## Overview

The Telsa coil winder was inspired by my son building a couple of different Telsa coil projects. For these projects we would wind and unwind after we noticed an overlap in the wire. It took hours to build a coil that was free of overlaps. A few times, we noticed the overlap only after the coil was completed. We took our chances only to discover that the wire would arc on the overlap destroying the coil.

Our initial solution was to build a coil winder that used a 12-volt motor and foot peddle to slowly turn the coil while you used your fingers to place the wire in the coil. This approach was better than the first, but still proved to be troublesome. We could wind the coil faster, but we also discovered overlap much later which required more unwinding to fix the issues.

We started searching the web for any tesla coil winders that someone might have built. I was not able to find exactly what I was looking for, but I was able to find enough information to develop an approach and identify the required components. Most of my inspiration came from the Masculinity and Kaj Luukko. They both use t-slot rails for structural supports. The credit for my structural design goes to the work done by Masculinity. I already had a bunch of 500MM T slot 2020 Aluminum Extrusion, so I patterned my design after his. By the time I found the link to download the sketch and the TFT files they were no longer available for download. It might be just as well considering I did not, nor did I plan on using all same parts used by Masculinity in my build. The links to the coil winders developed by Masculinity and Kaj Luukko are attached below.

Also note that this guide is not intended to teach you everything that you would need to know, but to provide a list of parts and guidance you can use to assemble you own Telsa Coil winder. You can find the source code for both Nextion and the Arduino UNO in my GitHub that is referenced below. Some of the most important guidance is simple provided as weblinks that you can either watch the YouTube video of read on your own.

## Reference Links

These projects provided inspiration for build that is detailed below.

[Tesla Coil Winder - Powered with arduino mega & nextion dispay | Arduino Project (youtube.com)](https://www.youtube.com/watch?v=HymLeTU4M8Q)

[W-2Magnify12EOS (youtube.com)](https://www.youtube.com/watch?v=qxfDYMZw_xw)

[(61) Tesla coil winding machine - powered by Arduino Nano - YouTube](https://www.youtube.com/watch?v=nC-06ZKFTeI)

[(67) Tesla Coil Winder - Project Icarus: Coil Winding Time lapse - YouTube](https://www.youtube.com/watch?v=QP9elbYsko0)

## Operations

The coil winder is controlled by a Nextion user interface (UI). The UI controls several functions.

* **Home Button:** Sends the wire winding carriage to home position. Moves to the left until it hit the limit switch. Once the limit switch is hit the carriage back up to the right until it just off the limit switch. The coil winder must be homed before any other functions can be done.
* **Offset -> Button:** Used to position the wire at the start location for the first coil. Move to the right away from the limit switch.
* **Offest <- Button :** Used to position the wire at the start location for the first coil. Move to the left in the direction of the limit switch.
* **Step by 25 or 500 Button:** When using offset buttons it tells the winding carriage how many steps to move 25 or 500. The button can have 2 different states.
* **Varnish Button:** Button causes the coil winding motor to turn continuously so that varnish or shellac can be applied to the coil.
* **Coil Length +10, -10, +1 and -1 Buttons:** Buttons are used to set the length of the coil. +10 adds 10MM, -10 subtracts 10MM, +1 adds 1MM, -1 subtracts 1MM. For example, pressing +10 four times and pressing +1 three times equals 43MM. Coil length is set in MM.
* **AWG Wire Guage 26, 28, 30, 32, 34, and 36 Buttons:** Selects the wire size being used.
* **Next and Back Buttons:** Moves the Nextion display to the next page.
* **Back Button:** Moves the Nextion display to the previous page.
* **Pause Button:** Stop process until the pause button is pressed again. The button has 2 separate states.
* **Start Button:** Starts the main process loops that builds the secondary coil.

### Wire Tension

Wire tension is created using 5 guide wheels that, so far, have provided enough tenson on the wire. In all fairness, the coil winder has only been tested with AWG, 26, 28, 30, 32, 34, and 36 gauge wire. I have not tested any wire that is larger diameter than 26 or thinner than 36 gauge. Also, you should note that changing the wire size will require changing to the Nextion display and changes to Arduino sketch program.

### Guide and Tension Wheels

A diagram of a machine

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## Assembly Tools

Tools you will need.

1.5mm Allen Wrench.

2.0mm Allen Wrench.

3.0mm Allen Wrench.

Drill press or handheld drill along with an assortment of Drill bits.

Band saw or hack saw to cut the aluminum rails, supports and stops.

Handheld file to clean up cut aluminum rails and parts.

3D Printer (not required). You can have the parts printed.

## T-Slot cut to the following lengths.

You might be able to buy the length specified directly from Amazon or other sources. The 500MM will limit the size of the coil that can be wound to about 340MM.

