M Terminals BGS2 & M55i datasheet

powered by

CINTERION
WIRELESS MODULES

Contents

Document history

Preceding document: **"M Terminals BGS2 & M55i" rev01.0"**
New document: **" M Terminals BGS2 & M55i" rev01.1"**

Chapter	What is new
---	Added new pictures, electrical and mechanical characteristics

1. Introduction

This document describes the hardware of HCP M Terminals BGS2 & M55i, with interface specifications, electrical and mechanical characteristics.

M Terminals, both BGS2 and M55i, are intended to use in variety of M2M applications, such as POS systems, parking meters, energy meters, vending machines etc.

1.1 Related documents

[1] MC55i AT command set
[2] BGS2 AT command set
[3] MC55i Hardware interface description
[4] BGS2 Hardware interface description

1.2 Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
ATC	AT Cellular
BTS	Base Transceiver Station
CB	Cell Broadcast
CODEC	Coder-Decoder
CPU	Central Processing Unit
DCE	Data Circuit terminating Equipment
DSP	Digital Signal Processor
DSR	Data Set Ready
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
FR	Full rate
G.C.F.	GSM Conformity Forum
GSM	Global Standard for Mobile Communication
HF	Hands-free
HR	Half rate
HW	Hardware
IC	Integrated Circuit
IF	Intermediate Frequency
IMEI	International Mobile Equipment Identifier
I/O	Input/ Output
IGT	Ignition
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
Li-Ion	Lithium-Ion
LVD	Low voltage Directive
Mbps	Mbits per second
MMI	Machine Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NC	Not Connected
NTC	Negative Temperature Coefficient
PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System

Abbreviation	Description
PDU	Protocol Data Unit
R&TTE	Radio and Telecommunication Terminal Equipment
RAM	Random Access Memory
RF	Radio frequency
RI	Ring Indication
ROM	Read Only Memory
RX	Receive direction
SIM	Subscriber Identification Module
SMS	Short Message Service
SRAM	Static Random Access Memory
SW	Software
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TX	Transmit direction
UART	Universal Asynchronous Receiver and Transmitter
VAD	Voice Activity Detection
ZIF	Zero Insertion Force

Table 1. Terms and Abbreviations

1.3 Safety Precautions

Safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal from HCP d.o.o.

Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. HCP d.o.o assumes no liability for customer's failure to comply with these precautions.

	When in hospitals or other health care facilities, observe the restrictions on the use of mobiles. Switch off the cellular terminal or mobile if to be instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy. The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on. This personal subgroup always should check the distance to the mobile
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both. Check the local and actual laws about these themes.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets,radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile while driving a vehicle unless it is securely mounted in a holder for speakerphone operation. Before making a call with a hand-held terminal or mobile park the vehicle. Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard. Check the actual and local laws about these themes.
	IMPORTANT! Cellular terminals or mobiles operate using radio signals and cellular networks. In that case connections cannot be guaranteed at all times under all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls. Remember, in order to make calls or receive calls the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength. Some networks do not allow for emergency calls if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may need to deactivate those features before you can make an emergency call. Some networks require a valid SIM card to be properly inserted in the cellular terminal or mobile.
	If a power supply unit is used to supply the device it must meet the demands placed on SELV circuits in accordance with EN60950. The maximum permissible connection length between the device and the supply source should not exceed 3m.
	According to the guidelines for human exposure to radio frequency energy, an antenna connected to the FME jack of the device should be placed at least 20cm away from human bodies.

2. Product Concept

2.1 Key Features of M55i Terminal

Feature	Implementation
General	
Incorporates Cinterion MC55i module	The MC55i module handles all processing for audio,signal and data within the M55i Terminal.
Frequency bands	Quad band: GSM 850/900/1800/1900MHz
GSM class	Small MS
Output power (according to Release 99, V5)	Class 4 (+33dBm ±2dB) for EGSM850 Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900
Power supply	Single supply voltage 8V to 30V DC
Ambient operating temperature according to IEC 60068-2	Normal operation: -20°C to +55°C Restricted operation: -40°C to -20°C, +55°C to +70°C
Physical	Dimensions: 64mm x 74mm x 33mm Weight: approx. 110g(approx.)
Housing color	Gray
RoHS	All hardware components fully compliant with EU RoHS Directive
GSM/GPRS features	

Data transfer	GPRS:
	  - Multislot Class 12
	  - Full PBCCH support
	  - Mobile Station Class B
	  - Coding Scheme 1 – 4
	CSD:
	  - V.110, RLP, non-transparent
	  - 2.4, 4.8, 9.6, 14.4kbps
	  - USSD
	PPP-stack for GPRS data transfer

