PP-BOB3-V1.0 Parallel Port Breakout Board

Document: Operation Manual
Document #: 29
Document Rev: 1.00

Product: PP-BOB3-V1.0
Product Rev: 1.0
Created: March, 2021
Updated: Initial

THIS MANUAL CONTAINS INFORMATION FOR INSTALLING AND OPERATING THE FOLLOWING PRODUCT: PP-BOB3-V1.0 Parallel Port Breakout Board
In the following pages, PP-BOB3-V1.0 “Parallel Port Breakout Board” is termed as Breakout Board or simply BOB.

TINY CONTROLS PRIVATE LIMITED
B-17/A , NISHAT PARK, KAKROLA MOR, NEW DELHI, INDIA – 110078
WEB: http://www.tinycontrols.com
PHONE: +91-991-119-3210 , +91-83840-24665

PARALLEL PORT BREAKOUT BOARD PACKAGE INCLUDES

1. Breakout Board

2. DB25 Cable Male to Female

GENERAL DESCRIPTION

The parallel port breakout board card is designed for a flexible interface between CNC machine and computer system. The board is fully compatible with software like Mach3, Turbo CNC, EMC2, KCAM etc.

The BOB gives step and direction outputs to stepper drives of 4 axes in CNC. The outputs for one axis are buffered twice and taken out from two different connectors to make card useful in gantry style machines also. All the outputs are buffered and taken out through screw terminals from card.

These outputs can be taken out in Pull up or pull down states and motor Common output signal can be taken as low or high by changing the jumper configuration .

Three relays are provided on the board and an isolated PWM to 0-10V analog output circuit is provided for controlling the spindle speed. An on-board 5V regulator is given with a 5V output terminal.

An on-board charge pump is provided for safety of card. It is jumper configurable and it can be operated from frequency as low as 200Hz to more than 15 KHz. Charge pump can be set disabled and this buffered output can be used as general purpose output by changing the position of respective jumper.

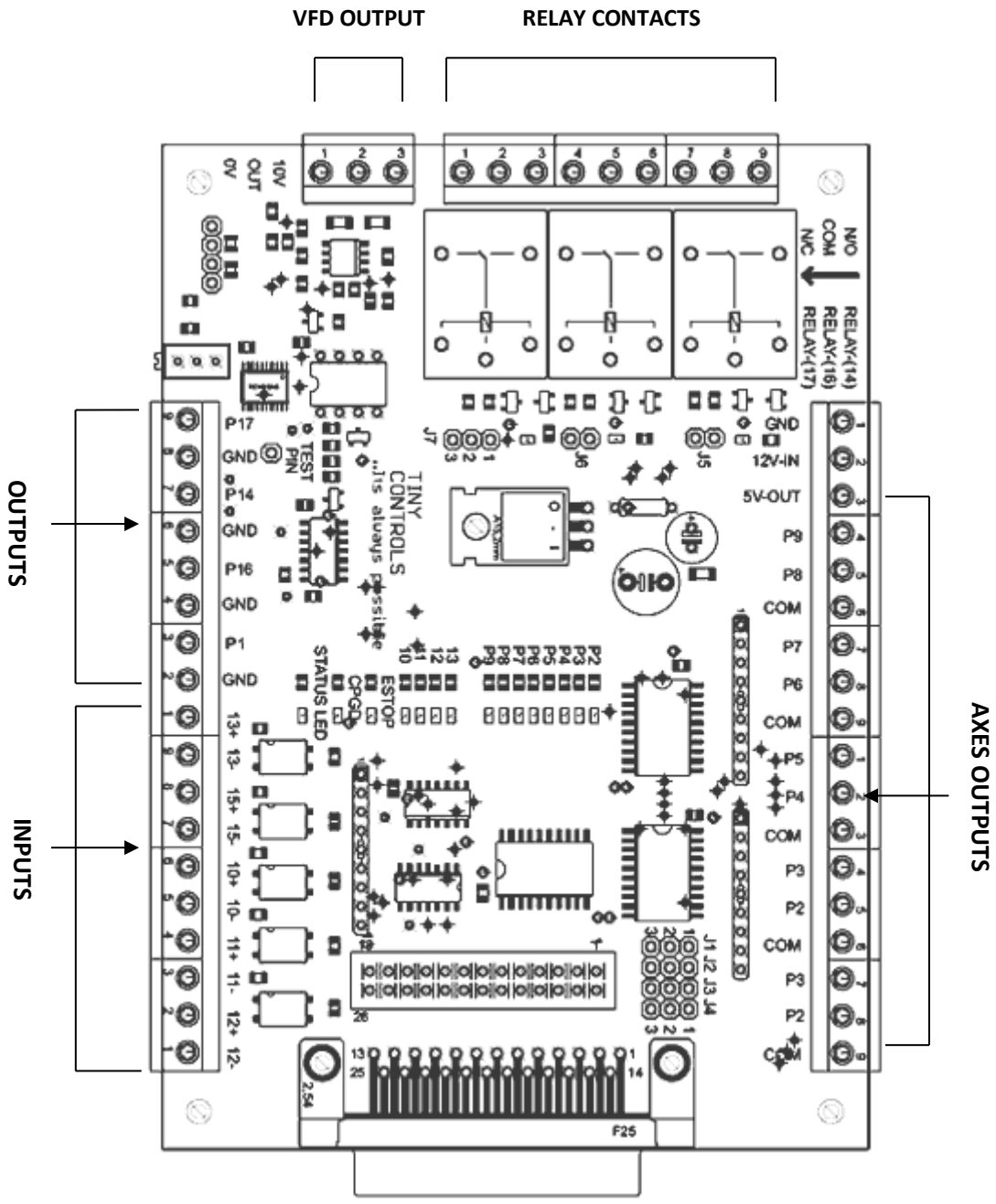
Input terminals compatible to 24V are given on the board. These are filtered for noise immunity ensuring any possibility of error. LED indicator for inputs and outputs make the signal debugging task easy.

All the outputs can also be used as general purpose outputs making the system flexible.

Technical Specifications

Contents	Specifications
Communication terminals	Parallel port terminal for connection with PC
Axes	8 (4 Axes Differential Outputs)
Axes drive control type	Step/ Direction
Digital outputs	4 in addition to Axes outputs
Digital inputs	5
Analog output (0-10V) isolated	1
Relays	3
Supply voltage	24V DC
Max Power Consumption	/ 0.5A
Ambient temperature range	0˚-55˚ C
Relative Humidity	90% (without condensation)
Dimensions	135x95
Weight	40g

Breakout Board Terminals

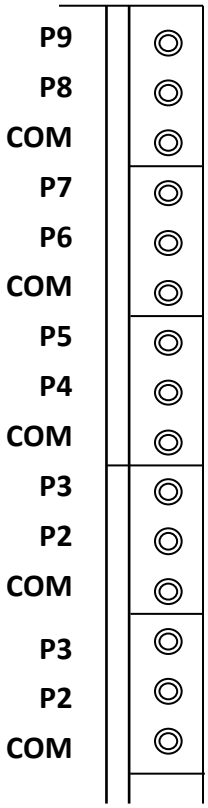


CONNECTING OUTPUTS:

Axes outputs:

PP-BOB3-V1.0 has dedicated Step, Dir and COM outputs for four independent axes named as X, Y, Z and A-axis.

