

VIVAmini

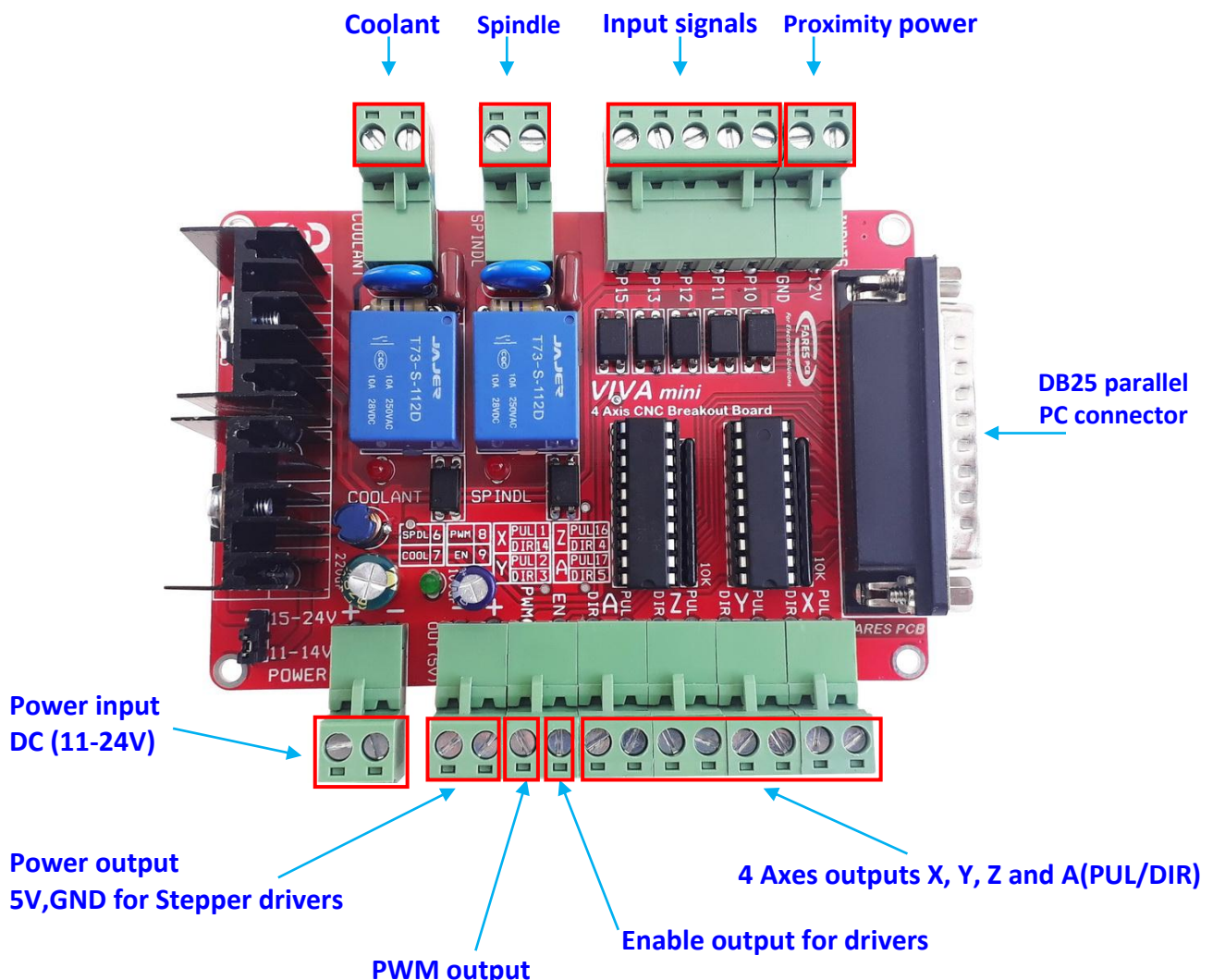
4 Axis CNC Breakout Board

General Description

VIVAm mini is a complete buffered CNC breakout board. It supports up to 4 axes CNC machine control signals (pulse/direction for each axis).

VIVAm mini supports five inputs that can be configured for axes limits, homing emergency input switch, and probe for auto-zero Z axis. External input signals are optically isolated from the PC parallel port for safety. Output control signals (pulse and direction) should be optically isolated on the stepper motor driver. Two output relays are added for spindle and coolant control.

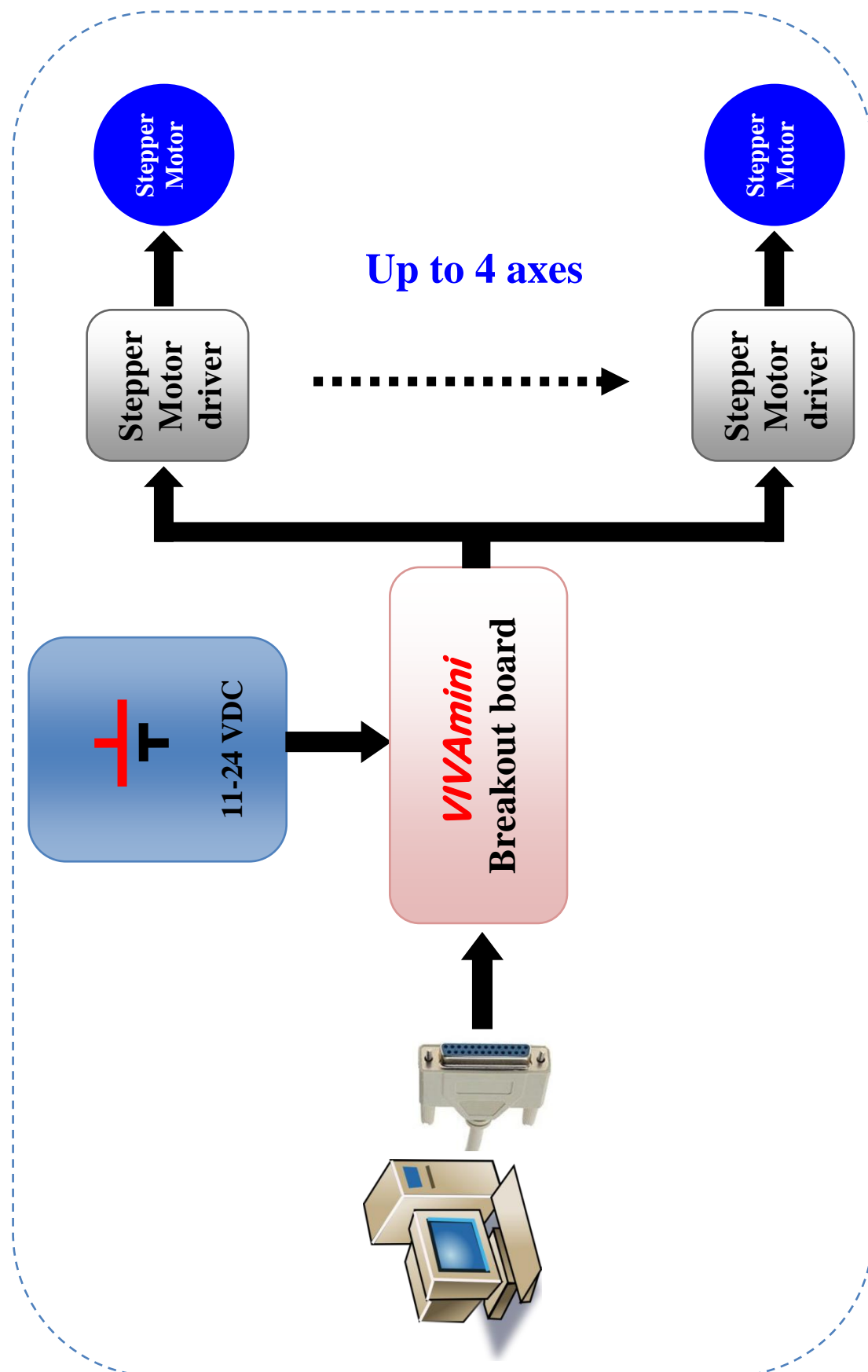
VIVAm mini provides a PWM output for controlling spindle speed.



VIVAm mini (Power, Inputs and outputs)

VIVAmimi Features

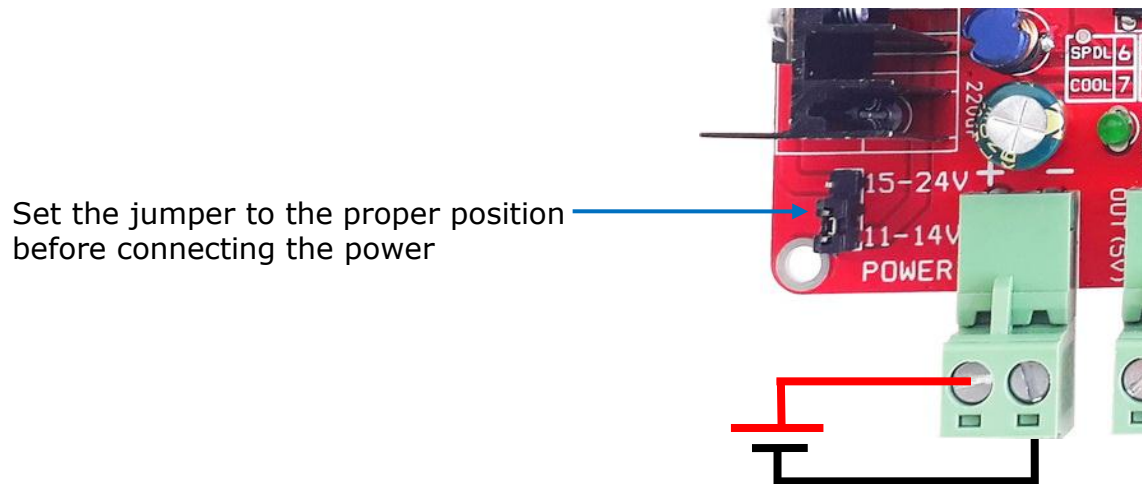
- Completely supports MACH3 and any other soft tool that use LPT port.
- Wide input power supply range (11-24 DCV).
- 4 axes control signals (Pulse" PUL" and Direction "DIR")
 - X axis
 - Y axis
 - Z axis
 - A axis
- Control signals are TTL compatible (10mA). For pin assignment and addressing refer to table1.
- Supports five external inputs.
- All inputs are optically isolated for safety.
- Two output relays for spindle and coolant control (3A maximum contact current).
- PWM output for controlling spindle speed.
- All outputs and inputs are brought out via pluggable screw clamp connector for flexibility.
- LED indicator for
 - Output relays "spindle", "coolant" (**RED** LED).
 - Input power (**Green** LED).
- Dimension: 109 x 73 x 27 mm.



