Various burst lengths are used for different ST activities. Four uses of signaling tone are:

- Indicates ringing
- Acknowledges a handoff
- Indicates call termination
- Indicates switch hook

Supervisory audio tone (SAT)

The supervisory audio tone (SAT) is one of three frequencies around 6 kHz used in AMPS signaling. SAT is generated by the cell site, checked for frequency or accuracy by the cellular telephone, then transponded (that is, not merely reflected but generated and returned) to the cell site on the REVC.

The cellular telephone uses SAT to verify that it is tuned to the correct channel after a new voice channel assignment. When the central controller (switch) signals the mobile regarding the new voice channel, it also informs the mobile of the SAT frequency vector to expect on the new channel. The returned SAT is used at the cell site to verify the presence of the telephone's signal on the designated channel.

Placing a call (mobile-to-land or mobile-to-mobile)

When a cellular telephone user originates a call, the cellular telephone re-scans the access channels to ensure that it is still tuned to the strongest one. The cellular telephone then transmits data at the rate of 10 kilobits per second on the control channel to notify the switch of its mobile identification number (MIN) and the number it wants to reach. The switch verifies the incoming data and assigns a voice channel, and when a SAT is correct, the telephone transponds the SAT back to the cell site and unmutes the forward audio.

At this point both forward and reverse audio paths are unmuted and the cellular telephone user can hear the other end ring, after which conversation can take place. The SAT is sent and received more or less continuously by both the base station and the cellular telephone. However, the SAT is not sent during data transmissions and the cellular telephone does not transpond the SAT continuously during voice operated transmit VOX operation. Notice that SAT and signaling tones are only used on AMPS voice channels, and that the signaling tone is transmitted only by the cellular telephone.

Receiving a call (land-to-mobile)

Once a cellular telephone has gone into service, it periodically scans the overhead message information in its memory and monitors the paging messages for its telephone number. When a page match occurs the cellular telephone scans each of the access channels and tunes into the strongest one. The cellular

telephone then acknowledges the page on that access channel and notifies the central controller of its cell location. The switch then assigns a voice channel and a SAT to the cellular telephone. The cellular telephone tunes to the voice channel, verifies the presence of the proper SAT frequency, and transponds the signal back to the cell site.

At the cell site, the reception of SAT signals the central controller that the cellular telephone is ready for the call. An alert order is then sent to the cellular telephone which responds with a 10 kHz signaling tone. The subscriber unit rings for 65 seconds or until someone answers. Then the 10 kHz signaling tone is terminated to alert the central controller that someone has answered. The switch then connects the incoming call to the appropriate circuit leading to the cell in contact with the cellular telephone. At this point both forward and reverse audio paths are unmuted and the conversation can take place. The SAT is sent more or less continuously by the base station and transponded by the cellular telephone, except during data transmission.

Power steps

As a call progresses, the site continuously monitors the reverse channel for signal strength.

Analog cellular telephones have eight power steps, but portable models are prevented from using the two highest power steps by the cell site. (Power steps 0 and 1 are the same as power step 2). Transmit power level commands are sent to the cellular telephone as required to maintain the received signal strength within prescribed limits.

This is done to minimize interference possibilities within the frequency re-use scheme. If the signal received from the cellular telephone is higher than the prescribed limit (such as when the unit is very near the cell site), the subscriber unit is instructed to step down to a lower level.

Handoffs

If the cellular telephone is at its maximum allowed power for the cell site it is using, and the received signal at the cell site is approaching the minimum allowable (typically -100 dBm), the cell site signals the switch to consider the subscriber unit for a handoff. The central controller (switch) in turn has a scanning receiver at each of the surrounding cell sites measure the cellular telephone's signal strength. The site with the strongest signal is the site to which the call is handed if there are available voice channels.

