ZIO, Motherboard

User Manual

1.0, March 2010

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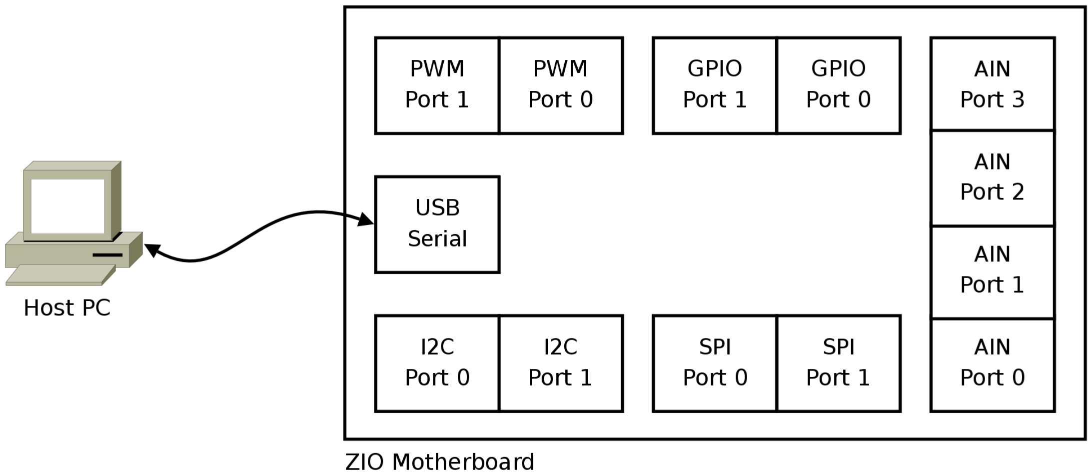
- Move development from micro-controllers to PC
- Use high level languages like Python and Java.
- Extend the IO capabilities of the PC.
- Rapid prototype development.

2. Product Features

- Connects to PC through USB
- Interfaces
  - Sensor Input
  - GPIO
  - PWM Output
  - SPI
  - I2C
- Host-side API for programming the ports
- APIs available for Java and Python
- API documentation for easy reference
- Port interfacing guidelines for common scenarios
- GUI based Control Panel to explore the board
- On-field firmware upgrade through USB

Figure 1.1. Block Diagram



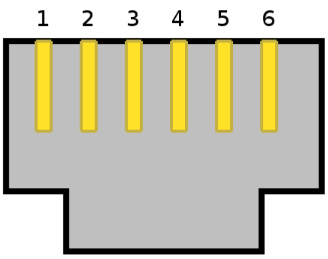
Chapter 2. Connecting to ZIO

In this chapter we will describe the connector used for the ZIO ports and the pins found on each of the ports. The ZIO has 4 different types of ports.

1. GPIO Port
2. I2C Port
3. SPI Port
4. Sensor Port (Marked as AIN on the ZIO)
5. PWM Port

All the ports are available through RJ12 jacks. The RJ12 is similar to RJ11, but has six pins. The RJ12 jack pins and pin numbering are shown in the following diagram.

Figure 2.1. RJ12 Jack (Female)



1. GPIO Port

The ZIO has two GPIO ports, marked as `GPIO-0` and `GPIO-1`. The signals on the GPIO ports are shown in the following tables.

Table 2.1. `GPIO-0` Signals

Pin No.	Signal
1	`+5V Power`
2	`GPIO Output 0`
3	`GPIO Output 1`
4	`GPIO Input 0`
5	`GPIO Input 1`
6	`GND`

Table 2.2. `GPIO-1` Signals

Pin No.	Signal
1	`+5V Power`
2	`GPIO Output 2`
3	`GPIO Output 3`
4	`GPIO Input 2`
5	`GPIO Input 3`
6	`GND`

`+5V Power` (Pin 1) This is the power supply for the external device. The supply has a total current limit of 200mA.

`GPIO Output` (Pin 2, 3)	These are digital output signals. The signal is a 5V logic signal, but the output can drive a 5V device or 3.3V device with 5V tolerance. The output signal has a series resistor of 270 ohm, to protect against accidental shorting to `GND`.
`GPIO Input` (Pin 4, 5)	These are digital input signals. The signal is a 5V logic signal. The signal is pulled up to 5V, through a 4.7K resistor.
`GND` (Pin 6)	This is the ground signal. All other signals are referenced to the this signal.

Figure 2.2. `GPIO-0` Port

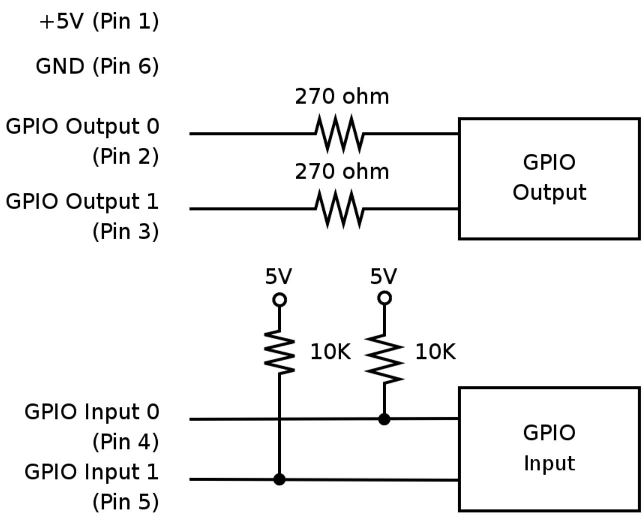
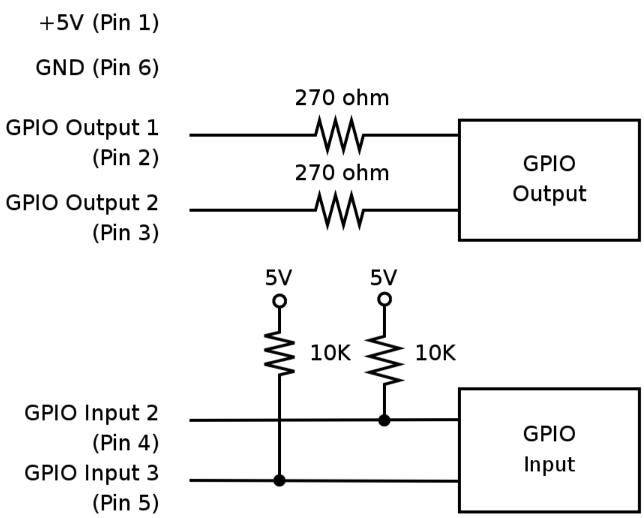


Figure 2.3. `GPIO-1` Port



2. I2C Port

The ZIO has two I2C ports, marked as `I2C-0` and `I2C-1`. The signals on the I2C ports are shown in the following tables.

Table 2.3. I2C-0 Port Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Reserved
5	Interrupt / GPIO Input 4
6	GND

Table 2.4. I2C-1 Port Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Reserved
5	Interrupt / GPIO Input 4
6	GND

`+5V Power` (Pin 1): This is the power supply for the external devices. The supply has a total current limit of 200mA.

`SCL`, `SDA` (Pin 2, 3): These are I2C bus signals, and can be used to connect I2C devices. Any 5V tolerant I2C device, can be connected to the bus.

`Interrupt` (Pin 5): This is a digital input signal. This is a shared signal (`GPIO Input 4`) for all I2C devices and should be driven by open collector outputs. The signal is pulled up to 5V, through a 10K resistor.

`GND` (Pin 6): This is the ground signal. All other signals are referenced to this signal.

Figure 2.4. I2C-0 Port

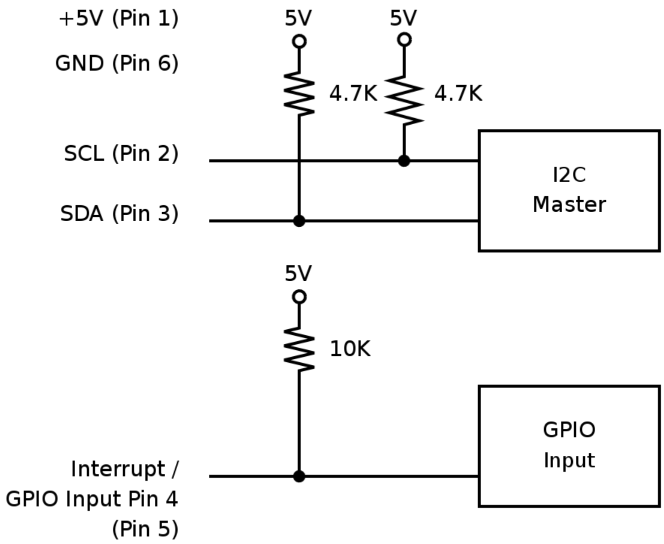
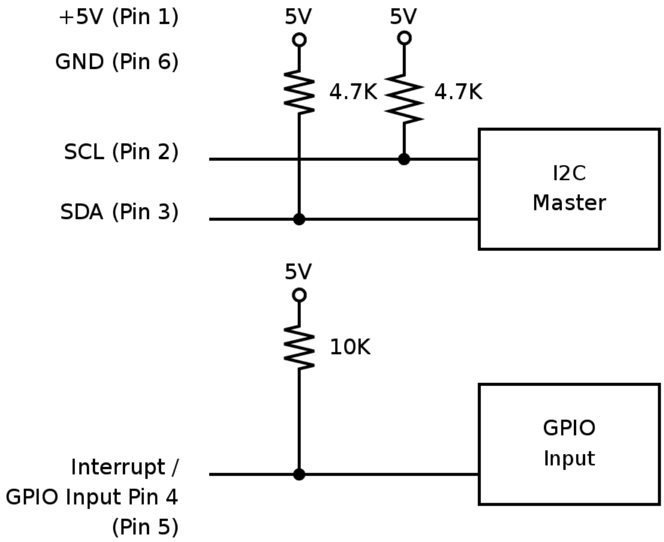


Figure 2.5. `I2C-1` Port



3. SPI Port

The ZIO has two SPI ports, marked as `SPI-0` and `SPI-1`. The signals on the SPI ports are shown in the following tables.

Table 2.5. `SPI-0` Port Signals

Pin No.	Signal
1	`+5V Power`
2	`SPI CS / GPIO Output 4`
3	`SPI MOSI`
4	`SPI MISO`
5	`SPI CLK`
6	`GND`

Table 2.6. `SPI-1` Port Signals

Pin No.	Signal
1	`+5V Power`
2	`SPI SS / GPIO Output 5`
3	`SPI MOSI`
4	`SPI MISO`
5	`SPI SCK`
6	`GND`

`+5V Power` (Pin 1) — This is the power supply for the external devices. The supply has a total current limit of 200mA.

`SPI SS` (Pin 2) — This is the SPI chip select signal.

`SPI MOSI` (Pin 3) — This is the _M_aster _O_utput, _S_lave _I_nput signal. The signal is a 5V logic signal, but the output can drive a 5V device or 3.3V device with 5V tolerance.

SPI MISO (Pin 4)	This is the _M_aster _I_input, _S_lave _O_utput signal. The signal is a 5V logic signal.
SPI SCK (Pin 5)	This is Serial Clock signal. The signal is a 5V logic signal, but the output can drive a 5V device or 3.3V device with 5V tolerance.
GND (Pin 6)	This is the ground signal. All other signals are referenced to this signal.