System Overview

Power connection

VIVAmmini card can be powered from any DC power supply. The recommended voltage is 12V. But, any voltage supply in the range from 11V to 24V is accepted. Just set the power select jumper according to the available power supply voltage before connecting it.



Output connections

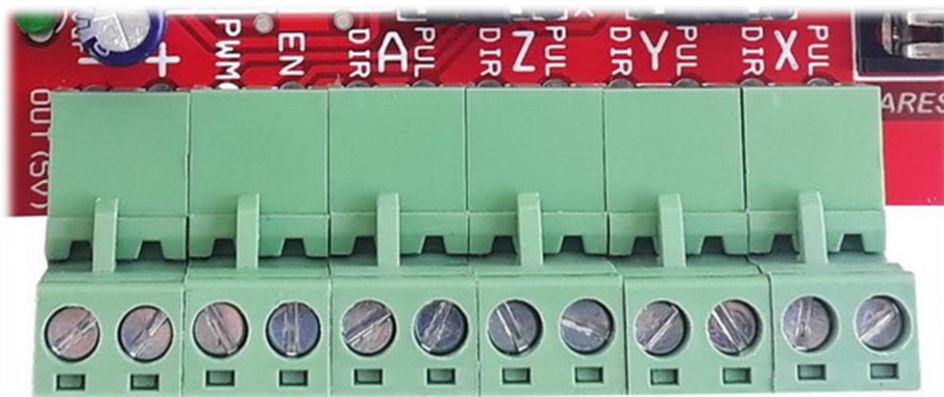
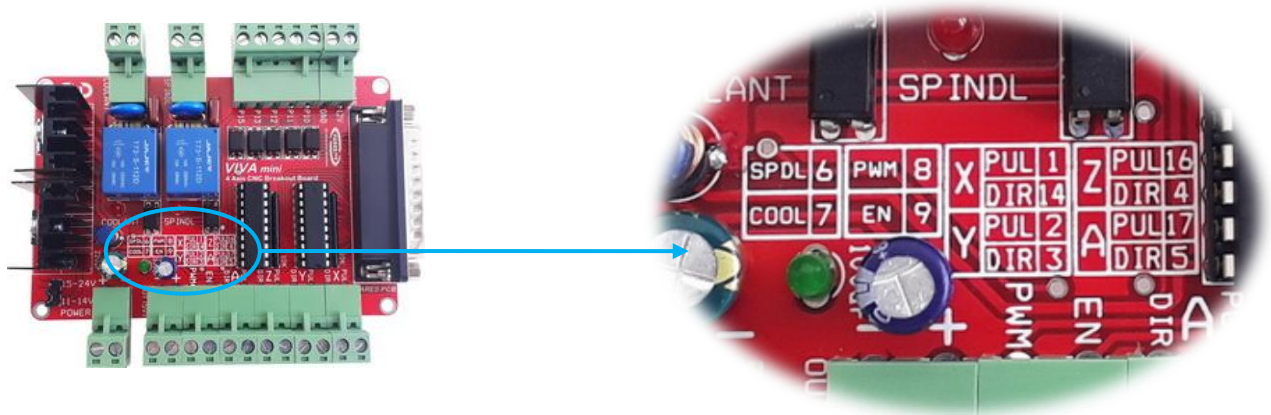


Table1 shows output name, pin number and its function on DB25 socket. Use this table to configure the software that interface to **VIVAmmini** card.

Table1. Output table

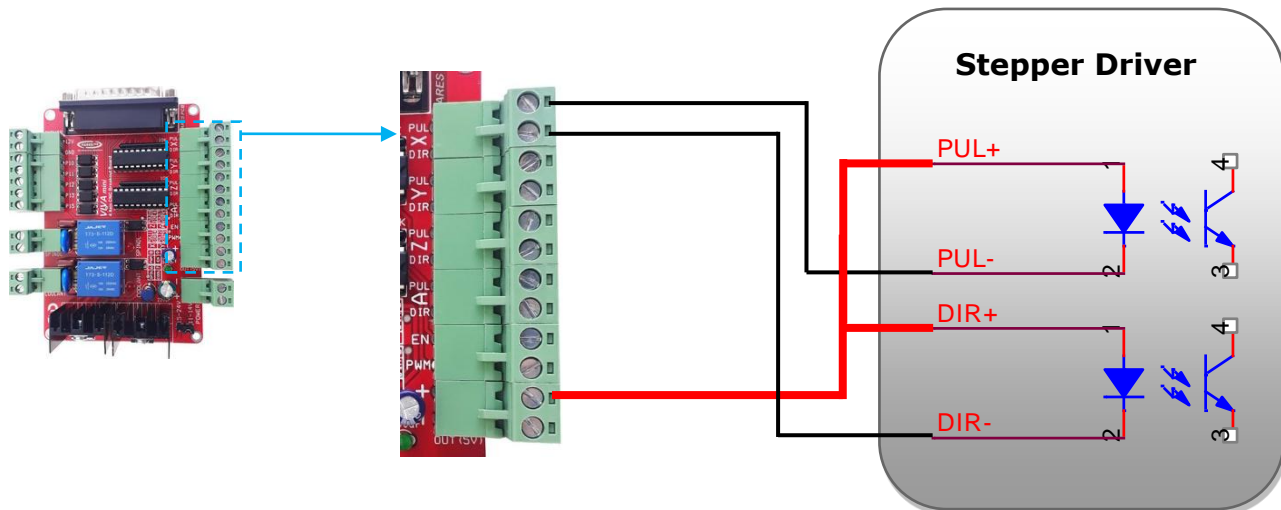
Output	Function	Pin#
PUL_X	X axis step	1
DIR_X	X axis direction	14
PUL_Y	Y axis step	2
DIR_Y	Y axis direction	3
PUL_Z	Z axis step	16
DIR_Z	Z axis direction	4
PUL_A	A axis step	17
DIR_A	A axis direction	5
Spindle	spindle on/off control	6
Coolant	coolant on/off control	7
PWM	PWM output to control Spindle speed	8
EN	Drivers Enable	9

Pin out table for outputs on *VIVAmini***How to connect axis control signals to stepper driver?**

There are two connection techniques to connect control signals to stepper driver. Common anode and Common cathode. *VIVAmini* supports both types of connections.

Common Anode connection

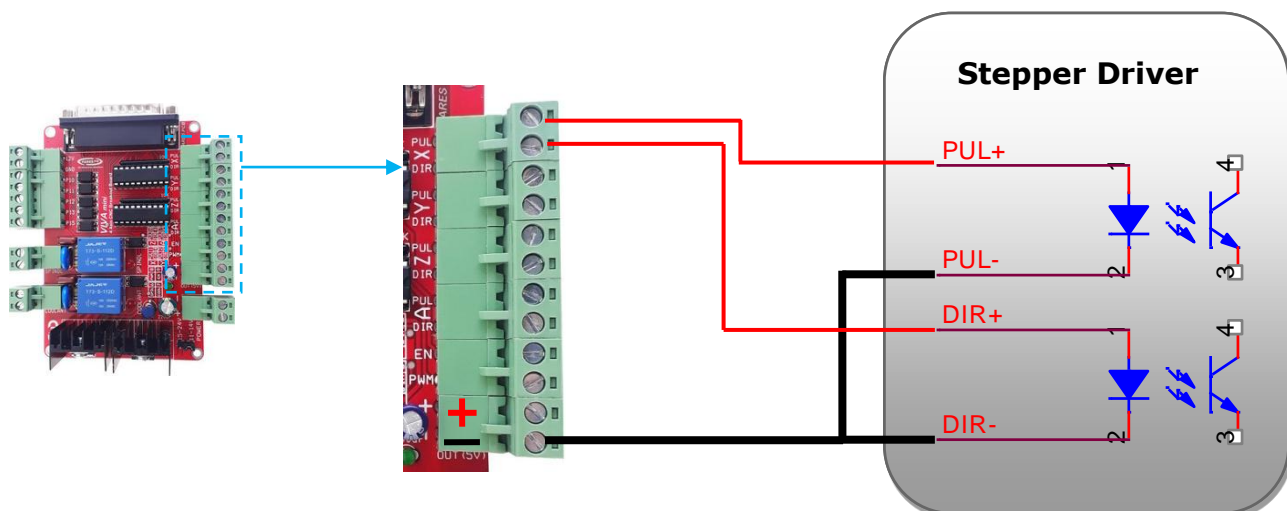
In this type of connection all the +ve signals in step motor driver are tied together and connected to +5V on breakout board, whereas pulse output "PUL" is connected to negative terminal of pulse input "PUL-" of stepper driver and in the same way the direction output "DIR" is connected to negative terminal of direction input "DIR-" of stepper driver as seen in figure



X axis connection (common anode)

