

# Model AR2 Electrical Enclosure

ELECTRICAL PANEL ASSEMBLY

# BILL OF MATERIALS

All Stepper motors, drivers and power supplies are available at:  
[www.omc-stepperonline.com](http://www.omc-stepperonline.com)



by BUD Industries  
BUD Industries NBF-32026 Plastic ABS NEMA Economy Box with Solid Door, 15-47/64" Length x 11-51/64" Width x 6-9/32" Height, Light Gray Finish

★★★★☆ 34 customer reviews | 11 answered questions

Price: \$38.83 ✓Prime

In Stock.

Want it Sunday, Feb. 26? Order within 40 mins and choose Two-Day Shipping at checkout. Details

Used & new (9) from \$32.23 ✓Prime

Specifications for this item

Part Number	NBF-32026	Length	15-47/64 inches
Number of Items	1	Material Type	Plastic



by BUD Industries  
BUD Industries NBX-32926-PL ABS Plastic Internal Panel, 14-1/4" Length x 10-27/64" Width x 9/64" Thick, for NBF Boxes

★★★★☆ 3 customer reviews

Price: \$20.10 ✓Prime

In Stock.

Want it Sunday, Feb. 26? Order within 39 mins and choose Two-Day Shipping at checkout. Details

New (3) from \$20.10 ✓Prime

Specifications for this item

Part Number	NBX-32926-PL	Material Type	Plastic
-------------	--------------	---------------	---------



by BUD Industries  
BUD Industries IPV-1116 IP32 Air Vent, 3.9" x 3.9"

See all 3 in this Product Family

★★★★☆ 6 customer reviews | 3 answered questions

Was: \$11.84

Price: \$6.28 ✓prime

You Save: \$5.53 (47%)

In Stock.

Want it Sunday, Aug. 6? Order within 7 hrs 17 mins and choose Two-Day Shipping at checkout. Details



uxcell Switch Power Supply Driver for LED Strip Light 110/220V 5V 2A 10W

by uxcell  
★★★★☆ 66 customer reviews | 12 answered questions

Price: \$6.99 ✓Prime

Get \$50.00 off instantly: Pay \$0.00 upon approval for the Amazon.com Rewards Visa Card. Details

Only 9 left in stock.

Want it Sunday, Feb. 26? Order within 37 mins and choose Two-Day Shipping at checkout. Details

Sold by uxcell and Fulfilled by Amazon. Gift-wrap available.

Size: DC 5V 2A 10W

DC 5V 2A 10W	DC 5V 3A 15W	DC 5V 5A 25W	DC 5V 8A 40W
DC 5V 10A 50W	DC 5V 12A 60W	DC 5V 20A 100W	DC 5V 30A 150W



leik Mega 2560 R3 ATmega2560-16AU + ATME USB Cable for Robot Arduino UNO MEGA2560 Duemilanove 2013

by IEIK  
★★★★☆ 89 customer reviews | 7 answered questions

Price: \$11.89 ✓Prime

In Stock.

Want it Sunday, Feb. 26? Order within 1 min and choose Two-Day Shipping at checkout. Details

Sold by Smilesupplier and Fulfilled by Amazon. Gift-wrap available.

- Our development boards and modules are compatible with the Arduino
- 1 x IEIK Mega 2560 R3 Board
- 1 x USB Cable



HESAI Mega 2560 Case Enclosure Trans Acrylic Computer Box Compatible with 2560 Rev3 R3

★★★★☆ 10 customer reviews

Price: \$5.99 ✓prime

FREE One-Day Pickup. Details

Get \$70 off instantly: Pay \$0.00 upon approval for the Amazon.com Rewards Visa Card. Details

In Stock.

Want it Sunday, March 4? Order within 1 hr 10 mins and choose checkout. Details

Sold by HeSai and Fulfilled by Amazon. Gift-wrap available.



JBtek 8 Channel DC 5V Relay Module for Arduino Pi DSP AVR PIC ARM

by JBtek  
★★★★☆ 147 customer reviews | 42 answered questions

Price: \$8.98 ✓Prime

In Stock.

Want it Monday, Feb. 27? Order within 17 hrs 37 mins and choose checkout. Details

Sold by JBtek and Fulfilled by Amazon. Gift-wrap available.

- 5V 8-Channel Relay interface board, and each one needs 15-20mA
- Equipped with high-current relay, AC250V 10A; DC30V 10A
- Standard interface that can be controlled directly by microcontroller (DSP, ARM, ARM, MSP430, TTL logic)
- Indication LED's for Relay output status

# BILL OF MATERIALS CONTINUED



**Switchcraft EHUSBBABX USB-B to USB-A Feedthru Panel Finish**  
by Switchcraft

★★★★★

**\$9.70** ✓prime  
Only 1 left in stock - order soon.

More Buying Choices  
\$9.70 (2 new offers)



**Switchcraft EHRJ45P5ES RJ45 CAT5e Feedthru Panel Mount Jack, Shielded, Plastic Black Housing**

★★★★★ 7 customer reviews

Was: \$11.70  
Price: **\$9.99** ✓prime  
You Save: \$1.71 (15%)

Get \$70 off instantly: Pay \$0.00 upon approval for the Amazon Prime Rewards Visa Card

**Only 13 left in stock (more on the way).**  
Want it Friday, March 9? Order within 2 mins and choose **Two-Day Shipping** at checkout.

Ships from and sold by Amazon.com. Gift-wrap available.

- The EH Series Connectors by Switchcraft is a complete line of Audio, Video and Data Connectors built into standard panel mount XLR housings.
- Custom Combinations can be loaded into any Switchcraft Q-G Panel or any panel punched for standard XLR's
- Once mounted, connecting equipment to the back of the EH Series is fast and easy.



**uxcell AC 600V 10A Red Mushroom Emergency Stop Push Button Switch 22mm NO NC**

★★★★★ 33 customer reviews | 5 answered questions

Price: **\$6.94** ✓prime

**In Stock.**  
Want it Tuesday, May 16? Order within 11 hrs 22 mins and choose **Two-Day Shipping** at checkout. Details

Sold by uxcell and Fulfilled by Amazon. Gift-wrap available.

- Item Name : Emergency Stop Push Switch>Type : Self Locking Rotary
- UI : 600V/Voltage Category : AC 125V, 5A; AC 300V, 3A,Button Diameter : 4cm/1.5"
- Contact Type : 1 NO (Normally Open)+ 1 NC (Normally Closed)Mount Hole Diameter : 2 / 0.87(7/8")Fit Panel Thickness(Adjustable) : Max 0.6cm / 0.24"
- Size : 3.7 x 3 x 7cm/ 1.4" x 1.2" x 2.8"(L\*W\*H)Material : Plastic and Metal>Main Color : Red
- Net Weight : 45g/Package Content : 1 x Emergency Stop Switch

See more product details



**Hilitchi 30 Piece Nylon Plastic Waterproof Adjustable 3.5 - 13mm Cable Glands Joints Cable Gland - PG7, PG9, PG11, PG13.5, PG16**

★★★★★ 2 customer reviews

Price: **\$10.41** ✓prime

Your cost could be \$5.41. Qualified customers get \$5 in Gift Card funds on first \$100 reload of their Amazon Gift Card Balance. Learn more

**In Stock.**  
Sold by Hilitchi and Fulfilled by Amazon. Gift-wrap available.

Color: **Black 30pcs**

High Quality Cable Gland Kit, Applied to Cable Fixing, Waterproof Design  
Package Includes: 30pcs (6 each size)  
Model: PG7, PG9, PG11, PG13.5, PG16



**ASI ASIUK5N Din Rail Mounted Terminal Block, Screw (Pack of 50)**

★★★★★ 4 customer reviews

List Price: \$24.42  
Price: **\$21.01** (\$0.42 / DIN Rail Terminal) ✓prime  
You Save: \$3.41 (14%)

**In Stock.**  
Want it tomorrow, Feb. 26? Order within 11 hrs 11 mins and choose **One-Day Shipping** at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

Used & new (4) from \$15.76 ✓prime

#### Specifications for this item

Part	ASIUK5N	Current	Amp
------	---------	---------	-----



**by Amico 15 Pcs 35mm Width Slotted Design Aluminum DIN Rail 9.8"**

★★★★★ 10 customer reviews

Price: **\$11.35** & FREE Shipping

Note: Not eligible for Amazon Prime.

**Only 1 left in stock.**  
Get it as soon as March 2 - 7 when you choose **Expedited Shipping** at checkout. Ships from and sold by uxcell.

New (5) from \$11.35 & FREE shipping.

