click [Installing the VA connector dust cover](#)

7.5.20

Installing the Back Shroud

Procedure:

1. Assemble the back shroud onto the back kit assembly.





2. Press towards the indicated direction.



To view the video for installing back shroud, click [Installing the back shroud](#)

7.5.21

Installing the Encoder Washer

Prerequisites: Recommended tools:

- Encoder Nut Bit (part number: TL000148A01)

Procedure:

1. Assemble the encoder washer to the encoder knob.



2. Use the Encoder Nut Remover to tighten the encoder nut.



To view the video for installing encoder washer, click [Installing the encoder washer](#)

7.5.22

Installing the Encoder Knob

Procedure:

1. Hold the radio in one hand with the top of the radio facing upwards.



2. Align the encoder knob and press down until the encoder knob is fully seated.



To view the video for installing encoder knob, click [Installing the encoder knob](#)

7.5.23

Installing the Lens Liner

Procedure:

Place the new liner.



To view the video for installing lens liner, click [Installing the lens liner](#)

7.5.24

Attaching the Battery



NOTE:

The radio detects non-Motorola Solutions batteries and prompts you on battery authentication. The `Invalid Battery` message is prompted upon power-up, with a tone.

Procedure:

1. Place the battery.



2. Press down the bottom portion of the battery until it clicks in place.



To view the video for installing battery, click [Installing the battery](#)

7.5.25

Attaching the Antenna

Procedure:

1. Insert and align the bottom part of the antenna into the threaded base on top of the radio.



2. Turn the antenna clockwise until snug.

To view the video for installing antenna, click [Installing the antenna](#)

Chapter 8

Radio Leak Test

This section discusses radio immersibility concerns, tests, and disassembly and reassembly of your radio.

8.1

Vacuum Leak Test

The vacuum leak test is performed to ensure that the radio is IPx8 compliant. Perform this test after servicing the radio and before returning the radio to the customer.

The following parts are required to perform a vacuum leak test:

Vacuum Leak Tester

The Vacuum Leak Tester comes with a gauge and a vacuum hose. A connector with an O-ring, required to be ordered separately, connects the vacuum hose to the radio leak test fixture. Purchase the Vacuum Leak Tester from the following supplier:

Supplier:

Horizon Land Malaysia Sdn. Bhd.

Website:

www.horizon-land.com

Contact:

+604-6463636

Model Description:

Horizon Land Delta Version TC-2000

Other items required for the test include:

Table 27: Other Vacuum Leak Test Parts

Part Number	Description
66007071001	Vacuum Leak Tester Connector
32007073001	Vacuum Leak Tester Connector O-ring
LB001049A01	Ventilation Label
3286058L01	GORE® Membrane

Leak Test Fixture

A Leak Test Fixture is also required for the vacuum leak test. Purchase the Leak Test Fixture from the following supplier:

Supplier:

Access Hitech

Website:

<http://www.accesshitech.com>

Motorola Solutions Part Number:

TE000060A01

Supplier Part Number:
MT001#20

8.1.1

Performing Vacuum Leak Test

The vacuum leak test uses tester that creates a vacuum inside your radio and monitors your radio for a stable vacuum reading. This reading shows if your radio is properly sealed. The Leak Test Fixture part number is TE000060A01.

Prerequisites:

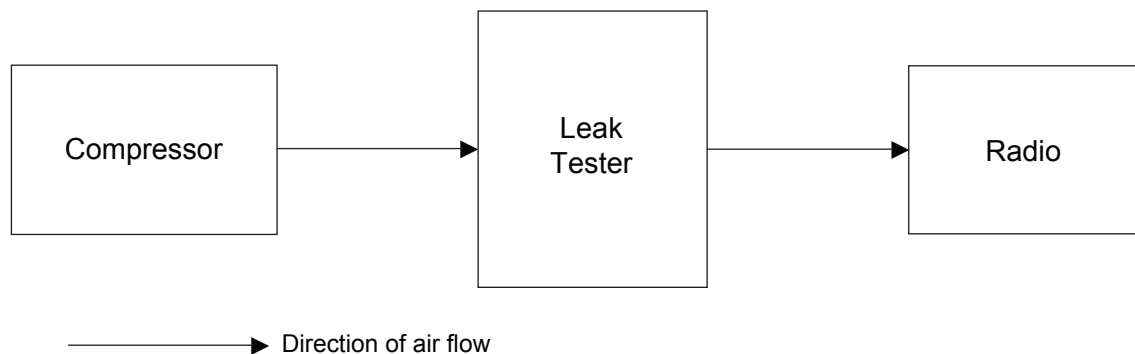
- Remove the antenna.
- Remove the battery.
- Remove the Ventilation Label and GORE membrane covering the vacuum port. Refer to [Replacement Parts List on page 61](#) for the location of these parts.
- Remove the keypad.

Procedure:

1. Attach the vacuum hose to the vacuum leak tester. Check the leak tester and the hose for leaks by blocking off the open end of the hose and operating the leak tester a few times.

