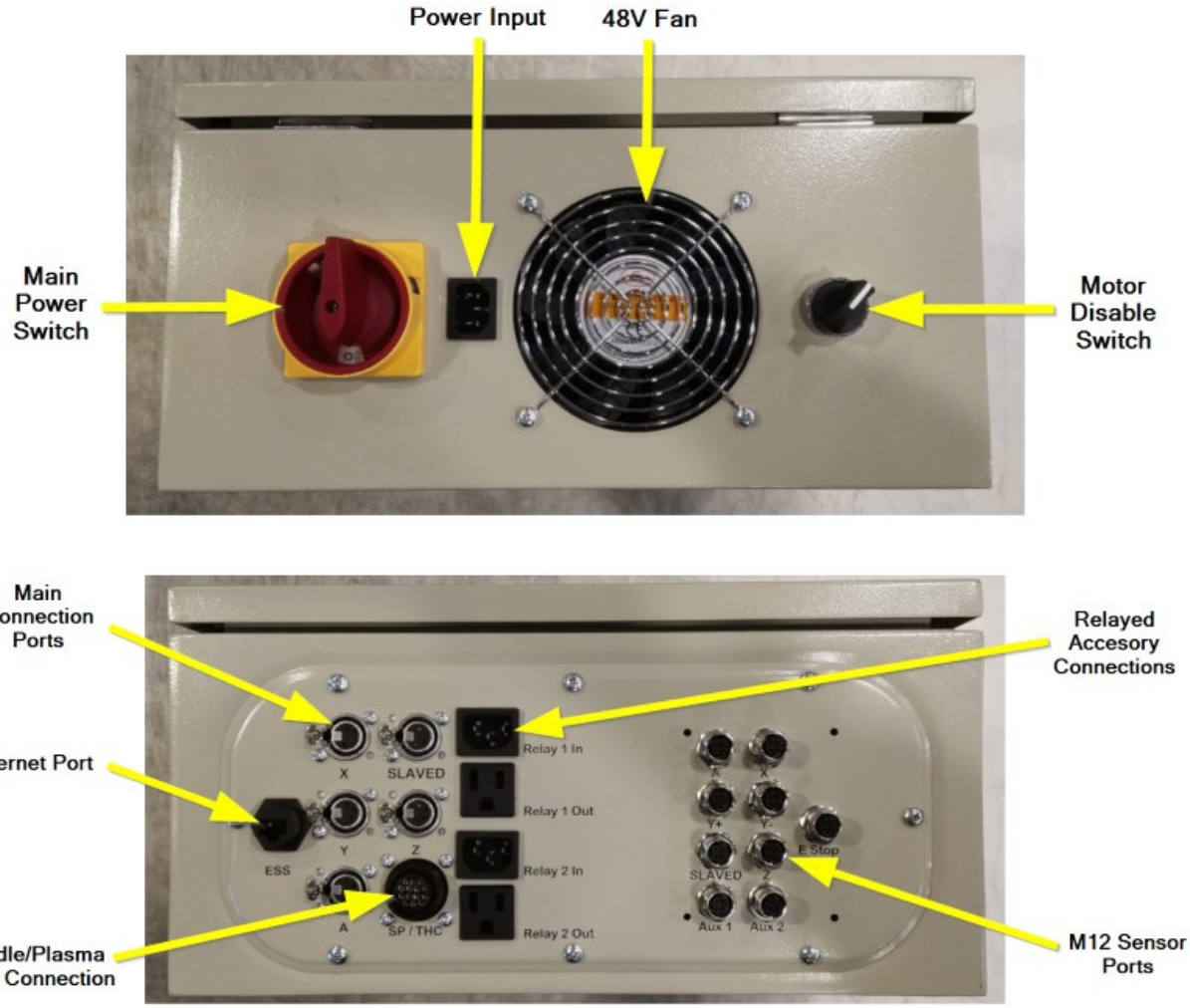
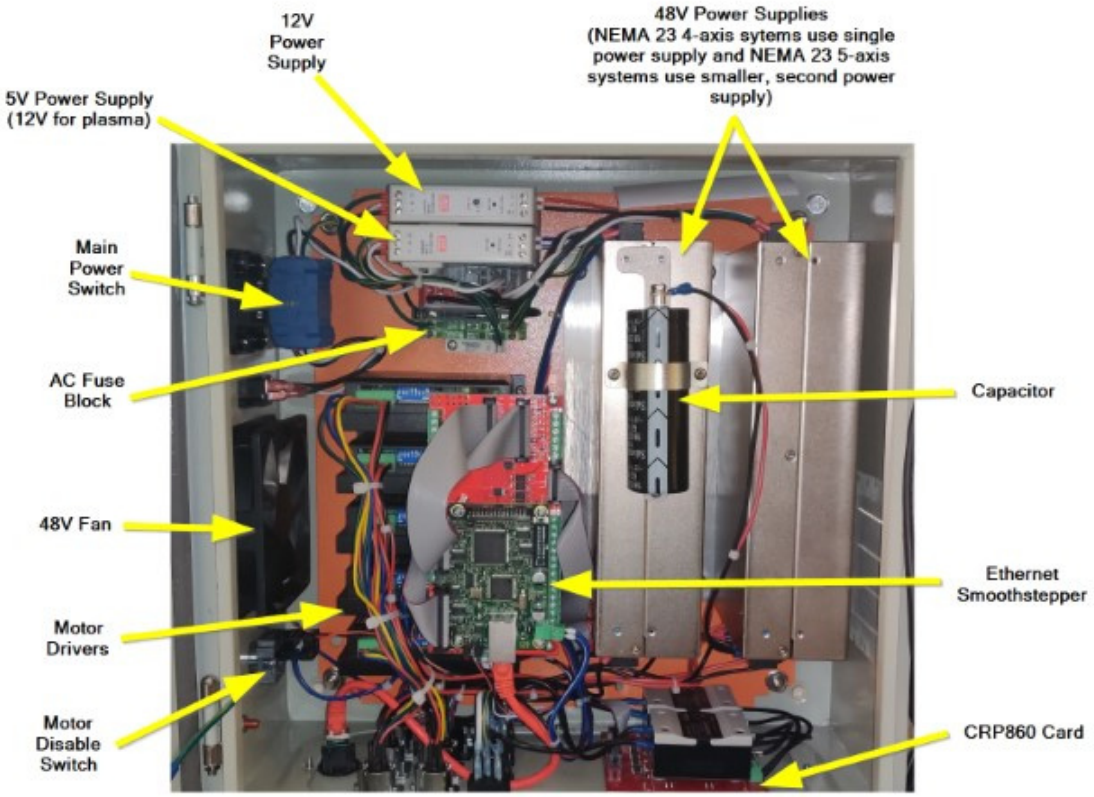
Plug and Play CNC Controller
Technical Manual

v2025Q1.1, 17.4 Model Revision

System Overview

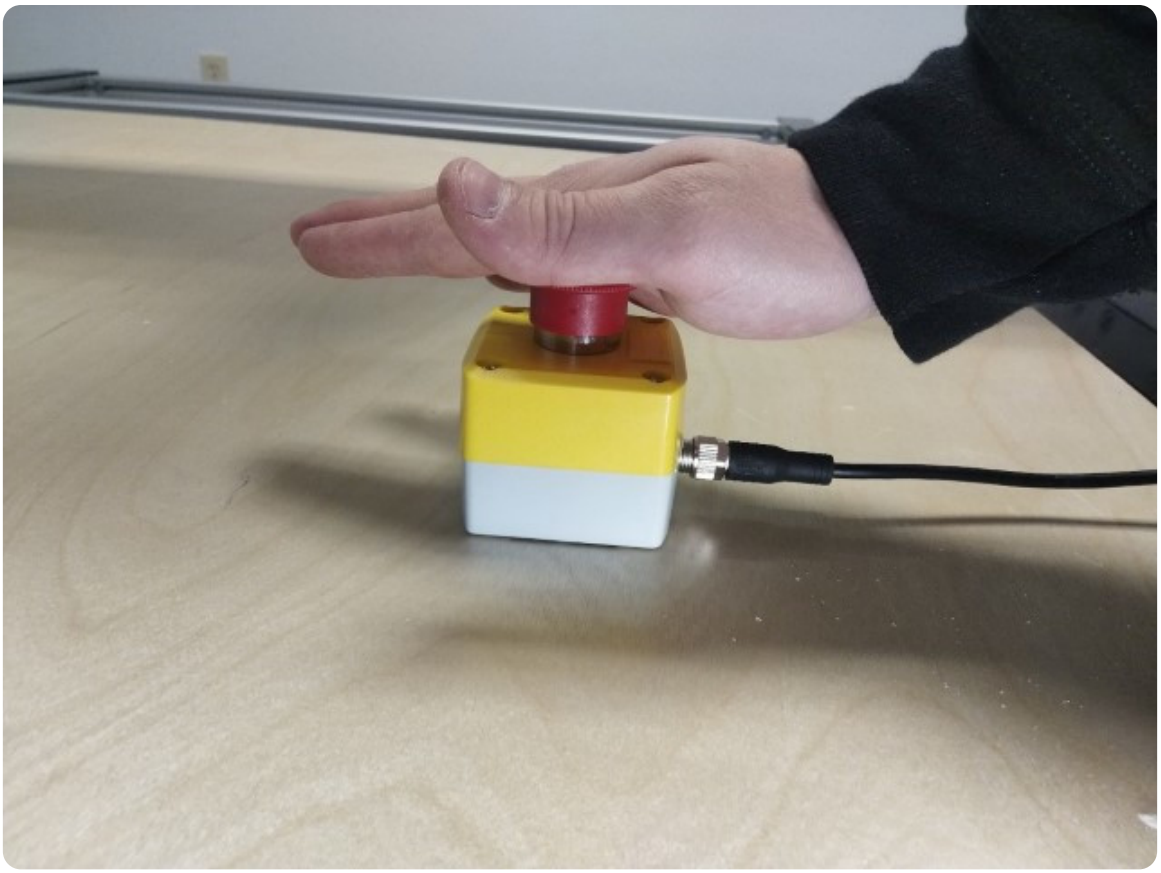
Major Components





Emergency Stop

The emergency stop system is a normally closed circuit and must be plugged in for the CNC controller to operate. It is recommended to keep it within easy reach during machine operation so it is quickly accessible if the machine needs to be emergency stopped.



To activate the emergency stop, press down on the red button. The machine will come to an immediate stop and all outputs connected to the CNC controller will be turned off.

In order to clear the emergency stop, twist the red button clockwise until it releases.

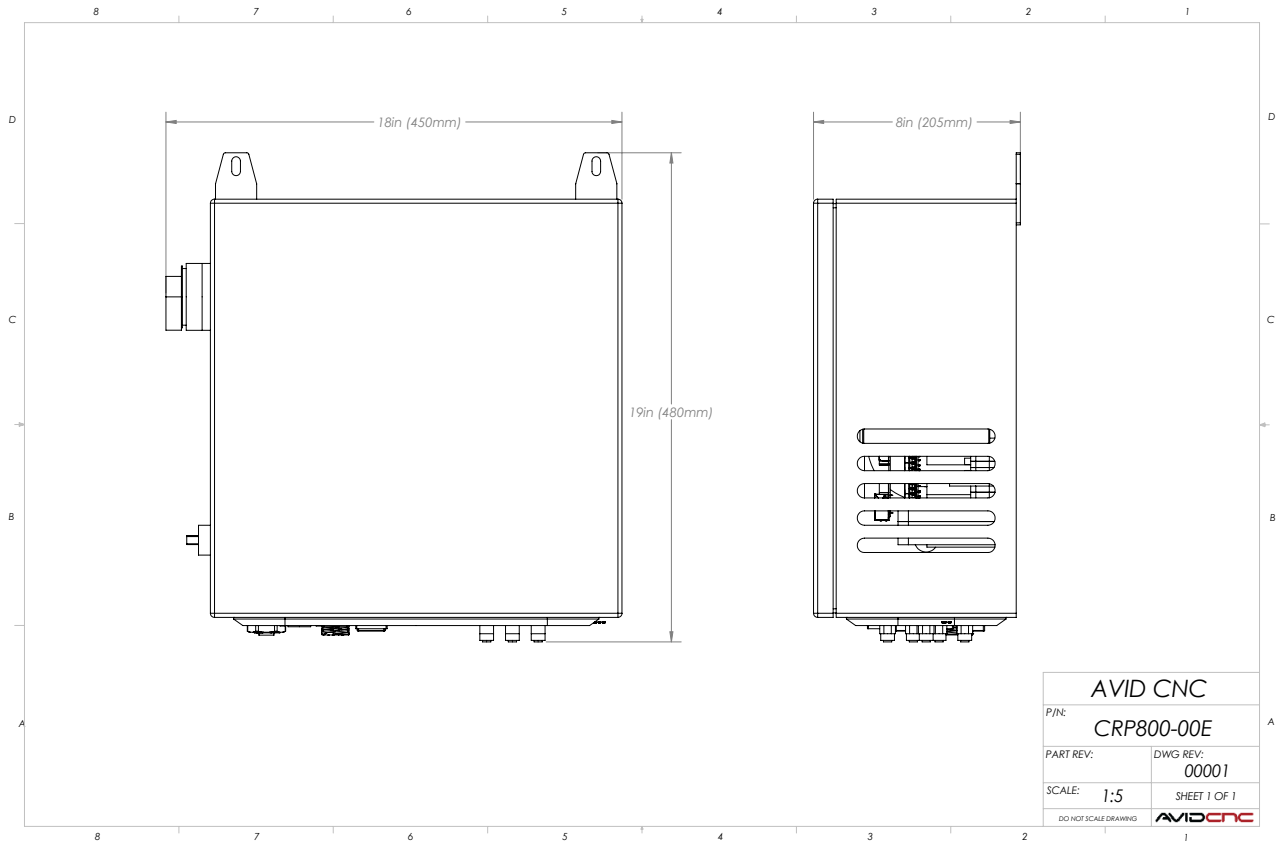
Motor Disable Switch

The motor disable switch can be found on the side of the box below the fan. Using the motor disable switch will disconnect power to the motor drives and motors. This works as a safety measure and allows you to perform maintenance, manually move the machine, or disconnect and reconnect motors without any danger to the motors or drives.

System Requirements

Size Requirements

CRP800-00E Control Box



Power Requirements

NEMA 23 CNC Controller:

- Input power: 100-120VAC or 200-240VAC, 50/60Hz
  - Voltage range must be set on main power supplies. They will be pre-configured for 100-120VAC, unless the system was specifically ordered for 200-240VAC power.
- Current draw (approx.): 6A @ 120VAC, 3A @ 240VAC

NEMA 34 CNC Controller:

- Input power: 100-120VAC or 200-240VAC, 50/60Hz
  - Voltage range must be set on main power supplies. They will be pre-configured for 100-120VAC, unless the system was specifically ordered for 200-240VAC power.
- Current draw (approx.): 12A[†] @ 120VAC, 6A @ 240VAC

[†] The C13 type input power socket is rated for 15A in North America and 10A in most international regions. In those regions the Plug & Play Controller should be powered with 200+ VAC.

Plug and Play Spindle / VFD Systems:

Please see the **Power Requirements** section in our Plug and Play Spindle / VFD Manual.

Initial Setup

Avid CNC Plug and Play Spindle Connections

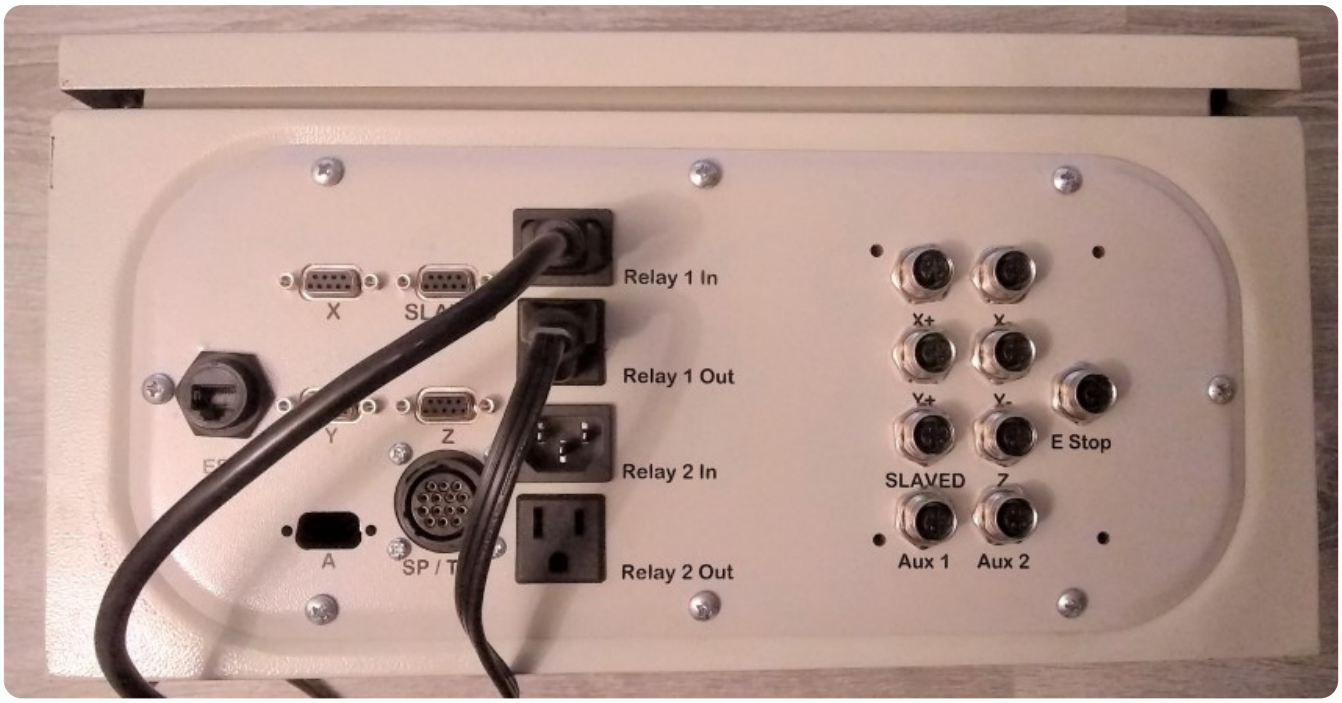
Refer to the appropriate setup instructions for your Spindle/VFD package:

- Plug and Play Spindle / VFD System: **CRP800 VFD Setup Guide**

Avid PRO CNC Plasma System Connections

Refer to the PRO CNC Plasma setup instructions: **PRO CNC Plasma Instructions**

Relay 1 Output Connections

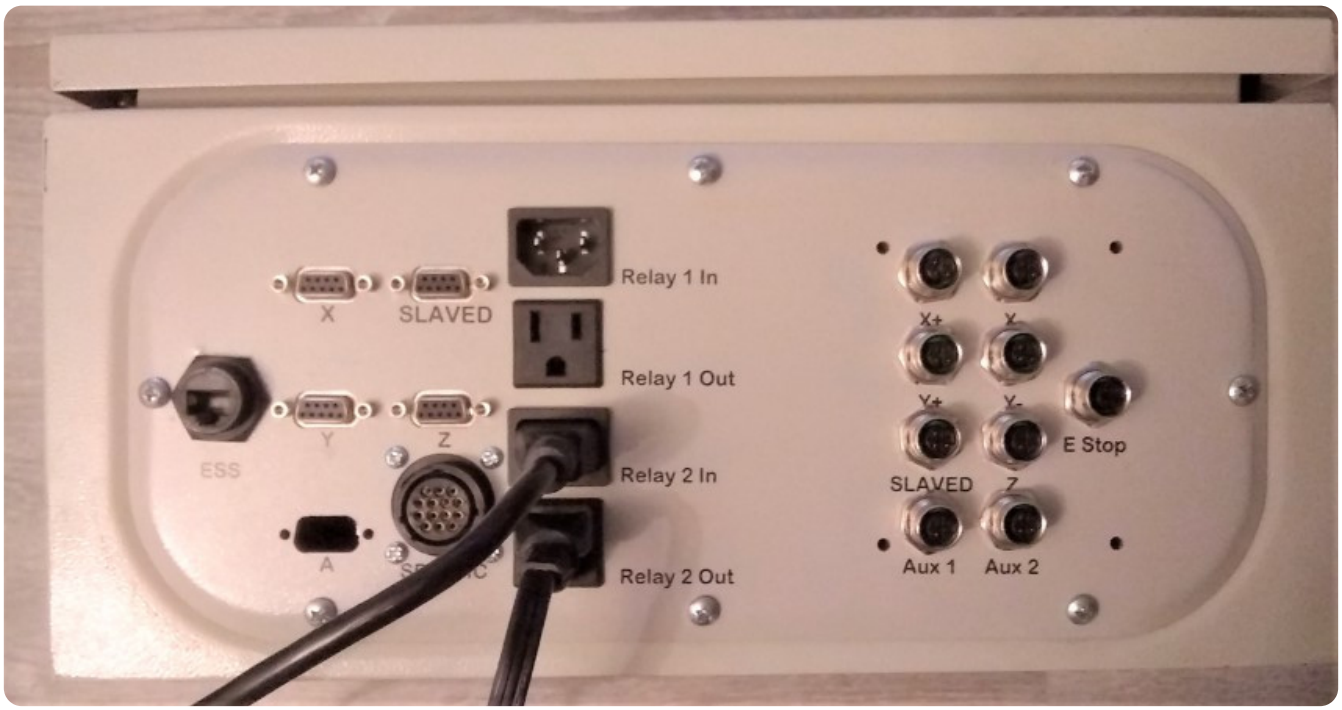


Relay 1 is rated for 250VAC and 15A† AC. The relay requires external AC power to be plugged in to "Relay 1 In" on the CNC controller. This output is commonly used in two ways:

- **Control a router:** When Avid CNC's version of **Mach4** is configured with a router cutting tool, the router should be plugged into "Relay 1 Out". By default it is controlled by either the **Router toggle button** in Mach4 or by G-code with M03 (spindle ON) and M05 (spindle OFF) commands.
- **Control a dust collector, coolant system, or general AC load:** When Avid CNC's version of **Mach4** is configured with a spindle or plasma cutting tool, relay 1 can be controlled either manually or using G-code. To manually operate the relay, use the **relay 1 toggle button**. Using G-code, M08 will turn relay 1 on and M09 will turn BOTH relay 1 and relay 2 off.

† The C13 type relay power plugs/sockets are rated for 15A in North America and 10A in most international regions.

Relay 2 Output Connections



Relay 2 is rated for 250VAC and 15A† AC. The relay requires external AC power to be plugged in to "Relay 2 In" on the CNC controller.

