Users Guide:
GSM2238UG001

Enfora® MT-µL
Users Guide
Revision 1.00

Enfora, Inc.
www.enfora.com

Document Title:	Enfora MT-µL Users Guide
Revision:	1.00
Date:	11/15/2007
Status:	Released
Document Control ID:	GSM2238UG001

General

All efforts have been made to ensure the accuracy of material provided in this document at the time of release. However, the items described in this document are subject to continuous development and improvement. All specifications are subject to change without notice and do not represent a commitment on the part of Enfora, Inc. Enfora, Inc. will not be responsible for any loss or damages incurred related to the use of information contained in this document.

This product is not intended for use in life support appliances, devices or systems where a malfunction of the product can reasonably be expected to result in personal injury. Enfora, Inc. customers using, integrating, and/or selling this product for use in such applications do so at their own risk and agree to fully indemnify Enfora, Inc. for any damages resulting from illegal use or resale.

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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 GSM2000 MT-µL 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 GSM2000 MT-µL 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 - $C\,\epsilon$

The GSM2238 MT-µL 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 GSM2000 and the integrated GSM0108 module.

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.

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LIMITED WARRANTY

Enfora warrants to the original purchaser of the product that, for a period of one (1) year from the date of product purchase, the product hardware, when used in conjunction with any associated software (including any firmware and applications such as the modem manager) supplied by Enfora, will be free from defects in material or workmanship under normal operation. Enfora further warrants to such original purchaser that, for a period of ninety (90) days from the date of product purchase, any software associated with the product will perform substantially in accordance with the user documentation provided by Enfora, and any software media provided with the product will be free from defects in material or workmanship under normal operation. Enfora does not warrant that the product hardware or any associated software will meet the purchaser's requirements or that the operation of the product hardware or software will be uninterrupted or error-free. This limited warranty is only for the benefit of the original purchaser and is not transferable.

During the warranty period applicable to the product hardware, Enfora, at its expense and in its sole discretion, will repair or replace the product if it is determined to have a covered hardware defect, provided that the purchaser first notifies Enfora of any such defect, furnishes Enfora with a proof of purchase, requests and obtains a return merchandize authorization (RMA) number from Enfora, and returns the product, shipping charges prepaid, to Enfora under that RMA. If, upon reasonable examination of the returned product, Enfora does not substantiate the defect claimed by purchaser, or determines that the defect is not covered under this limited warranty, Enfora will not be required to repair or replace the product, but may instead reship the product to the purchaser, in which case purchaser shall be responsible for paying Enfora's usual charges for unpacking, testing, and repacking the product for reshipment to purchaser. Purchaser shall bear the risk of loss or damage in transit to any product returned by purchaser to Enfora, or any returned product not found to be defective or covered under this warranty and reshipped by Enfora to purchaser. In the event Enfora repairs or replaces a defective product, the repaired or replacement product will be warranted for the remainder of the original warranty period on the defective product. If Enfora is unable to repair or replace a defective product, the purchaser's exclusive remedy shall be a refund of the original purchase price. Any returned and replaced product, or any product for which Enfora has refunded the original purchase price, becomes the property of Enfora.

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Enfora shall have no obligation under this limited warranty for (a) normal wear and tear, (b) the cost of procurement of substitute products or (c) for any defect that is (i) discovered by purchaser during the warranty period but purchaser does not notify or request an RMA number from Enfora, as required above, until after the end of the warranty period, (ii) caused by any accident, misuse, abuse, improper installation, handling or testing, or unauthorized repair or modification of the product, (iii) caused by use of any software other than any software supplied by Enfora, or by use of the product other than in accordance with its documentation or (iv) the result of electrostatic discharge, electrical surge, fire, flood or similar causes.

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In some instances, the product may also be covered by another limited warranty contained in a separate written agreement between Enfora and the distributor or reseller, if any, from whom purchaser purchased the product. That other limited warranty may provide, for example, a longer warranty period or a different product return procedure that may also be available to purchaser.

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.

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1. Objective

The objective of this document is to provide the user with basic information on how to configure the MT-µL and verify communication with Enfora's UDPAPI test server.

2. Equipment Needed

In this example the requirements are:

- GSM2238 MT-µL
- Enfora Serial / Power cable Part number GSM2238MG010
- Power supply, 12 VDC, 3A
- GSM quad band antenna
- GPS 3.3v Active antenna
- Computer with one available Serial port or USB-to-serial converter
- GSM/GPRS SIM with GPRS data enabled.
- An APN (Access Point Name).
- Username and Password, if GPRS is operating on a non-transparent network.

Note: *If you don't know the name of the APN you need to use, please contact your cellular network carrier for that information. Once you have acquired this information, please complete **Application Note GSM0000AN019 – GSM Network Configuration Worksheet** and keep this worksheet for future reference.*

3. References

- GSM0107AT001 - Enabler-IIG AT Command Set
- GSM0000AN019 – GSM Network Configuration Worksheet
- GSM2000CB001 - Mobile Tracker Event Cookbook
- GSM2000AT001 - Mobile Tracker AT Command Set

4. Product Specifications

System Requirements		Application Interface
L x W x H:	63.5 x 63.5 x 24.4 mm (Excluding connectors)	• Host Protocols: PPP, AT, UDP, TCP/IP
Housing:	Seamless Aluminum Extrusion	• Internal Protocols: UDP (PAD), TCP(PAD)
TX Power:	Class 4 (2W @850/900 MHz) Class 1 (1W @1800/1900 MHz)	• API Control/Status: AT or UDP(PAD), CMUX
Slot Class:	MS10(4RX/2TX, 5 MAX)	• Friend's IP Feature

Application Interface (continued):
- • 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
  - - Max Speed — - Virtual Odometer

Band Operation	SIM Card / Interface / I/O

GSM2238 (850/900/1800/1900)	• FAKRA Blue Coding C Antenna Connector for 3.3 Vdc GPS
	• External SIM accessible via end cap
	• 2.5mm Audio connection/1 Audio Input/Output
	• FAKRA Bordeaux Violet Coding D Antenna Connector for GSM
	• 3 Pin I/O – 2 Input, 1 Output
	      3 LED Status indicators
	      1 Ignition Sense

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
		Note:	Battery should only be charged between 0 and 50 degrees Celsius

GSM Functionality		Status Indicator
Voice:	Full Rate, Enhanced full rate and half rate, AMR (GSM2238)	• Power ON
CS Data:	Asynchronous, transparent and non transparent up to 9.6 KB	• Registration Status • GPS Status
GSM SMS:	Text, PDU, MO/MT, Cell broadcast	• User Defined

Certification (Pending)

GSM2238

FCC:	Parts 2, 15, 22, & 24		
GCF:	2.21.1		
PTCRB:	3.7.1		

Industry Canada
CE Mark
Emark
RoHS Compliant

Power

DC Voltage: 6 - 40 VDC

MT-µL 2238 BAND	**@ 13.8V MODE**	**Avg (mA)**	**Peak (A) @ (dBM)**
GSM 850& 900	1TX/1RX	390	0.600 @ 32.5
	1RX	180	
	Idle	65	
GSM 1800& 1900	1TX/1RX	400	0.570 @ 30.0
	1RX	190	
	Idle	55	

GPS Functionality

- • FAKRA Blue Coding C Antenna Connector for GPS
- • Supports 3.3V Active Antenna
- • GPS Protocols: NMEA, TAIP, Enfora binary
- • Stored GPS Messages Feature

