

B1-Variable Speed Control V1 (B1-VSC-V1)



<http://www.cncdoctor.co.uk>



1. Overview

A Variable frequency drive or inverter works by modifying the frequency of AC motors. You can control many of these with an external analogue signal (0-10V DC). If this board (B1-VSC-V1) outputs 5v the motor will run at 50% of the full speed, if it outputs 10v the motor will run at 100% of full speed. If there is no input signal the analogue output will go to 0v and the motor will stop.

2. Features

- *A step input is converted in to a 0-10V analogue output.*
- *Opto-isolated step input signal.*
- *On board Isolated supply. This board can share a grounded power supply even on VFD's (Variable Frequency Drives), DCMSC (DC Motor speed controllers) or inverters that have a 0-10V input signal at mains potential (e.g. non isolated input signal).*
- *A precision potentiometer for fine tuning the output voltage.*
- *An input frequency from 0-25 KHz with a Minimum on-state pulse width of 3uS will deliver an analogue 0-10V output for controlling a VFD (variable frequency drive).*

3. Safety notice

Be careful when wiring up any device that is 110V or greater. Always disconnect the device and wait 60 seconds or greater before touching the terminals. Please don't rely on this unit to stop the VFD, Inverter drive etc. use other means of isolating the drive by the use of a relay/contacter on it's power supply or run signal.

4. Tips

I recommend that you first get the drive and motor working with a potentiometer before you connect this board, you may need to tune your drive to suit the motor being driven. It is much better to do this before you install the B1-VSC unit to avoid confusion when setting up.

5. Configuring Mach

Go into “Mach 3” ->” Config”->”Engine Configuration.... Ports & Pins”->”Spindle Setup”

In the Motor Control column

- Tick Use Spindle Motor Output
- Tick Step/Dir Motor
- Apply these changes

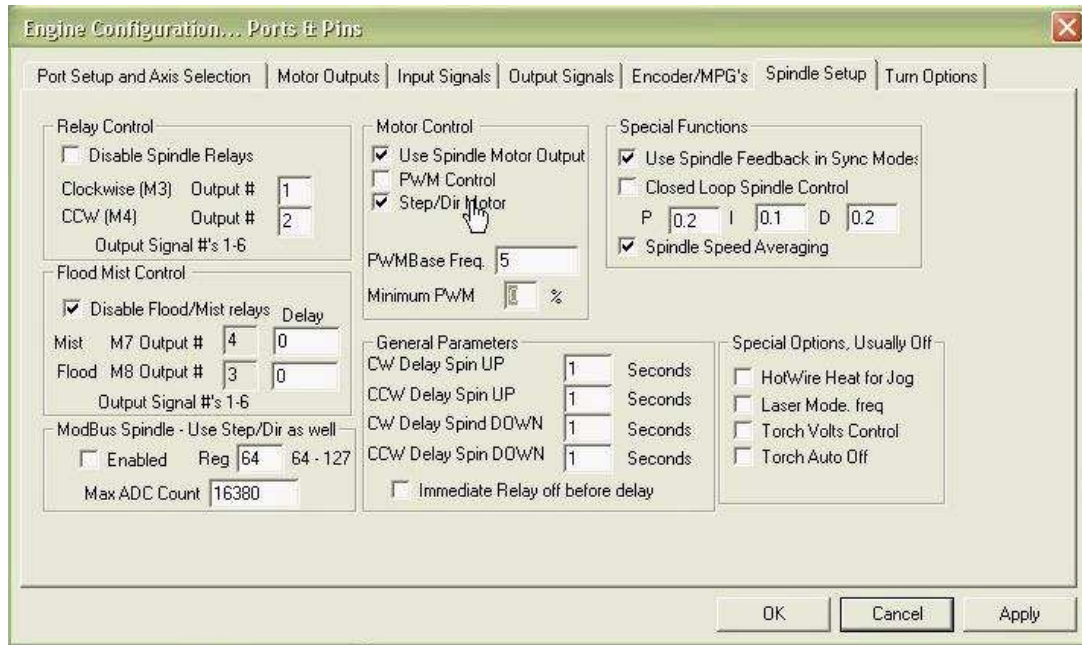


Fig. 1. Spindle Setup screen shot.

Go into “Mach 3” ->” Config”->”Engine Configuration.... Ports & Pins”->”Motor Outputs”.

