erco&gener

L'esprit Modem

User Guide

GenLoc 41e

Reference : EG_GenLoc41e_1055_UG_001_UK

Revision : 001

Date : 13/12/2011

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Document History

Revision	Modifications	Author	Date
000			
001	CREATION	YST	13/12/11

The main modifications of this document compared to the previous version are easily identifiable on a screen by the blue color of the text.

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Presentation

Entirely dedicated to geo-localization and embedded data services, the modem **GenLoc 41e** combines both GSM/GPRS and GPS functions in the same robust case.
The GPS data can be transmitted by SMS or data GSM/GPRS communication.
This product includes the GPS function 50 channels Hypersense and its sensitivity ensures the GPS data collection in difficult environmental conditions.
The modem is Quad-Bands 850/900/1800/1900 MHz and GSM/GPRS Class 10.
The GenLoc 41e has 3 operating modes:

- External mode (standard): The driving is made by an external application. The modem is used with the AT commands set (see EG_EGM_CL_xxx_yy of ERCO & GENER).
- Autonomous mode (optional): Once configured, the modem is autonomous; it cyclically registers the positions and transmits them automatically to the client's application via different services: SMS, GSM Data, TCP socket GPRS (see EG_EaseLoc_01_CL_xxx_yy of ERCO & GENER).
- Specific development mode: the EGM development tool allows to develop a personalized embedded application. For more information concerning the tools and the training, please contact our sales department.

The **GenLoc 41e** provides digital inputs/outputs allowing the creation of embedded telematic solutions with high added value.

This document describes the modem and provides the following information:

- General presentation,
- Functional description,
- Available basic services,
- Installation and use of the modem (first level),
- Trouble shooting,
- Recommended accessories for the use of the modem.
- Options, contact us.

For more information concerning this document, ERCO & GENER puts at your disposal the following elements:

- Commands List
  - External mode EG_EGM_CL_xxx_yy
  - Autonomous mode EG_EaseLoc_01_xxx_yy
- Application Note EG_GenLoc41e_1055_AN_xxx_yy
- Release Note EG_GenLoc41e_1055_RL_xxx_yy
- Client support (Hot-Line)

Warning

- **ERCO & GENER** advises to read carefully all the documents concerning the **GenLoc 41e** (User Guide, Application Notes, Command List).

- **ERCO & GENER** cannot be held responsible for:
  - The problems due to an inappropriate use of the **GenLoc 41e**.
  - The problems due to a wrong configuration
  - The problems due to a wrong use of an embedded software application developed or supplied by a third party.
  - The dysfunctions due to the absence or a bad coverage of the GSM, GPRS and GPS networks.
  - The dysfunctions if the product is used for the watching of physical persons where human life is engaged.

- **ERCO & GENER** reserves the right to modify the functions of its products "**GenLoc 41e**" and "EaseLoc" without previous notice.

- In order to avoid any risk of electrocution, do not open the casing.
- For any functioning, the casing must be closed.
- No internal part can be repaired by the user. The **GenLoc 41e** must be returned to the factory for any repair.
- The **GenLoc 41e** must be placed in a normally ventilated area, out of sources of heat.
- In order to guarantee the electromagnetic compatibility, the length of the serial cable, the supply cable and the inputs/outputs cable must not exceed 3 meters.
- The **GenLoc 41e** must not be connected directly to the mains supply; a voltage adapter must be used.

SCRAP THE WORN BATTERIES ACCORDING TO INSTRUCTIONS;

Copyright

1 References

1.1 Referred documents

Commands List of
Standard library of ERCO & GENER..... : EG_EGM_CL_xxx_yy
the embedded application EaseLoc of ERCO & GENER. : EG_EaseLoc_01_CL_xxx_yy
Application Notes GenLoc 41e of ERCO & GENER ..... : EG_GenLoc41e_1055_AN_xxx_yy

GSM reference documents:

- 3GPP TS 27.007 Technical Specification Group Core Network and Terminals; AT command set for User Equipment (UE)
- 3GPP TS 27.005 - Technical Specification Group Terminals; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Services (SMS) and Cell Broadcast Service (CBS)
- 3GPP TS 27.010 - Terminal Equipment to User Equipment (TE-UE) multiplexer protocol (Release 1999)

1.2 Abbreviations

Abbreviations Definition

AC	Alternative Current
ACM	Accumulated Call Meter
AMR	Adaptive Multi-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
EGM	Erco Gener Middleware
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
FTP	File Transfert Protocol
GCF	Global Certification Forum
GND	GrouND
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
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
LLC	Low Level Command
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
SMB	SubMiniature version B RF connector
SMS	Short Message Service
SNR	Signal-to-Noise Ratio
SNTP	Simple Network Time Protocol
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

1.3 Symbols

The following symbols are used to highlight the important information of this userguide.

A symbol for the essential information concerning the module integration and performance.

A warning symbol indicates the actions that could harm or damage the module

2 Packaging

2.1 Content

The GenLoc 41e is supplied with:

- a GenLoc 41e cardboard packaging,
- a modem GenLoc 41e,
- 2 fixing brackets,
- A 4-wire cable
  Red/Black/Orange/Green stripped with fuse 5x20 of 2.5A/250V
  or depending on supplying
  Red/Black /Yellow/Brown stripped with fuse mini Blade 2A/32V
- A 2-wire cable (Blue/Yellow) stripped.
- A technical sheet (Instructions Sheet).

2.2 Packaging

External dimensions of the modem packaging:

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

An identification label is put on the top of the packaging. It shows :

- The ERCO & GENER logo,
- The product reference: GenLoc 41e,
- The CE mark,
- The IMEI bar code with 15 digits.

Dimensions of the label:

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

2.3 Modem labels

On the standard casing, there are 2 labels placed on the back part of the modem:

▪ A production label indicating the following information:

- The CE mark,
- The crossed wheelie-bin mark (DEEE standards),
- The direct current mark (VDC),
- The mark R40,
- The IMEI bar code with 15 digits.

▪ A label of the markings: ROHS (2002/95/CE).

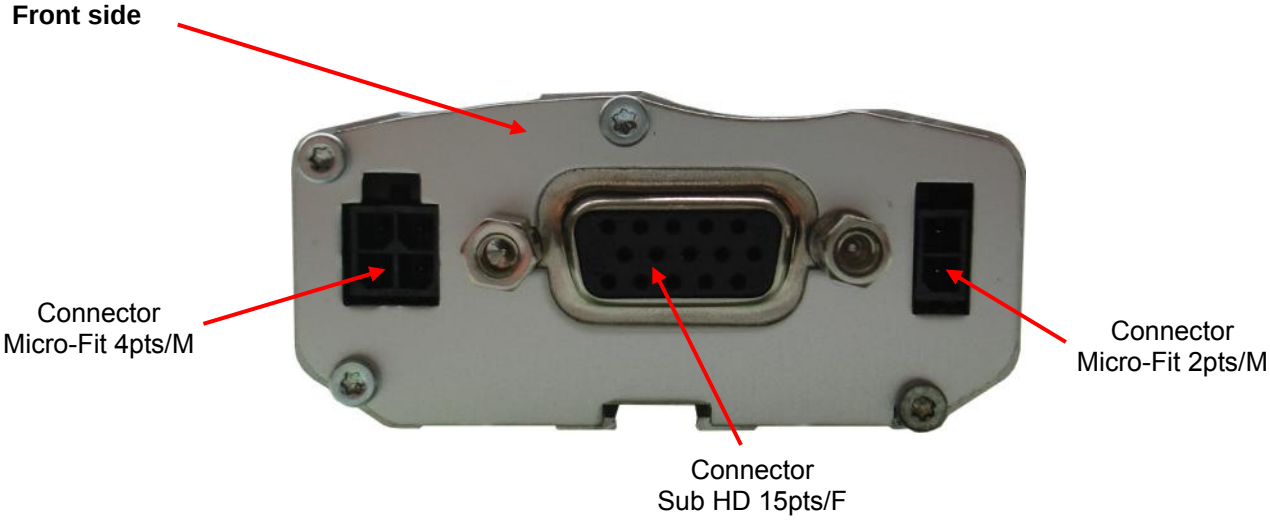
If the internal battery option has been mounted during production, the modem has the following label: Lithium-Polymer Battery Inside.

3 General Presentation

3.1 Description

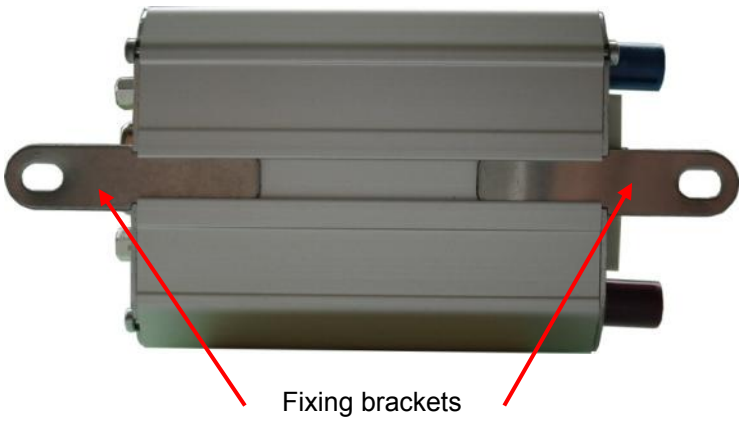
Description of the modem GenLoc 41e :

Front side



Back side

2 brackets to fix the modem on a support.



3.2 External connections

3.2.1 Connections

3.2.1.1 Antenna connectors

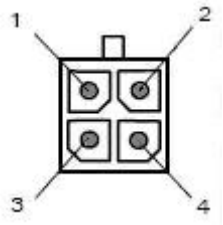
GSM antenna connector:
The GSM antenna connector is FAKRA-D female with a 50Ω impedance.

GPS antenna connector:
The GPS antenna connector is FAKRA-C male with a 50Ω impedance.

3.2.1.2 Micro FIT connectors

Female Micro FIT Connector with 4 male pins:

This connector of the GenLoc 41e is used for the external DC supply and the GPIOs (the 2 signals Input and Output).

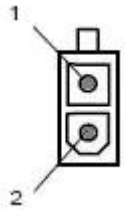


Pin N°	Signal
1	$+V_{DC}$
2	GND
3	INPUT 1(E1)
4	OUTPUT (S1)

The pins 3 and 4 are used for the Input/Output functions. The modem can only be powered by the pins 1 ($+V_{DC}$) and 2 (GND).

Female Micro FIT connector with 2 male pins:

This connector of the GenLoc 41e is used for the GPIO (2 Input signals).



Pin N°	Standard name	Circuit	I/O	Option	I/O	Option	I/O	Option	I/O
1	INPUT 3	Opto 5 / 35 V	I	Input/Output 0-3V non opto (GPIO)	I/O	INPUT One Wire Dallas 0-3V non opto	I/O	INPUT One Wire multi-slaves 0-3V	I/O
2	INPUT 2	Opto 5 / 35 V	I	Input/Output 0-3V non opto (GPIO)	I/O	Analog Input ANA-1 0-10V	I		

3.2.1.3 15-pin Sub D HD connector

The female 15-pin high density Sub D connector is used for:

- The RS232 serial link connection,
- The audio line connection (microphone and loud-speaker),
- The BOOT and RESET signals.

Pin N°	Standard name	Circuit (V24 – RS232C)	I/O	Option	I/O	Option	I/O
1	Buzzer [1]	Open collector	O	109 – DS – DCD	O		
2	Data emission	103 – ED – TXD	I				
3	Boot	BOOT	I				
4	Microphone +	MICP	I				
5	Microphone -	MICN	I				
6	Data reception	104 – RD – RXD	O				
7	Data set ready	107 – PDP – DSR	O	Frames NMEA/UBX	O	Output Clock I2C (TWCK) [2]	O
8	Data Terminal Ready	108/2 – TDP – DTR	I	Frames UBX	I	ON/OFF of power supply	I
9	Signalization ground	102 – TS – GND	-				
10	Loudspeaker +	SPKP	O				
11	Clear to send	106 – PAE – CTS	O				
12	Request To Send	105 – DPE – RTS	I			Output data I2C (TWD) [2]	O
13	Power supply [1]	3,8V / 100 mA	O	125 – IA – RI	O		
14	Reset	RESET	I				
15	Loudspeaker -	SPKN	O	Input ANA-2 0-10V	I		

([1]) Please note that by default:

- The pin 1 is the Buzzer output (wiring of the output 109/DCD optional).
- The pin 13 is a fixed tension (to power accessories like GenBlue 15e) of 3,8V 100mA (wiring of the output 125/RI optional).

