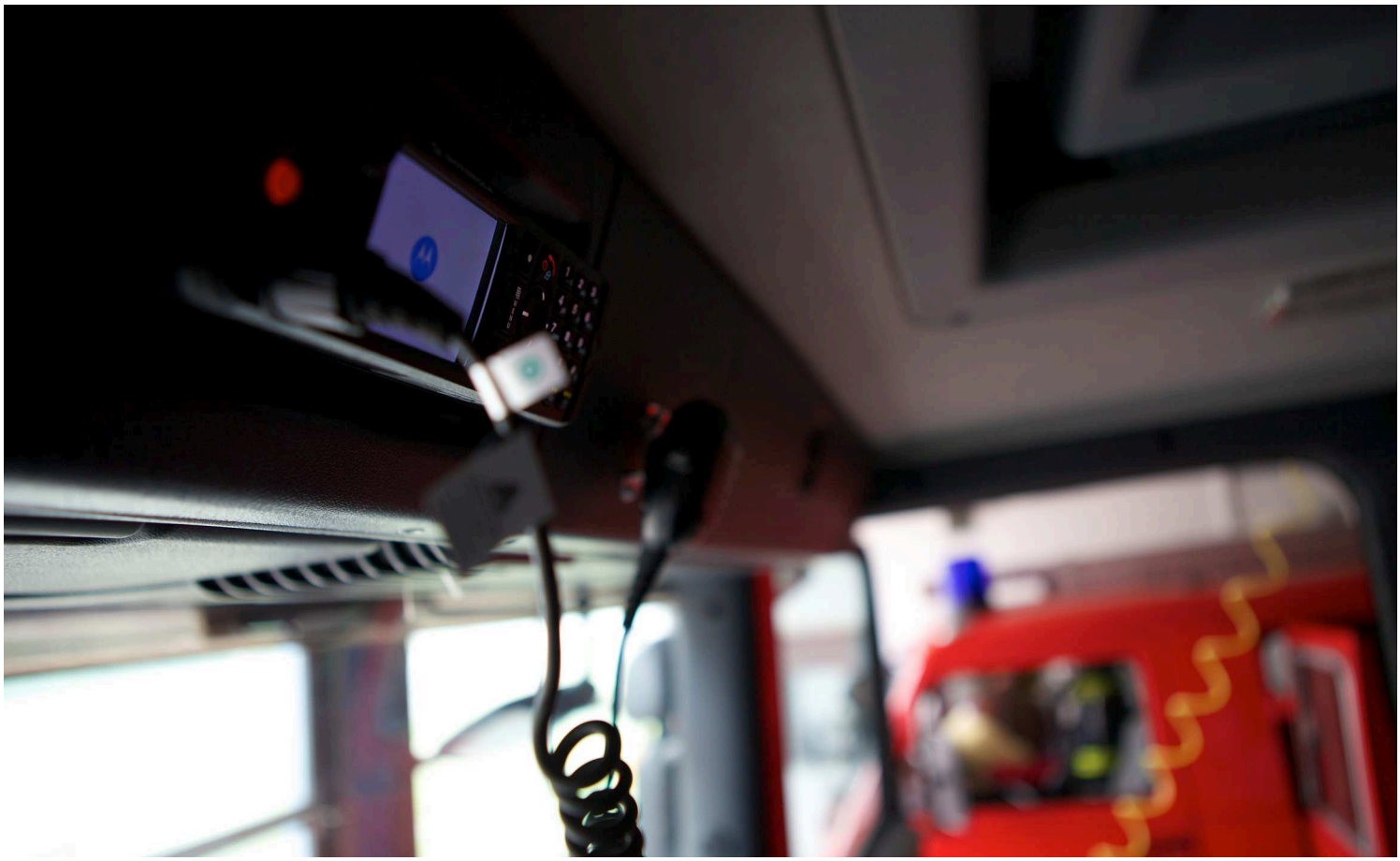
MTM5x00 / MTM800 FuG
MTM800 FuG ET

BASIC SERVICE MANUAL

380–430 MHz (MT953C/MT953CG)



November 2012 EN

68015000183-D

Technical Information Updates

As we continue to make engineering enhancements to our products, the information in our Service Manuals need to be updated accordingly. If you wish to be informed of these updates, kindly fill in and fax us your details.

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Manual No.: 68015000183

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1. Please check all the appropriate boxes:

	Complete	Incomplete	Correct	Incorrect	Clear	Confusing	Size Adequate	Size Too Small	Not Covered in this Manual
Disassembly Procedures									
Alignment Procedures									
Exploded Views									
Schematic Diagrams									
Circuit Board Details									
Electrical Parts List									
Exploded View Parts List									

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   ❑ excellent ❑ very good ❑ good ❑ fair ❑ poor
3. Did this Service manual provide you with the information necessary to service and maintain the specific equipment?
   ❑ very much so ❑ generally yes ❑ to some extent ❑ no
4. We would appreciate any corrections or recommendations for improving this manual. Please include the specific page number(s) of the diagram or procedure in question.

5. General comments/suggestions:

Manual No.: 68015000183

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Notes

DOCUMENT HISTORY

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

Edition	Description	Date
68015000183-A	Initial Release	Nov. 2010
68015000183-B	Updates include: • added new microphone to the Accessories-to-Model Chart on page 2-4. • added new infomation in the footnotes of the Accessories-to-Model Chart on page 2-6. • general updates on various parameters throughout Chapter 6, “Test Setup & Testing for 380–430 MHz”. • updated the part number for the *Mobile DDR* in Table 6-3 on page 6-5. • updated part number for the *Remote PWA kit* on page 6-28.	May. 2011
68015000183-C	Updates include: • added a note for the new LCD Module part number, Table 6-7 (Chapter 6). • updated diagram (Figure 6-1) and terminal disassembly step for Enhanced Control Head Removal (Chapter 6).	Jun. 2012
68015000183-D	Updates include: • added new Ethernet sales model and model descriptions for Model Descriptions table and Sales Model Nomenclature chart (Chapter 2). • added Ethernet model accessories and service kits for Accessories-to-Model Chart table (Chapter 2) and Service Kits-to-Model Chart table (Appendix A). • added new sections on disassembly/assembly steps, exploded view diagrams and parts list for TSCH, RBH and EEH (Chapter 6).	Nov. 2012

Notes

Product Safety and RF Energy Exposure for TETRA Mobile Terminals installed in Vehicles or as Fixed Site Control Stations

Caution

THIS CHAPTER IS AN EXTRACT OF THE MULTI LINGUAL MOBILE SAFETY BOOKLET PUBLICATION No. 6866537D37_.

FOR THE LATEST SAFETY INFORMATION REFER TO THE SEPARATE SAFETY BOOKLET DELIVERED WITH YOUR TERMINAL.

BEFORE USING THIS TERMINAL READ THIS INFORMATION WHICH CONTAINS IMPORTANT OPERATING INSTRUCTIONS FOR SAFE USAGE AND RF ENERGY AWARENESS AND CONTROL INFORMATION FOR COMPLIANCE WITH RF ENERGY EXPOSURE LIMITS IN APPLICABLE NATIONAL AND INTERNATIONAL STANDARDS.

The information provided in this document supersedes information contained in user guides, manuals and other documentation published prior to **February 2002.**

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

Note: This terminal 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 FCC/ICNIRP limits. This terminal device is NOT authorized for general population, consumer or any other use.

This 2-way terminal 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. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health and industry work with organisations 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 2-way terminals are designed, manufactured and tested to ensure they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of 2-way terminals. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it.

Please refer to the following Web sites 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

Federal Communications Commission Regulations (US markets only)

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for mobile 2-way terminals before they can be marketed in the U.S. When 2-way terminals 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. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information. Your Motorola 2-way terminal has an RF exposure product label. Do not remove this RF exposure label from the device. Also, your Motorola user manual, or separate safety booklet, includes information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

Compliance with RF Exposure Standard

Your Motorola terminal is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. **This terminal complies with IEEE and ICNIRP exposure limits for occupational/controlled RF** exposure environments at duty factors of up to 50% talk–50% listen and is authorised by the IEEE/ICNIRP for occupational use. In terms of measuring RF energy for compliance with these exposure guidelines, your terminal antenna radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

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

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR part 2 sub-part J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003
- ANATEL, Brasil Regulatory Authority, Resolution 256 (April 11, 2001) “additional requirements for SMR, cellular and PCS product certification.”

RF Exposure Compliance and Control Guidelines and Operating Instructions

To control exposure to yourself and others and to ensure compliance with the RF exposure limits, always adhere to the following procedures.

Guidelines:

- User awareness instructions should accompany device when transferred to other users.
- Do not use this device if the operational requirements described herein are not met.

Instructions:

- **Transmit no more that 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. Transmitting 50% of the time, or less, is important because this terminal generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).
- **Transmit only when people outside the vehicle are at least the recommended minimum lateral distance away, as shown in Table 1, from the body of a vehicle with a properly installed antenna.** This separation distance will ensure that there is sufficient distance from a properly installed (according to installation instructions) externally-mounted antenna to satisfy the RF exposure requirements in the standards listed above.

  Note: Table 1 lists the recommended lateral distance for bystanders in an uncontrolled environment from the body of a vehicle with an approved, properly installed transmitting antenna (i.e. monopoles over a ground plane, or dipoles) at several different ranges of rated radio power for mobile terminals installed in a vehicle.

Table 1

Mobile terminal Rated Power (see Note below)	Minimum Lateral Distance From Vehicle Body
Less than 7 Watts	20 cm (8 Inches)
7 to 15 Watts	30 cm (1 Ft)
16 to 39 Watts	60 cm (2 Ft)
40 to 110 Watts	90 cm (3 Ft)

Note: If you are not sure of the rated power of your terminal, contact your Motorola representative or dealer and supply the terminal model number found on the terminal model label. If you cannot determine the rated power out, then assure 90cms (3 feet) separation from the body of the vehicle.

Mobile Antenna Installation Guidelines

- These mobile antenna installation guidelines are limited to metal body motor vehicles or vehicles with appropriate ground planes.
- Antennas should be installed in the centre area of the roof or the trunk lid taking into account the bystander exposure conditions of backseat passengers and according to the specific instructions and restrictions in the Radio (Terminal) Installation Manual along with the requirements of the antenna supplier.

- Trunk lid installations are limited to vehicles with clearly defined flat trunk lids, and in some cases, to specific terminal models and antennas. See the Radio (Terminal) Installation Manual for specific information on how and where to install specific types of approved antennas to facilitate recommended operating distances to all potentially exposed persons.

- **Use only Motorola-approved supplied antenna or a Motorola approved replacement antenna**. Unauthorised antennas, modifications, or attachments could damage the terminal and may result in non-compliance with RF Safety Standards.

Approved Accessories

- This terminal has been tested and meets the RF Safety Standards when used with the Motorola accessories supplied or designated for this product. Use of other accessories may result in non-compliance with RF Safety Standards.

- For a list of Motorola approved antennas, please see your dealer or local Motorola contact. Your nearest dealer can be found at the following web site:

http://www.motorolasolutions.com

Additional Information

- For additional information on exposure requirements or other training information, visit

http://www.motorolasolutions.com/rfhealth

Compliance and Control Guidelines and Operating Instructions for Mobile Two-Way Terminals Installed as Fixed Site Control Stations

If mobile terminal equipment is installed at a fixed location and operated as a control station or as a fixed unit, the antenna installation must comply with the following requirements in order to ensure optimal performance and compliance with the RF energy exposure limits in the standards and guidelines listed on previous page:

- The antenna should be mounted outside the building on the roof or a tower if at all possible.

- As with all fixed site antenna installations, it is the responsibility of the licensee to manage the site in accordance with applicable regulatory requirements and may require additional compliance actions such as site survey measurements, signage, and site access restrictions in order to insure that exposure limits are not exceeded.

Electromagnetic Interference/Compatibility

Note: Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility. It may be necessary to conduct compatibility testing to determine if any electronic equipment used in or around vehicles or near fixed site antenna is sensitive to external RF energy or if any procedures need to be followed to eliminate or mitigate the potential for interaction between the terminal transmitter and the equipment or device.

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, turn off your terminal 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.

Vehicles

To avoid possible interaction between the terminal transmitter and any vehicle electronic control modules, such as, ABS, engine, or transmission controls, the terminal should be installed only by an experienced installer and that the following precautions be used when installing the terminal:

1. Refer to the manufacturer’s instructions or other technical bulletins for recommendations on terminal installation.

2. Before installing the terminal, determine the location of the electronic control modules and their harnesses in the vehicle.

3. Route all terminal wiring, including the antenna transmission line, as far away as possible from the electronic control units and associated wiring.

Driver Safety

Check the laws and regulations on the use of terminals in the area where you drive. Always obey them. **When using your terminal while driving, please:**

- Give full attention to driving and to the road.
- Pull off the road and park before making or answering a call if driving conditions so require.

WARNING

OPERATIONAL WARNINGS

For Vehicles With Air Bags

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

Potentially Explosive Atmospheres

Turn off your terminal prior to entering any area with a potentially explosive atmosphere. 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 referred to above include fuelling 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 terminal when you are near electrical blasting caps, in a blasting area, or in areas posted:
“Turn off two-way radio (terminal)”. Obey all signs and instructions.

For terminals 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 LP-gas standard, NFPA 58, contact the National Fire Protection Association, One Battery Park, Quincy, MA.

Caution

ADDITIONAL IMPORTANT INFORMATION FOR SERVICING AND INSTALLING THE TERMINAL

Only specialized workshops should be contacted for installation, maintenance and repair work.

This unit is equipped with protection fuses in the Power and Ignition Sense Cable.
Replace these fuses only with the original ratings!

Caution: Failure to use correct manufactures approved parts may result in physical damage to this unit.

Fuse for Power Cable GKN6270/GKN6274:	10A	(Motorola Part Number: 65C80283E05)
Fuse for Ignition Sense Cable HKN9327:	4A	(Motorola Part Number: 65C80283E02)
Fuse for Y-Cable PMKN4133/PMKN4134:	2A	(Motorola Part Number: 65012023001)

Achtung

ZUSÄTZLICHE SICHERHEITSINFORMATIONEN FÜR SERVICE UND INSTALLATION DES FUNKGERÄTES

Installations, Wartungs- und Reparaturarbeiten dürfen ausschließlich von autorisiertem und geschultem Personal ausgeführt werden.

Dieses Gerät ist mit einer Schutzsicherung im Stromversorgungskabel ausgestattet.
Bei Austausch ausschließlich den Originalwert verwenden

WARNUNG: Bei Einsetzen von nicht vom Hersteller freigegebenen Ersatzteilen kann das Gerät zerstört werden.

Sicherung für Stromversorgungskabel GKN6270/GKN6274:	10A	(Motorola Best.-Nr.:65C80283E05)
Sicherung für Zündungserkennungskabel HKN9327:	4A	(Motorola Best.-Nr.:65C80283E02)
Sicherung für Y Kabel PMKN4133/PMKN4134:	2A	(Motorola Best.-Nr.:65012023001)

Notes

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CHAPTER 3 OVERVIEW

CHAPTER 4 PROGRAMMING THE TERMINAL

CHAPTER 5 TEST SETUP & TESTING

CHAPTER 5.1 TEST SETUP & TESTING FOR 380–430 MHZ

CHAPTER 6 MAINTENANCE

APPENDIX A REPLACEMENT PARTS & KITS

APPENDIX B PRODUCT SPECIFIC INFORMATION

SPEZIELLE PRODUKTINFORMATIONEN

CHAPTER 1
SCOPE & WARRANTY INFORMATION

Scope of this Manual

This manual is intended for use by trained service technicians familiar with similar types of equipment only. It contains information required for the installation of the equipment described and is current as of the printing date. Changes which occur after the printing date may be incorporated by a complete Manual revision or alternatively as additions.

NOTE **Before planning or starting the installation, please read the Safety Information Section in the front of this manual.**

This manual is divided into the following sections:

- Copyright
- Document History
- User Safety, Training and General Information
- CHAPTER 1 Scope and Warranty Information
- CHAPTER 2 Model Information & Accessories
- CHAPTER 3 Overview
- CHAPTER 4 Programming the Terminal
- CHAPTER 5 Test Setup and Testing
- CHAPTER 6 Maintenance
- APPENDIX A Replacement Parts and Kits
- APPENDIX B Product Specific Information

Manuals & User Guides

Product Information Manual

68015000002	Tetra Terminal Product Information Manual
68015000883	MTM5x00 / MTM800 FuG / MTM800 FuG ET Terminal Product Information Manual (English)
68015000884	MTM5x00 Terminal Product Information Manual (English)

Installation Instructions

68015000181	MTM5400 Installation Manual (English)
68015000586	MTM5400 Feature User Guide (English, German)
68015000603	MTM5400 Installation Manual (English, German)
68015000553	MTM800 FuG Installation Manual (English, German)
68015000584	MTM800 FuG Installation Manual (English, German)
68015000747	MTM5500 Installation Manual (English)
68015000748	MTM5500 Installation Manual (English, German)
68015000749	MTM800 FuG ET Installation Manual (English)
68015000750	MTM800 FuG ET Installation Manual (English, German)

Service Manuals

68015000184	MTM5400 / MTM800 FuG Detailed Service Manual (English)
68015000183	MTM5400 / MTM800 FuG Basic Service Manual (English)

User Guides

68015000289	MTM5x00 Quick Start Guide (English)
68015000180	MTM5x00 Feature User Guide (English) only available on MOL: (http://www.motorola.com/emeaonline)
68015000284	MTM5x00 Quick Start Guide (Lithuanian)
68015000285	MTM5x00 Quick Start Guide (Arabic)
68015000290	MTM5x00 Quick Start Guide (Spanish)
68015000291	MTM5x00 Quick Start Guide (Norwegian)
68015000292	MTM5x00 Quick Start Guide (Dutch)
68015000293	MTM5x00 Quick Start Guide (German)
68015000294	MTM5x00 Quick Start Guide (Polish)
68015000295	MTM5x00 Quick Start Guide (Italian)
68015000296	MTM5x00 Quick Start Guide (French)
68015000297	MTM5x00 Quick Start Guide (Danish)
68015000298	MTM5x00 Quick Start Guide (Swedish)
68015000549	MTM5x00 Quick Start Guide (Russian)
68015000550	MTM5x00 Quick Start Guide (Portuguese)
68015000551	MTM5x00 Quick Start Guide (Hebrew)
68015000569	MTM5x00 Quick Start Guide (Romanian)
68015000865	MTM5x00 Quick Start Guide (Catalonian)
68015000613	TSCH Quick Start Guide (English)
68015000614	TSCH Quick Start Guide (German)
68015000675	TSCH Quick Start Guide (Lithuanian)
68015000676	TSCH Quick Start Guide (Norwegian)
68015000677	TSCH Quick Start Guide (Arabic)
68015000681	TSCH Quick Start Guide (Spanish)

68015000682	TSCH Quick Start Guide (Dutch)
68015000683	TSCH Quick Start Guide (Polish)
68015000684	TSCH Quick Start Guide (Italian)
68015000685	TSCH Quick Start Guide (French)
68015000686	TSCH Quick Start Guide (Danish)
68015000687	TSCH Quick Start Guide (Swedish)
68015000688	TSCH Quick Start Guide (Russian)
68015000689	TSCH Quick Start Guide (Portuguese)
68015000690	TSCH Quick Start Guide (Hebrew)
68015000691	TSCH Quick Start Guide (Romanian)
68015000692	TSCH Quick Start Guide (Catalonian)
68015000554	MTM800 FuG / MTM800 FuG ET Quick Start Guide (English)
68015000555	MTM800 FuG / MTM800 FuG ET Quick Start Guide (German)
68015000586	MTM5x00 Feature User Guide (English, German)
68015000585	MTM800 FuG / MTM800 FuG ET Feature User Guide (English)
68015000552	MTM800 FuG / MTM800 FuG ET Feature User Guide (English, German)
	All the Feature User Guides above are only available on MOL: (http://www.motorola.com/emeaonline)

CPS Start Up Manual

6802974C10	Tetra CPS Start Up Manual (English)
6866539D55	Tetra CPS Start Up Manual (English, Hungarian)
6866588D27	Tetra CPS Start Up Manual (English, German)
6866588D36	Tetra CPS Start Up Manual (English, Italian)

Safety Leaflets

6866537D37	Mobile Safety Leaflet

Accessory Leaflet

68015000182	MTM5x00 / MTM800 FuG / MTM800 FuG ET Accessory Leaflet (English)

Warranty and Service Support

Motorola 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 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. 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 terminal back to the appropriate Motorola warranty depot, please contact Customer Resources or your Motorola dealer, distributor or reseller. All returns must be accompanied by a Warranty Claim Form, available from your Customer Service representative or Motorola Online Extranet (MOL) or your Motorola dealer, distributor or reseller (refer to list in Appendix A). 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 continues to support its products in two ways.

- Motorola's Regional Radio Support Centres offer a repair service to both end users and dealers at competitive prices.
- AAD supplies individual parts and modules that can be purchased by dealers who are technically capable of performing fault analysis and repair.

CHAPTER 2

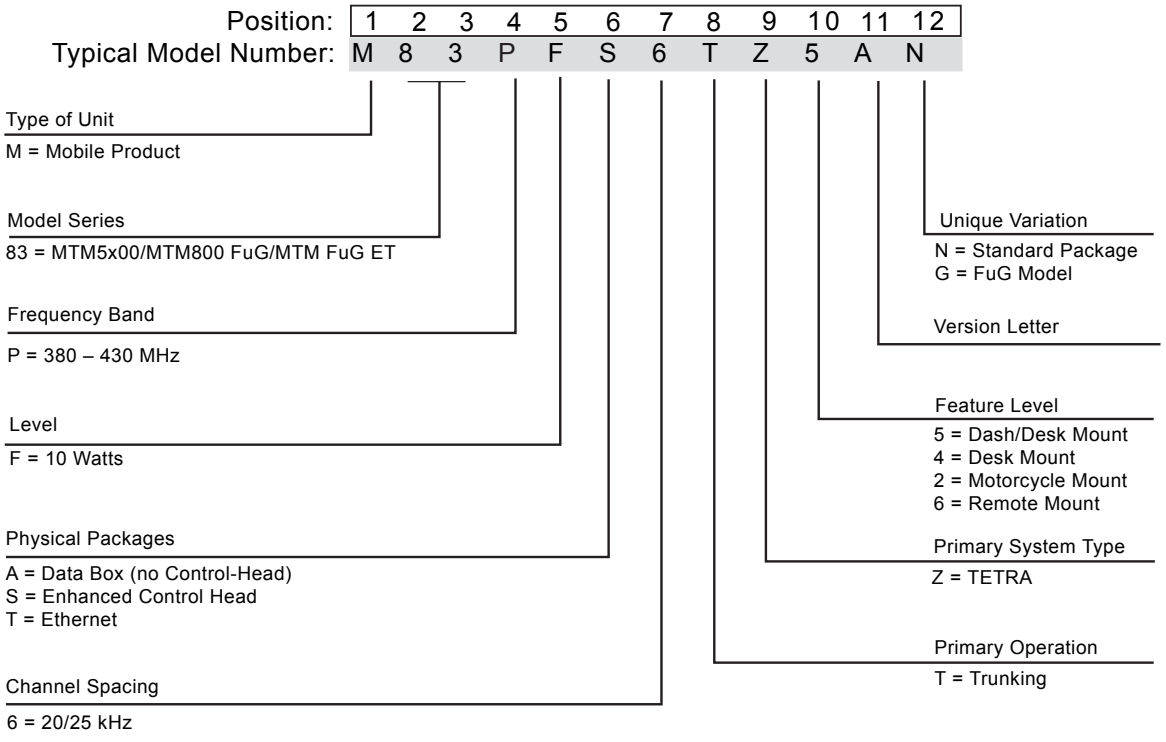
MODEL INFORMATION & ACCESSORIES

MTM5x00/MTM800 FuG/MTM800 FuG ET with Enhanced Control Head Mobile Terminal Model Information

This manual applies to the following Mobile Terminal Models:

Type No.	Sales Model No.	Short Description	Model
MT953C MT953CG	M83PFS6TZ5AN M83PFS6TZ5AG	MTM5400 380–430 MHz, DASH MTM800 FuG 380–430 MHz, DASH	M1
MT953C MT953CG	M83PFS6TZ4AN M83PFS6TZ4AG	MTM5400 380–430 MHz, DESK MTM800 FuG 380–430 MHz, DESK	M2
MT953C MT953CG	M83PFS6TZ6AN M83PFS6TZ6AG	MTM5400 380–430 MHz, REMOTE MTM800 FuG 380–430 MHz, REMOTE	M3
MT953C MT953CG	M83PFS6TZ2AN M83PFS6TZ2AG	MTM5400 380–430 MHz, M'CYCLE MTM800 FuG 380–430 MHz, M'CYCLE	M4
MT953C MT953CG	M83PFA6TZ5AN M83PFA6TZ5AG	MTM5400 380–430 MHz, Data MTM800 FuG 380–430 MHz, Data	M5
MT953C MT953CG	M83PFT6TZ6AN M83PFT6TZ6AG	MTM5500 380–430 MHz, REMOTE MTM800 FuG ET 380–430, REM ETHERNET	M6

Sales Model Nomenclature



Model Specifications

GENERAL

ETSi: ETS 300 394-1

Type Number:

MTM5400/MTM800 FuG ENH 380–430 MHz — MT912M

Temperature Range for Transceiver:

Operating	-30°C to +60°C
Storage:	-40°C to +85°C

Power Supply:

Minimum:	10.8 Vdc
Nominal:	13.2 Vdc
Maximum:	15.6 Vdc
Max. Current	Approx. 3.5 A

Dimensions (HxWxD) in mm:

Transceiver with Enhanced Control Head, Dash Mount — 60 x 188 x 198

Weight in grams:

Transceiver with Enhanced Control Head, Dash Mount — 1500

RECEIVER

Receiver Type: Direct Conversion

Frequency Range:

MTM5400 / MTM800 FuG ENH — 380–430 MHz

Channel Spacing: 25 kHz

Sensitivity (3.5%) BER: -114 dBm

Intermodulation: -47 dBm

Blocking (50–100 kHz): -40 dBm

Spurious Rejection: -45 dBm

Adjacent Channel Interference Ratio: -45 dB

Frequency Stability:

Locked to Base	+/-100 Hz
Unlocked to Base	+/- 1 kHz

Audio Rated (@4 Ohms):

For External Speaker:	10 W
Distortion at Rated Audio:	5% Max.

TRANSMITTER

Modulation Type: π/4DQPSK, 4-QAM, 16-QAM, 64-QAM

RF Power:

TMO	10 W / 40 dBm
DMO	10 W / 40 dBm
MSPD	5.6 W / 37.5 dBm
TEDS	3 W / 35 dBm

Frequency Range TMO:

MTM5400/MTM800 FuG ENH — 380–430 MHz

Frequency Range DMO:

MTM5400/MTM800 FuG ENH — 380–430 MHz

Frequency Stability:

Locked to Base	+/-100 Hz
Not Locked to Base	+/- 1 kHz

Spurious Emissions:

Conducted/Radiated	- 36 dBm <=1 GHz
	- 30 dBm > 1 GHz

Adjacent Channel Power Ratio (@ ± 25 kHz)

380–430 MHz -60 dBc

NOTE: Technical information may be subject to change without further notice.

Model Descriptions

Model	Description
M1	Dash Mount with Mobile Terminal with Direct Mount Enhanced Control Head, Speaker, Microphone or Handset, Standard User Guide, and Installation Accessories.
M2	Desk Mount with Mobile Terminal with Direct Mount Enhanced Control Head, Speaker, Microphone or Handset, Standard User Guide, Installation Accessories and Tray with power supply.
M3	Remote Mount with Mobile Terminal with Remote Mount Enhanced Control Head, optional either with Remote Head Enhanced or Data Expansion Head Enhanced, Speaker, Microphone or Handset, Remote Mount cables, Standard User Guide, and Installation Accessories.
M4	Motorcycle Mount with Mobile Terminal with Motorcycle Mount Enhanced Control Head, optional either with Remote Head Enhanced or Data Expansion Head Enhanced, Speaker, Microphone or Handset, Motorcycle cables, Standard User Guide, and Installation Accessories.
M5	Data Mount with Mobile Terminal with Remote Mount Enhanced Control Head, Data Expansion Head Enhanced, Speaker, Microphone or Handset, Remote Mount cables, Standard User Guide, and Installation Accessories.
M6	Remote Mount with Mobile Terminal with Remote Mount Ethernet Enhanced Control Head with Ethernet Data Expansion Head, Speaker, Microphone or Handset, Remote Mount cables, Standard User Guide, and Installation Accessories. The remote mount control heads can be: • Telephone Style Control Head • Ethernet Remote Control Head • A combination of the above or two of each

NOTE: Other combinations are not recommended or not possible.

