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**User Manual
of
TomTom
HD Traffic Receiver Module 1 US**

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Document History

Version	Date	Brief Description
1.0	Oct. 21, 2008	New established

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FCC Regulations:

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiated radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

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Warning:

The maximum antenna gain allowed for use with this device is -0.81 dBi.

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: S4L-HDTM 1”

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1. Introduction

HD Traffic Receiver Module is a GPRS modem module. It is a small, lightweight, low power consumption and RoHS compliant device that allow digital communication services wherever a GSM 850, PCS 1900 network is present.

The module is provided with a 20-pin board-to-board connector. Power input connector is necessary when link the modem PCB. It also provides a 50 Ohm Murata RF test port and antenna contact pads.

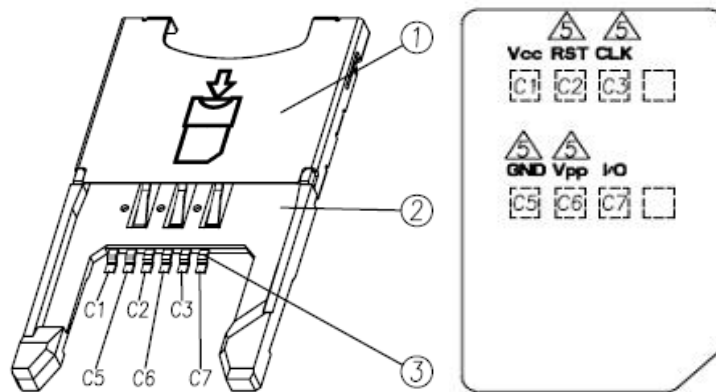
From the interface point of view, the module provides the following:

- RS232 UART interface
- Two wires RS232 interface
- 2.75V output power source
- 1.8V/3.0V SIM card holder
- System reset
- Power ON/OFF function
- System power interface

2. General Product Description

2.1 SIM Card Holder Support

The HD Traffic Receiver Module 1 US has on the backside of the PCB, the necessary pads to manually solder a SIM card holder. The type of the SIM card holder to be used is UNCR2103D006-0 of JESS-LINK.



2.2 Supply voltage

The external power supply must be connected to Vpower signal and must fulfill the following requirements:

- Nominal operating voltage 3.8 V
- Operating voltage range 3.4 V - 4.2 V

NOTE: 1. Operating voltage range must never be exceeded; care must be taken in order to fulfill min/max voltage requirements.

2. The minimum transmission burst voltage in worst network conduction should be kept 3.1V above.

2.3 Power consumption

The typical current consumption of HD Traffic Receiver Module 1US is:

Power off current (Typical)	<= 60 uA
Stand-by current (GSM idle)	<= 4 mA
Operating current in GSM channel	<= 300 mA
Operating current in GPRS class 10	<= 500 mA

2.4 SIM reader

The HD Traffic Receiver Module 1 US support phase 2 GSM11.14 - SIM 1.8V/3V volts.

2.5 Data transmission

The HD Traffic Receiver Module 1 US supports GPRS Class 10, MS Class B.

2.6 Logic level specifications

Where not specifically stated, all the interface circuits work at 2.8V CMOS logic levels.

The following table shows the logic level specifications used in the module interface circuits:

Absolute Maximum Ratings –Not Functional

Parameter	Min	Max
Input level on any digital pin when on	- 0.3 V	+ 3.75 V
Input voltage on any analog pins when on	- 0.3 V	+ 3.0 V

Operating Range –Interface level (2.8V CMOS)

Level	Min	Max
Input high level	2.1 V	3.3 V
Input low level	0 V	0.5 V
Output high level	2.2 V	3.0 V
Output low level	0 V	0.35 V

Operating Range –Interface level (2.0V CMOS)

Level	Min	Max
-------	-----	-----

Input high level	1.6 V	3.3 V
Input low level	0 V	0.4 V
Output high level	1.65 V	2.2 V
Output low level	0 V	0.35 V

2.7 Reset signal

RESET signal is used to reset the HD Traffic Receiver Module 1 US . Whenever this signal is pulled low, the module is reset. When the device is reset it stops any operation and after the release of the reset it is unconditionally rebooted, without doing any detach operation from the network where it is registered. This behavior is not like a proper shut down because any GSM device is requested to issue a detach request on turn off. For this reason the Reset signal must not be used to normally shutting down the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response.

The RESET is internally controlled on start-up to achieve always a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

Reset Signal Operating levels:

Signal	Min	Max
RESET Input high	2.2 V*	3.3 V
RESET Input low	0 V	0.2 V

* This signal is internally pulled up so the pin can be left floating if not used

If unused, this signal may be left unconnected. If used, then it must always be connected with an open collector transistor, to allow the internal circuitry the power on reset and under voltage lockout functions.

2.8 2.75V_out power output

A regulated power supply output is provided in order to supply small devices from module. This output is active when the module is ON and goes off when module is shut down. The operating range characteristics of the supply are:

Operating Range –2.75V_out power supply

	Min	Typical	Max

Output voltage	2.76 V	2.85 V	2.93 V
Output current			50 mA
Output bypass capacitor			2.2 uF

2.9 Connector interface

2.9.1 Board-to-board connector interface

PIN Definition			
GND	1	2	GND
Vpower	3	4	Vpower
Vpower	5	6	Vpower
GND	7	8	GND
SYS_EN	9	10	VIO
GND	11	12	GND
EXTRSTN	13	14	CTS
GND	15	16	RTS
NC	17	18	RXD
NC	19	20	TXD

2.9.2 Interface description

PIN	Name	I/O	Function	I/O type	Description
1	GND	PWR	GSM Power Supply	Ground	Power GND
2	GND	PWR	GSM Power Supply	Ground	Power GND
3	Vpower	PWR	GSM Power Supply	From 3.5 to 4.2 V (Typ: 3.8 V)	Input power for System
4	Vpower	PWR	GSM Power Supply	From 3.5 to 4.2 V (Typ: 3.8 V)	Input power for System
5	Vpower	PWR	GSM Power Supply	From 3.5 to 4.2 V (Typ: 3.8 V)	Input power for System
6	Vpower	PWR	GSM Power Supply	From 3.5 to 4.2 V (Typ: 3.8 V)	Input power for System
7	GND	PWR	GSM Power Supply	Ground	Power GND
8	GND	PWR	GSM Power Supply	Ground	Power GND
9	SYS_EN	I	Power on/off system	CMOS compatible 3.3V	When SYS_EN is high , the system will power on
10	VIO	O	2.85V Output	2.85V Output	The range of VIO is between 2.76V and 2.93V
11	GND	PWR	GSM Power Supply	Ground	Power GND

12	GND	PWR	GSM Power Supply	Ground	Power GND
13	EXTRSTN	I	External reset	CMOS compatible	3.3V External HW reset
14	CTS	I	Asynchronous Serial Interface 0	CMOS compatible	3.3V RTS (DCE)
15	GND	PWR	GSM Power Supply	Ground	Power GND
16	RTS	O	Asynchronous Serial Interface 0	CMOS compatible	3.3V CTS (DCE)
17	NC				
18	RXD	I	Asynchronous Serial Interface 0	CMOS compatible	3.3V RX (DCE)
19	NC				
20	TXD	O	Asynchronous Serial Interface 0	CMOS compatible	3.3V TX (DCE)

2.10 Operating Frequency

The Module supports 850/1900 Dual Band.

Mode Freq.	TX (MHz)	RX (MHz)
GSM-850	TX: 824.2 - 848.8MHz	RX: 869.2 - 893.8MHz
PCS-1900	TX: 1850.2 - 1909.8MHz	RX: 1930.2 - 1989.8MHz

2.11 GPRS mode

The Module compliant with GSM/GPRS protocol stack R.99

- GPRS multi-slot class 10
- MS class B
- Coding scheme 1-4

2.12 Transmitter output power

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2.12.1 GSM–850

The Module in GSM–850 operating mode are class 4 in accordance with the specifications that determine the nominal 2W peak RF power (+33dBm) on 50-Ohm load.

2.12.2 PCS –1900

The module in PCS–1900 operating mode are class 1 in accordance with the specifications that determine the nominal 1W peak RF power (+30dBm) on 50-Ohm load.

2.13 Reference sensitivity

2.13.1 GSM–850

The sensitivity of the GSM-850 according to the specifications for the class 4 is -109dBm typical in normal operating conditions.

2.13.2 PCS–1900

The sensitivity of the PCS–1900 according to the specifications for the class 1 is -108dBm typical in normal operating conditions.

2.14 Antenna connector

The Module is equipped with a 50 Ohm RF connector from Murata P/N MM8430-2610. Moreover, it has the antenna pads on the PCB to accept spring clips for antenna contact.

2.15 Power up / down scenarios

In general, be sure not to turn on the module while it is out of the operating range of voltage in Chapter 2.2.

2.15.1 Turn on the module

The module can be activated via SYS_EN signal. When switch on the Module the SYS_EN signal needs to be driven to high level for at least 150ms

2.15.2 Turn off the module

To switching the module off the following procedures may be used:

- * Normal shutdown:
Software controlled by sending the AT command over the serial application interface.
- * Automatic shutdown:
Takes effect if under voltage is detected.

2.15.3 Turn off The module using AT command

The best and safest approach to powering down the module is to issue the AT command. This procedure let the module log off from network and allows the software to enter into a secure state and save data before disconnecting the power supply. The mode is referred to as POWER OFF mode. In this mode, only the RTC stays active.

Command syntax: AT+CPWROFF

Command	Possible responses
AT+CPWROFF	OK
Note: switch off the module	Or CME ERROR: <error>
Test command AT+CPWROFF=?	OK

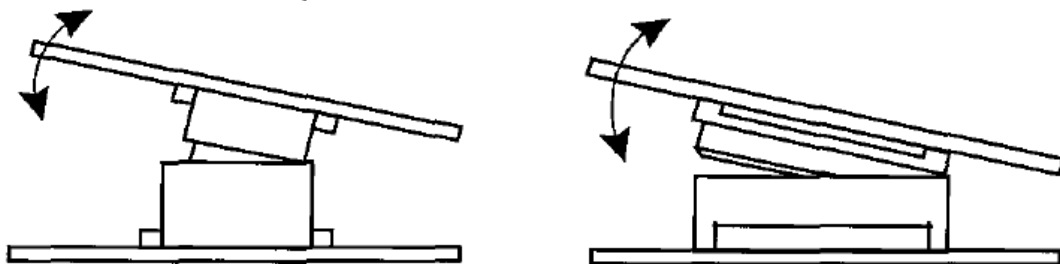
After sending AT+CPWROFF do not enter any other AT command. There are two ways to verify when the module turns off.

- * Wait for the "OK". It indicates that data have been stored in the non-volatile memory and the module turn off in less than 1 second.
- * Also, you can monitor the VIO pin. The low state of VIO definitely that the module is switched off.