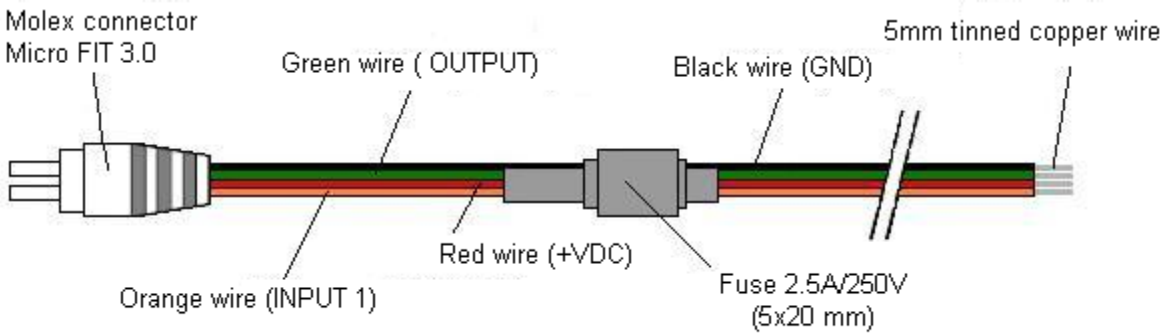
([2]) Contact us

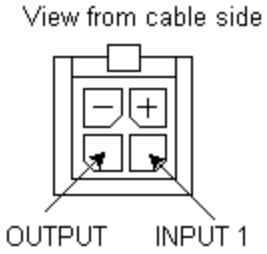
3.2.2 Cables

3.2.2.1 4-wire micro FIT cable

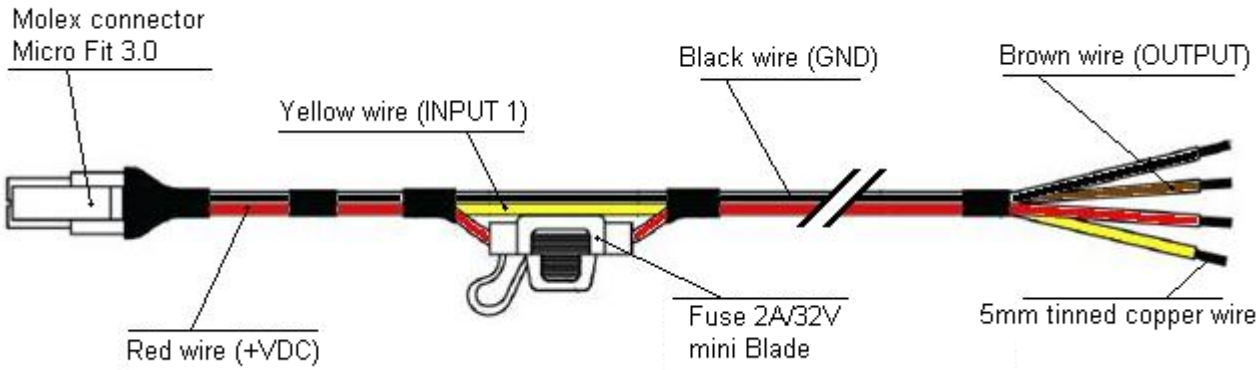
One of the 2 following cables is supplied:

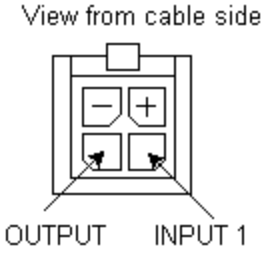
The 4-wire micro FIT cable allows to power the modem and to use the 2 signals Input and Output.





Component	Characteristics
4-pin Micro FIT connector	Supplier : MOLEX
Cable	Length ≈ 1.5m
Wire	Tinned copper 24 x 0.2 mm
	Section : 0.75 mm²
Fuse	F2.5A L250V

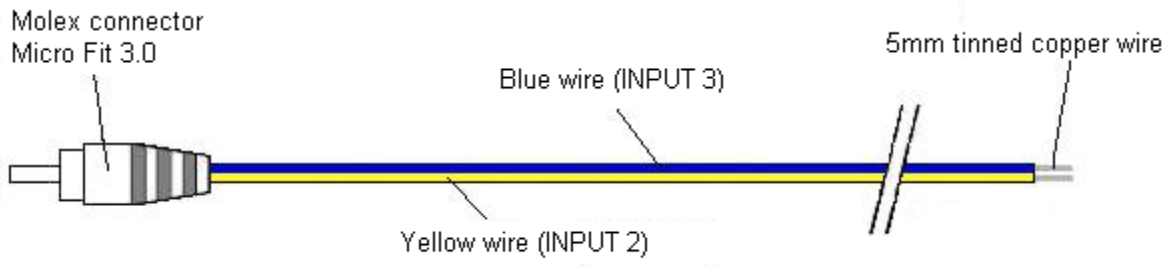




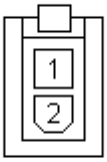
Component	Characteristics
4-pin Micro FIT connector	
Cable	Length ≈ 1.5m
Wire	Tinned copper 24 x 0.2 mm
	Section : 0.75 mm²
Fuse	mini N 2A 32V RAPIDE (grey)

3.2.2.2 2-wire micro FIT cable

The 2-wire micro FIT cable allows to use the 2 supplementary inputs.



View from cable side



Component	Characteristics
2-pin Micro FIT connector	Supplier : MOLEX
Cable	Length ≈ 1.5m
Wire	Section : 0.5 mm²

4 Characteristics and Services

The GenLoc 41e is:

A class10 GSM/GPRS modem dedicated to asynchronous binary data transmission, SMS, voice, and Fax Group 3 Class2.0.

A GPS module dedicated to position tracking.

The modem characteristics and the available services are summarized in the table below.

GSM Functions
- Quad-Bands GSM 850/EGSM 900/DCS 1800/PCS 1900 MHz
- ETSI GSM Phase 2+ Classe 4 (2W @ 850 / 900 MHz - 33 dBm) Classe 1 (1W @ 1800 / 1900 MHz - 30 dBm)
- SIM Toolkit
Voice FUNCTIONS
- Voice (GSM mode)
- Telephony, Emergency call 112
- Full Rate, Enhanced Full Rate, Half Rate and AMR (FR/EFR/HF/AMR)
- Echo cancelation and noise reduction
- Full Duplex Free-hand
DATA Functions
- GPRS Class 10 (up to 4Rx / 2Tx)
- PBCCH/PCCCH supported, Coding scheme : CS1 to CS4
- Library TCP/IP (UDP Socket*, TCP*)
- CSD 9600 kbs (Max.)
- SMS Text, PDU, point to point MT/MO and SMS Cell Broadcast
GPS Functions
- Civil frequency L1 (1575,42MHz)
- 50 channel receiver
- Precision : 2.5m CEP (DGPS 2m CEP)
- Sensitivity : -160dB
- Protocols : NMEA-0183, UBX Binary
- A-GPS compatible
Interfaces
- GSM Antenna : connector FAKRA-D
- GPS Antenna : connector FAKRA-C
- Management of GPS antenna active 3.3V
- Power supply : +6.5 ≤ +V_{DC} ≤ +32 VDC (micro-FIT connector)
- RS232 (300 to 115200bds) + Audio through the female 15-pin Sub-D
- AT commands : 3GPP TS 27.007 / 27.005 / 27.010
- Specific AT commands for GPS (DSR and DTR multiplexing / NMEA Position)
- SIM reader (SIM 3V – 1,8V)
- 3 opto-coupled Inputs and 1 open-collector Output
- External auto-supply via pin RI
- Buzzer output via pin DCD
Accessories supplied

- Fixing brackets (x2)
- 4-wire Micro FIT cables (Power supply, Input and Output)
- 2-wire Micro FIT cables (2 Inputs)
Options / Accessories *
- Back-up battery
- Management of battery charge
- Command ON/OFF of external supply by soft
- Command ON/OFF of external supply by DTR
- Power down of the RS232 by soft
- Backup Real Time Clock (if option backup battery)
- Bus I2C (instead of signals DSR and RTS)
- 3-axis accelerometer
- Analog input (instead of opto-coupled input E2)
- Analog input (instead of output SPKN)
- Gen 10400 : Adapter RS232 / Digital Tachograph
- GenBlue 15e : Adapter Bluetooth® / RS232 auto-supplied
- 1 port ONE_WIRE
- Software development kit : cdrom SDK EGM
- Accessories: Antennas, cables, power supply... (consult our website)

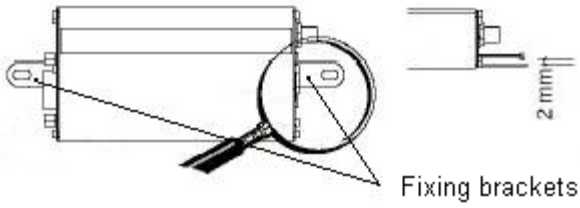
* contact us

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 described below.



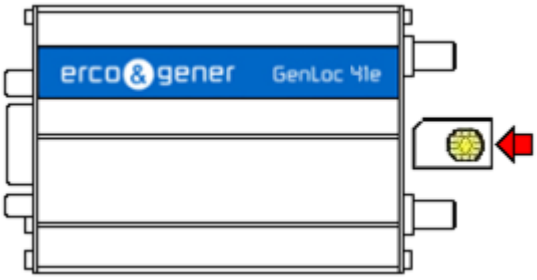
- Must be fixed on a flat surface.
- Max. height of the screw head : 2 mm.

The aluminum casing of the modem is connected to the 0V (GND) of the power supply and to the 0V of the RS232 serial link. To avoid any risk of conduction of the ground plane to other equipments, **the modem must be electrically insulated from its mechanical support.**

5.1.2 Installation of the modem

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

- Remove the SIM card cover on the back side.
- Carefully insert the SIM card into the reader.



- Push the SIM card until hearing a "clic" that ensures its correct positioning.
- Put the SIM cover back.
- Connect the GSM antenna to the connector FAKRA-D.
- Connect the GPS antenna to the connector FAKRA-C.
- For the connection to the DTE, connect the V24 link via the 15-pin Sub HD cable.
- Connect the supply cable to the continuous and regulated power source (for an automobile application, see the paragraph 5.2).
- Connect the supply cable to the modem and turn on the external power supply.

The modem is now ready.

There are different cases depending on the application installed inside the equipment:

- Without library: corresponds to the Boot_Loader.
- With EGM standard library
- The application ERCO & GENER EaseLoc-Vx.
- The owner application.

We may obtain different display. See the following paragraph.

5.1.3 Checking the communication with the modem

5.1.3.1 Without Library

The GenLoc 41e does not contain any library, it will return the menu of the Boot-Loader.

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

Configure the RS232 port of the DTE as follows:

- Bits per second ..... : **115 200 bps**,
- Data Bits..... : **8**,
- Parity ..... : **None**,
- Stop Bits..... : **1**,
- Flow control..... : **material.**

Use a communication software like Windows HyperTerminal ®.

Menu by default when there is no library inside the equipment (example of display)

```
Bootloader V4.03 GL41 UE Gener Ublox (HWE0 rev C)
GSM voltage = 4299 mV
 1 - Update application
 2 - Erase objects
 M - GSM direct access
 A - Advanced
 P - Power off
 E – Exit
```

With this status, the two leds are off.

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

- Check the RS232 connection between the DTE and the modem (DCE),
- Check the configuration of the COM port of the DTE.

5.1.3.2 With EGM standard library

The GenLoc 41e contains the EGM standard library; it is waiting for a command.

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

Set the RS232 port of the DTE as follows:

- Bits per second ..... : **115 200 bps**,
- Data Bits..... : **8**,
- Parity ..... : **None**,
- Stop Bits..... : **1**,
- Flow control..... : **material.**

Use a communication software like Windows HyperTerminal ® .

Send the AT command. The modem returns OK. For more precision about the commands, see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER.

With this status, the two leds are off.

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

- Check the RS232 connection between the DTE and the modem (DCE),
- Check the configuration of the COM port of the DTE.

5.1.3.3 The application ERCO & GENER EaseLoc-Vx

The GenLoc 41e contains the application EaseLoc_Vx.

Send the command ATI8. The modem returns the version (example of display)

EaseLoc V2.10b1 GenLoc41e-R40 eCos-Enabler IIIG_GSM0308-Thu Mar 17 10:29:40 2011

For more information about these AT commands and their associated parameters, see the documents "Commands List EG_EaseLoc_Vx_CL_yyy_UK" of ERCO & GENER.

5.1.3.4 The owner application

The GenLoc 41e contains your application.

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

Set the RS232 port of the DTE according to your parameters (speed, data bits, parity and stop bit).

Use a communication software like Windows HyperTerminal ®.

Check the display and the dialogue with the GenLoc 41e according to your own characteristics.

5.1.4 SIM card extraction

To remove the SIM card from the modem, it is recommended to do the following operations with the modem turned off:

- Remove the SIM card cover on the back side.
- Press the SIM card (simple pressure) until hearing a "clic" that ensures its ejection.
- Remove delicately the SIM card from the reader.
- Put the SIM cover back.

5.1.5 Hardware reset of the modem

To trigger a Hardware reset of the modem, a RESET signal (hardware) is available on the pin 14 of the 15-pin Sub HD connector (RESET).

The modem Reset is made when the RESET signal (pin 14) is held at a low level during 10ms.

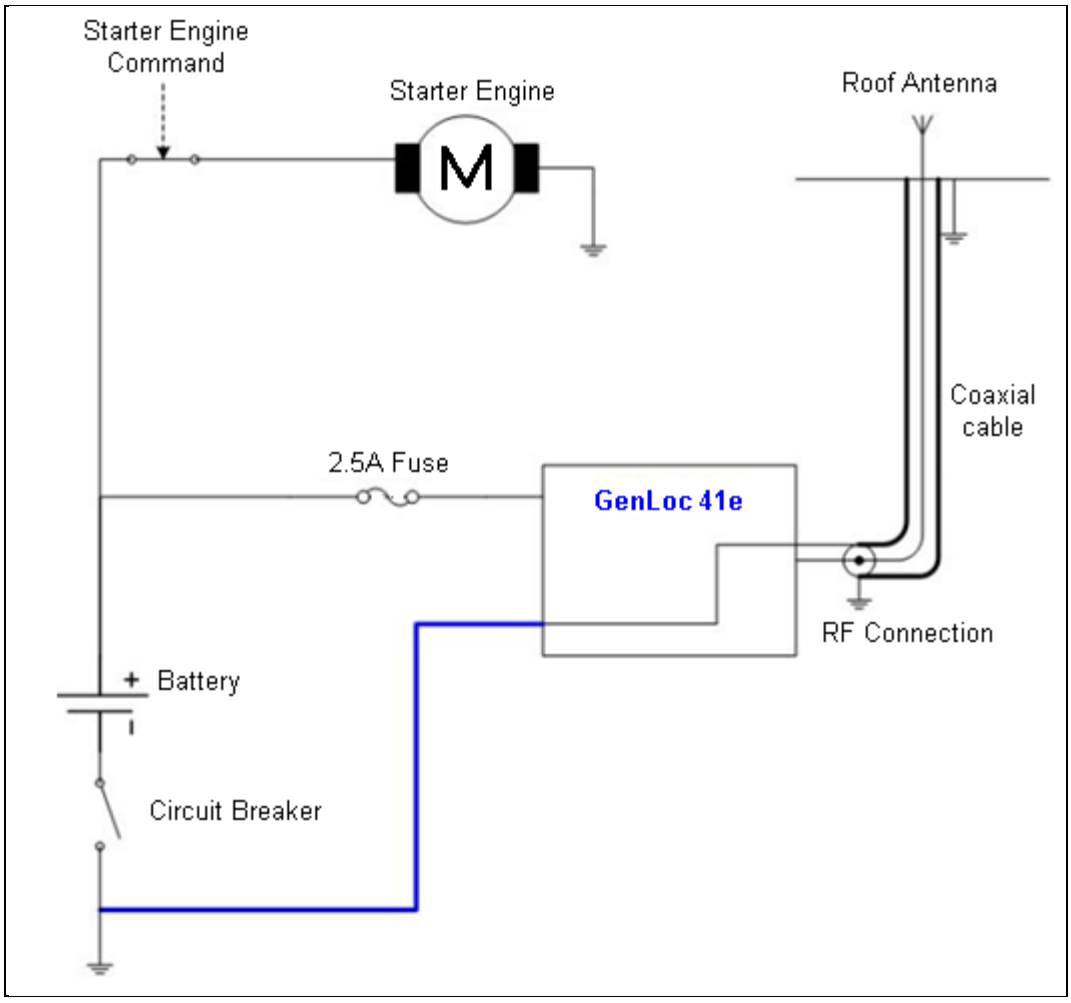
This signal must be considered as a way of reseting the modem in case of emergency only. For more details concerning the modem RESET, see the § *7.6 RESET*

5.2 Specific recommendations for the use of the modem in vehicles

The power supply connector of the modem GenLoc 41e must **NOT** be connected directly to the battery of the vehicle.

