

Manual

CDMA System

Revision History

File name / Revision	Date	Authors
Previous version BX	2004	RS/ JH
Unidata Manual - CDMA System MM5100 AT User Manual Issue 2.0	2007	AB/CB/JH/MS/KC

Copyright © Unidata Pty Ltd 2000-2008. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any spoken or computer language, in any form or by any means. Electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without prior written permission of Unidata Pty Ltd 40 Ladner St, O'Connor Western Australia 6163.

GIGA CDMA MODEM

The following is the settings for a CDMA modem to work with a Unidata logger.

AT instructions

AT+GMI - I.D. MODEM

AT&F0 - SET TO FACTORY DEFAULT

ATE0 - SET ECHO OFF

AT+IPR=9600 - LOCK LOCAL PORT TO 9600 BAUD

ATS0=2 - SET RINGS BEFORE ANSWER.

RS232 TIME OUT

The RS232 timeout must be set in the logger cdt. This must be set to 3 seconds.

Extended settings in (**).ini file

In every scheme that a CDMA modem will be used with the following settings must be made in the (*scheme name*).ini file. The following changes will need to be done after each time the scheme is saved.

TOUTI=1500 change to TOUTI=15000

TPWRDN=1500 change to TPWRDN=15000

add MAXIO=1024 to the bottom of the *.ini file.

Power

Current draw with a 12vdc battery is idle current = 30mA approx & operating current = 200mA approx.



Cables for Unidata loggers

15 pin socket			25 pin plug			9 pin plug	
pin No.	pin name		pin No.	pin name		pin No.	
5	DCD		4	RTS		7	
9	TXD		2	RXD		3	
10	RXD		3	TXD		2	
11	CTS	LI N K T O 1 2					
12	RTS	LI N K T O 1 1					
13	GND		7	GND		5	

CDMA+ 1xRTT external modem

form +
function



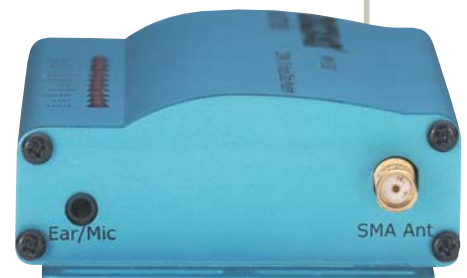
High-speed,
always-on wireless
connectivity over
CDMA 1x networks.

144kbps data,
sms, email, internet,
voice, LAN network,
pc fax, remote
data delivery.

speed +
finesse

Maxon's MM-5100 CDMA 1x Voice/Data Modem

Delivering feature enhanced high-speed
technology in today's wireless data world.



maxon

the *right* products,
made the *right* way,
at the *right* time.

CDMA+ 1xRTT external modem



Drawing from decades of valuable global experience in wireless data - including CDMA technologies - Maxon Australia's MM-5100 CDMA 1x RTT external voice/data modem offers enhanced functionality blended with proven concepts.

what+ why

the *right* products,
made the *right* way,
at the *right* time.

- ⚡ USB 1.1 Connector - For 1x high-speed data beyond 115kbps
- ⚡ RS232C DB15 Connector - Standard data connection or 1x up to 115kbps
- ⚡ 6-36VDC Input Voltage - Offers broad installation compatibility
- ⚡ Robust Metal Casing - Withstands industrial applications
- ⚡ In-built TCP/IP Stack - Future-proofing connectivity
- ⚡ External Mic/Ear Jack - Voice application compatibility
- ⚡ 2-Way SMS Support - SMS reporting using AT commands
- ⚡ Friendly SMS PC Software - Easy-to-use Windows™ SMS Management
- ⚡ Mode Selection Software - Click to select your preferred Mode
- ⚡ Easy-use Dialler Software - Click to dial either Voice, 1x or Async data
- ⚡ Automated SMS Reporting - Input Voltage & RSSI Reports give peace of mind

A unique merger of broad industry consultation, extensive software development and sophisticated state-of-the-art manufacturing techniques, sees the MM-5100 leading the global field in external high-speed 1x CDMA data modems.

Whether for high-velocity wireless access to the internet or e-mail, voice applications, sending or receiving PC faxes, accessing your organisation's network when on the road, or broad-ranging embedded industrial applications using asynchronous, packet or SMS data, the MM-5100 provides unmatched individuality and user friendliness.

Options for the MM-5100:

- ⚡ AC-DC power pack
- ⚡ Ear bud mic/headset
- ⚡ A range of personal, mobile or base antennas are available from Maxon



Included with the MM-5100:

- ⚡ CD containing User Manual, Voice/Data/QNC/SMS software, and USB drivers
- ⚡ DC power fly lead for connection to 6-36VDC power source
- ⚡ USB & RS-232 HD15 cables



Model	MM-5100	
Mechanical	Dimensions:	110 x 61.5 x 25mm
	Weight:	110g
Radio Frequencies	Band:	800 MHz
	Transmit RF:	824 to 849 MHz
	Receive RF:	869 to 894 MHz
	Receive Sensitivity:	Nominal -106dBm
Operating Voltage	6V~36VDC 10mA @ sleep mode CDMA Max: < 600mA (full rate at maximum output power) @ 7VDC	
Transmit Current Drain	CDMA Typical: ~150mA (based on CDG tests) @ 7VDC	
Data Options	Packet data, Async data, PC Fax, Two-way SMS, Quick Net Connect, Simple IP (planned support for Mobile IP)	
Data Rate	Up to 153Kbps (network dependant)	
Voice	13K QCELP, 8K EVRC	
Host Interfaces	RS-232 HD15pin, USB1.1	
Software Interfaces	IS-683A compliant over-air download/update capabilities, IS-707 AT command set and Maxon extended AT command set	
Chipset	QUALCOMM 1xRTT MSM5100 chipset	
Certifications	FCC, IC, ACA, Telstra	

maxon[®]
Electronics Australia Pty Ltd

Tel: +(612) 9707 2000

Fax: +(612) 9707 3328

sales@maxon.com.au

www.maxon.com.au

36a Gibson Ave, Padstow
NSW 2211 Australia

Maxon Electronics Australia Pty Ltd

MM-5100

CDMA 800MHz 1xRTT

Voice/Data/SMS Modem

AT Commands

User Manual



Version: 1.a
Date: August 8th, 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 device 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 radio or TV antenna
- Increase the separation distance between the equipment and the receiver
- Contact Maxon Electronics Australia Pty Ltd. Technical Support for assistance.

MM-5100 AT COMMAND USER'S MANUAL

All data and information contained in or disclosed by this document are proprietary information of Maxon Australia, and all rights therein are expressly reserved. By accepting this material, the recipient agrees that this material and the information contained therein are held in trust and will not be used, copied, reproduced in whole or in part, nor its contents used in any manner without the express written permission of Maxon Australia.

This information provided in this document is provided on an "as is" basis, is preliminary and subjected to change without notice.

In no event will Maxon Australia be liable for any damages arising directly or indirectly from any use of information contained in this document.

It is recommended that this manual be read in conjunction with other supporting documentation from Maxon Electronics Australia Pty. Ltd.

NOTES:

The user is cautioned that changes or modifications not expressly approved by Maxon Electronics Australia Pty Ltd could void the warrantee.

POTENTIALLY UNSAFE AREAS

Posted facilities: Turn off this device in any facility or area when posted notices require you to do so.

Blasting areas: Turn off your phone where blasting is in progress. Observe restrictions and follow any regulations or rules.

Potentially explosive atmospheres: Turn off your phone when you are in any area with a potentially explosive atmosphere. Obey all signs and instructions. Sparks in such areas could cause an explosion or fire, resulting in bodily injury or death.

Areas with a potentially explosive atmosphere are often but not always clearly marked. They include:

- fuelling areas such as gas or petrol stations
- below deck on boats
- transfer or storage facilities for fuel or chemicals
- vehicles using liquefied petroleum gas, such as propane or butane
- areas when the air contains chemicals or particles such as grain, dust or metal powders
- any other area where you would normally be advised to turn off your engine

1xRTT Operation:

Telstra advise that 1xRTT connectivity is not supported in PPP dial-up session.

1. REVISION HISTORY

Level	Date	History
0.1a	July 30 th , 2003	Commercial Release Version



2. CONTACT INFORMATION

Depending on the nature of your inquiry, please feel free to contact the following senior personnel:

Sales, Marketing & Corporate:

Ray Sanders – Managing Director Email: rayws@maxon.com.au

Phone: +61 2 9707 2000

Dana Baggetto – General Manager Email: danab@maxon.com.au

Phone: +61 2 9707 2000

Andrew Arnold – Cellular Business Development Manager

Phone: +61 418 977 778 Email: andrew@maxon.com.au

Technical:

Ashween Prasad – Technical Engineer

Phone: +61 2 9707 2000 Email: engineering@maxon.com.au

3. TABLE OF CONTENTS

MM-5100 AT COMMAND USER'S MANUAL	3
1. REVISION HISTORY	4
2. CONTACT INFORMATION	5
3. TABLE OF CONTENTS	6
4. OVERVIEW	10
4.1. General Description.....	10
4.2. Terms.....	11
4.3. References.....	12
5. AT INTERFACE DESCRIPTION	13
5.1. Basic Integration	13
5.2. Serial Interface	13
5.3. Command Format	13
5.4. Message Naming Convention	14
6. BASIC INTERFACE CONFIGURATION	15
6.1. Baud Rate Set-up.....	15
6.2. Serial Interface	15
6.3. USB Interface	15
6.4. AT Notification Options.....	16
7. SIGNAL INFORMATION	17
7.1. MT Voice Call	17
7.2. MT SMS	17
7.3. MT DATA.....	17
8. INTERFACE ENVIRONMENT	18
8.1. MT2 Basic Operational State.	18
8.1.1.1. Boot alert	18
8.1.1.2. Lock order	18
8.1.1.3. SMS TE2 emergency MO registration alert (AT\$EMMOREG).....	18
8.1.1.4. TE2 active command (AT\$TE2ALIVE).....	19
8.1.1.5. Power Reset (AT\$RESET)	19
8.1.1.6. Current time (AT\$TIME).....	19
8.1.1.7. Software Version inquiry (AT\$SWVER)	19
8.2. Power Conservation Commands	20
8.2.1.1. LED control (AT\$EXT_LED).....	20
8.2.1.2. RS232C Transceiver power-down control (AT\$RS232_PWRDOWN).....	20
8.3. Low Battery Voltage Notification And Alert.....	20
8.3.1.1. SMS low battery voltage set point (AT\$LOWBATT_VTG).....	21
8.3.1.2. Low battery notification (AT\$LOWBATT).....	21
8.4. Visual/Audible Call Alert Options.....	22
8.4.1.1. Receiving notification mode option (AT\$RCVMODE)	22
8.4.1.2. Ringer volume control (AT\$RINGLVL).....	22
8.4.1.3. Ringer melody selection (AT\$RINGIDX)	22
8.4.1.4. Ear volume level control (AT\$EARLVL)	23
8.4.1.5. Ring sound stop (AT\$SNDSTOP)	23



8.5.	Network Relational Settings.....	23
8.5.1.1.	Roaming indicator information (AT\$\$ROAMIND).....	23
8.5.1.2.	Antenna Signal Level report schedule (AT\$\$ANTSET).....	23
8.5.1.3.	Antenna Signal Level (AT\$\$ANTLVL).....	24
8.5.1.4.	RSSI inquiry (AT\$\$RSSI).....	24
8.5.1.5.	Reading MT2 state (AT\$\$CURRSTATE).....	24
8.5.1.6.	RF information (AT\$\$RFINFO).....	25
9.	DIAGNOSTIC COMMANDS.....	26
9.1.1.1.	Ring test (AT\$\$DIAG_RING).....	26
9.1.1.2.	LED test (AT\$\$DIAG_LED).....	26
10.	VOICE CALL AT COMMAND SET.....	27
10.1.1.1.	Voice call receiving restriction (AT\$\$RECEIVERRESTRICTION).....	27
10.1.1.2.	MO voice call (AT+CDV).....	27
10.1.1.3.	MT voice call (AT\$QCCAV).....	27
10.1.1.4.	Release Voice Call (AT+CHV).....	27
10.1.1.5.	Voice call connection notification (\$\$VOICECONNECT).....	27
10.1.1.6.	Voice call release notification (\$\$VOICERELEASE).....	28
10.1.1.7.	Answer alert (\$\$ANSWERALERT).....	28
10.1.1.8.	Call connect alert option (AT\$\$CONNECTTONE).....	28
10.1.1.9.	Call end alert option (AT\$\$ENDTONE).....	28
10.1.1.10.	Reading missed calls count (AT\$\$MSCALLCNT).....	28
10.1.1.11.	Reading missed calls information (AT\$\$MISSEDCALL).....	29
10.1.1.12.	Auto answering option (AT\$\$AUTOANS).....	29
10.1.1.13.	Speed dial number (AT\$\$PHONEn).....	29
10.1.1.14.	Call time information (AT\$\$CALLTIME).....	30
10.1.1.15.	Caller ID.....	30
10.1.1.16.	Reading latest caller ID (AT\$\$CNI).....	30
10.1.1.17.	Key input (AT\$\$KEY).....	30
10.1.1.18.	Microphone mute (AT\$\$VOICEOUT).....	31
11.	HEADSET FUNCTIONALITY.....	32
12.	DATA CALL SET-UP.....	33
12.1.1.1.	CRM Values (AT+CRM).....	33
13.	VOICE/DATA AT COMMAND EXAMPLES.....	34
13.1.	Voice Calls.....	34
13.1.1.1.	MT voice call.....	34
13.1.1.2.	MO voice call.....	34
13.2.	Data Calls.....	34
13.2.1.1.	MO data call.....	34
13.2.1.2.	MT Data Call.....	35
14.	SMS DETAIL.....	36
14.1.	SMS Auto Voltage Alert.....	36
14.1.1.1.	SMS \$\$LOWBATT 1 set point (AT\$\$LOWBATT_VTG).....	36
14.1.1.2.	SMS \$\$LOWBATT 1 set recipient number (AT\$\$AUTO_SMS).....	36
14.1.1.3.	SMS \$\$LOWBATT 1 set site name (AT\$\$SITE_NAME).....	37
14.2.	SMS Remote Report Requests.....	37
14.2.1.1.	Read ALL request.....	37

14.2.1.2.	VBATT request	38
14.2.1.3.	RSSI request	38
14.2.1.4.	LOCATION request	38
14.2.1.5.	SWVER request	38
14.3.	SMS Processing Options	39
14.3.1.1.	SMS MT alert Option (AT\$\$SMSNOTIF).....	39
14.4.	SMS & Voice Mail Notification.....	39
14.4.1.1.	Telstra SMS notification command (SMSOPT is 2).....	39
14.4.1.2.	Voice Mail notification command	39
14.5.	SMS & Voice Mail Access	39
14.5.1.1.	Review the number of stored MT SMS messages (AT\$\$MTCNT)	39
14.5.1.2.	Reading a MT message (AT\$\$READMT).....	40
14.5.1.3.	Reading all MT messages (AT\$\$READALLMT)	40
14.5.1.4.	Reading MO messages count (AT\$\$MOCNT).....	40
14.5.1.5.	Reading all MO SMS messages (AT\$\$READALLMO)	41
14.5.1.6.	Reading MT voice mail count (AT\$\$VMCNT).....	41
14.6.	SMS MO Syntax Options.....	41
14.6.1.1.	Telstra SMS MO (AT+MMC).....	41
14.6.2.	SMS Call Back Number & syntax options.....	42
14.6.2.1.	Alternative Call Back Number – User Programmed – Automatic Inclusion	42
14.6.2.2.	Modem automatically inserts AT\$\$CALLBACK_NUM.....	42
14.6.2.3.	User manually inserts an alternative call back number.....	42
14.6.2.4.	No alternative call back number is required.....	42
14.6.2.5.	Auto reply: Auto Recipient, Auto Callback Number	42
14.6.2.6.	Auto reply: Auto Recipient, Manual Callback Number	43
14.6.2.7.	Auto reply: Auto Recipient	43
14.6.3.	SMS Character and CR-LF Options	43
14.7.	SMS & Voice Mail Storage & Maintenance.....	44
14.7.1.1.	Deleting a MT (received) message (AT\$\$DELMT).....	44
14.7.1.2.	Delete all MT messages (AT\$\$DELALLMT).....	44
14.7.1.3.	Deleting a MO message (AT\$\$DELMO).....	44
14.7.1.4.	Deleting all MO messages (AT\$\$DELALLMO)	44
14.7.1.5.	Delete Voice mail (AT\$\$DELVM).....	44
15.	NVM vs. USER PROFILE STORAGE	45
16.	TIA/EIA/IS-707A AT COMMAND SET.....	46
16.1.1.	User modified profiles & NVM changes	46
16.1.1.1.	User Profile store (AT&Wn).....	46
16.1.1.2.	User Profile recall (AT&Fn).....	46
16.2.	Basic AT Commands.....	47
16.2.1.	Basic AT Parameters	47
16.2.2.	Basic S registers	48
16.2.3.	Basic action command set	49
16.2.4.	Basic result codes.....	50
16.3.	Extended AT Command Sets.....	50
16.3.1.	Extended AT configuration command set	50
17.	FACSIMILE SERVICE CLASS 2.0 AT COMMAND SET.....	62



17.1.1.	Facsimile service Class 2.0 parameters	62
17.1.2.	Facsimile action command set	64
18.	CELLULAR EXTENDED AT COMMAND SET	65
18.1.1.	Cellular AT Voice services command extensions	65
18.1.2.	Cellular AT parameter commands	65
18.1.3.	Cellular identification AT command extensions	70
18.1.4.	Cellular AT commands for Packet data services	73
18.1.5.	Cellular result codes for Asynchronous data services	73
18.1.6.	Cellular result codes for Packet data services	75
19.	QUALCOMM COMMAND SET.....	76
20.	DM COMMAND (DIAGNOSTIC MODE)	77

4. OVERVIEW

The MM-5100 modem is a rugged, full duplex 1xRTT CDMA Voice/Data/Fax/SMS modem designed to operate on CDMA 800MHz networks. CDMA is an efficient and secure cellular wireless technology that compliments fixed or mobile applications.

