DynaMyte 2400 Upgrade

Video Script

Intro

Hi, I'm Doug Coffland. Welcome to my garage. I have retrofitted a couple of DynaMyte 2400 CNC Mills using modern Buildbotics CNC Controllers. In this "how-to" video, I'll show how it's done.

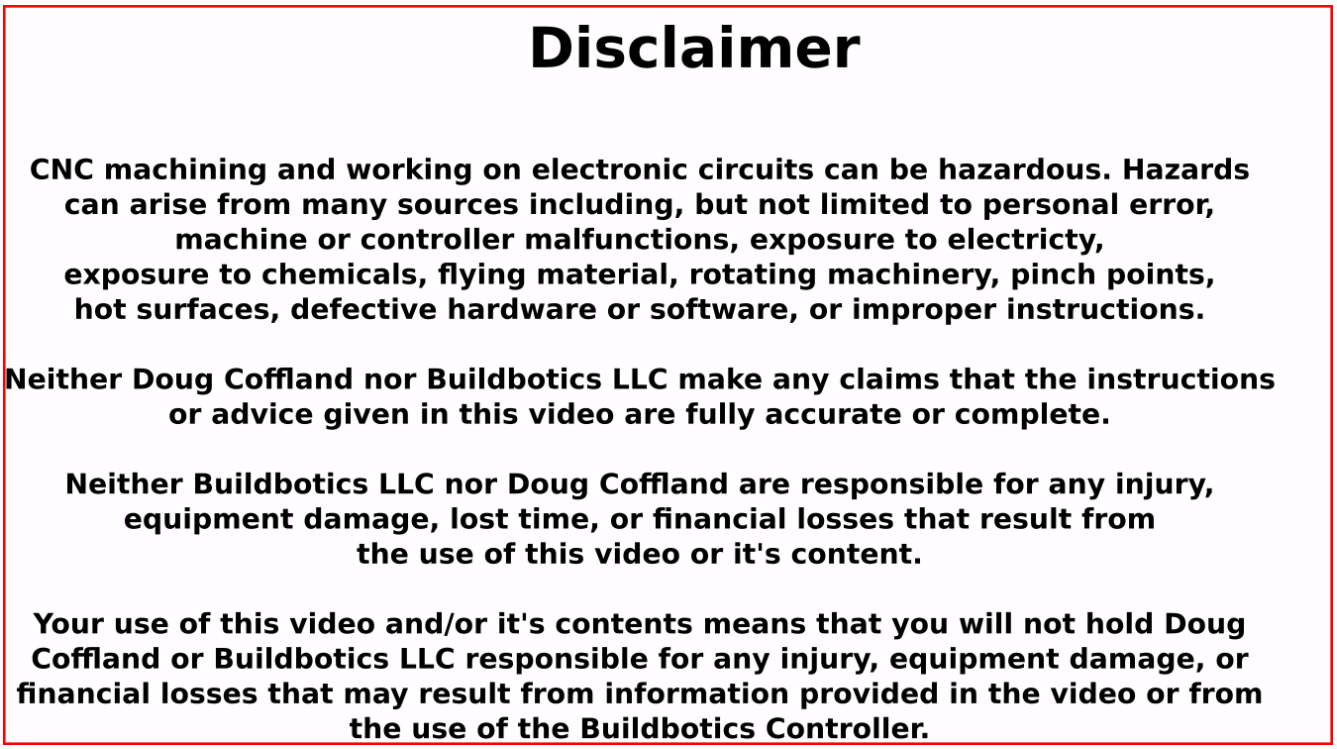
Specifically:

- I'll make some suggestions on where to mount the Buildbotics Controller and specify connections for:
- the power supply
- the motors
- the limit switches
- the spindle
- and the auxiliary receptacle

Finally, I’ll show you how to configure the controller for the Dyna.

Let’s get started.

Disclaimer



Read this disclaimer while showing it on the screen.

Safety Note

For your safety, make sure the power is turned off and the Dyna is unplugged before disassembling any part of the machine and whenever electrical wires or circuits are exposed.

Mounting Controller

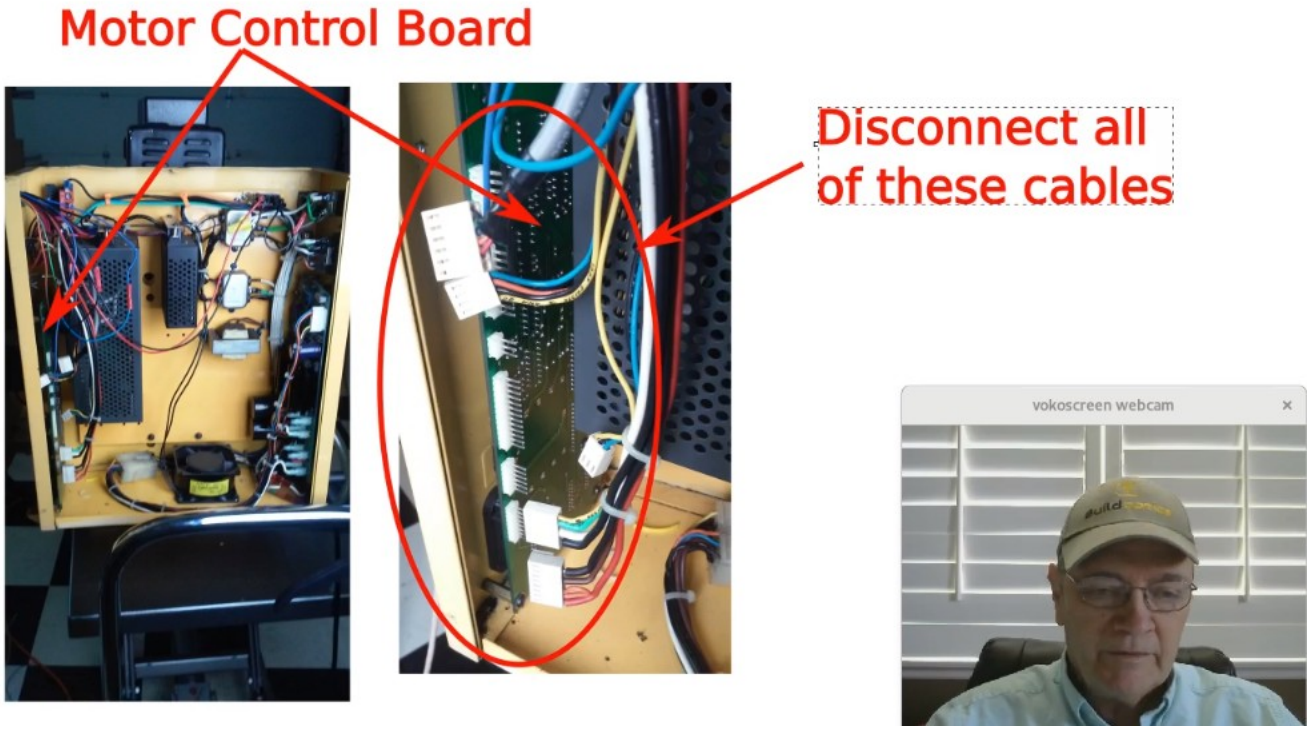
I recommend deciding where you want to locate the Buildbotics CNC Controller before starting to make electrical connections because the location of the new controller will determine how long the cables should be.

