



User Manual:

GSM/GPRS Modem Configuration

GSM/GPRS



GSM / GPRS Modem Configuration

User Guide

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GSM Modem

GSM is a network used for connecting two devices and exchanging data. It can be used by an OCS with an internal modem HE-GSM04A to communicate to other devices connecting to an Internet/GSM/PSTN network.

To install a GSM modem option card in an XLe/XLt/XL6 OCS, open the back cover of the OCS and connect the Modem **HE-GSM04A** and then connect the antenna to the modem.

INSTALLATION PROCEDURE

1. Disconnect all power from the XLe/XLt/XL6 OCS (Operator Control Station) unit including I/O power.
2. Remove the four screws on the back of the XLe/XLt/XL6 unit and remove the back cover. The back cover will be replaced with the extended back cover that ships with the communication add-on. Screws are re-used (Figure 1).
3. Plug the communication board onto the 24-pin connector. Make sure all the pins are properly aligned (Figure 2).
4. Place the extended back cover onto the unit. It can be helpful to tip it at an angle so the connector on the COM board passes through the opening on the back cover.
5. Place the screw back into the hole and turn the screw slowly counter clockwise until it clicks into the threads. This prevents the screw from being cross-threaded. Now, turn the screw clock-wise until the cover is firmly secured. Repeat this process for all four (4) screws.

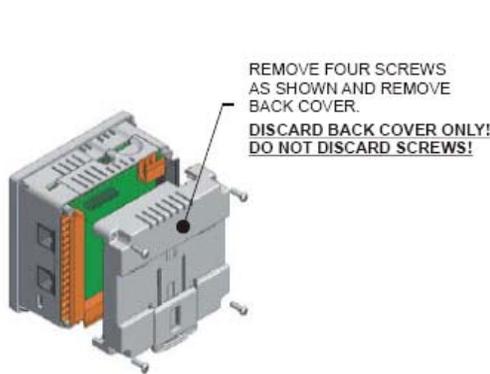


Figure 1 - Removing Back Cover of the XLE

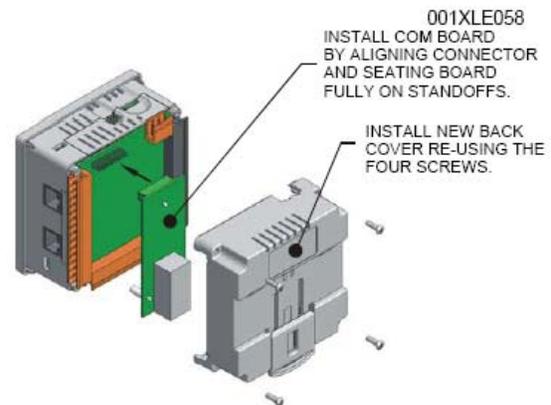


Figure 2 - Installing the COM Board in the XLE

With the GSM modem option card, the Data Exchange and Connectivity with Cscape can be established in the following two ways:

- GSM connectivity
- GPRS connectivity

Cscape configuration is explained in the following sections.

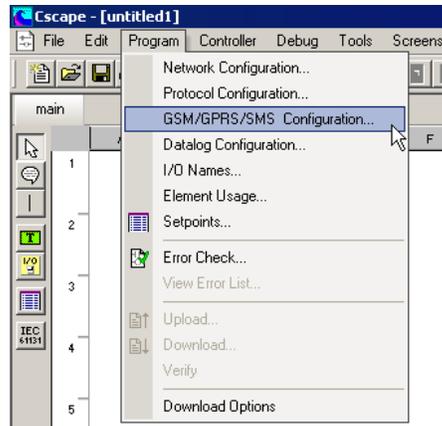
1 GSM Functionality

- GSM data call can be used for:
 - Peer to peer communication between two devices for exchanging register data.
 - Connect to Cscape for downloading / uploading and debugging the application
 - Send / receive configured SMS messages.
- GSM data call connects at 9600bps only.
- GSM data call requires 'data call enabled SIM'

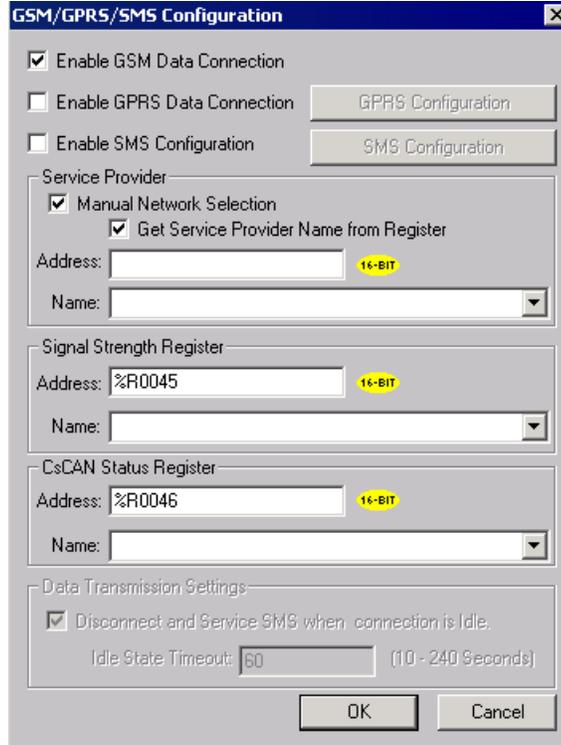
1.1 GSM Configuration

1.1.1 Peer to peer communication

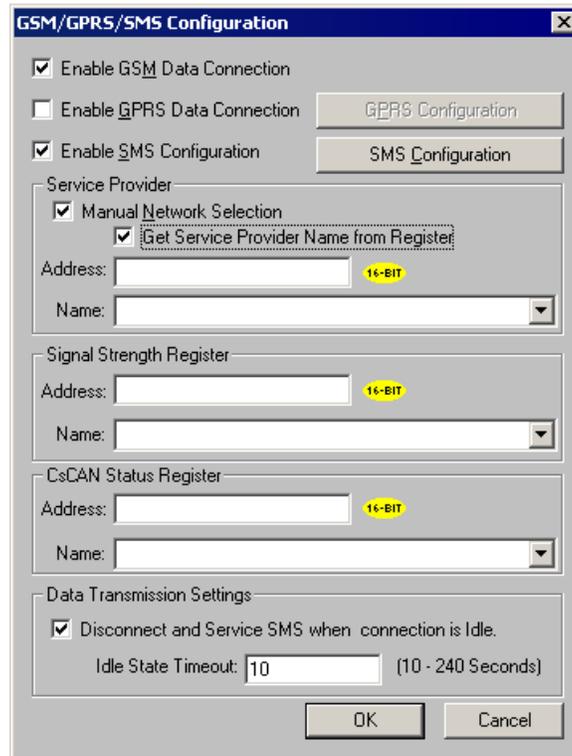
- Horner OCS firmware is designed to initialize a GSM modem to establish a GSM data call.
- In order to establish GSM data call connectivity using Horner OCS follow these steps.
- Select **Program and GSM/GPRS/SMS Configuration** from the Main Menu.



- Select the Enable GSM Data Connection checkbox in the GSM/GPRS/SMS Configuration window.



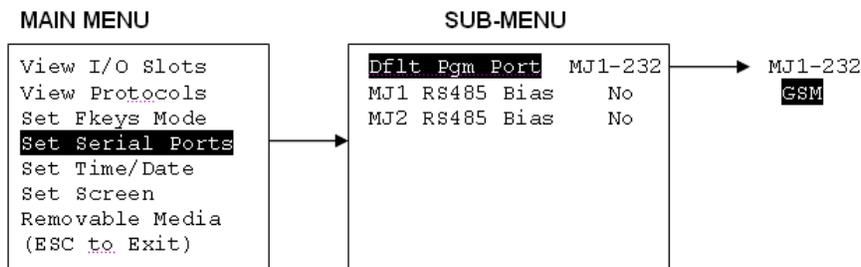
- If an SMS transmission needs to be carried out when the GSM connection is active then additional Data Transmission Settings need to be entered for servicing SMS. If SMS needs to be serviced when a GSM connection is active, select Enable SMS Configuration. This will enable [Data Transmission Settings](#). Select the checkbox and set the idle time after which SMS should be serviced i.e. if 10 secs is configured in this field, when the connection is idle (status 6) for 10 secs, SMS send/received (Status 5) would be serviced. If the checkbox is not selected, SMS will not be serviced.



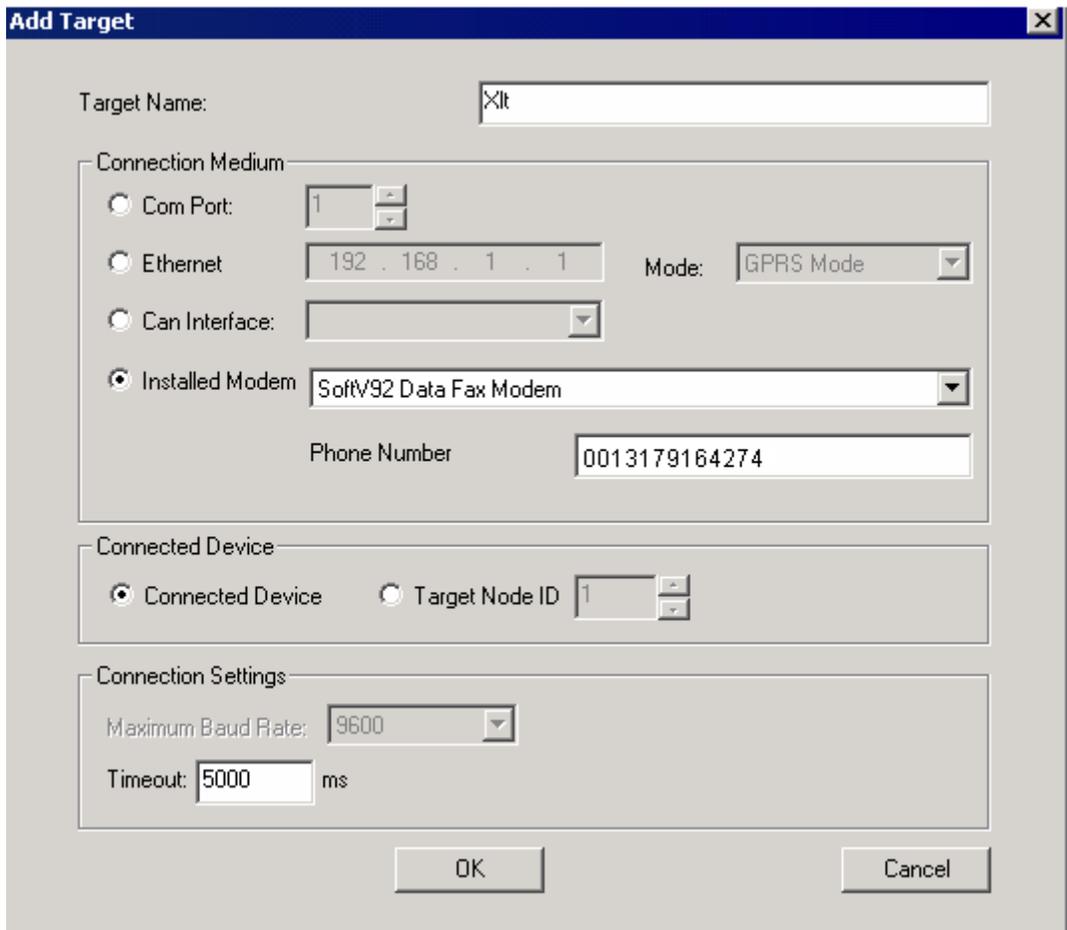
- Additional ladder programming **must be** written to answer or to make GSM data call using communication operation ladder blocks. Use of Communication blocks for [GSM/GPRS connectivity](#) is detailed in section 4.

1.1.2 Connectivity with Cscope

- On the device, Change the default programming port to GSMGPRS from the system menu, serial port option, i.e. OCS 'system menu -> Set Serial Ports -> Dflt Pgm Port ->GSM' for MJ1.



- Install a modem in the PC
- Open the Add Target dialog by selecting Tools | Editor Options | Communications Port and then click  from the Main Menu.
- Select the installed modem and enter GSM data no. of the SIM connected to the device and press OK.



Add Target

Target Name:

Connection Medium

Com Port:

Ethernet: Mode:

Can Interface:

Installed Modem:

Phone Number:

Connected Device

Connected Device Target Node ID:

Connection Settings

Maximum Baud Rate:

Timeout: ms

OK Cancel

Note: The status of the connection will be updated in the CsCAN Status Register specified in the GSM/GPRS/SMS Configuration window. Various status values are detailed in [section 4.3](#).

