

# MC66T Users Guide



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### 1.4 Revision history

Revision	Date	Status	Description
Original	2011-07-10	Advance Information /Confidential	First release

Table 1: Revision history

### 1.5 Legal information

#### 1.5.1 Definitions

Advance Information	The document contains the design specification for product development. Specifications may change in any manner without notice.
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## 1.6 Terms and abbreviations

Abbreviation	Description
ASC	Asynchronous Controller. Abbreviations used for first and second serial interface.
CSD	Circuit Switched Data
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Communication Equipment (typically a modem or a terminal)
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically a computer, notebook or a GSM application))
DTR	Data Terminal Ready
EIA	Electronic Industries Alliance
FME	(Sub-miniature connector for radio frequencies)
IDE	Integrated Development Environment
J2ME	Java 2 Platform, Micro Edition
Java ME™	Java Mobile Edition
GND	Ground
GPIO	General Purpose Input / Output
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
I <sup>2</sup> C	Inter-integrated Circuit
IP	Internet Protocol

Abbreviation	Description
I/O	Input / Output
JDK	Java Development Kit
LED	Light Emitting Diode
ME	Mobile Equipment
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NDIS	Network Driver Interface Specification
PBCCH	Packet Broadcast Control Channel
PDP	Packet Data Protocol
PIN	Personal Identification Number
PPP	Point-to-Point Protocol
RAM	Random Access Memory
RF	Radio Frequency
RIL	Radio Interface Layer
RLP	Radio Link Protocol
RO	Ring Indicator
RSA	Remote SIM Access
RTS	Ready To Send
RXD	Receive Data
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
SMS	Short Message Service
tbd	To be defined
TCP	Transmission Control Protocol
TXD	Transmit Data
UART	Universal asynchronous receiver-transmitter
URC	Unsolicited Result Codes
USSD	Unstructured Supplementary Service Data

**Table 2: Terms and abbreviations**

## 1.7 Related documents

[1] BG2 Hardware Interface Description, Cinterion Wireless Modules GmbH

[2] BG2 AT Command Set, Cinterion Wireless Modules GmbH

## 2 Introduction

The MC66T is a GSM/GPRS-terminal for control, measurement, security, vending systems and mobile communication application.

The MC66T supports dual-band technology (900/1800 MHz) or quad-band technology (850/900/1800/1900 MHz) for GSM networks.

The control of the MC66T operates with AT Commands<sup>1</sup> via the serial interface (EIA/RS-232). All AT Commands are summarized in [2] BG2 AT Command Set.

Additional hardware information are described in [1] BG2 Hardware Interface Description.

### 2.1 Features

The GSM- and GPRS-features are provided by the integrated GSM-/GPRS-engine BG2. Most of them are supported with the MC66T:

Feature	Implementation
<b>General</b>	
Frequency bands	Dual band: GSM 900/1800 MHz (MC66T with BG2-E)
	Quad band: GSM 850/900/1800/1900 MHz (MC66T with BG2-E)

<sup>1</sup> AT Commands based on the Hayes command set developed in the 1970<sup>th</sup>; a command-language for modem.









Feature	Implementation
GSM class	Small MS
Output power (according to Release 99, V5)	<ul style="list-style-type: none"> <li>Class 4 (+33dBm <math>\pm</math>2dB) for EGSM850 (quad band only)</li> <li>Class 4 (+33dBm <math>\pm</math>2dB) for EGSM900</li> <li>Class 1 (+30dBm <math>\pm</math>2dB) for GSM1800</li> <li>Class 1 (+30dBm <math>\pm</math>2dB) for GSM1900 (quad band only)</li> </ul> <p>The values stated above are maximum limits. The maximum output power in a multi slot configuration may be lower. The nominal reduction of maximum output power varies with the number of uplink timeslots used.</p>
Ambient operating temperature (board temperature)	<ul style="list-style-type: none"> <li>Normal operation: -30°C to +85°C</li> <li>Restricted operation: +85°C to +90°C; -30°C to -40°C</li> </ul>
<b>GSM / GPRS features</b>	
Data transfer	<p>GPRS:</p> <ul style="list-style-type: none"> <li>Multi slot Class 8</li> <li>Full PBCCH support</li> <li>Mobile Station Class B</li> <li>Coding Scheme 1 – 4</li> </ul> <p>CSD:</p> <ul style="list-style-type: none"> <li>V.110, RLP, non-transparent</li> <li>2.4, 4.8, 9.6 kbps</li> <li>USSD</li> </ul> <p>PPP-stack for GPRS data transfer</p>
SMS	<p>Point-to-point MT and MO</p> <p>Cell broadcast</p> <p>Text and PDU mode</p> <p>Storage: SIM card plus 25 SMS locations in mobile equipment</p> <p>Transmission of SMS alternatively over CSD or GPRS. Preferred mode can be user defined.</p>
Fax	Group 3; Class 1
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Cinterion Wireless Modules
SIM Application Toolkit	Supports SAT class 3, GSM 11.14 Release 99, support of letter class "c"
Firmware update	Windows executable for update over serial interface ASC0.
<b>Interface</b>	
1 serial interfaces	<p>ASC0:</p> <ul style="list-style-type: none"> <li>8-wire modem interface with status and control lines, unbalanced, asynchronous</li> <li>Fixed bit rates: 1200 bps to 230400 bps</li> <li>Autobauding: 1200 bps to 230400 bps</li> <li>RTS0/CTS0 and XON/XOFF flow control.</li> </ul>
SIM interface	Supported SIM cards: 3V, 1.8V
Antenna	50Ohms. External antenna can be connected via antenna connector.
<b>Power on/off, Reset</b>	
Power on/off	<p>Switch-on by hardware pin IGT</p> <p>Switch-off by AT command (AT^SMSO)</p> <p>Automatic switch-off in case of critical temperature and voltage conditions.</p>
Reset	<p>Orderly shutdown and reset by AT command</p> <p>Emergency reset by hardware pin EMERG_RST and IGT.</p>
<b>Special features</b>	
Real time clock	Timer functions via AT commands
Phonebook	SIM and phone