#### Specifications for this item

Part Number	a12022900ux0297
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**ASI ASIEB106 Din Rail Terminal Block External Bridge (10)**

★★★★★ 4 customer reviews

Price: **\$22.11** (\$2.21 / Din Rail Terminal) ✓prime

**In Stock.**  
Want it Monday, Sept. 11? Order within 2 hrs 15 mins and choose **Two-Day Shipping** at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

New (1) from \$22.11 ✓prime

#### Specifications for this item

Part Number	ASIEB106
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**WINGONEER Prototype Screw Terminal Block Shield Board K For Arduino MEGA 2560 (282764515179)**

ITEM PRICE:  
**US \$29.91**

**NOTE: This terminal block shield is optional – it makes some connections easier.**

# BILL OF MATERIALS CONTINUED



**eBoot 130 Pieces Solderless Flexible Breadboard Jumper V to Male for Arduino Prototype Shield**  
by eBoot

~~\$6.99~~ **\$10.99** ✓prime  
Get it by **Monday, Sep 11**



Smraza

**Smraza 120pcs Multicolored Jumper Wire 40pin Female, 40pin Male to Male, 40pin Female to Breadboard Jumper Wires Ribbon Cables Kit 1 connections S02**

★★★★★ 10 customer reviews

Price: ~~\$7.99~~ ✓Prime

**In Stock**

**Want it Thursday, March 9?** Order within **2 hrs 26 mins** and choose Two checkout. [Details](#)

Sold by SmrazaDirect and Fulfilled by Amazon. Gift-wrap available.

\* Multicolored 3 pieces Breadboard Jumper Wires as a set, High-grade C

[www.omc-stepperonline.com](http://www.omc-stepperonline.com)



**350W 24V 14.6A 115/230V Switching Power Supply Stepper Motor CNC Router Kits**

SKU: S-350-24

This professional 350W 24V 14.6A Switching CNC Power Supply can be widely used in Industrial Automation and CNC Stepper/Servo System. 115V and 230V can be choosed by switch. Powerful functions(eg. PWM control) and professional de..

~~\$23.96~~ As low as : \$21.06

**STEPPERONLINE**

**24 volt power supply**



**Digital Stepper Driver 1.0-4.2A 20-50VDC for Nema 17, 23, 24 Stepper Motor**

SKU: DM542T

This driver is brand STEPPERONLINE and manufactured by Leadshine (The most famous stepper driver company in China). The DM542T is a fully digital stepper driver developed with advanced DSP control algorithm based on the latest..

~~\$32.84~~ **\$25.49** As low as : \$22.09

**STEPPERONLINE**

**DM542T drivers for axis 1,2,3,5,6 and travel track.**



**Digital Stepper Driver 0.3-2.2A 18-30VDC for Nema 8, 11, 14, 16, 17 Stepper Motor**

★★★★★ 3 reviews | [Write a review](#)

SKU: DM320T

~~\$13.86~~ **\$18.02**

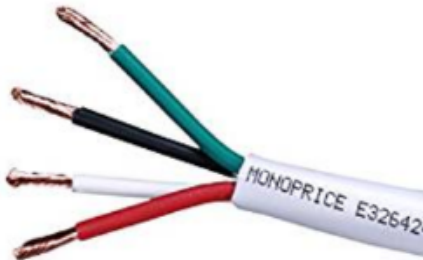
Bulk quantity price break:

**STEPPERONLINE**

**DM320T drivers for axis 4**



## BILL OF MATERIALS CONTINUED



### Monoprice 100-Foot 18AWG CL2 Rated 4-Conductor High-Purity Oxygen-Free Copper Speaker Wire



85 customer reviews | 15 answered questions

Amazon's Choice

for "speaker wire 4 conductor"

Price: **\$34.55** ✓prime



FREE One-Day Pickup. [Details](#)



### 4 Pin Metal Male Female Panel Connector 16mm GX16-4 Silver Aviation Plug of 10 pcs



1 customer review

**Note:** This item is only available from third-party sellers ([see all offers](#)).

Available from these sellers.

- Product Name : Aviation Connector Plug;Model : 16-4;Type : Male Female Plug;
- Contacts Pin Number : 4
- Rated : 125V/5A;WorkingVoltage : AC 200V;Withstand Voltage : AC 1500V
- Total Size : 4.7 x 1.9cm/ 1.8" x 0.7" (Lx Max.W);
- Material&Package: Metal;10 Pairs Aviation Connector Plug

› [See more product details](#)

[Compare with similar items](#)

**New (1)** from \$12.99 + \$5.27 shipping

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# ASSEMBLY





Install backplane into bottom of enclosure using the supplied screws.

---



Trace bolt pattern from bottom of 24vdc power supply onto a sheet of paper and transfer bolt pattern to bottom of enclosure as shown. Drill 5mm holes where marked.

---





Use (x4) 4mm screws from bottom to attach power supply.

---



Use stepped drill bit to create hole and install E-Stop switch in position shown.

---







Use stepped drill bit to create hole and install panel mount USB jack in position shown.



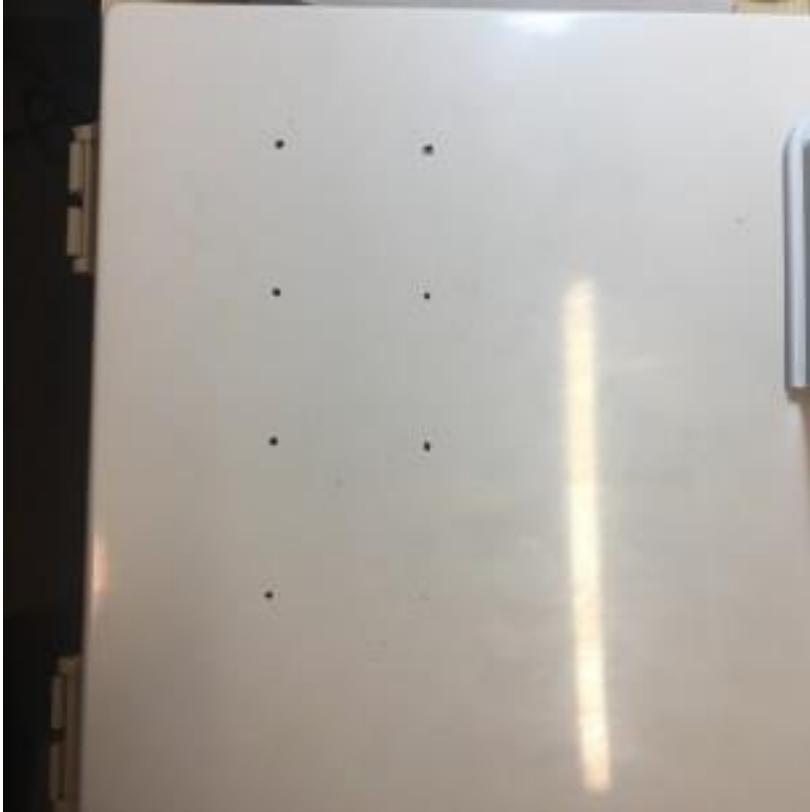
Cut 48mm x 30mm rectangular hole in right side of enclosure centered in panel with the top parallel to hasp as shown.

Install fused inlet socket, drill pilot holes and secure with (2) flat head screws.



Trace the circle from the vent onto front cover door; cut out circle using vibratory or roto saw and mount vent in door as shown.

---



Mark positions on door where you want to located the stepper motor aviation plugs. You will need (x6) for the robot and a (7<sup>th</sup>) if you plan on adding a travel track.

In this example I have (x7) places marked in a grid with 1.5" spacing.

---





Use stepped bit to drill each hole to 5/8".

---



Use stepped drill bit and rotary tool to create square hole then mount RJ45 panel mount jack as shown and secure with 2 flat head screws.

---





Mount stepper drivers as shown. I mounted the smaller DM320T up top to the right of backplane screw and the remaining DM542T drivers below that. ----- If you plan on ----- using a travel track install a 7<sup>th</sup> driver at the bottom.



Mount length of DIN rail in position shown.



Mark and Drill (x2) 4mm holes and then mount small 5vdc power supply to left side of enclosure as shown. Secure with (x2) 3mm screws.

NOTE: Arduino does not have enough current to power the relay board which is the purpose for having an additional power supply.



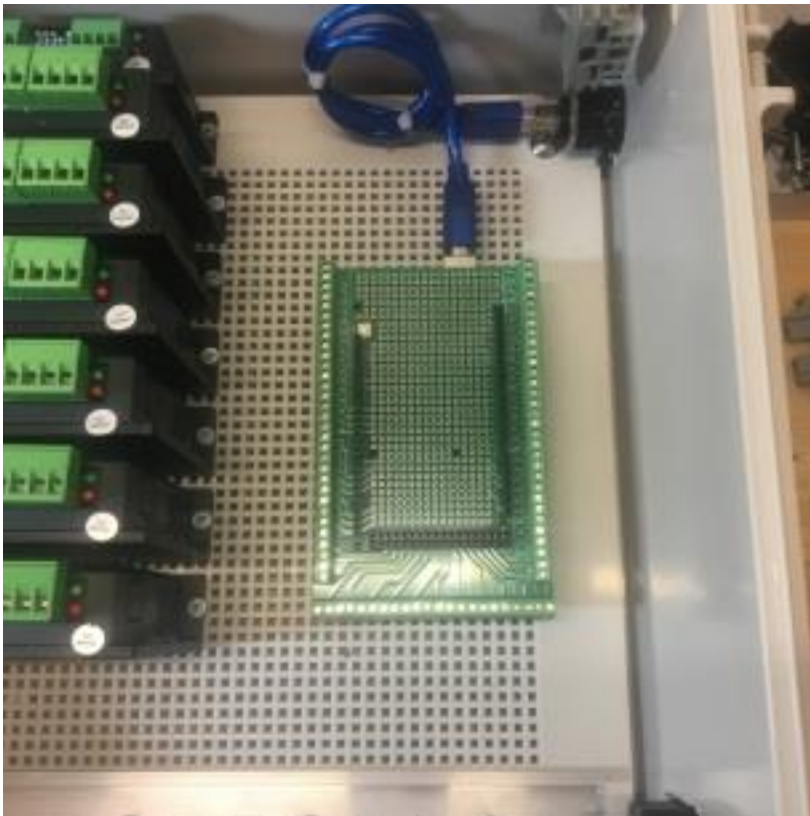
Mount Arduino Mega board to the base plate of mount as shown.





