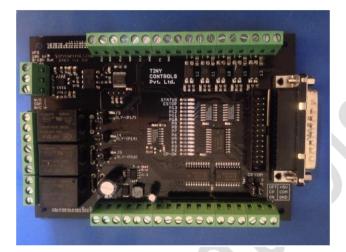


PP-BOB2-V2 PARALLEL PORT BREAKOUT BOARD



Document: Operation Manual Document #: T18 Document Rev: 1.0

Product: PP-BOB2-V2.0 Product Rev: 1.0 Created: October, 2015

THIS MANUAL CONTAINS INFORMATION FOR INSTALLING AND OPERATING THE FOLLOWING PRODUCT:

PP-BOB2-V2.0 PARALLEL PORT BREAKOUT BOARD

"TINY CONTROLS" AND THE TINY CONTROLS COMPANY'S LOGO ARE COPYRIGHTS OF TINY CONTROLS PVT. LTD. OTHER TRADEMARKS, TRADE NAMES, AND SERVICE MARKS OWNED OR REGISTERED BY ANY OTHER COMPANY AND USED IN THIS MANUAL ARE THE PROPERTY OF THEIR RESPECTIVE COMPANIES.

TINY CONTROLS PRIVATE LIMITED C-55, NISHAT PARK, KAKROLA MOR, NEW DELHI, INDIA – 110078 WEB: http://www.tinycontrols.com PHONE: +91-991-119-3210

CONTENTS

1. PARALLEL PORT BREAKOUT BOARD INCLUDES	3
2. GENERAL DESCRIPTION	3
3. SPECIFICATIONS	4
4. BREAKOUT BOARD TERMNALS	5
5. CONNECTING OUTPUTS	6
6. CONNECTING INPUTS	6
7. JUMPER SETTINGS	7
8. LED INDICATORS	7
9. EXAMPLES: INPUT/ OUTPUT CONNECTIONS	8
10. CONNECTION DIAGRAM	10
11. MACH3 CONFIGURATION EXAMPLE	11

In the following pages, PP-BOB2-V2.0 "Parallel Port Breakout Board" is termed as Breakout Board or simply BOB.

PARALLEL PORT BREAKOUT BOARD INCLUDES

1. Breakout Board

2. Cable wire with DB-25 Connector

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 Breakout Board (BOB) translates signals between CNC machines and PC signals and isolate PC motherboards from electrical problems. The BOB gives step and direction outputs to steppers for 4 axes of CNC. The outputs for X- axis are buffered twice and received from two different connectors to make card useful for gantry style machines. All the outputs are buffered and received through screw terminals from card.

These outputs can be received in Pull up or Pull down states and motor Common output signal can be set 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 charge pump is provided for safety of card. It is jumper configurable and it can be operated from frequencies 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 with 24V are filtered for noise ensuring that there is no 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.

A DB-25 connector and 26 pin box header is provided on the board making its connections with PC easy.

TECHNICAL SPECIFICATIONS

Contents	Specifications
Communication terminals	Parallel port terminal for connection with PC & 26 pins box header
Axes	4 axes and X- slave
Axes drive control type	Step/ Dir
Digital outputs	14
Digital inputs	5
Analog output (0-10V) isolated	1
Test Output	4khz signal
Relay	3
Supply voltage	24V DC
Max Power Consumption	24V/ 0.5A
Ambient temperature range	0°-55° C
Dimensions	135x95
Weight	40g