Common Cathode connection

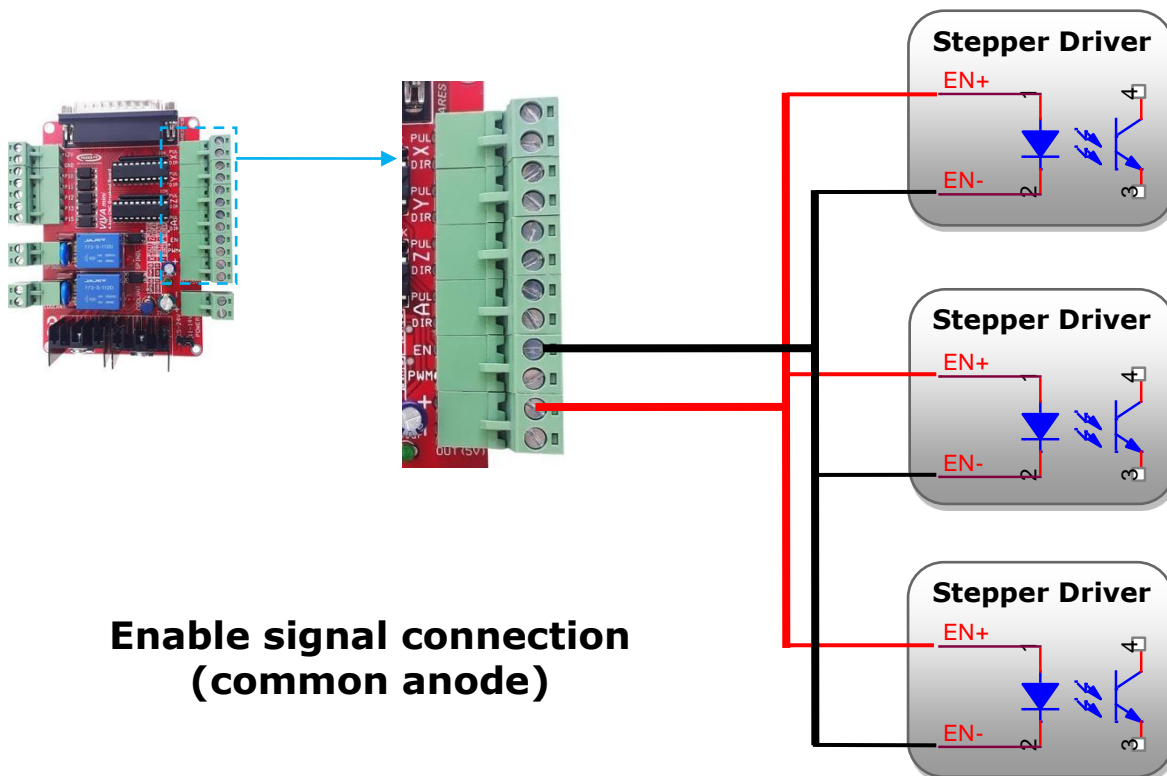
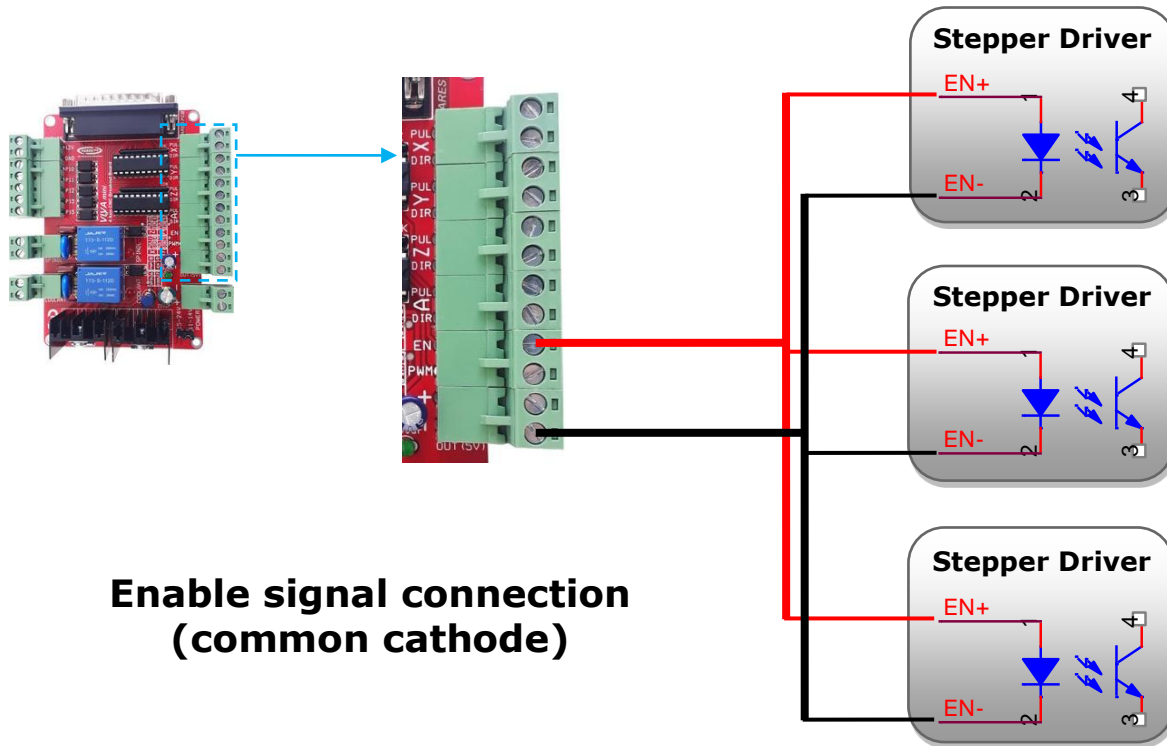
In this type of connection all the -ve signals in step motor driver are tied together and connected to ground on breakout board, whereas pulse output "PUL" is connected to positive terminal of pulse input "PUL+" of stepper driver and in the same way the direction output "DIR" is connected to positive terminal of direction input "DIR+" of stepper driver as seen in figure



X axis connection (common cathode)

Enable output

Use this output to allow CNC soft (such as MACH3) to enable/disable stepper driver. Enable output can be connected to the driver in the same way as "PUL" and "DIR" signals.



Spindle / Coolant outputs

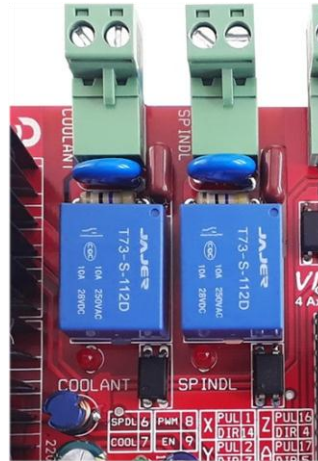


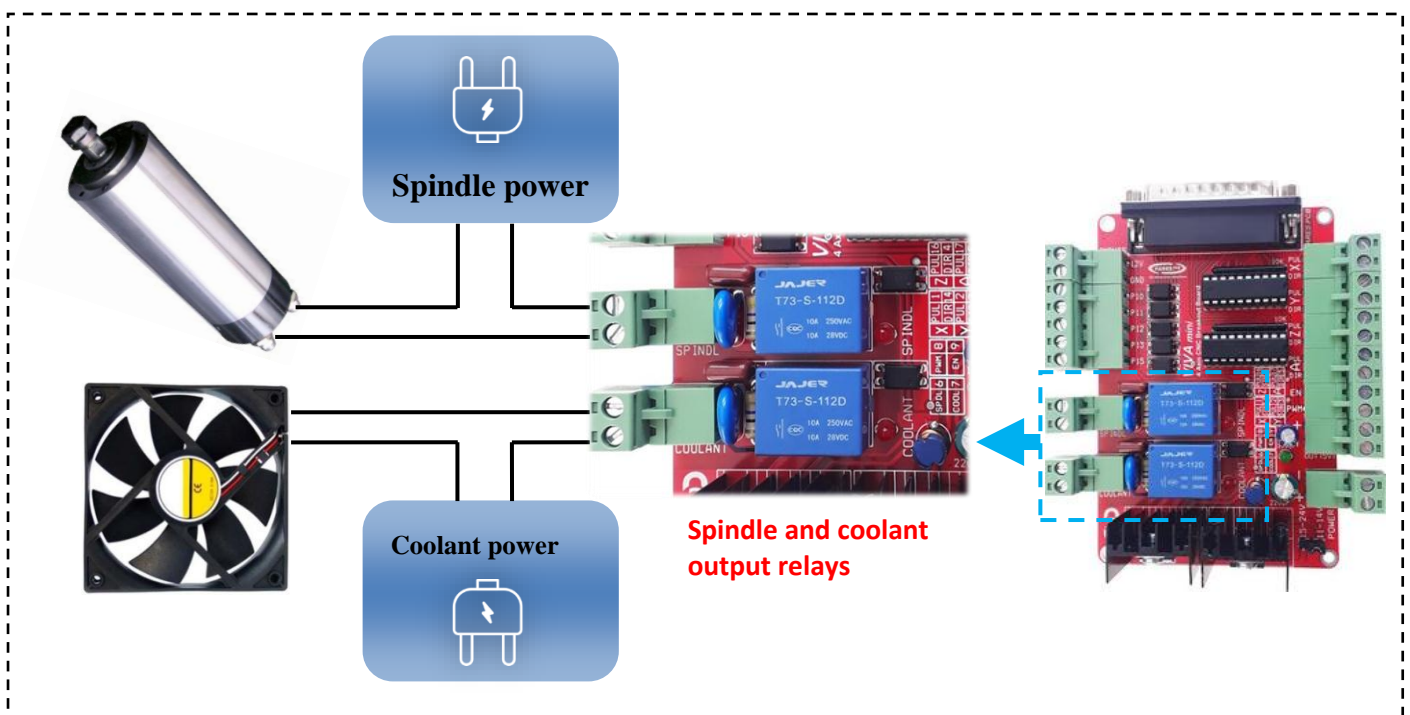
Table2. Spindle/Coolant outputs.

