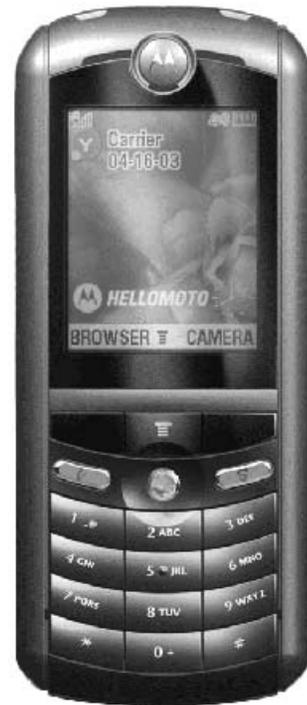




MOTOROLA

Level 1 and 2 Service Manual

E398/E399 GSM Tri-Band Wireless Telephone



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Introduction

Motorola® Inc. maintains a worldwide organization that is dedicated to provide responsive, full-service customer support. Motorola products are serviced by an international network of company-operated product-care centers as well as authorized independent service firms.

Available on a contract basis, Motorola Inc. offers comprehensive maintenance and installation programs that enable customers to meet requirements for reliable, continuous communications.

To learn more about the wide range of Motorola service programs, contact your local Motorola products representative or the nearest Customer Service Manager.

Product Identification

Motorola products are identified by the model number on the housing. Use the entire model number when inquiring about the product. Numbers are also assigned to chassis and kits. Use these numbers when requesting information or ordering replacement parts.

Product Names

Product names included in E398/E399 telephones are listed on the front cover. Product names are subject to change without notice. Some product names, as well as some frequency bands, are available only in certain markets.

Regulatory Agency Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause any harmful interference, and
- must accept interference received, including interference that may cause undesired operation.

This class B device also complies with all requirements of the Canadian Interference-Causing Equipment Regulations (ICES-003).

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Computer Program Copyrights

The Motorola products described in this manual may include Motorola computer programs stored in semiconductor memories or other media that are copyrighted with all rights reserved worldwide to Motorola. Laws in the United States and other countries preserve for Motorola, Inc. certain exclusive rights to the copyrighted computer programs, including the exclusive right to copy, reproduce, modify, decompile, disassemble, and reverse-engineer the Motorola computer programs in any manner or form without Motorola's prior written consent. Furthermore, the purchase of Motorola products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license or rights under the copyrights, patents, or patent applications of Motorola, except for a nonexclusive license to use the Motorola product and the Motorola computer programs with the Motorola product.

About this Service Manual

Using this service manual and the suggestions contained in it assures proper installation, operation, and maintenance of E398/E399 telephones. Refer questions about this manual to the nearest Customer Service Manager.

Audience

This manual aids service personnel in testing and repairing E398/E399 telephones. Service personnel should be familiar with electronic assembly, testing, and troubleshooting methods, and with the operation and use of associated test equipment.

Use of this manual assures proper installation, operation, and maintenance of Motorola products and equipment. It contains all service information required for the equipment described and is current as of the printing date.

Scope

The scope of this manual is to provide basic information relating to E398/E399 telephones, and provide procedures and processes for repairing the phones at Level 1 and 2 service centers including:

- Unit swap out
- Repairing of mechanical faults
- Basic modular troubleshooting
- Testing and verification of phone functionality
- Initiate warranty claims and send faulty modules to Level 3 or 4 repair centers

Conventions

Special characters and typefaces, listed and described below, are used in this manual to emphasize certain types of information.



Note: Emphasizes additional information pertinent to the subject matter.



Caution: Emphasizes information about actions that may result in equipment damage.



Warning: Emphasizes information about actions that may result in personal injury.



Keys to be pressed are represented graphically. For example, instead of “Press the Menu Key”, you will see “Press ”.

Information from a screen is shown in text as similar as possible to what appears in the display. For example, **ALERTS** or **ALERTS**.

Information that you need to type is printed in **boldface type**

Warranty Service Policy

This product is sold with the standard 12-month warranty terms and conditions. Accidental damage, misuse, and extended warranties offered by retailers are not supported under warranty. Non-warranty repairs are available at agreed fixed repair prices.

Out of Box Failure Policy

The standard out of box failure criteria applies. Customer phones that fail very early on after the date of sale, are to be returned to Manufacturing for root-cause analysis, to guard against epidemic criteria. Manufacturing will bear the costs of early life failure.

Product Support

Customer's original phone will be repaired but not refurbished as standard. Appointed Motorola Service Hubs will perform warranty and non-warranty field service for level 2 (assemblies) and level 3 (limited PCB component). The Motorola High Technology Centers will perform level 4 (full component) repairs.

Customer Support

Customer support is available through dedicated Call Centers and in-country help desks. Product Service training should be arranged through the local Motorola Support Center.

Parts Replacement

When ordering replacement parts or equipment, include the Motorola part number and description used in the service manual.

When the Motorola part number of a component is not known, use the product model number or other related major assembly along with a description of the related major assembly and of the component in question.

In the U.S.A., to contact Motorola, Inc. on your TTY, call: 800-793-7834

Accessories and Aftermarket Division (AAD)

Replacement parts, test equipment, and manuals can be ordered from AAD.

U.S.A.

Phone: 800-422-4210

FAX: 800-622-6210

Outside U.S.A.

Phone: 847-538-8023

FAX: 847-576-3023

To order spare parts in EMEA region call +49 461 803 1638.

To order spare parts in Asia region call +65 648 62995.

Specifications

General Function	Specification
Frequency Range GSM 850	824-848 MHz Tx 869-893 MHz Rx
Frequency Range GSM 900	880-915 MHz Tx (with EGSM) 925-960 MHz Rx
Frequency Range DCS 1800	1710-1785 MHz Tx 1805-1880 MHz Rx
Frequency Range PCS 1900	1850-1910 MHz Tx 1930-1990 MHz Rx
Channel Spacing	200 kHz
Channels	174 EGSM, 374 DCS, 374 PCS, carriers with 8 channels per carrier
Modulation	GMSK at BT = 0.3
Transmitter Phase Accuracy	5 Degrees RMS, 20 Degrees peak
Duplex Spacing	45 MHz GSM, 95 MHz DCS, 80 MHz PCS
Frequency Stability	± 0.10 ppm of the downlink frequency (Rx)
Operating Voltage	+3.0V dc to +4.2V dc (cell) +4.4V dc to +6.6V dc (external charger jack with 2.4 K ohm resistor)
Average Transmit Current	300 mA max
Average Stand-by Current	4.0 mA max (DRX2), 2.0 mA max (DRX9)
Dimensions	108mm x 46mm x 20.5mm (4.3 inches x 1.8 inches x 0.81 inches)
Size (Volume)	89 cc (5.4 in ³)
Weight	110 gm (3.9 oz) with cell
Temperature Range	-10° C to +55° C (+15° F to +130° F)
Battery Life, 800 mAh Li Ion Battery	Talk time 300-600 min., 240-360 min. with Bluetooth turned on. Standby time 215 Hrs., 210 Hrs. with Bluetooth turned on.
	All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted as a range from DRX=2 to DRX=9. Talk times are quoted as a range from DTX off to DTX on.

Transmitter Specification	
RF Power Output	33 dBm nominal GSM 900 30 dBm nominal GSM 1800 30 dBm nominal GSM 1900
Output Impedance	50 ohms nominal
Spurious Emissions	-36 dBm from 0.1 to 1 GHz, -30 dBm from 1 to 4 GHz

Receiver Specification	
Receive Sensitivity	-106 dBm GSM 900, -104 dBm GSM 1800, -104 dBm PCS
RX bit error rate (100k bits) Type II	< 2%
Channel Hop Time	500 microseconds

Receiver Specification	
Time to Camp	Approximately 5-10 seconds

Speech Coding Function	Specification
Speech Coding Type	Regular pulse excitation / linear predictive coding with long term prediction (RPE LPC with LTP)
Bit Rate	13.0 kbps
Frame Duration	20 ms
Block Length	260 bits
Classes	Class 1 bits = 182 bits; Class 2 bits = 78 bits
Bit Rate with FEC Encoding	22.8 kbps

Product Overview

Motorola E398/E399 mobile telephones feature global system for mobile communications (GSM) air interface, general packet radio service (GPRS) transport technology, and wireless application protocol (WAP) Internet browser. The mobile telephone uses a simplified icon and graphical-based user interface (UI) for easier operation, allow short message service (SMS) text messaging, and include clock, alarm, datebook, calculator, and caller profiling personal management tools. The E398/E399 is a tri band phone that allows roaming within the GSM 850 MHz, PCS 1900 MHz and digital cellular system (DCS) 1800 MHz bands, GSM 900 MHz, DCS 1800 MHz, and PCS 1900 MHz bands depending on the region and software flex.

