User Guide:
GSM1308UG001

Enfora GSM1308
Quad-Band SA-G+
User Manual

Revision 1.02

Enfora, Inc.
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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.

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Copyright

Limited Warranty

ENFORA, INC. 12-MONTH 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) 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.

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During the warranty period applicable to the software or its media, Enfora, at its expense, will replace any defective software or media if purchaser gives written notification of the defect to the technical support department at Enfora during the applicable warranty period. Enfora shall not have any obligation to provide any

software bug fixes, upgrades or new releases except as necessary to correct any covered defect of which purchaser notifies Enfora during the applicable warranty period.

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) 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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Some jurisdictions may require a longer warranty period than specified above and, accordingly, for products sold in those jurisdictions the applicable warranty period shall be extended as required under the law of those jurisdictions. Furthermore, some jurisdictions may not allow the disclaimer of implied warranties or the exclusion or limitation of incidental or consequential damages, so the above disclaimer, limitation or exclusion may not apply to products sold in those jurisdictions. This limited warranty gives the purchaser specific legal rights and the purchaser may have other legal rights that vary from jurisdiction to jurisdiction.

In some instances, certain aspects of the product warranty may also be covered in a separate written agreement between Enfora and the distributor or reseller, if any, from whom purchaser purchased the product. That agreement may provide,

for example, a longer warranty period or a different product return procedure that may also be available to purchaser (e.g., the product may be returned to Enfora through the distributor or reseller).

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.

Revision History

Revision Number	Release Date	Description of Changes
1.00	1/22/2008	Initial Release
1.01	4/11/2008	Added new images and mounting dimensions
1.02	10/29/2008	Edited sections 3.2.1 and 3.2.2 Edited Regulatory Section

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1.1   About the GSM/GPRS SA-G+

The GSM/GPRS SA-G+ is a compact, stand-alone wireless IP (GSM/GPRS) modem. The GSM/GPRS SA-G+ is designed for computing devices operating Windows XP and Windows 2000 or any serial-enabled platform. The SA-G+ can be used as a stand-alone serial device with other vertical applications. Enfora's GSM/GPRS SA-G+ provides maximum versatility in a single affordable device with 2 User-Definable Input/Outputs (I/O) and 1 User-Definable Output.

1.2   About this Manual

Contained in this manual are instructions on how to install and configure the GSM/GPRS SA-G+ modem. Please follow the instructions herein closely to avoid damaging the GSM/GPRS SA-G+.

The GSM/GPRS SA-G+ modem contains an Enfora Enabler-IIIG OEM module. Detailed information pertaining to the specifications and operation of the module will pertain, in part, to the GSM/GPRS SA-G+ platform.
The information can be accessed at the Enfora website (http://www.enfora.com) under *Support and Resource*s.
Refer to the following documentation for additional information, if required:

<u>Manuals</u>

GSM0308AT001 - Enfora IIIG Module AT Command Set Reference
GSM0308UG001 - Enfora GSM-GPRS Family API Reference

<u>Application Notes</u>

GSM0000AN002 - Enabler-G PPP Configuration for Windows 2000
GSM0000AN003 - Enabler-G Data Circuit Switched Call Configuration and Use
GSM0000AN004 - Enabler-G SMS Configuration and Use
GSM0000AN005 - Enabler-G Automated Network Connection Configuration and Use
GSM0000AN006 - Enabler-G Module Status Query
GSM0000AN007 - Enabler-G Status Reporting
GSM0000AN008 - Enabler-G PPP Configuration for Windows XP
GSM0000AN009 - Dynamic IP Assignment Support
GSM0000AN011 - PAD Configuration and Use
GSM0000AN012 - Network Transparency Configuration for PAD
GSM0000AN013 - Enabler-G Sleep Mode Configuration and Use

GSM0000AN014 - Anytime PPP API Access
GSM0000AN015 - Event Monitor and Reporting Overview
GSM0000AN016 - How to Send SMS Messages to an E-Mail Address
GSM0000AN017 - SMTP Mail Access via TCP PAD
GSM0000AN018 - USNO NTP Network Time Service TCP PAD
GSM0000AN019 - Network Configuration Worksheet
GSM0000AN020 - Comparison of Modem Power Control Pins in Enfora Modules
GSM0000AN022 - Sending AT Commands over SMS
GSM0000AN023 - Configure the Modem to talk to the Enfora Server
GSM0000AN024 - Enhanced Test Mode Commands
GSM0000AN025 - Enabler IIG Network Personalization
GSM0000AN026 - Using a Terminal Program to Test PAD
GSM0000AN027 - AT$ACTIVE Command Implementation Behavior

<u>Technical Notes</u>

GSM0000TN001 - Enabler-G Firmware Upgrade
GSM0000TN002 - Enabler-G PPP Negotiation Sequence
GSM0000TN006 - UDP Wakeup Message Header Decoding
GSM0000TN007 - Enabler-G 3-Wire Serial Interface Requirements
GSM0000TN009 - Server Application Design Considerations for Dynamic IP
GSM0000TN012 - Engineering Mode Manual

1.3 System Requirements

- Windows XP and Windows 2000 operating systems or other serial-enabled platform.
- One standard RS-232 serial port for GSM/GPRS SA-G+ configuration.

1.4 SA-G+ Front and Back View

Figure 1 - Front view of GSM/GPRS SA-G+ modem.

Figure 2 - Rear view of GSM/GPRS SA-G+ modem.

2 Regulatory Compliance

2.1 FCC

The modem was tested and certified to meet FCC Parts 15 in a stand-alone configuration, which demonstrated that the GSM1308 SA-G+ complies with Part 15 emission limits. FCC Part 22 & Part 24 is covered by the Enfora Enabler-IIIG "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 GSM1308 SA-G+ without additional FCC certification approvals, the installation must meet the following conditions:

- A separation distance of at least 20 cm (7.87 inches) between the antenna and the body of the user and other persons must be maintained at all times.