SMS	- Point-to-point MT and MO - Cell broadcast - Text and PDU mode - Storage: SIM card plus 25 SMS locations in mobile equipment - Transmission of SMS alternatively over CSD or GPRS. Preferred mode can be user defined.
Fax	Group 3; Class 2 and Class 1

Feature	Implementation
Audio	Speech codecs: - Half rate HR (ETS 06.20) - Full rate FR (ETS 06.10) - Enhanced full rate (ETS 06.50/06.60/06.80) - Adaptive Multi Rate AMR Echo cancellation, DTMF, 7 different ringing tones
TCP/IP	Over AT commands
Watchdog	Integrated watchdog timer that resets terminal every 8 to 10 hours
Software	
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Cinterion
Firmware update	Upgradeable via serial interface.
Interfaces	
Serial interface	RS-232 interface, bi-directional bus for AT commands and data. - Multiplex ability according to GSM 07.10 Multiplexer protocol - Fixed bit rates: 1,200bps to 230,400bps - Autobauding: 1,200bps to 230,400bps - Supports RTS/CTS hardware handshake and software XON/XOFFflow control
Audio	Analog (Microphone, Earpiece)
SIM interface	Supported SIM cards: 3V, 1.8V
Antenna	Connected via antenna FME connector
Power on/off, Reset	
Power on	• Automatic switch on when power supply is attached • DTR line at RS232 interface or IGNITION line at power connector
Power off	• Normal switch-off by AT^SMSO command • Emergency switch-off via EMERGENCY_OFF line at power connector • Automatic switch-off in case of critical temperature and voltage conditions
Reset	Orderly shutdown and reset by AT command or DTR line at RS232 interface Orderly reset by AT command or DTR line at RS232 interface or reset by integrated Watchdog timer on board.
Phonebook	SIM card and terminal

Table 2. Key feature of M55i Terminal

2.2 Key Features of M BGS2 Terminal

Feature	Implementation
General	
Incorporates Cinterion BGS2 module	The BGS2 module handles all processing for audio,signal and data within the M BGS2 Terminal. Internal software runs the application interface and the complete GSM/GPRS protocol stack.
Frequency bands	Dual band (BGS2-E): GSM 900/1800MHz Quad band (BGS2-W): GSM 850/900/1800/1900MHz
GSM class	Small MS
Output power (according to Release 99, V5)	Class 4 (+33dBm ±2dB) for EGSM850 (quad band only) Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900 (quad band only)
Power supply	Single supply voltage 8V to 30V DC
Ambient operating temperature according to IEC 60068-2	Normal operation: -20°C to +55°C Restricted operation: -40°C to -20°C, +55°C to +70°C
Physical	Dimensions: 64mm x 74mm x 33mm Weight: approx. 110g(approx.)
Housing color	Blue
RoHS	All hardware components fully compliant with EU RoHS Directive.
GSM/GPRS features	
Data transfer	GPRS: - Multislot Class 12 - Full PBCCH support - Mobile Station Class B - Coding Scheme 1 – 4 CSD: - V.110, RLP, non-transparent - 2.4, 4.8, 9.6, 14.4kbps - USSD PPP-stack for GPRS data transfer
SMS	- Point-to-point MT and MO - Cell broadcast - Text and PDU mode - Storage: SIM card plus 25 SMS locations in mobile equipment - Transmission of SMS alternatively over CSD or GPRS. Preferred mode can be user defined.
Fax	Group 3; Class 1 & 2

Feature	Implementation
Audio	Speech codecs: - Half rate HR (ETS 06.20) - Full rate FR (ETS 06.10) - Enhanced full rate (ETS 06.50/06.60/06.80) - Adaptive Multi Rate AMR Echo cancellation, DTMF, 7 different ringing tones
TCP/IP stack	Protocols: TCP server/client, UDP, HTTP, FTP, SMTP, POP3 Access by AT commands
Watchdog	Integrated watchdog timer that resets terminal every 8 to 10 hours
Software	
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Cinterion AT commands for RIL compatibility
Firmware update	Upgradeable via serial interface.
Interfaces	
Serial interface	RS-232 interface, bi-directional bus for AT commands and data. - Multiplex ability according to GSM 07.10 Multiplexer protocol - Adjustable baud rates: 1,200bps to 230,400bps - Autobauding: 1,200bps to 230,400bps - Supports RTS/CTS hardware handshake and software XON/XOFFflow control
Audio	Analog (Microphone, Earpiece)
SIM interface	Supported SIM cards: 3V, 1.8V
Antenna	Connected via antenna FME connector
Power on/off, Reset	
Power on	• Automatic switch on when power supply is attached • DTR line at RS232 interface or IGNITION line at power connector
Power off	• Normal switch-off by AT^SMSO command • Automatic switch-off in case of critical temperature and voltage conditions
Reset	Orderly reset by AT command or DTR line at RS232 interface or reset by integrated Watchdog timer on board.
Phonebook	SIM card and terminal

Table 3. Key feature of BGS2 Terminal

3. Interface Description

3.1 Overview

M Terminal provides the following connectors for power supply, communication and audio interface and antenna.

