

# Pluto GSM-GPRS Modem User Guide

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HW-debug-board-1.1

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MK00001

Department: Marketing

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## HISTORY

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Note:

1. The first release.
2. Replaced GPRS Modem install guide
3. Added SLM connector pin-outs
4. Removed text multiple version numbers; added note on 'access point node'.
5. Added volume level AT command info

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## 1. Objective

This document describes the Pluto GSM-GPRS modem features, interfaces, and specifications. It includes the installation procedure for Microsoft Windows XP-based notebooks and PCs. Normal modem interaction is achieved through a notebook/PC dial-in, to access the AT-command set via a serial link, e.g. for access to the internet or dialing a call.

Note that GSM-only users should ignore all references to GPRS functionality and features.

The suppliers take no responsibility for modem operation unless these guidelines are correctly followed. If in doubt, please refer to your supplier.

## 2. References

- [1] CCWW/UG/103: AT-command Set (us\_ds.pdf)
- [2] SLM-MB\_User\_Manual\_V1.0.3: Pluto\_MB\_Modem\_User\_Manual

## 3. Important Notices

1. Damage to the RF power-amp may occur if the modem is powered-up without a suitable antenna, or the antenna is disconnected whilst the modem is powered. Note the modem may be supplied with an in-built helix antenna (right-hand picture in 4.2 below) or with a connector (left-hand picture) for an external antenna.
2. If the modem is being correctly operated, and yet does not provide a connection to the internet from your PC, please check your PC fire-wall settings.

## 4. Introduction

### 4.1 Overview

The Pluto (Single-chip Terminal Architecture) GSM-GPRS Modem provides a high-performance, innovative, flexible and comprehensive platform that uses the Silicon Laboratories' AeroFONE™ 4904 device, providing the most cost-effective and best time-to-market solution for terminal developers creating GSM-GPRS modem-based products.

### 4.2 Description of Hardware

The Pluto GSM-GPRS Modem (SLM-GG) is a self-contained modem with an AT-command interface. It is shown below:



SLM-GG uses a SMD-type connector to plug into a mother-board with the following pin configuration:

J2_1				J3_1			
PIN NO.	NAME	I/O	Description	PIN NO.	NAME	I/O	Description
1	KEYIN0	I	Keypad input	1	VBATT	I	Battery Voltage
2	KEYOUT0	O	Keypad Output	2	VBATT	I	Battery Voltage
3	KEYIN1	I	Keypad input	3	VBATT	I	Battery Voltage
4	KEYOUT1	O	Keypad Output	4	GND	P	Power GND
5	KEYIN2	I	Keypad input	5	GND	P	Power GND
6	KEYOUT2	O	Keypad Output	6	GPIO5	I/O	General Purpose I/O
7	KEYIN3	I	Keypad input	7	GPIO2/EXTBOOT	I/O	General Purpose I/O/External Boot
8	KEYOUT3	O	Keypad Output	8	GPIO38/I2C_SCL	I	GPSR Clock
9	SYSRST#	O	System Reset Output(Active)	9	GPIO3	I/O	General Purpose I/O
10	KEYOUT4	O	Keypad Output	10	NRESET#		

11	BATT_THERMISTOR	I	Battery Temperature Detection	11	GPIO6	I/O	General Purpose I/O
12	KEYOUT5	O	Keypad Output	12	GPIO39/I2C_SDA	I/O	GPSR I/O
13	EAR_OUTN/HEADSET_R	O	Headset Output R-CH	13	GPIO57/SIM_PRESENSE	I	SIM Present? Input
14	GND	P	Power GND	14	GPIO49/SSI_OUT	O	SSI Serial Data
15	EAR_OUTP/HEADSET_L	O	Headset Output L-CH	15	SIM_RST	O	Active low reset output for SIM card
16	UART1_TD	O	Transmitted data	16	GPIO50/SSI_DATA	I/O	SSI Rx and Tx Data
17	GND	P	Power GND	17	SIM_DIO	I/O	Data I/O for SIM card
18	UART1_CTS	I	Clear to send	18	GPIO48/SSI_CLK	O	SSI Serial Data Clock
19	HSO_OUTP	O	Receiver Output(+)	19	SIM_CLK	I	SIM clock output
20	UART1_RTS	O	Request to send	20	GPIO51/SSI_SEL0	O	SSI Serial Select Line Output
21	HSO_OUTN	O	Receiver Output(-)	21	PWM1	O	PWM Out-Vibrator
22	UART1_RD	I	Received data	22	PWM0	O	PWM Out-Backlight
23	VCM_OUT	O	Headset Common Mode Output	23	GND	P	Power GND
24	AUX_PONKEY	I	Aux Power On Key(System)	24	UART0_DCD	O	Data Carrier Detect Output
25	LINEOUT_P	O	Line Driver Output(+)	25	UART0_RI	O	Ring Indicator
26	HEADSET_MIC	I	External(Headset)Microphone Input	26	UART0_RTS	I	Request to send
27	LINEOUT_N	O	Line Driver Output(-)	27	UART0_RD	O	Received data to external device
28	INTMIC_P	I	Voice Band Microphone Input	28	UART0_TD	I	Transmitted data from external device
29	GND	P	Power GND	29	UART0_DSR	O	Data set ready
30	SYSCLK_OUT	O	32KHz or System Clock Output	30	UART0_DTR	I	Data terminal ready
31	VCHG	I	Charger voltage input	31	UART0_CTS	O	Clear to send
32	GND	P	Power GND	32	GPIO8	I/O	General Purpose I/O
33	VCHG	I	Charger voltage input	33	VSIM		VDD SIM
34	VCHG	I	Charger voltage input	34	VBAT_RTC	I	RTC battery voltage input(coin cell)

SLM-GG is supplied with its GSM-GPRS protocol stack and drivers installed, ready to use. It supports a standard set of AT-commands, described in CCWW/UG/103 with examples given in Ch.8 of this guide.

For evaluation and onward development, SLM-GG is supplied with a mother-board (SLM-MB), a mains-powered DC supply, and 2 UART cables for connection to notebook/PC. Please refer to the Pluto Modem Mother Board User-Manual [2] for further information.

### 4.3 Operating the SLM-GG

SLM-GG can be used in conjunction with a customer's own mother board, or with CCAsia's mother board (SLM-MB) described in [2], supplied with the Pluto Modem Evaluation Kit (SLM-EVK).

When the modem is powered up:

1. Type AT into the notebook/PC AT-command window; the modem will reply with 'OK'
2. Follow operations described in Ch.7 and see also examples in CH.8 in this guide.