- GSM 850 mode: With the maximum conducted power at 32 dBm, the maximum antenna gain is 4.5 dBi (2.35 dBd) in order to meet maximum 7 watt ERP for mobile transmitters and MPE (Maximum Permissible Exposure) requirement of General Population/Uncontrolled exposures.

- GSM 1900 mode: With the maximum conducted power at 31dBm, the maximum antenna gain is 2 dBi in order to meet maximum 2 watt EIRP for mobile transmitters and MPE (Maximum Permissible Exposure) requirement of General Population/Uncontrolled exposures.

2.2 R&TTE - $C\epsilon$

The GSM1308 SA-G+ modem has been fully tested and complies with all the requirements of EN301 489-1, EN301 489-7 and EN60950-1:2001. Compliance to EN 301 511 has been demonstrated by testing on both the GSM1308 and the integrated GSM0308 module. At the separation distance of at least 20 cm (7.87 inches) between the antenna and the body of the user and other persons, the product also meet EN50392 MPE requirement.

2.3 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.

Enfora shall not be liable for consequential or incidental damages, injury to any person or property, anticipated or lost profits, loss of time, or other losses incurred by Customer or any third party in connection with the installation of the Products or Customer's failure to comply with the information and instructions contained herein.

3   Installation

3.1 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 service provider, and an encryption Ki (pronounced "key"). This information consists of a microprocessor and memory installed on a plastic card. To install the SIM card into the modem, insert the SIM card in the modem as shown below in Figure 3.

> *Note: The SIM is not provided with the SA-G+ modem. The SIM must be obtained from the GSM service provider and must be provisioned by the operator for data and/or voice. Always take care to protect the SIM: the GSM terminal will not operate without the SIM installed.*

Insert the SIM card here – please note that the notch must be in the upper left hand corner.

After inserting the SIM card, you MUST move the SIM lock switch to the left. If the lock is open, there will not be power to the SIM.

Figure 3 - Inserting a SIM Card in a GSM/GPRS SA-G+ Module

3.2 Eight (8) Pin Connector

The GSM/GPRS SA-G+ modem can utilize input power ranging from 6 Vdc to 40 Vdc. If your unit did not include an optional power supply, or if you wish to configure a separate power interface, the following connector parts are the Enfora recommended parts that can be used to mate with the existing modem power connector:
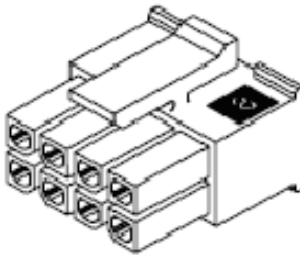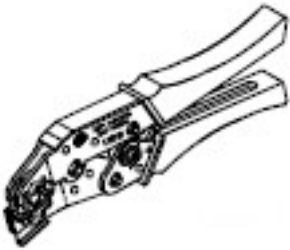
Connector: Manufacturer: Molex Part Number: 43025-0800	
Pins: Manufacturer: Molex Part Number: 43030-0008 20-24 AWG 43030-0011 26-30 AWG	
Crimp Tool: Manufacturer: Molex Part Number: 63811-2800	

Table 1 – Cable Assembly Parts

During installation take precautions to help ensure proper operation of the SA-G+. Do not create loops, sharp bends or crimps in the cables. Use proper terminations on all power cables.

> **Note:** *If the SA-G+ will be used in a vehicle, attach all cables to the vehicle and equipment in such a way to reduce stress or wear caused by vibration generated by moving vehicles.*

The user can purchase the optional eight (8) pin external I/O connector for the Enfora SA-G+ that can be used to interface with other devices. Enfora can provide an optional cable and connector (Part #CAB1308). The user also has the option of building his/her own cable. Table 2 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	Description
Pin – 1	Microphone +	
Pin – 2	Headset +	
Pin – 3	Ground	
Pin – 4	Ground	
Pin – 5	Supply Voltage	(6-40V)
Pin – 6	User Controlled IO1	(3.3 – 40V) – Uses GPIO1 of the Enabler IIIG Module
Pin – 7	User Controlled IO2	(3.3 – 40V) – Uses GPIO6 of the Enabler IIIG Module
Pin – 8	User Controlled Output	(1.5A sink) – Uses GPIO8 of the Enabler IIIG Module. This GPIO's state is latched during a reset.

Table 2 - 8 pin I/O Connector Interface
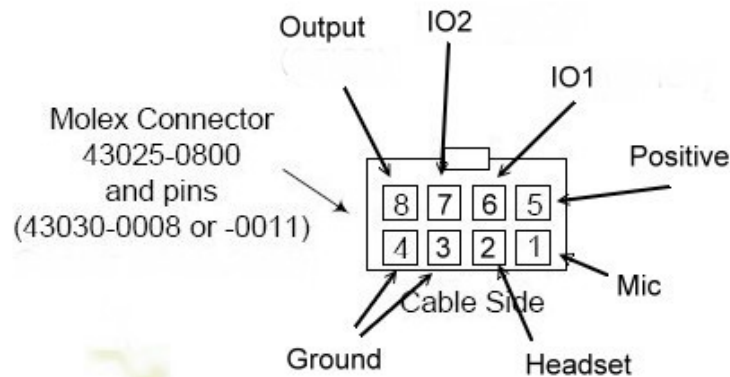
Figure 4 - Molex Connector and Pins

3.2.1 GPIO1 (Input/Output)

• GPIO1 as an Input

Set the bus direction to be "input" by using the "AT$IOGP1=1" command. Verify that GPIO1 is set to be an input by using the "AT$IOCFG?" command.

• GPIO1 as an Output

Change GPIO1 to be an output by using the "AT$IOCFG=xxx" command.
Set the bus direction to be an output by using the "AT$IOGP1=0" command.

3.2.2 GPIO2 (Input/Output) Programmable Pull-Up System

• GPIO2 as Pull-Down System

Set GPIO2 to 0 by using the "AT$IOPULUP=0" command.

