CNC4PC

Integration Solutions for CNC Projects

C35S- QUICK SETUP BREAKOUT BOARD Rev. 1.3
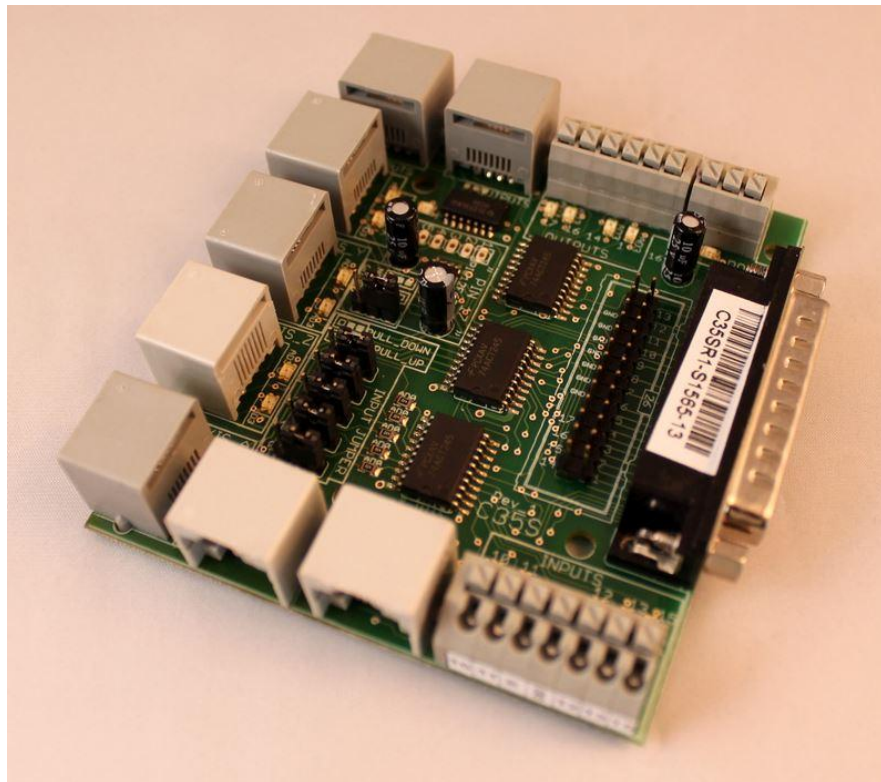
FEBRUARY, 2015

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1.0 OVERVIEW

This card provides an easy way of interfacing your inputs and outputs from the parallel port. It provides terminals and RJ45 for connections. It conditions the signals for use in CNC applications.

2.0 FEATURES

- IEEE 1284 Standard compatible.

- Easy connections with CNC4PC relay boards and speed control boards.

- Microcontroller based SCHP.

- Works directly with popular CNC hardware and software.

- Easy way to connect up to 4 stepper motor drivers by using Networks cables. (Pins 2-9).

- All TTL 5VDC signals.

- Buffered inputs and outputs.

- Screw-On connections for input signal terminals.

- Output pins 1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 16, 17.

- Input pins 10, 11, 12, 13, 15.

- Input and output pins with close by ground or +5vdc connections

- External Enable Pin (EN).

3.0   SPECIFICATIONS

DIGITAL INPUT SPECIFICATIONS	
On-state voltage range	2 to 5V DC
Maximum off-state voltage	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 voltage	0.44 V
Maximum operation frequency	4 MHz
Typical signal delay	10 nS
Time of transition to high impedance state	120 mS*