Table 3: Features

### 3 Safety requirement

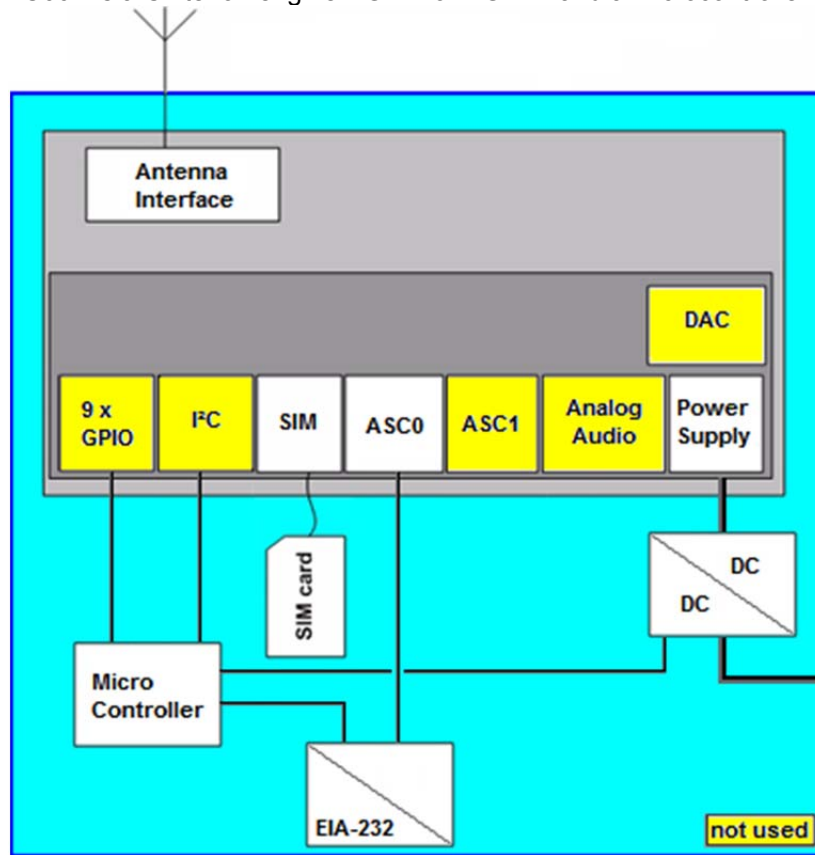


When in a hospital or other health care facility, observe the restrictions on the use of mobiles. Switch the cellular terminal or mobile off, if instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy. The operation of cardiac pacemakers, other 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.
	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.
	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 when 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.
	<b>IMPORTANT!</b> Cellular terminals or mobiles operate using radio signals and cellular networks. Because of this, connection 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 or receive calls, the cellular terminal or mobile must be switched on and 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 that a valid SIM card be properly inserted in the cellular terminal or mobile.
	Bear in mind that exposure to excessive levels of noise can cause physical damage to users! With regard to acoustic shock, the cellular application must be designed to avoid unintentional increase of amplification, e.g. for a highly sensitive earpiece. A protection circuit should be implemented in the cellular application.
	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 SMA jack of the device should be placed at least 20cm away from human bodies.

## 4 Product description

The core of the MC66T is a Cinterion engine BG2-E or BG2-W and a microcontroller.



**Figure 1: System overview**

The micro controller is responsible for the power supply, the interfaces and supervised the operation of the GSM engine BG2.

Detailed descriptions of the GSM engine BG2 are [1] BG2 Hardware Interface Description and [2] BG2 AT Command Set. Please consider these documents.

## 5 Interface description

### 5.1 Overview

The MC66T provide the following connectors:

- 6-pole Western plug (female) for power supply, ignition and power down signal (Emergency off)
- FME jack (male) for antenna (Radio Interface)
- SIM card holder
- 9-pole Sub-D plug (female) for EIA/RS-232 (RS-232) serial interface



