wavecom

Starter Kit V2 User Guide

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Distribution List

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Contents

1 Overview

This Document is intended to provide the user complete instructions on the capabilities and use of the Wavecom Starter Kit. The Wavecom Starter Kit is designed to allow the customer to interface to the Wavecom Q2300 and Q2400 CDMA and GSM/GPRS Module families. Control of the Module is done via AT Commands issued from an external PC running a terminal emulator, such as HyperTerminal. The User should refer to the Wavecom *CDMA AT Commands Interface Specification* for more information on supported commands.

2 Product Description

The Wavecom Starter Kit includes the following:

Interface Board

The Interface Board provides a working platform for testing and evaluating the performance of the Module, as well as allowing customer design of host software interfaces.

Module

One Wavecom module is included with the Starter Kit and comes pre-assembled on the Interface Board. The Module is soldered down via its four Ground contact pins, and is also mated to the 60 pin board-to-board connector of the Interface Board.

Handset

The Handset contains a standard telephony earpiece and microphone, providing a full audio interface to the Module through the Interface Board connectors.

Serial Cable

The Serial Cable connects the Interface Board to the controlling PC.

Antenna and RF Adapter

The Antenna provides sufficient omni-directional gain to allow the module to go over the air on the network. An Antenna Adapter is provided to allow the Antenna Cable to connect to the RF Connector of the Module.

Power Adapter

The included Power Adapter allows for use of the Starter Kit without the need for a lab power supply. The Adapter can source enough current to support CDMA, GSM, and GPRS modules at full transmit power, as well as the operation of the Interface Board. Some Kits may include a lab power supply cable instead of, or in addition to, the Power Adapter.

3 Description of the Interfaces

3.1 Power

A standard DC Power Jack is provided on the Interface Board. The included Power Adapter can be used to supply the Module and Interface Board via this jack.

Alternatively a lab power supply capable of supplying at least 3.8Vdc at 2.0Amps can be used. The advantage of the lab power supply is in allowing the user to monitor the current drain of the Module to help determine its operating state.

The Power Jack has a center positive connection, if a lab supply or other external source is used. A cable for this purpose is available.

3.2   Computer

The Interface Board communicates with the controlling PC through standard RS-232 Interfaces. Two such interfaces are provided, however the typical customer application will only require one of these (DATA).

3.2.1   DATA

The DATA Interface, J200, provides a full 8 wire RS-232 interface with the PC. This interface supports the AT Commands; the Diagnostic (DM) information; and high speed data.

Light Emitting Diodes (LEDs) for this port are included on the Interface Board on the RX, TX, DTR, DSR, RTS, CTS and DCD lines to indicate the state of the line. The red LED indicates a negative voltage on the RS-232 (Logic 1) and the green LED indicates a positive voltage on the RS-232 (Logic 0).

3.2.2   DM

The DM Interface, J201, provides a 2 wire RS-232 interface for Diagnostic information only. The typical customer application should not require this interface as all functionality of the DM Interface is now supported through the DATA Interface as well.

Light Emitting Diodes (LEDs) for this port are included on the Interface Board on both the RX and TX lines to indicate the state of the line. The red LED indicates a negative voltage on the RS-232 (Logic 1) and the green LED indicates a positive voltage on the RS-232 (Logic 0).

3.3   Switches and Jumpers

3.3.1   ON/OFF Switch

There is a slide switch, SW101, located on the back edge of the Interface Board. This switch interfaces directly to the ON/OFF control line of the Module, via pin 6 of the board-to-board connector. Sliding the switch in the "OFF" direction will pull the line low, causing the Module to shut off. Sliding the switch in the "ON" direction will pull the line high, turning on the Module and keeping it in the ON state.

3.3.2 BOOT Switch

A second slide switch, SW102, is located on the back edge of the Interface Board, beside the ON/OFF switch. The function of this switch depends on if a CDMA Module or GSM/GPRS Module is being used.