• GPIO2 as a Pull-Up System

Set GPIO2 to 1 by using the "AT$IOPULUP=1" command.

*Set the bus direction as described in 3.2.1 using the AT$IOGP2=x command where x is 0 or 1..

The following table provides the power characteristics of the GSM/GPRS SA-G+ modem.

Band	Mode	Avg (mA)	Peak (A@dBm)
GSM 850	1 TX/1 RX	200	1.30@33
EGSM 900	Idle	50 DRX 5	
DCS 1800	1 TX/1 RX	160	0.92@30
PCS 1900	Idle	50 DRX 5	
	Sleep	20	

Table 3 – GSM Operating Power

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

3.3 Connecting the Serial Cable

To connect the SA-G+ with a local computing device, connect one end (male end) of the 9-wire RS232 Serial Cable to the SA-G+ port labeled "Serial" and connect the other end to a computer.

The following figure provides the SA-G+ serial pin-out information.
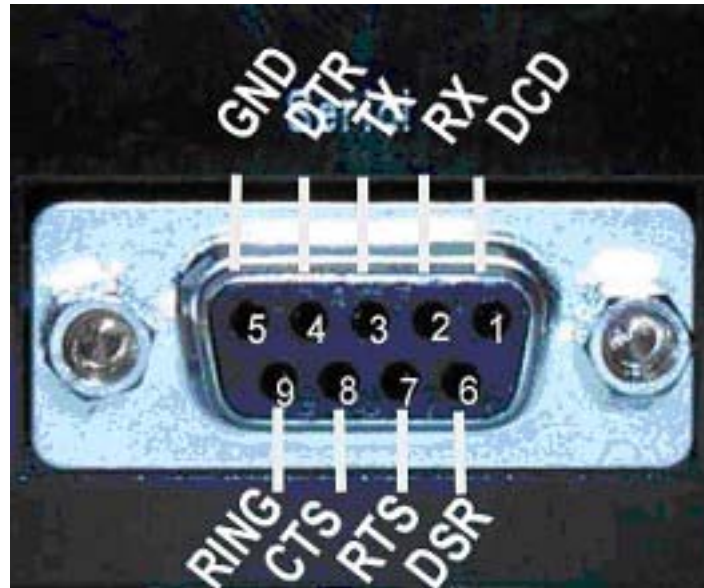

Figure 5 - Serial Pin-out

3.4   Connecting the GSM/GPRS Antenna

The antenna is supplied by the user. 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. See section 2 Regulatory
Compliance

FCC.

The GSM/GPRS SA-G+ operates at the 850/900/1800 and 1900 MHz frequency
bands. Care needs to be taken when connecting the antenna since the right type
of antenna will be required for proper operation of the modem. The antenna
connector on the GSM/GPRS SA-G+ modem is SMA Female. The antenna has
to be connected to the connector labeled "Antenna" as shown below in Figure5.

Connect the
GSM/GPRS
antenna here.

Figure 6 - GSM/GPRS SA-G+ Connecting the Antenna

3.5   LED Functions

The GSM/GPRS SA-G+ modem has one green LED on the front panel.

REG: Indicates GSM network registration status. Flashing when attempting to register on a GSM network. Solid when the modem is registered with a GSM network.

3.6   Mounting the SA-G+

The GSM/GPRS SA-G+ includes two mounting options.   The modem housing contains four thru holes that can utilize number 2 screws for securing the device. The other option available is the inclusion of four threaded holes for securing screws to be used to secure the device.
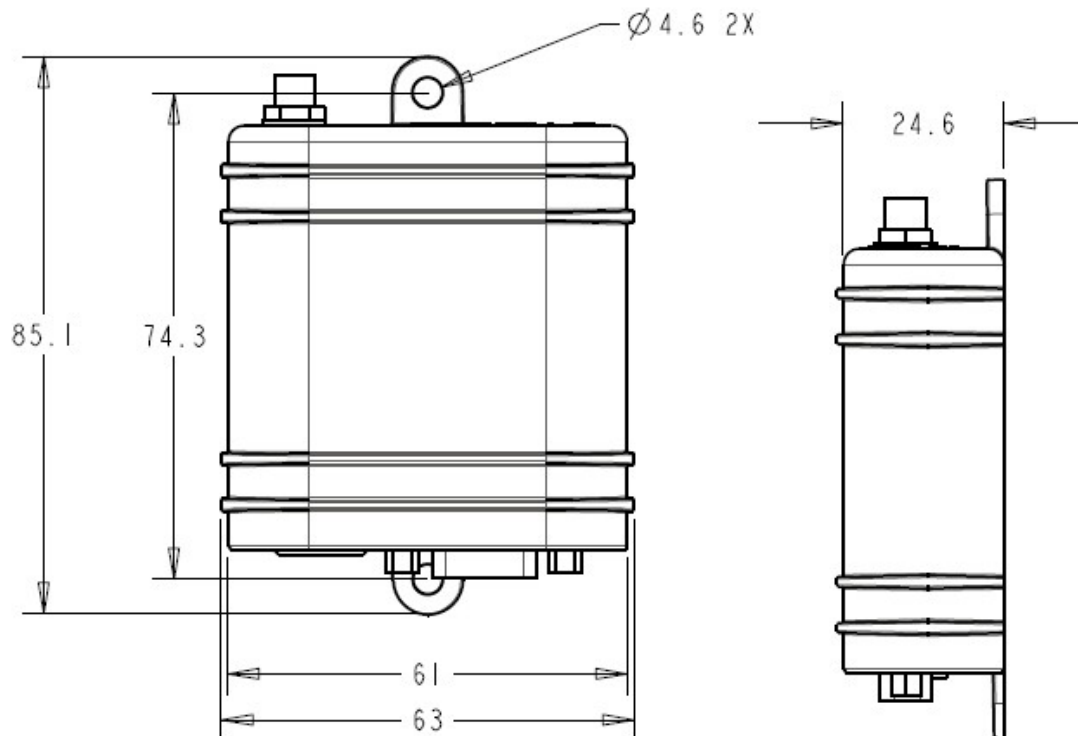

Figure 7 - Mounting Dimensions

4   Firmware Upgrade

To see if there is updated firmware for the SA-G+, please visit:

http://www.enfora.com > support

You will need to obtain a login to the website from Enfora Tech Support in order to download the firmware.