These are tied to parallel port signals (from down to top in image adjacent):



X1-axis: COM- Terminal COM
X1-axis: STEP- Terminal P2
X1-axis: DIR- Terminal P3

X2-axis: COM- Terminal COM
X2-axis: STEP- Terminal P2
X2-axis: DIR- Terminal P3

Y-axis: COM- Terminal COM
Y-axis: STEP- Terminal P4
Y-axis: DIR- Terminal P5

Z-axis: COM- Terminal COM
Z-axis: STEP- Terminal P6
Z-axis: DIR- Terminal P7

A-axis: COM- Terminal COM
A-axis: STEP- Terminal P8
A-axis: DIR- Terminal P9

However, for any system, if the outputs for any axis aren't used, these can be used for any purpose other than axis control. User can use these outputs as the general purpose outputs.

Analog output 0-10V:

A 0-10V analog output signal directly goes to VFD to control the spindle. This circuit is completely isolated from rest of control board. If **10V input** is fed from VFD to terminal **10V Analog IN**; an analog output in range of **0-10V** can be drawn from terminal **0-10V Analog OUT**. If **5V input** is fed from VFD to **10V Analog IN**, an analog output in range of **0-5V** can be drawn from terminal **0-10V Analog OUT** terminal. The output voltage can be set through the POT connected.

Test Output:

A test output is provided for testing stepper driver, it generate 1Khz 5v signal

Relay:

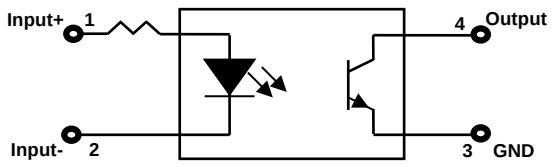
Relay Contact terminals are taken directly from this 3 pin connector. Pins are marked as N/O, COM and N/C. Digital Output signal P14 controls the relay-(14), P16 controls the relay-(16) and P17 controls the relay-(17). It depends on mounting of their respective jumper. In this condition, outputs on terminals P14, P16 and P17 remain unavailable. It is discussed in Jumper settings section of manual.

CONNECTING INPUTS:

Power supply:

Connect a power supply of +24V DC at the input pin of parallel port breakout board for its operation.

Input terminals:



The board has five opto-isolated inputs connected to signal P10, P11, P12, P13 and P15. All inputs are filtered for noise immunity and are active low. Active low means when the input of optoisolator is driven, the signal goes low.

Signal P15 is dedicated to emergency switch and corresponding LED indicator “ESTOP” shows the activity of this signal. The LED glows when the input is driven to terminal.

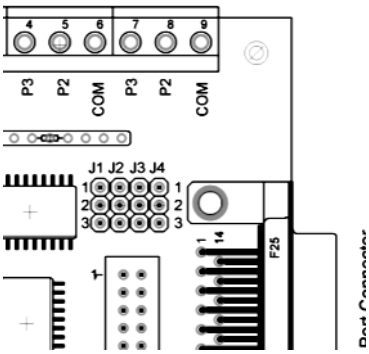
The inputs are directly connected to opto-couplers with 470 ohm series resistor. Care must be taken to use appropriate resistor while connecting the signals above +5V to the board to avoid any damage to the board. For 5V, no additional resistor to be added for input signal. For more than +5V, appropriate series resistors should be added.

See the example circuits mentioned further in manual for wiring different types of signals/ devices to board inputs.

JUMPER SETTINGS:

Jumper 1 (JP1) and Jumper 3 (JP3):

JP1 and JP3 at position 1-2:



This is the default position for both these jumpers. Charge pump on P1 signal is enabled and used to control the enable signals of output buffers for all output signals. In this mode, user needs to configure the CNC software to output the charge pump signal on P1. On the application of an appropriate charge pump signal, the output buffers are enabled otherwise all the output signals remain disabled. Charge pump works for frequency as low as 200Hz to more than 15 KHz. At this jumper position, LED “CPGD” glows when an appropriate “charge pump signal” is detected on P1 driven from CNC software.

JP1 and JP3 at position 2-3: Position both the jumpers in this configuration to keep the charge pump circuit disabled and the output buffers are permanently enabled. The buffered signal P1 is routed to the output terminal and can be used as a general purpose output. The corresponding LED is also disabled.

Jumper 2 (JP2):

JP2 at position 1-2: Position JP2 in this configuration to keep the “Step and Dir” signal of motor outputs in “Pull down” state. This is the default setting for JP2 in parallel port breakout board.

JP2 at position 2-3: Position JP2 in this configuration to keep the “Step and Dir” signal of motor outputs in “Pull up” state.

Jumper 4 (JP4):

JP4 at position 1-2: Position JP4 in this configuration to keep the Motor COM output signal connected to Ground. This is the default setting for JP4 in parallel port breakout board.

JP4 at position 2-3: Position JP4 in this configuration to keep the Motor COM output signal connected to Vcc.

Jumper 5 (JP5), Jumper 6 (JP6) and Jumper 7 (JP7):

JP5: This jumper controls the signal P14.

JP5 placed: This is the default setting for parallel port breakout board. This configuration routes the signal P14 to control the on board relay named “RELAY-(14)”. However, in this position, output signal on terminal P14 isn’t available.
JP5 removed: This configuration routes the buffered signal P14 directly to its output terminal and can be used as general purpose output signal.

Signal P14 have an associated LED to indicate the activity, the LED works irrespective of jumper position.

JP6: This jumper controls the signal P16.

JP6 placed: This is the default setting for parallel port breakout board. This configuration routes the signal P16 to control the on board relay named “RELAY-(16)”. However, in this position, output signal on terminal P16 isn’t available.
JP6 removed: This configuration routes the buffered signal P16 directly to its output terminal and can be used as general purpose output signal.

Signal P16 have an associated LED to indicate the activity, the LED works irrespective of jumper position.

JP7: This jumper controls the signal P17.

JP7 at position 1-2: This is the default setting for parallel port breakout board. This configuration routes the signal P17 to control the on board relay “RELAY-(17)” through PWM. However, in this position, output signal on terminal P17 isn’t available.
JP7 at position 2-3: This configuration routes the buffered signal P17 directly to its output terminal and can be used as general purpose output signal.

