Indunium 2i

GSM modem · User Guide

INDUNIUM

About This Document

This document describes the hardware and software of the *Indunium 2i Industrial GSM/GPRS Modem*.

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Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the modem are used in a normal manner with a well-constructed network, the modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Induo accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the modem, or for failure of the modem to transmit or receive such data.

Safety Precautions

General

- The modem generates radio frequency (RF) power. When using the modem care must be taken on safety issues related to RF interference as well as regulations of RF equipment.
- Do not use your modem in aircraft, hospitals, petrol stations or in places where using GSM products is prohibited.
- Be sure that the modem will not be interfering with nearby equipment. For example: pacemakers or medical equipment. The antenna of the modem should be away from computers, office equipment, home appliance, etc.
- An external antenna must be connected to the modem for proper operation. Only uses approved antenna with the modem. Please contact authorized distributor on finding an approved antenna.
- Always keep the antenna with minimum safety distance of 26.6 cm or more from human body. Do not put the antenna inside metallic box, containers, etc.

***Note**: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Modem may be used at this time.*

Using the modem in vehicle

- Check for any regulation or law authorizing the use of GSM in vehicle in your country before installing the modem.
- The driver or operator of any vehicle should not operate the modem while in control of a vehicle.
- Install the modem by qualified personnel. Consult your vehicle distributor for any possible interference of electronic parts by the modem.
- The modem should be connected to the vehicle's supply system by using a fuse-protected terminal in the vehicle's fuse box.
- Be careful when the modem is powered by the vehicle's main battery. The battery may be drained after extended period.

Protecting your modem

- To ensure error-free usage, please install and operate your modem with care. Do remember the follow:
- Do not expose the modem to extreme conditions such as high humidity / rain, high temperatures, direct sunlight, caustic / harsh chemicals, dust, or water.
- Do not try to disassemble or modify the modem. There is no user serviceable part inside and the warranty would be void.
- Do not drop, hit or shake the modem. Do not use the modem under extreme vibrating conditions.
- Do not pull the antenna or power supply cable. Attach/detach by holding the connector.
- Connect the modem only according to the instruction manual. Failure to do it will void the warranty.
- In case of problem, please contact authorized distributor.

Regulatory and Type Approval Information

Table 1: Directives

2002/95/EC	Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
2002/96/EC	Directive of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)
2003/108/EC	Directive of the European Parliament and of the Council of 8 December 2003 amending directive 2002/96/ec on waste electrical and electronic equipment (WEEE)

Table 2: Standards of the Ministry of Information Industry of the People's Republic of China

SJ/T 11363-2006	"Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products" (2006-06).
SJ/T 11364-2006	"Marking for Control of Pollution Caused by Electronic Information Products" (2006-06). According to the "Chinese Administration on the Control of Pollution caused by Electronic Information Products" (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Hardware Interface Description. Please see Table 3 for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.

Table 3: Toxic or hazardous substances or elements with defined concentration limits

Name of the part	Hazardous substances					
	(Pb)	(Hg)	(Cd)	(Cr(VI))	(PBB)	(PBDE)
Metal Parts	o	o	o	o	o	o
Circuit Modules	x	o	o	o	o	o
Cables and Cable Assemblies	o	o	o	o	o	o
Plastic and Polymeric parts	o	o	o	o	o	o

o:

Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

x:

Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials for this part *might exceed* the limit requirement in SJ/T11363-2006.

Contents

Chapter 1. Product Concept 7
1.1 Overview 7
1.2 Packing List 7
1.3 Features and Specifications 9
1.4 Dimensions 11
1.5 Selection and Ordering Data 11
Chapter 2. Installation 12
2.1 Overview 12
2.2 LED Indicators 12
2.3 Mounting the Modem 13
2.4 Installation the SIM Card 14
2.5 Connect the External Antenna (SMA Type) 14
2.6 Connect the Modem to External Device 15
2.7 Connecting the I/O Device and Sensors 15
2.8 Grounding the Modem 16
2.9 Power Supply 16
Chapter 3. Operate the Modem 17
3.1 Working Mode Overview 17
3.2 Modem Configurator Overview 17
3.2.1 Starting Modem Configurator 18
3.2.2 Export and Import Profiles 21
3.2.3 Basic 22
3.2.4 Direct 23
3.2.5 Advanced 26
3.2.6 Reboot 27
3.2.7 Networks 29
3.2.8 Init. String 30
3.2.9 DI 30
3.2.10 DO 32
3.2.11 Modbus 34
3.2.12 Coil 35
3.2.13 Register 36
3.2.14 Phone Book 37
3.2.15 Phone Group 38
3.2.16 Debug (Only Available under “Normal Mode”) 39
Chapter 4. Typical Applications 41
4.1 AT Command Set (Only Available under Normal Mode) 41
4.1.1 Starting Induo Modem Configurator 41
4.1.2 Starting Windows Hyper Terminal 41
4.1.3 AT Commands Examples 43
4.2 GSM CSD Connection (Only Available under Normal Mode) 44
4.2.1 Overview 44

4.2.2 Establishing a CSD Connection 44
4.2.3 Answering a CSD Connection 46
4.3 Using Short Message Service by Using AT Commands (Only Available under Normal Mode) .. 47
4.3.1 Sending a Short Message 47
4.3.2 Reading a Short Message 48
4.3.3 Deleting a Short Message 48
4.4 Using SMS Direct (Only Available under Config Mode) 49
4.5 GPRS Connection (Only Available under Normal Mode) 49
4.5.1 Overview 49
Chapter 5. Appendix 62
5.1 Factory Settings 62
5.2 Restore to Factory Default 62
5.3 SMS Commands for Remote Control 62
5.4 Modbus Address Mapping 70
5.5 GSM Alphabet 71
5.6 Troubleshooting 74
5.5.1 The modem's LED does not light: 74
5.5.2 INDUNIUM 2I keep rebooting all the time: 74
5.5.3 No connection with modem through serial link 75
5.5.4 Receiving "No Carrier" Message 75
5.7 Terms and Abbreviations 75

Chapter 1. Product Concept

1.1 Overview

- The Indunium 2i is a rugged GSM/GPRS modem offering state-of-the-art GSM/GPRS connectivity for machine to machine (M2M) applications.
- The modem transmits data and short messages (SMS) over GSM/GPRS/EDGE mobile networks, also is controlled by firmware through a set of AT commands.
- Featured **SMS Direct** mode can transparently converts serial data (Text, binary, and Unicode formats) to SMS or vise versa without using AT Commands, verification of incoming Caller ID is implemented to block uncertified users.
- Support Modbus RTU slave protocol, converts alarm to text format SMS without using AT commands.
- Built-in software selectable RS232 / RS485 interfaces, with 15 KV ESD serial line protections.
- Additional 1 Digital Input and 1 Digital Out with wireless communications via SMS.
- Six LED indicators provide signal strength (RSSI) and status.
- The modem supports a wide range of input voltages from 9 to 36 VDC and a wide range of temperature from -25 to 70°C.
- The metal enclosure can be mounted on a DIN-rail or on the wall, also with extra ground screw.

1.2 Packing List

Check your package to make certain it contains the following items:

- Indunium 2i modem x1

- SMA antenna (adhesive mount antenna with 2.5 m cable) x1

- 2-pin pluggable terminal block for power connector x1

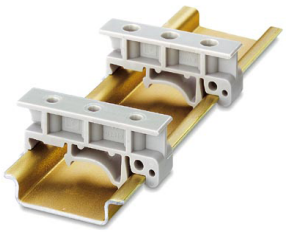
- CD with user guide and configuration utility x1

***Note**: Please notify your sales representative if any of the above items are missing or damaged.*

Optional accessories (can be purchased separately):

- Serial cable for RS232 (DB9 Female to DB9 Male, 1 meter) x1

- 35mm Din-Rail mounting kit x2



- AC/DC Power Supply Adapter (12VDC, 1A) x1

- DB9 Male to 9-pin 5mm pluggable terminal block for serial port and DI/DO x1

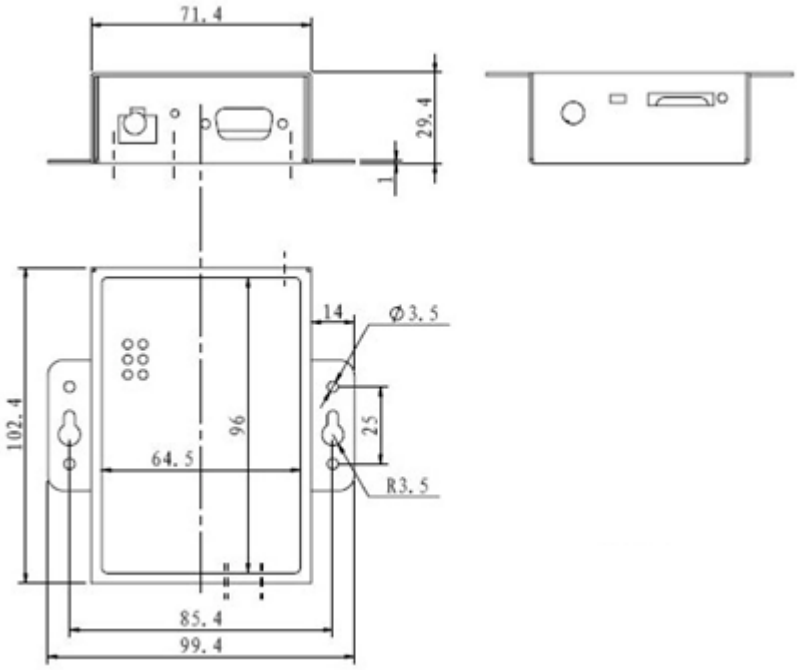
1.3 Features and Specifications

- **Configuration mode** and **Normal mode** selecting by switch
- Control via AT commands (Hayes 3GPP TS 27.007 and 27.005)
- PPP, TCP/IP stack for GPRS data transfer
- CSD Data Transmission Rate up to 14.4 kbps
- Send / receive SMS via AT commands (Under normal mode)
  - Text and PDU SMS
  - Point to point SMS (MT/MO)
- **SMS Direct** Mode can transparently converts serial data (Text, binary, and Unicode formats) to SMS or vise versa **without using AT Commands**, verification of incoming Caller ID is implemented to block uncertified users (Under Configuration Mode)
- Support Modbus RTU slave protocol, converts alarm to text format SMS without using AT commands
- Auto reboot at preset time of a day; Auto reboot via Caller ID/SMS
- 1xDI and 1xDO with wireless communications via SMS
- Remote configuration via SMS
- Firmware upgrade via serial interface

Cellular Interface	Standard	GSM and GPRS
	Band Options	Quad-Band 850/900/1800/1900 MHz
	GPRS Multi-slot Class	Class 10 (* Class 12 optional)
	GPRS Coding Schemes	CS1 to CS4
	CSD Data Transmission Rate	Up to 14.4 kbps
	Output Power	1 watt GSM1800/1900, 2 watts EGSM 900/GSM 850
SIM Interface	Number of SIMs	1
	SIM Card Reader	3V, 1.8V
Antenna Interface	Antenna Interface	SMA Female, 50 ohms impedance
Serial Interface	Number of Ports	1
	Interface	DB9 Female
	Serial Standards	RS232 and RS485 selectable by software
	ESD Protection	15KV
Serial Communication Parameters	Parameters	8, None, 1
	Flow Control	RTS/CTS hardware flow control XON/XOFF software flow control
	Baudrate	Baud rates from 300bps to 115200bps Auto-bauding from 1200 to 115200bps
Serial Signals	RS-232	TxD, RxD, RTS, CTS, GND
	RS-485	Data+ (A), Data- (B), GND
Digital Input	Type	Dry Contact
	Mode	DI or event counter

	Dry Contact	On: short to GND
		Off: open
	Isolation	3K VDC or 2K Vrms
	Counter Frequency	900 Hz
	Digital Filtering Time Interval	Software selectable
	Over-voltage Protection	36 VDC
Digital Output	Type	Sink
	Mode	DO or pulse output
	Pulse Output Frequency	1 kHz
	Over-voltage Protection	40 VDC
	Over-current Protection	0.5 A
	Isolation	3K VDC or 2K Vrms
LED Indicators	LED Indicators	6 LED indicators, PWR, RUN, NET and 3 level RSSI
RTC	Real Time Clock	Built-in real time clock with button battery
Watchdog	Watchdog and Timer	Built-in watchdog and timer
Switch	Switch	**Config. mode** and **Normal mode** selected by switch
Power Supply	Power Supply Interface	2-pin 5mm pluggable terminal block
Power Req.	Input Voltage	9 to 36 VDC
	Power Consumption	Idle: 50-60 mA @ 12 V
		Data Link: 100 to 200 mA (peak) @ 12 V
Characteristics	Housing	Metal
	Weight	300g
	Dimension	Without ears (L x W x H): 102.4 x 71.4 x 29.4 mm With ears (L x W x H): 102.4 x 99.4 x 29.4 mm
	Installation Method	35mm Din-Rail or wall mounting or desktop
Environmental Limits	Operating Temperature	-25 to 70°C
	Storage Temperature	-40 to 85°C
	Operating Humidity	5 to 95% RH
Regulatory and Type Approvals	Directives	RoHS and WEEE compliant
	CE and R&TTE Approval	CE 1177
Warranty	Warranty Period	1 year

1.4 Dimensions

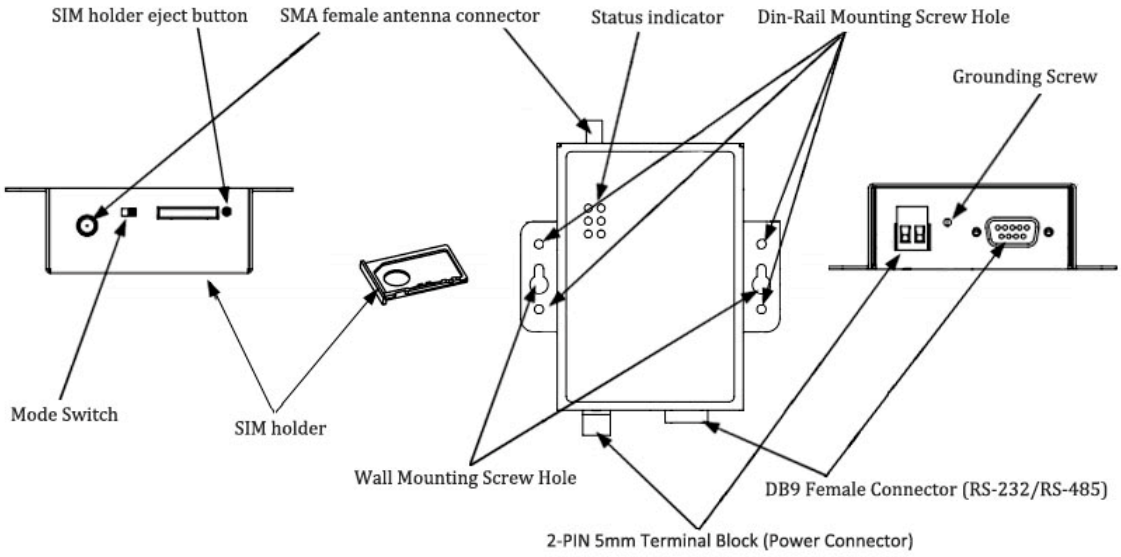


1.5 Selection and Ordering Data

Please refer to corresponding Indunium 2i datasheet.

Chapter 2. Installation

2.1 Overview



2.2 LED Indicators

Name	Color	Function
RSSI (3 LEDs)	Green	Cellular signal strength level
NET	Red	Please refer to ***Table ME Functions***
SYS	Green	Indicating the working mode. Normal: blinking 2 times/second Config: blinking 1 time/2 seconds
PWR	Green	On when DC power connection

RSSI LEDs	Function
None	No signal or SIM card not installed properly
1 bar	Weak or insufficient signal (SMS only)
2 bars	Average signal (GSM/CSD and GPRS connections)
3 bars	Exceptional signal (GSM/CSD and GPRS connections)

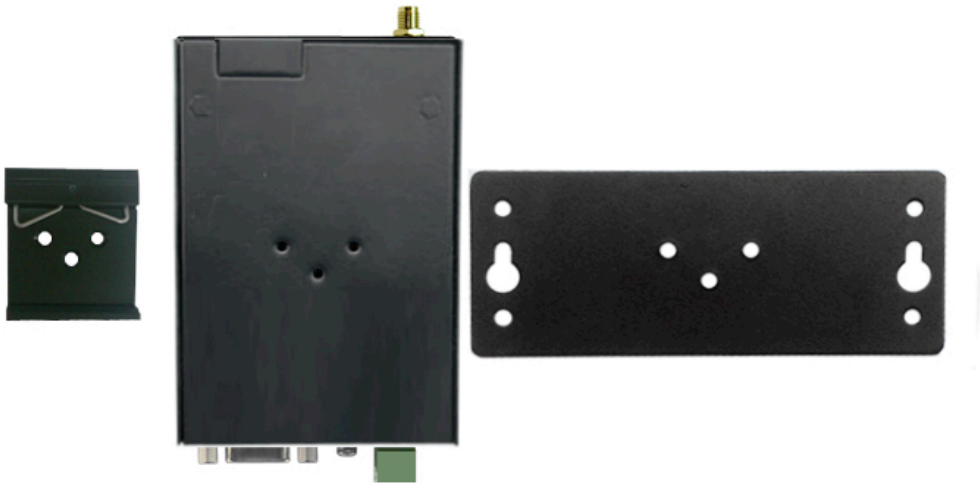
ME Functions

NET LED	Function
Off	ME is in one of the following modes: - POWER DOWN mode - ALARM mode - CHARGE ONLY mode - NON-CYCLIC SLEEP mode - CYCLIC SLEEP mode with no temporary wake-up event in progress
600 ms on / 600ms off	Limited Network Service: No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.
75 ms on / 3 s off	IDLE mode: The mobile is registered to the GSM network (monitoring control channels and user interactions). No call is in progress.
75 ms on / 75 ms off / 75 ms on / 3 s off	One or more GPRS PDP contexts activated.
500 ms on / 25 ms off	Packet switched data transfer is in progress.
On	Depending on type of call: Voice call: Connected to remote party. Data call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.

2.3 Mounting the Modem

Use 2 pcs of M3 screw to mount the modem on the wall.

Or to mount the modem on a DIN rail, you need DIN rail mount adapter.



2.4 Installation the SIM Card

Be sure to insert a SIM card before you use the modem.

***Note**: A SIM card set with PIN code cannot be used normally in the modem. You need to use Modem Configurator to unlock the PIN code of the SIM card before using it in the modem.*

Make sure to disconnect the charger and switch off your modem before inserting or removing your SIM/USIM card.

■ Inserting SIM Card

1. Make sure your charger is disconnected.
2. Use a ball pen or paper clip to press the SIM holder eject button. The SIM holder will come out a little. Then take out the SIM holder.
3. Insert the SIM card, with the metal surface facing downward, make sure it has completely sit on the tray. Put the tray back into the slot, until you hear “a cracking sound”.

■ Removing SIM card

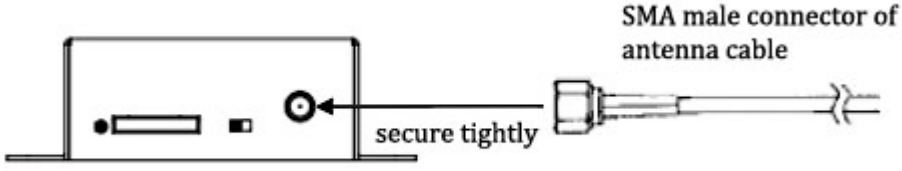
1. Make sure your charger is disconnected, and then press and hold down the power key until the *modem* is powered off.
2. Press the SIM card until you hear “a cracking sound”, when the SIM card will pop up to be pulled out.

Note:

1. *Don’t pull out the SIM holder without pushing the eject button.*
2. *Don’t touch the metal surface of the SIM card in case information in the card is lost or destroyed.*
3. *Don’t bend or scratch your SIM card. Keep the card away from electricity and magnetism.*
4. *Make sure to disconnect the power source from your modem before inserting and removing your SIM card.*

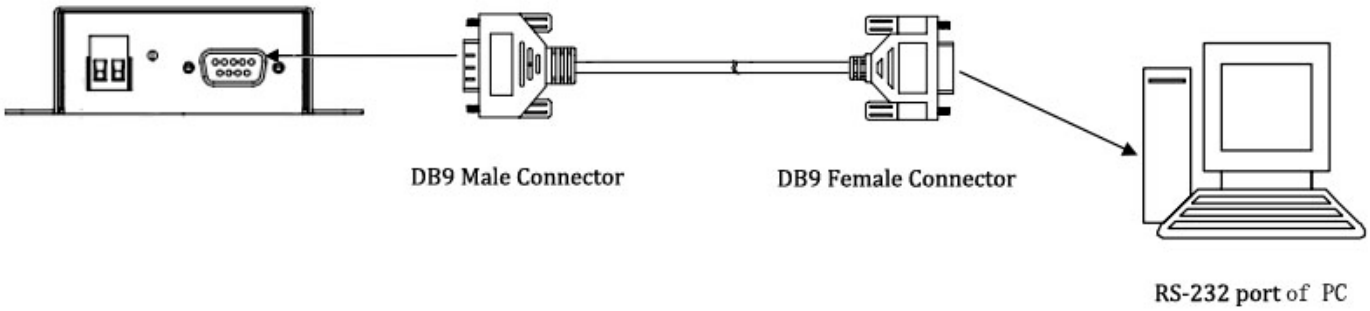
2.5 Connect the External Antenna (SMA Type)

Connect this to an external antenna with SMA male connector. Make sure the antenna is for the correct frequency as your GSM operator with impedance of 50ohm, and also connector is secured tightly.

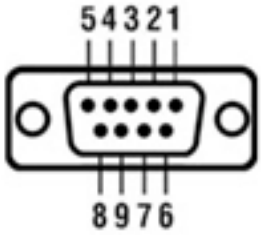


2.6 Connect the Modem to External Device

User can use the serial cable to connect the modem's DB9 female connector to external controller / computer.