It is not absolutely necessary to mount the controller in plain view, but I do find it helpful to be able to see the LCD display while running the Dyna.

Here are a couple of mounting examples. In one case, I mounted the controller to the side of the machine using a couple of shelf brackets that I bought at the local hardware store. In another case, I modified the plate that was used to hold the original touch panel controller and mounted the Buildbotics CNC Controller on that plate.

Another alternative would be to not mount the controller at all, and simply sit it on a table next to the machine.

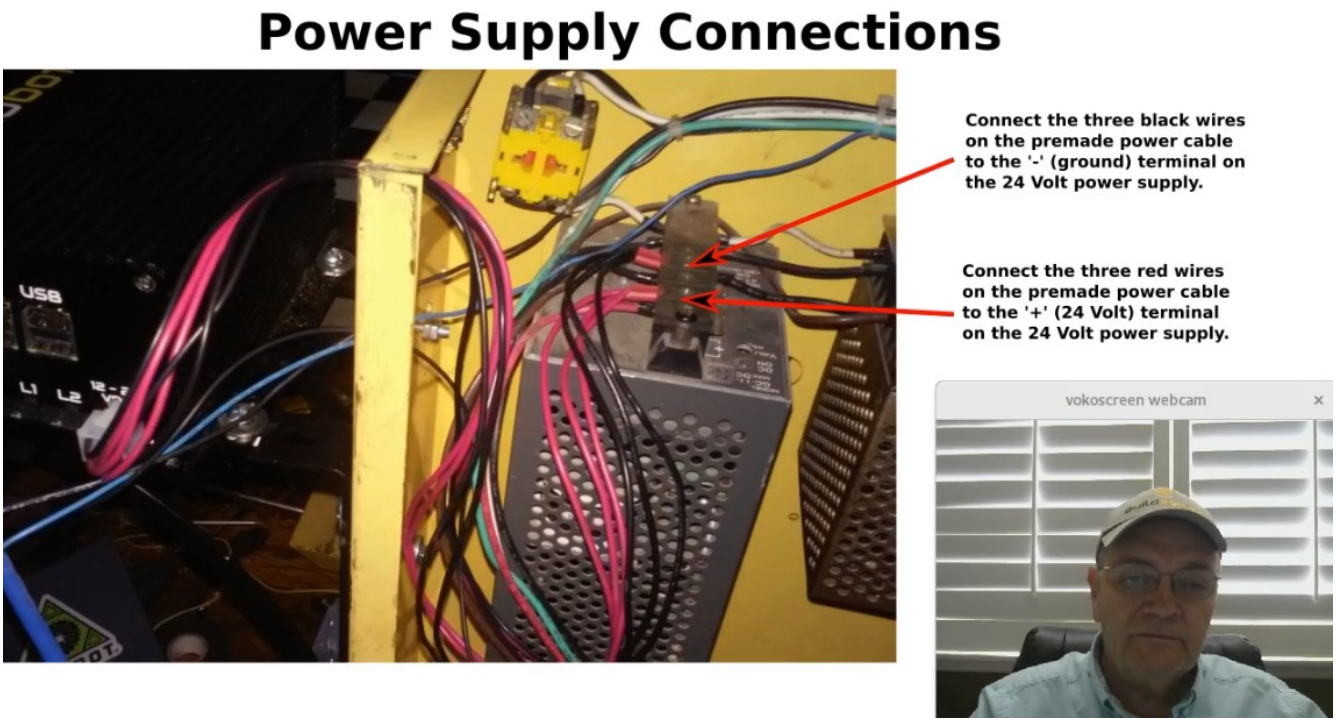
Remove cables from motor control board



Make sure the Dyna is unplugged and turned off before removing the cover from the back cabinet to prevent exposure to hazardous electricity.

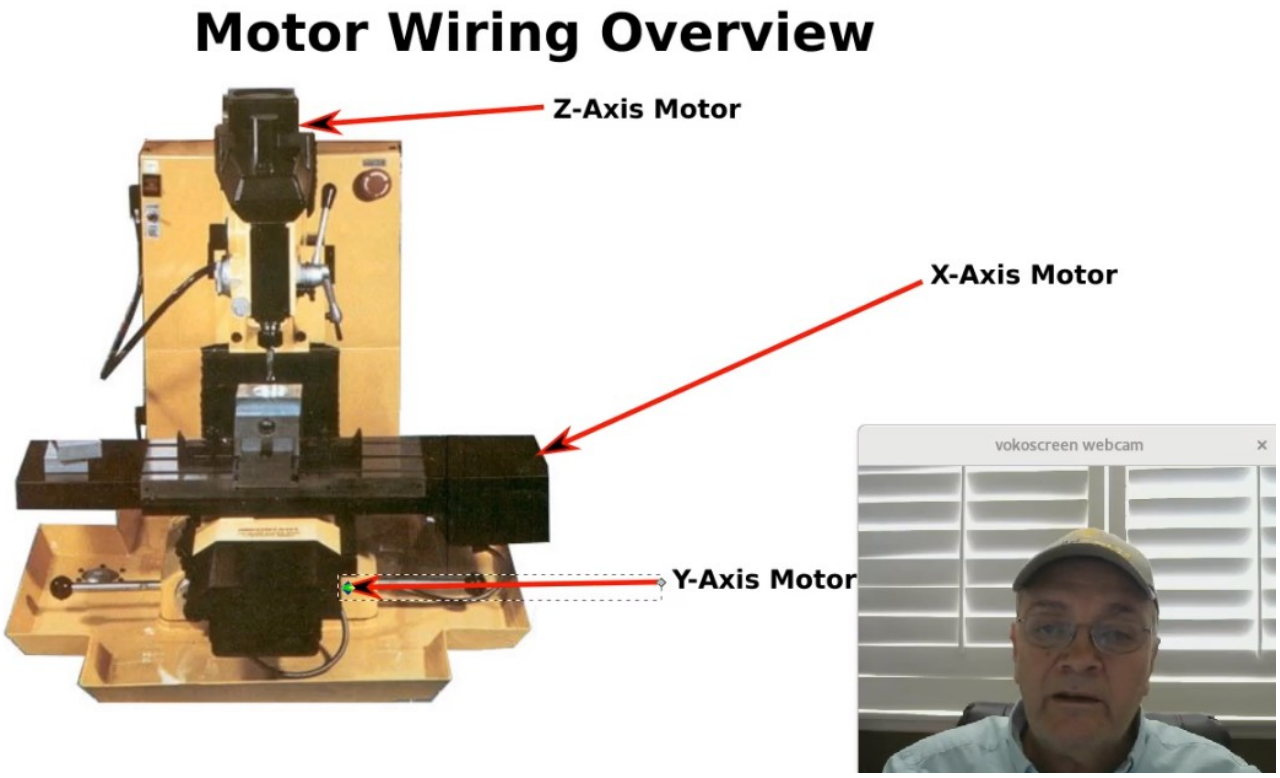
Disconnect all cables from the old motor control board. Otherwise, you'll get an obnoxious alarm when you turn on the machine. Optionally, you can completely remove the motor control board. The motor control board is mounted on the left wall when facing the back of the Dyna.

