



MOTOROLA

Level 1 & 2 Service Manual

6809505A64-A

V3xx



UMTS 850/1900, GSM 850/1800/1900 (North America Only)

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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 which 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 a label usually located under the battery. 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 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.

Product Changes

When electrical, mechanical or production changes are incorporated into Motorola products, a revision letter is assigned to the chassis or kit affected, for example; -A, -B, or -C, and so on.

The chassis or kit number, complete with revision number is imprinted during production. The revision letter is an integral part of the chassis or kit number and is also listed on schematic diagrams, and printed circuit board layouts.

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
- this device 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 V3xx telephones. Refer questions about this manual to the nearest Customer Service Manager. This manual contains mechanical service information required for the equipment described and is current as of the printing date.

Audience

This document aids service personnel in testing and repairing V3xx telephones. Service personnel should be familiar with electronic assembly, testing, and troubleshooting methods, and with the operation and use of associated test equipment.

Scope

This manual provides basic information relating to V3xx telephones, and also to provide procedures and processes for repairing the units at Level 1 and 2 service centers including:

- Unit swap out
- Repairing of mechanical faults
- Basic modular troubleshooting
- Testing and verification of unit 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 End 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, **Low Battery**.

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

Warranty Service Policy

The 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 to bear the costs of early life failure.

Product Support

Customer’s original phones 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). Motorola High Tech 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.

Replacement Parts Service Division (RPSD)

Order replacement parts, test equipment, and manuals from RPSD.

U.S.A.

Phone: 800-422-4210

FAX: 800-622-6210

Website: <http://businessonline.motorola.com>

Outside U.S.A.

Phone: 847-538-8023

FAX: 847-576-3023

EMEA

Phone: +49 461 803 1404

Website: <http://emeaonline.motorola.com>

Asia

Phone: +65 648 62995

Website: <http://asiaonline.motorola.com>

Specifications

General Function	Specification
Frequency Range GSM 900	<p>TX: 880 - 915 MHz Frequency (MHz) = $890 + (0.2 \times n)$ where: $0 \leq n \leq 124$ Frequency (MHz) = $890 + (0.2 \times (n - 1024))$ where: $955 \leq n \leq 1023$</p> <p>RX: 925 - 960 MHz Frequency (MHz) = $935 + (0.2 \times n)$ where: $0 \leq n \leq 124$ Frequency (MHz) = $935 + (0.2 \times (n - 1024))$ where: $955 \leq n \leq 1023$</p>
Frequency Range DCS 1800	<p>TX: 1710 to 1785 MHz Frequency (MHz) = $1710.2 + (0.2 \times (n - 512))$ where: $512 \leq n \leq 885$</p> <p>RX: 1805.2 to 1879.8 MHz Frequency (MHz) = $1805.2 + (0.2 \times (n - 512))$ where: $512 \leq n \leq 885$</p>
Frequency Range PCS 1900	<p>TX: 1850 to 1910 MHz Frequency (MHz) = $1850.2 + (0.2 \times (n - 512))$ where: $512 \leq n \leq 810$</p> <p>RX: 1930 to 1990 MHz Frequency (MHz) = $1930.2 + (0.2 \times (n - 512))$ where: $512 \leq n \leq 810$</p>
Frequency Range WCDMA 2100	<p>TX: 1920 to 1980 MHz Frequency (MHz) = $UARFCN^1 \div 5$, where: $9612 \leq UARFCN^1 \leq 9888$ UARFCN¹ in increments of 25</p> <p>RX: 2110 to 2170 MHz Frequency (MHz) = $UARFCN^1 \div 5$, where: $10562 \leq UARFCN^1 \leq 10838$ UARFCN¹ in increments of 25</p>
GSM 850 (North America)	<p>TX: 824 - 849 MHz Frequency (MHz) = $824.2 + (0.2 \times (n - 128))$ where: $128 < n < 251$</p> <p>RX: 869 - 894 MHz Frequency (MHz) = $869.2 + (0.2 \times (n - 128))$ where: $128 < n < 251$</p>
WCDMA 850 (North America)	<p>TX: 824 to 849 MHz Frequency (MHz) = $UARFCN \div 5$, where: $4132 < UARFCN < 4233$ UARFCN in increments of 25 Frequency (MHz) = $UARFCN \div 5 + 670.1$, where: UARFCN = 782, 787, 807, 812, 837, 862</p> <p>RX: 869 to 894 MHz Frequency (MHz) = $UARFCN \div 5$, where: $4357 < UARFCN < 4458$ UARFCN in increments of 25 Frequency (MHz) = $UARFCN \div 5 + 670.1$, where: UARFCN = 1007, 1012, 1032, 1037, 1062, 1087</p>
WCDMA 1900 (North America)	<p>TX: 1850 to 1910 MHz Frequency (MHz) = $UARFCN \div 5$, where: $9262 < UARFCN < 9538$ UARFCN in increments of 25 Frequency (MHz) = $UARFCN \div 5 + 1850.1$, where: UARFCN = 12, 37, 62, 87, 112, 137, 162, 187, 212, 237, 262, 287</p> <p>RX: 1930 to 1990 MHz Frequency (MHz) = $UARFCN \div 5$, where: $9662 < UARFCN < 9938$ UARFCN in increments of 25 Frequency (MHz) = $UARFCN \div 5 + 1850.1$, where: UARFCN = 412, 437, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687</p>

General Function	Specification
Duplex Spacing	45 MHz WCDMA 850, 80 MHz WCDMA 1900
Channel Spacing	200 kHz (GSM, DCS, PCS), 5 MHz UMTS
Channels	174 EGSM, 374 DCS, 274 PCS carriers with 8 channels per carrier, 11 UMTS
Modulation	GMSK AT BT = 0.3 (GSM, DCS, PCS), QPSK (UMTS)
Transmitter Phase Accuracy	5 degrees RMS, 20 Degrees peak
Duplex Spacing	45 MHz GSM, 95 MHz DCS, 80 MHz PCS, 190 MHz UMTS
Frequency Error	± 0.10 ppm
Input/Output Impedance	50 ohms (nominal)
Operating Voltage	+3.6V dc to ±10% (battery) +4.4V dc to ±10% (external connector)
Transmit Current Drain	101-260 mA average talk current drain
Stand-by Current drain	5 mA (DRX2), 2 mA (DXR9) typical
Temperature Range	-10° C to +55° C (+15° F to +130° F)
Dimensions, with 940 mAh Li Ion battery	53 mm x 103 mm x 15 mm (2.09 inches x 4.06 inches x 0.59 inches)
Size (Volume)	80 cc (4.88 in ³), with battery
Weight	100 grams (3.53 oz), with battery
Battery Life, with standard 940 mAh Li-Ion Battery	WCDMA Voice Call = 205mins P2P Call = 120 mins Standby = 375 hrs GSM Voice Call - 255 mins Standby DRx5 = 375 hrs All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted at DRX=5. Talk times are quoted with DTX on.
Battery Charge Time	4 hours to 90% of 940 mAh capacity
Alert volume	Max 95 dB @5cm, 0.5 Watts input

GSM System Functions	Specification
Speech Coding Type	Regular pulse excitation/linear predictive coding with long term prediction (RPE LPC with LTP)
Bit Rate	13.0 kbps
RF Power Output	32 dBm nominal GSM, 28.5 dBm nominal DCS / PCS
Spurious Emissions	-36 dBm from 0.1 to 1 GHz, -30 dBm from 1 to 4 GHz
Block Length	260 bits
Receive Sensitivity	-102 dBm GSM, -102 dBm DCS / PCS
RX Bit Error Rate	< 2%

UMTS System Functions	Specification
Speech Coding Type	Adaptive Multirate (AMR)
RF Power Output	Class 3. Nominal 23 dBm
Spurious Emissions	-36 dBm from 0.1 to 1 GHz, -30 dBm from 1 to 4 GHz
Error Vector Magnitude	< 17.5%
PN9 Bit Error Rate (VER)	0.1% @12.2K, -106.7 dBm
ACLR	-33 dBm @+5 MHz, -43 dBm @+10 MHz

Product Overview

Motorola V3xx telephones deliver 3G features in a small and lightweight package. These Global System for Mobile communications (GSM) General Packet Radio Service (GPRS) Wireless Application Protocol (WAP)-enabled mobile phones incorporate an icon based User Interface (UI) for easier operation, allows Short Message Service (SMS) text messaging, Multi-media Messaging Services (MMS), and includes Personal Information Manager (PIM) functionality. V3xx is a tri-band phones that allow roaming within the GSM 900 MHz (850 MHz), 1800 MHz Digital Cellular System (DCS), and PCS 1900 MHz bands, in addition to the UMTS WCDMA 2100 (850MHz/1900MHz) band.

V3xx telephones have a clam form factor. They feature an externally viewable 96 x 80 65K color STN CLI display for caller identification with date/time, and an internal 320 x 240 262K TFT color display located in the flip. The bottom part of the clam (front housing) contains the keypad, transceiver printed circuit board (PCB), microphone, flex connection, external accessory connector, smart button, volume buttons, and voice button. The standard 940 mAh Lithium Ion (Li Ion) battery fits behind a removable back cover and provides up to 255 minutes of talk time and 370 hours of standby time in GSM mode. The battery provides up to 205 minutes of talk time, up to 120 minutes of P2P time, and up to 375 hours of standby time in WCDMA mode.

The phone accepts 3V Subscriber Identity Module (SIM) cards that fit into the USIM holder under the battery. The antenna is a fixed stub type antenna. Inexpensive direct connection to a computer or handheld device through USB for data and fax calls, and for synchronizing phonebook entries with Motorola mobile Phone Tools™ software, can be accomplished using the optional data cable and soft modem.

Features

V3xx telephones use advanced, self-contained, sealed, custom integrated circuits to perform the complex functions required for WCDMA communication. Aside from the space and weight advantage, microcircuits enhance basic reliability, simplify maintenance, and provide a wide variety of operational functions.