PIN assignment for modem's DB9 female connector



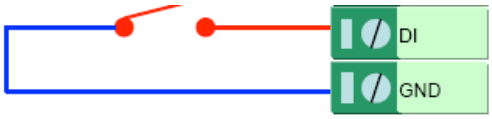
PIN Assignment

DB9 Female Connector

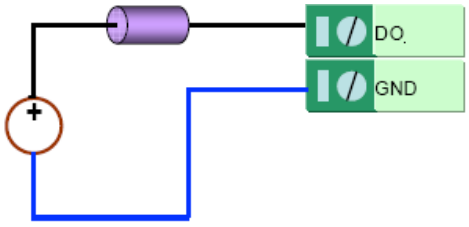
PIN	RS232	RS485 (2-wire)	I/O
1		Data- (B)	
2	RXD ->	Data+ (A)	
3	TXD <-		
4			DO
5	GND	GND	
6			DI
7	RTS <-		
8	CTS ->		
9			IO GND

2.7 Connecting the I/O Device and Sensors

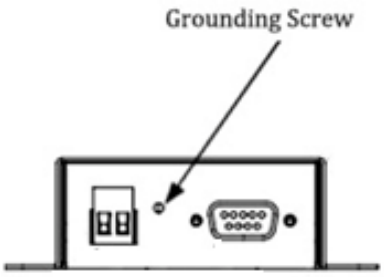
Digital Input Dry Contact:



Digital Output (Sink Type)

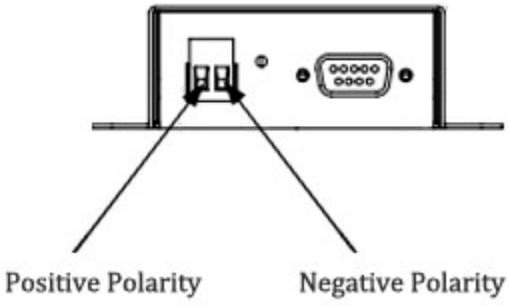


2.8 Grounding the Modem



Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.
***Note**: This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.*

2.9 Power Supply



The power supply range is 9 to 36VDC.
***Note**: Please take care about the polarity, and do not make reverse connection.*

Chapter 3. Operate the Modem

3.1 Working Mode Overview

There are two working modes available in the modem, please read carefully operate the Modem Configurator software:

Mode	Description
Config Mode	When DIP switches to **Config Mode**, user could use follow functions: 1. Configure modem via **Modem Configurator**; 2. SMS Direct; 3. Auto-reboot; 4. Upgrade firmware. **Serial port default parameters: 115200, 8, None, 1**
Normal Mode	When DIP switches to **Normal Mode**, user could use follow functions: 1. Control modem via AT commands; 2. Send/receive SMS via AT commands; 3. CSD communications; 4. GPRS communications; 5. Auto-reboot. **Serial port default parameters: Autobauding** **The autobauding mode allows the modem to automatically detect the transmission speed used by the DTE.** **Only the following speeds will be detected: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200bps. Auto-baud detection cannot be guaranteed for speeds below or above these speeds.**

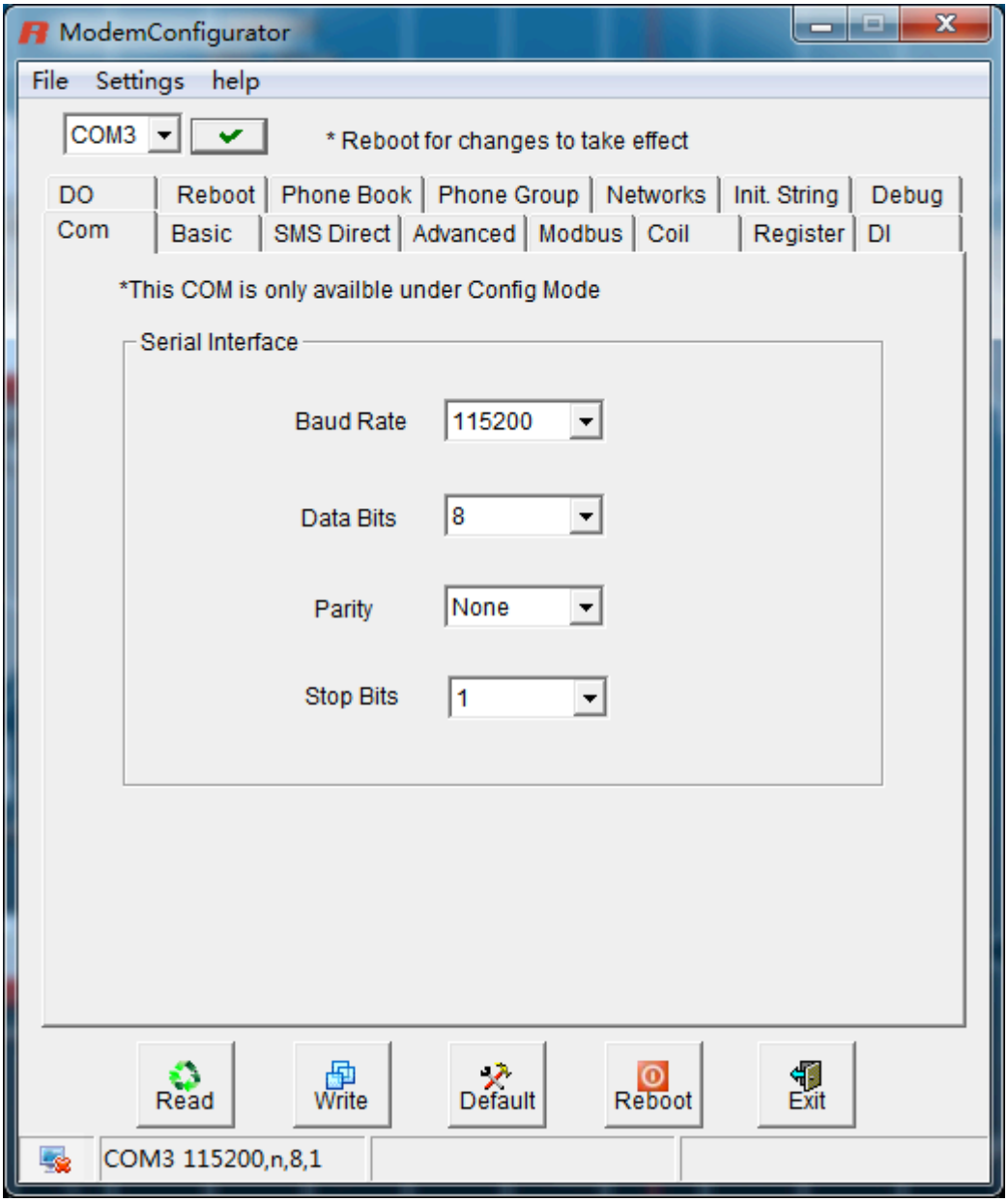
3.2 Modem Configurator Overview

Indunium-R Modem Configurator is a PC-based configuration software tool for managing and configuring Induo Indunium 2i modems. With a full graphics mode and Windows-based environment, even first time users will find it easy to learn how to use this new software tool. Indunium-R Modem Configurator can be used to configure the general phone settings and modes, but without needing to look up the appropriate AT commands. Indunium-R Modem Configurator provides a big improvement over the traditional configuration method that often required frequent checking of a thick AT command reference manual.

Indunium-R Modem Configurator not only makes configuration easier, but also makes it convenient to carry out “mass deployment” and “pre-configuration,” but without the need to use AT commands. The most

important benefits of using the “Modem Configurator” utility are:
1. Green software, no need installation;
2. Full graphics mode, easy to learn how to configure the Indunium 2i modems;
3. The configuration profile can be easily stored, and then replicated to other modems;
4. Easy to upgrade modem firmware.

***Note**: Indunium-R Modem Configurator can be used with Windows 2000/XP/Vista/7 32/64-bit operation systems.*



3.2.1 Starting Modem Configurator

1. Switch the modem to “Config Mode”, connect the RS-232 port of the modem to a host PC and power

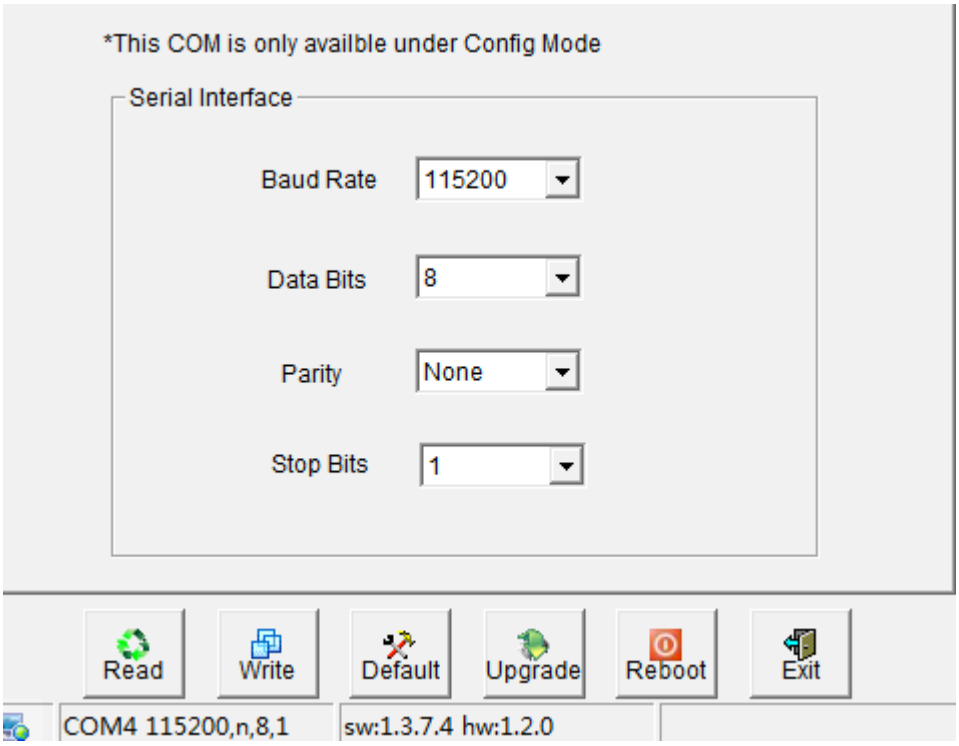
up the modem.

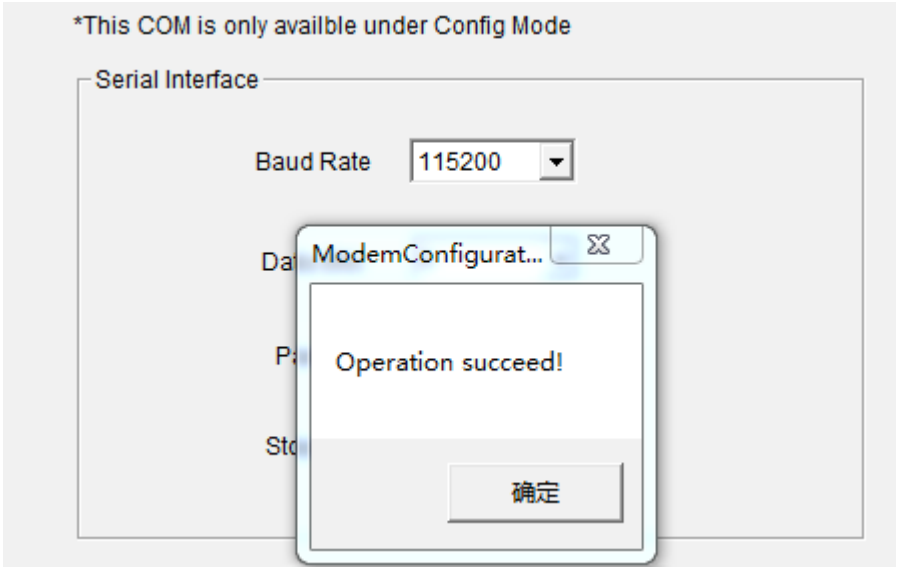
2. Double click “Modem Configurator.exe” to start the software.

3. Select the correct serial port that is connected to the modem, then click button.

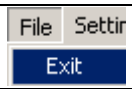
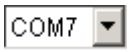
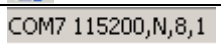
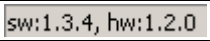
After that you can see the popup window “Operation Succeed”.

***Note**: The RS-232 connector uses the standard PINOUT. A direct male DB9 to female DB9 cable can be used to connect to a PC’s serial port. If you use a USB-to-serial product to configure the modem may cause unexpected errors when configuring the modem.*





Operation Area Introduction

Menu	Icon	Description
File->Exit		Exit the Modem Configurator.
Settings-Export		Export the modem's currently configuration file to your local PC.
Settings->Import		Import the modem's configuration file from local PC to the modem.
About->About		Manufacturer's information and Modem Configurator version.
Port No.		Select the local RS-232 port to communicate with the modem.
Connect		Connect the Indunium-R Modem Configurator to the modem, which will use the PC's local RS-232 port.
Disconnect		Disconnect the Indunium-R Modem Configurator to the modem and release the PC's RS-232 port.
Read		Read modem's currently settings.
Write		Save changes into modem. ***Note**: Reboot for changes to take effect.*
Default		Set modem to default factory settings, which will take effect after clicking "Write" button. ***Note:** PIN setting, Phone Book settings and COM settings will not be restored to factory default.*
Reboot		Reboot the modem. After rebooting, user should disconnect and re-connect to the RS-232 port again.
Exit		Exit the Modem Configurator.
Disconnecting		Modem is not communicating with Modem Configurator.
Connecting		Modem is communicating with Modem Configurator.
Serial Port Settings		Show the current RS-232 communication parameter.
Versions		Show the modem's current firmware and hardware version.

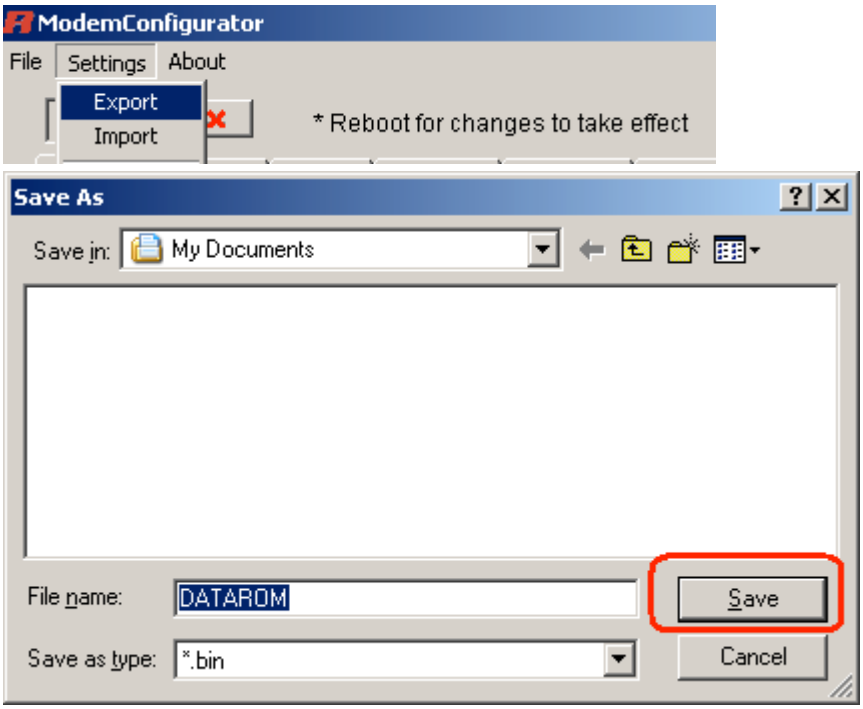
Important Notice

1. You must save your parameter changes by clicking "Write" button and then reboot your INDUNIUM 2I by clicking "Reboot" button to take effect for the parameter changes.
2. **Debug** tab is only available under **Normal Mode,** other tabs are available under **Config Mode**.

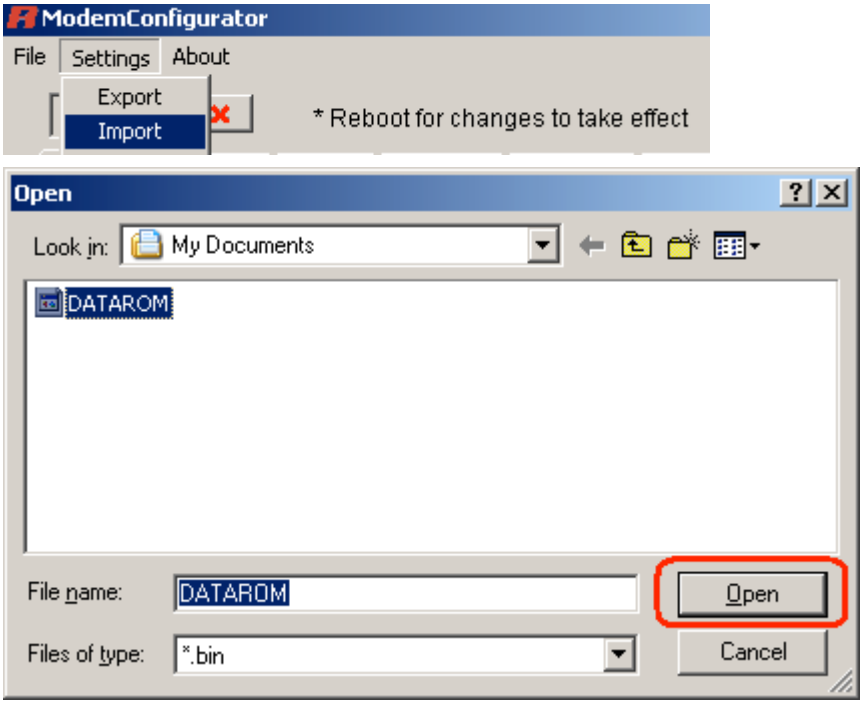
3.2.2 Export and Import Profiles

Users could export modem settings from one modem, then import the same settings to other modems, which makes it convenient to carry out “mass deployment” and “pre-configuration”.

1. Select **Export** from the **Settings** menu. Then select a folder and enter the file name for the profile. Click on **Save**, then a popup window “**Export Succeed**” will appear.



2. Select **Import** from the **Settings** menu. Then select a profile. Click **Open**.

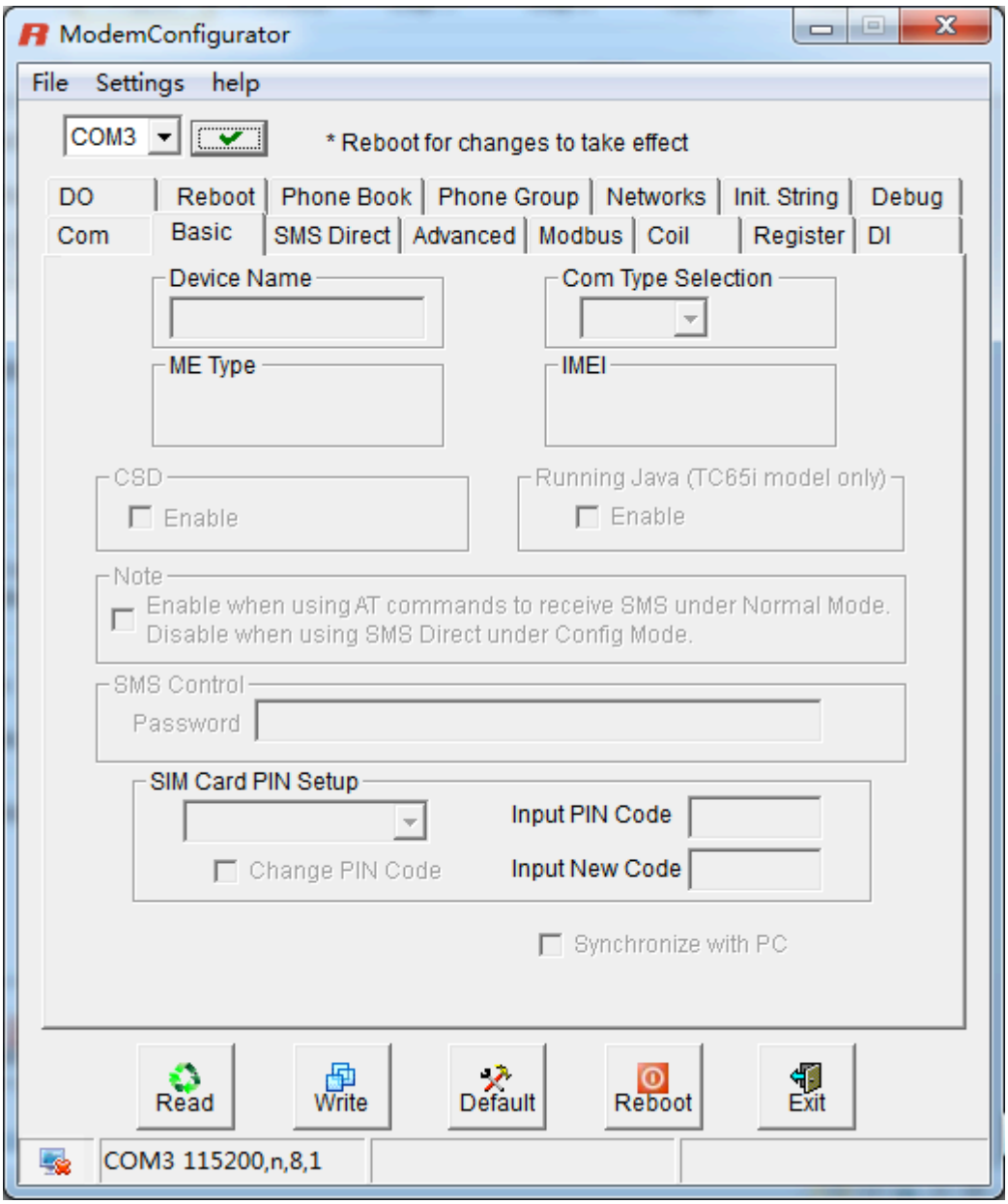


3. Click “**Write**” button then it will popup “**Import Succeed**” windows.

3.2.3 Basic

This tab allows user to set follow items:

Basic		
Item	Description	Default
Device Name	Write down the description name of the modem, such as write down the modem installation site name in order to identify each modem.	Modem
Com Selection	Select from “RS232” and “RS485”.	RS232
ME Type	Cellular module information, vary to each part number.	E.g. Cinterion MC55i, which is Cinterion MC55i GSM / GPRS module
IMEI	Cellular module’s IMEI number.	Vary to different cellular module
CSD	Click to enable **CSD** function under **Normal Mode**.	Disable
Running JAVA	When running JAVA virtual machine under **Normal Mode**, please enable this option. ***Note****: after enable this option TC65i module will only run JAVA software, other features such as SMS Direct, Reboot configured in Config Mode will be disabled; user could develop such features by JAVA if needed.*	Disable
Note	When using AT commands to receive SMS under **Normal Mode**, please enable the option. When using SMS Direct under **Config Mode**, please disable the option.	Disable
SMS Control Password	Password for SMS remote configuration.	Null
SIM Card PIN Setup	Select from “Disable PIN Lock” and “Enable PIN Lock”. After enable PIN lock, user could input your SIM’s PIN and store the current PIN in its memory, and then enter the PIN automatically each time the system boots up. ***Note****: Please ask your local GSM ISP to see whether your SIM card requiring PIN or not.* If user wants to change the SIM PIN, please tick the “Change PIN Code” checkbox to enable it, and then input the new PIN at “Input New Code”.	Disable
Synchronize with PC	Synchronize modem’s RTC to PC’s clock. The modem’s current RTC will be showed at left side of this function.	Modem factory RTC



3.2.4 SMS Direct

A major benefit of GSM technology is that it supports short messages (SMS) for easy communication over the mobile network. Indunium 2i´s proprietary SMS Direct allows you to expand your applications and reduce cost. For example, SMS Direct can be used to update the message on a highway display panel, place refill orders for vending machines, handle maintenance for remote rental equipment, or even help create an SMS alarm by directly transforming text, binary, or unicode data from a legacy device to short messages, but without using AT Commands. SMS Direct is particularly suitable for devices that communicate infrequently, or lack access to the local network. SMS Direct converts ASCII and binary data to short message transparently (both back and forth). In addition, a caller ID (phone number) identification can be used to block the message sent from the uncertified users, broadcast messages, and unwanted

SMS advertisements.