Power Supply Wiring



Connect the Buildbotics Controller to the existing Dyna 24Volt power supply using the pre-made power cable supplied by Buildbotics. Connect the three red wires to the plus terminal on the 24 Volt power supply inside the cabinet on the Dyna. And, connect the three black wires to the minus (or ground) terminal on the 24 Volt power supply. Plug the other end of the pre-made cable into the 12-36 VDC Power jack on the back of the Buildbotics Controller.

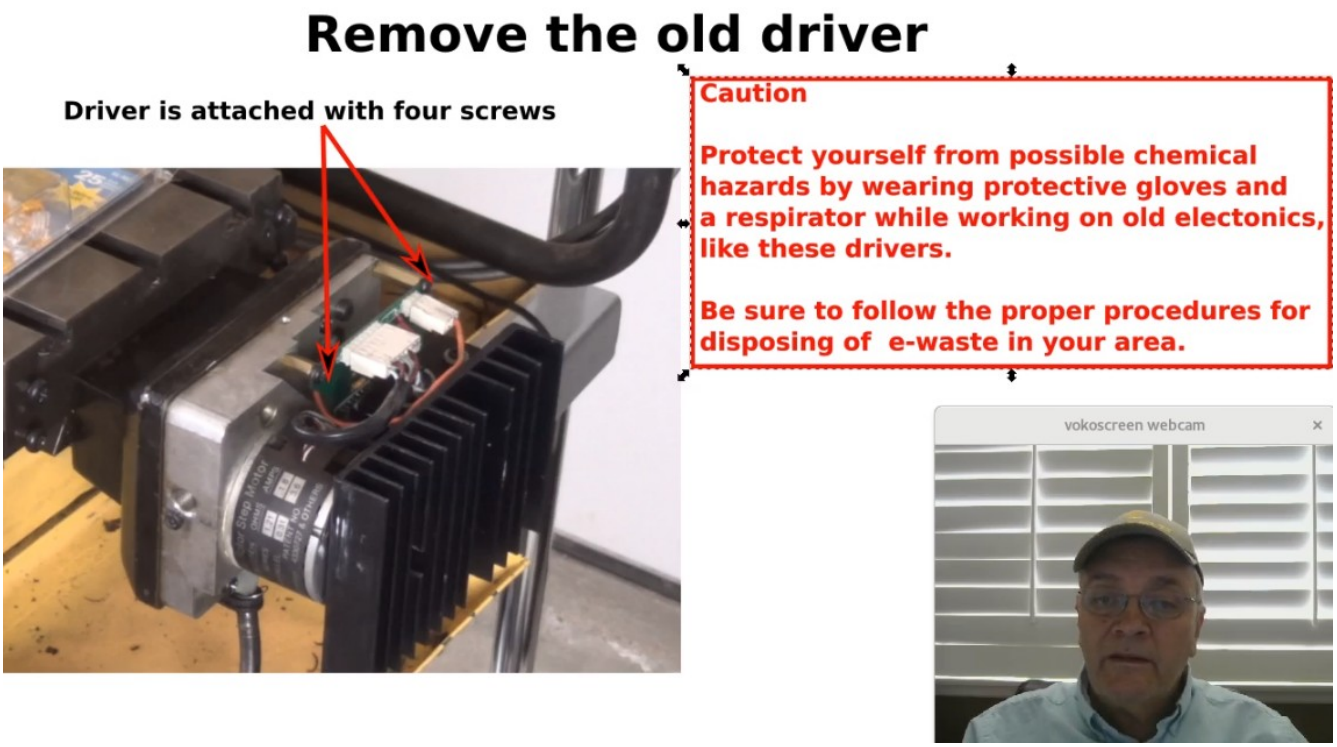
Motor Wiring



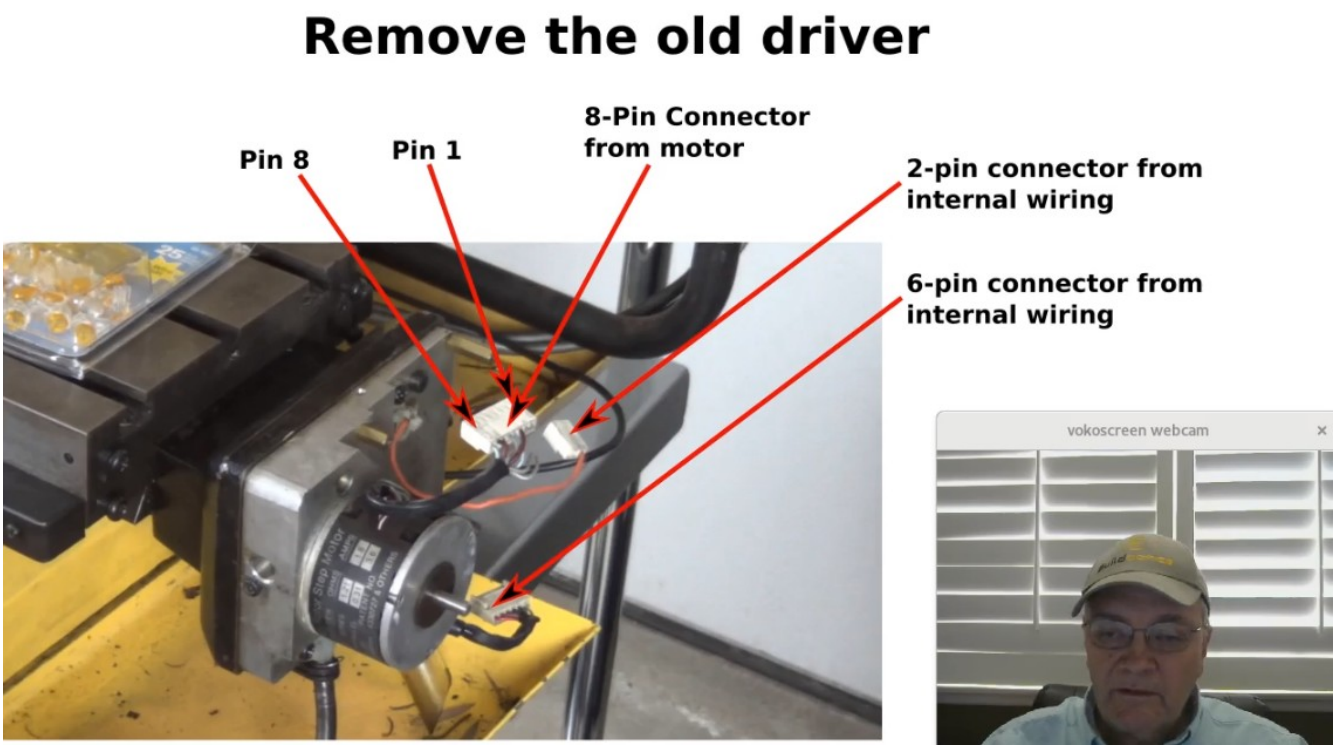
The motor on each axis must be connected to the respective port on the back of Buildbotics Controller.