- Enable the spindle signal with the check box
- In the step box select the pin you want to use (this will be the pin that supplies the step signal to the B1-VSC).
- Set the step port
- Apply the changes



Fig. 2. Motor Outputs screen shot.

Go into “Mach 3” ->” Config”->” Motor Tuning and Setup”

- Select spindle.
- Enter 1000 in the steps per box (left hand side).
- Under Step pulse length use a number from 2 to 5 but start with 2. This number is directly proportional to the final voltage you will get from the analogue output. Note: Use this number and fine-tune pot (VR1) to adjust the voltage you want to get at max speed.
- Move the velocity slider to its maximum (to the top).
- For acceleration, choose the acceleration that you feel comfortable with.
- Save Axis Settings.

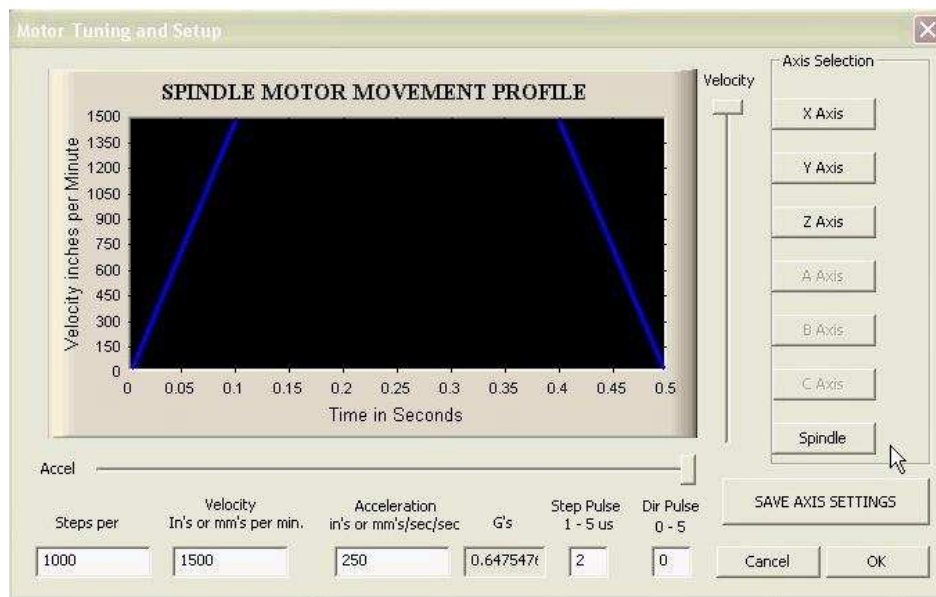


Fig. 3. Motor tuning screen shot

Spindle pulley setup

The final step is to tell Mach how fast the machine can go so it knows what speed to associate with the step pulses. You do this in the pulley configuration dialog.

- Go into “Mach 3” ->” Config”->”Spindle pulleys”
- Enter the minimum and maximum speeds.
- Press OK.



Fig. 4. Spindle Pulleys screen shot.

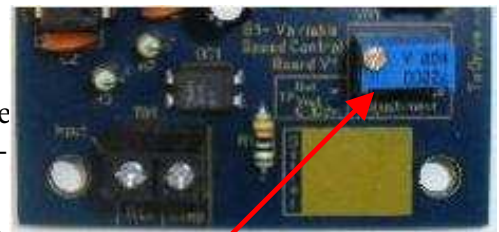
6. Wiring

After configuring Mach these are the following steps that should be followed.

- Step 1.** Make sure that all external power sources are set to **OFF**.
- Step 2.** Connect the power to the power inputs TB3.
- Step 3.** Connect the input signals to TB1. The step input needs a 25Khz signal to produce a 0-10V analogue output voltage.
- Step 4.** Turn the external power supplies on.
- Step 5.** Connect a DVM (Digital Volt Meter) between the analogue output and 0v.
- Step 6.** Start the spindle and adjust the speed using the controls on Mach screen or by using the MDI line e.g. type M3 and press enter then type S3200 and press enter. Use the fine tune pot to adjust the maximum output voltage.

Fig. 5. Fine-Tune potentiometer.

Make sure that when you reach the maximum speed in your control software you get 10V DC out on TB2. The voltage can vary depending on many things, including the electrical properties of your parallel port or breakout board, the length of step pulses that your control software is delivering and the normal hi or low status of the step pin.



