

**Document** : Datasheet

**Model #** : GSM -CV22

**Date** : 10-DEC-2014

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GSM/GPRS RS232 Modem from Elunda Inc. is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port. The baud rate can be configurable from 9600-115200 through AT command. Initially Modem is in Autobaud mode. This GSM/GPRS RS232 Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface.

The modem needed only 3 wires (Tx,Rx,GND) except Power supply to interface with microcontroller/Host PC. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V -13V). Yes, 5 V is in between !! .Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands.

### FEATURES

- High Quality Product (Not hobby grade)
- Quad-Band GSM/GPRS  
850/ 900/ 1800/ 1900 MHz
- Built in RS232 Level Converter (MAX3232)
- Configurable baud rate
- SMA connector with GSM L Type Antenna.
- Built in SIM Card holder.
- Built in Network Status LED
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connector
- Most Status & Controlling Pins are available at Connector
- Normal operation temperature: -20 °C to +55 °C
- Input Voltage: 5V-12V DC

### SPECIFICATIONS

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- GPRS multi-slot class 10/8
- GPRS mobile station class B
- Compliant to GSM phase 2/2+
  - Class 4 (2 W @850/ 900 MHz)
  - Class 1 (1 W @ 1800/1900MHz)
- Dimensions: 24\*24\*3mm
- Weight: 3.4g
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.0mA(sleep mode)
- Operation temperature: -40°C to +85 °C\

#### Specifications for Fax

- Group 3, class 1

#### Specifications for Data

- GPRS class 10: max. 85.6 kbps (downlink)
- PBCCCH support
- Coding schemes CS 1, 2, 3, 4
- CSD up to 14.4 kbps
- USSD
- Non transparent mode
- PPP-stack

#### Specifications for SMS via GSM/GPRS

- Point to point MO and MT
- SMS cell broadcast
- Text and PDU mode

#### Software features

- 0710 MUX protocol
- embedded TCP/UDP protocol
- FTP/HTTP

#### Special firmware

- MMS
- Java (cooperate with Iasolution)
- Embedded AT

### **Specifications for Voice**

- Tricodec
  - Half rate (HR)
  - Full rate (FR)
  - Enhanced Full rate (EFR)
- Hands-free operation
- (Echo suppression)
- AMR
  - Half rate (HR)
  - Full rate (FR)

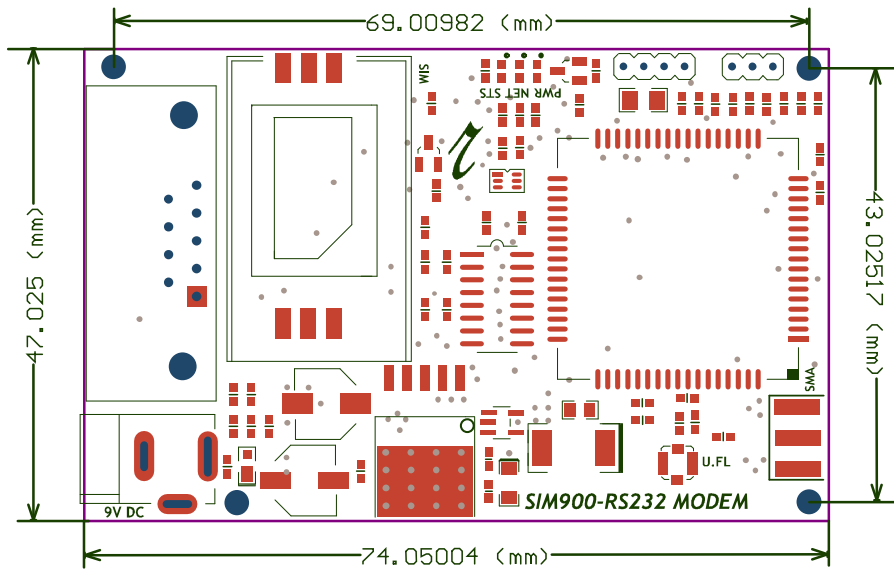
### **Interfaces**

- Analog audio interface pins at 2mm Pitch RMC
- RS232 Serial interface
- SMA Antenna Connector
- DC Power pins at 2mm Pitch RMC

### **Compatibility**

- AT cellular command interface

**DIMENSIONS**



**OPERATING CONDITIONS**

Parameter	IN/OUT	Minimum	Maximum	Unit
Supply Voltage - VIN	Input	4.2	13	V
Current Consumption	---	40	590	mA

## OPERATING MODES

The table below briefly summarizes the various operating modes referred to in the following chapters.

