Telit
GM862-QUAD
GM862-QUAD-PY
GM862-GPS
Product Description

TELIT Communications S.p.A. 2005

Model	P/N
GM862-QUAD	3990250655
GM862-QUAD-PY	3990250656
GM862-GPS	3990250657

Contents

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1 Overview

The GM862 family gets rich of a new generation of modules such as the GM862-GPS, GM862-QUAD-PY and GM862-QUAD, which combine the access to digital communication services in GSM 850, 900, DCS 1800, PCS1900 MHz networks with an additional key feature of the integrated GPS receiver (GM862-GPS only).

The Telit GM862-GPS includes a 20 channels GPS receiver. It provides all the features of the GM862-QUAD version such as Voice, Circuit Switched Data transfer, Phonebook, SMS, four bands GSM capability, hot removal sensing on board SIM Reader, GPRS Class 10 and battery charger circuitry.

Moreover, the GM862-GPS and GM862-QUAD-PY models, integrate the "***EASY SCRIPT*** " functionality. This is a PYTHON engine script interpreter allowing self-controlled operations. With the EASY SCRIPT feature the GM862-GPS and GM862-QUAD-PY become a finite product, they just need your script to be run.

The GM862 is specifically designed and developed by Telit for OEM usage and dedicated to portable data, voice and telematic applications, such as:

- ❑ **Telemetry and Telecontrol**
- ❑ **Security systems**
- ❑ **Vending Machines**
- ❑ **POS terminals**
- ❑ **Phones and Payphones**
- ❑ **Return channel for digital broadcasting**
- ❑ **Applications, where the external application processor can be replaced by the PYTHON engine provide by GM862-GPS or GM862-QUAD-PY**

Moreover, for the GM862-GPS:

- ❑ **Automotive and Fleet Management applications**
- ❑ **Position reporting and tracking**

All three models supports the following functionalities:

- ✓ *EASY GPRS (AT driven embedded TCP/IP protocol stack)*
- ✓ *EASY CAMERA (AT driven direct connection CAMERA function)*
- ✓ *EASY SCAN (full GSM frequency scanning)*
- ✓ *JAMMING DETECT & REPORT (detect the presence of disturbing devices)*

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From the interface point of view, the GM862-GPS, GM862-QUAD-PY and GM862-QUAD provide the following features:

- ✓ *Full RS232 UART, CMOS level (ASC0) interface for AT commands:*
    - *Auto-bauding from 2.4 up to 57.6 Kbps*
    - *Fixed baud rate up to 115.2 Kbps*
- ✓ *Two wires RS232, CMOS level (ASC1) for PYTHON debug:*
- ✓ *SIM card interface, 3 volts and 1.8 volts (GM862-GPS only)*
- ✓ *13 x GPIO ports (max)*
- ✓ *1 x A/D converters (GM862-GPS only)*
- ✓ *1 x buzzer output*
- ✓ *1 x led status output indicator*

In order to meet the competitive OEM and vertical market stringent requirements, Telit supports its customers with a dedicated Technical Support Policy with:

- ❑ Telit Evaluation Kit EVK2 to help you to develop your application;
- ❑ a Website with all updated information available;
- ❑ a high level technical support to assist you in your development;

For more updated information concerning product Roadmap and availability, technical characteristics, commercial and other issues, please check on the Telit website www.telit.com > Products > Modules.

NOTE: Some of the performances of the Telit GM862 modules depend on the SW version installed on the module itself.

The Telit GM862 SW group is continuously working in order to add new features and improve the overall performances.

The Telit GM862 modules are easily upgradeable by the developer using the Telit GM862 module Flash Programmer.

Furthermore, all the Telit GM862 products have the full conformity assessment against R&TTE.

Telit GM862 Module Pin-to-Pin Upgrade Policy will enable you to include in your application the new and future products of the GM862 family, allowing you to save your investments and to successfully penetrate new markets.

2 General Product Description

2.1　Dimensions

The Telit GM862-QUAD-PY and GM862-QUAD modules overall dimension are:

- **Length:**　　　　　**43.9 mm**
- **Width:**　　　　　**43.9 mm**
- **Thickness:**　　　　**6.9　mm**
- **Volume:**　　　　　**$\cong$ 13 cm^3**

The layout is shown in the following figure:
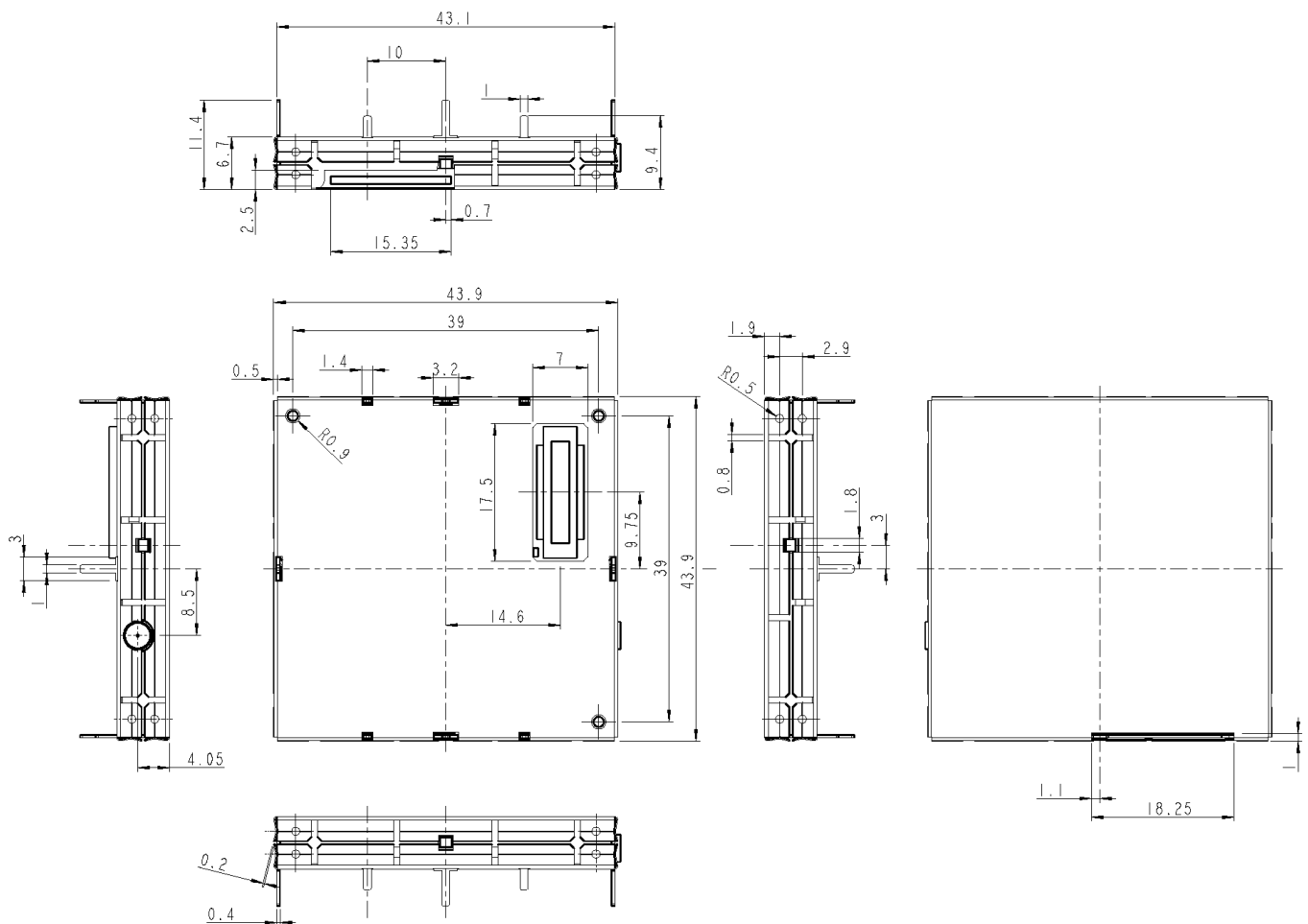
The layout of Telit GM862 GPS module is shown in the following figure:

GPS antenna connector
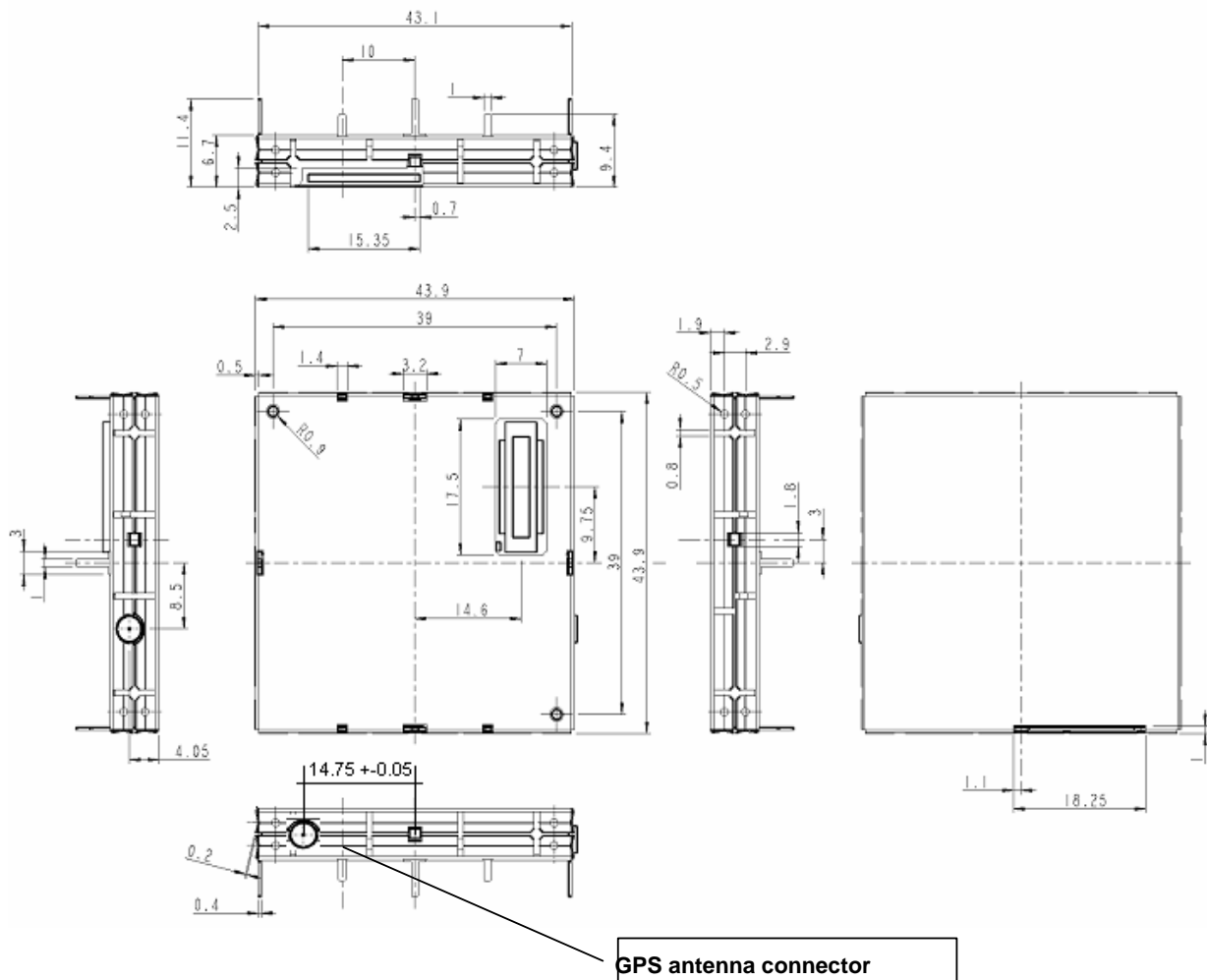
2.2   Weight

The Telit GM862 Family modules weight is **23÷28 gr** with shield and **16÷21 gr** without shield.

2.3   Environmental requirements

The Telit GM862 modules are compliant with the applicable ETSI reference documentation GSM 05.05 Release1999 ETSI EN300910 V8.4.1

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2.3.1 Temperature range

	GM862-QUAD / GM862-QUAD-PY	GM862-GPS
Temperature in normal operating conditions	−10°C ÷ +55°C	−10°C ÷ +55°C
Temperature in extreme operating conditions*	−30°C ÷ +80°C	−30°C ÷ +80°C (preliminary)
Temperature in storage conditions	−30°C ÷ +85°C	−30°C ÷ +85°C

* Temperature exceeding the range of normal functional conditions can affect the sensitivity, the performance and the MTBF of the module.

2.3.2 Vibration Test (non functional)

- 10 ÷12Hz   ASD = 1.92m 2 /s 3
- 12 ÷ 150Hz −3dB/oct

2.3.3 RoHS compliance

The GM862-QUAD /QUAD-PY and GM862-GPS are fully RoHS compliant to EU regulation.

2.4   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

2.5   Transmitter output power

GSM–850 / 900

The Telit GM862 modules in GSM–850 / 900 operating mode are of **class 4** in accordance with the specification which determine the nominal **2W** peak RF power (**+33dBm**) on 50 Ohm.

DCS–1800 / PCS–1900

The Telit GM862 modules 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.

2.6   Reference sensitivity

GSM–850 / 900

The sensitivity of the Telit GM862 modules according to the specifications for the class 4 GSM–850/900 portable terminals is **–107 dBm** typical in normal operating conditions.

DCS–1800 / PCS-1900

The sensitivity of the Telit GM862 modules according to the specifications for the class 1 portable terminals DCS-1800 / PCS-1900 is **–106 dBm** typical in normal operating conditions.