Other features available in this family of telephones include:

- WCDMA 2100 MHz, GSM/GPRS 900/1800/1900 MHz
- WCDMA 850/1900 MHz, GSM 850 MHz (North America Only)
- Bluetooth Class 2

Physical

- Width 53mm
- Height 102.9 mm
- Depth 14.9 mm
- Volume 75 cc
- Weight 103.0 grams

Audio

- AAC
- AAC+
- WAV
- MP3
- AAC+ Enhanced
- XMF

-
- RA v9
 - MIDI

Video

- MPEG4 Video clip playback

Display

- Main display 320 x 240 pixel 262k TFT
- CLI display 96 x 80 65k CSTN

Memory

- 64 MB internal RAM
- 64 MB internal ROM
- 64 MB internal ROM user memory
- Accepts removable TransFlash memory (16, 32 64, 128, 256 or 512MB) modules

Imaging

- Primary camera resolution 1.3 MP
- Secondary camera resolution VGA
- Dedicated camera key

Wireless Access Protocol (WAP) 2.0 Compliancy

In the WAP environment, access to the Internet is initiated in wireless markup language (WML), which is derived from hypertext markup language (HTML). The request is passed to a WAP gateway which retrieves the information from the server in standard HTML (subsequently filtered to WML) or directly in WML if available. The information is then passed to the mobile subscriber via the mobile network (Not supported in North America model).

The V3xx's microbrowser can be configured for baud, idle timeout, line type, phone number, and connection type.



Bitmap image data will download as text. If the image is larger than the screen, only part of the image will display.



If the user receives a call while in browser mode, the browser will pause and allow the user to resume after completing the call.

SIM Toolkit™ - Class 2

SIM Application Toolkit is a value-added service delivery mechanism that allows GSM operators to customize the services they offer their customers, from the occasional user who requests sports news and traffic alerts, to a high call time business user who receives stock alerts and checks flight times. Operators can now create their own value-added services menu quickly and easily in the phone. The customized menu will appear as the first menu and may be updated over-the-air with new services when customers request them.

Simplified Text Entry

iTAP™ predictive text entry. Press a key to generate a character and a dynamic dictionary uses this to build and display a set of word or name options. The iTAP™ feature may not be available on the phone in all languages.

Caller Line Identification

Upon receipt of a call, the calling party's phone number is compared to the phone book. If the number matches a phone book entry, that name will be displayed. If there is no phone book entry, the incoming phone number will be displayed. In the event that no caller identification information is available, an incoming call message is displayed.



User must subscribe to a caller line identification service through their service provider.

Personal Information Management

The V3xx telephone contains a built in calendar with date book reminders and phonebook that can be synchronized easily to a computer.

General Operation

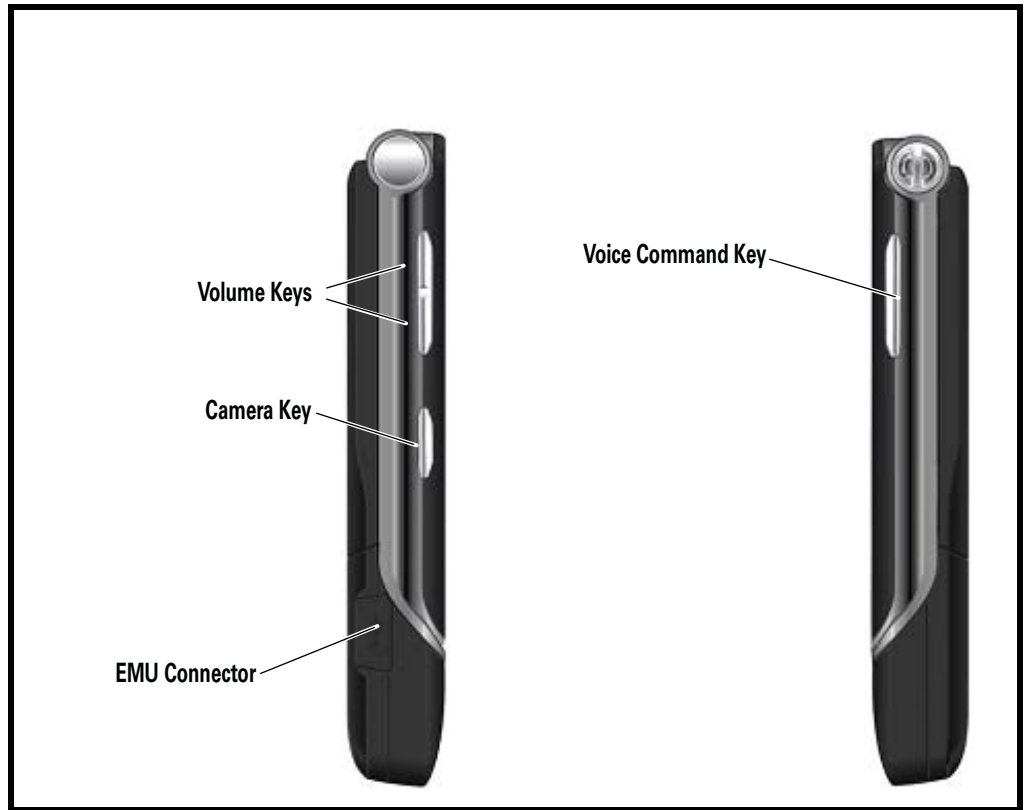
Controls, Indicators, and Input/Output (I/O) Connectors

The V3xx controls are located on the front and sides of the device, and on the keyboard, as shown in Figures 1 and 2.



Figure 1. Telephone Controls, indicators, and I/O Connections

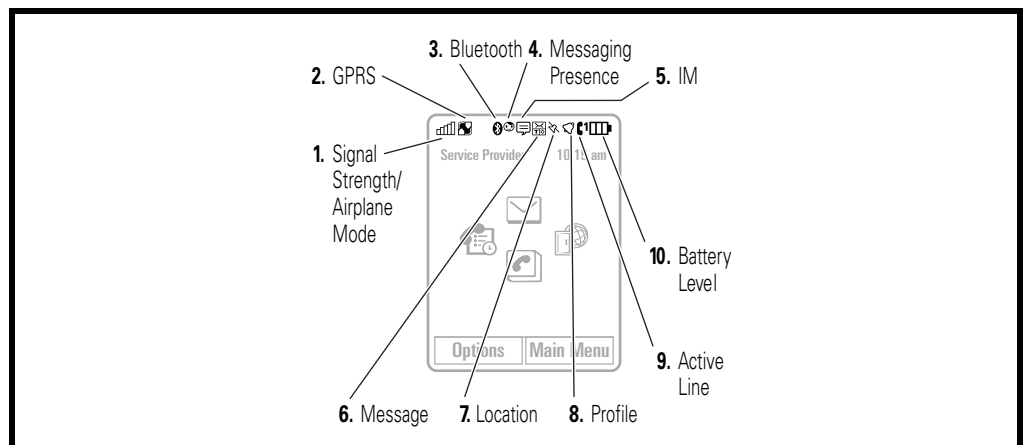
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Figure 2. Telephone Controls and Indicators Locations (Sides)


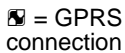
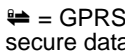




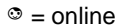
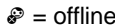
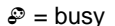




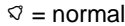
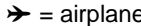

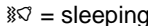
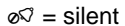
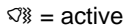



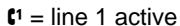
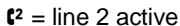
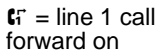
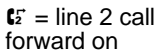
Indicators, in the form of icons, are displayed on the LCD (see Figure 3).



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Figure 3. Main Screen Icon Display

1. **Signal Strength/Airplane Mode Indicator** – Vertical bars show the strength of the network connection. You can't make or receive calls when the no signal indicator ∇ or airplane mode indicator \blacktriangleright shows. The roam indicator (Ⓜ or Ⓜ) shows when your phone is seeking or using a network outside your home network.

2. **GPRS Indicator** – Shows when your phone is using a high-speed *General Packet Radio Service* (GPRS) network connection. Indicators can include: 
- | | |
|--|---|
|  = GPRS connection |  = GPRS secure data transfer |
|  = GPRS data transfer |  = GPRS unsecure data transfer |
3. **Bluetooth Indicator** – Shows when your phone is connected to another device in a Bluetooth connection. 
4. **Messaging Presence Indicator** – Shows your instant messaging (IM) status. Indicators can include: 
- | | |
|---|--|
|  = online |  = offline |
|  = busy |  = discrete |
|  = invisible to IM | |
5. **IM Indicator** – Shows when you receive a new IM message. 
6. **Message Indicator** – Shows when you receive a new text or voicemail message. 
7. **Profile Indicator** – Shows the profile setting.
- | | |
|---|--|
|  = normal |  = airplane |
|  = vibrate |  = sleeping |
|  = silent |  = active |
|  = meeting |  = car |
8. **Active Line Indicator** – Shows X to indicate an active call, or Y to indicate when call forwarding is on. Indicators for dual-line-enabled USIM cards can include: 
- | | |
|--|--|
|  = line 1 active |  = line 2 active |
|  = line 1 call forward on |  = line 2 call forward on |
9. **Battery Level Indicator** – Vertical bars show the battery charge level. Recharge the battery when your phone shows **Low Battery**.

Menu Navigation

V3xx telephones are equipped with an icon and graphical-based user interface. All of the phone's features can be accessed with a 5-way navigation key that allows you to move easily through menus and select menu items.

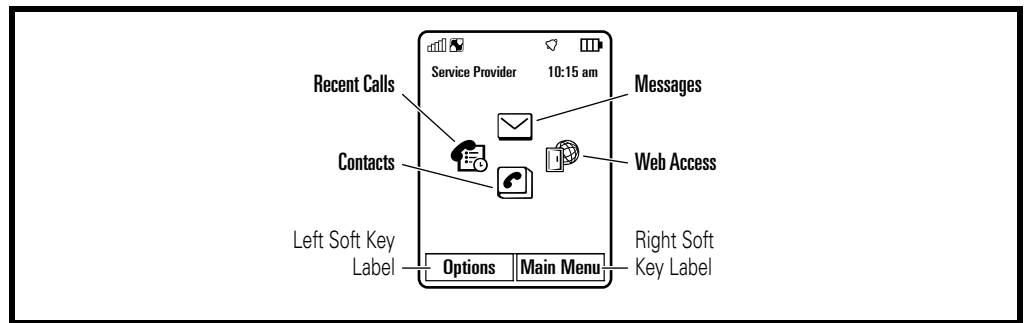
Liquid Crystal Display (LCD)

The LCD provides an large color display with user-adjustable brightness settings for optimum readability in all light conditions. The large 240 x 320 pixel display provides room for entering text, viewing graphics, tapping icons, and system prompts.



