User Guide

GenPro 18e

(GenPro18e)

Reference : EG_GenPro18e_1003_UG_007_UK

Revision :   007

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Document history

Révision	Modifications	Auteur	Date
000	CREATION	F. LE BRETON	27/05/08
001	Added Reset following SIM extraction (paragraph 5.1.4)	F. LE BRETON	27/05/08
002	Modified product package sticker page 09 et 11 Update consumptions page 35 Update declaration of conformity page 41	F. LE BRETON	30/05/08
003	Added consumptions page 34 Modified temperature range page 37	F. LE BRETON	10/06/08
004	Cancelation Error Code table page 25	F. LE BRETON	30/10/08
005	Modified "CPIN" page 16	F. LE BRETON	30/10/09
006	Updating the certificate of conformity.	YST	10/05/11
007	The GenPro 20e SQB becomes the GenPro 18e.	YST	10/10/11

The main modifications in this document compared to its previous version, are easily identifiable on a monitor by means of the blue text.

CONTENTS

Presentation

Entirely dedicated to the wireless markets throughout the world, the GenPro 18e allows a simple and rapid integration of GSM / GPRS connectivity into M2M applications.

The GenPro 18e is a robust, reliable and long life product. Its very compact metal case makes it ideally adapted to onboard standards.

The GenPro modem is Quad-Band 850/900/1800/1900 MHz and GSM/GPRS Class 10.

The GenPro 18e modem allows the immediate development of onboard high value-added telematic solutions.

The GenPro 18e provides an external mode of operation, controlled by an external application through an AT command set (see the ERCO & GENER Commands List).

This document describes the modem and provides the following information:

- General presentation,
- Functional description,
- Available basic services,
- Installation and use (first level),
- User-level trouble shooting,
- Recommended accessories.

For further information, please refer to the following documents:

- Commands List
- Application Notes
- Release Notes
- Client support (Hot-Line)

Warning

- TO AVOID ALL RISK OF ELECTROCUTION, DO NOT OPEN THE UNIT

- THE UNIT CONTAINS NO USER REPAIRABLE COMPONENTS

- THE UNIT MUST BE RETURNED TO THE MANUFACTURER FOR ANY REPAIRATION

- THE UNIT MUST NOT BE CONNECTED DIRECTLY TO THE MAINS SUPPLY. PLEASE USE A SUITABLE EXTERNAL POWER SUPPLY.

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1 References

1.1 Reference Documents

AT Commands Lists:
EG_GenProxxx_ xxx_1003_CL_000_UK

Software update procedure:
EG_GenProxxx_xxx_1003_UP_000_UK

Documents de reference GSM:
- GSM 07.05.
- GSM 07.07.

1.2 Abreviations

AC	Alternative Current
ACM	Accumulated Call Meter
AMR	Adaptative Multiple Rate
AT	Attention (prefix for modem commands)
BTS	Base Transceiver Station
CLK	ClocK
CMOS	Complementary Metal Oxide Semiconductor
CS	Coding Scheme
CTS	Clear To Send
dB	Decibel
dBc	Decibel relative to the Carrier power
dBi	Decibel relative to an Isotropic radiator
dBm	Decibel relative to one milliwatt
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCS	Digital Cellular System
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency
DTR	Data Terminal Ready
EEPROM	Electrically Erasable Programmable Read-Only Memory
EFR	Enhanced Full Rate
E-GSM	Extended GSM
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
ESD	ElectroStatic Discharges
ETSI	European Telecommunications Standards Institute
FIT	Series of connectors (micro-FIT)
FR	Full Rate
FTA	Full Type Approval
GCF	Global Certification Forum
GND	GrouND
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
HR	Half Rate
I	Input
IEC	International Electrotechnical Commission

IMEI	International Mobile Equipment Identification
I/O	Input / Output
LED	Light Emitting Diode
MAX	MAXimum
ME	Mobile Equipment
MIC	MICrophone
Micro FIT	Family of connectors from Molex
MIN	MINimum
MNP	Microcom Networking Protocol
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NOM	NOMinal
O	Output
Pa	Pascal (for speaker sound pressure measurements)
PBCCH	Packet Broadcast Control Channel
PC	Personal Computer
PCL	Power Control Level
PDP	Packet Data Protocol
PIN	Personal Identity Number
PLMN	Public Land Mobile Network
PUK	Personal Unblocking Key
RF	Radio Frequency
RFI	Radio Frequency Interference
RI	Ring Indicator
RMS	Root Mean Square
RTS	Request To Send
RX	Receive
SIM	Subscriber Identification Module
SMA	SubMiniature version A RF connector
SMS	Short Message Service
SNR	Signal-to-Noise Ratio
SPI	Serial Peripheral Interface
SPL	Sound Pressure Level
SPK	SpeaKer
SRAM	Static RAM
TCP/IP	Transmission Control Protocol / Internet Protocol
TDMA	Time Division Multiple Access
TU	Typical Urban fading profile
TUHigh	Typical Urban, High speed fading profile
TX	Transmit
TYP	TYPical
UTC	Universal Time Clock
VSWR	Voltage Stationary Wave Ratio

2 Packing

2.1 Contents

The GenPro 18e is supplied with:

- 1 GenPro 18e packing case,
- 1 GenPro 18e modem,
- 2 fixing brackets,
- Instructions Sheet.
- 2-wire cable (Red/Black) with in-line fuse

2.2 Packing Case

Packing case external dimensions:

- Width: 54.5 mm,
- Height: 68 mm,
- Length: 108 mm.

An identification label is attached to the top of the packing case. It contains

- The ERCO & GENER logo,
- The product reference (GenPro 18e),
- CE mark and RoHS compliance mark,
- The IMEI 15-digit bar code.

Identification label dimensions:

- Height: 37 mm,
- Length: 70 mm.

2.3 Modem Labels

One production label, attached to the underside of the modem, provides the following information:

- CE mark,

- Crossed wheelie-bin mark (DEEE standard),

- DC supply (VDC),

- The IMEI 15-digit bar code.

3 General Presentation

3.1 Physical Description

Description of the GenPro 18e modem:

Connector
Micro-Fit 4pins/M

Front side

Connector Sub HD
15pins/F

Rear side

Connector
SMA/F

SIM card cover

GSM LED
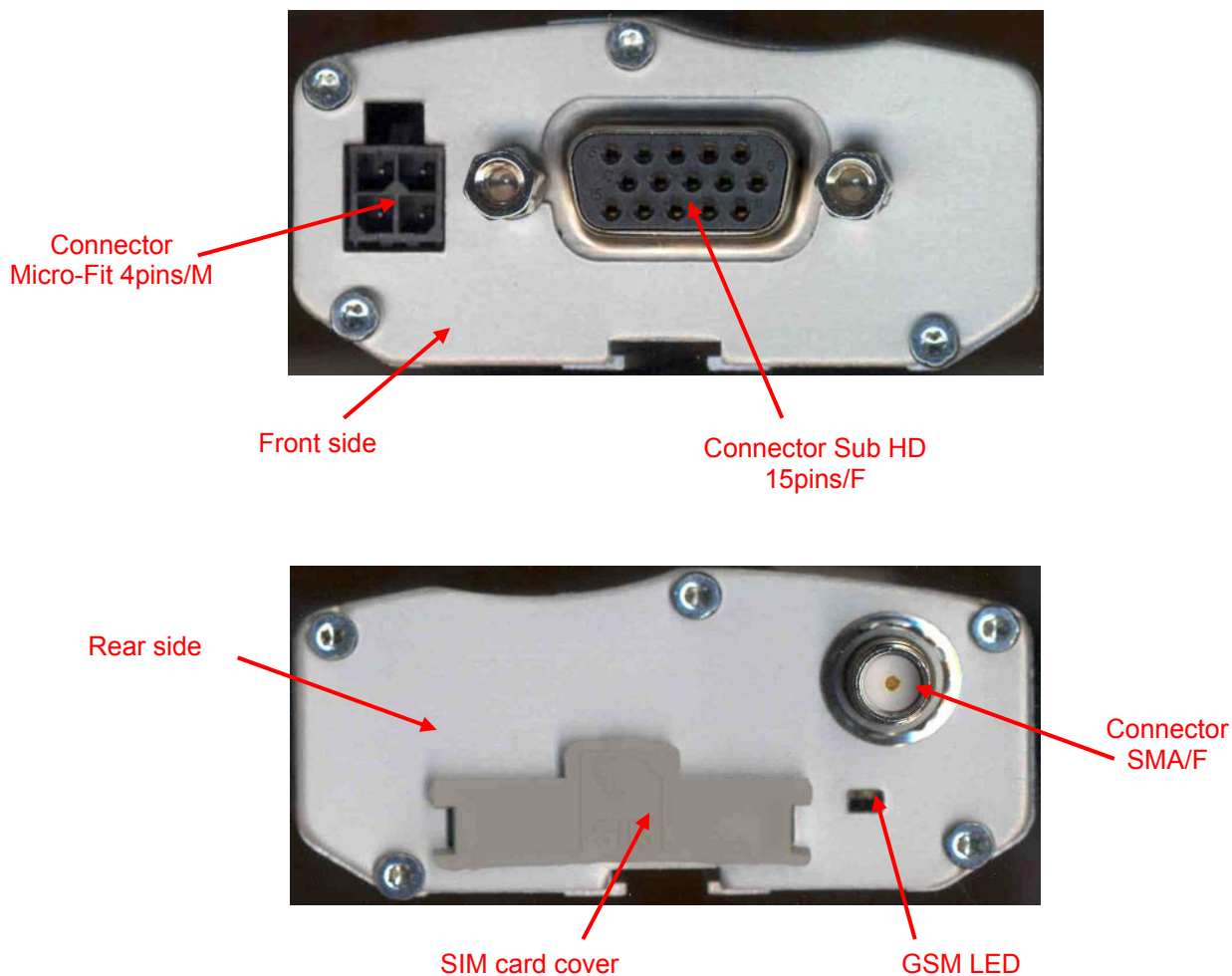
Two fixing brackets for attaching the modem to a support:

Brides de fixation
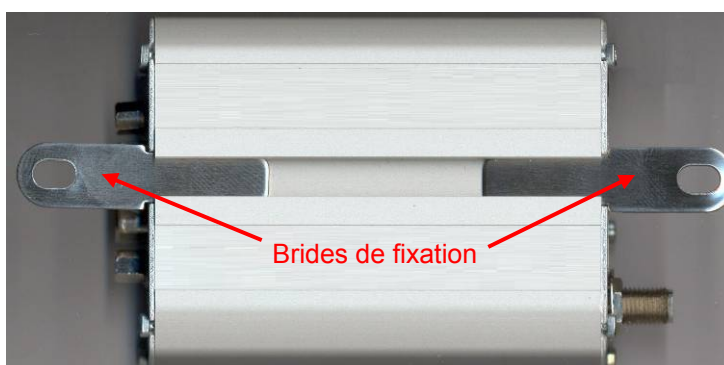
3.2 External connections

3.2.1 Connections

3.2.1.1 GSM antenna connector

The GSM antenna connector is a 50Ω impedance female SMA type.

3.2.1.2 4-pins Micro FIT female connector

This connector allows the connection of an external DC supply.
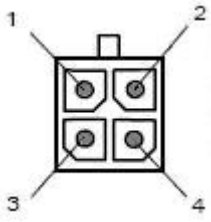
Pin N°	Signal
1	+VDC
2	GND
3	NC
4	NC

WARNING: pins 3 and 4 are not wired. It is strictly forbidden to connect a supply voltage to these pins – the modem may be damaged.

3.2.1.3 15-pin Sub HD female connector

This connector provides:

- The serial RS232 link,

- The audio line connection (microphone and loud-speaker),

- The BOOT and RESET signals.
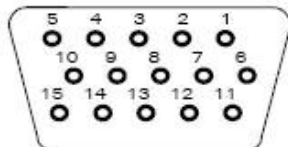
Pin N°	Description	Circuit (V24 – RS232C)	I/O
1	Signal detection / Buzzer	109 – DS – DCD	O
2	Data transmission	103 – ED – TXD	I
3	Boot	BOOT	I
4	Microphone +	MIC2P	I
5	Microphone -	MIC2N	I
6	Data reception	104 – RD – RXD	O
7	Data Set Ready	107 – PDP – DSR	O
8	Data Terminal Ready	108/2 – TDP – DTR	I
9	Ground	102 – TS – GND	-
10	Loud Speaker +	SPK2P	O
11	Clear To Send	106 – PAE – CTS	O
12	Request To Send	105 – DPE – RTS	I
13	Ring Indicator / 3,8V	125 – IA – RI	O
14	Reset	RESET	I
15	Loud Speaker -	SPK2N	O

Note : the pin 3 is not used.

3.2.2 2-wire micro FIT supply cable

This cable provides power to the modem.
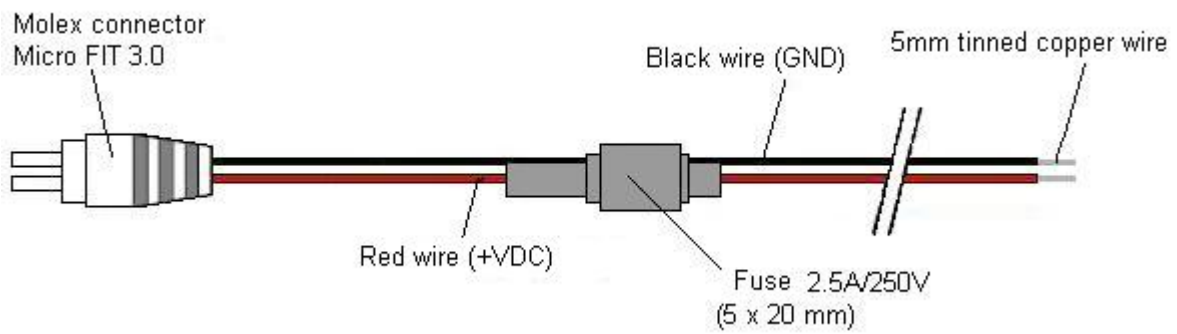
Component	Characteristics
4-pin Micro FIT connector	Type : MOLEX
Cable	Length ≈ 1.5m
Wire	Tinned copper 24 x 0.2 mm
	Surface area : 0.75 mm²

4 Characteristics and Services

The GenPro 18e is a class 10 GSM or GSM/GPRS modem intended for asynchronous binary data transmission, fax Group3 (Class 2), SMS and voice.

The features of the GenPro 18e modem are shown in the table below.

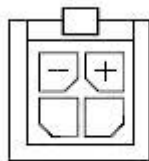| GenPro 18e modem |
|---|
| **GSM** |
| - Quad-Bands 850/900/1800/1900 MHz |
| - ETSI GSM Phase 2+   Classe 4 (2W @ 850 / 900 MHz)
                             Classe 1 (1W @ 1800 / 1900 MHz) |
| - SIM Toolkit Release 99 |
| **VOICE** |
| - Voice (GSM mode) |
| - Téléphonie, Emergency call 112 |
| - Full Rate, Enhanced Full Rate, Half Rate et AMR (FR/EFR/HF/AMR) |
| - Echo cancellation and noise reduction features |
| - Full Duplex Mains Libres |
| **DATA** |
| - GPRS Multi-Slot Class 10 supported (4Rx / 2Tx) |
| - PBCCH/PCCCH supported, coding schemes supported : CS1 - CS4 |
| - Circuit de Données asynchrones, transparent et non-transparent 9600 (Standard) à 14400bds (Selon réseau) |
| - Compatible Group 3 FAX |
| - SMS Text, PDU, MT/MO modes and SMS Cell Broadcast |
| **Interfaces** |
| - GSM antenna: SMA-F connector |
| - Electrical Power: +5.5 à +32 VDC (micro-FIT connector) |
| - RS232 (300 up to 115200 bds) + Audio through Sub-D 15 pins female connector |
| - AT commands : GSM 07.05 et 07.07 |
| - SIM reader(SIM 3V – 1,8V) |
| **Supplied accessories** |
| - Fixing brackets (x2) |
| - 2-wire micro FIT supply cable |
| **Option** |
| - Auto-power supply through the pin RI for external application (*) |