2.7   Antennas
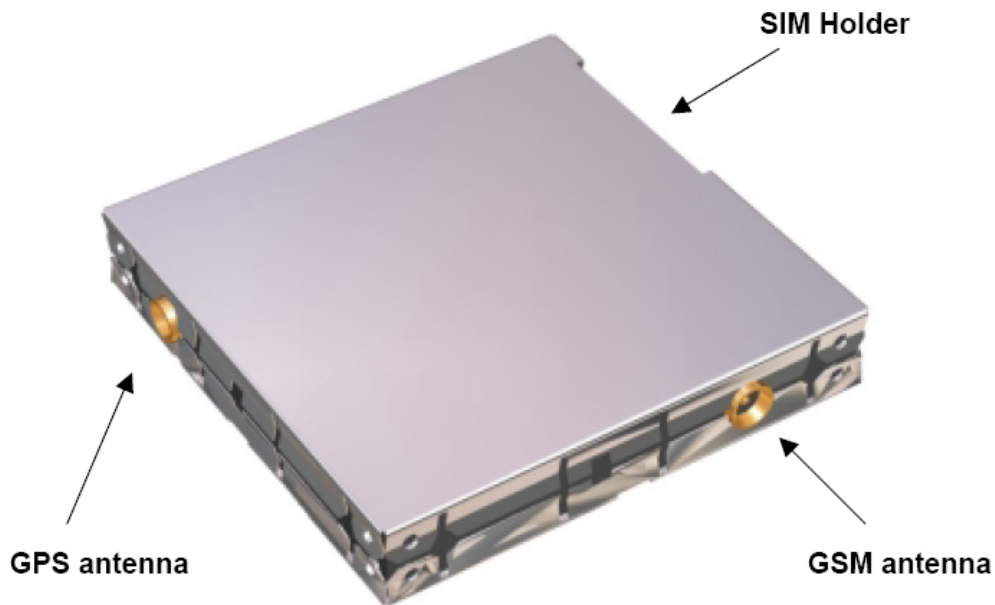
2.7.1 GSM Antenna

The antenna that the customer chooses to use, should fulfill the following requirements:

Frequency range	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, 150 MHz if GSM 850, 170 MHz in DCS, 140 MHz PCS band
Gain	1.5dBi $\leq$ Gain $<$ 3dBi (referenced to l/2 dipole)
Impedance	50 ohm
Input power	> 2 W peak power
VSWR absolute max	<= 10:1
VSWR recommended	<= 2:1

2.7.2 GPS Antenna

The Telit GM862-GPS Transceiver module includes a 50 Ohm MMCX connector for the GPS antenna.

Requirements

The GPS antenna should fulfil the following requirements:

Frequency range	GPS L1 (1575.42 MHz),
Power supply	3 – 5 V DC
Gain	3 dBi > Gain > 1,5 dBi
Impedance	50 ohm
Power consumption	20 mA max

2.7.3 Antenna connector

The Telit GM862 Family modules includes a 50 Ohm MMCX coaxial female. On the user application side the following connector must be used:
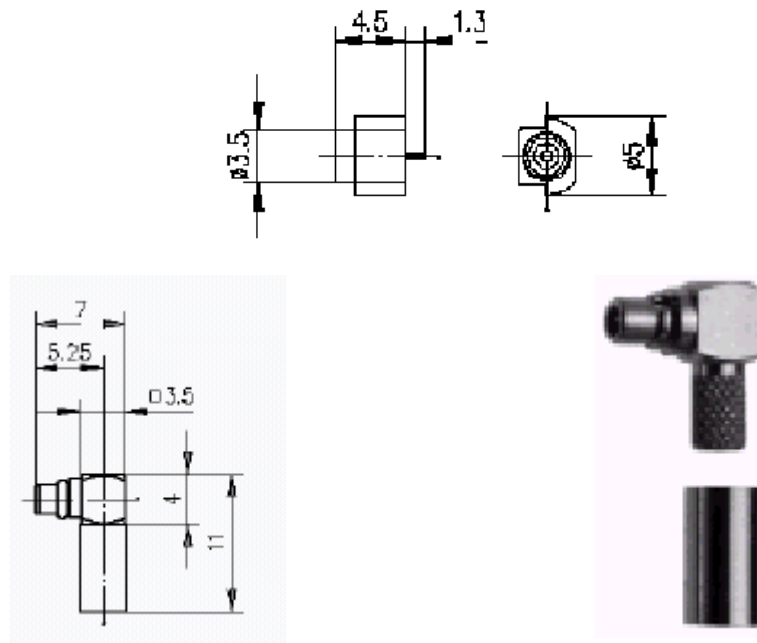
a) Telegärtner MMCX angle plug crimp - Order n. J01340A0121

NOTE: be very careful when connecting the Telit GM862 Family modules *RF connector. The RF connector can be damaged if not connected with the proper antenna RF connector. The minimum number of insertion cycles are recommended.*

2.8   GPS Module features

The GM862 include a SiRFstarIII™ single chip GPS receiver, that supports real-time location in urban area and wherever a high sensitivity acquisition is needed. As main features of such GPS receiver, we can mention:

- High sensitivity for indoor fixes
- Extremely fast TTFF's at low signal levels
- Hot starts < 2 seconds
- 200,000+ effective correlators
- Supports 20-Channel GPS

2.8.1 GPS Specifications

2.8.1.1   GPS Sensitivity

Type of Fix	Minimum Signal Strength (Signal Condition For All Satellites)
Hot Start (first fix after standby)	-159 dBm

2.8.1.2   GPS Average Power Consumption

The typical current consumption of the GPS part of the Telit GM862-GPS modules is:

Stand–by current	1 mA$_{rms}$ ±20%
Operating current	70 mA$_{rms}$ ±20%, including 50 mA for the GPS hardware and 20 mA for the antenna LNA

2.8.1.3   GPS Driving

The GPS functions are driven from the GSM BB processor trough a dedicated AT command set available in a separately specification.

2.8.1.4   GPS NMEA

The GPS data stream (NMEA 0183 format) is also available on the connector (pins 35 and 41 : TX_GPS and RX_GPS) in RS232 format 8N1, 4800 bps (9600, 19200, 38400, and 57600 bps are available too).

2.8.1.5 NMEA sentences

The following GPS sentences are available:

GGA - essential fix data which provide 3D location and accuracy data.

```
$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47
```

Where:

```
GGA           Global Positioning System Fix Data
123519        Fix taken at 12:35:19 UTC
4807.038,N    Latitude 48 deg 07.038' N
01131.000,E   Longitude 11 deg 31.000' E
1             Fix quality: 0 = invalid
                           1 = GPS fix (SPS)
                           2 = DGPS fix
                           3 = PPS fix
                           4 = Real Time Kinematic
                           5 = Float RTK
                           6 = estimated (dead reckoning) (2.3 feature)
                           7 = Manual input mode
                           8 = Simulation mode
08            Number of satellites being tracked
0.9           Horizontal dilution of position
545.4,M       Altitude, Meters, above mean sea level
46.9,M        Height of geoid (mean sea level) above WGS84
                  ellipsoid
(empty field) time in seconds since last DGPS update
(empty field) DGPS station ID number
*47           the checksum data, always begins with *
```

If the height of geoid is missing then the altitude should be suspect. Some non-standard implementations report altitude with respect to the ellipsoid rather than geoid altitude. Some units do not report negative altitudes at all. This is the only sentence that reports altitude.

VTG - Velocity made good. The gps receiver may use the LC prefix instead of GP if it is emulating Loran output.

```
$GPVTG,054.7,T,034.4,M,005.5,N,010.2,K
```

where:

```
VTG           Track made good and ground speed
054.7,T       True track made good
034.4,M       Magnetic track made good
005.5,N       Ground speed, knots
010.2,K       Ground speed, Kilometers per hour
```

Note that, as of the 2.3 release of NMEA, there is a new field in the VTG sentence at the end just prior to the checksum.

GSA - GPS DOP and active satellites. This sentence provides details on the nature of the fix. It includes the numbers of the satellites being used in the current solution and the DOP. DOP

(dilution of precision) is an indication of the effect of satellite geometry on the accuracy of the fix. It is a unitless number where smaller is better. For 3D fixes using 4 satellites a 1.0 would be considered to be a perfect number, however for overdetermined solutions it is possible to see numbers below 1.0.

There are differences in the way the PRN's are presented which can effect the ability of some programs to display this data. For example, in the example shown below there are 5 satellites in the solution and the null fields are scattered indicating that the almanac would show satellites in the null positions that are not being used as part of this solution. Other receivers might output all of the satellites used at the beginning of the sentence with the null field all stacked up at the end. This difference accounts for some satellite display programs not always being able to display the satellites being tracked. Some units may show all satellites that have ephemeris data without regard to their use as part of the solution but this is non-standard.

```
$GPGSA,A,3,04,05,,09,12,,,24,,,,,2.5,1.3,2.1*39
```

Where:

```
GSA        Satellite status
A          Auto selection of 2D or 3D fix (M = manual)
3          3D fix - values include: 1 = no fix
                                    2 = 2D fix
                                    3 = 3D fix
04,05...   PRNs of satellites used for fix (space for 12)
2.5        PDOP (dilution of precision)
1.3        Horizontal dilution of precision (HDOP)
2.1        Vertical dilution of precision (VDOP)
*39        the checksum data, always begins with *
```

GSV - Satellites in View shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data. It also shows current ability to track this data. Note that one GSV sentence only can provide data for up to 4 satellites and thus there may need to be 3 sentences for the full information. It is reasonable for the GSV sentence to contain more satellites than GGA might indicate since GSV may include satellites that are not used as part of the solution. It is not a requirment that the GSV sentences all appear in sequence. To avoid overloading the data bandwidth some receivers may place the various sentences in totally different samples since each sentence identifies which one it is.

The field called SNR (Signal to Noise Ratio) in the NMEA standard is often referred to as signal strength. SNR is an indirect but more useful value that raw signal strength. It can range from 0 to 99 and has units of dB according to the NMEA standard, but the various manufacturers send different ranges of numbers with different starting numbers so the values themselves cannot necessarily be used to evaluate different units. The range of working values in a given gps will usually show a difference of about 25 to 35 between the lowest and highest values, however 0 is a special case and may be shown on satellites that are in view but not being tracked.

```
$GPGSV,2,1,08,01,40,083,46,02,17,308,41,12,07,344,39,14,22,228,45*75
```

Where:

```
GSV        Satellites in view
2          Number of sentences for full data
1          sentence 1 of 2
```

```
    08              Number of satellites in view

    01              Satellite PRN number
    40              Elevation, degrees
    083             Azimuth, degrees
    46              SNR - higher is better
                    for up to 4 satellites per sentence
    *75             the checksum data, always begins with *
```

RMC - NMEA has its own version of essential GPS PVT (position, velocity, time) data. It is called RMC, The Recommended Minimum, which will look similar to:

```
$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A
```

Where:

```
    RMC             Recommended Minimum sentence C
    123519          Fix taken at 12:35:19 UTC
    A               Status A=active or V=Void.
    4807.038,N      Latitude 48 deg 07.038' N
    01131.000,E     Longitude 11 deg 31.000' E
    022.4           Speed over the ground in knots
    084.4           Track angle in degrees True
    230394          Date - 23rd of March 1994
    003.1,W         Magnetic Variation
    *6A             The checksum data, always begins with *
```

Note that, as of the 2.3 release of NMEA, there is a new field in the RMC sentence at the end just prior to the checksum.

GLL - Geographic Latitude and Longitude is a holdover from Loran data and some old units may not send the time and data active information if they are emulating Loran data. If a GPS is emulating Loran data they may use the LC Loran prefix instead of GP.

```
  $GPGLL,4916.45,N,12311.12,W,225444,A,*31
```

Where:

```
    GLL             Geographic position, Latitude and Longitude
    4916.46,N       Latitude 49 deg. 16.45 min. North
    12311.12,W      Longitude 123 deg. 11.12 min. West
    225444          Fix taken at 22:54:44 UTC
    A               Data Active or V (void)
    *31             checksum data
```

2.9   Supply voltage

The external power supply must be connected to VBATT signal (see paragraph 2.18,Interface connectors on GM862) and must fulfill the following requirements:

Nominal operating voltage	3.8 V
Operating voltage range	3.4 V – 4.2 V

NOTE: Operating voltage range must never be exceeded, care must be taken in order to fulfill min/max voltage requirements and peak current supply.

2.10 GSM Power consumption

The typical current consumption of the Telit GM862 Family modules are:

Power off current (typical)	< 26 μA;
Stand–by current (GSM Idle)	< 17 mA_{rms} (< 4 mA_{rms} using command AT+CFUN)
Operating current in voice channel	250 mA_{rms} ±20% @ typical network conditions
Operating current in voice channel	< 350 mA_{rms} / 1.9 A_{peak} @ worst network conditions
Operating current in GPRS class 10	< 700 mA_{rms} @ worst network conditions

The total power consumption of GM862-GPS is the sum of the consumptions of GSM and GPS part.

2.11 Embodied Battery Charger

The battery charger is suited for 3.7V Li-Ion rechargeable battery (suggested capacity 500-1000mAH). The Charger needs only a CURRENT LIMITED power source input and charges the battery directly through VBATT connector pins.

Battery charger input pin	CHARGE
Battery pins	VBATT, GND
Battery charger input voltage min	5.0 V
Battery charger input voltage typical	5.5 V
Battery charger input voltage max	7.0 V
Battery charger input current max	400mA
Battery type	Li-Ion rechargeable

NOTE: If embodied battery charger is used, then a LOW ESR capacitor of at least 100µF must be mounted in parallel to VBATT pin.

NOTE: when power is supplied to the CHARGE pin, a battery must always be connected to the VBATT pins.

2.12 User Interface

The user interface is managed by AT commands specified on the ITU-T V.250, GSM 07.07 and 07.05 specification.

2.12.1 Speech Coding

The Telit GM862 voice codec supports the following rates:

❑ Half Rate.
❑ Full rate,
❑ Enhanced Full Rate
❑ Adaptive Multi Rate

2.12.2 SIM Reader

The Telit GM862-QUAD and QUAD-PY support phase 2 GSM11.14 - SIM 3 volts. Moreover, the GM862-GPS supports 1,8V SIM too. For 5V SIM operation an external level translator can be added.

The Telit GM862-QUAD,QUAD-PY and GPS have an internal built-in SIM card reader that allows also hot removal of the SIM sensing. Therefore, the SIM can be extracted and reinserted while the module is still on, so there's no need for an external SIM housing.

NOTE: the hot removal of the SIM sensing is not supported during power saving mode (+CFUN: 5).

2.12.3 SMS

The Telit GM862 Family modules supports the following SMS types:

❑ Mobile Terminated (MT) class 0 – 3 with signalling 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 signalling of new incoming SMS.

2.12.4   Real Time Clock and Alarm

The Telit GM862 Family modules supports the Real Time Clock and Alarm functions through AT commands, furthermore an alarm output pin (GPIO6) can be configured to indicate the alarm with a hardware line output.

2.12.5   Data/fax transmission

As for the data and fax capabilities, the GM862-QUAD,QUAD-PY and GPS support the following:

	GM862-QUAD	GM862-QUAD-PY	GM862-GPS
GPRS Class 8, MS Class 8	X	X	X
GPRS Class 10, MS Class 8.	X	X	X
CSD up to 14.4 Kbps	X	X	X
Fax service, Class 1 Group 3	X	X	X

2.12.6   Local security management

With lock of Subscriber Identity module (SIM), and security code request at power–up.

