



Maxon Australia Pty Ltd

CDMA 1X Voice/Data Modem
MM-5100

Hardware Application

User Manual

Ver. 0.1

Date: Jan. 22, 2003

FCC RF EXPOSURE COMPLIANCE

In August 1996 the Federal Communications Commission (FCC) of the United States with its action in Report and Order FCC 96-326 adopted an updated safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC regulated transmitters. Those guidelines are consistent with the safety standard previously set by both U.S. and international standards bodies. The design of this phone complies with the FCC guidelines and these international standards.

Use only the supplied or an approved antenna. Unauthorized antennas, modifications, or attachments could impair call quality, damage the phone, or result in violation of FCC regulations.

The use of this device in any other type of host configuration may not comply with FCC RF exposure requirements and should be avoided. During operation, a 20cm separation distance should be maintained between the antenna, whether extended or retracted, and the user's/bystander's body (excluding hands, wrists, feet, and ankles) to ensure FCC RF exposure compliance.

CAUTION

Change or modification without the express consent of Maxon Electronics Australia Pty. Ltd. voids the user's authority to use the equipment. This equipment has been tested and found to comply with the limits pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in an appropriate installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used in accordance with instructions, can cause harmful radiation to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference in radio and television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna
- Increase the separation distance between the equipment and the receiver
- Contact Maxon Electronics Australia Pty Ltd. Technical Support for assistance.

MM-5100 Wireless Modem Application Manual

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Table of Contents

1. OVERVIEW	5
1.1 REVISION HISTORY	5
1.2 TERMS	5
1.3 MM-5100 WIRELESS MODEM OVERVIEW	6
1.4 FEATURES.....	6
1.5 APPLICATION SYSTEM DIAGRAM	7
1.6 BLOCK DIAGRAM.....	7
1.7 PHYSICAL DIMENSION.....	8
2. SPECIFICATIONS.....	9
2.1 MECHANICAL SPECIFICATIONS.....	9
2.2 ENVIRONMENT SPECIFICATIONS.....	9
2.3 CURRENT CONSUMPTIONS.....	9
2.4 USB SPECIFICATIONS	10
2.5 AUDIO SPECIFICATIONS	10
2.6 CDMA RF SPECIFICATIONS	10
3. MM-5100 WIRELESS MODEM INTERFACES.....	11
4. APPENDIX A	18

1. Overview

This document provides information on the MM-5100 CDMA 1X Voice/Data Modem (hereafter referred to as the “MM-5100 Wireless Modem”). This introduction provides a brief overview of the product. It is our goal to continue to refine this document for the benefit of the reader and their education in better use of the modem.

1.1 Revision history

Table 1-1 Revision History

Date	History
Jan. 24, 2003	Initial release

1.2 Terms

AT Command Set	Command set interface between data terminal equipment (TE2) and data circuit terminating equipment (MT2)
Mobile Termination 2 (MT2)	An MT2 provides a non-ISDN (R_m) user interface, e.g., CCITT V series or CCITT X series.
Terminal Equipment 2 (TE2)	A TE2 is a data terminal device that has a non-ISDN user-network interface, e.g., CCITT V series or CCITT X series.
R_m	Interface between MT2 and TE2
Base Station(BS)	A station in the Domestic Public Cellular Radio Telecommunications Service, other than a mobile station, used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, an IWF, or other part of the cellular
Mobile Station	A station in the Domestic Public Cellular Radio Telecommunications Service intended to be used while in motion or during halts at unspecified points. Mobile stations include portable units (e.g., hand-held personal units)and units installed in vehicles
Inter-Working Function (IWF)	An IWF provides the functions needed for terminal equipment connected to a mobile termination to inter-work with terminal equipment connected to the PSTN. A physical implementation may include a pool of modems.

1.3 MM-5100 Wireless Modem overview

The MM-5100 Wireless Modem performs data communication functions between Host and IS-95 CDMA Cellular station. The MM-5100 Wireless Modem incorporates the wireless-modem functionality together with the RS-232 and USB driver and DC/DC down converter, Voice interface.

The MM-5100 Wireless Modem connects directly to HOST computer utilizing a RS-232C or USB V1.1 interface. The Host signals are converted to the RS-232C or USB 1.1 signal levels.