These telephones support GPRS, SMS, and MMS, in addition to traditional circuit switched transport technologies. GPRS, where available, provides substantial increases in mobile data communications performance and the efficient use of radio spectrum. Data transmission rates for GSM networks can potentially increase from the current rate of 9.6 kbps up to a theoretical maximum of 171.2 kbps. An increased data rate is by no means the only benefit provided by GPRS. A key advantage is the provision of a permanent virtual connection to the network. This “always on” connection is possible because GPRS uses packet data transfer so that, for example, email can be downloaded in “background mode.” There is no need for the user to re-connect before requesting a service, eliminating connection set-up delays and adding convenience and immediacy to data services access. The “virtual” nature of this connection means that network resources are not consumed during periods when a user is not actually sending or receiving data.

The telephones are made of polycarbonate plastic. The display and speaker, as well as the 18-key keypad, transceiver printed circuit board (PCB), microphone, charger and headphone connectors, and power button are contained within the candy bar form-factor housing. The 800 mAh Lithium Ion (Li Ion) battery provides up to 220 minutes of talk time, 210 minutes with Bluetooth turned on and up to 600 hours of standby time¹, 360 hours with Bluetooth turned on. The phone accepts 3V and 1.8V mini subscriber identity module (SIM) cards which fit into the SIM holder under the rear housing cover. These telephones feature a 176 x 220 pixel 65K color TFT display and an integrated antenna.

Features

- Multi-Media Messaging (MMS)
- Integrated digital camera (VGA quality) w/ camera flash
- 22 KHz polyphonic speaker w/ 2003 Sound Engine, MP3, MIDI, and full music listening
- 3D Stereo Sound
- Removable memory
- Large, active color display (176 x 220, 65K TFT)
- Situational lighting (Side)
- Haptics Enhanced Games
- PIM functionality with Picture Caller ID
- Downloadable themes (ringers, images, sounds)
- MPEG4 Video Playback

1. All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted as a range from DRX=2 to DRX=9. Talk times are quoted as a range from DTX off to DTX on.

Personal Information Management

The E398/E399 telephone contains a built-in datebook with alarm reminders, message center, and a phonebook.

Other Features

Detailed descriptions of other features available for the E398/E399 wireless telephone are in the appropriate E398/E399 GSM User's Guide listed in the Related Publications section toward the end of this manual.

General Operation

Controls, Indicators, and Input/Output (I/O) Connectors

The E398/E399 telephones' controls are on the front of the device and on the keyboard as shown in Figure 1. Indicator icons are displayed on the LCD (see Figure 2).

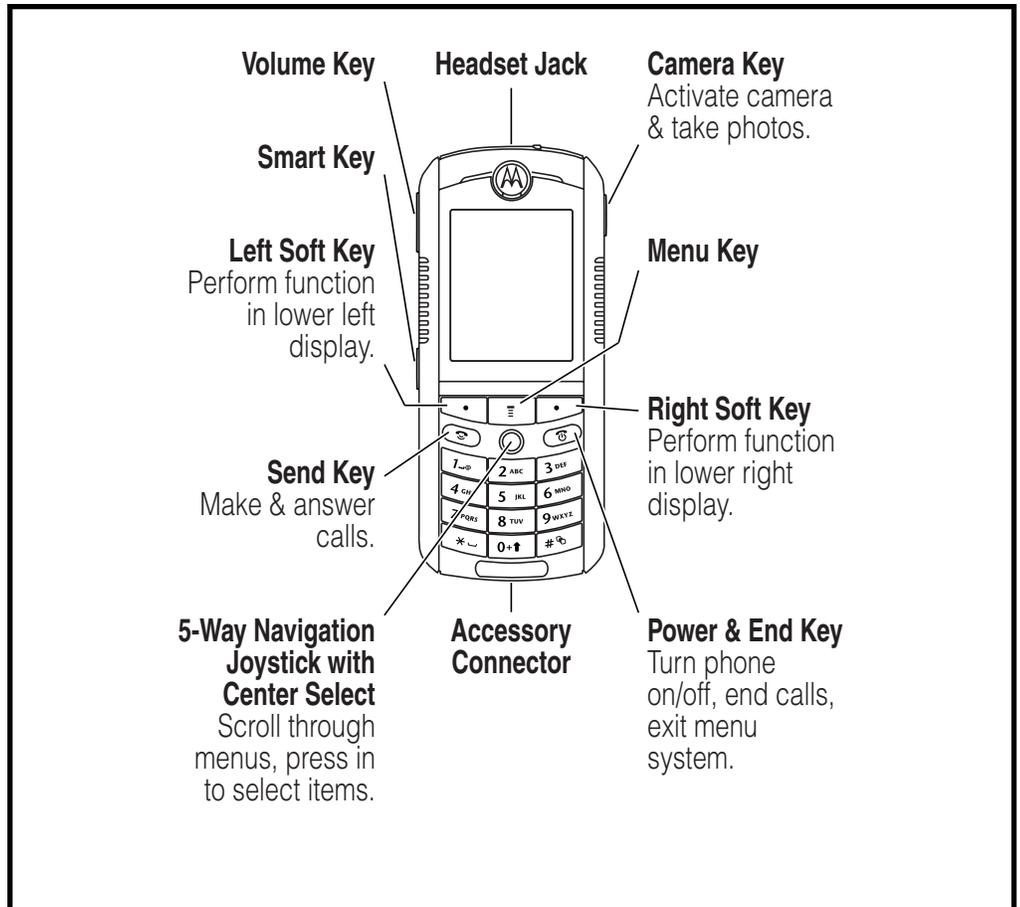


Figure 1. Controls and Indicators

Menu Navigation

E398/E399 telephones have a simplified icon and GUI. See Figure 3 for the E398/E399 menu structure. A scroll key allows you to move easily through menus.

Liquid Crystal Display (LCD)

The E398/E399 phone features a 176 x 220 color display offering 3 lines of text, 1 line of icons, and 1 line of prompts. The display provides constant graphical representations of battery capacity and signal strength, as well as the real-time clock.

Display animation makes the phone's icon menu move smoothly as you scroll up and down.



Whether a phone displays all indicators depends on the programming and services to which the user subscribes.

Figure 2 shows common icons displayed on the LCD.

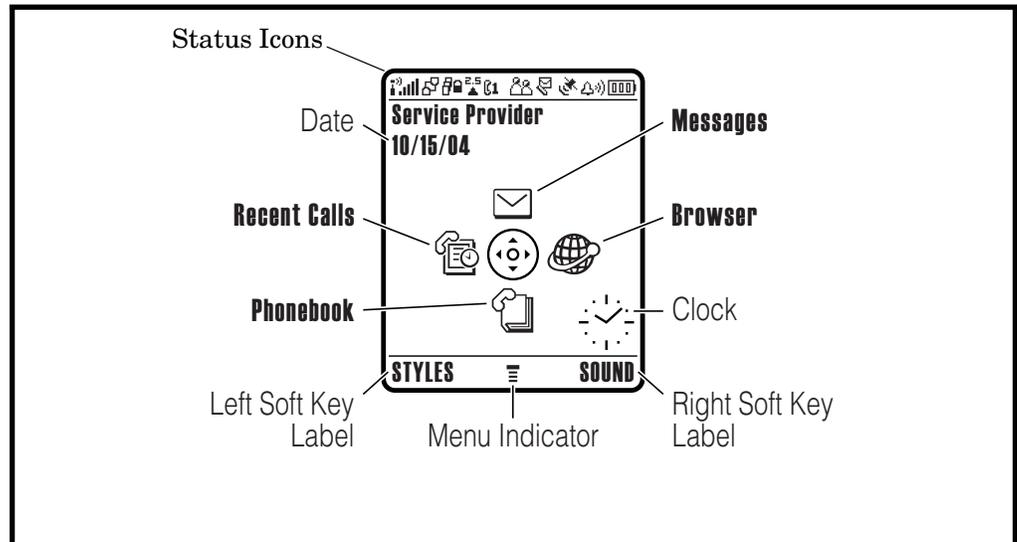


Figure 2. E398/E399 Display Idle Screen

1. **Status Icons** show the status of your phone.
2. **Real-Time Clock** shows the current time.
3. **Date** shows the current date.
4. **Soft Key Labels** provide selectable options in screen display.

