Service Manual

Level 2

Preliminary

MOTOROLA™

DIGITAL WIRELESS TELEPHONE

Model V810

CDMA 800, 1900MHz & Analog 800MHz

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V810 CDMA DUAL BAND TRI-MODE PHONE

Introduction

The V810 CDMA phone consists of a main housing assembly and a flip assembly. The phone has the main circuit board, battery, headset jack, and accessory connector in the main housing assembly. The display and Camera are located in the hinged flip assembly.

The flip assembly includes the entire hinge mechanism and is attached to the main housing by four screws. There is a full display on the inside of the flip assembly and a OLED on the outside of the flip assembly.

The main housing assembly includes a battery cover, chassis, main circuit board, keypad and plastic front housing.

The main circuit board is comprised of the Receiver, Transmitter, Synthesizer and Control Logic Circuitry which together form the dual band tri-mode phone electronics.

CDMA-PCS 1900 Mhz BAND

Performance specification:

General Frequency and channel information:

Channel No., Tx Frequency (Mhz), Rx Frequency (Mhz)

Channel No.	*Tx Frequency (Mhz)*	*Rx Frequency (Mhz)*
25	1851.25	1931.25
200	1860.00	1940.00
400	1870.00	1950.00
600	1880.00	1960.00
800	1890.00	1970.00
1000	1900.00	1980.00
1175	1908.50	1988.50

The 1900 MHz band is split into 6 blocks(ABCDEF) of channels. usually only one block is used in a given geographic area.
There are no “standard” primary and secondary channels.
The actual primary and secondary channel depends on which block is used.
The lowest valid channel number is 25.
The highest valid number is 1175.
Total Number of valid channel numbers is 46.

CDMA 1900MHz Performance Specifications General.

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Specifications

CDMA 800 MHz Channel Numbering
General information:

The 800 MHZ CDMA channel numbering evolved from the Amps analog system which shares the same spectrum.

The Amps channel spacing is 30 KHz, because the CDMA signal BW=1.25 MHz, the actual CDMA signal must be spaced every 41 channels

(41*30 KHZ = 1.23MHZ)

In a dual-mode system, CDMA signals would never occupy analog control channels 313 to 354.

A -System preferred channels: primary =283, Secondary = 691

B- System preferred channels: Primary =384, Secondary = 777

The lowest valid CDMA channel is 1013.

The highest valid CDMA channel is 777.

Table 2: Overall System CDMA 800MHz

Function	*Specification*
Frequency Range	824.04 - 848.97 MHz Tx, Channels 1 to 799, f_{Tx} = 0.03 * N+ 825 MHz Channels 990 to 1023, f_{Tx} = 0.03(N—1023) + 825 MHz 869.04 - 893.97 MHz Rx Channels 1 to 799 is f_{Rx} = 0.03 * N+ 870 MHz Channels 990 to 1023, f_{Rx} = 0.03(N—1023) + 870 MHz
Channel Spacing	30 KHz
Channels	832
Duplex spacing	45 MHz(amps)
Frequency Stability	+/- 2.5 ppm (Amps)
Operating Voltage	+3.6 v nominal (3.0v to 4.4 v DC)
Display	128 X 160 Pixel diagonal have 10 lines, 260K TFT Display caller ID LCD(graphics) 96X39, pixel OLED
RF Power Output	max power 25dBm for CDMA(800 & 1900) and 26.1 dBm for Analog.
Input/Output Impedance	50 ohms (nominal)
Spurious / Harmonic Emissions	Complies with Title 47, Part 22 of the code of Federal Regulations.
Audio Distortion	Less than 5% at -26dB
Hum and Noise(C-MSG)	32 dBm below +/- 8kHz deviation(transmit and receive)
Modulation	F3: + 12 kHz for 100% at 1 kHz, AMPS (wide) 1M25D1W (1.25 MHz bandwidth) CDMA
Transmit Audio Response	6 dBm/octave pre-emphasis
Transmit Audio sensitivity	(AMPS) + 2.9 kHz deviation (nom.) @ 97 dBm SPL input @ 1 kHz
Transmit Duty Cycle	full, 1/2, 1/4, 1/8 rate (CDMA Mode)
CDMA Transmit Waveform Quality(Rho)	0.94
Receiver Sensitivity	-116 dBm (AMPS, SINAD, C-MSG weighted) Sinad 12dB or greater -104 dBm (CDMA, 0.5% Static FER) 0.5% or less
Alternate Channel Desense Protection	-60 db@+/- 60kHz (Amps)

Table 3: Environmental

Function	*Specification*
Temperature Range	Operational -20 o C to +60 o C Storage -40 o C to +85 o C Thermal Shock -40 o C to +85 o C (-40 o F to +185 o F) meets Mil. Std. 810C
Shock	Exceeds EIA Standards RS152B (Section 15) and IS-19
Drop	Exceeds EIA Standards RS316B and IS-19
Humidity	95% Relative Humidity; meets EIA Standard IS-19
Vibration	Exceeds EIA Standards RS316B and IS-19
Salt Fog	Salt Solution fog at 35 o C (95 o F), tested for 48 hours
Dust	140 mesh blown silica flour test, tested for 5 hours
Notes:	• EIA (Electronic Industries Association) Standard RS152B states the minimum stan-dards for Land Mobile Communications, FM or PM transmitters 25-470 MHz. • EIA IS-19 states the recommended standards for 800 MHz cellular subscriber units. • EIA Standard RS316B states the standards for portable land mobile communications. • U.S. Military Standard 810D establishes uniform environmental test methods for determining the resistance of equipment to the effects of natural and induced environments peculiar to military operations. • TIA/EIA/IS-98 Recommended Minimum Performance Standards for Dual-Mode Wide band Spread spectrum Cellular Mobile Stations.

Specifications subject to change without notice.

Foreword

Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It is intended primarily to support basic servicing, which consists primarily of mechanical repairs and circuit board replacement.

Authorized distributors may opt to receive additional training to become authorized to perform limited component repairs. Contact your regional Customer Support Manager for details.

Replacement Parts Ordering

Motorola maintains a parts office staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Cellular products. Orders for all parts should be sent to the Motorola International Logistics Department at the following address:

Accessories and After market Division
Motorola Personal Communications Sector

Schaumburg, IL 60196

International Motorolans that need to purchase parts should contact AAD via one of the following numbers:

Phone: 1-847-538-8023, Fax: 1-847-576-3023

However, domestic Motorolans should contact AAD via one of the following numbers:

Phone: 1-800-422-4210, Fax: 1-800-622-6210

http://accesssecure.mot.com/Accesspoint/cgi-bin2/SoftCart.exe/Accesspoint/quick.html?L+test+rkod3498+930004870

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

Model and Kit Identification

Motorola products are specifically identified by an overall model number on the product label. In most cases, assemblies and kits which make up the equipment also have kit numbers stamped on them.

Service

Motorola's regional Cellular Subscriber Service Centers offer some of the finest repair capabilities available to Motorola Subscriber equipment users. The Cellular Subscriber Service Centers are able to perform computerized adjustments and repair most defective transceivers and boards. Contact your regional Customer Service Manager for more information about Motorola's repair capabilities and policy for in-warranty and out-of-warranty repairs in your region.

General Safety Information

CAUTION

Do not jump start vehicle or use an automotive battery charger while the vehicle adapter option and the portable radiotelephone are connected to the vehicle electrical system, as this may cause serious damage to the radio. Disconnect the radio by removing the cable kit fuses.

Portable Operation

DO NOT hold the radio so that the antenna is very close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if it is held in the same manner as you would hold a telephone handset, with the antenna angled up and over your shoulder. Speak directly into the mouthpiece.

DO NOT operate the telephone in an airplane.

DO NOT allow children to play with any radio equipment containing a transmitter.

Mobile Operation (Vehicle Adaptor)

As with other mobile radio transmitting equipment, users are advised that for satisfactory operation of the equipment and for the safety of personnel, it is recommended that no part of the human body shall be allowed to come within 20 centimeters of the antenna during operation of the equipment.

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are under certain conditions capable of interfering with blasting operations. When in the vicinity of construction work, look for and observe signs cautioning against mobile radio transmission. If transmission is prohibited, the cellular telephone **must be turned off** to prevent any transmission. *In standby mode, the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.*

All equipment must be properly grounded according to installation instructions for safe operation.

Cellular Overview

Table 4:

Note
The following description is intended only as a preliminary general introduction to cellular systems. This description is greatly simplified and does not illustrate the full operating capabilities, techniques, or technology involved in cellular systems.

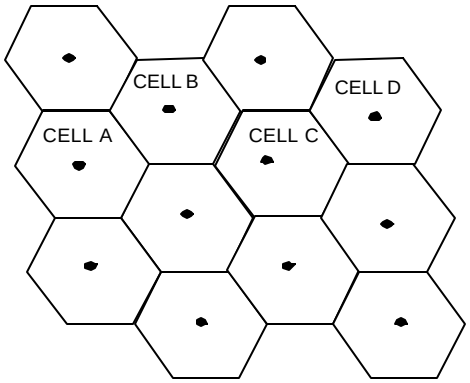
Overall Concept

Cellular systems are used to provide radio-telephone service in the frequency range of 824-894 MHz.

A cellular system provides higher call handling capacity and system availability than would be possible with conventional radiotelephone systems that require total system area coverage on every operating channel. The cellular system divides the system coverage area into several adjoining sub-areas, or cells.

Each cell contains a base station (cell site) which provides transmitting and receiving facilities. CDMA is a “spread spectrum” technology, which means that it spreads the information contained in a particular signal of interest over a greater bandwidth than the original signal. With CDMA, unique digital codes, rather than separate RF frequencies or channels are used to differentiate subscribers.

The codes are shared by both the mobile station and base station and are called “pseudo-random code sequences”. Since CDMA is a spread spectrum technology, all users share a range of the radio spectrum. CDMA cell coverage is dependent upon the way the network is designed. For each system 3 characteristics must be considered: coverage, quality, and capacity. These 3 must be balanced for desired lever of performance.



Some of the CDMA benefits are:

- Improved call quality with better and more consistent sound.
- Enhanced privacy.
- Variable rate vocoder.
- Soft hand off.

Hypothetical Cell System

Operation

In Figure 1: “Hypothetical Cell System”, the area bounded by bold lines represents the total coverage area of a cellular system. This area is divided into several cells, each containing a cell site base station which interfaces radiotelephone subscribers to the switching system. Since there are no reserved channels for each cell in CDMA, a user has a better chance of completing a call. Also, now there is no hard handoff between cell sites since all sites operate on the same frequency. This is called soft handoffs. In this system, subscribers in cell A & D simul-taneously operate in the same frequency. As a user moves from cell site to cell site, the base station monitors the signal strength of the user. Based on this signal strength, the base station decides which cell shall carry the call.