Output	Function	Pin#
Spindle	spindle on/off control	6
Coolant	Coolant on/off control	7

How to enable spindle and coolant?

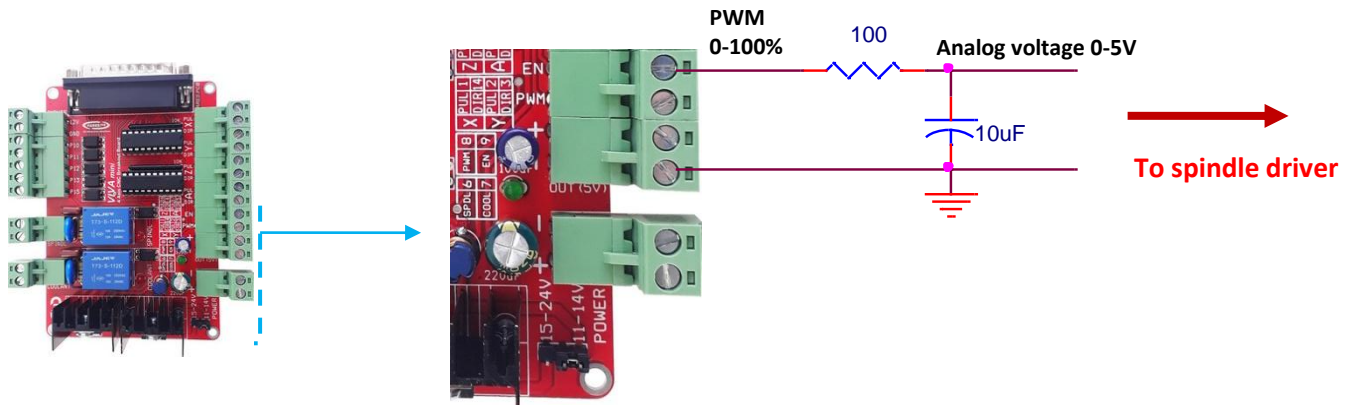
1. Set the output pin 6 as Spindle and the output pin 7 as coolant in software program.
2. The output is dry contact and rated for 3A max. So, if the load needs more current, use external relay or contactor.

Figure 7. Connection of spindle motor and coolant to VIVAmimi



PWM output

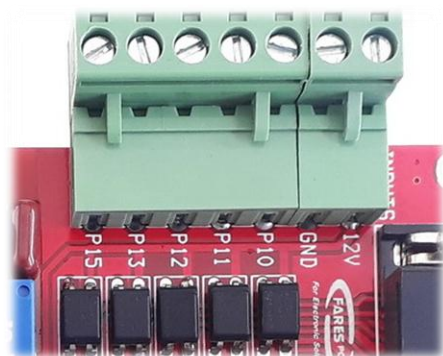
This output is TTL compatible (0-5V) and can be used to control the spindle speed by setting it as a PWM output in the CNC soft. If the spindle driver needs an analog signal to control speed , use an external circuit to convert the PWM signal to an analog voltage. The circuit can be simply a passive low pass filter RC filter as seen in figure



The resistor value is 100 ohm and the capacitor value depends on the frequency of PWM signal. As the frequency increased the required capacitance decreased. A 10uF is suitable for 10KHz. The recommended operating frequency range is 10 - 50 KHz. Over-capacitance value causes some delay response while under-capacitance value leads to high ripple voltage.

If the spindle driver requires a higher analog voltage (0 - 10V) then an active filter should be used. The filter converts the PWM signal to an analog voltage and amplifies it twice.

Input connections



VIVAmimi provides 5 inputs that can be used for axes limits, home signals, emergency stop switch, and auto-zero probe. All input signals can be simply limit switches or proximity sensor switch. Use the 12V output to power the magnetic proximity switch. All inputs are opto-isolated for protection.

Axis limits

Limit switches serve as the mechanism that tells the computer the limits of the CNC machine. When one of the axes moves to an axis limit, the switch is activated and the machine stops. These limit switches are also used to inform the computer of the home position. Typically, 6 of these switches are needed, two per axis. There are different kinds of switches you can use as limit switches. **VIVAmimi** supports micro switch and proximity sensor (NPN type) as an axis limit switch input.



Micro switch

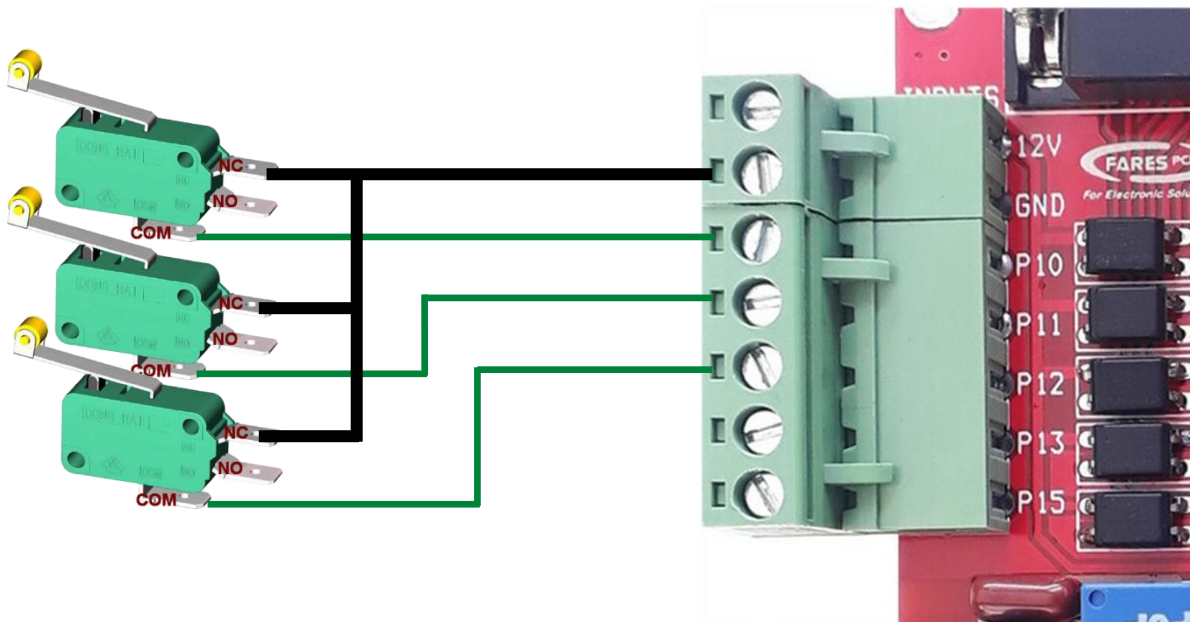


Proximity switch

Micro switch and proximity sensor

How to connect micro switches as axes limits?

Micro switch can be connected directly to any input (P10-P15) and GND.

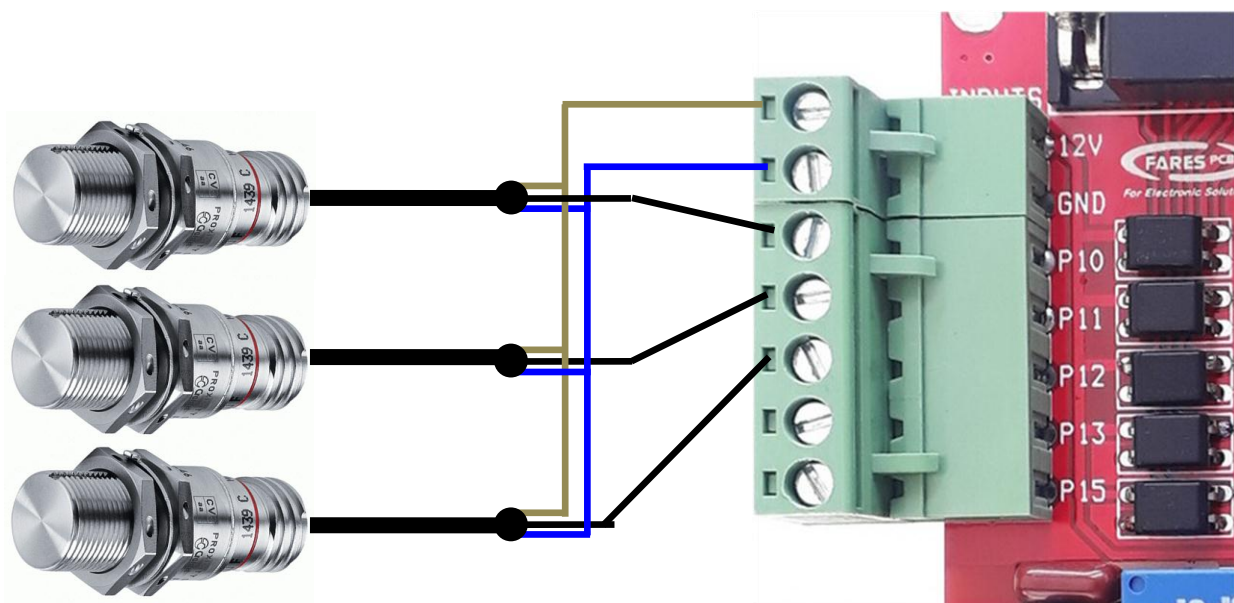


Connecting micro switches to **VIVAmimi**

Proximity sensors

The proximity sensor has three terminals. Two for power (10-30V, typically 12V), and one for output signal (GND in case of NPN proximity type).

A 3-wire sensor is typically color-coded with one brown wire for the +ve supply, blue wire for the common terminal of the power supply, and black terminal for the output signal. NPN type outputs GND when detecting a target while PNP type outputs +ve when detecting a target.



Connecting proximity switches to **VIVAmimi**

Note:

- Multiple micro switches can be paralleled to get multiple limit inputs for the same axis.
- Multiple proximity sensors can be paralleled to get multiple limit input for the same axis.