5.2.1 Recommended connection on the battery of a truck

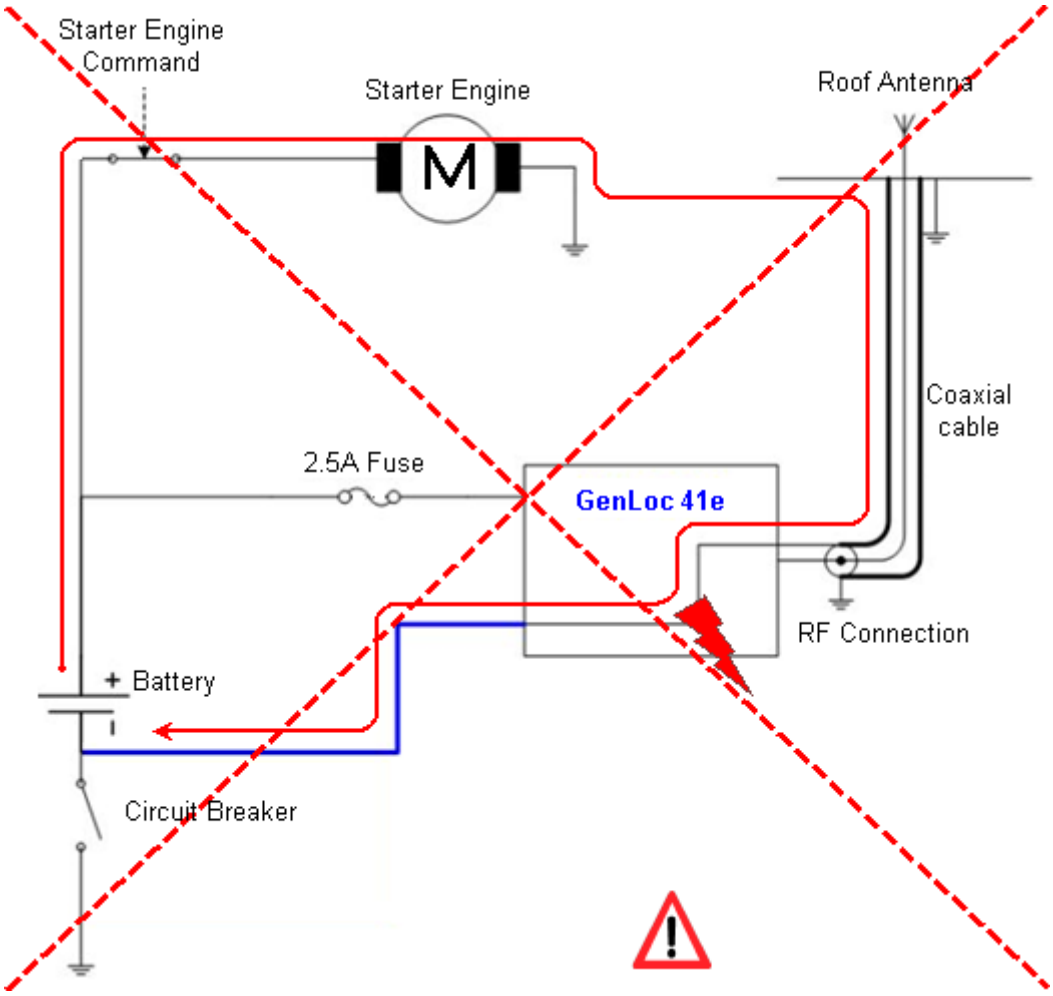
All trucks have a Circuit Breaker outside the cabin. The circuit breaker is used for security reasons: for example, if a fire breaks out in the electric box of the truck, the driver can cut off the power source and avoid more damage (explosion).
The circuit breaker is connected to the ground of the truck, usually connected to the fuse box.
Most of truck circuit breakers do not cut off the PLUS of the battery, but cut off the ground.



The scheme above shows a recommended power connection where the connection of the modem ground is not directly connected to the battery, but connected after the circuit breaker (to the ground of the truck or in the fuse box).

5.2.2 Technical constraints in trucks

It is highly recommended **NOT** to connect the modem supply directly to the battery but to the circuit breaker. Otherwise the modem can be damaged when the truck is starting up if the circuit breaker is closed (in this case, the ground of the truck and the ground of the battery will be connected via the modem as described in the scheme below).



Example of forbidden electrical connection (risk of damage on the modem)

The scheme above shows an example of electrical connection that could damage the modem due to the fact that the ground connection is directly connected to the battery ground.

In fact in this example, when the circuit breaker is open, the current escapes via the modem and the electrical circuits of the truck (the dashboard for example). And when the motor's starter is used, it will destroy the cables or the modem.

Moreover, the internal circuits of the modem are not designed to resist to a current of about 60 A (when starting the truck), or they would be destroyed.

5.3 Modem leds

5.3.1 GSM led

5.3.1.1 Without library

The GenLoc 41e does not contain any library. The led is off.

5.3.1.2 With EGM standard library

The led remains off.

5.3.1.3 The application ERCO & GENER EaseLoc-Vx

The status of the GSM module is indicated by the status of the GSM YELLOW LED situated on the back side of the modem. This is the yellow LED situated on the right side on the SIM reader (see § *3.1 Back side*).

GSM LED status	LED activity	GSM status
Off	LED off	Module not activated or off.
On	LED on	Module under attachement to GSM network.
LED flashing	0.5s ON / 1.5s OFF	Module attached to GSM network.
LED flashing	0.2s ON / 0.6s OFF	Module in data, voice or GPRS communication.

5.3.1.4 The owner application

The GenLoc 41e contains your application. The led status depends on your parameters.

5.3.2 GPS led

The positioning status of the modem is indicated by the GREEN GPS LED situated on the back side of the modem. It is the green LED situated on the left side on the SIM reader (see § 3.1 Back side).
The table below shows the signification of the different available status of the GPS LED.

GPS LED status	LED activity	GPS status
Off	LED off	The GPS is not activated or the GPS is searching for satellites.
On	LED flashing	The GPS is synchronized with different satellites. It found its position.

5.4 Echo function of AT commands deactivated

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER) in this case, if no echo is returned when entering an AT command, it means that:

- the "local echo " of your communication software (like Hyperterminal) is not activated,
- the echo function of the modem has been deactivated.

The echo function can be set with the command ***ATE*** ; it requires a back-up with the command ***AT&W***.

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

When sending AT commands to the modem using a communication software, it is recommended to:

- Deactivate the "local echo" parameter in your communication software (like Hyperterminal),
- Activate the echo function of the modem (the command ***ATE1***).

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

For more information about the ***ATE*** commands, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

5.5 Checking the quality of the GSM reception signal

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER) in this case, the modem will be able to make a call only if the received GSM signal is sufficient.

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

When the SIM card is inserted and the PIN code entered, the command ***AT+CSQ*** allows to measure the signal from the BTS of the subscribed operator network.

To check the quality of the GSM signal, do the following operations:

Use a communication software like Hyperterminal, enter the command ***AT+CSQ***.

The response is in the following format:

+CSQ : <rssi>, <ber> with:

<rssi> = indicates the reception level,

<ber> = receive bit error rate.

Check the returned value ***<rssi>*** with the help of the table below.

<*rssi*> value	Gain in dbm	Interpretation	<*ber*> value	Interpretation
0	-113 dbm	Insufficient	0 to 7	See ETSI GSM 05.08 standards
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 works normally with a minimum ***<rssi>*** between 11 and 15.

Bellow 10, the signal level is insufficient; the modem cannot work depending on the geographical situation or the vehicle mobility. Above 15, the signal is satisfatory.

For more information about AT commands, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

5.6 Verification of the PIN code

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the PIN code is necessary to make a call or to accept a response coming from the GSM network. This code is held in the SIM card and can be modified by the user.

To check that the PIN code has been entered, use a communication software like Hyperterminal, and enter the command ***AT+CPIN?***

The table below shows the main responses given by the modem:

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

For more information about AT commands, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

5.7 Verification of the modem registration on the GSM network

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case:

1. Ensure that a valid SIM card has been inserted in the SIM card reader of the modem.
2. Using a communications application like HyperTerminal, enter the following AT commands:
   a. ***AT+CPIN="xxxx"*** to enter the PIN code. The user has only 3 attempts to enter the PIN code. After the third attempt, only a second code (PUK code) supplied by the operator, will allow you to chose a new PIN code.
   b. ***AT+CREG?*** to check the registration status on the network. The response will be of the following format: ***+CREG : <mode>, <stat>*** with:
   <Mode> = configuration of the registration message not solicited,
   <Stat> = registration status.
3. Check the registration status according to the value returned in the table below.

Command	Response	Interpretation
AT+CREG?	***+CREG : 0,0***	The modem is not recognized by the network
	+CREG : 0,2 or ***0,3***	The modem is searching for a network operator.
	+CREG : 0,1	The modem is attached in GSM to the local operator.
	+CREG : 0,5	The modem is attached in GSM to the roaming operator.

If the modem is not registered: check the connection between the modem and the antenna or the reception level of the signal (cf. paragraph 5.5).
For more information about the AT commands, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

5.8 Reading a current position given by the GPS

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the reading of a GPS position can be done with the command ***AT+GPSPOS***. This command allows to get the information received of the current position. After powering on the modem, an acquisition time is necessary (around 45 seconds).
Send

- ***AT+GPSPWR=1*** starting of the GSM module
  Wait for the flashing of the green led verte and
- ***AT+GPSPOS***

The response is in the following format and the table below shows examples of responses:

+GPSPOS:<fix>,<time>,<date>,<latitude>,<longitude>,<altitude>,<hdop>,<speed>,<cap>,<nbsat>

<fix>
0 invalide fix
1 2D fix
2 3D fix
-1 impossible to define a position

<time> : hhmmss.zz
example : 083205.00 -> 8 hours 32 minutes 05 seconds and 00 hundredth of a second in UTC

<date> : ddmmyy
example : 180406 -> the 18 April 2006

<latitude> : ddmm.mmmmm(N/S)
dd (degree) 00 to 90
mm.mmmmm (minute) 00,00000 to 59,99999
N/S North or South
example : 4716.81310N -> latitude 47 degrees 16,81310 minutes North

<longitude> : dddmm.mmmmm(E/W)
ddd (degree) 00 to 180
mm.mmmmm (minute) 00,00000 to 59,99999
E/W East or West
example : 00003.51202W -> longitude 0 degree 0 3,51202 minutes West

<altitude> : mmmm.m in meters

<hdop> : mmm.mm horizontal dilution position in meters

<speed> : ssss.s ground speed in km/h

<cap> : dddmm.mmmm
ddd (degree) 000 to 360
mm.mmmm (minute) 00,0000 to 59,9999

<nbre sat> : nn number of satellites seen

The following table shows examples of responses returned by this command.

Command	Response	Interpretation
AT+GPSPOS	***+GPSPOS:-1,,,,,,,,,0***	It is not possible to define a position. Check the positioning of the GPS antenna or the GPS configuration (see paragraph 8.2.7.3 Installation of GPS external antenna).
	+GPSPOS:0,083138,180406,,,,,,,6	It is not yet possible to have a position but the date and time information are available. A complete frame should be obtained soon or the antenna position is not optimum (see paragraph 8.2.6.3)
	+GPSPOS:2,083205,180406,4716.81310N,00003.51202W,44.9,2.14,0.037,33.43,10	A position is read and all the information is available. The frame is considered as complete. The GPS LED is flashing.

5.9 Main AT commands (HAYES)

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the table below shows the main AT commands necessary for the control of the modem.

Other AT commands are available, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

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 registration on the network	AT+CREG?	***+CREG : 0,1***	The modem is attached in GSM to the local operator.
		+CREG : 0,5	The modem is attached in GSM to the roaming operator.
		+CREG : 0,2	The modem is searching for a network operator.
		+CREG : 0,0 or ***0,3***	The modem is not recognized by the network.
Reception of an incoming call (2*)	ATA	***OK***	Reply to the call
Make an outgoing voice call	ATD<telephone number>; (the **;** at the end of the sequence is important; it allows to make a voice call)	***OK***	Communication established
		+CME ERROR: 11	PIN code not entered
		+CME ERROR: 3	The credit has run out or a communication has already been established.
Make an emergency call (112)	ATD112;	***OK***	Communication established
Communication lost		***NO CARRIER***	
Hang-up	ATH	***OK***	

(1*) with ***+CMEE=1***. The command ***AT+CMEE=1*** allows the display of extended error codes; it is possible to save it with the command ***AT&W***.
By default, some event codes ***+EGEVT*** allow the display of status change of the SIM card (card present, card ready …) and allows to know some status of the modem (modem ready after a RESET…), see the Command List of ERCO & GENER.