When a radiotelephone is in use well within a cell, the signal strength received at the cell site base station will be high. As the phone is moved towards the edge of the cell, its received signal strength decreases. Signal strength information therefore provides an indication of the subscriber’s distance from a cell’s base station. This change is handled automatically, and is completely transparent to the user. For example, assume that a cellular tele-phone initiates a call in cell A and then moves across the system area through cells B and C to cell D. As the phone moves into cell B, it is instructed to change to a different frequency that operates through the B cell on that frequency. A similar change is performed when the phone moves from cell B to cell C and again when the phone moves from cell C to cell D.

In this example, the radiotelephone has operated in four cell sites, through four cell sites, and on the same spread spectrum without interruptions in voice communications. As the radiotelephone leaves a cell, the frequency on which the phone and base station were operating is made available to another subscriber in that cell. Since this radiotelephone is dual mode, the radiotelephone can operate in either a CDMA system or Analog system.

Service Area

The area within which calls can be placed and received is defined by the system oper-ator. (Because this is a radio system, there is no exact boundary that can be drawn on a map.) If the portable is outside the radio service area, a No Svc (no service) message will appear on the phone’s display, and calls cannot be placed or received. If this happens during a conversation, the call is lost. Places where the ability to place or receive calls would be lost are in totally enclosed areas, such as underground parking garages, in buildings without windows, and in elevators. This situation would be indicated either by the No Svc message illuminating, or by the sound of either a fast busy signal or a high-low siren signal when call placement is attempted.

General usage in buildings having reason-able glass area is usually quite good. However, it may be necessary to move closer to a window to ensure reliable opera-tion.

PCS System

(Personal communication System) is identical to this cellular system except that the radio tele-phone service in the frequency range of 1850 MHZ to 1990 MHZ and the duplex spacing is 80 MHZ.

Receiver

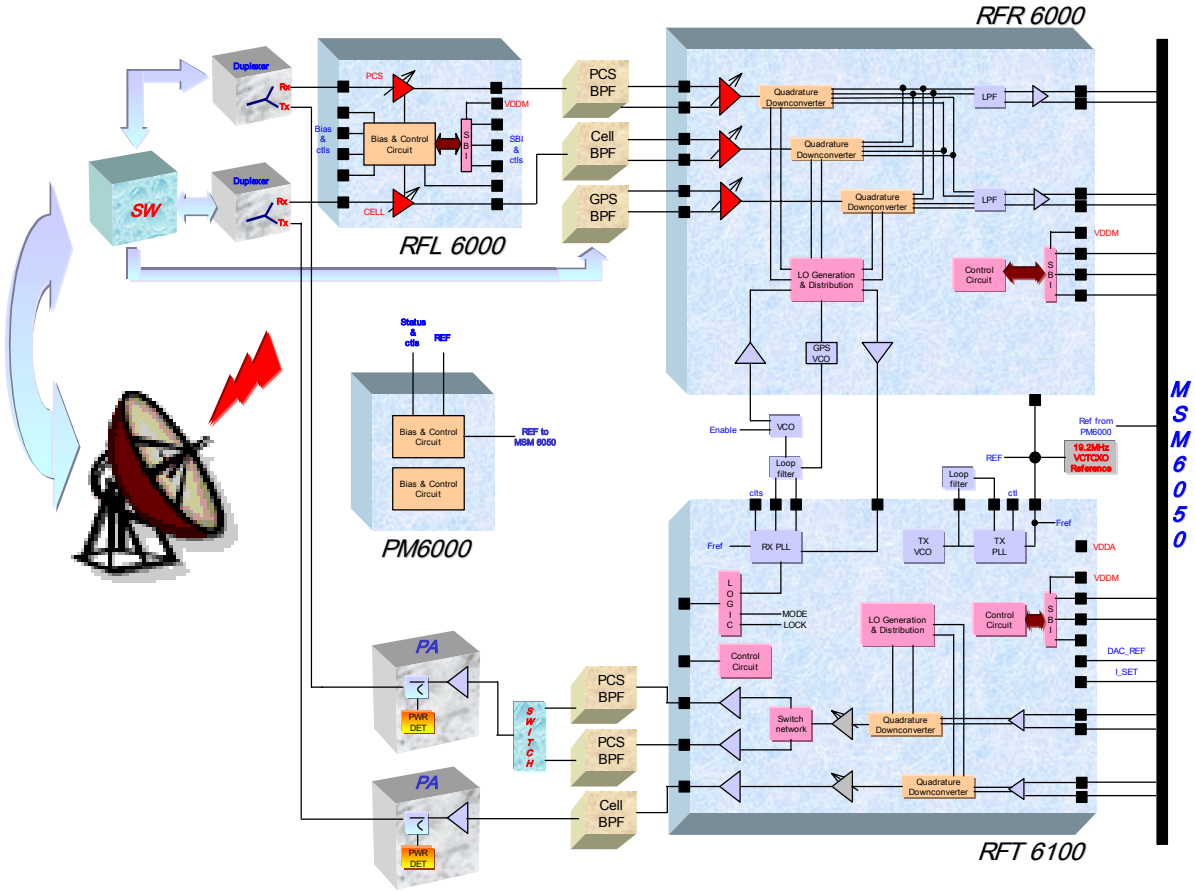
The receiver block consists of front end (RFL6000) and back end (RFR6000) also Audio signal processing is all achieved under DSP (Digital Signal Processor) control in the Audio/Logic section with MSM6050.

The received signal from the antenna is fed to antenna matching components, and then routed to the Band Selection Switch (SW100). At this point, the switch is selected as bands (Cellular, USPCS, GPS). For 800MHz (Cellular) band operation, the received signal is switched to the antenna port of the duplexer (DPX100) in both analog and digital mode (800MH CDMA), and then routed to the 800MHz LNA that is included in RFL6000 (IC101) through the receive port of the duplexer (DPX100). For 1900MHz (PCS – Personal Communications Service) operation, the received signal is switched to the antenna port of the 1900MHz duplexer (DPX101) and is fed to the 1900 MHz LNA that is contained in RFL6000 (IC101). For GPS, the GPS band pass filter (F103) is fed to the GPS LNA that is comprised in RFR6000 (IC100). F101 is band pass filter for 800MHz and F102 for 1900MHz. The IC101 is a front end IC that contains two sets of LNA .

The 800MHz and 1900Mhz receive signal is further filtered through the SAW band pass filters (F101, F102) for image rejection, LO leakage attenuation and Tx signal attenuation. The GPS receive signal is filtered through F103 for noise suppression before being fed to the LNA.

The LO signals for the 800Mhz and 1900Mhz is supplied by Dual band VCO. The GPS VCO is embedded in RFR6000 (IC100).

The 800MHz (CDMA), 1900MHz and GPS mixers down-convert the received signal to Baseband frequency and the 800Mhz (analog) to 12khz. All mixers typically require a LO input level of –4dBm at the LO input of IC100. The 800Mhz, 1.9Ghz and GPS Quadrature Downconverter outputs are combined to baseband filtering, and then are routed to IC201 (MSM6050).
This IC100 (RFR6000) provides these critical receiver functions for three different operating modes: CDMA, AMPS FM, and GPS position location. It is functionally compatible with the RFL6000, while adding GPS processing capability



Transmitter

transmitter

For the 800MHz band, the IC103 (RFT6100) provides the Zero-IF

Signal path, from analog baseband to RF driver amplifiers. In analog mode, also signals are used to generate from MSM6050. In digital mode, the I/Q signals are fed to I/Q modulator to provide QPSK. IC103 (RFT6100) has Tx VCO, Tx PLL and Rx PLL.

The final stage of IC103 (RFT6100) is Driver Amp, this provides adequate Pout and ACPR to PA block. According to Tx lineup calculation, Pout is 0.1dBm and ACPR is 56dBc in this stage. After that main signal pass cleanup filter, that has 2.4dB insertion loss for 824~849MHz and 38dB for Rxband rejection. The 800 MHz PA driver, IC104 has gain approximately 29dB. We have HBT PA module, Also High/Low power mode in conjunction with digital bias control. The transmitter signal is going to the SAW duplexer TX port, SP3T switch Tx port and finally Ant port will meet 24dBm for digital mode and 27dBm for analog mode.

For the 1900MHz band, RFT6100 output for PCS provides 1.1dBm of Pout and 58dBc of ACPR to the next stage. After that signal pass through Split SAW band pass filter, F105, whose typical insertion loss is 2.4 dB and 38dB for Rxband rejection. SPDT switch control to pass Split band, 1850-1880MHz and 1880-1910MHz, respectively. PA driver, IC107, whose gain is approximately 28dB. The output of IC107 is fed to PCS FBAR duplexer and then SP3T switch to Ant, the power level at the feeding point of the antenna is set to the suitable power output levels for each band of operation.

Synthesizer

The IC103 **(**RFT6100) consists of the Rx PLL, Tx PLL and Tx VCO. The external synthesizer block is composed of the RX dual band VCO (VCO100) and other supporting circuits including the loop filter and supports RF RX (Cellular 800Mhz, PCS CDMA and GPS). The TX RF synthesizer is totally internal to IC103 (RFT6100) except for the loop filter. All synthesizers are programmable via the data from MSM6050

The reference oscillator, TCXO100 is a temperature compensated crystal oscillator with frequency stability of 2 ppm over temperature extremes. Its frequency is 19.2MHz. Output of TCXO100 is supplied to MSM6050 (IC201), PM6000 (IC304), RFR6000 (IC100), and RFT6100 (IC103).

Main VCO covers the frequency range of 1715MHz to 1788MHz for the 800Mhz mode and 1.9Ghz mode. VCO control voltage range is 0.4 volts to 2.3 volts.

CONTROL LOGIC CIRCUITRY

Overview

The Audio and Control Logic circuitry is based on Qualcomm baseband IC (MSM6050/ PM6000). MSM6050 is a baseband CDMA Processor that has been optimized for wireless subscriber applications. It executes software that handles state control, MMI control, radio control, network communications and accessory control. External FLASH/PSRAM (IC309) provides the baseband Processor's MCU program and data memory. The General Control Power IC (IC304) provides the linear voltage regulator and battery charge control. Harness IC (IC300) is Motorola customed Asic to provide for CE bus Mux, additional GPIO and P-S converter etc.

External interfaces include Motorola's proprietary accessory interface (CN300) called as CE bus and an industry standard 2.5mm headset jack (EAR200). MIDI sound is created in MIDI IC (IC200). A microphone is located in the main board and a receiver speaker is located in the flip assembly. A dual window LCD is located in the flip assembly and main LCD support STN color display. White color backlighting is provided for main LCD display windows. Keypad with blue LED backlighting is provided in the main board.