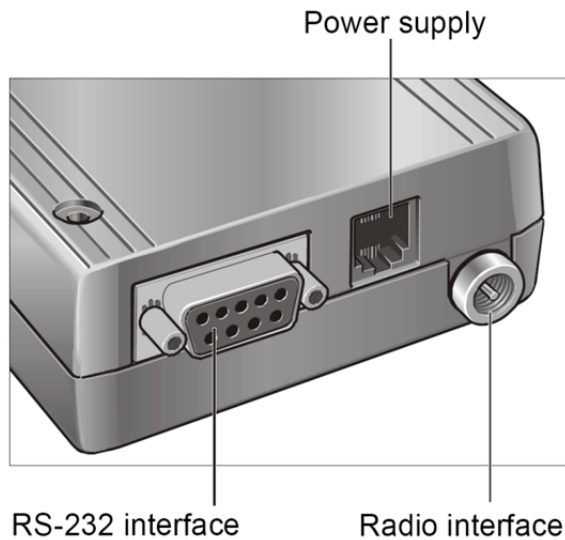


Figure 2: Interfaces

## 5.2 Supported operating modes

<b>Normal operation</b>	GSM / GPRS Sleep	Various power save 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=7 and 9 alternately 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
	GPRS IDLE	Module is ready for GPRS data transfer, but no data is currently sent or received. Power consumption depends on network settings and GPRS configuration (e.g. multi slot settings).
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates, GPRS configuration (e.g. used multi slot settings) and reduction of maximum output power.
<b>POWER DOWN</b>	Normal shutdown after sending the AT^SMSO command. Only a voltage regulator is active for powering the RTC. Software is not active. Interfaces are not accessible. Operating voltage (connected to BATT+) remains applied.	
<b>Airplane mode</b>	<p>Airplane mode shuts down the radio part of the module, causes the module to log off from the GSM/GPRS network and disables all AT commands whose execution requires a radio connection.</p> <p>Airplane mode can be controlled by using the AT commands AT^SCFG and AT+CALA:</p> <ul style="list-style-type: none"> <li>• With AT^SCFG=MEopMode/Airplane/OnStart the module can be configured to enter the Airplane mode each time when switched on or reset.</li> <li>• The parameter AT^SCFG=MEopMode/Airplane can be used to switch back and forth between Normal mode and Airplane mode any time during operation.</li> <li>• Setting an alarm time with AT+CALA followed by AT^SMSO wakes the module up into Airplane mode at the scheduled time.</li> </ul>	

Table 4: Supported operating modes

## 5.3 Power supply and on/off control

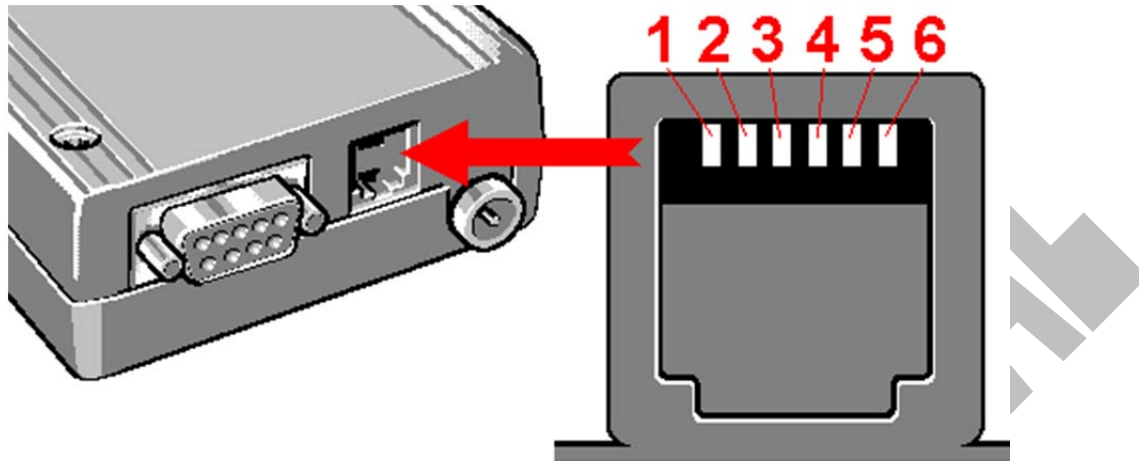
The power supply of the MC66T has to be a single voltage source of  $V_{PLUS} = 8\text{ V} \dots 30\text{ V}$ . The source has to be capable of providing peak currents of about 1.0 A at 12 V during an active transmission (pulsed 2.3075 ms at  $T = 4.615\text{ ms}$ ).

The power supply must be compliant with the EN60950 guidelines.

Pin	Signal name	Use	Parameters
1	PLUS	Power supply	8 – 30 V DC

Pin	Signal name	Use	Parameters
2	DO NOT USE	---	
3	POWER DOWN	Power Down Mode	$U_{IH} > 5\text{ V}$ for $t > 100\text{ ms}$ turns the terminal off.
4	IGNITION	Ignition	$U_{IH} > 5\text{ V}$ for $t > 100\text{ ms}$ turns the terminal on. Ignition is activated only by a rising edge.
5	DO NOT USE	--	
6	MINUS	Supply Ground	0 V

**Table 5: Pin assignment of the 6-pole Western jack for power supply, ignition and power down**



**Figure 3: Pin assignment of the 6-pole Western jack for power supply, ignition and power down**

## 5.4 Turn on

The terminal is switched on by an activating signal of Ignition (Pin 4 of the 6-pole Western jack) (rising edge).

Alternative the terminal can be switched on by an activating DTR signal on the EIA/RS-232 interface.

## 5.5 Turn off

### 5.5.1 Normal shutdown

To turn off the terminal use the AT Command "AT^SMSO"!

### 5.5.2 Emergency shutdown

In the case of hang-ups or similar the terminal can be switched off by applying a voltage of 5 V to 30 V to the "POWER DOWN" signal (pin 3 of the 6-pole Western jack).

**Use the "POWER DOWN" signal only in the case of serious problems! This procedure is intended only in the case of emergency!**

#### 5.5.2.1 Disconnecting the power supply

Before disconnecting the power supply, make sure that the terminal is switched off by the AT Command "AT^SMSO". The best way is to wait 1 second after the "^SHUTDOWN" result code has been indicated!

