



2011

Forwell Wireless M-450/G CDMA/GPRS Modem User Manual



Forwell Wireless Co., Ltd.

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USER MANUAL V1.10

New Exciting Product



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Thank you for your selection of the M-450/G Modem. We trust it will give you many years of valuable service.

ATTENTION!

Incorrect termination of supply wires may cause internal damage and will void warranty. To ensure your M-450/G enjoys a long life, double check ALL your connections with the user's manual before turning the power on.

All equipment must be properly grounded for safe operations. All equipment should be serviced only by a qualified technician.

IMPORTANT NOTICE:

M-450/G modem and its software are designed by ETEK TECHNOLOGY and manufactured by Forwell Wireless., LTD.

M-450/G modem is designed to be used in industrial environments, by experienced industrial engineering personnel with adequate knowledge of safety design considerations.

M-450/G modem is designed to operate in the presence of noise and interference, however in an extreme case, noise and interference could cause product operation delays or operation failure. Like all industrial electronic products, M-540/G modem can fail in a variety of modes due to misuse, age, or malfunction. We recommend that users and designers design systems using design techniques intended to prevent personal injury or damage during product operation, and provide failure tolerant systems to prevent personal injury or damage in the event of product failure. Designers must warn users of the equipment or systems if adequate protection against failure has not been included in the system design. Designers must include this Important Notice in operating procedures and system manuals.

These products should not be used in nonindustrial applications, or life support systems, without consulting Forwell Wireless Technologies first.

As a license free, the M-450/G modem must be used in accordance with local regulatory and communications authority guidelines. This includes the use of antenna and other radio communications accessories which form part of the communications between points in the network.

To avoid the risk of electrocution, the antenna, coaxial and serial cables and all terminals of the M-450/G module should be electrically protected. To provide maximum surge protection, the module should be connected to a suitable earth and the module should be installed as recommended in the Installation Guide.

To avoid accidents during maintenance or adjustment of remotely controlled equipment, all equipment should be first disconnected from the M-450/G module during these adjustments. Equipment should carry clear markings to indicate remote or automatic operation. E.g. "This equipment is remotely controlled and may start without warning. Isolate at the switchboard before attempting adjustments."

The M-450/G module is not suitable for use in explosive environments without additional protection.

- To minimize any implementation problems, prior to commissioning in the field it is strongly recommended that:
- A check is performed to ensure reliable signal strength is available at the proposed installation site.

The configuration/operation of the modem is tested on a work bench.

Repairs to the M-450/G modem should only be attempted by ForwellWireless personnel or upon consultation with ForwellWireless, its nominated representative and/or qualified technical personnel.

DO NOT:

- Operate the equipment near electrical blasting caps or in an explosive atmosphere
- Operate the transmitter when someone is within 20 cm (~ 8 inches) of the antenna.
- Operate the transmitter unless all RF connectors are secure and any open connectors are correctly terminated.

Limited Lifetime Warranty, Disclaimer and Limitation of Remedies:

M-450/G products are warranted to be free from manufacturing defects for the “serviceable lifetime” of the product. The “serviceable lifetime” is limited to the availability of electronic components. If the serviceable life is reached in less than 12 months following the original purchase from Forwell, Forwell will replace the product with an equivalent product if an equivalent product is available.

This warranty does not extend to:

- Failures caused by the operation of the equipment outside the particular product's specification, or
- Use of the module not in accordance with this User Manual, or
- Abuse, misuse, neglect or damage by external causes, or
- Repairs, alterations, or modifications undertaken other than by an authorized Service Agent.

Forwell’s liability under this warranty is limited to the replacement or repair of the product. This warranty is in lieu of and exclusive of all other warranties. This warranty does not indemnify the purchaser of products for any consequential claim for damages or loss of operations or profits and Forwell is not liable for any consequential damages or loss of operations or profits resulting from the use of these products. Forwell is not liable for damages, losses, costs, injury or harm incurred as a consequence of any representations, warranties or conditions made by Forwell or its representatives or by any other party, except as expressed solely in this document.

I. PROLOGUE

This document is just suit for the following module type; it helps you quickly to use function and resolves some common questions.

Type	Description
M-450/G	CDMA/GPRS modem
M-12	GPRS modem
M-13	CDMA modem

1.1. Version

Version	Date	Description	Author
1.00	2010-06-27	M-12/13	Gavin
1.10	2011-04-16	Update to R-450/G	Gavin

1.2. Referenced Documents

M12_Datasheet_Eng

M12_QuickStart_Eng

M13_Datasheet_Eng

M13_QuickStart_Eng

ME300_V AT command

1.3. Notice

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II. INTRODUCTION

2.1. Brief

This user manual outlines the features, mounting, operating parameters, connection, safe use and configuration of the E-450/G modem. When used in conjunction with the R Series Router, the user manual for the E-450/G must be consulted prior to configuration and commissioning. Failure to consult with the E-450/G manual may result in the warranty being voided.

The E-450/G is a GSM and CDMA Mobile Stations device capable of using GSM and CDMA Circuit Switched Data (CSD), Fax and Short Message Services (SMS) communications and output. The E-450/G is a quad band, GPRS device communicating at GSM850 / EGSM900 / DCS1800 / PCS1900 MHz, Class 10 GPRS data packet transfer and CDMA450Mhz band A-B. It has an embedded TCP/IP stack and DNS query protocol supporting static and dynamic IP address allocation, PPP, UDP and FTP functionality.

Programming of the E-450/G modem in use is either via the Forwell Wireless provided configuration utility, or via AT Commands. Connection to the host controller (Data Terminal Equipment DTE) is established through one RS232 standard port which also performs serial bidirectional Data and Fax transfer. Use of the E-450/G will require third party products and/or services such as telecommunications access.

The E-450/G AT command set listed later in this manual also features:

Network quality Detection allowing scanning of all GSM/CDMA (without SIM) channels to ascertain which provider has the best signal, most channels and/or transceiver base stations in optimizing service provision.

Jam Detect and Reporting attempts at interfering with the GSM/CDMA radio signal (reported as an unsolicited message on the RS232 port).

M-450/G is usually applicable to the Host, which has no TCP/IP but has serial interface, such as SCM Data Collection Transmission System, meters in AMR system...