Baseband Processor IC

IC201 MSM6050 CDMA 1X baseband Processor integrates functions that support a tri-mode CDMA/FM subscriber unit Subsystems within the MSM6050 device include a CDMA processor, a Digital FM (DFM) processor, QUALCOMM-designed DSP for voice compression, an ARM® ARM7TDMI microprocessor. To provide an optimized system solution for IS2000 –1X services, the MSM6050 device support 153kbps data rate air interface and also integrates a gpsOne Processor to support GPS one solution. Also integrated in the MSM6050 device are functions such as an audio voice codec, PLL, transmit DACs, ADCs, an Universal Serial Bus (USB) device controller, peripheral interfaces, and an enhanced clock and power management architecture. The MSM6050 IC contains the following major features:

- ☐ Integrated gpsOne Processor for direct interface to RF chipset
- ☐ Integrated 13-bit linear CODEC with multiple inputs (3) and outputs (3) with amplifiers
- ☐ Integrated general-purpose ADC for subscriber unit monitoring, e.g., temperature sensor
- ☐ Voice mode V1 (EVRC, PureVoice) all radio configurations
- ☐ Integrated PLL to provide additional on-chip clock frequencies
- ☐ Supports 19.2MHz TCXO frequencies
- ☐ Supports RadioOne ZIF (Zero I/F)
- ☐ Integrated Universal Serial Bus (USB) interface for plug-and-play (PC) applications
- ☐ 66-pin general-purpose interface (GPIO)
- ☐ Supports IS-95-A and IS-95-B compliant CDMA and DFM subscriber units

- Supports low-power, low-frequency crystal to enable TCXO shutoff
- Low Vdc power consumption during operation
- Software-controlled power management features
- ANSI/IEEE 1149.1A-93 compliant JTAG interface for Testability
- Enhanced I/O support for faster RS-232
- Supports page-mode flash memory

PM6000

The PM6000 chip (IC304) is a complete power management system device for CDMA handset applications whose primary functions provide battery management and charger control, and linear voltage regulation with programmable voltages for digital and RF/analog circuits. PM6000 IC contain the following features:

- 7 LDOs
- Serial Interface (SBI bus) to MSM
- TCXO control for Slotted mode operation
- Charging control for Li-Ion battery
- Ten 10-bit A to D converters (5 wired internally, 5 accessible)
- Keyboard/LCD backlight driver (not used)
- Ringer driver (not used)
- Vibrator driver (not used)
- MSM/32.768KHz clock driver
- Power On Reset control

FLASH/PSRAM Memory

IC309 Flash/PSRAM (Pseudo SRAM) Memory is mixed multi-chip package containing two 64Mbit Flash memories and one 64Mbit pseudo SRAM. The Flash/PSRAM Memory supports page mode for fast access time. Flash is for boot code, program code storage and NVM data storage. FLASH memory contains executable code that is executed directly from FLASH. Flash memory also contains configuration parameters, look-up tables, calibration constants, user selectable option settings, phonebook data, call history, etc. Pseudo SRAM contains run-time dynamic data storage, software stack/heap data, and other data that is frequently modified during run-time operation. The Baseband Processor accesses FLASH/PSRAM memory via a 16-bit asynchronous bus interface.

Accessory Interface

A 17 pin accessory connector (CN300), called as CE bus connector is provided at the bottom of the main housing. This interface supports charging accessories, analog and digital audio accessories, and RS-232 and USB communication accessories. The accessory interface provides for auto-detection of accessories upon insertion. Depending on the accessory, power can be provided to the phone from an external approved power accessory or power can be provided to the accessory for battery powered applications.

Battery Interface

The PM6000 (IC304) will be hardware configured for battery charging, which the external charging power supply is expected to provide the constant voltage and current regulation. Since CE Bus charging accessories do not provide the current and voltage regulation for charging lithium ion batteries, an external voltage/current control circuit is required. Pass Transistor (Q303), Battery Transistor (IC306) and Sense Resistor (R314,346) will provide the regulated voltage and current that is required for charging lithium-ion batteries.

The Bipolar PNP Transistor is used for Pass Transistor (Q303) and the P-channel MOSFET for Battery Transistor (IC306). The Sense Resistor (R314,346) used for current monitoring and protection is 0.15 Ohm. The HKADC AD converter of PM6000 monitors charging current, that is read and controlled by software.

Chargers for V810 are 2 types, mid-rate (400mA capable) and fast-rate (1.5A capable). Those should be recognized by phone at initial insertion. Charger is connected through CE bus connector pin 1(GND), 2 (BATTFDBK_RTS) and 3 (EXT_B+). Pin 3 is EXT_B+, main charging current path and pin 2 is battery feedback and manual test multiplexed signal. PM6000 will monitor battery voltage and charging current for battery icon displaying normal phone operation, without a charger attached

Power Distribution

Voltage regulation is provided by the PM6000 IC. The Low Dropout Regulators output voltages can be controlled by the MSM through the SBI. All of the LDO's outputs can be enabled or disabled with the LDO_ENABLE register, with the exception of the MSMP and MSMC LDOs. There is no provision for the enabling or disabling the MSMP and MSMC LDOs. The regulators and their load circuitries are described below:

- VREG_MSMC (1.867V) – MSM IC internal
- VREG_MSMP (2.887V) – MSM Digital, Memory, Harness, USB Transceiver, RFT6100, RFR6000, RFL6000
- VREG_MSMA (2.6V) – MSM Analog
- VREG_TCXO (2.85V) – TCXO supply, VCO
- VREG_RF_RX (2.85V) – RFR6000, RFL6000
- VREG_RF_TX (2.85V) – RFT6100, Temperature Sensor
- VREG_SYNTH (2.85V) – RFT6100
- B+ (3.6V) – PM6000
- B+_PA (3.6V) – PAM(800/1900), LCD Backlight LED, Audio AMP
- VREG_LED – Keypad Backlight LED,

AUDIO CONTROL CIRCUITRY

Audio Line-up

The audio routing and gain control will be supported by MSM6050 IC. With the integrated microphone and earpiece amplifiers, the MSM interfaces directly to the microphone and earpiece and greatly reduces

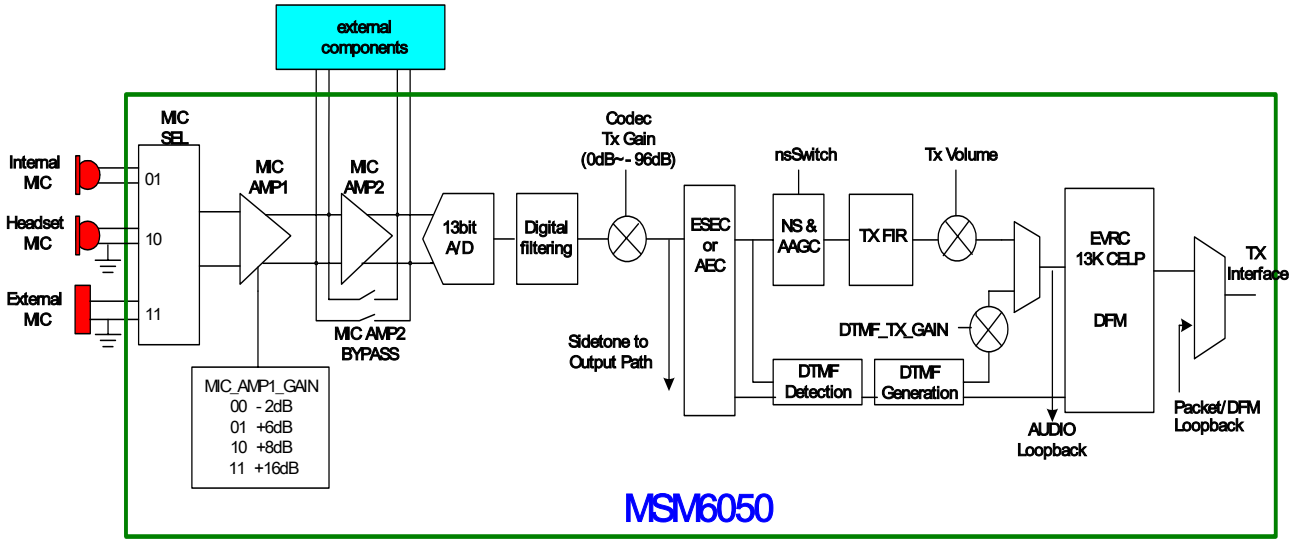
the audio interface into a few passive components. The integrated Codec converts an analog audio signal, either differential or single-ended, from the microphone into digital signals for the MSM6050's Vocoder. The integrated Codec also converts digital audio data from the Vocoder into an analog audio signal, either differential or single-ended, for the earpiece. The Codec is configured through the QDSP4000 Command types and is not directly controlled by the microprocessor. The Codec Configuration command is sent to the QDSP4000 and then the QDSP4000 executes the command and configures the Codec. The internal Vocoder supports EVRC, QCLEP 13K Vocoders, along with implementing two echo cancellers, an earseal (ESEC) and an acoustic echo canceller (AEC) for carkit applications. The Vocoder also supports digital FM (DFM), DTMF generation and detection, Noise Suppression, audio AGC control, and automatic volume control (AVC). The MSM6050 has an auxiliary Pulse Code Modulation (PCM) interface and programmable Tx and Rx 13-Tap compensation filters to support an auxiliary linear, mu-Law, or A-law Codec that is typically found in carkit applications.

Sidetone (DSP)

Sidetone is audio signal from the microphone summed into speaker path. The MSM6050 includes the capability of adding a portion of the Tx audio into the receive path. This sidetone is added with a programmable gain stage, with a range of 0 dB to -96 dB, controlled by the QDSP4000 DMA parameter CodecSTGain.

Transmit Path Audio

The mobile phone supports three microphone input paths identified as Internal Microphone (MIC1), Headset Microphone (MIC2), and External Accessory Microphone (AUDIO_IN). Headset and External Mic inputs are single ended and Internal MIC is differential Input. The proper Microphone path is selected by the MIC selector and path gain is programmable at the MIC AMP1, 2 in the MSM. Refer to the following sections and block diagram below.



A/D converter & Filtering

A/D is 13-bit linear two's complement converter. MIC AMP1 and MIC AMP2 gains should be selected to maximize the dynamic range without overloading the A/D (3.63Vpp max range). The transmit data from the microphone input is digitally filtered with an ITU G.712 compliant filter. The filter attenuates the input signals outside the 3400 Hz baseband and decimates the data rate to 8 kHz. The MSM6050 has two optional digital filters on the Tx path prior to the Vocoder, a slope filter and a high-pass filter. The slope filter is designed to provide pre-emphasis for the high frequency audio prior to the Vocoder.