Mode	Function	
<b>Normal operation</b>	GSM/GPRS SLEEP	Modem will automatically go into SLEEP mode if DTR is set to high level and there is no on air and no hardware interrupt (such as data on serial port). In this case, the current consumption of GSM Modem will reduce to the minimal Level.  In SLEEP mode, the Modem can still receive paging message and SMS from the system normally.
	GSM IDLE	<b>Software is active. Modem has registered to the GSM network, and the modem is ready to send and receive.</b>
	GSM TALK	<b>Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.</b>
	GPRS STANDBY	<b>Modem is ready for GPRS data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS configuration.</b>
	GPRS DATA	<b>There is GPRS data transfer (PPP or TCP or UDP) in progress. In this case, power consumption is related with network settings (e.g. power control level), uplink / downlink data rates and GPRS configuration (e.g. used multi-slot settings).</b>
<b>POWER DOWN</b>	Normal shutdown by sending the "AT+CPOWD=1" command or using the PWRKEY. The power management ASIC disconnects the power supply from the baseband part of the GSM Modem. Software is not active. The serial port is not accessible. Operating voltage remains applied to the internal circuitry	
<b>Minimum functionality mode (without remove power supply)</b>	Use the "AT+CFUN" command can set the modem to a minimum functionality mode without remove the power supply. In this case, the RF part of the modem will not work or the SIM card will not be accessible, or both RF part and SIM card will be closed, and the serial port is still accessible. The power consumption in this case is very low.	

### 1.3 Turn Off GSM Modem Using AT Command

You can use the AT command “AT+CPOWD=1” to turn off the modem. This command lets the GSM Modem log off from the network and allows the GSM Modem to enter into a secure state and save data before completely disconnecting the power supply. Before the completion of the switching off procedure the GSM Modem will send out result code:

“ **NORMAL POWER DOWN**”

After this moment, the AT commands can't be executed. The GSM Modem enters the POWER DOWN mode, only the RTC is still active. POWER DOWN can also be indicated by STATUS pin, which is a low level voltage in this mode.

### 1.5 Power Saving

There are two methods for the GSM Modem to enter into low current consumption status. “AT+CFUN” is used to set GSM Modem into minimum functionality mode and DTR hardware interface signal can be used to lead system to be in SLEEP mode (or slow clocking mode).

### 1.6 Minimum Functionality Mode

Minimum functionality mode reduces the functionality of the GSM Modem to a minimum and, thus, minimizes the current consumption to the lowest level. This mode is set with the “AT+CFUN” command which provides the choice of the functionality levels <fun>=014

- 0: minimum functionality;
- 1: full functionality (default);
- 4: disable phone both transmit and receive RF circuits;

If GSM MODEM has been set to minimum functionality by “AT+CFUN=0”, the RF function and SIM card function will be closed. In this case, the serial port is still accessible, but all AT commands correlative with RF function or SIM card function will not be accessible.

If GSM MODEM has been set by “AT+CFUN=4”, the RF function will be closed, the serial port is still active. In this case all AT commands correlative with RF function will not be accessible.

After GSM MODEM has been set by “AT+CFUN=0” or “AT+CFUN=4”, it can return to full functionality by “AT+CFUN=1”.

For detailed information about “AT+CFUN”, please refer to document [1].

### 1.7 Sleep Mode (Slow Clock Mode)

We can control SIM900 GSM Modem to enter or exit the SLEEP mode in customer applications through DTR signal. When DTR is in high level and there is no on air and hardware interrupt (such as GPIO interrupt or data on serial port), GSM MODEM will enter SLEEP mode automatically. In this mode, GSM MODEM can still receive paging or SMS from network but the serial port is not accessible.

**Note:** For GSM MODEM, it requests to set AT command “AT+CSClk=1” to enable the sleep mode; the default value is 0, that can’t make the GSM Modem enter sleep mode. For more details please refer to our AT command list.

