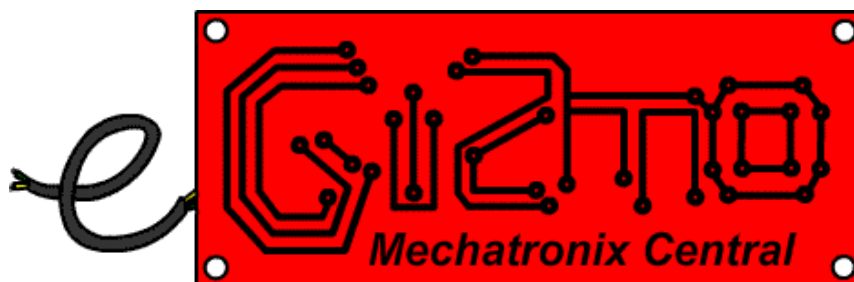
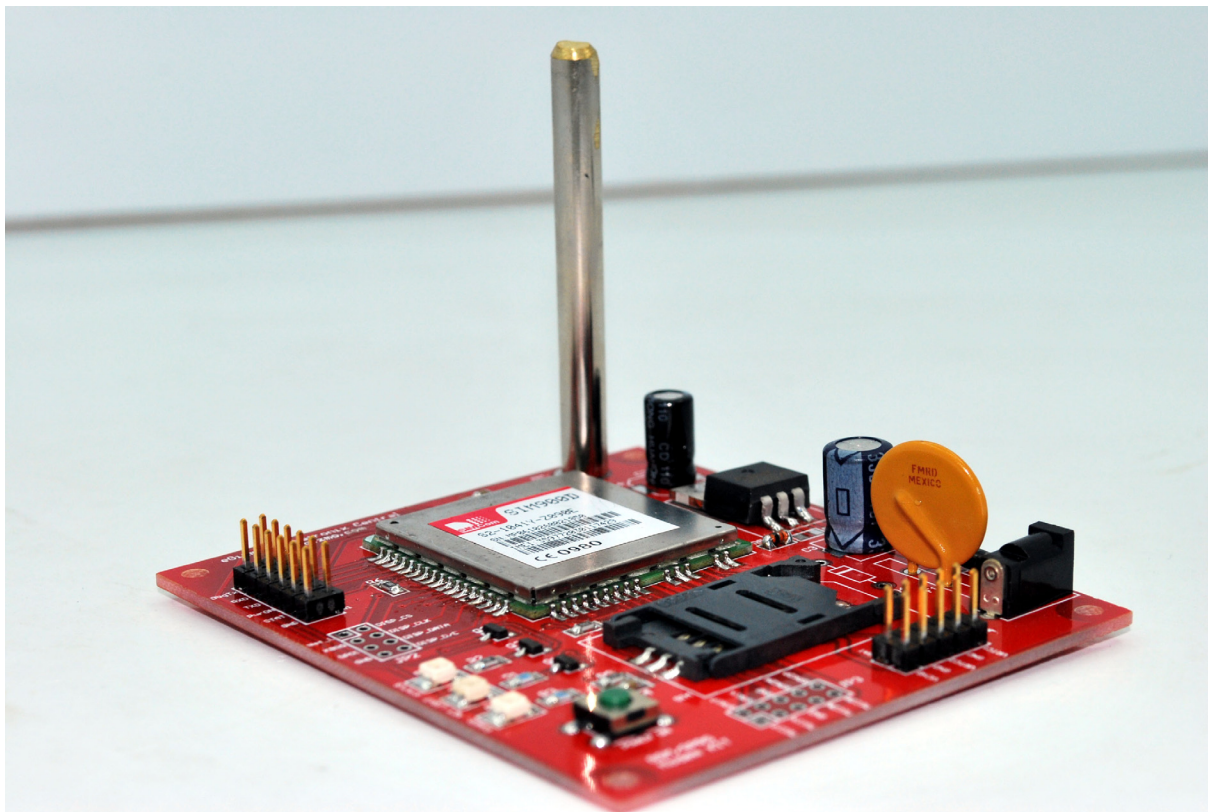


e-Gizmo

# GSM-GPRS MODEM

Hardware Manual



# GSM-GPRS Modem

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# GSM-GPRS Modem

## Introduction

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Of the many common technologies that are immensely necessary for many people at present times, the personal wireless and long-distance communication technologies, even from simple everyday observation, is obviously one of the foremost in its necessity. The ease and efficiency of communication brought about by personal wireless and long-distance transmission devices has led many technological companies such as Motorola and Nokia, to concentrate their resources on the creation and the continued development of the mobile phone (The first mobile phone was first introduced by Martin Cooper of Motorola during the year 1973). In addition to the creation of the mobile phone, companies called 'Network Service Providers' were also established. Network service providers, as from their name, provide the necessary base for the relaying of communications between mobile phones (which are called 'cell sites'). Over time, as mobile phone companies and network service providers increased and became widely distributed, the personal wireless, long-distance communication technology rapidly became commonplace in almost every country around the world.

In almost all cases of wireless communication, mobile phones are the primary devices used. However, because technology and information both became more readily available and obtainable over the last 40 years, the information regarding the mechanisms of the long-range wireless data communication also became more and more readily open to many innovations by those outside the official mobile phone companies. One of such innovations is the use of an existing network service provider to relay information or command from almost anywhere on earth! This is exactly the technological service that the e-Gizmo GSM-GPRS Modem provides.

With the e-Gizmo GSM GPRS Modem, one may utilize SMS or voice to initiate a remote control command from almost any range that the network service provider covers (which nowadays could might as well be just everywhere on earth). For example, a university may choose to give students the freedom of retrieving their academic grades from the university anytime and anywhere through a specific SMS message. The GSM Modem, situated within the university, is that which receives the remote command from a student through the specific SMS message and relays it to a computer processor of all student academic grade data. The processor then selects the corresponding unique data from the received SMS message and sends it back to the student. For personal applications one may simply transform the GSM Modem into a device similar to a mobile phone when connected to a PC. However, even in this simple application the user has more options in the management of the information within the SIM card (such as save phonebook data or messages directly into the PC). There are many more applications the user may discover from the e-Gizmo GSM-GPRS Modem and it begins with the simple knowledge that the e-Gizmo GSM-GPRS Modem provides 'worldwide' remote control and communication range.

# GSM-GPRS Modem

## Features

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- SIMCom SIM900D Module for SMS, Voice, Data, and Fax.
- SIMCom SIM900D Module offers Quad-Band range.
- 3.3V TTL level serial port.
- On-board 3.3V LDO regulator.
- Built-in Sim Card holder.

