

Robustel GoRugged M1000 USB Industrial Cellular USB Modem For 2G/3G/4G Networks

User Guide

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|----------------|-------------------------|
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This document describes the hardware of the *Robustel M1000 USB Industrial Grade USB 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 is 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. Robustel 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 20 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 devices in vehicle in your country before installing the modem.
- The driver or operator of any vehicle should not operate the modem while driving.
- 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 following:

- Do not expose the modem to extreme conditions such as high humidity / rain, high temperature, 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



| | | |
|------------|---|---|
| 2011/65/EC | Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) |  |
| 2012/19/EU | Directive 2012/19/EU the European Parliament and of the Council of 4 July 2012 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 | <p>"Marking for Control of Pollution Caused by Electronic Information Products" (2006-06).</p> <p>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.</p> <p>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.</p> |  |

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 |
| <p>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.</p> <p>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.</p> | | | | | | |

Revision History

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

| Release Date | Doc Version | Change Description |
|--------------|-------------|---|
| 2014-06-27 | V2.0.0 | First Release |
| 2015-05-13 | V2.1.0 | Update Section: Install SIM Card, Power Supply, Packing List, Safety Precautions, Regulatory and Type Approval Information, mount the modem, file format, Sentence Revision, Regulatory and Type Approval Information |
| 2015-11-18 | v.2.1.1 | Update logo |
| 2016-11-16 | v.2.1.2 | Updated section about 2.9 Power Supply |
| 2017-01-23 | v.2.1.3 | Changed Tel number to +86-20-29019902 Changed CD information in Chapter 1.2 |
| 2017-08-21 | v.2.1.4 | Changed frequency bands |

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Chapter 1 Product Concept

1.1 Overview

Robustel GoRugged M1000 USB is a rugged cellular modem with Mini USB interface offering state-of-the-art 2G (GPRS/EDGE)/3G (HSPA/EV-DO)/4G (LTE) connectivity for machine to machine (M2M) applications.

- Control via AT commands
- Mini USB 2.0 high speed interface allows it to manage and optimize the performances of 3G and 4G high-speed networks
- LTE downlink/uplink up to 100/50 Mbps
- GPS receiver optional for specified model
- Antenna diversity for improved fringe performance optional
- Comprehensive SDK and enabling drivers for Linux and Windows
- Wide range input voltages from 12 to 36 VDC and extreme operating temperature
- The metal enclosure can be mounted on a DIN-rail or on the wall, also with extra ground screw

1.2 Package Contents

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

- Robustel GoRugged M1000 USB Industrial Cellular Modem x 1



- SMA antenna (stubby antenna or magnet antenna optional) x 1

Stubby antenna



Magnet antenna



- 2-pin pluggable terminal block for power x 1



- USB Type A male to USB Mini Type A Male Data Cable x 1



- *Quick Start Guide* with download link of other documents or tools x 1

Please contact your sales representative if any of the above items are missing or damaged

Optional accessories (sold separately):

- Rx-Diversity SMA antenna optional (stubby antenna or magnet antenna optional)



- 35 mm DIN rail mounting kit



- AC/DC power adapter (12V DC, 1 A)



1.3 Specifications

Cellular Interface

- Standards: LTE (DL/UL up to 100/50 Mbps), HSPA+/HSUPA/HSDPA/UMTS, EDGE/GPRS
- SIM: 1 x (3 V & 1.8 V)
- Connector: SMA, female

USB Interface

- Number of ports: 1 x Mini Type A, female
- Speed: USB 2.0 High Speed (480 Mbit/s)
- ESD protection: ± 15 KV

GPS (optional for M1000-UP3P and M1000-UP4L)

- Protocol: NMEA
- Modes: Standalone GPS, Assisted GPS

Drivers

- Drivers: Multi-O/S

System

- LED indicators: 1 x NET

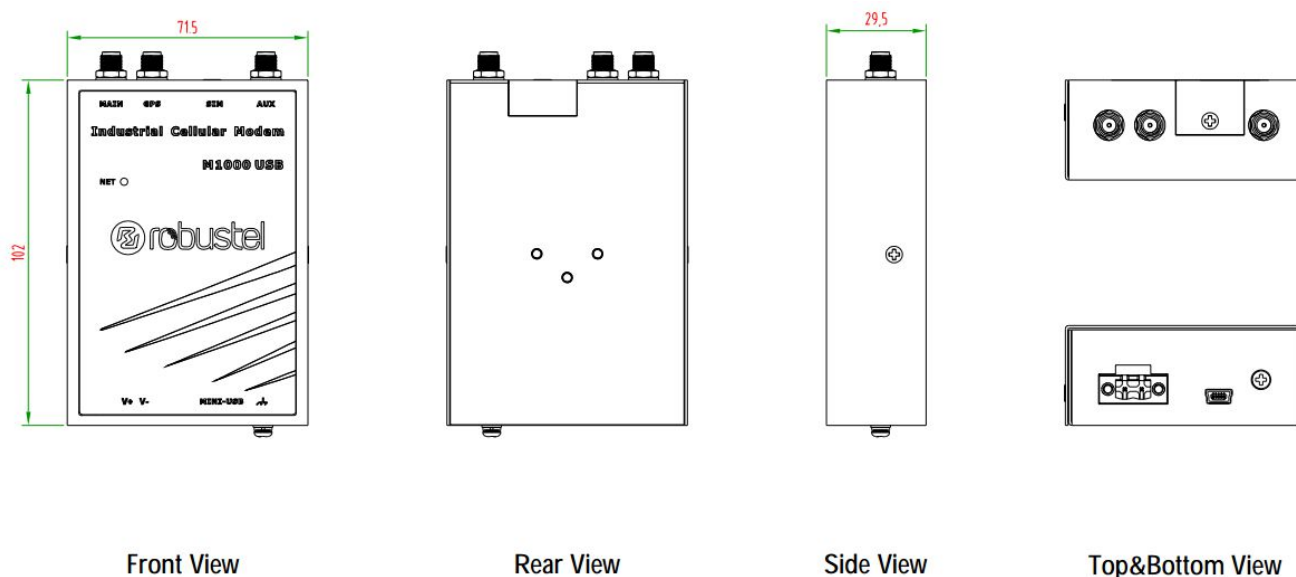
Power Supply and Consumption

- Connector: 2-pin 5 mm pluggable terminal block with lock
- Input voltage: 12 to 36V DC

Physical Characteristics

- Housing & Weight: Metal, 300 g
- Dimensions: 102 x 71 x 29 mm
- Installations: flat surface placement, wall mounting and 35 mm DIN rail mounting

1.4 Dimensions

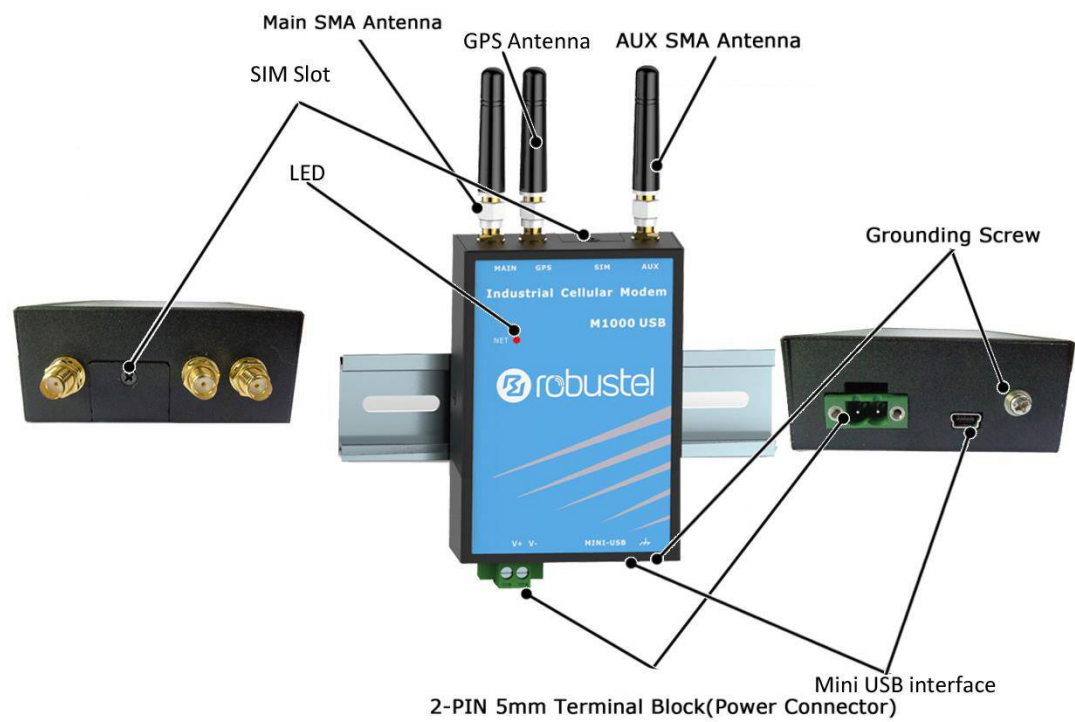


1.5 Ordering Information

| Model No. | Air Interface | Frequency | Operating Environment |
|-----------|---|---|-------------------------|
| M1000-U4L | GSM/GPRS/EDGE /HSDPA/HSUPA/HSPA+/UMTS/DC-HSPA+/TD-SCDMA/FDD LTE/TDD LTE | LTE B1/B2/B3/B4/B5/B7/B8/B20, B38/B39/B40/B41 HSDPA/HSUPA/HSPA+ B1/B2/B5/B6/B8/B9, TD-SCDMA B34/B39 UMTS/DC-HSPA+ B1/B2/B5/B6/B8 GSM/GPRS/EDGE 850/900/1800/1900 MHz | -40 to 85°C/5 to 95% RH |
| M1000-U3P | GSM/GPRS/EDGE /HSDPA/HSUPA/HSPA+ | HSDPA/HSUPA/HSPA+ 800/850/900/1900/2100 GSM/GPRS/EDGE 850/900/1800/1900 | -40 to 85°C/5 to 95% RH |
| M1000-USB | mPCIe interface | w/o module, mPCIe interface | -40 to 85°C/5 to 95% RH |

Chapter 2 Installation

2.1 Overview



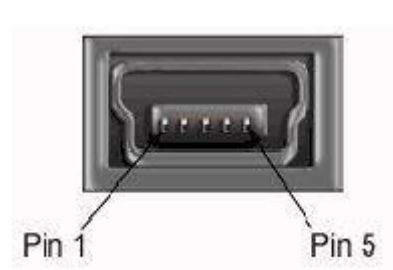
2.2 LED Indicators



| NET LED | Function |
|---------------------|--|
| Off | ME is in one of the following modes: <ul style="list-style-type: none"> - 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 Mini USB Interface



Mini USB 2.0 Connector

| PIN | Description |
|-----|-------------|
| 1 | VCC |
| 2 | Data (D-) |
| 3 | Data (D+) |
| 4 | Null |
| 5 | GND |

2.4 Install 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 adapter and switch off your modem before inserting or removing your SIM/USIM card.

- Inserting SIM Card

1. Make sure your adapter is disconnected.
2. Use a screwdriver to unscrew the screw on the cover, and then remove the cover, you could find the SIM Card slot.
3. Insert the SIM card, and you need press the SIM card with your fingers **until you hear “a cracking sound”**. Then use a screwdriver to screw the cover.

- Removing SIM card

1. Make sure your adapter 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** forget screw the cover for again-theft.

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. Please use the specific M2M SIM card when the device works in extreme temperature (temperature exceeding 0-40 °C), because the long-time working of regular SIM card in harsh environment (temperature exceeding 0-40 °C) may increase the possibility of SIM card failure.