 (*) Consult us

5 Using The Modem

5.1 Starting with the modem

5.1.1 Mounting the modem

To mount the modem on a support, use the fixing brackets as shown in the diagram below:
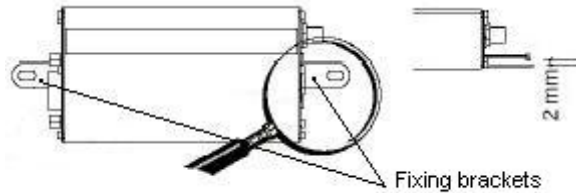
Note:
- Must be fixed to a flat surface.
- Maximum height of the screw head height: 2 mm

5.1.2 Installation of the modem

To install the modem, it is recommended to perform the following operations with the modem turned off:

- Remove the SIM card cover on the rear side.
- Carefully insert the SIM card into its holder.
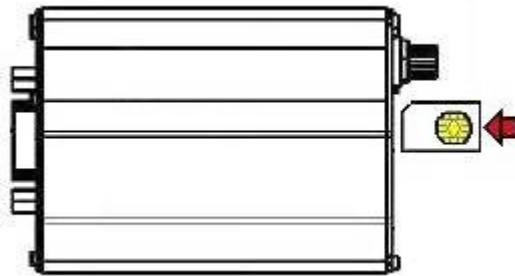
- Push the SIM card until the "click", which confirms you the SIM Card is correctly positioned.
- Replace the SIM card cover.
- Connect the GSM antenna to the SMA connector.
- To connect to a DTE, connect the V24 link using the 15-pin Sub HD cable.
- Connect the supply cable to an external regulated DC source (for automobile applications, refer to chapter *5.2 Recommendations for using the modem in vehicles*).
- Connect the supply cable to the modem and turn on the power supply. The GSM LED will light up.

The modem is now ready. Refer to chapter *5.8 Main AT commands (HAYES)* for a description of the commands for configuring and using the modem.

5.1.3 Communication with the modem

Connect the RS232 cable between the DTE (the COM port) and the modem (DCE).

Configure the DTE RS232 port as follows:

- Data rate: **9600 bps**,

- Data size: **8 bits**,

- Parity: **None**,

- Stop bits: **1**,

- Flow control: **hardware.**

Via the DTE (a PC running a communications application such as HyperTerminal), enter the command *AT(CR)*. The modem should reply with *OK*.

In the case where no communication can be established with the modem:

- Verify the RS232 connexion between the DTE and the modem (DCE),

- Verify the configuration of the COM port on the DTE.

Some examples of AT commands which can be sent to the modem once the communication has been established and verified (these commands are explained in detail later in the document):

- *AT+CGSN* : the modem should reply with a 15 digit number (beginning with "35873000xxxxxxx").

- *AT+CPIN="xxxx"* : enter the code of the SIM card xxxx (if active).

- *AT+CSQ* : verify the GSM signal reception level.

- *AT+CREG ?* : verify the registration of the modem on the network.

- *ATD<telephone number>* : start a voice call.

- *ATH* : hang-up (end of the call).

For further information about these AT commands and their associated parameters, refer to the "Commands List" from ERCO & GENER.

5.1.4 Extraction of the SIM card

To remove the SIM card from the modem, it is recommended to apply the following instructions, the modem not power supplied:

- Remove the SIM card cover from the rear side.

- Push on the SIM card (simple pression) up to the "click", allowing its eject.

- Remove carefully the SIM card from its holder.

- Place the SIM card cover.

- **Apply a Reset or an ON / OFF to save these operations.**

5.1.5 Re-initialisation of the modem

The hardware RESET signal is available on pin 14 of the 15-pin Sub HD connector. The modem is re-initialised when this RESET signal is held at a low level for at least 500µs.

> WARNING: This RESET signal should be considered as a means of re-initialising the modem in cases of emergency only. For further details concerning the RESET of the modem, see the chapter *7.6 RESET*.

5.2 Recommendations for using the modem in vehicles

> WARNING: The power supply connector on the GenPro 18e must **NOT** be connected directly to the battery of a vehicle.

5.2.1 Recommended connection to the battery in a lorry

All Lorries have a circuit breaker outside the cabin. The circuit breaker is necessary for security reasons. For example, if a fire breaks out in the lorry's electric box, the driver may cut the power source to avoid further danger and damage (explosion).

The circuit breaker is connected to the ground of the lorry, usually connected to the fuse box. As such, most lorry circuit breakers cut the ground connexion rather than the battery power side as shown in the diagram below:
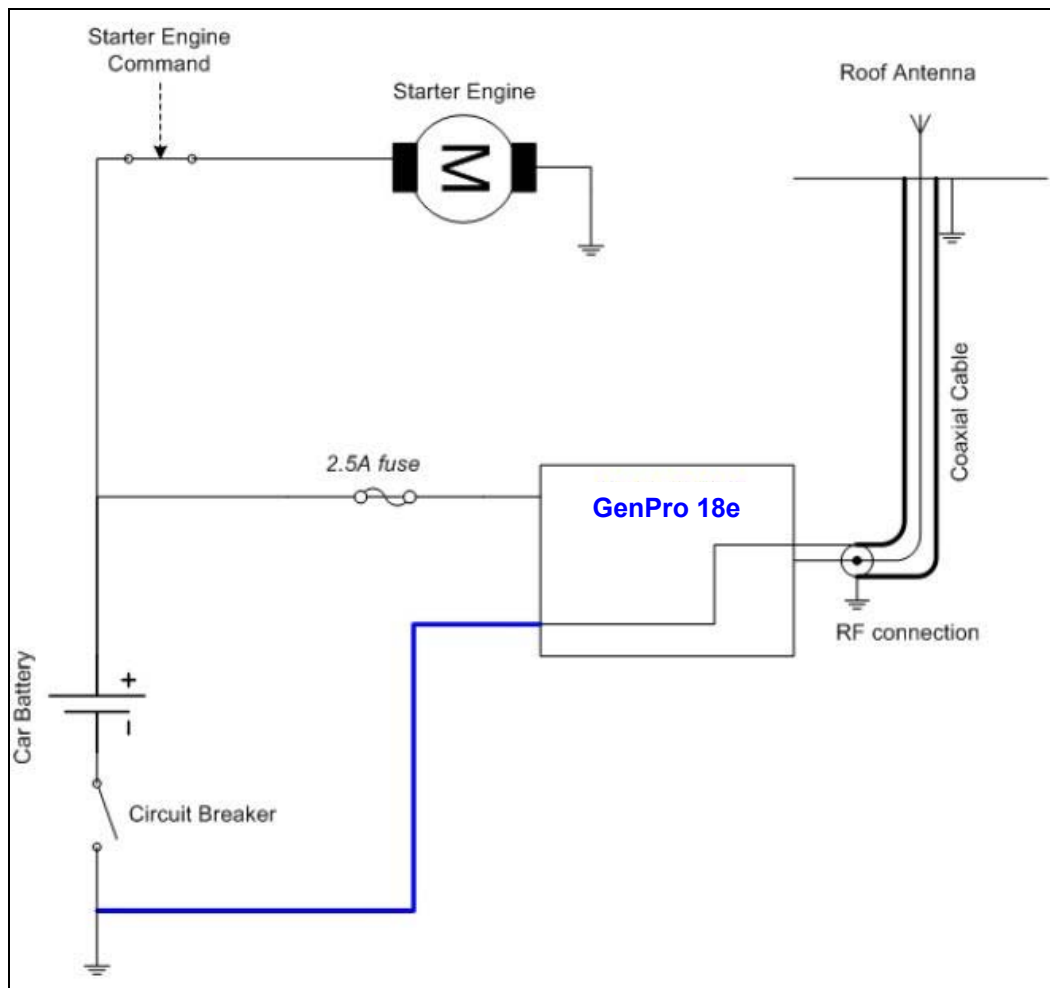
The diagram above shows a recommended connexion, where the modem is connected after the circuit breaker to the ground of the lorry (or in the fuse box) and **NOT** directly to the earth of the battery