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

Figure 4 shows the Idle Screen display.



061421o

Figure 4. Main Screen Display

Battery Information

Battery Charge Indicator

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

Battery Removal

Removing the battery causes the device to immediately shut down and any pending work (partially entered phone book entries or outgoing messages, for example) is lost.



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



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



To ensure proper memory retention, turn the phone OFF before removing the battery.

Tools and Test Equipment

The following table lists tools and test equipment recommended for disassembly and reassembly of V3xx telephones. Use either the listed items or equivalents.

Table 1. General Test Equipment and Tools

Motorola Part Number ¹	Description	Application
0-00-00-40810	(U)SIM test card	Used to enable manual test procedures.
RSX4043-A	Torque Driver	Used to remove and replace screws
—	Torque Driver Bit T-3, T-5 and T-3 Torx	Used with torque driver
See Table 7	Rapid Charger	Used to charge battery and to power device
0180386A82	Antistatic Mat Kit (includes 66-80387A95 antistatic mat, 66-80334B36 ground cord, and 42-80385A59 wrist band)	Provides protection from damage to device caused by electrostatic discharge (ESD)
0-00-00-30005 (AMS) ²	Disassembly tool, plastic with flat and pointed ends (manual opening tool)	Used during assembly/disassembly of device
19501980 (AMS) ²	Generic press tool	Used to assemble the main lens and CLI lens.

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

2. Not available from Motorola. To order, contact: AMS Software & Elektronik GmbH, c/o Holger Grube, Lise-Meitner-Straße9 D-24941 Flensburg Tel.: +49-461-90398-0 Fax: +49-461-90398-50.

Disassembly

The procedures in this section provide instructions for the disassembly of a V3xx telephone. Tools and equipment used for the phone are listed in Table 1, preceding.



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



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

Removing and Replacing the Battery Door and Battery



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

1. Ensure the phone is turned off.
2. Press in and hold the battery cover latch, as shown in Figure 1.

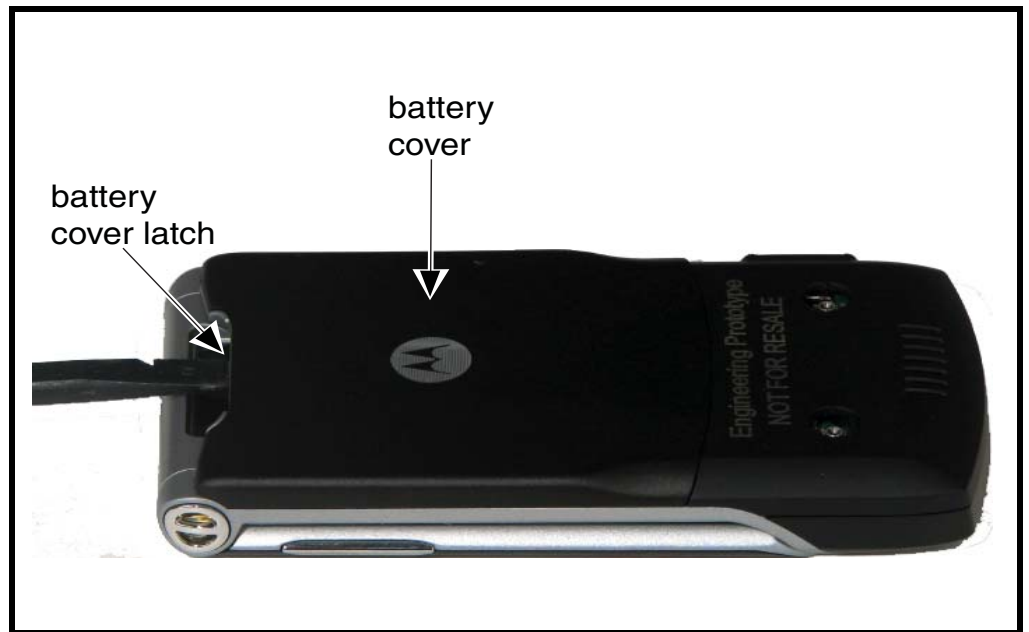


Figure 1. Removing the Battery Door

0614220

3. Lift the battery cover completely off the phone.

4. Lift the end of the battery and remove it completely. See Figure 2.

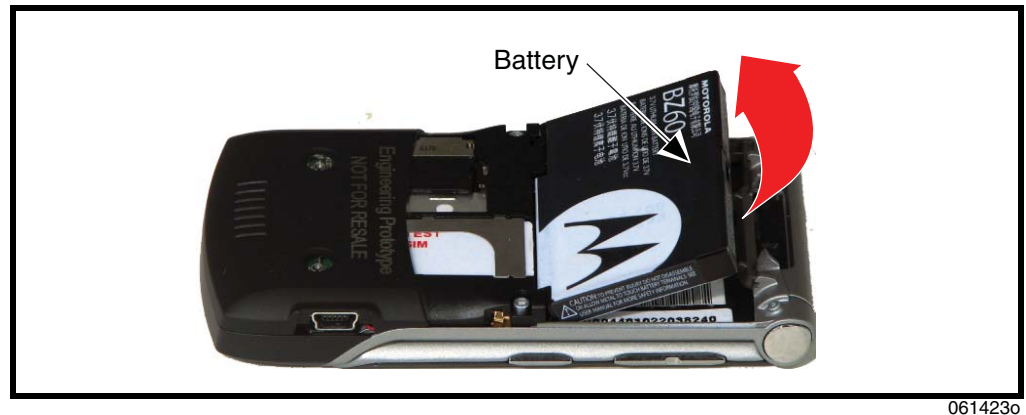


Figure 2. Removing the Battery



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.

5. To replace, Align the battery with the battery compartment so the contacts on the battery match the battery contacts in the phone.
6. Insert the battery, contacts side first, into the battery compartment and push down.
7. Insert the ridge at the bottom of the battery housing into the base of the phone, then push the cover down and snap it into place.

Removing and Replacing the Subscriber Identity Module (SIM) and Memory Card

1. Remove the battery door and battery as described in the procedures.

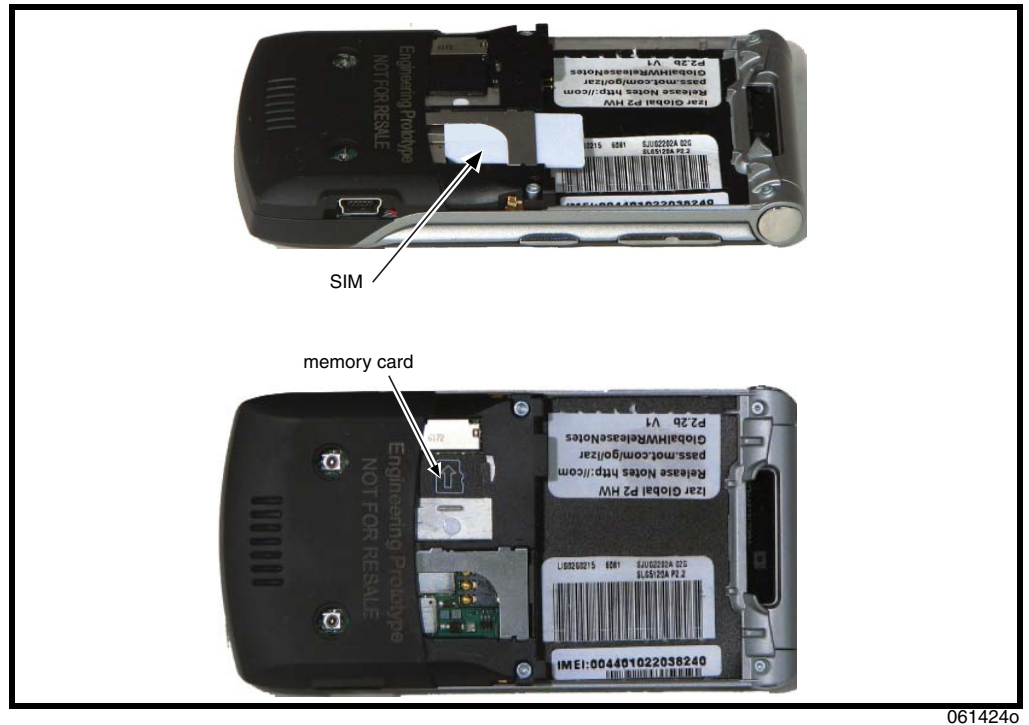


Figure 3. Removing the USIM and Memory Card

2. Slide the USIM away from the USIM holder, as shown in Figure 3.
3. Carefully lift the USIM from the phone.
4. To replace, insert the USIM into the holder, ensuring the keyed corner of the USIM faces the outward edge of the phone.
5. Replace the battery and battery door as described in the procedures.
6. Slide the memory card away from the memory card holder, as shown in Figure 3.
7. Carefully lift the memory card from the phone.
8. To replace, insert the memory card into the holder, ensuring the keyed corner of the memory card faces the top edge of the phone.
9. Replace the battery and battery door as described in the procedures.

Removing and Replacing the Rear Housing



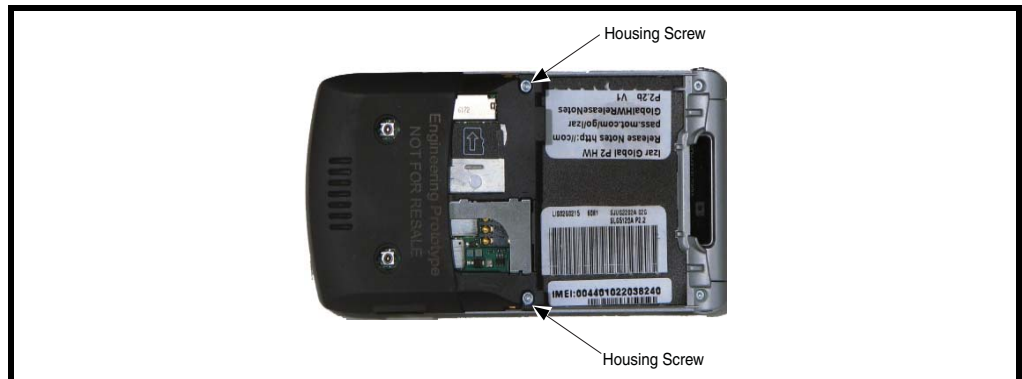
This product contains static-sensitive devices. Use anti-static handling procedures to prevent electrostatic discharge (ESD) and component damage.

