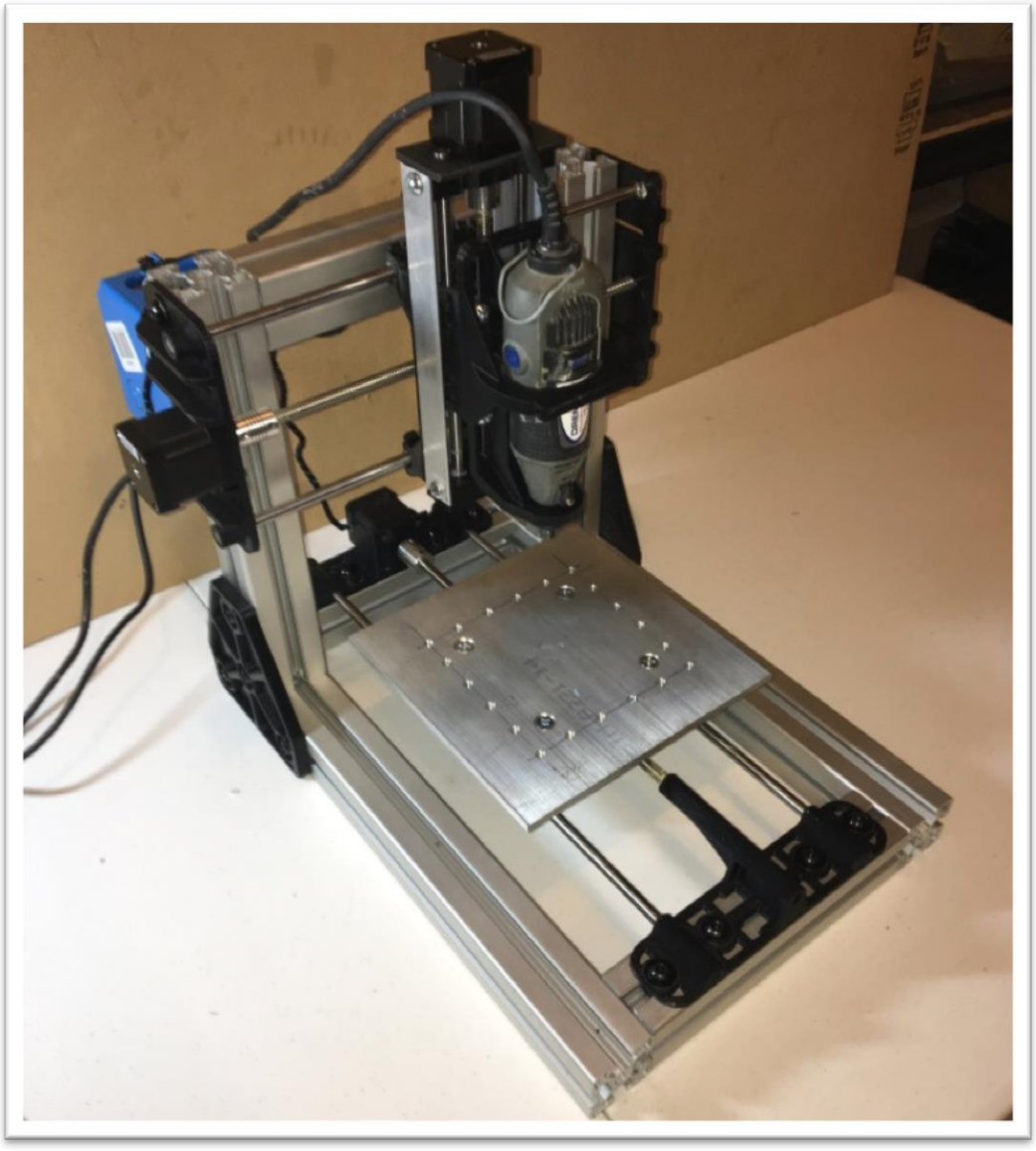


AE1 Engraver Manual

Bill of Materials

ITEMS FROM McMASTER-CARR:

McMASTER-CARR®

	T-Slotted Framing Single Rail, Silver, 45mm High x 45mm Wide, Hollow, 8' Long, Length: 8 5537T103	1 Each	$48.22 Each	$48.22
	T-Slotted Framing Concealed Connector for 45mm Rail Height 5537T277	8 Each	2.23 Each	17.84
	Steel End-Feed Fastener M8 Thread, for 45mm T-Slotted Framing 5537T456	6 Packs of 4 each	3.33 Pack	$19.98
	6061 Aluminum 1/4" Thick, 8" x 8" 9246K11	1 Each	$16.88 Each	$16.88

ITEMS FROM STEPPER ONLINE:

www.omc-stepperonline.com

You will need 3 of these stepper motors

Nema 17 Bipolar 59Ncm (84oz.in) 2A 42x48mm 4Wires w/ 1m Cable & Connector

★★★★★ 1 reviews | Write a review

SKU: 17HS19-2004S1

$8.45 ~~$11.41~~

STEPPERONLINE

You will need 1 24vdc power supply

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

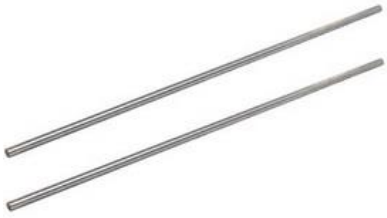
SKU: S-350-24

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 chosed by switch. Powerful functions(eg. PWM control) and professiona de..

$23.96 As low as : $21.06 STEPPERONLINE

ITEMS FROM AMAZON:

You will need of total of 5 (8mm) linear rods – I purchased 3 of these 2 packs



2-Pack - Linear Motion Rod 8 mm x 406mm Shaft , 16 in (406 mm) Length, Chrome Plated, Case Hardened, Metric

13 customer reviews

Price: ~~$22.50~~
Sale: $14.50 ($7.25 / Item) prime
FREE One-Day Pickup. Details
You Save: $8.00 (36%)

In Stock.

You will need one pack of 12 (8mm) bearings

Sintron

[Sintron] 12pcs LM8UU Linear Ball Bearing Bush Bushing for 8mm Rod RepRap 3D Printer Prusa Mendel i3 Kossel Delta etc..

12 customer reviews

Amazon's Choice for "LM8UU"

Price: ~~$19.99~~
Sale: $9.95 FREE Shipping for Prime members Details
You Save: $10.04 (50%)

Your cost could be $0.00: Qualified customers get $10 in bonus on their first reload of $100 or more.

In Stock.
Sold by Sintron Technology and Fulfilled by Amazon. Gift-wrap available.

You will need 3 (5mm x 8mm) couplings

Signstek

Signstek Aluminum Flexible Z Axes Coupler 5mm x 8mm 5/16" RepRap 3D Printer Prusa Mendel Silver

22 customer reviews | 5 answered questions

Price: $2.16 & **FREE Shipping**

Note: Not eligible for Amazon Prime.

In Stock.
Get it as soon as Oct. 30 - Nov. 21 when you choose **Standard Shipping** at checkout.
Ships from and sold by ZGCC(Ships From Hong Kong).

New (1) from $2.16 & FREE shipping.

Specifications for this item

Part Number	SW026
UNSPSC Code	23260000

You will need 3 (T8) lead screws that are 300mm long

NW T8 Lead Screw Dia 8MM Pitch 2mm Lead 4mm Length 300mm with Anti Backlash Spring Loaded Nut (Lead Screw Set)

★★★★☆ ▾ 1 customer review

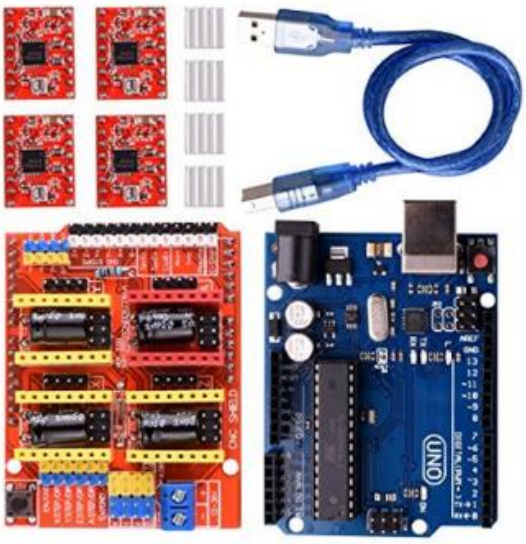
Sale: $11.99 ✓prime

Only 16 left in stock - order soon.

Want it Friday, Oct. 13? Order within **8 hrs 19 mins** and choose **Two-Day Shipping** at checkout. Details

Sold by David-sunwin and Fulfilled by Amazon. Gift-wrap available.

Pattern Name: **Lead Screw Set**



Roll over image to zoom in

Longruner

Longruner GRBL CNC Shield Expansion Board V3.0 +UNO R3 Board + A4988 Stepper Motor Driver With Heatsink for Arduino Kits (Arduino Kits)

★★★★☆ ▾ 12 customer reviews | 5 answered questions

Price: $29.00

Sale: $18.88 ✓prime

You Save: $10.12 (35%)

Your cost could be $8.88: Qualified customers get a $10 bonus on their first reload of $100 or more.

In Stock.

Want it Tuesday, Oct. 17? Order within **12 hrs 45 mins** and choose **One-Day Shipping** at checkout. Details

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

Color: **Arduino Kits**

- Latest CNC Shield Version 3.0 for Arduino.
- Arduino UNO R3 Board, MCU: ATmega328, USB interface: ATmega16U2.
- PWM Spindle and direction pins. 4-Axis support. Runs on 12-36V DC.
- 2 x End stops for each axis (6 in total).
- 4Pcs A4988 Stepper Motor Driver with radiator.

You will need engraving bits

EnPoint

EnPoint™ High-precision Carbide Sharp Standard Conical Metal Engraving V-Bit 3.175mm 1/8" Shank 20 Degree 0.1mm Tip Dia CNC V-Shaped Carving Router Tool Bit for PCB Wood Acrylic Copper Aluminum (Pack of 5)

★★★★★ ▾ 5 customer reviews

Price: $22.57

Sale: $19.37 ✓prime

FREE One-Day Pickup. Details

You Save: $3.20 (14%)

Use your **$18.34** Amazon.com Gift Card balance and only pay an additional **$1.03** for this item. Learn More.

Only 3 left in stock - order soon.

Want it Monday, Oct. 9? Order within **9 hrs 33 mins** and choose **Two-Day Shipping** at checkout. Details

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

Dremmel 100 or 200 series rotary tool

Dremel 200-1/15 Two-Speed Rotary Tool Kit

by Dremel

$49.95 prime

Get it by **Tomorrow, Oct 16**

Or FREE One-Day Pickup

More Buying Choices

$43.91 (17 new offers)

TR Industrial

TR Industrial TR88302 Multi-Purpose Cable Tie (100 Piece), 8", Black

309 customer reviews | 7 answered questions

Amazon's Choice for "zip ties"

Price: $5.77 prime

FREE One-Day Pickup. Details

Your cost could be $0.00: Qualified customers get a $10 bonus on their first reload of $100 or more.

In Stock.

Gikfun Mini Micro Jumper For Arduino (Pack of 50pcs) EK1025

by Gikfun

$6.28 prime

Only 18 left in stock - order soon.

More Buying Choices

$6.28 (2 new offers)

2

1 free items on purchas

promotions

Product Features

50PCS Mini Micro *Jump*

Header For *Arduino*

34Meter Long PE Polyethylene 4mm Spiral Cable Wire Wrap Tube Black

by Amico

$8.39 prime

Only 1 left in stock - order soon.

7

Product Features

... Diameter : *4mm* / 0. ... 03" Package

Content : 1 x *Spiral Wrap* ...

ITEMS FROM HARDWARE STORE:

1/16” aluminum angle

4” x 4” junction box with cover

4” x 4” mud ring

You will need 4 flat Head screws.

You will need 14 regular machine screws.

You will need 16 regular #4 wood screws.

Qty. 10
M3 x 8mm
socket head
cap screws

Qty. 2
M3 x 5mm
flat head
screws

You will need 6 low profile ¼-20 socket head Cap screws

Ultra-Low-Profile Socket Head Screw
1/4"-20 Thread Size, 1/2" Long

Each

ADD TO ORDER

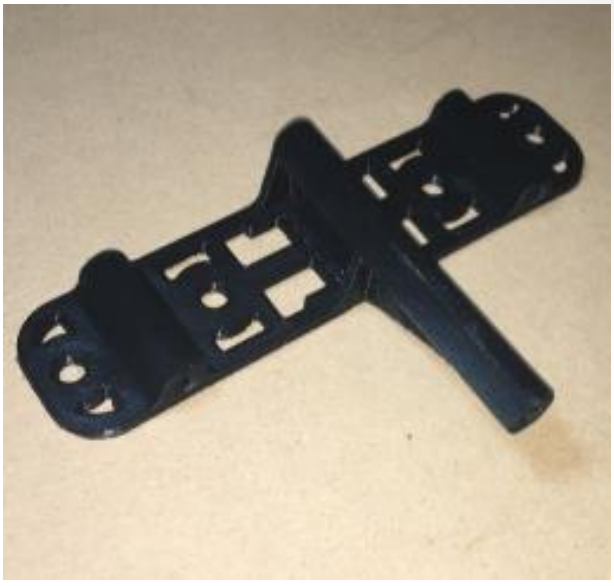
In stock
$3.79 Each
91223A217

They are rather expensive – you can save Quite a bit of money if you just grind down Some button head cap screws.

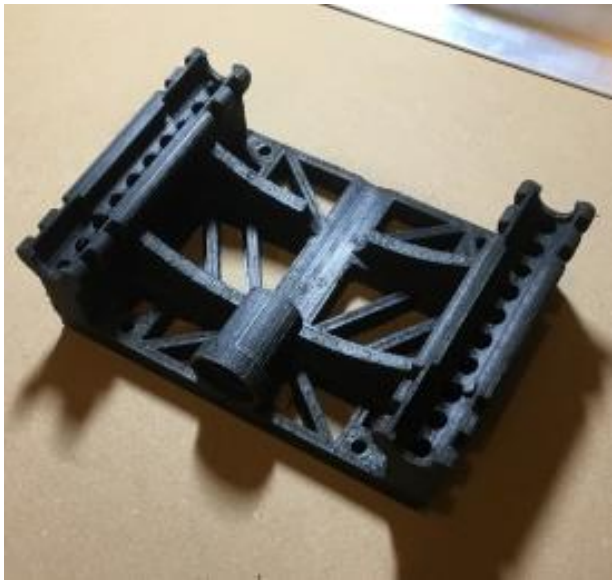
You will need a 5/16” or 8mm drill Bit for cleaning up the holes where The 8mm rods insert into the printed carriers. Grinding the end flat as shown helps with the bottom hole on the vertical carrier.

PRINTED PARTS:

BED MOUNT MOTOR SIDE



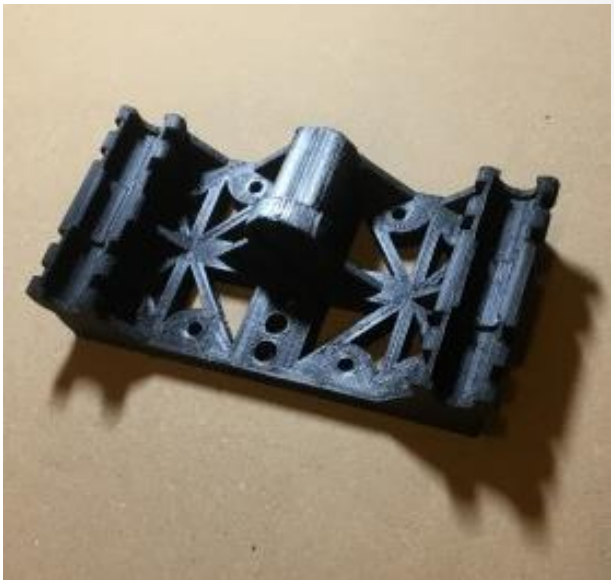
BED MOUNT SUPPORT SIDE



BED CARRIER

HORIZONTAL SUPPORT MOTOR SIDE

HORIZONATAL SUPPORT – SUPPORT SIDE



HORIZONTAL CARRIER

VERTICAL SUPPORT MOTOR SIDE

VERTICAL SUPPORT – SUPPORT SIDE

Vertical Carrier

Tool Holder

T Support Bracket
(you will need 2 of these)

Arduino Mounting Bracket

Assembly

Cut 45mm extruded aluminum down into (2) lengths that are **18”** long, cut (2) lengths to **12”** long and cut (3) lengths to **8.5”** long. Cutting these to exact length is not as important as making sure each group is the exact same length and that the ends are cut as square as possible.