Induo's proprietary SMS Direct has the following features:

1. Transparently converts serial data to short message or vise versa **without using AT Commands**.
2. Text, binary, and Unicode formats are supported.
3. Verification of Incoming Caller ID is implemented to block uncertified users.
4. The configuration profile can be easily stored, and then copied to other modems.

The follow table introduces the SMS Direct function.

SMS Direct ***Note: This function is only available under "Config Mode".***		
Item	Description	Default
Enable SMS-IN	Tick the **SMS-IN** checkbox to allow forwarding of incoming short messages from specified **Caller ID** to the modem's serial port as data. The **Caller ID** (phone number) should be specified in "**Phone Book**" tab by inputting the phone number and tick "**SMS In**" checkbox.	Disable
Enable SMS-OUT	Tick the **SMS-OUT** checkbox to allow data received from the attached serial device to be transmitted as short messages to **Target Phone Number**. The **Target Phone Number** (phone number) should be specified in "**Phone Book**" tab by inputting the phone number and tick "**SMS Out**" checkbox.	Disable
Text ASCII	7 bits text format (160 bytes per packet)	Disable
From Mobile	Enable when receiving text (ASCII) SMS from mobile phone. Disable when receiving text (ASCII) SMS from mobile phone.	Disable
To Mobile	Enable when sending text (ASCII) SMS from mobile phone. Disable when sending text (ASCII) SMS from mobile phone.	Disable
Unicode (UCS2)	16 bits Unicode (UCS2) format (70 bytes per packet)	Disable
Binary (8 bits)	8 bits binary (140 bytes per packet)	Disable
Auto Add Timestamp	Auto adds timestamp at the beginning of the SMS. Timestamp format is **dd.mm.yy hh:mm:ss**	Disable
Max. SMS/Day	Set daily limitation for sending SMS in SMS Direct function, when reaching the maximum limitation, INDUNIUM 2I will stop sending SMS any more at that day. 0 is no limitation. Customer could also clear the counter by sending SMS to INDUNIUM 2I with SMS Control privilege, the SMS is "**clear sms counter**"	0

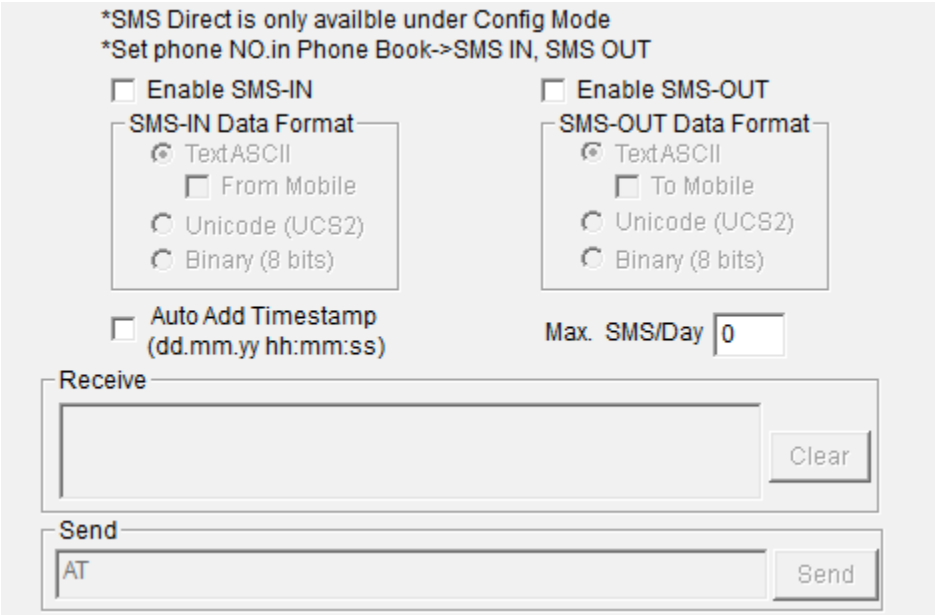
Receive	After enable **SMS-IN** function, **Receive** windows will be available, the incoming short messages from specified **Caller ID** to the modem's serial port will be displayed in this item.	Disable
Send	After enable **SMS-Out** function, **Send** windows will be available, user could input any text message in this item which will be transmitted as short messages to **Target Phone Number**.	Disable

Note:

1. *The phone numbers for SMS Direct function can be set in Phone Book tab.*
2. *The **Target Phone Number** must be specified if **SMS-OUT** is activated.*
3. *The **Target Phone Number** and **Caller ID** must be written in international format, starting with "+" followed by the country code.*
4. *If you leave **Caller ID** blank, the modem will allow all incoming short messages as serial data to be forwarded to its serial port. This includes system broadcasts and advertisements.*
5. *The timeout between characters is 0.5 second. Messages that require a longer time period will be split into 2 or more messages.*

SMS Data Format	
Text ASCII	7 bits text format (160 bytes per packet)
Unicode	16 bits Unicode (UCS2) format (70 bytes per packet)
Binary	8 bits binary (140 bytes per packet)

Note: *is not suppoted in ASCII.*



Note: The Phone NO. must be written in international format, starting with "+" followed by the country code.

e.g.: +156789, in which +1 is the USA country code, 56789 is the phone No.

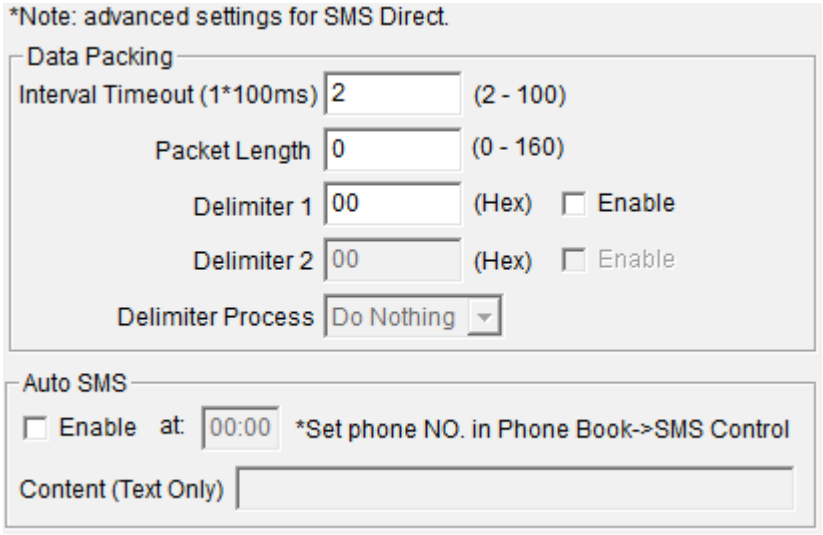
Item	Phone NO.	Call Reboot	SMS Reboot	SMS In	SMS Out	SMS Control
1	+86123456789	☐	☐	☑	☐	☐
2	+86987654321	☐	☐	☐	☑	☐
3		☐	☐	☐	☐	☐
4		☐	☐	☐	☐	☐
5		☐	☐	☐	☐	☐
6		☐	☐	☐	☐	☐
7		☐	☐	☐	☐	☐
8		☐	☐	☐	☐	☐
9		☐	☐	☐	☐	☐
10		☐	☐	☐	☐	☐

3.2.5 Advanced

Advanced settings for SMS Direct.

Advanced		
Item	Description	Default
Interval Timeout	**Interval Timeout** is the maximum timeout between two packets from serial port. INDUNIUM 2I will process as 2 SMS if the interval between two packets is larger than the value set in the box. The units of the timeout is 100ms, default value is 2, which mean the default packet timeout is 200ms. ***Note**: SMS will also be sent as specified by the packet length or delimiter settings even when SMS is not reaching the preset interval timeout.*	2
Packet Length	The Packet length setting refers to the maximum amount of data that is allowed to accumulate in the serial port buffer before sending. At the default of 0 for packet length, no maximum amount is specified and data in the buffer will be sent as specified by the interval timeout or delimiter settings. When a packet length between 1 and 140/160 bytes is specified, data in the buffer will be sent as soon it reaches the specified length. 0 is no limitation. SMS use Text ASCII has a maximum length of 160 bytes. SMS use Unicode (UCS2) and Binary (8 bits) has a maximum length of 140 bytes. ***Note**: SMS will also be sent as specified by the interval timeout or delimiter settings even when SMS is not reaching the preset packet length.*	0

Delimiter 1 and Delimiter 2	When Delimiter 1 is enabled, the serial port will queue the data in the buffer and send the data to the Cellular port when a specific character, entered in hex format, is received. A second delimiter character may be enabled and specified in the Delimiter 2 field, so that both characters act as the delimiter to control when data should be sent.	Disable
Delimiter Process	**Delimiter process** (default=Do Nothing): The Delimiter process field determines how the data is handled when a delimiter is received. Delimiter 1 must be enabled for this field to have effect. If Delimiters 1 and 2 are both enabled, both characters must be received for the delimiter process to take place. **Do Nothing**: Data in the buffer will be transmitted when the delimiter is received. **Strip Delimiter**: Data in the buffer is first stripped of the delimiter before being transmitted. ***Note**: SMS will also be sent as specified by the interval timeout or packet length settings even when there is no preset Delimiters.*	Do Nothing
Auto SMS	Click to enable **Auto SMS** function, which will send SMS to preset phone numbers in **Phonebook->SMS Control**. SMS sending time and content is configurable. ***Note**: Only support text format SMS.*	Disable



3.2.6 Reboot

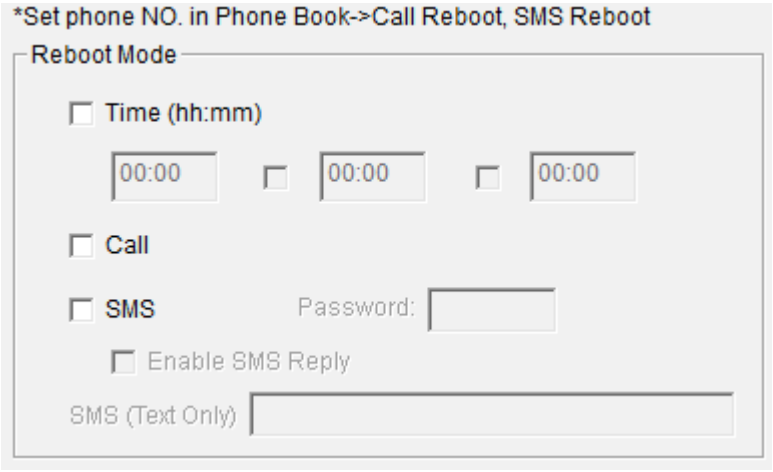
Since cellular network is not as stable as fixed line, Induo Indunium 2i modems support various auto reboot function to keep modem working 24x7 without hang up.

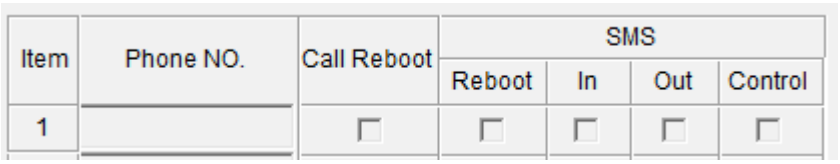
Reboot ***Note: This function is available under both "Config Mode" and "Normal Mode".***		
Item	Description	Default
Time	Tick the **Time** checkbox to allow modem auto reboot with preset time schedule every day, support maximum 3 time schedule/day (e.g. 07:00, 11:00 and 23:30 every day).	Disable
Call	Tick the **Call** checkbox to allow modem auto reboot with	Disable

	incoming call from specified **Caller ID** (phone number). The **Caller ID** (phone number) should be specified in "**Phone Book**" tab by inputting the phone number and tick "**Call Reboot**" checkbox.	
SMS	Tick the **SMS** checkbox to allow modem auto reboot with incoming specified short message from specified **Caller ID** (phone number). Specified short message is set at **Password** item. (e.g. reboot) The **Caller ID** (phone number) should be specified in "**Phone Book**" tab by inputting the phone number and tick "**SMS Reboot**" checkbox.	Disable
Enable SMS Reply	Tick the **Enable SMS Reply** checkbox to allow modem send reply short message after auto reboot by Call Reboot or SMS Reboot from specified **Caller ID** (e.g. Reboot ok!). ***Note**: Only support text format SMS.*	Disable

***Note**:*

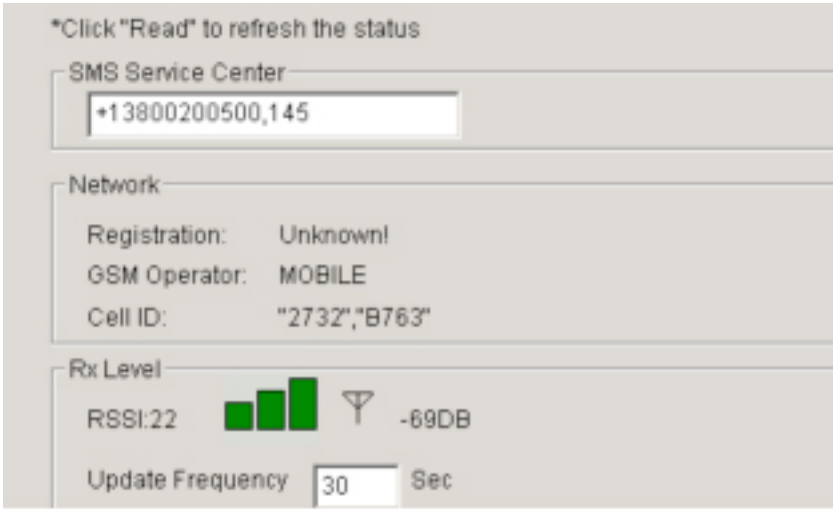
1. *Time format for Time reboot is 24-hours.*
2. *The phone numbers for **Call** and **SMS** function can be set in Phone Book tab.*
3. *The **Caller ID** must be written in international format, starting with "+" followed by the country code.*
4. *If you leave **Caller ID** blank, the modem will reboot with any incoming call, which may cause unexpected issue.*
   *It is highly recommend setting the **Call ID**.*





3.2.7 Networks

Networks		
Item	Description	Default
SMS Service Center	Read the Short Message service center.	Read SMS Service Center from SIM card
Registration	Show the modem current registration status. There are 3 status: 1. Not registered 2. Registered, home network 3. Registered, roaming	N/A
GSM Operator	Show the modem current registered GSM operator name.	N/A
Cell ID	Show the modem current register base station cell ID.	N/A
RSSI	Show the modem current RSSI from 0 to 31 and corresponding DB.	N/A
Update Frequency	The modem's 3 levels RSSI indicators will vary according to network status by preset interval.	30 seconds
Note: 1. *Usually modem can read the **SMS Service Center from** SIM Card, no need to modify or set a new SMS Service Center unless it the modem cannot read it from the SIM Card.* 2. *Click "Read" to refresh the "**Network**" and "**Rx Level**" status.*		



Values of received signal strength (RSSI)

Value of received signal strength indication (RSSI)	Interpretation of the received signal strength
0 to 12	Insufficient or weak
13 to 19	Average
20 to 31	Good
99	No signal

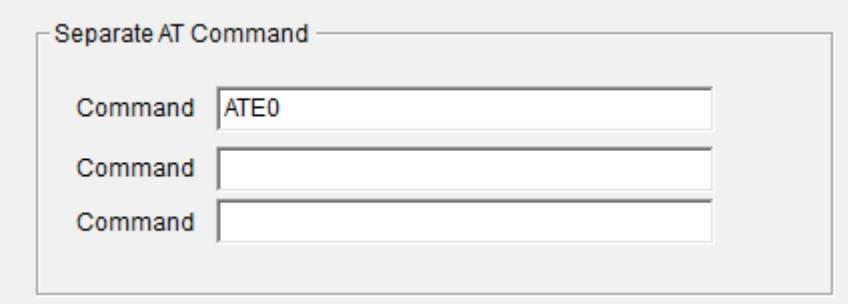
***Note**: RSSI should remain higher than 12 to create/accept GSM CSD data calls or establish a GPRS connection. Users can only transmit/receive by SMS (short message) if the RSSI is less than or equal to 11. A better way of verifying the RSSI signal (instead of using the Modem Configuration) is to check the "SIGNAL" LEDs on the front panel directly. See 2.2 LED Indicators for more information.*

Antenna selection guide

Value of received signal strength indication (RSSI)	Antenna selection
0 or 1	GSM/GPRS is not good solution in the area
1 <RSSI≤12	Select antenna gain > 10 dBi
12 <RSSI< 20	Select antenna gain > 3 to 5 dBi
≥21	Select antenna gain > 0 to 3 dBi

3.2.8 Init. String

User could enter the initial string in the text input box.
The preset **Init. String** will take effect under "**Normal Mode**".
***Note**: Maximum 39 characters for each initial string.*



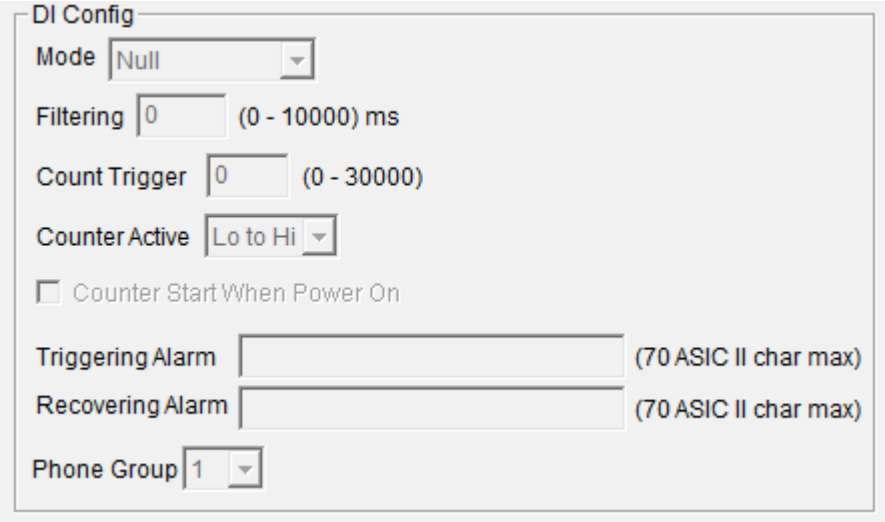
3.2.9 DI

Type	Logic 0 (OFF)	Logic 1 (ON)
Dry contact	Close to GND	open

This tab describes the Digital Input settings.

Networks		
Item	Description	Default
Mode	Mode refers to the status of a digital input channel. Selected from OFF, ON, OnChange, Event Counter and Null. OFF: is satisfied for as long as DI remains off ON: is satisfied for as long as DI remains on OnChange: triggering alarm when DI trigger the related action	Null

	whether it is ON or OFF Event Counter: under event counter mode Null: DI disabled	
Filtering	Software filtering is used to control switch bounces. Input from 0 to 10000ms.	0
Count Trigger	Available when DI under Event Counter mode. Input from 0 to 30000. (0=will not trigger alarm) It will trigger alarm when counter reaching this figure. After triggering alarm, DI keeps counting but will not trigger alarm again. To clear the counter, use SMS command or Modbus polling command. SMS command: please refer to 5.3 SMS Commands for Remote Control->Clear Event Counter Modbus address: please refer to 5.4 Modbus Address Mapping	0
Counter Active	Available when DI under Event Counter mode. In Event Counter mode, the channel accepts limit or proximity switches and counts events according to the ON/OFF status. When “Lo to Hi” is selected, the counter value increases when the attached switch is pushed. When “Hi to Lo” is selected, the counter value increases when the switch is pushed and released.	Lo to Hi
Counter Start When Power On	Available when DI under Event Counter mode. Start counting as soon as power on the modem when enable this option. If “Counter Start When Power On” is disabled, it will also start counting when receiving SMS command or Modbus polling command. SMS command: please refer to 5.3 SMS Commands for Remote Control->Start Event Counter Modbus address: please refer to 5.4 Modbus Address Mapping	Disable
Triggering Alarm	The SMS to receive upon triggering alarm. (70 ASIC II char max)	Null
Recovering Alarm	The SMS to receive upon recovering alarm. (70 ASIC II char max)	Null
Phone Group	The alarm SMS will send to specified phone group. Each phone group include up to 10 phone numbers.	Null
***Note**: the Event Counter value will be reset to zero if power is disconnected.*		



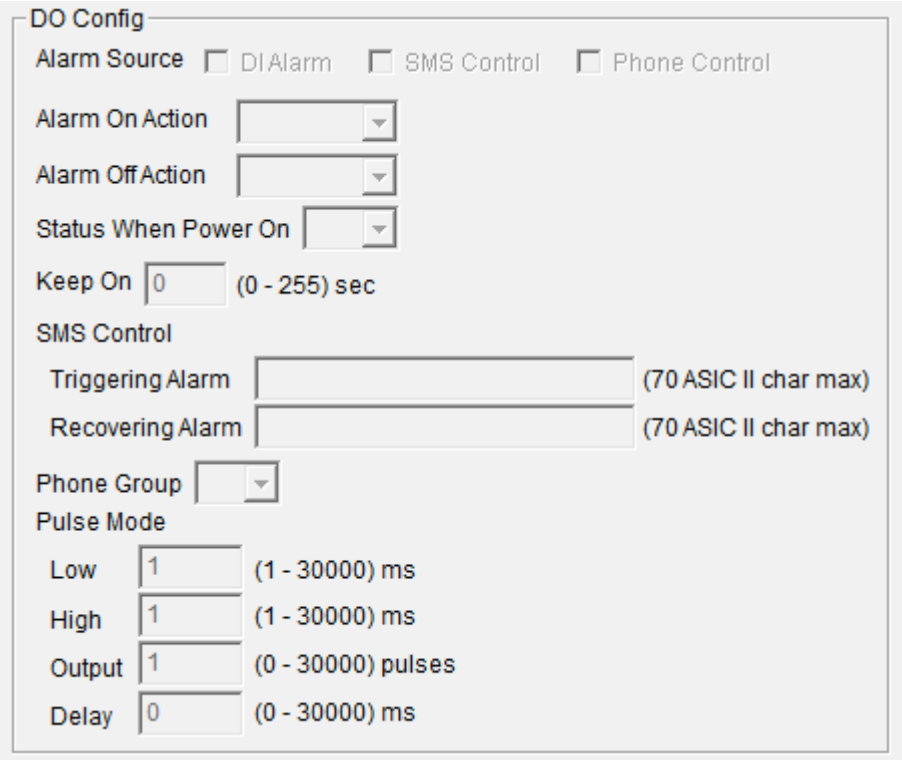
3.2.10 DO

Type	Logic 0 (OFF)	Logic 1 (ON)
DO	open	short

This tab describes Digital Output settings.