Two main data services are available on CDMA networks: 1xRTT, a packet switched connection; and IS-95A, a circuit switched connection. IS-95A over-air data rates are limited to 14.4 kbps. The 1x service is capable of data rates as high as 153.6 kbps [network dependant].

The MM-5100 modem has been specifically designed to be compatible with 1xRTT networks to take full advantage of the exceptional data speeds and always-on connection, and is backwards compatible with IS95A circuit switched networks.

When using the MM-5100 for 1x connections, access is achieved via a PPP (TCP/IP) connection to the CDMA network. The CDMA carrier provides the Internet connectivity, becoming the ISP for that session.

Applications such as web browsing, email, FTP, LAN access, etc function as normal.

The MM-5100 incorporates RS-232 and USB drivers, DC/DC down converter, and Voice interface.

The MM-5100 connects directly to a 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.

Designed to meet the requirements for global CDMA markets, the MM-5100 will operate over the following TX /RX frequency ranges:

TX frequency 824MHz – 849MHz

RX frequency 869MHz – 894MHz

The wide range supply input voltage of 6V to 36V provides compatibility for platforms utilizing a variety of power sources or battery capacity.

4.1. General Description

This manual has been provided to assist users and developers integrate the Maxon MM-5100 with host equipment and software for current or new applications. We will update the contents when applicable.

This manual defines the communications interface between host devices to the MM-5100 modem.

Integration with the cellular network is as per the following diagram.

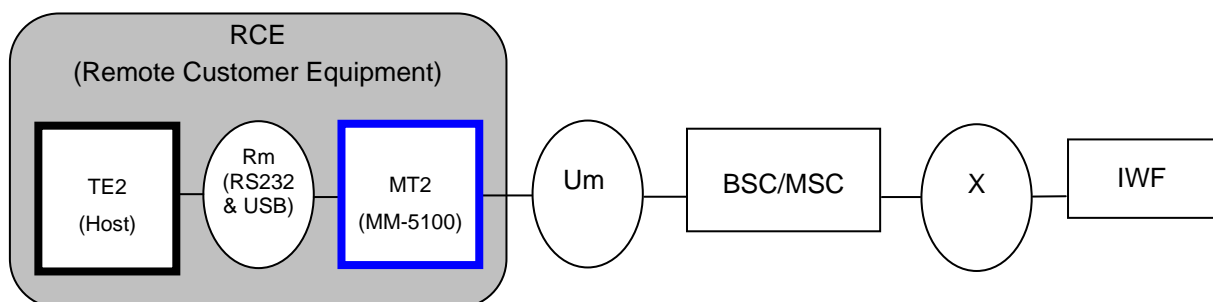


Figure 4-1 Network Integration

4.2. Terms

The following terms are used throughout this document. We have provided an explanation of these for your reference.

Table 4-1

Term	Description
<>	Field. Contents between '<' and '>' indicate the name of the field or the parameter required to complete the syntax.
	Delimiter/Space. Insert a space.
AT command set	Communications command set interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE).
BS	Base Station. Primarily a mobile phone tower in the carrier's domestic public cellular phone network used as the network end point for communicating with mobile stations. Depending upon the context, the term may refer to a cell, a sector within a cell, an MSC, an IWF, or other part of the cellular system.
BSC	Base Station Controller.
CDMA	Code Division Multiple Access. CDMA is a spread spectrum, digital wireless modulation scheme for cellular communication systems. It has approximately 3 times the voice capacity of GSM networks. See IS-95, IS-95A, IS-95B, IS-2000.
DCE	Same as MT2.
DTE	Same as TE2
IWF	Inter-working Function. An IWF provides the functions needed for data 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.
MO	Mobile-Originated where the SMS or the call is originated [sent] by the Mobile Station.
Mobile Station	A cellular device [e.g. this modem or a mobile phone handset] in the carrier's domestic public cellular phone network intended to be used when stationary, while in motion or during halts at unspecified points. Mobile stations may include fixed, portable (e.g., hand-held personal units) or vehicular units.
MSC	Mobile Switching Centre
MT	Mobile-Terminated where the SMS or the call is terminated [received] at the Mobile Station.
MT2	Mobile Termination 2 An MT2 provides a non-ISDN (Rm) user interface, e.g., CCITT V series or CCITT X series. Same as DCE. Refers to the MM-5100 modem.

Term	Description
NVM	Non Volatile Memory. User changeable and is written at time of change or entry to a separate section of memory unaffected by power cycles. The setting value is available in all profiles.
PSTN	Public Switched Telephone Network refers primarily to the telephone system based on copper wires carrying voice, fax & data.
RCE	Remote Customer Equipment. Describes the MT2, Rm and TE2 as one composite system.
Rm	Hardwire Interface between MT2 and TE2.
SMS	Short text Message Service.
TE2	Terminal Equipment 2. A TE2 is a data terminal device that has a non-ISDN user-network interface, e.g., CCITT V series or CCITT X series. Same as DTE. Products which can issue AT command set and handle the response through UART or RS-232 signalling ports of the MM-5100. The popular examples of MT2 are PC's, PDA and embedded systems i.e. Data Logger, PLC etc.
UART	Universal Asynchronous Receiver-Transmitter, the UART is a microchip component that handles asynchronous serial communication. Every computer contains a UART to manage the serial ports, and some internal modems such as MM-5100 have their own UART. UART 1(RS232 port) UART 2 (On serial for diagnostics)
UI	User Interface.
Um	Over-air interface between the MT2 and the BS.

4.3. References

The following standards are referenced in this text.

TIA/EIA/IS-95-A/B

Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular Systems

TIA/EIA/IS-637A

Short Message Services for Dual-Mode Wideband Spread Spectrum Cellular Systems

TIA/EIA/IS-707

Data Service Option for Wideband Spread Spectrum Systems

TIA/EIA/TSB74

Support for 14.4kbps Data Rate and PCS Interaction for Wideband Spread Spectrum Cellular System

TIA/EIA - 615

Data Transmission System and Equipment – Serial Asynchronous Automatic Dialling and Control – Extended command Syntax

TIA/EIA/IS-657

Packet Data Service Options for Wideband Spread Spectrum Systems

5. AT INTERFACE DESCRIPTION

5.1. Basic Integration

The MM-5100 supports asynchronous serial communication known as RS-232.

This chapter describes the basic integration and communication of MT2 with TE2. MT2 hereby defines MM-5100 and TE2 means host products which can issue AT commands and handle the response through UART or RS-232 signalling. The popular examples of TE2 are PC's, PDA's and unmanned systems such as Data Loggers, RTU's or PLC's.

5.2. Serial Interface

TE2's command and MT2's response pair is the basic interface sequence. The pairs should keep a pre-defined format and ignore the case of letters unless otherwise specified. MM-5100 supports 2 serial interfaces, UART1 and UART2. UART1 serves an AT command set with ASCII character sequence and UART2 as a factory diagnostic port, serves an AT command with Async-HDLC format.

5.3. Command Format

The AT command set in UART1 is based on ASCII text. The extended AT command set by Qualcomm start with "AT\$QC" and the extended AT command set by Maxon Australia start with "AT\$\$". All commands should finish by <CR>, 0x0d. Other formats and rules in the AT command set keep to IS-707A.

Any spaces in the AT command field are ignored and the space in the parameter field should be removed if it is not necessary unless otherwise specified.

With few exceptions the following syntax provides the given response for each AT command. Where not applicable the response is ERROR:

Table 5-2

Command	Description
AT***?	reads current set value
AT***=?	reads supported range of values
AT***=<value>	changes current set value to new set value

NOTE: *** stands for the specific AT syntax.

5.4. Message Naming Convention

The following diagram shows the naming convention of messages between MT2 and TE2.

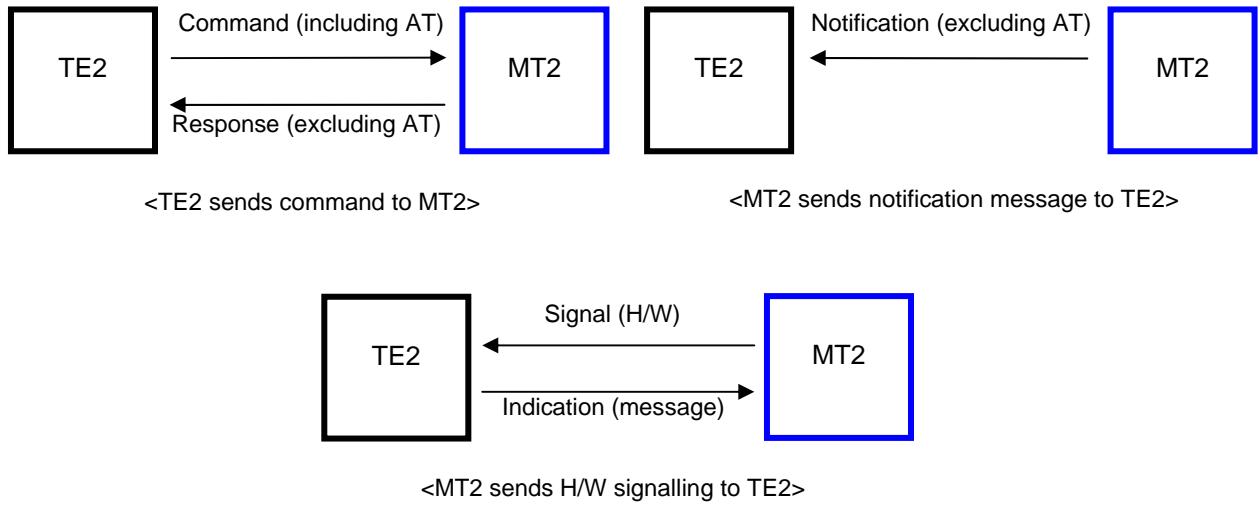


Figure 5-2 Naming convention diagram

6. BASIC INTERFACE CONFIGURATION

6.1. Baud Rate Set-up

This section provides basic information on setting the data communication rate [baud rate] on the Rm interface between MT2 and TE2.

Where CDMA 1xRTT Network access is available and required by the user for high speed internet access, we recommend that the appropriate supplied drivers be installed on your PC to support the higher baud rates and that this manual be read in conjunction with other supporting documentation from Maxon Electronics Australia Pty. Ltd.

6.2. Serial Interface

The default transfer rate is set to 115200bps with support to 230400bps. On the RS232 Serial connection, if the +IPR value is 0 [zero], autobaud support will be active. Autobaud automatically determines the incoming bit-rate on the Rm interface from TE2 up to 19200bps only.

On the RS232 Serial connection the +IPR setting may need to be changed for those devices that require a specific baud rate above 19200bps but below 115200bps. This would also apply to low baud rate devices that cannot transmit their specific baud rate to MT2.

NOTE: autobaud operates on UART1 only. UART2 does not perform autobaud.

6.3. USB Interface

Autobaud is intrinsic within the functionality of USB. However the +IPR setting may be useful to limit baud rate for specific applications. USB automatically negotiates the maximum baud rate available.

Table 6-3 Read command

Command	TE2	→	MT2	+IPR=?
Response	TE2	←	MT2	+IPR: <value>
Value	+IPR: (0, 1200, 2400, 4800, 9600, 19200), (45, 50, 75, 110, 150, 300, 600, 38400, 57600, 115200, 230400) [[(<supported_autodetectable_rates>), (<supported_fixed-only_rates>)] 0: Autobaud up to 19200bps Default: 115200			

Table 6-4 Read command

Command	TE2	→	MT2	+IPR?
Response	TE2	←	MT2	+IPR: <value>

Table 6-5 Set command

Command	TE2	→	MT2	+IPR=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

6.4. AT Notification Options

MT2 will send notification command as determined by the \$\$NOTIFCNT value.

Notification count (AT\$\$NOTIFCNT)

Table 6-6 Read command

Command	TE2	→	MT2	\$\$NOTIFCNT?
Response	TE2	←	MT2	\$\$NOTIFCNT: <value>
Value	0: No notification 1: Notify Once (Default) 2: Notify three times per every 3 seconds			

Table 6-7 Set command

Command	TE2	→	MT2	\$\$NOTIFCNT=<value>
Response	TE2	←	MT2	\$\$NOTIFCNT: 1 0 (Success Failure)

7. SIGNAL INFORMATION

7.1. MT Voice Call

Table 7-8

Signal	Action
AT: CNI	Notification where supported (to UART1 and USB)
Ring Buzzer	Audible Ring (excepting where Rcv_mode is 1)
RI LED	ON every three sec. (On for 1 sec., Off for 2 sec. repeated) (excepting where \$\$RCV_MODE is 2)

7.2. MT SMS

Table 7-9

Status	Signal	Action
Idle, Voice, Data	AT	SMS Notification to Serial and USB ports
	Buzzer	\$\$SMSNOTIF value "0": No alert \$\$SMSNOTIF value "1": Buzzer alerts 4 times initially only \$\$SMSNOTIF value "2": Buzzer alerts 4 times initially followed by once every two sec.
	LED	SMS LED ON (initially flashes 4 times, LED flashes by every two sec. where \$\$SMSNOTIF value is "1 or 2".)

Note: RI Signal doesn't notify when SMS message is received.

7.3. MT DATA

Table 7-10

Signal	Action
AT CNI	Notification where supported (on Serial and USB ports)
AT	'RING' notification
Ring Buzzer	Audible Ring (excepting where \$\$RCV_MODE is 1)
RI/RX LED	ON for duration of ring and when MT data call in progress. Operation is as RX LED otherwise.

8. INTERFACE ENVIRONMENT

8.1. MT2 Basic Operational State.

This command set enables the user to set up and/or confirm MT2's basic operational environment.

8.1.1.1. Boot alert

After power up MT2 notifies TE2 it is active on the network and in idle state by this command.

Table 8-11 Notification command

Notify	TE2	←	MT2	\$\$TELSTRA CDMA
---------------	------------	----------	------------	-------------------------

8.1.1.2. Lock order

If the ESN or the MIN stored in MT2 is invalid, MT2 sends this command to TE2.

Table 8-12 Notification command

Notify	TE2	←	MT2	+CERROR: NO CARRIER
---------------	------------	----------	------------	----------------------------

8.1.1.3. SMS TE2 emergency MO registration alert (AT\$\$EMMOREG)

This command is used for basic monitoring of TE2 condition. MT2 can be set to look for \$\$TE2ALIVE command from TE2. If MT2 doesn't receive \$\$TE2ALIVE command from TE2 within the time frame as set by this \$\$EMMOREG command, MT2 will assume a problem exists at TE2. MT2 automatically sends an SMS alert message to a user defined mobile number.

\$\$EMMOREG functionality is disabled after the first alert SMS message to prevent continual SMS transmittal.

NOTE: To re-enable this feature the modem requires the \$\$EMMOREG Set command to be re-entered.

The applicable TI for this function is; 4098 (text message).

Table 8-13 Read command

Command	TE2	→	MT2	\$\$EMMOREG?
Response	TE2	←	MT2	\$\$EMMOREG: period,terminatednumber,TI,msg
Value	period: 5 – 300 (seconds) terminatednumber: mobile number TI: Teleservice Identifier (4098) msg: User data			

Table 8-14 Set command

Command	TE2	→	MT2	\$\$EMMOREG=<period,terminatednumber,TI,msg>
Command	TE2	→	MT2	\$\$EMMOREG=CANCEL (Disable – No \$\$TE2ALIVE command expected by MT2)
Response	TE2	←	MT2	\$\$EMMOREG: 1 0 (Success Failure)

8.1.1.4. TE2 active command (AT\$\$TE2ALIVE)

If \$\$EMMOREG command has been enabled in MT2 then TE2 must transmit \$\$TE2ALIVE command to MT2 within the time frame value specified in the \$\$EMMOREG command.

Table 8-15

Command	TE2	→	MT2	\$\$TE2ALIVE
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.1.1.5. Power Reset (AT\$\$RESET)

Command to reset Modem, which is utilised to perform an immediate or scheduled soft power-off/on cycle.

Table 8-16 Read command

Command	TE2	→	MT2	\$\$RESET?
Response	TE2	←	MT2	\$\$RESET: <value>
Value	time: 0~12960000 (minutes) (0: Periodic Power Reset Disabled - Default)			

Table 8-17 Set command (scheduled reset)

Command	TE2	→	MT2	\$\$RESET=<value>
Response	TE2	←	MT2	\$\$RESET: <time> <result_code> (OK ERROR)

Table 8-18 Execute command (performs immediate reset)

Command	TE2	→	MT2	\$\$RESET
Response	TE2	←	MT2	\$\$RESET: 1 0 (Success Failure)

8.1.1.6. Current time (AT\$\$TIME)

This command enables the user to view the current date, time and day.

Table 8-19 Read command

Command	TE2	→	MT2	\$\$TIME
Response	TE2	←	MT2	\$\$TIME: <yyyy-mm-dd,HH:MM:SS,sss(Day of Week)>
Value	sss: milliseconds Day of Week: SUN, MON, TUE, WED, THU, FRI, SAT			

8.1.1.7. Software Version inquiry (AT\$\$SWVER)

Table 8-20 Read command

Command	TE2	→	MT2	\$\$SWVER?
Response	TE2	←	MT2	\$\$SWVER: <software_version>
Example	software_version: (example: C80tsxxx.yymmddhh)			

8.2. Power Conservation Commands

8.2.1.1. LED control (AT\$\$EXT_LED)

This command is used for control of the LED's on-time. Changes made to this function are written to NV memory and will be present in all profiles.

Where a value other than '0' is set, connecting the Maxon ear/mic headset into the modem will enable LED's for the duration of the set value.