The MM-5100 Wireless Modem functionality is specifically controlled from the Host via AT command sets. Designed to meet the requirements for Telstra's CDMA markets, the MM-5100 will operate over the following TX /RX frequency ranges: TX frequency 824.73MHz ~ 848.19MHz

RX frequency 869MHz – 894MHz

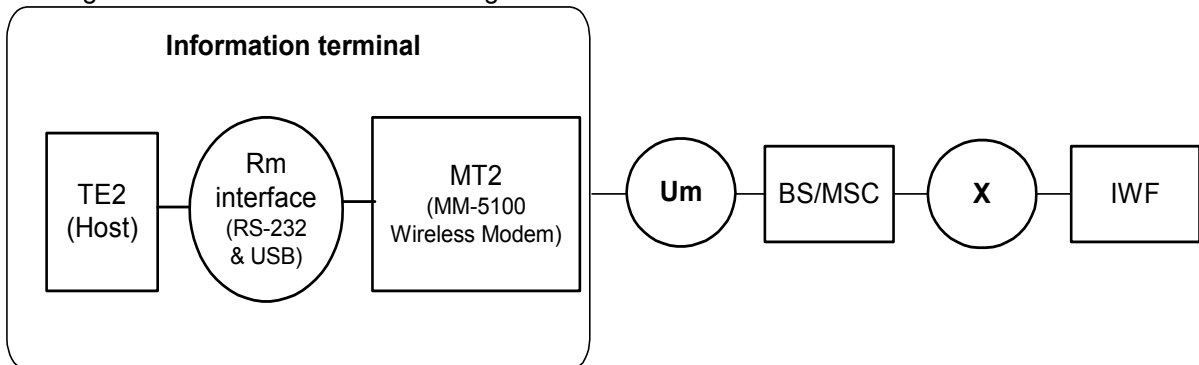
Wide range of supply voltage is from 6V to 36V which provides compatibility for platforms utilizing a vehicle and battery design. The MM-5100 Wireless Modem power saving mode is controlled from the Host via AT command.

1.4 Features

- IS-95A, B, and cdma 2000-1X CDMA Protocol Support
- Standard RS-232 and USB Rev. 1.1 Interface
- Remote controlled by AT command set
- DATA Transmission up to 153Kbps [network limited]
- LED indicating of the modem status
- Small size and lightweight