2.5 Connect the External Antenna (SMA Type)

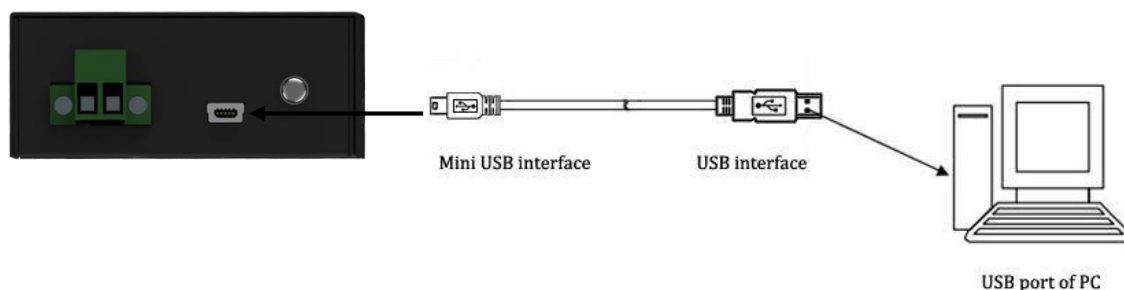
Connect this to an external antenna with SMA male connector. Make sure the antenna is within correct frequency range as your mobile service operator with impedance of 50ohm, and connector is screwed tightly.



2.6 Connect the Modem to External Device

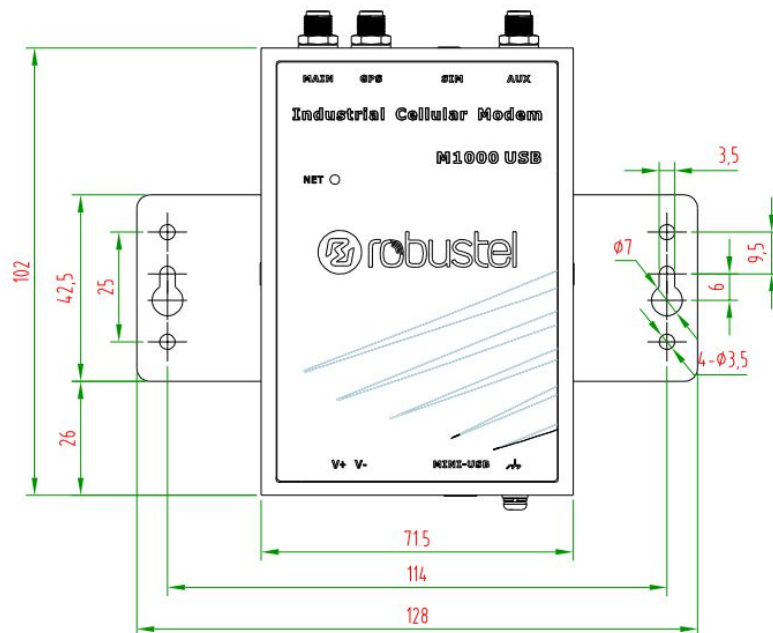
User can use the USB cable to connect the modem's USB Connector to external slave devices / controller / computer.

Note: User needs to install relevant USB driver to PC, which you can find by scanning the QR code of the Quick Start Guide.

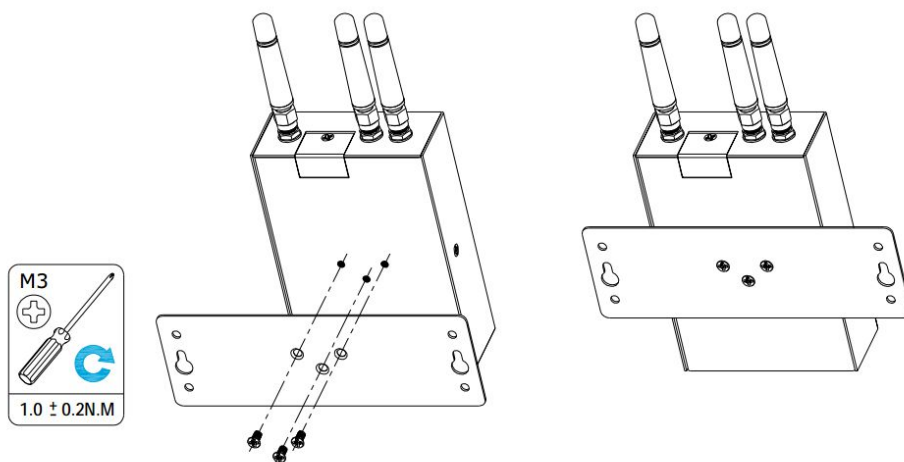


2.7 Mount the Modem

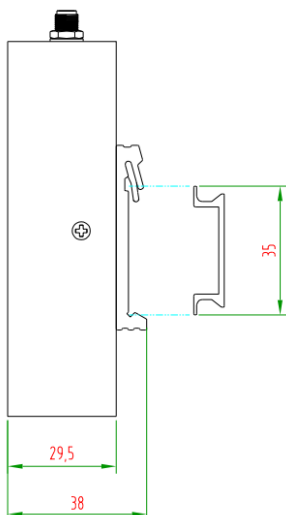
- Two ways of mounting the Modem
- Wall mounting



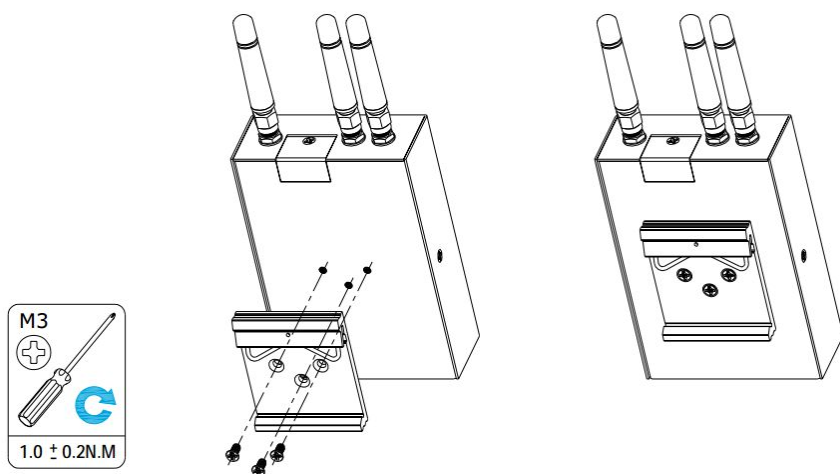
Use 3 pcs of M3 screw to mount the Modem on the Wall mounting Kit.
And then use 2 pcs of M3 screw to mount the Wall mounting Kit on the wall.



2. DIN rail mounting



Mount the Modem on a DIN rail with 3 pcs of M3 screws, and then hang the DIN-Rail on the holder. You need to choose a standard holder.



2.8 Ground the Modem



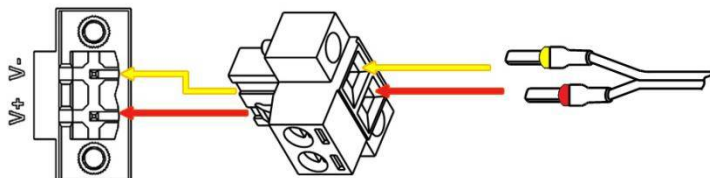
Grounding and wire router helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground by screwing to the grounding surface before connecting devices.

Note: This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.

2.9 Power Supply

CONNECTING THE POWER CABLE

| COLOR | POLARITY |
|--------|----------|
| RED | + |
| YELLOW | - |



M1000 USB supports reverse polarity protection, but always refers to the figure above to connect the power adapter correctly. There are two cables associated with the power adapter. Following to the color of the head, connect the cable marked red to the positive pole through a terminal block, and connect the yellow one to the negative in the same way.

Note: The range of power voltage is 12 to 36 VDC.

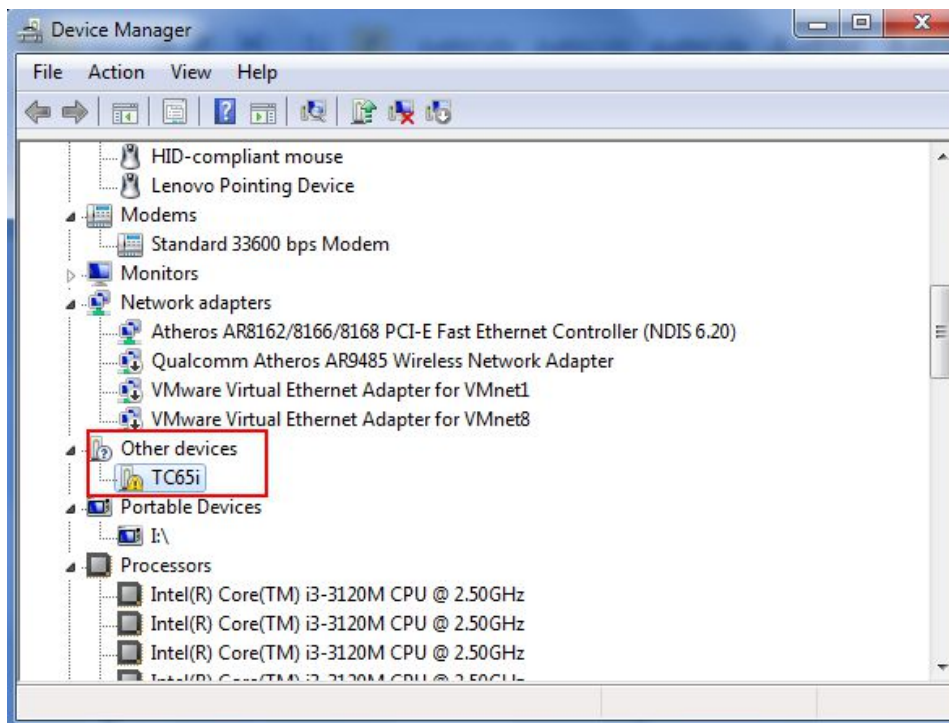
Chapter 3 Operate the Modem

3.1 AT command Set

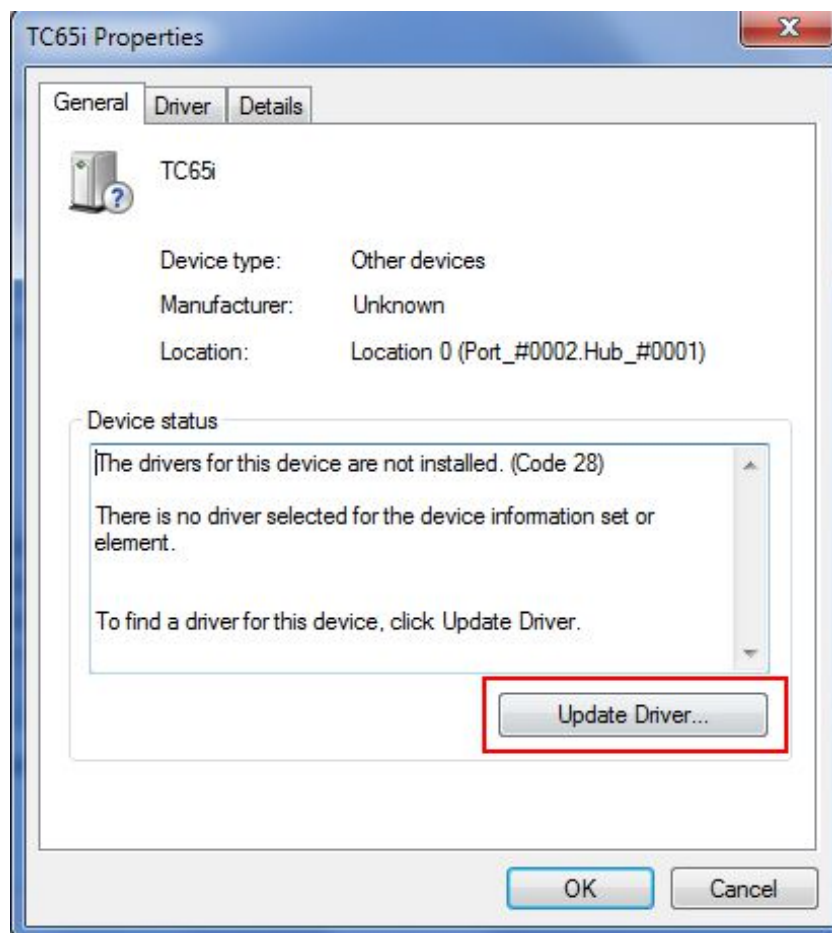
We can operate and configure M1000 USB via AT commands through USB interface. This chapter will introduce how to install USB driver and AT command examples while configuring M1000 USB.