Table 8-21 Read command

Command	TE2	→	MT2	\$\$EXT_LED?
Response	TE2	←	MT2	\$\$EXT_LED: <value>
Value	Time: 0~255 seconds (0: Continuous LED ON - Default)			

Table 8-22 Set command

Command	TE2	→	MT2	\$\$EXT_LED=<value>
Response	TE2	←	MT2	\$\$EXT_LED: <value> <result_code> (OK ERROR)

8.2.1.2. RS232C Transceiver power-down control (AT\$\$RS232_PWRDOWN)

This command is used for control of the RS232C Transceiver Power Down function. When there are no valid signal transmissions on all receiver and transmitter inputs for 30 seconds, the transceivers are shut off, reducing current draw for power conservation applications.

TE2 can activate resumption of RS232 power up via dummy AT command. MT2 activity such as MT calls or MT SMS or AT Alerts will wake RS232 from power-down and pass these to TE2.

Table 8-23 Read command

Command	TE2	→	MT2	\$\$RS232_PWRDOWN?
Response	TE2	←	MT2	\$\$RS232_PWRDOWN: <value>
Value	0: Power Down disabled (Default) 1: Power Down enabled			

Table 8-24 Set command

Command	TE2	→	MT2	\$\$RS232_PWRDOWN=<value>
Response	TE2	←	MT2	\$\$RS232_PWRDOWN: <value> <result_code> (OK ERROR)

8.3. Low Battery Voltage Notification And Alert

MT2 transmits low battery notifications to TE2 and initiates MO SMS alerts by this command where the voltage drops to user determined \$\$LOWBATT 1 set point or reaches the factory default set points.

8.3.1.1. SMS low battery voltage set point (AT\$\$LOWBATT_VTG)

This command also sets the SMS Auto Voltage Alert value. (For remote user SMS notification activation please see [SMS Auto Voltage Alert](#)).

Table 8-25 Read command

Command	TE2	→	MT2	\$\$LOWBATT_VTG?
Response	TE2	←	MT2	\$\$LOWBATT_VTG: <value1>
Value1	<p>610: Default – voltage point set for \$\$LOWBATT 1 notification xxxx: 4 digit number representing voltage to 2 decimal points x100 (ie 12.8 volts would be represented as 1280, 9VDC would be 0900) Value range is from 0610 to 3600. NOTE: If the first digit entered is a zero it is ignored in the response.</p>			

Table 8-26 Set command

Command	TE2	→	MT2	\$\$LOWBATT_VTG=<value>
Response	TE2	←	MT2	\$\$LOWBATT_VTG: <value> <result_code> (OK ERROR)

8.3.1.2. Low battery notification (AT\$\$LOWBATT)

Table 8-27 Notification command

Notify	TE2	←	MT2	\$\$LOWBATT: <value>
Value	<p>0: normal state (voltage above 6.1VDC or that set by \$\$LOWBATT_VTG) 1: Low Battery (voltage has dropped to the point set at \$\$LOWBATT_VTG) 2: Power-off sequence initiated - battery voltage has reached 5.8VDC</p>			

NOTE: When the power supply to MT2 reaches 6.5 volts the modem will power up and send a \$\$LOWBATT 1 notification to TE2. It does not send SMS alert at this time. SMS alert is automatically reinstated once the voltage exceeds the \$\$LOWBATT 1 set point PLUS 10% as seen by the modem.

The following shows MT2's responses against the battery level.

Table 8-28 Responses

Battery Level	MT2
Batt level=1	a) Notifies TE2 with AT: \$\$LOWBATT:1 b) Notifies local user: buzzer (repetition approx every 2 minutes) c) Notifies with MO SMS if enabled
Batt level=2	Transmits \$\$LOWBATT:2 to TE2 Executes the Power Down sequence

NOTE: Tolerance of voltage readings is +/-0.4V on average.

NOTE: Modem will auto power up once supply voltage reaches 6.5VDC.

8.4. Visual/Audible Call Alert Options

8.4.1.1. Receiving notification mode option (AT\$\$RCVMODE)

This command is used for selecting preferred mode of incoming call alert.

Table 8-29 Read command

Command	TE2	→	MT2	\$\$RCVMODE?
Response	TE2	←	MT2	\$\$RCVMODE: <value>
Value	0: LED with Ring (Default) 1: LED only 2: Ring Only			

Table 8-30 Set command

Command	TE2	→	MT2	\$\$RCVMODE=<value>
Response	TE2	←	MT2	\$\$RCVMODE: 1 0 (Success Failure)

8.4.1.2. Ringer volume control (AT\$\$RINGLVL)

The command is used to test or set ringer volume level. MT2 applies new setting after TE2 reads or changes the volume setting.

This command causes the MT2 to ring once at current or set level.

Table 8-31 Read command

Command	TE2	→	MT2	\$\$RINGLVL?
Response	TE2	←	MT2	\$\$RINGLVL: <value>
Value	ring level: (0~4) (0: mute) Default: 2			

Table 8-32 Set command

Command	TE2	→	MT2	\$\$RINGLVL=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.4.1.3. Ringer melody selection (AT\$\$RINGIDX)

This command is used to test or set ringer melody. MT2 applies new setting when TE2 reads or changes the ringer melody setting.

This command causes the MT2 to ring once at current or set level.

Table 8-33 Read command

Command	TE2	→	MT2	\$\$RINGIDX?
Response	TE2	←	MT2	\$\$RINGIDX: <value>
Value	Current melody Index (0~4) Default: 0			

Table 8-34 Set command

Command	TE2	→	MT2	\$\$RINGIDX=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.4.1.4. Ear volume level control (AT\$\$\$EARLVL)

This command is used to test or set ear piece volume level. MT2 applies new setting after TE2 reads or changes the volume setting.

This command causes the MT2 to ring once at current or set level.

Table 8-35 Read command

Command	TE2	→	MT2	\$\$\$EARLVL?
Response	TE2	←	MT2	\$\$\$EARLVL: <value>
Value	Volume level: (1~4) Default: 2			

Table 8-36 Set command

Command	TE2	→	MT2	\$\$\$EARLVL=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.4.1.5. Ring sound stop (AT\$\$\$SNDSTOP)

This command stops ringing of the buzzer or ear piece started by an MT call. This command only applies to existing call and is automatically reset for next call.

Table 8-37 Execute command

Command	TE2	→	MT2	\$\$\$SNDSTOP
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.5. Network Relational Settings

8.5.1.1. Roaming indicator information (AT\$\$\$ROAMIND)

This command is used for reading Roaming Indicator Information.

Table 8-38 Read command

Command	TE2	→	MT2	\$\$\$ROAMIND
Response	TE2	←	MT2	\$\$\$ROAMIND: <value>
Value	0: Not Roaming 1: Roaming inside preferred roaming list 2: Roaming outside preferred roaming list			

8.5.1.2. Antenna Signal Level report schedule (AT\$\$\$ANTSET)

The command is used for reading or setting the notification period of \$\$\$ANTLVL notification in seconds. If no changes are monitored \$\$\$ANTLVL does not report to \$\$\$ANTSET values.

Table 8-39 Read command

Command	TE2	→	MT2	\$\$\$ANTSET?
Response	TE2	←	MT2	\$\$\$ANTSET: <value>
Value	0: Read once 1~43200: Notification every <x> seconds			

Table 8-40 Set command

Command	TE2	→	MT2	\$\$ANTSET=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

8.5.1.3. Antenna Signal Level (AT\$\$ANTLVL)

The antenna level range is 0 (no service) to 7 (strong signal). If no changes are monitored \$\$ANTLVL does not report to \$\$ANTSET values.

Table 8-41 Notification command

Notify	TE2	←	MT2	\$\$ANTLVL: <value>
Value	0-7: 0 (no service) to 7 (strong signal)			

If MT2 doesn't receive a response (ACK) against ANTLVL, MT2 notifies two more times at the set interval irrespective to any changes to the level.

8.5.1.4. RSSI inquiry (AT\$\$RSSI)

The command is used for reading the current RSSI value of the signal.

The RSSI LED will be OFF when RSSI is less than -105dBm, flashing when in-between the -95dBm and -105dBm, and ON when greater than or equal to -95dBm.

NOTE: the higher the negative number i.e. the further away from ZERO, the weaker the received signal. The smaller the number i.e. the closer to ZERO, the stronger the received signal.

A flashing RSSI LED indicates potential need for an alternative antenna, relocating the antenna to a site more suited to signal acquisition, or elevation of the antenna to improve signal acquisition, or a combination of all the above.

A consistent RSSI reading of -95dBm or better [number closer to '0'] is advisable.

Table 8-42 Read Command

Command	TE2	→	MT2	\$\$RSSI?
Response	TE2	←	MT2	\$\$RSSI: <value>
Value	RSSI: (-dBm)			

8.5.1.5. Reading MT2 state (AT\$\$CURRSTATE)

This command displays current MT2 state information.

Table 8-43 Read command

Command	TE2	→	MT2	\$\$CURRSTATE
Response	TE2	←	MT2	\$\$CURRSTATE: <value>
Value	0: No service 1: Initialisation state 2: Idle state 3: Conversation state 4: Access state 5: Paging state 6: Ringing 7: Unknown (or error)			

8.5.1.6. RF information (AT\$\$RFINFO)

This command enables user to acquire RF information between MT2 and the on-air system. MT2 transmits the following messages according to an argument status between MT2 and the on-air system.

Table 8-44 Set command

Command	TE2	→	MT2	\$\$RFINFO=<interval_value>
Response	TE2	←	MT2	\$\$RFINFO:<CHAN,RX,[TX_ADJ],[TX],[FER],PN,EcIo>
Value	Interval: MT2's response cycle in seconds Interval 1: One time report(response) Interval x: Report per x seconds (2 - 255) Interval 0: No reporting (Default)			
Report	CHAN: Channel number(ex:779) RX: RX power (dBm) (ex:-60) [TX_ADJ]: Adjust value (dB), response on traffic status [TX]: TX power(dBm), response on traffic status [FER]: Frame error rate(%), response on traffic status PN: PN number no in best eclo(ex:470) EcIo: BestEcIo, (dB)			

9. DIAGNOSTIC COMMANDS

These commands are used for testing and diagnostic purposes. They can not be used in the calling state.

9.1.1.1. Ring test (AT\$\$DIAG_RING)

This command is used to confirm MT2 ring alert function.

Table 9-45 Execute Command

Command	TE2	→	MT2	\$\$DIAG_RING=<value>
Response	TE2	←	MT2	\$\$DIAG_RING: 1 0 (Success Failure)
Value	1 – 20000 Ringing time in msec 0: stop test			

9.1.1.2. LED test (AT\$\$DIAG_LED)

NOTE: This function incorporates a soft power reset.

This command is used to check MT2 LED lamps function and requires MT2 to be in the off-line command state. All LED are tested apart from PWR. After command has been issued the LED are turned off, then come on one by one. This is followed by a soft power reset.

Table 9-46 Execute Command

Command	TE2	→	MT2	\$\$DIAG_LED=1
Response	TE2	←	MT2	\$\$DIAG_LED: 1 (response back when test starts) \$\$DIAG_LED: (response when the tests finishes) OK (Modem resets power) (After power up the following screen dump response is effected only when the headset IS connected) MM-5100 H/W rev.:0.4 Memory:LRS1383 Boot block rev.:00000015 Compiled at Jul 21 2003 14:16:55 (After power up the following notification is effected where NO headset is connected) \$\$TELSTRA CDMA

10. VOICE CALL AT COMMAND SET

10.1.1.1. Voice call receiving restriction (AT\$RECEIVERRESTRICTION)

Only applicable to MT voice mode [not data], if MT2 is set to block voice call reception, MT2 will not notify TE2 (no ringing).

Table 10-47 Read command

Command	TE2	→	MT2	\$RECEIVERRESTRICTION?
Response	TE2	←	MT2	\$RECEIVERRESTRICTION: <value>
Value	1: On 0: Off (Default)			

Table 10-48 Set command

Command	TE2	→	MT2	\$RECEIVERRESTRICTION=<value>
Response	TE2	←	MT2	\$RECEIVERRESTRICTION:1 0 (Success Failure)

10.1.1.2. MO voice call (AT+CDV)

Use this command to initiate a MO voice call.

Table 10-49 Execute Command

Command	TE2	→	MT2	AT+CDV<dial number>
Response	TE2	←	MT2	\$\$VOICECONNECT <result_code> (OK ERROR)

10.1.1.3. MT voice call (AT\$QCCAV)

Use this command to answer a MT voice call.

Table 10-50 Execute Command

Command	TE2	→	MT2	AT\$QCCAV (answer call)
Notify	TE2	←	MT2	\$\$VOICECONNECT

10.1.1.4. Release Voice Call (AT+CHV)

Use this command to terminate a voice call.

Table 10-51 Execute Command

Command	TE2	→	MT2	AT+CHV
Response	TE2	←	MT2	\$\$VOICERELEASE <result_code> (OK ERROR)

10.1.1.5. Voice call connection notification (\$\$VOICECONNECT)

MT2 transmits this command to TE2 when MT2 detects MO voice call is being attempted.

Table 10-52 Notification command

Notify	TE2	←	MT2	\$\$VOICECONNECT
--------	-----	---	-----	------------------

10.1.1.6. Voice call release notification (\$\$VOICERELEASE)

Where voice call is released, MT2 transmits notification to TE2 by this command confirming that call has been released.

Table 10-53 Notification command

Notify	TE2	←	MT2	\$\$VOICERELEASE
---------------	------------	---	------------	-------------------------

10.1.1.7. Answer alert (\$\$ANSWERALERT)

MT2 sends this command to TE2 where MT2's MO voice call is answered. This command is displayed only if the carrier transmits CAI_TONE_OFF signal.

Table 10-54 Notification command

Notify	TE2	←	MT2	\$\$ANSWERALERT
---------------	------------	---	------------	------------------------

10.1.1.8. Call connect alert option (AT\$\$CONNECTTONE)

Table 10-55 Read command

Command	TE2	→	MT2	\$\$CONNECTTONE?
Response	TE2	←	MT2	\$\$CONNECTTONE: <value>
Value	1: On (Default) 0: Off			

Table 10-56 Set command

Command	TE2	→	MT2	\$\$CONNECTTONE=<value>
Response	TE2	←	MT2	\$\$CONNECTTONE: 1 0 (Success Failure)

10.1.1.9. Call end alert option (AT\$\$ENDTONE)

Table 10-57 Read command

Command	TE2	→	MT2	\$\$ENDTONE?
Response	TE2	←	MT2	\$\$ENDTONE: <value>
Value	1: On 0: Off (Default)			

Table 10-58 Set command

Command	TE2	→	MT2	\$\$ENDTONE=<value>
Response	TE2	←	MT2	\$\$ENDTONE: 1 0 (Success Failure)

10.1.1.10. Reading missed calls count (AT\$\$MSCALLCNT)

This command enables user to confirm the number of missed incoming calls.

Table 10-59 Read command

Command	TE2	→	MT2	\$\$MSCALLCNT
Response	TE2	←	MT2	\$\$MSCALLCNT: <n>
Value	n: the number of missed calls			

10.1.1.11. Reading missed calls information (AT\$\$MISSEDCALL)

Table 10-60 Read command

Command	TE2	→	MT2	\$\$MISSEDCALL
Response	TE2	←	MT2	\$\$MISSEDCALL:<id_number,caller_number,receiving_time>
Value	OK: no missed calls idnumber (0: the last call)			

10.1.1.12. Auto answering option (AT\$\$AUTOANS)

This command enables MT2 to answer a voice call automatically. This does not apply data.

Table 10-61 Read command

Command	TE2	→	MT2	\$\$AUTOANS?
Response	TE2	←	MT2	\$\$AUTOANS: <value>
Value	0: Disable Automatic Answering (Default) 1: Enable Automatic Answering after 1 ring 2: Enable Automatic Answering after 3 rings 3: Enable Automatic Answering after 5 rings			

Table 10-62 Set command

Command	TE2	→	MT2	\$\$AUTOANS=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

10.1.1.13. Speed dial number (AT\$\$PHONEn)

This command is used for entering, dialling or changing the speed dial number stored in current User Profile of MT2.

Table 10-63 Read command

Command	TE2	→	MT2	\$\$PHONEn?
Response	TE2	←	MT2	\$\$PHONEn: <dial_number>
Value	n: 1~3 of 3 phone numbers which can be stored in NVM. dial_number: number that will be dialled (ex: 01199991234)			

Table 10-64 Set command

Command	TE2	→	MT2	\$\$PHONEn=<dial_number>
Response	TE2	←	MT2	\$\$PHONEn: dial_number <result_code> (OK ERROR)

Table 10-65 Execute command

Command	TE2	→	MT2	\$\$PHONEn
Response	TE2	←	MT2	\$\$PHONEn: dial_number

10.1.1.14. Call time information (AT\$\$CALLTIME)

This command is used for reading call-time history.

Table 10-66 Read command

Command	TE2	→	MT2	\$\$CALLTIME
Response	TE2	←	MT2	\$\$CALLTIME: <x1,x2,x3,x4>
Value	x1: total number of calls x2: all call time (minutes:seconds) x3: last call time (minutes:seconds) x4: calling time (minutes:seconds) (x4 Calling time is for current call and is displayed in calling state only)			

10.1.1.15. Caller ID

When MT2 receives signal of an incoming voice call, MT2 transmits it to TE2 by this command.

Table 10-67 Notification command

Notify	TE2	←	MT2	[\$\$CNAP: NAME] (If CNAP) \$\$CNI: CID
Value	CID: Caller ID Phone number: if the caller ID exists. Restricted: if the sender has his number blocked None: if the recipient is not registered to use caller ID service CNAP: Calling Name Presentation (Notify where there is Calling Party Name) CNAP: only where network permits; otherwise '0'			

10.1.1.16. Reading latest caller ID (AT\$\$CNI)

This command enables user to review the latest caller ID.