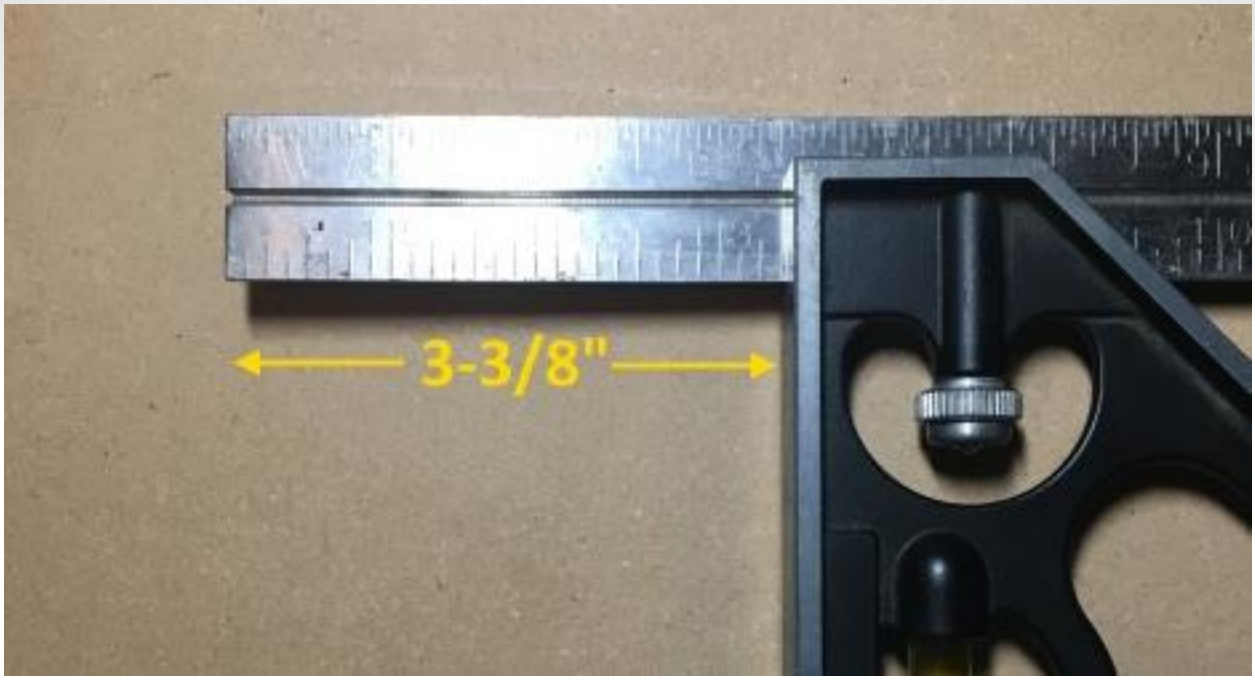
Set the depth on a carpenters square to just over 7/8” to 22.5mm.

Use the square to mark the center channel as shown – do this on each end of for both of the longer 18” lengths.

Center punch the marked position , drill a small pilot hole and then drill each location with a larger 13/32” drill.

You should now have holes drilled as shown in each end of the 18” lengths of extruded aluminum.

Perform the same process on the 2 medium 12” lengths but only drill holes on one end of each length as shown,



Set the depth on the carpenters square to 3-3/8”

On both of the longer 18” lengths use the square to mark the center channel one the side 90° to the side you already drilled near the ends. You will only need to mark and drill one end of each of the 18” lengths.

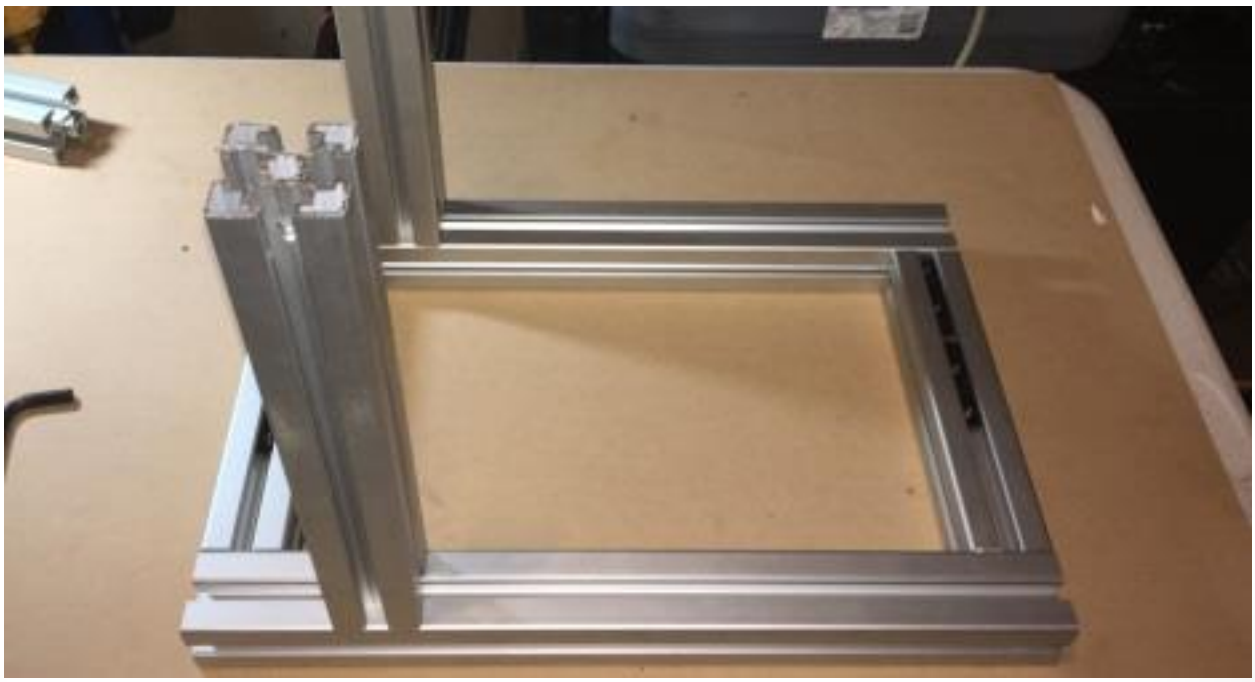
Center punch and drill the 18” lengths as shown. (*these holes are 3-3/8” from the end. They are drilled on the side 90° to the side that has the ends drilled)*

Drive 12mm conceal frame screws into both ends of all 3 short 8.5” long lengths and into one end of both 12” long lengths opposite the drilled holes.

This picture shows 12mm conceal screws inserted into both ends of all 3 short 8.5” long lengths and into one end of both 12” long lengths opposite the drilled holes.

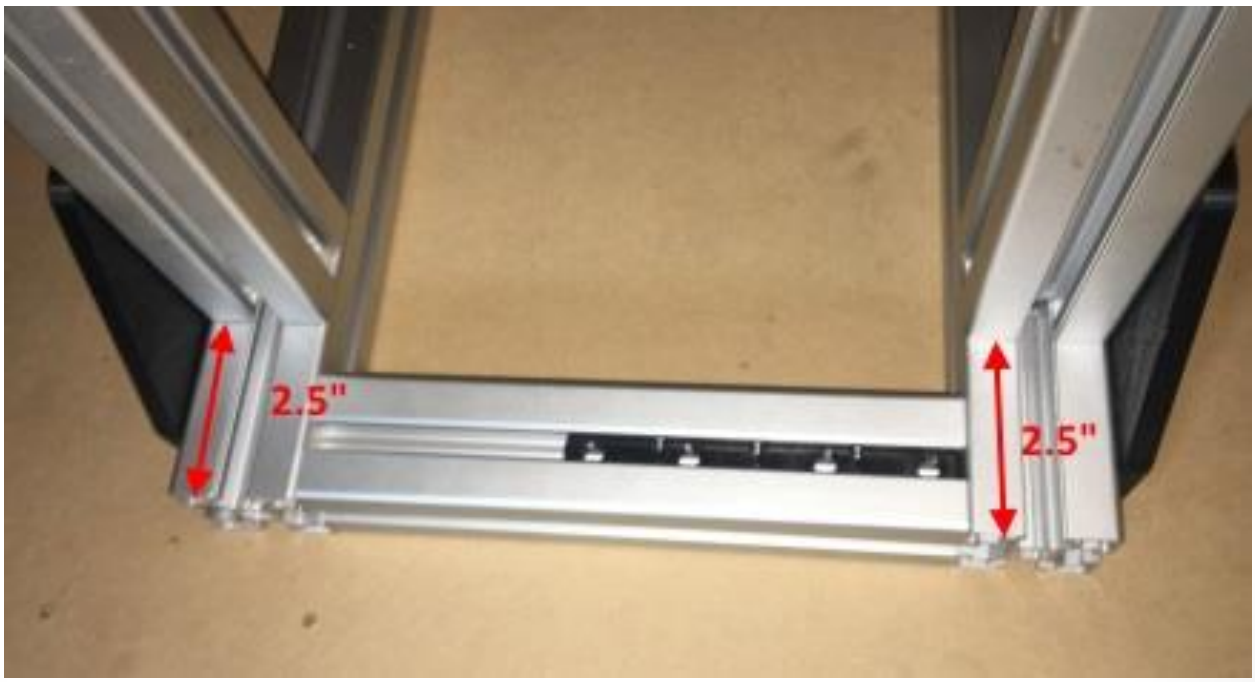
The next step is to assemble the lower frame using the 2 long 18” lengths and 2 of the short 8.5” lengths. Before sliding the pieces together insert 4 of the flat end feed fasteners into both of the short 8.5” lengths.

Assemble the frame as shown and tighten the 12mm conceal bolts on each corner using an 8mm hex wrench through the holes you drilled.

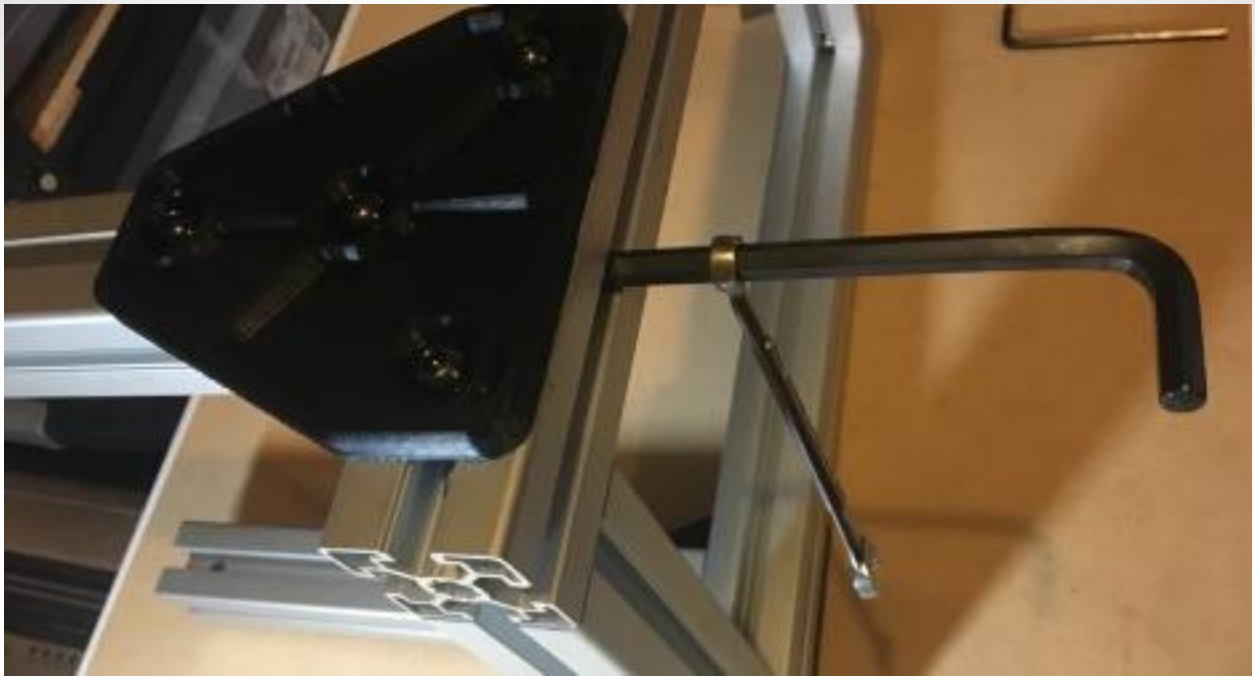


Slide 12” uprights onto frame as shown with conceal screws aligned over the holes in 18” lengths of fram.

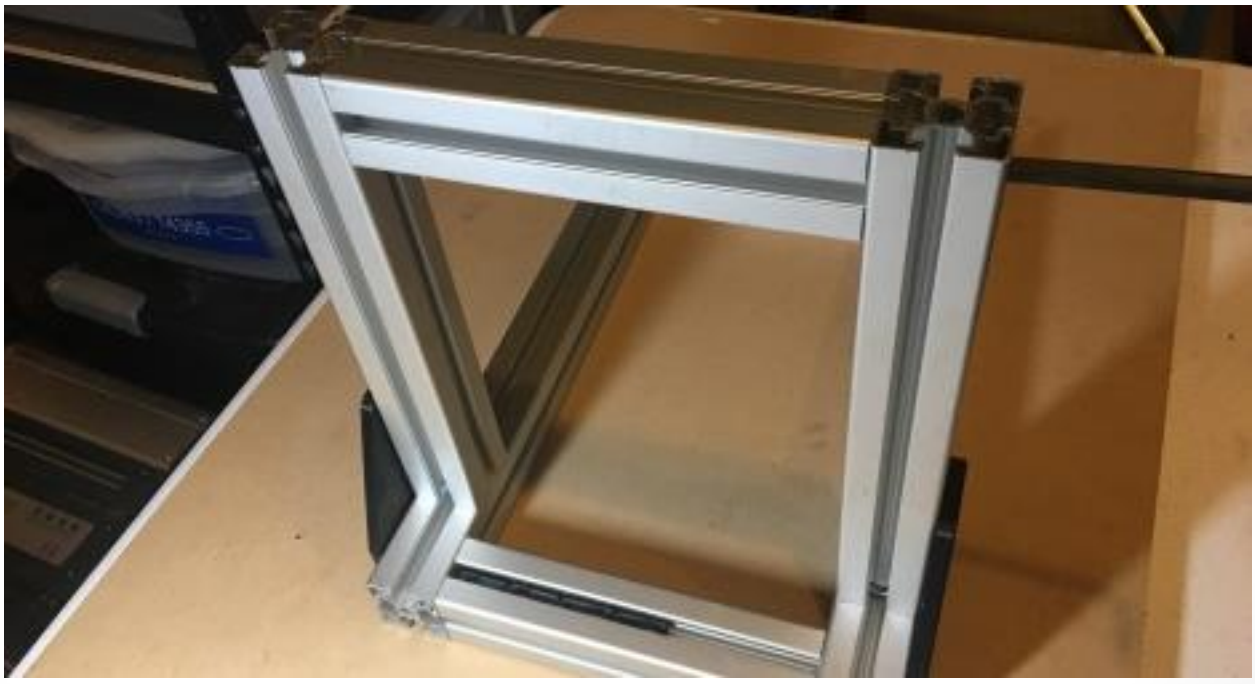
Install T Supports on both sides using end feed fasteners as shown.