3.1.1 Install USB driver

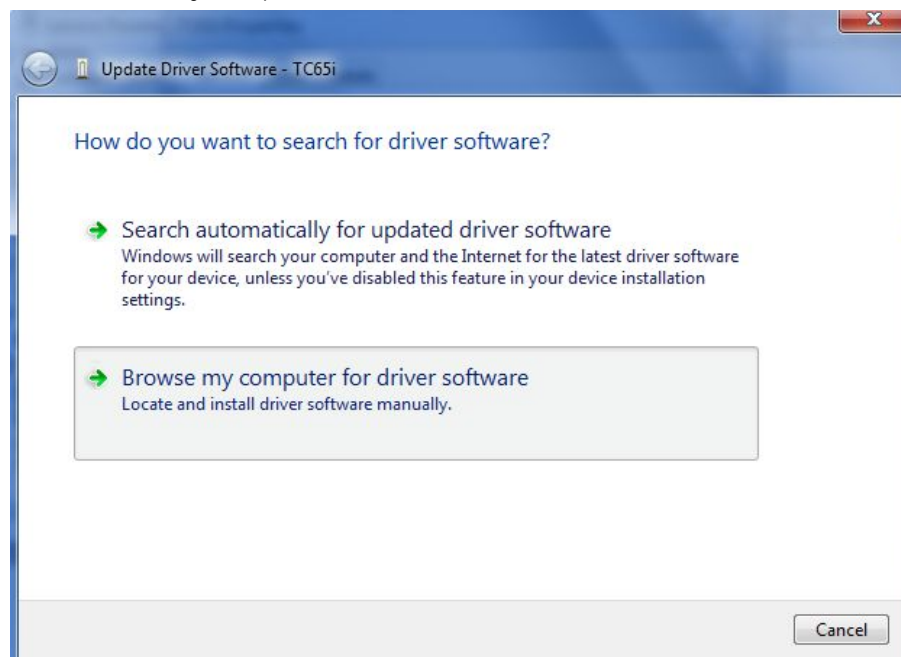
1. In the Control Panel, when you connect USB cable to PC, it will pop up tab *Other devices* and show M1000 USB's module version.



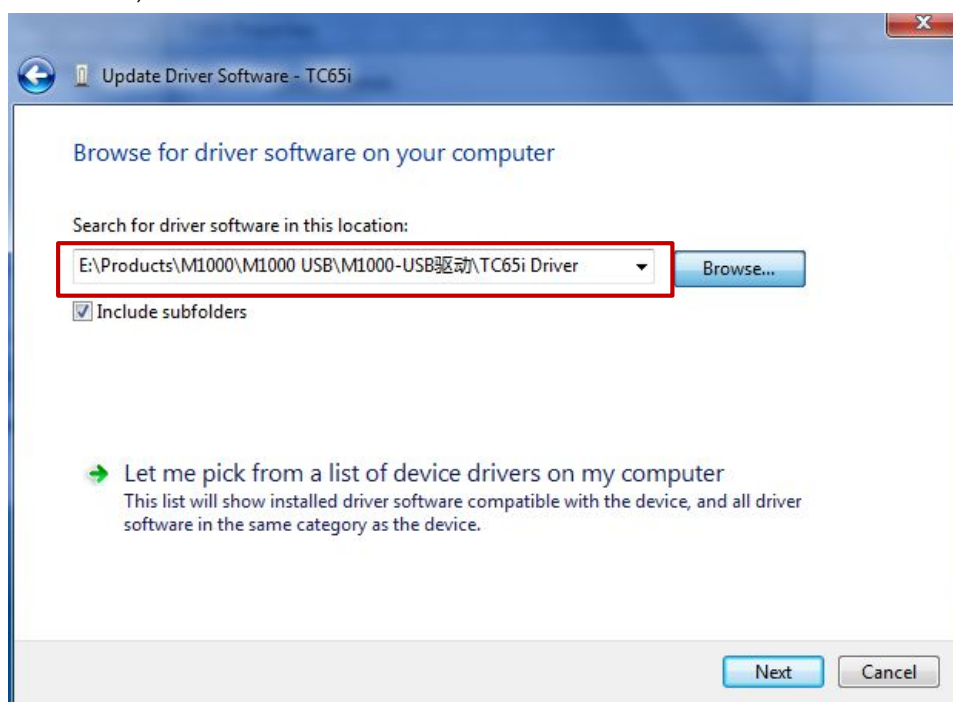
2. Right-click to enter *Properties* and then click *Update Driver*.



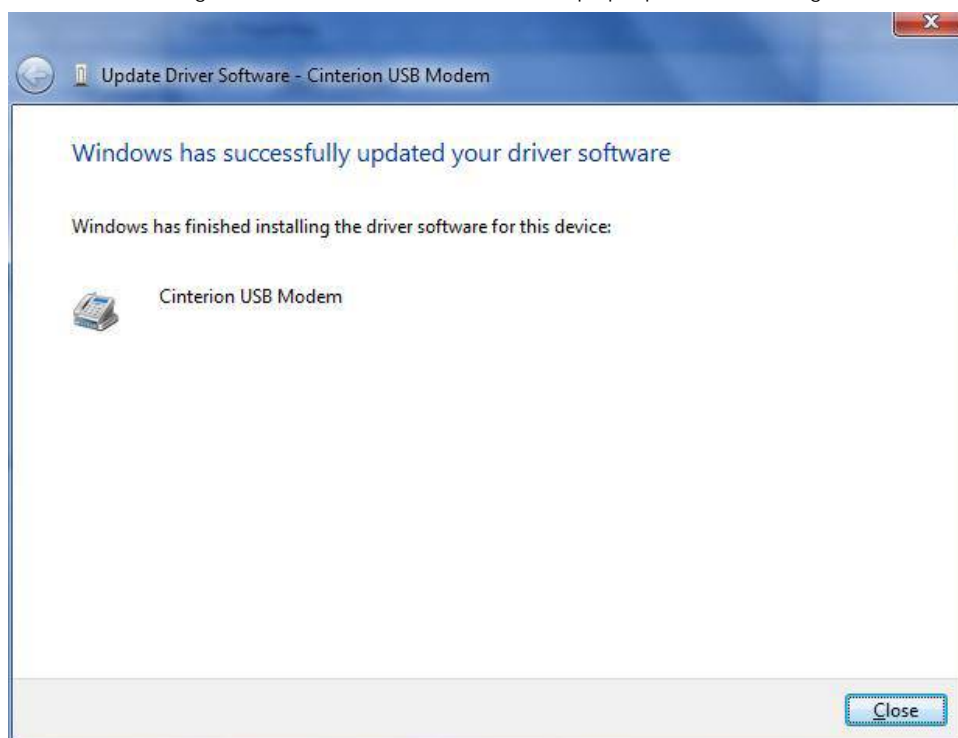
3. Click *Browse my computer for driver software*.



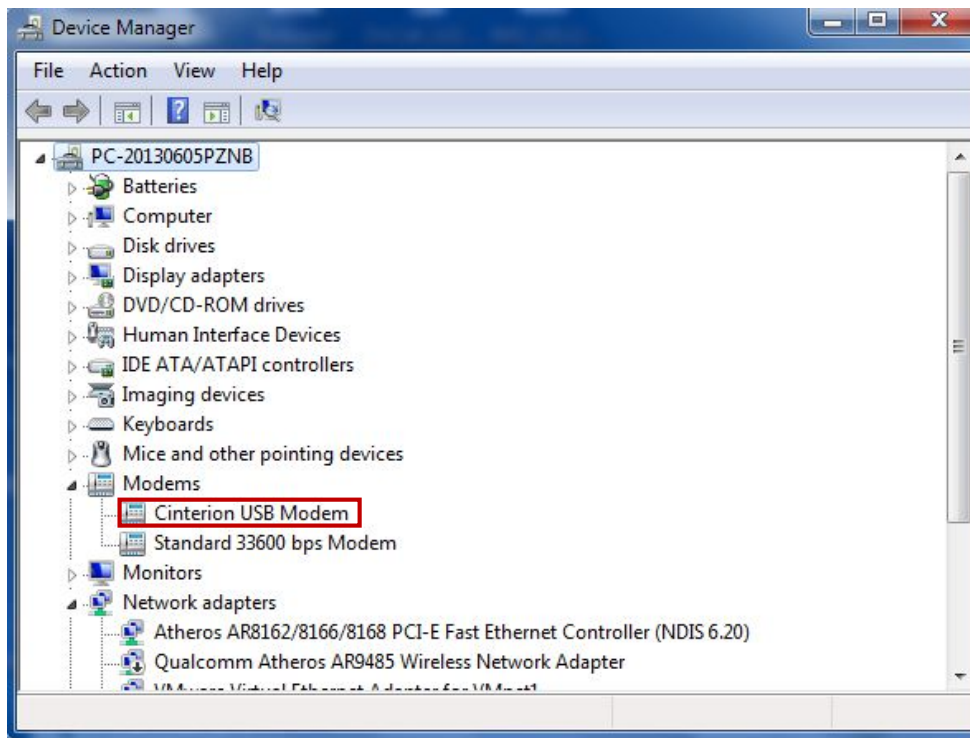
4. Click *Browse* to locate to position of the USB driver (you can scan the QR code of the Quick Start Guide to download the drivers), then click *Next*.



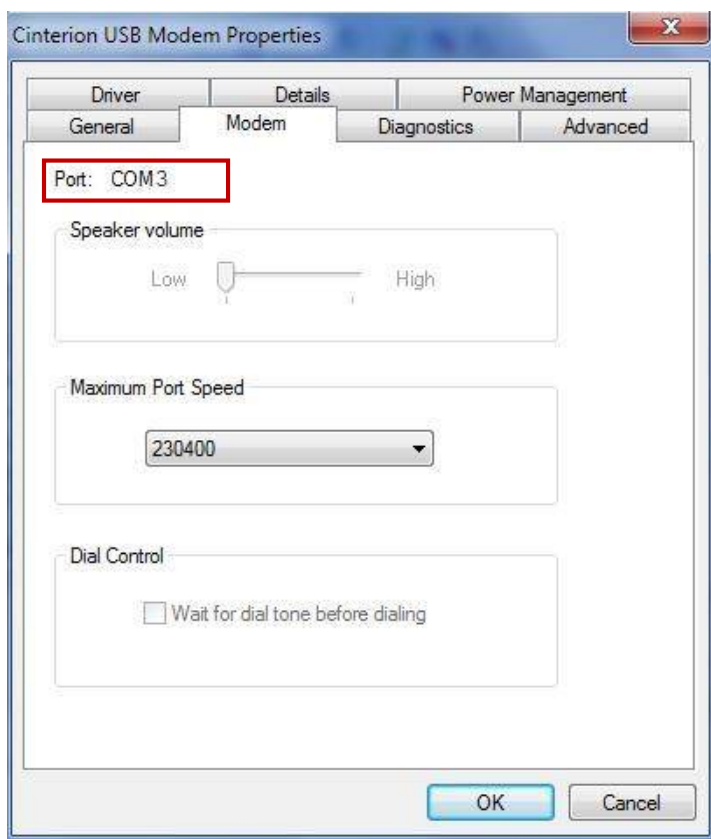
5. After succeeding to install the USB driver, it will pop up the following window.



6. A simulated virtual COM port which binds to the USB interface of M1000 USB will open after USB driver has been installed. Please check “Device Manager” -> “Modems”.



7. Select the USB modem and right-click to enter “Properties”. In tab “Modem”, you will find that there is simulated COM port which serial software such as secureCRT needs to connect to.



