

**User Guide:
GSM2218UG001**

Enfora MT-GL (GSM/GPRS) User Manual

Release 1.05

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**Enfora, Inc.
www.enfora.com**

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Regulatory Compliance

FCC

The modem was tested and certified to meet FCC Parts 15 in a stand-alone configuration, which demonstrated that the GSM2218 MT-GL complies with Part 15 emission limits. FCC Part 22 & Part 24 is covered by the Enfora Enabler-IIG "modular approval" process for a transmitter. This approach, described by FCC Public Notice DA 00-131407 released June 26, 2000, is intended to afford relief to equipment manufacturers by eliminating the requirement for obtaining a new equipment authorization for the same transmitter when installed in a new device.

In order to use the GSM2218 MT-GL without additional FCC certification approvals, the installation must meet the following conditions:

For the transmitter to meet the MPE categorical exclusion requirements of 2.1091, the ERP must be less than 1.5 watts for personnel separation distance of at least 20 cm (7.9 in). Therefore, the maximum antenna gain cannot exceed +3.3dBi. If greater than 1.5 watts exists, then additional testing and FCC approval is required.

R&TTE -

The GSM2218 MT-GL modem has been fully tested and complies with all the requirements of EN301 489-1, EN301 489-7 and EN60950-1:2001. Compliance to EN301 511 has been demonstrated by testing on both the GSM2218 and the integrated GSM0108 module.

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Governing Law

This limited warranty shall be governed by the laws of the State of Texas, United States of America, without regard to conflict of laws principles. This limited warranty shall not be governed in any respect by the United Nations Convention on Contracts for the International Sale of Goods.

Date	Rev	Author	Description
November 11, 2005	1.00	Mike Cook	Released
December 7, 2005	1.01		Added warning in section 2.7 regarding voltage
January 4, 2006	1.02	Diane O'Neil	Clarified Pin 1 description
April 7, 2006	1.03	Diane O'Neil	Added CE information
December 12, 2006	1.04	Diane O'Neil	Added voltage warning; Updated connector information
February 15, 2007	1.05	Diane O'Neil	Edited voltage information; Edited AT over SMS information Edited system antenna gain

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1 Introduction

1.1 About the GSM/GPRS MT-GL

The GSM/GPRS MT-GL (hereafter referred to as “MT-GL”) is an Automated Vehicle Locating (AVL) device that utilizes a GSM/GPRS modem and a Global Positioning Satellite (GPS) module. Working together, these technologies allow the MT-GL to simultaneously act as a stand alone GPS reporting device and wireless data retrieval unit. The MT-GL provides a flexible AVL solution with Input/Output (I/O), six selectable National Maritime Electronics Association (NMEA) GPS data format, Trimble ASCII Interface Protocol (TAIP) GPS data format, and Enfora’s own proprietary Binary GPS data format. The MT-GL is designed to work in a stand-alone device in an automobile. Enfora’s MT-GL provides maximum AVL versatility in a single affordable device.



The MT-GL (GSM2218) is designed to operate from 9 to 30 VDC. The user is responsible for ensuring the voltage supplied to the MT-GL remains in this voltage range to include transient voltage spikes and load dump voltages. Failure to comply with this warning may result in damage to the MT-GL.

1.2 About This Manual

Contained in this manual are instructions on how to install and configure the MT-GL. Please follow the instructions herein closely to avoid damaging the MT-GL.

1.3 Contents of Basic Package

- Enfora MT-GL (P/N - GSM2218)
- Mounting brackets
- Documentation CD-ROM

1.4 Available Accessories

The following accessories for the MT-GL are available directly from Enfora:

- Combination GPS and GSM/GPRS antenna. There are two models available; through-hole (P/N ANT1303) and magnetic mount (P/N ANT1313).
- 12-pin serial I/O loading cable with DB-9 connector (P/N ADT2218).
- 12-pin connector with pins.

1.5 System Requirements

It's necessary to have some type of terminal equipment, which includes a serial port, in order to configure the MT-GL modem. This can be a computer running a Windows Operating System with the HyperTerminal program.