Part Number

GSM2238   850/900/1800/1900

5. Procedures

5.1. MT-µL Panel Descriptions

1. Front View

Figure 1 – MT-µL Front View

2. Rear View
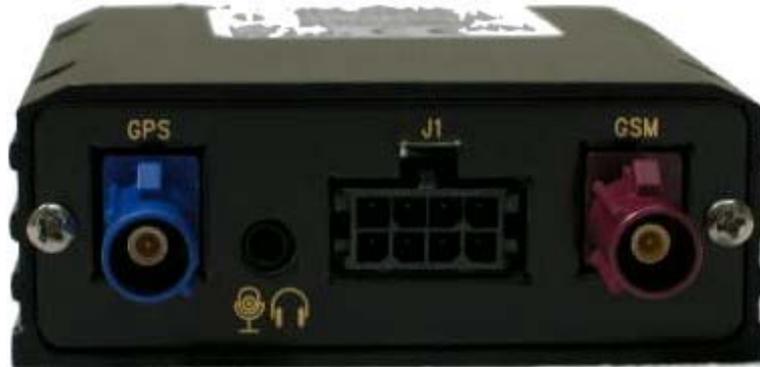
Figure 2 – MT-µL Rear View

6. Installation

Instructions provided in this section describe the hardware installation of the MT-µL device. To install the MT-µL 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-µL 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-µL in the drilled holes and secure it with mounting screws

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

6.1. Mounting Dimensions
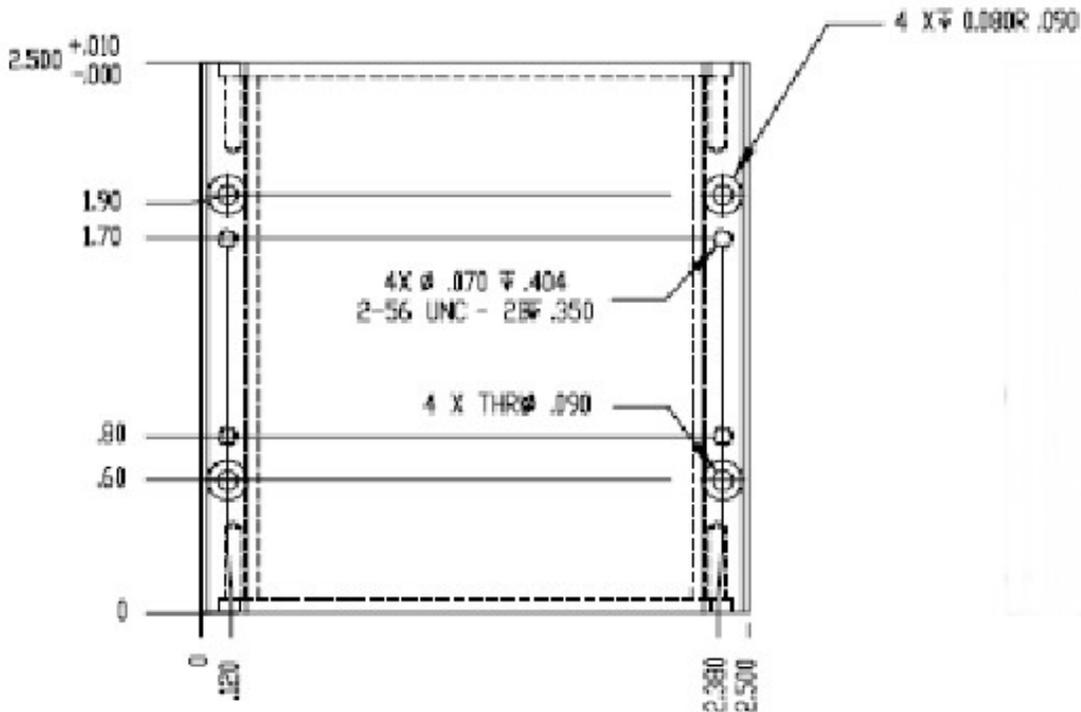
Figure 3 - Mounting dimensions of a MT-µL

6.2. Installing Cables

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

- Remove power from the MT-µL.
- 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

7. Eight (8) Pin Connector

The user can purchase the optional eight (8) pin external I/O connector for the Enfora MT-µL that can be used to interface with other devices. Enfora can provide an optional cable and connector (Part #CAB2238). The user also has the option of building his/her own cable. Table 1 describes the pin functionality for this 8 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	Switched Power (Ignition)
Pin – 2	Serial Data In (RS232)
Pin – 3	Serial Data Out (RS232)
Pin – 4	Ground
Pin – 5	Unswitched Power (Battery)
Pin – 6	User Controlled I/O
Pin – 7	User Controlled I/O
Pin – 8	User Controlled Output

Table 1 - 8 pin I/O Connector Interface
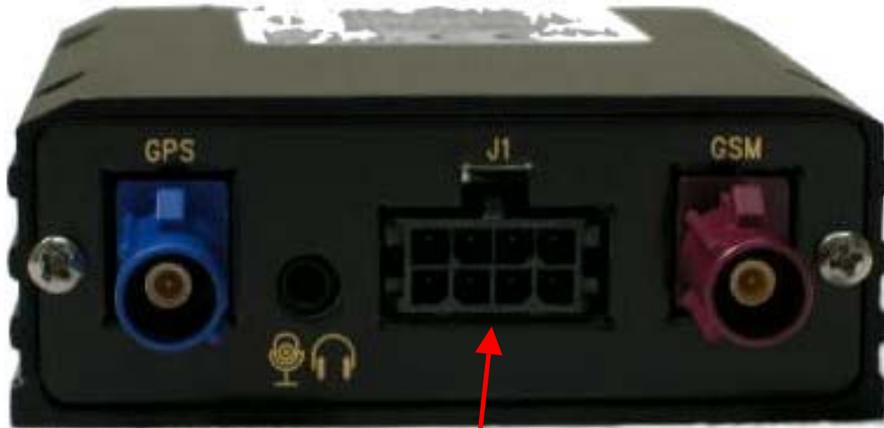
Figure 4 - I/O Connector

8. MT-µL Cables and Connections

8.1. MT-µL Serial Adapter (Optional)

Enfora P/N CAB2238 can be used to provide a standard serial interface for the MT-µL. This cable provides a standard DB9 serial interface and power to the unit. The cable would be used for loading new software onto the MT-µL.