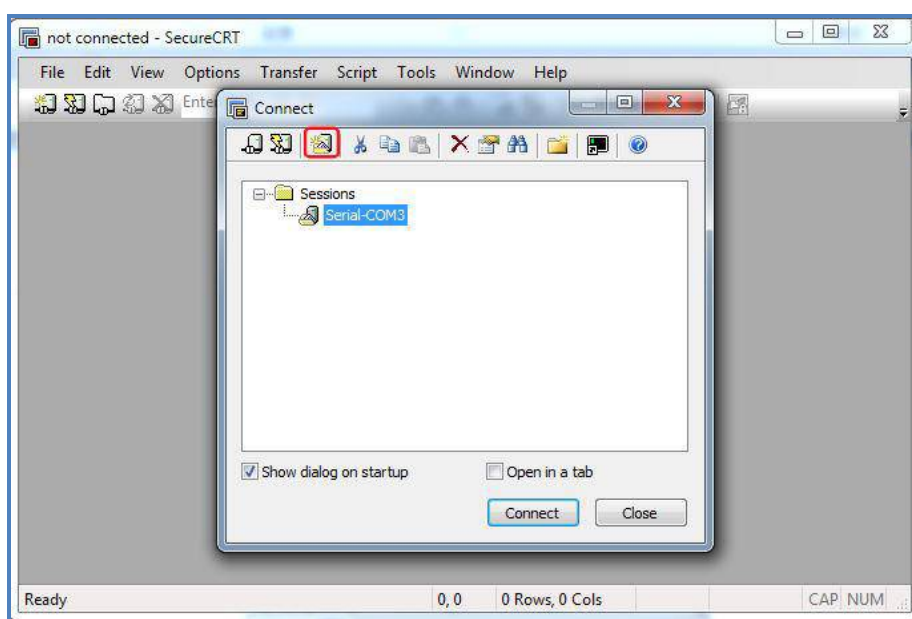
3.1.2 Start SecureCRT

We can enter AT commands to configure M1000 USB from serial software such as secureCRT, you can download this software via link: <https://app.box.com/s/arkn6xk1asgs1myvuuiie>.

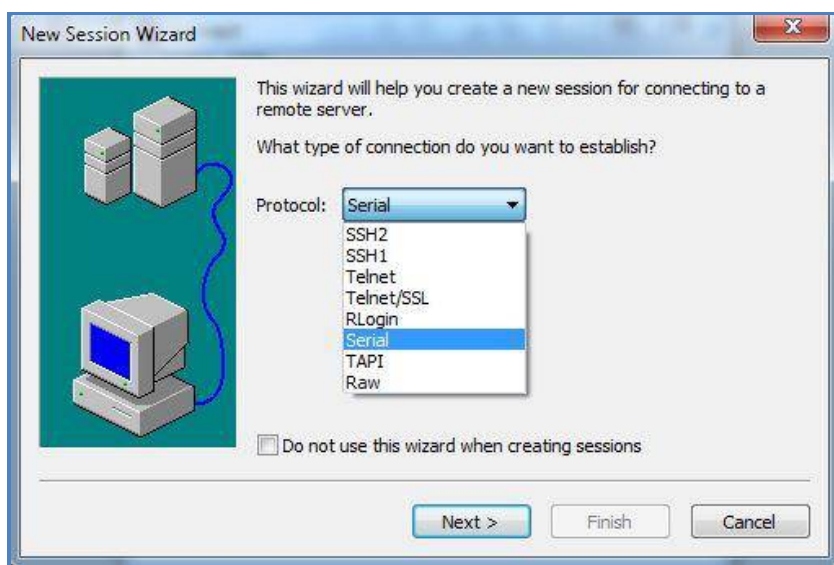
1. Double click SecureCRT Potable.exe .



2. File->Connect->New Session

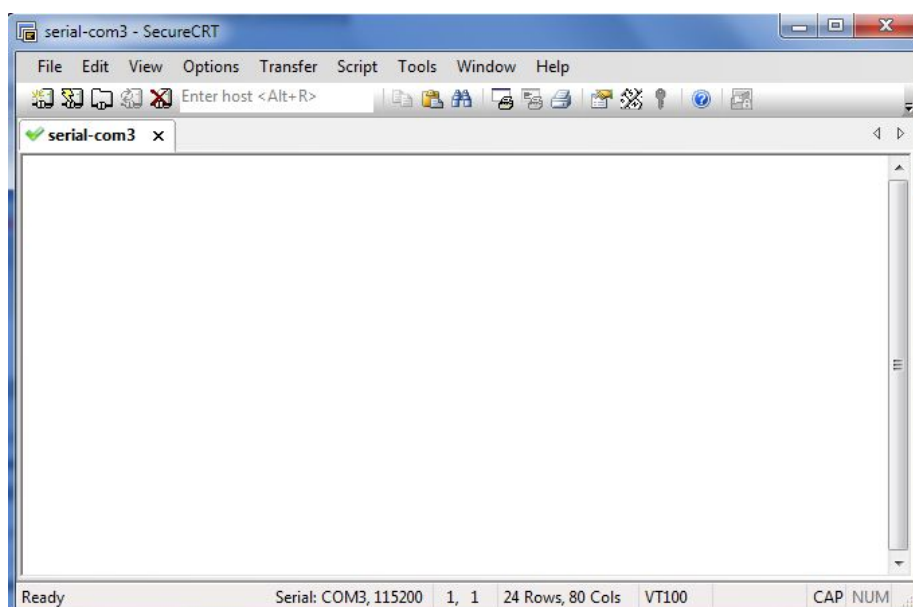
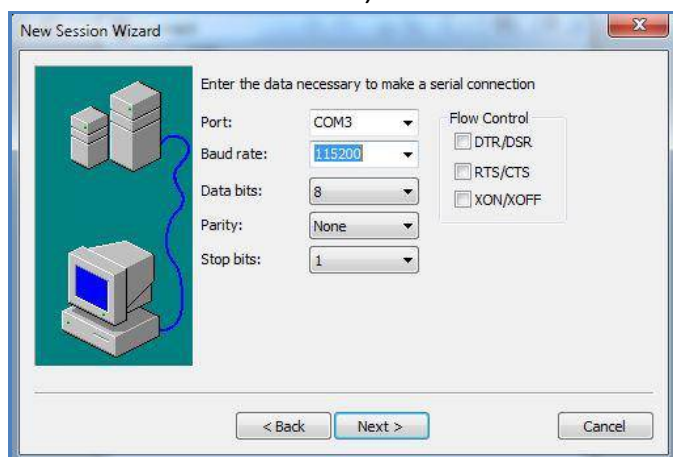


3. Select Protocol as "Serial".



4. Select the simulated COM port and match the parameters as below, click the “Next” button to finish this session.

Note: You need to disable “RTS/CTS”.



3.1.3 AT Command Examples

M1000 USB supports the guidelines known as the “AT Command Set.” AT Command Set is the industry standard line-oriented command language used to communicate with the modem.

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

| Description | AT commands | Modem response | Comments |
|---------------------------|-------------|----------------|--|
| Modem acknowledgement | AT | OK | Responding OK indicates that the modem is ready. |
| Receiving signal strength | AT+CSQ | +CSQ: 19,99 | The first parameter has to be at least 15 for normal communication. |
| Query current PIN status | AT+CPIN? | +CPIN: READY | SIM card is correctly inserted and modem is not pending for any password |

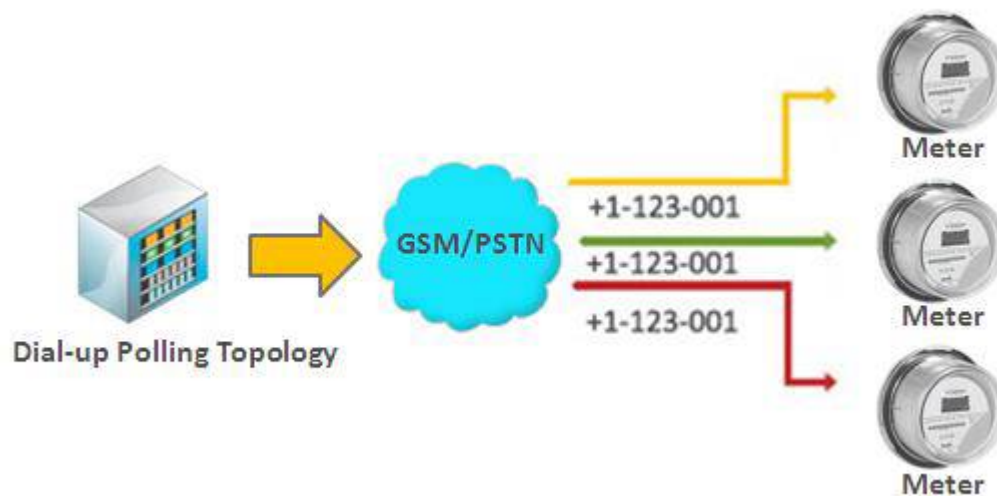
| | | | |
|---|------|----------------|--|
| | | +CPIN: SIM PIN | PIN1 is required |
| | | +CPIN: SIM PUK | PUK1 is required |
| Saves parameters in non-volatile memory | AT&W | OK | The configuration settings are stored. |

3.2 CSD Connection

3.2.1 Overview

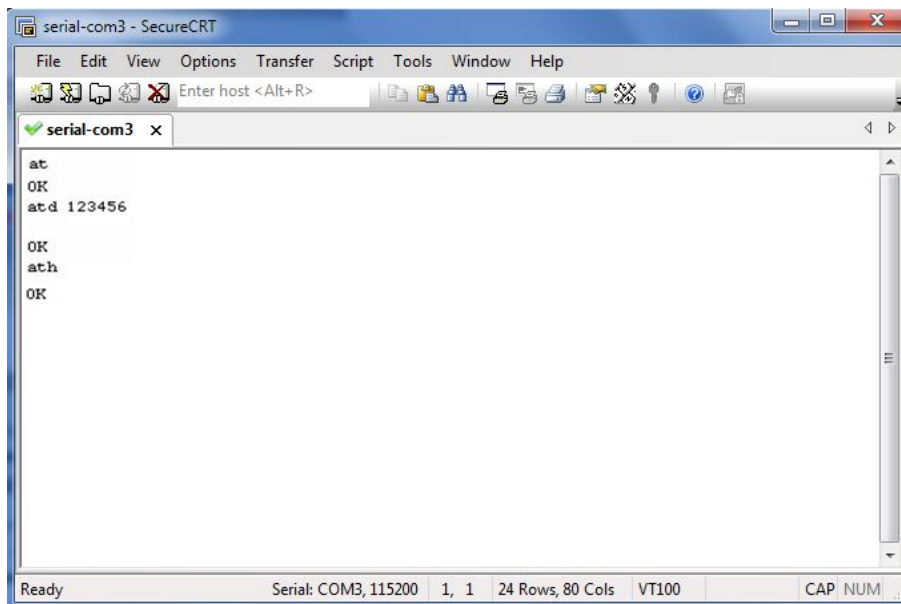
A Circuit-Switched Data Connection makes the wireless modem work in a manner similar to a regular analog modem. CSD (Circuit Switched Data) is the original form of data transmission developed for cellular systems. By using a single radio time slot, CSD is able to deliver 9.6 to 14.4 kbit/s data transmission to both the CELLULAR 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.



3.2.2 Establishing a CSD Connection

1. Start SecureCRT with serial parameters 115200,8,n,1.
2. Type `ATD <phone number>` and press Enter to establish a CSD connection. (e.g. `ATD 123456`, in which 123456 is the phone number.)
3. After remote side answering the CSD call, then the CSD connection has been established successfully.
4. To close the CSD connection, type `+++`. The modem will respond with OK to indicate that you have already switched back to the command mode. It means you can enter AT commands again via SecureCRT.
5. Type `ATH` and press Enter to disconnect.