- 6-pole RJ11 (female) for power supply, ignition, power down signal
- 4-pole RJ11 (female) for audio accessory, such as a handset
- 9-pole (female) SUB-D plug for RS-232 serial interface
- FME Jack (male) for antenna (Antenna interface)
- SIM card holder
- Status LED
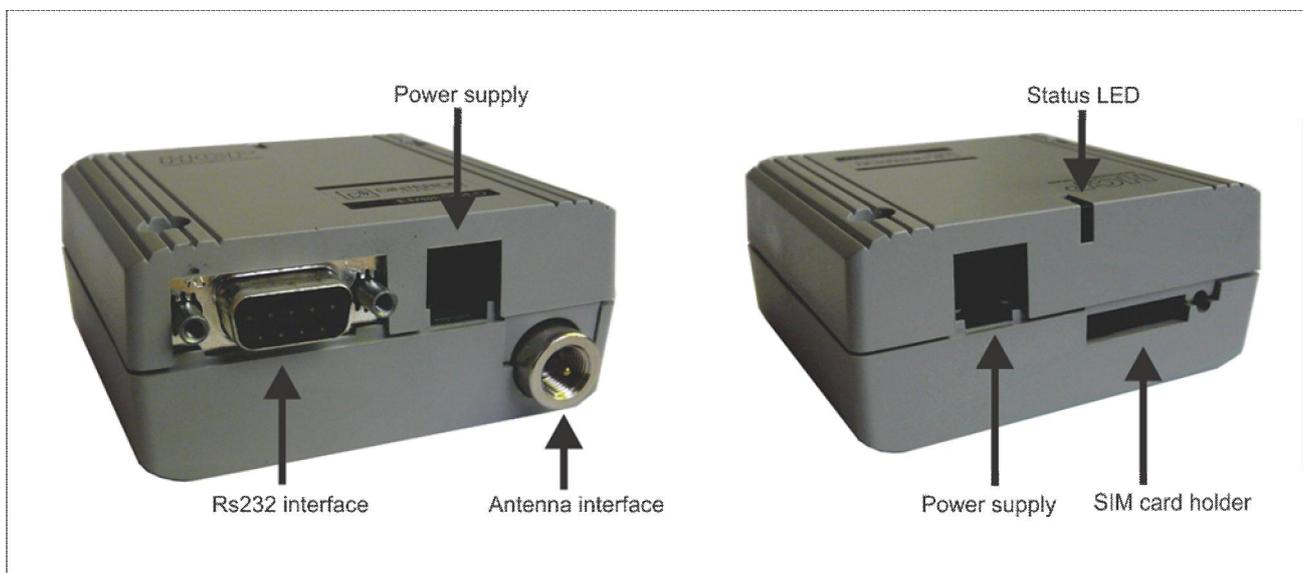
Figure 1. Front and rear view of M Terminal

3.2 Block Diagram

On Figure 2. shows block diagram of M terminal.

Figure 2. Block diagram of M terminal

3.3 Operating Modes M Terminals

The table below briefly summarizes the various operating modes referred to in the following sections.

