GT864-QUAD / PY Terminal
Product Description

80269ST10030a Rev. 4 - 2011-02-28

Making machines talk.

APPLICABILITY TABLE

PRODUCT	Part Number
GT864-QUAD	4990150152
GT864-PY	4990150153

Contents

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Such changes will, nevertheless be incorporated into new editions of this document.

1. Introduction

1.1. Scope

Scope of this document is to give an overview of the technical specific for the GT864 family of terminals.

1.2. Audience

This document is intended for customers who are evaluating the GT864 family of terminals.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:
http://www.telit.com/en/products/technical-support-center/contact.php
For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:
http://www.telit.com
To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).
Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.
Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- Software User Guide, 1vv0300784
- IP Easy User Guide, 80000ST10028
- AT Commands Reference Guide, 80000ST10025a
- Premium FOTA Management Product Description, 80287ST10048a
- PFM Application Note, 8000nt10013a
- PFM Certification Program Application Note, 8000nt10022a

1.6. Document History

Revision	Date	Changes
0	2007-04-20	First Issue
1	2007-07-30	-updated paragraph 2.6 Power Supply -added GT864 Terminal Accessories table (paragraph 6)
2	2008-03-20	Added mechanical design Updated accessories table Updated RoHS certification
3	2011-02-17	Updated RoHS and declaration of conformity certifications after the redesign of the terminal using the GE865 module. Added chapter 1 Updated software features chapter (4)
4	2011-02-28	Added part numbers to applicability table

2. Overview

Aim of this document is the description of features, functions and interfaces of the **Telit GT864 Terminal Family** which is a complete modem solution for wireless m2m applications with two models: GT864-QUAD based on the GE864-QUAD core and GT864-PY based on the GE864-PY. Since this Terminal is ready for use as a subsystem for wireless connections, Safety Information and basic instructions for taking the GT864 Terminals into operation are included, as well as guidance to other documentation and practical hints for the first steps.

The **Telit GT864 Terminal** is GSM Mobile Stations (MS class B) capable of using the GSM Circuit Switched Data (CSD), Fax and Short Message Services (SMS).

The embedded PYTHON engine in GT864-PY module allows performing stand-alone operations with the EASY SCRIPT feature, interpreting user-defined scripts in PYTHON language. In order to get more information refer to the Python Easy Script User Manual.

The GT864 Terminals can be remotely controlled by AT commands (GSM 07.07 and 07.05) and the connection to the host controller (Data Terminal Equipment DTE) is established through one RS232 standard port. This port serves also for serial bi-directional Data and Fax transfer.
All the interfacing is done by 4 connectors placed on the front and rear panels.
The Quad-band evolution **Telit GT864** includes features like sensing of hot removal of the SIM, the higher upload speed of the GPRS Class 10 Packet Data transfer and the entire structure results in a RoHS compliant product.

IP EASY Embedded

Telit GT864 embeds TCP/IP stack and DNS query protocol. Static and dynamic IP allocation, PPP and UDP as well as FTP Client are supported. Developers just need to add Telit Proprietary AT commands to establish a TCP/IP connection through the GPRS network.

EASY FREQUENCY SCAN® Function

Telit GT864 includes a dedicated set of AT commands to scan all the GSM channels, reporting all available parameters. With EASY FREQUENCY SCAN® the GSM network coverage at the location of the GT864 Terminal can be examined even without inserted SIM in order to select the provider with the best field strength, the most channels or base transceiver stations and to optimize the antenna position.

EASY SCRIPT® Function

Telit GT864-PY includes a dedicated set of AT commands to run scripts in PYTHON[1] language within the module. By using this EASY SCRIPT® feature, the script inside the module interacts with the interfaces, allowing other tasks to interrupt it. The script interpreter engine of **Telit GT864-PY** is allowing self controlled operations.

JAMMING DETECTION and REPORT

The **Telit GT864** offers the Jamming Detection and Report functionality, which allows the unit to detect attempts to discontinue GSM communication by interfering with the GSM radio signal. The "Jammed" status is reported as unsolicited message through the AT Command interface on the RS232 connection.

[1] PYTHON is a registered trademark of the Python Software Foundation.

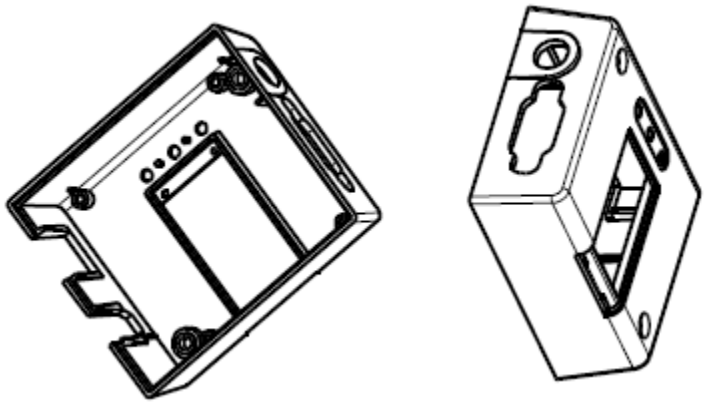
3. General Product Description

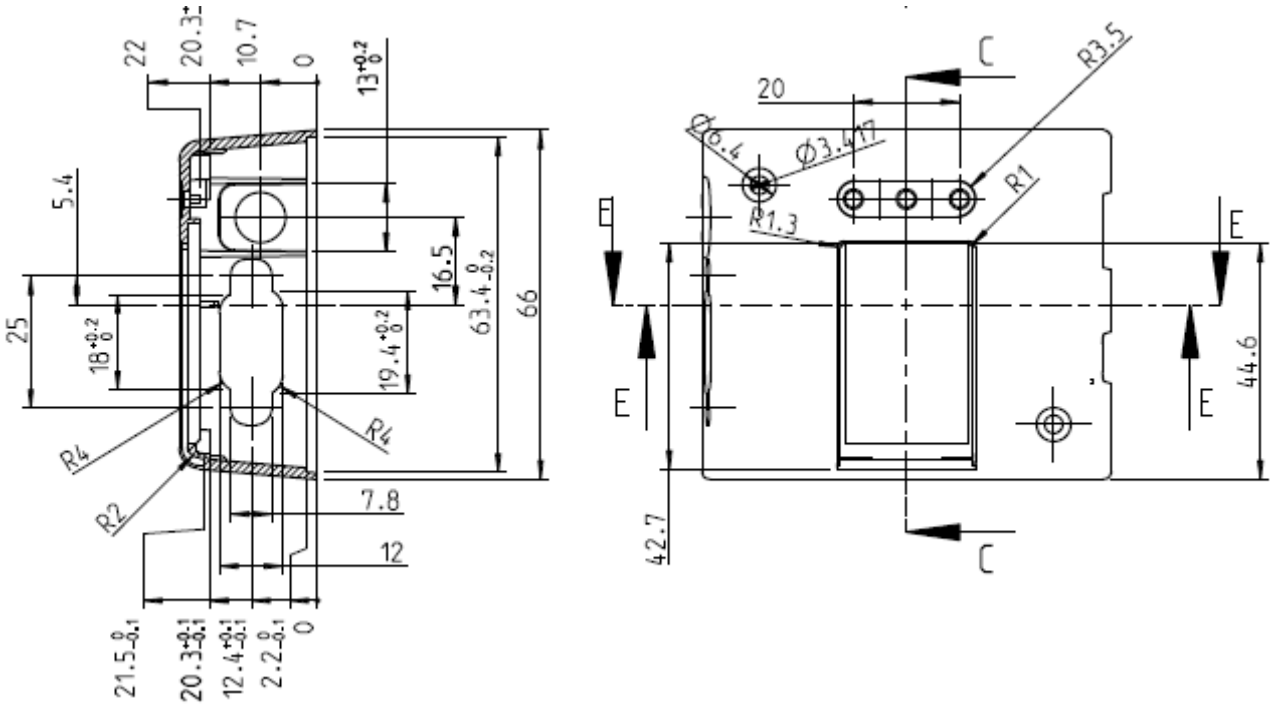
3.1. Dimensions

The **Telit GT864** dimensions are:

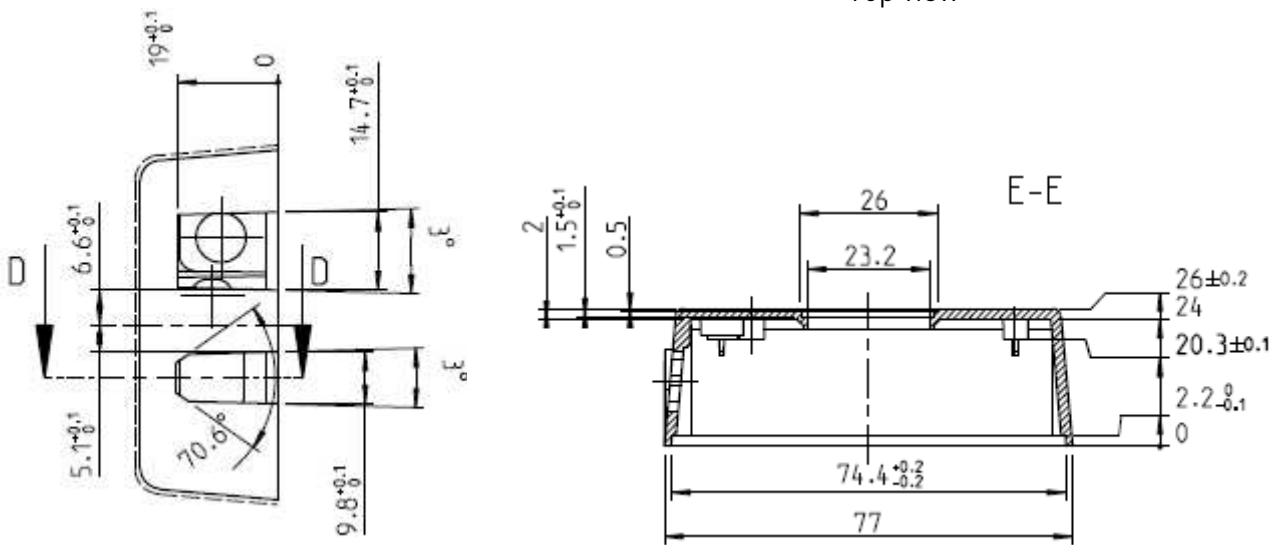
- Overall dimensions: 77 x 67 x 26 mm

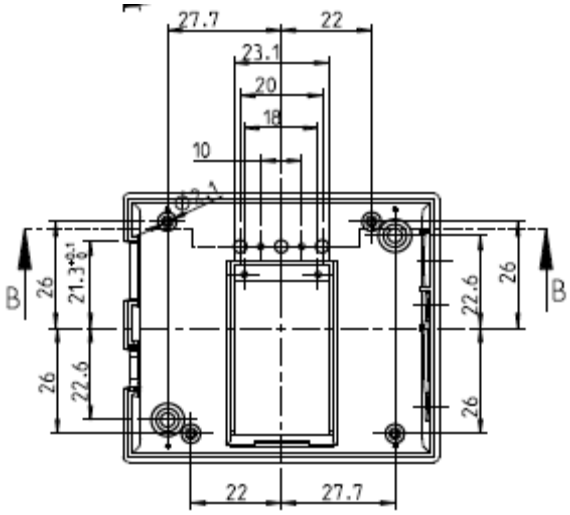
See the following figure:





Top view





Bottom view

3.2. Weight

The net weight of the **Telit GT864 Terminal** is 90 grams.

3.3. Installation

Before securing the modem take into account the amount of additional space required for the mating connectors and cables that will be used in the application.

- Where access is restricted, it may be easier to connect all the cables to the modem prior to securing it in the application.
- Securely attach the GT864-QUAD/PY Terminal modem to the host application using two 3mm diameter pan-head screws.

3.4. Environmental requirements

The **Telit GT864 Terminal** is compliant with the applicable ETSI reference documentation GSM 05.05 Release1999 ETSI EN300910 V8.4.1

3.4.1. Temperature range

	GT864-QUAD / GT864-PY	Note
Operation temperature	–20°C ÷ +55°C	Full function; Full specification compliance
	–30°C ÷ +75°C	Full function*
Temperature in not functional conditions	–40°C ÷ +85°C	

* Temperature outside the –20°C ÷ +55°C range can affect the sensitivity, the performance and the MTBF of the module.

3.4.2. RoHS compliance

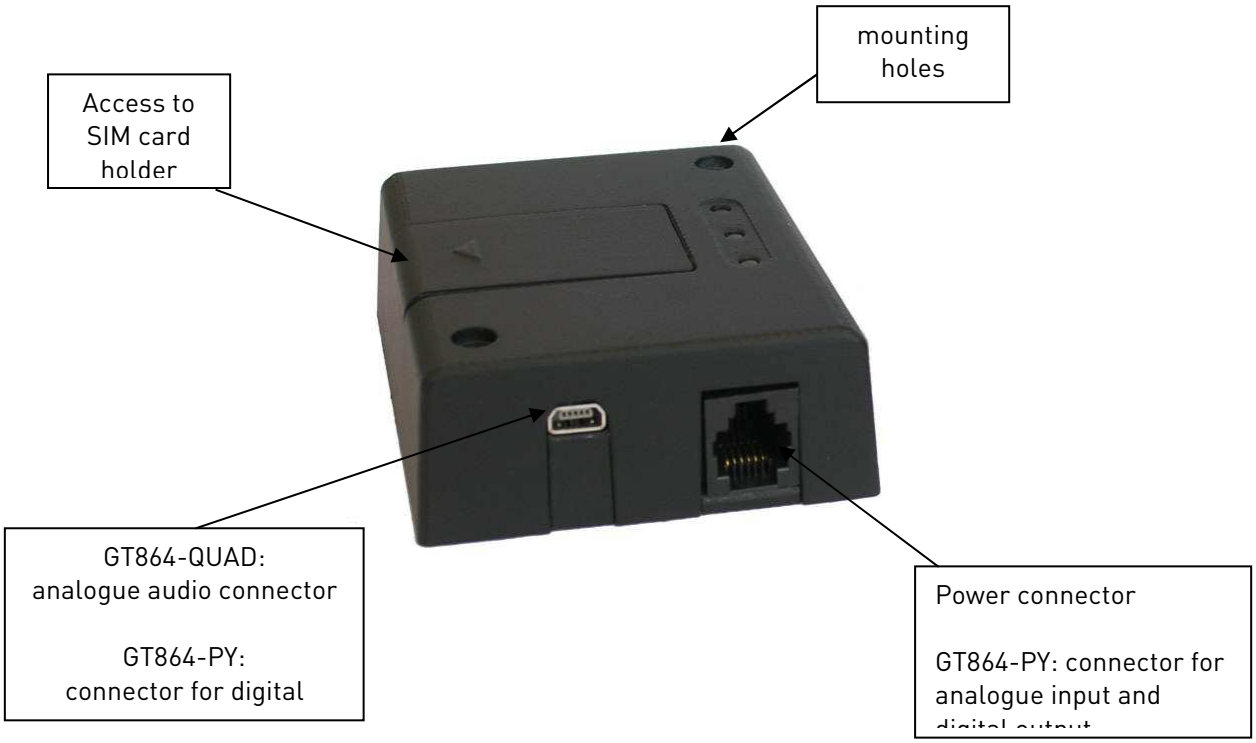
The **GT864 Terminal** is fully RoHS compliant to EU regulation.