Accessories-to-Model Chart

ACCESSORIES							
Control Heads	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Control Head, Roman Keypad	PMWN4009	X	X				
Control Head, Arabic Keypad	PMWN4012	X	X				
Control Head, Cyrillic Keypad	PMWN4014	X	X				
Control Head Hungarian Keypad	PMWN4015	X	X				
Control Head Hebrew Keypad	PMWN4016	X	X				
Remote Mount Control Head, Roman Keypad	PMWN4017			X			
Remote Mount Control Head, Arabic Keypad	PMWN4020			X			
Remote Mount Control Head, Cyrillic Keypad	PMWN4022			X			
Remote Mount Control Head, Hungarian Keypad	PMWN4023			X			
Motorcycle Mount Enhanced Control Head, Roman Keypad	PMWN4002				X		
Motorcycle Mount Enhanced Control Head, Arabic Keypad	PMWN4005				X		
Motorcycle Mount Enhanced Control Head, Cyrillic Keypad	PMWN4007				X		

ACCESSORIES							
Motorcycle Mount Enhanced Control Head, Hungarian Keypad	PMWN4008				X		
Expansion & Remote Head Kits	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Data Expansion Head	PMLN4908			X	X	X	
Remote Head	PMLN4904			X	X		
Ethernet Data Expansion Control Head	PMLN7009						X
Remote Ethernet Control Head	PMWN4024						X
Telephone Style Control Head	PMWN4025						X
Ethernet Port Dust Cover Kit (set of 2)	PMLN6344						X
Kit, Label, Color Code (Blue) (set of 5)	PMLN6339						X
Kit, Label, Color Code (Yellow) (set of 5)	PMLN6338						X
Kit, Label, Color Code (Red) (set of 5)	PMLN6337						X
Kit, Label, Color Code (Green) (set of 5)	PMLN6336						X
Kit, Label, Color Code (White) (set of 5)	PMLN6335						X
Microphones	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Desktop Microphone, Mobile Microphone Port	RMN5106	X	X	X			X
Compact Fist Microphone	RMN5107	X	X	X	X		X
Heavy Duty Fist Microphone	RMN5111	X	X	X	X		X
Fist Microphone (use together with Junction Box) [a]	GMMN4063	X	X	X		X	X
Impres Visor Microphone	RMN5054	X	X	X			X
Handset Speaker Microphone (HSM) [b]	PMMN4070	X[c]	X	X[d]			X
Hearer Speaker Mic with Jack Vol. C & Emer.	PMMN4086						X
Visor Microphone	PMMN4087	X	X	X			X
Loudspeakers	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Small Loudspeaker, 5W (use together with Junction Box) [a]	GMSN4078	X	X	X	X	X	X
External Speaker, 5W	RSN4004	X	X	X	X		X
External Speaker, 13W	RSN4002	X	X	X	X		X
Speaker Extension Cable [e]	GMKN4084	X	X	X	X		
Speaker Extension Cable	PMKN4119	X	X	X	X		
Handset	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Telephone-Style Handset [e]	GMUN1006	X	X	X	X		X
Impres GCAI Handset (for M4, use with Accessories Extension Cable) [f]	HLN7016	X	X	X	X		
Impres Telephone Style Handset	MDHLN7016						X
Impres PH-Handset MID PTT	MDHLN7016A SP01						X
Telephone – Style Handset (Telco) with middle button	GMUN1006BS SP01						X
PTT Switches	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
External PTT with Emergency Footswitch	RLN4836	X	X	X	X		X

ACCESSORIES							
Gooseneck PTT	RLN4858	X	X	X	X		X
Pushbutton with Remote PTT	RLN4857	X	X	X	X		X
Push Button PTT	RLN5926	X	X	X	X		X
Desktop & Data Box Mount	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Desktop Tray without Loudspeaker	GLN7318		X				
Desktop Tray with Loudspeaker	RSN4005A		X				
Desktop Power Supply	HPN4007C		X			X	
Desktop Power Supply	GPN6145B		X			X	
Power Cable (For Desktop Power Supply HPN4007C)	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
US Linecord (3060665A04) Packed	NTN7373		X			X	
Euro Linecord (3060665A05) Packed	NTN7374		X			X	
UK Linecord (3002120F02) Packed	NTN7375		X			X	
Power Cable, for use with HPN4007C and GPN6145B	GKN6266		X			X	
Cables	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Remote Mount Cable (Terminal to C/H), 3m	RKN4077			X	X		
Remote Mount Cable (Terminal to C/H), 5m	RKN4078			X	X		
Remote Mount Cable (Terminal to C/H), 7m	RKN4079			X	X		
Remote Mount Cable (Terminal to C/H), 10m	PMKN4020			X	X		
Accessories Expansion Cable, 2.3m	PMKN4029			X	X		
Motorcycle Mount TELCO Cable, 2.3m	PMKN4030				X		
Accessories Expansion Cable, 4m	PMKN4056			X	X		
Tetra Mobile Ethernet Cable, 40m	PMKN4135						X
Tetra Mobile Ethernet Cable, 12m	PMKN4136						X
Tetra Mobile Ethernet Cable, 10m	PMKN4138						X
Tetra Mobile Ethernet Cable, 7m	PMKN4139						X
Tetra Mobile Ethernet Cable, 5m	PMKN4140						X
Tetra Mobile Ethernet Cable, 3m	PMKN4141						X
RECH Y-Cable with Fuse (2 A)	PMKN4133						X
TSCH Y-Cable with Fuse (2 A)	PMKN4134						X
SIM Card Reader Cable, 60cm	PMKN4137						X
SIM Card Reader Cable, 195cm	PMKN4142						X
Spiral Cable Kit (Service replacement kit)	0104047J66						X
Junction Box	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Junction Box	GMLN5089	X	X	X	X		
Cable 6m Transceiver to Junction Box [a]	PMKN4101	X	X	X	X		
Cable 4m Transceiver to Junction Box [a]	PMKN4102	X	X	X	X		
Cable 2m Transceiver to Junction Box [a]	PMKN4103	X	X	X	X		
Power Cables (to Mobile Terminal)	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**

ACCESSORIES							
12V Power Cable to Battery, 3m with Fuse (10 A)	GKN6270	X		X	X		
12V Power Cable to Battery, 6m with Fuse (10 A)	GKN6274	X		X	X		
Ignition Sense Cable	PMKN4120A	X		X	X		
Installation	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
External Alarm Relay	GKN6272	X	X	X	X		
Accessory Connector Kit - radio rear 26-pin plug	HLN9457	X	X	X	X		
Accessory Connector Kit - junction box 26-pin plug [g]	PMLN5072A	X	X	X	X		
Buzzer Kit	GLN7282	X	X	X	X		
Mounting (Transceiver)	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Key Lock Mount	RLN4779	X	X	X	X	X	
High Profile Mounting Bracket	GLN7317	X	X	X	X	X	
Low Profile Mounting Bracket	GLN7324	X	X	X	X	X	
Mounting Frame to Install Transceiver in DIN-A Slot	PMLN5094	X	X	X	X	X	
Mounting (Control Head)	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Remote Mount Trunnion Kit	PMLN4912			X			
Motorcycle Mount Trunnion Kit	PMLN5092				X		
DIN Mount Bracket	PMLN5093			X			
Slim Mounting Bracket	PMLN6346						X
Programming/Data	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
USB Programming Cable (Terminal Rear Port)	PMKN4110	X	X	X	X		
Programming Cable	PMKN4105	X	X	X	X		X
Active Data Cable [a]	PMKN4104	X	X[a]	X	X		X
USB Programming Cable (Mobile Microphone Port)	HKN6184	X	X	X	X		
Cable Assembly: Micro USB Active Sync	25-124330-01R						X
Antennas (sold with terminals)	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Antenna Whip Tetra Hinged 380 – 430 MHz	GMAE4253A	X	X	X	X	X	X
Antenna Tetra Glass Mount 410 – 430 MHz	GMAE4254A	X	X	X	X	X	X
Antenna Tetra Panel/Roof Mount 380 – 430 MHz	GMAE4255A	X	X	X	X	X	X
Antenna Tetra Magnetic Mount 380 – 400 MHz	GMAE4256A	X	X	X	X	X	X
Antenna Tetra Magnetic Mount 410 – 430 MHz	GMAE4257A	X	X	X	X	X	X
Antenna Tetra Covert Strip Glass 380 – 400 MHz	GMAE4258A	X	X	X	X	X	X
Antenna Tetra Covert Strip Glass 410 – 430 MHz	GMAE4259A	X	X	X	X	X	X
Antenna Tetra Low Profile 380 – 400 MHz	GMAE4260A	X	X	X	X	X	X
Antenna Tetra Low Profile 410 – 430 MHz	GMAE4261A	X	X	X	X	X	X
Antenna Tetra Wall Mount 380 – 400 MHz	GMAE4262A	X	X	X	X	X	X
Antenna Tetra Wall Mount 410 – 430 MHz	GMAE4263A	X	X	X	X	X	X
Antenna Tetra Motorcycle 380 – 400 MHz	GMAE4266A	X	X	X	X	X	X
Antenna Tetra Motorcycle 410 – 430 MHz	GMAE4267A	X	X	X	X	X	X
Antennas (base only) and Whips	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**

ACCESSORIES							
Antenna Mount Panel/Roof thickness up to 4mm	GMLN4276A	X	X	X	X	X	X
Antenna Mount Panel/Roof thickness up to 6mm	GMLN4277A	X	X	X	X	X	X
Antenna Mount Magnetic	GMLN4278A	X	X	X	X	X	X
Antenna Whip Tetra Flexible Hinged 380 – 400 MHz	GMAE4279A	X	X	X	X	X	X
Antenna Whip Tetra Flexible Hinged 410 – 430 MHz	GMAE4280A	X	X	X	X	X	X
Antenna Whip Tetra Flexible Hinged 380 – 430 MHz	GMAE4281A	X	X	X	X	X	X
Antenna Whip Tetra Hinged 380 – 400 MHz	GMAE4282A	X	X	X	X	X	X
Antenna Whip Tetra Hinged 410 – 430 MHz	GMAE4283A	X	X	X	X	X	X
Antenna Whip Tetra Hinged 380 – 430 MHz	GMAE4284A	X	X	X	X	X	X
GPS	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
GPS Adaptor	PMKN4114	X	X	X	X	X	

a. The cable, PMKN4104, is only compatible when an Data Expansion Head Enhanced is not fitted as part of a remote mount configuration. In this configuration, access to the Tetra PEI for IP Packet Data and SDS services is available on the Data Expansion Head Enhanced, and the Active Data Cable PMKN4104 is not required.

b. The Handset Speaker Microphone (HSM) can offer better suppression to chopper noise by switching the steel grounding clip inside the control head with the correspondent golden grounding clip; see footnotes c and d. For details on how to make this switch, refer to the related instruction leaflet.

c. The golden grounding clip used in this model is 4216931H01. See footnote b.

d. The golden grounding clip used in this model is 4216932H01. See footnote b.

e. Requires Junction Box, GMLN5089.

f. Currently the GCAI handset has insufficient margin to EMC requirements and may require additional protection to pass. Additional protection can in most cases be provided by the car body and by planning to installation such that strong coupling from other electrical and electronic installation in the vehicle are avoided. In cases where further EMC protection is needed this can be achieved by installing (P/N: 01015001001) as shown in kit leaflet.

The specific configuration can be tested using the following technique:

The test requires a second radio in a quiet place or cooperation with a dispatcher.

i. Ensure that all other electrical and electronic equipment in the vehicle that may cause interference are not active.
ii. Then check all intended RX and TX audio paths of the radio installation one at a time.
iii. Listen to the idle channel noise and make sure there is no obvious noise or disturbance that can be attributed to radiated or magnetically coupled interference. Speech must be clear over the channel.

g. Keep the GCAI connector cover supplied with the new Control Head.

Notes

CHAPTER 3
OVERVIEW

General

The MTM5400/MTM800 FuG with Enhanced Control Head is Motorola's latest and most advanced digital mobile TETRA terminal. This terminal generation is based on a new digital platform technology which takes care of the linear modulation type of terminals to support the TETRA needs. It covers Trunk Mode Operation (TMO) as well as Direct Mode Operation (DMO) and among other new features it is supplied with extended code and operating memory capacity to support all new market requirements. The MTM5400/MTM800 FuG with Enhanced Control Head TETRA terminal ensures a high audio quality.

To achieve high spectrum efficiency, the MTM5400/MTM800 FuG with Enhanced Control Head uses digital modulation technology and sophisticated voice-compression algorithm. The voice of the person speaking into the microphone is converted into a digital bit stream consisting of zeros (0) and ones (1). This stream is then modulated into a radio-frequency (RF) signal, which is transmitted over the air to another MTM5400/MTM800 FuG with Enhanced Control Head. The process is called digital modulation.

Digital Modulation Technique

The MTM5400/MTM800 FuG with Enhanced Control Head is a 380–430 MHz mobile that can operate in dispatch mode. It uses several digital technologies for voice and data transmissions.

Voice transmission

Voice transmission is performed using $\pi/4$ DQPSK and Time Division Multiple Access (TDMA).

$\pi/4$ DQPSK is a modulation technique that transmits information by altering the phase of the radio frequency (RF) 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 TETRA system can accommodate 4-voice channels in the standard 25 kHz channel as used in the two-way terminal.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into four slots, one for each unit.

Time allocation enables each unit to transmit its voice information without interference from other transmitting units. Transmission from a unit or base station is accommodated in time-slot lengths of 15 milliseconds and frame lengths of 60 milliseconds. The TDMA technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compression/decompression and RF modulation/demodulation.

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 TETRA system uses a coding technique called ACELP (Algebraic Code Excited Linear Prediction). The compressed voice-data bits modulate the RF signal.

High Speed Data

There are two ways to transmit and receive packet data using the MTM5400/MTM800 FuG. The first is Multi-Slot Packet Data (MSPD), where the data throughput is increased by transmitting in more than one slot per frame, but using the older $\pi/4$ DQPSK modulation. This mode supports continuous transmission.

The other possibility is the TETRA Enhanced Data System (TEDS), which uses multi-carrier techniques and more complex modulation to achieve higher data throughput. The modulation supports channel bandwidths of 25 and 50 kHz with 8 and 16 subcarriers per channel, respectively. Each subcarrier is modulated using Quadrature Amplitude Modulation (QAM). The standard supports 4-QAM, 16-QAM or 64-QAM (2, 4 or 6 bits per symbol). This mode also supports continuous transmission.

CHAPTER 4

PROGRAMMING THE TERMINAL

Note: For programming the terminal, refer to TETRA Customer Programming Software (CPS) Start-up User Guide, Publication No. 6802974C10_.

Notes

CHAPTER 5

TEST SETUP & TESTING

WARNING

Any level 3 repairs can deeply affect the performance of the MTM5400 with Enhanced Control Head terminal and may cause a new tuning procedure. This tuning procedure can only be applied by certain authorized Motorola depots where the appropriate TEST&TUNE EQUIPMENT is available.
The appropriate TEST&TUNE EQUIPMENT is a special automated test equipment which is only available at some Motorola factories and Motorola repair centers.

Section Introduction

This Chapter contains the following Sections:

Notes

CHAPTER 5.1

TEST SETUP & TESTING FOR 380–430 MHZ

WARNING

Any level 3 repairs can deeply affect the performance of the MTM5400/MTM800 FuG with Enhanced Control Head terminal and may cause a new tuning procedure.
This tuning procedure can only be applied by certain authorized Motorola depots where the appropriate TEST&TUNE EQUIPMENT is available.
The appropriate TEST&TUNE EQUIPMENT is a special automated test equipment which is only available at some Motorola factories and Motorola repair centers.

Typical Test Setup

Before Testing

Carry out the following instructions before testing:

- Connect the DC cable to the DC connector on the terminal.
- Connect the other side of the DC cable to the DC output connector on the power supply
- Connect an RF cable to the N-type RF Connector of the IFR.
- Connect the other side of the RF cable to the antenna connector on the terminal.
- Set the DC voltage on the power supply to 13.2 Volts.
- Switch on the terminal.

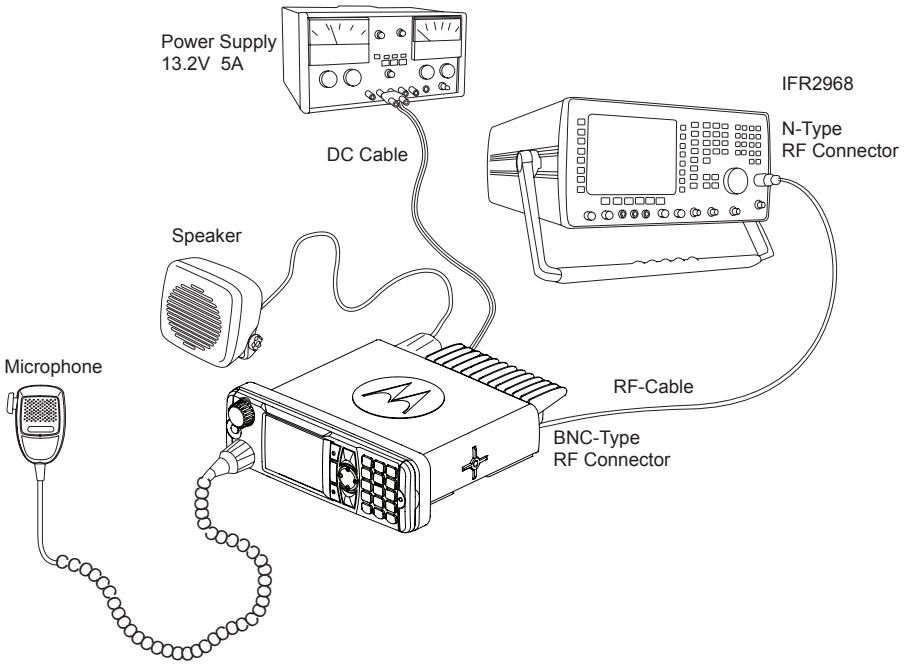


Figure 5.1-1 Typical Test Setup

Test Equipment

The table below lists the special test equipment required for servicing TETRA mobile terminals.

Table 5.1-1 Test Equipment

Name	Part Number
Digital Multimeter	R1072_
220V Power Supply	R1011_/220V
TETRA SVC MON. MOBILES ONLY	WADN4161A
TETRA SVC MON. MOB.+ DIR.MODE	WADN4163A
TETRA SVC MON. MOB.+ BASE ST.	WADN4164A
TETRA SVC MON. MOB.+ BASE ST. + DIRECT MODE	WADN4173A
TETRA SVC MON. MOB.+ DIR.MODE + MPT1327/1343	WADN4233A

Test Check List

The following table summarises the required test setups.

Table 5.1-2 Test Setup

No.	Test Name	Test Setup	Terminal Setup	Test Conditions	Limits
1.	IFR System Setup and Manual Test Screen	Control Channel		For 380–430 MHz terminal: 3605	
		Traffic Channel		For 380–430 MHz terminal: 3605	
		Time Slot		3	
		Country Code		234	
		Network Code		2392	
		Base Color		1	
		Location Area		224	
		Min Rx Level			-110dBm
		Max Tx Level			40dBm (10W)
		Access Parameter		-33dBm	
		Mobile Power	40dBm (10W)		
		Burst Type		Normal	
2.	Base Station Registration	RF Gen Level	For 380–430 MHz terminal: 390.125 MHz	-90dBm	
3.	Receiver RSSI	RF Gen Level	Cells Info RSSI TRACE	-90dBm	

Table 5.1-2 Test Setup (Continued)

No.	Test Name	Test Setup	Terminal Setup	Test Conditions	Limits
4.	Transmitter Tests	RF Gen Level	Range 1 Test Group 1	-90dBm	
		Burst Power			35 – 40dBm
		Timing Error			<=0.25 Symbols
		Frequency Error			-/+ 100 Hz
		Vector Error			Max 10% RMS, Max 30% Peak, Max 5% Residual
5.	Call Processing Talk Back	1 kHz Test Signal Group Mode	Range 1 Test Group 1	-90dBm	
6.	Call Processing Call to Mobile	Private Mode Private Call	Private Mode		
		RF Gen Level Burst Power		-90dBm	35 – 40dBm
		Timing Error			<=0.25 Symbols
		Frequency Error			-/+ 100 Hz
		Vector Error			Max 10% RMS, Max 30% Peak, Max 5% Residual
7.	Digital Duplex Test (Tx)	RF Gen Level	Private Mode	-50dBm	
		Burst Power			10 – 22dBm
		Timing Error			<=0.25 Symbols
		Frequency Error			-/+ 100 Hz
		Vector Error			Max 10% RMS, Max 30% Peak, Max 5% Residual

Receiver Tests

1. Simulate Base Station (registration)
2. RSSI Test

Transmitter Tests

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

Call Processing Tests

1. Talk Back
2. Call to Mobile

Duplex Test

1. Digital Duplex Test (Tx)

Measurement Capabilities:

Bar chart display for Tx Power, Frequency Error, Vector Error RMS, Power Analyzer, Spectrum Analyzer, Vector Analyzer, Vector Diagrams.

Configuration of the IFR 3901/3902 System Setup

The setup depends on the firmware version of the IFR 3901/3902, the firmware version of the radio, and the programmed parameters of the radio. Perform the following steps to configure the IFR 3901/3902 Digital Radio Test Set:

1. Turn ON the IFR.
2. Press the “Config” soft key twice, then go to “System” followed by “TETRA”. Select “MS”.
3. Configure the parameters for the “Channel Plan”.
   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Channel Plan”, and press the “Select” soft key.
   b. Press the “Select” soft key again, and select “No Plan”; press “New Plan”.
   c. Enter the parameters outlined below:

Channel Plan:	TETRA 380+0MS
Frequency Band:	3 (300 MHz)
Offset:	0 (0 kHz)
Duplex Spacing:	0 (10 MHz)
Reverse Operation:	0 (Normal)
Channel Block 1:	
Lowest Channel:	0
Highest Channel:	4000
Lowest Channel Downlink Freq:	380.125 MHz
Duplex Offset:	10 MHz
Channel Spacing:	25 kHz

   d. Press the “Save” button at the top left panel on the screen.
   e. To use this channel plan, press the “CONFIG” button, and select “Channel Plan”, then select “TETRA 380+0MS”.

4. Configure the parameters for the “System ID and Access Parameters”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “System ID & Access Parameters”, and press the “Select” soft key.

   b. Enter the parameters outlined below:

Mobile Country Code (MCC):	234
Mobile Network Code (MNC):	2392
Base Station Color Code (BCC):	1
Location Area Code (LA):	224

5. Configure the parameters for the “Mobile Parameters”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Mobile Parameters”, and press the “Select” soft key.

   b. Enter the parameters outlined below:

Short Subscriber Identity (SSI):	(use fixed) 100
Group Short Subscriber Identity (GSSI):	(use fixed) 3001
Power Class:	(use fixed) 3 (40.0dBm / 10W)
Receiver Class:	(use fixed) B

   Note: The number for Short Subscriber Identity (SSI) and Group Short Subscriber Identity (GSSI) base on the number key in the Codeplug of the radio.

6. Configure the parameters for the “Call Types”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Call Types”, and press the “Select” soft key.

   b. Enter the parameters outlined below:

Priority:	00 = Priority Not Defined
Calling Party SSI:	100

7. Configure the parameters for the “Call Timers and Trunking”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Call Timers & Trunking”, and press the “Select” soft key.

   b. Enter the parameters outlined below:

Trunking Type:	Transmission
Simplex Traffic Channel Type:	DL and UL TCH
Test Set Transmit Mode:	Continuous

   c. Leave the rest of the parameters in their default values.

8. Configure the parameters for the “Neighbor Cell Info”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Neighbor Cell Info”, and press the “Select” soft key.

b. Enter the parameters outlined below:

Broadcast:	Not supported
Broadcast Interval:	5s
Neighbour Cell Channel:	3500
Neighbour Cell Location Area:	1
Neighbour Cell Identifier:	1
Slow Re-select Threshold Above Fast:	10dB
Fast Re-select Threshold:	10dB
Slow Re-select Hysteresis:	10dB
Fast Re-select Hysteresis:	10dB

9. Configure the parameters for the “Base Service”.

   a. Press the “Config” soft key twice, then go to “Configure”, followed by “Base Service”, and press the “Select” soft key.

   b. Use the default parameters outlined below:

POWER ON REGISTRATION:	REQUIRED
POWER OFF DE-REGISTRATION:	REQUIRED
PRIORITY CELL:	YES
MINIMUM MODE SERVICE:	NEVER USED
MIGRATION:	SUPPORTED
SYSTEM WIDE SERVICE:	NORMAL MODE
TETRA VOICE SERVICE:	SUPPORTED
CIRCUIT MODE DATA SERVICE:	NOT SUPPORTED
(RESERVED):	NOT AVAILABLE
TETRA PACKET DATA SERVICE:	NOT AVAILABLE
AIR INTERFACE ENCRYPTION:	NOT AVAILABLE
ADVANCED LINK:	NOT SUPPORTED

10. You have now completed all the important configurations using the configuration menu.

    Note: Please store these setting in the IFR to be recalled for future use.

Configuration of the IFR 2968 System Setup

The setup depends on the firmware version of the IFR 2968, the firmware version of the terminal and the customer programming of the terminal.

Perform the following steps to configure the IFR 2968 System Setup with the terminal settings:

1. Turn ON the IFR.
2. Press the “Systems” Mode Key (wait until the digital system is initialised).
3. Press the “Tetra Mobile” soft key.
4. Press the “Setup” soft key and enter the System Parameters Screen.
5. Press the “Channel Plan” or “System Type” soft key.
6. Press the “TETRA 380+0MS” soft key for 380–430 MHz.

7. Press the “More” soft key if the Type cannot be seen.

   Note: If the required Mobile soft key in step 6 and step 7 is not displayed, the system needs to be set up manually as in step 8. If the MS type was chosen in step 6 and step 7, continue with step 9.

8. Perform the following steps to setup the system parameters:

   a. Press the “More” soft key until the “User defined” soft key is displayed.

   b. Press the “User Defined” soft key in the next Menu again.

   c. Press the “User Defined” soft key once more.

   d. Press the “Frequency Band” soft key and press the “3 (300 MHz)” soft key. Press the “More” soft key if the band is not displayed.

   e. Press the “Offset” soft key and press the “0 (0 kHz)” soft key.

   f. Press the “Duplex Spacing” soft key and press the “0 (10 MHz)” for 380–430 MHz soft key

   g. Press the “Reverse Operation” soft key and press the “0 (Normal)” soft key.

   h. Press the “Channel Block 1" soft key.

   i. Press the “Channel Block” soft key and press the “Include” soft key.

   j. Press the “Lowest Channel” soft key and enter “0000” for 380–430 MHz using the data keys followed by the “Lowest Channel” soft key.

   k. Press the “Highest Channel” soft key and enter “4000” for 380–430 MHz using the data keys followed by the “Highest Channel” soft key.

   l. Press the “Lowest Tx Freq” soft key and enter “380.125” for 380–430 MHz using the data keys followed by the “MHz” key.

   m. Press the “Duplex Offset” soft key and enter “10” for 380–430 MHz using the data keys followed by the “MHz” key.

   n. Press the “Channel Spacing” soft key and enter “25” using the data keys followed by the “kHz” key.

   o. Press the “Return” soft key.

   p. Verify that channel block 2 to 8 are excluded.

   q. Press the “Return” soft key.

9. Press the “Control Channel” soft key and enter “3605” for 380–430 MHz using the data keys followed by the “Control Channel” soft key.

10. Press the “Traffic Channel” soft key and enter “3605” for 380–430 MHz using the data keys. Press the “Traffic Channel” soft key again and check that the marker goes to Timeslot. Press data key “3” followed by the “Traffic Channel” soft key, to change to Timeslot “3”.

11. Press the “Country Code” soft key.
    Enter “234” and press the “Country Code” soft key.

12. Press the “Network Code” soft key.
    Thereafter, enter “2392” and press the “Network Code” soft key.

13. Press the “Base Color” soft key.
    Thereafter, enter “1” and press the “Base Color” soft key.

14. Press the “Location Area” soft key.
    Thereafter, enter “224” and press the “Location Area” soft key.

15. Press the “Min Rx Level” soft key.
    Thereafter, enter “-110dBm” and press the “Min Rx Level” soft key.

16. Press the “Max Tx Level” soft key.
    Thereafter, enter “40dBm (10W)” and press the “Max Tx Level” soft key.

17. Press the “Access Parameter” soft key.
    Thereafter, enter “-33dBm” and press the “Access Parameter” soft key.

18. Press the “Test Mode” soft key. Press the “Enable” soft key.

19. Press the “Base Service” soft key.

20. Press the “Support” soft key if it is displayed
    or verify that the following values are displayed:

POWER ON REGISTRATION:	REQUIRED
POWER OFF DE-REGISTRATION:	REQUIRED
PRIORITY CELL:	YES
MINIMUM MODE SERVICE:	NEVER USED
MIGRATION:	SUPPORTED
SYSTEM WIDE SERVICE:	NORMAL MODE
TETRA VOICE SERVICE:	SUPPORTED
CIRCUIT MODE DATA SERVICE:	SUPPORTED
(RESERVED):	NOT AVAILABLE
SNDCP SERVICE:	NOT AVAILABLE
AIR INTERFACE ENCRYPTION:	NOT AVAILABLE
ADVANCED LINK:	NOT SUPPORTED

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

21. Press the “Return” soft key.

22. Press the “Neighbr Cell” soft key.

23. Verify that the following values are displayed:

NEIGHBOUR CELL BROADCAST:	NOT REQUIRED
BROADCAST INTERVAL:	10s
NEIGHBOUR CELL CHANNEL:	0000
NEIGHBOUR CELL LOCATION AREA:	00001
NEIGHBOUR CELL IDENTIFIER:	01
SLOW RE-SELECT THRESHOLD:	10dB
SLOW RE-SELECT HYSTERESIS:	10dB
FAST RE-SELECT THRESHOLD:	10dB
FAST RE-SELECT HYSTERESIS:	10dB

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

24. Press the “Return” soft key.

25. Verify that “Trunking Type” is set to “Message”.

26. Press the “Call Type” soft key to enter the “Call Type” screen.

27. Press the “Private Call” soft key.

28. Press the “Simplex Duplex” soft key and “Simplex Call” soft key.

29. Press the “Signal Type” soft key and “Direct set-up” soft key.
30. Press the “Priority” soft key. Thereafter, enter “00” and press the “Priority” soft key.
31. Leave “Calling Party SSI” setting to default value.
32. Press the “Return” soft key.
33. This completes the System Setup configuration.