A general voltage separation will take place, if the 6pin western jack of the power supply will be completely removed.

#### 5.5.2.2 Automatic thermal shutdown

There is an on-board temperature measurement inside the terminal. If over- or under-temperature is detected the module is switched off.

## 5.6 Serial interfaces

The GSM-/GPRS-engine is equipped with two serial interfaces, ASC0 and ASC1 ([1] BG2 Hardware Interface Description). Here, only ASC0 is accessible from outside the case.

Via the serial interface, the host controller controls the terminal and transport data.

### 5.6.1 EIA/RS-232 interface

The EIA/RS-232 interface is realized with a D-Sub 9-pole female connector.

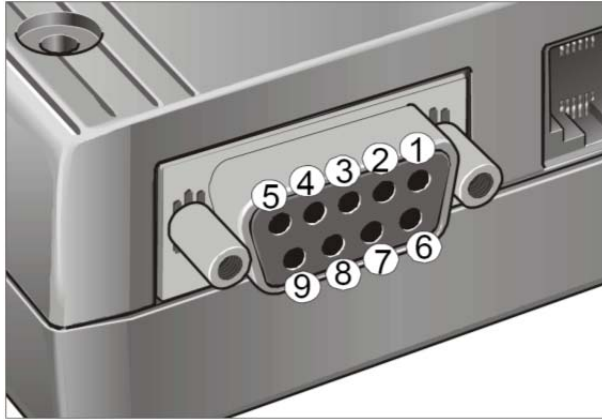


Figure 4: EIA/RS-232 interface (D-Sub 9-pole female connector)

Pin	Signal name	I/O	Function
1	/DCD	O	Data Carrier Detect
2	/RXD	O	Receive Data
3	/TXD	I	Transmit Data
4	/DTR	I	Data Terminal Ready
5	GND	-	Ground
6	/DSR	O	Data Set Ready
7	/RTS	I	Request To Send
8	/CTS	O	Clear To Send
9	/RI	O	Ring Indication

Table 6: Pin assignment of the EIA/RS-232 plug

The terminal is designed for use as a DCE. Thus, based on the convention for DCE-DTE connectors, the signal TXD is an input and RXD is an output.

#### 5.6.1.1 DTR - Data terminal ready

Activation the DTR signal (an edge from "space" to "mark") is switching on the terminal.

#### 5.6.1.2 RI – Ring indication

The ring indicator indicates incoming CSD- and voice-calls and additionally, Unsolicited Result Codes (URC) (see (1)).

The supported protocols are explained in [2] BG2 AT Command Set.

### 5.7 SIM interface

The SIM Interface is intended von 1.8 V and 3 V SIM cards.

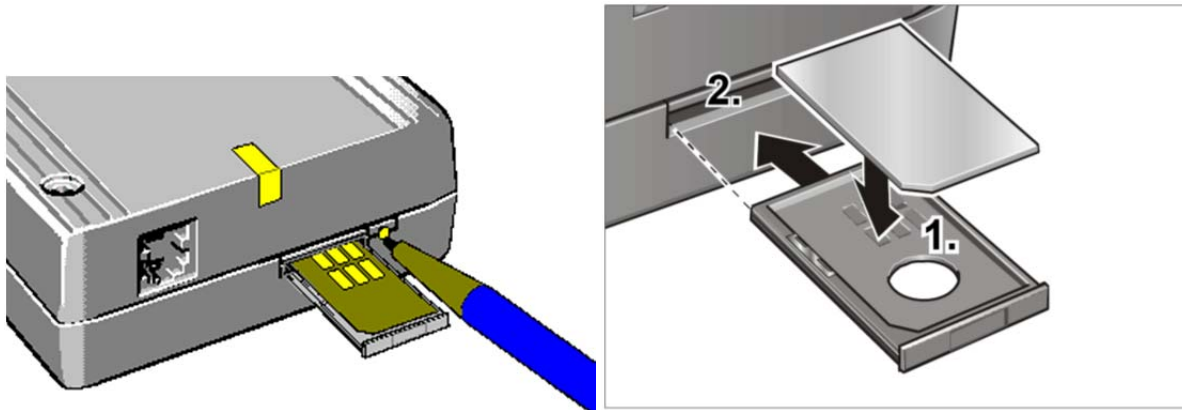


Figure 5: SIM interface

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 the terminal.

**Note:**

No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing 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 terminal.

### 5.8 Radio interface

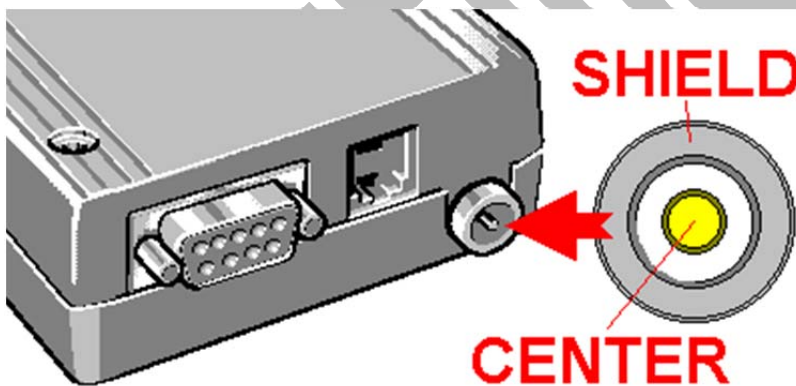


Figure 6: Radio interface

For the application it is recommended to use only FME (female) connectors:

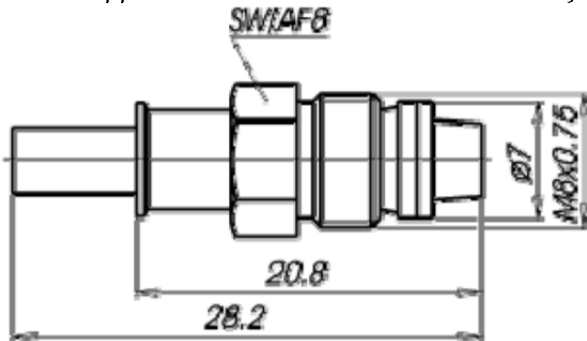
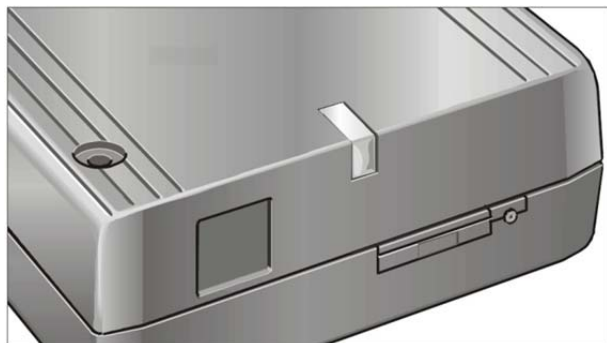


Figure 7: recommended antenna connector

## 5.9 Status LEDs



**Figure 8: Status LEDs**

There are LEDs to indicate the status and operation modes of the terminal. Additional to the following descriptions of the coding of the LEDs, the LEDs are flickering during the boot loader operation of the micro controller program (Firmware update) and during the configuration of the additional features (CCfg.exe etc.).

### 5.9.1 Red LED

The red LED indicates the power control and the status of the micro controller.

Operating status of the controller	LED mode	Description
Sleep mode	Off	Power supply connected, but not switched on
Ignition	flashing	The engine is switched on. The communication via the serial interface will be active after a few seconds.
Active mode	off	The red LED is off. Usually the yellow LED is flashing (Table 8: Coding of the yellow LED).
Standby mode	on	The duration of the Standby Mode is roundabout 30 seconds. If an ignition signal occurs (an active signal edge at pin 3 of the Western jack (5.4 Turn on) or an active edge on DTR (5.6.1.1 DTR - Data terminal ready)) the engine is activate immediately.

**Table 7: Coding of the red LED**

### 5.9.2 Yellow LED

The yellow LED is driven by the SYNC signal of the integrated GSM engine. The SYNC signal is configured by the AT Command "AT^SSYNC". For the purpose of the terminal it is recommend to use the AT Command "AT^SSYNC=1" ([2] BG2 AT Command Set).

LED mode	Operation status @ AT^SSYNC=1
Permanently off	ME is in one of the following modes: <ul style="list-style-type: none"> <li>• POWER DOWN mode</li> <li>• NON-CYCLIC SLEEP mode</li> <li>• CYCLIC SLEEP mode with no temporary wake-up event in progress <sup>1)</sup></li> </ul>
600 ms on / 600ms 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 registered to the GSM network (monitoring control channels and user interactions). No call is in progress.
75 ms on / 75 ms off / 75 ms on / 3 s off	One or more GPRS PDP contexts activated.
500 ms on / 50 ms off	Packet switched data transfer is in progress
Permanently on	Depending on type of call: <ul style="list-style-type: none"> <li>• Voice call: Connected to remote party.</li> <li>• Data call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.</li> </ul>

**Table 8: Coding of the yellow LED**

## 6 AT commands

All supported AT commands are described in [2] BG2 AT Command Set.

## 7 Software-/Firmware-update

Please differentiate between "Software" and "Firmware":

Software	"Software" means the program for GSM-/GPRS-engine. An update is possible via the serial interface. The actual version can be identified with the AT command "ATI". The response is for example "CINTERION, BG2-E, REVISION xx.yyy", with the Revision "xx.yyy". An update is possible with a Windows application.
Firmware	"Firmware" means the program for the micro controller inside the terminal. An update is possible via the serial interface. The actual version cannot be identified with an AT command! An update is possible with a Windows application.

Update programs are available from your local distributor.

## 8 Mechanical characteristics and mounting advice

<b>Weight:</b>	< 110 g				
<b>Dimensions (max):</b>	64 x 74 x 33 mm <sup>3</sup> (without connectors)				
<b>Temperature range:</b>		<b>Min</b>	<b>Type</b>	<b>Max</b>	<b>Unit</b>
	Normal operation	-30	+25	+85 <sup>2</sup>	°C
	Restricted operation <sup>1)</sup>	-40 to -30	---	+85 to +90	°C
	Automatic shutdown <sup>2)</sup>	<-40	---	>+90	°C
	Temperature measured on-board				
	<sup>1)</sup> Restricted operation allows normal mode speech calls or data transmission for limited time until automatic thermal shutdown takes effect. The duration of emergency calls is unlimited because automatic thermal shutdown is deferred until hang up.				
	<sup>2)</sup> Due to temperature measurement uncertainty, a tolerance on the stated shutdown thresholds may occur. The possible deviation is in the range of ±3°C at the over temperature limit and ±5°C at the under temperature limit.				
<b>Protection class</b>	IP40 (Avoid exposing to liquid or moisture, for example do not use in a shower or bath)				
<b>Air humidity</b>	5 ... 80% (non condensing)				

Table 9: Mechanical and operating characteristics

<sup>2</sup> The ambient temperature according to IEC 60068-2 is reduced to +75°C for GSM calls and GPRS Class 8 connections. For GPRS Class 10 connections it is reduced to +60 °C.