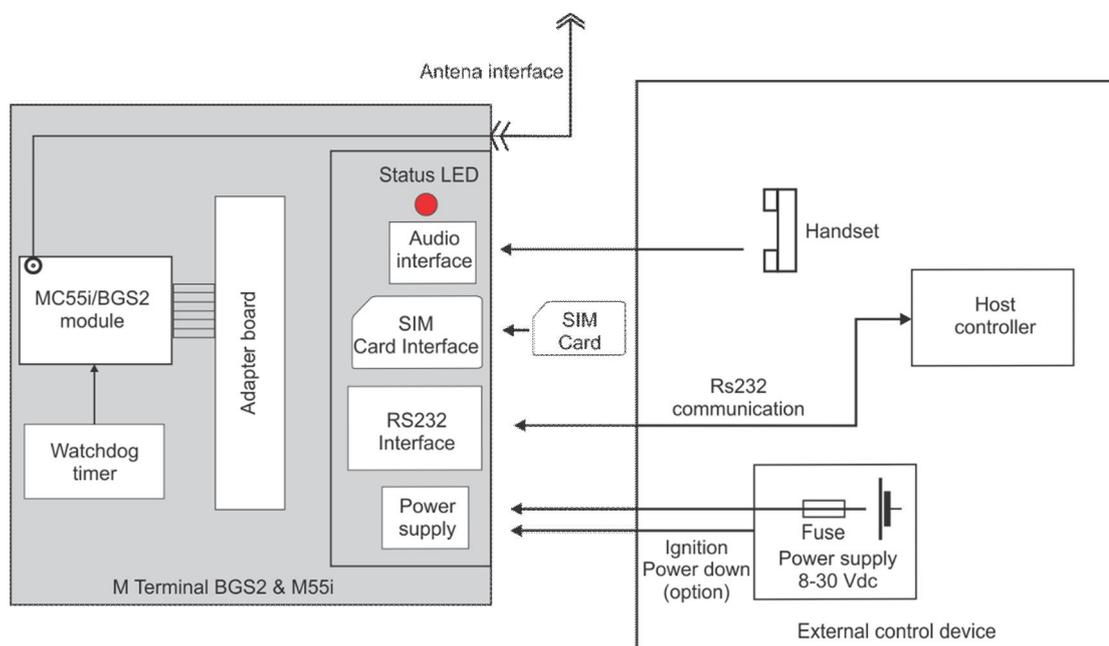| Mode	Function	
Normal operation	GSM/GPRS SLEEP	Various powersave modes set with AT+CFUN command. Software is active to minimum extent. If the module was registered to the GSM network in IDLE mode, it is registered and paging with the BTS in SLEEP mode, too. Power saving can be chosen at different levels: The NON-CYCLIC SLEEP mode (AT+CFUN=0) disables the AT interface. The CYCLIC SLEEP modes AT+CFUN=5, 6, 7, 8 and 9 (AT+CFUN=7 and 9 for BGS2) alternatingly activate and deactivate the AT interfaces to allow permanent access to all AT commands.
	GSM IDLE	Software is active. Once registered to the GSM network, paging with BTS is carried out. The module is ready to send and receive.
	GSM TALK	Connection between two subscribers is in progress. Power consumption depends on network coverage individual set-tings, such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.
	GPRS IDLE	Module is ready for GPRS data transfer, but no data is currently sent or received. Power consumption depends on net-work settings and GPRS configuration (e.g. multislot settings).
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / down-link data rates and GPRS configuration (e.g. used multislot settings).
POWER DOWN	Normal shutdown after sending the AT^SMSO command or after activation of the Power_down line (for M55i terminal)	

Table 4. Operating modes of M Terminals

3.5 Power Supply

The power supply of the M Terminals has to be a single voltage source of 8V to 30V capable of providing a peak current (pulsed 2x577ms at T=4.615ms) of about 1.2A at 12V during an active transmission.

The uplink burst causes strong ripple (drop) on the power lines. The drop voltage should not exceed 1V, but the absolute minimum voltage during drops must be >7.6V.

The MC55i Terminal is protected from supply voltage reversal.

Figure 3. Power supply connector

Pin	Singal name	Use	Parameters
1	Vcc	Positive power supply	8V – 30V DC
2	NC	--	--
3	Emergency_off	Signal for emergency off	U_{IH}>5V for minimum 200ms turns off M55i Terminal(Resets BGS2 Terminal)
4	Ignition	Ignition	U_{IH}>5V for minimum 200ms switches terminal on
5	NC	--	--
6	GND	Ground	0V

Table 5. Power supply connector pins

Pins on 6-pin RJ11 power supply connector 3. Emergency_off and 4. Ignition pin are additio- nal pins for ignition and emergency off of M terminal, you don't have to use them because M terminal has integrated circuits for ignition when the power supply is attached. Also M terminal can be restarted by DTR line on RS232 interace.

3.5.1 Turn M Terminal on

M terminal switches on automaticly when power supply is attached. After start-up, the MC55i Terminal enters the net searching state.

Also, if M terminal is switched off over AT command AT^SMSO, you can turn it on by activating the DTR line on RS232 interface.

After startup of the M Terminal the RS232 lines are in an undefined state for approx. 900ms. This may cause undefined characters to be transmitted over the RS232 lines during this period.

3.5.2 Reset M Terminal

One way to reset M Terminal is entering AT command AT+CFUN=x,1. For details on AT+CFUN please see [1], [2].

Other ways for restarting M terminal is:

- activating the DTR line on RS232 interface
- automatically by integrated watchdog timer on every 8 to 10 hours.

3.5.3 Turn off M Terminal

Normal shutdown:

- To turn off the MC55i Terminal use the AT^SMSO command, rather than disconnecting the power supply adapter.

This procedure lets the M Terminal log off from the network and allows the software to enter a secure state and save data before disconnecting the power supply. After AT^SMSO has been entered the M Terminal returns the following result codes:

^SMSO: MS OFF
OK
^SHUTDOWN

The "^SHUTDOWN" result code indicates that the M Terminal turns off in less than 1 second. After the shutdown procedure is complete the M Terminal enters the POWER DOWN mode. The status LED stops flashing (see Section 3.9 for a detailed LED description).