For normal operation of the GSM Module, this switch must be in the HI position upon power up or reset. This switch when in the LO position will put the GSM Module into its BOOT Mode. This allows software upgrades to the embedded code within the Module, via the serial interface of the Interface Board and an application such as the Wavecom DWLWin program. Note that the switch must be in the LO state upon power up or reset. Once the embedded code is executing, the status of the BOOT input is no longer monitored.

For the CDMA Modules, there is no need for this BOOT functionality. Thus this switch is for test purposes only and is connected to GPIO 42 of the Module. The input can be pulled LO or HI and monitored via AT Command Queries if needed.

3.3.3 RESET Switch

There is a master push button reset switch, SW100, located in the middle of the Interface Board that when depressed will pull the RESET/ line of the Module to Ground, causing a full Module microprocessor reset.

3.3.4 SNGL/DIFF Jumper

A four-pin jumper, J303, is located near the Audio connectors. This is used to configure the Headset Audio for either a single ended or differential speaker drive circuit. Silkscreen on the Interface Board indicates the jumper positions required for either case. For Differential, one jumper should be placed across pins 2 and 3. For Single Ended, two jumpers should be placed; one across pins 1 and 2, and the other across pins 3 and 4. Refer to *Audio* for more details on the functionality of this jumper block.

3.4 Audio

There are two unique audio paths provided for on the Interface Board, and supported by the Module.

3.4.1 Handset

The Handset Jack (J300) supports fully differential microphone and speaker signals. The microphone is also biased and filtered on the Interface Board. The Handset included in the Starter Kit can be used with this port.

This Handset audio path is considered Path 1 in the AT Command Set.

3.4.2 Headset

The Headset Jack (J301) supports a biased differential microphone however the speaker path is either single or differential for GSM/GPRS or single ended only for CDMA. This difference is due to limitations of the CDMA design, allowing for only one fully differential speaker path. Jumpers on

J303 configure the path for single (SNGL) or differential (DIFF) audio. The Handset included in the Starter Kit can be used with this port.

There is an additional audio jack included on the Interface Board that supports the use of a standard 2.5mm three-wire cell phone headset (not included). This jack (J302) supports only single ended microphone and speaker signals, and is wired in parallel with the Headset Jack, J301. Only J301 or J302 can be used at once, and the jumpers on J303 must be set for single ended operation to use J302. Note the single ended audio does result in an increased noise floor, especially when the Starter Kit is used with a GSM or GPRS Module. Careful filtering and attention to layout is required in a customer application to minimize this noise.

These Headset audio paths are considered Path 0 in the AT Command Set.

3.5 RF

There are two RF connection points on the Interface Board, both used to provide an RF path from the Module to the Interface Board mounted RF jack.

The Module will be supplied with an RF "pigtail" cable assembly. This pigtail is soldered to the module and terminates in a bulkhead style RF SMA connector. This can be mounted on the Interface Board through the ground ring labeled "RF", and the supplied Antenna screwed onto this connector. This is the preferred method of connecting the RF Antenna.

Alternatively, under the Module there are pads where an optional surface mount connector can be soldered that will mate with similar pads on the Module. A connector such as the Radiall R107.064.000 is suggested (see Note below). The RF signal would then be passed to J500, which supports a connector such as the AMP/TYCO 221790-1 Right Angle PCB Mount SMA Connector (not included). The Antenna included in the Starter Kit can attach to this jack.

Note: The Radiall connector has not been fully tested or characterized for either CDMA or GSM/GPRS. It is not recommended for customer testing or customer use in a final design. Some versions of the Module may not support the use of a surface mount RF connector.

3.6 SIM Socket

The SIM socket is provided for use with the RUIM (CDMA) or SIM (GSM/GPRS) card. The Interface Board supports the low voltage cards, having a supply of 2.8Vdc from the Module. The RUIM card is not yet required for North American CDMA modules.

