

MTP3100/MTP3150/MTP3200/ MTP3250/MTP3500/MTP3550 Basic Service Manual

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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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Document History

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

Table 1: Document History

Edition	Description	Date
68015000841-A	Initial edition.	May 2012
68015000841-B	Updated Model Numbering System chart for Model Information chapter. Updated “Removing and Installing the Volume and Frequency Knob” section and added new part, Tamper Label for both FKP and LKP Parts Lists for Maintenance chapter.	August 2012
68015000841-C	Added Sales Model table (Model Information chapter). Added new Antenna Stubby/Whip 806–870 MHz and Antenna Stubby 380–430 MHz for Radio Replacement and Accessories Replacement Parts List table (Maintenance chapter).	February 2013
68015000841-D	Added new part, Model Label for FKP/LKP Parts Lists tables (Maintenance chapter). Added Glossary chapter.	May 2013
68015000841-EA	Added MTP3500 and MTP3550 radio information, for UHF 380–470 MHz and 800 MHz.	March 2015
68015000841-EB	Added MTP3100/3150/3200/3250 Version B radio information.	April 2015
68015000841-EC	Added antenna AN000251A01 and battery PMNN4522 in the replacement part list. Updated Model Type numbers for MTP3500 and MTP3550. Updated Service Information with the latest contact information.	March 2018
68015000841-ED	Updated Radio Replacement Parts List	September 2018
68015000841-EE	Consolidate MTP3150 with the other models in one manual. Removed Motorola Solutions Propriety footer.	June 2019
68015000841-EF	Replaced PMUE4587_Z with PMUE5084_Z. Updated item 32012021014 to 33012021014.	July 2019
68015000841-EG	Updated the contact information in Service Information .	November 2019
68015000841-EH	Added PTBP952HE in Service Replacement Kit Matrix table.	December 2020

Edition	Description	Date
68015000841-EJ	<ul style="list-style-type: none">• Rename Man Down to Man Down (Fall Alert)• Added replacement for Encryption IC in Accessories Replacement Parts List on page 66.• Added PMUE4683_S in Service Replacement Kit Matrix on page 130 for MTP3550.• Added the information for the MTP3500/ MTP3550 Version D.	September 2022
68015000841-EK	<ul style="list-style-type: none">• Added PMUE4774_S and GMUE4774_S in Service Replacement Kit Matrix on page 130 for MTP3500.• Added PMUE4720_S and GMUE4720_S in Service Replacement Kit Matrix on page 130 for MTP3550.• Added GMUE4774_W for MTP3500 and GMUE4720_W for MTP3550 in Service Replacement Kit Matrix for Mainboard (EMEA)	December 2022
68015000841-EL	Updated Frequency Generating Section on page 36 .	December 2023

Read Me First

This manual contains information necessary to test and maintain the TETRA radio at the module level. It also contains information on radio assembling and disassembling.

Notations Used in This Manual

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



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



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



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

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 for Portable Two-Way Radios

ATTENTION!

This radio is restricted to Occupational use only. Before using the radio, read the RF Energy Exposure and Product Safety Guide for Portable Two-Way Radios, which contains important operating instructions for safe usage and RF energy awareness and control for Compliance with applicable standards and Regulations.

For a list of Motorola Solutions-approved antennas, batteries, and other accessories, visit:

<http://www.motorolasolutions.com>

Under Innovation, Science, and Economic Development Canada (ISED) regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by ISED to operate with Motorola Solutions-approved antenna with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

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:

- United States Federal Communications Commission (FCC), Code of Federal Regulations; 47 CFR et seq.
- FCC, OET Bulletin 65
- Institute of Electrical and Electronic Engineers (IEEE) C95.1
- International Commission on Non-Ionizing Radiation Protection (ICNIRP)
- Ministry of Health (Canada) Safety Code 6
- ISED RSS-102
- Australian Communications Authority Radiocommunications Standard et seq.
- ANATEL ANNEX to Resolution No. 303 et seq.

This radio complies with the IEEE (FCC) and ICNIRP exposure limits for occupational/controlled RF exposure environments at operating duty factors of up to 50 % talk-50 % listen. The IEEE/ICNIRP authorizes this radio for occupational use only.



NOTE: The approved batteries, supplied with the portable radio, are rated for a 5-5-90 duty cycle (5 % talk-5 % listen-90 % standby), even though this radio complies with IEEE/ICNIRP occupational exposure limits at usage factors of up to 50 % talk.

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/controlled conditions where users have full knowledge of their exposure and can exercise control over their exposure to meet the occupational limits in FCC/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 to the occupational/controlled environment exposure limits.

- Do not remove the RF Exposure Label from the device.
- User awareness instructions should accompany 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.
- Hold the radio in a vertical position in front of the face with the microphone (and other parts of the radio including the antenna) at least 2.5 cm (one inch) away from the nose or lips. Keep the antenna away from the eye. Keeping the radio at a proper distance is important as RF exposure decreases with increasing distance from the antenna.
- When worn on the body, always place the radio in a Motorola Solutions-approved clip, holder, holster, case, or body harness. The use of non-Motorola Solutions-approved accessories may result in exposure levels exceeding the IEEE/ICNIRP occupational/controlled environment RF exposure limits.
- When placing or receiving a phone call, hold your radio as you would a wireless telephone. Speak directly into the microphone.

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 IEEE/ICNIRP 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/>

Intrinsically Safe Radio Information

A radio that has been approved for intrinsic safety has the Intrinsically Safe Approval Label attached to the radio. This label specifies the hazardous Class/Division/Group along with the part number of the battery that must be used.

The Intrinsically Safe Approval unit refers to a product that has been approved as intrinsically safe by an approval agency (such as FM Approvals, CSA, UL, CENELEC, or ATEX). It certifies that a particular product meets the applicable intrinsic safety standards for specific types of hazardous classified locations of the agency.

Operational Cautions for Intrinsic Safe Equipment

Radios must be shipped from the Motorola Solutions manufacturing facility with the hazardous atmosphere capability and the intrinsic safety approval labeling (FM, UL, CSA, CENELEC, or ATEX). Radios will not be upgraded to this capability and labeled once they have been shipped to the field.

A modification changes the hardware of the unit from its original design configuration. Only the original product manufacturer can modify the hardware.



WARNING:

- Do not operate radio communications equipment in a hazardous atmosphere unless it is a type especially qualified (such as FM, UL, CSA, CENELEC, or ATEX approved). An explosion or fire may result.
- Do not operate a radio unit that has been approved as intrinsically safe product in a hazardous atmosphere if it has been physically damaged (for example, cracked housing). An explosion or fire may result.
- Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion or fire.
- Do not replace or change accessories in a hazardous atmosphere. Contact sparking may occur while installing or removing accessories and cause an explosion or fire.
- Turn off the radio before removing or installing a battery or accessory.
- Do not disassemble an intrinsically safe product in any way that exposes the internal circuits of the unit.
- Failure to use an intrinsically safe approved battery or approved accessories for the radio unit may result in the dangerously unsafe condition of an unapproved radio combination being used in a hazardous location.
- Unauthorized or incorrect modification of the intrinsically safe approved product negates the approval rating of the product.
- Incorrect repair or relabeling of any intrinsically safe agency-approved radio could adversely affect the approval rating of the unit.
- Use of a radio that is not intrinsically safe in a hazardous atmosphere could result in serious injury or death.

Repair

A repair constitutes something done internally to the unit that would bring it back to its original condition.

Repairs for Motorola Solutions products with intrinsically safe approval are the responsibility of the user. Repairs to a Motorola Solutions FM approved radio product should only be done at a location that has been FM audited under the FM 3605 repairs and service standard. Contact Motorola Solutions for assistance regarding repairs and service of Motorola Solutions intrinsically safe equipment.

Items not considered as repairs are items in which an action is performed on a unit which does not require the outer casing of the unit to be opened in a manner which exposes the internal electrical circuits of the unit.

Do Not Substitute Options or Accessories

The Motorola Solutions communications equipment certified as intrinsically safe by the approving agency (FM, UL, CSA, CENELEC, or ATEX) is tested as a complete system which consists of the listed agency approved portable, approved battery, and approved accessories or options, or both. This approved portable and battery combination must be strictly observed. There must be no substitution of items, even if the

substitute has been previously approved with a different Motorola Solutions communications equipment unit. The approving agency (FM, UL, CSA, CENELEC, or ATEX) lists all the approved configurations.

The Intrinsically Safe Approval Label affixed to the radio refers to the intrinsically safe classification of that radio product, and the approved batteries that can be used with that system.

The manual part number referenced on the Intrinsically Safe Approval Label identifies the approved accessories and/or options that can be used with that portable radio unit.

Using a non-Motorola Solutions intrinsically safe battery and/or accessory with the Motorola Solutions approved radio unit voids the intrinsically safe approval of that radio unit.

Electromagnetic Interference/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.

Aircraft

When instructed to do so, turn off your radio when on board an aircraft. Any use of a radio must be in accordance with applicable regulations per airline crew instructions.

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 in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a radio is placed in the air bag deployment area and the air bag inflates, the radio may be propelled 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). Do not remove, install, or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

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.

For radios installed in vehicles fueled by liquefied petroleum gas, refer to the (U.S.) National Fire Protection Association standard, NFPA 58, for storage, handling, and/or container information. For a copy of the liquefied petroleum standard, NFPA 58, contact the National Fire Protection Association, One Battery Park, Quincy, MA.

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.

Warranty and Service Support

Motorola Solutions offers long term support for its products. This support includes full exchange and/or repair 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.
- Dealers who are technically capable of performing fault analysis and repair can purchase individual parts and modules from the Radio Products and Solutions Organization (RPSO).

Related EMEA Region Publications

This section contains part numbers and titles of related Europe, Middle East, and Africa (EMEA) region publications.

Table 2: MTP3100 Quick Start Guides

Part Number	Language
MN001511A01	English
MN001516A01	Danish
MN001517A01	Dutch
MN001518A01	French
MN001519A01	German
MN001520A01	Hebrew
MN001521A01	Italian
MN001522A01	Norwegian (Bokmål)
MN001523A01	Polish
MN001524A01	Portuguese
MN001525A01	Swedish
MN001526A01	Spanish (Latin America)
MN001643A01	Russian
MN001526A01	Spanish
MN003190A01	Finnish
MN001513A01	Arabic (Egypt)

Table 3: MTP3150 Quick Start Guides

Part Number	Language
MN001527A01	English
MN001532A01	Danish
MN001533A01	Dutch
MN001534A01	French
MN001535A01	German
MN001536A01	Hebrew
MN001537A01	Italian
MN001538A01	Norwegian (Bokmål)
MN001539A01	Polish
MN001540A01	Portuguese
MN001541A01	Swedish

Part Number	Language
MN001542A01	Spanish (Latin America)
MN001662A01	Russian
MN001542A01	Spanish
MN002320A01	Slovak
MN003190A01	Finnish
MN001529A01	Arabic (Egypt)

Table 4: MTP3200 Quick Start Guides

Part Number	Language
MN001543A01	English
MN001548A01	Danish
MN001549A01	Dutch
MN001550A01	French
MN001551A01	German
MN001552A01	Hebrew
MN001553A01	Swedish
MN001554A01	Polish
MN001555A01	Portuguese
MN001556A01	Norwegian (Bokmål)
MN001557A01	Spanish (Latin America)
MN001558A01	Italian
MN001644A01	Russian
MN001557A01	Spanish
MN003192A01	Finnish
MN001547A01	Arabic (Egypt)

Table 5: MTP3250 Quick Start Guides

Part Number	Language
MN001559A01	English
MN001563A01	Danish
MN001564A01	Dutch
MN001565A01	Hebrew
MN001566A01	Italian
MN001567A01	Norwegian (Bokmål)
MN001568A01	Polish
MN001569A01	Portuguese

Part Number	Language
MN001570A01	Spanish (Latin America)
MN001571A01	Swedish
MN001572A01	German
MN001573A01	French
MN001574A01	Arabic (Egypt)
MN001645A01	Russian
MN001570A01	Spanish
MN003193A01	Finnish

Table 6: MTP3500 Quick Start Guides

Part Number	Language
MN001592A01	English
MN001596A01	Danish
MN001597A01	Dutch
MN001598A01	Hebrew
MN001599A01	Italian
MN001600A01	Norwegian (Bokmål)
MN001601A01	Polish
MN001602A01	Portuguese
MN001603A01	Spanish (Latin America)
MN001604A01	Swedish
MN001605A01	German
MN001606A01	French
MN001607A01	Arabic (Egypt)
MN001608A01	Japanese
MN001647A01	Russian
MN002318A01	Slovak
MN003195A01	Finnish
MN004972A01	Catalan

Table 7: MTP3550 Quick Start Guides

Part Number	Language
MN001575A01	English
MN001579A01	Danish
MN001580A01	Dutch
MN001581A01	Hebrew

Part Number	Language
MN001582A01	Italian
MN001583A01	Norwegian (Bokmål)
MN001584A01	Polish
MN001585A01	Portuguese
MN001586A01	Spanish (Latin America)
MN001587A01	Swedish
MN001588A01	German
MN001589A01	French
MN001590A01	Arabic (Egypt)
MN001591A01	Japanese
MN001646A01	Russian
MN002319A01	Slovak
MN003194A01	Finnish
MN004973A01	Catalan

Table 8: MTP3100 User Manuals

Part Number	Description	Language
68015000897	MTP3100 Feature User Guide	English
MN002116A01		English and Spanish
MN002117A01		English and Portuguese
MN002118A01		English and German
68015000902	MTP3100 Product Information Manual	English

Table 9: MTP3150 User Manuals

Part Number	Description	Language
68015000797	MTP3150 Feature User Guide	English
MN002122A01		English and Spanish
MN002123A01		English and Portuguese
MN002124A01		English and German
68015000798	MTP3150 Product Information Manual	English

Table 10: MTP3200 User Manuals

Part Number	Description	Language
68015000898	MTP3200 Feature User Guide	English
MN002119A01		English and Spanish

Part Number	Description	Language
MN002120A01		English and Portuguese
MN002121A01		English and German
68015000913	MTP3200 Product Information Manual	English

Table 11: MTP3250 User Manuals

Part Number	Description	Language
68015000899	MTP3250 Feature User Guide	English
MN002125A01		English and Spanish
MN002126A01		English and Portuguese
MN002127A01		English and German
68015000904	MTP3250 Product Information Manual	English

Table 12: MTP3500 User Manuals

Part Number	Description	Language
MN001488A01	MTP3500 Feature User Guide	English
MN002128A01		English and Spanish
MN002129A01		English and Portuguese
MN002130A01		English and German
MN001610A01	MTP3500 Product Information Manual	English

Table 13: MTP3550 User Manuals

Part Number	Description	Language
MN001489A01	MTP3550 Feature User Guide	English
MN002131A01		English and Spanish
MN002132A01		English and Portuguese
MN002133A01		English and German
MN001612A01	MTP3550 Product Information Manual	English

Table 14: Other Related Manuals

Part Number	Description	Language
68015000845	MTP3100/MTP3150/MTP3200/ MTP3250/MTP3500/MTP3550 Detailed Service Manual	English
68015000844	CMM Disclosure/TTT Table for MTP3000 Series	English

Part Number	Description	Language
68015000843	MTP3100/MTP3200/MTP3250 Accessory Leaflet	English

Chapter 1

Model Information

This manual applies to the following MTP3000 radio series, Class 3L, TETRA Handportable Terminal model.

Table 15: MTP3000 Series Sales Models

Type No.	Sales Model No.	Short Description
PT912OF	H61PCF6TZ1AN	MTP3100 350–430 MHz
PTB952F	H61PCF6TZ1BN	MTP3100 350–470 MHz
PT912OHE	H63PCH6TZ3AN	MTP3150 350–430 MHz
PTB952HE	H63PCH6TZ3BN	MTP3150 350–470 MHz
PT912OFE	H62PCF6TZ7AN	MTP3200 350–430 MHz
PT912OFG	H62PCF6TZ7AG	MTP3200 FuG 350–430 MHz
PTB952FE	H62PCF6TZ7BN	MTP3200 350–470 MHz
PT912OHE	H63PCH6TZ5AN	MTP3250 350–430 MHz
	H63PCH6TZ7AN	
PT912OHG	H63PCH6TZ7AG	MTP3250 FuG 350–430 MHz
PTB952HE	H63PCH6TZ5BN	MTP3250 350–470 MHz
PTBP952FE	H62PCF6TZ8AN	MTP3500 350–470 MHz
PTBP952HE	H63PCH6TZ8AN	MTP3550 350–470 MHz
PTBP953FE	H62PCF6TZ8BN	MTP3500 350–470 MHz
	H62PCF6TZ8BNB	
PTBP953HE	H63PCH6TZ8BN	MTP3550 350–470 MHz
	H63PCH6TZ8BNB	

1.1

Model Specifications



NOTE: Specifications subject to change without notice.

Table 16: General Specifications

GENERAL	
ETSI:	ETS 300 019-1-7
Type Number:	
MTP3100	PT912OF PTB952F
MTP3150	PT912OHE

GENERAL	
	PTB952HE
MTP3200	PT9120FE
	PTB952FE
MTP3200 FuG	PT9120FG
MTP3250	PT9120HE
	PTB952HE
MTP3250 FuG	PT9120HG
MTP3500	PTBP952FE
	PTBP953FE
MTP3550	PTBP952HE
	PTBP953HE
Temperature Range for Transceiver:	
Operating	-30 °C to +60 °C
Storage	-40 °C to +85 °C
Battery Types:	
Standard	NNTN8020_ Removable 1650 mAh Li-Ion
High Capacity	NNTN8023_ Removable 2150 mAh Li-Ion
	PMNN4522_ Removable 3400 mAh Li-Ion
Battery Voltage:	
Minimum	3.2 Vdc
Nominal	3.8 Vdc
Portable Dimensions: (HxWxD in mm)	
	124x53x33.5 mm with battery NNTN8020
	124x53x36.7 mm with battery NNTN8023
	124.2x53x37.4 mm with battery PMNN4522
Weight:	
FKP plain radio (with standard battery and stub-by antenna)	280+1% g
LKP plain radio (with standard battery and stub-by antenna)	279.2+1% g

Table 17: Receiver Specifications

RECEIVER	
Receiver Type:	Class A and B
Frequency Range:	350–470 MHz
Channel Spacing:	25 kHz
Sensitivity (3.5%) BER:	-114 dBm (guaranteed)
	-116 dBm (typical)

RECEIVER	
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:	15% Max.

Table 18: Transmitter Specifications


TRANSMITTER	
Modulation Type:	$\pi/4$ DQPSK
RF Power:	Class 4
	Class 3L
	Class 3
Frequency Range:	
TMO	350–470 MHz
DMO	350–470 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 19: Model Numbering Scheme

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

Table 20: 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	61 = Motorola Solutions MTP3100 Family
3		62 = Motorola Solutions MTP3200/MTP3500 Family
		63 = Motorola Solutions MTP3150/MTP3250/MTP3550 Family
4	Frequency Band	P = 350–470 MHz Q = 410–430 MHz U = 806 –870 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
		1 = 5 kHz
		2 = 6.25 kHz
	3 = 10 kHz	
	4 = 12.5 kHz	
	5 = 15 kHz	

Position	Description	Value
		6 = 25 kHz
		7 = 30 kHz
8		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, the radio uses digital modulation technology and sophisticated voice-compression algorithm. The voice received by the microphone is converted into a digital bit stream consisting of zeros (0) and ones (1).

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

2.1

Digital Modulation Technology

The radio operates in dispatch and phone modes.

The radio also operates in Trunked Mode Operation (TMO) and Direct Mode Operation (DMO). It uses the $\pi/4$ Differential Quadrature PhaseShift Keying (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 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. 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 its data information without interference from other transmitting units. Transmission from a unit or base station is accommodated in time-slot lengths of 15 ms and frame lengths of 60 ms. The TDMA technique requires sophisticated algorithms and a Digital Signal Processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation.

2.1.1

Voice Compression Technology

Voice is converted into a digital bit stream by sampling the voice at high rate and converting the samples into numbers, which are represented by bits.

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

2.1.2

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

2.1.2.1

Digital Section

The digital section is based on a Dual Core System On a Chip (SoC) processor. It consists of a low-power Advanced RISC Machine (ARM) application core and Digital Signal Processor (DSP) core with floating point. This section also has a coprocessor that does keypad scanning and several input or output (IO) interfaces.

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 the following function:

- linear 16-bit analog to digital conversions
- audio filtering
- level amplification for the microphone audio input and the received audio output

2.1.2.2

Transmitter Path

The transmitter circuitry includes a linear class AB Power Amplifier (PA) for the TETRA linear modulation of the terminal. It includes a Cartesian Loop to enhance its 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

The loop feedback path includes the following items.

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

The Cartesian Loop output power passes to the antenna through the Antenna Switch, Harmonic Filter, and Diplexer.

2.1.2.3

Receiver Path

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

The receiver path includes the following items.

- Diplexer
- Antenna Switch

- RF Switches
- Off Channel Detector and Inverting Schmitt Trigger
- Balanced-Unbalanced Converter (BALUN)
- Limiter
- 2-bit 6/12/18 dB Step Attenuator
- Discrete Front Filter
- Low Noise Amplifier (LNA) integrated with Step 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.

2.1.2.4

Frequency Generating Section


The frequency generating section includes the following components.

Table 21: Frequency Generating Section Components

Radio Model	Component
MTP3100/MTP3150/MTP3200/MTP3250 Version A	<ul style="list-style-type: none"> • RFIC Fractional-N Synthesizer • Reference Oscillator • Main VCO • Loop Filter • Voltage Multiplier
MTP3100/MTP3150/MTP3200/MTP3250 Version B and MTP3500/MTP3550	<ul style="list-style-type: none"> • Low Band VCO (350–410 MHz) • High Band VCO (410–470 MHz) • RFIC Fractional-N Synthesizer • Reference Oscillator • Loop Filter • Voltage Multiplier
MTP3500 and MTP3550 Version D (806–870 MHz)	<ul style="list-style-type: none"> • RFIC Fractional-N Synthesizer • Reference Oscillator • Main VCO • Loop Filter • Voltage Multiplier • RF Coupler • Tx LO Buffer

2.1.3

Global Positioning System, Bluetooth, and Global Navigation Satellite System Section

 **NOTE:** GNSS is only applicable for MTP3100/MTP3150/MTP3200/MTP3250 Version B, MTP3250 Version C and MTP3500/MTP3550. Bluetooth (BT) is not applicable for MTP3150.

The GPS/BT is provided by a single chip solution in a 65-nm CMOS process that integrates GPS and Bluetooth functions. The GNSS is a concurrent GNSS (GPS, GLONASS, and BeiDou) positioning chip.

The GPS/BT and GNSS section includes the following main components:

- Duplexer
- Front filters (separate filters for GPS and BT)
- Temperature Compensated Crystal Oscillator (TCXO)

MTP3250 Version C and MTP3500/MTP3550 Version D

The GNSS is provided by a single chip solution in QFN28 packaging. The GNSS is a concurrent GNSS (GPS, GLONASS, BeiDou and Galileo) positioning chip.

The GNSS section includes the following main components:

- Duplexer
- Front filters (separate filters for GPS and BT)
- Temperature Compensated Crystal Oscillator (TCXO)

Meanwhile, BT is provided by a single chip solution in a 65-nm CMOS process.

- Front filter
- Temperature Compensated Crystal Oscillator (TCXO)

Chapter 3

Programming the Radio

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

Figure 1: 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 may be some differences caused by the variety of software versions running on the testing equipment. Please consult the user guides of the respective testing equipment for further details.

4.1

Typical Test Setup

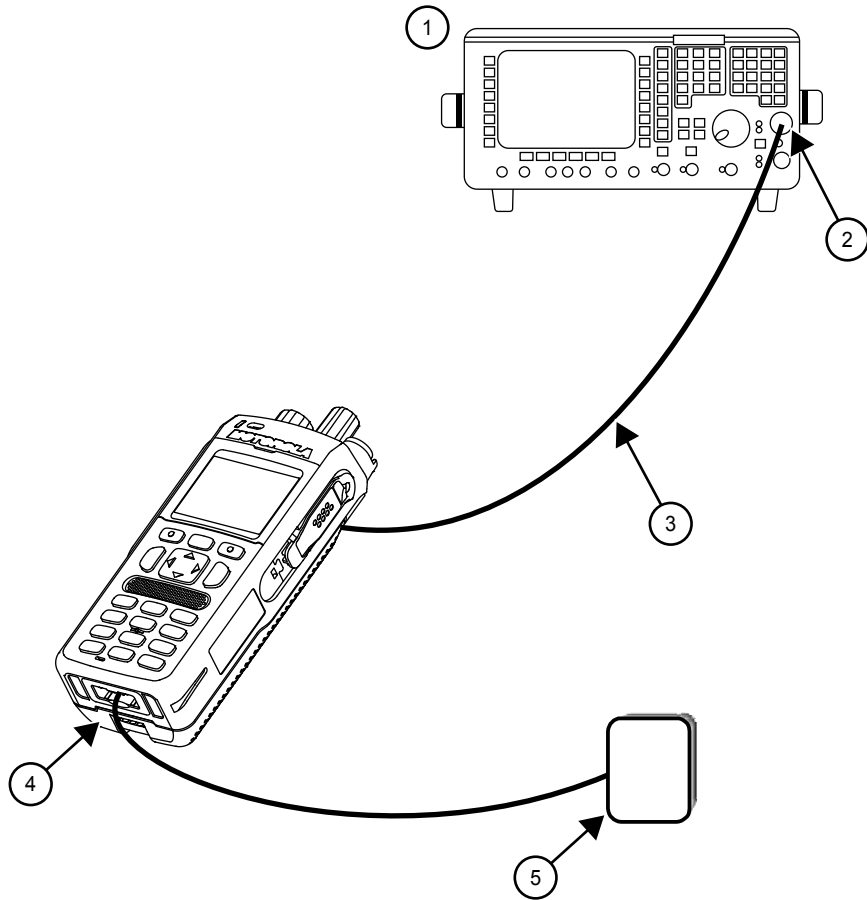
Carry out the following instructions before testing:

- Check that you have a fully charged battery (not required when using Battery Eliminator and RF radio antenna adapter).
- To test the radio, a special Battery Eliminator (PMLN6101_) and RF Antenna Adapter (PMLN5891_) with RF cable is required.
- Detach the antenna from the radio.
- Connect the RF adapter to the RF switch at the rear side of your radio and fix it by screwing the wing nut into the antenna nut.
- Connect the other side of the cable to the N-type RF Connector of the IFR using an N-type-to-SMA-adapter.
- Connect the power supply to the battery eliminator wires.



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

Figure 2: Typical Test Setup



Label	Description
1	IFR 39xx/IFR 2968
2	N-Type RF Connector
3	RF Cable (PMLN5891_)
4	Battery Eliminator (PMLN6101_)
5	3.8 V Power Supply

4.2


Alternative Test Setup

Cable adapter PMLN5891_ enables connecting to the RF adapter connector on the main board. Thus, it allows RF testing of the main board in a radio, which has its back cover disassembled. On one side, the cable adapter has a mating RF adapter connector with mechanical grasping mechanism to the antenna port; on the other side, the connection is SMA male.