2.12.7   Call control

Call cost control function.

2.12.8   Phonebook

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

2.12.9   Characters management

The GM862 supports the IRA characters set (International Reference Alphabet), in TEXT and PDU mode.

2.12.10   SIM related functions

The activation and deactivation of the numbers stored in phone book are supported, FDN, ADN and PINs too. The extension at the PIN2 for the PUK2 insertion capability for lock condition is supported too.

2.12.11   Call status indication

The call status indication by AT commands is supported.

2.12.12   Indication of network service availability

The STAT_LED pin status shows information on the network service availability and Call status. The pin is an Open Collector output where it is possible to directly connect a LED to show information on the network service availability and Call status.
Therefore, the status indicated in the following table is reversed with respect to the pin status.

LED status	Device Status
permanently off	device off
fast blinking (period 1s, Ton 0,5s)	Net search / Not registered / turning off
slow blinking (period 3s, Ton 0,3s)	Registered full service
permanently on	a call is active

2.12.13   Automatic answer (Voice, 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>.

2.12.14   Supplementary services (SS)

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

2.12.15   Acoustic signaling

The acoustic signalling of the GM862 on the selected acoustic device are the following:

- Call waiting;
- Ringing tone;
- SMS received tone;
- Busy tone;
- Power on/off tone;
- Off Hook dial tone;
- Congestion tone;
- Connected tone;

- Call dropped;
- No service tone;
- Alarm tone.

2.12.16   DTMF tones

DTMF tones managed by specific AT commands. These tones are generated with AT commands only during voice calls. The minimum duration of a DTMF tone is 100 ms.

Group low	Group high		
	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

NOTE: The GSM system architecture defines that the audio signal of the DTMF tones is inserted by the network switches on commands sent by the Mobile Station (MS). Thus, the default duration parameters may vary from network to network. In case that the devices to be controlled by DTMF are sensitive related to the duration of the tones and timing of the sequences, dedicated investigations on the parameter settings have to be made.

2.12.17   Buzzer Output

The General Purpose I/O pin GPIO7 can be configured to output the BUZZER output signal, with only an external Mosfet/transistor and a diode a Buzzer can be directly driven. The ringing tone and the other signalling tones can be redirected to this Buzzer output with a specific AT command.

2.12.18   RF Transmission Monitor

As alternate function of the GPIO5, the GM862-GPS, QUAD-PY and QUAD provide the RF transmission monitor. When the alternate function is activated, the pin of GPIO5 changes to HIGH every time the module transmits an RF signal and remains HIGH for the duration of the transmission sequence, i.e. it does not change with every GSM signal burst.

2.13 EMC

Compliant to EN301-489-1 and EN301-489-7 and all applicable GSM Specifications. Compliant to Directive 1999/05/CE.

2.14 Logic level specifications

Where not specifically stated, all the interface circuits work at 2.8V CMOS logic levels. The following table shows the logic level specifications used in the Telit GM862 interface circuits:

Absolute Maximum Ratings -Not Functional

Parameter	Min	Max
Input level on any digital pin when on	-0.3V	+3.75V
Input voltage on analog pins when on	-0.3V	+3.0 V

Operating Range - Interface levels (2.8V CMOS)

Level	Min	Max
Input high level	2.1V	3.3V
Input low level	0V	0.5V
Output high level	2.2V	3.0V
Output low level	0V	0.35V

For 2,0V signals:

Operating Range - Interface levels (2.0V CMOS)

Level	Min	Max
Input high level	1.6V	3.3V
Input low level	0V	0.4V
Output high level	1,65V	2.2V
Output low level	0V	0.35V

2.14.1   Reset signal

Signal	Function	I/O	Pin
RESET	Phone reset	I	23 (connector SO301)

RESET is used to reset the GM862. Whenever this signal is pulled low, the GM862 is reset. When the device is reset it stops any operation and after the release of the reset it shuts down, without doing any detach operation from the network where it is registered to. This behaviour is not a proper shut down because any GSM device is requested to issue a detach request on turn off. For this reason the Reset signal must not be used to normally shutting down the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response.

The RESET is internally controlled on start-up to achieve always a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

NOTE: do not use this signal to power off the GM862. Use the ON/OFF signal (Pin 17 of SO301) to perform this function or the AT#SHDN command.

Reset Signal Operating levels:

Signal	Min	Max
RESET Input high	2.2V*	3.3V
RESET Input low	0V	0.2V

* this signal is internally pulled up so the pin can be left floating if not used.

If unused, this signal may be left unconnected. If used, then it **must always be connected with an open collector transistor**, to permit to the internal circuitry the power on reset and under voltage lockout functions.

2.15 Audio levels specifications

The audio path of the Telit GM862 module is organized into two main paths:

internal path (called also MT)
external path (called also HF)

These two paths are meant respectively for handset and headset/hands free use. The Telit GM862 Family modules has a built in echo canceller and a noise suppressor, tuned separately for the two audio paths; for the internal path the echo canceller parameters are suited to cancel the echo generated by a handset, while for the external audio path they are suited for a hands free use.
For more information on the audio refer to the Hardware User Guide. The following table reports all the audio level specifications.

Microphone characteristics

	Internal audio mic. input	External audio mic. input
Nominal sensitivity	-45dBV$_{rms}$/Pa	-45dBV$_{rms}$/Pa
Distance	7cm	50cm
Line input characteristics		
Line coupling	AC (100nF cond.)	AC (100nF cond.)
Line type	Balanced	Balanced
Differential input resistance	25kΩ	25kΩ
Line nominal sensitivity	50mV$_{rms +- 2dB}$	3mV$_{rms +- 2dB}$
Max input voltage	360mV$_{rms}$	22mV$_{rms}$
Microphone nominal sensitivity - Analog Gain suggested	-45dB$_{Vrms/Pa}$ +- 2dB/ +24dB	-45dB$_{Vrms/Pa}$ +- 2dB / +10dB
Echo canceller type	handset	Car kit hands free

Speaker characteristics

	Internal audio ear. output	External audio ear. output
Speaker impedance	$\geq 16\Omega \pm 5\%$ @ 1kHz	$\geq 16\Omega \pm 5\%$ @ 1kHz
Rated Input Power	100mW	100mW
Line out driver		
Line coupling	DC	DC
Line type	Bridged	Bridged
Minimum load impedance	15Ω	15Ω
Signal bandwidth	150-8000 Hz @ -3dB	150-8000 Hz @ -3dB
Maximum output	1,3V$_{rms}$	1,3V$_{rms}$
Maximum power output	80mW/16Ω	80mW/16Ω
Volume level steps (SW)	-2dB	-2dB
Number of volume steps (SW)	14	14

2.16 Camera compatibility (EASY CAMERA)

The GM862-QUAD, QUAD-PY and GPS provide a direct support for the camera whose characteristics are the following:

Model:	TRANSCHIP TC5747
Technology:	CMOS COLOR camera
Max picture size:	VGA 640x480 pixels
Output format:	JPEG
Sensitivity:	4V/lux-sec (including gain)

The camera will be directly managed by the hardware/software with some interface circuitry, providing a custom AT command interface to operate with it.

The camera interface requires the pins and GPIOs:

Signal	*pin*
CAM_SDA	47
CAM_SCL	46
CAM_CLK	25
CAM_ON	32
CAM_RST	34

When the camera is activated, then these pins are not accessible as GPIO.
The AT commands of the module allows to take a snapshot and successively download it through the serial line in various formats.

Moreover, the GM862-QUAD, QUAD-PY support the Agilent camera as per the GM862-PCS and GM862-PY.

2.17 ADC Converter (GM862-GPS only)

The on board ADCs are 11-bit converter. They are able to read a voltage level in the range of 0÷2 volts applied on the ADC pin input, and convert it into 11 bit word.

	Min	Max	Units
Voltage range	0	2	Volt
AD conversion	11	11	bits
Resolution	1	1	mV
Sampling rate	1 (idle)	60 (on traffic)	secs

2.18 Interface connectors on GM862 modules

The Telit GM862 Family modules has the following interfaces:

1)   **GSM antenna connector** (see 2.7.3, Antenna connector)
2)   **Board To Board Interface connector**
3)   **SIM Card Reader**
4)   **GPS antenna connector (GM862-GPS only)**

The Telit GM862 Family modules board to board connector is a CSTP 50 pin vertical SMD Molex 52991–0508 (male).
Its pin-out (down view) is:

GPS Antenna
connector position
(on the vertical side)
(GM862 GPS only)

49   50

Connector Position
and PIN-Out order

1   2

GSM Antenna
connector position
(on the vertical side)

SIM CARD reader
position
(on the vertical side)
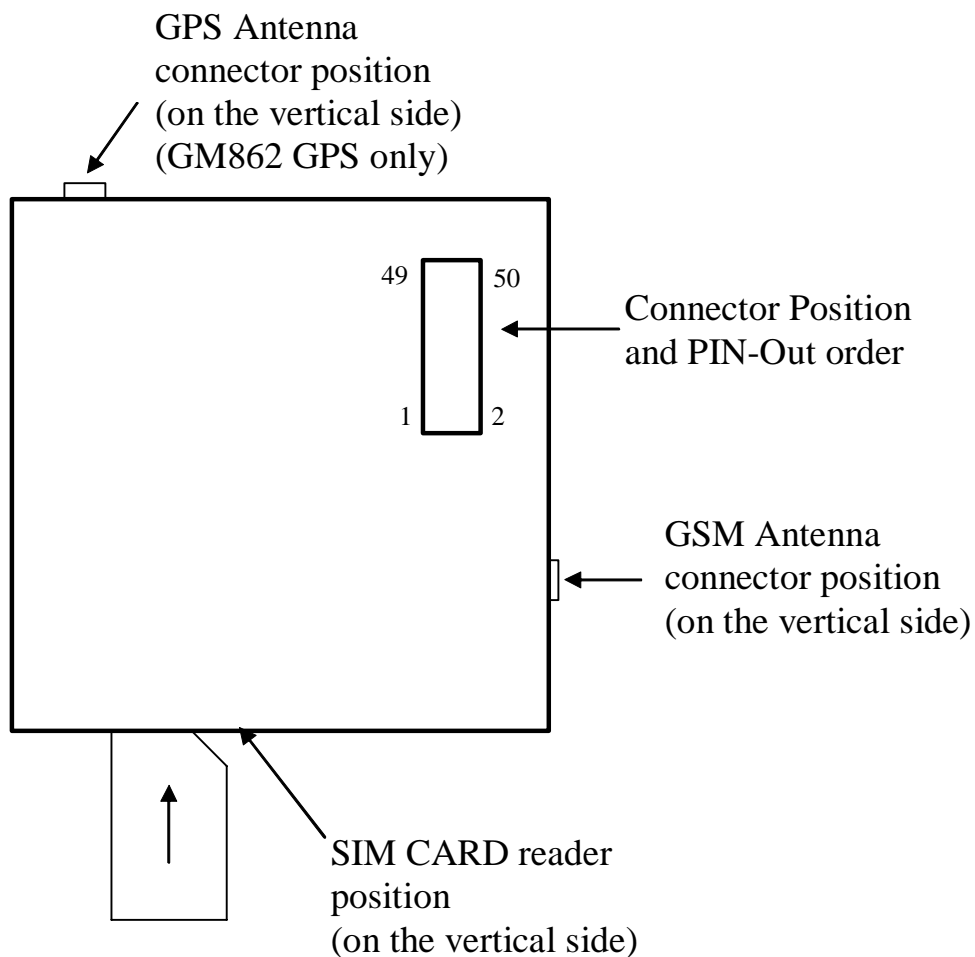
Molex 52991-0508 (male) GM862 Connector LAY-OUT

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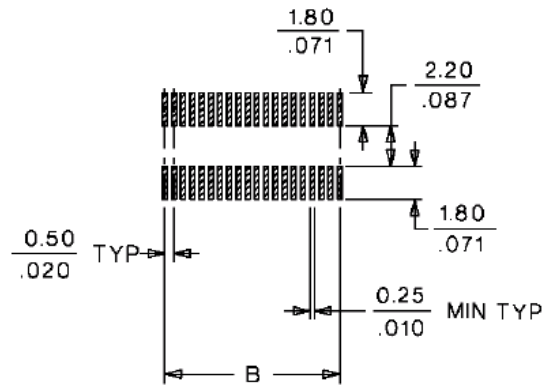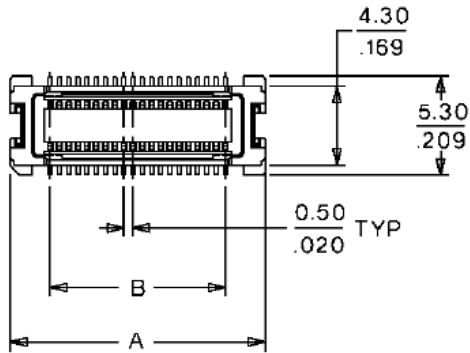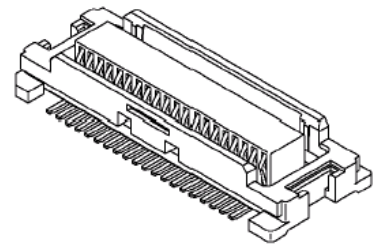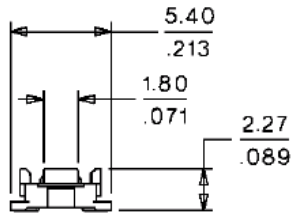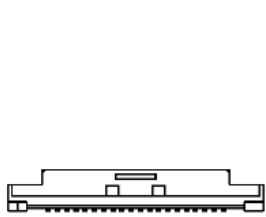
Molex 52991-0508 (male) GM862 Connector PIN-OUT

In the table below, the pin assignment of the all GM862-GPS, QUAD-PY and QUAD are compared against the previous models of GM862.

The cells marked with yellow colour, highlight the differences typically because more features are available on the newest models, except for the camera (see specific paragraph and application note).

