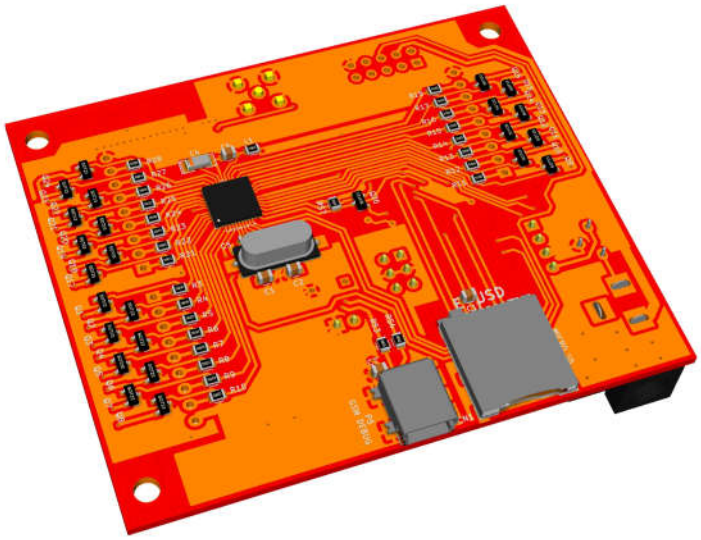
GSM REMOTE I/O KIT

Technical Manual Rev 1r0

GSMIO *is a highly configurable application specific SMS based board that you can use to add SMS remote control functionality to your projects, fast and easy. With GSMIO, you no longer have to get through all those long and difficult programs normally associated with developing SMS based devices. Thus with it, you can focus your effort to the more important functions of your projects.*

GSMIO is packed with just about everything you need to remotely control and monitor devices. In a lot of applications, it might be all you need.



GSMIO FEATURES:

- 28 I/O pins you can freely configure to function as input or output
- SMS Remote control and monitoring of each pin
- Independent auto OFF timers for each pins
- 5 ports can be configured to work as 10 bit ADC port
- serial functions allows you to connect and SMS remotely control add-ons serial devices with the GSMIO
- Configurable ALARM pin turns your GSMIO into an SMS based alarm unit
- Easy to use configuration menu allows you to setup GSMIO according to your needs
- Ports alias feature allows you to rename ports to your preference
- Host of supported remote SMS commands
- Uses a newer (and better) SIM800 GSM module.
- With voice enable commands or automatic answering the incoming call.
- Most Secure device good for your home automation projects or other applications via sms control.

GENERAL SPECIFICATIONS:

Input Supply: ***5-9VDC*** (External)
Req. current: ***1A-2.6A*** (External)
Interface: ***Serial communication***
Normal Operation: ***(-40 degC to 85 degC)***
SIM interface: ***Support SIM card 1.8V, 3V***
w/ Built-in ATmega644P MCU IC
Physical characteristics:
Size: 24mmX24mmX3mm
Weight: 3.2g
PCB Dimensions: 64mmx64mm