2.2. Features

- Two in one function: GPRS and CDMA;
- Support SMS, TCP/IP protocol;
- Auto Connect/disconnect as preprogram time schedule;
- Auto reset in multi mode;
- Support Connect/Disconnect to/from server by SMS or time schedule;
- Data transmission via Serial NET Mode, enters transmission mode when power on;
- Remote setup via SMS or TCP/IP
- Compact and easy to integrate into your solution;
- Multi-flexible and compact data interface: RS232 or RS485
- Data encryption;

- Multi-operating status LED;
- Optimized modularization design, easy to upgrade.

2.3. Specification

Network	Power
<ul style="list-style-type: none"> ▪ CDMA 2000 1x: 450Mhz band A-B ▪ GSM Phase2/2+: GSM(EGSM)900MHz DCS(GSM)1800MHz 	Modem: DC 6V~32V Adapter: input AC 100V~245V Output DC: 12V/2A max
Interface	Dimension
Antenna: 50Ω SMA female interface Serial Port: DB9 RS232 (RS485/ TTL option) 2400~115200bps SIM slot: 1.8V/3V	External: Dimension: 75*50/72*16mm Weight: 200g
Environment	Type test
Working: -10 ~ 55°C Storage: -2-0~75°C Humidity: ≤95%, non condensing	CE marking Safety EMC/ERM LVD R&TTE
Shell	Firmware
Aluminum shell: good electromagnetic shield and , heat radiate performance	Support Firmware update for better quality

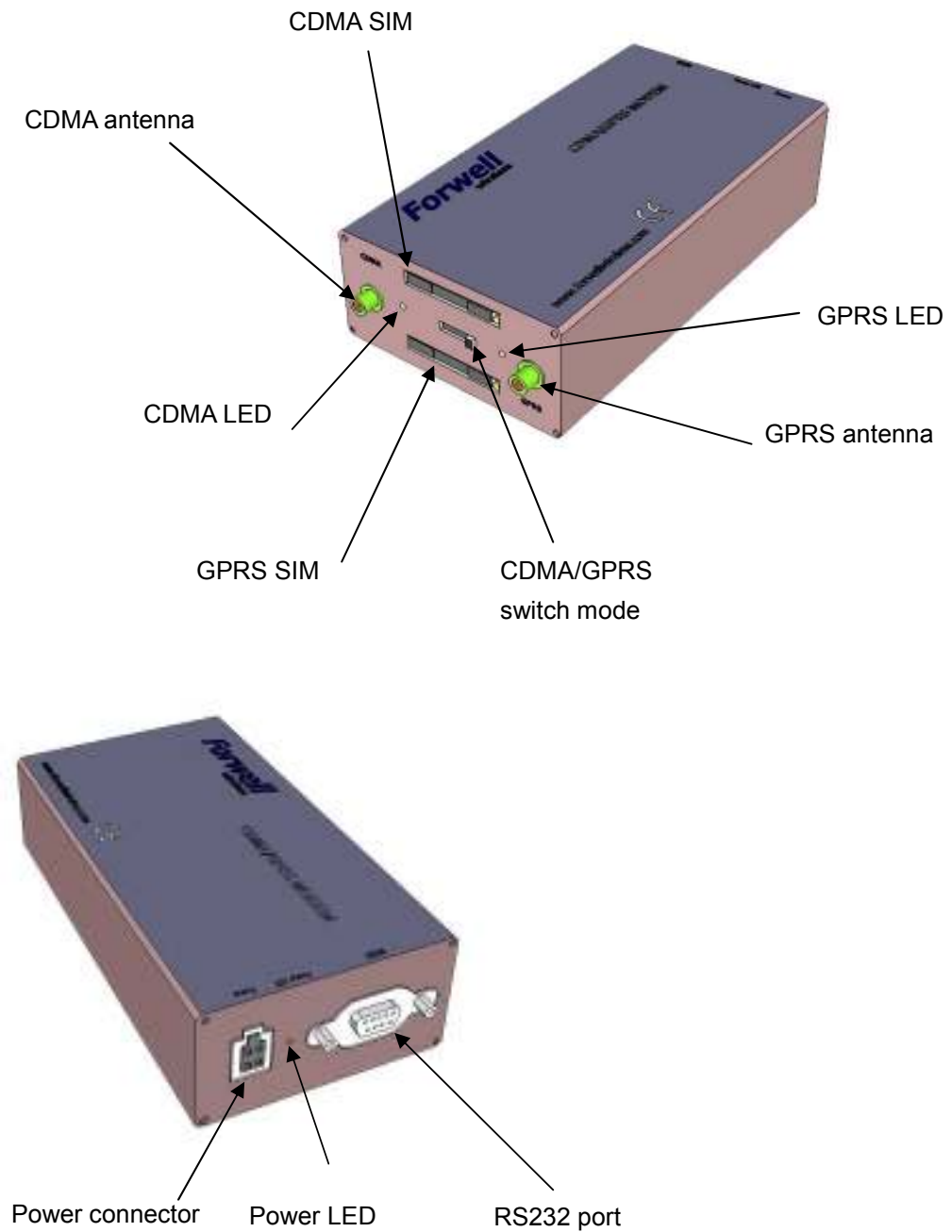
2.4. Application

- Remote Data Monitor and Control
- Water, gas and oil flow metering
- AMR (automatic meter reading)
- Power station monitoring and control
- Remote POS (point of sale) terminals
- Traffic signals monitor and control
- Fleet management
- Power distribution network supervision
- Central heating system supervision

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- Weather station data transmission
 - Hydrologic data acquisition
 - Vending machine
 - Traffic info guidance
 - Parking meter and Taxi Monitor
 - Telecom equipment supervision (Mobile base station, microwave or optical relay station)

3. INSTALLATION

3.1. Panel introduction



3.2. The LED state

In order to check the module working state. Our product have three Led, Power LED, CDMA LED state and GPRS LED state.