*Time passed since a low in the ENABLE input is detected and the outputs are disabled.
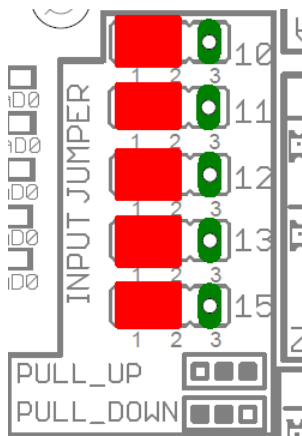
4.0 BOARD DESCRIPTION
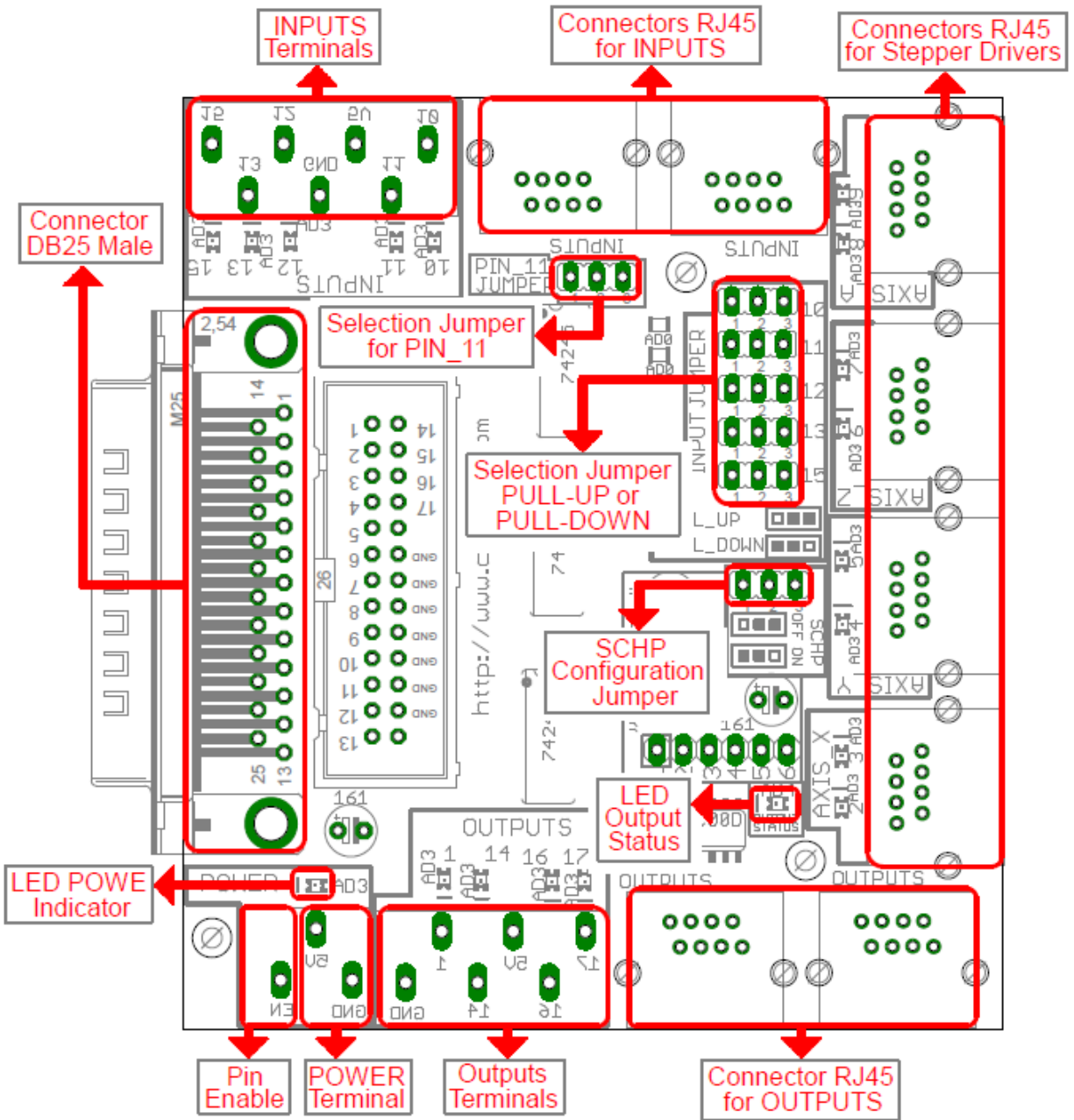
5.0   SELECTION JUMPER
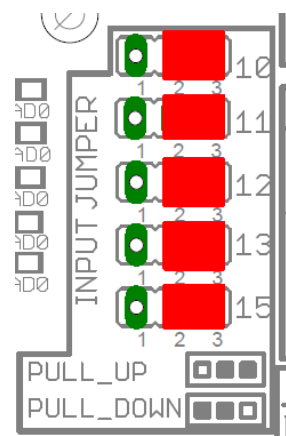
5.1   Input (PULL-UP or PULL-DOWN)

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.
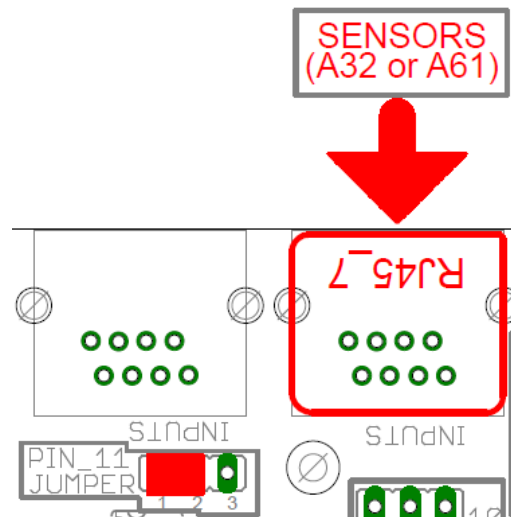
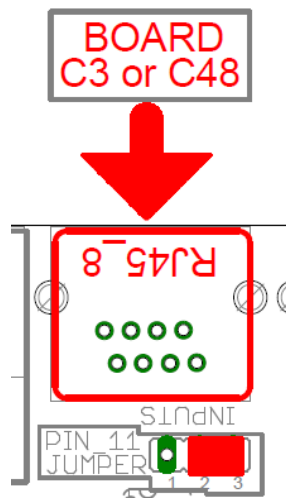**1-2: PULL-DOWN**