Table 10-68 Read command

Command	TE2	→	MT2	\$\$CNI?
Response	TE2	←	MT2	\$\$CNI: CID, CNAP
Value	CID: caller ID(phone number), otherwise 0 CNAP: caller CNAP information, otherwise 0			

10.1.1.17. Key input (AT\$\$KEY)

This command is used for simulating key operation with AT command.

Table 10-69 Execute command

Command	TE2	→	MT2	\$\$KEY<key_code_string>			
Response	TE2	←	MT2	(OK ERROR)			
Keycode	0~9		*	#	S	E	C
Means	Number		*	#	SEND	END	CLEAR



10.1.1.18. Microphone mute (AT\$\$VOICEOUT)

This command can be used for muting the microphone during a voice call.

Table 10-70 Read command

Command	TE2	→	MT2	\$\$VOICEOUT?
Response	TE2	←	MT2	\$\$VOICEOUT: <value>
Value	1: Mute 0: Resume/Open			

Table 10-71 Set command

Command	TE2	→	MT2	\$\$VOICEOUT=<value>
Response	TE2	←	MT2	\$\$VOICEOUT:1 0 (Success Failure)

11. HEADSET FUNCTIONALITY

The EAR-MIC key built into the cord of the Maxon headset operates as follows:

Table 11-72

Action	State	Function
Key Press	Incoming Call	Answers voice call
	In-call	Terminates voice call
	Idle	Displays: Redial: <telephone_number> and MT2 dials this number. <u>NOTE: if not in Idle mode then MT2 displays ERROR</u>

12. DATA CALL SET-UP

The following tables describe MO data call procedures.

12.1.1.1. CRM Values (AT+CRM)

This command enables user to select circuit switched or packet switched data options.

Table 12.73 Read Command

Command	TE2	→	MT2	+CRM?
Response	TE2	←	MT2	+CRM<value>
Values	AT+CRM=0			Async (Circuit Switched Data) (Default) Telstra Network
	AT+CRM=1			Packet (Packet Switched Data) Relay Layer Rm interface
	AT+CRM=2			Packet (Packet Switched Data) Network Layer Rm interface, PPP
	AT+CRM=129			PIWF (Proxy Inter-Working Function) SO 8003, Qualcomm proposed data service (9.6kbps)
	AT+CRM=131			Single Stack QNC Data (Circuit Switched QNC) (IS95A) Telstra Network
	AT+CRM=135			MDR
	AT+CRM=150			High Speed Packet Data(HSPD) (1xRTT) Telstra Network

Call released (Uses DTR pin)

Table 12.74 Notification command

Notify	TE2	←	MT2	NO CARRIER
--------	-----	---	-----	------------

13. VOICE/DATA AT COMMAND EXAMPLES

13.1. Voice Calls

The following describe voice call syntax procedures.

13.1.1.1. MT voice call

Table 13.75

Notify	TE2	←	MT2	Wake up Signal
Notify	TE2	←	MT2	\$\$CNI: Caller ID (on CNIP service)
Command	TE2	→	MT2	AT\$QCCAV
Notify	TE2	←	MT2	\$\$VOICECONNECT
Call State				
Command	TE2	→	MT2	AT+CHV
Notify	TE2	←	MT2	\$\$VOICERELLEASE
Response	TE2	←	MT2	<result_code> (OK ERROR)

13.1.1.2. MO voice call

Table 13.76

Command	TE2	→	MT2	AT+CDV<dial number>
Response	TE2	←	MT2	<result_code> (OK ERROR)
Notify	TE2	←	MT2	\$\$VOICECONNECT
Call State				
Command	TE2	→	MT2	AT+CHV
Notify	TE2	←	MT2	\$\$VOICERELLEASE
Response	TE2	←	MT2	<result_code> (OK ERROR)

13.2. Data Calls

13.2.1.1. MO data call

Table 13.77

Command	TE2	→	MT2	AT+CRM=<value> (Set CRM Value for this call)
Command	TE2	→	MT2	ATD<phone_number>
Notify	TE2	←	MT2	CONNECT (Data call connected) NO CARRIER (Data call failure)
Value	phone_number: for Packet/Circuit Switched QNC Data: #777 (Australia – requires authentication) for Circuit Switched Data: ISP modem phone number or other			

13.2.1.2. MT Data Call

Notify	TE2	←	MT2	AT: RING Buzzer: Audible (excepting where \$\$RCV_MODE is 1) RI/RX LED: ON for duration of ring and when MT data call in progress. Operation is as RX LED otherwise.
Command	TE2	→	MT2	ATA (answer data call)
Notify	TE2	←	MT2	CONNECT (Data call connected) NO CARRIER (Data call failure)
Call State				
Command	TE2	→	MT2	+++ (escape command to go to off-line command state) ATH (release call)
Notify	TE2	←	MT2	NO CARRIER

14. SMS DETAIL

Besides MO & MT SMS support, the MM-5100 is able to store 30 MT SMS (received) messages [including voice mail where network permits], and last 10 sent MO SMS (sent) messages.

14.1. SMS Auto Voltage Alert

Maxon have integrated advanced technology within MT2 for the MT2 to automatically initiate an SMS, to alert the user to voltage attaining a user defined level.

This section provides detail that allows the user to set an input voltage value that when reached will prompt MT2 to automatically send an SMS to a user-defined mobile phone number.

14.1.1.1. SMS \$\$LOWBATT 1 set point (AT\$\$LOWBATT_VTG)

This command also sets the MT2 to TE2 \$\$LOWBATT 1 notification value.

[Click here to go to \\$\\$LOWBATT.](#)

Table 14-78 Read command

Command	TE2	→	MT2	\$\$LOWBATT_VTG?
Response	TE2	←	MT2	\$\$LOWBATT_VTG: <value>
Value1	<p>610: (Default) xxxx: User definable 4 digit number representing voltage to 2 decimal points x100 (ie 12.8 volts would be represented as 1280, 9 volts would be 0900) Value range is from 0610 to 3600. NOTE: If the first digit entered is a zero it is ignored in the response.</p>			

Table 14-79 Set command

Command	TE2	→	MT2	\$\$LOWBATT_VTG=<value1>
Response	TE2	←	MT2	<result_code> (OK ERROR)

14.1.1.2. SMS \$\$LOWBATT 1 set recipient number (AT\$\$AUTO_SMS)

Table 14-80 Read command

Command	TE2	→	MT2	\$\$AUTO_SMS?
Response	TE2	←	MT2	\$\$AUTO_SMS: <value>
Value	<p><blank>: (Default) – no number set xxxxxxxxxxxx: Mobile phone number</p>			

Table 14-81 Set command

Command	TE2	→	MT2	\$\$AUTO_SMS=<value>
Response	TE2	←	MT2	\$\$AUTO_SMS: <value> <result_code> (OK ERROR)



14.1.1.3. SMS \$\$LOWBATT 1 set site name (AT\$\$SITE_NAME)

Table 14-82 Read command

Command	TE2	→	MT2	\$\$SITE_NAME?
Response	TE2	←	MT2	\$\$SITE_NAME: <value>
Value	<p><blank>: Default – no site name set</p> <p><text>: Site name for this modem as entered using the set command</p>			

Table 14-83 Set command

Command	TE2	→	MT2	\$\$SITE_NAME=<value>
Response	TE2	←	MT2	\$\$SITE_NAME: <value> <result_code> (OK or ERROR)

NOTE: When the power supply to MT2 reaches 6.5 volts the modem will power up and send a \$\$LOWBATT 1 notification to TE2. It does not send SMS alert at this time. SMS alert is automatically reinstated once the voltage exceeds the \$\$LOWBATT 1 set point PLUS 10% as seen by the modem.

14.2. SMS Remote Report Requests

Maxon have integrated advanced technology within MT2 for the MT2 to automatically reply by SMS, to SMS interrogation for specific operating information.

This reporting system will enhance the ability of the user to remotely interrogate important operating features via SMS.

An SMS is sent to a specific MM-5100 identified by its directory number. The MT2 automatically replies to the SMS request originator with specific requested detail.

For further details on the values associated with the specific commands see reference within this manual.

14.2.1.1. Read ALL request

This command incorporates the VBATT, RSSI, LOCATION & SWVER SMS automated response request in one command.

Table 14-84 Read Command

Command from SMS phone	<p>Enter directory number of specific MT2</p> <p>Enter message “maxon.all” (not case sensitive)</p> <p>Send message</p>
Response from MT2	<directory_number><report><time_date_stamp><site_name>
Value	<p>directory_number: phone number of remote MT2</p> <p>report: lists reports of VBATT, RSSI, LOCATION & SWVER</p> <p>time_date_stamp: hour day month,</p> <p>site_name: the name user has entered at \$\$SITE_NAME command under “SMS \$\$LOWBATT 1 set site name” section</p>

‘Site name’ is only applicable to this ‘maxon.all’ request and not the individual requests that follow.



14.2.1.2. VBATT request

Read supply voltage at remote MT2.

Table 14-85 Read command

Command from SMS phone	Enter directory number of specific MT2 Enter message “maxon.vbatt” (not case sensitive) Send message
Response from MT2	<directory_number> VBATT: <time_date_stamp>
Value	directory_number: phone number of remote MT2 time_date_stamp: hour day month

14.2.1.3. RSSI request

Read RSSI at remote MT2.

Table 14-86 Read command

Command from SMS phone	Enter directory number of specific MT2 Enter message “maxon.rssi” (not case sensitive) Send message
Response from MT2	<directory_number> RSSI: <time_date_stamp>
Value	directory_number: phone number of remote MT2 time_date_stamp: hour day month

14.2.1.4. LOCATION request

Read location information based on arguments between MT2 and Network.

Table 14-87 Read command

Command from SMS phone	Enter directory number of specific MT2 Enter message “maxon.location” (not case sensitive) Send message
Response from MT2	<directory_number> LOCATION: <time_date_stamp>
Value	directory_number: phone number of remote MT2 time_date_stamp: hour day month

14.2.1.5. SWVER request

Request Software Version information from the remote MT2.

Table 14-88 Read command

Command from SMS phone	Enter directory number of specific MT2 Enter message “maxon.swver” (not case sensitive) Send message
Response from MT2	<directory_number> SWVER: <see \$\$SWVER>.<time_date_stamp>
Value	directory_number: phone number of remote MT2 time_date_stamp: hour day month

14.3. SMS Processing Options

14.3.1.1. SMS MT alert Option (AT\$\$SMSNOTIF)

This command is used for selecting alert option when MT2 receives an SMS message.

Table 14-89 Read command

Command	TE2	→	MT2	\$\$SMSNOTIF?
Response	TE2	←	MT2	\$\$SMSNOTIF: <value>
Value	0: No notification 1: Notify one time(Default) 2: Notify every 2 minutes			

Table 14-90 Set command

Command	TE2	→	MT2	\$\$SMSNOTIF=<value>
Response	TE2	←	MT2	<result_code> (OK ERROR)

14.4. SMS & Voice Mail Notification

14.4.1.1. Telstra SMS notification command (SMSOPT is 2)

Table 14-91

Notify	TE2	←	MT2	Received SMS: <time stamp> <orig_number>: Originating number <call_back>: Callback number <user_data>: Message
---------------	------------	----------	------------	---

14.4.1.2. Voice Mail notification command

Table 14-92

Notify	TE2	←	MT2	\$\$VOICEMAIL:<n> <n>: the number of the voice mail
---------------	------------	----------	------------	---

14.5. SMS & Voice Mail Access

14.5.1.1. Review the number of stored MT SMS messages (AT\$\$MTCNT)

This command is used for determining how many messages MT2 has stored.

Table 14-93 Read command

Command	TE2	→	MT2	\$\$MTCNT?
Response	TE2	←	MT2	\$\$MTCNT: rcvmsgcount, unreadmsgcount
Value	rcvmsgcount: total received SMS message count unreadmsgcount: unread SMS message count (new messages)			

14.5.1.2. Reading a MT message (AT\$\$READMT)

This command is used for reading received SMS messages stored in MT2. MT2 stores SMS messages from 0 to xx in sequence of receipt.

Table 14-94 Read command

Command	TE2	→	MT2	\$\$READMT=<rcvmsgnumber> rcvmsgnumber: 0 is the most recent one.
Response	TE2	←	MT2	\$\$READMT: *)rcvmsgnumber, rcvtime, [callbacknumber], TI, voice_count, msg
Value	(*): means urgent(or emergency) priority if specified. rcvmsgnumber: message number rcvtime: time stamp(yyyymmddHHMMSS) 14 bytes. callbacknumber: call back number(optional) TI: Teleservice Identifier voice_count: the number of voice mail msg: user data			

14.5.1.3. Reading all MT messages (AT\$\$READALLMT)

This command enables user to read all MT messages [including voicemail where network supported].

Table 14-95 Read command

Command	TE2	→	MT2	\$\$READALLMT
Response	TE2	←	MT2	\$\$READALLMT: (*)rcvmsgnumber,rcvtime,[callbacknumber],TI,msg
Description	(*): means urgent(or emergency) priority if specified rcvmsgnumber: MT message number (0 means the latest one) rcvtime: Time stamp callbacknumber: the callback number TI: Teleservice Identifier (Paging (4097),Text (4098), Voice (4099)) msg: User data (Only Text message)			

14.5.1.4. Reading MO messages count (AT\$\$MOCNT)

This command is used for checking how many MO messages are stored in MT2.

Table 14-96 Read command

Command	TE2	→	MT2	\$\$MOCNT
Response	TE2	←	MT2	\$\$MOCNT: n
Value	n: number indicating stored sent messages (MO)			

14.5.1.5. Reading all MO SMS messages (AT\$\$READALLMO)

This command enables user to read all MO SMS messages in the outgoing buffer.

Table 14-97 Read command

Command	TE2	→	MT2	\$\$READALLMO
Response	TE2	←	MT2	\$\$READALLMO:orignumber, receiver_number,msg
Value	orignumber: MO SMS message number (0 means the most recent one) receiver_number: Receiver number msg: User Data			

14.5.1.6. Reading MT voice mail count (AT\$VMCNT)

This command enables user to check the number of stored voicemails.

Table 14-98 Read command

Command	TE2	→	MT2	\$VMCNT
Response	TE2	←	MT2	\$VMCNT: <value>
Value	n: number indicating stored received voice mails. (MT)			

14.6. SMS MO Syntax Options

14.6.1.1. Telstra SMS MO (AT+MMC)

This section covers MT2 syntax requirements and options for MO SMS on the Telstra network.

Table 14-99 Execute command

Command	TE2	→	MT2	+MMCSMSMO<rcv_number><call_back><msg><CR>
Description	: space <rcv_number>: Recipient number <call_back>: Callback number (optional) <msg>: Message, each byte of msg has to have the code larger than 0x1F, so it will be available with 0x20			
Response	TE2	←	MT2	Before sending: +MMC SMSMO OK
Value	After sending: SENDING SUCCESS!: The SMS has been sent SENDING FAIL!: Sending the SMS has failed			

14.6.2. SMS Call Back Number & syntax options

14.6.2.1. Alternative Call Back Number – User Programmed – Automatic Inclusion

This command is used to store an alternative callback number from the MT2 mobile phone number, for automatic inclusion in outgoing SMS messages where required.

Table 14-100 Read command

Command	TE2	→	MT2	AT\$\$\$CALLBACK_NUM?
Response	TE2	←	MT2	\$\$\$CALLBACK_NUM: <callback_number>
Value	<callback_number>: alternative mobile phone number 0 or blank: no callback number programmed			

Table 14-101 Set command

Command	TE2	→	MT2	AT\$\$\$CALLBACK_NUM=<callback_number>
Response	TE2	←	MT2	\$\$\$CALLBACK_NUM: <callback_number> <result_code> (OK ERROR)

14.6.2.2. Modem automatically inserts AT\$\$\$CALLBACK_NUM

Table 14-102 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO<recipient_mob_num>><text_message><CR>
----------------	------------	----------	------------	---

14.6.2.3. User manually inserts an alternative call back number

Table 14-103 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO<recipient_mob_num>><manual_callback_num><text_message><CR>
----------------	------------	----------	------------	--

14.6.2.4. No alternative call back number is required

In this syntax the modem will automatically insert its own mobile phone number into the SMS header and any callback will be to that number.

The character after SMSMO is a 'zero'

Table 14-104 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO0<recipient_mob_num>1<text_message><CR>
----------------	------------	----------	------------	--

14.6.2.5. Auto reply: Auto Recipient, Auto Callback Number

The auto reply feature only functions through the last SMS received.

The modem automatically inserts the recipient number and alternative callback number.

Table 14-105 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO<text_message><CR>
----------------	------------	----------	------------	--

14.6.2.6. Auto reply: Auto Recipient, Manual Callback Number

User manually inserts a specific callback number.

Table 14-106 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO<manual_callback_number>MESSAGE<CR>
----------------	------------	----------	------------	--

14.6.2.7. Auto reply: Auto Recipient

MT2 will automatically insert its own mobile phone number into the SMS header and any callback will be to that number.

Table 14-107 Execute command

Command	TE2	→	MT2	AT+MMCSMSMO<text_message><CR>
----------------	------------	----------	------------	---

14.6.3. SMS Character and CR-LF Options

If the communication message between the MT2 and the TE2 includes characters such as comma(,) used for delimiter of ASCII command and CR-LF, the message should be changed by octet stuffing using the following escape sequence.

The octet stuffing rule should also be applied to Message parameters of \$\$MOREQ and \$\$EMMOREG commands.

Where SMSOPT is 2

When the transmit message between TE2 and MT2 includes the following codes, the code will be changed.(TE2 ← → MT2)

Table 14-108

Originate code	Changed code
0x01	0x1B, 0x41: (0x01+ 0x40)
~	~
0x1F	0x1B, 0x5F: (0x1F + 0x40)

When the received message includes the following codes, the code will be changed. (TE2 ↔ MT2)

Table 14-109

Received code	Changed code
0x1B, 0x41	0x01
~	~
0x1B, 0x5F	0x1F

14.7. SMS & Voice Mail Storage & Maintenance

14.7.1.1. Deleting a MT (received) message (AT\$\$DELMT)

This command enables user to delete a specific message stored in MT2. Once deleted the next sequential remaining message fills the same message number.