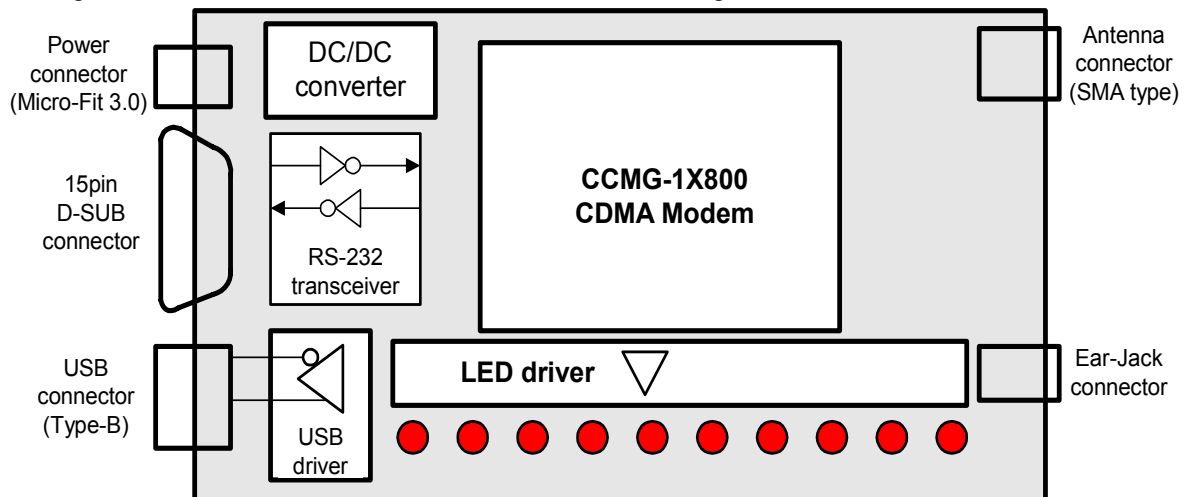
1.5 Application System Diagram

Figure 1.1 CDMA Network block diagram



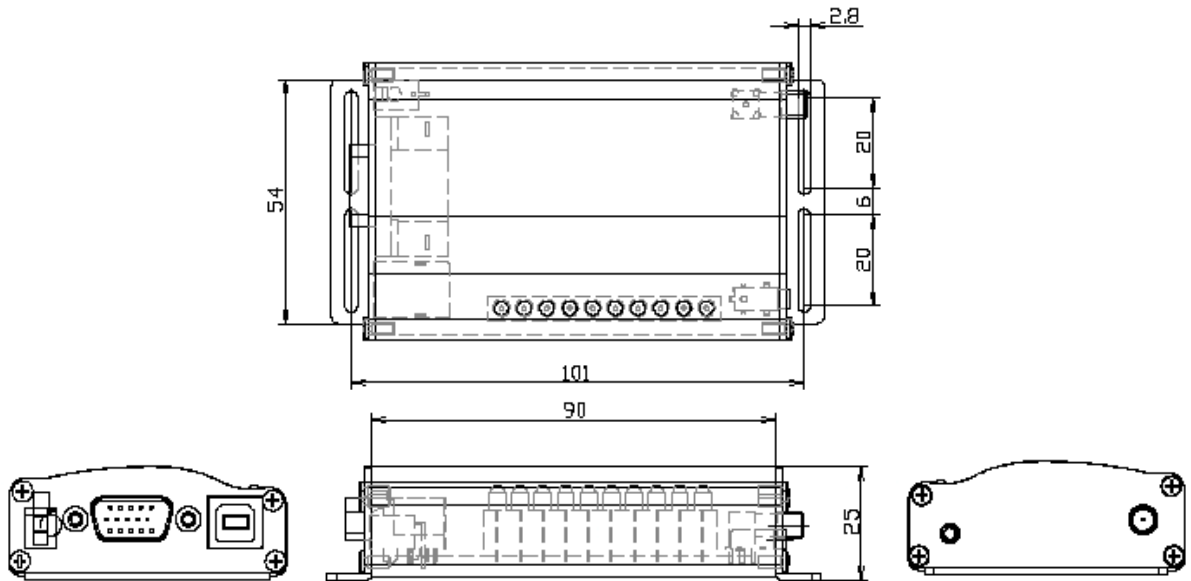
1.6 Block diagram

Figure 1.2 MM-5100 Wireless Modem Internal Block Diagram



1.7 Physical dimension

Figure 1.3 MM-5100 Wireless Modem Physical dimensions



2. Specifications

2.1 Mechanical Specifications

Table 2.1 Mechanical Specifications

Dimensions	110mm x 61.5mm x 25mm
Weight	115g
Color	Blue
Housing Material	CASE – SCM4 , SCM45C , Brackets – AL5052
Holding Bridles	φ2.8 mm

2.2 Environment Specifications

Table 2.2 Environment Specifications

- Power supply voltage	DC +6V ~ +36V
- Ambient Operating Temperature	0°C ~ +50°C
- Ambient Operating Humidity	95%(at 50°C), relative humidity (non-condensing)
- Storage Temperature	-40°C ~ +70°C
- Electrostatic Discharge Rating, Human Body Model	Power and RS-232 , USB signal lines : +/- 15KV Audio and Antenna signal lines : TBD

2.3 Current Consumptions

Table 2.3 Current Consumption (Test condition: power supply=7V, Temp.= 25°C)

On communication @ Maximum TX Power (24+/- 0.3dBm) with RS-232 and/or USB data communication	< 600mA
Power down state - LED off , RS-232 transceiver power down , Modem sleep state	< 10mA

(Note) The current consumption might vary of 5% over the whole operating temperature range.

2.4 USB specifications

The USB interface implemented in the MM-5100 Wireless Modem complies with the Universal Serial Bus (USB) Specification Revision 1.1.