(2*) with ***+CRC=1***. The command ***AT+CRC=1*** allows in the case of an incoming call to display an extended message that indicates the canal called. This message corresponds to the type of number called: voice or data, it is possible to save it with the command ***AT&W***.

Examples:
If the VOICE number is called, the modem replies: +CRING : VOICE
If the DATA number is called, the modem replies: +CRING : REL ASYNC

5.10 Turning off the modem

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, it is strongly advised to un-register from the network with the command AT+COPS=2.

There is no particular action to do on the GPS part before turning it.

If the Battery option is present, a mechanism allows to stop compeletely the application if the external power supply is unplugged, and also to prepare the modem for storage or transport phases in order to limit high discharges of the battery.
If the device is not used, it has to be deactivated by sending the following command:

- **If the modem contains an application developed with EGM** send the command ***AT+GPIOSET=35,0***
  And cut the external power supply of the modem.
- **If the modem does not contain any embedded application,** via the Boot-Loader menu
  Bootloader V4.03 GL41 UA Gener Ublox (HWE0 rev C)
  GSM voltage = 4295 mV
  1 - Update application
  2 - Erase objects
  M - GSM direct access
  A - Advanced
  P - Power off
  E - Exit
  Enter "P"
  And cut the external power supply of the modem.

Important note : The switching and the auto-maintain of the battery will be automatically reactivated once the modem will be connected again to its external power supply.

5.11 Updating procedure of the modem

To be able to benefit from the latest functions of the GenLoc 41e, an updating procedure can be used to upgrade the software program in the modem.

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

Contact us for the software updating.

6 Trouble Shooting

This section of the document describes the problems that may be encountered when using the modem.

6.1 Problem of communication between the modem and the RS232 link (V24)

If the modem does not respond to the AT commands via the RS232 link, see the table below for the possible causes and the solutions.

Table: Solutions when there is no dialogue between the modem and the RS232 link

If the modem...	Check :	Action
Returns nothing	Is the modem correctly powered?	Ensure that the modem is connected to an external regulated power source and supplies a voltage from 6.5V to 32V (§ *8.2.1 Power Supply*).
	Is the serial cable connected at both ends (PC and Modem)?	Check the connection of the serial cable.
	Is the serial cable correctly cabled according to the paragraph 3.2.1.3?	Connect the serial cable according to the table of paragraph § *3.2.1.3 15-pin Sub D HD connector*.
Returns nothing or random characters	Is the communications terminal correctly configured on the PC?	Ensure that the configuration of the communication terminal corresponds with the one of the modem. Factory configuration of the modem: Without library (BootLoader) Speed = 115 200 bps Data Bits = 8 Parity = none Stop Bits = 1 Flow Control = none With standard library Speed = 115 200 bps Data Bits = 8 Parity = none Stop Bits = 1 Flow Control = none ERCO&GENER Application – EasePro-01 Contact us. Owner application speed, data bit, parity and stop bit according to your parameters
	Is there another application used, creating a conflict during the access to the communication port?	Close the conflicting application.
	Is the modem without echo and without message reporting?	Send the command ***ATE1Q0*** followed by ***AT&W*** if a backup is required .

6.2 "ERROR" message

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

- The COM port is not directed to the modem GenLoc 41e but to another modem. Enter ***ATI0***, and the response must be ***"LEON-G100-06S-00"***. Any other response indicates a dialog with another modem. In this case, check the COM port used in Hyperterminal.
- The syntax of the AT command is incorrect: check it (see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER
- The syntax of the AT command is correct, but transmitted with wrong 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 the "ERROR" message in order to obtain the error code.

    In case of an error code, the response of the modem may be:

    +CME ERROR : < error code >

For more information about the error codes returned by the command ***AT+CMEE***, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

It is strongly recommended to systematically allow the modem to return the 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), see the table below for the possible causes and their solutions.

Table: Solutions when a message "NO CARRIER" is returned

If the modem...	Check :	Action
"NO CARRIER"	Is the received GSM signal strong enough?	See the paragraph 5.5 to check the quality of the received signal.
	Is the modem registered on the network?	See the paragraph 5.7 to check its registration.
	Is the antenna correctly connected?	See the paragraph 8.2.6.3 for the recommendations about the GSM antenna installation.
"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 (**;**) has 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 calls?	Ensure that the SIM card is allowed to make data 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*)

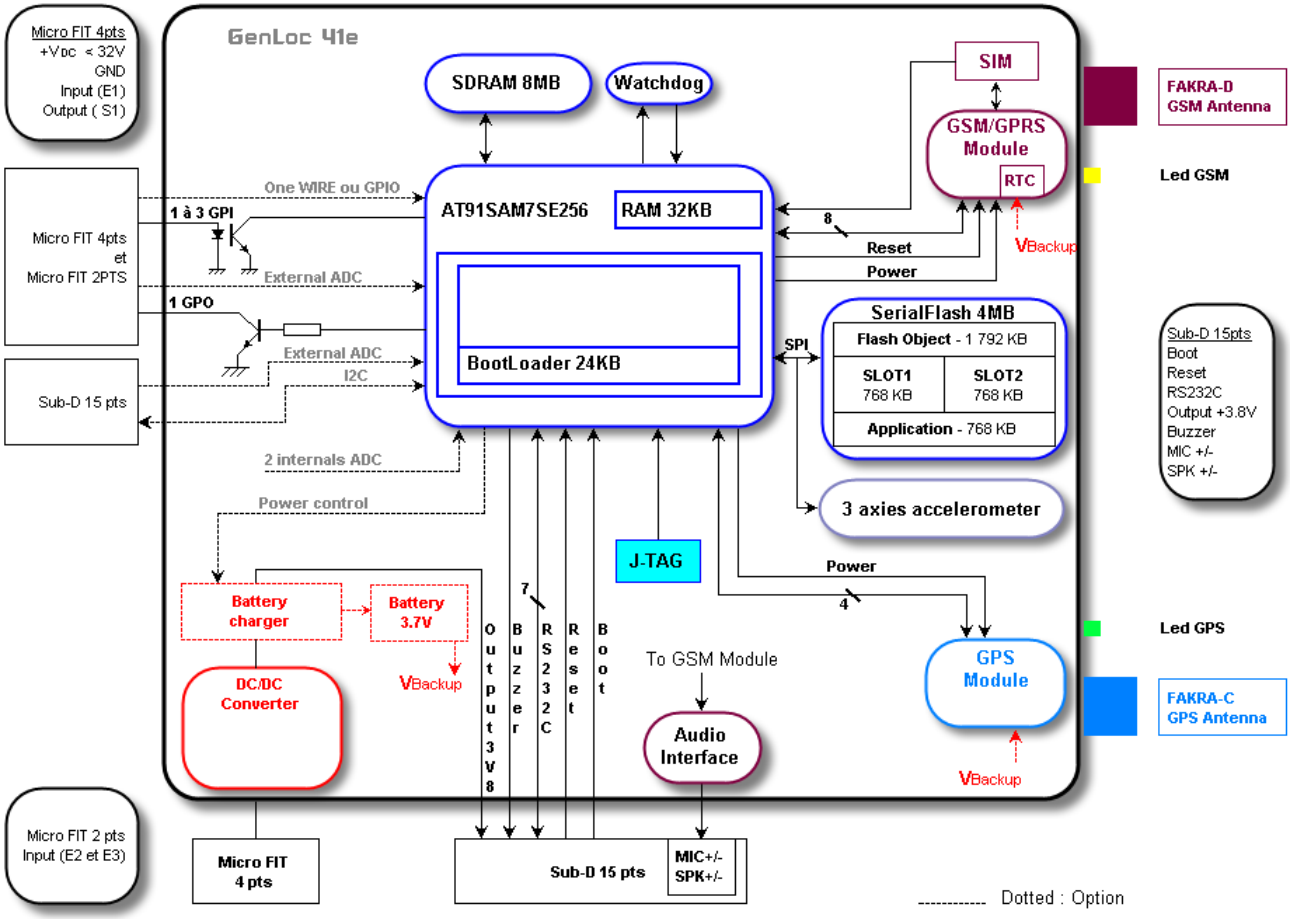
(1*) For more information about this AT command, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

If the modem returns the message "NO CARRIER", you can get the extended error code with the command ***AT+CEER***.

For more information about the error codes returned after having sent the command ***AT+CEER***, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER.

7 Functional Description

7.1 Architecture



7.2 Power supply

7.2.1 General presentation

The modem must be powered by an external DC tension ($+V_{DC}$) between:

Standard	$+6.5V \leq +V_{DC} \leq +32V$
With battery option	$+7.2V \leq +V_{DC} \leq +32V$

The regulation of the modem power supply is made with a DC/DC internal converter in order to supply all the necessary internal DC tensions.

For the GPS module, another regulation is done for its internal power supply.

A correct functioning of the modem in communication cannot be guaranteed if the input tension ($+V_{DC}$) falls below 6.5 V or 7.2 V depending on the presence of the battery option or not.

7.2.2 Internal battery option

7.2.2.1 Presentation of internal battery option

The battery is fixed inside the GenLoc 41e. It is connected to an additional charging circuit cabled on the mother board of the GenLoc 41e.

This battery allows to maintain the GenLoc 41e functioning in case of absence of its external power supply (power supply connected on the Micro-FIT 4-pin female connector).

The internal charging circuit allows to keep permanently the charge of the battery from the external power supply.

When the battery is completely discharged, 3 hours are necessary to obtain a new complete charge. It is normal if the box heats a little bit in this case.

The autonomy of the battery essentially depends on the mode of use of the GenLoc 41e (attachment in GSM/GPRS, Inputs/Outputs, GPS power supply, RS232 connected...).

The internal battery option is not cabled by default and its assembly must be made by us in our factory (contact us). The option is identified by a label (see § *2.3 Modem labels*)

If the battery option is present, prepare the modem for storage or transport phases in order to limit high discharges of the battery. For that, see the § *5.10 Turning off the modem*

7.2.2.2 Specifications of the internal battery option

The external power supply of the GenLoc 41e is from +7,2V to 32V DC. The internal regulator of charge supplies the 4.2V voltage necessary for the battery charge.

Table: Characteristics of the polymer lithium battery

Voltage (max.)	4.2V
Capacity	1000 mA/h typical
Exp. Cycle time	>500 cycles> 70% of initial capacity
Temperature range	Charge : 0°C to +45°C Discharge : -20°C to +45°C
Protection (Rearmable fuse)	Discharge voltage : 2.30V ±0.058V Maximum discharge current : 2A to 4A (1.0±0.3s)

7.2.2.3 Charge voltage and supply voltage

The following table shows the consumptions of the modem with GSM and GPS antennas and the SIM card present.

These values were measured after a complete discharge of the battery.

Table: Power consumption (2*) GSM and GPS OFF

CONDITIONS T=25°C		I Charge Nom.(mA) Without RS232
External supply voltage	@ 7.2V	174
	@ 12V	105
	@ 24V	55
	@ 32V	43

(2*) The power supply consumption may vary by 5% depending on the temperature range (-20 °C to +55 °C).

7.2.2.4 Indication of presence/absence of the external power supply

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the command ***AT+GPIOGET=27*** allows to know the status of the external power supply for the internal battery.

AT+GPIOGET=27

<Index>

0 indication of absence of external power supply
1 indication of presence of external power supply

Table: Examples of responses with the internal battery option cabled

Command	Response	Interpretation
AT+GPIOGET=?	***+GPIOGET: (0-27)*** ***OK***	Syntax
AT+GPIOGET=27	***+GPIOGET: 27=0*** ***OK***	External supply present
AT+GPIOGET=27	***+GPIOGET: 27=1*** ***OK***	External supply absent

For more information concerning this command, see the "EG_EGM_CL_xxx_yy" of ERCO & GENER.

7.2.2.5 Instruction and restrictions of use

The internal battery option is not cabled by default and its implementation must be made by us in our factory (contact us).

When the battery is completely discharged, it takes around three hours to obtain a complete charge.

When the battery is connected and charged, the act of removing the power supply + VDC does not turn off the equipment. For this see § *5.10 Turning off the modem*.

The battery cannot be replaced or modified by the user. The device must NOT be opened. For any action on the battery: the device must be returned to factory.
Do not throw the modem and the battery on fire.

7.2.3 Protections of the power supply

The modem is protected by a fuse F2.5 A / L250 V or 2A / 32V directly assembled on the power supply cable supplied with the modem.

The modem is also internally protected against voltage peaks of more than 32 V.

Filter guarantees: following certification CE.

7.3 RS232 serial link

7.3.1 General Presentation

The RS232 interface provides an adaptation of the tension levels (V24/CMOS ⇔ V24/V28) between the GSM/GPRS module (DCE) and the communication port of a PC (DTE).

The RS232 interface is internally protected (ESD protection) against electrostatic peaks coming from the RS232.

Filter guarantees: following certification CE.

The available signals on the RS232 serial link are:

TX data (CT103/TX) : Data emission,

RX data (CT104/RX) : Data reception,

Request To Send (CT105/RTS) : Request to send,

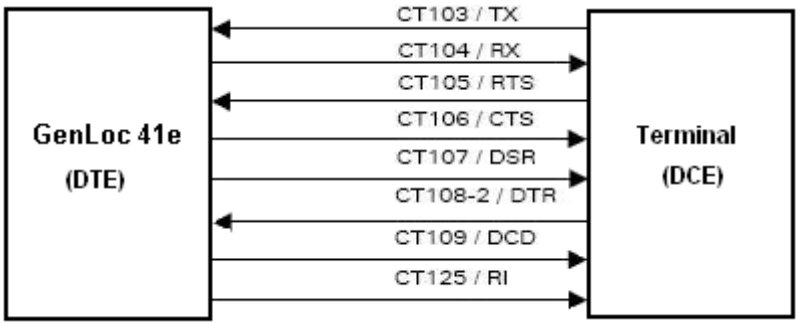
Clear To Send (CT106/CTS) : Ready to send,

Data Terminal Ready (CT108-2/DTR) : Data terminal ready,

Data Set Ready (CT107/DSR) : Data set ready,

Data Carrier Detect (CT109/DCD) : Signal detection (optional) and Buzzer output (by default),

Ring Indicator (CT125/RI) / 3.8V : Call indicator (optional) and 3.8V power supply for GenBlue 15e or Gen10400 (by default).



