Buildbotics Controller for Mega V XL

V1.0 (work in progress)

This is a quick setup of the buildbotics controller for the Mega V XL

This controller will replace the black controller box that comes with the Mega V XL

You can also order the Mega V XL without the controller for $400 less. (This is what I did)

https://buildbotics.com/product/113/buildbotics-cnc-controller#image-0

Buildbotics Controller INFO

No external computer needed
All control software included
Motor drivers are built in
No need for Mach 3 or LinuxCNC
Features
4 stepper motor outputs (up to 6A each)
Control and configure from your web browser
Gamepad manual control
Remote video monitoring (optional)
Wired or wireless, WiFi network
4 USB ports
2 Switched load outputs
8 Limit switch inputs
PWM & RS485 (VFD) spindle control
Z-axis probe interface
250k steps/second on each motor output
12 to 36 volt input
Up to 1/256th microstepping
S-Curve path planning
Understands all common GCodes
3D Visualization of GCode paths
Accurate ETA and time estimates
Free CAMotics GCode verification software
100% Open-Source

Included with purchase
The Buildbotics CNC Controller
A Logitech F310 gamepad for manual control
DB25 breakout box for easy access to all I/O
4 x 10-foot motor cables
1 x DC power supply cable
2 x load switch cable stubs

I purchased the following Power Supply from Buildbotics
Mean Well LRS-350-36 (36V, 350 watt power supply)

Optional

Mean Well LRS-350-36 36 Volt, 350 Watt Power Supply

Cable to connect to controller is included. Does not include an AC Power Cord

Connecting Motors to Buildbotics

You have two options for connecting the motors:

Option 1 – Cut aviation cables off motors and solder the wires to the supplied Buildbotics cables.

Option 2 – Buy aviation GX16 connectors and solder these to the supplied Buildbotics cables.

Now you can just plug the motor connectors into these connectors. (This is what I did)

Link to connectors

https://tinyurl.com/2w27nw5b

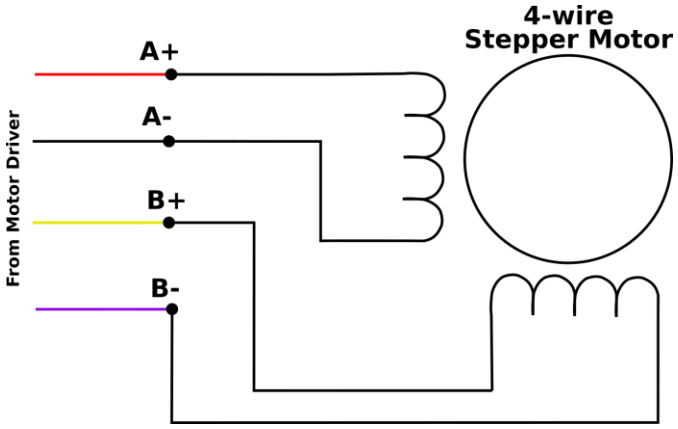
How to Wire Stepper Motors

Connecting a stepper motor to a Buildbotics CNC Controller requires properly connecting the four wires from the driver to the right wires on the motor. Unfortunately, stepper motors come in a variety of configurations and it is not always immediately obvious how to hook them up. There are several characteristics that make stepper motors different from one another.

The Buildbotics CNC Controller provides four motor driver outputs through the back panel on ports labeled M0(X), M1(Y1), M2(Z), M3(Y2)

Each output has four pins. The upper left pin is B+, the lower left is B-, the upper right is A-, and the lower right is A+. B- and B+ must drive one of the motor coils and A- and A+ must drive the other motor coil.

Buildbotics provides pre-made cables that connect to the driver outputs on one end. These cables are color coded such that the A+ wire is red, the A- wire is black, the B+ wire is yellow, and the B- wire is purple.



Connecting 4-wire motors

Connecting 4-wire stepper motors requires connecting A+ and A- to one of the motor coils and B+ and B- to the other motor coil.