Mount Arduino in position shown and connect USB cord from Arduino to back of flange mount USB jack.

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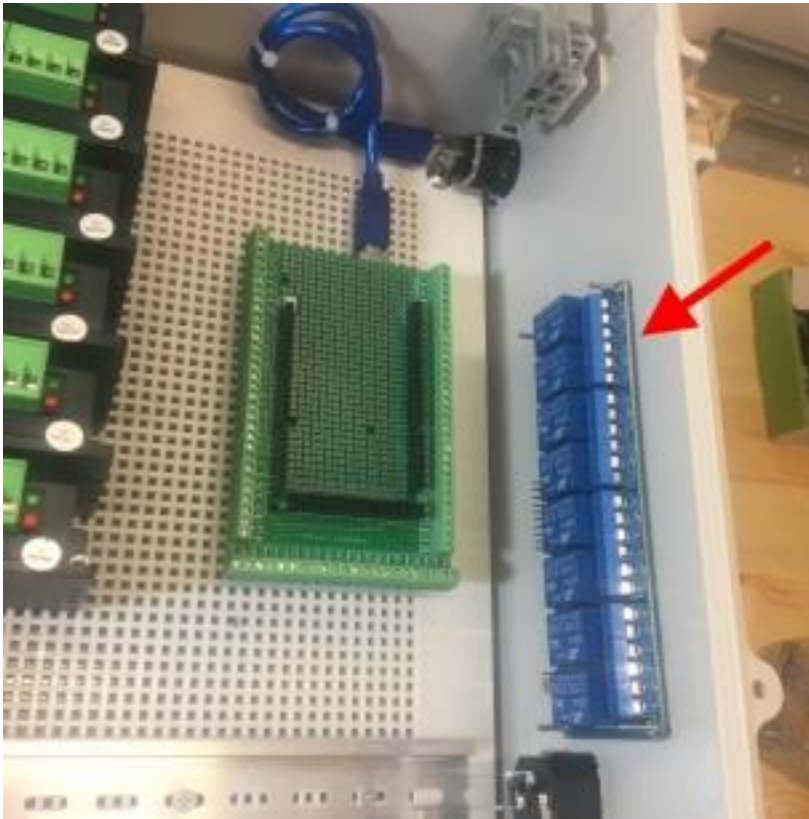


Install optional screw terminal shield on top of Arduino Mega.

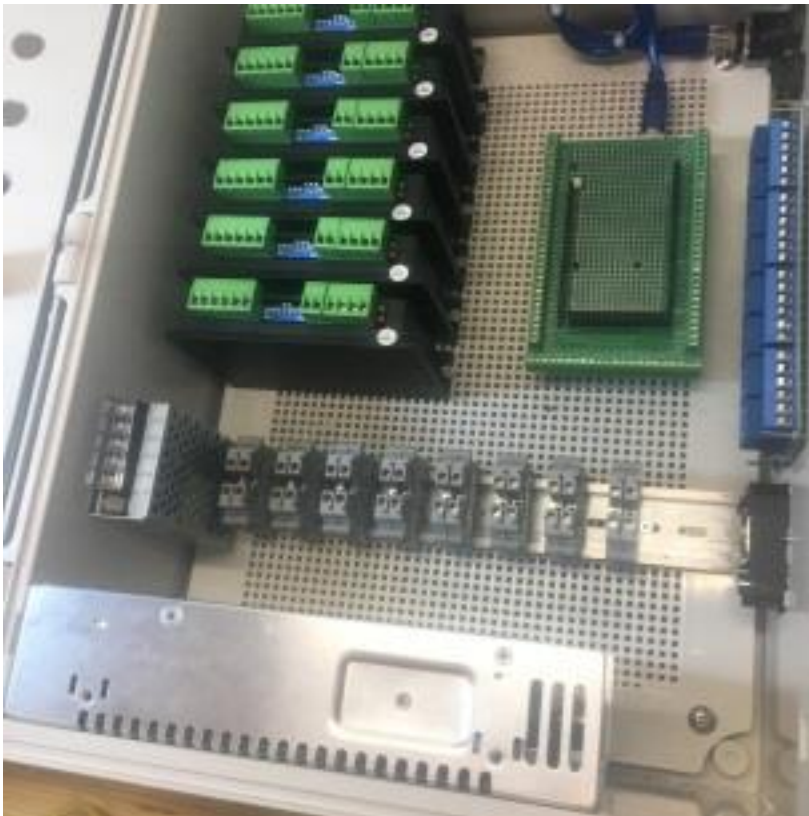
This board adds screw terminals (green perimeter screws) and makes some connections easier – it also retains the original breadboard pin terminals (center black terminals).

The primary reason I added this was so it would be easy to wire inputs to the Arduino in the case where the robot is waiting for a signal from a piece of equipment.

---



Mark and Drill (x4) 3mm holes and then mount 8 channel relay board to right side of enclosure as shown. Secure with (x4) 3mm screws.

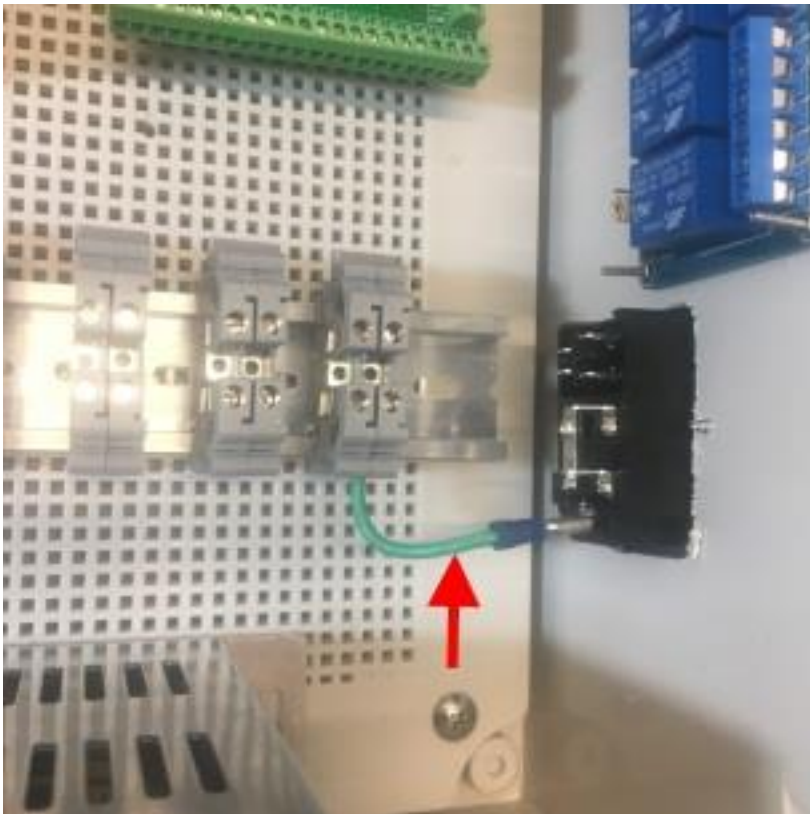


Install (x8) pairs of DIN rail terminal blocks.



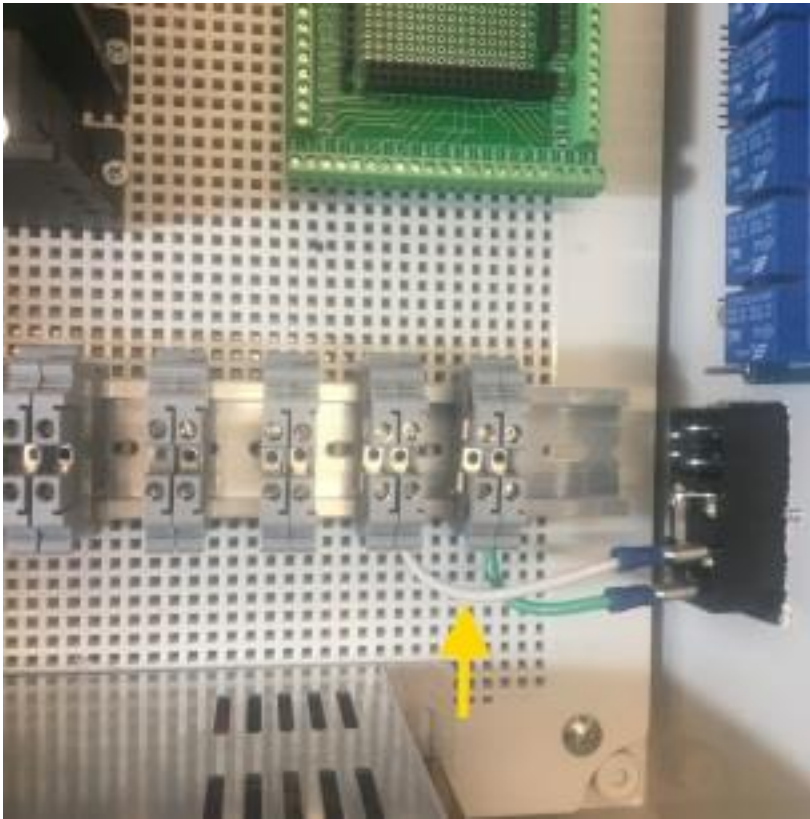
Use wire cutters to cut terminal strip jumpers into (x8) 2 prong jumpers and then install and secure jumpers into all 8 pairs of terminal blocks.