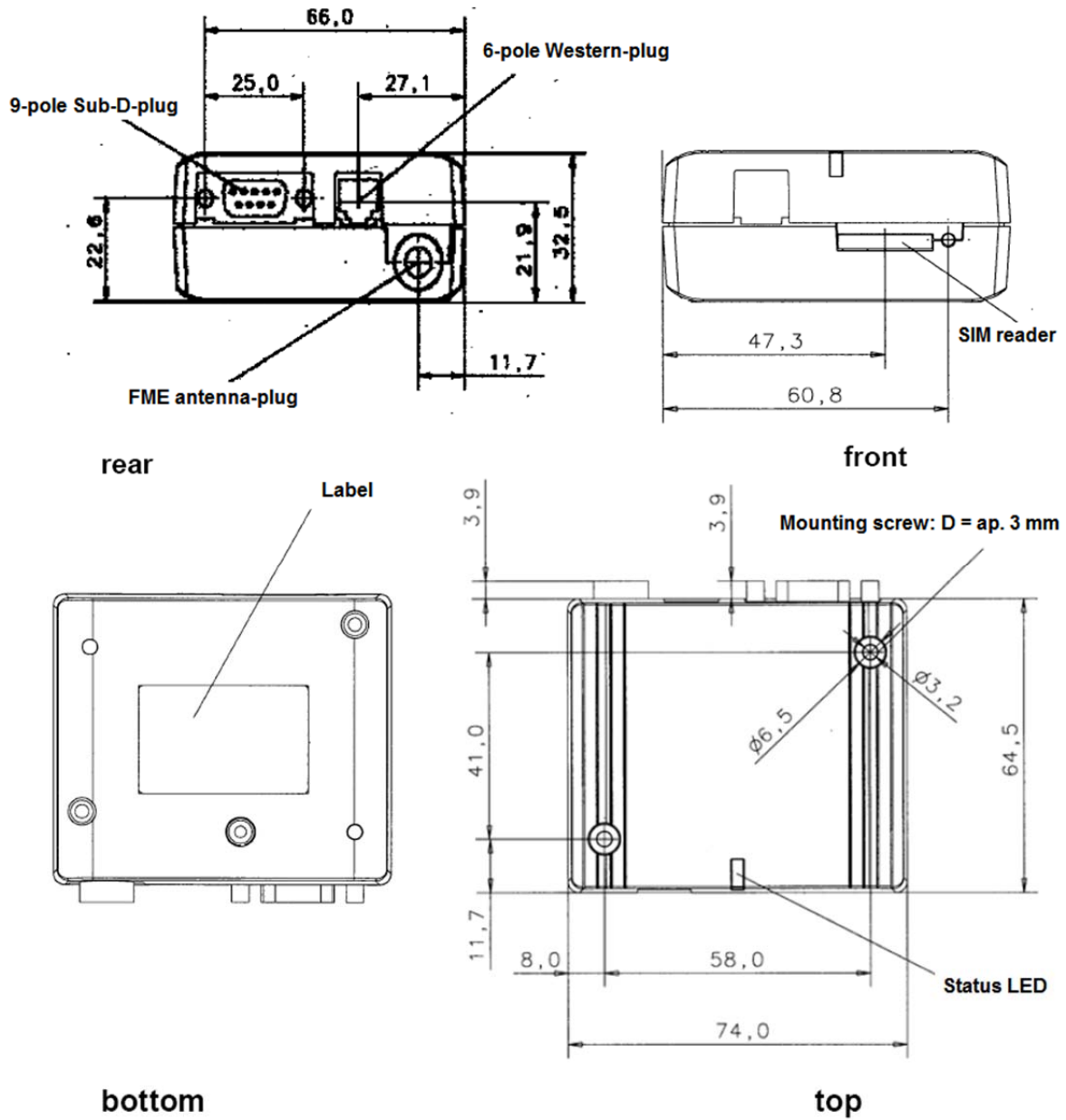


Figure 9: Design drawing

### 8.1 Mounting example

The terminal can be attached using two M3 x 50 mm screws.

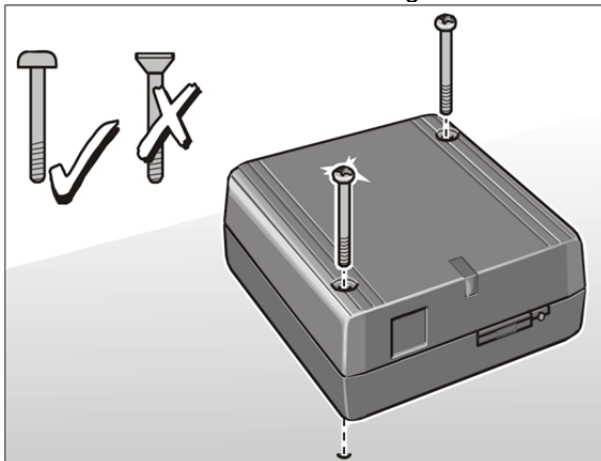


Figure 10: Recommend screws

## 9 Electrical and environmental characteristics

### 9.1 Absolute maximum ratings

Parameter	Port / Description	Min	Max	Unit
Supply Voltage	PLUS	0	30	V
Input voltage for on/off control lines	IGNITION, POWER DOWN	0	30	V
EIA/RS-232 input voltage range	/TXD, /DTR, /RTS /RXD, /CTS, /DSR, /DCD, /RING	-25	+25	V
Immunity against discharge of static electricity	PLUS, IGNITION, POWER DOWN	-8	+8	kV
	ESD-Protection: /TXD, /DTR, /RTS, /RXD, /CTS, /DSR, /DCD, /RING	-15	+15	kV
Protection class	IP40 (Avoid exposing to liquid or moisture, for example do not use in a shower or bath)		IP40	