3. Always type 'AT+CPWROFF' and await the response: 'Now Safe to Switch off' before switching off the power supply.
4. Use the following command to adjust handset volume:
  - AT+CLVL=<n> where n is an integer from 1 to 10; 10 is max volume
5. Please report any problems with the installation and operation to your supplier, who will expect a report to contain:
  - A description of operations leading up to the problem
  - Information from the notebook/PC configuration
  - Transaction history from the notebook/PC (and where appropriate, jHAT log-file)

## 5. Features

### Single chip solution

#### Processor

- ARM9 156MHz

#### RTOS

- Nucleus Plus for ARM9

#### Quad Band

- E- GSM 900 and DCS 1800
- GSM850 and PCS 1900

#### GPRS

- Class 12, Class B
- Coding scheme CS1 to CS4
- Nucleus NET and PPP

#### Keypads

- 5 x 5

#### Audio

- Speech codec: HR/FR/EFR/AMR
- Echo Cancellation + noise reduction
- Microphone (not supplied)
- Hand free Speaker (not supplied)
- Earphone (not supplied)

#### SMS

- Support Text and PDU mode

## 6. Interfaces

### SIM Interface

- 1.8V/2.8V SIM interface

### Peripheral interfaces

- 4-wire SPI
- 2 UART – Maximum baud rate up to 115.2Kbps

- I2C – Maximum rate up to 400kbps
- 2PWM – Vibrator and LCD backlight control
- 5 G PIOs:
  - GPIO: For Code Download
  - GPIO: For Audio Amp shutdown control.
  - GPIO: For customer use
  - GPIO: For memory power setting
  - GPIO: For customer use
- Reset Pin
- Power On Pin
- 13 MHz or 32.768KHz output

## 7. Specifications

### Transmit Power

Class 4  
(2W@850/900MHz)

### Power Supply

- Operating voltage 3.6 ~ 4.5V, Typical 3.9V
- Battery charge management is included

### Connector

- 60pins, Dual 2 x 17 female header pitch 1.27mm

### Antenna

- RF connector

### Real time Clock

### JTAG interface for development

### Modem Module

- Overall dimensions:
  - 40 x 40 x 3.3 mm (without antenna)
  - 40 x 40 x 6.5 mm (with supplied helix antenna)



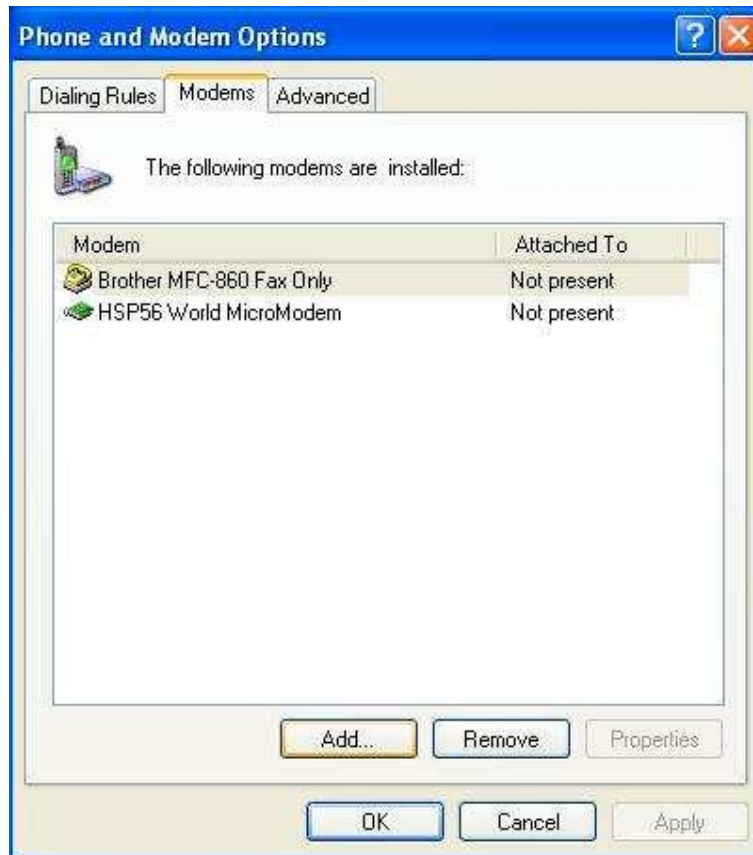
## 8. Notebook/PC Installation

### 8.1 Add a new modem

Navigate to Control Panel (usually accessible from the Start Menu) and Open 'Phone and Modem Options'.



On the following Dialogue box click 'Add...' to begin the 'add new hardware' wizard.



## 8.2 Installing the CCww Modem Driver

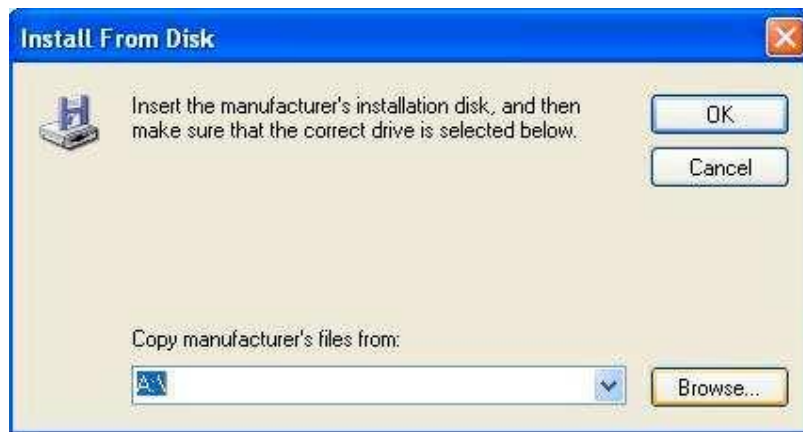
On the first screen of the wizard check the tick box next to 'Don't detect my modem; I will select it from a list' and click 'Next >'.