During the firmware upgrade, the LED's will display the following behavior:

	SIM Installed (registered with network)	SIM Not Installed (registering with network, LED is on)	SIM Not Installed (registering with network, LED is off)
REG LED Behavior	Solid		
		Solid	
			Off

Table 4 – REG LED Behavior During Firmware Upgrade

5   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) Autobaud (power up message at115200 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:
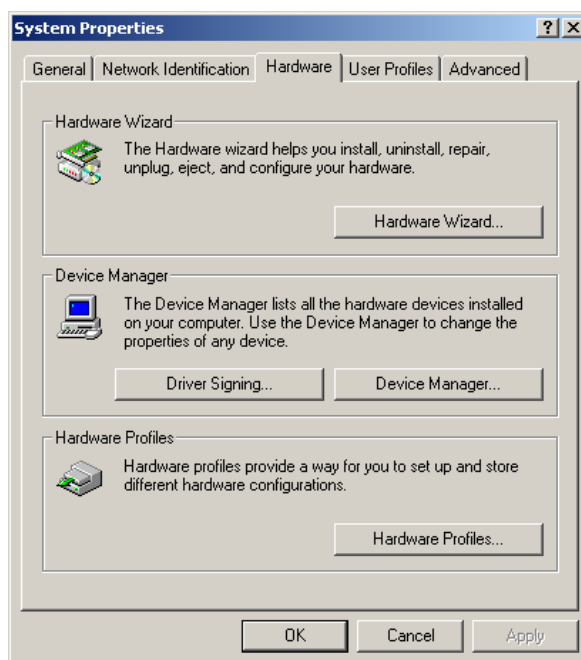
d) Select the Device Manager button. Expand the Ports section by selecting the + sign beside Ports. Your window should look like the following:
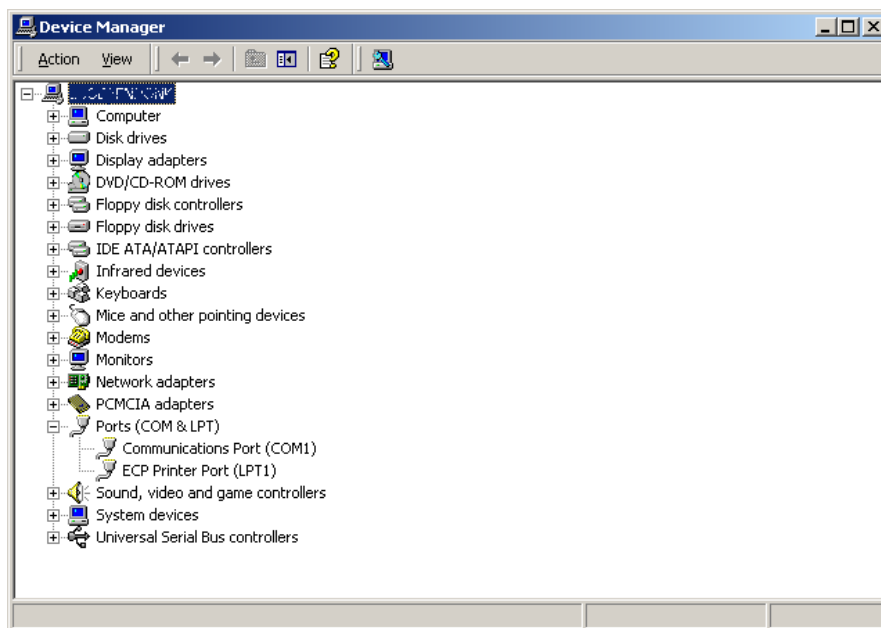
e) Plug in the USB-to-Serial converter. The window should change to show the USB-to-Serial converter installed.
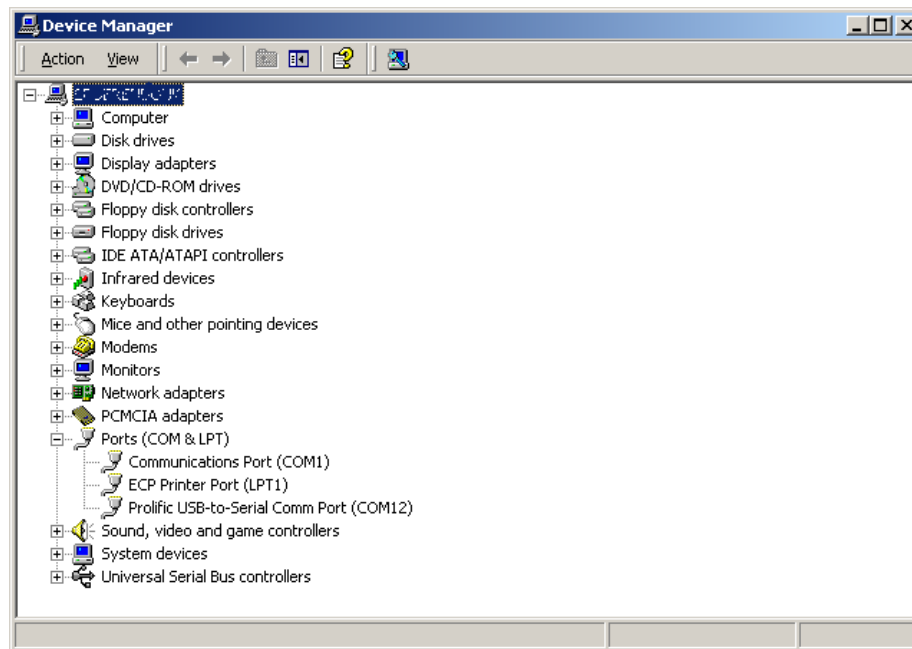
f) Most devices will show the Com port next to the device name. Record this number. In this case, it is COM12.
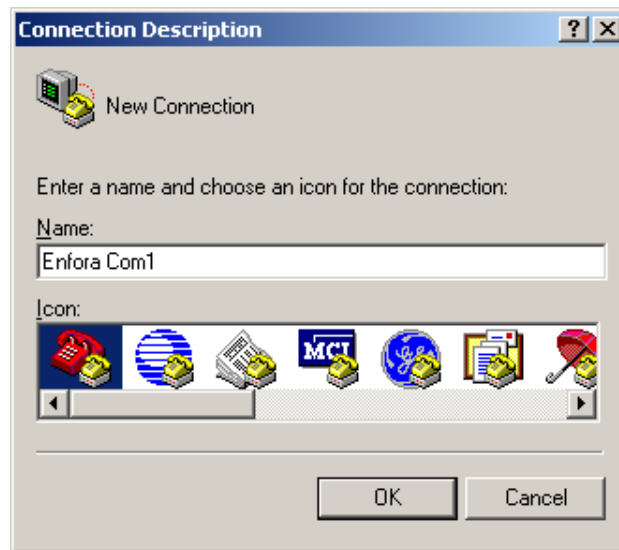
> **Note**: *Make sure there is no "!" or "X" next to the USB device. If you see an "!" or an "X," the device is not properly installed and will not work.*