When the module is in POWER OFF mode the application interface is switched off and must not be fed from any other source. Therefore, your application must be designed to avoid any current flow into any digital pins of the application interface.

2.15.4 Inserted and removal action direction

These models are made very thin so that they may be smaller in size and light in weight than before. Take care not to give them excessive force and insert by sliding when mating them together or un-mating them. Otherwise, breakage may result. To prevent damage from incorrect insertions please confirm the correct position before mating connection.



3. Getting Started

3.1 System requirement

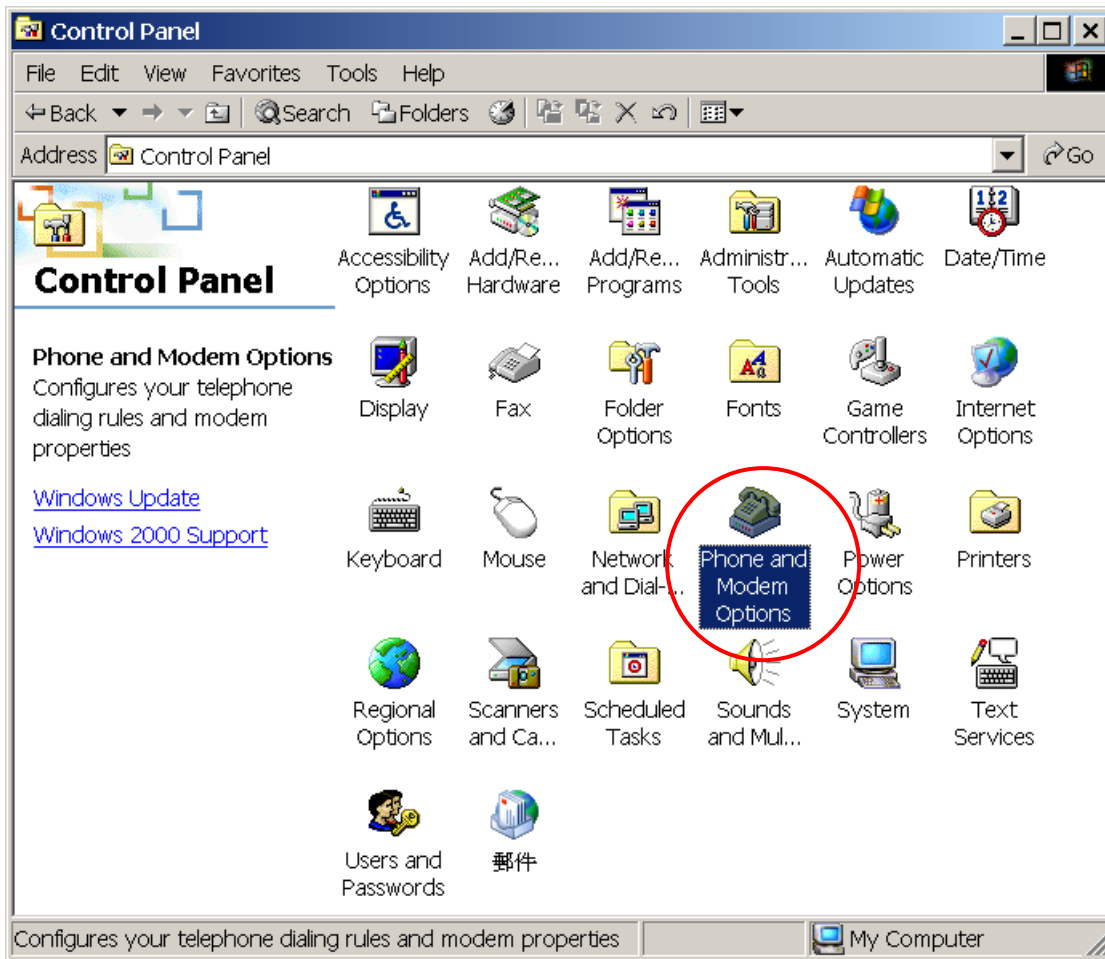
The following shows the operation by PC with Microsoft Window 2000, XP or Vista. The screen display for each procedure may be a little different for different operating system.

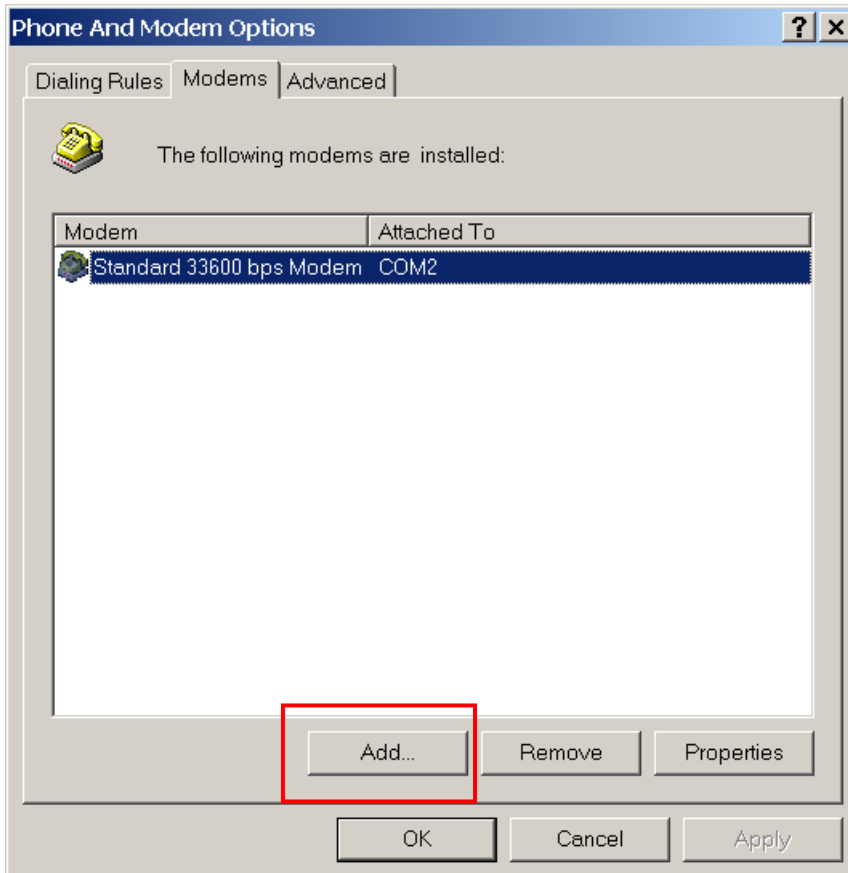
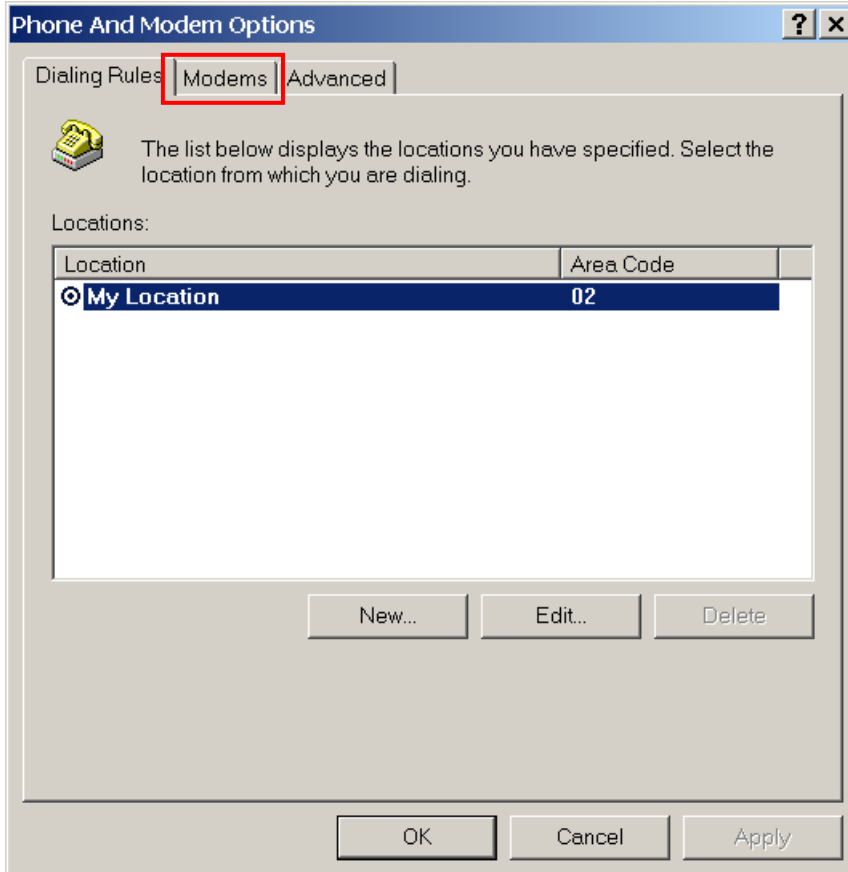
3.2 Driver installation

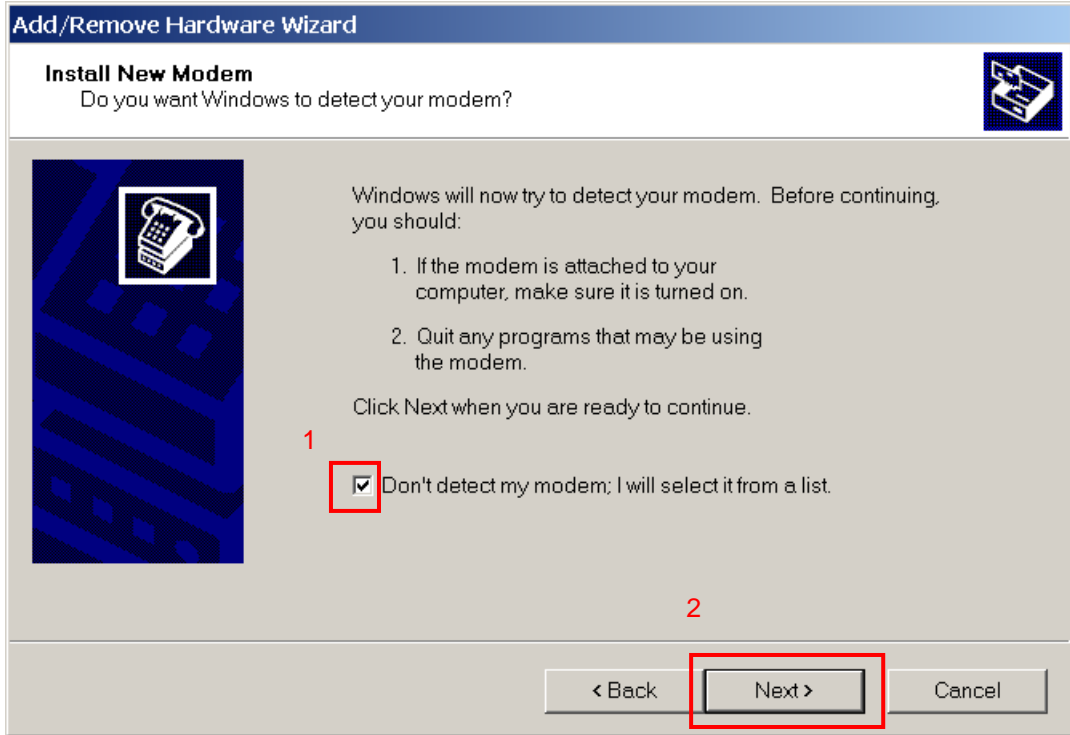
Please install "CP210x_VCP_Win2K_XP_S2K" driver on your PC before doing your Modem setting. The driver is for Silicon Laboratories' CP210X USB to UART Bridge chip in the device.