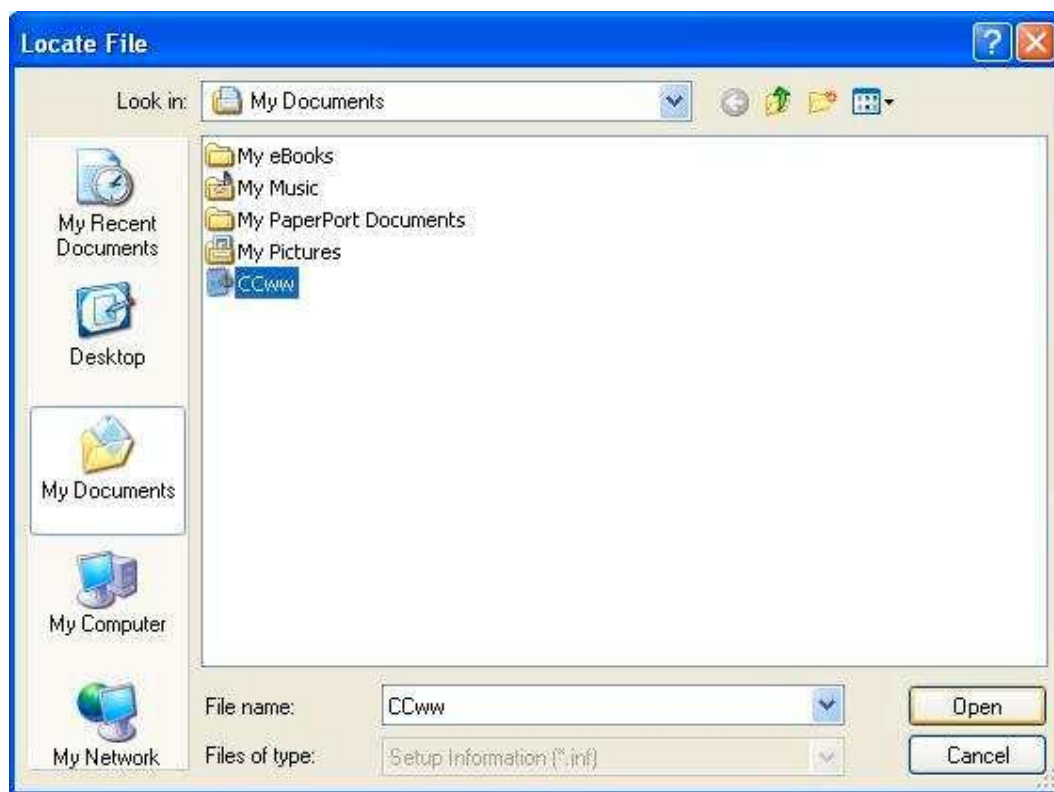
In the following dialogue box click 'Have Disk...'.



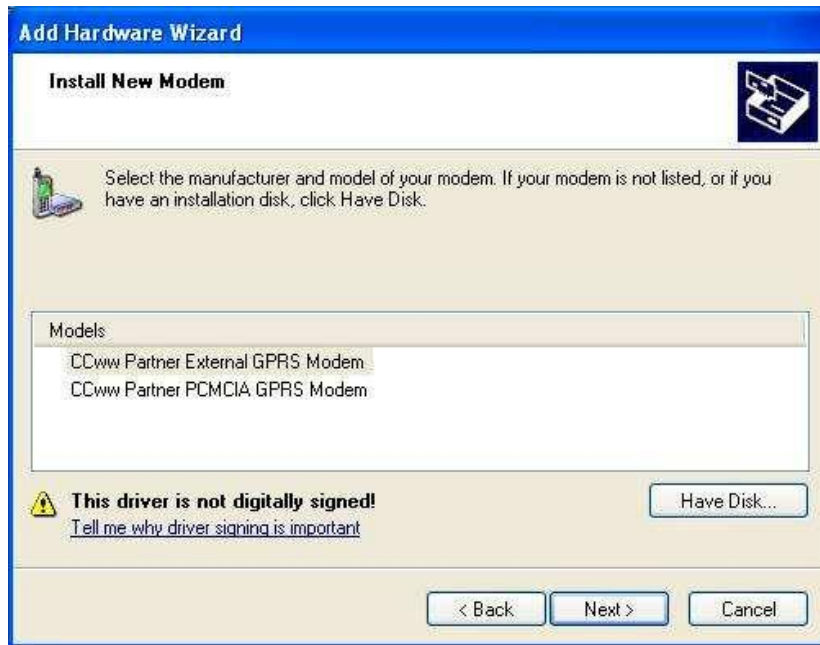
If you know the location of the driver file (Ccwv.inf) you can enter it in the text box below. Alternatively click 'Browse...':



Clicking 'Browse..' in the above will open up a 'Locate File' dialogue box allowing you to manually search the file system. Upon locating the file click 'Open'.



On the following Dialog select 'CCww Partner External GPRS Modem' and click 'Next >'.



On the following dialogue box select the radio button 'Selected ports' and select the COM port to which the modem is attached to (if the modem is attached to an on-board serial port on the back of a laptop or computer this will typically be COM1).  
Click 'Next >'.



During the installation the following warning will appear; this is normal. Click 'Continue Anyway'.

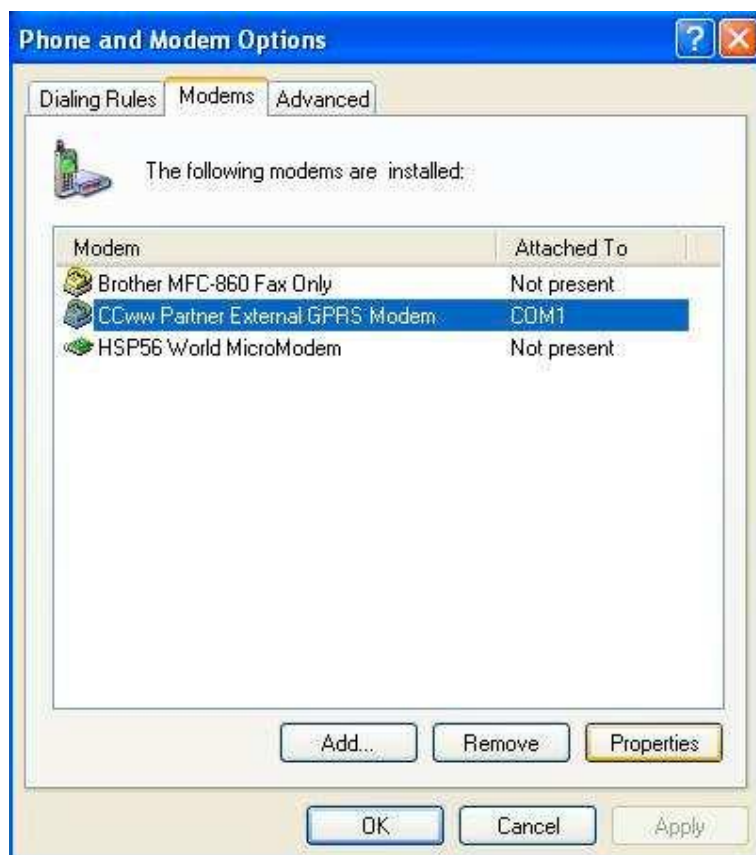


Click 'Finish' to complete the installation.