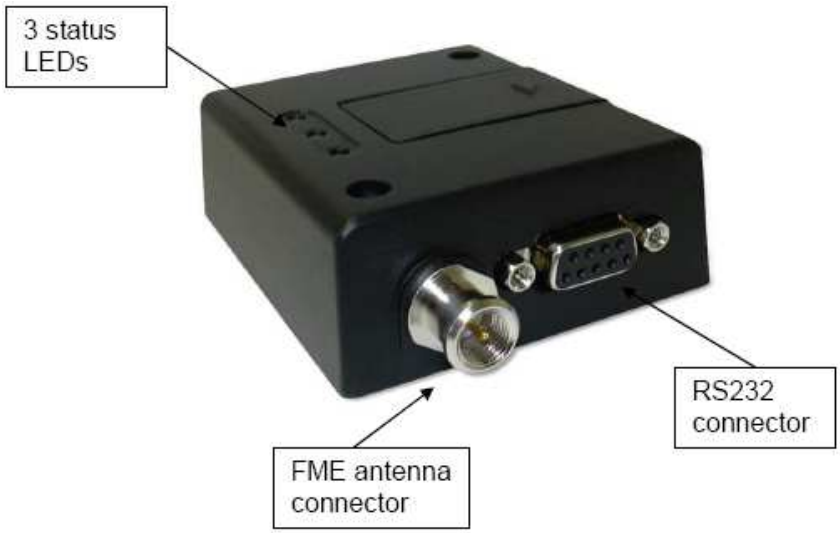
3.4.3. Documentation and User Guides

In order to get more detailed information on hardware and software features please consult different user guides for GE864. They're available on www.telit.com

3.5. GT864 Terminal Interfaces

The interfaces of the **GT864 Terminal** are the following industry standard connectors distributed on the front and rear panels, see figure.





- RJ11 6-way (power connector)
- Analog audio (GT864-QUAD only)
- 4 Input (GT864-PY only)
- SIM card reader
- FME male coaxial jack (antenna connector)
- Sub-D socket, 9 pin (RS232 serial port)

3.6. Power Supply

3.6.1. Supply voltage requirements

The DC power supply must be connected to the POWER input:

- Input voltage range 5 - 36V DC
- Nominal Voltage 12V DC

Application of the supply voltage does not switch the modem on. To do so an additional active-high control signal, TO_IN, must be applied for > 1s.
VCC and GND are reverse-polarity and over-voltage protected. Please note: this does not apply for the GND on the antenna connector if this coax GND/shield are connected to your applications ground-plane.

The measurement was realised by 4 different Voltages (5 V, 12V, 24 V and 32 V). The Terminals were connected via RS232 cable with the PC in order to receive AT commands.

Operation mode	[mA] @ 5V	[mA] @ 12V	[mA] @ 24V	[mA] @ 32V
GT864 off (VCC)*	0,060	0,064	0,072	0,076
GT864 off (VCC + TO-IN)*	0,070	0,470	1,660	2,560
GT864 off (VCC + DTR aktiv)*	9,0	7,4	8,3	8,9
GT864 idle mode (VCC)*	43,6	19,5	14,6	13,4
GT864 idle mode (VCC + TO-IN)*	43,7	20,0	16,2	15,9
GT864 voice call 900MHz (PL 5 / 33dBm)	325	150	72	58
GT864 voice call 900MHz (PL10 / 23dBm)	219	92	51	42
GT864 voice call 900MHz (PL15 / 13dBm)	181	77	43	36
GT864 voice call 1800MHz (PL 0 / 30dBm)	274	119	62	51
GT864 voice call 1800MHz (PL 5 / 20dBm)	201	85	47	39
GT864 voice call 1800MHz (PL10 / 10dBm)	175	75	42	35

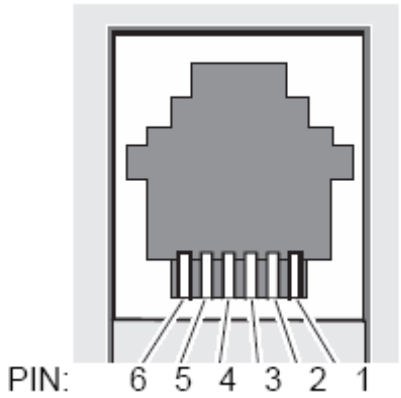
*Measurements without plugged serial portal (RS232)

NOTE:

In case that power supply equipment is to be ordered, its conformity needs to be verified with the mains supply voltage, frequency, connector type and other national requirements (e.g. certifications) in the countries of its use.

3.6.2. Power Connector

An RJ11 6-way connector, as shown and described below, serves as a means of supplying and controlling DC power to the modem.



Pin	Description
1	VCC
2	ADC_IN (GT864-PY only)
3	HR_IN
4	TO_IN
5	DIG_OUT (GT864-PY only)
6	GND

Signals of Power Connector:

PIN	Signal	Direction	Limits	Description
1	VCC	Input	5 – 36V	Positive power input, DC
2	ADC_IN or not connected	Input	0 – 36V	- No connection in GT864-QUAD version - Analogue Input in GT864-PY

3	HR_IN	Input	5 – 36V	Active high control line used to switch off or reset the modem V_{IH}>5V, V_{IL}<0.5V Power off: 1s < t < 2s
4	TO_IN	Input	5 – 36V	Positive edge triggered signal; used to switch on the modem V_{IH} > 5V, V_{IL} < 0.5V Power on: t > 1s
5	DIG_OUT / or not connected	Output	5 – VCC max. 36V	- Digital Output in GT864 PY - No connection in GT864 Quad version
6	GND	Input	-	Negative power (ground) input and return path for TO_IN and HR_IN

3.6.3. Mini USB type connector

There exist several different variants of the terminal module, all in (almost) the same housing, and all equipped with the mini USB-type connector:

- **GT864-QUAD with audio connector:** The GT864-QUAD Terminal provides "audio signals" on that connector, so you can connect a handset or microphone/speaker system here (available only for the GT864-QUAD)

- **GT864-PY with GPIO:** The programmable GT864-PY provides digital inputs on that connector, so you can use external digital signals to control the behaviour of the terminal thereby (available only for the GT864-PY)

You can find the version of your GT864 Terminal at the label on the button of the device.