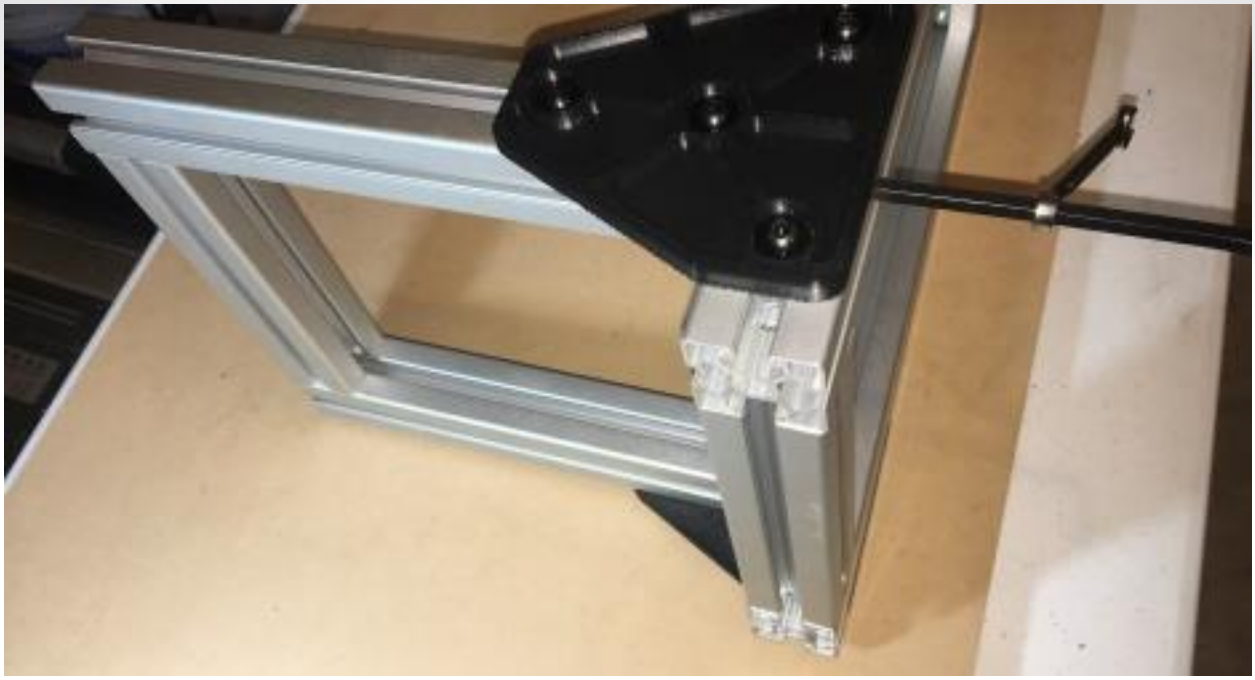
Make sure uprights are exactly 2.5” from end of frame as shown and then snug the bolts down on the T Support brackets.



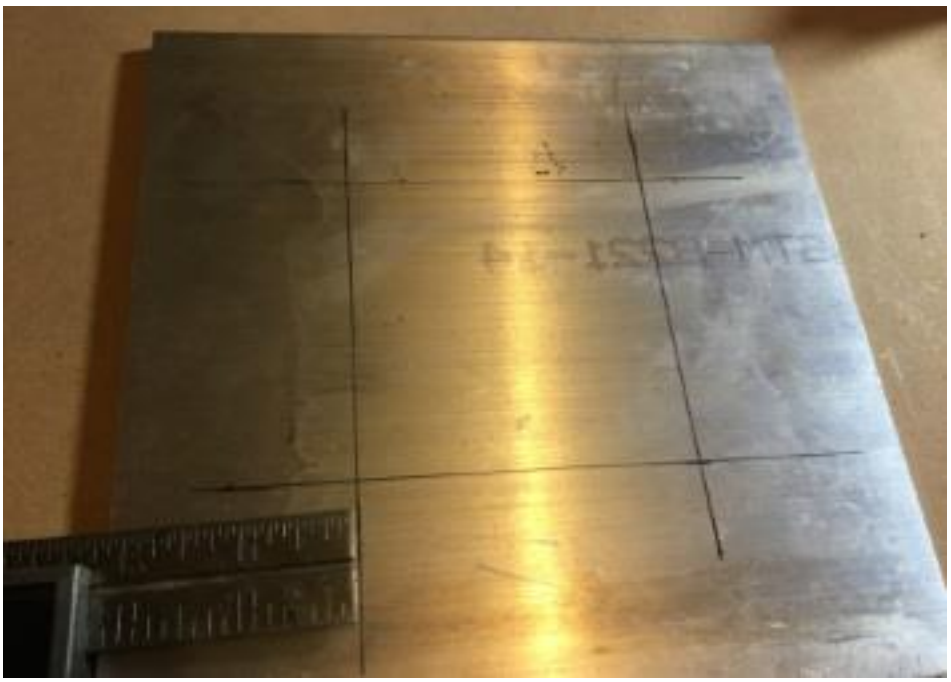
Flip the frame on its side and snug the conceal bolts from the bottom but do not tighten yet.



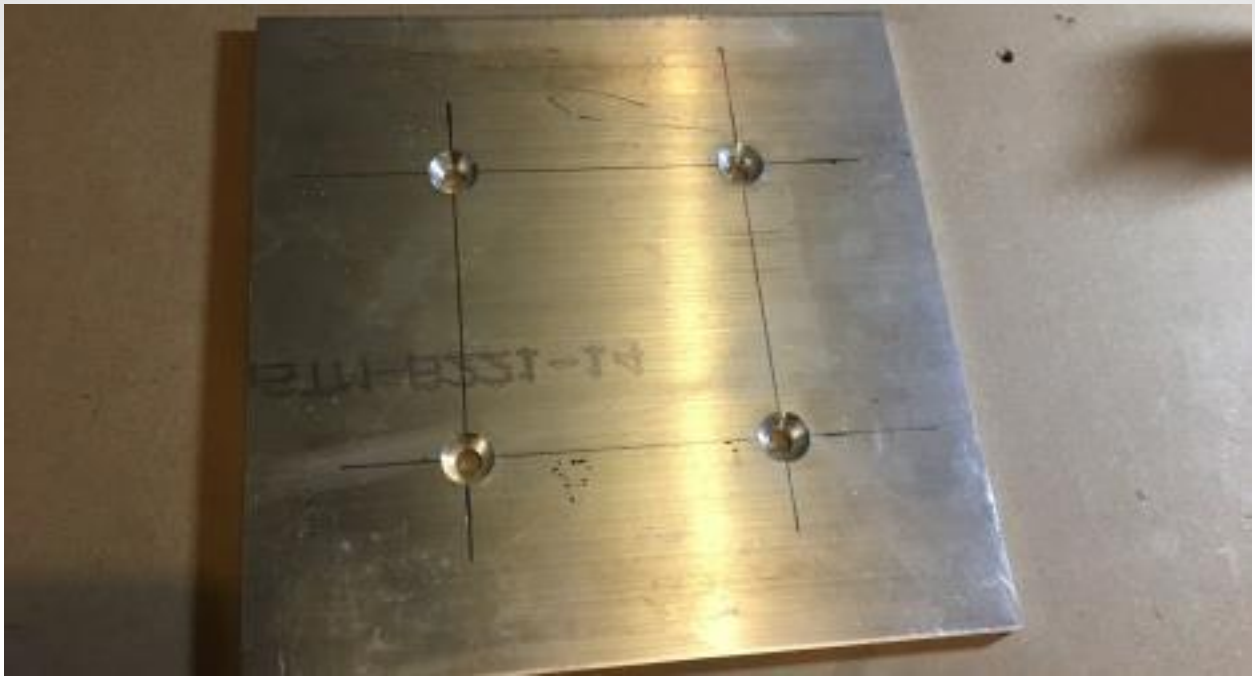
Install upper bar as shown and tighten 12mm conceal bolts.



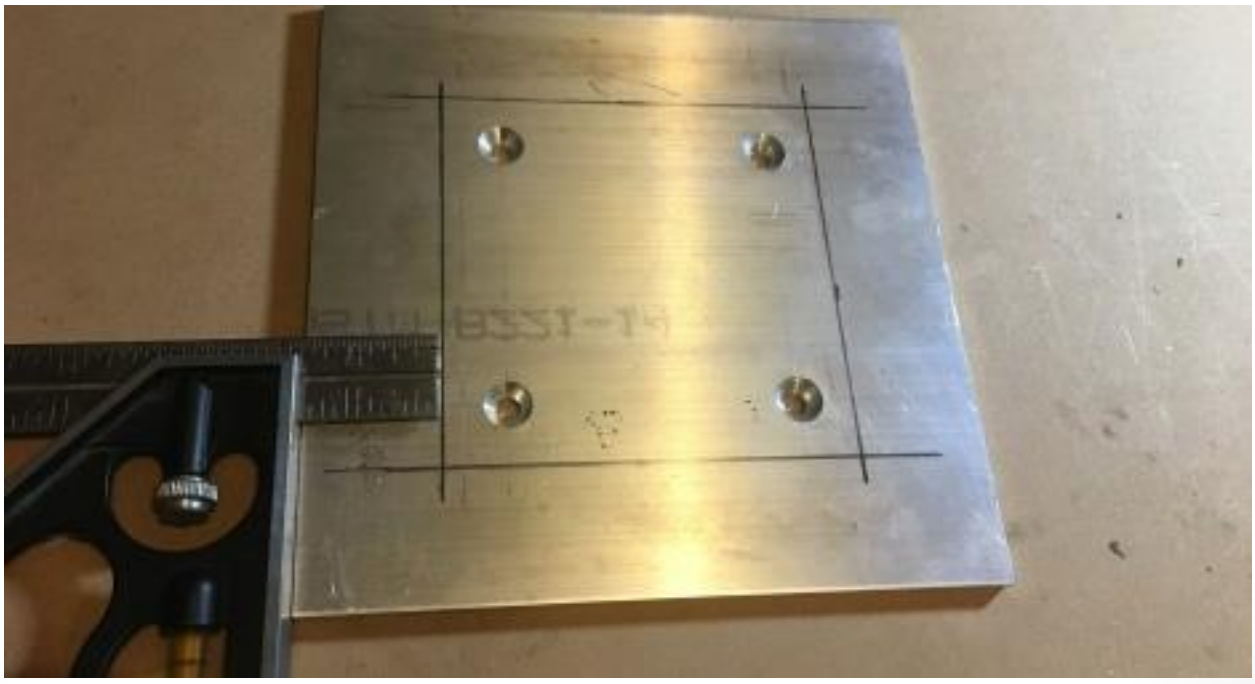
Flip frame back on its side and re-tighten bottom conceal bolts.



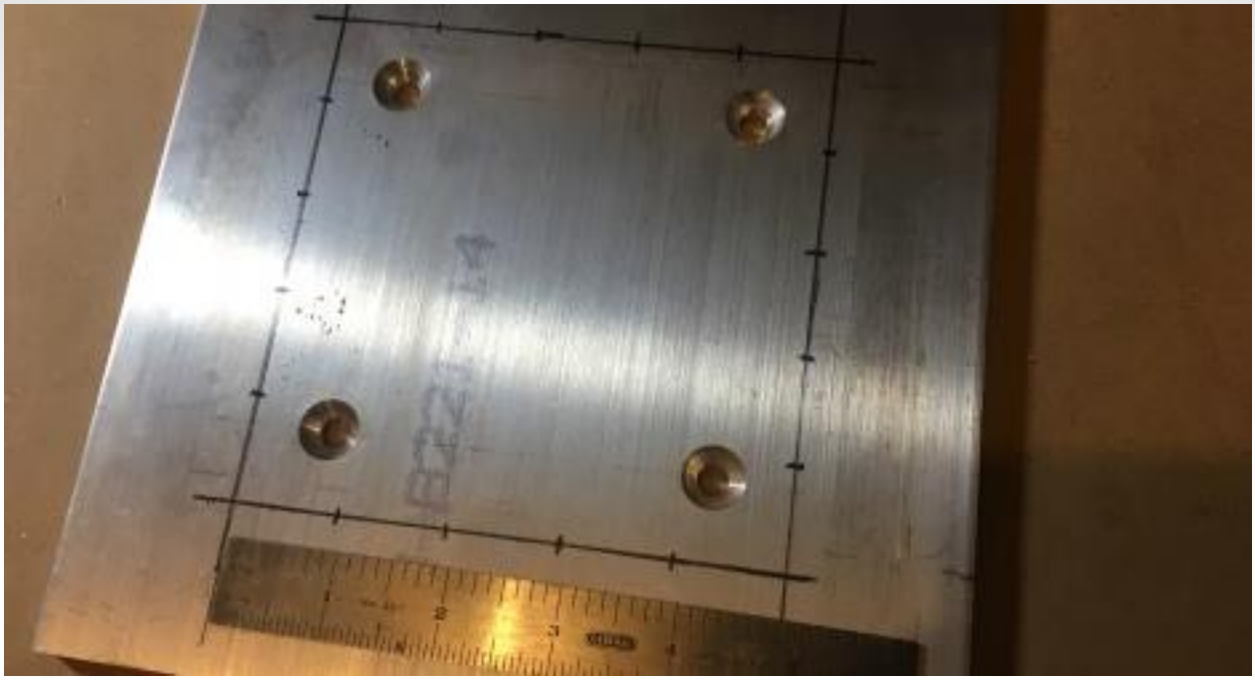
Set depth on square to 2.25” and then mark around each side of 8” aluminum table , use straight edge to complete marked lines creating a 3.5” square box.



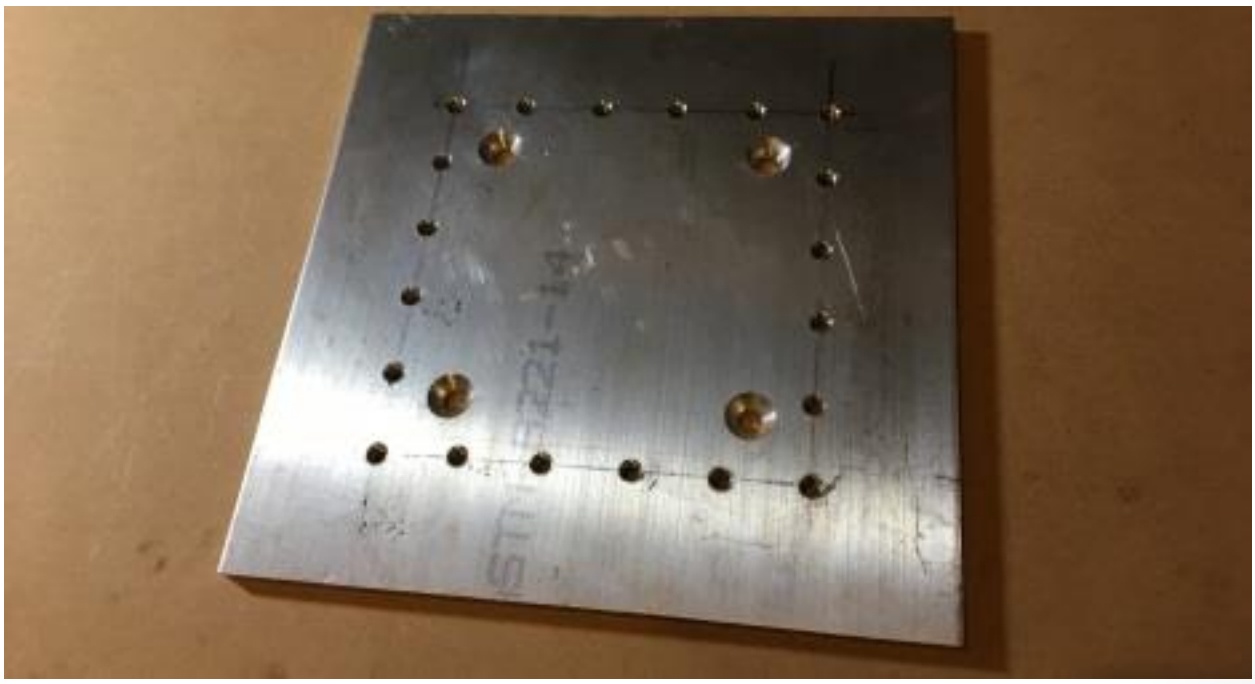
Drill ¼” hole at each corner of 3.5” square then countersink each hole.



