MOTOROLA

MTH500

TETRA Portable Radio
R1:380-400 MHz (PT811F)
R2:410-430 MHz (PT511F)

Basic Service Manual

Scope of this Manual

This manual contains information necessary to test and maintain the MTH500 Portable radio at the module level. It also contains information on radio assembling and disassembling. Accordingly, information in this manual is divided into four sections:

*   Overview
*   Test Setup and Testing
*   Programming the Radio
*   Maintenance

Manual Revisions

Changes which occur after this manual is printed are described in Manual Revisions. These Manual Revisions provide complete information on changes including pertinent parts listing data.

Related Publications

*   68P02963C30-O MTH500 User Guide
*   68P02963C70-O MTH500 Detailed Service Manual
*   68P02956C20-F CPS User's Guide
*   IFR-Operational Manual Supplement 46882-324
*   IFR-Operational Manual 46882-274T

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Safety And General Information

Important Information on Safe and Efficient Operation

Read this Information before Using your handset

The information provided in this document supersedes the general safety information contained in service manuals published prior to June 2001. For information regarding handset use in a hazardous atmosphere please refer to the Factory Mutual (FM) Approval Manual Supplement or Instruction Card which is included with handset models that offer this capability.

Radio Frequency (RF) Operational Characteristics

Your handset contains a radio frequency transmitter to convey the information you wish to send as well as occasional automatic signals used to sustain connection with the wireless network, and a receiver which enables you to receive communication and connection information from the network.

Handset Operation And EME Exposure

Your Motorola handset is designed to comply with the following national and international standards and guidelines regarding exposure of human beings to radio frequency electromagnetic energy:

*   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
*   National Council on Radiation Protection and Measurements (NCRP) of the United States, Report 86, 1986
*   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 1999 (applicable to wireless phones only)
- Anatel, Brasil Regulatory Authority "This equipment is in compliance with the limits of Specific Absorption Rate which refer to the exposal to electric, magnetic and electromagnetic fields adopted by ANATEL."

To assure optimal handset performance and make sure human exposure to radio frequency electromagnetic energy is within the guidelines set forth in the above standards, always adhere to the following procedures:

Phone Operation

When placing or receiving a phone call, hold your handset as you would a wireline telephone. **Speak directly into the microphone.**

Two-way radio Operation

When using your handset, **hold the handset in a vertical position with the microphone 2.5 to 5 cm away from your mouth.**

Body-worn Operation

To maintain compliance with these RF exposure guidelines, if you wear a handset on your body when transmitting, always place the handset in **a Motorola approved belt clip or leather case for this product.** Use of non-Motorola-approved accessories may exceed these RF exposure guidelines. **If you do not use a Motorola approved body-worn accessory and are not using the handset in the intended use positions along side of the head in the phone mode or in front of the face in the two-way radio mode, then ensure the antenna and handset is kept the following minimum distances from the body when transmitting:**

- **Phone or Two-way radio mode: 2.5 cm**

- **Data operation using any data feature with or without an accessory cable: 2.5 cm**

Antenna Care

Use only the supplied or an approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the handset and may violate FCC regulations.

DO NOT hold the antenna when the radio is "IN USE". Holding the antenna affects call quality and may cause the radio to operate at a higher power level than needed.

Approved Accessories

For a list of Approved Motorola accessories, please see "REPLACEMENT PARTS AND KITS" on page 45.

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 handset 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 handset when on board an aircraft. Any use of a handset must be in accordance with applicable regulations per airline crew instructions.

Medical Devices

Pacemakers

The Health Industry Manufacturers Association recommends that a minimum separation of 15 centimetres be maintained between a handheld wireless handset and a pacemaker. These recommendations are consistent with those of the U.S Food and Drug Administration.

Persons with pacemakers should:

- ALWAYS keep the handset more than 15 centimetres from their pacemaker when the handset is turned ON.
- not carry the handset in the breast pocket.
- use the ear opposite the pacemaker to minimise the potential for interference.
- turn the handset OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids

Some digital wireless handsets 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.

Safety and General

Use While Driving

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

When using the handset while driving, please:

• 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 so require.

WARNING

Operational Warnings

For Vehicles Equipped with an Air Bag

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

Potentially Explosive Atmospheres

Turn off your handset prior to entering any area with a potentially explosive atmosphere, unless it is a handset type especially qualified for use in such areas as "Intrinsically Safe" (for example, Factory Mutual, CSA, UL, or CENELEC 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.

NOTE: 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, and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often, but not always, posted.

Blasting Caps and Areas

To avoid possible interference with blasting operations, turn off your handset 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.

Caution

Operational Cautions

Antennas

Do not use any handset 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 jewellery, 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.

$C\!E$ 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

Midtager 20

DK-2605 Brondby

CONTENTS

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MTH500 Portable Radio Model Information

This manual applies to the following MTH500, 1W, Hand-Held Portable radio models:

R1 H39PCN6TZ5AZ (Black) 380-400MHz, H39PCN6TZ5AR (Blue) 380-400MHz

R2 H39QCN6TZ5AZ (Black) 410-430MHz, H39QCN6TZ5AR (Blue) 410-430MHz

MODEL NUMBERING SYSTEM

Typical Model Numbering:	M	1	2	P	C	N	6	T	Z	5	A	Z
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

02=Motorola Digital Communicator
06=Motorola Advanced Feature Digital
07=Motorola i370 Products
08=Motorola i1000 Products
12=Motorola 3:1 Mobile
13=Motorola Ruggedized Digital
39=Motorola MTH500 Family

Position 4 - Frequency Band

P=380 to 400 MHz
Q=410 to 430 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   5=15 kHz
2=6.25 kHz   6=25 kHz
3=10 kHz   7=30 kHz
4=12.5 kHz

Position 12 - Unique

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

Position 11 - Version

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

Position 10 - Feature Level

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

Position 9 - Primary System Type

R=iDEN Basic
S= iDen AFU
Z= Dimetra

Position 8 - Primary Operation

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

MTH500 Model Specifications

GENERAL		RECEIVER		TRANSMITTER	
ETSI	ETS 300 394-1	**Receiver Type:**	Class A and B	**Modulation Type:**	π/4DQPSK
Type Number:	**R1:** 380-400 MHz: PT811F **R2:** 410-430 MHz: PT511F	**Frequency Range:**	**R1:** 380-400 MHz **R2:** 410-430 MHz		
Temperature Range for Transceiver:		**Channel Spacing:**	25 kHz	**RF Power**	1 Watt
Operating:	-20°C to +60°C	**Sensitivity (4%) BER:**	-112 dBm		
Storage:	-40°C to +85°C	**Intermodulation:** **Interfering Signal Level:**	(4%) BER -47 dBm	**Frequency Range:**	**R1:** 380-400 MHz **R2:** 410-430 MHz
Battery Types: Standard SNN5705B 800mAH (LiIon) Standard SNN5705C 800mAH (LiIon) High Capacity SNN5706A 1100mAH (LiIon)		**Selectivity Blocking:** **(50-100 kHz)** **Interfering Signal Level:**	(4%) BER -40 dBm	**Frequency Stability:** Locked to Base Not Locked to Base	 ± 100 Hz ± 2 ppm
Battery Voltage: Minimum:	 3.4 Vdc			**Spurious Emissions** Conducted 30MHz-1GHz	 -36dBm
Nominal:	3.8 Vdc			1GHz-4GHz Radiated 30MHz-1GHz 1GHz-4GHz	-30dBm -36dBm -30dBm
Portable Dimensions HxWxD in MMs:	140x55x31 mm	**Spurious Rejection:** **Interfering Signal** **Level:**	(4%) BER -45 dBm		
Weight:	≤155gr, without battery	**Frequency Stability:**		**Adjacent Channel Power (at± 25kHz)**	− 60 dB
		Locked to Base	0.2 ppm		
		Unlocked to Base	2.0 ppm		
		Audio Rated:	0.5 W		
		Distortion at Rated Audio:	5% Max.		

Specifications subject to change without notice.

x

CHAPTER 1

OVERVIEW

To achieve a high spectrum efficiency, the MTH500 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 MTH500 is a portable radio that has two models operating in two different frequency ranges: R1: 380-400 MHz and R2: 410-430 MHz. These radios can operate in dispatch and phone mode. Also, these radios can 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).

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

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

Time allocation enables each unit to transmit 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 compressions/decompressions and RF modulation/demodulation.

Voice Compression Technology

Voice is converted into a digital bit stream by sampling the voice at a 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 MTH500 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 Redcap 2 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 GCAP III and includes power supplies, 13-bit CODEC, audio routing, microphone and ear piece amplifiers. A audio power amplifier is used for the loud speaker.

Transmitter Path Description

The transmitter circuitry includes a linear class AB Power Amplifier (PA) for the linear modulation of the MTH500. It also includes a novel cartesian feedback loop to enhance its transmitter linearity and reduced splattering power into adjacent channels.

The transmitter path consists of a novel cartesian feedback loop that contains the forward and loop feedback paths. The forward path includes the low noise ODCT (Offset Direct Conversion Transmitter), Balun, Attenuator, and Power Amplifier. The loop feedback path includes the directional coupler, attenuator, and LNODCT (Low Noise Offset Direct Conversion Transmitter) ASIC.