On an AMPS channel, the handoff is executed by interrupting the conversation with a burst of data (called blank and burst) containing the new voice channel assignment. The telephone acknowledges the order by a 50 millisecond burst of 10 kHz signaling tone on the originally assigned voice channel. The mobile telephone then drops the original voice channel and tunes to the newly assigned voice channel, keying up on that channel and transponding the assigned SAT.

Once the handoff has been accomplished, the newly assigned cell site then alerts the switch that the handoff has been completed and the old voice channel is dropped.

Note

This data exchange occurs very quickly, within only 260 milliseconds. However, when data or signaling tones are transmitted, audio is muted for the duration of that transmission and a syllable or two may be dropped from conversation.

This is normally not a problem, but during data signaling, such as that employed for telefacsimile, answering machine, and computer communications, significant amounts of information may be lost. For this reason it is recommended that when the cellular connection is used the vehicle should be stationary to avoid data loss during handoffs and other data transmission. Otherwise, the equipment should employ an error correction protocol.

CDMA carriers

The following is a partial list of CDMA carriers worldwide for PCS (1900 MHz) and cellular (800 MHz), and is subject to change. (For a current listing of CDMA carriers, please visit the Web site for the CDMA Development Group at CDG http://www.cdg.org.) Please verify that your carrier supports the Kyocera 200 Module.

Asia - Pacific

Australia

- AAPT Ltd.
- Hutchison Telecom Australia (Orange)
- Leap Wireless International (Oz Phone Pty)
- Orange
- Telestra Corporation Limited

Bangladesh

- Pacific Bangladesh Telecom Limited

China/Hong Kong

- China Unicom
- Hutchison Telecom (HK) Ltd.

India

- Mahanagar Telephone Nigam Limited (MTNL)
- Reliance India Mobile
- Shyam Telelink Limited
- Tata Teleservices Limited

Indonesia

- Komunikasi Selular Indonesia (Komselindo)

Japan

- DDI Corporation

Korea

- Korea Telecom Freetel, Inc.
- LG Telecom, Ltd.
- SK Telecom

New Zealand

- Telecom Mobile Limited

Europe - Russia

Russia

- Leap Wireless International

Global

- BellSouth International

Caribbean - Latin America

Argentina

- CTI Movil
- Movicom - Bellsouth

Brazil

- Vivo

Chile

- Bell South
- Smartcom PCS

Columbia

- Bell South

Dominican Republic

- Centennial Dominicana
- Codetel

Ecuador

- Bell South

Guatemala

- PCS Digital

Honduras

- Celtel

Mexico

- IUSACELL
- Operadora UNEFON SAde CV
- Telefonica.

Nicaragua

- Bell South

Panama

- Bell South

Peru

- Bell South
- Telefonica

Puerto Rico

- Centennial Wireless de Puerto Rico
- Movistar
- Sprint PCS
- Verizon

Uruguay

- Bell South

Venezuela

- Moviluet

Africa - Middle East

Angola

- Angola Telecom

Israel

- Pele-Phone Communications, Ltd.

North America

Canada

- Bell Mobility
- SaskTel
- Telus Mobility Cellular, Inc.

United States

- 3Rivers Wireless
- Alaska Digital
- Alltel Communications
- Amica Wireless
- Blackfoot Communications
- Cleartalk
- Cricket Communications
- First Cellular
- Hargray Communications
- Leap Wireless International (Chase Telecommunications)
- Nextel Communications, Inc.
- NTELOS
- PCS Digital
- Poka Lambro Wireless
- PVT Networks
- Pine Belt Wireless
- PYXIS Communications
- Qwest Wireless
- RCS Wireless
- San Isabel
- South Central Communications
- Sprint PCS
- SRT
- US Cellular
- Verizon Wireless
- Wireless North

Please note that this is only a partial list of CDMA carriers worldwide for PCS (1900 MHz) and cellular (800 MHz), and it is subject to change.