Configuration of the IFR 2968 Manual Test Screen

The setup depends on the firmware version of the IFR 2968, the firmware version of the terminal and the customer programming of the terminal. The following procedure is only an example.

1. To enter “Manual test” screen, press the “Manual” soft key.
2. Press the “Control Channel” soft key. Thereafter, enter the control channel Number and press the “Control Channel” soft key. The control channel Number for 380–43 0 MHz is “3605” = Rx 421.0125 MHz.
3. Press the “Traffic Channel” soft key. Enter “3605” for 380–430 MHz and press the “Traffic Channel” soft key. The marker goes to Timeslot. Enter “3” and press the “Traffic Channel” soft key.

   Note: The Traffic Channel number changes automatically after entering the Control Channel number).
4. Press the “RF Gen Level” soft key. Thereafter, enter “-90” and press “dBm” data keys followed by “RF Gen Level” soft key.
5. Press the “Mobile Power” soft key, enter “40dBm/10W“, using soft key.
6. Press the “Burst Type” soft key and “Normal” soft key.
7. This completes the Manual test equipment configuration setup.

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

RF Tests

Receiver Tests

Simulate Base Station (registration)

1. Turn the terminal ON. When the terminal is in Trunked Mode, continue with step 2. Otherwise perform steps a through c.
   a. Press “Options” using the Lower (soft) key.
   b. Press the “Down” navigation key to scroll to “Trunked Mode”.
   c. Press “Select” using the Lower (soft) key
2. Check that registration and “ITSI: ---/----/01490199” (as example only) is displayed on the IFR “Manual Test” screen.

   Note: The number “01490199” is the terminal ID (ISSI) which is displayed when the terminal is switched on.

RSSI Test

Note: To perform the procedure below the Test Page field must be enabled using the CPS.

Before carrying out the following steps, record the Insertion loss (dB) of the cable loss value - (X) dB.

1. In the IFR Manual Test Mode, press the “RF Gen Level” Soft Key and enter -90 dBm.
2. Before testing, the terminal should be configured to RSSI mode using the following sequence. When performing steps 3 through 6**,** make sure that you press the control head keys sequentially (less than a second between every consecutive press).
3. Press the “*” key.
4. Press the “#” key.
5. Press the “Menu” key.
6. Press the “Right Navigation” key.

Hereafter, there is no need for quick sequence of pressing the control head keys.

7. Press the “Down” navigation key to scroll to “Cells Info”.
8. Press “Select” using the Lower (soft) key.
9. Press the “Right” navigation key to scroll to the RSSI monitoring screen.

10. Press “Trace” using the Lower (soft) key.

    Note: RSSI results will flash on the screen every few seconds.
    The display shows: **SERV: 0/34348**
    RSSI: -90
    CX: 20
    CHQ: 99/E0
    Disregard the “SERV”, “CX” and “CHQ” results.

Actual RSSI measured
=IFR RF Gen Level - Cable insertion loss +/- other stray losses.

Range of Actual RSSI measured
= -90dBm - XdB (cable) +/- 1 dB.

Terminal RSSI result should be within the range of Actual RSSI.

To stop the “Trace” process, perform the following. When performing steps 11 trough 14, make sure that you press the control head keys sequentially (less than a second between every consecutive press):

11. Press the “*” navigation key.
12. Press the “#” key.
13. Press the “Menu” key.
14. Press the “Right Navigation” key.

Hereafter, there is no need for quick sequence of pressing the control head keys.

15. Press “Select” using the Lower (soft) key.
16. Press “Stop” using the Lower (soft) key.
17. Press “Back” using the Upper (soft) key twice.

Transmitter Tests

Before you start these tests, make sure that the terminal is in Trunked Mode.

1. Press “Options” using the Lower (soft) key.
2. Press the “Down” navigation key to scroll to “TG by abc”.
3. Press “Select” using the Lower (soft) key.
4. Scroll to one of the available groups and press select using the Lower (soft) key.
5. In the IFR Manual Test Mode press the “RF Gen Level” soft key. Enter “-90dBm” by pressing the data keys and “RF Gen Level” key.

6. Press the “PTT” of the terminal and monitor the IFR “Manual Test” screen which displays the Power Profile, Burst Power, Timing Error, Frequency Error and Vector Error.

   Note: You have to hold the PTT in the pressed position long enough to enable you to read the results.

Power Profile:	Passed.
Burst Power Required Results:	35 – 40dBm.
Timing Error:	≤ 0.25 symbols.
Vector Error:	Max 10% RMS, Max 30% Peak, Max 5% Residual.
Frequency Error:	+/- 100 Hz.

7. Press the “Clear Down” soft key, to proceed with other tests.

Call Processing Test

Before you start these tests, make sure that terminal and test equipment are configured the same as given in the Transmitter Test.

Talk Back

1. Press “Options” using the Lower (soft) key on the terminal and change to one of the available groups.
2. In the IFR Manual Test Mode press the “RF Gen Level” soft key. Enter “-90dBm” by pressing the data keys and “RF Gen Level” key.
3. Press the “PTT”, press the “Talk Back” soft key on the IFR and speak into the mic of the terminal for at least 3sec, then release “PTT“. You will hear from the terminal speaker the last three seconds of the speech frames before the “PTT” has been released.
4. Press the “Test Sound” soft key to provide the 1 kHz signal to the terminal speaker.
5. Press the “Silence” soft key to mute the 1 kHz audio signal of the speaker.
6. Press the “Clear Down” soft key and check that the “Cleardown Complete” status appears on the IFR “Manual Test” screen.

Call to Mobile

1. In the IFR Manual Test Mode press the “RF Gen Level” soft key. Enter “-90dBm” by pressing the data keys and “RF Gen Level” key.
2. Press the “Call Mobile” soft key and select “Private Call” on the IFR. Verify that two beeps are heard from the terminal speaker.
3. Press the “Abort Call” soft key.

Duplex Test (Phone/Private Mode)

Digital Duplex Test (Tx)

1. In the IFR Manual Test Mode press the “RF Gen Level” soft key. Enter “-50dBm” by pressing the data keys and “RF Gen Level” key.
2. Dial a random 4 digit number (e.g. “9359”) using the alphanumeric keys of the terminal, press “Calltype” using the Lower (soft) key until “Phone #” is displayed and press the “Send” Key  .

   The following results are displayed on the IFR “Manual Test” Screen

Power Profile:	Passed
Burst Power Required Results:	10–22dBm
Timing Error:	$\leq$ 0.25 Symbols.
Frequency Error:	-/+ 100 Hz
Vector Error:	Max 10% RMS, Max 30% Peak, Max 5% Residual.

3. Press the “Talk Back” soft key.
4. Speak into the terminal microphone and hear your speech (after a short delay) from the terminal loudspeaker.

   Note: If you need more details, press the “Duplex Test” mode key.

5. Press the “duplex test (Tx)” soft key. The “Digital Duplex test” results will be displayed on the IFR screen providing you with either one of the following:

   - bar charts measurement capabilities showing Tx Power, Frequency Error and Vector RMS in one screen
   - Tx Power (more details in Power Analyser)
   - Frequency Error (more details in Spectrum Analyser)
   - Vector RMS (more details in Vector Analyser)

For Power Analyser Graph:

6. Press “power ana” soft key.
7. Check that the power frame falls within the limits.

For Spectrum Analyser Graph:

8. Press “spec ana” soft key.
9. Monitor the Tx frequency.

For Vector Analyser Diagram:

10. Press the “vector ana” soft key.

11. Monitor the diagram for the following:

    - press “vector error” soft key for vector error.
    - press “mag error” soft key for magnitude error.
    - press “phase error” soft key for phase error.
    - Vector Error
    - Magnitude Error
    - Phase Error

For Vector Diagram:

12. Press the “vector diagram” soft key.

13. View the following:

    - press “symbol constel” soft key for graphical symbol constellation.
    - press “rotated vector” soft key to zoom in on the constellation.
    - press “phase traject” soft key to view trajectory of the constellation.

14. Press the terminal “End” key. 

Manual Mode Testing

Preparation for Testing

Verify that the radio is turned off.

Press the “1”, “2” and “3” keys together and then, press the On/Off key or the Rotary Push Button to turn the radio on. Keep the “1”, “2” and “3” keys pressed until the display turns on.

The display shows “User test mode, Press any key to start, Press SoftKeys to scroll”.

Tests

Note: Any key that will be pressed will cause the test to advance from one step to the next. You can use the soft keys to go to the next or back to the previous test. After a test has started you can press the upper soft key to go back to the start of the current test. At any time you can switch off the radio by pressing the On/Off key for 2 seconds.

1. Press any key to start the first test. The display shows “LCD Red-Green-Blue test”.
2. Press any key consecutively. First the display shows horizontal red lines that become thicker with every key press, until it becomes fully red. Then the display shows vertical green lines that become thicker with every key press, until it becomes fully green. After that the display shows horizontal blue lines that become thicker with every key press, until it becomes fully blue.
3. Press any key to start the next test. The display shows “LCD Color brightness test”.
4. Press any key consecutively. The display shows the color brightness levels “min”, “low”, “med” and “max”. Verify the color brightness of the display.
5. Press any key to start the next test. The display shows “Display backlight test”.

6. Press any key consecutively. The display shows the backlight brightness levels “min”, “low”, “med” and “max”. Verify the brightness of the display.

   Note: At level “min” the display contents is not visible.

7. Press any key to start the next test. The display shows “Keypad backlight test”.
8. Press any key again. The display shows “Keypad backlight is off”. Verify that the keypad backlight is off.
9. Press any key again. The display shows “Keypad backlight is on”. Verify that the keypad backlight is on.
10. Press any key to start the next test. The display shows “Emergency backlight test”.
11. Press any key consecutively. The display shows the emergency button brightness levels “min”, “low”, “med” and “max”. Verify the brightness of the emergency button.
12. Press any key to start the next test. The display shows “Status LED test”.
13. Press any key again. The display shows “Red LED is on” and the Red LED at the right side of the radio is lit.
14. Press any key again. The display shows “Green LED is on” and the Green LED at the right side of the radio is lit.
15. Press any key. The display shows “Orange LED is on” and the orange LED at the right side of the radio lit.
16. Press any key consecutively. The display shows the LED brightness levels “min”, “low”, “med” and “max”. Verify the brightness of the orange LED at the right side of the radio.
17. Press any key to start the next test. The display shows “Keypad test”.
18. Press any key again. The display shows all the radio keys.
19. Press every key, one by one. Each key you press causes its respective display to be highlighted. If you press a highlighted key again, the highlighting is removed. To exit this test before all keys are highlighted press the rotary push button.
20. Press any key to start the next test. The display shows “Rotary test”.
21. Turn the rotary switch clockwise and counter clockwise. Each step causes the respective displayed arrow sign to be highlighted. Turn the rotary switch until the two respective “OK” labels are highlighted.
22. Press the rotary push button consecutively until “OK” is highlighted.
23. Press any key to start the next test. The display shows “Fist MIC test”.
24. Press any key to continue. Connect a fist microphone. The display shows “Accessory connected”.
25. Press PTT to highlight all “0”.
26. Place the microphone on / off hook to highlight all “0”.
27. Press any key again. The display shows “End of user tests”, “Press any key to power off or use softkeys to scroll to any previous test”.
28. This completes the test. Press any key to turn the radio OFF.

Service Flow Chart (Board Level)

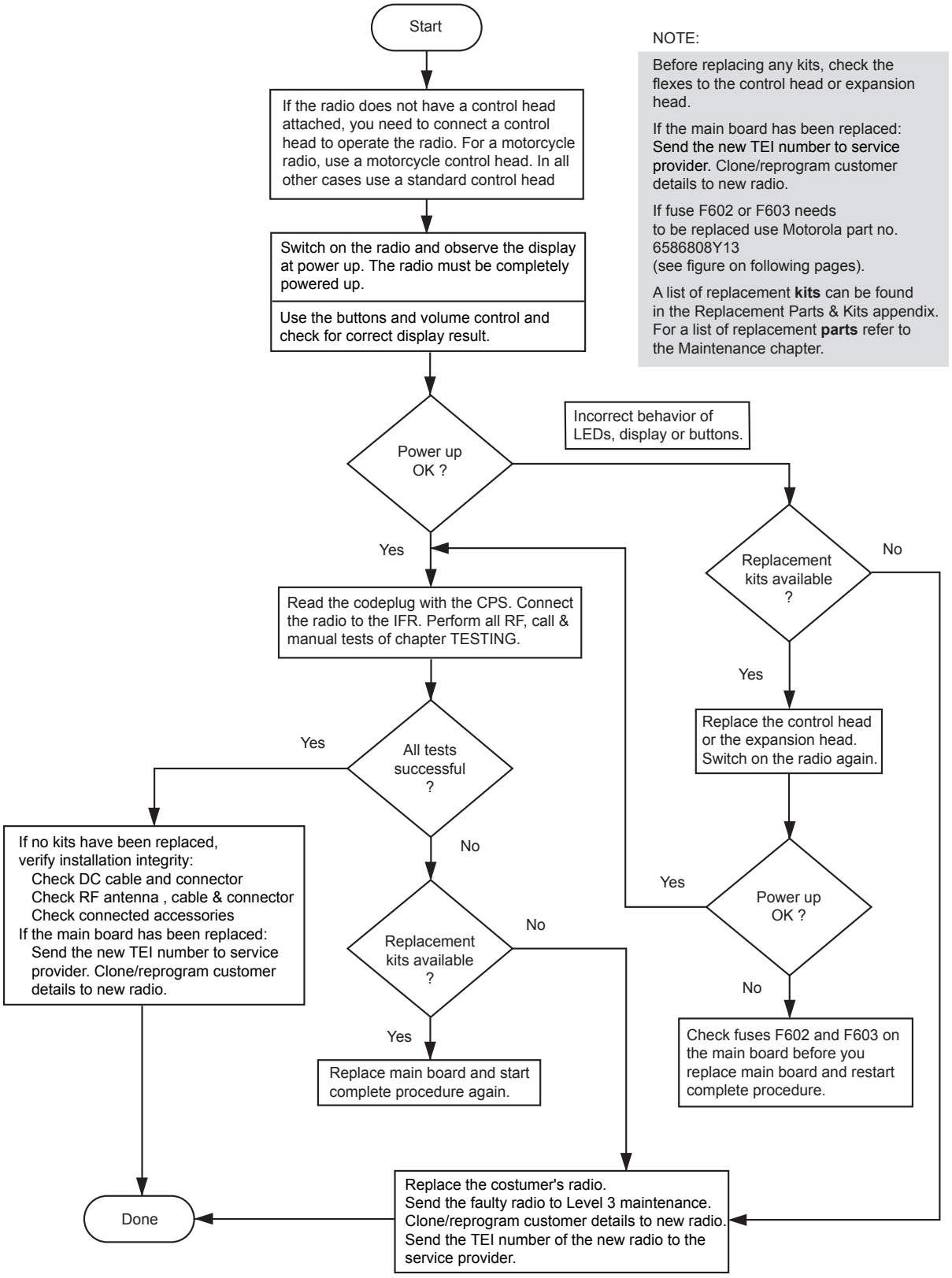


Figure 5.1-2 Servicing the MTM5400/MTM800 FuG with Enhanced Control Head

Fuses on the Mainboard

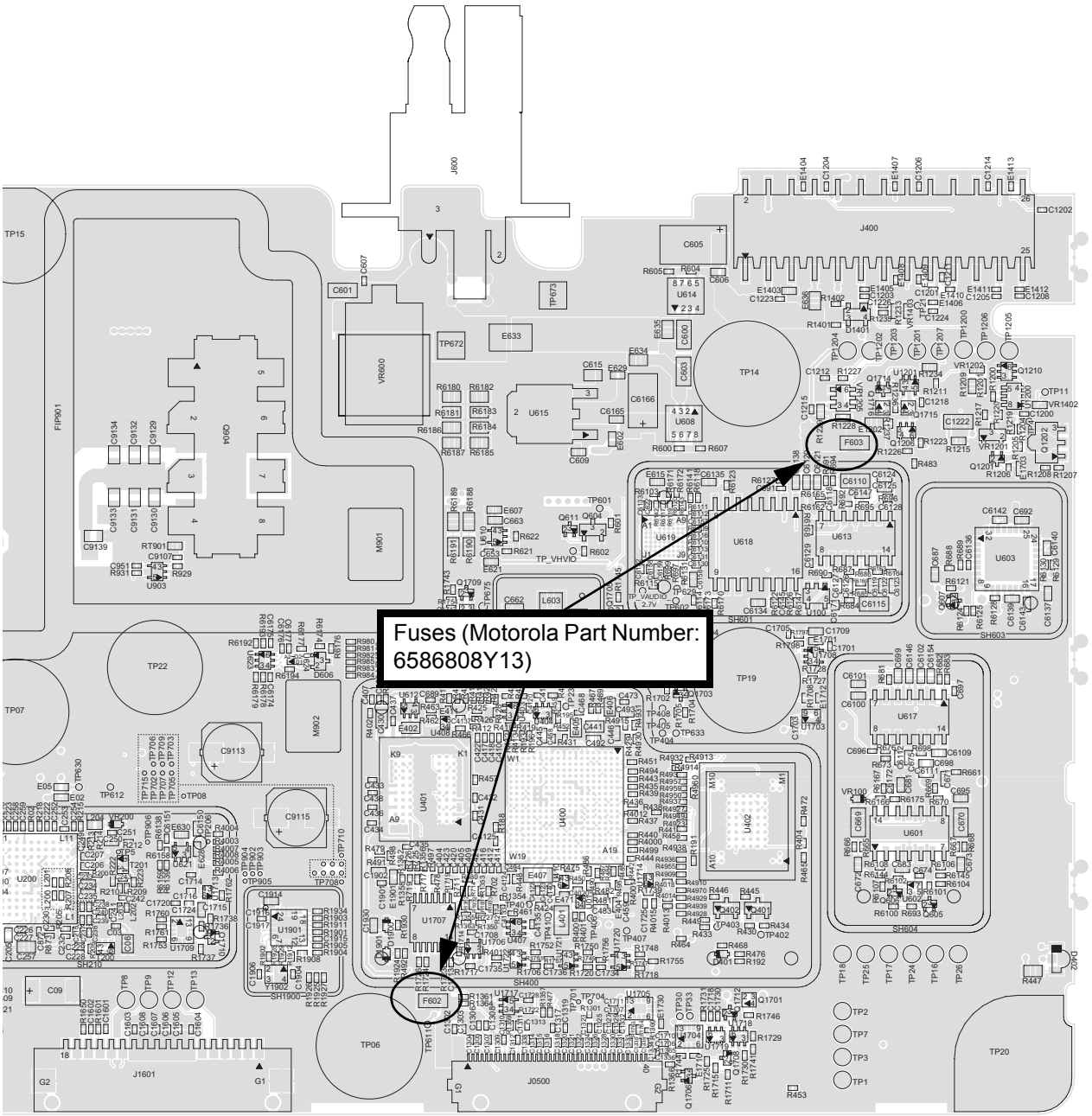


Figure 5.1-3 Position of Fuse F602/F603 (PCB Mainboard – TOP View)

Notes

CHAPTER 6
MAINTENANCE

Introduction

This chapter provides details about the following:

- Preventive maintenance (inspection and cleaning)
- Safe handling of CMOS and LDMOS devices
- Pre-baking of Integrated Circuits
- Repair procedures and techniques
- Disassembly and reassembly of the terminal
- Exploded views and parts lists

Preventive Maintenance

The terminals do not require a scheduled preventive maintenance program; however, periodic visual inspection and cleaning is recommended.

Inspection

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

Cleaning

The following procedures describe the recommended cleaning agents and methods to be used when cleaning the external and internal surfaces of the terminal. External surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, compound, or grime. Internal surfaces (circuit boards and components) should be cleaned only when the terminal is disassembled for servicing or repair.

The only recommended agent for cleaning external terminal surfaces is a 0.5% solution (one teaspoon of detergent per gallon of water) of mild dishwashing detergent in water. The internal surfaces should be cleaned only with isopropyl alcohol (100% by volume).

NOTE: **Internal surfaces should be cleaned only when the terminal is disassembled for service or repair.**

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

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

Cleaning External Plastic Surfaces

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

Cleaning Internal Circuit Boards and Components

Isopropyl alcohol (100%) may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the terminal. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. After completing of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

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

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 terminals, and are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

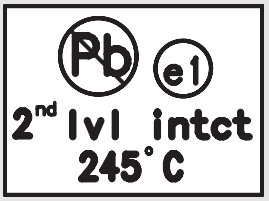
Handling precautions are mandatory for CMOS/LDMOS circuits and are especially important in low humidity conditions. DO NOT attempt to disassemble the terminal without first referring to the following CAUTION statement.

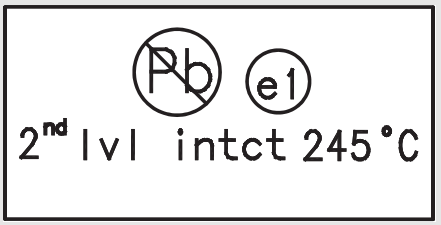
CAUTION: This terminal contains static-sensitive devices. Do not open the terminal unless you are properly grounded. Take the following precautions when working on this unit:

- **Store and transport all CMOS/LDMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS/LDMOS devices into conventional plastic “snow” trays used for storage and transportation of other semiconductor devices.**
- **Ground the working surface of the service bench to protect the CMOS/LDMOS device. We recommend using the Motorola Static Protection Assembly (part number 0180386A82), which includes a wrist strap, two ground cords, a table mat, a floor mat, 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 part number RSX4015_).**
- **Do not wear nylon clothing while handling CMOS/LDMOS devices.**
- **Do not insert or remove CMOS/LDMOS devices with power applied. Check all power supplies used for testing CMOS/LDMOS devices to be certain that there are no voltage transients present.**
- **When straightening CMOS/LDMOS pins, provide ground straps for the apparatus used.**
- **When soldering, use a grounded soldering iron.**
- **If at all possible, handle CMOS/LDMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.**

General Repair Procedures and Techniques

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





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

Table 6-1 Lead Free Solder Wire Part Number List

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

Table 6-2 Lead Free Solder Paste Part Number List

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

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement component is not locally available, check the parts list for the proper Motorola part number and order the component from the nearest Motorola Communications parts center listed in the "Piece Parts" section of this manual.

Rigid Circuit Boards

The family of radios uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The through-plated holes may interconnect multiple layers of the printed circuit. Therefore, care should be exercised to avoid pulling the plated circuit out of the hole.

When soldering near connector pins:

- avoid accidentally getting solder in the connector
- be careful not to form solder bridges between the connector pins
- closely examine your work for shorts due to solder bridges.

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

Pre-baking of Integrated Circuits

Electronic components are generally coated with plastic material which has the nature of not being waterproof. If kept unsealed the components can absorb humidity. When soldered to the board (especially with reflow techniques) the sudden change in temperature can cause fissure or crack which can result in malfunction or damage.

To avoid this problem these moisture sensitive components (MS) should be stored and shipped in a sealed wrapping (dry pack). Processing must take place only with “dry components” when an uninterrupted dry storage can be guaranteed, otherwise the components have to be pre-baked.

If a reflow procedure takes place close to MS components the whole board must be pre-baked.

Table 6-3 List of moisture sensitive components

Part. No.	MSL*	Description
5186988J77	3	Tx Power Control IC
51014650001/ 51012325001**	3	Power Management IC
5164015H28	3	RF IC
51012156001/ 51012239002**	3	NAND
51012058002	3	Mobile DDR
51012110004/ 51012295005**	3	Dual Core Processor
5115443H02	3	LNA
5187512V01	3	DCR Base-band Mixer
51012152001	3	Ethernet Transceiver

* Out of dry package Moisture Sensitivity Level (MSL) 2 : 1 year
2A : 1 month
3 : 168 hrs

** Applicable for newer board revisions (PCB: 8471860Y12 onwards)

Repair Procedures and Techniques – General

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement part is not locally available, check the parts list for the proper Motorola part number and order the part from the nearest Motorola Communications parts center listed in the “SUPPORT CENTRES” section of this manual.

Disassembling and Reassembling the Terminal – General

Since these terminals may be disassembled and reassembled with the use of only seven screws, it is important to pay particular attention to the snaps and tabs, and how parts align with each others.

The following tools are required for disassembling the terminal:

- Small flat blade screwdriver
- Small Phillips screw driver
- Dismantling Tool (Motorola Part No.: 6686119B01)
- TORX™ T screwdriver
- Blunt-tipped tweezers
- TORQUES:

Diecast Top Cover (7x):	1.92 – 2.03 Nm	(17 – 18 lb-in)
PCB (2x):	1.92 – 2.03 Nm	(17 – 18 lb-in)
GPS cable nut:	0.904 +/- 0.09 Nm	(8.0 +/- 0.8 lb-in)
Enhanced Control Head Screws:	0.57 +/- 0.046 Nm	(5.0 +/- 0.4 lb-in)
Remote Mount Ethernet Control Head Middle Screw (1x):	0.57 +/- 0.046 Nm	(5.0 +/- 0.4 lb-in)
Remote Ethernet Back Head PCB Screws (3x):	0.57 +/- 0.046 Nm	(5.0 +/- 0.4 lb-in)
TSCH Handset PCB Screws (4x):	0.25 +/- 0.011 Nm	(2.2 +/- 0.1 lb-in)
TSCH Handset Micro-USB Module Screws (2x):	0.17 +/- 0.0.011 Nm	(1.5 +/- 0.1 lb-in)
TSCH Handset Main Screws (4x):	0.36 +/- 0.011 Nm	(3.2 +/- 0.1 lb-in)
TSCH Cradle PCB Screws (2x):	0.57 +/- 0.046 Nm	(5.0 +/- 0.4 lb-in)
TSCH Cradle Main Screws (4x):	0.57 +/- 0.046 Nm	(5.0 +/- 0.4 lb-in)

NOTE: If a unit requires more complete testing or service than is customarily performed at the basic level, send this unit to a Motorola Authorized Service Center (refer to APPENDIX A: Support Centers). The following described disassembly procedures should be performed only if necessary.

CAUTION: The following parts that MUST be replaced every time the radio is disassembled:

- Pre-driver heat sink thermal pad (part number: 75012083001) – 2pcs
- RF PA thermal pad (part number: 75012082001) – 1pc.

Terminal Disassembly and Reassembly – Detailed

The procedure to remove and replace a Enhanced Control Head, Top Cover or Transceiver Board is similar for all models of terminal. A typical procedure is therefore shown followed by specific disassembly procedures for Enhanced Control Heads, Remote Head Enhanced and Data Expansion Head Enhanced on terminal models.

Enhanced Control Head Removal

1. Insert the dismantling tool (Motorola part number 6686119B01) in the chamfer between the Enhanced Control Head and the terminal assembly.