The trick is figuring out which wires make up the coil pairs. Here's two ways to figure this out:

Find the documentation for the motor. Assuming you don't already have it, read the model number off of the motor and then search for it on the Internet. With a little effort, it is usually possible to get a datasheet for the motor. The datasheet will usually specify the wires by A+, A-, B+, and B-, or at least show which wires by color attach to which coils.

If you can't find the datasheet, but have an multimeter, measure the resistance between any two of the motor wires. If you measure a near short, then that pair makes up one coil, and the other two wires make up the other coil. If it is an open, then measure between the first wire and another wire and then to the fourth wire until you find a near short. Notice that I say near short because the coil is a long thin wire and has some resistance. Once the pairs are identified, then arbitrarily assign one pair as "A" and the other as "B" and arbitrarily assign one wire as "+" and the other as "-" within each pair. Then connect the wires as shown. There is a 50% chance that the motor will turn backwards when connecting this way. If it does turn the wrong way simply click the reverse box in the motor settings or rewire the connector.

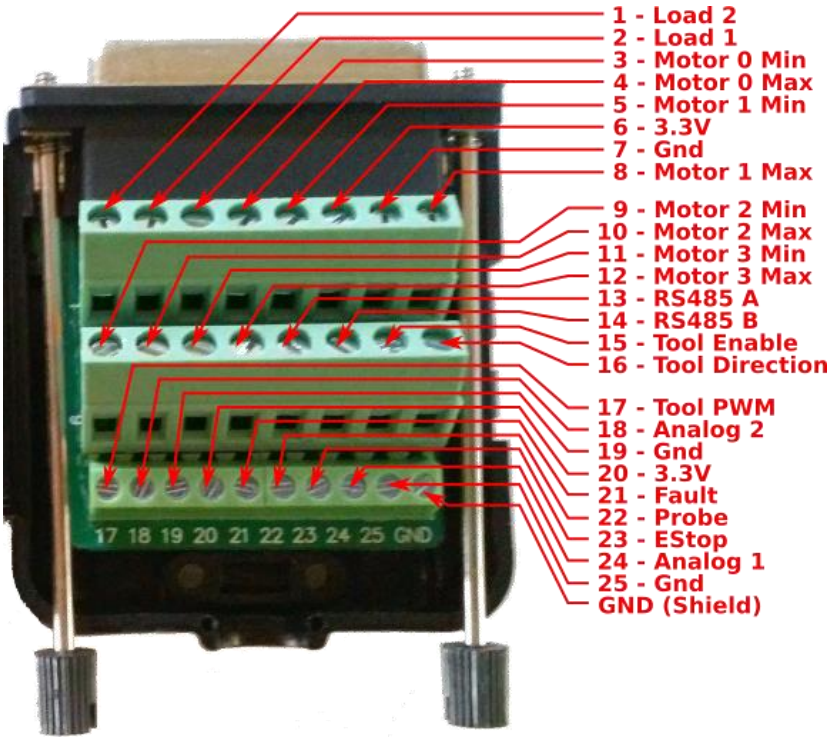
INSERT PICTURES OF MY CONNECTORS WIRED UP HERE