		GM862-GSM, -GPRS			GM862-QUAD, -QUAD-PY GM862-PCS / -PYTHON			GM862-GPS	
PIN	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION
1	I	VBATT	Main power supply	I	VBATT	Main power supply	I	VBATT	Main power supply
2	-	GND	Ground	-	GND	Ground	-	GND	Ground
3	I	VBATT	Main power supply	I	VBATT	Main power supply	I	VBATT	Main power supply
4	-	GND	Ground	-	GND	Ground	-	GND	Ground
5	I	VBATT	Main power supply	I	VBATT	Main power supply	I	VBATT	Main power supply
6	-	GND	Ground	-	GND	Ground	I	ADC_IN1	Analog / Digital Converter Input
7	I	VBATT	Main power supply	I	VBATT	Main power supply	I	VBATT	Main power supply
8	-	GND	Ground	AI	CHARGE	Charger Input	AI	CHARGE	Charger Input
9	AO	EAR_HF+	Handsfree ear signal output, phase+	AO	EAR_HF+	Handsfree ear signal output, phase+	AO	EAR_HF+	Handsfree ear signal output, phase+
10	AO	EAR_MT-	Handset earphone signal output, phase-	AO	EAR_MT-	Handset earphone signal output, phase-	AO	EAR_MT-	Handset earphone signal output, phase-
11	AO	EAR_HF	Handsfree ear signal output, phase-	AO	EAR_HF	Handsfree ear signal output, phase-	AO	EAR_HF-	Handsfree ear signal output, phase-
12	AO	EAR_MT+	Handset earphone signal output, phase+	AO	EAR_MT+	Handset earphone signal output, phase+	AO	EAR_MT+	Handset earphone signal output, phase+
13	AI	MIC_HF-	Handsfree microphone signal input, phase- , nominal level 500mVpp	AI	MIC_HF-	Handsfree microphone signal input, phase- , nominal level 500mVpp	AI	MIC_HF-	Handsfree microphone signal input, phase- , nominal level 500mVpp
14	AI	MIC_MT+	Handset microphone signal input, phase+ nominal level 1030mVpp	AI	MIC_MT+	Handset microphone signal input, phase+ nominal level 1030mVpp	AI	MIC_MT+	Handset microphone signal input, phase+ nominal level 1030mVpp
15	AI	MIC_HF+	Handsfree microphone signal input; phase+, nominal level 500mVpp	AI	MIC_HF+	Handsfree microphone signal input; phase+, nominal level 500mVpp	AI	MIC_HF+	Handsfree microphone signal input; phase+, nominal level 500mVpp

	GM862-GSM, -GPRS			GM862-QUAD, -QUAD-PY GM862-PCS / -PYTHON			GM862-GPS		
PIN	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION
16	AI	MIC_MT-	Handset microphone signal input; phase-, nominal level 1030mVpp	AI	MIC_MT-	Handset microphone signal input; phase-, nominal level 1030mVpp	AI	MIC_MT-	Handset microphone signal input; phase-, nominal level 1030mVpp
17[1]	I	ON/OFF	Input command for switched power ON or OFF (toggle command)	I	ON/OFF	Input command for switched power ON or OFF (toggle command)	I	ON_OFF*	Input command for switched power ON or OFF (toggle command)
18	I	AXE	Handsfree switching	I	AXE	Handsfree switching	I	AXE	Handsfree switching
19	I/O	SIMIO	External SIM signal – Data I/O	I/O	SIMIO	External SIM signal – Data I/O	I/O	SIMIO	External SIM signal – Data I/O
20	I	C103/TXD	Serial data input (TXD) from DTE (RX of Module)	I	C103 / TXD	Serial data input (TXD) from DTE (RX of Module)	I	C103 / TXD	Serial data input (TXD) from DTE (RX of Module)
21	O	PWRCTL	Power sense for external devices (pull up is 10Kohm)	O	PWRCTL / CAM_SYNC	Module Status ON indication (Signal output for power on/off control of external devices) / Camera Interface. Pull up is 820 ohm	O	PWRCTL	Module Status ON indication (Signal output for power on/off control of external devices) . Pull up is 1k
22[2]	I	SIMVCC	External SIM signal – Power	I	SIMVCC	External SIM signal – Power	I	SIMVCC	External SIM signal – Power
23	I	RESET*	Reset input	I	RESET*	Reset input	I	RESET*	Reset input
24	I	SIMRST	External SIM signal – Reset	I	SIMRST	External SIM signal – Reset	I	SIMRST	External SIM signal – Reset
25	-	-	RESERVED	O	MON1_CAM	Camera Interface	O	CAM_CLK	Camera Interface (CLK)
26	I	SIMCLK	External SIM signal – Clock	I	SIMCLK	External SIM signal – Clock	I	SIMCLK	External SIM signal – Clock
27	I/O	CCIN	External SIM signal – Presence (active low)	I/O	CCIN	External SIM signal – Presence (active low)	I/O	SIMIN	External SIM signal – Presence (active low)
28	O	GPO2	General purpose output Buffered	O	GPO2 / JDR	General purpose output (open collector) / Camera Interface / JDR	O	GPO2 / JDR	General purpose output (open collector) / JDR
29	O	C106/CTS	Output for Clear to send signal (CTS) to DTE	O	C106 / CTS	Output for Clear to send signal (CTS) to DTE	O	C106 / CTS	Output for Clear to send signal (CTS) to DTE

1 This pin is pulled up internally to VBATT and has a transistor base input.

2 On this pin a maximum of 47nF bypass capacitor is allowed

PIN	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION
		GM862-GSM, -GPRS			**GM862-QUAD, -QUAD-PY GM862-PCS / -PYTHON**			**GM862-GPS**	
30	O	C125/RING	Output for Ring indicator signal (RI) to DTE	O	C125 / RING	Output for Ring indicator signal (RI) to DTE	O	C125 / RING	Output for Ring indicator signal (RI) to DTE
31	I	GPI1	General purpose input Buffered	I	GPI1	General purpose input Buffered	I	GPI1	General purpose input Buffered
32	-	-	RESERVED	I/O	GPIO8 / PD[0]	General Purpose I/O / Camera Interface	I/O	GPIO8 / CAM_ON	General Purpose I/O / Camera Interface
33	O	C107/DSR	Output for Data set ready signal (DSR) to DTE	O	C107 / DSR	Output for Data set ready signal (DSR) to DTE	O	C107 / DSR	Output for Data set ready signal (DSR) to DTE
34	-	-	RESERVED	I/O	GPIO9 / PD[1]	General Purpose I/O / Camera Interface	I/O	GPIO9 / CAM_RST	General Purpose I/O / Camera Interface
35	O	EMMI TX	TX Data for debug monitor (1)	O	EMMI TX	TX Data for debug monitor (1)	O	TX_GPS	TX Data for NMEA (GPS)
36	O	C109/DCD	Output for Data carrier detect signal (DCD) to DTE	O	C109 / DCD	Output for Data carrier detect signal (DCD) to DTE	O	C109 / DCD	Output for Data carrier detect signal (DCD) to DTE
37	O	C104/RXD	Serial data output to DTE (TX of Module)	O	C104 / RXD	Serial data output to DTE (TX of Module)	O	C104 / RXD	Serial data output to DTE (TX of Module)
38	-	-	RESERVED	I/O	GPIO10 / PD[2]	General Purpose I/O / Camera Interface	I/O	GPIO10	General Purpose I/O
39	O	STAT LED	Status indicator led	O	STAT LED	Status indicator led	O	STAT_LED	Status indicator led
40	-	-	RESERVED	I/O	GPIO11 / PD[3]	General Purpose I/O / Camera Interface	I/O	GPIO11	General Purpose I/O / Trace / Debug Python
41	I	EMMI RX	RX Data for debug monitor (1)	I	EMMI RX	RX Data for debug monitor (1)	I	RX_GPS	RX Data for NMEA (GPS)
42	-	-	RESERVED	I/O	GPIO12 / PD[4]	General Purpose I/O / Camera Interface	I/O	GPIO12	General Purpose I/O / trace / Python debug
43	O	C108/DTR	Input for Data terminal ready signal (DTR) from DTE	O	C108 / DTR	Input for Data terminal ready signal (DTR) from DTE	O	C108 / DTR	Input for Data terminal ready signal (DTR) from DTE
44	-	-	RESERVED	I/O	GPIO13 / PD[5]	General Purpose I/O / Camera Interface	I/O	GPIO13	General Purpose I/O
45	O	C105/RTS	Input for Request to send signal (RTS) from DTE	O	C105 / RTS	Input for Request to send signal (RTS) from DTE	O	C105 / RTS	Input for Request to send signal (RTS) from DTE
46	I/O	GPIO3	General Purpose I/O	I/O	GPIO3 / PD[6]	General Purpose I/O / Camera Interface	I/O	GPIO3 / CAM_SCL	General Purpose I/O / Camera Interface

		GM862-GSM, -GPRS			GM862-QUAD, -QUAD-PY GM862-PCS / -PYTHON			GM862-GPS	
PIN	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION	I/O	SIGNAL	FUNCTION
47	I/O	GPIO4	General Purpose I/O	I/O	GPIO4 / IICSDA	General Purpose I/O / Camera Interface	I/O	GPIO4 / CAM_SDA	General Purpose I/O / Camera Interface
48	I/O	GPIO5	General Purpose I/O	I/O	GPIO5 / CAM_DRDY / RFTXMON	General Purpose I/O / Camera Interface / RF Transmission Monitor	I/O	GPIO5 / RFTXMON	General Purpose I/O / RF Transmission Monitor
49	I/O	GPIO6	General Purpose I/O	I/O	GPIO6 / ALARM / PD[7]	General Purpose I/O / ALARM output / Camera Interface	I/O	GPIO6 / ALARM	General Purpose I/O / ALARM output
50	I/O	GPIO7	General Purpose I/O	I/O	GPIO7 / BUZZER / CAM_PWR_ON	General Purpose I/O / BUZZER output Pin / Camera Interface	I/O	GPIO7 / BUZZER	General Purpose I/O / BUZZER output Pin

2.19 Mounting the GM862 modules on your Board

In order to electrically connect your board to the Telit GM862 Family modules, use a **CSTP 2x25 pin vertical SMD SCH–SCH Molex 53748 - 0504 (female, low profile)** as a counterpart to the **CSTP 50 pin vertical SMD Molex 52991–0508 (male)** of your Telit GM862 Family modules.
When mounting the Telit GM862 Family modules on your board, take care of soldering the GM862 shielding reeds on a ground plane or signal.

NOTE: be very careful when connecting the Telit GM862 module RF connector. The Telit GM862 module RF connector can be damaged if not connected with the proper antenna RF connector. The minimum number of insertion cycles is recommended.

2.19.1   Antenna Coaxial cable fixing

The following constraints must be respected in the Telit GM862 Family modules antenna cable connection:

- The fixing point of the coaxial cable must not be placed too close to the antenna connector of the GM862 module, leaving at least 30mm of flexible cable between the fixed point and the plug end.

- The fixing point must be at the same height of the GM862 module antenna connector, eventually using a wedge between the PCB and the cable if it is directly fixed to the PCB.

- The flexible cable must never be bent with a radius lower than 25mm (RG174 cable).

- The cable must be a RG174 type or more flexible ones.

The following pictures explain these constraints:
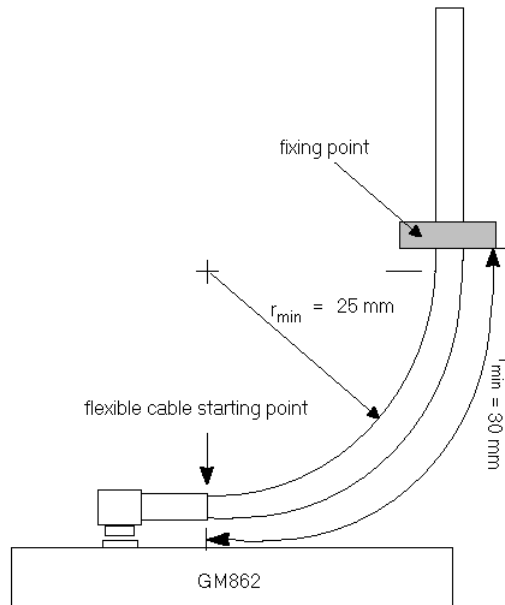
- Angle connector fixing example -

-
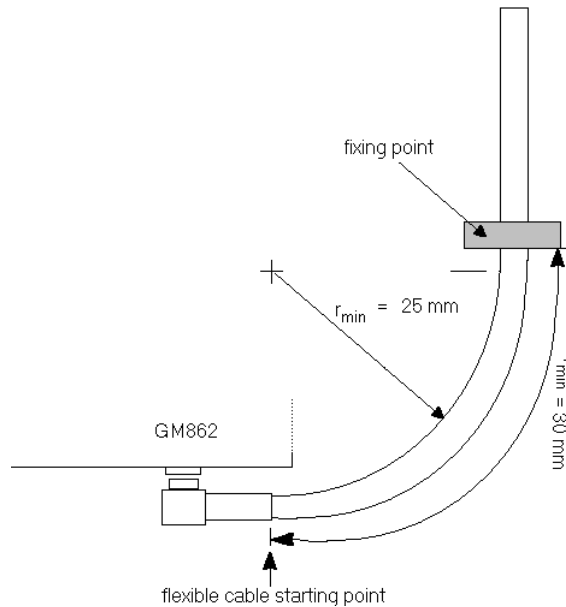
- Angle connector fixing example 2 -

NOTE: in the examples the cable is always bent, this is not a constrain. If the installation does not require it, then the cable can be kept straight, ensuring that the fixing is without sliding.

2.19.2   Precautions

- The plug should be inserted in the connector only after the installation of the Telit GM862 Family modules in the board. This is to prevent accidental breaking of the antenna connection during the transport.
- The coaxial cable must be fixed at least in one point, without sliding possibilities.
- The plug insertion/removal must be done axially with the female connector of the GM862, keeping lateral strains to a minimum.
- The insertion/crimping pull out force must be less than 15N.

3 Evaluation Kit

In order to assist you in the development of your Telit GM862 Family modules based application, Telit can supply an Evaluation Kit that interfaces the Telit GM862 Family modules directly with appropriate power supply, SIM card housing, RS 232 serial port level translator and USB, direct UART connection, Handset, Headset and Hands-free (car kit) audio, antenna.

The EVK provides a fully functional solution for a complete data/phone application.
The standard serial RS232 9 pin connector placed on the Evaluation Kit allows the connection of the EVK system with a PC or other DTE.
The development of the applications utilizing the Telit GM862 Family modules must present a proper design of all the interfaces towards and from the module (e.g. power supply, audio paths, level translators), otherwise a decrease in the performances will be introduced or, in the worst case, a wrong design can even lead to an operating failure of the module.