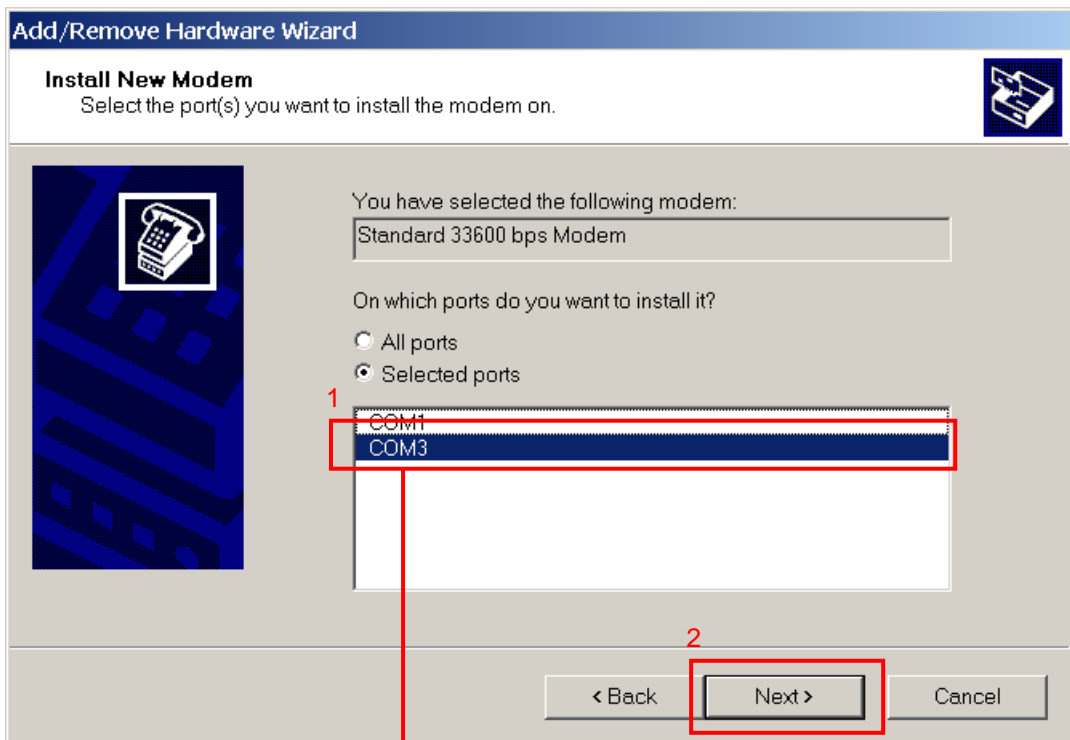
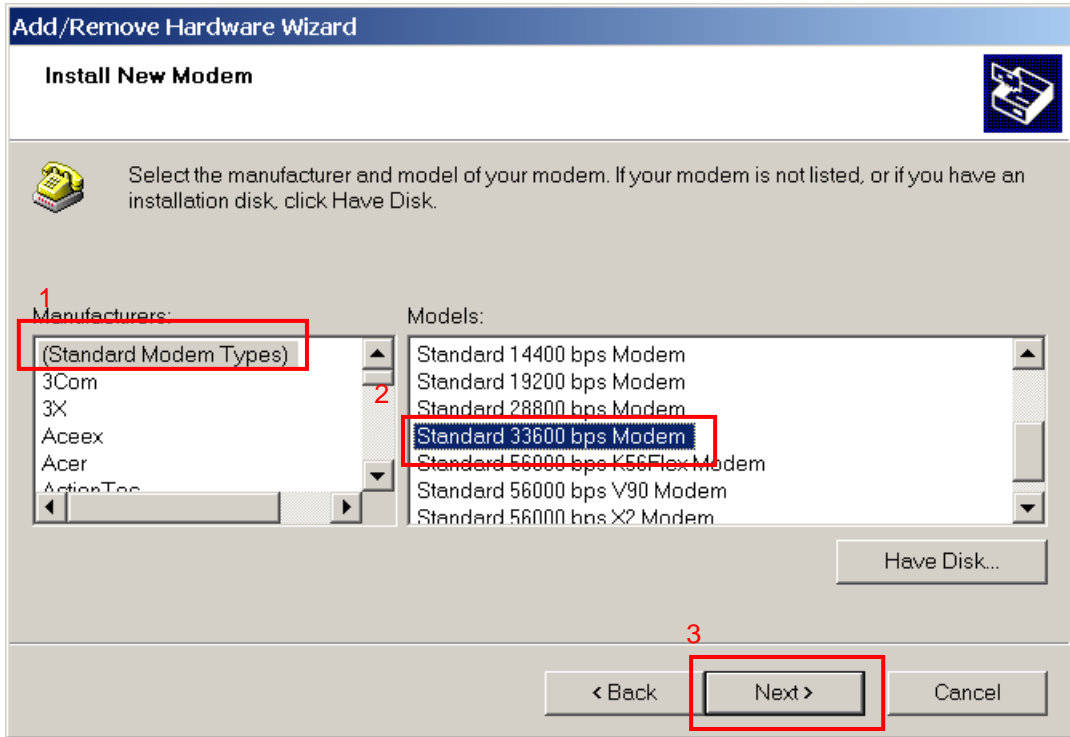
3.3 Modem setting

Please use "Control Panel" to install new modem.