Connecting the homing switches

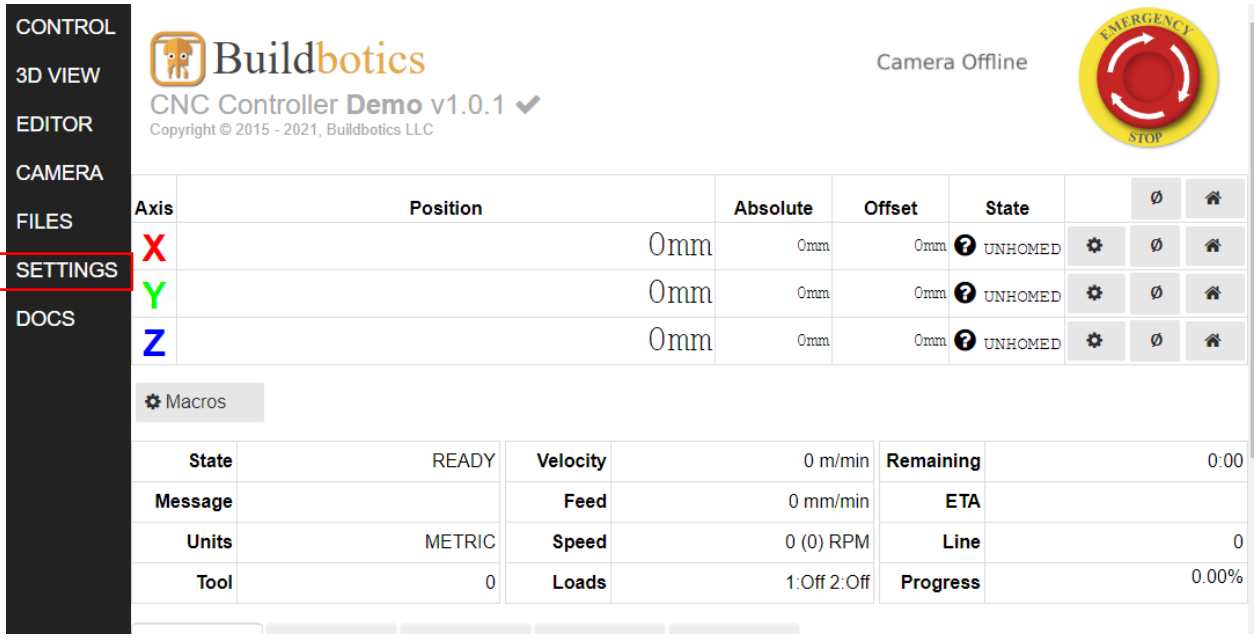
I placed my homing switches in the following locations
X= default location - left side of the gantry as viewed from the front (X min)
Y= front left of the machine (Y min)
Z= default location – top of Z (Z max)

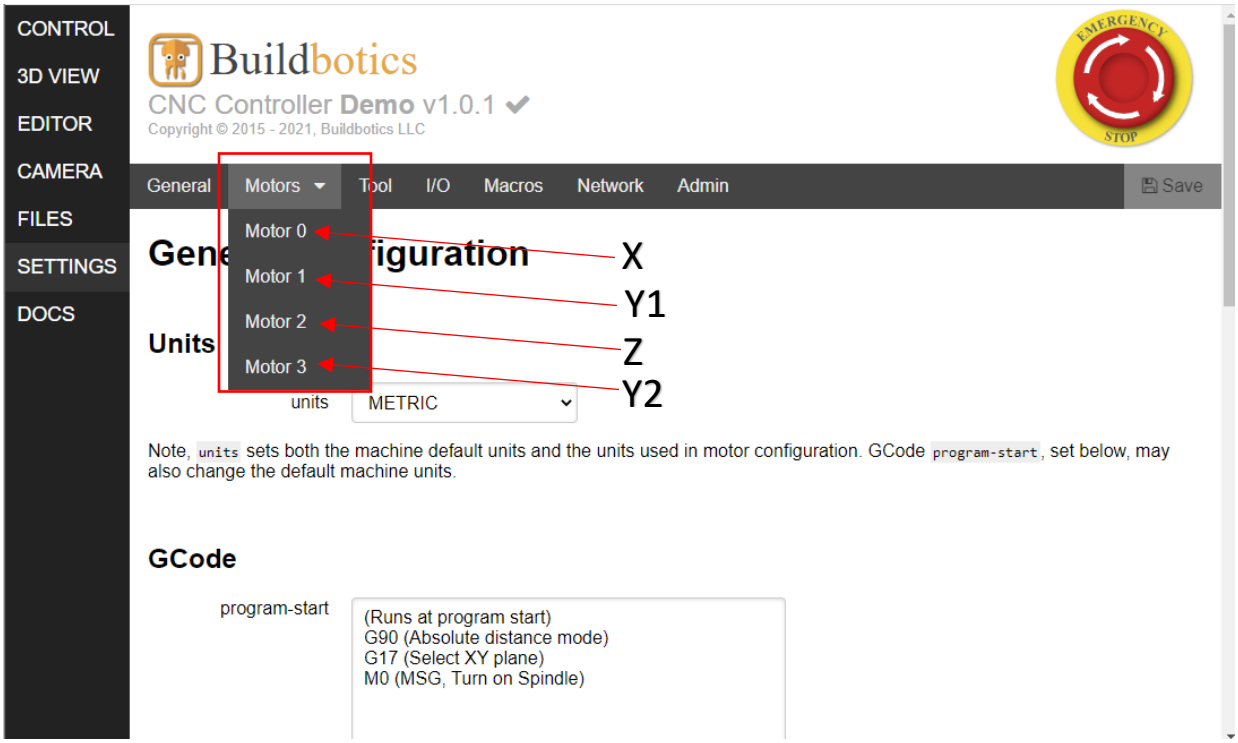
You then need to connect the wires to the DB25 breakout board pictured below.