The cartesian Feedback output power passes to the antenna through the Isolator, Antenna Switch, and Harmonic Filter.

Receiver Path Description

The receiver path includes the Antenna Switch, SAW, LNA, ceramic filter, mixer, Crystal Filter, and WPIC (World Phone IC). The first IF consists of the Crystal Filter and WPIC ASIC.

Frequency Generating Section Description

The frequency generating section provides description of the following main components: Fractional-N Synthesizer, REF. oscillator, Main VCO, WPIC ASIC Synthesizers, LNODCT ASIC Synthesizer, External Offset and second LO Synthesizer, DSP PLL, and Host PLL.

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CHAPTER 2

TEST SETUP & TESTING

WARNING

Any level 3 repairs can deeply affect the performance of the MTH500 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.

Before Testing

Carry out the following instructions before testing:

- Check that you have a fully charged battery (Not required when using Battery Eliminator WALN4097).
- Connect an RF cable to the N-type RF Connector of the IFR
- Connect the other side of the RF cable to the antenna adapter assembly (Motorola Part Number FLN9659). Connect the RF cable to the other side of the antenna assembly connector.
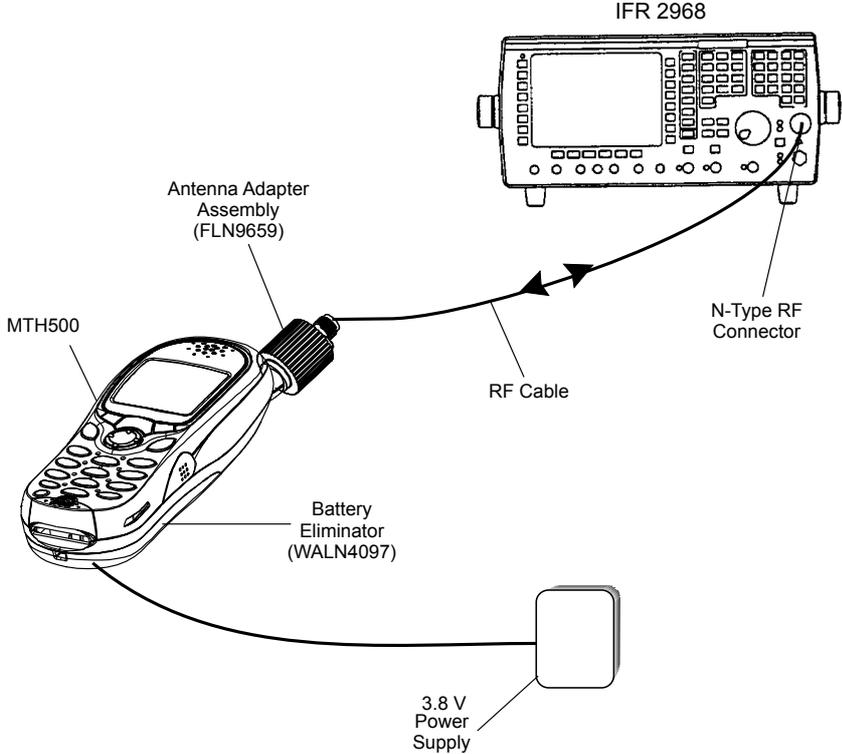
Typical Test Setup

IFR 2968

Antenna Adapter
Assembly
(FLN9659)

MTH500

N-Type RF
Connector

RF Cable

Battery
Eliminator
(WALN4097)

3.8 V
Power
Supply

Figure 1. 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				
		Traffic Channel	390.125 MHz 422.0125 MHz	3605 880	TETRA 380+OMS for R1 TETRA 410MS for R2
		Control Channel	390.125 MHz 422.0125 MHz	3605 880	TETRA 380+OMS for R1 TETRA 410MS for R2
		Time Slot		3	
		Country Code		753	
		Network Code		2361	
		Base Color		1	
		Location Area		22	
		Min Rx Level			-110dBm
		Max Tx Level			30dBm
		Access Parameter		-53dBm	
		Mobile Power	30dBm		
		Burst Type		Normal	
2.	Receiver RSSI	RF Gen Level		-80dBm	
3.	Transmitter Burst Power				
		RF Gen Level Burst Power		-90dBm	28-32dBm
		Timing Error			<=0.25 Symbols
		Vector Error			Max 10% RMS, 30% Peak
		Frequency Error			-/+ 100Hz
4.	Call Processing Talk Back				

No.	Test Name	Test Setup	Radio Setup	Test Conditions	Limits
		1KHz Test Signal Group Mode		-50dBm	
5.	Call Processing Call to Mobile				
		Private	4 digit random number & "Send"		28-32dBm
		RF Gen Level Burst Power		-90dBm	28-32dBm
		Timing Error			<=0.25 Symbols
		Vector Error			Max 10% RMS, 30% Peak
		Frequency Error			-/+ 100Hz

Receiver Tests

1. Simulate Base Station (registration)

2. RSSI

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

1. 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 2968 Setup

Perform the following steps to configure the IFR 2968 with the radio set:

1. Turn ON the IFR.

2. Press "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" soft key.

6. Press "Tetra 380+OMS" soft key for R1 or "Tetra 410MS" soft key for R2. The "Control Channel" automatically changes to "3600" for R1 or "800" for R2; and "Traffic Channel" automatically changes to "3700"for R1 or 900 for R2.

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 "753" and "Country Code" soft key.

9. Press "Network Code" soft key. Thereafter, enter "2361" 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 "Min Rx Level" soft key. Thereafter, enter "-110dBm" and press "Min Rx Level" soft key.

14. Press "Max Tx Level" soft key. Thereafter, enter "30dBm" and press "Max Tx Level" soft key.

15. Press "Access Parameter" soft key. Thereafter, enter "-53dBm" and press "Access Parameter" soft key.

16. Press "Test Mode" soft key. Press "Enable" soft key.

17. Press "Base Service" soft key and "Supported" 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 Services: supported

Circuit Mode Data Service: supported

(Reserved): available

SNDCD 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 REQUIRED

BROADCAST INTERVAL: 10s

NEIGHBOUR CELL CHANNEL: 0000

NEIGHBOUR CELL LOCATION AREA: 00000

NEIGHBOUR CELL IDENTIFIER: 01

SLOW RE-SELECT THRESHOLD: 10dB

PRESS "MORE" SOFT KEY

SLOW RE-SELECT HYSTERESIS: 10dB

FAST RE-SELECT THRESHOLD: 10dB

FAST RE-SELECT HYSTERESIS: 10dB

22. Press the "Return" soft key.

23. Press the "Trunk Type" soft key and "Tx Trunked" soft key.

24. Press "More" Softkey.

Note:

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

It is not required to configure "Call Types" and "Messages".

25. Press "More" Softkey.

How to Configure the IFR 2968 Manual Test Screen

1. To enter "Manual test" screen, press "Manual" soft key.

2. Press "Control Channel" soft key. Thereafter, enter "3605" for R1 and "880" for R2 and press "Control Channel" soft key (IFR 3605 = Rx 390.125MHz) for R1 and (IFR 880 = Rx 422.0125MHz) for R2.

3. Press "Traffic Channel" soft key. Enter "3700" for R1 and "900" for R2 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 "-50" 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.

7. 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

Receiver Tests

Simulate Base Station (registration)

1. Turn the radio ON

2. Check that registration and "ITSI: ---/----/00000xxx" is displayed on the IFR "Manual Test" screen.

Status: Registered (ITSI Attach)

RSSI Test

Before carrying out the following steps, record the Insertion loss (dB) of the cable loss value - (X) dB. Also, 0.5 dB, the maximum insertion loss of the Antenna assembly adapter should be added to the total calculated insertion loss.

1. In the IFR Manual Test Mode, press the "RF Gen Level" Soft Key and enter (–) 80dbm.

2. Before testing, the radio should be configured to RSSI mode using the following Sequence, When performing steps 3 thru 6, make sure that you press the handset keys sequentially (less then a second between every consecutive press).

3. Press the "Volume down" Key.

4. Press the "1 "key, and "Menu" Key.

5. Press the "2 "key, and "Menu" Key.

6. Press the "3 "key.

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

7. Press ⊕ Key to enter the "4 Cells Info" state.

8. Press "OK" using the Right (•) Key and press ⊕ .

9. Press "Trace" using the Right (•) Key.

Note: RSSI results will flash on the screen every few seconds.
The display shows: SERV: xx
RSSI: -81
SQE: xx
Disregard the "SERV" and "SQE" results.

The actual measured result should be:

{-80dBm (IFR RF Gen Level) -0.5dB(adapter)-XdB (cable)} +/-1 dB.

RSSI = {Radio RSSI Result – [Antenna assembly Adapter (dB) + Insertion loss of the Cable (dB)]}.

To stop the "Trace" process, perform the following. When performing steps 10. thru 13., make sure that you press the handset keys sequentially (less then a second between every consecutive press):

10. Press the "Volume down" Key.

11. Press the "1" key, and "Menu" Key.

12. Press the "2" key, and "Menu" Key.

13. Press the "3" key.

14. Press "Stop" using the Right (•) Key.

13

15. Press "Back" twice using the Left (.) Key.

Transmitter Tests

1. Change the "Mode Key" of the radio to "Group Mode".

2. Press the "RF Gen Level" soft key. Enter "-90dBm" by pressing the data keys and "RF Gen Level" Key.

3. 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.