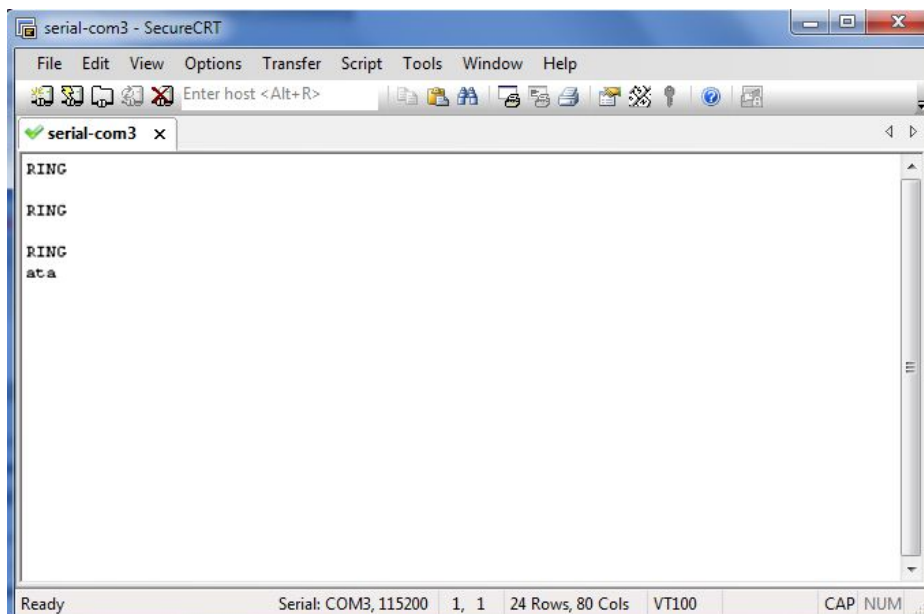


Note:

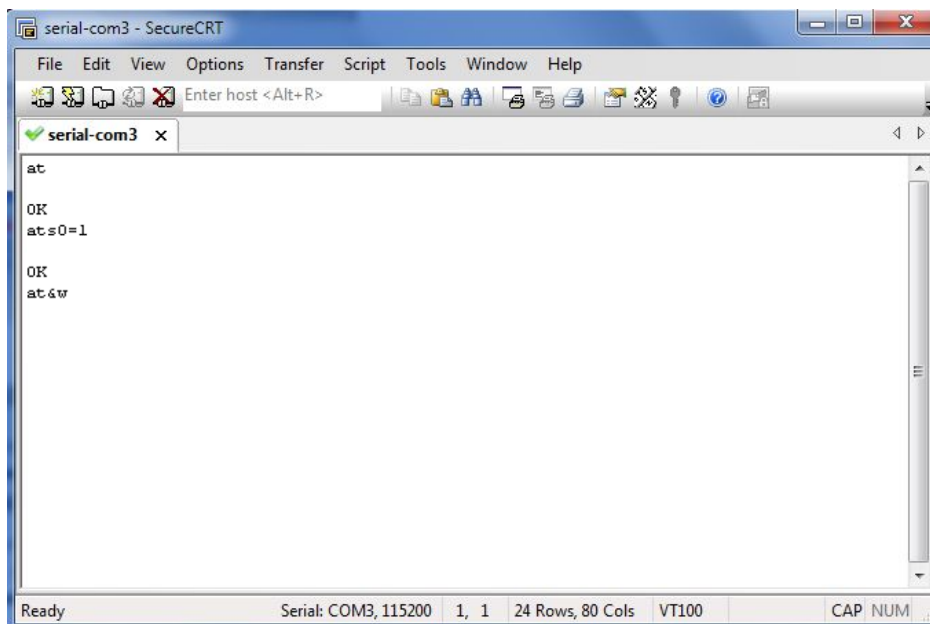
- *+++ is the escape sequence, and ATH is the hang-up command.*
- *For international calls, the local international prefix does not need to be set, but does need to be replaced by the + character. E.g., you would type ATD+86123456, in which +86 is the country code.*

3.2.3 Answering a CSD Connection

1. When secureCRT displays the RING response, type ATA, and press Enter.



2. In the secureCRT window, type ATSO=x and press Enter. For x, substitute the number of rings that the modem should receive before answering the call. For example, to answer after the first ring, type ATSO=1.
3. Type AT&W and press Enter.



4. To close the CSD connection, type +++. The modem will respond with OK to indicate that you have already switched back to the command mode.
5. Type ATH and press Enter to disconnect.

3.3 Using Short Message Service

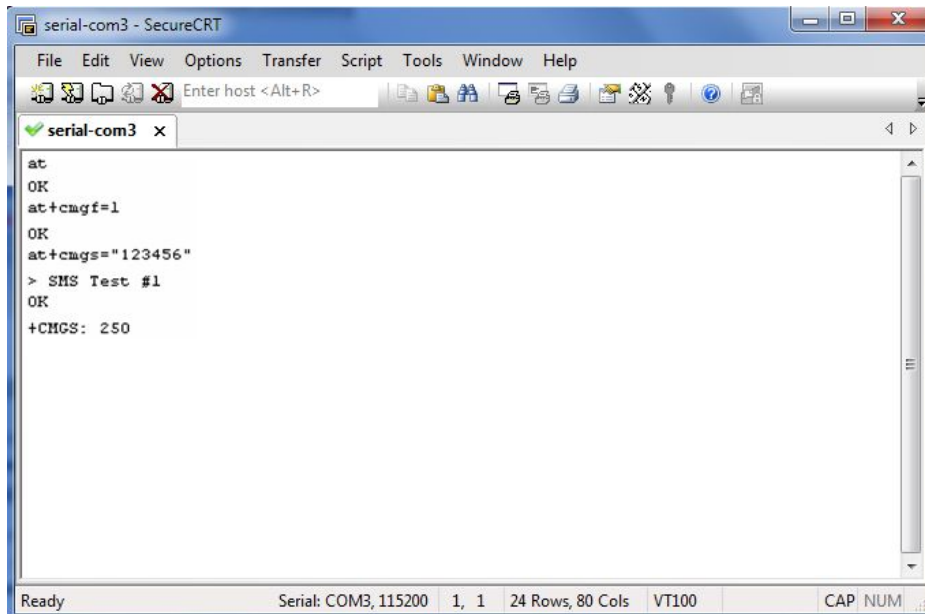
Cellular technology offers the benefit of using SMS (short message service) as an easy way to communicate over the mobile network.

The following topics are covered in this chapter:

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

3.3.1 Sending a Short Message

1. Type AT+CMGF=1 and press Enter.
2. Type **AT+CMGS="<phone number>"** and press Enter. The terminal will automatically move to the next line, which starts with >. Type your message on the right of the >.
3. Enter Ctrl + Z deliver the message.



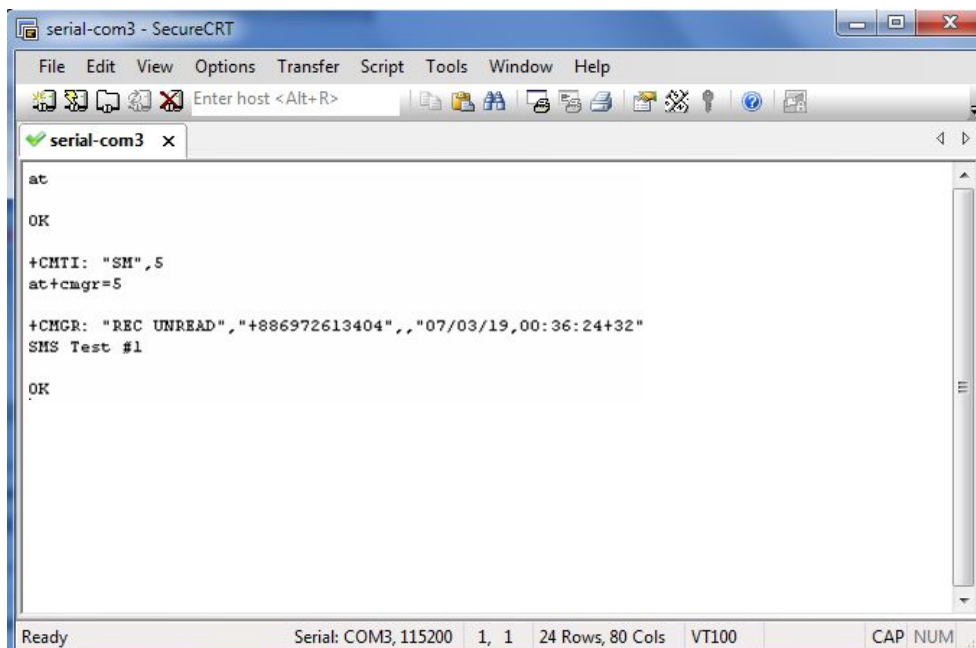
```
serial-com3 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com3 x
at
OK
at+cmgf=1
OK
at+cmgs="123456"
> SMS Test #1
OK
+CMGS: 250
```

Ready Serial: COM3, 115200 1, 1 24 Rows, 80 Cols VT100 CAP NUM

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

3.3.2 Reading a Short Message

1. Type AT+CMGF=1 and then press Enter.
2. Type AT+CNMI=2,1 and then press Enter.
3. 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).
4. Type AT+CMGR=x to read the message.
5. In the example shown below, the x=5 means that the message is stored in the 5th storage location.



```
serial-com3 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com3 x
at
OK
+CMIT: "SM", 5
at+cmgr=5
+CMGR: "REC UNREAD", "+886972613404", "07/03/19,00:36:24+32"
SMS Test #1
OK
```

Ready Serial: COM3, 115200 1, 1 24 Rows, 80 Cols VT100 CAP NUM

3.3.3 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 Documentations / AT_Commands / AT_Commands.pdf for further detail commands information using SMS.

3.4 Cellular Network Connection

3.4.1 Overview

A cellular network is a wireless network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. We can use our mobile phones or PCs to connect to cellular network basing on 2G (GPRS/EDGE)/3G (HSPA/EV-DO)/4G (LTE) technology.

M1000 USB offers state-of-the-art 2G (GPRS/EDGE)/3G (HSPA/EV-DO)/4G (LTE) connectivity for machine to machine (M2M) applications, it can provide cellular network connection for end-user devices such as PCs, embedded computers, and PLCs that are PPP-enabled and can be easily connected to the cellular network and the Internet.

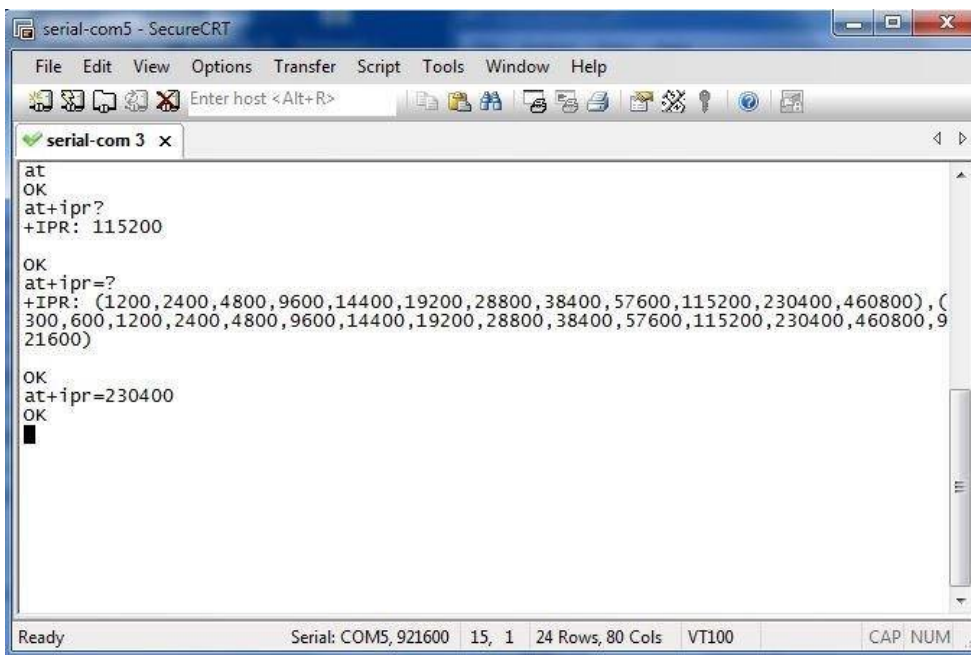


3.4.2 Internet Access for PC

The modem can use Windows DUN (Dial-up Networking) to provide the Internet access through the cellular network. Instructions are described in the following chapters.

Note: The specific steps may vary depending on your version of Windows and your Windows settings. Following steps are basing on Windows 7.