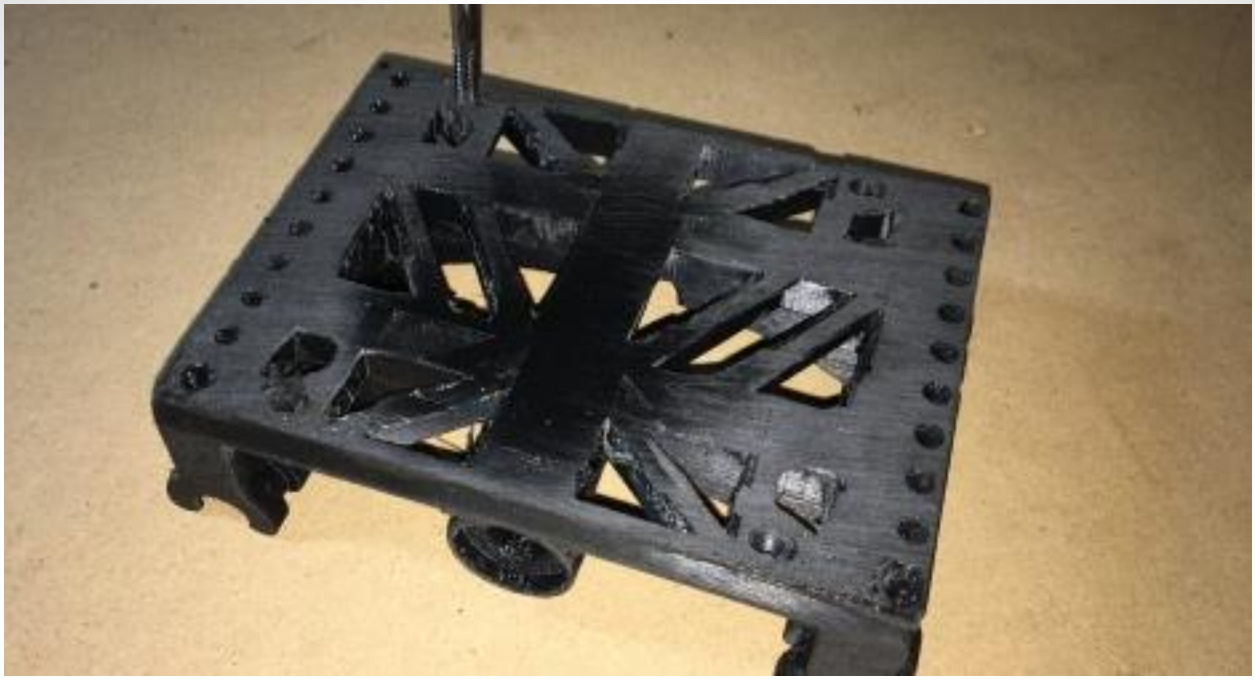
Set depth on square to 1.5” and mark another square around table.



Use ruler to mark every 1” around square.



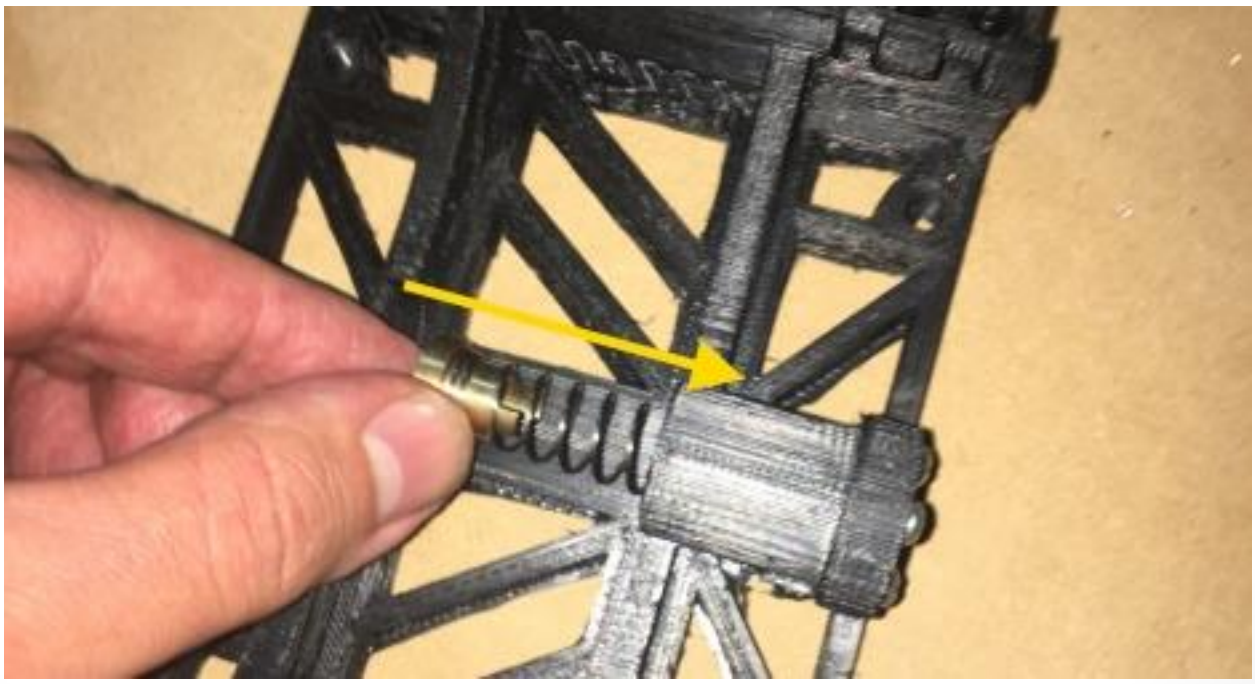
Drill each mark around square with 13/64” drill bit and then tap each hole with ¼-20 tap.



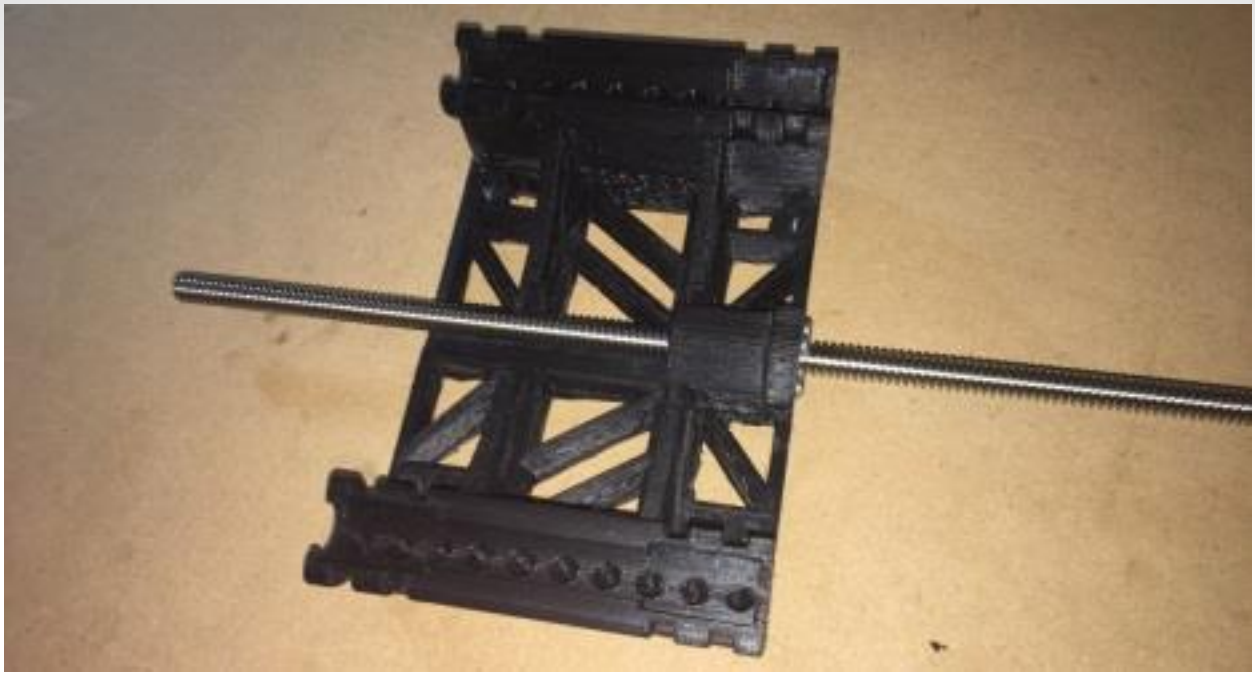
Tap 4 bed carrier mounting holes with ¼-20 tap.

Use 1/8” drill and open up flange holes in all 3 anti backlash nuts.

Clean holes out on plastic bed carrier with 5/64” drill bit and then use #4 screws to secure anti backlash flange nut to bed carrier as shown.

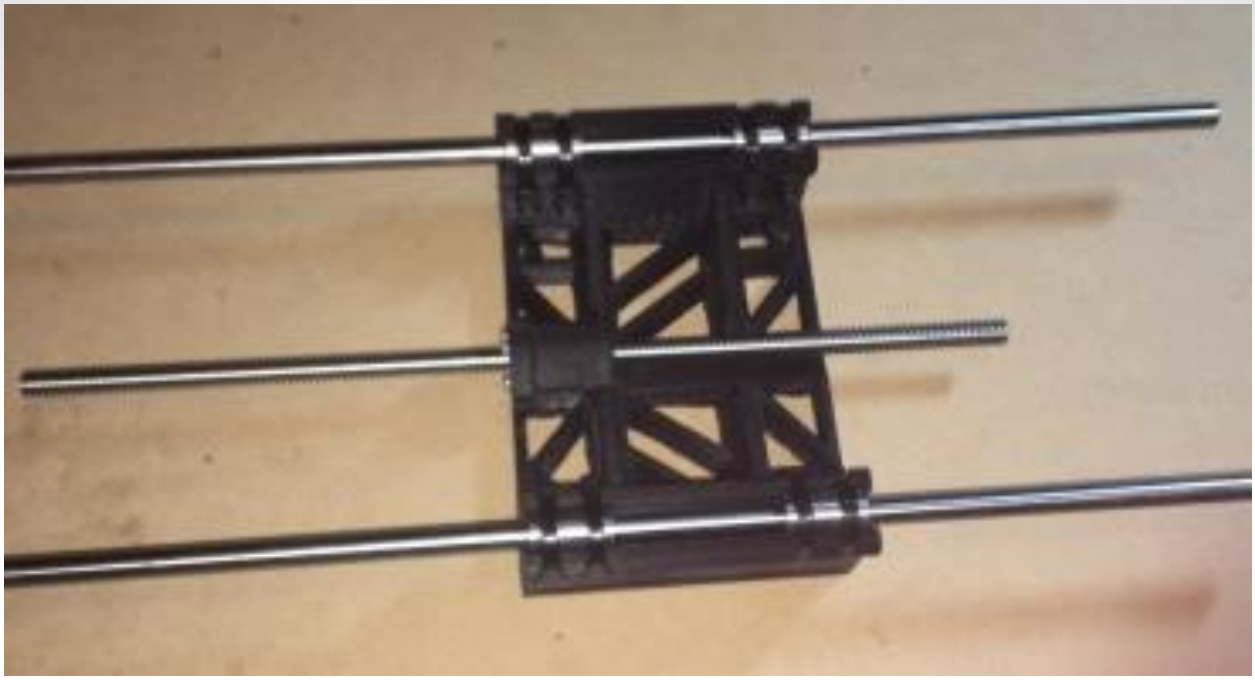


Insert spring and rear half of anti backlash nut into carrier as shown until both halves of anti backlash nut interlock.



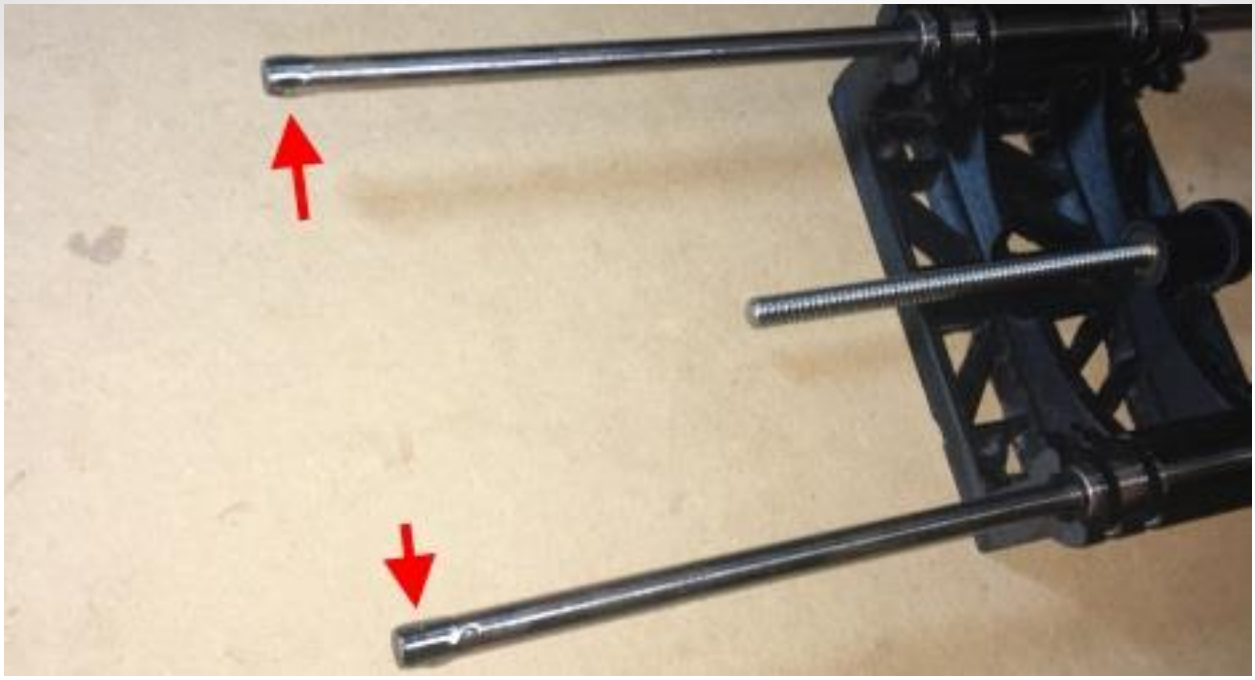
While using your finger to keep rear half of anti backlash nut inserted thread the 400mm rod into both parts of the anti backlash nut.

Grease the inside of 4 LMU88 bearings and carefully slide them onto 2 full length 8mm rods as shown.

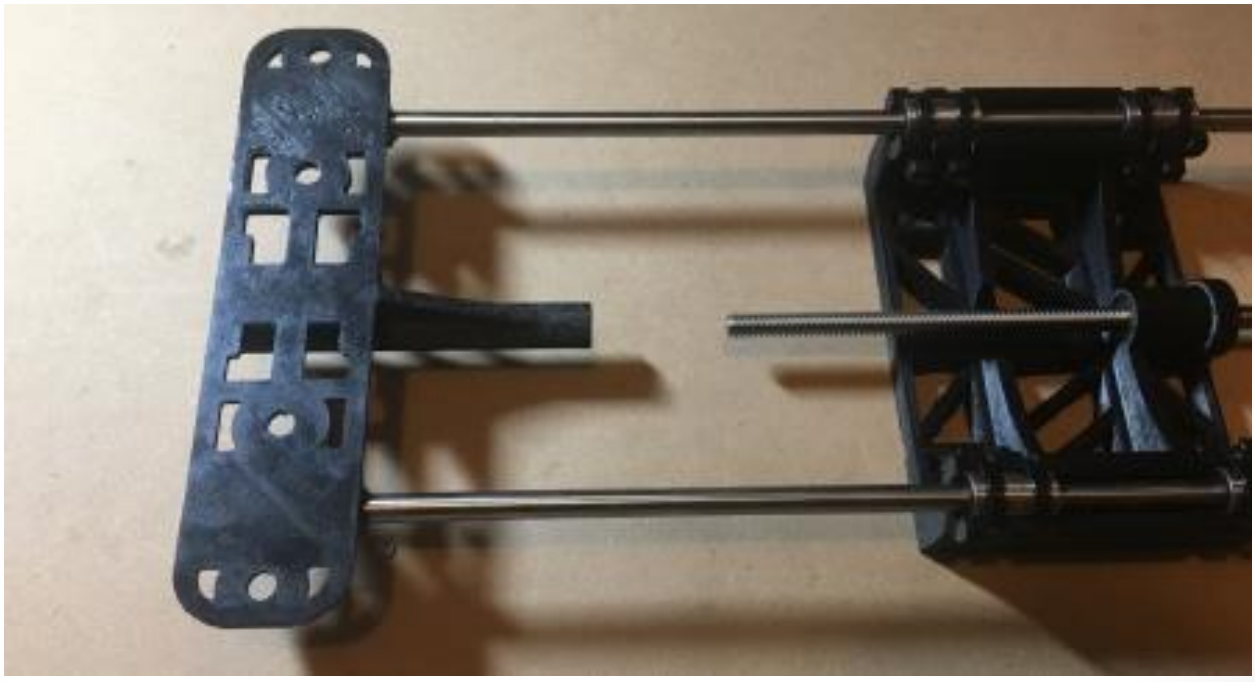


Snap rod and bearing assemblies into bed carrier as shown. Bearings will snap into place, also use zip ties to secure bearings .

