MT 2500

User Guide

GSM2418UG001

Version:1.01

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enfora®
A Novatel Wireless Company

General

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251 Renner Pkwy

Richardson, TX 75080 USA

Phone: (972) 633-4400

Fax: (972) 633-4444

Email: info@enfora.com

www.enfora.com

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[Revised: 11/11/2010]

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Regulatory Compliance

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits pursuant to Part 15 Subpart B, Part 22, and Part 24 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in an appropriate installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used in accordance with instructions, can cause harmful radiation to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

RF EXPOSURE

Your device is a radio transmitter and receiver. It is designed and manufactured not to exceed the emissions limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission (FCC) of the U.S. Government. These limits are part of comprehensive guidelines and establish permitted levels of RF energy for the general population. These guidelines are based on the safety standards previously set by the U.S. and international standards bodies. The standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.

The exposure standard for wireless RF devices, such as the device, employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6W/kg. SAR values at or below that limit are considered safe for the general public.

Before a wireless RF device is made available for sale to the Public, it must be tested and certified to the FCC that it does not exceed the SAR limits established by the FCC. Tests for SAR are conducted using the positions and locations (e.g., at the ear or worn on the body) as required by the FCC for each device model.

The device has been tested and meets the FCC RF exposure guidelines when used against the body under normal usage conditions.

R&TTE CE

Effective with HW revision B, the device is in conformity with the requirements of the R&TTE directive 1999/5/EC. It has been fully tested and complies with all the requirements of EN301489-1, EN301489-3, EN301489-7 and EN60950-1. Compliance to EN301511 has been demonstrated by testing on both the device and the integrated module.

The hardware revision of the device is identified on the label an also by the presence of the CE mark.

ROHS COMPLIANCE

The device complies with the European Union Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment ([RoHS) Directive (2002/95/EC), effective since July 1, 2006.

DISCLAIMER

The information and instructions contained within this publication comply with all FCC, GCF, PTCRB, R&TTE, IMEI and other applicable codes that are in effect at the time of publication. Enfora disclaims all responsibility for any act or omissions, or for breach of law, code or regulation, including local or state codes, performed by a third party. Enfora strongly recommends that all installations, hookups, transmissions, etc., be performed by persons who are experienced in the fields of radio frequency technologies. Enfora acknowledges that the installation, setup and transmission guidelines contained within this publication are guidelines, and that each installation may have variables outside of the guidelines contained herein. Said variables must be taken into consideration when installing or using the product, and Enfora shall not be responsible for installations or transmissions that fall outside of the parameters set forth in this publication.

BATTERY INFORMATION AND SAFETY REQUIREMENTS

NOTE: Failure to comply with all of the following precautions could:

- Cause personal injury or property damage
- Cause abnormal chemical reactions which would make the battery over heat, smoke, distort, leak, or catch on fire
- Destroy internal protections built into the battery

- Shorten battery life
- Reduce battery performance

Precautions

- Read this entire manual and the label on the exterior of the battery.
- Keep the battery away from sources of excessive heat such as fire, stoves, or direct sunlight.
- Keep the battery away from sources of high voltage or static discharge.
- Do not use or store the battery with other batteries or where it could touch metal.
- Do not put the battery into a microwave oven.
- Do not allow the battery to be crushed.
- Keep the battery away from children.
- Do not drop the battery.
- Do not allow anything to touch any of the battery contacts, or to connect two or more of the contacts.
- Do not disassemble, destroy, or attempt reassembly of the battery.
- Do not place or leave the battery in a damp or wet environment.
- Do not allow water to touch the battery.
- Do not wrap the battery with conductive material.
- Properly dispose of the battery.
- Do not incinerate or burn the battery.
- Do not leave or discard the battery where it could get wet or become submerged in water.
- Do not damage the battery.
- Do not weld or solder anything to the battery, the attached wires, or the connector.
- Do not use this battery in any device other than supplied.
- Do not touch a leaking battery. Avoid leaked-out materials. Do not allow it to touch your skin or clothes. If touched, immediately rinse affected areas thoroughly with water. Leaked materials may cause skin irritation. Seek medical attention if irritation persists. If it contacts your eyes, do not rub your eyes. Rinse the eyes thoroughly with water, and see a doctor immediately.
- Use of this battery in other devices could result in unsafe conditions.
- Risk of explosion if battery is replaced by an incorrect type.

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Table of Figures

1 Introduction

1.1 References

- Spider MT 2500 AT Command Set (GSM2418AT001)
- GSM Network Configuration Worksheet (GSM0000AN019)
- Mobile Tracker Event Cookbook (GSM2000CB001)

1.2 Applicable Products

This document applies to the following products:

- GSM2418-00
- GSM2418-01

2 Overview

2.1 Description

The MT 2500 has a V0 fire rated plastic housing measuring 82 x 46 x 21 mm. It contains internal GPS and quad-band GSM antennas, an internal SIM holder, 16-pin Molex I/O connector, a USB 2.0 connector, and three LED indicators.

2.1.1 MT 2500 Panel Illustration

Figure: 1 - MT 2500

2.2 Label

The MT 2500 has a printed label on the top side of the device. The figure below shows the information included on the label.

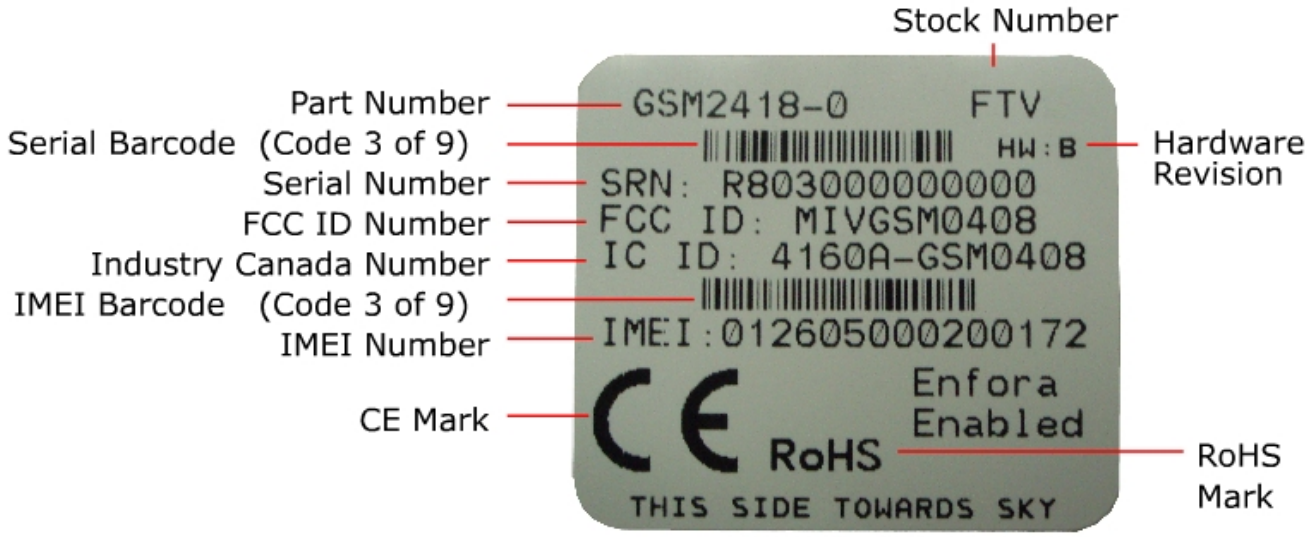


Figure: 2 - MT 2500 Label

2.3 Accelerometer

The three-axis digital accelerometer provides the following features:

- Motion alert (towing alert)
- Driver behavior reporting
    - Rapid acceleration
    - Harsh braking
- Configurable thresholds
    - Range settings
    - Mode (Normal, Sleep, Wakeup)
    - Wakeup pause (20 to 2560 msec)
    - Sample Rate (0-25 per second)
    - Filter Coefficient and Filter Bandwidth
    - Device Orientation Setup

2.4 Battery Power Switch

The MT 2500 Battery Power Switch is used to apply or remove battery power to the device. The on position is with the switch toward the dot. The off position is with the switch moved away from the dot.

The figure below shows the MT 2500 Battery Power Switch in the off position.

The power switch must be placed in the on position before the optional backup battery may be used for programming or operating the MT 2500.

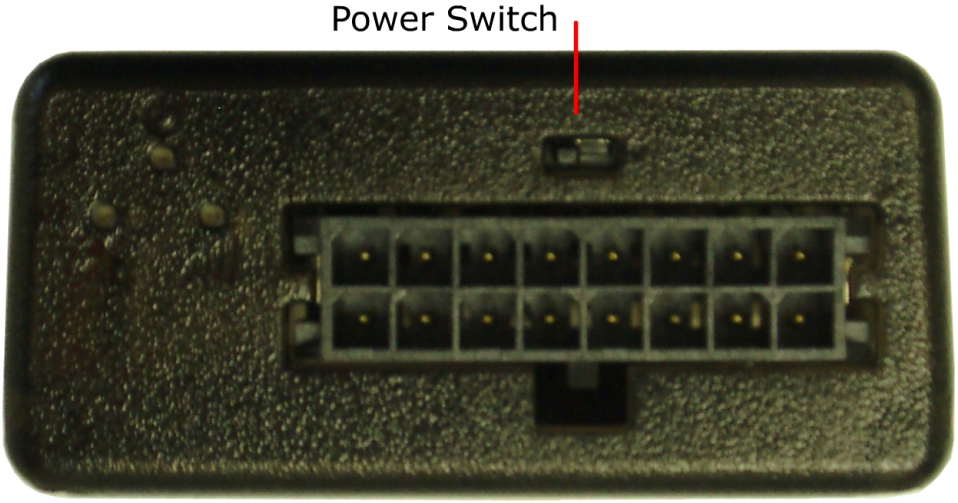


Figure: 3 - MT 25000 Power Switch

Move the power switch to the off position when shipping or transporting the device by air.

2.5 Connector and LEDs

The MT 2500 includes a 16-Pin I/O connector, a USB 2.0 connector, and LEDs to indicate GSM, GPS, and power status.

Figure: 4 - MT 2500 Connectors and LEDs

2.6 GSM Radio

The MT 2500 contains a quad-band (850/900/1800/1900 MHz) GSM radio.

- Class 4 (2W@850/900 MHz)
- Class 1 (1W@1800/1900 MHz)

2.7 GPS

GPS functionality includes:

- NMEA update with all data points
- Binary
- Buffered GPS message feature
- Geo-fencing
- Virtual odometer

2.8 GPIO

The MT 2500 includes the following inputs and outputs:

- 2 (0-16V) analog inputs
- 1 user programmable digital input
- 1 latched output
- 2 user programmable digital outputs

For detailed information about the MT 2500 inputs and outputs, see the 16-Pin IO Connector section of this manual.

2.9 Analog to Digital Converter (ADC)

The ADC voltage ranges are 0 to 16 volts and 0 to 32 volts.

2.9.1 ADC Scaling

The ADCs have 10 bit resolution.

The scale range of the AT$IOADC command is 0 to 1023.

This results in a value of 0.0156V per bit for the 0 to 16 volt ADC and a value of 0.03125V per bit for the 0 to 32 volt ADC.

The ADC resistor divider is +/- 1%.

For uses requiring precise values, Enfora recommends that the user calibrate to a known voltage. As there may be some drift over time or due to temperature, periodic recalibration is also recommended for those applications.

3 Hardware Features

3.1 Opening the Device

It is highly recommended that you use the Metal Lever (Enfora part number GPS0309MG299) when opening the MT 2500 in order to prevent damaging the device.

To open the MT 2500, follow the following steps:

1. Insert the curved foot of the Metal Lever into the gap between the lid and the body next to the retainer snaps as shown below.

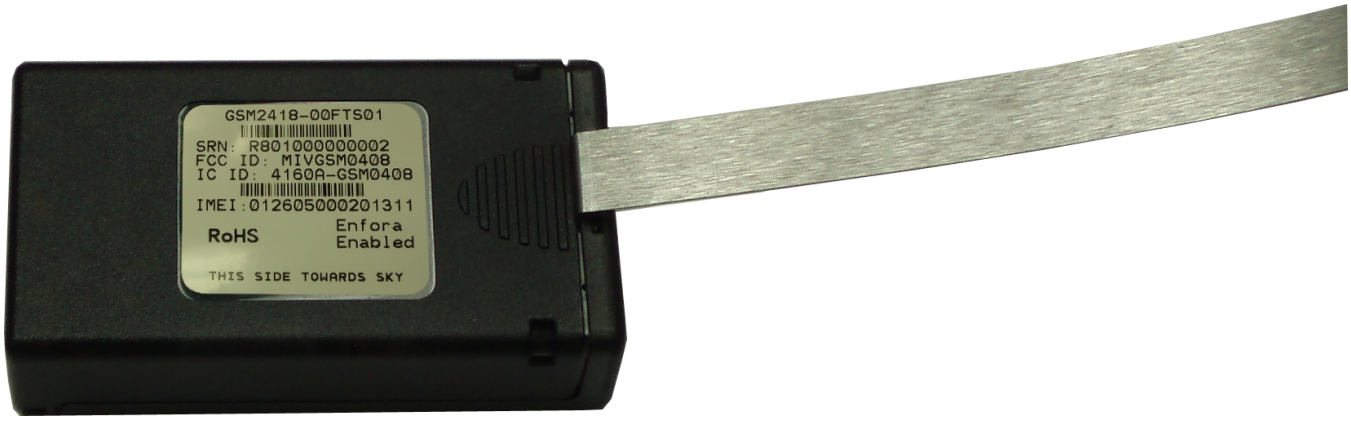


Figure: 5 - Opening the MT 2500 Case

2. Gently apply pressure upwards on the lever until the lid unsnaps.

Figure: 6 - MT 2500 With Cover Unsnapped

3. Carefully slide the cover off the device.

3.2 Closing the Device

Replace the MT 2500 cover by using the following steps:

1. Place the MT 2500 cover onto the base as shown in the following figure.

Figure: 7 - MT 2500 Cover Replacement

2. Carefully slide the lid so that it snaps in place.

3.3 SIM Card Access

The MT 2500 includes an onboard SIM carrier. There is no external access to the SIM.