This output is commonly used for dust collection or coolant systems, but can be used for many general AC loads. Relay 2 can be controlled manually in Mach4 with the **relay 2 toggle button**. The use of G-code to operate relay 2 will depend on your **Mach4 configuration**.

- Router cutting tool: Use M08 to turn relay 2 on and M09 to turn relay 2 off.
- Spindle or plasma cutting tool: Use M07 to turn relay 2 on and M09 to turn BOTH relay 1 and relay 2 off.

† The C13 type relay power plugs/sockets are rated for 15A in North America and 10A in most international regions.

3rd Party Spindle/VFD or non-Hypertherm Plasma Torch Connections

Use the information below to adapt external equipment to the 14-pin control cable supplied with the Avid CNC Plug and Play controller. The 14-pin female connector is pre-wired into the Plug and Play controller with these functions. Note: "Plasma" wires are only connected in plasma-enabled Plug and Play systems.

14-Pin Control Cable Pinout

Application

Plasma pins are populated but not connected by default on routing controllers, and Spindle pins are populated but not connected on plasma controllers.

ConnectorPin #	Use	In / Out	Description	Color	ESS Port/Pin
1	Spindle	Digital In	Fault Ground	Blue	
2	Spindle	Digital In	Fault Signal	White	2/13
3	Plasma	Digital Out	Torch ON	Orange/Black	3/17
4	Plasma	Digital Out	Torch ON	Green/Black	
5	Plasma	Analog In	Voltage Divider -	Red/Black	
6	Plasma	Analog In	Voltage Divider +	Red/White	
7	Spindle	Digital Out	FWD	Orange	2/14
8	Spindle	Digital Out	DCM	Green	
9	Spindle	Analog Out	AVI	Red	2/1
10	Spindle	Analog Out	ACM	Black	
11	Spindle	(optional) Analog	10V Ref	Blue/White	
12	Plasma	Digital In	Arc OK	White/Black	3/10
13	Plasma	GND	Ground	Blue/Black	
14	Plasma	Signal GND	Arc OK Ground	Green/White	

Pin 1/2, Fault Signal/Fault Ground: This input is used to read a fault from an external VFD, typically from thermal overload or a disconnected spindle power cable.

Pin 3/4, Torch ON: This output is from a small dry contact relay on the TMC3in1 used to trigger a CNC controllable plasma torch ON/OFF.

Pin 5/6, Voltage Divider: This input is the Tip Voltage used for Torch Height Control (THC). It is critical that the (+)(-) polarity of this signal is correct, as well as the voltage divider ratio. The ratio must be 50:1 (used by Hypertherm and preset in the Avid CNC Mach4 profile), 40:1, 30:1, 20:1, 16.67:1, or 15:1. **Note:** Do not connect raw tip voltage, this will damage the TMC3in1.

Pin 7/8, Spindle Relay: This output is from a small dry contact relay on the CRP850 breakout board and is used for sending an on/off signal to an external VFD, typically for a forward/stop command.

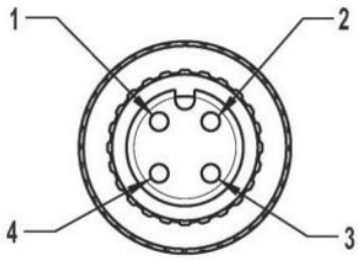
Pin 8/9, Spindle Analog Signal: This output is a 0-10V analog signal used to control VFD frequency/spindle RPM.

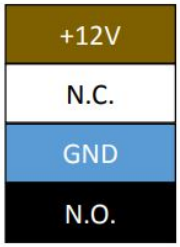
Pin 11, 10V Reference: Unused in most systems, this pin can provide a 10V reference if required by the VFD.

Pin 12/14, Arc Okay: This input signals to the CNC controller that the plasma arc has successfully transferred to the material and the cut program can continue motion. Typically the plasma power supply will close a dry contact relay to control this signal.

Custom M12 Inputs Connections

For custom machine applications, the M12 sensor inputs on the CRP860-00E breakout board can be used for purposes other than limits and probes. The inputs are Normally Open, rated for 12V, and follow a standard M12 A-coded pinout. See the section for more details on pin assignments in Mach4.





- Sensor Cables are A-Coded M12 connector standard.
- Pin 1 (Brown wire) is Power (12V or 24V)
- Pin 2 (White wire) is Normally Closed signal
- Pin 3 (Blue wire) is Ground
- Pin 4 (Black wire) is Normally Open signal

This picture is looking at a Female connector body - pin assignments will be mirrored for Male.

> **Note**
>
> Not all pins are populated for connectors on the CRP860-00E IO breakout board.
>
> - **Sensor and Aux inputs:** Pin 2 (Normally Closed) is not populated
> - **E Stop input:** Pin 4 (Normally Open) is not populated

System Settings

Power Settings

For NEMA 34 systems, the switch to change input voltages can be found on the power supply towards the top of the CNC controller enclosure.

The switch can be moved up or down and will display the input voltage setting of the power supply.

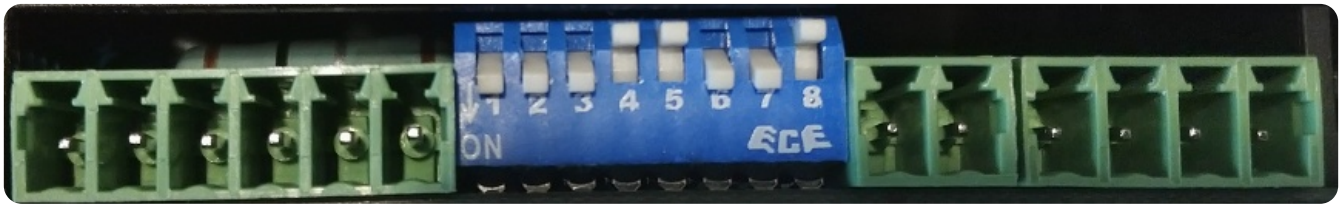
NEMA 23 5-Axis Systems

The second power supply in a NEMA 23 5-axis system will be smaller than those shown above. The switch to change input voltages on that power supply will be located on the top of the power supply.

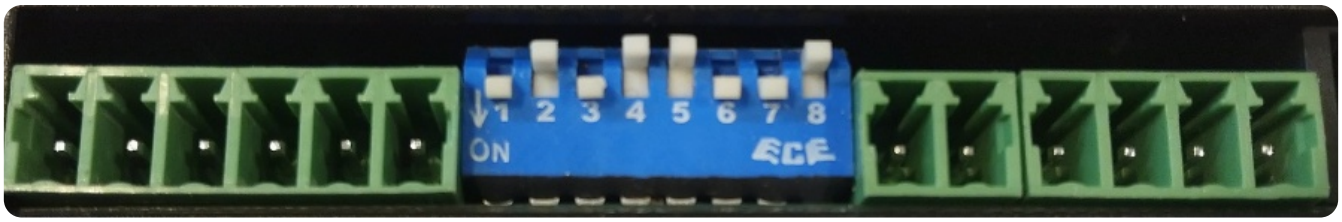
DIP Switch Settings

DIP switch settings on the motor drives will vary depending on your application. The DIP switch positions are shown below.

CRP8070 for 7.0A 1/2" NEMA 34 motors

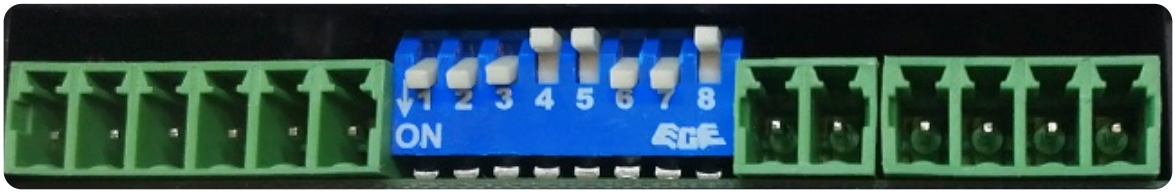


CRP5056 for 4.2A 3/8" Nema 23 motors

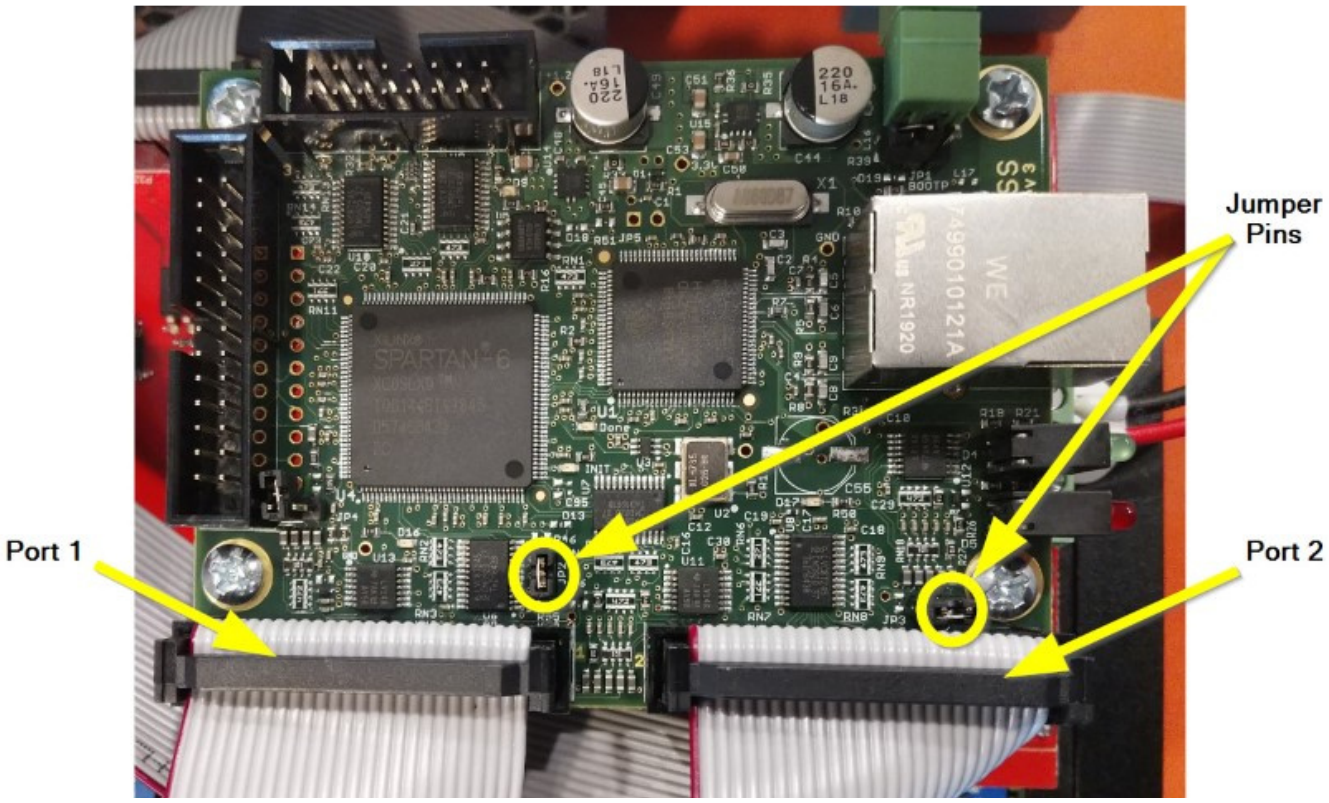


If you are using an Avid CNC rotary axis on a NEMA 23 system, be sure the rotary axis motor is hooked up to the 5th drive with that drive's DIP switch positions are set as shown below.

CRP5056 for 5.0A motors



ESS Jumper Settings



The jumper pins shown here can provide 5V to pin 26 of their adjacent header, port 1 or port 2. The ESS comes pre-configured in the CNC controller with these jumpers connected on port 1 and port 2.

5th Drive Upgrade for NEMA 23 Plug and Play Systems

Capacitor Installation

If your system has an existing 5th motor drive and you only need to install the capacitor, skip to the **Capacitor Installation** section.

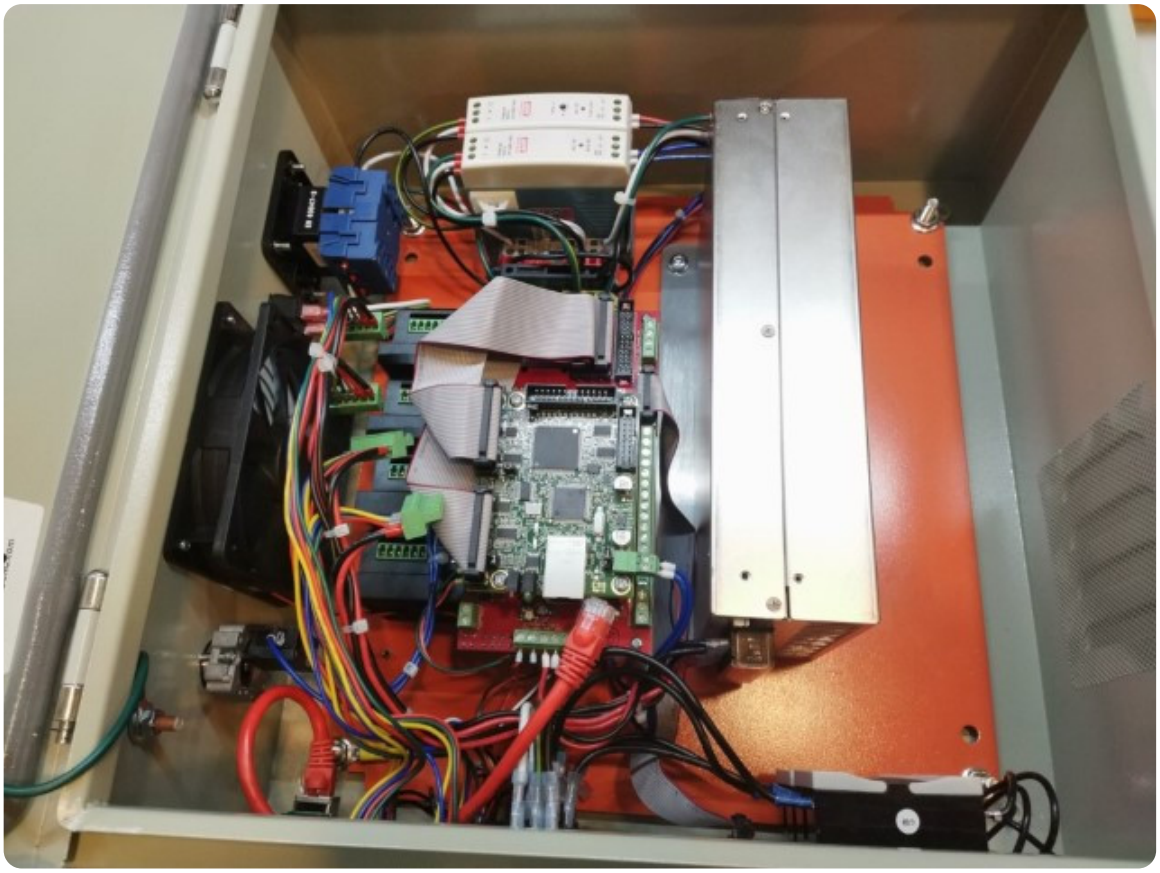
Warning

Ensure your plug and play control box is powered off with the power cable disconnected from the box. It is also recommended to remove the control box from the machine for easier installation of the motor drive.

1. Disconnect Components

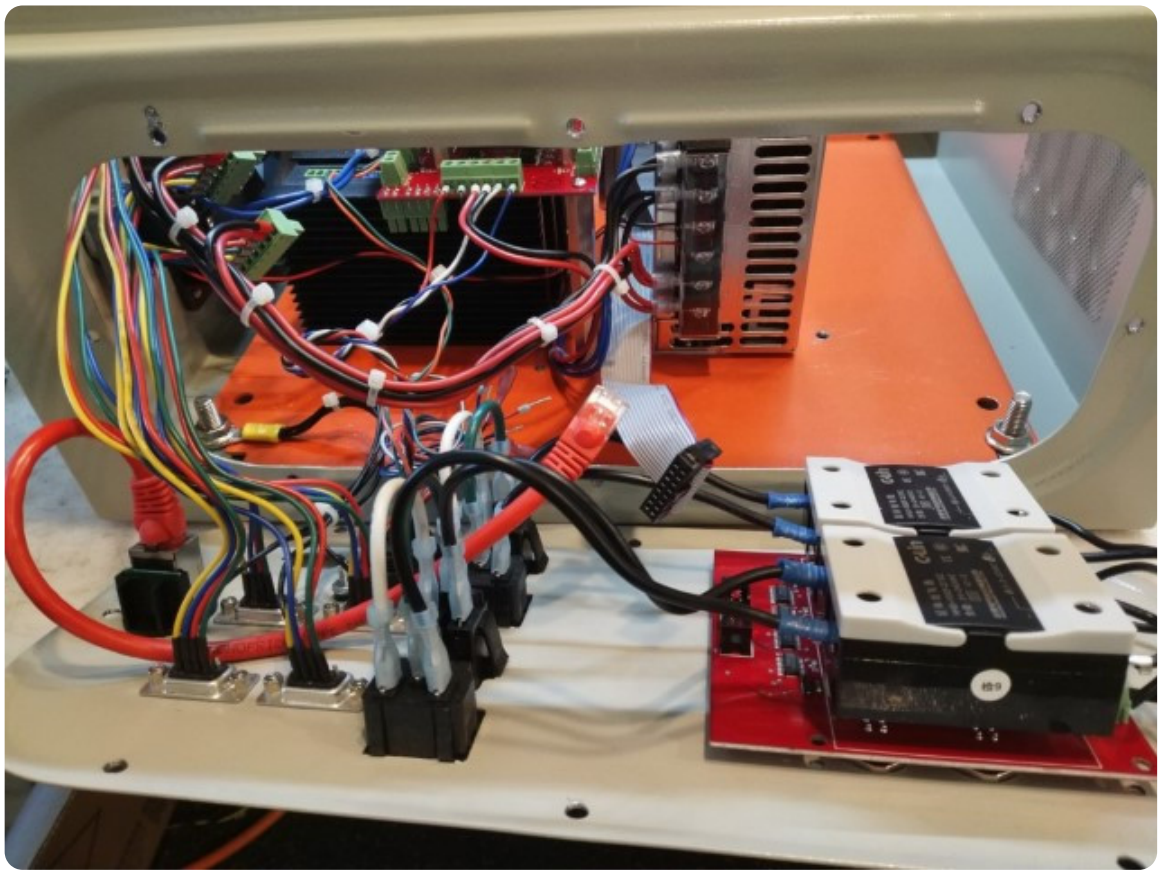
1.1

The fist step in upgrading your NEMA 23 system with a 5th drive will be to remove the gland plate and disconnect the breakout board. Unplug the four motor drivers and the ethernet cable connected to the breakout board.



1.2

Remove the gland plate fasteners, disconnect the ribbon cable attached to the relay board, and pull the gland plate away from the box.



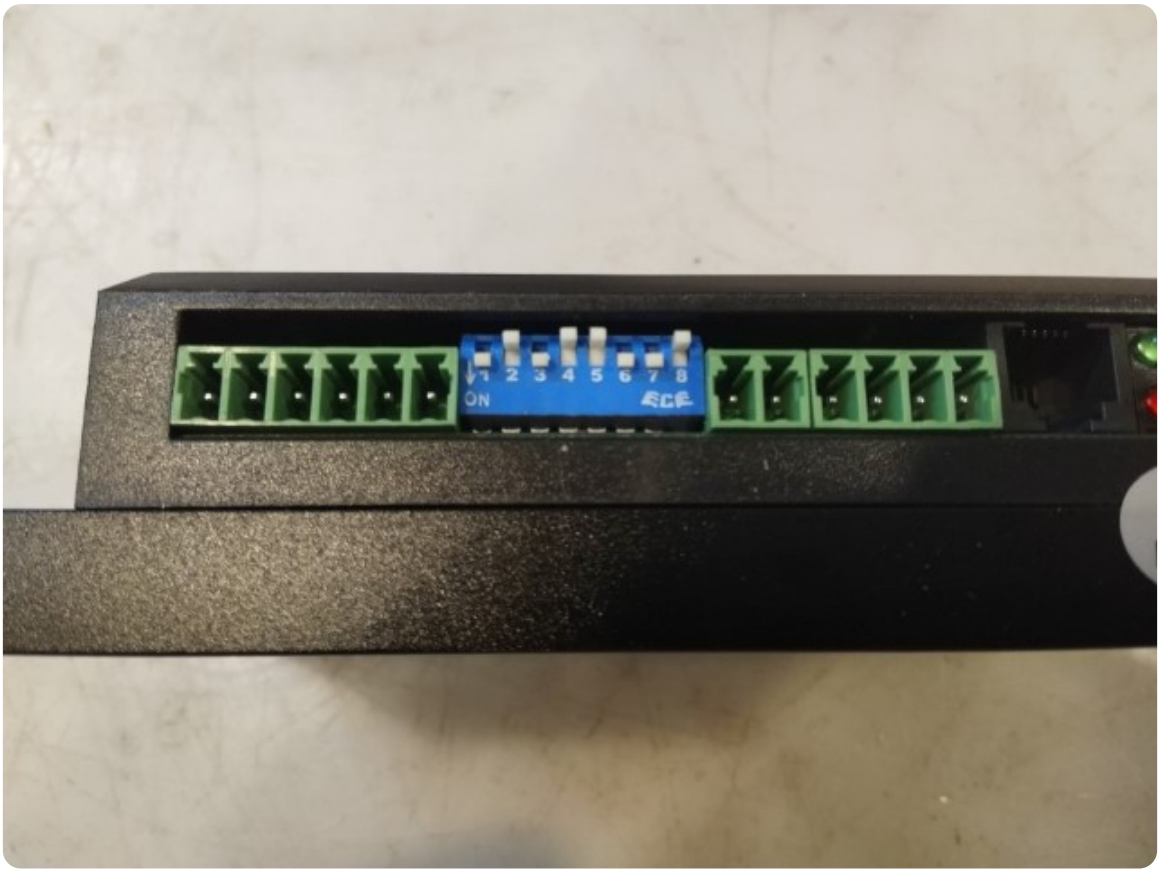
1.3

Remove the two fasteners holding the breakout board in place and carefully remove the board from the drives. Move the board into the opening left by the gland plate.