BREAKOUT BOARD TERMINALS

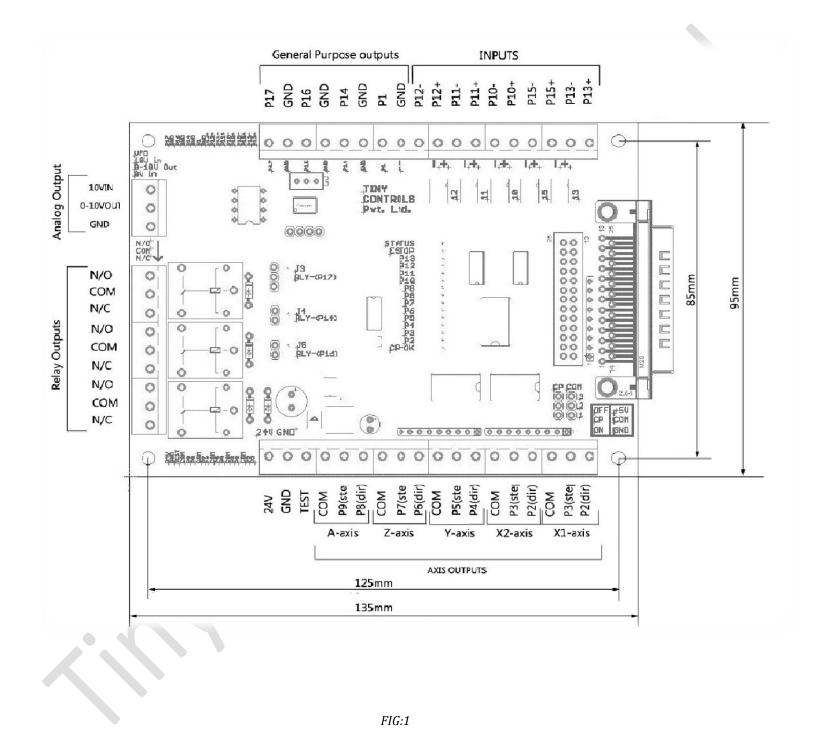


FIG:1

5

CONNECTING OUTPUTS:

Axes outputs:

PP-BOB2-V2.0 has dedicated Step, Dir and COM outputs for four independent axes named as X, Y, Z and A-axis. The X-axis outputs are double buffered, named as X1 and X2 and received through two individual terminals allowing easy connection to two motors on the same axis. This type of "**Hardware slaving**" of motors is used in gantry style machine design when two motors are used on the same axis. In total, there are five 3 pins terminals connectors with signal Com, Step and Direction. These are tied to parallel port signals as shown in figure *FIG:1.* However, for any system, if the outputs for any axis aren't used, then these outputs can be used for any purpose other than axis control. User can use these outputs as general purpose outputs.

Analog output 0-10V:

A 0-10V analog output signal goes directly to VFD to control the spindle. This circuit is completely isolated from rest of the 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.

Test:

Generates an output signal of frequency 4khz, for testing the stepper driver axis.

CONNECTING INPUTS:

Power supply:

Apply a supply voltage of +24V DC , make sure that polarity is correct.

Input terminals:

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

Signal P15 is dedicated to the emergency switch and the corresponding LED indicator "ESTOP" shows activity of this signal.

The example circuits mentioned further in the manual show how to wire different types of signals/ devices to board inputs.

JUMPER SETTINGS:

JUMPERS	POSITION 1-2	POSITION 2-3
Jumper1 (J1)	Charge pump on P1 enabled	Charge pump disabled
Jumper2 (J2)	COM output pulled down to ground (0v)	COM output pulled up to Vcc(+5v)
Jumper3 (J3)	P17 controls the Relay(P17) through PWM signal	P17 acts as general purpose output signal
	POSITION1-2(mounted)	POSITION1-2(removed)
Jumper4 (J4)	P14 controls the Relay(P14)	P14 acts as general purpose output signal
Jumper5 (J5)	P16 controls the Relay(P16)	P16 acts as general purpose output signal