> **Note:** *Only five of the pins are used; ground, serial in, serial out, vehicle power and ignition.*
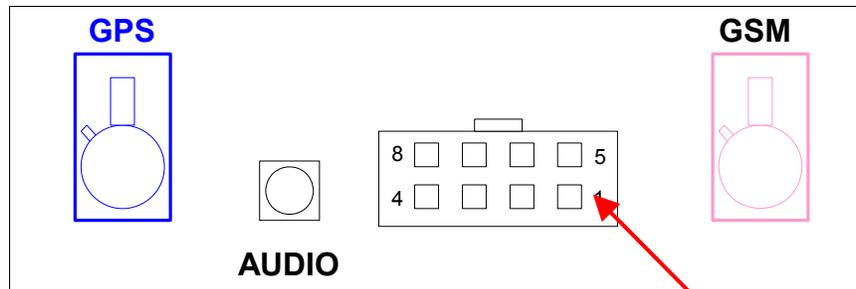
Figure 5 - 8-Pin Connection

Pin Number One

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:

Connector: Manufacturer: Molex Part Number: 43025-0800	
Pins: Manufacturer: Molex Part Number: 43030-0008 20-24 AWG 43030-0011 26-30 AWG	
Crimp Tool: Manufacturer: Molex Part Number: 63811-2800	
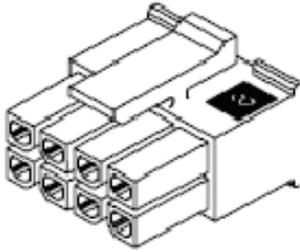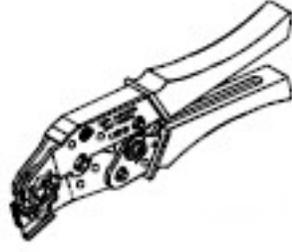
Table 2 – Cable Assembly Parts

8.2. Preparing the Power and Serial Communications Cable

Use a factory-built wiring harness (CAB2238) with serial data option or build a wiring harness according to the following schematic.
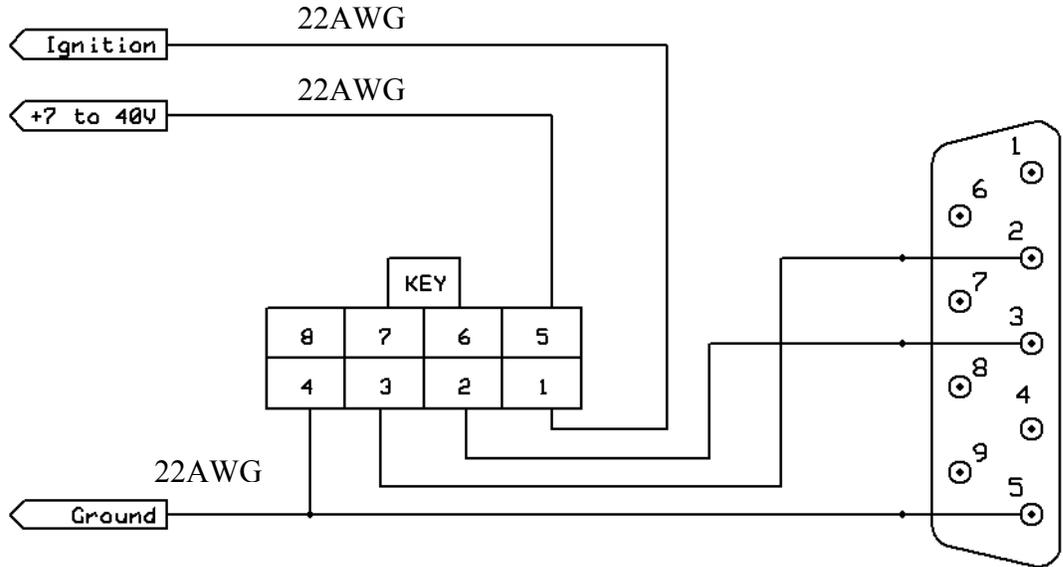
Figure 6 – Wiring Schematic

8.3. Preparing a Power-Only Cable

A cable may be manufactured that provides only power to the MT-µL as shown in the following schematic:
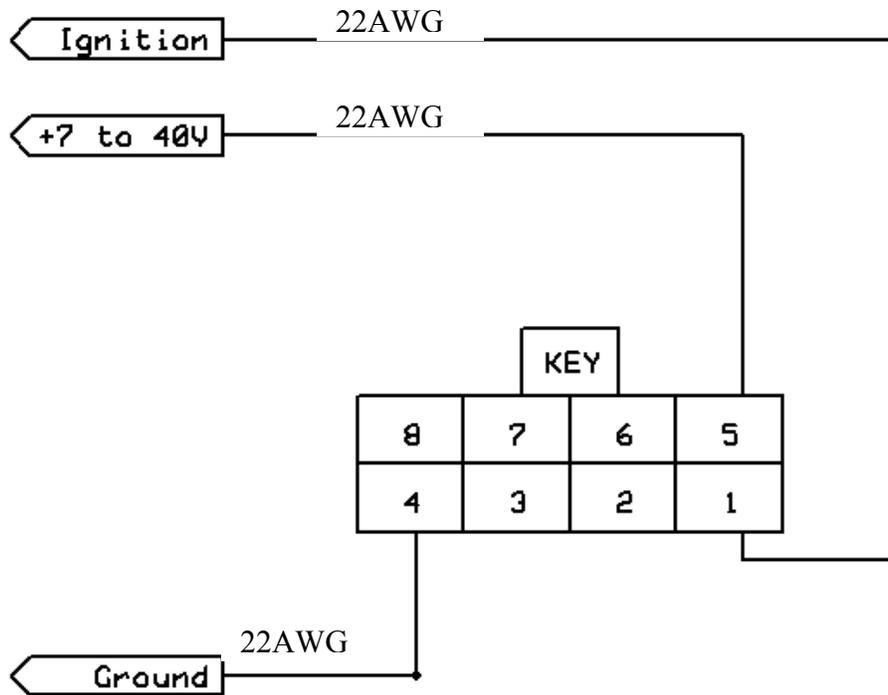
Figure 7 – Power-Only Cable Schematic

8.4. Connecting the GSM/GPRS Antenna

1. Choose an antenna that is designed for the frequency band the in which the MT-µL is currently going to operate. The antenna jack is a standard FAKRA Bordeaux Violet connector.

> **Note:** *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 dB for optimum performance.*

2. Attach the GSM/GPRS antenna to **GSM** jack.

GPS Antenna Jack

GSM/GPRS Antenna Jack

Figure 8 – GSM/GPRS Antenna

8.5. Connecting the GPS Antenna

The GPS receiver inside the MT-µL provides power to 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. The GPS antenna connector on the MT-µL model is a FAKRA Blue connector. The GPS antenna must be placed in an area where it can have direct view of the sky.

GPS
Antenna Jack

Figure 9 – GPS Antenna

1. Install the GPS antenna to the GPS jack on the MT-µL modem.

2. After a couple of minutes, the GPS status LED should switch to solid red. When this happens, the GPS receiver has enough information to track the current position.

8.6. Inserting the SIM and Applying Power

Insert the SIM per the Following Procedure:

Note: *The SIM card is not provided with the MT-µL 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. Without the SIM installed, MT-µL modem is limited to emergency voice communication only.*

1. Insert the SIM into the SIM Slot with the notch going into the slot first, and facing toward the left side of the MT-µL.

SIM Slot   SIM Lock
                              Switch

Figure 10 – SIM Slot and SIM Lock

2. Slide the SIM Lock Door to the left to lock the SIM into the holder.

Install the power cable as described in the following procedure:

Insert power cable

Figure 11 – Power Cable

1. Hook up the MT-µL to a 12 Vdc power source and apply power.
2. The **GPS Power LED** should be solid red and the **User 1 LED** should start blinking green.
3. Once the MT-µL attaches to the GSM network, the` **User 1 LED** should go solid green. If the **User 1 LED** stays blinking, then there is a problem with the SIM or cellular reception.
4. Once the MT-µL acquires a GPS fix, the **User 2 LED** will be solid red.

9. Connecting the Power Source

The GSM/GPRS MT-µL has an input voltage range of 6 – 40 V DC. The power and ignition pins can support 6 – 40 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-µL caused due to user error.