Pot for fine-tuning the analogue output voltage.

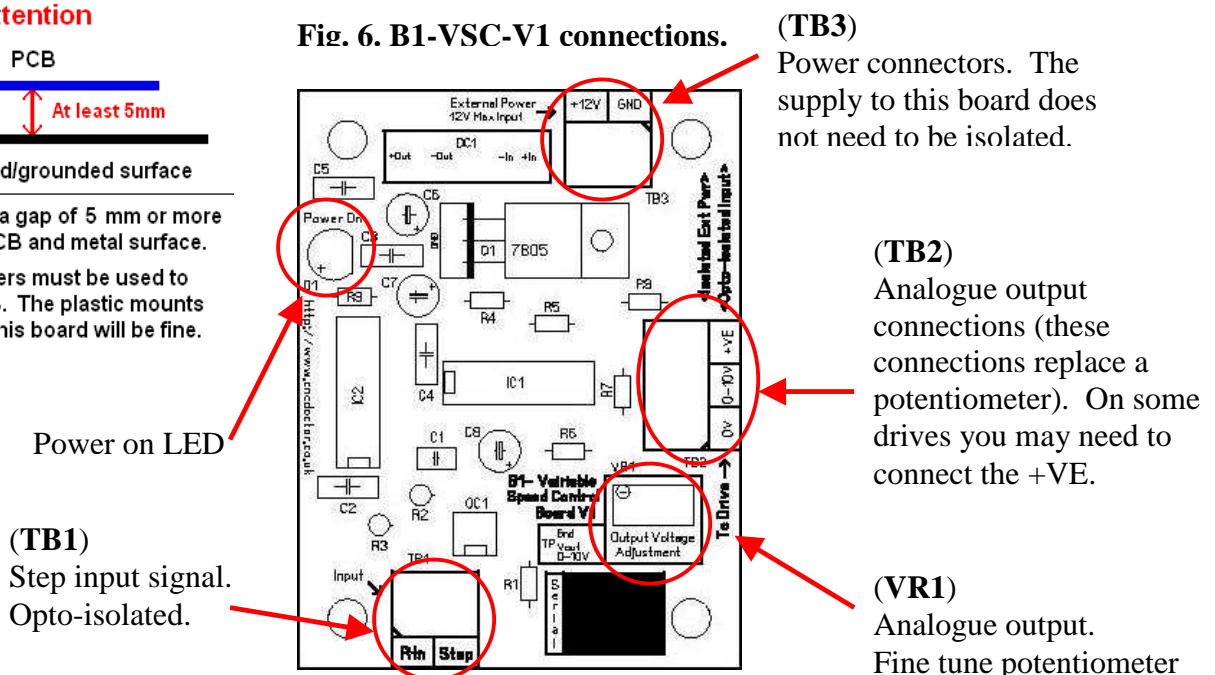
- Step 7.** Read your VDF's/Inverter drive manual thoroughly before connecting this board.
- Step 8.** Make sure that the supply is disconnected from your VDF before connecting this unit. If you are connecting this unit to a VDF that has been operated disconnect the supply and wait 60 seconds or greater before touching the terminals.

Attention

PCB

 At least 5mm
 Metal earthed/grounded surface
 There must be a gap of 5 mm or more between the PCB and metal surface. Insulated spacers must be used to mount the PCB. The plastic mounts supplied with this board will be fine.

Fig. 6. B1-VSC-V1 connections.



Replacing a potentiometer with the 0-10V circuit.

This unit can be used to replace a potentiometer on many types of motor speed control circuits. Measure the voltage between the reference voltage (P3) and GND (P1) on the potentiometer with a DVM (Digital Volt Meter). If this reading is between 10V-12V this will be fine.

- Remove the potentiometer.
- Connect +VE from TB2 to Reference Voltage (P3).
- Connect the 0V from TB2 to GND (P1).
- Connect 0-10V from TB2 to the wiper (P2).