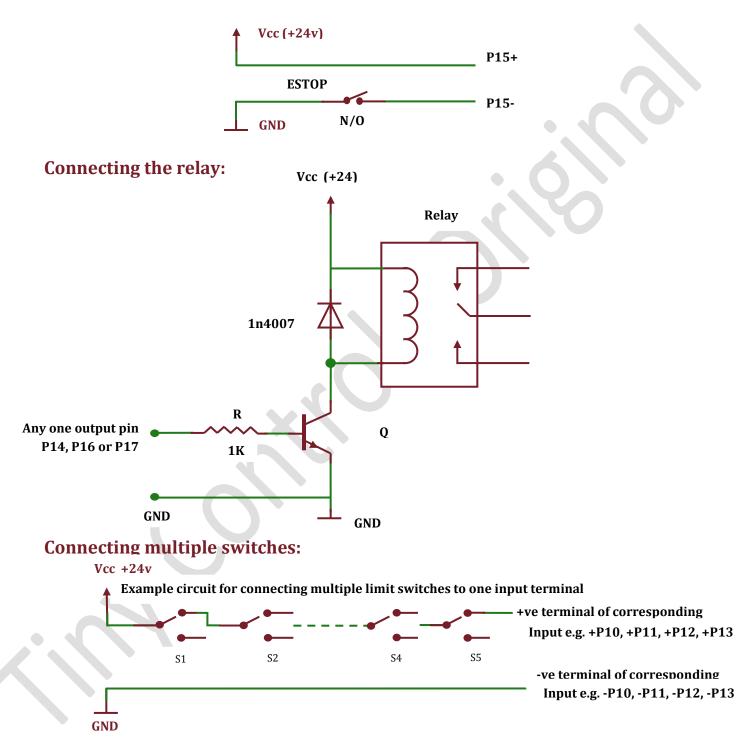
J1 at position 1-2:

When J1 is mounted at position 1-2, charge pump on P1 signal is enabled. 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. Charge pump works for frequency as low as 200Hz to more than 15 KHz.

LED INDICATORS:	
LED	FUNCTION
P2-P9	Indicates the activity of respective output terminal
P10-P13,ESTOP	Indicates the activity of respective input terminal
P14,P16,P17	Indicates the activity of respective signals
СР-ОК	Glows when an charge pump signal is detected at P1
	 Blinks fast if there is no PWM signal at P17
STATUS	 Blinks slow if an PWM of duty less 10% is detected
	 Glows continuously if detected PWM signal duty is
	greater than 10%

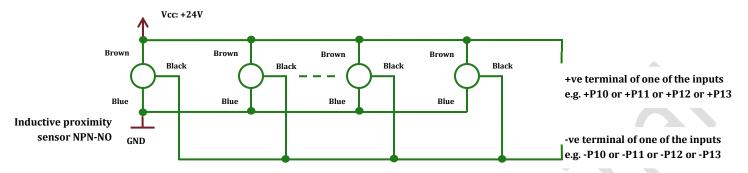
EXAMPLE: INPUT/ OUTPUTS CONNECTIONS

Example Circuit for connecting emergency switch



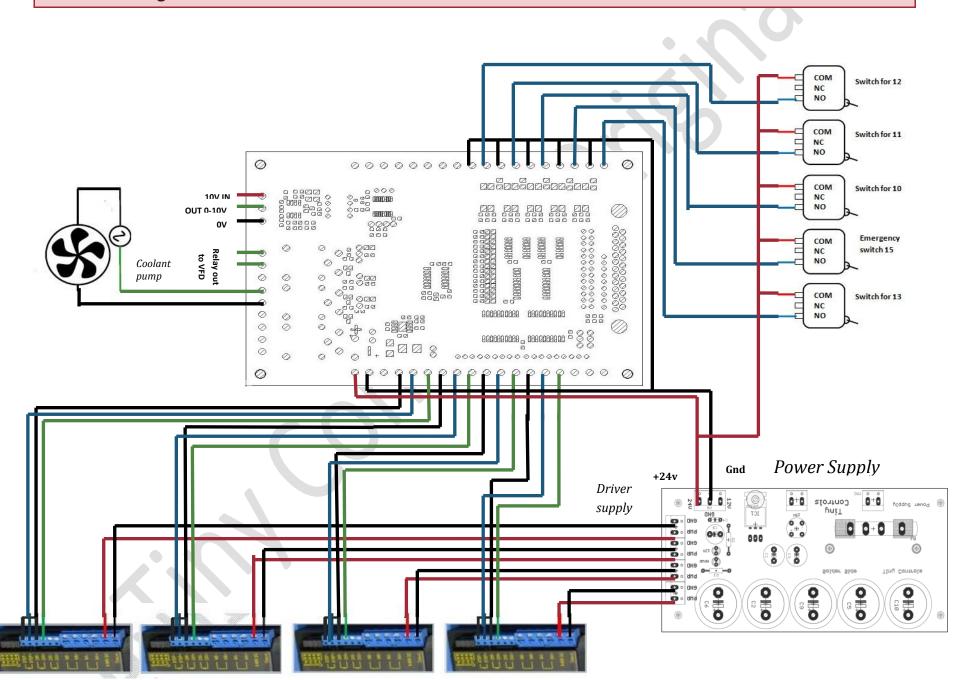
Connecting multiple switches:

<



Note: The above example circuits are just suggestions and may not work with all kinds of switches/ sensors voltages etc.

Connection diagram



Example: Mach3 Configuration

Step 1: After installing "Mach3" software, run Mach3 Mill from desktop.

Mach3 CNC Controller jle Config Function Cfg's View Wizards Operator PlugIn Control Help Program Run (Alt.4) MDI (Alt.2) Tool Path (Alt.4) Offsets (Alt.5)	Ettings (Alt-5) Disgnostics (Alt-7) MilliG 15 G80 G17 G40 G20 G94 G54 G49 G99 G84 G97
	Zero -2.5500 Scale 1.0000 A Zero -3.4420 Scale 1.0000 Y -3.4420 Scale 1.0000 Scale Y +0.0000 Scale 1.0000 Scale Y +0.0000 Scale 1.0000 Scale Y -0.0000 Radius Correct Correct PFLINE GOTC To Go Machine Soft
File: No File Loaded.	Load Wizards Last Wizard Regen. Display Jog NFS Wizards Chestelined. Toolpath Mode Follow Tool Information Feed Rate Spindle Speed
Cycle Start <alt-r> Recent File Close G.Code Reverse Run Load G.Code Block Delete Set Next Line M1 Optional Stop Stop Set Next Line Mun From Here Dwell</alt-r>	Tool Orange Rapid Coefficides FRO % Spindle CW FS 100 Dia. +0.0000 FRO 100 Tool 100 Tool 100 Tool Tool </td
Reset G.Codes M.Codes History Clear Status: No Shuttle Detected of type selected	Elapsed 00:00 Units/Min 0.00 Spindle Speed Units/Rev 0.00 Profile: Mach3Mil

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.

Config Function Cfg's	View Wizards Operator PlugIn Control	Help		
Select Native Units Ports and Pins	MDI (Alt-2) Tool Path (Alt-4) Of	Isets (Alt-5) Settings (Alt-6) Diag	nostics (Alt-7) Mill->G15 G80 G17 G40 G20 G90 G94 G54	G49 G99 G64 G97
Motor Tuning General Config System Hotkeys Homing/Umits ToolPath Slave Axis Backlash Fixtures Config Plugins Spindle Pulleys Safe Z Setup		R Zero R Zero L Zero H Z Zero E Zero GOTC TO GOTC TO	-2.5500 Scale +1.0000 -3.4420 Scale +1.0000 +0.0000 Scale +1.0000 +0.0000 Radius Correct Scale S	Too!0
Reset	Run From Here Dwell CV 1	N Tool 0 0 Dia. +0.0000 +0.0000 +0.0000 Auto Tool Zero Remember Return dode Return Return	Teel Rapid FRO Store FRO S	Regen. Display Mode Jog Toolpath Display Jog Follow Spindle Speed Spindle CW F5 100 RPM 0 S-ov 0 Spindle Speed 0
tory Clear St	atus: No Shuttle Detected of type selected		Profile: Mach3Mill	

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 the 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. Shown below is an example where the default "computer motherboard" is selected and standard address in "0x378".