The MT-µL (GSM2238) is designed to operate from 6 to 40 VDC. The user is responsible for ensuring the voltage supplied to the MT-µL 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-µL.

o   Connect the power and ground wires of the MT-µL to the battery leads. The MT-µL will always remain ON as long as the battery lasts.

o   The MT-µL will be non-operational when the input voltage and current requirements are not met (battery drains).

o   Connect the Ignition wire to a switched source that receives positive voltage when the ignition is on.

o   Device goes through a reset upon ignition on.

9.1. LED Operation

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

GPS PWR: Indicates power to the GPS module. LED is on when power is turned on and the GPS module is operational. LED is off when power is removed or when the MT-µL enters standby mode.

User LED 1:   This LED can be configured to display registration, 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.

10. Configure the Computer and Verify Correct Communications

Note: *The following examples use Windows 2000 and HyperTerminal. Any Terminal program should work, using the parameters in Step 1.*

1. Default Serial Parameters

   a) 115200 baud rate
   b) 8 data bits
   c) 1 stop bit
   d) No Parity
   e) Flow Control = None

2. Determine which Com port to use

   a) On older computers, there is usually a built in Com port. This is normally Com1.
   b) If you are using a USB-to-serial converter, you will need to determine which Com port it is installed on.

      Note: *If the USB-to-serial converter has not been installed, install the necessary drivers per the instruction supplied by your USB-to-Serial device. Then leave the device unplugged.*

   c) Open up the System Properties window. This is done through the Control Panel > System or right-click on My Computer and select Properties. Select the Hardware Tab. On Windows 2000 the screen looks like the following:
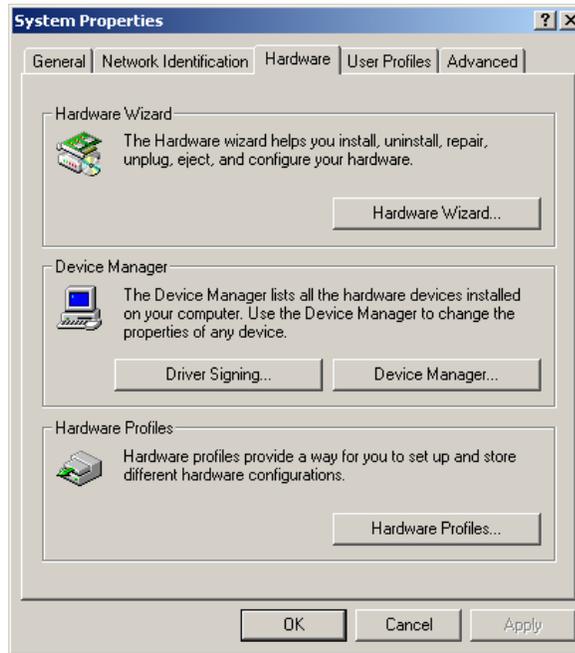
d) Select the Device Manager button. Expand the Ports section by selecting the + sign beside Ports. Your window should look like the following:
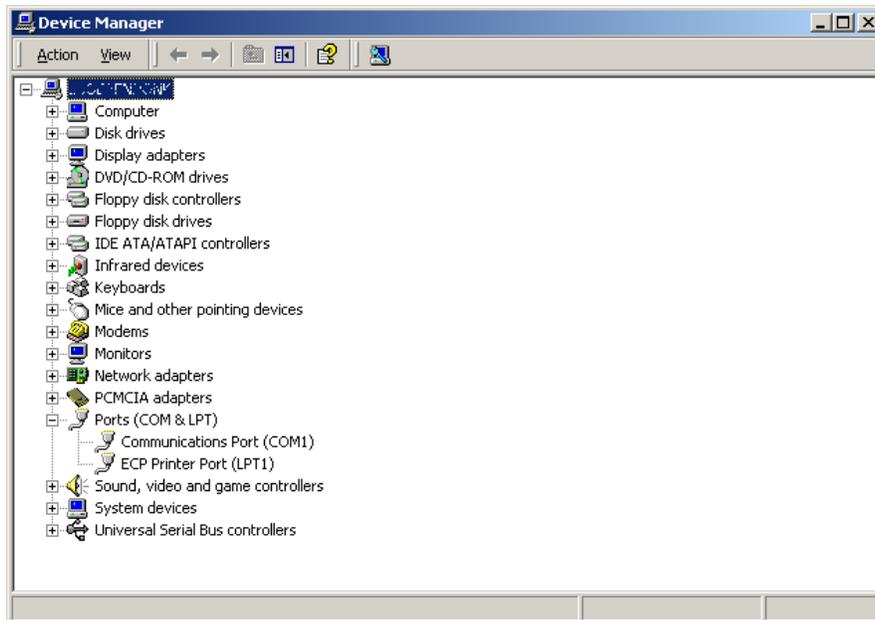
e) Plug in the USB-to-Serial converter. The window should change to show the USB-to-Serial converter installed.
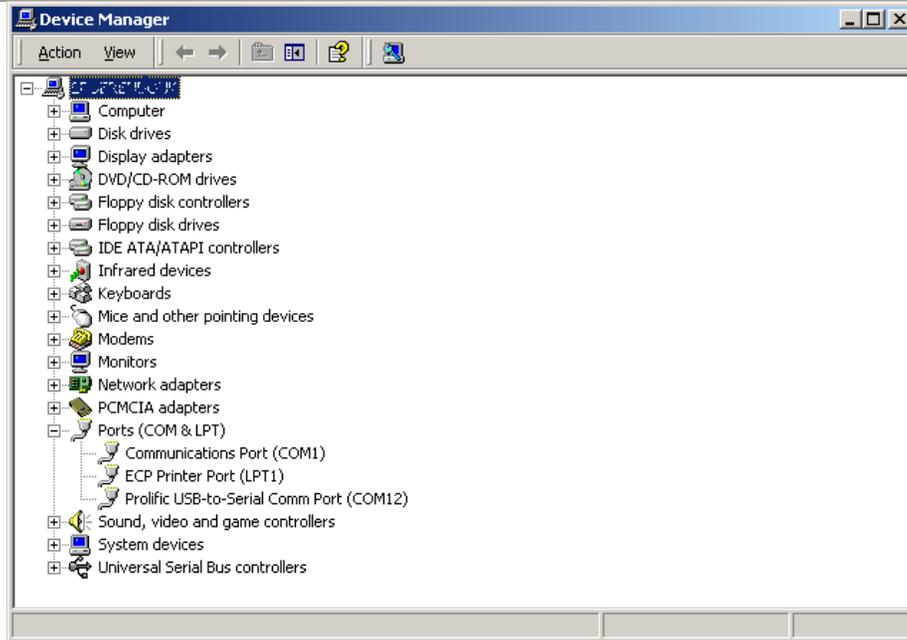
f) Most devices will show the Com port next to the device name. Record this number. In this case, it is COM12.