User Interface Menu Structure

Figure 3 shows the E398/E399 telephone menu structure.

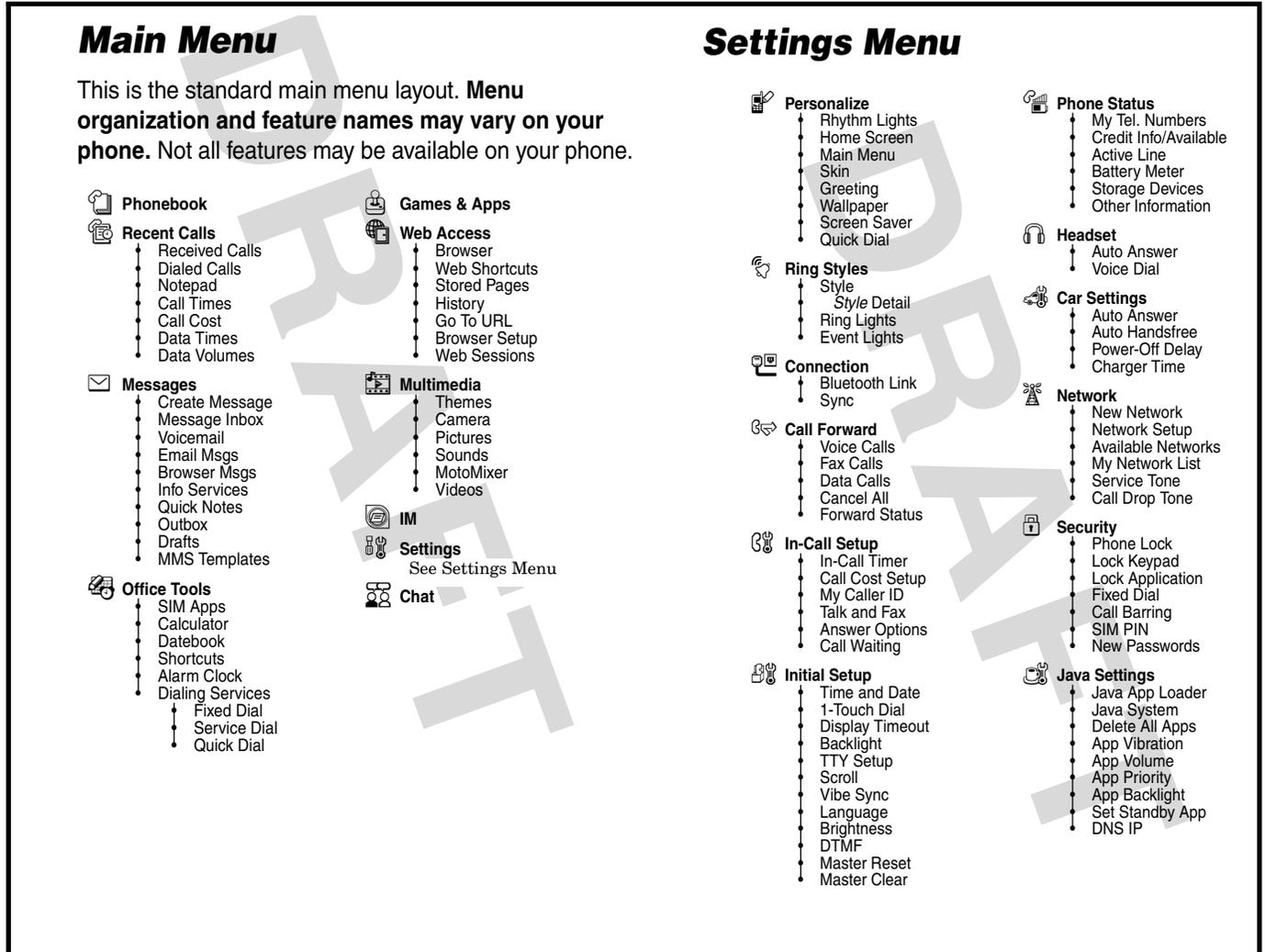


Figure 3. E398/E399 Menu Structure

Alert Settings

Motorola E398/E399 phones incorporate the VibraCall[®] discreet vibrating alert that helps to avoid disturbing others when a ringing phone is unacceptable.

Alerts can be set to ring only, vibrate only, vibrate then ring, or no ring or vibrate.

Battery Function

Battery Charge Indicator

The telephone displays a battery charge indicator icon in the idle screen to indicate the battery charge level. The gauge shows 4 levels: 100%, 66%, 33%, and Low Battery.

Battery Removal

Removing the battery causes the phone to shut down immediately and lose any pending work. For example, (partially entered phonebook entries or outgoing messages).



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 when handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.



If the battery is removed while receiving a message, the message is lost.



To ensure proper memory retention, turn the phone OFF before removing the battery. Immediately replace the old battery with a fresh battery.

Operation

For detailed operating instructions, refer to the appropriate User's Guide listed in the Related Publications section toward the end of this manual.

Tools and Test Equipment

Table 1 lists the tools and test equipment used on E398/E399 telephones. Use either the listed items or equivalents.

Table 1. General Test Equipment and Tools

Motorola Part Number ¹	Description	Application
See Table 6.	Charger	Used to charge battery and power phone.
0180386A82	Antistatic Mat Kit (includes 66-80387A95 antistatic mat, 66-80334B36 ground cord, and 42-80385A59 wrist band)	Provides protection from damage to phone caused by electrostatic discharge (ESD).
6680388B67	Disassembly Tool, plastic with flat and pointed ends (manual opening tool)	Used during assembly/disassembly.
6680388B01	Tweezers, plastic	Used during assembly/disassembly.
RSX4043-A	Torque Driver	Used to remove and replace screws.
—	Torque Driver Bit T-6 Plus, Apex 440-6IP Torx Plus or equivalent	Used with torque driver.
HP34401A ²	Digital Multimeter	Used to measure battery voltage.

1. To order in North America, contact Motorola Aftermarket and Accessories Division (AAD) by phone at (800) 422-4210 or FAX (800) 622-6210; Internationally, you can reach AAD by phone at (847) 538-8023 FAX (847) 576-3023.

2. Not available from Motorola. To order, contact Hewlett Packard at (800) 452-4844.

Disassembly

This section describes how to disassemble a E398/E399 telephone. Tools and equipment used are listed in Table 1.



Many of the integrated devices used in this phone are vulnerable to damage from ESD. Ensure adequate static protection is in place when handling, shipping, and servicing any internal components.



Avoid stressing the plastic in any way to avoid damage to either the plastic or internal components.

Removing and Replacing the Battery Cover

1. Ensure the phone is turned off.
2. Press down on the battery cover latch on the bottom of the phone, and gently slide the battery cover back away from the phone and lift it off (see Figure 4).



Figure 4. Removing the Battery Cover

3. To replace, align the battery cover with the rear housing.
4. Place the battery cover on the rear housing and gently slide the battery cover up into position until it snaps into place.

Removing and Replacing the Battery

1. Remove the battery cover as described in the procedures.
2. Lift the top end of the battery as indicated by the arrow in Figure 5.
3. Lift the battery up and out of the battery compartment.



Figure 5. Removing and Replacing the Battery



There is a danger of explosion if the Lithium-Ion battery is replaced incorrectly. Replace only with the same type of battery or equivalent as recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.

