MOTOROLA

MTP810 Ex
TETRA Portable Terminal
Basic Service Manual

When printed by Motorola

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Notes

DOCUMENT HISTORY

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

Edition	Description	Date
68015000106-A	Initial edition.	Oct. 2009

Notes

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.: 68015000106

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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									

2. How do you rate this particular Service Manual?
   ❑ 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:

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SAFETY INFORMATION

Product Safety and RF Exposure for Portable Two-Way Radios

Caution

BEFORE USING THIS RADIO, READ THIS BOOKLET WHICH CONTAINS IMPORTANT OPERATING INSTRUCTIONS FOR SAFE USAGE AND RF ENERGY AWARENESS AND CONTROL INFORMATION AND OPERATIONAL INSTRUCTIONS FOR COMPLIANCE WITH RF ENERGY EXPOSURE LIMITS IN APPLICABLE NATIONAL AND INTERNATIONAL STANDARDS. ALSO READ THE OPERATIONAL INSTRUCTIONS FOR SAFE USAGE. FOR RADIOS THAT HAVE BEEN APPROVED AS INTRINSICALLY SAFE, READ THE INSTRUCTIONS AND INFORMATION ON INTRINSIC SAFETY ON PAGE xiii.

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

NOTICE: This radio is intended for use in occupational/controlled conditions where users have full knowledge of their exposure and can exercise control over their exposure to meet the occupational limits in FCC/ICNIRP and International standards. This radio device is NOT authorized for general population consumer use.

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

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

All Motorola two-way radios 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 two-way radios. 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 websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits:

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

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

Federal Communication Commission (FCC) Regulations (US markets only)

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for portable two-way radios before they can be marketed in the U.S. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a product label directing users to specific user awareness information. Your Motorola two-way radio has a 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 Standards

Your Motorola two-way radio is designed and tested to comply with a number of national and International standards and guidelines (listed below) for human exposure to radio frequency electromagnetic energy. **This radio complies with the IEEE (FCC) and ICNIRP exposure limits for occupational/controlled RF exposure environments at operating duty factors of up to 50% talk-50% listen and is authorized by the IEEE/ICNIRP for occupational use only.**

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

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

Your Motorola two-way radio 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 ANNEX to Resolution No. 303 of July 2, 2002 "Regulation of limitation of exposure to electrical, magnetic and electromagnetic fields in the radio frequency range between 9 KHz and 300 GHz" and "Attachment to resolution # 303 from July 2, 2002"

RF Exposure Compliance and Control Guidelines and Operating Instructions

To control your exposure and ensure compliance with the occupational/controlled environment 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.

Operating Instructions:

- Transmit no more than the rated duty factor of 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. Transmitting 50% of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).
- When worn on the body, always place the radio in a Motorola-approved clip, holder, holster, case, or body harness for this product. Using approved body-worn accessories is important because the use of non-Motorola-approved accessories may result in exposure levels, which exceed the IEEE/ICNIRP occupational/controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position, along side the head in the phone mode (TETRA only), in front of the face in the hand held mode, then ensure the antenna and the radio are kept 2.5 cm (one inch) from the body when transmitting. Keeping the radio at a proper distance is important because RF exposures decrease with increasing distance from the antenna.

Hand-held Mode – Operating Instructions:

- Hold the radio in a vertical position in front of the face with the microphone (and other parts of the radio including the antenna) at least 2.5 cm (one inch) away from the nose or lips. Antenna should be kept away from the eye. Keeping the radio at a proper distance is important since RF exposures decrease with increasing distance from the antenna.

Phone Mode (TETRA only) – Operating Instructions:

- When placing or receiving a phone call, hold your radio product as you would a wireless telephone. Speak directly into the microphone.

Approved Accessories

- Use only Motorola-approved supplied or replacement antennas, batteries, and accessories. Use of non–Motorola - approved antennas, batteries and accessories may exceed IEEE/ICNIRP RF exposure guidelines. For a list of Motorola-approved antennas, batteries, and other accessories please see your dealer or local Motorola contact. Your nearest dealer can be found at the following web site:

http://www.motorola.com/governmentandenterprise

NOTE: **Only parts which are listed in the MTP850 Ex & MTP810 Ex Accessory Leaflet (P/N: 6866588D19), except for the chargers, are approved for use with the radio in potentially explosive atmospheres.**

Additional Information

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

http://www.motorola.com/rfhealth

Electromagnetic Interference/Compatibility

NOTE: **Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed, or otherwise configured for electromagnetic compatibility.**

Facilities

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

Aircraft

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

Medical Devices

Pacemakers

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

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

Hearing Aids

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

Other Medical Devices

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

Use of Communication Devices While Driving

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

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

Operational Warnings

WARNING

For Vehicles With An Air Bag

Refer to vehicle manufacturer's manual prior to installation of electronic equipment to avoid interference with air bag wiring.

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

Potentially Explosive Atmospheres

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

Turn off your radio prior to entering any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas as "Intrinsically Safe" (for example, Factory Mutual, CSA, UL, ATEX/IECEx or ATEX Approved). Do not remove, install, or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

The areas with potentially explosive atmospheres 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 radio when you are near electrical blasting caps, in a blasting area, or in areas posted:

"Turn off two-way radio". Obey all signs and instructions.

Operational Cautions

Caution

Antennas

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

Batteries

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

Intrinsically Safe Radio Information

The TETRA portable radios MTP850 Ex and MTP810 Ex are approved for use in potentially explosive environments according to the ATEX EC Directive 94/9/EC and IECEx certification scheme.The radio and battery approval labels give the information in which types/levels of hazardous areas the radios and battery can be used. The intrinsically safe protection rating for these radio models goes according to the ATEX Directive 94/9/EC:

MTP850 Ex – 2D - This model is marked with the ATEX approval number BVS 08 ATEX E XXX X. II 2G Ex ib IIC T4 (Category 2, Approved for Zone 1, 2 Equipment group II, Gas group C, Temperature class T4, Tamb -20°C to +50°C) II 2D Ex ibD 21 IP6x T90°C (Category 2, Approved for Zone 21, 22 Equipment group II).

MTP810 Ex – This model is marked with the ATEX approval number BVS 08 ATEX E YYY X. II 2G Ex ib IIA T3 (Category 2, Approved for Zone 1, Equipment group II, Gas group A, Temperature class T3, Tamb -20°C to +50°C) II 3D Ex ibD 22 IP6x T90°C (Category 3, Approved for Zone 22, Equipment group II).

Operational Cautions for Intrinsic Safe Equipment

Caution

- Do not operate radio communications equipment in a potentially explosive atmosphere unless it is a type especially qualified (for example, FM, UL, CSA, or ATEX/IECEx or ATEX approved). An explosion or fire may result.
- Do not operate a radio unit that has been approved as intrinsically safe product in a potentially explosive atmosphere if it has been physically damaged (for example, cracked housing). An explosion or fire may result.
- Do not replace or charge batteries in a potentially explosive atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion or fire.

