9897 A – HDV300 BRAKE ASSY NOTES

4-16-24 LOTHAR CRAMER

SYSTEM OVERVIEW:

This document discusses the design features and installation of a new Y Axis Stepper Motor for the HDV300 and HDV400. Although we will refer to the system as an HDV300, the only difference is the length of the X stage.

The gearbox and brushed motor are now replaced with a Nema Size 23 stepper motor linear actuator which contains a Non-captive lead screw. Non-captive means the lead screw does not rotate, but it does move axially up and down. The internal motor rotor contains the lead screw nut, which turns and translates the stage up and down.

The stage and knee weight of 70 pounds causes the new Y Axis to free wheel down quickly, consequently a Brake is required. A large yellow Damper is mounted on the bottom of the stepper motor assembly. Two springs press Brake Calipers onto the Damper O.D. and create the Braking force. The Calipers are also connected to Solenoids, which retract the Calipers, when energized. A 5 volt Brake Signal, from the M3 Controller, drives the Brake Relay PCB Assy which turns the Solenoids on or off. The Brake Signal is passed through the front panel of the M3 CNC controller, on unused pins of the Y Motor Cable. When M3 is powered on, a five volt brake signal is sent to the Brake Relay Board, which then energizess the Solenoids and retracts the Brake calipers. Stepper Motor holding Torque holds the motor in position when the brake is not applied. Pressing the EStop Button In will engage the Brake. Releasing the Brake from Estop is a two-step process. Twist and release the Estop Button, then displace the Joystick in the Y Axis direction. The second step retracts the Brake and turns on the motor Holding Torque.

(The Brake on AV350's is on the Z Axis, therefore you twist Z on the Joystick, to release, on that system)

BASIC MACHINE CHANGES:

The black anodized foot spacers, on the four chassis feet, are longer, now 1 inch.

The -2 Metlogix Controller is now a -3.

The gearbox and brushed motor are replaced with a Stepper Motor Assy.

The Stepper Motor Assy sits on a rubber isolation gasket, the gasket sits on the chassis cross beam.

The Brake Relay PCB Assy is mounted to the Electronics Chassis Din rail, next to the 24 volt power supply.

The Y Motor cable is new and also contains the Brake Signal that goes to the Brake Relay Board.

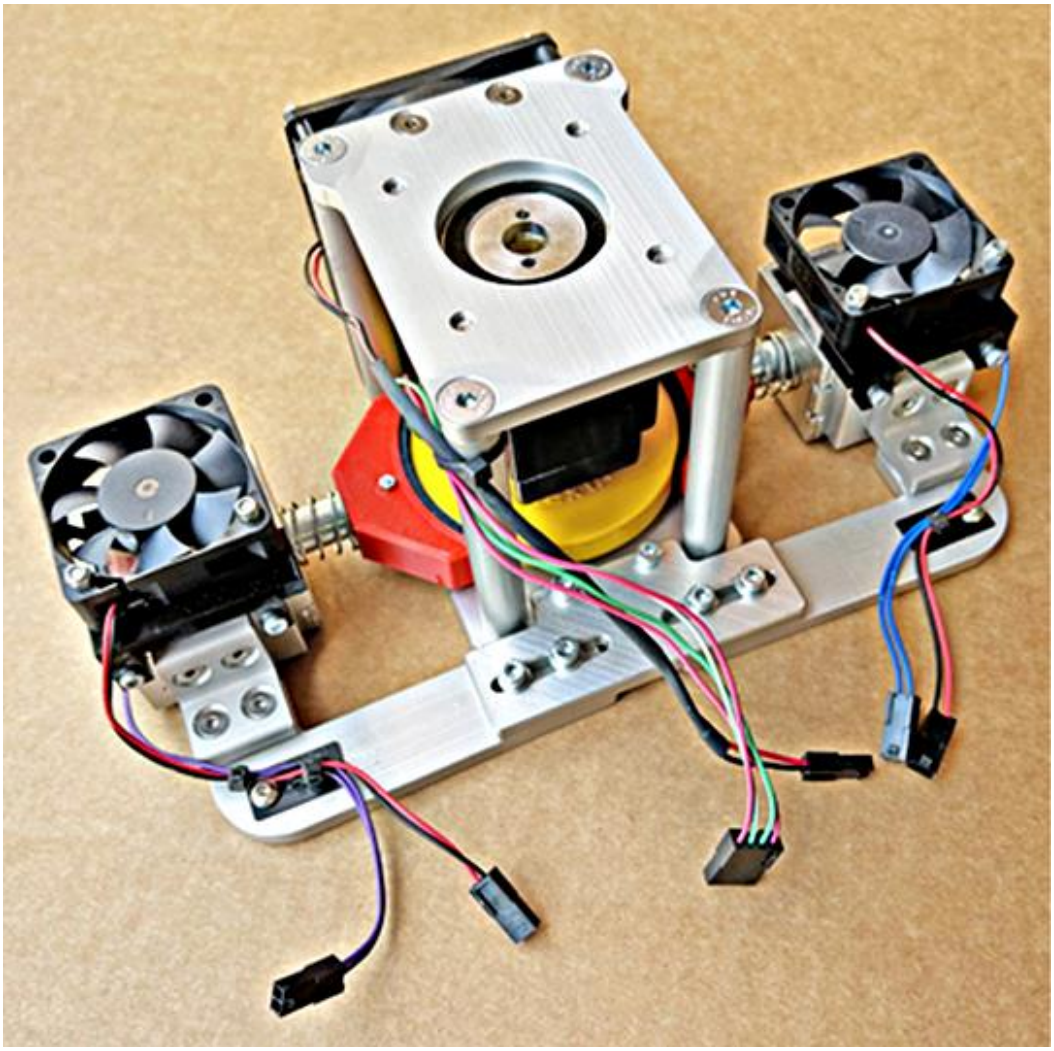
An additional new cable runs from inside the chassis to the Y Motor, next to the Y Motor cable and powers the motor fans and coils.