2-3: PULL-UP

5.2   Pin_11

If you connect sensors (A32 or A62), set jumper as sample in the image

If you connect board (C3 or C48), set jumper as sample in the image

6.0   ESPECIAL FUNCTIONS

6.1   Safety Charge Pump "SCP". (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 be 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 configures it as is shown in the Fig. 8   Next, press the *apply* button.
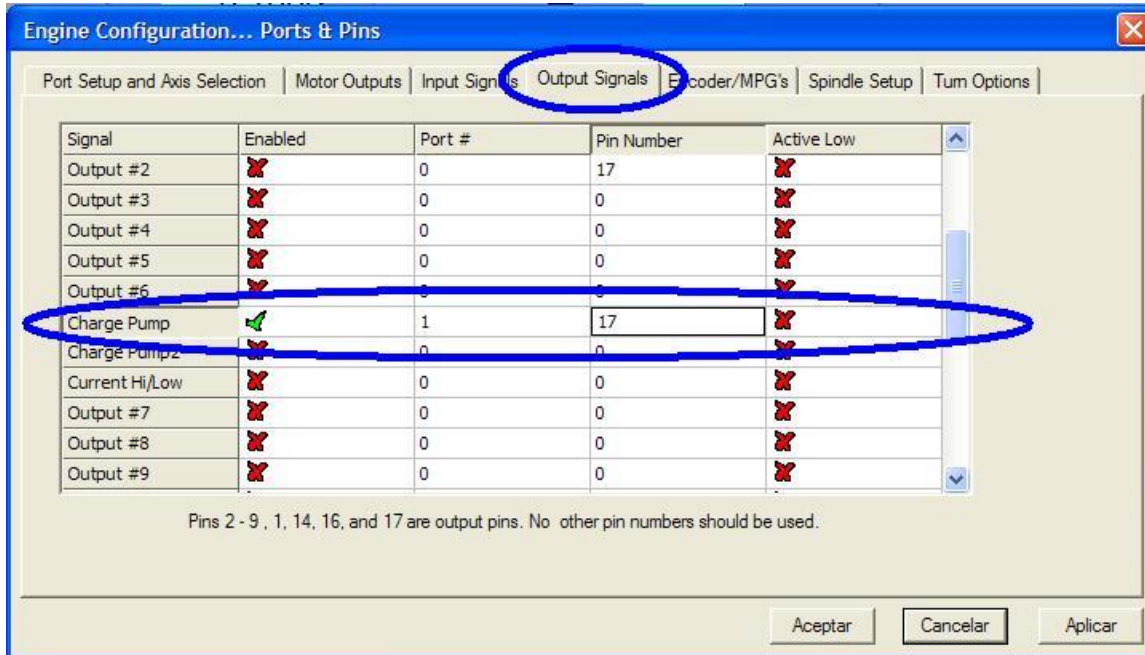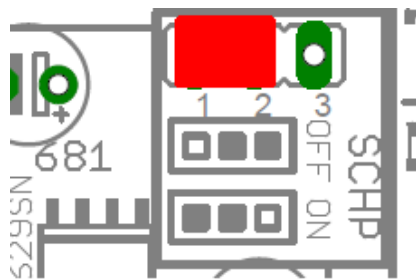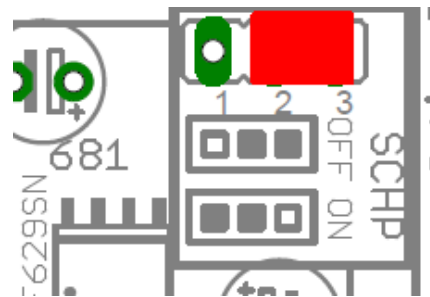
Fig. 1. Charge Pump configuration

Selecting the SCHP operation mode

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

1-2: ON   **2-3: OFF**

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.…

6.2   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. When the enable signal is not present, output signals sent high impedance state. If this function is not required, an jumper can be placed between +5vdc and the EN terminal. It has an internal 4.7kOhm pull-down resistor.
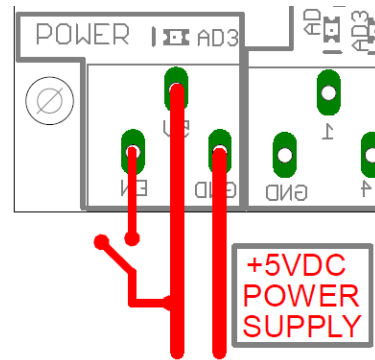
Wiring*:*
The Parallel Port Interface Card has a very basic design that provides the flexibility you look for on CNC projects.