3. Start **HyperTerminal**

On **Windows 2000**, click on:

Start>Programs>Accessories>Communications>HyperTerminal
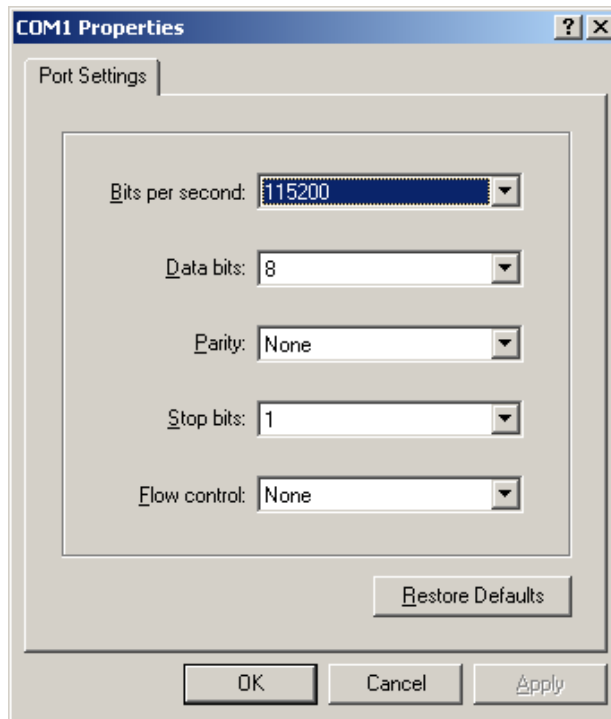
a) You should see the following screen.

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.
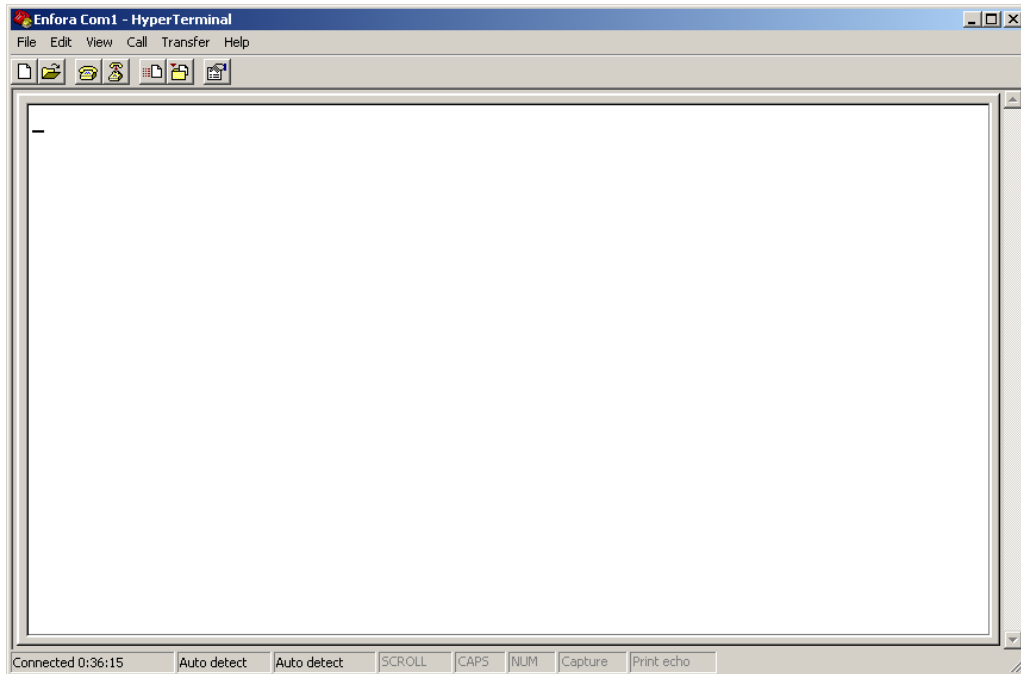
f) Click OK.