5.2.2 Technical constraints in lorry

It is highly recommended to **NOT** connect the modem supply directly the battery but instead to the circuit breaker. Otherwise the modem may be damaged when the lorry is starting and the circuit breaker is closed. In this case the ground of the lorry and the ground of the battery will be connected together via the modem as shown in the diagram below:
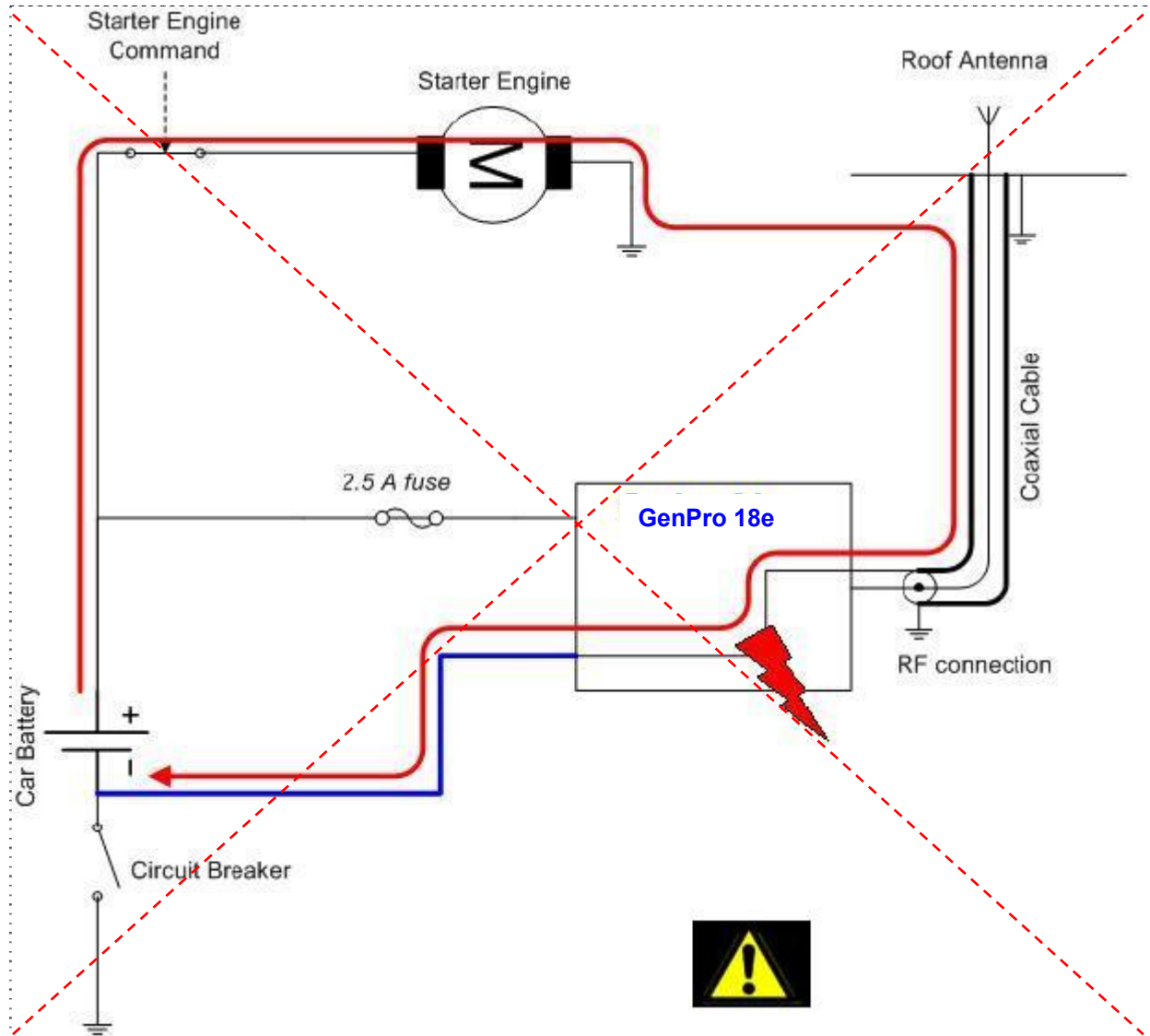
Example of a forbidden electrical connexion (risk of damage to the modem)

The diagram above shows an electrical connexion which may damage the modem because its ground is connected directly to the earth of the battery.

In this example, when the circuit breaker is closed, the current flows via the modem and the electrical circuits in the lorry (dash-board for example). When the lorry's starter motor is used it could result in the cables and or the modem being damaged or destroyed.

The internal circuits of the modem are not designed to withstand the high currents associated with starter motors.

5.3 GSM indicator LED

The state of the modem is indicated by the GSM LED located on the rear side of the modem, close to the SIM holder (see chapter **3.1 Physical Description**).

The table below shows the meaning of the different states of the GSM LED :

GSM LED	LED activity	Modem state
ON	LED on fixed	The modem is powered, it is ready to function but not yet recognised by the network; the PIN code has not yet been entered or the antenna is not connected.
	LED flashing (once every 2 seconds)	The modem is powered, the PIN code is active, the modem is recognised by the network and is ready to make or receive a call (Idle mode).
	LED flashing (Once a second)	The modem is powered and currently in communication (Voice, Data or Fax).
OFF	LED off	The modem is not powered or is in the RESET phase.

5.4 AT commands Echo deactivated

If no echo is returned when entering an AT command, it could be that :

    - the "Local echo" of your communication application is not activated,

    - and/or the modem's echo function has been deactivated.

The echo is configured by the command **ATE** and requires a back-up with the command **AT&W**.

To activate the modem echo, enter the command **ATE1**.

When using a communication application to send AT commands to the modem, it is recommended to :

    - deactivate the "local echo" in your communication application,

    - activate the modem echo (enter the command **ATE1**).

For a communication Machine to Machine with the modem, it is recommended to deactivate the modem echo (enter the command **ATE0**) to avoid the CPU receiving redundant responses.

For more information about the **ATE** command see the ERCO & GENER "Commands List".

5.5 Verifying GSM receive signal quality

The modem will be able to establish a call only if the received GSM signal is of a sufficient level.

The command **AT+CSQ** will return the reception level (*rssi*) of the signal sent by the closest GSM Base Transceiver Station (**BTS**), as well the receive bit error rate (*ber*).

When the SIM card is present and the PIN code has been entered, the command **AT+CSQ** will return the signal level from the BTS on the subscribed operator network.

When used without the SIM card, this command will simply indicate the closest BTS due to the fact that the modem cannot identify the current subscription. It is therefore advisable to make this test with the SIM card present.

To verify the GSM signal quality, perform the following operations:

> Using a communication application, enter the command **AT+CSQ**.

> The response is in the following format:

> **+CSQ: <rssi>,<ber>**   where : **<rssi>** = indicates the reception level,

>   **<ber>** = receive bit error rate.

> Verify the value **<rssi>** with the aid of the table below:

rssi value	Gain (dbm)	Interpretation	<ber> value	Interpretation
0	-113 dbm	Insufficient	0 to 7	See standard ETSI GSM 05.08
1 to 10	-111 to -95 dbm	Insufficient		
11 to 30	-93 to -53 dbm	Sufficient		
31 (max)	-51dbm	Perfect		
99		Unknown/not detectable	99	Unknown/not detectable

The GSM modem will function correctly with a minimum **<rssi>** of between 11 and 15.

Below 10 the signal is insufficient, the modem cannot function depending on the geographical situation or the mobility of the vehicle. Above 15 the signal is of a sufficient level.