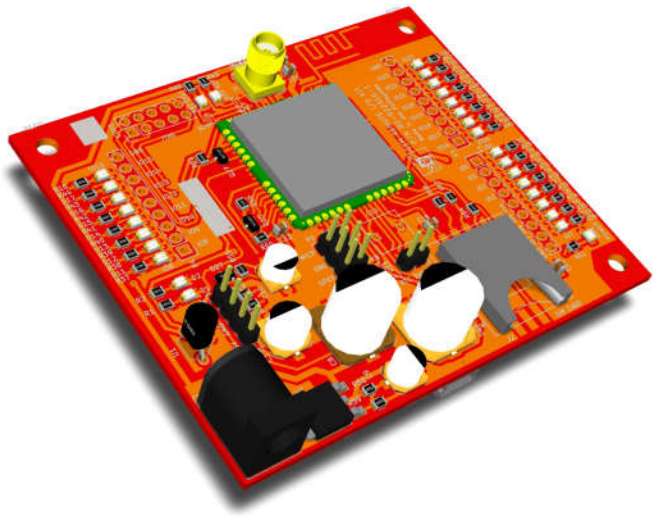


Figure 1. *Major parts presentation of GSM Remote I/O kit. (TopView)*

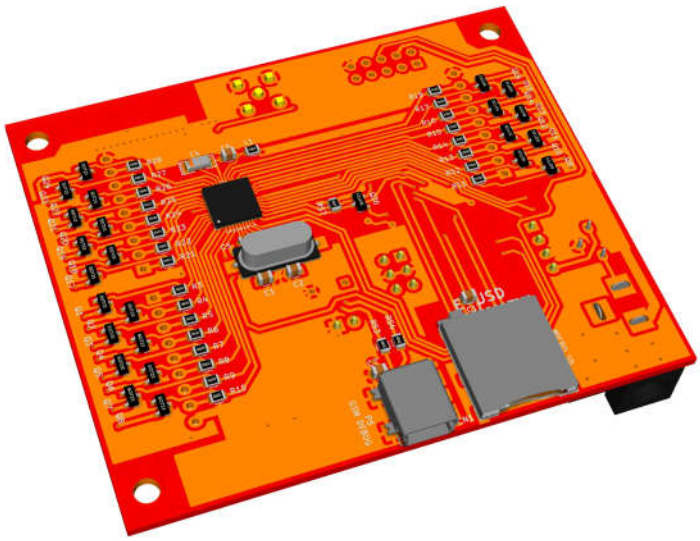


Figure 2. *Major parts presentation of GSM Remote I/O kit. (BottomView)*

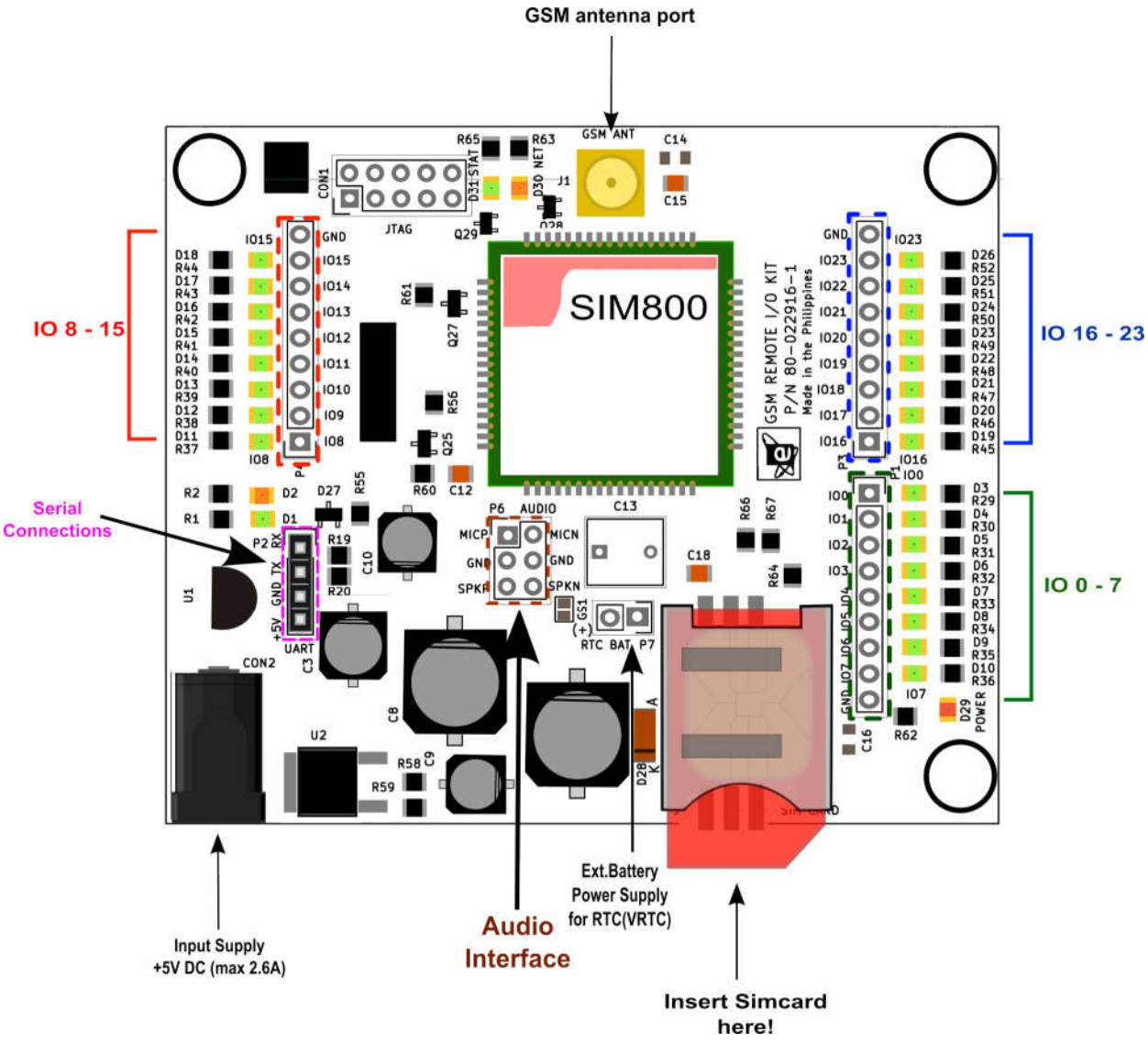


Figure 3. *Major parts presentation of GSM Remote I/O kit. (TopView)*

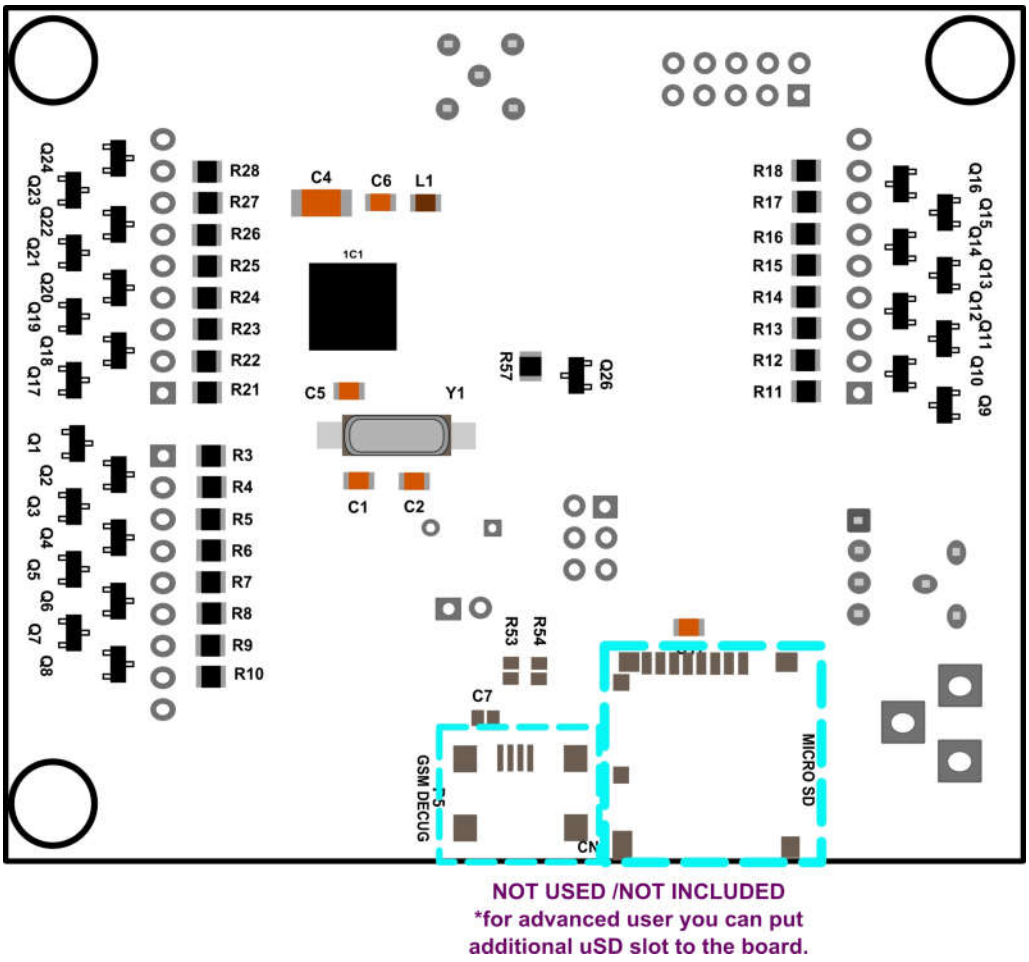


Figure 4. *Major parts presentation of GSM Remote I/O kit. (Bottom view)*

Table 1. P1 I/O 0 - 7 connection

NAME	TYPE	DESCRIPTION
IO0	I/O	Digital pin
IO1	I/O	Digital pin
IO2	I/O	Digital pin
IO3	I/O	Digital pin
IO4	I/O	Digital pin
IO5	I/O	Digital pin
IO6	I/O	Digital pin
IO7	I/O	Digital pin
GND	GND	Ground

Table 2. P2 Serial Connection

NAME	TYPE	DESCRIPTION
+5V	Source	Power Source
GND	GND	Ground
TX	Serial	Hardware Serial
RX	Serial	Hardware Serial

Table 3. P3 I/O 16 - 13 connection

NAME	TYPE	DESCRIPTION
IO16	I/O	Analog pin
IO17	I/O	Analog pin
IO18	I/O	Analog pin
IO19	I/O	Analog pin
IO20	I/O	Analog pin
IO21	I/O	Analog pin
IO22	I/O	Analog pin
IO23	I/O	Analog pin
GND	GND	Ground

Table 4. P4 I/O 8 - 15 connection

NAME	TYPE	DESCRIPTION
IO8	I/O	Digital pin
IO9	I/O	Digital pin
IO10	I/O	Digital pin
IO11	I/O	Digital pin
IO12	I/O	Digital pin
IO13	I/O	Digital pin
IO14	I/O	Digital pin
IO15	I/O	Digital pin
GND	GND	Ground

Table 5. GSM Debug connection*

NAME	TYPE	DESCRIPTION
USB_VBUS	Input	Debug and firmware upgrading*
USB_DN	I/O	
USB_DP	I/O	
GND		Ground

Table 6. P6 Audio Interface connection

NAME	TYPE	DESCRIPTION
MICP	Input	Differential audio input*
MICN	Input	Differential audio input*
GND	GND	Ground
GND	GND	Ground
SPKP	Output	Differential audio output*
SPKN	Output	Differential audio output*

Table 7. P7 Ext. Batt Descriptions*

NAME	TYPE	DESCRIPTION
Ext. Batt	I/O	Power supply for RTC*

Table 8. LED Functions

NAME	COLOR	DESCRIPTION
D29	RED	Power Indicator
D1	GREEN	GSMIO RDY ON = GSMIO is ready FLASH OFF = GSMIO SMS sending
D2	AMBER	GSMIO SIGNAL D2 flashes at fixed interval and indicates signal strenght by the ratio of time D2 is ON. The longer D2 is ON, the stronger is the signal. Signal is strongest when D2 stays on and is weakest when it flashes on very briefly. D2 will not light at all when no signal is being detected.
D31	GREEN	SIM800 STAT D31 is ON to indicate SIM800 is ready
D30	ORANGE	SIM800 NET D30 flashes at fast rate while SIM800 attempts to register to a network, and then flashes at a slow rate when connection to the provider network is established

Table 9. CON1 AVR - JTAG Descriptions*

NAME	TYPE	DESCRIPTION
TCK		Test Clock
GND	GND	Ground
TDO		Test Data Out
VREF	Input	+5V power source
TMS		Test mode Select
nSRST	Reset	Reset(Optional) to reset the device
NC		No Connection
nTRST		Test Reset
TDI		Test Data In
GND	GND	Ground

NOTE: ***Keep floating if unused

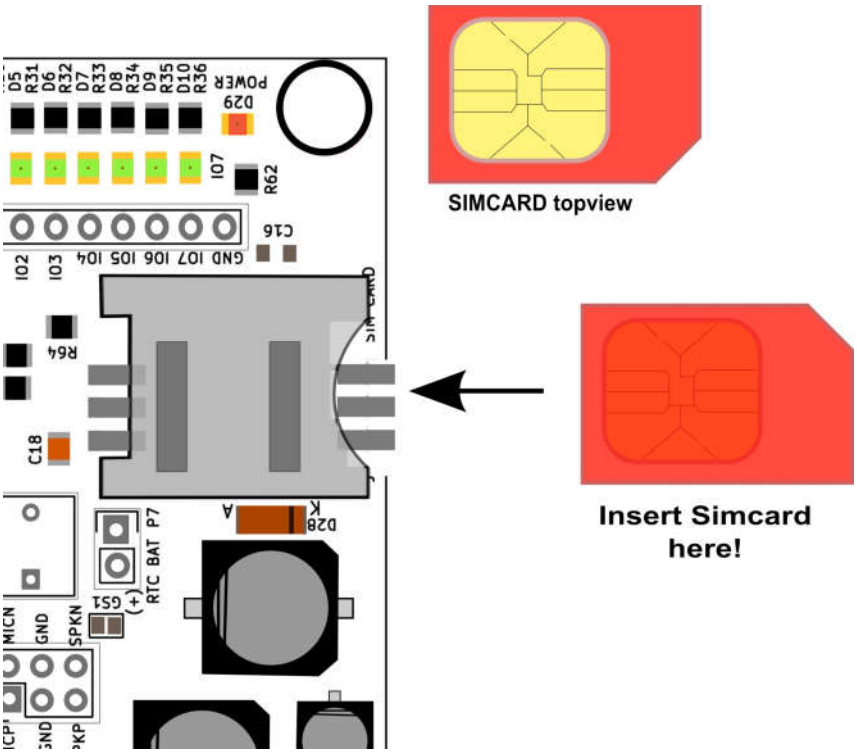
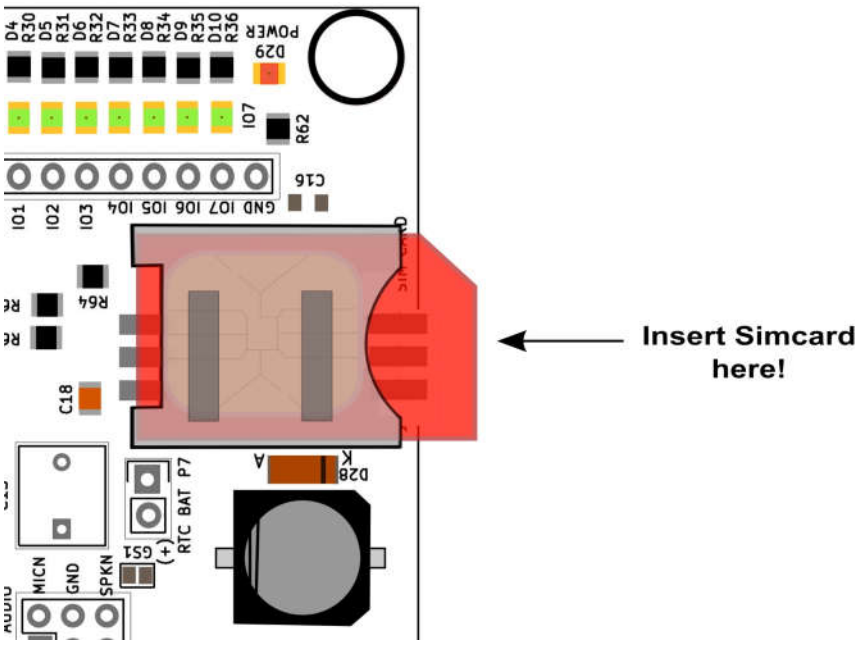