There are about 8 new small cables that connect M3, Stepper Motor, Fans, Relay board.

IMPORTANT BRAKE RELATED PRINTS:

9897 - HDV300 Brake Assy Notes	(New, this document)
9847 - Y Axis Stepper Motor Assy.	(New)
9889 -Brake Wiring	(New)
8214 - Cables and Misc parts.	(Existing new Rev)
7661-3 - M3 CNC Controller.	(New)

9847 -Y Axis Stepper Motor Assy: (picture)



80mm fan blow forward onto the stepper motor.

50mm fans blow down onto the solenoids.

Note specific wire routing.

7661-3 M3 CNC Controller is equal to the previous 7661-2 Controller, except that a Brake Function is wired into the Y Motor Connector. The -2 Controller has a Rotary Stepper motor added to the Z Motor Connector. These controllers are specific to only the HDV300 product Lines.

9889 – Brake Wiring provides the best wiring overview.

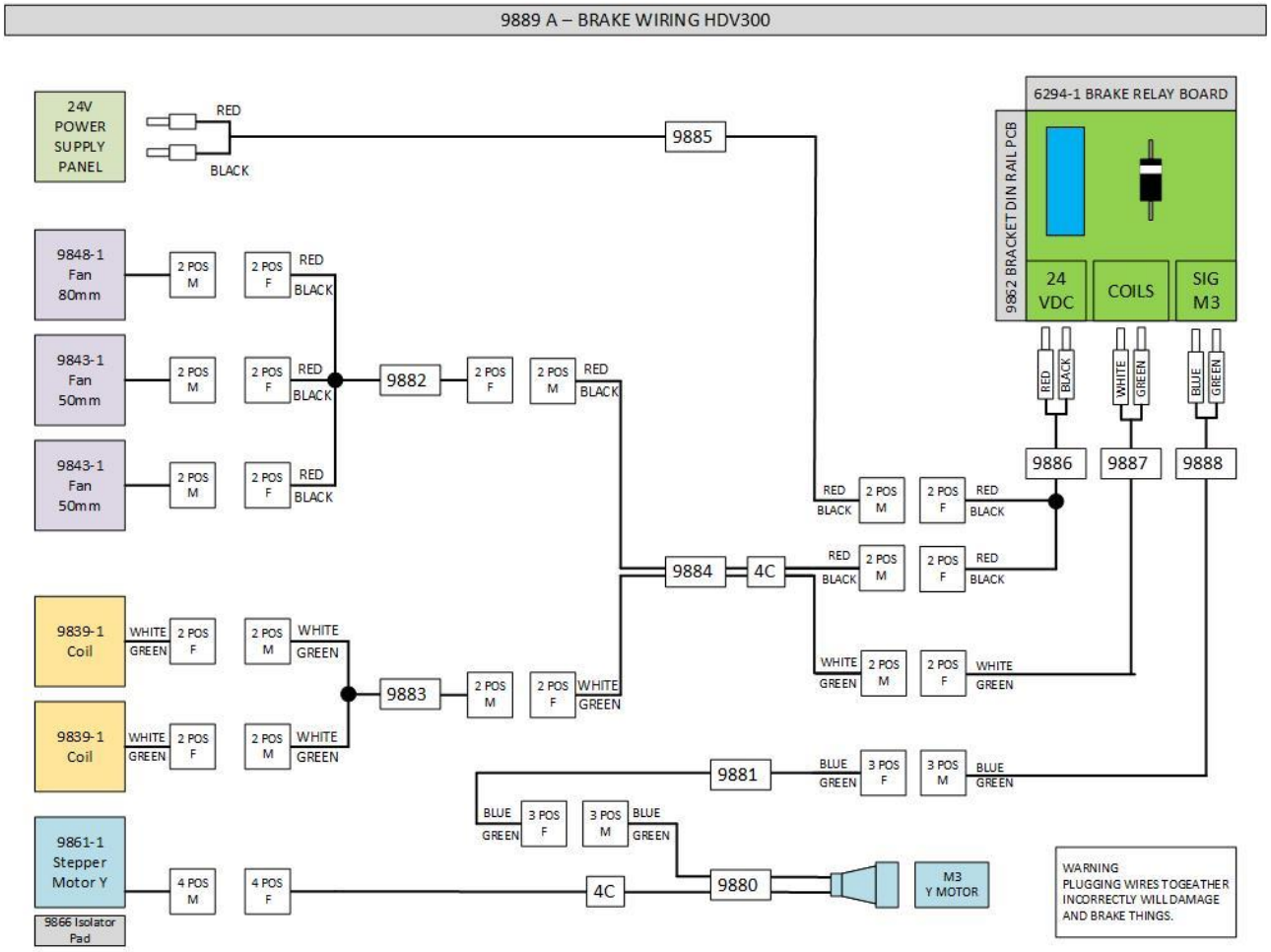
Tracing out the paths of the three color pairs of wires will simplify the understanding of 9889.