> **Note**: *Make sure there is no "!" or "X" next to the USB device. If you see an "!" or an "X," the device is not properly installed and will not work.*

3. Start **HyperTerminal**

On **Windows 2000**, click on:

Start>Programs>Accessories>Communications>HyperTerminal

a) You should see the following screen.

b) Enter a name for the Connection. In this example, the Name is Enfora Com1.

c) Click OK.

d) The next window that will appear is the Connect To window.

e) Change the Connect Using setting to the Com port that was determined in Step B.

f) Click OK.

g) The next window is the Port Settings window.
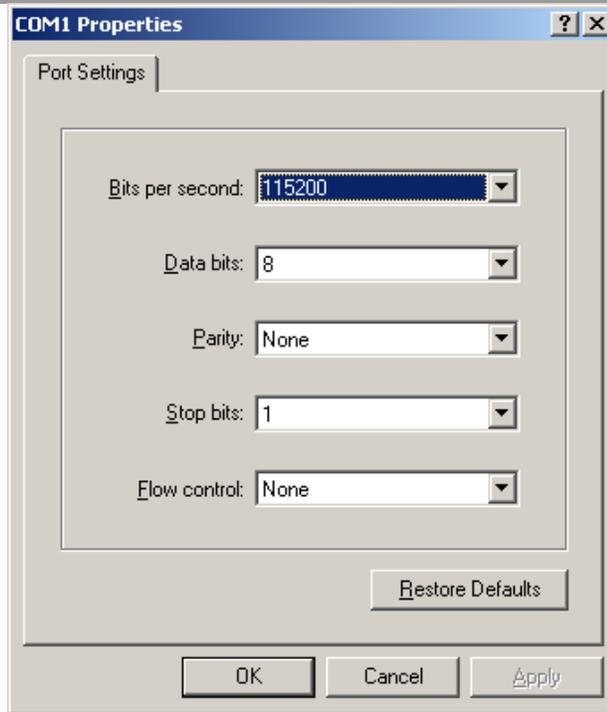
h) Make sure the settings match the example.

i) Click OK.

j) Now the Main Program Window should appear.
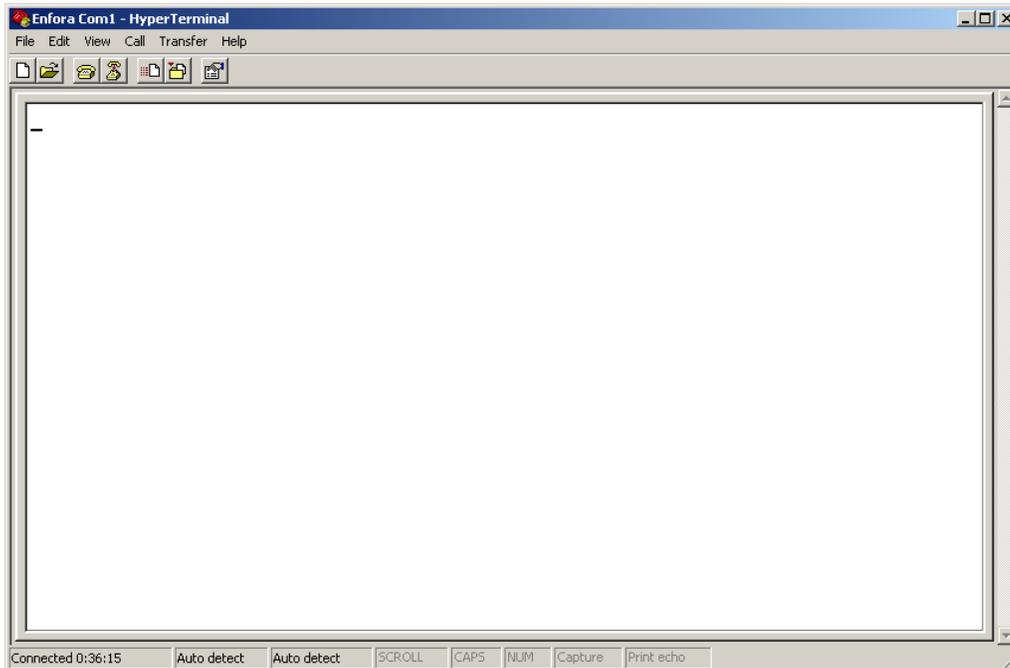
11. Configure the MT-µL to talk to the Enfora Server

1. Connect and verify Serial connectivity with the Enfora MT-µL.

   a) Connect the PC serial connector to the MT-µL serial port.

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

   b) With HyperTerminal open, hit the Enter key. The MT-µL should respond with OK. If you do not see this response, double-check your connections. If the connections seem correct, disconnect the MT-µL from the computer and perform the serial loop-back test (instructions follow):

      Serial Loop-back Testing

      ❑ Make sure the cursor is in the main window.
      ❑ Start typing characters.
      ❑ If all settings are correct, you should not see anything happening in the main window.
      ❑ Jumper Pins 2 and 3 together on the Serial connector.
      ❑ Start typing characters.
      ❑ You should now see what you are typing appearing in the main window.

      If this happens, the COM port is configured correctly.

   c) Type AT<CR>. The MT-µL should respond with OK. If you do not see the letters AT, send the following command to the MT-µL: ATE1<CR>

   d) Type ATI<CR>. The MT-µL should respond with Enfora, Inc. If you get any different response, you are not connected to the Enfora MT-µL.
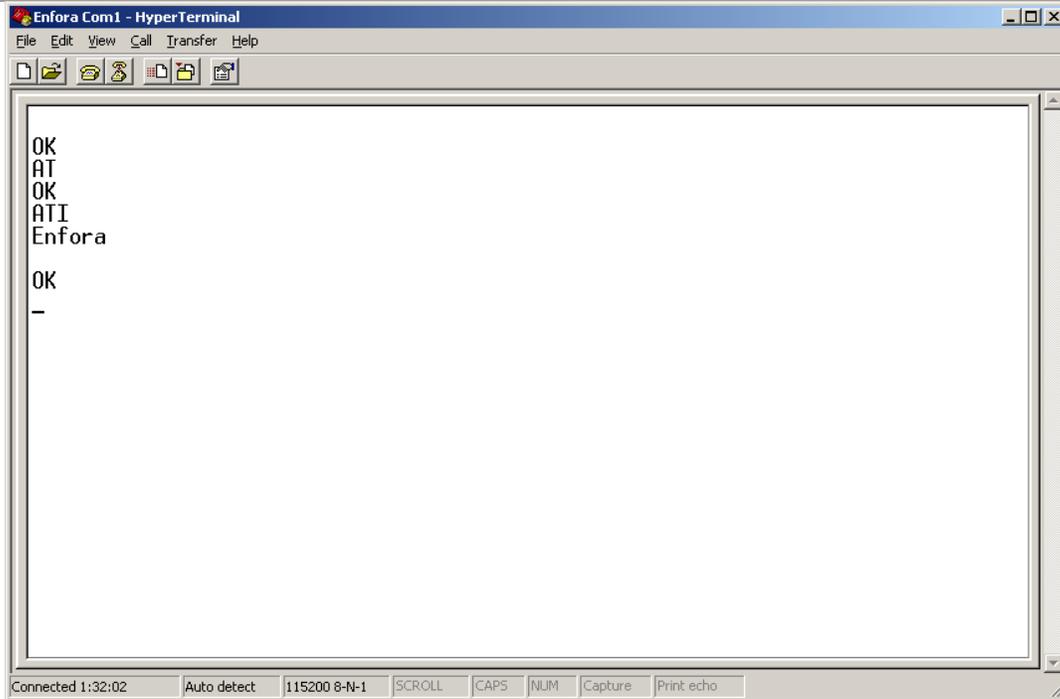
2. Configure the MT-µL to communicate with the Enfora Test Server.

   a) The following information will need to be obtained from the SIM provider. Please refer to GSM0000AN019 – Network Configuration Worksheet.
   b) APN
   c) Username and password (If necessary.)

      Note: In the following examples, the SIM is for Cingular.