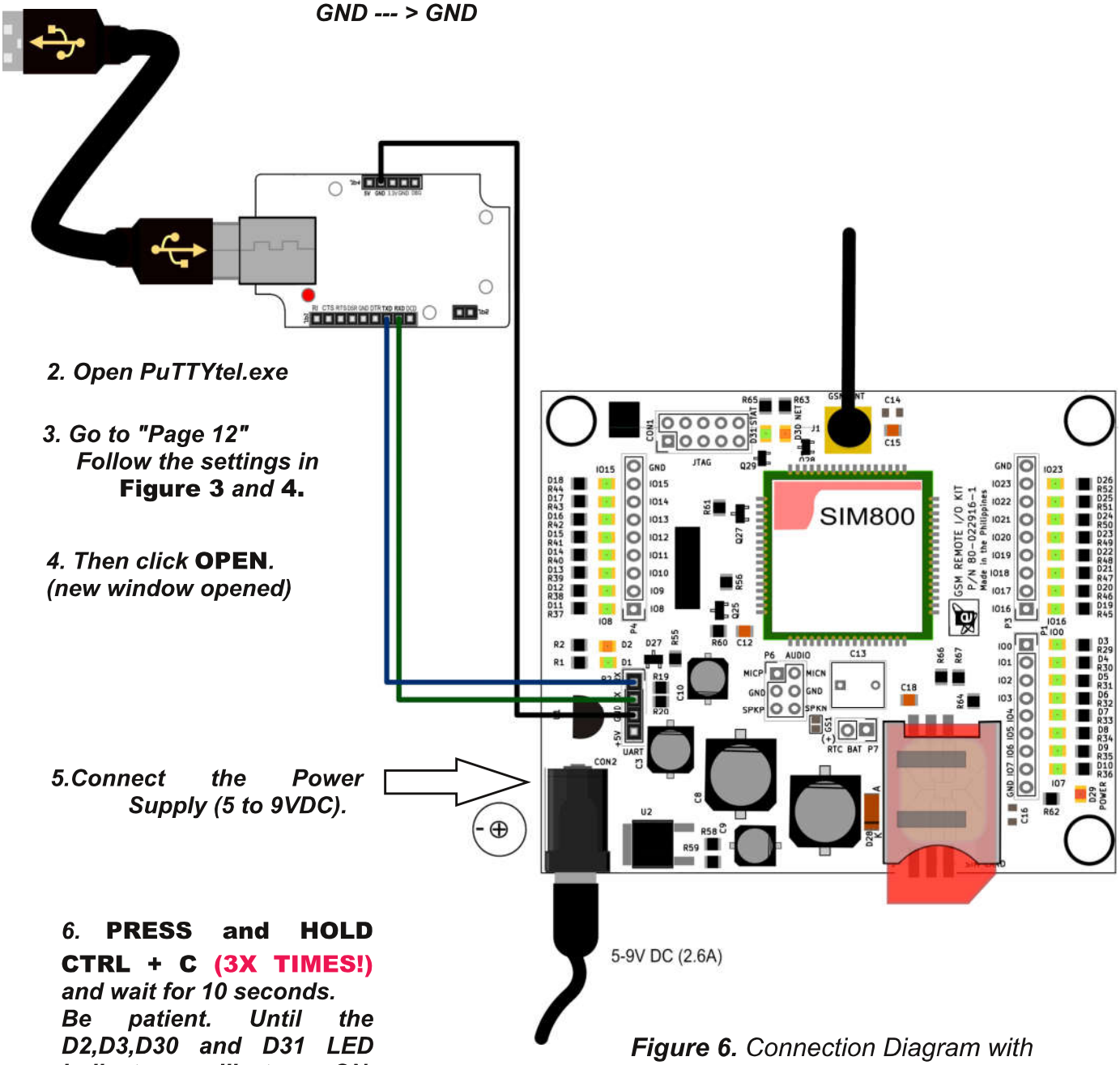
Figure 5. *How to insert SIM CARD*



1.Construct this Diagram. Wire connections from USB-TTL converter to GSMIO :

<--- TO PC

TXD --- > RX
RXD --- > TX
GND --- > GND



2. Open PuTTYtel.exe

3. Go to "Page 12"
Follow the settings in **Figure 3** ***and*** **4.**

4. Then click **OPEN.**
(new window opened)

5.Connect the Power Supply (5 to 9VDC).

6. **PRESS and HOLD CTRL + C (3X TIMES!)** ***and wait for 10 seconds. Be patient. Until the D2,D3,D30 and D31 LED indicators will turn ON. (After that e-Gizmo GSM I/O setup will show up)***
Read page 13 or
Watch the GSMIO Demo.

Figure 6. *Connection Diagram with USB - TTL converter to GSMIO Kit.*

Remote Commands

Important: All commands and its corresponding arguments are case sensitive (i.e. “Arm” is not the same as “arm”)

arm

Enable auto sending of SMS enabled inputs. This will also auto activate the alarm output function if it is enabled.

disarm

Stop auto sending of SMS enabled inputs. Alarm output function, if enabled, is likewise deactivated.

on *[port alias,on time]*

Activate (switch to logic high) the named port [port alias]. The named port will automatically turned OFF after a time as specified by [on time].

[on time] is an optional parameters and behaves in the following manner.

- if no [on time] is entered, the port will use the latest [on time] entered by you for this port to automatically switch off.

- Entering a value of zero 0 for [on time] disables the auto off function. The port will stay ON until turned OFF using the off command.

[on time] affects only the port it was entered with. Each port [on time] can be set independently.

[on time] format- ***hh:mm:ss***

where: **hh**- time in hour
mm - time in minutes
ss - time in seconds

- maximum value - 596,523 hours (No, please!)

The *[on time]* format does not strictly follow the standard time format. You can specify minutes and seconds in excess of 59. You can enter time in seconds or mm:ss only.

Examples:

on 01 1:25:30 - activate port 01 for 1 hour, 25minutes, 30 secs

on 01 - activate port 01 for 1 hour, 25minutes, 30 secs (latest entered value)

on 02 100:97:350 - activate port 02 for 100 hours, 97 minutes, 350 secs

on 03 1:36 - activate port 03 for 1 minute, 36 secs

on myvault,3601 - activate port myvault for 3601 secs

on porchlight 0 - activate porchlight, no auto off function

Note: You can rename any port pins to your preference using the GSMIO built-in configuration menu. myvault and porchlight are examples of user renamed ports.

Important: The timer function uses the system clock as time reference, and thus is not terribly accurate. Expect an error of as much as 1% (i.e. timer may advance as much as 1 sec for every 100 sec). Always keep this in mind.

off *[port alias]*

Turn OFF the named port.

Example:

off 03 - deactivate (turn OFF) port 03 output

status

Generate status report. The GSMIO will send back an sms report indicating

(ARMED) or (DISARMED)
- if the GSMIO auto sms is activated or disabled.

Network Provider name - e.g. SMART, GLOBE

Signal Strength - Signal strength in dbm.

Active Outputs: - List only the active output ports if there are any.

Active Inputs: - List only the active input ports if there are any.

Signal strength is displayed in -dbm unit. Hence stronger signal is indicated by a 'lower' number, i.e. -90dbm is better than -100dbm.

sms *[number] [msg]*

Get the GSMIO send and sms message [msg] to the indicated [number]. This feature is used mainly to enroll remotely the GSMIO in network provider promos, and check GSMIO remaining balance.

Example:

sms 222 BAL - SMS back the remaining balance [for GLOBE subscriber]

sms 9999 AT60 - Enroll GSMIO to unlimited text promo [for SMART subscriber]

Note: GSMIO will send back only the SMS reply immediately after this command is send. If you want GSMIO to send every single unsolicited message it receives, send to GSMIO unsolicited on command.

dial *[number]*

Like the sms function, this will allow the user to remotely access network provided features that are accessible only by dialing a specific number.

Example:

dial 1515 - SMS back load balance inquiry [for SMART subscriber]

Note: GSMIO will send back only the SMS reply immediately after this command is send. If you want GSMIO to send every single unsolicited message it receives, send to GSMIO **unsolicited on** command.

unsolicited *[on/off]*

Make the GSMIO relay all unsolicited message it receives to the telephone number registered in telephone #1 slot. Normally, GSMIO ignores all unsolicited messages it receives (messages it receives from unregistered telephone numbers). Turning this feature on will cause the GSMIO to relay all unsolicited messages it receives to telephone #1. This includes network provider sms promo, sms inquiry response, and .... text scams.

alias *[4/all]*

You can opt to rename any ports to any desired label (or alias) to make individual port functions easily recognizable. However, this may also tempt you to use long alias that will make composing sms command messages a bit tedious.

alias 4 - will allow you to enter just the first 4 characters of the alias in order to control an output. Just make sure no two port will have identical first 4 characters alias.

alias off - turns off this feature, GSMIO will now require you to enter the complete alias.

adc *[0 to 4 /off]*

Port I/O 16 to 20 can be made to function as 10-bit analog to digital input with 1.1V full scale reference. To use this function, you must configure the desired port as an input.

Once the adc command is initiated, the subject pin port will cease to function as digital input. You can revert all adc pin back to digital input anytime you find the need by sending the **adc off** command.

Example:

adc 0 - SMS back the analog voltage appearing across adc port 0 (port 16).

User should scale and calibrate each input (e.g. with the use of voltage divider resistor circuit) in order to make sense of the read out. GSMIO sms back the average of 16 readings taken each time the command is send.

list *[commands/alias]*

You can get a list of all available commands by texting GSMIO with **list commands.**
Likewise, **list alias** will get you a list of all port alias/names.

serial *[1/2/3/4],[timeout in ms]*

serial command is a powerful feature that lets you control and monitor serial enabled devices using your phone. Up to four preset serial command strings can be set up via the configuration menu. Each strings can have its own trap/stop search criteria- a feature that allows you to make GSMIO sms back only a portion of the connected uart device reply string useful to you. See the configuration section for more details.

[timeout] is an optional parameter and it instructs the GSMIO how long it should wait for the connected uart device to reply with the specified trap/stop criteria . If the uart device did not give the expected reply within the timeout period, GSMIO will stop waiting and send back an error message. [timeout] defaults to 1000ms (1 sec) if nothing is entered.

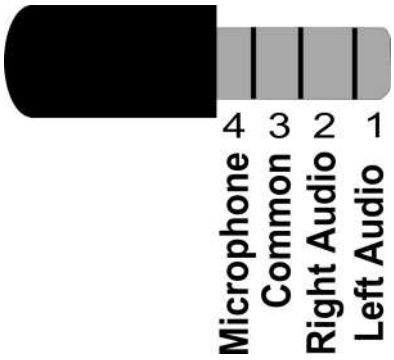
Example:

serial 1 3000 - Send serial string 1 and wait up to 3 secs for a reply.

serial 2 - Send serial string 2 and wait up to 1 sec for a reply.

For **serial [setups]** example read the ***"sample guide using gps serial.png".***

voice *[on/off]*



Turning ON the voice feature will make your GSMIO respond to voice calls. The GSMIO audio port will activate with your call, and you can use it with whatever purpose you intend to be. For example, you can connect the audio port pins to a public address system and make announcements remotely, and/or connect a microphone so that you can listen remotely to the surroundings where the GSMIO is installed. You may find these capability useful for security and monitoring applications (e.g. Patient Monitoring System).

Note: Only the registered number in GSM IO can call.