Normalized signals of a RS232 serial link

The RS232 interface was designed to allow a certain flexibility in the use of the serial interface signals. In fact, after the setting (see command ***AT+IFC***), the modem can work in 3-wire mode (using only the signals TX, RX, GND), but the use of the signals TX, RX, GND, CTS, RTS is required for a GPRS application, which is not the case for the signals DTR, DSR, DCD/Buzzer and RI/3.8V which may not be used.

7.3.2 Pins description

Signal	Sub HD connector Pin N°	I/O	RS232 standard	Description	Added function	
CTXD/CT103	2	I	TX	Transmit serial data		
CRXD/CT104	6	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	Frames NMEA/UBX	Output clock I2C (TWCK)
CDTR/CT108-2	8	I	DTR	Data Terminal Ready	Frames UBX	Command ON/OFF of power supply
CDCD/CT109	1	O	DCD		Buzzer output (1*)	
CRI/CT125	13	O	RI		Power supply 3.8V (1*)	
CT102/GND	9			Ground		Output data I2C (TWD)

(1*) By default

7.3.4 Output +3.8V

The tension available on the pin 13 of the 15-pin sub D HD is: see table below

Table: Conditions of use

Parameters	Condition	Min.	Typ.	Max.	Unit
V_{out}	6.5 V ≤ $+V_{DC}$ ≤ 32V		3.8		Vdc
I_{out}	Max.			100	mA

When the battery option is present, the tension available on the pin 13 of the 15-pin sub D HD is

Parameters	Condition	Min.	Typ.	Max.	Unit
V_{out}	Without power supply *	2.8		4.2	Vdc
	7.2 V ≤ $+V_{DC}$ ≤ 32V	4.4		4.5	Vdc
I_{out}	Max.			100	mA

* The min. 2.8 V is the limit of auto protection of the battery. From this moment, the battery puts itself in protection, and the output voltage becomes null.
When the battery is not connected, the output voltage is de 4.4V ≤ Vout ≤ 4.5 V as long as the power supply $+V_{DC}$ is present

7.4 Inputs/Outputs functioning

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the modem GenLoc 41e provides 3 inputs (opto-coupled) and 1 output (open collector) available for an external use.

These functions can be controlled by AT commands:

AT+GPIOSET for a writing access to a GPIO with the GPIO used as an output,

AT+GPIOGET for a reading access to the GPIO with the GPIO used as an input.

AT+GPIOSET=10 This command is used to control the output. By default, the output is cabled as an open collector. To control it:

AT+GPIOSET=<n>,<x> with:

<n> = 10 : Only 1 output available on the GenLoc 41e (so n=10),

<x> = 0 : Output OFF

1 : Output ON

Examples:

Command	Response	Interpretation
AT+GPIOSET=10,1	***OK***	Output 1 OFF, transistor closed
AT+GPIOSET=10,0	***OK***	Output 1 goes to ON (transistor open)

AT+GPIOGET This command is used to read the inputs. By default the inputs 1 to 3 are opto-coupled. To read them:

AT+GPIOGET=<n> with:

<n> = 7 : reading the input 1

8 : reading the input 2

9 : reading the input 3

Examples:

Command	Response	Interpretation
AT+GPIOGET=7	***+GPIOGET: 7= 1*** ***OK***	Input 1 read at 1, the input 1 is controlled
AT+GPIOGET=9	***+GPIOGET: 9= 0*** ***OK***	Input 3 read a 0, the input 3 is not controlled

See table of § 8.2.3 Inputs/Output

7.5 BOOT

This signal must NOT be connected, NOT used. Its use is strictly reserved for the manufacturer.

7.6 RESET

7.6.1 General presentation

This signal allows to make a Hardware RESET of the modem. In fact, this pin is used to force a RESET of the modem, doing a low level during at least 10 ms.

This signal must be used only in case of emergency RESET.

This signal must be driven with an open collector assembly:

- pin 14 (RESET) at 0, for the modem Reset,
- pin 14 (RESET) at 1, for normal mode.

Pin description

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

- This signal must be used only in case of emergency RESET. A Software RESET is always preferable to a Hardware RESET. It is strongly unadvised to execute this function whilst in communication or dialog, without having first detached it from the operator network.
- Using the RESET does not restore the factory parameters.

For more information about the Software RESET, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER and see paragraph 5.10 Turning off the modem and detach it correctly from the operator network.

7.6.2 RESET sequence

To activate the emergency RESET sequence, the RESET signal must be put to a low level during at least 10 ms.

As soon as the modem has been RESET, if a SIM card is inserted inside the SIM reader, you must wait for the end of the initialization before accessing it again. Moreover, the acquisition time of a GPS position will have to be taken into consideration.

Using the RESET does not restore the factory parameters.

7.7 WatchDog

The Hardware WatchDog function allows the surveillance of the modem software activity: the Software management of the WatchDog is implanted in the embedded application by default. In the case of a development (EGM) it must be implanted in the embedded application of the final customer.
If the software activity is interrupted, the WatchDog component starts a hardware Reset.
The WatchDog function is active only if the SIM card is present.

7.8 Audio

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, the audio interface is standard to connect an equipment like a telephone handset.
The echo cancelation (command ***AT+UMGC***) and noise reduction features are also available in order to improve the audio quality in the case of free-hand applications.
The audio interface is standard to connect a telephone handset (the command ***AT+UHFP*** allows the Handset selection, see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER).
ERCO & GENER advises the use of the cable DATA/AUDIO Sub D 9pts Fem / Sub HD 15pts Male / RJ9 (order code 4404000205) and a telephone handset (order code 3153400000).

Designation	SUBD 9 F	SUBD 15 M-HD
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	
Micro +	1	4
Speaker +	2	10
Speaker -	3	15
Micro -	4	5

* By default

7.8.1 Microphone inputs

The microphone inputs are assembled in differential to reduce the noise in common mode and the TDMA noise.

They already include the functionality for a microphone like Electret (0.5 mA and 2 Volts) and they are ESD protected. This Electret microphone can be directly connected to these inputs allowing an easy connection to a telephone handset.

The microphone impedance is around 1.5 kΩ.

The gain of the microphone inputs is internally adjusted by a differential amplifier and can be adjusted with the command ***AT+UMGC*** (see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER). The amplifier has a gain of 25.6 dB and a Bias generator that supplies an external voltage of 2 or 2.5V for the microphone Bias.

Pin description

Signal	Sub HD connector Pins number	I/O	I/O type	Description
MICP	4	I	Analog	Positive input of Microphone
MICN	5	I	Analog	Negative input of Microphone

7.8.2 Loud-speaker outputs (Speaker)

The outputs are assembled in differential to reduce the noise in common mode and the TDMA noise.

These outputs can be directly connected to a loudspeaker.

Pin description

Signal	Sub HD connector Pins number	I/O	I/O type	Description
SPKP	10	O	Analog	Positive output of loudspeaker
SPKN	15	O	Analog	Negative output of loudspeaker

7.8.3 Buzzer outputs

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, by default, the GenLoc 41e provides a Buzzer output on output 1 (instead of the DCD) of the 15-pin Sub-D connector. This output provides a frequency, and is used to drive a **Transducer**.

Pin description

Signal	Sub HD connector Pin number	I/O	I/O type	Description
Buzzer	1	O	Analog	Output Buzzer

7.9 Direct GPS mode (Analog Switch)

The modem contains the EGM standard library (see the documents "EG_EGM_CL_xxx_yy" of ERCO & GENER); in this case, it is possible to use directly the GPS frames via the RS232 (V24). In this case, the

internal analog switch allows to transfer the transmission and reception signals of the GPS module directly to the RS232 serial link.

The GSM_DSR signal becomes the GPS_TxD signal (transmission of the GPS NMEA frames) towards the terminal.

The GSM_DTR signal becomes the GPS_RxD signal (reception of the UBX frames) coming from the terminal.

The commands used to switch in direct GPS mode are:

For the DSR : ***AT+GPIOSET=19,<x>*** and for the DTR : ***AT+GPIOSET=20,<x>***

The transfer is made in the following form:

AT+GPIOSET=19,<x> et ***AT+GPIOSET=20,<x>*** with:

<x> = 0 : mode GSM_DSR and GSM_DTR

1 : mode GPS_TxD and GPS_RxD

Examples:

Command	Response	Interpretation
AT+GPIOSET=19	***+GPIOSET: 19=0*** ***OK***	Mode GSM_DSR
AT+GPIOSET=19,1	***AT+GPIOSET=19,1*** ***OK***	Mode GPS_TxD and GPS_RxD (direct GPS mode)
AT+GPIOSET=20,1	***AT+GPIOSET=20,1*** ***OK***	

In direct GPS mode, the format of data coming from the GPS module is 9600 bits/s by default.

7.10 GPS module

The GenLoc 41e was designed from a GSM/GPRS module with the GSM or GPRS communication functions and a high-sensitivity 50-channel GPS module. As a consequence, the GenLoc 41e is able to receive GPS positions with different filtering criteria (see the document "EG_EGM_CL_xxx_yy" of ERCO & GENER).

7.11 Internal processor

7.11.1 EGM presentation

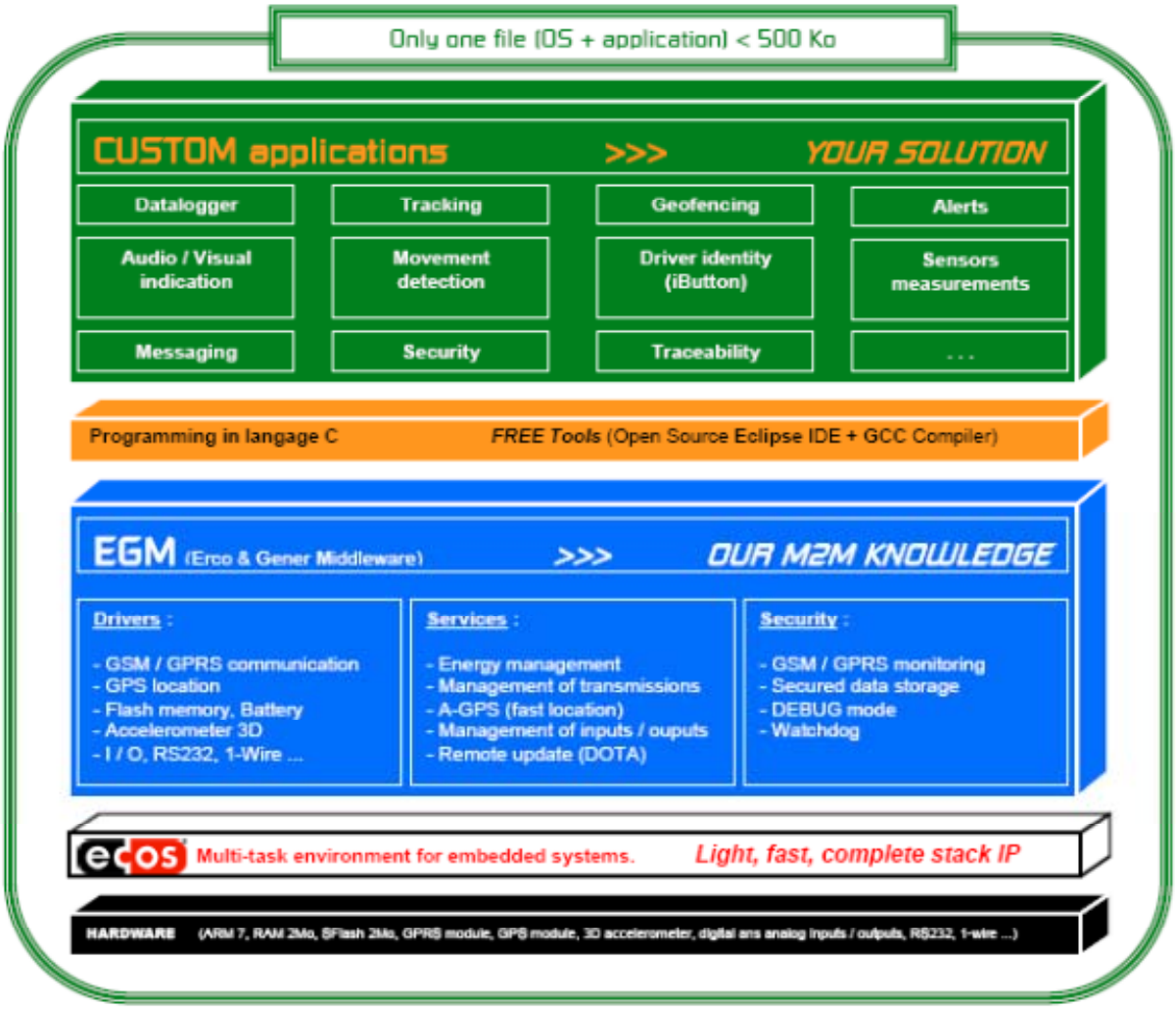
The GenLoc 41e has an ARM7 processor that allows to have an embedded application developed from the EGM libraries and based upon eCos.

The EGM libraries supplied by ERCO &GENER contain the following elements:

- EGM software library,
- eCos software library,
- A set of header files (.h) defining the EGM API functions,
- Source code samples.

7.11.2 EGM Architecture

The software architecture is described below.