You need to decide whether to run the cables outside the machine or attempt to re-use the internal wiring for the old motors. I have successfully used the internal wiring for the motors, but not the limit switches. You may find that the internal wiring is no longer usable for either the motors or the limit switches, in which case all cables will be run outside.

First, remove the housing and motor cover to access the motor driver.



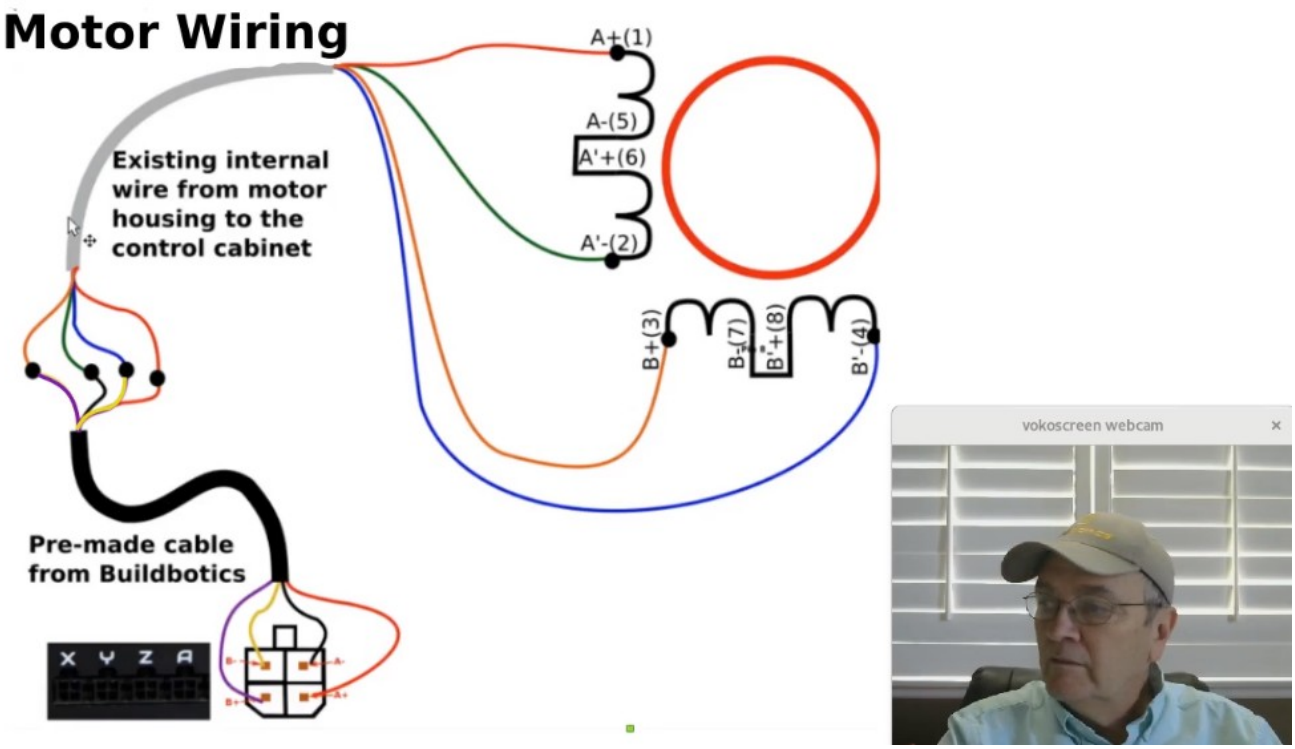
Next, remove the motor driver leaving the motor connectors behind. Beware of hazardous chemicals that may be present on the old motor drivers. I recommend wearing protective gloves and a respirator while removing the old drivers. Also be sure to properly dispose of the old motor drivers using the procedures established for e-waste disposal in your area.



Three connectors are exposed after the motor housing and motor driver are removed. The eight pin connector comes from the motor. The six pin connector attaches to internal wiring that connects through the machine to the control cabinet. The two pin connector attaches to internal wiring that goes to the limit switches.

The motor wiring is the same for each axis, but the limit switch wiring is slightly different for each axis.

The color coding on the motor wiring is likely to be faded, so it's important to keep track of the wires. I did this by cutting the wires off and attaching them one by one. There is a '1' on the 8 pin motor connector designating pin 1.



This schematic shows the connections from the motor jack to the 8-pin connector coming out of the motor.