2.5 Audio specifications

The output power for the single-ended EAR2P output is typically 3.3mW for a full-scale +3dBm0 sine wave into a 32ohm speaker. (+3dBm0 level corresponds to 13-bit, 0 dB Full-Scale sine-wave)

2.6 CDMA RF Specifications

RF performances are compliant with IS-95A/B, cdma2000-1X RTT CDMA Protocol.

Receiver

Table 2.4 Receiver performances

- Frequency range	869 MHz~ 894MHz	
- Sensitivity	Under -104dBm (FER=0.5%)	
- Single Tone Desensitization	Under -101dBm (FER=1%)	
- Inter-Modulation : Receiving Central Freq. +/-900KHz & 1.7MHz		
	@Tone Power -43dBm	Under -101dBm (FER=1%)
	@Tone Power -32dBm	Under -90dBm (FER=1%)
	@Tone Power -21dBm	Under -79dBm (FER=1%)

Transmitter

Table 2.5 Transmitter performances

- Frequency range	824.73MHz ~ 848.19MHz	
- Output Power	Over 23dBm/1.23MHz (Class 3)	
- Frequency Bandwidth	1.23MHz	
- Frequency Accuracy	Under defined Freq. +/- 300Hz	
- Conducted Spurious Emission	Over carrier +/-900KHz, -42dBc/30KHz	
	Over carrier +/-900KHz, -54dBc/30KHz	

3. MM-5100 Wireless Modem interfaces

The MM-5100 Wireless Modem comprises following interface ports;

- Power Supply input port
- Data communication ports ; RS-232 and USB
- Voice call interface connector
- RF connector for external antenna

Figure 3.1 MM-5100 Wireless Modem Figure

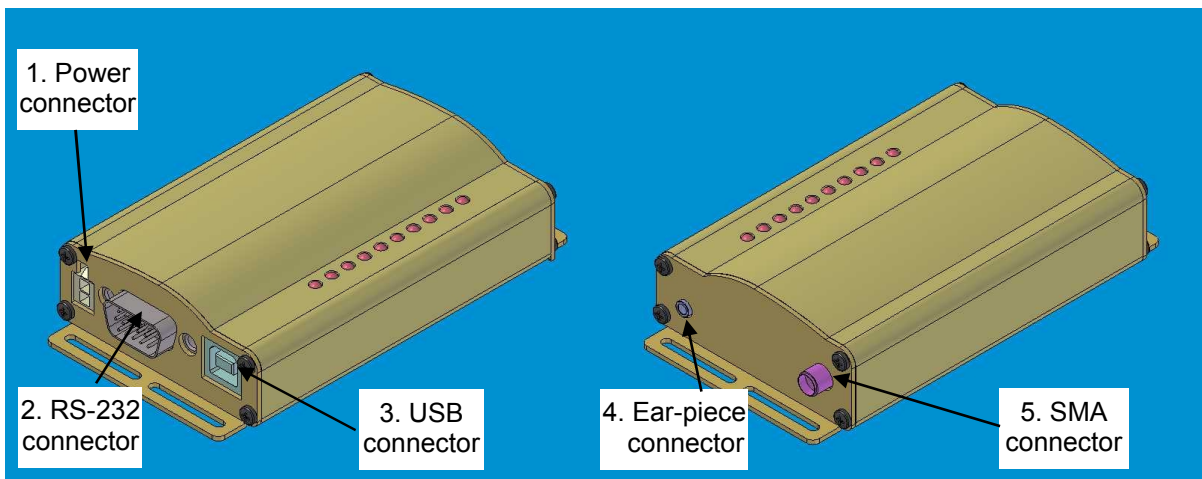
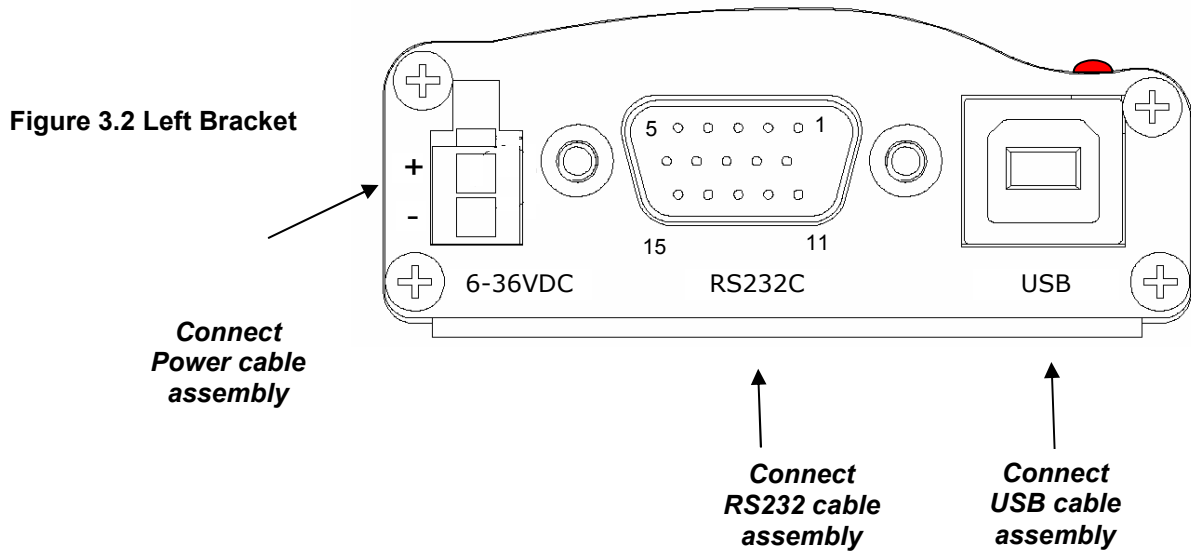