For more information about the AT commands see the "Commands List" from ERCO & GENER.

5.6 Verifying the PIN code

The PIN code is essential in order to make a call or to accept a call from the GSM network.

The PIN code is held on the SIM card and can be modified by the user.

To verify a previously entered PIN code, use a communication application and enter the command *AT+CPIN?*

The table below shows the main responses from the modem:

Command	Response	Interpretation
AT+CPIN?	*+CPIN: ERROR*	The SIM card is absent or unknown
	+CPIN: READY	The PIN code is correct
	+CPIN: SIM PIN	The PIN code is bad or not yet entered
	+CPIN: SIM PUK	The PUK code is required

For more information about the AT commands see the ERCO & GENER "Commands List".

5.7 Verifying modem registration on the GSM network

1. Ensure that a valid SIM card is present in the SIM card reader in the modem.
2. Using a communications application, enter the following AT commands :
   a. *AT+CPIN=xxxx* Enter the PIN code. The user has only 3 attempts to enter the PIN code. After the third attempt, only the PUK code (supplied by the operator) will allow a new PIN code to be entered.
   b. *AT+CREG?* Verify the network registration status. The response will be of the following format : *+CREG: <mode>,<stat>* where :
      <Mode> = un-solicited registration message configuration,
      <Stat> = registration status
3. Verify the registration status with the aid of the following table :

Command	Response	Interpretation
AT+CREG?	*+CREG: 0,0*	The modem is not recognised by the network.
	+CREG: 0,2	The modem is searching for a network operator.
	+CREG: 0,1	The modem is GSM attached to a local operator.
	+CREG: 0,5	The modem is GSM attached to an operator in roaming mode.

If the modem is not registered, verify the antenna connexion and the receive signal level (see chapter **5.5 *Verifying GSM receive signal quality***).

For more information about the AT commands see the "Command List" from ERCO & GENER.

5.8 Main AT commands (HAYES)

The table below shows at a quick glance the main AT commands useful for the control of the modem.

For further information concerning the complete command set see the ERCO&GENER "Commands List".

Table: Main AT commands used with the modem.

Description	AT Command	Response	Interpretation
Enter the PIN code	AT+CPIN=xxxx (xxxx = PIN code)	*OK*	PIN code accepted
		+CME ERROR: 16	PIN code incorrect (1*)
		+CME ERROR: 3	PIN code already entered (1*)
Verification of GSM network registration	AT+CREG?	*+CREG: 0,0*	The modem is not recognised by the network.
		+CREG: 0,2	The modem is searching for a network operator.
		+CREG: 0,1	The modem is GSM attached to a local operator.
		+CREG: 0,5	The modem is GSM attached to an operator in roaming mode.
Reception of an incoming call (2*)	ATA	*OK*	Reply to the call
Make a voice call	ATD<telephone number>; (IMPORTANT: the **;** at the end of the sequence specifies a voice call)	*OK*	Communication established
		+CME ERROR: 11	PIN code not entered
		+CME ERROR: 3	The credit has run out or the communication has already been established.
Make an emergency call (112)	ATD112;	*OK*	Communication established
Lost communication		*NO CARRIER*	
Hang-up	ATH	*OK*	

(1*) The command *AT+CMEE=1* allows the display of extended error codes. This command may be saved with the command *AT&W*.

The command *AT%CSTAT=1* allows the display of the change of status of the SIM card (present, ready…) and to check divers modem states (modem ready after RESET…). This command may be saved with the command *AT&W*.

(2*) The command *AT+CRC=1* will in the case of an incoming call, display more detailed ring information indicating the type of call - voice, data or fax. This command may be saved with the command *AT&W*.

Examples:

For VOICE :+CRING: VOICE

For DATA : +CRING: REL ASYNC

For FAX : +CRING: FAX

5.9 Powering down the unit

There is no specific AT command to be transmitted to the GenPro 18e modem before removing the power.

5.10 Updating the modem software

So as to be able to benefit from the latest functions of the GenPro 18e, a procedure is used which will upgrade the software in the modem.

This consists of downloading the software into the internal Flash memory via the RS232 serial link available on the 15-pin Sub HD connector.

Please refer to the software update procedure document for a detailed description of this procedure.

6 Trouble Shooting

This section describes various problems and their solutions that may be encountered when using the modem.

6.1 RS232 (V24) Communication problem

If the modem does not respond to any of the AT commands via the RS232 then refer to the table below for a list of possible causes and solutions.

Table: possible causes and solutions for RS232 communication problems

If the modem...	Check	Action
Returns nothing	Is the modem correctly powered?	Ensure that the modem is connected to an external regulated power source (5.5V to 32V DC). See chapter *8.2.1 Power supply*.
	Is the serial cable connected at both ends (PC and Modem)?	Verify the connexion of the serial cable.
	Is the serial cable correctly cabled according to the table in chapter *3.2.1.3 15-pin Sub HD female connector*?	Cable the serial cable according to the table in chapter *3.2.1.3 15-pin Sub HD female connector*.
Returns nothing or random characters	Is the communications terminal correctly configured on the PC?	Ensure that the terminal configuration corresponds to that of the modem. Factory configuration : Speed = 9600 bps Data bits = 8 Parity = none Stop bits = 1 Flow control = hardware
	Is there another application using the same port thus creating a conflict?	Close the conflicting application.
	Is the modem echo deactivated and without message reporting?	Enter the command *ATE1Q0* followed by *AT&W* if a backup is required.

6.2 "ERROR" message

The modem returns the message "*ERROR*" (in response to an AT command) in the following cases :

- The COM port is not directed to the GenPro 18e but to another modem. Enter the command *ATI1*. The response should be *Enabler_III*.... All other responses indicate a dialog with another modem. Verify the COM port used in the communications application.
- The syntax of the AT command is incorrect. Re-enter the command. (Refer to the ERCO & GENER "Commands List")
- The syntax of the AT command is correct, but with incorrect parameters :

- Enter the command **AT+CMEE=1** to obtain an error message with its error code instead of a simple "ERROR" message,

- Enter again the AT command which previously caused a problem to obtain the error code. In the case of an error, the response is in the form :

     +CME ERROR : <error code>

For further information about the error codes returned by the command **AT+CMEE**, refer to the ERCO & GENER "Commands List".

Note : It is strongly recommended to systematically allow the modem to return error codes (enter the command **AT+CMEE=1**).

6.3 "NO CARRIER" message

If the modem returns the message "NO CARRIER" after an attempted call (voice or data), check the table below for a list of possible causes and solutions.

Table : Causes and solutions when the "NO CARRIER " message is returned

Modem returns...	Check	Action
"NO CARRIER"	Is the received GSM signal strong enough?	Verify the received signal quality (see chapter *5.5 Verifying GSM receive signal quality*).
	Is the modem registered on the network?	Verify network registration (see chapter *5.7 Verifying modem registration on the GSM network*).
	Is the antenna correctly connected?	Check the GSM antenna installation (see chapter *8.2.6.3 External GSM Antenna* for installation recommendations).
"NO CARRIER" (when attempting a VOICE call)	Has the semi-colon (**;**) been entered immediately after the telephone number in the AT command?	Ensure that the semi-colon (**;**) been entered immediately after the telephone number in the AT command, for example : ATD0123456789**;**
"NO CARRIER" (when attempting a DATA call)	Has the SIM card been configured for data / fax calls?	Ensure that the SIM card is allowed to make data / fax calls (check with your SIM card supplier).
	Is the selected modulation type supported by the called number?	Ensure that the selected modulation type is supported by the called number.
	Is the selected modulation type supported by the network?	Ensure that the selected modulation type is supported by the network. If not, select a compatible modulation type with the command **AT+CBST=0,0,1** (1*).

(1*) For further information concerning this command see the ERCO&GENER "Commands List".

If the modem returns the message "NO CARRIER", use the command **AT+CEER** to see the extended error code.

For further information about the error codes returned by the command **AT+CEER**, refer to the ERCO & GENER "Commands List".