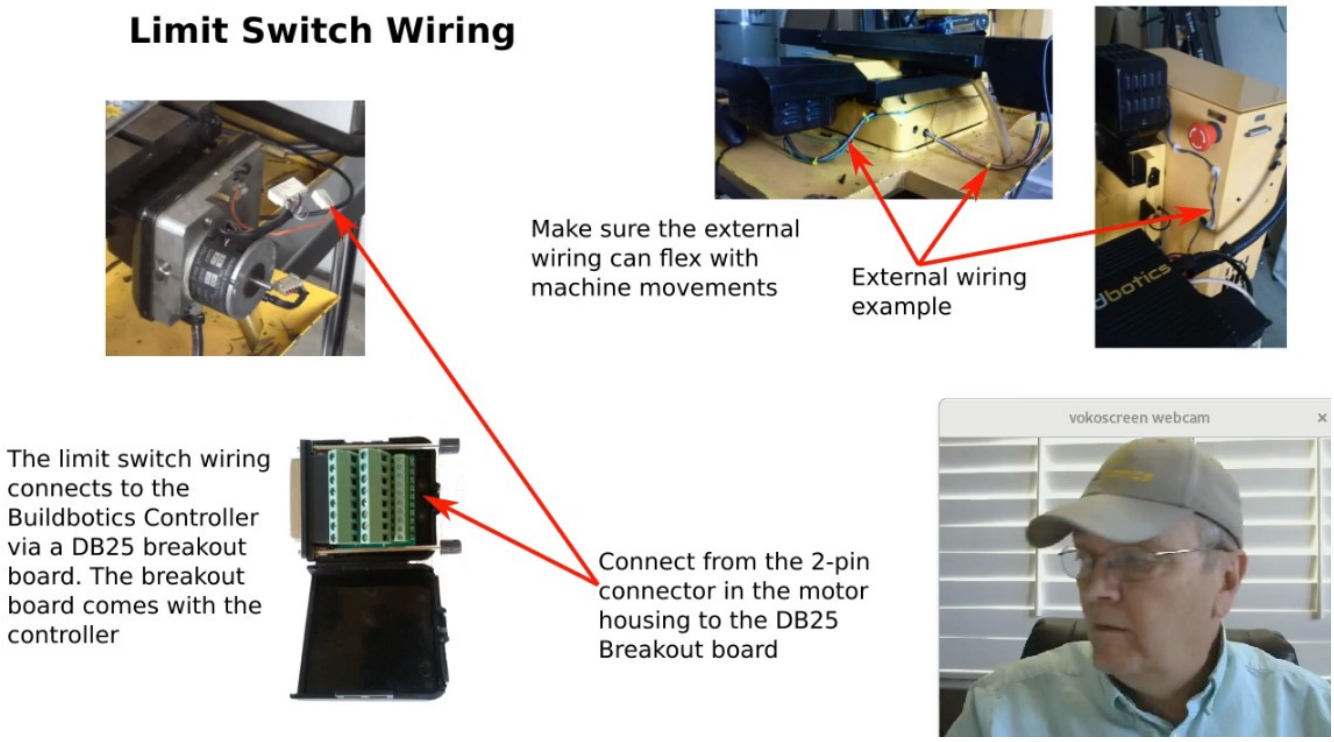
Pin 5 (A-) is connected to Pin 6 (A'+) and Pin 7(B-) is connected to Pin 8(B'+) on the 8-Pin connector. This configures the motor as "bipolar series". Note that A+(pin 1), A'-(pin 2), B+(pin 3), and B'- (pin 4) on the 8-pin motor connector are connected to A+, A-, B+, and B- respectively on the Buildbotics Controller jack.

This diagram also shows how the internal wiring is connected.

- The internal blue wire extends B- through the machine from the controller to the motor.
- The green wire extends A-.
- The red wire extends A+
- The orange wire extends B+

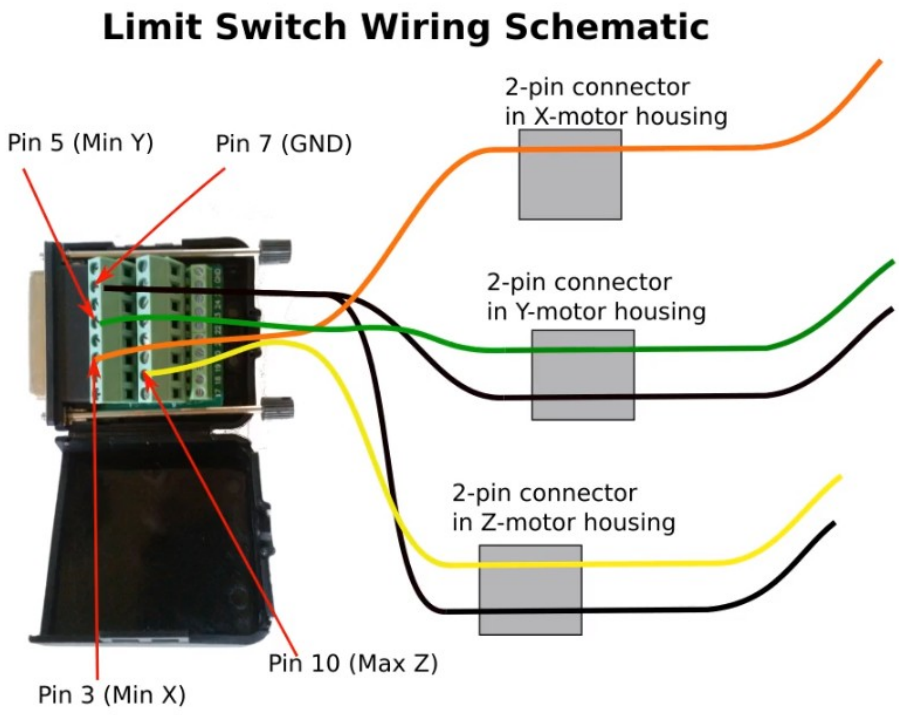
Note that not all of the internal wires are used. It's tempting to try to use the extra wires for limit switches, but I've found that there is too much noise coming from the motor wires to operate the limit switches reliably using the internal wires. So, the limit switches are routed outside of the machine.

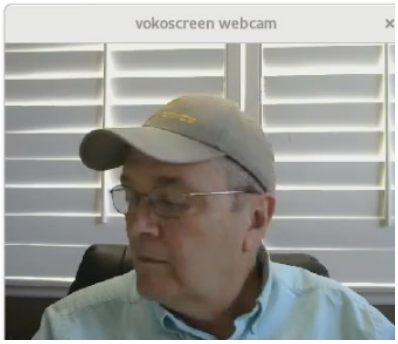
Limit Switch Wiring



The limit switch wires extend from the 2-pin connectors inside the motor housing to the Buildbotics Controller via the DB25 breakout box that plugs into the back of the controller. The DB25 breakout box comes with the controller.

Since the wiring is run outside of the Dyna housing, it is important to make sure that the wires have enough slack to accommodate machine movements. Additionally, the wires should be flexible and be able to withstand oil and coolant chemicals used with the machine. I use 18AWG type MTW stranded wire.