Table 14-110 Execute command

Command	TE2	→	MT2	\$\$DELMT=<rcvmsgnumber>
Response	TE2	←	MT2	\$\$DELMT: <rcvmsgnumber> (Success) \$\$DELMT: 255 (Failure)

14.7.1.2. Delete all MT messages (AT\$\$DELALLMT)

This command enables user to delete all messages stored in MT2.

Table 14-111 Execute command

Command	TE2	→	MT2	\$\$DELALLMT
Response	TE2	←	MT2	\$\$DELALLMT:1 0 (Success Failure)

14.7.1.3. Deleting a MO message (AT\$\$DELMO)

This command is used for deleting a specific MO (sent) message stored in MT2.

Table 14-112 Execute command

Command	TE2	→	MT2	\$\$DELMO=<orimsgnumber>
Response	TE2	←	MT2	\$\$DELMO:orimsgnumber (Success) \$\$DELMO:255 (Failure)

14.7.1.4. Deleting all MO messages (AT\$\$DELALLMO)

This command is used for deleting all MO messages stored in MT2.

Table 14-113 Execute command

Command	TE2	→	MT2	\$\$DELALLMO
Response	TE2	←	MT2	\$\$DELALLMO:1 0 (Success Failure)

14.7.1.5. Delete Voice mail (AT\$\$DELVM)

This command enables user to delete the voicemails stored in MT2. Even though it's deleted from MT2, the carrier's SMS centre still has the voicemails.

Table 14-114 Execute command

Command	TE2	→	MT2	\$\$DELVM
Response	TE2	←	MT2	\$\$DELVM: 1 0 (Success Failure)

15. NVM vs. USER PROFILE STORAGE

The following table indicates for each command listed, where it is saved.

X: Not Supported

O: Supported

Table 15.115

No.	Command	NV	User Profile	Remarks
1	\$\$ANTSET	X	X	
2	\$\$AUTO_SMS	O	X	
3	\$\$AUTOANS	O	X	
4	\$\$CALLBACK_NUM	O	X	
5	\$\$CONNECTTONE	O	X	
6	\$\$EARLVL	O	X	
7	\$\$EMMOREG	O	X	
8	\$\$ENDTONE	O	X	
9	\$\$EXT_LED	X	O	
10	\$\$LOWBATT_VTG	O	X	
11	\$\$NOTIFCNT	O	X	
12	\$\$PHONEN	O	X	
13	\$\$RCVMODE	O	X	
14	\$\$RECEIVERRESTRICTION	O	X	
15	\$\$RESET	O	X	
16	\$\$RFINFO	X	X	
17	\$\$RINGIDX	O	X	
18	\$\$RINGLVL	O	X	
19	\$\$RS232_PWRDOWN	O	X	
20	\$\$SMSNOTIF	O	X	
21	\$\$VOICEOUT	X	X	
22	&Fn	O	O	
23	+IPR	O	O	

16. TIA/EIA/IS-707A AT COMMAND SET

16.1.1. User modified profiles & NVM changes

16.1.1.1. User Profile store (AT&Wn)

This command is used for saving the current operating profile as a User Profile.

Table 16.116 Set command

Command	TE2	→	MT2	&W<value>
Response	TE2	←	MT2	(OK ERROR)
Value	1~5 User Profiles slots available. 0 is Factory Default and is unavailable			

16.1.1.2. User Profile recall (AT&Fn)

This command is used for confirming or recalling the User Profile. At each power up of modem or &Fn command the profile set by &Fn is loaded into the working area of Memory.

If user has not saved a profile to &Fn an attempt to load that profile using &Fn will elicit an ERROR response.

&F0 cannot be written to, using &W0 command. An attempt to write to that profile using &W0 will elicit an ERROR response.

Table 16.117 Read command

Command	TE2	→	MT2	&F?
Response	TE2	←	MT2	&F: <value>
Value	0~5 (0: Factory Default Profile)			

Table 16.118 Set command

Command	TE2	→	MT2	&F<value>
Response	TE2	←	MT2	(OK ERROR)

16.2. Basic AT Commands

The following table specifies the basic AT parameters to be supported for the CDMA data service. Exceptions to EIA/TIA-602 are indicated by square brackets. Default settings are shown in bold.

16.2.1. Basic AT Parameters

Table 16.119 Basic AT parameters

Parameter	Description	Async & Fax	Packet Data	STU-III
E0	Do not echo command set in command state or online command state.	R,M	O	N/A
E1	Echo command set in command state or online command state.	R,M	O	N/A
L0	Low speaker volume.	R,L	N/A	N/A
L1	Low speaker volume.	R,L	N/A	N/A
L2	Med speaker volume.	R,L	N/A	N/A
L3	High speaker volume.	R,L	N/A	N/A
M0	Speaker off.	R,M	N/A	N/A
M1	Speaker on until carrier reported (support of this feature is optional).	R,M	N/A	N/A
Q0	Return result codes.	R,M	R	R
Q1	Do not return result codes.	R,M	R	N/A
V0	Display result codes as numbers.	R,M	R	R
V1	Display result codes as words.	R,M	R	R
X1	Enable additional result code CONNECT <rate>. Disable dial tone and busy detection. ¹	R,M	N/A	N/A
X2	Enable additional result codes CONNECT <rate> and NO DIALTONE. Disable busy detection. Enable dial tone detection. ¹	R,M	N/A	N/A
X3	Enable additional result codes CONNECT <rate> and BUSY. Enable busy detection. Disable dial tone detection. ¹	R,M	N/A	N/A
X4	Enable additional result codes CONNECT <rate>, BUSY and NO DIALTONE. Enable busy and dial tone detection.¹	R,M	N/A	N/A
Z0	Reset to default user configuration.	R,L	R	N/A
&C0	Circuit 109 (CF) always ON.	R,L	R	N/A

Parameter	Description	Async & Fax	Packet Data	STU-III
&C1	Circuit 109 (CF) ON in accordance with the specified service.	R,L	R	N/A
&D0	Ignore circuit 108/2 (CD).	R,L	R	N/A
[&D1]	Enter online command state following ON-to-OFF transition of circuit 108/2. See service specific AT command processing for service state transitions.	R,L	R	N/A
&D2	Enter command state following On to Off transition of circuit 108/2. See service specific AT command processing for service state processing requirements.	R,L	R	N/A
T	Select tone dialling.	R,M	N/A	N/A
&FO	Set to factory-defined configuration. Effect is implementation dependent.	R,L	O	N/A

NOTE 1: For async data or fax settings, the dial tone detection settings do not apply.

Legend: R=Required, O=Optional, M=Remote AT command, L=Local AT command.

16.2.2. Basic S registers

The following table specifies the basic S registers to be supported for the CDMA data services. Exceptions to EIA/TIA-602 are indicated by square brackets. Default settings are shown in bold.

Table 16.120 Basic S-registers

Register	Value	Description	Async & Fax	Packet Data	STU-III
S0	[1 to 255] 1	Automatic answering. [Enable automatic answering after (Value: 1) x 6 seconds.] 0: Not Answer	R,L	N/A	N/A
S3	13	Carriage Return character.	R,M	O	N/A
S4	10	Line Feed character.	R,M	O	N/A
S5	8	Backspace character.	R,M	O	N/A
S6	2 to 10 2	Pause before blind dialling.	R,M	N/A	N/A
S7	1 to 255 [50]	Number of seconds to establish end-to-end data connection.	R,M	O	N/A
S8	0 to 255 2	Number of seconds to pause when “,” is encountered in dial string.	R,M	N/A	N/A

Register	Value	Description	Async & Fax	Packet Data	STU-III
[S9]	0 to 255 6	Carrier detect threshold in increments of 0.1 seconds.	R,M	N/A	N/A
S10	1 to 254 [14] [255]	Number of tenths of a second from carrier loss to disconnect. [255: Disable carrier detect.]	R,M	N/A	N/A
[S11]	50-255 95	DTMF tone duration and spacing in milliseconds.	O,M	N/A	N/A

16.2.3. Basic action command set

The following table specifies the Basic action command set to be supported for the CDMA data services. Exceptions to EIA/TIA-602 are indicated by square brackets. Default settings are shown in bold.

Table 16.121 Basic action commands

Command	Description
A/	Re-execute previous command.
A	Enter the online state. See service specific processing for further details.
D<dial string>	<p>Causes the MT2 to transition from the command state to the online state. The <dial string> is optional. For circuit switched data services, the dial string may contain the following characters: Digits 0 to 9, *, #, A, B, C, and D.</p> <p>The dial string may contain the following dial modifiers:</p> <ul style="list-style-type: none"> T Tone dialling [ignore] P Pulse dialling [ignore] , Pause during dialling W Wait for dial tone @ Wait for quiet answer ! Hook flash [\$] Wait for billing tone (for credit-card calls) ; After dialling, the IWF enters the online command state and maintains the connection
H0	Causes the MT2 to transition from online command state to command state. Use of the digit '0' is optional (see EIA/TIA-602).
00	Causes the MT2 to transition from online command state to online state. Use of the digit '0' is optional (see EIA/TIA-602).

16.2.4. Basic result codes

The following table specifies the Basic Result Codes to be supported for the CDMA data services. Exceptions to EIA/TIA-602 are indicated by square brackets. Default settings are shown in bold.

The ERROR result code shall be returned for all command sets which do not comply with the syntax rules of 5.1 of EIA/TIA-615, or Section 5 of EIA/TIA-602.

Table 16.122 Basic result codes

Numeric	Verbal	Description	Async & Fax	Packet Data	STUIII
0	OK	Command executed.	R	R	R
1	CONNECT	Entering online state.	R	R	R
2	RING	Alerting signal received from network.	R	N/A	N/A
3	NO CARRIER	Unable to activate the service.	R	R	N/A
4	ERROR	Command not recognized or could not be executed.	R	R	R
6	NO DIALTONE	No dial tone detected within time-out period.	R	N/A	N/A
7	BUSY	Reorder (Busy signal) received.	R	R	N/A
8	NO ANSWER	Five seconds of silence not detected after ring back when @ dial modifier is used.	R	N/A	N/A

16.3. Extended AT Command Sets

16.3.1. Extended AT configuration command set

Table 16.123 Extended AT configuration command set

Command	Value per	Description	Async & Fax	Packet Data
+DR	IS-131	Data Compression Reporting. This extended-format numeric parameter controls whether or not the extended-format "+DR:" intermediate result code is transmitted from the IWF over the Um interface. 0: Off (Default) 1: On	R,M	O
+DS	IS-131	Data Compression. This extended-format compound parameter controls the V.42bis data compression function on the PSTN link (if provided in the IWF). 3,0,2048,6 (Default)	R,M	O

Command	Value per	Description	Async & Fax	Packet Data
+EB	IS-131	<p>Break Handling in Error Control Operation. This extended-format compound parameter is used to control the manner of V.42 operation on the PSTN link (if present in the IWF).</p> <p>+EB=<b_s>,<t>,<d_l></p> <p>Where <break_selection>, specifies the type of break to be signalled to the remote DCE upon detecting a break from the local DTE</p> <p>0: Ignore break (do not signal to remote DCE)</p> <p>1: Non-expedited, non-destructive</p> <p>2: Expedited, non-destructive</p> <p>3: Expedited and destructive</p> <p>Where <timed>, specifies if the break signal to be signalled to the remote DCE is timed or not.</p> <p>0: Any transmitted V.42 L-SIGNAL shall not indicate break signal length</p> <p>1: Any transmitted V.42 L-SIGNAL shall indicate break signal length</p> <p>Where <default_length>, specifies the amount of time in tens of milliseconds that a break should be signaled to the local DTE when an indication of break is received from the remote DCE without a break length explicitly indicated.</p> <p>0: Do not deliver break to DTE</p> <p>1 – 254: Break length of 0.01 to 2.54 seconds.</p> <p>Default is 30</p> <p>1,0,30 (Default)</p>	R,M	O
+EFCS	IS-131	<p>This extended-format numeric parameter controls the use of the 32-bit frame check sequence option in V.42 on the PSTN link (if present in the IWF)</p> <p>0: Use 16-bit FCS</p> <p>1: Use 32-bit FCS if available in remote DCE; otherwise use 16-bit FCS (Default)</p> <p>2: Use 32-bit FCS if available in remote DCE; otherwise disconnect</p>	R,M	N/A

Command	Value per	Description	Async & Fax	Packet Data
+ER	IS-131	<p>Error Control Reporting. This extended-format numeric parameter controls whether or not the extended-format "+ER:" intermediate result code is transmitted from the IWF over the Um interface.</p> <p>0: Disabled (Default) 1: Enabled</p>	R,M	O

Command	Value per	Description	Async & Fax	Packet Data
+ES	IS-131	<p>Error Control Selection. This extended-format compound parameter is used to control the manner of operation of the V.42 protocol on the PSTN link (if present in the IWF).</p> <p>+ES <orig_rqst>,<orig_fbk>,<ans_fbk></p> <p>Where <orig_rqst>, specifies the initial requested mode of operation when the DCE is operating as the originator</p> <p>Where <orig_fbk>, specifies the acceptable fallback mode of operation when the DCE is operating as the originator</p> <p>0: Error control optional; if error control not established, maintain DTE-DCE data rate and use Buffered mode with flow control during non-error control operation</p> <p>1: Error control optional; if error control not established, change DTE-DCE data rate to match line rate and use Direct mode</p> <p>2: Error control required; if error control not established, disconnect</p> <p>3: Error control required; if error control not established, disconnect</p> <p>4: Error control required; if error control not established, disconnect</p> <p>Where <ans_fbk>, specifies the acceptable fallback mode of operation when the DCE is operating as the answerer.</p> <p>0: Direct mode</p> <p>1: Error control disabled, use Buffered mode</p> <p>2: Error control optional; if error control not established, maintain DTE-DCE data rate and use local buffering and flow control during non-error control operation</p> <p>3: Error control optional; if error control not established, change DTE-DCE data rate to match line rate and use Direct mode</p> <p>4: Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect</p> <p>5: Error control required (only LAPM acceptable); if error control not established, disconnect</p> <p>3,0,2 (Default)</p>	R,M	N/A

Command	Value per	Description	Async & Fax	Packet Data
+ESR	IS-131	<p>This extended-format numeric parameter controls the use of the selective repeat (SREJ) option in V.42 on the PSTN link (if present in the IWF).</p> <p>0: Do not use SREJ</p> <p>1: Use SREJ if available in remote DCE; continue without it if not(Default)</p> <p>2: Use SREJ FCS if available in remote DCE; disconnect if SREJ is not available</p>	R,M	N/A

Command	Value per	Description	Async & Fax	Packet Data
+ETBM	IS-131	<p>This extended-format compound parameter controls the handling of data remaining in IWF buffers upon service termination.</p> <p>This extended-format compound parameter controls the handling of data remaining in IWF buffers upon service termination.</p> <p>+ETBM <pending_TD>,<pending_RD>,<timer></p> <p>Where <pending_TD>, controls how previously-transmitted data remaining in the IWF buffers should be handled when the local DTE requests disconnection of the call</p> <p>0: Discard all buffered data immediately and disconnect</p> <p>1: Attempt until all data is delivered and acknowledged (ignore timer); if remote DCE disconnects, discard remainder</p> <p>2: Attempt until all data is delivered and acknowledged; if timer expires or remote DCE disconnects, discard remainder</p> <p>Where <pending_RD>, controls how previously-received data remaining in the IWF buffers should be handled when the remote DCE disconnects the call</p> <p>0: Discard all buffered data immediately and disconnect</p> <p>1: Attempt until all data is delivered (ignore timer); if local DTE requests disconnect, discard remainder</p> <p>2: Attempt until all data is delivered; if timer expires or local DTE requests disconnect, discard remainder</p> <p>Where <timer>, sets a maximum time limit on how long the IWF will attempt to deliver the buffered data before abandoning the attempt and discarding remaining data.</p> <p>0 to 30. Delivery timer value in seconds. Default is 20.</p> <p>Circuit 109 is held in the ON condition until all pending data is delivered or discarded.</p> <p>1,1,20 (Default)</p>	R,M	O

Command	Value per	Description	Async & Fax	Packet Data
+GCAP	IS-131	<p>This extended-format command causes the MT2 to transmit one or more lines of information text in a specific format. The content is a list of additional capabilities command +<name>s, which is intended to permit the user of the MT2 to identify the minimum capabilities of the MT2.</p> <p>An MT2 conforming to this standard shall include the following items, as a minimum, in the result code for the +GCAP command:</p> <p>+CIS707, +MS, +ES, +DS, +FCLASS (Default)</p>	R,L	O
+GMI	IS-131	<p>This command causes the MT2 to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the MT2 to identify the manufacturer. Typically, the text will consist of a single line containing the name of the manufacturer, but manufacturers may choose to provide more information if desired (e.g., address, telephone number for customer service, etc.).</p> <p>Maxon Electronics Australia Pty. Ltd.</p>	R,L	O
+GMM	IS-131	<p>This command causes the MT2 to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the MT2 to identify the specific model of the device. Typically, the text will consist of a single line containing the name of the product, but manufacturers may choose to provide any information desired.</p> <p>Model MM-5100 (Default)</p>	R,L	O
+GMR	IS-131	<p>This command causes the MT2 to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the MT2 to identify the version, revision level or date, or other pertinent information of the device. Typically, the text will consist of a single line containing the version of the product, but manufacturers may choose to provide any information desired.</p> <p>S/W VER: C80ts104, QUALCOMM S/W VER: ND2.1.754PAT (Default)</p>	R,L	O