In order to assist the hardware designer in his project phase, the EVK board presents a series of different solutions, which will cover the most common design requirements on the market, and which can be easily integrated in the OEM design as building blocks or can be taken as starting points to develop a specific one.
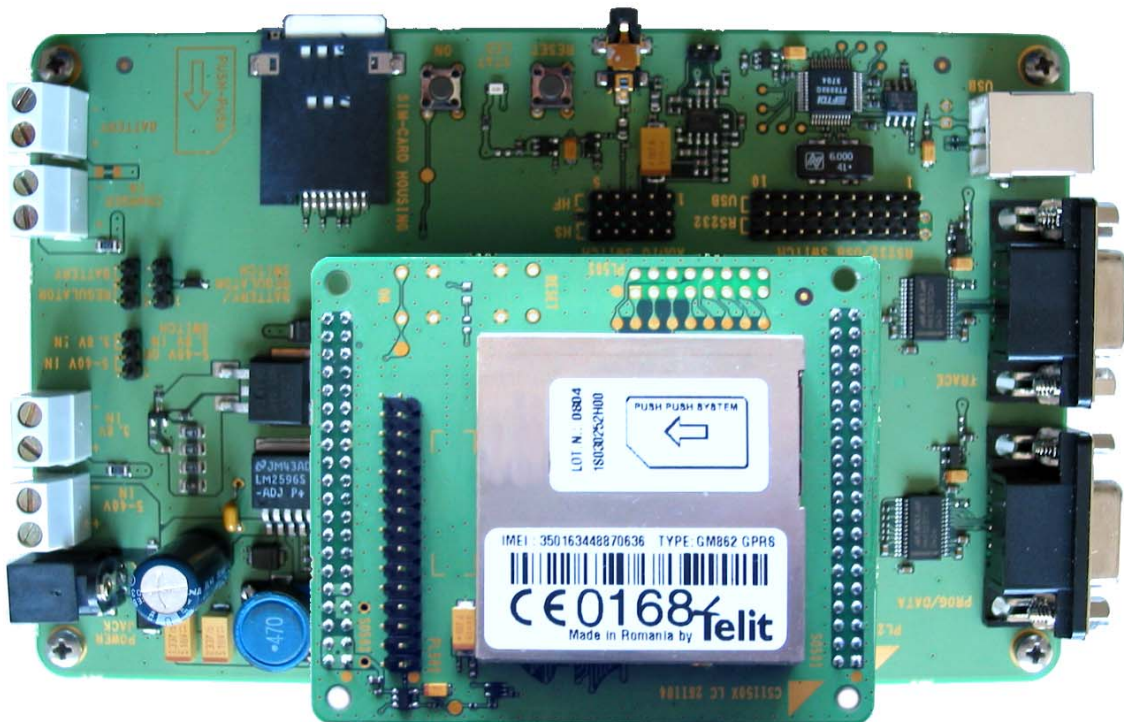
GM862-Evaluation Kit [preliminary picture]

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3.1　Evaluation Kit description

For a detailed description of the Telit GM862 Evaluation Kit refer to the documentation provided with the Telit GM862 Hardware User Guide.

3.1.1 Power Supply

In the Board there are three different power supply inputs, that embrace a wide range of applications, from the automotive +12V / +24V nominal input to the stand alone battery powered device.
The power sources nominal input voltages are:

- ❑ +5 ÷ +40V input
- ❑ +3.8V direct input for stabilized laboratory power supply
- ❑ direct Li-Ion Battery power input (also with charging function of the module, when a suitable charger is connected to the charger input

Each one of these power sources can supply both the Telit GM862 Family modules and the whole circuitry embodied in the Evaluation Kit.
Only one of these power sources can be used at a time and it is selectable with two jumpers.

3.1.2 Serial interface

The communications between your application and the Telit GM862 Family modules must be done through a serial interface which can be a standard CMOS UART or a RS232 port.
All levels of the RS232 port are conform to RS232 and V.24 standard and a PC serial port can be directly connected to this connector.
Both these interfaces are supported.

3.1.3 Audio

The Evaluation Kit board provides two software/hardware selectable audio paths, the internal and the external one. All the handset, headset and hands free-car kit functions are supported.
Furthermore for each audio path two solution are presented: single ended and balanced.

3.1.4 GPIO and Leds

All the General Purpose Input Output ports of the Telit GM862 Family modules are supported in a dedicated connector and several leds are added as a debug aid.

3.1.4.1   Telit GM862 Family modules interface connector

The PL401 transceiver interface connector placed on the Telit GM862 Evaluation Kit is a female CSTP 2x25 pin vertical SMD SCH–SCH Molex 53748 - 0504 (low profile). See pin out on the SO301 connector on Telit GM862 Family modules.

Molex 53748-0504 (female, low profile) Connector LAY-OUT

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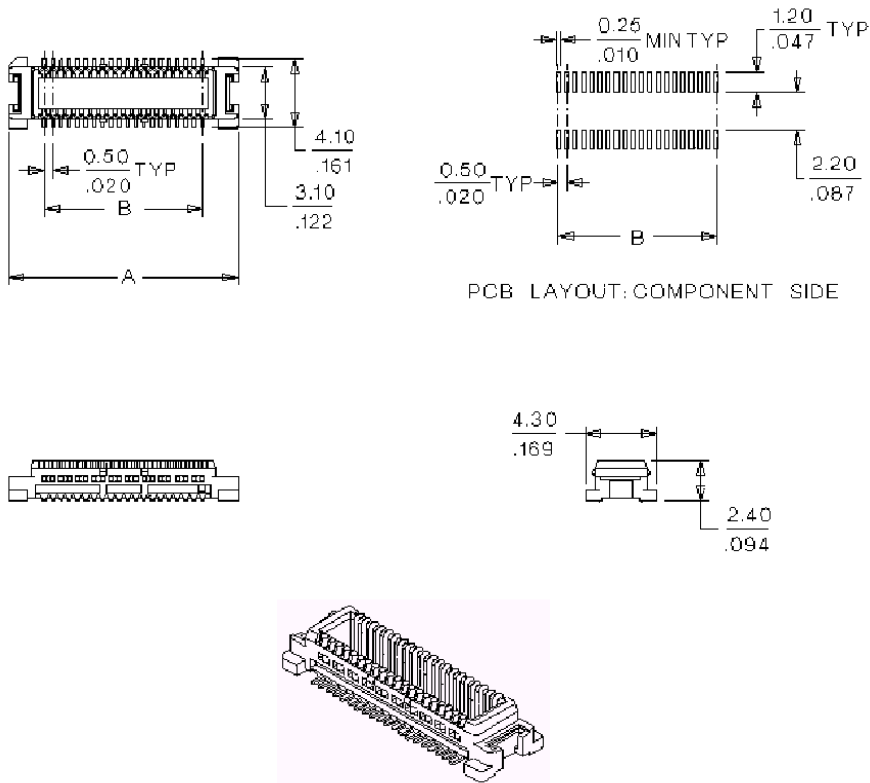
4 Service and firmware update

The Telit GM862 modules firmware can be updated through the same serial interface, which is used normally for the AT commands. Since the software group is continuously working, in order to improve the overall performances and introduce new features on the product, we suggest, in order to keep updated the module's firmware, to foresee an external access to that interface with level converters to RS232, which allows connecting a Windows-based PC. It shall be possible to start the update procedure at POWER OFF condition of the module and then switch it ON to continue.

During the application development or evaluation phase of the Telit GM862 module, the RS232 interface with the level converters or the USB port implemented on the **Telit Evaluation Kit EVK2** can be used to connect to a Windows-based PC on which the specific program for updating the Software (TFI) can be run.

4.1   Step-by-Step upgrade procedure

The firmware update can be done with a specific software tool provided by Telit that runs on Windows based PCs.

First the program will erase the content of flash memory, then the program will write on the flash memory. To update the firmware of the module, we suggest the following procedure:

  I. Collect information about the Hardware and implemented version of Software by the command
      - AT+CGMR<enter>, which returns the Software version information;
      - AT+CGMM<enter>, which returns the Model Identification.

 II. Switch OFF the module.

III. Run the file *TFI_xxxx.exe*. The following window should be displayed, Select the language preferred by pressing the correspondent button.

 IV. The End User License Agreement will appear. Please, read it and accept the terms if you are going to proceed.

V. Press OK to the initial message.
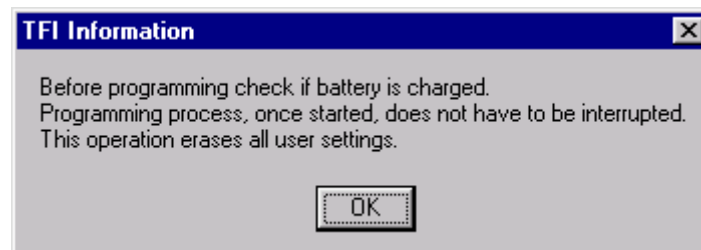
NOTE: In connection with the GM862 modules, charged battery has to be understood that the power supply must not be disconnected during the firmware update.

VI. Select the right COM port and speed. Note that to go faster than 115200 you need a special hardware on the PC. Then Press the Download button and within 5 seconds power-on the GM862.
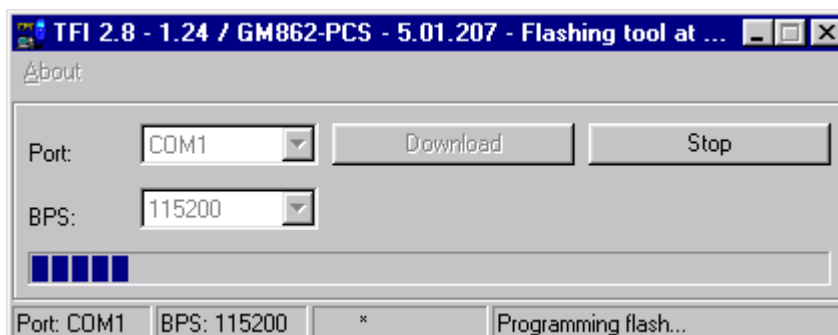
Wait for the end of programming green message OK
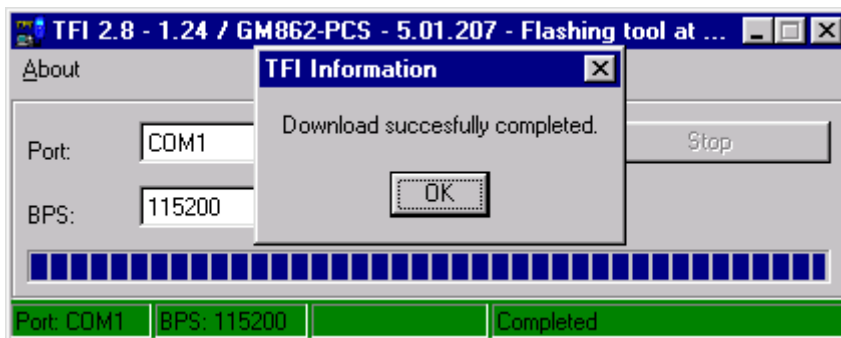
The Telit GM862 module is now programmed with the new firmware.

NOTE: the above pictures show how the application dialogs appear for the GM862-PCS product. The GM862-GPS, PY and QUAD TFI application will look similar.

5 Software Features

5.1   Enhanced Easy GPRS Extension

5.1.1 Overview

The Easy GPRS feature allows the models Telit GM862-QUAD,QUAD-PY and GPS 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 GM862** module, regardless of all the software stacks underlying.
An example of the protocol stack involved in the devices is reported:
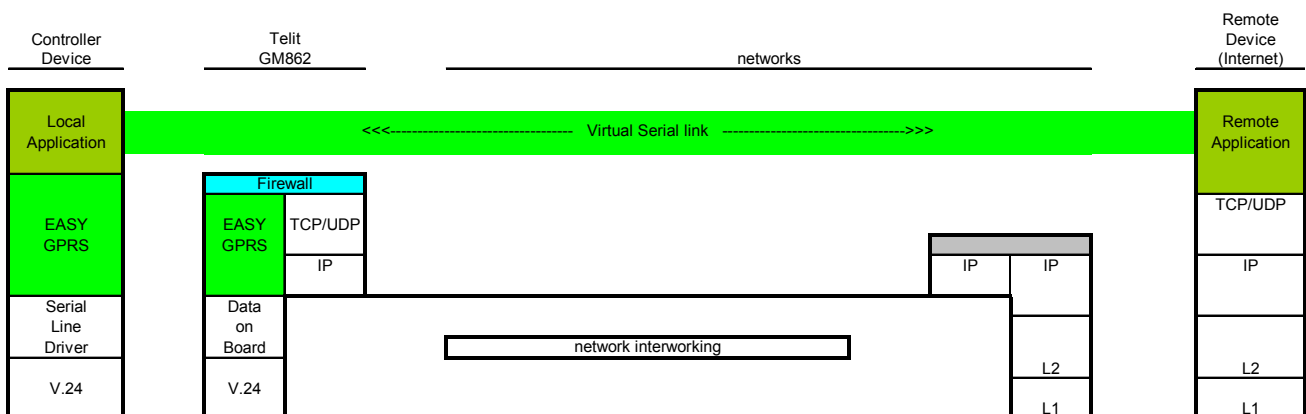
This particular implementation allows to the devices interfacing to the Telit GM862 module the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded inside the module. The new **Enhanced version** of the Easy GPRS overcomes some of the known limitations of the previous implementation and implements some new features such as:

- Keep the GPRS context active even after the closing of a socket, allowing the application to keep the same IP address;
- Also Mobile terminated (incoming) connections can be made, now it is possible to receive incoming TCP connection requests;
- A new internal firewall has been implemented in order to guarantee a certain level of security on internet applications.

5.1.2 Easy GPRS definition

The Easy GPRS feature provides a way to replace the need of an Internet TCP/IP stack at the terminal equipment side. The steps that will be required to obtain a virtual serial connection (that is actually a socket) to the Internet peer are:

- ❑ configuring the GPRS Access
- ❑ configuring the embedded TCP/IP stack behaviour
- ❑ defining the Internet Peer to be contacted
- ❑ request the GPRS and socket connections to be opened (host is connected)
- ❑ exchange raw data
- ❑ close the socket and GPRS context

All these steps are achieved through AT commands.
As for common modem interface, two logical status are involved: command mode and data traffic mode.