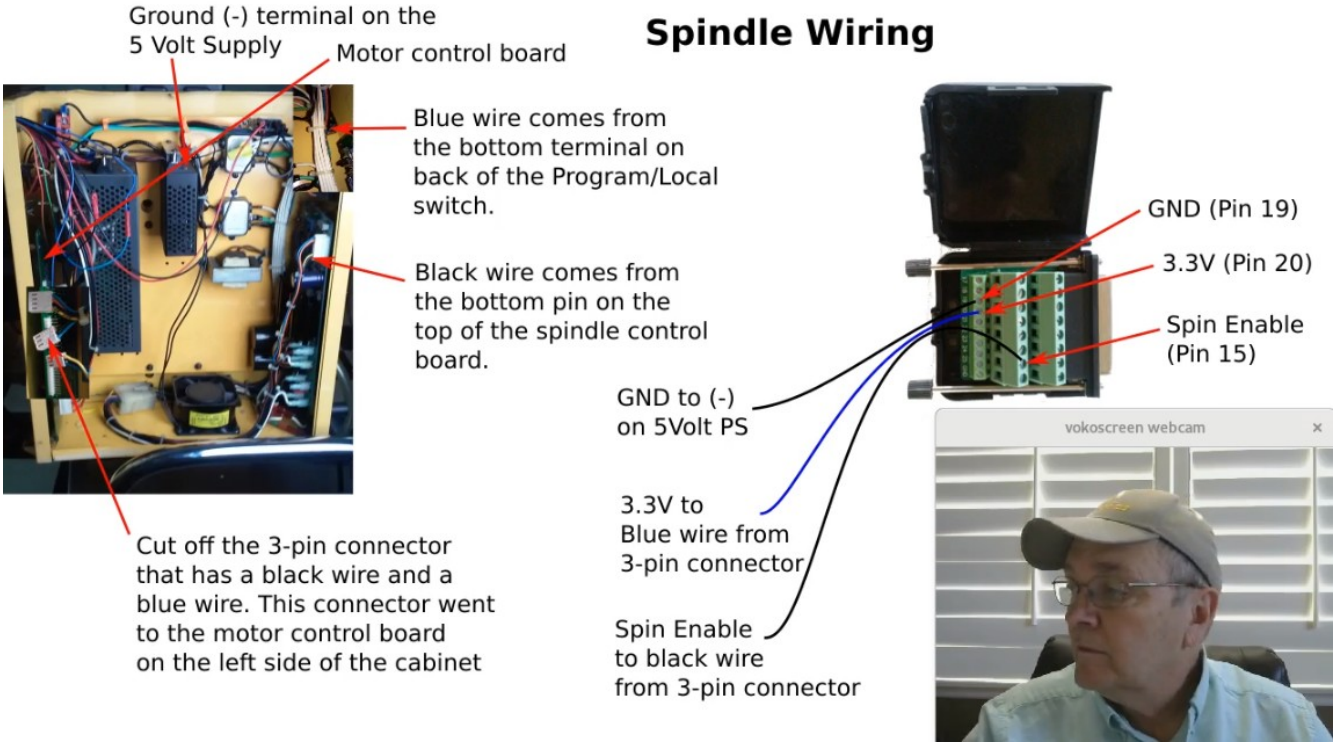
Limit switch wires are accessible inside the motor housing on the 2-pin connector. The connections for each axis are slightly different.

- Connect the yellow wire on the 2-pin connector at the Z motor to Pin 10 (Max Z) on the DB25 connector.
- Connect the black wire on the 2-pin connector at the Z motor to pin 7 (GND) on the DB25 connector.
- Connect the green wire on the 2-pin connector at the Y motor to Pin 5 (Min Y).
- Connect the black wire on the 2-pin connector at the Y motor to pin 7 (GND).
- Connect the orange wire on the 2-pin connector at the X motor to Pin 3 (Min X).

No ground wire is connected for the X-axis because the ground wire is connected to the ground for the Y axis inside the machine.

Finally, plug the DB25 connector into the controller.

Spindle Wiring



These connections will provide the ability to turn the spindle on and off from the Buildbotics Controller. The speed continues to be controlled with a rheostat on the side of the spindle.

Start by cutting off the 3-pin connector that has a black wire and a blue wire only and attaches to the motor control board on the side of the Dyna cabinet.

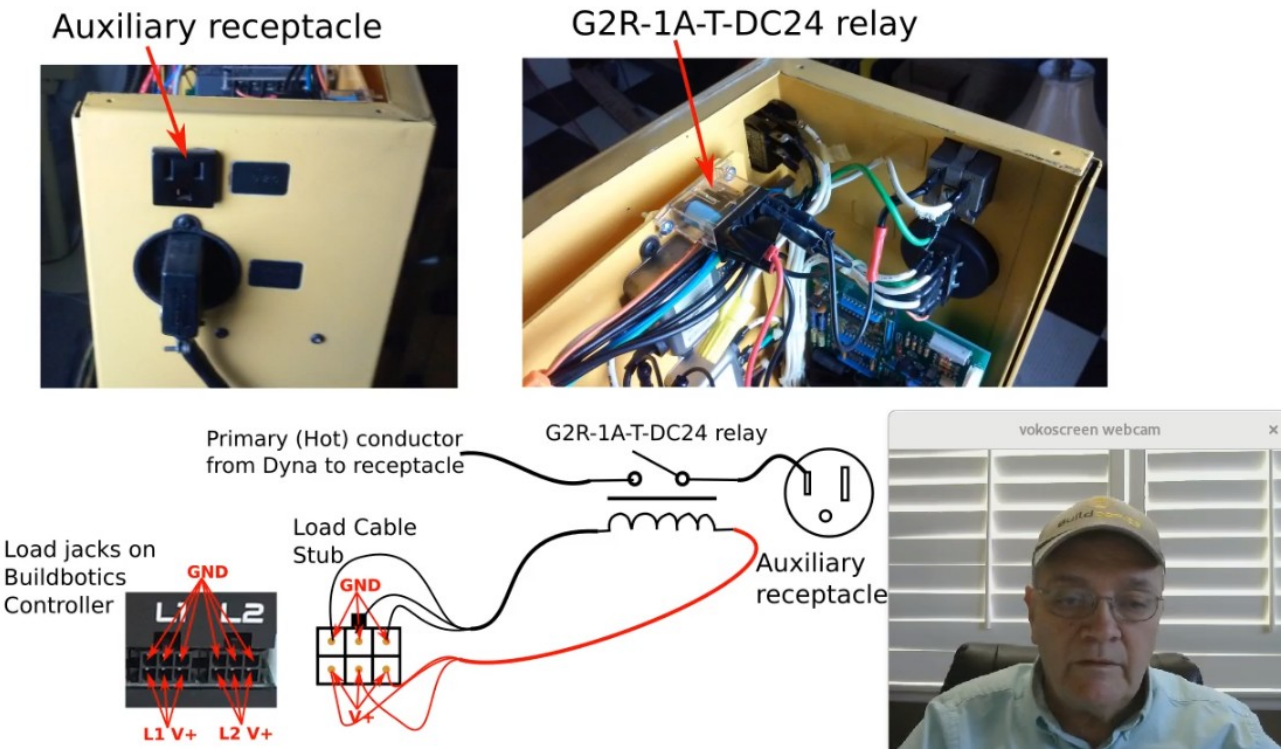
The black wire remains connected to the bottom pin on the 9-pin connector attached to the spindle control board. The blue wire remains connected to the bottom terminal on the back of the Program/Local switch. You may want to verify that you have the correct wires with an ohmmeter.