(Red/Black = 24 volts) (White/Green = Solenoid 24 volts) (Blue/Green = 5 volt Brake Signal)

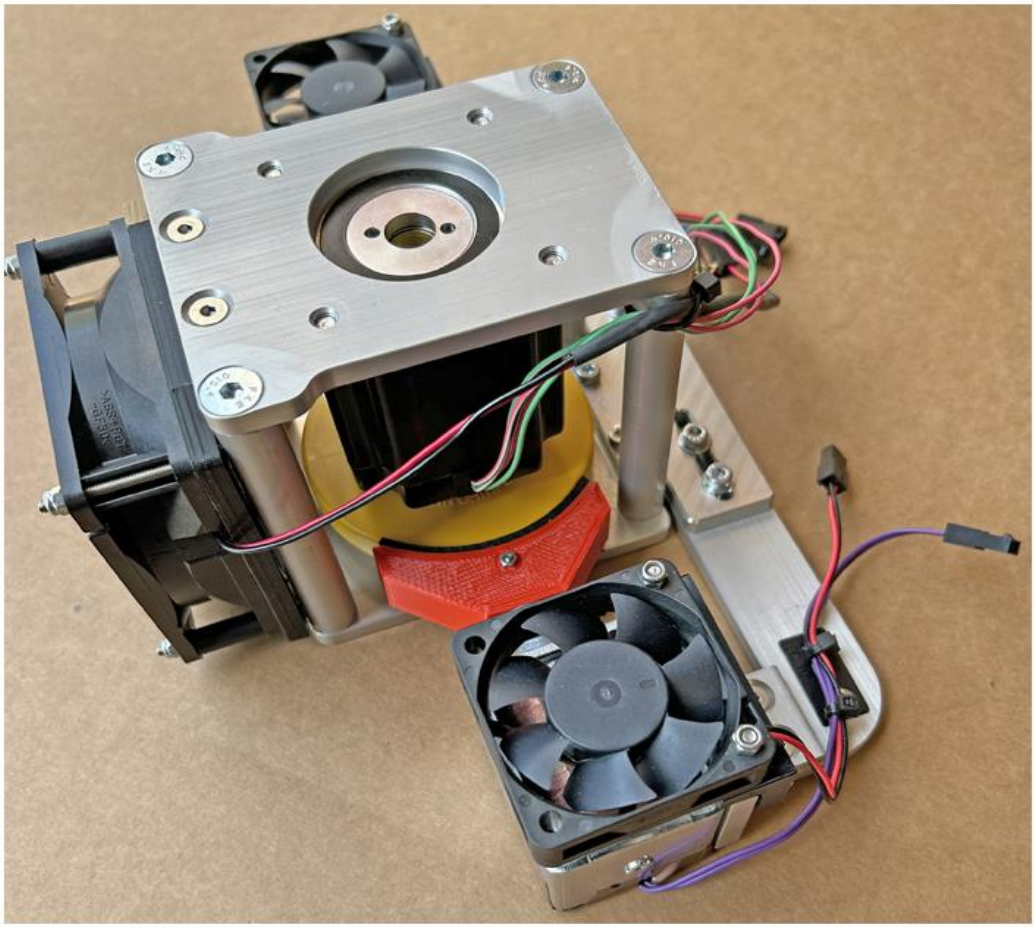
The 9885 Cable supplies 24 volts to the Brake Relay Board and also routes this voltage to the Motor Fans and Solenoids. (Red and Black wires)

The 9884 Cable contains both the Fan Power and also the Solenoid Power. The Solenoid Power is supplied by the Brake Relay Board. (White and Green wires)

The 9880 Cable powers the Y Axis stepper motor and also contains the Brake Signal. The Brake Signal uses 9881 and connects to the Brake Relay Board. (Blue and Green wires)