2. Drive Installation

2 .1

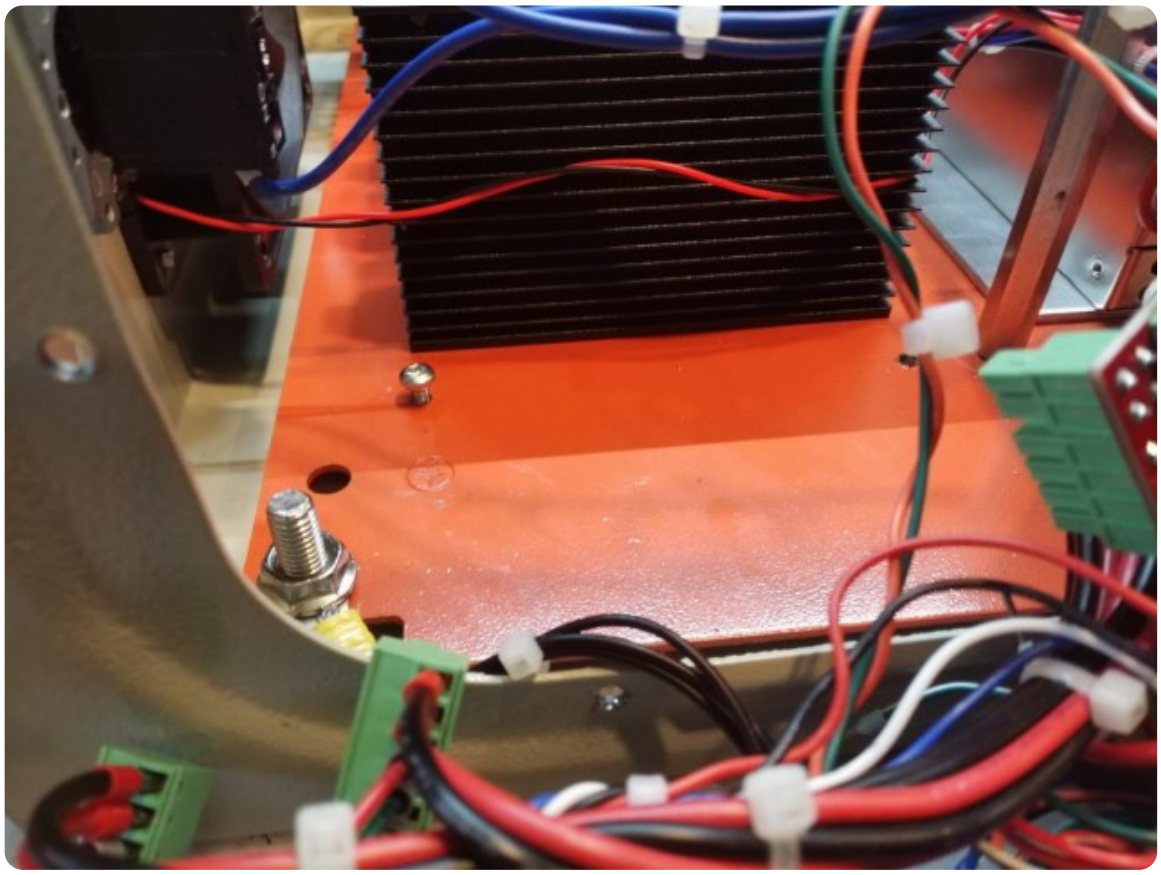
You will now be able to install the drive onto the chassis plate with the included (2) T20 M4 screws. Ensure the dip switches on the drive are in the correct orientation, as shown below:



- Dip switches in **ON** position: 1, 3, 6, 7
- Dip switches in **OFF** position: 2, 4, 5, 8

2.2

Partially install one of the M4 screws into a pre-drilled hole on the chassis plate, leaving room for the motor drive to slide under.

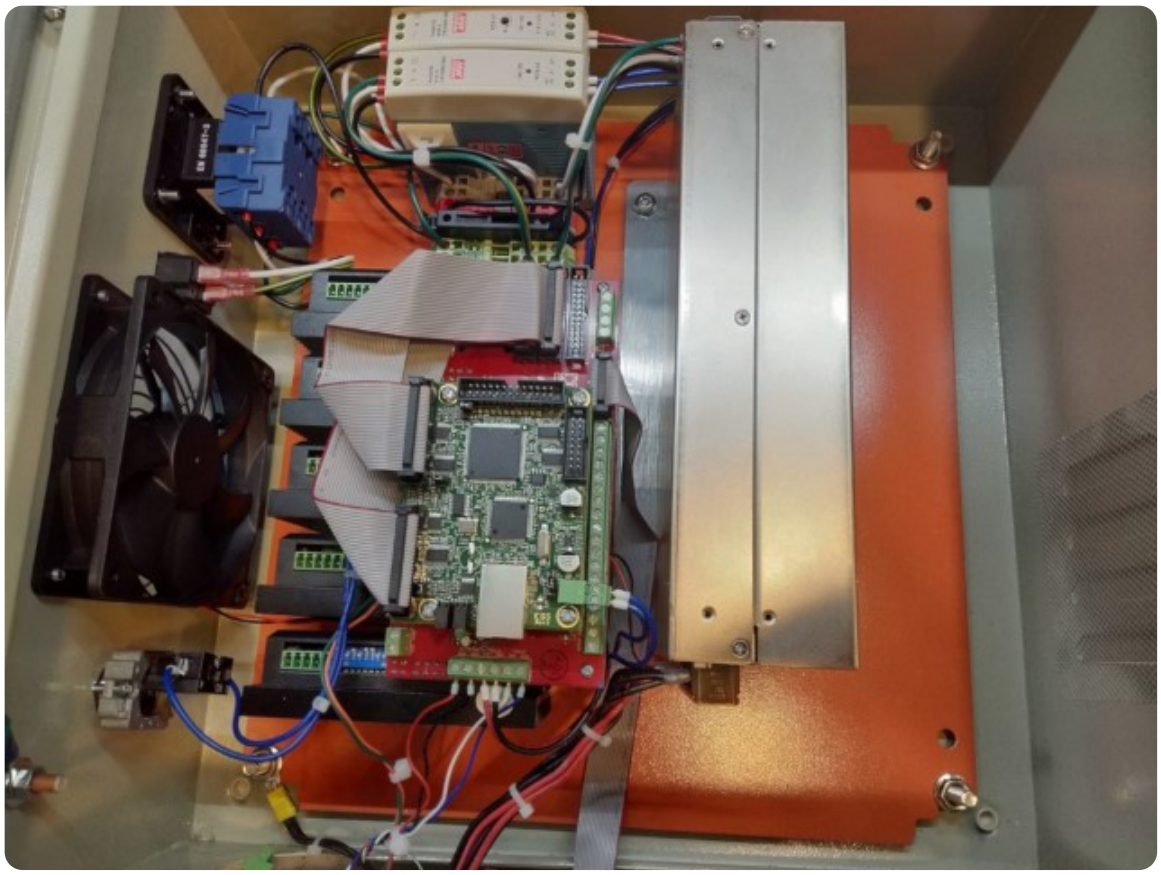


2.3

Slide the drive into place and fasten with the second M4 screw. Tighten both fasteners.

2.4

Plug the breakout board back into the drives and fasten with the two mounting screws.



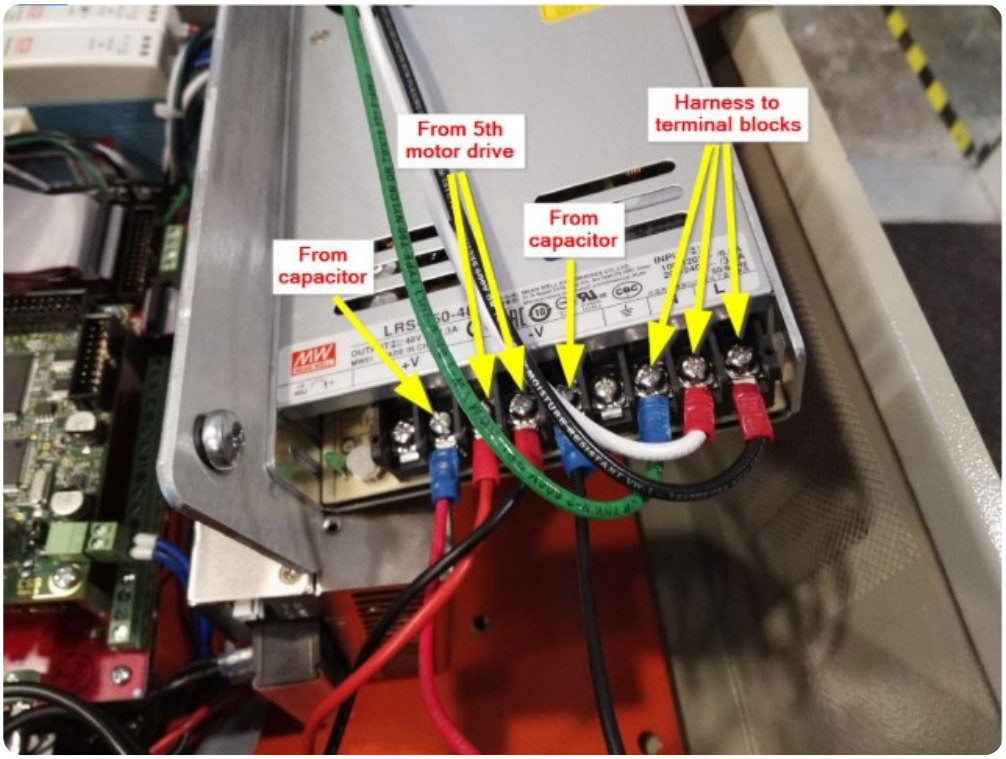
3. Capacitor Installation

Attach the capacitor to your existing power supply using the provided (2) M3 x 6mm socket head cap screws.

4. Power Supply Installation

4.1

After installing the drive, you will need to install the second power supply. Attach the drive power and capacitor wires to the power supply as shown below.



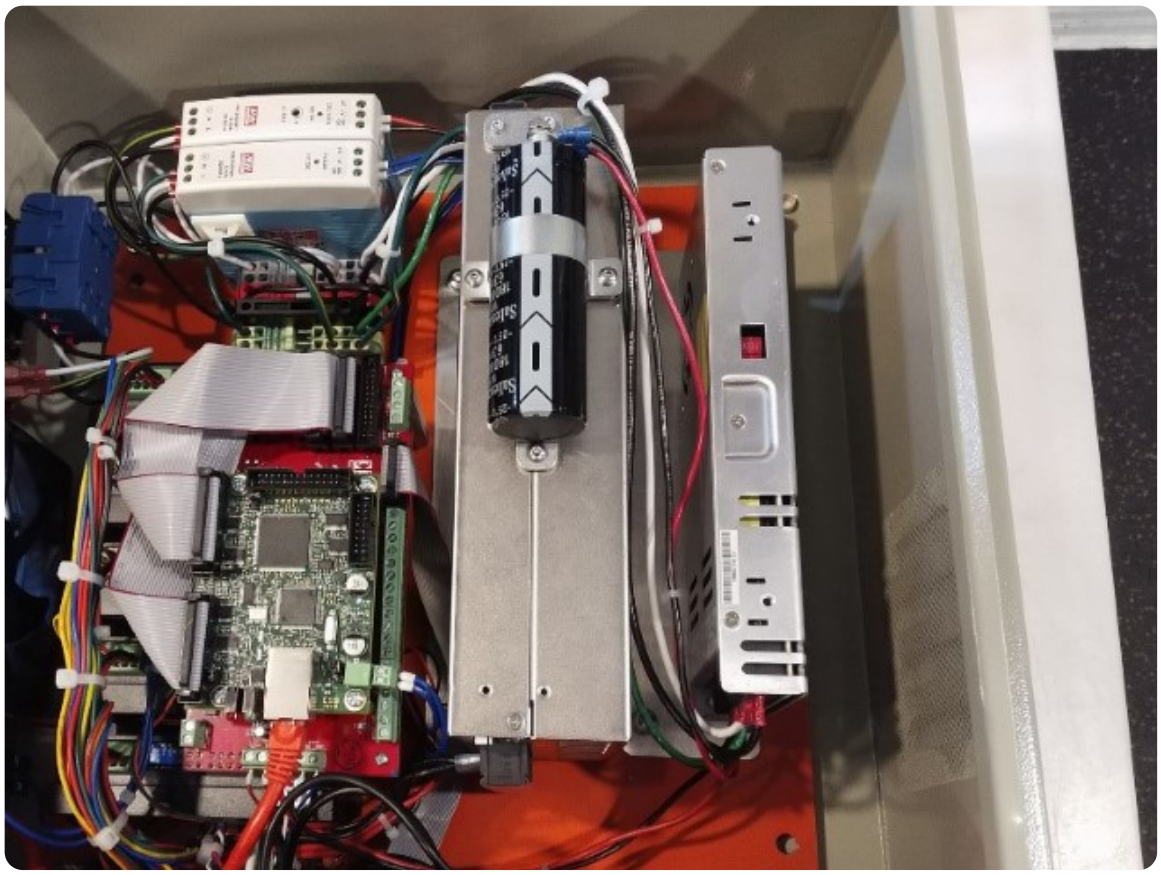
Harness	Wire Color	Power Supply Terminal
Capacitor	Red	V+
Capacitor	Black	V-
Motor Drive	Red	V+
Motor Drive	Black	V-
Terminal Blocks	Black	L
Terminal Blocks	White	N
Terminal Blocks	Green	⏚ (ground)

4.2

Ensure that the switch on top of the power supply is set to the correct voltage for your control box. This will be 115V unless you specifically ordered your control system setup for 230V.

4.3

Install the power supply onto the chassis plate using the provided (2) T20 M6 x 8mm screws.



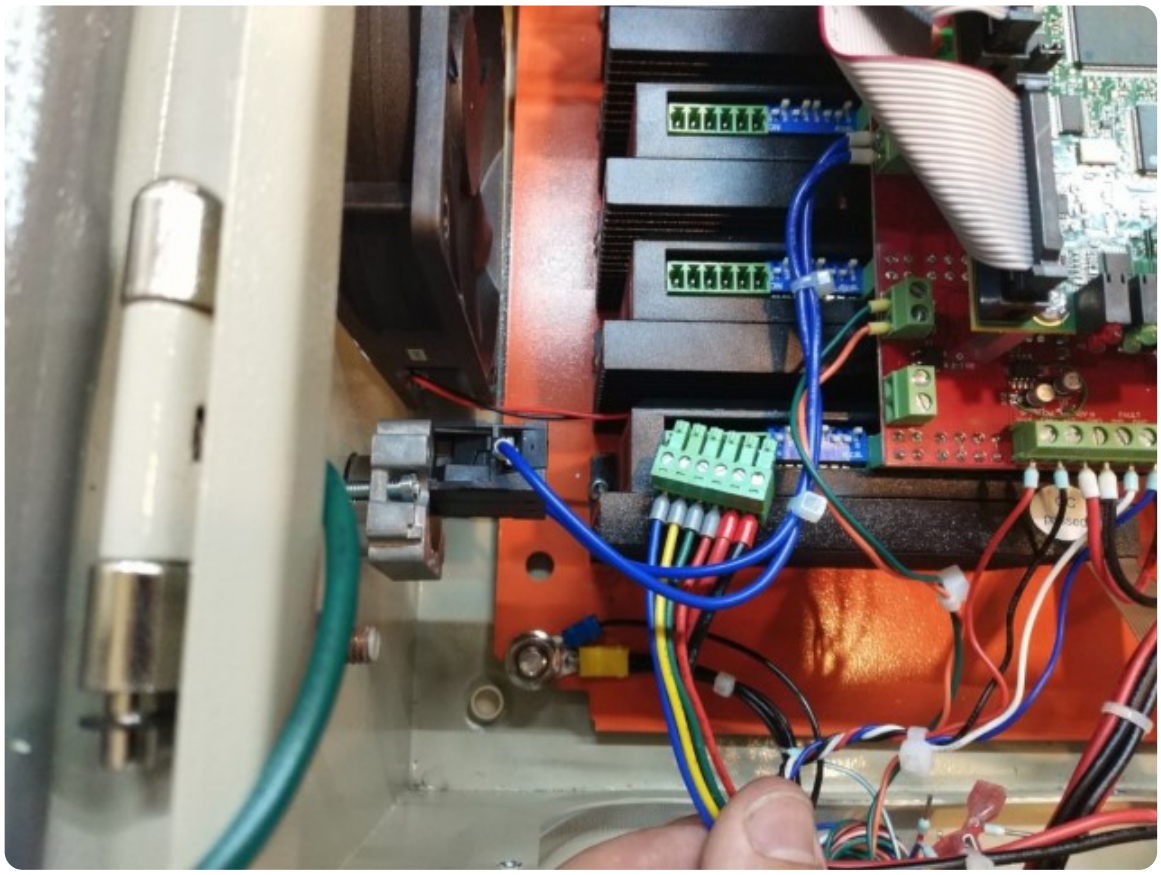
5. Wiring Installation

5.1

You will now install the wiring for the new motor drive and power supply. Press out the rubber hole plug from the **A axis** port on the gland plate. Fasten the DB9 bulkhead connector to the gland plate with the provided threaded studs.

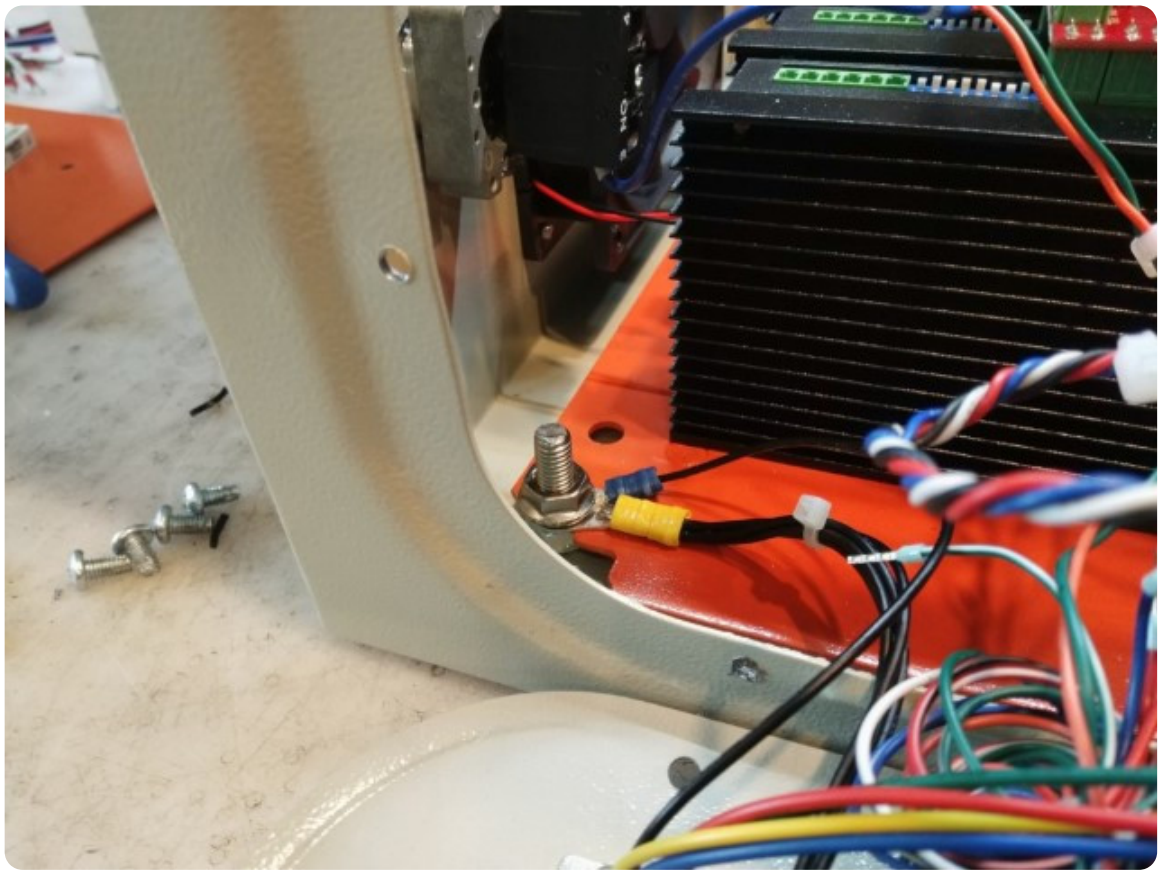
5.2

Attach the blue, yellow, green, and red wires from the DB9 connector to the motor drive's phoenix connector. Also attach the red and black power wires from the power supply to this connector. Connect the wires in the correct order, as shown below.



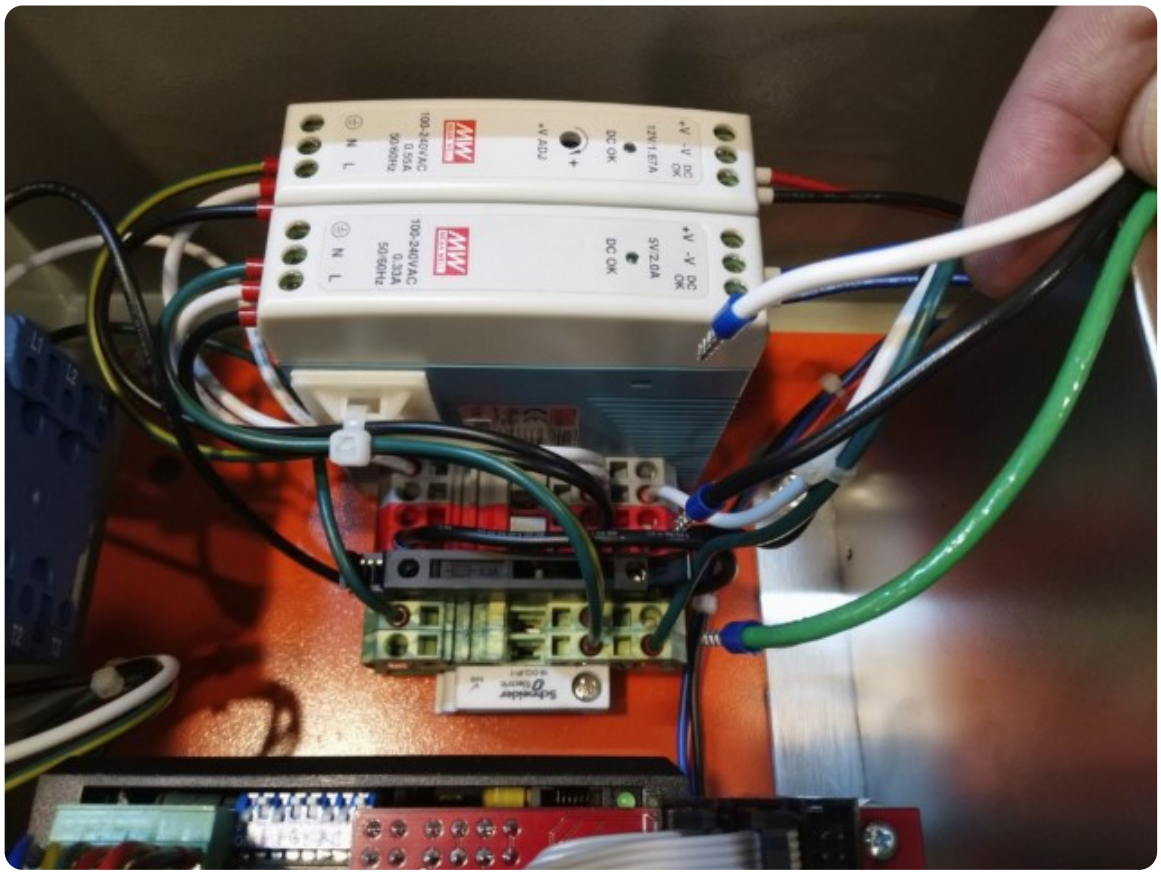
5.3

Remove the nut on the grounding wire stud, located at the bottom left corner of the box. Stack the DB9 connector's ground wire on top of the main grounding wires and fasten by reinstalling the nut.