Mach3 CNC Controller	
Elle Config Function Class View Wizards Operator Pl	
File: No File Loaded. File: No File Loaded. Feed Hold Stop Sto	Final Section Final Section Final Section Section Final Section Section Final Section Section Section Sectin Section
History Clear Status: No Shuttle Detected of	ype selected Profile: Mach3Mill

Step 5: Click on "Motor outputs" tab. Here, user can select the number of motors needed to be controlled and to which pin in printer port, drives for all motors are to be connected. Use the identical sequence as given below to configure.

- a. Enable X, Y, Z, A-axis and Spindle for **PP-BOB2-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.

🚱 Mach3 CIIC Demo											_ 8
Ble Config Function Cfg's Yew Wizards Operator PlugIn Control Help											
Program Run (Alt-1) MDI (Alt-2) Tool Path (Alt	4)	Offsets (Alt-5)	Se	ttings (Alt-6)	Diagr	ostics (Alt-	7) Mill	»G15 G1 G1	7 G40 G21 G90 G94 G54 G	49 G99 G64 G97	
		_			_	_	_	_	Scale		
		^	K E E	Zera X		+26	99.5	520	+1.0000	Tool:0	
			F					_	Scale		
			A	Zero	_	+	-14.7	380	+1.0000		
			L L			_	_	_			
	ingine Configur	ation Ports & I	lins	Zero			+9 6	578	× .0000		
	Port Setup and			ion e Sonais Ì O	utput Signals Encod	- MPCS Sa	inde Setun I 1	NI Ontinge I			
	Port Serop end			roor organity of	other off are Lineare	er ner or er i sp	non ontop [r	in opporte [ct		
	Signal	Enabled	Step Pin#	Dir Pin#		tep Low Ac	Step Port	Dir Port			
	X Axis	4	2	3	X 1	r	1	1	s		
	Y Axis	4	4	5	X 3	r	1	1			
File: No File Loaded.	Z Axis	4	6	7	x 1	r -	1	1	rd	Regen.	Display Jog
	A Axis	4	8	9	x 3	r	1	1		Toolpath	Mode Follow
Edit G-Code	B Axis	×	0	o	X 1	r	0	0	te	Sc	pindle Speed
Cycle Start <alt-r> Recent File</alt-r>	C Axis	×	0	0	X 1	r	0	0	FRO %		
Close G-Code	Spindle	4	17	17	¥ 3		1	1	100		pindle CW F5 6
Feed Hold Load G-Code									eset)		Reset)
Set Next Line											\bigcirc
Stop Line: 0									po	RPM	0
Run From Here						OK	Ca	ncel	ésply	S-ov	1508
		On/Off	Elapse	ed	00:0	0		_	6.00	Spindle S	Cread
Reset Emergency Mode Activ		Zinhibit		Jog Ol	N/OFF Ctrl-Alt-J		Units/Min	_	0.00	opinule	
G-Codes M-Cod	105	+0.000					Units/Rev		0.00		24000
History Clear Status: EStop Button Pressed.						_	Profi	le: Mac	:h3Mill		
						_					
🥂 Start 🕘 🚱 🙊 Evalót_Rx62 🖗 Evalót_Rx62 🏂 ires_tema5_2 😂	C:\Document	🔁 en532365.pd	🏠 My Co	mputer 🔡 :	connection di	PP-808-v2.d.	🦸 Contro	l Panel 🚼	PP-80821-r4 🖳 PP-808	21-74 🔞 Mach3	3 CNC 🕓 🕼 🛄 🎲 🛒 🔍 🐺 6:18 P

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 needed to be enabled. So disable the other axes.

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 to configure 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 has an emergency stop button which if pressed, halts the machine movement in the safest way possible to prevent any damage to machine and injury to operator.