1.1.3 Send / Receive SMS

SMS configuration for sending/receiving SMS is detailed in [section 5.2](#).

2 GPRS (General Packet Radio Service) Functionality

A **GPRS** network can be used to establish communication between OCS and any other communicating devices having unique IP address and port configuration.

- GPRS can be used to establish connectivity with:
 - remote servers for exchanging register data
 - Cscape for downloading / uploading and debugging the application using redirector software
 - GSM network for sending / receiving configured SMS messages
 - peer to peer communications
- Static SIM with VPN functionality is required. Static IP SIM or Semi – static IP SIMs with VPN are required for this functionality.
- GPRS service must be enabled in SIM.

Auto dial blocks of modem are required on both server and client. [See section 4.2 for details.](#)

2.1 GPRS Configuration

Horner OCS firmware is designed to initialize the GSM modem to establish GPRS connectivity. This configuration needs to be done for connectivity with remote server as well as for connectivity with Cscape.

- Open the GSM/GPRS/SMS Configuration by selecting Program, GSM/GPRS/SMS Configuration from the Main Menu.
- Select the Enable GPRS Data Connection check box.
- Configure Service Provider (Optional). If checked, the modem will get connected to the network provider mentioned here. A register address can also be given here, where the service provider name can be mentioned in registers. If the register option is selected, the service provider name should be terminated with a null. Only the first part of the name of network service provider can also be mentioned, i.e. instead of O2 IRELAND, only O2 can also be mentioned.
- Configure a register address to store Signal strength (Optional). [See section 4.4 for details.](#)
- Configure Status register for CsCAN communication (Optional). [See section 4.3 for details.](#)

GSM/GPRS/SMS Configuration

Enable GSM Data Connection

Enable GPRS Data Connection GPRS Configuration

Enable SMS Configuration SMS Configuration

Service Provider

Manual Network Selection

Get Service Provider Name from Register

Address: 16-BIT

Name:

Signal Strength Register

Address: 16-BIT

Name:

CsCAN Status Register

Address: 16-BIT

Name:

Data Transmission Settings

Disconnect and Service SMS when connection is Idle.

Idle State Timeout: (10 - 240 Seconds)

OK Cancel

- Click on the **GPRS Configuration** settings button to configure GPRS according to the information obtained by the Network Service Provider.

GPRS Configuration

GPRS Access Point Configuration

Get Access Point Configuration from Registers

User Name: Name:

Password: Name:

Access Point Address: Name:

GPRS Packet Assembler/Disassembler Configuration

Client Mode Server Mode

Get Source IP Address from Register

Address: **32-BIT** Name:

CsCAN Source IP Addr:

CsCAN Source Port: (2 - 65535)

Block Size: (3 - 512 Bytes)

Timeout Period: (0.1 - 6553.5 Seconds)

Forward Character: (00 - FF Hex)

Send Forward Character

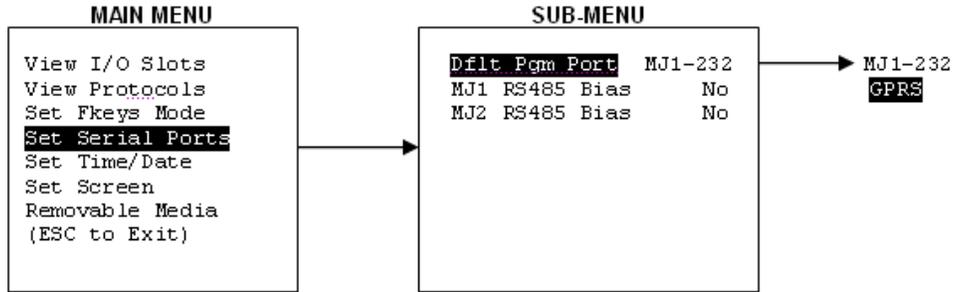
OK Cancel

GPRS Configuration	
GPRS Access Point Configuration	<p>The GPRS Access Point Configuration is mandatory and the fields are to be filled according to the information obtained by your Network Service Provider.</p> <p>Select Get Access Point Configuration checkbox configure registers instead of fixed values.</p>
GPRS Packet Assembler/Disassembler Configuration	<p>Client mode: In this mode the OCS behaves as client and connects to a specific server (Server IP/Port address to be specified in modem ladder block input).</p> <p>Server mode: In this mode the OCS behaves as server and accepts connection requests from specified client. Client IP addresses are to be specified in modem ladder block input.</p> <ul style="list-style-type: none"> For added security, the IP address for Cscape connectivity with a single device can also be specified. Enter the IP address of the device to connect to, for CsCAN connectivity directly in CsCAN Source IP Addr field or select the Get Source IP Address from Register checkbox and specify a %R register Address (32bit). When the IP address is mentioned, Cscape will connect to only that address and will reject connection requests from all other IP addresses. <p>Note: If the CsCAN Source IP Addr is 0.0.0.0, then the connection from any address will be accepted.</p> <p>Note: Server mode of operation is supported only when SIM with a static IP address or SIM having semi-static IP address with VPN is used.</p> <ul style="list-style-type: none"> CsCAN Source Port: When the modem is configured in server mode, the incoming connection request from any client will be accepted only via this port address. For Cscape connectivity this should be configured as 10001. This can be set to any value for peer to peer and data exchange provided the Server/Client port number is same. If Cscape connectivity is also required with data exchange/peer to peer connectivity, set this port to 10001. <p>Transmission of GPRS packet can take place on reaching packet size or occurrence of timeout or when forward character is found in the internal transmit buffer.</p> <ul style="list-style-type: none"> Block Size: GPRS packet size in number of bytes. Timeout Period: Transmission of GPRS packet to destination address will take place on occurrence of timeout mentioned. Forward Character: Transmission of GPRS packet will take place on finding character configured here. This value is to be entered in Hex value of ASCII character. For example, if '0D' is configured, the GPRS packet is transmitted when Line Feed character is put in the transmit buffer. This feature can be used to implement custom protocol over GPRS, such that the GPRS packet is sent after putting this character in the transmit buffer. Send Forward character: If this checkbox enabled, forward character will be sent together with GPRS packet.

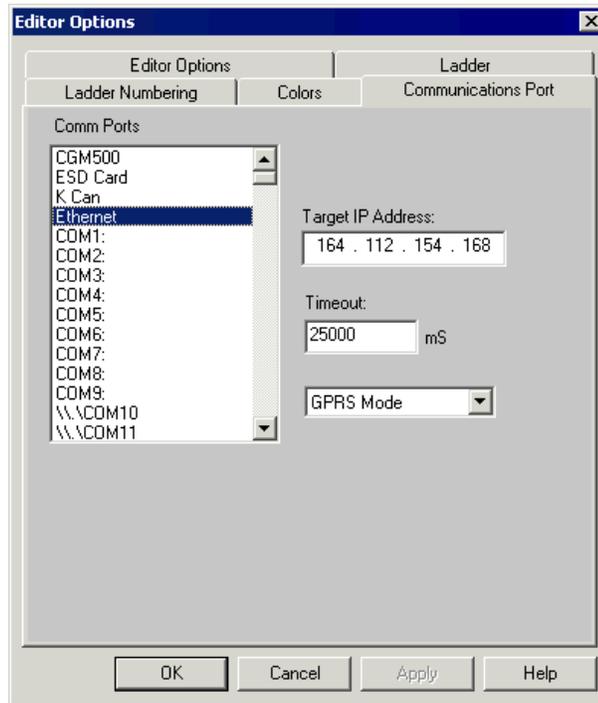
Additional ladder programming must be written to establish connection with remote server/client over GPRS service using ['communication operation' ladder blocks](#).

2.2 Connectivity with Cscope

- GPRS configuration must be downloaded into the OCS.
- Configure Sever/Client IP address in the OCS Main Menu -> Dflt Pgm Port -> GPRS
- This is valid for port MJ1 *only*.



- Select the default programming port as GPRS in the System Menu.
- The connectivity with Cscope over GPRS can be established only when the modem is configured in server mode.
- Open the Add Target dialog by selecting Tools| Editor Options | Communications Port and then click  from the Main Menu.



- Select Ethernet as the communications port (COMM Ports) and GPRS mode.
- Specify modem IP address and timeout.
- The communication timeout for Cscope should be increased to take care of the GPRS latency (typically 30 to 40 seconds).
- The status of the connection will be updated in CsCAN Status Register specified in the GSM/GPRS/SMS Configuration window. Various status values are described in the [Section 4.3 Modem Status Register Value Definitions](#) table. The same table can be used for the CsCAN Status Register. When the modem status value is 6, communications can be established.

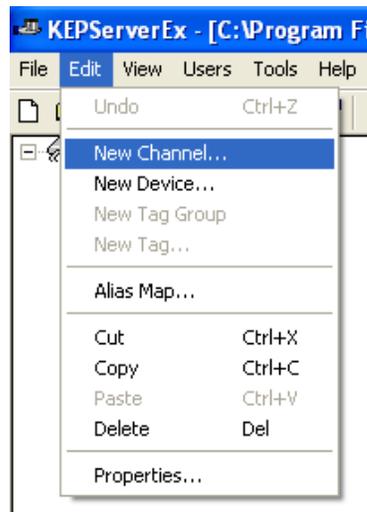
2.3 Configuring KEPServerEX for Data Exchange

KEPServerEX is the latest generation of Kepware's OPC server technology. The KEPServerEX gets the device and system data. It then translates it into a standard communication protocol (OPC or DDE) that all clients can receive and understand.

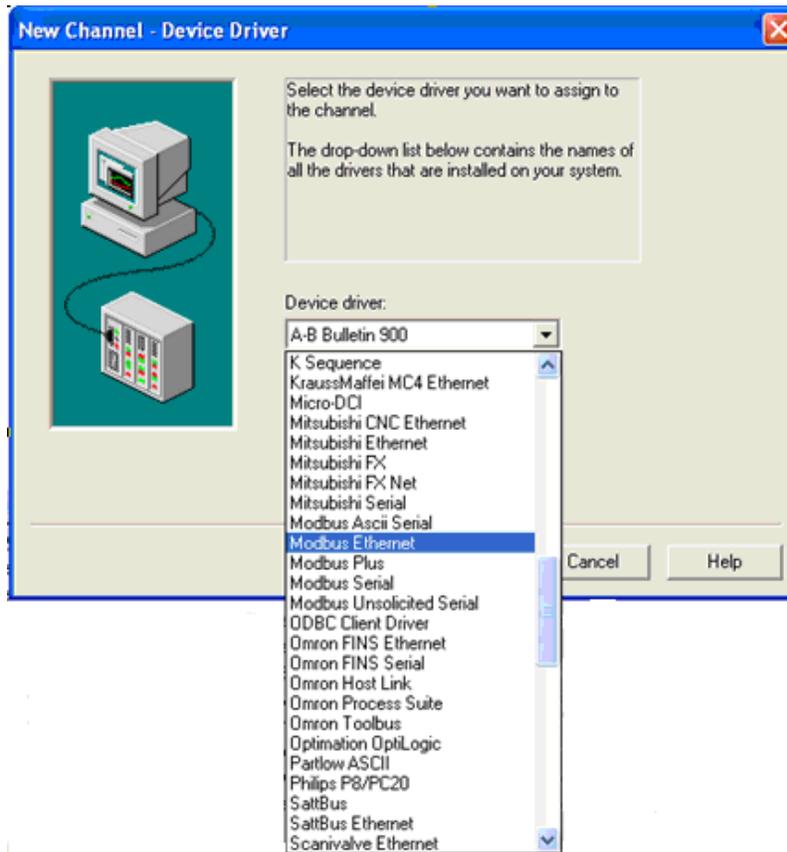
The following dialog gives details about the version of KEPServerEX with which the GPRS connectivity has been tested.



To configure KEPServerEX, a new channel is to be configured followed by a new device and tags for data mapping. Create a new channel by selecting New Channel from the Edit drop down on the KEPServerEX main menu:



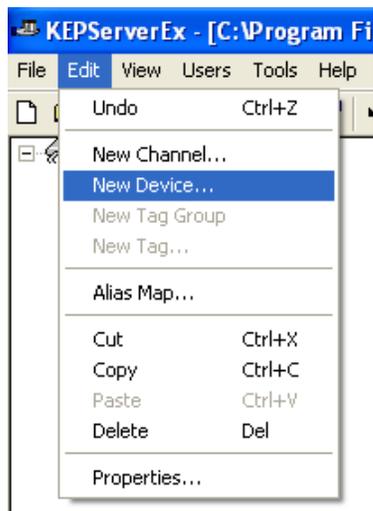
- After selecting name, choose the **Modbus Ethernet** option from the Device driver drop down.