Networks		
Item	Description	Default
Alarm Source	Digital Output acts according to different alarm source. Selected from DI Alarm, SMS Control, Call Control, selection can be one or more. DI Alarm: Digital Output triggers the related action when there is alarm from Digital Input. SMS Control: Digital Output triggers the related action when receiving SMS from the number in the phone book. Call Control: Digital Output triggers the related action when receiving phone call from the number in the phone book.	Null
Alarm On Action	Digital Output acts when there is an alarm. Selected from OFF, ON, Pulse, Null. OFF: Open when triggered. ON: Short contact when triggered. Pulse: Generates a square wave as specified in the pulse mode parameters when triggered. Null: Do nothing.	Null
Alarm Off Action	Digital Output acts when alarm recovered. Selected from OFF, ON, Pulse, Null. OFF: Open when triggered. ON: Short contact when triggered.	Null

	Pulse: Generates a square wave as specified in the pulse mode parameters when triggered. Null: Do nothing.	
Status When Power On	Specify the Digital Output status when power on. Selected from OFF, ON. OFF: Open. ON: Short contact.	Null
Keep On	Available when digital output Alarm On Action/Alarm Off Action status is ON, input the Digital Output keep on status time. Input from 0 to 255 seconds. (0=keep on until the next action)	0
Triggering Alarm	Available when enable SMS Control in Alarm Source. Input the SMS content to enable “Alarm On Action” by SMS. (70 ASIC II char max)	Null
Recovering Alarm	Available when enable SMS Control in Alarm Source. Input the SMS content to enable “Alarm Off Action” by SMS. (70 ASIC II char max)	Null
Phone Group	The alarm SMS will send to specified phone group. Each phone group include up to 10 phone numbers.	Null
Low	Available when enable Pulse in Alarm On Action/Alarm Off Action. In Pulse Output mode, the selected digital output channel will generate a square wave as specified in the pulse mode parameters. The low level widths are specified here. Input from 1 to 30000 ms.	1
High	Available when enable Pulse in Alarm On Action/Alarm Off Action. In Pulse Output mode, the selected digital output channel will generate a square wave as specified in the pulse mode parameters. The high level widths are specified here. Input from 1 to 30000 ms.	1
Output	Available when enable Pulse in Alarm On Action/Alarm Off Action. The number of pulses, input from 0 to 30000. (0 for continuous pulse output)	1
Delay	Available when enable Pulse in Alarm On Action/Alarm Off Action. The first pulse will be generated after a “Delay”. Input from 0 to 30000ms. (0=generate pulse without delay)	0

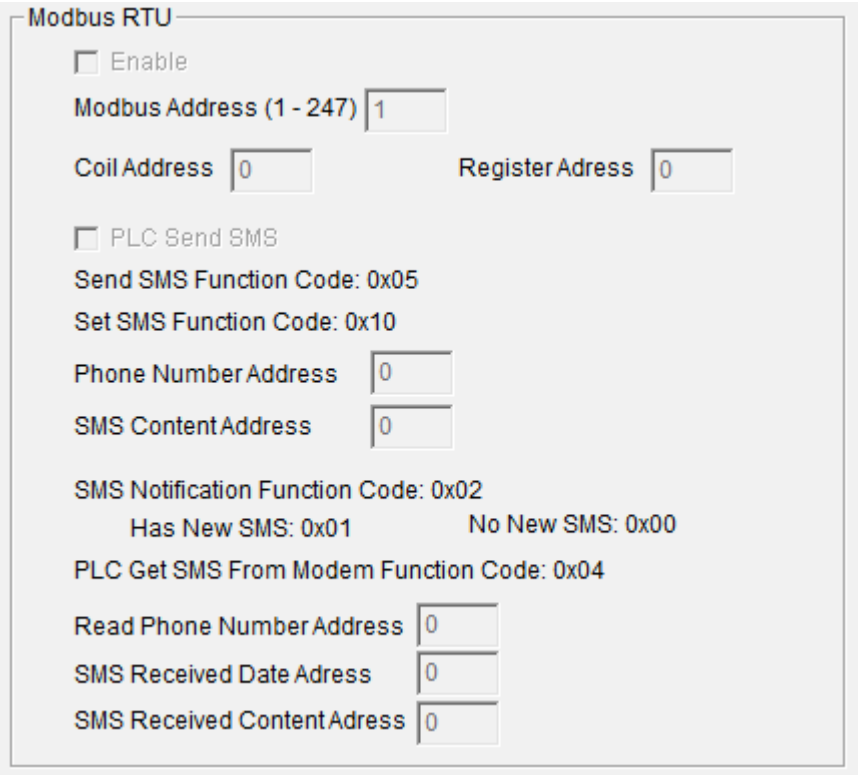


3.2.11 Modbus

This tab describes Digital Output settings.

Networks		
Item	Description	Default
Enable	Tick to enable Modbus RTU Slave function in the modem.	Disable
Slave ID	Modbus slave ID, input from 1 to 247.	1
Coil Address	Modbus address to read coils (0x01) or wire single coil (0x05). Input from 0 to 65535.	0
Register Address	Modus address to read holding register (0x03) or write single register (0x05). Input from 0 6o 65535	0
PLC Send SMS	Tick to enable. The PLC will poll the modem to send SMS, in which the SMS content and phone number can be set by PLC.	Disable
Send SMS Function Code (0x05)	Read only parameters. The function code for sending SMS.	
Set SMS Function Code (0x10)	Read only parameters. The function code for setting SMS content and phone number.	
Phone Number Address	The start address to save phone number, total 16 registers.	
SMS Content	The start address to save SMS content, total 35 registers.	

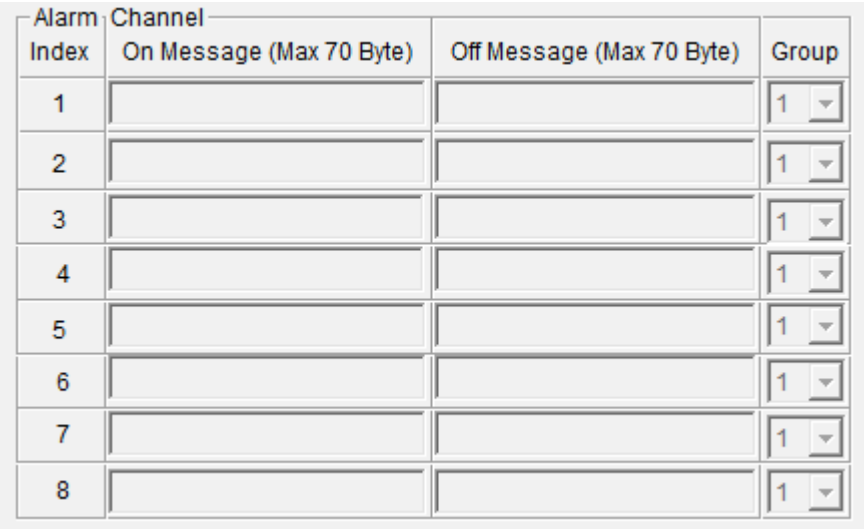
Address		
SMS Notification Function Code (0x02)	Read only parameters. The function code for the PLC polling the modem to check whether there is new SMS.	
Have New SMS (0x01)	Read only parameters. During polling, when there is new SMS, modem will reply 0x01.	
No New SMS (0x00)	Read only parameters. During polling, when there is no new SMS, modem will reply 0x00.	
PLC Get SMS From Modem Function Code (0x04):	Read only parameters. The function code for the PLC to read new SMS and get its content.	
Read Phone Number Address	The start address to save received SMS phone number, total 10 registers.	0
SMS Received Date Address	The start address to save received SMS date, total 6 registers.	0
SMS received Content Address	The start address to save received SMS content, total 70 registers.	0



3.2.12 Coil

This tab describes Coil settings.

Networks		
Item	Description	Default
Index	Index 1 coil address=0x00 Index 2 coil address=0x01 Index n coil address=Index (n-1) coil address + 1	
On Message	Send out SMS when coil value is 1. Input the SMS here. (70 ASIC II char max)	Null
Off Message	Send out SMS when coil value is 0. Input the SMS here. (70 ASIC II char max)	Null
Group	The SMS will send to specified phone group.	1



3.2.13 Register

This tab describes Register settings.

Networks		
Item	Description	Default
Index	Index 1 register address=0x00 Index 2 register address=0x01 Index n register address=Index (n-1) register address + 1	
Register Name	Input the register name. (30 ASIC II char max)	Null
Max	Modem will send out alarm SMS when register current value is bigger than Max value. SMS content=Register Name+Current Value+Min to Max range	Null
Min	Modem will send out alarm SMS when register current value is smaller than Max value. SMS content=Register Name+Current Value+Min to Max range	Null
Group	The SMS will send to specified phone group.	1

Index	Register Name (max 30 Bytes)	Max	Min	Group
1		0	0	1
2		0	0	1
3		0	0	1
4		0	0	1
5		0	0	1
6		0	0	1
7		0	0	1
8		0	0	1
9		0	0	1
10		0	0	1
11		0	0	1
12		0	0	1
13		0	0	1
14		0	0	1
15		0	0	1

3.2.14 Phone Book

Networks		
Item	Description	Default
Phone NO.	Input the telephone number.	N/A
Call Reboot	Tick the **Call Reboot** checkbox to allow modem auto reboot with incoming call from this number.	Disable
SMS Reboot	Tick the **SMS Reboot** checkbox to allow modem auto reboot with incoming specified short message from this number.	Disable
SMS In	Tick the **SMS IN** checkbox to allow forwarding of incoming short messages from this number to the modem's serial port as data.	Disable
SMS Out	Tick the **SMS OUT** checkbox to allow data received from the attached serial device to be transmitted as short messages to this number.	Disable
SMS Control	Tick the **SMS Control** checkbox to allow this number the following privileges: 1. SMS commands for remote control 2. Receive Auto SMS report every day after enable	Disable
***Note**: The **Phone NO.** must be written in international format, starting with "+" followed by the country code.*		

Note: The Phone NO. must be written in international format, starting with "+" followed by the country code.

e.g.: +156789, in which +1 is the USA country code, 56789 is the phone No.

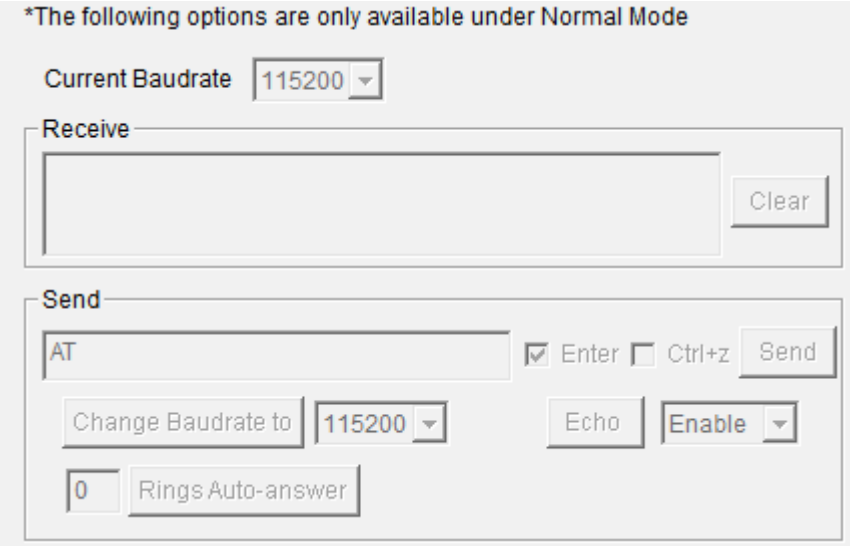
Item	Phone NO.	Call Reboot	SMS			
			Reboot	In	Out	Control
1		☐	☐	☐	☐	☐
2		☐	☐	☐	☐	☐
3		☐	☐	☐	☐	☐
4		☐	☐	☐	☐	☐
5		☐	☐	☐	☐	☐
6		☐	☐	☐	☐	☐
7		☐	☐	☐	☐	☐
8		☐	☐	☐	☐	☐
9		☐	☐	☐	☐	☐
10		☐	☐	☐	☐	☐

3.2.15 Phone Group

Phone Group is only available for DI, DO, Coil and Register tabs.
Select different phone numbers to include them in the same phone group.

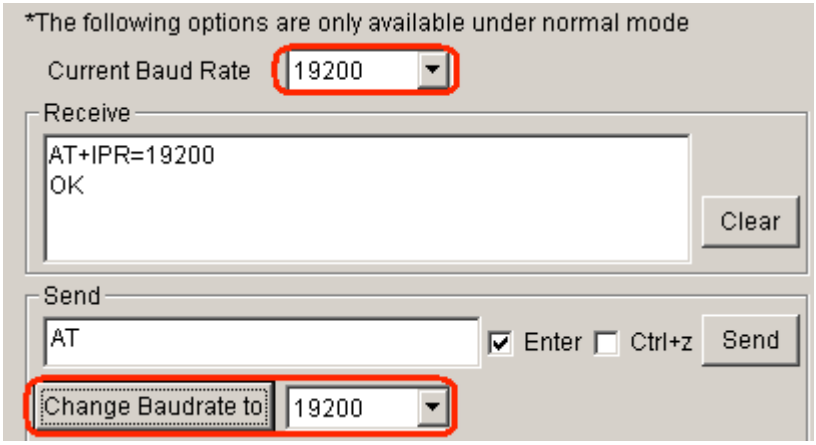
Index	Phone Book Index									
	1	2	3	4	5	6	7	8	9	10
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3.2.16 Debug (Only Available under “Normal Mode”)



In this tab, user could change serial port baud rate in **Normal Mode**. Please operate according to follow steps to change baud rage (default baud rate is 115200 bps, in this case we want to change baud rate to 19200 bps):

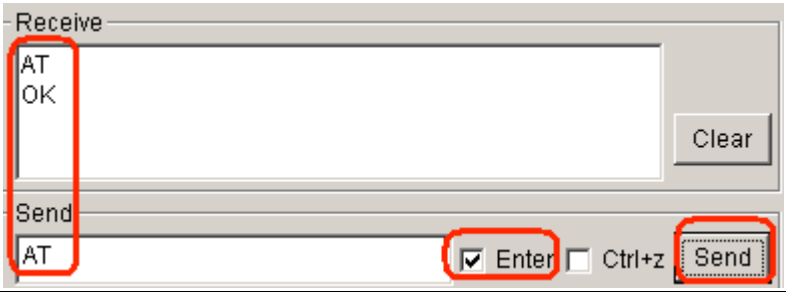
1. Select 19200 bps, then click “**Change Baudrate to**”, after that **Current Baud Rate** will also auto change to 19200 bps (it will auto display “AT+IPR=19200” and “OK” in Receive windows);



2. Test AT commands. Here we send “AT” then modem will reply “OK”.

Note:

1. *Please disconnect the COM connection, after that switch from **Config Mode** to **Normal Mode**, and then and then connect again to the COM.*
2. ***Receive** windows is a simple Hyper Terminal Emulator.*



Receive and Send windows		
Item	Description	Default
"Receive" windows	Display the command replied by the cellular module after sending the AT commands	N/A
"Send" windows	Input the AT commands in this windows	AT
Enter	The same as "Enter" in windows Hypter Terminal, click to enable or disable	Enable
Ctrl+z	The same as "Ctrl+z" in windows Hypter Terminal, click to enable or disable	Disable
Echo	Enable or Disable the Echo. ***Note**: 2-wire RS-485 uses half-duplex communication. For this reason, the modem's local echo should be disabled.*	Enable
"Send" button	Click to send out the AT commands and in "Send" windows	N/A
Clear	Click to clear the "Receive" windows	

In this tab, user could also set "auto-answer" for CSD communications.

It is much easier to activate Auto-answer using Modem Configurator.

Input the number of rings, for example input 1, and then click "Rings Auto-answer".

If there is an incoming CSD call, modem will auto answer after 1 ring tone.

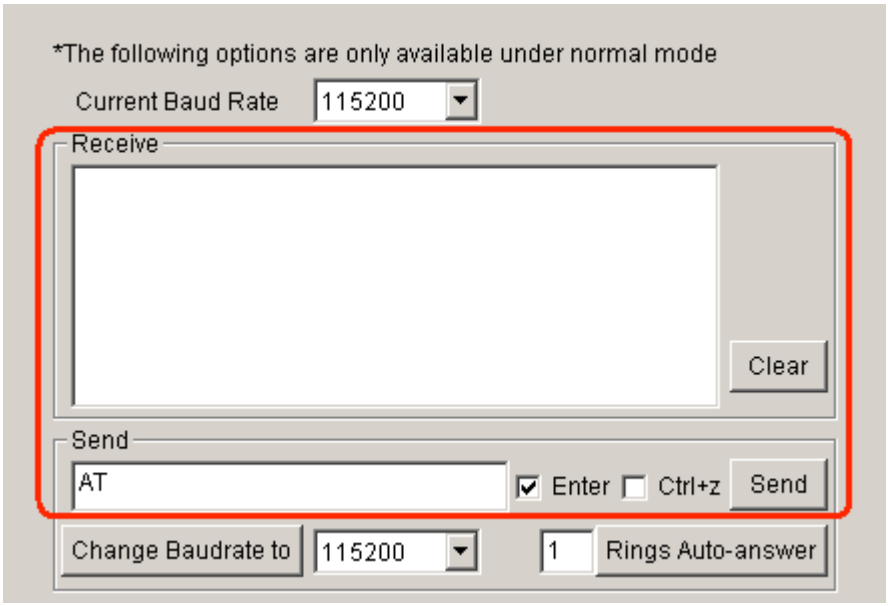
Chapter 4. Typical Applications

4.1 AT Command Set (Only Available under Normal Mode)

The modem supports the guidelines known as the “AT Command Set.” The AT Command Set is the industry standard line-oriented command language used to communicate with the modem.
***Note**: AT Commands may be entered from terminal software such as Induo Modem Configurator’s Debug Tab or Windows HyperTerminal.*

4.1.1 Starting Indunium-R Modem Configurator

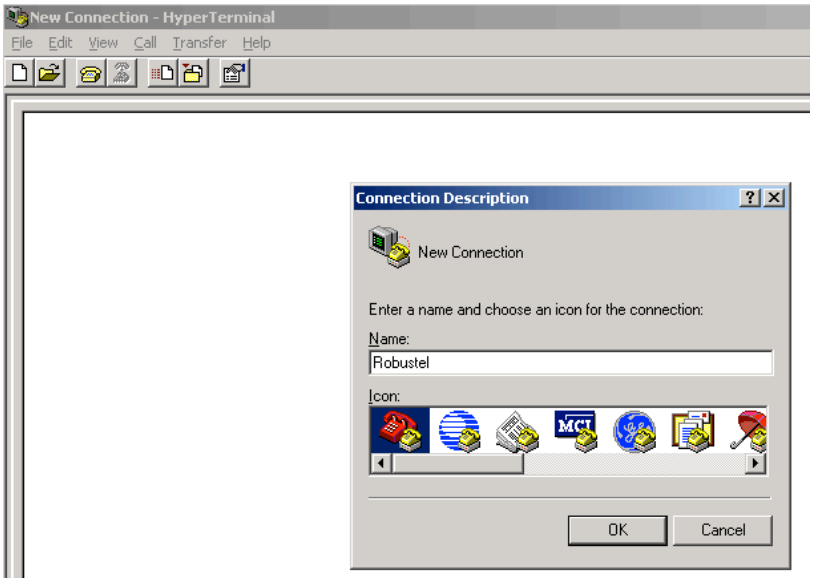
Please refer to Debug (Only Available under “Normal Mode”) and find out how to send AT Commands by the Modem Configurator.



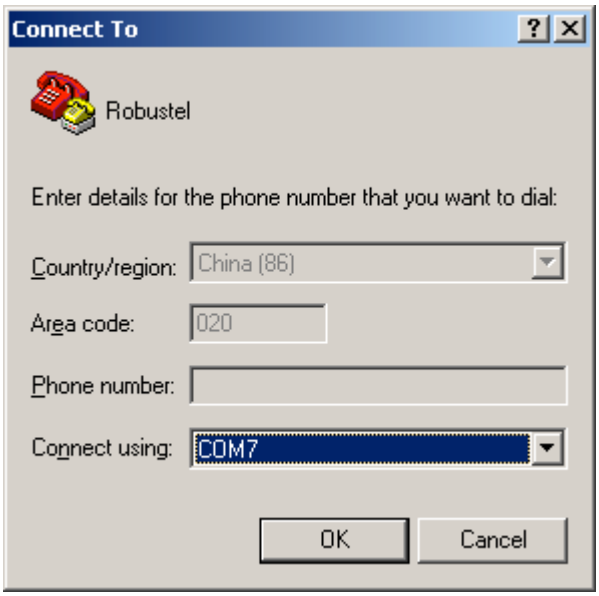
4.1.2 Starting Windows Hyper Terminal

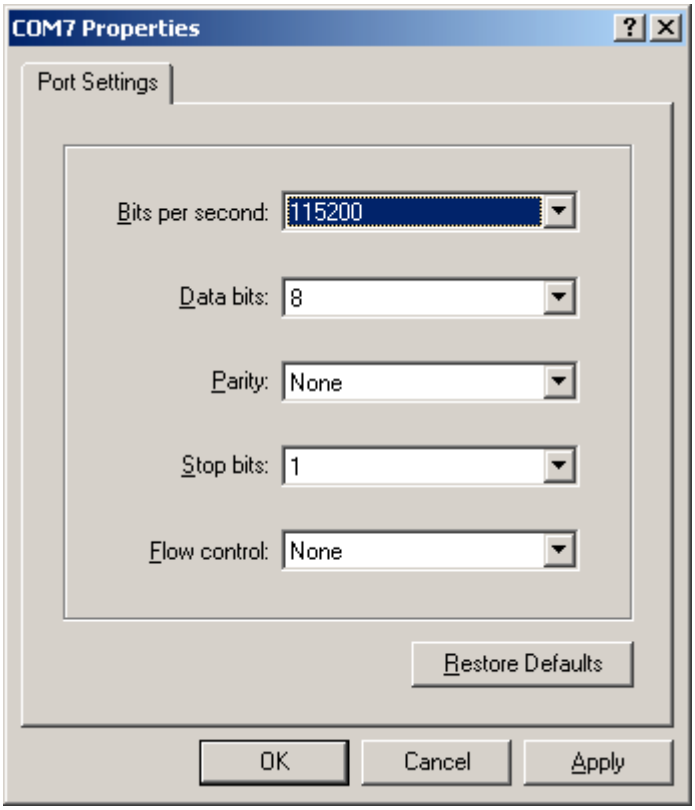
User could also control modem via AT Commands by Windows Hyper Terminal.