(6) = 150mm

(4) = 500mm

(2) = 460mm

A diagram of a shelf

Description automatically generated

Note: Carefully consider the length of the largest coil you will be creating. All the parts except for the Liner Actuator and the 2020 T-slot rails can be used with any size coil. These two parts will be the limiting factor as to the coil size. I already had 500MM 2020 T-slot rails, so I ordered a 500MM Liner Actuator which limits me to about a 340MM coil. I could have purchased 1000MM 2020 T-Slot rails and a 1000MM Liner Actuator for a small amount more. Looking back, I should have purchased the 1000MM 2020 T-Slot rails and the 1000MM Liner Actuator. That would have provided roughly an 850MM coil.

## Structural Assembly

The structural assembly is very straight forward. All but a few of the components can be purchased. There are only a few components that need to be constructed from Aluminum angle or 3D printed. I opted to build them from aluminum.

<pictures or Video>

## Stops, spacers and angle brackets.

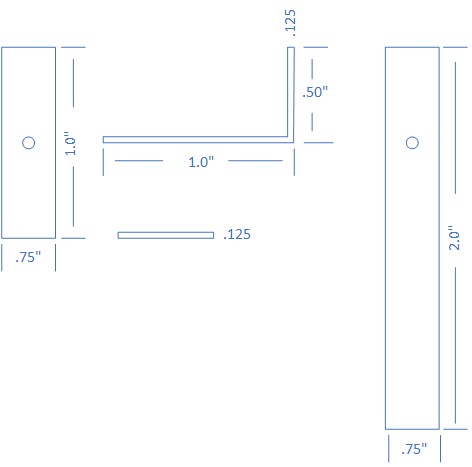
Using the aluminum flat and angle stock I built the following parts:

(4) .125 x .75 x 1” - Drill a hole in the center to attach the stops to the 2020 T-slot.

(2) .125 x .75 x 2 “ - Drill a hold near the bottom of the plate. It attaches between the 2020 T-slot and the Liner Actuator.

<Picture>

(1) .125 thick x .50 angle x 1.0 angle x ½ long. – used to hold the wire guide wheel.



<See Picture>

## Liner Actuator Bundle kit assembly

My Linear Actuator Bundle came unassembled. Please review the following link to see how to assemble the actuator.

[V-Slot® NEMA 17 Linear Actuator Bundle (Lead Screw) (youtube.com)](https://www.youtube.com/watch?v=X0Z_gfl-iGY)

## Electronics assembly

The wiring was for the most part is very straight forward. I used an Arduino Uno to run the controller along with 2 pre-built motor controllers. I used two voltage regulators to decrease the 12 volts coming from the power supply to 5 and 9 volts respectively. You can complete the build without using voltage regulators. I had several extra laying around. The motor controls required a 5-volt supply for the control logic and 12 volts to drive NEMA 17 motors. I used the barrel jack on the Arduino Uno which requires between 7 and 12 volts. I set the voltage in the middle at 9 volts. The Nextion display required 5 volts as well. There are other ways to provide power to the Arduino, Nextion and the motor controllers.

The motor controllers I purchased from Amazon have some limitations that that you need to work around. For example, the motor controllers do not have a sleep pin. As such, there is no easy way to put the motors to sleep. As an alternative, I developed my own PCB that can be used instead. The PCB can be found on GitHub.

You can use easy EDA to modify the design files and recreate your own Gerber files. You can use JLCPCB to have PCB created like I did. There are other options that can be used as well.

If you used the stepper motor controller from Amazon, linked below, the enable pin needs to be set to ground. If not the motors will ***not*** turn on.

The wiring is diagrammed below.

A diagram of a computer circuit

Description automatically generated

## Source code and programming:

The source code for this project can be found on GitHub at:

https://github.com/rduart/TelsaCoilWinder.git

Simply clone the repository to your local machine. You will need to contents of the repository to deploy the code to the Nextion display and to the Arduino Uno.

### Nextion Display

You will need to install the Nextion editor if you want to change the UI. As with all UI’s, there are a million ways to change it to make it look and feel the way you want.

**Note**: you will need a 30gb microSDSHC card to install the CoilWinderV4.tft file on the display. There is a fat32 restriction that requires the 30gb card to be used.

*Nextion download link:*

[DOWNLOAD - Nextion](https://nextion.tech/nextion-editor/)

[Nextion Instruction Set - ITEAD Wiki (iteadstudio.com)](https://wiki.iteadstudio.com/Nextion_Instruction_Set)

<https://www.arduinolibraries.info/libraries/nextion>

If you simply want to deploy our User interface from Github you will need to copy the CoilWinderV4.tft on to the MicroSD card, and follow the instructions in the link below, or find a youtube video that works for you.

[Using the Nextion microSD (upload) - Nextion](https://nextion.tech/faq-items/using-nextion-microsd/)

### Arduino IDE:

To update and deploy the Arduino stretch file you will need to install and configure the Arduino IDE. There are many YouTube videos that can guide you through how to install the IDE.