5.4

Route the three remaining wires from the new power supply up and around the left power supply, towards the terminal blocks.



Install the wires into the terminal blocks:

- Green wire to green terminal block
- Black wire to red terminal block
- White wire to white terminal block

6. Reconnect Components

Reinstall all components, in the reverse order in which they were removed. Ensure all components that were unplugged are plugged back in securely.

5th Drive Upgrade for NEMA 34 Plug and Play Systems

Capacitor Installation

If your system has an existing 5th motor drive and you only need to install the capacitor, skip to the **Capacitor Installation** section.

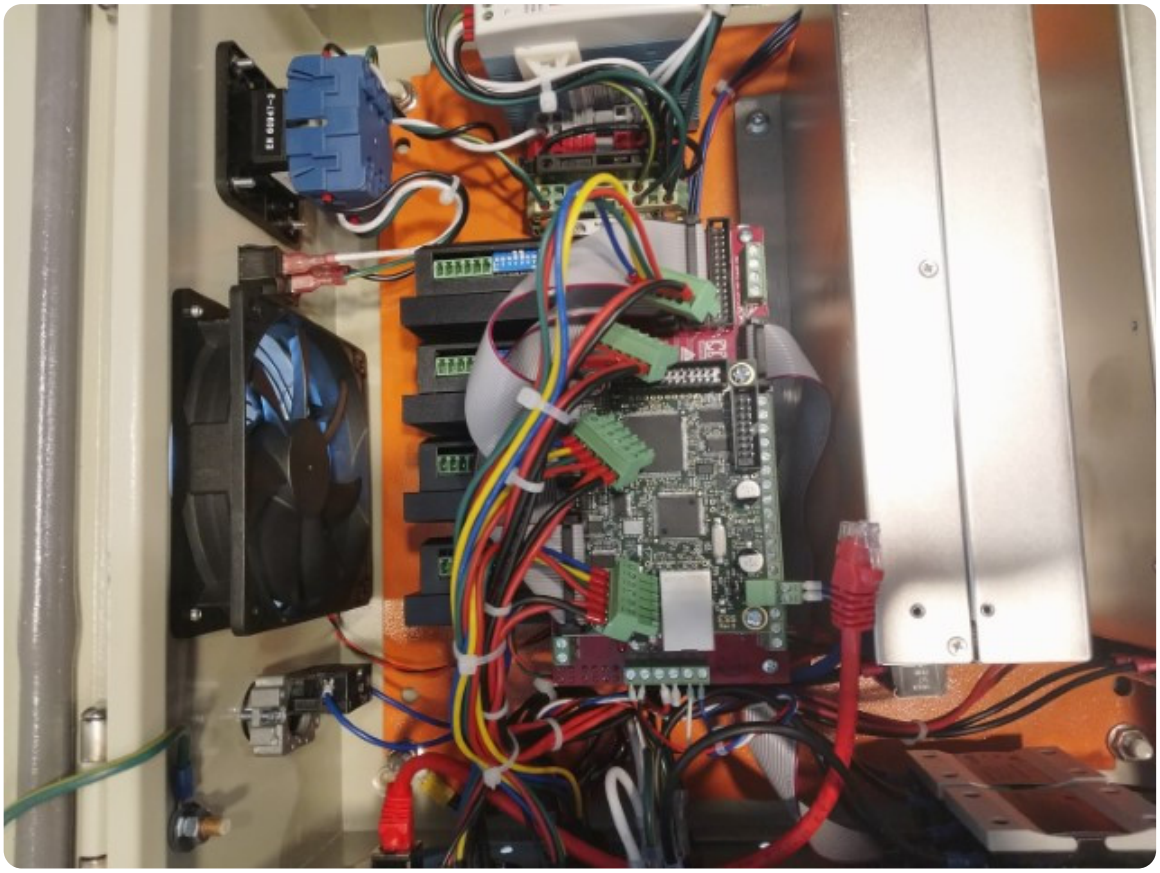
Warning

Ensure your plug and play control box is powered off with the power cable disconnected from the box. It is also recommended to remove the control box from the machine for easier installation of the motor drive.

1. Disconnect Components

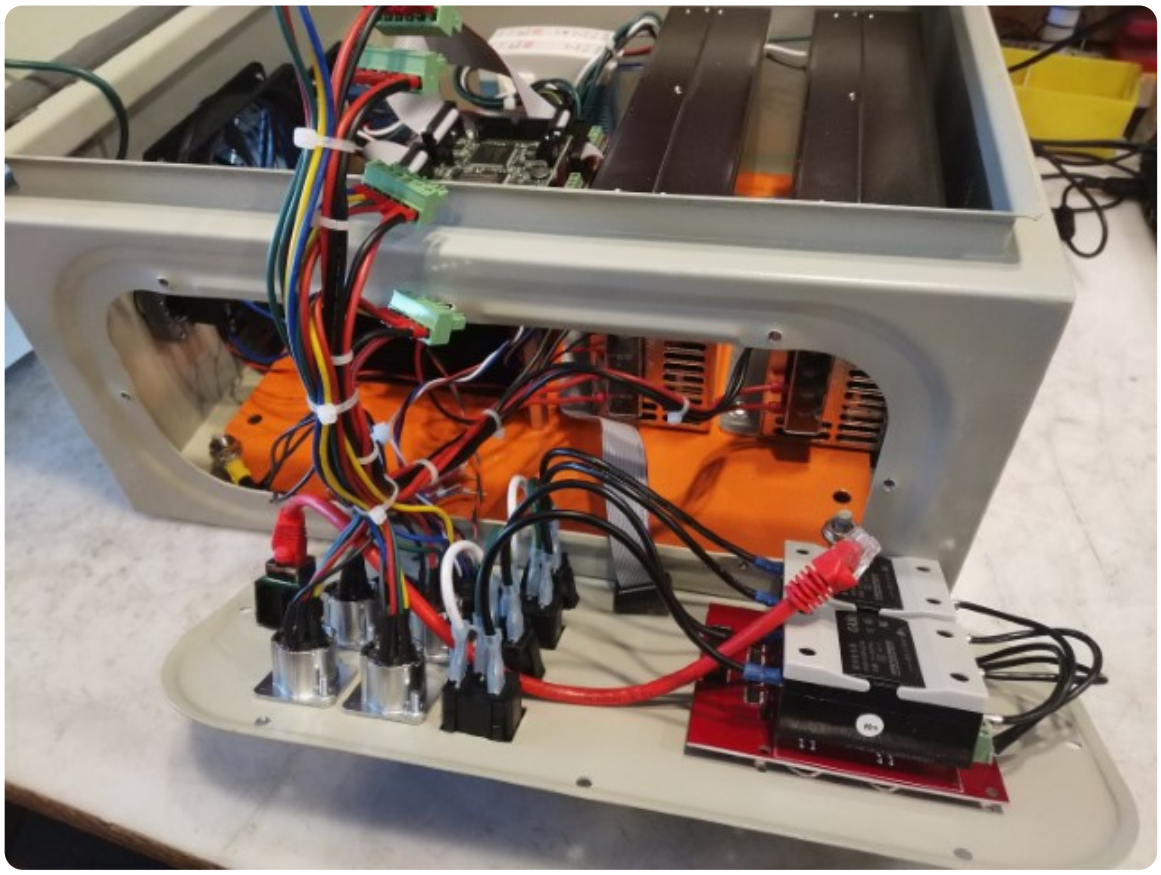
1.1

The fist step in upgrading your NEMA 34 system with a 5th drive will be to remove the gland plate and disconnect the breakout board. Unplug the four motor drivers and the ethernet cable connected to the breakout board.



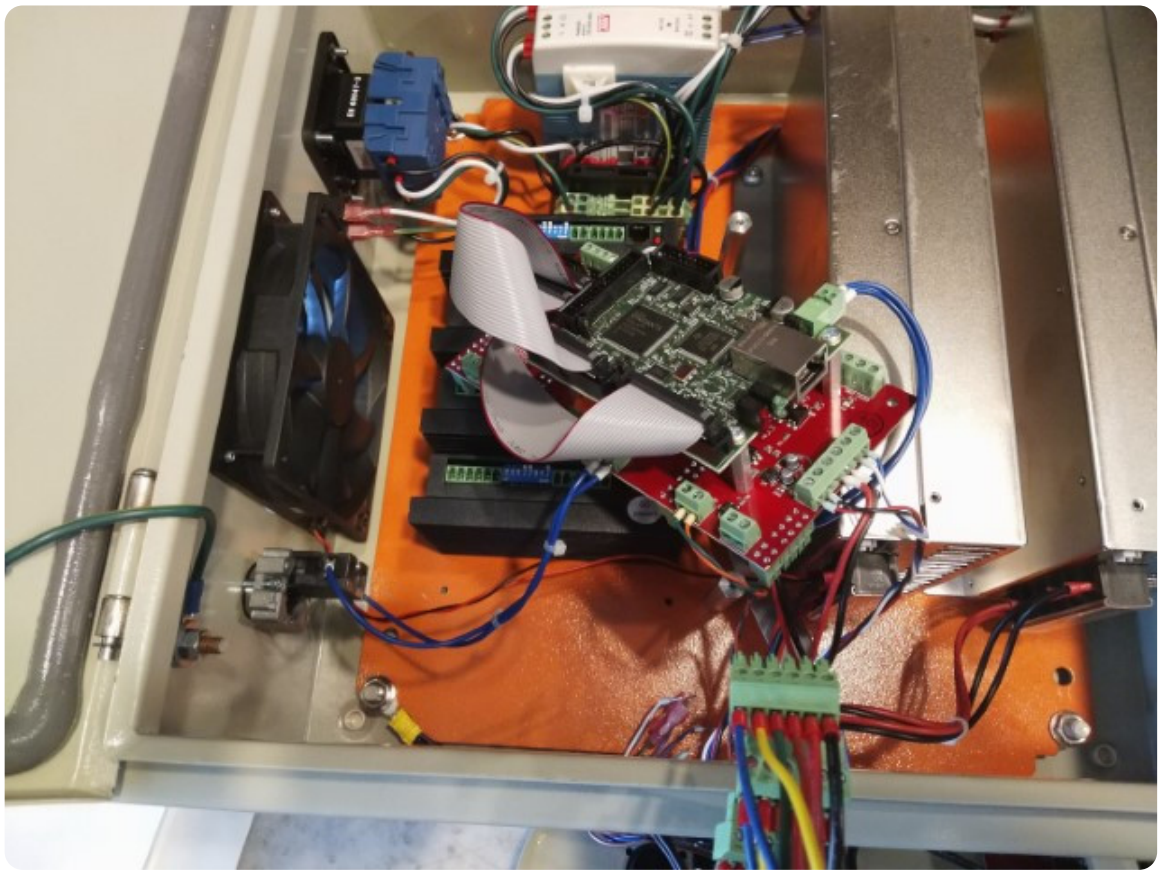
1.2

Remove the gland plate fasteners, disconnect the ribbon cable attached to the relay board, and pull the gland plate away from the box.



1.3

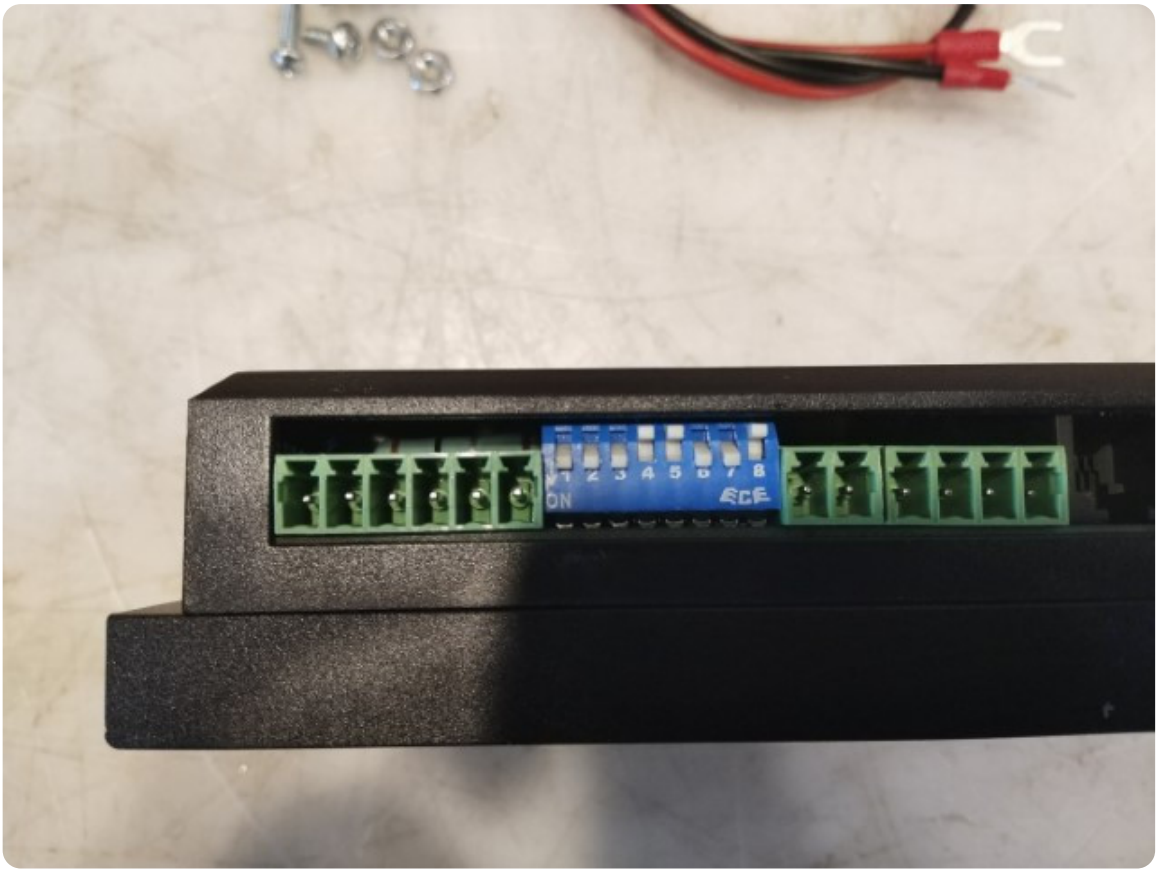
Remove the two fasteners holding the breakout board in place and carefully remove the board from the drives. Leave the breakout board in the box and do not disconnect any extra wires.



2. Drive Installation

2.1

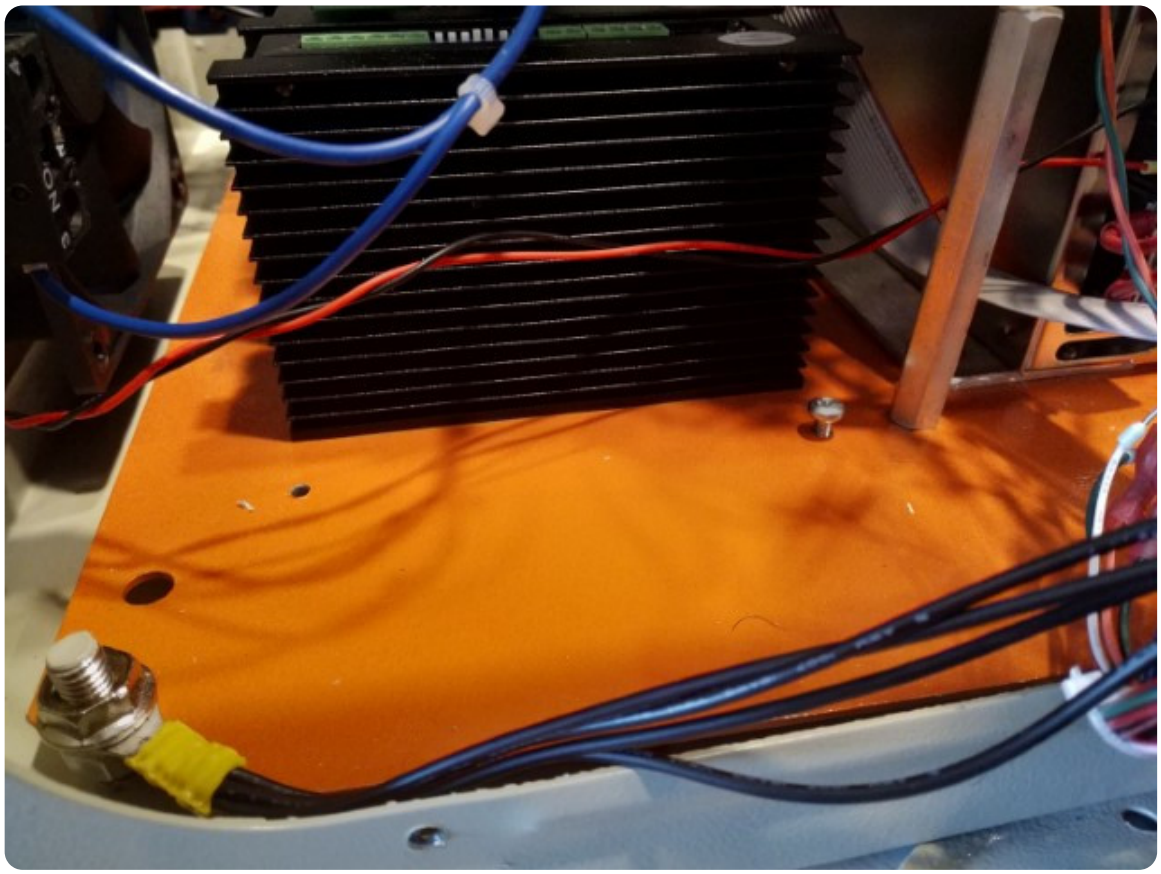
You will now be able to install the drive onto the chassis plate with the included (2) T20 M4 screws. Ensure the dip switches on the drive are in the correct orientation, as shown below:



- Dip switches in **ON** position: 1, 2, 3, 6, 7
- Dip switches in **OFF** position: 4, 5, 8

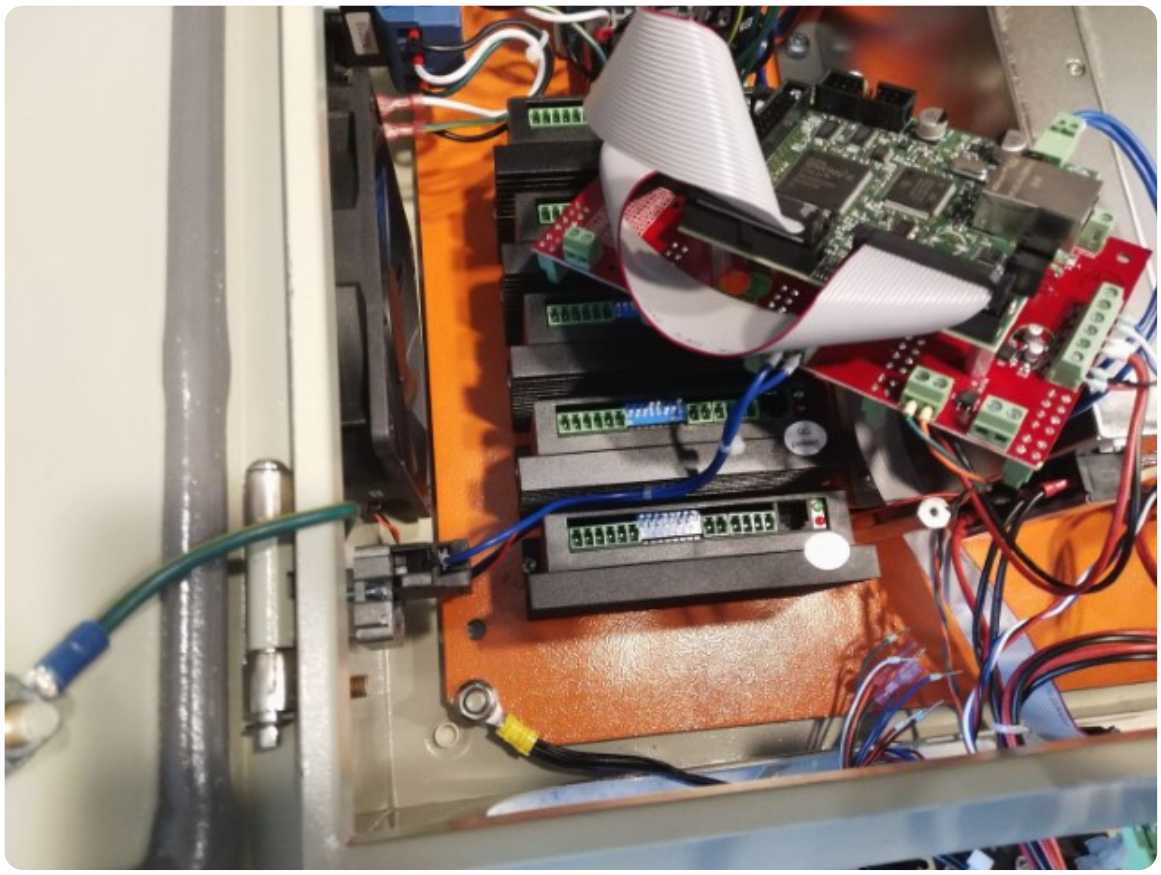
2.2

Partially install one of the M4 screws into a pre-drilled hole on the chassis plate, leaving room for the motor drive to slide under.