Radios must ship from the Motorola manufacturing facility with the potentially explosive atmosphere capability and the intrinsic safety approval labelling (FM, UL, CSA, ATEX/IECEx or ATEX). Radios will not be upgraded to this capability and labeled once they have been shipped to the field.

A modification changes the radio's hardware from its original design configuration. Modifications can only be made by the original product manufacturer.

WARNING

- **Do not replace or change accessories in a potentially explosive atmosphere. Contact sparking may occur while installing or removing accessories and cause an explosion or fire.**
- **Turn the radio off before removing or installing a battery or accessory.**
- **Do not disassemble an intrinsically safe product in any way that exposes the internal circuits of the radio.**
- **Failure to use an intrinsically safe approved battery or Approved accessories specifically approved for the radio unit may result in the dangerously unsafe condition of an unapproved radio combination being used in a hazardous location.**
- **Unauthorized or incorrect modification of the intrinsically safe approved Product will negate the approval rating of the product.**
- **Incorrect repair or relabeling of any intrinsically safe Agency-approved radio could adversely affect the Approval rating of the radio.**
- **Use of a radio that is not intrinsically safe in a potentially explosive atmosphere could result in serious injury or death.**

Repair

A repair constitutes something done internally to the radio that would bring it back to its original condition. Items not considered as repairs are those in which an action is performed on a radio which does not require the outer casing of the radio to be opened in a manner which exposes the internal electrical circuits of the radio.

WARNING

Repairs of Motorola ATEX/IECEx certified intrinsically safe radios must be carried out ONLY by Motorola I.S. trained personnel, who are aware of the special parts required and the procedures necessary to maintain the ATEX/IECEx conformance of the product. The Motorola internal service centres undergo regular training and receive a Motorola internal certification that enables them to conduct ATEX repairs.

- **Service personnel doing ATEX repairs have to have a mandatory annual ATEX/IECEx awareness training.**
- **The participation in the ATEX/IECEx awareness training plus a detailed product training certifies the person to conduct ATEX/IECEx repairs.**
- **The training records have to be kept for at least 10 Years.**
- **For every ATEX/IECEx repair at the minimum the service centre must record: Customer information, date of repair, serial number, date code and model number of the unit that was repaired, technician's name and ATEX training date as well as repair information/parts replaced. These records have to be kept under record retention for at least 10 Years after the repair was conducted.**

When conducting repair work, the following must be observed:

- **If the radio has an IP6x protection, a vacuum leak test has to be conducted after the radio is assembled. A confirmation that the leak test was conducted has to added to the repair records.**
- **It is essential that only original Motorola spare parts specifically listed for the particular unit can be used for repair. Any other replacement parts are not allowed and may impair the intrinsic safety of the unit.**

If any of the items below are observed, the intrinsic safety of the unit may be impaired and the customer must be informed about this.

- **ATEX/IECEx and CE markings damaged or modified**
- **Additional engraving, additional labels on the enclosure**
- **Repairs or modifications of the housings/enclosure**
- **Damages on the antennas especially if the isolation is broken**

Text proposal:

Dear customer,

We observed the following modifications on the units that were under repair:

1. .....

2. .....

...

These modifications are not authorized by Motorola and deviate from the approved design.

The modifications may impair the intrinsic safety of the units and as such may cause a higher risk of explosion when the units are used in a potentially explosive environment.

The final letter may deviate from the example above.

Contact the Motorola service organization (Georg Fröhlich) or the ATEX representaive (Fritz Bollmann) for further assistance regarding repairs and service of ATEX/IECEx certified Motorola equipment.

Do Not Substitute Options or Accessories

The Motorola communications equipment certified as intrinsically safe by the approving agency, is tested as a complete system which consists of the listed agency Approved portable, Approved battery, and Approved accessories or options, or both. This Approved portable and battery combination must be strictly observed. There must be no substitution of items, even if the substitute has been previously Approved with a different Motorola communications equipment unit. Approved configurations are listed in MTP850 Ex & MTP810 Ex Accessory Leaflet (P/N: 6866588D19).

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

The manual PN referenced on the Intrinsically Safe Approval Label identifies the approved Accessories and or options that can be used with that portable radio unit.

Using a non Motorola intrinsically safe battery and or accessory with the Motorola approved radio unit will void the intrinsically safe approval of that radio unit.

Any modification of the enclosure of the radios, batteries or accessories such as:

- placing additional labels
- engraving
- repairs after damages on the enclosure

is not allowed and will impair the intrinsic safety of the equipment. If this is observed, the customer has to be informed that these modifications are not allowed and the units are not approved for use in a potentially explosive atmosphere.

Only officially released radio SW has been tested properly and that the intrinsic safety of the radios is ensured. Radios are not allowed to operate with any other SW in a potentially explosive atmosphere. SW that is not officially released may impair the intrinsic safety of the radios.

CE European Union Directives Conformance Statement

This product is in conformance with the TETRA (TErrestrial Trunked RAdio) standard.
This product is in conformance with the requirements of the applicable EU Council Directives.
Declarations of Conformance with the requirements are located at:

Motorola a/s
Sydvestvej 15
DK-2600 Glostrup

Denmark

Notes

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CHAPTER 1
SCOPE & WARRANTY

Scope of this Manual

This manual is intended for use by service technicians familiar with similar types of equipment. 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 addendum.

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

This manual is divided into the following sections:

- Copyright
- Document History
- Safety
- Table of Contents
- CHAPTER 1 Scope & Warranty
- CHAPTER 2 Model Information & Accessories
- CHAPTER 3 Overview
- CHAPTER 4 Programming the Radio
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Related Publications

- 68015000107 MTP850 Ex Basic Service Manual 806–870 MHz
- 6866588D19 MTP850 Ex & MTP810 Ex Accessory Leaflet
- 6866588D20 MTP850 Ex & MTP810 Ex Safety Booklet
- 68015000002 TETRA Terminals Product Information Manual
- 6802974C10 TETRA Terminals CPS Start-up User Guide

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 radio 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 radio 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 Managed Technical Services (MTS) offers a repair service to both end users and dealers at competitive prices.
- MTS supplies individual parts and modules that can be purchased by dealers who are technically capable of performing fault analysis and repair.