Please use the following link to set up the Arduino Uno. The IDE assumes you will be using an Arduino mega.

[Nextion Display with Arduino - Getting Started | Random Nerd Tutorials](https://randomnerdtutorials.com/nextion-display-with-arduino-getting-started/)

*Arduino download link:*

[Software | Arduino](https://www.arduino.cc/en/software)

#### Libraries:

The following libraries will need to be installed in the Arduino IDE.

AccelStepper.h

[AccelStepper - Arduino Reference](https://www.arduino.cc/reference/en/libraries/accelstepper/)

Nextion.h

[Nextion - Arduino Libraries](https://www.arduinolibraries.info/libraries/nextion)

Note: The Nextion library proved to problematic. The library did not always work as expected when trying to get variable values from the UI, or when trying to set variable values on the UI. I discovered after much testing that I needed to set or get the variable multiple times. You can see it in the code at various places. It’s a problem that others that have found when using the nextion.h library.

Additional, Nextion links:

[Nextion Instruction Set - ITEAD Wiki (iteadstudio.com)](https://wiki.iteadstudio.com/Nextion_Instruction_Set)

Please follow the following link to install the libraries in the Arduino IDE.

[Installing Libraries | Arduino Documentation](https://docs.arduino.cc/software/ide-v1/tutorials/installing-libraries/)

## DRV8825 stepper motor controllers.

Before you begin you will need to set the current limit on the DRV8825 motor controller. Please see the following link on how you would set the current limit on the DRV8825 controllers. I ended up upsetting the current limit to .55V. Anything above .55V was causing one of my stepper motors to scatter while stepping. .55V appears to work perfectly for both of my motors.

[Stepper Motor with DRV8825 and Arduino Tutorial (4 Examples) (makerguides.com)](https://www.makerguides.com/drv8825-stepper-motor-driver-arduino-tutorial/)

## 3D printed parts

There are a few parts I created using one of my 3D printers. The printed parts were used to support the PVC or acrylic pipe while making the Telsa coil. The stl and gcode files can be found on github.

These printer files support the following sizes:

* 2 ID x 2.5 OD – Acrylic Pipe
* 1.5 ID x 2 OD – PVC Pipe
* 1.75 ID x 2 OD – Acrylic Pipe
* 3 ID x 3.5 OD – PVC Pipe
* 2.75 ID x 3.0 OD – Acrylic Pipe

## Supplies/parts

For this build, you will need the following parts (all available from Amazon.com, Blukman.com, or Openbuilds.com, or similar websites):

Most of the products can be purchased directly from Amazon, Bulkman or Openbuilds. The parts are a little less expensive from Bulkman, but the cost of shipping will offset the lower cost if your shipping destination is in the USA. You will need to run some calculations to determine the cheapest or best place for you to buy. I included links for each of the parts.

**500mm T slot 2020 Aluminum Extrusion – Rails structure**

[SeekLiny 10PCS T Slot 2020 Aluminum Extrusion European Standard 500mm(19.6’’) Length Anodized Extruded Aluminum for CNC DIY 3D Printer and Industrial Bracket Making: Amazon.com: Industrial & Scientific](https://www.amazon.com/SeekLiny-Aluminum-Extrusion-European-Industrial/dp/B0CN6NPBD2/ref=sr_1_1_sspa?crid=IPKSC3X6J4UX&dib=eyJ2IjoiMSJ9.WaVWVRqiTKHqPlQX1M7uJuE6qAujhRq9YXQBs5dKWo5OY2GB0Xv_YKqJNhYKdwV2vEpNksL3Yb72qnzKuvlbKftXgM3jCDqLYtbepnvtVbmvnOFkne8WH2V-jzXVIowrVvykU6zweFxJW1Q4VnukNV0xIUKIb7YBTl1-YJmf14rsWGoHH1isaZHT8ErWQOlQ-XLqnXLUGfQ6dekYP7-6SfD6FDKEOwabmBsSORt5oJ7KBAzfi48Ab9SpUmPi_N4XB2y7dtXQ5I734SJTBQUhuygrd6EjhoH2FhQ4MEBBGo8.ZEqfXCH-ljqplIvF8zGXHdOlko7AAjrAyNbdlAPMAVg&dib_tag=se&keywords=500mm%2B2020%2Bt%2Bslot&qid=1712606243&s=industrial&sprefix=500mm%2B2020%2Bt%2Bslot%2Cindustrial%2C169&sr=1-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1)

**Anti-Vibration Rubber Landing Mat Feet -- Rubber feet for the rail structure**

[Amazon.com: MakerHawk 20 Sets Anti-Vibration Rubber Landing Mat Feet, T Sliding Nut Block Square Nuts, M3 Screws with 1pc Wrench 3D Printer Accessories for 2020 Aluminum Extrusion Profile : Industrial & Scientific](https://www.amazon.com/dp/B07JKDZWKR?tag=jprytikov-20&geniuslink=true)