Emergency shutdown (reset)

- In the event of software hang-ups etc. the M Terminal can be switched off by applying a voltage >5V to the Emergency_off pin (pin 3) for more than 200ms.

The Emergency_off signal switches the M Terminal off (M55i Terminal switches off, BGS2 terminal resets). All internal supply voltages are off, except for the power down voltage.

When the MC55i Terminal enters the POWER DOWN mode, e.g. after you have issued the AT^SMSO command or activated the Emergency_off signal, all RS-232 interface lines are active for a period of 50ms to max. 3.5s. This may cause undefined characters to be transmitted on the RS-232 lines which can be ignored.

Caution: Use the Emergency_off pin only when, due to serious problems, the software is not responding for more than 5 seconds. Pulling the Emergency_off pin causes the loss of all information stored in the volatile memory since power is cut off immediately. Therefore, this procedure is intended only for use in case of emergency, e.g. if M Terminal fails to shut down properly.

3.5.4 Disconnecting power supply

Before disconnecting the power supply from the Vcc pin, make sure that the M Terminal is in a safe condition. The best way is to wait 1s after the "^SHUTDOWN" result code has been indicated.

3.5.5 Automatic thermal shutdown

On-board NTC measures the temperature of the built-in M Terminal. If over- or under temperature is detected on the module the M Terminal automatically shuts down to avoid thermal damage to the system.
Table 15 specifies the ambient temperature threshold for the M Terminal.

The automatic shutdown procedure is equivalent to the power-down initiated with the AT^SM-SO command, i.e. M Terminal logs off from the network and the software enters a secure state avoiding loss of data. In IDLE mode it takes typically one minute to deregister from the network and to switch off.

Alert messages transmitted before the M Terminal switches off are implemented as Unso-licited Result codes (URCs). For details see the description of AT^SCTM command provided in [1] and [2].
Thermal shutdown will be deferred if a critical temperature limit is exceeded, while an emergency call or a call to a predefined phone number is in progress, or during a two minute guard period after power up. See [1] for details.

3.6 RS-232 Interface

Over RS232 interface, external device, PC or other control device with RS232 interface, controls M Terminal.

Figure 4. M terminal RS232 pin assignment (D-Sub9 female)

Pin	Singal name	Input/Output	Function
1	DCD	output	Data Carrier Detect
2	RxD	output	Receive Data
3	TxD	input	Transmit Data
4	DTR	input	Data Terminal Ready ⚠ The ignition of M Terminal is activated via a rising edge of high potential (+3 ... +15 V)
5	GND	--	Ground
6	DSR	output	Data Set Ready
7	RTS	input	Request To Send
8	CTS	output	Clear To Send
9	RING	output	Ring Indication

Table 6. RS232 pin assigment

The RS-232 interface is implemented as a serial asynchronous transmitter and receiver conforming to ITU-T V.24 Interchange Circuits DCE. It is configured for 8 data bits, no parity and 1 stop bit, and can be operated at bit rates from 300bps to 230400kbps. Autobauding supports bit rates from 1200bps to 230400bps. Hardware handshake using the /RTS and /CTS signals and XON/XOFF software flow control are supported.

In addition, the modem control signals DTR, DSR, DCD and RING are available. The modem control signal RING (Ring Indication) can be used to indicate, to the cellular device

application, that a call or Unsolicited Result Code (URC) is received. There are different modes of operation, which can be set with AT commands.

3.7 Audio interface

Audio interface provides balanced analog microphone input and a balanced analog earpiece output.

M Terminal offers six audio modes which can be selected with the AT^SNFS command.
The electrical characteristics of the voiceband part vary with the audio mode. For example, sending and receiving amplification, sidetone paths, noise suppression etc. depend on the selected mode and can be altered with AT commands (except for mode 1).

Figure 5. Audio interface connector

Pin	Function
1	MICP – Microphone +
2	EPP – Earpiece
3	EPN – Earpiece
4	MICN – Microphone -

Table 7. Audio interface pin assignment

Please refer to [3] [4] for specifications of the audio interface and an overview of the audio parameters. Detailed instructions on using AT commands are presented in [1] and [2].

3.7 SIM interface

M Terminal provides SIM interface with automatic detection for 1.8V and 3V SIM cards in acc- ordance with GSM11.12 Phase 2.
The card holder is a six wire interface according to GSM 11.11 with detection whether or not a SIM card is inserted.

Figure 6. SIM interface

Removing and inserting the SIM card during operation requires the software to be reinitialized. Therefore, after reinserting the SIM card it is necessary to restart M Terminal.