1.6 MT-GL Front and Back View



Figure 1 - Enfora MT-GL Front View



Figure 2 - Enfora MT-GL Back View

1.7 Product Specifications

System Requirements		Application Interface	
Interface:	Serial – Host DSUB 9 connector	• Host Protocols:	PPP, AT Commands, UDP, TCP/IP
L x W x H:	4.0 x 5.0 x 1.6 in	• Internal Protocols:	UDP, TCP/IP (future release)
Housing:	One Piece, seamless Aluminum Extrusion	• API Control/Status:	AT or UDP
TX Power:	Class 4 (2W @850/900 MHz) Class 1 (1W @1800/1900 MHz)	• Friend's IP Feature	
Slot Class:	MS10(4RX/2TX, 5 MAX)	• Auto-Registration software upon power-up	
		• Over the air commands for:	
		- I/O Control	- Status Change Reporting
		- GPS TX Interval	- GPS Content
		- Binary Reporting	- Event Reporting
		- Timed Reporting	- Distance Reporting
		- Alarm Reporting	- Geo-Fencing
Band Operation		SIM Card / Interface / I/O	
GSM2218 (850/900/1800/1900)		• SMA Antenna Connector for 3.3 Vdc GPS 3.3	
		• External SIM accessible via end cap	
		• Audio connection	
		• TNC Antenna Connector for GSM	
		• 3 Pin I/O – 2 Input, 1 Output	
		3 LED Status indicators	
		1 Ignition Sense	
		• 1 Audio Input/Output	
GPRS Packet Data		Environment	
Mode:	Class B, Multislot 10 Certified	Operating:	-30°C to +70°C
Protocol:	GPRS Release 97, SMG 31	Spec. Compliant:	-20°C to +60°C
Coding Schemes:	CS1 – CS4	Storage:	-40°C to +85°C
Packet Channel:	PBCCH/PCCCH	Humidity:	Up to 95% non-condensing
GSM Functionality		Status Indicator	
Voice:	Full Rate, Enhanced full rate and half rate, AMR (GSM2218)	• Power ON	
CS Data:	Asynchronous, transparent and non transparent up to 9.6 KB	• Registration Status	
GSM SMS:	Text, PDU, MO/MT Cell broadcast	• GPS Status	
		• User Defined	
Certification (Pending)		Power	
GSM2218		DC Voltage:	9 - 30 V
FCC: Part 15,22,&24	Part 15	MT-GL 2218 @ 12V	
GCF: Version 3.11.0	Version 3.5.1	BAND	MODE
PTCRB: Version 2.9.1	Version 2.7.2	GSM 850&	1TX/1RX
Industry Canada	Industry Canada	900	1RX
RTTE	RTTE		Idle
			65
		GSM 1800&	1TX/1RX
		1900	1RX
			190
			Idle
			55
GPS Functionality		Part Number	
• SMA Antenna Connector for GPS		GSM2218	850/900/1800/1900
• Supports 3.3V Active Antenna			
• GPS Protocols: NMEA, TAIP, Enfora binary			
• Stored GPS Messages Feature			

2 Installation

Instructions provided in this section describe the hardware installation of the MT-GL device. To install the MT-GL in a vehicle, follow these steps:

- Choose a convenient location in the vehicle – either in the trunk or interior of a vehicle. Avoid locations that might expose the device to excessive heat or moisture.
- Hold the MT-GL in place and mark the location for mounting screw holes
- Using the markings as a guide, drill mounting holes in those positions
- Align the MT-GL in the drilled holes and secure it with mounting screws



The MT-GL is **NOT** a waterproof or sealed device. Care must be taken to ensure the device is kept away from water or any other liquids.