NOTE: **Only Motorola Own Service Centres or Approved Motorola Service Partners can perform these functions. Any tampering by non-authorised Service Centres voids the warranty of your radio. Please check with Motorola representatives or visit http://www.motorola.com/governmentandenterprise to find out about Motorola Own Service Centres.**

CHAPTER 2

MODEL INFORMATION & ACCESSORIES

MTP810 Ex Model Information

This manual applies to the following MTP810 Ex, 1 W, TETRA ATEX Portable Radio model:

H04UCF6TZ5AN, MTP810 Ex

MODEL NUMBERING SYSTEM

Typical Model Numbering:	H	0	4	U	C	F	6	T	Z	5	A	N
Position:	1	2	3	4	5	6	7	8	9	10	11	12

Position 1 - Type of Unit

H = Hand-Held Portable
M = Mobile Product

Positions 2 and 3 - Model Series

01=Motorola MTP850 Ex Family
02=Motorola Digital Communicator
04=Motorola MTP810 Ex Family
06=Motorola Advanced Feature Digital
07=Motorola i370 Products
08=Motorola i1000 Products
12=Motorola 3:1 Mobile
13=Motorola Ruggedized Digital
39=Motorola MTH650 Family
78=Motorola MTH800 Family
60=Motorola MTP850 Family

Position 4 - Frequency Band

P=380 to 430 MHz
U=806 to 870 MHz

*Values given represent range only; they are not absolute.

Position 5 - Power Level

A=0 to 0.7 Watts
B=0.7 to 0.9 Watts
C=1.0 to 3.9 Watts
D=4.0 to 5.0 Watts
E=5.1 to 6.0 Watts
F=6.1 to 10.0 Watts

Position 6 - Physical Packages

F=Limited Keypad - With Display
H=Full Keypad - With Display
K=Limited Controls - Basic Display
N=Enhanced Controls - Enhanced Display

Position 7 - Channel Spacing

1=5 kHz
2=6.25 kHz
3=10 kHz
4=12.5 kHz
5=15 kHz
6=25 kHz
7=30 kHz

Position 8 - Primary Operation

N=Digital Front
Q=Low Profile -Basic Display
R=Digital Multi-Service
T=TDMA Digital Dual Mode

Position 9 - Primary System Type

R=iDEN Basic
S=iDEN AFU
Z=Dimetra

Position 10 - Feature Level

1=Basic
2=Limited Pkg
3=Limited Plus
4=Intermediate
5=Standard Pkg
6=Standard Plus
7=Expanded Pkg
8=Expanded Plus
9=Full Feature/ Programmable

Position 11 - Version

Version Letter (Alpha) - Major Change
Version Letter (Beta) Major Change

Position 12 - Unique

Model Variations
N=Standard Package
R=Blue Housing
Z=Black Housing

MTP810 Ex Model Specifications

GENERAL		RECEIVER		TRANSMITTER	
ETSI	ETS 300 019-1-7	**Receiver Type:**	Class A and B	**Modulation Type:**	$\pi/4$DQPSK
Type Number:	806–870 MHz	**Frequency Range:**	851–870 MHz	**RF Power:**	1 Watt
Temperature Range for Transceiver:		**Channel Spacing:**	25 kHz	**Frequency Range:**	TMO 806–825 MHz DMO 851–870 MHz
Operating:	-10°C to +50°C	**Sensitivity (4%) BER:**	-112 dBm	**Frequency Stability:**	
Storage:	-40°C to +85°C	**Intermodulation:** Interfering Signal Level:	(4%) BER -47 dBm	Locked to Base Not Locked to Base	± 100 Hz ± 1000 Hz
Battery Types:	NNTN7383A Standard 725mAh (Li Ion)	**Selectivity Blocking:** (50–100 kHz) Interfering Signal Level:	(4%) BER -40 dBm	**Spurious Emissions:** Conducted 30MHz–1GHz 1GHz–12.75GHz	 -36dBm -30dBm
Battery Voltage: Minimum: Nominal:	 6.9 Vdc 7.4 Vdc	**Spurious Rejection:** Interfering Signal Level:	(4%) BER -45 dBm	Radiated 30MHz–1GHz 1GHz–12.75GHz	 -36dBm -30dBm
Portable Dimensions (HxWxD in MMs):	 135.4 x 55.8 x 38 mm with standard battery	**Frequency Stability:** Locked to Base: Unlocked to Base: Rated Audio:	 ±100Hz ±1000Hz 500mW	**Adjacent Channel Power (at± 25kHz):** -55dBc	
Weight (806–870MHz): 226g–234g Radio only (with antenna) 388g–396g with standard battery		**Distortion at Rated Audio:**	15% Max.		

Specifications subject to change without notice.

Accessories Replacement Parts List

Please refer to the MTP850 Ex & MTP810 Ex Accessory Leaflet (P/N: 6866588D19) for the latest accessory updates.

Accessories Allowed in a Potentially Explosive Environment

The following accessories can be used in a potentially explosive environment.

Part/Kit Number	Description
Batteries	
NNTN7383_	ATEX BATTERY LI-ION 7.4V 725 mAH
Carrying Options	
NTN5243_	SHOULDER STRAP
PMLN5004_	SHOULDER WEARING DEVICE
PMLN5134_	ATEX BELT CLIP 2.5 INCH
PMLN5287_	HARD LEATHER CASE FOR ATEX,BLACK
PMLN5288_	SOFT LEATHER CASE FOR ATEX,BLACK
Audio Accessories	
PMMN4058_	ATEX REMOTE SPEAKER MIC W/VOL CTRL
PMMN4063_	ATEX ENH THROAT MIC W/ 80MM PTT
PMLN5389_	ATEX ENH OVER THE HEAD H/DUTY HS
PMLN5390_	ATEX ENH BEHIND THE HEAD H/DUTY HS
PMLN5391_	ATEX ENH OVER THE HEAD LIGHTWT HS
PMLN5392_	ATEX ENH BEHIND THE HEAD LIGHTWT HS
Antennas	
8575277M02	MTP8X0 EX STUBBY ANTENNA (806–870 MHz)
85012000001	MTP8X0 EX WHIP ANTENNA (806–870 MHz)
Covers	
PMLN5419_	DUST COVER

Accessories NOT Allowed in a Potentially Explosive Environment

The following accessories CANNOT be used in a potentially explosive environment.