1. Go to “Windows Start->All Programms->Accessories-Communications>HyperTerminal” and click to open.
2. Establish a new connection and input the connection name.

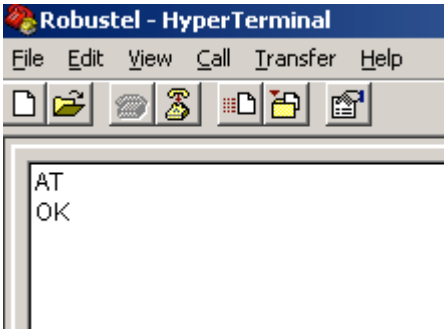


3. Select the right COM port (i.e. COM7) and baud rate settings (115200, 8bits, none parity, 1 stop bit, no flow control).





4. Input AT commands on the HyperTerminal screen (e.g. type “AT” to check the “OK” response from the modem).



4.1.3 AT Commands Examples

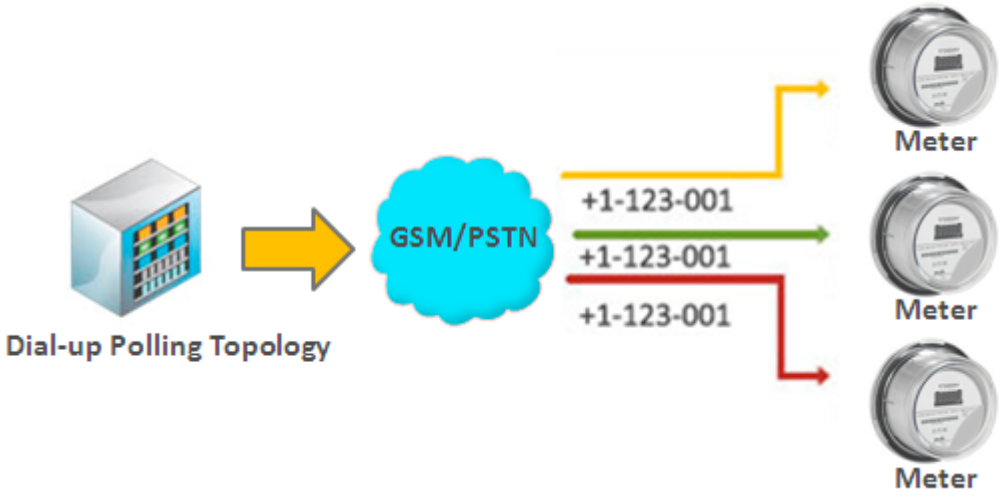
Followings are examples of some AT commands. Please refer to the AT command guide for a full description.

Description	AT commands	Modem response	Comments
Receiving signal strength	AT+CSQ	+CSQ: 19,99	The first parameter has to be at least 15 for normal communication.
Saves parameters in non-volatile memory	AT&W	OK	The configuration settings are stored.

4.2 GSM CSD Connection (Only Available under Normal Mode)

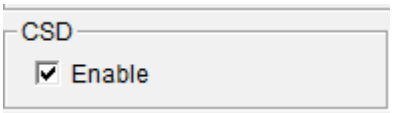
4.2.1 Overview

A Circuit-Switched Data Connection makes the wireless modem work in a manner similar to a regular analog modem.
CSD (Circuit Switched Data) is the original form of data transmission developed for GSM systems. By using a single radio time slot, CSD is able to deliver 9.6 to 14.4 kbit/s data transmission to both the GSM Network and PSTN Switching Subsystem through direct calls. Most of the time, it is initiated by standard AT commands. Using the modem to access remote devices by CSD is often more convenient than installing cables and data lines. Data collection and monitoring will be more flexible since CSD can be used for applications that are hard to wire or hard to access.
***Note**: Ensure that your SIM card has the CSD Service activated. For most regions, you must apply to your mobile service provider to receive this service.*

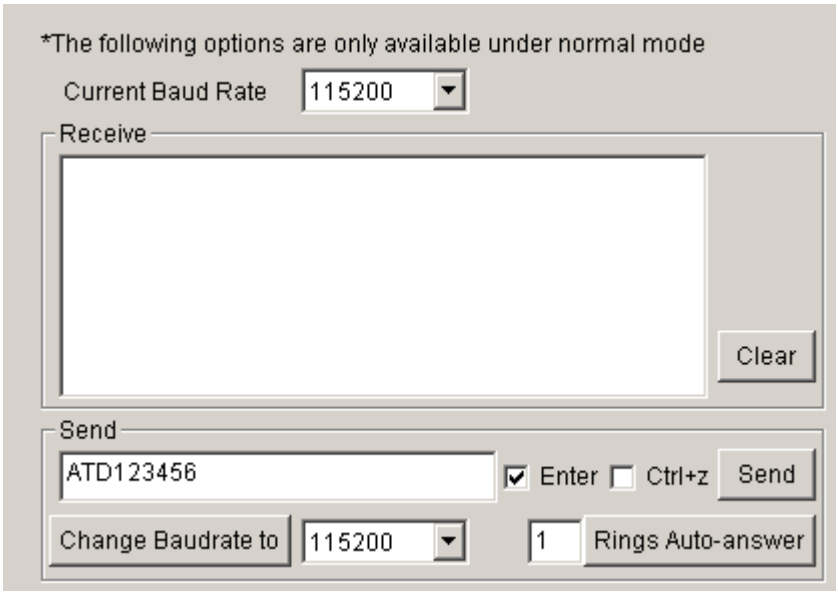


4.2.2 Establishing a CSD Connection

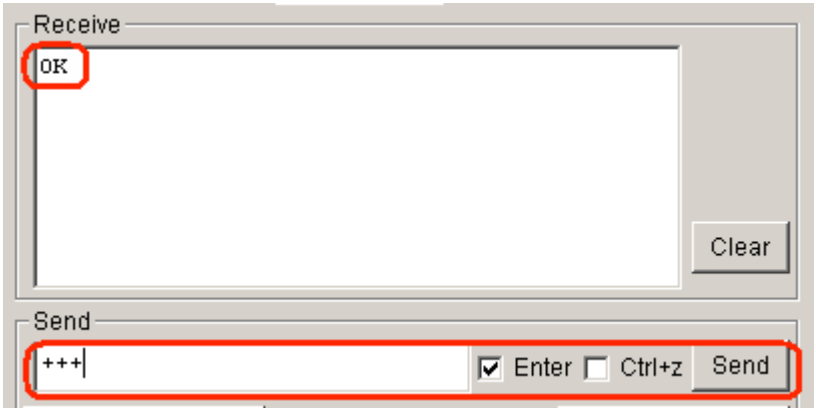
1. Enable **CSD** at Basic Tab under **Normal Mode**;



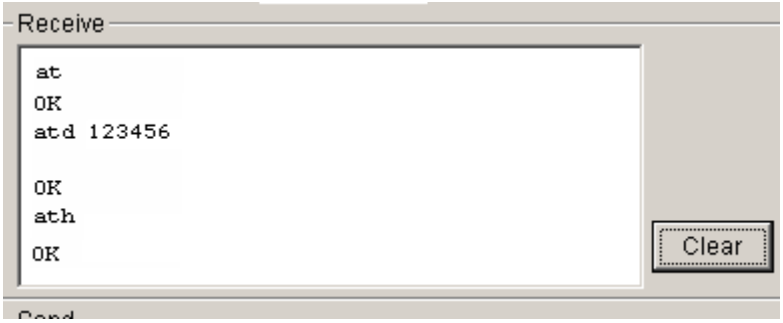
2. Start Indunium-R Modem Configurator and click the Debug tab under **Config Mode**, with the current communication parameters (default: 115200 bps, 8 for Data bits, None for Parity, 1 for Stop bits, and None for flow control).
3. Type **ATD** ***<phone number>*** and click **Send** to establish a CSD connection. (e.g. ATD 123456, in which 123456 is the phone number.)
4. After remote side answering the CSD call, then the CSD connection has been established successfully, and you can switch to data mode to proceed with data communication.



5. To disconnect the connection, type **+++** in **Send** windows and enable **Enter,** then click **Send.** The modem will respond with **OK** to indicate that you have already switched back to the command mode.



6. Type **ATH** and then press **Enter** to disconnect.

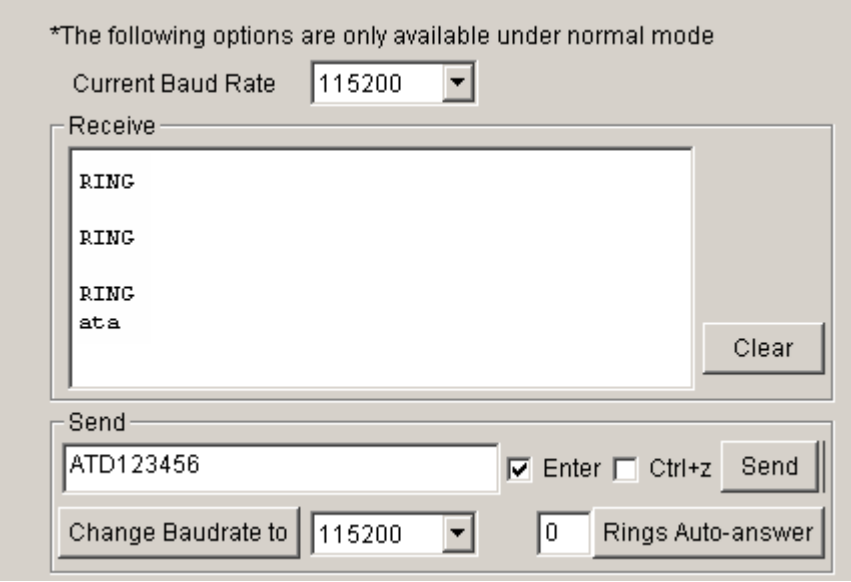


Note:

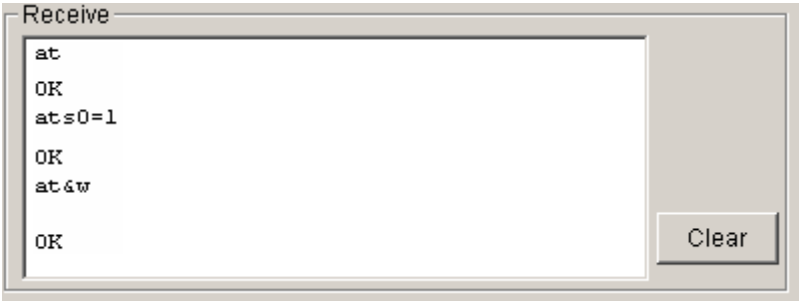
1. *+++ is the escape sequence, and **ATH** is the hang-up command.*
2. *For international calls, the local international prefix does not need to be set, but does need to be replaced by the + character. E.g., you would type **ATD+86123456,** in which +86 is the country code.*
3. *User could also establish a CSD connection by using terminal software such as Windows HyperTerminal, or Indunium-R Modem Configurator's Debug Tab.*

4.2.3 Answering a CSD Connection

1. To answer a call manually, when the Indunium-R Modem Configurator displays the RING response, type to answer a call manually, when the Indunium-R Modem Configurator displays the RING response, type **ATA** , enable **Enter** and click **Send.**

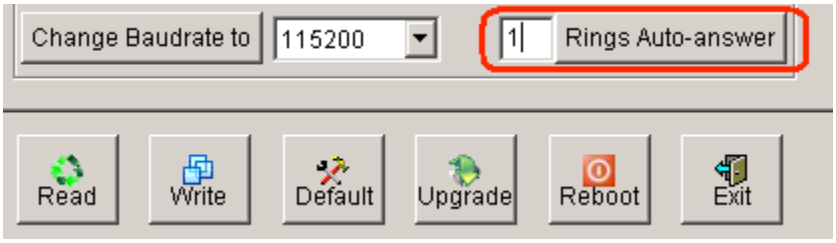


2. After the CSD connection has been established, and the modem will be in the data mode. At this point you can proceed with data communication.
3. To answer a call automatically, type **ATS0=x** and click **Send,** and then type **AT&W** and click **Send** in the Modem Configurator. In this case, replace **x** with the number of rings that the modem receive before answering the call.



Note:

1. ***ATA*** *is the Answer command.* ***ATS0=<x>*** *is the auto-answer command. The* ***AT&W*** *command helps to save the current settings to the modem.*
2. *It is much easier to activate Auto-answer using Modem Configurator. Input the number of rings to wait in the input box and then click* ***Rings Auto-answer****.*



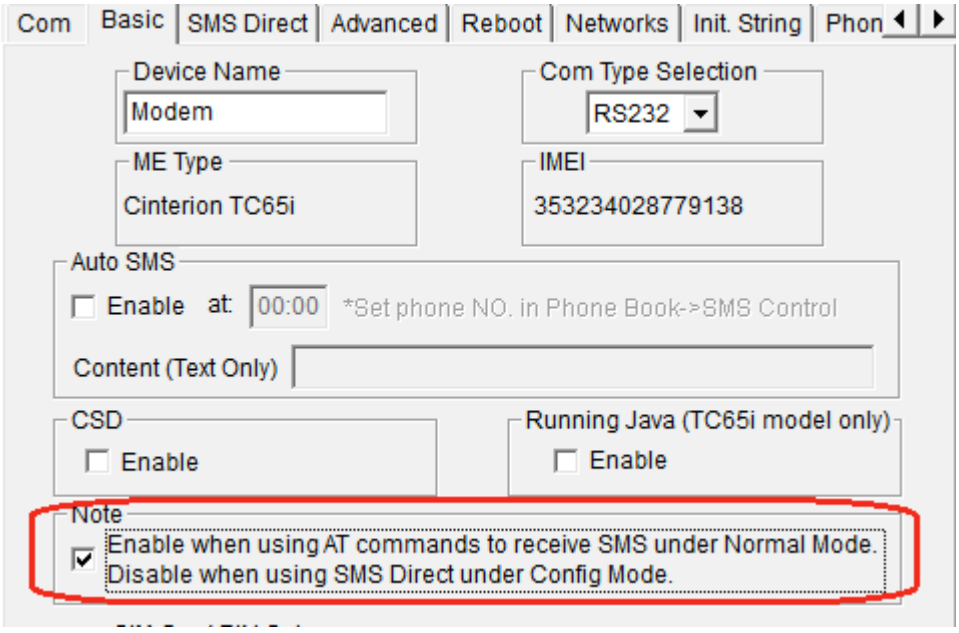
3. *To disconnect the modem, type **+++**. The modem will respond with **OK,** which means that you have already switched back to command mode.*
4. *Type **ATH** and press **Enter** to disconnect.*

4.3 Using Short Message Service by Using AT Commands (Only Available under Normal Mode)

GSM technology offers the benefit of using SMS (short message service) as an easy way to communicate over the mobile network.
The following topics are covered in this chapter:

1. Sending a Short Message
2. Reading a Short Message
3. Deleting a Short Message

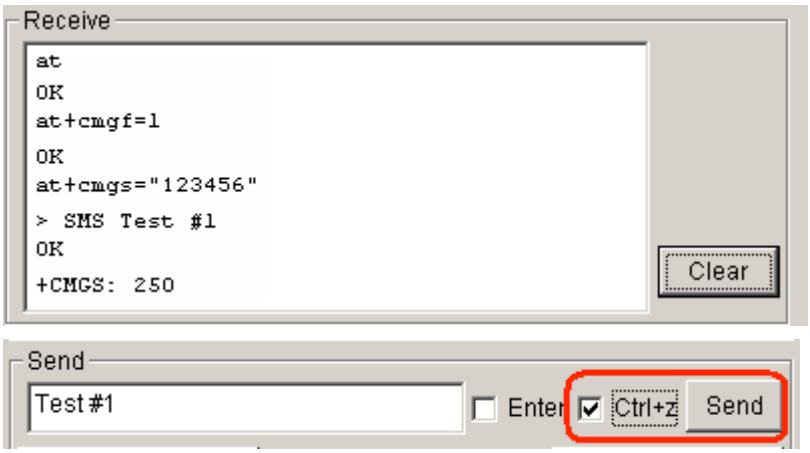
***Note**: Please enable the following option under Config Mode, then switch back to Normal Mode.*



4.3.1 Sending a Short Message

1. Type **AT+CMGF=1** and then click **Send**.

2. Type **AT+CMGS="<*phone number*>"** and then click **Send.** The terminal will automatically move to the next line, which starts with >. Type your message to the right of the >.
3. Enable **Ctrl + Z** and click **Send** to deliver the message.



***Note:** AT+CMGF=1 sets the SMS to Text mode.*

4.3.2 Reading a Short Message

1. Type **AT+CMGF=1** and then press **Enter**.
2. When a short message is received, the modem will show the storage number of the message after "**+CMIT: "SM", *x*"** (where the ***x*** is the storage number).
3. Type **AT+CMGR=*x*** to read the message.
4. In the example shown below, the ***x=5*** means that the message is stored in the 5th storage location.

```
at

OK

+CMTI: "SM",5
at+cmgr=5

+CMGR: "REC UNREAD","+886972613404",,"07/03/19,00:36:24+32"
SMS Test #1

OK
```

4.3.3 Deleting a Short Message

Type **AT+CMGD=*x,n*** and then press **Enter**.
This is where ***x*** represents one of the following options:
"REC UNREAD" Shows received unread messages.
"REC READ" Shows received read messages.
"STO UNSENT" Shows stored unsent messages.
"STO SENT" Shows stored sent messages.

“ALL” Shows messages.

This is where ***n*** represents one of the following options:
0 Delete message at location <include the index number>
1 Delete all READ messages.
2 Delete all READ and SENT messages.
3 Delete all READ, SENT, and UNSENT messages.
4 Delete ALL messages. “REC UNREAD” Shows received unread messages.

Note*: Refer to the Documentation and Software CD / AT_Commands / AT_Commands.pdf for further detail commands information using SMS.*

4.4 Using SMS Direct (Only Available under Config Mode)

Induo’s proprietary SMS Direct Mode has the following features:
1. Transparently converts serial data to short message or vise versa **without using AT Commands**.
2. Text, binary, and Unicode formats are supported.
3. Verification of Incoming Caller ID is implemented to block uncertified users.
4. The configuration profile can be easily stored, and then copied to other modems.

Please refer to **3.2.5 SMS Direct****.**

4.5 GPRS Connection (Only Available under Normal Mode)

4.5.1 Overview

GPRS is a packet-switched technology, which means that multiple users share the same transmission channel. In addition, GPRS transmits only when there is outgoing data. This means that the available bandwidth can be dedicated solely to data communication when needed. In general, a GPRS network can be viewed as a special IP network that offers IP connectivity to IP terminals. Devices such as PCs, embedded computers, and PLCs that are PPP-enabled can be easily connected to the IP network and the Internet.

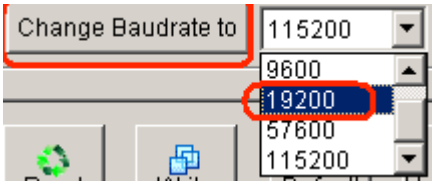
The modem provides multi-slot Class 10, which means that there are **4 Rx** timeslots plus **1 Tx** timeslot, or **3 Rx** timeslots plus **2 Tx** timeslot. The CS-1 to CS-4 Coding Schemes must be supported by the provider. GPRS offers no guaranteed data rates or bandwidth. The value assigned by the provider (coding scheme and timeslots) can change dynamically during a connection.
In general, for the **1 Tx + 4 Rx** combination, the **Tx** throughput is around 8-12 Kbps when the **Rx** throughput is around 32-48 Kbps.
For the **2 Tx + 3 Rx** combination, the Tx throughput is around 16-24 Kbps when the Rx throughput is around 24-36 Kbps.