2.1 Mounting Dimensions

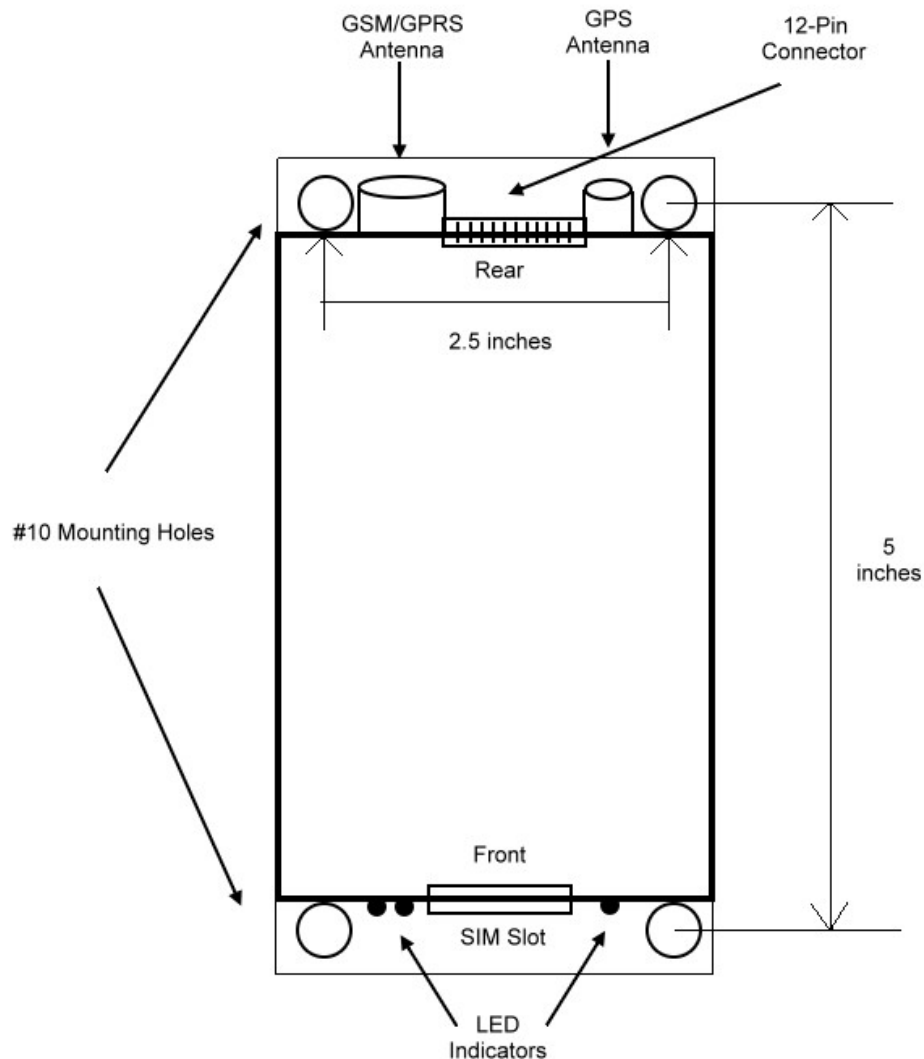


Figure 3 - Mounting dimensions of a MT-GL (Shown with mounting plate)

The bracket should be used as a template to mark screw holes for installation. See Figure 4 - MT-GL Mounting Brackets. The mounting holes are designed for a number 10 screw. Once mounting holes have been located for placement, the mounting plate can be easily broken into two parts as demonstrated in Figure 5 - MT-GL Mounting Bracket (separated). The mounting bracket must be separated in order to affix it to the MT-GL. The two pieces will easily slide into the grooves on the modem.



Figure 4 - MT-GL Mounting Bracket (attached)



Figure 5 - MT-GL Mounting Bracket (separated)



Figure 6 - MT-GL Bracket Installation



Figure 7 - MT-GL Bracket Installation

2.2 Installing Cables

During installation, the following precautions will help ensure proper operation of the MT-GL

- Remove power from the MT-GL.
- Do not create loops, sharp bends or crimps in the cables
- All cables should be attached to the vehicle and equipment in such a way to reduce stress or wear caused by vibration generated by moving vehicles.
- Use proper terminations on all power cables

2.2.1 12 pin Connector

The user can purchase the optional 12-pin external I/O connector for the Enfora MT-GL that can be used to interface with other devices. Enfora can provide an optional cable and connector (Part #ADT2218). The user also has the option of building his/her own cable. Table 1 describes the pin functionality for this 12 pin I/O connector. Pins that are not planned for usage can be left open without anything connected to them.

Pin Number	Functionality
Pin – 1	Serial Data Out
Pin – 2	Serial Data In
Pin – 3	Audio – Ear Speaker Out (-)
Pin – 4	Audio – Ear Speaker Out (+)
Pin – 5	Audio – Mic Input (+)
Pin – 6	Audio – Mic Input (-)
Pin – 7	User Controlled Output
Pin – 8	User Controlled I/O
Pin – 9	User Controlled I/O
Pin – 10	Switched Power (Ignition)
Pin – 11	Unswitched Power (Battery)
Pin – 12	Ground