## Specifications

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<b>GSM/GPRS Module</b>	SIMCom SIM900D
<b>Multi-band Type:</b>	Quad-Band
<b>SIM Card Type:</b>	Mini-SIM (ISO/IEC 7810:2003, ID-000)  Length: 2.5 cm Width: 1.5 cm Thickness: 0.076 cm
<b>Board Length:</b>	8.3 cm
<b>Board Width:</b>	7.3 cm
<b>Antenna Length:</b>	5.5 cm
<b>Operating Voltage:</b>	5 V
<b>Operating Current:</b>	1.50 A

# GSM-GPRS Modem

## Parts Information - Parts Placement

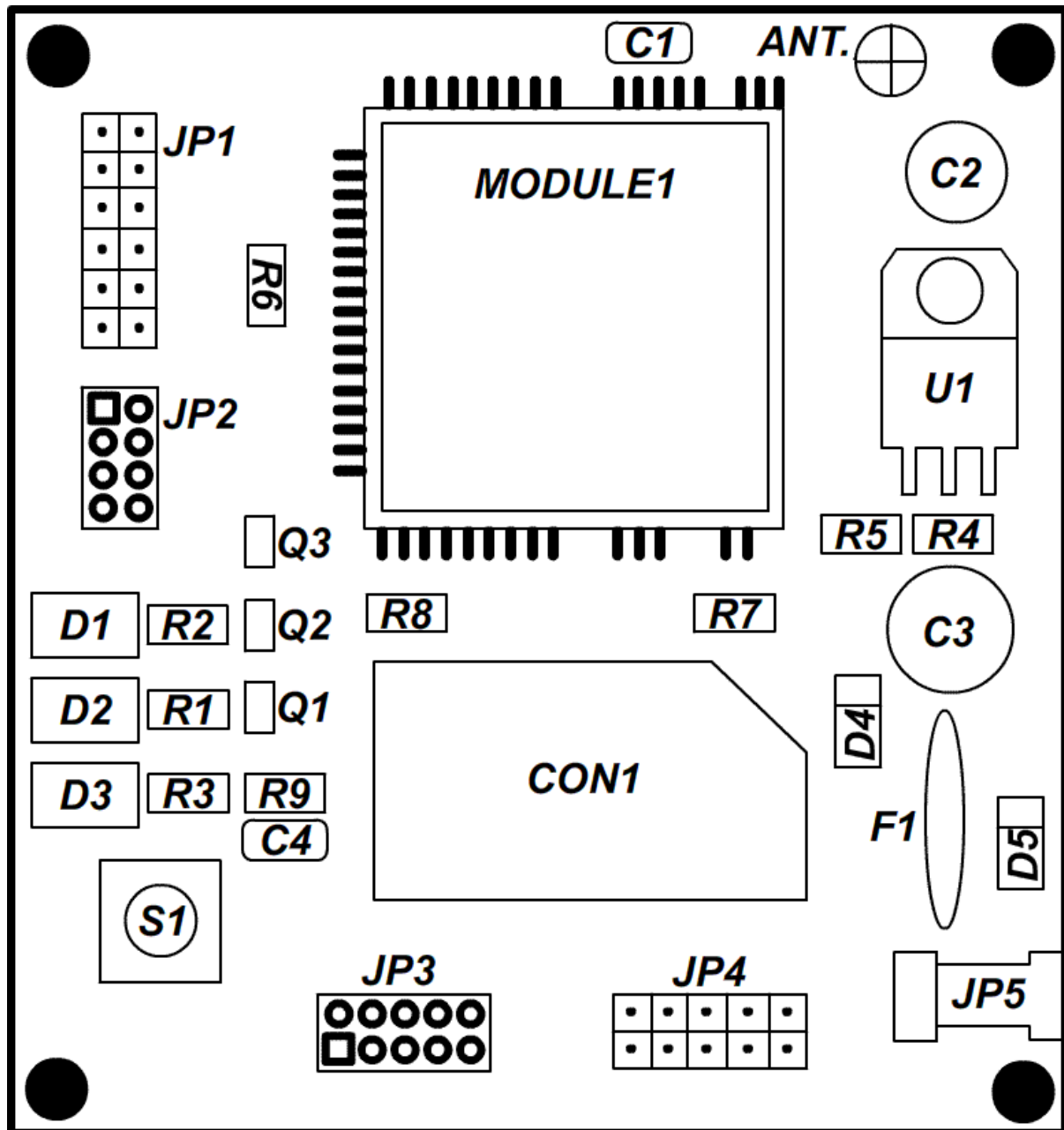
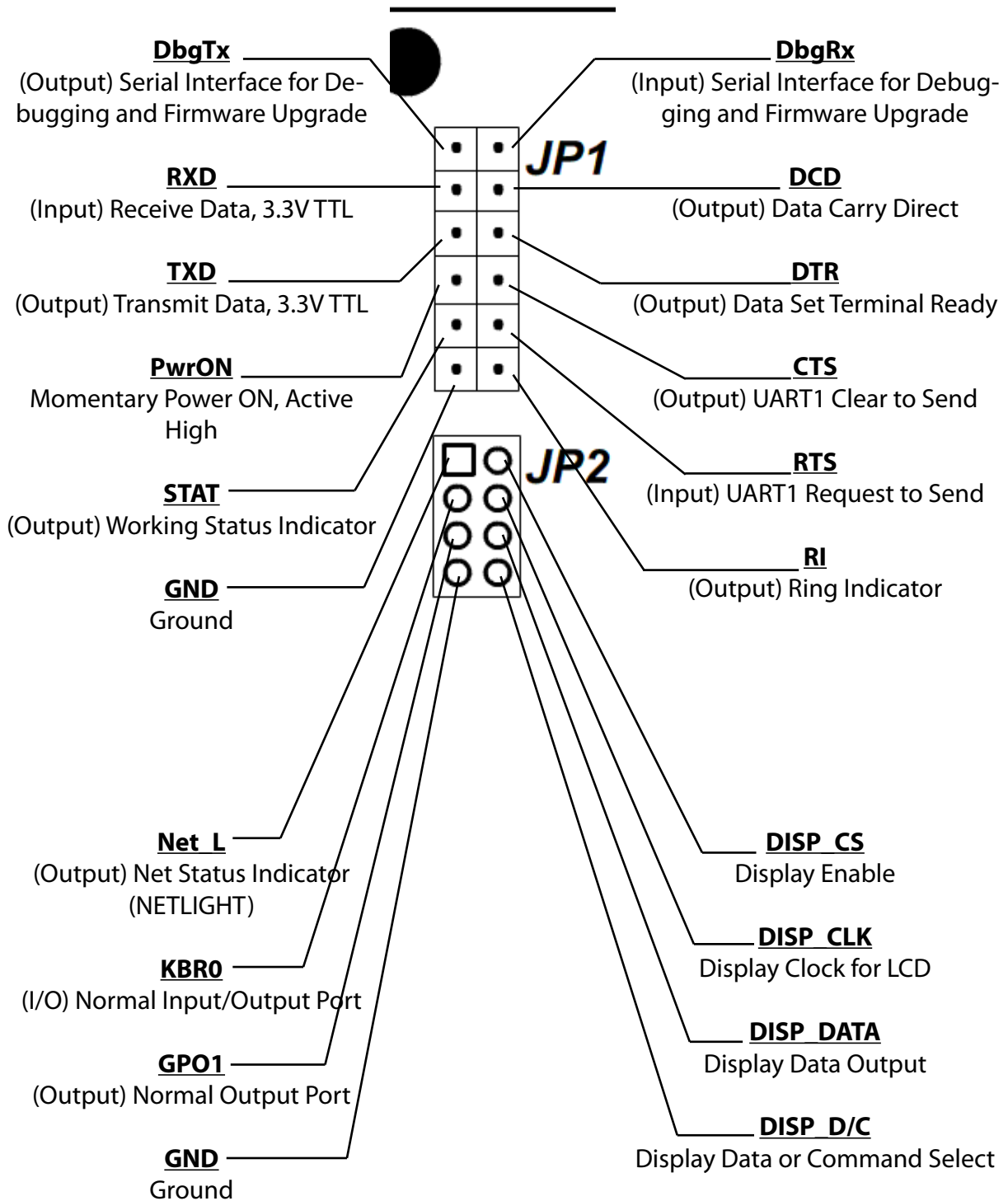