3 CDMA2000 3G

3G

The International Telecommunications Union (ITU), working with worldwide industry bodies, implemented the IMT-2000 program to develop standards for 3G systems. CDMA2000, one of the most important of the ITU IMT-2000 standards, is the first 3G technology to be commercially deployed.

cdma2000 3G standard

Five terrestrial standards were developed as part of the IMT-2000 program. CDMA2000 1X, like CDMA2000 3X, is an ITU-approved, IMT-2000 (3G) standard. It is part of what the ITU has termed IMT-2000 CDMA MC, and was sanctioned along with four other terrestrial IMT-2000 standards (listed below) when ITU-R completed the Recommendations in late 1999.

IMT2000 terrestrial radio interfaces:

- IMT-2000 CDMA Multi-Carrier (MC) – CDMA2000 1X and 3X
- IMT-2000 CDMA Direct Spread (DS) – WCDMA (UMTS)
- IMT-2000 CDMA TDD – Ultra TDD and TD-SCDMA
- IMT-2000 TDMA Single Carrier – UWC-136/EDGE
- IMT-2000 FDMA/TDMA – DECT

the cdma2000 family of standards

The cdma2000 family of standards specifies a spread-spectrum radio interface that uses Code Division Multiple Access (CDMA) technology to meet the requirements for 3G wireless communication systems. The standards in the family are:

IS-2000-1, *Introduction to cdma2000 Standards for Spread Spectrum Systems*

IS-2000-2, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*

IS-2000-3, *Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems*

IS-2000-4, *Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems*

IS-2000-5, *Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems*

IS-98-D, *Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Systems*

In addition, the family includes a standard that specifies analog operation, to support dual-mode mobile stations and base stations:

IS-2000-6, *Analog Signaling Standard for cdma2000 Spread Spectrum Systems*

Relationship to TIA/EIA-95-B

cdma2000 provides full backward compatibility with TIA/EIA-95-B. This permits cdma2000 infrastructure to support TIA/EIA-95-B mobile stations and permits cdma2000 mobile stations to operate in TIA/EIA-95-B systems. The cdma2000 family also supports reuse of existing TIA/EIA-95-B service standards, such as those that define speech services, data services, Short Message Services, and Over-the-Air Provisioning and Activation services, with the cdma2000 physical layer.

cdma2000 and spectrum

cdma2000 is not constrained to only the IMT band; it is defined to operate in all existing allocated spectrum for wireless telecommunications, thereby maximizing flexibility for operators. Furthermore, cdma2000 delivers 3G services while occupying a very small amount of spectrum (1.25 MHz per carrier), protecting this precious resource for operators.

These bands include:

- Cellular (824–849 and 869–894 MHz)
- PCS (1850–1910 and 1930–1990 MHz)
- TACS (872–915 and 917–960 MHz)
- JTACS (887–925 and 832–870 MHz)
- KPCS (1750–1780 and 1840–1870 MHz)
- NMT-450 (411–493 MHz, not continuous 10 MHz spacing)
- IMT-2000 (1920–1980 and 2110–2170 MHz)
- 700 MHz (776–794 and 746–764 MHz)

cdma2000 evolution

cdma2000 is evolving to continue to meet the future demands of the wireless marketplace. The cdma2000 1xEV standards will provide data-optimized channels, offering data rates well in excess of the ITU IMT-2000 2 Mbps requirement.

cdmaOne (IS-95-A):

- Voice
- Data up to 14.4 Kbps

cdmaOne (IS-95-B):

- Voice
- Data up to 115 Kbps

cdma2000 1X:

- 2X increases in voice capacity
- Up to 307 Kbps packet data on a single (1.25 MHz or 1X) carrier in new or existing spectrum
- First 3G system for any technology worldwide

cdma2000 1X has been commercially available since October 2000.

cdma2000 1xEV:

- Optimized, very high-speed data (Phase 1)
- Up to 2.4 Mbps (downlink) packet data on a single (1.25 MHz) carrier
- Integrated voice and data (Phase 2); up to 4.8 Mbps

cdma2000 1xEV is an evolution of cdma2000 1X. 1xEV-DO (Data Only) uses a separate 1.25 MHz carrier for data and offers peak data rates of 2.4 Mbps. 1xEV-DV (Data-Voice) integrates voice and data on the same carrier.