Tx Volume Control

The Tx and Rx audio path have separate volume controls to adjust the loudness levels on the Tx and Rx audio paths. The Rx and Tx volume controls are programmable multipliers

Headset Microphone Path

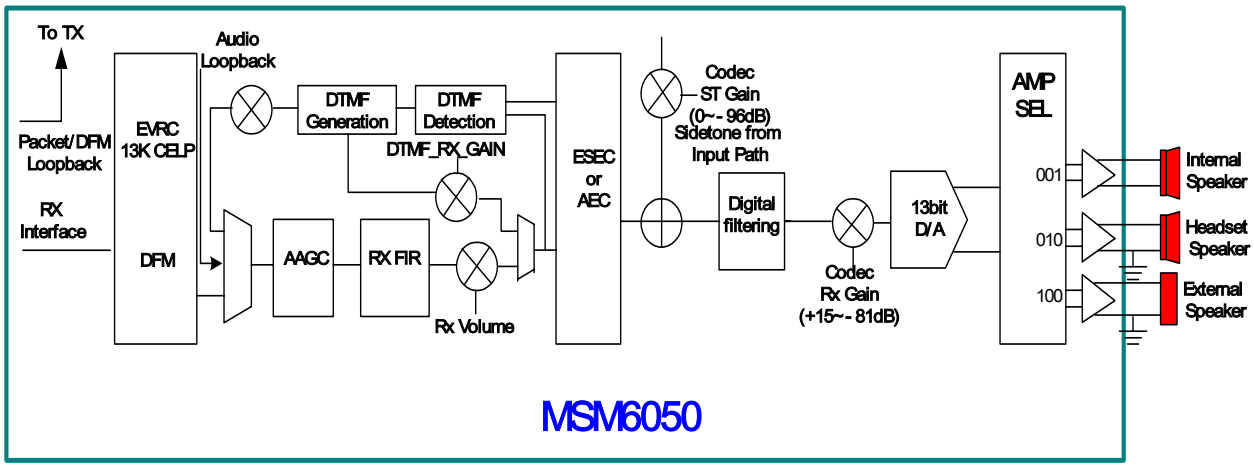
The Headset Microphone is pin 4 of EAR200, which is a 2.5mm jack. MICBIAS 1.8V from MSM is used for headset Mic bias. The single-ended MIC2P signal is fed to MSM headset Mic input and this line is shared as headset SEND/END detect signal from headset.

External Microphone Path

The External Microphone input is connected to pin 16 of CN300 (AUDIO_IN), the accessory connector for the mobile phone. The path is routed through IC301 to protect ESD and to the AUXIP pin on MSM. This single-ended signal feeds directly to the input MIC select multiplexer without an intervening gain stage. The audio signal shall have a nominal level (-27dBv) of 43.5mVrms at 1 kHz, between 300 Hz and 3 kHz.

Receive Path Audio Circuits

The mobile phone supports three audio output paths. The output of MSM's internal DAC drives the internal AMP SEL. The outputs can be routed to one of the three supported outputs via the internal multiplexer. These outputs connect to the EAR1OP, EAR1ON amplifier (Ear Speaker), the EAR2O amplifier (Headset boom speaker), and the AUXOP, AUXON amplifier (Accessory connector output). All outputs use the same D/A converter so only one output can be active at one time. The user can adjust the gain of the audio outputs with the volume control buttons. Forward link audio path block diagram is as below.



Rx FIR Filter

A type-I 13-tap FIR (Finite Impulse Response) filter is supported on the Tx and the Rx paths. Both filters are software programmable and can be reconfigured during Vocoder or DFM operation. Tx FIR is programmable 13-tap FIR filter whose coefficients can be programmed through the QDSP4000 parameters txPcmFiltLoad and Tx PcmFiltCoeff. Each filter consists of 7 coefficients with the outside taps, h[0] and h[12], h[1] and h[11], h[2] and h[10], h[3] and h[9], h[4] and h[8], and h[5] and h[7], using the same coefficient value. The Rx and Tx filters are intended to equalize the frequency response of the microphone (Tx), the earphone (Rx), and the frequency characteristics of the mechanical housing of the subscriber unit.

Codec Rx Gain

The Rx audio path contains a programmable gain stage, with a range of +15 dB to –81 dB, after the audio front end of the QDSP4000 and prior to the Digital-to-Analog conversion. The QDSP4000 DMA parameter CodecRxGain sets the Rx gain.

Ear Speaker Path

The Ear Speaker is driven by MSM's internal SPKR differential amplifier. This amplifier is powered by voltage VREG_MSMA and Speaker outputs from MSM are routed through the speaker path EAR1OP(+) and EAR1ON(-), that are routed to 40 pin B-B connector through main board and then connected to the transducer in the flip assembly.

Headset Speaker Path

The headset uses a standard 2.5mm phone jack. The phone will detect the presence of a headset using pin 2 on the headset jack, which is

pulled high by R213 and connected to the HEADSET_DET_N to MSM interrupt. This pin is aligned with the ground sleeve of the headset plug and will be pulled to a logic low whenever the headset plug is inserted into the jack. The headset may contain a momentary switch, which is normally closed and is in series with the microphone cartridge. When the momentary switch is pressed, the bias current being supplied to the microphone will be interrupted. The phone will detect this action and make an appropriate response to this action, which could be to answer a call, end a call, or dial the last number from scratchpad.

The Headset Speaker makes use of the amplifier in MSM and the single-ended EAR2O output audio path is routed through C237 to pin 3 of the Headset Jack (EAR200). If an external headphone jack is plugged into the phone, the HEADSET_DET_N pin will be pulled to ground and drive the headset speaker as single-ended off the Speaker-audio path.

External Speaker Path

The External Speaker is connected to pin 15 of CN300 (AUDIO_OUT ON/OFF), the accessory connector for the mobile phone. The audio path is routed through IC302 to protect ESD and connected to MSM AUXOP. The DC level of this AUDIO_OUT signal is also used to externally command the phone to toggle it's ON/OFF state. The AUDIO_OUT signal connects to PM6000 KBDPWR_ON pin via D301 to provide this capability. AUDIO_OUT will be routed to MSM GPIO to detect POWER/END key.

MIDI Alert Interface

The YMU762 (IC200) is an MIDI sound generator IC for mobile phone ringing melodies. The YMU762 provides high quality audio while requiring few external components and minimal power consumption. Due to its excellent PSRR, it can be directly connected to the battery, saving the use of an LDO.

MMI (KEYPAD/DISPLAY)

Keypad Interface

The keypad interface consists of an array of twenty-three buttons and multi control switch buttons located in the main board. Multi control switches are provided on the main board for volume control and voice activation. Keypad actuation is detected by the Baseband processor (MSM6050) through the integrated Keypad Port. Activation of a switch (Keypad or multi control switch) will assert (active low) two array signals that will be decoded by the MSM6050 to determine the active key-press. Key strobe signal is provided from Harness Chip (IC300). Keypad back-lighting is provided through an array of 14 LEDs on the main board. ON/OFF control of the LEDs is controlled through the backlight sink circuit.

Flip Open/Close Detection

The Hall sensor switch (IC204) is located on the main board to detect flip open/close status. When flip is closed, the Hall sensor is activated (active low) and this signal is routed to MSM interrupt.

Display Module Interface

The display module is housed in the flip assembly. The display module includes window LCD panel, back-light circuitry, and display driver circuitry. The Display Module interfaces to the main board via CN200. 16-bit parallel interface is used for LCD.

CAMERA

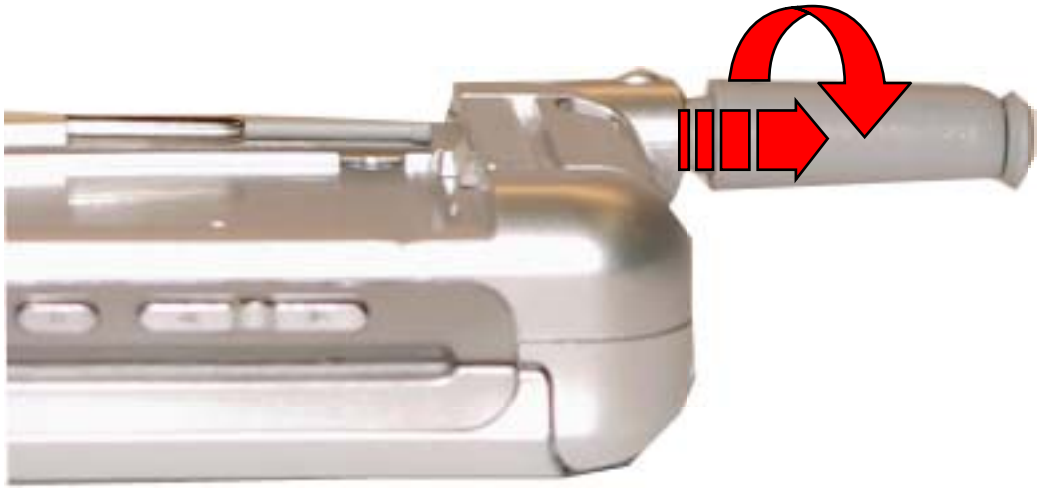
OMNIVISION CAMERA is located on the LCD board.
This camera is 300K Pixel COMS VGA type.
Operating voltage is 2.5V and 3.0V.

LEDs

The Keypad Backlight LED is realized by ten blue color LEDs which part number is LTST-C192TBKT. One indicate led is used for indication LED. This LED's part number is LNJ115W8PRA.. Harness chip (IC300) controls Keypad Backlight LED and indicate LED.

Antenna

Ensure the phone is turned off. Grab the bottom of the antenna Assembly, unscrew the antenna from the housing, lift the antenna away from the housing.



Battery Cover

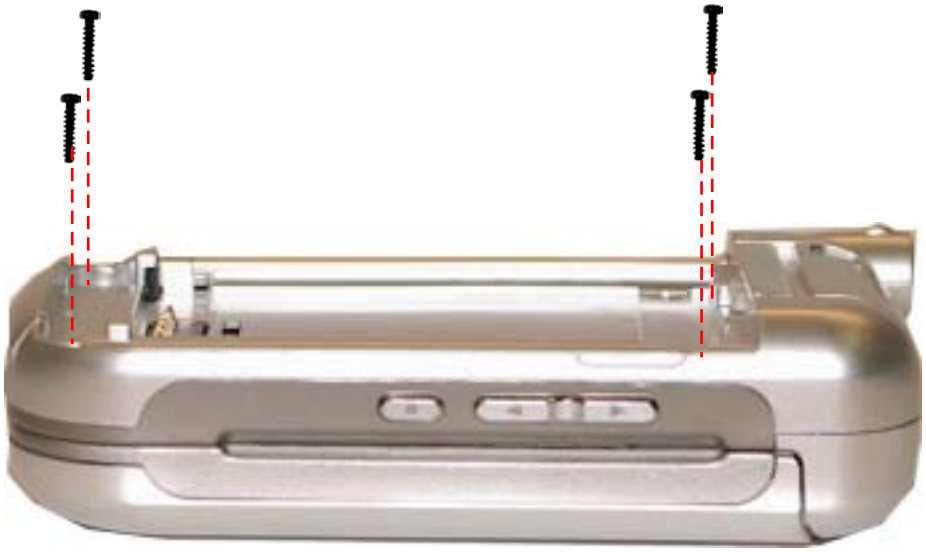
Pull the battery door latch, gently lift the battery door away from the rear housing.

Battery

Slide the battery in the direction of the arrow, lift the top end of the battery near the antenna up and out of the battery compartment as shown.