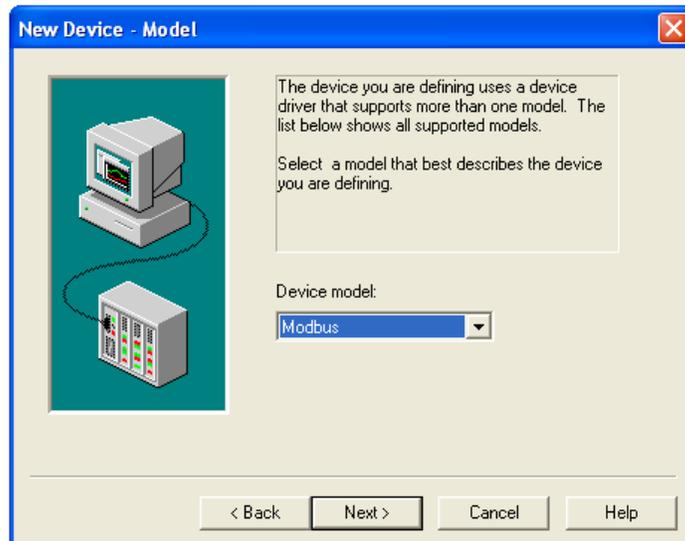
- Select the Enable Diagnostics check box and continue with other default settings.



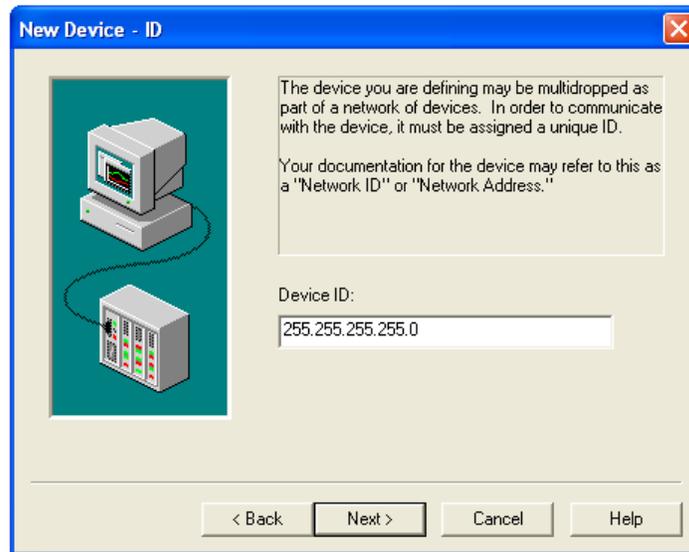
- Add a new device by selecting New Device from the Edit submenu in KEPServerEX.



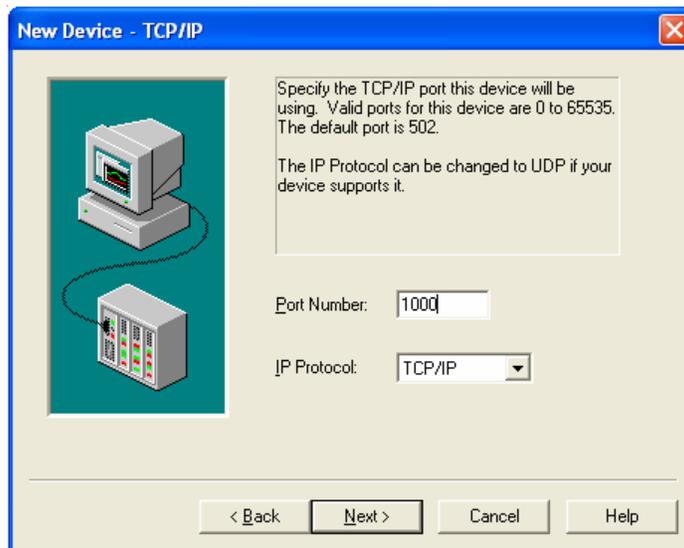
- After naming, choose **Modbus** from the Device Model menu.



In the New Device – ID dialog, set the **Device ID** (IP address of the sim card used). The last digit of the **Device ID** is a modbus slave ID, and it should match the settings from CSCALE (=2 as mentioned in the sample program).



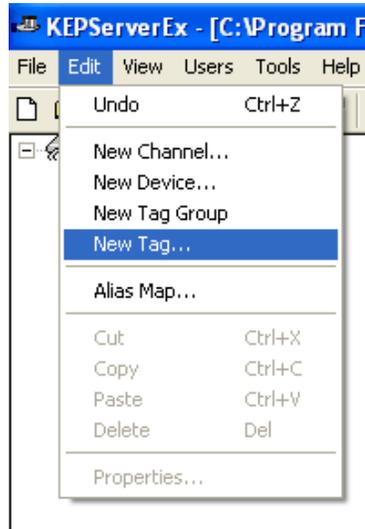
Clicking **Next>** opens the New Device – TCP/IP dialog box.



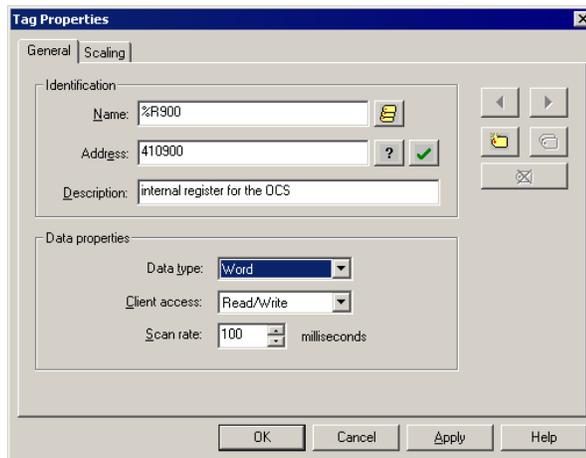
- Enter the correct port number (the same as in Cscale configurator), and TCP/IP protocol and continue with other default settings.

Note: The port number should be configured as 10001 if Cscale connectivity is also required.

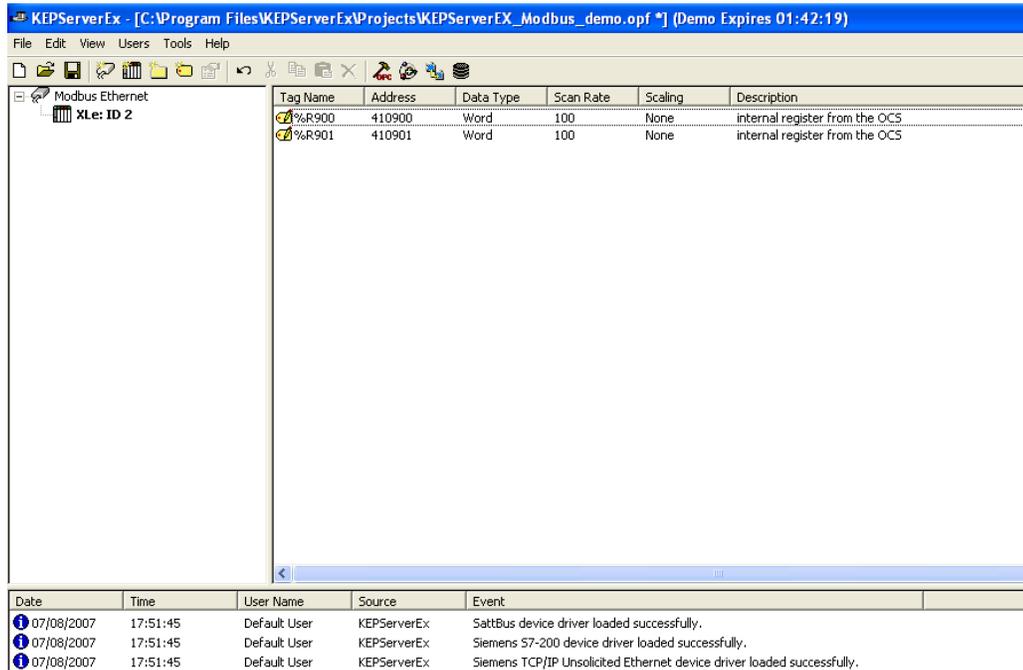
To be able to read and change internal registers, tags have to be created. Select **New Tag** from the **Edit** drop down on the KEPServerEx main menu.



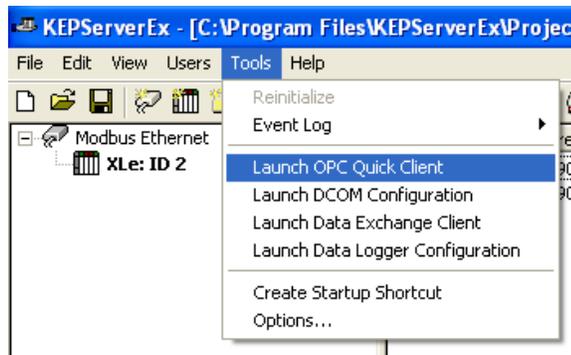
- The following Tag Properties dialog box show entries for register %R900. Likewise other tags can be created.



After creating a new tag this screen will show all the tags created with Tag Name, Address, Data Type, Scan Rate, Scaling and Description...



- To run OPC client, select **Launch OPC Quick Client** from Tools on the KEPServerEx main menu.



When a connection is made, the status register specified in the modem block will change to a 1. Test the data exchange.

2.4 Send / Receive SMS

[SMS configuration for sending/receiving SMS is detailed in section 5.2.](#)

3 Data Transmission Settings

If SMS needs to be serviced when a GSM/GPRS connection is active then additional Data Transmission Settings are needed. Select the **Enable SMS Configuration** checkbox with GSM or GPRS.

The screenshot shows a dialog box titled "GSM/GPRS/SMS Configuration" with a close button (X) in the top right corner. The dialog contains several sections:

- Enable GSM Data Connection:** A checkbox that is unchecked.
- Enable GPRS Data Connection:** A checkbox that is checked. To its right is a button labeled "GPRS Configuration".
- Enable SMS Configuration:** A checkbox that is checked. To its right is a button labeled "SMS Configuration".
- Service Provider:** A section containing:
 - Manual Network Selection:** A checked checkbox.
 - Get Service Provider Name from Register:** A checked checkbox.
 - Address:** A text input field with a "16-BIT" label to its right.
 - Name:** A dropdown menu.
- Signal Strength Register:** A section containing:
 - Address:** A text input field with a "16-BIT" label to its right.
 - Name:** A dropdown menu.
- CsCAN Status Register:** A section containing:
 - Address:** A text input field with a "16-BIT" label to its right.
 - Name:** A dropdown menu.
- Data Transmission Settings:** A section containing:
 - Disconnect and Service SMS when connection is Idle:** A checked checkbox.
 - Idle State Timeout:** A text input field containing the value "60", followed by the text "(10 - 240 Seconds)".

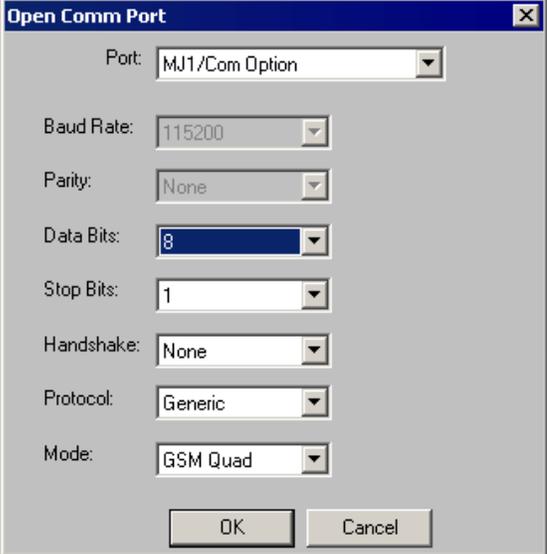
At the bottom of the dialog are two buttons: "OK" and "Cancel".

Select the checkbox, **Disconnect and Service SMS when connection is Idle**, to enable the **Idle State Timeout**. Enter the time duration from 10 to 240 seconds.

4 Data Transfer using Communication Blocks

For exchanging data over GSM / GPRS, communications block are required to be configured as follows:

4.1 Open Port



The screenshot shows a dialog box titled "Open Comm Port" with a close button (X) in the top right corner. The dialog contains several configuration options, each with a dropdown menu:

- Port: MJ1/Com Option
- Baud Rate: 115200
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Handshake: None
- Protocol: Generic
- Mode: GSM Quad

At the bottom of the dialog are two buttons: "OK" and "Cancel".