Kyocera 200 Module and cdma2000

The Kyocera 200 Module implements cdma2000 1X technology. The Module provides tri-mode operation with AMPS and CDMA in the 800 MHz cellular band and CDMA PCS in the 1900 MHz PCS band. The Kyocera 200 Module also supports data rates up to 153.6 Kbps in the reverse and forward links.

Support of E911 Phase 2 Position Location

It is a requirement of the FCC that 25% of new handset sales be Automatic Location Identification (ALI)-capable by December 31, 2001. AFLT (Advanced Forward Link Trilateration) alone is not accurate enough to meet the accuracy requirements of the mandate. With AGPS and AFLT, the Kyocera 200 Module provides the capabilities required for a handset-based voice solution utilizing an assisting element on the network called the PDE (Position Determination Equipment). Messaging between the Module and the network is supported by IS-801.1. The FCC's accuracy requirement for a system supporting E911 Phase 2 is 50 meters 67% of the time and 150 meters 95% of the time.

4 Module Overview

What is the Module?

The Kyocera 200 Module is intended for use by vendors and manufacturers who would like to design, build, and sell a wireless product using CDMA technology. The Module is suited for business applications like remote metering or security, point of sale, wireless vending, and vehicle tracking. It can support enterprise-wide needs like wireless voice and data solutions for automotive telematics and handheld devices.

The Module's continuing utility is ensured by advanced features like trimode capability (AMPS 800 MHz, CDMA digital 800 MHz, and CDMA PCS 1900 MHz), A-GPS position location capability, and support for IS-2000 data rates.

Embedded Module

The Kyocera 200 Module is a fully functional wireless phone designed to be embedded into another piece of hardware. It then provides wireless connectivity to that device for the purposes of transferring telemetry data and providing remote monitoring, control, and asset tracking.

The Module integrates easily with your device through a board-to-board connector. Just supply power, attach an antenna, and use the two serial ports to make and take calls, send and receive SMS messages, get status, and get a GPS location fix. (It incorporates A-GPS.)

The Module provides state-of-the-art wireless data technology to take advantage of the nationwide footprint of the 1xRTT networks. It works equally well on both the 800 and 1900 networks and can even communicate via the legacy AMPS analog network.

We at Kyocera Wireless Corp. have applied our expertise in design and manufacturing of CDMA phones to the creation of an extremely robust, high-performance module. And because the Kyocera 200 Module is provisioned like a phone, you can get service for it through CDMA cellular service providers.

What can it do?

The CDMA service providers support voice and various levels of data services, SMS messaging, and GPS location capabilities. Because the Kyocera 200 Module is designed around the core technology upon which we build our phones, it can utilize all of those services.

Today, well over 100 million consumers worldwide rely on CDMA for clear, reliable voice communications and leading-edge data transmission. In North America CDMA is the dominant wireless technology, and elsewhere it is being

adopted in Central and South America as well as in Australia, China, and India. Over 35 countries have either commercial or trial activity ongoing. CDMA will continue to lead in delivering the most advanced 3G services around the world. Kyocera Wireless Corp. has approved devices operating on many carriers' networks, and the list is continually growing.

Will it work in my application?

The chances are: Yes.

Please call us so that we can answer your questions concerning the integration of our technology into yours.

What is the process to evaluate the Module?

Our Module Development Kit is available for evaluation upon execution of a nondisclosure agreement. With our Module Development Kit you can begin working with the Module immediately to try out its capabilities.

What is the process to evaluate the Module?

Our Module Development Kit is available for evaluation upon execution of a nondisclosure agreement.

What is included in the development kit?

We provide everything you need to get started, including extensive documentation and an interface board for immediate connection to your computer's serial ports.

Specific contents of our Module Development Kit are shown in Chapter 12.

How do I integrate the Module into my product from a mechanical perspective?