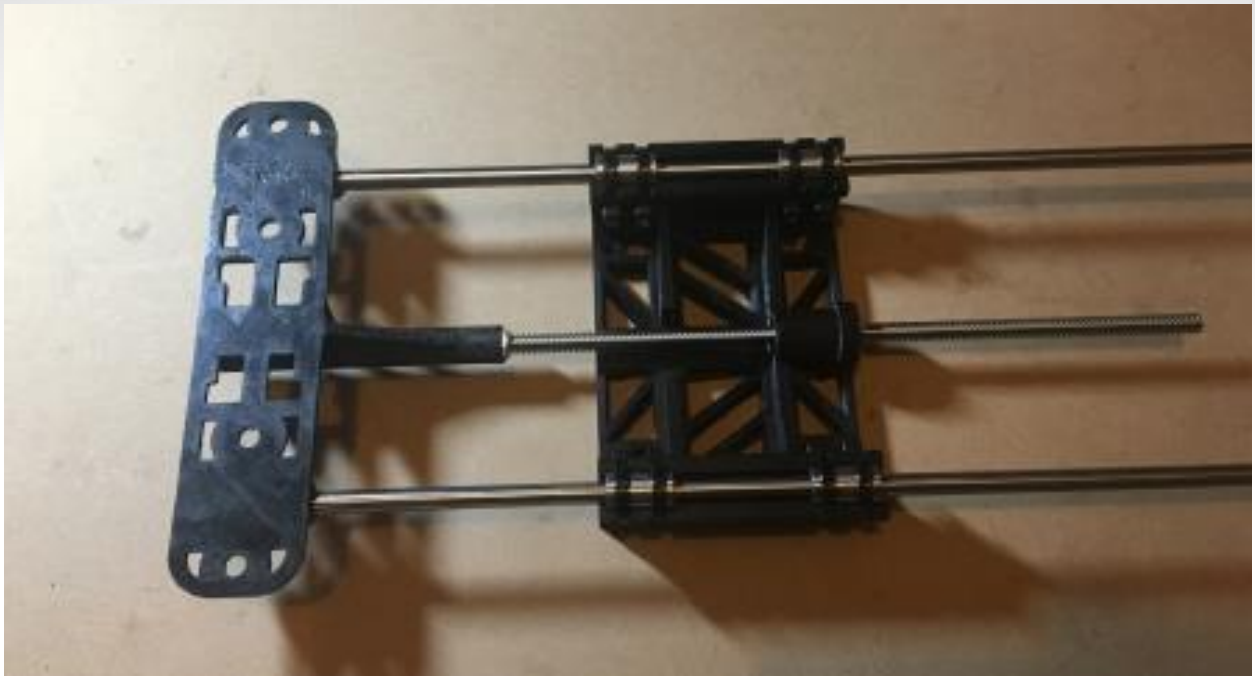
Close up image of bearings secured to carrier.



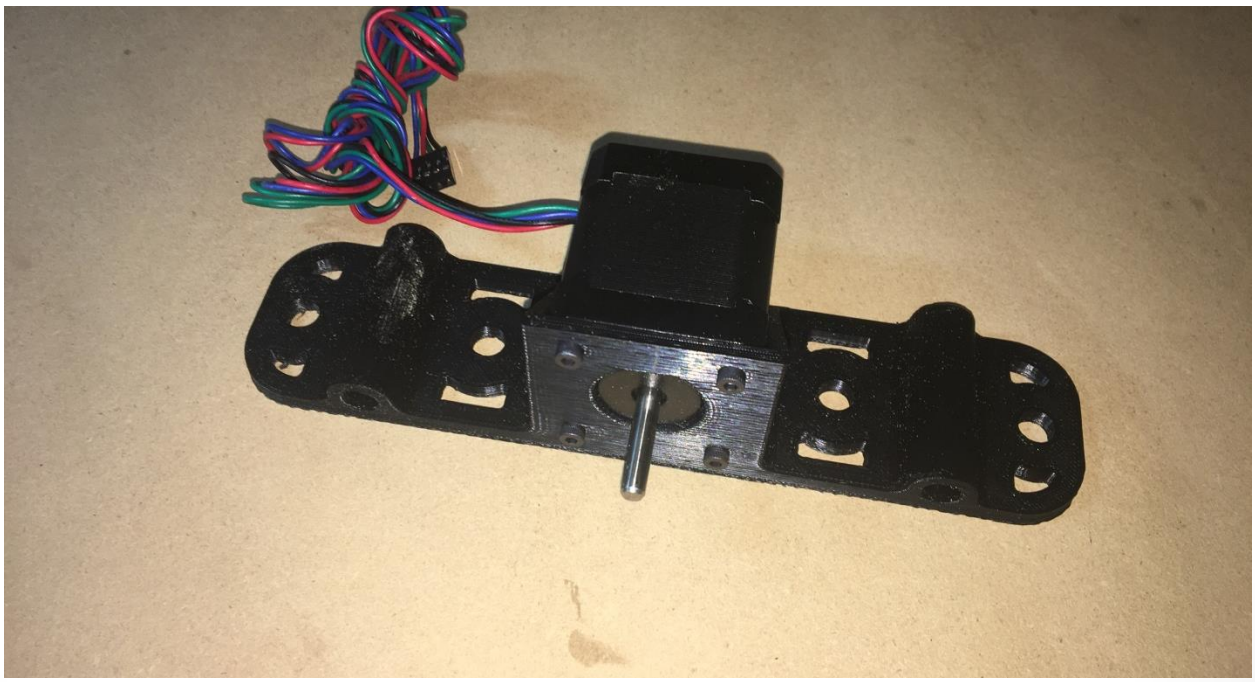
Apply epoxy to ends of 8mm rods as shown.



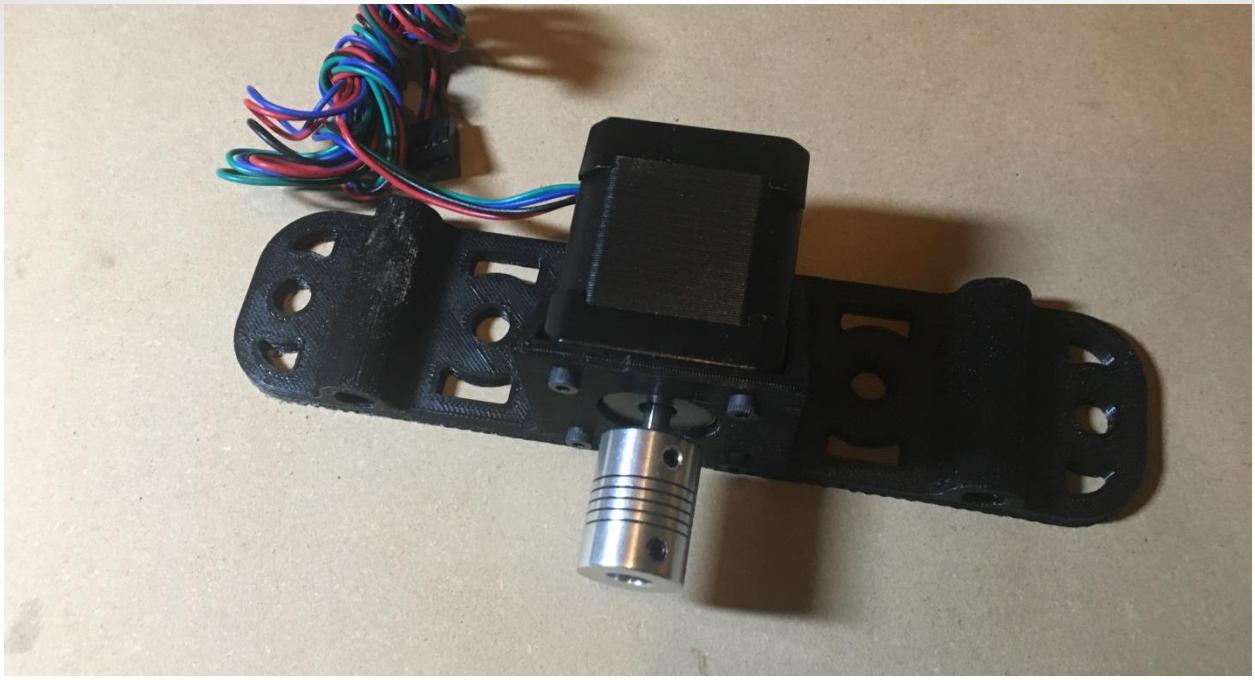
Clean out holes in bed support using 5/16” or 8mm drill bit then Insert 8mm rods into bed support as shown. Each rod should be inserted into support 1” deep.



Apply grease to end of T8 leadscrew then slide carrier forward and insert screw into support.

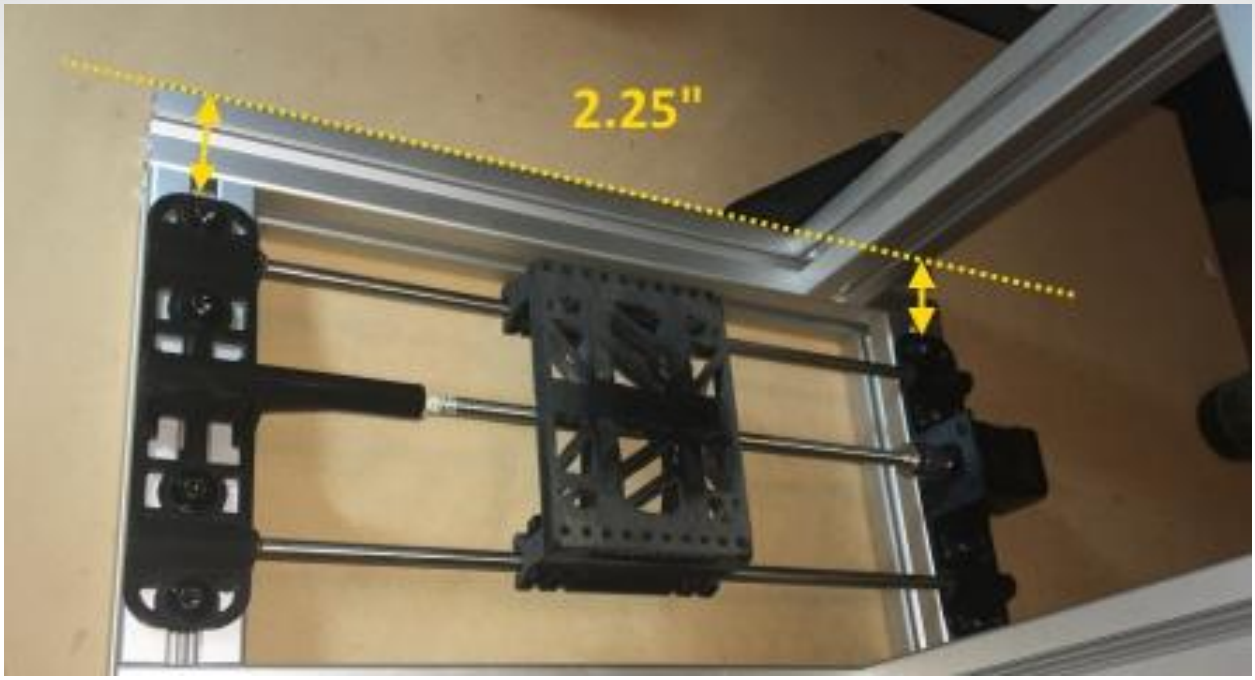


Secure nema 17 motor to bed motor side support using (4) M3 screws as shown.

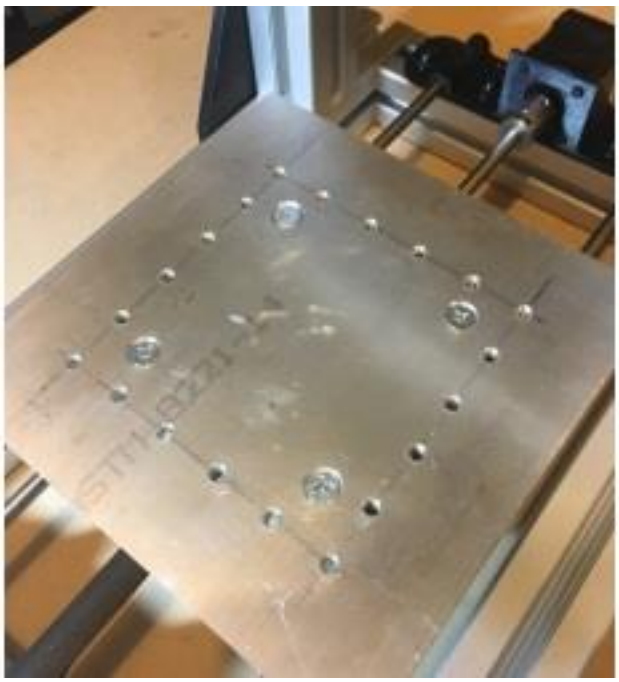


Install coupler onto motor shaft as shown.

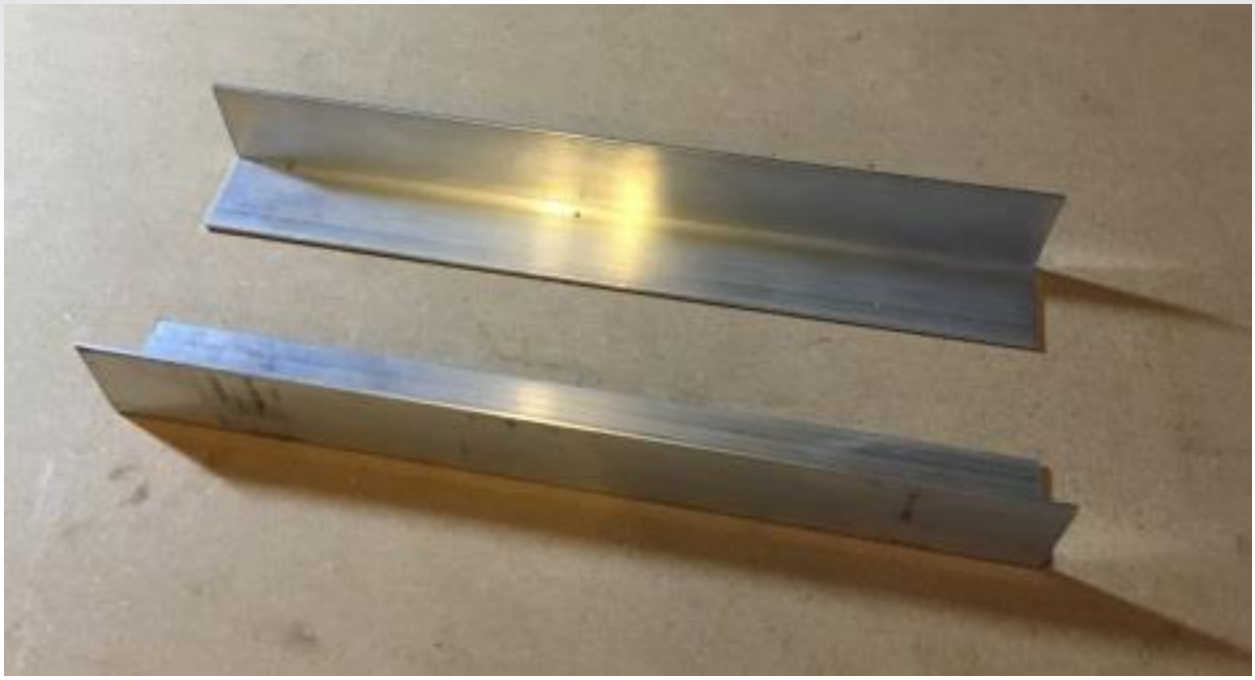
Slide motor assembly onto 8mm guide rods as shown. Make sure the distance between the ends of the supports at both sides measures 18”.