**Nextion Display 4.3 - UI display to control the winder**

[Amazon.com: NEXTION Display 4.3 NX4827T043 Touchscreen : Electronics](https://www.amazon.com/dp/B07B9XTSWH?tag=jprytikov-20&geniuslink=true)

**Rigid Flange Coupling Motor Guide Shaft Coupler - Used to connect the 3D printer parts to the winder rod.**

[Amazon.com: uxcell 10mm Inner Dia H13\*D16 Rigid Flange Coupling Motor Guide Shaft Coupler Motor Connector Silver Tone 2 PCS for DIY Parts : Industrial & Scientific](https://www.amazon.com/dp/B07PLBRMDQ?tag=jprytikov-20&geniuslink=true)

**Power Supply 5V 12V 24V Output -- Power for all components**

[Amazon.com: Arcity 5V 12V 24V Output Switching Power Supply Unit Adjustable for Video Multi Games Machine Console Cocktail CCTV Computer DIY New : Electronics](https://www.amazon.com/dp/B07RT54H9V?tag=jprytikov-20&geniuslink=true)

**Bergen Industries Inc PS613163 3-Wire Appliance and Power Tool Cord, 6 ft -- Cord to connect the poser supply to the electrical power.**

[Bergen Industries Inc PS613163 3-Wire Appliance and Power Tool Cord, 6 ft, 16 AWG, 13A/125V AC, 1625w,Black - Amazon.com](https://www.amazon.com/Bergen-Industries-Inc-PS613163-Appliance/dp/B07C9D6CXY/ref=sr_1_7?crid=2S1GU0IK7DYGB&dib=eyJ2IjoiMSJ9.GXTEFjgNQIlTGJVIcnNpkDKxSvg4HV94pnyPAYM7-7_USABV0dWay2Min5-F-tsbH9xEo97fbL3vzUYHPTaMDolF1ehdjK71Rj8ZHCMQS3R3vRGTtaoYqyfaMGskx5lMQXNdTULVKVfqWT84uukdxLCH9fPLflqRHs72ebra5Ovg2scr7TEH-REiDlixKrec1OzXTqWLtkMz-wbpOV2Eh9i44eRu2AOXZkV1okDJGUEUFY54e6rj18frduqtW2YwNHPbLfHYzrpjX6HQ20AhwYElvoV4N1pZPiHNTBTaV1w.oDEp8C5L4XtjzbuNNhkZHXhxZulXiw2Ec3nFB3Pe-kU&dib_tag=se&keywords=replacement%2Belectric%2Bcord&qid=1712609197&s=industrial&sprefix=replacement%2Belectric%2Bcord%2B%2Cindustrial%2C170&sr=1-7&th=1)

**90 Degree Angle Brackets Interior Joint Corner Bracket - Structural parts for assembly.**

[Amazon.com: KOOTANS 20-Pack 90 Degree Angle Brackets Interior Joint Corner Bracket for European Standard 2020 Series T Slot 6mm Aluminum Extrusion Profile, with Screws and Wrench : Industrial & Scientific](https://www.amazon.com/dp/B07PJ8H5ZQ?tag=jprytikov-20&geniuslink=true&th=1)

**GT2 Synchronous Wheel 20&60 Teeth 8mm Bore – Used to connect the winder motor the winder rod.**

[Zeelo 2PCS Set GT2 Synchronous Wheel 20&60 Teeth 8mm Bore Aluminum Timing Pulley with 2PCS Length 200mm Width 6mm Belt (20-60T-8B-6): Amazon.com: Industrial & Scientific](https://www.amazon.com/Zeelo-Synchronous-Aluminum-Timing-20-60T-8B-6/dp/B0BYVFNYWM/ref=sr_1_6?crid=3QP91FZGVKAN6&dib=eyJ2IjoiMSJ9.NeK44BFTKS2VtbMxr43l1a2A9XIQEMSYXeFP7G0w-e_J0iYWsi_l6m5m59vZtUwT3tTLYSgLbvqI-AP-DArpT1jrXwea7Jjof5aM1SFSh8wTFsrPT9zDl3XBcg_RDSdTkA7G1vNKzspnTFsXIm_uvX9xS7luEDKDVhN_b5kpx8WkQZSZocXz6kav8-FA2bnITEtemwhSee9N1icDFPULJjg8KoxLDbUoYZgr20ZGZxLwHLFoaRimXP-7AWLSLd5VzLKhcripzrSlvHlezm2RGXL1p6HLJi_oe0NQm2RvjsY.XzCdIBLVaFEQy-OFSqQJrvoJfW15nLa9rIZuj7B0D-U&dib_tag=se&keywords=GT2%2BSynchronous%2BWheel%2B20%2660%2BTeeth%2B8mm&qid=1712606979&s=industrial&sprefix=gt2%2Bsynchronous%2Bwheel%2B20%2660%2Bteeth%2B8mm%2Cindustrial%2C169&sr=1-6&th=1)