Signal P17 have an associated LED to indicate the activity, the LED works irrespective of jumper position.

LED INDICATORS:

P2, P4, P6 and P8: These LED glows when a step pulse is driven to motor drive of respective axis.

P3, P5, P7 and P9: These LED glows when a direction signal is driven to motor drive of respective axis.

P10-P13: The respective LED glows when an input is driven at terminal P10-P13.

ESTOP: This LED is dedicated for emergency signal and glows when an emergency input is driven at terminal P15.

CPGD: LED CPGD glows when an appropriate “charge pump” signal is detected on terminal P1 from the CNC software configured. This LED doesn’t glow if charge pump is kept disabled and the output is used as general purpose output.

LED associated with signal P14, P16 and P17 indicates the activity of respective signals.

STATUS: Status LED has three states:

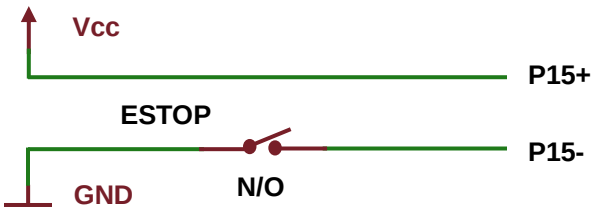
Fast Blink: When the power is connected to the board, this LED blinks fast.

Lazy Blink: When a PWM signal is available, this LED blinks lazy.

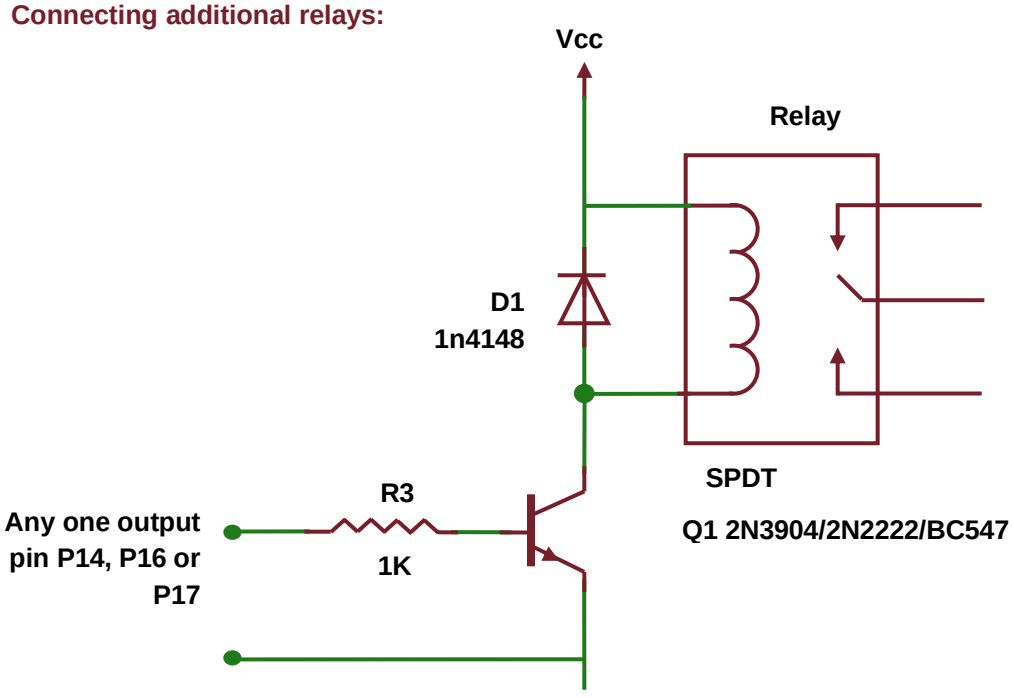
Continuous ON: This LED glows continuously when a valid PWM signal more than 10% is available.

EXAMPLE: INPUT/ OUTPUTS CONNECTIONS

Example Circuit for connecting emergency switch



Connecting additional relays:

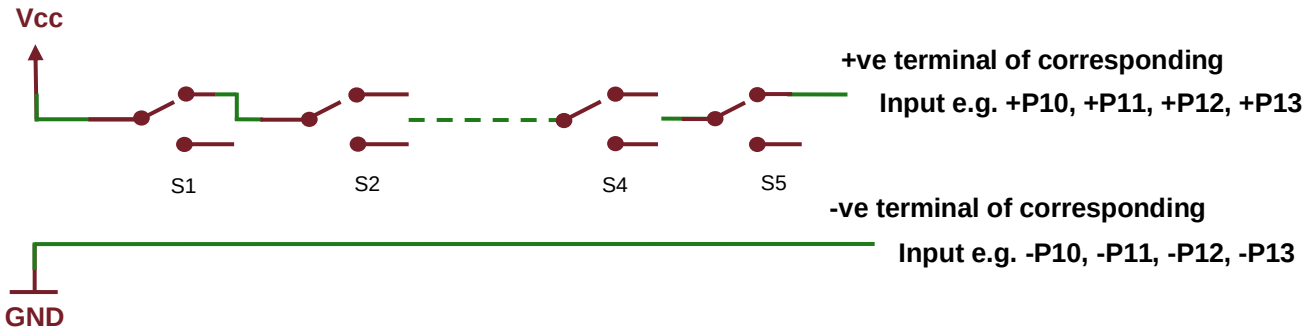


GND

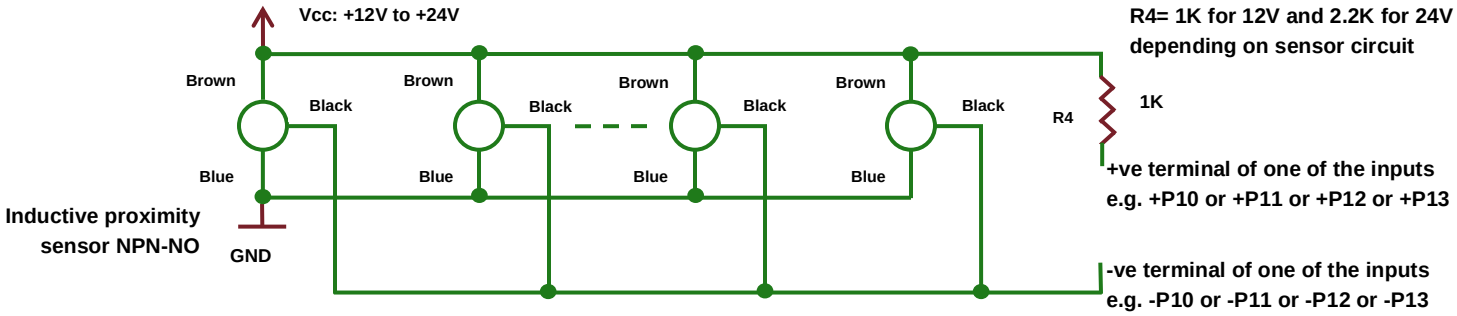
GND

Connecting multiple switches:

Example circuit for connecting multiple limit switches to one input terminal

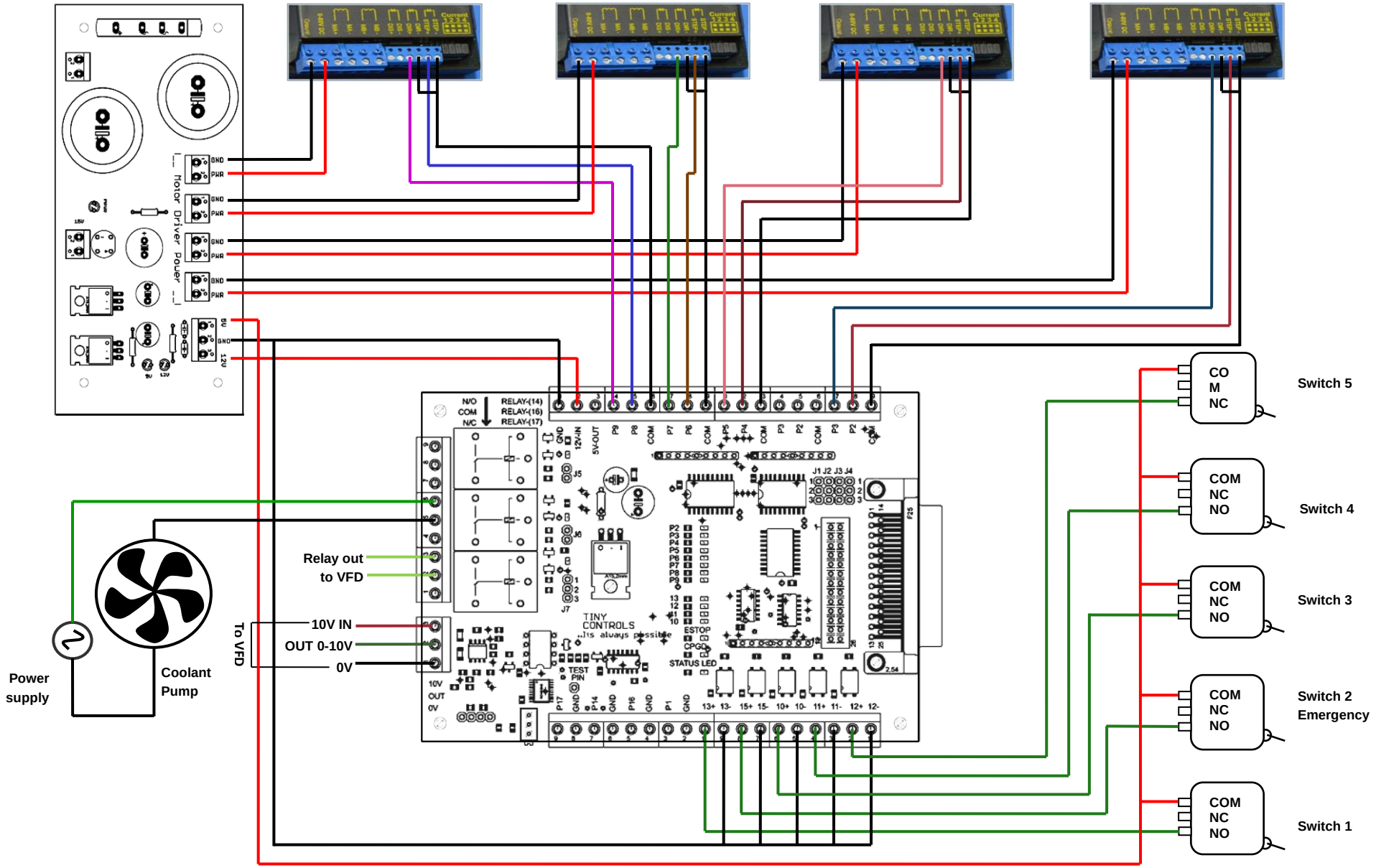


Connecting multiple switches:



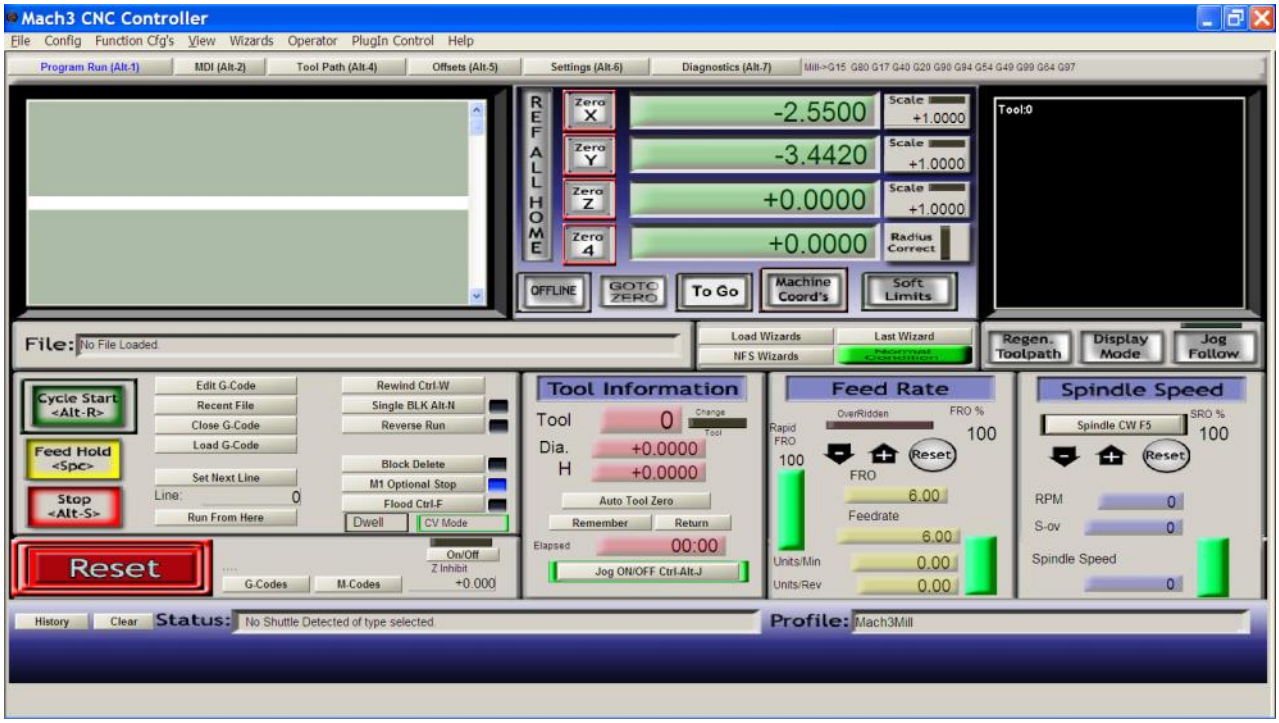
Note: The above example circuits are just suggestions and mayn't work with all kind of switches/ sensors voltages etc.