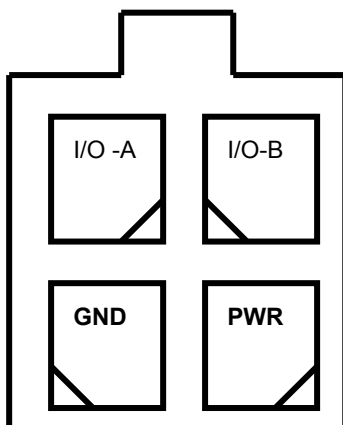
	Power LED	CDMA LED	GPRS LED
GPRS mode	ON	OFF	
CDMA mode	ON		OFF
Logon network	ON	0.5s ON/2s OFF flash	0.5s ON/2s OFF flash
On line	ON	1s flash	1s flash
Off line	ON	2s flash	2s flash
Date transfer	ON	0.5s flash	0.5s flash

3.3. Power Supply and Adapter

The M-450/G modem can be powered from a 6 - 32 VDC power supply. The positive side of the supply **must not be connected to earth**. The supply negative is connected to the unit case internally. The DC supply may be a floating supply or negatively grounded. The power requirements of the M-450/G unit are 1200mA @ 12V or 900mA @24VDC. Power connection is made by the included cable. Connect the Green “GND” wires to the supply negative, and connect the Red “PWR” to the supply positive.

Two “I/O” wire is available for sensing modem connection status, but is not required for power supply connection.

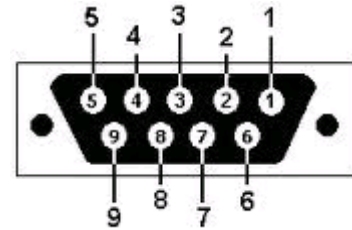
Adapter supplied with modem was design to work in hazard source. It was integrated two protection fuse, one AC inside Resistance fuse and other for DC output. Adapter uses switching & MOSFET technology to auto control and protect over voltage and current.



3.4. Serial Data Port

The serial port is a 9 pin DB9 female and provides for connection to a host device as well as a laptop computer for configuration, field testing and for factory testing.

Communication is via standard RS232 signals or RS485 interface(option). The M-450/G is configured as DCE equipment with the pin outs detailed below.



No.	Name	Direction	Function	Note for metering
1	DCD	Out	Data Carrier Detect	Not to use
2	Tx	Out	Transmit Data	
3	Rx	In	Receive Date	
4	DTR	In	RS485-A (option)	
5	GND			
6	DSR	Out	RS485-B (option)	
7	RTS	In	Request To Send	Not to use
8	CTS	Out	Clear To Send	Not to use
9	RI	Out	Ring Indicator	Not to use

3.5. Antenna Port

The M-450/G includes two SMA bulkheads female, class 4(2W) coaxial connector for the external antenna.

NOTE: *BEFORE connecting the M-450/G to a Power Supply source, a suitable antenna shall be connected and properly installed.*

The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from persons (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against applicable SAR regulations.




For good efficiency of the antenna and minimum interference with other electronic systems, a space of min. 40 cm around the radiating part should be free, at least of electrically conducting materials (except the ground plane on which it is attached).

Less distance and less obstacles there are between the antenna connected to the E-450/G and the antenna of the CDMA and GSM network base station, the less power is radiated by the Terminal under normal conditions and the higher is the safety margin in case of disturbances.

Antenna type

For best performance, ensure the antenna is of the correct type.

Name	GSM Antenna	
Type	Magnetic mount	
Frequency Range(MHz)	900/1800MHz	
Gain(dBi)	3.5dBi	
V.S.W.R	<1.5:1	
Input Impedance(Ω)	50 Ω	
Cable	RG-174U length 2.5m	
Polarization mode	Vertical	
Connector Type	SMA male	

Name	CDMA Antenna	
Type	Magnetic mount	
Frequency Range(MHz)	450 MHz	
Gain(dBi)	3.5dBi	
V.S.W.R	<1.5:1	
Input Impedance(Ω)	50 Ω	
Cable	RG-174U length 2.5m	
Polarization mode	Vertical	
Connector Type	SMA male	

3.5. Data Cables

Connect to PC or DTE:

Modem	PC comport	For modem configuration
Pin 2	Pin 2	✓
Pin 3	Pin 3	✓
Pin 4		
Pin 5	Pin 5	✓
Pin 6		
Pin 7	Pin 8	
Pin 8	Pin 7	
Pin 9	Pin 9	

Connect to ELSTER A1700 meter

Modem	Meter (25 pins RS232)
Pin 2	Pin 3
Pin 3	Pin 2
Pin 5	Pin 7
	Pin 8 connect to pin 15

Connect to Landis- Gy meter

Modem	Meter (RS232 interface)
Pin 2	Pin 5
Pin 3	Pin 2
Pin 5	Pin 3

Connect to Genius and Actaris meter

Modem	Meter (RS232 interface)	Meter	Modem
Pin 2	Pin 3		
Pin 3	Pin 2		
Pin 5	Pin 5		

3.6. SIM Card Holder

There are 2 SIM card holder , one for CDMA and one for GPRS service.

Using a ball pen or paper clip to press the SIM holder reject button. The SIM holder will come out a little then out the SIM holder.

Put the SIM card to the tray and put the tray back into the slot.

IV. OPERATION

4.1. Operating mode

The G-450/G operates in one of two modes, Automatic Connect Mode or AT Command Mode.

Automatic Connect Mode allows the modem to operate with host equipment that is not designed to operate with modems. The modem makes a connection to a preconfigured TCP port and location, then transparently or encryption transfers data over the configured connection.

AT Command Mode is used when the host equipment is designed to operate with a modem. The host equipment needs to support AT commands to command the modem to make the required connections.

4.2. Automatic Operation Mode

In this mode, the modem automatically make a connection between the onboard RS232 serial port and a TCP connection point (port) on a remote device which is connected to the internet. This socket may be either an internal connection point (TCP port) on a Server, to a virtual serial port on a PC, or any other TCP socket with access to the internet.

Automatic Connect mode is configured with the supplied M-450/G Configuration utility. Refer to the Configuration Manual for detail on how to use the configuration utility to test, diagnose, and configure the modem.

At powerup, the modem waits 10 seconds to allow access by the configuration utility. If the modem receives any configuration commands during this time, it will abort the start up sequence and wait for further commands.