The Module footprint, pinout, and connector specifications are provided in Chapters 14 and 15.

How do I integrate the Module into my product from an electronic perspective?

Integration is made easy with serial ports at TTL levels.

How do I integrate the Module into my product from a software perspective?

UART1 uses the IS-707 AT command set. UART2 uses our proprietary KMIP protocol for enhanced power and flexibility.

What must I do to get my final product approved for service?

There is a certification process for FCC and carrier approval. But we will help you get through the process quickly and keep the costs to a minimum.

Module type

The Kyocera 200 Module provides:

- Envelope dimensions 64 mm x 48 mm, 11.4 mm thick
- Serial control and data interface
- Two sub-miniature RF connectors, 50 ohm
- 3.6 VDC to 4.2 VDC input
- Analog audio interface
- CDMA data up to 153.6 Kbps (forward and reverse link) depending on services available from your carrier
- AMPS 800 MHz mode for voice only
- Software stacks including ANSI J-STD-008, IS-95, IS-707-A (formerly IS-99 circuit switched data and fax, IS-657 packet data), and IS-637-A (two-way SMS including Broadcast SMS capabilities) (as carriers support these features)
- IS-2000 (CDMA2000 Release 0) MOB_P_REV6 radio configurations and features as supported by the MSM5100 and infrastructure
- IS-95-A/IS-95-B (J-STD-008) backward compatibility (MOB_P_REV1,3,4,5)
- 13 Kbps QCELP and EVRC vocoder support, compatible with TTY/TDD with operations in support of Telecommunications Act, Section 255
- IS-683-A support; OTASP and OTAPA
- IS-707-A service options (async/fax and packet data)
- IS-835 (TCP/IP/PPP) simple IP and mobile IP
- Quick Net Connect (single and double stack)
- Dual NAM support

Module benefits

The tri-mode CDMA Module provides access to the CDMA wireless networks without need for engineering a CDMA product from ASIC level up. The time-to-market advantage saves resources and provides access to the latest wireless data technology.

The Module is the core technology of KWC's CDMA phones. It has been repackaged to provide a ready-to-integrate product. The developer can then concentrate on the specific application and hardware development application. The CDMA technology within the Module includes the RF and digital signal processing, analog audio interface, and serial interface. This is the basis from which to build a device.