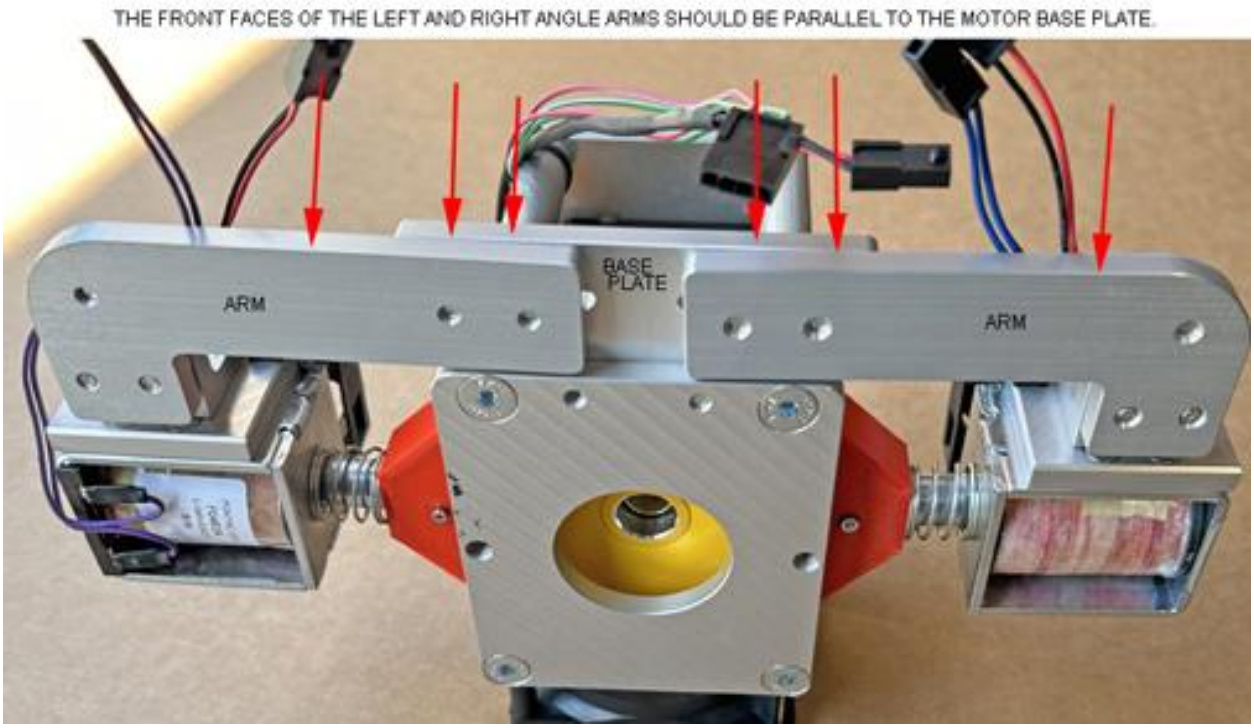


9847 STEPPER MOTOR ASSY



Note specific wire routing.

BRAKE ALIGNMENT.



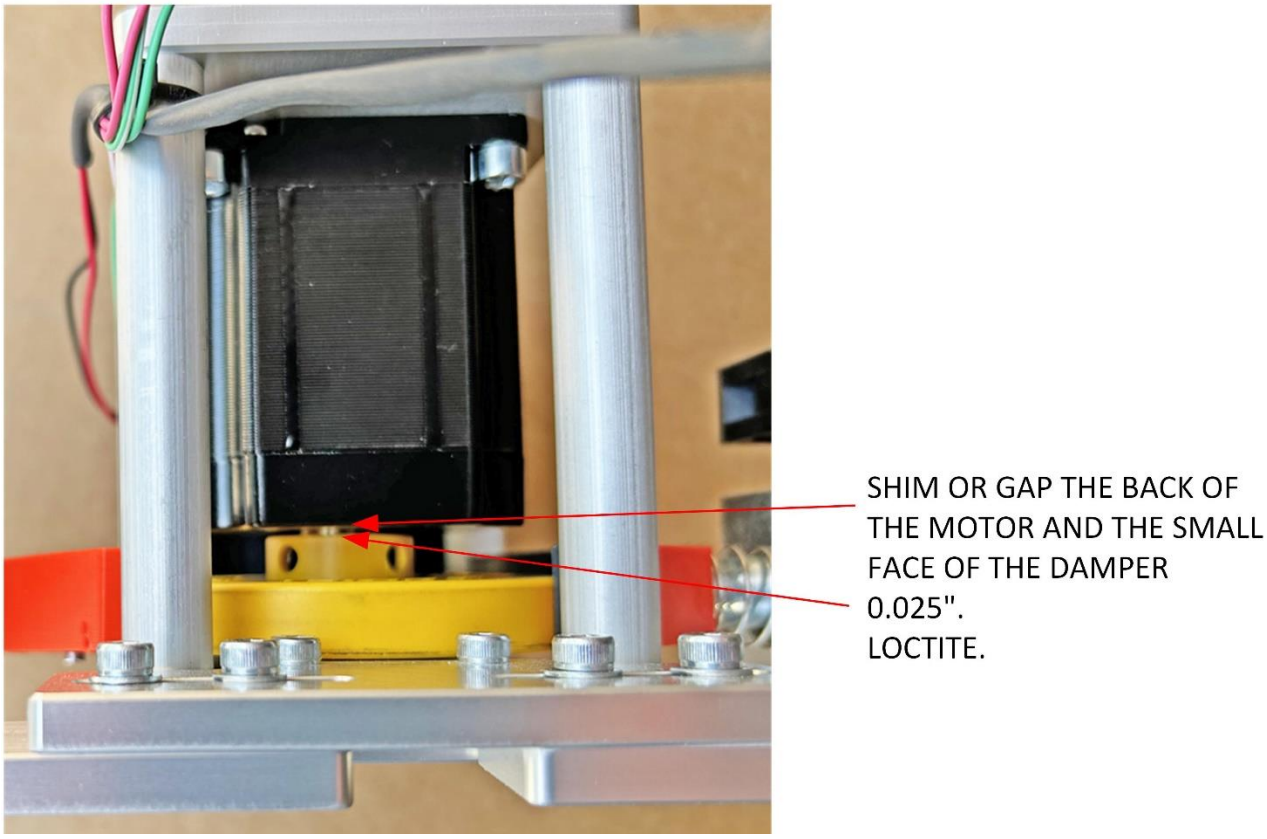
The Bracket Arms also slide left and right, this controls the gap between the Brake surface and the Damper, when the Coils are energized.

The gap should be less than ¼ inch and greater than 1/8 inch.

The gap should always be equal on both sides.

Note the left Solenoid has the wire connections mounted down and the right Solenoid is mounted up.

DAMPER INSTALLATION REQUIREMENTS



Glue the Damper to the motor encoder shaft using Loctite 609, p/n 9895.

Set the Gap as shown above.

Clean the surfaces with Isopropyl Alcohol 3 times using a clean paper towel each time.

In this manner grease is removed rather then just smeared around.

Do not touch the cleaned surfaces.