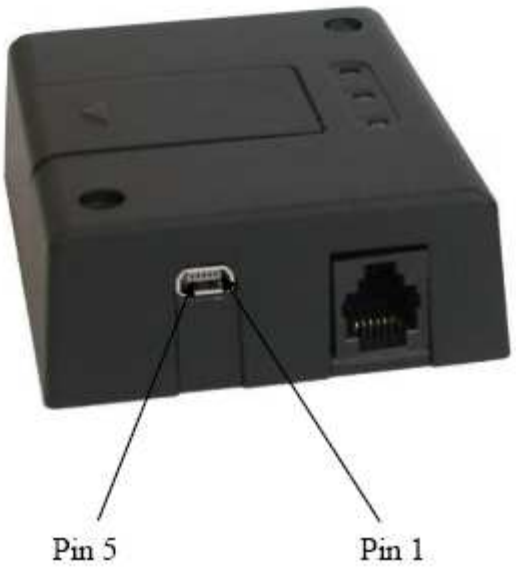
By their nature these 2 different signals are completely different regarding voltage levels, signal direction and applied energy. Especially the audio signals are quite sensitive to over-voltage, but are only protected against it to a limited extend, since otherwise the audio signal would be significantly deteriorated. So please make sure you are using the right variant for your application and do not mix up different variants - **especially do not drive any digital signals into the USB-type-connector of the audio-variant, since that might seriously damage the device.**

3.6.3.1. GT864-QUAD with audio connector

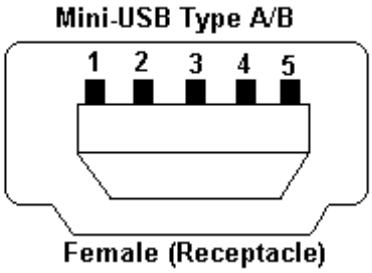
The USB connector supports the connectivity of a headset or any other audio equipment using the analogue microphone and loudspeaker interface of GT864-QUAD Terminal. The table below describes the signals on the USB connector.

Pinning Mini USB connector GT864-QUAD:

Pin	Signal	Colour[2]
1	MIC -	yellow
2	EAR -	red
3	MIC +	white
4	EAR +	turquoise
5	(GND – not necessary for audio)	black



[2] The colours of the cable are only for the cable delivered by company CEP! If you use other cable, please check the pinning before!



Available Voice Features are the following:

- Telephony, Emergency call
- Half rate, full rate, enhanced full rate and adaptive multi rate voice codec (HR, FR, EFR, AMR)
- Superior Echo cancellation & noise reduction
- DTMF

NOTE:

Please consult AT Commands Reference Manual for more detailed information.

3.6.3.2. GT864-PY with GPIO

At the mini USB connector are 4 inputs, with the following technical description:
- max. voltage V_{IN} is 30V
- low level: 0...1V
- high level: 12...30V
- ESD protected
- under full control of embedded application

Pinning of the USB connector for the GT864-PY:

GT864-PY GPIO	GE865-QUAD PIN	Mini USB	Mini USB PIN
GPIO 5	G2	IN1	1
GPIO 6	H8	IN2	2
GPIO 7	G6	IN3	3
GPIO 8	D4	IN4	4
-	-	GND	5

All inputs are under control of an embedded application script or AT commands.

The following commands have to be used to initialise and to read the status of the GPIOs:

at#GPIO=5,2,0(read GPIO5, PIN1 Mini USB)

at#GPIO=6,2,0(read GPIO6, PIN2 Mini USB)

at#GPIO=7,2,0(read GPIO7, PIN3 Mini USB)

at#GPIO=8,2,0(read GPIO8, PIN4 Mini USB)

3.7. Serial Ports

The RS232 standard interface serves to connect a PC, Data Terminal Equipment (DTE) or an application, which acts as host controller of the GT864 Terminal with all its functions. Through the RS232 interface it can be used as GSM/GPRS modem for sending and receiving of SMS, Data and Fax calls.

The **Telit GT864-PY**, on the basis of the EASY SCRIPT® feature and with a PYTHON script developed by the user, can allow self-controlled operations which put the RS232 interface in a different serial data transmission mode, e.g. to communicate with a sensor or actuator.

3.7.1. RS232 standard interface connector

Connector type on the terminal is:

- standard RS232 Sub-D 9pin female
- Maximum baud rate to communicate with the GT864 is 230,4 kbit/s
- Autobauding (300 to 38.400 bit/s)

The electrical characteristics of the serial port signals are shown below:

PIN	Signal	Direction	Voltage levels	Description
1	DCD	Output	> + 4 V < - 4 V	Data carrier detect
2	RD	Output	> + 4 V < - 4 V	Received data
3	TD	Input	> + 2,4 V < 0.8 V	Transmitted data
4	DTR	Input	> + 4 V < 0.8 V	Data terminal ready
5	GND	-	0 V	Ground connection
6	DSR	Output	> + 4 V < - 4 V	Data set ready
7	RTS	Input	> + 2,4 V < 0.8 V	Request to send
8	CTS	Output	> + 4 V < - 4 V	Clear to send
9	RI	Output	> + 4 V < - 4 V	Ring indicator

To connect to a PC as DTE, a pin-to-pin, 9 pin cable with D9 type connectors on both sides is needed (1 male & 1 female). Shielding of this cable is recommended and its length shall not exceed 3m.

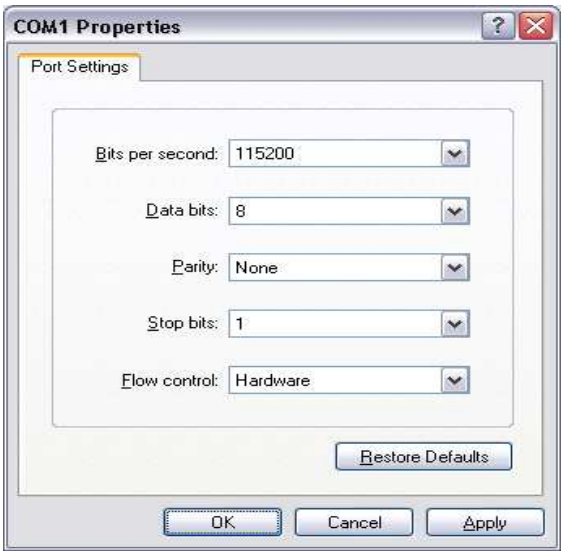
3.7.2. Serial Data

The modem supports the standard data character format of

- Programmable baud rate
- Auto-configuration mode with auto-baud.

3.7.3. The PC as Data Terminal Equipment (DTE)

The software application for using the PC RS232 standard serial interface (COM-port) as Data Terminal Equipment (DTE) is usually Hyper Terminal. Connect using the COM-port to which the GT864 Terminal is connected with the following settings:



For more information about which AT Commands are implemented on the GT864 Terminal can be found in the "GE864 Software User Guide" and "AT Commands Reference Guide", available on www.telit.com

NOTE:

We remind you that when you consult the AT Commands Reference Guide referring to the GE864 please consider the due to the limitations of the GT864 Terminal, such as number of GPIO, not all AT Commands can be implemented.

3.8. SIM Interface Characteristics

The GT864 Terminal is fitted with a SIM card reader designed for 3V SIM cards. It is the flip-up type which is lockable in the horizontal position and is accessed through a removable panel.

The **Telit GT864 Terminal** has an enhanced SIM card reader with a sensor that allows detecting of a "hot" removal of the SIM, therefore the SIM can be extracted and re-inserted while the module is still on.

NOTE:

On the **Telit GT864 Terminal** the sensing of a hot removal of the SIM is not supported during power saving mode (AT+CFUN=5).

3.8.1. SIM card precautions

Before handling the SIM card in your application, ensure that you are not charged with static electricity. Use proper precautions to avoid electrostatic discharges.

- When the SIM card hatch is opened, the SIM card connectors lie exposed under the SIM card holder. ***Caution!*** Do not touch these connectors! If you do, you may release an electrical discharge that could damage the modem or the SIM card.
- When designing your application, the SIM card's accessibility should be taken into account. We always recommend that you have the SIM card protected by a PIN code. This will ensure that the SIM card cannot be used by an unauthorized person.