**Jumper Wires – Used to connect the electrical components.**

[Amazon.com: EDGELEC 120pcs Breadboard Jumper Wires 10cm 15cm 20cm 30cm 40cm 50 cm 100cm Wire Length Optional Dupont Cable Assorted Kit Male to Female Male to Male Female to Female Multicolored Ribbon Cables : Electronics](https://www.amazon.com/dp/B07GD2BWPY?tag=jprytikov-20&geniuslink=true&th=1)

**8mm Inner Bore Ball Mounted Pillow Block Flange - Used to connect the winder rod and wire rod to the structure.**

[8mm Inner Bore Ball Mounted Pillow Block Flange Micro Vertical Bearing, Pack of 4: Amazon.com: Industrial & Scientific](https://www.amazon.com/UNIMORE-Mounted-Pillow-Vertical-Bearing/dp/B0B2JQRM23/ref=sr_1_2?crid=2HWDNRNW3O6LU&dib=eyJ2IjoiMSJ9.sRF9RBOD8qoCTuQaZ0laFsq9IV-Fs57JVqE5hWOGfI4zapj05oj2_5U1ersPTTUBcSBcScTUfQVhfpRM3HsL-71ZDcLL6p6umtoKuoh4fJrCd8b7BBheyKpgTbIgAPXf0ESgVs73mGXcI4KH5RnfPxfzC1a9ChMuKikDVLGQxC1QF6BryTBKwm0L8Nd9XaDNBAvSSE3pYupyuBBIM7-BtwxFV6Bm8SJHl8SrLXtHF975cdqqjw9Cr4oICRU43oYL0T33Vhvurp84AlzZ7XhsK6NQhHEBEABXfZMabqeGxD0.6Ag6EW2g4DnSJTIVzS7bnbBiaParIGcXPEtVvq8au30&dib_tag=se&keywords=8mm+Inner+Bore+Ball+Mounted+Pillow+Block+Flange+Micro+Vertical+Bearing&qid=1712607212&s=industrial&sprefix=8mm+inner+bore+ball+mounted+pillow+block+flange+micro+vertical+bearing%2Cindustrial%2C177&sr=1-2)

**Aluminum Profile Connector 90 Degree Corner - Structural parts for assembly.**

[Amazon.com: Artilife 20 Sets Aluminum Profile Connector Set Including 20pcs 90 Degree Corner Brackets, 40pcs M5 T Nuts and M5 Hex Screw Bolt for Slot 6mm 20S Aluminum Rail Accessories (Black) : Industrial & Scientific](https://www.amazon.com/dp/B08PCTFNWD?tag=jprytikov-20&geniuslink=true&th=1)

**GT2 Pulley 20 Teeth 5mm Bore -- Winder stepper motor pulley**

[TMYPN 5PCS GT2 Pulley 20 Teeth 5mm Bore for Ender 3 V2 Pro 3s CR10 CR-10S CR6 SE 3D Printer Parts 6mm Width 20T Timing Belt, Aluminum 3D Printer Timing Belt Pulley Wheel with Allen Wrench: Amazon.com: Industrial & Scientific](https://www.amazon.com/TMYPN-Pulley-CR-10S-Printer-Aluminum/dp/B0CPYN865G/ref=sr_1_1_sspa?dib=eyJ2IjoiMSJ9.04MfU6XMw-FCp-QJFiswrSLrSV8_B5tIZoGQbZOBDId_h1tw-1QhI4-biLUkzDFGrknSYD46RTZmuaj-m88Jh5Lck_7gsr5xcMgUI4hg6_ZUwsDIEZu2xmw15Q3Ys4X9H40VNt75AXtB-r0QWzQ9UxvxoEXlECbyYwLba_8tfdx6aPwgeWuEd5KT-qf0nmCeo4gZGh6nrtTSZYGSdjwF9U_yLilYnUnIB_zraSS2rKI.vuYQfVI_uFFeoBm0PTtvz9YyCEaGYDi6XsEtEN8GUkk&dib_tag=se&keywords=gt2%2B20%2Bteeth%2B5%2Bmm&qid=1712607344&sr=8-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1)