Table 1 - 12 pin I/O Connector Interface

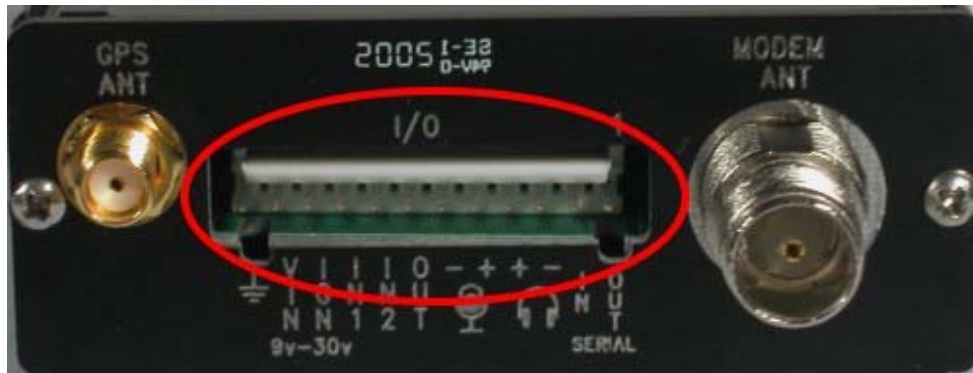


Figure 8 - I/O Connector

2.2.2 MT-GL Serial Adapter (Optional)

Enfora P/N ADT2218 can be used to provide a standard serial interface for the MT-GL. This adapter provides a standard DB9 serial interface and power to the unit. The adapter would be used for loading new software onto the MT-GL. The customer may choose to connect directly to the 12-pin connector serial interface pins, or order this convenient adapter from Enfora.

Note: Only three of the pins are used; ground, serial in and serial out.

See Figure 9 - 12-Pin Connection.



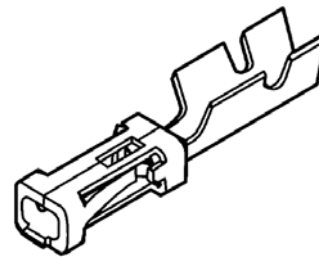
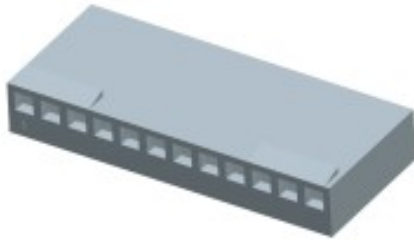
Figure 9 - 12-Pin Connection

The customer can also build their own cable, if they choose. The following information contains photographs and Enfora part numbers for the parts needed to build the cable. Enfora recommends using 20-gauge wire when building the connector.

The following show your options for connectors and pins:

CON-3000-1012

TRM-4000-0004

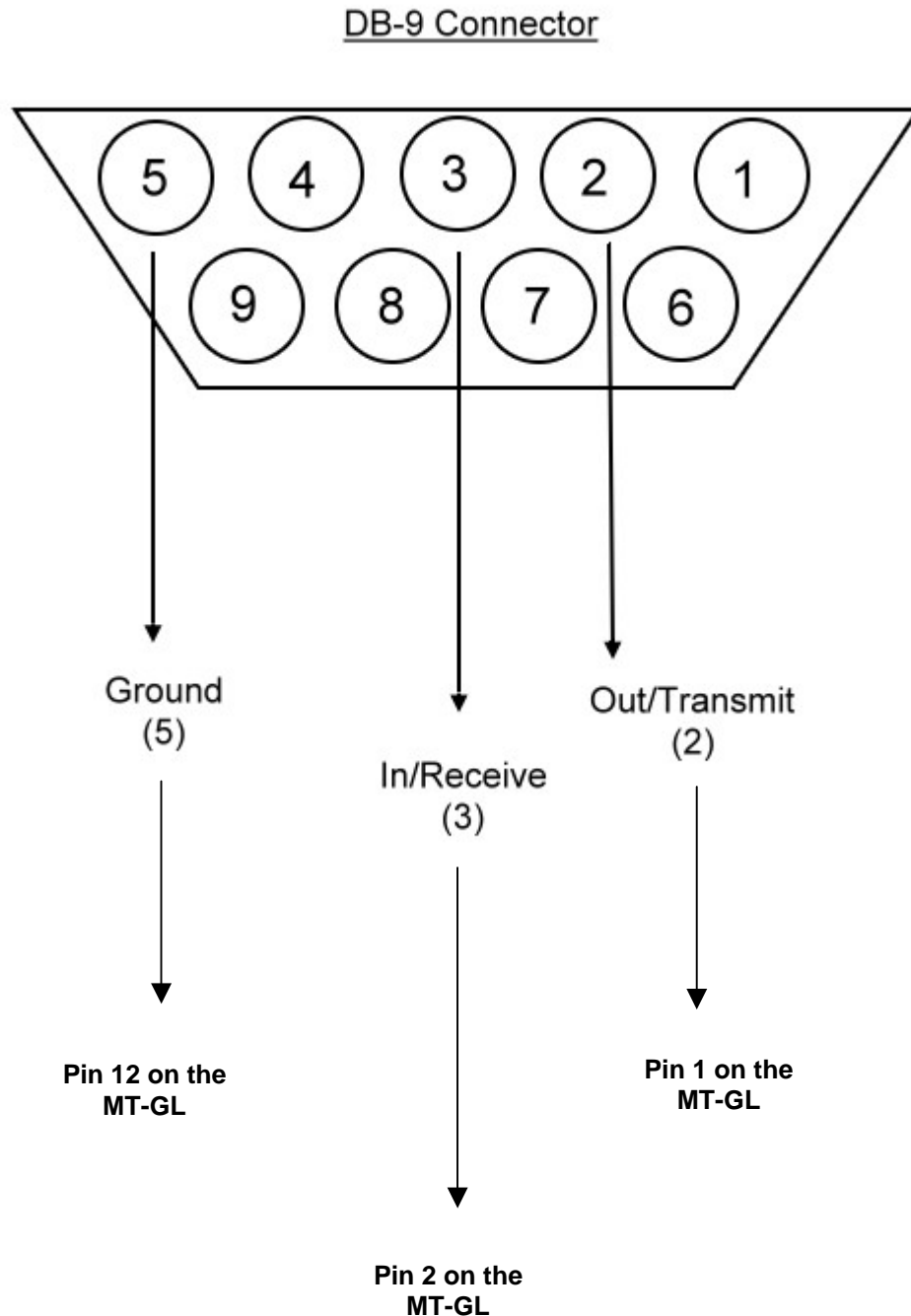


NOTE: Instead of using the previous two parts, you can build the cable using the Wago 733-112 connector (Enfora part number CON-3000-0112.) This connector is keyed, so the user won't be able to insert the connector into the MT-GL the wrong way.

DB-9 Pinout

There are three pins that are used to connect to the serial port of your computer. These are for transmit (out), receive (in) and ground.

The following diagram displays the serial end of the interface cable.



2.3 Installing Subscriber Identity Module (SIM) Card

The SIM, an integral part of any GSM terminal device, is a “smart card” that is programmed with subscriber information. The user information consists of an International Mobile Subscriber Identity (IMSI) number which is registered with the GSM/GPRS service provider and an encryption Ki (pronounced “key”). This information consists of a microprocessor and memory installed on a plastic card. A SIM card can be installed by simply inserting the SIM card in the SIM slot provided in the front of the device. See Figure 10 - Inserting a SIM below.

Note:

The SIM card is not provided with the MT-GL device. The SIM must be obtained from the GSM/GPRS service provider and must be provisioned by the operator for data and/or voice. Always take care to protect the SIM. MT-GL’s GSM/GPRS related functionality will not operate without the SIM installed.



Ensure the power to the MT-GL is disconnected before inserting the SIM card. Failure to do so might result in unusable MT-GL or a damaged SIM card.



Insert the SIM into the SIM Slot with the notch going into the slot first, and facing toward the left side of the modem.

Figure 10 - Inserting a SIM

2.4 Audio In/Audio Out

The only way of connecting the microphone/speaker is via pins 3 - 6 of the 12-pin connector.



Please follow the specifications as listed in the table below. Enfora is not liable for damage to the MT-GL caused due to user error.

Ear – Speaker Output:

Parameter	Conditions	MIN UNIT	TYP	MAX
Maximum Input Range – Mic(+) to Mic(-)	Inputs 3 dBm0 (Max. digital sample amplitude when PGA gain set to 0 dB)		32.5 mVrms	
Nominal Ref. Level – Mic(+) to Mic(-)			-10 dBm0	
Differential Input Resistance – Mic(+) to Mic(-)			100 kΩ	
Microphone Pre-Amplifier Gain			25.6 dB	
Bias Voltage on Mic(+)	2.0 or 2.5 V	2.0 Vdc		2.5
Mic Bias Current Capability		0 mA		0.5

Handset Speaker Output

Parameter	Conditions	MIN	TYP	MAX	UNIT
Maximum Swing – Ear(+) to Ear(-)	$R_L = 32\ \Omega$ & 5% distortion	1.2	1.5		V _{pp}
Maximum Capacitive Load – Ear(+) to Ear(-)				100	pF
Amplifier Gain			1		dB
Amplifier State in Power Down	High Z				

Table 2 - Audio Settings

2.5 Connecting GSM/GPRS modem Antenna

The user must supply the GSM/GPRS antenna. The antenna must have a nominal impedance of 50 Ohms. The VSWR must be less than 2.0:1. System antenna gain should be 0 – 2 dBi for optimum performance.