Table 3.1 Connector Types

Connector Function	Connector Type
Power connector	Micro-Fit 3.0 – Dual row right angle thru hole Header Part Number : 43045-0221 Mated Type : 43025-0200 www.molex.com
RS-232 connector	High Density 15Pin D-SUB connector 0.30" , Right angle , Female
USB connector	Universal Serial Bus Shielded I/O Type 'B' Receptacle
Ear-jack connector	2.5φ Earphone Jack, Type 'A'
Antenna connector	SMA connector, Right Angle Jack Receptacle , H-Cutting



*caution: please grip and pull out the connector head only, not the line side in case of dissembling the Power cable & RS232 cable.

Table 3.2 Cable assembly types

Power cable assembly	1.5m AWG22 wire , Micro-Fit 3.0 receptacle-43025-0200
RS232 cable assembly	counter connector: 9pin female , 2m
USB cable assembly	counter connector: A-type , 2m

Table 3.3 **Power connector** Termination assignment

Pin No.	Signal name	Description
1	V+	DC Power (DC +6V to +36V)
2	GND	System reference(ground)

(Note 1) To keep overall performance of the MM-5100 Wireless Modem such as RF and audio, the power supply should meet some electrical characteristics. For best performance, good supply regulation is required because the most important characteristic of power supply is supply voltage stability.

(Note 2) If supply voltage falls below 5.7v, the MM-5100 Wireless Modem will automatically power down and then restart once voltage increased to 6.0v. The MM-5100 Wireless Modem is protected against voltage over 36V.

(Note 3) If the over-voltage is continuous, the protection is guaranteed by the fuse.

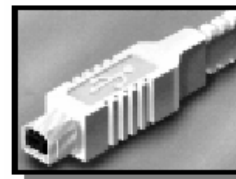
In cases of transient-voltage or surge current, protection is guaranteed by TVS(Transient Voltage Suppressor) device.

Multiple service functions (eg: SMS and Data communication) of the MM-5100 Wireless Modem will be through the TE2 and Rm interface.

“RS-232 Data” port and/or “USB” port are both for data communication however, the Modem can communicate with only one port at a time. The Modem looks for active connection on power up and communicates with the connection found. If both connections are active, the USB will be selected. The USB is a Qualcomm standard that operates under MS-Windows-98SE and MS-Windows2000.

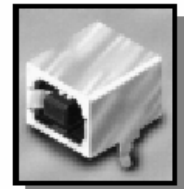
Table 3.4 **USB connector** Termination assignment

Pin No.	Signal name	Typical wiring Assignment
1	Vbus	Red
2	USB-	White
3	USB+	Green
4	GND	Black



"B" Plugs
(From the
Host System)

"B" Receptacles
(Upstream Input to the
USB Device or Hub)



(Note 1) USB+ and USB- are the differential pair signals provided for the TE2.