⚠️**WARNING:** This card must have the power supplied while it is connected to the PC. If power is removed to the card while it is connected to the PC, noise can be introduced to the output lines. This can create a dangerous situation as relays or other devices that might be connected to this card could get activated.

7.0   REQUIREMENTS

It requires a 5VDC @ 500 milliamps power supply to operate. This power can be taken from the computer's power supply or USB port. Consider using the A3 – USB Power Cable found under Accessories in the website.

⚠️ **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. Follow the steps bellow.

8.0 FUNCTIONAL BLOCK DIAGRAMS

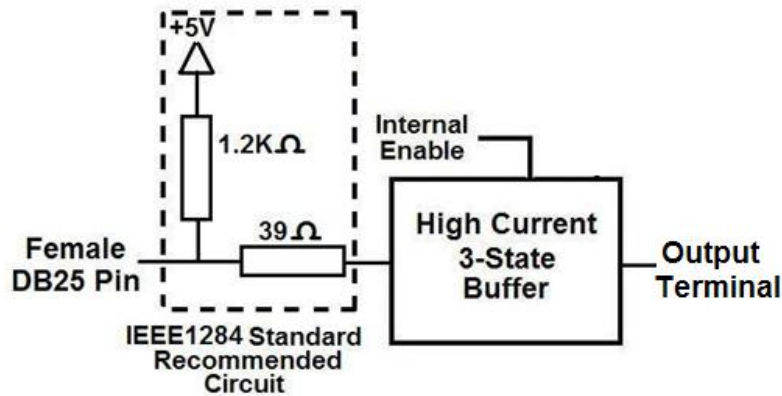### 8.1 Pins 2-9 simplified block diagram

Fig. 2 Simplified functional block diagram for pins 2-9.
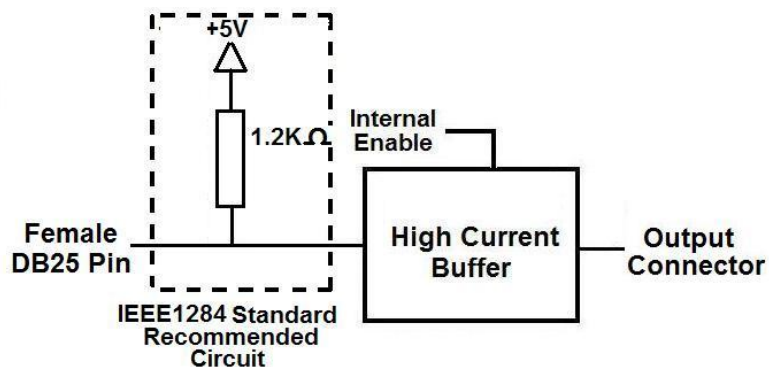
7.2 Pins 1, 14, 16 and 17 simplified block diagram

Fig. 3 Simplified functional block diagram for outputs 1, 14, 17 and 16, .