Connection diagram



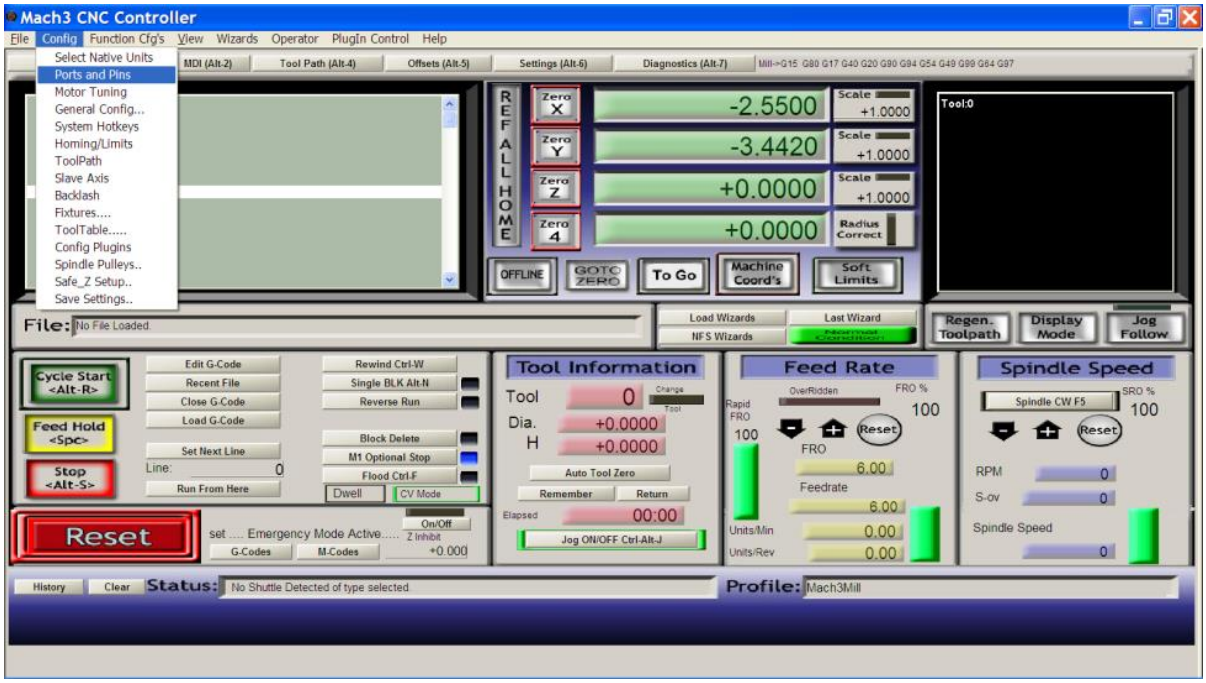
Example: Mach3 Configuration

Step 1: After installing “Mach3” software, run Mach3 Mill from desktop. Screen appears as below:

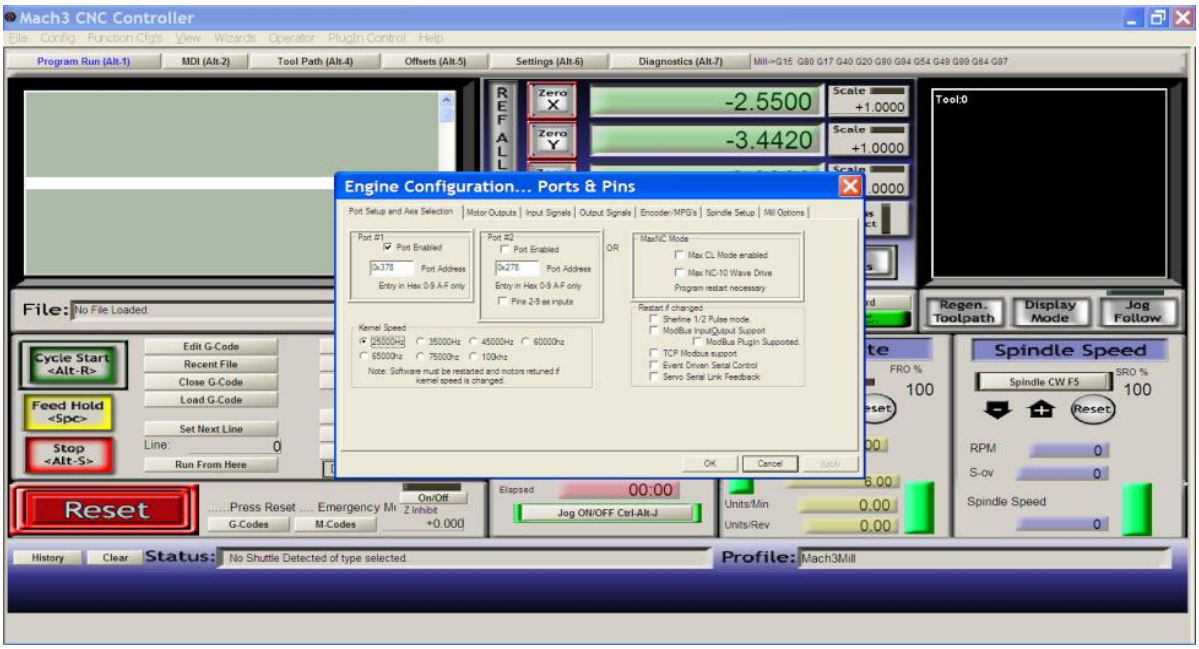


Step 2: To select the native units of choice, Select Config =>Select native unit. Press Ok if the message appears. Select units for “Motor setup” by clicking on option button and press Ok. Choose Inches for Imperial units.

Step 3: Configure ports and pins in Mach3. Select Config=> Ports and Pins.



Step 4: After step 3, a window appears. A screen for first tab “Port setup and Axis select” appears. If the port available on computer motherboard is to be used, standard address for this port is 0x378. But other addresses are sometimes used as well. This information is conveyed to Mach3 by selecting “Ports and Pins” under Config menu. Here is shown an example where the default “computer motherboard” is selected and standard address in 0x378.