   - Burst Power Required Results: 28-32dbm.

   - Power Profile: Passed.

   - Timing Error: ≤ 0.25 symbols.

   - Vector Error: Max 10% RMS, Max 30% Peak.

   - Max 5% residual.

   - Frequency Error: -/+ 100Hz.

4. Press the "Clear Down" soft key, to proceed with other tests.

Call Processing Test

Talk Back

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

1. Press the "PTT" and speak into the mic of the radio. You will hear the last three seconds of the speech frames before the "PTT" is released.

2. Press the "Test Sound" soft key to provide the 1kHz signal to the radio speaker.

3. Press the "Silence" soft key to mute the 1KHz 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

1. Press the radio "Mode" key and change to "Private" mode.

2. Press the "Call Mobile" soft key on the IFR.

Note: Select type of call.

3. Press "Private" Call.

Note: You will hear beeps from the handset speaker.

4. Press "Abort Call" soft key.Duplex Test (Phone/Privet Mode)

Digital Duplex Test (Tx)

1. Press the "Mode" key of the radio and select "Phone" or "Privet" mode.

2. Dial a random number "9359" using the Alphanumeric keys of the radio and press the "Send" Key.

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

- Burst Power Required Results: 28-32dbm

- Power Profile: Passed

- Timing Error: <0.25 Symbols.

- Vector Error: Max 10% RMS, Max 30% Peak.

- Max 5% residual.

- Frequency Error: -/+ 100Hz

3. Speak into the Handset Microphone and hear your speech (after a short delay) from the handset Earpiece.

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

4. Press the "duplex test (Tx)" soft key twice. The "Digital Duplex test" results will be displayed on the IFR screen providing you with the following bar charts measurement capabilities:

   - Power

   - Vector RMS

   - Frequency Error

 For Power Analyser Graph:

5. Press "power ana" soft key.

6. Check that the power frame falls within the limits.

For Spectrum Analyser Graph:

7. Press "Spect ana" soft key.

8. Monitor the Tx frequency.

For Vector Analyser Diagram:

9. Press the "Vect Anal" soft key

10. Monitor the constellation diagram.

11. Press the "Vector Diagram" soft key.

12. Press the "Rotated vector" to zoom in on the constellation.

13. Press the handset "End" key.

DMO Test

IFR 2968 Test Setup

1. Press the "System" softkey.

2. Press "TETRA Direct" Softkey.

3. Press "Setup" Softkey.

4. Press "Channel Plan" Softkey, press "TETRA 380+ODM" softkey for R1or TETRA 410+ODM for R2.

5. Press DM Tx Mode" softkey, press "discontinue" softkey

How to Configure the IFR 2968 Manual Test Screen

1. Press the "Manual" softkey.

2. Press "Channel" Softkey, thereafter enter "4000= 390 MHz" for R1or "1200=420 MHz for R2 and press "Channel" softkey.

3. Press "Expected Power" Softkey, enter 30.0dBm/1.0 w.

4. Press "Burst Type" Softkey and "Normal" softkey.

Radio Configuration for DMO

Modify the radio for DMO option by carrying out the following sequence:

1. Turn ON the radio.

2. Press the "Menu" key

3. Press ⊙ key and select mode "network", press "OK" softkey.

4. Select "OPERMODE", and press "OK" softkey.

5. Select "DIRECMODE" softkey and press "OK" softkey

.

RF Test - Transmit Test

Hold the PTT in the pressed position long enough to enable you to read the results:

- Results: - Power Profile: Passed
- Burst Power Request Results: 28-32 dBm
- Frequency Error: +/- 100Hz max.
- Vector Error: Max. 10% RMS, Max. 30% Peak, Max. 5% Residual.

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CHAPTER 3
PROGRAMMING THE RADIO

</div>

Before Using the Customer Programming Software (CPS)

Before you begin programming, ensure the following:

• That your radio battery is fully charged.
• That you have connected the Data cable (FKN4897), according to Figure 2.
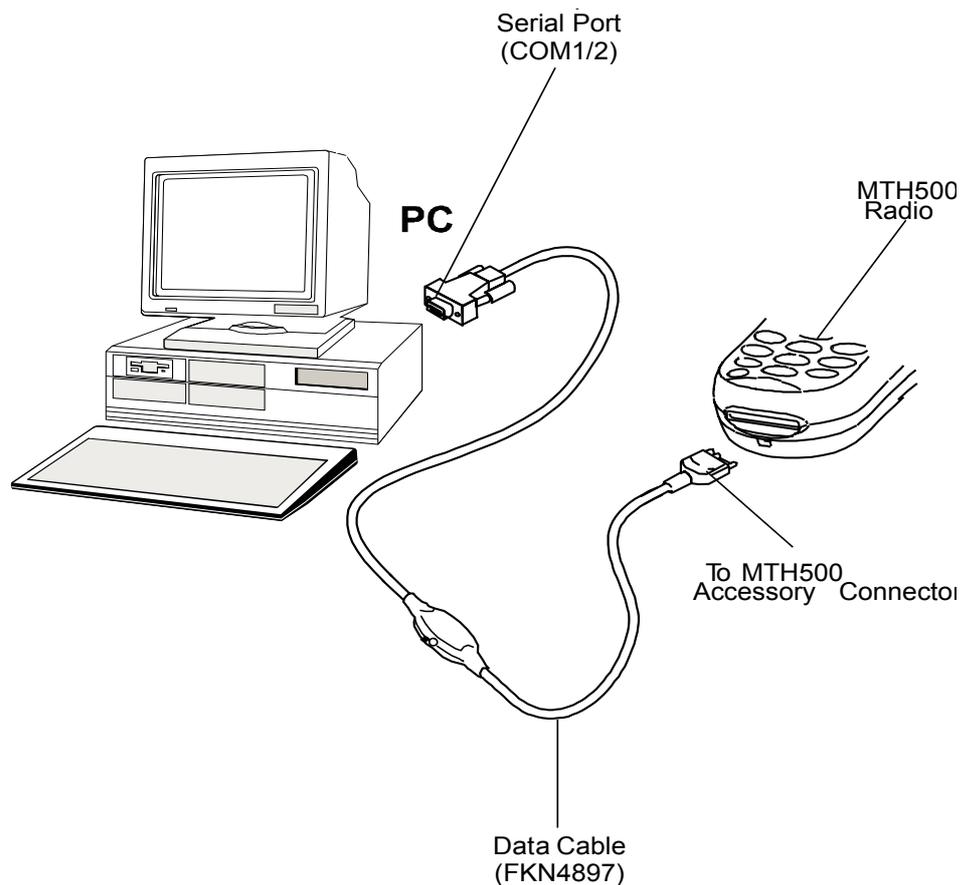• That the Customer Programming Software (CPS) is installed in your computer.

Figure 2. Setup for Radio Programming.

Programming the Radio

1. Verify that the radio is turned off.

2. Run the Customer Programming Software (CPS) on your computer.

3. Press the "1" and "9" keys together and then the On/Off key for about 3 seconds. Verify that no display appears on the LCD screen.

4. Click the Toolbar "Read Phone" icon. *Refer to the CPS Application Window Screen in the CPS User Guide, Publication No. 68P02956C20.* The setup enters an initialization process that takes about 20 seconds. After that, a reading process starts.

Note: While reading is in progress, the radio screen displays the following data:
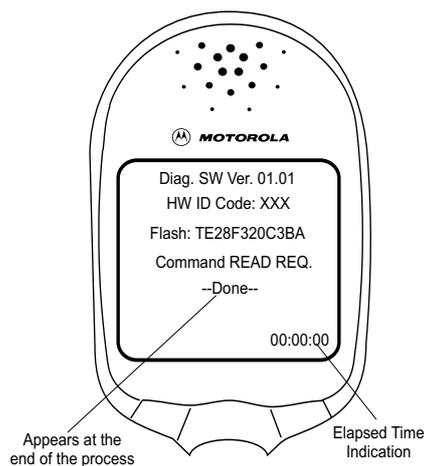
A progress bar appear on the computer screen. After the reading process is finished, the radio Codeplug screen appears.

CodePlug Programming

1. On the menu bar, click "File" "Open".

2. Browse for the required Codeplug file and open the file.

3. The Codeplug window appears on the screen.

4. Click the Toolbar "Tools" and select "Write Entire Codeplug".

5. Press "Yes" icon.

Note: The Codeplug is now being written into the radio. A progress bar is displayed on the computer screen showing the writing status.
After a successful writing, the message "The Operation Was Successful" appears on the computer screen.

6. Press the OK button.

Application Programming

1. On the menu bar click "Tools", "Write Software".

2. Press "Continue" icon.

Note: The Codeplug reads data from the radio. A progress bar is displayed on the computer screen showing the writing status.
After a successful reading, the "Write Software to Phone" appears on the computer screen.

3. Choose the Customized Choice" option.

4. Browse for the required application file and select it.

5. Press the "Write" button.

Note: The Codeplug is now being written into the radio. A progress bar is displayed on the computer screen showing the writing status.
After a successful writing, the message "The Operation Was Successful" appears on the computer screen.