3.7   Additional Interfaces

3.7.1   Vibrator

The Interface Board includes vibrator driver circuitry that will allow the customer to plug in an optional external vibration motor for testing. The connection is made via test points TP500. A standard 1.6V to 3.0V cell phone vibration motor can be used.

Alternatively, for test purposes a red LED has been added to indicate the state of the line, and is located near the "VIBRA" label on the board.

3.7.2   Ringer

The Interface Board includes ringer driver circuitry that will allow the customer to plug in an optional external buzzer/ringer for testing. The connection is made via test points TP501. A standard 2.0V to 3.0V cell phone ringer can be used.

Alternatively, for test purposes a green LED has been added to indicate the state of the line, and is located near the "RINGER" label on the board.

3.7.3   GPIO

Included in the design are Test Points to allow the customer to access all unused General Purpose Input/Outputs (GPIOs) provided by the Module. These are direct from the Module, with no circuitry added. They are located next to the Reset switch in the middle of the Interface Board, and are labeled according to the CDMA Module schematic pin name. Two of these lines are Analog to Digital inputs to the Module microprocessor, if required for testing.

Note that for the GSM Module design, the test point names do not apply and the user will have to refer to the GSM schematic to determine the correct test point location for a given line.

3.7.4   Keypad

For testing purposes, an optional keypad can be installed on the Interface Board that will provide the customer a 5x4 matrix of keys for test and debug. The keypad should be a Grayhill 88JB2 and can be purchased in North America through Digikey with a GH5020-ND part number. The Module itself can support a bigger matrix, however the keypad chosen was the largest standard keypad that could be found.

Note that for the CDMA Module, the JTAG and Keypad share the same Module interface pins thus cannot be used at the same time. Additionally, the CDMA Module itself requires a different hardware population to implement each path. The default population configuration for the CDMA module enables the Keypad, not the JTAG Interface.

3.7.5   JTAG

Included on the Interface Board for debugging purposes is a JTAG Header (J202). The connector, when needed, should be soldered to the bottom side of the Interface Board. This connector will not be required in a customer application, and is therefore not normally populated on the board.

Note that only the CDMA Module supports a JTAG interface. The JTAG and Keypad Interfaces share the same Module interface pins thus cannot be used at the same time. Additionally, the CDMA Module itself requires a different hardware population to implement each path. The default population configuration for the CDMA module enables the Keypad, not the JTAG Interface.

3.8   LED Function

There are two general status indicators, LED1 and LED2, on the Interface Board. The drive circuits for these are controlled directly from the Module, via the 60 pin board-to-board connector. Both LEDs are located near the Power Jack on the Interface Board.

Additional indicators are included for the Vibrator and Ringer driver circuits, and for the DM and DATA Interface ports. Refer to these headings for more details of their function.

3.8.1   LED1

This LED is red when illuminated, and provides the user with an indication of the Module status according to the following table:

LED1 Status	Module Status
OFF	In download mode or OFF
ON: Permanent	ON but not registered on a network
ON: Slow Flash - 200mS ON, 2S OFF	ON and registered on a network
ON: Quick Flash - 200mS ON, 600mS OFF	ON, registered on a network and communication in progress

3.8.2   LED2

This LED is green when illuminated. The functionality of this LED can be defined to provide a method of test and debug by the user via AT Commands. It is connected via pin 54 of the board-to-board connector and is driven by GPIO 8 on the CDMA Modules, and GPIO 4 on the GSM/GPRS Modules.

4   Start-up

The following gives a description of the connections and configurations required to bring up the Module. Be sure to consider these recommendations before applying power to the Interface Board and Module.

4.1   Connections

Be sure the Module is securely seated on the Interface Board, and the board-to-board connector is correctly aligned. Ideally, the four grounding feet of the Module should be soldered to the Interface Board from the bottom side. If the Module is not soldered, an additional grounding clip may be required to provide uninterrupted ground to the Module. Attach the Antenna, via the Antenna Adapter, to the Module's RF Cable.

Connect a serial cable to the DATA Connector on the Interface Board and to an unused port on the controlling PC.