3.9. Antenna

3.9.1. General

The antenna is the component in your system that maintains the radio link between the network and the modem. Since the antenna transmits and receives electromagnetic energy, its efficient function will depend on:

- the type of antenna (for example, circular or directional);
- the placement of the antenna;
- communication disturbances in the vicinity in which the antenna operates.

In the sections below, issues concerning antenna type, antenna placement, antenna cable, and possible communication disturbances are addressed. In any event, you should contact your local antenna manufacturer for additional information concerning antenna type, cables, connectors, antenna placement, and the surrounding area. You should also determine whether the antenna needs to be grounded or not. Your local antenna manufacturer might be able to design a special antenna suitable for your application.

3.9.2. Antenna type

Make sure that you choose the right type of antenna for the modem. Consider the following requirements:

Frequency range	Quad-band GSM 850/900 MHz GSM 1800/1900 MHz Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth	80 MHz in EGSM 900, 70 MHz if GSM 850, 170 MHz in DCS, 140 MHz PCS band
Gain	> 1.5 dBi
Impedance	50 ohm
Input power	> 2 W peak power
VSWR absolute max.	10:1
VSWR recommended	<= 2:1

3.9.3. Antenna placement

The antenna should be placed away from electronic devices or other antennas. The recommended minimum distance between adjacent antennas, operating in a similar radio frequency band, is at least 50cm. If signal strength is weak, it is useful to face a directional antenna at the closest radio base station. This can increase the strength of the signal received by the modem. The modem's peak output power can reach 2W. RF field strength varies with antenna type and distance. At 10cm from the antenna the field strength may be up to 70V/m and at 1m it will have reduced to 7V/m. In general, CE-marked products for residential and commercial areas, and light industry can withstand a minimum of 3V/m.

3.9.3.1. The antenna cable

Use 50Ω impedance low-loss cable and high-quality 50Ω impedance connectors (frequency range up to 2GHz) to avoid RF losses. Ensure that the antenna cable is as short as possible. The Voltage Standing-Wave Ratio (VSWR) may depend on the effectiveness of the antenna, cable and connectors. In addition, if you use an adapter between the antenna cable and the antenna connector, it is crucial that the antenna cable is a high-quality, low-loss cable. Minimize the use of extension cables, connectors and adapters. Each additional cable, connector or adapter causes a loss of signal power.

3.9.3.2. Antenna Connector

The **Telit GT864 Terminal** antenna connector allows transmission of radio frequency (RF) signals between the modem and an external customer-supplied antenna. The modem is fitted with a 50Ω FME male coaxial jack.

Description of antenna connector parameters:

Parameter	Limit	Description
Nominal impedance	50Ω	
Output Power	2 Watt peak (Class 4) 1 Watt peak (Class 1)	GSM900/850 GSM1800/1900

3.9.3.3. Antenna precautions

If the antenna is to be mounted outside, consider the risk of lightning. Follow the instructions provided by the antenna manufacturer.

- Never connect more than one modem to a single antenna. The modem can be damaged by radio frequency energy from the transmitter of another modem.
- Like any mobile station, the antenna of the modem emits radio frequency energy. To avoid EMI (electromagnetic interference), you must determine whether the application itself, or equipment in the application's proximity, needs further protection against radio emission and the disturbances it might cause. Protection is secured either by shielding the surrounding electronics or by moving the antenna away from the electronics and the external signals cable.
- The modem and antenna may be damaged if either come into contact with ground potentials other than the one in your application. Beware, ground potential are not always what they appear to be.

3.10. Operating Frequency

The operating frequencies in GSM, DCS, PCS modes are conform to the GSM specifications.

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels (ARFC)	TX - RX offset
E-GSM-900	890.0 - 914.8	935.0 - 959.8	0 – 124	45 MHz
	880.2 - 889.8	925.2 - 934.8	975 - 1023	45 MHz
GSM-850	824.2 – 848.8	969.2 – 893.8	128 - 251	45 MHz
DCS-1800	1710.2 - 1784.8	1805.2 - 1879.8	512 – 885	95 MHz
PCS-1900	1850.2 - 1909.8	1930.2 - 1989.8	512 - 810	80 MHz

3.11. Transmitter output power

GSM–850 / 900
The GT864 wireless modem in GSM–850/900 operating mode are class 4 in accordance with the specification which determine the nominal 2W peak RF power (+33dBm) on 50 Ohm.

DCS–1800 / PCS-1900
The GT864 wireless modem in DCS–1800/PCS-1900 operating mode are of class 1 in accordance with the specifications which determine the nominal 1W peak RF power (+30dBm) on 50 Ohm.

3.12. Reference sensitivity

GSM–850 / 900
The sensitivity of the GT864 wireless modem according to the specifications for the class 4 GSM–850/900 portable terminals is –107dBm typical in normal operating conditions.

DCS–1800 / PCS-1900
The sensitivity of the GT864 wireless modem according to the specifications for the class 1 portable terminals DCS-1800 / PCS-1900 is –106 dBm typical in normal operating conditions.

3.13. User Interface

The user interface of the GT864 Terminal is accessible from a Data Terminal Equipment DTE connected to the RS232 interface and it is managed by AT commands according to the GSM 07.07 and 07.05 specification and the supported commands are listed in the *AT Commands Reference Guide*.

3.13.1. Switching the GT864 Terminal ON and OFF

In this paragraph will be explained the way to switch the GT864 Terminals ON or OFF.

3.13.1.1. Switching ON the modem

There are two ways to switch on the modem, once power is applied:
• assert TO_IN high for > 1s;
• activate the RS232 control line DTR

The modem is fully operational after 4 seconds. Logging onto a network may take longer than this and is outside the control of the modem. The modem can be configured to start up at the time power is applied by permanently tying power connector signals TO_IN (pin 4) and VCC (pin 1) together. In this case DTR must be used to switch the modem on again after it has been switched off or reset, while power is still applied.

NOTE:

DTR must be cycled from low to high.

NOTE:

The TO_IN signal requires a positive "edge" (a "sharp" signal transition from low to high) to turn the modem on. This transition should be a rising signal from 0V (GND) to VCC, or at least a large fraction of that voltage range, and must be applied at the same time as VCC or after it. Very slow transitions (significantly slower than many milliseconds) or very small transitions (e.g. only a few volts instead of 0V to VCC) will not turn on the module (since they are not considered to be a "positive edge").
Although this will not be an issue in almost all typical applications of the modem, please consider the following points:

- large capacitors in your power supply which will lead to slow leading and falling edges (issue does not apply with modern stabilized switching regulator power-adaptors) AND TO_IN tied in parallel to VCC (instead of separate dedicated digital signal)
- slow analogue signals used to assert TO_IN
- TO_IN signal not before VCC

All 3 cases above might prevent the modem from recognizing the power-up signal this is no failure of the modem itself, the same would apply to almost any electronic device that provides a separate "power-on" or "reset" signal.
If you are in doubt, please

- use the mains power adapter that is provided by your distributor and is known to work properly with your modem
- make sure that your signal and system design is according to the above
- consult our support team that will be more than happy to assist you.

3.13.1.2. Switching OFF the modem

There are three ways to switch off (power down) the modem as described below:

- use the AT#SHDN command; DTR permanently to low (0,8V)
- HR_IN to high level for 1s < t < 2s

A delay of up to 10s is experienced as the modem logs off the network

3.13.2. SMS

The **Telit GT864** supports the following SMS types:

- Mobile Terminated (MT) class 0 – 3 with signaling of new incoming SMS, SIM full, SMS read
- Mobile Originated class 0 – 3 with writing, memorize in SIM and sending
- Cell Broadcast compatible with CB DRX with signaling of new incoming SMS.