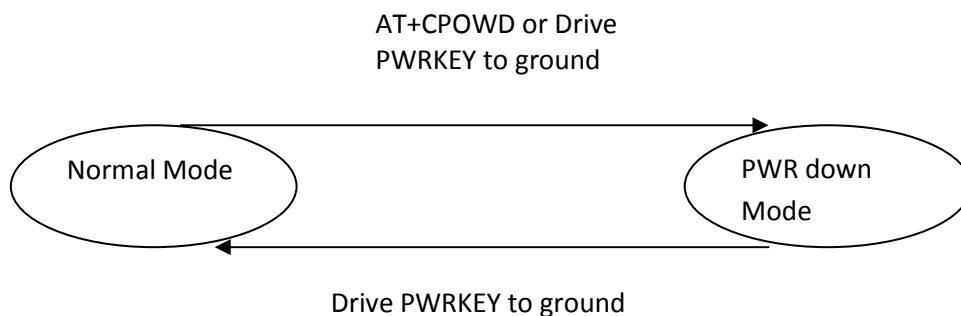
### 1.8 Wake Up GSM MODEM from SLEEP Mode

When GSM MODEM is in SLEEP mode, the following methods can wake up the GSM Modem.

- Enable DTR pin to wake up GSM MODEM.  
If DTR pin is pulled down to a low level this signal will wake up GSM MODEM from power saving mode. The serial port will be active after DTR changed to low level for about 50ms.
- Receiving a voice or data call from network to wake up GSM MODEM.
- Receiving a SMS from network to wake up GSM MODEM.

### 1.9 Summary of State Transitions (except SLEEP mode)

The following figure shows how to proceed from one mode to another.



## 2.0 Serial Interfaces

	Name	Pin	Function
<b>Serial Port DB9</b>	GND	5	Ground
	CTS	8	Clear to send
	RTS	7	Request to send
	TXD	2	Transmit data
	RXD	3	Receive data

The GSM module is designed as a DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection. The GSM Modem and the client (DTE) are connected through the following signal (as following figure shows). Auto bauding supports baud rate from 1200bps to 57600bps.

### Serial port

- TXD: Send data to the RXD signal line of the DTE
- RXD: Receive data from the TXD signal line of the DTE

serial port of the GSM engine supports auto bauding for the following baud rates: 1200, 2400, 4800, 9600, 19200, 38400 and 57600bps. Factory setting is auto bauding enabled. This gives you the flexibility to put the GSM engine into operation no matter what baud rate your host application is configured to. To take advantage of auto bauding mode, specific attention should be paid to the following requirements:

### Synchronization between DTE and DCE:

When DCE powers on with the auto bauding enabled, user must first send "A" to synchronize the baud rate. It is recommended to wait 2 to 3 seconds before sending "AT" character. After receiving the "OK" response, DTE and DCE are correctly synchronized. The more information please refer to the AT command "AT+IPR".

*We bring the world to you.....*

### Restrictions on autobauding operation

- The serial port has to be operated at 8 data bits, no parity and 1 stop bit (factory setting).
- The Unsolicited Result Codes like "RDY", "+CFUN: 1" and "+CPIN: READY" are not indicated when you start up the ME while autobauding is enabled. This is due to the fact that the new baud rate is not detected unless DTE and DCE are correctly synchronized as described above.

**Note: You can use AT+IPR=x to set a fixed baud rate and save the configuration to non-volatile flash memory. After the configuration is saved as fixed baud rate, the Unsolicited Result Codes like "RDY" should be received from the serial port all the time that the GSM MODEM is power on.**

### AT Command Syntax

When DCE powers on with the autobauding enabled, user must first send "A" to synchronize the baud rate. It is recommended to wait 2 to 3 seconds before sending "AT" character. After receiving the "OK" response, DTE and DCE are correctly synchronized **The "AT" or "at" prefix must be set at the beginning of each Command. To terminate a Command line enter <CR> , otherwise known as carriage return or \r.**

**Commands are followed by a response that includes <CR><LF><response><CR><LF>. Only the responses are presented in the document here, <CR><LF> are omitted intentionally.**

Example: With Local Echo enabled:

Transmit: AT\r

Receive: AT\r\r\nOK\r\n

### SETTINGS FOR EASY MICROCONTROLLER COMMUNICATION

When communicating with the GSM Modem using a microcontroller, you usually want very short responses, no local echo, and no startup messages.