The antenna connector on the GSM/GPRS MT-GL model is a TNC female connector.

The antenna has to be connected to the connector labeled “MODEM ANT”. See Figure 11 - GSM/GPRS Antenna Connection.

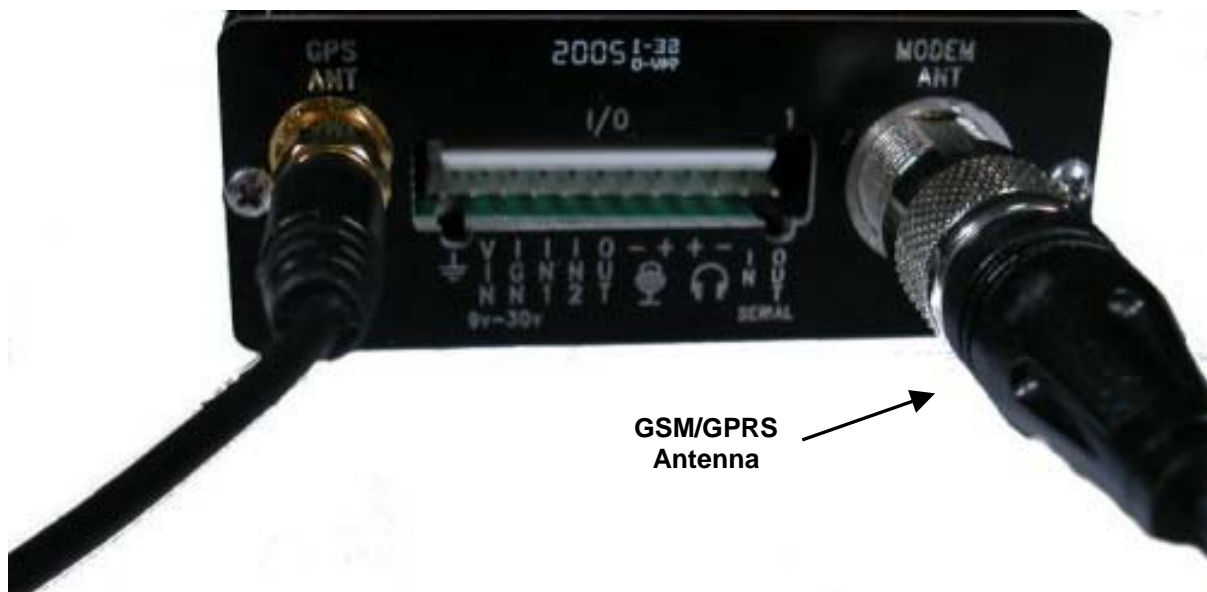


Figure 11 - GSM/GPRS Antenna Connection

2.6 Connecting GPS Antenna

The user must supply the GPS antenna. The GPS receiver inside the MT-GL powers the pre-amplifier in the GPS antenna (Active-style) by applying a power of 3.3 Volts to the center conductor of the RF input to the GPS receiver. If a passive-style GPS antenna must be used, please verify that it has a DC block installed in order to prevent shorting to ground. GPS antenna connector on the MT-GL model is a SMA female connector. The GPS antenna must be placed in an area where it can have direct view of the sky.

The GPS antenna must be connected to the connector labeled “GPS ANT”. See Figure 12 - GPS Antenna Connection.