Three connections are required.

- Connect from GND (Pin 19) on the DB25 Connector to the Ground (-) terminal on the 5 Volt power supply in the Dyna cabinet.
- Connect from 3.3V (Pin 20) on the DB25 connector to the blue wire from the 3-pin connector.
- Connect from Spin Enable (Pin 15) on the DB25 connector to the black wire from the 3-pin connector.

In order for the Buildbotics Controller to control the spindle, the Program/Local switch on the front of the cabinet must be in the “Program” position and the spindle Off/On switch on the side of the spindle must be “On”.

Auxiliary receptacle wiring



The user of the Dyna wants to use a coolant pump in conjunction with the Dyna. This diagram shows the circuitry required for controlling the auxiliary receptacle on the Dyna from the Buildbotics Controller.

First, a G2R-1A-T-DC24 24 Volt relay was mounted to the mounting panel inside the Dyna control cabinet and near the back of the auxiliary receptacle.

The black primary (hot) wire feeding the auxiliary receptacle was cut and the relay contacts were connected to the cut ends of the wire.

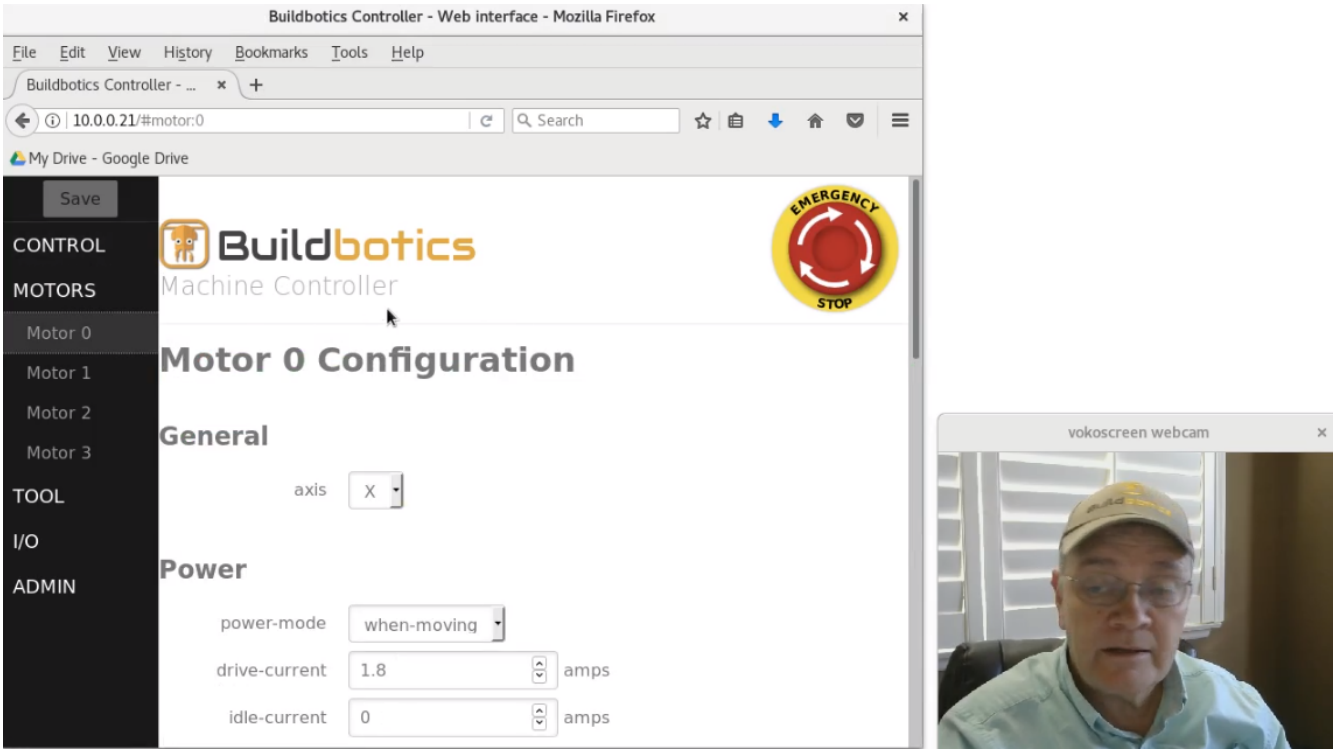
Buildbotics supplies two pre-made load cable stubs for connecting to the load jacks on the Controller. Using one of those stubs, the three black wires from the stub twere spliced together and spliced to a single black wire. That black wire was connected to one side of the relay coil. Similarly, the three red wires from the stub were spliced together and to a single red wire. The red wire was connected to the other side of the relay coil.

Finally, the load cable stub was plugged into the back of the Buildbotics Controller.

Configuration

The wiring is now complete. Now we need to configure everything. Put the cover back on the machine and plug it in. Attach the Buildbotics Controller to the local area network. Turn on the Dyna, and Enable the Buildbotics Controller.

Connect to the Buildbotics controller using a web browser.



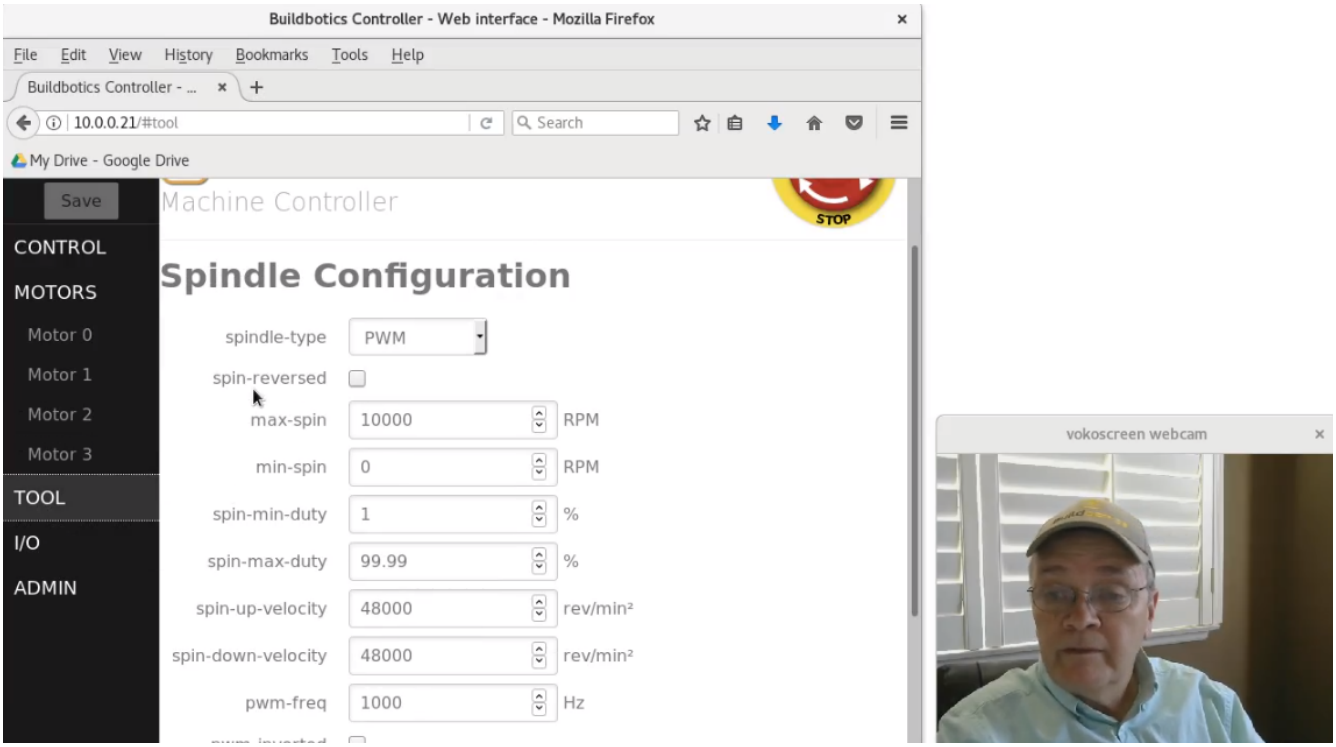
We'll start by configuring the X-axis motors and limit switches