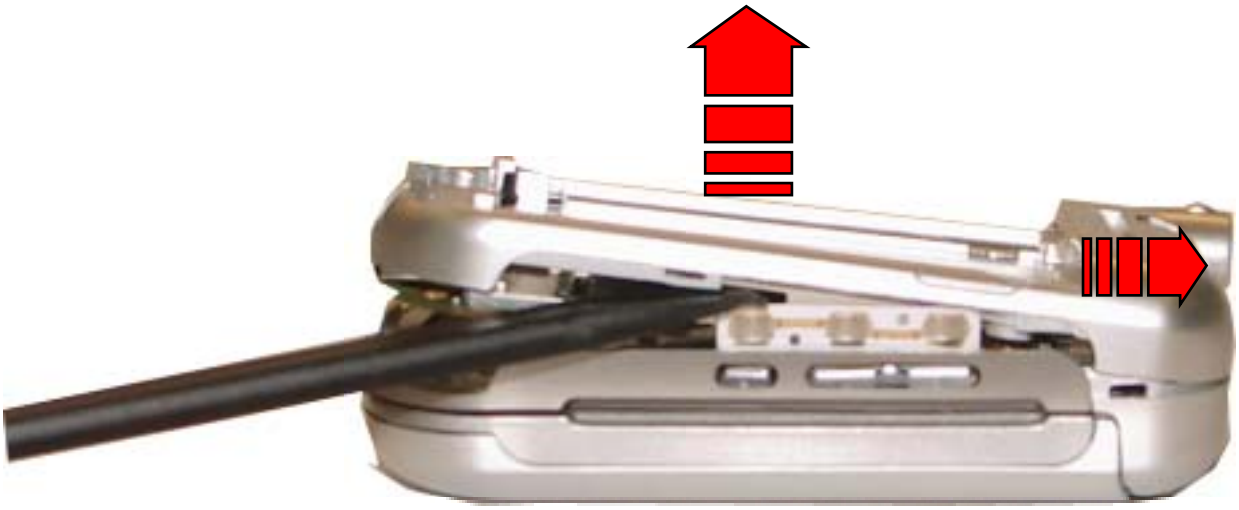
Back Screws

Using a T-drive with a T- 6 bit, remove the 4 screws from the rear housing.



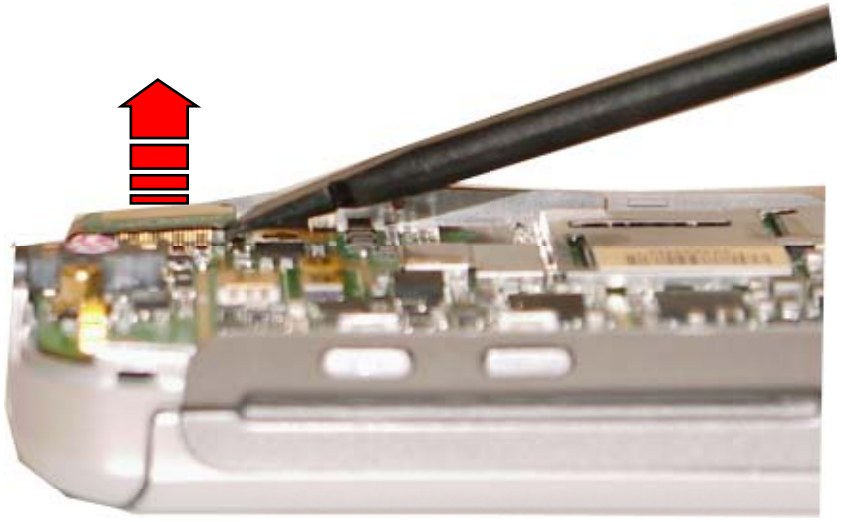
Back Housing

There are the Snap fits on both side of the rear housing. Pry them with the bezel stick and release both Snap fits as shown in the picture below. After releasing the Snaps fits, gently lift the back housing and push to the front.



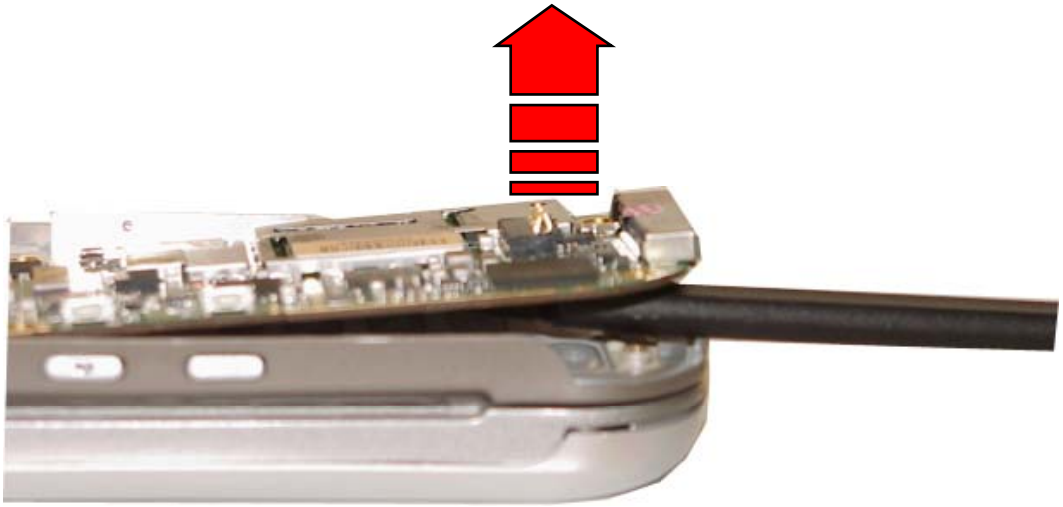
Flip Connector

Using the bezel stick tool, pull up the flip Flex cable connector.



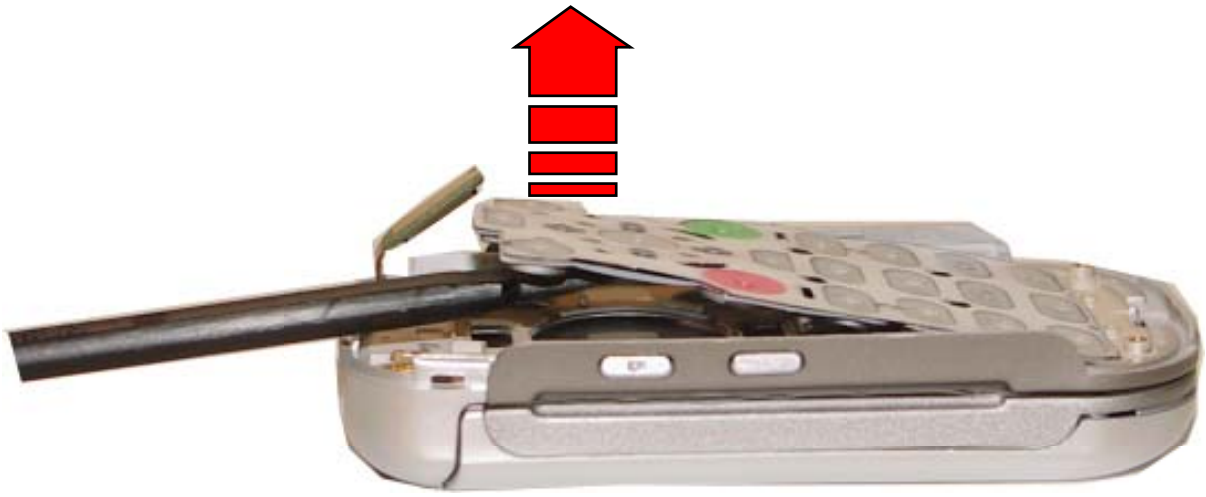
Main Board

Pull up the bottom side of the PCB board Assembly.



Keypad

Pull up the Keypad Assembly.

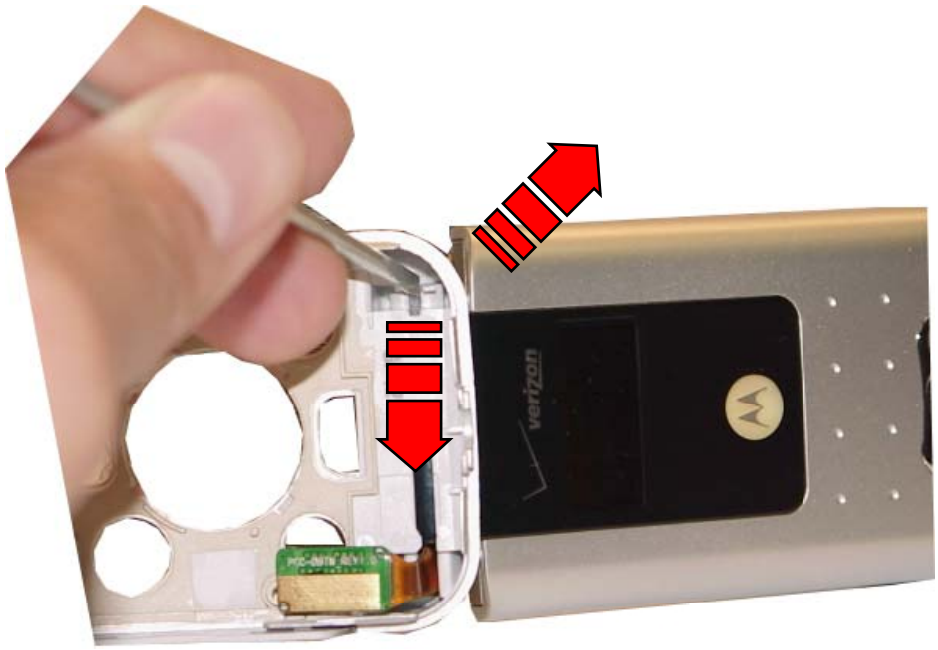


Flip Ground

Use twister to remove the flip ground Assembly. (Please make sure to re-install the flip ground assembly back in to place).

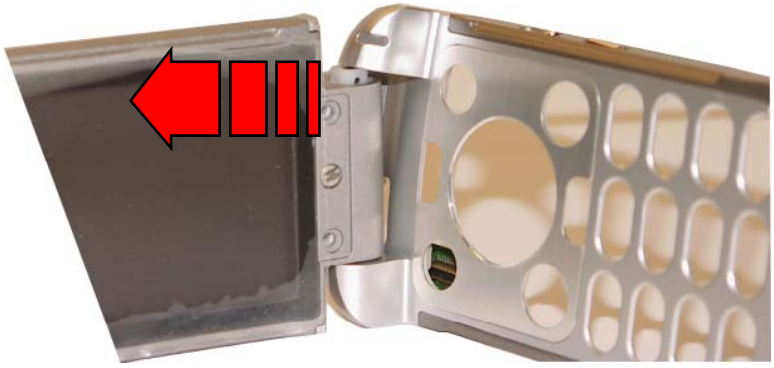
Flip Hinge

Use a small flat head screw driver. Push down the Hinge Assembly, pull off the flip Assembly.



Flip Remove

Push down (Twist) the Grip, pull up the flip Assembly.