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: The outputs will be deactivated if the board is not connected to the PC parallel port.
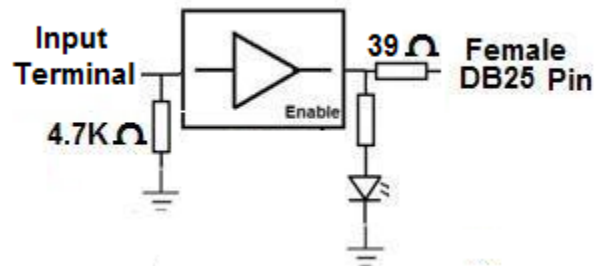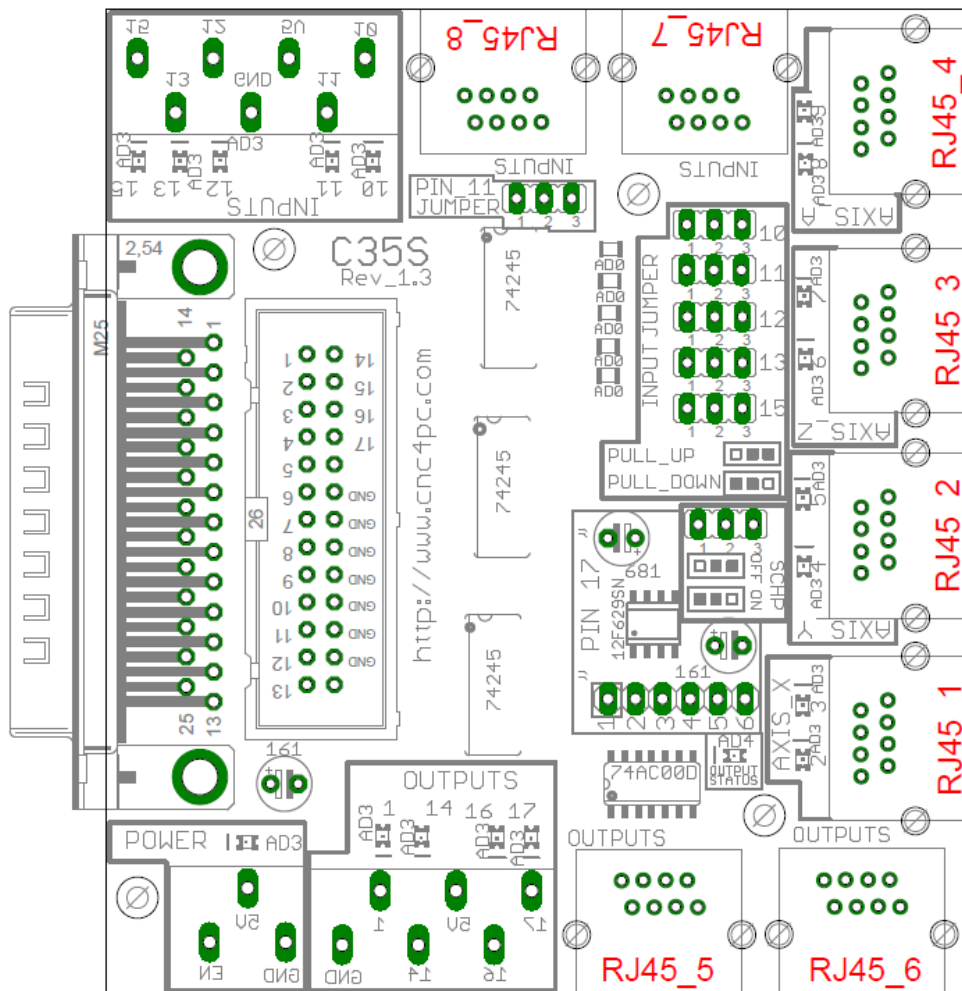
8.2 Inputs simplified block diagram

Fig. 4 Simplified functional block diagram for inputs.

9.0 PINOUT

PINS USED ON EACH RJ45 CONNECTOR.

	RJ45_1 Function	RJ45_2 Function	RJ45_3 Function	RJ45_4 Function	RJ45_5 Function	RJ45_6 Function	RJ45_7 Function	RJ45_8 Function
RJ45 PIN 1	Not Used	Not Used	Not Used	Not Used	GND	GND	GND	GND
RJ45 PIN 2	P.P. Pin 2	P.P. Pin 4	P.P. Pin 6	P.P. Pin 8	P.P. Pin 17	Not Used	P.P. Pin 13	Not Used
RJ45 PIN 3	Not Used	Not Used	Not Used	Not Used	P.P. Pin 16	Not Used	P.P. Pin 12	P.P. Pin 10
RJ45 PIN 4	GND	GND	GND	GND	P.P. Pin 1	P.P. Pin 16	P.P. Pin 11	P.P. Pin 11
RJ45 PIN 5	EN (5V)	EN (5V)	EN (5V)	EN (5V)	P.P. Pin 14	P.P. Pin 17	Not Used	P.P. Pin 15
RJ45 PIN 6	P.P. Pin 3	P.P. Pin 5	P.P. Pin 7	P.P. Pin 9	Not Used	Not Used	Not Used	ENABLE
RJ45 PIN 7	Not Used	Not Used	Not Used	Not Used	5V	5V	5V	5V
RJ45 PIN 8	5V	5V	5V	5V	Not Used	Not Used	Not Used	Not Used

10.0 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 an example, any input can be used for the connections.