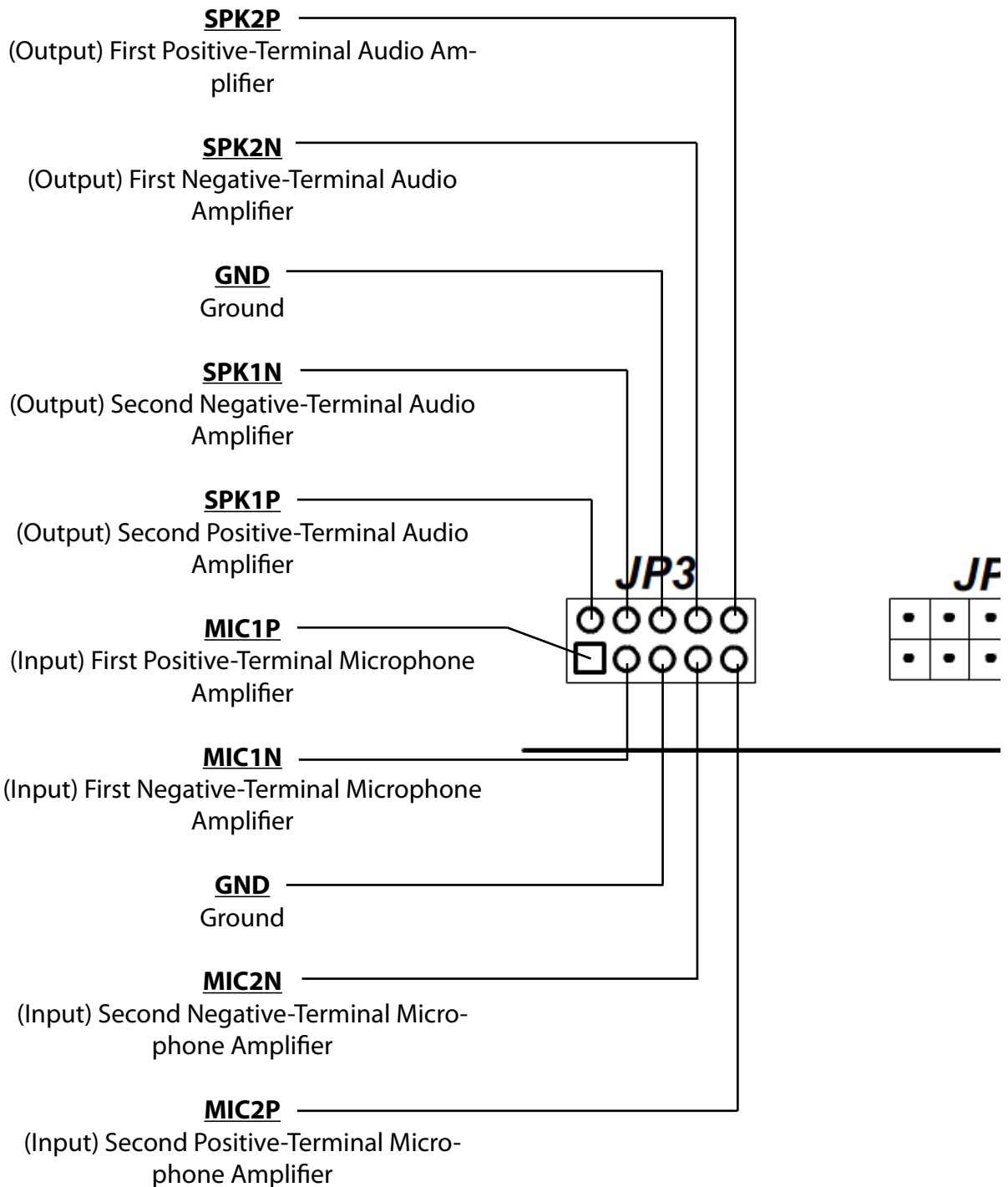
Figure 1 - Parts Placement Diagram

# GSM-GPRS Modem

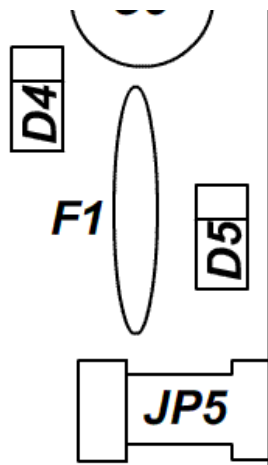
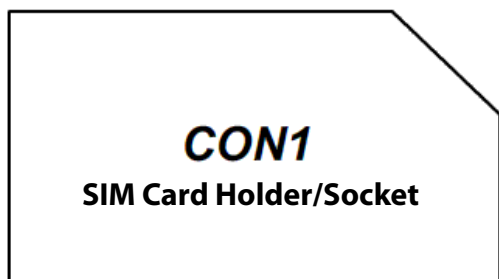
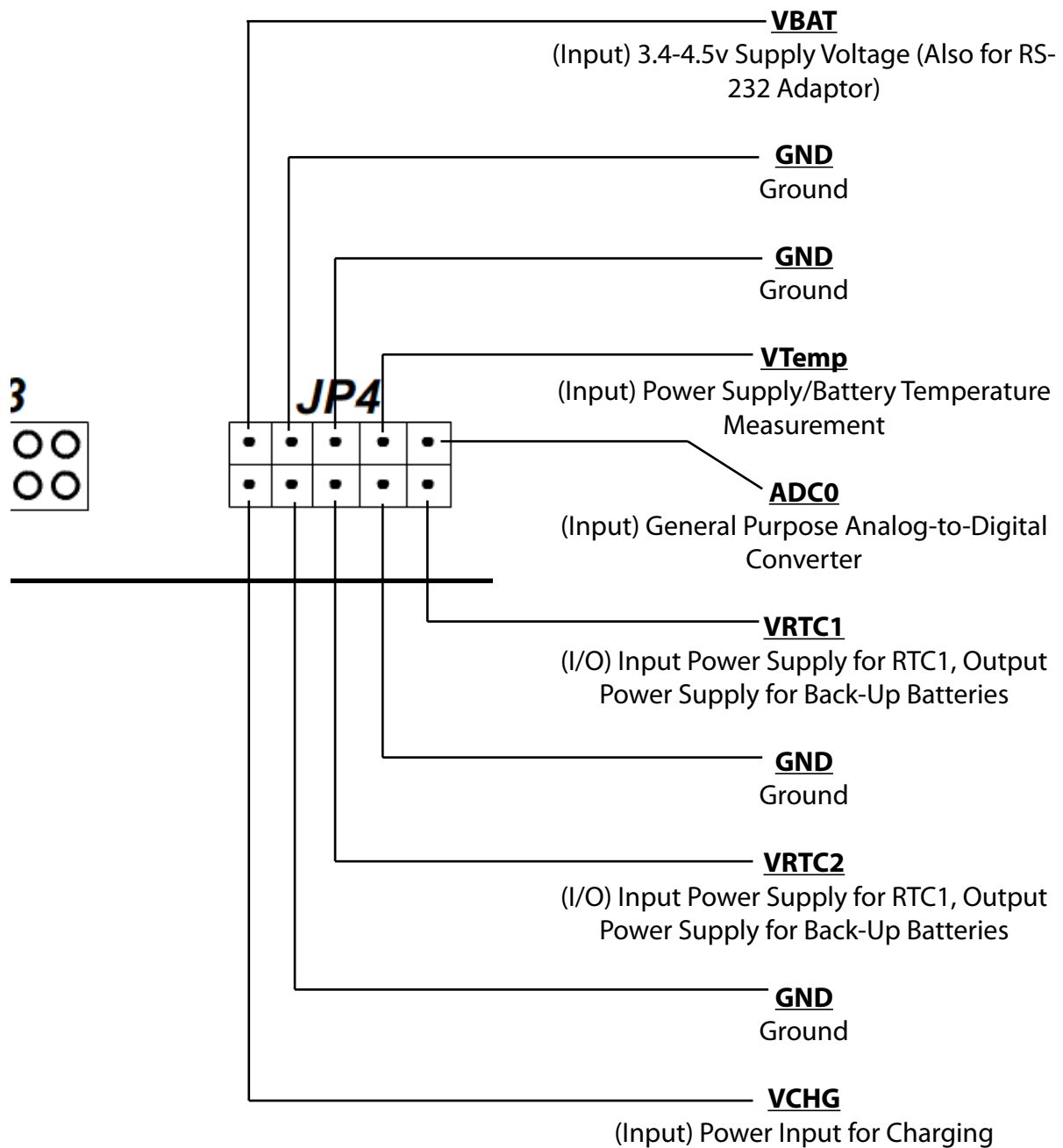
## Parts Information - Pin Junctions



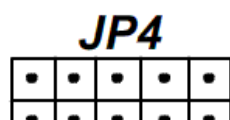
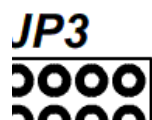
# GSM-GPRS Modem



# GSM-GPRS Modem



5-Volts, 1.5 Amperes Power Supply





## **GSM-GPRS Modem**

### **Operations - Mode of Transmission**

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The e-Gizmo GSM-GPRS Modem utilizes an existing and available network service provider (such as Globe Telecom, or Smart) to achieve its wide-range communications of data. As such, a SIM card corresponding to a specific network service provider must be attached to the GSM modem. Part of the advantages of this is that the line of communication made by the GSM modem with the SIM card gains automatic uniqueness; one does not need any more go through the trouble of finding an unused signal for transmission unlike standard radio communications. Instead of GSM modem's direct use of a unique signal frequency, the SIM card and network provider provides a line of communication that is unique in terms of the 'number code' (Cellular phone number) registered on the SIM card. If for example the SIM card number code is meant to be known privately and is somehow discovered by others, the user may simply exchange the present, compromised SIM card with another one.

The advantages in using a network service provider do not come without costs, however. In using the network service provider as a global relay of data, the user and the transmissions of the GSM modem must conform to the requirements that the particular chosen network service provider demands. Amongst these requirements, the most common is the occasional monetary payment. Messages sent to-and-from the GSM modem consumes a 'load' value or monetary value of 1 (based on the Smart and Globe Telecom network service providers). Thus in order to maintain open communications to-and-from the GSM Modem, both receivers and senders of data must maintain the credits needed to spend for information transmission by their network service provider.