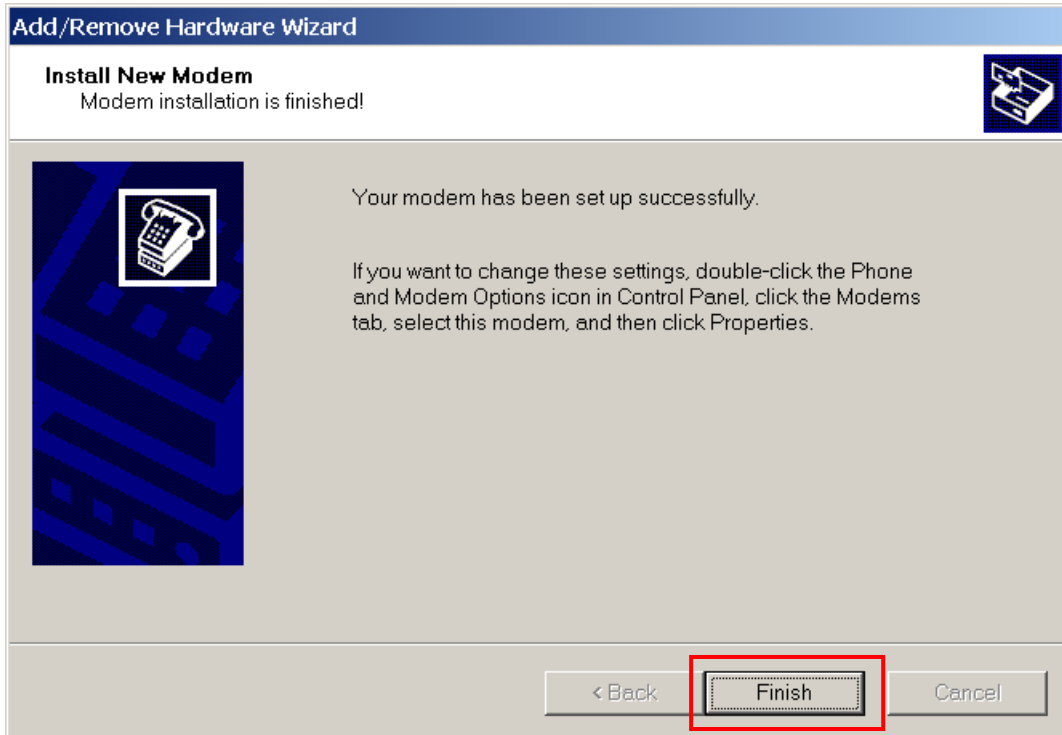






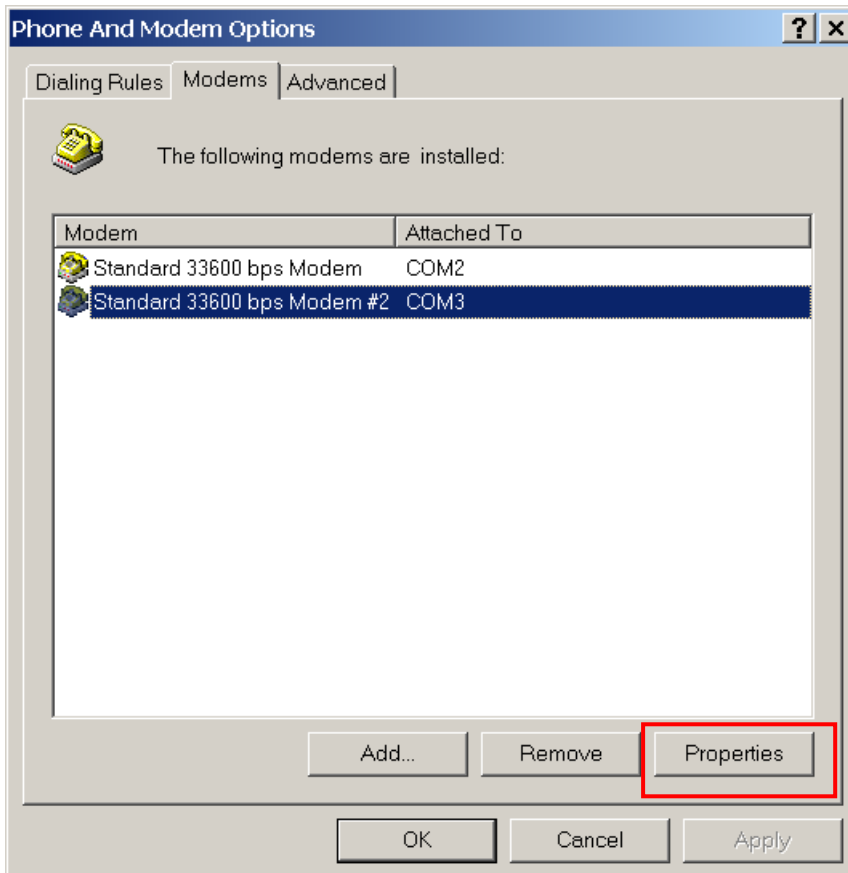


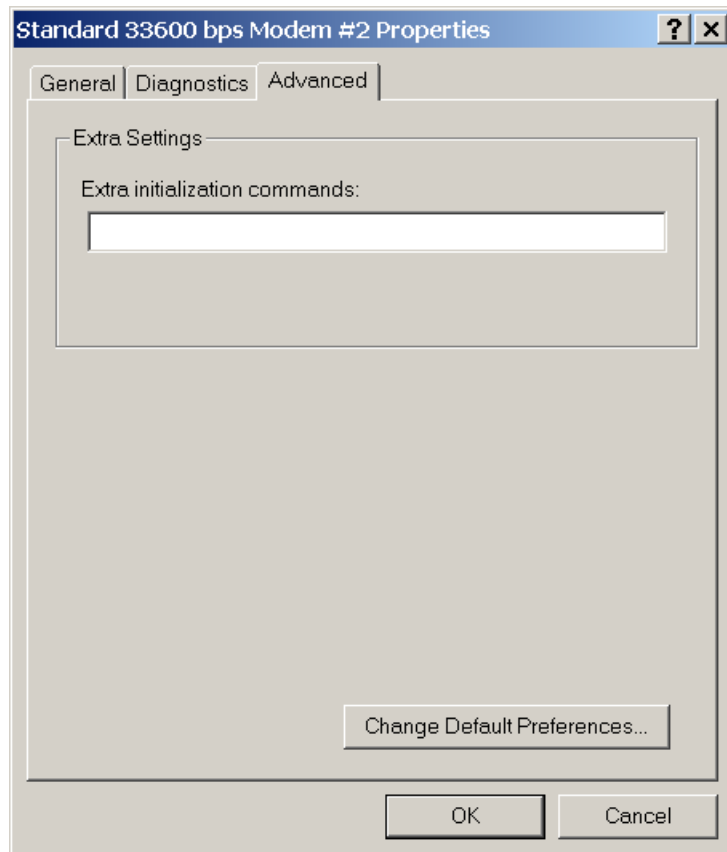
Select the COM port that you have installed "CP210x_VCP_Win2K_XP_S2K3" driver. For example: COM3 in the installation demo.

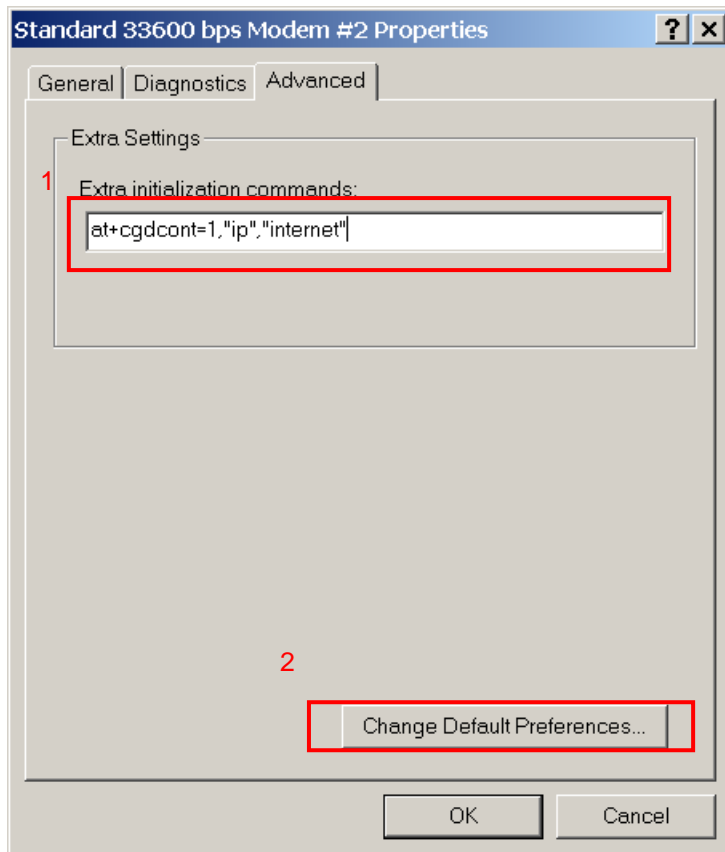


Your modem has been set up for the first step.

Next step, we will run advanced setting of modem.

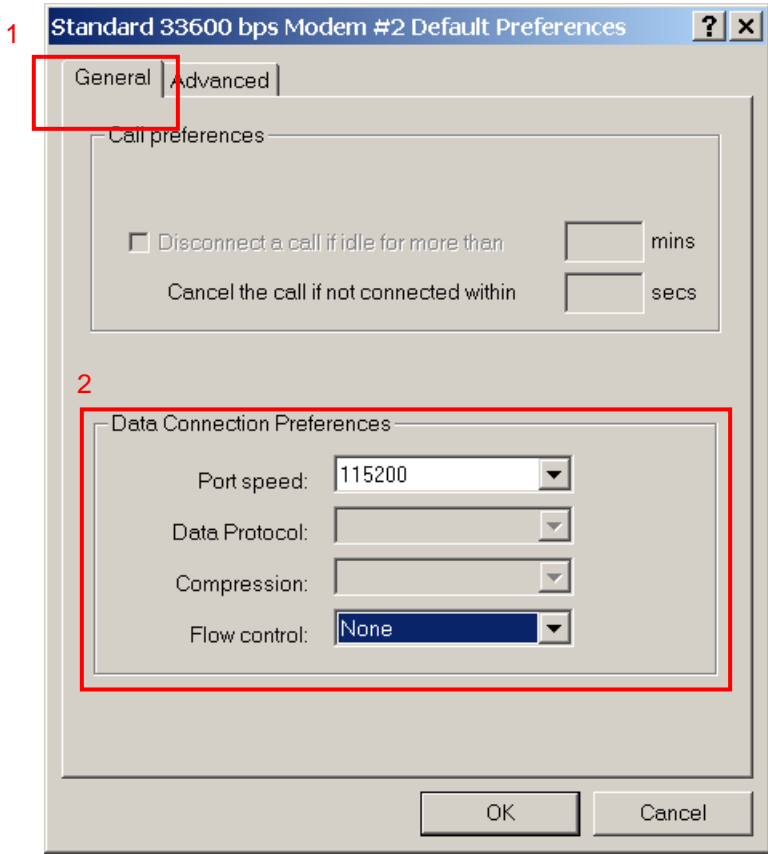




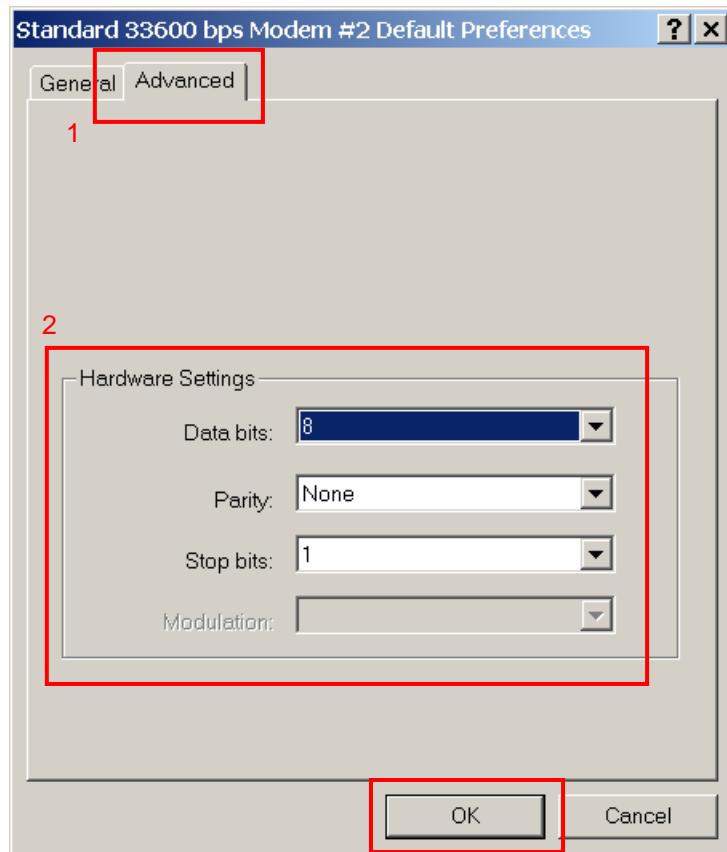


Typing into “at+cgdcont=1, “ip”, “internet” for extra initialization commands.

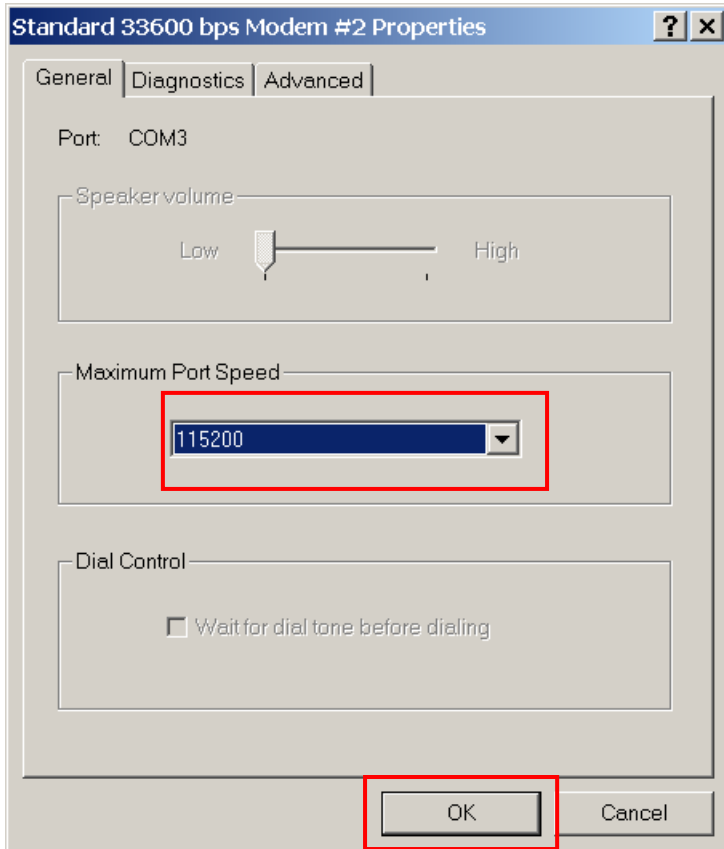
This command allows to specify specific PDP context parameter values for a PDP context.



Please make sure that the flow control is "None".