Note: No guarantee can be given, nor any liability accepted, if loss of data is encountered afterremoving the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart the M Terminal.

3.8 Status LED

Red status LED displays the operating status of the M Terminal.

Figure 7. Red status LED flashing on M Terminal

The LED is driven by the SYNC line of the integrated MC55i module and GPIO5 pin on integrated BGS2 module which can be configured by using the AT^SSYNC command. For the purpose of the M Terminal it is recommended to retain the default setting of AT^SSYNC=1 (AT^SSYNC=0 is not applicable).

The following table lists the possible LED patterns and describes the operating status of the M Terminal indicated by each pattern if AT^SSYNC=1.

During the transition from one LED pattern to another the "on" and/or "off" periods of the LED may vary in length. This is because an event that triggers the change may occur any time and, thus, truncate the current LED pattern at any point.

LED mode	Operating status of M Terminal
Permanently off	M Terminal is in one of the following modes: - POWER DOWN mode - ALARM mode - NON-CYCLIC SLEEP mode - CYCLIC SLEEP mode with no temporary wake-up event1 in progress.
600 ms on / 600 ms off	Limited Network Service: No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.
75 ms on / 3 s off	IDLE mode: The mobile is logged to the network (monitoring control channels and user interactions). No call in progress.
75 ms on / 75 ms off / 75 ms on / 3 s off	One or more GPRS contexts activated.
500 ms on / 25 ms off	Packet switched data transfer in progress.
Permanently on	Depending on type of call: Voice call: Connected to remote party. CSD call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.

Table 8. Status LED operating status

3.9 Antenna interface

The external antenna is connected via the M Terminal FME jack (male), look at figure 8.

Figure 8. Antenna interface – FME jack

An internal antenna cable adapts the antenna reference point (antenna connector type U.FL-R-SMT from Hirose) to the FME (male) connector.

- Cable loss of the internal cable
  <0.4dB @ 900MHz
  <0.6dB @ 1800MHz
- The system impedance is 50
- In every case, for good RF performance the return loss of the customer application's antenna should be better than 10dB (VSWR < 2).

- M Terminal withstands a total mismatch at this connector when transmitting with power control level for maximum RF power.

4. Electrical and Environmental Characteristics

4.1 Apsolute Maximum Ratings

Parameter	Pin / Parameter	Min.	Max.	Unit
Supply voltage	Vcc	8	30	V
Input voltage for on/off contro lines	Ignition, Emergency_off	3	6	V
RS232 input voltage range	TxD, DTR, RTS	-20	+20	V
	RxD, CTS, DSR, DCD, RING	-0.3	+5.3	V
Microphone input voltage	MICP, MICN	-10	+10	V
Earpiece input voltage	EPP, EPN	-0.3	+0.3	V
Immunity against ESD	RS232 LINES	-15	+15	kV
Protection Class	IP40(avoid exposing M Terminal to liquid or moisture)		IP40	

Table 9. Apsolute maximum ratings

4.2 Recommended Operating conditions

Parameter	Pin / Parameter	Min.	Typ.	Max.	Unit
Supply voltage	Vcc		12		V
Operating temperature	M55i Terminal	-20	+25	+70	°C
	BGS2 Terminal	-30	+25	+85	°C

Table 10. Recommended operating conditions

4.3 Storage Conditions

Type	Condition	Unit	Reference
Air temperature: Low High	-30 +75	°C	ETS 300 019-2-1: T1.2, IEC 60068-2-1 Ab ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Humidity relative: Low High Condens.	10 90 at 30°C 90-100 at 30°C	%	--- ETS 300 019-2-1: T1.2, IEC 60068-2-56 Cb ETS 300 019-2-1: T1.2, IEC 60068-2-30 Db
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1: 1K4 IEC TR 60271-3-1: 1K4
Movement of surrounding air	1.0	m/s	IEC TR 60271-3-1: 1K4
Water: rain, dripping, icing and frosting	Not allowed	---	---
Radiation: Solar Heat	1120 600	W/m²	ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Chemically active substances	Not recomm.		EC TR 60271-3-1: 1C1L
Mechanically active substances	Not recomm.		IEC TR 60271-3-1: 1S1

Table 11. Storage conditions

The conditions stated above are only valid for devices in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is 12 months maximum.