1. Remove the battery cover, battery, USIM and memory card as described in the procedures.



In addition to 2 screws, the rear housing assembly is fastened with plastic latches. These are fragile and should be released with care.

2. Using a Torx driver with a T-6 bit, remove the screws at each side of the phone. Retain the screws for reassembly. See Figure 4.



0614250

Figure 4. Removing the Rear Speaker Housing Screws

3. Release the four housing latches by inserting the flat end of the plastic disassembly tool into the openings on the rear housing.

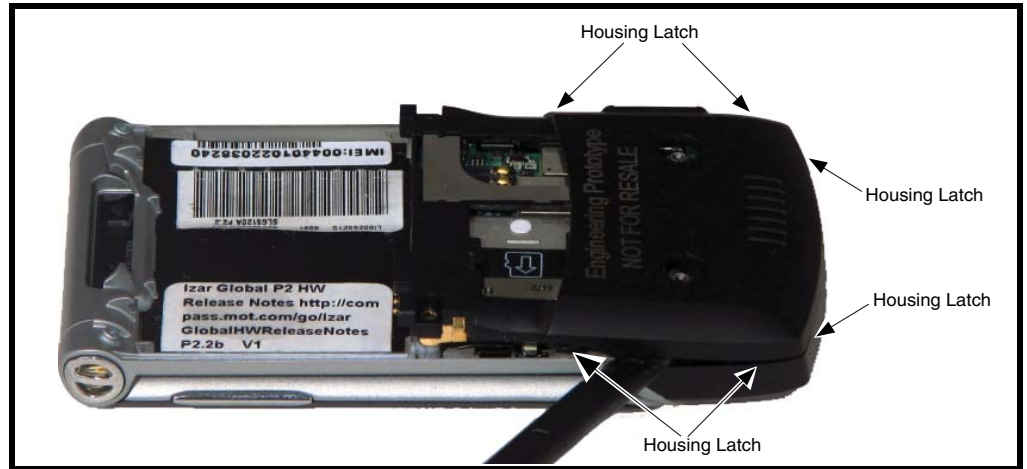


Figure 5. Removing the Rear Housing Latches

0614260

4. Carefully rotate the rear housing away from the front housing and flip assembly. The flip flex connector will disconnect when the rear housing is removed.

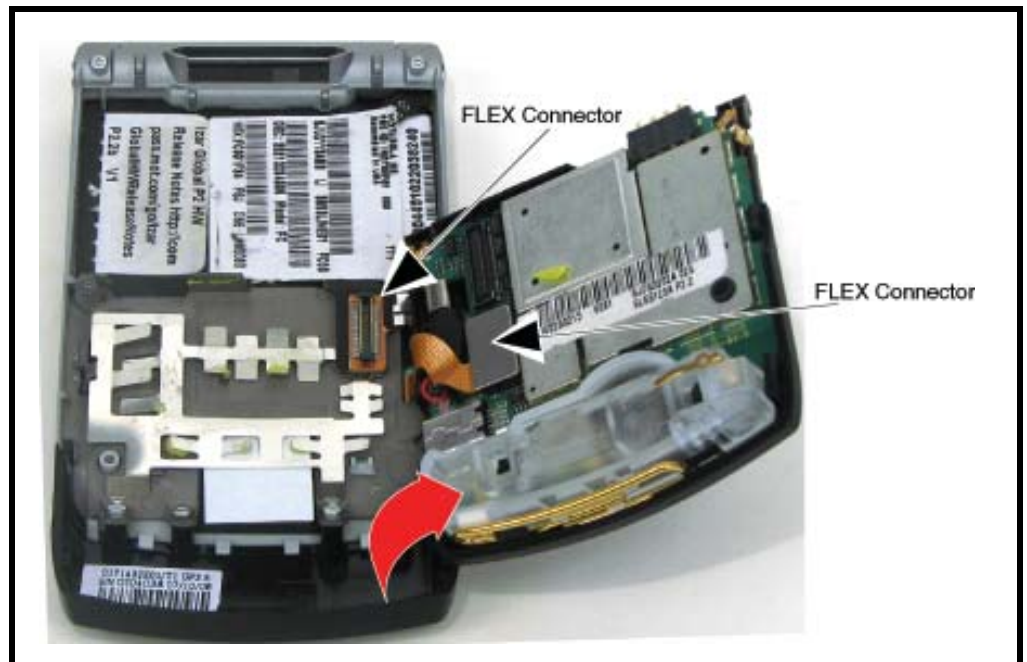


Figure 6. Removing the Rear Housing Assembly

0614660



The flexible printed cable (FPC) (flex) is easily damaged. Exercise extreme care when handling.

5. Use the disassembly tool to unseat the two flex connectors from it's socket.
6. Lift the rear housing assembly away from the phone.
7. To replace, carefully align the two flex connectors to their respective socket on the rear housing assembly, then gently press down on each of the two flex connectors until they are properly seated in their own socket.
8. Rotate the rear housing assembly so it sits over the phone.
9. Align the housing latches with the corresponding openings on the front housing. Gently press the housings together until the catches snap into place.
10. Replace the 2 housing screws and tighten to a final torque setting of 1.7 inch pounds. Do not over tighten.
11. Replace the USIM, memory card, battery, and battery cover as described in the procedures.

Removing and Replacing the Antenna

1. Remove the battery cover, battery, USIM, memory card, and rear housing assembly as described in the procedures.
2. Use the plastic tweezers to grasp the rubber antenna grommets and carefully remove them from the antenna assembly. See Figure 7. Set the rubber grommets aside for reuse.

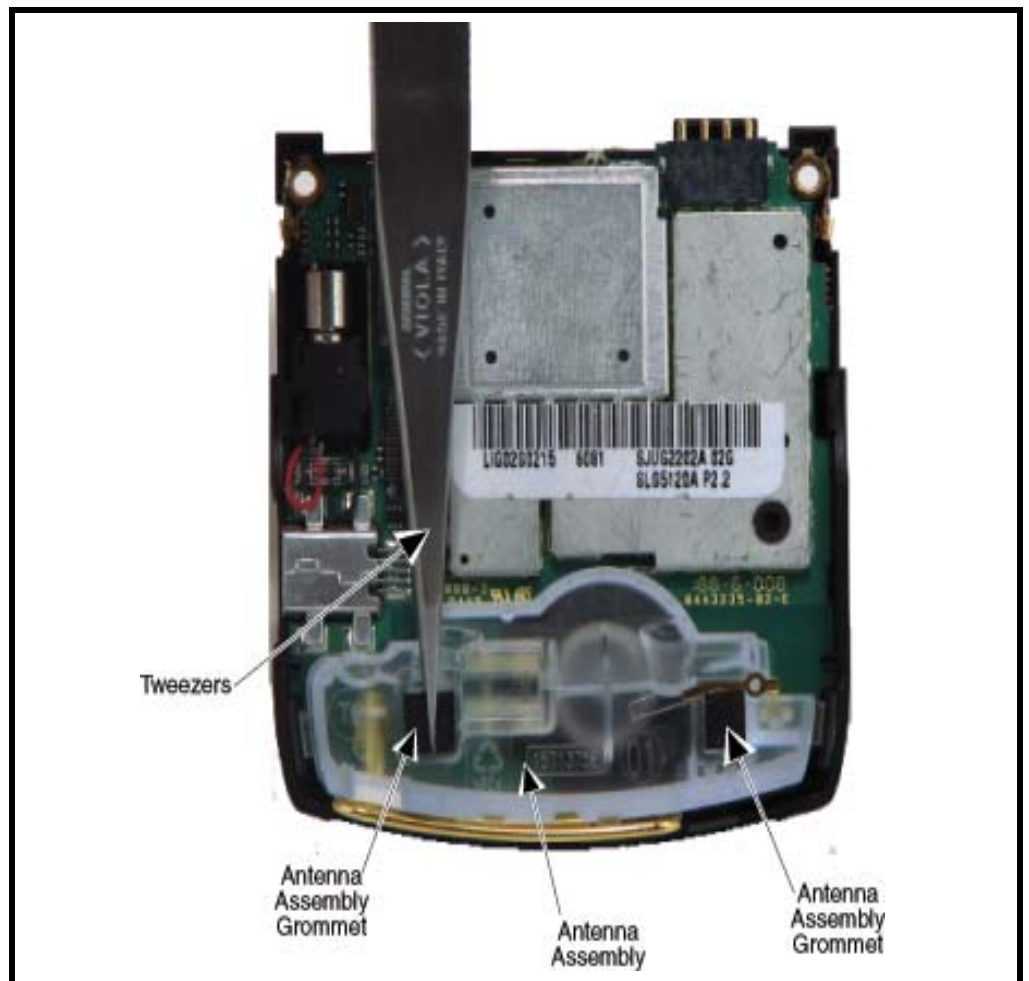
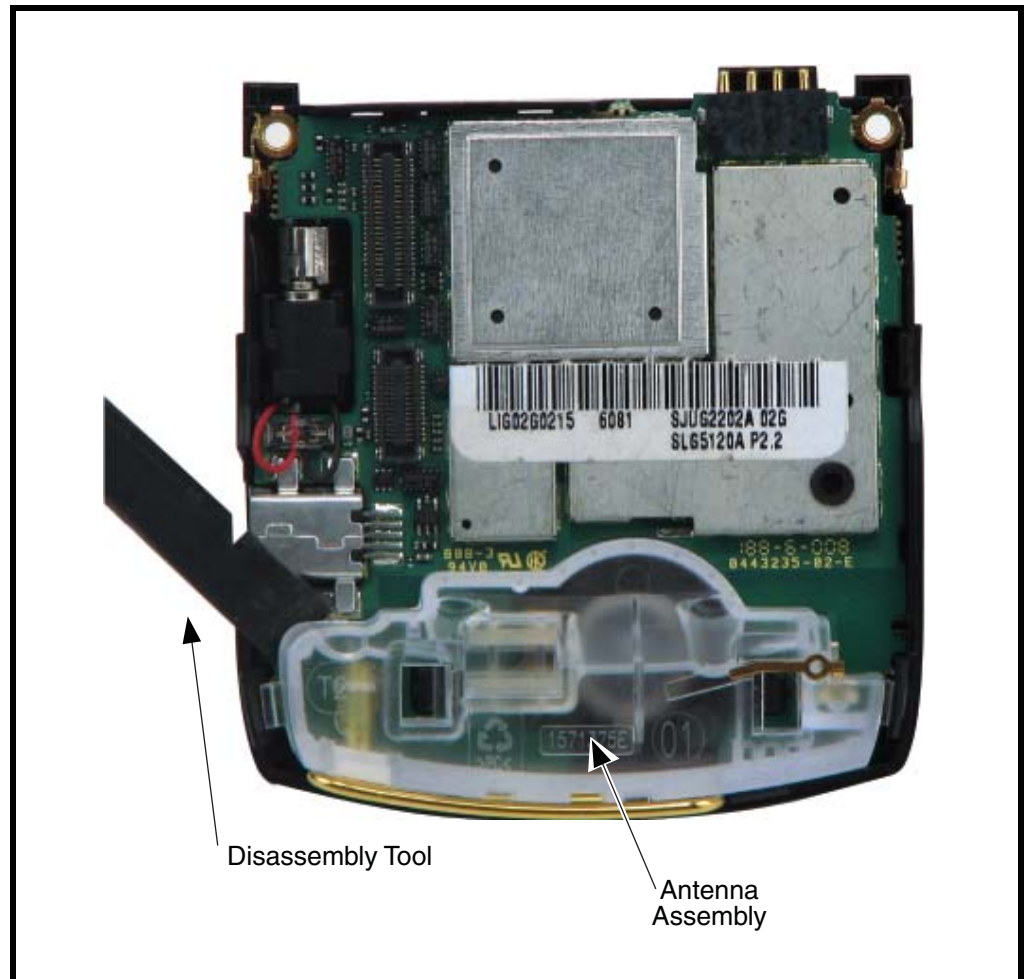