Command	Value per	Description	Async & Fax	Packet Data
+GOI	IS-131	<p>This command causes the MT2 to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the MT2 to identify the device, based on the ISO system for registering unique object identifiers. Typically, the text will consist of a single line containing numeric strings delimited by period characters.</p> <p>(empty) (Default)</p>	R.L	O
+GSN	IS-131	<p>This command causes the MT2 to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the MT2 to identify the individual device. Typically, the text will consist of a single line containing a manufacturer determined alpha-numeric string, but manufacturers may choose to provide any information desired.</p>	R.L	O

Command	Value per	Description	Async & Fax	Packet Data
+ICF	IS-131	<p>TE2-MT2 Character Framing. This extended-format compound parameter is used to determine the local serial port start-stop (asynchronous) character framing that the MT2 shall use while accepting TE2 command set and while transmitting information text and result codes to the TE2, if this is not automatically determined (see +IPR).</p> <p><format> valid numeric values</p> <p>0 auto detect [NOT SUPPORTED]</p> <p>1 8Data 2Stop</p> <p>2 8Data 1Parity 1Stop</p> <p>3 8Data 1Stop (Default)</p> <p>4 7Data 2Stop</p> <p>5 7Data 1Parity 1Stop</p> <p>6 7Data 1Stop</p> <hr/> <p><parity> defined numeric values</p> <p>0 odd</p> <p>1 even</p> <p>2 Mark [NOT SUPPORTED]</p> <p>3 space (Default)</p> <p>+ICF? Shows current settings</p> <p>+ICF=? Shows supported range</p> <p>+ICF=<format_value,parity_value> sets value</p>	R.L	R

Command	Value per	Description	Async & Fax	Packet Data
+IFC	IS-131	<p>TE2-MT2 Local Flow Control. This extended-format compound parameter is used to control the operation of local flow control between the TE2 and MT2 [1].</p> <p><c_by_t> Description</p> <p>0 None</p> <p>1 Xon/Xoff local DC1/DC3 on circuit 103; do not pass DC1/DC3 characters to the remote DCE.</p> <p>2 Circuit 133 (Ready for Receiving) (Default)</p> <p>3 Xon/Xoff global DC1/DC3 on circuit 103 with DC1/DC3 characters being passed through to the remote DCE in addition to being acted upon for local flow control</p>	R.L	R
		<hr/> <p><t_by_c> Description</p> <p>0 None</p> <p>1 Xon/Xoff local DC1/DC3 on circuit 104</p> <p>2 Circuit 106 (Clear to Send/Ready for Sending) (Default)</p> <p><c_by_t>: specifies the method to be used by the DTE to control the flow of received data from the DCE;</p> <p><t_by_c>: specifies the method to be used by the DCE to control the flow of transmitted data from the DTE.</p> <p>AT+IFC=<[[c_by_t]DCE_DTE]>,<[[t_by_c]DTE_DCE]></p> <p>+IFC? Shows current settings</p> <p>+IFC=? Shows supported range</p> <p>+IFC=<c_by_t,t_by_c> sets value</p>		

Command	Value per	Description	Async & Fax	Packet Data
+IPR	IS-131	<p>Fixed Rm Rate. This numeric extended-format parameter specifies the data rate at which the MT2 will accept command set, in addition to 1200 bit/s or 9600 bit/s (as required in EIA/TIA-602). It may be used to select operation at rates at which the MT2 is not capable of automatically detecting the data rate being used by the TE2.</p> <p>115200bps. (Default)</p> <p>'0' is 'auto baud' up to 19200bps.</p> <p>+IPR? Displays current set value.</p> <p>+IPR=? Displays range of (supported autodetectable rates), (list of supported fixed-only rates). e.g. +IPR: (0, 1200, 2400, 4800, 9600, 19200), (45, 50, 75, 110, 150, 300, 600, 38400, 57600, 115200, 230400)</p> <p>+IPR=<value> Set value</p>	R.L	R
+MA	IS-131	<p>Modulation Automode Control. This extended-format compound parameter is a list of modulations that the base station may use to connect with the remote DCE in Automode operation, for answering or originating data calls, as additional alternatives to the modulation specified in the +MS command.</p> <p>(empty) (Default)</p> <p>Range: Blank, 0 - 6</p>	R.M	N/A
+MR	IS-131	<p>Modulation Reporting Control. This extended-format numeric parameter controls whether or not the extended-format +MCR:<carrier> and +MRR:<rate> intermediate result codes are transmitted from the IWF to the mobile station.</p> <p>0: Disables reporting of modulation connection (+MCR: and + MRR: are not transmitted) (Default)</p> <p>1: Enables reporting of modulation connection (+MCR: and + MRR: are transmitted)</p>	R.M	N/A
+MS	IS-131	<p>Modulation Selection. This extended-format compound parameter is used to control the manner of operation of the modulation capabilities in the IWF.</p>	R.M	N/A

Command	Value per	Description	Async & Fax	Packet Data
+MV18R	IS-131	V.18 Reporting Control. This extended-format numeric parameter controls whether or not the extended-format "+MV18R:" result code is transmitted from the IWF to the mobile station. O: (Default) 1:	O,M	N/A
+MV18S	IS-131	V.18 Selection. This extended-format compound parameter is used to control the manner of operation of the V.18 capabilities (if present in the IWF). 0,0,0	O,M	N/A
<p><u>NOTE 1. TIA/EIA/IS-131 states that this command only applies when V.42 error control is being used, or when fallback to non-error control mode is specified to include buffering and flow control. In this standard this command applies independently of the use and setting of V.42. If V.42 is not used or not configured appropriately data loss may occur.</u></p>				

17. FACSIMILE SERVICE CLASS 2.0 AT COMMAND SET

17.1.1. Facsimile service Class 2.0 parameters

Table 17.124 Fax service Class 2.0 parameters

Parameter	Value per	Description	Type
+FAA	EIA/TIA-592	Adaptive-answer parameter (see +FCLASS)	Remote
+FAP	TIA/EIA/IS-134	Addressing and polling capabilities parameter	Remote
+FBO	EIA/TIA-592	Phase-C data-bit-order parameter	Remote
+FBS	EIA/TIA-592	Buffer size parameter (read-only)	Local
+FBU	EIA/TIA-592	HDLC-frame-reporting parameter	Remote
+FCC VR [BR]	EIA/TIA-592	DCE-capabilities parameters Vertical-resolution subparameter Bit-rate subparameter	Remote
	0	• 2400 bits/s	
	1	• 4800 bits/s	
	2	• 7200 bits/s	
	31	• 9600 bits/s	
WD	EIA/TIA-592	Page-width subparameter	
[LN]	EIA/TIA-5922	Page-length subparameter	
[DF]	EIA/TIA-5922	Data-compression-format subparameter	
[EC]	EIA/TIA-5922	Error-correction subparameter	
BF	EIA/TIA-592	Binary-file-transfer subparameter	
ST	EIA/TIA-592	Scan-time-per-line subparameter	
[+FCLASS]	0 1 2.03	Service-class selection parameter • Class-0 • [Class-1 support unavailable] • Class-2.0 fax service (EIA/TIA-592)	Remote
+FCQ	EIA/TIA-592	Copy-quality-checking parameter	Remote
[+FCR]	EIA/TIA-5922	Capability-to-receive parameter	Remote
+FCS	EIA/TIA-592	Current-session results parameters	Remote
+FCT	EIA/TIA-592	DTE Phase-C timeout parameter	Remote
+FEA	EIA/TIA-592	Phase-C received EOL-alignment parameter	Remote
+FFC	EIA/TIA-592	Format-conversion parameter	Remote
+FHS	EIA/TIA-592	Call-termination-status parameter	Remote

Parameter	Value per	Description	Type
+FIE	EIA/TIA-592	Procedure-interrupt-enable parameter	Remote
+FIS	EIA/TIA-592	Current-session negotiation parameters	Remote
[+FLI]	EIA/TIA-5922	Local-ID-string parameter (TSI or CSI)	Remote
+FLO	EIA/TIA-5922	Flow-control-select parameter	Local
+FLP	EIA/TIA-592	Indicate-document-to-poll parameter	Remote
+FMI	EIA/TIA-592	Request DCE manufacturer identification	
+FMM	EIA/TIA-592	Request DCE model	
+FMR	EIA/TIA-592	Request DCE revision	
[+FMS]	EIA/TIA-5922	Minimum-Phase-C-speed parameter	Remote
+FNR	EIA/TIA-592	Negotiation-message-reporting control parameters	Remote
+FNS	EIA/TIA-592	Nonstandard-frame FIF parameter	Remote
+FPA	TIA/EIA/IS-134	Selective Polling Address Parameter	Remote
[+FPI]	EIA/TIA-5922	Local-polling-ID-string parameter	Remote
[+FPP]	EIA/TIA-5924	Packet-protocol-control parameter	Local
+FPR	EIA/TIA-592	Serial-port-rate-control parameter	Local
[+FPS]	EIA/TIA-5925	Page-status parameter	Remote
+FPW	TIA/EIA/IS-134	Password parameter (Sending or Polling)	Remote
[+FRQ]	EIA/TIA-5922	Receive-quality-threshold parameters	Remote
+FRY	EIA/TIA-592	ECM-retry-value parameter	Remote
+FSA	TIA/EIA/IS-134	Subaddress Parameter	Remote
[+FSP]	EIA/TIA-5922	Request-to-poll parameter	Remote
<p>NOTE:</p> <ol style="list-style-type: none"> 1. Use of option 3 may cause degradations in the quality of certain faxes. 2. Some values for this parameter are optional in EIA/TIA-592. In this standard, all parameters of this command shall be supported. 3. Class 2.0 represents EIA/TIA-592. 4. Support of packet protocol is optional. 5. Values 4 and 5 of this parameter are optional. 			



17.1.2. Facsimile action command set

Table 17.125 Fax action command set

Command	Description	Type
+FDR	Receive Phase-C data.	Remote
+FDT	Transmit Phase-C data.	Remote
+FIP	Initialize facsimile parameters.	Remote
+FKS	Terminate session.	Remote

18. CELLULAR EXTENDED AT COMMAND SET

AT command lines containing the command set specified start with “AT” and end with a carriage return. Default configurations appear in boldface type.

18.1.1. Cellular AT Voice services command extensions

Table 18.126 Cellular AT voice service command extensions

Command	Description	Async & Fax	Packet Data	STUIII
+CHV	Hang-up voice call	O,L	N/A	R
+CDV<dial string>	Dial command for voice calls. The format of <dial string> is identical to that for the ATD command. This command does not cause the MT2 to change to the online state.	O,L	N/A	R

18.1.2. Cellular AT parameter commands

Table 18.127 CDMA AT parameter commands

Command	Description	Async & Fax	Packet Data	STUIII
+CXT=<value>	Cellular Extension. 0: Do not pass unrecognized command set to the IWF. (Default) 1: When detecting an unrecognized AT command, open transport layer connection and pass unrecognized command to the IWF.	R,L	N/A	N/A
+CFG="<string>"	Configuration String. The string (up to and including the termination character) will be stored by the MT2 and sent to the base station prior to dialling. Each transmission of an AT+CFG command from the TE2 replaces the contents of the previous string. The string may be up to 248 characters. (empty) (Default)	R,L	N/A	N/A

Command	Description	Async & Fax	Packet Data	STUIII
+CAD?	Query Analogue or Digital Service. Returns: 0: if no service is available 1: if CDMA Digital service available 2: if TDMA Digital service available 3: if Analogue service is available (values 4-255 reserved)	O,L	O	N/A
+CDR?	Um Interface Data Compression Reporting. This extended-format numeric parameter controls whether or not the extended-format "+CDR:" intermediate result code is transmitted by the MT2. The result code is the same as for the TIA/EIA/IS-131 +DR: result code. 0: (Default) 1:	R,L	N/A	N/A
+CDS	Um Interface Data Compression. This extended-format compound parameter controls the V.42bis data compression function on the Um interface. The command format is the same as for the TIA/EIA/IS-131 +DS command. 0,1,2048,6 (Default) Range: (0-0),(1-1),(512-65535),(6-250)	R,L	N/A	N/A
+CRM=<value>	Set Rm interface protocol. 0: Asynchronous Data or Fax (Default) 1: Packet data service, Relay Layer Rm interface 2: Packet data service, Network Layer Rm interface, PPP 129: PIWF (Proxy Inter Working Function) 131: Single Stack QNC Data (Circuit Switched QNC) 135: MDR 150: High Speed Packet Data(HSPD) (3-127 Reserved for future use) (128-255 Reserved for manufacturer specific use)	R,L	R	R

Command	Description	Async & Fax	Packet Data	STUIII
+CBC?	<p>Battery Charge.</p> <p>Read-only. Returns <BCS>,<BCL></p> <p>BCS:</p> <p>0: Response to BLC will always be 0 since MT2 cannot discriminate between battery and other power supply sources.</p> <p>BCL:</p> <p>n.n: Current battery capacity in Volts</p>	R,L	O	N/A
+CQD=<value>	<p>Command State Inactivity Timer. (Where IWF supports this feature)</p> <p>0: Ignored</p> <p>1-255: Release call after 5x<value> seconds have elapsed without activity.</p> <p>The default <value> shall be 10, corresponding to 50 seconds.</p>	R,M	N/A	N/A
+CRC=<value>	<p>Cellular Result Codes (see Table 4.4.2-1).</p> <p>0: Disable Cellular Result Codes</p> <p>1: Enable Cellular Result Codes</p>	R,M	N/A	N/A
+CMIP?	<p>Mobile Station IP Address.</p> <p>Read-only. Returns the mobile station's temporary IP address.</p> <p>Responds 'OK' if no IP address assigned or not in packet supported cell</p>	R,L	N/A	N/A
+CBIP?	<p>Base Station IP Address.</p> <p>Read-only. Returns the base station's IP address.</p> <p>Responds 'OK' if not in Packet Data Cell</p>	R,L	O	N/A

Command	Description	Async & Fax	Packet Data	STUIII
+CSS?	Serving System. Read-only. Returns <AB>,<SID> AB: A: The mobile station is registered with an A-band system. B: The mobile station is registered with a B-band system. Z: The mobile station is not registered. ?: Registration unknown SID: 0-16383: The mobile station is registered with the system indicated. 99999: The mobile station is not registered.	R,L	O	N/A

Command	Description	Async & Fax	Packet Data	STUIII																																																
+CSQ?	<p>Query Received Signal Quality.</p> <p>Returns the Signal Quality Measure <SQM> and the Frame Error Rate <FER> as follows:</p> <p>Signal Quality Measure <SQM></p> <p>0-31: Signal Quality Measurement (see NOTE 1).</p> <p>Following table shows approximate conversion of CSQ reading to RSSI -dBm reading, as it applies to the MM-5100</p> <table border="1" data-bbox="491 622 751 1570"> <thead> <tr> <th>CSQ</th> <th>RSSI</th> </tr> </thead> <tbody> <tr><td>9</td><td>110</td></tr> <tr><td>10</td><td>108</td></tr> <tr><td>11</td><td>107</td></tr> <tr><td>12</td><td>105</td></tr> <tr><td>13</td><td>103</td></tr> <tr><td>14</td><td>102</td></tr> <tr><td>15</td><td>100</td></tr> <tr><td>16</td><td>99</td></tr> <tr><td>17</td><td>97</td></tr> <tr><td>18</td><td>95</td></tr> <tr><td>19</td><td>93</td></tr> <tr><td>20</td><td>92</td></tr> <tr><td>21</td><td>90</td></tr> <tr><td>22</td><td>89</td></tr> <tr><td>23</td><td>87</td></tr> <tr><td>24</td><td>85</td></tr> <tr><td>25</td><td>84</td></tr> <tr><td>26</td><td>82</td></tr> <tr><td>27</td><td>81</td></tr> <tr><td>28</td><td>79</td></tr> <tr><td>29</td><td>77</td></tr> <tr><td>30</td><td>76</td></tr> <tr><td>31</td><td>74</td></tr> </tbody> </table> <p>Frame Error Rate <FER></p> <p>0: <0.01%</p> <p>1: 0.01% to less than 0.1%</p> <p>2: 0.1% to less than 0.5%</p> <p>3: 0.5% to less than 1.0%</p> <p>4: 1.0% to less than 2.0%</p> <p>5: 2.0% to less than 4.0%</p> <p>6: 4.0% to less than 8.0%</p> <p>7: 8.0%</p> <p>99: <FER> is not known or is not detectable.</p>	CSQ	RSSI	9	110	10	108	11	107	12	105	13	103	14	102	15	100	16	99	17	97	18	95	19	93	20	92	21	90	22	89	23	87	24	85	25	84	26	82	27	81	28	79	29	77	30	76	31	74	R,L	O	N/A
	CSQ	RSSI																																																		
9	110																																																			
10	108																																																			
11	107																																																			
12	105																																																			
13	103																																																			
14	102																																																			
15	100																																																			
16	99																																																			
17	97																																																			
18	95																																																			
19	93																																																			
20	92																																																			
21	90																																																			
22	89																																																			
23	87																																																			
24	85																																																			
25	84																																																			
26	82																																																			
27	81																																																			
28	79																																																			
29	77																																																			
30	76																																																			
31	74																																																			
<p>All rights reserved. Page 69 of 77</p>																																																				

Command	Description	Async & Fax	Packet Data	STUIII
AT+CSO=<n>	Change Service Option to Service Option <n>.	O	O	R
AT+CMUX=<n>	Select Multiplex Option 1: Multiplex Option 1 2: Multiplex Option 2 C,2 (Default) Range: (1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, F),(1, 2)	O	O	R
AT+CAU=<n>	NOT SUPPORTED Audio passthrough between TE2 and MT2 0: Audio Pass Through Disabled 1: Audio Pass Through Enabled	N/A	N/A	R
+CFC=<value>	Um Interface Fax Compression. 0: No compression (Default) Range not supported: 1: V.42bis compression with parameters as set by the +CDS command 2: Modified Read compression	R,L	N/A	N/A
<p>NOTE 1: The exact meaning of the Signal Quality Measure shall be manufacturer defined. The lowest quality reported by SQM shall be defined as value 00. The highest quality reported by SQM shall be defined as value 31.</p>				