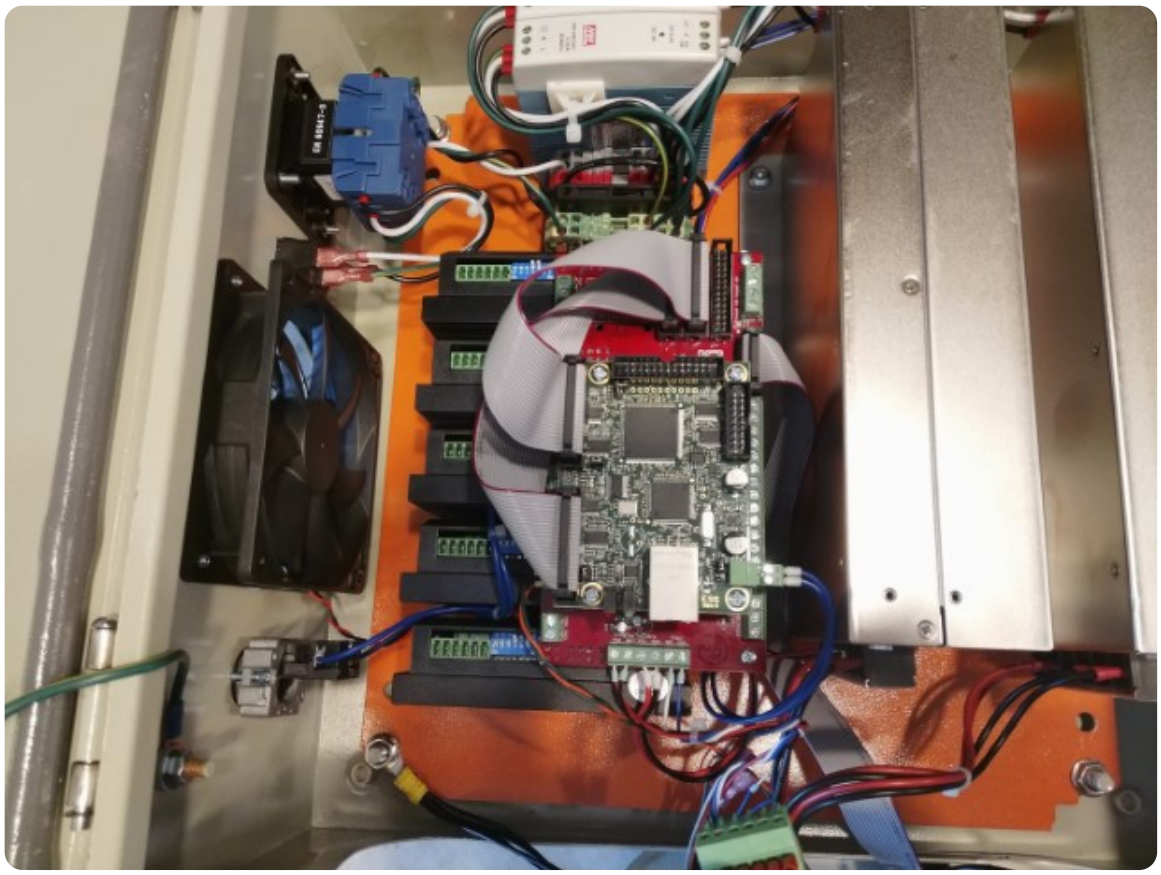
2.3

Slide the drive into place and fasten with the second M4 screw. Tighten both fasteners.



2.4

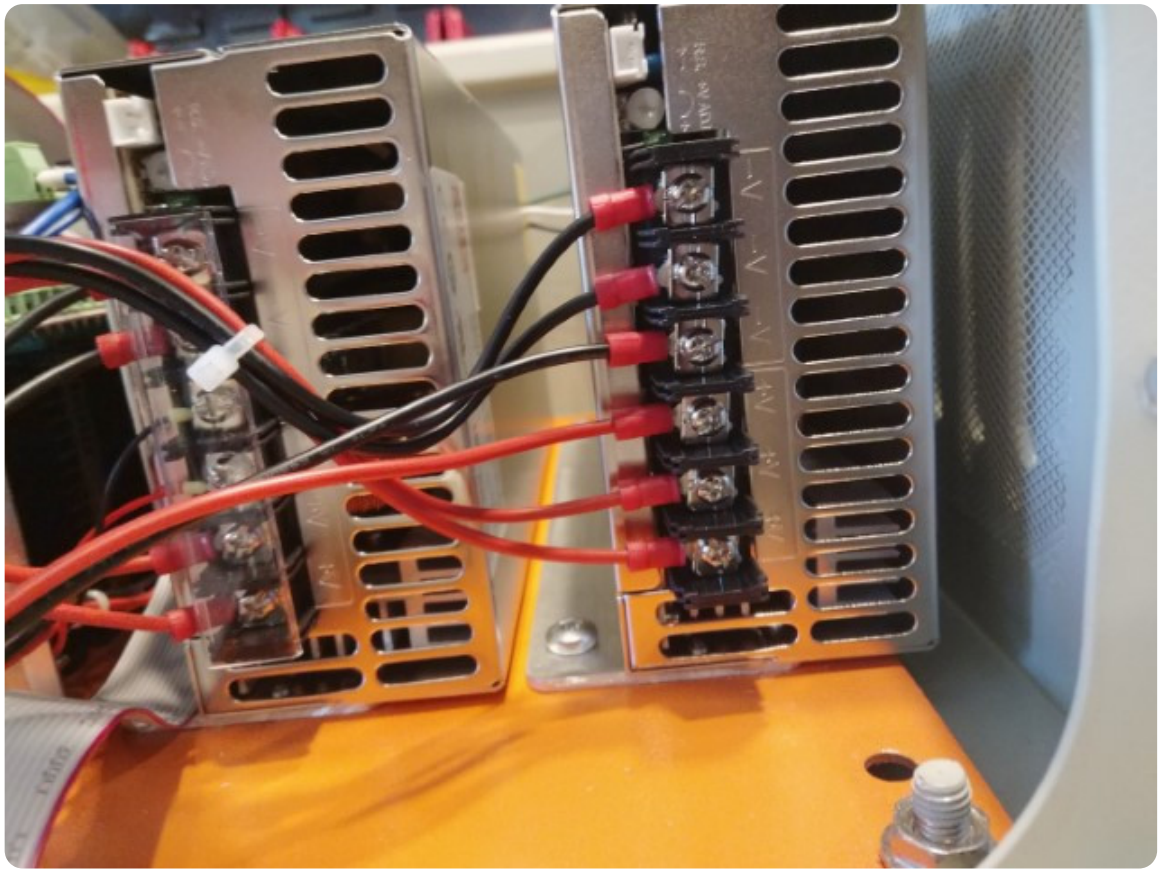
Plug the breakout board back into the drives and fasten with the two mounting screws.



3. Wiring Installation

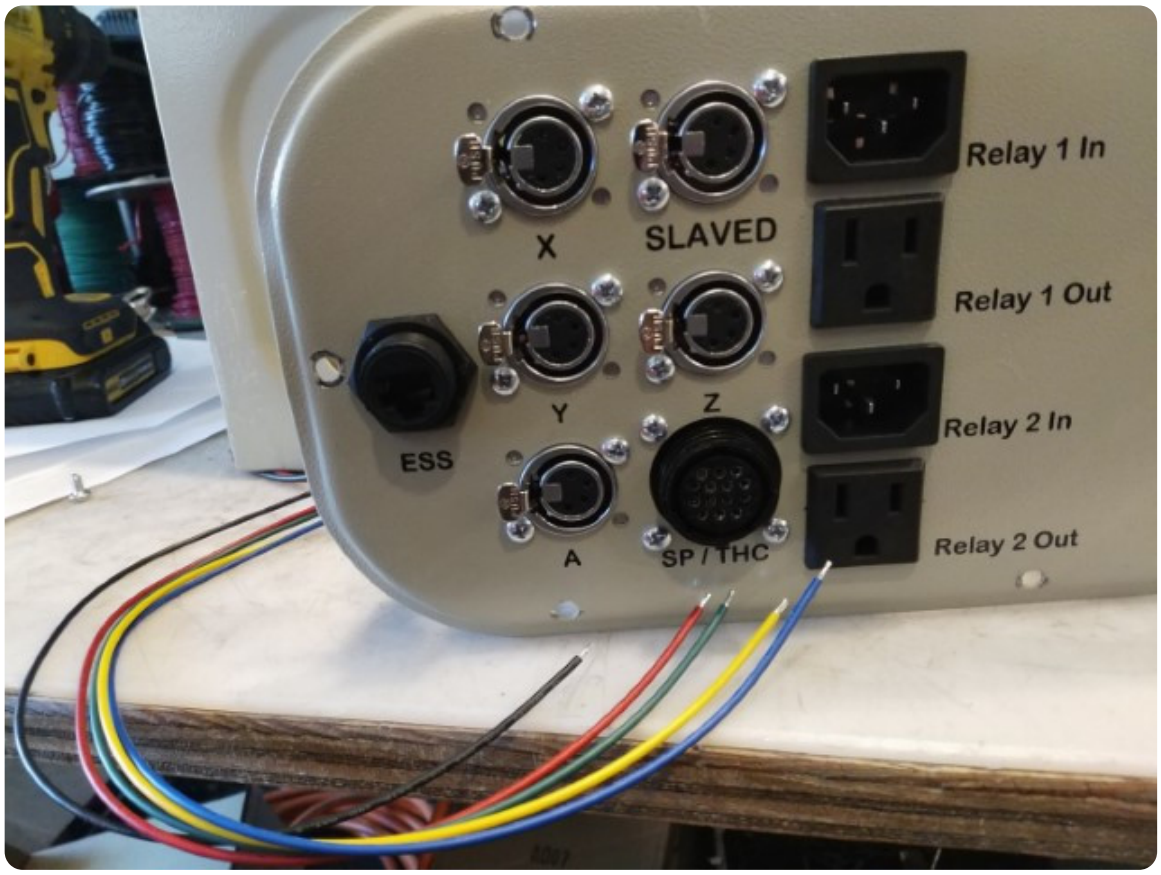
3.1

You will now install the wiring for the new motor drive. Remove the clear cover on the power supply's terminals and install the red and black wires from the provided harness. Fully tighten the terminal screws and replace the cover.



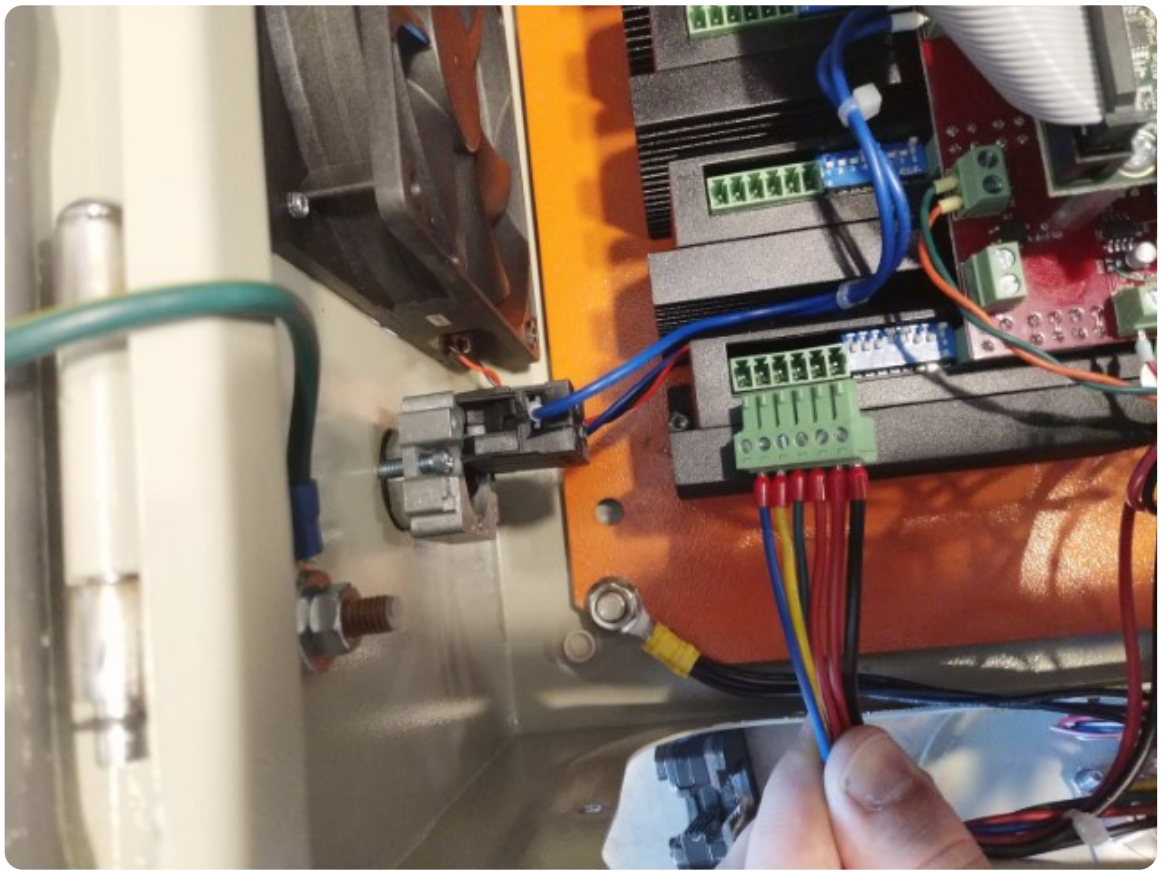
3.2

Press out the rubber hole plug from the **A axis** port on the gland plate and attach the XLR bulkhead connector. Fasten the connector with the provided screws and nuts, in the diagonal pattern used on the other XLR connectors.



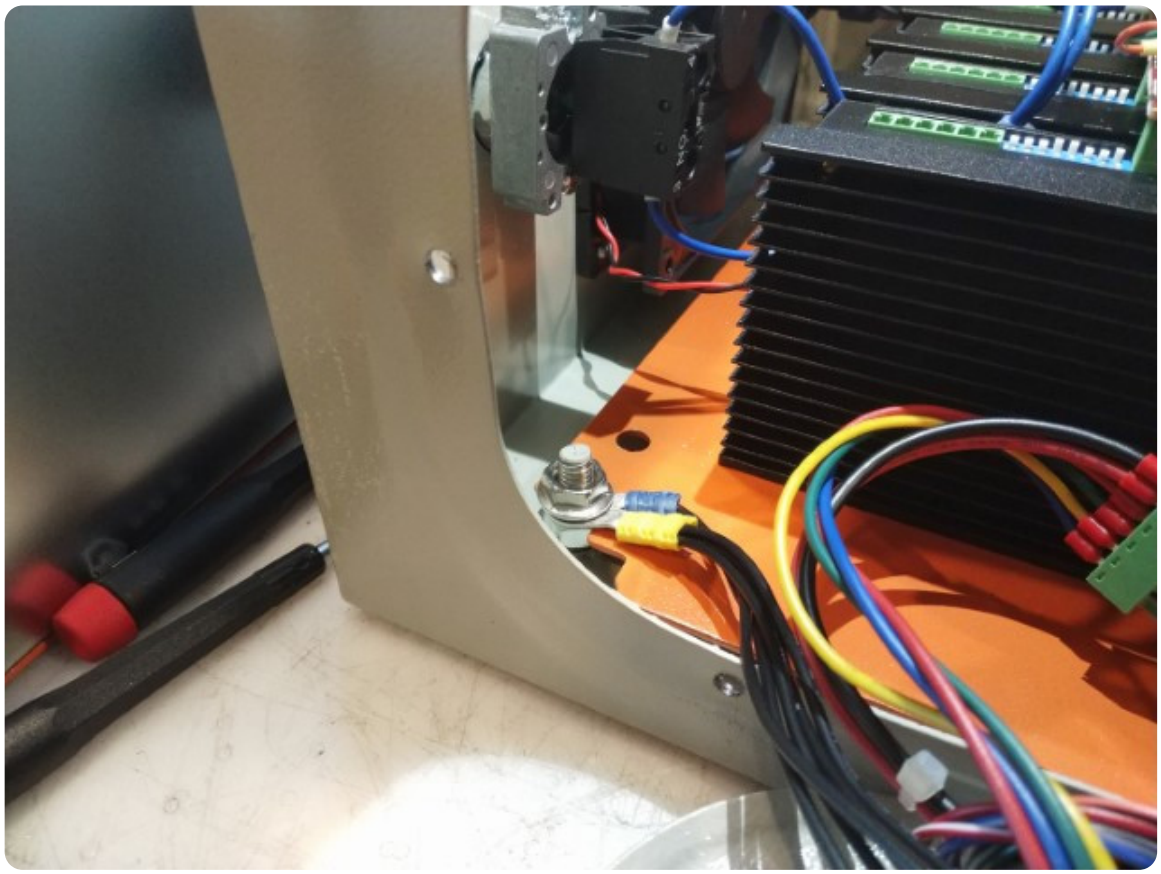
3.3

Attach the blue, yellow, green, and red wires from the XLR connector to the motor drive's phoenix connector in the order shown below. Also attach the red and black wires from the power supply to this connector, using the terminals on the right (as shown below).



3.4

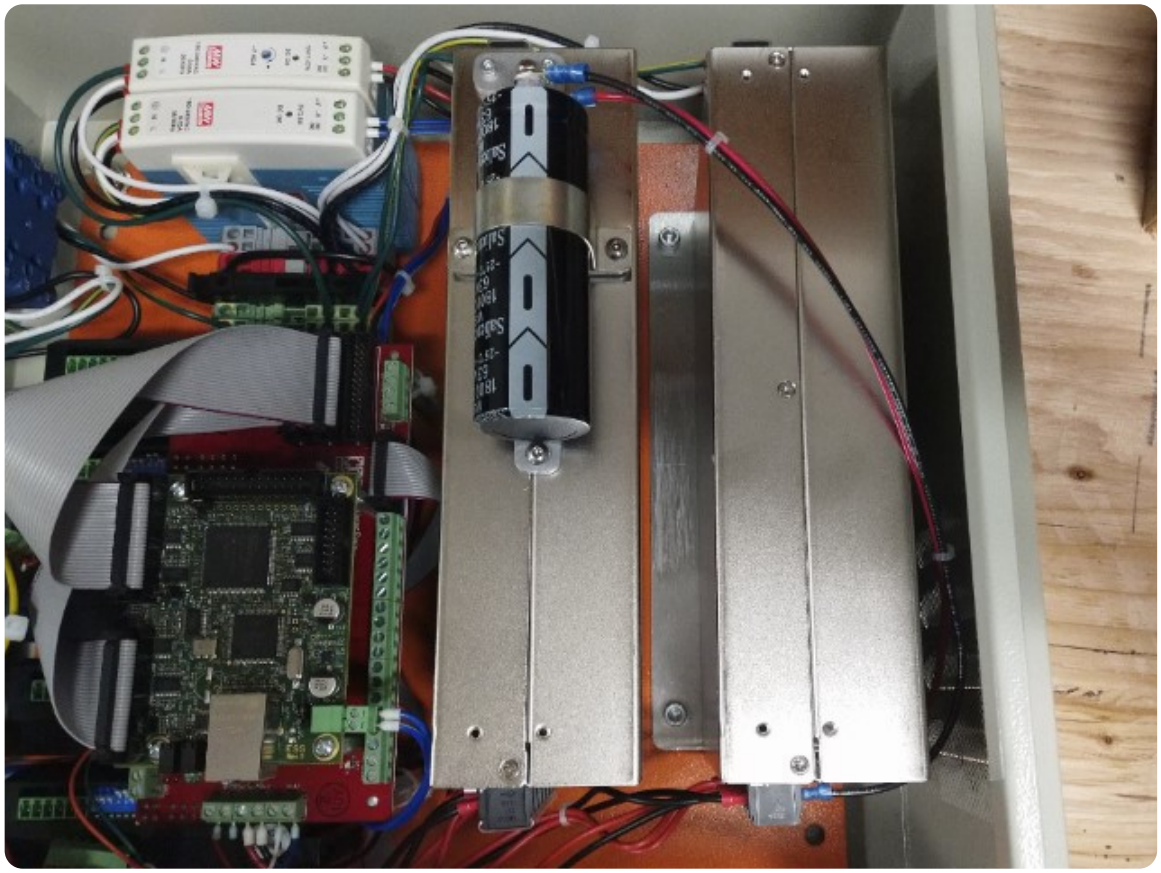
Remove the nut on the grounding wire stud, located at the bottom left corner of the box. Stack the XLR connector's ground wire on top of the main grounding wires and fasten by reinstalling the nut.



4. Capacitor Installation

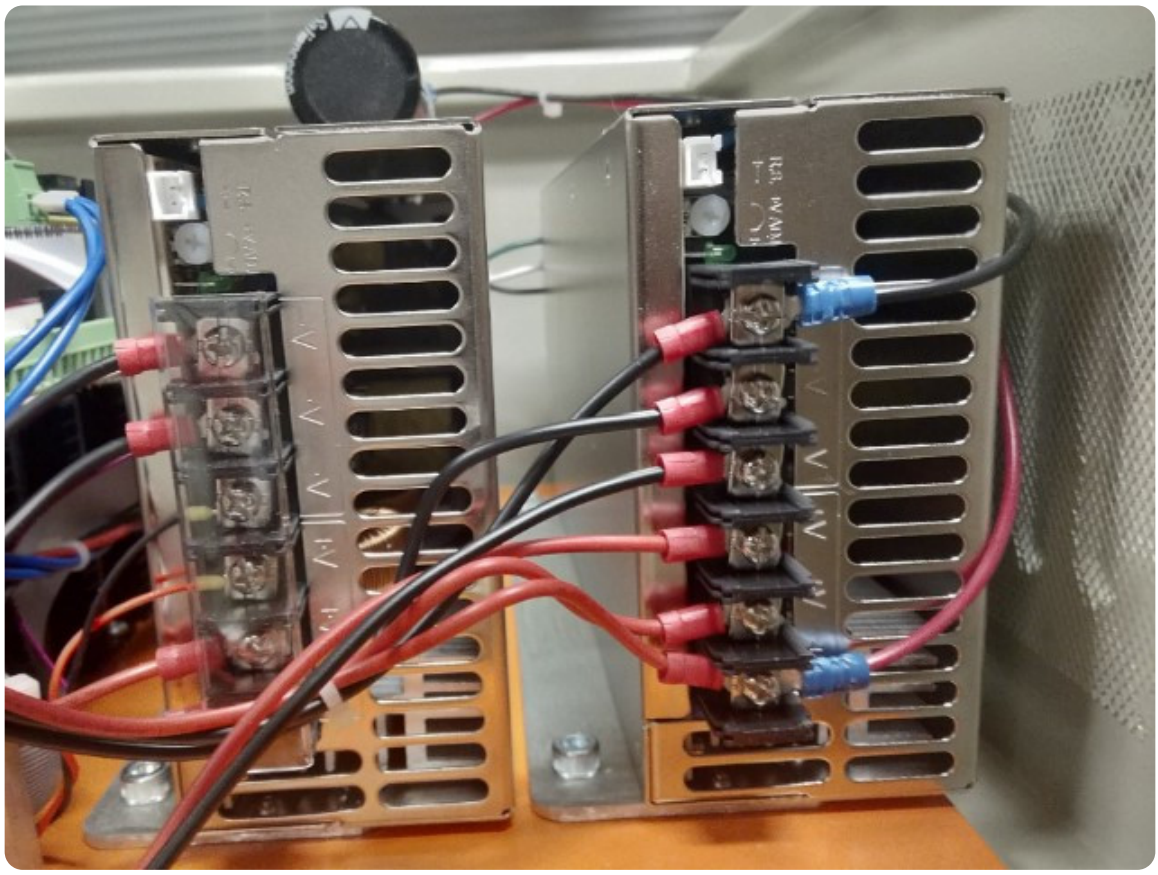
4.1

Attach the capacitor to the left power supply using the provided (2) M3 x 6mm socket head cap screws.