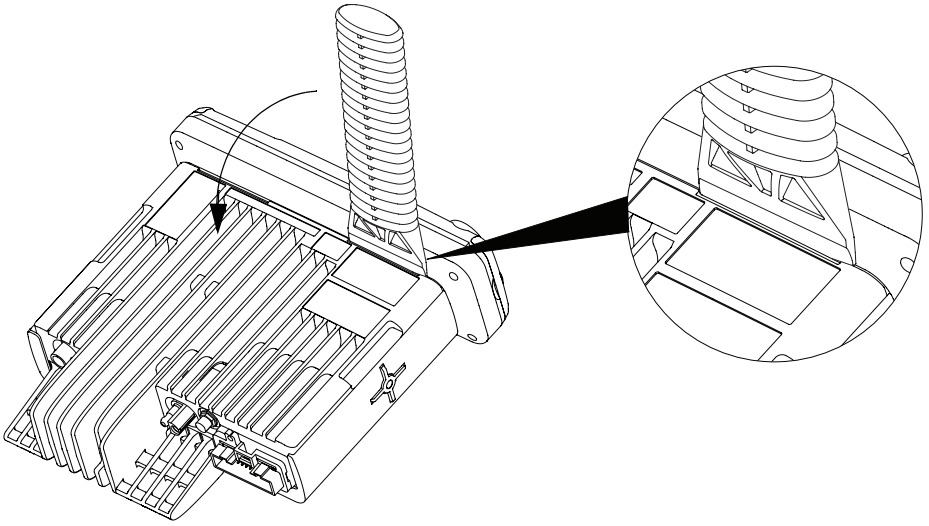


Figure 6-1 Typical Enhanced Control Head Removal

2. Push down the handle of the dismantling tool to pry open the control head until the chassis tabs disengage from the Enhanced Control Head at both sides.
3. Remove the Enhanced Control Head and flexible connection from the terminal assembly.

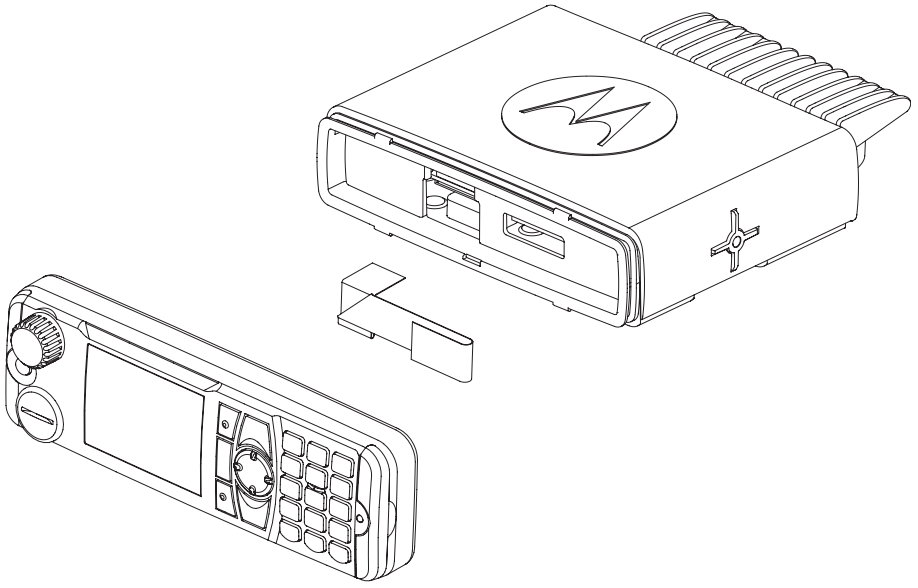


Figure 6-2 Flexible Connection Removal

Top Plastic Cover Removal

1. Insert the dismantling tool in the middle of the terminal assembly side groove.

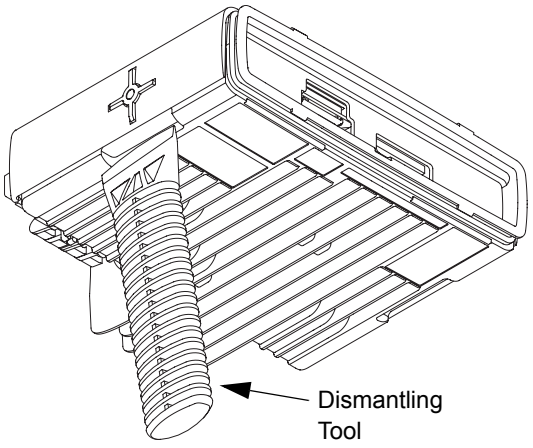


Figure 6-3 Top Cover Removal

2. Pull and maneuver the sides of the top plastic cover, until the cover is released from the terminal chassis.
3. Lift the top plastic cover from the chassis.

Transceiver Board Removal

1. Remove the tamper label on the die cast cover.

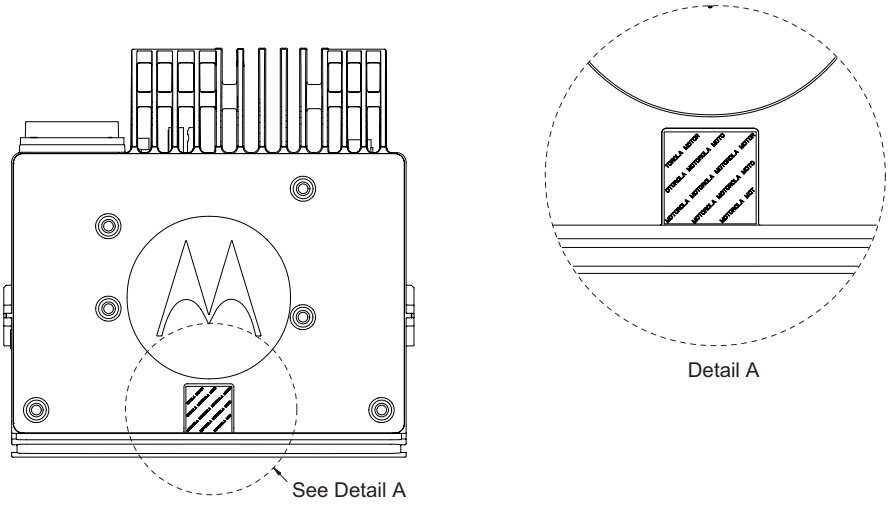


Figure 6-4 Tamper Label Removal

2. Remove seven screws from the diecast cover using a T20 TORX™ driver, and remove the die cast cover.

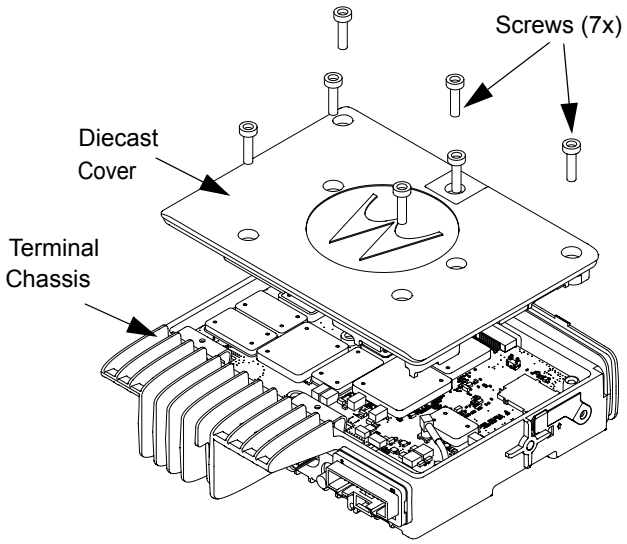


Figure 6-5 Diecast Cover Removal

NOTE: The diecast cover may be difficult to remove due to the main seal adhesion, if the diecast cover has not been removed for a long time. The dismantling tool (Motorola part number 6686119B01) can be used as a lever to pry and remove the diecast cover.

3. Remove the two connector clips on the antenna connector and power connector. A tool can be used to remove the clips, if required.
4. Remove the GPS cable connector from the transceiver board.

CAUTION: Do NOT disconnect the GPS cable connector by jerking or pulling the cable; instead disconnect by pulling the connector-head from the transceiver board.

5. Open the dust cover situated on the left side of the terminal. If a SIM card is present, push it to dislodge and remove the SIM card.

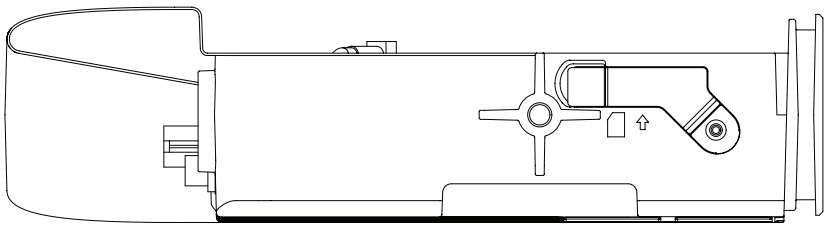


Figure 6-6 Open Dust Cover

NOTE: The SIM card must be removed before the transceiver board is removed to prevent damage to the SIM card and connector.

6. Pull out the plastic accessory connector housing from the back of the terminal.

CAUTION: Do NOT use excessive force or twist the plastic accessory connector housing, as this may damage the connector pins.

7. Remove the two PCB screws using a T20 TORX driver.

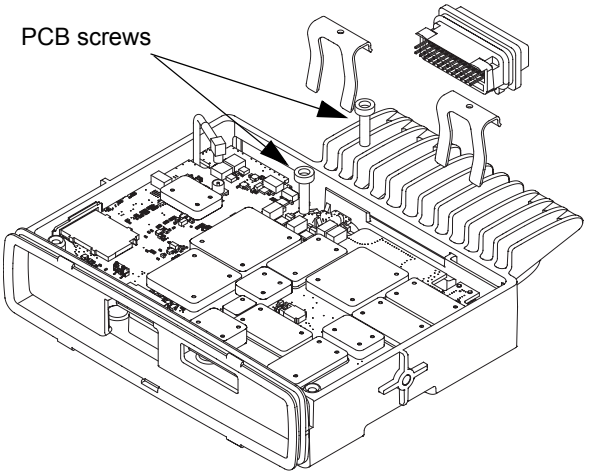


Figure 6-7 Connector Clips, Accessory Connector and PCB Screws Removal

8. Lift the front edge of the transceiver board (the edge that mates with the Enhanced Control Head), and pull it towards the front of the terminal. Take care to slide the antenna connector and power connector out of the bottom die cast towards the front.

SIM Dust Cover Removal

1. Remove the dust cover screw using a Phillips screwdriver.
2. Remove the dust cover from the chassis.

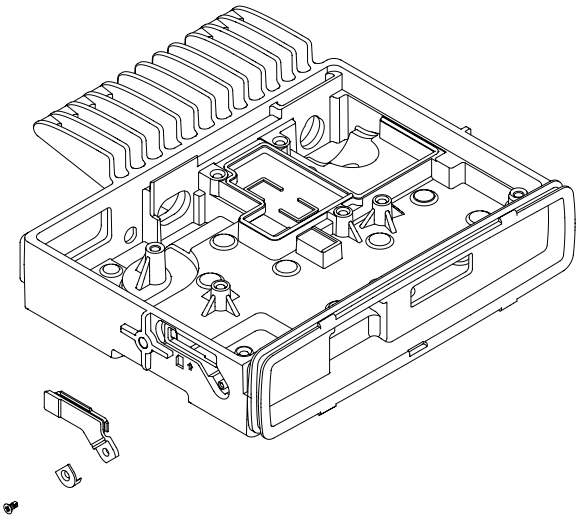


Figure 6-8 SIM Dust Cover Removal

Reassemble the Terminal Chassis And Transceiver Board (torques, see page 6-6)

1. Inspect the bottom diecast and diecast cover for remnants from the transceiver main seal. If necessary remove the remnants using isopropyl alcohol (100%) applied on a soft, absorbent, lintless cloth or tissue.
2. Check the main seal and control head O-ring on the terminal for damage. Replace part if damage is found (refer to the exploded view diagrams and part list).

3. Clean thermal pad contact surfaces on the diecast with isopropyl alcohol (100%) applied on a soft, absorbent, lintless cloth or tissue before new thermal pads are applied. Place the new thermal pads at the bottom of the diecast using a blunt-tipped tweezer. Align the pre-driver heat sink thermal pad's corner with the alignment feature on the bottom diecast.

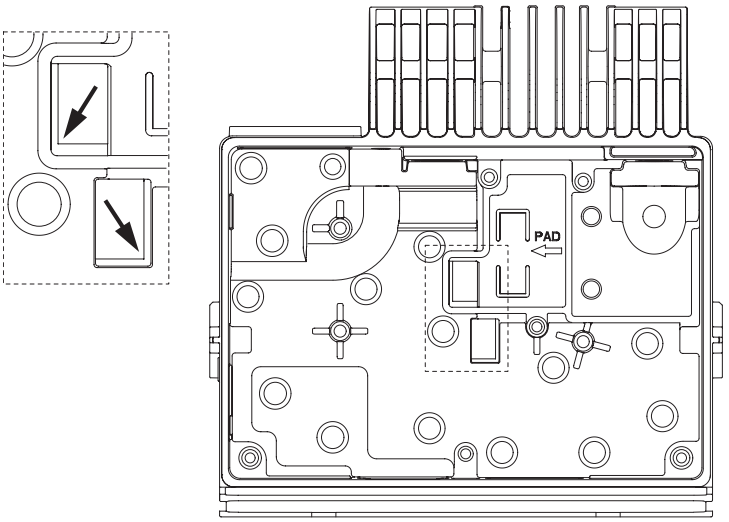


Figure 6-9 Placing the Heat Sink Thermal Pad

4. Place the RF PA thermal pad within the outlined guide.

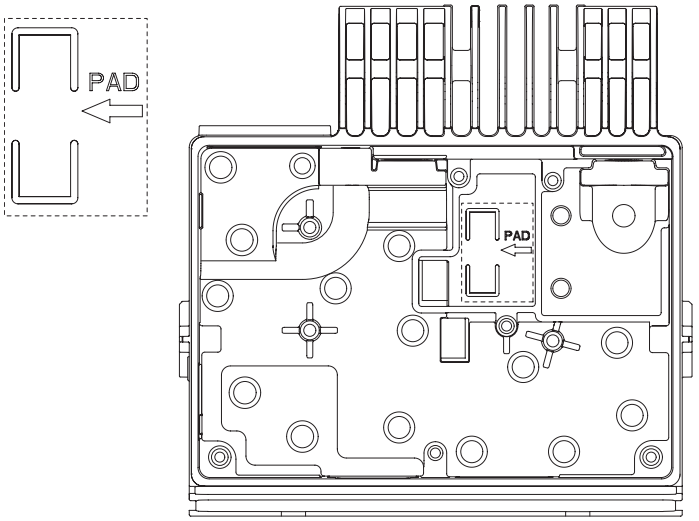


Figure 6-10 Placing the RF PA Thermal Pad

NOTE: For the previous steps above, ***REMEMBER*** to remove the thermal pads' liner after placing them at the designated areas.

5. If the GPS cable is removed, attach the bulkhead to the bottom of the chassis; then tighten the lock nut and the washer with a 5/16" socket driver using a torque of 0.904 Nm (8 lbin).
6. Guide the GPS cable into the PCB slot, while inserting the transceiver board at an angle (approximately 30°) into the chassis; carefully slide the antenna connector and power connector into their cut-outs in the bottom die cast.
7. Lower the transceiver board onto the bottom of the diecast, and align the two locating holes of the board with the locating screw bosses on the bottom of the diecast.
8. Assemble the power connector clip followed by the antenna connector clip.

9. Tighten the two PCB screws with 1.9 Nm (17 lbin) using a T20 TORX™ driver following the sequence specified on the PCB.
10. Connect the GPS MCX connector to the board's GPS connector.
11. Connect the plastic accessory connector housing.

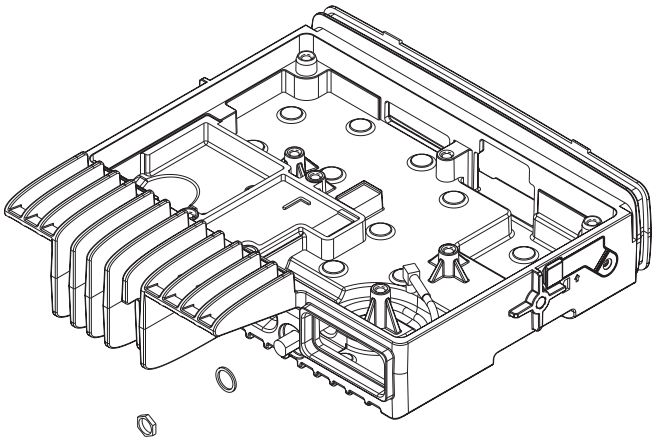


Figure 6-11 Assembling the GPS Cable Bulkhead

12. Secure the diecast cover, and tighten the seven screws with 1.9 Nm (17 lbin) following the sequence shown using a T20 TORX™ driver.

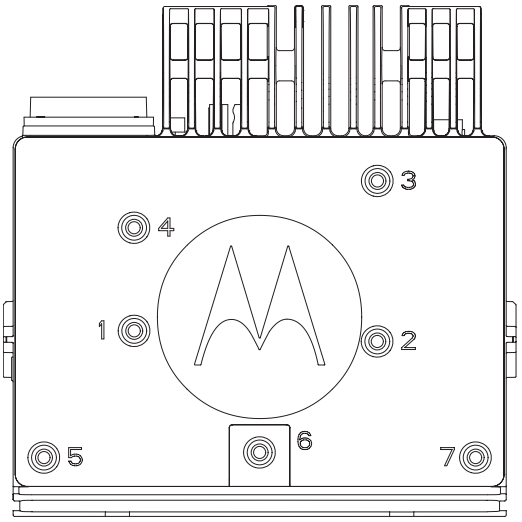


Figure 6-12 Screw Sequence for Tightening the Diecast Cover

13. Insert the SIM card (if applicable), and reattach the SIM dust cover.

CAUTION: Ensure that the dust cover is flushed with the diecast surface. If the dust cover is NOT flushed properly, sealing failure may occur.

14. Refit the top plastic cover over the assembled terminal chassis. Press cover down until it snaps into place.

SIM Dust Cover Assembly

1. Place the SIM dust cover in place before placing the SIM dust cover plate. Tighten the screw with 0.23 Nm (2 lbin) using a Phillips screwdriver.

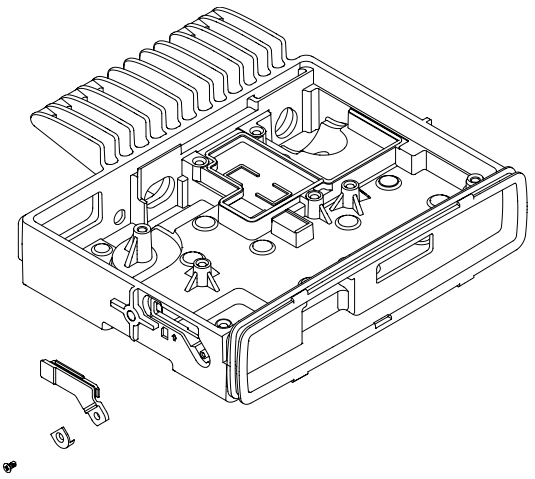


Figure 6-13 SIM Dust Cover Assembly

CAUTION: Ensure that the dust cover is flushed with the diecast surface. If the dust cover is NOT flushed properly, sealing failure may occur.

Enhanced Control Head Fitting

1. Connect the flex to the top small connector in the terminal with the '**dot**' or '**O**' facing upwards and away from the terminal; make sure the '**dot**' or '**O**' aligns with the '**O**' on the terminal. The flex must be fully pushed into the connector.
2. Check that the back housing O-ring seal is undamaged, and fits properly in the groove. Replace the seal, if it is damaged (refer to the exploded view diagrams and parts list).
3. Fit the back housing to the Enhanced Control Head. Ensure that the tags on the back housing align with the snap catch grooves on the Enhanced Control Head. Press the back housing until it snaps into place.
4. Check that the terminal chassis O-ring seal is undamaged, and fits properly in the groove on the chassis assembly. Replace the seal, if it is damaged.

Enhanced Control Head – Disassembly

1. Remove the middle screw from the back of the Enhanced Control Head using a T10 TORX™ as shown in the following figure.

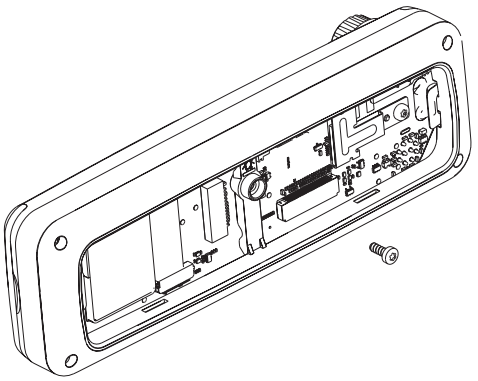


Figure 6-14 Middle Screw Removal

2. To dismount the Enhanced Control Head front housing from the back housing, insert the dismantling tool in the groove between the two housings as shown in the following figure.

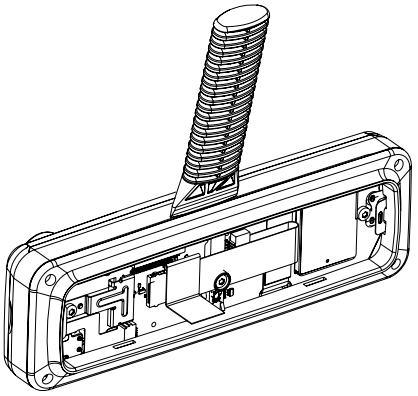


Figure 6-15 Enhanced Control Head Back Housing Removal

3. Press the dismantling tool until the snap connectors on the side of the back housing release from the Enhanced Control Head.
4. Remove the board from the Enhanced Control Head front housing by unscrewing the screws using a T10 TORX™ and disassemble the encoder switch flex from the socket on the board.
5. Remove the board from the Enhanced Control Head housing by stretching the Enhanced Control Head housing and pulling up the board.

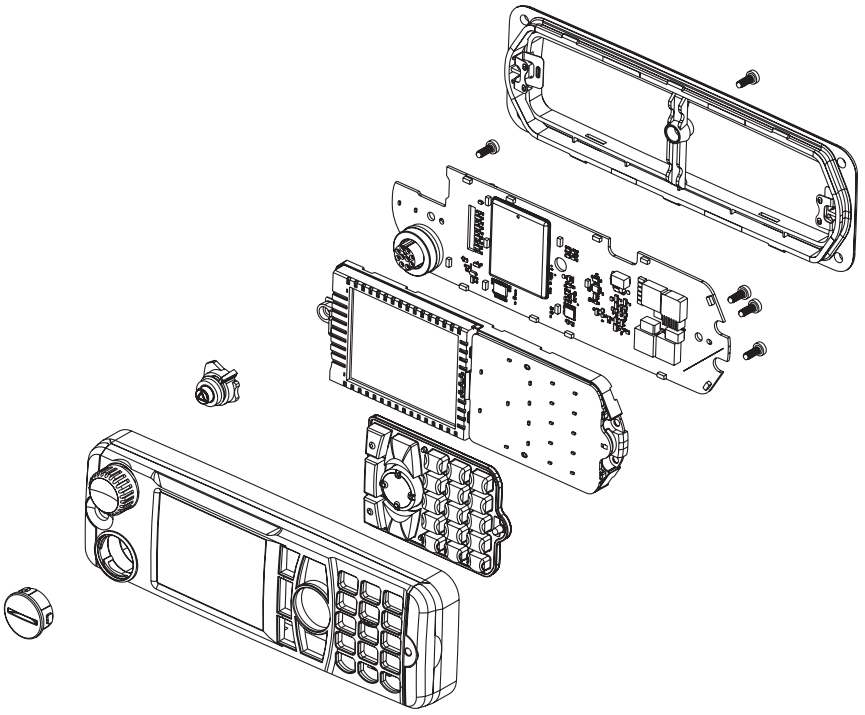


Figure 6-16 Enhanced Control Head Board Removal

6. Remove the keypad by gently pressing the keypad out from the Enhanced Control Head front housing.

NOTE: Care should be taken not to touch or contaminate the conductive pads on the under side of the keypad or the conductive contacts on the printed circuit board.

Enhanced Control Head – Reassembly

1. Fit the rubber keypad onto the Enhanced Control Head housing and ensure that the keypad is correctly aligned and pressed onto the groove on the front housing.
2. Assemble the board to the Enhanced Control Head front housing.
3. Assemble the encoder switch flex to the socket on the board.
4. Screw the two 8mm self tapping screws and one 14 mm self tapping screw.
5. Snap the back housing into the Enhanced Control Head front housing in the orientation shown in Figure 6-17, on page 6-16.

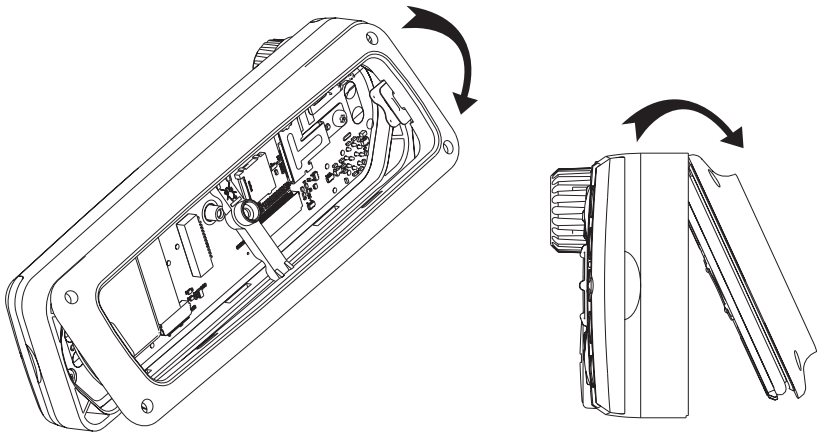


Figure 6-17 Reassemble Enhanced Control Head Housing

6. Screw the middle screw to the back housing.

Remote Head Enhanced – Disassembly

CAUTION: The terminal must be disconnected from the power supply before commencing any disassembly. The Installation Manual should be referred to for more detailed information on warnings and safety.

To Disassemble the Remote Head Enhanced from the Terminal:

1. Remove the Remote Enhanced (PMLN4904_) from the terminal by inserting the dismantling tool (Motorola part number 6686119B01) in the chamfer between the Remote Head Enhanced and the terminal assembly.
2. Use the dismantling tool to push and pry until the chassis tabs disengage from the Remote Head Enhanced on both sides.
3. Remove the flex.

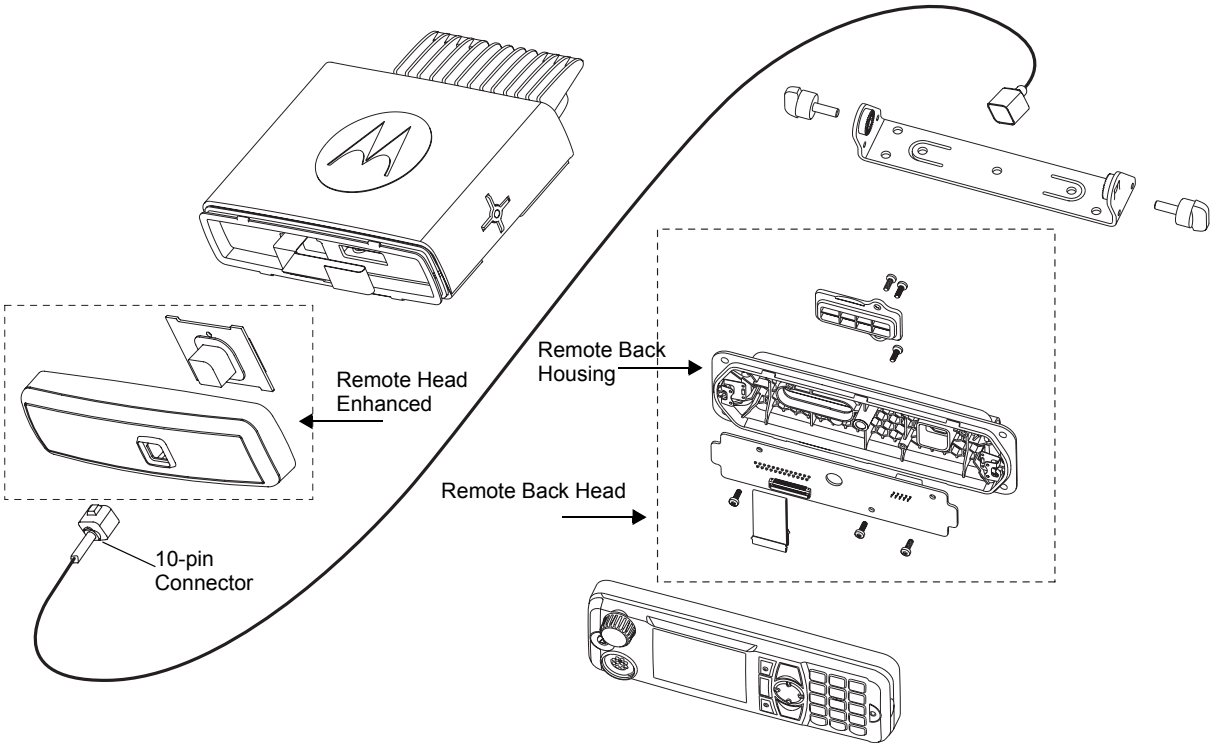


Figure 6-18 Remote Mount Enhanced Control Head with Remote Head Enhanced

Remote Head Enhanced ─ Fitting

To Fit the Remote Front Housing:

1. Connect the flex from the Remote Head Enhanced to the top small connector in the terminal with the '**dot**' or '**O**' facing upwards away from the terminal; make sure the '**dot**' or '**O**' aligns with the '**O**' on the terminal. The flex must be fully pushed into the connector.
2. Press the Remote Head Enhanced onto the terminal chassis until the chassis tabs snap into place.
3. Check that the terminal chassis O-ring seal is undamaged, and fits properly in the groove on the bottom diecast. Replace the O-ring, if it is damaged.