These signals are capable of directly driving a USB cable. Internal USB_DETECT logic is used to signal the MM-5100 Wireless Modem that a USB cable is attached.

(Note 2) ESD protection for USB signal lines to +/- 15KV

(Note 3) Internal USB_DETECT logic is used to signal the Modem that a USB cable is attached.

Table 3.5 15pin D-SUB connector pin information

Pin No.	Signal	Signal Description
1	DCD	The On condition on this signal line, as sent by the MT2, informs the TE2 that it is receiving a carrier signal from the remote TE2 that meets its criteria.
3	TXD	Sending data signal from TE2 to MT2 serially.
2	RXD	Receiving data signal from TE2 serially.
6	DSR	This signal, in conjunction with DTR, indicates equipment readiness. DSR is turned ON by the MT2 to indicate to the TE2 it is ready to receive or transmit data.
13	DTR	This is a signal turned ON by the TE2 to indicate to the MT2 that it is connected to the line.
8	CTS	The signal is turned ON by the MT2 to indicate now it is ready to transmit data. (In the case of Hardware flow control)
7	RTS	The signal is turned ON by the TE2 to indicate now it is ready to receive data. (In the case of Hardware flow control)
10	RI	The ring indicator is turned on by the MT2. Mobile device informs arrival message of voice call to TE2.
11	DM_TXD	Sending data signal (for DM) from TE2 to MT2 serially.
12	DM_RXD	Receiving data signal (for DM) from TE2 serially.
5	VCC	Power supply(for DM), DC +3.8V(typical)
14	GND	Ground(for DM)

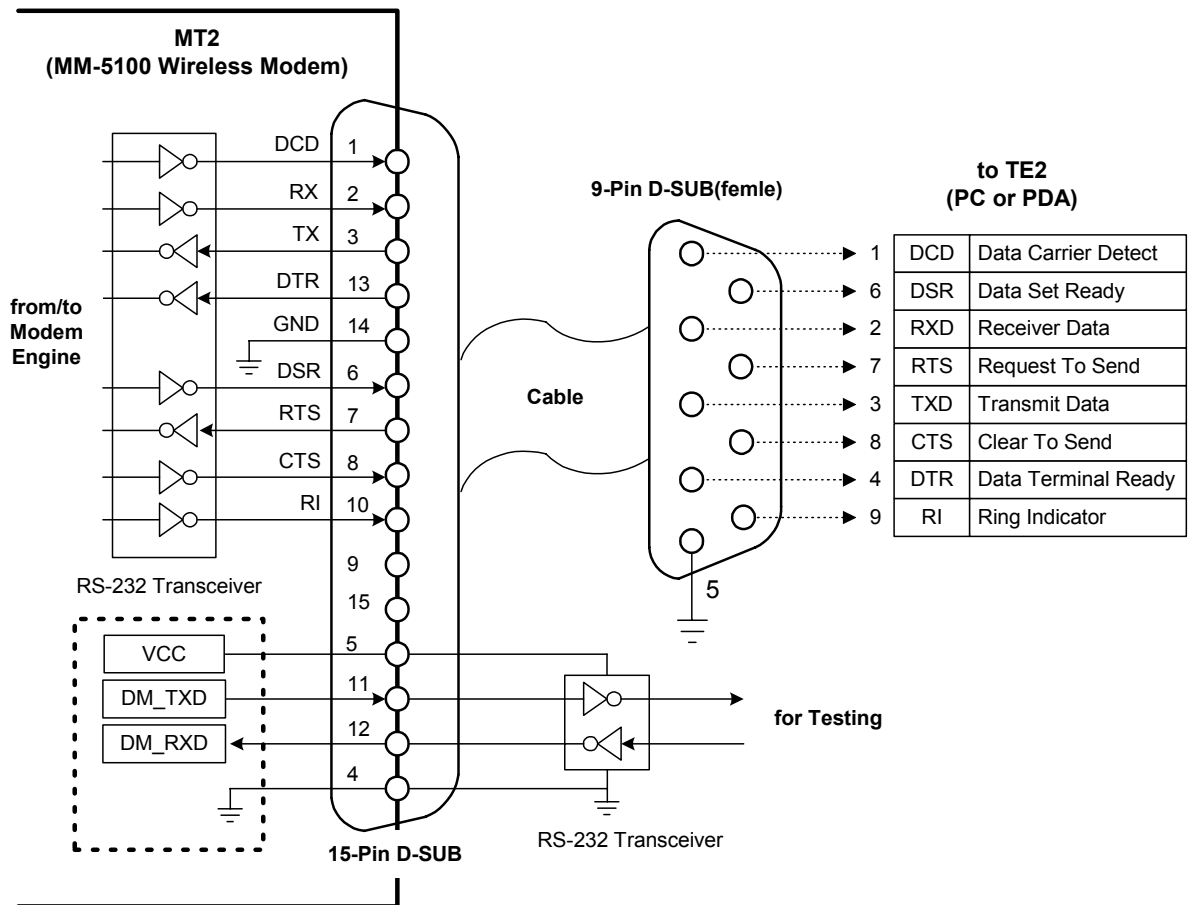
(Note1) The signal name is based on TE2.