P1 = GND

P2 = Wiper

P3 = Reference voltage

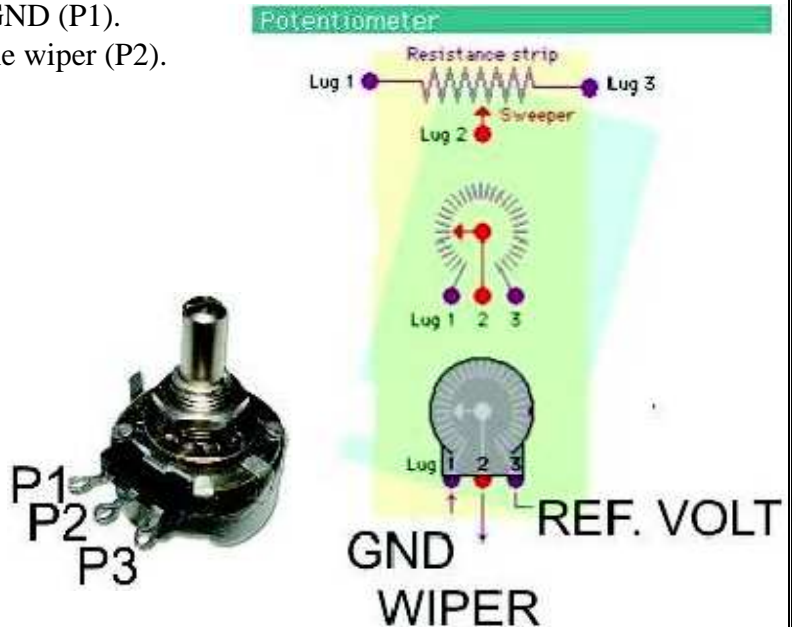
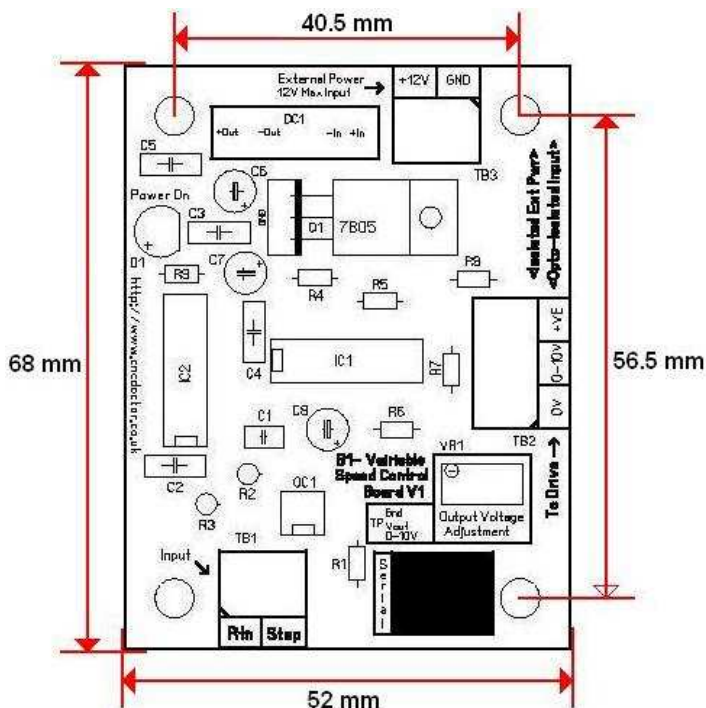


Fig. 7. Potentiometer connections.

Fig. 8. B1-VSC-V1 Dimentions.



Ratings

Maximum Supply (TB3)	Max 12V DC
Operating current	Max 30mA @ 12V DC
Polarity protection	None

Step input specifications	
On-state voltage range	3.5V to 5V
Minimum on-state current	8 mA
Maximum off state voltage	0.8 V
Maximum operating frequency	50Khz
Minimum on-state pulse width	3uS
Signal type	Active High

Disclaimer

Caution cnc machines are very dangerous in the wrong hands; CNC doctor is not liable for any accidents caused by improper use or incorrect connection of our devices. It is up to the operator to maintain his/her Health & Safety. We will not be responsible for damage to the parts of a cnc machine, robot etc. by the incompetents of the user. Devices from CNC doctor are not to be used on anything for life support. The products described here are manufactured under one or more U.K patents or patent pending CNC doctor reserves the right to manufacturer this product. Before placing an order, the user is cautioned to verify that information herein is current and believed to be accurate and reliable.

Please look at our terms & conditions on our website (<http://www.cncdoctor.co.uk>) before you purchase this item.

If you need any assistance please contact Jonathan
by email: jonathan.cncdoctor@yahoo.co.uk