Figure 2.6. SPI-0 Port

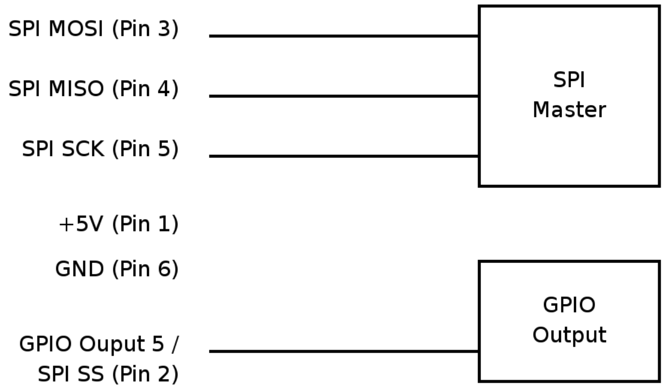
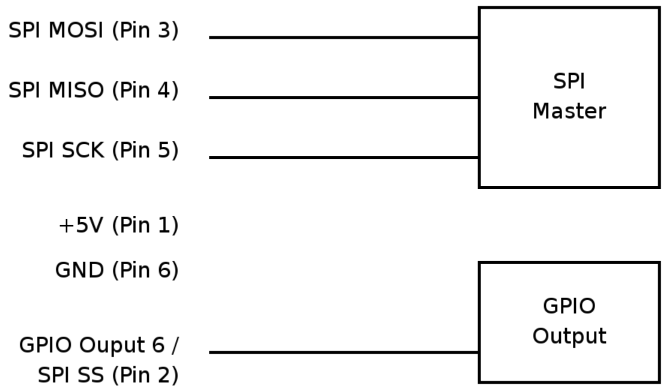


Figure 2.7. SPI-1 Port



4. Sensor Port

The ZIO has four sensor ports, marked as AIN-0, AIN-1, AIN-2 and AIN-3. The signals on the sensor ports are shown in the following table.

Table 2.7. AIN-0 Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Sensor Input 0
5	Sensor Input 1
6	GND

Table 2.8. AIN-1 Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Sensor Input 2
5	Sensor Input 3
6	GND

Table 2.9. AIN-2 Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Sensor Input 4
5	Sensor Input 5
6	GND

Table 2.10. AIN-3 Signals

Pin No.	Signal
1	+5V Power
2	SCL
3	SDA
4	Sensor Input 6
5	Sensor Input 7
6	GND

+5V Power (Pin 1)
: This is the power supply for the external sensors. The supply has a total current limit of 200mA.

SCL, SDA (Pin 2, 3)
: These are I2C bus signals, and can be used to connect I2C devices. Any 5V tolerant I2C device, can be connected to the bus.

Sensor Input (Pin 4, 5)
: These are analog input signals. The signals are connected to a 10-bit ADC. The input signal range is 0 to 3V. The input is translated to a value in the range 0 to 1023, by the ADC. The pins are connected to a 3V reference through 10K pull up resistors.

GND (Pin 6)
: This is the ground signal. All other signals are referenced to this signal.

Figure 2.8. `AIN-0` Port

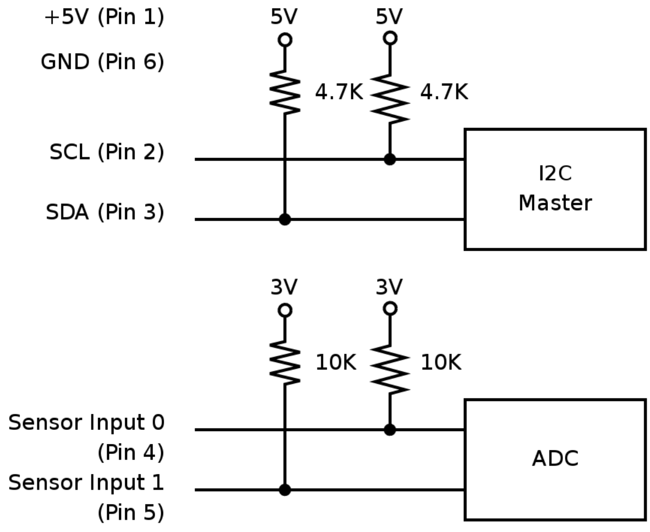


Figure 2.9. `AIN-1` Port

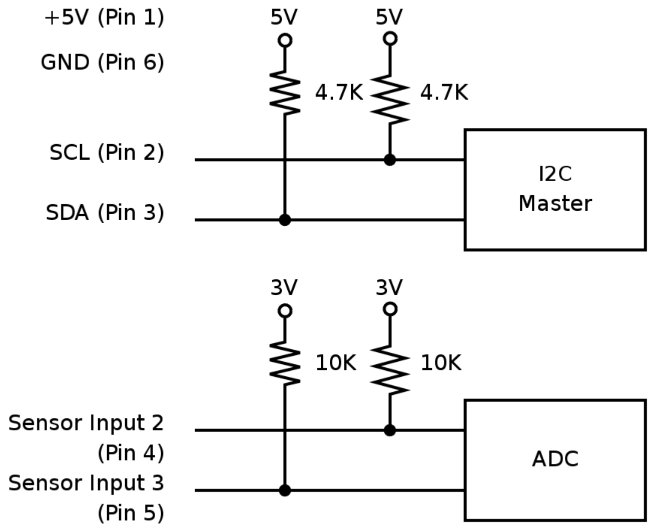


Figure 2.10. `AIN-2` Port

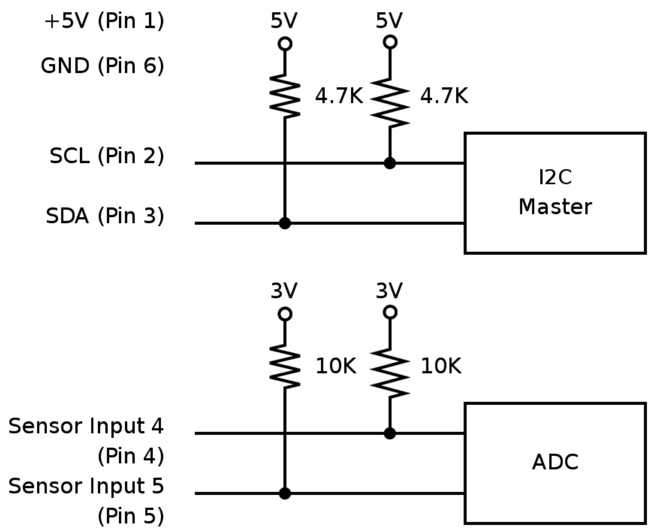
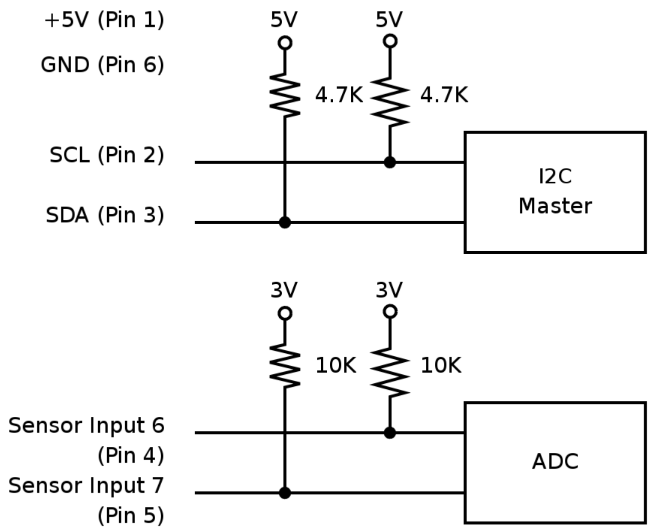


Figure 2.11. `AIN-3` Port



5. PWM Port

The ZIO has two PWM ports, marked as `PWM-0` and `PWM-1`. The signals on the PWM ports are shown in the following tables.

Table 2.11. `PWM-0` Signals

Pin No.	Signal
1	`+5V Power`
2	`PWM Output 0`
3	`PWM Output 1`
4	Reserved
5	Reserved
6	`GND`

Table 2.12. PWM-1 Signals

Pin No.	Signal
1	+5V Power
2	PWM Output 2
3	PWM Output 3
4	Reserved
5	Reserved
6	GND

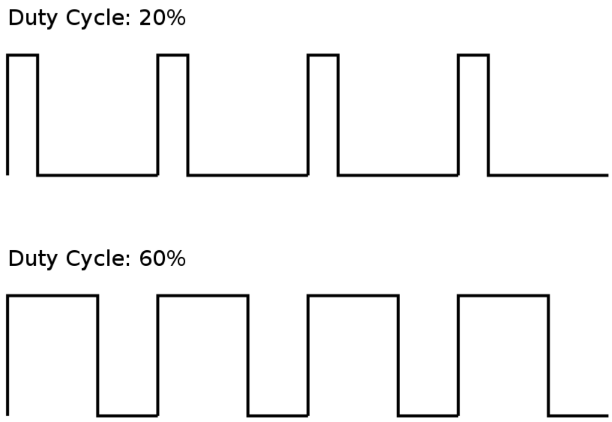
+5V Power (Pin 1)
: This is the power supply for the external sensors. The supply has a total current limit of 200mA.

PWM Output (Pin 2, 3)
: These are PWM output signals. The PWM signal when active produces a stream of pulses whose width can be controlled through software. An important parameter of a PWM signal is the **duty cycle**. The duty cycle is defined as the ratio between the pulse duration and pulse period of a rectangular waveform.

The PWM signal can be used to control the power delivered to a load, by controlling the duty cycle of the PWM signal. PWM signals are generally used for Motor speed control, LED brightness control, power supplies and wave form generation.

The PWM signal is a 5V CMOS/TTL output. The signal has a series resistor of 270 ohm, to protect against accidental shorting to GND.

Figure 2.12. PWM signals with various pulse widths



GND (Pin 6)
: This is the ground signal. All other signals are referenced to this signal.

Figure 2.13. PWM-0 Port

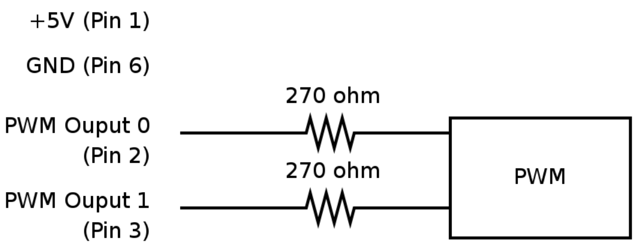
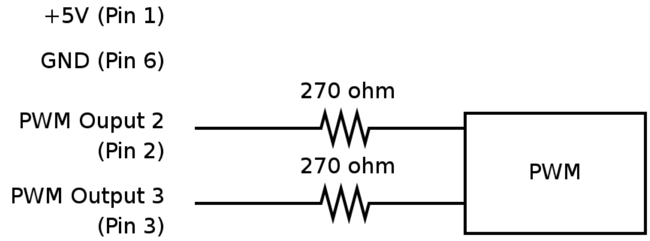


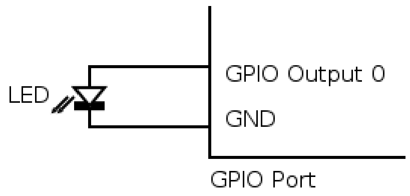
Figure 2.14. `PWM-1` Port



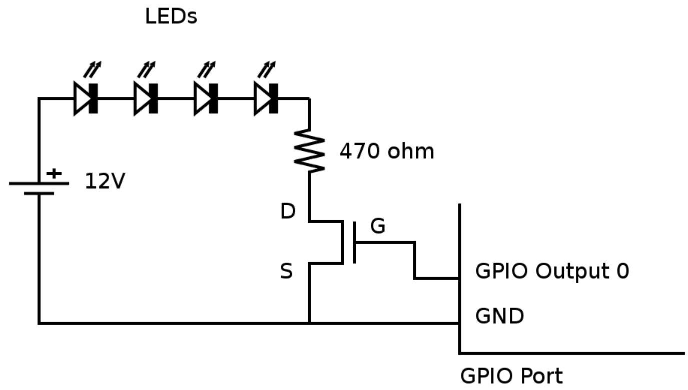
Chapter 3. ZIO Recipes

1. GPIO Port

Connecting LEDs. Connect the anode of the LED to an `Output` signal, and the cathode to GND. The built-in series resistor is sufficient to limit the current.