Table 10: Absolute maximum ratings

### 9.2 Operation supply specification

Parameter	Description	Conditions	Min.	Typ. <sup>3</sup>	Max.	Unit
V <sub>PLUS</sub>	Supply voltage PLUS to MINUS measured at 6-pole Western jack plug (pin 1 to 6).		8	12	30	V
I <sub>PLUS</sub>	Burst current <sup>4</sup>				>1	A
I <sub>PLUS</sub>	Average supply current	Power Down Mode	@ 8 V	1,5	5,5	mA
			@ 12V	1,5	5,5	mA
			@ 30V	1,7	5,5	mA
		Sleep Mode	@ 8 V	1,5	5,5	mA
			@ 12V	1,5	5,5	mA
			@ 30V	1,7	5,5	mA

Table 11: Operation supply specification

Parameter	Description	Conditions						Unit
		Mode	GSM frequency	RF power <sup>5</sup>	Input Voltage <sup>6</sup>			
					8 V	12 V	30 V	
I <sub>PLUS</sub>	Average supply current	IDLE mode (GSM / GPRS)			15	12.5	12	mA
		GSM CSD mode	850/900 MHz	2 W	90	65	35	mA
			1800/1900 MHz	1 W	70	50	30	mA
		GPRS Data mode Class 8 (1 TX, 4 RX)	850/900 MHz	2 W	80	60	30	mA
			1800/1900 MHz	1 W	70	50	30	mA
		GPRS Data mode Class10 (2 TX, 3 RX)	850/900 MHz	2 W	140	100	50	mA
				1 W				mA
			1800/1900 MHz	1 W	110	80	40	mA
			0,5 W				mA	

Table 12: Average supply current

<sup>3</sup> The Parameters are tested and calculated. In practice they can vary depending of the antenna signal quality and the distance between the terminal and the GSM base station!

<sup>4</sup> The value and duration of the burst current depend on several conditions. Pay attention to use only power supplies that comply with the conditions in this document!

<sup>5</sup> The (maximal) RF power is adjustable by the command AT^SCFG="Radio/OutputPowerReduction"[,<ropr>] (see [2] BG2 AT Command Set)

<sup>6</sup> The Parameters are tested and calculated. In practice they can vary depending of the antenna signal quality and the distance between the terminal and the GSM base station!  
Peak levels are possible up to 1.4 A!



### 9.3 On-board operating temperature of build in GSM engine

Parameter	Min	Typ.	Max	Unit
Normal operation <sup>7</sup>	-30	+25	+85	°C
Restricted operation	-40 to -30	---	+85 to +90	°C
Automatic thermal shutdown	≤-40	---	≥+90	°C

Table 13: On-board operating temperature of build in GSM engine

### 9.4 On/off control line specification

Parameter	Description	Conditions	Min	Typ.	Max	Unit
V <sub>in,high</sub>	IGNITION, POWER DOWN			2,0		V
V <sub>in,low</sub>	IGNITION, POWER DOWN			1,5		
R <sub>IN</sub>	IGNITION, POWER DOWN			100		kΩ

Table 14: On/off control line specification

### 9.5 EIA/RS-232 interface specification

Parameter	Description	Conditions (T <sub>A</sub> =+25°C)	Min	Typ.	Max	Unit
V <sub>OUT</sub>	Transmitter output voltage for /RXD, /CTS, /DSR, /DCD, /RING	All transmitter outputs loaded with 3kΩ to ground	±5	±5.4		V
R <sub>OUT</sub>	Transmitter output resistor for /RXD, /CTS, /DSR, /DCD, /RING		300	10M		Ω
R <sub>IN</sub>	Receiver input resistor for /TXD, /RTS, /DTR		3	5	7	kΩ
V <sub>in</sub>	Input Voltage Range		-25		+25	V
V <sub>in,low</sub>	Input threshold voltage low		0.6	1.2		V
V <sub>in,high</sub>	Input threshold voltage high			1.5	2.4	V
V <sub>in,hysteresis</sub>	Input hysteresis			0.3		V
Baud rate	Maximum data rate	R <sub>L</sub> =3kΩ, C <sub>L</sub> =250pF	1000 <sub>8</sub>			kbps

Table 15: EIA/RS-232 interface specification

## 10 Power supplies

If you do not use the special power supply for the terminal, for example an alternative wall adapter please verifies the conditions and the necessary parameters.

- A voltage of 12 VDC is strictly recommended.
- The minimum output current should be 1.2 Ampere or more.
- The GSM burst transmissions are causing pulse currents at the power supply input.
- The power supply has to be protected against short circuit.
- Additional low-ESR Capacitors could be necessary.
- At higher voltages it is recommend placing a serial resistor into the power line.