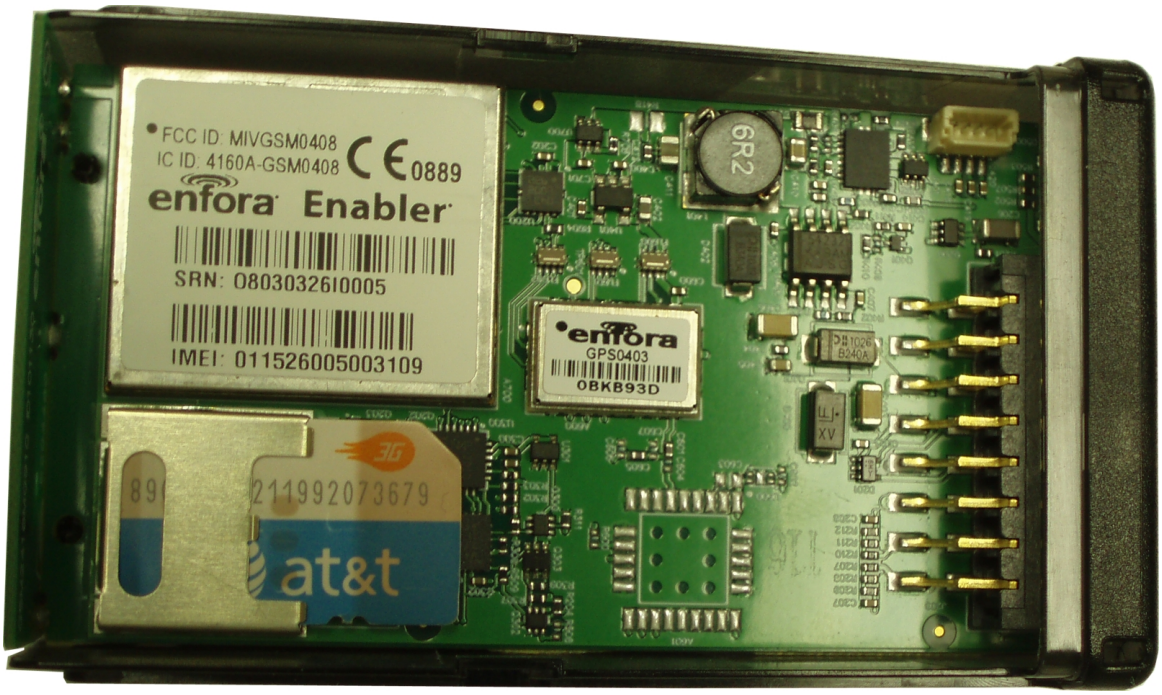
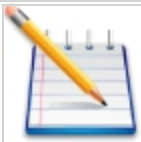


Figure: 8 - MT-2500 Internals

3.4 Power

The MT 2500 requires 9-16 VDC minimum 2 amps input power. Pin 11 on the 16-Pin IO connector is the power input and pin 6 is ground.



An inline power fuse has been added to the HW revision B of the product. Refer to the device label for the hardware version.

3.5 Power Consumption

Typical Power Consumption for the MT 2500:

- +12V, Sleep=2, GPS on, GSM idle, DRX5* = ~70 mAmps
- +12V, Sleep=2, GPS off, GSM idle, DRX5* = ~38 mAmps
- +12V, Sleep=4, GPS on, GSM idle, DRX5* = ~48 mAmps

• +12V, Sleep=4, GPS off, GSM idle, DRX5* = ~16 mAmps

> Discontinuous Reception (DRX) refers to the setting of the GSM paging interval. This is normally sent from the network to the mobile terminal. The units are in 51-multiframes, which are 235 msec each. So a setting of DRX 5 indicates that the paging interval is 5 * 235 msec or 1.175 sec. This allows the mobile to reduce the power consumption between the paging and 'wake up' at the correct time to receive the network paging signals.

3.6 GPS Specifications

Specification	Parameter/Conditions	Min	Typ	Max	Units
Accuracy	-130 dBm, Autonomous CEP (50%)		2		m
	-130 dBm, Autonomous CEP (95%)		3	5	m
Acquisition Times	Cold Start TTFF @ -130 dBm		37	60	Seconds
	Hot Start	2		6	Seconds
	Reacquisition after 30 sec loss		6		Seconds
Sensitivity	Tracking	-161			dBm
	Acquisition	-149			dBm

3.7 Optional Battery Backup

An optional 230 mAH backup battery is available. The battery backup may be turned off using a recessed on/off switch when required (e.g. when shipping by air). The following figures show the optional battery and the connector cable.

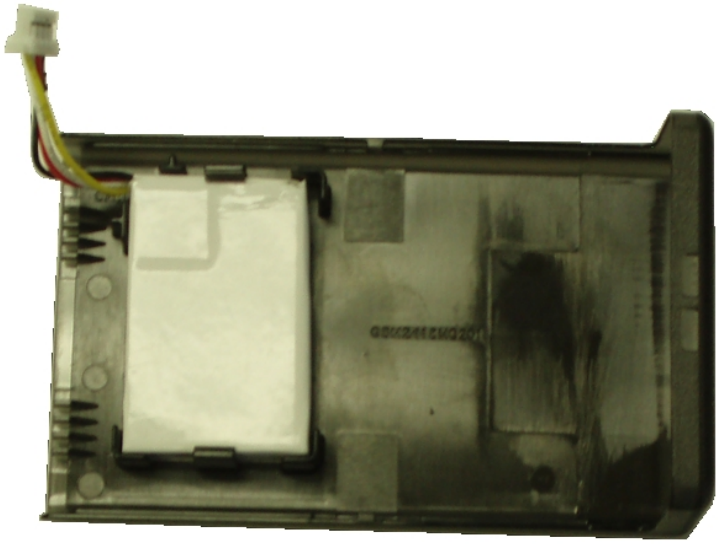


Figure: 9 - MT 2500 Optional Battery Mounted in Cover

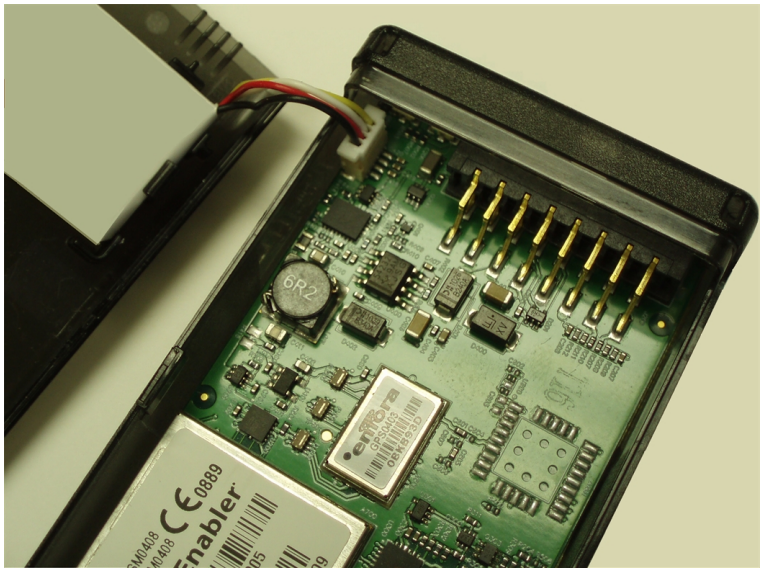


Figure: 10 - MT 2500 Optional Battery Connection

3.8 USB 2.0 Connector

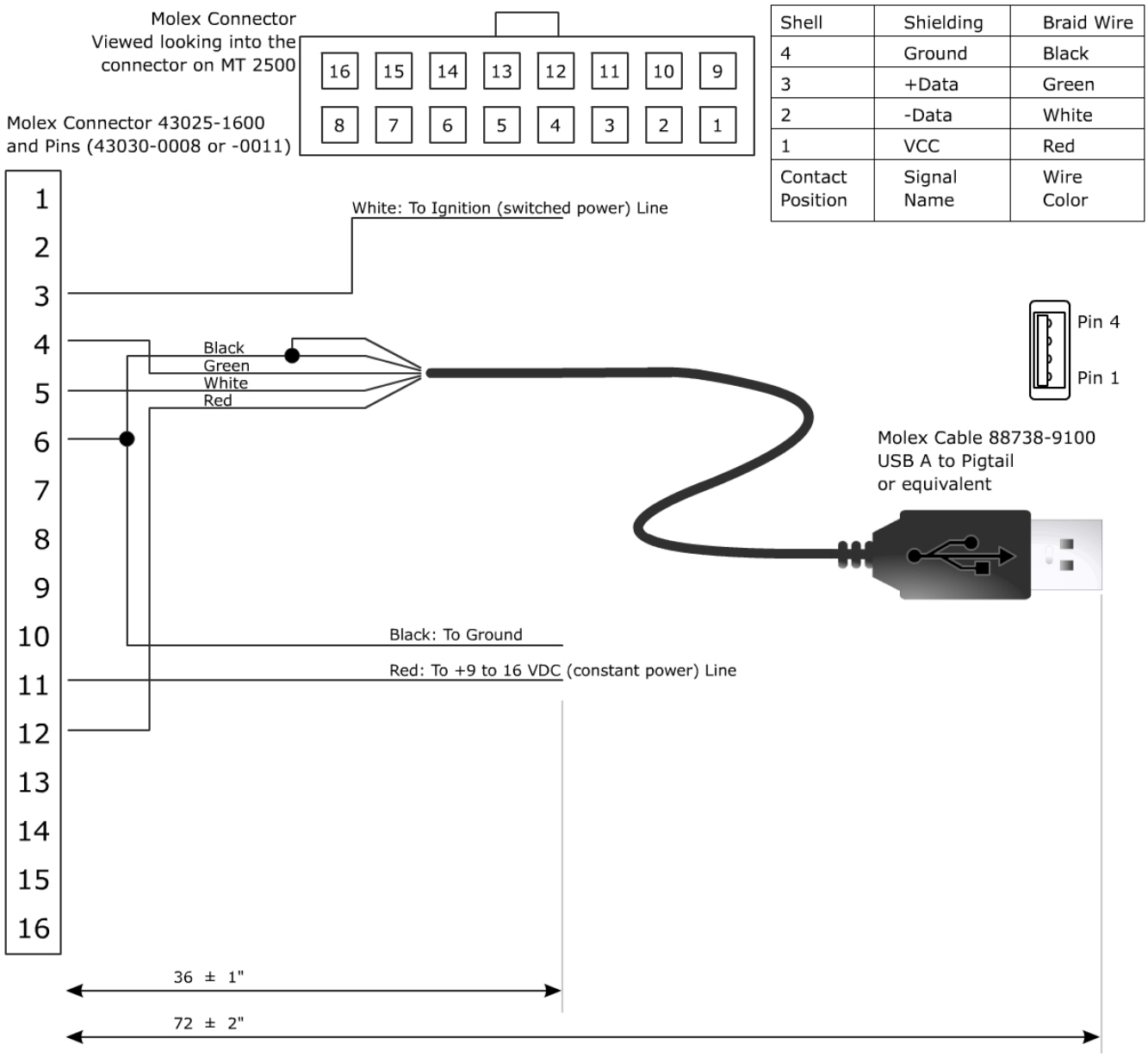
Warning: The USB (2.0) connector is an input/output connector and is not intended for general use. This connector should only be used when programming the modem.

Note: This USB port cannot be used to supply power to other USB devices and nothing should be connected to this port which the vehicle is in motion.

The USB connector is only used to program the modem. When programming the modem, a USB cable is required.

3.9 USB Cable

The USB connector is only used to program the modem. When programming the modem, a USB cable is required.



Shell	Shielding	Braid Wire
4	Ground	Black
3	+Data	Green
2	-Data	White
1	VCC	Red
Contact Position	Signal Name	Wire Color

Figure: 11 - USB Power Cable Construction

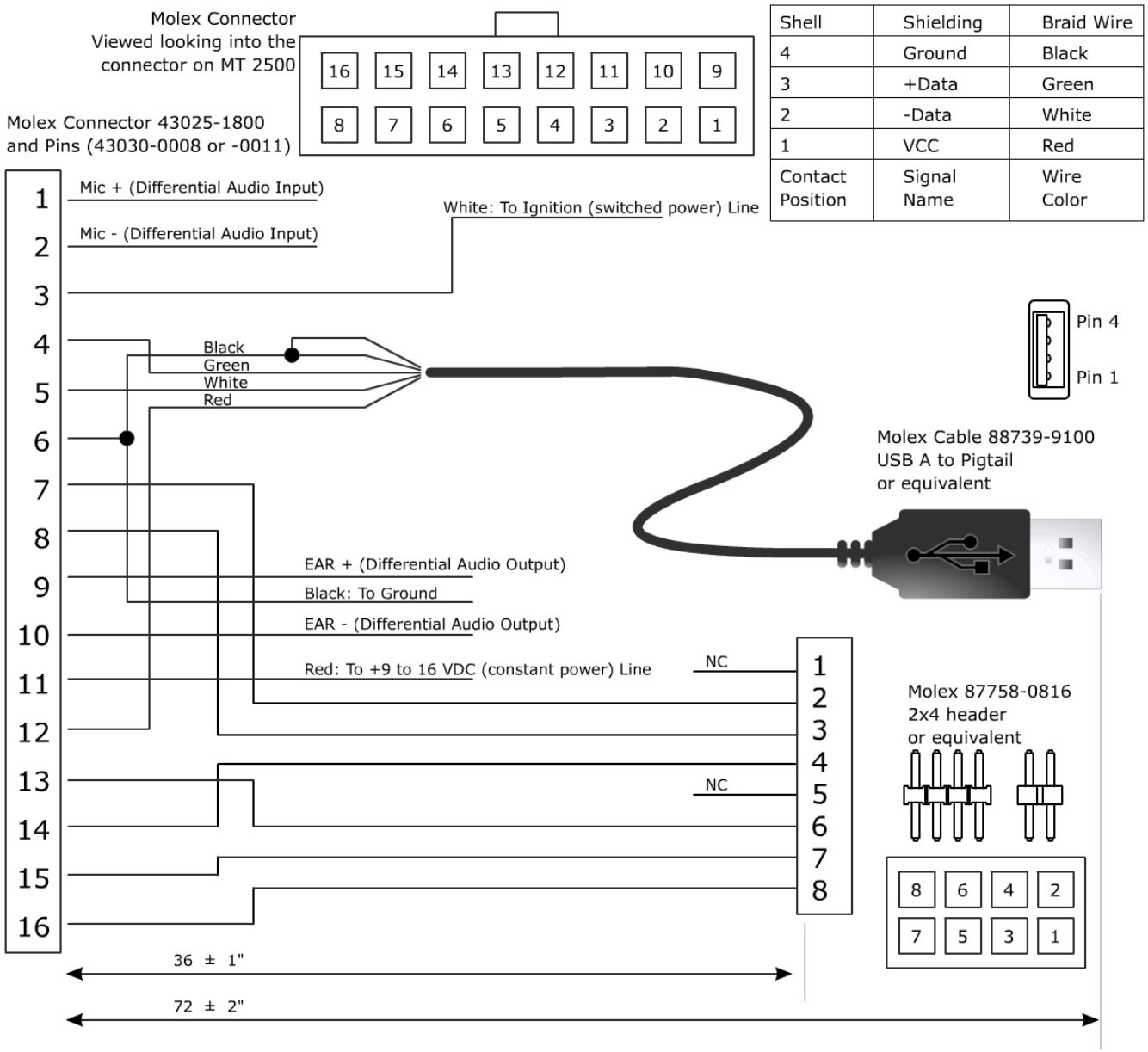


Figure: 12 - USB Power Cable with I/O and Audio Construction

3.10 16-Pin I/O Connector

The 16-Pin I/O Connector provides the following functionality:

PIN	SIGNAL
1	Mic + (Differential Audio Input)
2	Mic - (Differential Audio Input)
3	Ignition Sense
4	USB D+
5	USB D-
6	Ground
7	GPO5 (General Purpose Output)
8	GPO2 (General Purpose Output)
9	EARP (Differential Audio Output)
10	EARN (Differential Audio Output)
11	Power Input (9-16 VDC)
12	USB Vbus
13	GPI1 (General Purpose Digital Input)
14	GPO3 (Latched General Purpose Output)
15	A/D IN 2 (Dual Function Input) (Operation as Analog or Digital Input is Configured via AT Command)
16	A/D IN 1 (Analog Input)

16-Pin I/O Connector

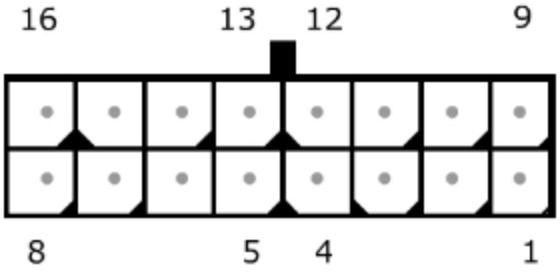


Figure: 13 - 16-Pin I/O Connector

Pin	Label	Function	Description
1	Mic+	Differential Microphone Input (+)	Maximum differential input range
2	Mic-	Differential Microphone Input (-)	Maximum differential input range
1 & 2	Mic+ & Mic-	Differential Microphone Input (+ / -)	Nominal reference level

1 & 2	Mic+ & Mic-	Differential Microphone Input (+ / -)	Differential input resistance
3	Ignition Sense	Switched Vehicle Power	Operating Range
4	USB D+	USB Data (+) 5 V Tolerant Data	Serial Interface Input High (VIH_RXD_DAT)
			Serial Interface Input Low (VIL_RXD_DAT)
5	USB D-	USB Data (-) 5 V Tolerant Data	Serial Interface Output High (VOH_TXD_DAT)
			Serial Interface Output Low (VOL_TXD_DAT)
6	GND	Ground (Vehicle Chassis)	
7	GPO5	User Output	High Output, No Load (VOHNL)
			High Output (VOH)
			Low Output (VOL) NOTE: During RESET, Output is LOW
8	GPO2	User Output	High Output, No Load (VOHNL)
			High Output (VOH) NOTE: During RESET, Output is HIGH
			Low Output (VOL)
			Sink Resistance (RDSON)
9	EARP	Differential Audio Out (+)	Differential resistive load (ZLOAD)
10	EARN	Differential Audio Out (-)	Differential resistive load (ZLOAD)
9 & 10	EARP & EARN	Differential Audio Out (+) & Differential Audio Out (-)	Differential Maximum capacitor load
			Common mode Minimum Resistive Load
11	Power In	Unswitched Vehicle Power	Common mode Maximum Capacitive Load
12	USB VBUS	5v-tolerant USB power Supply VBUS line	Operating Range
13	GPI-1	Digital Input with Selectable Pull-Up/Down	Pull-up/Pull-down
			Minimum High input threshold (VIH)
			Maximum Low input threshold (VIL)
			Input range (VIN)
14	GPO3	High Current Sink - Latched	High Output (no sourcing capability) (VOH)
			Low Output (VOL)
15	A/D_IN2	Analog to Digital Input #2	Measurement range, 10 bit (0 to 1023) (VIN)
15 alternate	GPI-9	Digital Input with Selectable Pull-Up/Down	Pull-up/Pull-down
			Minimum High input threshold (VIH)
			Maximum Low input threshold (VIL)
			Input range (VIN)
16	A/D_IN1	Analog to Digital Input #1	Measurement range, 10 bit (0 to 1023) (VIN)
			Input resistance (RIN)

Pin	**Conditions**	**Min**	**Norm**	**Max**	**Units**
1				32.5	mVrms

2				32.5	mVrms
1 & 2			-10		dBm0
1 & 2			36		kΩ
3	RIN = 100 kΩ	2.0	14.2	16.0	Vdc
4	RXD Input High On D+	2.0			V
4	RXD Input Low On D+			0.8	V
5	ISOURCE = 4 mA TXD Output High On D-	2.4	3.3	3.6	V
5	ISINK = -4 mA TXD Output Low on D-	0.0	0.1	0.4	V
6					
7	no load			4.2	V
7	ISOURCE = 10 mA RSOURCE = 100 Ω		3.0		V
7	ISINK = -4 mA	0.0	0.1	0.4	V
8	no load			4.2	V
8	ISOURCE = 10 mA		3.0		V
8	ISINK = -1.1 A (maximum) Switch Max Pwr = 2 W	0.0		0.55	V
8			250	500	mΩ
9	Between EARP and EARN.	33		120	Ω
10	Between EARP and EARN.	33		120	Ω
9 & 10	Between EARP and EARN			100	pF
9 & 10	Load at EARP or EARN.		200		kΩ
11	Load at EARP or EARN.			50	pF
12		8.0	14.2	16.0	Vdc
13	Ref. 3.3 V / GND	4.4	5.0	5.25	Vdc
13			47		kΩ
13		1.5			Vdc
13				0.3	Vdc
14		0.0		16.0	Vdc
14	ISINK = -1.1 A (maximum) Switch Max Pwr = 2 W			16.0	V
15	RIN = 37.6 kΩ	0.0		0.55	V
15 alternate	Ref. 3.3 V/GND	0.0		16.0	Vdc
15 alternate			47		kΩ
15 alternate		1.5			Vdc
15 alternate				0.3	Vdc
16		0.0		16.0	Vdc
16		0.0		16.0	Vdc
16			16.8		kΩ

4 Software Features

4.1 Software Features

The MT 2500 supports the following software features:

- FOTA
- I/O control
- Binary reporting
- Timed reporting
- Alarm reporting
- Driver behavior events with configurable thresholds
    - Sudden acceleration
    - Harsh braking
    - Motion detection
- GPS content
- Distance reporting
- Geo-fencing
- Virtual odometer
- Status change reports
- Maximum speed exceeded alerts

5 Installation

5.1 Inserting the SIM

Insert the SIM per the following procedure:

> Note: The SIM card is not provided with the MT 2500 device. The SIM must be obtained from the GSM/GPRS service provider and must be provisioned by the operator for data. Always take care to protect the SIM. Without the SIM installed, the MT 2500 modem is not able to communicate on the network.

1. Carefully remove the device cover to access the internal SIM holder.
2. Insert the SIM into the SIM holder of the MT 2500.
3. Replace the cover.

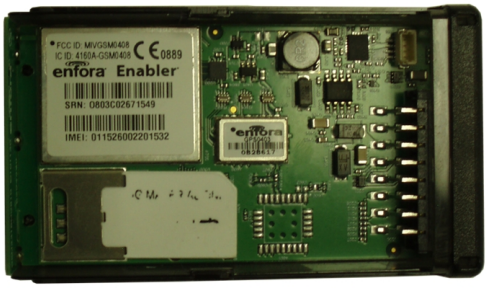


Figure: 14 - MT 2500 SIM Holder with SIM Installed (Lower Left)

5.2 Device Installation

The MT 2500 case includes molded anchor points for mounting as shown in the figure below. Additionally, the device must be mounted with the correct side facing skyward as shown in the figure below.

See "Device Installation" on page 19

Figure: 15 - MT 2500 Mounting Anchors and "Sky Side" Label

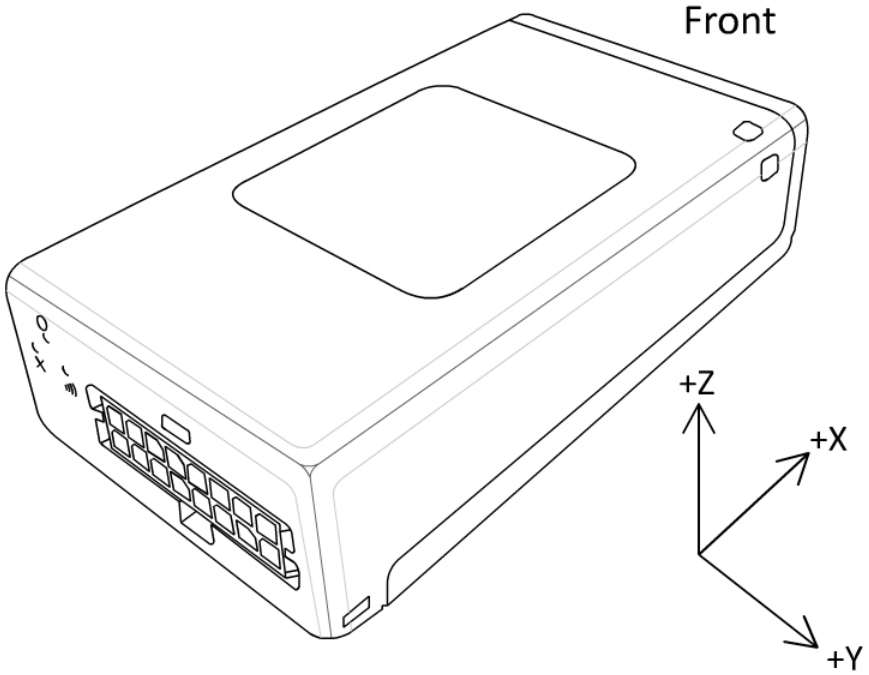
Power must be applied to the MT 2500 by moving the Battery Power Switch to the ON position before connecting any auxiliary I/O device. Failure to apply power to the MT 2500 before connecting auxiliary devices may result in damage to the attached I/O device.

The MT 2500 must be securely mounted to ensure proper accelerometer operation. Mounting the device to cable runs or other structures that may allow the device's orientation to shift may cause inaccurate results to be reported by the accelerometer.

5.3 Device Orientation

The device orientation is set with respect to the vehicle body by the AT$ACCORN command.

The orientation parameters are used to convert the accelerometer axes to the vehicle axes so that acceleration and deceleration along the vehicle centerline (front-to-back) can be measured separately from the side-to-side and up-and down accelerations.



5.4 Manual USB Driver Installation

These instructions illustrate how to manually install the USB drivers in Windows XP. The procedure will vary for other Operating Systems.

1. Connect the Device to the USB port on a Windows-based computer.
2. Install the USB drivers (as described in this section).

5.4.1 Connect the device to a USB Port

Supported Operating Systems include Windows 2000, Windows XP, and Windows Vista. When you connect the device to the computer, you will be prompted to install the drivers.

Follow the steps in the next section to install the drivers.

5.4.2 Install the USB Drivers

After you download the USB drivers, make sure you note the location on your computer where the drivers are located.

Note: Drivers can be requested from Enfora® support via email techsupp@enfora.com or using the support section of the website http://www.enfora.com.

After connecting the device to the computer, follow these instructions to complete the installation of the USB drivers.

There may be multiple steps to installing the USB drivers. Once each step is complete, the process will automatically begin again.

The following screen captures may reflect a different device driver that the one you are installing, however the steps in the procedure will remain the same.

1. The Windows Operating System will detect the new USB device.
2. You will see the following screen:

Figure: 16 - Found New Hardware Wizard Window

3. Click on No, not this time.
4. Click Next.
5. You will see the following screen:
   The name of the driver may vary based on the product, but the process remains the same.

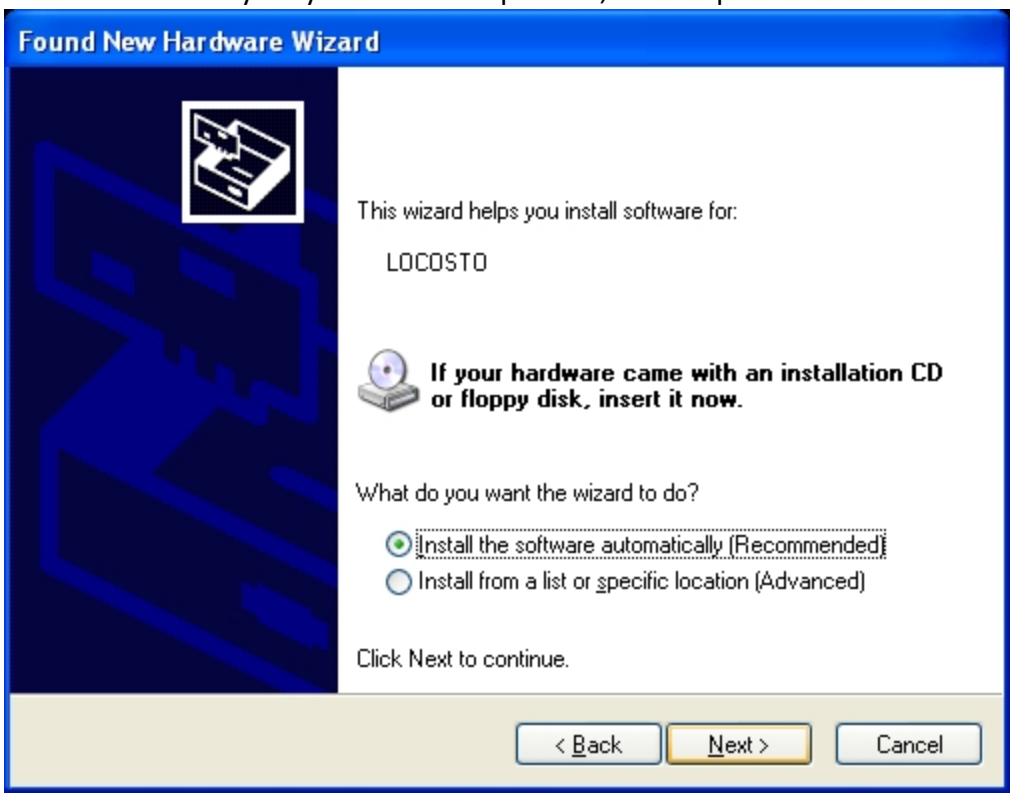


Figure: 17 - Hardware Wizard – Install from specific location

6. Click the radio button next to Install from a list or specific location (Advanced).
7. Click Next.
8. You will see the following screen:

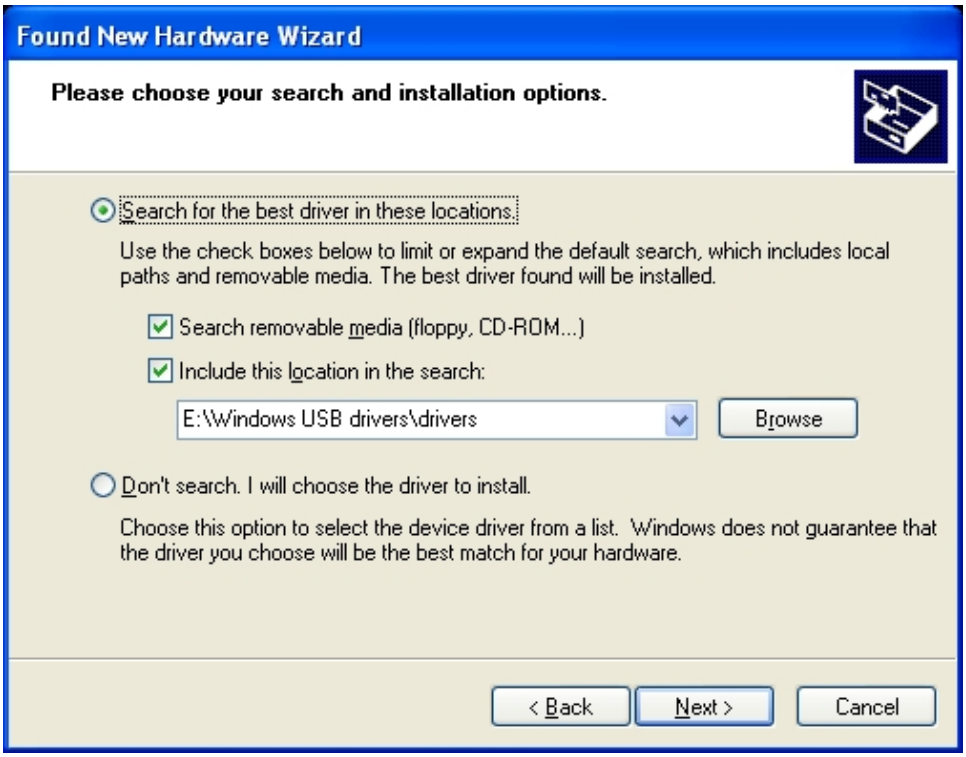


Figure: 18 - Hardware Wizard – Search for best driver

9. Click on the check box marked Include this location in the search.
10. Browse to the location on your computer where the USB drivers are located.
11. Click Next.
12. You may see the following screen:

Figure: 19 - Hardware Wizard – Windows Logo testing

Note: If you see this warning, click on Continue Anyway

13. You will see the screen that shows the installation progress:

Figure: 20 - You will see the screen that shows the installation progress:

14. When the installation of the USB device driver is complete, you will see the following screen (the name of the driver on the following screen may vary based on the product, but the process remains the same):

Figure: 21 - Hardware Wizard – Completing

15. Click Finish.

This process may need to be repeated a number of times depending on which device driver is being installed.