- Select motor 0 and set the configuration as follows:
  - axis – X
  - power-mode "when-moving"
  - drive-current – 1.8
  - idle-current – 0
  - reverse – checked
  - microsteps – 32
  - max-velocity – 0.762
  - max accel – 100
  - max-jerk – 50
  - step-angle – 3.6
  - travel-per-rev – 0.25
  - min-soft-limit – 0

    - max-soft-limit 150
    - min-switch – normally-open
    - max-switch – disabled
    - homing-mode – switch-min
    - search-velocity – 500
    - latch-backoff – 5
    - zero-backoff – 5
- Select motor 1 to configure the Y axis and set the configuration as follows:
    - axis – Y
    - power-mode “when-moving”
    - drive-current – 1.8
    - idle-current – 0
    - reverse – not checked
    - microsteps – 32
    - max-velocity – 0.762
    - max accel – 100
    - max-jerk – 50
    - step-angle – 3.6
    - travel-per-rev – 0.25
    - min-soft-limit – 0
    - max-soft-limit 120
    - min-switch – normally-open
    - max-switch – disabled
    - homing-mode – switch-min
    - search-velocity – 500
    - latch-backoff – 5
    - zero-backoff – 5

- Select motor 2 to configure the Z and set the configuration as follows:
    - axis – Z
    - power-mode “when-moving”
    - drive-current – 1.8
    - idle-current – 0
    - reverse – checked
    - microsteps – 32
    - max-velocity – 0.762
    - max accel – 100
    - max-jerk – 50
    - step-angle – 3.6
    - travel-per-rev – 0.25
    - min-soft-limit – -50
    - max-soft-limit -60
    - min-switch – disabled
    - max-switch – min-switch
    - homing-mode – switch-max
    - search-velocity – 500
    - latch-backoff – 5
    - zero-backoff – 5

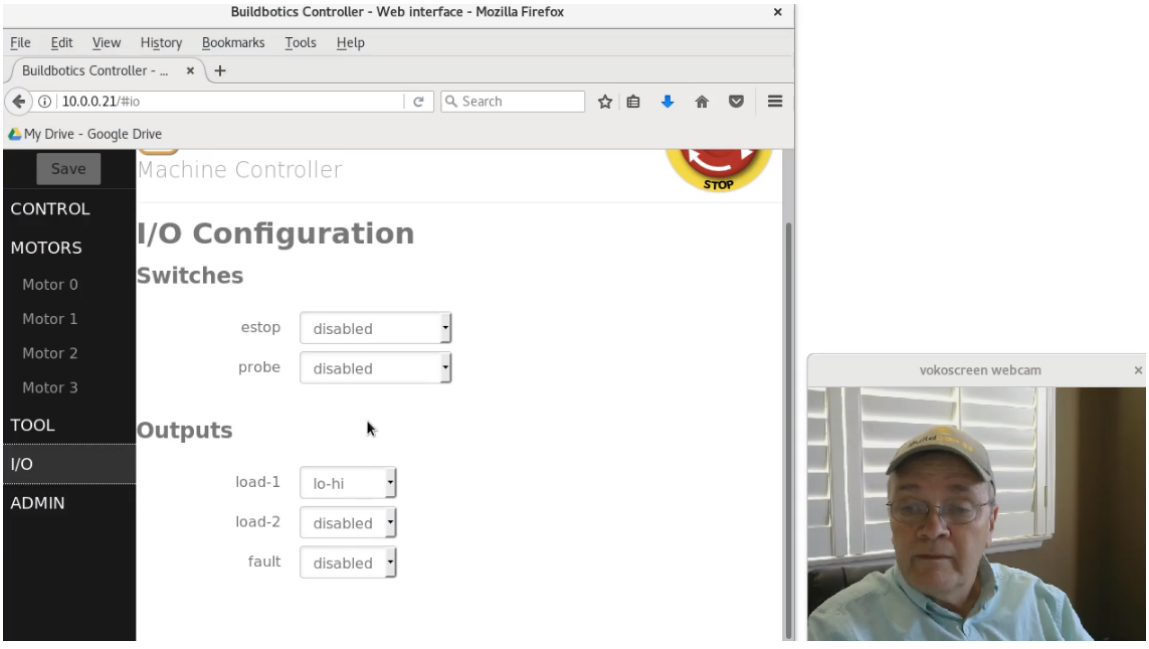
Next we will configure the spindle and the load switch that serves the auxiliary receptacle



Select “TOOL” set the following fields

- spindle-type – PWM
- tool-enable-mode – hi-lo
- None of the other fields matter because we are not controlling speed.

Finally, select “IO” and set the fields as follows:



- e-stop is disabled (the Dyna has a hardware estop that is not controlled by the Buildbotics Controller)
- probe – disabled
- load-1 – (lo-hi) (turns on the auxiliary receptacle when high)
- load-2 – disabled
- fault – disabled

Congratulations! The Dyna is ready to go with the new Buildbotics Controller.

Invitation to forum

Thank you so much for watching this video. For more information including a link to the full text with images for this video, join the Buildbotics Forum:

forum.buildbotics.com

To learn more about the Buildbotics CNC Controller, go to:

www.buildbotics.com

To purchase a Buildbotics CNC Controller, go to:

store.buildbotics.com