4. To replace, insert the bottom of the battery into the battery compartment with contacts facing downward.
5. Press the top of the battery into the battery compartment.
6. Replace the battery cover as described in the procedures.

Removing and Replacing the SIM Card

1. Remove the battery cover as described in the procedures.
2. Lift the top end of the battery as indicated by the arrow in Figure 6.
3. Lift the battery up and out of the battery compartment.
4. Lift up the SIM card holder and slide the SIM card out

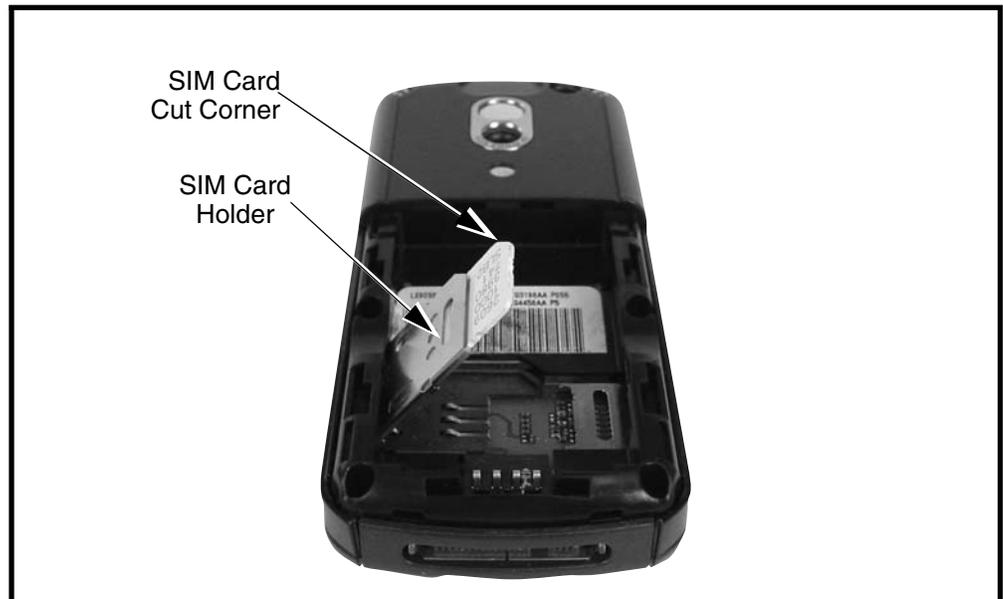


Figure 6. Removing and Replacing the SIM Card

5. To replace, slide the SIM card into the SIM card holder with the "cut" corner located as shown and press the SIM card holder back down into the battery compartment.
6. Insert the bottom of the battery into the battery compartment with contacts facing downward.
7. Press the top of the battery into the battery compartment.
8. Replace the battery cover as described in the procedures.

Removing and Replacing the Rear Housing

1. Remove the battery cover, battery, as described in the procedures.
2. Using a Torx® driver with a T-6 bit, remove the 6 screws from the rear housing (see Figure 7).
3. Carefully separate the rear housing from the front housing by starting at the top and lifting the rear housing up and away from the front housing to remove.

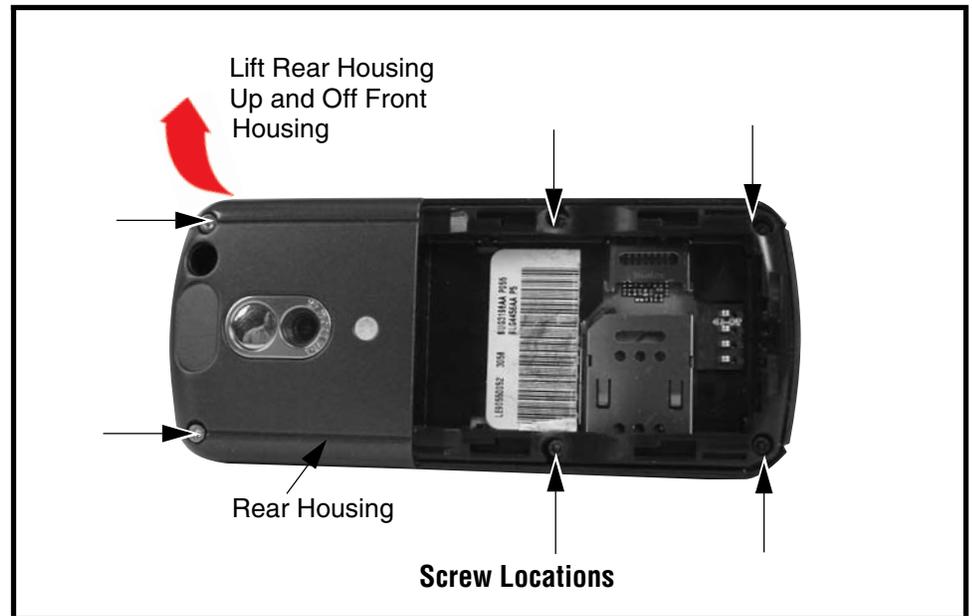


Figure 7. Removing and Replacing the Rear Housing

4. To replace, insert the bottom of the rear housing into the front housing and gently press together.
5. Insert and torque the 6 screws to 2.6 in. pounds.
6. Replace the battery, and battery cover as described in the procedures.

Removing and Replacing the Transceiver PC Board

1. Remove the battery cover, battery, and rear housing as described in the procedures.



This product contains static-sensitive devices. Use anti-static handling procedures to prevent ESD and component damage.

2. Insert the flat end of the disassembly tool between the front housing and the transceiver PC board as shown in Figure 8.

3. At the top of the front housing, gently pry up and lift the transceiver PC board out of the front housing.

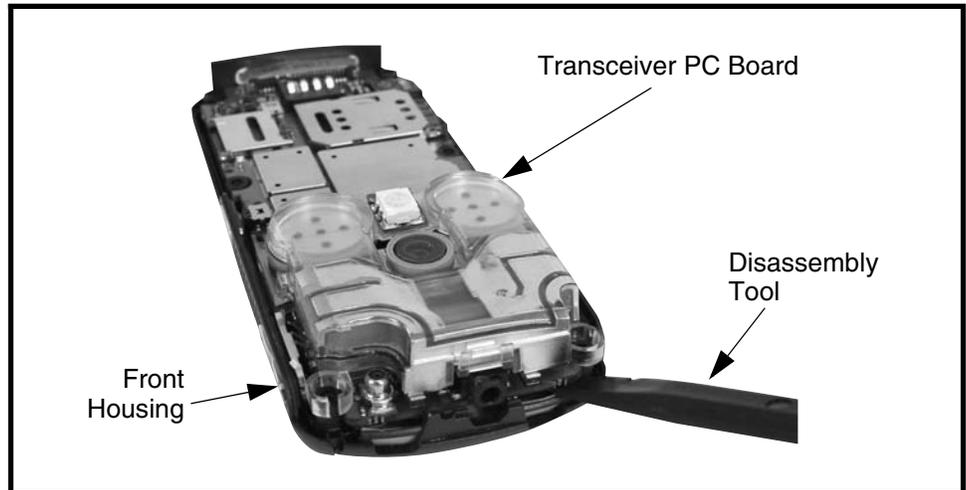


Figure 8. Removing and Replacing the Transceiver PC Board

4. To replace, insert the bottom of the circuit board into the bottom of the front housing (display side down) and gently press the top of the circuit board into the front housing.
5. Replace the rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Keyboard

1. Remove the battery cover, battery, rear housing, and transceiver PC board, as described in the procedures.
2. Using the disassembly tool, gently pry up the keyboard disconnecting it from the transceiver PC board as shown in Figure 9.