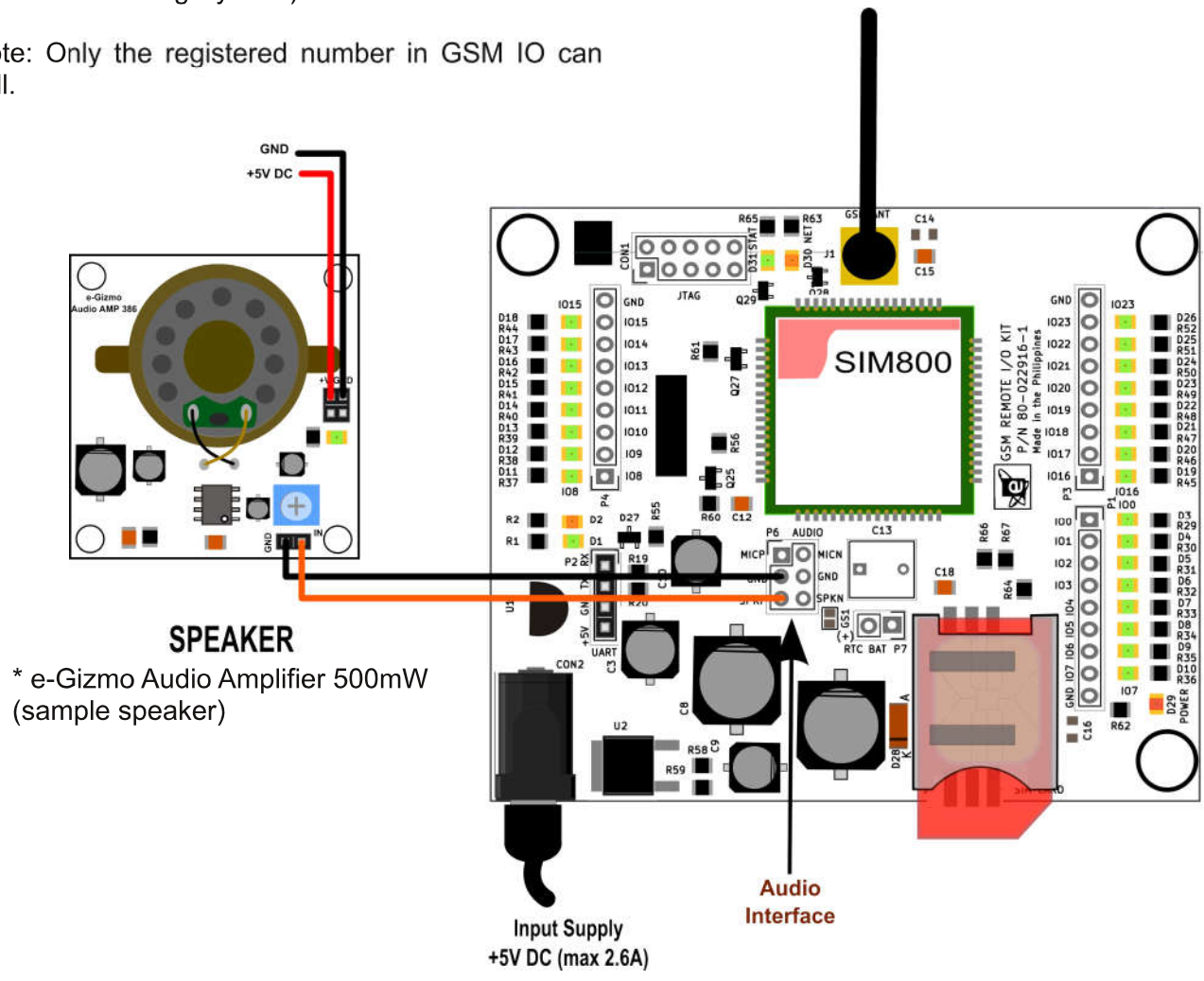


Figure 7. Sample connection for Speaker to GSMIO kit.
You can use headphones or other speaker with amplifier.

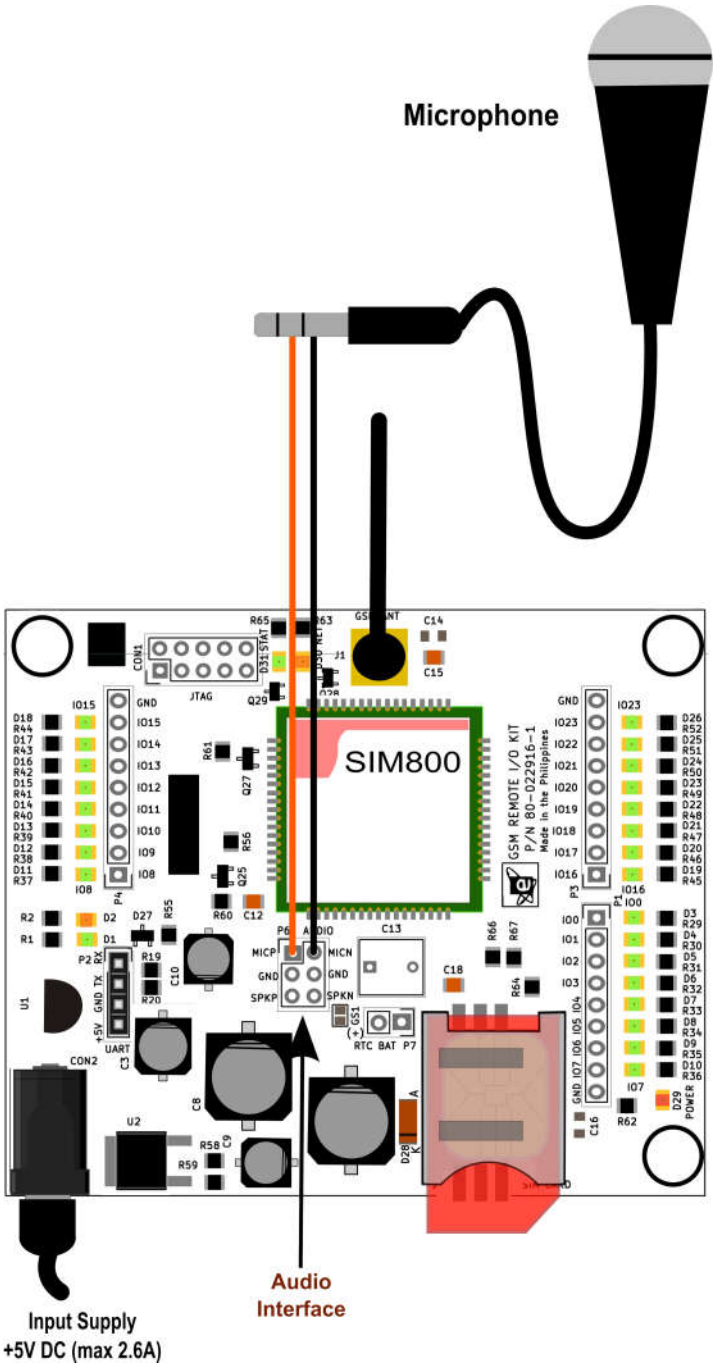
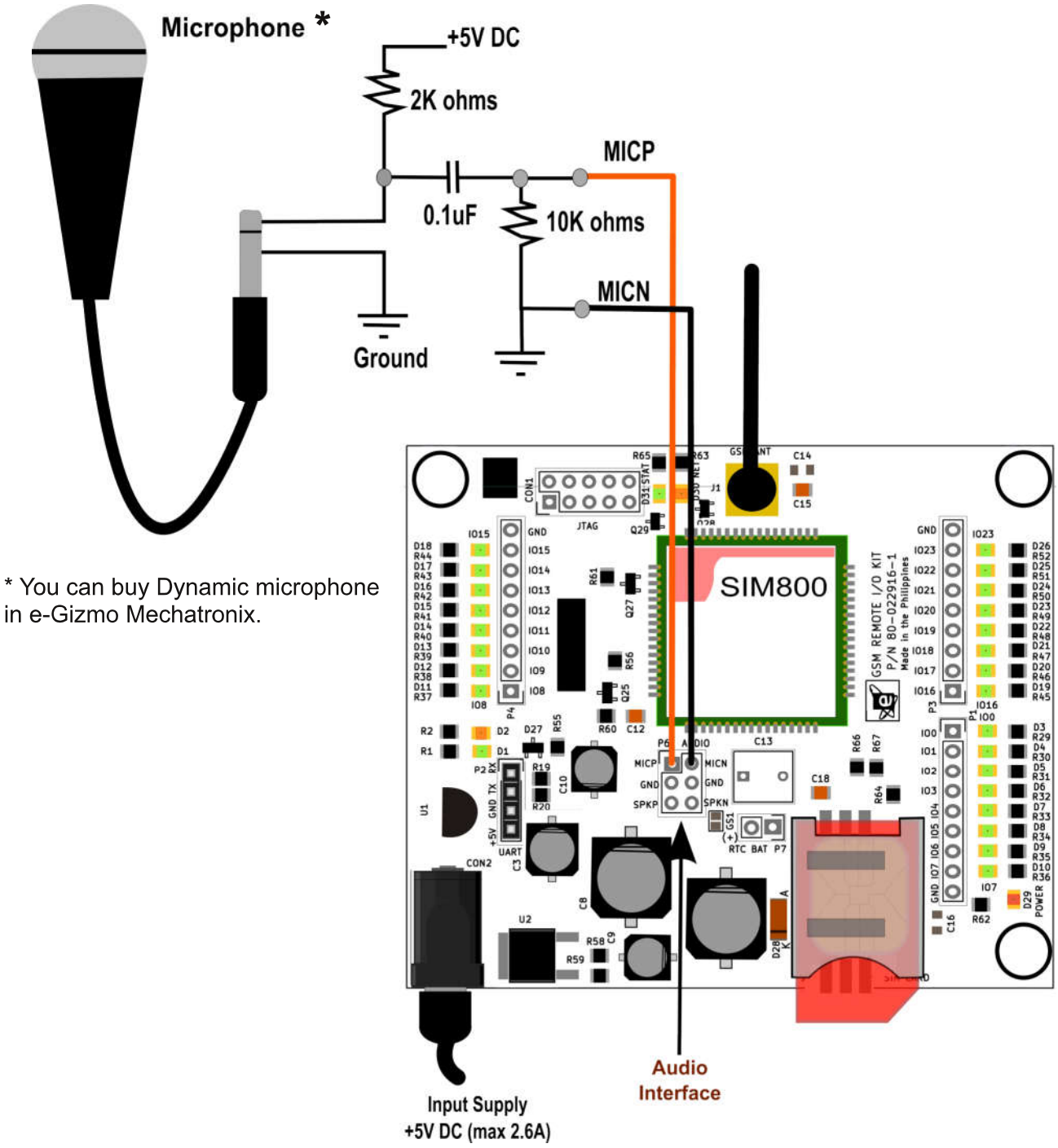


Figure 8. Sample connection for Stereo type microphone to GSMIO kit.



* You can buy Dynamic microphone in e-Gizmo Mechatronix.

Figure 9. Sample connection for Dynamic type microphone to GSMIO kit.

CONFIGURATION MENU

The GSMIO has a built in configuration menu that can be accessed via its uart port. You need a PC running a terminal apps and a USB to UART bridge connector.

There was once a terminal program bundled with the Windows OS (Hyperterminal), but this was gone since Windows 7. Fortunately, there are still a few free terminal programs in the wild. My favorite is the feature laden Terminal 1.9b by Br@y. There is also the much simpler PuTTYtel which we will be using in our example sessions. You can use any other terminal programs you prefer, just keep in mind the important requirement here is that your terminal program must not block or change control characters that you may need to enter.

Download your free copy of PuTTYtel.exe by clicking on this link:
http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

This handy program does not need the usual Windows programs installation rituals. After you dowloaded it, you simply double click it to use it.

Serial Communications Parameters

The configuration menu works under the following fixed communication settings:

Baud Rate: 9600
Data size: 8 bit
Stop Bit: 1
Parity: None
Handshake: None

USB to UART bridge cable: e-Gizmo USB to UART (Code: 77011931) or generic USB to UART CH340 (Code: 580012536)

Install the USB to UART bridge PC driver corresponding to your USB UART cable. The drivers and PC driver installation procedures are detailed in the corresponding pages of the product. Connect your USB to uart bridge with the GSMIO using the following ilustrated wiring guide:

Plug your USB bridge cable to any available USB port in your PC (make sure you properly installed the drivers before you do this). And then find out and note what COM port did your OS assigned for it.

Launch your PuTTYtel.exe program. A Security Warning window will appear. Click [Run]

PuTTYtel Configuration window will show up. Configure as follows:

1. Connection Type - click to select Serial.

2. Enter the USB to UART cable assigned COM address at Serial Line text box.

3. Change the Speed to 9600

4. Click “Terminal” in the Category box. The terminal Options will replace the content of the configuration window. Find Implicit LF in every CR checkbox and click to activate the option.

5. Click “Session” in the Category box to return to the session configuration. Enter a name (GSMIO in this example) and click the save button. GSMIO (or the NAME you entered) will now appear in the Saved Session list. Double click GSMIO to start your session.

The next time you start PuTTYtel, you only need to double click GSMIO to run PuTTYtel under the configuration you made in the previous steps.

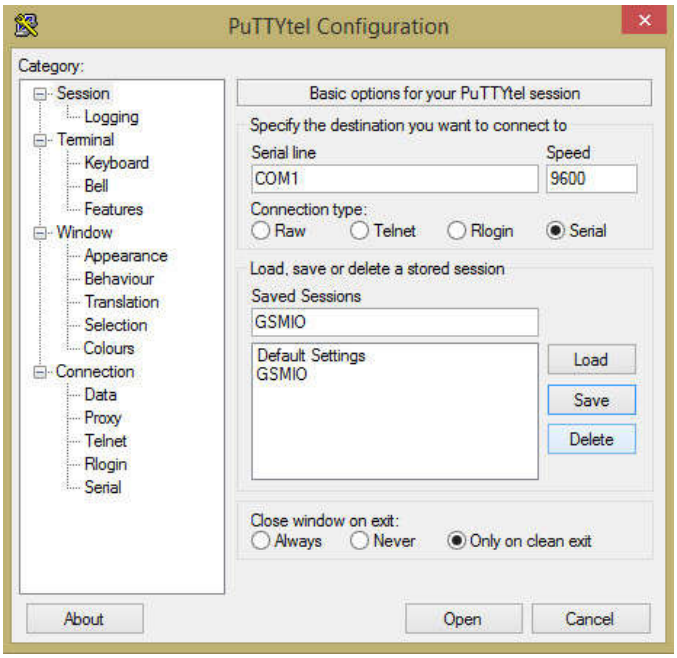


Figure 10. PuttytelSession.

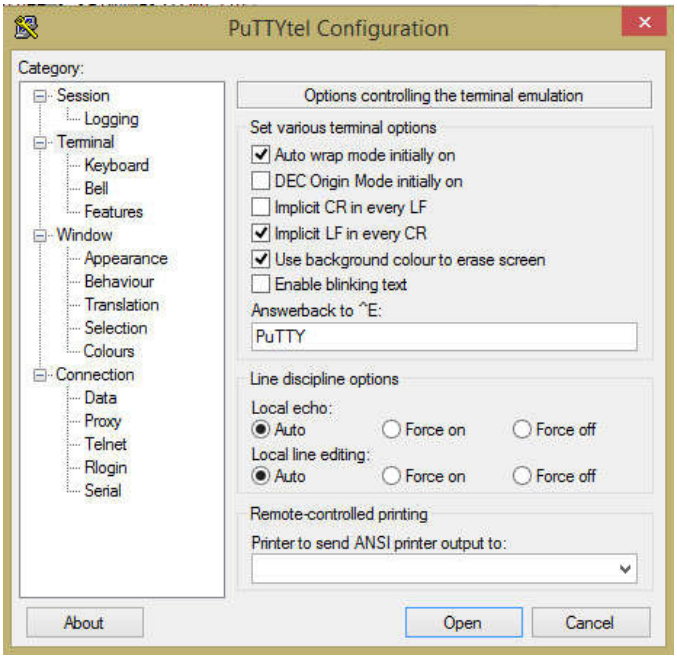


Figure 11. PuttytelOptions.

Entering the configuration menu

The configuration menu can be launched while the GSMIO is in the process of booting up:

With the GSMIO connected to the PC via the USB to UART cable and PuTTYtel up and running, apply power to the GSMIO module. Wait a second and then type Ctrl+C through the PuTTYtel window at least three times. Wait for the configuration menu to display.

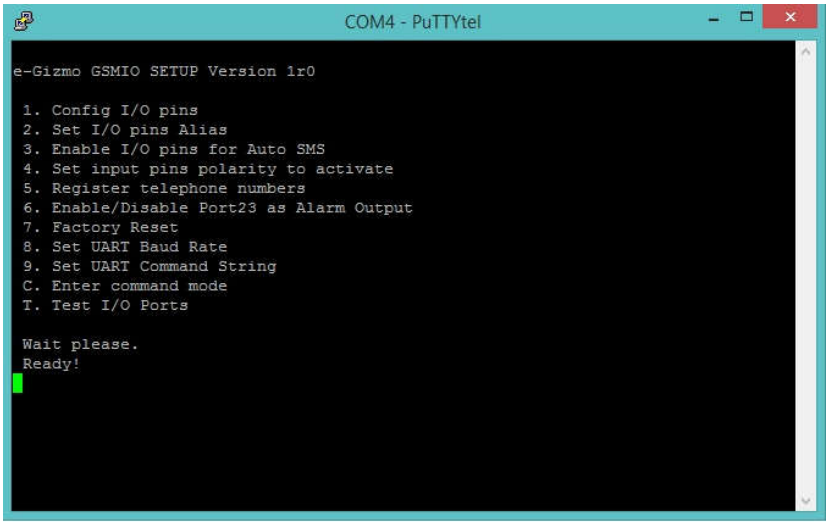
Note:

1. Boot up process time varies but may take as little as 10 seconds to complete. You should **PRESS Ctrl+C three times** within this time window to enter the configuration menu.

2. A valid SIM card must be installed in the GSMIO to gain access to the configuration menu.

The configuration menu in brief

All changes are automatically stored in the system non volatile memory and will automatically be put in effect on GSMIO power up.

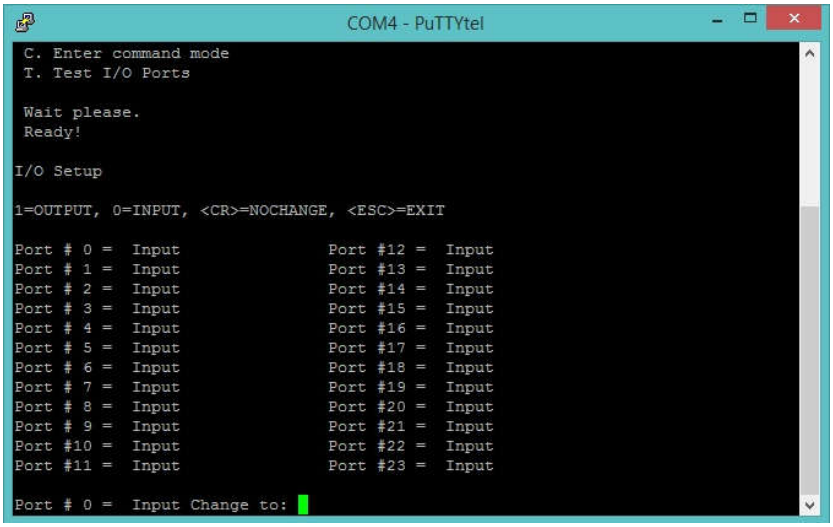


1. Config I/O pins

This allows you to define the digital function of each port pins.

Pressing [1] will display the current settings of each port pins (Input or Output), and then will wait for your keystroke to determine your desired settings.

While in setting state, press [**1**] to set the currently enumerated port as an ***output***, [**0**] makes it an ***input***, [**CR**] will keep the current setting ***unchanged***, and [**ESC**] will end/***exit or autosaved*** the Config IO function.

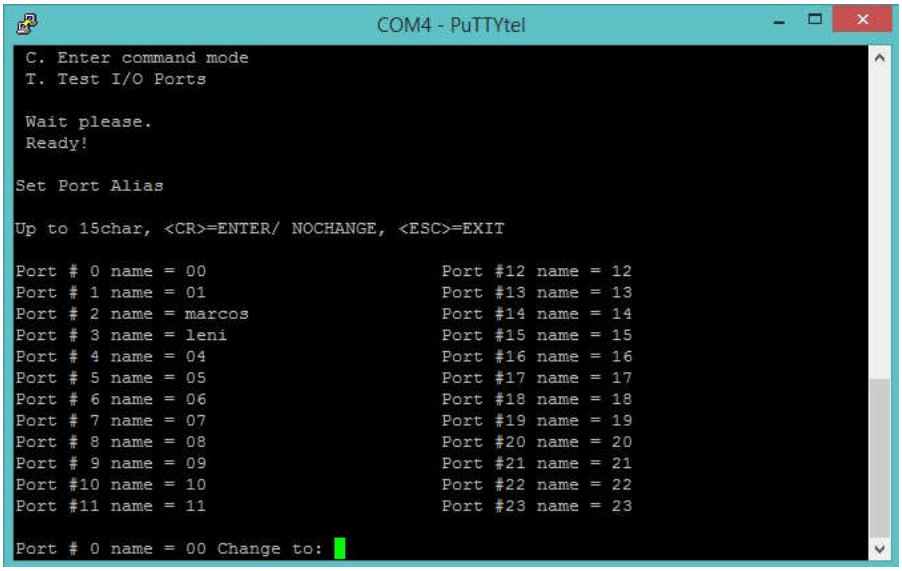


2. Set I/O pins Alias

It's the same as renaming the IO pins the way you like it. Port pins by default are assigned a dry, unimaginative name, like 1,22,16. With this function, you can give each pin your desired alias, and then control and monitor these pins later addressing them by the alias you gave them. For example, io port pin 12 is named on default as, well, 12. This hardly tells you anything about the pin function, which can be hard to remember and getting used to. By renaming it with a new alias, like "patiolight", you will easily know what that port is supposed to be controlling.

An alias can be up to 15 characters long. You probably don't want a very long alias as this would make texting commands too annoying.

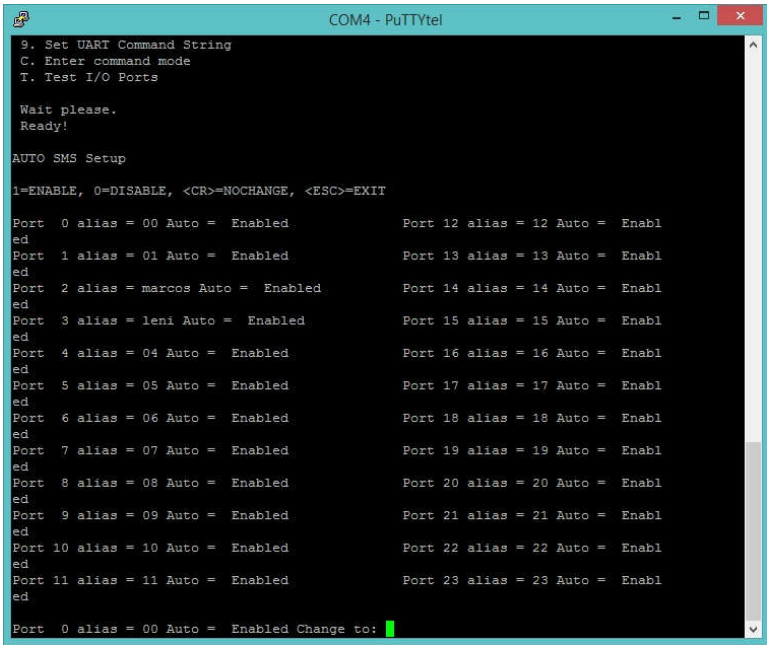
Tip: Make the first 4 characters for each port alias unique. This will allow you later on to activate naming shortcuts using the alias 4 remote command as described in the Remote Commands section. Avoid using white space characters. This will just confuse you later.



3. Enable I/O pins for Auto SMS

With this option, you can selectively pick which pins should send an auto SMS when activated.

[**1**] ***Enable*** the pin to auto SMS.
[**0**] ***Disable*** auto SMS for the pin.
[**CR**] ***No Change.***
[**ESC**] ***Exit*** this menu.

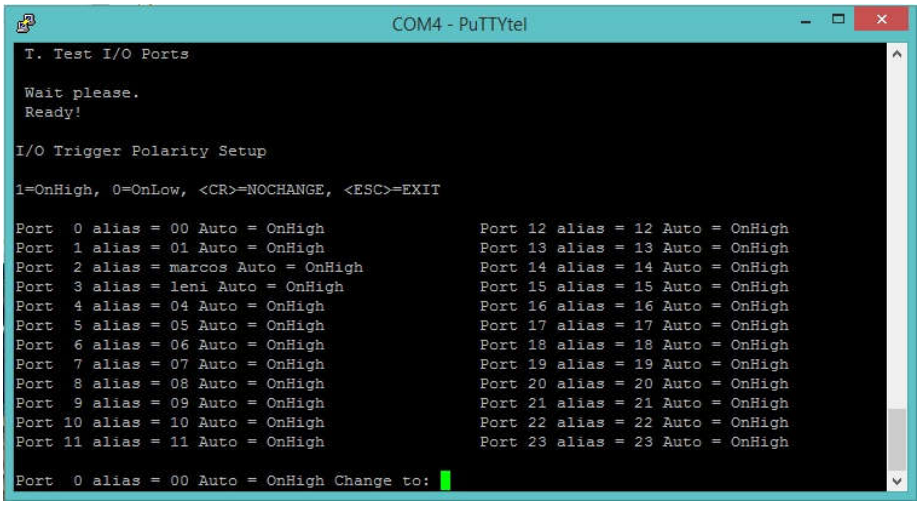


4. Set input pins polarity to activate

This option allows you to selectively set inputs active state, i.e. if the input is active high or active low. This affects the decision of the GSMIO when to send the SMS notification, and the Alarm output is used.

For example, if port 10 input is configured as active low, the GSMIO will send an SMS notification (and trigger the alarm output) whenever port 10 goes from high to low.

[**1**] Sets the input pin to activaye OnHigh
[**0**] Sets the input pin to activate OnLow
[**CR**] No Change.
[**ESC**] Exit this menu.



5. Register Telephone Numbers

This configuration option allows you to register your phone numbers in the GSMIO.

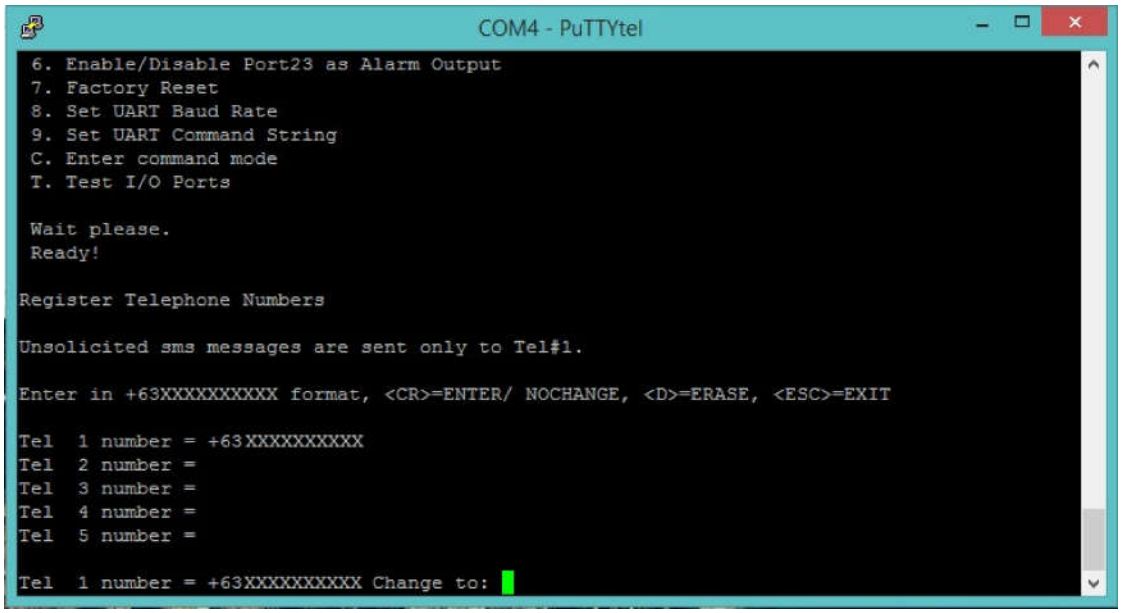
GSMIO will respond only to commands coming from registered numbers.

The phone numbers should be entered in +IMSI format, i.e. **+63XXXYYYYZZZ format**. The GSMIO will ignore the number if it does not start with a plus sign.

Phone #1 is the primary phone number. All unsolicited sms (if enabled) will be sent by the GSMIO on this number only, hence and should not be left unfilled.

You can register up to 5 different numbers, but you have to keep in mind that GSMIO will send auto sms to ALL registered numbers. This could dramatically slow down the GSMIO response time. Register only numbers that are really needed.

Telephone number input accepts only to + and numeric inputs
[**D**] ***Erase*** the current number entry
[**CR**] ***No Change.***
[**ESC**] ***Exit*** this menu.



6. Enable/Disable Port23 as Alarm Output.

Using port 23 as Alarm Output gets you to a working SMS enabled alarm system! This pin automatically goes to a high state for 3 minutes when GSMIO is in ARMED state and any of the auto sms inputs is activated.

Remotely DISARMing the GSMIO will also pull Alarm output down to a low state. Like the rest of the port, ALARM output can be remotely activated and deactivated at any time using the on and off command.

Enable Alarm Output

Y=Yes, N=Disable

[]

7. Factory Reset

As it name suggests, this configuration menu will initialize all configurable parameters, including aliases, back to their default values. Telephone numbers will likewise be erased.

```
Factory Reset

Y=Yes, N=No

[]
```

8. Set UART Baud Rate

The configuration menu runs at a fixed 9600 baud rate. Upon exiting (or power up), the baud rate will be set to the value you entered in this configuration. The baud rate can be set to any of the five values to match your equipment that you may be connecting in your UART port:

[**1**] = ***4800*** baud
[**2**] = **9600**
[**3**] = ***19200***
[**4**] = ***38400***
[5] = 57600

Other communications parameter settings are fixed at the following values, make sure your UART device is set to work on the following parameters:

Data size: 8 bit
Stop Bit: 1
Parity: None
Handshake: None

```
Set Uart BAUD Rate

1=4800 2=9600 3=19.2K 4=38.4K 5=57.6K <ESC>=EXIT

1 Change to: []
```

9. Set UART Command String

The UART serial function allows you to control and extract data via remote sms to a serial device connected on the GSMIO UART port. The initiating command string required by the uart device, if any, are entered through this configuration function.

As the serial device can have a long string of reply data, you can tell GSMIO which part of the reply data you only need by specifying a trap string and a stop character. GSMIO will then sms back to you only this slice of the uart device reply string.

Command String (Up to 47 characters)- command needed by the uart device to respond with the desired data. This vary from device to device. Some do not even need a command, and are configured to just send a stream of data at predetermined intervals. An example of uart device that is usually configured like this is a GPS module. Some serial device may require a control character in their string, like the [STX] and [ETX] marker in most e-Gizmo brand serial devices. Enter these by directly entering their corresponding control keystroke (e.g. ctrl+B for [STX] and ctrl+C for [ETX]). You might want to keep a copy of this ascii table detailing the corresponding key stroke for each control characters:

https://www.cs.tut.fi/~jkorpela/chars/c0.html

Trap String (Up to 14 characters) - GSMIO will look for this string and will start collecting data immediately and only after the trap string is first found.

Stop character - GSMIO collects and sms the reply string once this character is encountered.

GSMIO will sms the uart reply only if both the trap string and stop character are detected in that order.

You can store up to four command strings with their corresponding trap and stop characters.

Example application:

Extracting data from a GPS module

Your GPS sends out this data at fix interval, and you are only interested on the GPGGA and GPGSV slice.

$GPGGA,183730,3907.356,N,12102.482,W,1,05,1.6,646.4,M,-24.1,M,,*75
$GPGSA,A,3,02,,,07,,09,24,26,,,,,1.6,1.6,1.0*3D
$GPGSV,2,1,08,02,43,088,38,04,42,145,00,05,11,291,00,07,60,043,35*71
$GPGSV,2,2,08,08,02,145,00,09,46,303,47,24,16,178,32,26,18,231,43*77
$PGRME,22.0,M,52.9,M,51.0,M*14
$GPGLL,3907.360,N,12102.481,W,183730,A*33

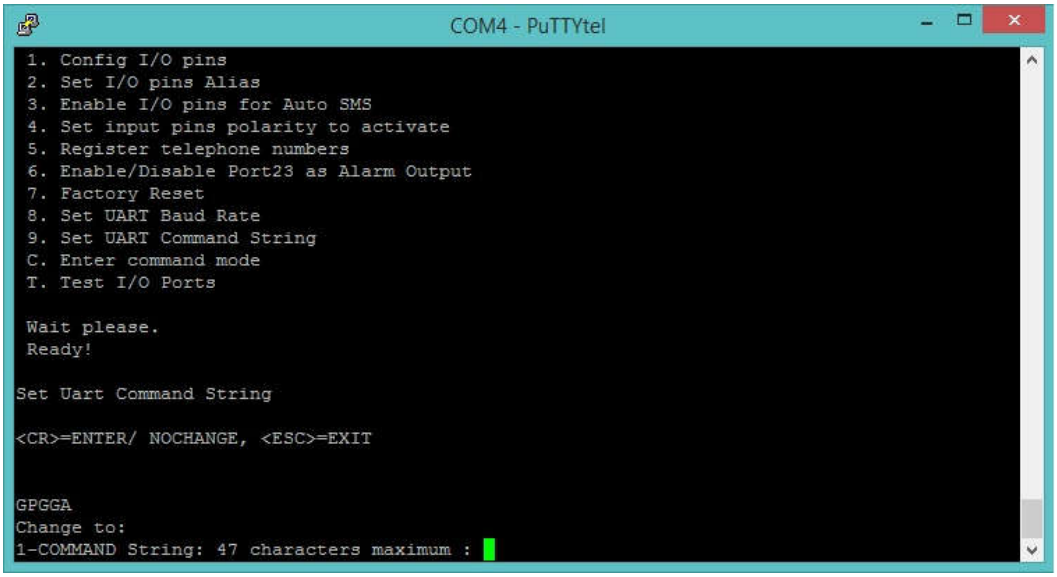
Configure command strings as follows: (Note: [CR] means PRESS carriage return button. Do not enter as ''[CR]")

1-COMMAND string= [CR] No command string needed
1-TRAP string = GPGGA Wait for GPGGA
1-STOP character = [CR] Until Carriage return is encountered

2-COMMAND string= [CR]
2-TRAP string = GPGSV
2-STOP character = [CR]
[ESC]

texting serial 1 to GSMIO will make it sms back "GPGGA,183730,3907.356,N,12102.482,W,1,05,1.6,646.4,M,-24.1,M,,*75"

texting serial 2 to GSMIO will make it sms back "GPGSV,2,2,08,08,02,145,00,09,46,303,47,24,16,178,32,26,18,231,43*77"



C. Enter command mode

Press [C] to exit configuration mode and enter command mode.

Entering command mode at user specified baud rate ... []

T. Test I/O Ports

This is a quick way to visually check the health of your GSMIO ports. Pressing [T] will make the GSMIO turn ON each port pin one by one in succession. If the port is not working, the LED corresponding to the port may not light or will just stay ON. A dim LED may signify a damaged (weak) port.

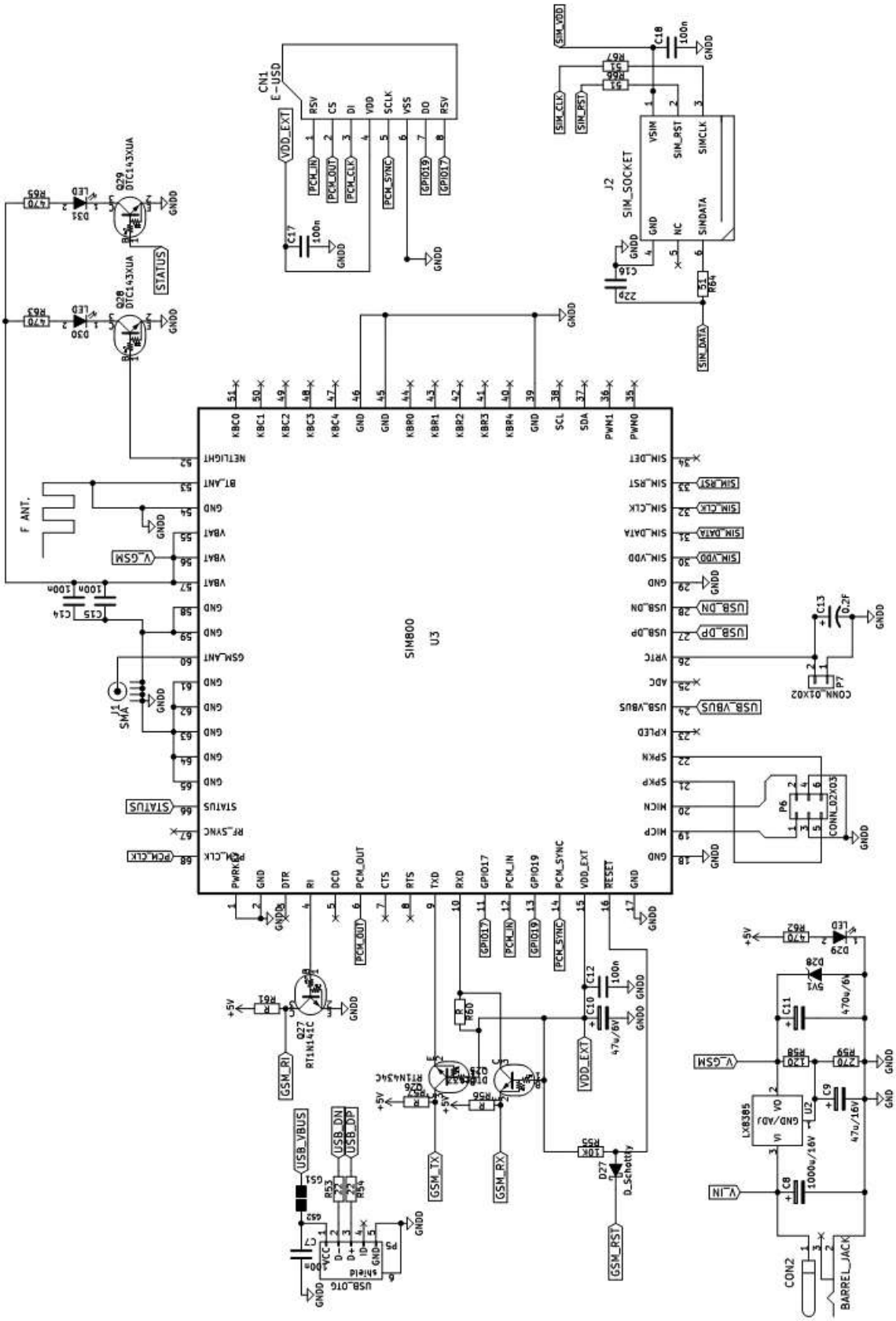
Press [ESC] to terminate the test.

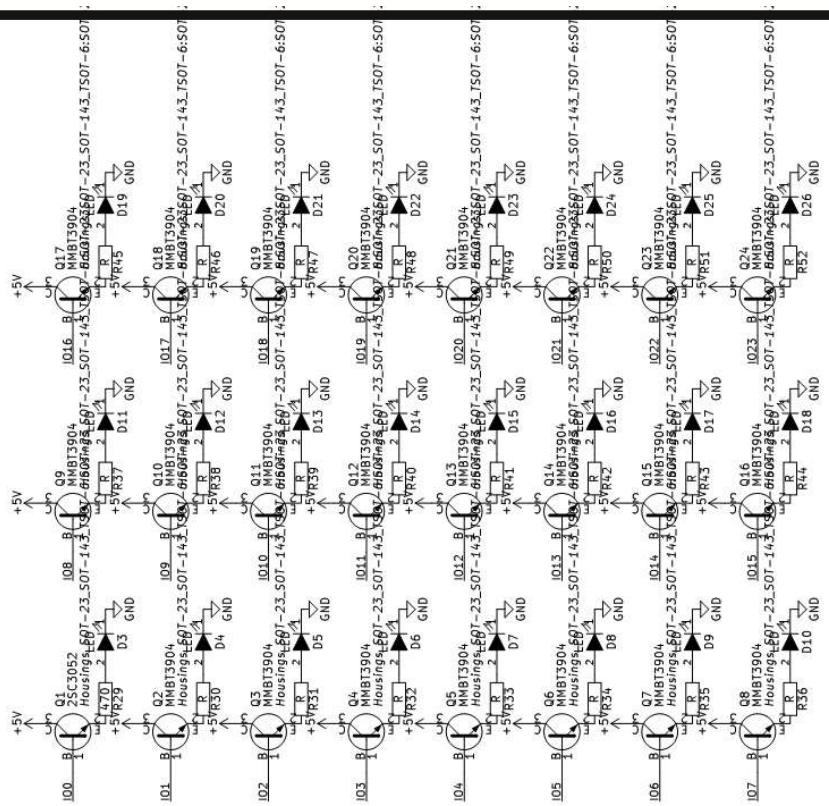
Important: This test works best when the unit is not connected to any other circuit. If you wish to perform this test with other stuffs already connected with it, do it at your own risk. It is your responsibilty to ensure it is safe to do so.

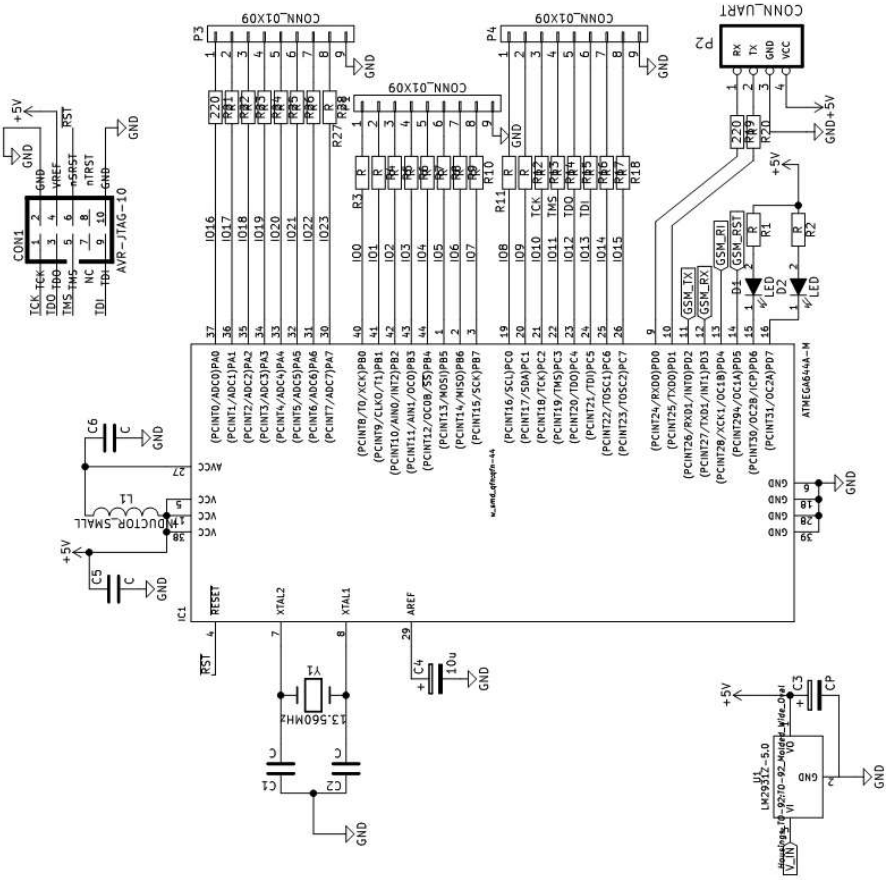
This will force active all I/Os.
Perform only if you are absolutely sure it is safe for your connected system.

Y=Yes, N=No, ESC=Exit test

[]







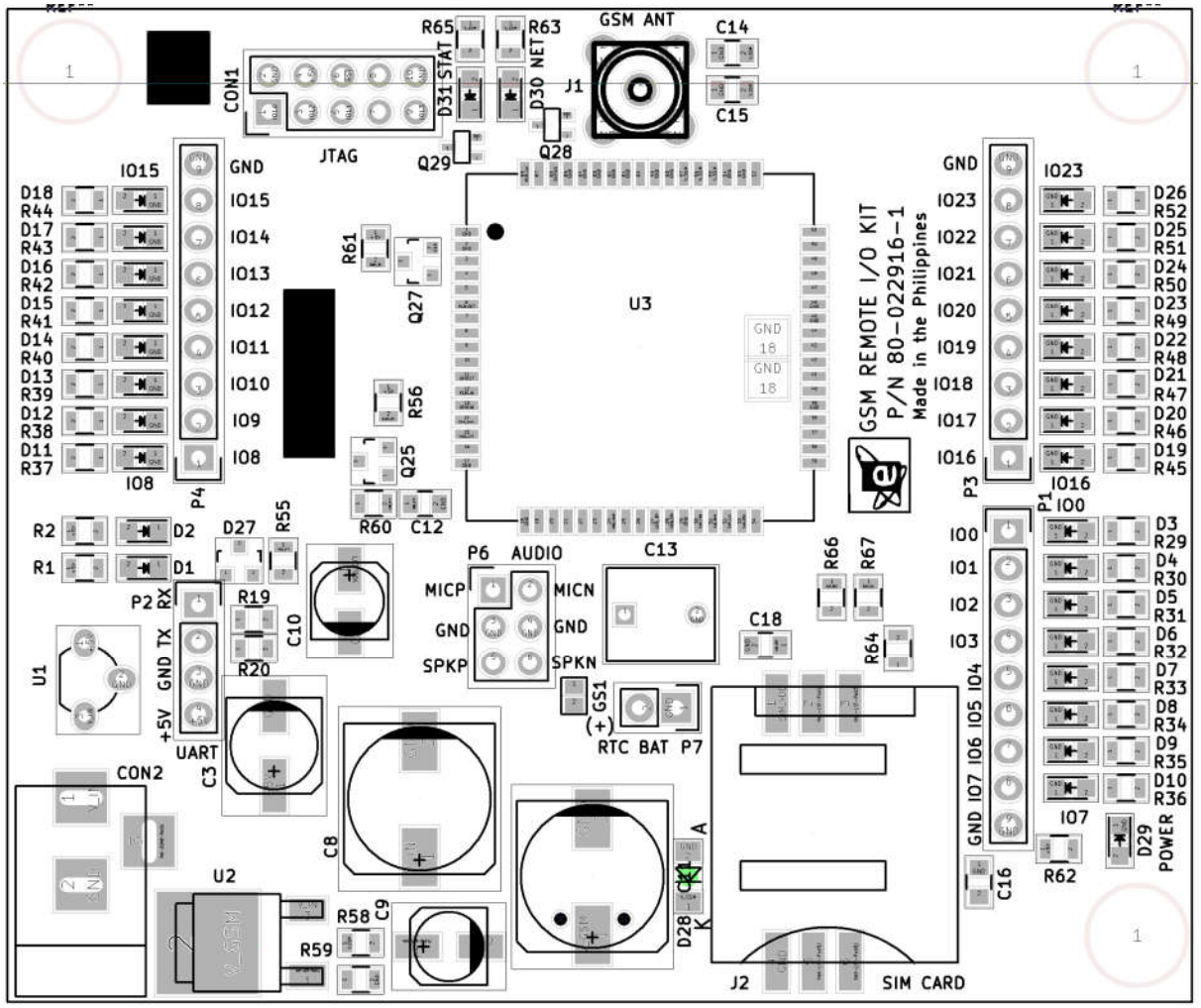


Figure 12. Parts Placement

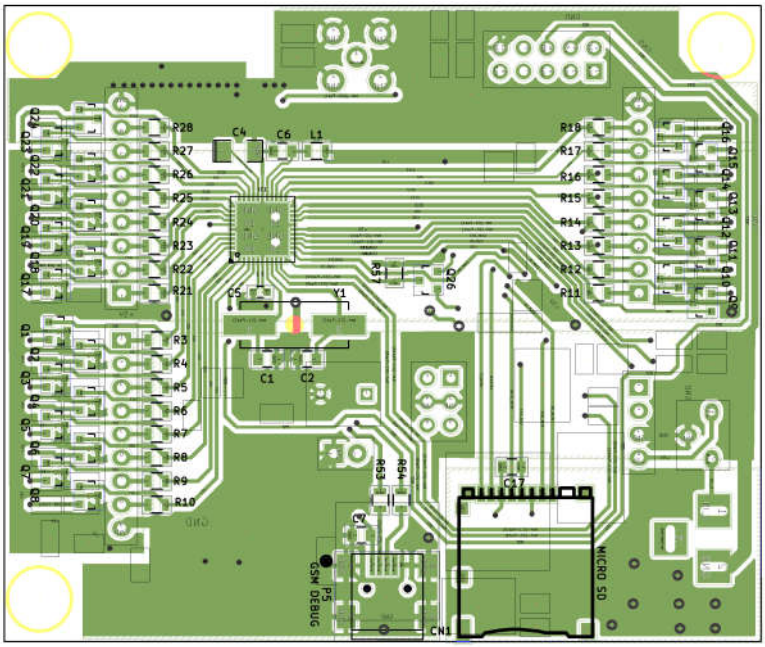


Figure 13. Bottom Guide PCB Layout

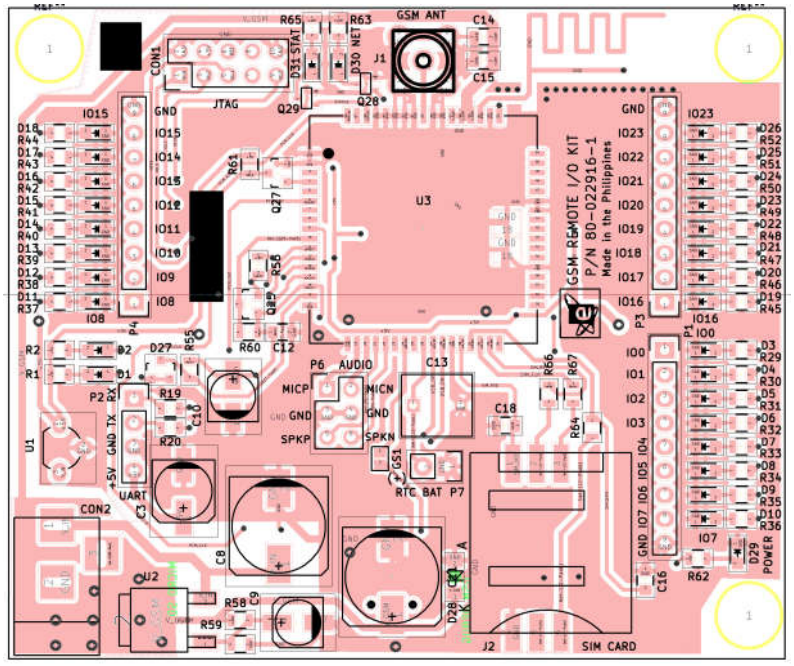


Figure 14. Top Guide PCB Layout