4.2.1

Assembling Procedures for Alternative Test Setup

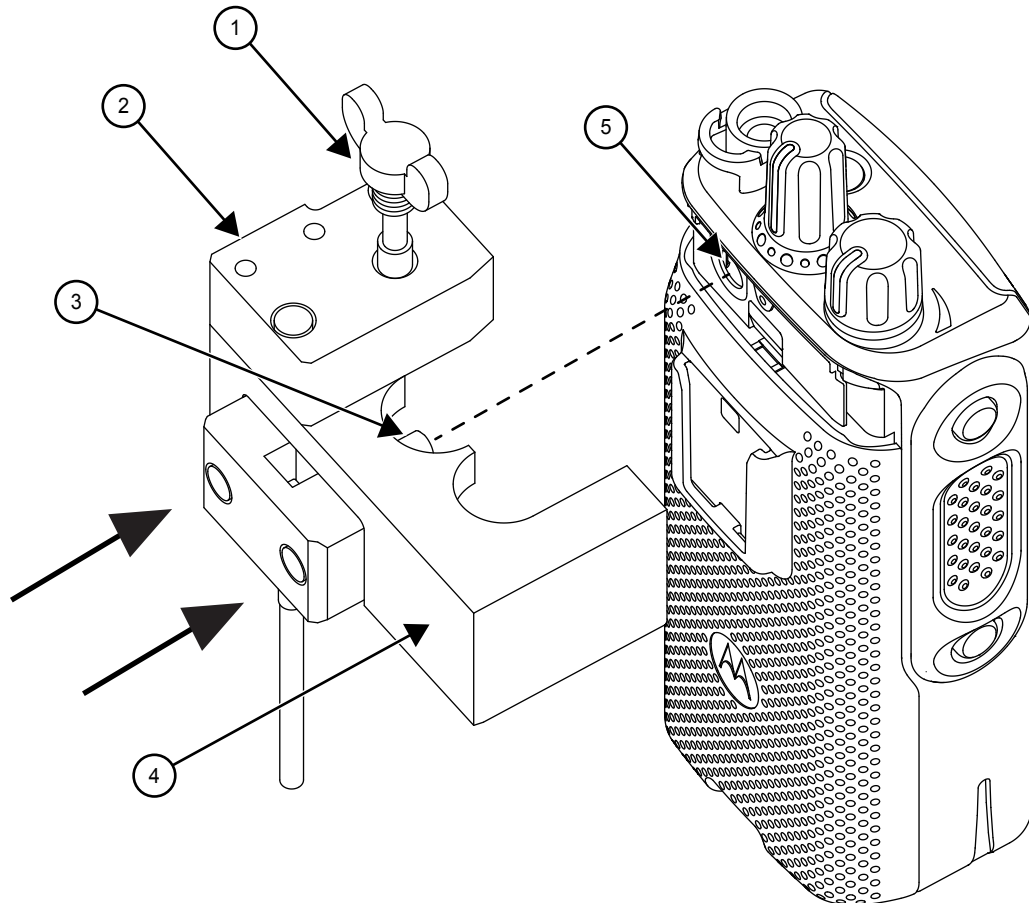
When and where to use:

 **NOTE:** The RF Antenna Adaptor is used for testing purposes only.

Procedure:

1. Align the RF plug to the chassis slot.

Figure 3: RF Antenna Adaptor – Insertion



Label	Description
1	Wing screw
2	RF antenna adaptor plastic block
3	RF plug
4	RF Antenna Adaptor (PMLN5891_)
5	Chassis slot

2. Carefully insert the RF plug into the chassis slot on the radio. A slight friction will be felt when the RF plug is mated to the RF switch located inside the chassis slot.
3. Gently push the RF plug deeper into the recess slot until it reaches the maximum level.

4. The wing screw on the RF antenna adapter plastic block is now aligned with the antenna tower. Tighten the wing screw by rotating clockwise until it touches the plastic block on the RF antenna adapter.

4.2.2

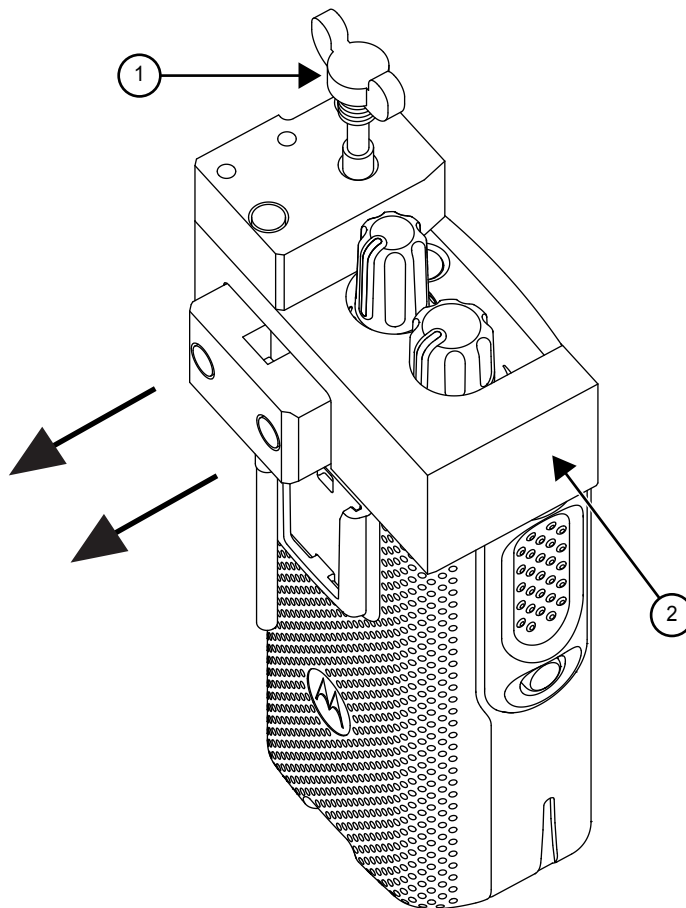
Disassembling Procedures for Alternative Test Setup

Procedure:

1. Loosen the wing screw completely by rotating the screw counter clockwise. Ensure that the spring on the wing screw is fully retracted from the adapter plastic block.

CAUTION: Failure to loosen the wing screw completely from the RF antenna adapter plastic block while moving the block backwards will cause damage to the RF switch.

Figure 4: Antenna Adapter – Removal



Label	Description
1	Wing screw
2	RF antenna adapter plastic block

2. Gently remove the RF antenna adapter block horizontally backwards. Be careful not to exert any side force to the RF plug before it is fully removed from the chassis slot.

4.3

Test Check List

Table 22: Test Setup for 350–470 MHz Radio Models

The following table summarizes the required test setup for 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	22	N/A
	Min Rx Level	N/A	N/A	-110 dBm
	Max Tx Level	N/A	N/A	30 dBm (Class 4)
				32.5 dBm (Class 3L)
				34.5 dBm (Class 3)
Access Parameter	N/A	-53 dBm	N/A	
Mobile Power	30 dBm (Class 4) 32.5 dBm (Class 3L) 34.5 dBm (Class 3)	N/A	N/A	
			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)
				32.5–36.5 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	28–32 dBm (Class 4)

Test Name	Test Setup	Radio Setup	Test Conditions	Limits
				30.5–34.5 dBm (Class 3L)
				32.5–36.5 dBm (Class 3)
	RF Gen Level Burst Power	N/A	–90 dBm	28–32 dBm (Class 4)
				30.5–34.5 dBm (Class 3L)
				32.5–36.5 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

Table 23: Test Setups for 806–870 MHz Radio Models

The following table summarizes the required test setup for 806–870 MHz radio models.

Test Name	Test Setup	Radio Setup	Test Conditions	Limits	
Base Station Registration	Control Channel	851.8125 MHz	2072	TETRA 800MS	
	Traffic Channel	851.8125 MHz	2072	TETRA 800MS	
	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	22	N/A	
	Min Rx Level	N/A	N/A	–110 dBm	
	Max Tx Level	N/A	N/A	30 dBm (Class 4)	
					32.5 dBm (Class 3L)
		Access Parameter	N/A	–53 dBm	N/A
		Mobile Power	30 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)	
	Timing Error	N/A	N/A	±0.25 Symbols	

Test Name	Test Setup	Radio Setup	Test Conditions	Limits
	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	28–32 dBm (Class 4) 30.5–34.5 dBm (Class 3L)
	RF Gen Level Burst Power	N/A	-90 dBm	28–32 dBm (Class 4) 30.5–34.5 dBm (Class 3L)
	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

4.3.1

Transmitter Tests

1. Power Burst (Control Range)
2. Power Profiles
3. Tx Burst Timing Error
4. Vector Error RMS and Peak
5. Tx Frequency Error

4.3.2

Call Processing Tests

1. Talk Back
2. Call to Mobile

4.3.3

Duplex Test

Digital Duplex Test (Tx)

Measurement Capabilities:

- Bar charts (Tx Power, Frequency Error, Vector Error RMS)
- Spectrum Analyzer
- Power Analyzer
- Vector Analyzer

- Vector Diagrams

4.4

Configuring IFR 3901/IFR 3902/IFR 3920 Setup

Use these procedures to configure the IFR 3901/IFR 3902/IFR 3920 setup.

Procedure:

1. Turn ON the IFR.
2. Press **CONFIG** → **CONFIG**. Select **System** → **TETRA** → **MS**.
3. Press **CONFIG** → **CONFIG**. Select **Configure** → **Channel Plan**.
4. Perform one of the following actions:
 - For 350–470 MHz radios, press **SELECT** → **TETRA 380+0MS**.
 - For 806–870 MHz radios, press **SELECT** → **TETRA 800MS**.
5. Press **CONFIG**. Select **System ID & Access Params**.
6. Enter 234 for Mobile Country Code (MCC). Press **Enter**.
7. Enter 2392 for Mobile Network Code (MNC). Press **Enter**.
8. Enter 1 for Base Station Color Code (BCC). Press **Enter**.
9. Enter 22 for Location Area Code (LA). Press **Enter**.
10. Enter -110 for Min Rx Level For Access. Press **Enter**.
11. Perform one of the following actions:
 - For 350–470 MHz radios, enter 30 for Max Tx Level. Press **Enter**.
 - For 806–870 MHz radios, enter 30 (Class 4 radio) or 32.5 (Class 3L radio) for Max Tx Level. Press **Enter**.
12. Enter -53 for Access Parameter. Press **Enter**.
13. Press **CONFIG**. Select **Base Services**.



NOTE: You are entering base services setup. The displayed value are factory defaults and should not be changed.

```
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
```

14. Press **CONFIG**. Select **Neighbor Cell Info**.
15. Verify that the following NEIGHBOUR CELL INFO values are displayed:



NOTE: The displayed values are factory defaults and should not be changed.

```
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
```

16. Press **CONFIG**. Select **Call Timers & Trunking**.
17. Select **Transmission** for Trunking Type.
18. Select **Continuous** for Test Set Transmit Mode.

4.5


Configuring IFR 2968 Setup

Use these procedures to configure the 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. Perform one of the following actions:
 - For MTP3100/3150/3200/3250 Version A 350–430 MHz radios, press **380+0MS**.
The Control Channel automatically changes to 3600, and Traffic Channel automatically changes to 3700.
 - For MTP3100/3150/3200/3250 Version A 806–870 MHz radios, press **380+0MS**.
The Control Channel automatically changes to 2040, and Traffic Channel automatically changes to 2140.
 - For MTP3100/3150/3200/3250 Version B and MTP3500/3550 350–470 MHz radios, press **Tetra 380+0MS**.
The Control Channel automatically changes to 3600, and Traffic Channel automatically changes to 3700.
 - For MTP3100/3150/3200/3250 Version B and MTP3500/3550 806–870 MHz radios, press **Tetra 800MS**.
The Control Channel automatically changes to 2040, and Traffic Channel automatically changes to 2140.
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**. Enter 2392 and press **Network Code**.
10. Press **Base Color**. Enter 1 and press **Base Color**.
11. Press **More**.
12. Press **Location Area**. Enter 22 and press **Location Area**.
13. Press **More**.
14. Press **Min Rx Level**. Enter -110 dBm and press **Min Rx Level**.

15. Press **Max Tx Level**. Enter 30 dBm and press **Max Tx Level**.
16. Press **Access Parameter**. Enter -53 dBm and press **Access Parameter**.
17. Press **Test Mode** → **Enable**.
18. Press **Base Service**.

 **NOTE:** You are entering base services setup. The displayed value are factory defaults and should not be changed.


```
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
```

19. Press **More**.

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

20. Press **Return**. Select **Neighbor Cell**.

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

 **NOTE:** The displayed values are factory defaults and should not be changed.

```
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
```


22. Press **More**.

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

23. Press **Return**.

24. Press **Trunk Type** → **message Trunked** (Transmission).

25. Press **More**.

 **NOTE:** The displayed values are factory defaults and should not be changed. It is not required to configure Call Types, Call Arial, and Messages.

26. Press **More**.

4.6

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

Use these procedures to configure the IFR 3901/IFR 3902/IFR 3920 manual screen test.

Procedure:

1. Press **TEST** → **TAB**.

2. Perform one of the following actions:
 - For 350–470 MHz, enter 3600 for Control Channel.
 - For 806–870 MHz, enter 2072 for Control Channel.
3. Perform one of the following actions:
 - For 350–470 MHz, enter 3700 for Traffic Channel.
 - For 806–870 MHz, enter 2072 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 Tx 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. However, the Manual Test Setup is not saved.

4.7

Configuring IFR 2968 Manual Screen Test

Use these procedures to configure the IFR 2968 manual screen test.

Procedure:

1. Press **Manual** to enter the Manual Test screen.
2. Press **Control Channel**. Perform one of the following actions:
 - For 350–470 MHz, enter 3605 and press **Control Channel**.
(IFR 3605 = Rx 390.125000 MHz)
 - For 806–870 MHz, enter 2072 and press **Control Channel**.
(IFR 2072 = Rx 851.8125 MHz).
3. Press **Traffic Channel**. Perform one of the following actions:
 - For 350–470 MHz, enter 3605 and press **Traffic Channel**.
 - For 806–870 MHz, enter 2072 and press **Traffic Channel**.

The marker goes to Timeslot.

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



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

5. Press **RF Gen Level**. Enter -75 and press **dBm** → **RF Gen Level**.
6. Press **Mobile Power**. Enter 30 dBm/1 W.
7. 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. However, the Manual Test Setup is not saved.

4.8

RF Tests

This section lists the applicable RF Tests and its procedures for the radio.

4.8.1

Testing Receiver using IFR 3901/IFR 3902/IFR 3920

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

Procedure:

1. Turn ON the radio.
2. Do 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
```

4.8.2

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.
2. Do 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
```


4.8.3

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 **Tx Measurement** window, which displays the Power Profile, Burst Timing, Vector Peak, Vector RMS, Freq Error, and Residual Carrier.

```
Burst Power Required Results: 28.0-32.0 dBm (Class 4) or 30.5-34.5 dBm  
(Class 3L)  
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**.

4.8.4

Testing Transmitter Using IFR 2968

Procedure:

1. Press **RF Gen Level**. Enter -90 dBm and press **RF Gen Level**.
2. Press **PTT**.

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

Monitor the IFR Manual Test screen, which displays the Burst Power, Power Profile, Timing Error, Vector Error, and Frequency Error.

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

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

4.9

Call Processing Tests

This section list the applicable Call Processing Tests and its 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 before you start this test.

Procedure:

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

3. Press **PTT** and speak into the microphone of the radio.
The last 3 sec 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 3 sec.
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 the handset and test equipment are configured the same as given in the Transmitter Test before you start this test.

Procedure:

1. Press **PTT** and speak into the microphone of the radio.
The last 3 sec 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 3 sec.
3. Press the **Silence** to mute the 1 kHz Audio Signal of the speaker.
4. Press **Clear Down**. Check that the `Cleardown Complete` status appears on the IFR Manual Test screen.

4.9.3

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

Digital Duplex Test (Tx) Using IFR 3901/IFR 3902/IFR 3920

Procedure:

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

Burst Power Required Results: 28.0–32.0 dBm (Class 4) or 30.5–34.5 dBm (Class 3L)
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 Rx Measurement Window.

Option	Actions
Power Analyzer Graph	<ol style="list-style-type: none"> a. Select Power → Profile Full. b. To view the detail of Profile Full, select <input type="checkbox"/> 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	<ol style="list-style-type: none"> a. Select Mod Accuracy → Vector Error. b. To view the detail of Vector Error, select <input type="checkbox"/>, 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

Digital Duplex Test (Tx) Using IFR 2968


Procedure:

1. On the 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)
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 (Tx)**.

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	Actions
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 Tx 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

Manual Mode Testing

When and where to use: Use these procedures to set up radio for DALT Mode testing.

Procedure:

1. Verify that the radio is turned OFF.
2. Perform one of the following actions:
 - For Full Keypad, press and hold **1**, **2**, and **3** keys simultaneously and press the **On/Off** button for more than 5 seconds to enter DALT mode.
 - For Limited Keypad, press and hold **Left** and **Right** keys simultaneously and press the **On/Off** button for more than 5 seconds to enter DALT mode.

4.12.1

Testing in DALT Mode



NOTE: Any key pressed causes the test to advance from one step to the next. You are to respond accordingly to the instructions on the screen.

Procedure:

Display Test

1. The display shows:

Display
Test

2. Do the following:

Action	The display shows:
Press any key.	Horizontal red lines.
Press any key consecutively.	Horizontal red lines become thicker with every key press, until it becomes fully red.
Press any key.	Four colored rectangles.
Press any key consecutively.	Vertical green lines that become thicker with every key press, until it becomes 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.

Battery Test

4. The display shows:

Battery
Test

5. Do the following:

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

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

SIM Card Test

7. The display shows:

SIM card
Test

8. Do the following:

Action	Result
Press any key.	<ul style="list-style-type: none"> If SIM card is detected in SIM slot, the display shows: SIM card PASSED Press Any key To Continue

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

Vibrator Test¹

10. The display shows:

¹ Only applicable for MTP3100/3150/3200/3250 Version B and MTP3500/3550.

Vibrator
Test

11. Do the following:

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

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

LEDs Test

13. The display shows:

LEDs
Test

14. Do the following:

Action	Result
Press any key.	The display shows: Red LED on LED Status Indicator lights up in red.
Press any key.	The display shows: Green LED on LED Status Indicator lights up in green.
Press any key.	The display shows: Amber LED on LED Status Indicator lights up in amber.
Press any key.	The display shows: All LEDs on LED on the top of the radio blinks in combination of red, green, and amber.

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

Backlight Test

16. The display shows:

Backlight
Test

17. Do the following:

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

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

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

MACE Test¹

19. The display shows:

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

20. Do the following:

Action	Result
Press any key.	<ul style="list-style-type: none"> If CRYPTR card is detected in SD slot, the display shows: MACE ping test PASSED Press Any key To Continue If CRYPTR card is not detected in SD slot, the display shows: MACE ping test FAILED Press Any key To Continue

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

Accessory Connect Test

22. The display shows:

```
Accessory
Connect Test
```

23. Do the following:

Action	Result
Press any key.	The display shows: Connect GCAI 1. Core Accy 2. IMPRES Accy to the radio and press any key
Attach Core or IMPRES accessory to the SLIM connector.	Core RSM connected or IMPRES RSM PMMNxxxx connected

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

Tones Test

25. The display shows:

Tones
 Test

26. Do 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.

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

Loopback Test

28. The display shows:

Loopback
 Test

29. Do 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.

Action	Result
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.

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

Chopper Noise Test

31. Do the following:

Action	Result
Press any key.	The display shows: Int MIC to internal earp
Place the internal earpiece close to your ear and listen for Chopper Noise Test.	Make sure that the chopper noise is not audible.
Press any key.	The display shows: Connect RSM accessory to the radio (RSM Connected)
Press any key.	The display shows: TOP Mic to RSM Chopper Noise Test (RSM connected)
Bind around the antenna one binding of the earpiece cable and place the external earpiece close to your ear and listen for chopper noise.	Make sure that the chopper noise is not audible.
Press any key.	The display shows: Connect RSM accessory to the radio (RSM connected)
Press any key.	The display shows: RSM MIC to INT Ear Chopper Noise Test
Listen for chopper noise at the radio earpiece.	Make sure that the chopper noise is not audible.
Press any key.	The display shows: Connect RSM accessory to the radio (RSM connected)
Press any key.	The display shows: TOP Mic to RSM Chopper Noise Test (RSM connected)

Action	Result
Bind around the antenna one binding of the earpiece cable and place the external earpiece close to ear and listen for chopper noise.	Make sure that the chopper noise is not audible.

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

Keypad Test

33. The display shows:

```
Keypad
Test
```

34. Do the following:

Action	Result
Press any key.	The display shows: <ul style="list-style-type: none"> For Full Keypad model: <pre> Emergency Left Menu Right Send Up 1 2 3 Ptt 4 5 6 Down 7 8 9 * 0 # Rotary to Exit </pre> For Limited Keypad model: <pre> Emergency Left Menu Right Send Up Ptt Down Rotary to Exit </pre>
Press the corresponding key to continue.	The respective display disappears every time you press a key. Continue until display is empty.

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

Navigation Button Test

36. The display shows:

```
Navigation
Test
```

37. Do the following:

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

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

Rotary Knob Test

39. The display shows:

```
Rotary
Test
```

40. Do the following:

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

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

Man Down (henceforth known as Fall Alert) Test¹

42. The display shows:

Mandown
 Test

43. Do 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 beep 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 beep sounds after 10 seconds. Man Down (Fall Alert) angle detection feature is functional.

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

Bluetooth Test¹

45. The display shows:

Bluetooth
 Test

46. Do 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.

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

The display shows:

TX Power Class 3L test

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

The display shows:

TX Power Class 4 test

49. 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 the radio OFF.

4.12.2

Testing Charger Recognition

Procedure:

1. Turn the radio ON.
2. Connect the Rapid Travel Charger accessory connector to the handset. Check the following:
 - LCD display shows `charger connected`.
 - A beep is heard.
 - Keypad back-light is turned ON.
 - Charging icon is shown.
3. Connect the Vehicle Power Adapter (VPA) Charger accessory connector to the handset. Check the following:
 - LCD display shows `charger connected`.
 - Keypad back-light is turned ON.
4. Connect the handset to the Desktop Charger. Check the following:
 - LCD display shows `charger connected`.
 - A beep is heard.
 - Keypad back-light is turned ON.
 - Charging icon is shown.
5. Connect the handset to the USB Charger. Check the following:
 - LCD display shows `charger connected`.
 - Three beeps are heard.
 - Keypad back-light is turned ON.
 - Charging icon is shown.
6. Connect the handset to the MUC Charger. Check the following:
 - LCD display shows `charger connected`.
 - A beep is heard.
 - Keypad back-light is turned ON.
 - Charging icon is shown.
7. Verify that the battery charger is in progress.



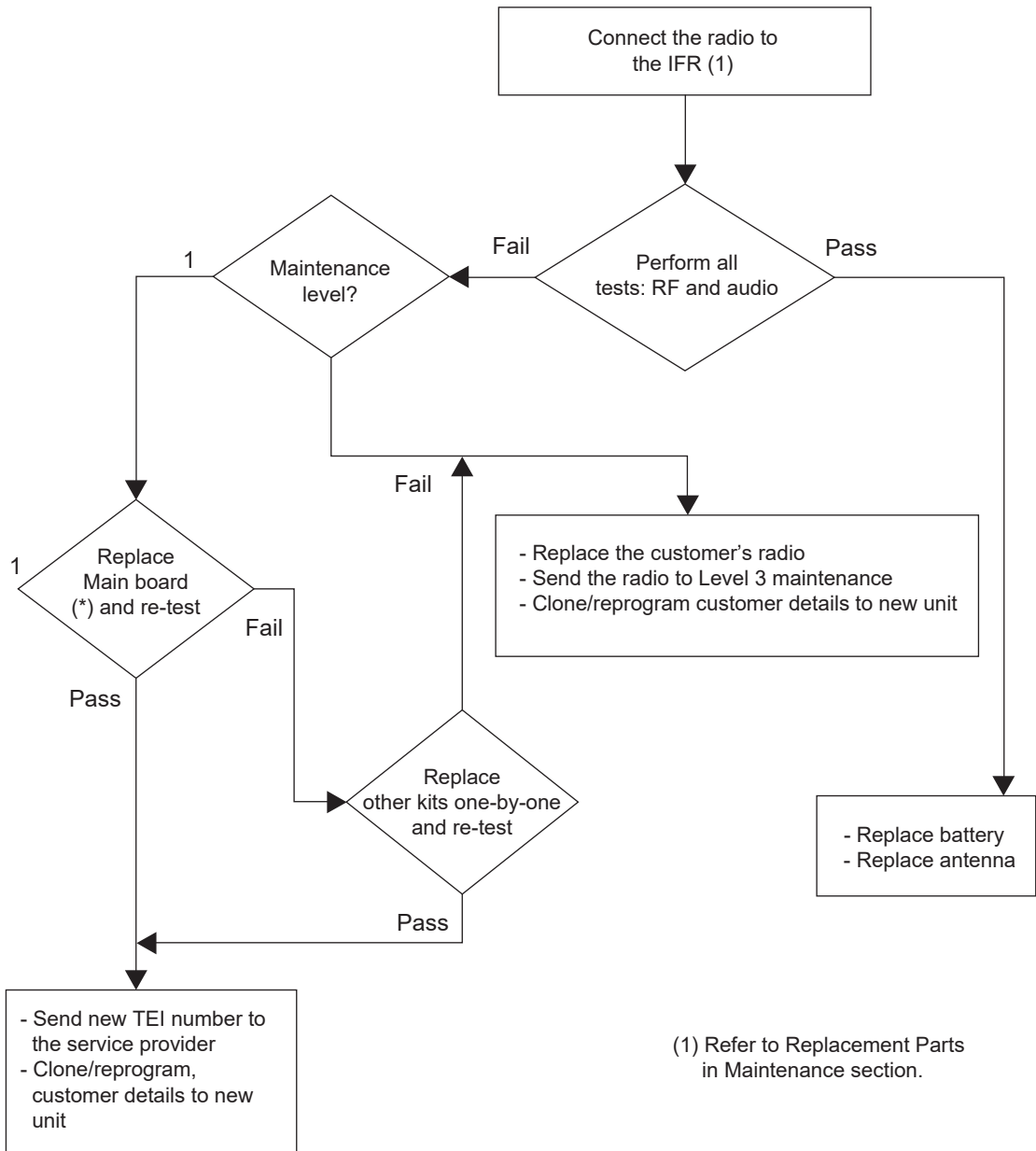
NOTE: The process advance is indicated on the Battery Strength icon.

- 8. Press the **Power ON/OFF**.
The radio turns OFF.

4.13 Service Flowchart

The service flowchart shows the expected results and their next required actions for the testing procedure of the radio.

Figure 5: Service Flowchart



Note: (*) Main Board – See Service Replacement Kit, in Appendix A. Not field replaceable for Latin America.

Chapter 5

Maintenance

This chapter provides information about the care and maintenance of this radio.

5.1

Preventive Maintenance

Periodic visual inspection and cleaning are recommended.

Inspection

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

Cleaning Procedures

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

External surfaces include the front cover, housing assembly, and battery. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime.



CAUTION: Use all chemicals as prescribed by the manufacturer. Follow all safety precautions as defined on the label or material safety data sheet. The effects of certain chemicals and their vapors can have harmful results on certain plastics. Avoid using aerosol sprays, tuner cleaners, and other chemicals.



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 soft brush to clean the bottom connectors (do not use fluids).

Cleaning External Plastic Surfaces



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

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

Cleaning Internal Circuit Boards and Components



IMPORTANT:

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

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

Apply Isopropyl alcohol (100%) with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of your radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since it can cause the liquid to collect in unwanted

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

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 create 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.

Handling precautions are mandatory for CMOS/LDMOS circuits and are especially important in low humidity conditions. Do not attempt to disassemble your radio without referring to the following caution statement.



CAUTION:

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

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

5.3

Accessories Replacement Parts List

Table 24: Batteries

Part Number	Description
NNTN8020_	1650M 1700T Standard Lithium-Ion Battery

Part Number	Description
NNTN8020_C	1650M 1700T Standard Lithium-Ion Battery, China
NNTN8023_	2150M 2200T Hi-Capacity Lithium-Ion Battery
NNTN8023_C	2150M 2200T Hi-Capacity Lithium-Ion Battery, China
PMNN4522_	IMPRES 2™ 3400 mAh Hi-Capacity Lithium-Ion Battery

Table 25: Chargers and Charging Accessories

Part Number	Description
NNTN6844_	TETRA Multi-Unit Charger – Wall Mount Bracket
NNTN7560_	TETRA Multi-Unit Charger Base Tray
NNTN8234_	Desktop Dual-Unit Charger Base Only
NNTN8244_	Desktop Dual-Unit Charger, US plug
NNTN8245_	Desktop Dual-Unit Charger, Euro plug
NNTN8245_A	Desktop Dual-Unit Charger, Euro/APAC plug
NNTN8246_	Desktop Dual-Unit Charger, UK plug
NNTN8246_A	Desktop Dual-Unit Charger, UK/APAC 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
NNTN8252_	Charger, Switch Mode Power Supply, Barrel, 110–240 V, UK plug
NNTN8253_	Charger, Switch Mode Power Supply, Barrel, 110–240 V, US plug
NNTN8254_	Charger, Switch Mode Power Supply, Barrel, 110–240 V, Euro plug
NNTN8255_	Charger, Switch Mode Power Supply, Barrel, 110–240 V, Australia/NZ plug
NNTN8258_	Power Supply, D_Charger, Switch Mode Power Supply, 25012023002 Korea plug
NNTN8260_	Charger, Switch Mode Power Supply, Barrel, 110–240V, China plug
NNTN8036_	Radio Insert for 6-Pockets Multi-Unit Charger
NNTN8037_	Battery Insert for 6-Pockets Multi-Unit Charger
NNTN8144_	TETRA Multi-Unit Charger, Radio ITM Insert, NA/LA
NNTN8145_	TETRA Multi-Unit Charger, Radio ITM Insert, Euro
NNTN8146_	TETRA Multi-Unit Charger, Radio ITM Insert, UK
NNTN8147_	TETRA Multi-Unit Charger, Radio ITM Insert, Australia/NZ
NNTN8148_	TETRA Multi-Unit Charger, Radio ITM Insert, Argentina
NNTN8149_	TETRA Multi-Unit Charger, Radio ITM Insert, Korea
NNTN8150_	TETRA Multi-Unit Charger, Radio ITM Insert, China
NNTN8164_	TETRA Multi-Unit Charger, Radio ITM Insert, Brazil

Part Number	Description
NNTN8151_	TETRA Multi-Unit Charger, Battery Alone Insert, NA/LA
NNTN8152_	TETRA Multi-Unit Charger, Battery Alone Insert, Euro
NNTN8153_	TETRA Multi-Unit Charger, Battery Alone Insert, UK
NNTN8155_	TETRA Multi-Unit Charger, Battery Alone Insert, Argentina
NNTN8165_	TETRA Multi-Unit Charger, Battery Alone Insert, Brazil
NNTN8040_	Vehicular Power Adapter, 12–24 V
NNTN8038_	Personal Charger, Switch Mode Power Supply, 110–240 V, US plug
NNTN8039_	Personal Charger, Switch Mode Power Supply, 110–240 V, Brazil plug
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
NNTN8137_	Personal Charger, Switch Mode Power Supply, 25012023003 Korea plug
NNTN8159_	Personal Charger, Switch Mode Power Supply, 110–240 V, China plug

Table 26: 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
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
HLN9714_	2.5 inch Large Belt Clip
JMZN4020_	Hand Strap For Radio
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
PMLN5885_	Hard Leather Case 3 inch Swivel Belt Loop, Full Keypad and Limited Keypad model
PMLN5887_	Soft Leather Case 3 inch Swivel Belt Loop Full Keypad and Limited Keypad model

Part Number	Description
PMLN5888_	Soft Leather Case 2.5 inch Swivel Belt Loop Full Keypad and Limited Keypad model
PMLN5890_	Soft Leather Pouch, use with Peter Jones 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 27: Audio Accessories

Part Number	Description
PMMN4072_	IMPRES™ Large Noise-Canceling Remote Speaker Microphone, with 3.5 mm audio jack and Emergency button, IP54
PMMN4074_	IMPRES™ Small Windporting Remote Speaker Microphone, with 3.5 mm audio jack and Emergency button, IP55
PMMN4075_	RSM Small Windporting Remote Speaker Microphone, no Emergency button, IP57
PMMN4078_	RSM Small Windporting Remote Speaker Microphone, with 3.5 mm audio jack and Emergency button, IP55
PMLN5724_	2-Wire Surveillance Kit, Black
PMLN5726_	2-Wire Surveillance Kit, Beige
PMLN5727_	Mag One swivel earpiece with in-line microphone and push-to-talk
PMLN5728_	Mag One swivel receive-only earpiece with short cord for shoulder-worn radio, black
PMLN5729_	IMPRES Bone Conduction Ear Microphone with in-line large push-to-talk with protective ring
PMLN5731_	Heavy-Duty Headset with Noise-Canceling boom microphone and in-line push-to-talk, 24 dB noise reduction rating
PMLN5732_	Mag One lightweight Earset with boom microphone and in-line push-to-talk
PMLN5733_	Mag One Earbud with in-line microphone and push-to-talk button
PMLN4620_	D-Shell Receive-Only Earpiece (3.5 mm)
MDRLN4941_	Receive-Only Earpiece with Translucent Tube and Rubber Ear-tip
MDRLN4885_	Receive-Only Covered Ear-bud with Coiled Cord and 3.5 mm Plug
WADN4190_	Receive-Only Flexible Earpiece with Coiled Cable and 3.5 mm Plug

Table 28: Antennas

Part Number	Description
85012034001	Stubby 80 mm (350–390 MHz)
85012033001	Stubby 80 mm (380–430 MHz)
85012056001	Stubby 55mm (380–430 MHz)
AN000251A01	Stubby 55 mm (380–430 MHz)

Part Number	Description
	(Replacement of 85012056001 once inventory depletes.)
85012031001	Whip 110 mm (380–430 MHz)
85012069001	Stubby 36.6 mm (806–870 MHz)
85012070001	Whip 70 mm (806–870 MHz)

Table 29: Programming Cable

Part Number	Description
PMKN4127_	Bottom Connector Serial Data Cable
PMKN4129_	TETRA USB Data Cable

Table 30: Miscellaneous

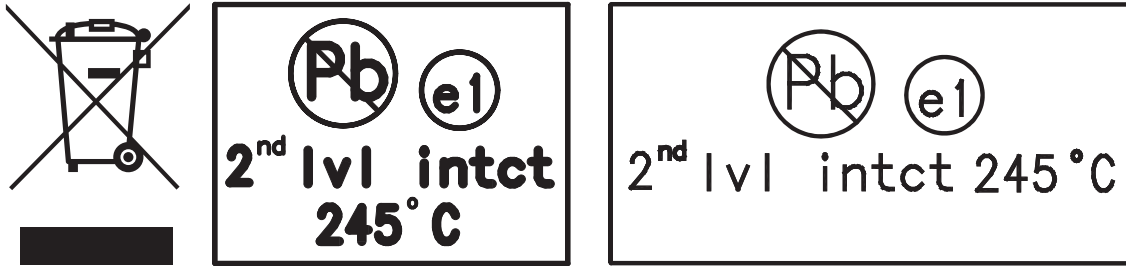
Part Number	Description
PMHN4178_	Slim Connector Dust Cover Assembly
PMHN4210_	Bottom Connector Dust Cover
PMLN6285_	5-Color Rings for Antenna (Blue)
PMLN6286_	5-Color Rings for Antenna (Pearl White)
PMLN6287_	5-Color Rings for Antenna (Neon Green)
PMLN6288_	5-Color Rings for Antenna (Neon Yellow)
PMLN6289_	5-Color Rings for Antenna (Neon Red)
PMUE4100_ (AES128)	Encryption IC board
PMUE4101_ (AES256)	Encryption IC board
36012016002	Volume knob
36012017002	Frequency knob

5.4

General Repair Procedures and Techniques

Environmentally Preferred Products (EPP) were developed and assembled using environmentally preferred components and solder assembly techniques. These 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 specified parts 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 to those 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 31: 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 32: Lead Free Solder Paste Part Number List

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

Parts Replacement and Substitution

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

Rigid Circuit Boards

This family of radios 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 may interconnect multiple layers of the printed circuit. Therefore, exercise care to avoid pulling the plated circuit out of the hole.

When soldering near a connector:

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

For soldering components with Hot-Air or 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

The radio (device with antenna and battery assembled) is IP67 compliant. It is fully protected from dust, and can withstand being submerged up to 30 minutes in one meter 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 will decrease 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.

5.5

Level 1 and Level 2 Maintenance

This manual covers Level 1 and Level 2 Maintenance.

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

5.6

Protection of Static-Sensitive Devices

This unit contains static-sensitive devices. Static-sensitive devices must be protected 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 ohm resistor to 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 might have accumulated.

Store or Transport a Circuit Board

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

5.7

Torque Specification Chart for Full Keypad Radio

Table 33: Torque Specification Chart for Full Keypad Radio

Description	Part/Kit	Quantity	Torque
Back chassis screw (M2.5)	03012039002	4	5.5±0.1 in-lb (0.62±0.011 Nm)

Description	Part/Kit	Quantity	Torque
Main board screw (M2 self tap)	0375375A01	2	2.5±0.1 in-lb (0.28±0.011 Nm)
Speaker retainer screw (M1.4 self tap)	0386434Z02	1	2.5±0.1 in-lb (0.28±0.011 Nm)
SIM card screw (M1.4)	03012036001	1	1.75±0.1 in-lb (0.2±0.011 Nm)