Remote Mount Enhanced Control Head ─ Disassembly

To Disassemble the Remote Mount Enhanced Control Head:

1. Unscrew the wing screws of the remote trunnion and remove the remote trunnion from the Remote Mount Enhanced Control Head.
2. Unscrew the middle screw from the back housing.
3. Remove the back housing by inserting the dismantling tool (Part No. 6686119B01) in the recess between the back housing and Remote Mount Enhanced Control Head front housing.
4. Remove the flex between the remote PCB and Main PCB.

5. Remove the board from the Remote Mount Enhanced Control Head front housing by unscrewing the screws using T10 TORX^{TM} and disassemble the encoder switch flex from the socket on the board.
6. Remove the board from the Remote Mount Enhanced Control head front housing by stretching the Remote Mount Enhanced Control Head front housing and pulling up the board.
7. Remove the keypad by gently pressing the keypad out from the Remote Mount Enhanced Control Head front housing.
8. Unscrew three screws using T10 TORX^{TM} to extract remote PCB from the remote back housing.

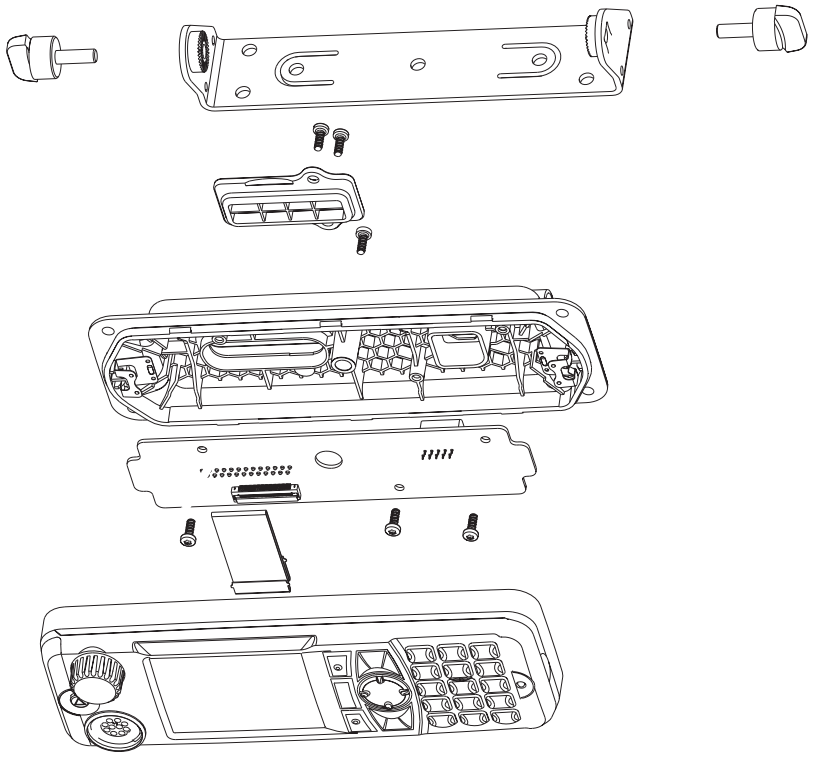


Figure 6-19 Remote Mount Enhanced Control Head

Remote Mount Enhanced Control Head ─ Reassembly

1. Fit the rubber keypad onto the Remote Mount Enhanced Control Head front housing and ensure that the keypad is correctly aligned and pressed onto the groove of the front housing.
2. Assemble the board to the Remote Mount Enhanced Control Head front housing.
3. Assemble the encoder switch flex to the socket on the board.
4. Screw the two 8mm self tapping screws and one 14mm self tapping screw.
5. Assemble the remote PCB into the remote back housing by screwing the three screws.
6. Connect the flex from the remote board on the back housing to the connector on the PCB board of the Remote Mount Enhanced Control Head front housing.
7. Snap the back housing into the Remote Mount Enhanced Control Head front housing.
8. Screw the middle screw to the back housing.

Data Expansion Head Enhanced – Disassembly

CAUTION: The terminal must be disconnected from the power supply before commencing any disassembly. The Terminal Installation Manual should be referred to for more detailed information warnings and safety.

To Disassemble the Data Expansion Head Enhanced from the Terminal

1. Remove the Data Expansion Head Enhanced (PMLN4908_) from the terminal by inserting the dismantling tool (Motorola part number 6686119B01) in chamfer between the Data Expansion Head Enhanced and the terminal assembly.
2. Push and use the dismantling tool to pry until the chassis tabs disengages from the Data Expansion Head Enhanced on both sides.
3. Remove the two flexes.

To Disassemble the Expansion Board from Expansion Head Housing

1. Remove the board from the expansion head housing by levering the expansion head housing and pulling up on the expansion board.

NOTE: The 40-pin connector has a top latch that needs to be lifted before the flex is inserted and closed after flex insertion.

2. Lift the top latch and remove the 40-Pin flex from connector board.

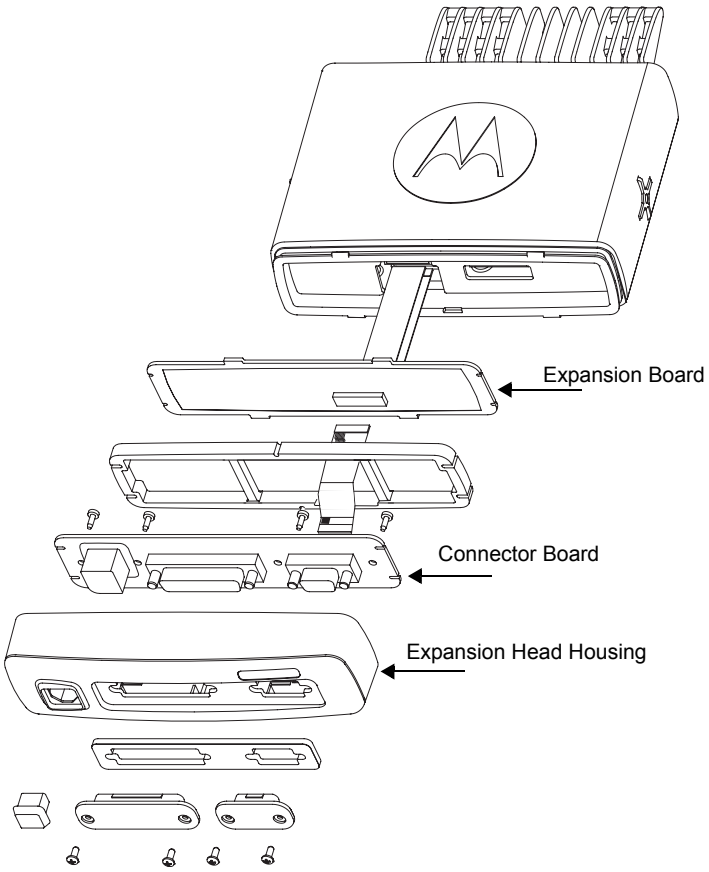


Figure 6-20 Expansion Head Enhanced Exploded View

To Disassemble the Connector Board from Expansion Head Housing

1. Remove the silicon rubber frame.
2. Remove the four screws from the connector board.
3. Remove all the protection caps on the front of the expansion head housing.
4. Lift the connector board from the expansion head housing.

Data Expansion Head Enhanced – Reassembly and Fitting

To Reassemble and fit the Data Expansion Head Enhanced

1. Insert the connector board into the expansion head housing.
2. Secure the connector board with the four screws previously removed.
3. Insert the rubber frame.
4. Insert the 40-pin flex from the connector board to the Expansion board, ensuring that the top latch is firmly closed.
5. Snap the Expansion board into the expansion head housing.
6. Connect the 12 line flex to the Terminal, top small connector.
7. Connect the 40 line flex to the Terminal, bottom large connector.

NOTE: **For correct orientation, the contacts of both flexes should face the PCB. Connect the flex from the Data Expansion Head Enhanced to the top small connector in the terminal with the 'dot' or 'O' facing upwards away from the terminal; make sure the 'dot' or 'O' aligns with the 'O' on the terminal.**

8. Close the top latch after flex insertion.
9. Push the expansion head housing onto the terminal until all the diecast tabs snap firmly into place.

NOTE:
- **The Expansion Head has a protection grade of IP54. To maintain IP54 sealing when connecting a RS232 data cable, make sure to use a IP54 specified cable (example: ROLINE AT-Modem cable ST-BU 1.8m order no. 11.01.4518).**
- **The flex is not designed for continuous insertion, replace after several uses.**

Motorcycle Mount Enhanced Control Head – Disassembly

To disassemble the Motorcycle Mount Enhanced Control Head:

1. Unscrew the screws of the Motorcycle Mount Enhanced Control Head trunnion and remove the Motorcycle Mount Enhanced Control Head from the trunnion.
2. Twist and pull out the telco cable from the connector.
3. Unscrew the middle screw from the back housing.
4. Unscrew the four screws of the two side caps.
5. Remove the back housing by inserting the dismantling tool (Part No. 6686119B01) in the recess between the back housing and Motorcycle Mount Enhanced Control Head front housing.

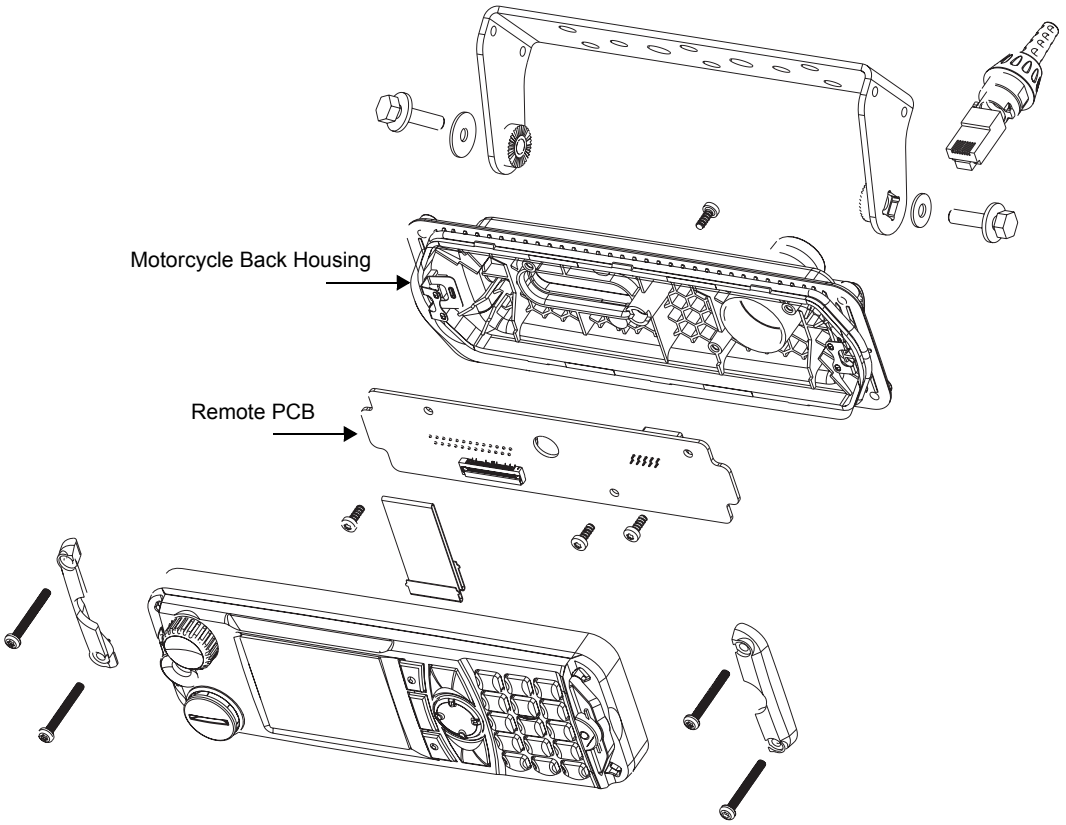


Figure 6-21 Motorcycle Enhanced Control Head Exploded View

6. Remove the flex between the remote PCB and Main PCB.
7. Remove the board from the Motorcycle Mount Enhanced Control Head front housing by unscrewing the screws using T10 TORX™ and disassemble the encoder switch flex from the socket on the board.
8. Remove the board from the Motorcycle Mount Enhanced Control head front housing by stretching the Motorcycle Mount Enhanced Control Head front housing and pulling up the board.
9. Remove the keypad by gently pressing the keypad out from the Motorcycle Mount Enhanced Control Head front housing.
10. Unscrew three screws using T10 TORX™ to extract remote PCB from the motorcycle back housing.

Motorcycle Mount Enhanced Control Head ─ Reassembly

1. Fit the rubber keypad onto the Motorcycle Mount Enhanced Control Head front housing and ensure that the keypad is correctly aligned and pressed onto the groove of the front housing.
2. Assemble the board to the Motorcycle Mount Enhanced Control Head front housing.
3. Assemble the encoder switch flex to the socket on the board.
4. Screw the two 8mm self tapping screws and one 14mm self tapping screw.
5. Assemble the remote PCB into the motorcycle back housing by screwing the three screws.
6. Connect the flex from the remote board on the back housing to the connector on the PCB board of the Motorcycle Mount Enhanced Control Head front housing.
7. Snap the back housing into the Motorcycle Mount Enhanced Control Head front housing.
8. Screw the middle screw to the back housing.

Remote Ethernet Expansion Head – Disassembly

CAUTION: The terminal must be disconnected from the power supply before commencing any disassembly. The Installation Manual should be referred to for more detailed information on warnings and safety.

To Disassemble the Remote Ethernet Expansion Head from the Terminal:

1. Remove the Remote Ethernet Expansion Head (PMLN7009_) from the terminal by inserting the dismantling tool (Motorola part number 6686119B01) in the chamfer between the Remote Ethernet Expansion Head and the terminal assembly.
2. Use the dismantling tool to push and pry until the chassis tabs disengage from the Remote Ethernet Expansion Head on both sides.
3. Remove the two flexes from the terminal to disassemble the Remote Ethernet Expansion Head.

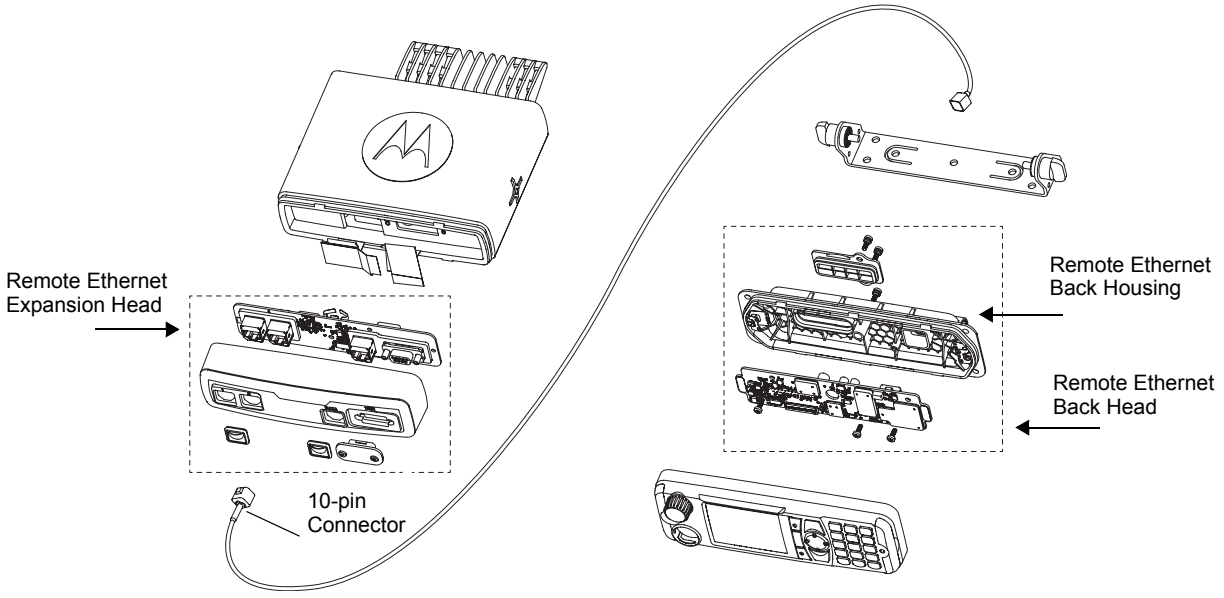


Figure 6-22 Remote Mount Ethernet Control Head with Remote Ethernet Expansion Head

Remote Ethernet Expansion Head – Fitting

To Fit the Remote Ethernet Expansion Head to the Terminal:

1. Connect the 40pos flex from the Remote Ethernet Expansion Head to the 40pos connector in the terminal on the left facing downwards to the terminal chassis; make sure the gold pads on the flex are facing upwards to the terminal top cover with the “1” legend on flex align next to the “0” on the terminal chassis. Ensure the flex is inserted fully before the closing the connector lid.
2. Connect the 18pos flex from the Remote Ethernet Expansion Head to the 18pos connector in the terminal on the right facing downwards to the terminal chassis; make sure the “THIS SIDE UP” legend on the flex is facing upwards to the terminal top cover. Ensure the flex is inserted fully into the connector.
3. Press the Remote Head Enhanced onto the terminal chassis until the chassis tabs snap into place.
4. Check that the terminal chassis O-ring seal is undamaged, and fits properly in the groove on the bottom diecast. Replace the O-ring, if it is damaged.

Telephone Style Control Head – Disassembly

1. Unlatch the Handset from the Cradle as shown in Figure 6-23.

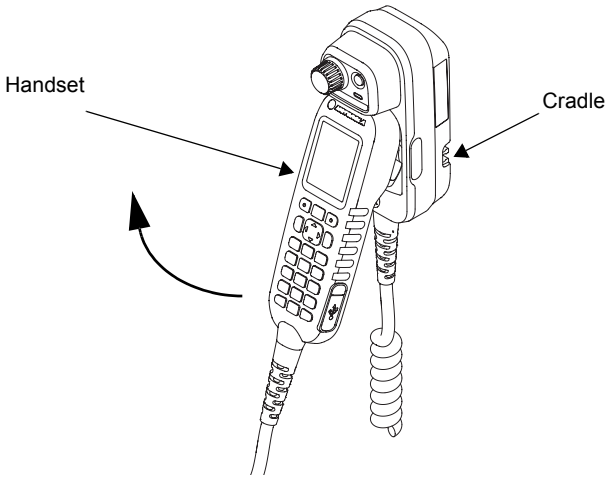


Figure 6-23 Handset Removal

2. Remove the four screws from the back of the Cradle using a T10 TORX™ screw bit.

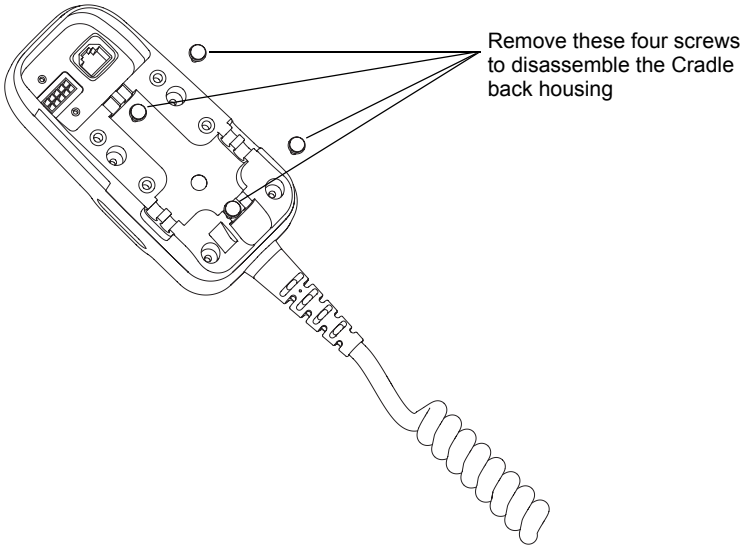


Figure 6-24 Cradle Back Housing Removal

3. Disassemble the Cradle back housing assembly from front housing assembly as shown in Figure 6-25, on page 6-25.

4. Disassemble the Cradle top control flex BTB (board to board) connector, RJ50 flex BTB connector and the wire harness wire to board connector from the Cradle main PCB.

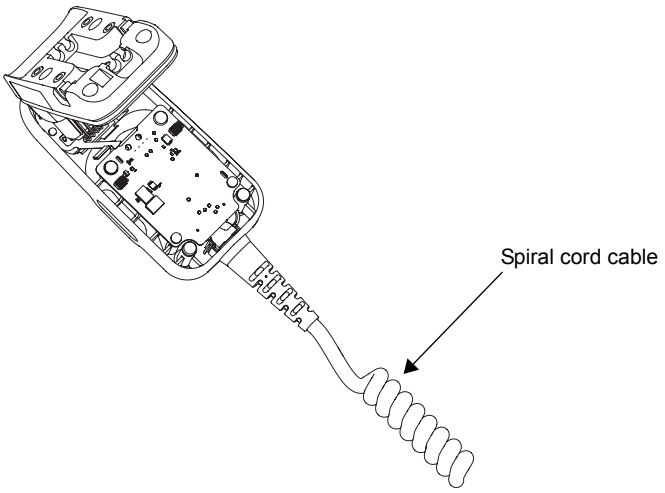


Figure 6-25 Cradle Back Housing Assembly Removal

5. Remove the main PCB from the Cradle front housing by unfastenning the two self tapping screws using a T10 TORX™ screw bit.
6. Remove the spiral cord retainer from the Cradle front housing.

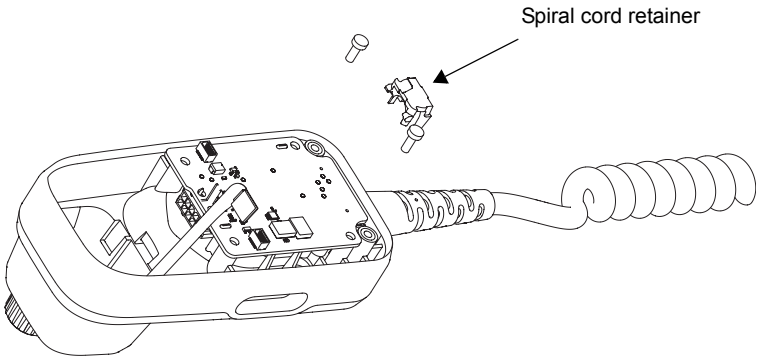


Figure 6-26 Main PCB Removal

7. Unplug the spiral cord cable wire to board connector from the Cradle main PCB. Refer to Figure 6-27.

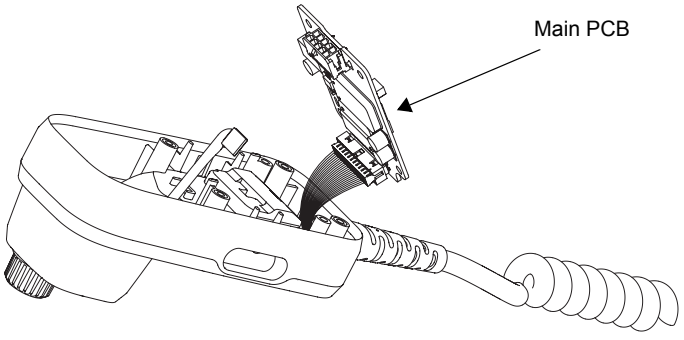


Figure 6-27 Spiral Cord Cable Wire Removal

8. Remove the spiral cord cable from the Cradle front housing by pulling back the strain relief and carefully push the wire to board connector in vertical position out from the Cradle front housing as shown in Figure 6-28 below.

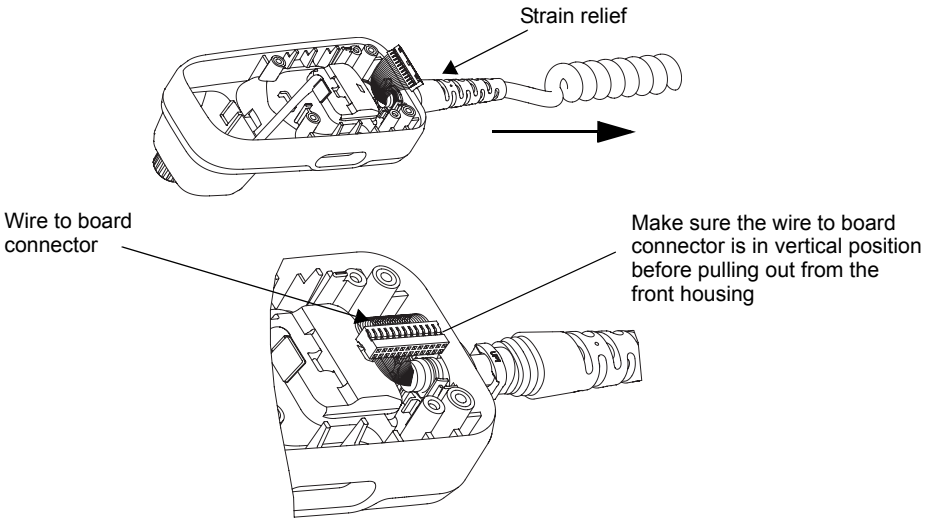


Figure 6-28 Spiral Cord Cable Removal from Front Housing

9. Remove the four machined screws from the back of the Handset using a T8 TORX™ screw bit as shown below.

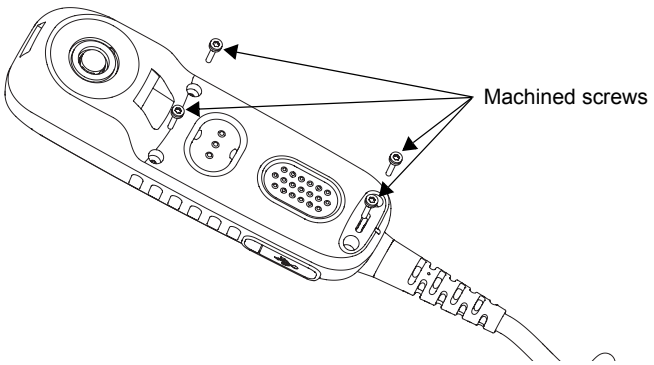


Figure 6-29 Machined Screws Removal

10. Disassemble the Handset back housing assembly from the Handset front housing assembly.
11. Unplug the Handset LCD flex and keypad flex BTB from the Handset main PCB as shown in Figure 6-30.

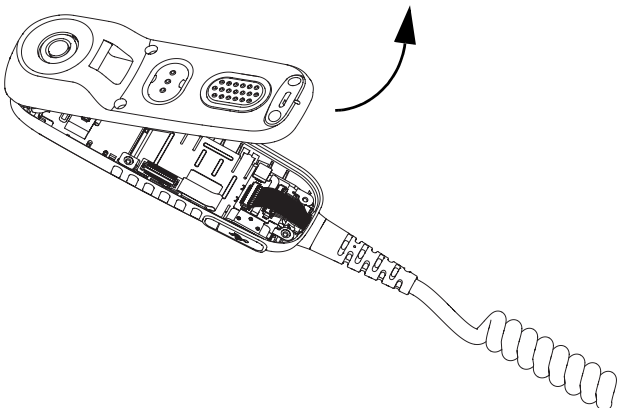


Figure 6-30 LCD and Keypad Flex BTB Removal

12. Remove the main PCB from the Handset back housing by unfastenning the four self tapping screws using a T7 TORX™ screw bit.
13. Unplug the earpiece and microphone wire to board connectors from the Handset main PCB. Remove the Handset main PCB from the Handset back housing.

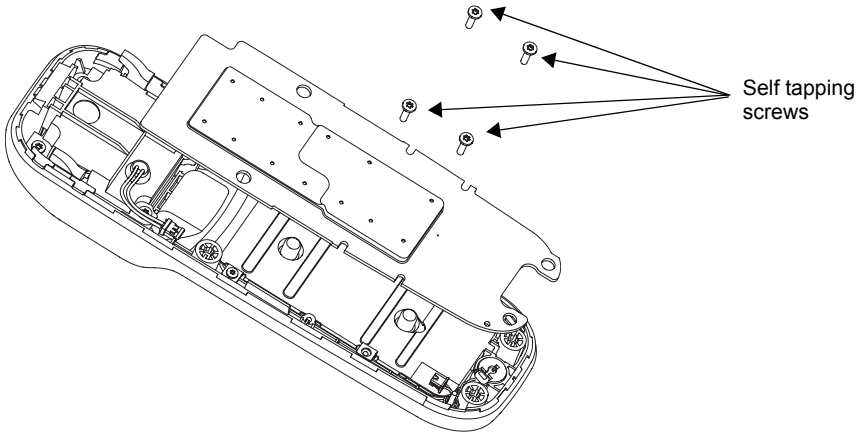


Figure 6-31 Main PCB Removal from Handset Back Housing

14. Unplug the micro-USB BTB connector from the keypad flex.
15. Remove the two screws from the Handset front housing using a T6 TORX™ screw bit and remove the micro-USB module from the Handset front housing.