Sticking on the &W to the end of the command saves the setting into memory.

ATV0&W\r Enable short response

ATE0&W\r Disable Local Echo

AT+CIURC=0;&W\r Disable "CALL READY" Startup Message

Now instead of commands returning OK or ERROR in plain text, as well as repeating all written commands, the GSM Modem will not echo what you transmit and the GSM Modem will return error codes in single bytes. For example, instead of:

Transmit: AT\r

Receive: \r\nOK\r\n

You'll have:

Transmit: AT\r

Receive: \r\n0\r\n

## SAMPLE AT COMMANDS CODE

### 1. PHONE COMMUNICATION

Goal: Call a phone

Dial 123-456-7890 = ATD1234567890;\r

This command returns OK or ERROR. Returns NO CARRIER when phone hangs up

### 2. SEND A TEXT MESSAGE

Goal: Send a text

AT+CMGF=1\r

Returns OK or ERROR

AT+CSCS="GSM"\r

Returns OK or ERROR

AT+CSCA="+13123149810" \r

Returns OK or ERROR. This number +13123149810 is the short

message center for AT&T/Cingular service. T-Mobile's is +12063130004

AT+CSMP=17,167,0,240\r

Returns OK or ERROR. These numbers refer to settings for text

message sending, keep them this way.

AT+CMGS="

AT+CMGS="1234567890"\r

Returns > , prompting what message to send. 1234567890 is the

phone number that the text message will be sent to.

Hello this is a message <Ctrl+z>

*We bring the world to you.....*

Type any message, then press <Ctrl+z>. Returns confirmation

message and Message ID number

### **3. SEND A TEXT MESSAGE**

Goal: Read a Text

AT+CMGF=1\r

Returns OK or ERROR

AT+CMGDA="DEL ALL"

Delete all text

AT+CNMI=0,0

Disable unsolicited error code

AT+CMGR=1

Read Message #1

AT+CMGL="REC UNREAD"

Read all received unread messages

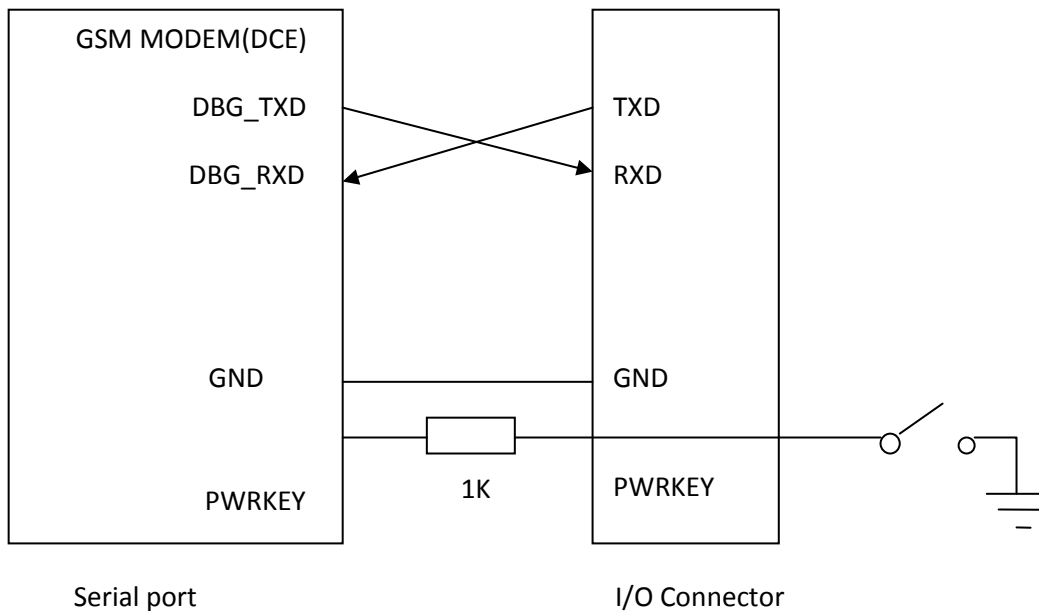
#### Debug port

- Null modem port
- Only contain Data lines TXD and RXD
- Debug Port used for debugging and upgrading firmware. It cannot be used for CSD call, FAX call. And the Debug port can not use multiplexing function. It does not support autobauding function.
- Debug port supports the communication rates is 115200bps