**Arduino Uno REV3 - Controller**

[Amazon.com: Arduino Uno REV3 [A000066] : Electronics](https://www.amazon.com/gp/aw/d/B008GRTSV6/?_encoding=UTF8&pd_rd_plhdr=t&aaxitk=3501c7a23c342f753fd19465a2e9adf6&hsa_cr_id=5130128880501&qid=1712607466&sr=1-2-9e67e56a-6f64-441f-a281-df67fc737124&ref_=sbx_be_s_sparkle_lsi4d_asin_1_title&pd_rd_w=q73EC&content-id=amzn1.sym.417820b0-80f2-4084-adb3-fb612550f30b%3Aamzn1.sym.417820b0-80f2-4084-adb3-fb612550f30b&pf_rd_p=417820b0-80f2-4084-adb3-fb612550f30b&pf_rd_r=CZ1NEF78X80GDAZ1XTYW&pd_rd_wg=k9squ&pd_rd_r=aa76cf67-d108-4517-b837-b752a84d858a&th=1)

**DRV8825 Stepper Motor Driver Module – Needed if using custom PCB**

[Amazon.com: Teyleten Robot 3D Printer Parts DRV8825 Stepper Motor Driver Module with Heat Sink for Ramps 1.4 StepStick A4988 (5pcs) : Industrial & Scientific](https://www.amazon.com/Teyleten-Robot-Printer-DRV8825-StepStick/dp/B0CP92T4QR/ref=sr_1_1_sspa?crid=1UXL9RNDO9U8G&dib=eyJ2IjoiMSJ9.jtW1s5EjZmzhMyjwEgAlT8yrA90xvD-zxO8zvLF3-Z4puSBDkityY8XZgWxI6JYvKZnYuVhu_yinWCq8vyKx_vvIquUXRxFuklmhVjoW5p4.05y6IliFtQPhWIgXmVmu0GzyVcr7GKudm9MIAK5pmnk&dib_tag=se&keywords=dvr8825+stepper+driver&qid=1712607694&s=electronics&sprefix=dvr8825+stepper+driver%2Celectronics%2C172&sr=1-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1)

**Type-30 Miter Track Stop, Aluminum Alloy T Slot Stop - wire guide**

[Type-30 Miter Track Stop, Aluminum Alloy T Slot Stop Fence Chute Limiter Woodworking DIY for 30MM T-Slot T-Tracks Woodworking Guide Rail - Amazon.com](https://www.amazon.com/Miter-T-Slot-T-Tracks-Woodworking-Locator/dp/B09PYFWYM3/ref=sr_1_3?crid=8O9JIH0J2GCS&dib=eyJ2IjoiMSJ9.gwPX1fRCFz5yZ1jyQYx5q78riX03hzAfYvuPQCekuSBz40Iv2eDybIy3HgMhcymNw9dW49-GjQDr499LQtbwQiB4loXSsKKOoAsSdpKoLY9Q63ERhk3ajjq6gaaCxEe73JqM2HdYyZfBtxWfu2UudYmHNvZlADBGYuN31NP3CQ4SwNsQ6ij776EAeqlfHbwbx0ByteaZmNiTvxUV58Zp9Vsebss5783zUTZLu3iKXyryBQLjRnHc9TopLx5FCEaJy3r6iqmJOpO-I_a4RRvKJCg1f35Tc_mMzeRmrvzfe6U.BvQx6-vgDDZOAD2NGpEVCyTvGH7rSPdEX6sGVAm7_Ww&dib_tag=se&keywords=Hilitand+Type-30+Miter+Track+Stop&qid=1712608250&sprefix=hilitand+type-30+miter+track+stop+%2Caps%2C175&sr=8-3)

**DC to DC Voltage Regulator 4-40V - used to reduce volage to 9 or 5 volts.**

[Amazon.com: Valefod 3 Pack LM2596 DC to DC Voltage Regulator 4-40V to 1.5-35V Buck Converter with LED Display : Electronics](https://www.amazon.com/Valefod-Voltage-Regulator-1-5-35V-Converter/dp/B07WQJ2GD6/ref=sxin_15_pa_sp_search_thematic_sspa?content-id=amzn1.sym.15cc3230-a9b8-401a-b977-01853843e97b%3Aamzn1.sym.15cc3230-a9b8-401a-b977-01853843e97b&crid=2Q1UGVZL0BQGH&cv_ct_cx=adjustable+voltage+regulator&dib=eyJ2IjoiMSJ9.QXXDjwL1XjcqDRfKKsAEdg8yuxKFGkeQ7u6X6VuK8E9mWY_3YtYmnMuxbROA9s-xjnWWxgAFKZUnWzDGXrUO2A._f1lvq_BR5iEXWxo9fgScbfmse9NCqyZwe8Gj74hh88&dib_tag=se&keywords=adjustable+voltage+regulator&pd_rd_i=B07WQJ2GD6&pd_rd_r=12f9d05d-50a5-4e09-802c-89d33cec7a88&pd_rd_w=VoNn7&pd_rd_wg=K68gH&pf_rd_p=15cc3230-a9b8-401a-b977-01853843e97b&pf_rd_r=QR22403X0M92Q0S39BQS&qid=1712608308&sbo=RZvfv%2F%2FHxDF%2BO5021pAnSA%3D%3D&sprefix=adjustable+voltage+%2Caps%2C179&sr=1-2-364cf978-ce2a-480a-9bb0-bdb96faa0f61-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9zZWFyY2hfdGhlbWF0aWM&psc=1)