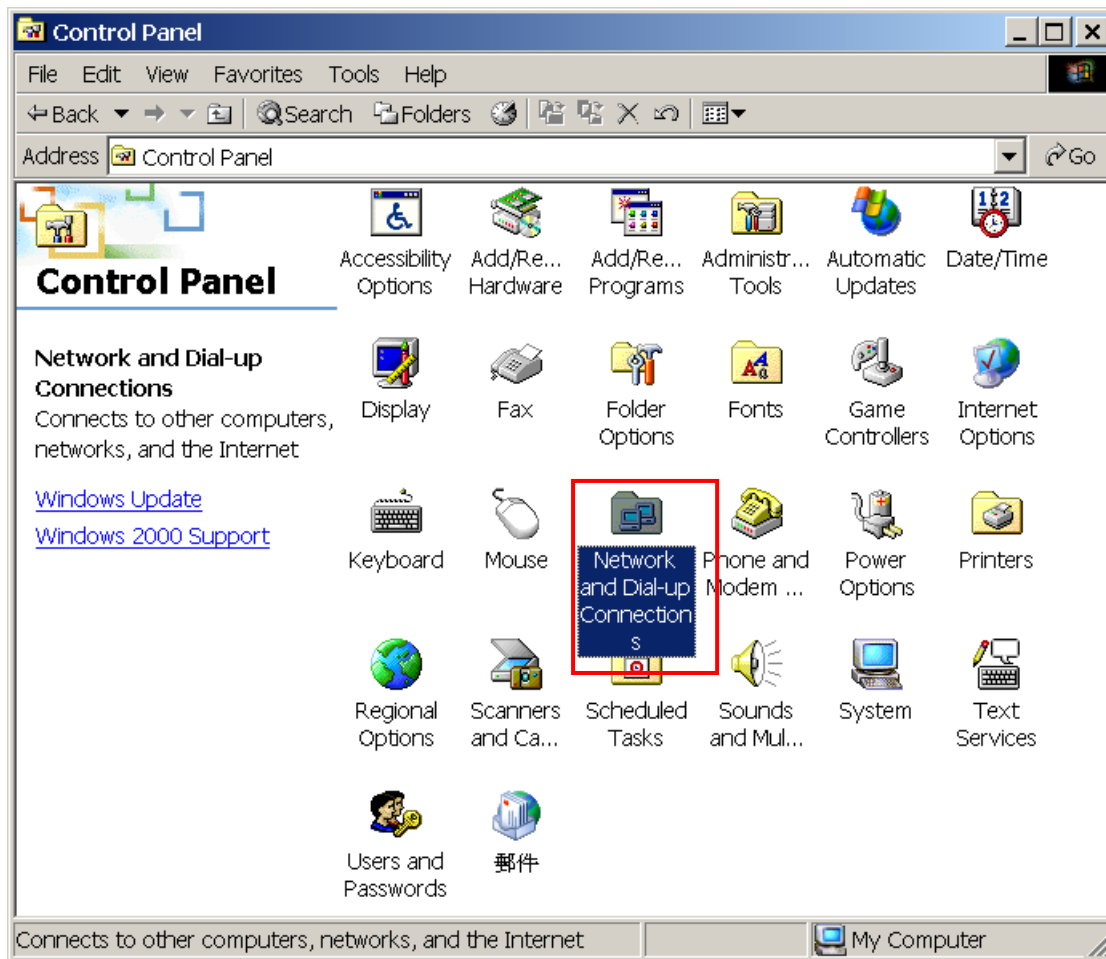


Please make sure that hardware settings are the same as above.

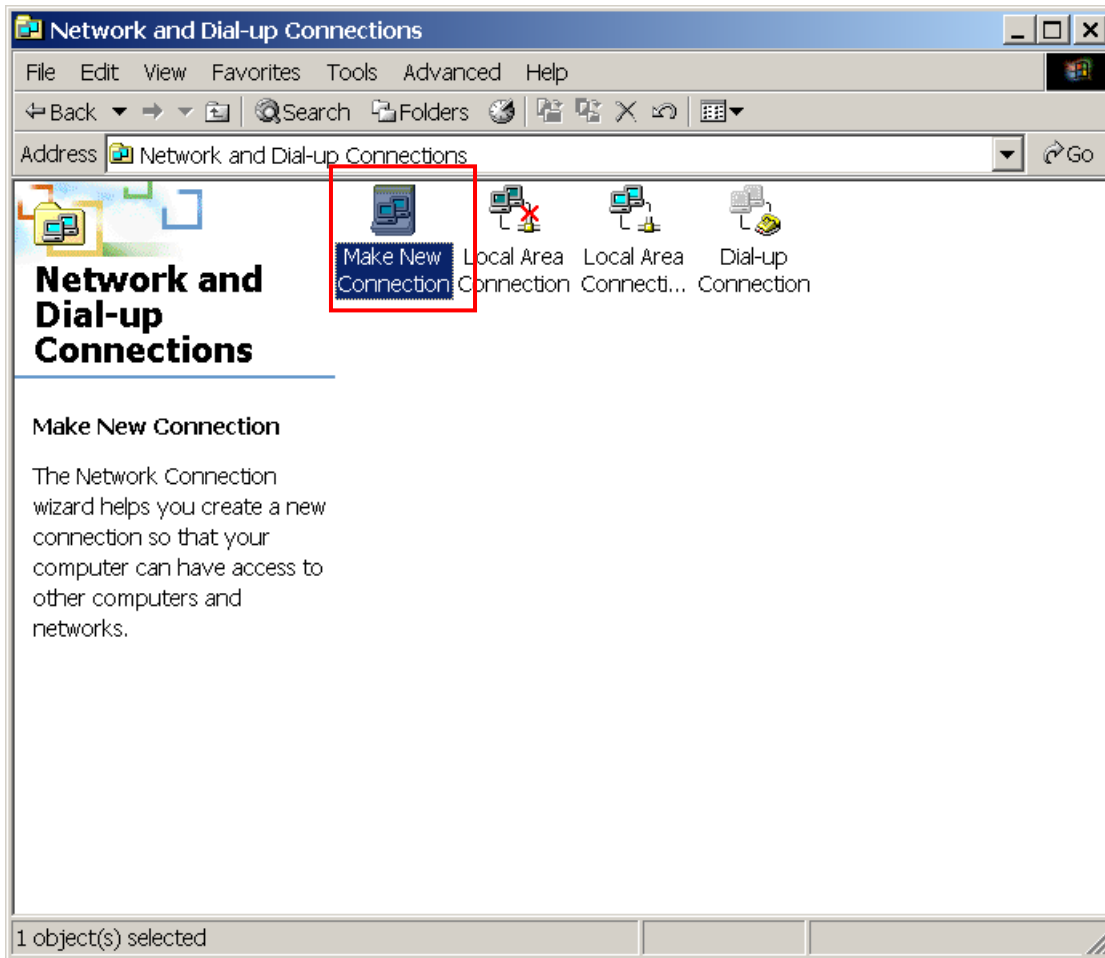


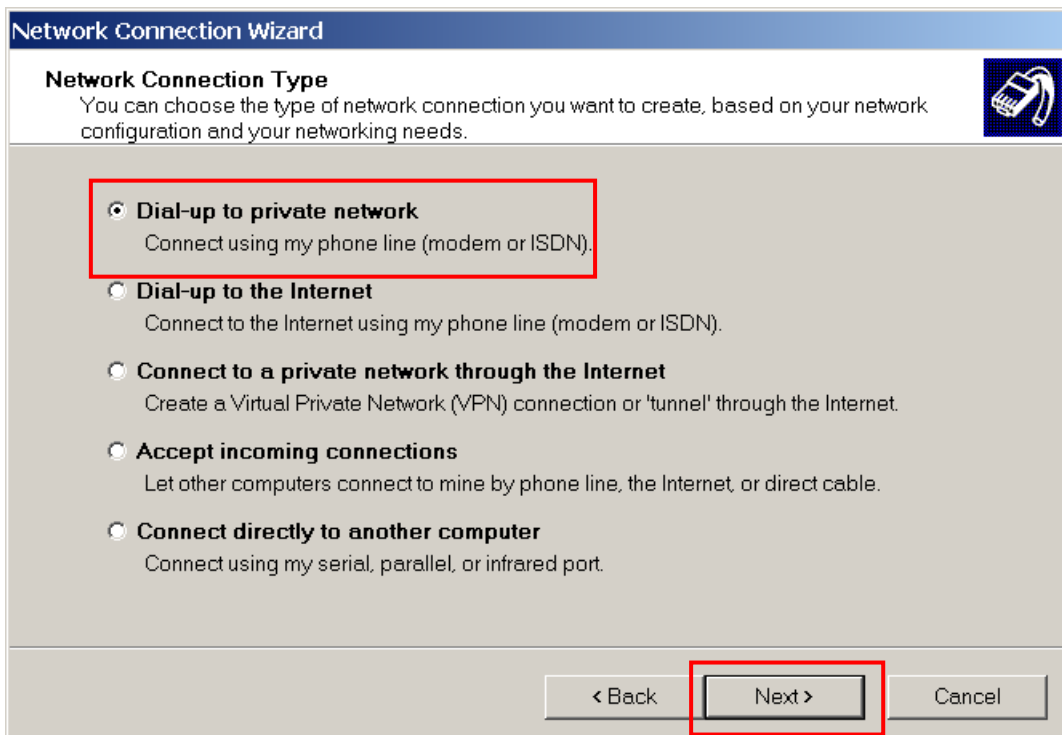
Please make sure maxmun port speed to be 115200.