7 Functional description

7.1 Architecture
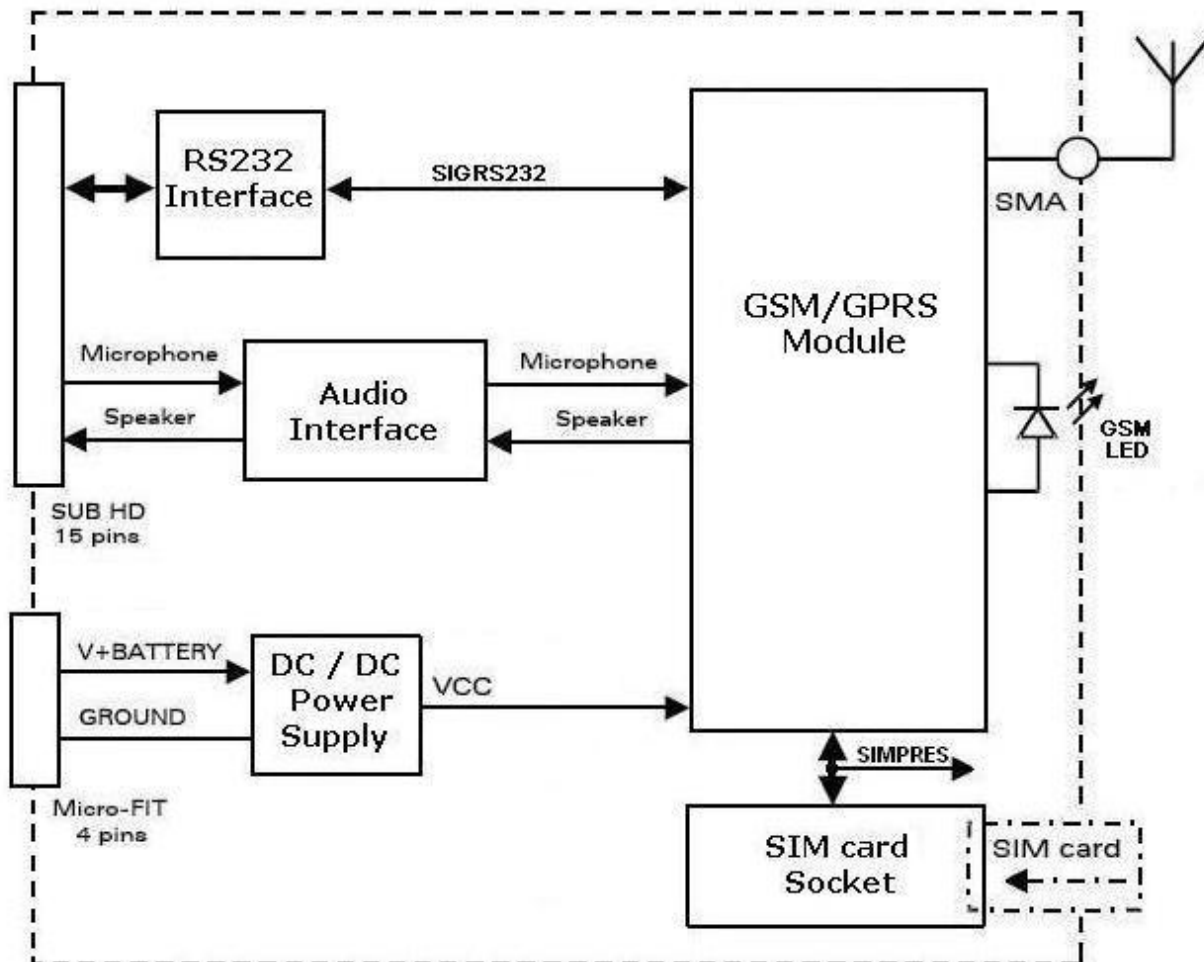
7.2 Power supply

7.2.1 General

The modem must be powered (V+BATTERY) by an external regulated DC power source of between 5.5V and 32V.

The modem's various internal DC voltages are provided by an internal DC/DC converter.

The correct functioning of the modem cannot be guaranteed if the input voltage (V+BATTERY) falls below 5.5V.

7.2.2 Protection

The modem is protected by an in-line 2.5A / 250V fuse in the power supply cable supplied with the modem.

It also has internal protection against power supply spikes of more than 32V.

Filter guarantees:

> Input/output EMI/RFI protection,
>
> Signal smoothing.

7.3 RS232 serial link

7.3.1 General

The RS232 interface provides a level translation (V24/CMOS ⇔ V24/V28) between the GSM module DCE) and the PC COM port (DTE).

The RS232 interface is protected internally (ESD protection) against external electrostatic spikes.

Filter guarantees:

Input/output EMI/RFI protection,

Signal smoothing.

The following signals are available:

TX data (CT103/TX)

RX data (CT104/RX)

Request To Send (CT105/RTS)

Clear To Send (CT106/CTS)

Data Terminal Ready (CT108-2/DTR)

Data Set Ready (CT107/DSR)

Data Carrier Detect (CT109/DCD) : optional Buzzer output,

Ring Indicator (CT125/RI) / 3.8V : optional 3.8V supply for GenBlue xxe.
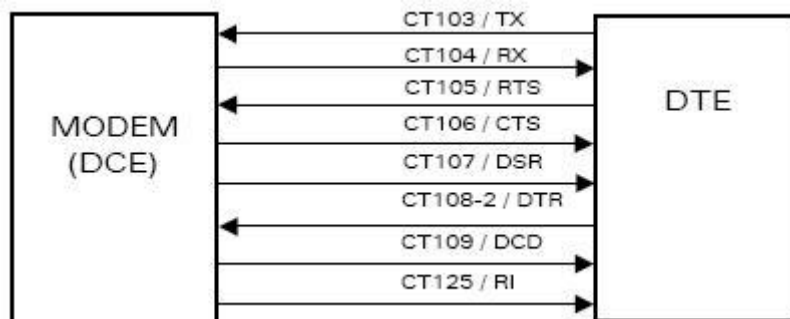
RS232 signals

The DSR signal is always present in a high level when the modem is power supplied.

The RS232 interface allows a certain amount of flexibility in the use of its signals. For example, after configuration (see command *AT+IFC*) the modem may operate in the 3-wire mode using only the TX, RX and GND signals. However, the TX, RX, GND, CTS and RTS signals will also be required for GPRS applications and Xmodem upgrade. This is not the case for the DTR, DSR, DCD and RI signals which may be not used.

7.3.2 Auto-baud mode

The auto-baud mode allows the modem to automatically detect the transmission speed used by the DTE. (only from 1200 up to 115200 bps).

The auto-baud mode is controlled by the command *AT+IPR*. This function is explained in detail in the ERCO & GENER "Commands List".

Note: By default, the GenPro 18e is delivered with the RS232 interface configured to 9600 bps, no parity, 8 data bits, 1 stop bit.

It is recommended to prefer a fixed speed to the auto-baud mode.

7.3.3 Auto-power supply mode through the pin RI

An option (not soldered by default) exists allowing the auto-power supply mode in 3.8V, through the pin RI , for an external application (the GenBlue 15e for instance).

7.3.4 Pins description

Table: Pins description

Signal	Pin number on Sub HD connector	I/O	RS232 standard	Description
CTXD/CT103	2	I	TX	Transmit serial data
CRXD/CT104	16	O	RX	Receive serial data
CRTS/CT105	12	I	RTS	Request To Send
CCTS/CT106	11	O	CTS	Clear To Send
CDSR/CT107	7	O	DSR	Data Set Ready
CDTR/CT108-2	8	I	DTR	Data Terminal Ready
CDCD/CT109	1	O	DCD	Data Carrier Detect
CRI/CT125	13	O	RI	Ring Indicator / 3.8V option (*)
CT102/GND	9			Ground

 (*) This 3.8V auto-power supply option is not wired by default.