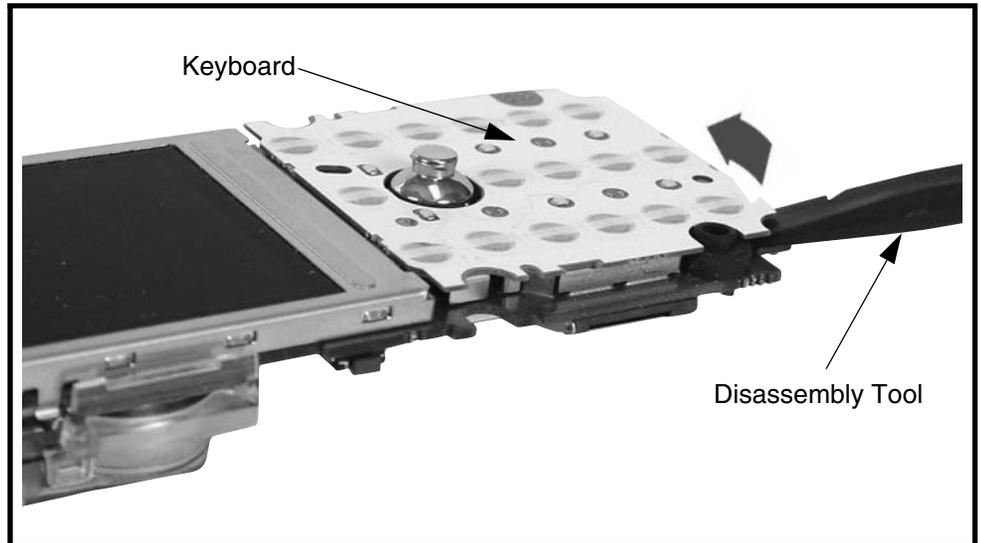


Figure 9. Removing and Replacing the Keyboard

3. To replace, align the keyboard connector of the keyboard with the keyboard connector on the transceiver board and press it into place.
4. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Microphone

1. Remove the battery cover, battery, rear housing, transceiver PC board and the keyboard, as described in the procedures.
2. Use the disassembly tool or plastic tweezers unplug the keyboard assembly from the transceiver PC board.
3. Use plastic tweezers remove the microphone grommet.
4. Use the plastic tweezers to unplug the microphone from the transceiver board as shown in Figure 10.

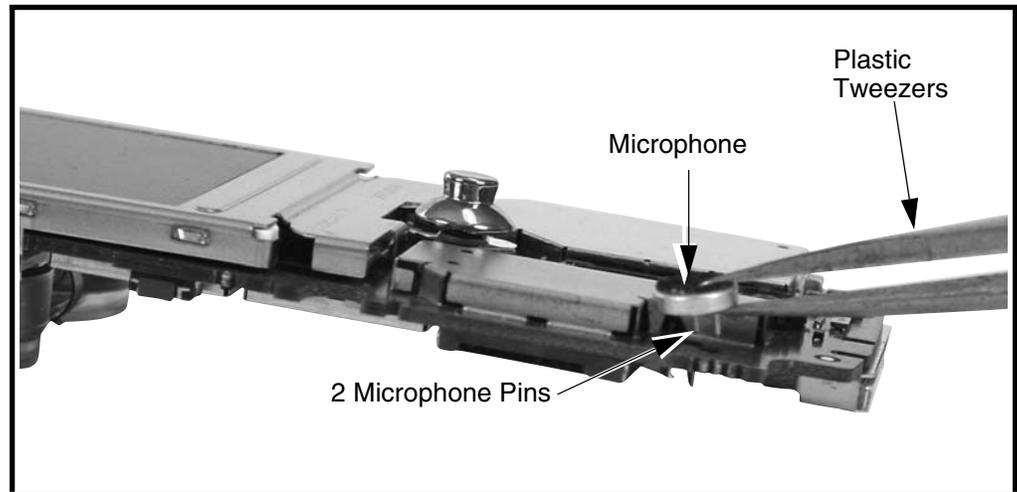


Figure 10. Removing and Replacing the Microphone

5. To replace, align the 2 microphone pins into the microphone contact holes. Press the microphone firmly in place.
6. Replace the microphone grommet over the microphone.
7. Replace the keyboard assembly on the transceiver PC board and press firmly in place.
8. Replace the transceiver PC board in the front housing, replace the rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Speaker

1. Remove the battery cover, battery, rear housing, and circuit board as described in the procedures.
2. Use the disassembly tool or plastic tweezers to release the speaker from the front housing as shown in Figure 11. The speaker should come away easily.

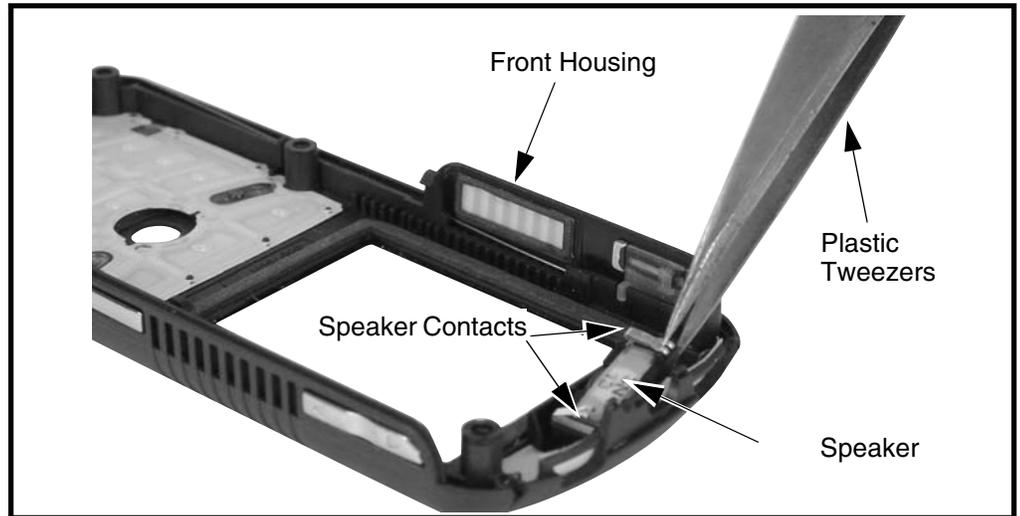


Figure 11. Removing and Replacing the Speaker

3. To replace, align the speaker with its socket with the speaker contacts facing as shown.
4. Gently press the speaker into place.
5. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Keypad

1. Remove the battery cover, battery, rear housing, and transceiver PC board, as described in the procedures.
2. Lift the keypad up from one corner as shown in Figure 12 and remove it from the front housing.

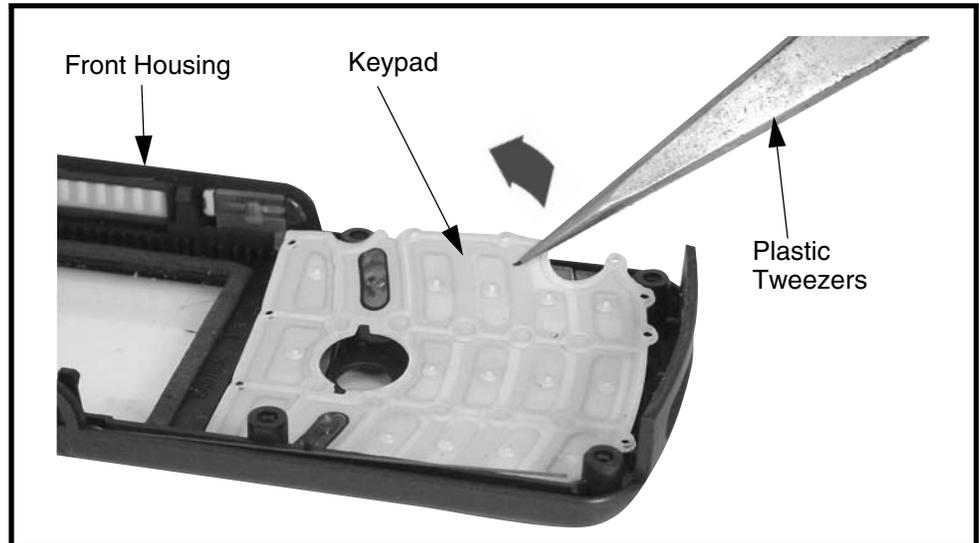


Figure 12. Removing and Replacing the Keypad

3. To replace, align the keypad with the front housing and press it into place.
4. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Volume Switch Dome

1. Remove the battery cover, battery, rear housing, and transceiver PC board, as described in the procedures.
2. Lift the switch domes out from the front housing as shown in Figure 13.