After the installation you will be returned to the 'Phone and Modem Options' dialogue and you will see your new modem below.

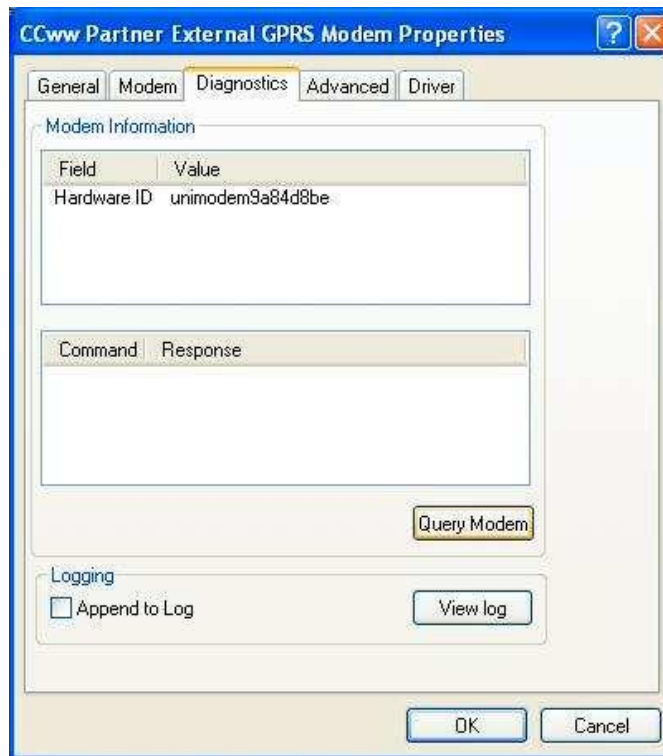
Select the 'CCww Partner External GPRS Modem' and click 'Properties'.





### 8.3 Checking Modem Connection

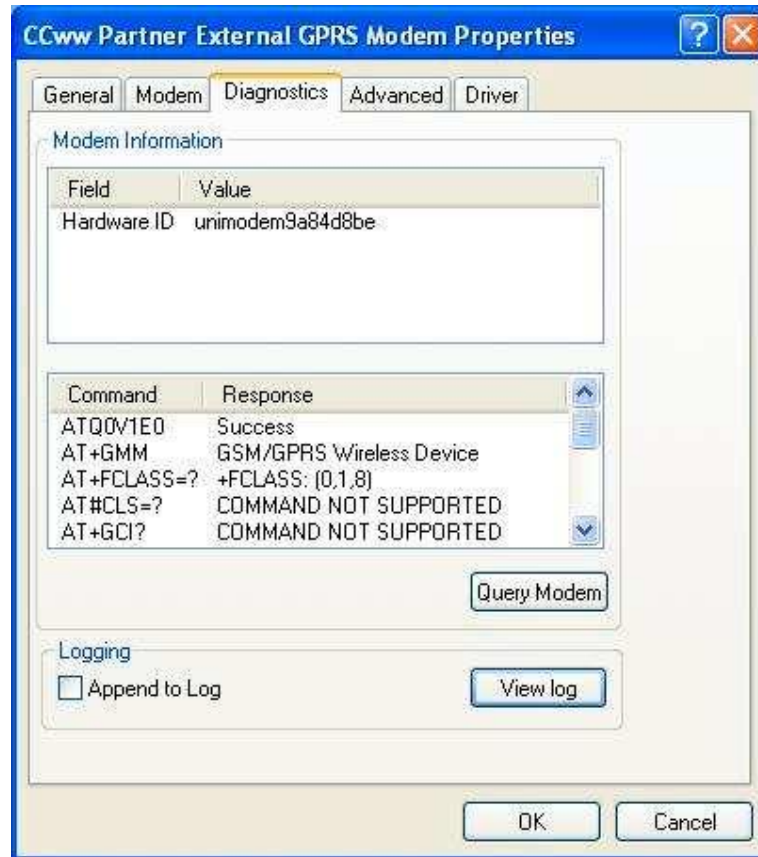
On the Diagnostics tab click 'Query Modem' to check the connection.



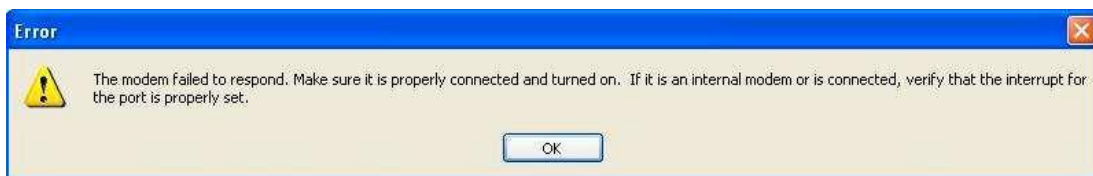
If the Modem is working fine you will see the following message.



And you will see the following output in the dialog box



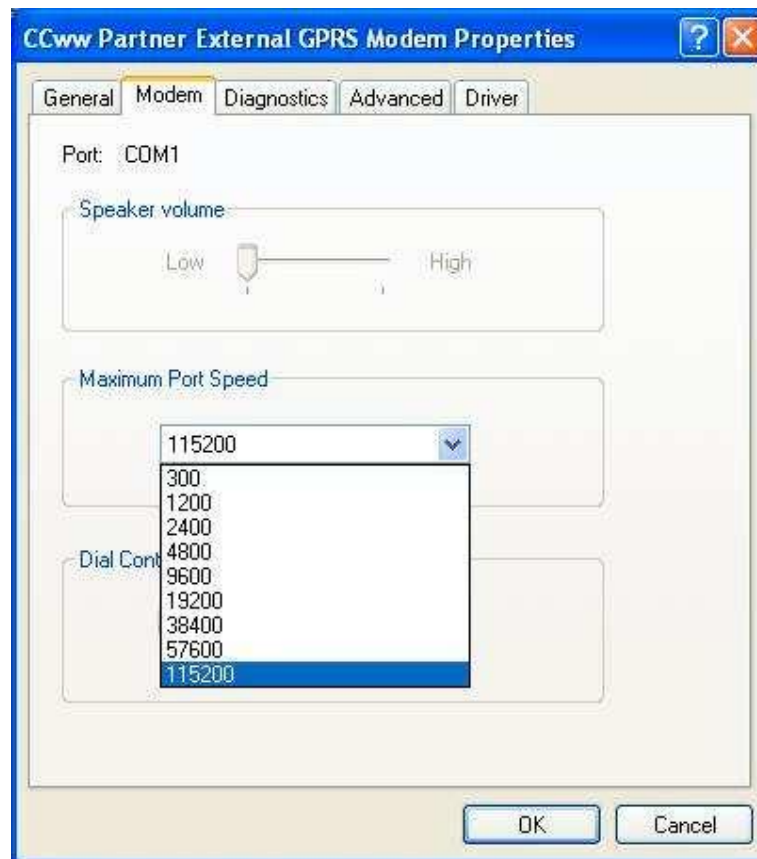
If you see the following error make sure you selected the correct COM port, and verify the modem is on and the port settings are correct.