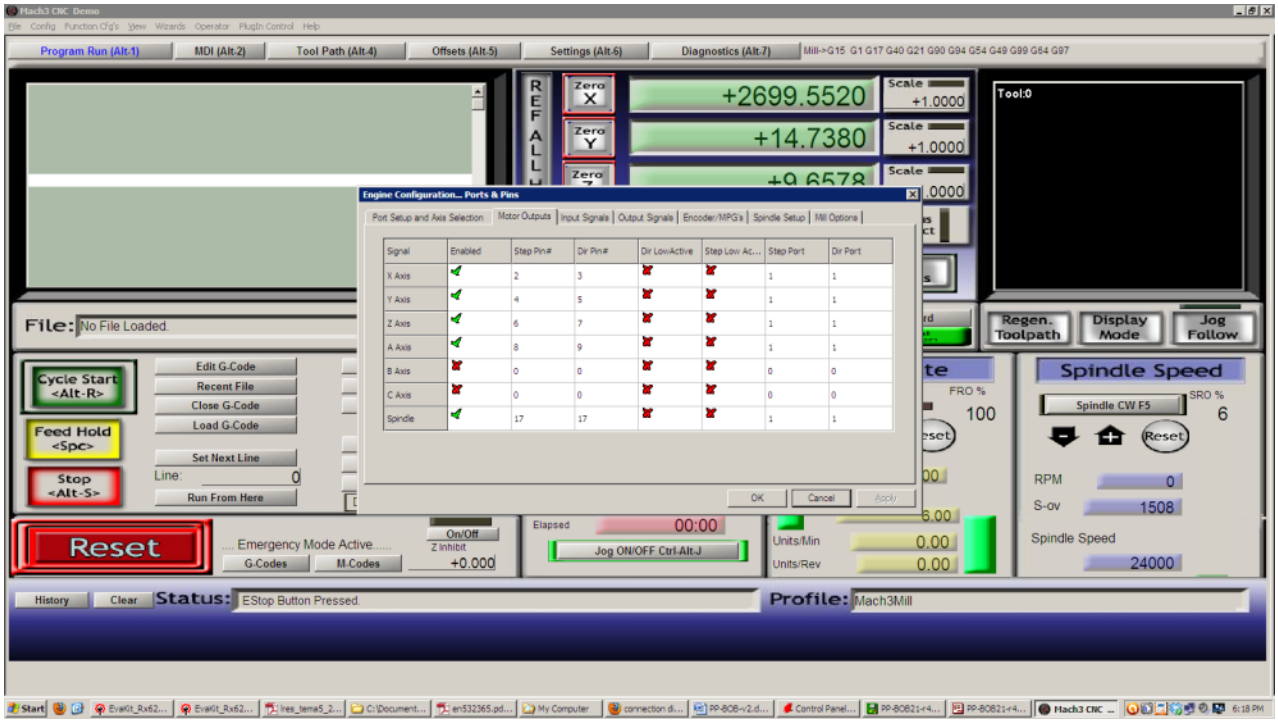


Step 5: Click on “Motor outputs” tab. Here is selected, number of motors needed to be controlled and to which pin in printer port, drives for all motors are to be connected. Make configuration as explained below in same sequence.

a. Enable X, Y, Z, A-axis and Spindle for **PP-BOB1-V2** by ensuring that there is a green checkmark in first column of those axes.

b. The second column sets pin to which the step input on our motor drive is connected. In this case, X-axis drive step input is connected to pin 2, Y to pin 4, Z to pin 6, A to pin 8 and spindle to pin 17.

c. The third column sets drive direction inputs. In this case, X-axis direction input is connected to pin 3, Y to pin 5, Z to pin 7, A to pin 9 and spindle to pin 17.



Note: It’s not mandatory to enable all four axes if not required, for example in case of lathe machine; only X and Z axes are needed to be enabled.

If one of the axis moves in reverse direction, user can correct it by ticking “Active Low” on corresponding “Dir low active”.

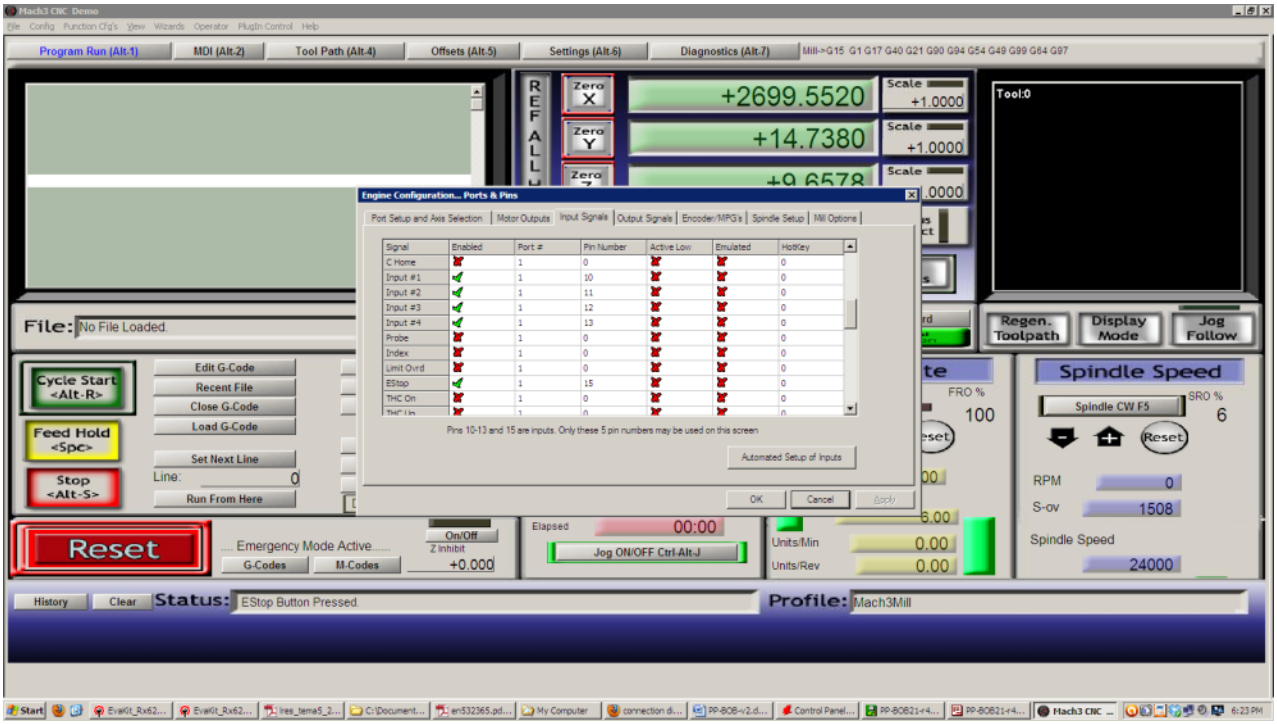
Step 6: Click on “Input signal” tab for configuring Input signals. Configure the following settings.

a. To enable the input terminals, enable Input# 1, Input# 2, Input# 3 and Input# 4.

b. Change pin numbers 10, 11, 12 and 13 respectively in pin number column.