This will make each pair a 4 terminal bridge.



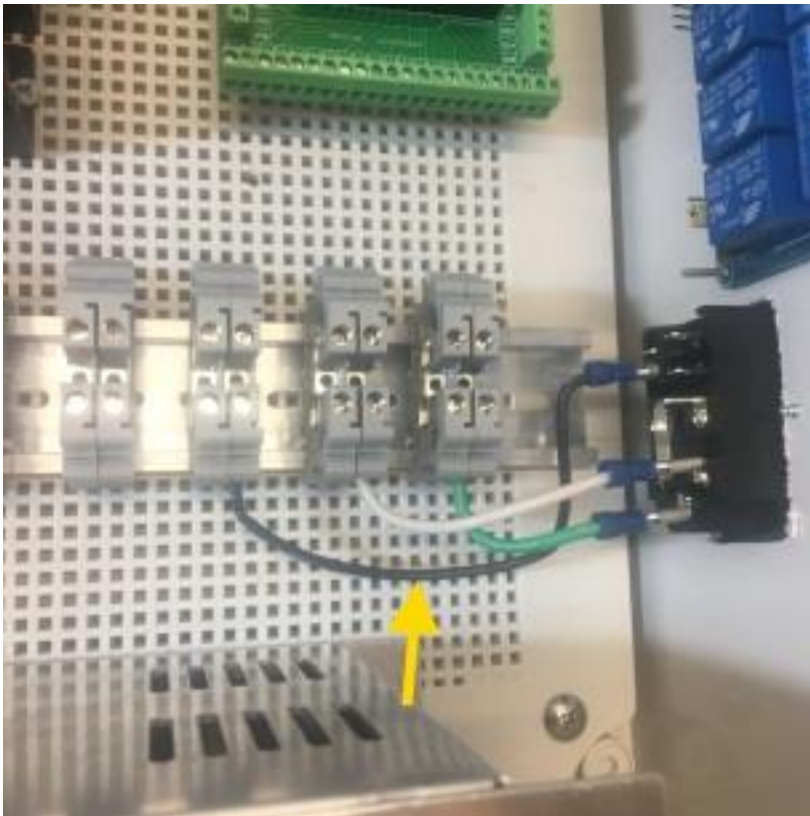
Install green (ground) wire from bottom terminal on fused inlet socket to 8th terminal block set.





Install white (neutral) wire from 2nd terminal on fused inlet socket to 7th terminal block set.

---

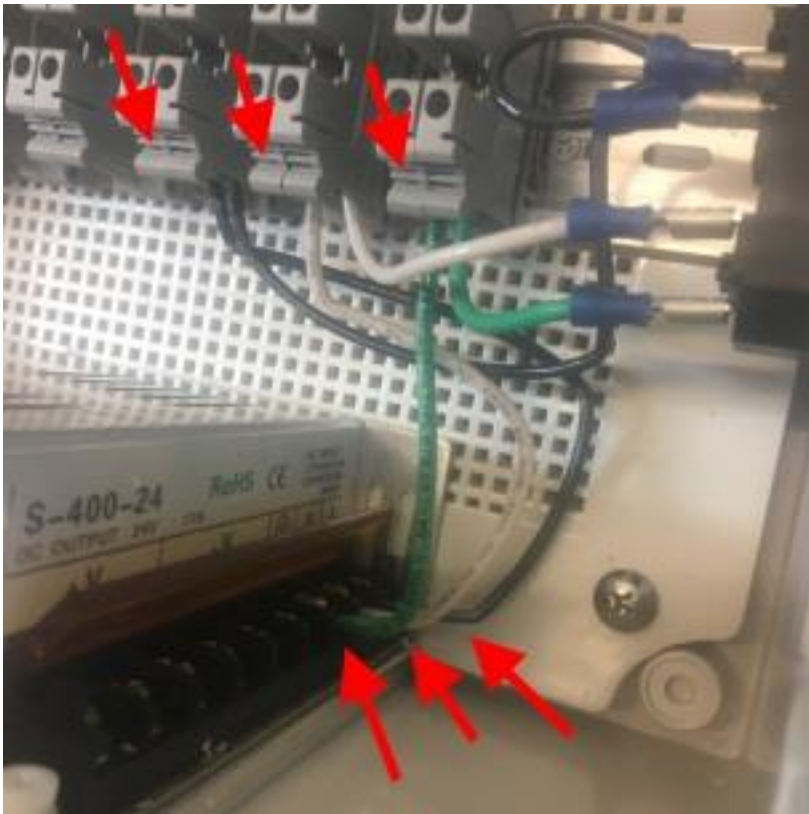


Install black (hot) wire from upper left terminal (switch) on fused inlet socket to 6th terminal block set.

---



Install black (hot) jumper wire from 3<sup>rd</sup> terminal to upper right terminal (switch) on fused inlet socket.

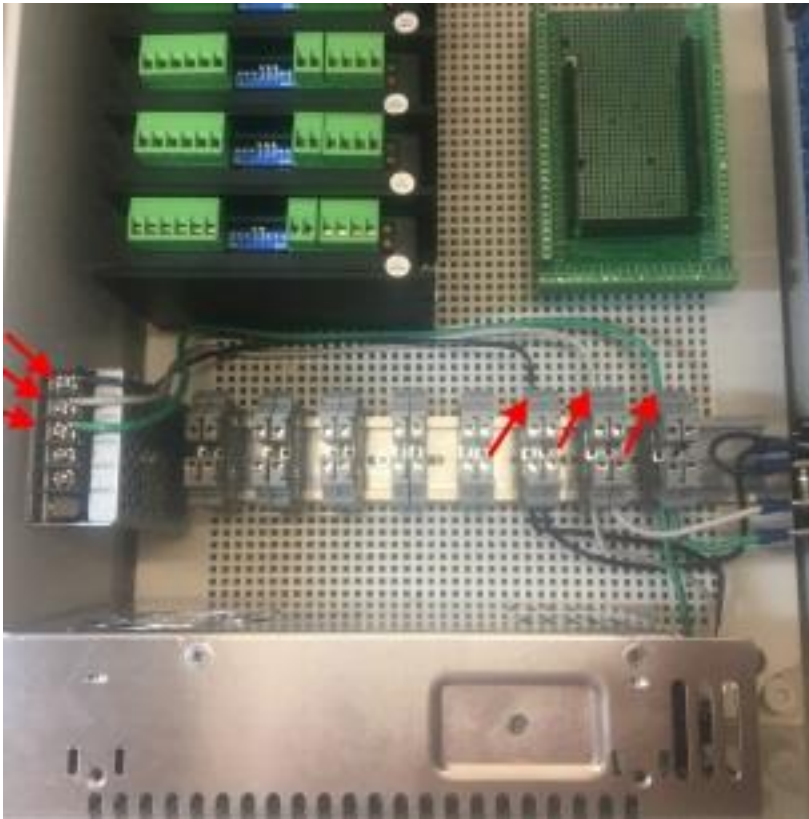


Install Ground wire from 8<sup>th</sup> terminal block to ground terminal on 24vdc power supply.

Install Neutral wire from 7<sup>th</sup> terminal block to Neutral terminal on 24vdc power supply.

Install Hot/Line wire from 6<sup>th</sup> terminal block to Line terminal on 24vdc power supply.





Install Ground wire from 8th terminal block to ground terminal on 5vdc power supply.

Install Neutral wire from 7th terminal block to Neutral terminal on 5vdc power supply.

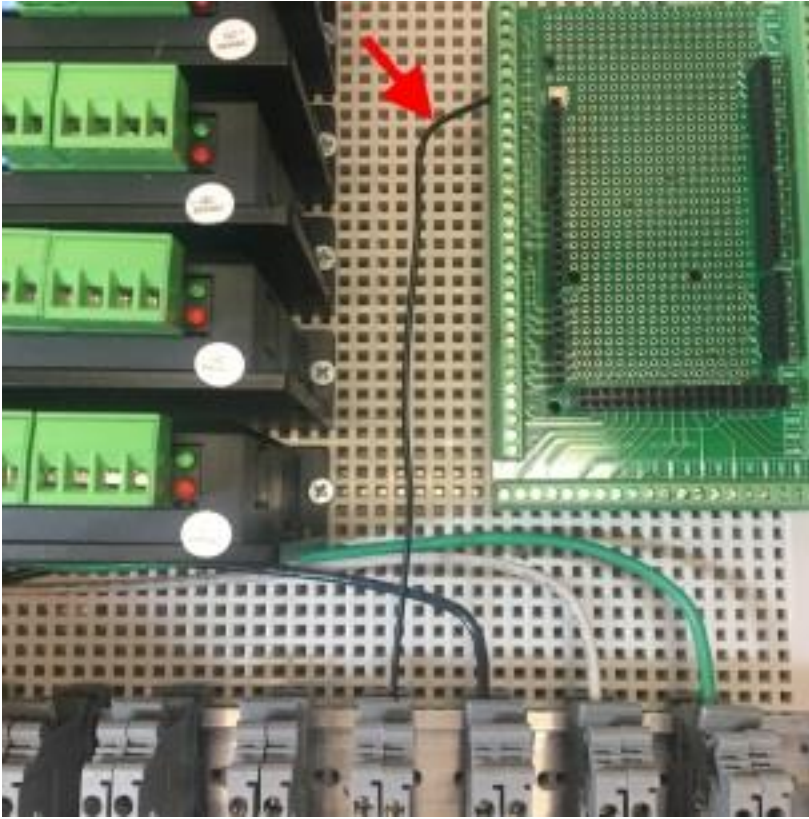
Install Hot/Line wire from 6th terminal block to Line terminal on 5vdc power supply.