3.13.3. Data/fax transmission

The **Telit GT864** supports:

- Packet Data transfer GPRS Class B, Multi-slot Class 8.
- Packet Data transfer GPRS Class B, Multi-slot Class 10.
- Data transmission according to the GSM 07.07, 07.05
- CSD up to 14.4 Kbps
- Fax service, Class 1 Group 3

3.13.4. Phonebook

Function available to store the telephone numbers in SIM memory.
Capability depends on SIM version/memory

3.13.5. Characters management

Availability of lowercase, uppercase and IRA characters (International Reference Alphabet), in TEXT and PDU mode.

3.13.6. LED Indicators

The GT864 Terminals have 3 LED indicators, two are status LEDs and one is power up LED.

3.13.6.1. Power up LED (green LED in the middle)

The modem has a green power up LED, as depicted below, which is used to indicate various operating states. These states are described in following table.

Operating state of GT864-QUAD/PY Terminal	Power up LED state
device off	permanently off
net search / not registered	Fast blinking (period=1s, LED_{on}=0,5s)
registered full service	Slow blinking (period=3s, LED_{on}=0,3s)
a call is active	permanently on

3.13.6.2. Status LEDs (one yellow, one red)

The red and yellow Status LEDs are under control of GPIO1 and GPIO2 of the GT864-QUAD/PY modem inside of the Terminal. They can be controlled via AT commands. The default status of these two LEDs is off.

The following commands have to be used to initialise and to configure the GPIOs to control the two LEDs:

Switching on GPIO1	at#gpio=1,1,1
Switching off GPIO1	at#gpio=1,0,1
Switching on GPIO2	at#gpio=2,1,1
Switching off GPIO2	at#gpio=2,0,1

These LEDs can be controlled e.g. by an external micro controller via AT commands issued to the terminal via the serial RS232 interface. They can be used for signalling any useful status of the external application such as:

- error indication
- status of communication (GPRS, SMS, CSD, etc.)
- status of GSM-network (to simulate GSM LED)
- quality of service

3.13.7. Automatic answer (Data or FAX)

After a specified number of rings, the module will automatically answer with a beep. The user can set the number of rings by means of the command ATS0=<n>.

3.13.8. Supplementary services (SS)

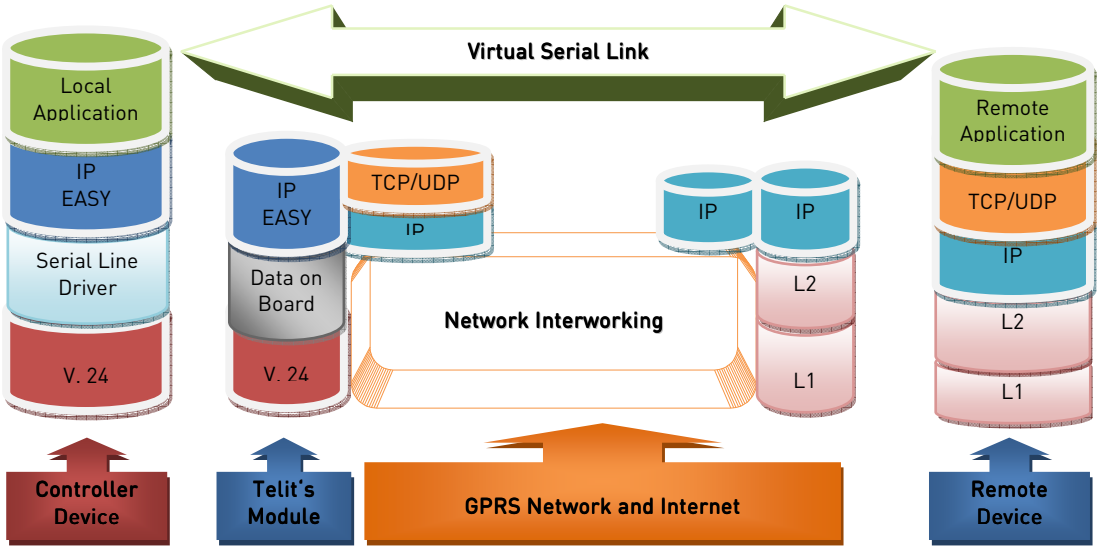
- Call Barring,
- Call Forwarding,
- Calling Line Identification Presentation (CLIP),
- Calling Line Identification Restriction (CLIR),
- Call Waiting, other party call Waiting Indication,
- Closed User Group supplementary service (CUG),
- Advice of Charge,
- Unstructured SS Mobile Originated (MO)

4. Software Features

4.1. IP Easy Extension

4.1.1. Overview

The IP Easy feature allows the Telit GT864 family of terminals user to contact a device in internet and establish with it a raw data flow over the GPRS and Internet networks.
This feature can be seen as a way to obtain a "virtual" serial connection between the Application Software on the Internet machine involved and the controller of the Telit GT864 family of terminals, regardless of all the software stacks underlying.



This particular implementation allows to the devices interfacing to the Telit GT864 family of terminals the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded in the module.

For more detailed information regarding the use of the IP Easy feature, please consult IP Easy User Guide and AT Commands Reference Guide.

4.2. Multisocket

The multisocket is an extension of Telit IP Easy feature, which allows the user to have two contexts activated (that means two different IP address), more than one socket connection (with a maximum of 6) and simultaneous FTP client service.

For more detailed information please consult the IP Easy User Guide.

4.3. Jamming Detection

4.3.1. Overview

The Jammed Detect feature allows the GT864 family of terminals to detect the presence of a disturbing device such as a Communication Jammer and give indication to the user.
This feature can be very important in alarm, security and safety applications that rely on the module for the communications. In these applications, the presence of a Jammer device can compromise the whole system reliability and functionality and therefore shall be recognized and reported to the local system for countermeasure actions.

4.4. CMUX

CMUX (Converter-Multiplexer) is a multiplexing protocol implemented in the GE865-QUAD that can be used to send any data, SMS, or TCP data.

4.4.1. Architecture

The Multiplexer mode enables one serial interface to transmit data to four different customer applications. This is achieved by providing four virtual channels using a Multiplexer (MUX).
This is especially advantageous when a data/GPRS call is ongoing. Using the Multiplexer features, e.g. controlling the module or using the SMS service can be done via the additional channels without disturbing the data flow; access to the second UART is not necessary.
Furthermore, several accesses to the module can be created with the Multiplexer. This is of great advantage when several independent electronic devices or interfaces are used.
To access the three virtual interfaces, both the GSM engine and the customer application must contain MUX components, which communicate over the multiplexer protocol.
In Multiplexer mode, AT commands and data are encapsulated into packets. Each packet has channel identification and may vary in length.