Figure 7. Removing the Antenna Grommets

0614670

3. Use the disassembly tool to release the antenna assembly as shown in Figure 8.



0614280

Figure 8. Removing the Antenna Assembly

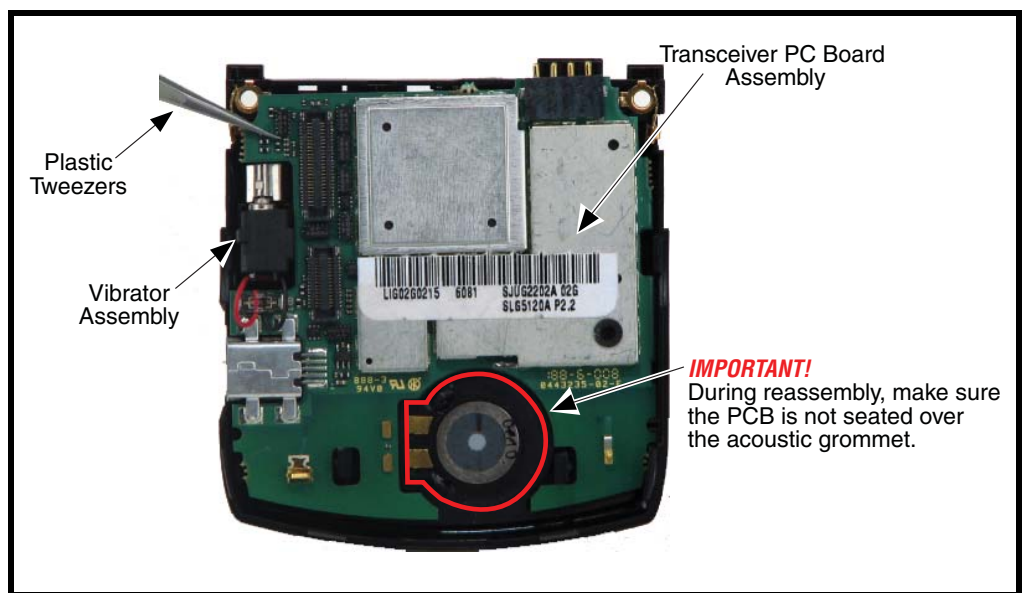
4. Carefully lift the antenna assembly away from the phone.
5. To replace, assembly starts from right to left. Align the antenna assembly to the phone.
6. Carefully press the antenna assembly into position until the antenna assembly latches snap into position.
7. Reinstall the rubber antenna assembly grommets into their slots.
8. Replace the rear housing assembly, USIM, battery and battery cover as described in the procedures.

Removing and Replacing the Transceiver Board Assembly



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

1. Remove the battery cover, battery, USIM, antenna, rear housing and battery tray as described in the procedures.
2. Use the plastic tweezers to pry loose and remove the vibrator assembly.
3. Lift the transceiver board assembly out of the front housing with the plastic tweezers. See Figure 9.



0614690

Figure 9. Disconnecting the Flex from the Transceiver Board

4. To replace, insert the transceiver board assembly into the rear housing.
5. **IMPORTANT** During reassembly, make sure the PCB is not seated over the acoustic grommet.
6. Carefully and gently press the transceiver board into position and until it snaps into place.
7. Replace the antenna assembly, rear housing, USIM, battery, and battery cover as described in the procedures.

Removing and Replacing the Flip Assembly Cover

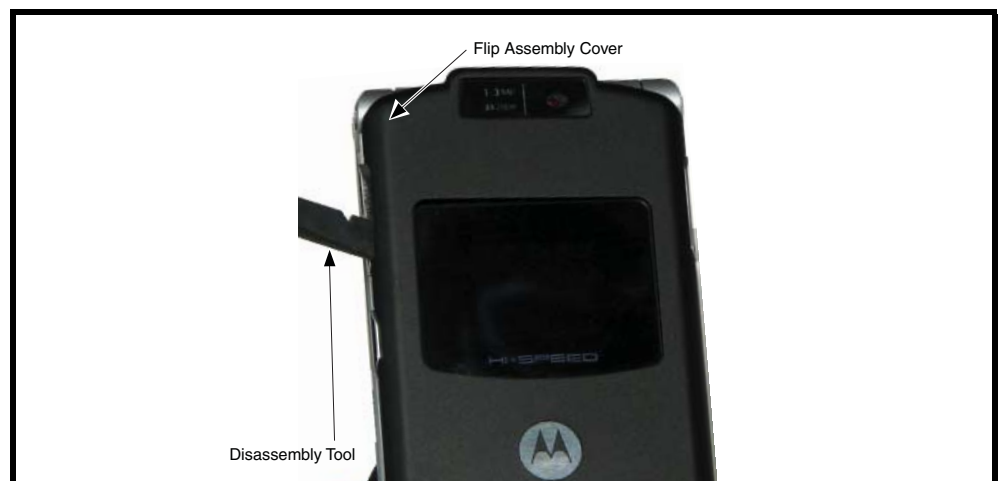
1. Remove the battery cover, battery, USIM, memory card, rear housing, and transceiver board assembly as described in the procedures.
2. Remove the 4 flip assembly screw caps.
3. Use the T-5 driver to remove the 4 screws from the flip assembly (see Figure 10). Retain the screws for re-assembly.



061431o

Figure 10. Removing the Flip Assembly Screws

4. Before removing the flip cover, note the locations of the smart buttons on the sides of the flip assembly.
5. Use the disassembly tool to gently pry off the flip cover (see Figure 11).



040722o

Figure 11. Separating the Flip Assembly Cover

6. Remove the smart buttons on the side of the flip assembly. Set them aside for reassembly.
7. Lift the flip cover away from the flip assembly. Be careful not to damage the display flex cable (see Figure 12).



0407230

Figure 12. Removing the Flip Assembly Cover

8. To replace, insert the smart buttons into the phone. Ensure the buttons contact their respective switches on the display assembly.
9. Align the flip cover to the flip assembly, gently press the flip cover onto the flip assembly until the flip cover latches engage.
10. Insert the 4 screws, tighten to a final torque setting of 1.7 inch pounds, to secure the flip cover to the flip assembly. Avoid damage to the flex cable.
11. Insert the 4 rubber screw covers over the flip assembly screws.
12. Replace the transceiver board assembly, rear housing, antenna assembly, USIM, battery, and battery cover as described in the procedures.

Removing and Replacing the Camera Assembly

1. Remove the battery cover, battery, USIM, antenna, rear housing, and transceiver board assembly, flip assembly cover, and CLI lens cover as described in the procedures.



The flexible printed cable (FPC) (flex) is easily damaged. Exercise extreme care when handling.

2. Unlock the ZIF connector and remove the camera assembly flex connector.
3. Carefully lift the camera assembly and flex out of the flip assembly (see Figure 13).