Note: Because of this behavior, it is important to ensure that any host equipment does not send any data containing the sequence “AT” within 10 seconds of power on. The RS232 DCD pin will be low until the modem makes a connection to the remote TCP device.

After 10 seconds, the modem attempts to connect to the cellular network. On connection, the modem optionally sends an SMS message to report that it has connected. Once it is connected to the cellular network, it attempts to connect to a TCP port on a remote device. If the connection is lost, or if the connection cannot be made, the modem may be configured to attempt to connect to a redundant secondary socket location. If both the primary and redundant secondary socket are unavailable, the modem can be configured to send an alarm message via SMS. At this stage, the modem may be configured to either wait for an SMS message commanding it to restart, or can be configured to retry the connection to the primary and secondary connection locations.

4.3. AT Command mode

In this mode, the modem waits for AT Commands from the host device. The host device must be able to issue the appropriate AT commands to force the modem to perform the required behavior. This mode provides full access to all of the features of the modem, including SMS, TCP/IP connection, and FAX data.

At power up, the modem issues the prompt “OK”, and then waits for commands from the host. At this point the host can issue AT commands to:

- Send an SMS Message
- Make a TCP/IP connection to a remote device
- Make a serial data connection to a remote device
- Transfer data to a remote FTP server

Refer to AT command list for more information.

V. CONFIGURATION

Configuration of the M-450/G modem is performed using the AT Command set. Forwell provides a configuration utility to simplify the configuration of modems operating in Automatic Connect mode. A simple and intuitive interface allows easy selection of the required functionality, then the configuration utility sends the AT commands to the modem to set up the requested configuration.

5.1. Configuration using Configuration Utility Software

The configuration utility allows you to configure the modem for operation in Automatic Connect mode. The configuration utility is available on the CD supplied with your modem.

The following sections describe how to use the configuration utility.

The configuration software allows for the easy setup and configuration of Forwell's M-450/G. It is Microsoft Windows based software that lets a user easily configure the modem without the need to remember complex AT command sequences.

The configuration software also enables a user to save/read configuration data to a file which can be used for quick backup or mass deployment of the M-450/G modem settings.

Another handy feature of the configuration software is that it comes with a built in terminal emulator which eliminates the need to use external terminal software. It is especially useful for people who want to use advanced AT command set for configuring the modem and provides a unified compact solution.

The configuration software allows for redundant connection setup where the M-450/G modems can connect to a secondary address in case the primary becomes unavailable. This feature is especially useful in high availability scenarios.

In addition to the easy to use GUI for configuring the M-450/G modems, the configuration software also enables the user to get advanced diagnostics information like signal strength, available providers, IMEI number, SIM PIN status etc.

5.2. Installing Configuration Utility Software

System Requirements:

- OS: Windows 98/2000/XP/Vista (Although it's been tested to work with older windows operating systems. It is designed to work best with XP and over.)
- CPU 1 GHz or over (P4 2 GHz or more recommended)
- 128 Mb RAM (at least 256 Mb recommended)
- 10 Mb free disk space
- 800 x 600 screen resolution (recommended 1024 x 768 or more)
- RS232 serial port

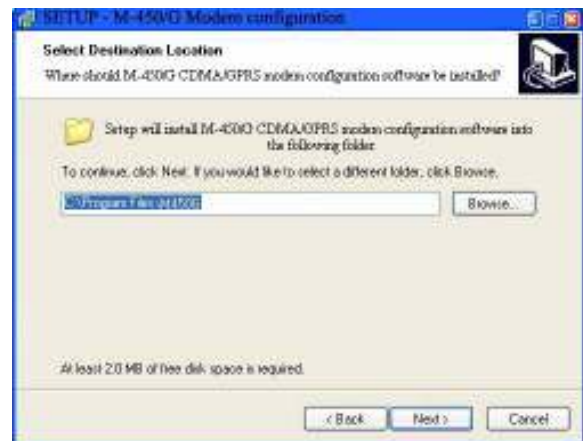
Double click on Setup.exe file to start
Installation



Click NEXT to see License Agreement.
Read it and accept it if you wish to proceed



Select different location or click Next to proceed



Click Finish to complete the installation.
the configuration software is now
successfully installed and ready to be used.



5.2. Startup and Connection

Launch the M-450/G Configuration Software by clicking on Start > Programs > M-450/G > Configuration. If the configuration software is used for the first time it will display factory default values for all the settings. On subsequent uses it will automatically load the most recent configuration data that was entered.

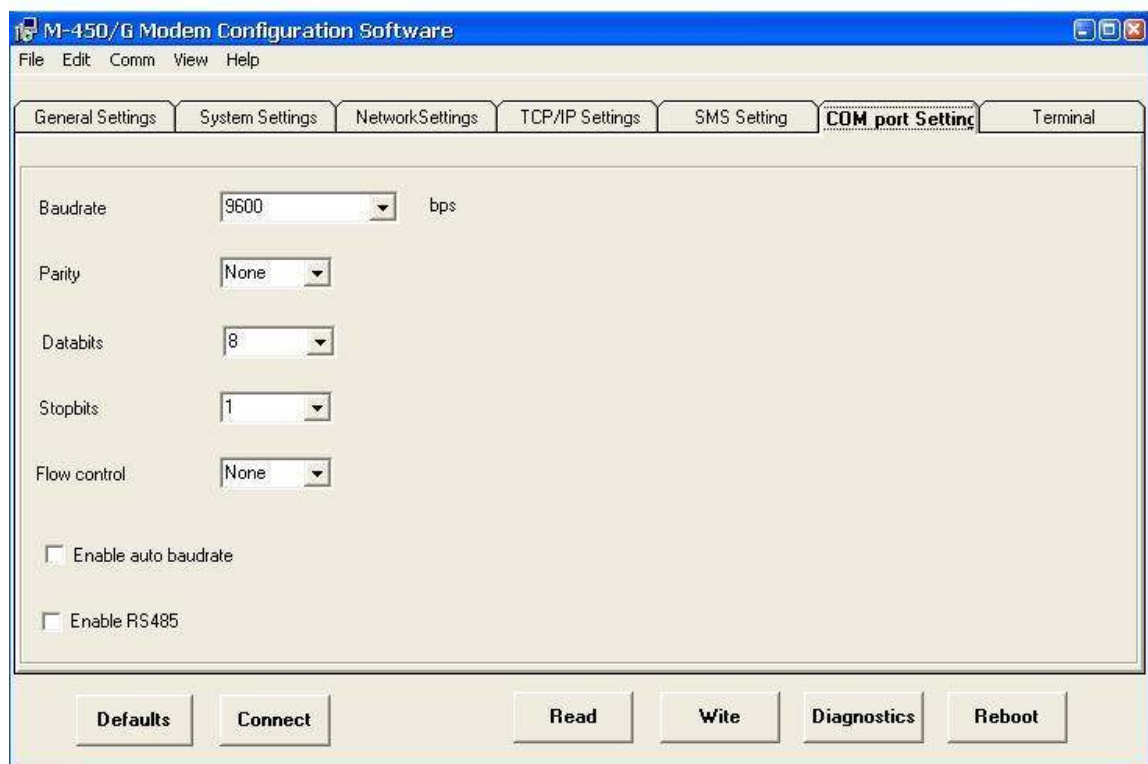
5.2.1. Serial Port Settings:

All M-450/G modems have a fixed factory default serial baud rate of 9600. Any changes to this speed should be reflected in the serial port settings while establishing the connection to the modem.

If a com port is not already selected then the serial port settings window is automatically displayed when you hit the Connect button. Alternatively, it can be displayed by clicking on the command menu, Comms > Serial Port Setup

The default comm. port settings for connecting to a M-450/G modem are

Boud rate: 9600
Parity: None
Data bits: 8
Stop bits: 1
Flow control: None



As you may notice that these fields are disabled by default and don't need to be changed. However, if you do need to change these settings then you have to select "Advanced Config" which is discussed later under the section Configuration > Advanced Config.

NOTE: Setting the serial baud rate of the M-450/G modem to auto (AT+IPR=0) may cause problems while performing diagnostics. Therefore, it is recommended to keep the serial baud rate to a fixed value.

5.2.2. General Settings

Installed location: Installed location of meter or address of customer (max. 32 chars)

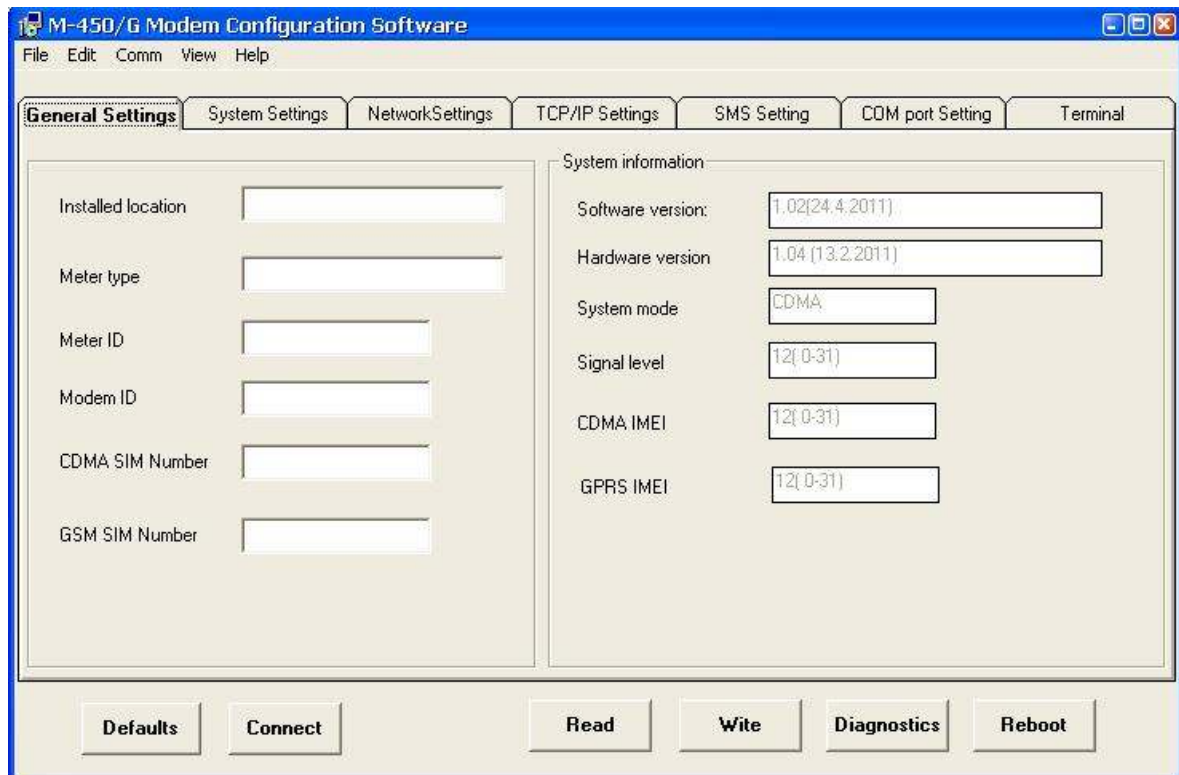
Meter type: Type of meter connect with modem customer (max. 32 chars)

Meter ID: ID of meter connect with modem

Modem ID: ID of modem

CDMA SIM number: Telephone number of CDMA card

GPRS SIM number: Telephone number of GPRS card



The screenshot shows the 'M-450/G Modem Configuration Software' window. The 'General Settings' tab is active, displaying various configuration fields. The 'System information' section on the right shows the current system details.

Field	Value
Installed location	
Meter type	
Meter ID	
Modem ID	
CDMA SIM Number	
GSM SIM Number	
Software version	1.02(24.4.2011)
Hardware version	1.04 (13.2.2011)
System mode	CDMA
Signal level	12(0-31)
CDMA IMEI	12(0-31)
GPRS IMEI	12(0-31)

Buttons at the bottom: Defaults, Connect, Read, Write, Diagnostics, Reboot.