Part/Kit Number	Description
Chargers	
NNTN7470_	IMPRES SUC WITH SMPS CHINA CORD
NNTN7471_	IMPRES SUC W/KOREAN PLUG
PMLN5188_	IMPRES SUC WITH SMPS EU AC CORD
PMLN5194_	IMPRES SUC WITH SMPS UK AC CORD
PMLN5198_	IMPRES SUC WITH SMPS US AC CORD
PMLN5199_	IMPRES SUC WITH SMPS AUSTRALIA/NZ CORD
PMLN5214_	IMPRES SUC WITH SMPS AR AC CORD
WPLN4145_	IMPRES MUC W/DISPLAY – KOREAN PLUG
WPLN4146_	IMPRES MUC NO DISPLAY – KOREAN PLUG
WPLN4182_	IMPRES SUC W/US PLUG
WPLN4183_	IMPRES SUC W/UK PLUG
WPLN4184_	IMPRES SUC W/EURO PLUG
WPLN4185_	IMPRES SUC W/AUST/NZ PLUG
WPLN4186_	IMPRES SUC W/ARGENTINA PLUG
WPLN4187_	IMPRES MUC, NO DSPL – US PLUG
WPLN4188_	IMPRES MUC, NO DSPL – UK PLUG
WPLN4189_	IMPRES MUC, NO DSPL – EURO PLUG
WPLN4190_	IMPRES MUC, NO DSPL – AUST/NZ PLUG
WPLN4191_	IMPRES MUC, NO DSPL – ARGEN PLUG
WPLN4192_	IMPRES MUC W/DSPL – US PLUG
WPLN4193_	IMPRES MUC W/DSPL – UK PLUG
WPLN4194_	IMPRES MUC W/DSPL – EURO PLUG
WPLN4195_	IMPRES MUC W/DSPL – AUST/NZ PLUG
WPLN4196_	IMPRES MUC W/DSPL – ARGEN PLUG
WPLN4197_	CHARGER, IMPRES MUC NON-DISPLAY (BASE UNIT)
WPLN4198_	CHARGER, IMPRES MUC DISPLAY (BASE UNIT)
WPLN4199_	CHARGER, IMPRES SUC
WPLN4204_	MUC WITH DISPLAY INTL 110V

Part/Kit Number	Description
WPLN4205_	MULTI UNIT CHARGER (MUC) INTL 110V
Others	
66007029001	RF RADIO REAR ANTENNA ADAPTOR
66007029002	BATTERY ELIMINATOR

Notes

CHAPTER 3
OVERVIEW

General

To achieve a high spectrum efficiency, the MTP810 Ex 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 radio. The process is called digital modulation.

Digital Modulation Technology

The MTP810 Ex is a TETRA ATEX Portable Radio that can operate in dispatch and phone modes. The radio can also operate in TMO (Trunked Mode Operation) and DMO (Direct Mode Operation) modes. It uses two digital technologies: $\pi/4$ DQPSK and Time Division Multiple Access (TDMA).

π/4DQPSK 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 system can accommodate 4-voice channels in the standard 25 kHz channel as used in the two-way radio.

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

Time allocation enables each radio to transmit its voice information without interference from other transmitting units. Transmission from a radio 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 compressions/decompressions 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 MTP810 Ex uses a coding technique called ACELP (Algebraic Code Excited Linear Prediction). The compressed voice-data bits modulate the RF signal.

Description

Transceiver Description

All the radio circuitry is contained in the Digital/RF Board and the keypad board. The Digital/RF board is divided into the following sections: digital, frequency generating, transmitter, and receiver.

Digital Section Description

The digital section includes the Patriot IC that consists of the Mcore risk machine and the Digital Signal Processor (DSP).

The Mcore is the controller of the Digital/RF Board. It controls the operation of the transmitter, receiver, audio, and synthesizer integrated circuits located in the RF section. It communicates with the keypad and display.

The Digital Signal Processor (DSP) performs modulation and de-modulation functions for the radio. It also performs Forward Error Correction and other correction algorithms for overcoming channel errors and ACELP speech coding. It carries out linear 16-bit analog to digital conversions, audio filtering, and level amplification for the microphone audio input and the received audio output.

The power and audio section is based on the PCAP and includes power supplies, 13-bit CODEC, audio routing, microphone and earpiece amplifiers. PCAP audio power amplifier is used for the loudspeaker.

Transmitter Path Description

The transmitter circuitry includes a linear class AB Power Amplifier (PA) for the linear modulation of the MTP810 Ex. It includes a Cartesian Loop to enhance its transmitter linearity and reduced splattering power into adjacent channels.

The transmitter path consists of a Cartesian Loop that contains the forward and feedback paths. The forward path includes the JAVELIN IC, BALUN, Attenuator, Power Amplifier and Isolator. The Loop feedback path includes the directional coupler, attenuator, BALUN, and JAVELIN IC.

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

Receiver Path Description

The receiver section in MTP810 Ex is based on the DCR (Direct Conversion) technology, the main concept of this technology is down converting of the RF signal directly into a base band signal, skipping the intermediate stage of IF signal.

The receiver path includes the Duplexer, Antenna Switch, Limiter, 10dB Step Attenuator, Pre-Selector SAW Filter, RF switches, LNA integrated with 23dB Step Attenuator, 22dB of Gain and 40dB of AGC continuous attenuation (in parallel with LNA bypass feature), Post-Selector SAW Filter, BALUN, Half-Life Mixer, one-pole baseband filter, and the Tomahawk IC which consists of all the base band receive chain.

Global Positioning System (GPS) Section Description

The GPS section includes the following main components: Duplexer, Front filter, LNA, Post Filter, SiRF Instant GSCi-5000, RTC, TCXO, Logic Buffer, and Level Shifter.

The GPS in the MTP810 Ex is based on the SIRF Instant GSCi-5000, which comprises a standalone ROM-based multimode GPS receiver in a single chip BGA Package.

Notes

CHAPTER 4
PROGRAMMING THE RADIO

NOTE: For programming the radio, refer to TETRA Terminals CPS Start-up User Guide (P/N: 6802974C10) for MTP810 Ex.

Notes

CHAPTER 5
TEST SETUP & TESTING

Caution

Any level 3 repairs can deeply affect the performance of the portable radio and may cause a new tuning procedure. This tuning procedure can be applied by certain authorised 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

Carry out the following instructions before testing:

- Check that you have a fully charged battery.
  Not required when using Battery Eliminator (P/N: 66007029002) and RF radio rear antenna adapter (P/N: 66007029001).
- For testing the radio, a special Battery Eliminator (P/N: 66007029002) and RF radio rear antenna adapter (P/N: 66007029001) with RF cable is required.
- Detach the antenna from the radio.
- Connect the special RF adapter to the rear side antenna connector of your radio and fix it by screwing the wing nut into the antenna thread.
- Connect the other side of the cable to the N-type RF Connector of the IFR using a N-type-to-SMA-adapter.
- Connect the power supply to the battery eliminator wires.

CAUTION: Connect the red (+) and black (-) wires of the battery eliminator to the respective positive and negative points of the power supply, and use the correct voltage (7.4VDC, max. 7.8VDC). Neglecting this would damage your radio and/or the power supply.