Connect all of the black wires to a GND connection
Connect X to pin 3(motor 0 min)
Connect Y to pin 5 (motor 1 min)
Connect Z to pin 10 (motor 2 max)



Configuring the Software





Motor 0 Configuration

General

axis	X	

Power

enabled	☑	
drive-current	2.8	amps
idle-current	0.5	amps

Set this to 1000 to start then home your machine and then jog to the maximum limit and input that value here

Motion

reverse	☐		
microsteps	32	per full step	(28.6k µstep/sec)
max-velocity	15	m/min	(268 RPM)
max-accel	50	km/min²	(1.416 g)
max-jerk	250	km/min³	(7.08 g/min)
step-angle	1.8	degrees	(200 steps/rev)
travel-per-rev	55.9	mm	(279.5 µm/step)

This will need to be calibrated.
This is the value that worked for me.

Limits

min-soft-limit	0	mm	
max-soft-limit	900	mm	
min-switch	normally-open		Pin 3
max-switch	disabled		Pin 4

Homing

homing-mode	switch-min		
search-velocity	0.5	m/min	(9 RPM)
latch-velocity	0.1	m/min	
latch-backoff	100	mm	
zero-backoff	1.999	mm	

You may need to adjust this as well.
This sets the distance the machine backs off of the homing switch

This is the left side Y motor.

Motor 1 Configuration

General

axis	Y	

Power

enabled	☑	
drive-current	2.8	amps
idle-current	0.5	amps

If the motors are turning the wrong way you can click this box to fix it

Motion

reverse	☐		
microsteps	32	per full step	(28.6k µstep/sec)
max-velocity	15	m/min	(268 RPM)
max-accel	50	km/min²	(1.416 g)
max-jerk	250	km/min³	(7.08 g/min)
step-angle	1.8	degrees	(200 steps/rev)
travel-per-rev	55.92	mm	(279.6 µm/step)

Limits

min-soft-limit	0	mm	
max-soft-limit	895	mm	
min-switch	normally-open		Pin 5 ⊖
max-switch	disabled		Pin 8 ○

Homing

homing-mode	switch-min		
search-velocity	0.5	m/min	(9 RPM)
latch-velocity	0.1	m/min	
latch-backoff	100	mm	
zero-backoff	1	mm	

Motor 2 Configuration

General

axis	Z	

Power

enabled	☑	
drive-current	2.8	amps
idle-current	0.5	amps

Motion

reverse	☐		
microsteps	32	per full step	(65.8k µstep/sec)
max-velocity	5	m/min	(617 RPM)
max-accel	25	km/min²	(0.708 g)
max-jerk	250	km/min³	(7.08 g/min)
step-angle	1.8	degrees	(200 steps/rev)
travel-per-rev	8.1	mm	(40.5 µm/step)

Limits

min-soft-limit	-95	mm	
max-soft-limit	95	mm	
min-switch	disabled		Pin 9 ○
max-switch	normally-open		Pin 10 ⊖

Homing

homing-mode	switch-max		
search-velocity	0.5	m/min	(62 RPM)
latch-velocity	0.1	m/min	
latch-backoff	7	mm	
zero-backoff	7	mm	

This is the right side Y motor

Motor 3 Configuration

General

axis: Y (slave motor)

Power

drive-current: 2.8 amps

idle-current: 0.5 amps

Motion

reverse: ☐