5.5 USB Driver Installation Using the Enfora Driver Setup Utility (Windows XP)

These instructions illustrate how to correctly install the USB drivers in Windows XP using the Enfora Driver Setup Utility.

1. Run the Enfora Driver Setup Utility by double clicking the EnforaDriverSetup executable file.

The Enfora Driver Setup Utility Extraction window will open.

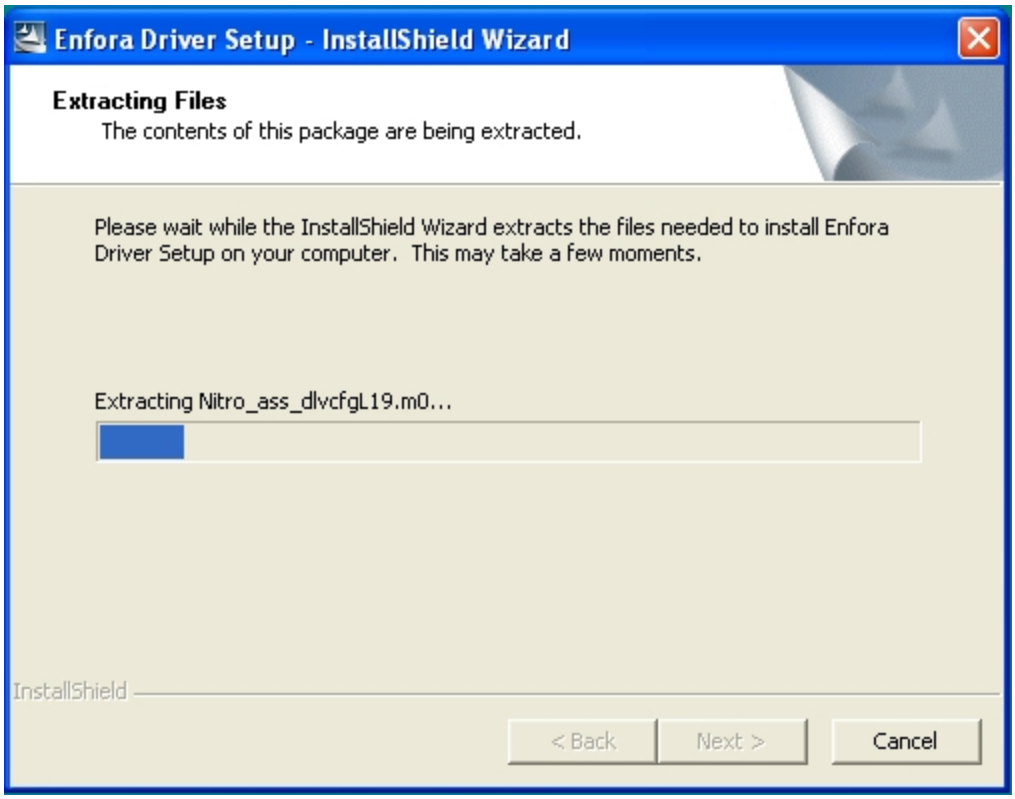


Figure: 22 - Enfora Driver Setup Utility Extraction

Once the contents have been extracted to memory the Welcome Window is displayed.

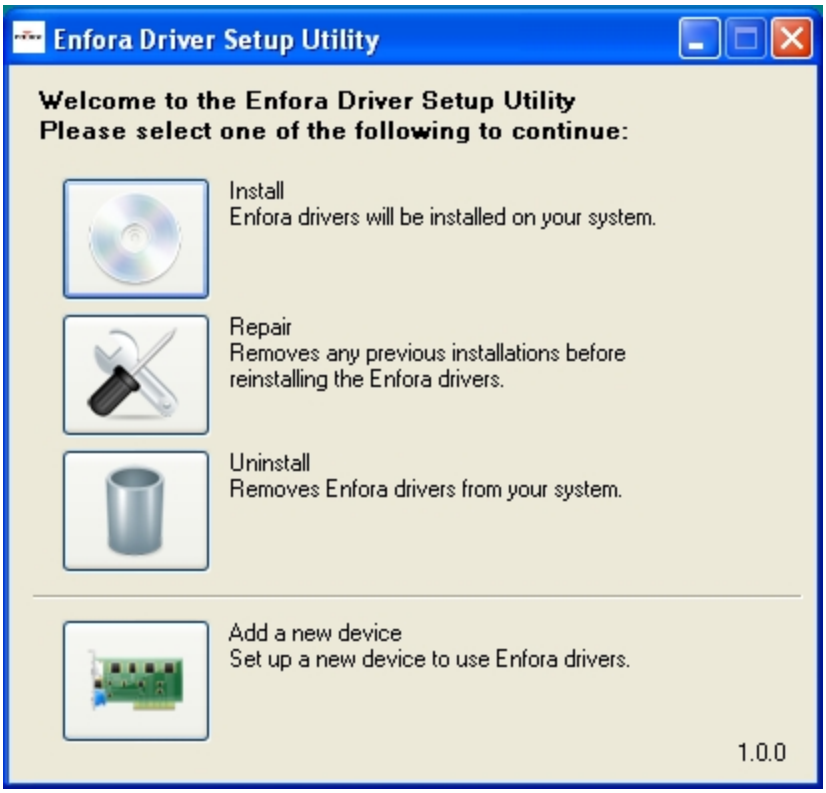


Figure: 23 - Enfora Driver Setup Utility Welcome

2. To install the drivers, select the **Install** button.

The Enfora Driver Setup Utility Prepare System Window will be displayed.

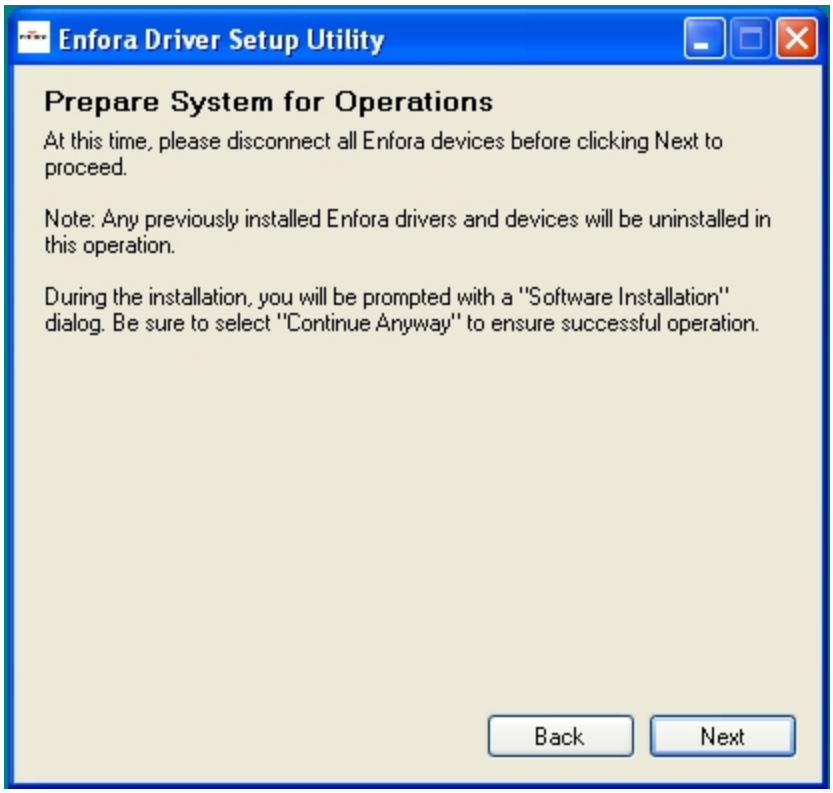
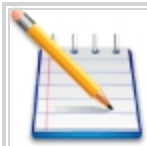


Figure: 24 - Enfora Driver Setup Utility Prepare System Window

3. Select the **Next** button to continue.

The Enfora Driver Setup Utility Installation Window will be displayed while the system installs the drivers.

Be sure to disconnect any Enfora devices. Previous drivers will be removed during this phase.



Note: During the installation, your computer's display may freeze and appear non-responsive. If this occurs, allow the computer to continue working. After 2-3 minutes the display and installer will resume normal behavior.