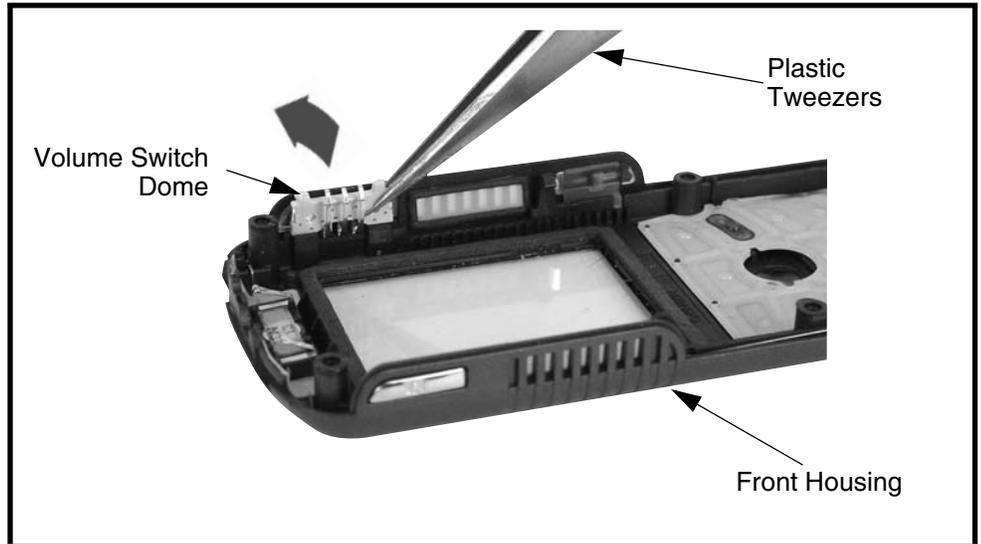


Figure 13. Removing and Replacing the Volume Switch Dome

3. To replace, insert the volume switch dome into the proper location in the front housing.
4. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Display

1. Remove the battery cover, battery, rear housing, and transceiver PC board as described in the procedures.
2. Using the disassembly tool, gently pry up the display and lift it up from the transceiver PC board as shown in Figure 14.
3. Using the disassembly tool, gently pry up the display flex connector from the transceiver PC board.

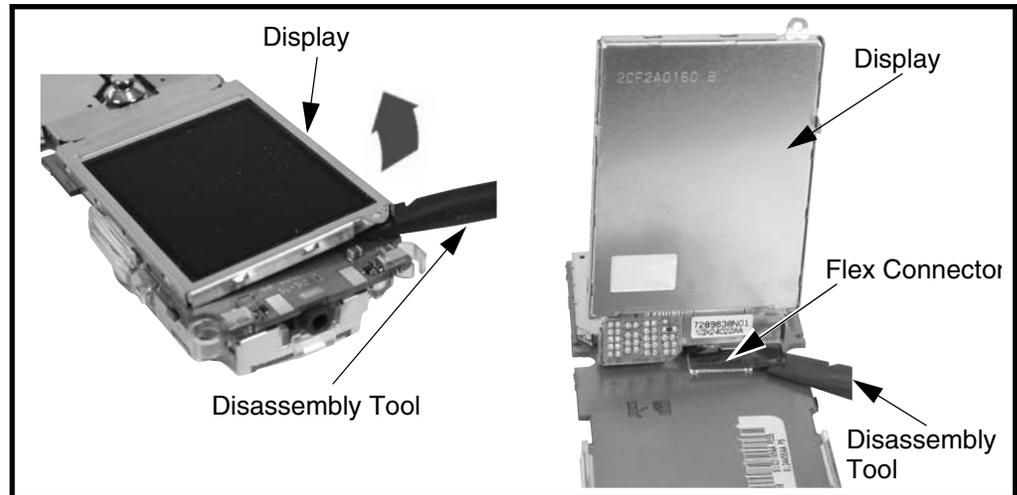


Figure 14. Removing and Replacing the Display

4. To replace, place the display flex connector on the transceiver PC board display connector and press it into place.
5. Lay the display on the transceiver PC board and gently press it into place.
6. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the MFT Chamber Assembly and Camera

1. Remove the battery cover, battery, rear housing, and transceiver PC board as described in the procedures.
2. Disengage the two plastic MFT Chamber assembly side connectors from the transceiver PC board and lift up the MFT Chamber assembly as shown in Figure 15.
3. Using the disassembly tool, gently pry up the camera flex connector from the transceiver PC board.

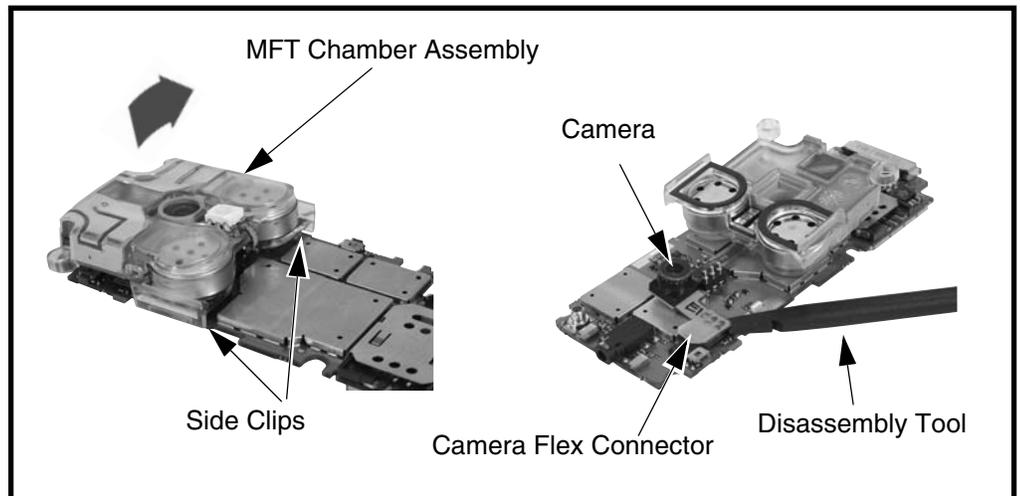


Figure 15. Removing and Replacing the MFT Chamber Assembly

4. To replace, place the camera flex connector on the transceiver PC board camera connector and press it into place.
5. Fold over the MFT Chamber assembly, aligning the camera with the camera hole in the MFT Chamber and press into place engaging the two plastic side clips on to the transceiver PC board.
6. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Removing and Replacing the Camera From MFT Chamber Assembly

1. Remove the battery cover, battery, rear housing, and transceiver PC board as described in the procedures.
2. Disengage the two plastic MFT Chamber assembly side connectors from the transceiver PC board and lift up the MFT Chamber assembly.
3. Using the disassembly tool, gently pry up the camera flex connector from the transceiver PC board.
4. Using plastic tweezers, gently pry the connection between the camera flex and the MFT Chamber assembly separating the adhesive.

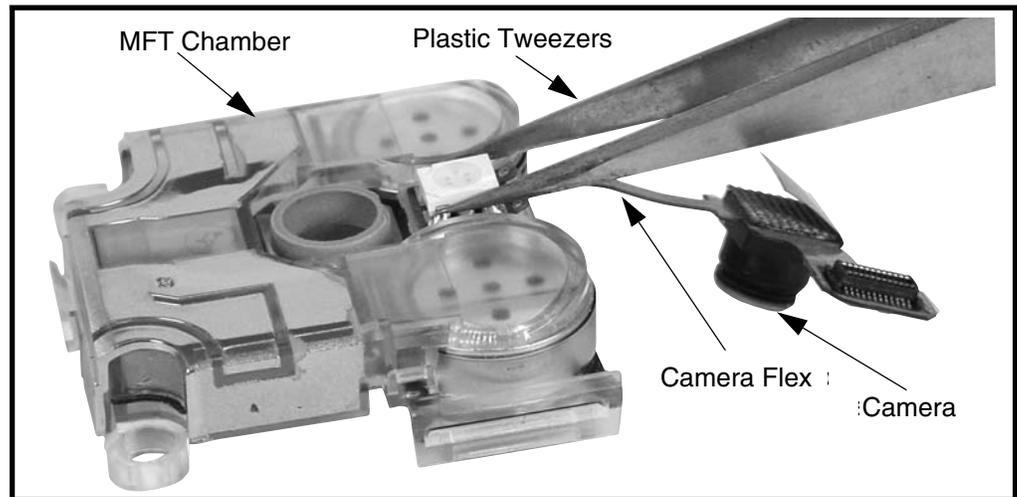


Figure 16. Removing and Replacing the Camera From the MFT Chamber Assembly

5. To replace, press the MFT Chamber side of the camera flex connector onto the MFT Chamber assembly.
6. Place the camera flex connector on the transceiver PC board camera connector and press it into place.
7. Fold over the MFT Chamber assembly, aligning the camera with the camera hole in the MFT Chamber and press into place engaging the two plastic side connectors on to the transceiver PC board.
8. Replace the transceiver PC board, rear housing, battery, and battery cover as described in the procedures.