When using the internal GSM modem, Mode should be specified GSM Quad. The **Protocol** can be selected as CsCAN, Generic or Modbus. For Modbus, Slave or Master block should be used.

4.2 Modem Control Block

Note: To use modem control block, the com port is to be opened first.

- **Auto Dial modem Option**
- GSM data call
 - Modem Control block with 'Auto Dial' option is used for calling remote device (server)
 - Remote device data number must be entered in 'Number' text box.
 - Select type of dialing i.e. Pulse or Tone
 - Configure the status register to show the status of the connection. The status values are detailed in [section 4.3](#).
- GPRS connectivity
 - Modem Control block with 'Auto Dial' option is used to connect to remote server/client using the GPRS service.
 - Remote server IP and Port address must be entered in 'Number' text box in the format IP Address/Port.
 - In case of device acting as client, the IP address of the server needs to be mentioned here.
 - In case of device acting as server, the IP address can be given as 0.0.0.0. to accept connection from any client or IP address of the client can also be mentioned to accept connection only from that specific IP address for added security.
 - Select type of protocol UDP or TCP over IP.
 - Configure the status register to show the status of the connection. The status values are detailed in [section 4.3](#).
 - If the modem ladder block input is enabled then the modem tries establishing connection with a remote server in client mode or waits for a connection request from the client in server mode.

Comm Modem Control

Port: MJ1/Com Option

Operation: Auto Dial

Pulse (UDP)
 Tone (TCP)

Number (IP/Port Address): 10.111.64.1/10001

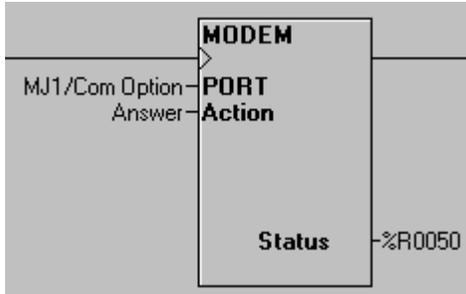
Use Register for Phone Number (IP/Port.)

Status Address: %R0050 Name:

Client Mode
 Server Mode

OK Cancel

- **Auto Answer modem Option**
- GSM data call
 - Modem Control block with 'Auto Answer' option is used for receiving connection requests from a remote server or device.
 - Number of rings after which connection request is accepted is entered in the text box provided.
 - Configure the status register to show the status of the connection. The status values are detailed in [section 4.3](#).



The screenshot shows a dialog box titled 'Comm Modem Control'. It contains the following fields and options:

- Port: MJ1/Com Option (dropdown menu)
- Operation: Auto Answer (dropdown menu)
- Radio buttons: Pulse (UDP) and Tone (TCP)
- Number of Rings: 1 (text box)
- Status Address: %R0050 (text box)
- Name: (empty dropdown menu)
- Buttons: OK and Cancel

- **Initialize modem Option**

- Modem Control block with 'Initialize Modem' option is used for execution of modem specific AT commands.
- Modem specific AT command to be executed is to be entered in 'Init String' text box provided in control.
- If AT command execution is successful then Modem Control block output is enabled, if not, the output is disabled.
- The status register is updated depending upon the response from the modem.
- The response from the modem is stored in consecutive register locations starting from 'status register+1' address.

Example:

- Modem control block with 'Initialize Modem' option is used for balance of minutes remaining from your service provider.
- The service provider balance request string is entered in the 'Init String' box together with CUSD AT command.
- The response from the service provider is stored in consecutive register locations starting from 'Status Address + 1'.

Note: The command to be sent for balance inquiry is: +CUSD = 1,"*111#",15 where "*111#" is the string to request balance remaining in SIM and **may vary** depending on the service provider.

The screenshot shows a dialog box titled "Comm Modem Control". It contains the following fields and options:

- Port: MJ1/Com Option
- Operation: Initialize Modem
- Init String: +CUSD=1,"*111#",15
- Status Address: %R0065
- Name: Modem_Status
- Client Mode (selected)
- Server Mode
- Radio buttons for Pulse (UDP) and Tone (TCP)
- OK and Cancel buttons

4.3 Modem Status Register value definitions

Modem Status	Register Value	Modem Output Power
Modem is inactive	65535 (0xFFFF)	Disabled
Modem command started and waiting for response	65534 (0xFFFE)	Disabled
Modem is not responding (Command Timeout)	65533 (0xFFFD)	Disabled
Modem Command succeeded	0 (0x0)	Enabled (Only in case of Initialization modem command else Disabled)
Modem is connected to destination server	1(0x1)	Enabled
Modem is Ringing (i.e. incoming call)	2 (0x2)	Disabled
Modem detected no/lost carrier	3(0x3)	Disabled
Modem command syntax error	4(0x4)	Disabled
SMS functionality is Active	5(0x5)	Disabled
Modem in Listen (Server) Mode	6 (0x6)	Disabled

Note:

- The status values are same for all GSM and GPRS modes i.e. Cscape connectivity or data exchange. However different status registers should be used for different modes.
- Status of '6' indicates Mode is waiting for connection request from specified client and it is applicable in case of GPRS server mode.
- When the modem returns status 'Connected', then TX, RX or another communications ladder block can be used to exchange data with a destination server according to protocol.
- Disabling the Modem Control ladder block input will disconnect GPRS service. The Status Register value changes to 65534 (0xFFFE i.e. indicates waiting for modem response for disconnect command) and then to 65535 (0xFFFF). It can be used to trigger SMS sending on an alarm.
- SMS functionality works based upon 'Data Transmission Settings' in the SMS configuration window while the GSM/GPRS connection is active.
- Connecting to a GPRS network and establishing connection with remote server may require 3 to 4 minutes.
- Breaking connection with a remote server may take 10 to 20 seconds.
- If a continuous error response is seen in the status register or 0xFFFE response while connecting the modem as the default programming port then please check the following:
 - a. GPRS configuration parameters (in case of GPRS connection)
 - b. GSM Signal strength
 - c. Proper insertion of SIM card in modem
 - d. Is the SIM enabled for a given service (i.e. GPRS or GSM data call).
 - e. Antenna connected properly/antenna connection
 - f. VPN connectivity
- If the default programming port is switched to the default serial port option from GSM/GPRS then the port should be released after 20 to 30 seconds after complete GPRS connection drop.
- Only one modem control block in specific mode (Initialize/Auto Dial/Auto Answer) can be used in ladder. More than one modem control block can be used in ladder if they are in different modes.

4.4 Signal Strength

- GSM/GPRS signal strength value is updated in 16bit long register. The 16bit long value consists of 2 fields as below:
 - Bit 1 to 8 represents Bit Error rate
Possible values are
Value 0 to 7
value 99(63h): Not known or Not detectable.
 - Bit 9 to 16 represents Received Signal Strength Indication
Possible values are
 - 0 : -113dBm or less (Very Poor signal Strength)
 - 1 : -111dBm or less (Poor signal Strength)
 - 30(1Eh) : -109 to -53 dBm (Good signal Strength)
 - 31(1Fh) : -51dBm or greater (Very Good signal Strength)
 - 99(63h) : Not known or Not detectable.

5 SMS Communications

5.1 Overview

SMS (Short Message Service) is a type of communications process that enables the transmission of short text messages and data transfers to and from mobile devices such as cell phones. Messages are usually limited from 140 to 160 characters in length and are stored and forwarded at SMS centers. This allows messages and data transfers to be retrieved immediately or at a later time via an SMS center.

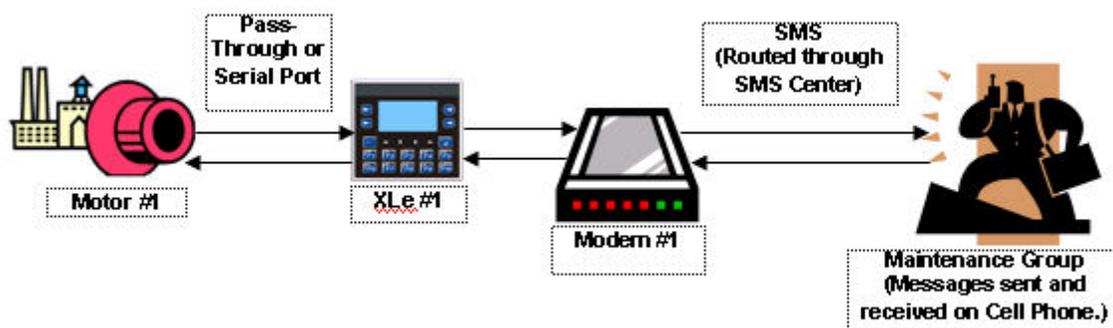
Advantages of using SMS

SMS communications provide an affordable and convenient means to send and receive data using mobile devices such as cell phones. Businesses and industry often require 24-hour coverage of their operations and have personnel who are on-call after normal work hours to handle work-related issues and emergencies. There are employees who are responsible for the proper functioning of equipment and processes at remote sites. Managers need to be notified of significant events.

Using SMS Communications with Horner Controllers

The SMS feature in selected Horner controllers provides the capability of sending and receiving text messages and register data values using mobile devices such as a cell phone. Depending upon the configuration, approved group members can read and write values into the controller's data registers. This kind of communication is referred to as a **data transfer**.

Data Transfer Example



- o Motor #1 stops. Data is sent to a register in the OCS controller (XLe/XLt/XL6).
- o The OCS reads the data register value indicating Motor #1 has stopped. A message is sent to the cell phone of a Maintenance Group member via SMS Communications. Transmissions are routed through an SMS center.
- o The Maintenance Group member receives the following message on a cell phone:
- o **Motor #1 speed is 0**
- o The Maintenance Group member sends the following message back to the OCS using a cell phone via SMS communications:
- o **Motor #1 Start Speed is 1800**
- o The OCS reads the register containing the data value sent from the Maintenance Group member and responds as programmed.
- o The OCS sends a signal to start Motor #1
- o Motor #1 re-starts, and normal operation is restored.

SMS Security Measures

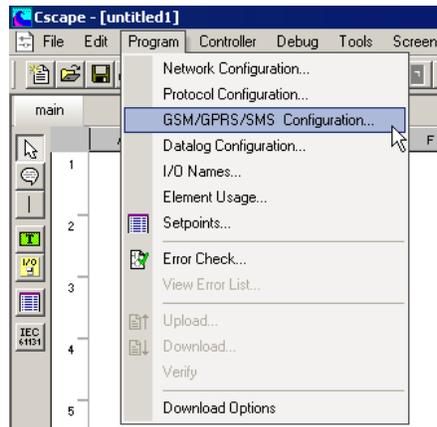
As part of the SMS configuration, a list of approved phone numbers and authorized messages that will be used for SMS communications must be provided. Because the SMS feature allows users to read and write to controller registers it is important to follow good standard security practices to safeguard systems. Whether users are allowed to write to registers or not, ensure that security is in place to protect against unauthorized inputs to registers.

5.2 SMS Configuration

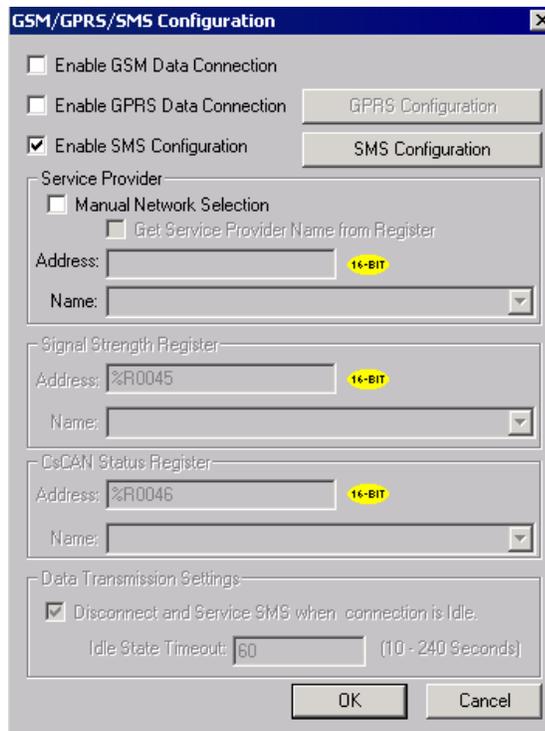
Cscape software is used to configure the necessary attributes in selected Horner controllers such as the XLe/XLt/XL6 to send and receive short text messages and data transfers using SMS communications. After the SMS configuration is completed and downloaded into the controller, approved group members can send and receive a variety of information such as register values and emergency alerts using cell phones and other mobile devices.

Refer to **SMS Communications** for more information on SMS and its capabilities.