### **2.1 Software Upgrade and Software Debug**

The DBG\_TXD, DBG\_RXD and GND must be connected to the IO connector when user need to upgrade software and debug software, the DBG\_TXD, DBG\_RXD should be used for software upgrade and for software debugging. The TXD and RXD also should be connected to the IO connector, if user wants to send AT command or data stream to GSM MODEM. The PWRKEY pin is recommended to connect to the IO connector. The user also can add a switch

between the PWRKEY and the GND. The PWRKEY should be connected to the GND when GSM MODEM is upgrading software. Please refer to the following figure.



## 2.2 Audio Interfacing

	Pin Name	Pin Number	Function
AIN/AOUT	MIC	1	Microphone1 input +
	GND	2	Common Ground
	SPK	3	Audio output+

The GSM Modem provides one analog input channel, AIN, which may be used for microphone. The electret microphone is recommended when the interface is used for microphone. The outputs connect to the receiver. Thereceiver outputs only can directly drive 32Ω.

External line inputs are available to directly mix or multiplex externally generated analog signals such as polyphonic tones from an external melody IC or music generated by an FM tuner IC or module. You can use AT+CMIC to adjust the input gain level of microphone, use AT+SIDET to set the side-tone level. In addition, you can also use AT+CLVL to adjust the output gain level. For more details, please refer to document

It is suggested that you adopt one of the following two matching circuits in order to improve audio performance. The difference audio signals have to be layout according to difference signal layout rules. As show in following figures (*Note: all components package are 0603.*) If you want to adopt an amplifier circuit for audio, we recommend National Company’s LM4890. Of course you can select it according to your requirement.

**INTERFACING THE GSM MODEM**

➤ *Interfacing the Modem to microcontroller (Basic connection)*

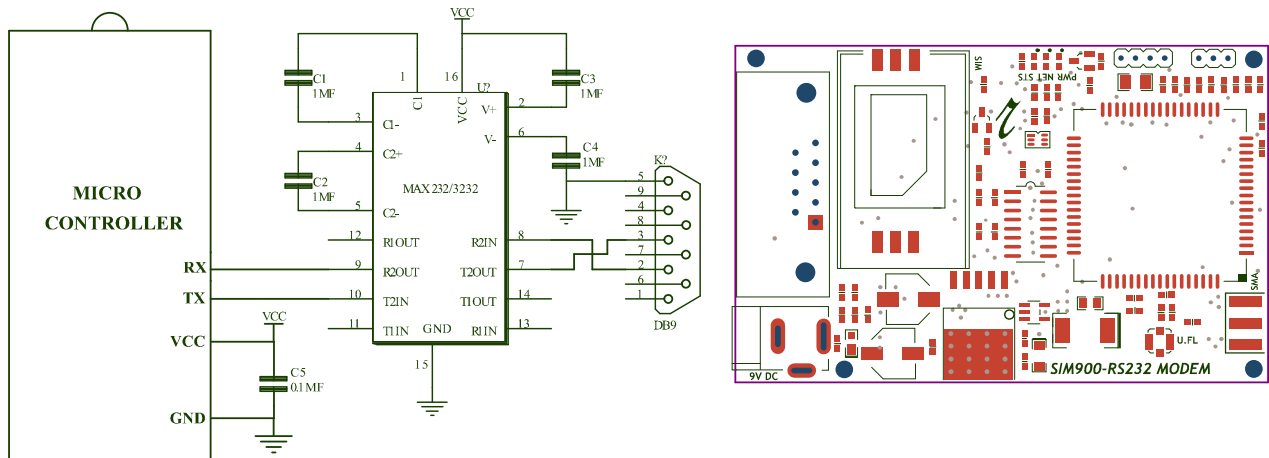
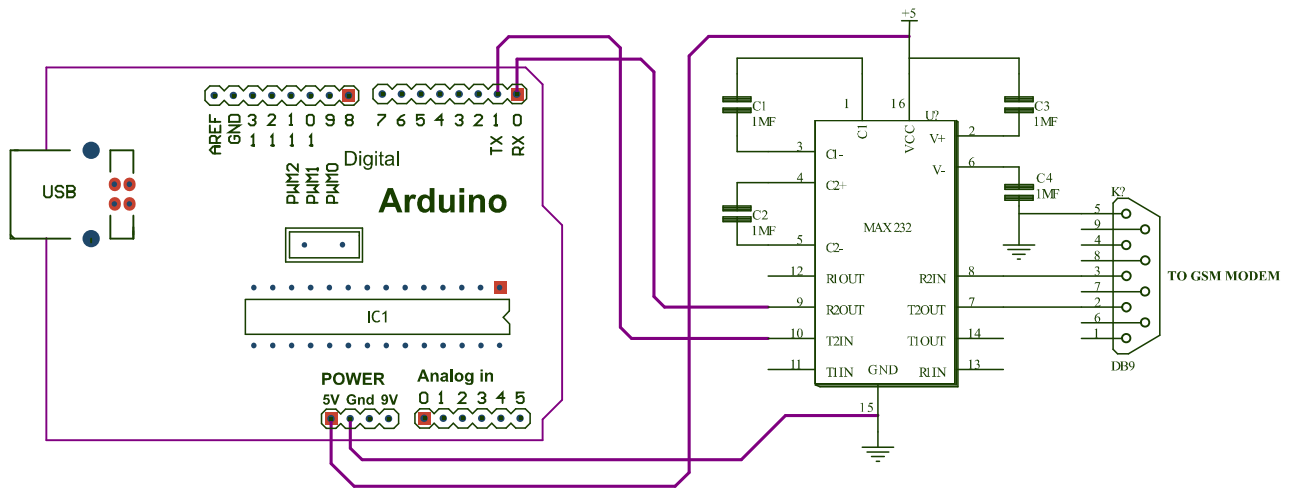