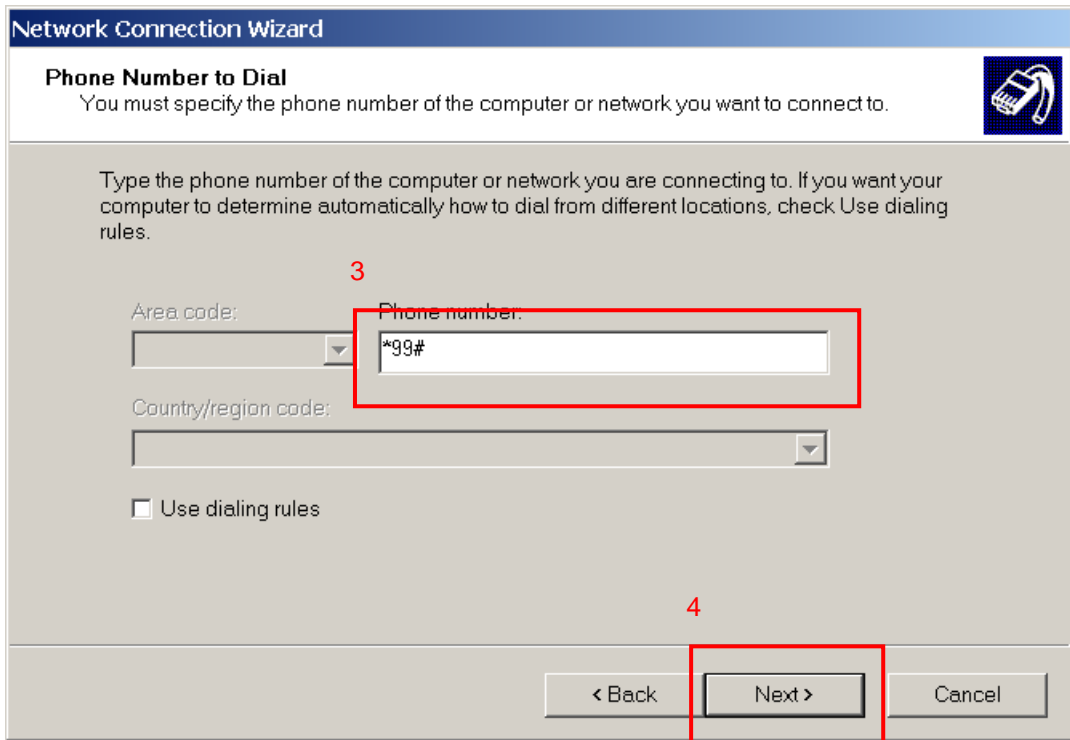
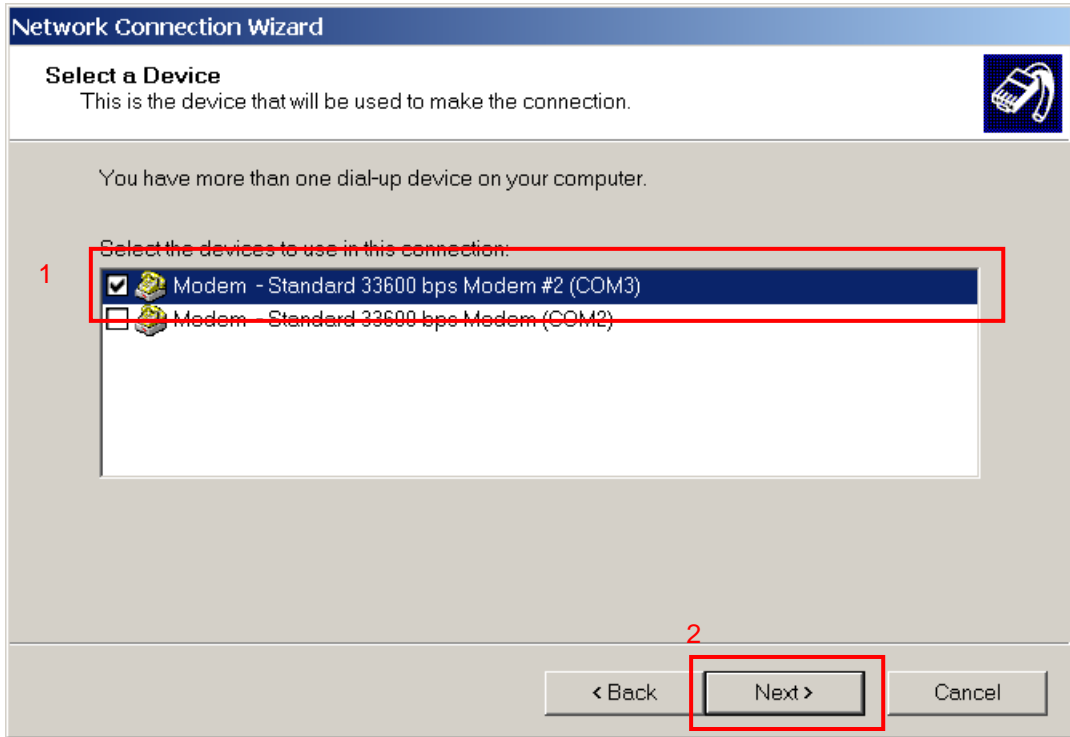
3.4 Network setting



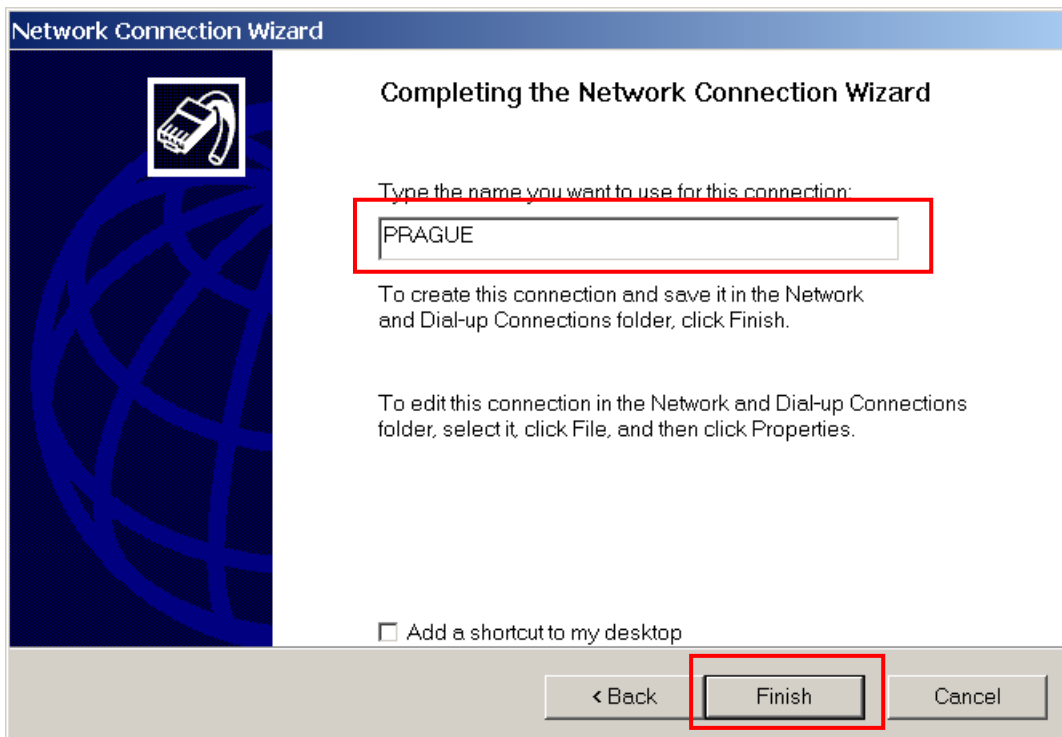
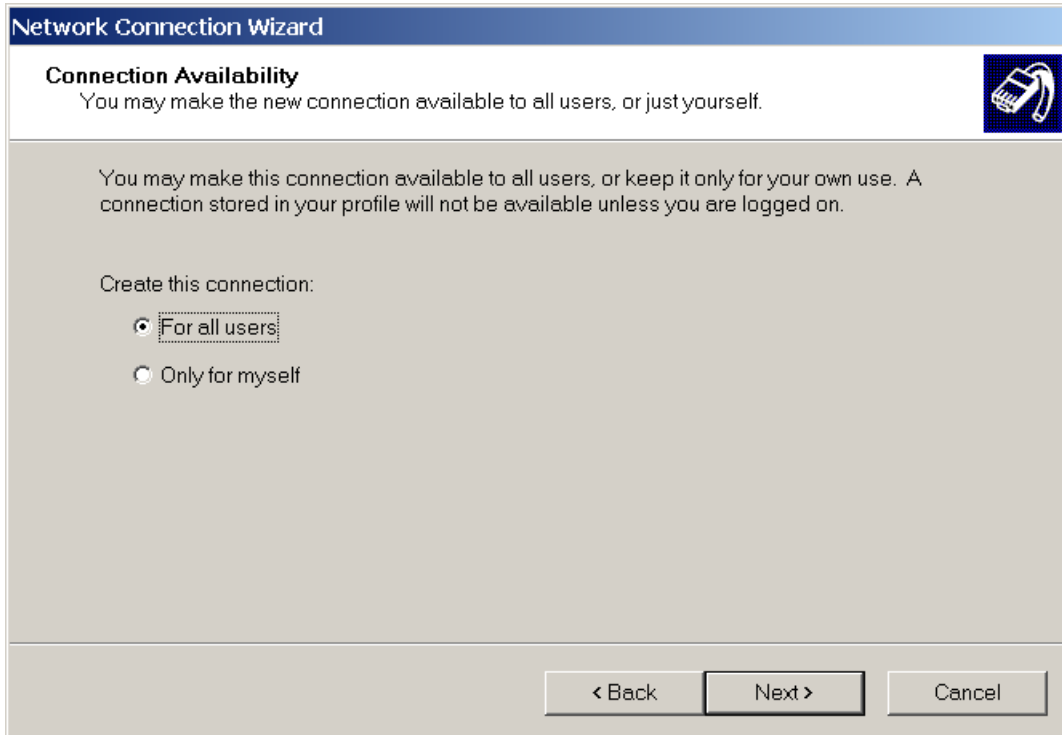
Double click "Network and Dial-up Connections" icon to run network setting.