Plug the Power Adapter into wall outlet (or alternate Power Supply Cable and lab power supply). Plug the round jack into Power Connector on the Interface Board.

Insert the Handset Cable into the Handset and into whichever Audio Jack, Headset or Handset, is to be used.

In the case of the GSM/GPRS Module, or the CDMA module requiring an R-UIM, be sure to install the SIM/R-UIM into the socket provided.

4.2   Configuration

4.2.1   Computer

Control of the Module is via AT Commands issued from the PC running a terminal emulator, such as HyperTerminal. Configure the PC serial port as shown below:

Bits per second	115200/9200
Data Bits	8
Stop Bits	1
Flow control	Hardware

NOTE: 115200 is the default for CDMA. 9200 is the default for GSM.

4.2.2 Power Supply

The Power Adapter supplies 4.0 Volts DC and a maximum of 2.0 Amps. It can be plugged into a 110 Volt or 220 Volt Mains input.

If a lab power supply is used instead, it should be set for 3.8 Volts DC with a minimum current limit of 2.0 Amps.

4.2.3 Interface Board

Install the SNGL/DIFF Jumper as desired. Refer to the details above under *SNGL/DIFF Jumper*. The OFF/ON switch can be in either position when power is applied, but will have to be moved to the ON position after the power is applied in order to activate the module. The BOOT switch should be left in the HI position for normal operation of the GSM/GPRS Module. For CDMA Modules, the state of this switch is not critical.

5 Troubleshooting

5.1 No RF signal

- Verify the Antenna is correctly connected to the Module. Verify the position of the Antenna is in a strong signal location.

5.2 The Module does not answer through the serial link

- No or incorrect power is being supplied to the Module. Verify the Power Supply and ON/OFF Switch position.
- The Module is not adequately assembled onto the Interface Board. Verify that proper grounding (ideally solder) is provided.
- The wrong DB-9 connector is being used. Verify that the DATA Port is connected to the controlling PC.
- The terminal emulator application, HyperTerminal for example, is not correctly configured for the Module. Verify the Baud rate. It is possible that the Module has been configured for a different default Baud rate, so it may be necessary to try different rates in HyperTerminal.
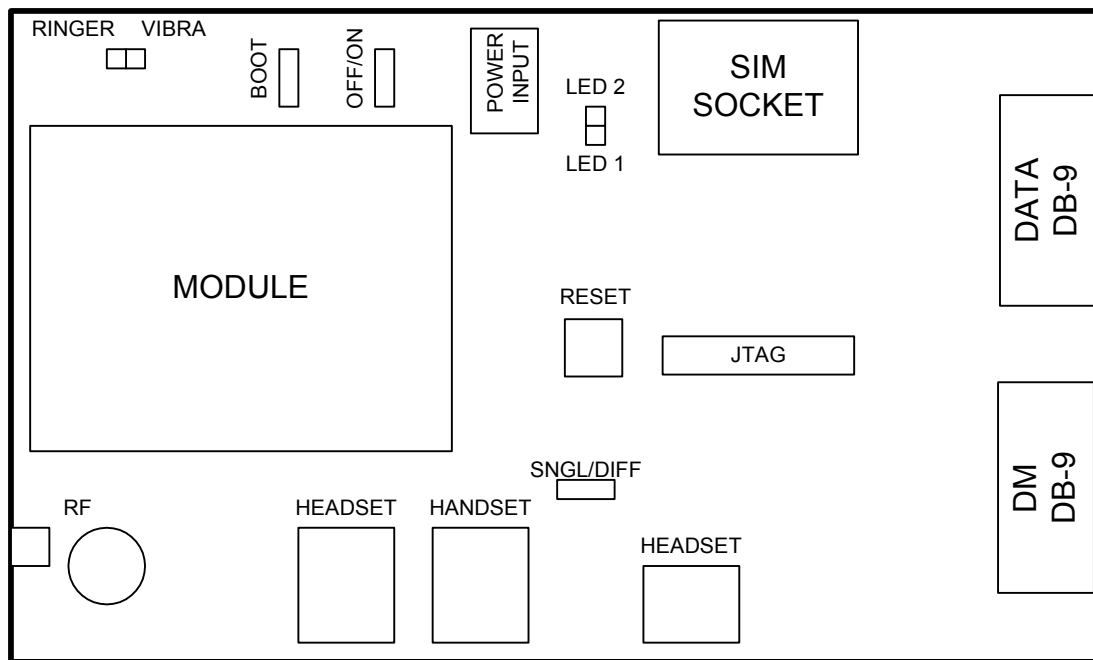
5.3 No audio