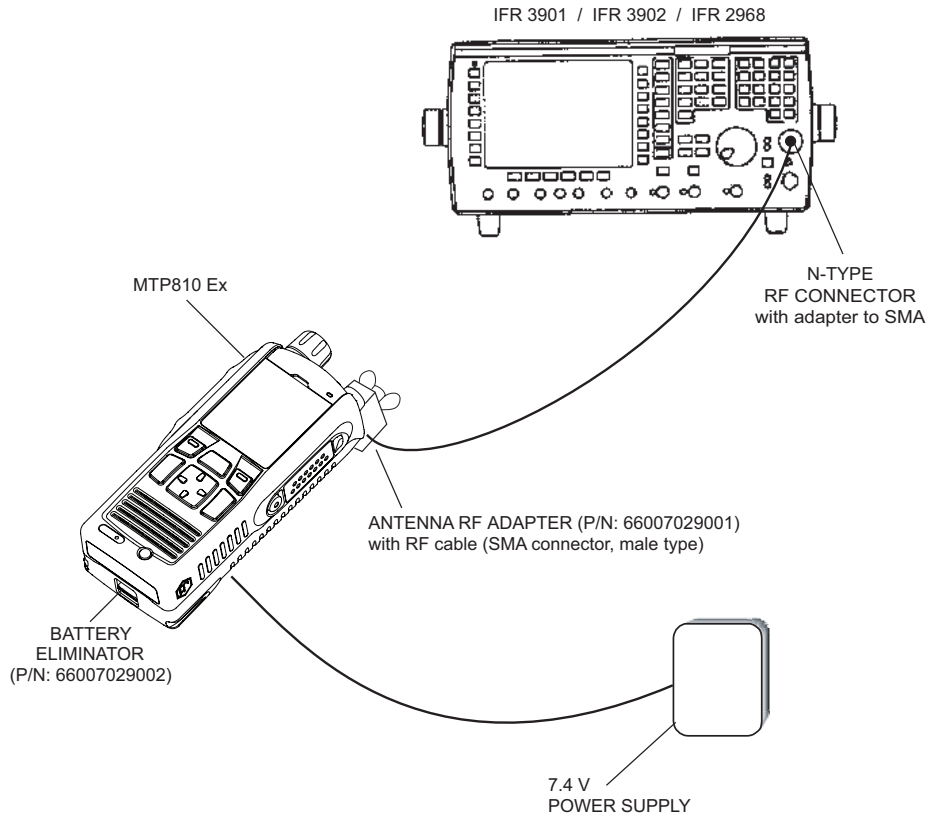

Figure 17 Typical Test Setup

Test Check List

The following table summarises the required test setups.

No.	Test Name	Test Setup	Radio Setup	Test Conditions	Limits
1.	Base Station Registration				
	806–870MHz	Control Channel	851.8125 MHz	2072	For **IFR 3901 / IFR 3902**: TETRA 805–870 +12.5 or TETRA 805–870 ZERO For **IFR 2968**: TETRA 800MS
	806–870MHz	Traffic Channel	851.8125 MHz	2072	
		Time Slot		3	

No.	Test Name	Test Setup	Radio Setup	Test Conditions	Limits
		Country Code		234	
		Network Code		2392	
		Base Color		1	
		Location Area		22	
		Min Rx Level			-110dBm
		Max Tx Level			30dBm
		Access Parameter		-53dBm	
		Mobile Power	30dBm		
		Burst Type		Normal	
2.	Transmitter Burst Power				
		RF Gen Level Burst Power		-90dBm	28–29dBm
		Timing Error			+/-0.25 Symbols
		Vector Error			Max 10% RMS, 30% Peak
		Frequency Error			-/+ 100Hz
3.	Call Processing Talk Back				
		1KHz Test Signal Group Mode		-50dBm	
4.	Call Processing Call to Mobile				
		Private	4 digit random number & “Send”		28–29dBm
		RF Gen Level Burst Power		-90dBm	28–29dBm
		Timing Error			+/-0.25 Symbols
		Vector Error			Max 10% RMS, 30% Peak
		Frequency Error			-/+ 100Hz

Transmitter Tests

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

Call Processing Tests

1. Talk Back
2. Call to Mobile

Duplex Test

Digital Duplex Test (Tx)

Measurement Capabilities:

Bar charts (Tx Power, Freq. Err, Vector Rms.), Spectrum Analyser, Power Analyser, Vector Analyser, Vector Diagrams

How to Configure the IFR 3901 / IFR 3902 / IFR 2968 Setup

For **IFR 3901 / IFR 3902**, perform the following steps to configure the unit with the radio set:

1. Turn ON the IFR.
2. Press “CONFIG” soft key twice, go to “System” followed by “TETRA”. Select “MS”.
3. Press “CONFIG” soft key twice, go to “Configure” followed by “Channel Plan”.
4. Press “SELECT” soft key then select “TETRA 805-870 +12.5” or “TETRA 805-870 ZERO”.
5. Press “CONFIG” soft key, select “System ID & Access Parameters”.
6. Enter “234” for Mobile Country Code (MCC), press enter.
7. Enter “2392” for Mobile Network Code (MNC), press enter.
8. Enter “1” for Base Station Color Code (BCC), press enter.
9. Enter “22” for Location Area Code (LA), press enter.
10. Enter “-110” for Min Rx Level For Access, press enter.
11. Enter “30” for Max TX Level, press enter.
12. Enter “-53” for Access Parameter, press enter.
13. Press “CONFIG” soft key, select “Base Services”.

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

Power On Registration: Required

Power Off De-registration: Required

Priority Cell: Yes

Minimum Mode Service: May Be Used

Migration: Supported

System Wide Services: Normal Mode

TETRA Voice Service: Supported

Circuit Mode Data Service: Supported

(Reserved): Available

TETRA Packet Data Service: Available

Air Interface Encryption: Not Available

Advanced Link: Not Supported

14. Press “CONFIG” soft key, select “Neighbor Cell Info”.
15. Verify that the following Neighbor Cell Info values are displayed:

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

Broadcast: Not Supported

Broadcast Interval: 5s

Neighbor Cell Channel: 3500

Neighbor Cell Location Area: 17

Neighbor 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

16. Press “CONFIG” soft key, select “Call Timers & Trunking”.
17. Select “Transmission” for Trunking Type.
18. Select “TCH and FACCH” or “DL and UL TCH” for Simplex Traffic Channel Type.
19. Select “Continuous” for Test Set Transmit Mode.

For **IFR 2968**, perform the following steps to configure the unit with the radio set:

1. Turn ON the IFR.
2. Press “Systems” Mode Key (wait until the digital system is initialized).
3. Press “Tetra Mobile” soft key.
4. Press “Setup” soft key and enter the System Parameters Screen.
5. Press “Channel Plan” soft key.
6. Press “Tetra 800MS” soft key for Channel Plan. The “Control Channel” automatically changes to “2040”; and “Traffic Channel” automatically changes to 2140.
7. Press twice the “Traffic Channel” soft key and check that the marker goes to Timeslot. Press Data key “3” followed by the “Traffic Channel” soft key, to change to Timeslot “3”.
8. Press “Country Code” soft key. Enter “234” and press again “Country Code” soft key.
9. Press “Network Code” soft key. Thereafter, enter “2392” and press “Network Code” soft key.
10. Press “Base Color” soft key. Thereafter, enter “1” and press “Base Color” soft key.
11. Press “more” soft key.
12. Press “Location Area” soft key. Thereafter, enter “22” and press “Location Area” soft key.
13. Press “more” soft key.
14. Press “Min Rx Level” soft key. Thereafter, enter “-110dBm” and press “Min Rx Level” soft key.
15. Press “Max Tx Level” soft key. Thereafter, enter “30dBm” and press “Max Tx Level” soft key.
16. Press “Access Parameter” soft key. Thereafter, enter “-53dBm” and press “Access Parameter” soft key. Press “Test Mode” soft key and press “Enabled”.
17. Press “Base Service” soft key.