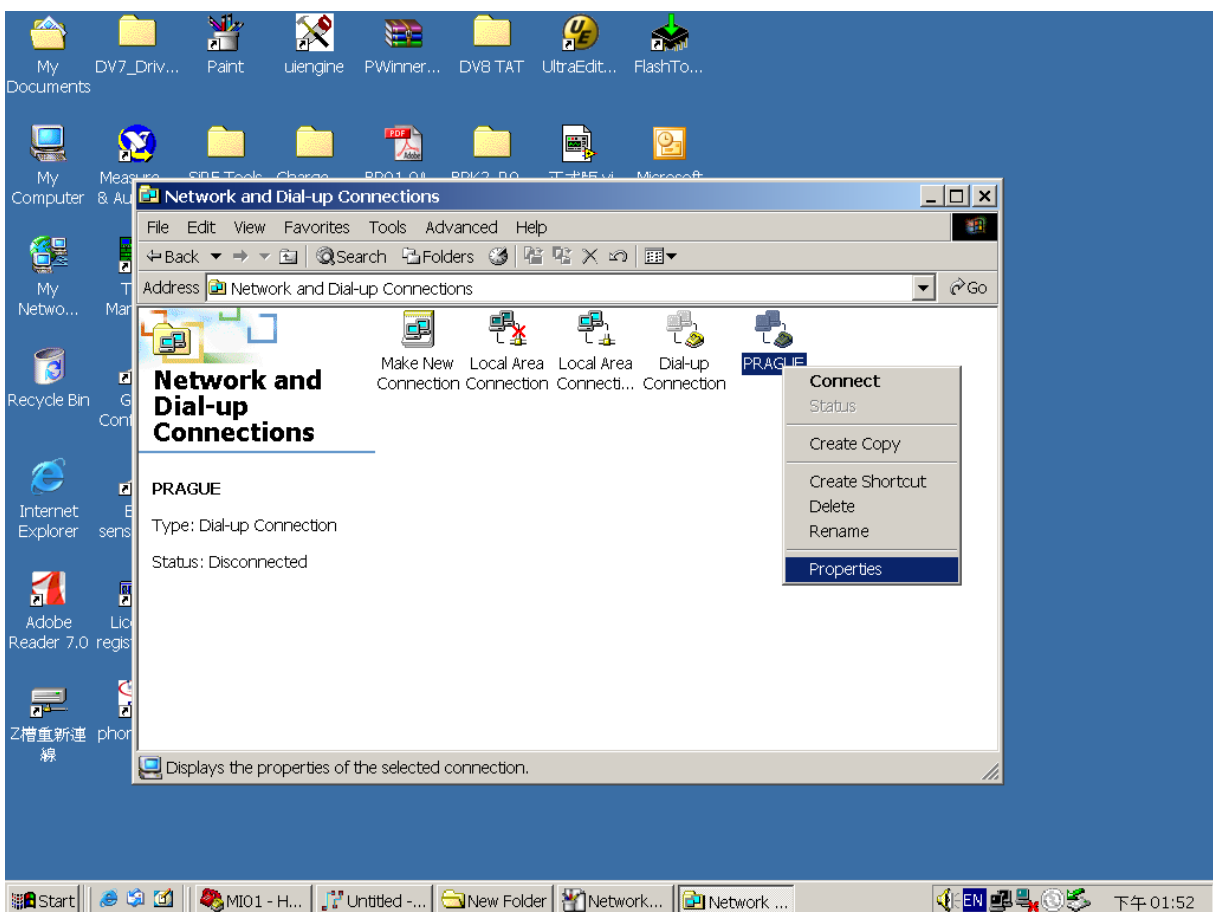
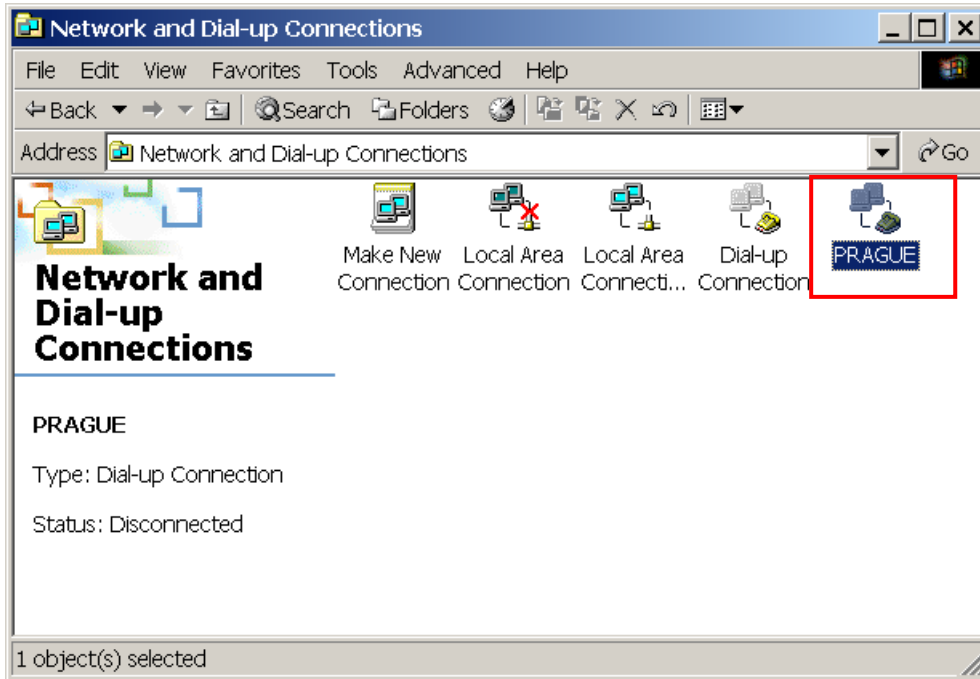




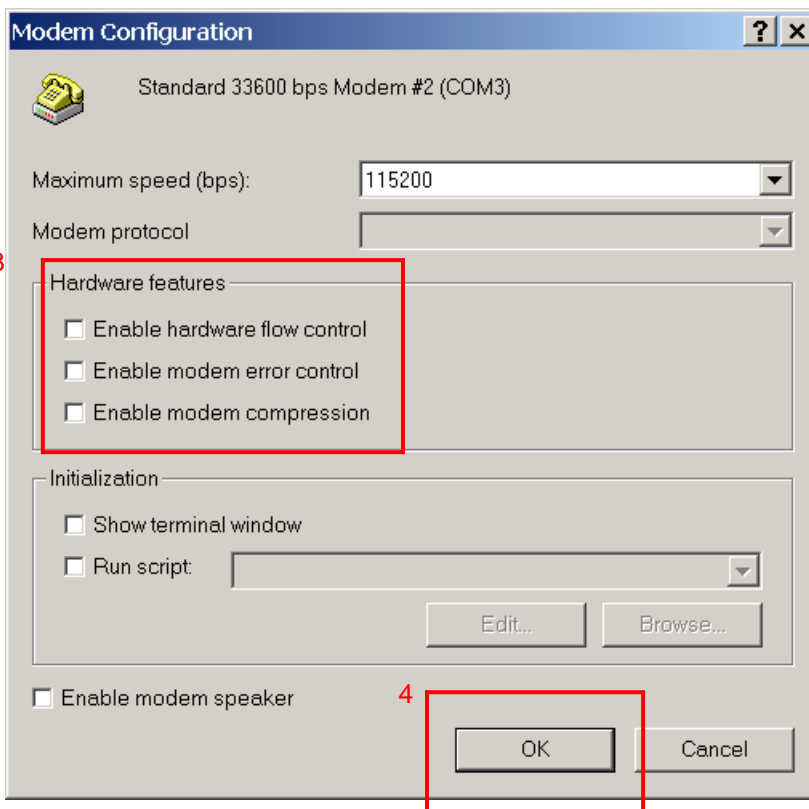
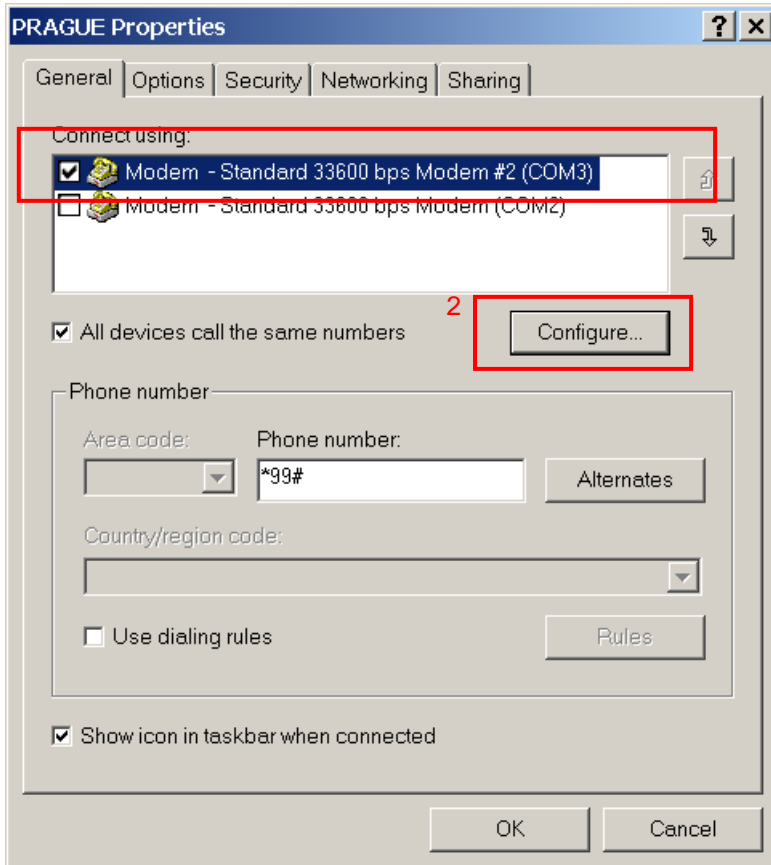
Please type “*99#” into phonebook number.



Type the name you want to use for this connection. For example: Prague

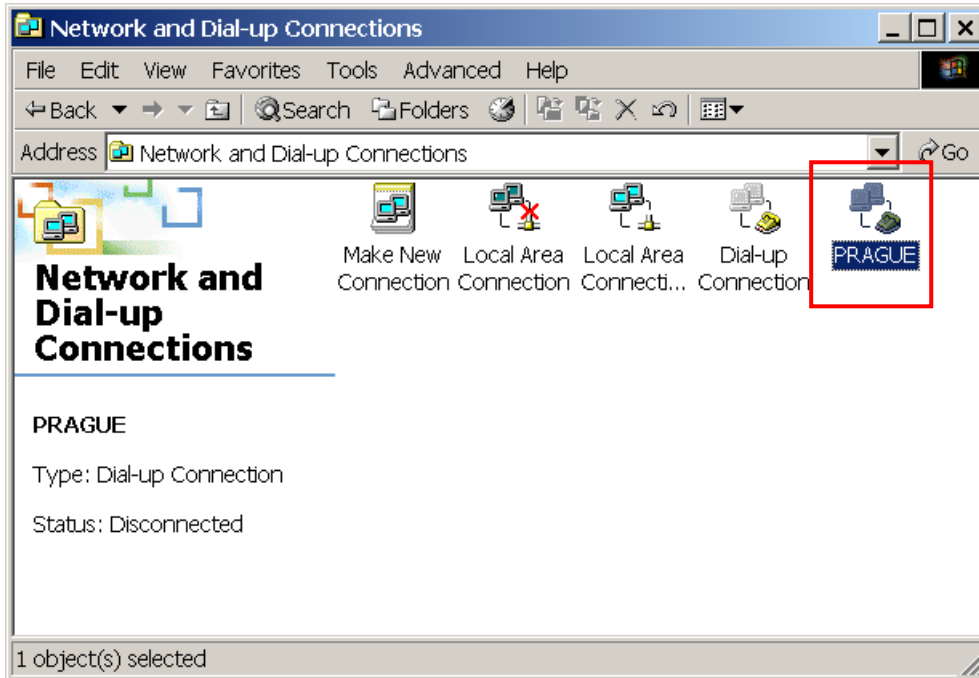


Pressing the right button of mouse on “Prague” connection icon, you need to change the properties.