Connect black wire from negative 5vdc terminal to 5<sup>th</sup> set of terminal blocks.

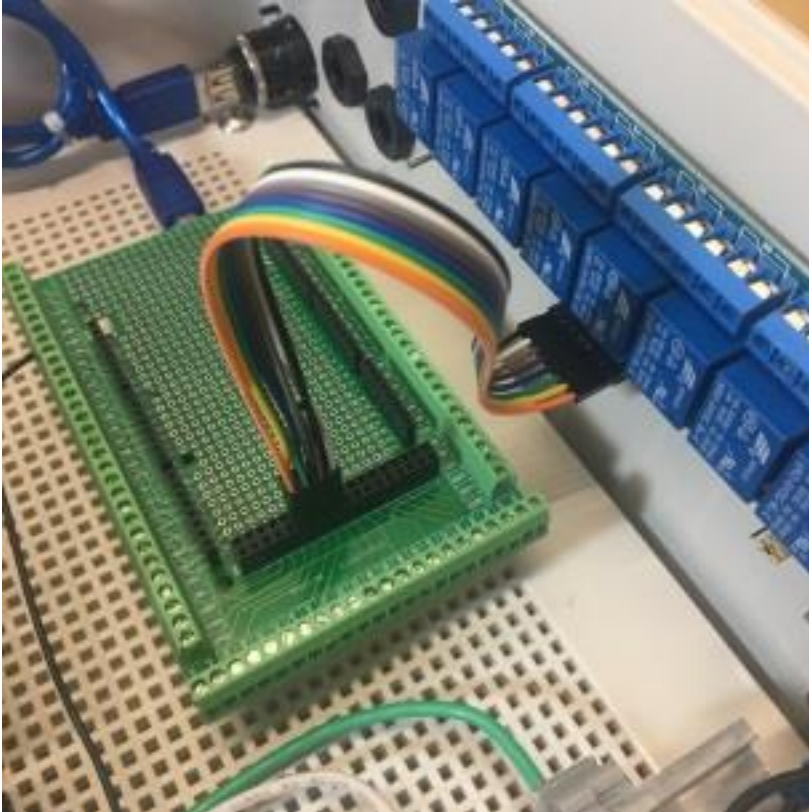
Connect red wire from positive 5vdc terminal to 4<sup>th</sup> set of terminal blocks.





Run a black wire from ground/neg. terminal on Arduino to 5<sup>th</sup> terminal block on DIN rail (5vdc power supply neg)

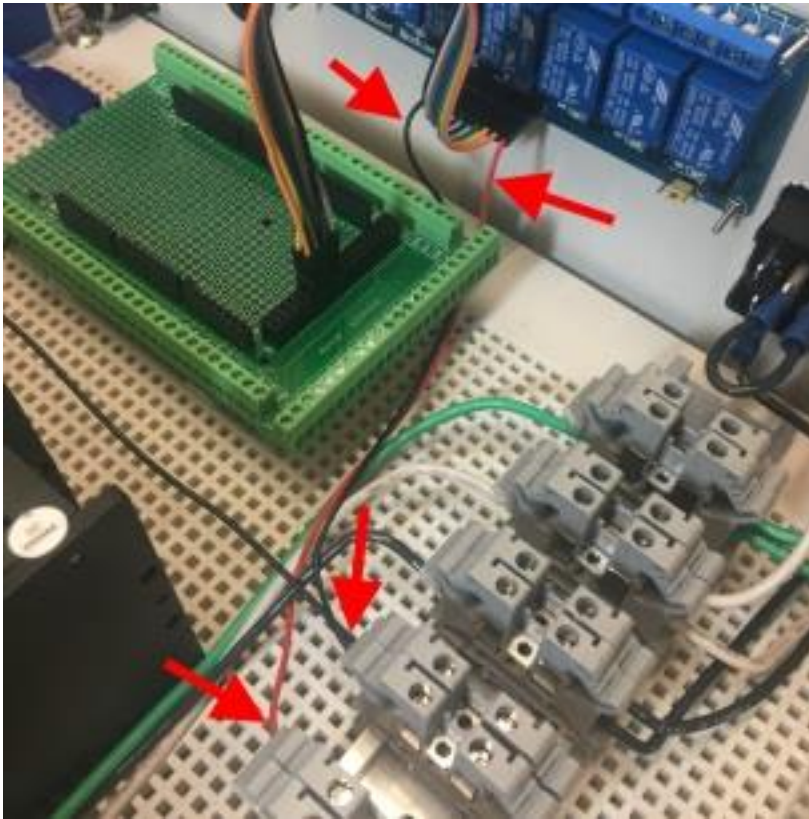
The Arduino and the 5vdc must share a negative signal - otherwise relays being powered by the 5vdc supply but receiving signal from Arduino will not work.



Connect a ribbon of (8) wires from the 8 channel relay board to the Arduino as follows:

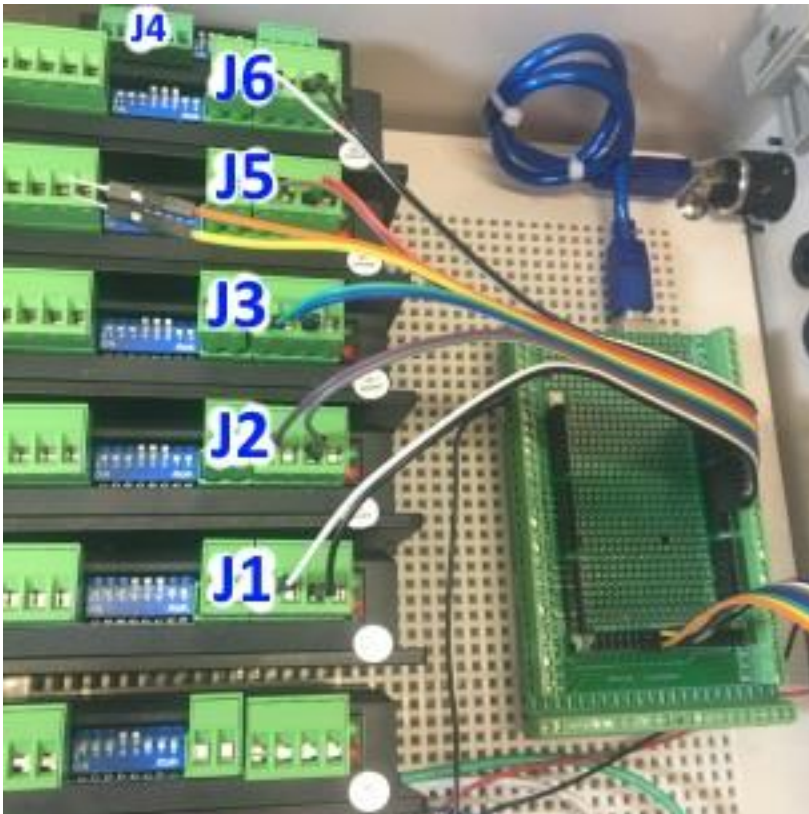
- IN1 to black to Arduino pin 38
- IN2 to white to Arduino pin 39
- IN3 to grey to Arduino pin 40
- IN4 to purple to Arduino pin 41
- IN5 to blue to Arduino pin 42
- IN6 to green to Arduino pin 43
- IN7 to yellow to Arduino pin 44
- IN8 to orange to Arduino pin 45





Connect a long red jumper from the VCC terminal on the relay board to the +5Vdc terminal blocks on the DIN rail (4<sup>th</sup> terminal block)