User features

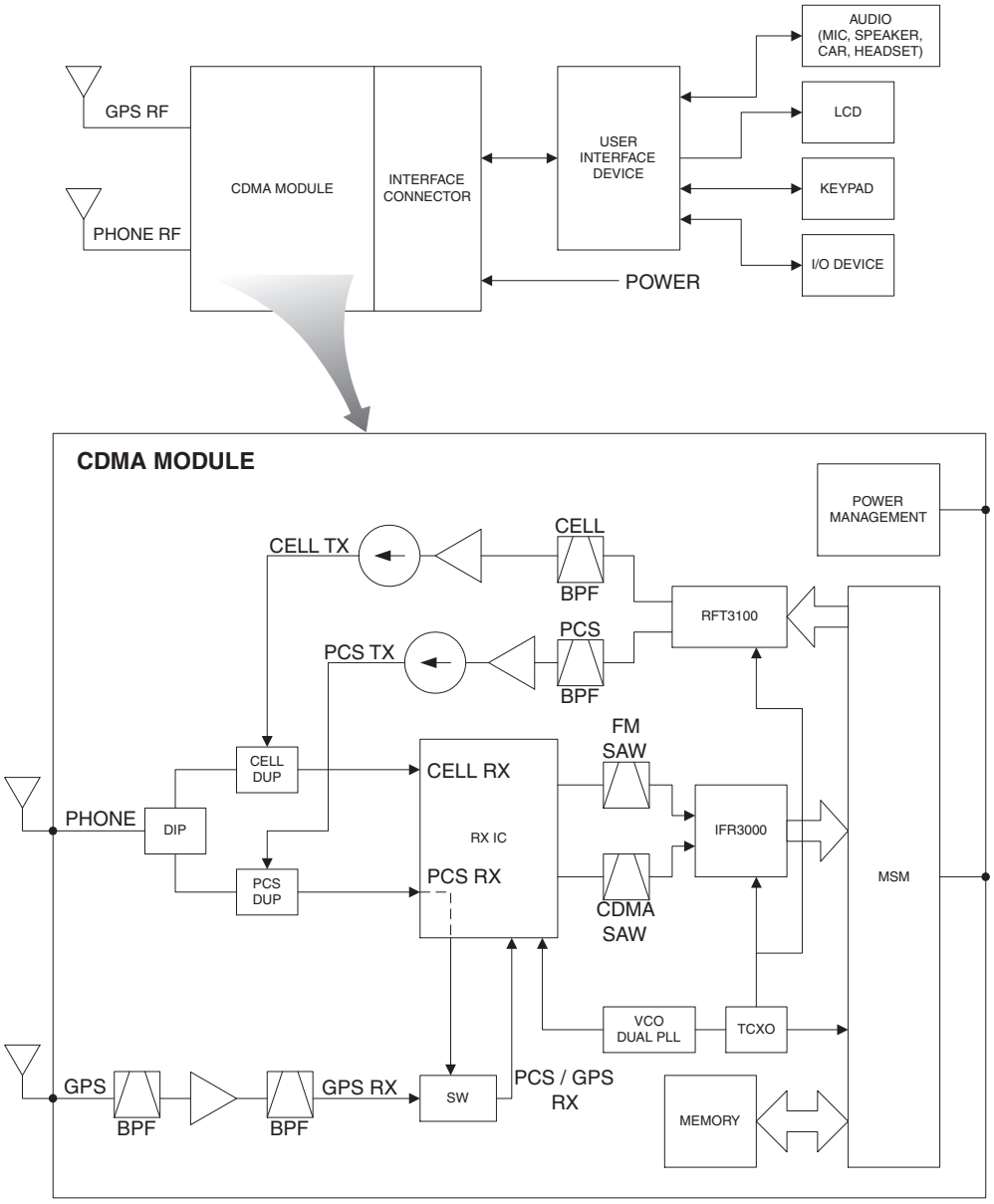
The phone Module provides a complete solution to all functionality of a tri-mode cellular phone minus the keypad, display, and battery. The Module was developed to allow the system integrator to build CDMA-based devices and to allow very fast time to market. Applications might include a complete phone, a data modem, or an embedded component in a more powerful device that needs voice and/or data connectivity in a small form factor.

Definitions of subsystems

Module

The Module card includes MSM ASIC, TCXO, synthesizers for frequency conversion, MSM clocking, necessary filtering to meet performance requirements, AGC circuits, DC power conditioning circuits, volume control, Rx circuitry, and memory.

The following figure shows that it is possible to build a full-featured voice phone with the addition of an external user microprocessor, LCD, keypad, and battery. This figure also shows a typical module interface.



The Module card includes the following circuits, with the necessary filtering and AGC circuits to meet performance requirements.

- MSM5100 ASIC
- Memory
- Power management
- Audio
- Transmit and receive

RF interface/antenna port

Two 50 ohm coaxial RF connectors have been provided for Module testing and integration into an end user device. The OEM developer must provide a 50 ohm antenna that works in the desired frequency band of operation. Refer to Chapter 11 for more details.

Wireless data service

The convergence of wireless telephony with mobile computing is making wireless data services a reality. Among the services and capabilities that can be expected are:

- Direct access to the Internet
- Diagnostic and monitoring applications
- Email capabilities for telephones, PDAs, and connected devices
- Access to corporate intranets from vehicles and remote sites

Data standards supported

- IS-99 – Circuit Switched Data
- IS-657 – Packet Switched Data
- IS-707-A – The combined CDMA Data Standard
- Quick Net Connect (not a standard)

Full documentation for TIA standards can be obtained from Global Engineering in Colorado (http://www.global.ihs.com) at 800-854-7179.