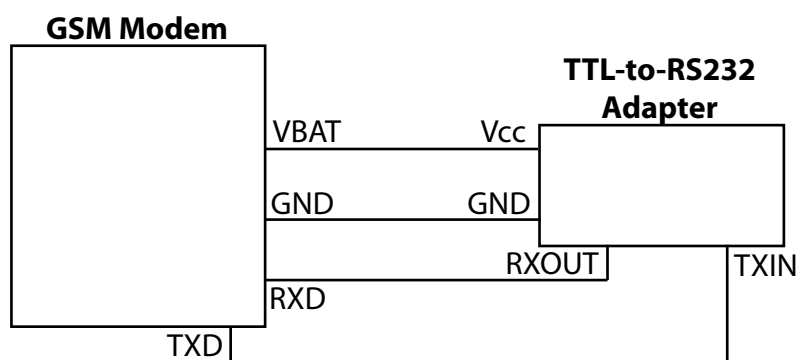
### **Operations - GSM Modem-to-PC Assembly**

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One of the simplest ways to test the e-Gizmo GSM-GPRS Modem is to use the HyperTerminal application program of a PC running with the Microsoft® Windows Operating System. In the first place, the user must provide the GSM modem a steady DC supply of 5.0 volts and 1.5 amperes, which can be done by attaching to JP5 an AC/DC power adapter with the required voltage and current output (Such an adapter is available from the e-Gizmo Mechatronics Central store). Also, most obviously, a SIM card must already be installed and locked into the CON1 (SIM card holder) of the GSM Modem. Once the past two prerequisites are met the user must then attach the antenna of the GSM modem unto the ANT. socket (see Figure 1) if the user has not done so yet. Apart from the GSM modem the e-Gizmo GSM-GPRS modem set includes an antenna and one hexagonal screw nut. To attach the antenna, the user simply inserts the screw-threaded end of the antenna into the ANT. socket, which is then locked into place with the hexagonal nut.

# GSM-GPRS Modem

Once the basic assembly of the GSM modem is completed, the user may now continue with the setup of a connection to a PC. Because the e-Gizmo GSM-GPRS Modem supports the TTL level serial port connection, and from the fact that communication ports of present day computers commonly use either serial or USB ports, it is advisable for the user to acquire, for example, a TTL level serial to RS-232 adapter/converter (The adapter is also available at the e-Gizmo Mechatronix Central store. One may also use a TTL level serial to USB adapter/converter). The proper pin attachments for both adapters are shown in the figures below.



Note: VBAT and GND pins on the GSM Modem are situated right beside each other.

Figure 2 - GSM Modem to TTL-RS232 Adapter Junctions

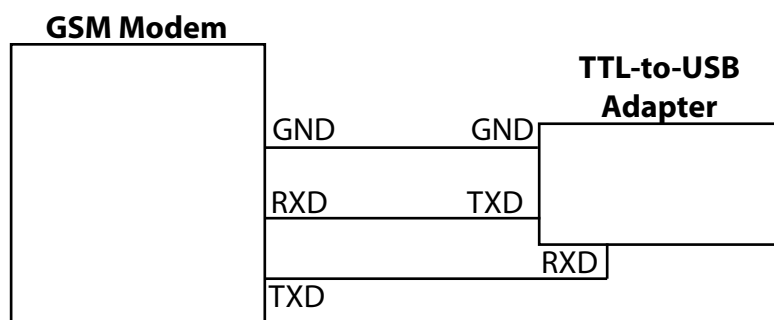
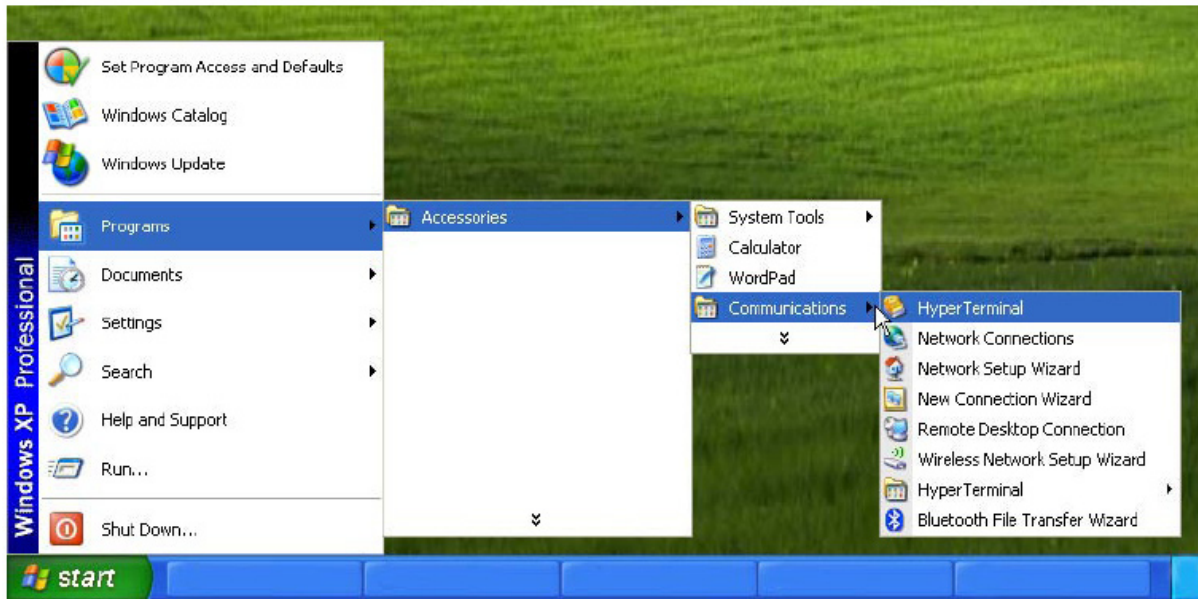


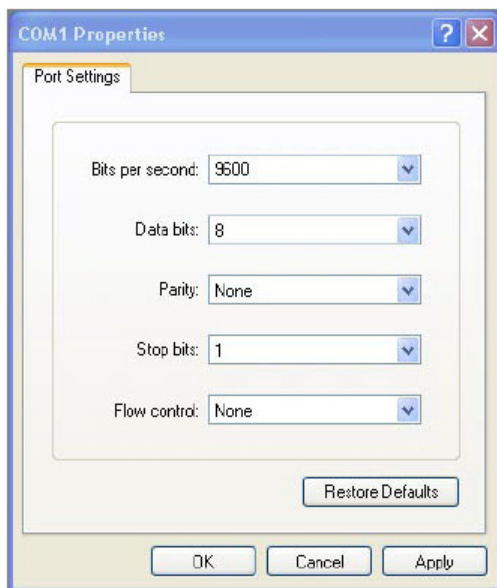
Figure 3 - GSM Modem to TTL-USB Adapter Junctions

## GSM-GPRS Modem

After attaching a preferred adapter both to the e-Gizmo GSM-GPRS Modem and to a selected PC serial port (For our purposes, we will use COM1), on the computer, click on the 'Start Menu' found on the default screen of a Microsoft® Windows Operating System, then open the folders 'Programs' > 'Accessories' > 'Communications', to finally arrive at 'HyperTerminal'. (The HyperTerminal Application is not present by default in Windows Operating Systems Vista and 7. However, they can be downloaded from various unofficial websites)



As the HyperTerminal Program is initiated a window will appear requesting for the desired name of the connection created and the communication port that the connection is using. For the existing example, the connection name 'test' was typed and the communication port 'COM1' was selected (replace this with the COM port in which the GSM modem is attached to).