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.
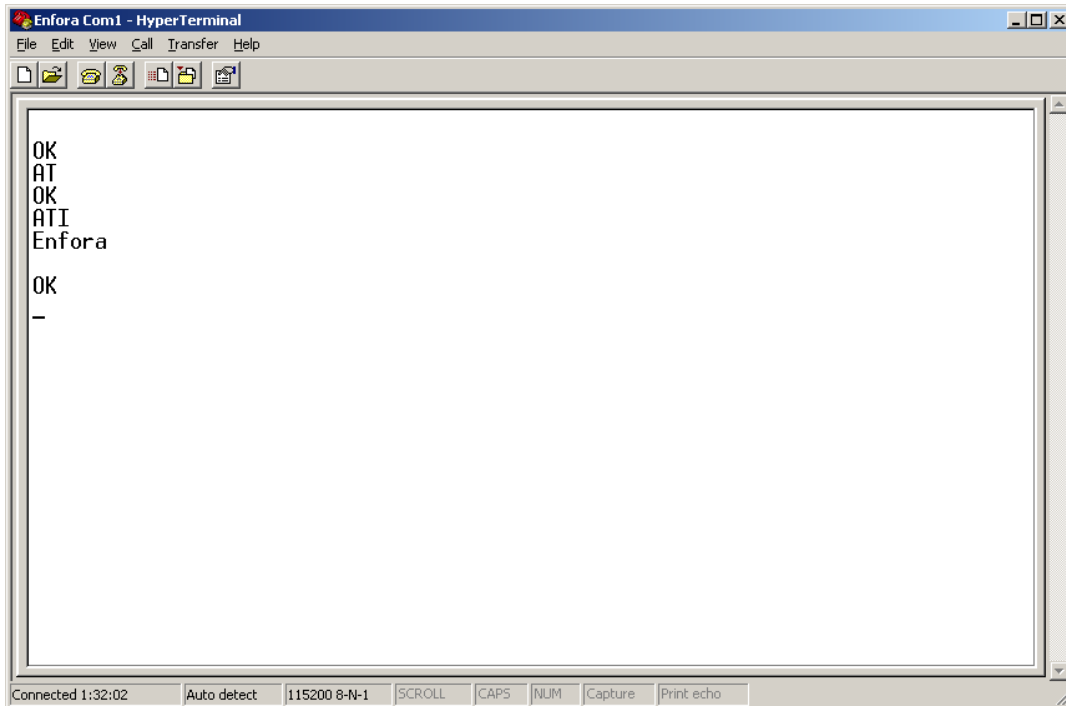
6 Configure the SA-G+ to talk to the Enfora Server

1. Connect and verify Serial connectivity with the Enfora SA-G+.

    a) Connect the PC serial connector to the SA-G+ serial port.

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

       With HyperTerminal open, hit the Enter key. The SA-G+ should respond with OK. If you do not see this response, double-check your connections.

    b) Type AT<CR>. The SA-G+ should respond with OK. If you do not see the letters AT, send the following command to the SA-G+: ATE1<CR>

    c) Type ATI<CR>. The SA-G+ should respond with Enfora, Inc. If you get any different response, you are not connected to the Enfora SA-G+.

2. Configure the SA-G+ 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 SA-G+ to factory defaults:

      1. To restore the SA-G+ 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 SA-G+, send the following command:
         AT$RESET<CR>

e) Configure the SA-G+ to Access the GPRS network.

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

3. To configure the SA-G+ 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 SA-G+ 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)
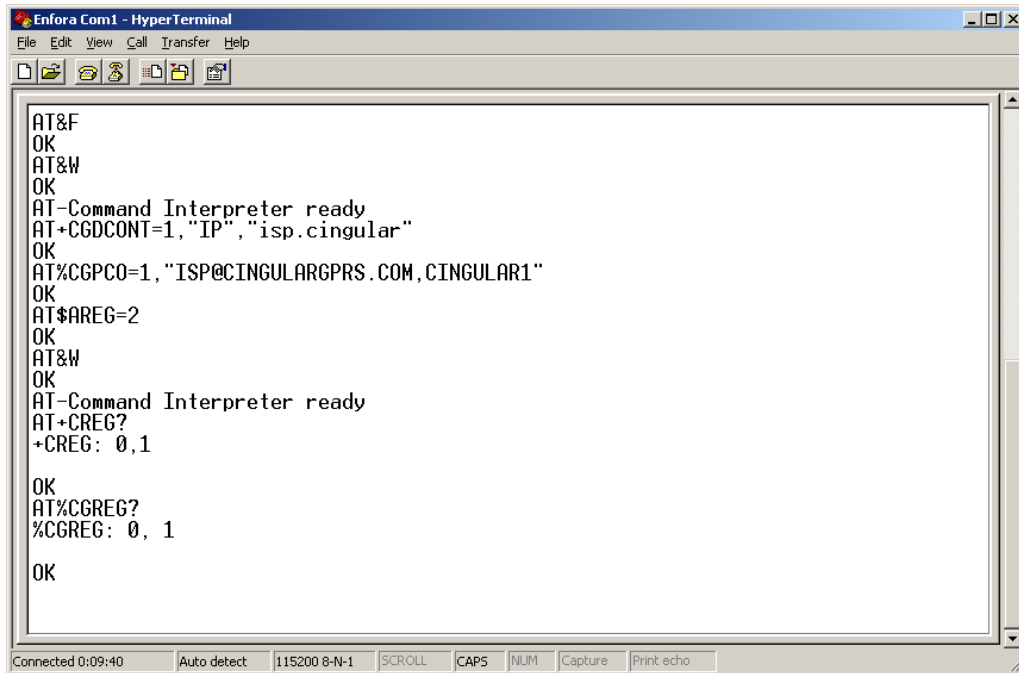   OR
   +CREG: 0,5 (GSM registered roaming.)