6. Press the "Cancel" button.

7. Click the Toolbar *"R"* (Reset) icon.

Manual Mode Testing

Preparation for Testing

1. Verify that the radio is turned off.

2. Press the "4", "5" and "6" keys together and then, press the On/Off key to turn the radio on.

3. The display shows "LCD 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.

LCD Display Test

1. Press any key consecutively. The display shows horizontal lines that becomes thicker with every key press, until it becomes fully dark.

2. Press any key again, the following appears at the top of the display:

3. Press any key consecutively. The display shows vertical lines that becomes thicker with every key press, until it becomes fully dark.

4. Press any key again. The display shows a map of Europe.

5. Press any key again. The display shows "Vibrator On", verify that the radio is vibrating.

6. Press any key again. The display shows "Red Led on" and the Red LED at the top of the radio is lit.

7. Press any key again. The display shows "Green Led on" and the Green LED at the top of the radio is lit.

8. Press any key, the LED located on the top of the radio (near the antenna), turns ON, and the two halves of this LED starts blinking with RED and Green lights.

9. Press any key again. The display shows "Backlight On" and the display back-light is On.

10. Press any key again. The display shows "Speaker Tone Test", a tone is heard via the speaker.

11. Press any key again. The display shows "Earpiece Tone Test", a tone is heard via the earpiece.

12. Press any key again. The display shows "Audio Loopback Test", speak into the microphone, you should hear your voice via the earpiece.

13. Press any key again. The display shows "Chopper-Noise Test", a low hum is heard via the earpiece.

14. Press any key again. The display shows all the radio keys.

15. Press every key, one by one. Each key you press causes its respective display to disappear.

16. Press ⊕ Key. Every time you press causes the respective display to disappear.

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

18. Turn the radio Off.
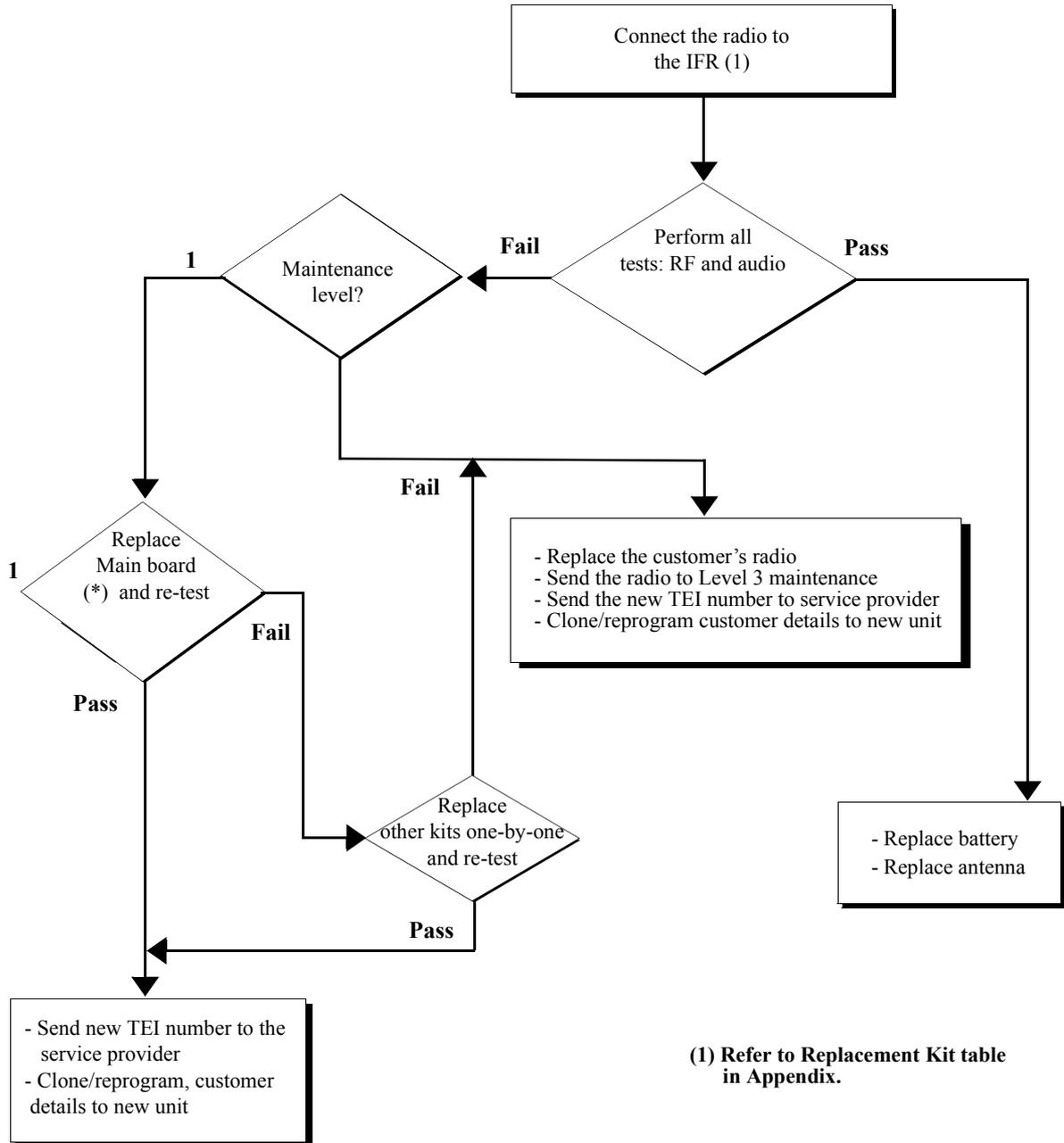
Charger Recognition Test

- Turn the radio ON.
- Connect the Rapid Travel Charger accessory connector to the handset. Check whether the LCD display shows "charger connected" and that the keypad back-light is turned ON.
- Connect the Vehicle Power Adapter (VPA) Charger accessory connector to the handset. Check whether the LCD display shows "charger connected" and that the keypad back-light is turned ON.
- Connect the handset to the Desktop Charger. Check whether the LCD display shows "charger connected" and that the keypad back-light is turned ON.
- Place the handset in the Digital Car Kit cradle. Verify that the car ignition switch is turned ON. Check whether the LCD display shows "Car it con-nected", and that the keypad back-light 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.

Service Flowchart

Connect the radio to
the IFR (1)

Perform all
tests: RF and audio

Fail | **Pass**

1 Maintenance
level?

1 Replace
Main board
(*) and re-test

Fail

Pass

Fail

Replace
other kits one-by-one
and re-test

Pass

- Replace the customer's radio
- Send the radio to Level 3 maintenance
- Send the new TEI number to service provider
- Clone/reprogram customer details to new unit

- Replace battery
- Replace antenna

- Send new TEI number to the
  service provider
- Clone/reprogram, customer
  details to new unit

**(1) Refer to Replacement Kit table
in Appendix.**

(*) Main Board: See Radio Replacement Parts List (Appendix A)
Note: Not field replaceable for Latin America

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CHAPTER 4

MAINTENANCE

Preventive Maintenance

This portable radio does not require a scheduled preventive maintenance program. However, periodic visual inspection is recommended.

Inspection

Inspect the radio's external surfaces. A detailed inspection of interior circuitry is not needed or recommended.

Cleaning

The following procedures describe the recommended cleaning agents and methods to be used when cleaning the external and internal surfaces of the radio. 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 radio is disassembled for servicing or repair.

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. The internal surfaces should be cleaned only with isopropyl alcohol (70% by volume).

Safe Handling of CMOS Devices

Complementary metal-oxide semiconductor (CMOS) devices are used in the radio. While the attributes of CMOS devices are many, their characteristics make them susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failure occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair. The following handling precautions are mandatory for CMOS circuits, and are especially important in low humidity conditions.

• All CMOS devices must be stored or transported in conductive material so that all exposed leads are shorted together. CMOS devices must not be inserted into conventional plastic "snow" or plastic trays of the type that are used for storage or transportation of other semiconductor devices.

• All CMOS devices must be placed on a grounded bench surface and the technician must also be grounded before handling the devices. This is done most effectively by having the technician wear a conductive wrist strap in series with a 100kΩ resistor to ground.

• Do not wear nylon clothing while handling CMOS circuits.

• Do not insert or remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices and be certain there are no voltage transients present.

• When straightening CMOS device leads, provide ground straps for the apparatus used.

• When soldering, use a grounded soldering iron.

• All power must be turned off in a system before printed circuit boards containing CMOS devices are inserted, removed, or soldered.

Level 1 and Level 2 Maintenance

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

Note: For Level 1 maintenance instructions refer to the information given in Chapter 2. For Level 2 maintenance also refer to Chapter 2, and the instructions given below.

Removing and Installing the Antenna

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

Recommended tools: no tools are required.