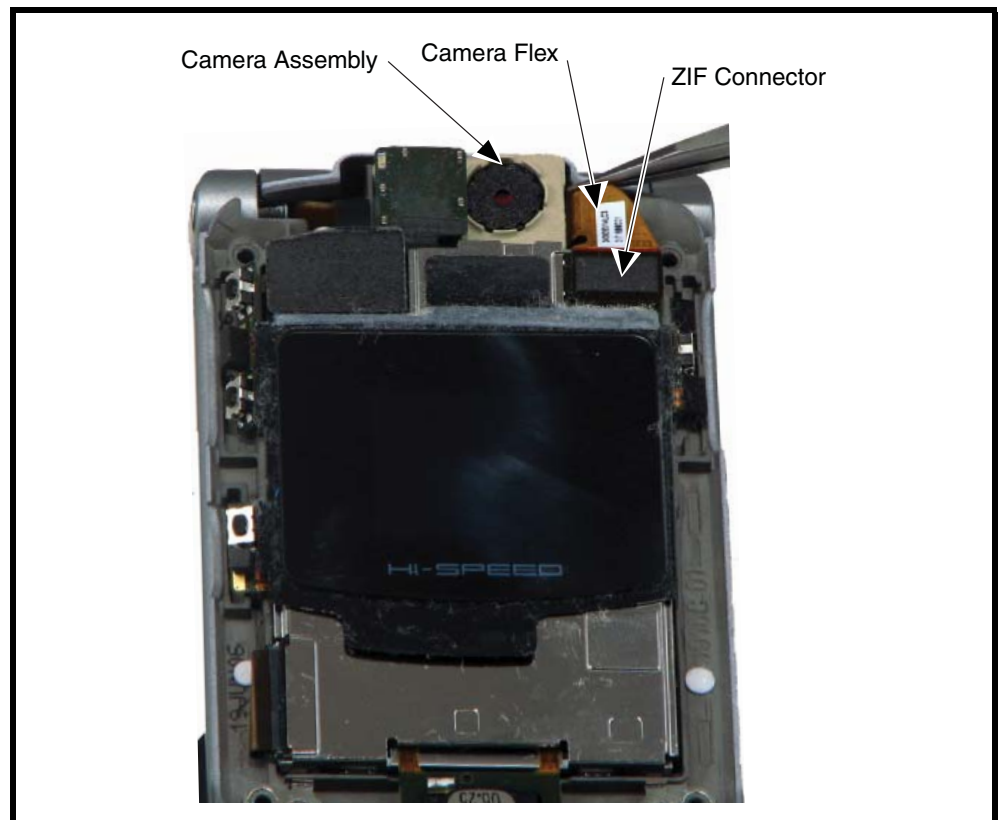


Figure 13. Camera Assembly Removal

4. To replace, carefully press the camera assembly into its slot in the flip assembly.
5. Insert the end of the camera assembly flex cable into its slot in the ZIF connector on the flip display assembly. Avoid damage to the flex cable.
6. Replace the flip assembly cover, transceiver board, rear housing, antenna, USIM, battery, and battery cover as described in the procedures.

Removing and Replacing the Display Module Assembly

1. Remove the battery cover, battery, USIM, rear housing, antenna, transceiver board assembly, flip assembly cover, and camera assembly, as described in the procedures.



The flexible printed cable (FPC) (flex) is easily damaged. Exercise extreme care when handling.

2. Use the disassembly tool to unseat the display module assembly flex connector from its socket (see Figure 14)

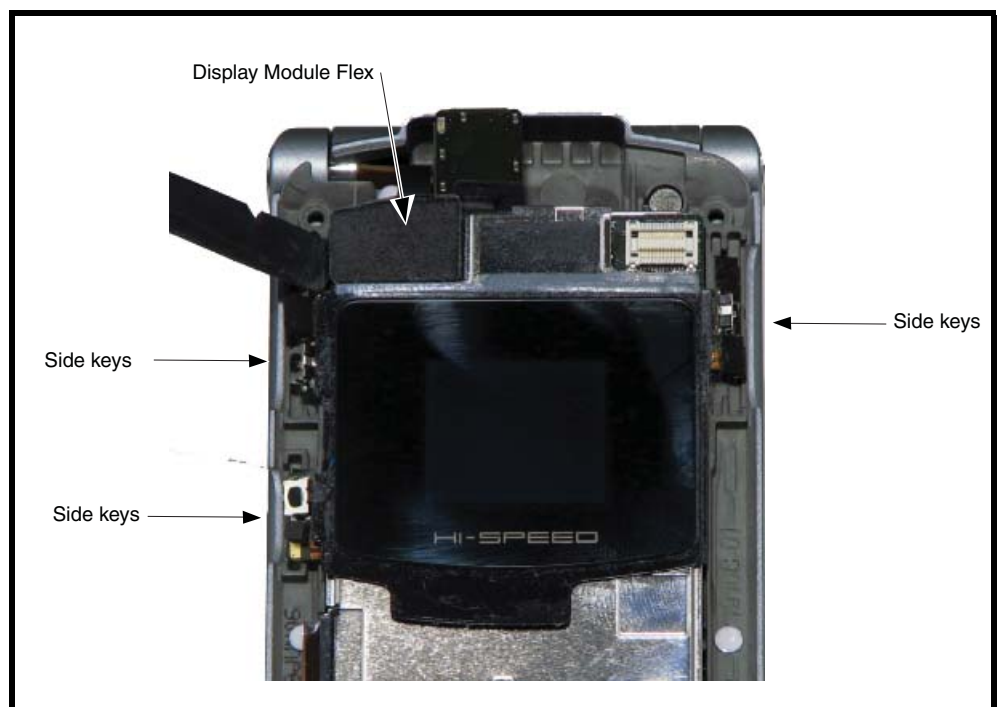


Figure 14. Display Module Assembly Flex Connector

3. Carefully and gently lift one corner of the display module assembly out of the flip assembly.
4. Separate side keys, set aside for reassembly.
5. Separate the speaker from its adhesive by prying the speaker off using the disassembly tool.
6. Avoid damage to the electrical components on the flex while carefully removing the display module assembly from the flip assembly.

- Carefully lift the display lens away from the flip assembly.



Figure 15. Removing the Display Module Assembly

- To remove the display module lens, carefully pry off the metal shield protecting the lens module.
- Disconnect the lens flex connector.
- Carefully pry off the display lens using the disassembly tool.



Figure 16. Removing the Display Module Lens

IMPORTANT To properly replace the display lens, a new adhesive strip and a lens press is used.

11. To replace, using the lens press, properly align the display lens onto the adhesive strip. Then press into place.
12. Carefully place the metal shield over the display lens and press firmly into place.
13. Align the display module assembly to the flip assembly.
14. Carefully lower the display module into the flip assembly. Ensure that all of the display none of the display assembly components are damaged.
15. Align the flip display flex to the flex connector on the flip display assembly and gently press down on the flex connector until properly seated.
16. Replace the camera assembly, flip assembly cover, transceiver board, rear housing, antenna, USIM, battery, and battery connector as described in the procedures.

UMTS Subscriber Identity Module (USIM) and Identification

USIM

A USIM 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 USIM contains:

- All the data necessary to access UMTS and 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.

Personality Transfer

A personality transfer is required when a phone is express exchanged or when the main board is replaced. Personality transfers reproduce the customer's original personalized details such as menu and stored memory such as phone books, or even just program a unit with basic user information such as language selection. V3xx telephones use TrueSync® synchronization software to effect a personality transfer.

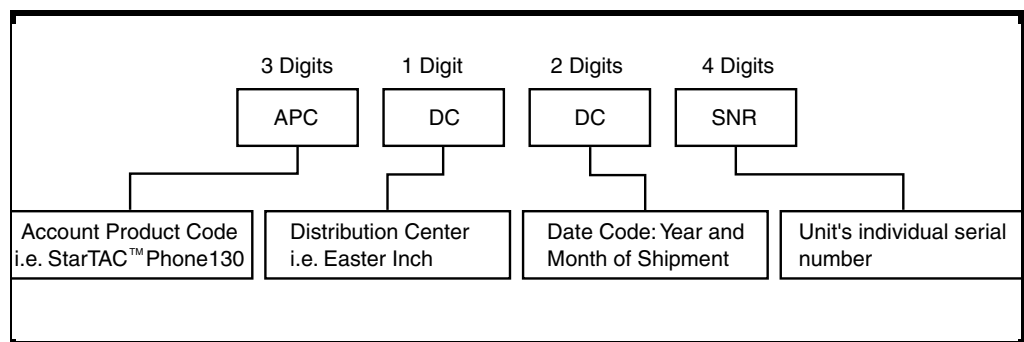
Identification

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

Mechanical Serial Number (MSN)

The Mechanical Serial Number (MSN) is an individual unit identity number and remains with the unit throughout the life of the unit.

The MSN can be used to log and track a unit 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
NNXXXXXX	ZZZZZZ	A

Where

TAC Type Allocation Code, formerly known as Type Approval Code

NN Reporting body identifier

XXXXXX Type Identifier

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:

- **TRANSCIEVER 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

Troubleshooting Chart

Table 3. : 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 the battery voltage is <3.25 Vdc, recharge the battery using the appropriate battery charger. If the battery will not recharge, replace the battery. If battery is not at fault, proceed to b.
	b) Battery connectors open or misaligned.	Visually inspect the battery connectors on both the battery and the telephone. Realign and, if necessary, either replace the battery or refer to a Level 3 Service Center for the battery connector replacement. If battery connectors are not at fault, proceed to c.
	c) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
	d) keyboard assembly failure.	Replace the keyboard assembly. Temporarily connect a +3.6 Vdc supply to the battery connectors. Press and hold the PWR button. If unit turns on and stays on, disconnect the dc power source and reassemble with the new keyboard assembly.
2. Telephone exhibits poor reception or erratic operation such as calls frequently dropping or weak or distorted audio.	a) Antenna assembly defective.	Check to make sure that the antenna pin is properly connected to the transceiver board assembly. If connected properly, substitute a known good antenna. If the fault is still present, proceed to b.
	b) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
3. Display is erratic, or provides partial or no display.	a) Transceiver board connections faulty.	Remove rear chassis assembly from unit, check general condition of flexible printed cable (flex). If the flex is good, check that the flex connector is fully pressed down. 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) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to c.
	c) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
4. Incoming call alert transducer audio distorted or volume is too low.	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 obstructed by user while holding the phone	Verify transmit audio quality. If transmit audio quality is still weak and microphone is not obstructed, proceed to b.
	b) Microphone defective.	Replace the microphone as described in the procedures. If fault is not cleared, proceed to c.