Fig:3 GSM Modem Interfacing with Microcontroller

The Modem can be directly interface with 5V microcontrollers like PIC ,AVR , 8051 Derivatives , Arduinos and 3V3 Microcontrollers like ARM ,ARM Cortex XX ect. Make ensure V\_INTERFACE pin is supplied with same voltage level as the microcontroller VCC. As per the Fig:3 there is only 2 connections are required to use the modem . Connect RX pin of the modem to the TX pin of the microcontroller and TX pin of the modem to microcontroller’s RX pin. The connected power supply (4.2v to 12v dc) should be capable of handling current up to 1 A .

➤ *Interfacing the Modem to ARDUINO*



## GETTING STARTED

### 1) **Insert SIM card**

Open the SIM cardholder by sliding it as per the arrow mark and lift up. Insert the SIM card , so as to align the chamfered corner suits in card holder .After inserting the SIM card, lock the holder by sliding it to the opposite direction of arrow mark.

### 2) **Connect The Antenna**

Fix the Supplied RF antenna to the SMA Antennae connector and tighten it by Rotating the Nut ( Never rotate the antennae for tightening ).

### 3) **Connect the Pins**

Connect the GSM modem as per the circuit diagram provided

### 4) **Power the Modem**

Power the modem from suitable power supply, which is having enough current capacity (>1A).

### 5) **Check the Status of the LEDs**

PWR LED - Red LED will lit immediately

STS LED - Green LED will lit after 1-2 seconds

NET LED -Blue LED will starts to blink in fast for few seconds(Searching For Network) and becomes slow blinking once the Modem registers with the Network.

### 6) **Network LED**

The Network LED indicates the various status of GSM module eg. Power on, Network registration & GPRS connectivity. When the modem is powered up, the status LED will blink every second. After the Modem registers in the network (takes between 10-60 seconds), LED will blink in step of 3 seconds. At this stage you can start using Modem for your application.