To remove the antenna from the unit:

(See Figure 1)

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

To install the antenna in the unit
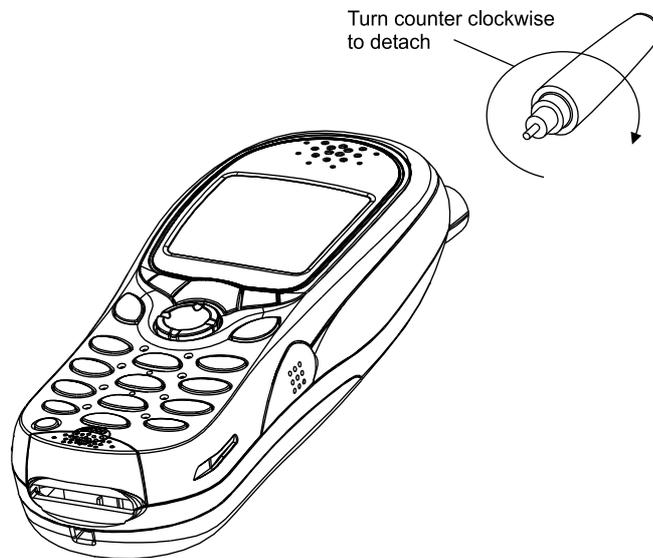
1.   Screw the antenna clockwise to the handset.

Turn counter clockwise
to detach

Figure 1 Antenna Removal and Installation

Removing and Installing Battery Door and Battery

Recommended tools: no tools are required

To remove the battery door from the unit:

(See Figure 2)

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

2. Press the battery door release button, slide the door towards the bottom of the unit and lift it up from the unit.

To remove the battery:

(See Figure 3)

1. Press the battery fastening bridge toward the upper side of the unit.

2. Simultaneously, using other hand, release the battery from its chamber.

To install the battery:

1. Locate the battery so that the lower part (coloured silver) is touching the lower wall of the battery chamber.

2. Carefully press the battery down until it snaps into location.

To install the battery door:

1. Position the door on the unit over the battery so that the door release button is just above the battery fastening bridge.

2. Slide the door upward until the door snaps into location.

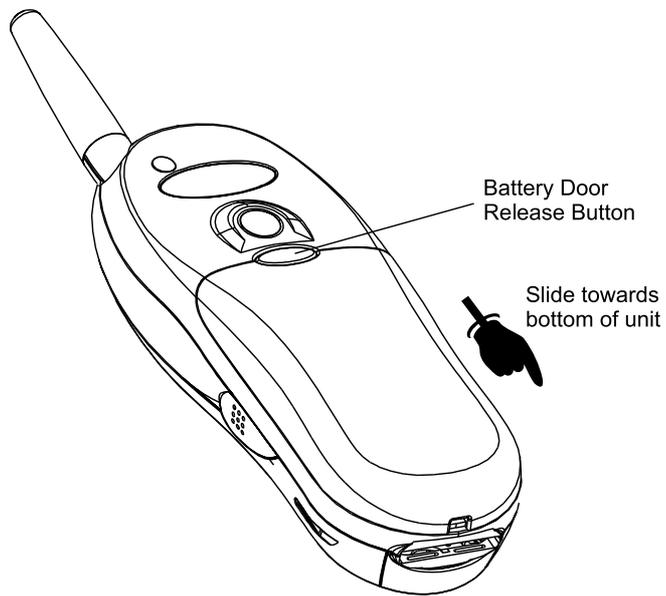3. Verify that the door is aligned with the handset back housing.

Battery Door
Release Button

Slide towards
bottom of unit

Figure 2 Battery Door Removal and Installation

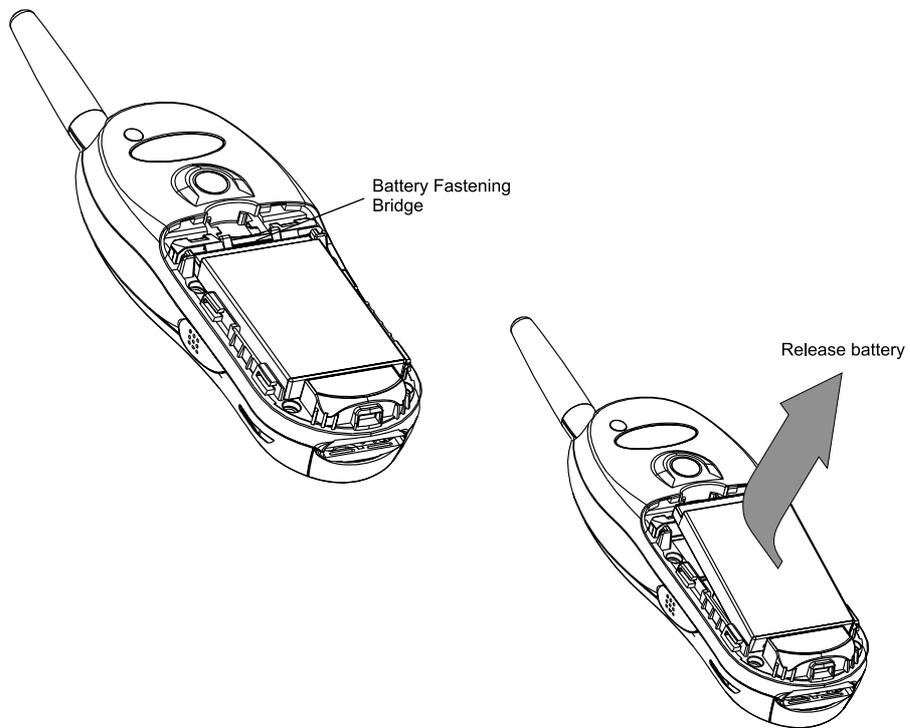Battery Fastening
Bridge

Release battery

Figure 3 Battery Removal and Installation

Removing and Installing the Back Housing

Recommended tools: T-8 Torx bit, Torx driver, mini flat-tip screwdriver

To remove the back housing from the unit:

(See Figure 4)

1. Remove the antenna, refer to "Removing and Installing the Antenna" on page 29.

2. Remove the battery door and the battery, refer to "Removing and Installing Battery Door and Battery" on page 30.

3. Place the unit facing down on the work area.

4. Using the screwdriver remove the oval label at the top of the unit and the tamper evident label in the center to enable access to all six screws fastening the back housing. Clean the adhesive remains of the tamper evident label using alcohol.

5. Using the Torx driver with the T-8 Torx bit, unscrew the six screws fastening the back housing.

6. Carefully remove the back housing from the unit.

To install the back housing:

1. Position the back housing over the unit.

2. Verify that the cover is positioned correctly, screw holes are aligned to the threads of the front housing, external antenna connector is inserted into its dedicated hole, and the styling groove of the back housing meets the styling groove of the front housing.

3. Set the Torx driver to 3.5 in-lb.

4. Screw the back housing screws in the following order: Upper left and right screws, center left and right screws and lower left and right screws.

5. Glue a new oval label over the holes of the two upper screws and a new tamper evident label on the holes of the two center screws.

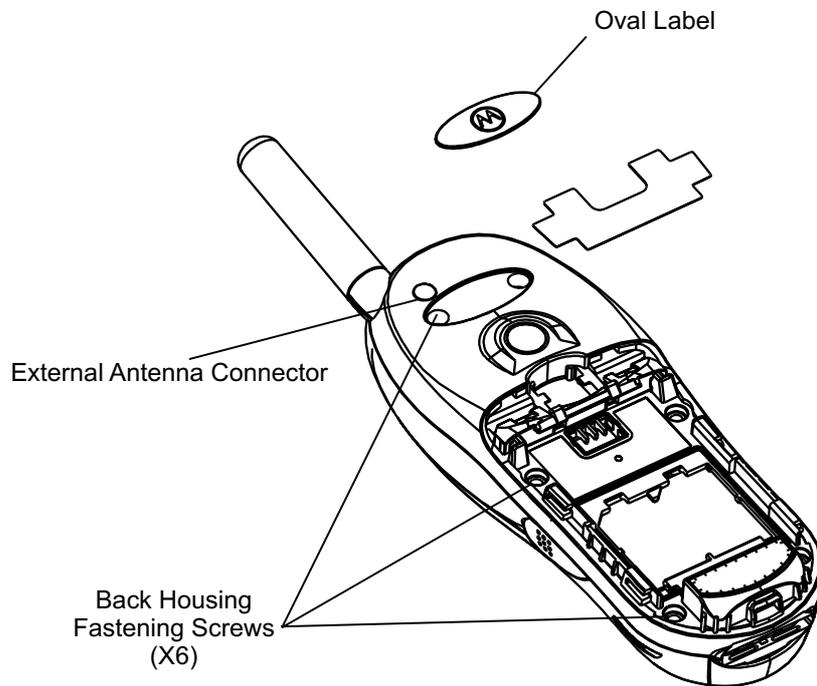6. Install the battery and the battery door, refer to "Removing and Installing Battery Door and Battery" on page 30.

Oval Label

External Antenna Connector

Back Housing
Fastening Screws
(X6)

Figure 4 Back Housing Removal and Installation

Removing and Installing the Main Board

Recommended tools: no tools are required

To remove the main board from the unit:

(See Figure 5)

1. Remove the back housing, refer to "Removing and Installing the Back Housing" on page 32.

2. Gently lift the main board, I/O connector side at the bottom of the board first, and remove it from the unit.

To install the main board:

1. Position the main board in location. Verify that the two guide pins are inserted into the holes in the main board.

2. Gently push the main board down and verify that the Board-to-Board connector is properly connected to the keypad board.

