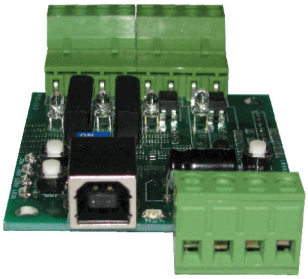
PIC-113
USB+RS232
I/O Controller

User Manual

Product Code: PIC-113
Version: ver 1.0
Last Updated: 25-Jul-2012

Content



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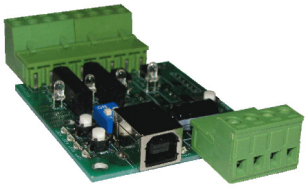
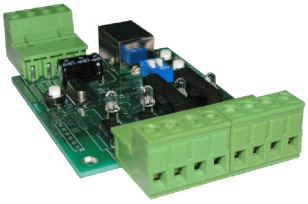
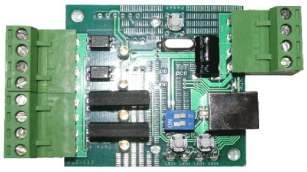
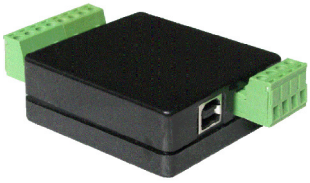
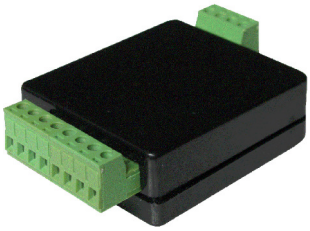







Description

This is a I/O controller which allows you to control on/off, or control/drive external hardware devices. It has inputs which allow interface to sensors or a simple contact switch. Command can be sent via the USB (virtual com port) or RS232 port by opening a communication port through your software. Communication stream can be opened using the standard library from the typical C#, C++, Visual Basic, Java, etc... programming language.

Features

- Control I/O (input/output) using USB or RS232 communication port.
- 2x Input and 2x Output port (customizable up to 4x input or output)
- LED indicators.
- 5V operation.
- Enclosure (available separately)
- Pluggable screw terminal interface to ease installation and maintenance work.

1 Product description

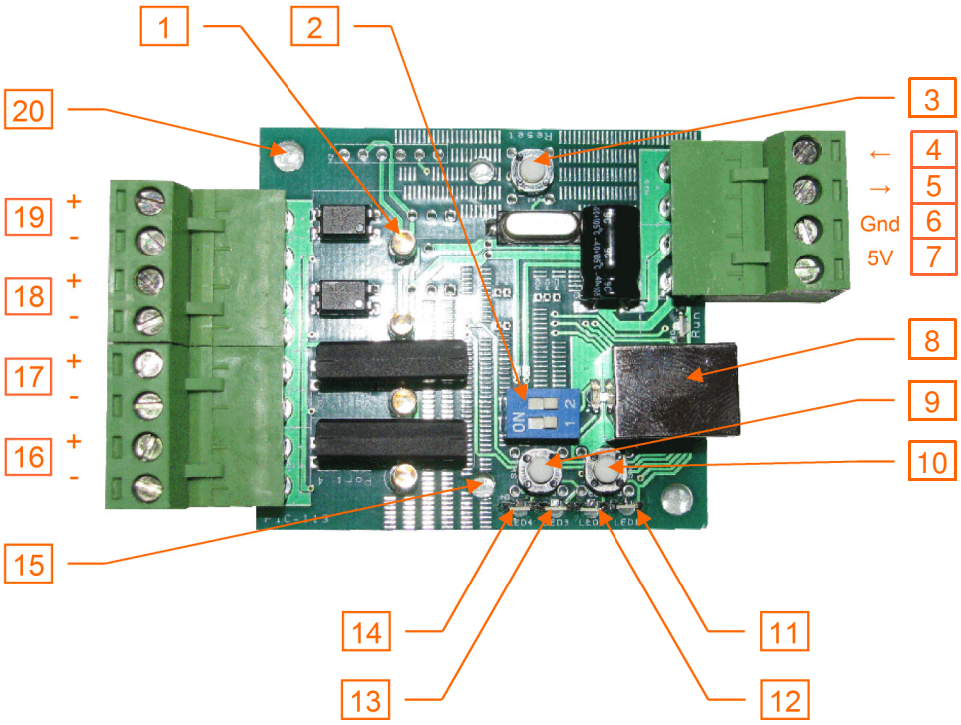


Fig: Board Interface

S/N	Name	Description
01	Indicators	Respective indicators for Port 1 to 4
02	Mode Switch	Mode switch for selecting function. Please restart the device for any change in settings. **SW1 -** **Off** I/O control through USB or RS232 **On** Convert USB to RS232 (Available on future version) **SW2 -** **Off** USB CDC (Virtual Communication Port) **On** USB Keyboard (Available on future version)
03	Reset	Reset this device.
04	RS232 Rx	Incoming RS232 signal from another RS232 device. (Baud rate 9600bps)
05	RS232 Tx	Outgoing RS232 signal to another RS232 device. (Baud rate 9600bps)
06	Gnd	Common Gnd for RS232 and Power supply.
07	5V	Regulated 5V supply out (When USB port is connected to a PC), Regulated 5V power in (For RS232 operation when USB port is not connected)
08	USB port	Type B USB socket (to be connect to a host PC)
09	Push Switch 2	(Reserved for future implementation)
10	Push Switch 1	(Reserved for future implementation)
11~14	LED	LED indicator 1 to 4. LED1 & 2 indicates USB operating status. LED toggling between 1 & 2 means a healthy USB in operations.
15	Mounting holes	2x mounting holes for the standard enclosure.
16	Port 4	Output port 4 (Default) Note: Can be customised to an input port. Please contact us.
17	Port 3	Output port 3 (Default) Note: Can be customised to an input port. Please contact us.
18	Port 2	Input port 2 (Default) Note: Can be customised to an output port. Please contact us.
19	Port 1	Input port 1 (Default) Note: Can be customised to an output port. Please contact us.
20	Mounting holes	2x M3 mounting holes for a customised platform.

Fig: Board Interface legend list

2 Using PIC-113 for USB Communication

The PIC-113 is design to control I/O port through USB CDC (Communication Device Class). USB CDC is commonly known as virtual serial communication port. When the device is plugged to the host PC, a virtual serial port will be created allowing connection from your RS232 or serial communication software.

PIC-113 can be controlled with RS232 directly. Instruction for I/O control through RS232 is available in the next section.

2.1 Wiring Connection

The following illustrate PIC-113 connection to a PC host using a USB cable (type A to type B).

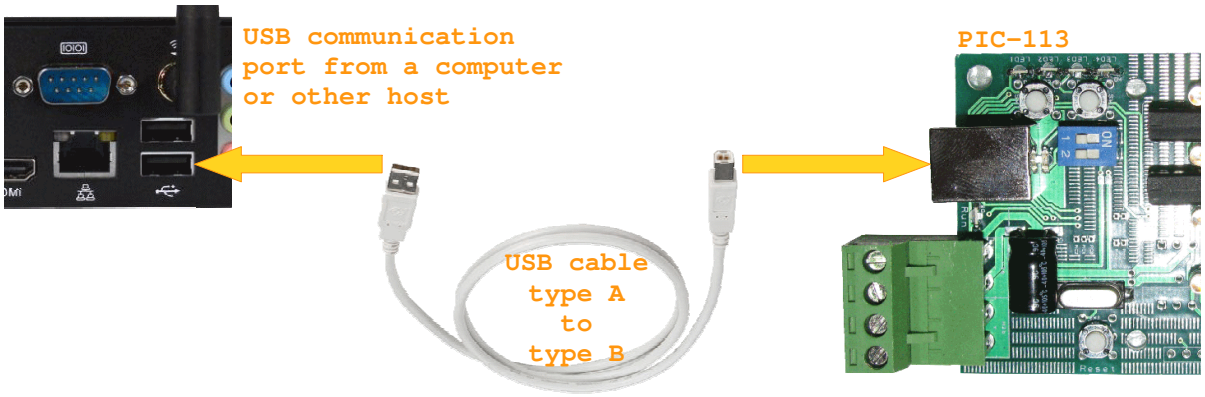
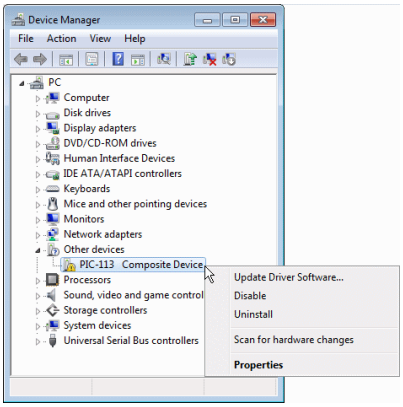
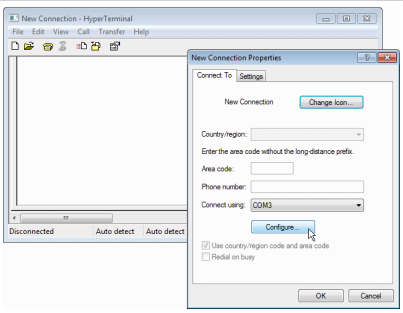
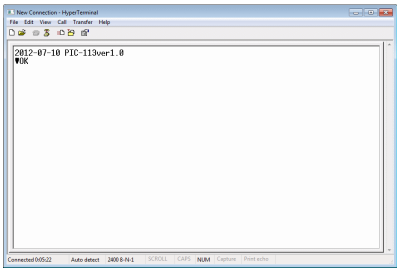


Fig: USB communication wiring diagram

2.2 Communication Setup

The following illustrate a step by step setup with standard serial communication software. There are various free serial comm software available for download, namely Hyperterminal (WinXP), Docklight, RS232 Monitor, etc...

Step 1	Plugged in the device to the host with a USB cable. You will notice that LED 1 & 2 will start to blink alternately. This indicates that the USB device is running well.	
Step 2	When the device is plugged to the host for the first time, it might not be recognized by the Windows operating system. You might get to see the screen shot on your "Device Manager". The small yellow icon PIC-113 Composite Device indicates that the drivers for this device are not installed. To install the driver, right click the device "PIC-113 Composite Device" and click "Update Driver Software...". Browse to the directory that contains the driver file "pic-113 cdc driver" and install the driver. After the driver is successfully installed, you will notice that the device PIC-113 Comm Port (COM3) is now on the list. It indicates that the PIC-113 device is assigned to COM3. You may be assigned with a different com port number on your system. The PIC-113 device will appear every time when the device is plugged to the host. Please take note of the assigned com port indicated. If the device is plugged to a different physical USB port on the host, the COM3 port that was assigned may change.	
Step 3	Open any free serial communication software to test the connection. For this setup, the software used is "HyperTerminal" from WinXP OS. Open up the HyperTerminal program. Click "Cancel" for all the pop up dialog boxes. Just ignore them. When presented with the HyperTerminal window, go to File>Properties. Connect using: COM3. (Note: Select your COM number as indicated in your device manager. Refer to Step 2). There is no need to configure other settings. Click OK, to complete the setup.	

Step 4	With the HyperTerminal window active, press the <Esc> key on your keyboard. You should be able to see the device version number. Congratulation, you have successfully connected with the USB device through the virtual com port. Testing a simple OK commands. Hold the <Ctrl> key while pressing <C> key. This will be followed by <O>, then <K> and lastly the <Enter> key. OK command: <Ctrl>+<C>, <O>, <K>, <Enter> You should be able to see a "♥OK" message on the screen terminal. Next, we try to activate the output port number 4, by issuing the OP command. OP command: <Ctrl>+<C>, <O>, <P>, <0>, <4>, <Enter> You should see that the LED for port number 4 is lighted up or changed in its logic state. You should also see another "♥OK" message on the screen terminal indicating that your command is accepted. Please take note that the command contains a character 'O' and a number zero '0'. If you have key in wrongly, try keying them again.	
Step 5	Now that you have managed to get the device working, you can proceed further to develop your software to communicate with this com port. You can develop the software using C#, C++, Java, or any other programming language. Use the serial communication port library to connect to this device.	

3 Using PIC-113 for RS232 Communication

The PIC-113 can also be controlled through a RS232 serial communication port. This section illustrate the necessary connection and setup, to control the PIC-113 controller through RS232 communication.

3.1 Wiring Connection

The following illustrate the connection for RS232 communication. The board requires a regulated 5V power supply in order to operate. You can supply the power wiring in through the screw connector or supply through a USB power source.

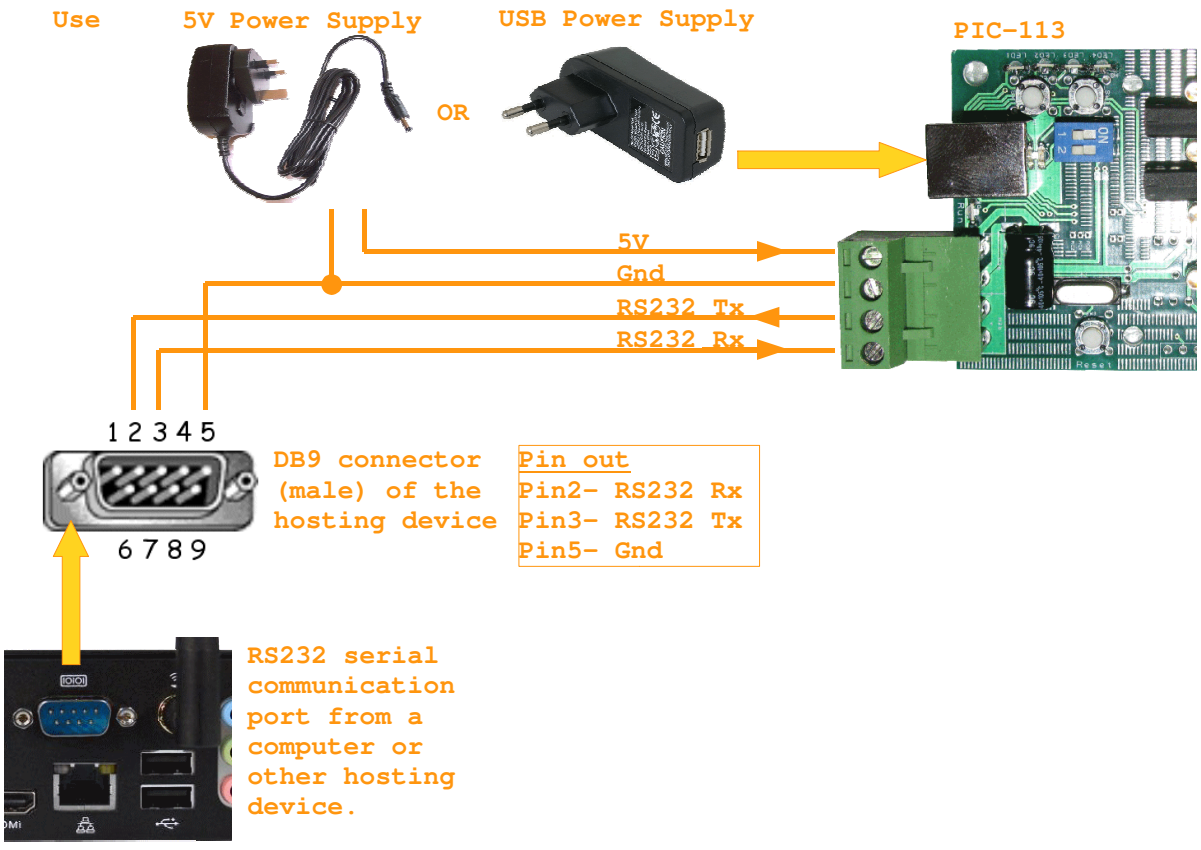
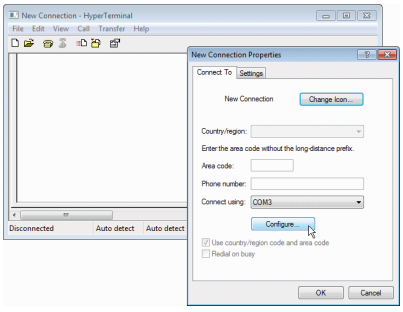
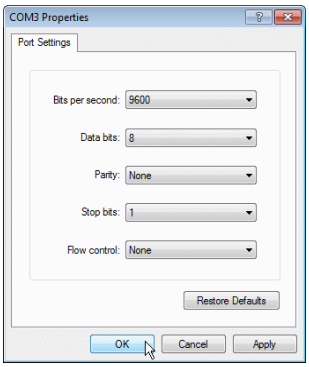
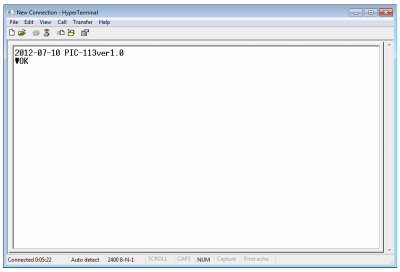


Fig: RS232 communication wiring diagram

3.2 Communication Setup

The wiring for RS232 setup is more complex than the USB connection, but the communication setup is however much simpler. There is no driver installation required. Your host PC have the comm port and should allow direct access to its RS232 port.

Step 1	Plugged in the device to the host using a RS232 cable. Power up the device with a 5V power supply adapter.	
Step 2	Open any free serial communication software to test the connection. For this setup, the software used is "Hyperterminal" from WinXP OS. Go to File>Properties. Connect using: COM3 Select the COM port as indicated in your device manager.	
Step 3	Click on the button "Configure...", and set the following RS232 communication configuration. Bits per second:9600bps (know as baud rate) Data bits: 8 Parity: None Stop bits: 1 Flow control: None Click OK, to complete the setup.	
Step 4	With the HyperTerminal window active, press the <Esc> key on your keyboard. You should be able to see the device version number. Congratulation, you have successfully connected with the USB device through the virtual com port. Testing a simple OK commands. Hold the <Ctrl> key while pressing <C> key. This will be followed by <O>, then <K> and lastly the <Enter> key. OK command: <Ctrl>+<C>, <O>, <K>, <Enter> You should be able to see a "♥OK" message on the screen terminal. Next, we try to activate the output port number 4, by issuing the OP command. OP command: <Ctrl>+<C>, <O>, <P>, <0>, <4>, <Enter> You should see that the LED for port number 4 is lighted up or changed in its logic state. You should also see another "♥OK" message on the screen terminal indicating that your command is accepted. Please take	

	note that the command contains a character 'O' and a number zero '0'. If you have key in wrongly, try keying them again.	
Step 5	Now that you have managed to get the device working, you can proceed further to develop your software to communicate with this com port. You can develop the software using C#, C++, Java, or any other programming language. Use the serial communication port library to connect to this device.	

4 PIC-113 for I/O Connection

There are a total of 4 port on the device. The standard interface hardware provide 2x Input (Port 1 & 2) and 2x Output (Port 3 & 4). The I/O on PIC-113 is base on dry contact interface.

The product can be custom configured with various configuration up to 4x input or output. Please contact us for any special request.

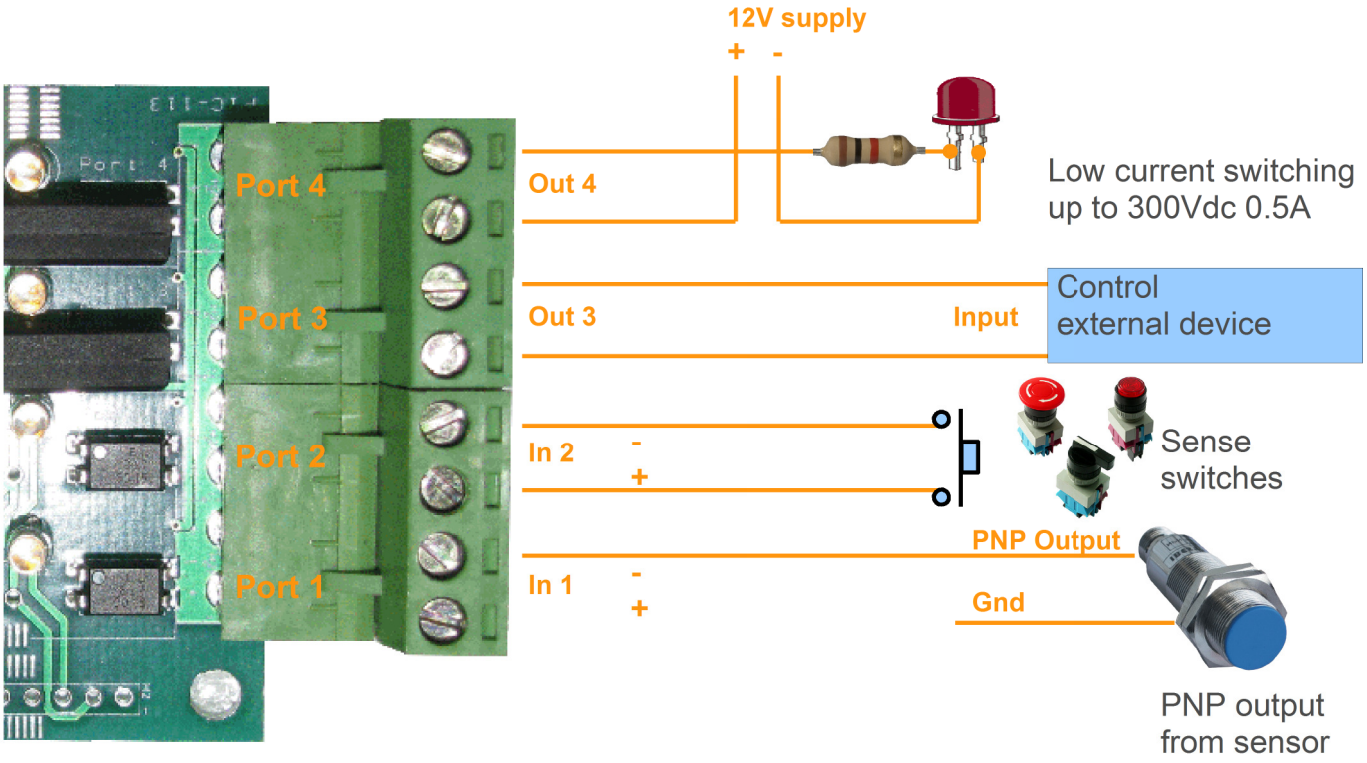


Fig: I/O wiring diagram

The input port is able to sense switch (dry contact), and is also able to interface the npn output from a typical sensor interface. The output port is a simple contact switch which can support up to 300Vdc 0.5A. External relay or module can be interface to the output to support higher rated voltage/current devices. High power device like solenoid, heater and motor can be easily be control via a relay or transistor. High voltage 230Vac electrical appliances can be easily controlled via PIC-117 (Mini AC Switch Relay).

5 Communication Protocol

The protocol uses ASCII standard for data communication, is designed to be readable through HyperTerminal or any other ASCII decoder program. This allows the development work, onsite maintenance and troubleshooting easier.

The protocol begins with the start byte 0x03 (ETX), and ends with the following 2 bytes 0x0D 0x0A. Data capturing is simplified by monitoring only the start and end bytes. The data bytes between the start and end bytes contain pairs of ascii chars which is the command, address, data bytes. The data is represented by alpha-numeric character range from 0x30 to 0x7A.

The ascii character 0x03 can be send from the HyperTerminal program by keying "Ctrl+C". It will appears as a '♥' symbol. The character 0x0D 0x0A can be send by hitting the enter key. It is a carriage return function and will not be displayed in the HyperTerminal program.

The following presents a few examples of the command, followed by the complete list of commands. There will also be a step by step tutorial at the end of this section, a quick run through of the important features.

EXAMPLE 1:

Command:

Set output port 3 with logic ON, "♥OP0301←"

Command String	♥	O	P	0	3	0	1	←			
Key Stroke	Ctrl+'C'	'O'	'P'	'0'	'3'	'0'	'1'	Enter key			
Hex Byte	0x03	0x4F	0x50	0x30	0x33	0x30	0x31	0x0D 0x0A			

♥ - Start byte '0x03'.
OP - InPut port command.
03 - select port 3.
01 - Result 01 representing logic 1.
← - End bytes '0x0D', '0x0A'.

Response:

"♥OK" indicates that the command is acceptable.

EXAMPLE 2:

Command:

Set output port 3 with logic OFF, "♥OP0300←"

Command String	♥	O	P	0	3	0	0	←			
Key Stroke	Ctrl+'C'	'O'	'P'	'0'	'3'	'0'	'0'	Enter key			
Hex Byte	0x03	0x4F	0x50	0x30	0x33	0x30	0x30	0x0D 0x0A			

♥ - Start byte '0x03'.
OP - InPut port command.
03 - select port 3.
00 - Result 00 representing logic 0.
← - End bytes '0x0D', '0x0A'.

Response:

"♥OK" indicates that the command is acceptable.

EXAMPLE 3:

Command:

Read port 1 input, "♥IP01←"

Command String	♥	I	P	0	1	←				
Key Stroke	Ctrl+'C'	'I'	'P'	'0'	'1'	Enter key				
Hex Byte	0x03	0x49	0x50	0x30	0x31	0x0D 0x0A				

♥ - Start byte '0x03'.
IP - InPut port command.
01 - select port 1.
← - End bytes '0x0D', '0x0A'.

Response:

Command String	♥	I	P	0	1	0	0	←			
Key Stroke	Ctrl+'C'	'I'	'P'	'0'	'1'	'0'	'0'	Enter key			
Hex Byte	0x03	0x49	0x50	0x30	0x33	0x30	0x30	0x0D 0x0A			

♥ - Start byte '0x03'.
IP - InPut port command.
01 - port 1.
00 - Result 00 or 01 representing logic 0 or 1.
← - End bytes '0x0D', '0x0A'.

5.1 Command List

List of available commands

	Command to Device	Description	Response from board
1.	Esc	(0x1B) Display firmware information	Print out system settings & variables.
2.	♥OK←	Ping test	♥OK←
3.	♥IP@@←	I/O Input command, where @@ 2 char address byte	♥IP@@%%← where @@ is the input address and %% is the input status. 0x00 off, 0x01 on
4.	♥OP@@←	I/O Output toggle command, where @@ 2 char address byte	♥OK←
5.	♥OP@@%%←	I/O Output command, where @@ 2 char address byte %% 2 char data byte, 0x00 off, 0x01 on	♥OK←
6.	♥O1@@←	I/O Output logic '1' pulse command with logic '0' in idling state, where @@ 2 char address byte	♥OK←
1.	♥O2@@←	I/O Output logic '0' pulse command with logic '1' in idling state, where @@ 2 char address byte	♥OK←
7.	♥O3@@←	I/O Output double toggle command with a delay of 0.5sec in between, where @@ 2 char address byte	♥OK←
8.	♥SCIC%%←	Set Configuration command for Input Change notification. %% - 2 char data byte, 0x00 off, 0x01 on	♥OK←
9.	♥GCIC←	Get Configuration command for Input Change notification. See ♥SC for further information on ##	♥GCIC%%← %% is the config status. 0x00 off, 0x01 on

5.2 Test Case (Tutorial)

The following example tests all the hardware functionality of the I/O board. The test ensure that the circuit is in working condition. The DIP switch should be set in the respective position (1:Off, 2:Off).

Please refer to the previous section for further details.

Command issued	Comments
•OP0301•	Port 3 becomes active. You notice that its indicator on the port gets lighted up. The output port 4 terminal will gets shorted.
•OP0300•	Port 3 becomes inactive. You notice that its indicator on the port is off. The output port 4 terminal will be opened.
•OP0401•	Port 4 becomes active.
•OP040•	Port 4 becomes inactive.
•OP03•	Toggle Port 3 's state. If the port is active, it will become inactive. If it is inactive, it will become active.
•O103•	Port 3 will turn on for about 1 sec, and then turn off. +Pulse output.
•O203•	Port 3 will turn off for about 1 sec, and then turn on. -Pulse output.
•O303•	Port 3 will toggle, and then toggle again after about 1 sec.
	Short the Port 1 terminal. You should be able to receive •IP0101• Release (open circuit) the Port 1 terminal. You should be able to receive •IP0100•
	Shorting and Releasing the terminal on Port 2, you will receive •IP0201• and •IP0200• respectively.
	The device will send out information automatically when the inputs get activated. If you prefer to do polling for the input's state, you can disable this input change notification feature.
•SCIC00•	This command will disable input change notification feature. To enable it back, you can issue the command •SCIC01•
•IP01•	Poll input Port 1. The device will response with •IP0101• if the input is activated, and •IP0100• if the input is not activated.
•IP02•	Poll input Port 2.

6 Mechanical Dimension

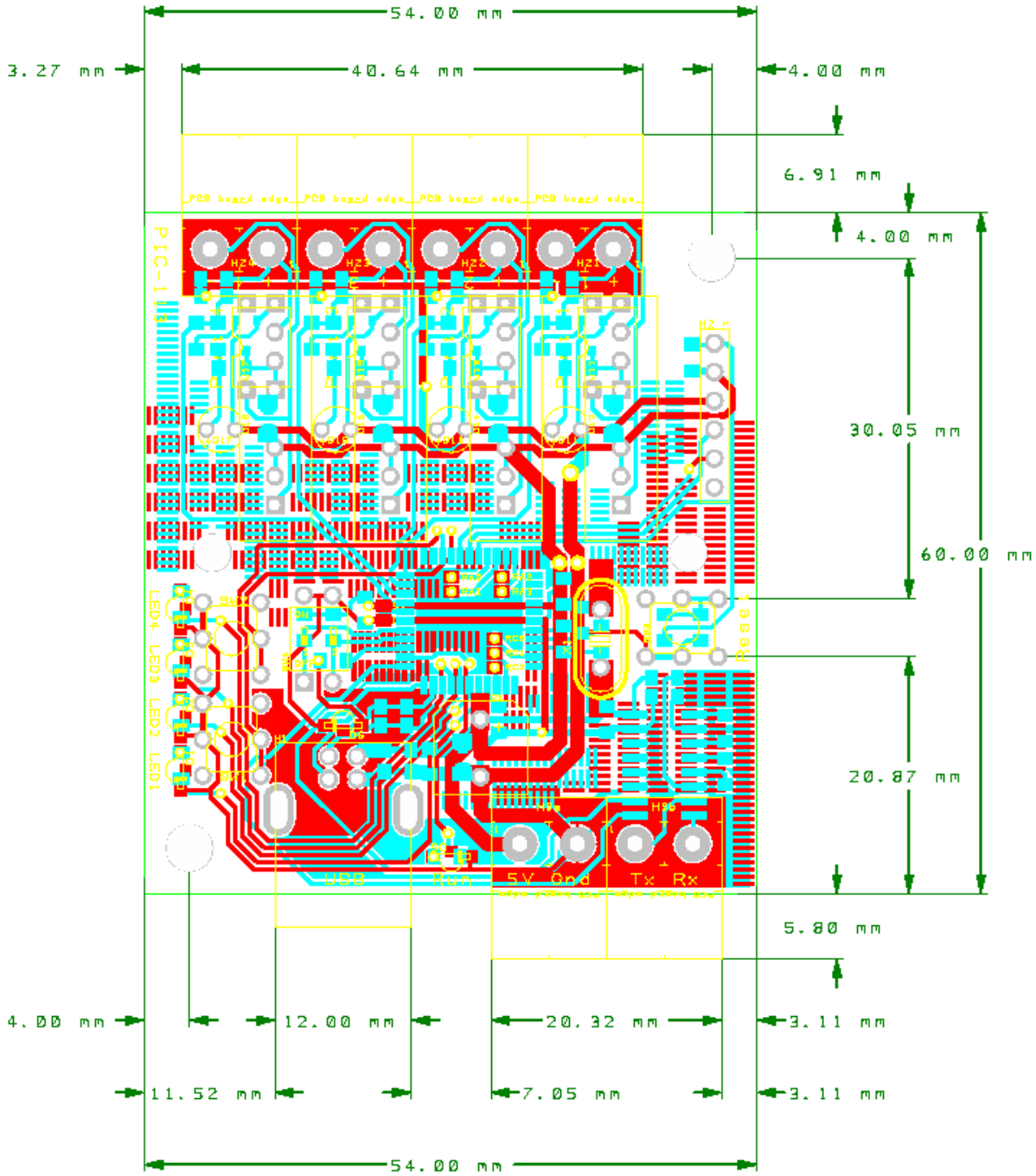


Fig: PIC-113 dimension

7 Specifications & Features

Data Communication		
	USB and RS232	
Interface		
5V Power / RS232	4 way free plug, 5.08 pitch Alternative power input/output. RS232 port	
Host communication	USB type B connector	
Input	Port 1 & 2 (for dry contact) (4 way pluggable terminal, 5.08 pitch)	
Output	Port 3 & 4 (dry contact rating up to 300Vdc 0.5A) (4 way pluggable terminal, 5.08 pitch)	
DIP Switch	Mode Select (2 pole switch)	
Power Source		
Input Voltage	5V 0.5A (from USB power or external 5V regulated power source)	
Environment		
Operating	0° to 70℃	
Storage Temperature	-45° to 85℃	
Size		
	Overall size approximate 94 x 60 x 25.6mm, L x W x H	
Weight		
PIC-113	90g ±10g (without enclosure is 50g)	
Accessories (not included)		
Cable recommendation	Power Supply-	2 core, 8AWG (ø3.3mm, 8.4mm^2)
	USB	USB cable Type A to Type B
	Input	24AWG (ø0.5mm, 0.2mm^2)
	Output	24AWG (ø0.5mm, 0.2mm^2)
Enclosure		

LAST PAGE

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