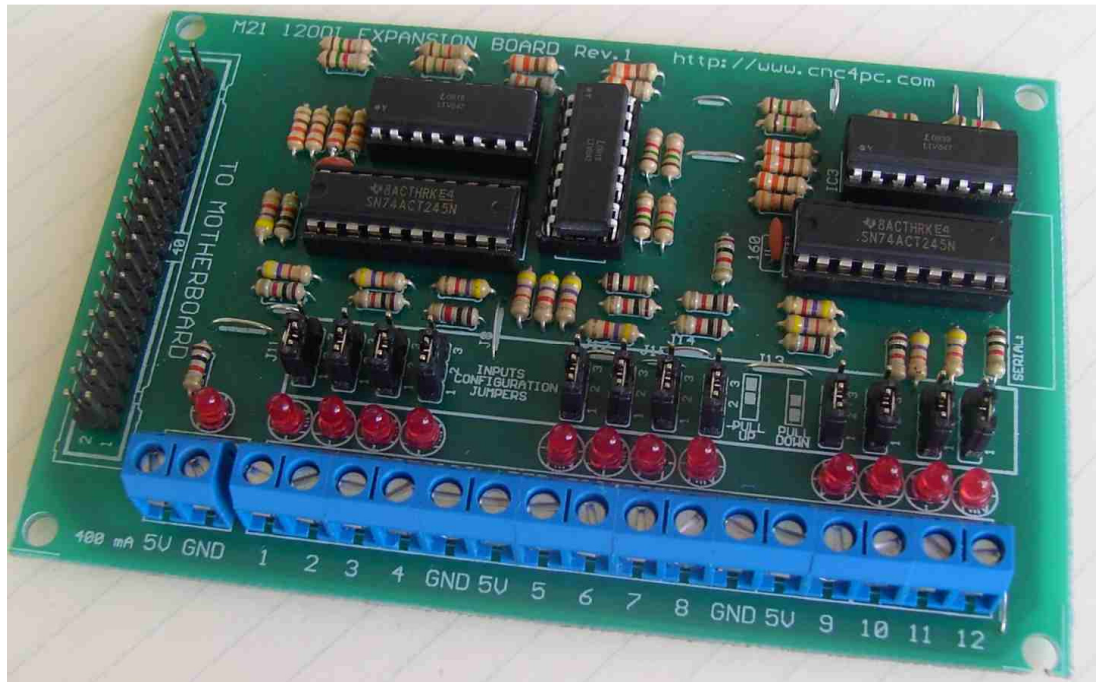


M21- 12ODI EXPANSION BOARD Rev. 1

User manual Rev. 2.1



1. Overview

This expansion board provides 12 discrete optoisolated inputs for +5vdc TTL signals.

2. Features

- **12 Optoisolated Discrete 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 terminals.**
- **Fully optoisolated.**
- **Support for up to 10 KHz optoisolation.**

- **Status LEDs on all inputs 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
Maximum operation frequency	10 KHz

4. Pinout

M21					
40 Pins Header (Pin # / Description)	Terminal/Function	Exp. Port 1 (Pokeys Pin #)	Exp. Port 2 (Pokeys Pin #)	Exp. Port 3 (Pokeys Pin #)	Exp. Port 4 (Pokeys Pin #)
1 / GND					
2 / GND					
3 / GND					
4 / GND					
5 / I/O	Input 1	PK01	PK11	PK25	PK35
6 / I/O	Input 2	PK02	PK12	PK28	PK36
7 / I/O	Input 3	PK03	PK54	PK29	PK37
8 / I/O	Input 4	PK04	PK14	PK30	PK38
9 / I/O	Input 5	PK05	PK15	PK26	PK39
10 / I/O	Input 6	PK06	PK16	PK32	PK40
11 / I/O	Input 7	PK07	PK21	PK33	PK41
12 / I/O	Input 8	PK08	PK22	PK34	PK42
13 / I/O	Input 9	PK09	PK27	PK23	PK47
14 / I/O	Input 10	PK10	PK31	PK24	PK48
15 / I/O	Input 11	PK17	PK19	PK43	PK45
16 / I/O	Input 12	PK18	PK20	PK44	PK46
17 / 3.3V					
18 / 5V					
19 / 5V					
20 / 5V					

5. Board description

5.1 Power Requirements

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

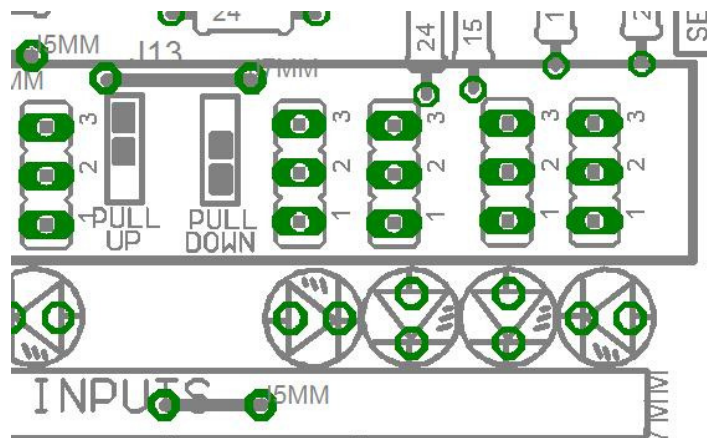


WARNING

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 inputs.

Jumper allows to change the 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

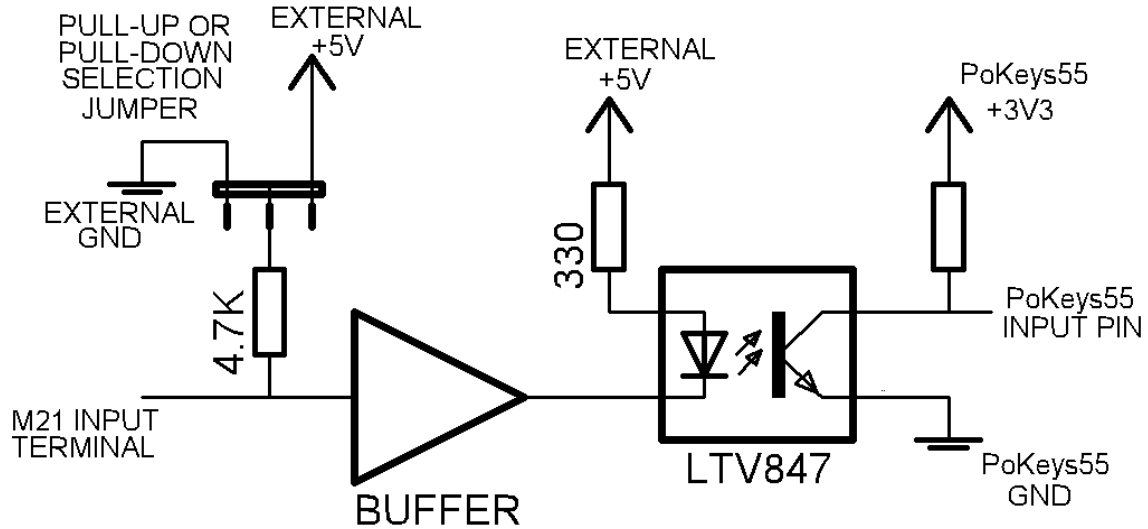


Fig. 1 Inputs schematic

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

7. Wiring diagrams

Different kind of sensors and switches can be connected to inputs board, but this board support only TTL signal. If you need to connect devices that generates 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.

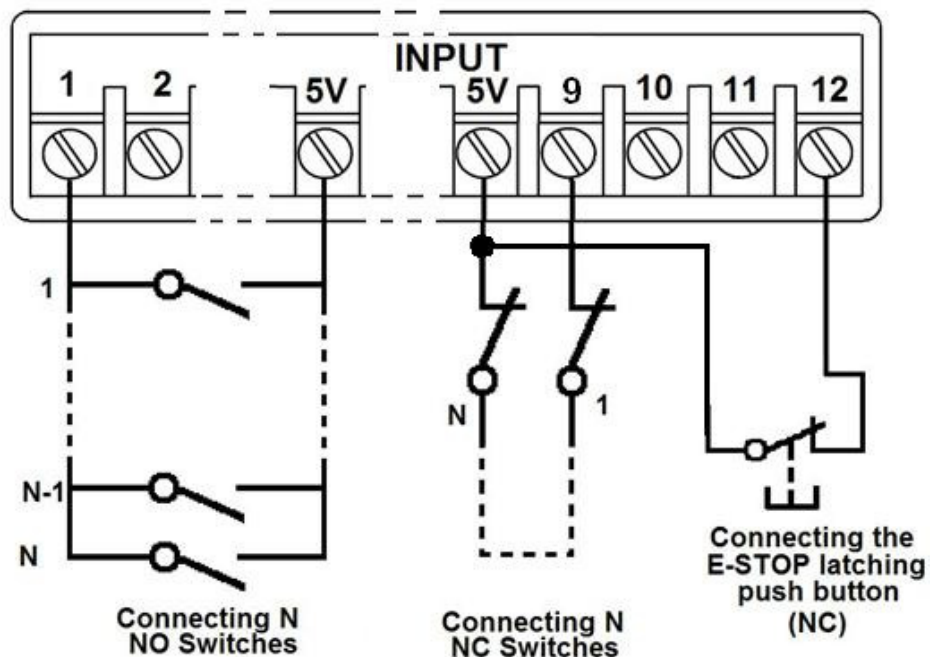


Fig. 2 Wiring diagram to connect switches.

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.

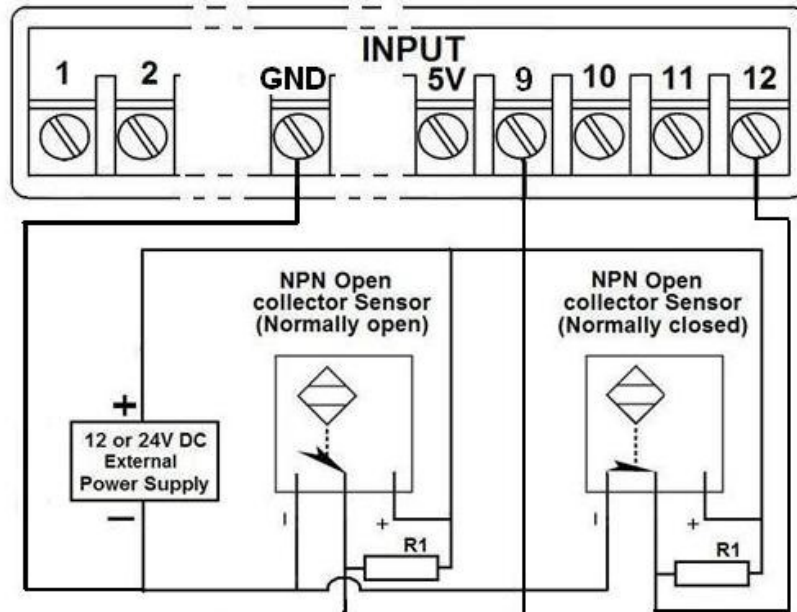


Fig. 3 Wiring diagram to connect NPN open collector proximity sensors.

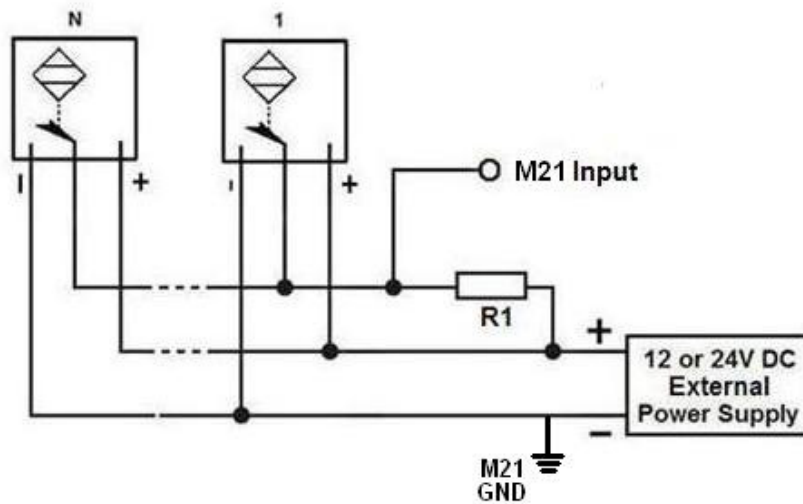


Fig. 4 Wiring diagram to connect in parallel NPN open collector proximity sensors.

Connecting NPN open collector proximity sensor with the M21	
R1 Value (12V)	R1 Value (24V)
Aprox. 10KΩ	Aprox. 25KΩ

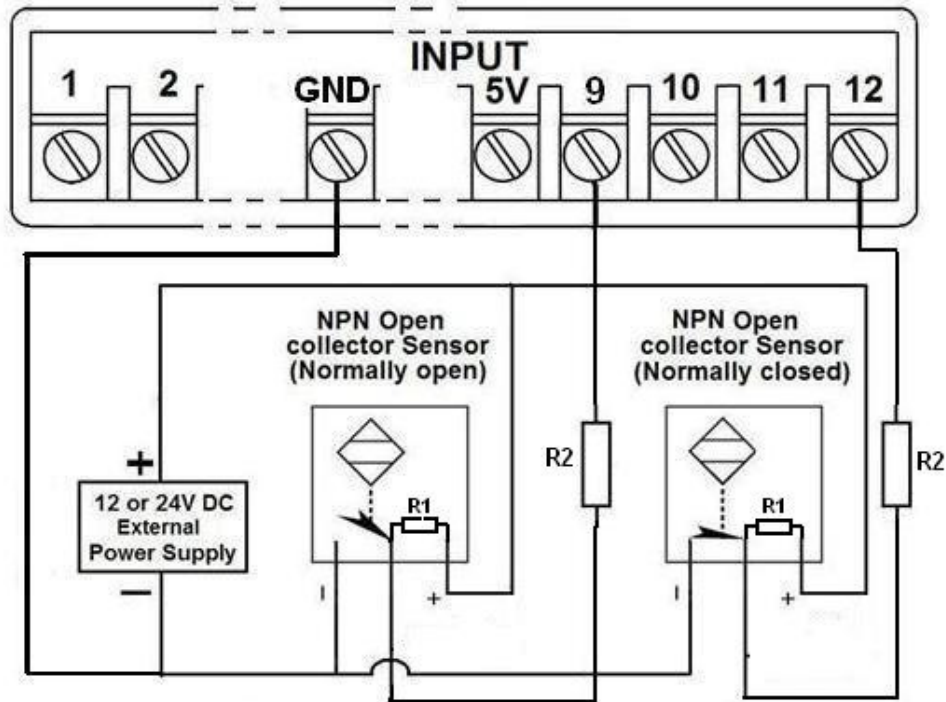


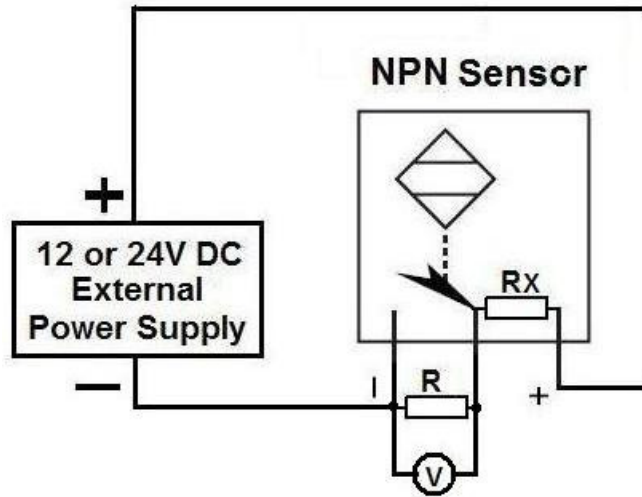
Fig. 5 Wiring diagram to connect NPN proximity sensors with internal pull up resistor.

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 M21	
(R1+R2) Value (12V)	(R1+R2) Value (24V)
Aprox. 10KΩ	Aprox. 25KΩ

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 an 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.

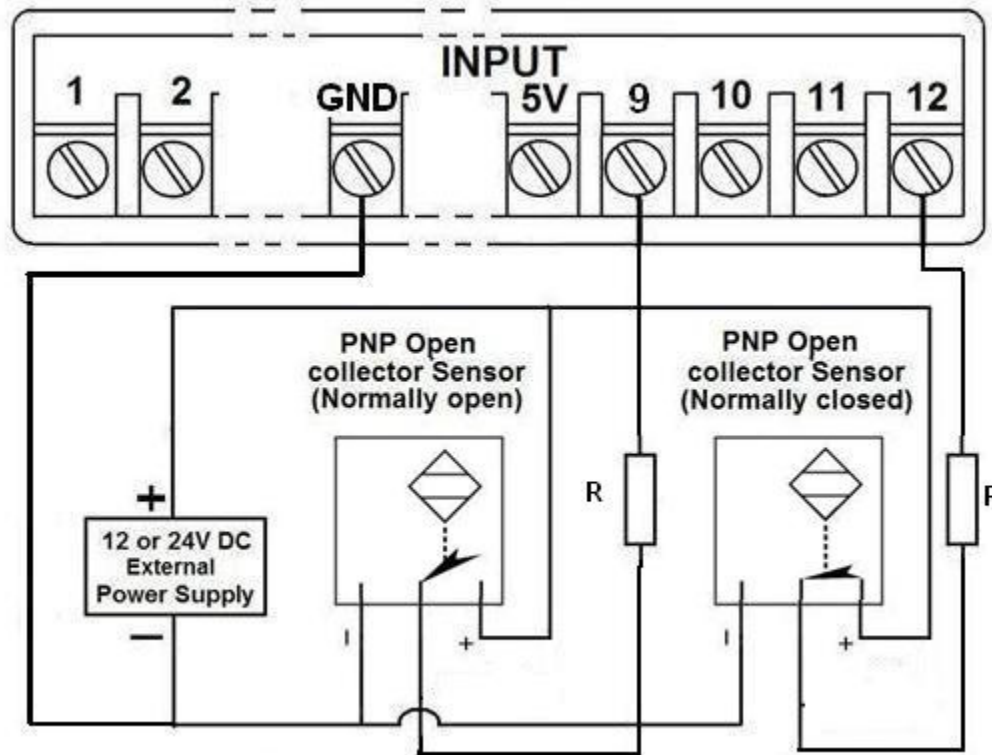


Fig. 6 Wiring diagram to connect PNP proximity sensors

Connecting PNP proximity sensor with the M21	
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.

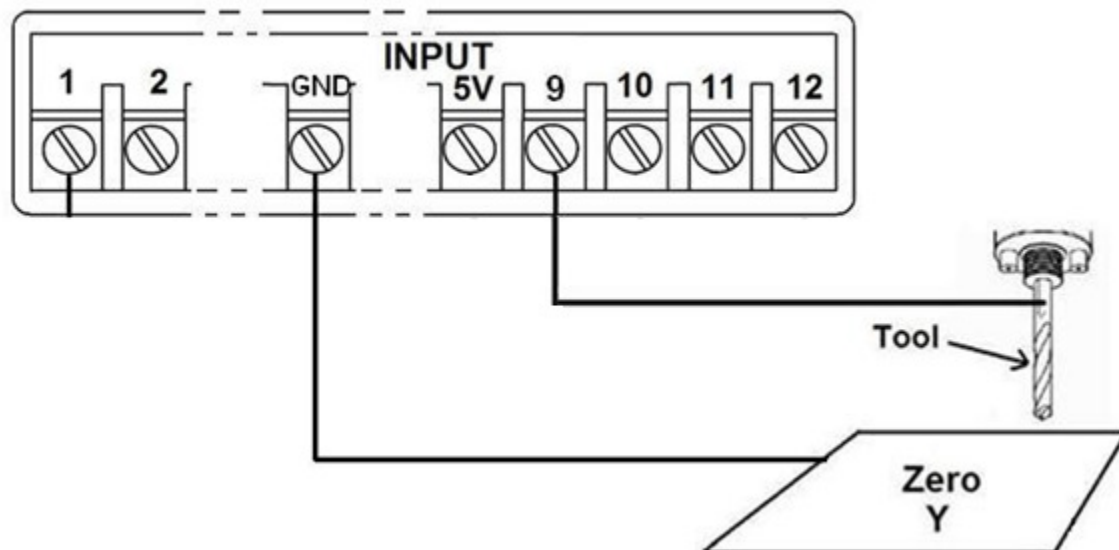


Fig. 7 Wiring diagram to do an “Auto Tool Zero”

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. Troubleshooting.

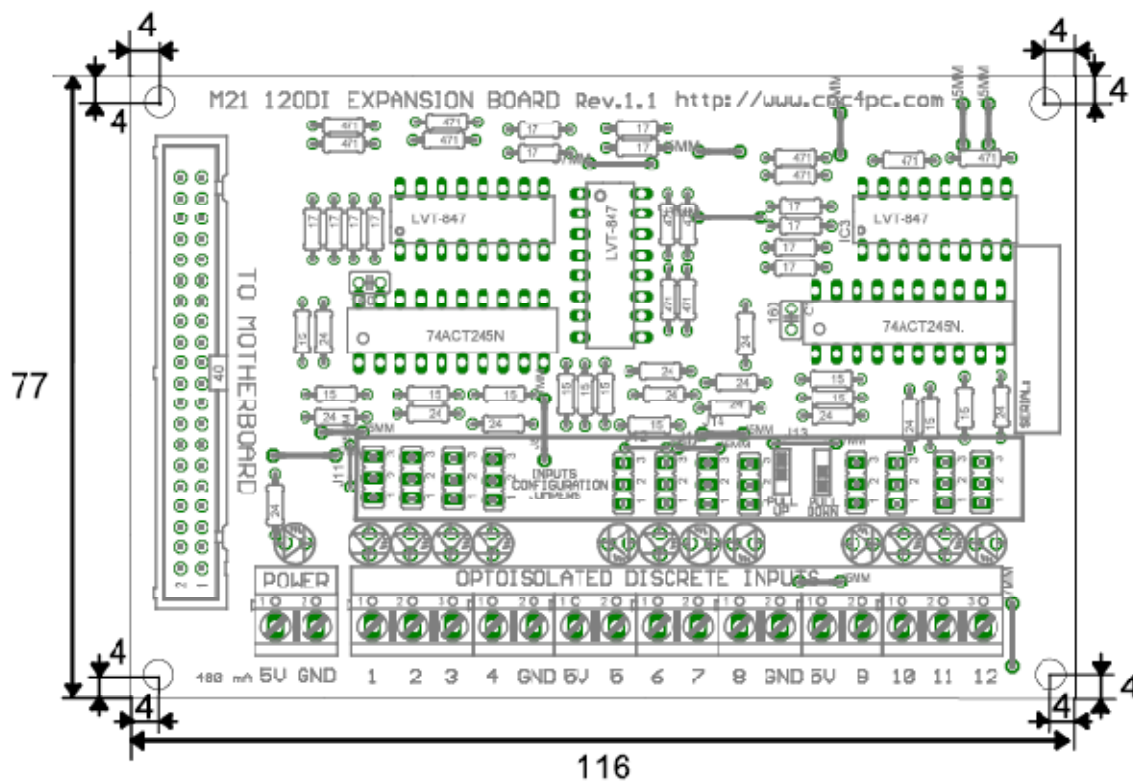
SYMPTOM 1: THE BOARD DOES NOT REACT TO THE SIGNAL.

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 M21 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.