- ❑ In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- ❑ In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.2.1   Configuring the GPRS access

The GPRS access configuration is done by setting the following:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

5.1.2.2   Configuring the embedded TCP/IP stack

The TCP/IP stack behaviour must be configured by setting:

- ❑ the packet default size (see command #PKTSZ)
- ❑ the data sending timeout (see command #DSTO)
- ❑ the socket inactivity timeout (see command #SKTTO)

5.1.2.3   Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set the socket definition (see command #SKTSET).
This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

5.1.2.4   Open the connection with the internet host

With the AT#SKTOP all the process required to connect with the internet host starts:

- ❑ GM862 activates the first context
- ❑ GM862 proceeds to the authentication with the parameters specified
- ❑ Eventually does the DNS query to resolve the IP address of the host name internet peer
- ❑ GM862 establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- ❑ Once the connection is up the module reports the code: CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

5.1.2.5   Close the Socket and deactivate the context

The connection can be closed because of:

- ❑ remote host TCP connection close
- ❑ socket inactivity timeout
- ❑ Terminal Equipment by issuing the escape sequence "+++"
- ❑ Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.
The pause time is defined in the parameter S12.
On the reception of an escape sequence the GM862 closes the connection, deactivates the GPRS context returning to command mode and issuing the NO CARRIER code.

5.1.3 Enhanced Easy GPRS Outgoing connection

The New Enhanced Easy GPRS feature provides a way to place outgoing TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.
The steps that will be required open a socket and close it without closing the GRPS context are:

- ❑ configuring the GPRS Access
- ❑ configuring the embedded TCP/IP stack behaviour
- ❑ defining the Internet Peer to be contacted
- ❑ request the GPRS context to be activated
- ❑ request the socket connection to be opened
- ❑ exchange data
- ❑ close the TCP connection while keeping the GPRS active

All these steps are achieved through AT commands. As for common modem interface, two logical status are involved: command mode and data traffic mode.

❑ In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
❑ In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.3.1   Configuring the GPRS access

The GPRS access configuration is done by setting:

❑ the GPRS context number 1 parameters (see +CGDCONT command)
❑ the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

5.1.3.2   Configuring the embedded TCP/IP stack

The TCP/IP stack behaviour must be configured by setting:

❑ the packet default size (see command #PKTSZ)
❑ the data sending timeout (see command #DSTO)
❑ the socket inactivity timeout (see command #SKTTO)

5.1.3.3   Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set the socket definition (see command #SKTSET).
This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.
If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.
Note that this setting command is not needed if the new #SKTD command is used.

5.1.3.4   Request the GPRS context to be activated

With the new command #GPRS you can activate or deactivate a GPRS context INDEPENDENTLY from the TCP socket opening:

    AT#GPRS=1 activates the context,
    AT#GPRS=0 deactivates the context

Therefore with the AT#GPRS=1 command the module:

❑ GM862 activates the context previously defined with AT+CGDCONT
❑ GM862 proceeds to the authentication with the parameters specified

Note that activating a context implies getting an IP address from the network and this will be maintained throughout the session.
The response code to the AT#GPRS=1 command reports the IP address obtained from the network, allowing the user to report it to his server or application.
Deactivating the context implies freeing the network resources previously allocated to the device.

5.1.3.5   Open the connection with the internet host

With the new command #SKTD (socket Dial) the TCP/UDP request to connect with the internet host starts:

❑ Eventually does the DNS query to resolve the IP address of the host name internet peer
❑ GM862 establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
❑ Once the connection is up the module reports the code: CONNECT

Note that the peer specifications of this socket Dial are within the command and not the one stored with #SKTSET command.
From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.
In the same manner, when disconnecting the #SKTD command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

5.1.3.6   Close the Socket without deactivating the context

The connection can be closed because of:

❑ remote host TCP connection close
❑ socket inactivity timeout
❑ Terminal Equipment by issuing the escape sequence "+++"
❑ Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.
The pause time is defined in the parameter S12.
On the reception of an escape sequence if the socket was opened with the AT#SKTD command, the GM862 closes the connection, does not deactivate the GPRS context and returns to command mode issuing the NO CARRIER code.

5.1.4 Enhanced Easy GPRS Incoming Connection

The New Enhanced Easy GPRS feature provides a way to accept incoming TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.
The steps that will be required to open a socket in listen, waiting for connection requests from remote hosts and accept these request connections only from a selected set of hosts, then close it without closing the GRPS context are:

- ❑ configuring the GPRS Access
- ❑ configuring the embedded TCP/IP stack behaviour (see par. 5.1.3.2)
- ❑ defining the Internet Peer that can contact this device (firewall settings) (see par. 5.1.4.1)
- ❑ request the GPRS context to be activated (see par. 5.1.3.4)
- ❑ request the socket connection to be opened in listen (see par. 5.1.4.2)
- ❑ receive connection requests (see par. 5.1.4.3)
- ❑ exchange data
- ❑ close the TCP connection while keeping the GPRS active (see par. 5.1.3.6)

All these steps are achieved through AT commands.
As for common modem interface, two logical status are involved: command mode and data traffic mode.

- In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.4.1   Defining the Internet Peer that can contact this device (firewall settings)

The GM862 has an internal Firewall that controls the behaviour of the incoming connections to the module.
The firewall applies for INCOMING (listening) connections, OUTGOING connections will be always done regardless of the firewall settings.
Firewall General policy is DROP, therefore all packets that are not included into an ACCEPT chain rule will be silently discarded.

When a packet incomes from the IP address <incoming IP>, the firewall chain rules will be scanned for matching with the following criteria:

<incoming IP> & <net mask> = <ip_address> ?

if the result is yes, then the packet is accepted and the rule scan is finished, otherwise the next chain is taken into account until the end of the rules when the packet is silently dropped if no matching was found.

For example, let assume we want to accept connections only from our devices which are on the IP addresses ranging from 197.158.1.1 to 197.158.255.255

We need to add the following chain to the firewall:
AT#FRWL=1,"197.158.1.1","255.255.0.0"

5.1.4.2   Request the socket connection to be opened in listen

With the new command #SKTL (socket Listen) the TCP request to start listening for connection requests is executed. The GM862 opens a listening socket on the port specified, waiting for incoming TCP connections (depending on the parameter request) with the internet hosts

The parameters that shall be specified are the local port where packets shall be received, the type of socket and the closing behaviour.

5.1.4.3   Receiving connection requests

Once the connection request is received, the module reports an indication of connection with an unsolicited code
> +CONN FROM: <remote address>

- then connection is accepted and once it is up the module reports the code:
> CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.
Note that the connections request are FIRST screened in the firewall, then if they are accepted they pass to the listening socket; therefore only hosts that are in the ACCEPT chain rules of the firewall can induce a connection request, the other host requests will be silently discarded without any indication to the remote host (for security reasons).
Once the connection is received and closed, the socket is not anymore in listen. If the application needs again to be in listen, then it shall send again the socket listen #SKTL command.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.
In the same manner, when disconnecting the #SKTL command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

5.1.5 FTP Client

On top of the embedded TCP/IP stack, an FTP client is available. Such FTP is a versatile protocol suite, designed to be powerful, compact and simple to use for file transfer over the TCP/IP and therefore over the GPRS network.

As far as the AT commands list is concerned, the customer shall refer to the AT Commands chapter.

5.1.6 Known limitations

The implementation of the EASY GPRS feature has the following known limitations:

❑ Only one socket can be opened at a time, no multiple socket connections can be made;
❑ Only one connection request can be accepted at a time, subsequent requests will be silently discarded.

❑ Only the first GPRS context is associated with this feature;

It is taken for granted that external processor will be able to handle at least a limited v.24 implementation: RTS, CTS and, highly recommended, DCD lines; this because software flow control is not applicable to the feature;
Due to the particularity of this feature, the flow control of both the directions uplink and downlink is interlocked.

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5.2   Jammed Detect & Report Extension

5.2.1 Overview

The Jammed Detect & Report feature allows a Telit GM862-QUAD,QUAD-PY and GPS modules to detect the presence of a disturbing device such as a Communication Jammer and give indication to the user and/or send a report of that to the network.

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 either to the local system for countermeasure actions or to the network providing remote actions.

An example scenario could be an intrusion detection system that uses the module for sending the alarm indication for example with an SMS to the system owner, and a thief incomes using a Jammer to prevent any communication between the GSM module and the network.

In such a case, the module detects the Jammer presence even before the break in and can trigger an alarm siren, other communication devices (PSTN modem) or directly report this condition to the network that can provide further security services for example sending SMS to the owner or police. Obviously this last service depends also from network infrastructure support and it may not be supported by some networks.

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5.3   Easy Script Extension - Python interpreter

5.3.1 Overview

This feature is available only on models GM862-QUAD-PY and GM862-GPS.

The Easy Script Extension is a feature that allows to drive 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 module through the AT command interface.

A schematic of such a configuration can be:
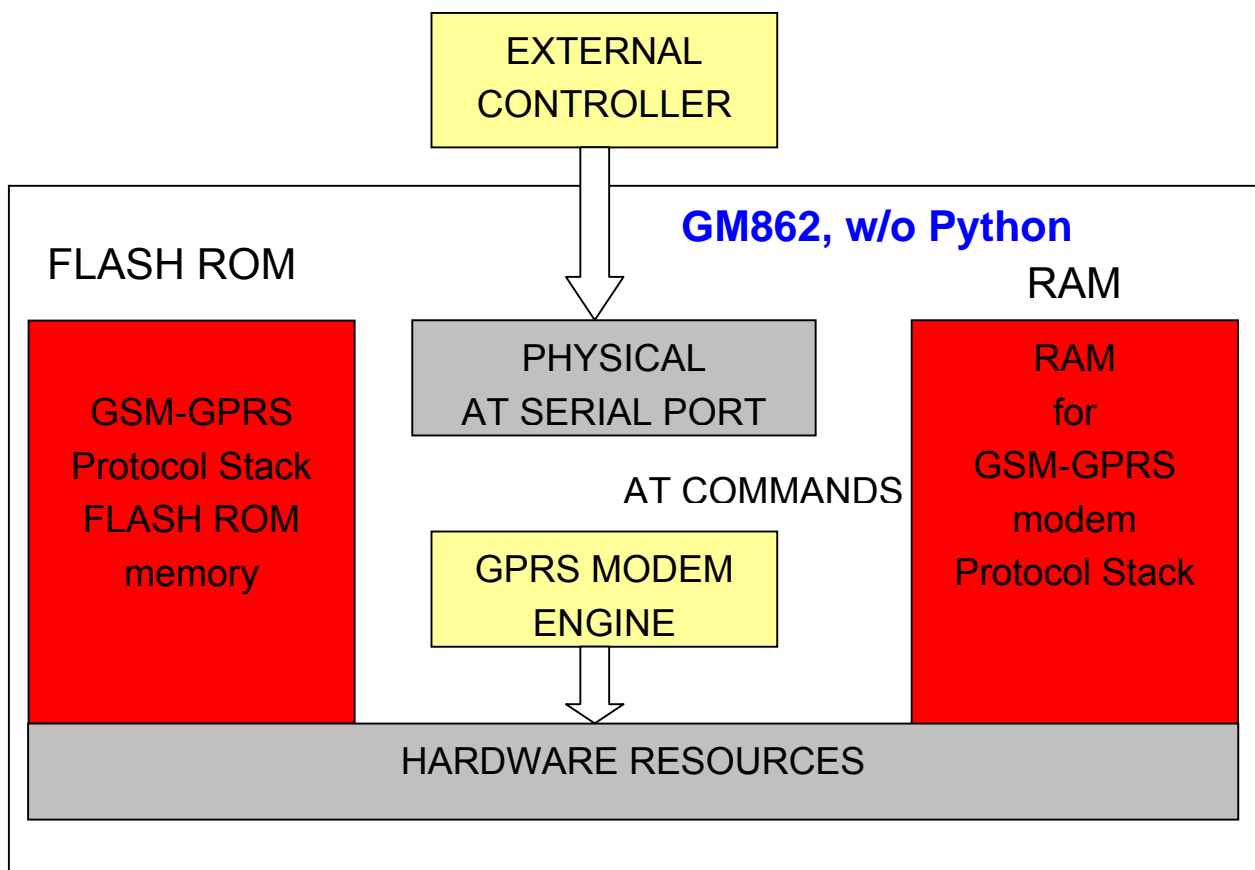
In order to eliminate this external controller, and further simplify the programming of the sequence of operations, inside the module has been included:

- *Python script interpreter engine v. 1.5.2+*
- *around 3MB of Non Volatile Memory room for the user scripts and data*
- *1.5 MB RAM reserved for Python engine usage*

A schematic of this approach is:
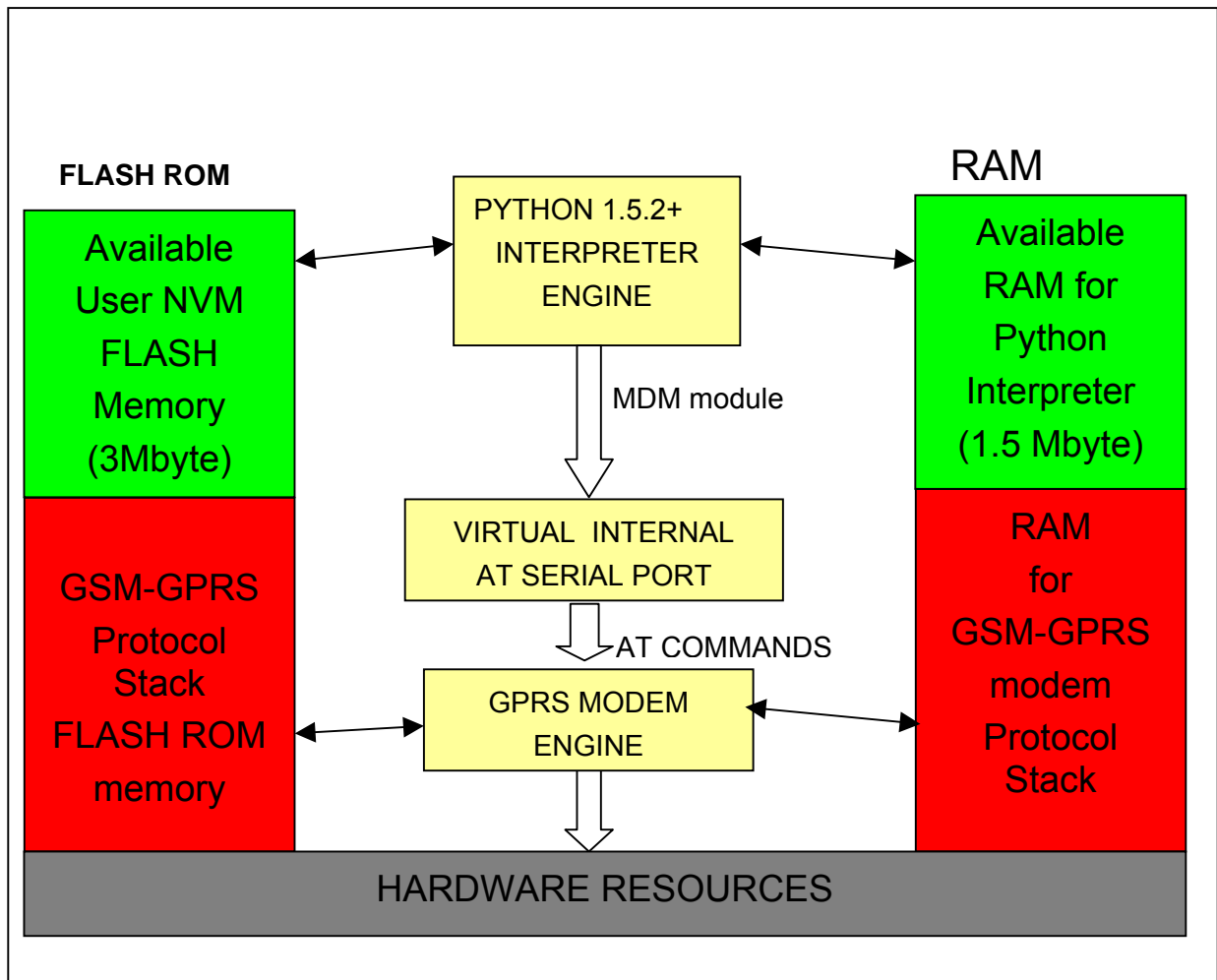
5.3.2 Python 1.5.2+ Copyright Notice