Connecting series of LEDs. Since the `Output` signal can not provide sufficient power for more than one LED, and external power source is to be used. And the power supply can be controlled using a MOSFET switch.



The circuit diagram for connecting a series of LEDs is shown above. The following formula can be used to calculate the resistance for the current limiting resistor. (The voltage drop across the MOSFET is considered to be negligible.)

$R = (V_{cc} - NV_d) / I_d$

Where,

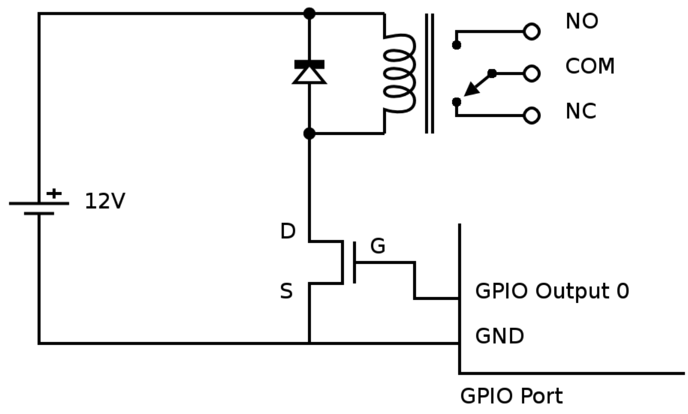
V_d	Voltage Drop Across LED
N	No. of LEDs
I_d	Current for the required brightness
V_{cc}	LED supply voltage
R	Current Limiting Resistor

As an example, for the following parameters,

- $V_{cc} = 12V$
- $I_d = 11mA$
- $N = 4$

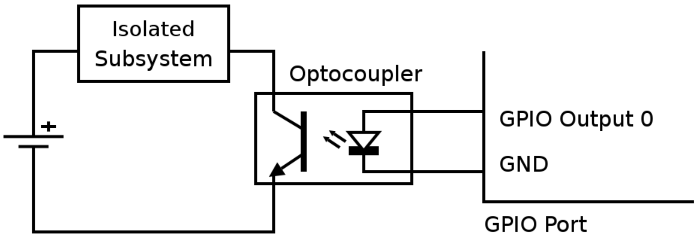
the calculated current limiting resistance is 470 ohms.

Connecting relays. Relays are used to control a high-voltage/high-current circuit with a low-voltage/low-current signal. A relay can be connected to the ZIO through a MOSFET as shown in the following circuit diagram.

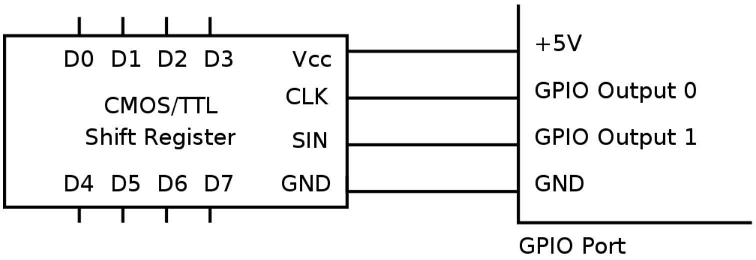


Isolating outputs using opto-coupler. There are situations in which signals from one subsystem need to be electrically isolated from another subsystem in an electrical equipment. For example, a microcontroller operating at 5V, controls the power to a load operating at 230V AC. In such situations, the microcontroller needs to be electrically isolated from the high voltage section, using a opto-coupler.

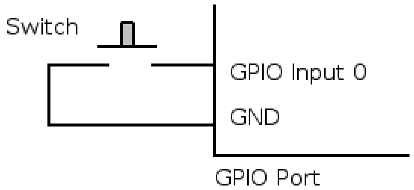
Note that, though relays can also be used for this purpose, they are generally bulky, slow, unreliable, and power hungry.



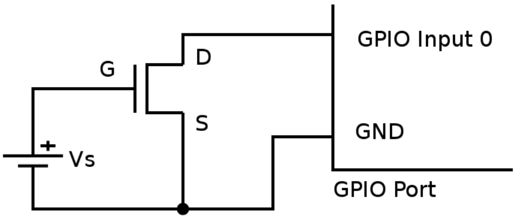
Connecting to CMOS/TTL inputs. CMOS/TTL inputs can be directly connected to the `Output` signal. An example of shift register connected to the `Output` signals is shown in the following circuit diagram.



Connecting Switches. Switches can be directly connected between the `Input` and `GND`. When the switch is pressed the `Input` signal will be low, and when the switch is released the `Input` signal will be become high due to the built-in in pull-up resistor.

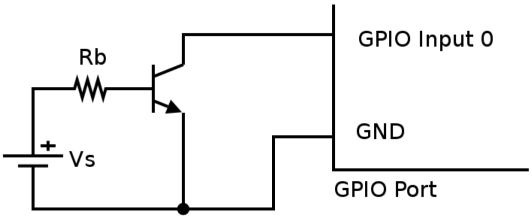


Detecting External Voltage. Any external voltage input can be connected to the ZIO `Input` signal through a MOSFET or a BJT. An example circuit using a MOSFET is shown below.



If the input voltage (V_S) is greater than the threshold voltage of the MOSFET, the `Input` signal will be low, or else it will be high.

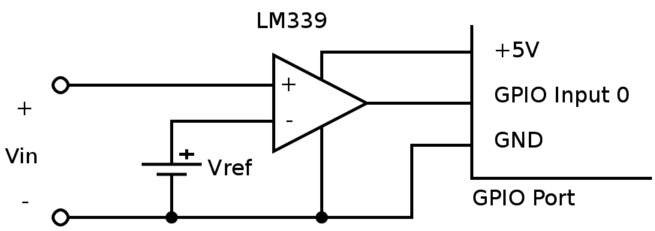
An example circuit using a BJT is shown below.



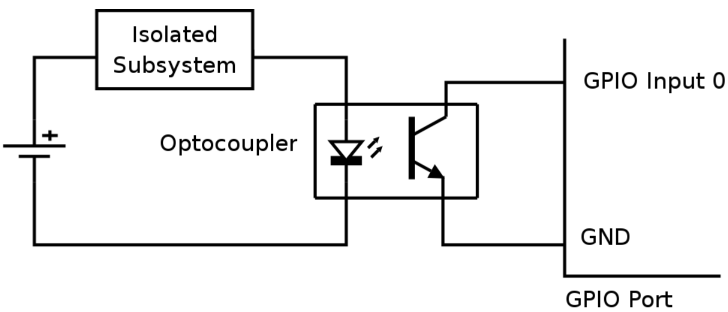
If the input current (I_S) is greater than (I_t = 0.5mA / h_{FE}), the `Input` signal will be low, or else it will be high. For all practical purposes, a (I_t = 1mA) input current is sufficient to make the `Input` signal go low. The base resistance (R_b) has to be chosen to make the `Input` signal low, when the required input voltage is driven.

$R_b = (V_s - V_{be}) / I_t$

Connecting an Analog Comparator. An analog comparator can be used to identify if the input voltage is larger than a specified reference voltage. Any operational amplifier can be used as a comparator, but a dedicated comparators like LM339 which provide open collector CMOS/TTL outputs are suitable for interfacing with logic circuits. An example circuit is shown in the following diagram.

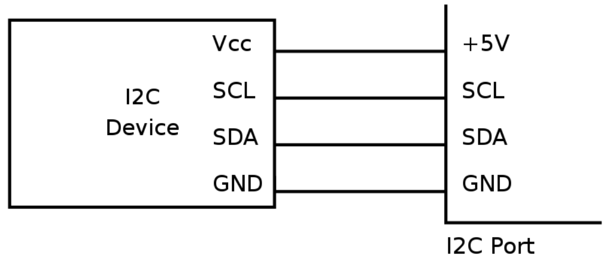


Isolating inputs using opto-coupler. As in the case of outputs, inputs can also be electrically isolated using opto-couplers.

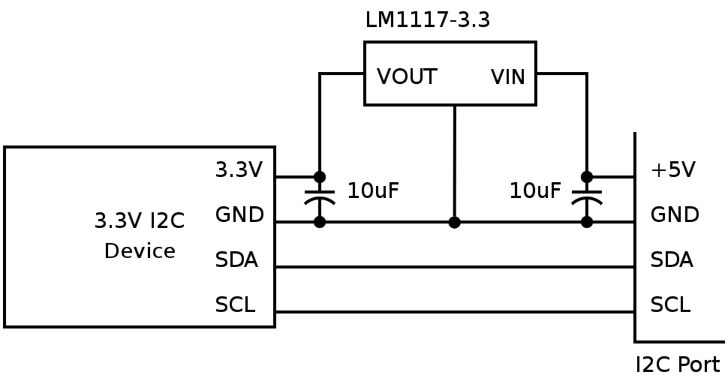


2. I2C Port

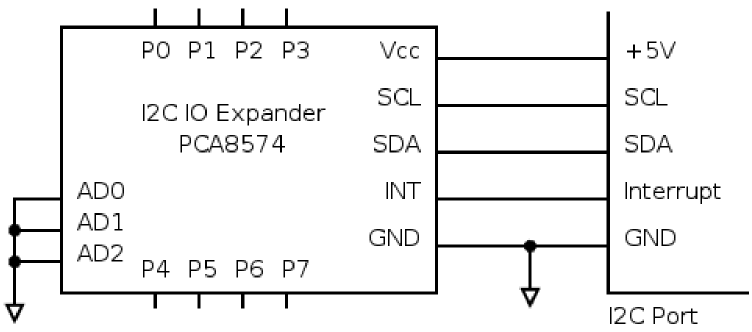
Connecting 5V I2C devices. Since the I2C signal are pulled up to 5V, 5V I2C devices can be directly connected to the I2C port.



Connecting 3.3V I2C devices with 5V tolerance. Any 3.3V I2C device with 5V tolerance can be directly connected to the I2C port. The device can be powered from an external 3.3V supply, or the 3.3V supply can be generated from the `+5V Power` using a regulator. An example circuit with the commonly available LM1117-3.3 regulator is shown below.

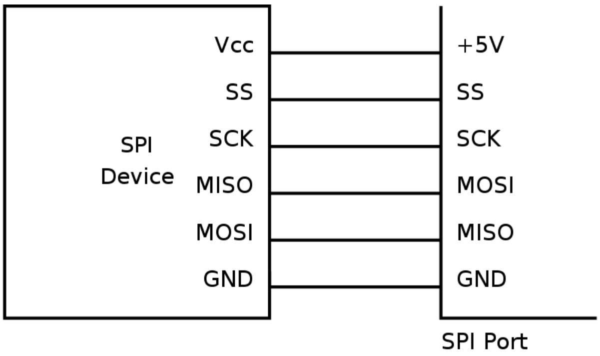


IO Expander. Additional digital inputs and outputs, if required, can be obtained using a I2C IO expander. The PCA8574 provides 8 digital I/O lines, and PCA8578 provides 16 digital I/O lines. An example circuit using the PCA8574, with I2C device address set to `0x20`, is shown below.