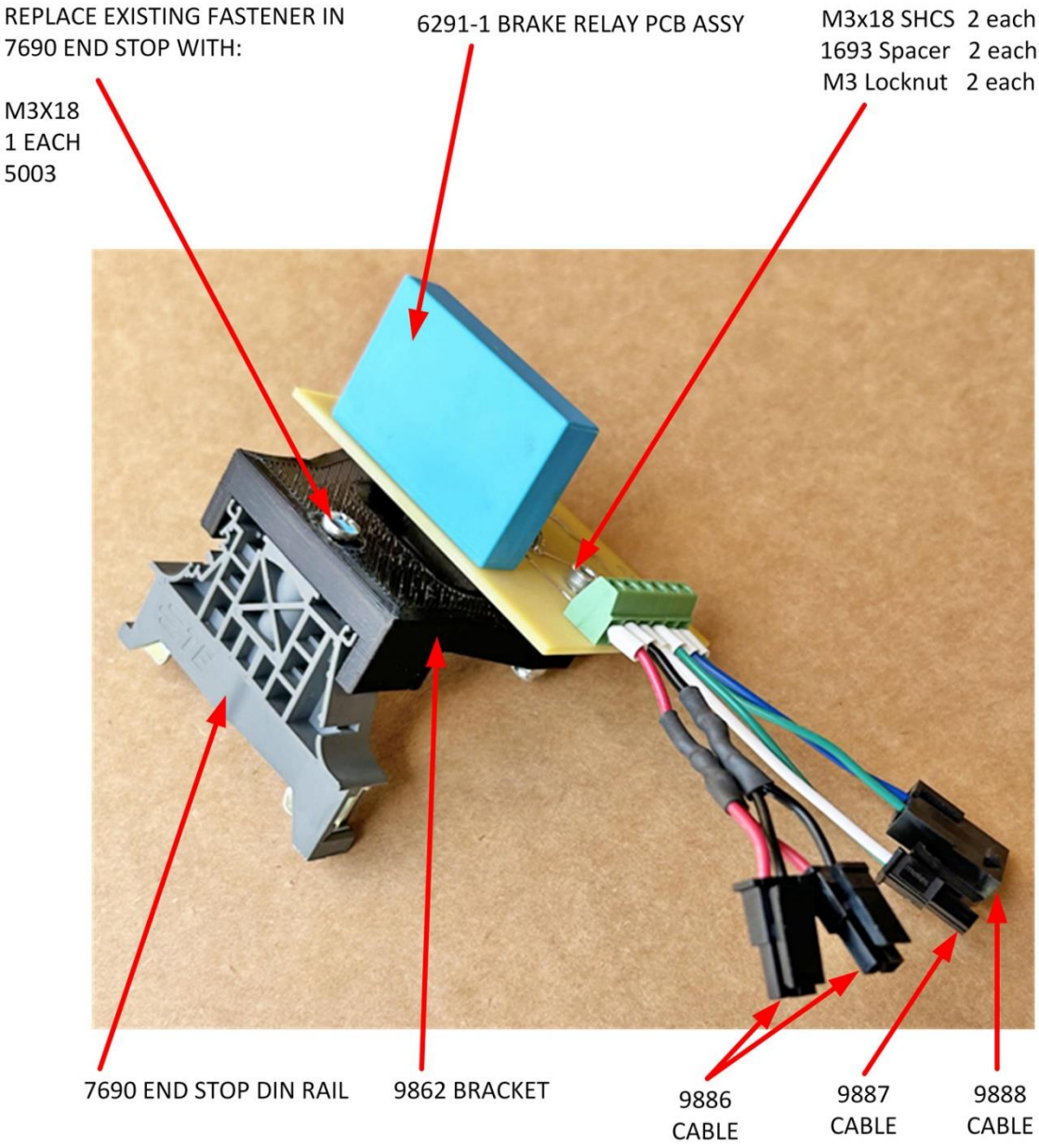
Loctite Primer, 7649, p/n 9896, can be used and will reduce the working time to 1 or two minutes.

Install the two Damper Set Screws using “Blue” Locktite and tighten moderately to firm.

Allow the glued joint to fully cure.

The design intent is to permenently attach the Damper to the Stepper motor, because it is part of the Brake system.

RELAY BRAKE ASSY



Wire only to the 24 volt power supply.

BRAKE RELAY BOARD MOUNTED ON DIN RAIL NEXT TO POWER SUPPLIES.

The big power supply is 48 volts.

The small power supply is 24 volts.

Wire Only to the small 24 volt power supply.

SUGGESTED WOOD BLOCKING FOR ACCESS AND INSTALLATION.

Access from the bottom is required.