- Select the desired controller. This feature is available on OCS types XLe, XLt, and XL6 and requires Cscape 8.1 or higher for SMS configuration. See **How to Select a Controller Model** if needed.
- Click **Program** and then select the **GSM/GPRS/SMS Configuration** tab on the Cscape main menu.

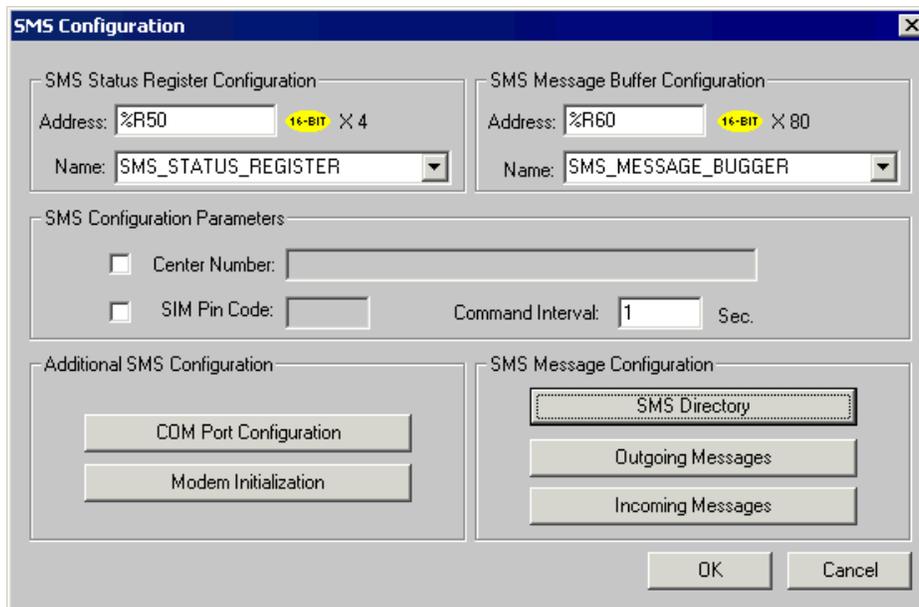


- Select the **Enable SMS Configuration** checkbox and then click **SMS Configuration** to begin SMS configuration.



5.2.1 GSM Modem Settings – SMS Configuration

- In this example, the screen is already configured. The **SMS Configuration** screen has several sections that require configuration.



Status Register Settings	
Address	Enter the starting register location to indicate the status of the SMS communication. This is a block of four registers that are consecutive in memory. For example, if you are using R31– R34, you need to enter the starting register address as %R0031.
Name	Enter (or select) an I/O Name.

The Status Register contains a status bit indicating the condition of the SMS communication. The following table contains the meaning of each status bit...

Status Bits		
SMS Status Bits		Description
Bit 13	Receive response failed	Set within 10 seconds if Read SMS command fails
Bit 14	Initialization Failed	Set after 1 min of entering into RUN mode if Modem initialization fails
Bit 15	Transmit Failed	Set within 10 seconds if SMS Transmit fails
Bit 16	Communication Failed	Set within 10 seconds if communication with modem fails
Bit 17 - Bit 24	Bit Error Rate value. See section 4.4 for details	Updated within 30 sec after entering into RUN mode
Bit 25 – Bit 32	Receive level value. See section 4.4 for details	Updated within 30 sec after entering into RUN mode
Bit 33 - Bit 48	Invalid message count	Count is incremented whenever a message is received from not configured sender or in not configured message format.
Bit 49 - Bit 56	Send/Receive retry count	Incremented every time when send / Receive of SMS fails. It is incremented within 10 seconds if Send / Receive failure.
Bit 57 – Bit 64	Re-initialization count	This count is incremented whenever modem initialization fails. The modem re-initializes itself if the send / receive command fails for 10 consecutive times.

Status Bits for Siemens Modems & Internal Modem	
Bit 1	CPIN Command Failed: This command is used to unlock the SIM. This bit will be set if supplied PIN is invalid or SIM is blocked or modem fails to respond within 2 sec of sending this command. This command is NOT executed if SIM Pin code is not enabled.
Bit 2	CSCA service center number command Failed: This command is used to set the SMS service center number. This bit will be set if setting SMS service center number command fails or modem fails to respond within 2 sec of sending this command. This command is NOT executed if Service center number is not provided.
Bit 3	CREG Command Failed: This command is used to register mobile device to the GSM network. This bit will be set if registration fails or modem fails to respond within 2 sec of sending this command.
Bit 4	CMGF Command Failed: SMS format selection command. This bit is set if modem returns Error response to this command or modem fails to respond within 2 sec of sending this command.
Bit 5	CNMI Command Failed: Command used to check newly received SMS message. This bit is set if modem returns Error response to this command or modem fails to respond within 2 sec of sending this command.
Bit 6	CSQ Command Failed: This command is used to get signal strength. This bit is set if modem returns Error response to this command or modem fails to respond within 2 sec of sending this command.
Bit 7	COPS Command Failed: This command is used to select and register to a GSM network operator. This bit is set if modem returns Error response to this command or modem fails to respond within 2 sec of sending this command.
Bit 8	CPEE Command Failed: This command (CMEE) is used to disable mobile equipment (ME) error indication. This bit is set if modem returns Error response to this command or modem fails to respond within 2 sec of sending this command.
Bit 9	ATE Command Failed: This bit will be set if Echo off command to Modem returns Error or modem fails to respond within 2 sec of sending this command.
Bit 10	CSMP Command failed: This bit will set if "Set SMS text mode parameter" command to Modem returns error or Modem fails to respond within 2 Sec of sending this command.
Status Bits for User Specific Initialization	
Bit 1 – Bit 12	If command(s) fails in the user script, a corresponding bit is set indicating failure. For example: Bit 1 is set when the first command in the script fails. Bit 2 is set when the 2nd command in the script fails.

SMS Message Buffer Register Settings

The Message Buffer Register holds the latest SMS message string sent or received by the controller. An individual SMS message can have up to 160 characters.

Message Buffer Register Settings	
Address	Enter the starting register location where the latest SMS message string is stored. This is a block of 80 registers that are consecutive in memory. For example, if you are using R101– R180, you need to enter the starting register address as %R0101.
Name	Enter (or select) an I/O Name.

SMS Configuration Parameters

Configuration Parameters	
Center Number	If required, select the box and type in Center number (up to 16 digits). The Center Number uses numbers 0 – 9 and these special characters: , () – +
SIM Pin Code	If required, select the box and type Pin number (up to 4 digits). SIM Pin Code can have only digits 0 – 9.
Command Interval	This is the interval of time (in seconds) that the OCS poll for messages (valid range: 1 - 100).

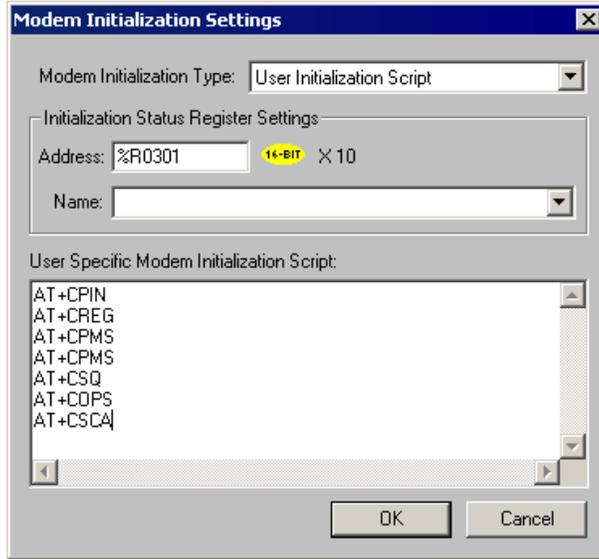
Note: SMS service center number should be configured correctly to send a SMS successfully.

Additional SMS Settings

Be sure to click each button and perform the configuration procedures associated with each button.

Modem Initialization Settings

Configure this screen to select the type of Modem Initialization that is going to be used.



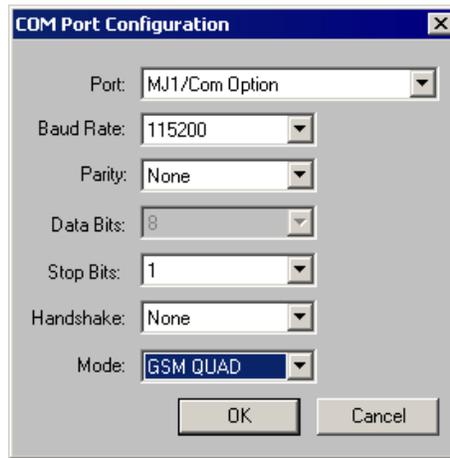
Configuration of **Initialization Status Register Settings** and **User Specific Modem Initialization Script** in the above screen is required when **User Initialization Script** is selected.

Modem Initialization Settings	
Modem Initialization Type	<p>The following options are available:</p> <p>No Initialization (Modem Preconfigured): No initialization of GSM modem will be done. Select this option if the attached GSM modem is pre-configured and does not require initialization.</p> <p>Internal Modem Initialization: Select this option if you have an XLe/XLt/XL6 with internal modem.</p> <p>Siemens TC Modem Initialization: In case of external GSM modem, select this option.</p> <p>User Initialization Script: To use your own initialization script, select User Initialization Script. When User Initialization Script is selected, the internal initialization of the device is not performed. It is necessary to configure initialization status register and provide initialization script.</p> <p>The type of Modem Initialization used affects various settings that are available on the COM Port screen.</p>
Address	Enter the starting register address location used to store the additional modem initialization script's latest command executed. This is a block of 10 registers that are consecutive in memory. For example, if you are using R301 to R310, you need to enter the starting register address as %R301.
Name	Enter (or select) the I/O Name.
User Specific Modem Initialization Script	Enter your script in this box.

5.2.2 COM Port Settings

Note: Before configuring this screen, you need to configure the Modem Initialization Settings screen. The type of Modem Initialization used affects various settings that are available on the COM Port screen such as the Port, Baud Rate, and Mode.

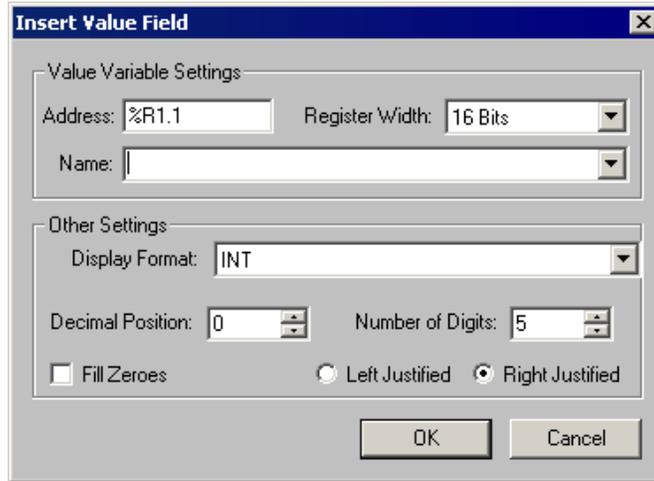
After configuring the Modem Initialization Settings, configure the port to be used for communications.



The following selections must match the default settings of the modem you are using.

COM Port Configuration Settings	
Port	Select the desired port. The number of ports varies depending on the controller used. For an XLe/XLt/XL6 internal modem MJ1 should be selected.
Mode	Select the connection mode. The drop-down list changes according to the port selection. For an XLe/XLt/XL6 internal modem, this selection should be GSM QUAD. For an external GSM Modem, RS 232 should be selected.
Comm Settings	Select Baud Rate, Parity, Data Bits, Stop Bits and Handshake settings as per the default settings of the modem being used.