The next step is to configure the COM port parameters. These parameters are the 'Baud Rate' or 'Bits per second', 'Data bits', 'Parity', 'Stop bits', and 'Flow control'. Each of these must be set according to the values found on the figure to the left.

## GSM-GPRS Modem

When the configurations are set, click on 'OK' to continue to the main HyperTerminal window.

At this point, the GSM modem may now be switched on by pushing on the button S1. To see whether the e-Gizmo GSM-GPRS Modem is ready for testing, type in 'AT' at the main HyperTerminal window (Although the letters will not be displayed in the window) and press 'ENTER' on the keyboard. When the GSM modem responds with the text 'OK', the GSM modem is ready for testing.

### Operations - GSM Modem Testing and Configurations

In this section, communication between the user and the GSM modem is emphasized and as such, commands from the user and responses from the GSM modem are numerous. Color coding will be used in identifying a command line from the user or a response line from the GSM modem. The line of text colored in **RED** corresponds to the command line that the user types into HyperTerminal, while the line of text colored in **BLUE** corresponds to the GSM modem's reply to a particular user command issued.

Note: The characters **<CR>** represent a 'Carriage Return' command. It is simply an 'ENTER' key command on the keyboard.

Initial setup and testing of the e-Gizmo GSM-GPRS Modem are the commands entered as follows:

Type:

**AT<CR>**

GSM Response:

**OK**

This is just the commands previously done.

Type:

**ATE1<CR>**

GSM Response:

**OK**

This command tells the GSM Modem to echo the characters you type into the Hyper Terminal, which allows the display of every character typed.

Type:

**AT+CMGF=1<CR>**

GSM Response:

**OK**

This command tells the GSM Modem to display SMS messages in the Human Readable Text Format.

# GSM-GPRS Modem

Type:

`AT+CMEE=2<CR>`

GSM Response:

`OK`

This command lets the GSM Modem report any errors found in a readable format.

Type:

`AT+CFUN=1<CR>`

GSM Response:

`OK`

This command sets all the GSM Modem functions to be available to the user.

Type:

`AT+COPS=0<CR>`

GSM Response:

`OK`

This command lets the GSM Modem functions choose an available network operator automatically. The process may take some time to complete, and its completion is marked by the 'OK' response. This usually takes around 30 seconds to complete.

Type:

`AT+CPAS<CR>`

GSM Response:

`OK`

Whenever this command is executed during the processing time from the above command, it reports on the status of the loading process. When the GSM modem is still loading, it will respond with an 'OK'. Otherwise, if it is done it will respond 'Ready'. If the GSM modem responds an 'Error' up until a minute then the problem may result in the improper attachment of the SIM card. To remedy this, turn off the GSM modem power, carefully reattach the SIM card and check if it is properly placed, and resume with the start up process once again.

## Some GSM Module Commands

After all the steps of commands this far, the user is now ready to play with some other useful commands! The user may wish to try some of the many commands available. Here are a few:

Display SIM number: `AT+CNUM<CR>`

Show operator network: `AT+COPS?<CR>`

Show signal quality: `AT+CSQ<CR>`

# GSM-GPRS Modem

Display an SMS message: **AT+CMGR=1<CR>**

(If there are no messages in storage of the SIM card, it will return an 'Error' message.)

Display all SMS messages: **AT+CMGL="ALL"<CR>**

WARNING: If there are large amounts of SMS messages in the SIM card, this command will flood your HyperTerminal with SMS messages.

Send an SMS message: **AT+CMGS="SIM number"<CR>**  
**User Message <CTRL Z>**

For example, if the user types in **AT+CMGS="09123456789"** and executes 'ENTER', and types in for the message 'Hello There!' (excluding the apostrophes) and presses down both 'CTRL' and 'Z' simultaneously, the GSM modem will send a 'Hello There!' message to the desired number. Note that this will cost an amount of credit or load depending on the network service provider.

Show list of all available commands: **AT+CLAC<CR>**

Switches GSM Module power to OFF: **AT+CPOWD<CR>**

For more information regarding all the available commands of the GSM module, the user may refer to the SIM900D 'AT Command' manual.

## Microcontroller Interfacing

The capabilities of the e-Gizmo GSM-GPRS Modem is not limited to functioning much like a mobile phone as one would conclude from the example commands of the GSM module. Users of the e-Gizmo GSM-GPRS Modem have the freedom of interfacing that device with an external microcontroller, and thus possess a wide variety of possible applications utilizing wide-range communications. Many popular kinds of microcontrollers are compatible with the e-Gizmo GSM-GPRS Modem. The user is recommended to choose a microcontroller with an included UART; this built-in feature will save the user from heavy amounts of programming and other programming difficulties that are dealt usually by advanced or professional programmers.

In choosing a microcontroller to combine with the e-Gizmo GSM-GPRS Modem, it is also recommended that the operating voltage of the microcontroller to be at 3.3 volts. This is due to the design of the RX junction pin of the GSM modem to accept a 3.3 volt logic level only. As such, forcing a microcontroller with an operating voltage of around 5 volts will damage the GSM modem. In order to prevent this damage while still utilizing a 5-volt microcontroller, a resistive divider must be attached to the TX junction pin of the 5-volt microcontroller (This is illustrated in Figure 2). An example code using z8! Encore XP Microcontroller can be downloaded from the [www.e-Gizmo.com](http://www.e-Gizmo.com) product page. The programming code is written in C language. This is to introduce ease in the user's manipulation and modification of the code as it may be necessary if it is to be applied to other microcontrollers.