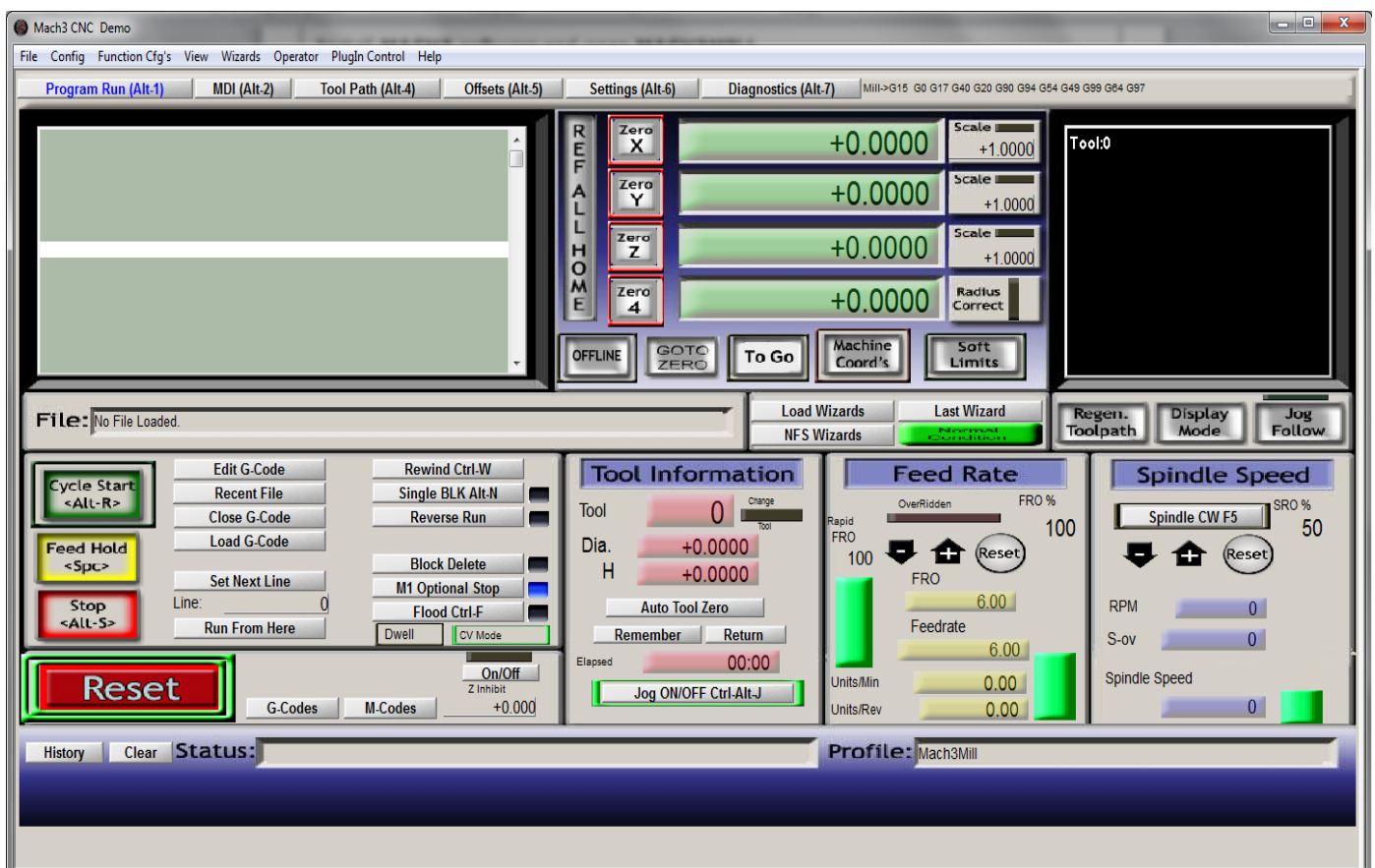
MACH3 configuration for VIVAmimi

We will demonstrate the configuration of MACH3 for VIVAmimi
In this configuration:

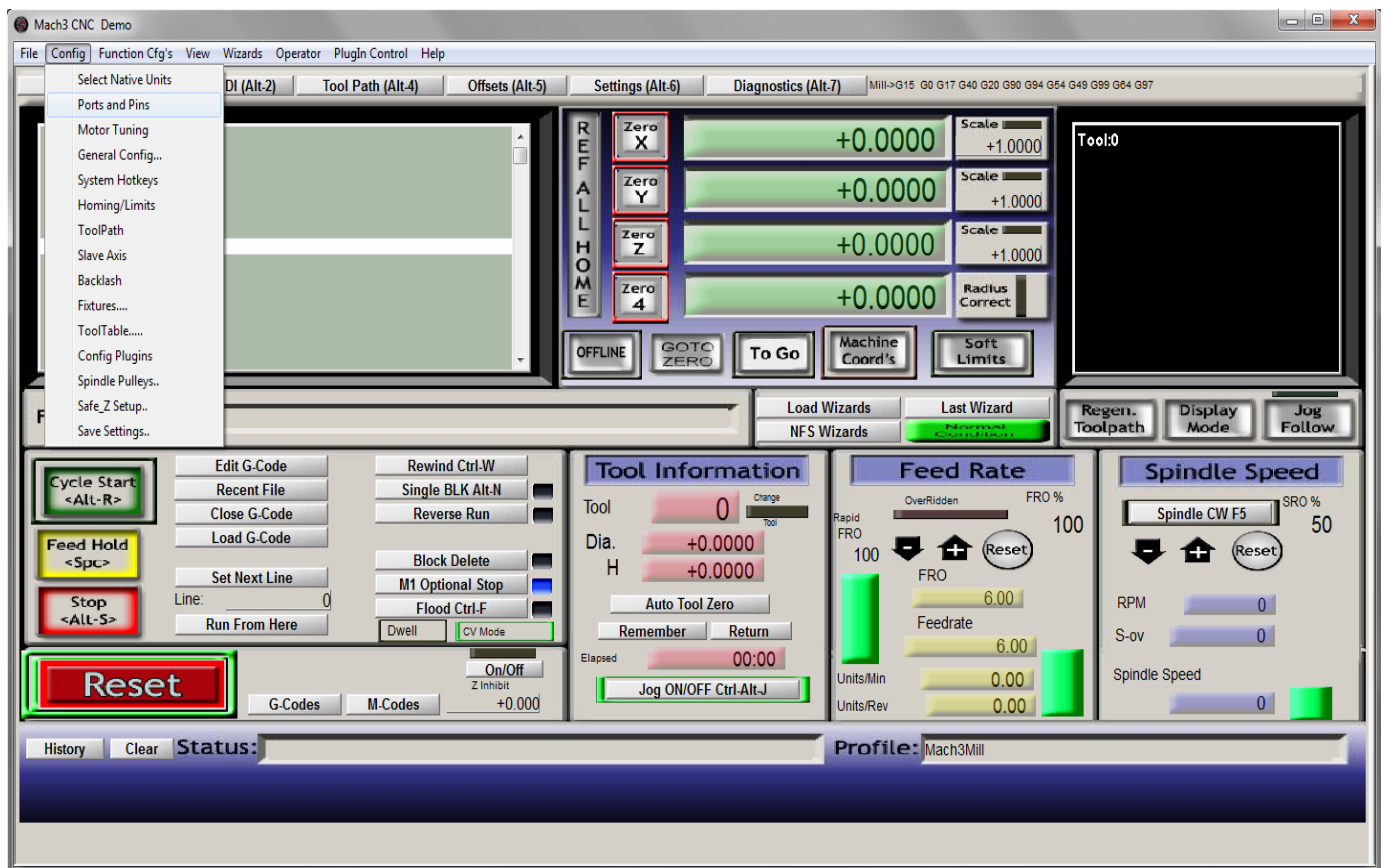
- ✓ X, Y, and Z axes are activated. A is not used in this configuration.
- ✓ Spindle and Coolant output are configured.
- ✓ Spindle speed control is enabled using PWM.
- ✓ X, Y, Z input limits are configured
- ✓ Emergency input is configured

Suppose six proximity sensors are used as a limit inputs. A pair of sensors for each axis. Also let a touch probe is used and an emergency stop switch (normally closed).