Step 7: A good machine tool have an emergency stop button which if pressed, halts the machine movement in possible safest way to prevent the damage to machine and injury to operator.

This manual makes the user to pay attention how the Mach3 understand about the emergency button whether it has been pressed. Configure the emergency button as shown in following steps:



a. Config=> Ports and Pins=>Input signals.

b. Enable ESTOP enable by checking green checkmark.

c. In pin number column, make it 15.

d. Emulated can be ticked for test purpose (when physical switches are not attached).

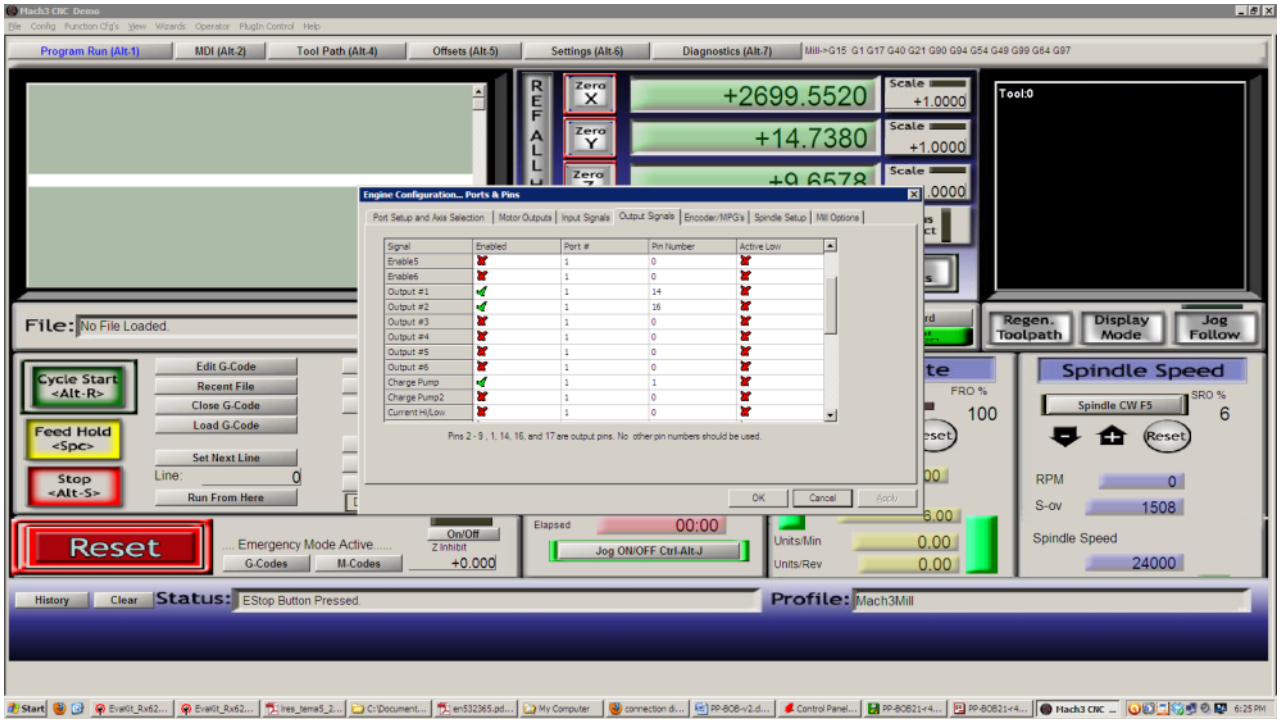
Step 8: Click on “Output signals” tab for configuring output signals. Configure the following settings.

a. To enable relays with J5 and J6, enable the output# 1 and output# 2.

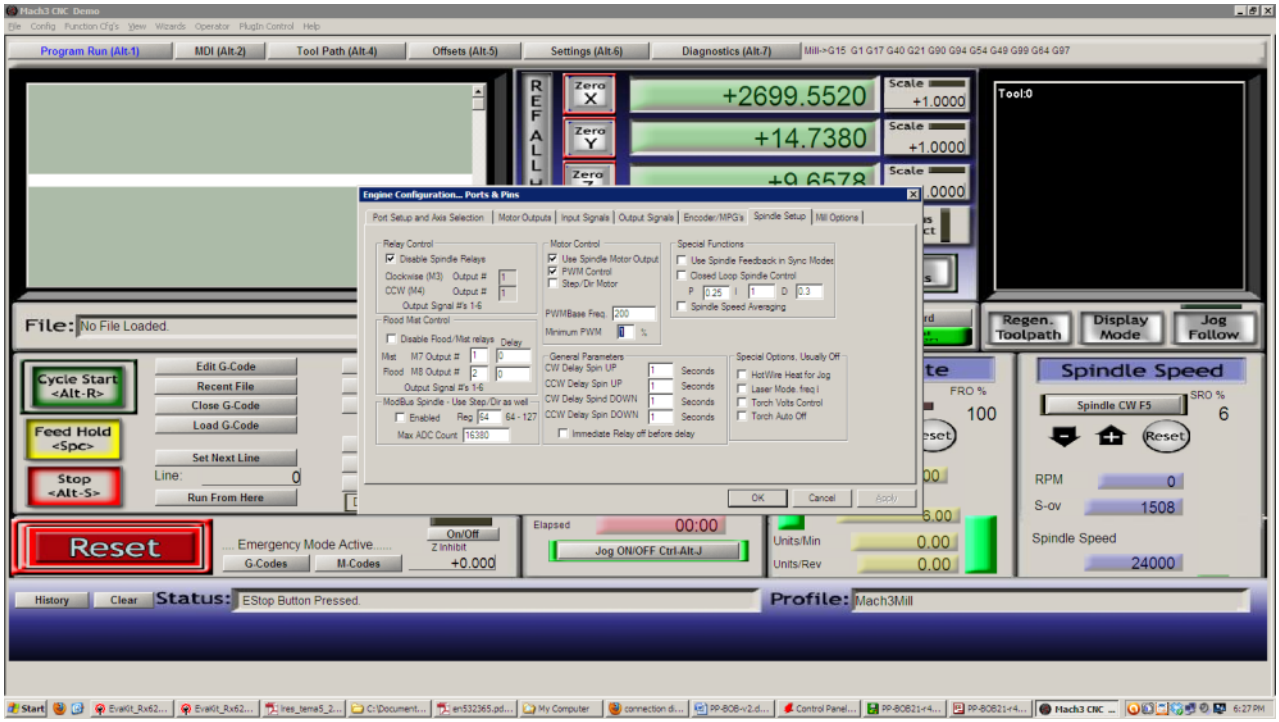
b. Change the pin number 14 for output#1 and pin number 16 for output# 2.

c. To enable charge pump, make charge pump enable and change pin number to 1.