18.1.3. Cellular identification AT command extensions

Table 18.128 Cellular identification AT command extensions

Command	Value per	Description	Async & Fax	Packet Data	STUIII
+CXT=<value>		Cellular Extension. Applies to the following +C commands. 0: Do not pass unrecognized command set to the IWF. (Default) 1: When detecting an unrecognized AT command, open transport layer connection and pass unrecognized command to the IWF.	R,L	N/A	N/A

Command	Value per	Description	Async & Fax	Packet Data	STUIII
+CGCAP	IS-131	<p>This extended-format command causes the IWF to transmit one or more lines of information text in a specific format. The content is a list of additional capabilities command +<name>s, which is intended to permit the user of the IWF to identify the minimum capabilities of the IWF.</p> <p>IWF's conforming to this standard shall include the following items, as a minimum, in the result code for the +CGCAP command:</p> <p>+CIS707, +MS, +ES, +DS, +FCLASS [NOTE 1]</p>	O,M	N/A	N/A
+CGMI	IS-131	<p>This command causes the IWF to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the IWF to identify the manufacturer. Typically, the text will consist of a single line containing the name of the manufacturer, but manufacturers may choose to provide more information if desired (e.g., address, telephone number for customer service, etc.).</p>	O,M	N/A	N/A
+CGMM	IS-131	<p>This command causes the IWF to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the IWF to identify the specific model of the device. Typically, the text will consist of a single line containing the name of the product, but manufacturers may choose to provide any information desired.</p>	O,M	N/A	N/A

Command	Value per	Description	Async & Fax	Packet Data	STUIII
+CGMR	IS-131	This command causes the IWF to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the IWF to identify the version, revision level or date, or other pertinent information of the device. Typically, the text will consist of a single line containing the version of the product, but manufacturers may choose to provide any information desired.	O,M	N/A	N/A
+CGOI	IS-131	This command causes the IWF to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the IWF to identify the device, based on the ISO system for registering unique object identifiers. Typically, the text will consist of a single line containing numeric strings delimited by period characters.	O,M	N/A	N/A
+CGSN	IS-131	This command causes the IWF to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the IWF to identify the individual device. Typically, the text will consist of a single line containing a manufacturer determined alpha-numeric string, but manufacturers may choose to provide any information desired.	O,M	N/A	N/A
<p>NOTE: The format of these +C command set shall comply with the corresponding format of the +G command set specified in TIA/EIA/IS-131.</p> <p>NOTE: The MT2 shall treat all command set in this table as unrecognized command set.</p> <p>NOTE 1: The +CIS707 result code indicates support of the AT command set and result codes in Tables 18.128, 18.129, 18.130, 18.131.</p>					

18.1.4. Cellular AT commands for Packet data services

Table 18.129 Cellular AT commands for Packet Data services

Command	Description
+CTA=<value>	Set/Read/Test Um packet data inactivity timer. 0: Traffic Channel not released during inactivity periods. 1-255: Release the Traffic Channel after <value> 1 second intervals have elapsed since last sending or receiving RLP data frames on the Um interface. 255: (Default)
+CPS=<value>	Select the service option to be used for packet data service. Values shall be as specified in TSB58.
+CPSR=<value>	Enables/disables packet call state reporting. 0: Disables call state reporting 1: Enables call state reporting
+CPTC=<value>	Controls Traffic Channel state without affecting the IWF Link Layer connection. 0: Release Traffic Channel 1: Originate Traffic Channel
+CPEP=<value>	Enables/disables packet call event reporting. 0: Disables call event reporting 1: Enables call event reporting

18.1.5. Cellular result codes for Asynchronous data services

Table 18.130 Cellular result codes for Asynchronous data services

Result Code	Description	Async & Fax	Packet Data	STUIII
+CRC=<value>	Cellular Result Codes 0: Disable Cellular Result Codes 1: Enable Cellular Result Codes	R,M	N/A	N/A
+CERROR: BAD REQUEST	Intercept received after call origination.	R	N/A	N/A
+CERROR: INIT FAILED <failed command>	Initialization string failed.	R	N/A	N/A
+CERROR: LINK FAIL	Mobile station has declared a loss of the Traffic Channel.	R	N/A	N/A
+CERROR: NO SERVICE	Origination was attempted while the mobile station was not able to monitor a CDMA Paging Channel.	R	N/A	N/A

Result Code	Description	Async & Fax	Packet Data	STU-III
+CERROR: NO <service option> SERVICE	The indicated service option was rejected. The <service option> shall be "ASYNC" or "FAX."	R	N/A	N/A
+CERROR: PAGE FAIL	Mobile station received a page but not an alert.	R	N/A	N/A
+CERROR: PAGED	Mobile station attempted to originate after receiving a page.	R	N/A	N/A
+CERROR: RELEASE	Indicates call release.	R	N/A	N/A
+CERROR: RETRY	Reorder received after call origination.	R	N/A	N/A
+CPROG: ANSWER	Indicates remote DCE has answered.	R	N/A	N/A
+CPROG: BONGTONE	Billing Tone was detected.	R	N/A	N/A
+CPROG: DIALING <number>	Indicates PSTN Dialling.	R	N/A	N/A
+CPROG: DIALTONE	Dial tone was detected.	R	N/A	N/A
+CPROG: QUIET ANSWER	Indicates Quiet Answer.	R	N/A	N/A
+CPROG: RINGING	Indicates PSTN Ringing.	R	N/A	N/A
+CPROG: VOICE	Voice detected on the PSTN connection.	R	N/A	N/A
RING <service option>	Specifies active service option. The <service option> shall be "ASYNC", "FAX" or "STU-III."	R	N/A	N/A

18.1.6. Cellular result codes for Packet data services

Table 18.131 Cellular result codes for Packet Data services

Result Code	Description
+CPACKET	May be returned after AT+CRM=1 or 2. Indicates packet data service is in the Active State. (IS95A/B only)
+CPSR:<value>	<p>Packet call state. Sent autonomously when +CPSR=1.</p> <p>0: Packet data service is in the Inactive State</p> <p>1: Packet data service is in the Active State, and the call control function is in the Initialization/Idle State</p> <p>2: Packet data service is in the Active State, and the call control function is in the Initialization/Traffic State</p> <p>3: Packet data service is in the Active State, the call control function is in the Connected State, and the packet data service option is using primary traffic</p> <p>4: Packet data service is in the Active State, the call control function is in the Connected State, and the packet data service option is using secondary traffic</p> <p>5: Packet data service is in the Active State, and the call control function is in the Dormant/Idle State</p> <p>6: Packet data service is in the Active State, and the call control function is in the Dormant/Traffic State</p> <p>7: Packet data service is in the Active State, and the call control function is in the Reconnect/Idle State</p> <p>8: Packet data service is in the Active State, and the call control function is in the Reconnect/Traffic State</p> <p>9-255: Reserved</p>
+CPER:<value>	<p>Packet call event. Sent autonomously when +CPER=1.</p> <p>0: Enter Idle State</p> <p>1: Idle handoff, same system</p> <p>2: Idle handoff, new system</p> <p>3: Page received</p> <p>4: Origination sent</p> <p>5: Traffic Channel assigned</p> <p>6: Hard handoff</p> <p>7-255: Reserved</p>
+CERROR: LINK FAIL	Mobile station has declared a loss of the Traffic Channel
+CERROR: NO SERVICE	Mobile station is not able to monitor a Paging Channel
+CERROR: RETRY	Reorder received during reconnect attempt

19. QUALCOMM COMMAND SET

This chapter provides the details for the QUALCOMM Proprietary AT command set implementation. The definition and purpose of each proprietary AT command implemented by QUALCOMM is described in the tables of this chapter.

Command	Description	Operation
\$QCCAV	Command used to answer a MT voice call	
\$QCVAD=	<p>Prearrangement setting; respond to Page message that has a Voice service option with a Page response that has a Data service option</p> <p>Use this command and options where the MT call mode for next or all calls deviates from the default 0.</p>	<p>0: Voice Only</p> <p>1: Fax for next call</p> <p>2: Fax for all calls</p> <p>3: Async for next call</p> <p>4: Async for all calls</p> <p><u>NOTE: \$QCVAD command default value changes may be written to a user profile using &W command.</u></p> <p><u>Where this is done MT2 will power up in the new set \$QCVAD mode. When using \$QCVAD values 1 or 3 MT2 will revert to default '0' after termination of the prearranged call irrespective of whether you have used the &W command.</u></p> <p><u>NOTE: For MT2 to auto answer a \$QCVAD value 3 or 4 MT call, the S0 register must be set to 1 or higher. For \$QCVAD values 1 or 2 the proprietary fax software (i.e. WinFax Pro) will determine the MT call answer regime.</u></p>
\$QCPREV	Reads if local cell supports packet data	<p>Valid values: 3, 6</p> <p>3: Asynchronous data only</p> <p>6: Packet data support available</p>

20. DM COMMAND (DIAGNOSTIC MODE)

All the AT command set can be used at UART2 DM port with Async-HDLC format except the periodic report command set such as RINFO and ANTLVL. The DM command set has the command/response structure in Async-HDLC format. The command/response packet format is described in the following tables.

NOTE: The last character of the Request Field should be "0x0D".

Table 20.132 Request packet

Field	Length(bytes)	Description
Command code	1	Cmd Code (0xC8)
Request field	Variable	ASCII Cmd (This field should finish with 0x0d)
Frame check	2	16-bit CRC
Ending flag	1	0x7E

Table 20.133 Response packet

Field	Length(bytes)	Description
Command code	1	Cmd Code(0xC8)
Length	2	Packet length
Response Filed	Variable	ASCII
Frame check	2	16-bit CRC
Ending flag	1	0x7E

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 device 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 radio or TV antenna
- Increase the separation distance between the equipment and the receiver
- Contact Maxon Electronics Australia Pty Ltd. Technical Support for assistance.

MM-5100 HARDWARE SPECIFICATIONS & USER'S MANUAL

All data and information contained in or disclosed by this document are proprietary information of Maxon Australia, and all rights therein are expressly reserved. By accepting this material, the recipient agrees that this material and the information contained therein are held in trust and will not be used, copied, reproduced in whole or in part, nor its contents used in any manner without the express written permission of Maxon Australia.

This information provided in this document is provided on an "as is" basis, is preliminary and subjected to change without notice.

In no event will Maxon Australia be liable for any damages arising directly or indirectly from any use of information contained in this document.

It is recommended that this manual be read in conjunction with other supporting documentation from Maxon Electronics Australia Pty. Ltd.

NOTES:

The user is cautioned that changes or modifications not expressly approved by Maxon Electronics Australia Pty Ltd could void the warrantee.

POTENTIALLY UNSAFE AREAS

Posted facilities: Turn off this device in any facility or area when posted notices require you to do so.

Blasting areas: Turn off your phone where blasting is in progress. Observe restrictions and follow any regulations or rules.

Potentially explosive atmospheres: Turn off your phone when you are in any area with a potentially explosive atmosphere. Obey all signs and instructions. Sparks in such areas could cause an explosion or fire, resulting in bodily injury or death.

Areas with a potentially explosive atmosphere are often but not always clearly marked. They include:

- fuelling areas such as gas or petrol stations
- below deck on boats
- transfer or storage facilities for fuel or chemicals
- vehicles using liquefied petroleum gas, such as propane or butane
- areas when the air contains chemicals or particles such as grain, dust or metal powders
- any other area where you would normally be advised to turn off your engine

1xRTT Operation:

Telstra advise that 1xRTT connectivity is not supported in PPP dial-up session.



1. REVISION HISTORY

Level	Date	History
0.1a	August 4 th , 2003	Commercial Release Version



2. CONTACT INFORMATION

Depending on the nature of your inquiry, please feel free to contact the following senior personnel:

Sales, Marketing & Corporate:

Ray Sanders – Managing Director Email: rayws@maxon.com.au

Phone: +61 2 9707 2000

Dana Baggetto – General Manager Email: danab@maxon.com.au

Phone: +61 2 9707 2000

Andrew Arnold – Cellular Business Development Manager

Phone: +61 418 977 778 Email: andrew@maxon.com.au

Technical:

Ashween Prasad – Technical Engineer

Phone: +61 2 9707 2000 Email: engineering@maxon.com.au

3. TABLE OF CONTENTS

MM-5100 HARDWARE SPECIFICATIONS & USER'S MANUAL	3
1. REVISION HISTORY	4
2. CONTACT INFORMATION	5
3. TABLE OF CONTENTS	6
4. OVERVIEW	7
4.1. GENERAL DESCRIPTION	7
4.2. TERMS.....	8
4.3. REFERENCES	9
5. FEATURES	10
6. SYSTEM DIAGRAMS	11
1.1.1. <i>Block Diagram</i>	11
1.1.2. <i>Physical Dimensions</i>	11
7. SPECIFICATIONS	12
1.1.3. <i>Mechanical Specifications</i>	12
1.1.4. <i>Environment Specifications</i>	12
1.1.5. <i>Current Consumption</i>	12
1.1.6. <i>USB Specifications</i>	12
1.1.7. <i>Audio Specifications</i>	12
1.1.8. <i>CDMA RF Specifications</i>	13
1.1.8.1. Receiver.....	13
1.1.8.2. Transmitter	13
8. MM-5100 INTERFACES	14
9. LED FUNCTIONS	18

4. OVERVIEW

The MM-5100 modem is a rugged, full duplex 1xRTT CDMA Voice/Data/Fax/SMS modem designed to operate on CDMA 800MHz networks. CDMA is an efficient and secure cellular wireless technology that compliments fixed or mobile applications.

Two main data services are available on CDMA networks: 1xRTT, a packet switched connection; and IS-95A, a circuit switched connection. IS-95A over-air data rates are limited to 14.4 kbps. The 1x service is capable of data rates as high as 153.6 kbps [network dependant].

The MM-5100 modem has been specifically designed to be compatible with 1xRTT networks to take full advantage of the exceptional data speeds and always-on connection, and is backwards compatible with IS95A circuit switched networks.

When using the MM-5100 for 1x connections, access is achieved via a PPP (TCP/IP) connection to the CDMA network. The CDMA carrier provides the Internet connectivity, becoming the ISP for that session.

Applications such as web browsing, email, FTP, LAN access, etc function as normal.

The MM-5100 incorporates RS-232 and USB drivers, DC/DC down converter, and Voice interface.

The MM-5100 connects directly to a 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.

Designed to meet the requirements for global CDMA markets, the MM-5100 will operate over the following TX/RX frequency ranges:

TX frequency 824MHz – 849MHz

RX frequency 869MHz – 894MHz

The MM-5100 functionality including power saving options are controlled from TE2 via AT command.

4.1. General Description

This manual has been provided to assist users and developers integrate the Maxon MM-5100 with host equipment and software for current or new applications. We will update the contents when applicable.

This manual defines the hardware specifications and how to use these features of the MM-5100 modem.

Integration with the cellular network is as per the following diagram.

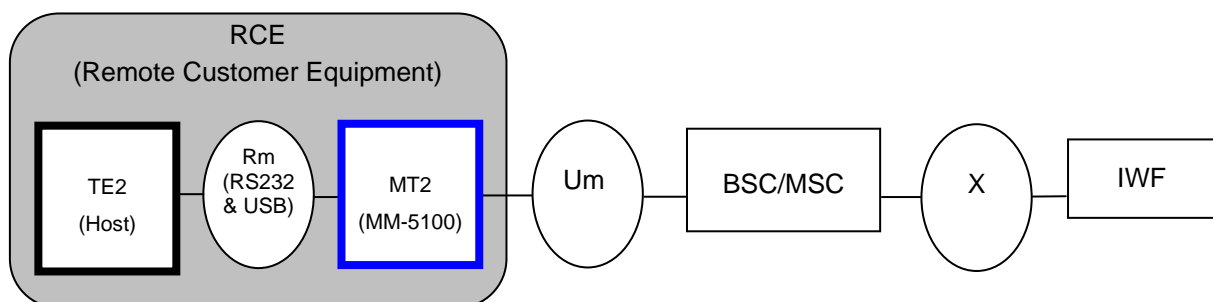


Figure 4-1 Network Integration

4.2. Terms

The following terms are used throughout this document. We have provided an explanation of these for your reference.

Table 4-1

Term	Description
<>	Field. Contents between '<' and '>' indicate the name of the field or the parameter required to complete the syntax.
	Delimiter/Space. Insert a space.
AT command set	Communications command set interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE).
BS	Base Station. Primarily a mobile phone tower in the carrier's domestic public cellular phone network used as the network end point for communicating with mobile stations. Depending upon the context, the term may refer to a cell, a sector within a cell, an MSC, an IWF, or other part of the cellular system.
BSC	Base Station Controller.
CDMA	Code Division Multiple Access. CDMA is a spread spectrum, digital wireless modulation scheme for cellular communication systems. It has approximately 3 times the voice capacity of GSM networks. See IS-95, IS-95A, IS-95B, IS-2000.
DCE	Same as MT2.
DTE	Same as TE2
IWF	Inter-working Function. An IWF provides the functions needed for data 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.
MO	Mobile-Originated where the SMS or the call is originated [sent] by the Mobile Station.
Mobile Station	A cellular device [e.g. this modem or a mobile phone handset] in the carrier's domestic public cellular phone network intended to be used when stationary, while in motion or during halts at unspecified points. Mobile stations may include fixed, portable (e.g., hand-held personal units) or vehicular units.
MSC	Mobile Switching Centre
MT	Mobile-Terminated where the SMS or the call is terminated [received] at the Mobile Station.
MT2	Mobile Termination 2 An MT2 provides a non-ISDN (Rm) user interface, e.g., CCITT V series or CCITT X series. Same as DCE. Refers to the MM-5100 modem.