         APN = isp.cingular
         Username = ISP@CINGULARGPRS.COM
         Password = CINGULAR1

   d) Reset the MT-µL to factory defaults:

      1. To restore the MT-µL to factory defaults, send the following command:
         AT&F<CR>
      2. To write current config to memory, send the following command:
         AT&W<CR>
      3. To reset the MT-µL, send the following command:
         AT$RESET<CR>

   e) Configure the MT-µL to Access the GPRS network.

1. To inform the MT-µL of the proper APN, send the following command:
   AT+CGDCONT=1,"IP","apn"<CR> (substitute the letters apn for the supplied apn.)

2. To inform the MT-µL of the proper username and password, (if necessary) send the following command: AT%CGPCO=1,"username,password",0<CR> (substitute the correct username and password)

3. To configure the MT-µL to enable auto GPRS registration, send the following command:

   AT$AREG=2<CR>

4. Store the current configuration to memory, send the following command:
   AT&W<CR>

5. Reset the MT-µL by removing power or sending the **AT$RESET<CR>** command.

6. 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.)

7. 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.)
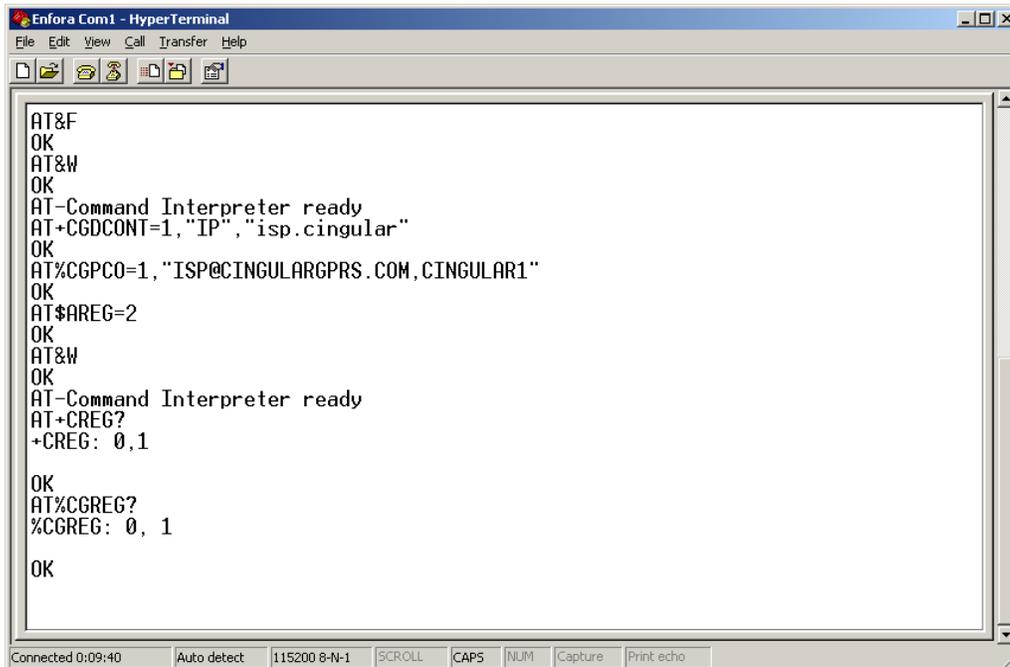
8. Verify GPRS activation by sending the following command: AT$NETIP?<CR>

   If the response is non-zero, then everything is working. Skip to Step 10.
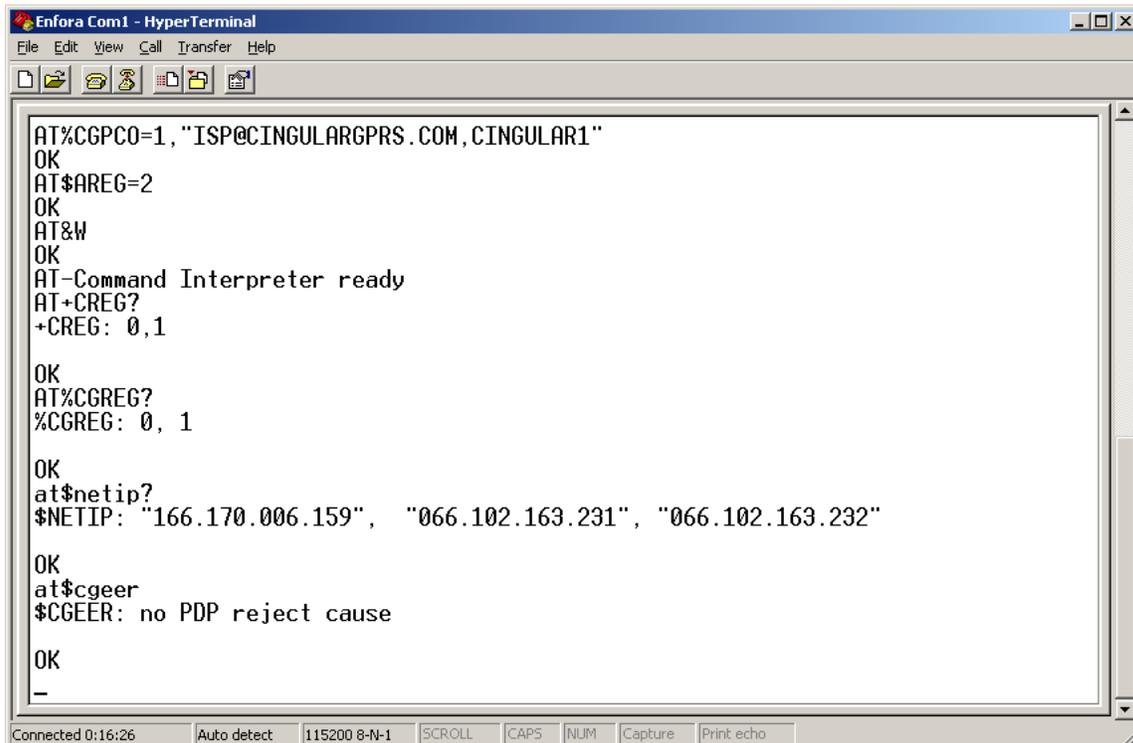
9. If AT$NETIP returns all zeros, send the following command: AT$CGEER<CR>

- 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.)

10. Configure the MT-µL to access the Enfora Server.

Note: *To configure the MT-µL for server interoperability, several things have to be addressed:*

- Most GPRS configurations are Mobile Originate only. The mobile MT-µL must initiate a conversation with a remote server before the remote server can talk to the MT-µL.
- 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

11. Give the MT-µL 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 MT-µL and create a window of opportunity where the server can send commands to the MT-µL

12. Configure the MT-µL to talk with a specific server.

- Send the following command:
  AT$FRIEND=1,1,"apitest.enfora.com"

13. Set the port number

- Send the following command: AT$UDPAPI=,1721

14. Enable periodic messages (wakeup) to be sent to the server every 60 seconds

- Send the following command: AT$WAKEUP=1,1

12.   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 here: 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**.