References

- http://www.3GPP2.com
- http://www.tiaonline.com
- http://www.cdg.org
- http://www.fcc.gov

Carrier requirements must be acquired from each individual operator.

5 Environmental Specifications

This chapter provides nonoperating and operating environmental requirements for the CDMA Module and includes specifications for the following:

- Temperature
- Humidity
- Vibration
- Mechanical shock
- Drop

Nonoperating

Temperature

Storage temperature for the CDMA Module shall be -40°C to +85°C. After exposure of the Module to either temperature extreme for 96 hours and stabilization at normal conditions, no damage or abnormal operation of performance resulted.

Vibration

The Module showed no signs of abnormality in operation and performance criteria after the following swept-sine vibration conditions in three mutually penpendicular directions: 1.5g acceleration, 5-500-5 Hz sinusoidal vibration, swept at 1.0 octave per minute.

Mechanical shock

The Module showed no signs of abnormality in operation and performance criteria after the following shock conditions: three shocks in both positive and negative directions along each of the three orthogonal axes, with input level of 20g at 7 to 11 ms, half-sine waveform.

Drop

The Module showed no signs of abnormality in operation and performance criteria after the following drop conditions: Dropped six times, on all six faces, from 12 cm (4.9 in.) off the ground onto concrete covered with 1/8-inch vinyl tile.

Operating

Temperature

The Module shall meet all the operational requirements over the temperature range of -30°C to +60°C.

Humidity

The Module shall meet operational requirements over humidity conditions ranging from 0% to 85% relative humidity (non-condensing).

Vibration

The Module shall meet operational requirements under the following vibration conditions:

- Swept-sine — 1.5g acceleration, 5-500-5 Hz sinusoidal vibration, swept at 0.1 octave per minute
- Random — 1.5g rms overall from 5 to 500 Hz, 0.025 power spectral density from 5 to 50 Hz with 6 dB per octave roll-off from 50 to 500 Hz for 60 minutes in each axis.

6 System Specifications

Operating temperature

The Kyocera 200 Module is capable of operating in ambient air inside the user equipment from -30°C to +60°C (-22°F to +140°F).

Dimensions

The Kyocera 200 Module has "envelope" dimensions of 64.8 mm × 48.2 mm (56.4 mm with mounting tabs) × 11.4 mm. (See mechanical drawing in Chapter 14.) Other formats may be developed over time.

Weight

The weight of the Kyocera 200 Module, as measured, is 39 grams.

Antennas

The Kyocera 200 Module provides two 50 ohm RF connectors, one for CDMA/AMPS and one for A-GPS. The antenna matching circuits on the circuit board are matched to 50 ohms (see chapter 15).

User interface

The Kyocera 200 Module has a serial interface that provides access to user interface functions. This interface is capable of the following basic features by the use of specially formatted information packets.

- Basic phone keypad operability
- Received Signal Strength Indicator (RSSI) level
- Basic phone setting adjustments for carrier selection, roaming, service programming
- Call control, setup, teardown, and maintenance
- Volume control
- Data services control

Interface connector

Refer to Chapter 14 A for detailed technical information about the interface connector.

The *Kyocera 200 Module User's Guide*, 82-M8863-1, contains detailed technical information. This document is part of the complete CDMA Module Developer's Kit (MDK) and is made available for purchase and license under the terms of certain module supply or module licensing agreements with the signing of a Non-Disclosure Agreement.

7 Features

Standard features

Indicators and displays

The CDMA Module does not have any visible indicators or displays.

Audible indicators

The CDMA Module does not have any audible indicators.

Volume controls

The Module takes serial port input commands for volume controls and uses these to set the gain factor in the codec stream. This allows you to control the audio volume without having to build an external volume control interface.

Power on/off

The Module has a power on/off sequence to ensure that the system has been shut down properly. Refer to the *Kyocera 200 Module User's Guide*, 82-M8863-1, for details.