5.2.3. System setting

Reboot setting:

Reboot via SMS

This setting can be used to enable/disable the remote rebooting of the M-450/G via an SMS message. The text box can be used to modify the trigger string (case insensitive). When this setting is enabled, the modem will wait for an SMS message containing the reboot trigger string indefinitely once the number of socket connection retry has failed. If the SMS on Socket Failure is enabled then an indicative string “SMS reboot enabled” is also appended to the outgoing SMS message. This is useful to remind operators on connection failures that the M-450/G modem can be rebooted by sending an SMS to it. As an example, this setting is especially useful in planned downtime scenarios where the operators don’t want the modem to continuously retry connection but rather wait for the reboot SMS to resume connection.

Contain of reboot SMS: “REBOOT”

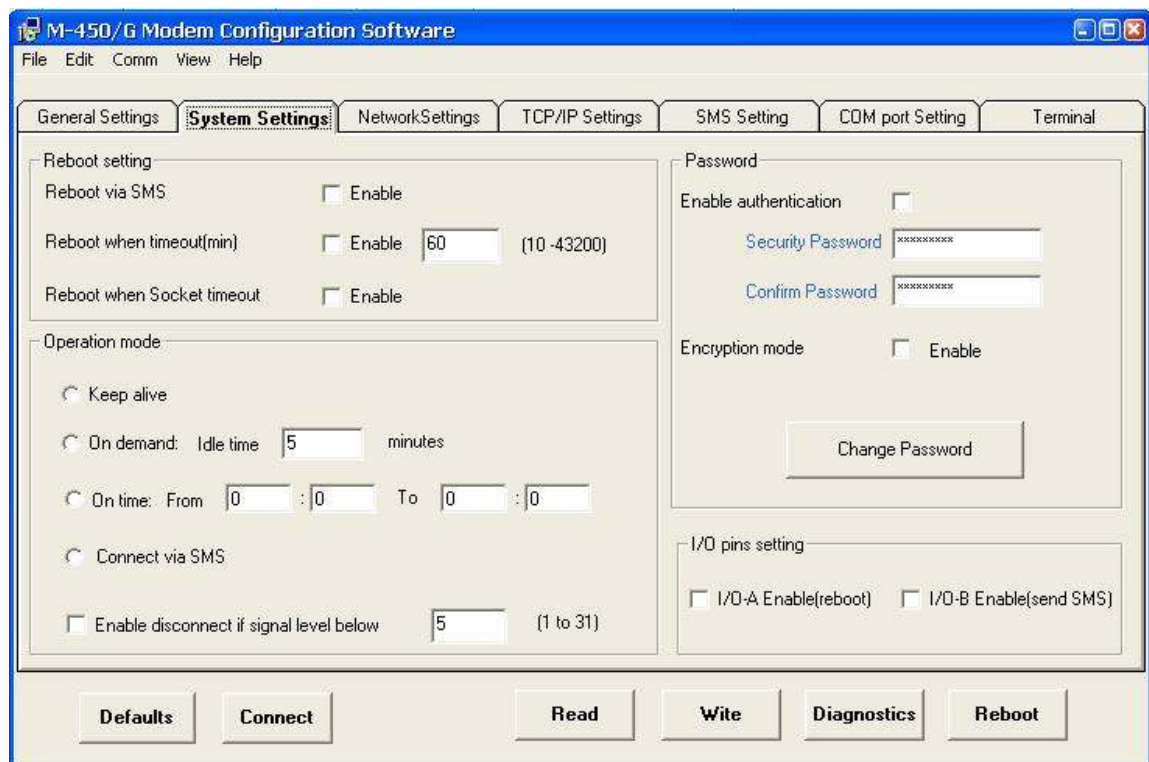
Note: Modem only response with SMS sent from the telephone numbers was stored on modem.

Reboot when timeout

Modem will reboot every interval time in the text box.

Reboot when Socket timeout

This setting can be used to enable/disable the rebooting when socket is failure with interval time is longer then Socket timeout parameter in TCP/IP setting tab.



Operation mode:***Keep alive***

Always connect with server or router

On demand

Modem will automatic close socket (disconnect to server) after enter idle mode longer than setting time (default is 5 minutes)

On time

Modem only connects to server during this setting time.

Connect via SMS

This option allows modem connects to server or router when it received a SMS with contain "CONNECT"

Note: Modem only response with SMS sent from the telephone numbers was stored on modem.

This tab also provides an Automatic Disconnect function when signal level is below presetting value.

Password:***Enable Authentication***

This setting needs to be enabled only if you use password authentication while connecting through a router or Server software of Forwell. It provides an extra level of security on the M-450/G router side to drop any unsolicited TCP connections. The password fields (max 32 chars) are enabled once this setting is enabled and the proper password needs to be entered.

Encryption mode

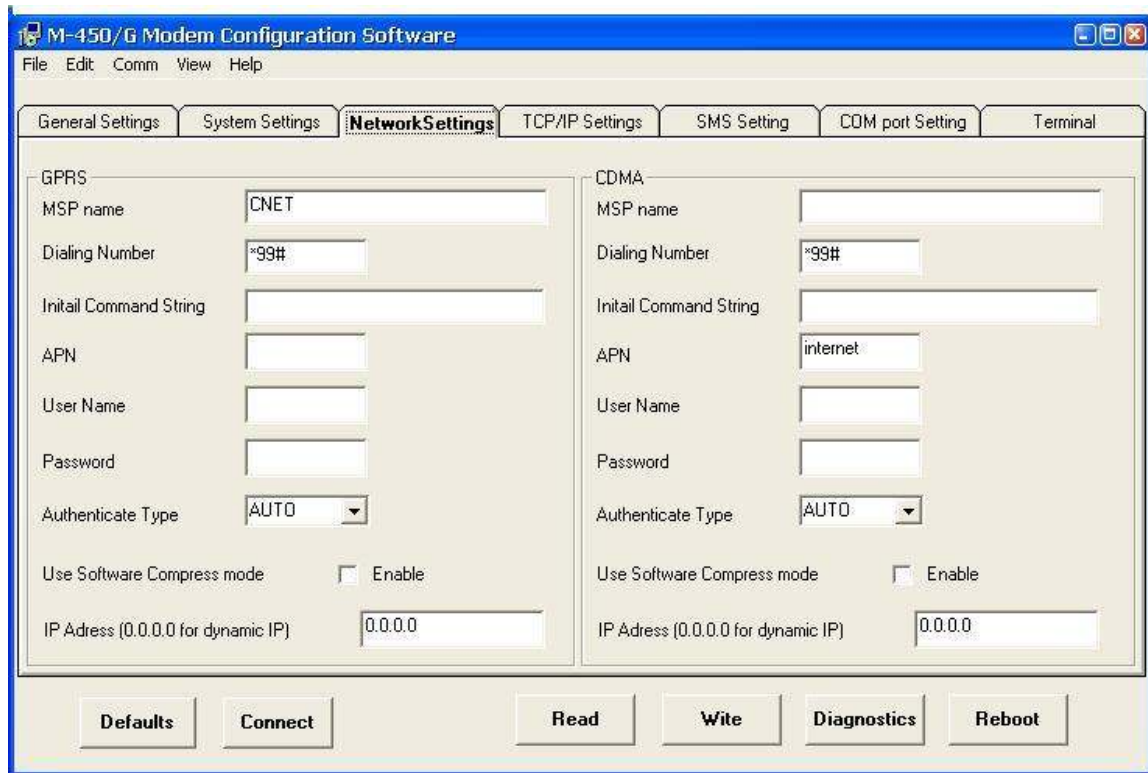
This setting can be used to enable/disable the coder/decoder of modem. All data sent out from modem will be coding.