### 7) **Baud rate**

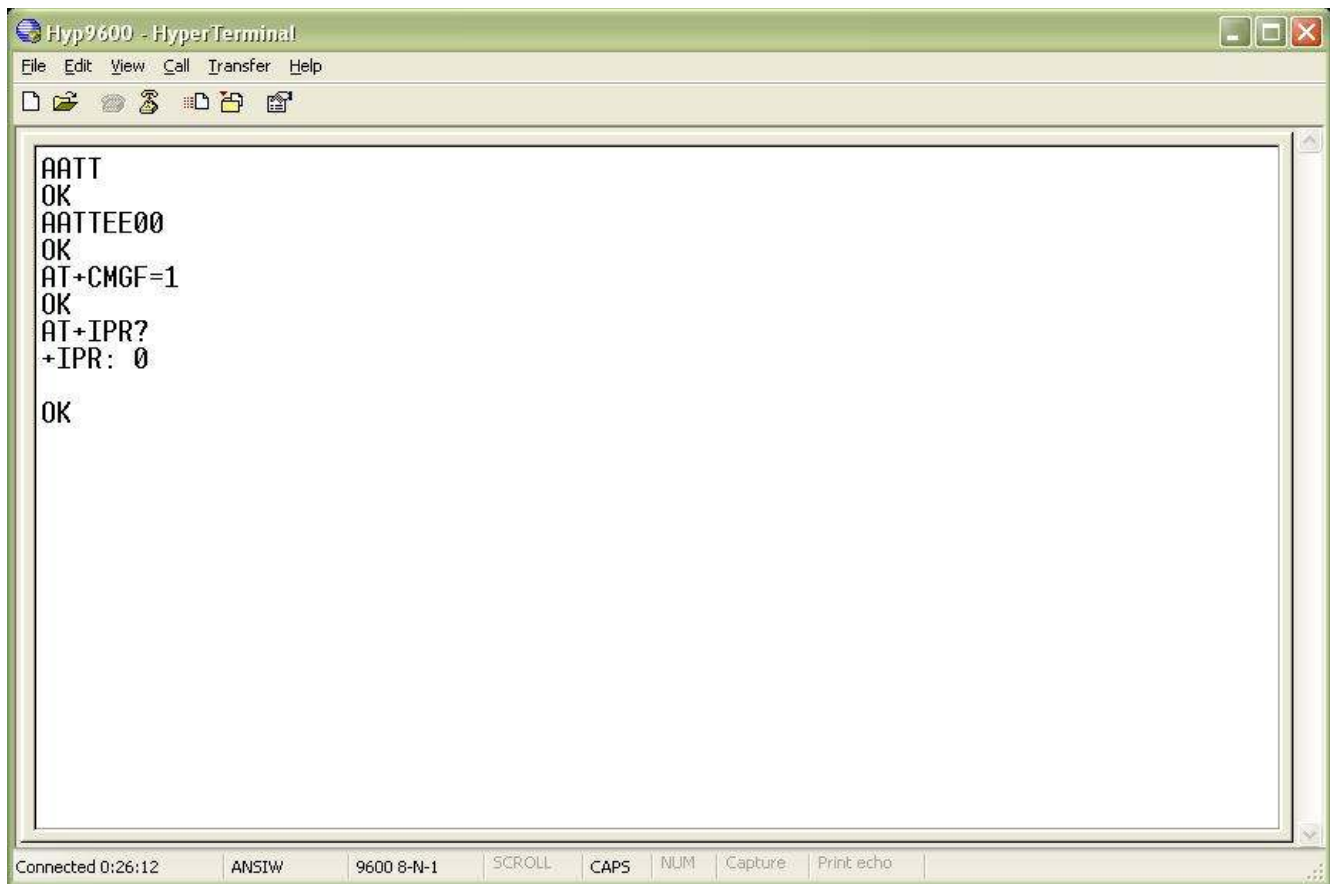
The Baud rate supported by the modem is between 9600 and 115200. Make sure the host system is set to the supported baud rate.

- *The modem automatically sets to the baud rate of the first command sent by the host system after it is powered up. User must first send "A" to synchronize the baud rate. It is recommended to wait 2 to 3 seconds before sending "AT" character. After receiving the "OK" response, Your Device and GSM Modem are correctly synchronized. So there is no need for setting the baud rate using commands.*
- *Before You Start using the modem, please make sure that the SIM card you inserted support the needed features and there is enough balance in SIM.!!!*

## **Testing with a PC**

1. Connect the GSM Modem to a PC COM Port
2. Create a HyperTerminal (Windows tool for serial port communications) window with Baudrate 9600 and connect it to the COM Port to which GSM is connected.
3. Type any AT command in the HyperTerminal window and you could see the modem responding by sending "OK".