(Note2) TE2: DTE - PC or PDA APPLICATION

(Note3) MT2: DCE - MM-5100 Wireless Modem

(Note4) A RS-232 transceiver (ICL3288xx) for serial communication with HOST is installed in MM-5100 Wireless Modem.

Figure 3.3 RS-232 Interface example circuit



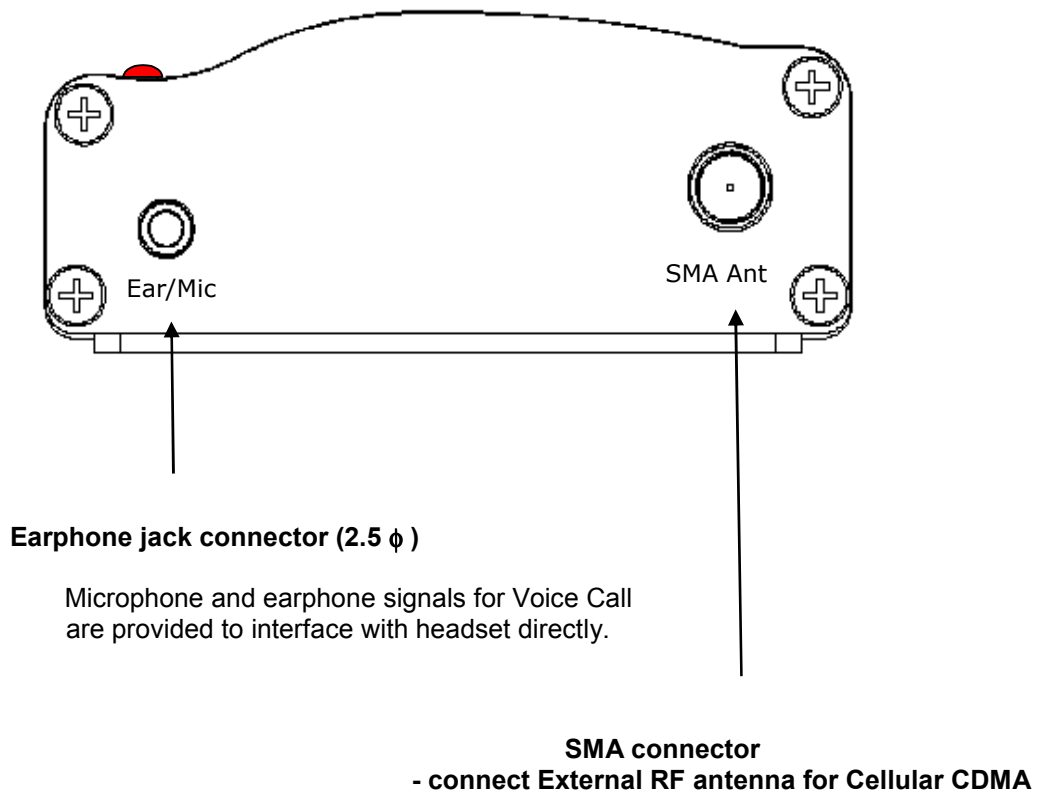
(Note 1) While the Modem is in power save mode, the MM-5100 will power itself down whenever there is 30 seconds of inactivity on the receiver and transmitter inputs.