3. Verify that the I/O rubber seal is properly located in the unit.

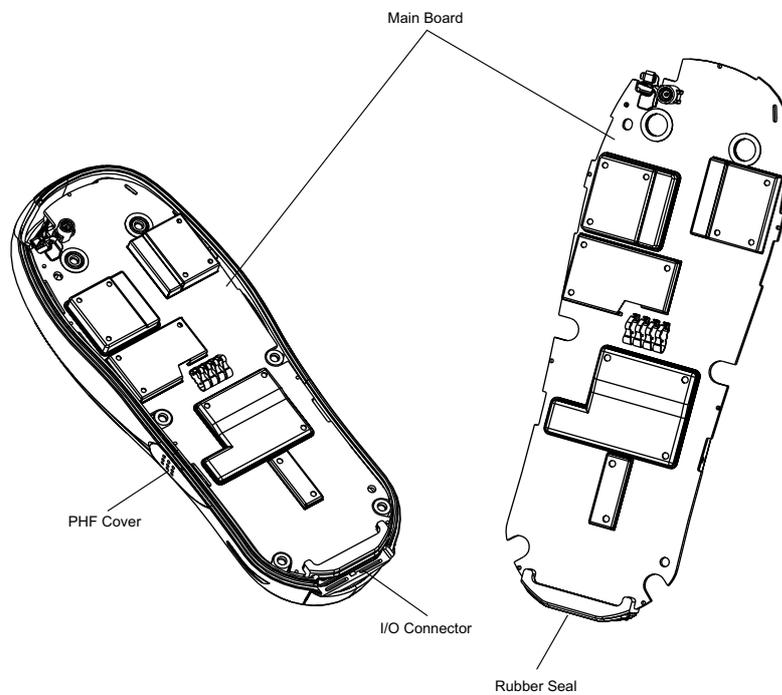4. Install the back housing, refer to "Removing and Installing the Back Housing" on page 32.

Main Board

PHF Cover

I/O Connector

Rubber Seal

Figure 5 Main Board Removal and Installation

Removing and Installing the Keypad and LCD Boards

Recommended tools: mini flat-tip screwdriver

To remove the keypad and LCD boards from the unit:

(See Figure 6)

1. Remove the back housing, refer to "Removing and Installing the Back Housing" on page 32.

2. Place the unit facing down on the work area.

3. Open the Personal Hands-Free Kit (PHF) jack cover (See Figure 5).

4. Using the screwdriver, remove the chassis assembly including the main board, keypad board and LCD board, out from the unit.

5. Place the chassis assembly, with the keypad and LCD boards facing down, on the work area.

6. Remove the main board from the chassis assembly.

7. Insert the screwdriver into one of the slots in the upper side of the chassis assembly, above the LCD board, and gently push the boards out from the chassis assembly.

8. According to the board to be replaced, open the required Zero Insertion Force (ZIF) connector, release the flat cable and the board.

To install the keypad and LCD boards:

1. Place the keypad and LCD boards on the work area so that the ZIF connectors are facing up.

    CAUTION: Care must be taken when installing the keypad and LCD boards on the chassis. Failure to comply may result in tear of the flat cable between the two boards.

2. Insert the flat cable into the ZIF connectors and close the connectors doors until a click is heard.

3. Insert the LCD board between the two snags at the sides of the chassis assembly.

4. Push the LCD board down until it snaps into location.

5. Verify that the chassis center guide pin is properly located inside the hole in the LCD board and that the snag at the top of the chassis is inserted into the slot of the board.

6. Install the keypad board on the chassis assembly.

7. Verify that the keypad board is sited parallel to the chassis assembly.

8. Verify that the main board is fully installed with the rubber seal.

9. Turn the chassis assembly up side down.

10. Install the main board on the chassis assembly. Verify that the two guide pins are inserted to the holes in the main board.

11. Verify that the guide pins are properly located and that the Board-to-Board connector is properly connected to the main board.

12. Install the chassis assembly with the boards into the unit. Verify that the I/O connector rubber seal is properly located in the unit.

13. Install the back housing, refer to "Removing and Installing the Back Housing" on page 32.
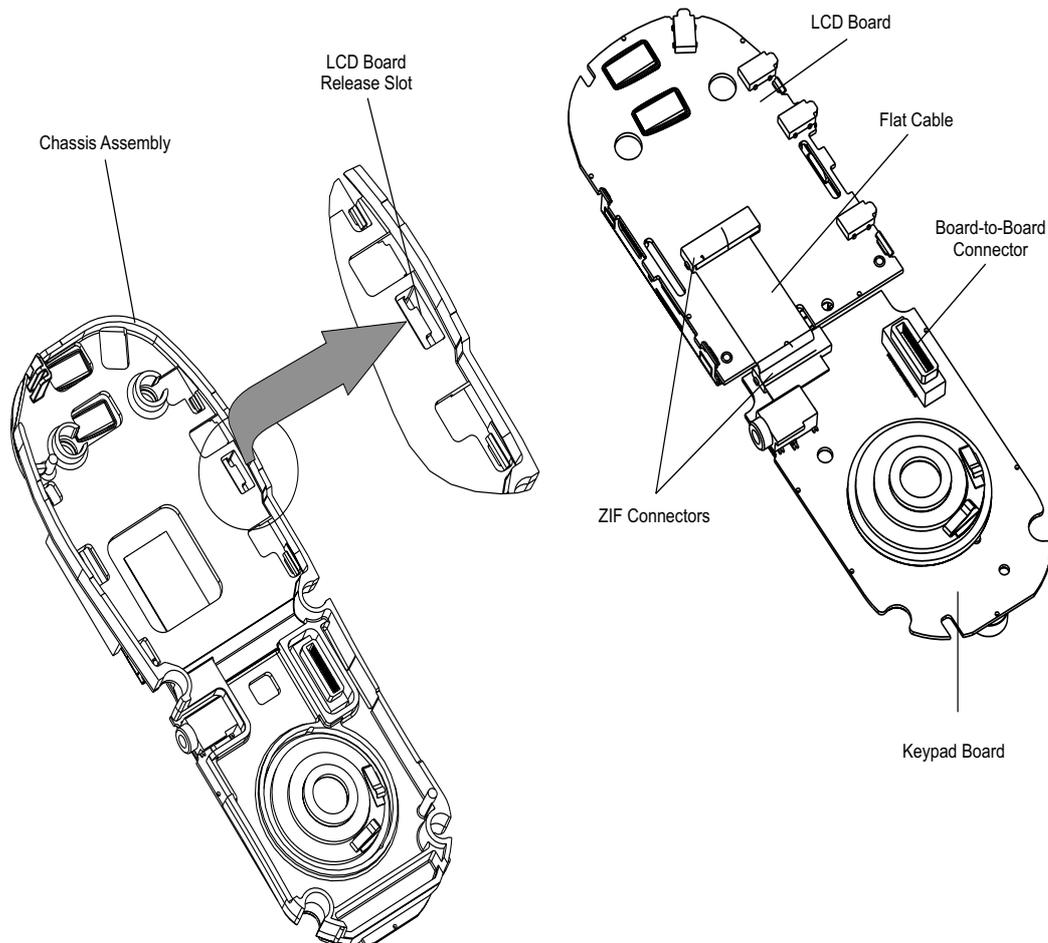
Figure 6 Keypad and LCD Boards Removal and Installation

Removing and Installing the LCD Module Assembly

Recommended tools: no tools are required

To remove the LCD module assembly:

(See Figure 7)

1. Remove the LCD board, refer to "Removing and Installing the Keypad and LCD Boards" on page 35.

Note: *Do not* touch the LCD module assembly in the active viewing area; fingerprints on this surface cannot be easily removed.

2. Using your hand, gently disengage the right two snaps and rotate the LCD module assembly to the left until it disengaged from the LCD board.

To install the LCD module assembly:

Note: *Do not* touch the LCD module assembly in the active viewing area; fingerprints on this surface cannot be easily removed.

1. Locate the LCD module above the LCD board so that the two guide pins are aligned with the holes in the LCD board.

2. Gently push the module down, right snaps first and then left snaps.

3. Verify that the snaps are located correctly inside the board slots.

4. Remove the protective film from the LCD glass. Verify that no damage exists on the LCD glass.

5. Install the LCD board, refer to "Removing and Installing the Keypad and LCD Boards" on page 35.
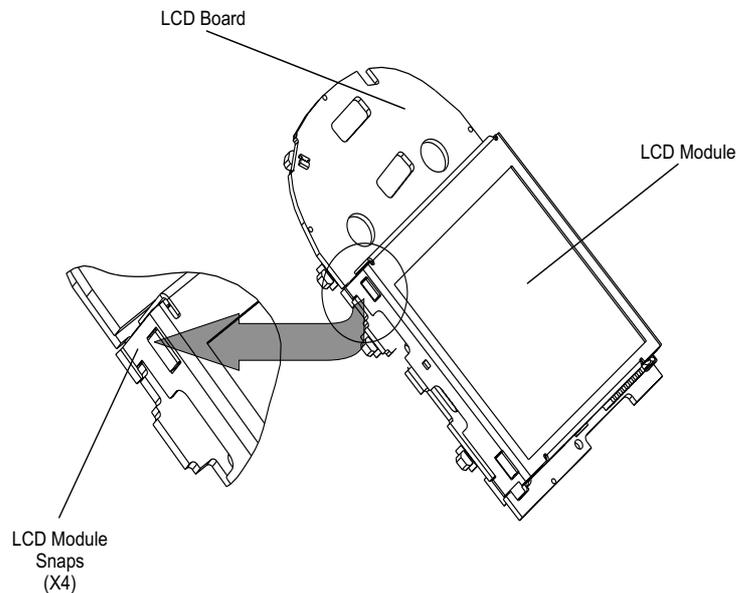
LCD Board

LCD Module

LCD Module
Snaps
(X4)

Figure 7 LCD Module Removal and Installation

Removing and Installing the Keypad

Recommended tools: no tools are required

To remove the keypad:

(See Figure 8)

1. Remove the chassis assembly, refer to "To remove the keypad and LCD boards from the unit:" on page 35, steps 1 through 3.

