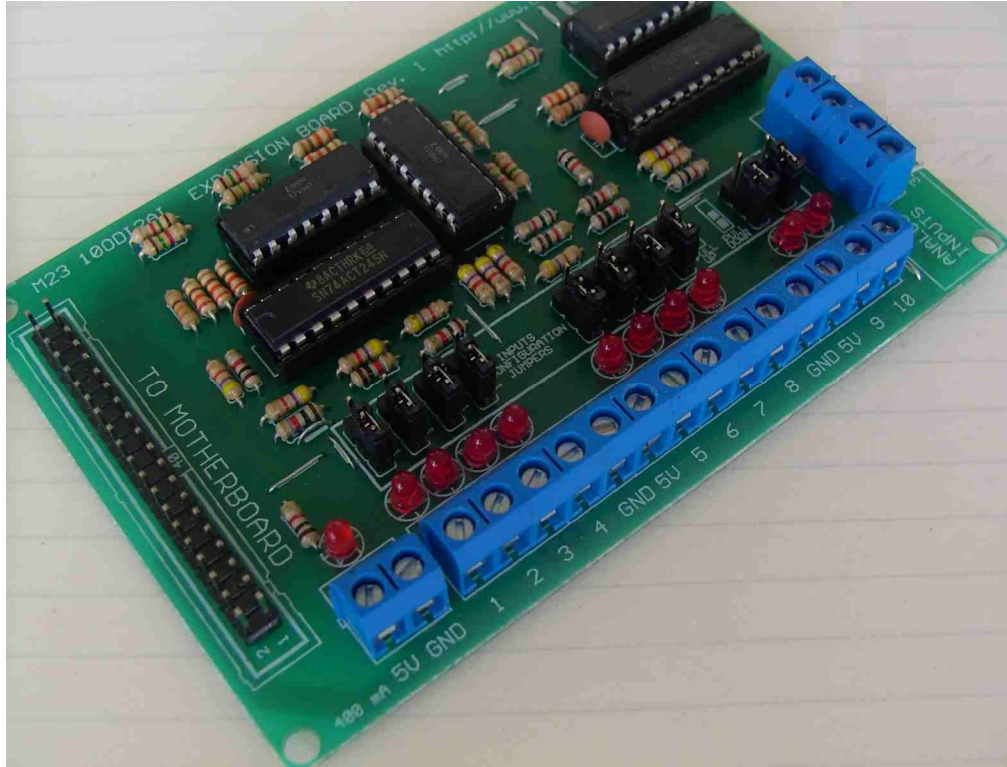


M23- 10ODI2AI EXPANSION BOARD

Rev. 1.1

User manual Rev. 3.1



1. Overview

This expansion board provides 10 discrete optoisolated inputs for +5vdc TTL signals, and 2 non-optoisolated analog inputs.

2. Features

- **10 Optoisolated Discrete inputs.**
- **2 Analog inputs.**
- **PULL-UP or PULL-DOWN selection for inputs.** Includes jumpers to select the best input configuration for your application.
- **Buffered inputs**
- **Input pins with close by ground or +5vdc connections**
- **Screw-On connections for all terminals.** You only have to screw-on the wires to make all your connections.

- **Support for up to 10 KHz optoisolation.**
- **Status LEDs on all inputs and output connections.** No more guessing. You can SEE all your signals.

3. Specifications.

| DIGITAL INPUT SPECIFICATIONS | |
|--------------------------------|------------|
| On-state voltage range | 2 to 5V DC |
| Maximum on-state input current | 1.1 mA |
| Maximum off-state voltage | 0.8V |
| Maximum off-state current | 1.1 mA |
| Analog voltage input range | 0V- 3.3V |
| Maximum operation frequency | 10 KHz |

4. Pinout

| M23 and M2R1.1 Pinout | | | |
|---|--------------------------|---------------------------------------|---------------------------------------|
| 40 Pins Header (Pin # / Description) | Terminal/Function | Exp. Port 2 (Pokeys Pin #) | Exp. Port 4 (Pokeys Pin #) |
| 1 / GND | | | |
| 2 / GND | | | |
| 3 / GND | | | |
| 4 / GND | | | |
| 5 / I/O | Input 1 | PK25 | PK35 |
| 6 / I/O | Input 2 | PK28 | PK36 |
| 7 / I/O | Input 3 | PK29 | PK37 |
| 8 / I/O | Input 4 | PK30 ENABLE | PK38 |
| 9 / I/O | Input 5 | PK26 | PK39 |
| 10 / I/O | Input 6 | PK32 | PK40 |
| 11 / I/O | Input 7 | PK33 | PK41 |
| 12 / I/O | Input 8 | PK34 | PK42 |
| 13 / I/O | Input 9 | PK23 | PK47 |
| 14 / I/O | Input 10 | PK24 | PK48 |
| 15 / I/O | Analog Input 1 | PK43 | PK45 |
| 16 / I/O | Analog Input 2 | PK44 | PK46 |
| 17 / 3.3V | | | |
| 18 / 5V | | | |
| 19 / 5V | | | |
| 20 / 5V | | | |

| M23 and M2R3 Pinout | | | |
|---|--------------------------|---------------------------------------|---------------------------------------|
| 40 Pins Header (Pin # / Description) | Terminal/Function | Exp. Port 2 (Pokeys Pin #) | Exp. Port 4 (Pokeys Pin #) |
| 1 / GND | | | |
| 2 / GND | | | |
| 3 / GND | | | |
| 4 / GND | | | |
| 5 / I/O | Input 1 | 35 | 40 |
| 6 / I/O | Input 2 | 36 | 41 |
| 7 / I/O | Input 3 | 9 | 42 |
| 8 / I/O | Input 4 | 38 | 50 |
| 9 / I/O | Input 5 | 39 | 51 |
| 10 / I/O | Input 6 | 37 | 52 |
| 11 / I/O | Input 7 | 10 | 53 |
| 12 / I/O | Input 8 | 11 | 54 |
| 13 / I/O | Input 9 | 15 | 23 |
| 14 / I/O | Input 10 | 16 | 24 |
| 15 / I/O | Analog Input 1 | 44 | NOT AVAILABLE |
| 16 / I/O | Analog Input 2 | 45 | 46 |
| 17 / 3.3V | | | |
| 18 / 5V | | | |
| 19 / 5V | | | |
| 20 / 5V | | | |

Note: If the M23 is connected to the port 3, the analog input 1 can not be used.

| M23 and M2R4 Pinout | | | |
|---|--------------------------|---------------------------------------|---------------------------------------|
| 40 Pins Header (Pin # / Description) | Terminal/Function | Exp. Port 2 (Pokeys Pin #) | Exp. Port 4 (Pokeys Pin #) |
| 1 / GND | | | |
| 2 / GND | | | |
| 3 / GND | | | |
| 4 / GND | | | |
| 5 / I/O | Input 1 | 3 | 40 |
| 6 / I/O | Input 2 | 4 | 41 |
| 7 / I/O | Input 3 | 9 | 42 |
| 8 / I/O | Input 4 | 38 | 50 |
| 9 / I/O | Input 5 | 39 | 51 |
| 10 / I/O | Input 6 | 43 | 52 |
| 11 / I/O | Input 7 | 10 | 53 |
| 12 / I/O | Input 8 | 11 | 54 |
| 13 / I/O | Input 9 | 15 | 23 |
| 14 / I/O | Input 10 | 16 | 24 |
| 15 / I/O | Analog Input 1 | 44 | NOT AVAILABLE |
| 16 / I/O | Analog Input 2 | 45 | 46 |
| 17 / 3.3V | | | |
| 18 / 5V | | | |
| 19 / 5V | | | |
| 20 / 5V | | | |

Note: If the M23 is connected to the port 3, the analog input 1 can not be used.

5. Board description

5.1 Power Requirements

It requires a 5VDC @ 400 milliamps external power supply to operate.

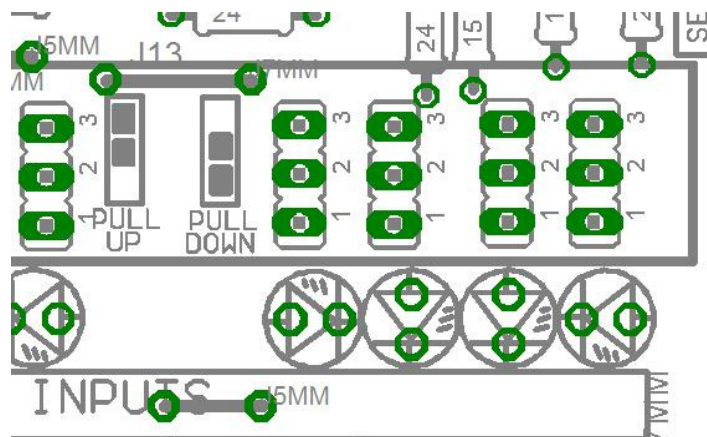


WARNING

Check the polarity and voltage of the external power source and connect the 5V and GND. Overvoltage or reverse-polarity power applied to these terminals can cause damage to the board, and/or the power source.

5.2 Using the Pull-up or Pull-down selection jumper for discrete inputs.

Jumper allows to change the discrete input configuration. Using the Pull-up or Pull-down selection jumpers the input voltage is pulled through a 4.7Kohm resistor to up or down in this way:



6. Schematics

5.1 Discrete inputs

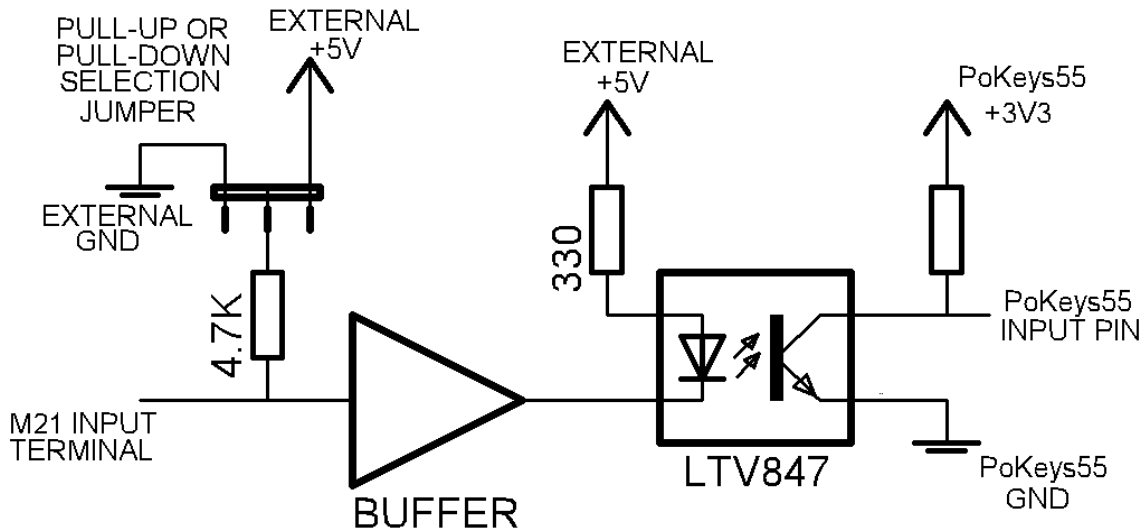


Fig. 1 Discrete Inputs schematic

A Pull-up or Pull-down selection jumper allows to select the configuration for the all inputs

5.2 Analog inputs

The analog inputs are directly routed to the PoKeys55 Pins.

7. Wiring diagrams

Different kind of sensors and switches can be connected to discrete inputs board, but this board support only TTL signal. If you need to connect devices that generate 12V or 24V signals in some cases is necessary to add external resistors.

Note: The below wiring diagrams are an example, any input can be used for the connections.

Note. The below wiring diagrams require to set the input with pull-down resistor. Use the pull-down or pull-up selections jumpers of every bank to do it.

7.1 Connecting Switches or push button.

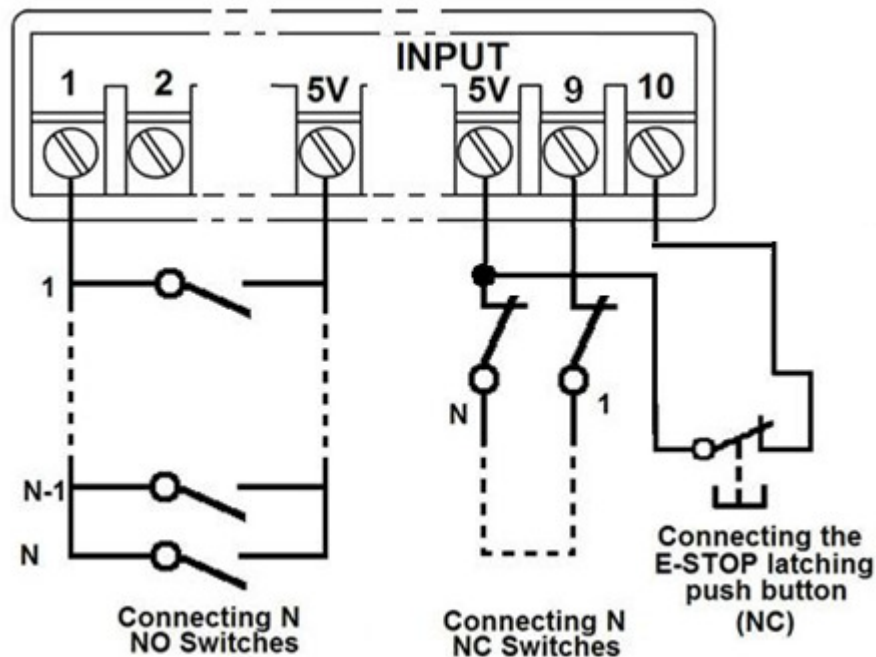


Fig. 2 Wiring diagram to connect switches.

Note: AUTO TOOL ZERO, E-Stop, homing, or other real time functions, should not be used with devices with serial communications. They need to operate in real time.

7.2 Connecting NPN sensors.

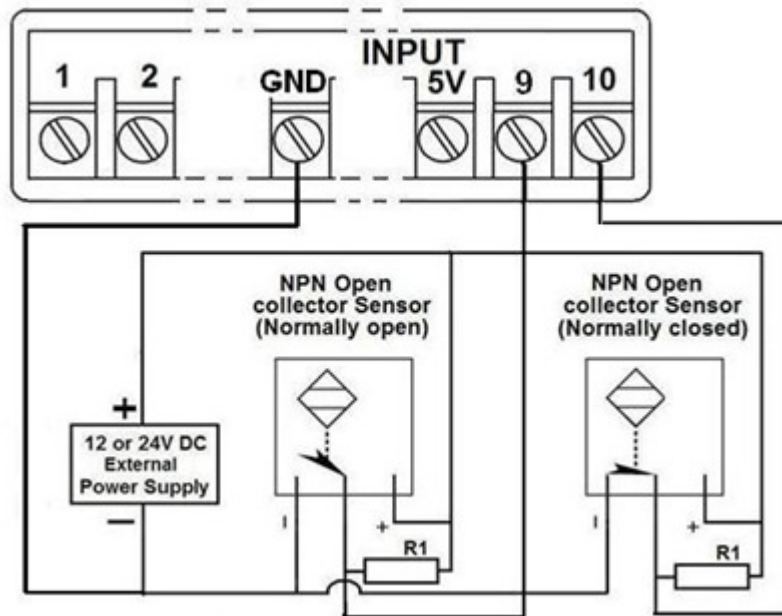


Fig. 3 Wiring diagram to connect NPN open collector proximity sensors.

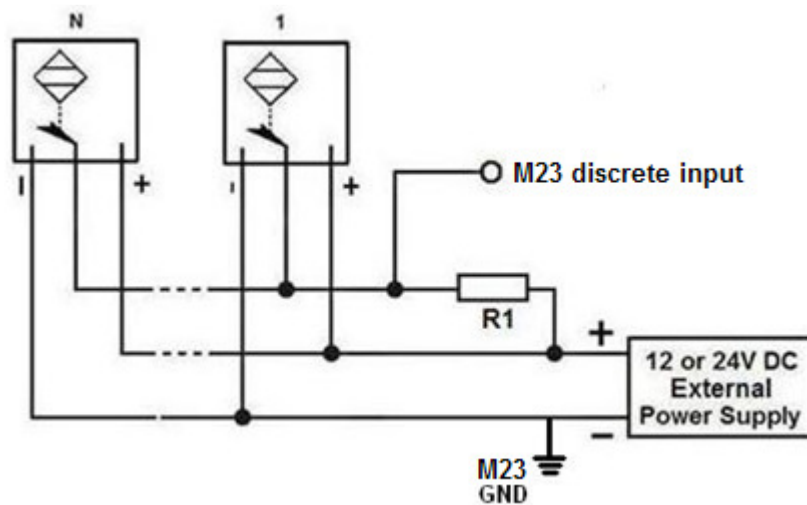


Fig. 4 Wiring diagram to connect in parallel NPN open collector proximity sensors.

| Connecting NPN open collector proximity sensor with the M23 | |
|---|---------------------|
| R1 Value (12V) | R1 Value (24V) |
| Aprox. 10K Ω | Aprox. 25K Ω |

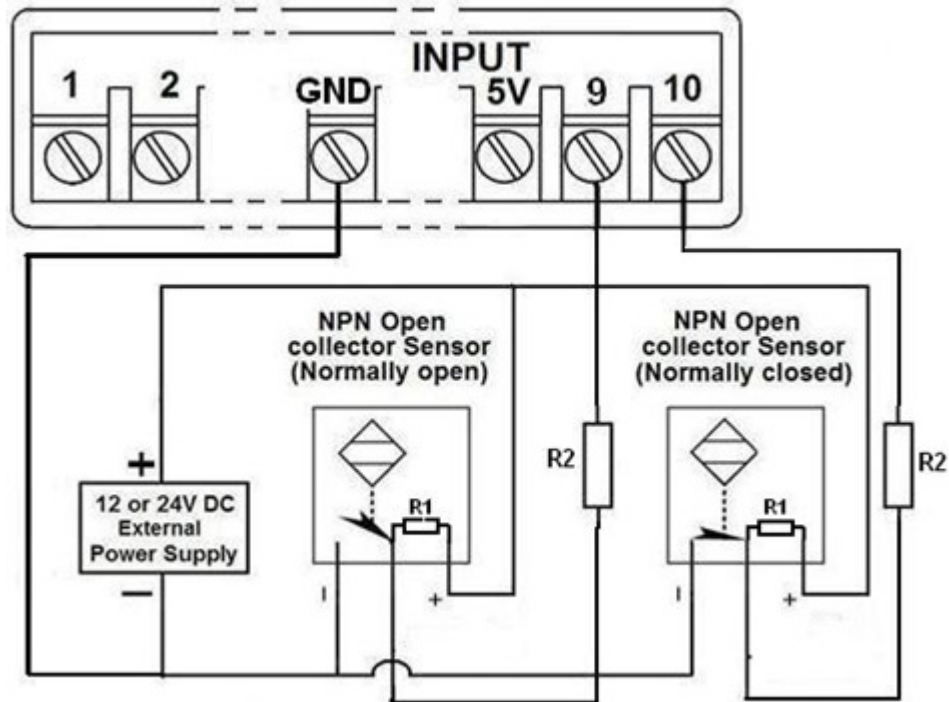


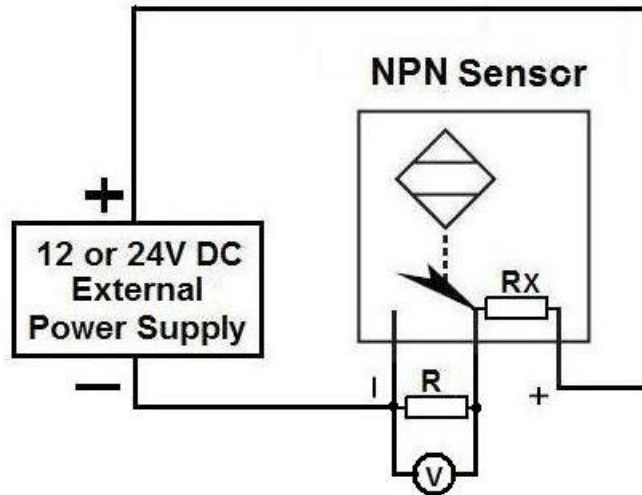
Fig. 5 Wiring diagram to connect NPN proximity sensors with internal pull up resistor.

Some NPN proximity sensor has internally a pull-up resistor (R1). It is necessary to know its value in order to connect safely the sensor with the expansion board. Follow this recommendation:

| Connecting NPN open collector proximity sensor with the M23 | |
|---|---------------------|
| (R1+R2) Value (12V) | (R1+R2) Value (24V) |
| Aprox. 10K Ω | Aprox. 25K Ω |

Calculating the R1 value.

Note: Being an unknown value resistor, in the follow explanation this resistor go to be named Rx.



$$R_x = V_{EX} \cdot (R/V) - R \quad (1)$$

Where:

V_{EX} is the external power supply voltage

V is the voltage across the R resistor

To calculate the internal resistor (R_x) values are required an external resistor and a voltmeter. Do the connection as are shown in the figure above and do the calculations using the equation (1).

Note. The user should know the R value to do this operation. It is recommended a 4.7KOhm@1/2W.

For example, if you are using a 12V power supply (V_{EX}), and use a 4.7KOhm as external resistor (R), and the voltage across R is 6V, using the equation 1, the R_x value is 4.7KOhm.

7.3 Connecting PNP sensors.

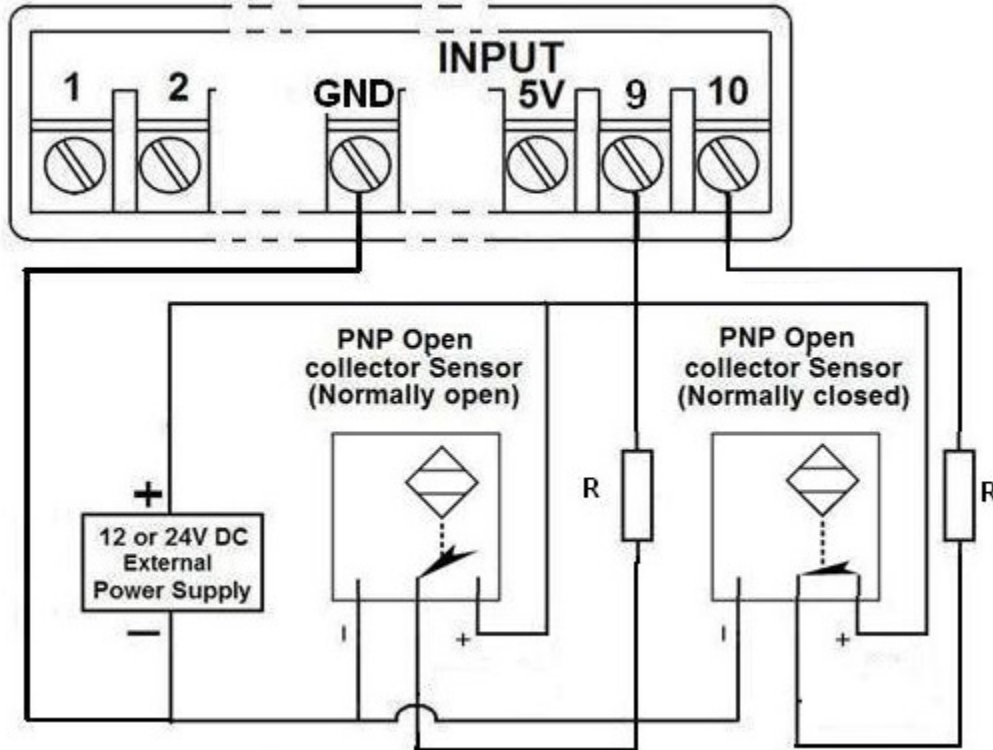


Fig. 6 Wiring diagram to connect PNP proximity sensors

| Connecting PNP proximity sensor with the M23 | |
|--|---------------------|
| R Value (12V) | R Value (24V) |
| Aprox. 10K Ω | Aprox. 25K Ω |

7.4 Other connection.

Other connections can be implemented by setting the inputs with pull-up resistor. Use the pull-down or pull-up selections jumpers of every bank to do it.

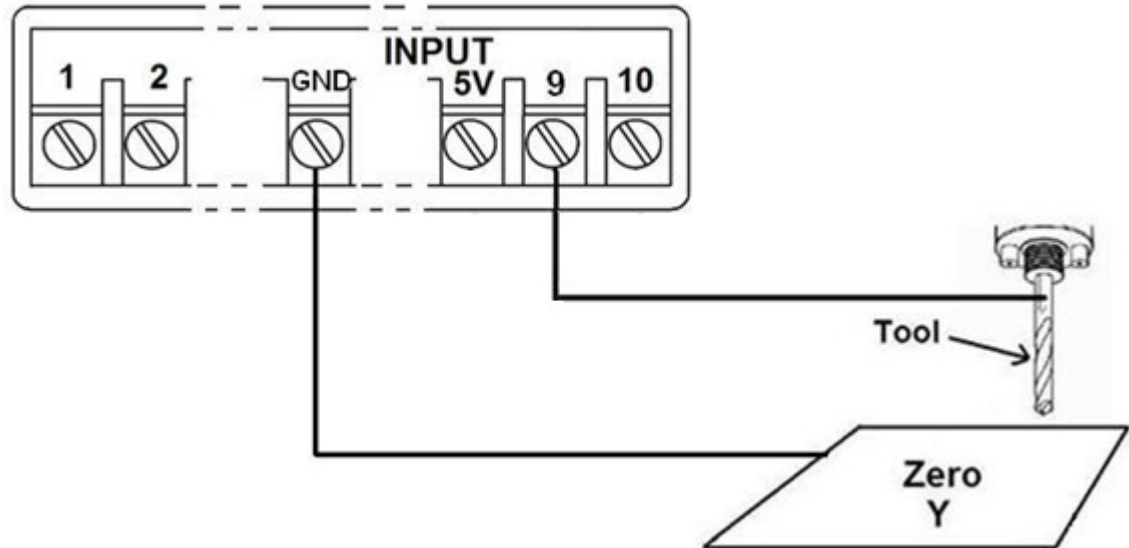
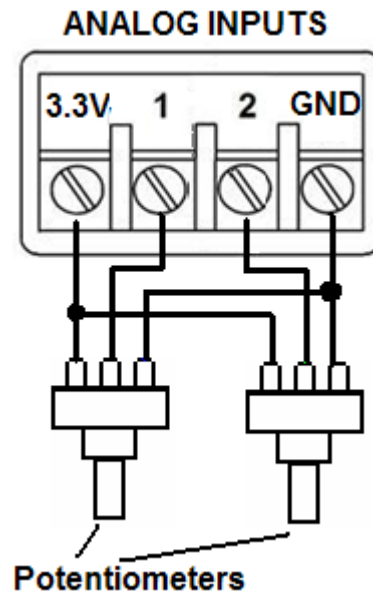


Fig. 7 Wiring diagram to do an “Auto Tool Zero”

Note: AUTO TOOL ZERO, E-Stop, homing, or other real time functions, should not be used with devices with serial communications. They need to operate in real time.

7.5 Analog inputs connection.



This is the recommended connection for the analog inputs.

Note: The analog input voltage can't exceed 3.3V.

7. Troubleshooting.

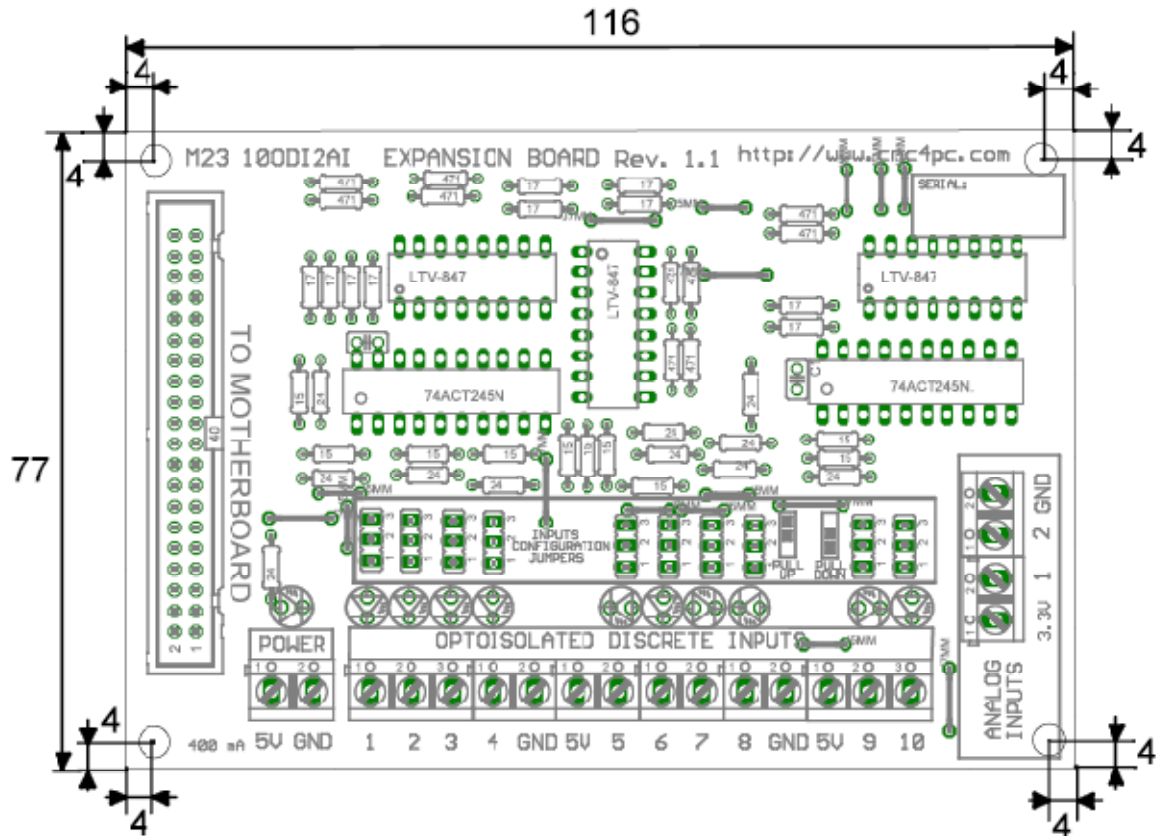
SYMPTOM 1: THE BOARD DOES NOT REACT TO THE SIGNAL.

| POSSIBLE CAUSE | POSSIBLE SOLUTIONS |
|--|--|
| <ul style="list-style-type: none"> - Pin conflict or mach3 configuration. It is possible that the port address used for the pin is not right, or that there is a pin conflict. That is that you are using that same pin twice. (it could be assigned to a different function). | <ul style="list-style-type: none"> - Check that the pin you are using is not been used anywhere else in your setup. |

SYMPTOM 5: AN INPUT PIN MIGHT NOT BE WORKING.

| POSSIBLE CAUSE | POSSIBLE SOLUTIONS |
|---|--|
| <ul style="list-style-type: none"> - A chip may have gone bad. These buffers could act as fuses for the signals, and they can go bad because of noise spikes or even strong static. | <ul style="list-style-type: none"> - These chips are inexpensive and readily available. You can order them here: http://www.cnc4pc.com/Store/osc/index.php?cPath=38. - Carefully moving chips around and checking if the problem moves around could be a way of figuring out if this is the case. |
| <ul style="list-style-type: none"> - There could be a problem with the cable | <ul style="list-style-type: none"> - Test this with a different ribbon cable |

8. Dimensions.



All dimensions are in Millimeters.

Disclaimer:

Use caution. CNC machines could be dangerous machines. DUNCAN USA, LLC or Arturo Duncan are not liable for any accidents resulting from the improper use of these devices. The M23 is not fail-safe device, and it should not be used in life support systems or in other devices where its failure or possible erratic operation could cause property damage, bodily injury or loss of life.