4.5.2 Windows GPRS Access

The modem can use Windows DUN (Dial-up Networking) to provide the Internet access through the GPRS mobile network. Instructions are described in the following chapters.
***Note**: The specific steps may vary depending on your version of Windows and your Windows settings.*

Set Modem Baud Rate to 19200 bps under Normal Mode

1. Select 19200 bps, and then click "**Change Baudrate to**";

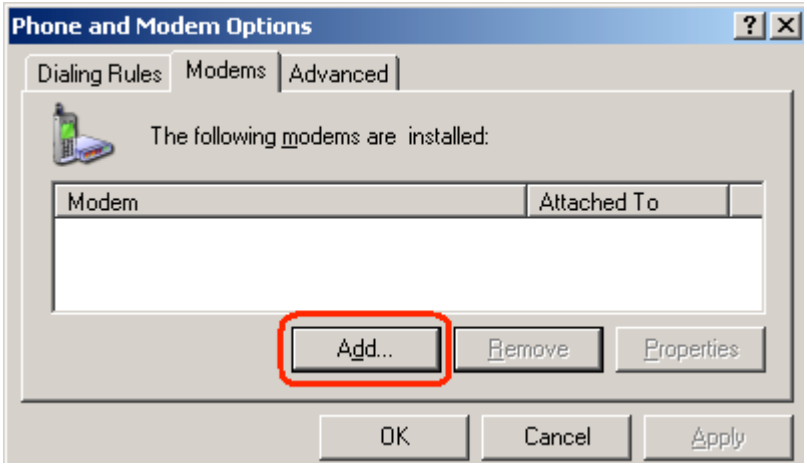


2. Exit the Modem Configurator.

***Note**: Please make sure your COM port connecting to the modem is free and do not be used by any software or application (e.g. **Modem Configurator**).*

Installing the Modem Driver

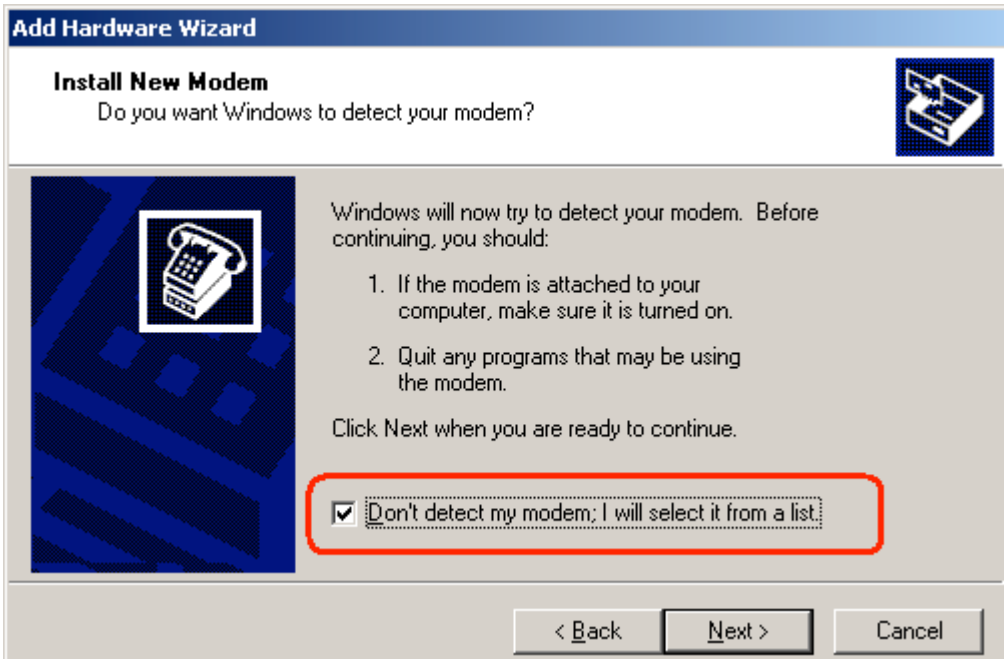
1. In the Control Panel, open "Phone and Modem Options" and click the "Modem" tab. Click **Add** to add a new modem.



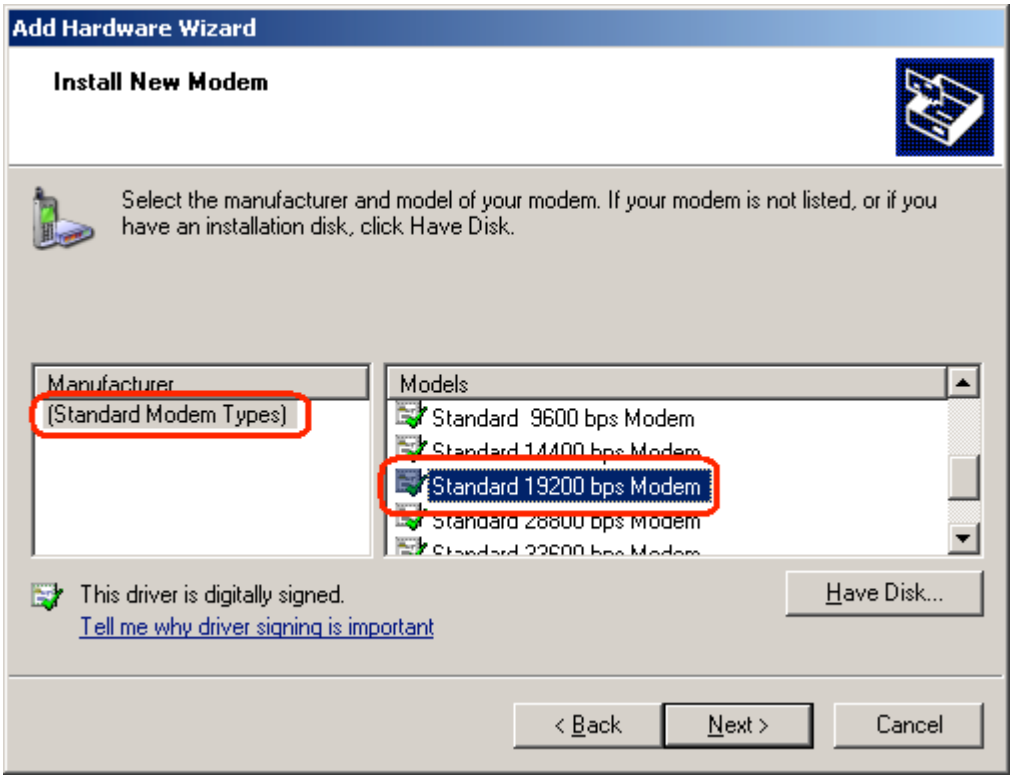
***Note**: The first time you access the **Phone and Modem Options**, Windows will ask you to input the area code. Enter the area code to proceed.*

2. When the Install Mode window opens, select **Don't detect my modem, I will select it from a list**

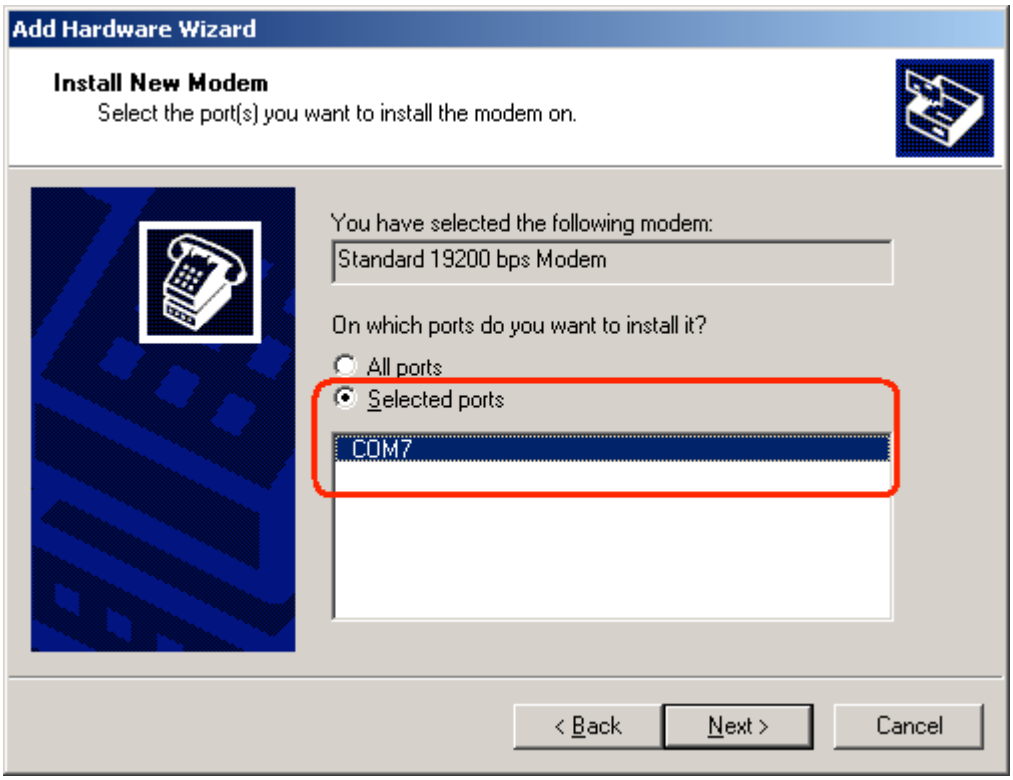
and then click **Next**.



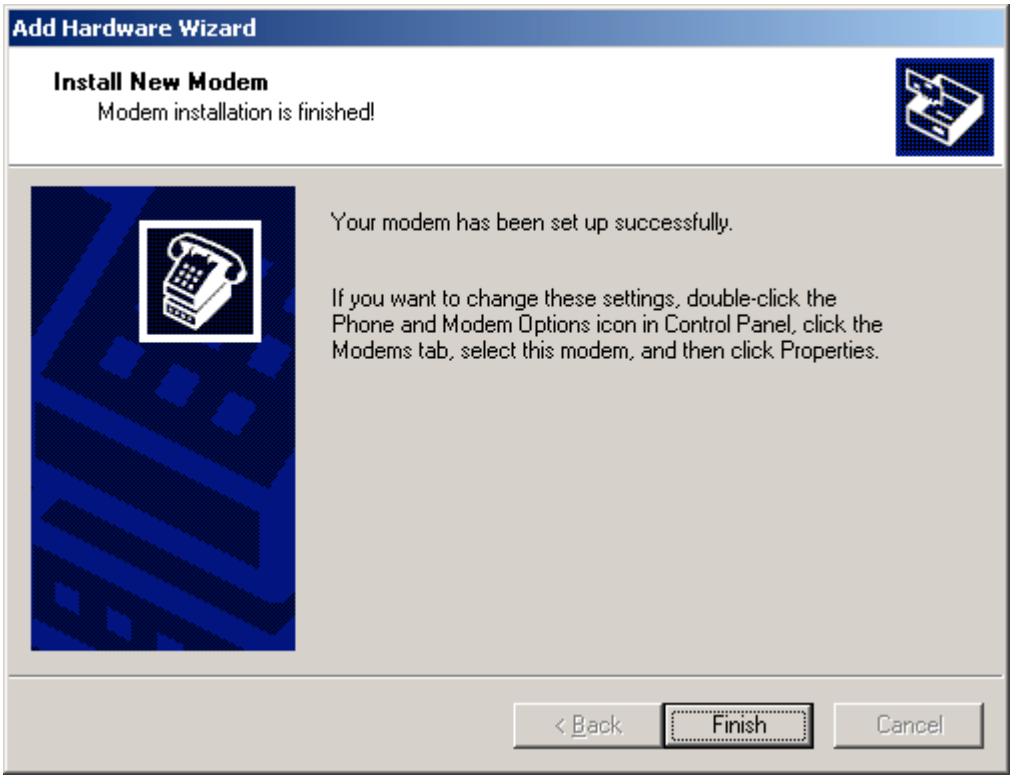
3. Next, click **Standard Modem Types->Standard 19200 bps Modem,** then click **Next**.



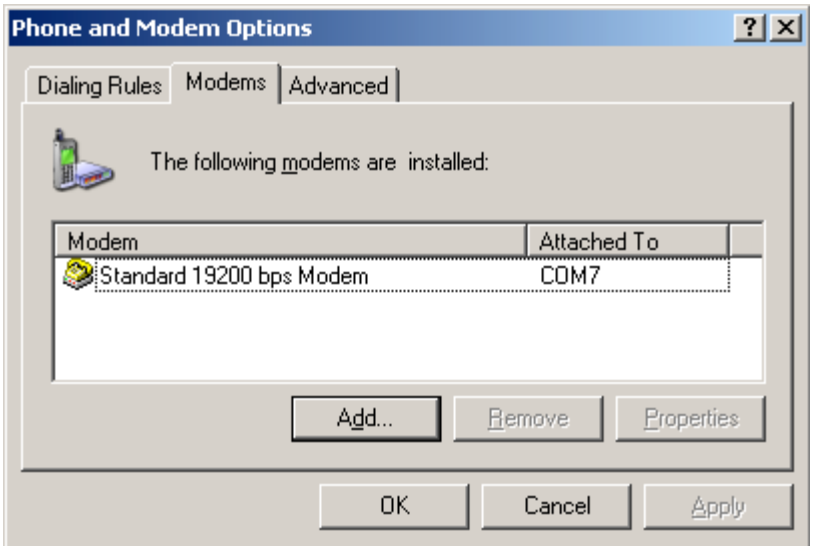
4. Select the port you want to install the modem on, we select **COM7** here, then click **Next**.



5. The modem installation is finished, click **Finish**.



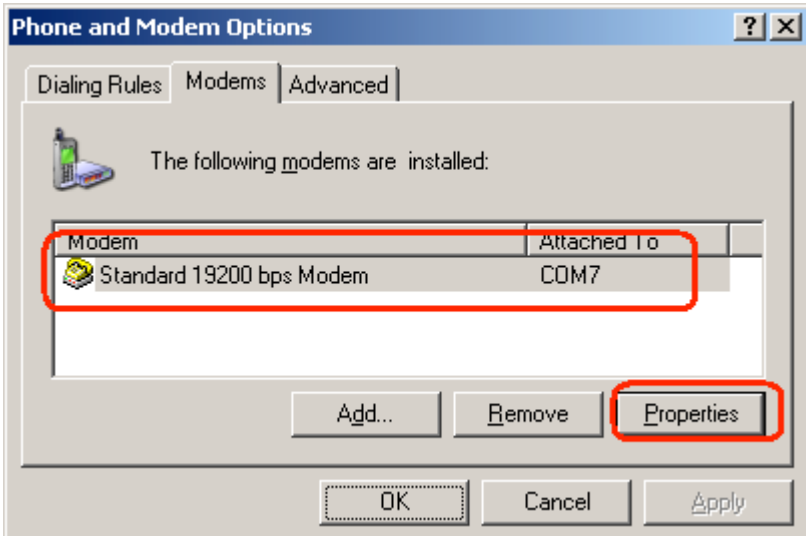
6. At this point, the modem driver should be listed on the “Modems” tab under “Phone and Modem Options.”



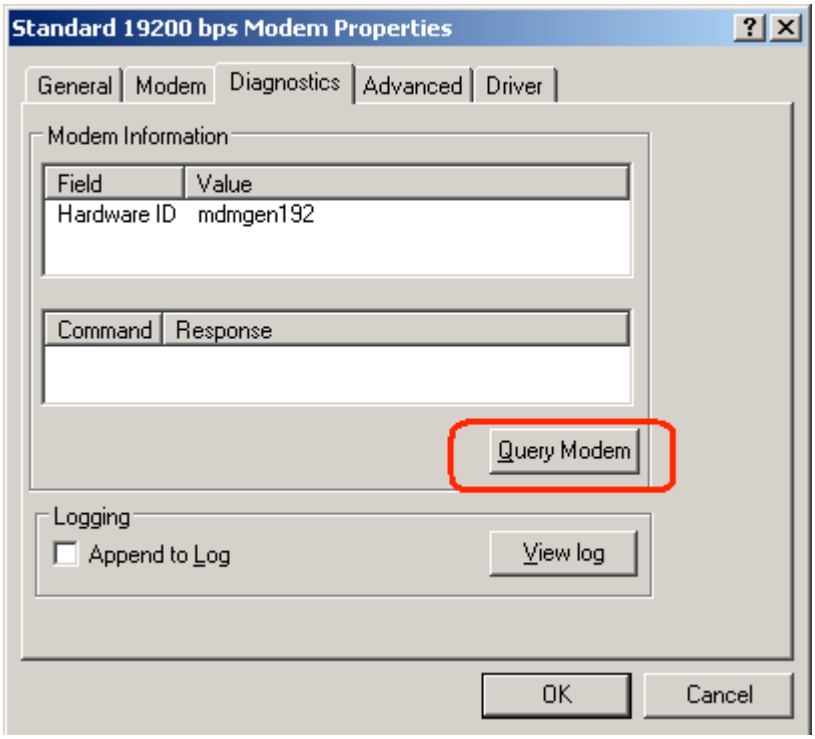
Modem Diagnostics

Follow these steps to verify that the modem is installed properly and has been activated.

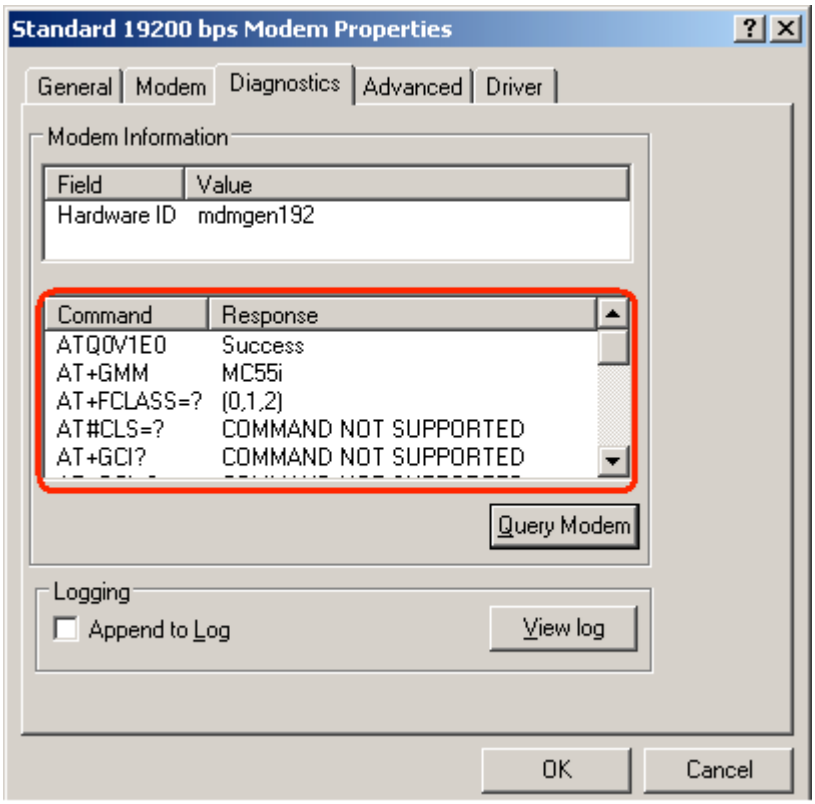
1. From the Control Panel, open **Phone and Modem Options**, click the **Modem** tab, and then click **Properties**.



2. Click the **Diagnostics** tab, and then click **Query Modem**.



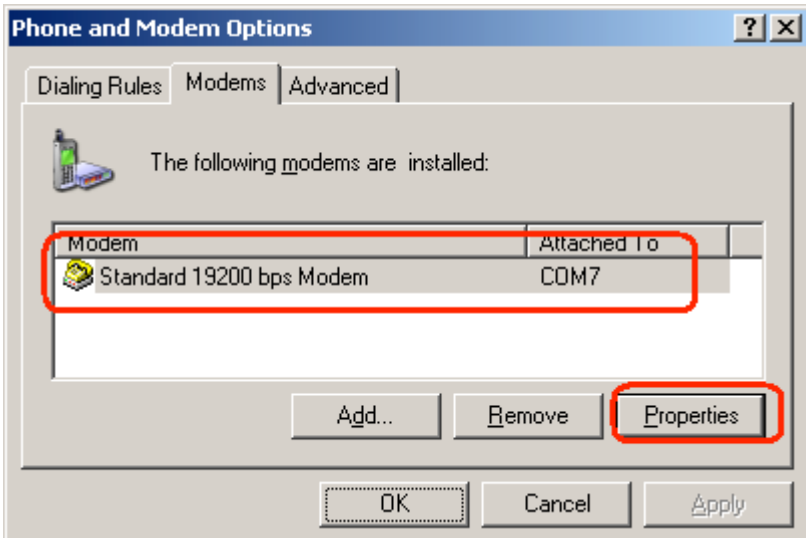
3. If the query is successful, both commands to the modem and responses from the modem will be displayed.



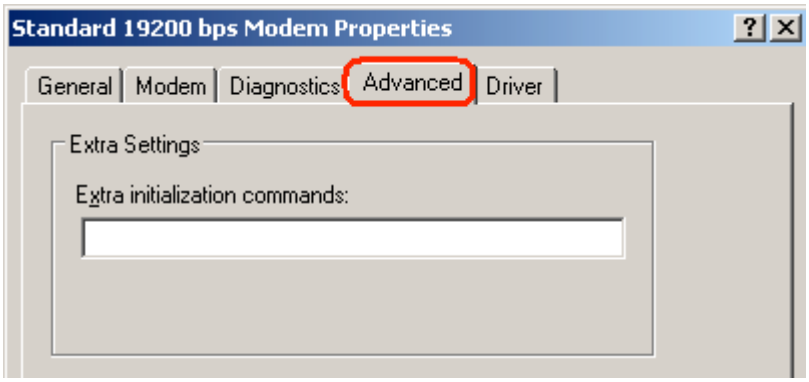
Setting up the APN

Before using the GPRS on the Windows DUN, the APN (Access Point Name) must be added as a modem initialization command. Detailed instructions are shown below.

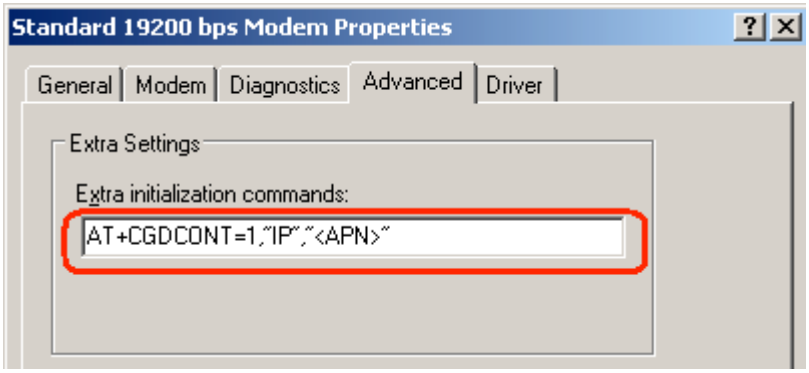
1. From the Control Panel, open **Phone and Modem Options**, click the **Modem** tab, and then click **Properties**.



2. Click the **Advanced** tab next.



3. Enter the following commands in the **Extra initialization commands:** text box.
   AT+CGDCONT=1,"IP","*<APN>*"
   Replace <APN> with the correct service for your account. For example:
   AT+CGDCONT=1,"IP","cmnet"



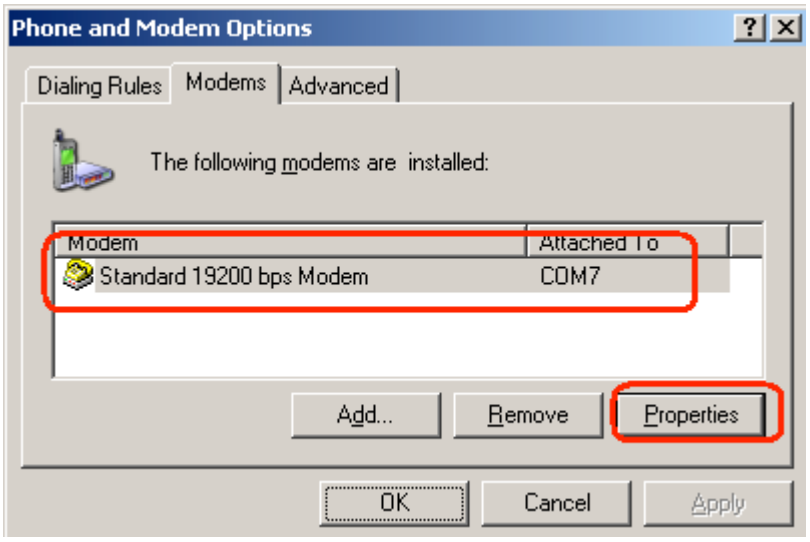
4. Click **OK** to close the **Properties** window.