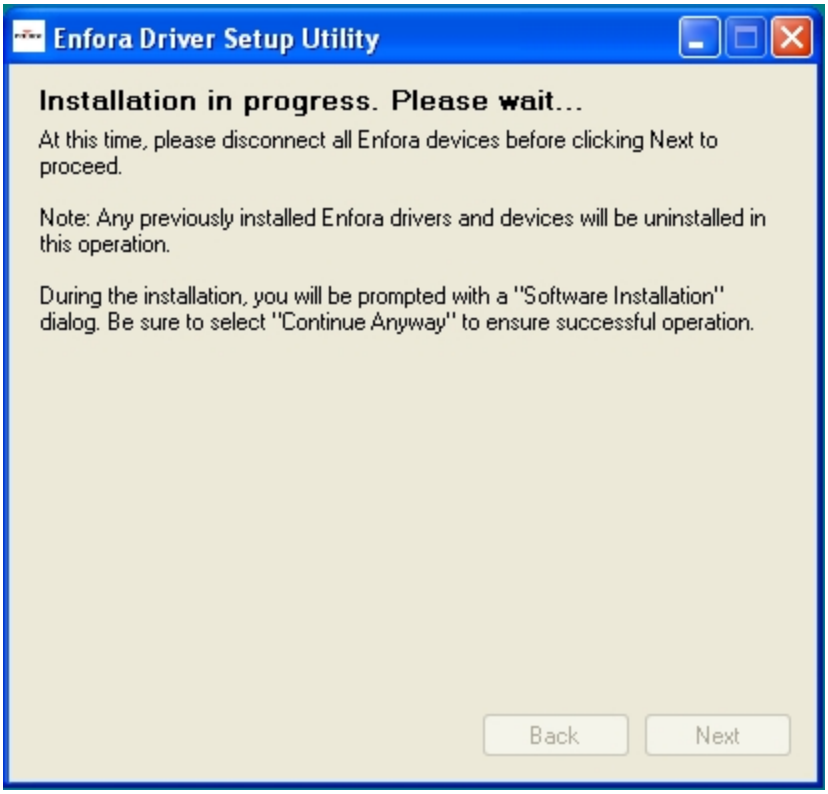


Figure: 25 - Enfora Driver Setup Utility Installation Window

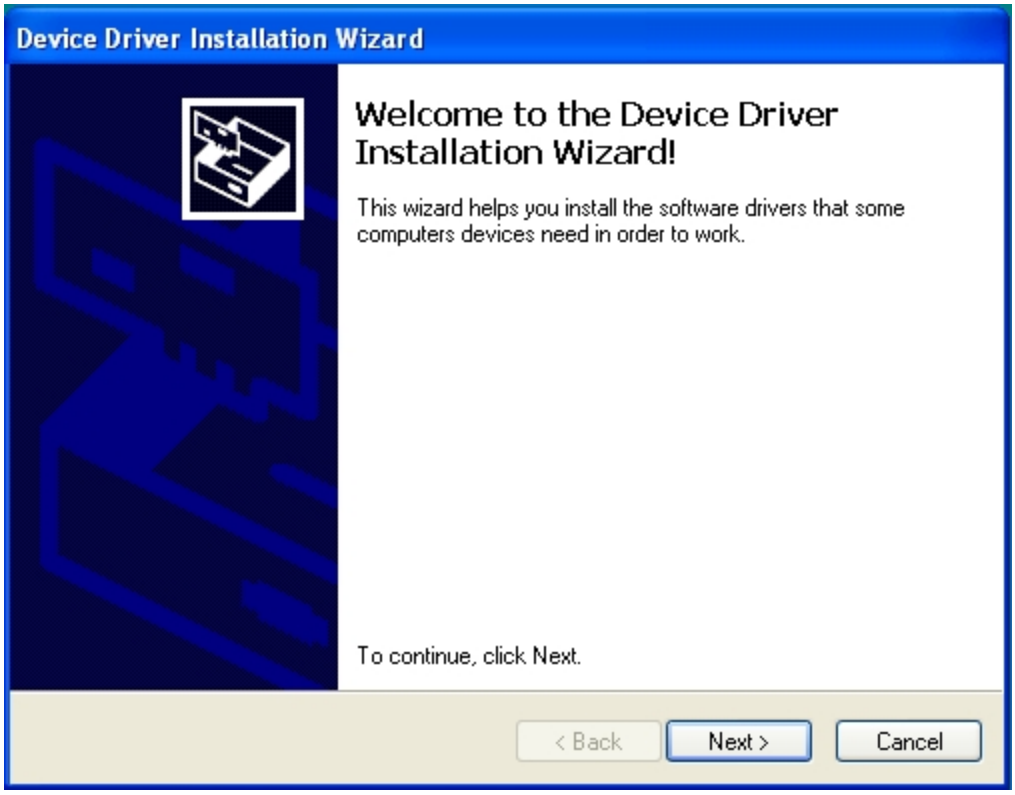


Figure: 26 - Enfora Driver Setup Utility Driver Installation

4. When prompted to install the device driver select the **Next** button.

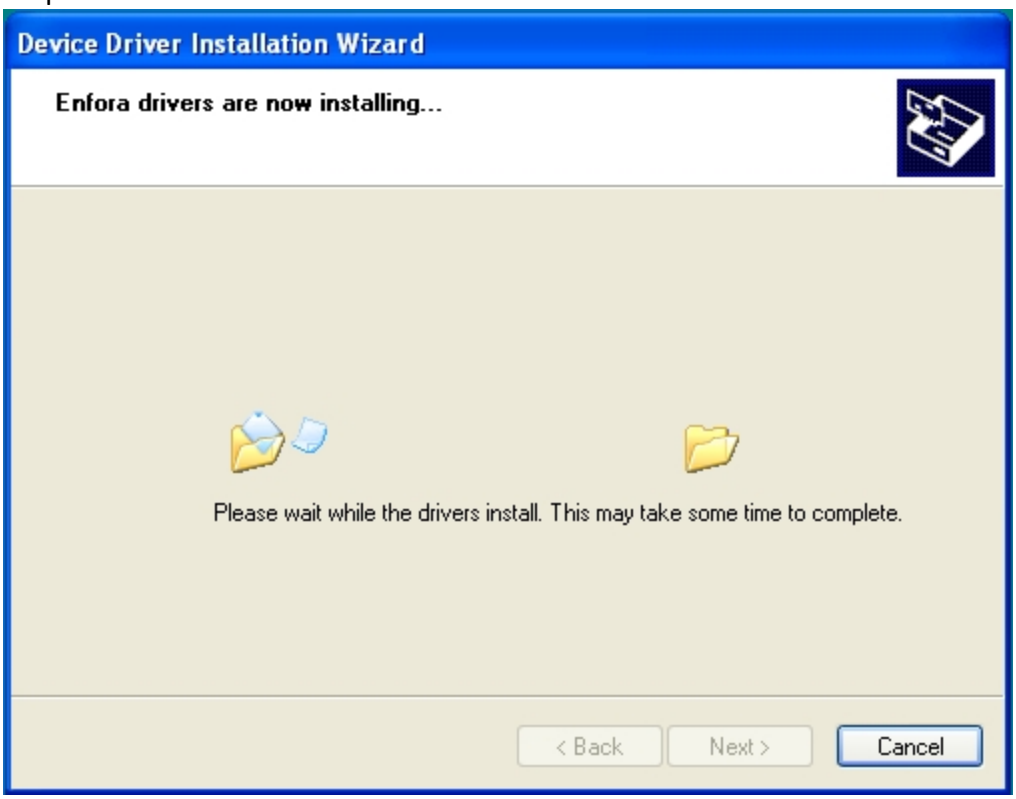


Figure: 27 - Enfora Driver Setup Utility Driver Installation Progress

5. During the driver install phase you may be prompted to Continue or Stop installation due to potential compatibility issues. Select the **Continue Anyway** button.

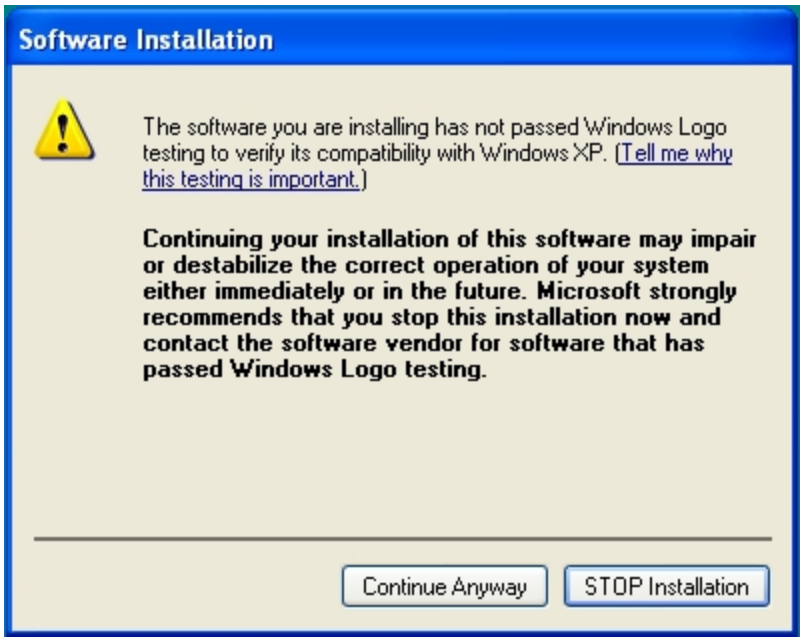


Figure: 28 - Windows Security Window

Upon completion of the installation the Enfora Driver Setup Utility Driver Install Completion Window is displayed.

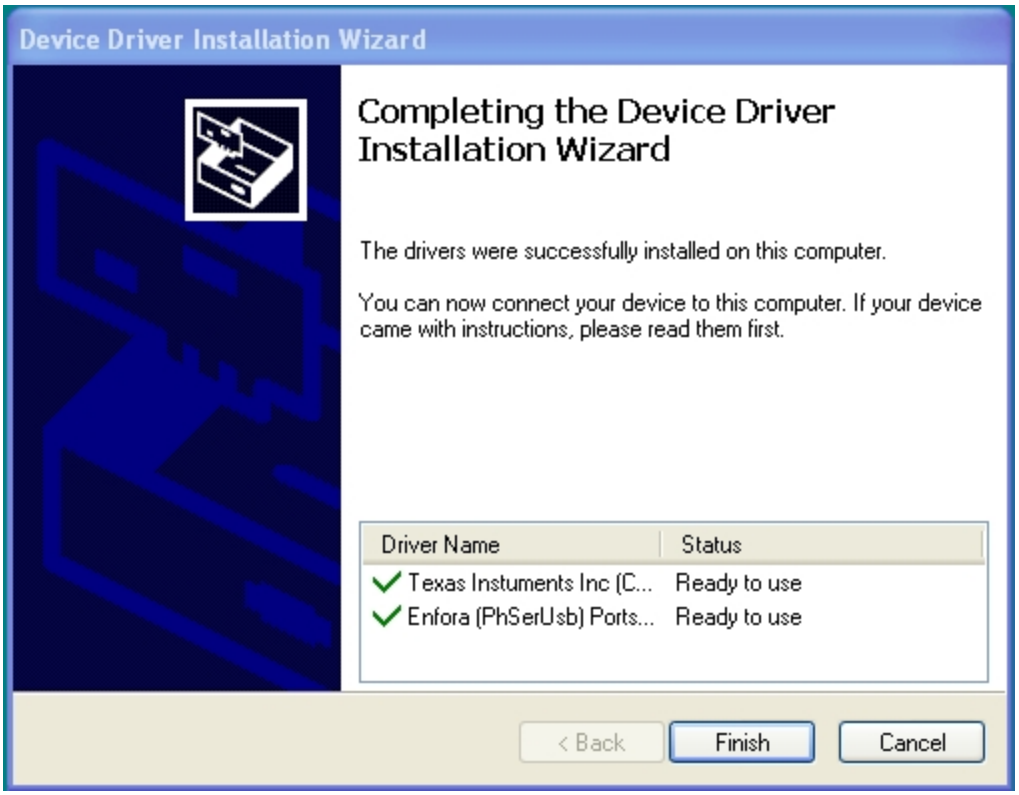


Figure: 29 - Enfora Driver Setup Utility Driver Install Completion Window

6. Select the **Finish** button.

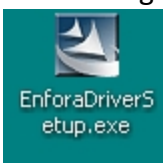
When the installation is complete the list of Attached Devices will be displayed within the Enfora Driver Setup Utility Attached Devices Window

Figure: 30 - Enfora Driver Setup Utility Attached Devices Window

5.6 USB Driver Installation Using the Enfora Driver Setup Utility (64 Bit Windows 7)

These instructions illustrate how to correctly install the USB drivers in Windows 7 using the Enfora Driver Setup Utility.

1. Run the Enfora Driver Setup Utility by double clicking the EnforaDriverSetup executable file.



The Enfora Driver Setup Utility Extraction window will open.

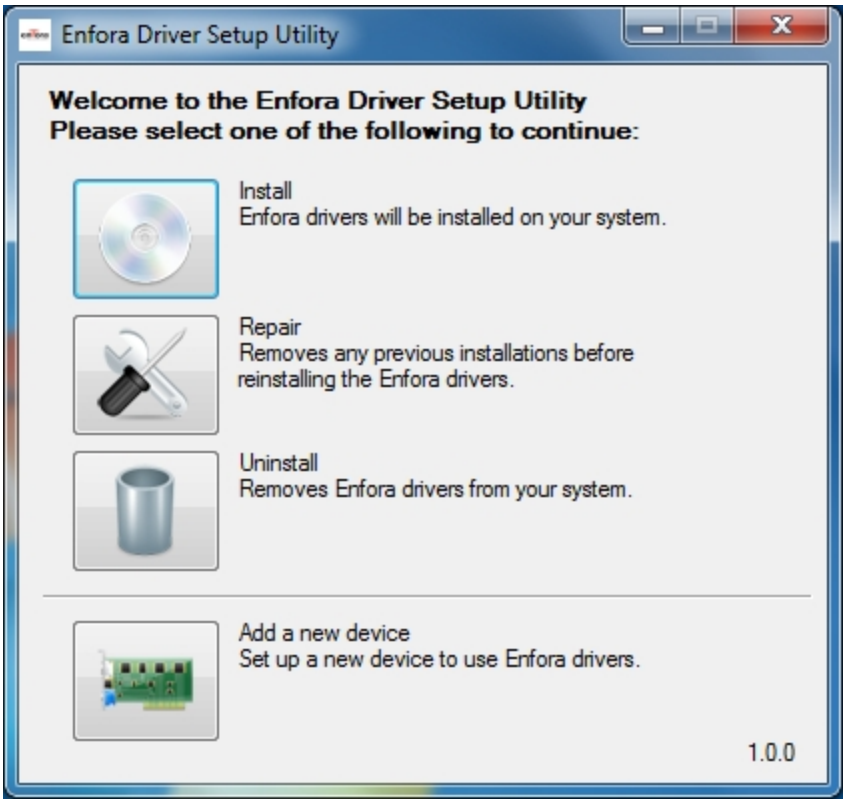


Figure: 31 - Enfora Driver Setup Utility Welcome Window

Once the contents have been extracted to memory the Welcome Window is displayed.

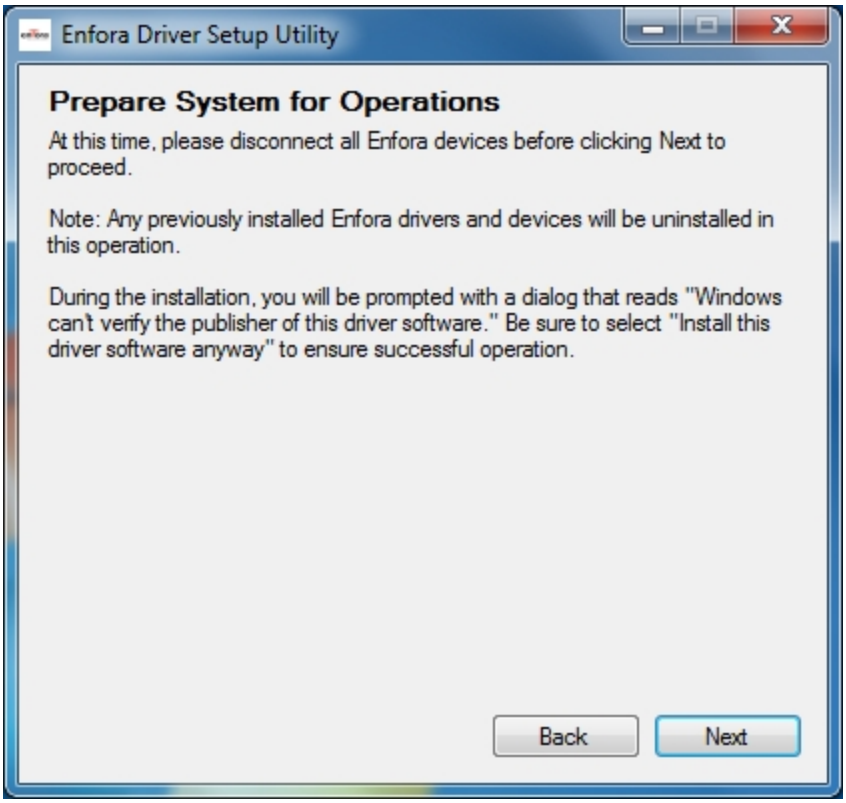


Figure: 32 - Enfora Driver Setup Utility Preparation Window

2. To install the drivers, select the **Install** button.

The Enfora Driver Setup Utility Prepare System Window will be displayed.

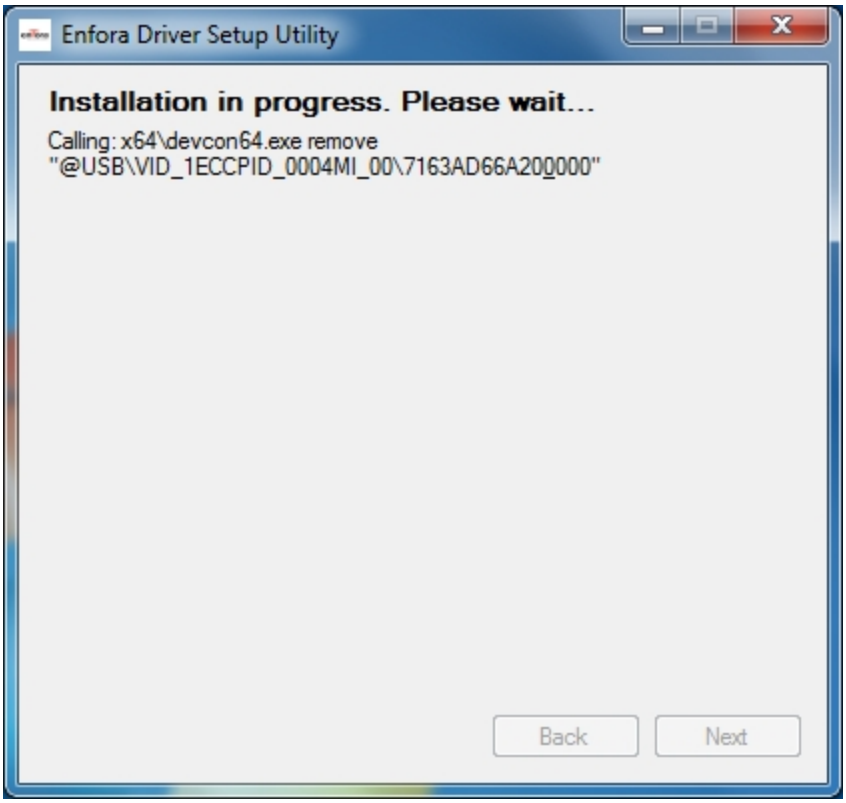


Figure: 33 - Enfora Driver Setup Utility Installation Window

3. Select the **Next** button to continue.

The Enfora Driver Setup Utility Installation Window will be displayed while the system installs the drivers.

Be sure to disconnect any Enfora devices. Previous drivers will be removed during this phase.

Note: During the installation, your computer's display may freeze and appear non-responsive. If this occurs, allow the computer to continue working. After 2-3 minutes the display and installer will resume normal behavior.