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

Power On Registration: REQUIRED

Power Off Deregistration: REQUIRED

Priority Cell: YES

Minimum Mode Service: MAY BE USED

Migration: SUPPORTED

System Wide Services: NORMAL MODE

18. Press “more” soft key.

TETRA Voice Service: SUPPORTED

Circuit Mode Data Service: SUPPORTED

(Reserved): AVAILABLE

SNDCP Service: AVAILABLE

Air Interface Encryption: NOT AVAILABLE

Advanced Link: NOT SUPPORTED

19. Press the “return” soft key.

20. Press the “neighbr cell” soft key.

21. Verify that the following Neighbour Cell Info values are displayed:

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

Neighbour Cell Broadcast: NOT SUPPORTED

Broadcast Interval: 5s

Neighbour Cell Channel: 3500

Neighbour Cell Location Area: 00017

Neighbour Cell Identifier: 01

Slow Re-select Threshold: 10dB

22. Press “more” soft key.

Slow Re-select Hysteresis: 10dB

Fast Re-select Threshold: 10dB

Fast Re-select Hysteresis: 10dB

23. Press the “return” soft key.

24. Press the “trunk type” soft key and the “message Trunked” soft key (Transmission).

25. Press “more” soft key.

Note: The displayed values are factory defaults and should not be changed. It is not required to configure “Call Types” “Call Arial” and “Messages”.

26. Press “more” soft key.

How to Configure the IFR 3901 / IFR 3902 / IFR 2968 Manual Test Screen

For **IFR 3901 / IFR 3902**, perform the following steps to configure the manual test screen:

1. Press “TEST” soft key.
2. Press “TAB” soft key to select RF Settings.
3. Enter “2072” for Control Channel.
4. Enter “2072” for Traffic Channel.
5. Enter “3” for Slot.
6. Enter “-75” for RF Gen Level.
7. Select “Expected” and “30.0dBm/1W” for Mobile Power.
8. Press “TAB” to select Tx Measurements.
9. Select “Normal” for Burst.

   This completes the 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.

For **IFR 2968**, perform the following steps to configure the manual test screen:

1. To enter “Manual test” screen, press “MANUAL” soft key.
2. Press “control channel” soft key. Thereafter, “2072” and press “control channel” soft key (IFR 2072 = Rx 851.81250MHz).
3. Press “traffic channel” soft key. Enter “2072” and press “traffic channel” soft key. The marker goes to Timeslot. Enter “3” and press “traffic channel” soft key. (Note that the Traffic Channel number changes automatically after entering the Control Channel number).
4. Press “rf gen level” soft key. Thereafter, enter “-75” and press “dBm” data keys followed by “rf gen level” soft key.
5. Press “mobile power” soft key, enter 30 dBm/1W, using soft key.
6. Press “burst type” soft key and “normal” soft key.

   This completes the 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 using IFR 3901 / IFR 3902 / IFR 2968

Receiver Tests

Note: This test requires programming the radio.
Refer to TETRA Terminals CPS Start-up User Guide (P/N: 6802974C10) for TETRA ATEX Portable Radios.

For **IFR 3901 / IFR 3902**, perform the following steps:

1. Turn the radio ON.
2. Enter the radio test page using either:
3. CPS, or
4. Pressing the following keys in sequence:
   Left navigation key, Right navigation key, Left navigation key, Menu key.
5. Check that registration and “ITSI ---/---: xxxx” is displayed on the IFR “Operations Status” screen.

   Group: XXXXXXX Selected

For **IFR 2968**, perform the following steps:

1. Turn the radio ON.
2. Enter the radio test page using either:
3. CPS, or
4. Pressing the following keys in sequence:
   Left navigation key, Right navigation key, Left navigation key, Menu key.
5. Check that registration and "ITSI ---/---: xxxx" is displayed on the IFR “Manual Test” screen.

   STATUS: REGISTERED (ITSI ATTACH)

   GSSI: XXXXXXX SELECTED

Transmitter Tests

For **IFR 3901 / IFR 3902**, perform the following steps:

1. Press “TAB” soft key to select RF Settings.
2. Enter “-90” for RF Gen Level.
3. Press soft key to ON RF Gen.
4. Press soft key to OFF Pre Amp.
5. Press “PTT” of the radio and monitor the Tx Measurements window which display Power Profile, Burst Timing, Vector Peak, Vector RMS, Freq Error and Residual Carrier.

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

- Power Profile: Pass. Average: 28–29dbm.
- Burst Timing: +/-0.25 symbols.
- Vector: Max 10% RMS, Max 30% Peak, Max 5% Residual Carrier.
- Frequency Error: -/+ 100Hz.

6. Press “TAB” to select Operations/ Status.
7. Press “Call Mobile” soft key followed by “Group Call” then “Cleardown”.

For **IFR 2968**, perform the following steps:

1. Press “rf gen level” soft key. Thereafter, enter “-90” and press “dBm” data keys followed by “rf gen level” soft key.
2. Press the “PTT” of the radio and monitor the IFR “Manual Test” screen which displays the Burst Power, Power Profile, Timing Error, Vector Error, and Frequency 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: 28–29dbm.
- TIMING ERROR: +/-0.25 symbols.
- FREQUENCY ERROR: -/+ 100Hz.
- VECTOR ERROR: Max 10% RMS, Max 30% PEAK, Max 5% RESIDUAL.

3. Press the “clear down” soft key, to proceed with other tests.

Call Processing Tests using IFR 3901 / IFR 3902 / IFR 2968

Talk Back

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

For **IFR 3901 / IFR 3902**, perform the following steps:

1. Press “Call Mobile” followed by “Group Call” soft key.
2. Press “TALKBACK” soft key.
3. Press the “PTT” and speak into the mic of the radio. You will hear the last three seconds of the speech frames after the “PTT” is released.
4. Press “test tone” soft key to provide the 1 kHz signal to the radio speaker, you will hear a 1 kHz tone from the radio speaker for about three seconds.
5. Press the “silence” soft key to mute the 1 kHz Audio Signal of the speaker.
6. Press the “clear down” soft key.

For **IFR 2968**, perform the following steps:

1. Press the “PTT” and speak into the mic of the radio. You will hear the last three seconds of the speech frames after the “PTT” is released.
2. Press the “test sound” soft key to provide the 1 kHz signal to the radio speaker, you will hear a 1 kHz tone from the radio speaker for about three seconds.
3. Press the “silence” soft key to mute the 1 kHz Audio Signal of the speaker.
4. Press the “clear down” soft key and check that the “Cleardown Complete” status appear on the IFR “Manual Test” screen.