2. Remove the keypad from the unit.

To install the keypad:

1. Install the keypad inside the front housing.

2. Verify that all the keys are properly inserted into their dedicated holes.

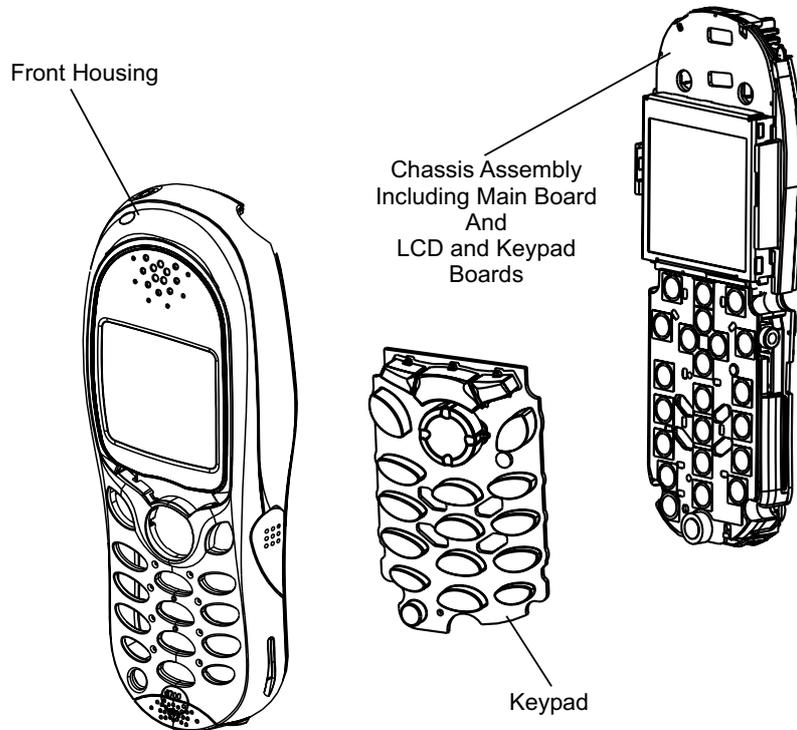3. Install the chassis assembly, refer to "To install the keypad and LCD boards:" on page 35, steps 1 and 2.

Front Housing

Chassis Assembly
Including Main Board
And
LCD and Keypad
Boards

Keypad

Figure 8 Keypad Removal and Installation

Removing and Installing the Microphone

Recommended tools: no tools are required

To remove the microphone from the unit:

(See Figure 9)

1. Remove the chassis assembly, refer to "To remove the keypad and LCD boards from the unit:" on page 35, steps 1 through 3.

2. Remove the microphone.

To install the microphone:

1. Insert a microphone into location.

2. Install the chassis assembly, refer to "To install the keypad and LCD boards:" on page 35, steps 1 and 2.

Removing and Installing the Earphone

Recommended tools: mini flat-tip screwdriver

To remove the earphone from the unit:

(See Figure 9)

1. Remove the chassis assembly, refer to "To remove the keypad and LCD boards from the unit:" on page 35, steps 1 through 3.

2. Using the screwdriver, remove the earphone from the unit. If the earphone was detached from its bottom plate, remove the plate as well.

To install the earphone:

1. Using the screwdriver, remove the protective film from the adhesive layer at the earphone bottom plate. Remove the Acoustic Safety Rubber.

2. Insert the earphone into location. Verify that the two snags at the earphone sides are properly located in their dedicated slots.

3. Gently push the earphone until it is firmly glued inside the front housing. Place the Acoustic Safety Rubber.

4. Install the chassis assembly, refer to "To install the keypad and LCD boards:" on page 35, steps 1 and 2.
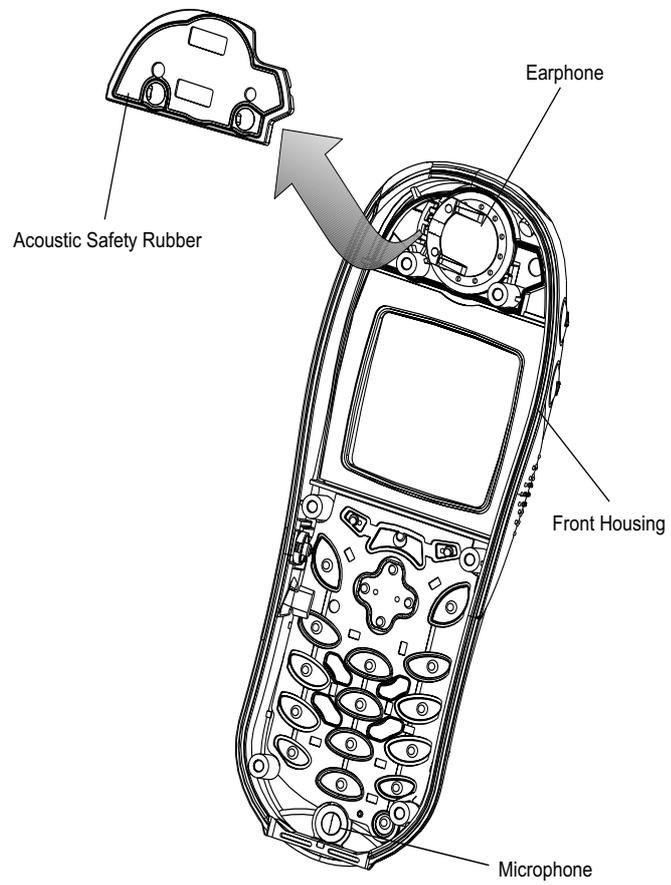
Figure 9 Microphone and Earphone Removal and Installation

MTH500 Unit - Exploded View

MTH500 components are listed in the table below. The first column marked with a # sign provides you with the call out numbers of the components as marked in Figure 10 and Figure 11.

MTH500 Components List

#	Description	Part/Kit
1	Front Housing Assembly (Black) Front Housing Assembly (Blue)	0186163T07 0186163T08
2	Keypad Assembly	0186630T01
3	Chassis Assembly	See Figure 10
4	Back Housing Assembly (Black) Back Housing Assembly (Blue)	0186396T04 0186396T05
5	Antenna 380-400 MHz (R1) Antenna 410-430 MHz (R2)	8586381J03 8586381J02
6	Screw, Self Forming	0304637P17
7	Label, Back	5486278T01
8	Standard Battery Door Assembly (Black) Standard Battery Door Assembly (Blue)	0186613T01 0186613T02
	Extended Battery Door Assembly (Black) Extended Battery Door Assembly (Blue)	0186239T01 0186239T02
9	LCD Module	7287702M01
10	Keypad Kit	FCN9090A
11	Flex LCD to Keypad	8486498T01
12	LCD Kit	FCN9797A
13	Chassis	2786168T01
14	Main Board (R1) Main Board (R2)	See Service Replacement Kit Matrix in Appendix A