Rubber Bumper

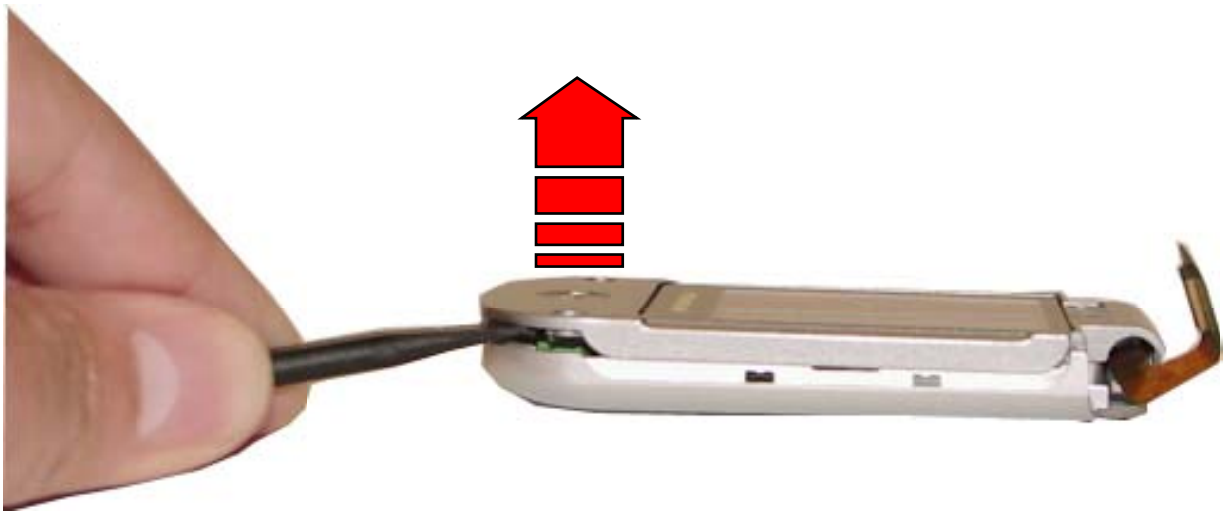
Using a twister tool remove the ribber Bumpers from the flip Assembly.

Flip Screws

Using a small head Phillips screw driver, remove the 4 screws from the flip Assembly.

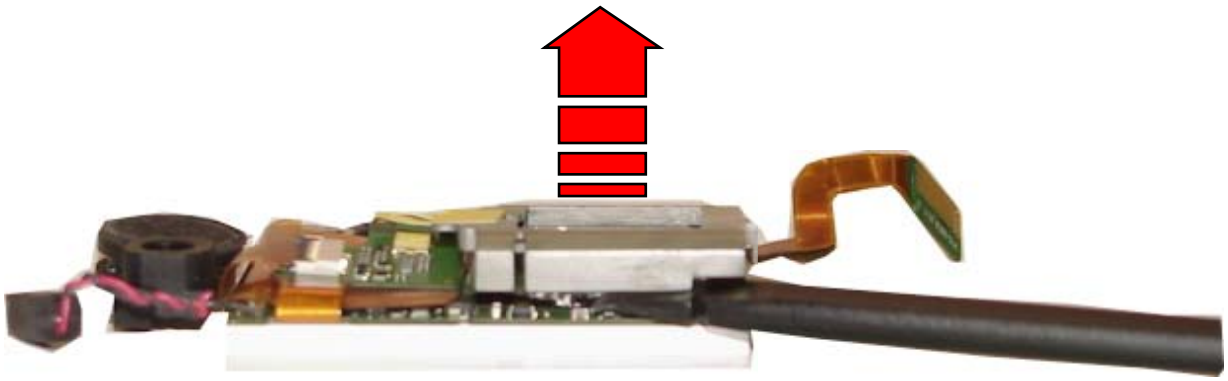
Flip Cover

Using the bezel stick, pull up the flip Assembly.



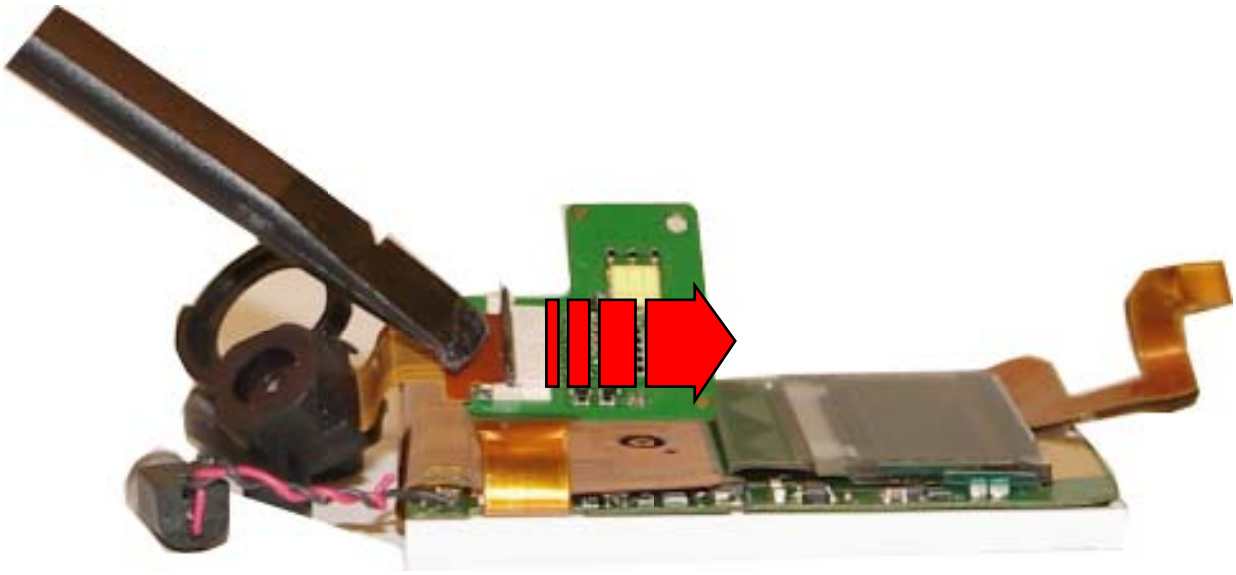
Bracket Sub LCD

Using the bezel stick, remove the bracket sub LCD Assembly from the CLI Display.



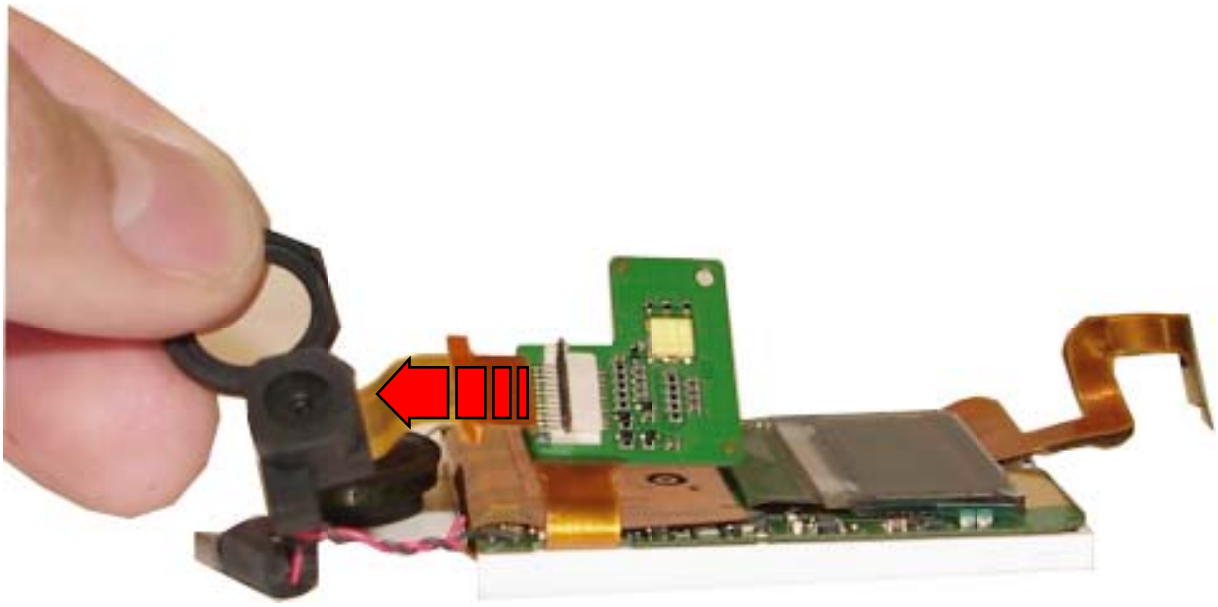
Camera Connector

Using the bezel stick tool, pull up the camera Flex cable connector.



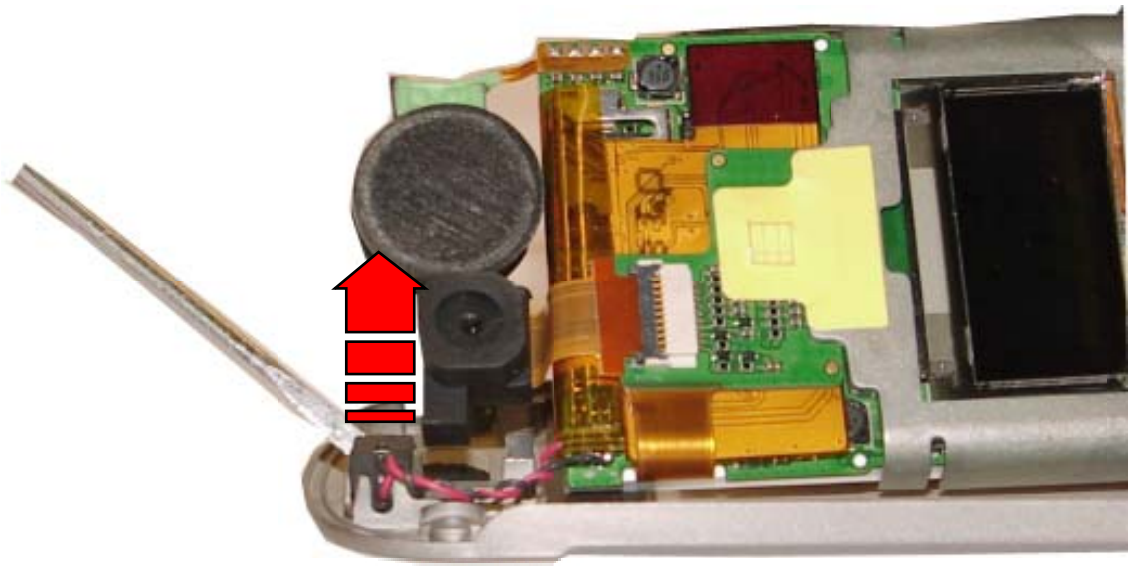
Camera Remove

Pull off the camera Assembly from the connector.