Call to Mobile

For **IFR 3901 / IFR 3902 / IFR 2968**, perform the following steps:

1. Press the “Call Mobile” soft key on the IFR.

Note: Select type of call.

2. Press “Private Call”.

Note: You will hear beeps from the handset speaker.

3. Press “Abort” soft key.

Note: Repeat step 1 through 3 for Phone and Emergency calls.

Digital Duplex Test (Tx) using IFR 3901 / IFR 3902 / IFR 2968

For **IFR 3901 / IFR 3902**, perform the following steps:

1. Go to "Menu" of the radio, then select "Contact".
   After that select "Contact 1". Press "Send" soft key.

The following results are displayed on Tx Measurements window.

- Power Profile: Pass. Average: 28–29dbm.

- Burst Timing: +/-0.25 symbols.

- Vector: Max 10% RMS, Max 30% Peak, Max 5% Residual Carrier.

- Frequency Error: -/+ 100Hz

2. Press “Call Mobile” soft key followed by “Group Call” soft key then press “TALKBACK” soft key.
3. Speak into the handset microphone and hear your speech (after a short delay) from the handset internal earpiece.

Note: If you need more details, select "▼" at the Rx Measurement Window.

For Power Analyser Graph:

4. Select “Power” followed by “Profile Full”.
5. To view the detail of “Profile Full”, select " □ " and press “Select” soft key.
6. To minimize the window, press “Select” soft key.
7. Select any item under “Power” dropdown list to view the rest of the power analyser graphs.

For Vector Analyser Diagram:

8. Select “Mod Accuracy” followed by “Vector Error”.
9. To view the detail of “Vector Error”, select " □ " and press “Select” soft key.
10. To minimize the window, press “Select” soft key.
11. Select any item under “Mod Accuracy” dropdown list to view the rest of the vector analyser diagram.
12. Press the handset “End” key.

For **IFR 2968**, perform the following steps:

1. Go to "Menu" of the radio, then select "Contact".
   After that select "Contact 1". Press "Send" soft key.

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

- POWER PROFILE: Passed.
- BURST POWER: 28-29dbm.
- TIMING ERROR: +/-0.25 symbols.
- FREQUENCY ERROR: -/+ 100Hz.
- VECTOR ERROR: Max 10% RMS, Max 30% PEAK, Max 5% RESIDUAL.

2. Speak into the handset microphone and hear your speech (after a short delay) from the handset internal earpiece.

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

3. Press the “duplex test (Tx)” soft key. The “DIGITAL DUPLEX TEST” results will be displayed on the IFR screen providing you with the following bar charts measurement capabilities:

- POWER
- FREQUENCY ERROR
- VECTOR RMS

For Power Analyser Graph:

4. Press “power ana” soft key.
5. Check that the power frame falls within the limits.

For Spectrum Analyser Graph:

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

For Vector Analyser Diagram:

7. Press the “vector ana” soft key
   Monitor the constellation diagram.
8. Press the “vector diagram” soft key. Monitoring the vector diagram.
9. Press the “rotated vector” to zoom in on the constellation.
10. Press the handset “End” key.

Manual Mode Testing

Preparation for Testing

1. Verify that the radio is turned off.
2. Press the “Left” and “Mute” keys together and then, press the On/Off key to turn the radio on.
3. The display shows “LCD Color test Press Any Key To Proceed”.

Tests

Note: Any key that will be pressed will cause the test to advance from one step to the next.

1. Press any key consecutively. The display shows horizontal red lines that becomes thicker with every key press, until it becomes fully red.
2. Press any key again, the display shows four colored rectangles.
3. Press any key consecutively. The display shows vertical green lines that becomes thicker with every key press, until it becomes fully green.
4. Press any key again. The display becomes fully blue and the message “END LCD test !!!” appears.
5. Press any key again. The display shows “Battery Interface Test”.
6. Press any key again. The display shows “Battery Interface Test PASS”.
7. Press any key again. The display shows “Red Led on” and the Red LED at the top of the radio is lit.
8. Press any key again. The display shows “Green Led on” and the Green LED at the top of the radio is lit.
9. Press any key. The display shows “Both Leds on” and the LED located on the top of the radio is blinking in amber (combination of red and green lights of the two halves of the LED).
10. Press any key again. The display shows “Keypad Backlight On” and the keypad backlight is On.
11. Press any key again. The display shows “Display Backlight On” and the display backlight is On.
12. Press any key again. The display shows

    "Connect accessory:
    1. RSM
    2. SB9600

3. RS232 Cable
4. Light Headset
5. Heavy Headset
6. Hurric. Headset
7. Skull Mic

to the radio and press any key". Connect one of the accessories listed to the UC side connector and press any key. The display will identify the type of accessory connected.

Note: The following reading appears only when a UCM board is not installed in the radio.

13. Press the Programmable Side Keys 1 to "Tones Test" .
Press any key again. The display shows "Internal Speaker Tone Test", a tone is heard via the speaker.

14. Press any key again. The display shows “Internal Earpiece Tone Test”, a tone is heard via the internal earpiece.

15. Press any key again. The display shows “Connect RSM from Universal connector to the radio for the following Test”. Attach a RSM to the Universal connector. Press any key again. The display shows “RSM Universal tone test RSM Univ. connected”. A tone is heard via the RSM speaker.

16. Press any key again. The display shows "Int Mic to INT EAR Loopback Test". Speak into the bottom microphone, and you will hear your voice via the earpiece.

17. Press any key again. The diplay shows “Connect RSM from Universal connector to the radio for the following Tests”.

18. Press any key again. The display shows "RSM Universal connector MIC to INT EAR Loopback Test". Speak into the top microphone, and you will hear your voice via the Internal earpiece.

19. Press any key again. The display shows "Chopper-Noise Test Int MIC to INT EAR". Place the internal earpiece close to your ear and listen for chopper noise. Make sure chopper noise is not audible.

20. Press any key again. The diplay shows “Connect RSM from Universal connector to the radio for the following Tests”.

21. Press any key again. The display shows "RSM Universal Connector MIC to INT EAR Chopper-Noise Test". Bind around the antenna one binding of the earpiece cable and place the external earpiece close to your ear and listen for chopper noise. Make sure chopper noise is not audible.

22. Press and key .The display shows

Emergency
Left Menu Right
Send end
Up
Ptt
Down
Mute

Every time you press causes the respective display to disappear

23. The display shows "press any key to continue".

24. Press ⊕ Key. The display shows:

```
        *
        *
        *
        *
<<<<    >>>>
        *
        *
        *
        *
```

    Every time you press causes the respective display to disappear.