The Python code implemented into the GM862-PYTHON is copyrighted by Stichting Mathematisch Centrum, this is the license:

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5.3.3 Python implementation description

Python scripts are text files, it is possible to run one Python script in the **Telit** module.
The Python script is stored in NVM inside the Telit module, there's a file system inside the GM862 that allows to write and read files with different names on one single level (no subdirectories are supported).
The Python script is executed in a task inside the Telit module at the lowest priority, making sure this does not interfere with GPRS/GSM normal operations. This allows serial ports, protocol stack etc. to run independently from the Python script.
The Python script interacts with the Telit module functionality through four build-in interfaces.
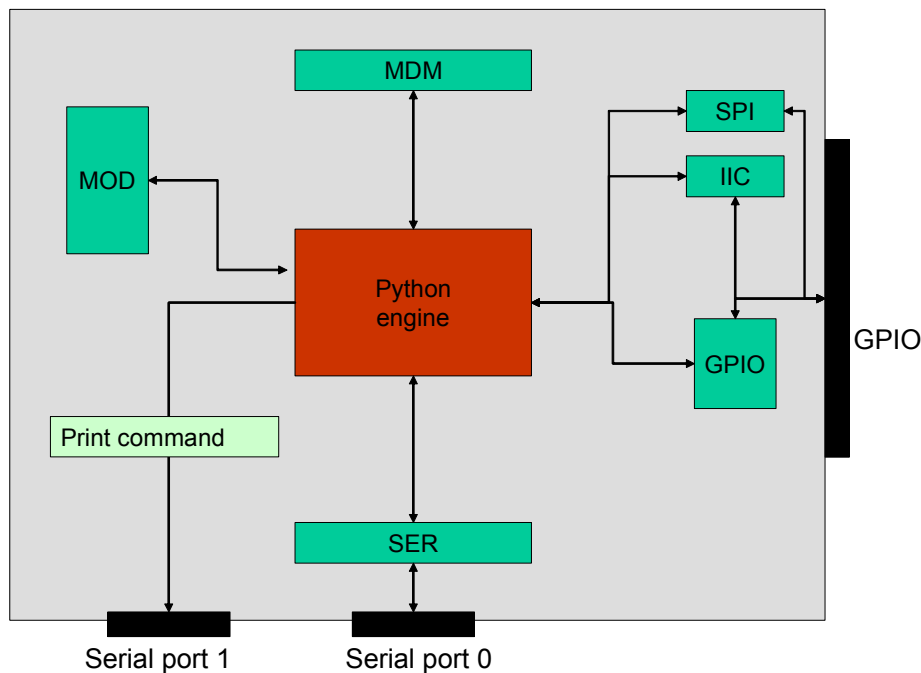
The MDM interface is the most important one. It allows Python script to send AT commands, receive responses and unsolicited indications, send data to the network and receive data from the network during connections.

It is quite the same as the usual serial port interface in the Telit module. The difference is that this interface is not a real serial port but just an internal software bridge between Python and mobile internal AT command handling engine.

All AT commands working in the Telit module works in this software interface as well. Some of them have no meaning on this interface, such as those regarding serial port settings.

The usual concept of flow control keeps its meaning over this interface, but it's managed internally.

The SER interface allows Python script to read from and write to the REAL, physical serial port where usually the AT command interface resides, for example to read NMEA information from a GPS device. When Python is running this serial port is free to be used by Python script because it is not used as AT command interface since the AT parser is mapped into the internal virtual serial port. No flow control is available from Python on this port.

The GPIO interface allows Python script to handle general purpose input output faster than through AT commands, skipping the command parser and going directly to control the pins.

The MOD interface is a collection of useful functions.

For the debug, the print command is directly forwarded on the EMMI TX pin (second serial port) at 9600 baud 8N1.

5.3.4 Python core supported features

The Python core version is 1.5.2+ (string methods added to 1.5.2).
You can use all Python statements and almost all Python built-in types and functions.
The following are not supported:
complex;   *float;*   *long;*   *docstring.*

Available modules are
marshal,   imp,   __main__,   __builtin__,   sys
md5

All the others are not supported.

5.3.5 Python Build-in Custom Modules

Several build in custom modules have been included in the python core, specifically aimed at the hardware environment of the module.
The build in modules included are:

MDM: interface between Python and mobile internal AT command handling;
SER: interface between Python and mobile internal serial port ASC0 direct handling;
GPIO: interface between Python and mobile internal general purpose input output direct handling;
MOD: interface between Python and mobile miscellaneous functions.
IIC: custom software Inter IC bus that can be mapped on creation over almost any GPIO pin available.
SPI: custom software Serial Protocol Interface bus that can be mapped on creation over almost any GPIO pin available.

More details about the Python modules are available in the reference guide.

6 AT Commands

The **GM862** module can be driven via the serial interface using the standard AT commands[3]. The **GM862** module are compliant with:

1. Hayes standard AT command set, in order to maintain the compatibility with existing SW programs.
2. ETSI GSM 07.07 specific AT command and GPRS specific commands.
3. ETSI GSM 07.05 specific AT commands for SMS (Short Message Service) and CBS (Cell Broadcast Service)
4. FAX Class 1 compatible commands

Moreover the **GM862** supports also Telit proprietary AT commands for special purposes.
The following table lists all supported AT commands and related brief description.
For a detailed description of GM862GSM/GPRS/PCS/PYTHON modules AT Commands refer to document, code 80264ST10013a.
For a detailed description of GM862GPS modules, refer to the AT Command Description document, code 80268ST10015a.

Hayes Compliant AT Commands		GM862 module Command availability		
Generic Modem Control		QUAD	QUAD-PY	GPS
&F	Reset base section factory profile configuration	•	•	•
&F1	Reset full factory profile configuration	•	•	•
Z	Soft reset	•	•	•
+FCLASS	Select active service class	•	•	•
&Y	Designate a default reset basic profile	•	•	•
&P	Designate a default reset full profile	•	•	•
&W	Store current configuration	•	•	•
&Z	Store telephone number in the internal phonebook	•	•	•
&N	Display internal phonebook stored numbers	•	•	•
+GMI	Request manufacturer identification	•	•	•
+GMM	Request model identification	•	•	•
+GMR	Request revision identification	•	•	•
+GCAP	Request capabilities list	•	•	•
+GSN	Request serial number	•	•	•
&V	Display current configuration & profile	•	•	•
&V0	Display current configuration & profile	•	•	•
&V1	Display S registers values	•	•	•
&V2	Display last connection statistics	•	•	•

---

[3] The AT is an ATTENTION command and is used as a prefix to other parameters in a string. The AT command combined with other parameters can be set up in the communications package or typed in manually as a command line instruction.

&V3	Display S registers values	•	•	•
\V	Single line connect message	•	•	•
%L	Report line signal level	•	•	•
%Q	Report line quality	•	•	•
+GCI	Select the country of installation	•	•	•
L	Monitor speaker loudness	•	•	•
M	Monitor speaker mode	•	•	•
DTE - modem interface control		**QUAD**	**QUAD-PY**	**GPS**
E	Command echo	•	•	•
Q	Quiet resut codes	•	•	•
V	Result code form	•	•	•
X	Extended result codes	•	•	•
I	Request identifier and software checksum	•	•	•
&C	Data carrier detect (DCD) control	•	•	•
&D	Data terminal ready (DTR) control	•	•	•
&K	Flow control	•	•	•
&Q	Sync/async mode	•	•	•
&S	Data set ready (DSR) control	•	•	•
\R	Ring (RI) control	•	•	•
+IPR	Fixed DTE interface rate	•	•	•
+IFC	DTE - DTA flow control	•	•	•
+ILRR	DTE - modem rate reporting	•	•	•
+ICF	DTE - modem character format	•	•	•
Call Control		**QUAD**	**QUAD-PY**	**GPS**
D	Dial	•	•	•
T	Set tone dial	•	•	•
P	Set pulse dial	•	•	•
A	Answer	•	•	•
A/	Last command automatic repetition	•	•	•
H	Disconnect	•	•	•
O	Return to On Line Mode	•	•	•
&G	Guard tone	•	•	•
Modulation control		**QUAD**	**QUAD-PY**	**GPS**
+MS	Modulation control	•	•	•
%E	Enable/disable line quality monitor and auto retrain or fallback / fallforward	•	•	•
\N	Operating mode	•	•	•
Compression control		**QUAD**	**QUAD-PY**	**GPS**
+DS	Set data compression	•	•	•
+DR	Data compression reporting	•	•	•
Break control		**QUAD**	**QUAD-PY**	**GPS**
\B	Transmit break to remote	•	•	•
\K	Break handling	•	•	•

S parameters		QUAD	QUAD-PY	GPS
S0	Number of rings to auto answer	•	•	•
S1	Ring counter	•	•	•
S2	Escape character	•	•	•
S3	Carriage return character	•	•	•
S4	Line feed character	•	•	•
S5	Backspace character	•	•	•
S7	Wait time for carrier, silence or dial tone	•	•	•
S12	Escape prompt delay	•	•	•
S25	Delay to DTR off	•	•	•
S30	Disconnect inactivity timer	•	•	•
S38	Delay before forced hang up	•	•	•
ETSI GSM 07.07 AT Commands		**QUAD**	**QUAD-PY**	**GPS**
+CGMI	Request manufacturer identification	•	•	•
+CGMM	Request model identification	•	•	•
+CGMR	Request revision identification	•	•	•
+CGSN	Request product serial number identification	•	•	•
+CSCS	Select TE character set	•	•	•
+CIMI	Request international mobile subscriber identity (IMSI)	•	•	•
Call control		**QUAD**	**QUAD-PY**	**GPS**
+CBST	Select bearer service type	•	•	•
+CRLP	Radio link protocol	•	•	•
+CR	Service reporting control	•	•	•
+CEER	Extended error report	•	•	•
+CRC	Cellular result codes	•	•	•
+CSNS	Single numbering scheme	•	•	•
Network service handling		**QUAD**	**QUAD-PY**	**GPS**
+CNUM	Subscriber number	•	•	•
+COPN	Read operator names	•	•	•
+CREG	Network registration report	•	•	•
+COPS	Operator selection	•	•	•
+CLCK	Facility lock/ unlock	•	•	•
@CLCK	Facility lock/ unlock (improved)	•	•	•
+CPWD	Change facility password	•	•	•
+CLIP	Calling line identification presentation	•	•	•
+CLIR	Calling line identification restriction	•	•	•
+CCFC	Call forwarding number and conditions	•	•	•
+CCWA	Call waiting	•	•	•
+CHLD	Call holding services	•	•	•
+CUSD	Unstructured supplementary service data	•	•	•
+CAOC	Advice of charge	•	•	•

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+CLCC	List current calls	•	•	•
+CSSN	SS Notification	•	•	•
+CCUG	Closed User Group supplementary service control	•	•	•
Mobile Equipment control		**QUAD**	**QUAD-PY**	**GPS**
+CPAS	Phone activity status	•	•	•
+CFUN	Set phone functionality (Power Saving Management)	•	•	•
+CPIN	Enter PIN	•	•	•
+CSQ	Signal quality	•	•	•
+CPBS	Select phonebook memory storage	•	•	•
+CPBR	Read phonebook entries	•	•	•
+CPBF	Find phonebook entries	•	•	•
+CPBW	Write phonebook entry	•	•	•
+CCLK	Clock Management	•	•	•
+CALA	Alarm Management	•	•	•
+CALM	Alert sound mode	•	•	•
+CRSL	Ringer sound level	•	•	•
+CLVL	Loudspeaker volume level	•	•	•
+CMUT	Microphone mute control	•	•	•
+CACM	Accumulated call meter	•	•	•
+CAMM	Accumulated call meter maximum	•	•	•
+CPUC	Price per unit and currency table	•	•	•
+CCID	Read ICCID (Integrated Circuit Card Id.)	•	•	•
Mobile equipment errors		**QUAD**	**QUAD-PY**	**GPS**
+CMEE	Report mobile equipment error	•	•	•
Voice Control (TIA IS-101)		**QUAD**	**QUAD-PY**	**GPS**
+VTS:	DTMF tones transmission	•	•	•
Commands For GPRS		**QUAD**	**QUAD-PY**	**GPS**
+CGACT	PDP context activate or deactivate	•	•	•
+CGATT	GPRS attach or detach	•	•	•
+CGDATA	Enter data state	•	•	•
+CGDCONT	Define PDP context	•	•	•
+CGPADDR	Show PDP address	•	•	•
+CGREG	GPRS network registration status	•	•	•
+CGQMIN	Quality of service profile (minimum acceptable)	•	•	•
+CGQREQ	Quality of service profile (requested)	•	•	•
Commands For Battery Charger		**QUAD**	**QUAD-PY**	**GPS**
+CBC	Battery Charge	•	•	•
ETSI GSM 07.05 AT Commands for SMS and CB services		**QUAD**	**QUAD-PY**	**GPS**
+CSMS	Select message service	•	•	•
+CPMS	Preferred message storage	•	•	•
+CMGF	Message format	•	•	•
+CSMP	Set parameters in text mode	•	•	•

