Sound Logic Spindle Speed Control

Rev 2 NOTE: This document is only for Mach3

The spindle speed control accepts step and direction signals form Mach3 and converts the step signals to a 0 to 5 volt or 0 to10 volt analog (DC) signal for driving a VFD, or DC motor drive. Warning VFDs analog in ground is not at earth potential , in fact it is often greater that 300 volts. The spindle speed control board uses an isolated power supply and an analog optical isolator to provide the necessary safety for the installer and operators well protecting the electronics.



Set up and Adjustment:

Do not connect the spindle speed control board to the breakout board while power is applied to the breakout board.

The first thing to do is configure Mach3 to provide the step and direction signals on the proper pins. Mach3 also needs to be setup to output the step frequency range.

Refer to the screen shots to configure Mach3. Spindle speed screen snapshots are available for download.

Here are some of the important settings.

Ports and Pins / Port setup, Spindle setup. Under Motor control, put a check mark in "Use Spindle Motor Output". Then check step and dir motors.

Under Pulley rations select pulley #4. Set the minimum to 100 and the maximum to 3600. Click on Apply then OK.

Engine Configuration Ports & Pin	S				
	puts Input Signals Output Sign	nals Encoder/MPG's	Spindle Setup	Mill Options	1
Relay Control Disable Spindle Relays Clockwise (M3) Output # 1 CCW (M4) Output # 1 Output Signal #'s 1-6 Flood Mist Control Disable Flood/Mist relays	Motor Control	Pulley Ratios Current Pulley Set Pulley Ratio #1 Pulley Ratio #2 Pulley Ratio #3		Max Speed 512 1024 2048 3600	RPM
Mist M7 Output # 2 Flood M8 Output # 3 Output Signal #'s 1-6 ModBus Spindle - Use Step/Dir as well Enabled Reg 64 64 - 127 Max ADC Count 16380	General Parameters CW Delay Spin UP 1 CCW Delay Spin UP 1 CW Delay Spind DOWN 1 CCW Delay Spin DOWN 1 Immediate Relay off before	Seconds Seconds Seconds Seconds	ecial Functions Laser Mode, fre Use Spindle Fe Closed Loop Sp P 0.25 1 Spindle Speed.	edback in Sync bindle Control	Mode:
			ок	Cancel	Apply

Ports and Pins output signals, Set output #1 to port 1 pin 1. Output #2 to port 1, pin 14. Click on apply.

					1		
Signal	Enabled	Step Pin#	Dir Pin#	Dir LowActive	Step Low Ac	Step Port	Dir Port
X Axis	4	2	6	X	4	1	1
Y Axis	4	3	7	X	4	1	1
Z Axis	4	4	8	X	4	1	1
A Axis	4	5	9	X	4	1	1
B Axis	X	0	0	X	×	0	0
C Axis	X	o	0	X	X	0	0
Spindle	4	1	14	X	X	1	1

NOTE: The first two outputs are being used for the spindle speed control. This leaves you with one relay output plus the charge pump relay output.

Motor Tuning: Click on the Spindle option and set the Velocity to 540 and the steps per unit to 1,000. The acceleration can be set to 5000. The minimum Pulse width to 1 and the Direction to 0.



Once Mach3 is configured make sure the power is off to the breakout board.

1. Connect the cable provided with the spindle speed control to the breakout board and the spindle speed control board.

Do not connect the motor drive at this time.

2. Enter the Pulley Ratio four value into Mach3 spindle speed RPM DRO and press enter. (run screen shot). The example shows **3600**. For testing we used 3600. Once the spindle speed board it checked out and calibrated you can use a different spindle speed in Ratio 4 or set your maximum speed in another pulley speed and then make that pulley your current pulley.