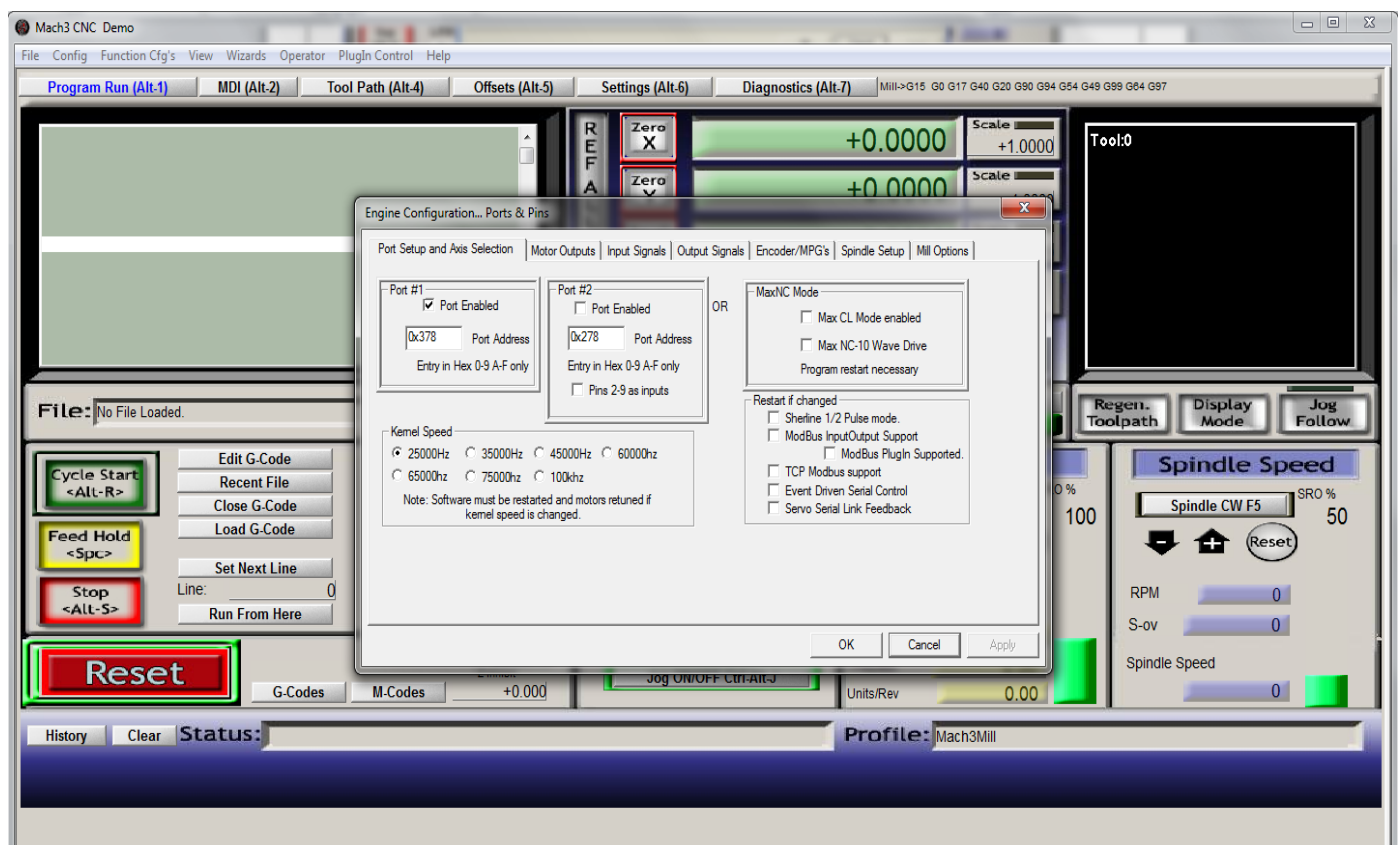
Install **MACH3** software and open **MACH3MILL**



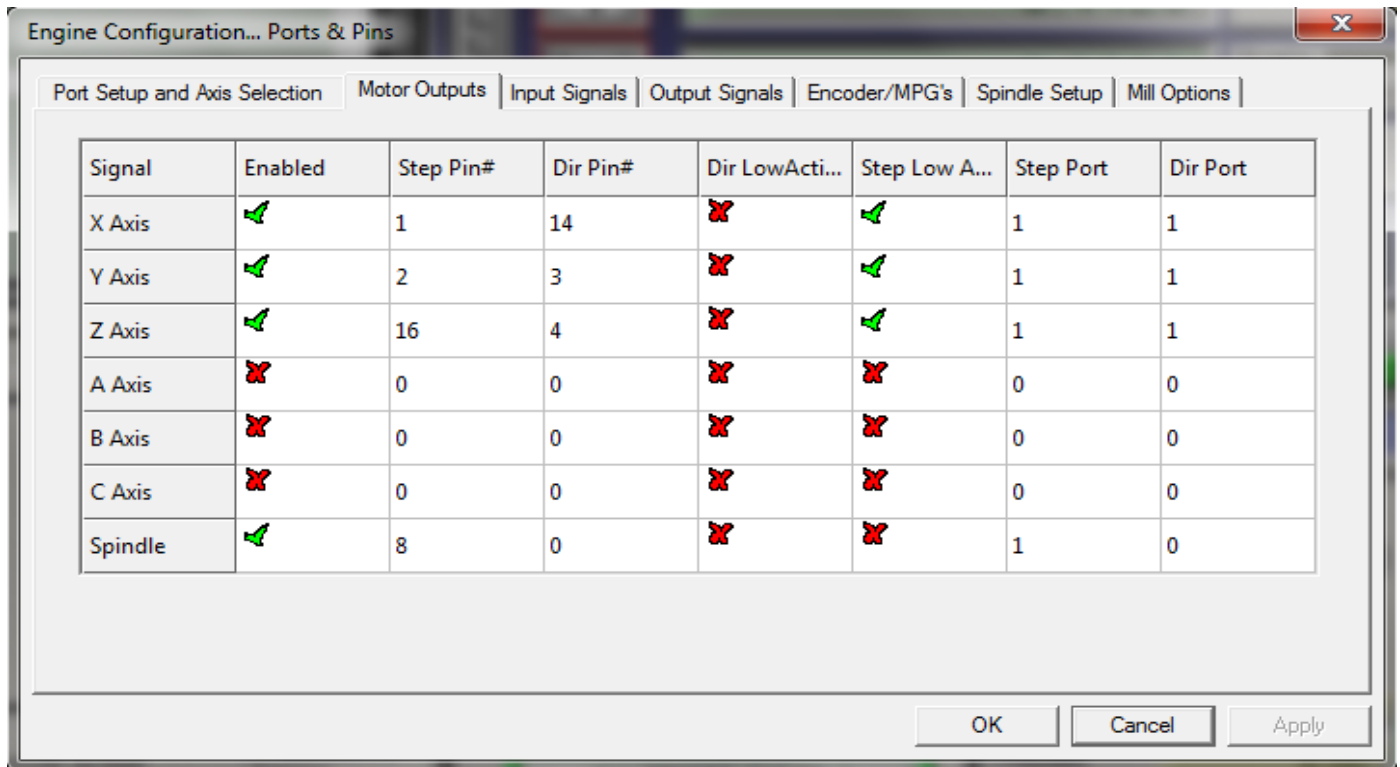
Go to Config menu -> ports and pins as shown in figure



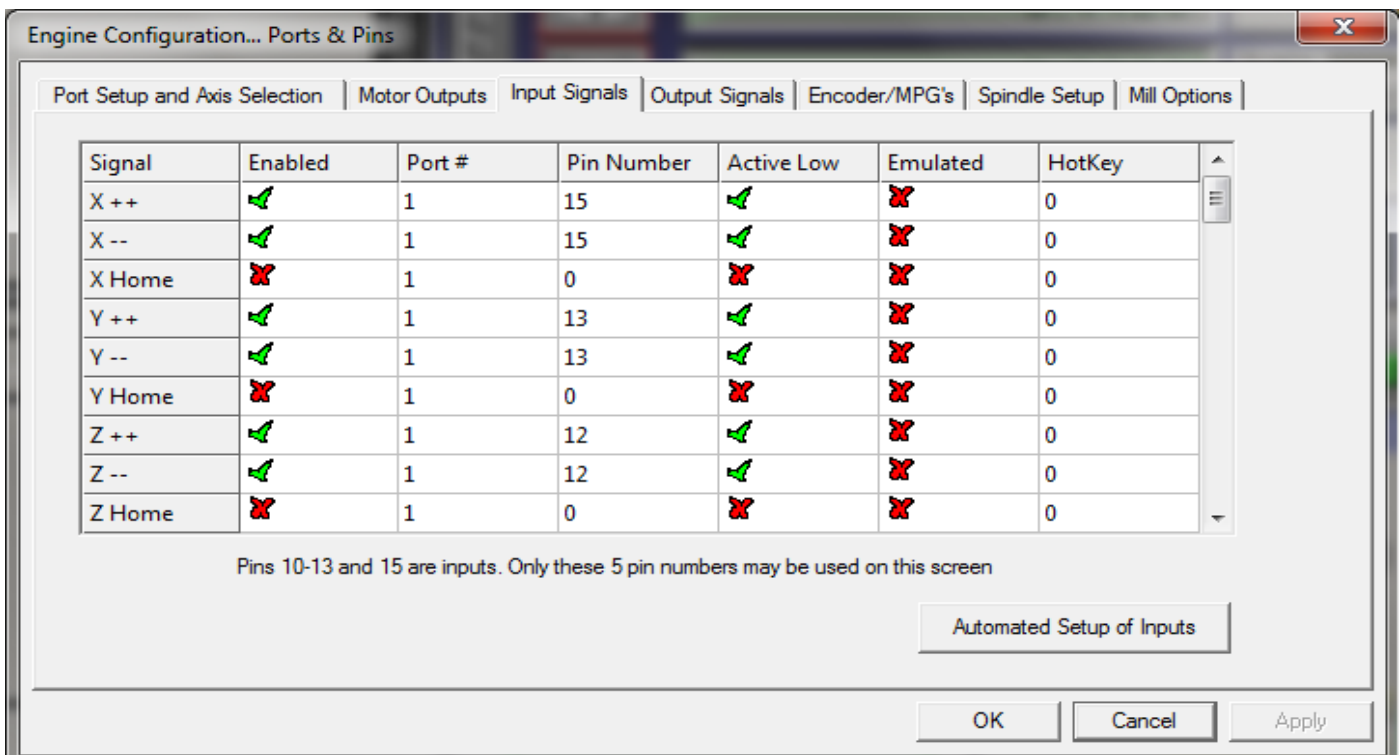
Set the parallel port address (0x378 by default)