## 8.4 Configuring Port Speed

Click the 'Modem' Tab on the 'Properties' dialogue and select '115200' as the maximum port speed.

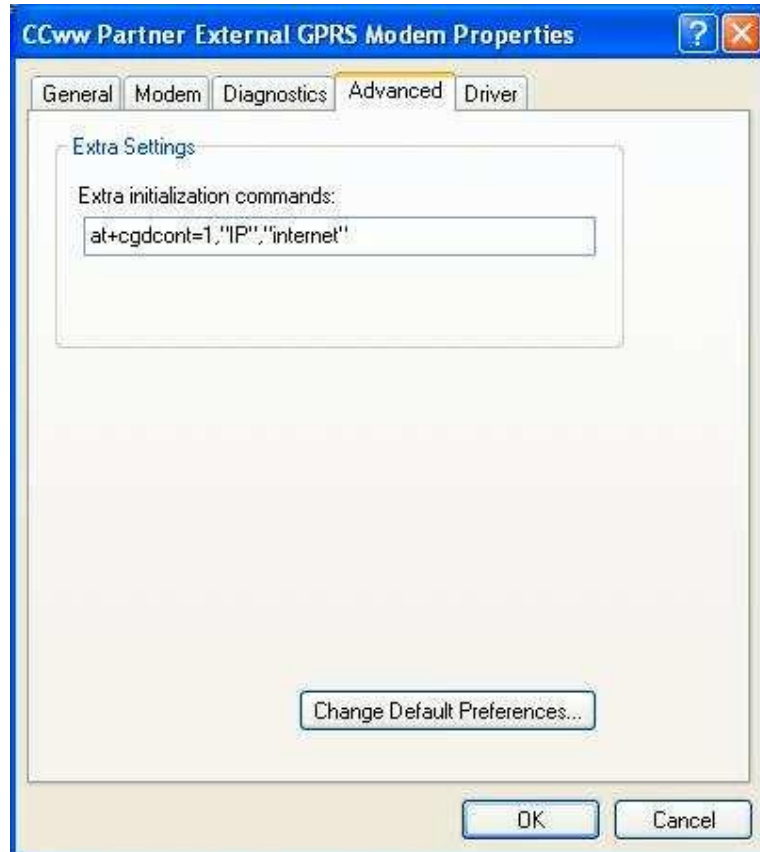


## 8.5 Initialization Commands

Select the 'Advanced' tab and enter `at+cgdcont=1,"IP","internet"` in the text-box (see picture) and click 'Change Default Preferences...'.

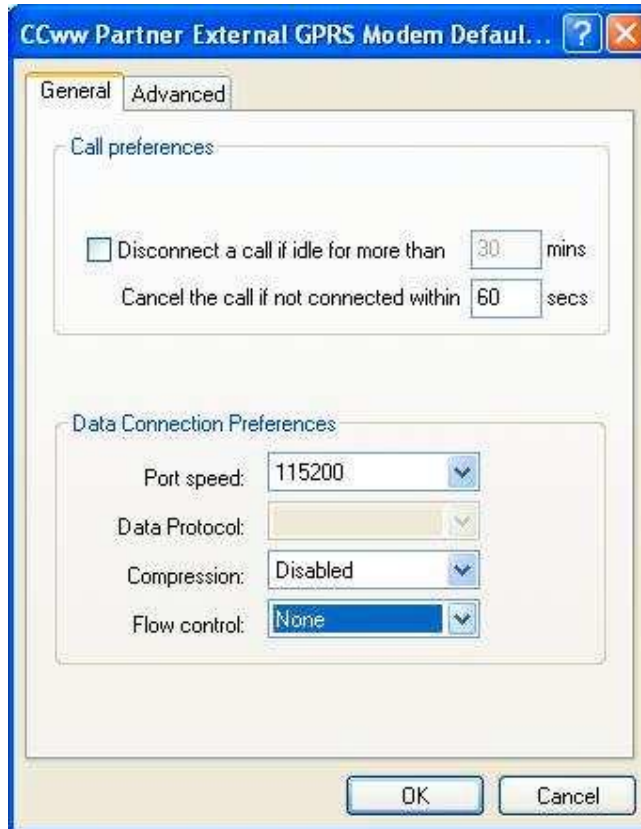
Note:

Please substitute "internet" in this command with your provider's access point node (APN), e.g. "wap.vodafone.co.uk".



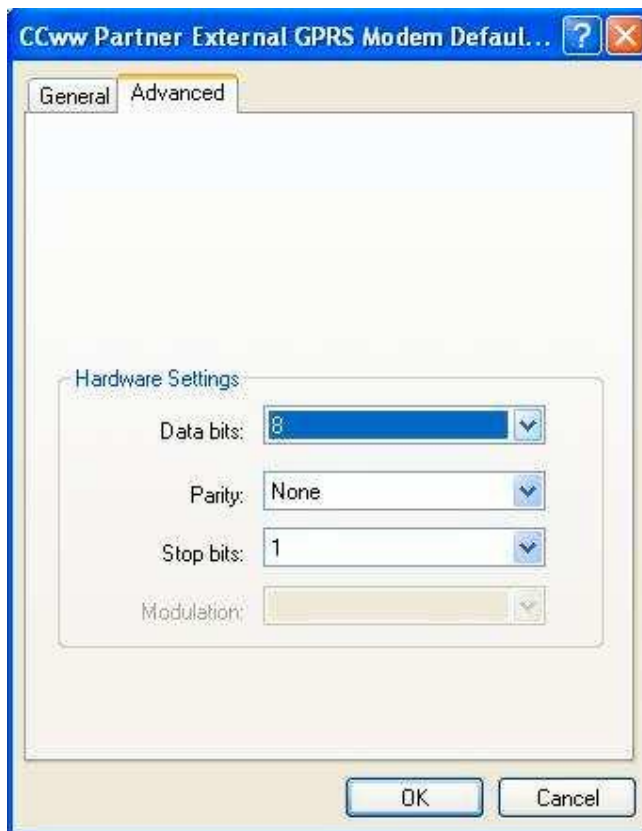
## 8.6 Data Connection Preferences

In the default preferences set 'Compression' to 'Disabled' and 'Flow control' to 'None'. Then select the advanced tab.