# GSM-GPRS Modem

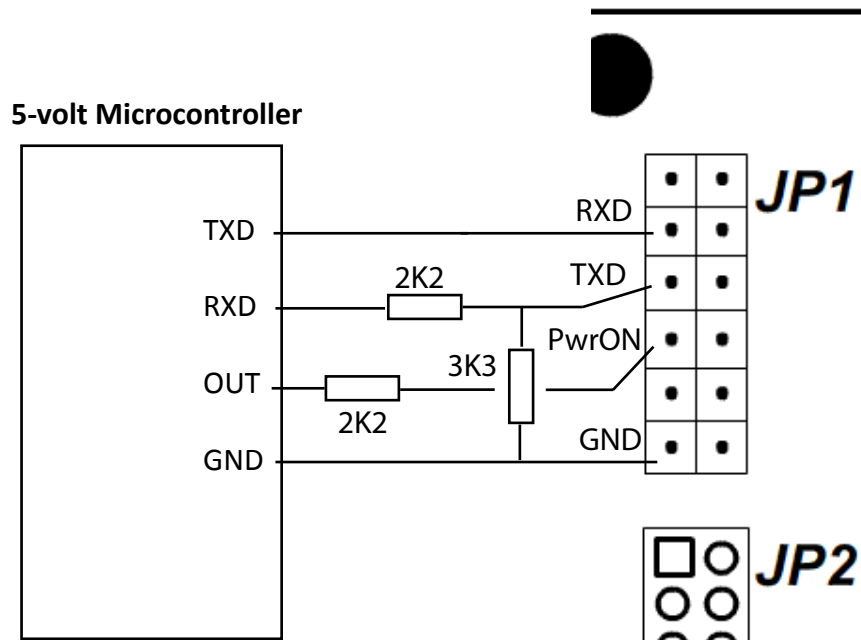
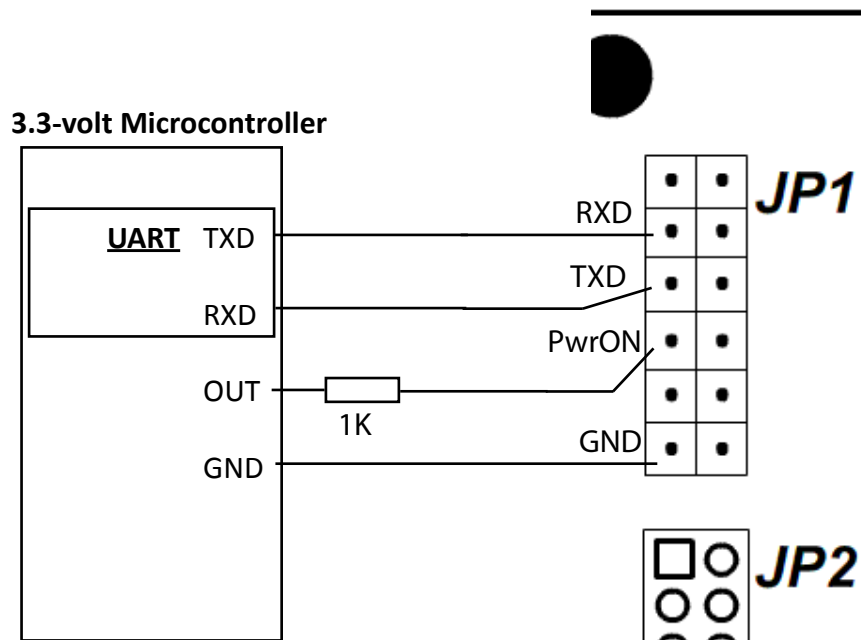


Figure 4 - Resistive Dividers



Note: Pulse PwrON to Logic 1 > 150ms to power the GSM module.

Figure 5 - 3.3 Volts Microcontroller Junctions

# GSM-GPRS Modem

## Image References

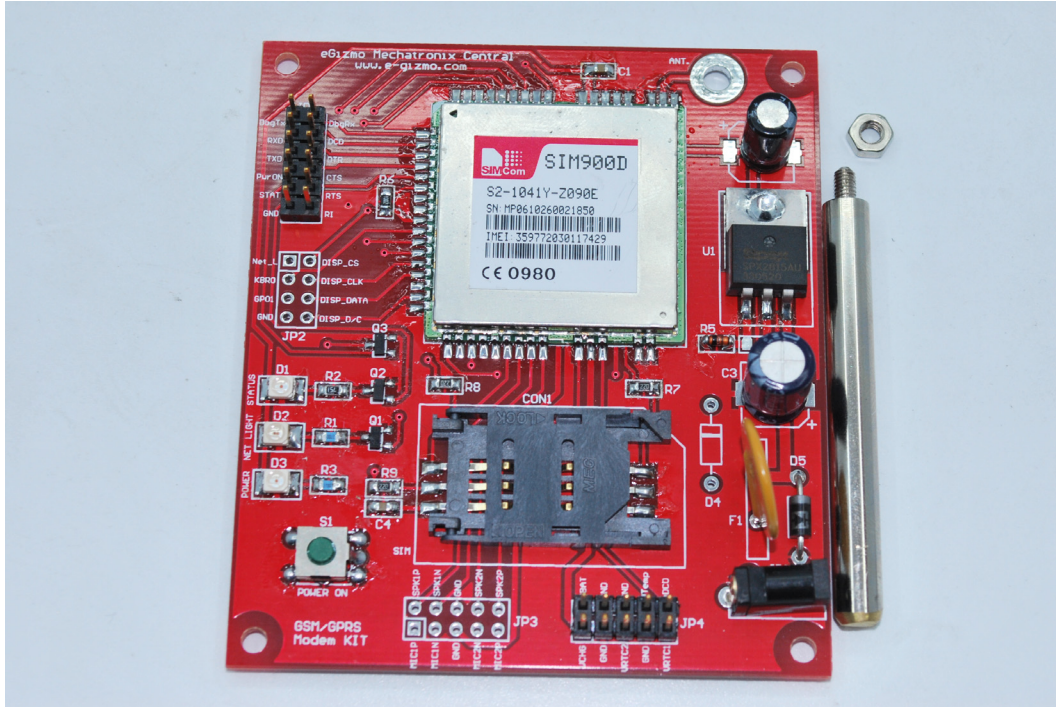


Figure 6 - GSM Modem w/ Antenna (Front)