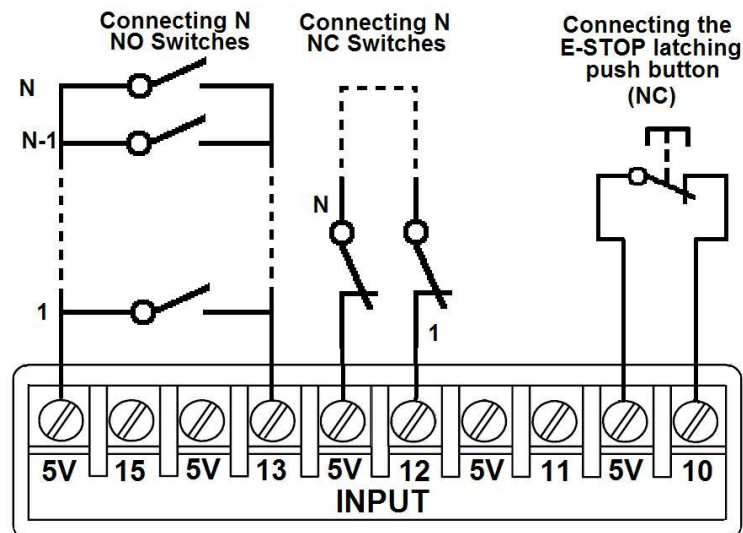### 10.1 Connecting Switches or push button.

Fig. 6 Wiring diagram to connect switches.
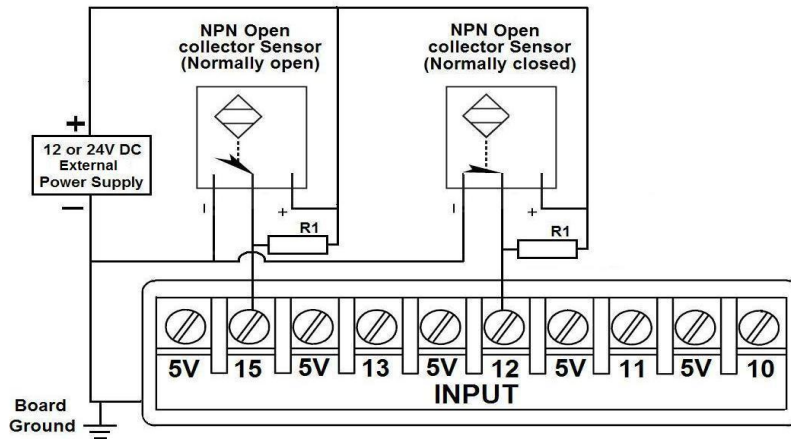
10.2 Connecting NPN sensors.

Fig. 7 Wiring diagram to connect NPN open collector proximity sensors.
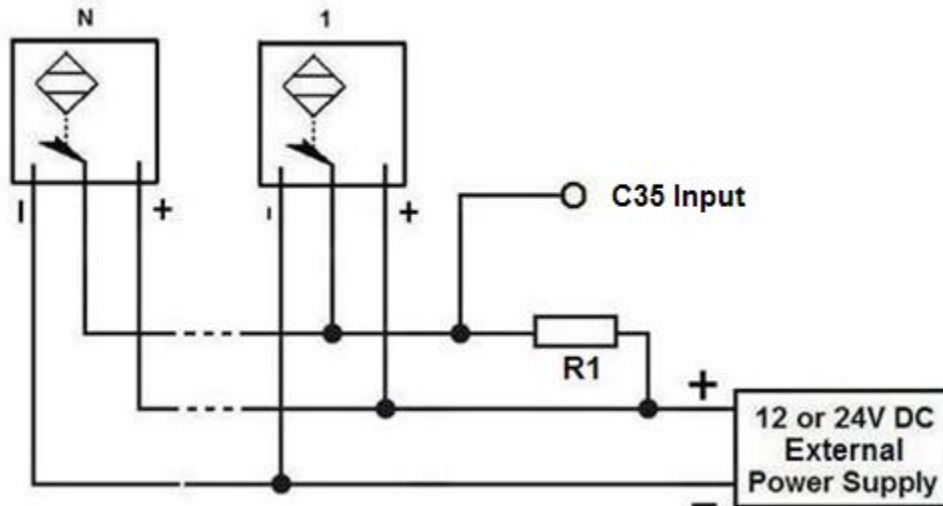

Fig. 8 Wiring diagram to connect in parallel NPN open collector proximity sensors.