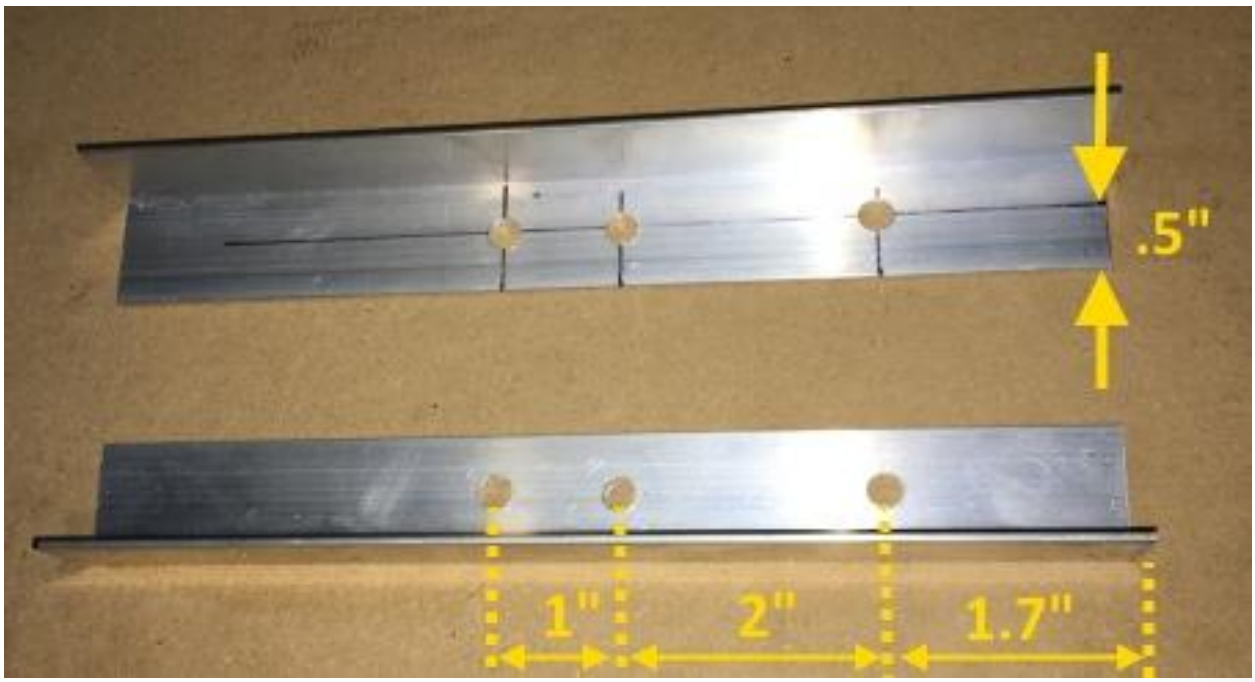
Secure bed carrier assembly to frame using M8 screws from end feed connectors threaded into end feed nuts that were placed in the channel. Make sure the assembly is perfectly square to frame – use a caliper to verify the distance is exactly 2.5” between frame edge and mounts at both ends.



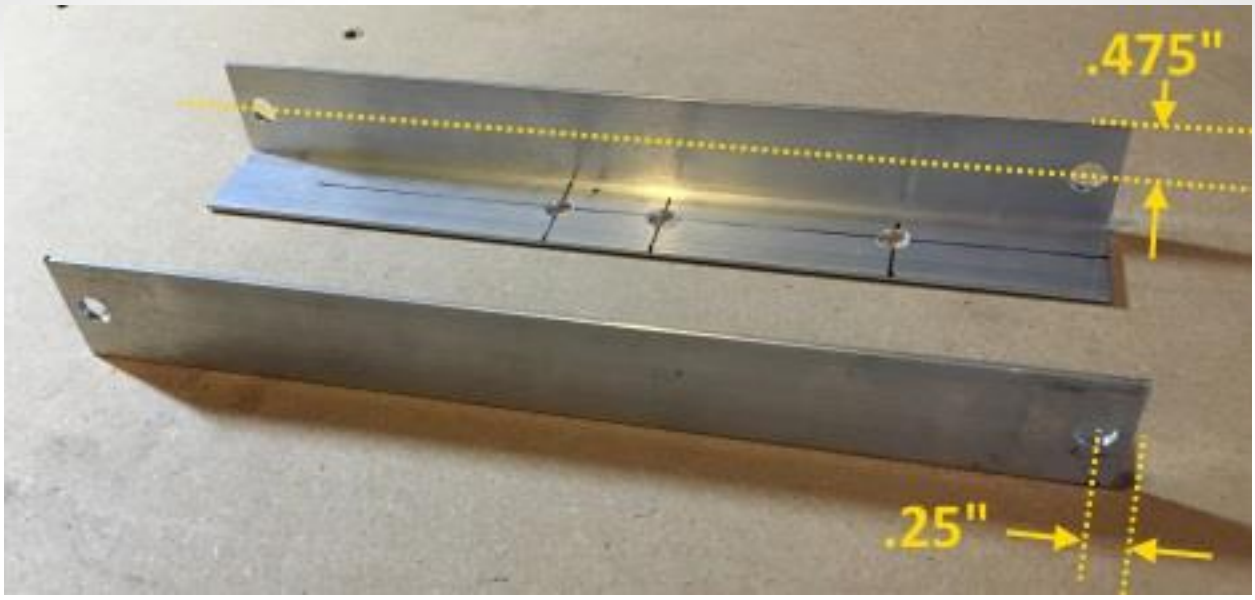
Secure aluminum table to bed carrier using (4) ¼-20 flat head screws as shown.



Cut 2 lengths of aluminum angle to 8” long. Its important that they are exactly the same length.

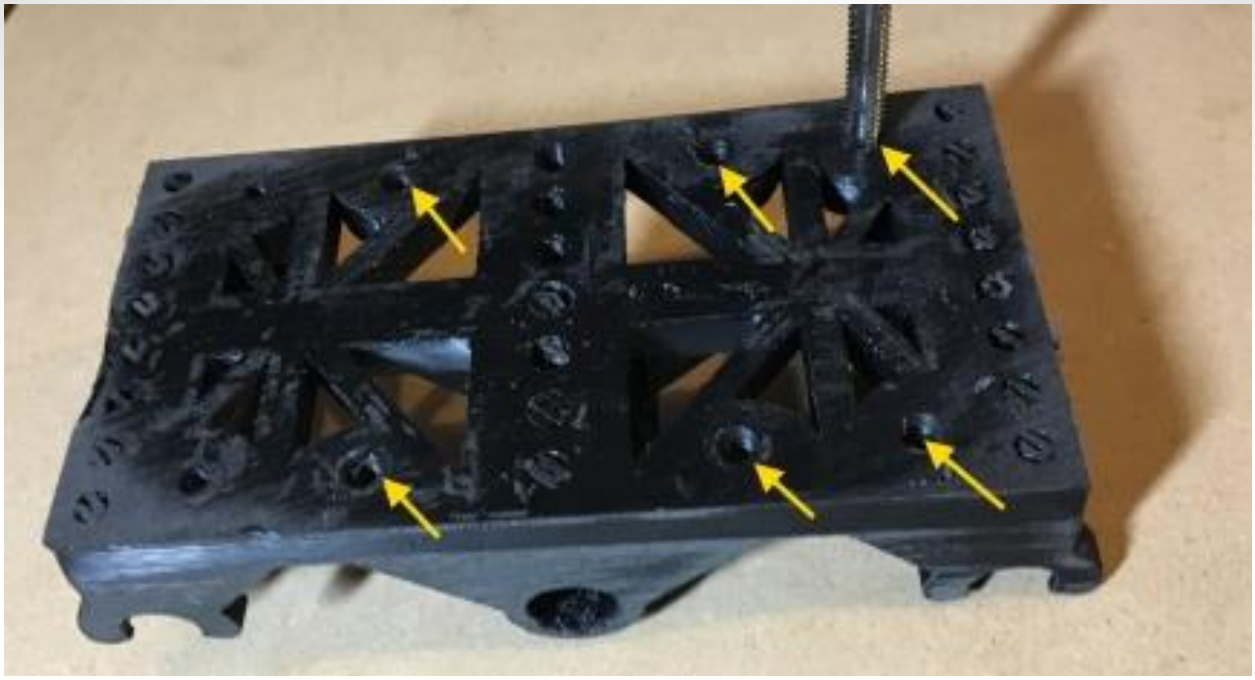


Drill ¼” holes as outlined in this photo.



Drill ¼” holes on adjacent surface as outlined in this photo.

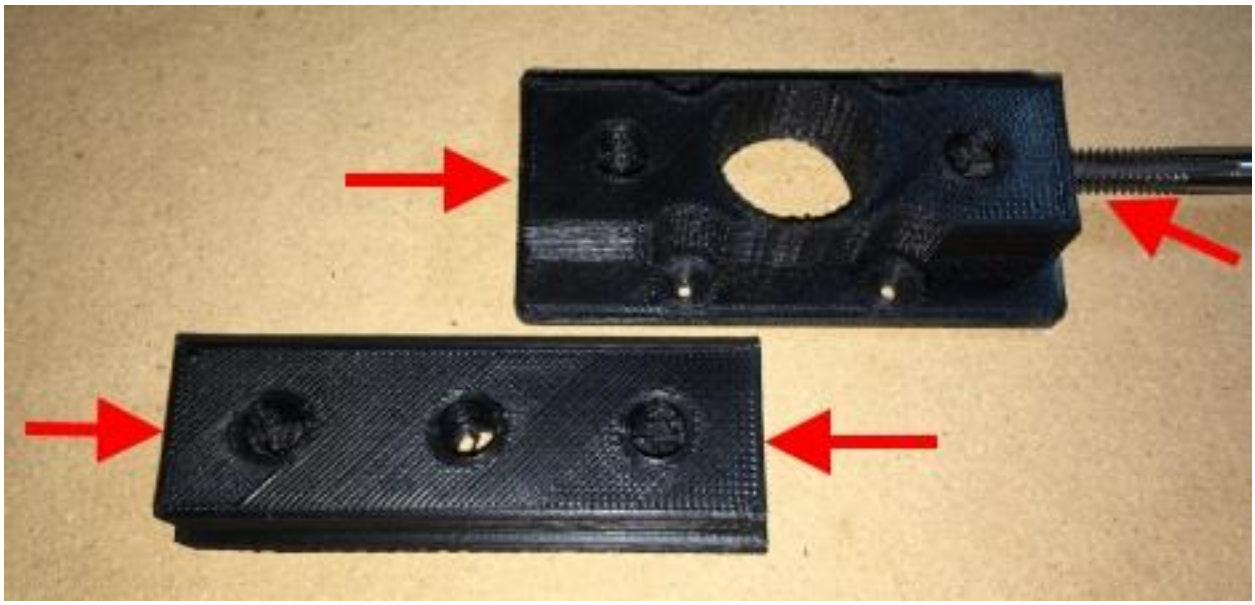
Clean holes out on plastic Horizontal carrier with 5/64” drill bit and then use #4 screws to secure anti backlash flange nut to horizontal carrier as shown.



Use ¼-20 tap to thread the holes shown in horizontal carrier.

Use low profile ¼” machine screws to secure aluminum angle to horizontal carrier as shown.

Use rotary grinding tool to cut relief in ends of aluminum angle as shown.



Use ¼-20 tap to thread each side of both horizontal motor and support mounts.

Using an abrasive saw cut one of the 406mm long guide rods in half.

Grease the inside of 4 LMU88 bearings and carefully slide them onto the half length 8mm rods as shown.

Snap rod and bearing assemblies into vertical carrier as shown. Bearings will snap into place.

Use zip ties to secure bearings to vertical carrier

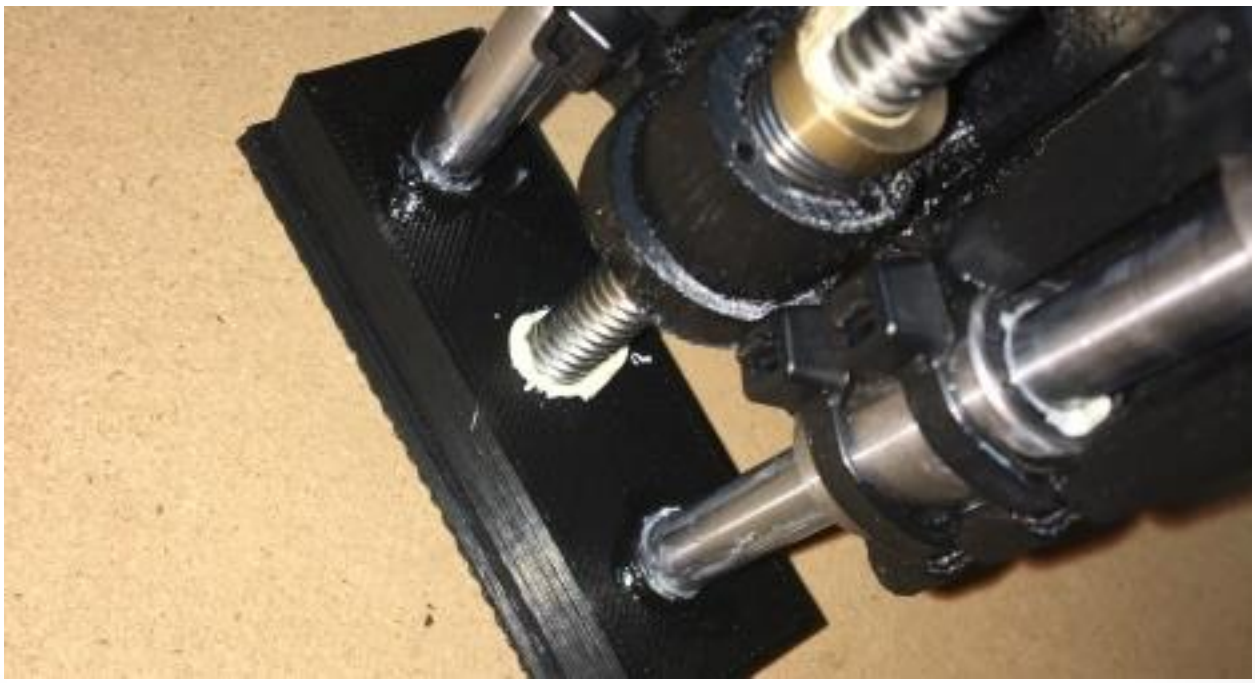
Install coupling onto one of the nema 17 motors as shown and tighten set screws.

Cut one of the T8 leadscrews down to 7.125” long.

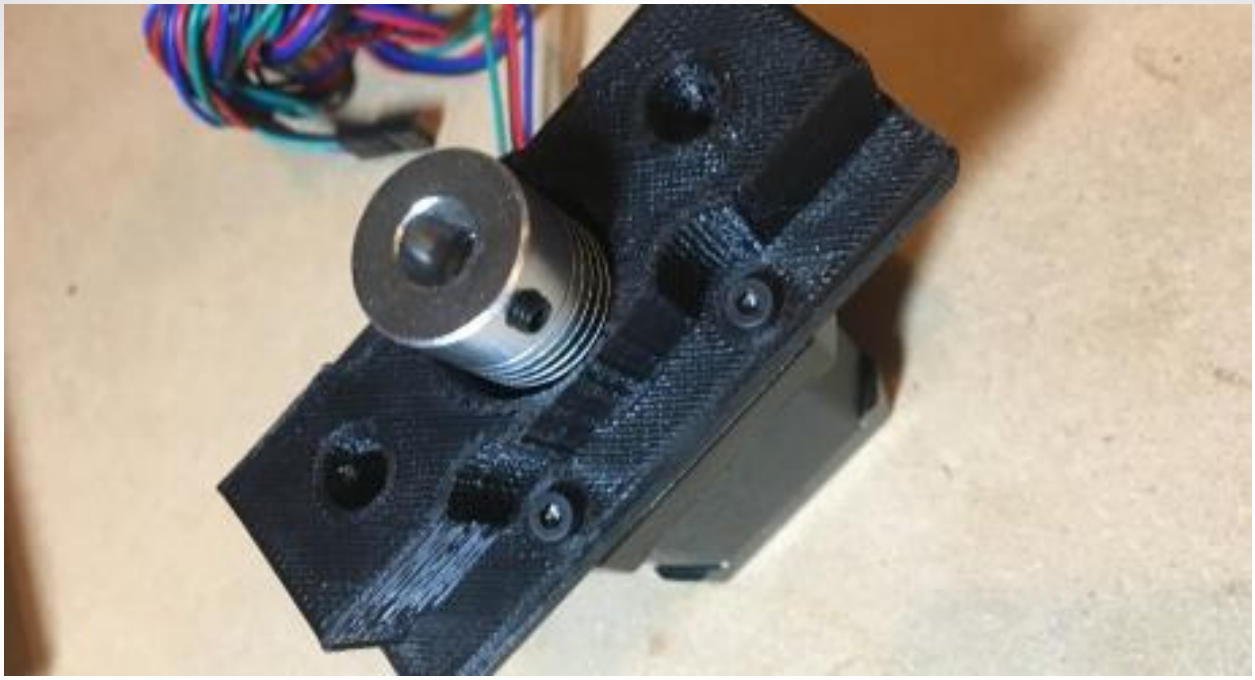
Insert spring and rear half of anti backlash nut into carrier as shown until both halves of anti backlash nut interlock then thread 7.125” length of T8 lead screw into anti backlash nut

Use ground down 5/16” or 8mm drill to clean up holes in vertical carrier support as shown. Make sure T8 leadscrew can spin freely in hole but is still snug with no play.