Subscriber Identity Module (SIM) and Identification Label

SIM

A SIM is required to access the existing local GSM network, or remote networks when traveling (if a roaming agreement has been made with the provider).

The SIM card contains:

- All the data necessary to access GSM services
- The ability to store user information such as phone numbers
- All information required by the network provider to provide access to the network

Identification

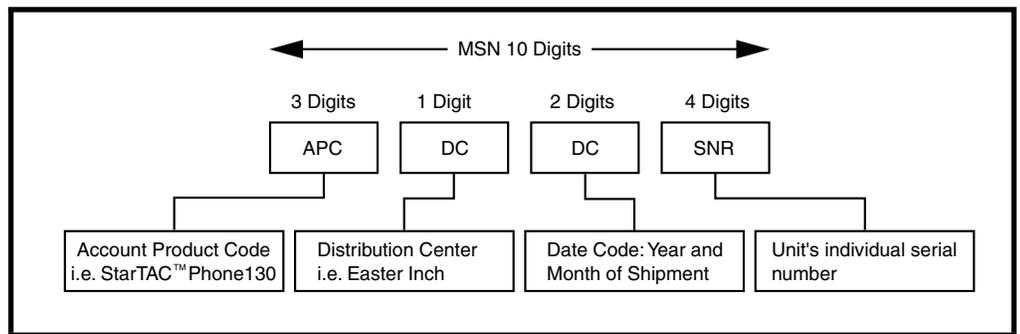
Each Motorola GSM phone is labeled with a variety of identifying numbers. The following information describes the current identifying labels.

Mechanical Serial Number (MSN)

The MSN is an individual unit identity number and remains with the unit throughout its life.

The MSN can be used to log and track a phone on Motorola's Service Center Database.

The MSN is divided into 4 sections as shown in Figure 17.



000807a

Figure 17. MSN label breakdown

International Mobile Station Equipment Identity (IMEI)

The International Mobile station Equipment Identity (IMEI) number is an individual number unique to the PCB and is stored within the unit's memory.

The IMEI uniquely identifies an individual mobile station and thereby provides a means for controlling access to GSM networks based on mobile station types or individual units. The full IMEI structure is listed in Table 2.

Table 2. IMEI Number Breakdown

TAC	Serial Number	Check Digit
NNXXXX YY	ZZZZZZ	A

Where

TAC Type Allocation Code, formerly known as Type Approval Code

NN Reporting body identifier

XXXX Type Identifier

YY YY is set to 00 from 01/01/2003 until 31/03/2004

ZZZZZZ Individual unit serial number

A Phase 1 = 0.

Phase 2 = check digit defined as a function of all other IMEI digits

Other label number configurations present are:

- **TRANSCEIVER NUMBER:** Identifies the product type. Normally the SWF number. (i.e. V100).
- **PACKAGE NUMBER:** Identifies the equipment type, mode, and language in which the product is shipped.

Troubleshooting

Manual Test Mode

Motorola E398/E399 telephones are equipped with a manual test mode capability. This allows service personnel to verify functionality and perform fault isolation by entering keypad commands.

To enter the manual test command mode, a GSM/DCS test SIM must be used.

1. Turn the phone OFF.
2. Remove the battery as described in the procedures.
3. Remove the customer's SIM card from the phone as described in the procedures.
4. Insert the test SIM into the SIM slot.
5. Replace the battery as described in the procedures.
6. Turn the phone ON.

Manual Test Mode Commands

Table 3. Manual Test Commands

Key Sequence	Test Function/Name	Remarks
<Menu>048263*	Enter manual test mode	
"End" Key	Exit manual test mode	
54*	Suspend	Required for all Test Mode Operations
0*0*0	Select tone 0	
0*0*1	Select tone 1	
0*0*2	Select tone 2	
0*0*3	Select tone 3	
0*0*4	Select tone 4	
0*0*5	Select tone 5	
0*0*6	Select tone 6	
0*0*7	Select tone 7	
0*0*8	Select tone 8	
0*0*9	Select tone 9	
0*1*X	Disable tone X	
3*0*1	Enable vibrator	
3*0*0	Disable vibrator	
5*0*0	Set audio level 0	
5*0*1	Set audio level 1	
5*0*2	Set audio level 2	
5*0*3	Set audio level 3	
5*0*4	Set audio level 4	
5*0*5	Set audio level 5	
5*0*6	Set audio level 6	
5*0*7	Set audio level 7	

Table 3. Manual Test Commands (Continued)

Key Sequence	Test Function/Name	Remarks
5*0*8	Set audio level 8	
5*0*9	Set audio level 9	
5*0*10	Set audio level 10	
5*0*11	Set audio level 11	
5*0*12	Set audio level 12	
5*0*13	Set audio level 13	
5*0*14	Set audio level 14	
5*0*15	Set audio level 15	
6*2*2*0*0	Set Audio Path. Int Mic, IntSpk, RX unmute, TX unmute	
6*4*6*0*0	Set Audio Path. Boom Mic, Boom Spk, RX unmute, TX unmute	
10*0*3	Set band GSM 900	
10*0*4	Set band DCS 1800	
10*0*5	Set band PCS 1900	
10*0*6	Set dual band GSM 900/1800	
10*1*0	Read band	3= GSM 4= DCS 5= PCS 6 =GSM/DCS
18*0	Initialize non-volatile memory (Master Reset)	
18*1	Initialize non-volatile memory (Master Clear)	
55*2*001	Test Display. All pixels ON	
55*2*000	Test Display. All pixels OFF	
55*2*002	Test Display. Checkerboard pattern A	
55*2*003	Test Display. Checkerboard pattern B	
55*2*004	Test Display. Border pixels ON	
*#06#	IMEI Check	No Test Mode Required
Phone Set up --> Phone Status --> Other Information	Flex Version/Technology/S-W Version/Readiness Status	No Test Mode Required

Troubleshooting Chart

Table 4. E389/E399 Telephone: Level 1 and 2 Troubleshooting Chart

Symptom	Probable Cause	Verification and Remedy
1. Telephone will not turn on or stay on.	a) Battery either discharged or defective.	Measure battery voltage across a 50 ohm (>1 Watt) load. If battery voltage is <3.25 Vdc, recharge the battery using the appropriate battery charger. If battery will not recharge, replace the battery. If battery is not at fault, proceed to b.
	b) Battery terminals open or misaligned.	Visually inspect battery terminals on both the battery and the telephone. Realign and, if necessary, either replace the battery or refer to a Level 3 Service Center for battery connector replacement. If battery terminals are not at fault, proceed to c.
	c) Transceiver board defective.	Remove the transceiver board assembly. Substitute a known good transceiver board and temporarily reassemble the phone. Press the Power/End key; if phone turns on and stays on, disconnect the dc power source and reassemble the phone with the new transceiver board. Verify that the fault has been cleared.
2. Telephone exhibits poor reception or erratic operation such as calls frequently dropping or weak or distorted audio.	a) Antenna defective.	Check connection between the antenna and the transceiver board. If the connection is OK, substitute a known good antenna. If the fault is still present, proceed to b.
	b) Transceiver board defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board.
3. Display is erratic, or provides partial or no display.	a) Transceiver board connections faulty.	Check general condition of flexible printed cable (flex). If the flex is good, check that the flex connector is fully seated. If not, check connector to transceiver board connections. If faulty connector, replace the transceiver board assembly. If connector is not at fault, proceed to b.
	b) Display assembly defective.	Temporarily replace the display assembly with a known good assembly. If fault has been cleared, reassemble with the new display assembly. If fault not cleared, proceed to c.
	c) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
4. Incoming call alert transducer audio distorted or volume is too low.	a) Speaker assembly defective	Temporarily replace the speaker assembly with a known good assembly. If fault has been cleared, reassemble with the new speaker assembly. If fault not cleared, proceed to
	b) Faulty transceiver board assembly.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
5. Telephone transmit audio is weak. (usually indicated by called parties complaining of difficulty in hearing voice).	a) Microphone defective.	Replace the microphone as described in the procedures. If fault is not cleared, proceed to b.