4.4 Electrical Specifications of the Application Interface

4.4.1 Power Supply Ratings

Param.	Description	Conditions		Min.	Typ.	Max.	Unit
Vcc	Allowed votage ripple (peak to peak), drop during transmit	TALK mode					
Icc	Average supply current (average time 3 min.)	Power Down mode	@8V		500		µA
			@12V		720		
			@30V		1800		
		SLEEP mode (GSM/GPRS)	@8V		50		mA
			@12V		35		
			@30V		19		
		Net searching mode(no net)	@8V		75		mA
			@12V		53		
			@30V		34		
		IDLE mode (GSM/GPRS)	@8V		71		mA
			@12V		50		
			@30V		32		
		GSM TALK mode	@8V		280		mA
			@12V		180		
			@30V		75		
		GPRS DATA mode(1 Tx, 4 Rx)	@8V		290		mA
			@12V		185		
			@30V		80		
		GPRS DATA mode(2 Tx, 3 Rx)	@8V		380		mA
			@12V		190		
			@30V		80		
	Peak supply current (during 577µs transmission slot every 4.6ms)	Power control level for Pout max	@8V		1.6		A
			@12V		1.2		
			@30V		0.75		
t_{PLUS}	Allowed powerfail time without terminal reset or power down	After this time the M Terminal will be reset or switched off				1	ms
t_{R_PLUS}	Allowed rise time of Vcc	0 to 100%				20	ms

Table 12. Power supply ratings

4.4.2 On/Off Control

Param.	Description	Conditions	Min.	Typ.	Max.	Unit
V_{HIGH}	Input voltage	active high	4			V
V_{LOW}	-Ignition, -Emergency_off				2	V
V_{HIGH}	Input voltage	active high	4		+15	V
V_{LOW}	DTR		-15		1.2	V
t_{D_IGT}	Duration of active high -Ignition, DTR		200			ms
t_{D_EOff}	Duration of active high -Emergency_off		50			ms
t_{R_IGT}	Rise time on –Ignition pin for power up	0 to 100%			20	ms
t_{R_RTS}	Rise time on DTR pin for power up	0 to 100%			20	ms
t_{D_off}	Passive state(low) of –Ignition and DTR pin before restart	after power down	1s			ms

Table 13. On/off control

4.4.3 RS232 interface

Param.	Description	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Transmitter output voltage for RxD, CTS, DSR, DCD, RING	@3K to GND	±5	±5.4		V
R_{OUT}	Transmitter output resistance RXD, CTS, DSR, DCD, RING		300	10M		
R_{IN}	Resistance TxD, RTS, DTR		3	5	7	k
V_{IN}	Receiver input voltage range TxD, RTS, DTR		-25		+25	V
V_{LOW}	Input threshold low				0.8	V
V_{HIGH}	Input threshold high		2			
Baudrate		Autobauding	1,200		230,400	bps
		Fixed range	1,200		230,400	bps
RS232 cable				1.8	2	m

Table 14. RS232 interface

4.4.4 Audio interface

Parameter		Min.	Typ.	Max.	Unit
Microphone MICP, MICN	DC (no load) at MICP	5.6	5.9	6.2	V
	DC at MICP in POWER DOWN		0		V
	DC (no load) at MICN		0		V
	DC resistance differential MICN, MICP (balanced)	9.3	9.4	9.5	k
	Impedance Zi (balanced)		4.8		k
	Input level U_{iMAX}			1.03	V_{PP}
	Gain range 6dB steps	0		42	dB
	Frequency range	300		3400	Hz
Earpiece EPP, EPN	Fine scaling by DSP (inCalibrate)	–		0	dB
	Impedance (audio not active)		30		k
	Impedance (balanced)		15.2		k
	AC output level UO Gain = 0dB @ 3.14 dBm0 no load audio mode = 5, outBbcGain = 0, outCalibrate = 32767	3.3	3.7	4.07	V_{PP}
	Gain range	-18		0	dB
	Gain accuracy			0.8	dB
	Frequency area	300		3400	Hz
	DC Offset (balanced)			100	mV
	Attenuation distortion for 300...3900Hz			1	dB
	Out-of-band discrimination	60			dB

Table 15. Audio interface

For more information about audio interface refer to [3] and [4], for AT commands for controlling audio interface refer to [1] and [2].

4.4.5 Antenna interface

Parameter		Min.	Typ.	Max.	Unit
Frequency range Uplink (MS → BTS)	GSM 850	824		849	MHz
	E-GSM 900	880		915	MHz
	GSM 1800	1710		1785	MHz
	GSM 1900	1850		1910	MHz
Frequency range Downlink (BTS → MS)	GSM 850	869		894	MHz
	E-GSM 900	925		960	MHz
	GSM 1800	1805		1880	MHz
	GSM 1900	1930		1990	MHz
RF power @ ARP with 50 load	GSM 850	31	33	35	dBm
	E-GSM 900	31	33	35	dBm
	GSM 1800	28	30	32	dBm
	GSM 1900	28	30	32	dBm