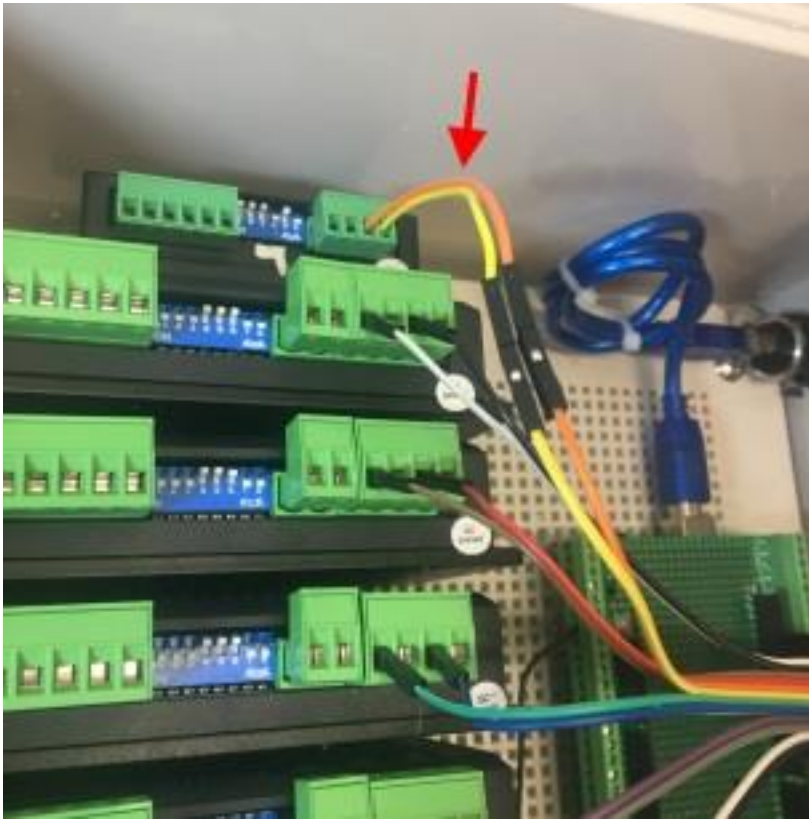
Connect a long black jumper from the GND terminal on the relay board to the -5Vdc terminal blocks on the DIN rail (5<sup>th</sup> terminal block)



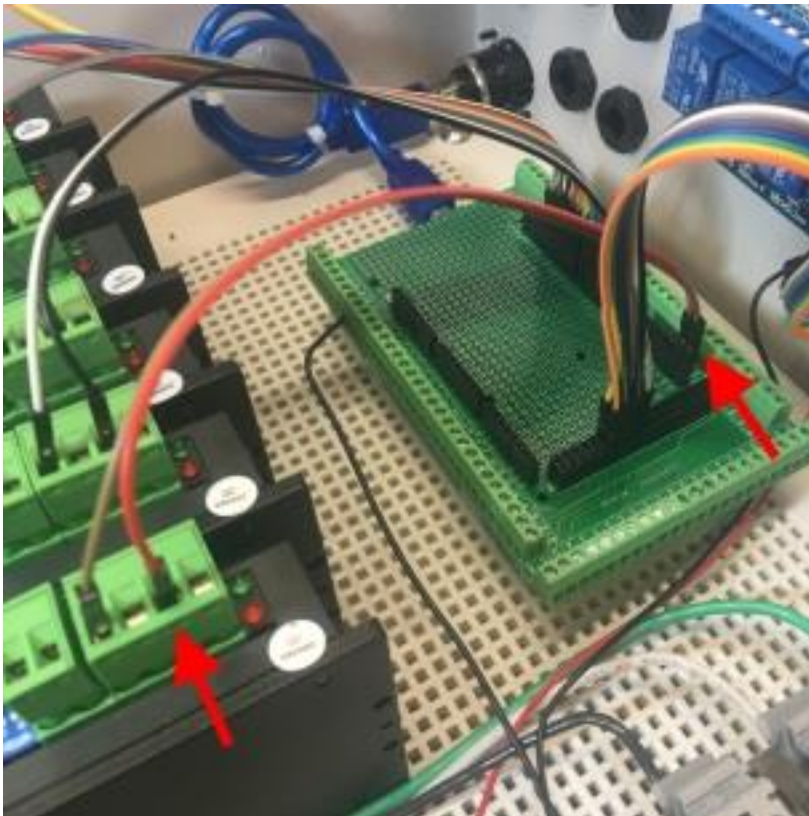
Connect a ribbon of (12) jumper wires to pins 2 through 13 on the Arduino board as follows:

- Pin 2 to black to J1 PUL(-5)
- Pin 3 to white to J1 DIR(-5)
- Pin 4 to grey to J2 PUL(-5)
- Pin 5 to purple to J2 DIR(-5)
- Pin 6 to blue to J3 PUL(-5)
- Pin 7 to green to J3 DIR(-5)
- Pin 8 to yellow to J4 PUL(-5)
- Pin 9 to orange to J4 DIR(-5)
- Pin 10 to red to J5 PUL(-5)
- Pin 11 to brown to J5 DIR(-5)
- Pin 12 to black to J6 PUL(-5)
- Pin 13 to white to J6 DIR(-5)

**NOTE:** the J4 driver is not in sequence and will be hooked up in the next step



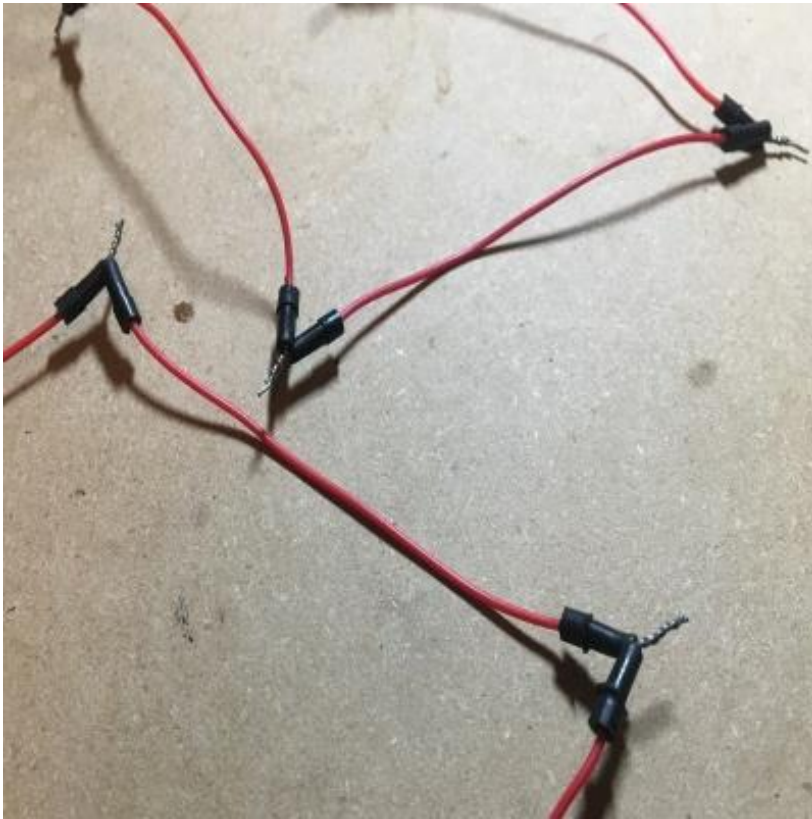
As noted in previous step the smaller DM320T for J4 is out of sequence at the top therefore connect jumper extensions to the orange and yellow wires and connect to the driver as shown.



If using a 7<sup>th</sup> axis travel track connect 7<sup>th</sup> driver to Arduino board as follows:

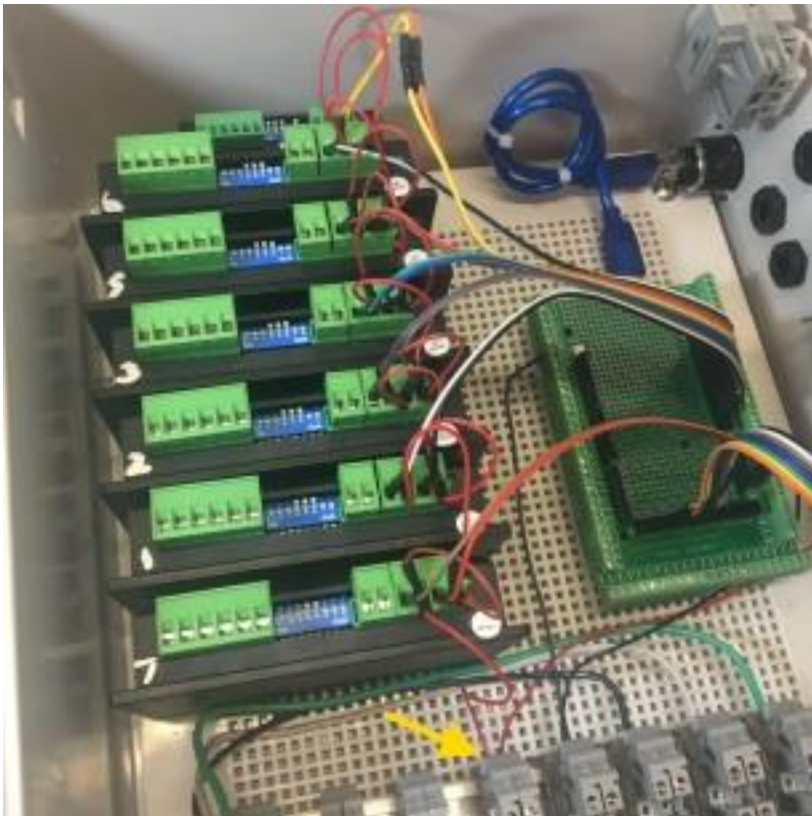
- Pin 20 to brown to J7 PUL(-5)
- Pin 21 to red to J7 DIR(-5)





- For the next step you will need to jumper +5vdc across all +driver terminals. Use 12 short red jumpers and one long red jumper - twist ends together end to end so you have a chain of jumpers. Test continuity across all jumpers before installing.