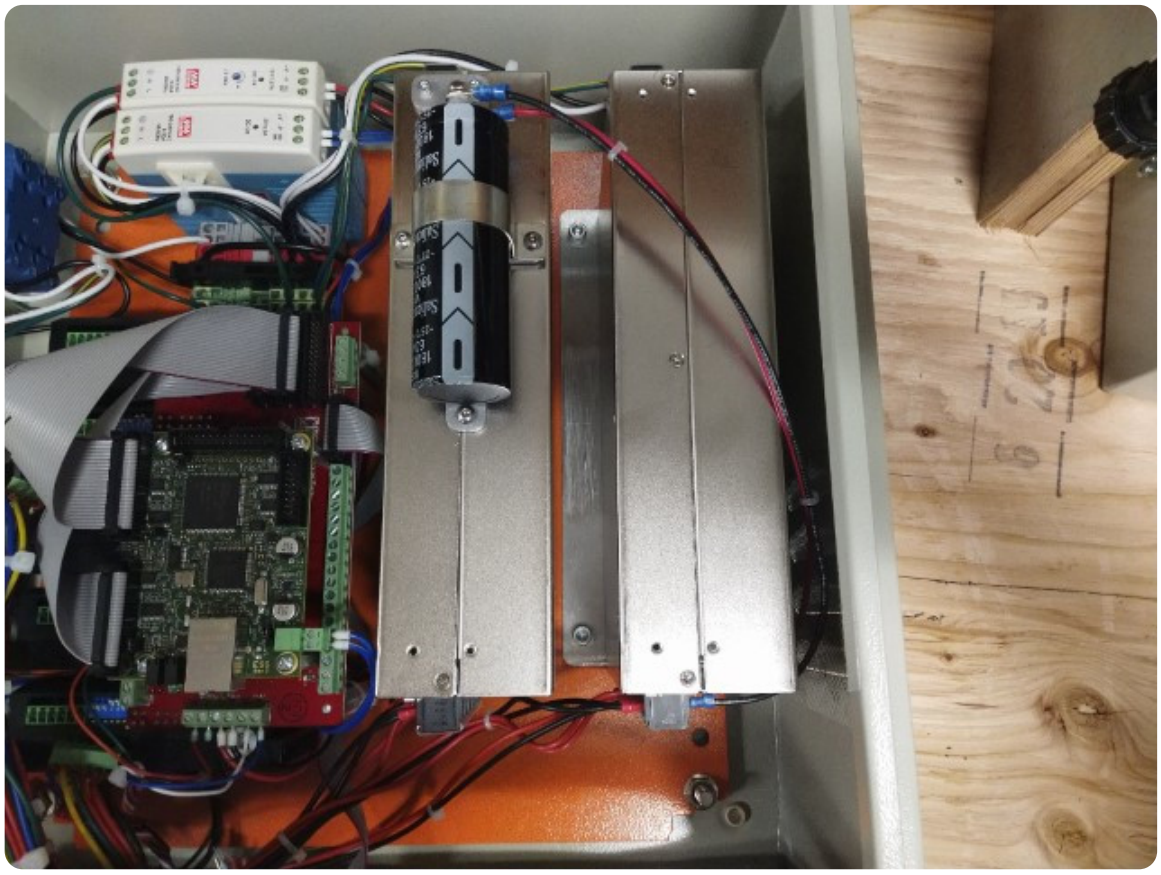
4.2

Connect the capacitor harness to the power supply on the right as shown below. Connect the **black wire to V-** and the **red wire to V+**.



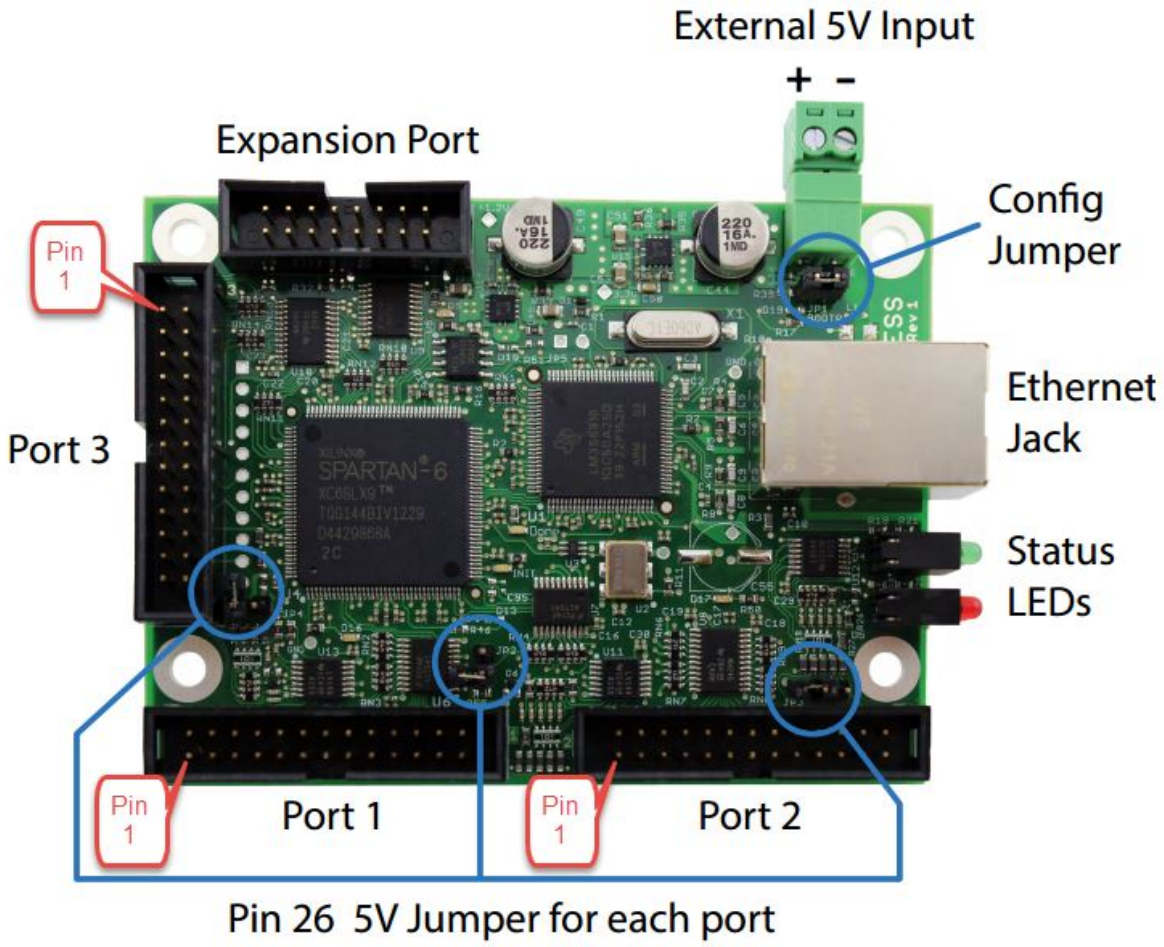
5. Reconnect Components

Reinstall all components, in the reverse order in which they were removed. Ensure all components that were unplugged are plugged back in securely.



Your plug and play control system is now upgraded and ready to operate a 5th motor. If you experience any trouble with this set up, please feel free to Contact Us.

Adding Additional IO (non-Plasma Systems)



If the existing IO (both the M12 sensor inputs and the screw terminals on the CRP850-00E Breakout Board) are not enough for your application, it is possible to add an additional ribbon cable and breakout board to the Ethernet Smoothstepper (ESS). Port 3 on the ESS is a standard 26-pin low profile male parallel port connector. Connecting this to an external breakout board will expose 4 outputs, 8 inputs, and 5 bi-directional pins. You will need at minimum:

- A ribbon cable with appropriate connectors. To power the breakout board from the ESS a 26-pin connector on both ends is required.
- A breakout board with appropriate connectors and opto-isolation for the input signals.

For complete information see Warp9's documentation: **warp9td.com/index.php/documentation/doc-ess**

Adding Z Axis Electromagnetic Brake Output

The 24.2 version of the PRO Ballscrew Z axis features an electromagnetic holding brake that requires 24VDC to release. These instructions cover upgrading a CRP800-00E controller with the necessary power supply and connector.

Safety Note

Ensure your CNC control box is powered off with the power cable disconnected from the box.

Parts

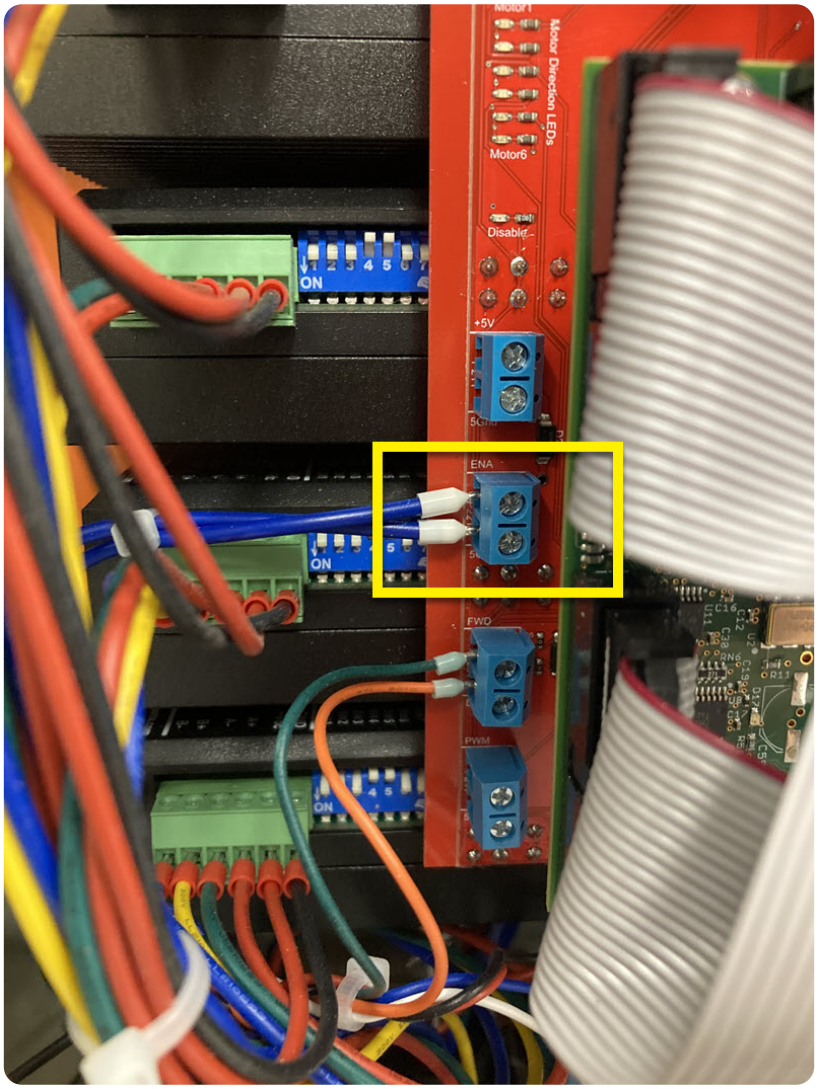
ID	QTY	Part Number - Description
	1	CRP800-00E-ZUP-24.2 - Kit, CRP800-00E Retrofit, Z Axis Brake
A	1	CRP850-31E - Wire Harness, Brake Retrofit
B	2	FW-625-SHIM - Flat Washer, 5/8" ID x 1-1/4" OD

Tools

- 17mm open end wrench
- 18mm open end wrench
- Small flathead screwdriver
- Phillips Head PH2 screwdriver

1 - Remove the Motor Disable Switch

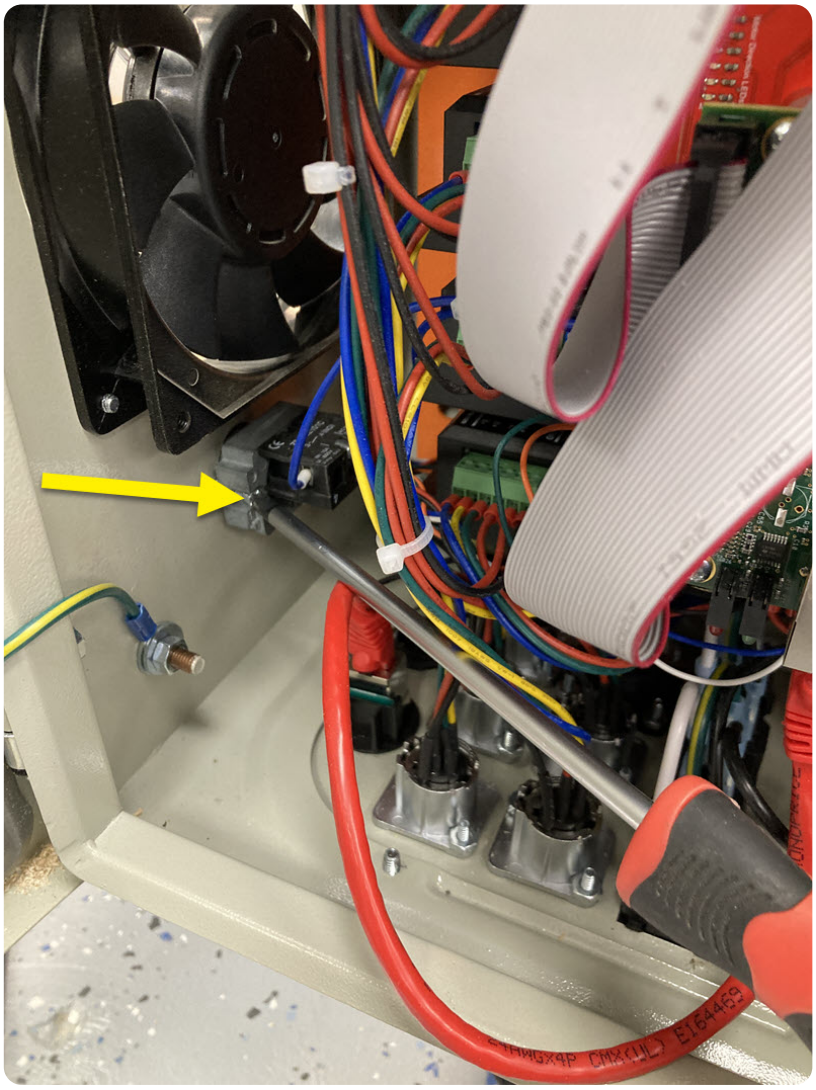
1.1



- Locate and remove the Enable wires from the CRP850-00E breakout board.

1.2 - Remove the Disable Switch

1.2.1



- Inside the enclosure, loosen the accessible Phillips head screw until the switch is loose.
- Rotate the switch body to access the second Phillips head screw and loosen it.

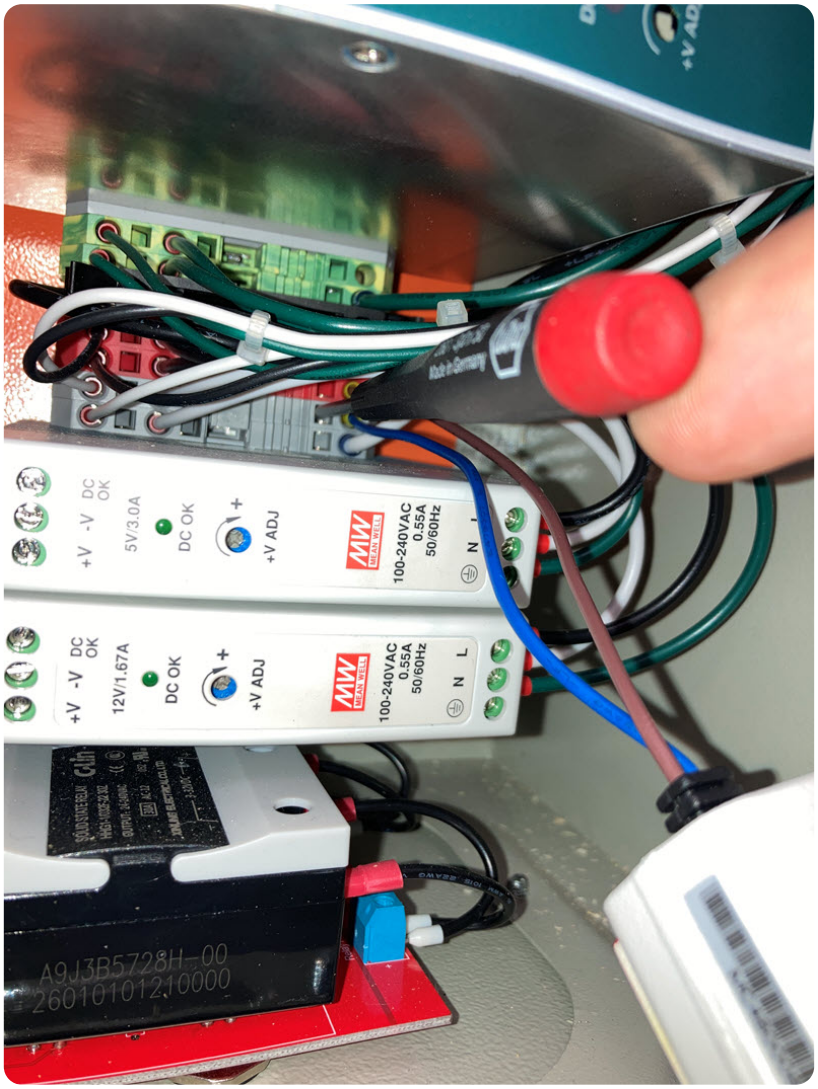
- Remove the switch exterior by pushing in and turning.
- Remove the switch body and wiring from the controller.

2 - Install the 24V Power Supply

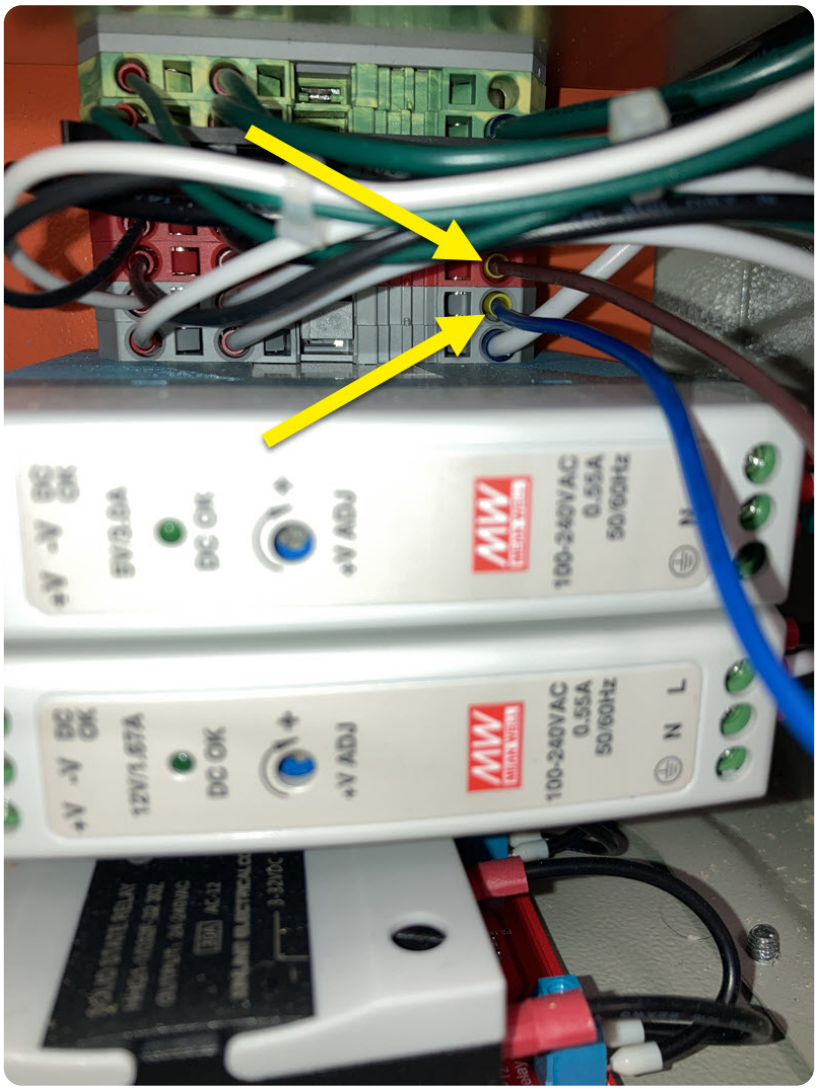
> **Revision Note**
>
> These instructions show a 20.1+ revision controller. For older CRP800-00E controllers the steps are the same, but component locations are different. See step **2.2.2** for locations.

2.1 - Connect APV to Terminal Blocks

2.1.1



- Use a flathead screwdriver as shown to insert the ferruled wires into terminal blocks. Insert the screwdriver into a square opening next to the open round terminal position. Push the top of the screwdriver **away from** the terminal position to open. Insert the ferrule.