Keypad bezel screw (M1.4 self tap)	0386434Z03	4	2.5±0.1 in-lb (0.28±0.011 Nm)

5.8

Torque Specification Chart for Limited Keypad Radio

Table 34: Torque Specification Chart for Limited Keypad Radio

Description	Part/Kit	Quantity	Torque
Back chassis screw (M2.5)	03012039002	4	5.5±0.1 in-lb (0.62±0.011 Nm)
Main board screw (M2 self tap)	0375375A01	2	2.5±0.1 in-lb (0.28±0.011 Nm)
Speaker retainer screw (M1.4 self tap)	0386434Z02	1	2.5±0.1 in-lb (0.28±0.011 Nm)
SIM card screw (M1.4)	03012036001	1	1.75±0.1 in-lb (0.2±0.011 Nm)
Keypad bezel screw (M1.4 self tap)	0386434Z03	4	2.5±0.1 in-lb (0.28±0.011 Nm)

5.9

Replacement Parts

Damaged parts must be replaced 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.

5.9.1

MTP3000 Series Full Keypad Radios Exploded View

The [MTP3000 Series Full Keypad Radios Replacement Parts List on page 78](#) provides the part/kit numbers of the components shown in the following exploded view diagrams.

Figure 6: Full Keypad – Exploded View 1

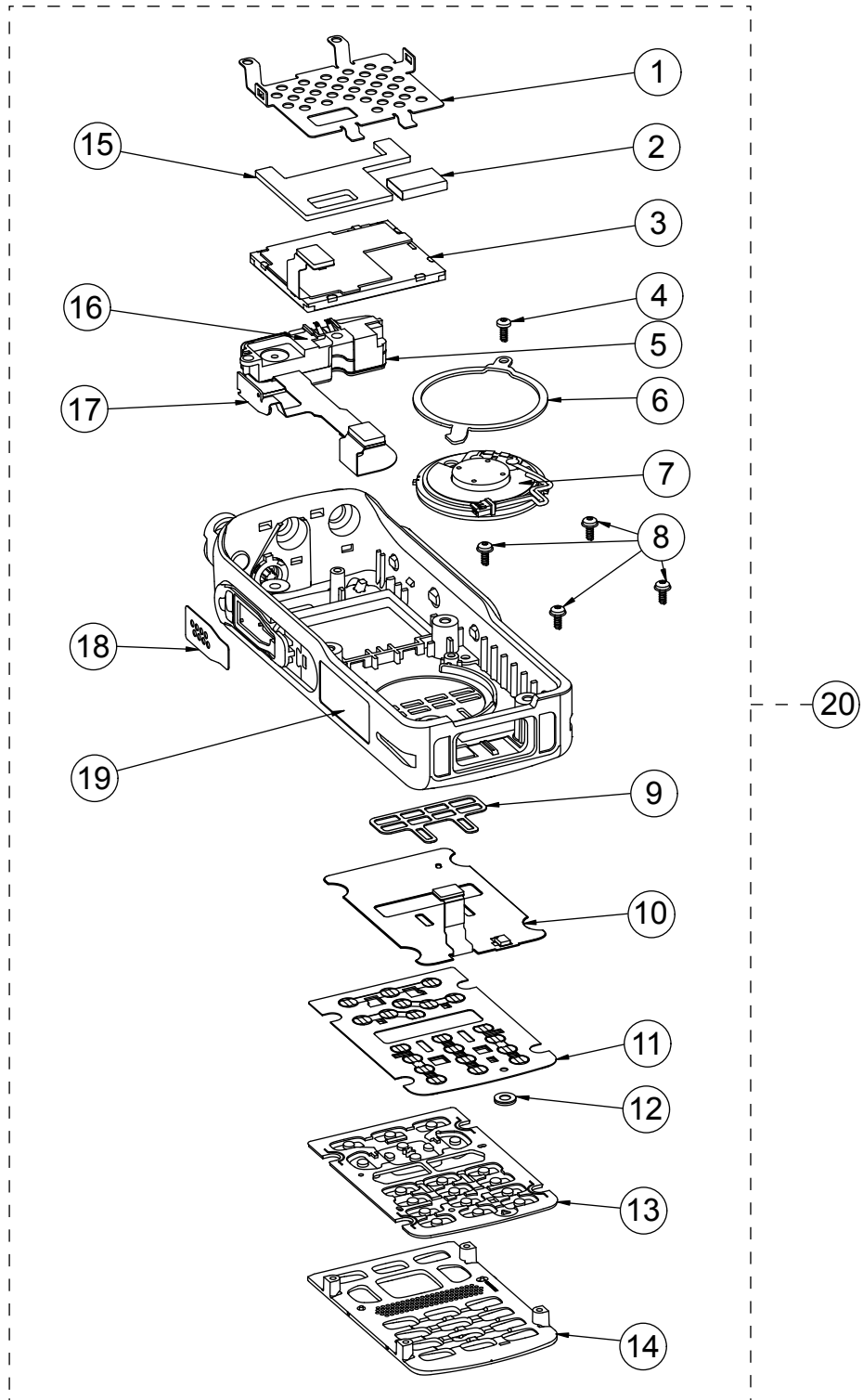


Figure 7: Full Keypad – Exploded View 2

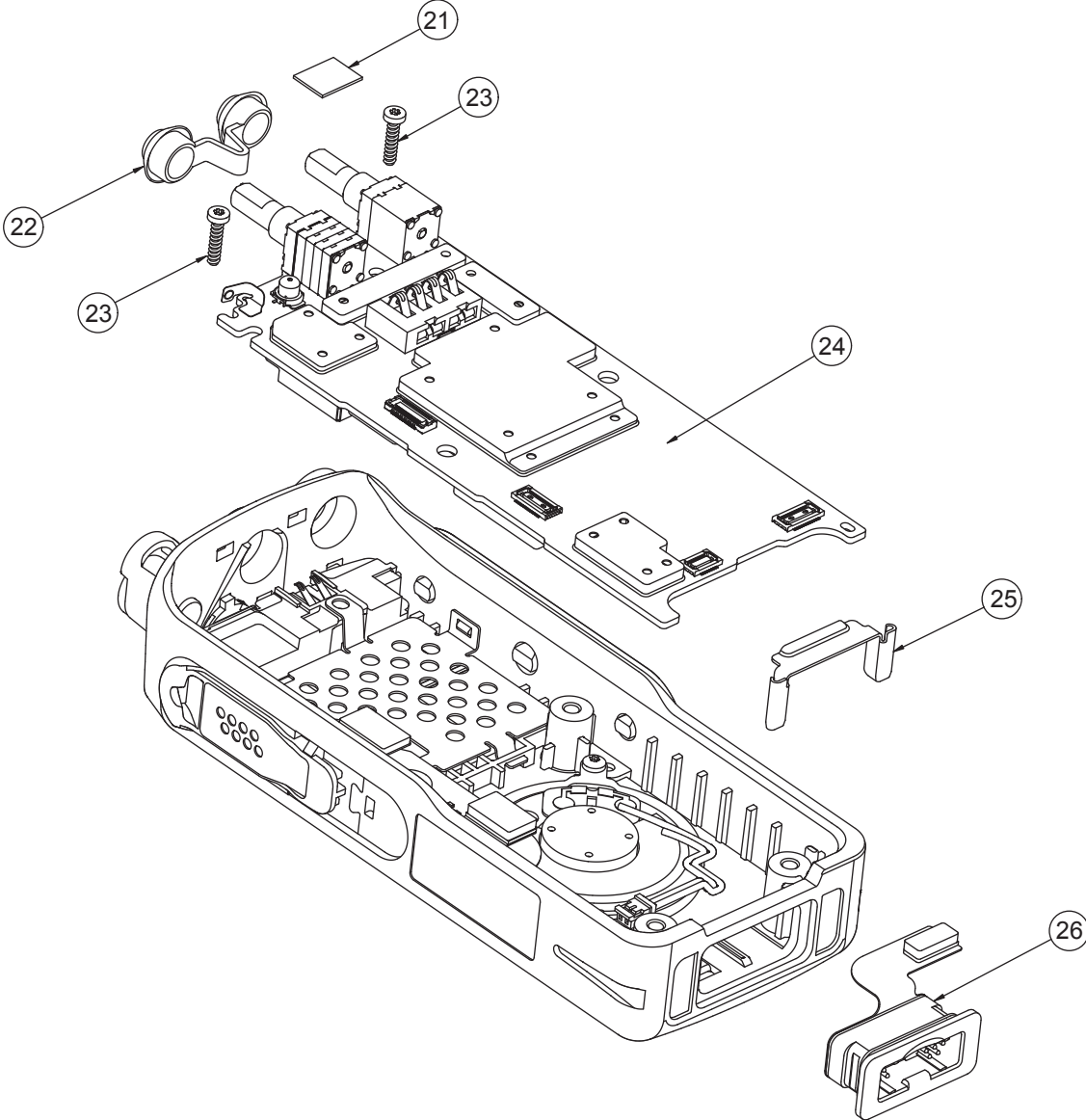


Figure 8: Full Keypad – Exploded View 3

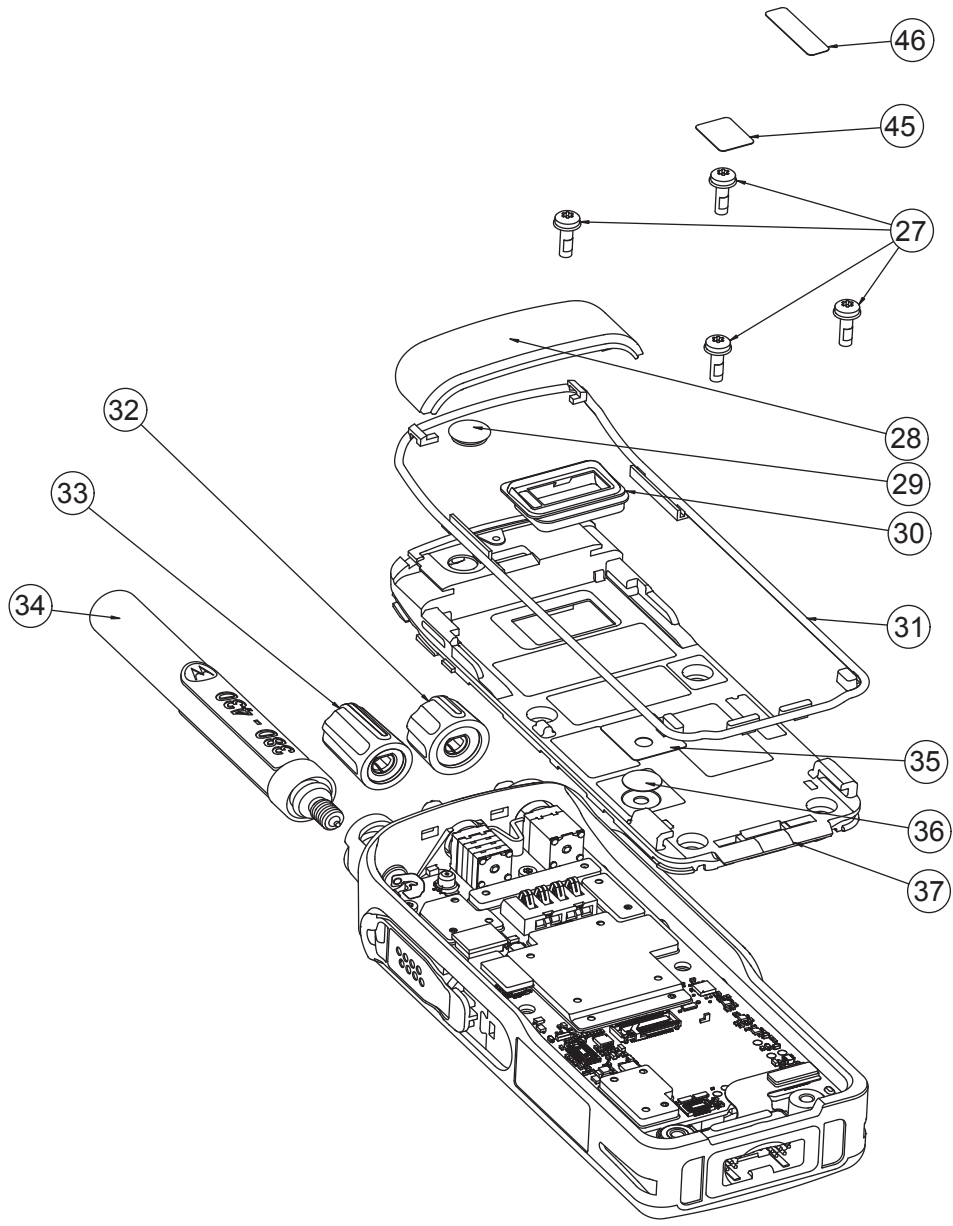


Figure 9: Back Chassis Assembly (SIM) – Part No. 0104045J11

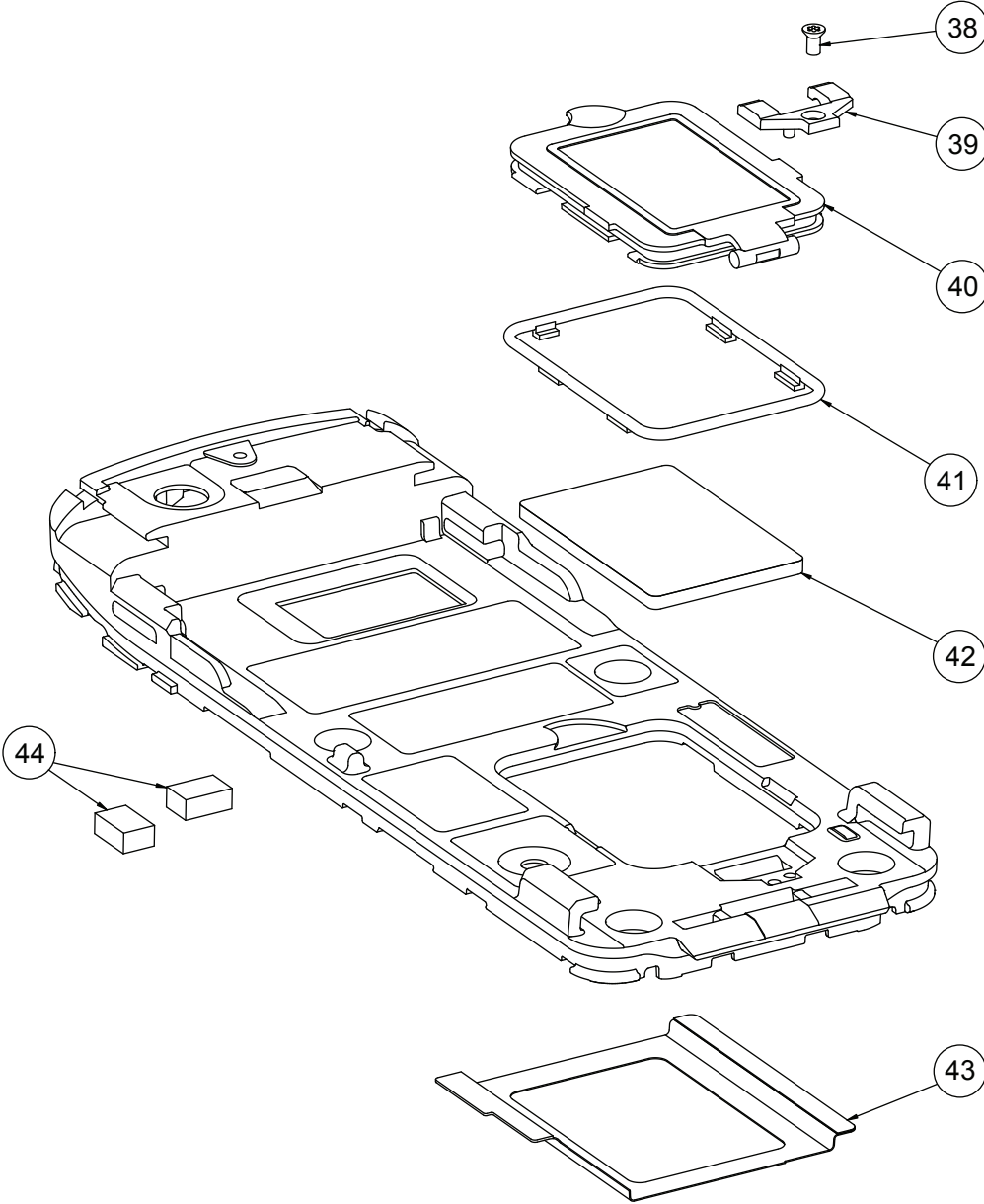


Figure 10: Back Chassis Assembly (Plain) – Part No. 0104054J35

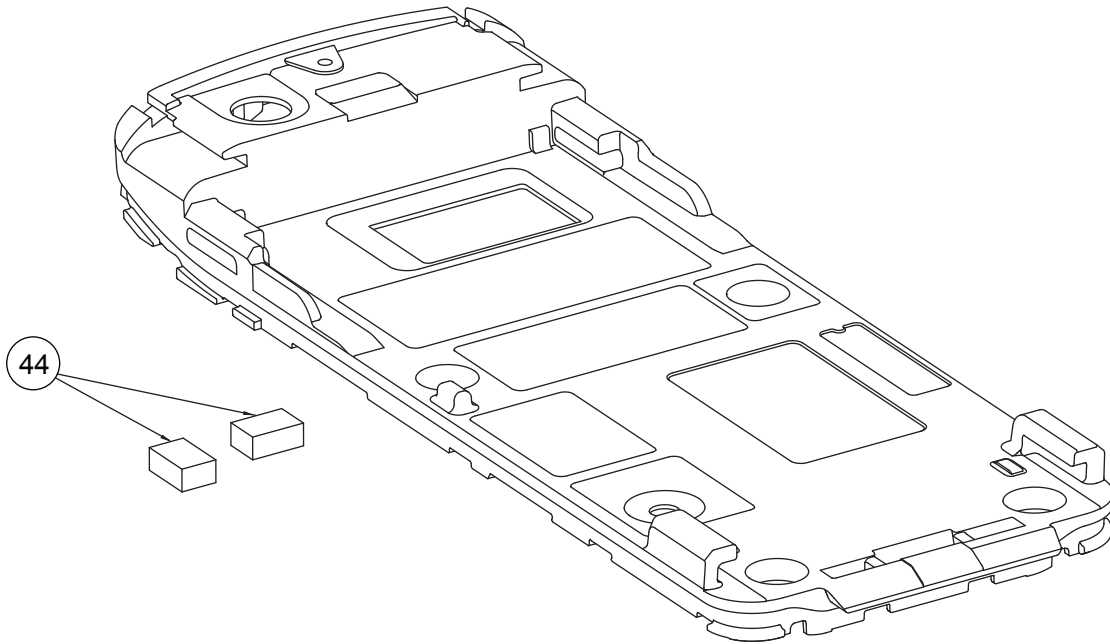
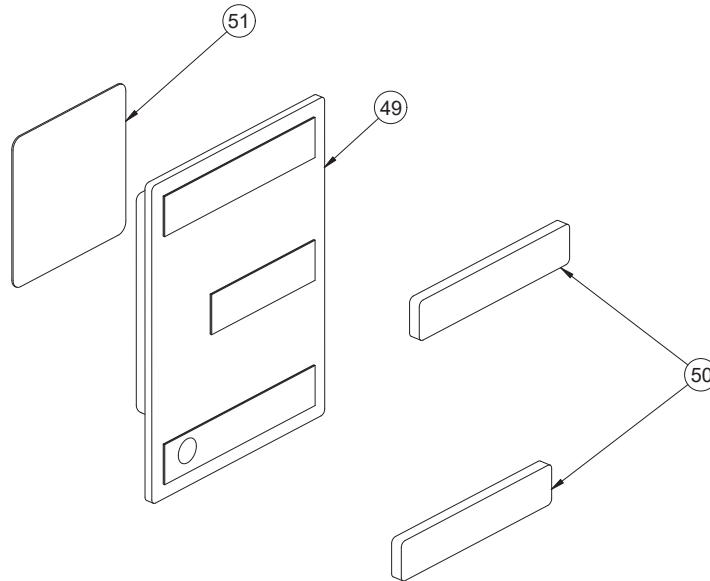


Figure 11: Encryption IC Exploded View



5.9.1.1

MTP3000 Series Full Keypad Radios Replacement Parts List

Table 35: MTP3000 Series Full Keypad Radios Replacement Parts List

No.	Part/Kit Number	Description	Remark
1	42012047001	LCD retainer	Serviceable. Bend the side latches to 90° angle after servicing and before assembly.


No.	Part/Kit Number	Description	Remark
2	75012148002	LCD module conductive pad	Serviceable.
3	72012010002	LCD module	
4	0386434Z02	Speaker retainer screw	
5	–	Seal, earpiece	Not serviceable. Included in item #19.
6	42012045001	Speaker retainer	Serviceable.
7	50012013002	Speaker assembly	
8	0386434Z03	Keypad bezel screw M1.4	
9	–	Speaker mesh	Not serviceable. Included in item #19.
10		Full keypad flex assembly	Not serviceable. Included in item #20.
11		Mylar dome, main keypad	
12		Membrane, bottom mic	
13	75012097001 ²	Main keypad (Hebrew)	Serviceable.
	75012097002 ³	Main keypad (Chinese)	
	75012097003 ³	Main keypad (Bopomofo)	
	75012097004 ²	Main keypad (Cyrillic)	
	75012097005 ²	Main keypad (Arabic)	
	75012097006 ³	Main keypad (Korea)	
	75012097007 ²	Main keypad (Roman)	
	75012097008 ³	Main keypad (Japanese)	
14	13012019001	Keypad bezel	
15	75012099001	LCD module back pad	
16	–	Bluetooth antenna assembly	Not serviceable. Included in item #19. ⁴
17		UC+ earpiece flex assembly	
18	33012020001	UC Escutcheon	Serviceable. Included in item #19.
19	0104042J07 ⁵	Front housing assembly	Not serviceable. Comprises of item #5, 9, 16, 17, and 18.
	0104064J81	Front housing assembly, MTP3550	
	0104065J27 ⁶	Front housing assembly without Bluetooth	
	0104065J29 ⁶	Front housing assembly with Bluetooth	

² Available in EMEA region.

³ Available in APAC region.

⁴ Bluetooth is not applicable for MTP3150.

⁵ MTP3150 and MTP3250 Version A. This radio model displays **MOTOROLA** above the user interface screen.

⁶ MTP3150 and MTP3250 Version B. This radio model displays  **MOTOROLA** above the user interface screen.

No.	Part/Kit Number	Description	Remark
20	PMHN4169_Z ^{2, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Hebrew)	Serviceable. Comprises of item #19. ⁴
	PMHN4181_Z ⁵	Front Housing Hardware Kit with Bluetooth Antenna (Roman)	
	PMHN4182_Z ^{3, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Chinese)	
	PMHN4183_Z ^{2, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Cyrillic)	
	PMHN4184_Z ^{3, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Bopomofo)	
	PMHN4185_Z ^{2, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Arabic)	
	PMHN4217_Z ^{3, 5}	Front Housing Hardware Kit with Bluetooth Antenna (Korea)	
	PMHN4287_Z	Front Housing Hardware Kit with Bluetooth Vibrator (Roman), MTP3550	
	PMHN4292_Z ⁶	Front Housing Hardware Kit with Bluetooth (Roman)	
	PMHN4303_Z ³	Front Housing Hardware Kit with Bluetooth Vibrator (Chinese), MTP3550	
	PMHN4304_Z ²	Front Housing Hardware Kit with Bluetooth Vibrator (Cyrillic), MTP3550	
	PMHN4305_Z ³	Front Housing Hardware Kit with Bluetooth Vibrator (Taiwanese), MTP3550	
	PMHN4306_Z ²	Front Housing Hardware Kit with Bluetooth Vibrator (Arabic), MTP3550	
	PMHN4307_Z ²	Front Housing Hardware Kit with Bluetooth Vibrator (Hebrew), MTP3550	
	PMHN4308_Z ³	Front Housing Hardware Kit with Bluetooth Vibrator (Korea), MTP3550	
	PMHN4309_Z ³	Front Housing Hardware Kit with Bluetooth Vibrator (Japanese), MTP3550	
	PMHN4311_Z ^{3, 6}	Front Housing Hardware Kit with Bluetooth (Chinese)	
	PMHN4312_Z ^{2, 6}	Front Housing Hardware Kit with Bluetooth (Cyrillic)	
	PMHN4313_Z ^{3, 6}	Front Housing Hardware Kit with Bluetooth (Taiwanese)	
	PMHN4314_Z ^{2, 6}	Front Housing Hardware Kit with Bluetooth (Arabic)	
	PMHN4315_Z ^{2, 6}	Front Housing Hardware Kit with Bluetooth (Hebrew)	

No.	Part/Kit Number	Description	Remark
	PMHN4316_Z ^{3, 6}	Front Housing Hardware Kit with Bluetooth (Korea)	
	PMHN4317_Z ^{3, 6}	Front Housing Hardware Kit with Bluetooth (Japanese)	
21	75012091001 ⁵	Thermal pad	Serviceable. Replace with a new thermal pad if found cracked/torn.
	BU000063A01 ^{5, 6}	Thermal pad, MTP3550	
22	32012177001	Control top seal	Serviceable.
23	0375375A01	Screw M2.0	
24	Refer to Table 42: Service Replacement Kit Matrix on page 130	Main board kit	
25	42012039002	Bottom connector locking retainer	
26	0104042J09	Bottom connector flex assembly	
27	03012039001 ⁶	Screw M2.5, MTP3550	
	03012039002 ⁵	Screw M2.5	
28	15012128001 ⁵	Back cover	
	15012128002 ⁶	Back cover, MTP3550	
29	32012139001	RF switch seal	
30	32012124001 ⁵	Battery connector seal	
	SL000220A01 ⁶	Battery connector seal, MTP3550	
31	32012135001	Main O-ring	Serviceable. Replace with a new main O-ring after servicing.
32	36012029001	RFID knob (offered as an option through DC)	Serviceable.
	36012016002	Volume knob (by default)	
33	36012017002	Frequency knob	
34	85012031001	Antenna whip 380–430 MHz	
	85012033001	Antenna stubby 380–430 MHz	
	85012056001		
	AN000251A01 ⁷		
	85012034001 ³	Antenna stubby 350–390 MHz	
	85012065001	Antenna whip 410–470 MHz	
	85012066001	Antenna short stubby 410–470 MHz	
	85012069001 ^{3, 8}	Antenna stubby 806–870 MHz	
	85012070001 ^{3, 8}	Antenna whip 806–870 MHz	

⁷ Replacement of 85012056001 after inventory depletes.

⁸ Available in LACR region.

No.	Part/Kit Number	Description	Remark
35	54012165001	Ventilation label	Serviceable. Replace together with item #36.
36	3286058L01	Gore port	Serviceable. Replace together with item #35.
37	0104054J35 ⁵	Back chassis assembly (Plain)	Serviceable.
	0104045J11 ^{2, 5, 8, 9}	Back chassis assembly (SIM)	
	0104064J82 ⁶	Back Chassis Assembly (SIM), MTP3550	
	0104064J83 ⁶	Back Chassis Assembly (Plain), MTP3550	
38	03012036001 ^{2, 8, 9}	Screw M1.4	
39	55012011002 ^{2, 8, 9}	SIM door catch	
40	15012112001 ^{2, 8, 9}	SIM door	
41	32012119001 ^{2, 8, 9}	SIM door O-ring	
42	75012167001 ^{2, 8, 9}	SIM door pad	Not serviceable. Order together with item #40.
43	13012029001 ^{2, 8, 9}	SIM door escutcheon	Serviceable.
44	75012176001	Chassis conductive pad	Serviceable. Replace when chassis is removed.
45	54012164001	Tamper label	
46	33012021001 ^{5, 6}	Model label	Serviceable.
	33012021010 ^{5, 6}		
	33012021013	Model label, MTP3550	
47	BR000138A01	PTT metal plate	Serviceable. Assemble to any returned housing without a PTT metal plate.
48	0104064J98	Vibrator and boot assembly	Serviceable. This part is for MTP3550 only.
49	PMUE4100_ (AES128)	Encryption IC board	Serviceable.
	PMUE4101_ (AES256)		
50	75012188001	Conductive pad	Serviceable.
51	11012100001	Conductive adhesive	Serviceable. Replace with a new unit after every service.

⁹ Not offered for 800 MHz radio models.

5.9.2

MTP3000 Series Limited Keypad Radios Exploded View

The [MTP3000 Series Limited Keypad Radios Replacement Parts List on page 87](#) provides the part/kit numbers of the components shown in the following exploded view diagrams.

Figure 12: Limited Keypad – Exploded View 1

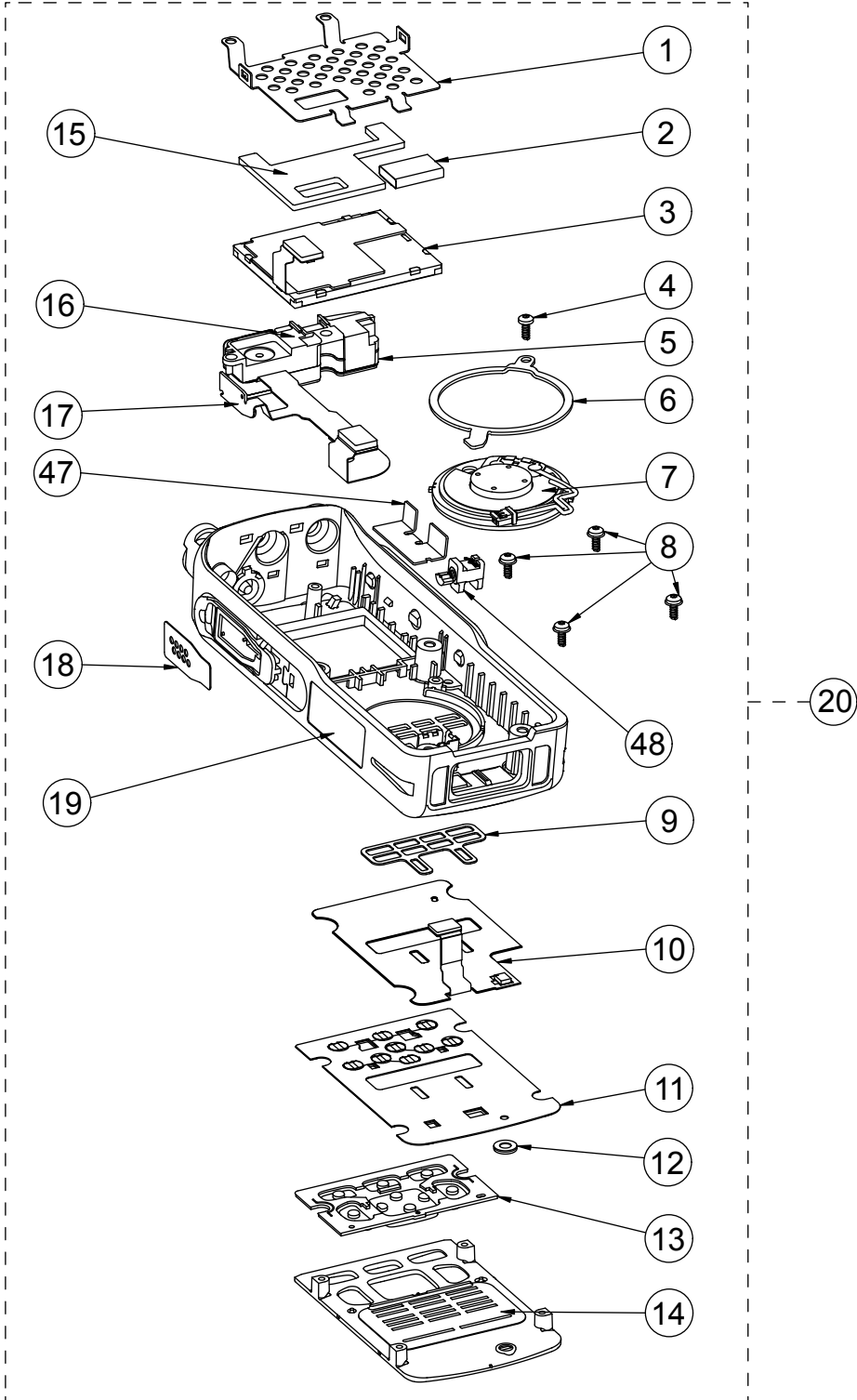


Figure 13: Limited Keypad – Exploded View 2

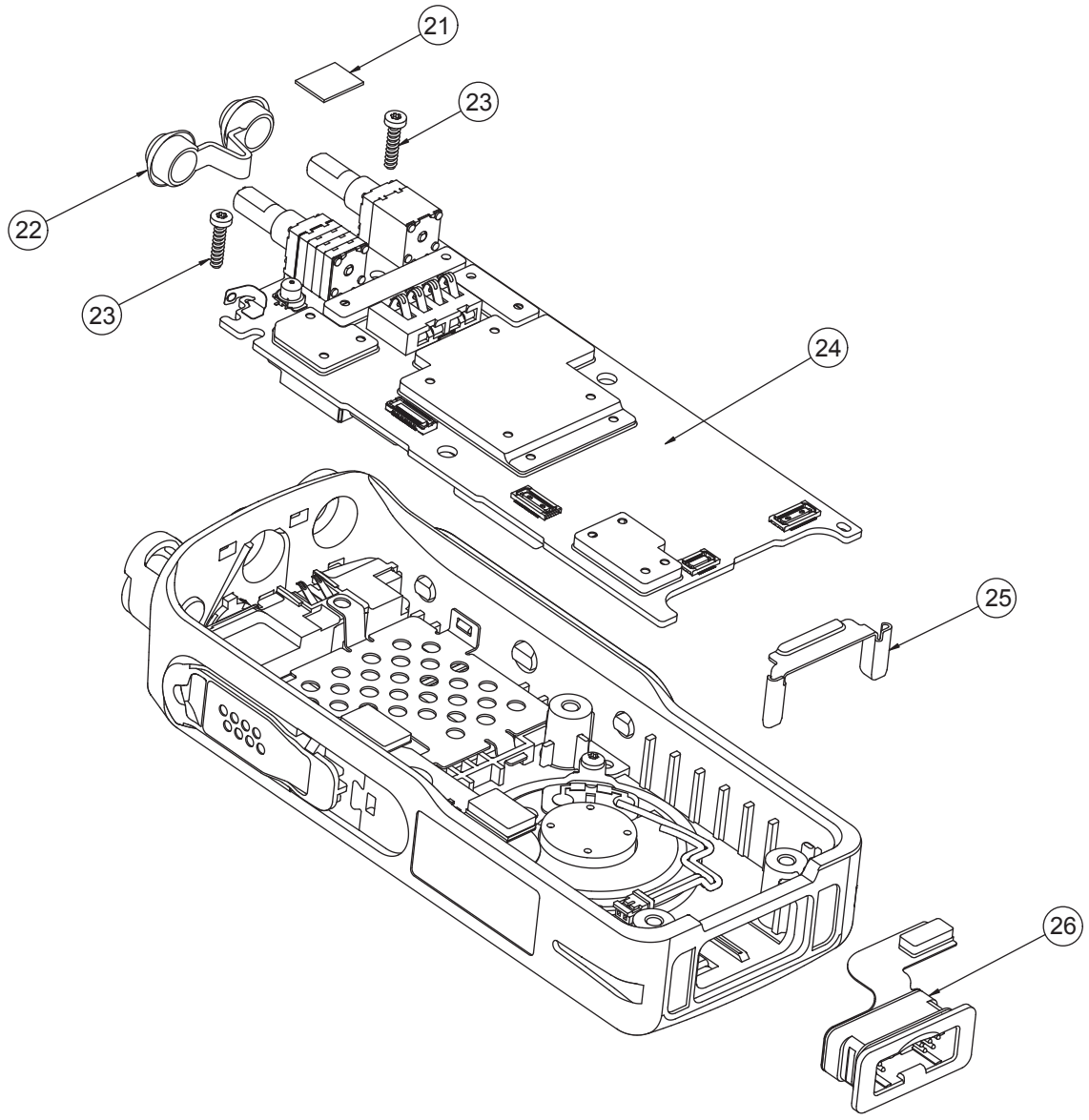


Figure 14: Limited Keypad – Exploded View 3

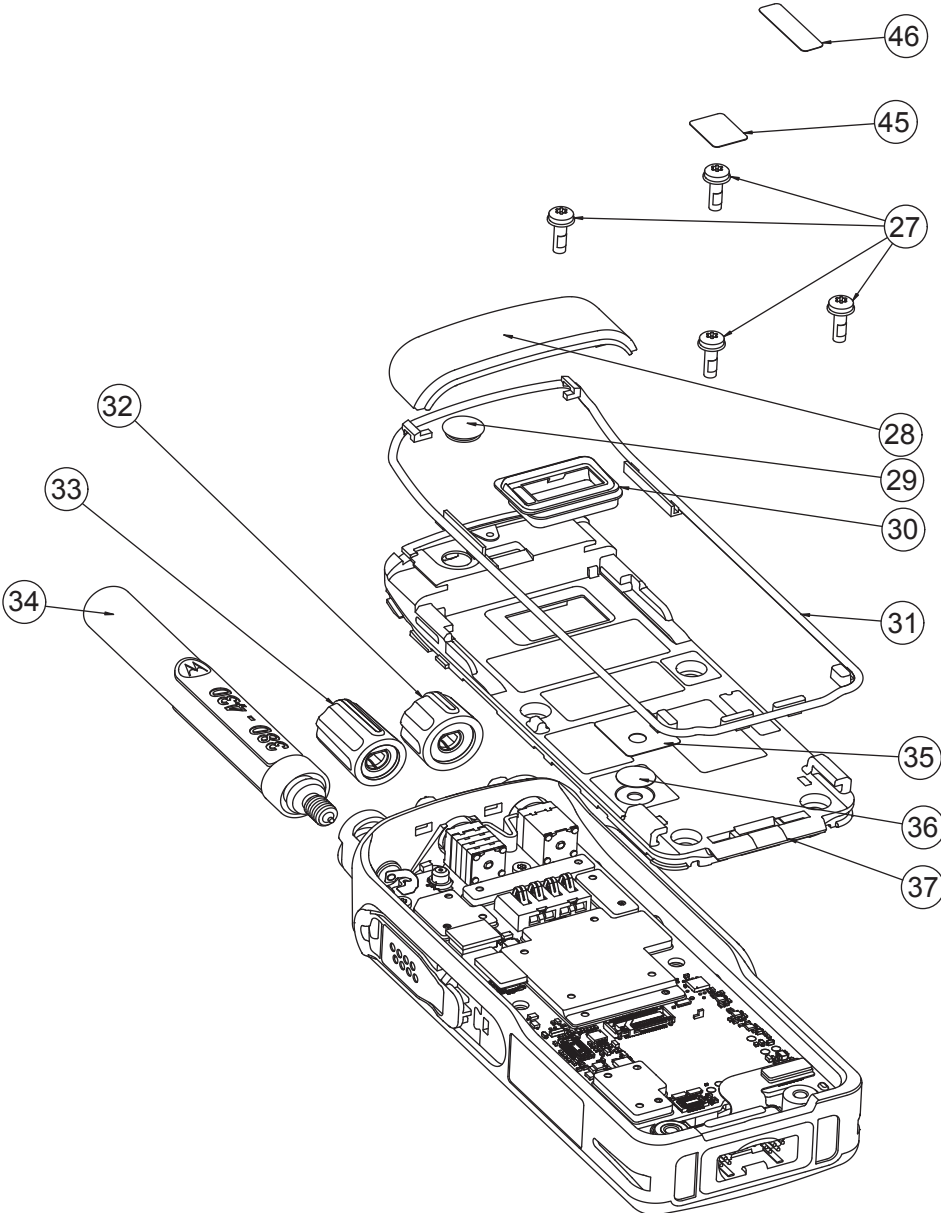


Figure 15: Back Chassis Assembly (SIM) – Part No. 0104045J11

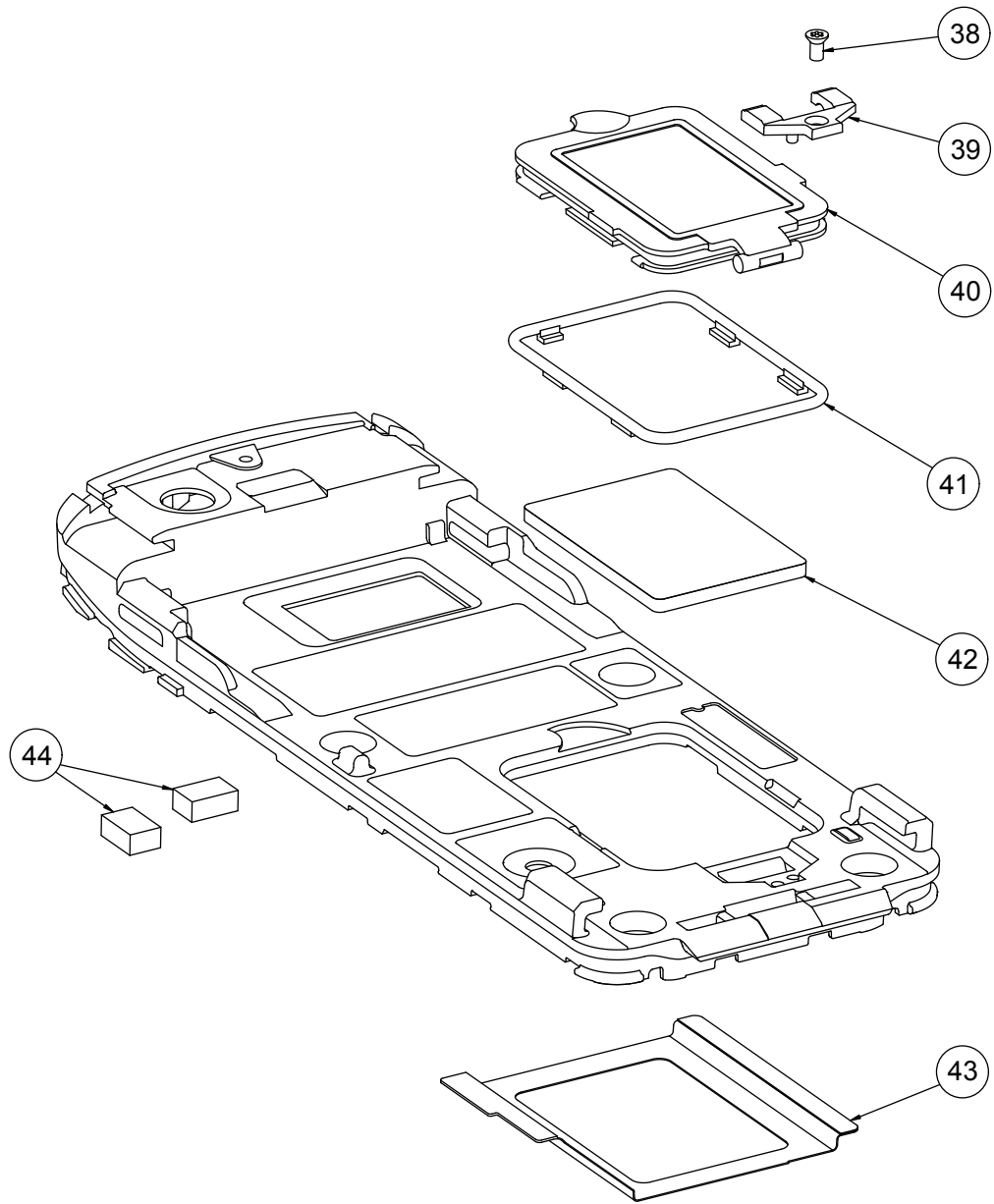


Figure 16: Back Chassis Assembly (Plain) – Part No. 0104054J35

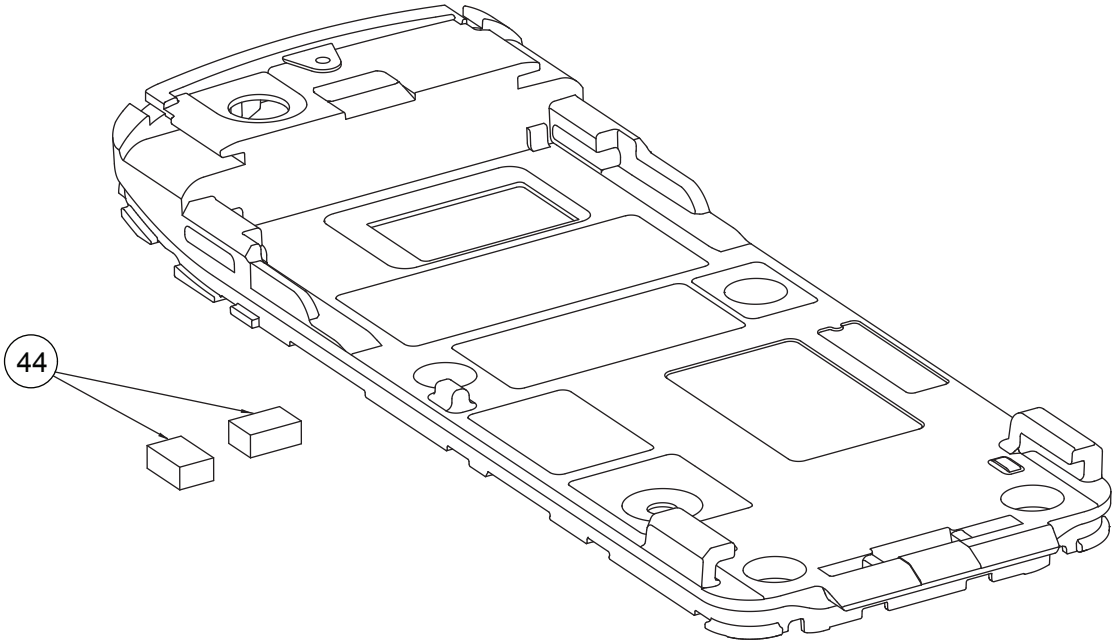
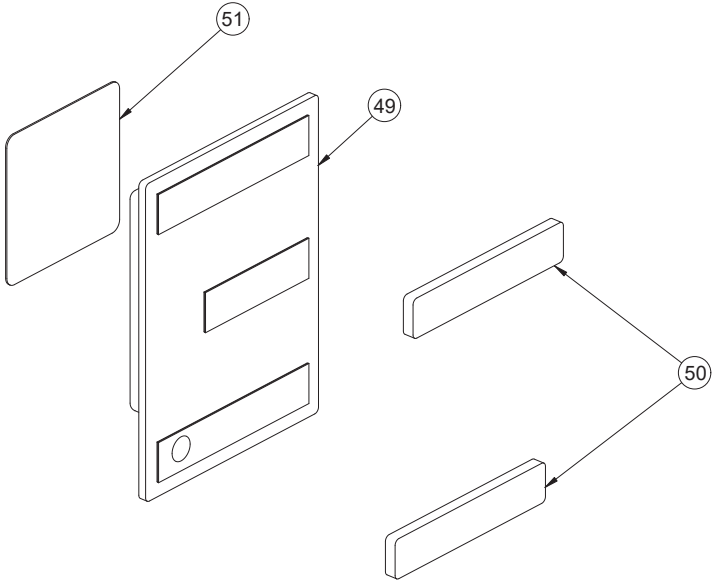


Figure 17: Encryption IC Exploded View



5.9.2.1
MTP3000 Series Limited Keypad Radios Replacement Parts List

Table 36: MTP3000 Series Limited Keypad Radios Replacement Parts List


No.	Part/Kit Number	Description	Remark
1	42012047001	LCD retainer	Serviceable. Bend the side latches to 90° angle

No.	Part/Kit Number	Description	Remark
			after servicing and before assembly.
2	75012148002	LCD module conductive pad	Serviceable.
3	72012010002	LCD module	
4	0386434Z02	Speaker retainer screw	
5	–	Seal, earpiece	Not serviceable. Included in item #19.
6	42012045001	Speaker retainer	Serviceable.
7	50012013002	Speaker assembly	
8	0386434Z03	Keypad bezel screw M1.4	
9	–	Speaker mesh	Not serviceable. Included in item #19.
10		Limited keypad flex assembly	Not serviceable. Included in item #20.
11		Mylar dome, main keypad	
12		Membrane, bottom mic	
13	75012096001	Main keypad	Serviceable.
14	13012018001	Keypad bezel	
15	75012099001	LCD module back pad	
16	–	Bluetooth antenna assembly Low audio capsule housing	Not serviceable. Included in item #19.
17		UC+ earpiece flex assembly	
18	33012020001	UC Escutcheon	Serviceable. Included in item #19.
19	0104042J07 ^{10, 11, 12}	Front housing assembly with Bluetooth antenna	Not serviceable. Comprises of 0104042J37, item #5, 9, 17, and 18.
	0104055J09 ¹²	Front housing assembly without Bluetooth antenna	Not serviceable. Comprises of 55012012001, item #5, 9, 17, and 18.
	0104064J81	Front housing assembly with Bluetooth antenna, MTP3500	Not serviceable. Comprises of 0104042J37, item #5, 9, 17, and 18.
	0104065J27 ¹³	Front housing assembly without Bluetooth antenna	Not serviceable. Comprises of 55012012001, item #5, 9, 17, and 18.

¹⁰ Available in EMEA region.

¹¹ Available in LACR region.

¹² MTP3100 and MTP3200 Version A. These radio models display **MOTOROLA** above the user interface screen.

¹³ MTP3100 and MTP3200 Version B. These radio models display  **MOTOROLA** above the user interface screen.

No.	Part/Kit Number	Description	Remark
	0104065J29 ¹³	Front housing assembly with Bluetooth antenna	Not serviceable. Comprises of 0104042J37, item #5, 9, 17, and 18.
20	PMHN4172_Z ¹²	Front housing hardware kit without Bluetooth antenna	Serviceable. Comprises of 55012012001 and item #19.
	PMHN4173_Z ¹²	Front housing hardware kit with Bluetooth antenna	Serviceable. Comprises of 0104042J37 and item #19.
	PMHN4293_Z ¹³	Front housing hardware kit with Bluetooth	
	PMHN4294_Z ¹³	Front housing hardware kit without Bluetooth antenna	Serviceable. Comprises of 55012012001 and item #19.
	PMHN4310_Z	Front housing hardware kit with Bluetooth vibrator, MTP3500	Serviceable. Comprises of 0104042J37 and item #19.
21	75012091001 ¹²	Thermal pad	Serviceable. Replace with a new thermal pad if found cracked/torn.
	BU000063A01 ^{12,13}	Thermal pad, MTP3500	
22	32012177001	Control top seal	Serviceable.
23	0375375A01	Screw M2.0	
24	Refer to Table 43: Service Replacement Kit Matrix for Mainboard (EMEA) on page 134.	Main board kit	
25	42012039002	Bottom connector locking retainer	
26	0104042J09	Bottom connector flex assembly	
27	03012039001 ¹³	Screw M2.5, MTP3500	
	03012039002 ¹²	Screw M2.5	
28	15012128001 ¹²	Back cover	
	15012128002 ¹³	Back cover, MTP3500	
29	32012139001	RF switch seal	
30	32012124001 ¹²	Battery connector seal	
	SL000220A01 ¹³	Battery connector seal, MTP3500	
31	32012135001	Main O-ring	Serviceable. Replace with a new main O-ring after servicing.
32	36012016002	Volume knob (by default)	Serviceable.
	36012029001	RFID knob (offered as an option through DC)	
33	36012017002	Frequency knob	
34	85012034001 ¹⁴	Antenna stubby 350–390 MHz	

No.	Part/Kit Number	Description	Remark
	85012031001	Antenna whip 380–430 MHz	
	85012033001	Antenna stubby 380–430 MHz	
	85012056001		
	AN000251A0 ¹⁵		
	85012065001	Antenna whip 410–470 MHz	
	85012066001	Antenna short stubby 410–470 MHz	