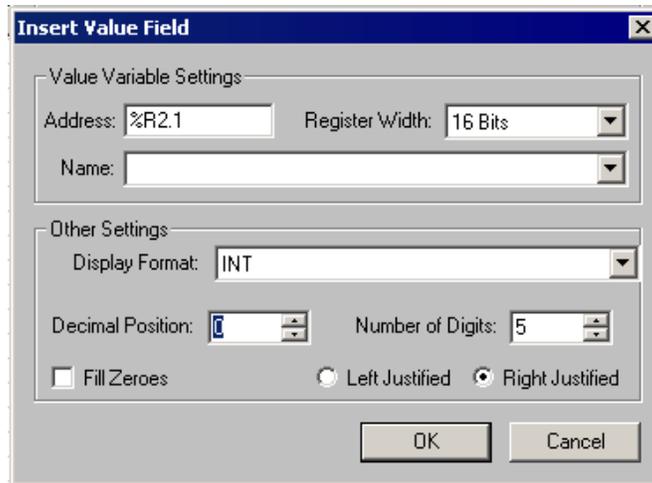
SMS Message Configuration	
Notify Variable Settings	Enter a <i>bit</i> reference in the Address field that will be set to high by the system when a valid SMS message associated with the variable is received from the specified Group member. I/O name can be entered or selected in the Name field.
Message Attributes	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;"> Message Attributes Allowed Group: MAINTENANCE <input type="checkbox"/> Ack Message </div> Enter or select the group that can send an SMS message to the controller. Select the Ack Message check box if you want to send an acknowledgement to the user that the controller has received the message.
SMS Message Configuration	Messages can contain text and register data values that approved group members can read and write into the controller's data registers at runtime. See Rules for Send and Receive Messages. <ul style="list-style-type: none"> The text of the message is entered starting in the upper most left block of the text input field (shown in green). In order to display register data values, click F2 = Edit Field button and configure the Insert Value Field screen shown below:



Insert Value Field	
Value Variable Settings	Enter a register reference where data embedded in the received message will be stored. Select Register Width .
Other Settings	Select or enter the data type in the Display Format field. In the Decimal Position field, click the position of the decimal point. Click the number of digits in the Number of Digits . Example: xxxxx shows that there is no decimal and the total number of digits is 5. If there had been a decimal point in the example, the decimal would have counted as one digit and would be included as part of the total number of digits. Click the Fill Zeroes box and the Left Justified or Right Justified box if desired.

SMS Message Configuration	
Trigger Variable Settings	An event is needed to trigger a SMS communication from the controller to the member(s) of a Group. Enter a bit reference in the Address field that (when set to HIGH) causes the SMS message associated with the trigger to be sent to the specified Group member(s). The application code should make the trigger bit high. It will be made low by the firmware once the SMS send request is serviced. An I/O name can be entered or selected in the Name field.
Message Attributes	Enter or select the group that the SMS message is sent to.
SMS Message Configuration	<p>Messages can contain text and register data values that approved group members can read and write into the controller's data registers at runtime. See Rules for Send and Receive Messages.</p> <ul style="list-style-type: none"> • The text of the message is entered starting in the upper most left block of the text input field (shown in green). • In order to edit/add register data values, click F2 = Edit Field button and configure the Insert Value Field screen shown below:

5.2.8 Insert Value Field



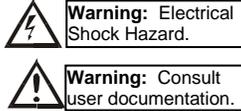
Insert Value Field	
Value Variable Settings	Enter a register reference where the data embedded in the message to send will be stored. An I/O name can be entered or selected in the Name field. Select Register Width .
Other Settings	<p>Select or enter the data type in the Display Format field. In the Decimal Position field, click the position of the decimal point. Click the number of digits in the Number of Digits.</p> <p>Example: xx.xx shows that the decimal is in the 3rd position and the total number of digits (including the decimal) is 5.</p> <p>Click the Fill Zeroes box and the Left Justified or Right Justified box if desired.</p>

6 GPRS / GSM Modem Specifications

HE-GSM04 SPECIFICATIONS			
Antenna Interface	Female SMA.		
Frequency bands	EGSM 900, DCS 1800, and PCS 1900, GSM 850 capability.		
GSM/GPRS features supported	Provides for all GSM/GPRS authentication, encryption, and frequency hopping algorithms. GPRS Coding Schemes CS1-CS4 supported. Multi-Slot Class 10 (4RX/2TX, Max 5 Slots).		
Regulatory Agency approvals	GCF Type Approval PTCRB Type Approval FCC Certification (Part 24) RTTE CE (European Community Certification) IC (Industry Canada) Approval		
GSM/GPRS Functionality	Mobile-originated and mobile-terminated SMS messages: up to 140 bytes or up to 160 GSM 7-bit ASCII characters. Reception of Cell Broadcast Message SMS Receipt acknowledgement Circuit Switched Data (Transparent & Non-transparent up to 9.6 Kbps) Voice (EFR, FR, HR) Supports Unstructured Supplementary Service Data (USSD) Multi-Slot Class 10 Supported (4Rx/2TX), (5 Slot Max) PBCCH/PCCCH Supported.		
SIM	3 V Mini-Subscriber Identity Module (SIM) compatible		
Size (L x W)	82.3 mm x 34.6 mm x 3.1 mm		
Weight	Less than 80 grams		
Operating & Storage temperature	0°C to +60°C (Operating) -10°C to +85°C (Storage)		
Relative humidity	5 - 95%		
Air pressure (altitude)	70 kPa to 106 kPa (-400 m to 3000 m)		
Transmit Power	Frequency	Power Class	Transmit Power
	1900 MHz 1800 MHz	GSM Power Class 1	1-W conducted power maximum (30 dBm +/- 2 dB), measured at the antenna port
	850 MHz 900 MHz	GSM Power Class 4	2-W conducted power maximum (33 dBm +/- 2 dB), measured at the antenna port
Receive Power	Frequency	Sensitivity	Mode
	1900 MHz 1800 MHz	-106 dBm (typical)	GPRS Coding Scheme 1 (CS1)
	850 MHz 900 MHz	-106 dBm (typical)	GPRS Coding Scheme 1 (CS1)

7 Installation / Safety

When found on the product, the following symbols specify:



WARNING: To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

- All applicable codes and standards need to be followed in the installation of this product.
- Adhere to the following safety precautions whenever any type of connection is made to the module:
 - ✓ ▪Connect the safety (earth) ground on the power connector first before making any other connections.
 - ✓ ▪When connecting to electric circuits or pulse-initiating equipment, open their related breakers.
 - ✓ ▪Do not make connections to live power lines.
 - ✓ ▪Make connections to the module first; then connect to the circuit to be monitored.
 - ✓ ▪Route power wires in a safe manner in accordance with good practice and local codes.
 - ✓ ▪Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
 - ✓ ▪Ensure hands, shoes, and floor are dry before making any connection to a power line.
 - ✓ ▪Make sure the unit is turned OFF before making connection to terminals.
 - ✓ ▪Make sure all circuits are de-energized before making connections.
 - ✓ ▪Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

8 Technical Support

For assistance, contact Technical Support at the following locations:

EUROPE
 Email: tech.support@horerirl.ie
 Fax: +353 (0)21 4321 826
 Tel : +353 (0)21 4321 266
 Website : <http://www.horner-apg.com>

USA
 Email: techspt@heapg.com
 Fax: +1 317 916 4274
 Tel: +1 317 916 4297
 Website : <http://www.heapg.com>

9 Appendix

A. SIM Card Features

GSM

- Data enabled SIM.
- Voice number can be disabled for the SIMs taken for this purpose. It will take out the possibility of any disconnection if someone tries to dial the voice number.

GPRS

- GPRS enabled static SIM / semi-static SIM with VPN connectivity.
- Voice number can be disabled for the SIMs taken for this purpose. It will take out the possibility of any disconnection if someone tries to dial the voice number.

B. AT Command Set

1. ATD Dial command

Command Function	This command is used to setup an outbound voice or data call.
Command Functional Group	Call Control
Command Format Query Response	N/A N/A
Write Format Response	N/A N/A
Read Format Response	N/A N/A
Execution Format Response	ATD1234567I; NO DIALTONE or NO CARRIER or CONNECT <value> or BUSY or OK
Parameter Values	
<n>	V.25ter Dialing Digits = 0 – 9, *, #, +, A, B, C V.25ter Dialing Modifiers = , (comma), T, P, I, @, W
<cm0d>	GSM Modifier Characters I = Restrict CLI, i = Allow CLI
<;>	Semicolon after dialing string or modifier indicates voice call and forces TA into command mode after successful completion.
Modem Responses	
NO DIALTONE	if no dial tone is detected
NO CARRIER	if call cannot be set up
CONNECT <value>	when connected in a non-voice call (data mode) <value> dependent on ATX setting
BUSY	if dialed number is busy
OK	when successful voice call or TA ends current call and returns to command mode

Example:

```
ATD5551212I
```

The TA will dial the number 5551212 and will block the CLI when made.

2. AT+CBST Select Bearer service type

AT+CBST	Select Bearer service type	
Command Function	This command is used to select the bearer service with data rate and the connection element to be used when data calls are originated.	
Command Functional Group	Call Control	
Command Format Query Response	AT+CBST=? +CBST: (0-7, 12, 14, 65, 66, 68, 70, 71,75), (0-1), (0-3)	
Write Format Response	AT+CBST=<baud rate>,<name>,<ce> OK/ERROR	
Read Format Response	AT+CBST? +CBST: 7,0,1	
Execution Format Response	N/A N/A	
Parameter Values		
<baud rate>	0	Autobauding (automatic selection of the speed; this setting is possible in case of 3.1 kHz modem and non-transparent service)
	1	300 bps (V.21)
	2	1200 bps (V.22)
	3	1200/75 bps (V.23)
	4	2400 bps (V.22bis)
	5	2400 bps (V.26ter)
	6	4800 bps (V.32)
	7	9600 bps (V.32)
	12	9600 bps (V.34)
	14	14400 bps (V.32)
	65	300 bps (V.110)
	66	1200 bps (V.110)
	68	2400 bps (V.110 or X.31 flag stuffing)
	70	4800 bps (V.110 or X.31 flag stuffing)
	71	9600 bps (V.110 or X.31 flag stuffing)
75	14400 bps (V.110 or X.31 flag stuffing)	
<name>	0	none
<ce>	0	transparent
	1	non-transparent
	2	both, transparent preferred
	3	both, non-transparent preferred
Example		
<pre> AT+CBST=7,0,1 ├── Non-transparent ├── No name └── 9600 bps (V.32) </pre>		

3. AT+CREG Network Registration Info

Command Function	Write command controls the presentation of an unsolicited result code +CREG: <stat> . Read command returns the status of result code, which shows whether the network has currently indicated the registration of the ME.	
Command Functional Group	Network Information	
Command Format Query Response	AT+CREG=? +CREG: (0,2) OK	
Write Format Response	AT+CREG=[<n>] OK	
Read Format Response	AT+CREG? +CREG: <n>,<stat>[,<lac>,<ci>] OK	
Execution Format Response	N/A N/A	
Parameter Values		
<n>	0	disable network registration unsolicited result code
	1	enable network registration unsolicited result code +CREG: <stat>
	2	enable network registration and location information unsolicited result code +CREG: <stat>[,<lac>,<ci>]
<stat>	0	not registered, ME is not currently searching a new operator to register to
	1	registered, home network
	2	not registered, but ME is currently searching a new operator to register to
	3	registration denied
	4	unknown
	5	registered, roaming
<lac>	string type; two-byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)	
<ci>	string type; two-byte cell ID in hexadecimal format	

4. AT+COPS Operator Selection

AT+COPS	Operator Selection
Command Function	<p>Write command forces an attempt to select and register the GSM network operator. <mode> is used to select whether the selection is done automatically by the ME or is forced by this command to operator <oper> (it shall be given in format <format>). If the selected operator is not available, no other operator shall be selected (except <mode> = 4). The selected operator name format shall apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to all further registration (e.g. after <mode>=2, ME shall be unregistered until <mode>=0 or 1 is selected).</p> <p>Read command returns the current mode and the currently selected operator. If no operator is selected, <format> and <oper> are omitted.</p> <p>Test command returns a list of quadruplets, each representing an operator present in the network. Quadruplet consists of an integer indicating the availability of the</p>

	operator <stat>, long and short alphanumeric format of the name of the operator, and numeric format representation of the operator. Any of the formats may be unavailable and will then be an empty field (,). The list of operators comes in the following order: Home network, networks referenced in SIM, and other networks.	
Command Functional Group	Network Information	
Command Format Query Response	AT+COPS=? +COPS: (2, " ", " ", "31022"), (3, " ", " ", "310380") OK	
Write Format Response	AT+COPS=<mode> [, <format> [, <oper>]] OK or +CME ERROR: <err>	
Read Format Response	AT+COPS? +COPS: 0 OK	
Execution Format Response	N/A N/A	
Parameter Values		
	0	automatic (<oper> field is ignored)
	1	manual (<oper> field shall be present)
	2	deregister from network
	3	set only <format> (for read command +COPS?), do not attempt registration/deregistration (<oper> field is ignored); this value is not applicable in read command response
	4	manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode=0) is entered
<format>	0	long format alphanumeric <oper>
	1	short format alphanumeric <oper>
	2	numeric <oper>; GSM Location Area Identification Number
<oper>	operator in format as in per <format>	
<stat>	0	Unknown
	1	Available
	2	Current
	3	Forbidden
Example:		
To manually register the modem on a known PLMN: AT+COPS=1,2,"xxxxx" 		To read operator information: AT+COPS=? +COPS: (2,"Voicestream","Vstream","31022")