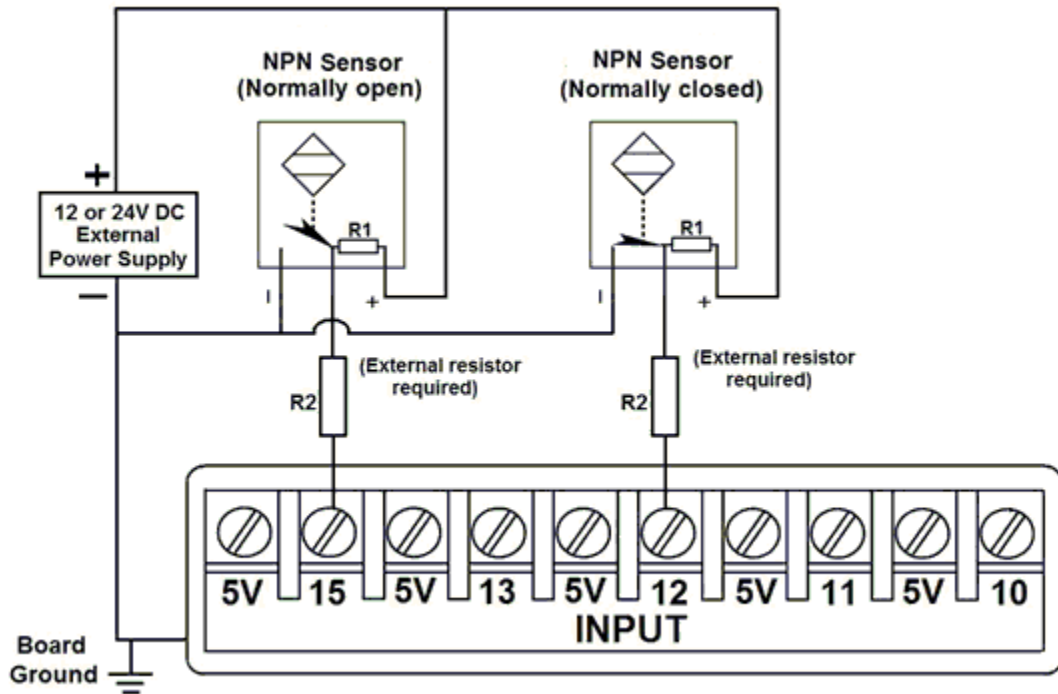| Connecting NPN open collector proximity sensor with the C35	
R1 Value (12V)	**R1 Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ

Fig. 9 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 C35	
(R1+R2) Value (12V)	**(R1+R2) Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ

Calculating the R1 value.

Note: Rx is the unknown resistor value.
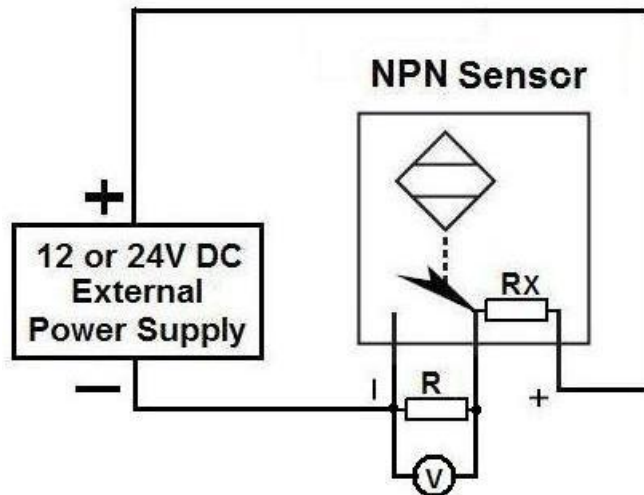
$$R_X = V_{EX}.(R/V) - R \quad (1)$$

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.
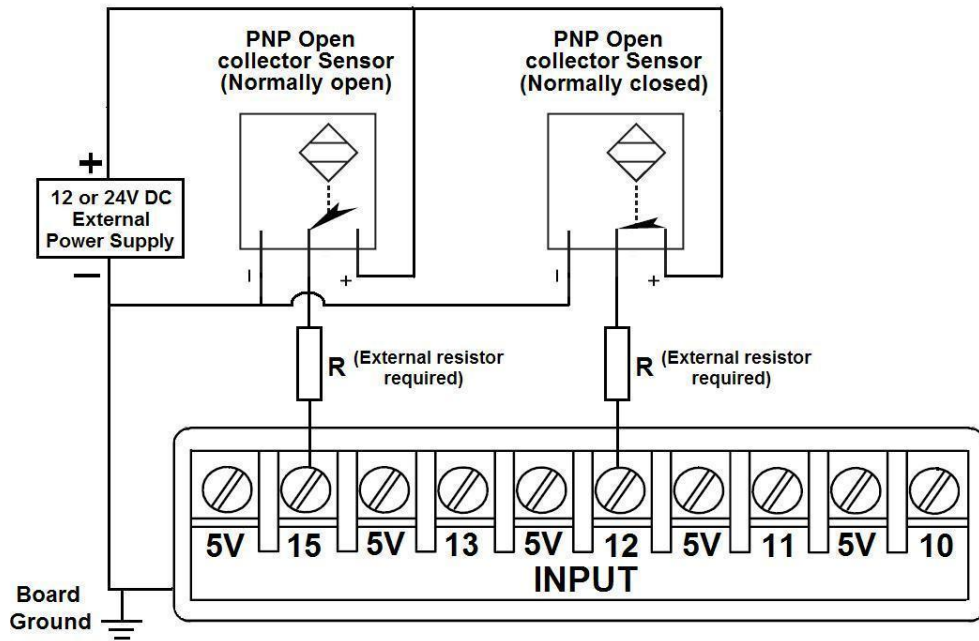
10.3 Connecting PNP sensors.