Program Run Alt-1 MDI Alt2 ToolPath Alt4 Offsets Alt5 Settings	Alt6 Diagnostics Alt-7 Mill->	G15 G80 G17 G40 G20 G90 G94	G54 G49 G99 G61 G97		
	F Zero H Z +0 M Zero 4 +0	.0000 Scale .0000 Scale .0000 Scale .0000 Scale .0000 Scale .0000 Radius .0000 Correct Machine Soft	Tool:0		
File: No File Loaded. Load Wizards Last Wizard Regen. Display Jog Conversational Mode Follow					
Cycle Start Edit G-Code Rewind Ctrl-W Kalt-R> Recent File Single BLK Alt-N Close G-Code Reverse Run Load G-Code Block Delete Stop Set Next Line Line: 0 Run From Here Flood Ctrl-F Dwell CV Mode Reset G-Codes	Tool Information Tool 0 Dia. +0.0000 H +0.0000 Auto Tool Zero Remember Return Bapsed 00:00:00 Jog Ollioff Cul-Ak-J	Feed Rate FRO 6.00 F 6.00 F 6.00 Units/Rev 0.00 On:off Zinhibit +0.000 Lower Zini	RPM 0 S 3600 Increment 10 L (Loop)		
History Clear Error: Profile: SpindleM3					

- 3. Apply **power** to the breakout board. The Charge pump LED should come on.
- 4. Clip the ground lead of your volt meter to TP7 and the plus lead to Tp8.
- 5. Click on the Spindle Button on the Mach2 screen . The output 1 Led should come on.
- 6. Adjust VR3 for +5.00 vdc. If it doesn't adjust, make sure that your are adjusting Vr3.

Warning VFDs analog in ground is not at earth potential Makes sure the VFD is disconnected.

- 7. Move the meter ground probe to Tp2
- 8. Move the plus probe to TP1 to verify +12
- 9. connect the Plus probe to TP3 and adjust VR4 for +5.00vdc.

10. Move the plus probe to TP4 and adjust VR1 (Gain) for +5 vdc or +10 vdc which ever you drive requires.

- 11. Change the spindle speed DRO to 1800 and press enter.
- 12. the output will go to $\frac{1}{2}$ the value of step 10.
- 13. Change the spindle speed DRO to 100 and press enter
- 14. you will see the activity LED blinking.

15. Adjust VR2 full CW then CCW until the Run relay energizes Use an ohm meter between the center connector (COM) and NC on the RUN relay K1. It will show continuity when the RUN relay energizes. This sets the low speed cutoff. It can be set at the lowest speed you can safely run the motor. The motor will run much hotter at low speeds so keep this in mind when you adjust it. It can also be controlled in Mach2/config/logic/ low speed %.

16. This completes the set up and adjustments.

The drive has high voltage at the connection points so **BE CAREFUL!!!**

Power every thing down, computer, breakout board and the VFD for safety.

Connecting the drive:

The drive has high voltage at the connection points so BE CAREFUL and remove power from the drive!!!

There are more than one way that manufactures set there VFDs up.

The analog is simple, just connect the SPD output of the spindle speed board to the analog input of the drive. The GND will connect to the analog ground.

The direction and start/runs is where the difference is.

Some drives start as soon as they receive a direction signal , normally a FWD and REV input to the drive. Others you set the direction with the FWD and REV input that give a start/run signal.

If your drive starts to run when the direction signals are applied, install the jumper JP1 on the spindle speed control PCB. The board is normally shipped with the jumper installed.

Connections:

DIR terminal block

NC to Fwd of the drive

NO to REV of the drive

LEAVE COM OPEN. The ground to your drive will come from the Com screw terminal on the Run terminal block. Internally the Com terminal on the Dir terminal block is connected to the normally open terminal on the Run terminal block.

The Run terminal block

NC in open NO to start or Run input to the drive Com to the GND input of the drive

If your drive requires the start/run signal as well as the direction signal

Remove Jumper JP1 on the spindle speed control board. (place it on one of the pins to keep it with the drive PC board.

Connections:

DIR terminal block:

NC to Fwd of the drive NO to REV of the drive Com to the GND input of the drive

The **Run** terminal block:

NC in open NO to start or Run input to the drive Com to the GND input of the drive If you find another configuration please let me know and we will help you get it wired.

The Sound Logic Spindle Speed board can be used with other breakout boards.

NOTE: The spindle speed board can be run from any breakout board that can supply power (15 to 24 VDC) to J6 and step and direction signals to J4.

External power: J6 + = 15 to 24vdc - = ground

External step and dir signals: J4

StepParallelGndParallel port groundDirParallel