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.)

```
Enfora Com1 - HyperTerminal
File  Edit  View  Call  Transfer  Help

AT&F
OK
AT&W
OK
AT-Command Interpreter ready
AT+CGDCONT=1,"IP","isp.cingular"
OK
AT%CGPCO=1,"ISP@CINGULARGPRS.COM,CINGULAR1"
OK
AT$AREG=2
OK
AT&W
OK
AT-Command Interpreter ready
AT+CREG?
+CREG: 0,1

OK
AT%CGREG?
%CGREG: 0, 1

OK

Connected 0:09:40    Auto detect    115200 8-N-1    SCROLL    CAPS    NUM    Capture    Print echo
```
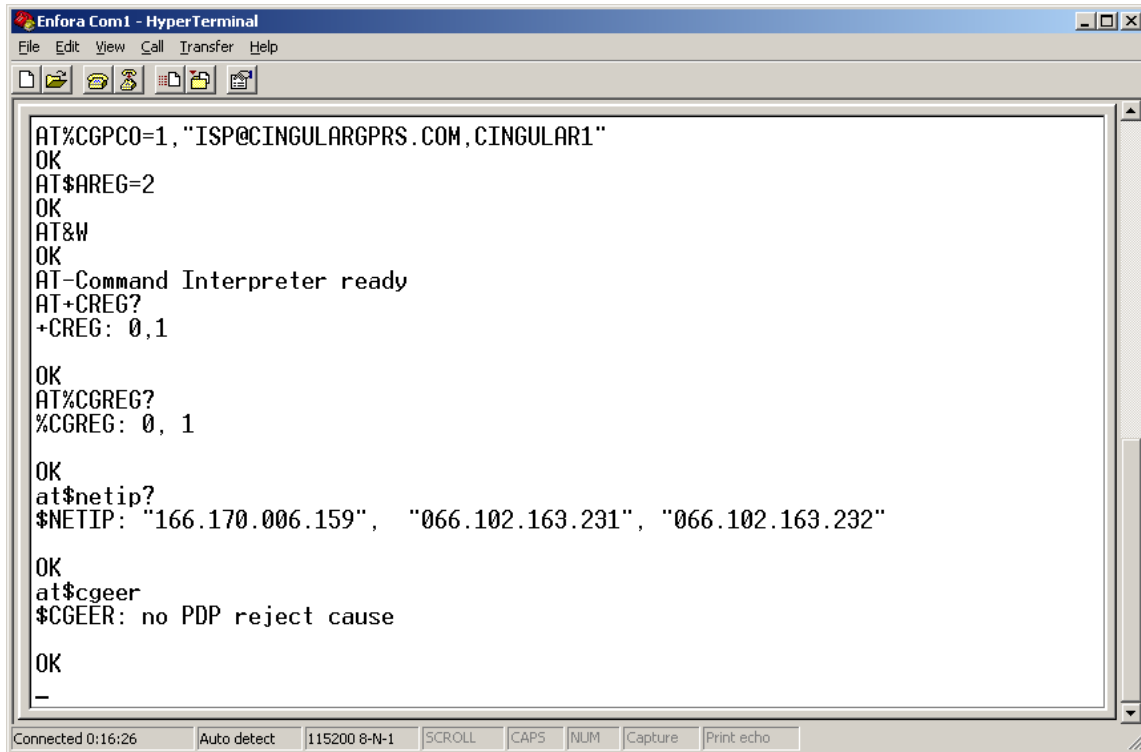
8. Verify GPRS activation by sending the following command: AT$NETIP?<CR>

   If the response is non-zero, then everything is working. Skip to Step 10.

```
Enfora Com1 - HyperTerminal
File  Edit  View  Call  Transfer  Help

AT%CGPCO=1,"ISP@CINGULARGPRS.COM,CINGULAR1"
OK
AT$AREG=2
OK
AT&W
OK
AT-Command Interpreter ready
AT+CREG?
+CREG: 0,1

OK
AT%CGREG?
%CGREG: 0, 1

OK
at$netip?
$NETIP: "166.170.006.159",  "066.102.163.231", "066.102.163.232"

OK
at$cgeer
$CGEER: no PDP reject cause

OK
_

Connected 0:16:26    Auto detect    115200 8-N-1    SCROLL    CAPS    NUM    Capture    Print echo
```

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 SA-G+ to access the Enfora Server.

    Note: *To configure the SA-G+ for server interoperability, several things have to be addressed:*

    - Most GPRS configurations are Mobile Originate only. The mobile SA-G+ must initiate a conversation with a remote server before the remote server can talk to the SA-G+.
    - 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 = "SAG_Test"
  - Remote Server DNS address = apitest.enfora.com
  - Remote Server IP port = 1721

11. Give the SA-G+ a unique name.

   - Send the following command:
     AT$MDMID="SAG_Test"
     This command, combined with the wakeup message, will allow the server to associate a Public IP address with a specific SA-G+ and create a window of opportunity where the server can send commands to the SA-G+