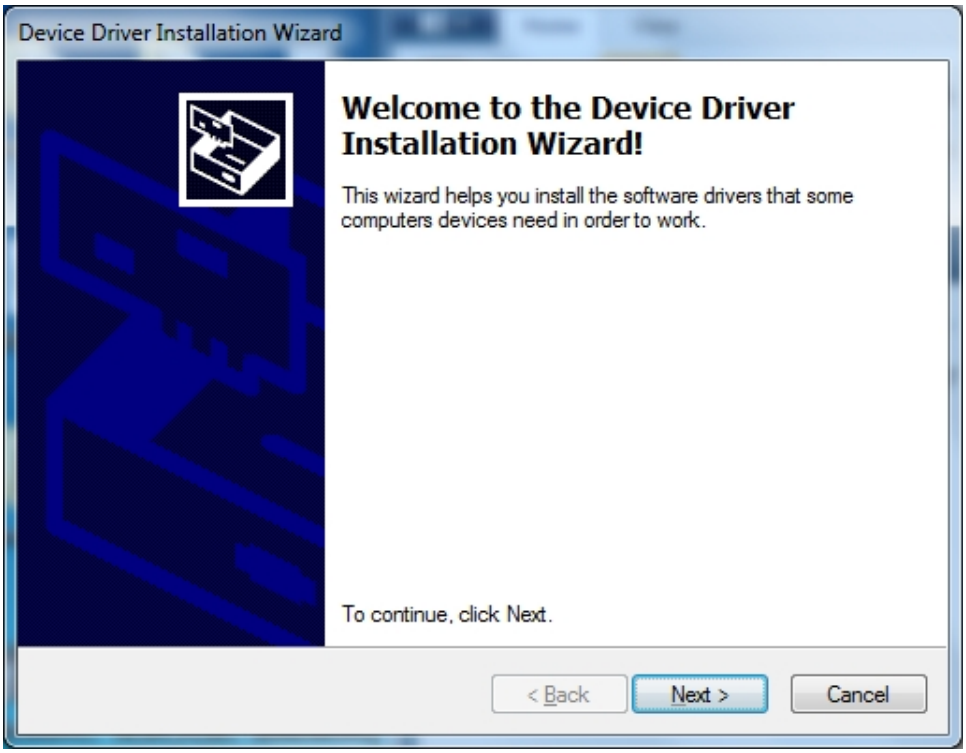


Figure: 34 - Enfora Driver Setup Utility Driver Installation

4. When prompted to install the device driver select the **Next** button.

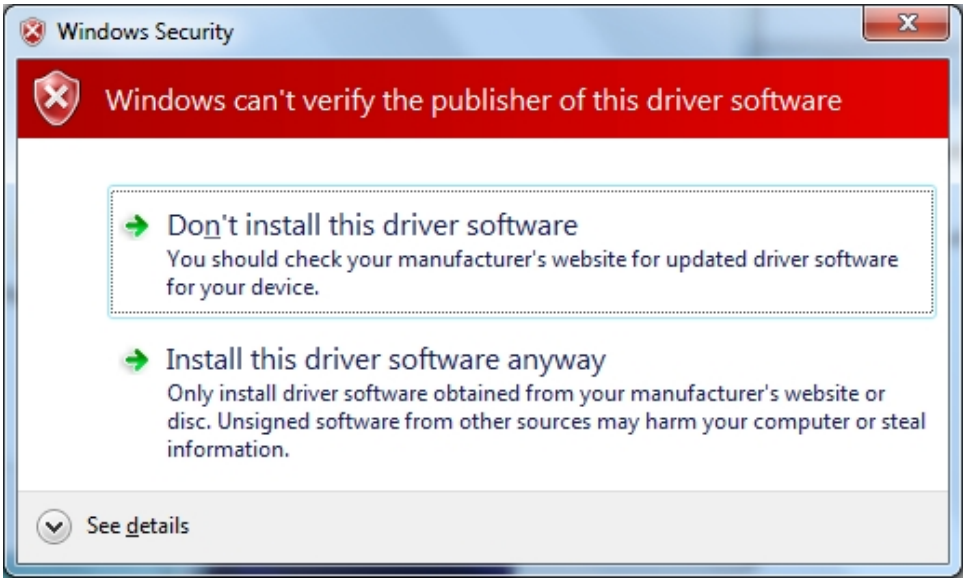


Figure: 35 - Windows Security Window

During the driver install phase you may be prompted to Continue or Stop installation due to potential compatibility issues. Select the **Install this driver software anyway** button.

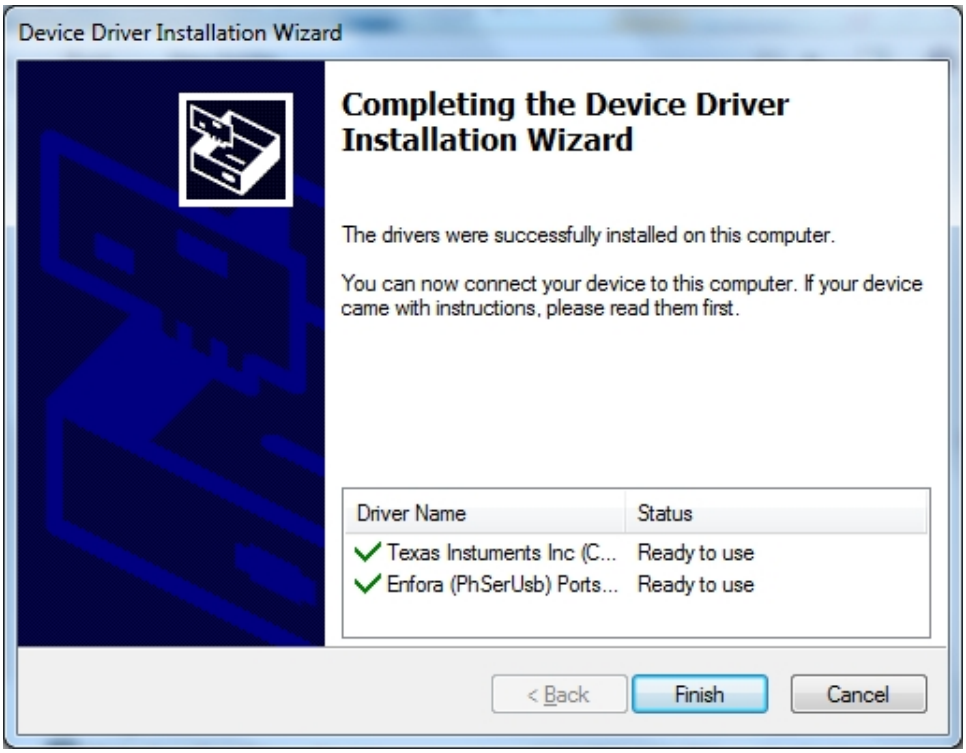


Figure: 36 - Enfora Driver Setup Utility Driver Install Completion Window

Upon completion of the installation the Enfora Driver Setup Utility Driver Install Completion Window is displayed.

5. If the Status displayes an issue click on the **Correct issues** button
6. At the "OK to apply fix" prompt, click on the **Yes** button.

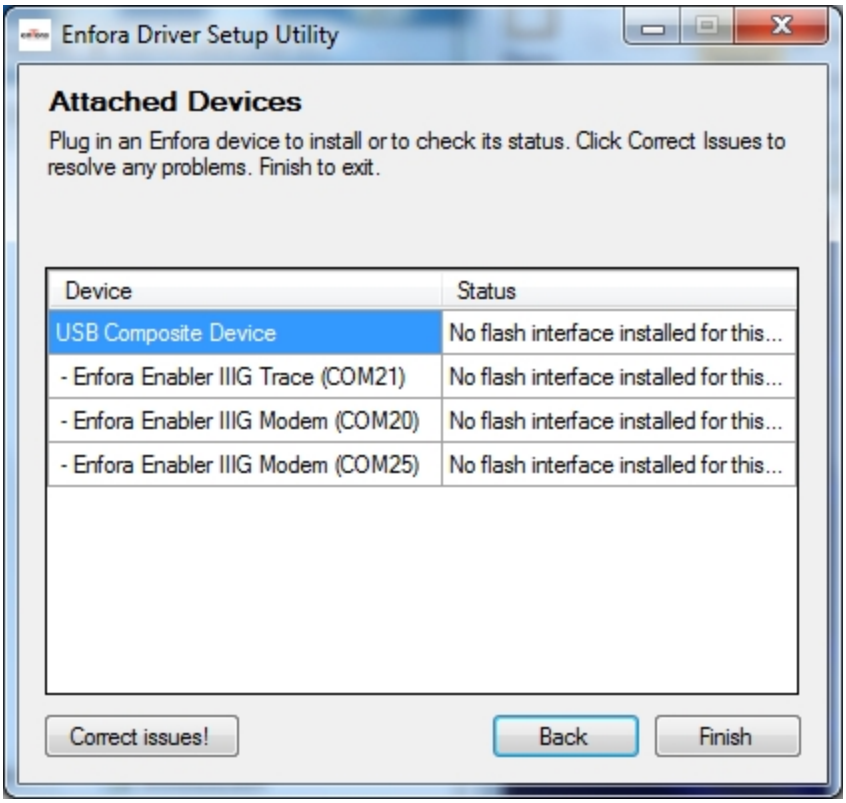


Figure: 37 - Enfora Driver Setup Utility Attached Devices Window

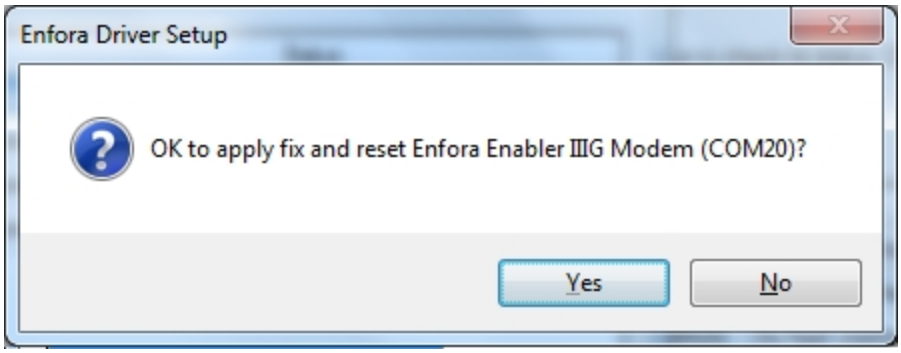


Figure: 38 - Enfora Driver Setup Utility Apply Fix Window

When the installation is complete the list of Attached Devices will be displayed within the Enfora Driver Setup Utility Attached Devices Window.

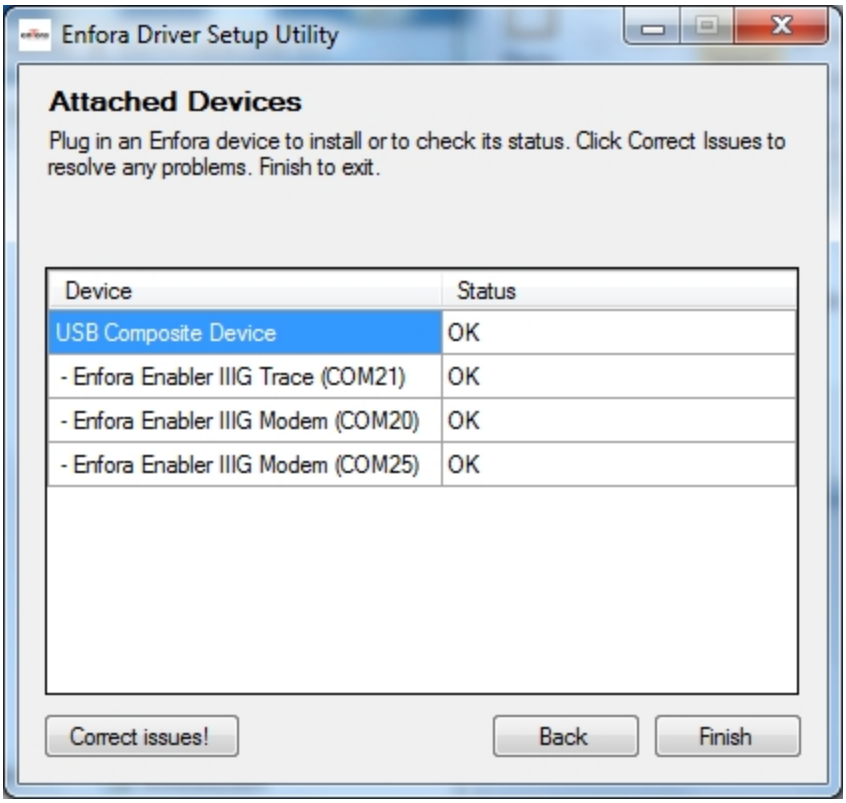


Figure: 39 - Enfora Driver Setup Utility Attached Devices Window

6 Network Test Procedure

6.1 Configure the Computer and Verify Correct Communications

Please refer to Enfora document ENF0001IN001 – USB Installation Guide for detailed instructions for installing USB drivers and connecting with the modem.

6.1.1 Configure the Device to Communicate with the Enfora Server

Note: In the following instructions, <CR> means using the Enter Key on the keyboard.

1. Connect and verify connectivity with the device.
    a. Connect the PC connector to the device.
    b. Type AT<CR>. The device should respond with OK.
        i. If you do not see the letters AT, send the following command to the device:
        ii. ATE1<CR>
    c. Type ATI<CR>. The device should respond with Enfora, Inc. If you get any different response, you are not connected to the Enfora device. See Figure: 40 - "ATI Response"

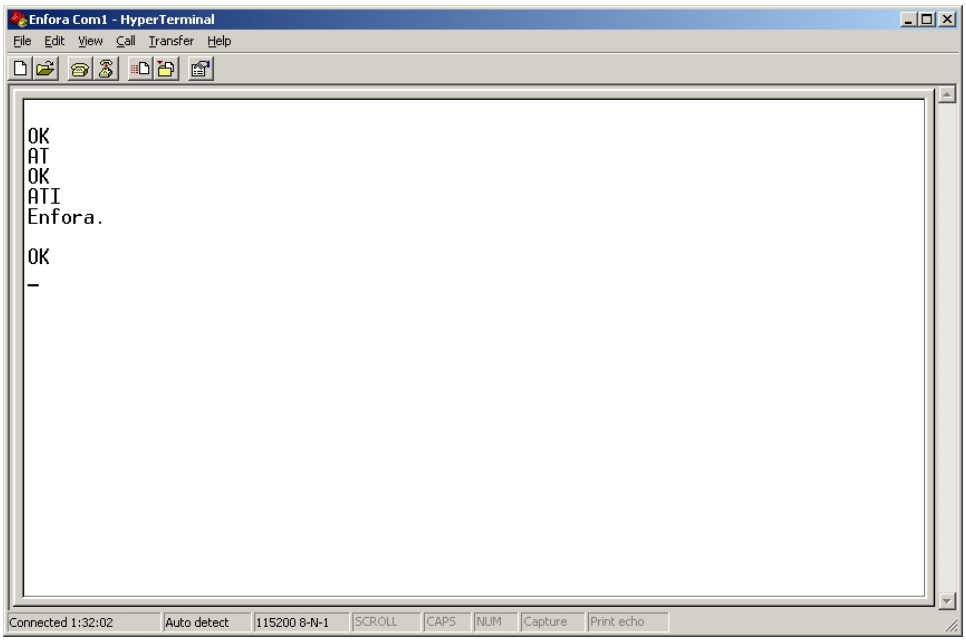


Figure: 40 - ATI Response

2. Configure the device to communicate with the Enfora Test Server.
   a. The following information will need to be obtained from the SIM provider. Please refer to GSM0000AN019 – Network Configuration Worksheet.
      i. APN
      ii. Username and password (If necessary.)
   b. Reset the device to factory defaults:
      i. To restore the device to factory defaults, send the following command: AT&F<CR>
      ii. To write current configuration to memory, send the following command: AT&W<CR>
      iii. To reset the device, send the following command: AT$RESET<CR>
   c. Configure the device to access the GPRS network.
      i. To configure the device with the proper APN, send the following command: AT+CGDCONT=1,"IP","apn"<CR> (substitute the letters "APN" for the supplied APN.)
      ii. To configure the device with the proper username and password, (if necessary) send the following command: AT%CGPCO=1,"username,password",0<CR> (substitute the correct username and password)
      iii. To configure the device to enable auto GPRS registration, send the following command: AT$AREG=2<CR>

Note: When the device is reset, Windows will detect the detachment of the device and you may have to close and reopen the communication program to reestablish communications with the device.