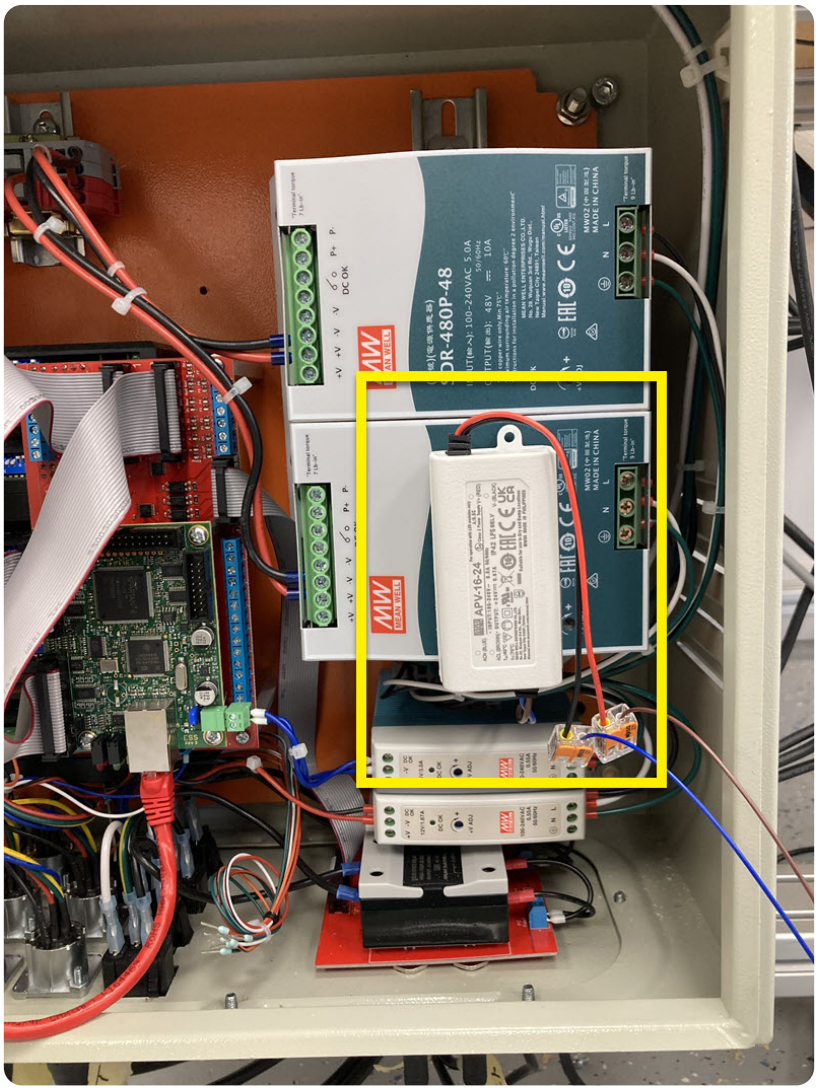


- Connect the ferruled Brown wire to an open Red terminal block.
- Connect the ferruled Blue wire to an open Gray terminal block.

2.2 - Mount the APV

2.2.1

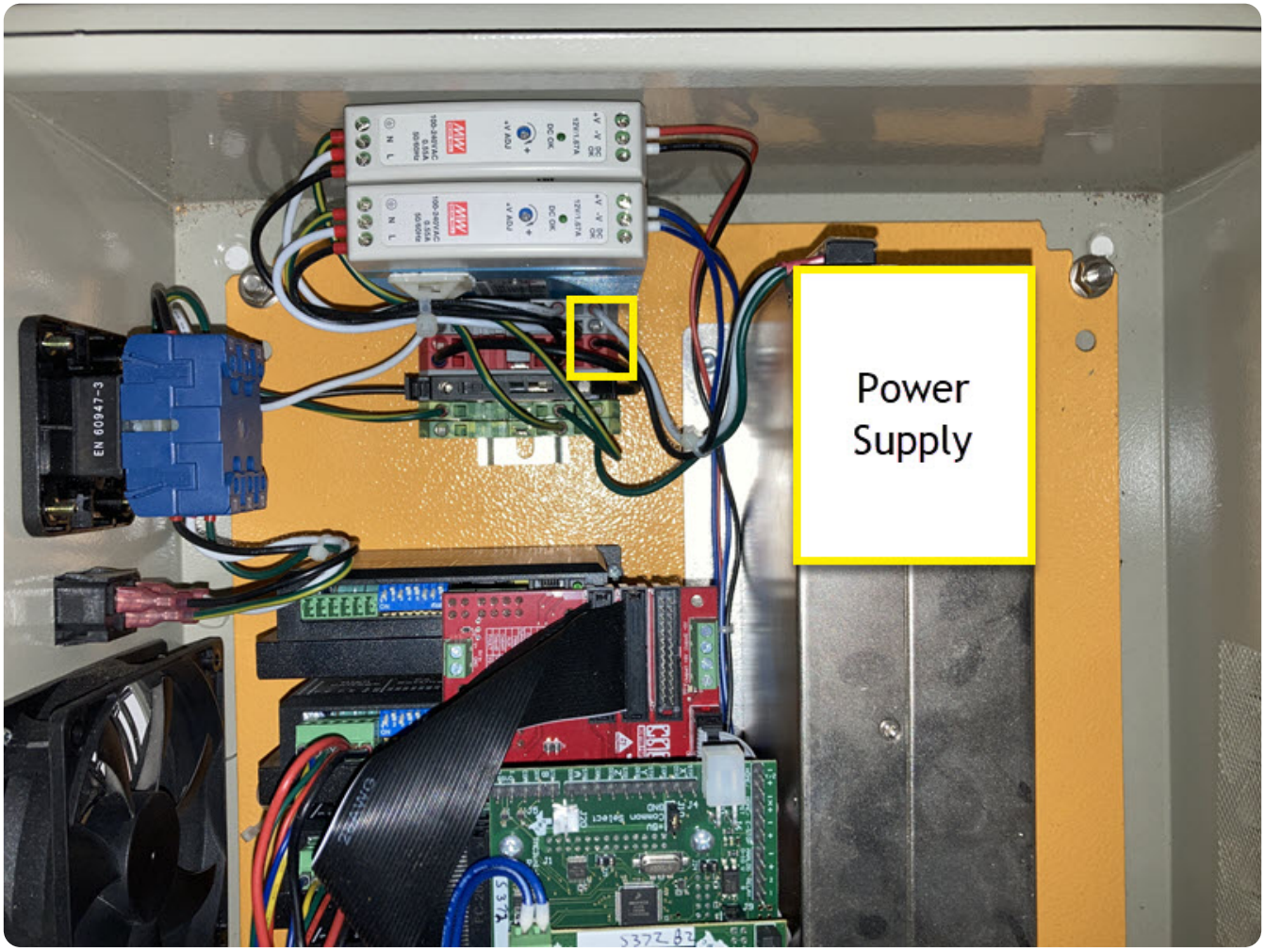
> **Revision Note**
>
> For 20.1 and newer controllers. For older CRP800-00E controllers, skip to **2.2.2**.



- Clean the surface of the 48V PSU where the new power supply will mount.
- Mount the APV to the PSU as shown. Apply pressure to ensure the adhesive makes full contact.

Revision Note

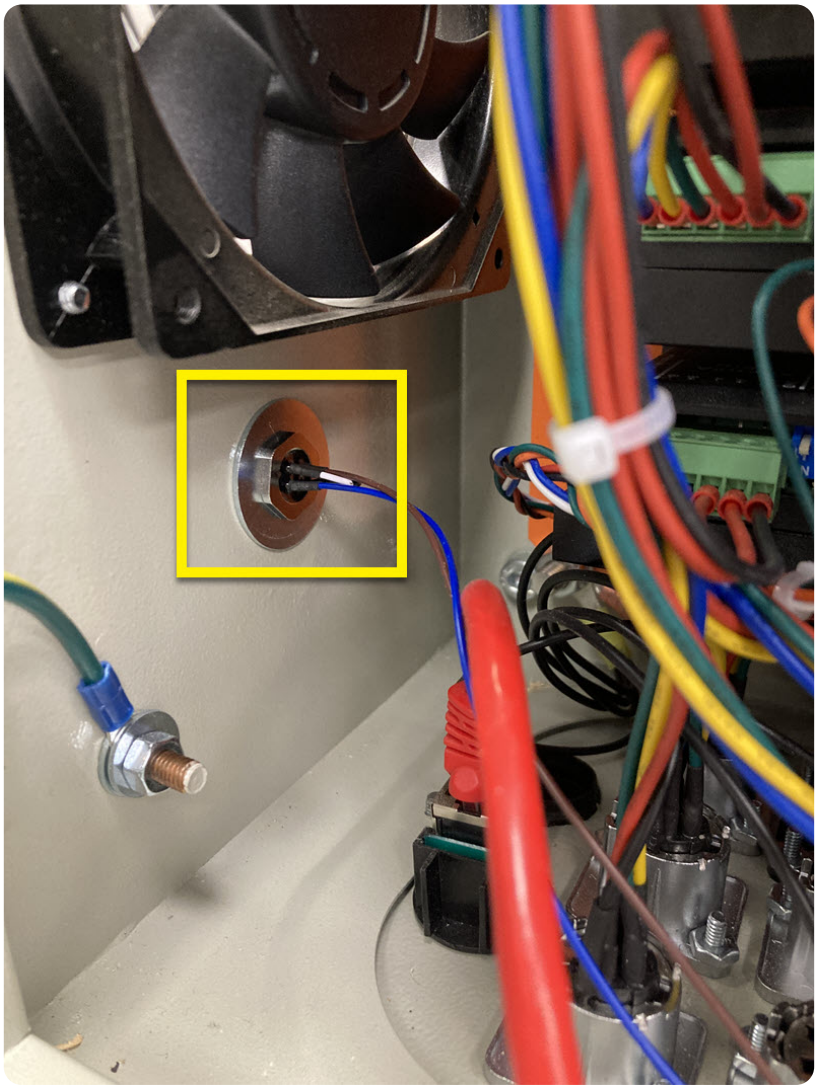
For CRP800-00E controllers older than 20.1.



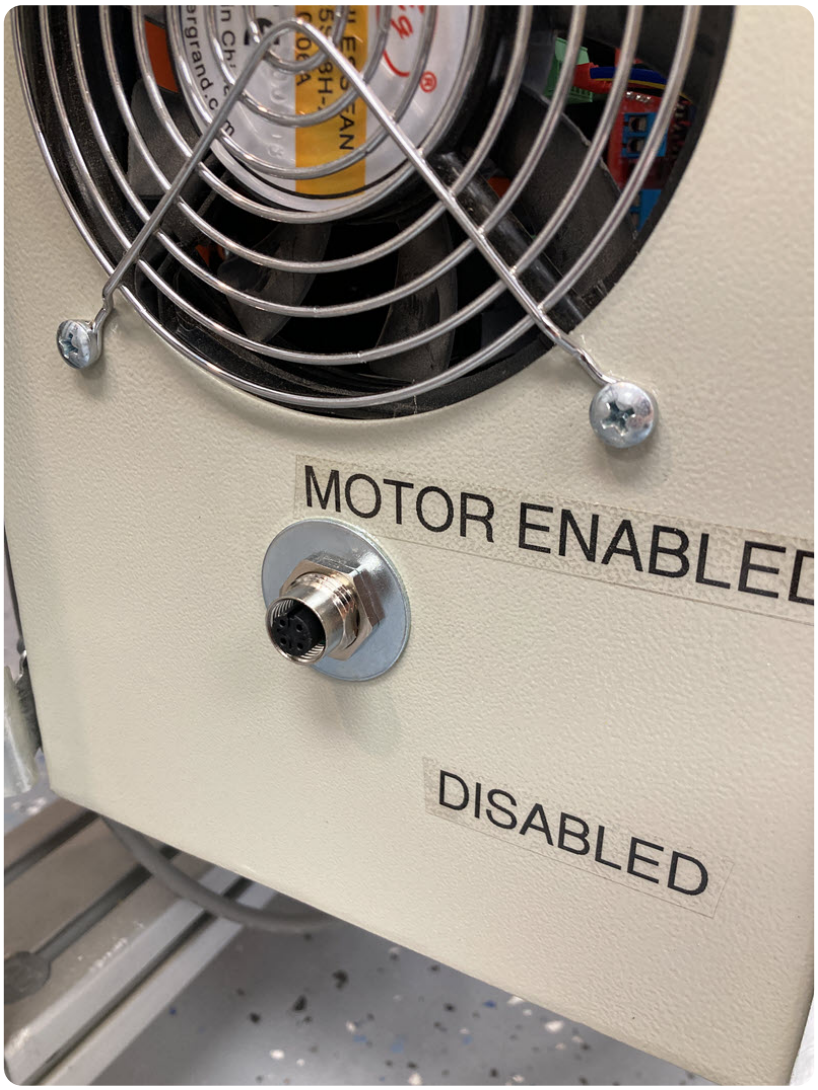
- Clean the surface of the 48V PSU where the new power supply will mount.
- Mount the APV to the PSU as shown. Apply pressure to ensure the adhesive makes full contact.

2.3 - Install the M12 connector

2.3.1



- Remove nut from the M12 connector.
- Put a shim washer on the inside and outside of the empty Motor Disable Switch hole.



- Put the M12 connector through the shims and tighten the jam nut to pinch the washers and secure the connector.

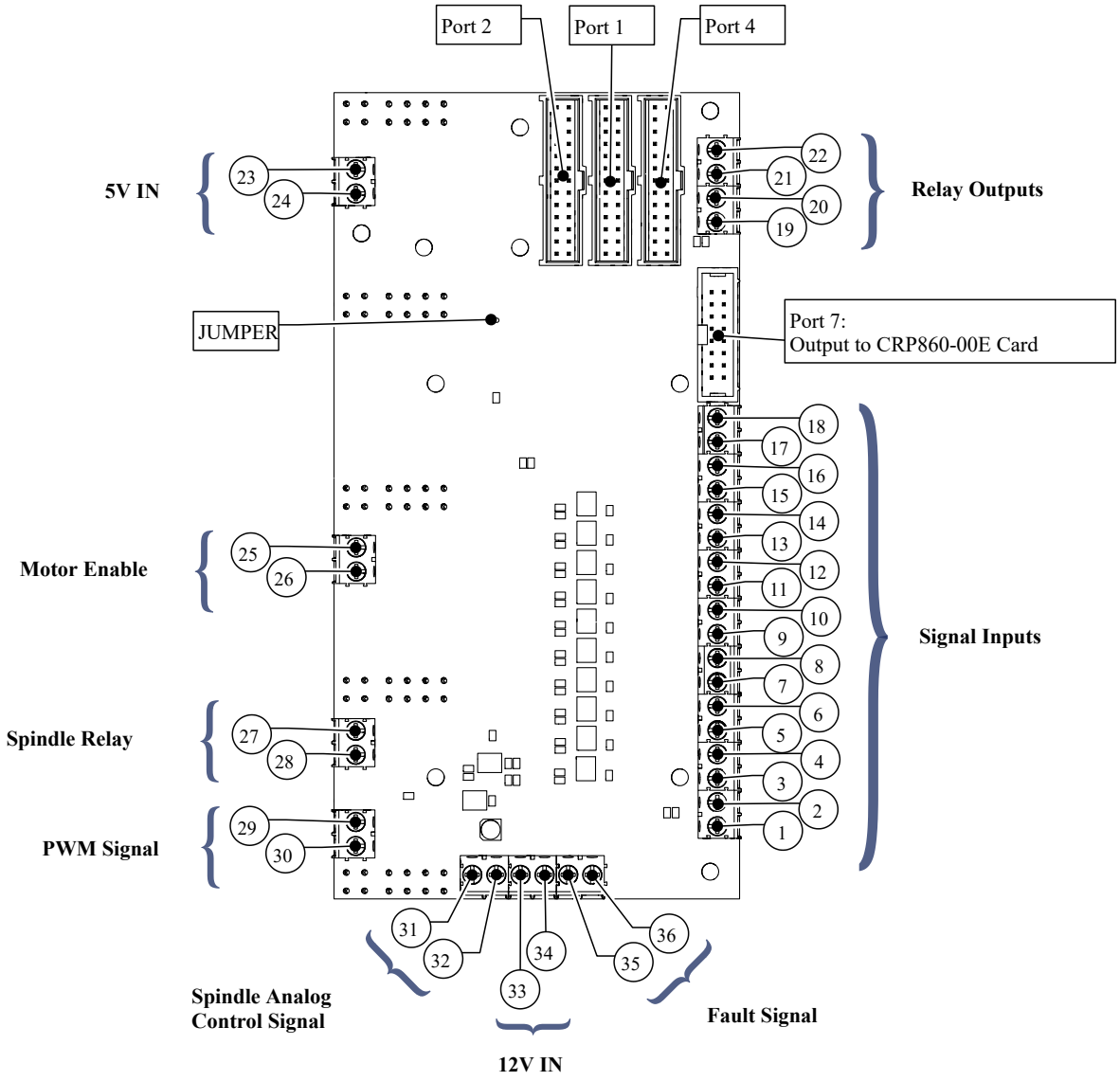
3 - Finish Installation

- Connect the Brake cable to this new connector.

The brake will now disengage whenever the PSU is supplying power to the Z axis stepper motor.

Schematics

CRP850-00E Break-out-Board



Listed on the following pages are descriptions and port/pin assignments.

Port 4 is a pass-through from Port 1

Signal Inputs: The signal inputs on the CRP850-00E board are designed for NPN signals, which close signal to ground. The input signal terminals provide ports for direct wiring of limit switches, touch plate, and auxiliary signals. These same signals are also replicated through Port 7, which goes out to the CRP860-00E board.

Relay Outputs: These are 5V digital outputs which can be used to drive relays with 5V coils or 5V logic level devices. Note, these outputs are not relays themselves. These same signals are replicated through Port 7, which goes out to the CRP860-00E board and are normally tied to solid state relays used for controlling AC loads.

5V IN: The CRP850-00E board can be powered either by 5V through this port, or via pin 26 on port 1. In most CRP800 applications, this port is not used, as 5V is passed through to the CRP850-00E board on pin 26 from the Ethernet Smoothstepper.

Motor Enable: When this terminal is jumpered, the CRP850-00E board will place a 5V potential across the motor enable terminals on all 5 motor driver connectors, disabling the motors. Typically, a mechanical switch is connected to these terminals. When the switch is closed, the motors are disabled so that the machine can be manually positioned, and motors can be safely plugged and unplugged from the system without powering down the entire controller.

Spindle Relay: These terminals provide contacts for a small dry contact relay useful for sending an on/off signal to an external VFD, typically for a forward/stop command. This signal is wired into pins 7 and 8 on the SP/THC connector in CRP800 controllers.

PWM Signal: These terminals provide a digital 0-5 signal designed to be used for speed control via PWM. This same signal (output 1 on port 2) is also routed through analog circuitry on the board to produce a 0-10V analog output.

Spindle Analog Control Signal: These terminals provide a 0-10V analog output typically used for speed control on an external VFD. This signal is wired to pins 9 and 10 on the SP/THC connector in CRP800 controllers.

12V IN: The CRP850-00E requires 12V power, both to power the optical isolators connected to all input signals, and to provide a voltage that is regulated to 0-10V for the Spindle Analog Control Signal.

Fault Signal: This input signal terminal is specifically designed to read a fault from an external VFD, typically from thermal overload or a disconnected spindle power cable.

Phoenix Connector Terminal Blocks

The jumper can be used if only a single port is available for input from the CRP850-00E card.

Note: these Port and Pin assignments match the ESS configuration

Terminal #	Description	Port/Pin *(Jumper OFF)*	Port/Pin *(Jumper ON)*
1	E-Stop Input Signal	2/15	1/15
2	12V GND		
3	12V GND		
4	AUX 2 Input Signal	2/8	2/8
5	Slaved- Sensor Input Signal	2/7	1/12
6	+12V Output		
7	12V GND		
8	Z+ Sensor Input Signal	2/6	2/6
9	Touch Input Signal	2/9	1/13
10	+12V Output		
11	12V GND		
12	Y+ Sensor Input Signal	2/5	2/5
13	Y- Sensor Input Signal	2/4	1/11
14	+12V Output		
15	12V GND		
16	X+ Sensor Input Signal	2/3	2/3
17	X- Sensor Input Signal	2/2	1/10
18	+12v Output		
19	Relay 1 Control Switch	2/17	2/17
20	+5V		
21	Relay 2 Control Switch	2/16	2/16
22	+5V		
23	5V In, +5V		
24	5V GND		
25	ENABLE +5V		
26	ENABLE Signal		
27	Spindle FWD		
28	Spindle DCM	2/14	
29	PWM	2/1	1/1
30	5V GND		
31	0-10V Out, V+	2/1	1/1
32	12V GND		
33	12V In, +12V		
34	12V GND		
35	Fault Signal	2/13	

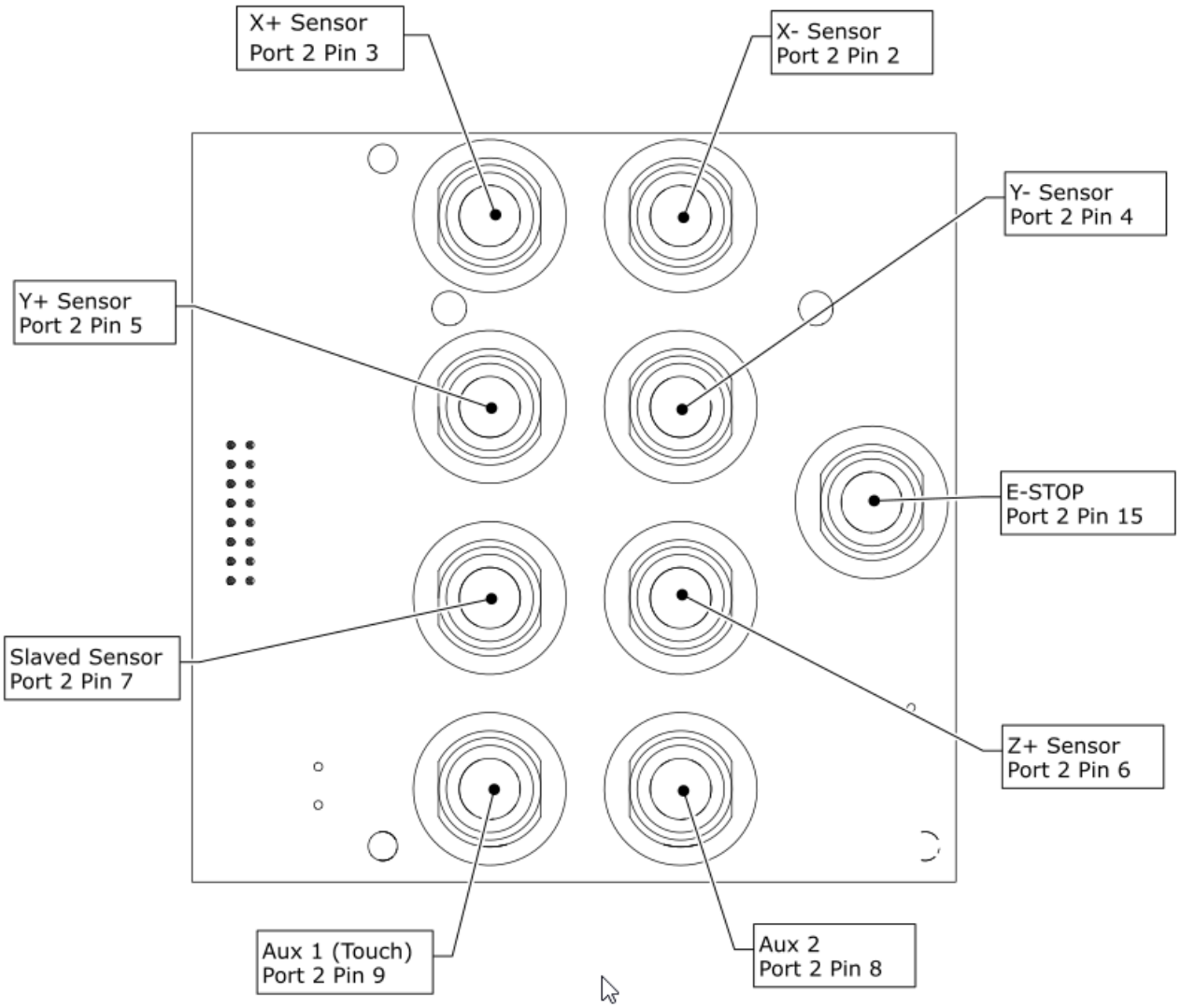
36	12V GND		

Port 7 Output to CRP860-00E Pin Assignments

Pin #	Description
1	+12V
2	X- Sensor Signal
3	Y- Sensor Signal
4	Slaved- Sensor Signal
5	Touch Sensor Signal
6	X+ Sensor Signal
7	Y+ Sensor Signal
8	Z+ Sensor Signal
9	AUX 2 Signal
10	E-Stop Signal
11	+5V
12	Relay 1 Control Switch
13	Relay 2 Control Switch
14	GND I/O
15	12V GND
16	12V GND