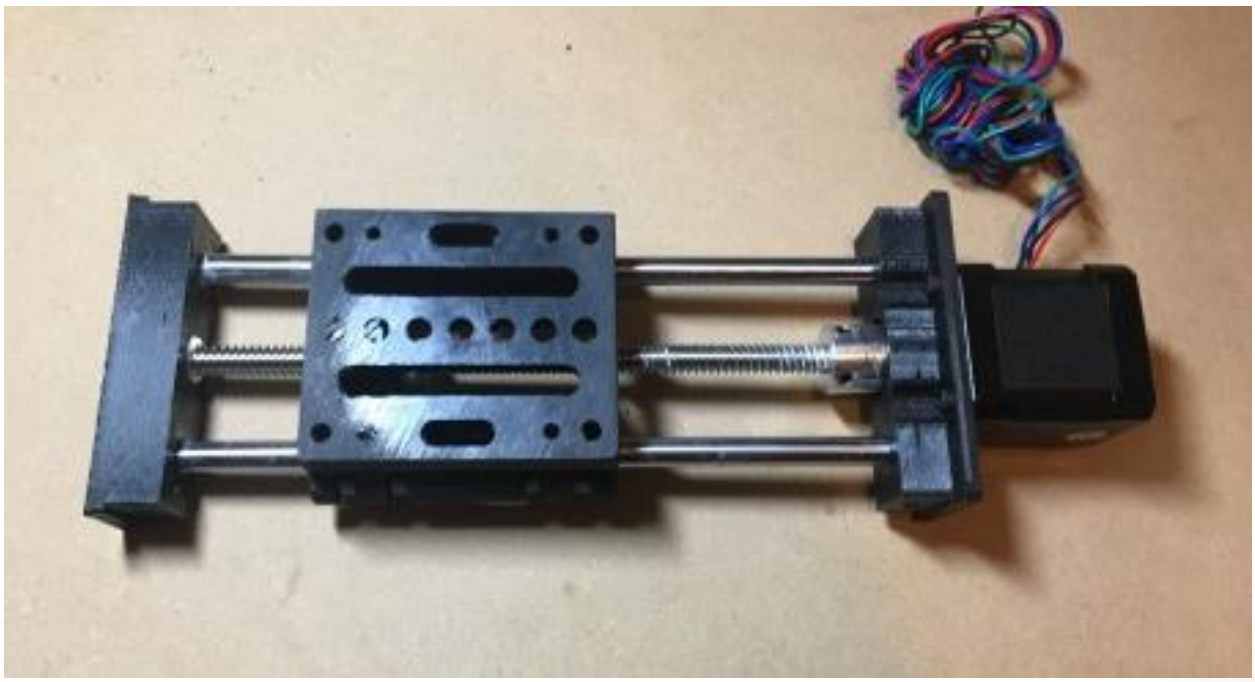
Insert 8mm rods into vertical support as shown. Make sure nut is toward support and that lip on support is facing out as shown.



Grease center hole and slide lead screw into place as shown.



Secure motor t o the motor side vertical support using M3 cap screws.

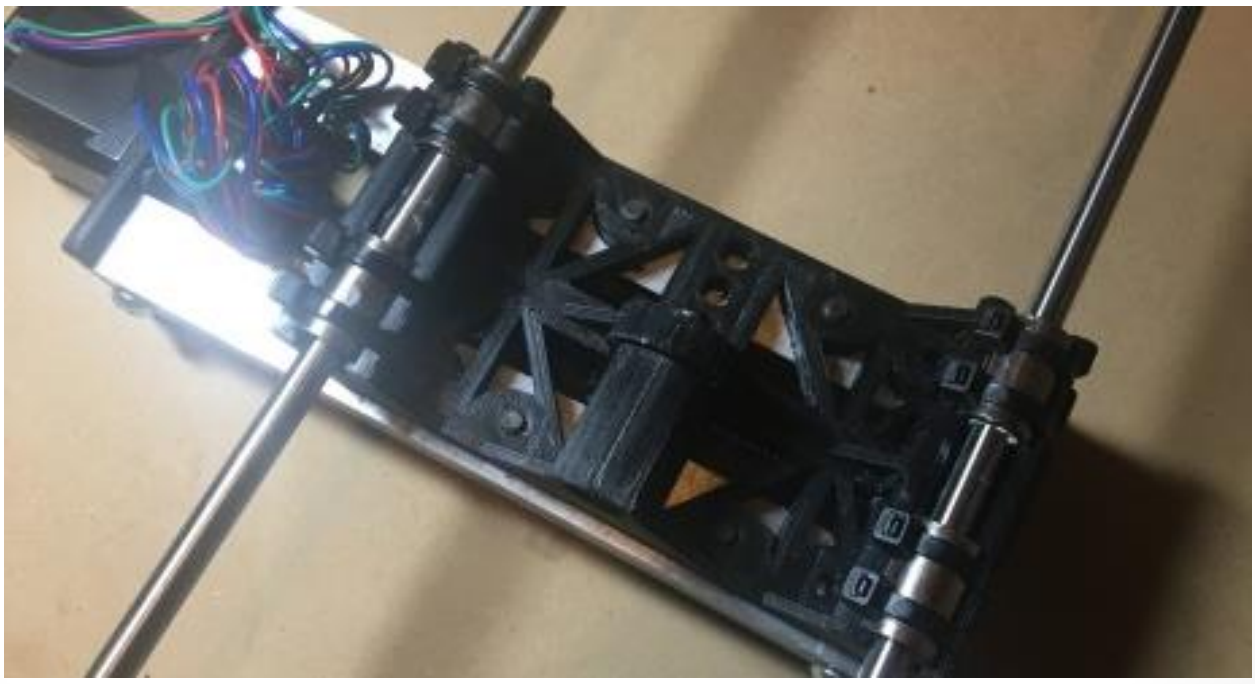


Insert motor assembly onto 8mm rods and T8 lead screw.

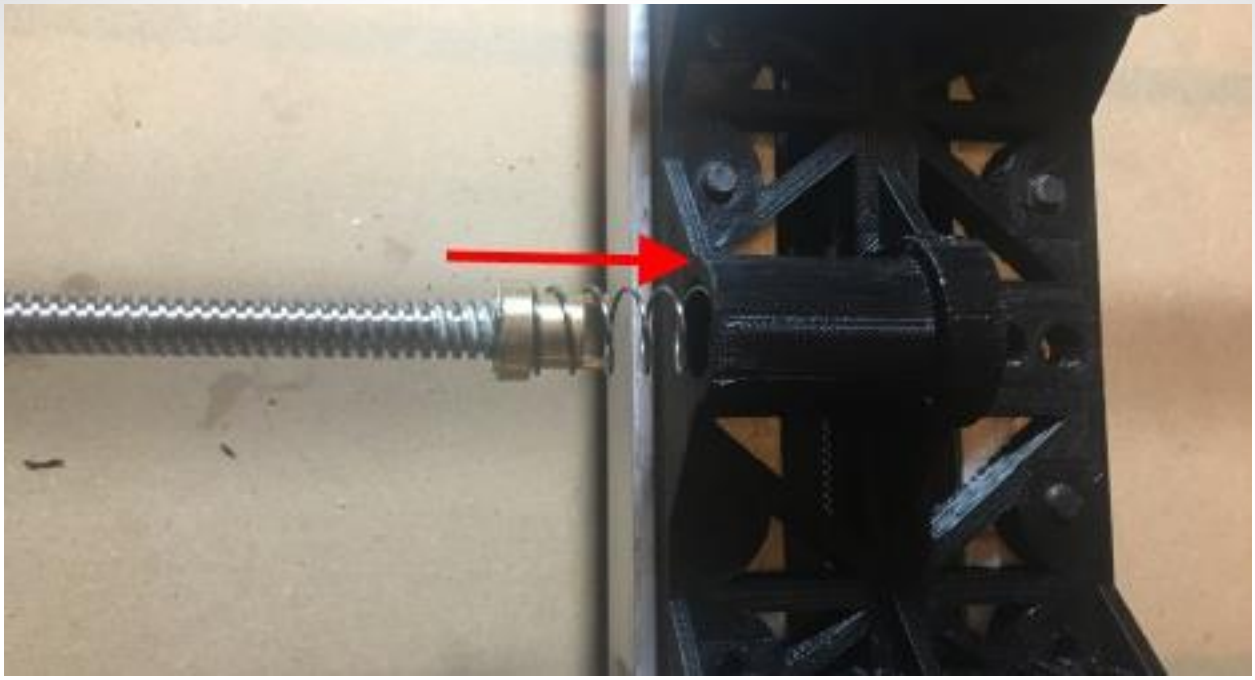
Install vertical slide assembly into horizontal carrier / aluminum angle assembly and secure with ¼-20 screws in each corner as shown. Tighten set screws in coupling to the T8 lead screw.

Cut (2) 8mm guide rods down to 13.25” inlength.

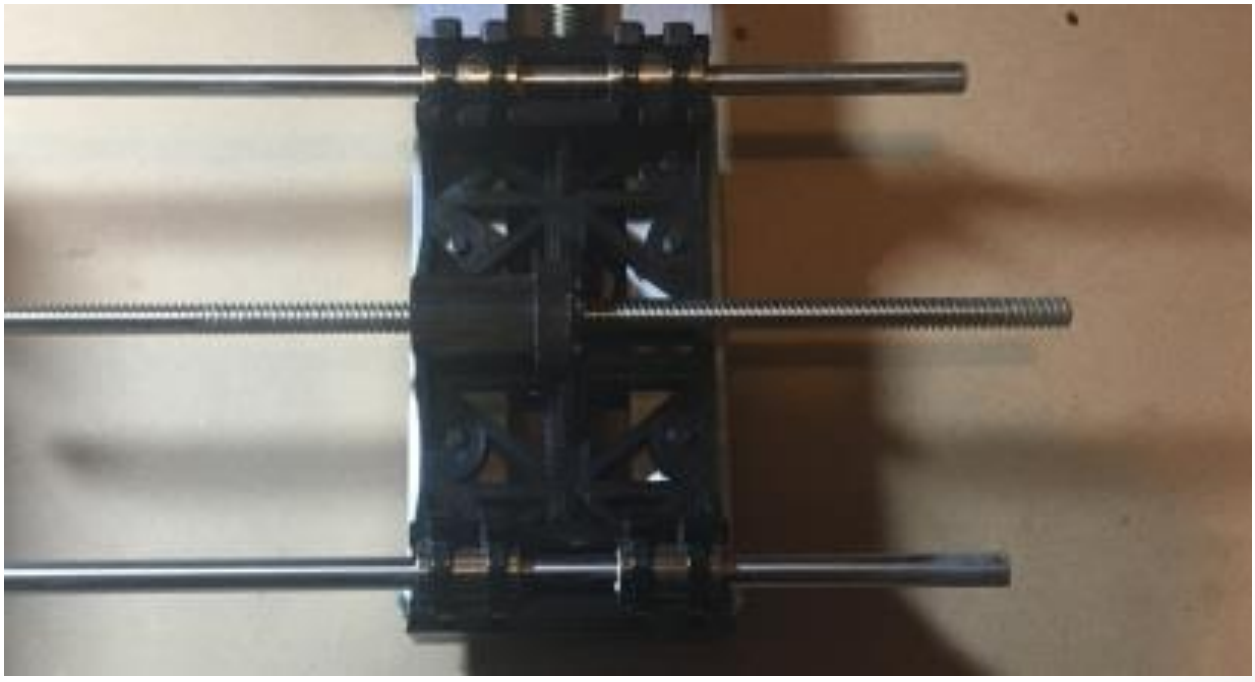
Grease the inside of 4 LMU88 bearings and carefully slide them onto the 13.25” lengths of 8mm rods as shown.



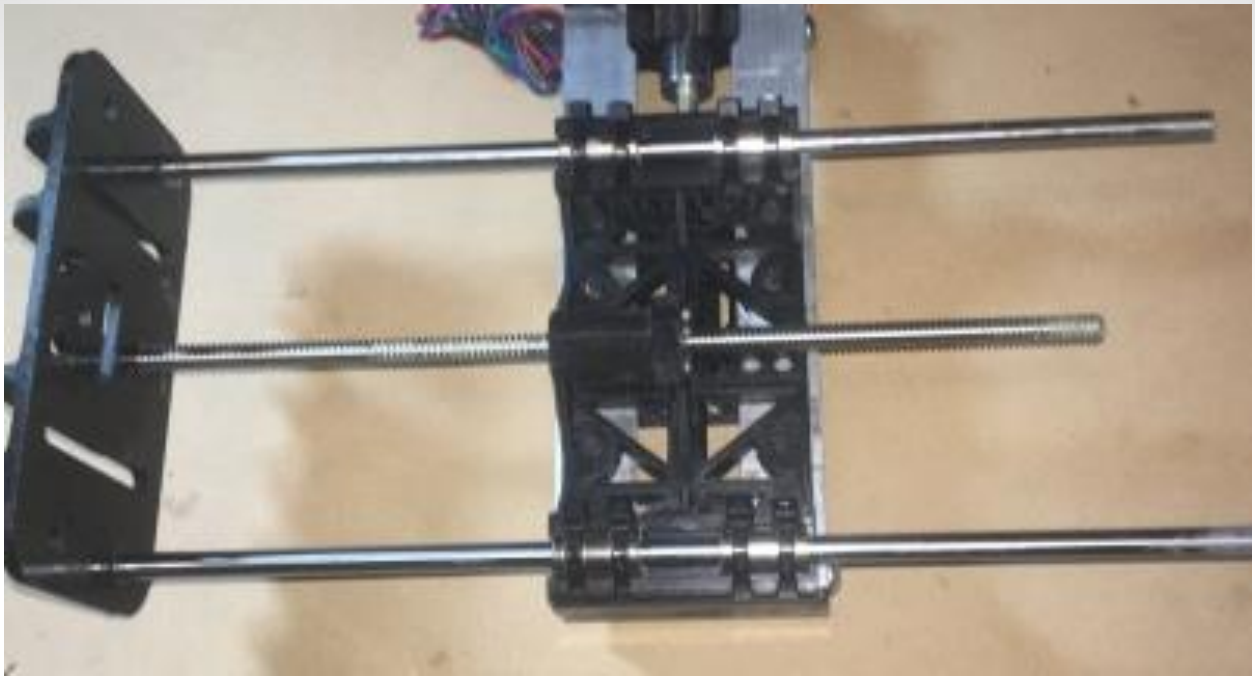
Snap 13.25” rod and bearing assemblies into vertical carrier as shown. Bearings will snap into place, also use zip ties to secure bearings .