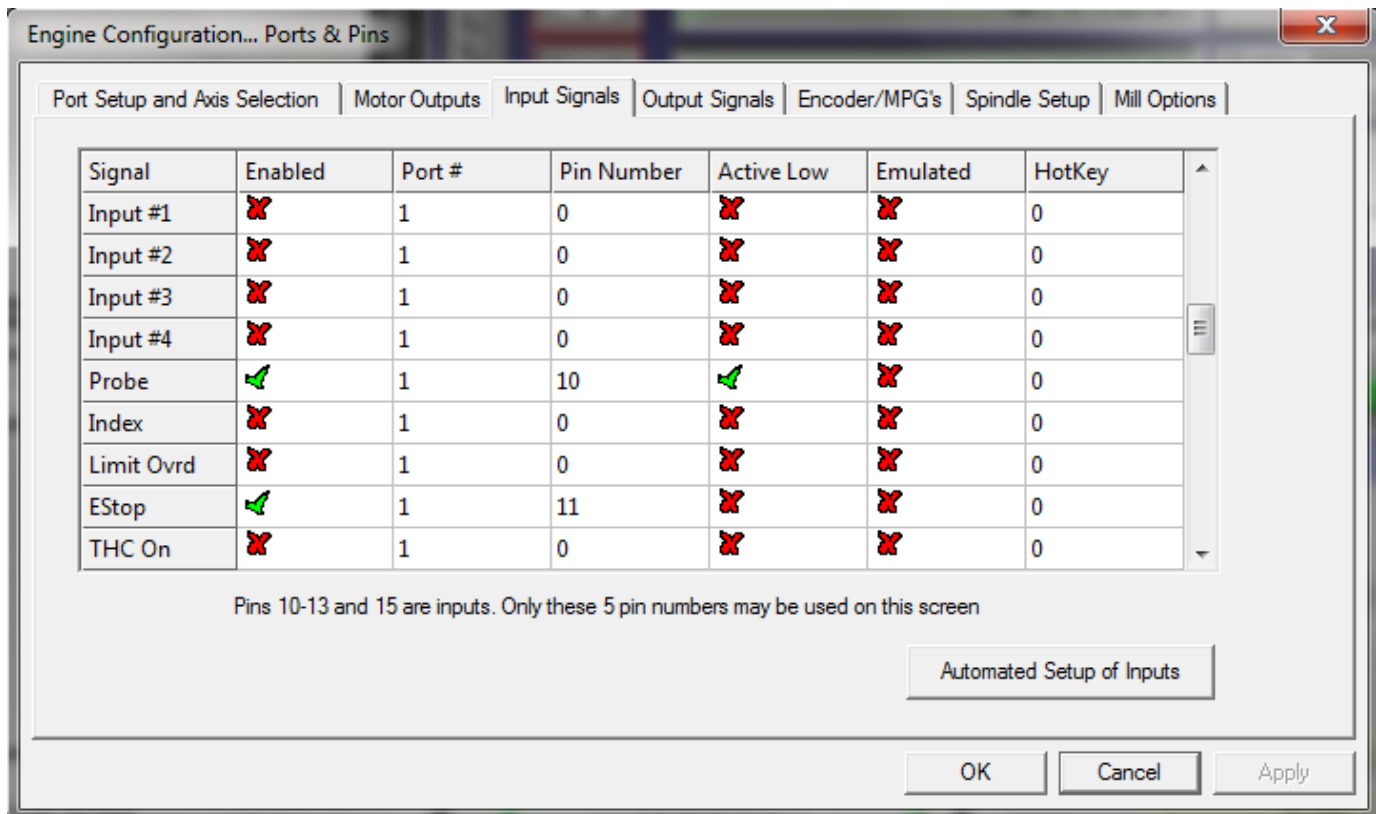
Go to motor output tab and enable X, Y, Z axis and spindle and set addresses as shown in figure



Go to input signals tab and set the following,
 Enable X axis limits (X++, X--).
 Enable Y axis limits (Y++, Y--).
 Enable Z axis limits (Z++, Z--).
 Set all inputs as active low, and set addresses as shown in figure



Enable Probe input (active low) and Estop input and set addresses as shown in figure



Go to Spindle Setup tab and set the following,

Relay Control

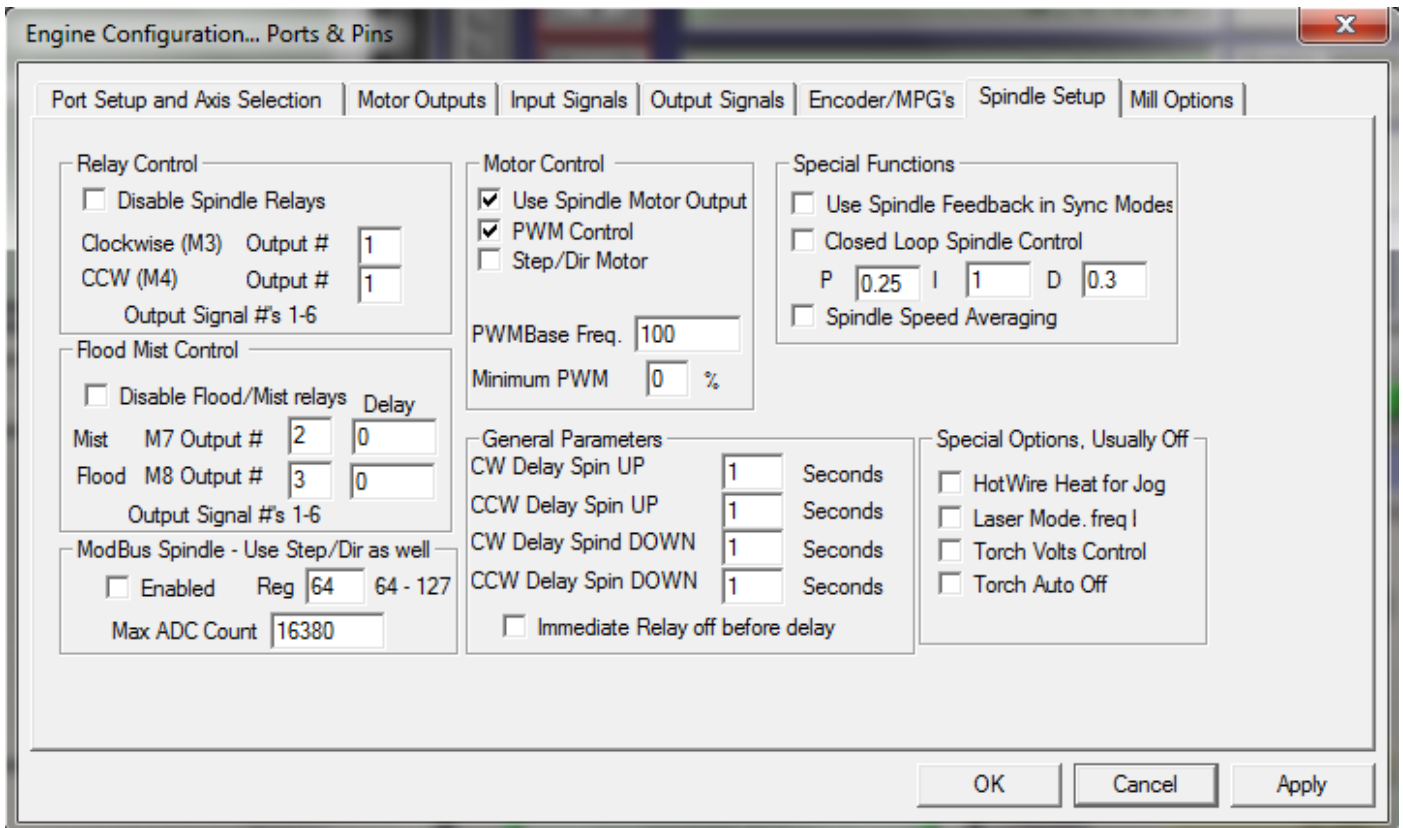
- Uncheck Disable Spindle Relays.
- Set Clockwise(M3) to output# 1.
- Set CCW(M4) to output# 1.

Flood/Mist Control

- Uncheck Disable Flood/Mist relays.
- Set Mist M7 to output# 2.

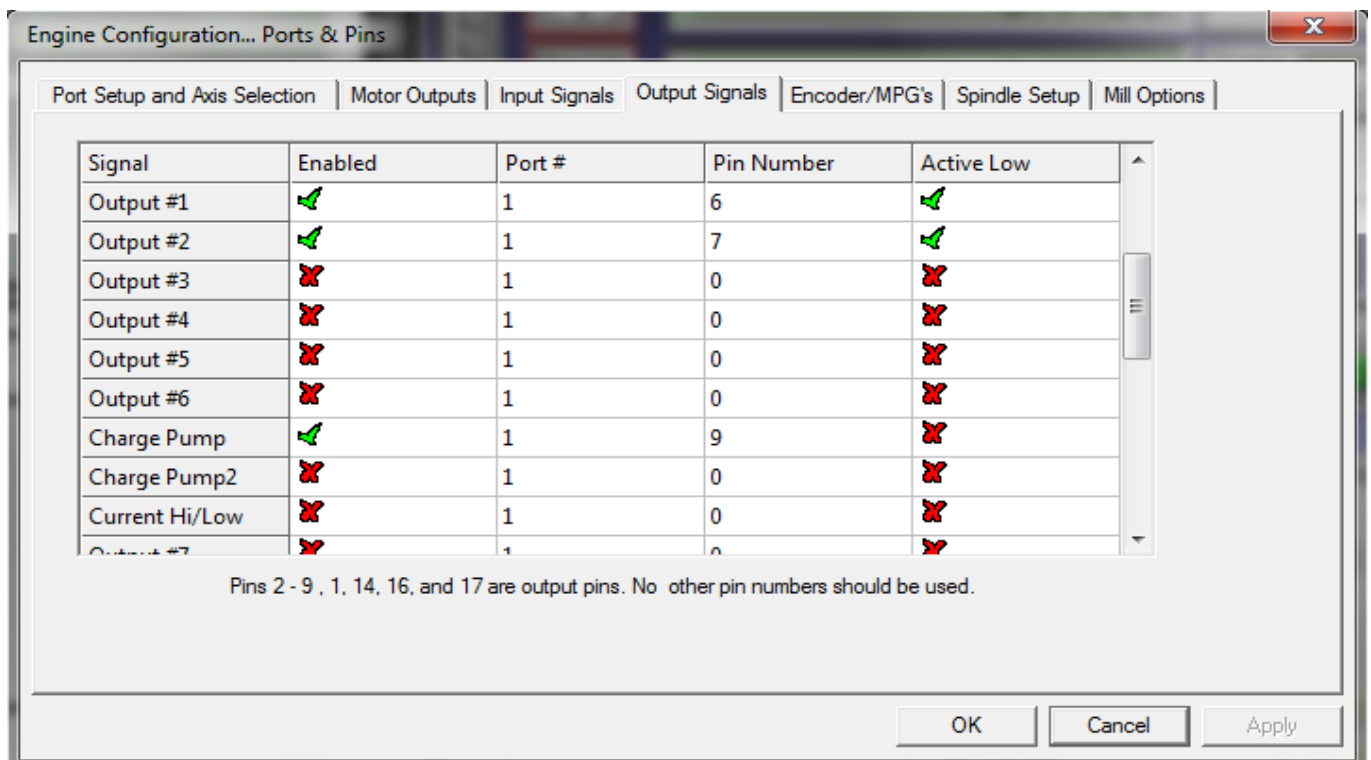
Motor Control

- Check Use Spindle Motor Output.
- Check PWM Control.
- Set PWM Base Freq to 100.
- Set Minimum PWM to 0.