User must disconnect power before connecting the GPS antenna

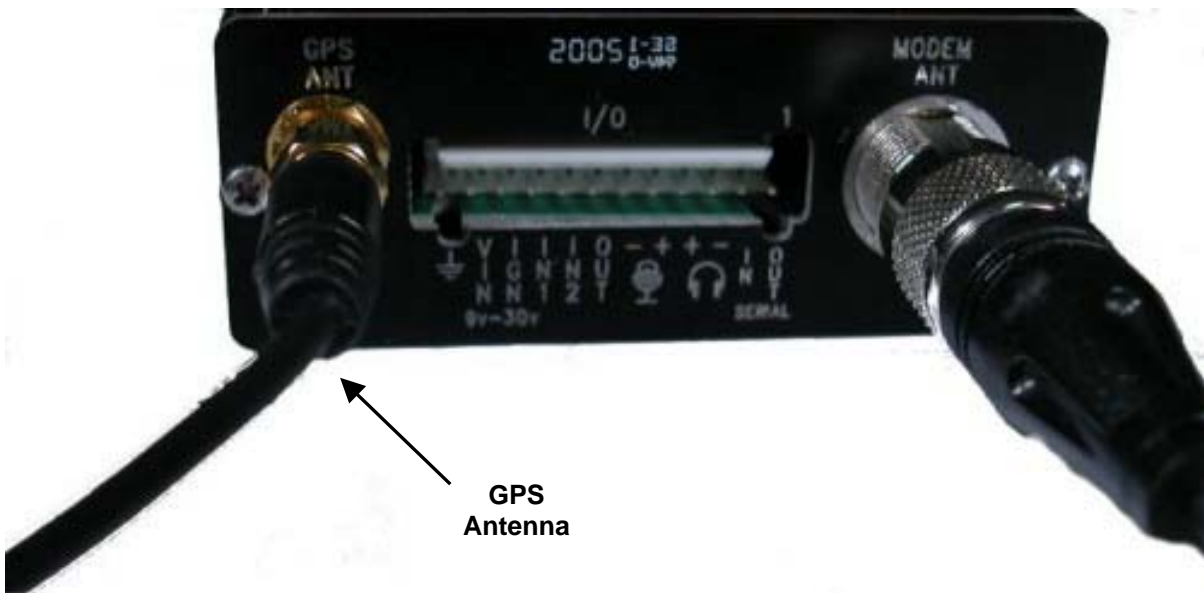


Figure 12 - GPS Antenna Connection

2.7 Connecting the Power Source

The GSM/GPRS MT-GL has an input voltage range of 9 – 30 V DC. (See Table 3 and Table 4). The power and ignition pins can support 9 – 30 V DC input voltage. The user has an option to connect these wires depending on the desired functionality. Described below are the desired functionality and their associated wire connecting procedure:



Use of the device outside of the specified voltage range may result in damage to the device and/or undesirable results.



Please follow the specifications as listed in the table below. Enfora is not liable for damage to the MT-GL caused due to user error.



The MT-GL (GSM2218) is designed to operate from 9 to 30 VDC. The user is responsible for ensuring the voltage supplied to the MT-GL remains in this voltage range to include transient voltage spikes and load dump voltages. Failure to comply with this warning may result in damage to the MT-GL.

PRELIMINARY TABLES

Enfora MT-G (@ 12 Volts)			Average Current (mAmps)	Peak Current (Amps)
GSM 850 & 900	GSM	1TX/1RX	390 mA	0.600@32.5
		1RX	180 mA	
		Idle	65	
DCS 1800 & PCS 1900	GSM	1TX/1RX	400 mA	0.570@32.0
		1RX	190 mA	
		Idle	55 mA	

Table 3 - GSM Operating Power

Enfora MT-G (@ 12 Volts)			Average Current (mAmps)	Peak Current (Amps)
GSM 850 & 900	GPRS	TBD1TX/1RX	400 mA	0.590@32.0
		1RX	190 mA	
		Idle	55 mA	
DCS 1800 & PCS 1900	GPRS	TBD	400 mA	0.560@31.5
			200 mA	
			55 mA	

Table 4 - GPRS Operating Power

- Connect the power and ground wires of the MT-GL to the battery leads. The MT-GL will always remain ON as long as the battery lasts.
- The MT-GL will be non-operational when the input voltage and current requirements are not met (battery drains).
- Connect the Ignition wire to a switched source that receives positive voltage when the ignition is on.
- Device goes through a reset upon ignition on.

2.8 LED Operation

The MT-GL has three LED's on its front panel.

- | | |
|-------------|--|
| PWR: | Indicates power to the modem. LED is on when power is turned on and the modem is operational. LED is off when power is removed or when the modem enters low power mode. |
| User LED 1: | This LED can be configured to display registration, GPS fix status, or other user functions. By default, this LED indicates GSM/GPRS registration status. LED state of OFF indicates that the device is not attempting to register to the network. Blinking LED indicates that the device is trying to connect to the network. LED always ON indicates that the device is attached to the network. |
| User LED 2: | This LED can be configured to display registration, GPS fix status, or other user functions. By default, this LED indicates GPS fix status. The LED remains in OFF state when invalid GPS data is received. The LED remains ON when valid GPS data is received. |

3 Additional Software Features

The following software features are included in version 0.6.0 and greater:

A user can send AT commands, via SMS, to the MTG in the following format:

Please refer to Enfora Application Note [GSM0000AN002 – AT Commands Over SMS](#)

The ability to store event data in memory, upon event trigger occurrence, and transmit data when desired.