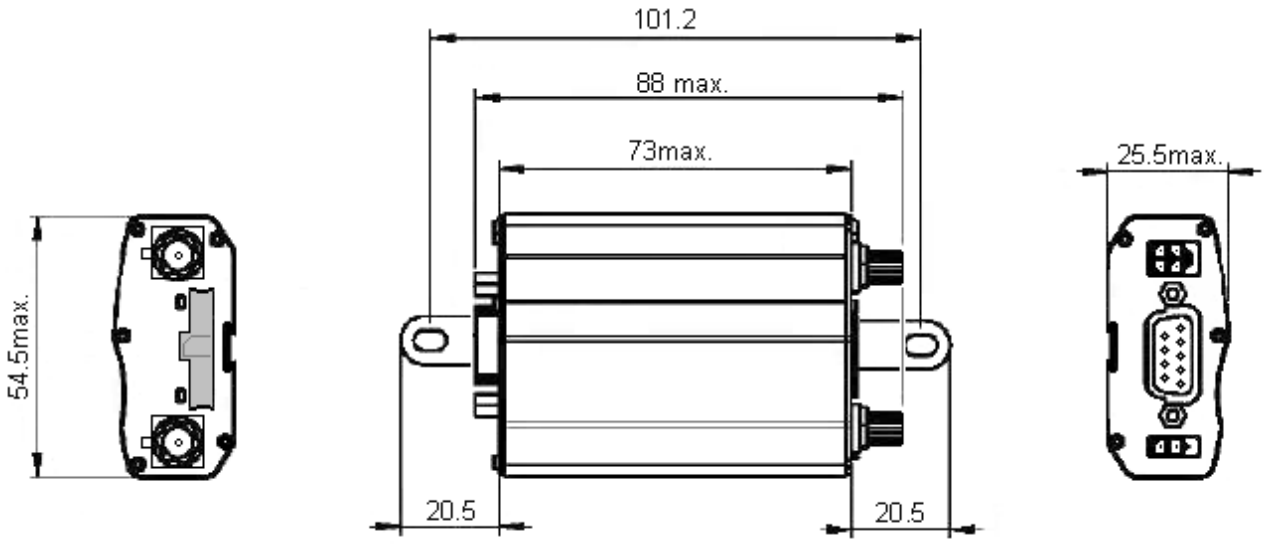
For more information about EGM, see the ERCO & GENER documents for a description of the different functionalities.

8 Technical Characteristics

8.1 Mechanical characteristics

Dimensions	73 x 54.5 x 25.5 mm (excluding the connectors)
Complete dimensions	88 x 54.5 x 25.5 mm
Weight	≈ 87 grams (modem only) < 190 grams (modem + brackets + cables)
Volume	101.5 cm³
Casing	Aluminum profile
Waterproof level	IP31

The illustration below shows the dimensions of the modem including the clearances necessary for the installation of the modem.



8.2 Electrical characteristics

8.2.1 consumption

Table: Electrical characteristics

Power supply range	- 6.5V to 32V DC (GSM or DCS or GPRS)
Average consumption	- GSM 900 MHz : 154 mA @ 12V en communication - GSM 1800 MHz : 146 mA @ 12V en communication - Mode repos : 20 mA @ 12V (GPS désactivé) - GPS : 20 mA @ 12V en recherche de position 16 mA @ 12 V en fixe

Once the power supply is connected, the modem is permanently consuming.

If the battery option is present, prepare the modem for storage or transport phases in order to limit high discharges of the battery. For that, see the § *5.10 Turning off the modem*

The following table describes the consequences of over-voltage or insufficient voltage on the modem.

Table: Effects of a power supply defect

	Then:
▪ Voltage falls below 6.5V	▪ The functioning and the GSM and GPS communication are not guaranteed.
▪ Voltage above 32V (Punctual peaks)	▪ The modem guarantees its own protection.
▪ Voltage above 32V (Continuous over-voltage)	▪ The modem is protected by the fuse (the modem is put in c.c. via a para surtensor internal varistance).

The following tables show the modem consumption without/with the GPS antenna and without the RS232 connected.

The power supply consumption may vary by 5% depending on the temperature range (-20 °C to +55 °C).

Table: Mother board consumption @ 25 °C

Mother board	I Nominal average				Unit.
V_{IN}	6.5	12	24	32	V
	37	20,8	12,4	10,3	mA

Table: Load battery consumption @ 25 °C

Charge batterie	I Nominal average				Unit.
V_{IN}	7.2	12	24	32	V
	160	87	46	36	mA

When the battery is completely discharged, 3 hours are necessary to obtain a new complete charge.

Tableau : GSM module consumption @ 25 °C

Module GSM	Band	Mode	I Nominal average				Unit.
V_{IN}			6.5	12	24	32	V
Low power	Power Off Mode		0,1	0,1	0,03	0,02	mA
	GSM/GPRS Power	@ DRX = 5	1,4	0,9	0,5	0,4	mA
	Saving (Idle) (1)	@ DRX = 9	0,9	0,6	0,32	0,26	mA
Peak current			2184	1065	504	374	mA
GSM (2)	850 / 900 MHz (P = 32.2 dBm typ.)		212	115	60	47	mA
	1800 / 1900 MHz (P = 29.2 dBm typ.)		177	96	50	39	mA
GPRS(2) 2 Tx + 3 Rx slots TBF	850 MHz (P = 30.5 dBm typ.)		290	158	81	63	mA
	900 MHz (P = 30.5 dBm typ.)		247	135	70	54	mA
	1800 MHz (P = 27.5 dBm typ.)		233	127	66	51	mA
	1900 MHz (P = 27.5 dBm typ.)		240	131	68	53	mA

(1) The module is attached to the network
(2) The module transmits at maximum power.

Tableau : GPS module consumption @ 25 °C

Module GPS	Mode	I Nominal average				Unit.
V_{IN}		6.5	12	24	32	V
Acquisition (during TTFF)		34	19,2	11,5	9,6	mA
Tracking (1)	Max Performance	28	16,1	9,8	8,3	mA
	Eco Mode	27	15,3	9,4	7,9	mA
	Power Save mode	13	8,1	5,1	4,1	mA
Peak current		48	27	15,6	12,8	mA

(1) Typically : 12 mn after the coldstart
15 s after the Hot start

Tableau : Active antenna consumption GPS @ 25 °C

Active antenna	I Nominal average				Unit.
V_{IN}	6.5	12	24	32	V
of 10 mA	8	5	3,1	2,5	mA
of 20 mA	15	9	5,7	4,7	mA

Tableau : GSM module consumption on battery @ 25 °C

Module GSM	Band	Mode	I Nominal average	Unit.
$V_{batterie}$			4.2	V
Faible consommation	Power Off Mode		0,09	mA
	GSM/GPRS Power Saving (Idle) (1)	@ DRX = 5	1,6	mA
		@ DRX = 9	0,99	mA
Courant pic			2500	mA
GSM (2)	850 / 900 MHz (P = 32.2 dBm typ.)		300	mA
	1800 / 1900 MHz (P = 29.2 dBm typ.)		250	mA
GPRS(2) 2 Tx + 3 Rx slots TBF	850 MHz (P = 30.5 dBm typ.)		410	mA
	900 MHz (P = 30.5 dBm typ.)		350	mA
	1800 MHz (P = 27.5 dBm typ.)		330	mA
	1900 MHz (P = 27.5 dBm typ.)		340	mA

(1) Le module est attaché au réseau
(2) Le module émet à sa puissance maximum.

Tableau : GPS module consumption on battery @ 25 °C

Module GPS	Mode	I Nominal average	Unit.
$V_{batterie}$		4.2	V
Acquisition (during the TTFF)		47	mA
Tracking (1)	Max Performance	39	mA
	Eco Mode	37	mA
	Power Save mode	17,5	mA
Courant pic		67	mA

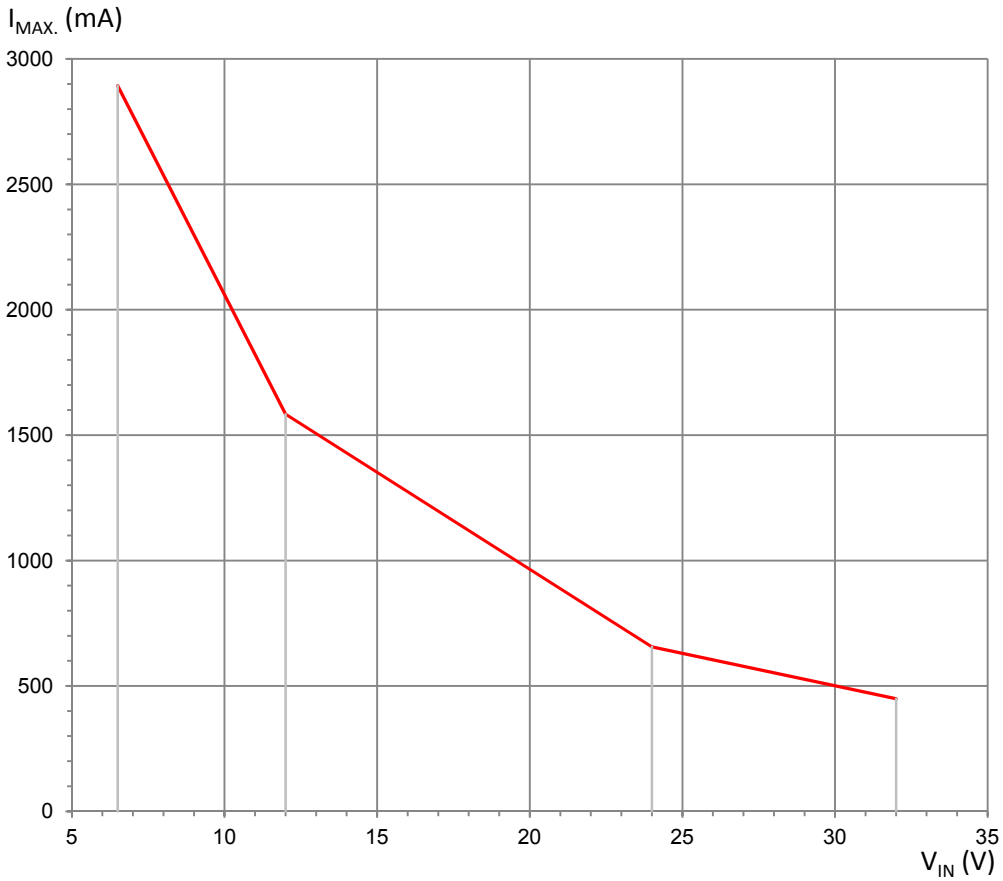
(1) Typiquement : 12 mn after the coldstart
15 s after the Hot start

Tableau : Active antenna consumption GPS on battery @ 25 °C

Active antenna	I Nominal average	Unit.
$V_{batterie}$	4.2	V
de 10 mA	10	mA
de 20 mA	20	mA

8.2.2 Max consumption

The graph below shows the current peak maximum. The power supply must be able to provide this current during the "Burts" GSM and GPS.



8.2.3 Audio interface

The audio interface is available via the 15-pin Sub HD connector, see the § *3.2.1.3 15-pin Sub D HD connector.*

Main AT commands to control the audio string.

- AT+UHFP: Hand Free Parameters
- AT+UMGC: Microphone Gain Control
- AT+USGC: Speaker Gain Control
- AT+USTN: Sidetone
- AT+USPM: Audio Path mode setting
- AT+USTN: Sidetone

8.2.3.1 Microphone

The microphone input is designed for the direct connection of the electret condenser micro (fore more details, see the command AT+USPM).

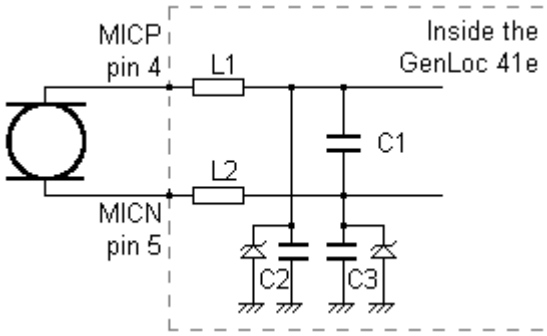
By default, the microphone input is active (pins MICP, MICN)

Polarization characteristics for a dynamic Microphone

Micro Input	Parameter/Conditions	Min	Typ	Max	Units
Microphone supply open circuit voltage output	Provided by MICP with MICN.		2.2		V
Microphone supply current				2	mA
Microphone supply output resistance		2.85	3	3.15	kΩ
Microphone ground	MICN		0		V

Characteristics recommended for the dynamic Microphone

Micro Input	Parameter/Conditions	Min	Typ	Max	Units
Maximum Input Level Range	Full scale single-ended voltage. Signal applied to MICP with MICN as reference.			1.03	V_{PP}
Input Impedance – Mic(+) to Mic(-)	At 1 kHz. Impedance between MICP and MICN.		1.5		kΩ
Internal discrete high-pass -3dB cutoff frequency	Differential MIC		70		Hz



Component	Value
C1, C2, C3	CAPACITOR 22pF
L1, L2	Inductance 82nH

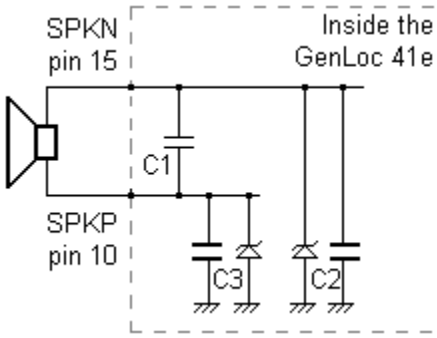
8.2.3.2 Loudspeaker

By default, the loudspeaker output is not active.
For more details, see the command AT+USPM. This output corresponds to SPK_P and SPK_N of the documentation.