CRP860-00E Break-out-Board

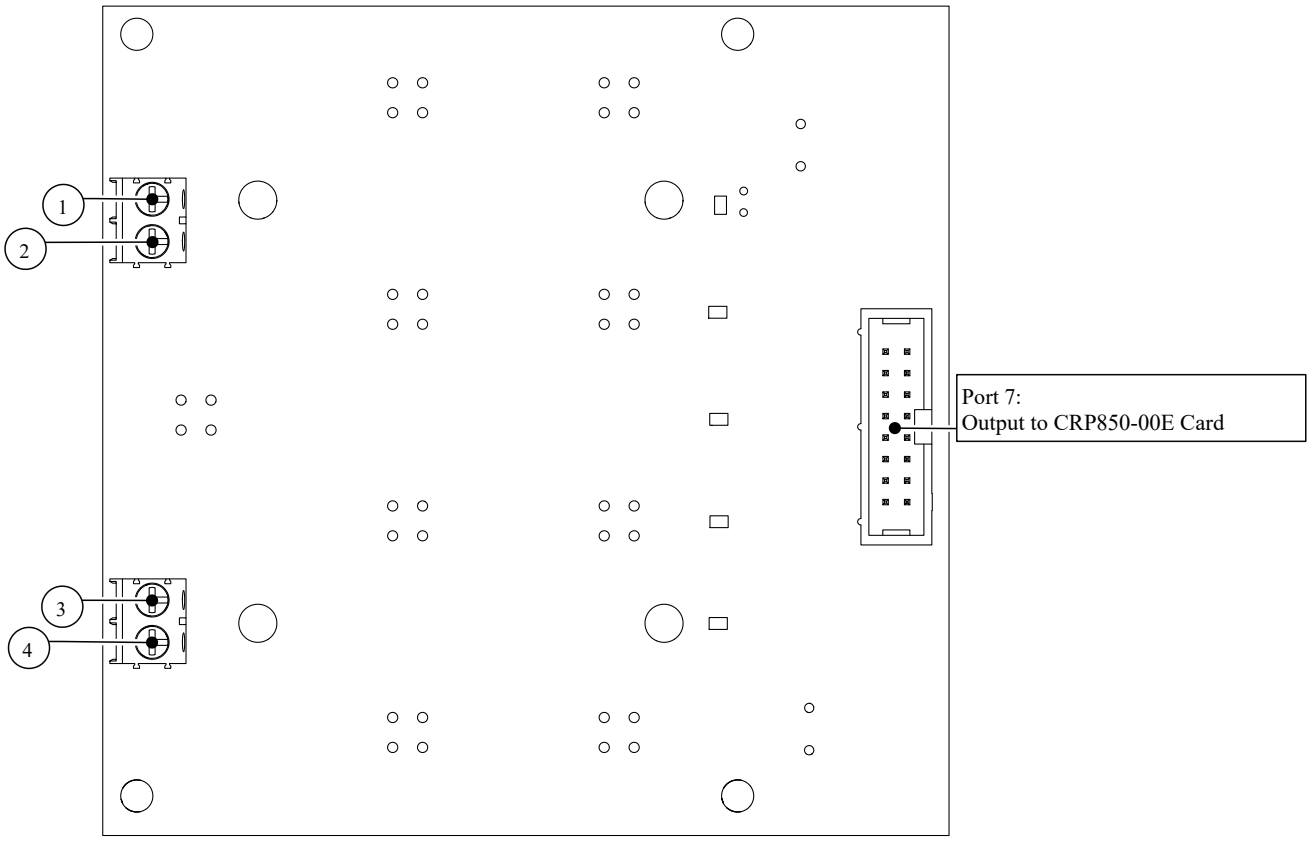
FRONT VIEW



Note

All M12 inputs are A-coded. See **M12 Sensor Inputs**

BACK VIEW

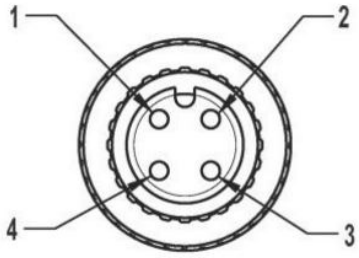


Phoenix Connector Terminal Blocks

Terminal #	Description	Pin (Port 2 on CRP850-00E card)
1	Relay 1 Control Switch	17
2	12V GND	
3	Relay 2 Control Switch	16
4	12V GND	

Common Connector Pinouts

M12 Sensor Inputs



- Sensor Cables are A-Coded M12 connector standard.
- Pin 1 (Brown wire) is Power (12V or 24V)
- Pin 2 (White wire) is Normally Closed signal
- Pin 3 (Blue wire) is Ground
- Pin 4 (Black wire) is Normally Open signal

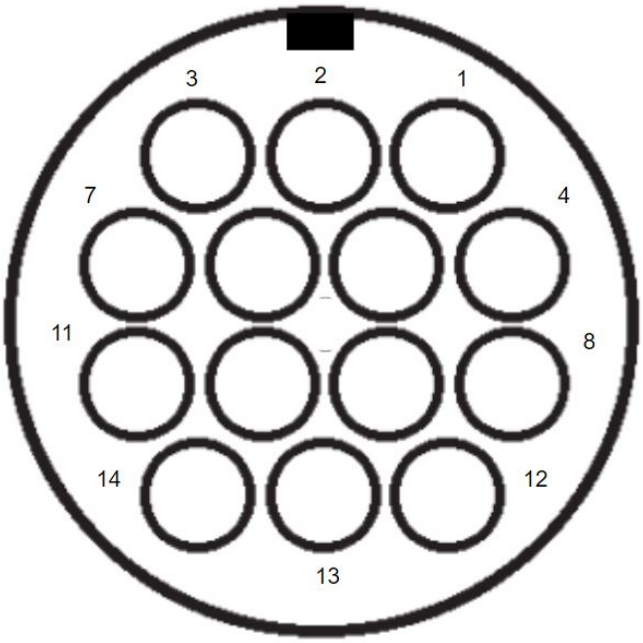
This picture is looking at a Female connector body - pin assignments will be mirrored for Male.

Note

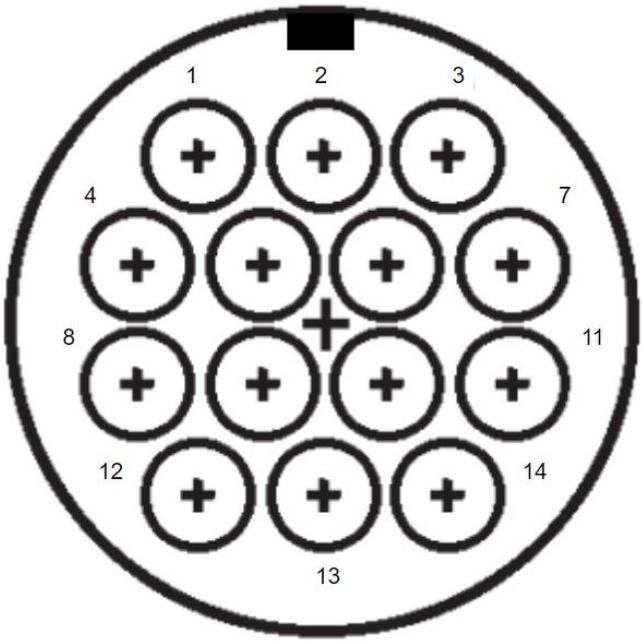
Not all pins are populated for connectors on the CRP860-00E IO breakout board.

- **Sensor and Aux inputs:** Pin 2 (Normally Closed) is not populated
- **E Stop input:** Pin 4 (Normally Open) is not populated

14-pin Control Cable



FEMALE connector



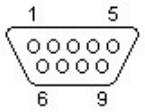
MALE connector

Application

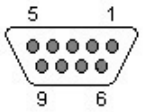
Plasma pins are populated but not connected by default on routing controllers, and Spindle pins are populated but not connected on plasma controllers.

ConnectorPin #	Use	In / Out	Description	Color	ESS Port/Pin
1	Spindle	Digital In	Fault Ground	Blue	
2	Spindle	Digital In	Fault Signal	White	2/13
3	Plasma	Digital Out	Torch ON	Orange/Black	3/17
4	Plasma	Digital Out	Torch ON	Green/Black	
5	Plasma	Analog In	Voltage Divider -	Red/Black	
6	Plasma	Analog In	Voltage Divider +	Red/White	
7	Spindle	Digital Out	FWD	Orange	2/14
8	Spindle	Digital Out	DCM	Green	
9	Spindle	Analog Out	AVI	Red	2/1
10	Spindle	Analog Out	ACM	Black	
11	Spindle	(optional) Analog	10V Ref	Blue/White	
12	Plasma	Digital In	Arc OK	White/Black	3/10
13	Plasma	GND	Ground	Blue/Black	
14	Plasma	Signal GND	Arc OK Ground	Green/White	

DB9 Motor Connectors



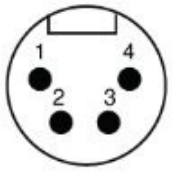
DB-9 Male



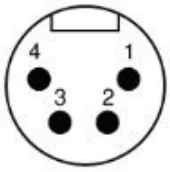
DB-9 Female

Pin #	Function	Wire Color
1	Current Set Resistor	N/A
2	N/C	N/A
3	N/C	N/A
4	N/C	N/A
5	Current Set Resistor	N/A
6	B + Phase	Yellow
7	B - Phase	Blue
8	A + Phase	Red
9	A - Phase	Green

XLR Motor Connectors



(male connector)



(female connector)

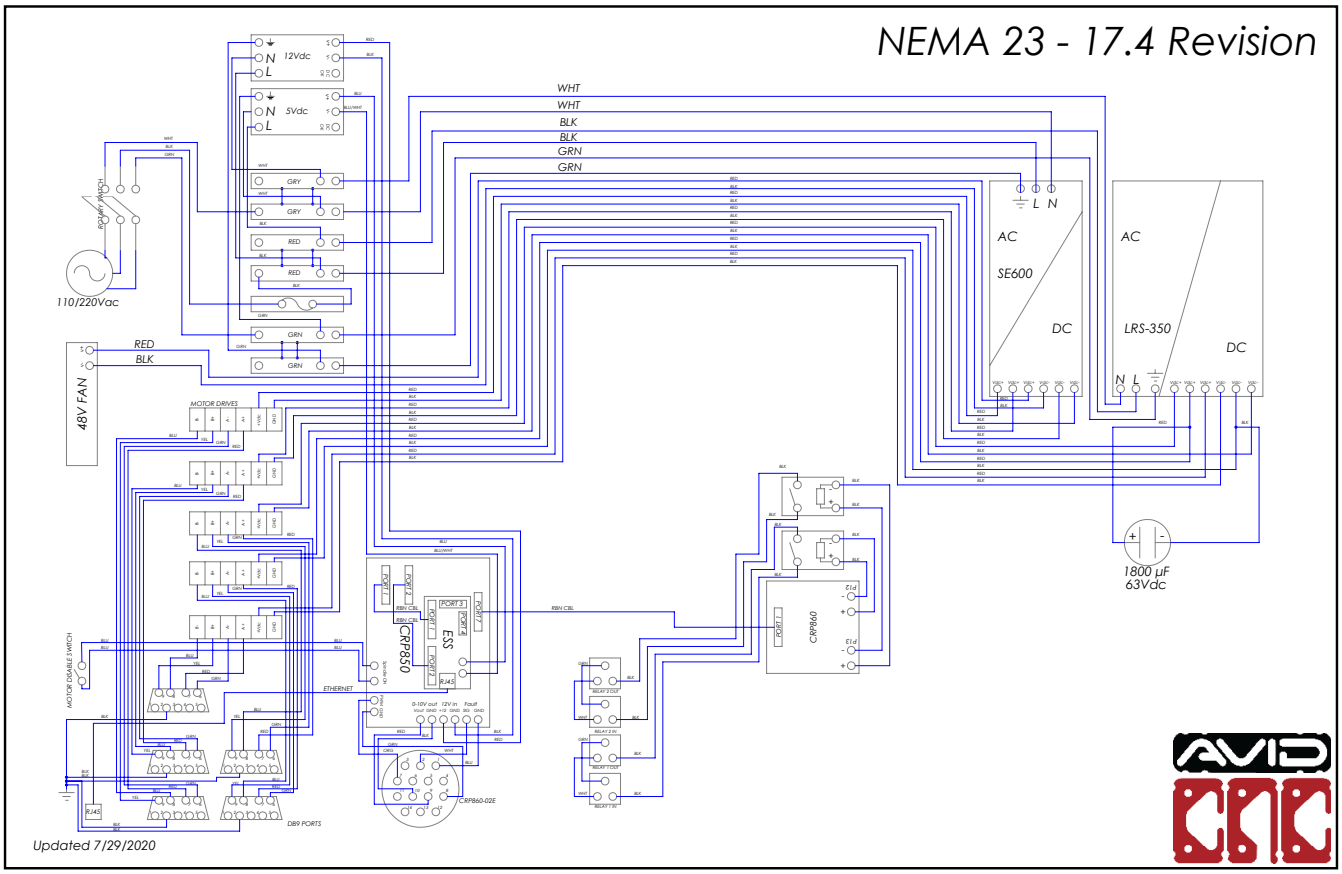
Pin #	Motor Phase	Wire Color
1	A +	Red
2	A -	Green
3	B +	Yellow
4	B -	Blue

Wiring Diagrams

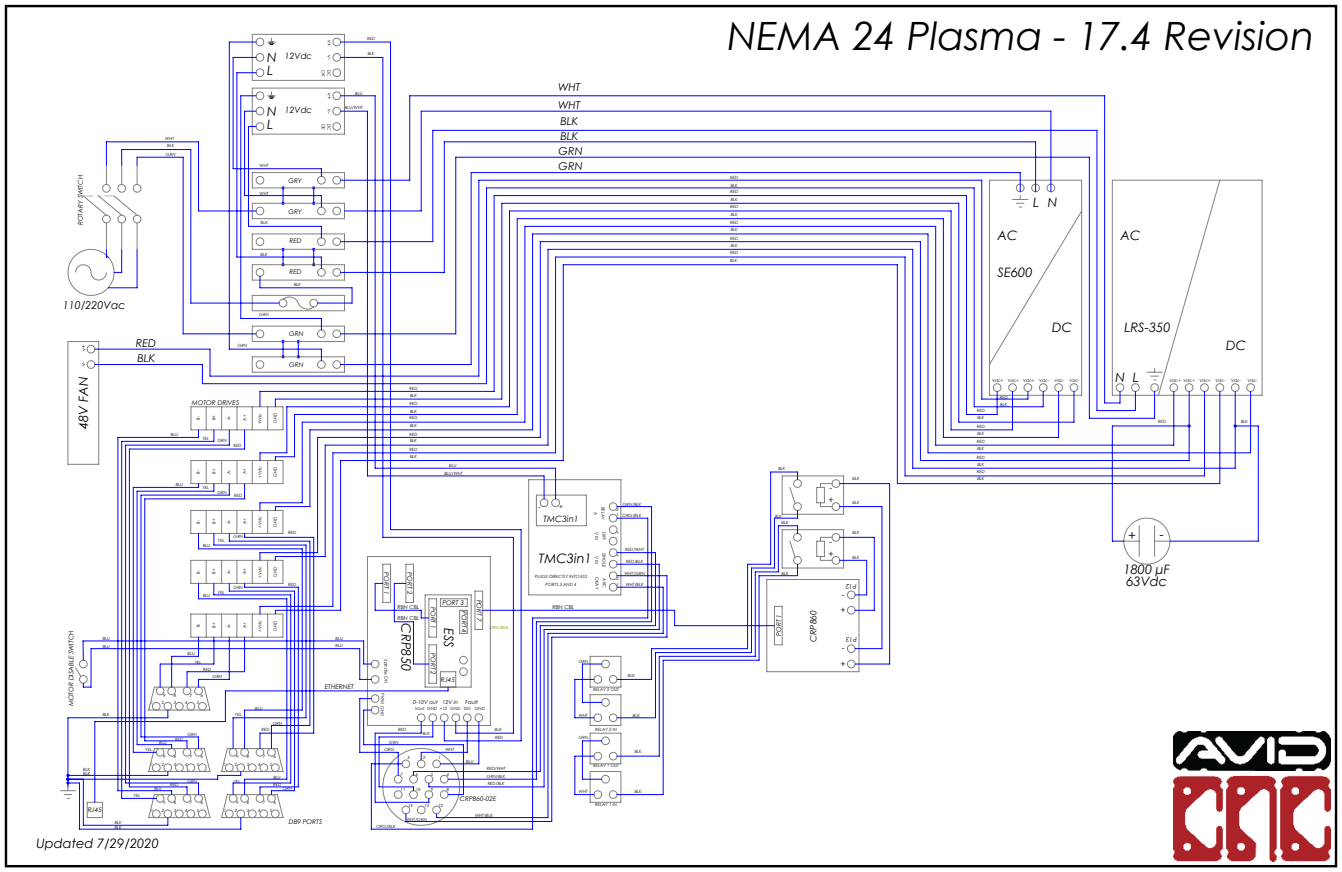
Application

Wiring diagrams shown below are for 4-axis (5 motor drivers) systems.

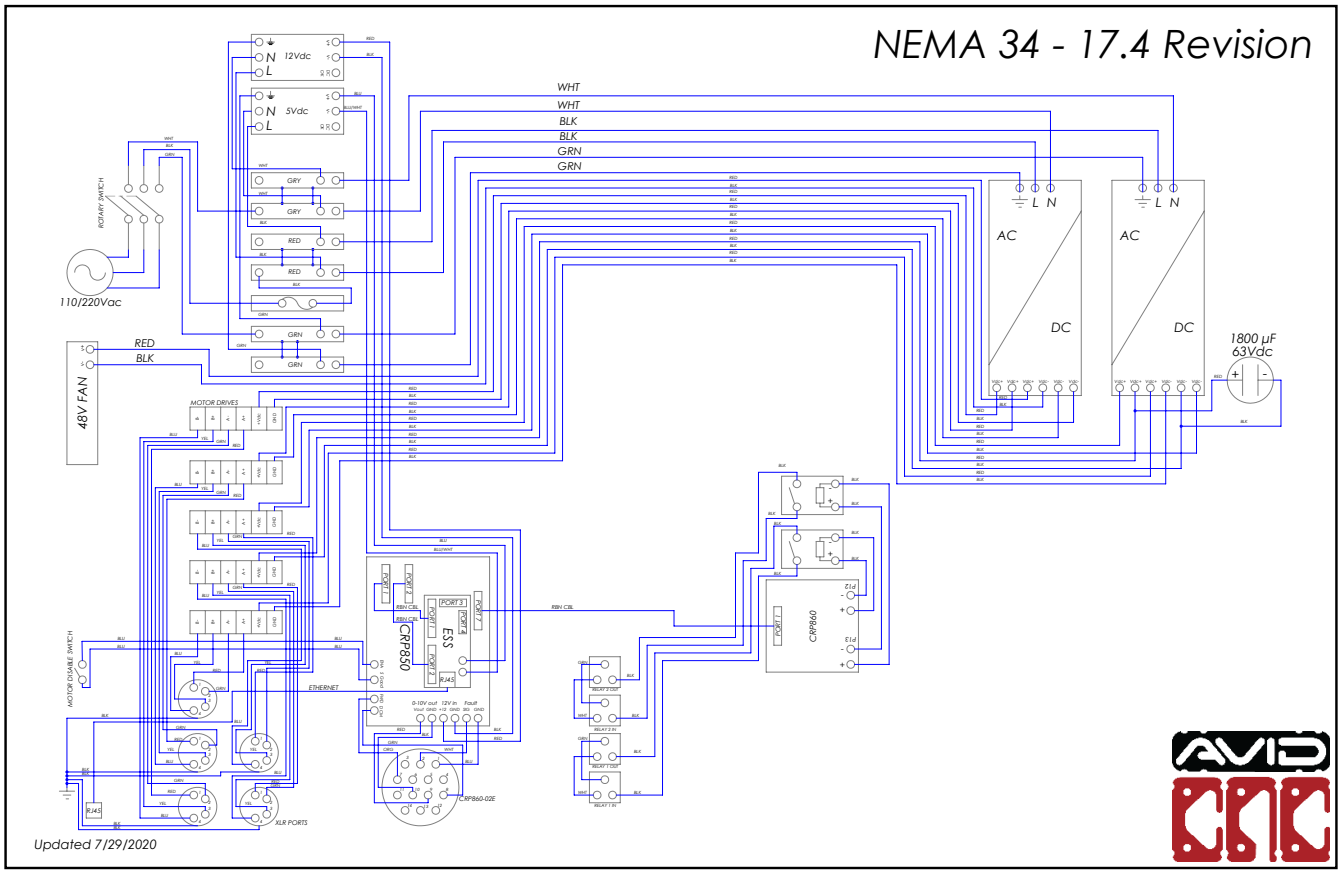
NEMA 23



NEMA 23 Plasma



NEMA 34



NEMA 34 Plasma