This manual allows the user to pay attention to how the Mach3 understands the emergency button and whether it has been pressed. Use the steps given below to configure the emergency button:

Program Run (Alt.1) MDI (Alt.2) Tool Path (ai(4)	Offsets (Alt-5)	REFALL	Zero Y Zero	Diag	+	99.55 14.73	520 380	140 621 690 694 654 649 Scale +1.0000 Scale Scale Scale	5910 501:0	
	Engine Configura	tion Ports &	Pins						× 0000		
	Port Setup and A	xis Selection 1	Motor Outputs	input Signals Output	t Signals Enco	der/MPG's Spi	ndle Setup MI (Optione	et s		
	Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	-			
	C Home	×	1	0	×	×	0				
	Input #1	4	1	10	*		0		s		
	Input #2 Input #3		1	11	2	2	0				_
Le: No File Loaded.	Input #4	4	1	13	ž.	×	0		rd	legen. Display	Jog
	Probe	×	1	0	×	×	0		Te	olpath Mode	Follow
Edit G-Code	Index		1	0	*		0				
Cycle Start	Limit Ovrd EStop	-	1	0	¥	-	0		te	Spindle S	peed
<alt-r></alt-r>	THC On		1	0	x	×	0	-81	FRO %		SRO %
Close G-Code	THC IIn	*	1	0	×	*	0	-	100	Spindle CW F5	6
eed Hold Load G-Code		Pins 10-13 an	d 15 are inputs. (Only these 5 pin num	ers may be used	on this screen			eset	B 🔂 Res	et
<spc> Set Next Line</spc>	-					Autom	ated Setup of Inp	uts			
	-								00	RPM	
<pre>stop Line: 0 <alt-s> Run From Here 0</alt-s></pre>							100	_		RPM	0
Run From Here	C					OK	Cance	400 <u>A</u> 00		S-ov 150	8
1		On/Off	Elapse	be	00:0	00		_	6.00		
Reset Emergency Mode Ac	tive z	Inhibit	1.0	Jog ON/C	FF Ctrl-Alt-J		Units/Min	_	0.00	Spindle Speed	
G-Codes M-	Codes	+0.000		oog one	TT CUTHICO	_	Units/Rev	_	0.00	2400	0
			-				ILLING PROPERTY				
istory Clear Status: EStop Button Presse	d.						Profile	e: Mach3	3Mill		

- 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, enable charge pump and change pin number to 1.

These steps are shown below:

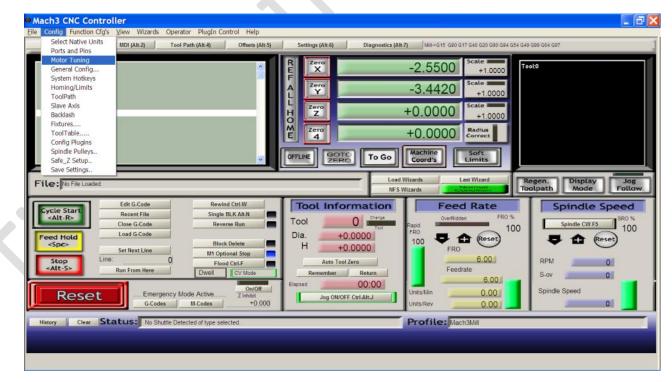
Hach3 GHC Denico Ble Config Function Ofg's Yew Weards Operator Plugtin Control Help Program Run (Alt-1) MDI (Alt-2) Tool Path (A	lt-4) Offsets ((Alt.5)	Settings (Alt-6)	Diagno	ostics (Alt.7)	ll≫G15 G1 G17 G40 G21	I G90 G94 G54 G49 (_1 599 G64 G97
		REFALL	Zera X Zera Y	_	+2699.5	Scale	1.0000	0!0
	Engine Configuration P	orts & Pins			÷ d P	×	.0000	
	Port Setup and Axis Select	tion Motor Outputs		utput Signals Encoder.	/MPG's Spindle Setup		rs ct	
		Enabled	Port #	Pin Number	Active Low	•		
	Enable5	¥ ¥	1	0				
	Enable6 Output #1	4	1	0	5		s	
	Output #2	2	1	16	2	-		
File: No File Loaded.	Output #3	¥	1	0	2		rd R	egen. Display Jog
Tite . No File Loaded.	Output #4	X	1	0	×	-	То	olpath Mode Follow
	Output #5	X	1	0	¥			
Edit G-Code	Output #6	X	1	0	×		te	Spindle Speed
Cycle Start <alt-r> Recent File</alt-r>	Charge Pump	4	1	1	*	- 2	FRO %	SR0 %
Close G-Code	Charge Pump2	X.	1	0		-8		Caladia CIM FE
Feed Hold <spc> Set Next Line</spc>	Current Hi/Low Pins 2	1.7		o other pin numbers sho	uld be used.		eset 100	spinale (WF3 6
Stop Line: 0							00	RPM 0
Alt-S> Run From Here		_				ancel <u>Acciv</u>	6.00	S-ov 1508
Reset Emergency Mode Act	ve Z Inhibit	Off Elap	sed	00:00	Units/Mit	n ()	0.00	Spindle Speed
G.Codes M.Co		.000	Jog O	N/OFF Ctrl-Alt-J	Units/Re		0.00	24000
History Clear Status: EStop Button Pressed					Prof	ile: Mach3Mill		