*(Also refer to the full wiring diagram at the end of this manual )*



The next step is to run 5vdc to all the (+5v) terminals across all of the stepper drivers. The drivers are NPN or negative switching which means the step and direction pulses will be made by the negative wire and the positive is high or on all the time on all the (+5v) terminals. Each driver has (2) positive terminals that require a constant +5v signal:

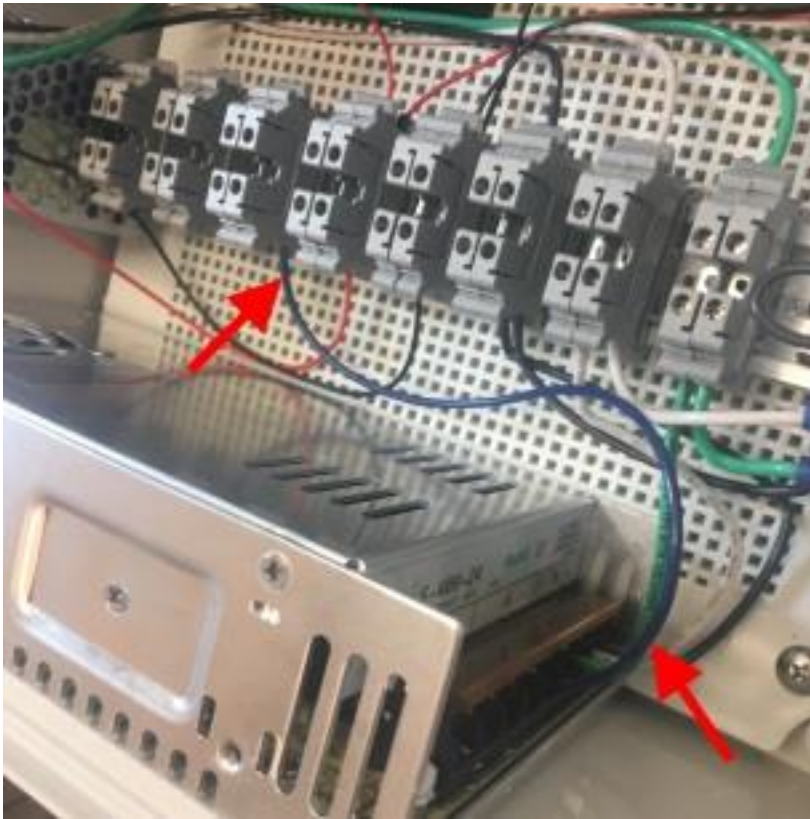
- PUL+(+5)
- DIR+(+5)

Run a long jumper from the 4<sup>th</sup> terminal block to the bottom stepper drivers DIR+(+5) and jumper that over to the PUL+(+5), then jumper to the next driver and across its (2) (+5) terminals and continue up and across all drivers – you will need a total of (12) short jumper wires.

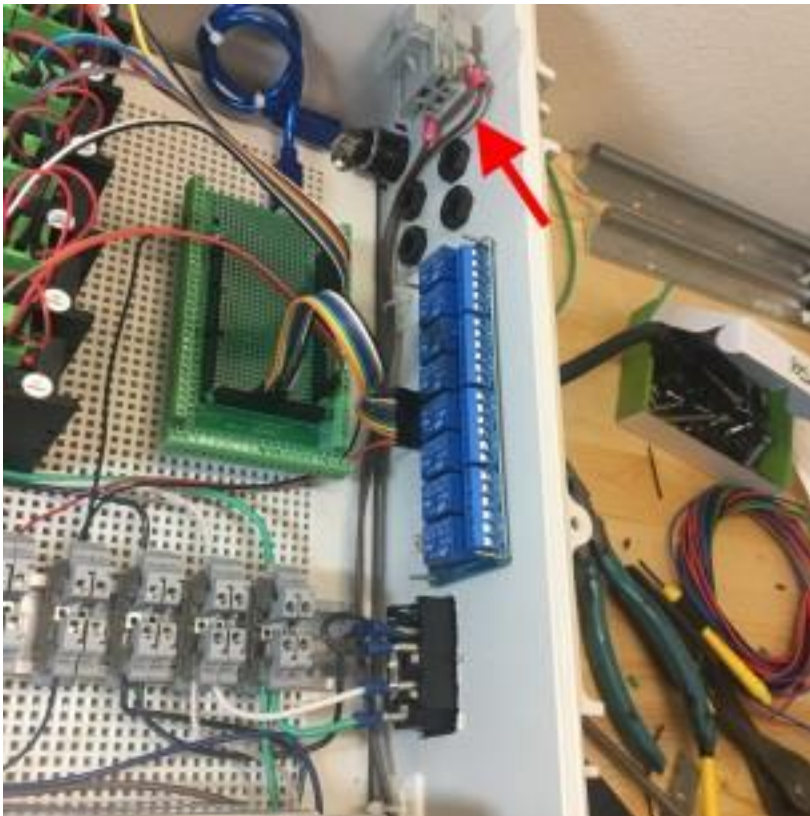
NOTE: when you get to the top DM320T driver it only has one (+5) terminal which is labeled “Opto”.

*(Also refer to the full wiring diagram at the end of this manual )*





Run blue wire from -24vdc terminal on power supply to the 3<sup>rd</sup> terminal block.



Run brown wire from +24vdc terminal power supply up to one terminal on E-Stop switch then run brown wire from other terminal on E-Stop switch back down to the 2<sup>nd</sup> terminal block.

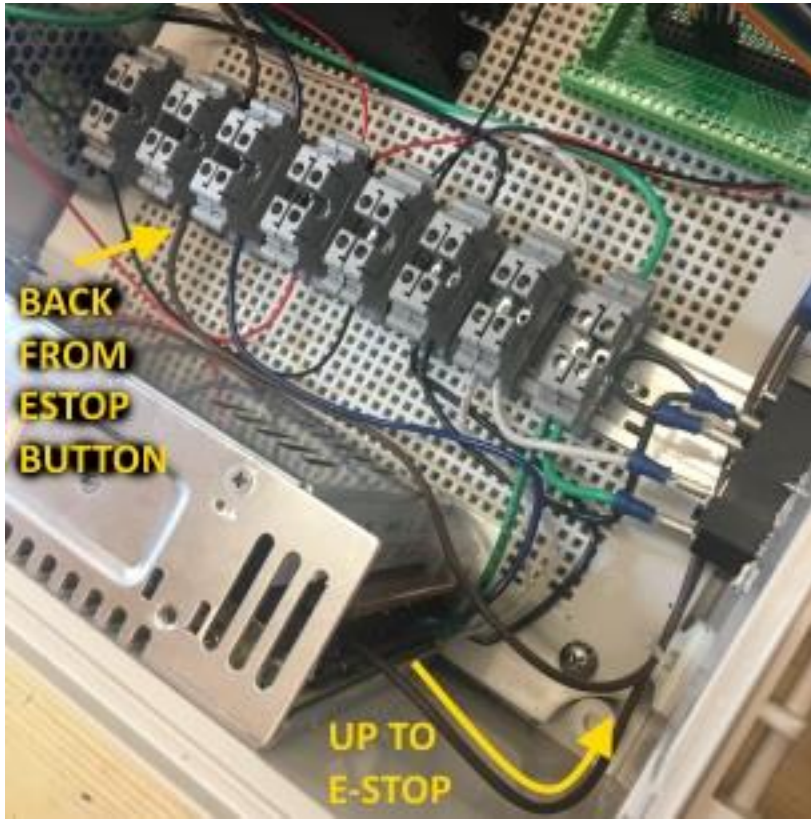


Photo shows brown wire from +24vdc going up to estop and coming back down and tied into terminal block 7.



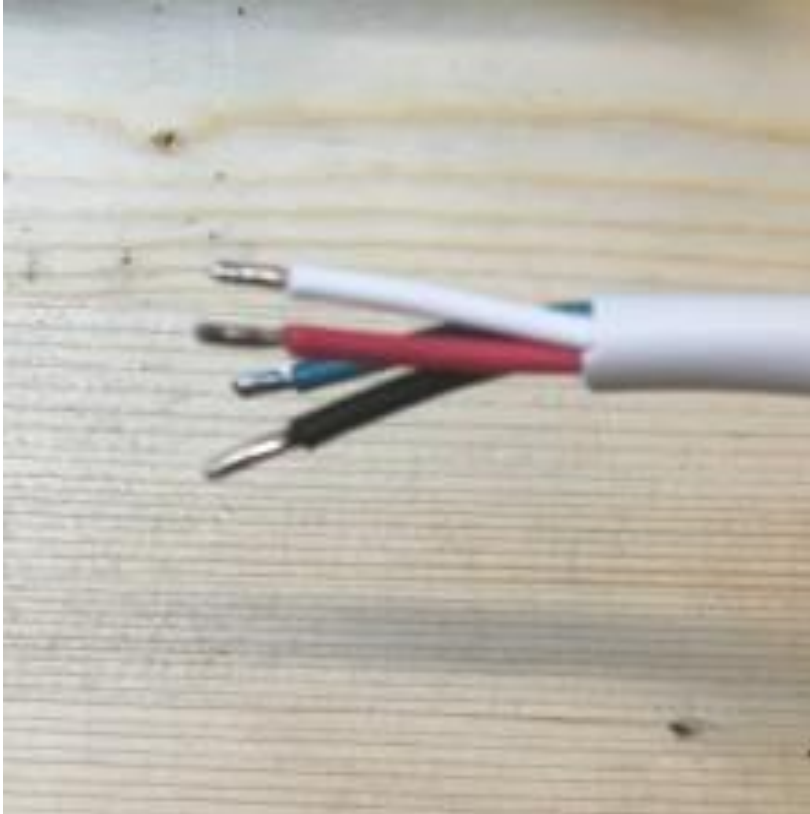
Jumper -24vdc from terminal block #3 across all drivers -voltage terminals using blue wire.