Table 3. : Level 1 and 2 Troubleshooting Chart (Continued)

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
	c) Transceiver board defective.	Forward to an authorized level 3 service center.
6. Receive audio from earpiece speaker is weak or distorted.	a) Connections to or from transceiver board assembly defective.	Gain access to the transceiver board assembly as described in the procedures. Check flex and the flex connector from the flip assembly to the transceiver board assembly. If flex is at fault, replace flip assembly. If flex connector is at fault, proceed to d. If connection is not at fault, proceed to b.
	b) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to c.
	c) Antenna assembly defective.	Check to make sure the antenna is installed correctly. If the antenna is installed correctly, substitute a known good antenna assembly. If this does not clear the fault, reinstall the original antenna assembly and proceed to d.
	d) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
7. Telephone will not recognize or accept USIM.	a) USIM defective.	Check the USIM contacts for dirt. Clean if necessary and check if fault has been cleared. If the contacts are clean, insert a known good USIM into the telephone. Power up the unit and confirm that the USIM has been accepted. If the fault no longer exists, replace the defective USIM. If the USIM is not at fault, proceed to b.
	b) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to c.
	c) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
8. Phone does not sense when flip is opened or closed (usually indicated by inability to answer incoming calls by opening the flip, or inability to make outgoing calls).	a) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to b.
	b) Transceiver board assembly defective.	Forward to an authorized level 3 service center.
9. Vibrator feature not functioning.	Transceiver board assembly defective.	Forward to an authorized level 3 service center.
10. Internal Charger not working.	Faulty charger circuit on transceiver board assembly.	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 unit with the new transceiver board assembly.

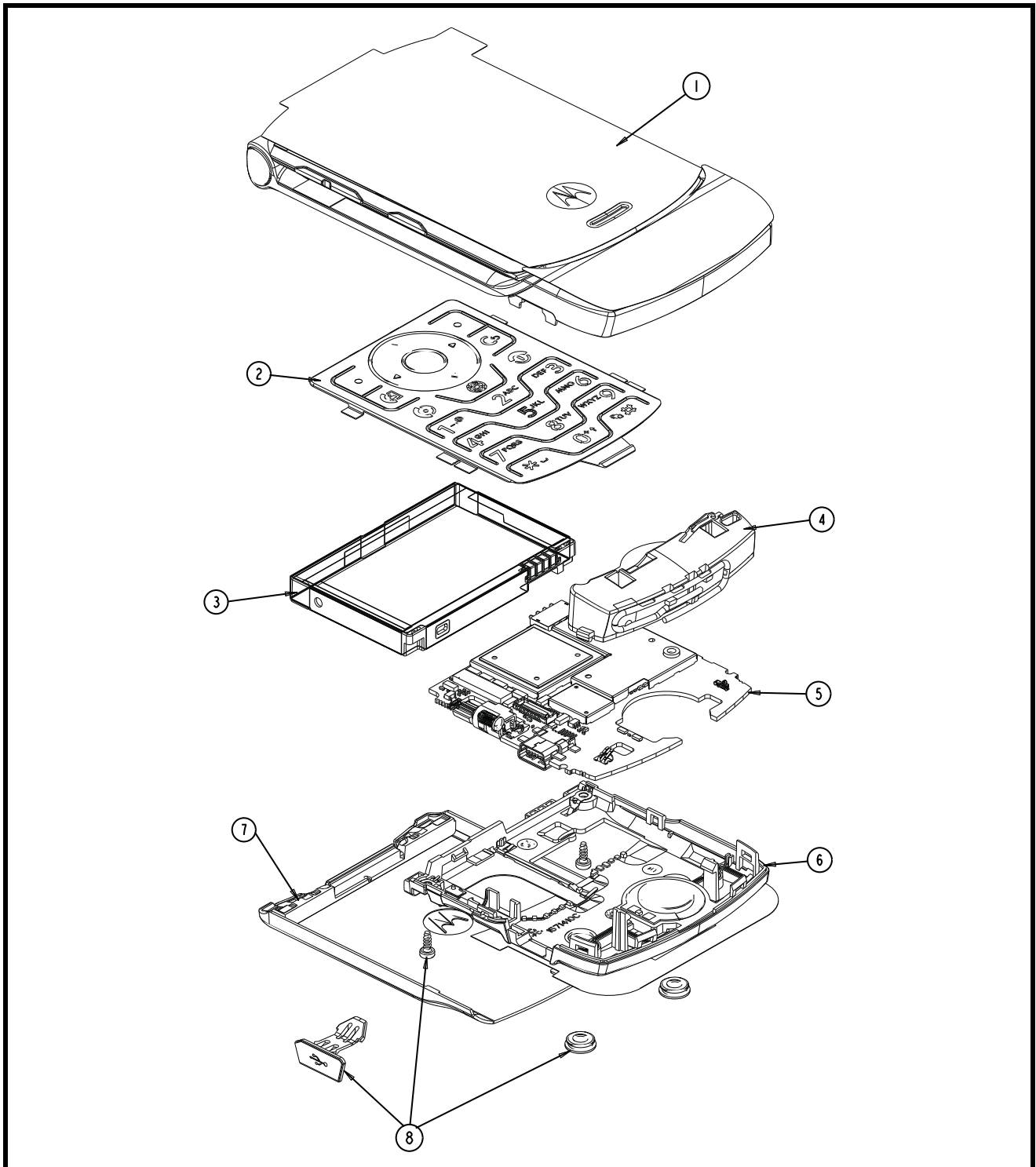
Table 3. : Level 1 and 2 Troubleshooting Chart (Continued)

SYMPTOM	PROBABLE CAUSE	VERIFICATION AND REMEDY
11. Real Time Clock resetting when standard battery is removed.	Lithium button cell in the display board may be depleted.	Refer service to a Level 3 service center for replacement.
12. No or weak audio when using headset.	a) Headset not fully pushed home.	Ensure the headset plug is fully seated in the jack socket. If fault not cleared, proceed to b.
	b) Faulty jack socket on 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.

Programming: Software Upgrade and Flexing

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

Exploded View Diagram (Main assembly)



v462597

Figure 18. Exploded View Diagram (Main assembly)

Exploded View Parts List (Main assembly)

The following part number table is provided only for reference. Please contact your local Motorola parts organization for current part number information.

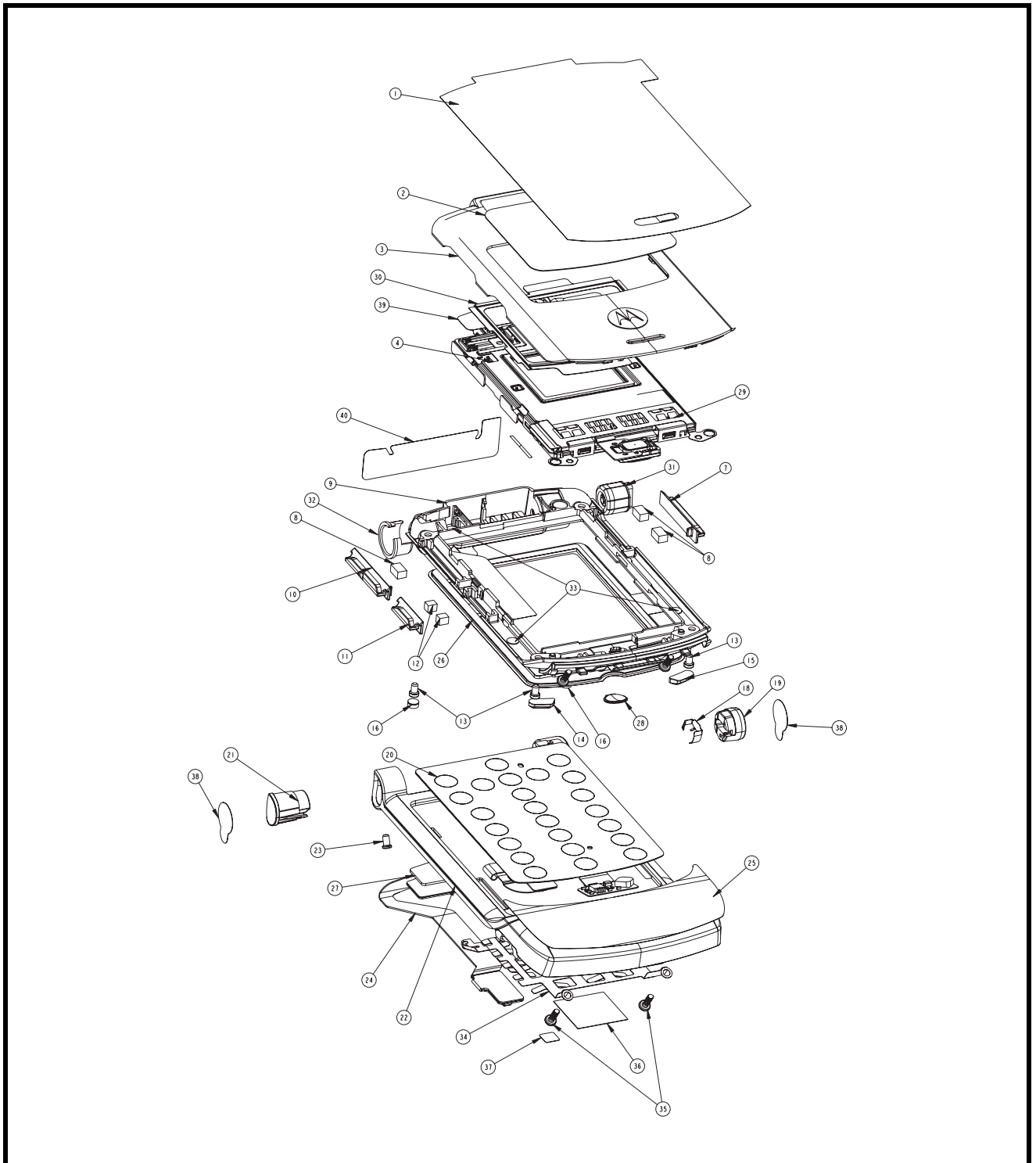
Table 4. Exploded View Parts List

Item	Part Number	Description	Item	Part Number	Description
1	0171432E01 0171432E02 0171432E03 0171433E03 0171433E06	Assembly, flip Orange Assembly, flip, Black Assembly, flip, Dragon Assembly, hsg, Dark Pearl Gray Assembly, hsg Summit gold	5	SLG5120A	Assembly, PCB, XCVR
2	0171437E01 3871989E05 3871989E06	Assembly, keypad Assembly, keypad dk pearl gray Assembly, keypad summit gold	6	0171431E01 0171431E02 0171431E03 1571103D05 1571103D07	Assembly, housing rear Orange Assembly, housing rear, Black Assembly, housing rear, Dragon Assembly, housing rear, dk prl gry Assembly, housing rear, sumit gld
3	SNN5789B	Battery	7	SHN0024A SHN9867A SHN0245A	Assembly, battery door Orange Assembly, battery door, Black Assembly, battery door, Dragon
4	0171656E01	Assembly, Antenna	8	SHN9853A SHN9853B SHN9853C	Hsg and Hdw generic, Orange Hsg and Hdw generic, Black Hsg and Hdw generic, Dragon



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.