## 8.7 Hardware Settings

On the advanced tab set 'Data bits' to '8', 'Parity' to 'None', and 'Stop bits' to '1'. Then click 'OK' for all open dialogues.

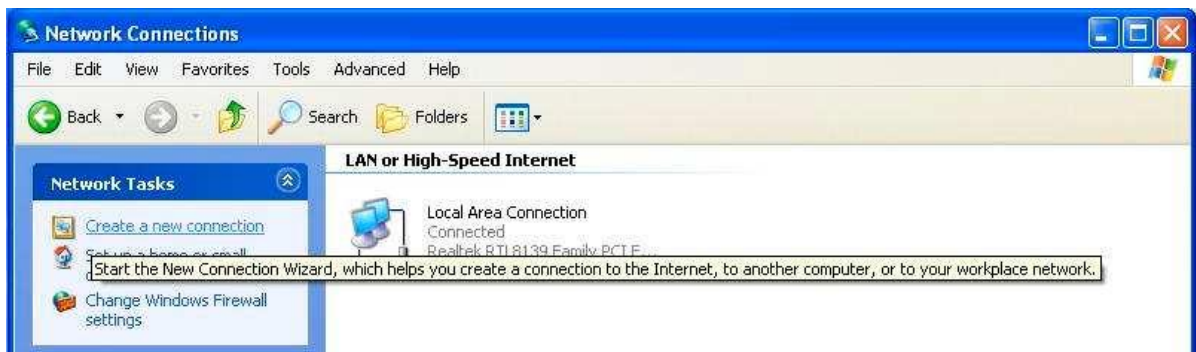


## 8.8 Configuring Dial-Up Connection

From Control Panel open 'Network Connections'...



On the right-hand side of the 'Network Connections' window click 'Create a new connection' to begin the New Connection Wizard



Click 'Next >'



Select 'Connect to the Internet' and click 'Next >'



Select 'Set up my connection manually' and click 'Next >'



Select 'Connect using a dial-up modem' and click 'Next >'



If you have more than one configured modem you may see the following dialog. Tick 'Modem – CCww Partner External GPRS Modem' and un-tick any others. Click 'Next >'



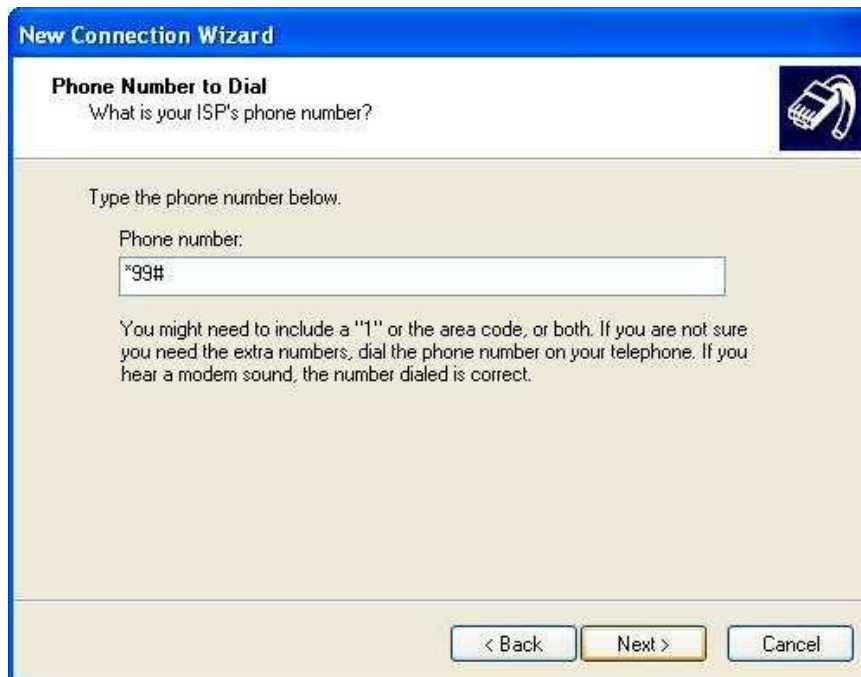


Enter a name for your ISP in the text box and click 'Next >'



The screenshot shows the 'New Connection Wizard' window with the 'Connection Name' tab selected. The title bar is blue with the text 'New Connection Wizard'. The main area has a light beige background. At the top, the text 'Connection Name' is bolded, followed by the question 'What is the name of the service that provides your Internet connection?'. Below this, it says 'Type the name of your ISP in the following box.' and 'ISP Name'. There is a text input box containing the placeholder text 'Your ISP Name Here'. Below the box, it says 'The name you type here will be the name of the connection you are creating.' At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'. A small icon of a modem is in the top right corner.

Enter \*99# in the text box and click 'Next >'



The screenshot shows the 'New Connection Wizard' window with the 'Phone Number to Dial' tab selected. The title bar is blue with the text 'New Connection Wizard'. The main area has a light beige background. At the top, the text 'Phone Number to Dial' is bolded, followed by the question 'What is your ISP's phone number?'. Below this, it says 'Type the phone number below.' and 'Phone number:'. There is a text input box containing the text '\*99#'. Below the box, it says 'You might need to include a "1" or the area code, or both. If you are not sure you need the extra numbers, dial the phone number on your telephone. If you hear a modem sound, the number dialed is correct.' At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'. A small icon of a modem is in the top right corner.



Enter your user name and password in the text boxes (see documentation for your ISP). The two checkboxes are optional



The screenshot shows the 'New Connection Wizard' window, specifically the 'Internet Account Information' step. The window has a blue title bar and a light beige background. At the top, it says 'Internet Account Information' and 'You will need an account name and password to sign in to your Internet account.' Below this, it instructs the user to 'Type an ISP account name and password, then write down this information and store it in a safe place. (If you have forgotten an existing account name or password, contact your ISP.)' There are three text input fields: 'User name:' with the placeholder 'Your Username Here', 'Password:' with masked characters, and 'Confirm password:' with masked characters. Below the fields are two checkboxes: 'Use this account name and password when anyone connects to the Internet from this computer' (checked) and 'Make this the default Internet connection' (unchecked). At the bottom right are three buttons: '< Back', 'Next >', and 'Cancel'.