3. Select the tab with the MT-µL name. Within approximately 60 seconds the wakeup messages should be seen in the window.
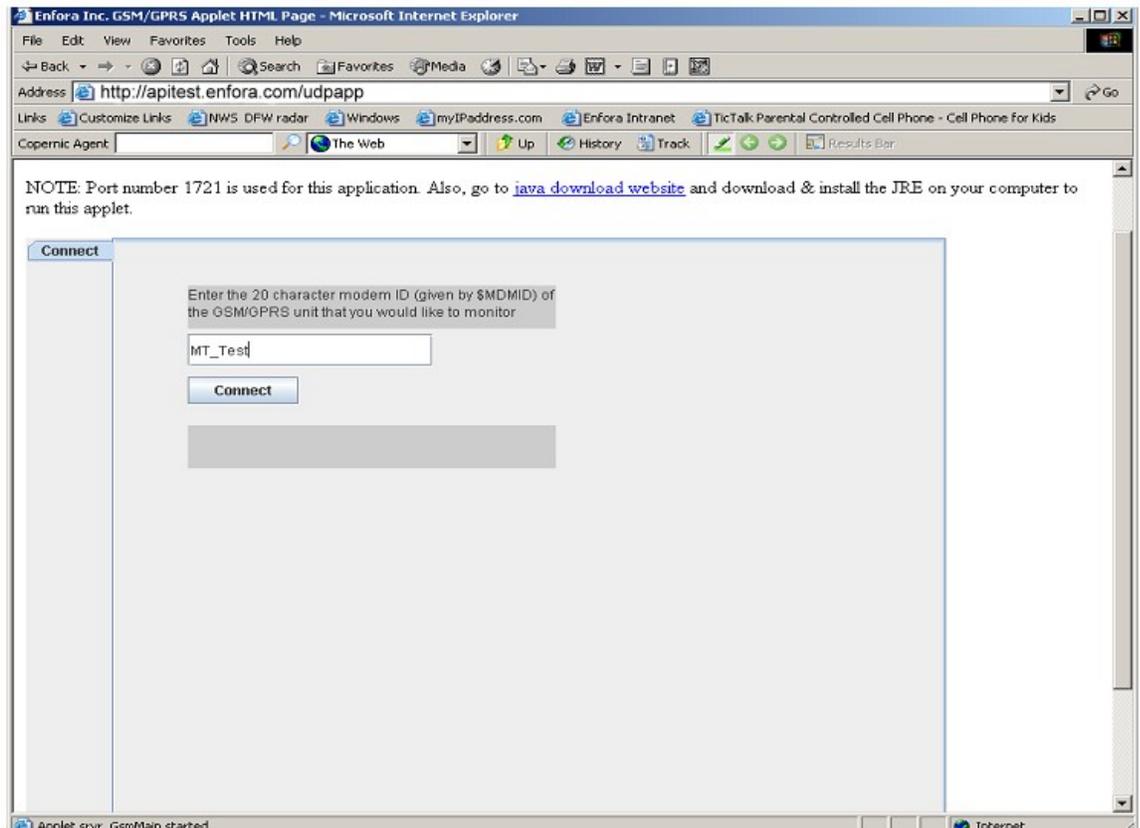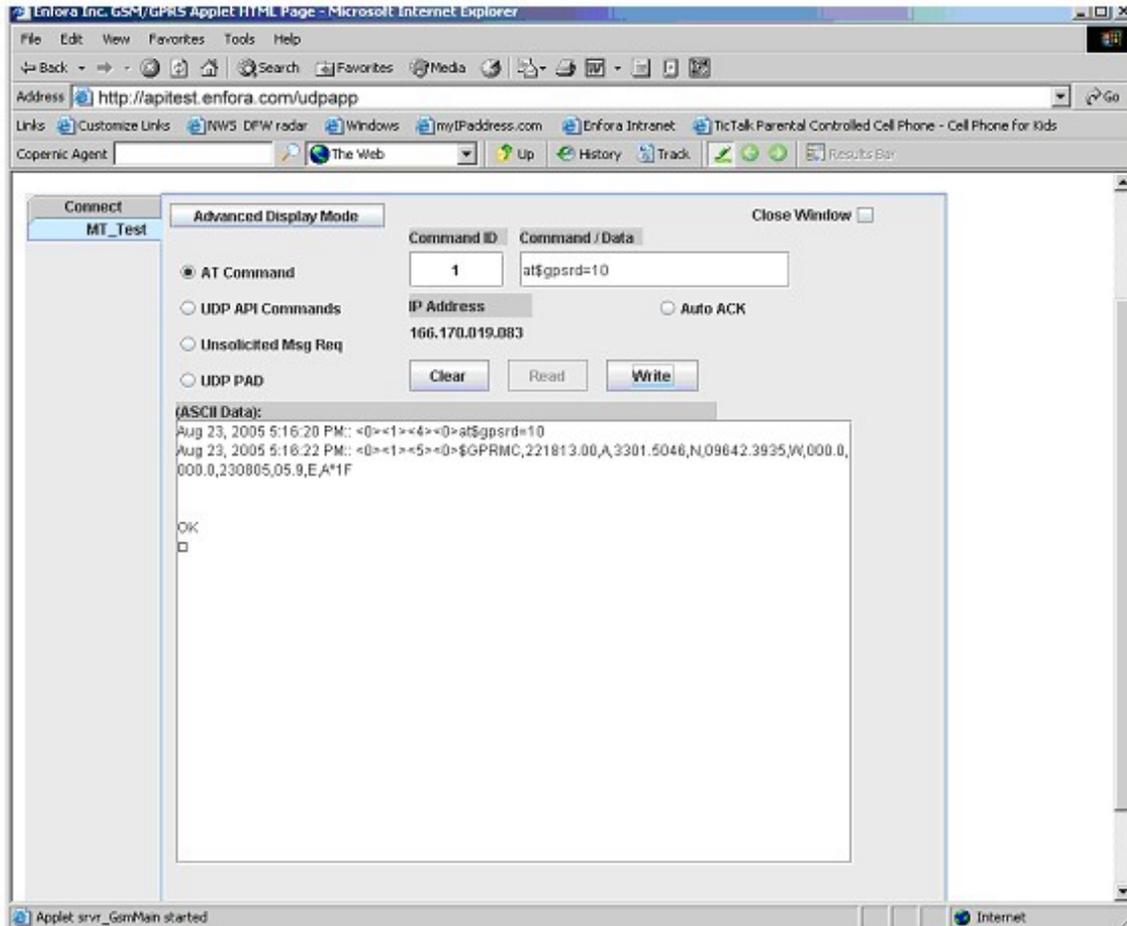
4. Enter the following command in the command/ data block: ATI