🐮 Start 🕘 🕝 🙊 Exel (24.52...) 🙊 Exel (24.52...) 💯 Hey Ganes, 2.... 🖸 Cliptocament...) 💆 Hey Scale 4...) 🍛 Hy Computer ...) 🔮 connection d...) 😢 199-806-12.d...) 🧟 Control Panel...) 🚇 199-80511-4...) 👰 199-80511-4...)

Step 9: Click on "Spindle setup" tab. Please 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.

© Hach Chill Decimine Bie Config Function Clig's tyrew Weards Operator Plugh Control Help Program Run (Alt.1) MDI (Alt.2) Tool Path (A	It.4) Offsets (AIt.5) Settings (AIt.6)	Diagnostics (Ait.7) Mill-015 01017 +2699.5520 +14.7380 +9.6578	G40 G21 G90 G94 G54 G49 G99 G84 G Scale +1.0000 Scale +1.0000 Scale	27 27
File: No File Loaded. Cycle Start Recent File Close G.Code Stop Stop Line: O Run From Here Reset Emergency Mode Act G.Codes M.C.So	Explane Configuration Furth & Pres Point Serup and Avia Selection Motor Outputs Imput Signals Output Signals Imput Deals Sonder Relays Imput Signals Output Signals Output Signals Output Signals Imput Deals Sonder Relays Imput Signals Imput Signals Imput Signals Output Signals Imput Deals Relays Imput Signals Imput Signals Imput Signals Imput Signals Imput Deals Relays Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Imput Signals Impu Signals	ali Encoder/MRB Sonde Setue MI Optione Secola Functions Use Sonde Feedback in Sync Mode Deck Loop Sonde Circle P [D321 1 1 1 1 2 2 2 1 1	6.00	Spindle Speed Spindle CW F5 56 SRO % 6 C C C C C C C C C C C C C C C C C C C
History Clear Status: EStop Button Pressed		Profile: Mach		часаз сис 🖓 🖉 🖗 6:2794

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.

Mach3 CNC Controller
Program Run (Alt-1) MDI (Alt-2) Tool Path (Alt-4) Offsets (Alt-5) Settings (Alt-5) Diagnostics (Alt-7) Mill->G15 G80 G17 G40 G20 G94 G54 G49 G99 G84 G97
R Zerro -2.5500 Scale Toold A Zerro -3.4420 \$cale +1.0000 \$cale +1.0000
Motor Tuning and Setup
File: No File Loaded Edit G-Code Cycle Start Edit G-Code Stopp 0 </td
On/Off Elapsed O0:00 Outs Min O.00 Spindle Speed G.Codes M.Codes +0.000 Jog ON/OFF Ctrl.Alt.J Units/Min 0.000 Spindle Speed
History Clear Status: No Shuttle Detected of type selected

Press "Save axis settings" every time any parameter value is changed else any changes made by the user won't be saved.