Table 4. E389/E399 Telephone: Level 1 and 2 Troubleshooting Chart (Continued)

Symptom	Probable Cause	Verification and Remedy
	b) Transceiver board defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board.
6. Receive audio from earpiece speaker is weak or distorted.	a) Connections to or from transceiver board defective.	Check connection from the earpiece to the transceiver board. If connection is not at fault, proceed to b.
	b) Earpiece speaker defective.	Temporarily replace the speaker with a known good speaker. Ensure good connection. Place a call and verify improvement in earpiece audio. If fault is cleared, reassemble the phone with the good transceiver board. If fault is not cleared, proceed to c.
	c) Transceiver board defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board.
7. Vibrator feature not functioning.	a) Speaker Module defective	Replace Speaker Module. If the fault has not been cleared, proceed to b.
	b) Transceiver board defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board.
8. Internal Charger not working.	Faulty charger circuit on transceiver board.	Test a selection of batteries in the rear pocket of the desktop charger. Check LED display for the charging indications. If these are charging properly, then the internal charger is at fault. Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board assembly.
9. No or weak audio when using headset.	a) Headset plug not pushed in fully.	Ensure the headset plug is fully seated in the jack.
	b) Faulty jack on transceiver board.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the phone with the new transceiver board.

Programming: Software Upgrade and Flexing

Contact your local technical support engineer for information about equipment and procedures for flashing and flexing.

Part Numbers

The following section provides a reference for the parts associated with E398/E399 telephones.

Exploded View Diagram

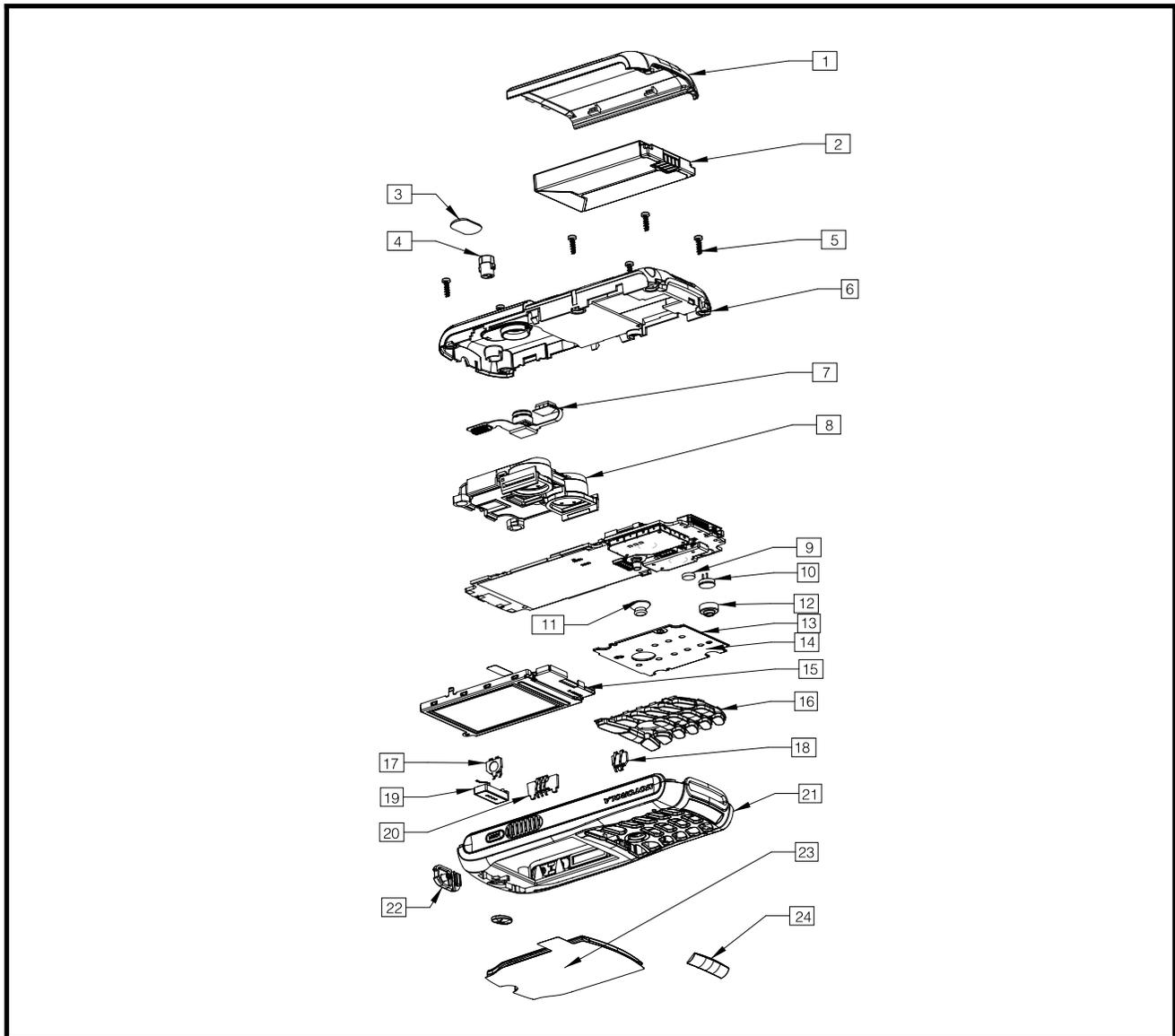


Figure 18. E398/E399 Exploded View Diagram

Exploded View Parts List

Table 5. Exploded View Parts List

Item Number	Motorola Part Number	Description
1	1589653N01	Battery Door Assembly
2		Battery
3	1389586N01	Rear Escutcheon
4	0589607N01	Conductive Camera Grommet
5		Torx Screws (6)
6	0189652N01	Rear Housing Assembly
7	0189619N01	Camera Assembly
8	158960N01	MFT Chamber Assembly
9	6087603L01	RTC Battery
10	5087974K02	Microphone
11		??
12	0589598N01	Microphone Grommet

Item Number	Motorola Part Number	Description
13	4089581N01	Mylar
14		Keyboard Assembly
15	72D89638N01	Display Assembly
16	3889517N01	Keypad
17	4089522N01	Single Switch Dome
18	4089522N01	Single Switch Dome
19	5089574N01	Speaker
20	4089521N01	Volume Switch Domes
21	1589601N01	Front Housing Assembly
22	0589579N01	Headset Jack Grommet
23	6189597N01	Lens
24	1389573N01	Front Escutcheon



There is a danger of explosion if the Lithium ion battery pack is replaced incorrectly. Replace only with the same type of battery or equivalent as recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.

To order parts please use the following link:

<https://accesssecure.mot.com>

(Password is required)

Accessories

Table 6. List of Accessories

Description	Part Number
Power Supply, US & Taiwan	SPN5037B
Travel Charger, Euro	SPN5038
Travel Charger, UK/Hong Kong	SPN5039
Travel Charger, PRY	SPN5040
Travel Charger, Australia	SPN5046
Travel Charger, India	SPN5046
Headset, Black	CHYN4516

Related Publications

Publication Title	Part Number (Kit Number)
Motorola E398 User Guide, English	6887301Z52

Note: Kit numbers are not all inclusive and may change without notice.

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