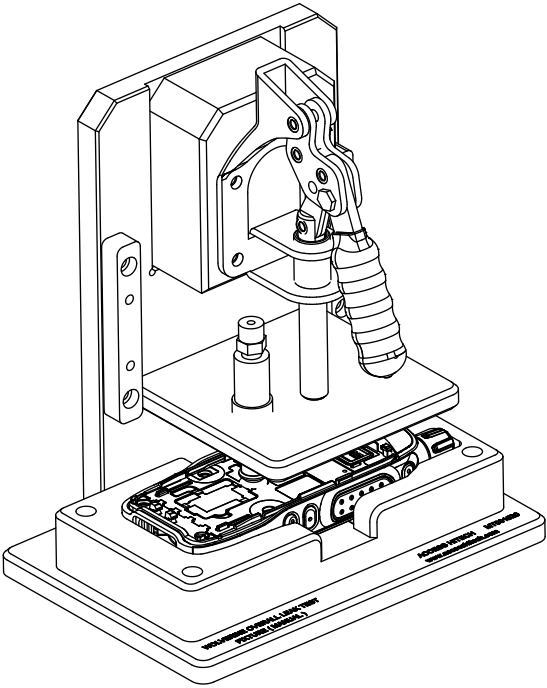
 **NOTE:** Ensure that the difference between the maximum and minimum fluctuation readings of the gauge pointer remains within 0.05 inHg. The actual reading of the gauge pointer is not important.

Figure 13: Vacuum Leak Test Setup



2. Block the open end of the hose and adjust the leak tester so that the gauge shows 6.60 inHg. Repair or replace the tool if there is any loss of vacuum.
3. Attach the open end of the hose to the air hole adapter of the leak test fixture.
4. Face your radio downwards and place your radio in the leak test fixture. Ensure that your radio is positioned perfectly in the mold with the back chassis facing up.

Figure 14: Leak Test Fixture



- 5. Slowly lower the fixture toggle clamp, ensuring ventilation port is fully covered by the fixture seal.
- 6. Start the vacuum leak test. Observe the gauge for 20 seconds with the vacuum leak tester running.
 **NOTE:** Maximum allowable pressure drop after 20 seconds is 0.10 inHg.
- 7. Perform one of the following actions depending on the result of the previous test:

Options	Actions
Pass the test	Radio is properly sealed. Perform the following actions: a. Replace a new GORE membrane and ventilation label. b. Assemble the keypad.
Fail the test	Continue with Performing Leak Area Troubleshooting on page 164 with the leak test spacer still attached.

8.2

Performing Leak Area Troubleshooting

If your radio fails the vacuum leak test, identify the leak area for servicing or replacement.

Prerequisites: Label the original components or kits with a marker or sticker to avoid confusion.

Procedure:

1. Prepare a golden sample for troubleshooting reference.
 **IMPORTANT:** Golden sample kit must pass the vacuum leak test.
2. Troubleshoot the faulty radio starting from the steps at [Performing Back Chassis Sub-Assembly Troubleshooting on page 165](#).

8.2.1

Performing Back Chassis Sub-Assembly Troubleshooting

Procedure:

1. Replace the back chassis sub-assembly.
2. Check for pinching of main O-ring, battery connector seal and SIM card door seal during assembly.
3. Perform leak test by following the steps from [Performing Vacuum Leak Test on page 163](#).
4. Perform one of the following actions:

If...	Then...
Pass	Troubleshooting ends here.
Fail	Continue to the next step.

5. Reassemble back chassis sub-assembly onto the golden sample kit and perform vacuum leak test.
6. Perform one of the following actions:

If...	Then...
Pass	Back chassis sub-assembly can be reused.
Fail	Scrap the back chassis sub-assembly.

7. Proceed with [Performing Bottom Connector Sub-Assembly Troubleshooting on page 165](#).

8.2.2

Performing Bottom Connector Sub-Assembly Troubleshooting

Procedure:

1. Replace the bottom connector sub-assembly.
2. Check for pinching of bottom connector O-ring.
3. Perform leak test by following the steps from [Performing Vacuum Leak Test on page 163](#).
4. Perform one of the following actions:

If...	Then...
Pass	Troubleshooting ends here.
Fail	Continue to the next step.

5. Reassemble bottom connector sub-assembly onto the golden sample kit and perform vacuum leak test.

6. Perform one of the following actions:

If...	Then...
Pass	Bottom connector sub-assembly can be reused.
Fail	Scrap the bottom connector sub-assembly.

7. Proceed with [Performing Front Housing Kit Troubleshooting on page 166](#).

8.2.3

Performing Front Housing Kit Troubleshooting

Procedure:

1. Replace the front housing kit, and reassemble your radio.



NOTE: Ensure that the main O-ring, battery connector seal, and SIM card door seal are not pinched during assembly.

2. Perform leak test by following the steps from [Performing Vacuum Leak Test on page 163](#).
3. Perform one of the following actions:

If...	Then...
Pass	Troubleshooting ends here.
Fail	Continue to the next step.

4. Reassemble the front housing kit on to the golden sample kit, and perform the vacuum leak test again.
5. Perform one of the following actions:

If...	Then...
Pass	Front housing kit is good for reuse.
Fail	Scrap the front housing kit.

6. Proceed to [Performing Miscellaneous Troubleshooting on page 166](#).

8.2.4

Performing Miscellaneous Troubleshooting

Procedure:

1. Reassemble the whole radio.
Leakage can be due to improper assembly.
2. Repeat [Performing Leak Area Troubleshooting on page 164](#) with a second golden sample set.

Chapter 9

NFC/Secure Pairing Check

Your radio has a passive Near Field Communication (NFC) tag with Bluetooth MAC ID to allow out-of-band Bluetooth pairing with smartphones.