25. After pressing all keys, the display is clear.

26. Press any key to continue. The display shows “Rotary test”. Turn the rotary switch clockwise, each click causes the respective clockwise arrow sign to disappear.
    Then, a set of counter clockwise arrows appear, turn the rotary switch counter clockwise, each click causes the respective counter clockwise arrow sign to disappear. The display shows “Press the rotary”.

27. Press any key to continue. The display shows “To next test Press any key”.

28. The display will show "Mandown Test". Press any key to continue.

29. The display will show "45 Degree Angle Detection Mandown Test". Place radio in a 45 degree angle. After some time, the radio will start to 'beep' continually.

30. Place radio upright (90 degrees) and radio will stop beeping.

31. Press any key to continue.
    The display will show "No-movement Mandown Test".

32. Leave the radio stationary.
    After sometime, the radio will start to 'beep' continually.

33. Pick the radio up.
    Move the radio about and the radio will stop beeping.

Charger Recognition Test

- Turn the radio ON.
- Connect the handset to the Desktop Charger. Check whether the LCD display shows “charger connected” and that the keypad backlight is turned ON.
- Verify that the battery charger is in progress (the process advance is indicated on the Battery Strength icon).

Press the “ON/OFF” key. The radio should turn OFF.

Notes

CHAPTER 6
MAINTENANCE

Preventive Maintenance

Inspection and Cleaning

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

The following procedures describe the recommended cleaning agents and methods to be used when cleaning the external surfaces of the radio. External surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, compound, or grime.

Cleaning External Plastic Surfaces

The only recommended agent for cleaning external radio surfaces is a 0.5% solution (one teaspoon of detergent per gallon of water) of mild dishwashing detergent in water. Apply sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. Use a soft, absorbent, lintless cloth or tissue to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

NOTE: **Internal surfaces should be cleaned only when the radio is disassembled for service or repair, and only can be done by Motorola's Regional Radio Service Centers or Authorized Motorola Service Centers.**

Notes

APPENDIX A
SERVICE INFORMATION

Servicing MTP810 Ex Portable Radios

Service for the radios 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 PCB is faulty, it is replaced. If the radio requires more complete testing or servicing than that is available at field level, it is sent to the Motorola Regional Service Centre (for Asia Pacific Region and Latin American Caribbean Region) or the European Radio Support Centre (for Europe, Middle East and Africa Region) where it is serviced, and returned (refer to “Service Information”).

Level 1 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.

For details, please refer to “Technical Support” and “Further Assistance From Motorola” on page A-2.

The MTP810 Ex portable radios are programmed at the factory. They cannot be tuned at the field service level.

Service Information

Asia Pacific Region (APAC)

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's Managed Technical Services (MTS). 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 Radio: **The CPS has no capability to tune the radio. Tuning the radio can only be performed at the factory or at the appropriate Motorola Service Centre. Component replacement can affect the radio tuning and must only be performed by the appropriate Motorola Service Centre.**

Request for help in identification of spare parts should be directed to your local Motorola Managed Technical Service representative.

Technical Support

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

Further Assistance From Motorola

Only Motorola Own Service Centres or Approved Motorola Service Partners can perform these functions. Any tampering by non-authorised Service Centres voids the warranty of your radio. Please check with Motorola representatives or visit http://www.motorola.com/governmentandenterprise to find out about Motorola Own Service Centres.

Latin American Caribbean Region (LACR)

Replacement Parts Ordering

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Motorola Online

Motorola Online users can access our online catalog at
http://www.motorola.com/businessonline

To register for online access:

- Have your Motorola Customer number available.
- Go to http://www.motorola.com/businessonline and click on “Sign Up Now”.
- Complete form and submit it.
- Contact your BDM to complete set-up and it will be done within 24 to 48 hours.

Motorola Service Centres

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

Motorola de México, S.A.
Bosques de Alisos 125
Col. Bosques de las Lomas CP 05120
México D.F.
México
Tel: (5) 257-6700

Motorola de Colombia, Ltd.
Carrera 7 No. 71-52
Bogota – Colombia
Tel: (571) 376-6990

Europe, Middle East and Africa Region (EMEA)

European Radio Support Centre (ERSC)

Motorola European Radio Support Centre is available at:

Motorola European Radio Support Centre ERSC
Tel.: +49 (0)30 6686 1555
Fax: +49 (0)30 6686 1579
Am Borsigturm 130
13507 Berlin
Germany

EMEA Systems Support Centre (ESSC)

The Systems Support Centre is available at:

Telephone:	+44 (0) 1256 484448
E-mail:	ESSC@motorola.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's Managed Technical Services (MTS). 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 Radio: **The CPS has no capability to tune the radio. Tuning the radio can only be performed at the factory or at the appropriate Motorola Service Centre. Component replacement can affect the radio tuning and must only be performed by the appropriate Motorola Service Centre.**

Request for help in identification of spare parts should be directed to your local Motorola Managed Technical Service representative.

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

EMEA Test Equipment Support

Information related to support and service of Motorola Test Equipment is available by calling the Motorola Test Equipment Service in Germany at +49 (0) 6128 702179, Telefax +49 (0) 6128 951046, through the Customer Care Organization of Motorola's local area representation, or via the Internet at: http://www.gd-decisionsystems.com/cte/

Recommended Programming Equipment

MTP810 Ex CPS	Part Number
MR5.10 CPS Tetra Subscribers (for programming only)	GMVN5539_

Note: Future revisions of the MTP810 Ex CPS tool will be included in this table along with the current revision.

Programming Cables / Tools	Part Number
USB Programming cable	PMLN5235_
RS-232 Data cable	PMLN5237_
RF Radio rear antenna adaptor	66007029001
Battery Eliminator	66007029002

Note: These programming cables / tools CANNOT be used in a potentially explosive environment.

Service Replacement Kit Matrix

Sales Model Description	Service Tanapa	Description
MTP810 Ex 806–870 MHz	PMUF1444AS	MTP810Ex 800 LKP CLR ENG
	PMUF1445AS	MTP810Ex 800 LKP TEA1 ENG
	PMUF1471AS	MTP810Ex 800 LKP TEA2 ENG
	PMUF1446AS	MTP810Ex 800 LKP TEA3 ENG
	PMUF1447AS	MTP810Ex 800 LKP CLR CHI
	PMUF1448AS	MTP810Ex 800 LKP TEA1 CHI
	PMUF1449AS	MTP810Ex 800 LKP TEA3 CHI
	PMUF1450AS	MTP810Ex 800 LKP CLR TAI
	PMUF1451AS	MTP810Ex 800 LKP TEA1 TAI
	PMUF1452AS	MTP810Ex 800 LKP TEA3 TAI
	PMUF1453AS	MTP810Ex 800 LKP CLR KOR
	PMUF1454AS	MTP810Ex 800 LKP TEA1 KOR
	PMUF1455AS	MTP810Ex 800 LKP TEA3 KOR

Note: All models listed in the Service Tanapa Column are not field replaceable.

Notes