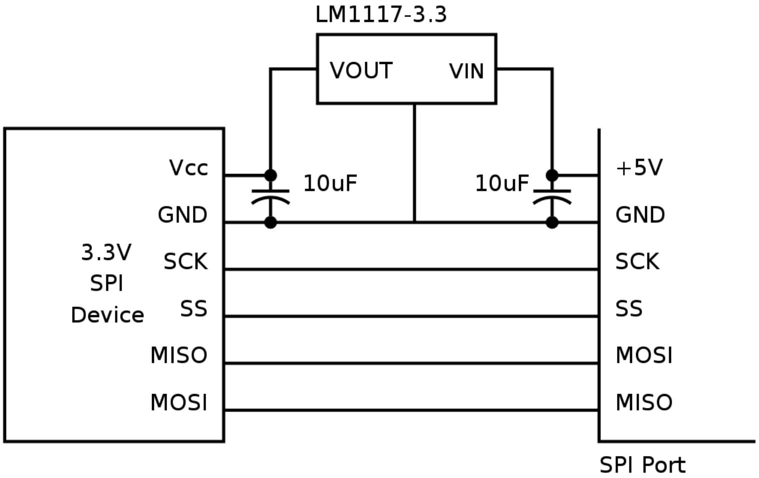


3. SPI Port

Connecting 5V SPI devices. Since the SPI signal are 5V TTL/CMOS signals, 5V SPI devices can be directly connected to the SPI port.



Connecting 3.3V SPI devices with 5V tolerance. Any 3.3V SPI device with 5V tolerance can be directly connected to the SPI port. The device can be powered from an external 3.3V supply, or the 3.3V supply can be generated from the +5V `Power` using a regulator. An example circuit with the commonly available LM1117-3.3 regulator is shown below.



4. Sensor Port

4.1. Resistive Sensors

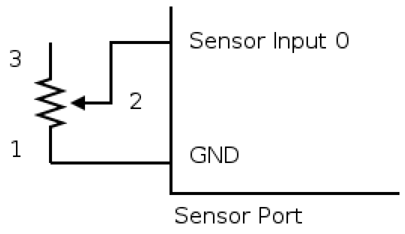
Connecting a Potentiometer. The position of potentiometer can be sensed by connecting the potentiometer to the sensor input as shown in the figure below. When the centre pin 2 of the potentiometer is moved from pin 1 to pin 3, the raw value varies from 0 to N_{max}. Where N_{max} is given by the following formula.

N_{max} = (0xFFFF x R_{max}) / (R_{max} + 10K)

Here,

- R_{max} is the maximum resistance of the potentiometer
- 10K is the internal pull up resistor on the Sensor signal. For more details refer Section 4, "Sensor Port".

For a 10K potentiometer, N_{max} = (0xFFFF x 10K) / (10K + 10K) = 0x7FFF



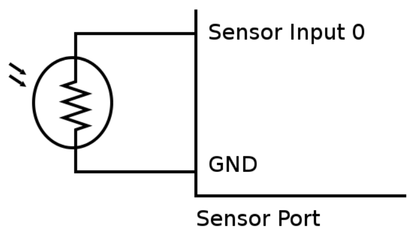
Connecting a Resistive Sensor. Sensors whose resistance varies with the parameter being measured are called resistive sensors. Examples of resistive sensors are Light Dependent Resistor (LDR), thermistor, etc. These sensors can be directly connected between the `Sensor` signal and `GND`. As the parameter being measured varies, the resistance varies accordingly, and the raw value (N) produced is given by the following formula.

N = (0xFFFF x R) / (R + 10K)

Here,

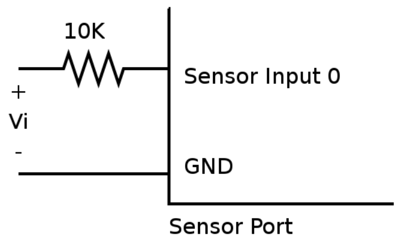
- R is the resistance of the sensor
- 10K is the internal pull up resistor on the Sensor signal. For more details refer Section 4, “Sensor Port”.

An example circuit, using the LDR, is shown below.

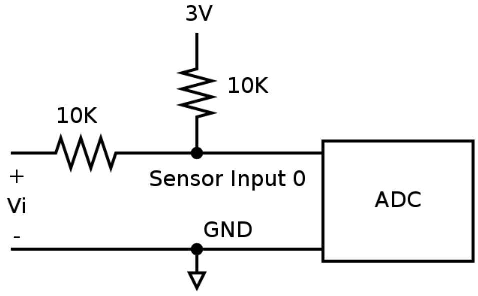


4.2. Voltage Sensors

Voltage measurement, -3V to +3V. Though the ADC input range is 0 to 3V, it is possible to measure voltages between -3V and +3V using a simple circuit. The circuit diagram is shown in the figure below.



To better understand the operation of the circuit, the circuit is shown with the internal pull-up resistor on the `Sensor` signal, in the following diagram.



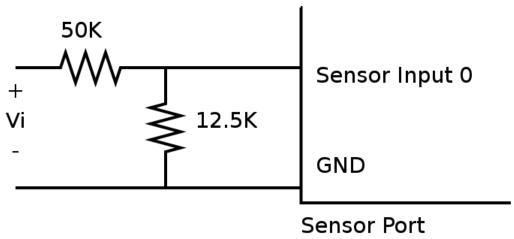
Using superposition, the voltage at `Sensor 0` is given by the following formula.

Voltage at `Sensor 0` = 1.5V + V_i / 2

As V_i decreases from 3V to -3V, the voltage at the `Sensor 0` decreases linearly from 3V to 0V, and the raw value from 0xFFFF to 0.

V_i (V)	**Voltage at Sensor 0 (V)**	**Raw Value**
3	3	0xFFFF
0	1.5	0x7FFF
-3	0	0

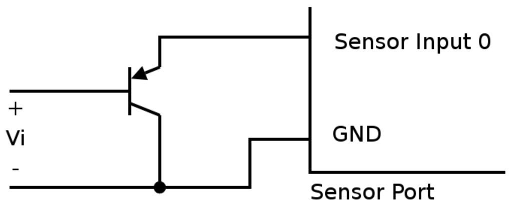
Voltage measurement, -15V to +15V. The following circuit can be used to measure voltages in the range -15V to +15V. The input voltages and the corresponding raw values is shown in the table below.



V_i (V)	**Voltage at Sensor 0 (V)**	**Raw Value**
15	3.0	0xFFFF
0	1.5	0x7FFF
-15	0.0	0

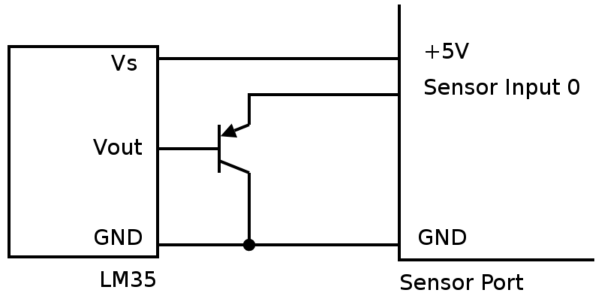
4.3. Non-resistive Sensors

Transistor Buffer. Non-resistive sensors usually generate a voltage signal that varies with the parameter being measured. Such sensors cannot be directly connected to the `Sensor N` signal, due the signal being pulled-up to 3V using a 10K resistor. A transistor buffer can be used to overcome this problem. The transistor isolates the sensor from the pull-up. A transistor buffer circuit is shown below.



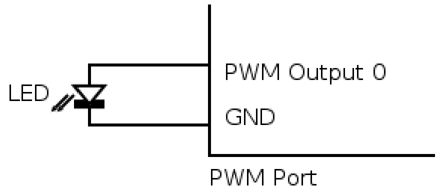
This is a PNP emitter follower, where the emitter voltage is almost equal to the base voltage. For a V_i range of 0 to 4.4V, the voltage at `Sensor 0` is (V_i + 0.6). To compensate for the added 0.6V, subtract 0.6 to the obtained voltage.

Temperature Sensor. The LM35 is an example of an non-resistive sensor. The LM35 produces a voltage that is proportional to the temperature. The voltage output by the LM35, increases by 10mV for every degree Celsius rise in temperature. As the temperature changes from 2^{o}C to 150^{o}C, the voltage rises from 0V to 1.5V. The LM35 can be connected to the Sensor port using the transistor buffer and is shown in the following circuit.

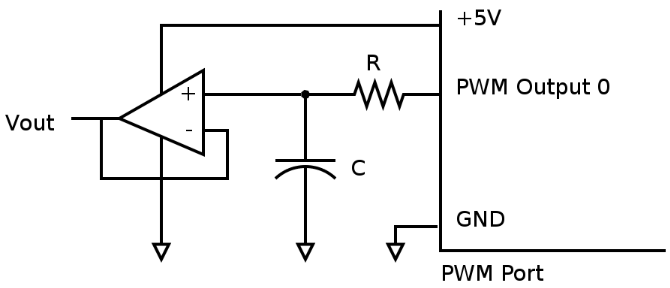


5. PWM Port

LED Brightness Control. An LED can be connected between the `PWM N` signal and `GND` as shown in the following diagram. When the duty cycle is varied the LED brightness varies accordingly.



One Bit DAC. An analog output can be generated from the PWM signal, using a low pass filter circuit. The low pass filter circuit with an op-amp buffer is shown in the following diagram.

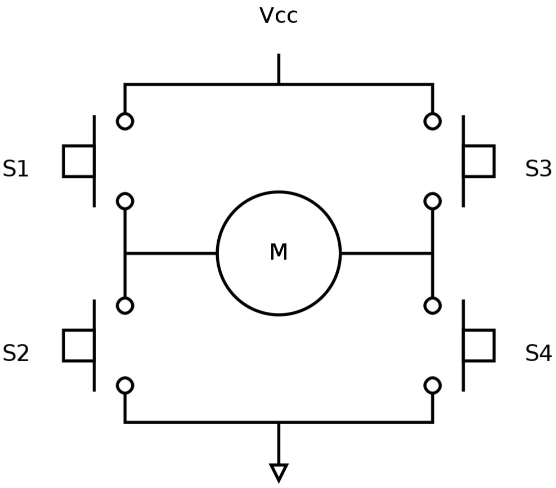


If the analog output has a frequency of F, the PWM frequency should be much higher than F. The values of R and C are given by the following formula.

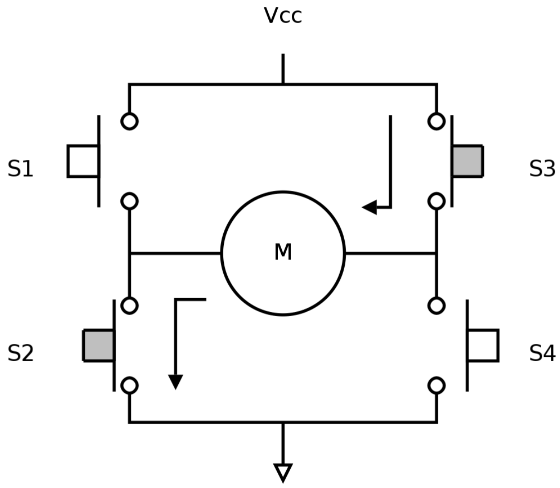
$RC = 1 / (2 \pi F)$

For an output frequency of 1kHz, choosing R = 4kohm, C = 0.04uF.

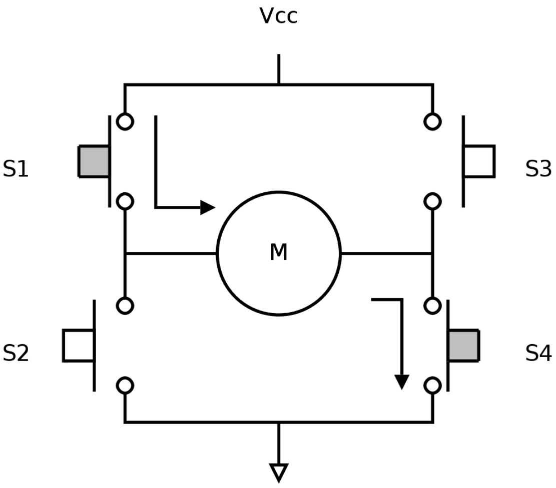
DC Motor Control. A DC motor's speed and direction of rotation can be controlled using the PWM port. The DC motor has to be interfaced through a circuit called the H-Bridge. A simple H-Bridge constructed using switches is shown in the following diagram. By controlling, the switches the motor can be made to rotate forward, reverse, brake, and free run. The various switch states and their effect on the motor is shown in the following table.



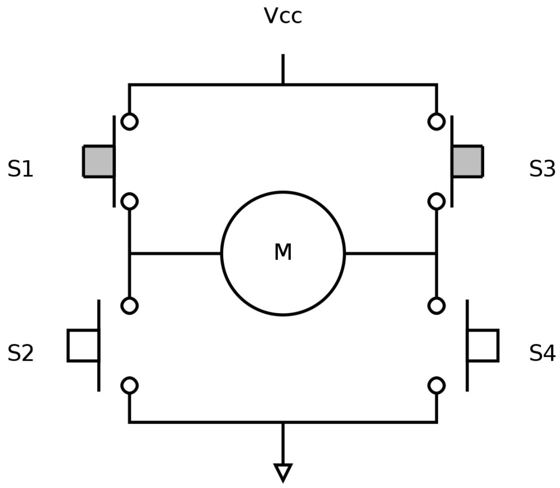
(a) Free Running State



(b) Reverse State



(c) Forward State

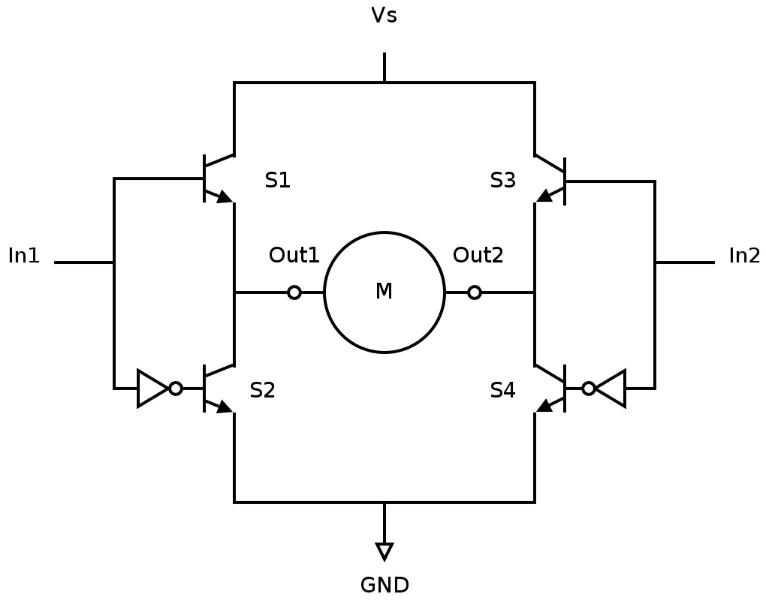


(d) Brake State

S1	S2	S3	S4	Function
0	0	0	0	Free-run
0	1	1	0	Reverse
1	0	0	1	Forward
0	1	0	1	Brake
1	0	1	0	Brake

Forward	The current to flows in one direction through the motor.
Reverse	The current flows in the opposite direction through the motor.
Brake	Applying same voltage to both the terminals, counters the back EMF produced by the motor, and causes it to come to a sudden stop.
Free-run	Power is cut-off from the motor, and the motor free-runs and eventually stops.

To control the motor through digital signals, the switches are replaced by transistors / MOSFETs. Driver ICs like the L298, that implement the H-Bridge can also be used for motor control applications. The block diagram of one half of a L298 is shown in the following diagram.



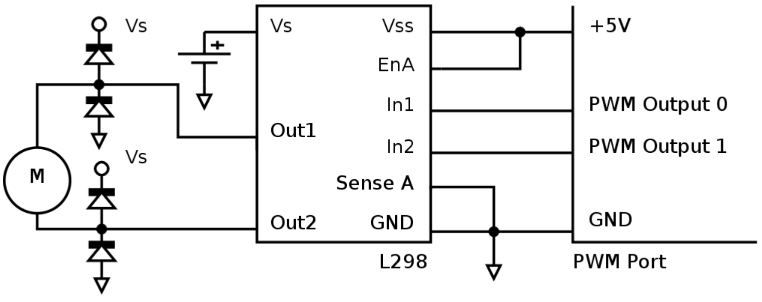
By controlling the inputs, various functions can be selected, as shown in the table below.

In1	In2	Function
0	0	Brake
0	1	Reverse
1	0	Forward
1	1	Brake

When in Forward state or Reverse state, the speed of the motor can be controlled by driving the inputs with a PWM signal

In1 (Duty Cycle)	In2 (Duty Cycle)	Function
0%	0%	Brake
100%	100%	Brake
0%	100%	Reverse, full speed
100%	0%	Forward, full speed
0%	X%	Reverse, speed proportional to duty cycle
X%	0%	Forward, speed proportional to duty cycle

A circuit for interfacing a DC motor to the PWM port using the L298, is shown in the following diagram.



Chapter 4. ZIO Control Panel

The ZIO Control Panel is a GUI application that allows most features of ZIO to be tested without writing code.

When the control panel is started, the application prompts for the serial device name of the ZIO motherboard, as show in Figure 4.1, “Serial Device Input”. Select the serial device and click on `OK`. The control panel window as shown in Figure 4.2, “Control Panel Screenshot” is displayed. The control panel has multiple sub-panels, one for each module.

Figure 4.1. Serial Device Input

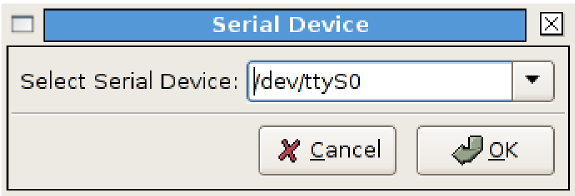
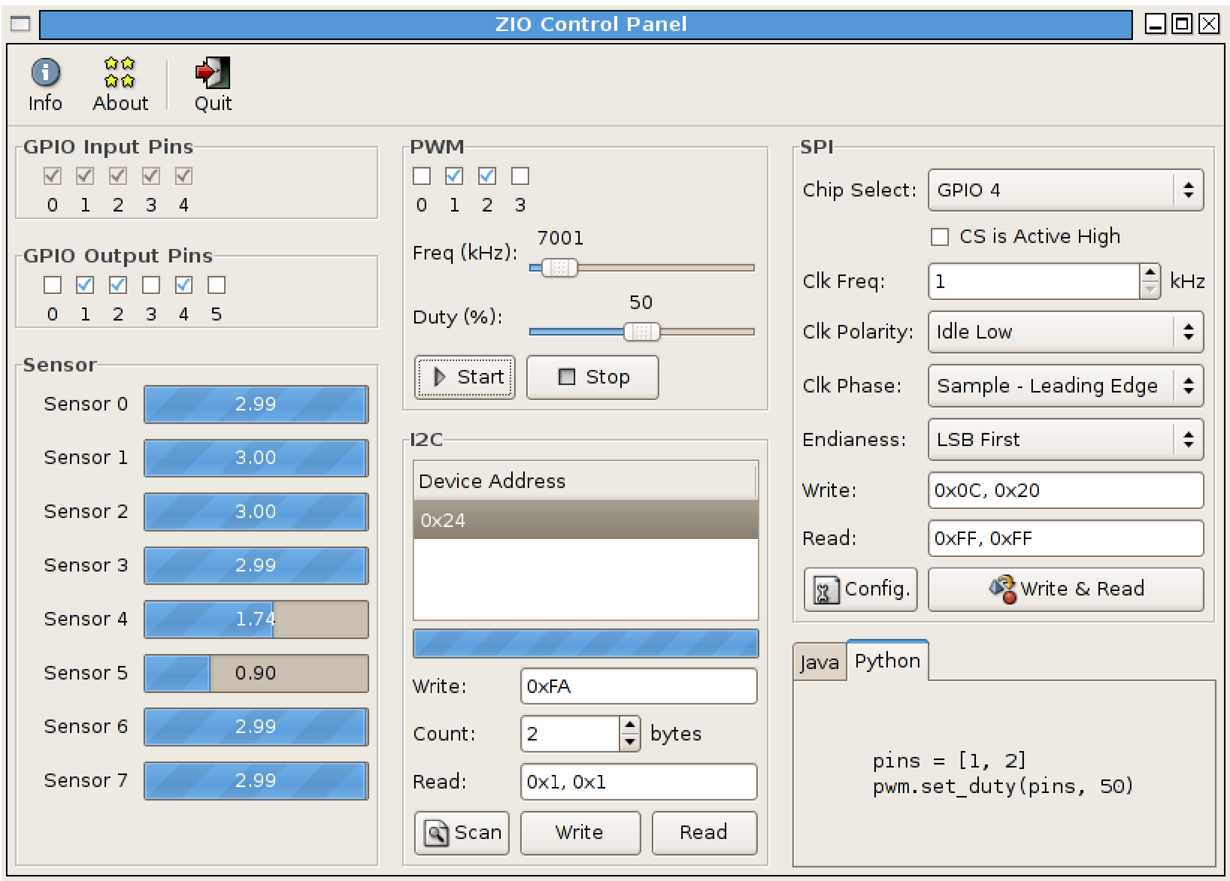


Figure 4.2. Control Panel Screenshot



Controlling GPIO Outputs. The GPIO outputs can be controlled by toggling the check box on the `GPIO Out` panel.

Reading GPIO Inputs. The GPIO inputs can be read by inspecting the check box on the `GPIO In` panel.

Reading Sensor Inputs. The Sensor inputs can be read by inspecting the progress bar on the `Sensor` panel.

Controlling PWM Outputs. PWM signals can generated using the controls in the `PWM` panel,

1. Select the PWM channels, by toggling the checkboxes.
2. Set the PWM frequency, in the frequency slider.
3. Set the PWM duty cycle, in the duty cycle slider.
4. Click `Start` to start generating PWM signal.
5. Click `Stop` to stop generating PWM signal.

Controlling I2C Devices. I2C devices can be accessed using the controls in `I2C` panel. To list devices present on the bus,

1. Click on the `Scan` button.
2. Addresses of devices present on the bus is displayed on the list box.

To write to a device,

1. Select the device address.
2. Enter the data bytes to be written in hex, separated by commas, in the `Write` text box.
3. Click on the `Write` button.

To read from a device,

1. Select the device address.
2. Select the no. of bytes to read.
3. Click on the `Read` button.

Controlling SPI Devices. SPI devices can be accessed using the controls in `SPI` panel.

To configure the device,

1. Specify the GPIO output that is to be used as chip select, in the `Chip Select` combo box.
2. If the chip select is active high, select the `CS is Active High` check box.
3. Specify the clock polarity in the `Clk Polarity` combo box.
4. Specify the clock phase in the `Clk Phase` combo box.
5. Specify the endianess in the `Endianess` combo box.
6. Click on `Config.` to select the configuration specified. The has to be done every time the configuration is changed.

To write and read from the device.

1. Specify the list of bytes to be written in the `Write` text box.
2. Click on `Write & Read` to write the specified byte and read an equal no. of bytes.

Equivalent Code. The equivalent code for the currently performed operation is indicated in the Java and Python tabs. This is an easy way to learn the Java and Python API.

Chapter 5. Software Installation

1. Under GNU/Linux

Supported distributions are:

1. Debian 5.0.4 (Lenny) and above
2. Ubuntu 8.04 (Hardy) and above
3. Mint 5 (Elyssa) and above
4. Fedora 9 and above

Tip

In the following sections, commands that have a `#` (hash) prompt, should be executed as `root`. In case of Ubuntu, the command should be invoked using `sudo`.

1.1. ZIO Driver

The ZIO motherboard is accessed through a USB serial interface. The USB serial interface driver `option.ko` can be used with the ZIO motherboard. A few configuration changes has to be made to use the driver with ZIO.

Step 1. Copy the file `drivers/linux/30-zio.rules` from the ZIO Software CD-ROM to `/etc/udev/rules.d/`. This can be done by issuing the following command from the CD-ROM mount point.

```
# cp drivers/linux/30-zio.rules /etc/udev/rules.d/
```

Step 2. Plug the ZIO Motherboard into the USB port. `dmesg` should report that the device was detected and attached to `ttyUSBx`. This device file name should be used to communicate with the board.

```
$ dmesg | tail -n 3
option: USB Driver for GSM modems: v0.7.2
option 1-3:1.0: GSM modem (1-port) converter detected
usb 1-3: GSM modem (1-port) converter now attached to ttyUSB0
```

Even though the message says that the driver is for GSM Modems, the same driver is capable of handling the ZIO Motherboard as well.

Step 3. The device file generally belongs to the `dialout` group. Users who would like to access the device should be a member of the `dialout` group. The user `xyz` can be added to the `dialout` group using the following command.

```
# usermod -a -G dialout xyz
```

1.2. Java API

Step 1. Make sure the JDK is installed. If not, install it using the following command

```
# apt-get install openjdk-6-jdk         # Under Ubuntu/Mint/Debian
# yum install java-1.6.0-openjdk-devel  # Under Fedora
```

Step 2. Install the serial library package `librxtx-java` using the following command

```
# apt-get install librxtx-java          # Under Ubuntu/Mint/Debian
```

```
# yum install rxtx                        # Under Fedora
```

Step 3. The ZIO Java API is available in the JAR file `software/zio-java-api-1.0.jar` on the ZIO Software CD-ROM. Copy it to a convenient location and add it to your `CLASSPATH`.

Step 4. Test your installation using the Java program available on the CD-ROM at `software/TestZio.jar`. The JAR file is executable. When executed, it will prompt for the serial device file and will then test access to the board through the Java API.

1.3. Python API

Step 1. Make sure you have Python 2.x installed. If not install it using the following command

```
# apt-get install python                  # Under Ubuntu/Mint/Debian
# yum install python-devel                # Under Fedora
```

Step 2. Install the serial library package `python-serial`, using the following command

```
# apt-get install python-serial           # Under Ubuntu/Mint/Debian
# apt-get install pyserial                # Under Fedora
```

Step 3. The ZIO Python API is available in `api/zio-python-api-1.0.tar.gz` Install the ZIO Python API using the following command sequence.

```
$ tar --gunzip -x -f zio-api-1.0.0.tar.gz
$ cd zio-api-1.0.0
# python setup.py install
```

Step 4. Test your installation using the Python program available on the CD-ROM at `software/test-zio.py`. When executed, the program will prompt for the serial device file and will test access to the board through the Python API.

1.4. ZIO Control Panel

Step 1. Install the Python API using the command sequence specified in the previous section.

Step 2. Install the GTK libraries using the following command.

```
# apt-get install python-gtk2             # Under Ubuntu/Mint/Debian
# apt-get install python-dbus             # Under Ubuntu/Mint/Debian
# yum install pygtk2-libglade             # Under Fedora
# yum install dbus-python                 # Under Fedora
```

Step 3. Install the ZIO control panel using the following command sequence.

```
$ tar --gunzip -x -f zio-cpanel.tar.gz
$ cd zio-cpanel
# python setup.py install
```

2. Under Windows

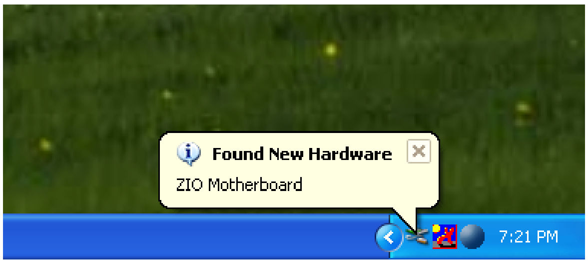
Supported Windows releases are:

1. Windows XP
2. Windows Vista

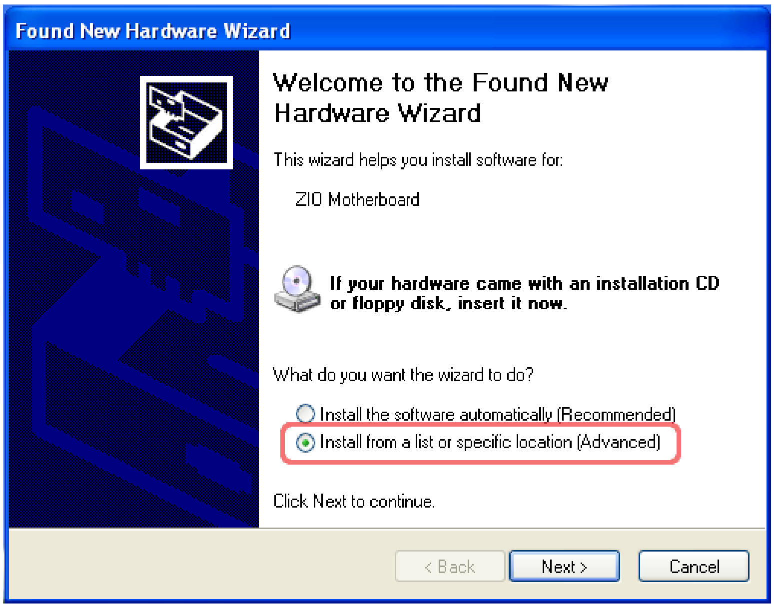
2.1. ZIO Driver Installation in XP

Step 1. Insert the ZIO Software CD-ROM into the CD drive.

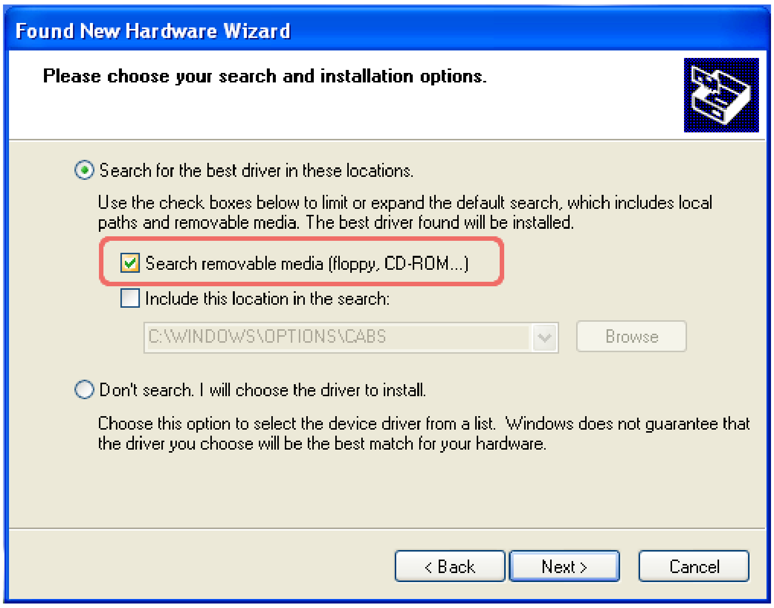
Step 2. Connect the ZIO Motherboard to the PC. Windows will detect the device.



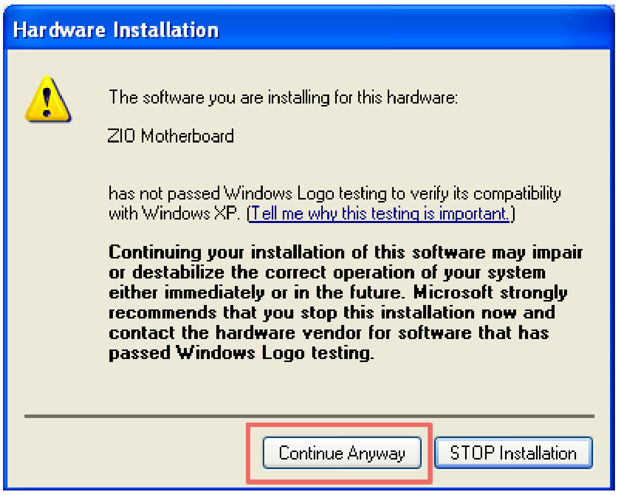
Step 3. In the "Found New Hardware Wizard", select "Install from a list of specific location", and click on "Next".



Step 4. In the next wizard page, select the "Search removable media" checkbox.



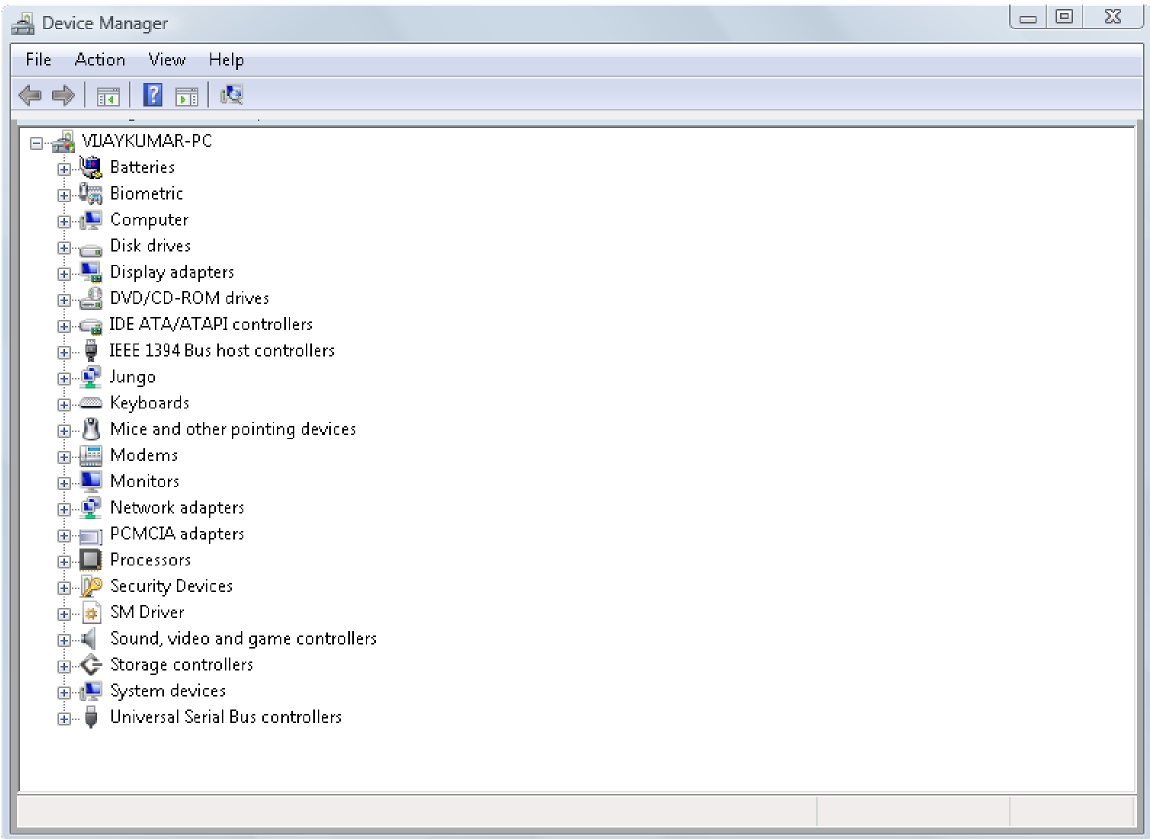
Step 5. Windows searches for the driver, and indicates that driver has not passed Windows Logo testing. Select "Continue Anyway" to install the driver.



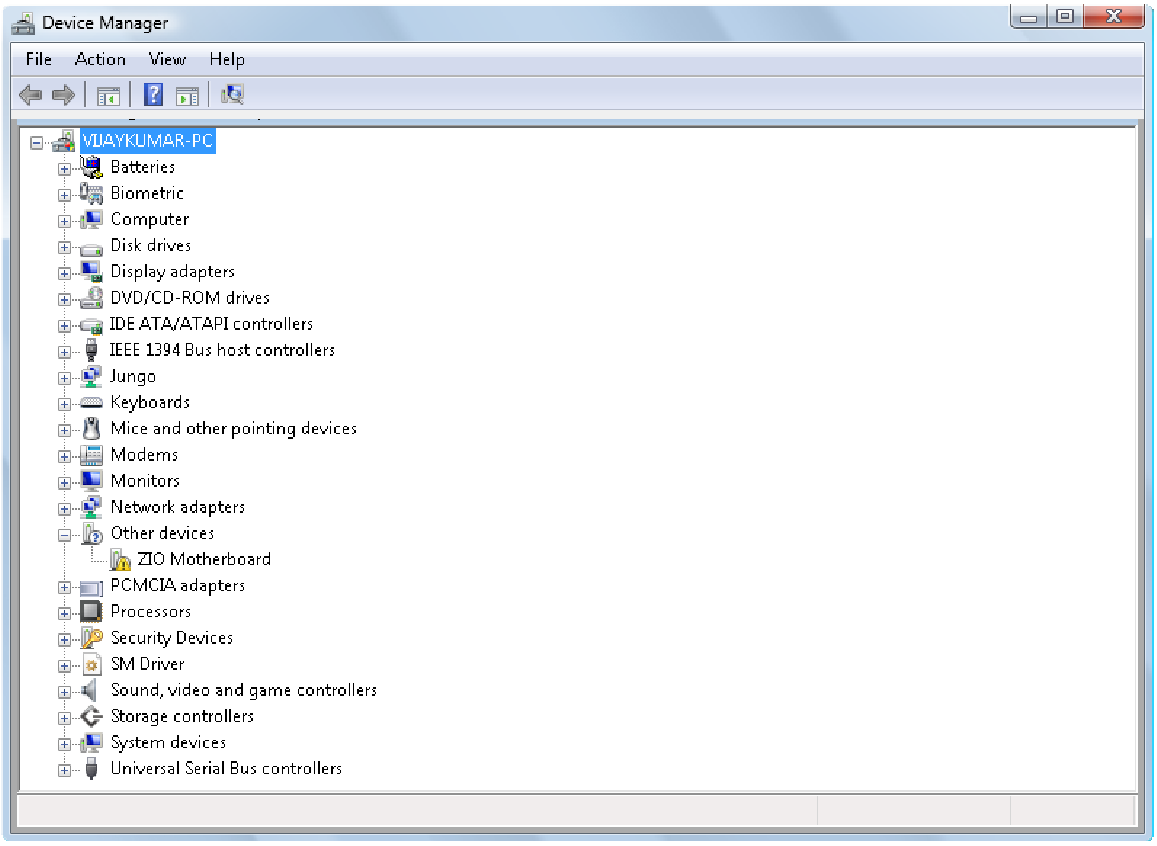
2.2. ZIO Driver Installation in Vista

Step 1. Insert the ZIO Software CD-ROM into the CD drive.

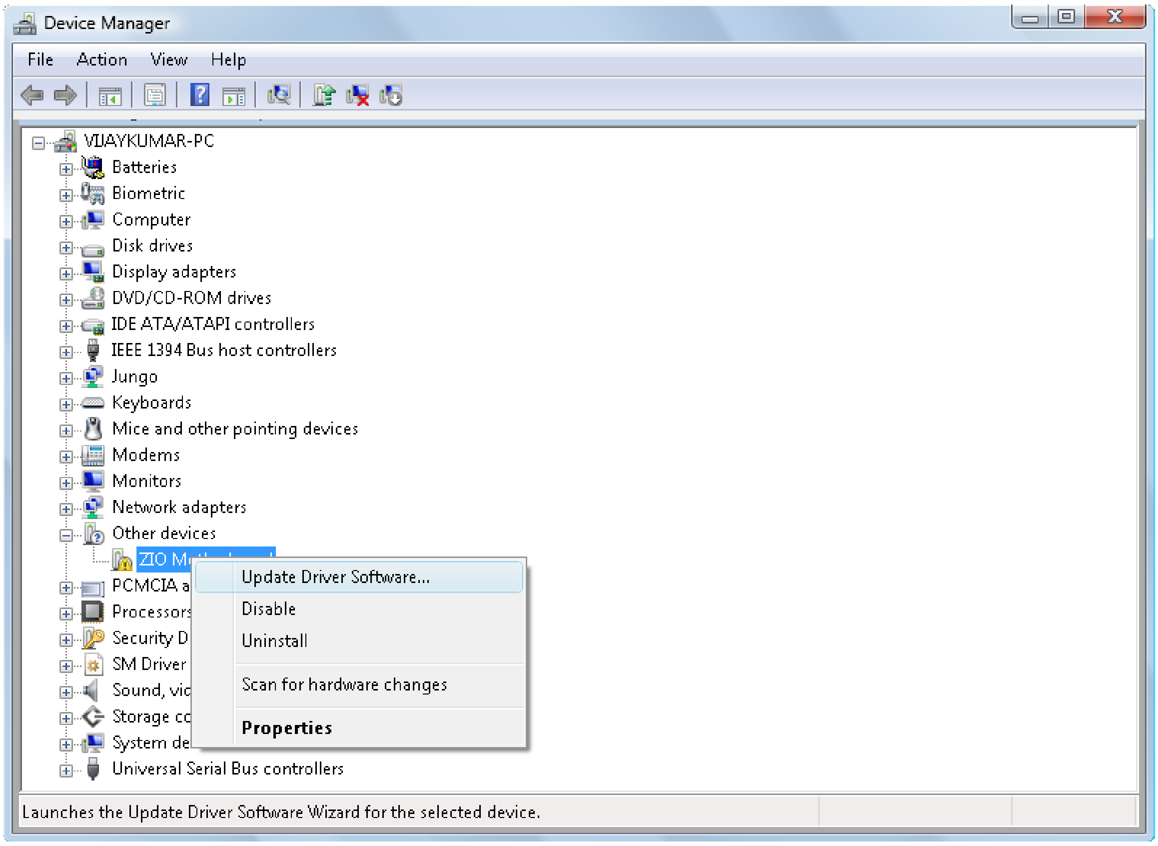
Step 2. Goto "Control Panel > System and Maintenance > Device Manager"



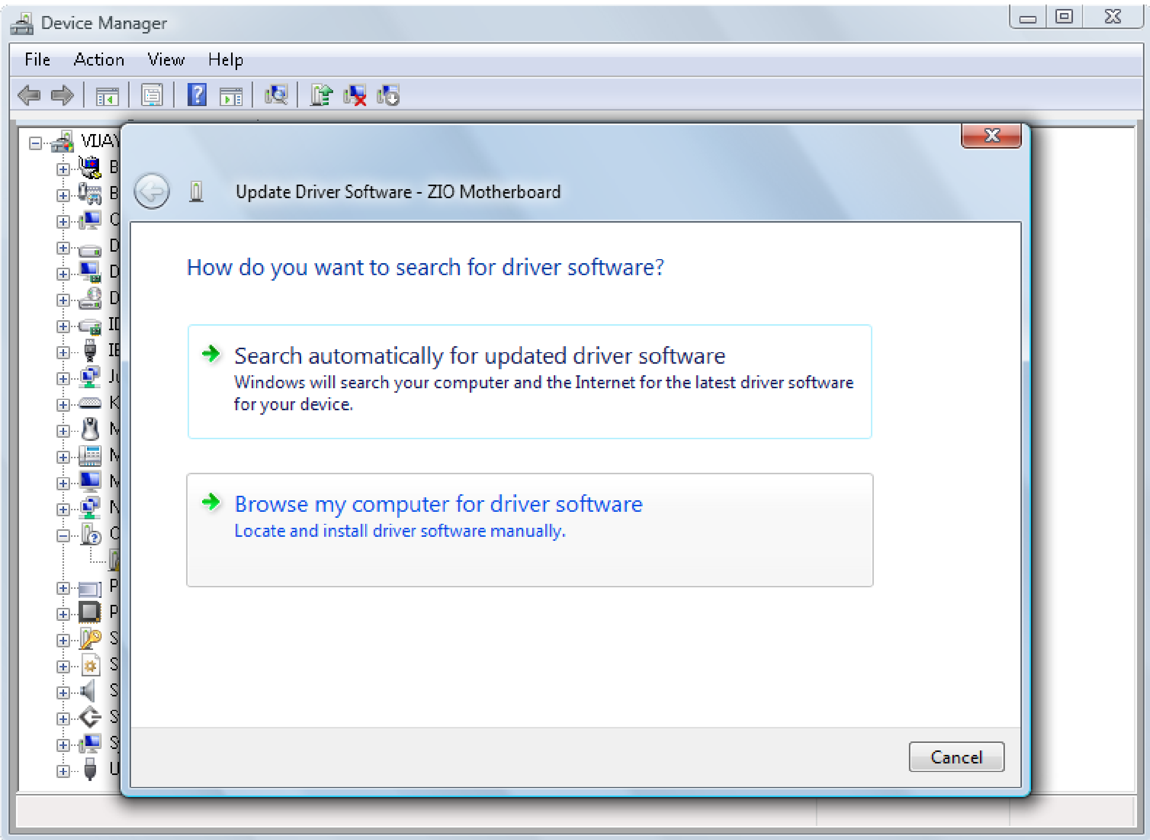
Step 2. Connect the ZIO Motherboard to the PC. The Device Manager will display "ZIO Motherboard" under "Other Devices".



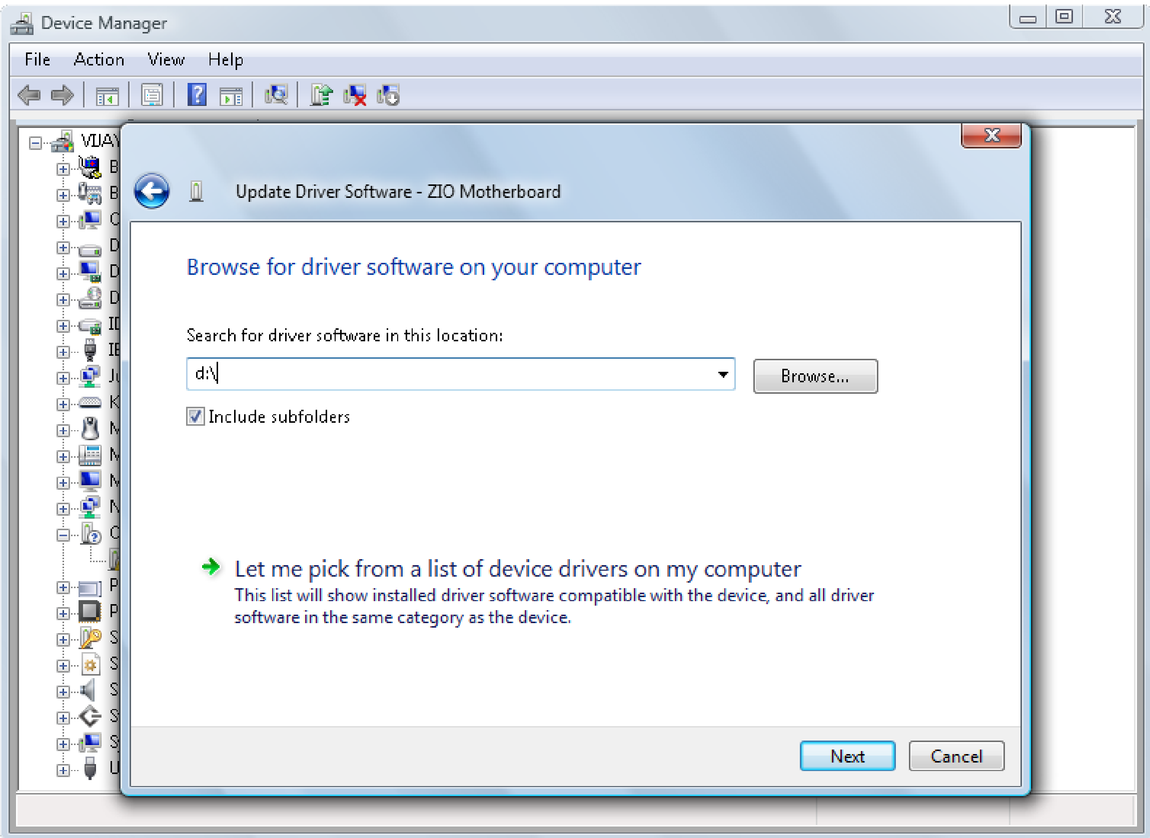
Step 3. Right click on the "ZIO Motherboard", and select "Update Driver Software …" in the drop down menu.



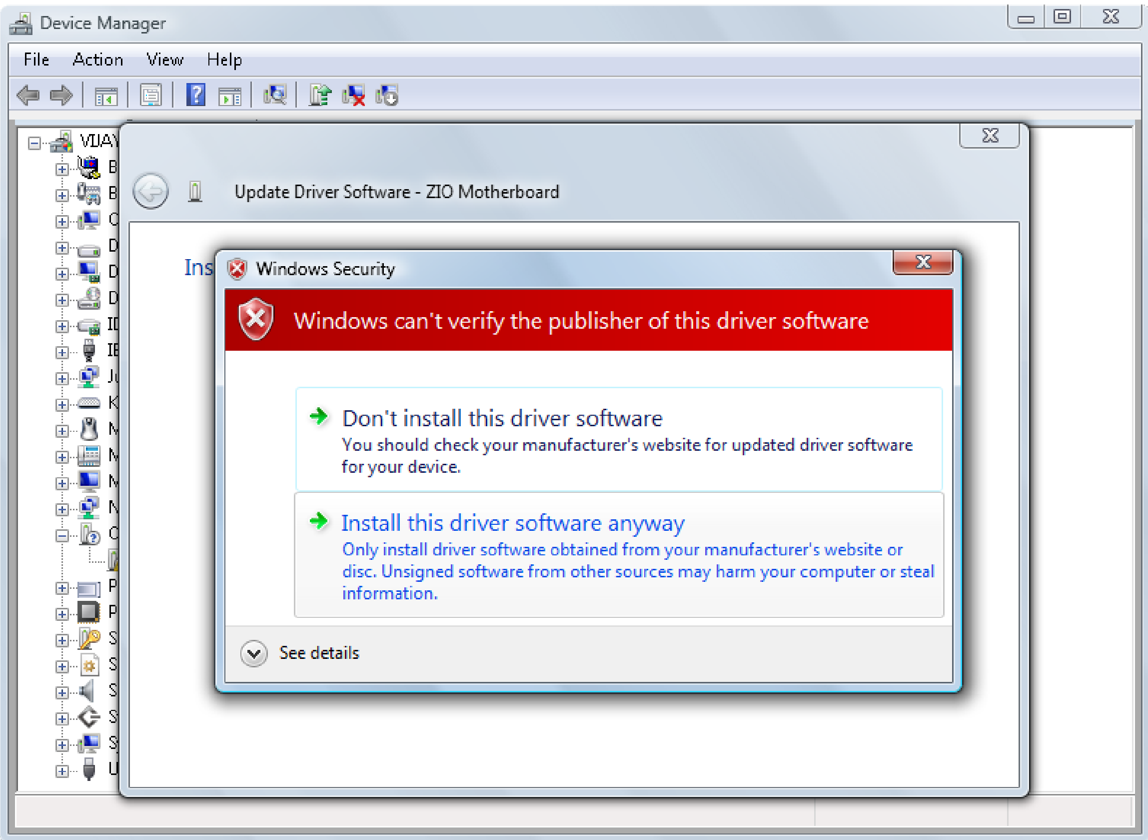
Step 4. In the dialog that appears select "Browse my computer for driver software".



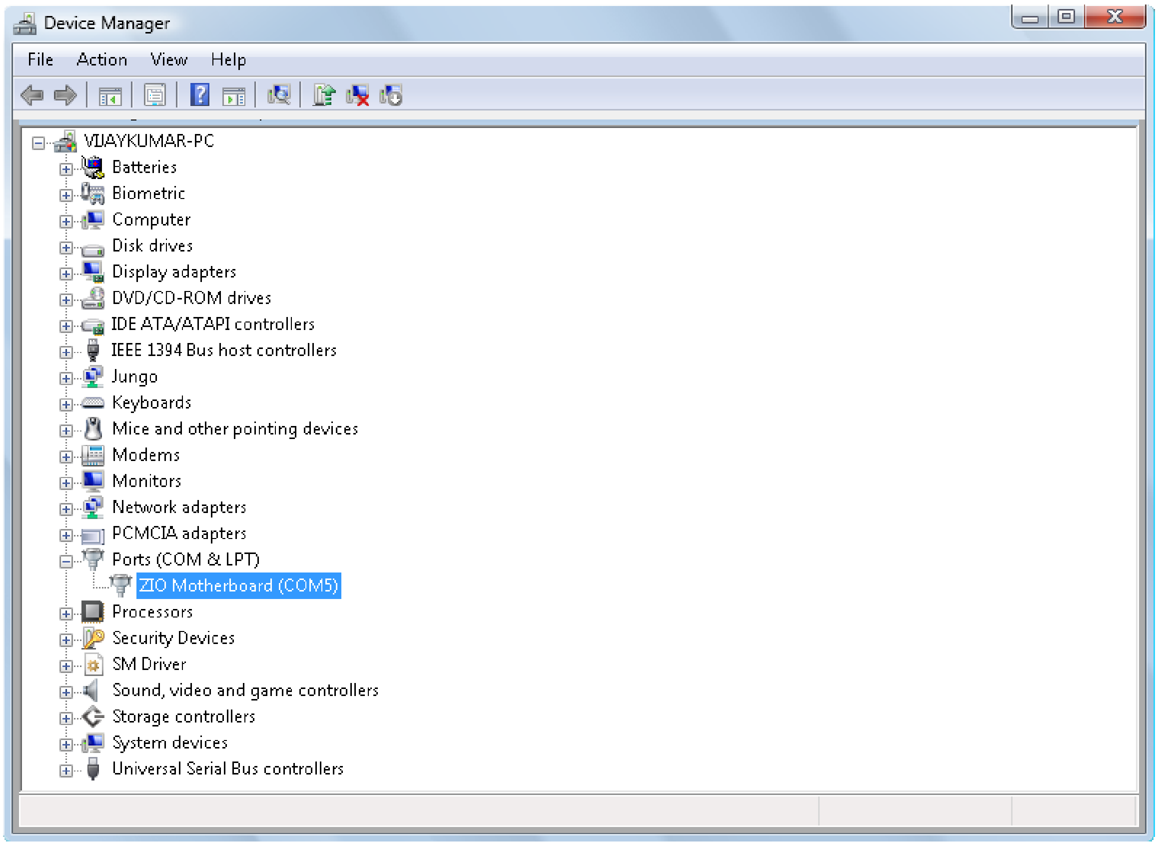
Specify the CD-ROM drive, as the location to search for drivers.



Step 5. Windows searches for the driver, and indicates that publisher of the driver cannot be verified. Select "Install this driver software anyway" to install the driver.



Step 6. The driver will get installed and the COM port will be displayed in the Device Manager.



2.3. Java API

Step 1. Make sure the JDK > 1.5 is installed. If not, install the JDK from the ZIO Software CD-ROM. The setup program is located at `software/jdk-6u18-windows-i586.exe`. Let's assume that the JDK is installed in `C:\Program Files\Java\jdk1.6.0_18\` and the JRE is install in `C:\Program Files\Java\jre6\`

Step 2. Install the serial library package. Copy the JAR file `RXTXcomm.jar` present in `software/rxtx-2.1.7-bins-r2.zip` to the following locations

```
C:\Program Files\Java\jdk1.6.0_18\jre\lib\ext\
C:\Program Files\Java\jre6\lib\ext\
```

Copy the DLL file `rxtxserial.dll` present in `software/rxtx-2.1.7-bins-r2.zip` to

```
C:\Program Files\Java\jdk1.6.0_18\jre\bin
C:\Program Files\Java\jre6\bin
```

Step 3. Install the ZIO Java API. Copy the JAR file `zio-java-api-1.0.jar` to

```
C:\Program Files\Java\jdk1.6.0_18\jre\lib\ext\
C:\Program Files\Java\jre6\lib\ext\
```

Step 4. Test your installation using the Java program available on the CD-ROM at `software/TestZio.jar`. The JAR file is executable. When executed (double-clicked), it will prompt for the serial device file and will then test access to the board through the Java API.

2.4. Python API

Step 1. Make sure Python 2.x is installed. If not install the setup file `software/python-2.6.4.msi` provided on the ZIO Software CD-ROM.

Step 2. Install the serial library using the setup file `software/pyserial-2.5-rc2.win32.exe` provided on the ZIO Software CD-ROM.

Step 3. Install the ZIO Python API using the setup file `software/zio-python-api-1.0.win32.exe` provided on the ZIO Software CD-ROM.

Step 4. Test your installation using the Python program available on the CD-ROM at `software/test-zio.py`. When executed (double-clicked), the program will prompt for the serial device file and will test access to the board through the Python API.

2.5. ZIO Control Panel

Install the ZIO Control Panel using the setup file `software/zio-cpanel-1.0.win32.exe` provided on the ZIO Software CD-ROM.