I/O port setting:

Enable/Disable modem response if there is state change of these I/O pins.

5.2.4. Network setting

This tab used to setup parameter from network provider. Please contact with service provider to get more information.



TCP/IP Setting

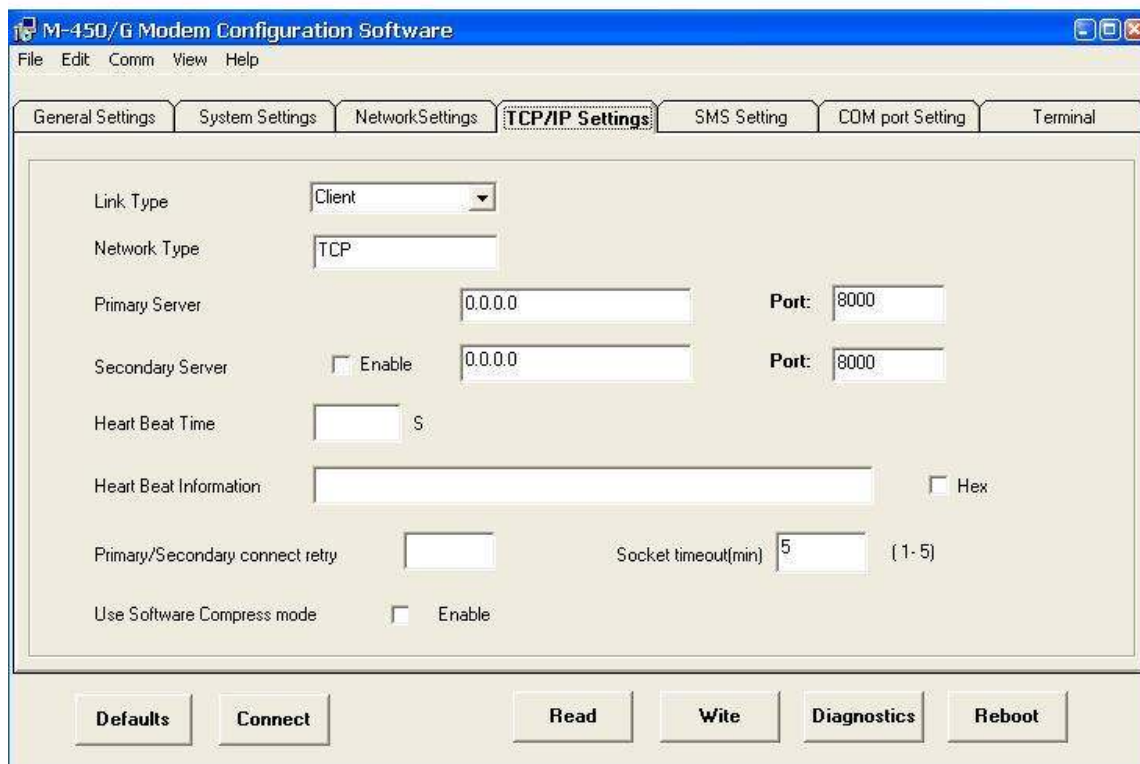
Link type: This setting allows modem work as a client or a server. If “server” is selected we suggest we should to use FIX IP of SIM card provider.

Primary Server: Enter the IP address or domain name and TCP port number of the primary device the M-450/G modem will connect to.

Enable Secondary Server: Check this box if you have a secondary device for the M-450/G modems to connect to incase the primary is unavailable. This provides redundancy in high availability scenario for continued operation.

Secondary Server: Similar to primary this defines the secondary host IP address or domain name when the secondary address is enabled.

Primary/Secondary Connect Retry: This defines the number of times the primary and secondary addresses will be tried before the modem decides that something is wrong and start timer of Socket timeout as well as sends out a warning SMS to operators. Default value is 3. You can increase this to a higher value. However, please note that no warning SMS will be sent out till it has tried that number of times. A better option is to use a moderate value in conjunction with “Remote SMS Reboot”, and/or “Total Number of SMS sent” discussed later.



Heart Beat function: You can define heart beat time and heart beat information. So that Server can use the heart beat information to identify modem.