Reconfigure and test the NFC tag every time you swap the board, or service your radio housing.

9.1

Programming the NFC Tag

When you program the Near Field Communication (NFC) tag, you can verify the basic operations of the NFC secure pairing interface, allowing you to perform the following:

- Write:
 - Bluetooth MAC Address
 - Radio Name
 - Radio Serial Number
 - Radio TEI
- Read and verify the written information.

Prerequisites: Recommended tools:

- Promag MP101A – Multi-protocol 13.56 MHz/NFC RFID Reader/Writer
- Promag Multi-Protocol Studio software



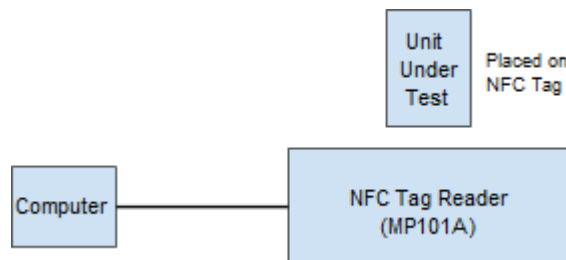
NOTE: The Promag Multi-Protocol Studio software is provided together with the Promag MP101A.

For more information, see <https://www.promageurope.com/products/mifare-readers-and-writers/mp101a-multi-protocol-rfid-reader-nfc.htm>.

Procedure:

1. Connect the NFC Tag Reader to your computer. Place the radio on the Tag Reader.

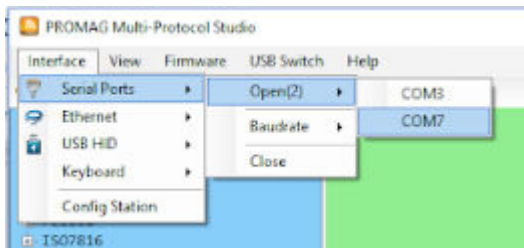
Figure 15: NFC Programming Basic Setup



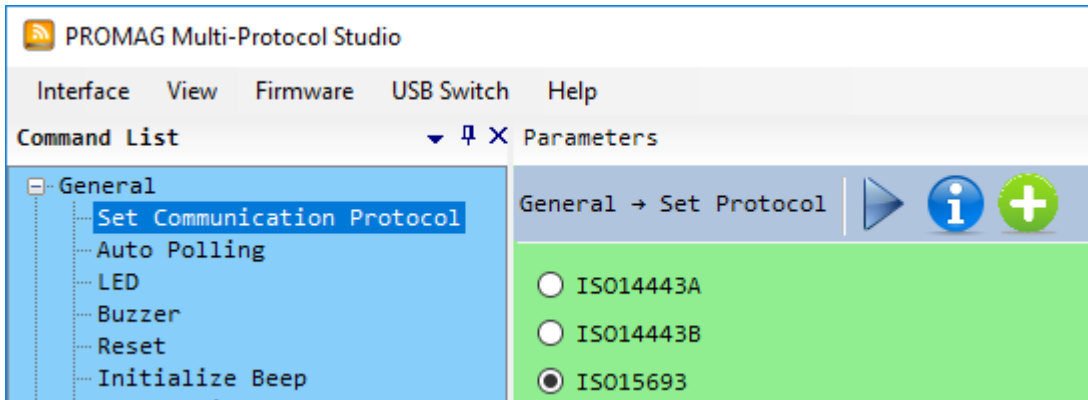
2. Launch the application **PROMAG Multi-Protocol Studio**.
3. Click **Interface** → **Serial Ports** → **Open(<2>)** → **COM[<7>]**.



NOTE: The number <2> and <7> denotes the connections or ports used on your computer.



4. In the **Command List** window, click **General** → **Set Communication Protocol**.
5. Select **ISO15693** and click **Run**.



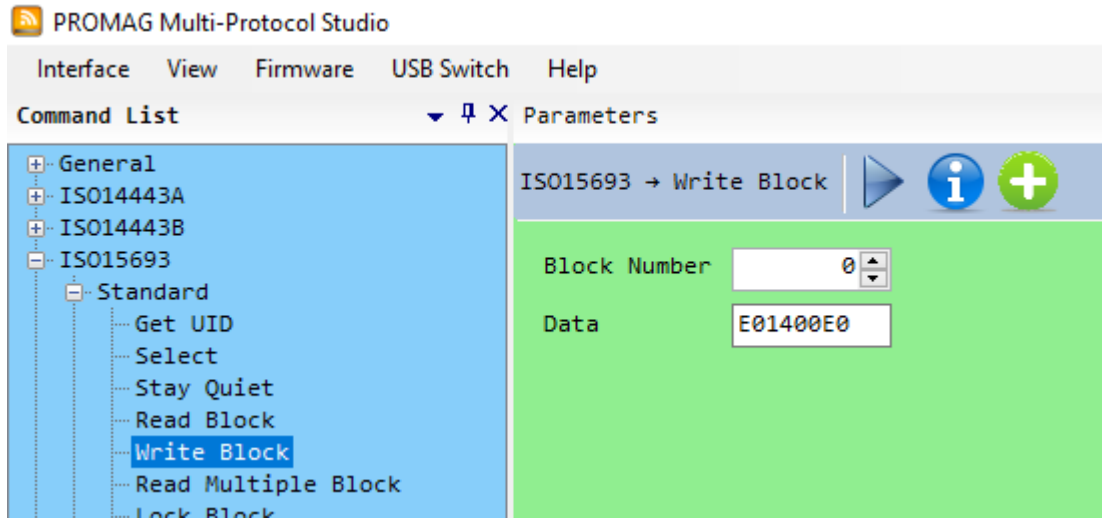
- If Response OK is shown, continue to [step 6](#).

```
Response
Response Time:17:20:06.996
Response OK
```