Verify GSM status by sending the following command:

`AT+CREG?<CR>`

If everything is working, you should receive one of two responses:

`+CREG: 0,1` (GSM registered to home network)

OR

`+CREG: 0,5` (GSM registered roaming.)

Verify GPRS status by sending the following command: AT%CGREG?<CR>

If everything is working, you should receive one of two responses:

`%CGREG: 0,1` (GPRS registered to home network)

Or

`%CGREG: 0,5` (GPRS registered roaming.)

See Figure: 41 - "Verify GPRS Status"

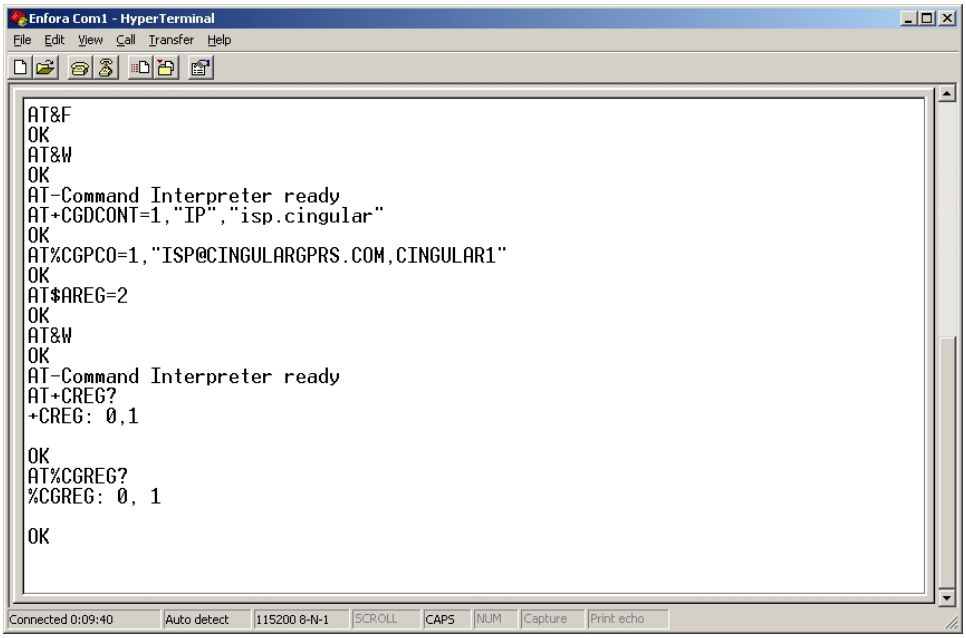


Figure: 41 - Verify GPRS Status

Verify GPRS activation by sending the following command: AT$NETIP?<CR>

If the response is non-zero, then everything is working.

See Figure: 42 - "Verify GPRS Activation"

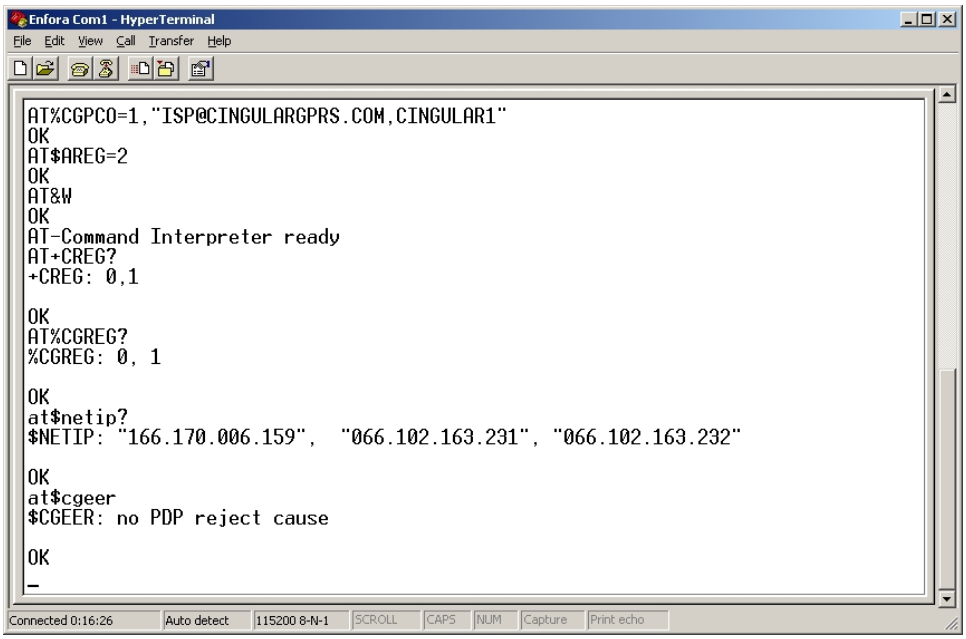


Figure: 42 - Verify GPRS Activation

If AT$NETIP returns all zeros, send the following command: AT$CGEER<CR>

There are three common responses:

- $CGEER: no PDP reject cause (Everything should be working OK)
- $CGEER: requested service option not subscribed (APN is incorrect or SIM has not been enabled for data mode.)
- $CGEER: user authentication failed (username and/or password is incorrect.)

Configure the device to access the Enfora Server.

To configure the device for server interoperability, several things have to be addressed:

- Most GPRS configurations are Mobile Originate only. The mobile device must initiate a conversation with a remote server before the remote server can talk to the device.
- IP addresses are dynamically assigned and can change.
- Some IP addresses are NAT and are non-routable IP addresses.

These issues are addressed with the following configuration commands.

The examples will use the following information:

- Modem ID/name = “MT_Test”
- Remote Server DNS address = apitest.enfora.com
- Remote Server IP port = 1721

1. Give the device a unique name send the following command:

```
AT$MDMID=”MT_Test”
```

This command, combined with the wakeup message, will allow the server to associate a Public IP address with a specific device and create a window of opportunity where the server can send commands to the device See Figure: 4 - "Wakeup Command"

2. To talk with a specific server send the following command:

```
AT$FRIEND=1,1,”apitest.enfora.com”
```

3. To set the port number send the following command:

```
AT$UDPAPI=,1721
```

4. To Enable periodic messages (wakeup) to be sent to the server every 60 seconds send the following command:

```
AT$WAKEUP=1,1
```

See Figure: 43 - "Wakeup Command"

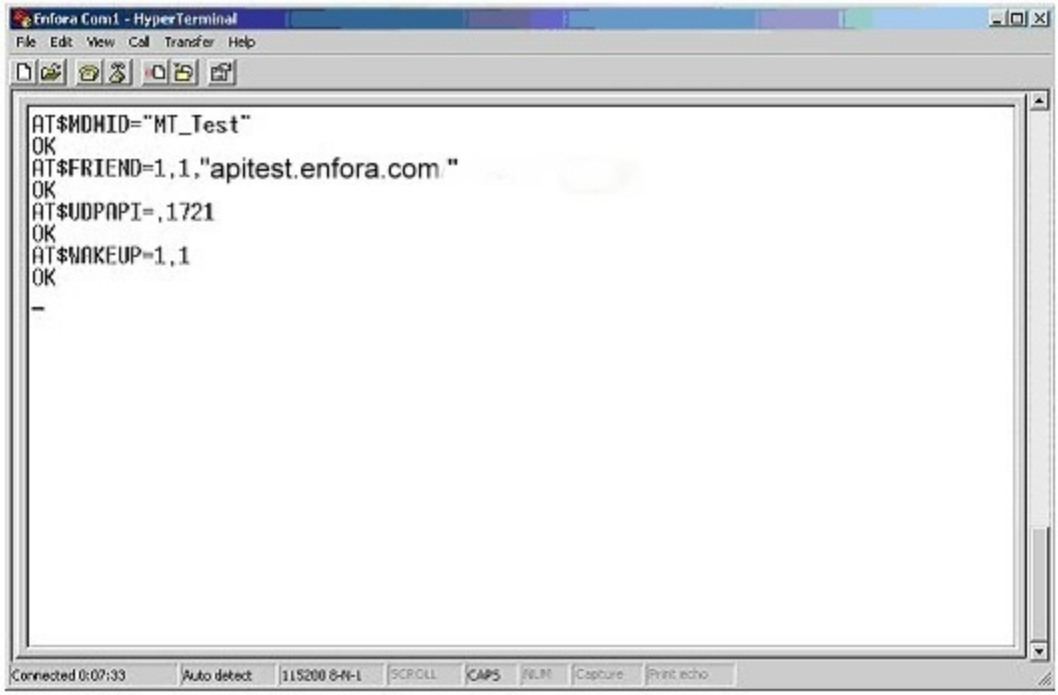
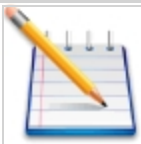


Figure: 43 - Wakeup Command

6.2 Verifying Server Connectivity



Note: For the following tests, Java Runtime must be installed on the computer. (To install Java Runtime, please visit the Java website: http://www.java.com/en/download/manual.jsp)

1. Start Internet Explorer and enter the following URL: http://apitest.enfora.com/udpapp/

2. Enter the name used in the MDMID command in the box. Select Connect See Figure: 44 - "Verify Server Connectivity"

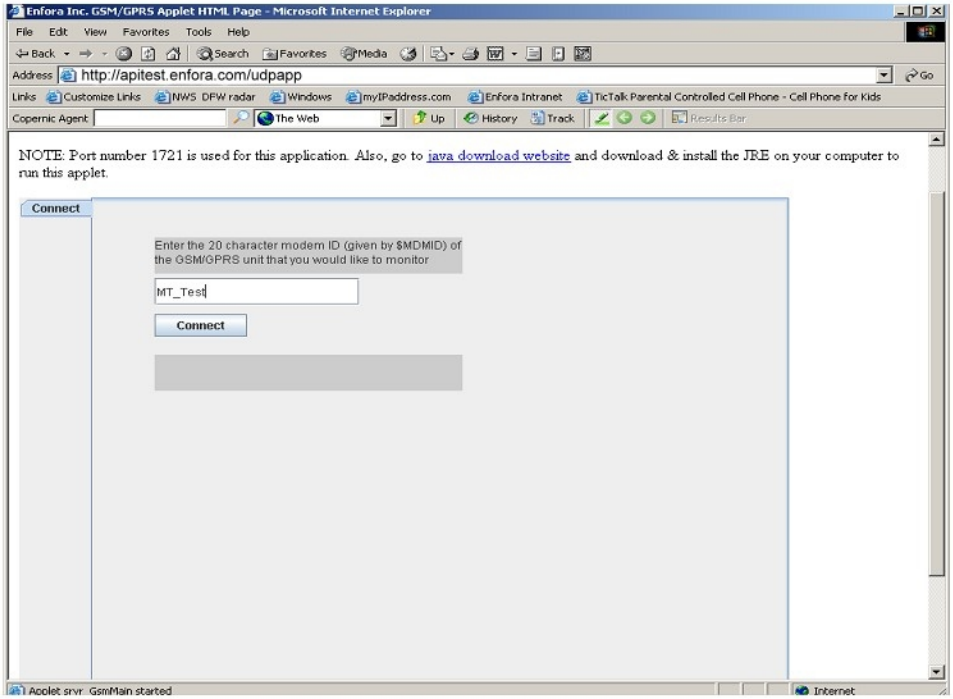


Figure: 44 - Verify Server Connectivity

3. Select the tab with the device name. (In this diagram it is labeled "MT_Test") Within approximately 60 seconds the wakeup messages should be seen in the window See Figure: 45 - "Wakeup Messages"

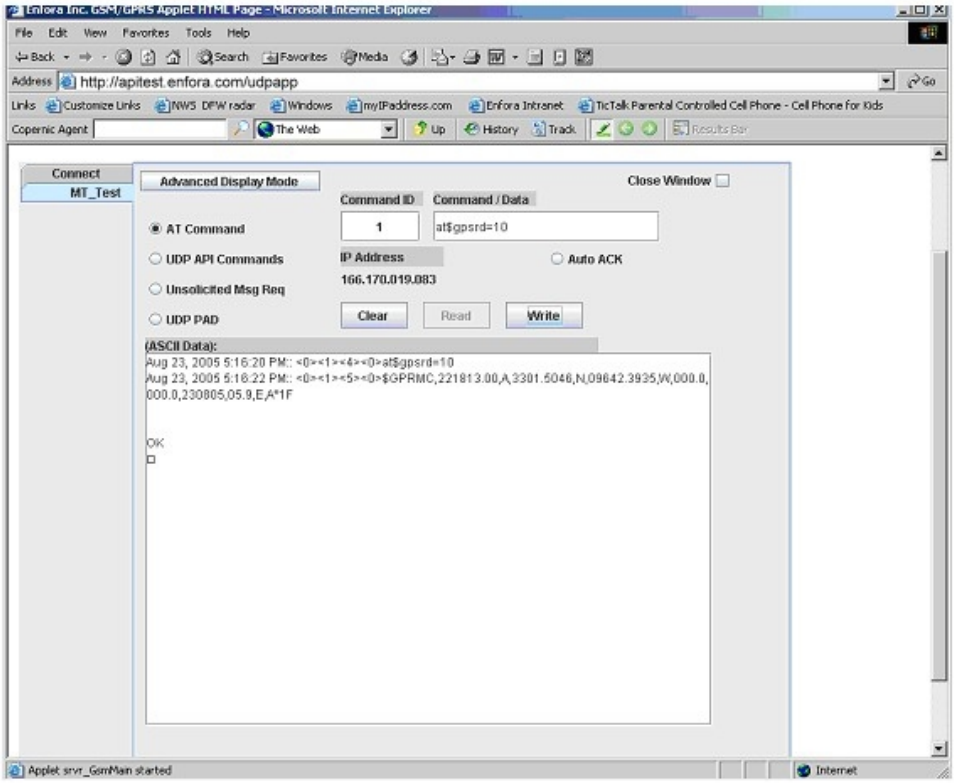


Figure: 45 - Wakeup Messages

4. Enter the following command in the command/ data block:

```
ATI
```

5. Select Write
6. Verify that you see the device respond with Enfora, Inc. See Figure: 46 - "ATI Response" . If so, you have successfully configured the device to talk with the server.