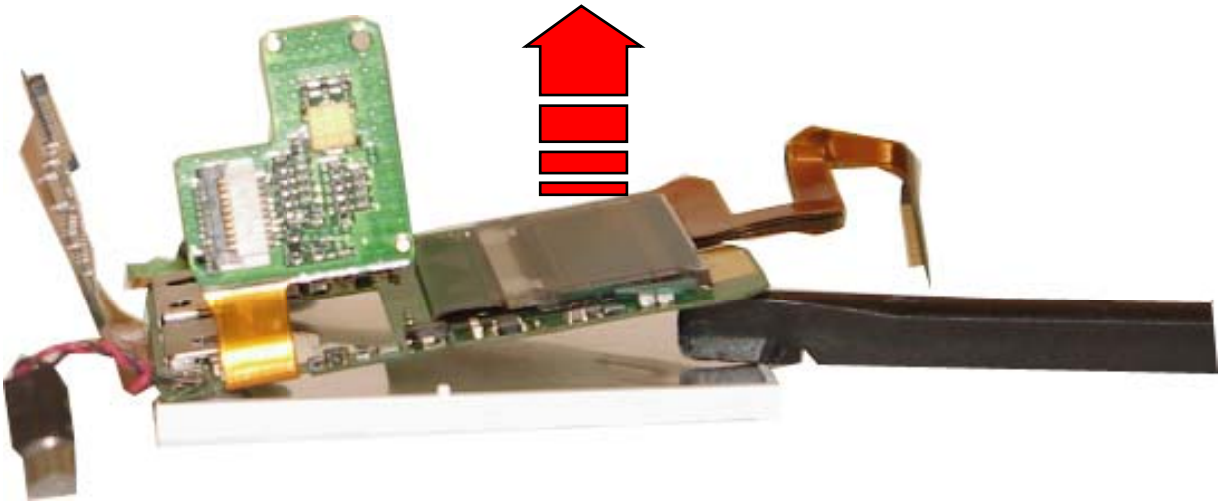
Vibrator

Using a flat screw driver pull off the vibrator motor from the flip housing.



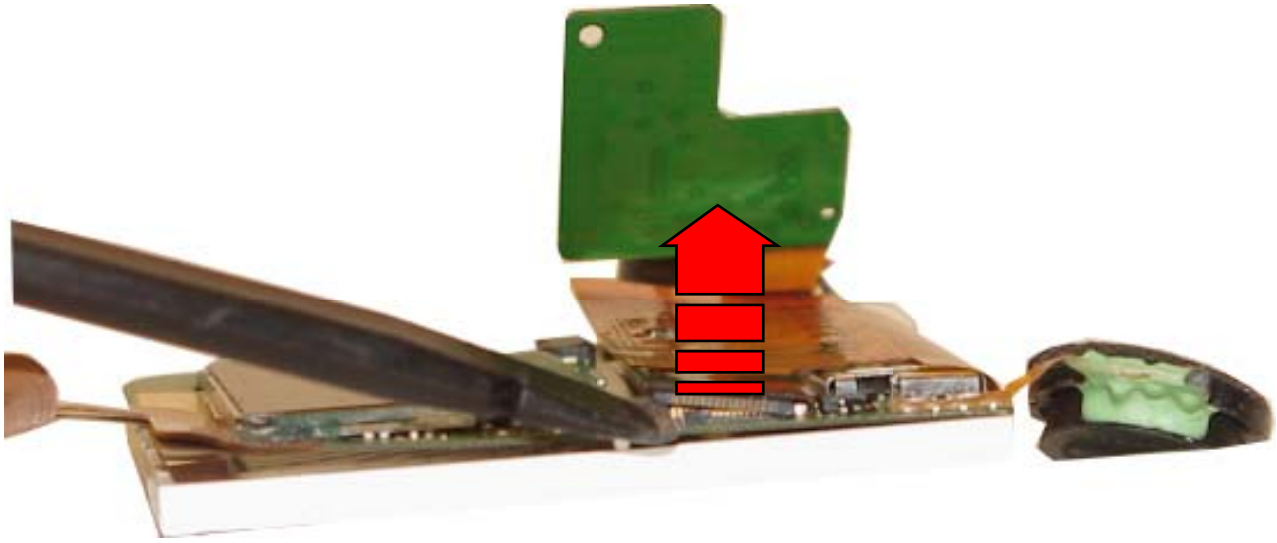
Display's Disassembly

Using the bezel stick tool, pull up the Display Assembly from the flip Assembly.



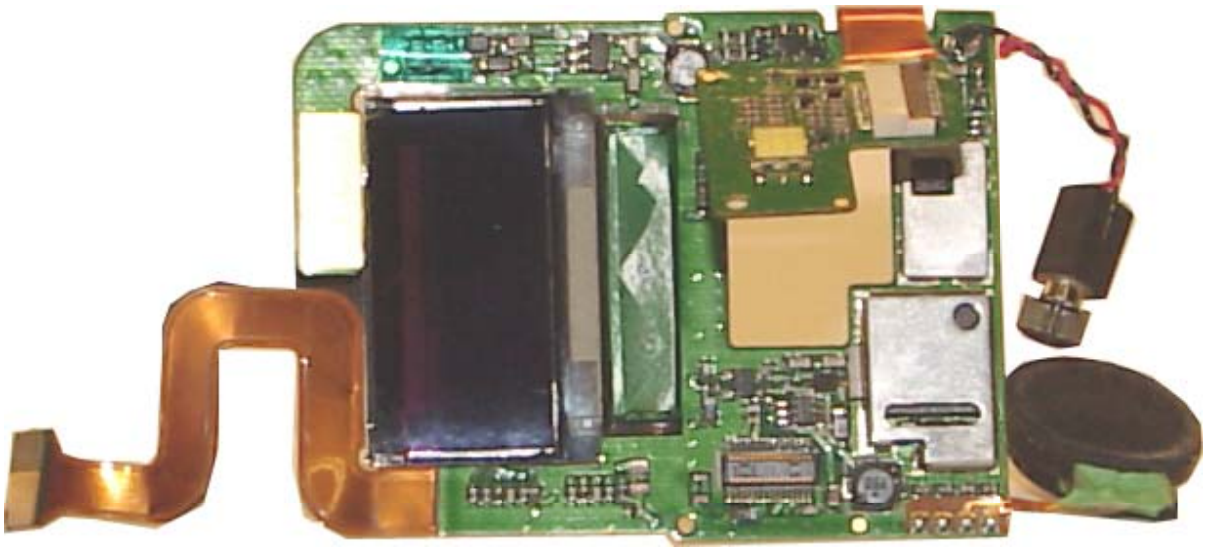
Main Display Connector

Using the bezel stick tool, pull off the Main Display Flex cable connector.



Main Display

CLI display, Flash, vibrator, Speaker and camera circuit Module.



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V810 PRODUCT SUPPORT TOOLS

FLASHING/FLEXING/NAM PROGRAMMING

V810 is a Qualcomm chipset based and it uses the 17 pin CE Bus Connector which uses the RS232 & USB communication protocols. The following are the hardware and software requirements:

1. Personal computer with
2. PST 6.6 or latest software Motorola test interface adapter box (junior board) -
3. SYN8400A Interface adapter power supply –
4. SPN4029A or Wall charger
5. SPN4278D CE Bus cable
6. SKN6304B Serial & USB cable same as used for tarpon P2K

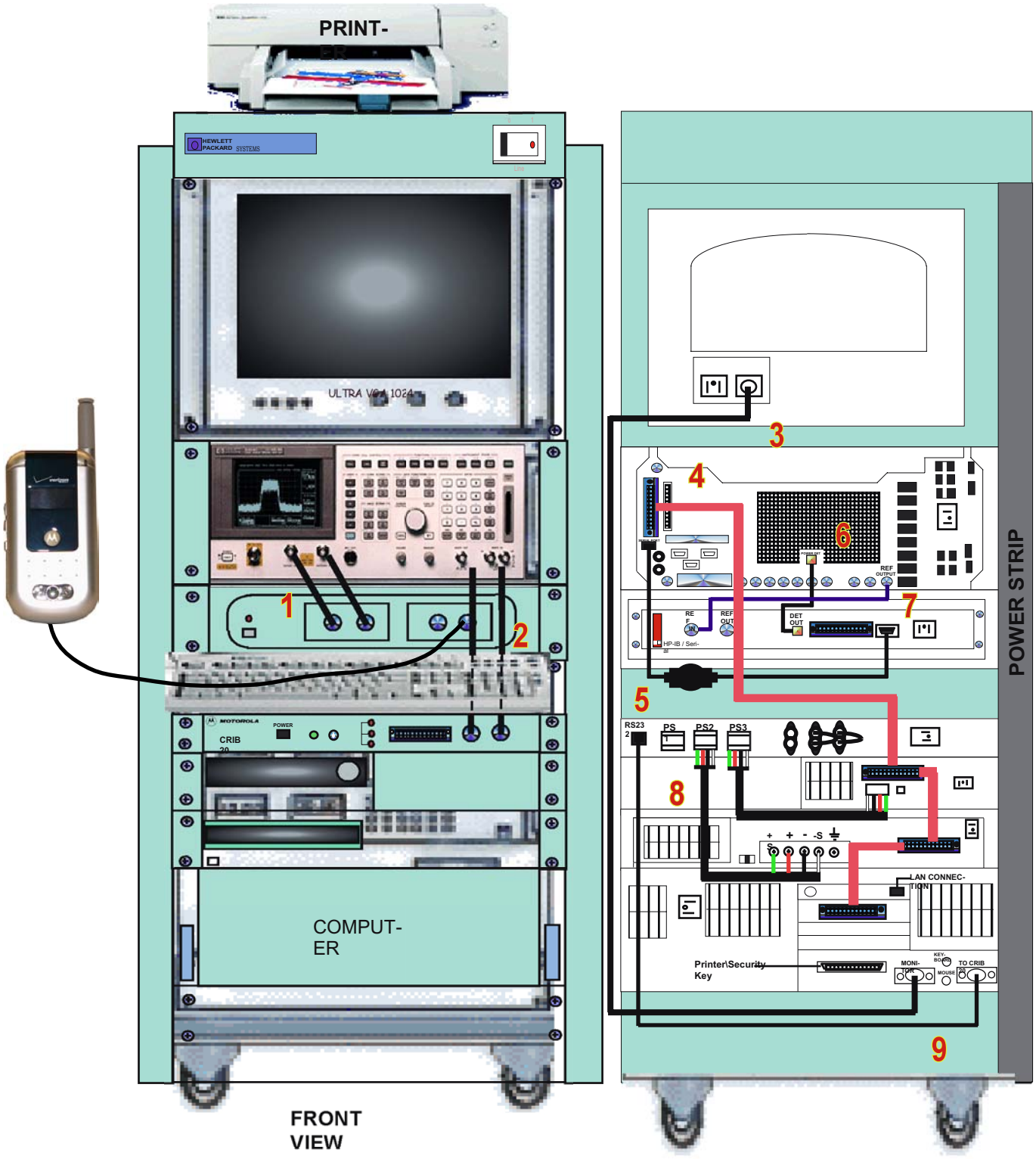
About Junior board operation:

V810 will support both USB & Serial communication. V810 uses

the T720 Rf Cable adaptor part # 288792Ok01 which is used for all Rf Phasing and testing.