Table 16. Antena interface

Please refer to [3] [4] for more information about antenna interface (air interface).
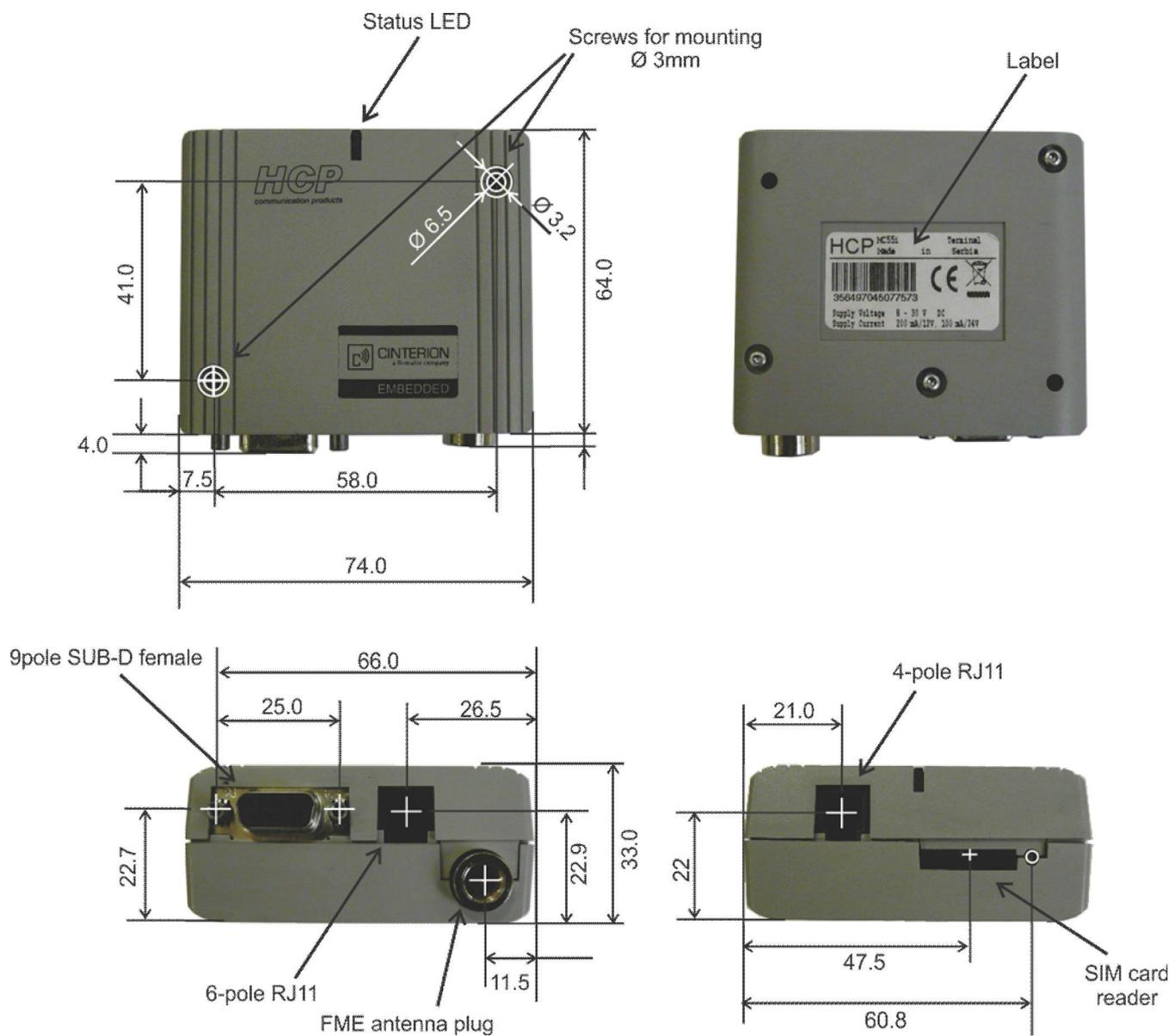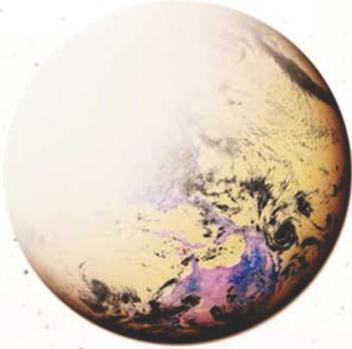
5. Mechanical Characteristics

Figure 8. Mechanical characteristics

6. List of Parts and Accessories

Description	Supplier	Picture
M Terminal BGS2	**HCP d.o.o**	
M Terminal M55i	**HCP d.o.o**	
Power supply (AC/DC 9V/2A)	**HCP d.o.o**	
FME antenna	**HCP d.o.o**	
RS232 cable (male – female)	**HCP d.o.o**	
Handset	**---**	

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