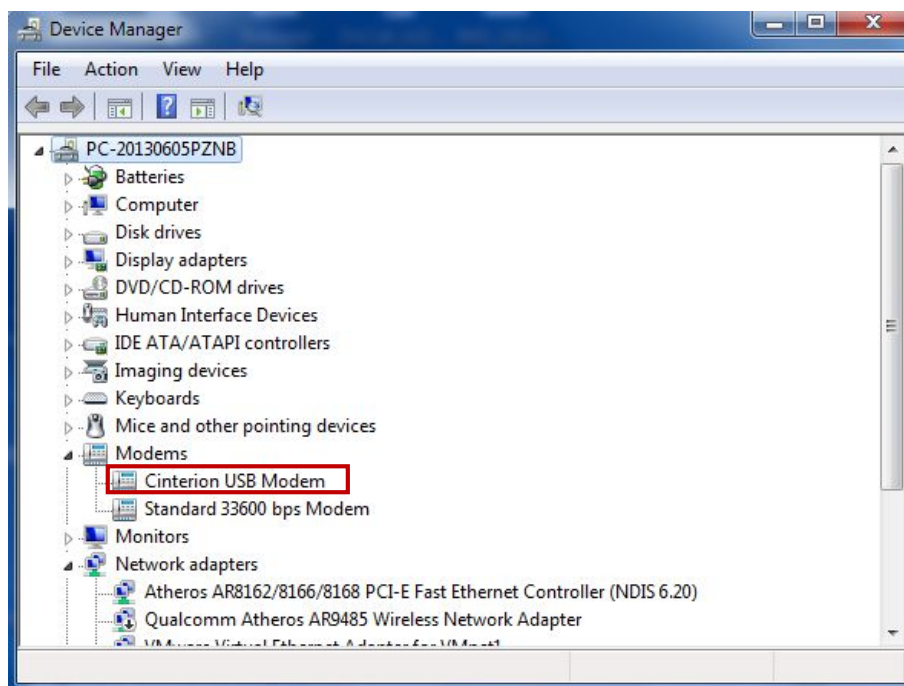
- Change baudrate of modem
1. You can set baudrate of the simulated COM port to highest speed following the diagram below. The highest speed of the simulated port varies from different module of M1000 USB, you can use AT command “AT+IPR=?” to check baudrate details. In this document, we use AT **command** “AT+IPR=230400” to set baudrate of the simulated COM port to 230400.



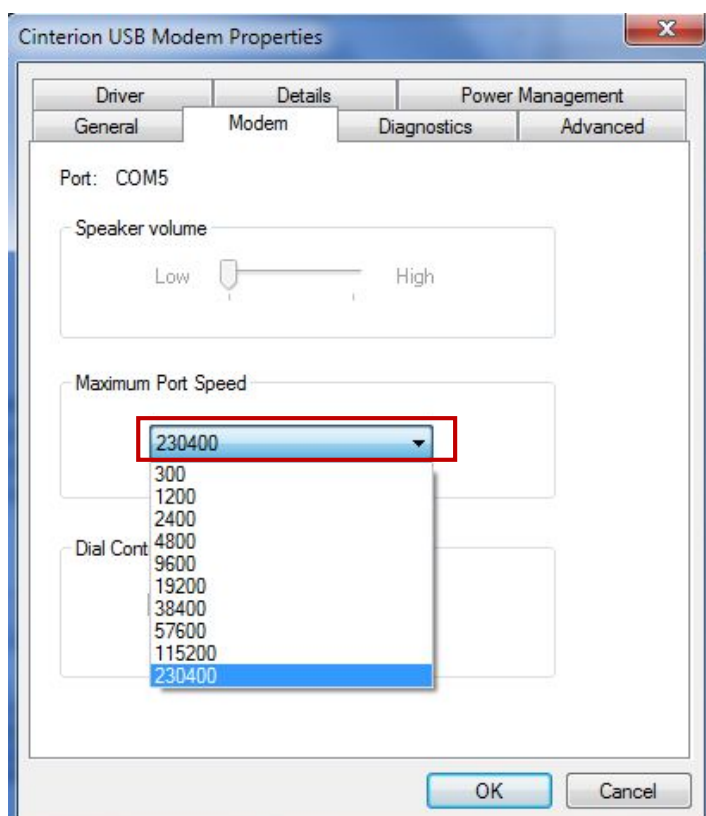
```
serial-com5 - SecureCRT
File Edit View Options Transfer Script Tools Window Help
Enter host <Alt+R>
serial-com 3 x
at
OK
at+ipr?
+IPR: 115200
OK
at+ipr=?
+IPR: (1200,2400,4800,9600,14400,19200,28800,38400,57600,115200,230400,460800), (
300,600,1200,2400,4800,9600,14400,19200,28800,38400,57600,115200,230400,460800,9
21600)
OK
at+ipr=230400
OK
█
Ready Serial: COM5, 921600 15, 1 24 Rows, 80 Cols VT100 CAP NUM
```

- Set Maximum Port Speed

1. In the Control Panel, Select the USB modem in tab *Device Manager* -> *Modems* -> *XXX USB modem*.



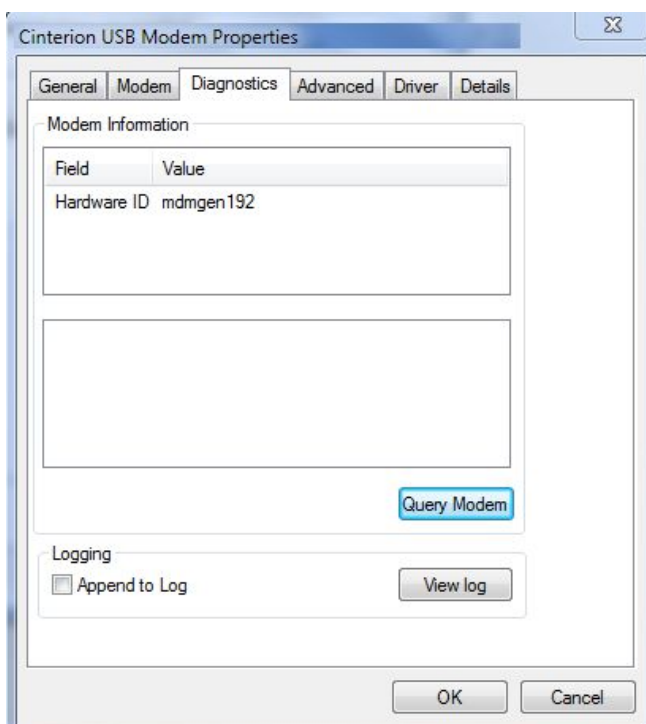
2. Right-click to enter *Properties*. You can select the maximum port speed as 230400 in tab *Modem*.



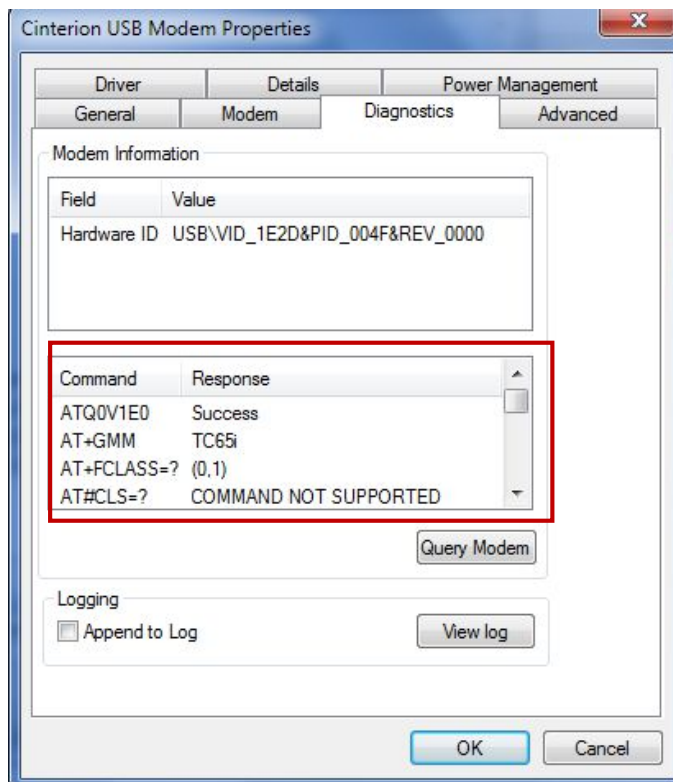
- Modem Diagnostics

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

1. Click the *Diagnostics* tab, and then click *Query Modem*. **After that it will popup “Please Wait” window.** This process will almost take you 4 seconds.



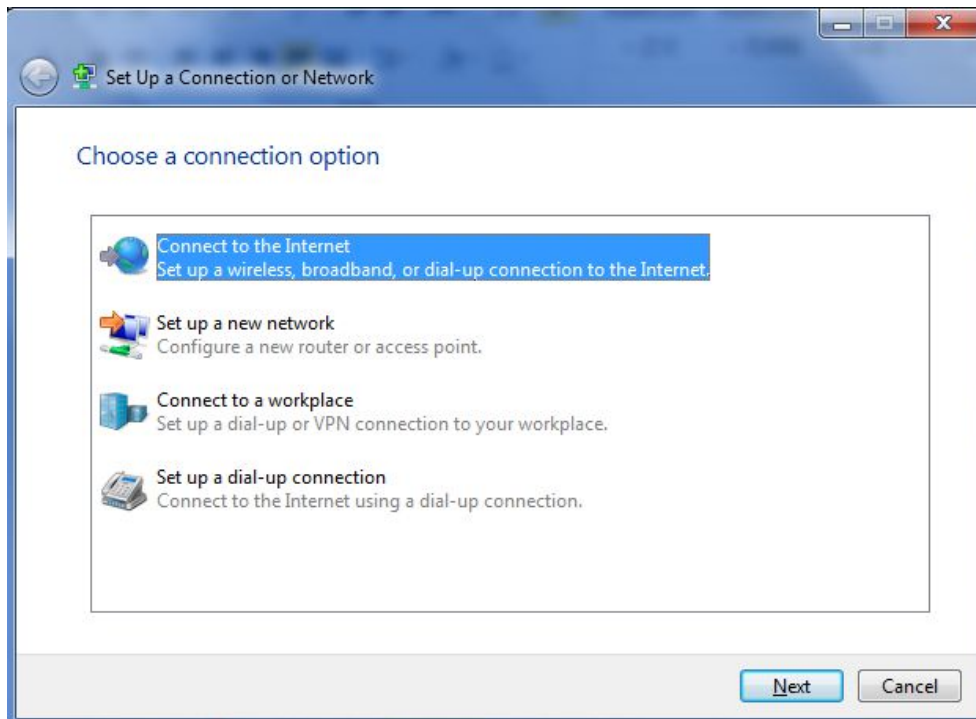
2. If the query is successful, both commands sent to the modem and responses from the modem will be displayed. Click OK to close the window.



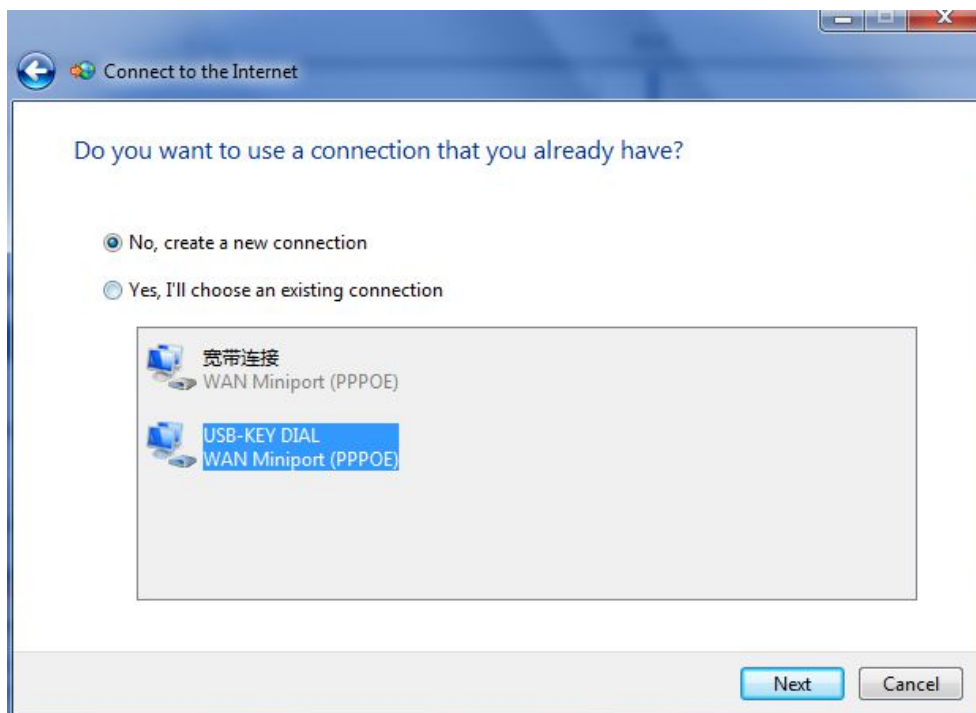
- Adding Windows DUN

Follow these steps to add Windows Dial-up Networking.