Exploded View Diagram (Flip Assembly)



0318260

Figure 19. Exploded View Diagram (Flip assembly)

Exploded View Parts List (Flip Assembly)

The following part number table is provided only for reference. Please contact your local Motorola parts organization for current part number information.

Table 5. Exploded View Parts List

Item	Part Number	Description	Item	Part Number	Description
1	11711964C01	Liner, Flip outer	19	1571118F03	Knuckle cap, hinge
2	6171924C02	CLI lens	20	0171642C01	Keypad flex assembly
3	0171981C05 0171981C06 0171981C08 0171981C07 0171981C10	Flip outer hsg assy orange Flip outer hsg assy Black Flip outer hsg assy Dragon Flip outer hsg assy Dk pearl gray Flip outer hsg assy Summit gold	21	1571119F03	Knuckle cap
4	0170995D04 0171995D03	Display module assembly Display module assembly (N.A.)	22	0171433E01 0171433E02 0171433E04	Xcvr Frt Hsg assy orange Xcvr Frt Hsg assy black Xcvr Frt Hsg assy dragon
5		Blank	23	0387726M08	M1,6X035x2,5MM Torx Plus (2)
6		Blank	24	0171700D01	Hinge flex assembly
7	3871978C03	VR button	25	1171964C02	Liner antenna cover
8	7588382Y01	Large button pad qty 3	26	6171923C02 6171923C09	Main lens assembly Main lens assembly summit gold
9	0171979C03 0171979C02 0171303F03	Flip inner hsg assy Flip inner hsg assy Dk pearl gray Flip inner hsg assy Summit gold	27	7571022E01	Pad hinge flex board 2 board
10	3871974C03	Volume button	28	3387630Y01	Medallion
11	3871976C03	Smart button	29	3971041E01	Grounding chinstrap
12	7588382Y02	Small button pad	30	1171249E01	Mylar, water ingress
13	0387726M09	M1, 6X0, 35x2, 5mm Torx Plus	31	5571836E01	Hinge
14	3871836D01	Flip nose bumper left	32	4371759D01	Knuckle bushing
15	3871836D02	Flip nose bumper right	33	5471536C01	3mm water detect label
16	3890022N01	Flip knuckle bumper qty 2	34	3971127E02	Grounding bootstrap
17		Blank	35	0387647Y01	Screws PT Custom pan hd (2)
18	3971139F01	Hinge ground clip	36	1471426E01	Bootstrap mylar insulator
--	5088017N06	Midi speaker, North America			
--	0171698C01	camera assembly, North America			



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.

Accessories (Optional)

Table 6. Accessories

Part Description	Part Number
Audio and Media	
Bluetooth Headset (Green) HS820	SYN0945
Bluetooth Headset - H700	SYN1311
Bluetooth Headset - HS805	SYN0986
Bluetooth Headset (Pearl Dark Gray) - H300	SYN1297
Bluetooth Headset (Pink) - H300	SYN1417
Bluetooth Headset (Pure White) - H300	SYN1416
Bluetooth Headset (Refresh - Dk Blue) - HS815	SYN1201
Bluetooth Headset - Glossy Black - HS820	SYN9951
Bluetooth Headset - Grey - HS820	SYN1106
Bluetooth Headset - H605	SYN1303
Bluetooth Headset - HS850 (Refresh - Black)	SYN1107
Bluetooth Headset - HS850 (Refresh - Blue)	SYN1226
Bluetooth Module (Stereo Music and Telephony)	SYN1447
Bluetooth Mono Headset, Nickel- H500	SYN1290
Bluetooth Stereo Headset HT820	SYN0948
Bluetooth Stereo Transceiver DC800	SYN1001
DJ Headset - Bluetooth - Music and Telephony	SYN1673
H3 Bluetooth Headset Cherry Red	SYN1736
H3 Bluetooth Headset Dark Pearl Grey	SYN1507
H350 Bluetooth Headset Dark Pearl Grey	SYN1763
H350 Bluetooth Headset Sapphire Blue	SYN1738
H350 Bluetooth Headset Silver Quartz	SYN1765
H350 Bluetooth Headset Silver Sail	SYN1764
H350 BT Headset Black	SYN1439
H500 Bluetooth Headset Black Soft Touch Japan	SYN1685
H500 Bluetooth headset Black Softtouch	SYN1374
H500 Bluetooth Headset Bubble Gum	SYN1671
H500 Bluetooth Headset Celery	SYN1732
H500 Bluetooth Headset Cosmic Blue	SYN1617
H500 Bluetooth Headset Fire Red	SYN1667
H500 Bluetooth Headset Hot Pink	SYN1525
H500 Bluetooth Headset iPod Blue	SYN1523
H500 Bluetooth Headset iPod Gold	SYN1524

Table 6. Accessories(Continued)

Part Description	Part Number
H500 Bluetooth Headset Oi	SYN1735
H500 Bluetooth Headset Pumpkin	SYN1733
H500 Bluetooth Headset Spa Blue	SYN1527
H500 Bluetooth Headset Steel Teal	SYN1734
H500 Bluetooth Headset White	SYN1526
H500 Gloss Black	SYN1375
H500 Nickel Japan	SYN1441
H500 Pink	SYN1436
Headset Mono One Touch w/ Send-End (EMU)	SYN0896
RAZR H3 Black	SYN1437
RAZR H3 Silver	SYN1438
Stereo Headset - EMU	SYN1301
Bluetooth Car Kit - Asia/Americas	S9642
Bluetooth Car Kit - Euro	S9643
Bluetooth Car Kit - HF850	98675H
Bluetooth Car Kit - IHF1000 -Americas/Asia	98676J
Bluetooth Car Kit - IHF1000 - EMEA	CFLN1232AB
Bluetooth Speaker (Quadrant Refresh) -HF820	SYN0736
Self Install Car Kit Universal - Mandarin -Smart Drive+	SYN0888
Self Install Car Kit Universal - Smart Car Kit - Smart Drive	SYN0890
128MB microSD card & Mot SD adapter	SYN1403
1GB microSD card & Mot SD adapter	SYN1406
256MB microSD card & Mot SD adapter	SYN1404
32MB microSD card & Mot SD adapter	SYN1401
512MB microSD card & Mot SD adapter	SYN1405
64MB microSD card & Mot SD adapter	SYN1402
Bluetooth Class 1 USB Adapter PC850	SYN1244
Bluetooth TXTR Keyboard (champagne gold)	SYN1664
Bluetooth TXTR Keyboard (silver)	SYN1391
TransFlash Card with SD Adapter - 128MB	SYN0943
TransFlash Card with SD Adapter - 16MB	SYN0940
TransFlash Card with SD Adapter - 256MB	SYN0944
TransFlash Card with SD Adapter - 32MB	SYN0941

Table 6. Accessories(Continued)

Part Description	Part Number
TransFlash Card with SD Adapter - 512MB	SYN1293
TransFlash Card with SD Adapter - 64MB	SYN0942
USB 2.0 SD Card Reader	SYN1045
Data Cable Mini USB/USB/Serial	SKN6371
Mobile Phone Tools	Region-specific
Bluetooth Helmet Adapter (Mage) - HS830	SYN0996
Bluetooth Helmet Headset - HS830 (Mage)	SYN0997
Oakley RAZRWIRE (Mercury: NA) - H7	98679H
Oakley RAZRWIRE (Pewter/Black: NA) - H7	98677H
Oakley RAZRWIRE (Plantinum/Rootbeer: NA) - H7	98678H
Reverb (Oakley Stereo Bluetooth Eyewear - BLK)	SYN1552
Reverb (Oakley Stereo Bluetooth Eyewear - WHT)	SYN1553
REVERB (Oakley Stereo Bluetooth Eyewear Br. Sm.)	SYN1554
Battery BT60 (PF5) Li-Ion 1020mAh	SNN5744
Battery-Only-Charger for PF batteries, HongKong plug	SYN1491A
Battery-Only-Charger for PF batteries, PRC plug	SYN1489A
Battery-Only-Charger for PF batteries, Taiwan plug	SYN1490A
Battery-Only-Charger for PF batteries, US/Euro plug	SYN1488A
Charger Adapter EMU/CE (Y-cable)	SKN6185
Charger Adapter EMU/EMU (Y-cable)	SKN6222
P790 Power on the Go	SPN5353
Power On The Go - Verizon	SYN1435
Smart Cable EMU - Motorola	SYN1003
Standard Car Charger EMU - P310	SYN1630
Travel Charger EMU Mid-Rate Switcher -Argentina	SPN5192
Travel Charger EMU Mid-Rate Switcher -Australia	SPN5193
Travel Charger EMU Mid-Rate Switcher -BRAZIL	SPN5187
Travel Charger EMU Mid-Rate Switcher -EURO	SPN5189
Travel Charger EMU Mid-Rate Switcher -INDIA	SPN5194
Travel Charger EMU Mid-Rate Switcher -JAPAN	SPN5274
Travel Charger EMU Mid-Rate Switcher -MEXICO	SPN5186
Travel Charger EMU Mid-Rate Switcher -PRC	SPN5188

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Travel Charger EMU Mid-Rate Switcher -TWN	SPN5216
Travel Charger EMU Mid-Rate Switcher -UK/HK	SPN5190
Travel Charger EMU Mid-Rate Switcher -US ENG	SPN5185
Travel Charger EMU Rapid Switcher -Argentina	SPN5197
Travel Charger EMU Rapid Switcher -BRAZIL	SPN5196
Travel Charger EMU Rapid Switcher - HK	SPN5199
Travel Charger EMU Rapid Switcher -Japan	SPN5275
Travel Charger EMU Rapid Switcher -MEXICO	SPN5200
Travel Charger EMU Rapid Switcher -PRC	SPN5198
Travel Charger EMU Rapid Switcher - US	SPN5202
Travel Charger EMU Rapid TWN	SPN5270
Vehicle Power Adapter EMU - VC700	SYN0847

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