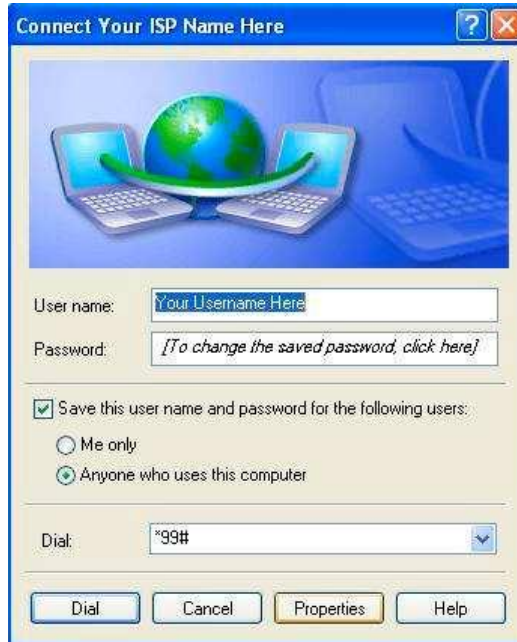
Click 'Finish' to complete the wizard (the check box is optional)



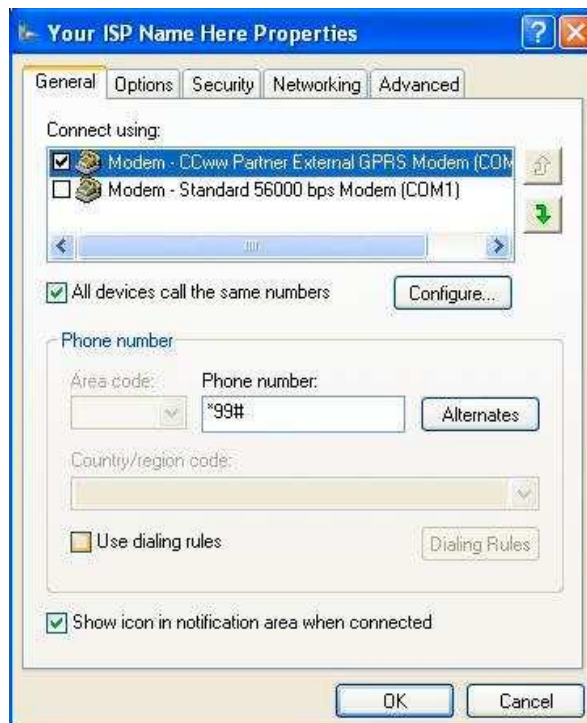
The screenshot shows the 'New Connection Wizard' window, specifically the 'Completing the New Connection Wizard' step. The window has a blue title bar and a light beige background. On the left is a blue sidebar with a globe icon. The main area says 'Completing the New Connection Wizard' and 'You have successfully completed the steps needed to create the following connection:'. Below this, it lists 'Your ISP Name Here' with two bullet points: 'Share with all users of this computer' and 'Use the same user name & password for everyone'. It then states 'The connection will be saved in the Network Connections folder.' and has a checkbox 'Add a shortcut to this connection to my desktop' (unchecked). At the bottom, it says 'To create the connection and close this wizard, click Finish.' At the bottom right are three buttons: '< Back', 'Finish', and 'Cancel'.

## 8.9 Connection Properties

Upon completion of the wizard the connection dialog will appear.  
Click 'Properties'

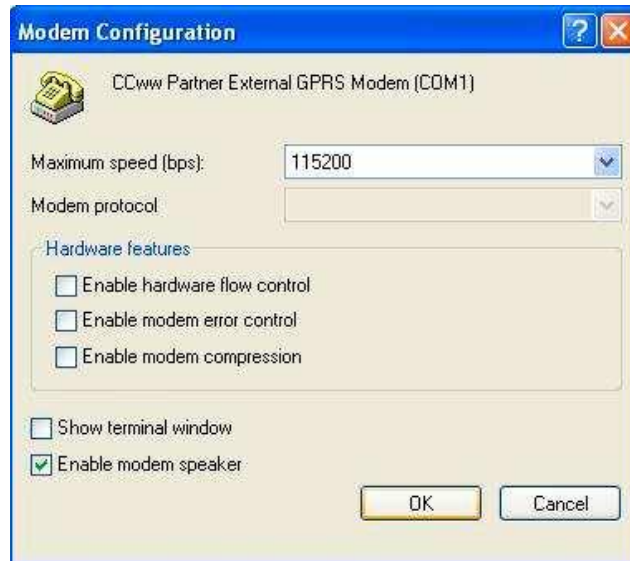


Select the 'CCww Partner External GPRS Modem' form the list and click 'Configure'



## 8.10 Modem Configuration

Confirm that the Maximum speed is set to 115200 and all hardware features are not enabled then click 'OK'.

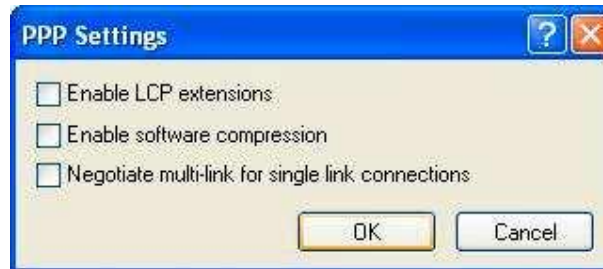


## 8.11 PPP Settings

Click the 'Networking' tab then click 'Settings'



Disable all PPP settings and click 'OK'.



## 8.12 TCP/IP Settings

If you need to modify your TCP/IP settings (check ISP documentation) select Internet Protocol from the networking list and click 'Properties'



## 9. Examples of at command

This section describes how to use the AT interface by providing examples of each command. The column on the right show what is input by the user/application by a '<' symbol. Information to the user is shown by a '>'. Information to the user is shown by a '>'.

### 9.1 Initialization

ATZ0	< Restore profile 0
OK	> Preferences Recalled
AT+CPIN?	< Request PIN status
+CPIN: SIM PIN	> Must enter PIN
OK	>
AT+CPIN="1234"	< PIN entry
OK	> Acceptance
AT+CREG?	< Check REG status
+CREG: 0,2	> Not, but trying
OK	>
A/	< Check REG status
+CREG: 0,1	> Registered on home
OK	> network (IMSI)
AT+COPS?	< Which network?
+COPS: 0,0,"Vodafone UK"	> Auto selected Vodafone UK
OK	>
AT+CSQ?	< Signal quality?
+CSQ: 20,1	> 73 dBm and 1% ber
OK	>
AT+CREG=1	< Enable unsolicited
OK	> reg status
AT+CPWROFF	< Power down
OK	>
+CPWROFF: Please Wait	>
+CREG: 0	> Now deregistered
+CPWROFF: Now Safe to Switch off	> Settings saved