Modify Modem Baud Rate to 115200 bps under Normal Mode

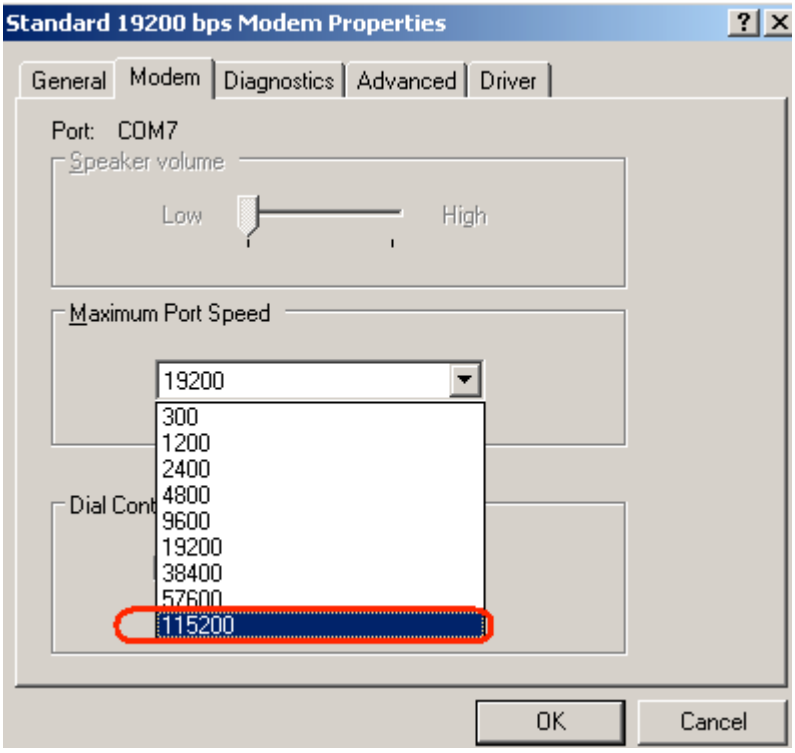
1. In the Modem Configurator, Click the **Debug** tab, select 115200 bps, and then click "**Change Baudrate to**".

Modify Modem Driver Baud Rate to 115200 bps

1. From the Control Panel, open **Phone and Modem Options**, click the **Modem** tab, and then click **Properties**.



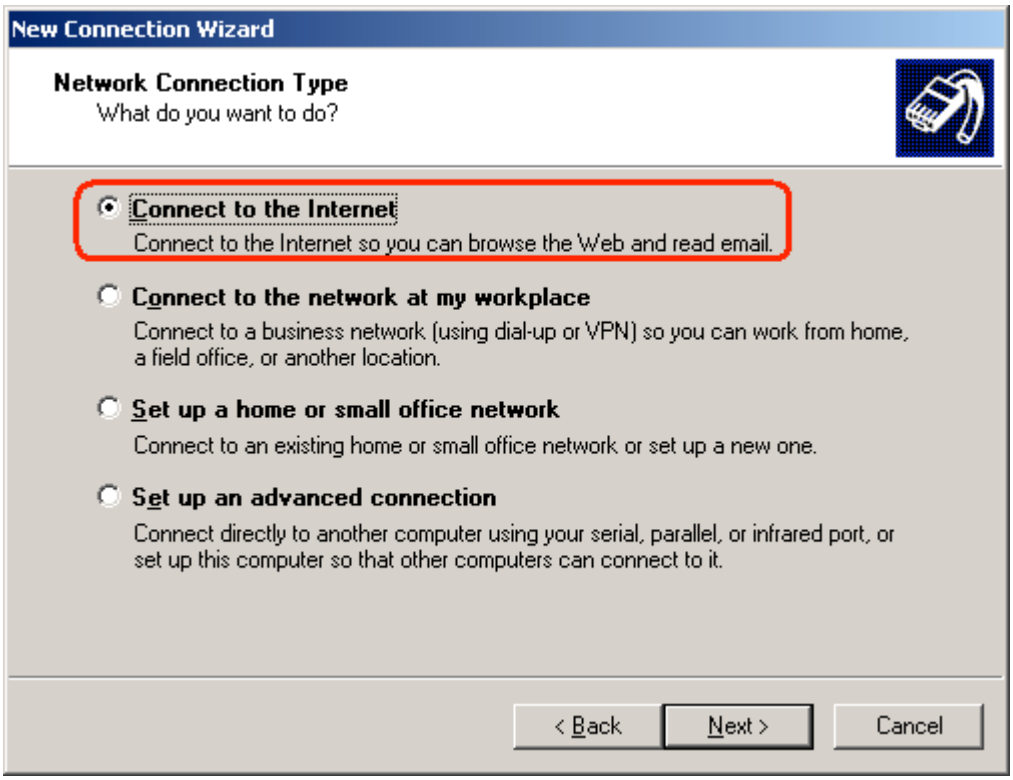
2. Click the **Modem** tab next, select 115200 at **Maximum Port Speed** then click OK.



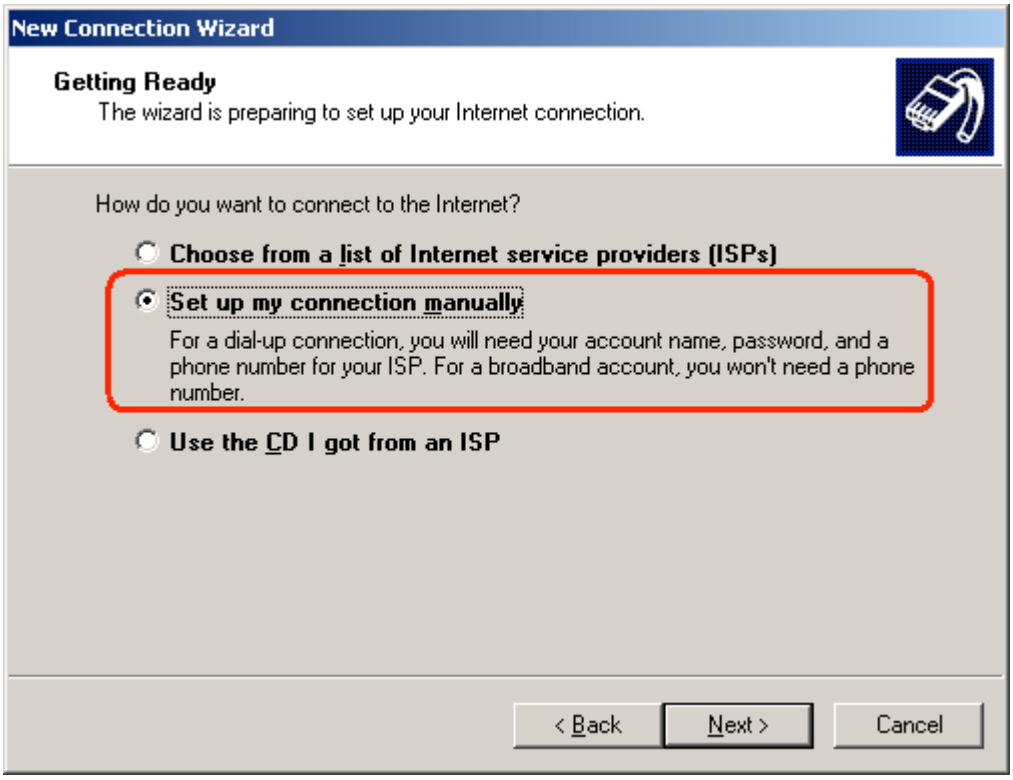
Adding Windows DUN

Follow these steps to add Windows Dial-up Networking.

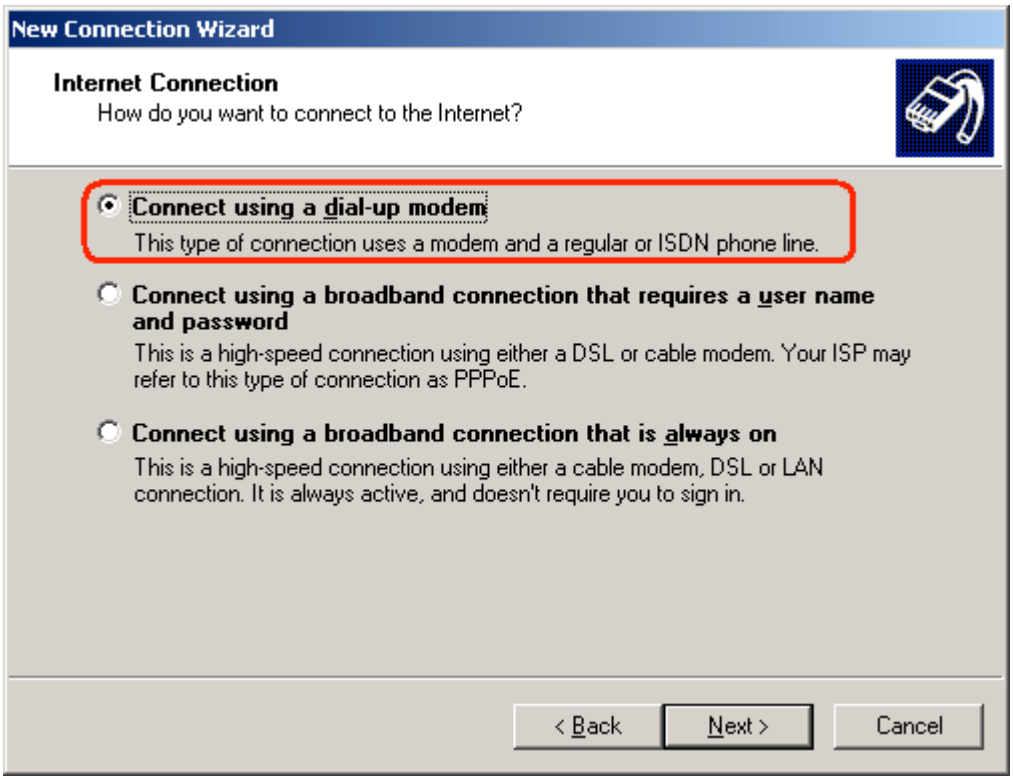
1. In the Control Panel, open Network Connections, and then click **Create a new connection**.
2. When the **New Connection Wizard** window opens, select the **Connect to Internet** option, and then click **Next**.



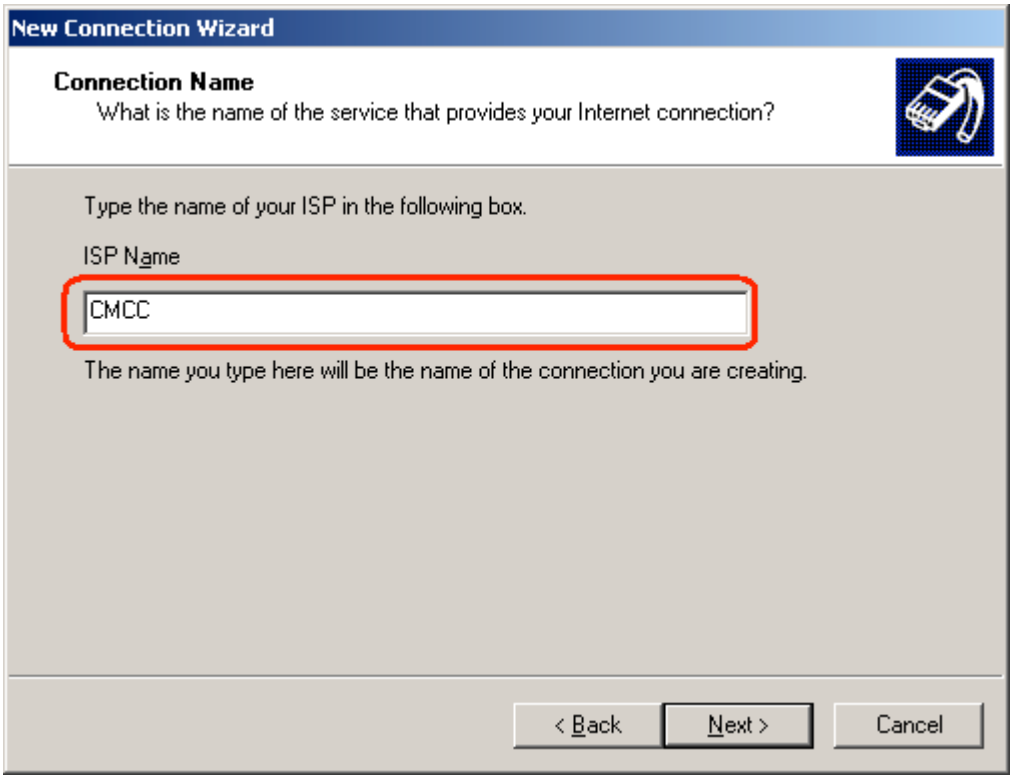
3. Select the **Set up my connection manually** option, and then click **Next.**



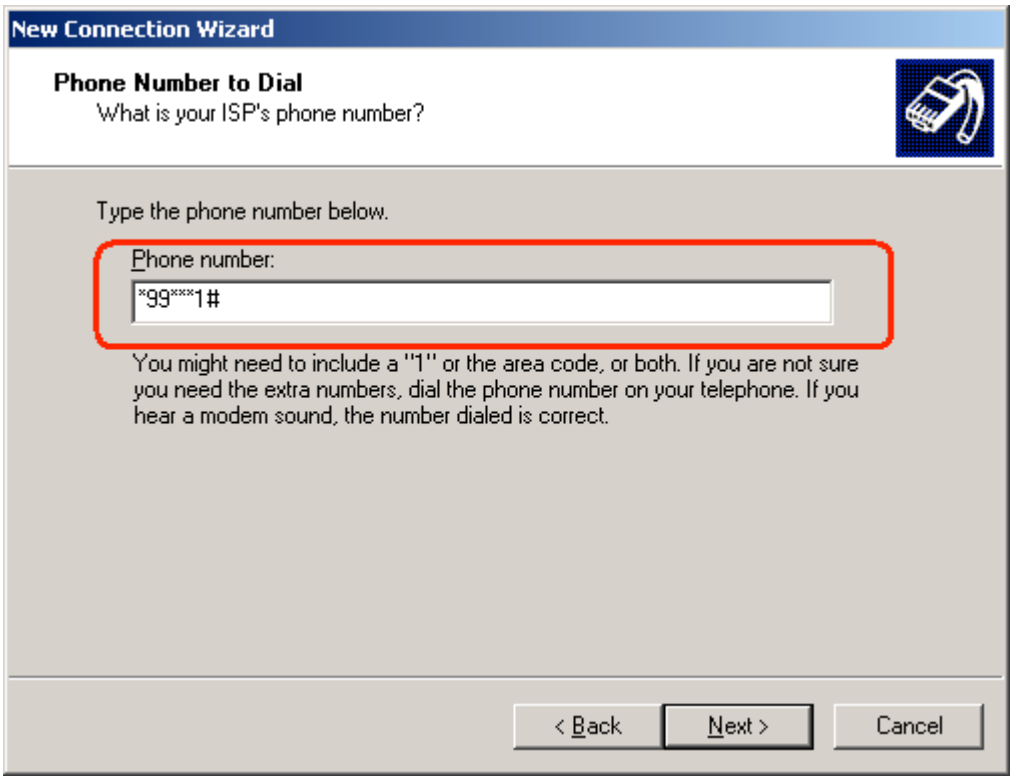
4. Select the **Connect using a dial-up modem** option, and then click **Next.**



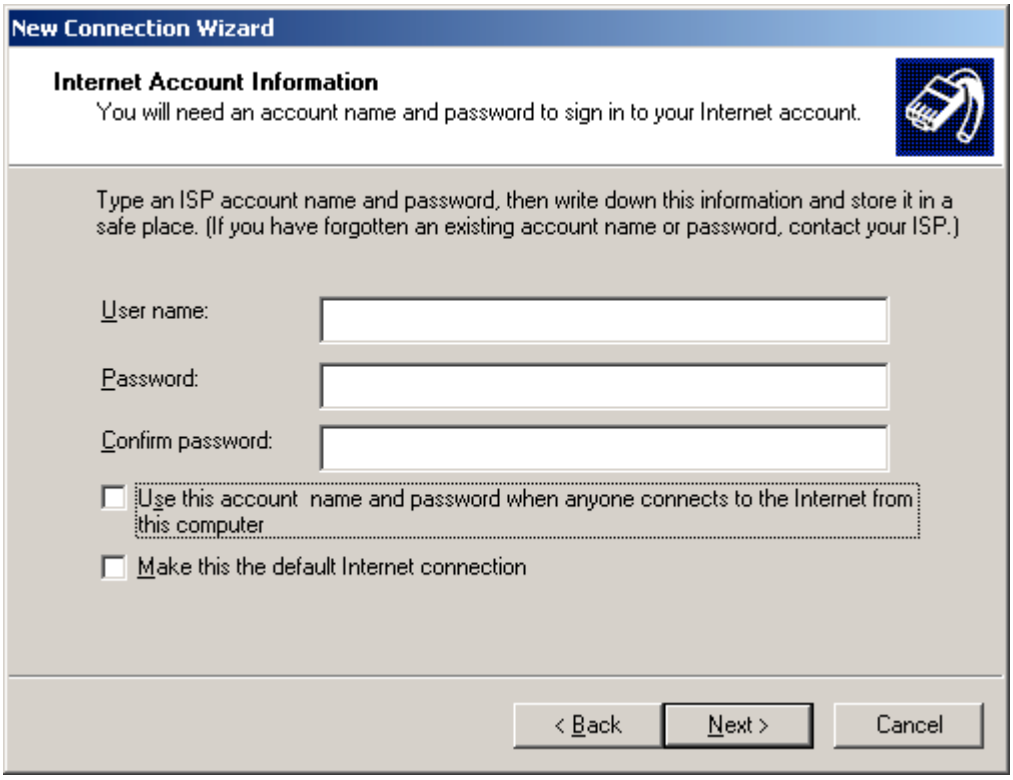
5. Type the name of your service provider in the text input box, and then click **Next.**



6. Type ***99***1#** in the Phone number text input box, and then click **Next**.

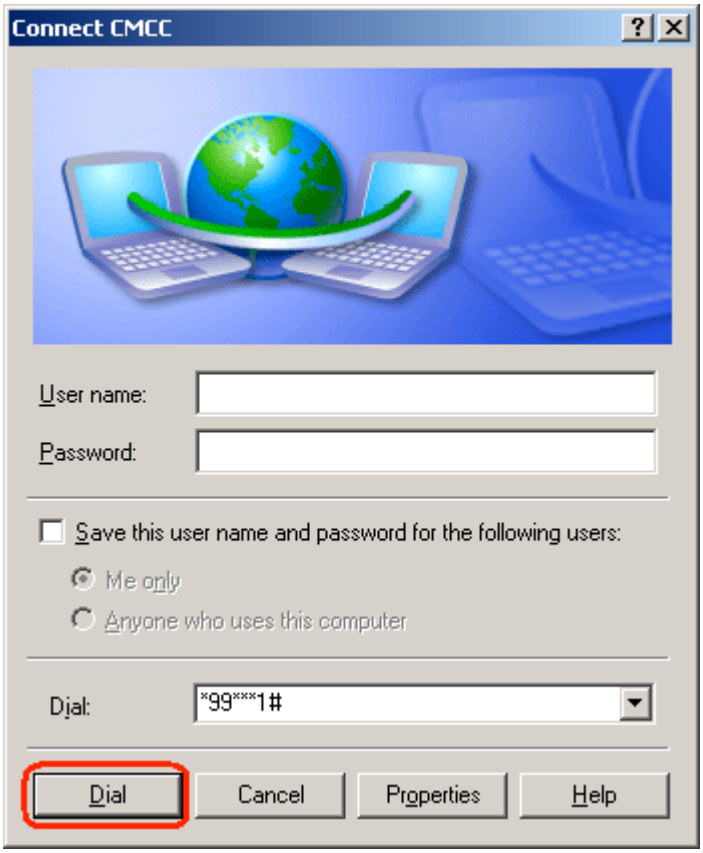


7. Type the **User name** and **Password** in the appropriate text boxes, and then click **Next.**



8. Click **Finish**.

9. Click **Dial** to establish the connection.



Chapter 5. Appendix

5.1 Factory Settings

Factory setting of the modem COM port under **Config Mode** is:
Data bits = 8
Parity = none
Stop bits = 1
Baud = 115200 bps
Flow control = none

Factory setting of the modem COM port under **Normal Mode** is: **Autobauding**
The autobauding mode allows the modem to automatically detect the transmission speed used by the DTE.
Only the following speeds will be detected: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600,
115200bps. Auto-baud detection cannot be guaranteed for speeds below or above these speeds.

5.2 Restore to Factory Default

The modem could be restored to factory default by Modem Configurator, SMS and hardware operation.
Following steps indicate how to restore to factory default by hardware operation:
1. Set the modem under Normal Mode, power on the modem;
2. Within 3 seconds, change the modem from Normal Mode to Config Mode;
3. Within 3 seconds, change the modem from Config Mode to Normal Mode again;
4. Within 3 seconds, change the modem from Normal Mode to Config Mode again;
5. Restore successfully.

***Note**: PIN setting, Phone Book settings and COM settings will not be restored to factory default.*

5.3 SMS Commands for Remote Control

INDUNIUM 2I supports remote configuration and remote modem status reading via SMS.
An SMS command has following structure:
Password:cmd1,a,b,c;cmd2,d,e,f;cmd3,g,h,i;...;cmdn,j,k,n
Note:
1. *Password: SMS control password is configured at **Basic->SMS Control->Password**, which is an*

optional parameter.

When there is no password, SMS command has following structure: ***cmd1;cmd2;cmd3;...;cmdn***

When there is a password, SMS command has following structure: ***Password:cmd1;cmd2;cmd3;...;cmdn***

2. *Cmd1, cmd2, cmd3 to Cmdn, which are command identification number 0000 – 9999*
3. *A, b, c to n, which are command parameters*
4. *The semicolon character (';') is used to separate more than one commands packed in a single SMS.*
5. *After setting new parameters for INDUNIUM 2I Pro, please use 0004 command to save parameters and reset the modem, then the new parameters will take effect.*
6. *E.g., 1234:1001,INDUNIUM 2I;0004*

In this command, password is 1234, and we set device name as "INDUNIUM 2I", then save parameters and reset the modem to take effect with command 0004.