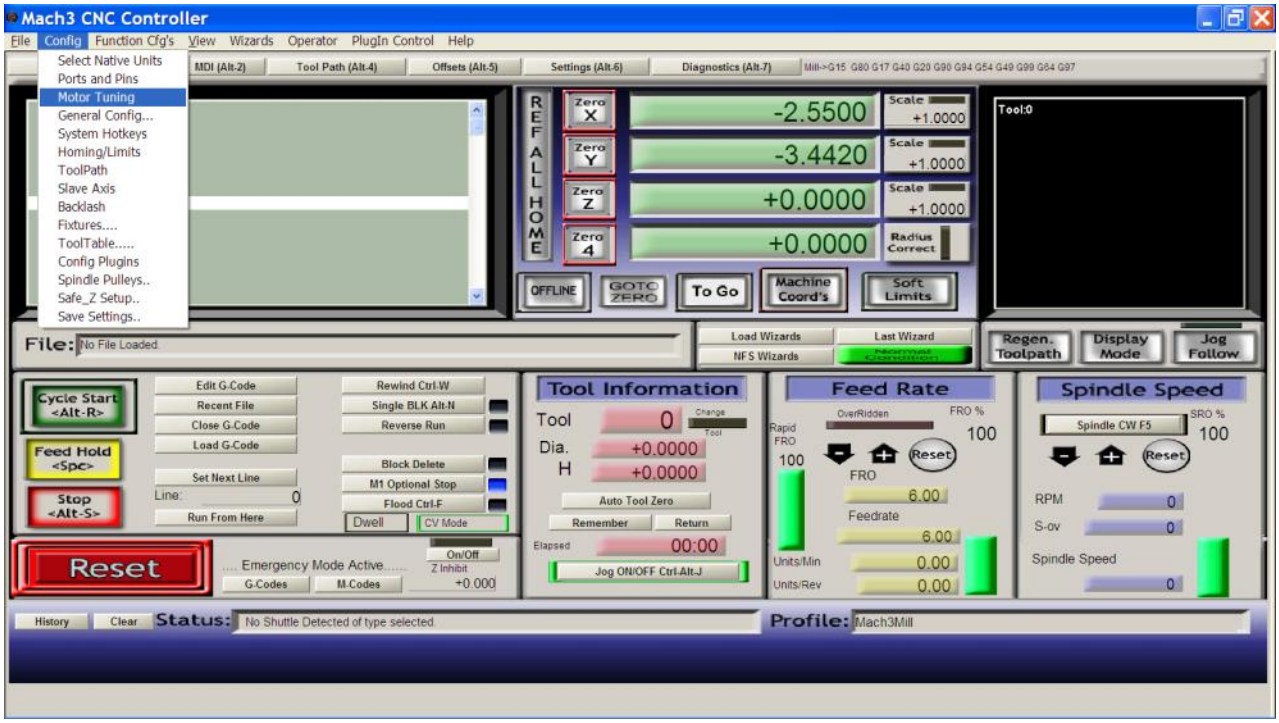
These steps are shown below:



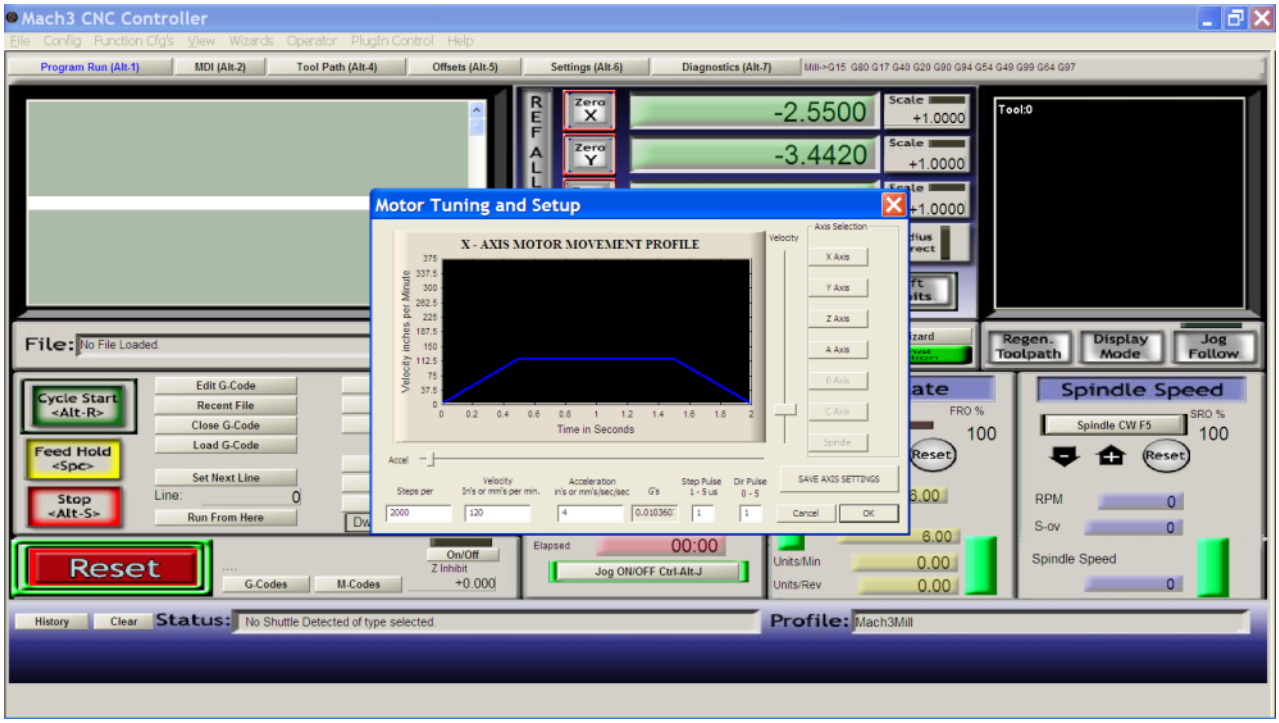
Step 9: Click on “Spindle setup” tab and note that on M3 and M4 commands, spindle moves in clockwise and anticlockwise directions respectively. Tick on disabled “Spindle relays” in relay control section, all this is to be controlled through PWM.



Step 10: Save all the configurations by clicking on Apply and then Ok button.



Step 11: Select Config=> Motor Tuning Config. Configure motor tuning parameter for each axis.



Press “Save axis settings” every time any parameter value is changed otherwise changes won’t be saved.