4.4.2. Features

- 3GPP 27.010 CMUX Basic Option used
- CMUX implementation support four full DLCI (Serial Port)
- Every CMUX instance has its own user profile storage in NVM

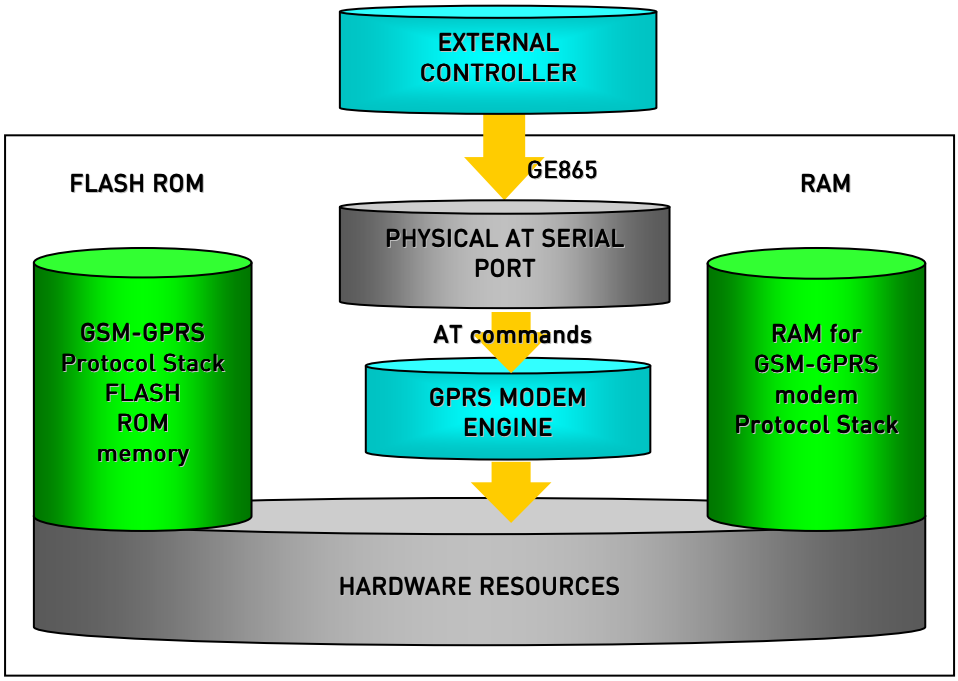
- Independent setting of unsolicited message.
- Every CMUX instance has its own independent flow control

NOTE: More details about the Multiplexer mode are available in the CMUX User Guide.

4.5. Easy Script Extension - Python interpreter

4.5.1. Overview

The Easy Script Extension is a feature that allows driving the modem "internally", writing the controlling application directly in a nice high level language: Python. The Easy Script Extension is aimed at low complexity applications where the application was usually done by a small microcontroller that managed some I/O pins and the GE865-QUAD through the AT command interface.
A schematic of such a configuration can be:



In order to not use any external controller, and further simplify the programming of the sequence of operations, the customer can benefit of these feature already embedded in the terminal:

- Python script interpreter engine v. 1.5.2+
- 1.9 MB of Non Volatile Memory room for the user scripts and data
- 1 MB RAM reserved for Python engine usage

4.5.2. Python 1.5.2+ Copyright Notice

The Python code implemented into the Telit module is copyrighted by Stichting Mathematisch Centrum, this is the license:
Copyright © 1991-1995 by Stichting Mathematisch Centrum, Amsterdam, The Netherlands. All Rights Reserved
Copyright (c) 1995-2001 Corporation for National Research Initiatives; All Rights Reserved.
Copyright (c) 2001, 2002, 2003, 2004 Python Software Foundation; All Rights Reserved.
Copyright (c) 2001-2008 Python Software Foundation; All Rights Reserved.
All Rights Reserved are retained in Python.
Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the names of Stichting Mathematisch Centrum or CWI or Corporation for National Research Initiatives or CNRI not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.
While CWI is the initial source for this software, a modified version is made available by the Corporation for National Research Initiatives (CNRI) at the Internet address ftp://ftp.python.org.

STICHTING MATHEMATISCH CENTRUM AND CNRI DISCLAIM ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, IN NO EVENT SHALL STICHTING MATHEMATISCH CENTRUM OR CNRI BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

NOTE: More details about the Python modules are available in the Easy Script in Python User Guide.

4.6. SAP: SIM Access Profile

4.6.1. Architecture

The SAP feature allows the module to use the SIM of a remote SIM Server. This feature is implemented using special AT Command on a Virtual circuit of the CMUX interface.

4.6.2. Implementation features

- SAP is based on 3GPP 27.010 CMUX Basic Option used
- Only SAP Client features
- Logic HW flow control is recommended on the Virtual instance selected for the SAP command.

4.6.3. Remote SIM Message Command Description

The module sends request commands to the client application through a binary message that is crowned in the CMUX message. The client application shall extract the message and send it to the SAP server, through the appropriate protocols (e.g. by RFCOMM, that is the Bluetooth serial port emulation entity).
The client application shall extract all the messages sent by SAP server and put them in the CMUX message, to be sent to the module.

The module fulfills the following feature requirements:

- Connection management
- Transfer APDU
- Transfer ATR
- Power SIM on
- Report Status
- Error Handling

Every feature needs some procedures support:

Feature	Procedure
Connection Management	Connect
	Report Status
	Transfer ATR
	Disconnection Initiated by the Client
	Disconnection Initiated by the Server
Transfer APDU	Transfer APDU
Transfer ATR	Transfer ATR
Power SIM on	Power SIM on
	Transfer ATR
Report Status	Report Status
Error Handling	Error Response

Report Status, Disconnection Initiated by the Server and Error Response are independent messages sent by server. The other procedures consist of couples of messages, started by client.

NOTE: More details about the SAP are available in the SAP User Guide.

4.7. Premium FOTA Management (PFM) Service

The premium FOTA Management Service provides a cost-effective, fast, secure and reliable way for wirelessly reflashing the firmware on mobile devices, ensuring that embedded software is up-to-date with the latest enhancements and features. Customers, who want to benefit from this service, must pass through the Telit certification program, where Telit will assist the customer in validating the correct implementation of FOTA.

4.7.1. FOTA (Firmware Over The Air)

Telit, which has signed a partnership agreement with the worldwide leader of Firmware OTA technology Red Bend, has integrated its unique vCurrent® Mobile client software for use in its m2m product portfolio. Telit is therefore able to upgrade its products by transmitting only a delta file, which represents the difference between one firmware version and another.
See “PFM Application Note” for details in www.telit.com > Product > GSM/GPRS > Product Family > Application Notes.

4.8. AT Commands

The Telit GT864 family of terminals can be driven via the serial interface using the standard AT commands.

The Telit GT864 family of terminals are compliant with:

1. Hayes standard AT command set, in order to maintain the compatibility with existing SW programs.
2. 3GPP 27.007 specific AT command and GPRS specific commands.
3. 3GPP 27.005 specific AT commands for SMS (Short Message Service) and CBS (Cell Broadcast Service)

Moreover the terminals support also Telit proprietary AT commands for special purposes.
For a more information about AT commands supported please refer to the AT Commands Reference Guide.