Fig. 10 Wiring diagram to connect PNP proximity sensors

Connecting PNP proximity sensor with the C35	
R Value (12V)	**R Value (24V)**
Aprox. 10KΩ	Aprox. 25KΩ

10.4 Other connection.

Other connections can be implemented by setting the inputs to pull-up resistor.
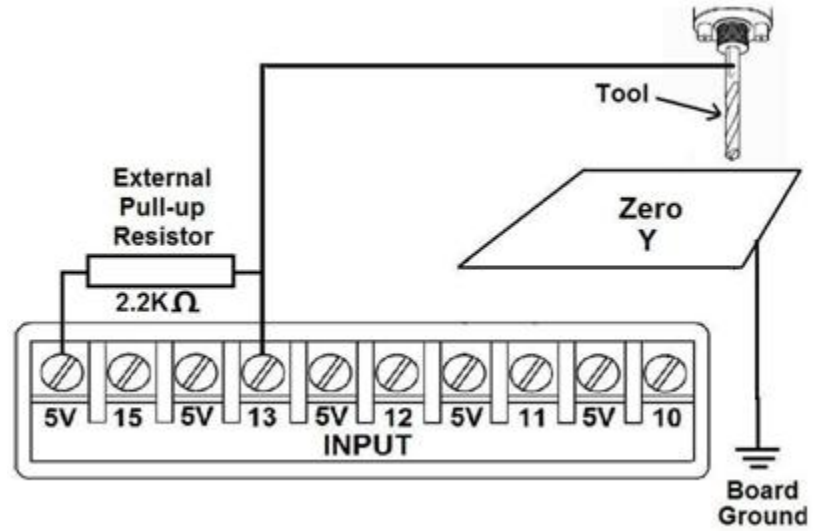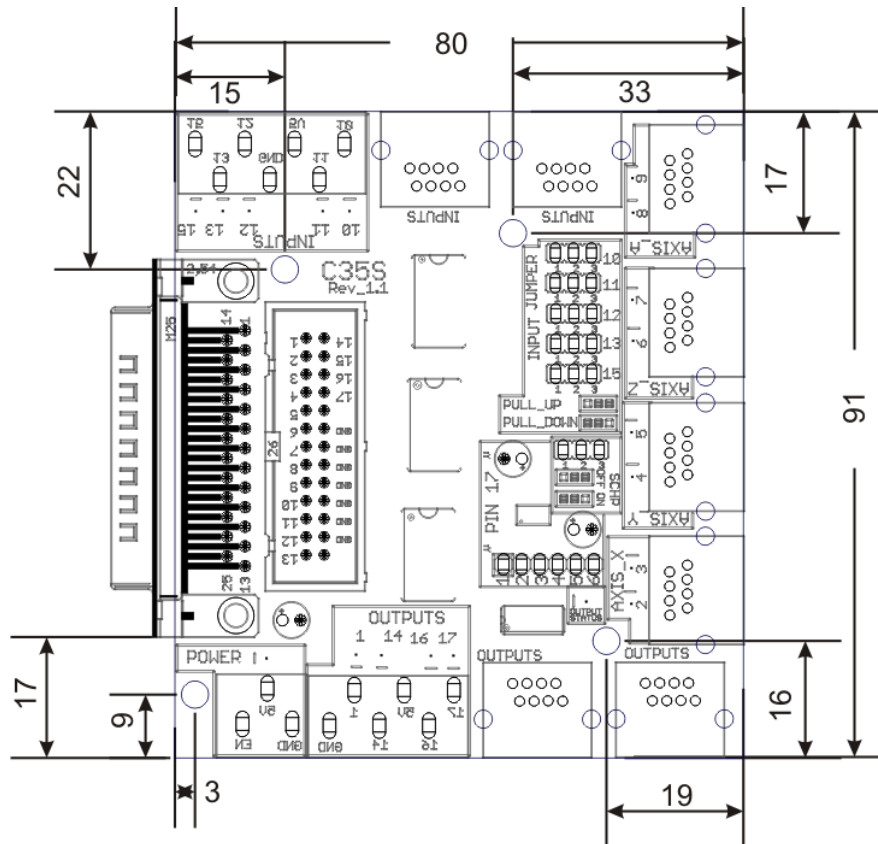

Fig. 11 Wiring diagram to do an "Auto Tool Zero"

11.0 DIMENSIONS

All dimensions are in Millimeters.

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 its failure or possible erratic operation could cause property damage, bodily injury or loss of life.