5. Select **Write**.

6. Verify that you see the following the MT-μL response with Enfora, Inc. If so, you have successfully configured the MT-μL to talk with the server.
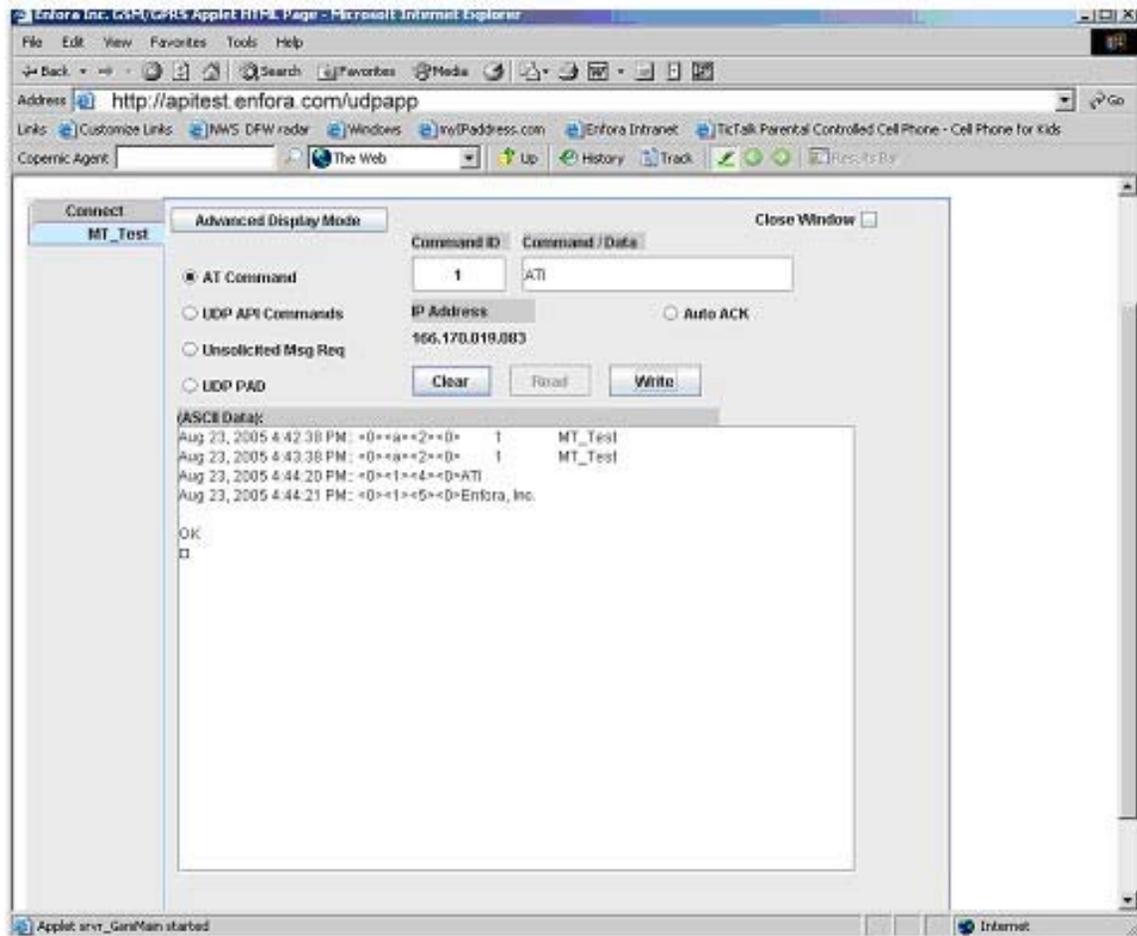
13. Verify GPS Operation

Follow these directions to verify GPS Operation.

1. From the terminal window, send the following command:
   AT$GPSRD=10<CR>

2. The MT-µL 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

Note: The entry shown in bold is the current GPS status.
There are three possible values here:

- 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 app.
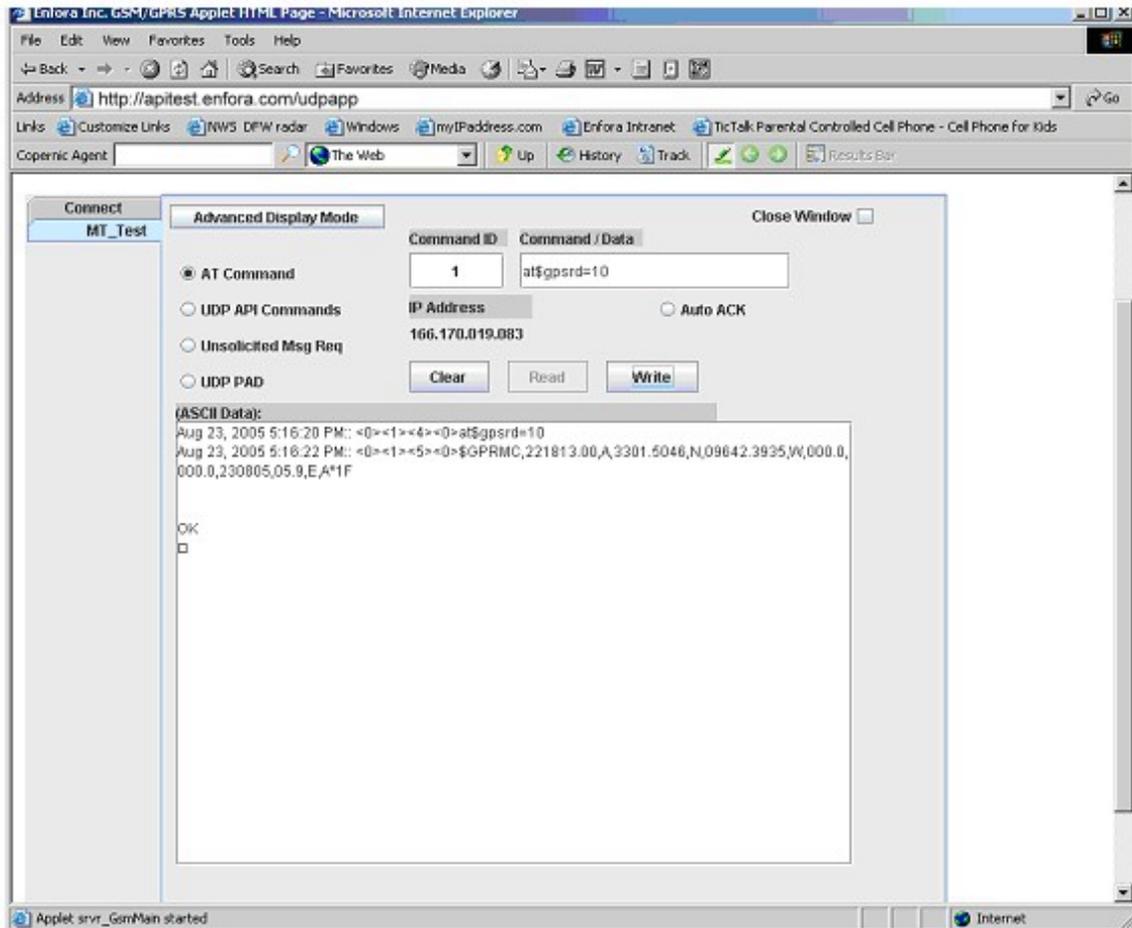
14.   GPIO Table

Signal Name	Direction	AT-Command	Notes
GPIO - 1	IN/OUT	AT$IOGP1	General purpose I/O pin, pin can be pulled HIGH or LOW by using AT$IOPULUP.
GPIO - 2	IN/OUT	AT$IOGP2	General purpose I/O pin, pin is internally pulled HIGH
GPIO - 3	OUT	AT$IOGP3	General-purpose output, sinks to ground, max current 250 mA. The PIC reset circuit latches this GPIO's state during reset.
GPIO - 4	IN	AT$IOGP4	General purpose input, LOW = Running on Battery
GPIO - 5	OUT	AT$IOGP5	General-purpose output, controls the RESET line of the GPS receiver. Set HIGH for normal operation, LOW to RESET the GPS receiver
GPIO - 6	OUT	AT$IOGP6	General purpose output, controls USR2 LED
GPIO - 7	OUT	AT$IOGP7	General purpose output, controls USR1 LED
GPIO - 8	IN	AT$IOGP8	General purpose input, detects the state of Ignition

15.   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 MT-µL in the following format:

Please refer to Enfora Application Note *GSM0000AN022 – 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-µL 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

Revision History

Date	Rev	Author	Description
11/15/07	1.00	Diane O'Neil	Initial release.