- The wrong Audio Path has been selected. Try the other Audio Jack, or issue the AT Command to verify/select the correct path.
- The SNGL/DIFF Jumper is not correctly installed. This only affects the Headset Audio Path.

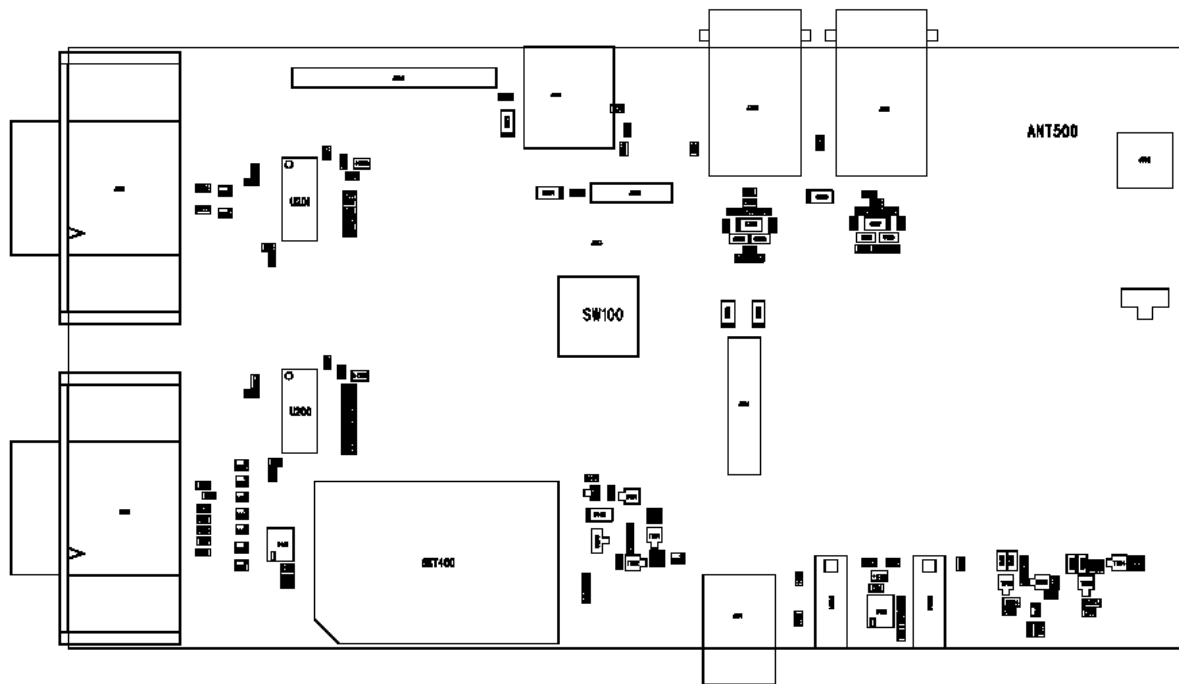# 6 Interface Board Physical Drawings

6.1 Layout

The following drawing indicates the relative position of all switches, connectors, and jumpers on the Interface Board, by functional name.

6.2 Assembly Drawing

The following drawing indicates the position of all components on the Interface Board by schematic reference designator.

6.3 Isometric

The following drawing is an Isometric drawing of the Interface Board including the Module.