5. Conformity Assessment Issues

The **Telit GT864 terminals** are conform with the following European Union Directives:

- R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments)
- Low Voltage Directive 73/23/EEC and product safety
- Directive 89/336/EEC for conformity for EMC

In order to satisfy the essential requisite of the R&TTE 99/5/EC directive, the GT864 terminals are compliant with the following standards:

- GSM (Radio Spectrum). Standard: EN 301 511 and 3GPP 51.010-1
- EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 and EN 301 489-7
- LVD (Low Voltage Directive) Standards: EN 60 950

5.1. Declaration of Conformity

CEP

Aktiengesellschaft
Cellulare Produkte

CEP AG
Cellulare Produkte
Raiffeisenallee 12b
82041 Oberhaching
Telefon 089 / 450292-0
Telefax 089 / 450292-22

CE Konformitätserklärung / Declaration of Conformity

Hiermit wird erklärt, dass unsere Produkte / hereby we declare that our products

GT864-QUAD V2 Terminal, GT864-PY V2 Terminal
(based on the GE865 GSM module)

den folgenden Normen entsprechen / are in compliance with the following European Standards

EU Richtlinien / EU directives:

ETSI EN 301 489/EN 301511
Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services:

Part1: "Common technical requirements"
Part 7: "Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
- EN 61000-4-2
- EN 61000-4-3
- EN 55022

EN 60950-1
Safety of Information Technology

Oberhaching, 21st December 2010

Dr. Ditmar Prigge ; Vorstand

CEP AG Cellulare Produkte
Aufsichtsratsvorsitzende: Dr. Helene Prigge
Vorstand: Dr. Ditmar Prigge (Vorsitzender)
Frank Heineck

Hypo Vereinsbank
BLZ 700 202 70
Kto. 80 84 1370

Sitz der Gesellschaft: 82041 Oberhaching
HRB 143723, AG München
UST-ID: DE813494442

5.2. RoHS Certificate

CEP
Aktiengesellschaft
Cellulare Produkte

DECLARATION OF EU RoHS Compliance

We,
CEP AG

Of:
Raiffeisenallee 12b
82041 Oberhaching
Germany

declare under our sole responsibility that the products

GT864-Quad V2 (commercial name GT864 Quad)
GT864-PY V2 (commercial name GT864 PY)
(based on the GE865 GSM module)

to which this declaration relates, is in full compliance with EU Directive 2002/95/EC and subsequent amendments, on restriction of the use of certain Hazardous Substances in electrical an electronic equipment (RoHS).

The technical documentation or other showing that electrical and electronic equipment which has put on the market, complies the requirements of regulation, will be held at:

CEP AG
Raiffeisenallee 12b
82041 Oberhaching
Germany

Oberhaching, 21st December 2010

Frank Heineck
Managing Board CEP AG

CEP AG Cellulare Produkte
Aufsichtsratsvorsitzende: Dr. Helene Prigge
Vorstand: Dr. Ditmar Prigge (Vorsitzender)
Frank Heineck

Hypo Vereinsbank München
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Konto: 808 413 70
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Steuer-Nr.: 143/100/20509
USt-ID: DE813494442
Sitz der Gesellschaft: 82041 Oberhaching
HRB 143723 AG München

6. GT864 Terminal Accessories table

The following accessories for the GT864 can be provided separately:

Article	Telit Part No.
Power supply 230V AC / 12 V DC, 6pin RJ11 connector	4990250033
GSM Dual-Band Stub straight Antenna FME female (900/1800MHz)	4990250034
GSM Dual-Band Stub 90 degree Antenna FME female (900/1800MHz)	4990250035
RS232 data cable, 9-pin sub-D, L-180 9pin D-sub male D-sub female	1FF1400119TLB

NOTE:

Specifications and Part Numbers are subject to modifications.

7. GT864 Technical Support

Telit's technical support to Telit GT864 wireless modem customers:

- All available technical documentation is included for download into the Website www.telit.com
- Telit's engineering support is accessible via a selective E-Mail service with 48h replies assured under normal conditions.

In case of technical inquiries, the following information would be relevant to optimize Technical Support:

- Write Company, Project, Product Type, Trouble and Person reference in the "subject" field of the e-mail so that all mails can be easily retrieved also after several forwards
- The e-mail text should report:
  - Product Type
  - Delivery Date
  - Serial Number S/N of the GT864 Terminal
  - LOT N.
  - HW and SW code xSxxxxxxHxx
  - HW version of the GT864 Terminal: v.xx
  - Installed SW version (AT+CGMR)
  - IMEI (AT+CGSN)
  - Description of the Application, reference to its version (SW, HW)
  - SIM Type (issued by which Mobile Network Operator of Home PLMN or Service Provider and SIM type & supplier)
  - Network Conditions: location, registered network, coverage (AT#CSURV)
  - Antenna type
  - Used Services (MO, MT, voice, SMS, data, fax, GPRS)

...and then the question or trouble:

- Command & Response sequences
- Listing of the relevant parts of a Python Script
- Signal / pin, timing, levels...

Thank you!

8. SAFETY RECOMMENDATIONS

READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. The same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the people (20 cm). In case of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

8.1. Disposal of this product in the European Union

According to the directives 2002/95/CE, 2002/96/CE and 2003/108/CE, which have been transposed in Italian Legislative Decree of July 25, 2005, n. 151, Telit Communications S.p.A informs that:

- The symbol of the crossed-out wheeled bin reproduced on the product or on the packaging, indicates that the product, at the end of life cycle, must be gathered separately from the other waste.
- The separate collection of rubbish for this product at the end of its life cycle is arranged and managed by the manufacturer. The user, who wants to dispose the product, must contact the manufacturer and follow the available system that allows the separate collection of rubbish for this product that has reached the end of the life cycle.
- The suitable separate collection of rubbish, necessary for the subsequent transfer of the obsolete product for the recycling, the treatment and the compatible environment disposal, contributes to avoid possible negative effects to the environment and the health, and helps in the re-use and/or recycle of the materials from which this product is composed.
- The illegitimate disposal of the product by the holder implies the enforcement of the administrative penalties provided for the regulations in force.
- The company is enrolled on the register of the manufacturers of Electric and Electronic Equipment (EEE) of the Italian Minister for the Environment with the number: IT08020000002357

Reference Directives and Laws

2002/95/EC	Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
2002/96/EC	Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)
2003/108/EC	Directive of the European Parliament and of the Council of 8 December 2003 amending directive 2002/96/EC on waste electrical and electronic equipment (WEEE)
Italian Legislative Decree of July 25, 2005, n. 151	Attuazione delle direttive 2002/95/CE, 2002/96/CE e 2003/108/CE, relative alla riduzione dell'uso di sostanze pericolose nelle apparecchiature elettriche ed elettroniche, nonche' allo smaltimento dei rifiuti.

9. List of Acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
CB	Cell Broadcast
CBS	Cell Broadcasting Service
CCM	Call Control Meter
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CMOS	Complementary Metal-Oxide Semiconductor
CR	Carriage Return
CSD	Circuit Switched Data
CTS	Clear To Send
DAI	Digital Audio Interface
DCD	Data Carrier Detected
DCE	Data Communications Equipment
DRX	Data Receive
DSR	Data Set Ready
DTA	Data Terminal Adaptor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Equipment Institute
FTA	Full Type Approval (ETSI)
GPRS	General Radio Packet Service
GSM	Global System for Mobile communication
HF	Hands Free
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IRA	Internationale Reference Alphabet
ITU	International Telecommunications Union
IWF	Inter-Working Function
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Linefeed
ME	Mobile Equipment
MMI	Man Machine Interface
MO	Mobile Originated

MS	Mobile Station
MT	Mobile Terminated
OEM	Other Equipment Manufacturer
PB	Phone Book
PDU	Protocol Data Unit
PH	Packet Handler
PIN	Personal Identity Number
PLMN	Public Land Mobile Network
PUCT	Price per Unit Currency Table
PUK	PIN Unblocking Code
RACH	Random Access Channel
RLP	Radio Link Protocol
RMS	Root Mean Square
RTS	Ready To Send
RI	Ring Indicator
SAR	Specific Absorption Rate (e.g. of the body of a person in an electromagnetic field)
SCA	Service Center Address
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SPI	Serial Protocol Interface
SS	Supplementary Service
TIA	Telecommunications Industry Association
UDUB	User Determined User Busy
USSD	Unstructured Supplementary Service Data