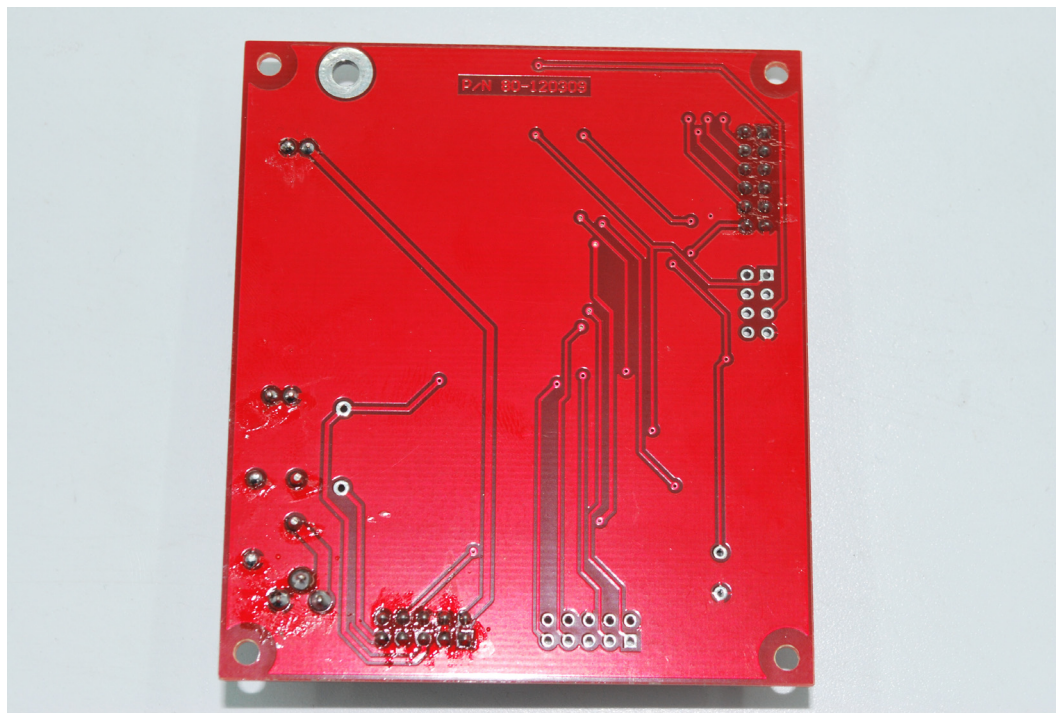


Figure 7 - GSM Modem (Back)



# GSM-GPRS Modem

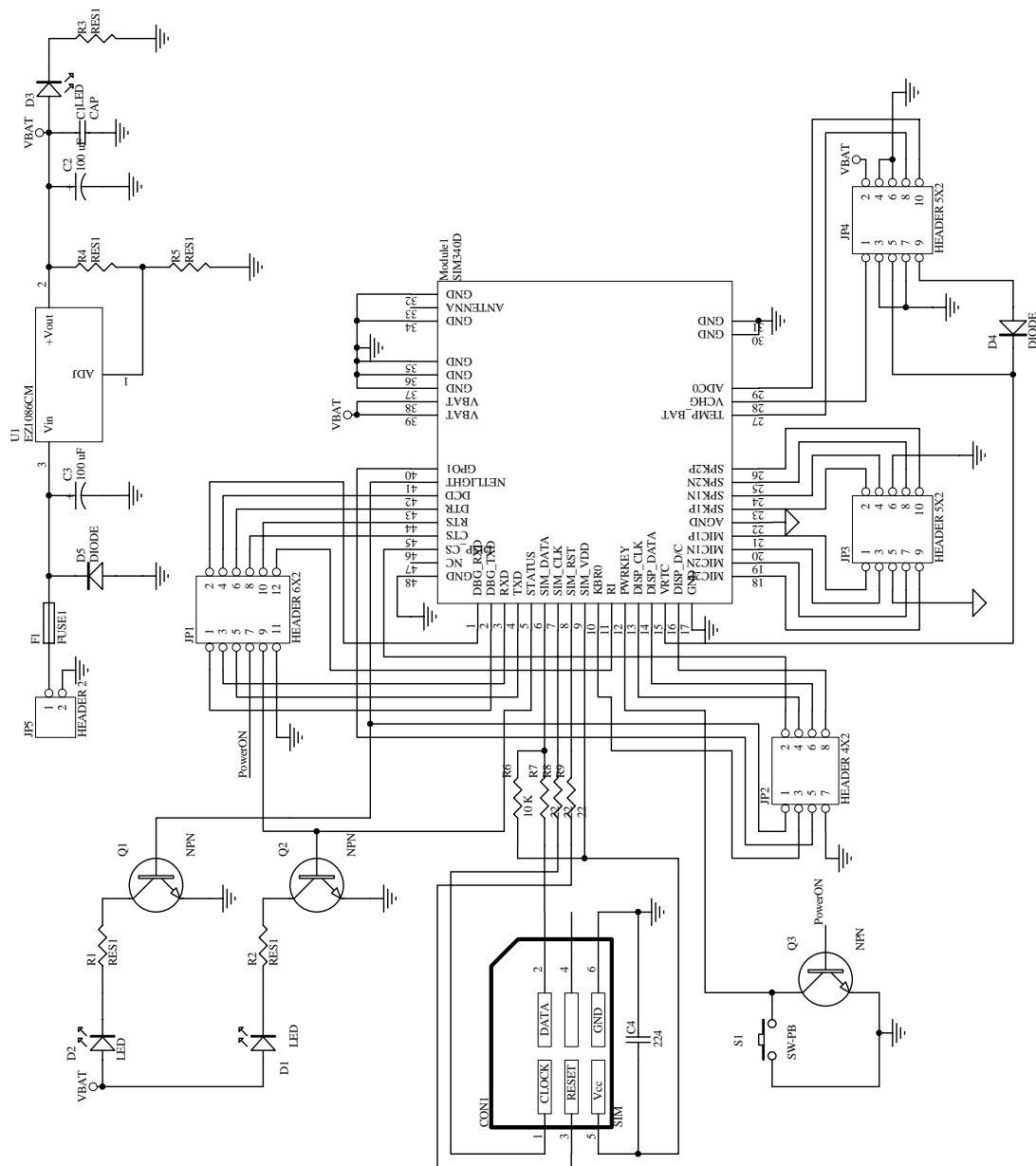


Figure 8 - Schematic Diagram

# GSM-GPRS Modem

Visit the website at **[www.e-gizmo.com](http://www.e-gizmo.com)** for the latest gadgets and updates on products.

For suggestions or inquiries, contact the e-Gizmo Mechatronix Central Branch via landline (**02-536-33-78**) or via cellular phone (**Globe +63915-973-76-91, Smart +63921-779-07-48**).