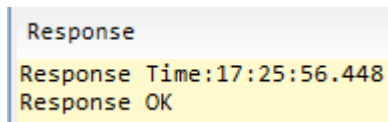
- If Error is shown, check the placement of your radio on the NFC Tag Reader and repeat [step 4](#).

```
Response
Response Time:17:22:21.662
Response Error:E0(No Response)
```

6. Select **ISO15693** → **Write Block**.
7. Set Block Number to 0 and Data to E1400E00. Click **Run**.



OK is shown.



8. Repeat [step 6](#) for Block Number 1 to 27.
9. Set the Data for each of the Block Number by following [Table 28: Parameters of NFC Programming for Write Block on page 169](#).

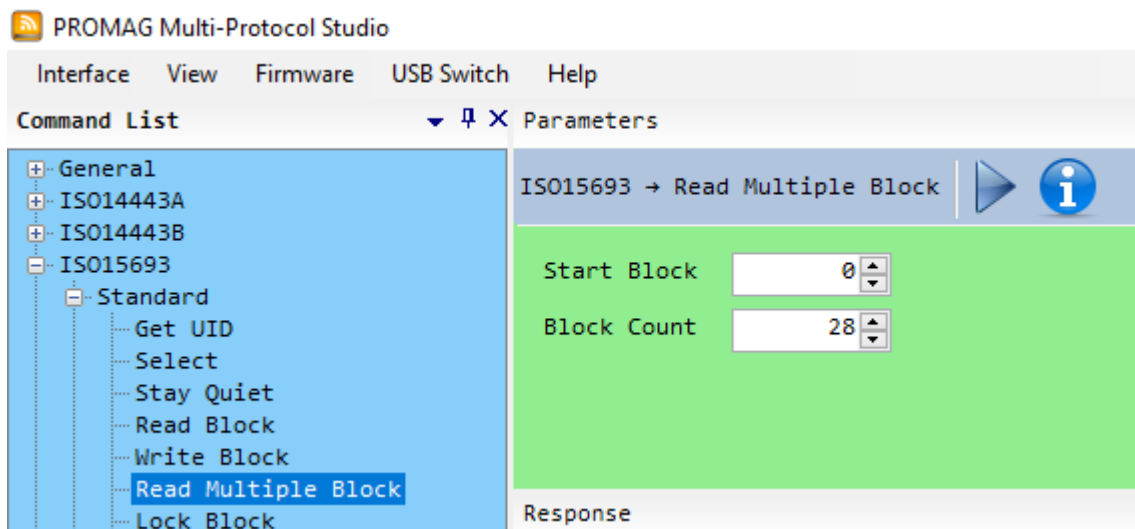
Table 28: Parameters of NFC Programming for Write Block

Block Number	Data (Hex, 4 Bytes)	Remark
0	E1400E00	
1	03659102	
2	0A487312	
3	D1020461	
4	63010130	
5	001A2010	
6	01617070	
7	6C696361	
8	74696F6E	
9	2F766E64	
10	2E626C75	
11	65746F6F	
12	74682E65	
13	702E6F6F	
14	62301000	

Block Number	Data (Hex, 4 Bytes)	Remark
15	<AB907856>	Bluetooth Address format: example: 12:34:<56:78:90:AB> Replace the SAP of BT address in reverse order.
16	<3412>0709	Bluetooth Address format: example: <12:34>:56:78:90:AB Replace the NAP of BT address in reverse order.
17	<4D585036>	Device Name format: <MXP6>00 M = 4D, X = 58, P = 50, 6 = 36  NOTE: This require ASCII to Hex conversion
18	<3030>5101	Device Name format: MXP6 <00> 0 = 30, 0 = 30  NOTE: This require ASCII to Hex conversion.
19	1D540265	
20	6E <333834>	Device Serial Number format: example: <384>TRT0000 3 = 33, 8 = 38, 4 = 34  NOTE: This require ASCII to Hex conversion.
21	<54525430>	Device Serial Number format: example: 384<TRT0>000 T = 54, R = 52, T = 54, 0 = 30  NOTE: This require ASCII to Hex conversion.
22	<303030>5F	Device Serial Number format: example: 384TRT0<000> 0 = 30, 0 = 30, 0 = 30  NOTE: This require ASCII to Hex conversion.
23	<30303031>	Device TEI Format: example: <0001>6B110029290 0 = 30, 0 = 30, 0 = 30, 1 = 31  NOTE: This require ASCII to Hex conversion.
24	<36423131>	Device TEI Format: example: 0001 <6B11>0029290

Block Number	Data (Hex, 4 Bytes)	Remark
		6 = 36, B = 42, 1 = 31, 1 = 31  NOTE: This require ASCII to Hex conversion.
25	<30303239>	Device TEI Format: example: 00016B11 <0029>290 0 = 30, 0 = 30, 2 = 32, 9 = 39  NOTE: This require ASCII to Hex conversion.
26	<323930>FE	Device TEI Format: example: 00016B110029 <290> 2 = 32, 9 = 39, 3 = 0  NOTE: This require ASCII to Hex conversion.
27	FE000000	

10. Select **ISO15693** → **Read Block**.
11. Set Start Block to 0 and Block Count to 28. Click **Run**.



OK is shown followed by the data for each block.

```
Response
Response Time:13:22:55.740
Response OK
Block 0 :E1400E00
Block 1 :03659102
Block 2 :0A487312
Block 3 :D1020461
Block 4 :63010130
Block 5 :001A2010
Block 6 :01617070
Block 7 :6C696361
Block 8 :74696F6E
Block 9 :2F766E64
Block 10 :2E626C75
Block 11 :65746F6F
Block 12 :74682E65
Block 13 :702E6F6F
Block 14 :62301000
Block 15 :AB907856
Block 16 :34120709
Block 17 :4D585036
Block 18 :30305101
Block 19 :1D540265
Block 20 :6E333834
Block 21 :54525430
Block 22 :3030305F
Block 23 :30303031
Block 24 :36423131
Block 25 :30303239
Block 26 :323930FE
Block 27 :FE000000
```

12. Verify the response data with the data in [Table 28: Parameters of NFC Programming for Write Block on page 169](#).

To view the video for programming the NFC, click [Programming the NFC](#)

Chapter 10

Service Information

Service for your radio is based on the substitution method. A working part replaces a faulty one, providing quicker service to the customer. For example, replace the controller board if faulty.

If your radio requires complete testing or servicing than that is available at field level, it is sent to the European Radio Service Center where it is serviced and returned to the Regional Service Center

If your radio requires complete testing or servicing than that is available at field level, it is sent to the Motorola Solutions Service Center where it is serviced, and returned to the Regional Service Center.

Level 1 and Level 2 Maintenance

This manual covers Level 1 and Level 2 Maintenance.

Level 1 Maintenance

You replace your radio, accessories, or both. You then send the faulty radio, accessories, or both to a higher level of maintenance.

Level 2 Maintenance

Your radio board is replaced.

Your radios are programmed at the factory and cannot be tuned at the field service level.

Level 3 Maintenance

Level 3 maintenance can only be done at the Motorola Solutions Service Center or Depot. To find out more about Motorola Solutions Service Center, visit <https://www.motorolasolutions.com/>.

Replacement Parts

Damaged parts are replaced with identical replacement parts. For complete information on ordering required parts and kits, contact your local customer service representative.

10.1

Service Information

Technical & Repair Support (for Contracted Customers Only)

If you would like to contact the Motorola Solutions Customer Care team, use the appropriate contact details below. Please be prepared to provide your contract number, product serial numbers, and detailed issue description for a faster response and a resolution. If the support request is Technical Support related, the request will be handled by the Technical Support Operations (TSO) team. This team of highly skilled professionals provides Technical Support to help resolve technical issues and quickly restore networks and systems. If you are unsure whether your current service agreement entitles you to benefit from this service, or if you would like more information about the Technical or Repair Support Services, contact your local customer support or account manager for further information.

Contact Details

Technical Requests: techsupport.emea@motorolasolutions.com

Repair Support: repair.emea@motorolasolutions.com

Contact Us: https://www.motorolasolutions.com/en_xu/support.html

Parts Identification and Ordering

If you need help with identifying non-referenced spare parts, direct a request to the Customer Care Organization of a local area Motorola Solutions representative. Orders for replacement parts, kits, and assemblies should be placed directly at the local distribution organization of Motorola Solutions.

However, you cannot order export-controlled products or spare parts such as TEA-related boards through an online shop or <https://shop-business.motorolasolutions.com/>. Send an order form with actual end-customer details by e-mail to your customer care team.

10.2

Service Information for APAC

This topic contains contact details to service centers in the Asia and Pacific region.

Technical Support

Technical support is available to assist the dealer or distributor in resolving any malfunction, which may be encountered. Initial contact must be by telephone wherever possible. When contacting Motorola Solutions Technical Support, be prepared to provide the product model number and the serial number.

Further Assistance From Motorola Solutions

You can also contact the Customer Help Desk through the website: http://www.motorolasolutions.com/en_xp/products. If a unit requires further complete testing, knowledge, details, or both of component level troubleshooting or service than is customarily performed at the basic level, send your radio to a Motorola Solutions Service Center as listed in the following table:

Table 29: Service Information – Telephone Numbers and Addresses of the Asia and Pacific Motorola Solutions Centers

Country	Telephone Number	Address
Singapore	+65-6352-6383	Motorola Solutions Singapore Pte. Ltd, c/o Azure Engineering, 49 Jalan Pemimpin, #03-11 APS Industrial Building, Singapore 577203 Contact: Alvin Tan E-mail: alvin.tan@motorolasolutions.com Contact: Gan Saw See E-mail: gan.sawsee@motorolasolutions.com
Malaysia	+603-7809-0000	Motorola Solutions Sdn. Bhd. Level 14, Persoft Tower, No. 68, Pesiaran Tropicana, 47410 Petaling Jaya, Selangor Darul Ehsan, Malaysia Contact: Koh Tiong Eng E-mail: A21001@motorolasolutions.com
Indonesia	+62-21-3043-5239	PT. Motorola Solutions Indonesia 30th Floor, Gedung BRI II, Suite 3001,

Country	Telephone Number	Address
		Jl. Jend. Sudirman Kav. 44-46, Jakarta 10210, Indonesia Contact: Eko Haryanto E-mail: Eko.Haryanto@motorolasolutions.com
Thailand	Tel: +662-653-220 Fax: +668-254-5922	Motorola Solutions (Thailand) Ltd. 142 Two Pacific Place Suite 2201, 3220 Sukhumvit Road, Klongtoey, Bangkok 10110 Contact: Nitas Vatanasupapon E-mail: Nitas@motorolasolutions.com
India	+91-9844218850	Motorola Solutions India Pvt. Ltd. C/o Communication Test Design India Private Limited, #4, 5 Maruthi Industrial Estate, Rajapalya, Hoodi Village, Bangalore - 560048, India Contact: K. Umamaheswari E-mail: umamaheshwari@motorolasolutions.com
China	+86-10-8473-5128	Motorola Solutions (China) Co. Ltd. No. 1 Wang Jing East Road, Chao Yang District, Beijing, 100102, P.R. China Contact: Sophy Wang E-mail: C18170@motorolasolutions.com
Hong Kong	852-2966-4823	Motorola Solutions Asia Pacific Ltd. Unit 1807-1812, 18/F, Two Harbourfront, 22 Tak Fung Street, Hung Hom, Kowloon, Hong Kong Contact: Judy Leung E-mail: Judy.Leung@motorolasolutions.com
Philippines	Tel: +632 858-7500 Fax: +632 841-0681	Motorola Communications Philippines, Inc. Unit 2102, One Global Place Building, 5th Ave., Bonifacio Global City, Taguig, Philippines 1634. Contact: Arthur Nieves E-mail: Arthur.Nieves@motorolasolutions.com
Korea	+822-3497-3649	Motorola Solutions Korea, Inc. 9th Floor, Hibrand Building, 215, Yangjae-Dong, Seocho-Gu, Seoul, 137-924,

Country	Telephone Number	Address
		Korea. Contact: KS Kwak E-mail: r45321@motorolasolutions.com
Taiwan	+886-2-8729 8000	Motorola Solutions Taiwan, Ltd. 8F, No. 9, Songgao Rd., Taipei 110, Taiwan (R.O.C.) Contact: Michael Chou E-mail: ftpe239@motorolasolutions.com
Australia	+613-9847-7725	Motorola Solutions Australia Pty. Ltd. 10 Wesley Court, Tally Ho Business Park, East Burwood Victoria 3151, Australia. E-mail: servicecentre.au@motorolasolutions.com

Piece Parts

Some replacement parts, spare parts, product information, or all can be ordered directly. If a complete Motorola Solutions part number is assigned to the part, the part is available from the Motorola Solutions Service Organization. If no part number is assigned, the part is not normally available from Motorola Solutions. If a list of parts is not included, that means no user-serviceable parts are available for that kit or assembly.

Customer Programming Software has no capability to tune your radio. Tuning your radio can only be performed at the factory or at the appropriate Motorola Solutions Repair Center. Component replacement can affect your radio tuning and must only be performed by the appropriate Motorola Solutions Repair Center.

All orders for parts or information must include the complete Motorola Solutions identification number. All part orders must be directed to your local Motorola Solutions Service Organization. See your latest price pages.

Parts Identification and Ordering

Request for help in identification of nonreferenced spare parts must be directed to the Customer Care Organization of Motorola Solutions local area representation. Orders for replacement parts, kits, and assemblies must be placed directly on a Motorola Solutions local distribution organization.

10.3

Recommended Programming Equipment

Table 30: Recommended Programming Equipment

Name	Part Number
Customer CPS User Guide	6802974C10
Serial Data and Programming cable (RS-232 with switch at level shifter)	PMKN4122_
Serial Data cable (RS-232 without switch at level shifter)	PMKN4127_
USB Programming cable	PMKN4129_

10.4

Model Plates

The following is the model plate for your radio.

Table 31: Model Plate

Part Number	Model Label
MXP600	

10.5

Service Replacement Kit Matrix

The following kits consist of complete radio but exclude any accessories, battery, and antenna.

Service Replacement Kit Matrix

Table 32: Service Replacement Kit for MXP600

Service Tanapa	Description	APAC	EMEA
PMUE5551_S	MXP600 350-470 ROM CLR		✓
PMUE5552_S	MXP600 BSI 350-470 ROM CLR		✓
PMUE5561_S	MXP600 350-470 CYR CLR		✓
PMUE5570_S	MXP600 350-470 ARB CLR		✓
PMUE5579_S	MXP600 350-470 HEB CLR		✓
GMUE0008_S	MXP600 350-470 ROM TEA2		✓
GMUE0009_S	MXP600 350-470 ROM TEA2 BSI		✓
GMUE0010_S	MXP600 350-470 ROM AES 128 TEA2		✓
GMUE0011_S	MXP600 350-470 ROM AES 256 TEA2		✓
GMUE5553_S	MXP600 350-470 ROM TEA1		✓
GMUE5554_S	MXP600 350-470 ROM TEA3		✓
GMUE5555_S	MXP600 350-470 ROM AES 128 CLR		✓
GMUE5556_S	MXP600 350-470 ROM AES 128 TEA1		✓
GMUE5557_S	MXP600 350-470 ROM AES 128 TEA3		✓
GMUE5558_S	MXP600 350-470 ROM AES 256 CLR		✓
GMUE5559_S	MXP600 350-470 ROM AES 256 TEA1		✓