5. AT+CPIN Enter PIN

AT+CPIN	Enter PIN
Command Function	Set command sends to the ME a password that is necessary before it can be operated (SIM PIN, SIM PUK, PH-SIM PIN, etc.). If no PIN request is pending, no action is taken towards ME and an error message, +CME ERROR, is returned to TE. If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <newpin> , issued to replace the old pin in the SIM.
Command Functional Group	Phone Control
Command Format Query Response	AT+CPIN=? OK
Write Format Response	AT+CPIN=<"pin">,[<"newpin">]
Read Format Response	AT+CPIN? +CPIN: <code> OK or +CME ERROR: <err>
Execution Format Response	N/A N/A
Parameter Values	
<code>	READY ME is not pending for any password
	SIM PIN ME is waiting SIM PIN to be given
	SIM PUK ME is waiting SIM PUK to be given
	PH-SIM PIN ME is waiting phone-to-SIM card password to be given
	PH-FSIM PIN ME is waiting phone-to-very first SIM card password to be given
	PH-FSIM PUK ME is waiting phone-to-very first SIM card unblocking password to be given
	SIM PIN2 ME is waiting SIM PIN2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (i.e. +CME ERROR: 17); if PIN2 is not entered right after the failure, it is recommended that ME does not block its operation)
	SIM PUK2 ME is waiting SIM PUK2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (i.e. +CME ERROR: 18); if PUK2 and new PIN2 are not entered right after the failure, it is recommended that ME does not block its operation)
	PH-NET PIN ME is waiting network personalization password to be given
	PH-NET PUK ME is waiting network personalization unblocking password to be given
	PH-NETSUB PIN ME is waiting network subset personalization password to be given
	PH-NETSUB PUK ME is waiting network subset personalization unblocking password to be given
	PH-SP PIN ME is waiting service provider personalization password to be given
	PH-SP PUK ME is waiting service provider personalization unblocking password to be given
	PH-CORP PIN ME is waiting corporate personalization password to be given
	PH-CORP PUK ME is waiting corporate personalization unblocking password to be given

6. AT+CSQ Signal Quality and Bit Error Rate

AT+CSQ	Signal Quality and Bit Error Rate	
Command Function	Execution command returns received signal strength indication <rssi> and channel bit error rate <ber> from the ME.	
Command Functional Group	Phone Control	
Command Format Query Response	AT+CSQ=? +CSQ: (2-31,99),(99) OK	
Write Format Response	N/A N/A	
Read Format Response	N/A N/A	
Execution Format Response	AT+CSQ +CSQ: <rssi>, <ber> OK	
Parameter Values		
<rssi>	0	-113 dBm or less
	1	-111 dBm
	2-30	-109... -53 dBm
	31	-51 dBm or greater
	99	not known or not detectable
<ber> (in percent)	0-7	as RXQUAL values in the table in GSM 05.08 [20] subclause 8.2.4
	99	not known or not detectable

7. AT+CMGF SMS Format

AT+CMGF	SMS Format	
Command Function	Set command tells the TA, which input and output format of messages to use. <mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters).	
Command Functional Group	Short Message Services	
Command Format Query Response	AT+CMGF=? AT+CMGF: (0,1) OK	
Write Format Response	AT+CMGF=<mode> OK	
Read Format Response	AT+CMGF? +CMGF: 1 OK	
Execution Format Response	N/A N/A	
Parameter Values		
<mode>	0	PDU mode
	1	Text mode
Notes	Use of PDU mode requires an in depth understanding of PDU message and header formats.	

8. AT+CSCA Service Center Address - Message Configuration Commands

AT+CSCA	Service Center Address
Command Function	Set command updates the SMSC address, through which mobile originated SMS are transmitted.
Command Functional Group	Short Message Services
Command Format Query Response	AT+CSCA=? OK
Write Format Response	AT+CSCA=<"sca">,<tosca> +CSCA: <"sca">,<tosca> OK
Read Format Response	AT+CSCA? +CSCA="12063130004", 145 OK
Execution Format Response	N/A N/A
Parameter Values	
<"sca">	SMSC Address
<tosca>	SC address Type-of-Address
Notes	The service center address must be present to complete delivery of SMS. Most SIMs are delivered from the service provider with a service center already programmed into the SIM. A "+" should be entered in front of the sms address, but is not required by all operators.

9. AT+CSMP Set Text Mode Parameters

AT+CSMP	Set Text Mode Parameters
Command Function	Selects additional values needed when the SIM is sent to the network or placed in storage.
Command Functional Group	Short Message Services
Command Format Query Response	AT+CSMP=? OK
Write Format Response	AT+CSMP=<fo>,<vp>,<pid>,<dcs> OK
Read Format Response	AT+CSMP? +CSMP: 17, 167, 0, 0 OK
Execution Format Response	N/A N/A
Parameter Values	
<fo>	depending on the command or result code: first octet of GSM 03.40 SMS- DELIVER, SMS-SUBMIT (default 17), or SMS-COMMAND (de-fault 2) in integer format
<vp>	depending on SMS-SUBMIT <fo> setting: GSM 03.40 TP-Validity-Period either in integer format (default 167)), in time-string format (refer <dt>), or if is supported, in enhanced format (hexadecimal coded string with quotes)
<pid>	Protocol-Identifier in integer format (default 0), refer GSM 03.40
<dcs>	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format depending on the command or result code: GSM 03.38

10. AT+CNMI New Message Indication to TE - Message Receiving and Reading Commands

2.5.3.1. AT+CNMI		New Message Indication to TE	
Command Function		Selects how incoming messages from the network are indicated to the TE when the TE is active.	
Command Functional Group		Short Message Services	
Command Format Query Response		AT+CNMI=? +CNMI: (0-2), (0-3), (0,2), (0,1), (0,1) OK	
Write Format Response		AT+CNMI=<mode>, <mt>, <bm>,<ds>,<bfr> OK	
Read Format Response		AT+CNMI? +CNMI: 1,1,0,0,0 OK	
Execution Format Response		N/A N/A	
Parameter Values			
<mode>		0	Buffer unsolicited result codes in the TA
		1	Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved
		2	Buffer unsolicited result codes in the TA when TA-TE link is reserved and flush them to the TE after reservation
<mt>	Receiving procedure for different message data coding schemes (refer GSM 03.38 [2])		
0	no class: as in GSM 03.38, but use <mem3> as preferred memory class 0: as in GSM 03.38, but use <mem3> as preferred memory if message is tried to be stored class 1: as in GSM 03.38, but use <mem3> as preferred memory class 2: as in GSM 03.38 class 3: as in GSM 03.38, but use <mem3> as preferred memory message waiting indication group (discard message): as in GSM 03.38, but use <mem3> as preferred memory if message is tried to be stored message waiting indication group (store message): as in GSM 03.38, but use <mem3> as preferred memory		
1	as <mt>=0 but send indication if message stored successfully		
2	no class: route message to TE class 0: as in GSM 03.38, but also route message to TE and do not try to store it in memory class 1: route message to TE class 2: as <mt>=1 class 3: route message to TE message waiting indication group (discard message): as in GSM 03.38, but also route message to TE and do not try to store it in memory message waiting indication group (store message): as <mt>=1		
3	class 3: route message to TE others: as <mt>=1		
<bm>		0	No CBM indications are routed to the TE
		1	If CBM is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code: +CBMI: <mem>,<index>
		2	New CBMs are routed directly to the TE using unsolicited result code
		3	Class 3 CBMs are routed directly to TE using unsolicited result codes defined in <bm>=2. If CBM storage is supported, messages of other classes result in indication as defined in <bm>=1
<ds>		0	No SMS-STATUS_REPORTs are routed to the TE
		1	SMS-STATUS-REPORTs are routed to the TE using unsolicited result code
<bfr>		0	TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...2 is entered.
		1	TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...2 is entered.

11. AT+CMGL List Messages

AT+CMGL	List Messages
Command Function	List messages from storage.
Command Functional Group	Short Message Services
Command Format Query Response	AT+CMGL=? +CMGL: ("REC UNREAD","REC READ","STO UNSENT","STO SENT","ALL") OK
Write Format Response	N/A N/A
Read Format Response	N/A N/A
Execution Format Response	AT+CMGL =<stat> +CMGL: <index>, <stat>, <da/oa>, [<alpha>, <scts>, <tooa/toda>, <length>] <CR><LF> data OK
Parameter Values	See Notes
<index>	Memory location integer
<stat>	Status of message "REC UNREAD" "REC READ" "STO UNREAD" "STO READ" "ALL"
<do/oa>	destination address
<alpha>	alphanumeric representation of <da> or <oa> corresponding to the entry found in MT phonebook
<scts>	Service center time stamp
<tooa/toda>	Address Type-of-Address octet in integer format
<length>	Length of message in octets
Notes	Above settings for <stat> assume AT+CMGF=1 (text mode). For AT+CMGF=0 (PDU mode), the following <stat> values are supported: 0,1,2,3,4. Parameters in [] may or may not be reported dependent upon the setting of AT+CMGF.
	0 "Rec Unread"
	1 "Rec Read"
	2 "Sto Unsent"
	3 "Sto Sent"
	4 "ALL"

12. AT+CMGR Read Message

AT+CMGR	Read Message
Command Function	Read stored messages.
Command Functional Group	Short Message Services
Command Format Query Response	N/A N/A
Write Format Response	N/A N/A
Read Format Response	N/A N/A
Execution Format Response	AT+CMGR=<index> +CMGR: <stat>, <oa>, <scts>, [<tooa>, <fo>, <pid>, <sca>, <tosca>, <length>]<CR><LF><data> OK
Parameter Values	
<stat>	Status of message (Rec Read, Rec Unread, Sto Unsent, Sto Sent)
<oa>	Originating address
<scts>	Service center time stamp
<tooa>	Originating address – type of address
<fo>	First octet
<pid>	Protocol identifier
<sca>	Service center address
<tosca>	Type of address
<length>	Length of message in octets
Notes	The above parameters are for text mode.

13. AT+CMGS Send Message - Message Sending and Writing Commands

AT+CMGS	Send Message
Command Function	Sends message from the TE to the network.
Command Functional Group	Short Message Services
Command Format Query Response	N/A N/A
Write Format Response	N/A N/A
Read Format Response	N/A N/A
Execution Format Response	AT+CMGS="<da>",<[<tooda>] Enter text <ctrl Z> +CMGS <mr> OK
Parameter Values	
<da>	Destination address
<mr>	Message reference
Notes	The example provided is for text mode (AT+CMGF=1). An in depth understanding of PDU messages is required for PDU mode.

14. AT+CMGD Delete Message

2.5.4.4. AT+CMGD

Command Function

Command Functional Group

Command Format Query Response

Write Format Response

Read Format Response

Execution Format Response

Parameter Values

<index>

Notes

Delete Message

Deletes message from preferred storage location.

Short Message Services

N/A

N/A

N/A

N/A

N/A

N/A

AT+CMGD=<index>

OK

Integer value of memory location.

If there is no message stored in the selected index, an error will be returned.

15. +CGDCONT Define PDP Context

+CGDCONT	Define PDP Context
Command Function	Specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid>.
Command Functional Group	GPRS Commands
Command Format Query Response	AT+CGDCONT=? +CGDCONT: (1-2),"IP",,(0,1),(0,1) OK
Write Format Response	AT+CGDCONT=<cid>,<PDP_Type>,<APN>,<PDP_ADDR>,<d_comp>,<h_comp> OK
Read Format Response	AT+CGDCONT? +CGDCONT: <cid>,<PDP_Type>,<"APN">,<"PDP_ADDR">,<d_comp>,<h_comp> OK
Execution Format Response	N/A N/A
Parameter Values	
<cid>	PDP Context Identifier
<PDP_type>	"IP"
<"APN">	"Access Point Name"
<"PDP_addr">	" Identifies the MT in the address space"
<d_comp>	0 off
	1 on
<h_comp>	0 off
	1 on
Notes	AT+CGDCONT must be entered before Context activation. AT+CGDCONT=1,"IP","",",",0,0 may be entered for networks that dynamically assign the APN. Contact your service provider for correct APN information.