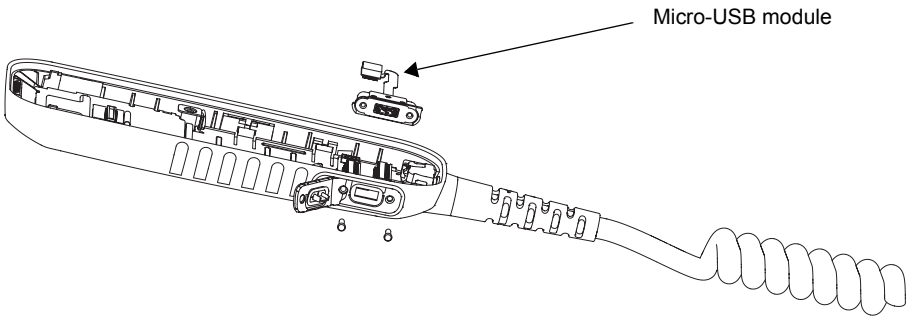


Figure 6-32 Micro-USB Module Removal

16. Remove the spiral cord retainer from the Handset front housing.
17. Remove the keypad retainer by stretching the Handset front housing outwards as shown in Figure 6-33.

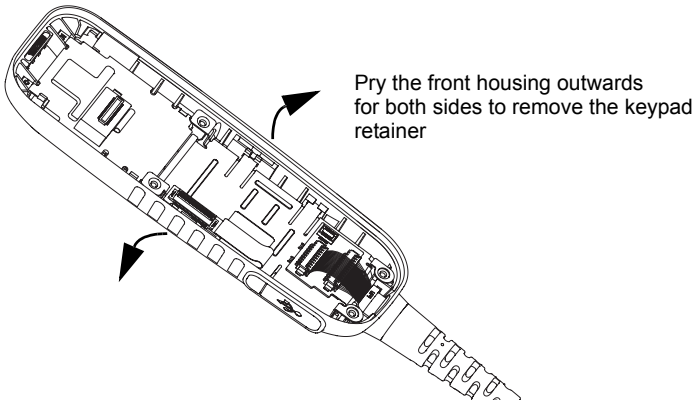


Figure 6-33 Keypad Retainer Removal

18. Pull back the strain relief of the spiral cord cable by pushing the spiral cord inside towards the Handset front housing.

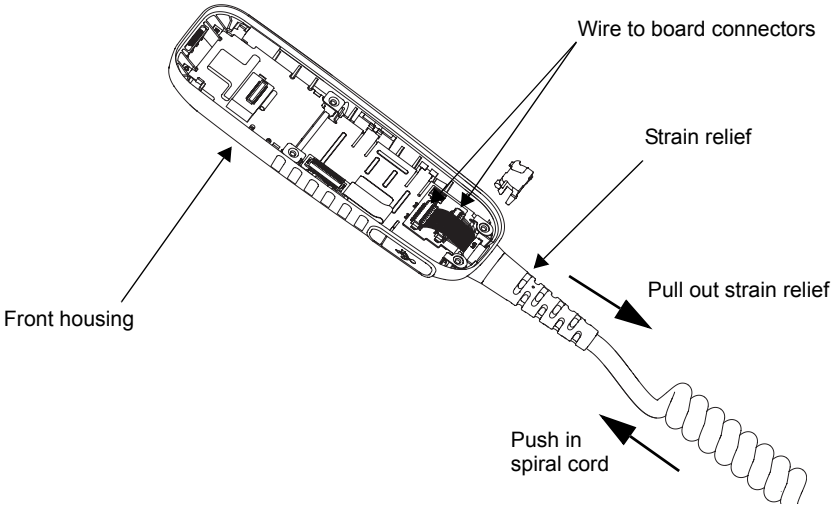


Figure 6-34 Spiral Cord Cable Connectors Removal

19. Unplug the two wire to board connectors of the spiral cord cable from the keypad flex.

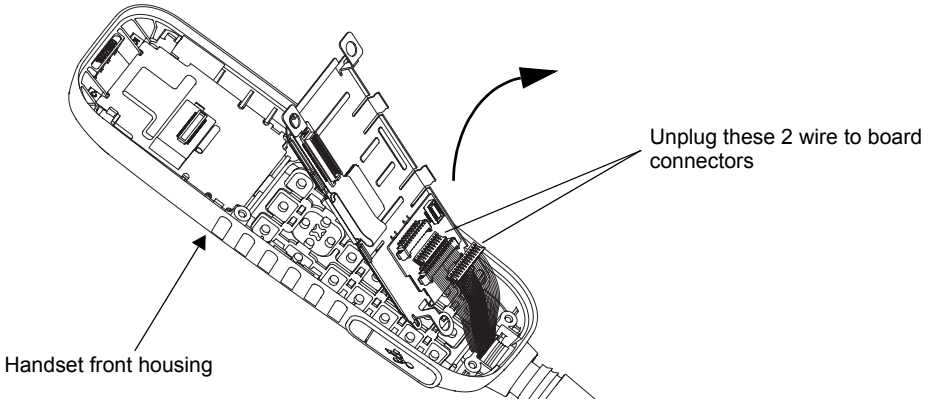


Figure 6-35 Spiral Cord Cable Removal 1

20. Remove the spiral cord cable from the Handset front housing by pushing the two wire to board connectors in vertical position out of the Handset front housing. Refer to Figure 6-36.

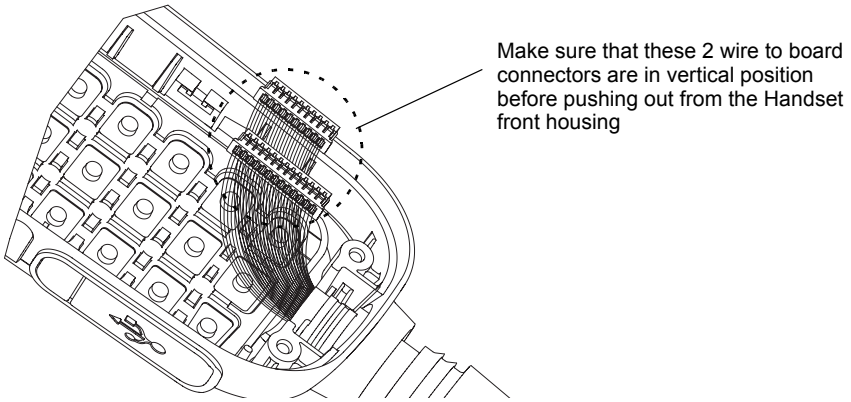


Figure 6-36 Spiral Cord Cable Removal 2

Telephone Style Control Head – Reassembly

1. To assemble the Spiral Cord Cable assembly, slot in the two wire to board connectors into the Handset front housing.

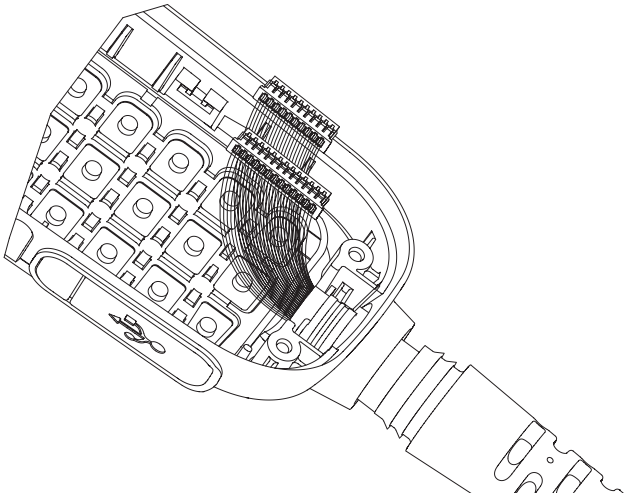


Figure 6-37 Spiral Cord Cable Removal 2

2. Assemble the wire to board connectors to the keypad flex as shown in Figure 6-38.

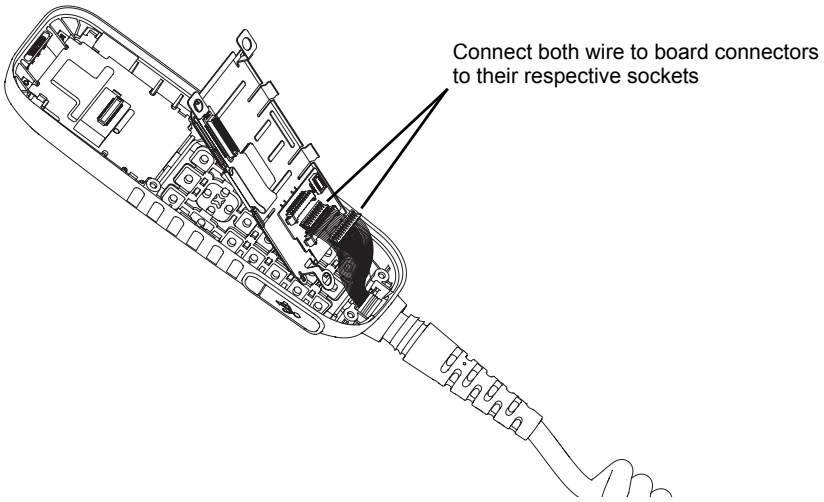


Figure 6-38 Wire to Board Connectors

3. Tongue in the two catches and snap the keypad retainer into the Handset front housing. Make sure the keypad flex is aligned to the front housing guiding pin as shown in Figure 6-39.
4. Push in the spiral cord strain relief into the front housing and pull back the spiral cord at the same time.

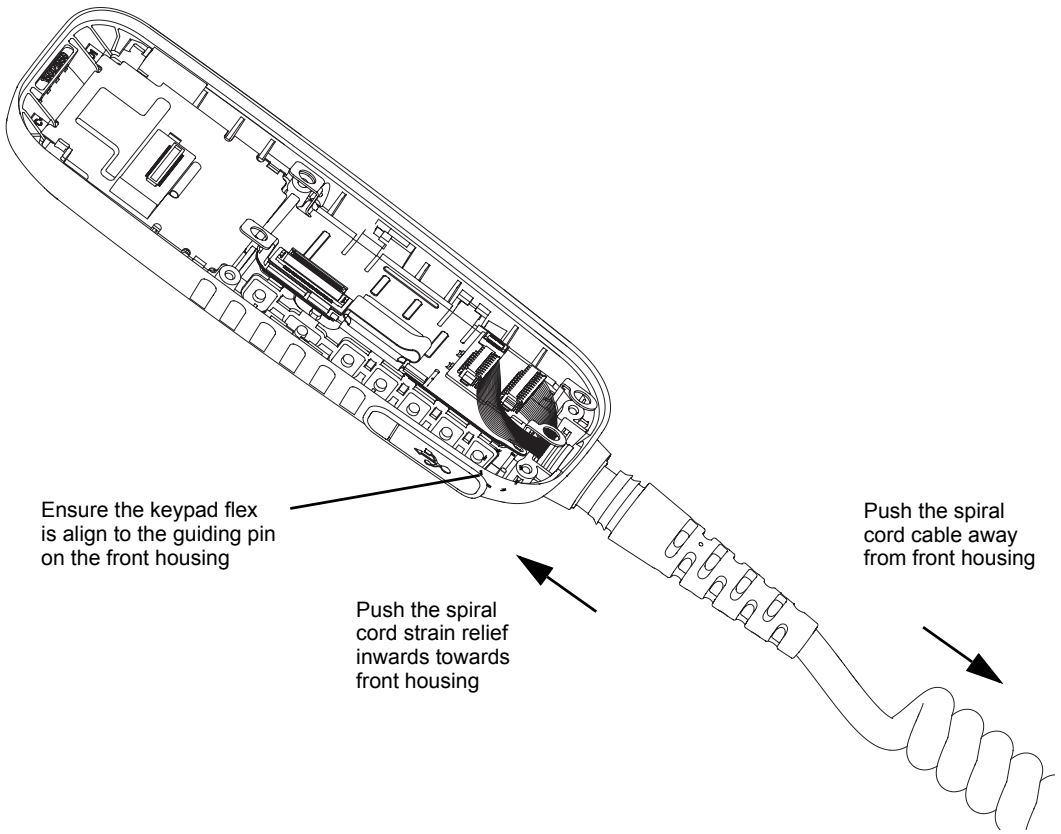


Figure 6-39 Keypad Retainer Assembly

5. Assemble the spiral cord cable retainer as shown below.

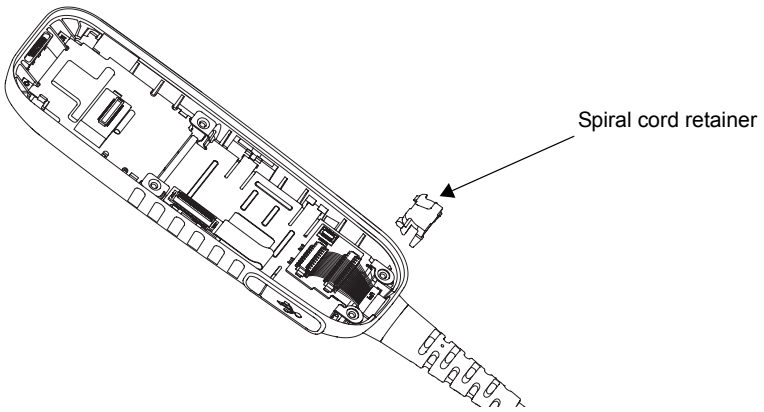


Figure 6-40 Spiral Cord Cable Retainer Assembly

6. Assemble the micro-USB module into the Handset front housing and fasten the two screws using a T6 TORX™ screw bit with 1.5+/-0.1 lb-in torque.

7. Assemble the micro-USB BTB connector to the keypad flex.

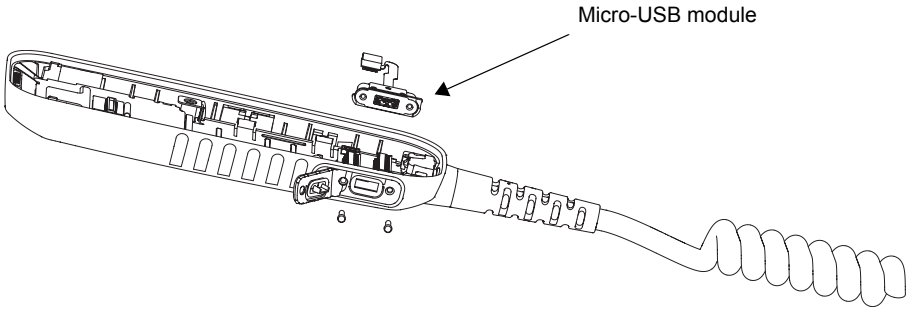


Figure 6-41 Micro-USB Module Assembly

8. Assemble the earpiece and microphone wire to board connectors to the Handset main PCB.
9. Assemble the Handset main PCB to the Handset front housing by aligning to the PCB to the front housing's guiding pin as shown in Figure 6-42 below. Make sure the wire is not pinched.
10. Fasten the four self tapping screws to the Handset back housing by using a T7 TORX™ screw bit with 2.2+/-0.1 lb-in torque.

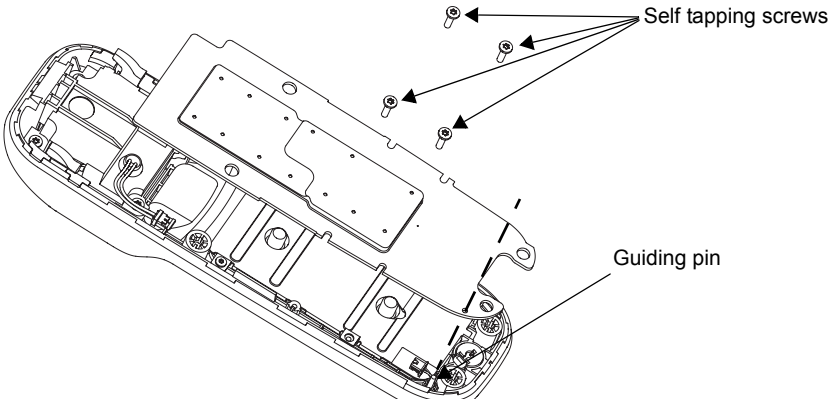


Figure 6-42 Handset Back Housing

11. Assemble the LCD flex and keypad flex BTB connector to the Handset main PCB. Refer to Figure 6-43 below.
12. Assemble the Handset back housing assembly to the Handset front housing assembly by tongue in the back housing assembly to front housing assembly at the top region. Fasten the four machined screws from the back of the Handset using a T8 TORX™ screw bit with 3.2+/-0.1 lb-in torque.

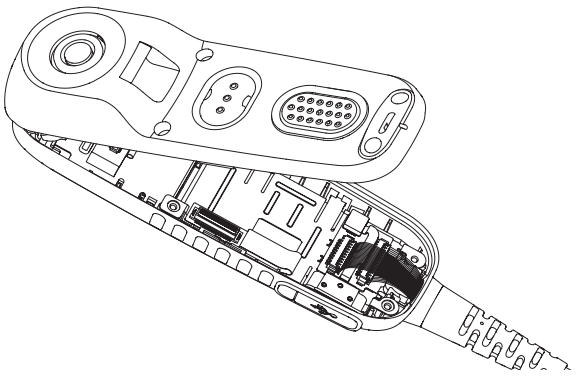


Figure 6-43 LCD and Keypad Flex BTB Connector

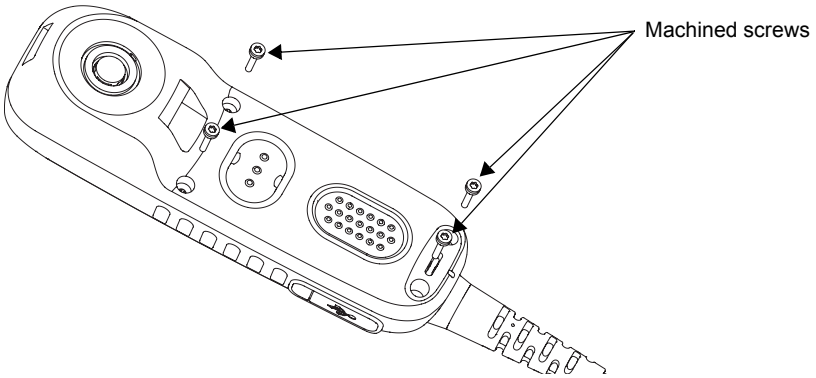


Figure 6-44 Back Housing Assembly

13. Twist the spiral cord wire to board connector to vertical postion as shown below and insert through the Cradle front housing as illustrated in Figure 6-45.

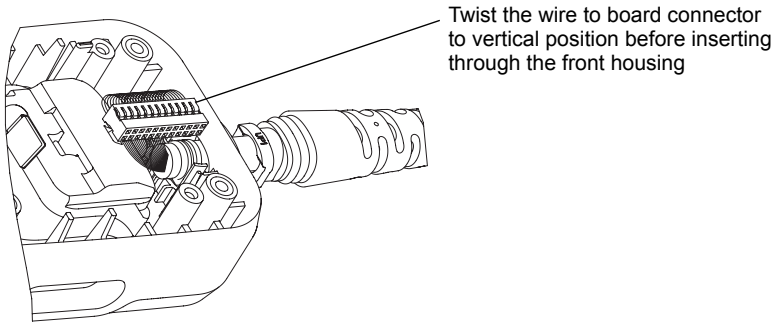


Figure 6-45 Spiral Cord Connector

14. Assemble the spiral cord cable retainer to the Cradle front housing.

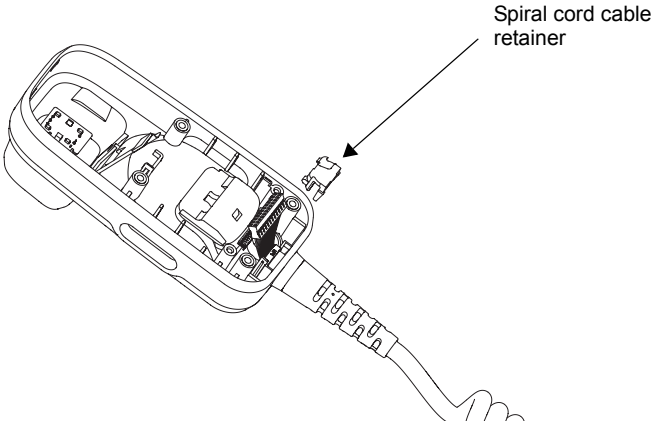


Figure 6-46 Spiral Cord Cable Retainer Assembly

15. Connect the spiral cord cable wire to board connector to the Cradle main PCB.

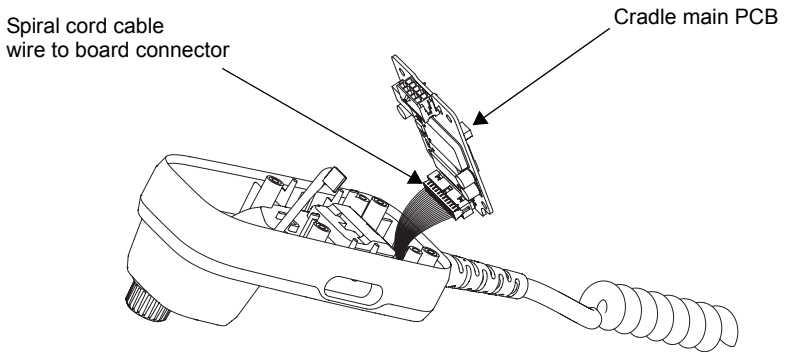


Figure 6-47 Spiral Cord Cable Connector Assembly

16. Assemble the Cradle main PCB to the Cradle front housing by aligning the PCB to the front housing guide pins.
17. Fasten the two self tapping screws to Cradle front housing by using a T10 TORX™ screw bit with 5.0+/-0.1 lb-in torque. Refer to Figure 6-48.

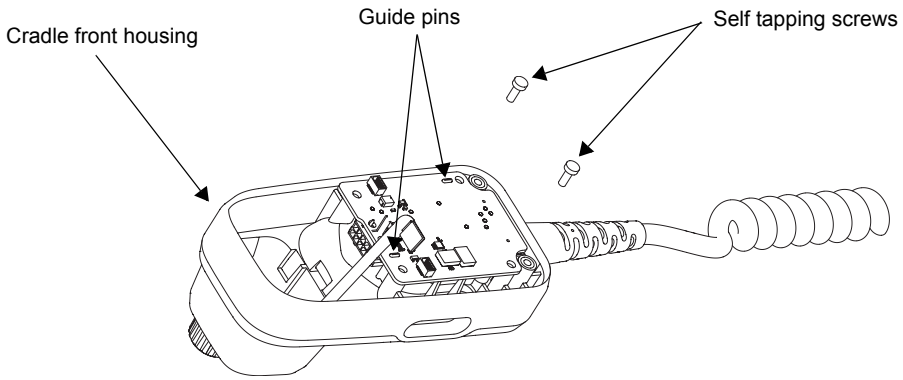


Figure 6-48 Cradle Main PCB Assembly

18. Connect the wire harness wire to board connector, top control flex BTB connector and RJ50 flex BTB connector to the Cradle main PCB in sequence.
19. Assemble the Cradle back housing assembly to the Cradle front housing assembly by tongue in the back housing assembly to the front housing assembly. Fasten the four main screw assembly to the front housing by using a T10 TORX™ screw bit with 5.0+/-0.1 lb-in torque.

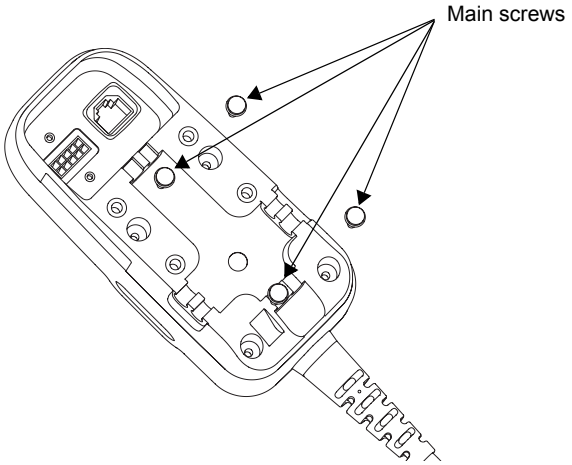


Figure 6-49 Cradle Back Housing Assembly Installation 1

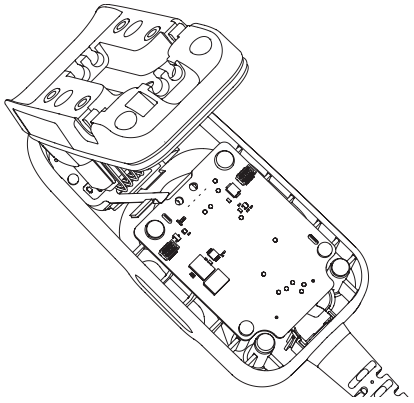


Figure 6-50 Cradle Back Housing Assembly Installation 2

20. Latch the Handset back on the Cradle as shown in Figure 6-51 below.

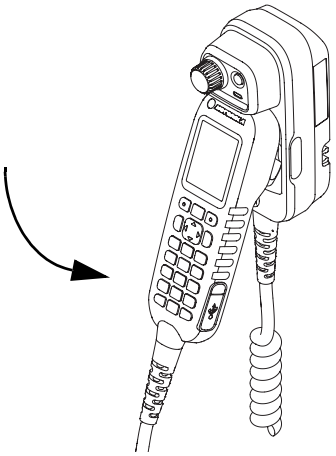


Figure 6-51 Handset Assembly

Service Aids

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

Table 6-4 Service Aids

Motorola Part No.	Description	Application
6666500A01	Housing Eliminator	Test Fixture used to bench test the terminal PCB
6686119B01	Dismantling Tool	Assists in the removal of terminal Enhanced Control Head
0180320B16 6680321B81 6680321B56	Torx Screw Driver Kit (T6,8,10,15,25) Torx Bit Insert Bit extra long	–
T-20 TORX (or equivalent)	Screwdriver with torque meter	–
–	5/16” socket driver	To assemble & disassemble GPS nut
–	Phillips screwdriver	To assemble & disassemble SIM dust cover plate

Exploded Views & Parts Lists

NOTE: **For optimum performance, all replacement parts, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.**

Transceiver – Exploded View and Parts List

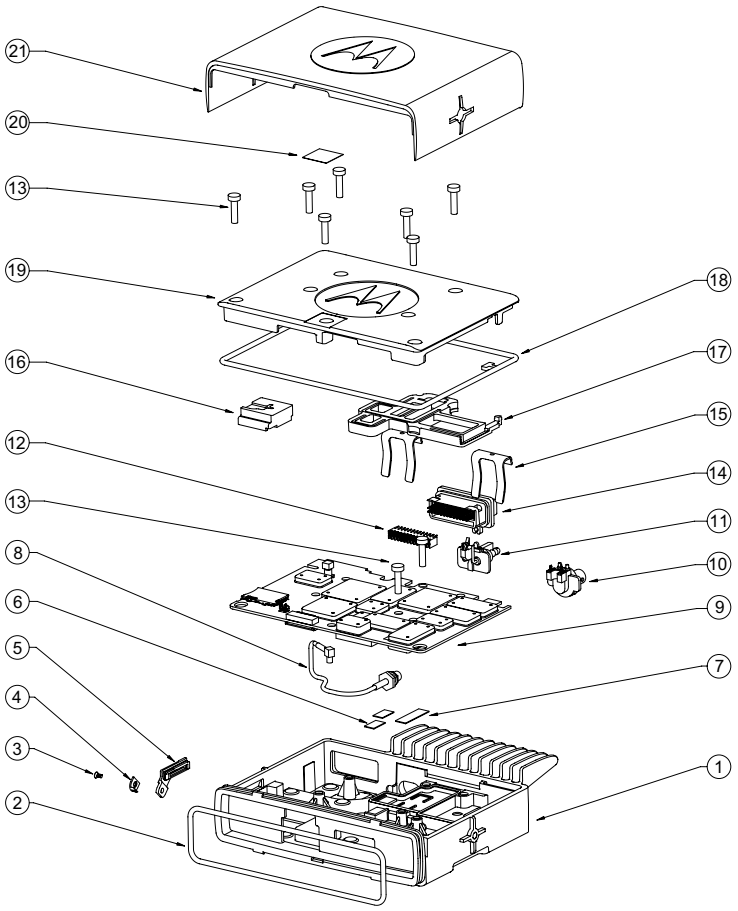


Figure 6-52 Transceiver Exploded View

NOTE: **Terminals with special label OPTION BOARD MOUNTED (see dotted lines on figure above) are equipped with an additional board inside the transceiver cover plate.**
Refer to the figure next page before disassembling such terminals.