**STEPPERONLINE NEMA 17 Stepper Motor mounting -- Motor mounting plate**

[STEPPERONLINE NEMA 17 Stepper Motor (Economy Geared Stepper Motor) Alloy Steel Mounting Bracket ST-M1 - Amazon.com](https://www.amazon.com/dp/B00Q6F51C0?tag=jprytikov-20&geniuslink=true)

**Nema 17 Stepper Motor**

[STEPPERONLINE Nema 17 Stepper Motor Bipolar 2A 59Ncm(84oz.in) 48mm Body 4-Lead W/ 1m Cable and Connector Compatible with 3D Printer/CNC - Amazon.com](https://www.amazon.com/dp/B00PNEQKC0?tag=jprytikov-20&geniuslink=true)

**V-Slot NEMA 17 Linear Actuator Kit 500mm --**

[V-Slot NEMA 17 Linear Actuator Kit (bulkman3d.com)](https://bulkman3d.com/product/v-slot-nema-17-linear-actuator-kit/)

Or

[V-Slot® NEMA 17 Linear Actuator Bundle (Lead Screw) - OpenBuilds Part Store](https://openbuildspartstore.com/v-slot-nema-17-linear-actuator-bundle-lead-screw/)

**Metal Dual V Wheel -- used as wire guides and tension**

[Metal Dual V Wheel Kit Unassembled (bulkman3d.com)](https://bulkman3d.com/product/vk0008/)

Or

[Dual V Wheel Kit - Metal - Maker Store USA](https://makerstore.cc/product/dual-v-wheel-kit-metal/)

**10 V-156-1C25 Micro Limit Switch -- Limit switch**

[BlueStars Pack of 10 V-156-1C25 Micro Limit Switch Blade Momentary 250VAC/125VDC 15A Perfect for Arduino, Appliance and General Electrical Equipment Supplies: Amazon.com: Industrial & Scientific](https://www.amazon.com/BlueStars-V-156-1C25-Momentary-Appliance-Electrical/dp/B0CR1JJMJ7/ref=sr_1_1_sspa?crid=YQ7OBIL1UR0A&dib=eyJ2IjoiMSJ9.FcXV5ZVnKXVvoOq9fCCfE0COqCNi71SULgUexSi3OR2i_44rb8f3G00Ck82pzn7Bbh7AWJg1Qr7oBEH-RzNB3fdB9Bmke_YLasjh4p8e-4jBSMUk8gd89Pub5A_MVhRXF4kP6ng8eDrX8YQ-_Obme5glpCEyDnLhZS-qlKAi8NasifhxXNGUwSzQEYXwtLh5ZBTcqfdeSXKAGEfabvIttgyAsxVz_P3SynlGLdufO1xi3NuaUQGZNQU40cFmbH_UpPBGpK2K1qBSHCarDHO2M_rLQFseBYaavbpXWgnsx2U.mweST7IuGgQPiS0eF-H18VYzqw_1k94STEh_6ClJkR0&dib_tag=se&keywords=v-156-1c25&qid=1712609105&s=industrial&sprefix=v-156-1c25%2Cindustrial%2C170&sr=1-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1)

**DC Power Cable 5A 12v DC Power Plug Cord Male -- Connects Arduino to 9 volts.**

[Amazon.com: CENTROPOWER 20 Pcs DC Power Cable 5A 12v DC Power Plug Cord Male Connectors 2.1mm x 5.5mm, DC Pigtail Adapter Plug Socket Wire?for CCTV Security Camer : Electronics](https://www.amazon.com/CENTROPOWER-Connectors-Pigtail-Adapter-Security/dp/B0BTHSDF4S/ref=sr_1_17_sspa?crid=8GZ2GWBJKEB0&dib=eyJ2IjoiMSJ9.2w4cZZrHsCO_Cyp_vbqifI_I92-O2Ic_dbLGEK32LWawT7MkJjaH9OtgWqznghgyAHMJ2oSxuPblR8tUAwZoj2BeCkdOZ97KyyJuv2uKDkNgQZwkqaW7DH8tR7Z6iPecVpiS5cuA67ulAkIxATYXkOKphtcR-bJ07L_5XfongzGBVLbMNpuPs5_rCTOrRxqdYAJ3YNg58CEhyhU6MjuzJGYm62IPFQkW5xGWMxincbU.fb5FpqgOtwy7l5SpETwWTDj8XSj4315YJNXh-smrZLQ&dib_tag=se&keywords=arduino%2Bmale%2Bpower%2Bcable&qid=1712610682&sprefix=arduino%2Bmale%2Bpower%2Bcable%2B%2Caps%2C169&sr=8-17-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9tdGY&th=1)