16. \$UDPAPI Modem API Address - UDP API Commands

\$UDPAPI	Modem API Address
Command Function	This command allows the user to query/set the API IP address and port number. Any UDP packet received from a local host and addressed to the modem API IP and port will be intercepted and processed as a modem API request. Any UDP packet received from a remote server and addressed to the modem API port will be intercepted and processed as a modem API request.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$UDPAPI=? \$UDPAPI: "(0-255).(0-255).(0-255).(0-255)",(0-65535) OK
Write Format Response	AT\$UDPAPI="<API IP>",<API port> OK
Read Format Response	AT\$UDPAPI? \$UDPAPI: "<APIIP>",<API port>
Execution Format Response	N/A N/A
Parameter Values	
<API IP>	IP address for local API access
<API port >	Udp port number for local and remote API access

17. PAD Commands

\$PADDST	PAD Destination IP/Port
Command Function	This command allows the user to query/set the PAD destination IP and port address.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$PADDST=? \$PADDST: "(0-255),(0-255),(0-255),(0-255)",(0-65535) OK
Write Format Response	AT\$PADDST ="<PAD destination IP>",<PAD destination port> OK
Read Format Response	AT\$PADDST? \$PADDST: ="<PAD destination IP>",<PAD destination port>
Execution Format Response	N/A N/A
Parameter Values	
<PAD destination IP >	Destination IP for PAD data. PAD data is sent to and received from this IP. A destination IP address of 0 will allow PAD access from any IP destination, and will cause all locally generated PAD data to be sent to the IP address associated with the last remotely received PAD data.
<PAD destination port >	Destination port for PAD data. PAD data is sent to and received from this port. A destination port of 0 will allow PAD access from any port, and will cause all locally generated PAD data to be sent to the port associated with the last remotely received PAD data.
Notes	A value of 0 will allow any IP/port access to the TCP PAD. If populated and in passive, server mode (AT\$ACTIVE=0) the TCP PAD will limit access to the IP/port defined.

18. \$PADSRC PAD Source Port

\$PADSRC	PAD Source Port
Command Function	This command allows the user to query/set the API PAD source port. Remote data received from a valid destination address to this source port will be processed as incoming PAD data. This port is also used as the source port for all data sent to the PAD destination. This value must be different than the UDPAPI port.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$PADSRC=? \$PADSRC: (0-65535) OK
Write Format Response	AT\$PADSRC = <PAD source port> OK
Read Format Response	AT\$PADSRC? \$PADSRC: <PAD source port>
Execution Format Response	N/A N/A
Parameter Values	
<PAD source port >	PAD source port is used as the source port in all outgoing PAD data messages. The remote host must use this port number as the destination port for PAD data sent to the device.

19. \$ACTIVE TCP PAD State

\$ACTIVE	TCP PAD State				
Command Function	This command determines the active or passive state of the TCP PAD connection.				
Command Functional Group	Enfora Specific				
Command Format Query Response	AT\$ACTIVE=? \$ACTIVE: (0-1) OK				
Write Format Response	AT\$ACTIVE =<state > OK				
Read Format Response	AT\$ACTIVE? \$ACTIVE: <state>				
Execution Format Response	N/A N/A				
Parameter Values					
<state>	<table border="1"> <tr> <td>0</td> <td>TCP PAD passive/server mode</td> </tr> <tr> <td>1</td> <td>TCP PAD active/client mode</td> </tr> </table>	0	TCP PAD passive/server mode	1	TCP PAD active/client mode
0	TCP PAD passive/server mode				
1	TCP PAD active/client mode				
Notes	If passive is chosen, the PAD will be in server mode and listen for inbound TCP connection requests. If active is chosen, the PAD will be in client mode and will initiate a connection based on the ATDT command, or if atd*99# is used to initiate a GPRS connection, the values populated in AT\$PADDST. A value of 0 indicates passive, server mode of operation. A value of 1 indicates active, client mode of operation. ATDT will be used to initiate the passive, server mode functionality. If ATDTxxx.xxx.xxx.xxx/xxxx is used, it will override the passive mode and replace the AT\$PADDST parameters as it does in UDP PAD mode.				

20. \$PADBLK PAD Block Size

\$PADBLK	PAD Block Size
Command Function	This command allows the user to query/set the PAD block size.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$PADBLK=? PADBLK: (3-512) OK
Write Format Response	AT\$PADBLK =<block size > OK
Read Format Response	AT\$PADBLK? \$PADBLK: <block size>
Execution Format Response	N/A N/A
Parameter Values	
<block size >	PAD data will be created at the requested PAD block size (number of bytes) unless an enabled forward character or PAD timeout forces the data to be sent out at a smaller block size. Block size does NOT include the IP or TCP/UDP header size.

21. \$PADFWD PAD Forward Character

\$PADFWD	PAD Forward Character
Command Function	This command allows the user to query/set the PAD forward character. If PAD forward is enabled via AT\$PADCMD, receipt of this character will immediately forward all currently buffered PAD data.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$PADFWD =? \$PADFWD: (0-ff) OK
Write Format Response	AT\$PADFWD =<forward character> OK
Read Format Response	AT\$PADFWD? \$PADFWD: <forward character>
Execution Format Response	N/A N/A
Parameter Values	
<backspace character >	Hex representation of user selected forward character. Default forward character is 0D (Carriage return).

22. \$PADTO PAD Timeout Value

\$PADTO	PAD Timeout Value
Command Function	This command allows the user to query/set the PAD timeout value. Data will be forwarded to the PAD destination even if the PAD block size has not been reached if <pad timeout> period has elapsed since the last PAD character was received from the local host.
Command Functional Group	Enfora Specific
Command Format Query Response	AT\$PADTO \$PADTO: (0-65535) OK
Write Format Response	AT\$PADTO = <PAD timeout> OK
Read Format Response	AT\$PADTO \$PADTO: <PAD timeout>
Execution Format Response	N/A N/A
Parameter Values	
<PAD timeout>	The number of tenths of seconds to wait for the receipt of more PAD data before forwarding the currently accumulated PAD buffer to the PAD destination. A value of zero disables the PAD timeout feature. If the PAD timeout feature is disabled, no data will be forwarded to the destination until either an enabled forward character is received, or the selected PAD buffer size is reached. (50 = 5 seconds)

23. DP Dial Command for UDP PAD

DP	Dial Command for UDP PAD
Command Function	This command is used to invoke the UDP PAD via a dial command.
Command Functional Group	Enfora Specific
Command Format Query Response	N/A N/A
Write Format Response	atdp<IP_ADDRESS>/ <UDP Port Number> Connect
Read Format Response	N/A N/A
Execution Format Response	N/A N/A
Parameter Values	
<IP_ADDRESS>	IP Address of the destination host.
<UDP Port Number>	UDP Port number. If no UDP port number is required, a value zero (0) should be specified here.
Notes	This command will override the AT\$PADDST settings for the current connected session.
Example:	atdp123.456.789.1/0 atdp123.456.789.2/3000

24. DT Dial Command for TCP PAD

DT	Dial Command for TCP PAD
Command Function	This command is used to invoke the TCP PAD via a dial command.
Command Functional Group	Enfora Specific
Command Format Query Response	N/A N/A
Write Format Response	atdt <IP_ADDRESS> / <TCP Port Number> Connect
Read Format Response	N/A N/A
Execution Format Response	N/A N/A
Parameter Values	
<IP_ADDRESS>	IP Address of the destination host.
<TCP Port Number>	TCP Port number. If no TCP port number is required, a value zero (0) should be specified here.
Notes	This command will override the AT\$PADDST settings for the current connected session.
Example:	atdt123.456.789.1/0 atdt123.456.789.2/3000

25. %CGPCO Set Type of Authentication, Username and Password

%CGPCO	Set Type of Authentication, Username and Password
Command Function	This command sets the type of Authentication, username and password for GPRS context activation.
Command Functional Group	Enfora Specific
Command Format Query Response	AT%CGPCO=? %CGPCO: 0,(0-251),(1-2) OK
Write Format Response	AT%CGPCO=<Input format>, "<Authentication data>", <cid> OK
Read Format Response	AT%CGPCO? CGPCO: 0,"<PCO Hex string>",1 CGPCO: 0,"<PCO Hex string>",2 OK AT%CGPCO? CGPCO: 1,"<Username,Password>",1 CGPCO: 1,"<Username,Password>",2 OK
Execution Format Response	N/A N/A
Parameter Values	
<Input format>	0 - Inputs specified in Hexadecimal 1 - Inputs specified in ASCII
<Authentication data>	Authentication data (ASCII) <username>,<password> where Username: Maximum 64 bytes ASCII string. Password: Maximum 64 bytes ASCII string. Authentication data (Hexadecimal): Protocol Configuration Option specified in Hex value; maximum size is equal to 251 bytes.
<cid>	0 – The new username and password is to be applied to all context Activation. 1 – The new username and password is to be applied to Context identifier 1. 2 – The new username and password is to be applied to Context identifier 2.
Notes	If %CGPCO is set with the input format of 0 (hexadecimal), then the setting of AT%CGPPP will be ignored. Username and Password are case sensitive.
%CGPCO	Set Type of Authentication, Username and Password (continued)
Example:	
Example of ASCII input parameters: AT%CGPCO=1, "username, password", 1 AT%CGPCO? CGPCO: 1,"username,password",1 (PAP:80C023160101001608757365726E616D65087061737 776F726480211001010010810600000000830600000000)	
Example of Hex input parameters: AT%CGPCO=0, "80C023160101001608757365726E616D650870617373 776F726480211001010010810600000000830600000000", 1	

26. \$AREG Auto Registration

\$AREG	Auto Registration						
Command Function	This command sets the auto registration state of the modem						
Command Functional Group	Enfora specific						
Command Format Query Response	AT\$AREG=? \$AREG: (0,2) OK						
Write Format Response	AT\$AREG=<state> OK						
Read Format Response	AT\$AREG? \$AREG: <state> OK						
Execution Format Response	N/A N/A						
Parameter Values							
<state>	<table border="1"> <tr> <td>0</td> <td>Autoreg off</td> </tr> <tr> <td>1</td> <td>Autoreg on</td> </tr> <tr> <td>2</td> <td>Auto GPRS Activation on Power up. (for \$hostif=1 and 2, MT will perform GPRS activation and go into PAD data mode. For Hostif=0 and 3, MT will perform GPRS activation, but remain in AT command mode)</td> </tr> </table>	0	Autoreg off	1	Autoreg on	2	Auto GPRS Activation on Power up. (for \$hostif=1 and 2, MT will perform GPRS activation and go into PAD data mode. For Hostif=0 and 3, MT will perform GPRS activation, but remain in AT command mode)
0	Autoreg off						
1	Autoreg on						
2	Auto GPRS Activation on Power up. (for \$hostif=1 and 2, MT will perform GPRS activation and go into PAD data mode. For Hostif=0 and 3, MT will perform GPRS activation, but remain in AT command mode)						
Notes	<p>This command sets GSM registration state.</p> <p>When set to 1, upon power on, the modem will automatically register on the GSM network. To set the modem to automatically attach to the GPRS network on power on, see AT%CGAATT command.</p> <p>AT+CGDCONT must be entered and saved before MT is placed in AREG=2.</p> <p>* If PIN is enabled, the modem will not complete the auto registration process until after the PIN has been entered (AT+CPIN).</p>						

27. \$HOSTIF Configure Host to Modem Interface

\$HOSTIF	Configure Host to Modem Interface								
Command Function	This command allows the user to configure the desired Host to Modem interface. This parameter determines the behavior of the ATD command.								
Command Functional Group	Enfora Specific								
Command Format Query Response	AT\$HOSTIF=? (0-3)								
Write Format Response	AT\$HOSTIF=<host interface> OK								
Read Format Response	AT\$HOSTIF=? HOSTIF: <host interface>								
Execution Format Response	N/A N/A								
Parameter Values									
<host interface>	<table border="1"> <tr> <td>0</td> <td>Establish normal external Dial up networking modem to network connection.</td> </tr> <tr> <td>1</td> <td>Establish UDP PAD session. Upon establishment of a network activation, a CONNECT message will be displayed. "No Carrier" or error will indicate failed or terminated UDP PAD session.</td> </tr> <tr> <td>2</td> <td>Establish TCP PAD session Upon establishment of a network activation, a CONNECT message for at\$active=1, or a LISTEN message for at\$active=0 will be displayed. "No Carrier" or error will indicate failed or terminated TCP PAD session.</td> </tr> <tr> <td>3</td> <td>Establish non-GPRS PPP connection.</td> </tr> </table>	0	Establish normal external Dial up networking modem to network connection.	1	Establish UDP PAD session. Upon establishment of a network activation, a CONNECT message will be displayed. "No Carrier" or error will indicate failed or terminated UDP PAD session.	2	Establish TCP PAD session Upon establishment of a network activation, a CONNECT message for at\$active=1, or a LISTEN message for at\$active=0 will be displayed. "No Carrier" or error will indicate failed or terminated TCP PAD session.	3	Establish non-GPRS PPP connection.
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