Table 6-5 Transceiver Parts List

Item No.	Description	Part Number
1	Chassis	27012003001
2	Gasket, Enhanced Control Head	3202620Y01
3	Screw, (M2X0.4)	0378341A01
4	SIM dust cover plate	64012011001
5	SIM dust cover	32012066001
6	Pre-driver heat sink thermal pad	75012083001
7	RF PA thermal pad	75012082001
8	GPS cable	3015953H01
9	Main PCB (Item 10 – 12 included)	Refer to APPENDIX A – Replacement Parts & Kits
10	BNC antenna connector[1]	0986166B03
11	Power connector[1]	0986165B06
12	Accessory Connector[1]	0916017H01
13	TORX 20 Screw with O-ring, 9X (M4X0.7)	0104023J41
14	Connector assembly	0178042A01
15	Retainer clip, 2X	4285702E01
16	Filler pad	75012050001
17	Pressure pad	75012088001
18	Chassis cover gasket	32012065001
19	Chassis cover	27012002001
20	Anti-tamper label	54012082001
21	Cover, plastic	15012064001

1. Non-field replaceable. Change main PCB.

CAUTION: The following parts MUST be replaced every time the radio is disassembled:

- Pre-driver heat sink thermal pad (part number: 75012083001) – 2pcs.
- RF PA thermal pad (part number: 75012082001) – 1pc.

Enhanced Control Head – Exploded View and Parts List

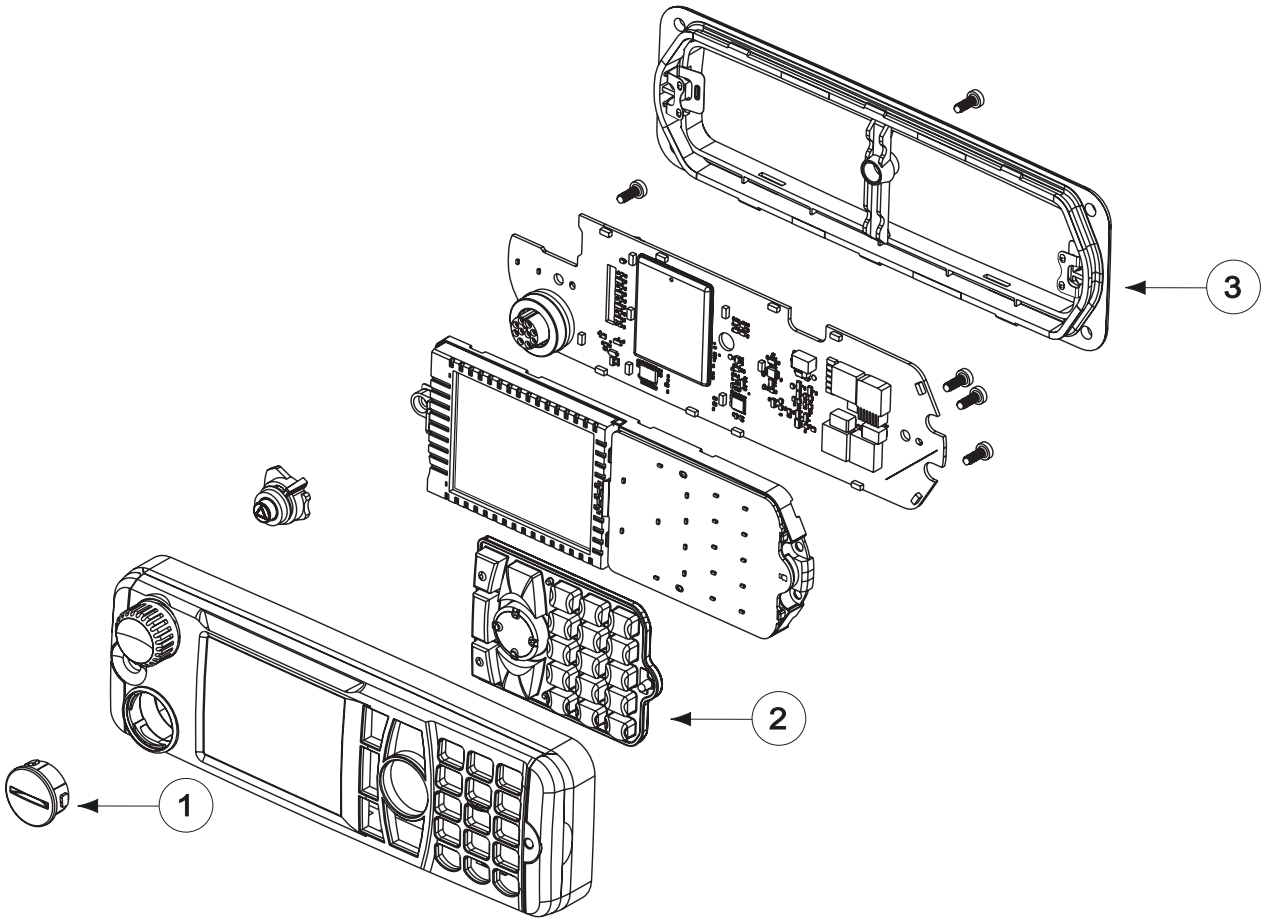


Figure 6-53 Enhanced Control Head – Exploded View 1

Table 6-6 Enhanced Control Head – Parts List 1

Item No	Description	Part No.
1	GCAI Cover	1515048C01
2	Keypad Assembly – English Keypad Assembly – Arabic Keypad Assembly – Chinese Keypad Assembly – Cyrillic Keypad Assembly – Korean Keypad Assembly – Bopomofo	7571017L01 7571017L02 7571017L03 7571017L04 7571017L05 7571017L06
3	Head Bridge Assembly	0104025J29

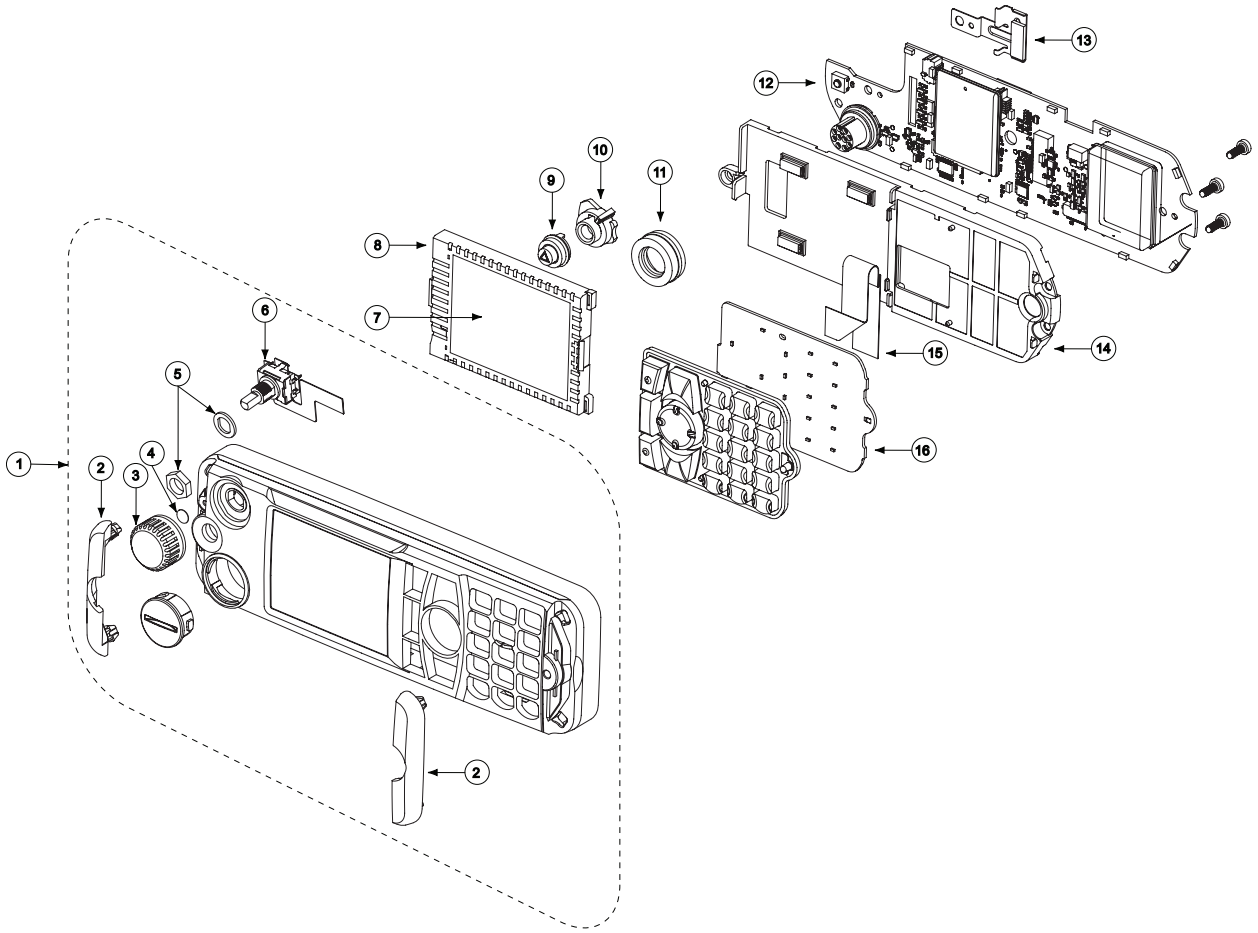


Figure 6-54 Enhanced Control Head – Exploded View 2

Table 6-7 Enhanced Control Head – Parts List 2

Item No	Description	Part No.
1	Front Housing Assembly	0104022J38
2	Side Cap	3816950H01
3	Encoder Knob	3616898H01
4	Gore Port	3205472M02
5	Encoder Nut and Seal	PMLN5123_
6	Encoder Assembly	0104025J36
7	LCD Module LCD Module*	7271138D01 72012019001
8	LCD Rubber Jacket	7516954H01
9	Emergency Key	3816953H01
10	Emergency Key Frame	0716944H01
11	GCAI Seal	3264133H01

Item No	Description	Part No.
12	Main PWA Kit	PMLN5226_
13	LCD Metal Retainer	4216900H01
14	Chassis	2716937H01
15	Keypad FFC	8471919L01
16	Keypad PWA Kit	PMLN5445_

* New parts replacement. Older parts are to be used till stock depletion.

Data Expansion Head Enhanced – Exploded View and Parts List

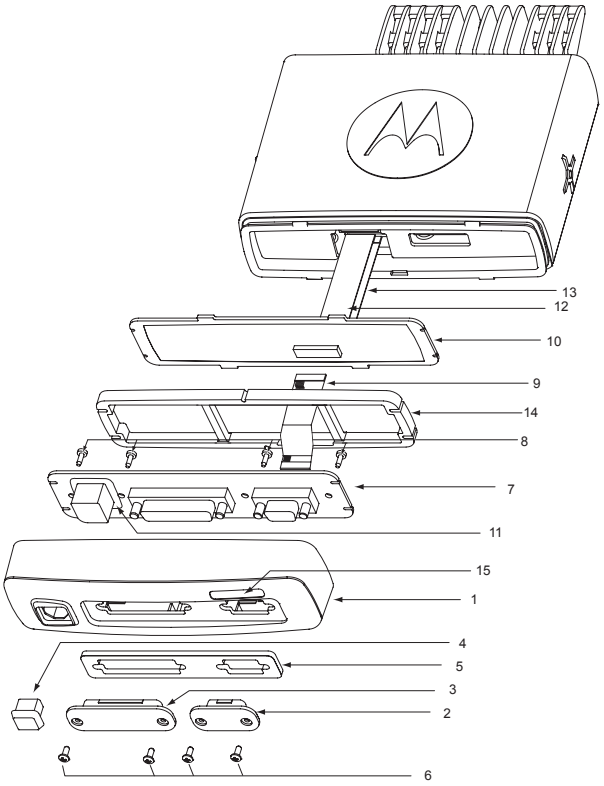


Figure 6-55 Data Expansion Head Enhanced – Exploded View

Table 6-8 Data Expansion Head Enhanced – Parts List

Item No	Description	Part No.
1	Expansion Head Housing	1564290B01
2	Cover 9 Sub-D	3864326B01
3	Cover 25 Sub-D	3864326B02
4	Protection Caps/Bung, Telco	GLN7306_
5	Seal, Expansion Head (not available to customers)	–
6	Screw, Protection Caps/Bung (4 required)	0305137Q02
7	Connector Board	PMLN5087A
8	Screw, Connector PCB (4 required)	0385944A02
9	Flex 40-Pin	8415157H01
10	Expansion Board, not part of Housing Kit	PMLN4939_
11	Seal for 10-Pin Telco on PCB	3264291B01
12	Flex 12-Pin	8486127B01
13	Flex 40-Pin	8466543A01
14	Silicone Pressure Pad	3264337B01
15	Label	5464344B07

Remote Mount Enhanced Control Head – Exploded View and Parts List

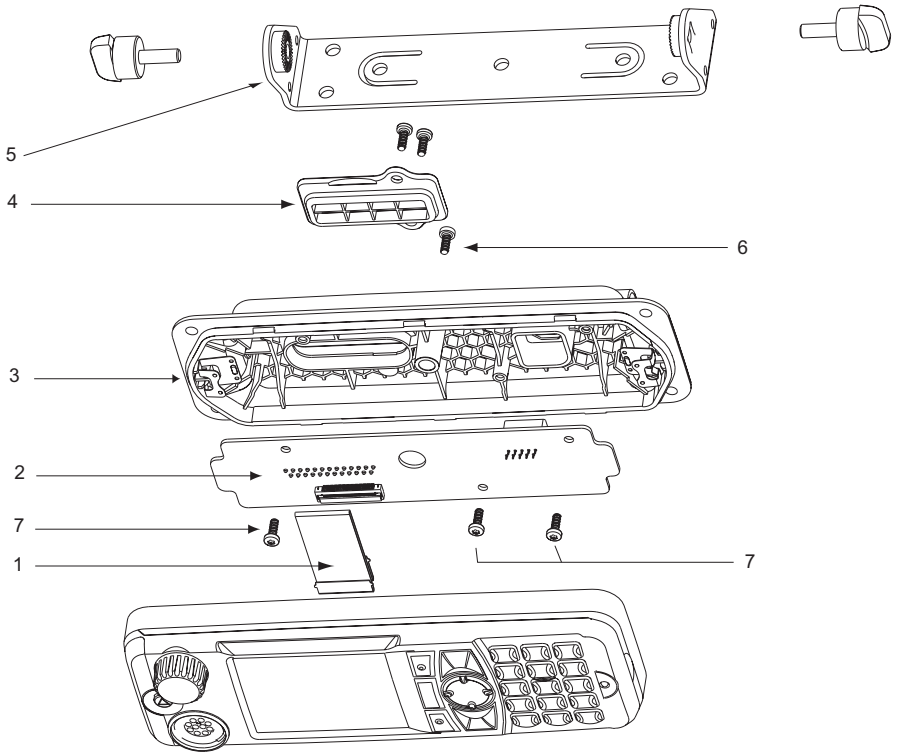


Figure 6-56 Remote Mount Enhanced Control Head – Exploded View

Table 6-9 Remote Mount Enhanced Control Head – Parts List

Item No.	Description	Part No.
1	Remote FFC (Main to Remote)	8471921L01
2	Remote PWA Kit	0104037J05
3	Remote Back Housing Assembly	0104025J30
4	D Sub Cover	1571012L01
5	Trunnion	PMLN4912_
6	Middle Screw	0371912L01
7	Self Tapping Screw	0316961H01

Telephone Style Control Head – Exploded View and Parts List

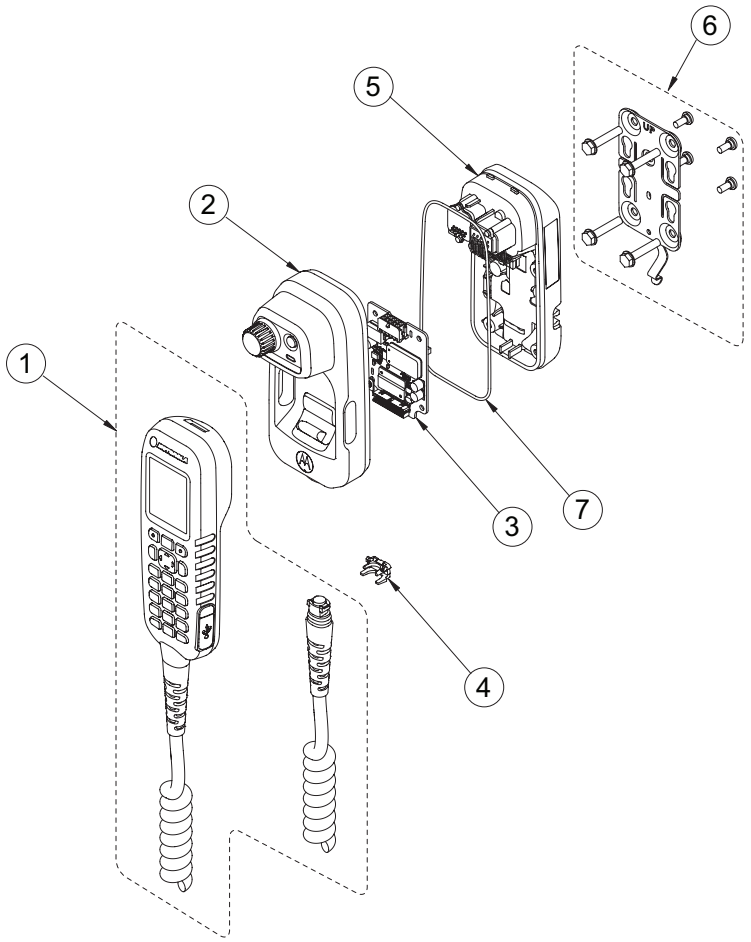


Figure 6-57 Telephone Style Control Head – Exploded View 1

Table 6-10 Telephone Style Control Head – Parts List 1

Item No	Description	Part No.
1	Kit, Handset, TSCH	PMLN6198_
2	Assembly, Front Housing, Cradle, TSCH	Motorola Use Only
3	Assembly, Main Board, Cradle, TSCH	Motorola Use Only
4	Retainer, Spiral Cord Cable	Motorola Use Only
5	Assembly, Back Housing, Cradle, TSCH	Motorola Use Only
6	Kit, Slim Mounting Bracket	Motorola Use Only
7	O-ring, Main, Cradle	Motorola Use Only

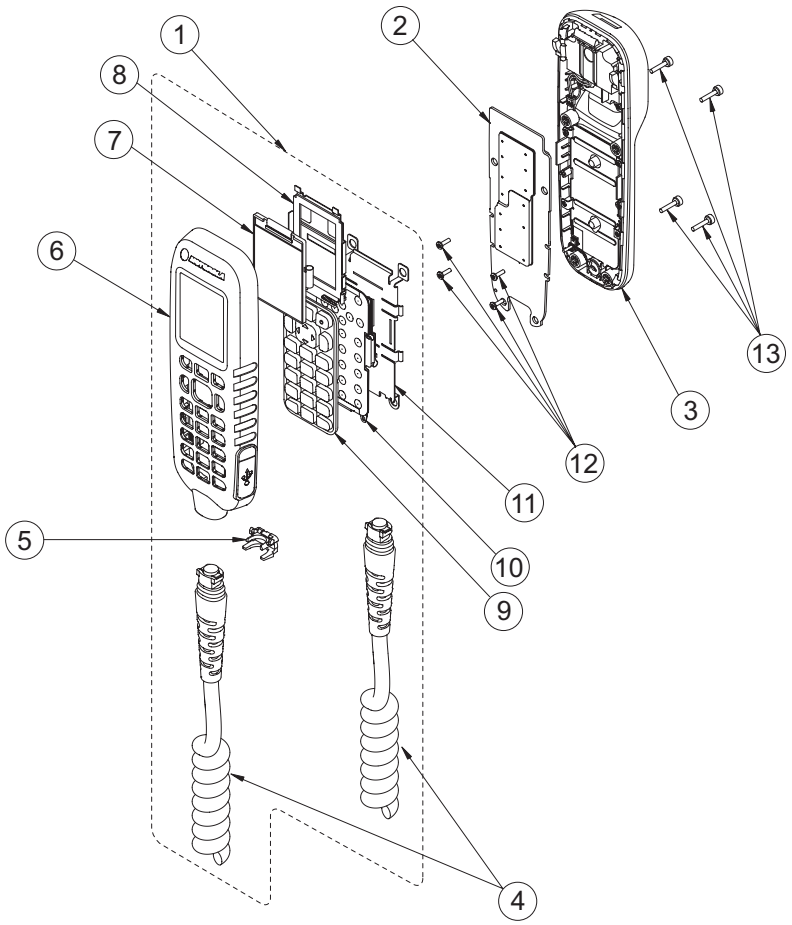


Figure 6-58 Telephone Style Control Head (Handset) – Exploded View 2

Table 6-11 Telephone Style Control Head (Handset) – Parts List 2

Item No	Description	Part No.
1	Assembly, Front Housing, Handset, TSCH	Motorola Use Only
2	Assembly, Main Board, Handset, TSCH	Motorola Use Only
3	Assembly, Back Housing, Handset, TSCH	Motorola Use Only
4	Cable Assembly, Spiral Cord	0104047J66
5	Retainer, Spiral Cord Cable	Motorola Use Only
6	Sub-Assembly, Front Housing, Handset, TSCH	Motorola Use Only
7	LCD Module	Motorola Use Only
8	Retainer, Display with Poron Pad	Motorola Use Only
9	Keypad, Alphanumeric	Motorola Use Only
10	Flex Assembly, Keypad	Motorola Use Only
11	Retainer, Keypad	Motorola Use Only
12	Self Tapping Screw, Handset PCB (4 required)	Motorola Use Only
13	M2.5 Machined Screw with O-ring (4 required)	Motorola Use Only

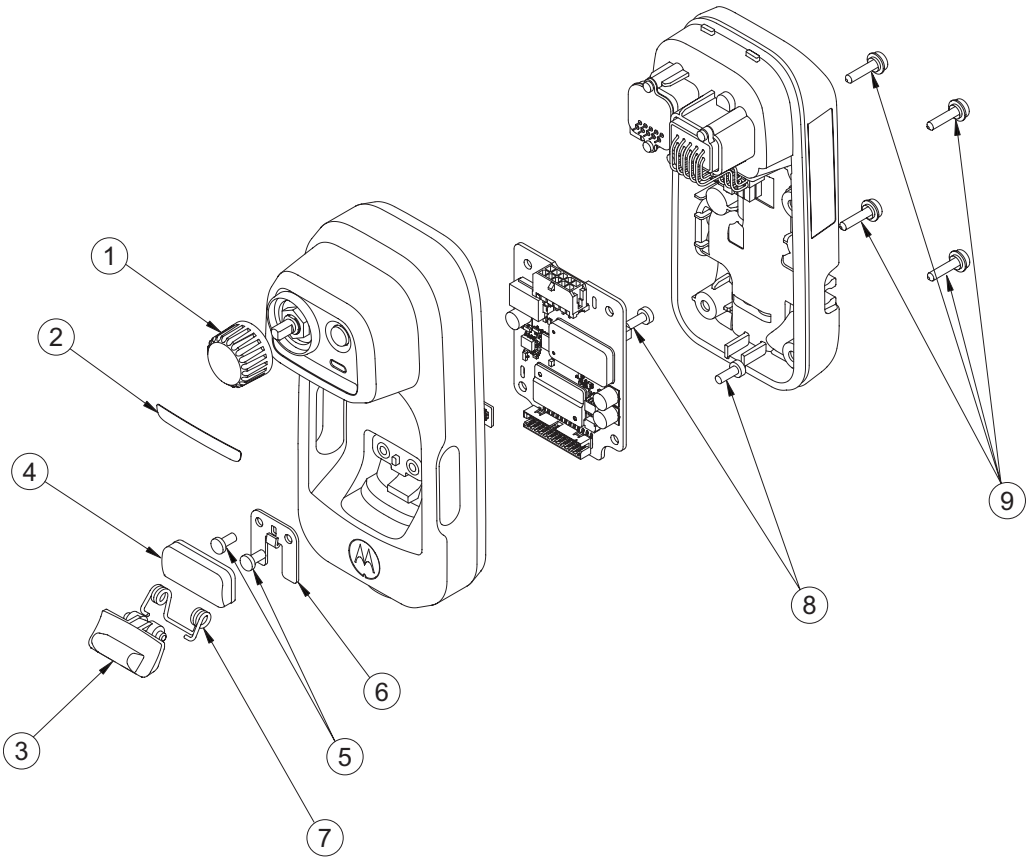


Figure 6-59 Telephone Style Control Head (Cradle) – Exploded View 3

Table 6-12 Telephone Style Control Head (Cradle) – Parts List 3

Item No	Description	Part No.
1	Knob, Encoder with D-Clip	3616898H01
2	Kit, Label, Color Code (White) (set of 5)	PMLN6335_
	Kit, Label, Color Code (Green) (set of 5)	PMLN6336_
	Kit, Label, Color Code (Red) (set of 5)	PMLN6337_
	Kit, Label, Color Code (Yellow) (set of 5)	PMLN6338_
	Kit, Label, Color Code (Blue) (set of 5)	PMLN6339_
3	Armlock, Latch	Motorola Use Only
4	Rubber Bumper	75012170001
5	M3 Screws, Latch Retainer (2 required)	Motorola Use Only
6	Retainer Plate, Latch	Motorola Use Only
7	Coiled Spring, Latch	Motorola Use Only
8	Self Tapping Screws, Cradle PCB (2 required)	Motorola Use Only
9	Main Screw Assembly (4 required)	Motorola Use Only

Remote Ethernet Expansion Head – Exploded View and Parts List

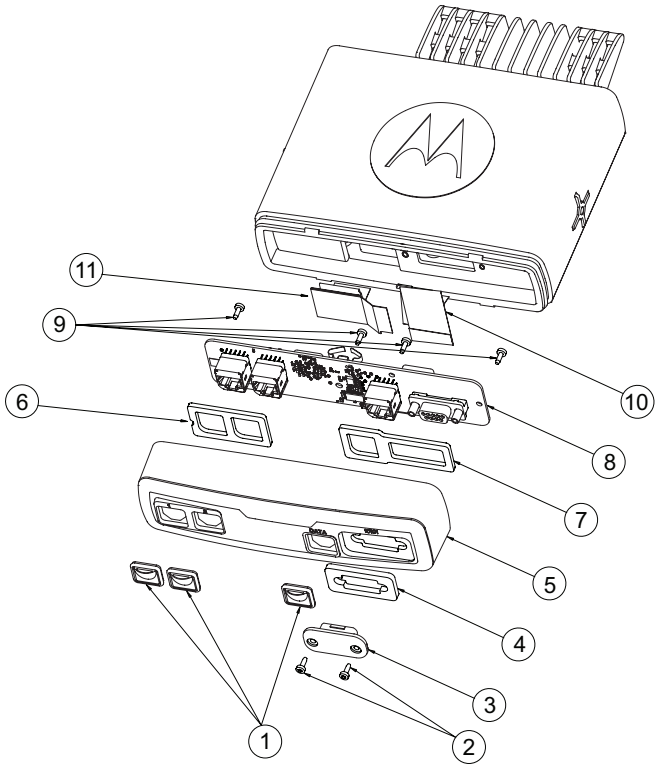


Figure 6-60 Remote Ethernet Expansion Head – Exploded View

Table 6-13 Remote Ethernet Expansion Head – Parts List

Item No	Description	Part No.
1	Ethernet Port Dust Cover Kit (set of 2)	PMLN6344_
2	Screw, Protection Cap (2 required)	0305137Q02
3	Cover 9 Sub-D	3864326B01
4	Seal, Poron, 9 Sub-D, Outer	32012180001
5	Ethernet Expansion Head Housing	Motorola Use Only
6	Seal, Poron, dual Ethernet	Motorola Use Only
7	Seal, Poron, 9 Sub-D and Ethernet	Motorola Use Only
8	Ethernet Expansion PCB Kit	Motorola Use Only
9	Screw, Connector PCB (4 required)	Motorola Use Only
10	FPC 40 pins	Motorola Use Only
11	FPC 18 pins	Motorola Use Only
–	Remote Ethernet Expansion Head	Refer to APPENDIX A – Replacement Parts & Kits

Remote Mount Ethernet Control Head – Exploded View and Parts List

WARNING: Ethernet Expansion Heads are only compatible with Ethernet Remote Heads. Do not mix Ethernet control head with non-Ethernet control heads.