**DRV8825/A4988 Stable 42 Stepper Motor Driver Expansion Board 3D Printer Control Shield Module for 3D Printer -- Not needed if using the custom PCB.**

[Amazon.com: DRV8825/A4988 Stable 42 Stepper Motor Driver Expansion Board 3D Printer Control Shield Module for 3D Printer (1) : Industrial & Scientific](https://www.amazon.com/DRV8825-Stepper-Expansion-Printer-Control/dp/B08RP2SCJ7/ref=sr_1_13?crid=3HSCJZXUFFYBM&dib=eyJ2IjoiMSJ9.udfksiX7LFGERxF_aUe-NPYsC6Hy_73grM_4oNcR3TTH6D4kvKonTqXgZv4pbh__UaCScW5NUBMlWYz4tKp8j-A6ymfhi85jiV14368yBze5Unw-jxuIaaPyXBQSpU_BOBsrlU2kUpFP_NpTc4Eesc6SpBtJ_Eh7oOvxrsOtYPrRkdQ1milJ4NL64IdK_a6KsCgMpR8MCxZrP8Oi3VICA_LuhXpbeiZJvjOAOd2SAVs.m9q262J37S4WP6S-0IlNEWHOg5OuQ_wnf_r4glR4vS8&dib_tag=se&keywords=stepper%2Bmotor%2Bshield&qid=1713224245&sprefix=stepper%2Bmotor%2Bshield%2Caps%2C279&sr=8-13&th=1)

Aluminum stock used to build stops and spacers, or big box store.

[Amazon.com: 10 Pieces 1/8"x 3/4" ALUMINUM 6061 FLAT BAR 12" Long +.07"/-0 Solid T6511 New Extruded Bar Stock : Industrial & Scientific](https://www.amazon.com/Pieces-ALUMINUM-Solid-T6511-Extruded/dp/B01F80W26Q/ref=sr_1_8?crid=6UOJZ0ABN1BW&dib=eyJ2IjoiMSJ9.9kvcOTyW_vpbwOX7czJFslzoKbYZQy53IAtdyJ2WimjUwhyr5JH5ZS_ri6ZjT3YhkgrYLdhBhG6SyT6fxi_tloiaXNWnF5sUIoWRnI-3pXmoy45A-Mvz-uRxQFDuG1VygP5BjPMi4L7pYoi1EDh_a0EV8TvRAiNIFV4kveeFVEiPNTfXw_uo2fsRiXBGIpOFwhDiECs38Ri7ilWyAa5n3Jfh7n44myfs8NLTzWanwi7LpEgfNV8FwI2Lg5zvcwlW0HmJKavoAC2ggpA_hLwAoKCJQSDZA-kW9d0GUQc32FU.YTIzc-_5POs6Jt0C1ndr2IRnRJjH7AG0INkRb-8gmJY&dib_tag=se&keywords=1%2F8x3%2F4+aluminum+flat&qid=1714065328&s=industrial&sprefix=1%2F8x3%2F4+aluminum+flat%2Cindustrial%2C177&sr=1-8)

Aluminum stock used to build wire guide wheel support.

[Amazon.com: Orange Aluminum Industrial 90-Degree Angled Extrusion - Aluminum Channel, Used for Home Improvement, T5-Temper, USA-Made, ASTM B221-14 Compliant, Lightweight for DIY and Construction : Industrial & Scientific](https://www.amazon.com/Orange-Aluminum-Extrusion-Extruded-Bracket/dp/B07RB7HHC8/ref=sr_1_9?crid=3VIW8G9MCBT2&dib=eyJ2IjoiMSJ9.7pStmIjHRsSBYoyvWiSqPOX5tnF9uOatBayvcv67_NPQCHT3Xs9nMxmQ4dzvPCo6Pgf2nrVFc949Yn2AvSeUHVbE7QIbbTYeycB-Q4BHtNbV1Fg0MDNY7rLOuy-nsgNPKlWNbJeTDdptoNkWFLKiabuGpjBI7R-dzMbwYc9jNAIPrK1T0d3aj-Y_N_aSOmajDaIu4F6vP2mQpXWlQOCuFqfc-EUONZXfdUYVCJ_EPQPl3zRz8mqTN8RAs6pHis-Rb2HFQDgIxn5GMNxdGw8fTy319n9HesW3Eut2ltz32iE.E-hmqRG1h-vrRQaARXFwGY-DQKHfgz86wcYxRhm-wMA&dib_tag=se&keywords=1x1+aluminum+90+degree&qid=1714065552&s=industrial&sprefix=1x1+aluminum+90+degree%2Cindustrial%2C178&sr=1-9)