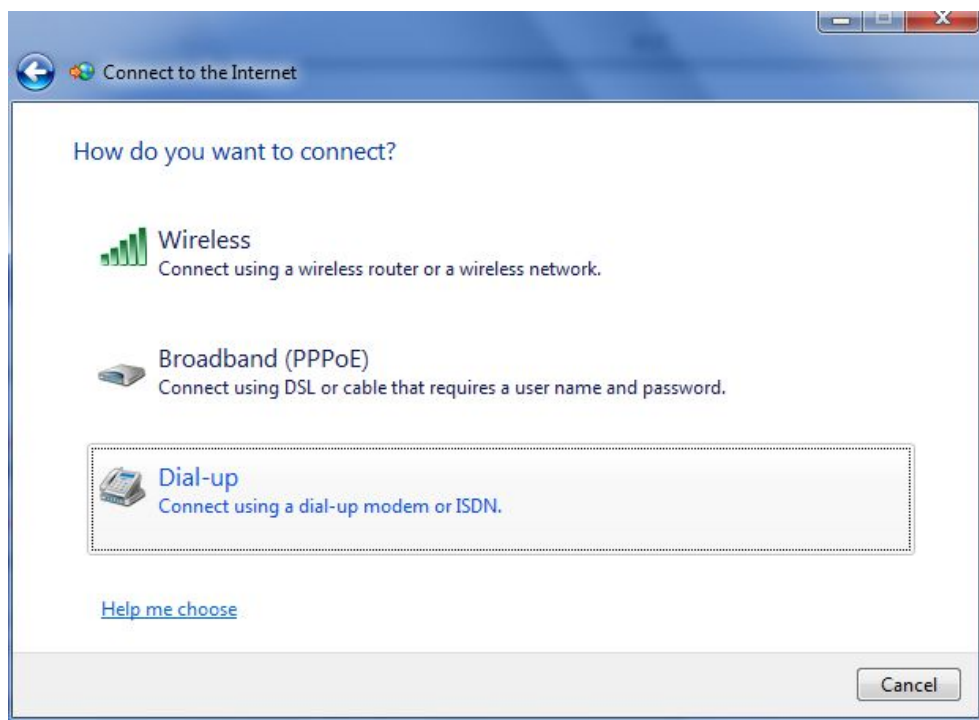
1. In the Control Panel, open *Network and Sharing Center*, and then click *Set up a new connection or network*.
2. When the *Set Up a Connection or Network* window opens, select the *Connect to the Internet* option, and then click *Next*.



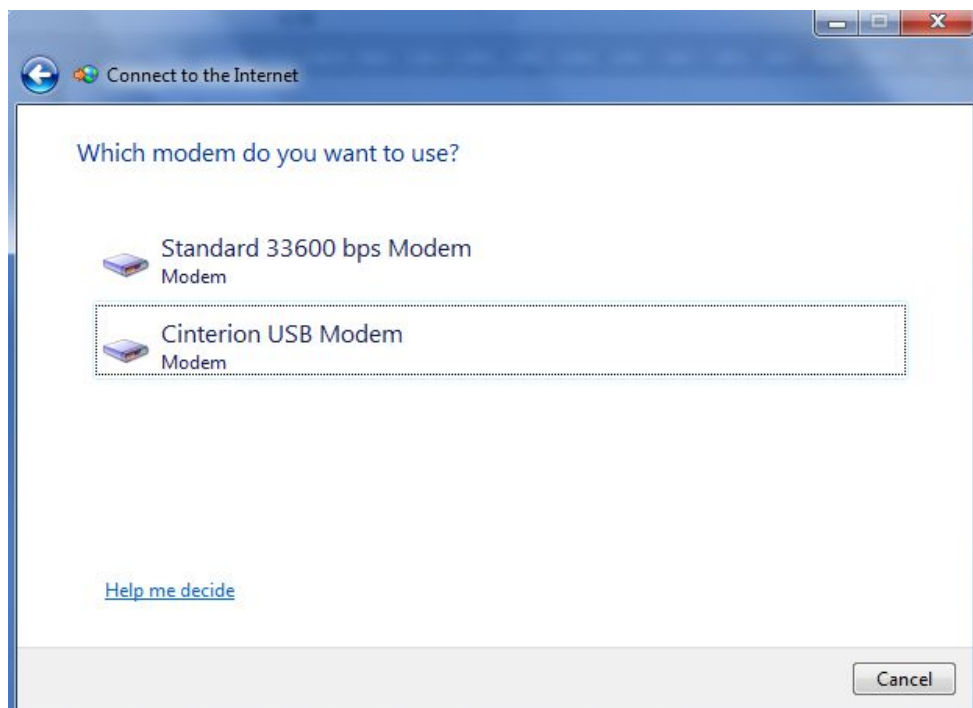
3. Select the *No, create a new connection* option, and then click *Next*.



4. Select the *Dial-up* option.

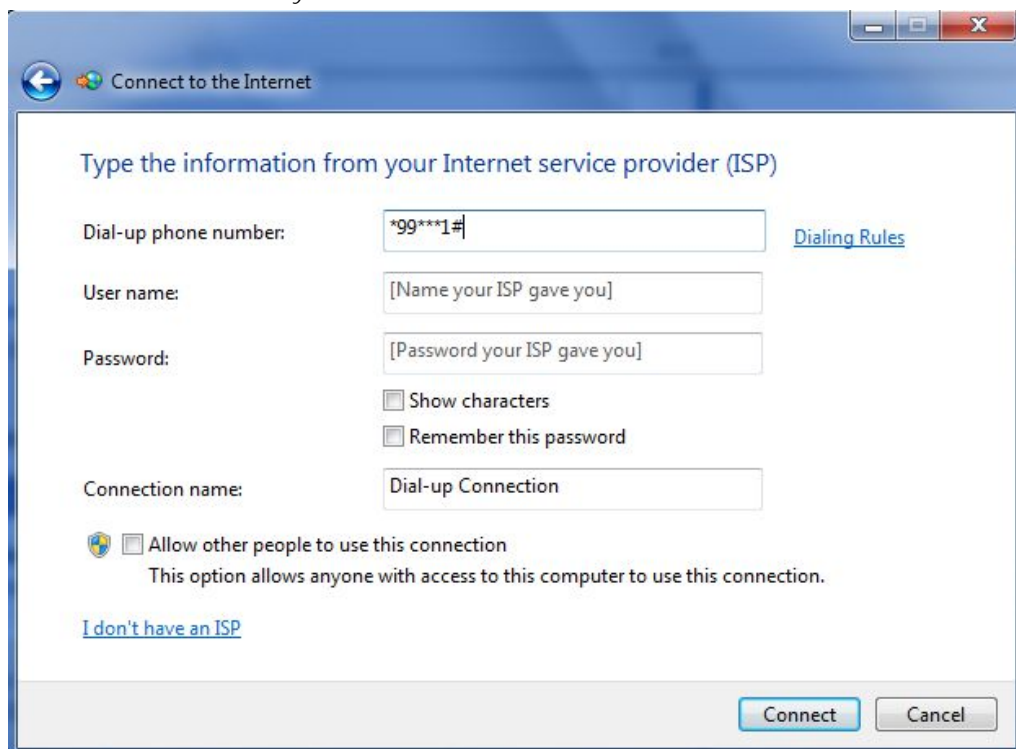


5. Select the correct USB Modem which is shown as the same as *Device Manager -> Modems -> XXX USB modem*.

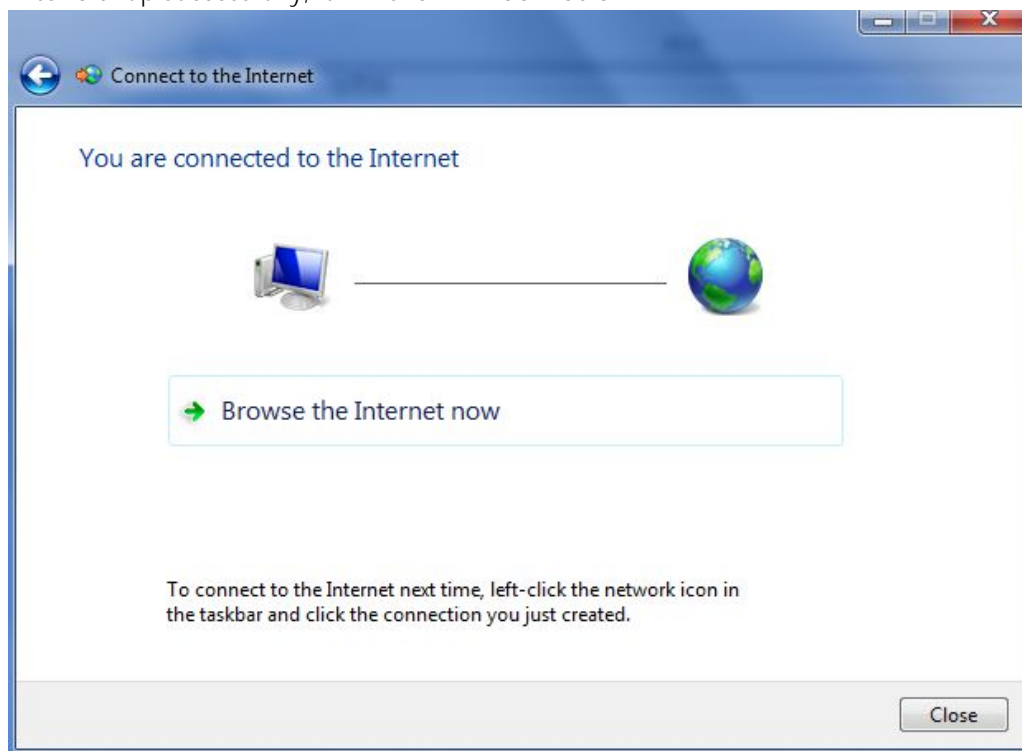


6. Type *99***1# in the Phone number text input box, and type the *User name* and *Password* in the appropriate text boxes, and then click *Connect*.

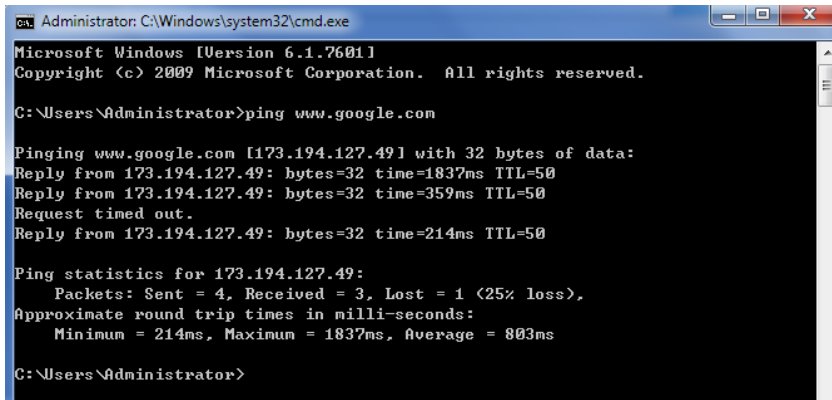
Note: User Name and Password is used for cellular dial-up connection, you can check with local ISP whether you need to enter and what you need to enter.