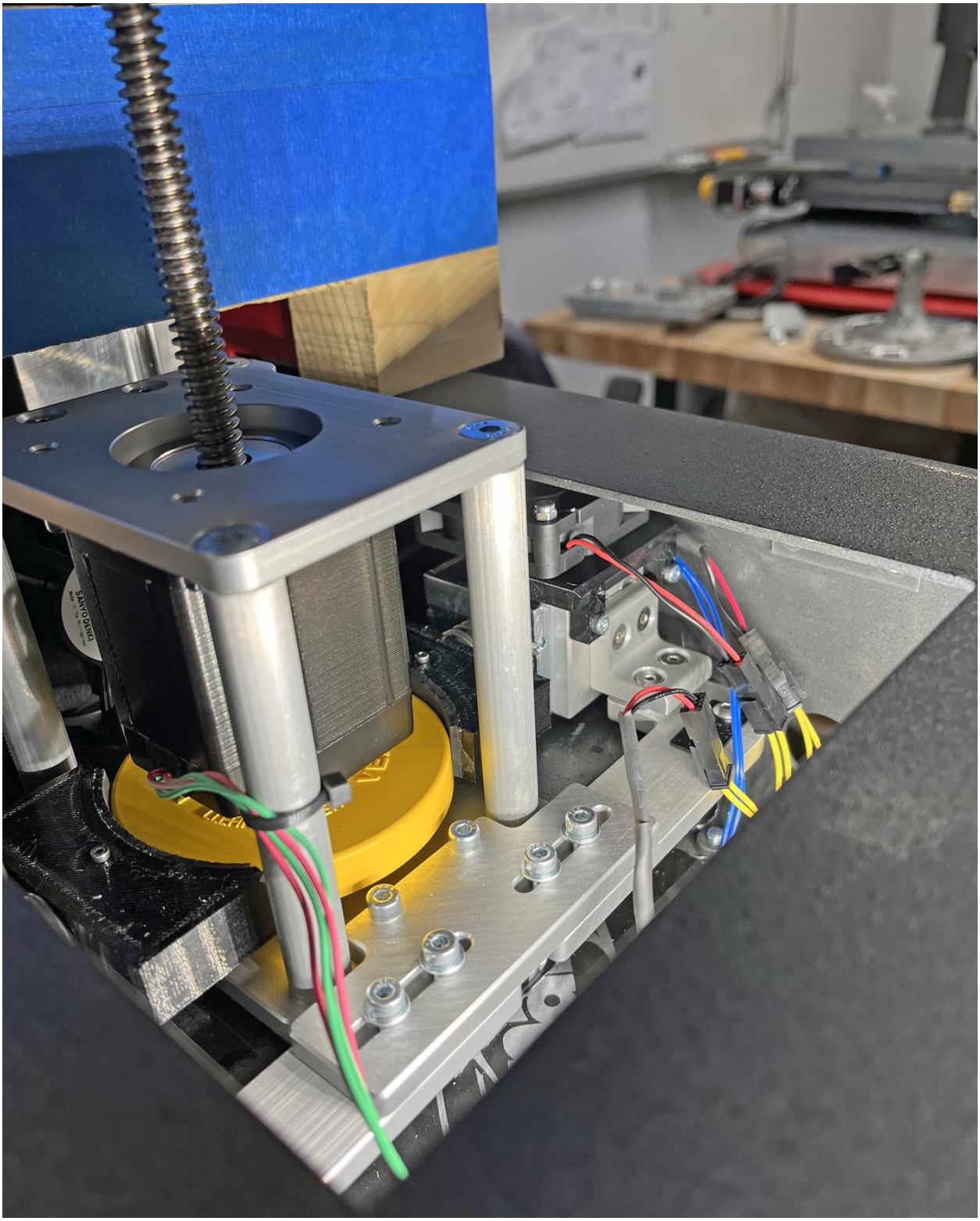
Serious pinch points exist with this assembly.

The Knee/Stage Assy weighs 70 pounds and will quickly free wheel down.

Always use a wood block between the Knee/Stage Assy and the top of the Chassis to protect from pinching hands or fingers.

Turning the Damper by hand, to raise the Knee/Stage Assy, can only be done if both brake calipers are retracted. Movement up is very slow.

COMPACT INSTALLATION.



INSTALLATION RECOMMONDATIONS:

The fully assembly unit will not fit into the chassis.

The Center Motor Assy should be unbolted from the two Side Fan/Solenoid Assy's.

Install only the Center Motor Assy, with the Lead Screw.

Move the Lead Screw up about 75%, then place the Motor Assy into the Chassis.

A large Rubber Isolation Pad rests between the bottom of the Motor Assy and the top of the Chassis.

Turn the Damper and move the Lead Screw Bearing Box Up and into the rectangular caveaty in the bottom of the Knee/Stage Assy. Leave the parts loose and then install the M5 bolts in the top and the M6 bolts in the bottom. Move and align the entire Assembly so the four fastener hold are inline, then tighten the bolts.

Use Blue Loctite on the lower M6 Bolts and do not over tighten them, which will compress the rubber Isolation pad. Unequal bolt tightness can cause misalignment.

Next install the two side Fan/Solenoid Assy using the open space in the bottom front of the chassis.

For removal from the chassis reverse the process. Remove the Fan/Solenoid Assy's, then the Center Motor Assy.

The Red and Black pair of wires plug into a three way splitter and provides power to the motor and coil fans.

The White and Green pair of wires plug into a two way splitter and provides power to the Solenoids.