Characteristics of the output for the loudspeaker

Speaker Output	Parameter/Conditions	Min	Typ	Max	Units
Maximum differential output voltage	Overdrive Gain stage = +9 dB		7.8		V_{PP}
Common mode output voltage			1.6		V
Output load resistance			8		Ω
Single-ended output load capacitance				10	nF
Inductive load				400	µH
Signal to noise	Load = 16 Ω, Gain stage = +0 dB, Input signal = 0 dBFS, Code 0, A-weighted	70	80		dB
Signal to distortion (THD)	Load = 8 Ω, 350 mW	50			dB
Power supply rejection	1 kHz	60			dB

If not precised, the parameters are measured in the frequency band 20 Hz,...,20 kHz.



Component	Value
C1, C2, C3	CAPACITOR 22pF

8.2.3.3 Buzzer

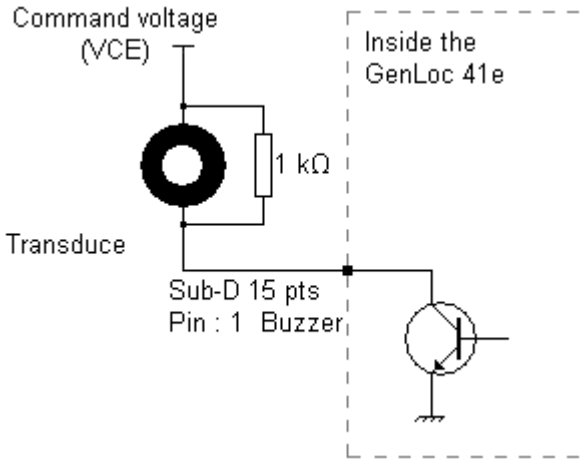
Table: Characteristics of the buzzer output

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
collector-base voltage	V_{CB0}	Transmiter open			48	V_{dc}
collector-emitter voltage	V_{CE0}	Open base			40	V_{dc}
collector current (DC)	I_C				600	mA_{dc}
peak collector current	I_{CM}				800	mA_{dc}
Collector Cutoff Current	I_{CB0}	IE = 0; VCB = 60 V; Tj = 25 °C			10	nA_{dc}
		IE = 0; VCB = 60 V; Tj = 125 °C			10	μA_{dc}
collector-emitter saturation voltage	V_{CEsat}	IC = 150 mA; IB = 15 mA *			300	mV_{dc}
		IC = 500 mA; IB = 50 mA *			1	V_{dc}
transition frequency	f_T	IC = 20 mA; VCE = 20 V; f = 100 MHz			300	MHz
collector capacitance	C_C	$I_E = I_e = 0$; VCB = 10 V; f = 1 MHz			8	pF
total power dissipation	P_{Ttot}	$T_{amb} \leq 25$ °C			225	mW

* Pulse test: tp ≤ 300 µs; δ ≤ 0.02.

Example of transducer tested with the GenLoc 41e:

Buzzer characteristics	Values
Type	Transducer AT-2720-T-R
Consumption	1-30V peak/3.5mA max.
Resonance frequency	2.048Hz ±500HZ
Acoustic level (SPL)	Min.88dBA @10cm



8.2.4 Inputs/Output

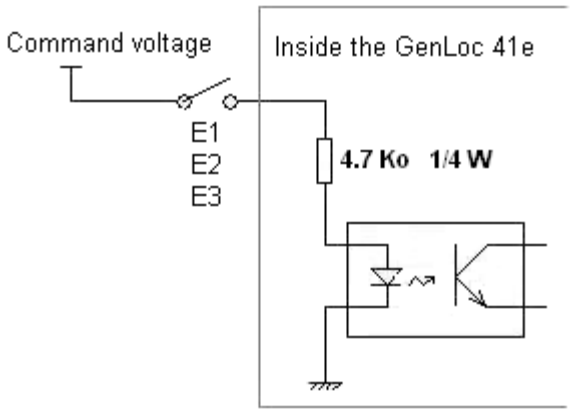
By default, the GenLoc 41e provides 3 opto-coupled inputs (I1 to I3) and 1 open-collector output (O1).

As an option, it is possible to have an analog input instead of the opto-coupled input I2.

8.2.4.1 Opto-coupled Inputs (I1, I2, I3)

Table: Diode Characteristics of the opto-coupled inputs

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
max. current	$I_{F\ (rms)}$				50	mA
max. inverted voltage	V_R				5	V
Direct voltage	V_F	I_F = 10 mA	1.0	1.15	1.3	V
Inverted current	I_R	V_R = 5 V			10	µA
Capacity	C_T	V=0, f = 1 MHz	---	30	---	pF
Transfer Ratio	I_C / I_F	I_F = 5 mA, V_{CE} = 5 V	50	---	600	%
Saturation of the transfer ratio	I_C / $I_{F\ (SAT)}$	I_F = 1 mA, V_{CE} = 0.4 V		60		%
Command voltage			3,5		35	V
Idle voltages					1	V



Internal electric scheme of the 3 inputs

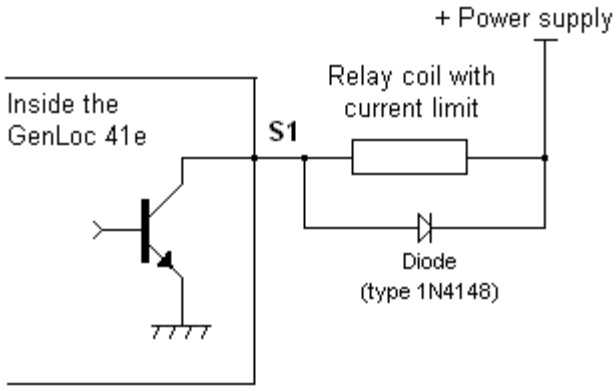
The minimum of voltage command for detection is: 3.5 **V**

The maximum voltage command is: **35 V**

8.2.4.2 Opto-coupled output (O1)

Table: Characteristics of the open-collector output

Characteristics	Symbols	Conditions	Max.	Unit
max. tension	V_{CE0}	Transmitter open	48	V_{DC}
max. tension	V_{CES}	V_{BE} = 0 V	48	V_{DC}
Collector current	I_C		0.5	A
Saturation voltage	V_{CEsat}	I_C = 500 mA	1.3	V
Dissipation	P_{Ttot}	$T_{amb} \leq 25$ °C, T_j = 110 °C	0.78	W



Electric scheme of the output

No protection is provided. The user must respect the values of the table above.

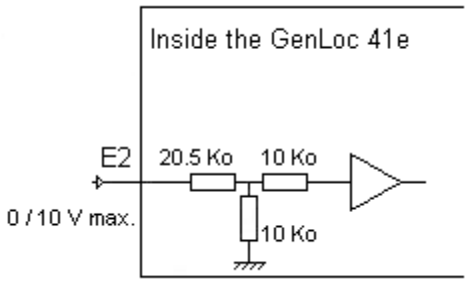
8.2.4.3 Analog input - ANA1 (0 - 10V) on INPUT2

As an option, it is possible to have an analog input instead of the opto-coupled input I2.

This analog input allows to do a tension measure (contact us).

Table: Characteristics of the analog input option

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
Analog input	ANA1				12	V_{dc}
Conversion range		5.5 V ≤ $+V_{DC}$ ≤ 32V	0.010		10.33	V_{dc}
Polarization current		From 10 mV to 10.33 V	1.34		350	μA_{dc}



Internal electrical scheme of the option Analog Input 1

The integrator has the responsibility to protect the input from electric disturbances and to respect the values of the functioning parameters.

8.2.4.4 Analog Input - ANA2 (0 - 10V) on SPKN

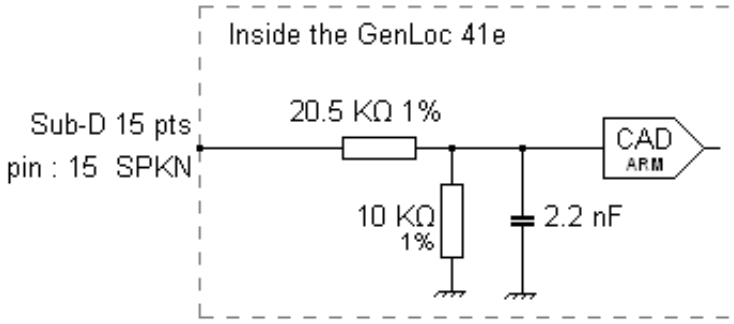
As an option, it is possible to have an analog input instead of the SPKN output.

This analog input allows to do a tension measure.

If the ANA2 option is present, the audio speaker output is available between SPKP (pin 10 of the 15-pin sub D HD) and the 0V.
In this case, the audio power available is divided by 2 compared with the specifications.

Table: Characteristics of the analog input option

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
Analog input	ANA2				12	V_{dc}
Conversion range		5.5 V ≤ $+V_{DC}$ ≤ 32V	0.010		10.33	V_{dc}
Polarization current		De 10 mV à 10.33 V	1.34		350	μA_{dc}



Internal electrical scheme of the option Analog Input 2

The integrator has the responsibility to protect the input from electric disturbances and to respect the values of the functioning parameters.

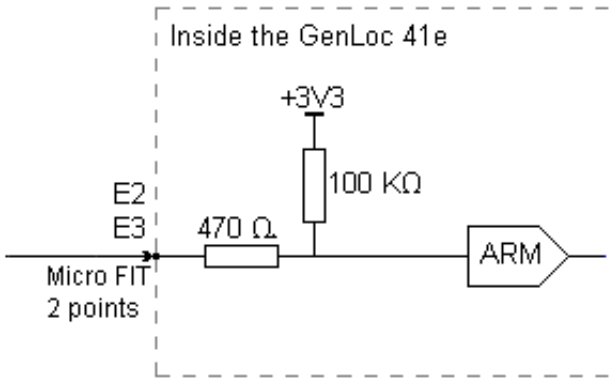
8.2.4.5 Input/Output (0 – 3.3 V) direct on INPUT2, INPUT3

As an option on the GenLoc 41e, it is possible to have 3.3V input directly connected to the ARM. (Contact us).

These Input/Output INPUT2, INPUT3 are directly connected on the ARM : INPUT2 on Port PA1 and INPUT3 on port PA2.
The selection of the direction (Input/Output) is done by software.

Table: Electric characteristics of the ARM

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
Input Voltage – Low	V_{IL}		-0.3		0.8	V_{dc}
Input Voltage – High	V_{IH}		2		3.5	V_{dc}
Hysteresis Voltage	V_{Hys}		0.4		0.7	V_{dc}
Input Leakage Current	I_{LEAK}		-4		38	μA_{dc}
Input capacitance	C_{IN}				14	pF
Output Low-level Voltage	V_{OL}				0.4	V_{dc}
Output High-level Voltage	V_{OH}		2.8			V_{dc}
Output Current	I_o				±16	mA_{DC}



Internal electric scheme of the option direct Input/Output

The integrator has the responsibility to protect the input from electric disturbances and to respect the values of the functioning parameters.

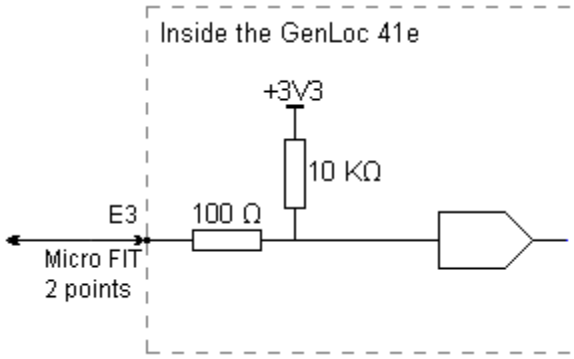
8.2.4.6 Bus One Wire (0 - 3.3V) on INPUT3

As an option on the GenLoc 41e, it is possible to have an input Bus One Wire instead of the opto-coupled input I3.

The bus is managed by the ARM.

Table: Electric characteristics of the ARM

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
Input Voltage – Low	V_{IL}		-0.3		0.8	V_{dc}
Input Voltage – High	V_{IH}		2		3.5	V_{dc}
Hysteresis Voltage	V_{Hys}		0.4		0.7	V_{dc}
Input Leakage Current	I_{LEAK}		-4		38	μA_{dc}
Input capacitance	C_{IN}				14	pF
Output Low-level Voltage	V_{OL}				0.4	V_{dc}
Output High-level Voltage	V_{OH}		2.8			V_{dc}
Output Current	I_o				±16	mA_{DC}



Internal electric scheme of the bus One Wire

This input E3 is directly connected on the ARM. Port PA2.
The selection of the direction (Input/Output) is done by software.

Assembly working with identification keys type DS1990 i-button of the manufacturer MAXIM.

The integrator has the responsibility to protect the input from electric disturbances and to respect the values of the functioning parameters.

8.2.4.7 Bus One Wire (0 - 3.3V) multi-salves Dallas on INPUT3

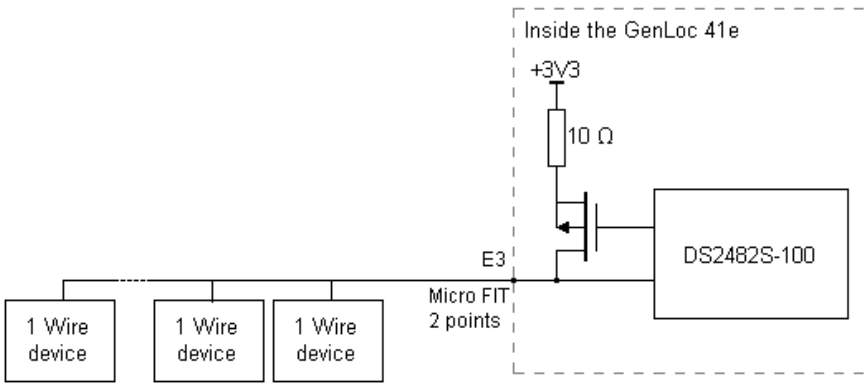
As an option on the GenLoc 41e, it is possible to have an input Bus One Wire multi slaves instead of the opto-coupled input E3.

The bus is managed by a DS 2482S-100 from the manufacturer Maxim.