7. After dial up successfully, it will show window below.



8. Also you can try to ping to www.google.com to check whether GPRS connection has been established.



```
Administrator: C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>ping www.google.com

Pinging www.google.com [173.194.127.49] with 32 bytes of data:
Reply from 173.194.127.49: bytes=32 time=1837ms TTL=50
Reply from 173.194.127.49: bytes=32 time=359ms TTL=50
Request timed out.
Reply from 173.194.127.49: bytes=32 time=214ms TTL=50

Ping statistics for 173.194.127.49:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 214ms, Maximum = 1837ms, Average = 803ms

C:\Users\Administrator>
```

Chapter 4 Appendix

4.1 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 |
|------|-----|--|-----------|----------------|
| 0x00 | 0 | COMMERCIAL AT | @ | 64 |
| 0x01 | 1 | POUND SIGN | £ | 163 |
| 0x02 | 2 | DOLLAR SIGN | \$ | 36 |
| 0x03 | 3 | YEN SIGN | ¥ | 165 |
| 0x04 | 4 | LATIN SMALL LETTER E WITH GRAVE | è | 232 |
| 0x05 | 5 | LATIN SMALL LETTER E WITH ACUTE | é | 233 |
| 0x06 | 6 | LATIN SMALL LETTER U WITH GRAVE | ù | 249 |
| 0x07 | 7 | LATIN SMALL LETTER I WITH GRAVE | ì | 236 |
| 0x08 | 8 | LATIN SMALL LETTER O WITH GRAVE | ò | 242 |
| 0x09 | 9 | LATIN CAPITAL LETTER C WITH CEDILLA | Ç | 199 |
| 0x0A | 10 | LINE FEED | | 10 |
| 0x0B | 11 | LATIN CAPITAL LETTER O WITH STROKE | Ø | 216 |
| 0x0C | 12 | LATIN SMALL LETTER O WITH STROKE | ø | 248 |
| 0x0D | 13 | CARRIAGE RETURN | | 13 |
| 0x0E | 14 | LATIN CAPITAL LETTER A WITH RING ABOVE | Å | 197 |
| 0x0F | 15 | LATIN SMALL LETTER A WITH RING ABOVE | å | 229 |
| 0x10 | 16 | GREEK CAPITAL LETTER DELTA | Δ | |
| 0x11 | 17 | LOW LINE | — | 95 |
| 0x12 | 18 | GREEK CAPITAL LETTER PHI | Φ | |
| 0x13 | 19 | GREEK CAPITAL LETTER GAMMA | Γ | |
| 0x14 | 20 | GREEK CAPITAL LETTER LAMBDA | Λ | |
| 0x15 | 21 | GREEK CAPITAL LETTER OMEGA | Ω | |
| 0x16 | 22 | GREEK CAPITAL LETTER PI | Π | |
| 0x17 | 23 | GREEK CAPITAL LETTER PSI | Ψ | |
| 0x18 | 24 | GREEK CAPITAL LETTER SIGMA | Σ | |

| | | | | |
|--------|--------|-------------------------------------|---|-------------------|
| 0x19 | 25 | GREEK CAPITAL LETTER THETA | Θ | |
| 0x1A | 26 | GREEK CAPITAL LETTER XI | Ξ | |
| 0x1B | 27 | ESCAPE TO EXTENSION TABLE | | |
| 0x1B0A | 27 10 | FORM FEED | | 12 |
| 0x1B14 | 27 20 | CIRCUMFLEX ACCENT | ^ | 94 |
| 0x1B28 | 27 40 | LEFT CURLY BRACKET | { | 123 |
| 0x1B29 | 27 41 | RIGHT CURLY BRACKET | } | 125 |
| 0x1B2F | 27 47 | REVERSE SOLIDUS (BACKSLASH) | \ | 92 |
| 0x1B3C | 27 60 | LEFT SQUARE BRACKET | [| 91 |
| 0x1B3D | 27 61 | TILDE | ~ | 126 |
| 0x1B3E | 27 62 | RIGHT SQUARE BRACKET |] | 93 |
| 0x1B40 | 27 64 | VERTICAL BAR | | 124 |
| 0x1B65 | 27 101 | EURO SIGN | € | 164 (ISO-8859-15) |
| 0x1C | 28 | LATIN CAPITAL LETTER AE | Æ | 198 |
| 0x1D | 29 | LATIN SMALL LETTER AE | æ | 230 |
| 0x1E | 30 | LATIN SMALL LETTER SHARP S (German) | ß | 223 |
| 0x1F | 31 | LATIN CAPITAL LETTER E WITH ACUTE | É | 201 |
| 0x20 | 32 | SPACE | | 32 |
| 0x21 | 33 | EXCLAMATION MARK | ! | 33 |
| 0x22 | 34 | QUOTATION MARK | “ | 34 |
| 0x23 | 35 | NUMBER SIGN | # | 35 |
| 0x24 | 36 | CURRENCY SIGN | ¤ | 164 (ISO-8859-1) |
| 0x25 | 37 | PERCENT SIGN | % | 37 |
| 0x26 | 38 | AMPERSAND | & | 38 |
| 0x27 | 39 | APOSTROPHE | ‘ | 39 |
| 0x28 | 40 | LEFT PARENTHESIS | (| 40 |
| 0x29 | 41 | RIGHT PARENTHESIS |) | 41 |
| 0x2A | 42 | ASTERISK | * | 42 |
| 0x2B | 43 | PLUS SIGN | + | 43 |
| 0x2C | 44 | COMMA | , | 44 |
| 0x2D | 45 | HYPHEN-MINUS | - | 45 |
| 0x2E | 46 | FULL STOP | . | 46 |
| 0x2F | 47 | SOLIDUS (SLASH) | / | 47 |
| 0x30 | 48 | DIGIT ZERO | 0 | 48 |
| 0x31 | 49 | DIGIT ONE | 1 | 49 |
| 0x32 | 50 | DIGIT TWO | 2 | 50 |
| 0x33 | 51 | DIGIT THREE | 3 | 51 |
| 0x34 | 52 | DIGIT FOUR | 4 | 52 |
| 0x35 | 53 | DIGIT FIVE | 5 | 53 |
| 0x36 | 54 | DIGIT SIX | 6 | 54 |
| 0x37 | 55 | DIGIT SEVEN | 7 | 55 |
| 0x38 | 56 | DIGIT EIGHT | 8 | 56 |

| | | | | |
|------|----|---------------------------------------|---|-----|
| 0x39 | 57 | DIGIT NINE | 9 | 57 |
| 0x3A | 58 | COLON | : | 58 |
| 0x3B | 59 | SEMICOLON | ; | 59 |
| 0x3C | 60 | LESS-THAN SIGN | < | 60 |
| 0x3D | 61 | EQUALS SIGN | = | 61 |
| 0x3E | 62 | GREATER-THAN SIGN | > | 62 |
| 0x3F | 63 | QUESTION MARK | ? | 63 |
| 0x40 | 64 | INVERTED EXCLAMATION MARK | ¡ | 161 |
| 0x41 | 65 | LATIN CAPITAL LETTER A | A | 65 |
| 0x42 | 66 | LATIN CAPITAL LETTER B | B | 66 |
| 0x43 | 67 | LATIN CAPITAL LETTER C | C | 67 |
| 0x44 | 68 | LATIN CAPITAL LETTER D | D | 68 |
| 0x45 | 69 | LATIN CAPITAL LETTER E | E | 69 |
| 0x46 | 70 | LATIN CAPITAL LETTER F | F | 70 |
| 0x47 | 71 | LATIN CAPITAL LETTER G | G | 71 |
| 0x48 | 72 | LATIN CAPITAL LETTER H | H | 72 |
| 0x49 | 73 | LATIN CAPITAL LETTER I | I | 73 |
| 0x4A | 74 | LATIN CAPITAL LETTER J | J | 74 |
| 0x4B | 75 | LATIN CAPITAL LETTER K | K | 75 |
| 0x4C | 76 | LATIN CAPITAL LETTER L | L | 76 |
| 0x4D | 77 | LATIN CAPITAL LETTER M | M | 77 |
| 0x4E | 78 | LATIN CAPITAL LETTER N | N | 78 |
| 0x4F | 79 | LATIN CAPITAL LETTER O | O | 79 |
| 0x50 | 80 | LATIN CAPITAL LETTER P | P | 80 |
| 0x51 | 81 | LATIN CAPITAL LETTER Q | Q | 81 |
| 0x52 | 82 | LATIN CAPITAL LETTER R | R | 82 |
| 0x53 | 83 | LATIN CAPITAL LETTER S | S | 83 |
| 0x54 | 84 | LATIN CAPITAL LETTER T | T | 84 |
| 0x55 | 85 | LATIN CAPITAL LETTER U | U | 85 |
| 0x56 | 86 | LATIN CAPITAL LETTER V | V | 86 |
| 0x57 | 87 | LATIN CAPITAL LETTER W | W | 87 |
| 0x58 | 88 | LATIN CAPITAL LETTER X | X | 88 |
| 0x59 | 89 | LATIN CAPITAL LETTER Y | Y | 89 |
| 0x5A | 90 | LATIN CAPITAL LETTER Z | Z | 90 |
| 0x5B | 91 | LATIN CAPITAL LETTER A WITH DIAERESIS | Ä | 196 |
| 0x5C | 92 | LATIN CAPITAL LETTER O WITH DIAERESIS | Ö | 214 |
| 0x5D | 93 | LATIN CAPITAL LETTER N WITH TILDE | Ñ | 209 |
| 0x5E | 94 | LATIN CAPITAL LETTER U WITH DIAERESIS | Ü | 220 |
| 0x5F | 95 | SECTION SIGN | § | 167 |
| 0x60 | 96 | INVERTED QUESTION MARK | ¿ | 191 |
| 0x61 | 97 | LATIN SMALL LETTER A | a | 97 |
| 0x62 | 98 | LATIN SMALL LETTER B | b | 98 |

| | | | | |
|------|-----|-------------------------------------|---|-----|
| 0x63 | 99 | LATIN SMALL LETTER C | c | 99 |
| 0x64 | 100 | LATIN SMALL LETTER D | d | 100 |
| 0x65 | 101 | LATIN SMALL LETTER E | e | 101 |
| 0x66 | 102 | LATIN SMALL LETTER F | f | 102 |
| 0x67 | 103 | LATIN SMALL LETTER G | g | 103 |
| 0x68 | 104 | LATIN SMALL LETTER H | h | 104 |
| 0x69 | 105 | LATIN SMALL LETTER I | i | 105 |
| 0x6A | 106 | LATIN SMALL LETTER J | j | 106 |
| 0x6B | 107 | LATIN SMALL LETTER K | k | 107 |
| 0x6C | 108 | LATIN SMALL LETTER L | l | 108 |
| 0x6D | 109 | LATIN SMALL LETTER M | m | 109 |
| 0x6E | 110 | LATIN SMALL LETTER N | n | 110 |
| 0x6F | 111 | LATIN SMALL LETTER O | o | 111 |
| 0x70 | 112 | LATIN SMALL LETTER P | p | 112 |
| 0x71 | 113 | LATIN SMALL LETTER Q | q | 113 |
| 0x72 | 114 | LATIN SMALL LETTER R | r | 114 |
| 0x73 | 115 | LATIN SMALL LETTER S | s | 115 |
| 0x74 | 116 | LATIN SMALL LETTER T | t | 116 |
| 0x75 | 117 | LATIN SMALL LETTER U | u | 117 |
| 0x76 | 118 | LATIN SMALL LETTER V | v | 118 |
| 0x77 | 119 | LATIN SMALL LETTER W | w | 119 |
| 0x78 | 120 | LATIN SMALL LETTER X | x | 120 |
| 0x79 | 121 | LATIN SMALL LETTER Y | y | 121 |
| 0x7A | 122 | LATIN SMALL LETTER Z | z | 122 |
| 0x7B | 123 | LATIN SMALL LETTER A WITH DIAERESIS | ä | 228 |
| 0x7C | 124 | LATIN SMALL LETTER O WITH DIAERESIS | ö | 246 |
| 0x7D | 125 | LATIN SMALL LETTER N WITH TILDE | ñ | 241 |
| 0x7E | 126 | LATIN SMALL LETTER U WITH DIAERESIS | ü | 252 |
| 0x7F | 127 | LATIN SMALL LETTER A WITH GRAVE | à | 224 |

4.2 Troubleshooting

This section of the document describes possible problems encountered when using the Robustel M1000 USB and their solutions.

4.2.1 The modem's LED does not light:

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

4.2.2 The modem keep rebooting all the time:

- Please make sure you have inserted the SIM card.

4.2.3 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? | Use “AT+CSQ” to check RSSI, please check Signal Strength Indication. |
| | Is the antenna properly connected? | Refer to section 2.5. |
| “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 |

Signal Strength Indication

| 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 |

4.3 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 |