Cmd	Description	Syntax	Comments
Control Commands			
0000	Set Factory Defaults	password:cmd or cmd	if no password, please use command "cmd", or use command "password:cmd" if there is a password. Following commands are the same.
0001	Reset Device	cmd	
0002	Save Parameters	cmd	
0003	Get Device Status	cmd	
0004	Save Parameters and Reset Device	cmd	
0005	Clear SMS Count	cmd	
0006	Clear Event Count	cmd	
0007	Start Event Counter	cmd	
Set Commands			
1000	Set Comm Parameters	cmd,baud rate,parity,data bits,stop bits,flag	baud rate: 1200 - 115200 parity: n,o,e,m,s data bits: 7,8 stop bits: 1,2 *flag: 0 - RS232 1 - RS485
1001	Set Device Name	cmd,name	name(max 20 bytes)
100	Set SIM Card Pin	cmd,flag1,pin,flag2,newPin	flag1:

2			0 - disable pin lock 1 - enable pin lock pin(4 - 8 bytes) flag2: 0 - disable change pin 1 - enable change pin *newPin(4 - 8 bytes and can be null)
1003	Set SMS Control Passwd	cmd,passwd	*passwd(max 20 bytes and can be null)
1004	Enable Auto CSD	cmd,flag	flag: 0 - disable 1 - enable
1005	Enable Auto Delete SMS	cmd,flag	flag: 0 - disable 1 - enable
1006	Set SMS in	cmd,flag1,format,flag2	flag1: 0 - disable SMS in 1 - enable SMS in format: 0 - text ASCII 1 - Unicode(UCS2) 2 - Binary(8 bits) flag2:(only avaible in format "text ASCII") 0 - from mobile 1 - not from mobile
1007	Set SMS out	cmd,flag1,format,flag2	flag1: 0 - disable SMS out 1 - enable SMS out format: 0 - text ASCII 1 - Unicode(UCS2) 2 - Binary(8 bits) flag2:(only avaible in format "text ASCII") 0 - to mobile 1 - not to mobile
1008	Enable Auto Add Timestamp	cmd,flag	flag: 0 - disable 1 - enable
1009	Set Max SMS Day Sent	cmd,value	value: 0 - 10000
1010	Set Data Packing Interval Timeout	cmd,timeout	timeout: (2 - 100)* 100ms

1011	Set Packet Length	cmd,length	length: 0 - 1024
1012	Set Packet Delimiter 1	cmd,flag,delimiter	flag: 0 - disable 1 - enable delimiter: 00 - ff (hex format)
1013	Set Packet Delimiter 2	cmd,flag,delimiter	flag: 0 - disable 1 - enable delimiter: 00 - ff (hex format)
1014	Set Packet Delimiter Process	cmd,process	process: 0 - do nothing 1 - delimiter +1 2 - delimiter +2 3 - strip delimiter
1015	Set Auto SMS	cmd,flag,time,content	flag: 0 - disable 1 - enable time: 00:00 - 23:59 content: max 30 bytes
1016	Set Time Reboot	cmd,flag,time1,time2,time3	flag: 0 - disable time reboot 1 - enable time reboot time1: 00:00 - 23:59 *time2: 00:00 - 23:59 (can be null) *time3: 00:00 - 23:59 (can be null)
1017	Set Call Reboot	cmd,flag1,flag2,content	flag1: 0 - disable call wakeup 1 - enable call wakeup flag2: 0 - disable sms reply 1 - enable sms reply content(max 20 bytes)
1018	Set SMS Reboot	cmd,flag1,flag2,passwd,content	flag1: 0 - disable sms wakeup 1 - enable sms wakeup flag2:(can be null) 0 - disable sms reply 1 - enable sms reply *passwd(max 20 bytes and can be null) *content(max 20 bytes and can be null)

1019	Set Ignition	cmd,flag1,flag2,value	flag1: 0 - disable DTR wakeup 1 - enable DTR wakeup flag2: 0 - don't ignore AT^SMSO 1 - ignoreAT^SMSO value: 0 - 60s (power on delay turn on module)
1020	Set Singal Update Frequency	cmd,value	value: 5 - 1200s
1021	Set Init String	cmd,index,content	index: 0 - 3(0 - INDUNIUM 2I will auto generate a index when the init string array isn't full) content: max 40 bytes
1022	Set Phone Number	cmd,index,number,flag	index: 0 - 10(0 - INDUNIUM 2I will auto generate a index when the phone book isn't full) number(max 20 bytes) flag: xxxxx (binary format: 00000 - 11111) flag.0: 0 - disable call reboot 1 - enable call reboot flag.1: 0 - disable sms reboot 1 - enable sms reboot flag.2: 0 - disable sms in 1 - enable sms in flag.3: 0 - disable sms out 1 - enable sms out flag.4: 0 - disable sms control 1 - enable sms control
1023	Set Phone Group	cmd,index,flag	index: 1 - 10(phone group index) flag: xxxxxxxxxx (binary format: 0000000000 - 1111111111) flag.0 ~ flag.9: (phone number index) 0 - exclude in this phone group 1 - include in this phone group

1024	Set Modbus Parameters	cmd,flag1,id,address1,address2,flag2,address3,address4,address5,address6,address7	flag1: 0 - enable modbus 1 - disable modbus *id - slave address *address1 - coil address *address2 - register address *flag2: 0 - enable PLC send SMS 1 - disable PLC send SMS *address3 - write phone number address *address4 - SMS content address *address5 - read phone number address *address6 - SMS received date address *address7 - SMS received content address
1025	Set Coil Parameters	cmd,index,content1,content2,group	index: 1 - 8 *content1: on message (max 70 bytes) *content2: off message (max 70 bytes) group: 1 - 10 (phone group)
1026	Set Register Parameters	cmd,index,name,max,min,group	index: 1 - 15 *name: register's name max: max value (0 - 65535) min: min value (0 - 65535) group: 1 - 10 (phone group)
1027	Set DI Parameters	cmd,mode,filtering,trigger,active,flag,message1,message2,group	mode: 1 - OFF 2 - ON 3 - ONChange 4 - Event Counter 5 - Null filtering: (0 - 10000) *trigger: (0 - 30000) *active: 0 - Lo to Hi 1 - Hi to Lo *flag 0 - disable counter start when power on 1 - enable counter start when power on *message1: alarm on message (max 70 bytes) *message2: alarm off message (max 70 bytes)

			*group: 1 - 10 (phone group)
1028	Set DO Parameters	cmd,flag,onAction,offAction,flag1,keepOn	flag: xxxx (binary format: 000 - 111) flag.0 : 0 - disable DI alarm control DO output 1 - enable DI alarm control DO output flag.1: 0 - disable SMS control DO output 1 - enable SMS control DO output flag.2 : 0 - disable phone control DO output 1 - enable phone control DO output onAction: alarm on action 1 - OFF 2 - ON 3 - Pulse 4 - Null offAction : alarm off action 1 - OFF 2 - ON 3 - Pulse 4 - Null flag1: 0 - DO open when power on 1 - DO close when power on *keepOn: how many times the DO keeps close (0 - 255)
1029	Set Pulse Parameters	cmd,low,high,output,delay	low: 1 - 30000 high: 1 - 30000 output: 0 - 30000 delay: 0 - 30000
1030	Set DO SMS Control Parameters	cmd,onContent,offContent,group	*onContent: max 70 bytes *offContent: max 70 bytes group: 1 - 10 (phone group)
Get Commands			

2000	Get Base Parameters	cmd	return: 1 - comm 2 - comm type 3 - device name 4 - ME Type 5 - IMEI 6 - auto CSD 7 - auto delete SMS 8 - sms control passwd 9 - SIM card pin setup
2001	Get SMS Direct Parameters	cmd	return: 1 - sms in 2 - sms out 3 - auto add timestamp 4 - max SMS day sent
2002	Get Data Packing Parameters	cmd	return: 1 - data packing interval timeout 2 - packet length 3 - delimiter1 and enable 4 - delimiter and enable 5 - delimiter process 6 - Tx delay 7 - enable online sms notification 8 - internal roaming
2003	Get Reboot Parameters	cmd	return: 1 - time reboot 2 - call reboot 3 - sms reboot 4 - ignition
2004	Get Init Strimg Parameters	cmd	return: 1 - index 2 - AT content
2005	Get Phone Number Parameters	cmd	return: index,number,call reboot,call wakeup,sms reboot,sms wakeup,sms control
2006	Get Firmware Version	cmd	return: firmware version
2007	Get Phone Group Parameters	cmd	return: index: phone group index flag: xxxxxxxxxx (binary format: 0000000000 - 1111111111) flag.0 ~ flag.9: (phone number index) 0 - exclude in this phone group

			1 - include in this phone group
2008	Get Modbus Parameters	cmd	return: modbus parameters
2009	Get Coil Parameters	cmd	return: coil parameters
2010	Get Register Parameters	cmd	return: register parameters
2011	Get DI Parameters	cmd	return: DI parameters
2012	Get DO Parameters	cmd	return: DO parameters

Note:

1. *All the phone number stored in Phone Book has the right to control the modem via SMS.*
2. *PIN setting, Phone Book settings and COM settings will not be restored to factory default.*

SMS Control Examples: Set Comm Parameters

a. do not modify serial type, serial port parameters are 9600-none-8-1, corresponding command is: **1000,9600,n,8,1**

b. set serial port type as RS485, serial port parameters are 9600-none-8-1, corresponding command is: **1000,9600,n,8,1,1**

5.4 Modbus Address Mapping

DI and DO:

Address	Description	Value
0x3000 Read/Write Coils		
0x3000	DI_0 Status	1: On 0: Off
0x3001	DI_1 Status	1: On 0: Off
0x3002	DO_0 Status	1: On 0: Off
0x3003	DI_0 Clear Count Value	1: Clear Counter Value 0: Return Illegal Data Value
0x3005	DI_0 Start Event Counter	1: Start Event Conuter 0: Return Illegal Data Value
0x4000 Read/Write Registers		
0x4000	DI_0 Count Value	

5.5 GSM Alphabet

Standard SMS can contain 160 characters. However, the characters typed must be part of the so-called 7-bit default alphabet as specified by GSM 3.38. You can see in the table below that this alphabet contains all ASCII characters and some accented characters.
For example, u umlaut (ü) and e with grave (è), are in this set. Please study the table below to have a complete overview. Using any character not in this set, will make the SMS a Unicode SMS and limit the length of the SMS to 70 characters.
Note: a few characters actually count as two characters. These characters are:
{}[]~|\ and the Euro symbol: €
You can also see that in the table below in the hex column. These characters need to be escaped.
Below is the 7 bit default alphabet as specified by GSM 03.38. The corresponding ISO-8859-1 decimal codes are shown in the rightmost column. Note that the euro sign (€) is also included.

Hex	Dec	Character name	Character	ISO-8859-1 DEC
0×00	0	COMMERCIAL AT	@	64
0×01	1	POUND SIGN	£	163
0×02	2	DOLLAR SIGN	$	36
0×03	3	YEN SIGN	¥	165
0×04	4	LATIN SMALL LETTER E WITH GRAVE	è	232
0×05	5	LATIN SMALL LETTER E WITH ACUTE	é	233
0×06	6	LATIN SMALL LETTER U WITH GRAVE	ù	249
0×07	7	LATIN SMALL LETTER I WITH GRAVE	ì	236
0×08	8	LATIN SMALL LETTER O WITH GRAVE	ò	242
0×09	9	LATIN CAPITAL LETTER C WITH CEDILLA	Ç	199
0×0A	10	LINE FEED		10
0×0B	11	LATIN CAPITAL LETTER O WITH STROKE	Ø	216
0×0C	12	LATIN SMALL LETTER O WITH STROKE	ø	248
0×0D	13	CARRIAGE RETURN		13
0×0E	14	LATIN CAPITAL LETTER A WITH RING ABOVE	Å	197
0×0F	15	LATIN SMALL LETTER A WITH RING ABOVE	å	229
0×10	16	GREEK CAPITAL LETTER DELTA		
0×11	17	LOW LINE	_	95
0×12	18	GREEK CAPITAL LETTER PHI		
0×13	19	GREEK CAPITAL LETTER GAMMA		
0×14	20	GREEK CAPITAL LETTER LAMBDA		
0×15	21	GREEK CAPITAL LETTER OMEGA	Ω	
0×16	22	GREEK CAPITAL LETTER PI		
0×17	23	GREEK CAPITAL LETTER PSI		
0×18	24	GREEK CAPITAL LETTER SIGMA		
0×19	25	GREEK CAPITAL LETTER THETA		
0×1A	26	GREEK CAPITAL LETTER XI		
0×1B	27	ESCAPE TO EXTENSION TABLE		
0×1B0A	27 10	FORM FEED		12

0×1B14	27 20	CIRCUMFLEX ACCENT	^	94
0×1B28	27 40	LEFT CURLY BRACKET	{	123
0×1B29	27 41	RIGHT CURLY BRACKET	}	125
0×1B2F	27 47	REVERSE SOLIDUS (BACKSLASH)	\	92
0×1B3C	27 60	LEFT SQUARE BRACKET	[	91
0x1B3D	27 61	TILDE	~	126
0x1B3E	27 62	RIGHT SQUARE BRACKET	]	93
0×1B40	27 64	VERTICAL BAR	|	124
0×1B65	27 101	EURO SIGN	€	164 (ISO-8859-15)
0×1C	28	LATIN CAPITAL LETTER AE	Æ	198
0×1D	29	LATIN SMALL LETTER AE	æ	230
0×1E	30	LATIN SMALL LETTER SHARP S (German)	ß	223
0×1F	31	LATIN CAPITAL LETTER E WITH ACUTE	É	201
0×20	32	SPACE		32
0×21	33	EXCLAMATION MARK	!	33
0×22	34	QUOTATION MARK	“	34
0×23	35	NUMBER SIGN	#	35
0×24	36	CURRENCY SIGN	¤	164 (ISO-8859-1)
0×25	37	PERCENT SIGN	%	37
0×26	38	AMPERSAND	&	38
0×27	39	APOSTROPHE	‘	39
0×28	40	LEFT PARENTHESIS	(	40
0×29	41	RIGHT PARENTHESIS	)	41
0×2A	42	ASTERISK	*	42
0×2B	43	PLUS SIGN	+	43
0×2C	44	COMMA	,	44
0×2D	45	HYPHEN-MINUS	-	45
0×2E	46	FULL STOP	.	46
0×2F	47	SOLIDUS (SLASH)	/	47
0×30	48	DIGIT ZERO	0	48
0×31	49	DIGIT ONE	1	49
0×32	50	DIGIT TWO	2	50
0×33	51	DIGIT THREE	3	51
0×34	52	DIGIT FOUR	4	52
0×35	53	DIGIT FIVE	5	53
0×36	54	DIGIT SIX	6	54
0×37	55	DIGIT SEVEN	7	55
0×38	56	DIGIT EIGHT	8	56
0×39	57	DIGIT NINE	9	57
0×3A	58	COLON	:	58
0×3B	59	SEMICOLON	;	59
0×3C	60	LESS-THAN SIGN	<	60
0×3D	61	EQUALS SIGN	=	61
0×3E	62	GREATER-THAN SIGN	>	62

0×3F	63	QUESTION MARK	?	63
0×40	64	INVERTED EXCLAMATION MARK	¡	161
0×41	65	LATIN CAPITAL LETTER A	A	65
0×42	66	LATIN CAPITAL LETTER B	B	66
0×43	67	LATIN CAPITAL LETTER C	C	67
0×44	68	LATIN CAPITAL LETTER D	D	68
0×45	69	LATIN CAPITAL LETTER E	E	69
0×46	70	LATIN CAPITAL LETTER F	F	70
0×47	71	LATIN CAPITAL LETTER G	G	71
0×48	72	LATIN CAPITAL LETTER H	H	72
0×49	73	LATIN CAPITAL LETTER I	I	73
0×4A	74	LATIN CAPITAL LETTER J	J	74
0×4B	75	LATIN CAPITAL LETTER K	K	75
0×4C	76	LATIN CAPITAL LETTER L	L	76
0×4D	77	LATIN CAPITAL LETTER M	M	77
0×4E	78	LATIN CAPITAL LETTER N	N	78
0×4F	79	LATIN CAPITAL LETTER O	O	79
0×50	80	LATIN CAPITAL LETTER P	P	80
0×51	81	LATIN CAPITAL LETTER Q	Q	81
0×52	82	LATIN CAPITAL LETTER R	R	82
0×53	83	LATIN CAPITAL LETTER S	S	83
0×54	84	LATIN CAPITAL LETTER T	T	84
0×55	85	LATIN CAPITAL LETTER U	U	85
0×56	86	LATIN CAPITAL LETTER V	V	86
0×57	87	LATIN CAPITAL LETTER W	W	87
0×58	88	LATIN CAPITAL LETTER X	X	88
0×59	89	LATIN CAPITAL LETTER Y	Y	89
0×5A	90	LATIN CAPITAL LETTER Z	Z	90
0×5B	91	LATIN CAPITAL LETTER A WITH DIAERESIS	Ä	196
0×5C	92	LATIN CAPITAL LETTER O WITH DIAERESIS	Ö	214
0×5D	93	LATIN CAPITAL LETTER N WITH TILDE	Ñ	209
0×5E	94	LATIN CAPITAL LETTER U WITH DIAERESIS	Ü	220
0×5F	95	SECTION SIGN	§	167
0×60	96	INVERTED QUESTION MARK	¿	191
0×61	97	LATIN SMALL LETTER A	a	97
0×62	98	LATIN SMALL LETTER B	b	98
0×63	99	LATIN SMALL LETTER C	c	99
0×64	100	LATIN SMALL LETTER D	d	100
0×65	101	LATIN SMALL LETTER E	e	101
0×66	102	LATIN SMALL LETTER F	f	102
0×67	103	LATIN SMALL LETTER G	g	103
0×68	104	LATIN SMALL LETTER H	h	104
0×69	105	LATIN SMALL LETTER I	i	105
0×6A	106	LATIN SMALL LETTER J	j	106

0×6B	107	LATIN SMALL LETTER K	k	107
0×6C	108	LATIN SMALL LETTER L	l	108
0×6D	109	LATIN SMALL LETTER M	m	109
0×6E	110	LATIN SMALL LETTER N	n	110
0×6F	111	LATIN SMALL LETTER O	o	111
0×70	112	LATIN SMALL LETTER P	p	112
0×71	113	LATIN SMALL LETTER Q	q	113
0×72	114	LATIN SMALL LETTER R	r	114
0×73	115	LATIN SMALL LETTER S	s	115
0×74	116	LATIN SMALL LETTER T	t	116
0×75	117	LATIN SMALL LETTER U	u	117
0×76	118	LATIN SMALL LETTER V	v	118
0×77	119	LATIN SMALL LETTER W	w	119
0×78	120	LATIN SMALL LETTER X	x	120
0×79	121	LATIN SMALL LETTER Y	y	121
0×7A	122	LATIN SMALL LETTER Z	z	122
0×7B	123	LATIN SMALL LETTER A WITH DIAERESIS	ä	228
0×7C	124	LATIN SMALL LETTER O WITH DIAERESIS	ö	246
0×7D	125	LATIN SMALL LETTER N WITH TILDE	ñ	241
0×7E	126	LATIN SMALL LETTER U WITH DIAERESIS	ü	252
0×7F	127	LATIN SMALL LETTER A WITH GRAVE	à	224

5.6 Troubleshooting

This section of the document describes possible problems encountered when using the Induo INDUNIUM 2I modem and their solutions.

5.5.1 The modem’s LED does not light:

- Check if modem has connected to a 9 to 36VDC power supply properly.
- Check if the power connector is properly inserted.

5.5.2 INDUNIUM 2I keep rebooting all the time:

Please make sure you have inserted the SIM card.

5.5.3 No connection with modem through serial link

- Check if the serial cable has been connected properly.
- Check if the serial cable has been made by following pin assignment given in table **PIN Assignment** for RS232 and RS485.
- Check if your program has proper setting. Factory setting of the modem under **Normal Mode** is listed at **5.1**.
- Check if there is another program interfering with the communication program, such as conflict on communication port access.

5.5.4 Receiving "No Carrier" Message

If the modem returns a "No Carrier" message upon an attempted call (voice or data), then refer to the table below for possible causes and solutions.

If the modem returns…	Then ask…	Action…
"No Carrier"	Is the received signal strong enough?	Refer to section 5.2.7 Networks -> Values of received signal strength (RSSI)
	Is the modem registered on the network?	Refer to section 5.2.7 Networks -> Registration
	Is the antenna properly connected?	Refer to section 2.5 Connect the External Antenna (SMA Type).
"No Carrier" (when trying to issue a voice communication)	Is the semicolon (;) entered immediately after the phone number in the AT command?	Ensure that the semicolon (;) is entered immediately after the phone number in the AT command. e.g. ATD123456;
"No Carrier" (when trying to issue a data communication)	Is the SIM card configured for data / fax calls?	Configure the SIM card for data / fax calls (Ask your network provider if necessary).
	Is the selected bearer type supported by the called party?	Ensure that the selected bearer type is supported by the called party.
	Is the selected bearer type supported by the network?	Ensure that the selected bearer type is supported by the network. If no success, try bearer select type by AT command: AT+CBST=0,0,3

5.7 Terms and Abbreviations

Abbreviations	Description

AC	Alternating Current
APN	Access Point Name of GPRS Service Provider Network
CE	Conformité Européene (European Conformity)
CHAP	Challenge Handshake Authentication Protocol
CSD	Circuit Switched Data
CTS	Clear to Send
dB	Decibel
dBi	Decibel Relative to an Isotropic radiator
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment (typically modems)
DCS 1800	Digital Cellular System, also referred to as PCN
DI	Digital Input
DO	Digital Output
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-frequency
DTR	Data Terminal Ready
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ESD	Electrostatic Discharges
ETSI	European Telecommunications Standards Institute
GND	Ground
GPRS	General Package Radio Service
GSM	Global Standard for Mobile Communications
IMEI	International Mobile Equipment Identification
kbps	kbits per second
LED	Light Emitting Diode
MAX	Maximum
Min	Minimum
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
PAP	Password Authentication Protocol
PC	Personal Computer
PCN	Personal Communications Network, also referred to as DCS 1800
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-point Protocol
PIN	Personal Identity Number
PSU	Power Supply Unit
PUK	Personal Unblocking Key
R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio Frequency

RTC	Real Time Clock
RTS	Request to Send
Rx	Receive Direction
SIM	Subscriber Identification Module
SMA	Subminiature Version A RF Connector
SMS	Short Message Service
TCP/IP	Transmission Control Protocol / Internet Protocol
TE	Terminal Equipment, also referred to as DTE
Tx	Transmit Direction
UART	Universal Asynchronous Receiver-transmitter
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Stationary Wave Ratio