### Terminal Window on PC where GSM Modem is connected



The screenshot shows a HyperTerminal window titled "Hyp9600 - HyperTerminal". The window has a menu bar with "File", "Edit", "View", "Call", "Transfer", and "Help". Below the menu bar is a toolbar with icons for file operations and communication. The main text area contains the following text:

```
AATT
OK
AATTEE00
OK
AT+CMGF=1
OK
AT+IPR?
+IPR: 0
OK
```

At the bottom of the window, there is a status bar with the following information: "Connected 0:26:12", "ANSIW", "9600 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

**SAMPLE CODE – FOR INTERFACING WITH MICROCONTROLLER**

```

/* This program module sends an SMS from the modem to a prefixed number */

void main()
{
    SerialPortInit();                /* Serial Communication – 9600-N-8-1 */
    Send2Gsm("AT\r\n");              /* Transmit AT to the module – GSM Modem sends
    OK */ DelayS(2);                 /* 2 sec delay */
    Send2Gsm("ATE0\r\n");           /* Echo Off */
    DelayS(2);                       /* 2 sec delay */
    Send2Gsm("AT+CMGF=1\r\n");      /* Switch to text mode */
    DelayS(2);                       /* 2 sec delay */
    Send2Gsm("AT+CMGS=\"+919447367176\"\r\n"); /* Send SMS to a cell number */
    DelayS(2);                       /* 2 sec delay */
    Send2Gsm("TEST DATA FROM RhydoLABZ-COCHIN"); /* Input SMS Data */
    SerialTx(0x1a);                 /* Ctrl-Z indicates end of SMS */
    DelayS(2);                     /* 2 sec delay */
    while(1);
}

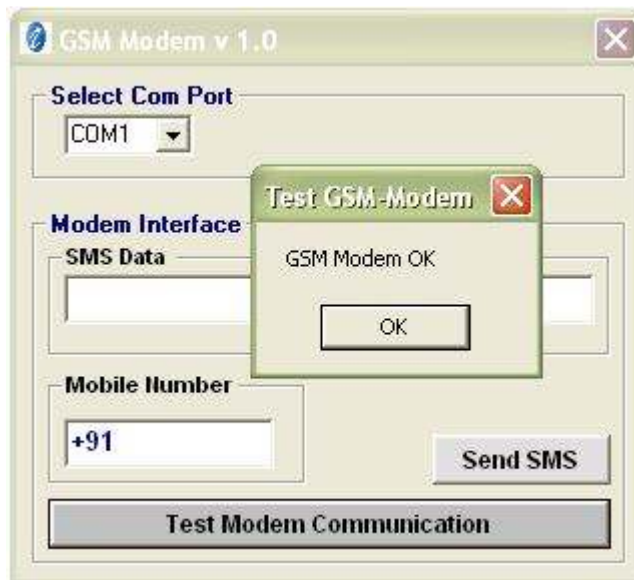
```

**Function Description**

SerialPortInit – Module to initialize serial communication parameters  
Send2Gsm -- Module to transmit a string of data through Serial Port  
SerialTx – Module to transmit a byte through serial port

## PC INTERFACE SOFTWARE FOR GSM MODEM

- Download setup file from our website
- Install the setup file in your PC. Once the installation is completed, open the application from StartMenu-Programs-Rhydolabz-GSM Modem.
- Connect the GSM Modem to a PC Com port using a MAX-232 circuit or TTL-RS-232/TTL-USB and Power it Up.
- Select the Comport\* (in the application software) to which GSM modem is connected and Press the “Connect” button.
- Click on the button “Test Modem Communication”. If the connection is OK, the software displays “GSM Modem OK”.
- If you want to send an SMS to another mobile using the modem, type the SMS data and Mobile Number (Add Country code as prefix) and click “Send SMS” button.



*\* If the comport number to which the modem is connected does not appear in the software, re-assign the Comport to an available one. (Can be done in Device Manager- Comport-Properties)*