	85012069001 ^{11, 14}	Antenna stubby 806–870 MHz	
	85012070001 ^{11, 14}	Antenna whip 806–870 MHz	
35	54012165001	Ventilation label	Serviceable. Replace together with item #36.
36	3286058L01	Gore port	Serviceable. Replace together with item #35.
37	0104045J11 ^{10, 11, 12, 16}	Back chassis assembly (SIM)	Serviceable.
	0104054J35 ¹²	Back chassis assembly (Plain)	
	0104064J82 ¹³	Back chassis assembly (SIM), MTP3500	
	0104064J83 ¹³	Back chassis assembly (Plain), MTP3500	
38	030120360014	Screw M1.4	
39	550120110022 ¹⁶	SIM door catch	
	550120110023 ¹⁶		
40	150121120012	SIM door	
	150121120013		
	150121120014		
41	320121190012	SIM door O-ring	
	320121190013		
	320121190014		
42	750121670012	SIM door pad	Not serviceable. Order together with item #40.
	750121670013		
	750121670014		
43	130120290012	SIM door escutcheon	Serviceable.
	130120290013		
	130120290014		

¹⁴ Available in APAC region.

¹⁵ Replacement of 85012056001 after inventory depletes.

¹⁶ Not offered for 800 MHz radio models.

No.	Part/Kit Number	Description	Remark
44	75012176001	Chassis conductive pad	Serviceable. Replace when chassis is removed.
45	54012164001	Tamper label	
46	33012021002 ^{12, 13}	Model label	Serviceable.
	33012021005 ^{12, 13}		
	33012021014	Model Label, MTP3500	
47	BR000138A01	PTT metal plate	Serviceable. Assemble to any returned housing without a PTT metal plate.
48	0104064J98	Vibrator and boot assembly	Serviceable. This part is for MTP3500 only.
49	PMUE4100_ (AES128)	Encryption IC board	Serviceable.
	PMUE4101_ (AES256)		
50	75012188001	Conductive pad	Serviceable.
51	11012100001	Conductive adhesive	Serviceable. Replace with a new unit after every service.
52	0386104Z03	M2 screw	Serviceable.

5.10

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.

5.10.1

Disassembling the Radio

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

5.10.1.1

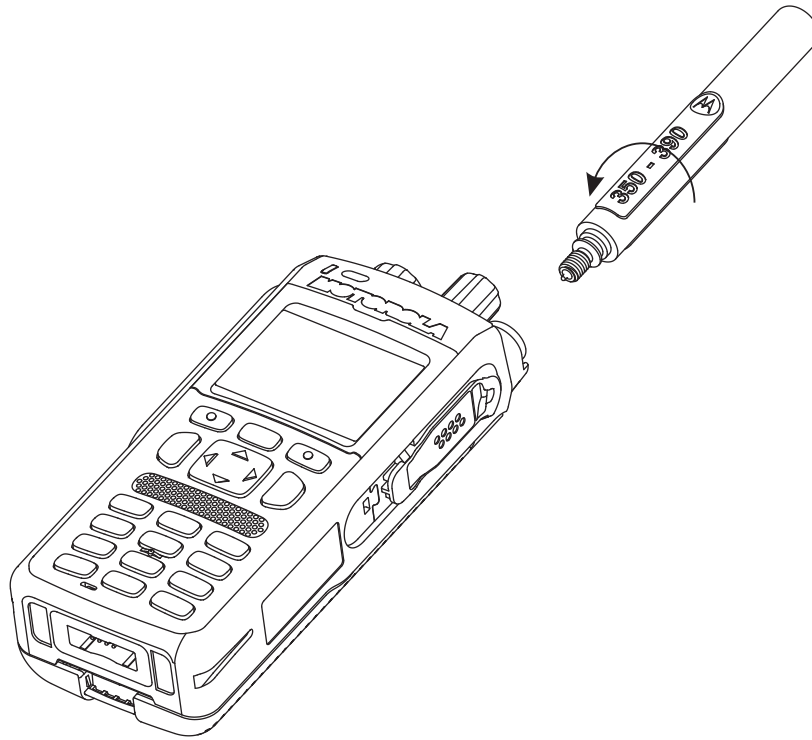
Removing the Antenna

Prerequisites: The antenna must be removed each time the back housing is removed.

Procedure:

Unscrew the antenna counter clockwise until it is detached from the handset.

Figure 18: Removing the Antenna



5.10.1.2

Removing the Battery

Procedure:

1. Place the unit facing down on the work area.
2. Press the battery release button, slide the battery downwards away from the unit and remove the battery from the unit.

Figure 19: Removing the Battery



5.10.1.3

Removing the Volume and Frequency Knob

There are three options that you can use to remove the Volume Knob.

- Option 1: Using the Knob Opener Removal Method
- Option 2: Using the Manual Removal Method
- Option 3: Using the Fixture Removal Method

There are two options that you can use to remove the Frequency Knob.

- Option 1: Using the Knob Opener Removal Method
- Option 2: Using the Manual Removal Method

5.10.1.3.1

Using the Knob Opener Removal Method

Prerequisites: Recommended tools: Knob Opener (part number: 66012034002).



NOTE: It is strongly recommended to replace both the Volume and Frequency knobs after using the Knob Opener due to cosmetic damage that may occur after the knobs are removed.

Procedure:

1. Hold the radio in one hand so that the top of the radio faces upward, and the front of the radio faces you.
2. With the other hand, slide the Knob Opener into the Volume knob from the left as shown in [Figure 20: Volume and Frequency Knob Removal Using the Knob Opener on page 94](#). With the Knob Opener firmly latching onto the Volume knob, push the knob upwards away from the Volume switch.

- Slide the Knob Opener from either behind or front direction into the Frequency knob. Using the Knob Opener, push the Frequency knob upwards until it is free from the Frequency switch.


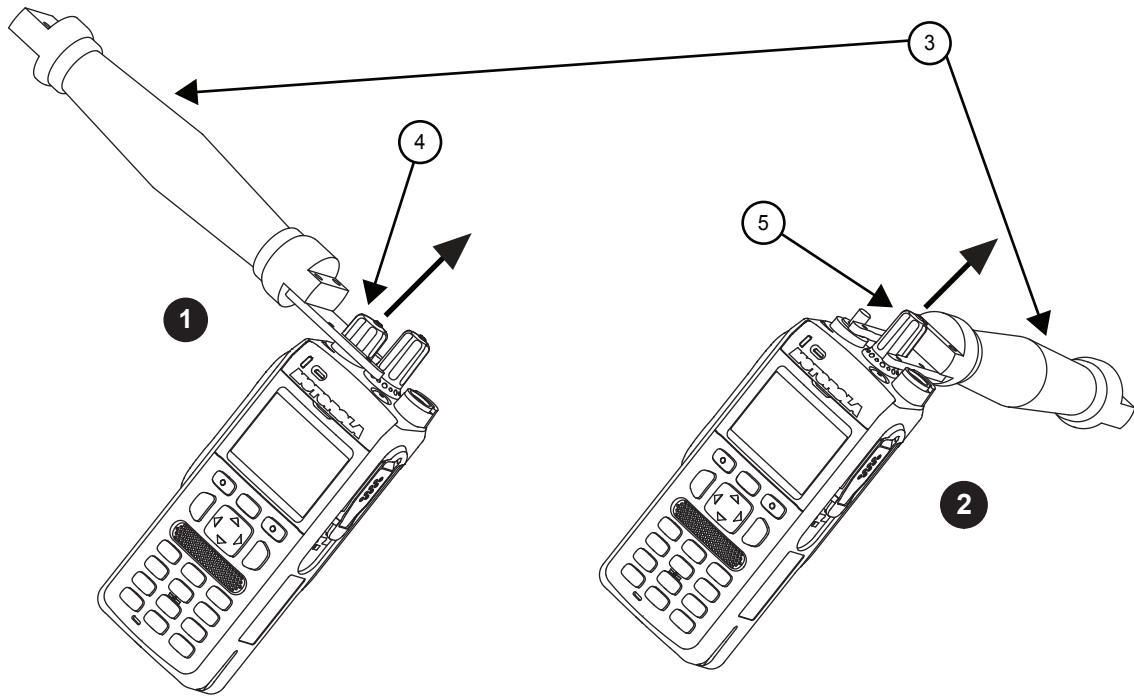
 **NOTE:** Note: Pay close attention on the Knob Opener direction and the sequence of the knobs removal as stated in [step 2](#) and [step 3](#).

Figure 20: Volume and Frequency Knob Removal Using the Knob Opener



No.	Description
3	Knob opener
4	Volume knob
5	Frequency knob

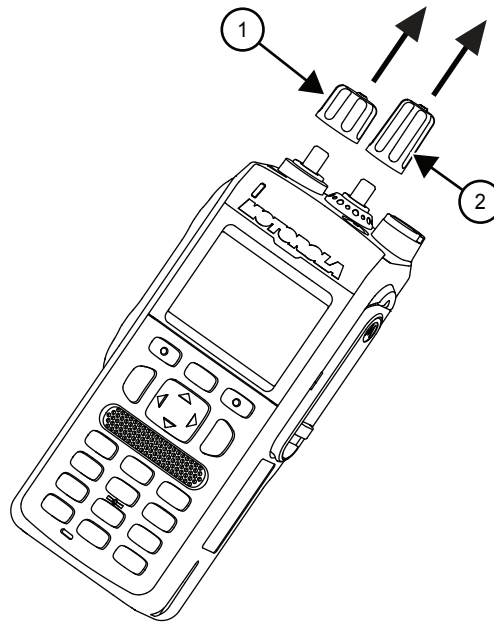
5.10.1.3.2

Using the Manual Removal Method

Procedure:

- Hold the radio in one hand so that the top of the radio faces upward, and the front of the radio faces you.
- With the other hand, grasp the Frequency knob and pull it upward until the knob is free from the Frequency switch.
- Repeat [step 2](#) to remove the Volume knob.

Figure 21: Volume and Frequency Knob Removal Using Hand



No.	Description
1	Volume knob
2	Frequency knob

5.10.1.3.3

Using the Fixture Removal Method

Prerequisites: Recommended tools: Volume Knob Opener and RFID Knob assembly fixture (Supplier part number: MT076/14).

The fixture can be purchased from the following supplier:

ACCESS HITECH AUTOMATION SDN BHD (592024-U)

Website: www.accesshitech.com

Contact Number: 604-6261699

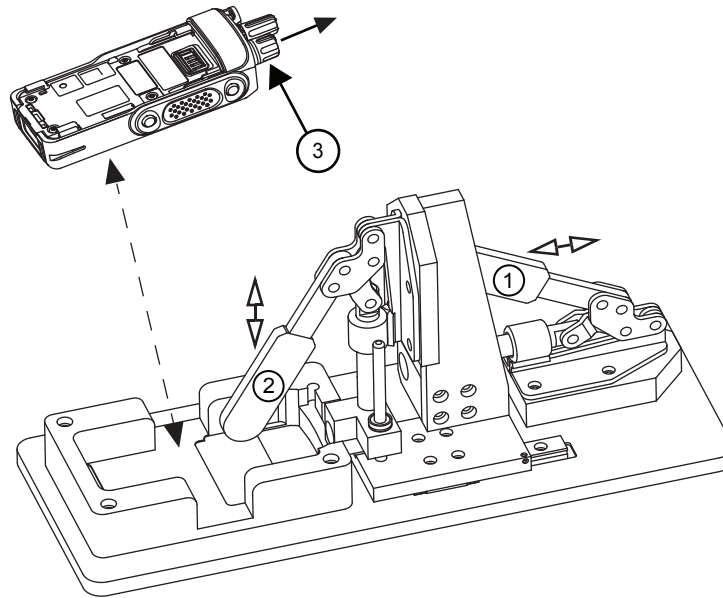


NOTE: The Volume Knob can be removed using the knob opener or through a manual removal method. However, it is recommended to replace the Volume Knob with the RFID Knob using a fixture, to avoid any cosmetic damage that may occur after removing the knob.

Procedure:

1. Move the fixture handle (1) to the right, away from the nest, and move the handle (2) up.
2. Place the radio into the fixture nest, with the back chassis facing up and the knob facing right.
3. Move the fixture handle (1) to the left, towards the nest, before moving the handle (2) down to clamp the knob.
4. Move the fixture handle (1) to the right, until the Volume Knob is free from the volume switch.
5. Move the fixture handle (2) up, and remove the Volume Knob.

Figure 22: Volume Knob Removal Using Fixture



No.	Description
3	Volume Knob

5.10.1.4

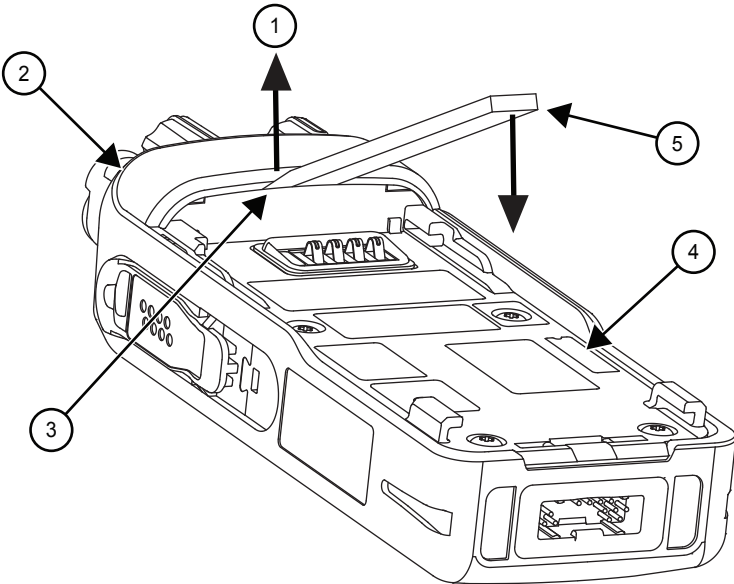
Removing the Back Cover

Prerequisites: Recommended tools: Black Stick or flat-tip screwdriver.

Procedure:

1. Insert the Black Stick or flat-tip screwdriver carefully into the small slot in between the Back Cover and the Back Chassis.
2. Lift up the Back Cover slightly using the Black Stick/flat-tip screwdriver with one hand and slide the Back Cover downwards at the same time with the other hand.

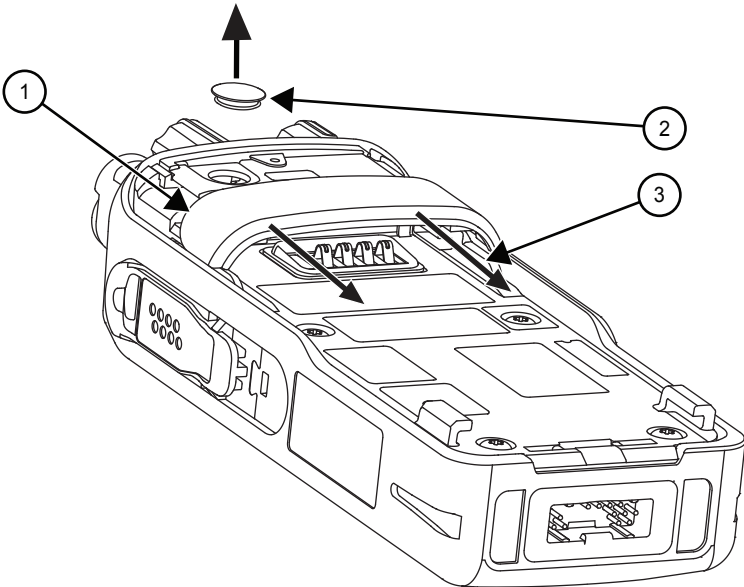
Figure 23: Removing the Back Cover



No.	Description
1	Pry the Back Cover upwards
2	Back Cover
3	Slot in between Back Cover and Back Chassis
4	Black Stick/Flat-tip screwdriver
5	Back Chasis

3. Remove the RF Switch Seal from the Back Chassis.

Figure 24: Removing the RF Switch Seal



No.	Description
1	Back Cover
2	RF Switch Seal
3	Slide the Back Cover downwards to remove

5.10.1.5

Removing the Back Chassis

Prerequisites: Recommended tools:

- 8IP Torx-Plus bit
- Torx driver
- Mini flat-tip screwdriver

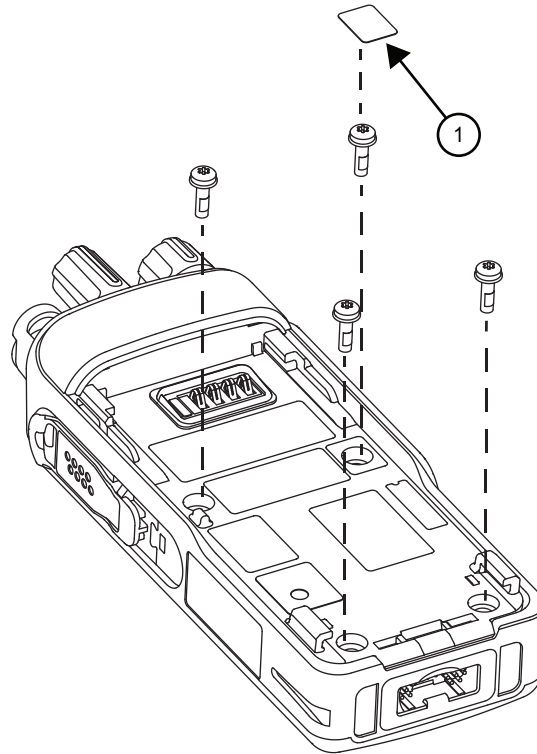


NOTE: The tamper label must be replaced each time the back chassis is removed.

Procedure:

1. Remove the antenna.
2. Remove the battery.
3. Place the unit facing down on the clean work area.
4. Peel off the tamper label from the back chassis.
5. Using the Torx driver with the 8IP Torx-Plus bit, unscrew the four screws fastening the back chassis.
6. Carefully remove the back chassis from the unit, lifting the bottom away from the unit first and then carefully removing the top away from under the front housing tab.
7. The main seal can then be removed from the back chassis.
8. The battery seal can then be removed from the back chassis.
9. Remove the thermal pad from either main board or back chassis.

Figure 25: Back Chassis Removal



No.	Description
1	Tamper label

5.10.1.6

Removing the SIM Card Door

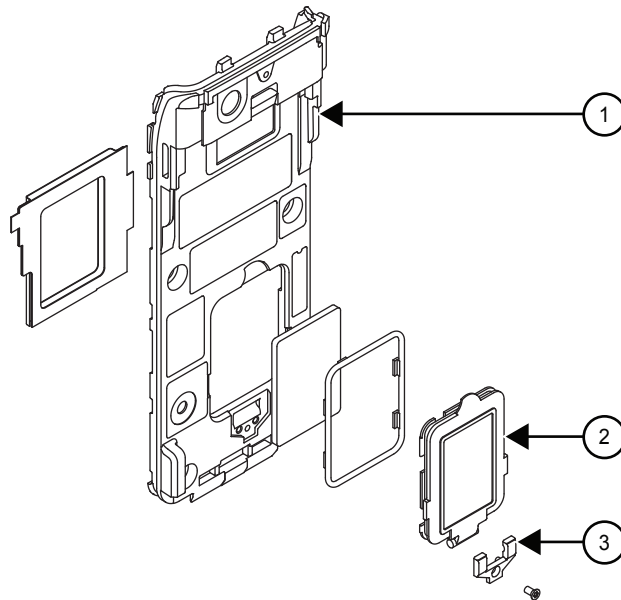
Prerequisites: Recommended tools:

- T-5 Torx bit
- Torx driver

Procedure:

1. Remove the battery.
2. Using the Torx driver with the T-5 Torx bit, unscrew the single screw fastening the SIM card holder to the back chassis.
3. Remove the SIM card holder from the back chassis.
4. Remove the SIM card Door.
5. Using the Torx driver with the T-5 Torx bit, screw with a torque of 1.75 ± 0.1 in-lb (0.2 ± 0.011 Nm).

Figure 26: SIM Card Door Removal



No.	Description
1	Back chassis
2	SIM card door
3	SIM card holder

5.10.1.7

Removing the Main Board

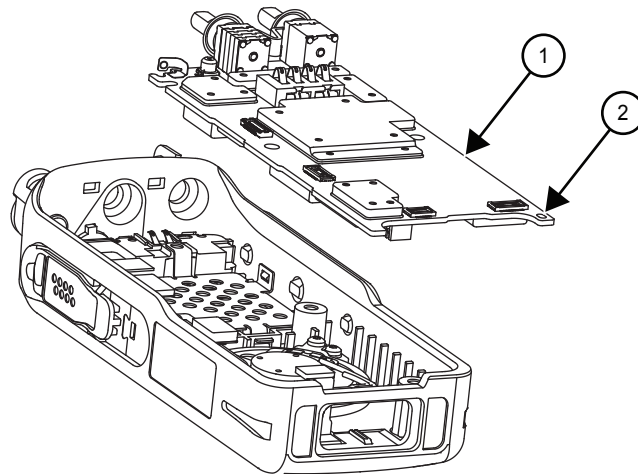
Prerequisites: Recommended tools:

- 6IP Torx-Plus bit
- Torx driver

Procedure:

1. Using the Torx driver with the 6IP Torx-Plus bit, unscrew the two screws at the top portion of the main board with the torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).
2. Carefully remove all flex connectors from the main board.
3. Gently tilt the bottom portion of the main board upwards but do not pull out the board at this time. Using the other hand, push either the frequency or volume metal stub to ease the removal of the board.
4. With the main board partially lifted, remove the speaker assembly connector.
5. Remove the main board from the front housing assembly.

Figure 27: Main Board Removal



No.	Description
1	Main board
2	PCB Guide hole

5.10.1.8

Removing the Bottom Connector

Prerequisites: Recommended tools:

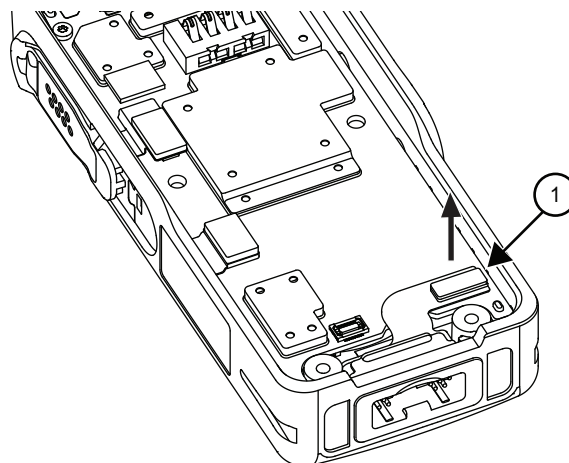
- Mini flat-tip screwdriver

Procedure:

1. Unplug the BTB (Board-to-Board) connector from the Main Board. Make sure the connector is removed from the right edge.

CAUTION: Failure to remove the BTB connector from the correct edge will cause damage to the bottom connector flex.

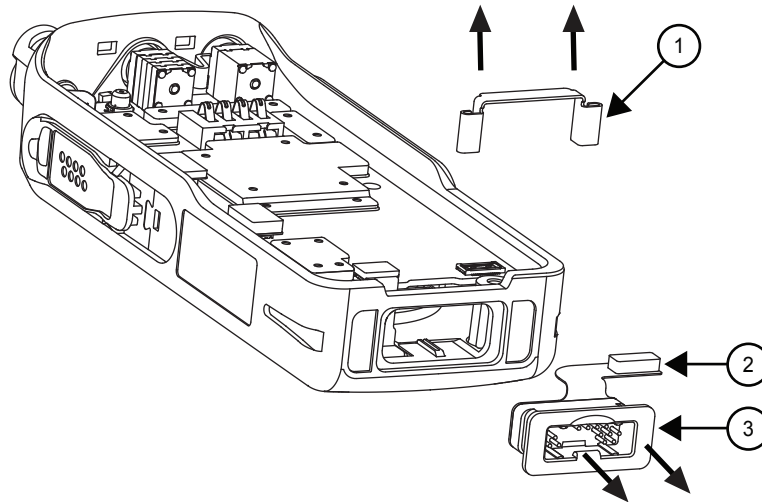
Figure 28: BTB Connector Removal



No.	Description
1	Unplug the BTB connector from this side

2. Using a flat-tip screwdriver, carefully pry the metal retainer upwards.
3. Push the bottom connector downwards away from the housing. Be careful when guiding the flex connector through the housing gap.

Figure 29: Bottom Connector Removal



No.	Description
1	Retainer
2	BTB Connector
3	Bottom Connector

5.10.1.9

Removing the Display

Prerequisites: Recommended tools:

- Mini flat-tip screwdriver

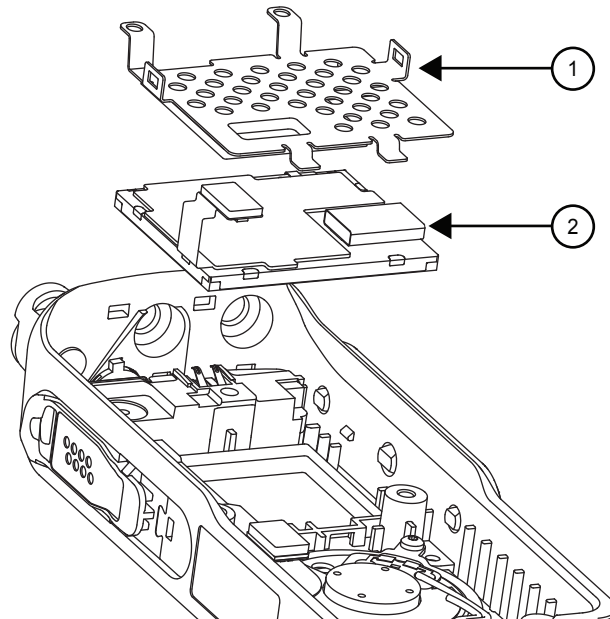


NOTE: Note: Do not touch the display in the active viewing area; fingerprints on this surface cannot be easily removed. When servicing the display, work in a clean cell using de-ionized air pressure.

Procedure:

1. Place the Front Housing Assembly, with the display facing down, on the clean work area.
2. Insert the flat-tip screwdriver into the side slot (PTT side) in the upper side of the housing assembly, and gently push the LCD retainer out from the housing. Be careful not to damage the UC/Earpiece flex connector or scratch the housing surface in the process.
3. Carefully remove the display.

Figure 30: Display Removal



No.	Description
1	LCD retainer
2	LCD module

5.10.1.10

Removing the UC Escutcheon

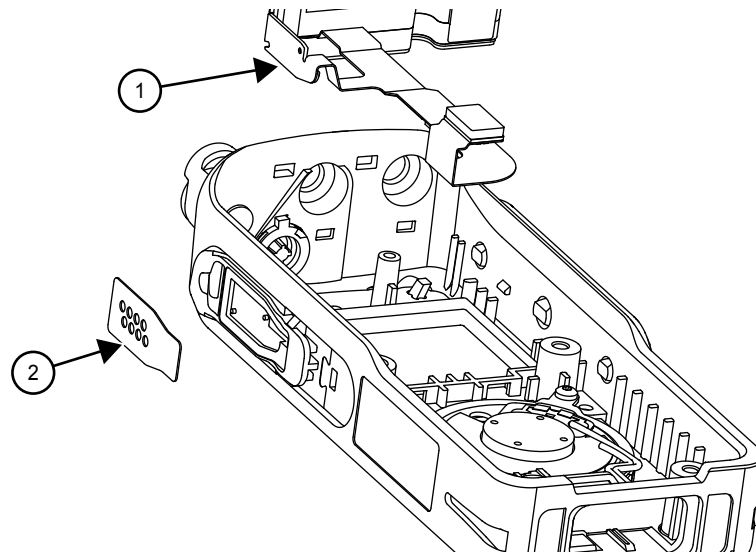
Prerequisites: Recommended tools:

- Tweezers or narrow blade knife

Procedure:

1. Carefully insert the tweezers or knife inside the escutcheon.
2. Using the tweezers or knife, gently pry the UC Escutcheon away from the front housing. Careful handling is required to avoid causing cosmetic defects to the surrounding components.
3. Remove any remains of the adhesive.

Figure 31: UC Escutcheon Removal



No.	Description
1	UC flex
2	UC Escutcheon

5.10.1.11

Removing the Speaker Assembly

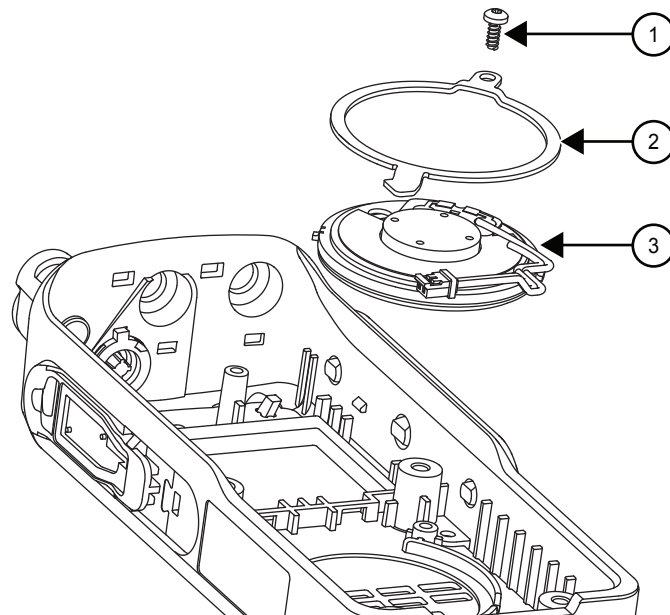
Prerequisites: Recommended tools:

- 6IP Torx-Plus bit
- Torx Driver

Procedure:

1. Using the Torx driver with the 6IP Torx-Plus bit, unscrew the single speaker retainer screw fastening the speaker retainer to the front housing with a torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).
2. Lift up the speaker retainer. Be careful not to damage the speaker connector wires.
3. Remove the speaker assembly from the front housing assembly.

Figure 32: Speaker Assembly Removal



No.	Description
1	Speaker Retainer screw
2	Speaker Retainer
3	Speaker Assembly

5.10.1.12

Removing the Keypad

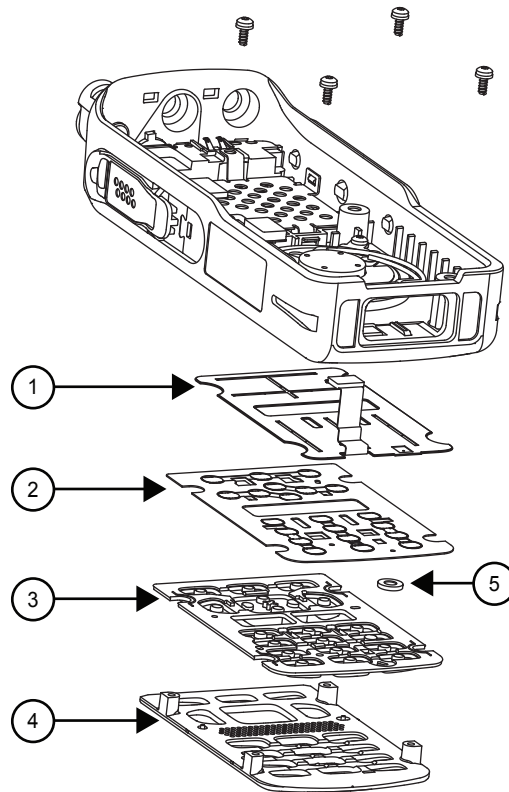
Prerequisites: Recommended tools:

- 6IP Torx-Plus Bit
- Torx Driver

Procedure:

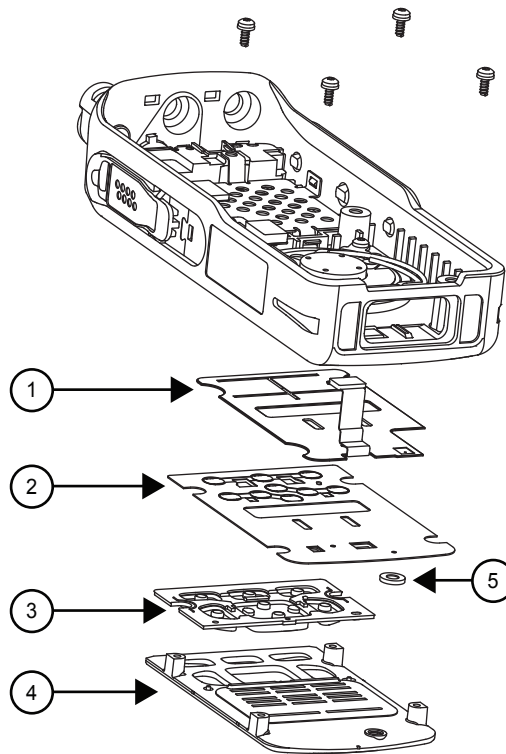
1. Using the Torx driver with the 6IP Torx-Plus bit, unscrew the four screws fastening the main keypad bezel to the front housing with a torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).
2. Remove the keypad bezel and main keypad from the front housing.

Figure 33: Keypad Removal FKP Keypad



No.	Description
1	FKP keypad flex assembly
2	Mylar dome
3	Main keypad (FKP)
4	Keypad bezel (FKP)
5	Membrane, Bottom Mic

Figure 34: Keypad Removal LKP Keypad



No.	Description
1	LKP keypad flex assembly
2	Mylar dome
3	Main keypad (LKP)
4	Keypad bezel (LKP)
5	Membrane, Bottom Mic

5.10.2

Reassembling the Radio

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

5.10.2.1

Installing the Keypad

Prerequisites: Recommended tools:

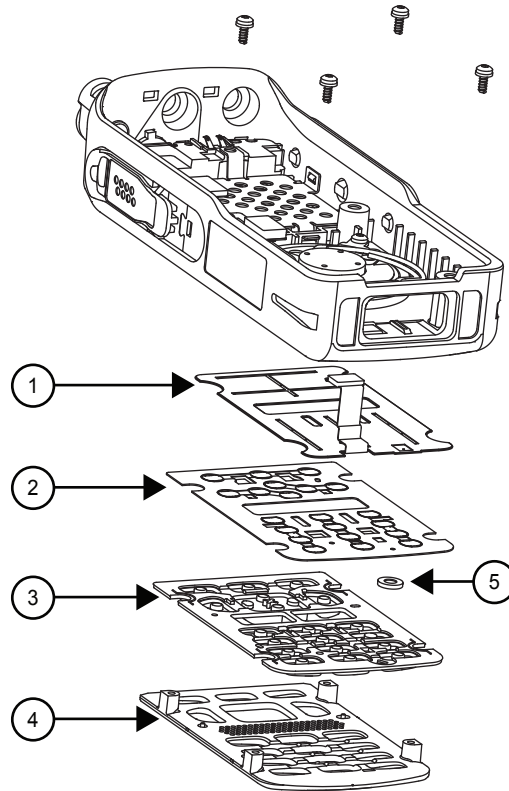
- 6IP Torx-Plus Bit
- Torx Driver

Procedure:

1. Push the main keypad into the keypad bezel. Make sure that the main keypad is pressed firmly on the three ribs marked on the keypad bezel.

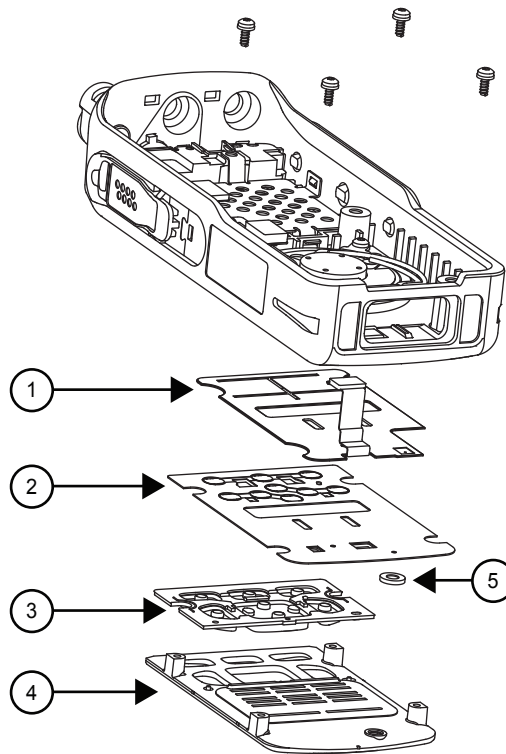
2. Place the keypad bezel and main keypad combination on the front housing. Using the Torx driver with the 6IP Torx-Plus bit, screw in the four screws on the front housing with a torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).

Figure 35: Keypad Installation FKP Keypad



No.	Description
1	FKP keypad flex assembly
2	Mylar dome
3	Main keypad (FKP)
4	Keypad bezel (FKP)
5	Membrane, Bottom Mic

Figure 36: Keypad Installation LKP Keypad



No.	Description
1	LKP keypad flex assembly
2	Mylar dome
3	Main keypad (LKP)
4	Keypad bezel (LKP)
5	Membrane, Bottom Mic

5.10.2.2

Installing the Speaker Assembly

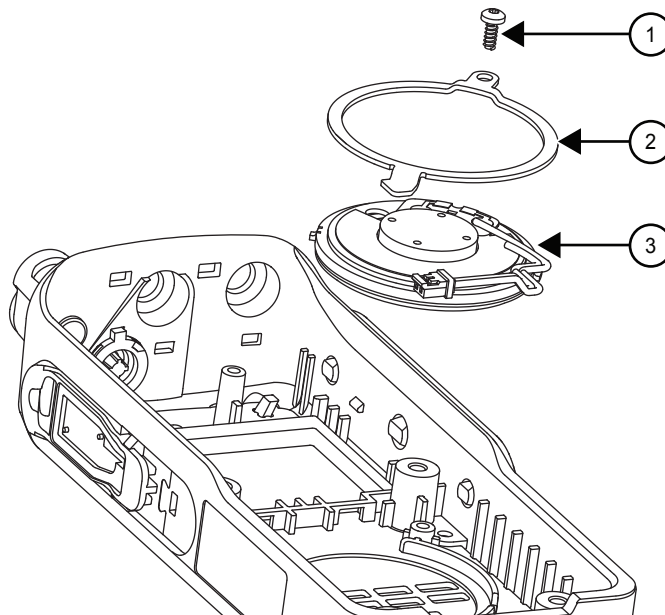
Prerequisites: Recommended tools:

- 6IP Torx-Plus bit
- Torx Driver

Procedure:

1. Carefully place the speaker assembly on the front housing assembly. Note that both the speaker's smaller and bigger grooves on its edge must coincide with their respective positions on the front housing.
2. Slide the speaker retainer through the speaker's wiring and align the retainer's screw hole with the threads of the front housing. The other end of the retainer must also be slotted in to the front housing catch.
3. Screw in the speaker retainer screw with a torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).

Figure 37: Speaker Assembly Removal



No.	Description
1	Speaker Retainer screw
2	Speaker Retainer
3	Speaker Assembly

5.10.2.3

Installing the UC Escutcheon

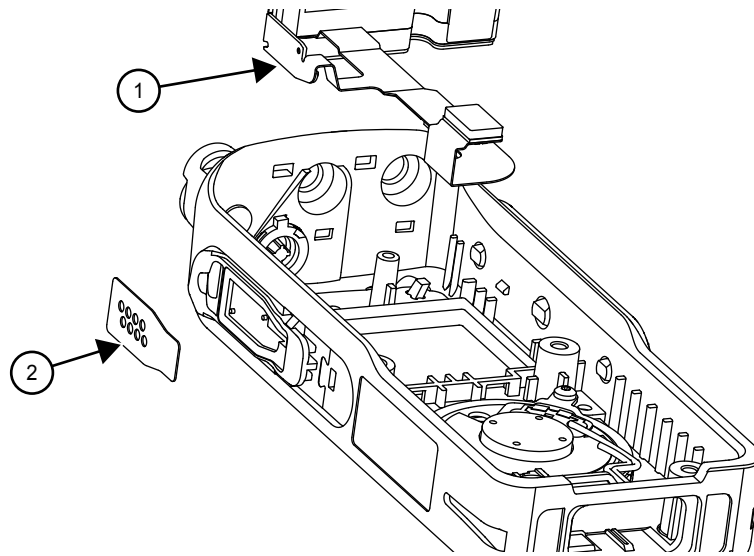
Prerequisites: Recommended tools:

- Tweezers or narrow blade knife

Procedure:

1. Align the UC Escutcheon appropriately to the front housing by using the UC Escutcheon slot as a guide.
2. Press the UC Escutcheon into the Front Housing until it fits in place.

Figure 38: UC Escutcheon Removal



No.	Description
1	UC flex
2	UC Escutcheon

5.10.2.4

Installing the Display

Prerequisites: Recommended tools:

- Mini flat-tip screwdriver

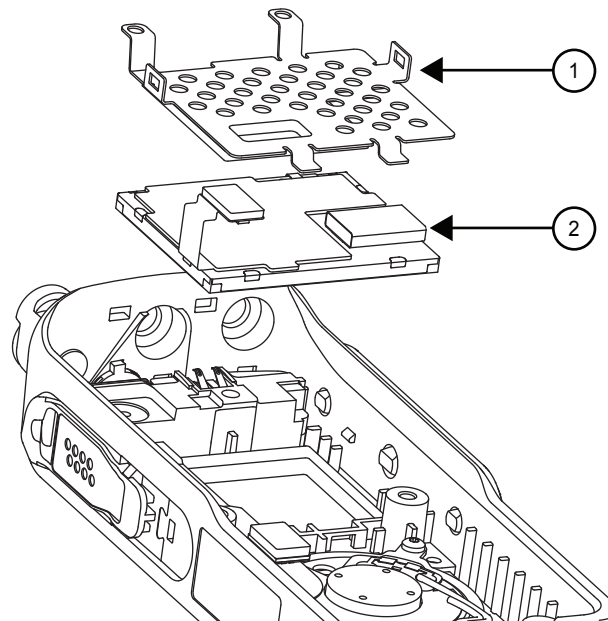


NOTE: Do not touch the display in the active viewing area; fingerprints on this surface cannot be easily removed. When servicing the display, work in a clean cell using de-ionized air pressure.

Procedure:

1. Verify that no damage exists on the LCD glass.
2. Locate the display above the housing assembly and slide top side of LCD display under housing tab and ease into place.
3. Carefully install the LCD retainer. Verify that the bottom retainer is anchored firmly on the housing assembly and securely snapped into the side slots.

Figure 39: Display Installation



No.	Description
1	LCD retainer
2	LCD module

5.10.2.5

Installing the Bottom Connector

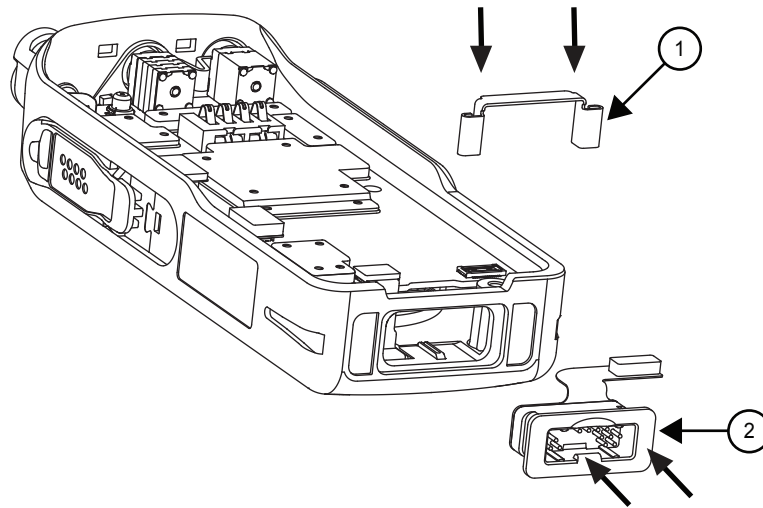
Prerequisites: Recommended tools:

- Mini flat-tip screwdriver

Procedure:

1. Install the bottom connector to the front housing. Make sure that the flex connector is always on top and guide the flex connector through the housing gap. Be careful not to damage both the bottom connector and the keypad's flex connectors during the process.
2. Push and hold the bottom connector firmly to the housing and slide in the retainer into its proper position on the housing.
3. Plug in the BTB connector on the Bottom Connector flex assembly to the BTB connector on the Main Board.

Figure 40: Bottom Connector Installation



No.	Description
1	Retainer
2	Bottom Connector

5.10.2.6

Installing the Main Board

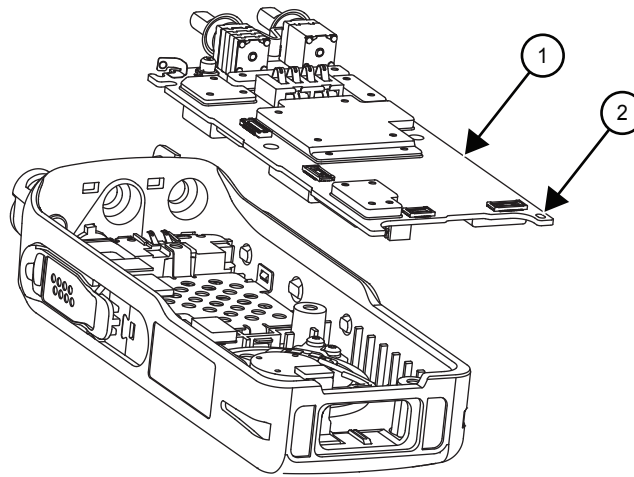
Prerequisites: Recommended tools:

- 6IP Torx-Plus Bit
- Torx Driver

Procedure:

1. Connect the speaker assembly connector to the main board, then place the main board in position on the front housing assembly.
2. Gently place the main board into position on the assembly, making sure that the volume and frequency metal stubs are pushed through their respective gaps on the front housing assembly and all flex connectors are not damaged.
3. Make sure the PCB slot at the bottom portion of the Main Board is aligned with the front housing guide hole on the bottom-right corner.

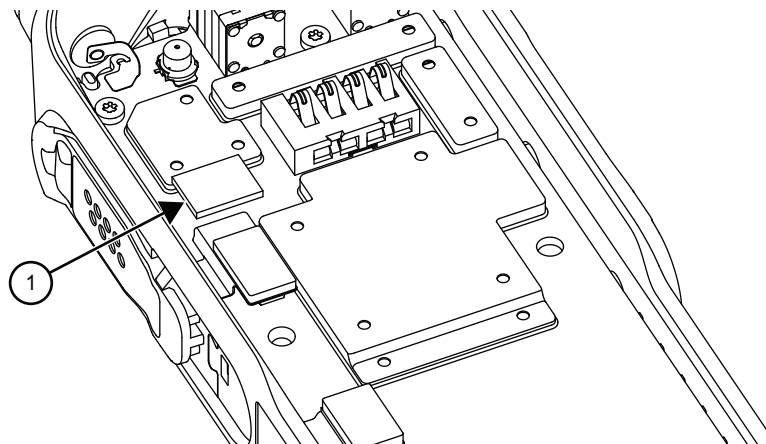
Figure 41: Main Board Installation




No.	Description
1	Main board
2	PCB Guide hole

4. Carefully connect all flex connectors to the main board.
5. Place the thermal pad on top of the head spreader on the main board. Make sure it is aligned properly with the head spreader.

Figure 42: Thermal Pad Installation



No.	Description
1	Thermal pad
2	Place the thermal pad on top of the head spreader at this position.

 **NOTE:** Note: Replace the thermal pad after every service. Do not reuse the outdated pad.

6. Using the Torx driver with the 6IP Torx-Plus bit, screw the two screws with a torque of 2.5 ± 0.1 in-lb (0.28 ± 0.011 Nm).

5.10.2.7

Installing the SIM Card Door

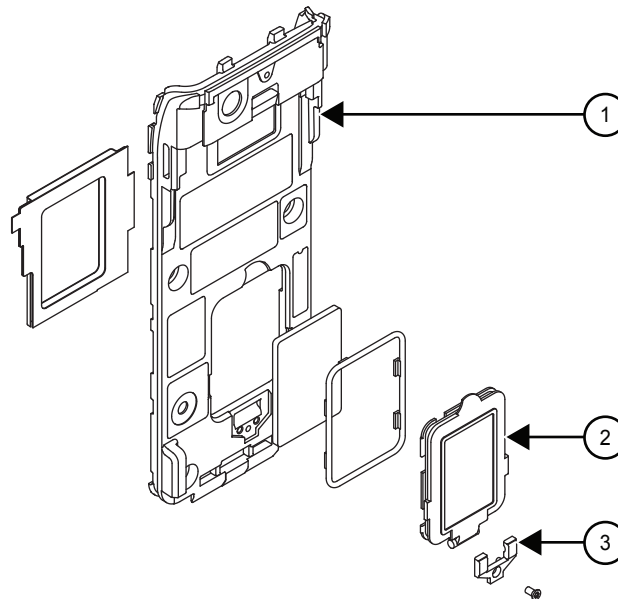
Prerequisites: Recommended tools:

- T-5 Torx bit
- Torx driver

Procedure:

1. Place the SIM card Door into position on the back chassis.
2. Place the SIM card holder onto the back chassis, including the single flathead screw.
3. Using the Torx driver with the T-5 Torx bit, screw the single screw fastening the SIM card holder to the back chassis.
4. Using the Torx driver with the T-5 Torx bit, screw with a torque of 1.75 ± 0.1 in-lb (0.2 ± 0.011 Nm).

Figure 43: SIM Card Door Installation



No.	Description
1	Back chassis
2	SIM card door
3	SIM card holder

5.10.2.8

Installing the Back Chassis

Prerequisites: Recommended tools:

- 8IP Torx-Plus bit
- Torx driver

- Mini flat-tip screwdriver

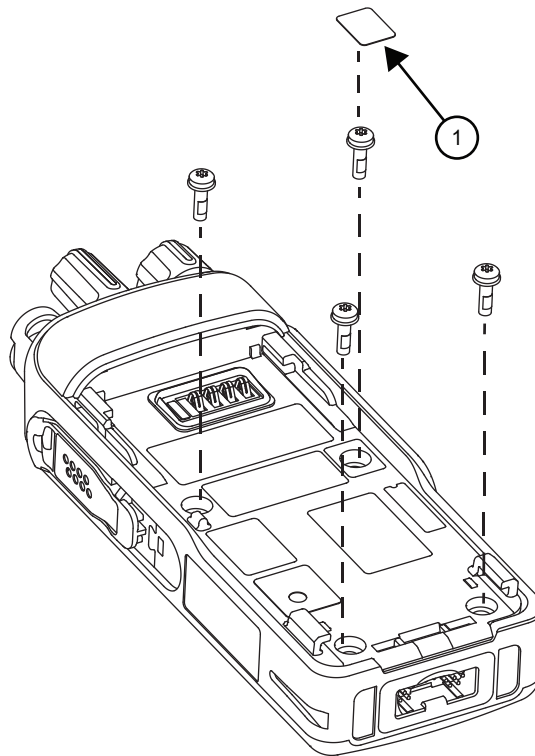


NOTE: The tamper label must be replaced each time the back chassis is removed.

Procedure:

1. Place main seal in back chassis making sure that all tabs fit well in the back chassis and the seal rests in the groove that goes around the back chassis.
2. Place the battery seal in position in the back chassis.
3. Position the back chassis over the unit.
4. Carefully insert the top of the back chassis under the front housing tab, and move the bottom of the back chassis to the unit, making sure that the main seal stays located on the back chassis and the battery seal remains in place and around the battery connector.
5. Verify that the back chassis is positioned correctly, screw holes are aligned to the threads of the front housing and the external antenna connector is visible through its dedicated hole.
6. Using the Torx driver with the 8IP Torx-Plus bit, screw with a torque of 5.5 ± 0.1 in-lb (0.62 ± 0.011 Nm).
7. Place a new tamper label into its designated slot.

Figure 44: Back Chassis Installation



No.	Description
1	Tamper label

5.10.2.9

Installing the Back Cover

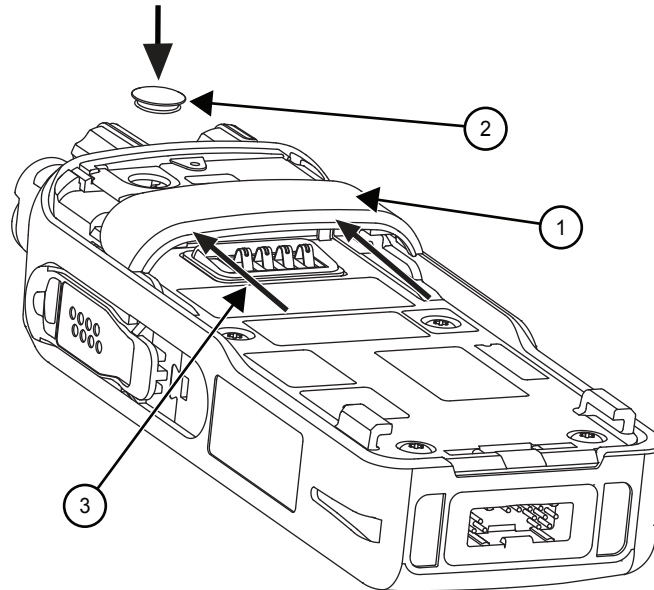
Prerequisites: Recommended tools:

- Black Stick or flat-tip screwdriver

Procedure:

1. Attach the RF Switch Seal on the Back Chassis.
2. Slide the Back Cover upwards along the grooves on the Back Chassis.


Figure 45: RF Switch Seal and Back Cover Installation



No.	Description
1	Back Cover
2	RF Switch Seal
3	Slide the Back Cover upwards along the grooves to install

5.10.2.10

Installing the RFID Knob

 **NOTE:** The Volume Knob can be removed using the knob opener or through a manual removal method. However, it is recommended to replace the Volume Knob with the RFID Knob using a fixture, to avoid any cosmetic damage that may occur after removing the knob. Purchase the Volume Knob Opener and RFID Knob assembly fixture from the following supplier:

Supplier

ACCESS HITECH AUTOMATION SDN BHD (592024-U)

Website

www.accesshitech.com

Contact Number

604-6261699

Model Description

Volume Knob Opener and RFID Knob assembly fixture (Supplier part number: MT076/14)

There are two options that you can use to install the RFID Knob.

- Option 1: Using the Manual Method
- Option 2: Using the Fixture Installation Method

5.10.2.10.1

Installing the RFID Knob Using the Manual Method

Procedure:

Remove the radio from the fixture nest. Insert the RFID Knob vertically into the volume switch. Ensure that the knob is pushed all the way into the switch using hand.

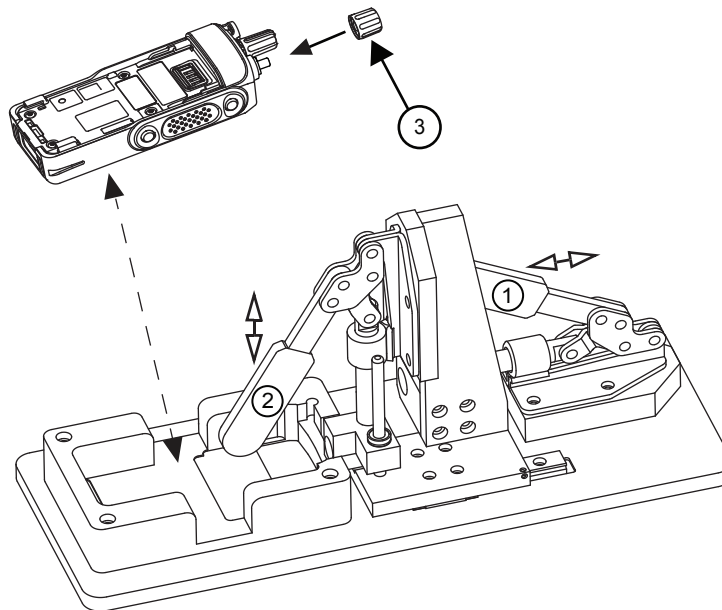
5.10.2.10.2

Installing the RFID Knob Using Fixture Installation Method

Procedure:

1. Partially insert the RFID Knob to the switch, while the radio remains in the fixture nest.
2. Move the fixture handle (2) down, before moving the fixture handle (1) to the left towards the nest. Ensure that the knob is pushed all the way into the switch.
3. Move the fixture handle (2) up, and move the fixture handle (1) to the right, before taking out the radio from the fixture nest.

Figure 46: RFID Knob Installation Using Fixture



No.	Description
3	RFID Knob (part number: 36012029001)

5.10.2.11

Installing the Volume and Frequency Knob

Procedure:

Insert both Frequency and Volume knob vertically into their respective switches. Ensure that both knobs are pushed all the way into their respective switches.

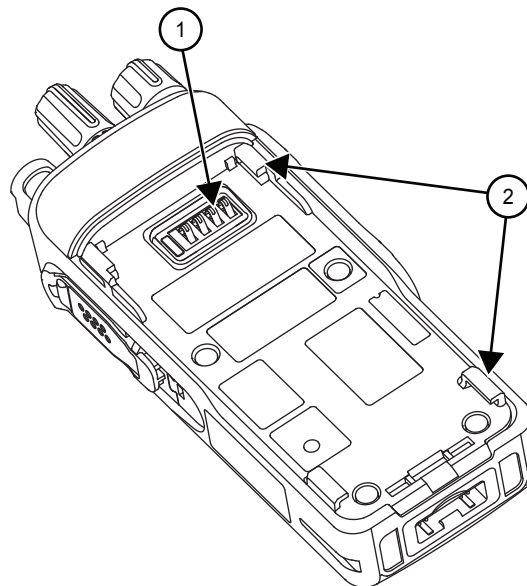
5.10.2.12

Installing the battery

Procedure:

1. Align the top fastening bridge of the battery to the top fastening bridge on the radio.

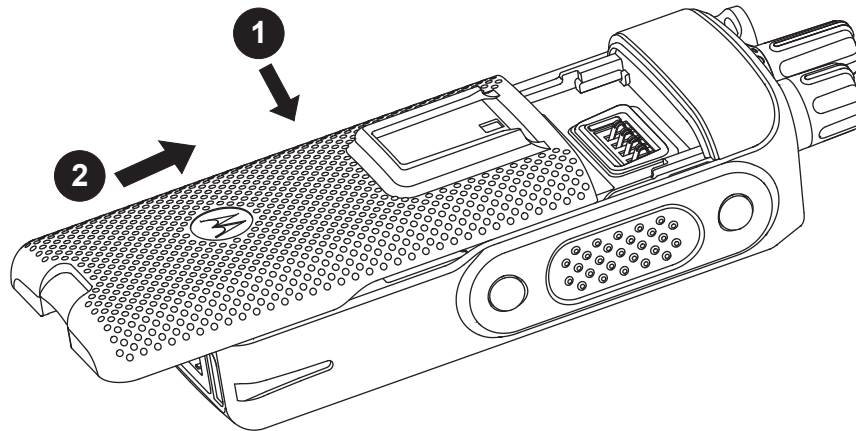
Figure 47: Location of Fastening Bridge & Battery Contacts



No.	Description
1	Battery contacts
2	Fastening bridge

2. Carefully slide the battery (top part) upwards until it clicks into place.

Figure 48: Battery Installation



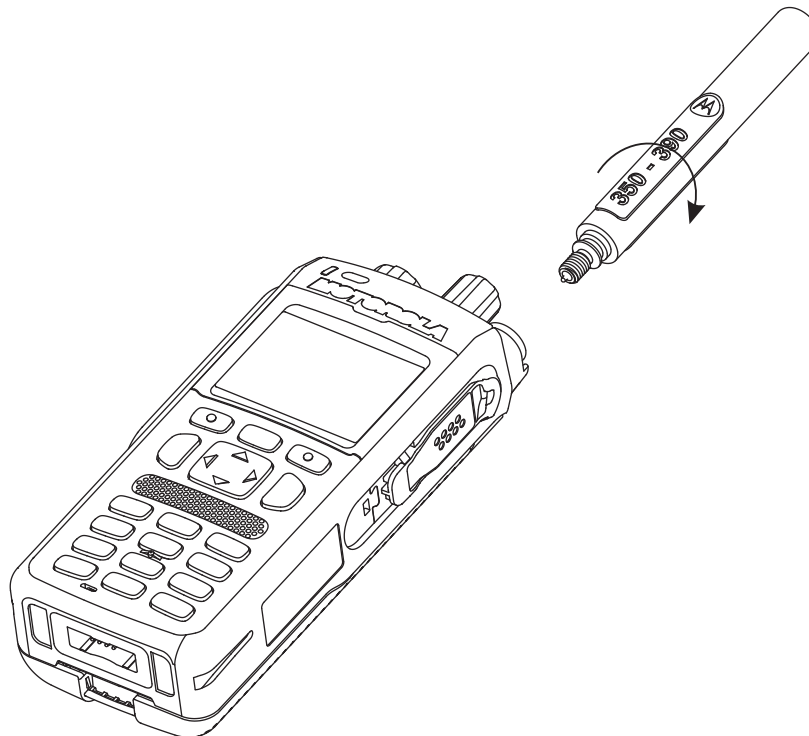
5.10.2.13

Installing the Antenna

Procedure:

Screw the antenna clockwise to the handset.

Figure 49: Installing the Antenna



5.11

Radio Leak Test

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

5.11.1

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, which must 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 37: Other Vacuum Leak Test Parts

Part Number	Description
66007071001	Vacuum Leak Tester Connector
32007073001	Vacuum Leak Tester Connector O-ring

5.11.1.1

Performing Vacuum Leak Test

The vacuum leak test uses tester that creates a vacuum inside the radio and monitors the radio for a stable vacuum reading. This reading shows if the radio is properly sealed.

Prerequisites:

- Remove the battery from the radio.
- Replace the main O-ring with a new one.

Procedure:

1. Attach the vacuum hose to the vacuum leak tester.
2. To verify that the leak tester is functioning, 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.

3. Ensure that the difference between the maximum and minimum fluctuation readings of the gauge pointer remains within 0.05 inHg.


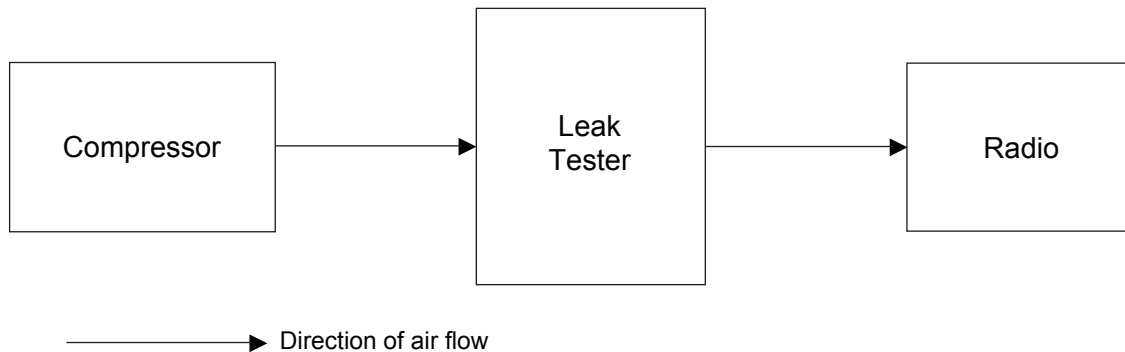

 **NOTE:** The actual reading of the gauge pointer at this point is not important.


Figure 50: Vacuum Leak Test Setup



4. Block the open end of the hose and adjust the leak tester so that the gauge shows 3.40 inHg.
5. Unscrew the antenna on the radio for leak test.
6. Ensure that a vacuum leak tester connector O-ring is attached to the vacuum leak tester connector.
7. Screw the connector into the antenna port and ensure that the connector is screwed properly.
8. Attach the open end of the hose to the leak text fixture.
9. Place the radio on a flat surface with the back chassis facing upward.
10. Place a few drops of water on the vent membrane that protects the seal port on the back chassis.

 **IMPORTANT:** To prevent air leak through the seal, ensure that water covers the entire vent membrane.

11. Start the vacuum leak test and observe the gauge for 20 seconds while the vacuum leak tester is running.

 **NOTE:** Maximum allowable pressure drop after 20 seconds is 0.10 inHg.

12. Allow the radio to equalize by drying the water from the membrane that protects the seal port.
13. Remove the vacuum hose and connector from the radio.

5.11.2

Hand Pump Vacuum Leak Tester Kit

The vacuum leak test is performed to ensure that the radio is IPX7 compliant. This test must be performed after servicing the radio and before returning the radio to the customer.

The hand pump leak tester can be purchased through MSI system:

Hand Pump Vacuum Kit
NLN9839

The hand pump vacuum leak tester comes with a gauge and a vacuum hose. A connector with O-ring, which must be ordered separately, connects the vacuum hose to the radio through the antenna port.

Table 38: Hand Pump Vacuum Leak Test Parts

Part Number	Description
66012067001	Hand Pump Vacuum Leak Tester Connector
32007073001	Vacuum Leak Tester Connector O-ring


5.11.2.1

Performing Hand Pump Vacuum Leak Test

The hand pump leak test uses a manual tester that creates a vacuum condition inside the radio and monitors the radio for a stable vacuum reading. This reading shows if the radio is properly sealed.

Prerequisites:

- Remove the battery.
- Replace the main O-ring with a new one.

 **NOTE:** To create a vacuum condition inside the radio, pull then handle upwards. Pressure inside the radio will increase gradually with repeated pulling actions.

Procedure:

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


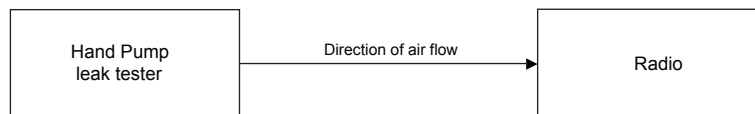

 **NOTE:** Ensure that when the pulling action is stopped, there is no pressure drop observed; the actual reading of the gauge pointer at this point is not important. Proceed with a leak test only if no pressure drop is observed.

Figure 51: Hand Pump Leak Test Setup



2. Unscrew the antenna on the radio for a leak test.
3. Ensure that a vacuum leak tester connector O-ring is attached to the hand pump leak tester connector. Insert the connector into the antenna port and tighten the connection.
4. Attach the open end of the pump hose to the connector.
5. Place the radio on a flat surface with the back chassis facing upward. Place a few drops of water on the vent membrane that protects the seal port on the back chassis.

 **IMPORTANT:** To prevent air leaking through the seal, ensure that water covers the entire vent membrane.

6. Start the vacuum leak test by pulling the hand pump to achieve vacuum pressure of 6.5 inHg. Observe the gauge for 60 seconds.


 **NOTE:** The maximum allowable pressure drop after 60 seconds is 0.5 inHg. If the gauge indicator drops more than one scale increment on the indicator, then the radio leak test fails.

Figure 52: Initial Pressure for Hand Pump Vacuum Leak Test at 6.5 inHg

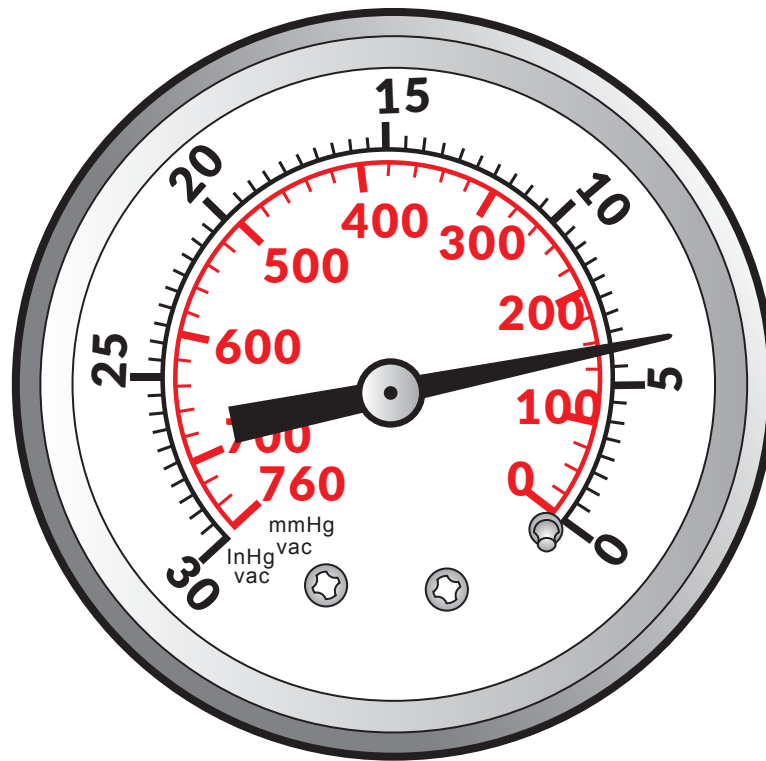
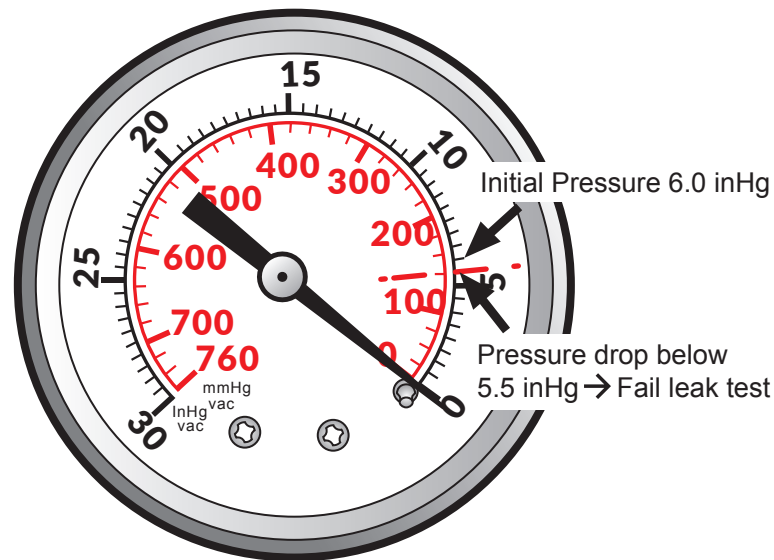


Figure 53: Initial Pressure and Maximum Allowable Pressure Drop



7. Dry the water from the membrane after the leak test that protects the Seal Port to allow the radio pressure to equalize.
8. Remove the hand pump hose and connector from the radio.

5.11.3

Performing Leak Area Troubleshooting

If the radio fails the vacuum leak test, the leak area must be identified and serviced or replaced.

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

Procedure:

Prepare a golden sample for troubleshooting reference.



IMPORTANT: Golden sample kit must pass the vacuum leak test.

5.11.3.1

Performing Back Chassis Sub-Assembly Troubleshooting

Procedure:

1. Replace the back chassis subassembly.
2. Watch for pinching of main O-ring, battery connector seal and SIM card door seal during assembly.
3. Perform leak test following the steps from [Performing Vacuum Leak Test on page 121](#), or [Performing Hand Pump Vacuum Leak Test on page 123](#).
4. Perform one of the following actions:

Option	Actions
Pass	Troubleshooting ends here.
Fail	Continue to step 5 .

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

Option	Actions
Pass	Back chassis subassembly can be reused.
Fail	Scrap the back chassis subassembly.

7. Proceed with [Performing Bottom Connector Sub-Assembly Troubleshooting on page 125](#).

5.11.3.2

Performing Bottom Connector Sub-Assembly Troubleshooting

Procedure:

1. Replace the bottom connector subassembly.
2. Watch for pinching of bottom connector O-ring.
3. Perform leak test following the steps from [Performing Hand Pump Vacuum Leak Test on page 123](#).
4. Perform one of the following actions:

Option	Actions
Pass	Troubleshooting ends here.

Option	Actions
Fail	Continue to step 5

- Reassemble bottom connector subassembly onto the golden sample kit and perform a vacuum leak test.
- Perform one of the following actions:


Option	Actions
Pass	Bottom connector subassembly can be reused.
Fail	Scrap the bottom connector subassembly.

- Proceed with [Performing Front Housing Kit Troubleshooting on page 126](#).

5.11.3.3

Performing Front Housing Kit Troubleshooting

Procedure:

- Replace the front housing kit, and reassemble the radio.
 -  **NOTE:** Ensure that the main O-ring, battery connector seal, and SIM card door seal are not pinched during assembly.
- Perform the leak test following the steps from [Performing Vacuum Leak Test on page 121](#) or [Performing Hand Pump Vacuum Leak Test on page 123](#).
- Perform one of the following actions:

Option	Actions
Pass	Troubleshooting ends here.
Fail	Continue to step 4 .

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

Option	Actions
Pass	Front housing kit is good for reuse.
Fail	Scrap the front housing kit.

- Proceed to [Performing Miscellaneous Troubleshooting on page 126](#)

5.11.3.4

Performing Miscellaneous Troubleshooting

Procedure:

- Reassemble the whole radio.
 - Leakage may be due to improper assembly.
- Repeat [Performing Leak Area Troubleshooting on page 125](#) with a second golden sample set.

Appendix A

Service Information

Service for the radio is based on the substitution method; whereby a working part replaces a faulty one, providing quicker service to the customer. For example, if the controller board is faulty, it is replaced.

If the 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.

Level 1 and Level 2 Maintenance

This manual covers Level 1 and Level 2 Maintenance.

Level 1 Maintenance

You replace the radio and/or accessories and send the faulty radio and/or accessories to a higher level of maintenance.

Level 2 Maintenance

A radio board is replaced.

The radios are programmed at the factory. They cannot be tuned at the field service level.

Level 3 Maintenance

Level 3 maintenance can only be done at the Motorola Solutions Service Center/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.

A.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 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.

A.2

Service Information for Americas

This topic contains contact details to service centers in Latin America and Caribbean region.

Technical Support

To request technical support, go to <https://businessonline.motorolasolutions.com>, **Contact Us**.

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola Solutions part number is assigned to the part, it is available from Motorola Solutions. If no part number is assigned, the part is not normally available from Motorola Solutions. If the part number is appended with an asterisk, the part is serviceable by Motorola Solutions Depot only. If a list of parts is not included, that means that no user-serviceable parts are available for that kit or assembly.

Warranty and Repairs

Table 39: Service Information – Telephone Numbers and Addresses of Latin America Radio Support Centers

Country	Telephone Number	Address
Colombia	571- 376-6990	Motorola Solutions de Colombia Service Centre Torre Banco Ganadero Carrera 7 No. 71-52 Torre B piso 13 Oficina 1301 Bogota
Mexico	5252576700	Motorola Solutions de México Service Centre Bosques de Alisos #125 Col. Bosques de las Lomas CP 05120 Mexico DF

Piece Parts

To order parts in Latin America and the Caribbean contact your local Motorola Solutions CGISS representative.

Table 40: Service Information – Telephone Numbers and Addresses of Latin America Motorola Solutions Centers

Country	Telephone Number	Address
Argentina	5411-4317-5300	Motorola Solutions Argentina

Country	Telephone Number	Address
		Ave. del Libertador 1855 B1638BGE, Vicente Lopez Buenos Aires
Brasil	5511-3847-668	Motorola Solutions Ltda Av. Chedid Jafet 222 Bloco D Conjuntos 11,12,21,22 E 41 Condominio Millennium Office Park 04551-065- Vila Olimpia, Sao Paulo
Chile	562-338-9000	Motorola Solutions Chile S.A. Av. Nueva Tajamar 481 Edif. World Trade Center Of. 1702, Torre Norte Las Condes Santiago
Colombia	571-376-6990	Motorola Solutions Colombia LTDA. Carrera 7 #71-52 Torre A, Oficina 1301 Bogotá
Costa Rica	506-201-1480	Motorola Solutions de Costa Rica Parque Empresarial Plaza Roble Edificio El Portico, 1er Piso Centro de Negocios Internacional Guachepelin, Escazu San Jose
Ecuador	5932-264-1627	Motorola Solutions del Ecuador Autopist Gral. Rumiñahui, Puente 2 Conjunto Puerta del Sol Este-Ciudad Jardin Pasa E, Casa 65 Quito
Mexico	52-555-257-6700	Motorola Solutions de México, S.A. Calle Bosques de Alisos #125 Col. Bosques de Las Lomas 05120 México D.F.
Peru	511-211-0700	Motorola Solutions del Peru Ave. República de Panama 3535 Piso 11, San Isidro Lima 27
USA	954-723-8959	Motorola Solutions, Inc. Latin American Countries Region 789 International Parkway Sunrise, FL 33325
Venezuela	58212-901-4600	Motorola Solutions de Los Andes C.A. Ave. Francisco de Miranda

Country	Telephone Number	Address
		Centro Lido, Torre A Piso 15, El Rosal Caracas, 1060

A.3

Recommended Programming Equipment

Table 41: Recommended Programming Equipment

Name	Part Number
Customer CPS User Guide	6802974C10
RS-232 Programming cable (set cable switch to FLASH)	PMKN4122_
USB Programming cable	PMKN4129_

A.4

Service Replacement Kit Matrix

Table 42: Service Replacement Kit Matrix

The following kits consist of a complete radio except accessories, battery, and antenna.

Sales Model	Service Tanapa	Description
MTP3100	PMUE3829_S	MTP3100 UHF Limited Keypad CLR ROM
	PMUE3866_S	MTP3100 UHF Limited Keypad TEA1 ROM
	PMUE3867_S	MTP3100 UHF Limited Keypad TEA2 ROM
	PMUE3868_S	MTP3100 UHF Limited Keypad TEA3 ROM
	PMUE4625_S	MTP3100 UHF Limited Keypad CLR
	PMUE4645_S	MTP3100 UHF Limited Keypad TEA1
	PMUE4646_S	MTP3100 UHF Limited Keypad TEA2
	PMUE4647_S	MTP3100 UHF Limited Keypad TEA3
MTP3150	PMUE3968_S	MTP3x50 UHF Full Keypad GPS CLR HEB
	PMUE3969_S	MTP3x50 UHF Full Keypad GPS CLR ROM
	PMUE3970_S	MTP3x50 UHF Full Keypad GPS CLR ARB
	PMUE3971_S	MTP3x50 UHF Full Keypad GPS CLR CYR
	PMUF1619_S	MTP3x50 800 MHz Full Keypad GPS CLR ROM
	PMUF1646_S	MTP3x50 800 MHz Full Keypad GPS CLR CHI
MTP3200	PMUE3972_S	MTP3200 UHF Limited Keypad GPS/Bluetooth ROM with SIM
	PMUE4042_S	MTP3200 FuG UHF Limited Keypad TEA2 ROM BSI
	PMUE4047_S	MTP3200 UHF Limited Keypad GPS/Bluetooth TEA1 ROM SIM

Sales Model	Service Tanapa	Description
	PMUE4049_S	MTP3200 UHF Limited Keypad GPS/Bluetooth TEA2 ROM SIM
	PMUE4052_S	MTP3200 UHF Limited Keypad GPS/Bluetooth TEA3 ROM SIM
	PMUE4627_S	MTP3200 UHF Limited Keypad CLR
	PMUE4628_S	MTP3200 UHF Limited Keypad CLR GNSS
	PMUE4649_S	MTP3200 UHF Limited Keypad TEA1
	PMUE4650_S	MTP3200 UHF Limited Keypad TEA2
	PMUE4651_S	MTP3200 UHF Limited Keypad TEA3
	PMUE4652_S	MTP3200 UHF Limited Keypad TEA1 GNSS
	PMUE4653_S	MTP3200 UHF Limited Keypad TEA2 GNSS
	PMUE4654_S	MTP3200 UHF Limited Keypad TEA3 GNSS
MTP3250	PMUE3828_S	MTP3250 UHF Full Keypad GPS/Bluetooth CLR ROM
	PMUE3850_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA1 ROM
	PMUE3851_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA3 ROM
	PMUE3968_S	MTP3x50 UHF Full Keypad GPS/Bluetooth CLR HEB with SIM
	PMUE3969_S	MTP3x50 UHF Full Keypad GPS/Bluetooth CLR ROM with SIM
	PMUE3970_S	MTP3x50 UHF Full Keypad GPS/Bluetooth CLR ARB with SIM
	PMUE3971_S	MTP3x50 UHF Full Keypad GPS/Bluetooth CLR CYR with SIM
	PMUE4041_S	MTP3250 FuG UHF Full Keypad TEA2 ROM BSI
	PMUE4046_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA3 ARB SIM
	PMUE4048_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA1 ARB SIM
	PMUE4050_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA3 CYR SIM
	PMUE4051_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA1 CYR SIM
	PMUE4053_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA1 ROM SIM
	PMUE4054_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA2 ROM SIM
	PMUE4055_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA3 ROM SIM
	PMUE4111_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA3 HEB SIM
	PMUE4112_S	MTP3250 UHF Full Keypad GPS/Bluetooth TEA1 HEB SIM
	PMUE4631_S	MTP3x50 UHF Full Keypad CLR ROM
	PMUE4632_S	MTP3x50 UHF Full Keypad CLR ROM GNSS
	PMUE4739_S	MTP3250 UHF Full Keypad TEA1 ROM
	PMUE4740_S	MTP3250 UHF Full Keypad TEA2 ROM
	PMUE4741_S	MTP3250 UHF Full Keypad TEA3 ROM
	PMUE4742_S	MTP3x50 UHF Full Keypad CLR CYR
	PMUE4743_S	MTP3250 UHF Full Keypad TEA1 CYR
	PMUE4747_S	MTP3x50 UHF Full Keypad CLR HEB
	PMUE4748_S	MTP3250 UHF Full Keypad TEA1 HEB

Sales Model	Service Tanapa	Description
	PMUE4759_S	MTP3250 UHF Full Keypad TEA1 ROM GNSS
	PMUE4760_S	MTP3250 UHF Full Keypad TEA2 ROM GNSS
	PMUE4761_S	MTP3250 UHF Full Keypad TEA3 ROM GNSS
	PMUE4762_S	MTP3x50 UHF Full Keypad CLR CYR GNSS
	PMUE4763_S	MTP3250 UHF Full Keypad TEA1 CYR GNSS
MTP3500	GMUE4774_S	MTP3500 UHF Limited Keypad TEA2 GNSS
	PMUE4765_S	MTP3500 UHF Limited Keypad CLR
	PMUE4766_S	MTP3500 UHF Limited Keypad TEA1
	PMUE4767_S	MTP3500 UHF Limited Keypad TEA2
	PMUE4768_S	MTP3500 UHF Limited Keypad TEA3
	PMUE4769_S	MTP3500 UHF Limited Keypad TEA2 SIM
	PMUE4770_S	MTP3500 UHF Limited Keypad CLR AES128
	PMUE4771_S	MTP3500 UHF Limited Keypad CLR AES256
	PMUE4772_S	MTP3500 UHF Limited Keypad CLR GNSS
	PMUE4773_S	MTP3500 UHF Limited Keypad TEA1 GNSS
	PMUE4774_S	MTP3500 UHF Limited Keypad TEA2 GNSS
	PMUE4775_S	MTP3500 UHF Limited Keypad TEA3 GNSS
	PMUE4776_S	MTP3500 UHF Limited Keypad CLR AES128 GNSS
	PMUE4777_S	MTP3500 UHF Limited Keypad CLR AES256 GNSS
	PMUE4782_S	MTP3500 UHF Limited Keypad TEA1 AES128
	PMUE4783_S	MTP3500 UHF Limited Keypad TEA2 AES128
	PMUE4784_S	MTP3500 UHF Limited Keypad TEA3 AES128
	PMUE4785_S	MTP3500 UHF Limited Keypad TEA1 AES256
	PMUE4786_S	MTP3500 UHF Limited Keypad TEA2 AES256
	PMUE4787_S	MTP3500 UHF Limited Keypad TEA3 AES256
	PMUE4788_S	MTP3500 UHF Limited Keypad TEA1 AES128 GNSS
	PMUE4789_S	MTP3500 UHF Limited Keypad TEA2 AES128 GNSS
	PMUE4790_S	MTP3500 UHF Limited Keypad TEA3 AES128 GNSS
	PMUE4791_S	MTP3500 UHF Limited Keypad TEA1 AES256 GNSS
	PMUE4792_S	MTP3500 UHF Limited Keypad TEA2 AES256 GNSS
	PMUE4793_S	MTP3500 UHF Limited Keypad TEA3 AES256 GNSS
MTP3550	GMUE4720_S	MTP3550 UHF Full Keypad TEA2 ROM GNSS
	PMUE4587_S	MTP3550 SIM UHF Full Keypad TEA2 ROM
	PMUE4588_S	MTP3550 UHF Full Keypad CLR ROM
	PMUE4635_S	MTP3550 UHF Full Keypad CLR ROM AES256
	PMUE4655_S	MTP3550 UHF Full Keypad TEA1 ROM

Sales Model	Service Tanapa	Description
	PMUE4656_S	MTP3550 UHF Full Keypad TEA2 ROM
	PMUE4657_S	MTP3550 UHF Full Keypad TEA3 ROM
	PMUE4658_S	MTP3550 UHF Full Keypad CLR CYR
	PMUE4659_S	MTP3550 UHF Full Keypad TEA1 CYR
	PMUE4663_S	MTP3550 UHF Full Keypad CLR HEB
	PMUE4664_S	MTP3550 UHF Full Keypad TEA1 HEB
	PMUE4676_S	MTP3550 UHF Full Keypad CLR ROM AES128
	PMUE4677_S	MTP3550 UHF Full Keypad TEA1 ROM AES128
	PMUE4678_S	MTP3550 UHF Full Keypad TEA2 ROM AES128
	PMUE4679_S	MTP3550 UHF Full Keypad TEA3 ROM AES128
	PMUE4680_S	MTP3550 UHF Full Keypad CLR CYR AES128
	PMUE4681_S	MTP3550 UHF Full Keypad TEA1 CYR AES128
	PMUE4683_S	MTP3550 UHF Full Keypad TEA1 ARB AES128
	PMUE4684_S	MTP3550 UHF Full Keypad CLR HEB AES128
	PMUE4685_S	MTP3550 UHF Full Keypad TEA1 HEB AES128
	PMUE4697_S	MTP3550 UHF Full Keypad TEA1 ROM AES256
	PMUE4698_S	MTP3550 UHF Full Keypad TEA2 ROM AES256
	PMUE4699_S	MTP3550 UHF Full Keypad TEA3 ROM AES256
	PMUE4700_S	MTP3550 UHF Full Keypad CLR CYR AES256
	PMUE4701_S	MTP3550 UHF Full Keypad TEA1 CYR AES256
	PMUE4705_S	MTP3550 UHF Full Keypad CLR HEB AES256
	PMUE4706_S	MTP3550 UHF Full Keypad TEA1 HEB AES256
	PMUE4718_S	MTP3550 UHF Full Keypad CLR ROM GNSS
	PMUE4719_S	MTP3550 UHF Full Keypad TEA1 ROM GNSS
	PMUE4720_S	MTP3550 UHF Full Keypad TEA2 ROM GNSS
	PMUE4721_S	MTP3550 UHF Full Keypad TEA3 ROM GNSS
	PMUE4722_S	MTP3550 UHF Full Keypad CLR CYR GNSS
	PMUE4723_S	MTP3550 UHF Full Keypad TEA1 CYR GNSS
	PMUE4725_S	MTP3550 UHF Full Keypad CLR ROM AES128 GNSS
	PMUE4726_S	MTP3550 UHF Full Keypad TEA1 ROM AES128 GNSS
	PMUE4727_S	MTP3550 UHF Full Keypad TEA2 ROM AES128 GNSS
	PMUE4728_S	MTP3550 UHF Full Keypad TEA3 ROM AES128 GNSS
	PMUE4729_S	MTP3550 UHF Full Keypad CLR CYR AES128 GNSS
	PMUE4730_S	MTP3550 UHF Full Keypad TEA1 CYR AES128 GNSS
	PMUE4732_S	MTP3550 UHF Full Keypad CLR ROM AES256 GNSS
	PMUE4733_S	MTP3550 UHF Full Keypad TEA1 ROM AES256 GNSS

Sales Model	Service Tanapa	Description
	PMUE4734_S	MTP3550 UHF Full Keypad TEA2 ROM AES256 GNSS
	PMUE4735_S	MTP3550 UHF Full Keypad TEA3 ROM AES256 GNSS
	PMUE4736_S	MTP3550 UHF Full Keypad CLR CYR AES256 GNSS
	PMUE4737_S	MTP3550 UHF Full Keypad TEA1 CYR AES256 GNSS

Table 43: Service Replacement Kit Matrix for Mainboard (EMEA)

Radio Version	Service Main Board Kit	Description
MTP3100 350–430 MHz PT9120F	PMUE3829_W ¹⁷	MTP3100 UHF Limited Keypad CLR Mainboard PEN
	PMUE3829_Z ¹⁸	
	PMUE3866_W ¹⁷	MTP3100 UHF Limited Keypad TEA1 Mainboard PEN
	PMUE3867_W ¹⁷	MTP3100 UHF Limited Keypad TEA2 Mainboard PEN
MTP3150 350–430 MHz PT9120HE	PMUE3868_W ¹⁷	MTP3100 UHF Limited Keypad TEA3 Mainboard PEN
	PMUE3969_W ¹⁹	MTP3x50 UHF Full Keypad GPS CLR ROM
	PMUE3969_Z ²⁰	
	MTP3200 350–430 MHz PT9120FE	PMUE3972_W ¹⁷
PMUE3972_Z ¹⁸		
PMUE4047_W ¹⁷		MTP3200 UHF Limited Keypad TEA1 Mainboard
PMUE4049_W ¹⁷		MTP3200 UHF Limited Keypad TEA2 Mainboard
MTP3200 FuG 350–430 MHz PT9120FG	PMUE4052_W ¹⁷	MTP3200 FuG UHF Limited Keypad TEA2 Main- board PEN
	PMUE4042_Z ¹⁸	
MTP3250 FuG 350–430 MHz PT9120FG	PMUE4042_Z ¹⁸	
	PMUE4042_Z ¹⁸	
	PMUE3969_W ¹⁷	MTP3x50 UHF Full Keypad CLR Mainboard with SIM PEN
	PMUE3969_Z ¹⁸	MTP3x50 UHF Full Keypad CLR Mainboard
MTP3250 350–430 MHz PT9120HE	PMUE4053_W ¹⁷	MTP3250 UHF Full Keypad TEA1 Mainboard
	PMUE4054_W ¹⁷	MTP3250 UHF Full Keypad TEA2 Mainboard
	PMUE4055_W ¹⁷	MTP3250 UHF Full Keypad TEA3 Mainboard
	PMUE4041_W ¹⁷	MTP3250 FuG UHF Full Keypad TEA2 Mainboard PEN
MTP3250 FuG 350–430 MHz PT9120HG		

¹⁷ For external customer ordering.
¹⁸ For internal Motorola Solutions ordering.
¹⁹ For external customer ordering.
²⁰ For internal Motorola Solutions ordering.

Radio Version	Service Main Board Kit	Description
MTP3500 350–430 MHz PT912OFE PTBP953FE	PMUE4041_Z ¹⁸	MTP3250 FuG UHF Full Keypad TEA2 Mainboard
	GMUE4774_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 GNSS Mainboard
	PMUE4765_W ¹⁷	MTP3500 UHF Limited Keypad CLR Mainboard
	PMUE4766_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 Mainboard
	PMUE4767_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 Mainboard
	PMUE4768_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 Mainboard
	PMUE4769_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 SIM Mainboard
	PMUE4770_W ¹⁷	MTP3500 UHF Limited Keypad CLR AES128 Mainboard
	PMUE4771_W ¹⁷	MTP3500 UHF Limited Keypad CLR AES256 Mainboard
	PMUE4772_W ¹⁷	MTP3500 UHF Limited Keypad CLR GNSS Mainboard
	PMUE4773_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 GNSS Mainboard
	PMUE4774_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 GNSS Mainboard
	PMUE4775_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 GNSS Mainboard
	PMUE4776_W ¹⁷	MTP3500 UHF Limited Keypad CLR AES128 GNSS Mainboard
	PMUE4777_W ¹⁷	MTP3500 UHF Limited Keypad CLR AES256 GNSS Mainboard
	PMUE4782_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 AES128 Mainboard
	PMUE4783_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 AES128 Mainboard
PMUE4784_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 AES128 Mainboard	
PMUE4785_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 AES256 Mainboard	
PMUE4786_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 AES256 Mainboard	
PMUE4787_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 AES256 Mainboard	
PMUE4788_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 AES128 GNSS Mainboard	
PMUE4789_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 AES128 GNSS Mainboard	

Radio Version	Service Main Board Kit	Description
	PMUE4790_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 AES128 GNSS Mainboard
	PMUE4791_W ¹⁷	MTP3500 UHF Limited Keypad TEA1 AES256 GNSS Mainboard
	PMUE4792_W ¹⁷	MTP3500 UHF Limited Keypad TEA2 AES256 GNSS Mainboard
	PMUE4793_W ¹⁷	MTP3500 UHF Limited Keypad TEA3 AES256 GNSS Mainboard
MTP3550 350–430 MHz PT912OFE	GMUE4720_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM GNSS Mainboard
PTBP952HE	PMUE5084_Z ¹⁸	MTP3550 SIM UHF TEA2 Mainboard PEN
PTBP953HE	PMUE4587_W ¹⁷	MTP3550 SIM UHF Full Keypad TEA2 ROM Mainboard
	PMUE4588_Z ¹⁸	MTP3550 UHF CLR Mainboard PEN
	PMUE4588_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM Mainboard
	PMUE4635_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM AES256 Mainboard
	PMUE4655_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM Mainboard
	PMUE4656_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM Mainboard
	PMUE4657_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM Mainboard
	PMUE4676_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM AES128 Mainboard
	PMUE4677_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM AES128 Mainboard
	PMUE4678_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM AES128 Mainboard
	PMUE4679_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM AES128 Mainboard
	PMUE4697_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM AES256 Mainboard
	PMUE4698_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM AES256 Mainboard
	PMUE4699_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM AES256 Mainboard
	PMUE4718_Z ¹⁸	MTP3550 UHF CLR GNSS Mainboard PEN
	PMUE4718_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM GNSS Mainboard
	PMUE4719_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM GNSS Mainboard
	PMUE4720_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM GNSS Mainboard

Radio Version	Service Main Board Kit	Description
	PMUE4721_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM GNSS Mainboard
	PMUE4725_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM AES128 GNSS Mainboard
	PMUE4726_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM AES128 GNSS Mainboard
	PMUE4727_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM AES128 GNSS Mainboard
	PMUE4728_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM AES128 GNSS Mainboard
	PMUE4732_W ¹⁷	MTP3550 UHF Full Keypad CLR ROM AES256 GNSS Mainboard
	PMUE4733_W ¹⁷	MTP3550 UHF Full Keypad TEA1 ROM AES256 GNSS Mainboard
	PMUE4734_W ¹⁷	MTP3550 UHF Full Keypad TEA2 ROM AES256 GNSS Mainboard
	PMUE4735_W ¹⁷	MTP3550 UHF Full Keypad TEA3 ROM AES256 GNSS Mainboard

Appendix B

Bottom/GCAI Connector

Mode Select (Option 1 and Option 2)

Table 44: 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			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				

Table 45: Bottom to BTB Connector

Bottom Connector Pin	BTB Connector Pin, J1200	Signal
1	11	USB_DP_TXD
2	14	USB_5V
3	22	OPT2
4	24	OPT1
5, 9, 14	1, 3, 5, 7, 9, 15, 17, 19, 20, 21, 23, 25, 27, 29, 30	GND
6	13	USB_DM_RXD

Bottom Connector Pin	BTB Connector Pin, J1200	Signal
7	26, 28	SWB+_SUPPLY
12	2, 4, 6, 8, 10, 12	EXTB+
15	16	BOOT_MODE

SLIM Connector and FuG Terminals

Figure 54: SLIM Connector

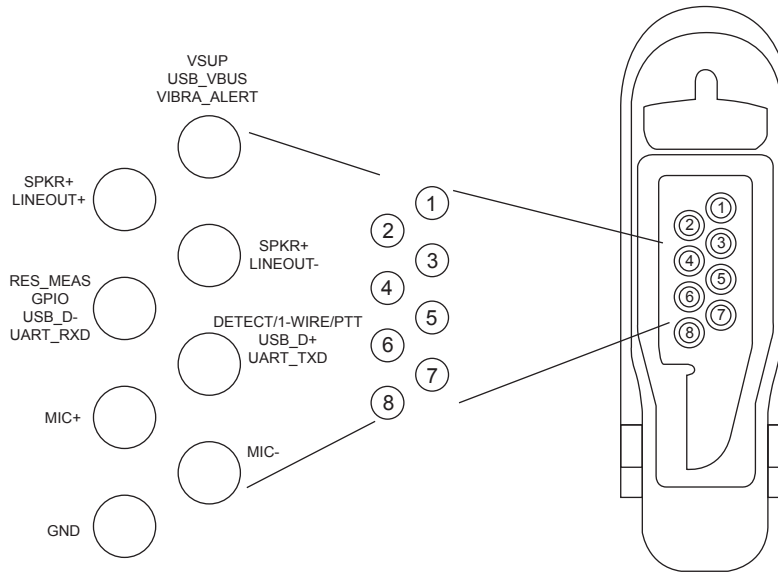



Table 46: SLIM Side Audio UC – Modes of Operation

Pin	Empty States	Default State (Spkr & Mic) "RSM"	Default State (Spkr only) "Ear-piece"	IMPRES State "RSM/Earpiece"
VSUP USB_VBUS VI- BRA_ALERT	OFF (0 V)	5.0 V	5.0 V	5.0 V
GND	0 V	0 V	0 V	0 V
SPKR+ LINE- OUT+		ON (Default Pro- file)	ON (Default Pro- file)	ON (IMPRES Pro- file)
SPKR- LINE- OUT-	OFF	ON (Default Pro- file)	ON (Default Pro- file)	ON (IMPRES Pro- file)
MIC+	OFF	ON (Default Pro- file)	OFF	ON (IMPRES Pro- file)
MIC-	0 V	0 V	0 V	0 V

 **NOTE:** HIGH = Logic 1 = 2.775 V±10%, and LOW = Logic 0 = < 0.4 V

Appendix C

Service Aids

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

Table 47: Service Aids List

Name	Part Number
Anritsu Digital Signal Generator ²¹	MG3660A
Battery Eliminator (1 meter)	PMLN6101_
Hand Pump Vacuum Leak Tester Kit	NLN9839
Hand Pump Vacuum Leak Tester Connector	66012067001
Vacuum Leak Tester Connector O-ring	32007073001
IFR System ²¹	2968/3901/3902/3920
Knob Opener	66012034002
Multi-channel GPS Simulator ²¹	Spirent STR4500
Power Meter ²¹	HP437B
Power Supply ²¹	HP6032A
R&S Audio Analyzer ²¹	UPL16
RF Antenna Adapter	PMLN5891_
RF Probe ²¹	HP85024A
Serial Data Cable (with switch at level shifter)	PMKN4122_
Serial Data Cable (without switch at level shifter)	PMKN4127_
Spectrum Analyzer ²¹	HP8560E
TETRA USB Data Cable	PMKN4129_
Universal Multimeter ²¹	HP3457A
Vacuum Leak Tester ²¹	TC-2000
Vacuum Leak Tester Connector	66007071001
Vacuum Leak Tester Connector O-ring	32007073001
Volume Knob Removal and Assembly Fixture ²¹	MT076/14 (Supplier: Access Hitech)

²¹ This test equipment is not provided by Motorola Solutions. You are required to obtain the equipment from external vendors.

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 the 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 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 pre-defined set of parameters.

Differential Quadrature Phase Shift Keying (DQPSK) A sub-class 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 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 is passed through it.

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 the 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.