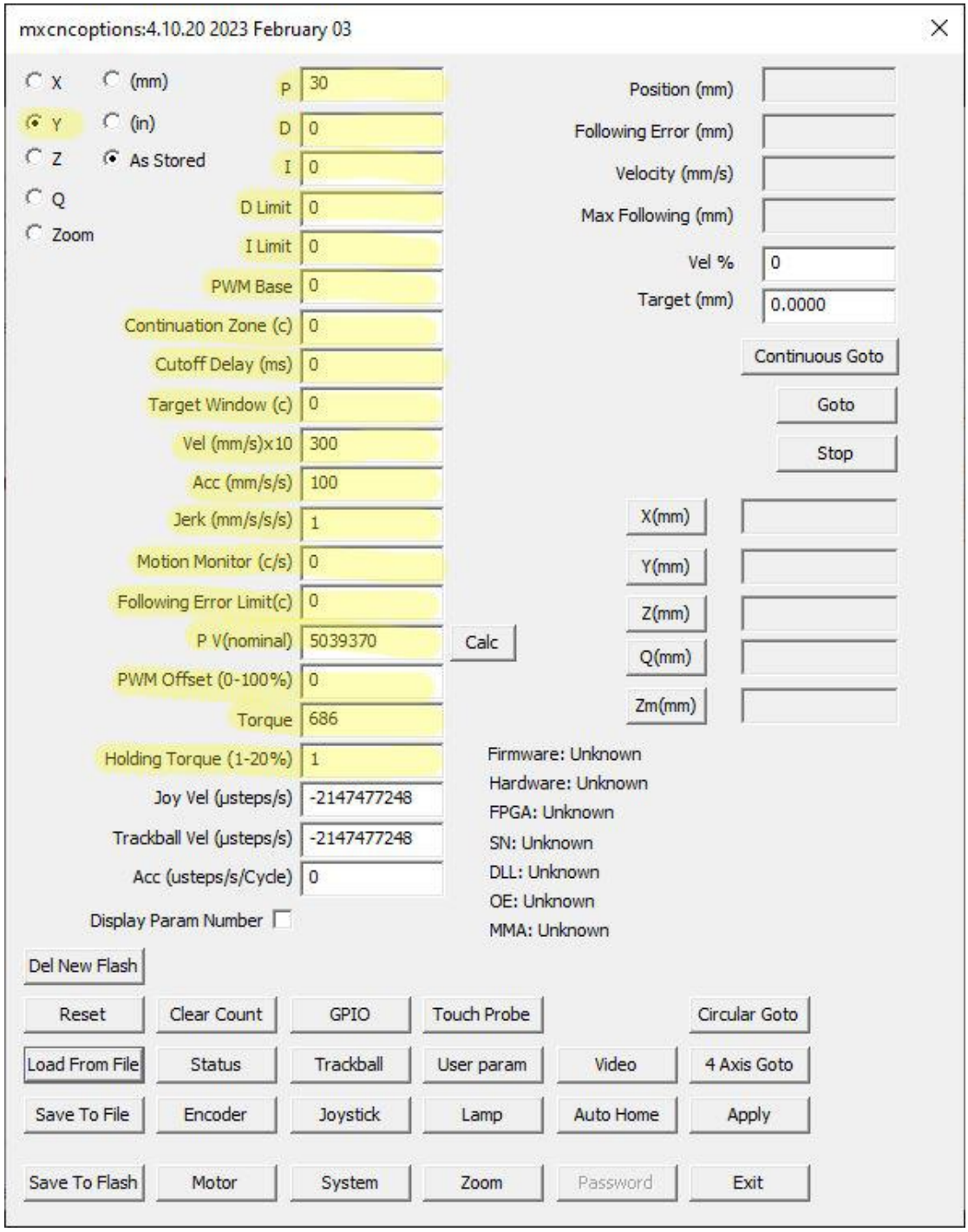
Fan power and Solenoid power, at the Stepper Motor Assy, have different connectors and can not be incorrectly plugged togeather.

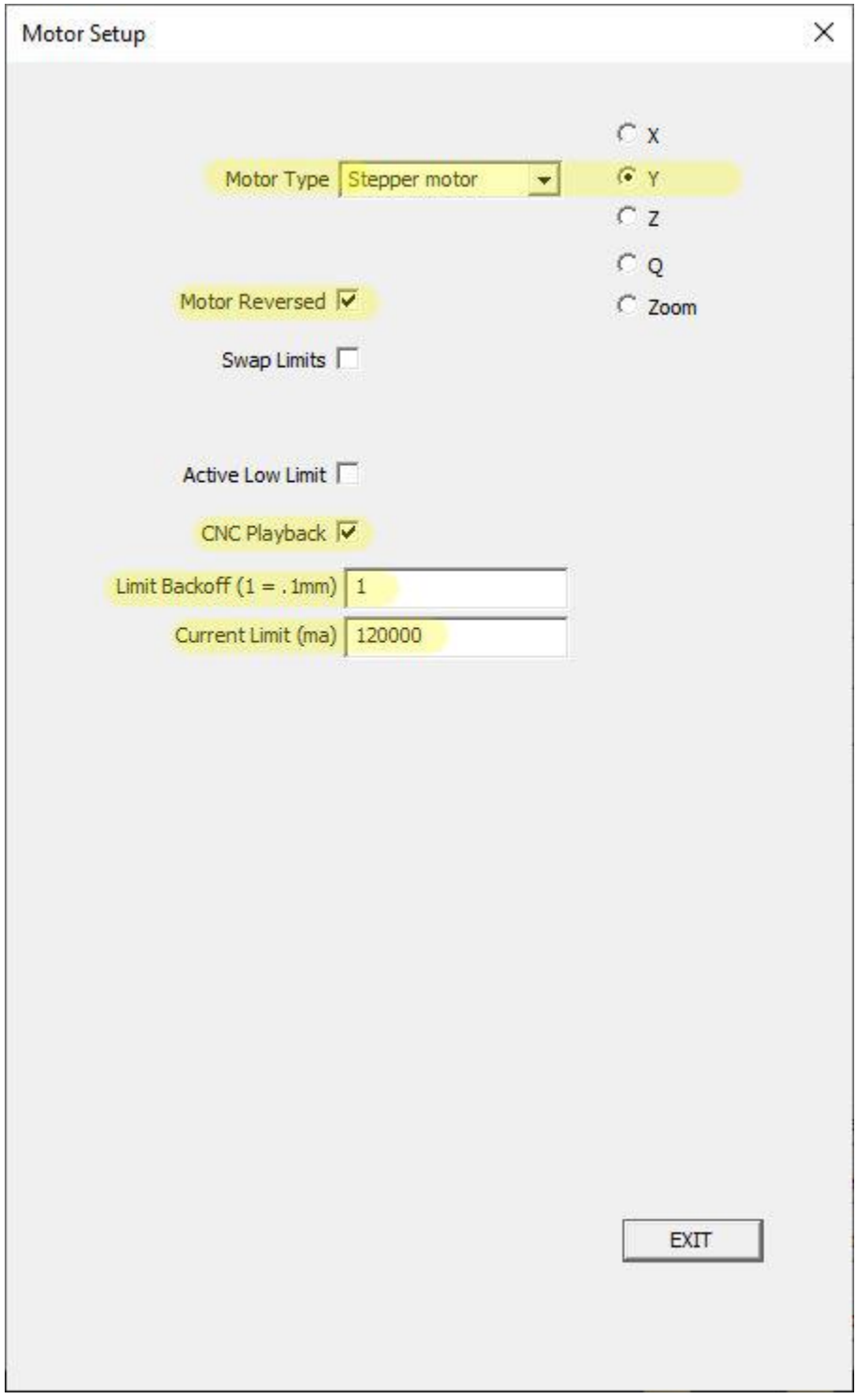
MXCNCOPTIONS CHANGES:

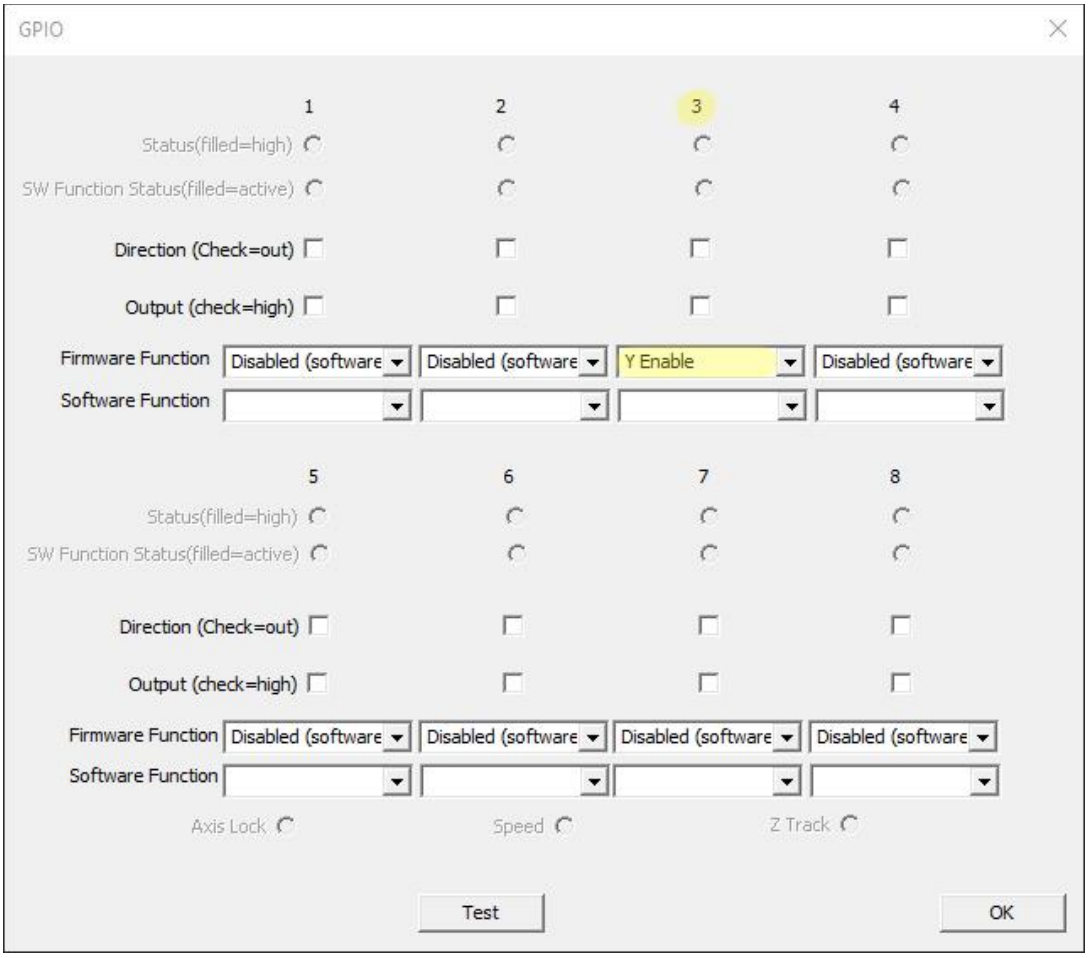
All changes are only on the Y Axis.

An updated PAR file is available.

Below are the changes required to update an existing PAR file.




Motor Setup
X
Motor Type
Stepper motor
Y
Z
Q
Motor Reversed
Zoom
Swap Limits
Active Low Limit
CNC Playback
Limit Backoff (1 = .1mm)
1
Current Limit (ma)
120000
EXIT



RETRO FIT COMMENTS:

Field Retro Fits should be fairly straight forward and simple, for systems with 48 volt M3 controllers.

An existing 7661-2 M3 Controller can be rewired into a 7661-3 by rerouting two internal wires.

Remove the entire control box, or simply remove the four front panel screws and pull out the pcb board cluster.

Having the proper wood blocks might be the most important tool for Retro Fit and Safty.

Block One holds the stage up, at the right height.

Block Two supports the bottom of the chassis, behind the front feet, and allows the machine to be pulled forward and over the work table. This allows access to the front bottom of the chasiss.

The other to support the bottom of the chassis and allow the machine to be pulled forward and over the table. The block for holding up the stage needs to be in the shape of an inverted letter U.