The MM-5100 remains powered down until an AT command is received via Host and/or has detected an incoming call. For exiting power down state, the MODEM needs a dummy AT command to wake-up from the power down state because the first command will be ignored.

(Note 2) ESD protection for RS-232 signal lines to +/- 15KV.

(Note 3) DM_TXD and DM_RXD signals are used for factory testing purpose.

Figure 3.4 Right Bracket



*caution: please do not over tighten antenna to the connector.

Fig 3.5 Case Marking

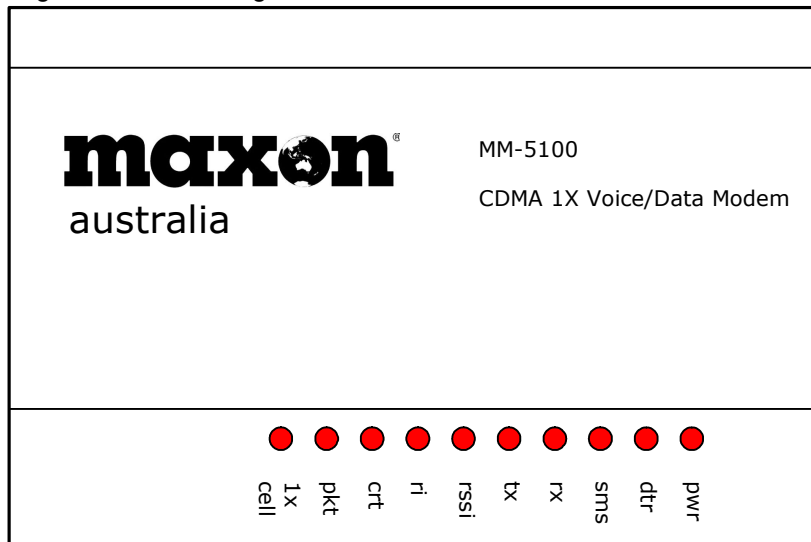


Table 3.5 LED function description

LED Signal	Description
pwr	Light continuously when power is applied to modem
dtr	To indicate MODEM is live from Host device
sms	Blinks if there is unread SMS message
rx	Blinks on data from PC to MODEM
tx	Blinks on data from MODEM to PC
rssi	Lights continuously in RSSI > -95dBm, Blinks if -95dBm > RSSI > -105dBm, Turn-off if RSSI < -105dBm
ri	Blinks on incoming voice call, lights continuously on incoming data call. Light is extinguished when call is answered.
crt	To indicate connection on IS-95A Circuit Switched mode
pkt	To indicate connection in Packet Switched mode
1x cell	To indicate that local cell supports Packet Switched data

(Note 1) In ALL-LED-OFF state, when you plug-in ear piece to the MM-5100, the LEDs are enabled for 30 minutes. If a longer time for LED activation is required, disconnect the ear piece and immediately re-connect. This action will give another 20 minutes.

(Note 2) If the LEDs are turned off by AT command prior to power cycle, All LEDs will remain in turn off state when power is turned on again.

4. Appendix A

Software downloading (updating) method

Perform according to the procedure listed below.

Downloading procedure of Firmware is as follows;

- 1) Disconnect the power cable from MM-5100 Wireless Modem
- 2) Connect Ear-piece
- 3) Connect RS232 cable
- 4) Open “Maxon Firmware Update Program” which is a software downloading program

If you click “Update” on Firmware Update Program, the message below will be displayed.

1. Please Reset Modem
2. Wait for response from modem

- 5) Connect the power cable to MM-5100 Wireless Modem
- 6) Check that Firmware Update program is operating normally.

If Firmware update is finished, the MM-5100 Wireless Modem will initialize itself and will be ready to commence its service function.

(Note 1) Power supply and data cable must remain connected while the firmware is downloading.

(Note 2) Please refer to the “Maxon Firmware Update program” manual for detailed information.