Call processing features

The Module supports the following features with support packets in the serial interface. The customer is responsible for implementing the displays or actions taken from these features.

Indicators and display support features

- Incoming call
- Call dropped alert
- "Missed call" indicator

Audible indicators

The Module supports the following indicators. Where possible, these are output on the audio output.

- Service warning-dropped call
- Low voltage warning
- Voice mail alert

- Minute alert
- SMS alert

Keypad and dialing features

The Module supports the following features.

- Adjustable audio output volume controls
- Full dialing keypad simulation
- Voice and text access/retrieval
- Send key
- End key
- Phone number storage/memory
- DTMF tone length
- DTMF mute
- Mute

Convenience features

- Call timer
- Total call timer
- Subscriber number display
- Reprogrammable memory
- Call waiting
- Call forwarding – if supported by carrier
- Three-party call – if supported by carrier
- Clock – requires CDMA service
- Caller ID – when available on the CDMA system

8 Software Description

This chapter contains information on the software (Firmware) that runs on the Module.

Software

Software on the Module controls all aspects of its operation. The latest version is loaded onto the Module at the factory and is configured in accordance with the customer's preferred service provider.

The Phone Support Toolkit (PST), which is included with the Module Development Kit, is the Windows-based application that enables you to flash new software to the Module when upgrades become available. The PST also allows you to view and load a Preferred Roaming List (PRL).

Note The AT command 'AT+GMR' will return the software version number and the PRL verson number.

The Module is loaded with a PRL file. This file tells the Module how to acquire the network to which it has been assigned. It serves as an authorization between carriers for subscribers to utilize another carrier's coverage area. Documentation is included with the PST.

Interface

There are two UARTs (RS232 communication ports) on the Module.

UART 1 is used for communicating with the Module in AT command mode. AT commands can initiate calls (voice, packet data, asynchronous data) and query the Module for status and configuration information. Chapter 7 of the *Kyocera 200 Module Reference Guide* provides a complete AT command listing.

UART 2 is used to communicate with the Module using Kyocera Multiplex Interface Protocol (KMIP). KMIP is a stop-and-wait protocol using HDLC-like frames. This interface protocol gives a broad range of Module control including capability to query the Module; make calls; send, receive, and acknowledge SMS messages; and access the A-GPS feature of the Module. The Reference Guide fully details this protocol.

Kyocera Wireless Phone Support Toolkit (included with the MDK)

The Phone Support Toolkit is a set of Windows-based tools designed to interface with, control, and test Kyocera Wireless Corp. phones and modules. The Phone

Support Toolkit server can keep track of multiple phones and modules on local host machines. System requirements are shown below.

Computer:	Desktop or laptop computer, 166 MHz Pentium®, running Microsoft® Windows 95, Windows 98, Windows NT (with Service Pack 3 or later), Windows 2000, or Windows ME
RAM:	32 MB or greater
Hard drive:	Application requires 20 MB of available space. Additional space is recommended for storing backup and download files.
CD-ROM drive:	For installing Kyocera Wireless Phone Support Toolkit
Video monitor:	Minimum display resolution of 800x600
Serial communications:	Free serial I/O (COM) ports for up to eight phone connections

The Phone Support Toolkit currently consists of the server application (which has no interface) and the following six component (or "client") applications.

Kyocera Wireless PST Configuration

This client application provides basic phone status display (MIN, ESN, model) and allows phone control and monitoring.

Service Programming

This application saves service programming data to file, allows download of the same service programming to multiple phones, and allows download of dialing plan, carrier plan, carrier information, and roaming list.

Software Download

This application downloads software to connected Kyocera Wireless Corp. phones. It also backs up and restores nonvolatile (NV) memory contents between downloads.

Phone Configuration Transfer

This application provides personality transfer for Kyocera Wireless Corp. phones of the same model. It guides you through the transfer process using a wizard-based interface.

Service Console

This application allows the service center to record a problem phone's fault codes inside the phone itself.