## 9.2 SMS Configuration

AT+CSMP?	< SMS parameters?
+CSMP: 17,167,0,0	> Defaults - fo,vp,
OK	> pid,dcs
AT+CSCA?	< Service Centre?
+CMS ERROR: SMSC address unknown	> None defined,see Note 1
AT+CSCA="+44385016005"	< Define Service Centre
OK	>
AT+CSCA?	< Query Service Centre
+CSCA: +44385016005,145	>
OK	>
AT+CSAS=1	< Save to SIM SMS pr. 1
OK	> Saved
AT+CPMS?	< Check for SMS space
+CPS: "SM",10,10	> Full
OK	>
AT+CMGR=1	< Read message #1
+CMGR="REC	> SMS-DELIVER
READ","+447887538007","99/04/28,13:30:00+00",145	
,17,0,0,"+44385016005",145,4	>
Test	>
OK	
AT+CMGD=1	< Delete that message
OK	>
AT+CPWROFF	< Power Down
OK	>
+CPWROFF: Please Wait	>
+CPWROFF: Now Safe to Switch off	>

### Note 1:

At this point, we have registered and the SMSP (SMS parameters) file within the SIM card has been read. It contained no data about the SMSC. Therefore we now require setup relevant parameters and saving them to the SIM (+ CSASn).

### 9.3 SMS (PDU) Mode

AT+CPMS?	< Check for SMS space
+CPS: "SM",4,5	> 4 out of 5 spaces
OK	> used
AT+CMGF?	< Are we in PDU mode?
+CMGF: 1	> CMGF=1, text mode
OK	>
AT+CMGF=0	< Set PDU mode on
OK	>
AT&W1	< Save settings to profile 1
OK	>
AT+CMGL=4	< List all SM's in SIM
+CMGL: 1,1,,158	> SM #1
06818011112222000A811032896745000099604090858200	>
9F54747A0E4ACF41747419442E9BC375361D442FCFE9A076	>
793E0F9FCB01C18050301C5C09D7C2E5723C2011C98452B1	>
5C3019D786D3F17C4021D18854329D5029D58AD572BD6031	>
D98C56B3DD7039DD8ED7F3FD8041E19058341E9149E592D9	>
743EA181E9945AB56EB159ED96DBF57EC161F1985C369FD1	>
69F59ADD76BFE171F99C5EB7DFF179FD9EDFF7FF01	>
+CMGL: 2,1,,158	> SM #2
06818011112222000A811032896745000099702061359100	>
9F54747A0E4ACF41747419442E9BC375361D442FCFE9A076	>
793E0F9FCB01C18050301C5C09D7C2E5723C2011C98452B1	>
5C3019D786D3F17C4021D18854329D5029D58AD572BD6031	>
D98C56B3DD7039DD8ED7F3FD8041E19058341E9149E592D9	>
743EA181E9945AB56EB159ED96DBF57EC161F1985C369FD1	>
69F59ADD76BFE171F99C5EB7DFF179FD9EDFF7FF01	>
<CONTINUED>	
+CMGL: 3,2,,30	> SM #3
0281F011FF0C9144212055922900000012C8721E24ADCFE7	>
A0B09B0C82A2D36C17	>
+CMGL: 4,1,,20	> SM #4
06818011112222000A811032896745000099500251938500	>
02C834	>
OK	>



## 9.4 How to Send and receive Short Message

- Set Format  
 AT+CMGF? ; 0: PDU, 1: TXT  
 +CMGF: 1 ; modem response data  
 OK ; modem response
- Set Service center number  
 AT+CSCA? ; What is the number of service center  
 +CSCA: "+886931000099"  
 OK ; modem response
- Set SMS storage space and used  
 AT+CPMS? ;  
 How many short message was in SIM  
 +CPMS: "SM",5,30,"SM",5,30,"SM",5,30  
 OK ; modem response
- List received SMS in SIM  
 AT+CMGL="ALL" ; "ALL" must be UpperCase  
 +CMGL: 1,"REC READ", ; 1st short message in SIM and was read  
 ERROR  
 +CMGL: 2,"REC READ", ; 2nd SMS  
 ERROR  
 +CMGL: 3,"REC UNREAD", ; 3rd SMS but did not read yet  
 ERROR  
 +CMGL: 4,"REC READ",  
 ERROR  
 +CMGL: 5,"REC READ",  
 ERROR  
 OK
- Send SMS "1234Test" to number "+886928103301"  
 AT+CMGS="+886928103301" enter; send short message "1234Test" to 0928-103-301  
 > 1234Test ^z  
 OK
- Get the list of short message was read in SIM card  
 AT+CMGL="REC READ" ; send command  
 +CMGL: 1,"REC READ", "+886958160075",,"02/03/28,17:17:23+32"  
 12345678  
 ; modem response, item1: Message Number,  
 ; item2: Read status,item3: Caller number,



; item4: Time, item5: content.

+CMGL: 2,"REC READ","+123",,"02/03/29,21,24:42+00"  
You have 1 New Voice Mail, please call 123.

+CMGL: 3, "REC READ","+886958160075",,"02/04/03,14:10:31+00"  
Short message Test  
OK

- Read SMS index=3

**AT+CMGR=3** ; send command for read 3rd short message in  
; SIM card

+CMGR: "REC UNREAD","+886928103301",,"06/02/16,10:34:13:37+32",  
Short message service test ; modem response  
OK

- Delete SMS

AT+CMGD = 5 <CR> ; To delete message item 3

## 9.5 Setting or query configuration information command

- Baud rate  
AT+IPR?

Return: +IPR: 115200

AT+IPR=9600  
Return: OK

; Now, the baud rate is changed to 9600.

- "RING"  
AT+CLIP?  
Return: +CLIP:(0,1)

AT+CLIP=1  
Return:

; If the modem is received calling, it will show  
; caller's telephone number.

- SMS indication  
**AT+CNMI?**  
Return: +CNMI:3,0,0,0

; Can't response any indicator when received SMS

AT+CNMI=3,1,0,0

; Now, it will send indication out from modem when it  
; receives SMS.

Return: OK

## 9.6 MT or MO

- MO Call  
**ATD 0920200222 <CR>**

; Make a MO Call to 0920200222

- Hang Up  
**ATH**

; Hang Up

- Answer Call  
**ATA**

; Answer call

## 9.7 Get Current Network ID

- Get the current Network ID  
**AT+COPS? <CR>**

; Got the current network ID

## **FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT**

This equipment 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 radiate 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.

### **CAUTION:**

Any 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 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.

FCC RF Radiation Exposure Statement

RF exposure warning This equipment must be installed and operated

in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance