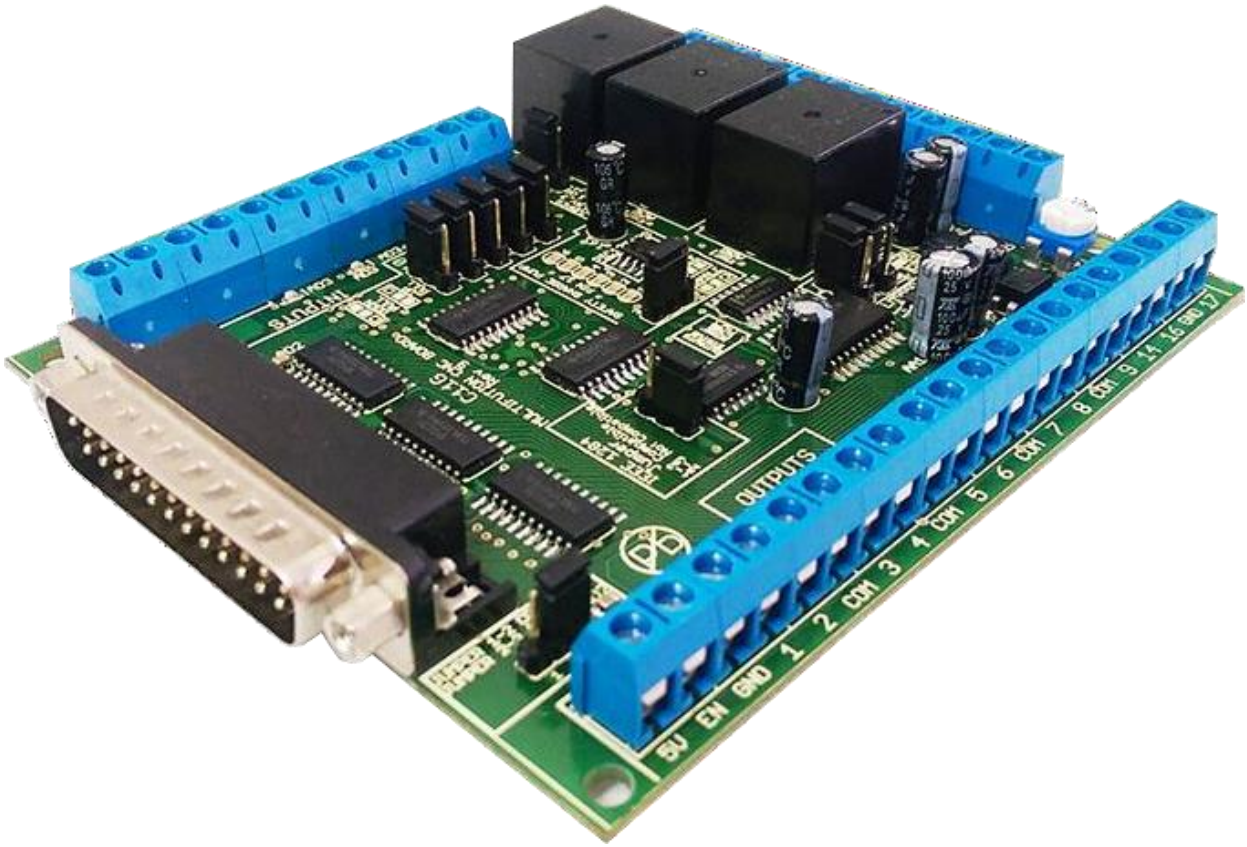
CNC4PC

Integration Solutions for CNC Projects

USER'S MANUAL VER.1

C11G- MULTIFUNTCION CNC BOARD
Rev. 9



MARCH, 2017

USER'S MANUAL

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1.0 OVERVIEW

This card has been designed to provide a flexible interface and functions to your computer projects by using the parallel port or USB-based or Ethernet-based controller. This board comes as a response to many customers that have been asking for a faster way to connect devices and reduce the possibility of wiring errors.

2.0 FEATURES

- **IEEE 1284 Standard compatible.**
- **PULL-UP or PULL-DOWN selection for inputs.**
- **Buffered inputs and outputs.**
- **Microcontroller based SCHP.**
- **Built-in Variable Speed Control.**
- **3 Electromechanical Relays with NO and NC positions.**
- **Status LEDs on all inputs and output connections.**
- **Output pins 1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 16 and 17.**
- **Input pins 10, 11, 12, 13 and 15.**
- **Input and output pins close to ground or +5vdc connections.**
- **Common terminal for pins 2-9 can be ground or +5vdc.**
- **External Enable Pin (EN).**
- **Works directly with popular CNC hardware and software.**
- **All TTL 5VDC signals.**
- **Screw-On connections for all terminals.**
- **All pins can be used in a concurrent manner.**

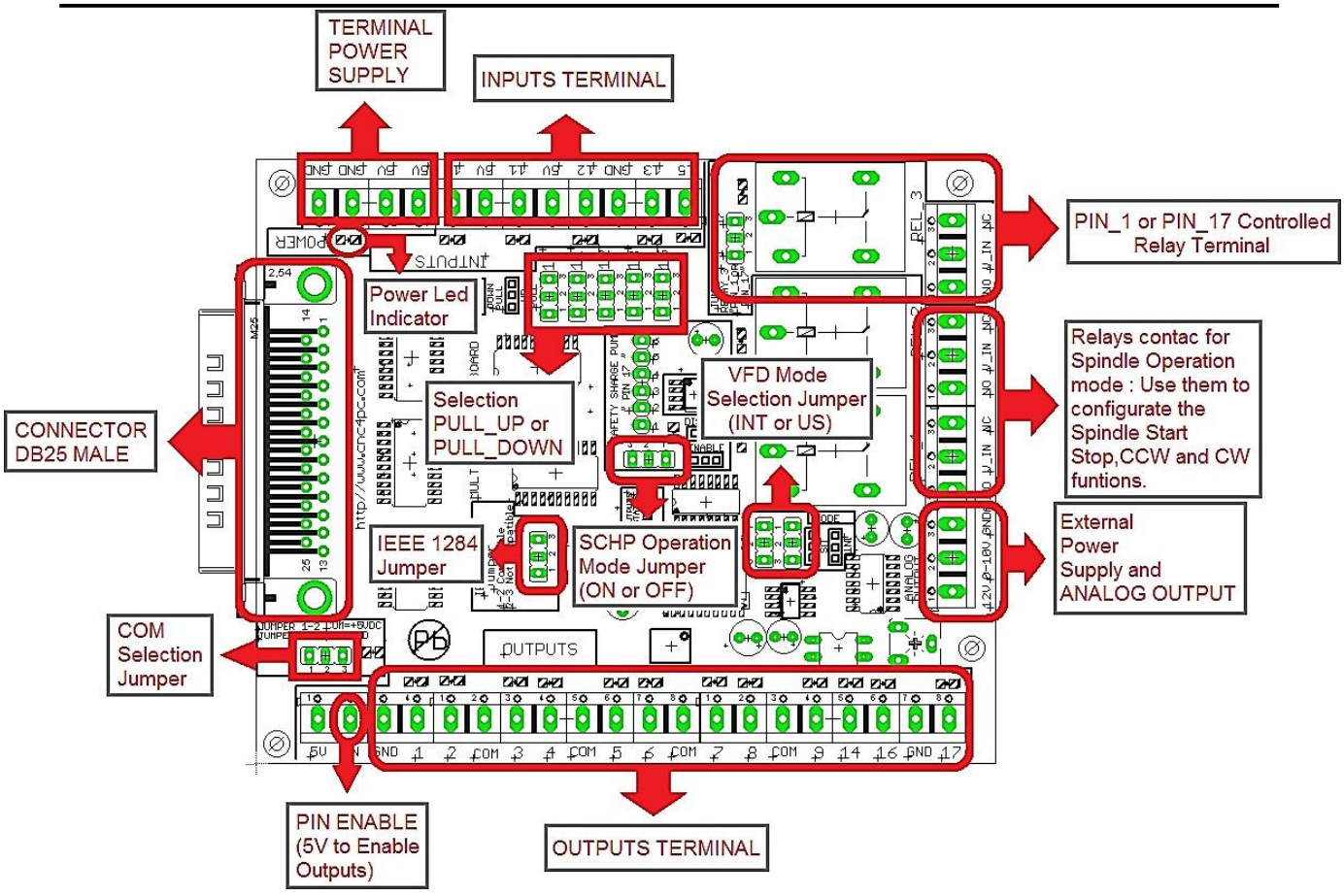
3.0 SPECIFICATIONS

DIGITAL INPUT SPECIFICATIONS	
On-state voltage range	2 to 5V DC
Maximum off-state voltaje	0.8V
Maximum operation frequency	4 MHz
Typical signal delay	10nS

DIGITAL OUTPUT SPECIFICATIONS	
Maximum output voltage	(5V power supply voltage) + 0.5V
Typical output current	24mA
Maximum off-state voltaje	0.44 V
Maximum operation frequency	4 MHz
Typical signal delay	10 nS
Time of transition to high impedance state	12 nS*

*Time passed since a low in the ENABLE input is detected and the outputs are disabled

4.0 BOARD DESCRIPTION



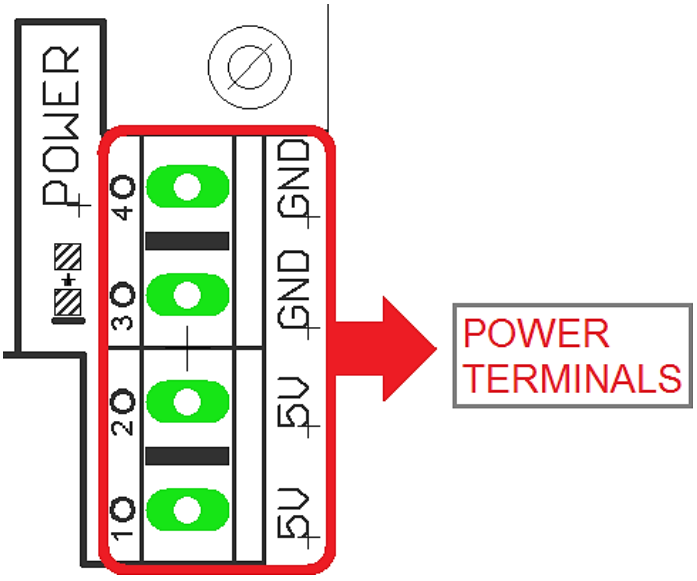
5.0 POWER TERMINALS AND CONFIGURATION JUMPERS

Regulated +5VDC@ 1A is required to power this board.

WARNING

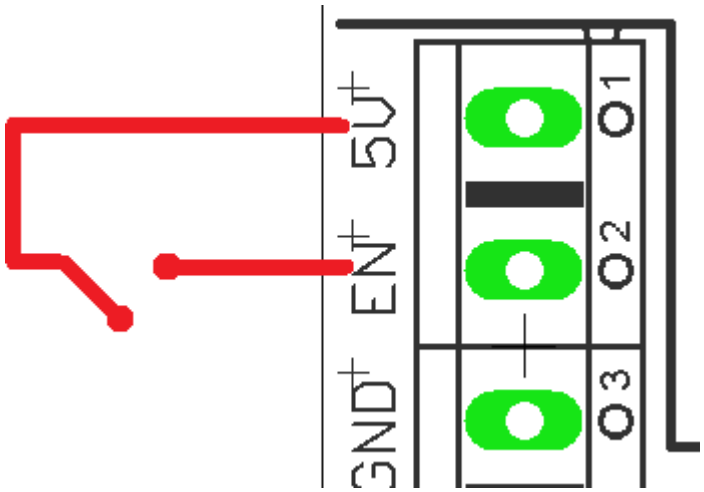
Check the polarity and voltage of the external power source and connect the 5VDC and GND. Overvoltage or reverse-polarity power applied to these terminals can cause damage to the board, and/or the power source.

5.1 Power Terminal



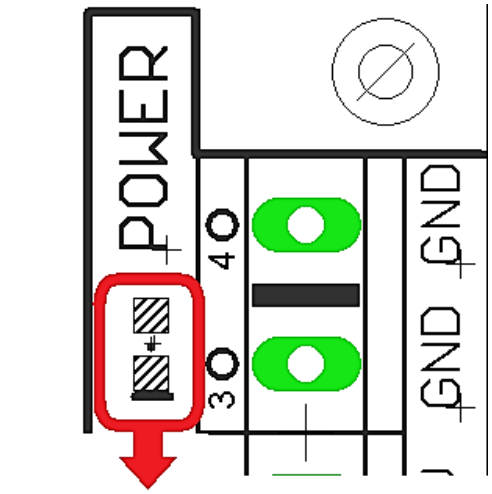
5.2 External Enable Pin.

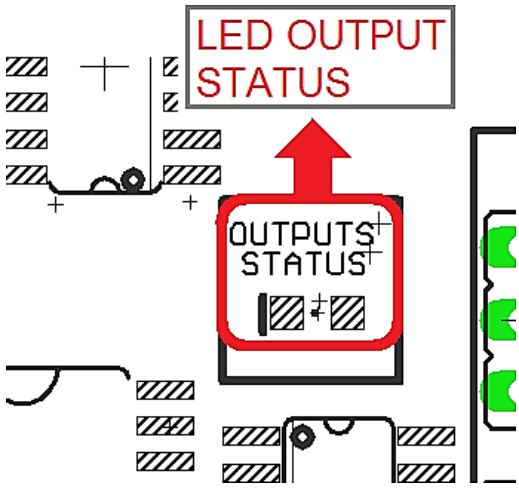
The card must be provided with a 5VDC signal to enable operation. This feature has been added to externally control the status of the outputs. An external switch or a Safety Charge Pump can be added to provide the enabling signal. When the enable signal is not present, output signals send high impedance state. If this function is not required, a jumper can be placed between +5vdc and the EN terminal. It has an internal 4.7kOhm pull-down resistor.



5.3 Led Indicator

The **power LED** lights indicate that the system is ready but disabled. When **Status LED,** (Green LED) lights, it indicates that the system is enabled.

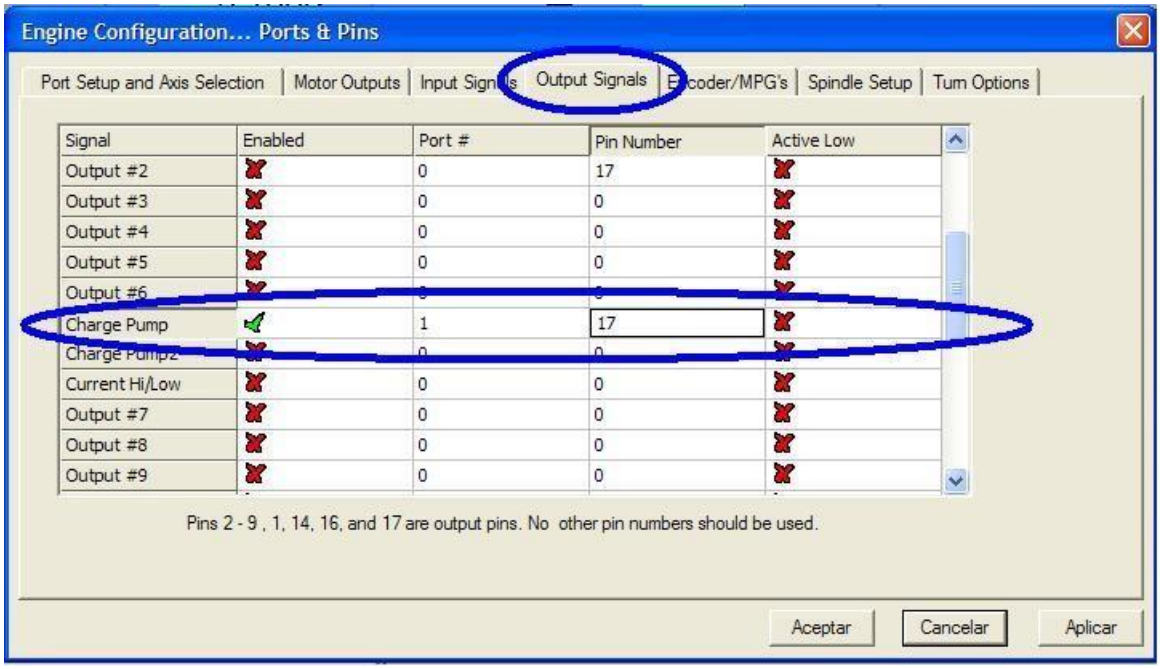




5.4 Safety Charge Pump “SCHP”. (Pin 17).

This board takes advantage of Mach ability to send a specific frequency through one of the pins of the parallel port when the program is in control of the system. CNC machinery can be very dangerous, and you could have a risk of the machine doing something different that what you intend the machine to do if the program loses control of your system. Mach can be programmed in a way, so when it is “in control”, it delivers a 12.5 KHz signal through one of the pins. This card lets you use this signal to work as an On/Off switch for your system, enabling a powerful safety system for your equipment. If you ever had windows crash on you, then this card is for you. The port can also do weird things while the system is coming up, or down.

For Configuring the *Charge Pump* in *Mach X*: Use the dialog *Config* / *Ports and pins* / *Output Signals*. Enable the *Charge Pump* output and configure it as is shown in the Fig. 8 Next, press the *apply* button.

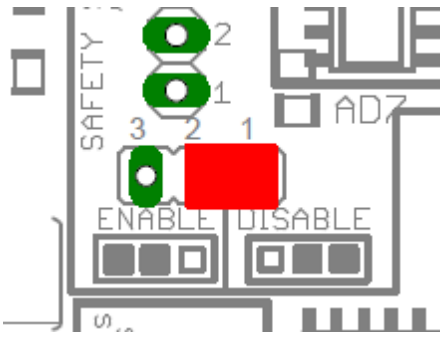


Charge Pump configuration

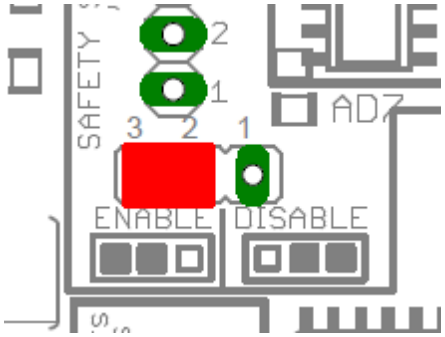
Selecting the SCHP operation mode

The Safety Charge Pump can be activated or deactivated depending on the jumper position

1-2: SCHP OFF



2-3: SCHP ON

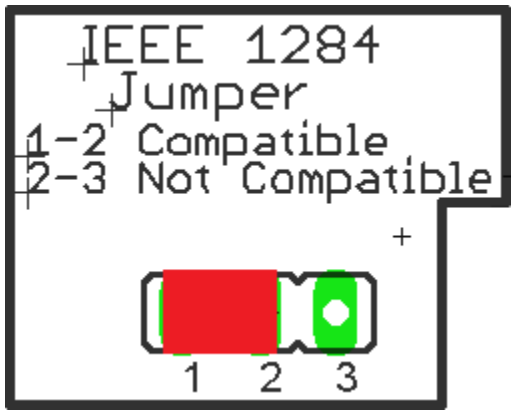


Note: When the Safety Charge Pump is activated, the EN terminal is active and a valid SCHP signal is present, pin 17 will go high. This high signal can be used to enable other external devices, such as enabling other Breakout Boards, or relays that would enable servos, VFDs, contactors etc….

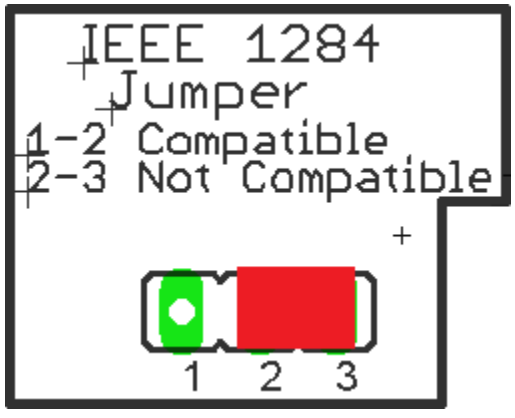
5.5 Controller selection jumpers (IEEE1284)

Some motion controllers are not IEEE1284 compatible, set the jumper to select the compatibility.

Compatible (IEEE1284)



Not Compatible (IEEE1284)



6.0 VARIABLE SPEED CONTROL

This function lets you control your spindle with PWM signal. It converts the PWM signal into an analog (0-10VDC).
This function can also be used on many DC motor controllers by replacing the potentiometer that controls the speed.

Requirements:
It requires a power supply external +12VDC@ 30mA for the analog output

WARNING: To keep the output signals optoisolated, these must not have common ground or connections to current with other circuits you are using. You will require a voltmeter to fine tune your system.

Wiring:
Before connecting anything, please be sure to read your VFD's manual and make sure you understand all the safety issues.

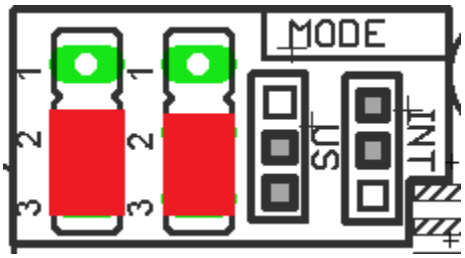
Spindle uses Pins 14 for step (PWM at 1000hz) and 16 for Dir.

6.1 Operation Mode Jumper

This jumper allows selecting the way how the relays are activated when a PWM signal and REV signal are present in the inputs terminals. See the tables below.

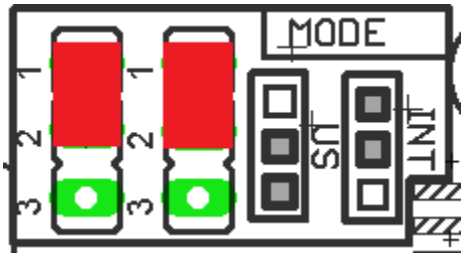
US MODE (US)			
INPUTS		**RELAYS**	
PWM (Pin 14)	***REV (Pin 16)***	***REL 1***	***REL 2***
ON	ON	OFF	ON
ON	OFF	ON	OFF
OFF	ON	OFF	OFF
OFF	OFF	OFF	OFF

MODE - US



INTERNATIONAL MODE (INT)			
INPUTS		**RELAYS**	
PWM (Pin 14)	***REV(Pin 16)***	***REL 1***	***REL 2***
ON	ON	ON	ON
ON	OFF	ON	OFF
OFF	ON	OFF	ON
OFF	OFF	OFF	OFF

MODE - INT



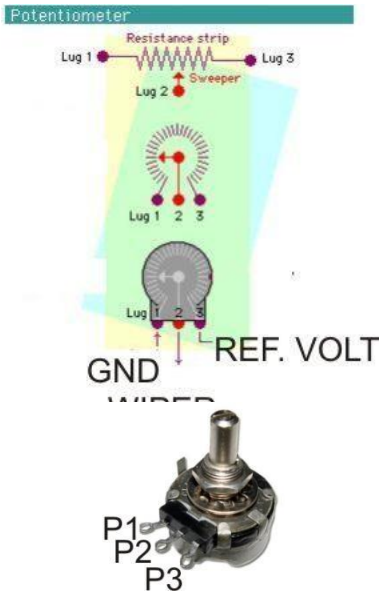
Relay 1 and 2

They can be used to control the VFD. The relay specifications are shown in this table.

ELECTROMECHANICAL RELAYS SPECIFICACTIONS	
Maximun Current (AC)	7A@240VAC; 10A@125VAC
Maximun Current (DC)	15A@524VDC; 10A@28VDC

Electromechanical Relays Specifications

Replacing a Potentiometer:



This circuit can be used to replace a potentiometer of DC moto. These speed controller circuits are very commonly used by SIEG, KB Electronics, and many other oriental machines. Before explaining how to do it, please first keep in mind that it can be done if the voltage that goes through the pot is +12vdc or less. This circuit cannot be used for AC currents.
In most cases the terminals that go to the potentiometer will carry these signals:

P1 = GND
P2 = WIPER
P3 = REFERENCE VOLTAGE

These are the steps for replacing a potentiometer:

1. Measure the voltage difference between P1 and P3. Make sure it measures under +12vdc.

2. Fine tune the analog output to the output voltage you got from step 1.

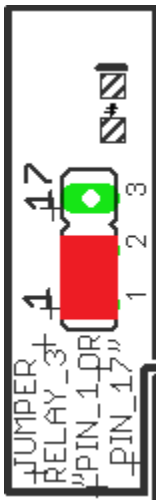
3. Connect the ground from the analog output to the ground of the potentiometer (P1).

4. Connect the analog output to the wiper connection of the potentiometer (P2).

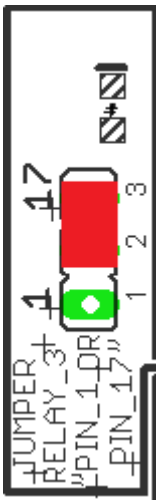
6.2 Electromechanical relays. (Pin_1 or Pin_17)

This RELAY is activated with the PIN_1 or PIN_17, set jumper as sample in the image.

PIN_1



PIN_17



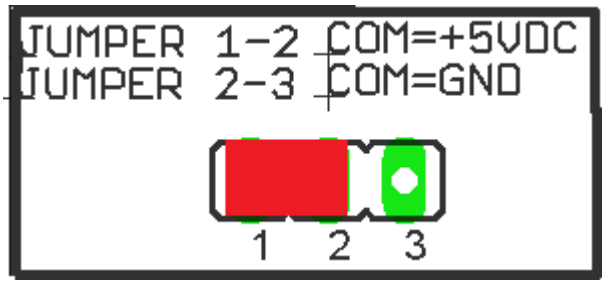
Mechanical relays are very flexible because they can be used for AC or DC and come with NO and NC (Normally Open and Normally Closed) positions. The relay specifications are shown in the below table.

ELECTROMECHANICAL RELAYS SPECIFICACTIONS	
Maximun Current (AC)	7A@240VAC; 10A@125VAC
Maximun Current (DC)	15A@524VDC; 10A@28VDC

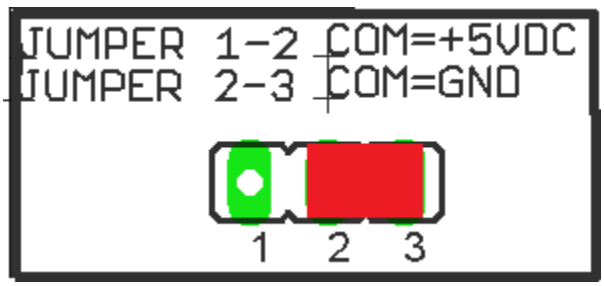
6.3 Using the COM configuration jumper.

This is for selecting the value to get at the COM terminals found next to step and direction terminals (Pin 2-9). Some drivers expect a ground, and others expect +5vdc. There is a jumper that allows you to select +5VDC or GND for the COM pins.

1-2: COM= 5V

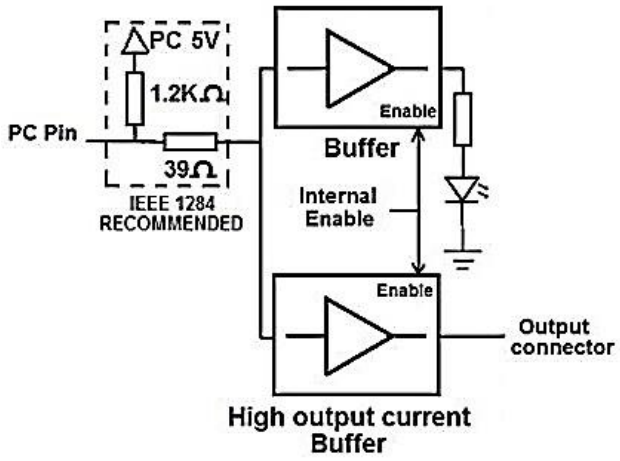


2-3: COM= GND



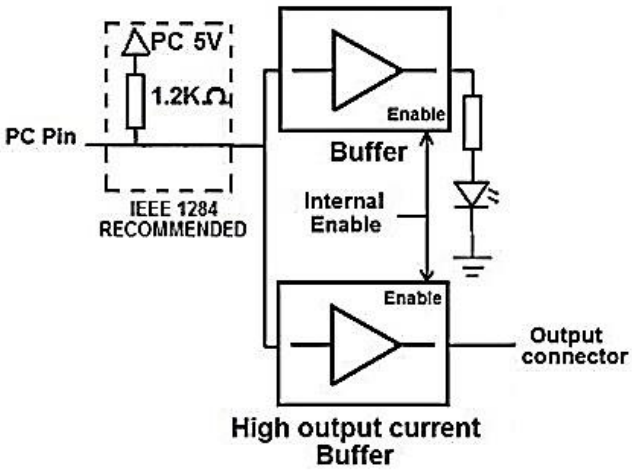
7.0 FUNCTIONAL BLOCK DIAGRAMS

7.1 Outputs 2-9 simplified functional block diagram



Parallel Port circuit uses IEEE 1284 standard recommendation. The LEDs for the pins are driven by a separate buffer.

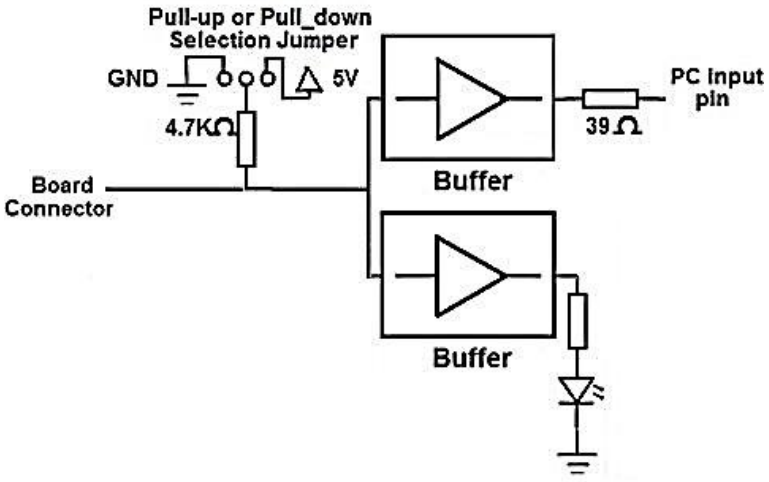
7.2 Outputs 1, 14, 16 and 17 simplified functional block diagram



Note*: "Internal Enable"* **=** *"External Enable Pin"* **AND (***"SCHP"* **OR** *"Bypassed SCHP"***)**
The "Internal Enable" is the result of an AND Operation between the "External Enable Pin" and the SCHP operation mode selected by the user.

Note: All Outputs will be deactivated if the board is not connected to the PC parallel port.

7.3 Input simplified functional block diagram

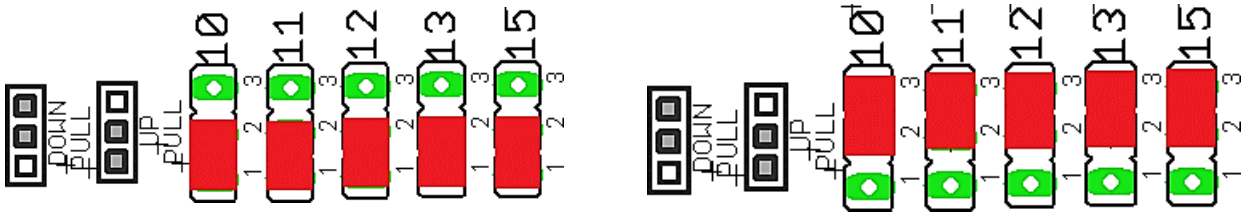


Simplified functional block diagram for the inputs

7.4 Selection Jumper PULL-UP or PULL-DOWN

Pins 10,11,12,13 and 15 can be set to pull-up or pull-down by selecting the jumper in the appropriate position.
The input pins can be set to be pulled up or down with a 4.7Kohm resistor.

1-2: PULL-UP **2-3: PULL- DOWN**



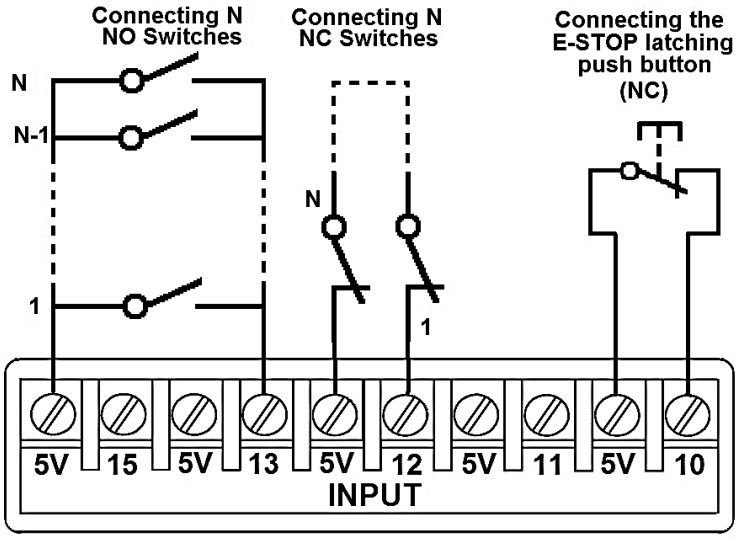
Pull up/down resistors determine the normal status of a pin when left in the air (not wired or circuit open). If active high it sends a high to the controller and it requires a low or ground or 0vdc to make it change states. If active low, then it sends a low to the controller and it requires +5vdc from the board to make it change state.

8.0 WIRING DIAGRAMS

While this board supports only TTL +5VDC signals, different kind of sensors, switches using different voltages can be connected using the diagrams that follow:
Note: The below wiring diagrams are examples, any input can be used for the connections.

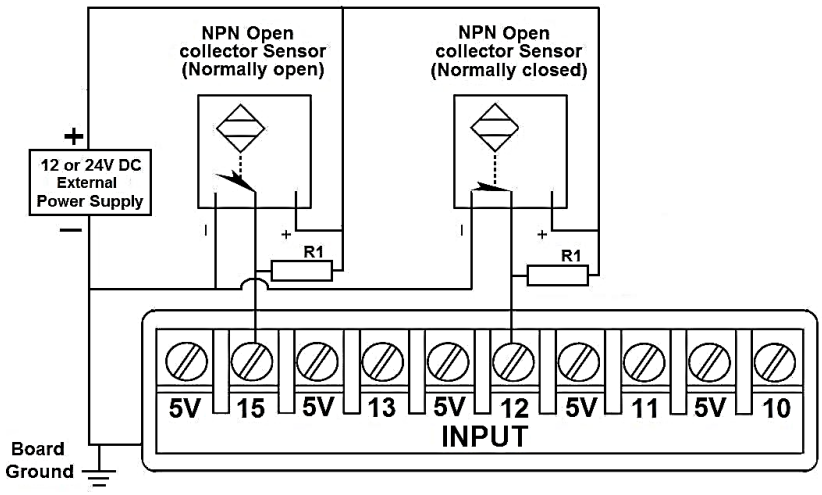
Note. The bellow wiring diagrams require setting the inputs to use pull-down resistor.

8.1 Connecting Switches or push button.

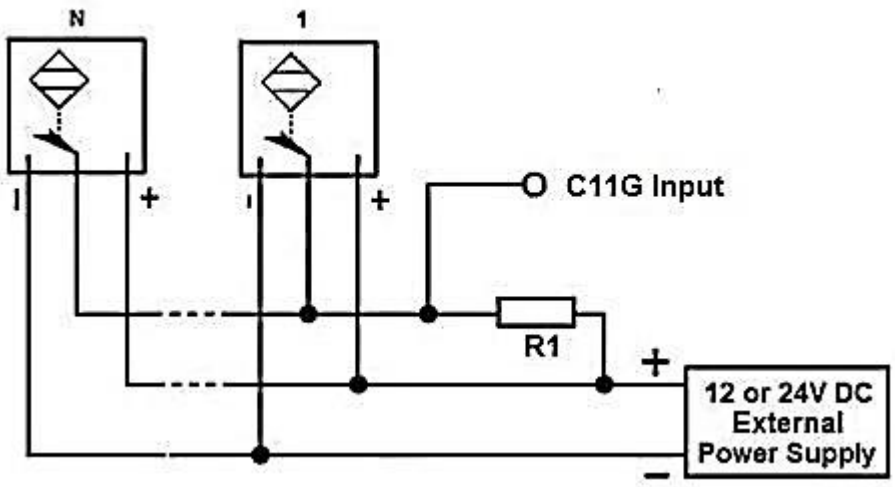


Wiring diagram to connect switches

8.2 Connecting NPN sensors.

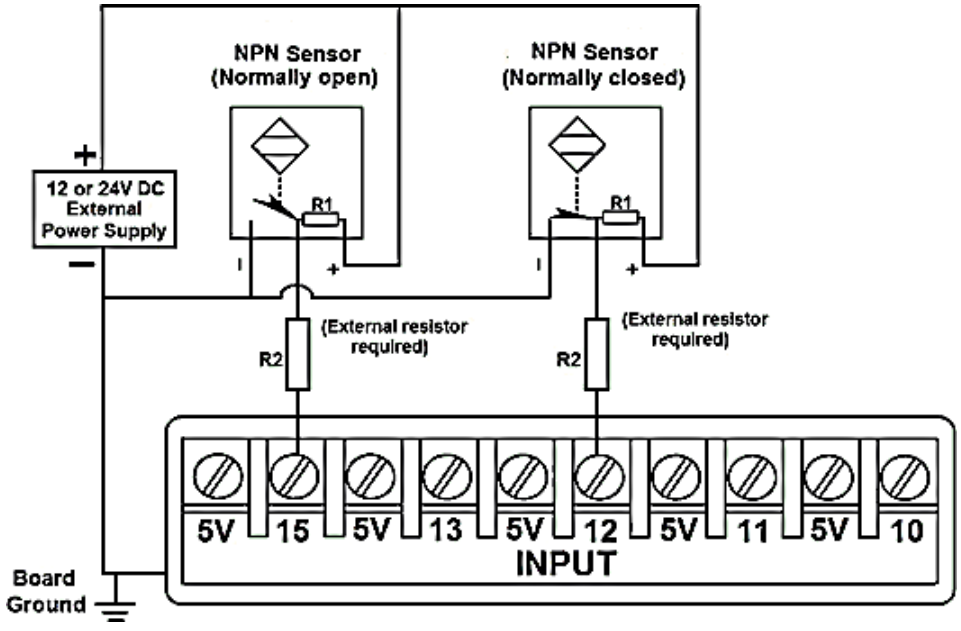


Wiring diagram to connect NPN open collector proximity sensors



Wiring diagram to connect in parallel NPN open collector proximity sensors

Connecting NPN open collector proximity sensor with the C11GS	
R1 Value (12V)	**R1 Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ



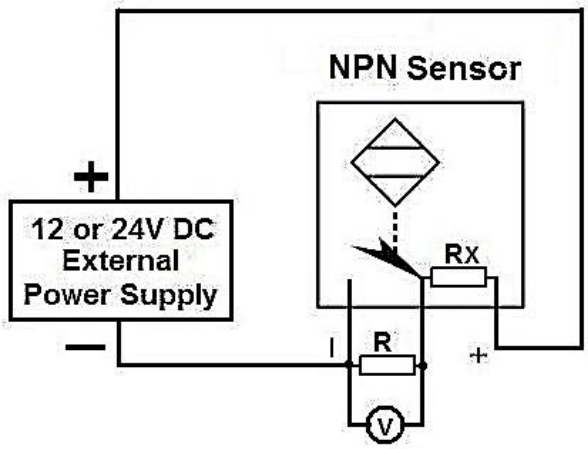
Wiring diagram to connect NPN proximity sensors with internal pull up resistor

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

Connecting NPN open collector proximity sensor with the C11GS	
(R1+R2) Value (12V)	**(R1+R2) Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ

Calculating the R1 value

Note: Rx is the unknown resistor value.



$$R_X = V_{EX}. (R/V) - R \quad (1)$$

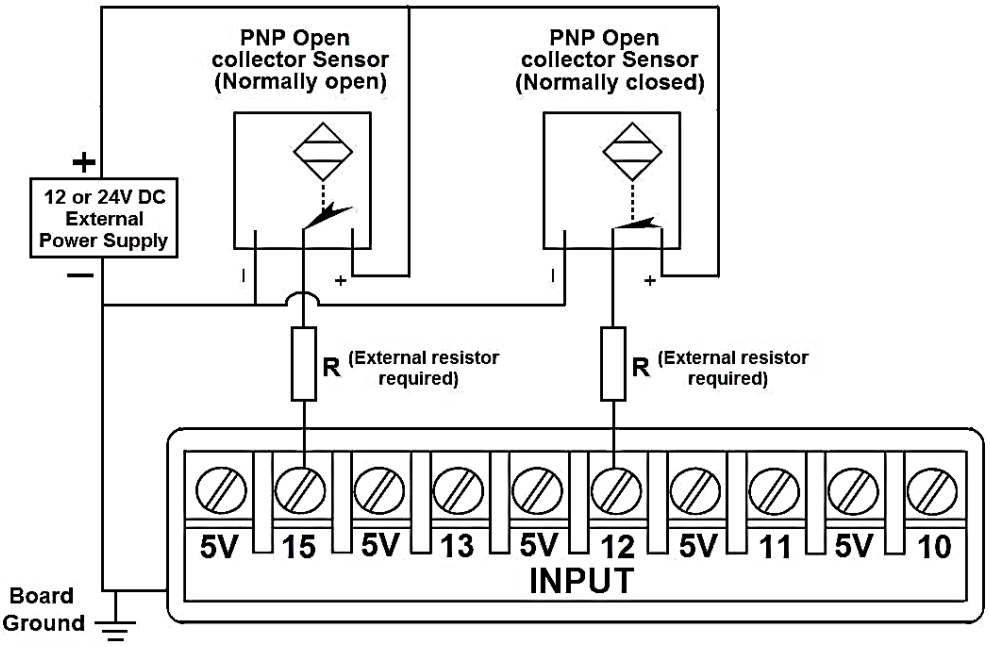
Where:

V_{EX} is the external power supply voltage

V is the voltage across the R resistor

An external resistor and a voltmeter are required to calculate the internal resistor (Rx) value.
Note. The user should know the R value to do this operation. A 4.7KOhm @ 1/2W is recommended.
SAMPLE: if you are using a 12V power supply (V_{EX}), and using a 4.7KOhm as external resistor (R), then the voltage across R should be 6V, using the equation 1, the Rx value is 4.7KOhm.

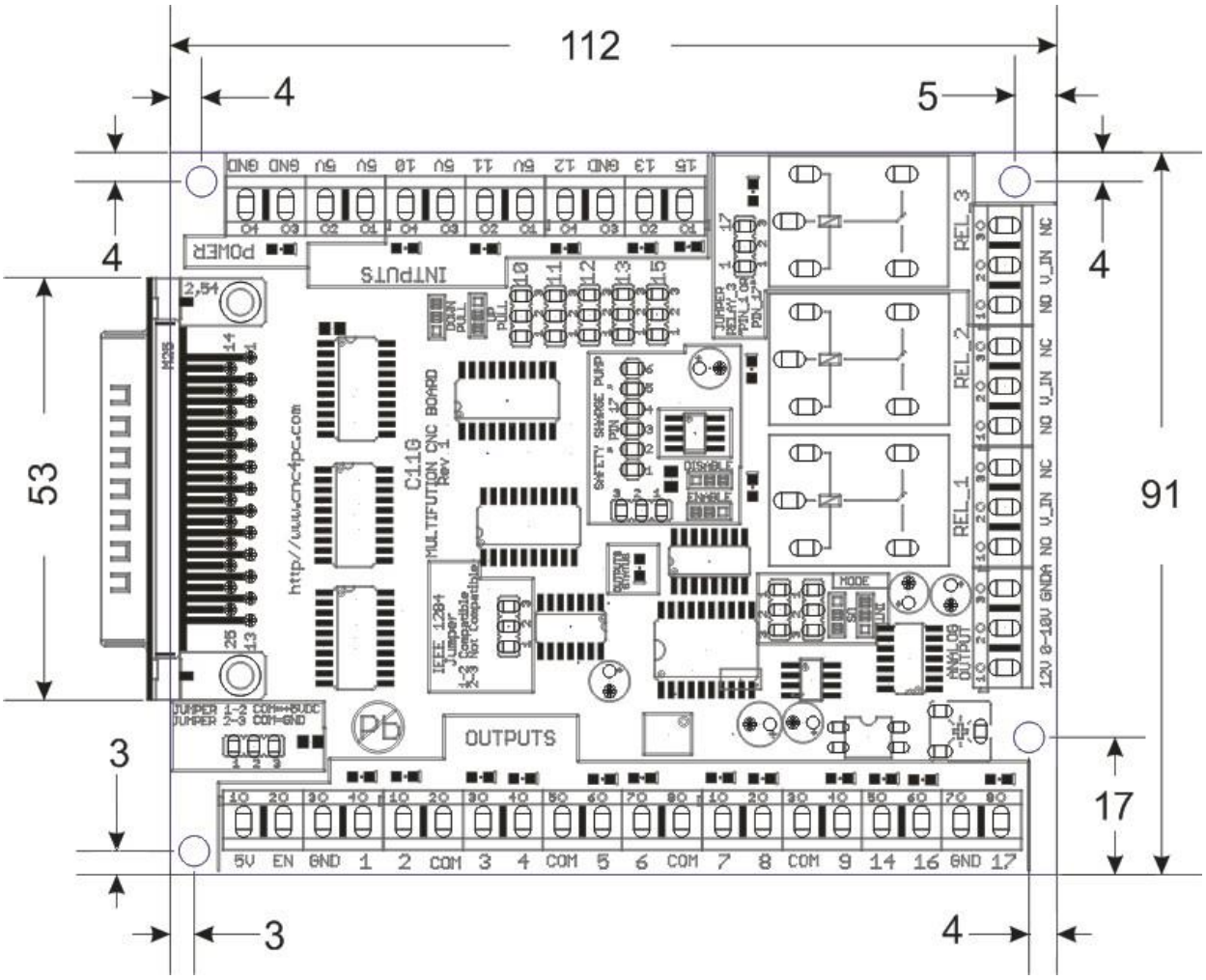
8.3 Connecting PNP sensors.



Wiring diagram to connect PNP proximity sensors

Connecting PNP proximity sensor with the C11GS	
R Value (12V)	**R Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ

9.0 DIMENSIONS



All dimensions are in Millimeters
Fixing holes (3.8mm).

DISCLAIMER:

Use caution. CNC machines can be dangerous machines. Neither DUNCAN USA, LLC nor Arturo Duncan are liable for any accidents resulting from the improper use of these devices. This board is not a fail-safe device and it should not be used in life support systems or in other devices where their failure or possible erratic operation could cause property damage, bodily injury or loss of life.