Service Tanapa	Description	APAC	EMEA
GMUE5560_S	MXP600 350-470 ROM AES 256 TEA3		✓
GMUE5562_S	MXP600 350-470 CYR TEA1		✓
GMUE5571_S	MXP600 350-470 ARB TEA1		✓
GMUE5572_S	MXP600 350-470 ARB TEA3		✓
GMUE5573_S	MXP600 350-470 ARB AES 128 CLR		✓
GMUE5574_S	MXP600 350-470 ARB AES 128 TEA1		✓
GMUE5575_S	MXP600 350-470 ARB AES 128 TEA3		✓
GMUE5576_S	MXP600 350-470 ARB AES 256 CLR		✓
GMUE5577_S	MXP600 350-470 ARB AES 256 TEA1		✓
GMUE5578_S	MXP600 350-470 ARB AES 256 TEA3		✓
GMUE5580_S	MXP600 350-470 HEB TEA1		✓
GMUE5581_S	MXP600 350-470 HEB AES 128 CLR		✓
GMUE5582_S	MXP600 350-470 HEB AES 128 TEA1		✓
GMUE5583_S	MXP600 350-470 HEB AES 256 CLR		✓
GMUE5584_S	MXP600 350-470 HEB AES 256 TEA1		✓
PMUE5763_S	MXP600 SECTRA 350-470 ROM CLR		✓
GMUE5585_S	MXP600 SECTRA 350-470 ROM TEA2		✓
PMUE5786_S	MXP600 350-470 ROM CLR GREEN		✓
PMUE5787_S	MXP600 350-470 ARB CLR GREEN		✓
GMUE5732_S	MXP600 350-470 ROM TEA1 GREEN		✓
GMUE5735_S	MXP600 350-470 ROM TEA2 GREEN		✓
GMUE5736_S	MXP600 350-470 ROM AES 128 TEA2 GREEN		✓
GMUE5737_S	MXP600 350-470 ROM AES 256 TEA2 GREEN		✓
GMUE5733_S	MXP600 350-470 ARB TEA1 GREEN		✓

Main Board Service Replacement Kit Matrix

Table 33: Service Replacement Kit Matrix for Main Board

Radio Version	Service Main Board Kit	Description	APAC	EMEA
MXP600 350-470 MHz	PMUE5551AZ	MXP600 350-470 ROM CLR MBD PEN  NOTE: Not available for external customer. Only for service center.	✓	✓
	PMUE5552AZ	MXP600 BSI 350-470 ROM CLR MBD PEN  NOTE: Not available for external customer. Only for service center.		✓
	PMUE5551BZ	MXP600 350-470 ROM CLR MBD PEN  NOTE: . ● Not available for external customer. Only for service center. ● The minimum software support is MR2021.2.	✓	✓
	PMUE5552BZ	MXP600 BSI 350-470 ROM CLR MBD PEN  NOTE: ● Not available for external customer. Only for service center. ● The minimum software support is MR2021.2.		✓
	PMUE5551CZ	MXP600 350-470 ROM CLR MBD PEN  NOTE: ● Not available for external customer. Only for service center. ● The minimum software support is MR2022.2.	✓	✓

Radio Version	Service Main Board Kit	Description	APAC	EMEA
	PMUE5552CZ	MXP600 BSI 350-470 ROM CLR MBD PEN  NOTE: - Not available for external customer. Only for service center. - The minimum software support is MR2022.2.		✓
	PMUE5763CZ	MXP600 SPECTRA 350-470 ROM CLR MBD PEN  NOTE: - Not available for external customer. Only for service center. - The minimum software support is MR2022.2.		✓

Chapter 11

Service Aids

This section lists the test equipment required to service the radio.

Table 34: Service Aids List

Name	Part Number
Audio Analyzer ³	–
Digital Signal Generator ³	–
IFR System ³	2968/3901/3902/3920
Encoder Knob, Back Opener Fixture ³	TL000146A01
Multi-channel GPS Simulator ³	Spirent GSS7000 / STR4500
Encoder Nut Bit	TL000148A01
Power Meter ³	Keysight N1913A / HP437B
Power Supply ³	Keysight N8737A / HP6032A
RF Adaptor	TL000147A01
RF Probe ³	HP85024A
Serial Data Cable (with switch at level shifter)	PMKN4122_
Serial Data Cable (without switch at level shifter)	PMKN4127_
Spectrum Analyzer ³	Keysight N9020B /HP8560E
TETRA USB Data Cable	PMKN4129_
Universal Multimeter ³	Keysight 34411A
Vacuum Leak Tester ³	TC-2000 66007071001
Vacuum Leak Test Fixture	TE000060A01
Vacuum Leak Tester Connector O-ring	32007073001

³ This test equipment is not provided by Motorola Solutions. You are required to obtain the equipment from external vendors.

Warranty and Service Support

Motorola Solutions offers long-term support for its products. This support includes full exchange, repair, or both of the product during the warranty period, and service, repair or spare parts support out of warranty.