Jumper +24vdc from terminal block #2 across all drivers +voltage terminals using brown wire.



Cut (x6) 20" long lengths of 4 strand cable.

Cut a 7<sup>th</sup> if installing driver for a 7<sup>th</sup> axis travel track.



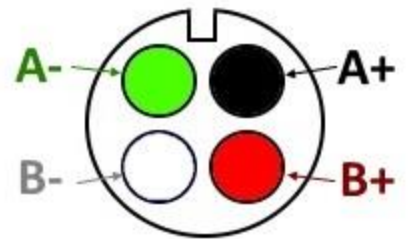
Tin the wire ends with solder as shown. Also pre-apply solder to the solder connection joints on the aviation plugs.





Solder wires as shown to the rear of the aviation plug.

This diagram shows the which terminals to solder which wire color. Note: this is showing the connector from the backside where wires connect.



Repeat this for all motor/driver wires.



Install all driver/motor wires as shown.

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Mark each wire for which driver it will go to. Facing the enclosure door J1 is top left.

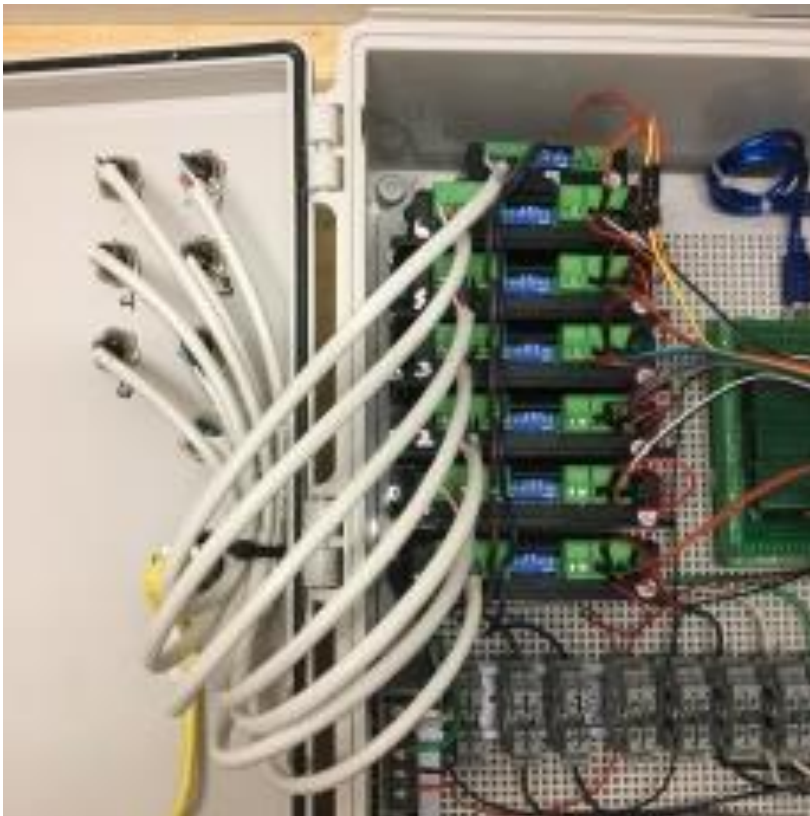
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Install adhesive cable tie anchor and loom cables as shown.



Connect each wire to its corresponding driver.

BLACK = A+

GREEN = A-

RED = B+

WHITE = B-





Route Ethernet wire as shown.

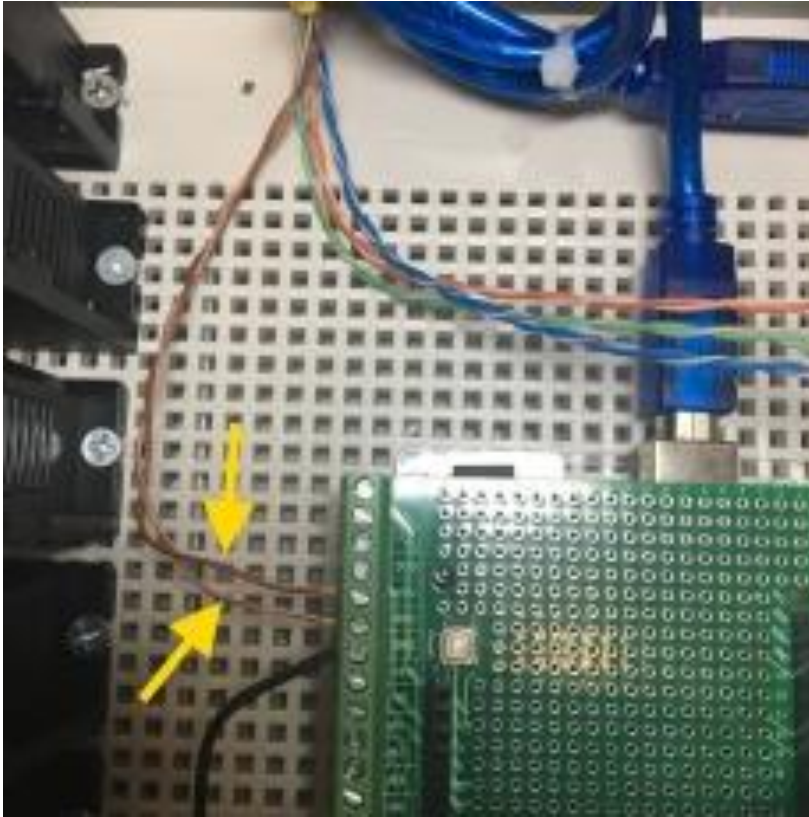
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Connect RJ45 wires as follows:

- RJ45 white/or stripe to arduino pin 14
  - RJ45 or/white stripe to arduino pin 15
  - RJ45 white/gr stripe to arduino pin 16
  - RJ45 blue/white stripe to arduino pin 17
  - RJ45 white/blue stripe to arduino pin 18
  - RJ45 green/white stripe to arduino pin 19
- 





- RJ45 brown/wh stripe to arduino +5v
  - RJ45 white/brown stripe to arduino GND
- 

## ENABLE CIRCUIT

NOTE: The enable circuit wiring was not shown in this manual. The wiring for the enable circuit is shown in the electrical schematic. The enable circuit is used to disable all drivers – this could be used in a situation where you have a fence circuit that you want to disable the robot while a gate is open or a condition is not made. In this case you would jumper +5vdc to all +ENA terminals on drivers and then jumper all –ENA terminals together and connect to terminal block #1. You could then connect any -5vdc grounding fence circuit to a terminal on terminal block #1 and all drivers will be disabled while fence is open or ground is made.





# DIP SWITCH SETTING

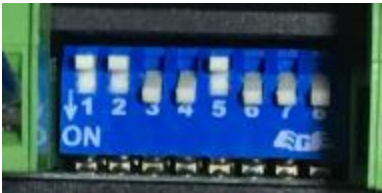
THESE SETTINGS ARE USED FOR THE FOLLOWING SERIES MOTORS:

• J1 - 17HS15-1684S-HG20	1/1 STEPS	1.46 AMP
• J2 - 23HS22-2804S-HG50	1/2 STEPS	2.37 AMP
• J3 - 17HS15-1684S-HG50	1/2 STEPS	1.46 AMP
• J4 - 11HS20-06742-PG14	1/2 STEPS	.5 AMP
• J5 - 17LS19-1684E-200G	1/4 STEPS	1.46 AMP
• J6 - 14HS13-0804S-PG19	1/2 STEPS	1 AMP
• J7 - Nema 17 48mm body	1/2 STEPS	1.46 AMP



J1 – (DM542T):

SW1 = OFF SW2 = ON SW3 = ON SW4 = ON  
SW5 = ON SW6 = ON SW7 = ON SW8 = ON



J2 – (DM542T):

SW1 = OFF SW2 = OFF SW3 = ON SW4 = ON  
SW5 = OFF SW6 = ON SW7 = ON SW8 = ON



J3 – (DM542T):

SW1 = OFF SW2 = ON SW3 = ON SW4 = ON  
SW5 = OFF SW6 = ON SW7 = ON SW8 = ON



J4 – (DM320T):

SW1 = ON SW2 = OFF SW3 = ON  
SW4 = ON SW5 = ON SW6 = ON



J5 – (DM542T):

SW1 = OFF SW2 = ON SW3 = ON SW4 = ON  
SW5 = ON SW6 = OFF SW7 = ON SW8 = ON



J6 – (DM542T):

SW1 = ON SW2 = ON SW3 = ON SW4 = ON  
SW5 = OFF SW6 = ON SW7 = ON SW8 = ON

NOTE: If using a 7<sup>th</sup> joint travel track (nema 17) use the same setting as J1.