5.2.5. SMS setting

Remote Setting Via SMS Enable: This function enable operators with attached telephone numbers can setup some parameters of modem via SMS with contain as below:

Primary IP server setting: "IP1 xxx.xxx.xxx PORT xxxxx"

Secondary IP server setting: "IP2 xxx.xxx.xxx PORT xxxxx"

CDMA network APN setting: "CDMA APN name"

GPRS network APN setting: "GPRS APN name"

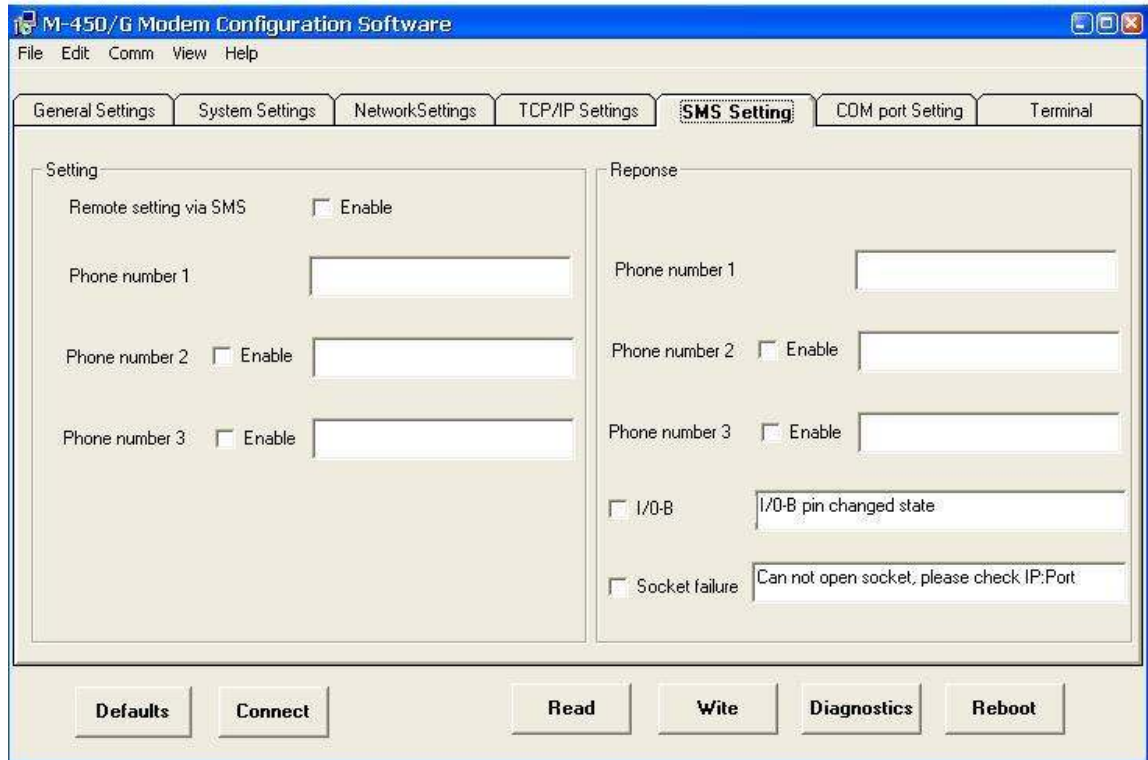
CDMA password setting: "CDMA PASS password"

GPRS password setting: "GPRS PASS password"

CDMA user name setting: "CDMA USER username"

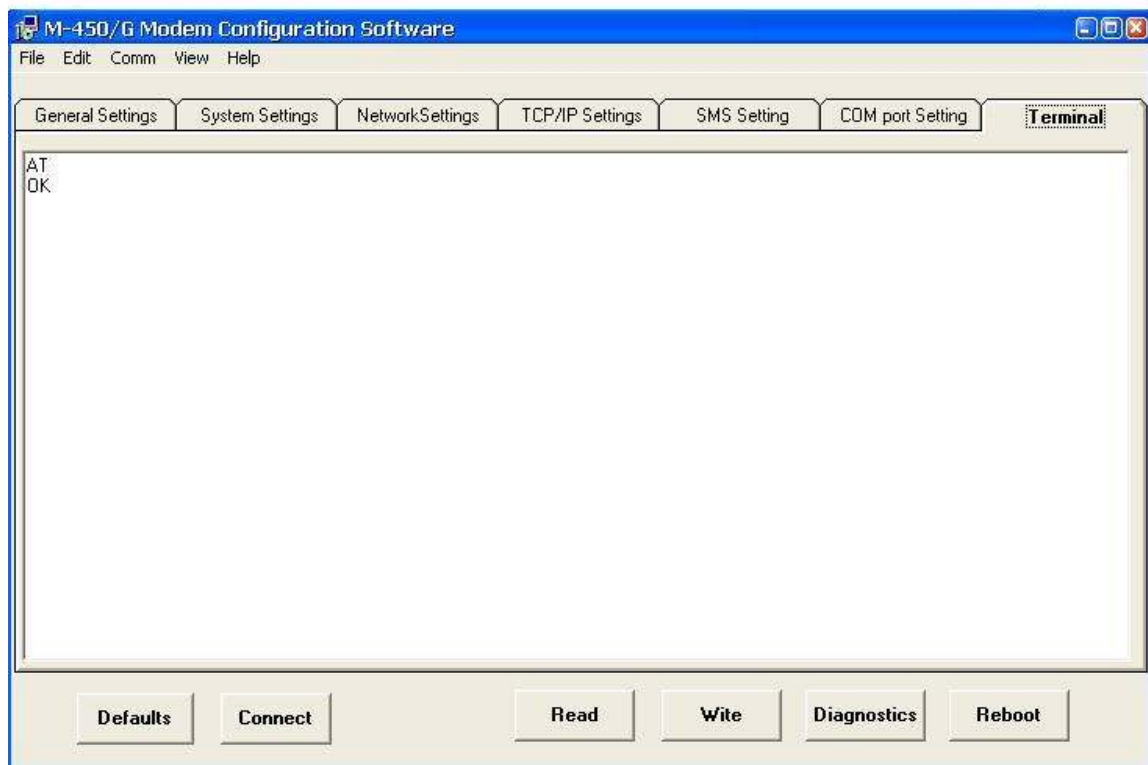
GPRS user name setting: "GPRS USER username"

SMS response: If this function is enable, modem will send out SMS to telephone number of operators once there was a change of I/O pins or socket problem.



5.2.6 Terminal

This interface used to debug and run modem in command mode.



VI. PRODUCTS LIST



Name	unit	number	description
Modem	Entries	1	Standard supply
Adapter	Entries	1	Supply 12V
Antenna	Entries	2	Standard supply
Cable	Entries	1	Cable connect to meter
Stick	Entries	1	
Installation manual	Entries	1	