TEST AND PHASING

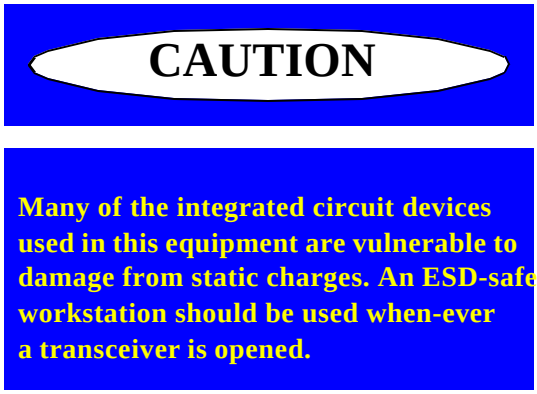
Gate 24 supports the testing and phasing of V810 product, For more details on Test and Phasing contact Service Test Engineering Group.



Troubleshooting

Introduction

Known good replacement parts and assemblies should be available to be used for trou-bleshooting by substitution, and for replacement of defective parts/assemblies. Defective circuit boards should be forwarded to the appropriate Motorola service facility for repair. Refer to the “Replacement Parts” section of this manual for a list of replacement part descriptions and part numbers.



Troubleshooting and Repair

Refer to the disassembly instructions located in the “Disassembly” section of this manual for instructions on removing parts/assemblies.

Testing after Repair

After any repair work has been carried out, the unit should be thoroughly tested to ensure that it operates correctly. This is especially important if the Logic / RF assembly is replaced.

For general repairs which do not include replacing the Logic/RF assembly, simply placing a call and checking signal strength, and transmit and receive audio quality is normally sufficient.

When the Logic/RF assembly is replaced, the unit must have a comprehensive test on a CDMA cellular/PCS compatible communications analyzers. See “Testing” for further details. Placing a call on air is usually carried out at this stage to complete the testing procedure.

(Note: The field test guide will also provide you with additional information and help you in investigating a problem.

TROUBLESHOOTING

The goal in trouble shooting is to quickly narrow down the possibilities to isolate a failure to a single faulty component. This is especially important before deciding to replace a large IC, filter or any component that is difficulty or risky to replace. Sometimes the problem will be visually obvious. For example: a cold solder joint, cracked chip, tombstone parts etc., other times it will be necessary to take some measurements.

NO TURN ON – DEBUG PROCEDURE

- Visual check – look for any damaged parts, unsolder, Cold solder or missing parts
- Checking for short circuits – apply 4.4V power supply with a 1A current limit through the external connector. If the phone draws more than 0.5A, check all the regulators signals for short to ground
- Check for the power B+ at IC306 pin 1,

- Place a zero ohm resistor at R310
- Check the regulated output voltages

•.if the voltages on the regulators are not correct

Table 7:

Linear Regulator	Nominal Voltage	Location to check
VREG_MSMP	2.88V	C329
VREG_MSMC	1.86V	C330
VREG_MSMA	2.65V	C331
VREG_RFRX	2.85V	C328
VREG_TCXO	2.85V	C325

reflow or replace IC306

- Check the 19.2 Mhz clock signal at TCXO100 if not present replace TCXO100

Remember to remove R310 – zero ohm resistor after the trouble shooting process.

Internal Charger Test Debugging

Phone must be in Phone T mode to analyze charger.
In DMSS mode, the default state of the charger is off unless a valid charger (fast or mid rate) and battery (EPROM and Thermistor present) are detected by software.

Charging circuitry (except for PM6000) is next to battery contact block and not under any shields.

When charger is disabled, the EXT_B+ current should be ~150mA +/- 50mA. Otherwise battery charge test current limits will be exceeded. This failure may not be caused by the charger circuit.

When charger is enabled (using set DVT Option command) with 3.6V battery connected, EXT_B+ current should be at 1.5A for high current test, and ~400 for mid rate current test. If not, verify that EXT_B+ is >4.4V at CEBUS connector and battery voltage is 3.6V at the battery contact block.

When charger is enabled, battery charge current will be 1.5A – EXT_B+_Current for high rate, and 400mA – EXT_B+_Current for mid rate current settings.

When charger is enabled, voltage on Q303 should be at 1.2V.
This voltage is proportional to the EXT_B+ current and is calculated by (EXT_B+_CURRENT/ CURRENT_LIMIT) * 1.5 where current limit is either 1.5A or 0.400A.

Symptom	Probable Cause	Verification and Remedy
1. Phone will not turn on or stay on.	a) Battery either discharged or defective.	1. Measure battery voltage across a 50 ohm (>1 Watt) load. 2. If the battery voltage is <3.4 V DC, recharge the battery using the appropriate battery charger. 3. If the battery will not recharge, replace the battery.
	b) Battery connector open or misaligned.	1. Visually inspect the battery connectors on both the battery pack and the transceiver, including the solder connections from the battery connector to the main PC board. 2. Realign the contacts or, if necessary, replace either the battery or battery connector.
	c) Transceiver Board defective.	1. Replace the keypad membrane with a known good part. 2. Temporarily connect 4.5 V DC to the battery contacts. 3. Depress the PWR button; if unit turns on and stays on, disconnect the power source and reassemble the phone with the new keypad membrane.
	d)Transceiver Board Debugging Follow the no turn on Debug procedure.	1. Remove the Transceiver Board. Substitute a known good board. 2. Temporarily connect 4.5 V DC to the battery contacts. 3. Depress the PWR button; if unit turns on and stays on, disconnect the power source and reassemble the phone with the new RF/Audio-Logic board and re-test phone.
2. Phone exhibits poor reception and/or erratic operation (such as calls frequently dropping, weak and/or distorted audio, etc.)	a) Defective antenna or damaged antenna connector. b) Defective RF/ Audio-Logic Board.	1. Replace the antenna with a known good antenna. 2. Check for loose or damaged cans.

Symptom	Probable Cause	Verification and Remedy
3. Display is erratic, or provides partial or nodisplay.	a) Defective display module. b) RF/Audio-Logic board defective.	1. Disassemble the display and reassemble to check the connection. If it does not recover, check the transceiver board. 2. Check connection. If connection not at fault, proceed to b. Replace the RF/Audio-Logic Board
4. Alert ringer volume is distorted or too low.	a) Alert defective. b) RF/Audio-Logic board defective.	1. Replace the defective alert with a known good alert. 2. Replace the RF/Audio-Logic Board
5. Transmit audio is weak, distorted, or dead.	a) Microphone defective. b) RF/Audio-Logic board defective.	1. Replace defective microphone. 2. Replace the RF/Audio-Logic Board
6. Receive audio is weak and/or distorted.	a) Speaker defective. b) RF/Audio-Logic board defective.	1. Replace defective speaker. 2. Replace the RF/Audio-Logic Board

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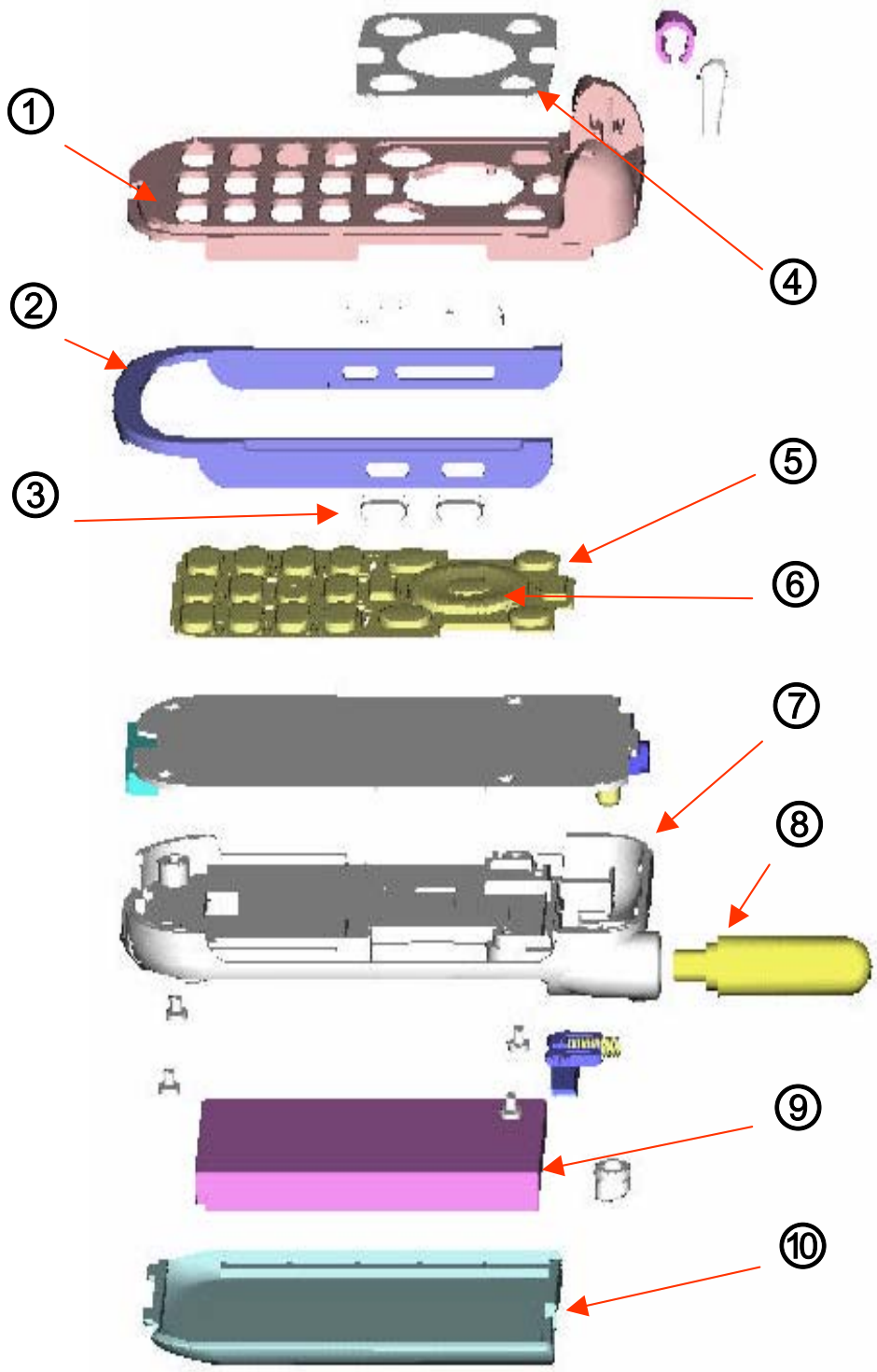

Parts Numbers

NO.	Description	Part Number
1	Housing front	01-36011-01
2	Frame front	-
3	Side Key	40-00010-01
4	Plate deco front	-
5	Tel key	37-36000-01
6	Navigation key	10-36000-03
7	Housing rear	01-36012-01
8	Antenna	01-36000-01
9	Battery Pack	SNN5724A, 5725A, 5726A
10	Cover Battery	-