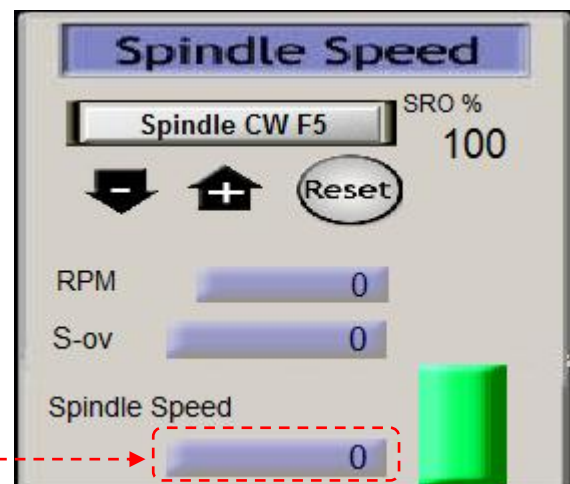
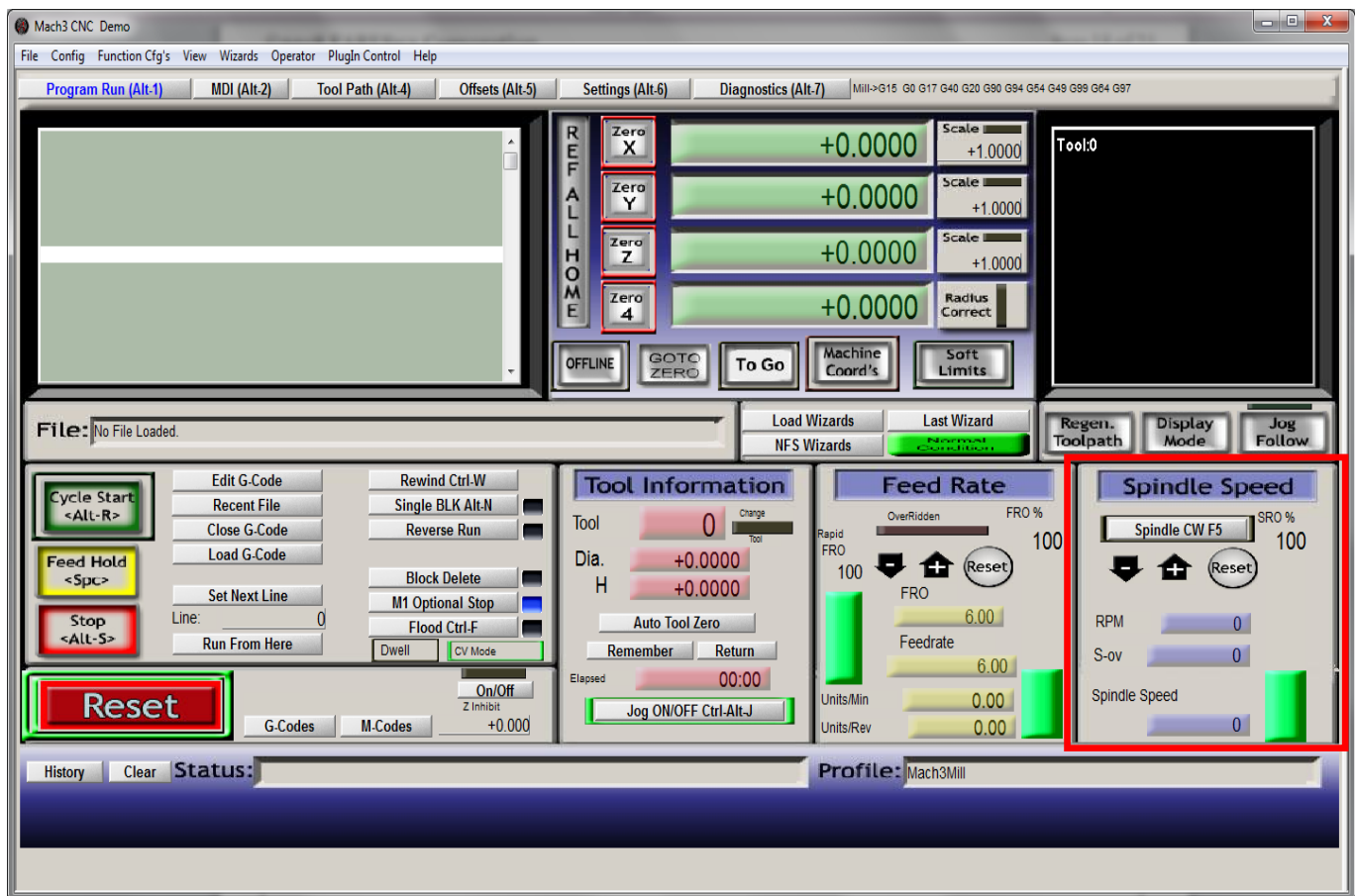


Go to output signals tab and set the following,

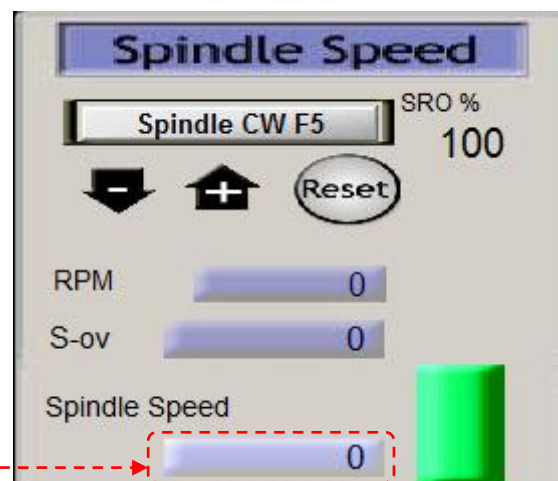
- Enable output#1, Output#2 and Charge Pump output
- Set Output#1 and Output#2 as an active low output
- Set charge Pump output as an active high output
- Set addresses as shown in figure.



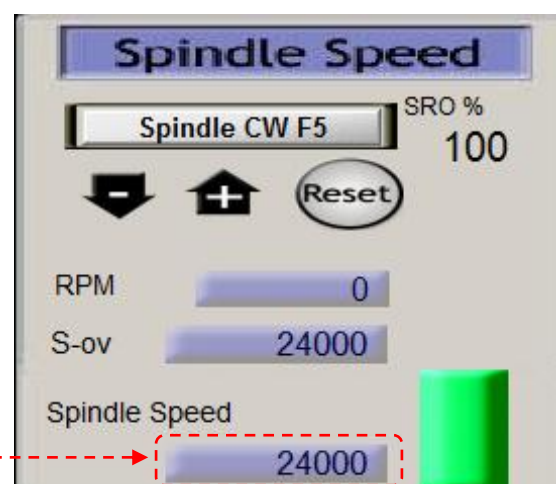
To set spindle speed, go to main screen of MACH3 program and press spindle speed button to edit spindle speed (8000 in our example) and press <Enter>key shown in figures



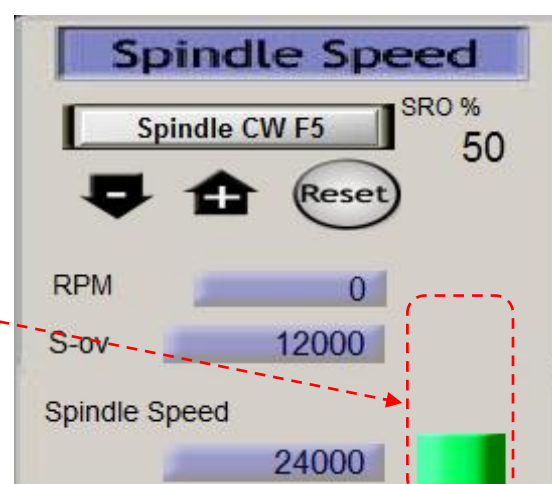
Before button clicking



After button clicking



Entering spindle speed



Use this bar to change spindle speed

Use this button to turn On/Off spindle



Jog hotkeys table

X		Y		Z	
++	--	++	--	++	--
Right arrow	Left arrow	Up arrow	Down arrow	Page Up	Page Down

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FARESPCB co. (Head office)

32 El-Falaky st, Bab El-Louq, Tahrir, Cairo, Egypt.

Tel: +202-23904484

Mob: +201000652977

Mob: +201022457902

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Distributor:
RAM Electronics
32 El Falaky St. Bab El Louk,
Tahrir, Cairo
Egypt.
Tel: +202-27960551
www.ram.com.eg
Sales@ram-electronics.com

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