7.4 Audio

The audio interface is a standard interface for connecting a telephone handset (the command AT$VSELECT enables you to select the handset, please refer to ERCO & GENER "Commands List").

Echo cancellation (see command *AT$MICAEC*) and noise reduction features are also available to improve the audio quality in hands-free applications.

ERCO & GENER recommend the use of the following cable: DATA/AUDIO Sub D 9pts Fem / Sub HD 15pts Male / RJ9 (order code 4404000205) and a telephone handset (order code 3153400000).

Table: Pin identification

Pin name	SUBD 9 F pin number	SUBD 15 M-HD pin number
DCD/Buzzer	1	1
RXD	2	6
TXD	3	2
DTR	4	8
GND	5	9
DSR	6	7
RTS	7	12
CTS	8	11
RI/3.8V	9	13
	RJ9 pin number	
Micro +	1	4
Speaker +	2	10
Speaker -	3	15
Micro -	4	5

7.4.1 Microphone

Differential microphone inputs are used to help reduce common–mode and TDMA noise. They are ESD protected.

An electret type microphone (0.5 mA / 2 Volts) may be connected directly to these inputs allowing the connexion of a telephone handset.

The microphone impedance is approximately 36 kΩ.

The gain of the microphone input may be internally adjusted by a differential amplifier and may be defined by using the command *AT+PREAMP* (see the ERCO & GENER "Commands List").

The amplifier has a gain of 25.6 dB and a Bias generator providing an external voltage of 2 or 2.5V for the Bias microphone.

Table: Pins description

Signal name	Pin number Sub HD Connector	I/O	Type	Description
CMIC2P	4	I	Analogue	Microphone +ve
CMIC2N	5	I	Analogue	Microphone -ve

7.4.2 Loud-speaker

Differential outputs are used to help reduce common–mode and TDMA noise.

The loud-speaker may be connected directly to the output pins.

Table: Pins description

Signal name	Pin number Sub HD Connector	I/O	Type	Description
CSPK2P	10	O	Analogue	Loud-speaker +ve
CSPK2N	15	O	Analogue	Loud-speaker -ve

7.5 RESET

7.5.1 General

A low level input on this pin (over at least 10ms) allows a forced emergency hardware RESET of the modem. In this case it acts as an input. It must be driven by an open-collector circuit.

- PIN 14 (RESET) AT 0, TO RESET THE MODEM,
- pin 14 (RESET) at 1, normal operating mode.

This pin may also be used to provide a RESET to an external equipment. In this case it acts as an output. If an external RESET is not required it may be left unconnected.

Table: Pin description

Signal	Pin number on Sub HD Connector	I/O	Type	Description
RESET	14	I/O	SCHMITT	Reset Modem

WARNING: This signal must only be used in a case of emergency. A software RESET is always preferable to a hardware RESET. It is strongly unadvised to execute a RESET whilst in communication or dialogue without having first detached from the network operator

7.5.2 RESET sequence

To activate the emergency RESET sequence, the RESET signal may be pulled to a low level for at least 10ms.

After the modem has been RESET, if a SIM card is present in the reader there will be a delay whilst it is initialised before being accessible.

8 Technical Characteristics

8.1 Mechanical

Table: Mechanical characteristics

Dimensions	73 x 54.5 x 25.5 mm (excluding connectors)
Overall Dimensions	90 x 54.5 x 25.5 mm
Weight	≈ 88 grams (modem only) < 197 grams (modem + fixing brackets + cables)
Volume	101.5 cm³
Case	Extruded aluminium
Ingress Protection	IP31

The illustration below indicates the dimensions (in mm) of the modem showing the clearances necessary for installation.
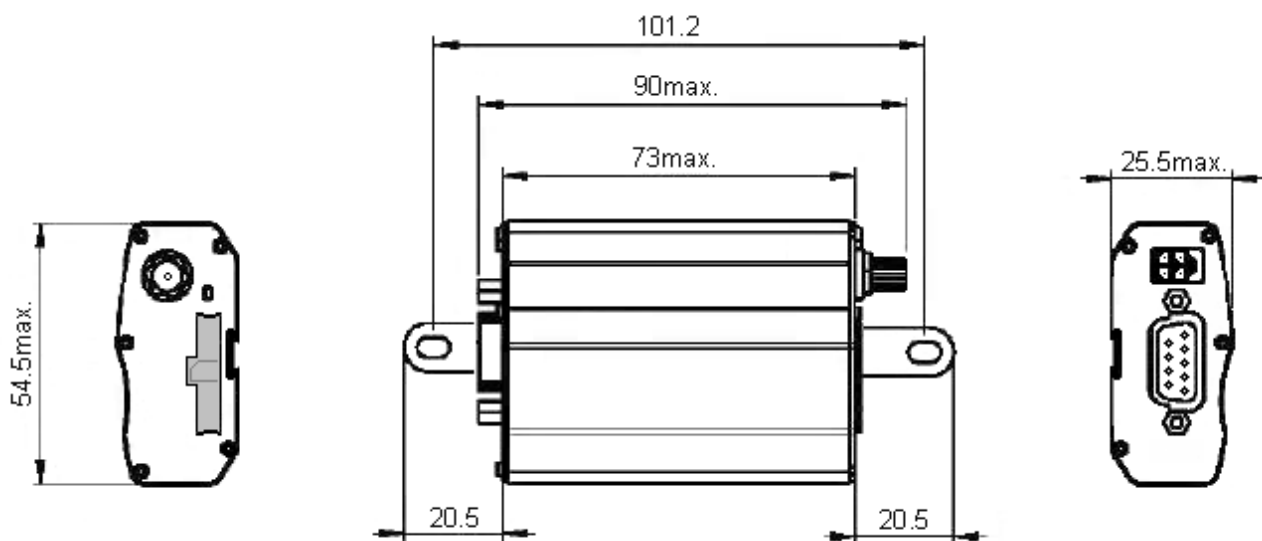
8.2 Electrical

8.2.1 Power supply

Table: Voltage range and power consumptions

Operating voltage range	5.5V to 32V DC (GSM or DCS or GPRS)
Average power consumptions	- GSM 900 MHz : 90mA @ 12V in communication - GSM 1800 MHz : 80mA @ 12V in communication - Idle mode : 12mA @ 12V

Note : The modem is permanently powered once the power supply is connected.

The table below indicates the consequences of over and under-voltage on the modem.

Table: Effects of a power supply defect

If the voltage :	Then :
falls bellow 5.5V	GSM and GPS communications cannot be guaranteed.
goes above 32V (transient peaks)	The modem guarantees its own protection.
goes above 32V (continuous over-voltage)	The modem is short-circuited by an internal varistor. The modem is then protected by the in-line fuse.

The table below indicates the power supply consumption of the modem without the RS232 connected.

Table: Consumption (1*) without RS232 connected

CONDITIONS T=25°C and 3V SIM card		E-GSM/GPRS 900MHz I Nom.(mA)	E-GSM/GPRS 1800MHz I Nom.(mA)
Idle mode (2*)	@ 5,5V	17,5	17,5
	@ 12V	12	12
	@ 24V	11	11
	@ 32V	8,5	8,5
In communication GSM 1RX/1TX	@ 5,5V	180	156
	@ 12V	90	80
	@ 24V	46.5	39.5
Power (2W/1W)	@ 32V	35	30
In communication GPRS CL10 3RX/2TX	@ 5,5V	329	275
	@ 12V	167	140
	@ 24V	86.5	72.5
Power (2W/1W)	@ 32V	65	54
During TX bursts	@ 5,5V	1250	1000
	@ 12V	630	506
	@ 24V	318	252.5
Power (2W/1W)	@ 32V	246	197

(1*) The power consumption may vary by 5% over the whole operating temperature range (-20 °C to +60 °C)
(2*) Idle mode: modem is registered on the network but not in communication.

8.2.2 Audio interface

The audio interface is accessible via the 15-pin Sub HD connector (see chapter 7.4).