+CSDH	Show parameters in text mode	●	●	●
+CSAS	Save setting text mode	●	●	●
+CRES	Restore text mode settings	●	●	●
+CSCB	Select Cell Broadcast Message types	●	●	●
Message configuration		**QUAD**	**QUAD-PY**	**GPS**
+CSCA	Service center address	●	●	●
Message receiving and reading		**QUAD**	**QUAD-PY**	**GPS**
+CNMI	New message indications to Terminal Equipment	●	●	●
+CMGL	List messages	●	●	●
+CMGR	Read message	●	●	●
Message sending and writing		**QUAD**	**QUAD-PY**	**GPS**
+CMGS	Send message	●	●	●
+CMSS	Send message from storage	●	●	●
+CMGW	Write message to memory	●	●	●
+CMGD	Delete message	●	●	●
Custom AT Commands		**QUAD**	**QUAD-PY**	**GPS**
#SELINT	Select type of interface	●	●	●
#CGMI	Request manufacturer identification	●	●	●
#CGMM	Request model identification	●	●	●
#CGMR	Request revision identification	●	●	●
#CGSN	Request product serial number identification	●	●	●
#CIMI	Request international mobile subscriber identity (IMSI)	●	●	●
#CAP	Change Audio Path	●	●	●
#SRS	Select ringer sound	●	●	●
#SRP	Select Ringer Path	●	●	●
#STM	Signaling Tones Mode	●	●	●
#PCT	Display PIN Counter	●	●	●
#SHDN	Software Shut Down	●	●	●
#WAKE	Wake from Alarm mode	●	●	●
#QTEMP	Query Temperature overflow	●	●	●
#SGPO	Set General Purpose Output	●	●	●
#GGPI	Read General Purpose Input	●	●	●
#GPIO	General Purpose Input/Output pin control	●	●	●
#ADC	Read Analog/Digital Converter input			●
#VAUX	Auxiliary Voltage Output Control			●
#AUTOATT	Enables / Disable GPRS Auto Attach	●	●	●
#MONI	Monitor Cells	●	●	●
#QSS	Query SIM Status	●	●	●
#ACAL	Set Automatic Call	●	●	●
#SMOV	SMS Overflow	●	●	●
#SHFEC	Set Handsfree echo canceller	●	●	●

#HFMICG	Handsfree Microphone Gain	•	•	•
#HSMICG	Handset Microphone Gain	•	•	•
#SHFSD	Set Handsfree side tone	•	•	•
#/	Repeat last command	•	•	•
#BND	Select Band	•	•	•
#NITZ	Network Timezone	•	•	•
#SKIPESC	Skip escape sequence	•	•	•
FAX Class 1 Commands		**QUAD**	**QUAD-PY**	**GPS**
+FCLASS	Select active service class	•	•	•
+FMI	Report manufacturer ID	•	•	•
+FMM?	Report model ID	•	•	•
+FMR	Report revision ID	•	•	•
Transmission/Reception control		**QUAD**	**QUAD-PY**	**GPS**
+FTS	Stop Transmission and pause	•	•	•
+FRS	Wait for receive silence	•	•	•
+FTM	Transmit data modulation	•	•	•
+FRM	Receive data modulation	•	•	•
+FTH	Transmit data with HDLC framing	•	•	•
+FRH	Receive data with HDLC framing	•	•	•
Serial port control		**QUAD**	**QUAD-PY**	**GPS**
+FLO	Select flow control specified by type	•	•	•
+FPR	Select serial port rate	•	•	•
+FDD	Double escape character replacement control	•	•	•
Enhanced Easy GPRS custom AT command Definition		**QUAD**	**QUAD-PY**	**GPS**
#USERID	Authentication User ID control	•	•	•
#PASSW	Authentication Password control	•	•	•
#PKTSZ	Packet Size control	•	•	•
#DSTO	Data Sending TimeOut control	•	•	•
#SKTTO	Socket inactivity timeout control	•	•	•
#SKTSET	Socket definition control	•	•	•
#SKTOP	Socket Open command	•	•	•
#QDNS	Query DNS	•	•	•
#SKTCT	Socket TCP Connection Timeout	•	•	•
#SKTSAV	Socket Parameters Save Command	•	•	•
#SKTRST	Socket Parameters Reset Command	•	•	•
#GPRS	GPRS context activation control	•	•	•
#SKTD	Socket Dial	•	•	•
#SKTL	Socket Listen	•	•	•
@SKTL	Socket Listen (improved)	•	•	•
#FRWL	Firewall setup	•	•	•
FTP CLIENT AT Commands		**QUAD**	**QUAD-PY**	**GPS**
#FTPOPEN	FTP Open command	•	•	•

#FTPCLOSE	FTP Close command	•	•	•
#FTPPUT	FTP Put command	•	•	•
#FTPGET	FTP Get command	•	•	•
#FTPTYPE	FTP Type command	•	•	•
#FTPMSG	FTP read message command	•	•	•
#TFPDELE	FTP Delete command	•	•	•
#FTPPWD	FTP print working directory command	•	•	•
#FTPCWD	FTP change working directory command	•	•	•
#FTPLIST	FTP List command	•	•	•
Easy Camera Extension - Camera Management		**QUAD**	**QUAD-PY**	**GPS**
#CAMON	Camera ON	•	•	•
#CAMOFF	Camera OFF	•	•	•
#TPHOTO	Camera Take Photo	•	•	•
#RPHOTO	Camera Read Photo	•	•	•
#OBJL	Object List	•	•	•
#OBJR	Object Read	•	•	•
#CAMQUA	Camera Select Quality of Photo	•	•	•
#CMODE	Camera Select Operating MODE	•	•	•
#SELCAM	Camera Model selection	•	•	•
#CAMEN	Camera ON/OFF	•	•	•
#CAMRES	Camera resolution	•	•	•
#CAMCOL	Camera colour mode selection	•	•	•
#CAMZOOM	Camera zoom setting	•	•	•
#CAMTXT	Camera Time/Date overprint	•	•	•
Email management		**QUAD**	**QUAD-PY**	**GPS**
#ESMTP	Email SMTP server	•	•	•
#EADDR	Email sender address	•	•	•
#EUSER	Email authentication USER NAME	•	•	•
#EPASSW	Email authentication PASSWORD	•	•	•
#SEMAIL	Send Email	•	•	•
#EMAILACT	E-mail context activation control	•	•	•
#EMAILD	E-mail socket dial	•	•	•
#ESAV	Email Parameters Save Command	•	•	•
#ERST	Email Parameters Reset Command	•	•	•
Easy Scan Extension		**QUAD**	**QUAD-PY**	**GPS**
#CSURV	Network Survey of the complete 900/1800/1900 Network	•	•	•
#CSURVC	Network Survey in computer friendly format	•	•	•
#CSURVU	Network Survey of user defined 900/1800/1900 channels	•	•	•
#CSURVUC	Network Survey in computer friendly format	•	•	•
#CSURVF	Network Survey Format	•	•	•
Jammed Detect & Report custom AT command		**QUAD**	**QUAD-PY**	**GPS**

#JDR	Jammed Detect & Report	•	•	•
PYTHON Script Management commands		**QUAD**	**QUAD-PY**	**GPS**
#WSCRIPT	Write script command		•	•
#ESCRIPT	Select Active script command		•	•
#RSCRIPT	Read script command		•	•
#LSCRIPT	List script names command		•	•
#DSCRIPT	Delete script command		•	•
#REBOOT	Reboot command		•	•
GPS commands		**QUAD**	**QUAD-PY**	**GPS**
$GPSP	GPS controller power management			•
$GPSR	Get position information			•
$GPSSAV	Save GPS parameters			•
$GPSRST	GPS RESET			•
$GPSD	GPS DEVICE TYPE SET			•
$GPSSW	GPS SOFTWARE VERSION			•
$GPSAT	GPS ANTENNA TYPE DEFINITION			•
$GPSAV	GPS ANTENNA SUPPLY VOLTAGE READOUT			•
$GPSAI	GPS ANTENNA CURRENT CONSUMPTION READOUT			•
$GPSAP	GPS ANTENNA PROTECTION SYSTEM			•
$GPSDATA	ENABLE SERIAL PORT FOR GPS DATA			•
$GPSDATAS	SERIAL PORT SPEED			•
$GPSS	GPS SERIAL PORTS SPEED			•
$GPSNMUN	UNSOLICITED NMEA DATA CONFIGURATION			•
$GPSACP	GET ACTUAL POSITION			•
$GPSCON	DIRECT ACCESS TO GPS MODULE			•
$GPSSAV	SAVE in EEPROM current GPS parameters configuration			•
$GPSRST	RESTORE TO DEFAULT GPS PARAMETERS			•

7 Conformity Assessments

The **Telit GM862 modules** are assessed to be conform to the R&TTE Directive as stand-alone products, so If the module is installed **in conformance with Telit Communications installation instructions** require no further evaluation under Article 3.2 of the R&TTE Directive and do not require further involvement of a R&TTE Directive Notified Body for the final product. In all other cases, or if the manufacturer of the final product is in doubt then the equipment integrating the radio module must be assessed against Article 3.2 of the R&TTE Directive**.** In all cases assessment of the final product must be made against the Essential requirements of the R&TTE Directive Articles 3.1(a) and (b), safety and EMC respectively, and any relevant Article 3.3 requirements. The **Telit GM862 modules** 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 GM862PCS module is 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

In this document and the Hardware User Guide, Software User Guide all the information you may need for developing a product meeting the R&TTE Directive is included.

Furthermore the Telit GM862-QUAD, GM862-QUAD-PY and GM862-GPS modules is FCC Approved as module to be installed in other devices. If the final product after integration is intended for portable use, a new application and FCC is required.

The Telit GM862-QUAD, GM862-QUAD-PY and GM862-GPS modules are conform with the following US Directives:

❑ Use of RF Spectrum. Standards: FCC 47 Part 24 (GSM 1900)
❑ EMC (Electromagnetic Compatibility). Standards: FCC47 Part 15

To meet the FCC's RF exposure rules and regulations:

❑ The system antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

❑ The system antenna(s) used for this module must not exceed 3 dBi for mobile and fixed or mobile operating configurations.

❑ Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

❑ Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.

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7.1 GM862-QUAD: Conformity Assessment

Certificate

This certificate is issued to

Telit Communications S.p.A

of

Viale Stazione di Prosecco 5/B
34010 Sgonico
Trieste
Italy

to certify that the Equipment known as

GM862-QUAD

as described in the Annex to this certificate
conforms to the essential requirements of Directive 1999/5/EC
of the European Parliament and European Council on the basis
of Technical Construction File number SC 0134-0018-002_TCF
in relation to the essential requirements of
Articles 3.1(a), 3.1(b) & 3.2 of the Directive.

Signed:

On Behalf of BABT

Issue Date: 16 November 2005

Number: NC/12603   Issue: 01

This certificate is issued by BABT and represents a formal Notified Body opinion under Annex IV of Directive 1999/5/EC permitting the use of the BABT CE0168 mark on the equipment described above subject to the equipment meeting the compliance requirements of all applicable EU directives. This certificate is not transferable and remains the property of BABT.

British Approvals Board for Telecommunications · TÜV SÜD Group · Balham House · Churchill Road · Watchmoor Park · Surrey · KU2 2TD · United Kingdom

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7.2 GM862-QUAD FCC Equipment Authorization

Under approval.

7.3   GM862-QUAD-PY: Conformity Assessment

Under approval.

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7.4   GM862-QUAD-PY FCC Equipment Authorization

Under approval.

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7.5   GM862-GPS: Conformity Assessment

Under approval.

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7.6   GM862-GPS FCC Equipment Authorization

Under approval.

8 SAFETY RECOMMENDATIONS

<u>READ CAREFULLY</u>

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.

Electronic equipment to be introduced in the market has to be conforming to the related Directives of the European Community. All the relevant information is available on the European Community's website, especially:

Telit GM862-GPS, GM862-QUAD-PY and GM862-QUAD
Product Description

80272ST10019a Rev. 2 – 22/01/06

- The Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment …:
  http://europa.eu.int/comm/enterprise/rtte/dir99-5.htm

- The Low Voltage Directive (LVD) 73/23/EEC and The Council Directive 89/336/EEC of 3 May 1989 on ... electromagnetic compatibility (EMC Directive) are available at:
  http://europa.eu.int/comm/enterprise/electr_equipment/index_en.htm

- The DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE) and the DIRECTIVE 2002/95/EC 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") are available at:
  http://europa.eu.int/scadplus/leg/en/lvb/l21210.htm

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9 GM862 Family Technical Support

Telit's technical support to **GM862** wireless modem customers consists in:

• <u>Technical documentation</u>: available for download on the Website www.telit.com >Products >Modules > selected model.

• <u>Engineering support</u>: accessible via E-Mail service with 48 hr replies assured under normal conditions.

10 Acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
BGA	Ball Grid Array (of solder balls on surface mount devices)
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)
FTP	File Transfer Protocol
GGA	Global Positioning System Fix Data
GLL	Geographic Posotion – Latitude/Longitude
GPS	Global Positioning System, based on reception of signals from orbiting satellites
GPRS	General Radio Packet Service
GSA	GPS receiver operating mode, SVs used for navigation, and DOP values.
GSM	Global System for Mobile communication
GSV	Number of SVs in view, PRN numbers, elevation, azimuth & SNR values.
HF	Hands Free

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IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IRA	International 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
NMEA	National Marine Electronics Association
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
RMC	Recommended Minimum Specific GPS/TRANSIT Data
RMS	Root Mean Square
RoHS	Reduction of Hazardous Substances
RTS	Ready To Send
RI	Ring Indicator
SCA	Service Center Address
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SS	Supplementary Service
TIA	Telecommunications Industry Association
TTFF	Time To First Fix
UDUB	User Determined User Busy

USSD	Unstructured Supplementary Service Data
VTG	Actual track made good and speed over ground

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11 Document Change Log

Revision	Date	Changes
ISSUE#0	10/04/05	initial release.
ISSUE#1	27/10/05	Paragraphs reviewed: 1 Overview 2.1 Dimensions (GPS antenna position frozen) 2.3.1 Temperature range 2.6 Reference sensitivity 2.7.1 GSM Antenna 2.8 GPS Module features 2.8.1.1 GPS Sensitivity 2.8.1.2 GPS Consumption 2.12.9 Character management 2.12.12 Indication of network service availability 2.17 ADC Converter (GM862-GPS only) 4 AT Commands (Camera cmds, FTP cmds, GPS cmds, #NITZ, #SKIPESC, etc) 5.1.5 FTP Client
ISSUE#2	24/01/06	Added products order codes table on page 2