- The user can configure the MT-GL to store event-generated data, to be sent over the air to a remote server, in its internal memory. This feature can be enabled or disabled using the AT\$MSGLOGEN command.
- “Total Number of Unread Messages” is decremented if an unread message is read via the AT\$MSGLOGRD command.

Example: Assume there are 50 unread messages in the GPRS queue and the total number of messages in GPRS queue is 100. This means that the first 50 messages have been read while the last 50 messages have not been read. If a user sends AT\$GPSLOGRD=0,1,51 then the total number of unread messages drops down to 49 after successful transmission of that message. However, if a user sends AT\$GPSLOGRD=0,1,99 then the total number of unread messages still remains at 50 – that message is transmitted to the remote server.

- A user can also read a message that has already been read from the memory by passing in the appropriate starting index number.

Synchronize RTC time with GPS time

- RTC time is synched with GPS time automatically
- RTC time is synched with GPS time every time the device is powered up and the device acquires valid GPS data
- RTC time is synched with GPS time every time the GPS time rolls over from 23:59:59 to 00:00:01

Allow a user to append RTC date and time at the end of event data

- Bit-21 for Parm2, for output message types 40 – 42 & 45 (in AT\$EVENT command), has been added to allow users to send RTC time along with event data
- The RTC date and time contains Year, Month, Day, Hour, Minute, and Second fields
- 6 bytes of information is appended in Binary format when bit-21 is enabled. Each byte represents an individual field
- 12 ASCII character (12-bytes) representing RTC date and time is appended in ASCII format when bit-21 is enabled. Two bytes (or two ASCII characters) represents an individual field

4 Appendix 1 – Cable Wiring Diagrams

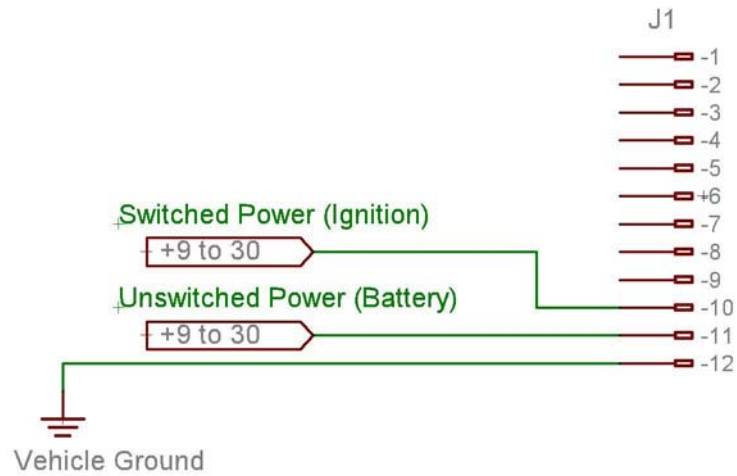


Figure 13 – Wiring for Power Only

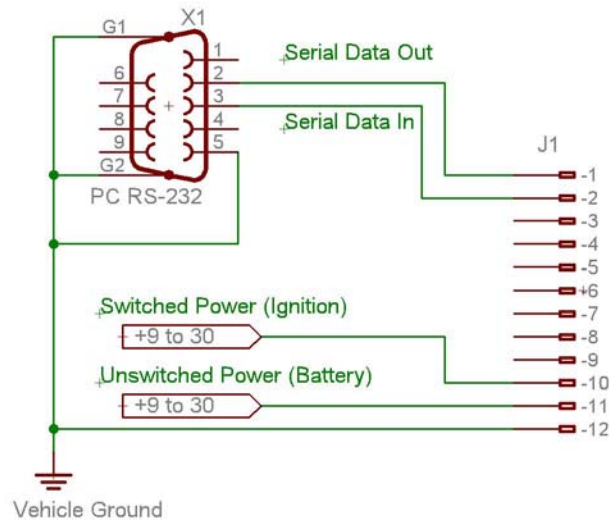


Figure 14 – Wire for Programming Cable