Table: Characteristics of the audio interface on the 15-pin Sub HD connector

Mic Input	Parameter/Conditions	Min	Typ	Max	Units
Maximum Input Range – Mic(+) to Mic(-)	Inputs 3 dBm0 (Max. digital sample amplitude when PGA gain set to 0 dB)			32.5	mV_{RMS}
Nominal Ref. Level – Mic(+) to Mic(-)	Differential MIC		-10		dBm0
Differential Input Resistance – Mic(+) to Mic(-)	Differential MIC, *MICAMP* gain = 25.6 dB		36		kΩ
Microphone Pre-Amplifier Gain	Differential MIC		25.6		dB

8.2.3 SIM Interface

Table: SIM card characteristics

SIM Card	3 V or 1.8 V

8.2.4 GSM/DCS

8.2.4.1 RF performances

The RF performances are compliant with the ETSI GSM 05.05 recommendation.

The RF performances for receiver and transmitter are given in the table below.

Table: Receiver and Transmitter RF performances

| Receiver	
850MHz/900MHz sensitivity	- 106 dBm, GPRS Coding Scheme 1 (CS1)
1800MHz/1900MHz sensitivity	- 106 dBm, GPRS Coding Scheme 1 (CS1)
Transmitter	
Transmit Power (Power Class1 - 850/900) at ambient temperature	33 dBm +/- 2 dB @ antenna connection
Transmit Power (Power Class4 - 1800/1900)) at ambient temperature	30 dBm +/- 2 dB @ antenna connection

8.2.4.2 External GSM Antenna

The external GSM antenna is connected to the modem via the SMA/M connector. It must have the characteristics listed in the table below.

Table: External GSM antenna characteristics

Antenna frequency range	850/900/1800/1900 MHz
Impedance	50 Ohms nominal
DC Impedance	0 Ohm
Gain (antenna + cable)	0 dBi (in a minimum direction)
VSWR (Rx max TX max)	1.5:1
Polarisation	Linear

Note: See chapter *10 Recommended Accessories* for GSM antenna recommended by ERCO & GENER.

8.2.5 RESET Signal
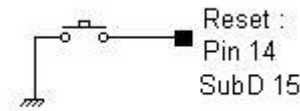
Typical Reset Connection

Table : RESET signal operating conditions

Parameter	Condition	Min.	Typ.	Max.	Unit
V_{IL}	Input Voltage – Low or float			0.58	Vdc
V_{IH}	Input Voltage – High	1.36		1.95	Vdc
I_{PU}	Internal Pull-Up Resistor	-40	-31	-15	µA
I_{IL}	Current sink			-2.0	mA
Reset Pulse Duration		10			mS

8.3 Environmental characteristics

To ensure the correct operation of the modem, the limits listed in the table below should be respected.

Table: Environmental characteristics

Operating temperature	-20 °C to +60 °C
Storage temperature	-30 °C to +85 °C
Operating humidity without condensation	HR < 70% @ +55°C
Atmospheric pressure	normal

8.4 Standards / Conformities

The product conforms to the following requirements:

- R&TTE 1999/5/EC Directive,
- Regulations of standard ETSI EN 301 489-7 (02),
- ROHS compliant : directive 2002/95/CE
- 2002/96/CE DEEE (crossed out wheelie bin).

The following mark is visible on the underside of the unit:

$$C\;E$$

9 Security Recommendations

9.1 General

It is important to follow the specific regulations for the use of radio operator equipment, in particular the possible risks of radio frequency interference (RFI). Please follow carefully the security advice given below.

Turn off your GSM modem:

- On an aircraft. The use of cellular telephones can endanger the operations of the plane, disturb the cellular network and is illegal. The non-observance of this instruction can lead to the suspension of cellular telephone services as well as a fine.
- At a refuelling station.
- In any area with a potentially explosive atmosphere which could lead to an explosion or a fire.
- In hospitals and similar places where medical equipment may be in use.

Restrictions of use of radio operator equipment in:

- Fuel depots.
- Chemical factories.
- Locations where demolition is under way.
- Other places where signs indicate that the use of cellular telephones is prohibited or dangerous.
- Other places where you should normally turn off the engine of your vehicle.

There can be a danger associated with the use of your GSM modem close to insufficiently protected medical devices such as acoustic apparatus and pacemakers. Consult the manufacturers of medical equipment to determine if it is adequately protected.

The use of your GSM modem close to other electronic equipment may also cause interference if the equipment is insufficiently protected. Observe all the manufacturer's warnings and recommendations for the equipment.

The modem is designed to be used with "fixed" and "mobile" applications:

- "Fixed application": The GSM modem is physically connected to a site and it is not possible to be easily moved to another site.
- "Mobile application": The GSM modem is designed to be used in various places (other than fixed) and is intended for use in portable applications.

9.2 Security in a vehicle

Do not use your GSM modem whilst driving a vehicle, unless equipped with a correctly installed ear-piece/hands-free kit.

Respect the national regulations for the use of cellular telephones in vehicles. Road safety is always a priority.

An incorrect installation of a GSM modem in a vehicle could cause incorrect operation of the electronics of the vehicle. To avoid such problems, ensure that the installation is carried out by a qualified person. At the time of the installation, verify the electronic protection system of the vehicle.

The use of an apparatus to activate the headlights or the horn of a vehicle on a public highway is not authorized.

9.3 Care and maintenance

The suggestions below will help you to look after and preserve this product for many years.

- Do not expose the modem to the extreme environments such as a high temperature or a high humidity content.
- Do not use or store the modem in dusty or dirty places.
- Do not open or disassemble the modem. ALL WARRANTIES ARE VOID IF THE PRODUCT IS OPENED, ALTERED, AND/OR DAMAGED.
- Do not expose the modem to liquids. It is not impermeable.
- Avoid dropping, striking, or shaking the modem violently.
- Do not place the modem near computer disks, credit or voyage cards or other magnetic media. The information contained on the discs or the cards can be affected by the modem.
- The use of third party equipment or accessories, not made or authorized by ERCO & GENER can cancel the guarantee.

9.4 Your responsibility

This modem is under your responsibility. Treat it with care. It is not a toy. Install it in a secure place out of the reach of children.

Make a careful note of your PIN and PUK codes. Familiarize yourself with the modem and its functions. Use the security functions to prevent unauthorized use and/or theft.

10 Recommended Accessories

The accessories recommended by ERCO & GENER for use with the GenPro modem are shown on our Internet site in the section **Products > Accessories**. For more information, contact our sales department.

11 Client support

ERCO & GENER ensures customer support for all sold modems. As such you will have access to:

The latest version of this document,

The product's brief commercial description,

The latest OS User Guides,

Conformity certificates,

Application notes.

DECLARATION OF CONFORMITY

Manufacturer: ERCO & GENER

Address: Rue des Petites Granges
Z.I. de Saint Lambert des Levées
B.P. 30163
49412 SAUMUR CEDEX – France

Website: http://www.ercogener.com

declares that the products :

Name: GenPro 18e   Type: Modem

Complies with :

  - R&TTE 1999/5/EC Directive,

  - EN301489-1:V1.8.1

  - EN301489-7:V1.3.1

  - §6.5, §6.6, §6.8 and §6.9 of the 2004/104/CE directive

  - EN 301 511 v9.0.2

  - EN 60950-1:2006 + A11:2009

  - EN50385 :2002

  - ROHS Compliant : Directive 2002/95/CE

  - "REACH" N°1907/2006- R&TTE 1999/5/EC Directive

$$C \in$$

The corresponding markings appear under the appliance.

Saumur, January 10th 2011

Charles CHAUSSONNIER
Managing Director

S.A. ERCO & GENER – ZI de St. Lambert-des-Levées – BP 30163 – F-49412 SAUMUR Cedex
Tél. : +33 (0)2 41 83 13 00 – Fax : +33 (0)2 41 67 19 20 – www.ercogener.com – infos@ercogener.com
SA CAPITAL 200873 € – R.C. SAUMUR B 332 174 820 – SIRET 332 174 820 00032 – NAF 2630Z – TVA Intra : FR 16 332 174 820