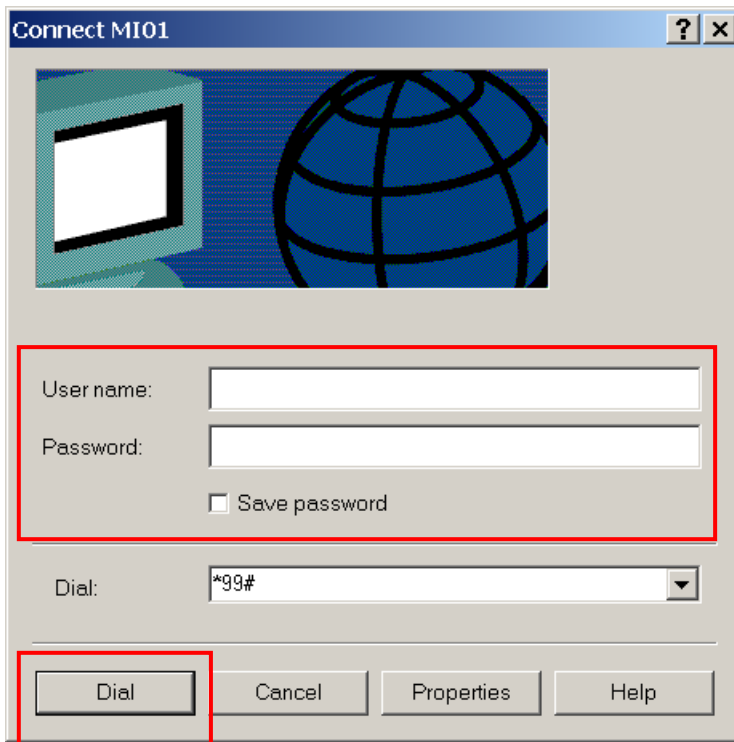


All hardware features of modem protocol should be disabled. Now, you have completed all modem and network setting. You can use Section 2.3 to dial up network directly in the future.

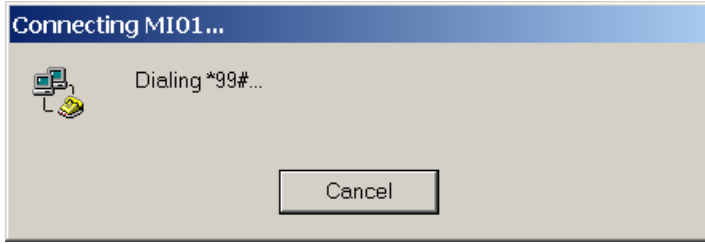
3.5 Dial-up network by HD Traffic Receiver 1 US



Pressing "Prague" icon to dial up network.



Keep empty for user name and password.



3.6 How to setup Hyper Terminal for AT commands

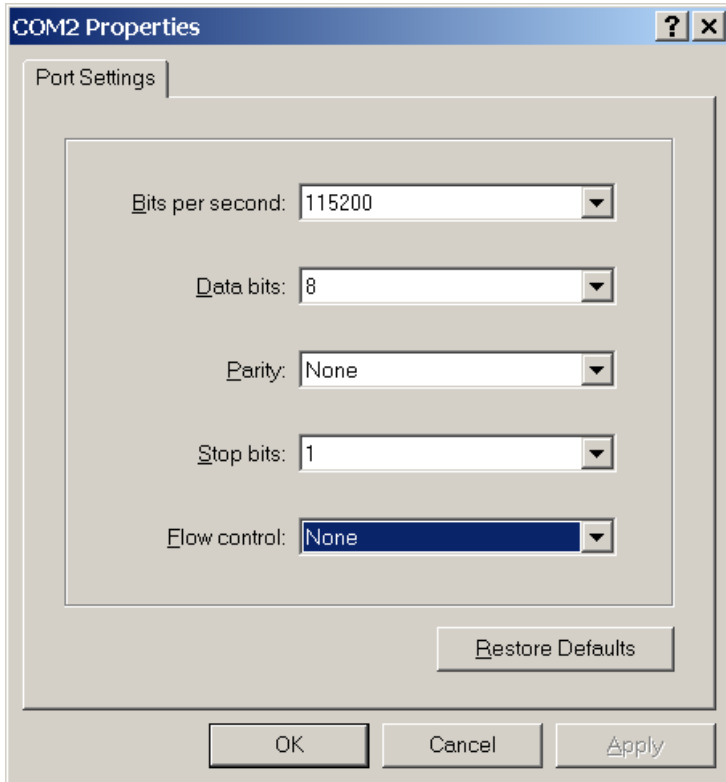
Run Hyper Terminal from Windows XP Start->Programs->Accessories->Communications->Hyper Terminal



Set the name for connection (e.g. "MI01_connection"), then press OK
 Select the PC serial port (for example COM2) , then press OK



Select the appropriate setting for MI01 data modem serial port setting; then select APPLY/OK.



If the HD Traffic Receiver module is power up, you type AT then the response must be OK.

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Annex A - AT command set for HD Traffic Receiver Module

1. General commands

- Manufacturer identification +CGMI
- Request model identification +CGMM
- Request revision identification +CGMR
- Request product serial number identification +CGSN
- Set TE character set +CSCS
- Request international mobile subscriber identification +CIMI
- Card identification +CCID
- Request complete capabilities list +GCAP
- Repeat last command A/

2. Call control commands

- Select type of address +CSTA
- Dial command D
- Select tone dialing T
- Select pulse dialing P
- Call answer A
- Hook control H
- Monitor speaker loudness L
- Monitor speaker mode M
- Call mode +CMOD
- Hangup call +CHUP
- Extended error report +CEER
- Tone duration +VTD
- DTMF and tone generation +VTS
- Redial last telephone number ATDL
- Automatic answer S0

3. Network service commands

- Subscriber number +CNUM
- Signal quality +CSQ
- Operator selection +COPS
- Network registration +CREG
- Preferred operator list +CPOL
- Read operator names +COPN

4. Security commands

- Enter PIN +CPIN
- Facility lock +CLCK
- Change password +CPWD

5. Mobile equipment control and status commands

- Phone activity status +CPAS
- Switch off MS +CPWROFF
- Set phone functionality +CFUN
- Battery charge +CBC
- Indicator control +CIND
- Mobile termination event reporting +CMER
- Clock +CCLK
- Alarm +CALA
- Delete alarm +CALD
- Restricted SIM access +CRSM
- Alert sound mode +CALM
- Ringer sound level +CRSL
- Speech volume level +CLVL

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- Mute control +CMUT
- Call meter maximum event +CCWE
- Set greeting text +CSGT
- Automatic Time Zone Update +CTZU
- Time Zone Reporting +CTZR
- Report mobile termination error +CMEE
- List all available AT commands +CLAC

6. Phonebook commands

- Select phonebook memory storage +CPBS
- Read phonebook entries +CPBR
- Find phonebook entries +CPBF
- Write phonebook entry +CPBW

7. Short messages commands

- Select message service +CSMS
- Preferred message storage +CPMS
- Preferred message format +CMGF
- Save settings +CSAS
- Restore Settings +CRES
- Show text mode parameters +CSDH
- New message indication +CNMI
- Read message +CMGR
- New Message Acknowledgement to ME/TA +CNMA
- List message +CMGL
- Send message +CMGS
- Write message to memory +CMGW
- Send message from storage +CMSS
- Set text mode parameters +CSMP
- Delete SMS +CMGD
- Service center address +CSCA
- Select cell broadcast message types +CSCB

8. Supplementary services commands

- Call forwarding +CCFC
- Call waiting +CCWA
- Calling line identification restriction +CLIR
- Calling line identification presentation +CLIP
- Connected line identification presentation +COLP
- Connected line identification restriction +COLR
- Advise of charge +CAOC
- Accumulated call meter +CACM
- Accumulated call meter maximum +CAMM
- Price per unit and currency table +CPUC
- Call related supplementary services +CHLD
- Call deflection +CTFR
- List current calls +CLCC
- Supplementary service notifications +CSSN
- Unstructured supplementary service data +CUSD
- Closed user group +CCUG
- Calling name presentation +CNAP

9. Data commands

- Select bearer service type +CBST
- Service class selection and identification +FCLASS
- Service reporting control +CR
- Cellular result codes +CRC
- Radio link protocol +CRLP

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10. V24 control and V25ter commands

- Reset to default configuration Z
- Set to factory defined configuration &F
- Circuit 109 behavior &C
- Circuit 108/2 behavior &D
- DSR override &S
- Flow control &K
- Store current configuration &W
- Display current configuration &V
- Designate a default reset profile &Y
- Request identification information I
- Request manufacturer Identification +GMI
- Request model identification +GMM
- Request revision identification +GMR
- Request product serial number identification +GSN
- DTE-DCE character framing +ICF
- DTE-DCE local flow control +IFC
- Set flow control \Q
- Fixed DTE rate +IPR
- Return to on-line data state O
- Escape character S2
- Command line termination character S3
- Response formatting character S4
- Command line editing character S5
- Pause before blind dialing S6
- Connection completion timeout S7
- Command dial modifier time S8
- Automatic disconnect delay S10
- Escape prompt delay (EPD) S12
- Command echo E
- Result code suppression Q
- DCE response format V
- Result code selection and call progress monitoring control X

11 Specific AT commands

- Production test command #
- GPRS cell environment description +CGED
- Switch trace ON/OFF +TRACE
- Select Band +XBANDSEL
- Set reporting call status +XCALLSTAT
- Display generation and SW version +XGENDATA
- Read counters of sent or received GPRS data +XGCNTSET
- Set/reset counter of sent or received GPRS data +XGCNTSET
- Set hands free mode +XHANDBFREE
- Call the L1-specific function +XL1SET
- Configuration trace and modem (AT) interfaces +XSIO
- ADC read command +NADC
- GPIO select configuration command +NGPIOC
- GPIO read command +NGPIOR
- GPIO set command +NGPIOW
- Ringer select command +NRNG
- Tone generator +NTGN (Tone GeNerator)
- Alert sound mode +NMSM (Message Sound Muting)
- Power saving control +NPSV (Power SaVing)

12. GPRS commands

- Define PDP context +CGDCONT
- GPRS event reporting +CGEREP
- Quality of service profile (requested) +CGQREQ
- Quality of service profile (minimum acceptable) +CGQMIN

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- GPRS attach or detach +CGATT
- PDP context activate or deactivate +CGACT
- Enter data state +CGDATA
- Automatic response to a network request for PDP context activation +CGAUTO
- Show PDP address +CGPADDR
- GPRS mobile station class +CGCLASS
- GPRS network registration status +CGREG
- Select service for MO SMS messages +CGSMS

13. TCP/IP AT Commands

- Packet Switched Data +NPSD
- Packet Switched Data Action +NPSDA
- Packet Switched Network Assigned Data +NPSND
- Circuit Switched Data +NCSD
- Circuit Switched Data Action +NCSDA
- Circuit Switched Network Assigned Data +NCSND
- Create Socket +NSOCR
- Set Socket Option +NSOSO
- Get Socket Option +NSOGO
- Close Socket +NSOCL
- Get Socket Error +NSOER
- Set Listening Socket +NSOLI
- Connect Socket +NSOCO
- Write Socket Data +NSOWR
- Read Socket Data +NSORD

14. Reference

3GPP TS27.007 Technical Specification Terminals; AT command set for User Equipment (UE); V3.11.0