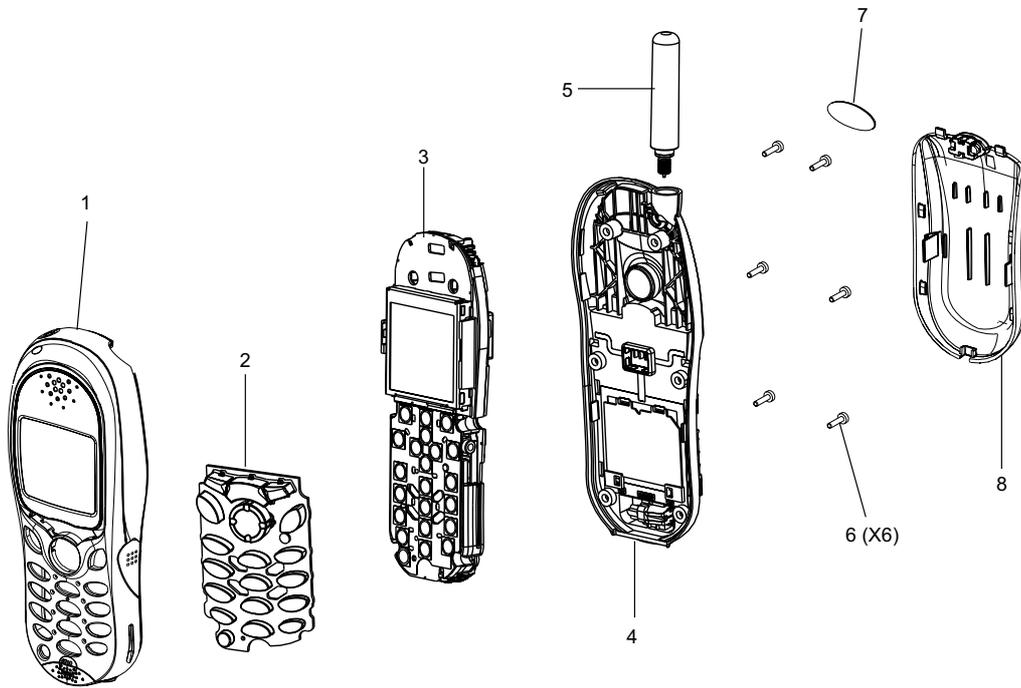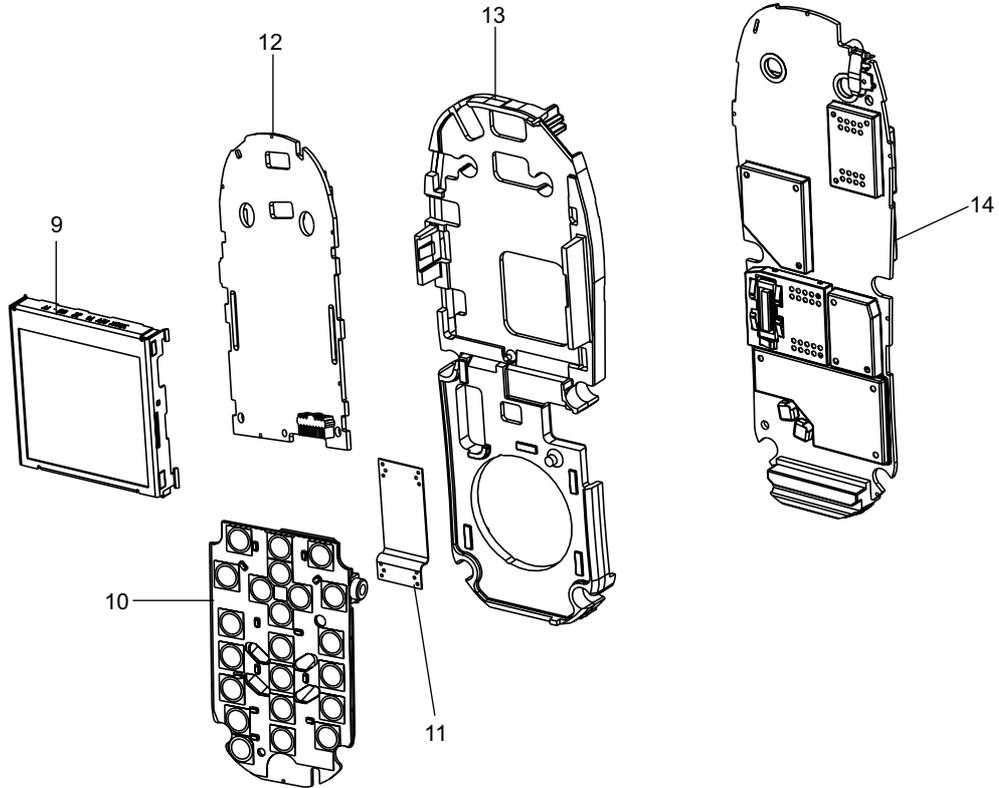Figure 10 Exploded View

Figure 11 Exploded View of Chassis Assembly

<div align="right">

APPENDIX A

REPLACEMENT PARTS AND KITS

</div>

Damaged parts should be replaced with identical replacement parts.

Replacement Parts

For complete information on ordering required parts and kits, contact your local customer service representative.

Level 3 Maintenance

EMEA Region

EMEA Radio Support Depots are level 3 service partners. The depots are capable of performing repairs down to component level where retuning is required. Contact your local CGISS office for information.

Motorola European Radio Support Centre ERSC Phone: +49 6128 702618
Heinrich Hertz Strasse 1
D-65232 Taunusstein
Germany

ERSC Customer Information Desk available through the following service number:

Austria:	06 60 75 41	Italy:	16 78 77 387
Belgium:	08 00 72 471	Luxemburg:	08 00 23 27
Denmark:	80 01 55 72	Netherlands:	60 22 45 13
Finland:	08 00 11 49 10	Norway:	80 01 11 15
France:	05 90 30 90	Portugal	05 05 49 35
Germany:	01 30 18 75 24	Spain:	90 09 84 902
Greece:	00 80 04 91 29 020	Sweden:	02 07 94 307
UK:	08 00 96 90 95	Switzerland:	1 55 30 82
Ireland	18 00 55 50 21	Iceland:	80 08 147
or dial	+49 6128 70 2618		

Please use these numbers for repair enquires only.

Latin America Region

Latin America Radio Support Centers
The Customer Support is available through the following service centers:

Warranty and Repairs:
Motorola De Colombia Service Center
Carrera 7 No. 71-52
Torre B piso 13
Oficina 1301
Bogota- Colombia
(571) 376-6990

Motorola De Mexico Service Center
Bosques de Alisos #125
Col. Bosques de las Lomas
CP 05120 Mexico DF
5252576700

Piece Parts:
To order parts in Latin America and the Carribean:
7:00 A.M. to 7:00 P.M. (Central Standard Time)
Monday through Friday (Chicago, USA)
1-847-538-8023

Technical Support:
https://businessonline.motorola.com, go to Contact Us to request technical support

Motorola Parts (Accessories and Aftermarket Division AAD):
Attention: Order Processing
1313 E. Algonquin Road
Schaumburg. IL. 60196

Parts Identification:
1-847-538-0021 (Voice)
1-847-538-8194 (Fax)

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 After market and Accessory Division (AAD). 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.

Radio Replacement Parts List

Part/Kit Number	MTH500 Model Description
0186163T07 0186163T08	Front Housing Assembly (Black) Front Housing Assembly (Blue)
0186630T01	Keypad Assembly
0186396T04 0186396T05	Back Housing Assembly (Black) Back Housing Assembly (Blue)
8586381J03 8586381J02	Antenna 380-400 MHz (R1) Antenna 410-430 MHz (R2)
0186613T01 0186613T02 0186239T01 0186239T02	Standard Battery Door Assembly (Black) Standard Battery Door Assembly (Blue) Extended Battery Door Assembly (Black) Extended Battery Door Assembly (Blue)
7287702M01	LCD Module
FCN9090A	Keypad Kit
FCN9797A	LCD Kit
(See Service Replacement Kit Matrix below)	Main Board (R1) Main Board (R2)

Accessories Replacement Parts List

Kit Number	MTH500 Model Description
Batteries	
FTN6030A	Extended battery, 1100mAh, LiIon, Black (with battery door)
FTN6037A	Extended battery, 1100mAh, LiIon, Blue (with battery door)
FTN6031A	Standard battery, 800mAh, LiIon, Black (with battery door)
FTN6038A	Standard battery, 800mAh, LiIon, Blue (with battery door)
Chargers	
FLN9468A	Dual Pocket Desktop Charger
SPN4716B	Travel charger
SYN7455A	Plug Adapter UK for travel Charger
SYN7456A	Plug Adapter EU for travel Charger
FLN9469A	Vehicular battery charger
Vehicular Adapters	
FLN2850A	Car Kit
FLN9569A	Stand alone car cradle
Audio accessories	
WADN4184A	Headset with Boom mic and in line PTT
FLN9470A	Headset with Boom mic (On Hold)
FLN9568A	PHF
Carrying Accessories	
FLN9476A	Soft leather carry case
FHN6246A	Belt clip
Others	
FKN4897A	Data cable

Recommended Programming Equipment

Name	Part Number
MTH500 CPS	PMVN4065B
Data Cable	FKN4897A

Service Replacement Kit Matrix (1)

Sales Model Description	Service Tanapa	Description
MTH500 Black 380-400 MHz PT811F	FUF1208AS	MTH500 Black S/T R1 CLEAR
	FUF1210AS	MTH500 Black S/T R1 TEA1
	FUF1211AS	MTH500 Black S/T R1 TEA2
MTH500 Blue 380-400 MHz PT811F	FUF1209AS	MTH500 Blue S/T R1 CLEAR
	FUF1212AS	MTH500 Blue S/T R1 TEA1
	FUF1213AS	MTH500 Blue S/T R1 TEA2
MTH500 Black 410-430 MHz PT511F	FUF1222AS	MTH500 Black S/T R2 CLEAR
	FUF1222AS	MTH500 Black S/T R2 TEA1
	FUF1225AS	MTH500 Black S/T R2 TEA2
MTH500 Blue 410-430 MHz PT511F	FUF1222AS	MTH500 Blue S/T R2 CLEAR
	FUF1226AS	MTH500 Blue S/T R2 TEA1
	FUF1227AS	MTH500 Blue S/T R2 TEA2

Note: All models listed in the Service Tanapa Column
are not field replaceable for Latin America

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