Warranty Period and Return Instructions

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

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

Prior to shipping any radio back to the appropriate Motorola Solutions warranty depot, please contact Customer Resources or your Motorola Solutions dealer, distributor or reseller. All returns must be accompanied by a Warranty Claim Form, available from your Customer Service representative or your Motorola Solutions dealer, distributor or reseller. Products should be shipped back in the original packaging, or correctly packaged to ensure no damage occurs in transit.

After Warranty Period

After the Warranty period, Motorola Solutions continues to support its products.

- Motorola Solutions Regional Radio Support Centers offer a repair service to both end users and dealers at competitive prices.

Glossary

Advanced RISC Machine (ARM) A processor architecture based on a 32-bit reduced instruction set (RISC) computer.

Air Interface Encryption (AIE) Provides confidentiality on your radio link over the air.

Algebraic Code Excited Linear Prediction A speech (or other audio signals) encoding algorithm where a limited set of pulses is distributed as excitation to a linear prediction filter.

| **Abbreviation:**ACELP

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

Analog-to-Digital Converter A device that converts analog signals into digital data. Also known as codec.

| **Abbreviation:**ADC

Automatic Gain Control (AGC) A process or means by which gain is automatically adjusted in a specified manner as a function of a specified parameter, such as received signal level.

BALUN Balanced-unbalanced converter.

Band Frequencies allowed for a specific purpose.

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

CMOS Complementary Metal-Oxide Semiconductor

Co-uP Co-Processor

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

Default A predefined set of parameters.

Differential Quadrature Phase Shift Keying (DQPSK) A subclass of the QPSK methods of transmitting data. Rather than using the absolute

value of phase (as in QPSK), only the difference between the current value of phase and the previous value of phase are used. By using phase differences, the implementation is simpler (since an absolute reference source is not required).

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

Digital-to-Analog Converter A device that converts a digital value to a corresponding dc voltage value.

| **Abbreviation:**DAC

Digital Signal Processor (DSP) A special-purpose microprocessor that can perform math calculations very rapidly.

Electrically Erasable Programmable Read-Only Memory (EEPROM) Integrated circuit used to store data, which can be erased by electrical methods.

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

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

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

Global Core Accessory Interface Motorola Solutions proprietary accessory port for use with Motorola Solutions approved cables. USB and RS232 styles are supported.

| **Abbreviation:**GCAI

Global Navigation Satellite System A standard generic term for satellites orbiting the Earth to determine the geographical location. GNSS uses satellites from the GPS, GLONASS, Galileo, and BeiDou systems.

| **Abbreviation:**GNSS

Global Positioning System (GPS) System of 24 satellites that identify earth locations, launched by the U.S. Department of Defense. By triangulating signals from three of the satellites, a GPS receiving unit can pinpoint its current location anywhere on earth to within a few meters.

Input Output For computers, bidirectional input/output (I/O) ports couple the microcontroller to external devices. This interface can operate in parallel or serial form and is usually digital (0 to +5 Vdc) logic. Parallel interfaces allow I/O data transfer of eight bits at a time to parallel ports on the microcontroller. The technology is typically used to transfer data between the microcontroller and the external logic it controls. Screen reader support is enabled.

| **Abbreviation:**I/O

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

integrated Terminal Management integrated Terminal Management in Motorola Solutions Dimetra radio systems.

| **Abbreviation:**iTM

Intermediate Frequency A range of frequent audio and radio frequencies.

| **Abbreviation:**IF

Joint Test Action Group Same as IEEE std 1149.1a, which defines signals and behavior for serial testing.

| **Abbreviation:**JTAG

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

LDMOS Laterally Diffused Metal Oxide Semiconductor.

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

Local Oscillator A tunable oscillator used in a radio or TV receiver to select a particular channel for reception.

| **Abbreviation:**LO

Low Noise Amplifier (LNA) The main amplifying unit in the receiver.

Low-Pass Filter A filter that passes only frequency components lower than a certain frequency.

| **Abbreviation:**LPF

Man Machine Interface (MMI) An interface that enables information to be passed between a human user and hardware or software components of a computer system.

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

Phase-locked Loop (PLL) A circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.

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

Programming Cable A cable that allows the computer to communicate directly with certain radios using USB.

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

Radio Frequency Power Amplifier Amplifier having one or more active devices to amplify radio signals.

| **Abbreviation:**RFPA

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.

Request-To-Send In General Packet Radio Service (GPRS), a handshaking signal used with some communication links to indicate that data is ready for transmission.

| **Abbreviation:**RTS

RESET Reset line. An input to the microcontroller that restarts execution.

Signal An electrically transmitted electromagnetic wave.

SLIM Slim Connector

Spectrum Frequency range within which radiation has specific characteristics.

Static Random Access Memory Static-RAM chip used for volatile, program/data memory.

| **Abbreviation:**SRAM

Subscriber Identity Module A smart card that holds subscriber information (including the authentication key) and is inserted into your radio to grant its personality.

| **Abbreviation:**SIM

System-On-a-Chip An integrated circuit with all the required circuitry and components of an electronic system on a single chip.

| **Abbreviation:**SoC

Time Division Multiple Access (TDMA) A channel access method to allow several users to share the same frequency channel by dividing the signal into different time slots

Transceiver Transmitter-receiver: A device that both transmits and receives signals.

| **Abbreviation:**XCVR

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

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

Voltage Controlled Oscillator (VCO) An oscillator whereby the frequency of oscillation can be varied by changing a control voltage.