## 11 Over temperature

Data transmission for a longer time can cause higher temperature of the GSM-/GPRS-engine. If the on-board temperature rises over the limited rating, the engine switches off automatically.

To avoid over temperature take care of the cooling.

- Do not cover the terminal!
- Take care for suitable ambient temperature.
- Use only recommended antennas.
- Use power supplies with an output voltage between 12 VDC and 15 VDC.

<sup>7</sup> The ambient temperature according to IEC 60068-2 is reduced to +75°C for GSM calls and GPRS Class 8 connections. For GPRS Class 10 connections it is reduced to +60 °C.

<sup>8</sup> The maximum baud rate of the GSM engine is 230400 bps.

## 12 Regulatory and type approval information

### 12.1 Directives and standards

The GSM-/GPRS-engine has been approved to comply with the directives and standards listed in [1] BG2 Hardware Interface Description.

It is the responsibility of the application manufacturer to ensure compliance of the final product with all provisions of the applicable directives and standards as well as with the technical specifications provided in [1] BG2 Hardware Interface Description.

### 12.2 SAR requirements specific to portable mobiles

Mobile phones, PDAs or other portable transmitters and receivers incorporating a GSM module must be in accordance with the guidelines for human exposure to radio frequency energy. This requires the Specific Absorption Rate (SAR) of portable GSM-/GPRS-applications to be evaluated and approved for compliance with national and/or international regulations.

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## 13 Configuration the special functions with "Ccfg.exe"

The configuration occurs with the program "Ccfg.exe".

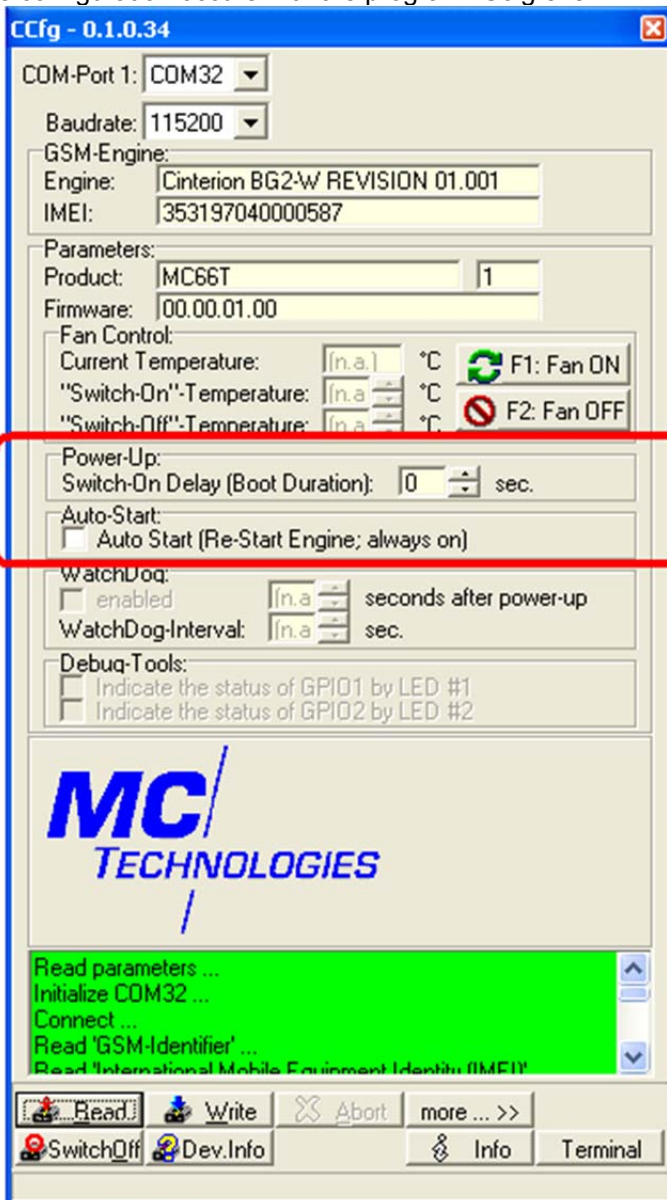


Figure 11: "Ccfg.exe"

### 13.1 Auto-Start

In autonomous application without personal control a fall out of the terminal perhaps would occur in dramatic effects - even in the case of only a little problem like a small power failure.

To prevent the terminal and of course the Java applications from longer breakdowns the "Auto-Start" functions re-starts the GSM-/GPRS-engine in the case that it is switched off. If the controller logic recognizes the off-state of the engine, it switched on the engine again automatically.

The "Auto-Start" function is an option that has to be enabled with the Windows program "Ccfg.exe" (13 Configuration the special functions with "Ccfg.exe").

## 14 Programming hints and warnings

- Do not use (internal) hardware features of the integrated GSM engine like Analog-Digital-Converter, charging etc.
- Do not use the GPIOs.

- The yellow LED is controlled by a signal from the GSM engine. **Never** use the command "AT^SSYNC=0" (see [2] BG2 AT Command Set).
- The Real Time Clock of the engine is only powered if the engine is switched on. There is no (power) backup. Thus the write command "AT+CCLK=<time>" and read command "AT+CCLK?" have no sense (see [2] BG2 AT Command Set). The command "AT+CALA=<time>[, <n>[, <type>[, <text>]]]" (see [2] BG2 AT Command Set) should never be used!
- The I2C bus of the engine should not be used. They are used internal of the terminal and incorrect usage could damage the terminal!

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