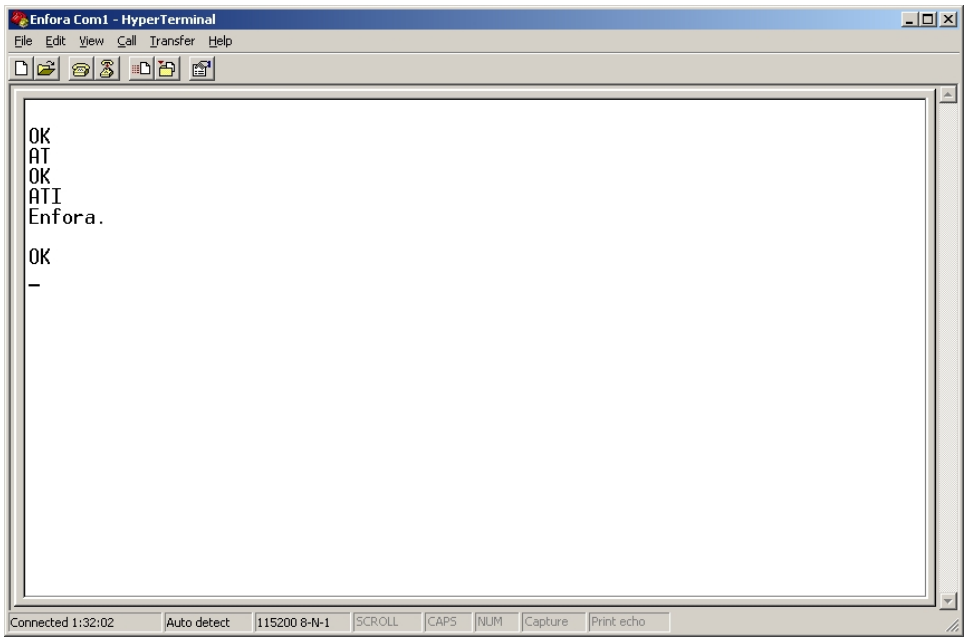


Figure: 46 - ATI Response

6.3 Verify GPS Operation

Follow these directions to verify GPS Operation.

1. From the terminal window, send the following command: AT$GPSRD=10<CR>
2. The device should respond with a standard GPRMC message that looks similar to the following: $GPRMC,221223.00,A,3301.5080,N,09642.3857,W,000.0,000.0,230805,05.9,E,A*19

- A = OK
- V = Warning
- 9 = Enfora Specific response that GPS solution is not valid and the last known GPS location is being substituted.

Here is an example of a GPRMC message without a GPS lock: $GPRMC,221553.30,V,,,,,,,,,,N*7C The same command can be used in the server application See Figure: 47 - "Verify GPS Operation" .

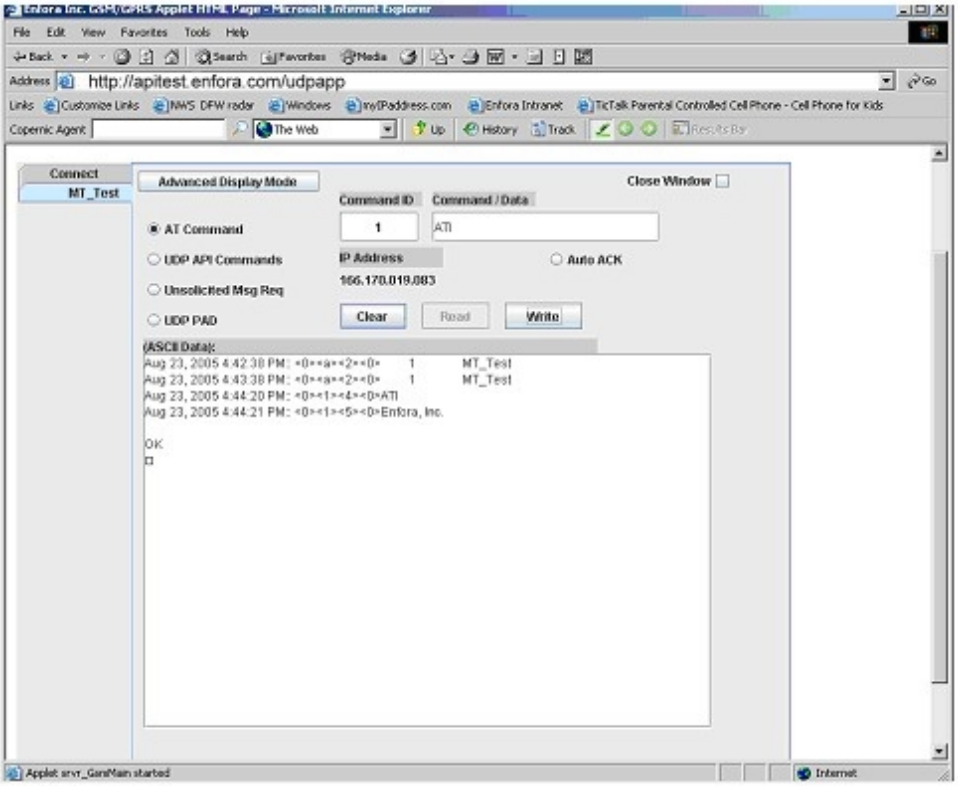


Figure: 47 - Verify GPS Operation

7 Glossary

A

Analog

Analog refers to signals that can represent an infinite range of numbers, as opposed to digital which can only be distinct whole numbers. Analog data often comes from measurements, like a sine wave. The sound a modem makes over the phone is analog since it can be any of a number of different frequencies. The fixed-line networks usually transfer analog data and fax. The GSM networks are Digital.

ANSI

ANSI graphics is a set of cursor control codes which originated on the VT100 smart terminal. Many BBS's use these codes to help improve the sending of characters to communications programs. It uses the escape character, followed by other characters, which allows movement of the cursor on the screen, a change of color, and more.

ASCII

American Standard Code of Information Interchange. It uses 7 bits to represent all uppercase and lowercase characters, as well as numbers, punctuation marks, and other characters. ASCII often uses 8 bits in the form of bytes and ignores the first bit.

ASCII transfer

When a text file is sent directly as it is, without any special codes.

Asynchronous Transmission

Transmission method in which the intervals between transmitted characters may be unequal of length. Transmission is controlled by start and stop bits at the beginning and end of each character. This way, if there is line noise, the modem can find out right away where the next byte should start.

AT commands

AT is a contraction of attention, a command used to program SmartModems from Hayes Microcomputer Products. AT commands program a variety of modem hardware settings and were adopted by other modem manufacturers who wanted to market their wares with the coveted phrase Hayes-compatible. At one time, you couldn't call yourself an online aficionado if you didn't

know that ATL0 turned your modem speaker way down and ATM0 turned it off. Now the commands are usually hidden under a menu option in your communication software.

Auto Reliable

The ability of a modem to be able to communicate both with modems that do have error-control and/or data compression, and those that do not.

B

Bandwidth

The difference between the upper and lower limits of a band. A range of radio, audio, or other frequencies. Since it is so limited, a modem must carefully change data into sounds that "fit" within this range. Similar to frequency spectrum. Bandwidth of a voice channel is 3000Hz-300Hz which equals 2700Hz. Telephone lines have a bandwidth from 300 hertz to 3400 hertz.

Baud

A term referring to the speed at which modems communicate. Technically, it is the number of changes in an electronic signal per second. Since the number of changes used to be the same as the number of bits sent or received per second, bps and baud are often used interchangeably. However, there is a difference, which is very often confused. For example, many 1200bps modems were advertised as 1200 baud, even though they operate at 600 baud. They send out 2 bits 600 times a second, which means that it is 600 baud. However, since it is so often misunderstood, you can assume that when you see "baud" it means bits per second, unless it is stated otherwise. The term comes from the scientist J. M. E. Baudot.

BFT

Binary File Transfer

Bit

A Binary digIT. It is a number in base 2 (binary), which means that it can only be a 0 or a 1. It is used in the expres-sion `bits per second'.

Block size

When used with either error control or data compression protocols, refers to the number of characters to be sent at one time. If error control is used, the codes are sent immediately following this block. Typical block sizes are 64, 128, 192, or 256 characters. Small block sizes are better when the line quality is bad (such as for long distance calls), while large block sizes are better during good connections (such as for local calls).

bps

Bits Per Second. The transmission speed of most modems is measured in baud or bps. Bps is literally the number of bits sent by the modem every second.

byte

A group of 8 bits. It usually represents one character.

C

Carrier Detect

The information as to whether or not the modem senses a carrier, like a fixed-line dialling tone or a data/fax services enabled on a GSM subscription.

Carrier Detect Threshold

A way of measuring how well a modem can detect valid data over noisy phone lines. It is measured in negative dBm's (decibel-milliwatts). The bigger the number (the more negative) the better. For example,45 dBm is better than40 dBm.

CCITT

Consultative Committee International on Telephones and Telegraphy. Used to set standards for modems. Replaced by the ITU.

CDMA

Code Divison Multiple Access. A digital cellular technique invented by Qualcomm.

Cell

The receiver/transmitter a GSM phone connects to; the equivalent of the base station of a cordless phone. A cell can support a number of simultaneous calls.

Cell Broadcast

Cell Broadcast is designed for simultaneous delivery of messages to multiple users in a specified area.

Checksum

A number that represents a larger group of numbers in order to check for errors in data transmission. It is commonly used when downloading a program, as well as in error control protocols. The checksum is the result of a mathematical equation, such as adding all the numbers in a block together.

CLIP

Caller Line ID Presentation. A code that is sent over the phone lines in some areas when a person makes a phone call. This code includes the phone number of the person making the call. Some modems are able to understand this signal, and let you know who is calling you before you answer the phone.

CLIR

Caller Line ID Restriction. The ability to block someone who you're calling from seeing your number.

CODEC

COmpressor/DECompressor, the chip inside every digital GSM cellphone that allows the cellphone to tranmsit voice data at high efficiency and speed across the GSM cellular network. The CODEC will trip redundant voice data like when neither party is talking allowing more effcient use of scarse bandwidth.

Compress

To make data take up less space. Archiving programs do this, which means that files will take less time to transfer with modems. Many modems now have the ability to automatically compress the information they send and receive.

CTS

Clear To Send. This is when the modem lets the other computer know that it can send information to the other computer.

D

Data Transmission rate

The speed at which data travels. For example, data may be sent at 115,200bps. Same as transmission rate, transmission speed, data rate.

dBm

Decibel refers to one milliwatt. This is used to measure certain levels, such as transmit level.

DCE

Data Circuit Terminating Equipment. Sets up and maintains a data connection link over a communications medium. For example, a modem.

Digital

A system using discrete numbers to represent data. In computer systems, these are the numbers 0 and 1 (for binary).

DRX

Discontinuous Reception

DTMF

Dual Tone Multi-Frequency. This is used in tone dialing. It is a method where 2 distinct tones are sent for each digit dialed.

E

EEPROM

Electrically Erasable Programmable Read-Only Memory.

E-mail

Electronic mail. Messages that are sent to individual people. You choose who to send the message to and only that person receives the message.

F

FAQ

Frequently Asked Questions.

Flow control

A method of controlling when information is sent. One method is Xon/Xoff, where a BBS will send information until your computer sends an Xoff (CTRL-S). It will resume sending information when you send an Xon.

Full Duplex

A channel providing simultaneous transmission in both directions.

G

GSM

GSM originally stood for Groupe Speciale Mobile but has been anglicised to Global System for Mobile Communications, an international digital cellular standard.

H

Half Duplex

A channel which signals in both directions, but not simultaneously.

Handover

What occurs when a cell phone used in a car moves out of the range of one cell and needs to connect to the next available cell. The preceding cell then hands over the connection to the stronger cell.

Hertz

A unit of frequency, which equals cycles per second.

I

ISO

The International Standards Organisation, the body responsible for setting world technical standards. It is based in Geneva, Switzerland.

ITU

International Telecommunications Union, based in Geneva, Switzerland.

M

MO/MT

Mobile Originated/Mobile Terminated. Mobile Originated: Device sending the message is mobile. Mobile Terminated: Device receiving the message is mobile.

Modem

A MOdulator DEModulator computer peripheral which allows a computer to communicate over telephone lines. This is the heart of computer telecommunications. The main factor that differentiates modems is their speed, measured in bps. Analogue modems talk to one another by converting digital info from the computer into tones called PSK's.

Modulation

A process whereby a signal is transformed from its original form into a signal that is more suitable for transmission over the medium between transmitter and receiver.

N

Network Operators

The companies who install and maintain GSM cellular networks. Click here to see a list of GSM operators around the world.

P

PABX

Private Branch Exchange. This is the telephone system that many offices have, allowing extensions for each telephone, and a connection to the main telephone system.

Parity Bit

Most modems have the capability to send an extra bit for every byte sent, which is used to help sense errors. This is called the parity bit. It can be set to no parity, mark parity, space parity, odd parity or even parity.

PDU

Protocol Data Unit. Information delivered as a unit that may contain control information, address information, or data.

PSTN

Public Switched Telephone Network. This is the regular phone lines that just about everybody uses.

Pulse dialing

A method that some phones use to dial numbers. It involves a series of "clicks." Most modems support this type of dialing, which is the only type available in some remote areas. The other method of dialing is tone dialing.

R

Reset

A modem can be reset. This will change any options (such as parity and speed) to the values that they have when the modem is first used. This can be useful if you change some values for the modem and aren't sure what they do, and then you find that the modem won't work. Resetting the modem will fix everything for you. With Enfora modems, this is the ATZ command.

S

Serial Transmission

A method of transmitting data in which bits are sent sequentially.

SIM

Subscriber Identity Module. This is a Smart Card installed in every GSM handset. Within the GSM application the three primary roles of the SIM are access control to the network (authentication & ciphering), service personalisation (SMS, advice of charge, etc.), network branding and advertising (graphics printed on SIM card). The new generation of Phase 2+ SIMs will enable services such as virtual cash, mobile banking, ticket reservations etc.

SMS

Short Message Service will display a pager-like 160 character message in the LCD panel on the phone. Your phone must support SMS.

T

TDMA

Time Division Multiple Access, the magical technique used by the digital GSM network to squeeze more calls onto one channel by dividing a calling channel into a few "discontinuous" pieces.

Tone Dialing

This is a method that a phone or modem can use to dial a phone number. It uses one audible tone per digit to be dialed.

U

UART

Universal Asynchronous Receiver/Transmitter. This is a device in a computer or modem that will change serial data (the way data comes in over the phone line) to parallel, and vice versa.

X

Xoff

The CTRL-S character. This is often used to pause information that is being sent. The information will be continued when an CTRL-Q is received.

Xon/Xoff

The flow control method using the Xon and Xoff characters. It is built into the software, not the hardware.