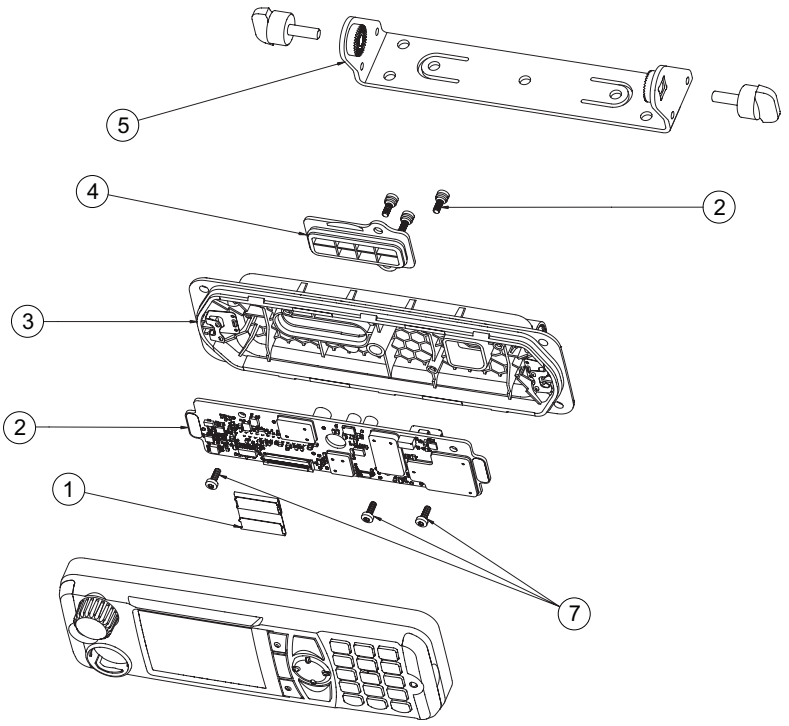


Figure 6-61 Remote Mount Ethernet Control Head – Exploded View

Table 6-14 Remote Mount Ethernet Control Head – Parts List

Item No.	Description	Part No.
1	Remote Ethernet FPC (Main to Remote)	Motorola Use Only
2	Remote Ethernet PWA Kit	Motorola Use Only
3	Remote Ethernet Back Housing Assembly	Motorola Use Only
4	D Sub Cover	Motorola Use Only
5	Trunnion	Motorola Use Only
6	Middle Screw	Motorola Use Only
7	Self Tapping Screw	Motorola Use Only
–	Remote Mount Ethernet Control Head	Refer to APPENDIX A – Replacement Parts & Kits

Remote Mount Configuration – Exploded View and Parts List

WARNING: Ethernet Expansion Heads are only compatible with Ethernet Remote Heads. Do not mix Ethernet control head with non-Ethernet control heads.

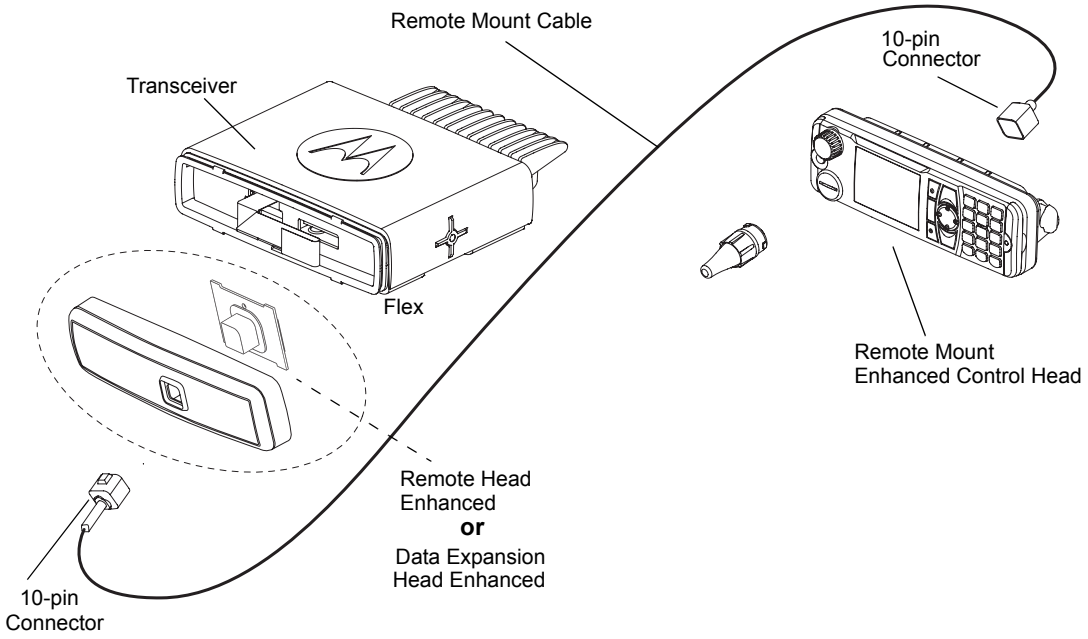


Figure 6-62 Remote Mount Configuration – Exploded View

Table 6-15 Associated Components for Remote Mount Configuration

Item No.	Description	Part No.
1	Remote Mount Cable, 3 m	RKN4077_
2	Remote Mount Cable, 5 m	RKN4078_
3	Remote Mount Cable, 7 m	RKN4079_
4	Remote Mount Cable, 10 m	PMKN4020_
5	Speaker Extension Cable	GMKN4084_
6	Remote Head Enhanced	PMLN4904_
7	Data Expansion Control Head	PMLN4908_

Motorcycle Mount Enhanced Control Head – Exploded View and Parts List

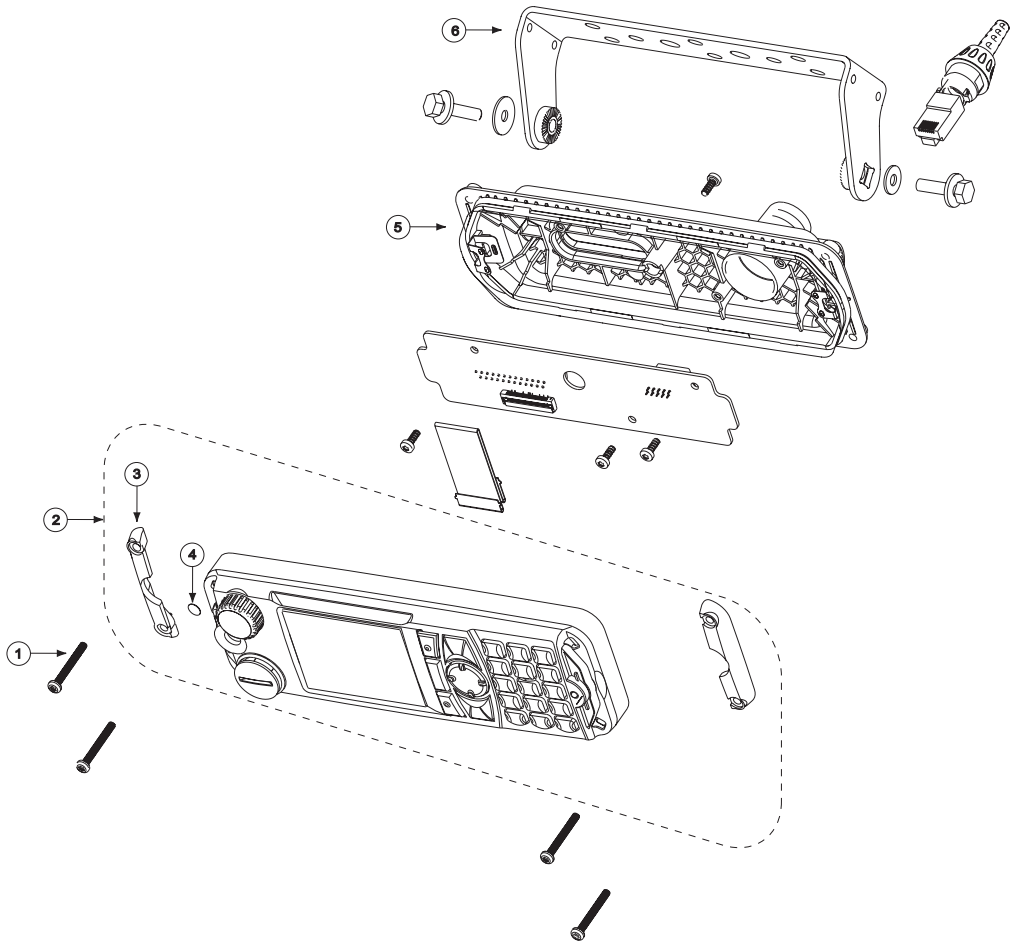


Figure 6-63 Motorcycle Mount Enhanced Control Head – Exploded View

Table 6-16 Motorcycle Mount Enhanced Control Head – Parts List

Item No.	Description	Part No.
1	Side Cap Screw	0316960H02
2	MC Front Housing Assembly	0104024J34
3	MC Side Cap	3871547L01
4	MC Gore Port	3271555L01
5	MC Back Housing Assembly	0104025J31
6	MC Trunnion	0771445L01

Ethernet Remote Mount Configuration – Exploded View and Parts List

WARNING: Ethernet Expansion Heads are only compatible with Ethernet Remote Heads. Do not mix Ethernet control head with non-Ethernet control heads.

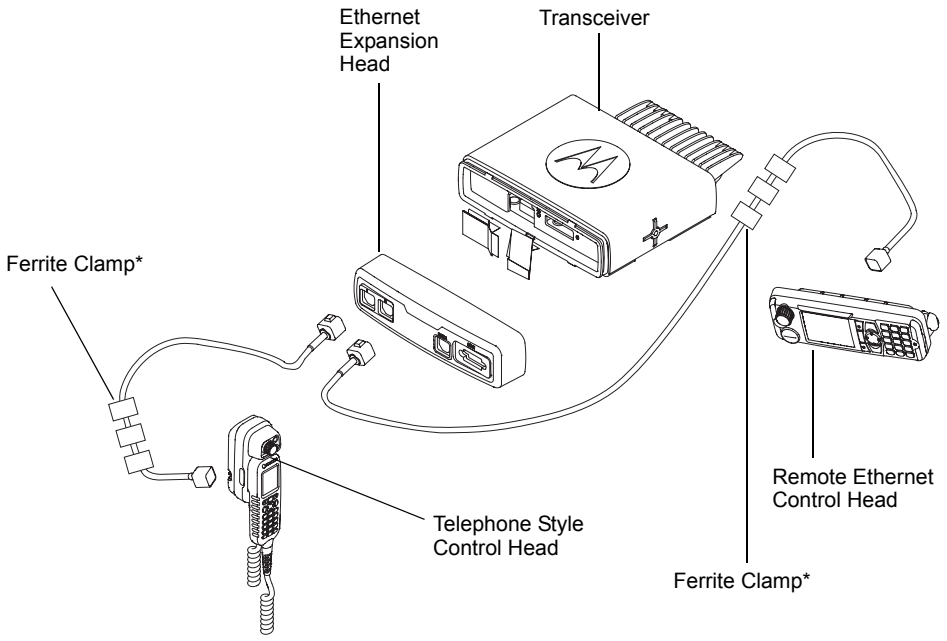


Figure 6-64 Ethernet Remote Mount Configuration – Exploded View

Table 6-17 Associated Components for Ethernet Remote Mount Configuration

Item	Part No.
Tetra Mobile Ethernet Cable, 3 m	PMKN4141_
Tetra Mobile Ethernet Cable, 5 m	PMKN4140_
Tetra Mobile Ethernet Cable, 7 m	PMKN4139_
Tetra Mobile Ethernet Cable, 10 m	PMKN4138_
Tetra Mobile Ethernet Cable, 12 m	PMKN4136_
Tetra Mobile Ethernet Cable, 40 m	PMKN4135_
Ferrite Clamp (3 required)*	91012044001

* Please order together with the Mobile Ethernet Cable when connecting for TSCH and RECH.

NOTE: For optimum performance, please use Ethernet cables with Ethernet Remote Heads.

The Ethernet Remote Mount can be configured with the following configurations below:

1. Single TSCH
2. Dual TSCH
3. Single RECH
4. Dual RECH
5. TSCH and RECH

APPENDIX A

REPLACEMENT PARTS & KITS

Servicing MTM5x00/MTM800 FuG/MTM800 FuG ET with Enhanced Control Head Mobile Units

Service for the mobile units is based on the substitution method; a faulty part is replaced by a working one, providing quicker service to the customer. For example, if the controller board is faulty, it is replaced. If the mobile requires more complete testing or servicing than that is available at field level, it is sent to the European Radio Service Centre; where it is serviced, and returned to the Regional Service Centre.

Level 1 and Level 2 Maintenance

This manual covers Level 1 and Level 2 Maintenance: at Level 1 maintenance you replace the transceiver and/or accessories and send the faulty transceiver and/or accessories to higher level of maintenance; at level 2 maintenance a transceiver board is replaced.

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

Level 3 Maintenance

All Radio Support Depots are level 3 service partners. The depots are capable of performing repairs down to component level where retuning is required. To find out more about Motorola Service Center, please visit

http://www.motorolasolutions.com

Replacement Parts

Damaged parts should be replaced with identical replacement parts.
For complete information on ordering required parts and kits, contact your local customer service representative (see following pages).

Service Information

Europe, Middle East and Africa Region

European Radio Support Centre (ERSC)

The ERSC Customer Information Desk is available through the following service numbers:

Austria:	08 00 29 75 41	Italy:	80 08 77 387
Belgium:	08 00 72 471	Luxemburg:	08 00 23 27
Denmark:	80 88 58 80	Netherlands:	08 00 22 45 13
Finland:	08 00 11 49 910	Norway:	80 01 11 15
France:	08 00 90 30 90	Portugal:	08 00 84 95 70
Germany:	08 00 18 75 240	Spain:	90 09 84 902
Greece:	00 80 04 91 29 020	Sweden:	02 07 94 307
UK:	08 00 96 90 95	Switzerland:	08 00 55 30 82
Ireland:	18 00 55 50 21	Iceland:	80 08 147

Or dial the European Repair and Service Centre
Tel.: +49 (0)30 6686 1555
Fax: +49 (0)30 6686 1579
Email: ERSC@motorolasolutions.com

EMEA Systems Support Centre (ESSC)

The Systems Support Centre is available at:

Telephone:	+44 2030 277499
E-mail:	ESSC@motorolasolutions.com

Piece Parts

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola part number is assigned to the part, it is available from Motorola Radio Products and Solutions Organization (RPSO). If no part number is assigned, the part is not normally available from Motorola. If a parts list is not included, this generally means that no user-serviceable parts are available for that kit or assembly.

Note on this digital Tetra Terminal: **The CPS has no capability to tune the terminal. Tuning the terminal can only be performed at the factory or at the appropriate Motorola Repair Centre. Components replacement can affect the terminal tuning and must only be performed by the appropriate Motorola Repair Centre.**

Parts identification and ordering

Request for help in identification of non-referenced spare parts should be directed to the Customer Care Organization of Motorola's local area representation. Orders for replacement parts, kits and assemblies should be placed directly on Motorola's local distribution organization or via the Extranet site Motorola Online at:

http://www.motorola.com/emeaonline

Latin America Region

Latin America Radio Support Centres
The Customer Support is available through the following service centres:

Warranty and Repairs:

MOTOROLA DE COLOMBIA SERVICE CENTRE
Torre Banco Ganadero
Carrera 7 No. 71-52
Torre B piso 13
Oficina 1301
Bogota - Colombia
(571) 376-6990

MOTOROLA DE MEXICO SERVICE CENTRE
Bosques de Alisos #125
Col. Bosques de las Lomas
CP 05120 Mexico DF
5252576700

Piece Parts:

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

MOTOROLA, INC.
Latin American Countries Region
789 International Parkway
Sunrise, FL 33325
USA 954-723-8959

MOTOROLA DE ARGENTINA
Ave. del Libertador 1855
B1638BGE, Vicente Lopez
Buenos Aires, Argentina
5411-4317-5300

MOTOROLA DE LOS ANDES C.A.
Ave. Francisco de Miranda
Centro Lido, Torre A
Piso 15, El Rosal
Caracas, 1060 Venezuela
58212-901-4600

MOTOROLA DO BRASIL LTDA.
Av. Chedid Jafet
222 Bloco D Conjuntos 11,12,21,22 E 41
Condominio Millennium Office Park
04551-065- Vila Olimpia, Sao Paulo
Brasil
5511-3847-6686

MOTOROLA CHILE
Ave. Nueva Tajamar 481
Edif. World Trade Center
Of. 1702, Torre Norte
Las Condes
Santiago, Chile
562-338-9000

MOTOROLA DE COLOMBIA, LTDA.
Carrera 7 #71-52
Torre A, Oficina 1301
Bogotá, Colombia
571-376-6990

MOTOROLA DE COSTA RICA
Parque Empresarial Plaza Roble
Edificio El Portico, 1er Piso
Centro de Negocios Internacional
Guachepelin, Escazu
San Jose, Costa Rica
506-201-1480

MOTOROLA DEL ECUADOR
Autopist Gral. Rumiñahui, Puente 2
Conjunto Puerta del Sol Este-Ciudad Jardin
Pasa E, Casa 65
Quito, Ecuador
5932-264-1627

MOTOROLA DE MEXICO, S.A.
Calle Bosques de Alisos #125
Col. Bosques de Las Lomas
05120 México D.F.
México
52-555-257-6700

MOTOROLA DEL PERU, S.A.
Ave. República de Panama 3535
Piso 11, San Isidro
Lima 27, Peru
511-211-0700

Technical Support:

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

Service Kits

Table A-1 Model Numbering Information

Type No.	Sales Model No.	Short Description	Model
MT953C MT953CG	M83PFS6TZ5AN M83PFS6TZ5AG	MTM5400 380–430 MHz, DASH MTM800 FuG 380–430 MHz, DASH	M1
MT953C MT953CG	M83PFS6TZ4AN M83PFS6TZ4AG	MTM5400 380–430 MHz, DESK MTM800 FuG 380–430 MHz, DESK	M2
MT953C MT953CG	M83PFS6TZ6AN M83PFS6TZ6AG	MTM5400 380–430 MHz, REMOTE MTM800 FuG 380–430 MHz, REMOTE	M3
MT953C MT953CG	M83PFS6TZ2AN M83PFS6TZ2AG	MTM5400 380–430 MHz, M'CYCLE MTM800 FuG 380–430 MHz, M'CYCLE	M4
MT953C MT953CG	M83PFA6TZ5AN M83PFA6TZ5AG	MTM5400 380–430 MHz, Data MTM800 FuG 380–430 MHz, Data	M5
MT953C MT953CG	M83PFT6TZ6AN M83PFT6TZ6AG	MTM5500 380–430 MHz, REMOTE MTM800 FuG ET 380–430, REM ETHERNET	M6

Table A-2 Service Kits-To-Model Chart

MTM5x00/MTM800 FuG/MTM800 FuG ET Service Kits							
Description	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Service Boards 380–430 MHz							
MTM5400/MTM800 FuG 380–430 CLEAR[1]	PMUE4495_Z	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 CLEAR	PMUE4495_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA1[2]	PMUE4496_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA2[2]	PMUE4497_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA3[2]	PMUE4498_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 CLEAR MAINBOARD[3]	PMUE4495_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA1 MAINBOARD[2,3]	PMUE4496_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA2 MAINBOARD[2,3]	PMUE4497_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA3 MAINBOARD[2,3]	PMUE4498_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M AES128[1]	PMUE4499_Z	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M AES128	PMUE4499_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA1 AES128[2]	PMUE4500_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA2 AES128[2]	PMUE4501_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA3 AES128[2]	PMUE4502_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M CLEAR AES128 MAINBOARD[3]	PMUE4499_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M TEA1 AES128 MAINBOARD[2,3]	PMUE4500_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M TEA2 AES128 MAINBOARD[2,3]	PMUE4501_W	X	X	X	X	X	

Table A-2 Service Kits-To-Model Chart (Continued)

MTM5x00/MTM800 FuG/MTM800 FuG ET Service Kits							
Description	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
MTM5400/MTM800 FuG 380–430 UCM-M TEA3 AES128 MAINBOARD[2,3]	PMUE4502_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M AES256[1]	PMUE4503_Z	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M AES256	PMUE4503_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA1 AES256[2]	PMUE4504_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA2 AES256[2]	PMUE4505_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380 UCM-M TEA3 AES256[2]	PMUE4506_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M CLEAR AES256 MAINBOARD[3]	PMUE4503_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M TEA1 AES256 MAINBOARD[2,3]	PMUE4504_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M TEA2 AES256 MAINBOARD[2,3]	PMUE4505_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 UCM-M TEA3 AES256 MAINBOARD[2,3]	PMUE4506_W	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 CLEAR SIM-E2EE	PMUE4511_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA1 SIM-E2EE[2]	PMUE4512_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA2 SIM-E2EE[2]	PMUE4513_S	X	X	X	X	X	
MTM5400/MTM800 FuG 380–430 TEA3 SIM-E2EE[2]	PMUE4514_S	X	X	X	X	X	
Enhanced Control Head/Kits							
Dash/Desk Mount – English Keypad	PMWN4009_	X	X				
Chinese Keypad	PMWN4010_	X	X				
Korean Keypad	PMWN4011_	X	X				
Arabic Keypad	PMWN4012_	X	X				
BoPoMoFo Keypad	PMWN4013_	X	X				
Cyrillic Keypad	PMWN4014_	X	X				
English Keypad – Hungarian	PMWN4015_	X	X				
Hebrew Keypad	PMWN4016_	X	X				
Remote Mount – English Keypad	PMWN4017_			X		X	
Chinese Keypad	PMWN4018_			X		X	
Korean Keypad	PMWN4019_			X		X	
Arabic Keypad	PMWN4020_			X		X	
BoPoMoFo Keypad	PMWN4021_			X		X	
Cyrillic Keypad	PMWN4022_			X		X	
English Keypad – Hungarian	PMWN4023_			X		X	
Motorcycle – English Keypad	PMWN4002_				X		
Chinese Keypad	PMWN4003_				X		
Korean Keypad	PMWN4004_				X		
Arabic Keypad	PMWN4005_				X		
BoPoMoFo Keypad	PMWN4006_				X		
Cyrillic Keypad	PMWN4007_				X		
English Keypad – Hungarian	PMWN4008_				X		

Table A-2 Service Kits-To-Model Chart (Continued)

MTM5x00/MTM800 FuG/MTM800 FuG ET Service Kits							
Description	**Part Number**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Expansion & Remote Head Kits							
Data Expansion Head Enhanced	PMLN4908_			X	X	X	
Remote Head Enhanced	PMLN4904_			X	X		
ETHERNET DATA EXPANSION CONTROL HEAD	PMLN7009_						X
REMOTE ETHERNET CONTROL HEAD	PMWN4024_						X
TELEPHONE STYLE CONTROL HEAD	PMWN4025_						X
TELEPHONE STYLE CONTROL HEAD HANDSET MAINBOARD[1]	PMWN4026_Z						X
TELEPHONE STYLE CONTROL HEAD CRADLE MAINBOARD[1]	PMWN4027_Z						X
Remote Ethernet PWA[1]	0104046J34_						X
Ethernet Expansion PCB[1]	PMLN7016_Z						X
Cables/Kits							
Remote Mount Cable – 3m	RKN4077_			X	X		
Remote Mount Cable – 5m	RKN4078_			X	X		
Remote Mount Cable – 7m	RKN4079_			X	X		
Remote Mount Cable – 10m	PMKN4020_			X	X		
Accessories Expansion Cable, 2.3m	PMKN4029_			X	X		
Motorcycle Mount TELCO Cable, 2.3m	PMKN4030_				X		
Accessories Expansion Cable, 4m	PMKN4056_			X	X		
Cable, Ethernet, MTM5400/MTM800 FuG, 40 m	PMKN4135_						X
Cable, Ethernet, MTM5400/MTM800 FuG, 12 m	PMKN4136_						X
Cable, Ethernet, MTM5400/MTM800 FuG, 10 m	PMKN4138_						X
Cable, Ethernet, MTM5400/MTM800 FuG, 7 m	PMKN4139_						X
Cable, Ethernet, MTM5400/MTM800 FuG, 5 m	PMKN4140_						X
Cable, Ethernet, MTM5400/MTM800 FuG, 3 m	PMKN4141_						X
Remote Ethernet Control Head Y-Cable with Fuse (2 A)	PMKN4133_						X
Telephone Style Control Head Y-Cable with Fuse (2 A)	PMKN4134_						X
SIM Card Reader Cable, 60 cm	PMKN4137_						X
SIM Card Reader Cable, 195 cm	PMKN4142_						X
Spiral Cable Kit	0104047J66						X
Dual Control Head Cables							
Dual NGCH Cable Assembly	PMKN4078_			X			
Dual NGCH Slave Cable	PMKN4080_			X			
Power Cable 3086026B02	PMKN4081_			X			

1. For internal use only.
2. TETRA Encryption Algorithm 1, 2, or 3.
3. Main boards are shipped with new Serial and TEI numbers.

CAUTION: The following parts that MUST be replaced every time the radio is disassembled:

- Pre-driver heat sink thermal pad (part number: 75012083001) – 2pcs.
- RF PA thermal pad (part number: 75012082001) – 1pc.

Notes

APPENDIX B

PRODUCT SPECIFIC INFORMATION

for TETRA Terminals Type MT912M

This section gives the Service Personnel an overview about product specific notes. This is necessary to take special precautions to avoid the introduction of hazards when operating, installing, servicing or storing equipment. This terminal meets the applicable safety standards if it is used as described. All operating and safety instructions are to be followed carefully.

Equipment Electrical Ratings

Rated Voltage: 12 Volt DC

Rated Voltage Range: 10.8 to 15.6 V DC

Rated Current: 3.5 Amps @ 10Watts RF power

Please be aware when planning the installation that there is a current consumption of approx. 3.5 A during PTT and even 30 mA when terminal is switched off.

Transmitter Frequency Range:
TMO: 380–430 MHz (MT912M)
DMO: 380–430 MHz (MT912M)

Receiver Frequency Range:
380–430 MHz (MT912M)

Normal Load Conditions:

Rated RF Power: 10 Watts

Rated Audio Power: 13 Watts @ 4 Ohms; 6 Watts @ 8 Ohms

Antenna Impedance: 50 Ohms

Operating Temp. Range: -30 to +60°C

Operating Time*: Continuous / Intermittent

*Note: In general, the terminal transmit and receive time (operating cycle time) is determined by the communication system. On overload, respectively on extensive use beyond the systems specifications at high ambient temperatures, the terminal is protected by its thermal control, which cuts down the RF output power, thus reducing the terminal coverage range.

Fuse Identification

In case of blown fuses during the installation only replace those with identically value. **Never insert different values.**

Fuse for Power Cable GKN6270/GKN6274: 10 A (Motorola Part Number: 6580283E05)
Fuse for Ignition Sense Cable HKN9327: 4 A (Motorola Part Number: 6580283E02)
Fuse for Y-Cable PMKN4133/PMKN4134: 2 A (Motorola Part Number: 65012023001)

Spezielle Produktinformationen

für Funkgeräte des Typs MT912M

Dieses Kapitel gibt dem geschulten Servicepersonal einen Überblick über wichtige produktspezifische Informationen. Diese Informationen sind wichtig, um Risiken beim Bedienen, Installieren und Service zu vermeiden. Dieses Funkgerät erfüllt die allgemeinen Sicherheitsstandards, sofern es so betrieben wird, wie in der Bedienungsanleitung beschrieben.

Nennwerte für das Funkgerät

Nennspannung: 12 Volt DC

Nennspannungsbereich: 10.8 bis 15.6 V DC

Nennstrom: 3,5 A @ 10 Watt HF Leistung

Bevor Sie die Installation planen, bedenken Sie, dass das Sprechfunkgerät beim Senden einen Stromverbrauch von ca. 3,5 A hat und auch im ausgeschalteten Zustand einen Strom von ca. 30 mA verbraucht.

Sender-Nennfrequenzbereich:
TMO: 380–430 MHz (MT912M)
DMO: 380–430 MHz (MT912M)

Empfänger-Nennfrequenzbereich:
380–430 MHz (MT912M)

Betriebsbedingungen

HF Nennleistung: 10 Watt

Lautsprecher Nennleistung: 13 Watt an 4 Ohm; 6 Watt an 8 Ohm

Antennenimpedanz: 50 Ohm

Betriebstemperatur Bereich: -30 to +60°C

Betriebszeit*: fortwährend / periodisch

*Hinweis: Im allgemeinen wird die Sende- und Empfangsszeit (Betriebszeit) des Funkgerätes durch das Funksystem bestimmt. Bei Überlastung bzw. extensivem Betrieb über die Systemsspezifikationen hinaus bei hohen Umgebungstemperaturen wird das Funkgerät durch eine Temperaturkontrollschaltung geschützt, die die HF-Leitung reduziert. Daraus kann sich eine Verringerung der Leistungsmerkmale des Gerätes ergeben.

Sicherungen

Sollte während der Installation die Sicherung durchbrennen, darf sie **nur durch eine gleichwertige** Sicherung ersetzt werden.

Sicherung für DC Kabel GKN6270/GKN6274: 10 A (Motorola Bestellnummer: 6580283E05)
Sicherung für Ignition Sense Kabel HKN9327: 4 A (Motorola Bestellnummer: 6580283E02)
Sicherung für Y Kabel PMKN4133/PMKN4134: 2 A (Motorola Bestellnummer: 65012023001)

68015000183-D

Motorola Solutions Malaysia Sdn Bhd (Co. No. 455657-H)
Plot 2 Bayan Lepas Technoplex Industrial Park
Mukim 12 S.W.D
11900 Penang, Malaysia

November 2012.