Table: Main electric characteristics of the DS2482S-100

Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
1-Wire Input High	V_{IH1}		1.9			V_{dc}
1-Wire Input Low	V_{IL1}				0.9	V_{dc}
1-Wire Weak Pullup Resistor	R_{WPU}		1 000		1 675	Ω
1-Wire Output Low	V_{OL1}	At 4mA load			0.4	V_{dc}
Active Pullup On Time	t_{APUOT}	Standard	2.3	2.5	2.7	µs
		Overdrive	0.4	0.5	0.6	µs
Strong Pullup Voltage Drop	ΔV_{STRPU}	VCC ≥ 3.2V, 1.5mA load			0.3	V_{dc}
Pulldown Slew Rate	PD_{SRC}	Standard (3.3V ±10%)	1		4.2	V_{dc}/µs
		Overdrive (3.3V ±10%)	5		22.1	V_{dc}/µs
Pullup Slew Rate	PU_{SRC}	Standard (3.3V ±10%)	0.8		4	V_{dc}/µs
		Overdrive (3.3V ±10%)	2.7		20	V_{dc}/µs

For more information, see the documentation of the manufacturer.
http://datasheets.maxim-ic.com/en/ds/DS2482-100.pdf



Internal electric scheme of the bus One Wire multi salves

The integrator has the responsibility to protect the input from electric disturbances and to respect the values of the functioning parameters.

8.2.5 SIM interface

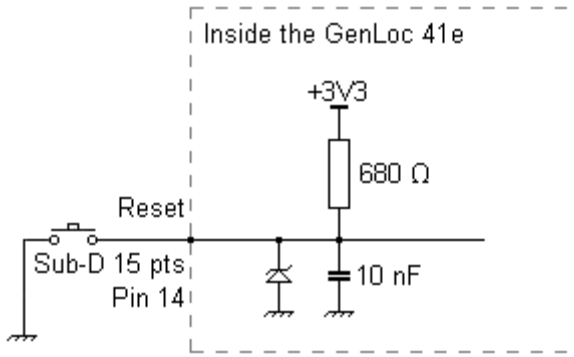
Table: Characteristics of the SIM card supply voltage

SIM Card	3 V or 1.8 V

8.2.6 RESET signal

Table: Conditions of use

Parameters	Condition	Min.	Typ.	Max.	Unit
V_{IL}	Input Voltage – Low or float	-0.3		0.8	Vdc
V_{IH}	Input Voltage – High	2		3.5	Vdc
R_{IPU}	Internal Pull-Up Resistor		680		Ohms



Wiring scheme

8.2.7 RF GSM/DCS characteristics

8.2.7.1 RF functioning

The RF functioning complies with the ETSI GSM Standards.

The RF performances for the receiver and the transmitter are described below.

Table: Parameters of the RF receiver and transmitter

Receiver	
Sensitivity in 850/900 @ 25 °C	- 110 dBm, GPRS Coding Scheme 1 (CS1)
Sensitivity in 1800/1900 @ 25 °C	- 109 dBm, GPRS Coding Scheme 1 (CS1)
Transmitter	
Maximum power (Power Class4 - 850/900) at ambient temperature	33 dBm +/- 2 dB @ antenna connection
Maximum power (Power Class1 - 1800/1900) at ambient temperature	30 dBm +/- 2 dB @ antenna connection

8.2.7.2 GSM external antenna

The GSM external antenna is connected to the modem via the FAKRA-D connector.

The external antenna must have the characteristics described in the table below.

Table: Characteristics of the GSM external antenna

Frequency band		
GSM 900	880..960 MHz	
GSM 1800	1710..1880 MHz	
GSM 850	824..894 MHz	
GSM 1900	1850..1990 MHz	
Impedance	50 Ohms nominal	
Input power	> 2 W peak	
Gain	< 3 dBi	
VSWR	< 2:1 recommended	< 3:1 acceptable
Return Loss	S_{11}<-10 dB recommended	S_{11}<-6 dB acceptable

See § 10 Recommended Accessories, for the GSM antennas recommended by ERCO & GENER.

8.2.8 GPS characteristics

8.2.8.1 GPS functioning

The GPS performances are described in the table below.

Table: GPS parameters

Parameters	**Specifications**	
Type of reception	Frequency L1 C/A Code – 50 channels	
Time To First Fix [1]	Cold Start (Autonomous)	32 s
	Warm Start (Autonomous)	32 s
	Hot Start (Autonomous)	< 1s
	Aided Starts[2]	< 3 s
Sensibility [3]	Tracking & Navigation	-160 dBm
	Reacquisition	-160 dBm
	Cold Start (Autonomous)	-146 dBm
Horizontal Position Accuracy [4]	Autonomous	< 2.5 m
	SBAS	< 2.0 m
Max Navigation Update Rate	5 Hz	
Velocity Accuracy [5]	0.1 m/s	
Heading Accuracy [5]	0.5 degrees	
Dynamics	≤ 4 g	
Operational Limits Velocity	500 m/s	

[1] All satellites at -130 dB
[2] Dependent on aiding data connection speed and latency
[3] Demonstrated with a good active antenna
[4] Under good GPS signal conditions
[5] Assuming Airborne <4g platform

8.2.8.2 GPS external antenna

The GPS external antenna is connected to the modem via the FAKRA-C connector.

The external antenna must have the characteristics described in the table below.

Table: Characteristics of the GPS external antenna

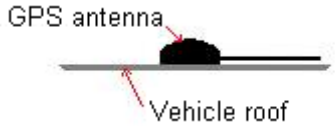
Rx frequency	1575.42 MHz +/-1.023 MHz
Impedance	50 Ohms nominal
Antenna gain	15 dB typ / 50 dB max
Maximum noise figure	1.5 dB
Power supply voltage	3.2V
Power supply current (max)	50mA

See § 10 Recommended Accessories, for the GPS antennas recommended by ERCO & GENER.

8.2.8.3 Installation of the GPS external antenna

The quality of the GPS signal received depends on the quality of installation of the antenna. To obtain an optimal signal, some rules have to be respected:

- Place the antenna horizontally, dome towards the top and preferably outside the vehicle,
- Do not place the antenna under athermic windscreens,
- Do not place the antenna under metallic surfaces



Installation scheme of GPS antenna

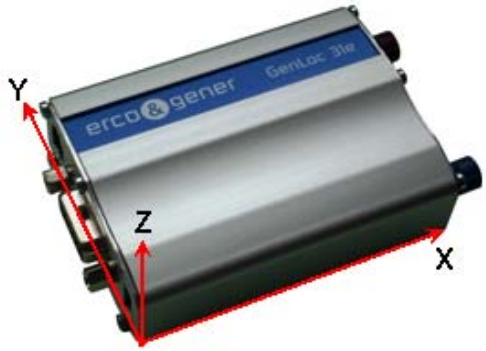
8.2.9 Characteristics of the accelerometer

As an option on the GenLoc 41e, it is possible to have an accelerometer. (Contact us).

Table: Characteristics of the accelerometer

Dynamic	± 2g or ± 8g driven by software
Interface (internal)	SPI with the ARM
Multiple Interruption	programmable
Up-going filter	programmable

Position of axis



8.2.10 Characteristics of the serial link (UART)

Table: Characteristics of the UART

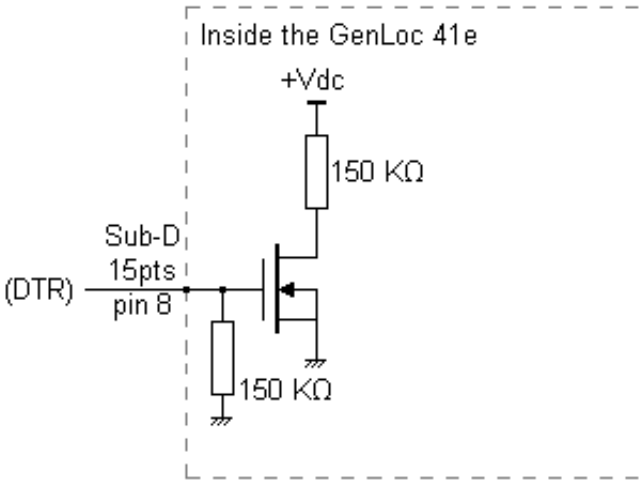
Characteristics	Symbols	Conditions	Min.	Typ.	Max.	Unit
Input Voltage – Range	V_{Input}	Input Voltage – Range	-25		+25	V_{dc}
Input Voltage – Low	V_{IL}	Input Voltage – Low	0.4	1.3		V_{dc}
Input Voltage – High	V_{IH}	Input Voltage – High		2	24	V_{dc}
Input Hysteresis	V_{Hys}	Input Hysteresis		0.14		V_{dc}
Input Resistance	R_{in}	Input Resistance	3	5	7	KΩ
Output Voltage	V_{out}	All transmitter outputs loaded with 3 kΩ to ground	±5	±6.4		V_{dc}
Transmitter Output Resistance	R_{out}		300			Ω
RS-232 Output Short-Circuit Current	I_{cc}			±15	±60	mA

8.2.11 ON/OFF commande of the power supply

As an option on the GenLoc 41e, it is possible to have an input to put equipment in low power. (Contact us).

Table: Characteristics of the transistor

Characteristics	Symbols	Conditions @ 25°C	Min.	Typ.	Max.	Unit
max. command tension	V_{GSM}	$+V_{DC}$ < 30V			±30	V_{dc}
		$+V_{DC}$ ≥ 30V			+30 -28	
Threshold command tension	V_{GS}		1	2	2.5	V_{dc}
gate leakage current	I_{GSS}	V_{GS} = ±15V; VDS = 0V		10	100	nA
Input capacitance	C_{ISS}	VGS = 0V; VDS = 10V; f = 1 MHz;		31	50	pF



Wiring scheme

8.2.12 Bus I2C

As an option, it is possible to have a bus I2C. (Contact us).

8.3 Environmental characteristics

To ensure a correct functioning of the modem, the limits listed in the table below must be respected.

Table: Environmental characteristics

Operating temperature	-20 °C to +60 °C
Storage temperature	-40 °C to +85 °C
Operating humidity without condensation	HR < 70% @ +55°C
Atmospheric pressure	normal

If the battery option is present, the environmental conditions are different. See table below.

Operating temperature	
Battery charging	0 °C to +45 °C
Battery discharging	-20 °C to +45 °C
Storage temperature	1 year of storage between -20°C to + 35°C 3 months of storage between -20°C to + 45°C 1 month of storage between -20°C to + 60°C
Relative humidity	65 ±20%

8.4 Standards/Conformities

The product complies with the following requirements:

- 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
- 2002/96/CE DEEE (Crossed-out wheelie bin).

The following marking appears under the device.

CE

9 Security recommendations

9.1 General security

It is important to respect the specific regulations concerning the use of radio equipment, in particular with the possible risks of interference due to radio frequency (RF). Please respect carefully the following security advices.

Turn off your GSM modem:

- On an aircraft, the use of cellular telephone can endanger the plane operations; disturbing the cellular network is illegal. The non-observance of this instruction can lead to the suspension or the exclusion of the cellular phone services, or even to a trial, or both,
- At a refueling station,
- In any area with a potential explosive atmosphere that could cause an explosion or a fire,
- In hospitals and other places where medical equipment may be used.

Restrictions of use of radio equipments in:

- Fuel warehouses,
- Chemical factories,
- Places where destruction operations are in the running,
- Other places where signs indicate that the use of cellular phones 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 devices and pacemakers.

Consult the manufacturers of medical equipment to know if it is adequately protected.

Using your GSM modem close to other electronic equipments may also cause interferences if the equipment is insufficiently protected.

Pay attention to the warnings and the recommendations of the manufacturers.

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

▪ “Fixed" application: The GSM modem is physically linked to a site and it is not possible to move it easily to another site.

▪ "Mobile" application: The GSM modem is designed to be used in various places (other than fixed) and is intended to be used in portable applications.

▪ The modem must be used at more than 20cm from the human body.

This equipment is supplied in Very Low Security Voltage and at non-dangerous energy level.

9.2 Security in a vehicle

Do not use your Modem whilst driving, unless equipped with a correctly installed ear-piece/hands-free kit.
Respect the national regulations concerning the use of cellular telephones in vehicles. Road safety is always a priority.
An incorrect installation of the GSM modem in a vehicle could cause an incorrect functioning of the vehicle's electronics. To avoid such problems, ensure that the installation was made by a qualified person. During the installation, a verification of the electronic protection system of the vehicle must be done.
The use of a warning equipment that activates the headlights or the horn of a vehicle on public highway is not authorized.

9.3 Care and maintenance

The suggestions below will help you to preserve this product for many years.
Do not expose the modem to the extreme environments, to high temperature or high humidity.
Do not use or store the modem in dusty or dirty places, it could be damaged.
Do not try to disassemble the modem, at the risk of cancelation of the guarantee.
Do not expose the modem to water, rain or spilled beverage, it is not impermeable.
Avoid dropping, striking, or shaking the modem violently. The lack of care can damage it.
Do not place the modem next to computer disks, credit or travel cards or other magnetic supports. The information contained on disks or cards can be affected by the modem.
The use of other equipments or accessories not made or not authorized by ERCO & GENER can cancel the guarantee of the modem.

If the battery option is present, the battery is not under guarantee.

9.4 Your responsibility

This modem is under your responsibility. Treat it with care, it is not a toy. Keep it always in a secure place and out of the reach of children.
Try to remember your PIN and PUK codes. Familiarize yourself with the modem and use the security functions to lock it in case of non authorized using or in case of theft.

10 Recommended Accessories

The accessories recommended by ERCO & GENER for the modem GenLoc 41e are described on our website in the section Products/Accessories. For more information, contact our sales department.

11 Client support

ERCO & GENER ensures the client support for all its modems sold. You will then have access to:

- The latest version of this document
- The datasheet of the product
- The latest versions of the OS user guides
- Certificates
- Application notes

The support concerning the EGM developments is optional (contact us).

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 product :

Name : GenLoc 41e 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

CE

The corresponding markings appear under the appliance.

Saumur, xxx xxth xx

Charles CHAUSSONNIER
Managing Director