12. Configure the SA-G+ 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

7 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 SA-G+ name. Within approximately 60 seconds the wakeup messages should be seen in the window.
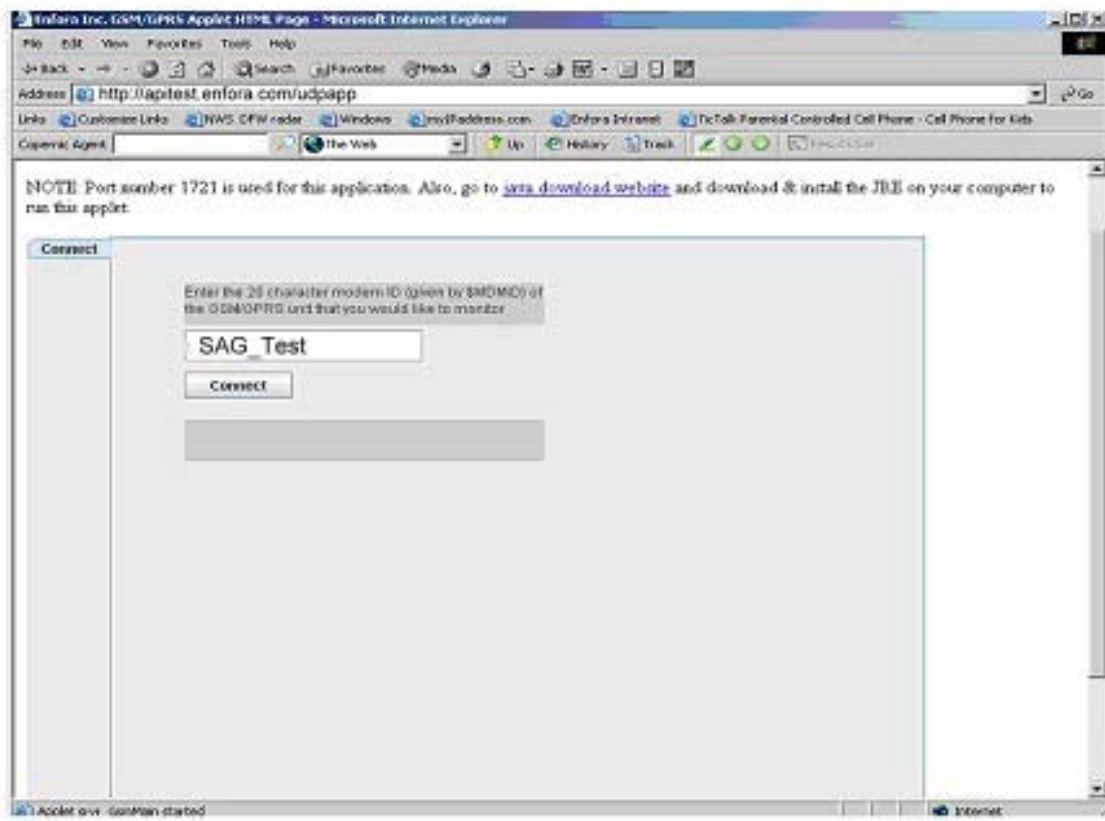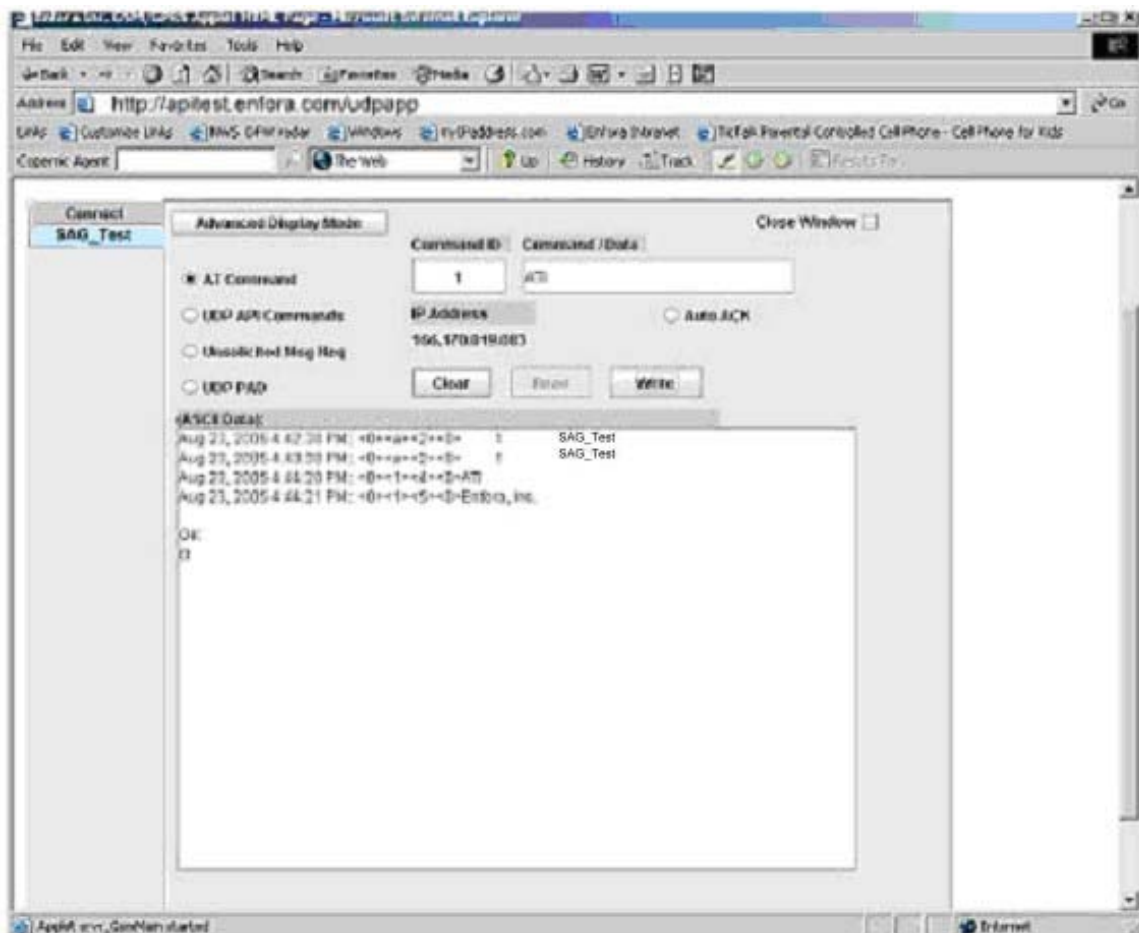
4. Enter the following command in the command/ data block:
   ATI

5. Select **Write**.

6. Verify that you see the following the SA-G+ response with
   Enfora, Inc. If so, you have successfully configured the SA-
   G+ to talk with the server.

8   Tech Support

For problems stemming from your network access, contact your GSM/GPRS carrier service. For technical support and customer service dealing with the modem itself, contact the company where you purchased the product. If you purchased the product directly from Enfora, visit the *Support and Resources* page on the Enfora website: http://www.enfora.com.