Term	Description
NVM	Non Volatile Memory. User changeable and is written at time of change or entry to a separate section of memory unaffected by power cycles. The setting value is available in all profiles.
PSTN	Public Switched Telephone Network refers primarily to the telephone system based on copper wires carrying voice, fax & data.
RCE	Remote Customer Equipment. Describes the MT2, Rm and TE2 as one composite system.
Rm	Hardwire Interface between MT2 and TE2.
SMS	Short text Message Service.
TE2	Terminal Equipment 2. A TE2 is a data terminal device that has a non-ISDN user-network interface, e.g., CCITT V series or CCITT X series. Same as DTE. Products which can issue AT command set and handle the response through UART or RS-232 signalling ports of the MM-5100. The popular examples of MT2 are PC's, PDA and embedded systems i.e. Data Logger, PLC etc.
UART	Universal Asynchronous Receiver-Transmitter, the UART is a microchip component that handles asynchronous serial communication. Every computer contains a UART to manage the serial ports, and some internal modems such as MM-5100 have their own UART. UART 1(RS232 port) UART 2 (On serial for diagnostics)
UI	User Interface.
Um	Over-air interface between the MT2 and the BS.

4.3. References

The following standards are referenced in this text.

TIA/EIA/IS-95-A/B

Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular Systems

TIA/EIA/IS-637A

Short Message Services for Dual-Mode Wideband Spread Spectrum Cellular Systems

TIA/EIA/IS-707

Data Service Option for Wideband Spread Spectrum Systems

TIA/EIA/TSB74

Support for 14.4kbps Data Rate and PCS Interaction for Wideband Spread Spectrum Cellular System

TIA/EIA - 615

Data Transmission System and Equipment – Serial Asynchronous Automatic Dialling and Control – Extended command Syntax

TIA/EIA/IS-657

Packet Data Service Options for Wideband Spread Spectrum Systems

5. FEATURES

IS-95C 1x Packet Data to 153kbps
IS-95A/B backwards compatible for broad network deployment
Extended AT command sets
Input Voltage SMS alert support
Remote RSSI readout support
Remote Input Voltage readout support
Auto voltage alerts to host device
Auto power reset timer
Voice support for Voice communications
5 user profile levels offering complete customisation
2-way SMS support
SMS management PC software
SMS out-box storage
SMS in-box storage
PC Fax Class 2 support
Power saving modes ... minimal power consumption
RS232 Transceiver power down control
LED's Off/On control
Soft stand-by mode
Speed dial entries
Ring LED's, or Buzzer modes
Contemporary design
Compact form factor facilitates installation
Robust metal casing
Extensive LED's for comprehensive status display
USB connector to maximised throughput of 1x data to 153kbps
RS232-C DB15 connector for general data transfer to 115kbps
Molex DC input provides secure power connection
6-36VDC input voltage offers broad installation
Can be powered solely from USB (limited to 500mA load current)
Mic/Ear Jack for Voice call support
SMA antenna jack for external antenna connection

6. SYSTEM DIAGRAMS

1.1.1. Block Diagram

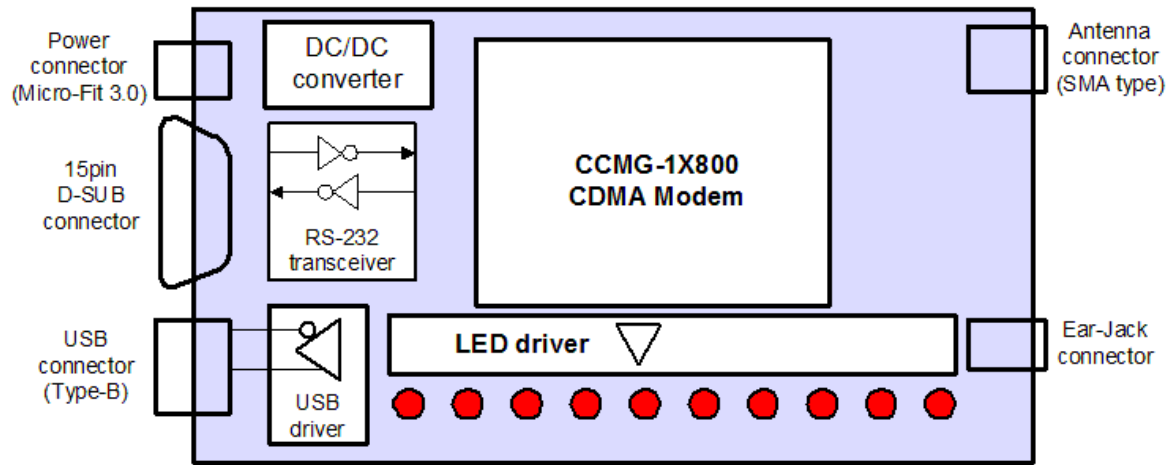


Figure 6-2 Block Diagram

1.1.2. Physical Dimensions

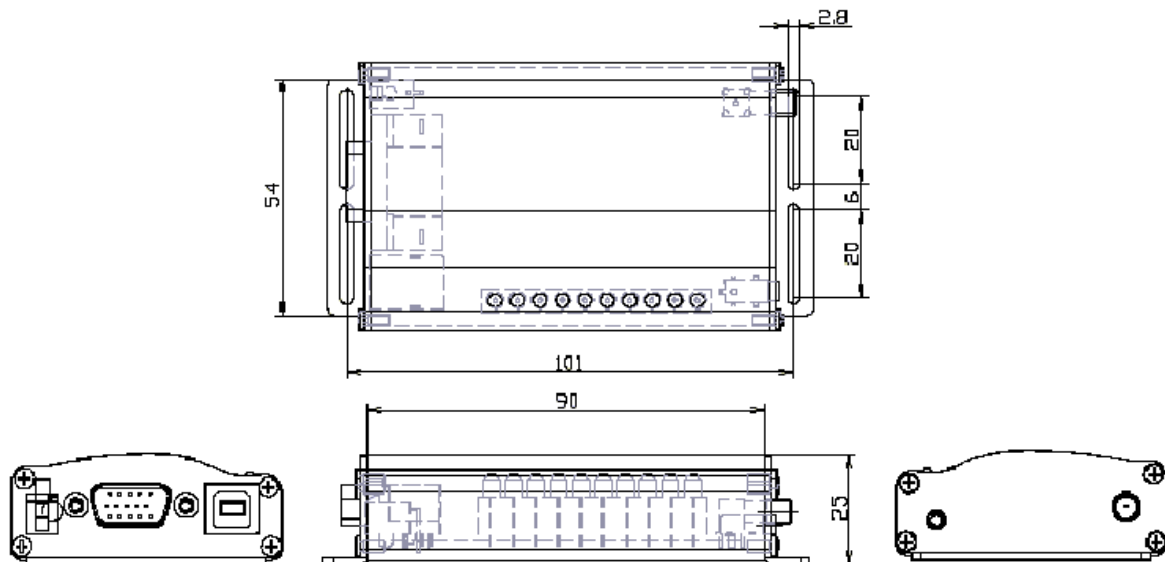


Figure 6-3 Physical Dimensions

7. SPECIFICATIONS

1.1.3. Mechanical Specifications

Table 7.2 Mechanical Specifications

Dimensions	110mm x 61.5mm x 25mm- include projecting connect parts
Weight	Approx. 110g - excepting CDMA antenna and cable assemblies
Colour	Frost Blue
Housing Material	CASE – SCM4, SCM45C, Brackets – AL5052
Holding Bridles	φ2.8 mm

1.1.4. Environment Specifications

Table 7.3 Environment Specifications

Power supply voltage	DC +6V* ~ +36V *DC +6V must be guaranteed during maximum power transmission
Ambient Operating Temperature	0°C ~ +60°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, RS-232, and USB signal lines: +/- 15KV Audio and Antenna signal lines: TBD

1.1.5. Current Consumption

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

Table 7.4 Current Consumption

On communication @ Maximum TX Power (24+/- 0.3dBm) with RS-232 and/or USB data communication	<600mA
Power down state with 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.

1.1.6. USB Specifications

The USB interface implemented in the MM-5100 complies with the Universal Serial Bus (USB) Specification Revision1.1.

1.1.7. 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)



1.1.8. CDMA RF Specifications

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

1.1.8.1. Receiver

Table 7.5 Receive Performance

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%)

1.1.8.2. Transmitter

Table 7.6 Transmit Performance

Frequency range	824MHz ~ 849MHz	
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	

8. MM-5100 INTERFACES

The MM-5100 comprises the following interface ports:

Power Supply input port

Data communication ports; RS-232 and USB

Voice call interface connector

RF connector for external antenna

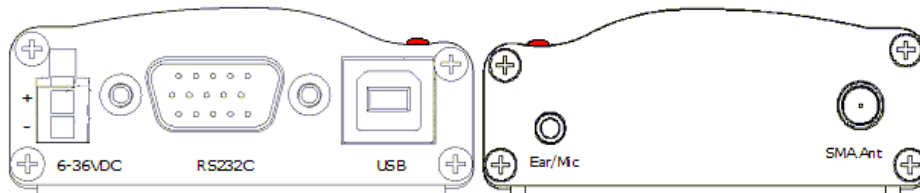


Figure 8-4 End Plate Figures

Table 8.7 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

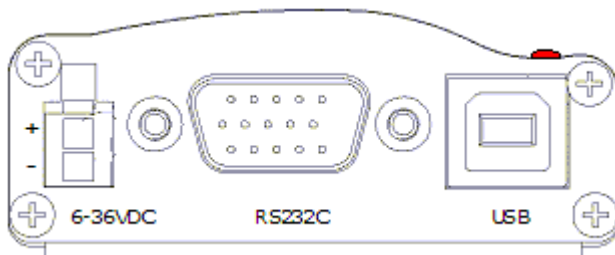


Figure 8-5 Left End Plate

**Caution: When removing cables please grip the connector head only, not the cable.

Table 8.8 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 8.9 Power connector Termination assignment

Pin No.	Signal name	Description
1	V+	DC Power (DC +6V to +36V) *DC +6V must be guaranteed during maximum radio power transmission
2	GND	System reference(ground)

Note 1: To keep overall performance of the MM-5100 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 5.8v, the MM-5100 powers off totally and then will restart once voltage has increased to 6.5v.

Note 3: If voltage overload is continuous, protection is afforded by the in-line fuse on the DC lead.

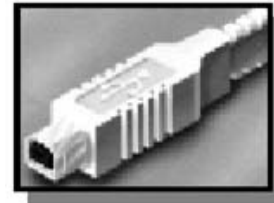
For transient-voltage or surge current spikes, protection is afforded by an in-line fuse.

Multiple service function (ex: SMS and Data communication) of the MM-5100 will be serviced through the TE2 and Rm interface.

“RS-232 Data” port and/or “USB” port is for data communication and each port can be connected with PC or other device directly. The Modem can communicate with only one port at one time. The Modem is looking for active connection at power up and communicates with the found connection. If both connections are active, USB will be selected. The USB is a Qualcomm solution which operates under MS-Windows-98SE and MS-Windows2000.

Table 8.10 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)

Note 1: USB+ and USB- are the differential pair signals provided for the TE2. These signals are capable of directly driving a USB cable.

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 8.11 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 TE2 that it is receiving a carrier signal from the remote TE2 that meets its criteria.
3	TXD	Sending serial data signal from TE2 to MT2
2	RXD	Receiving serial data signal from TE2
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. Module informs TE2 of incoming voice or data calls.
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)

Note 1: The signal name is based on TE2.

Note 2: TE2/DTE = PC or PDA, HOST DEVICE or APPLICATION

Note 3: MT2/DCE = MM-5100

Note 4: A RS-232 transceiver for serial communication with HOST is installed in MM-5100.

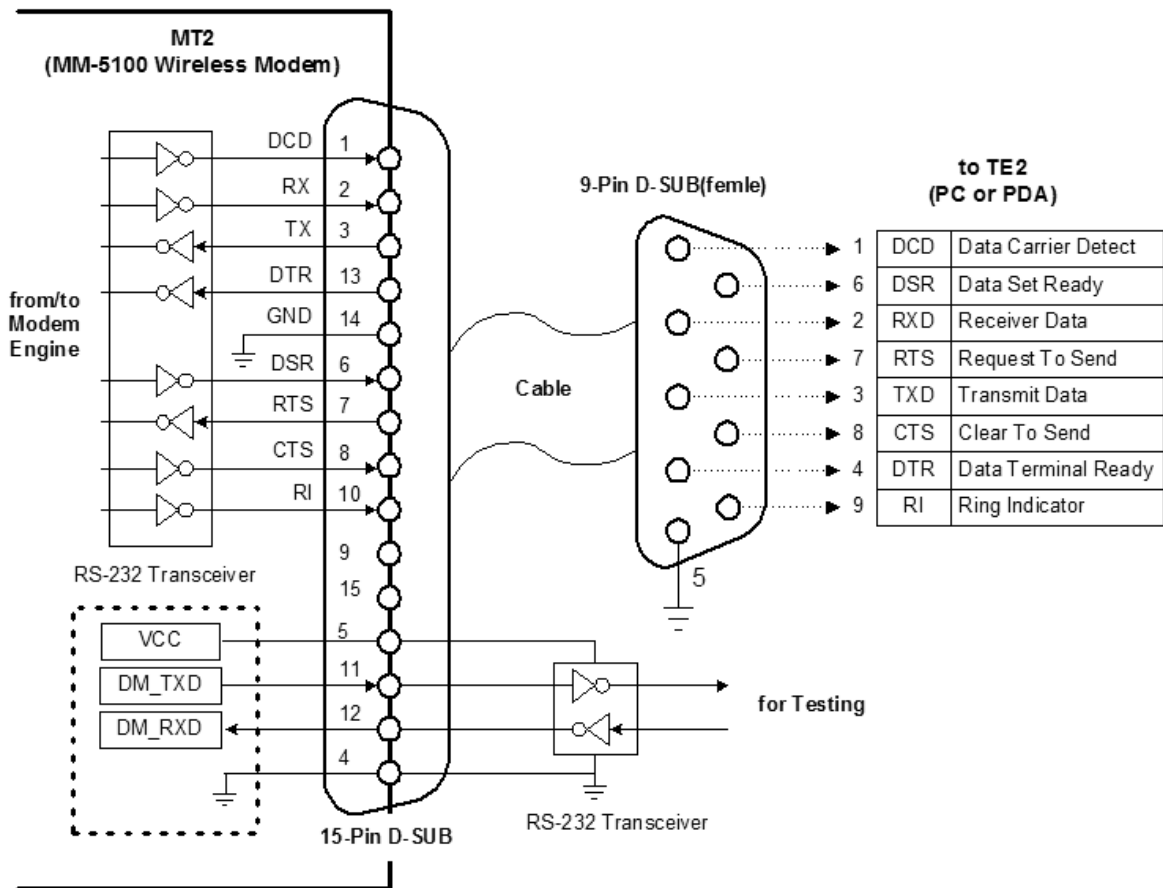


Figure 8-6 RS-232 Interface Example Circuit

Note 1: While the Modem is power save mode, the RS-232 transceiver powers down whenever there is 30 seconds of inactivity on the receiver and transmitter inputs. The RS-232 transceiver remains powered down until the AT command is received via Host and/or detects an incoming call or SMS. To exit TE2 initiated power down state, the MT2 requires 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.

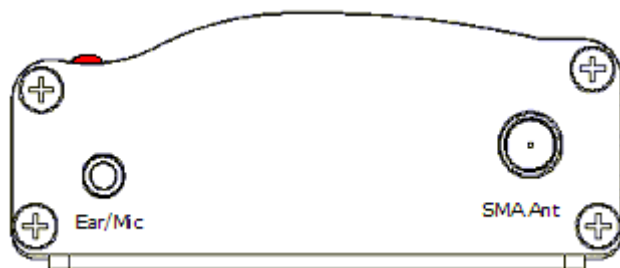


Figure 8-7 Right End Plate

Microphone and earphone signals for Voice Calls are provided to interface directly with headset.

9. LED FUNCTIONS

The RSSI LED will be OFF when RSSI is less than -105dBm, flashing when in-between the -95dBm and -105dBm, and ON when greater than or equal to -95dBm.

NOTE: the higher the negative number i.e. the further away from ZERO, the weaker the received signal. The smaller the number i.e. the closer to ZERO, the stronger the received signal.

A flashing RSSI LED indicates potential need for an alternative antenna, relocating the antenna to a site more suited to signal acquisition, or elevation of the antenna to improve signal acquisition, or a combination of all the above.

A consistent RSSI reading of -95dBm or better [number closer to '0'] is advisable.

Table 9.12 LED function description

LED Label	Description
pwr	Lit continuously when power is applied to modem
dtr	To indicate MODEM is live on Host device
sms	Blinks if there is unread SMS message
ri/rx	Blinks on incoming voice call, lights continuously on incoming data call, blinks on data from PC to MODEM
tx	Blinks on data from MODEM to PC
rssi	Lights continuously in RSSI range > -95dBm (This is the preferred range) Blinks in RSSI range -95dBm > -105dBm, (Signal is marginal) Turn-off at RSSI < -105dBm (No signal available)
roam	ON when inside a preferred roaming carrier network but outside Telstra's network, FLASHES when inside a <u>non</u> -preferred roaming carrier network but outside Telstra's network, OFF when inside Telstra network
crt	To indicate connection in Circuit Switched mode
pkt	To indicate active connection in Packet Switched mode (OFF when in dormant mode)
1x cell	To indicate that local cell supports Packet Switched data (OFF indicates cell supports only IS95A)

Note 1: In ALL-LED-OFF state, when you connect ear piece to the MM-5100, the LED's are enabled for a value set by AT command AT\$EXT_LED=<1-255sec>. If LED always ON is required, change the AT command parameter to '0'.

Note 2: If the LED's have been disabled by AT command prior to power cycle, all LED's will remain in OFF state until ear-piece is connected.