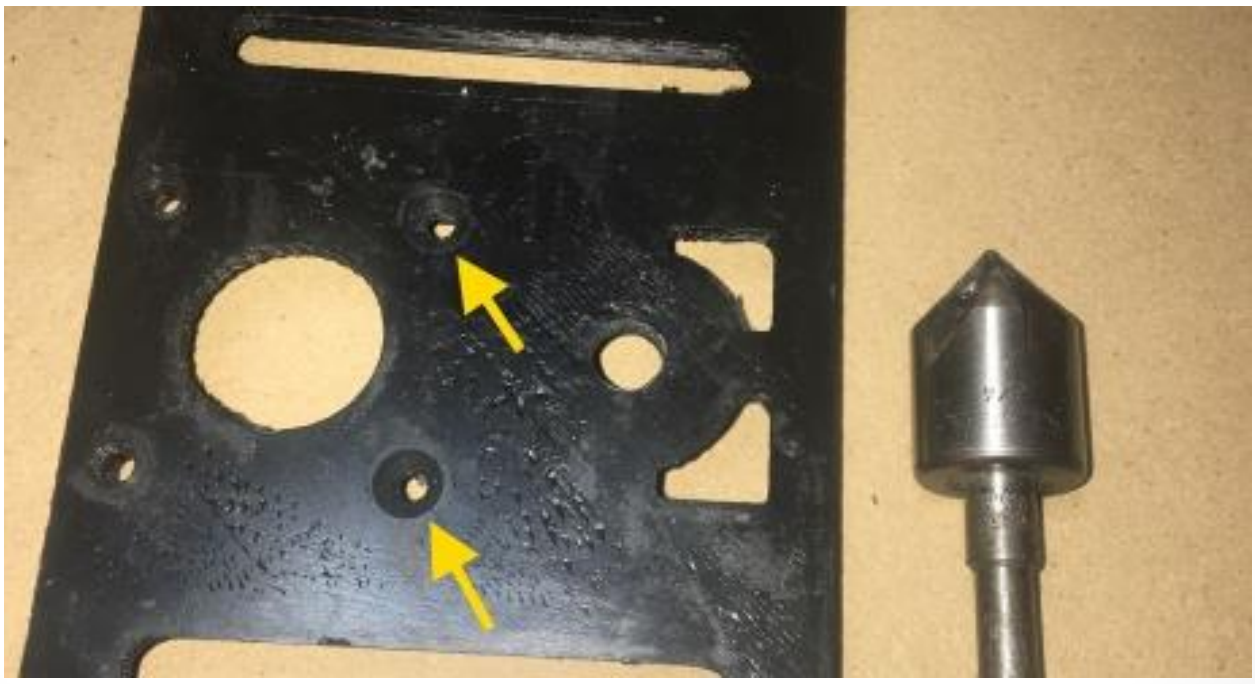
Thread back half of anti backlash nut onto end of T8 leadscrew with spring and then use the leadscrew to insert back half of nut into the front half of nut until the slots engage and then screw leadscrew through both halves.



Shows leadscrew fully threaded into anti backlash nut in vertical carrier.



Use 5/16” or 8mm drill bit to clean out the 3 8mm holes in horizontal support then apply epoxy to 8mm guide rods and insert into horizontal support as shown.

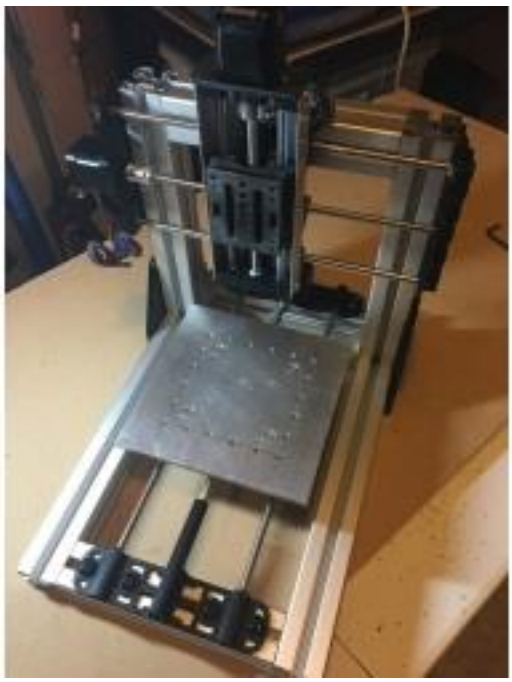


Use countersink to taper the 2 holes shown on inside of horizontal motor side support.

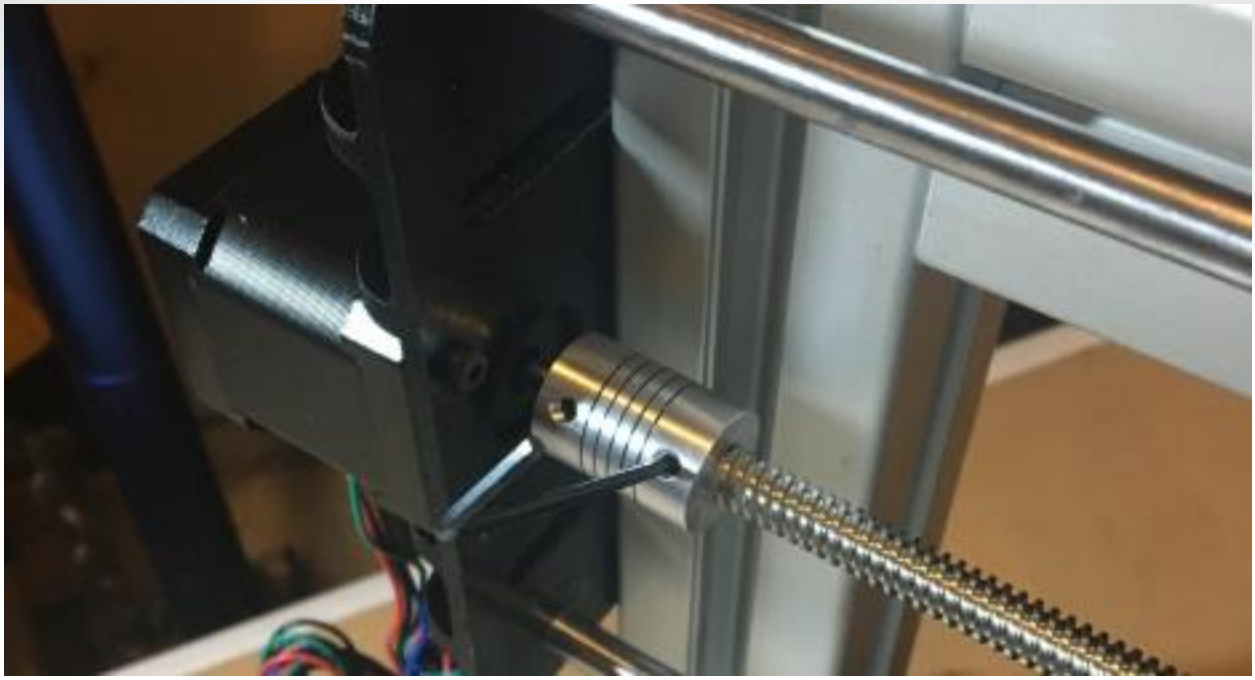
Install Nema 17 stepper motor into horizontal motor side support using 2 M3 flat head screws and 2 M3 cap head screws as shown.

Install coupler on motor shaft as shown.

Pre install end feed fasteners as shown onto motor and support side horizontal supports. Only thread the end feed nuts onto screws a few threads.



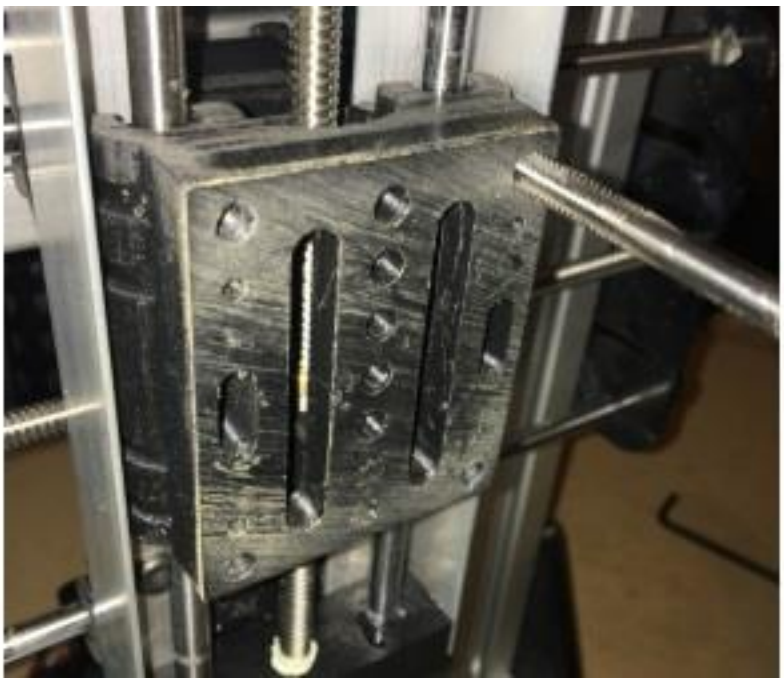
Slide horizontal / vertical slide assembly onto frame inserting the pre installed end feed fasteners into slots on sides of frame uprights. Make sure the assembly is level and tighten the 8mm screws (3 each side).



After assembly is tightened down tighten the set screws on coupler for horizontal axis.

Test fit Dremel rotary tool into holder. This is meant to be a snug or friction fit around the main body – some sanding or filing will need to be done to get a snug fit.

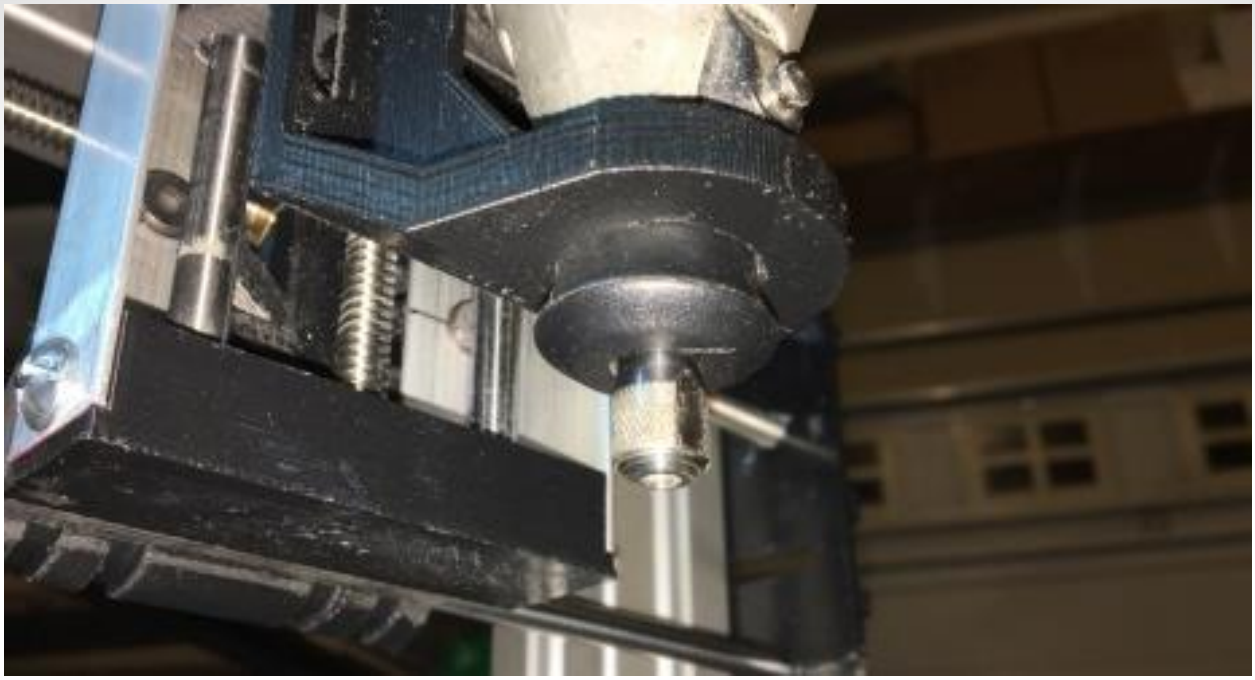
Sand down Dremel collar on belt sander until unthreaded portion of lip is removed and threads begin at surface.



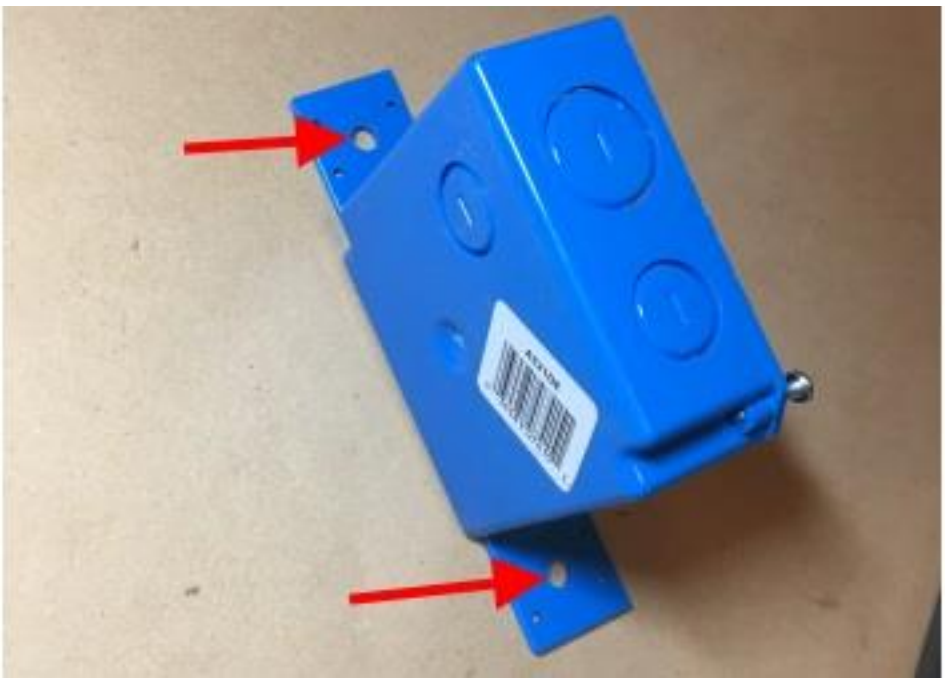
Tap each of the 4 mounting holes in vertical carrier with ¼-20 tap.

Mate dremel holder to vertical carrier using (4) ¼-20 machine screws as shown.

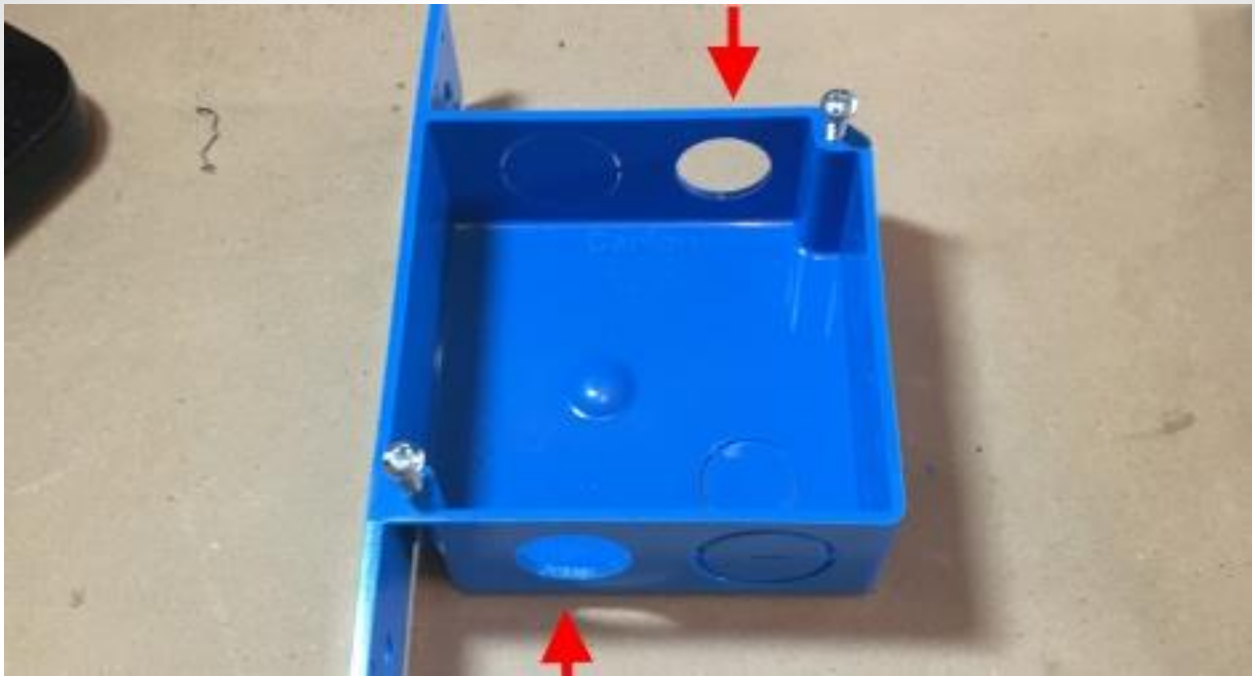
Install Dremel tool into tool holder.



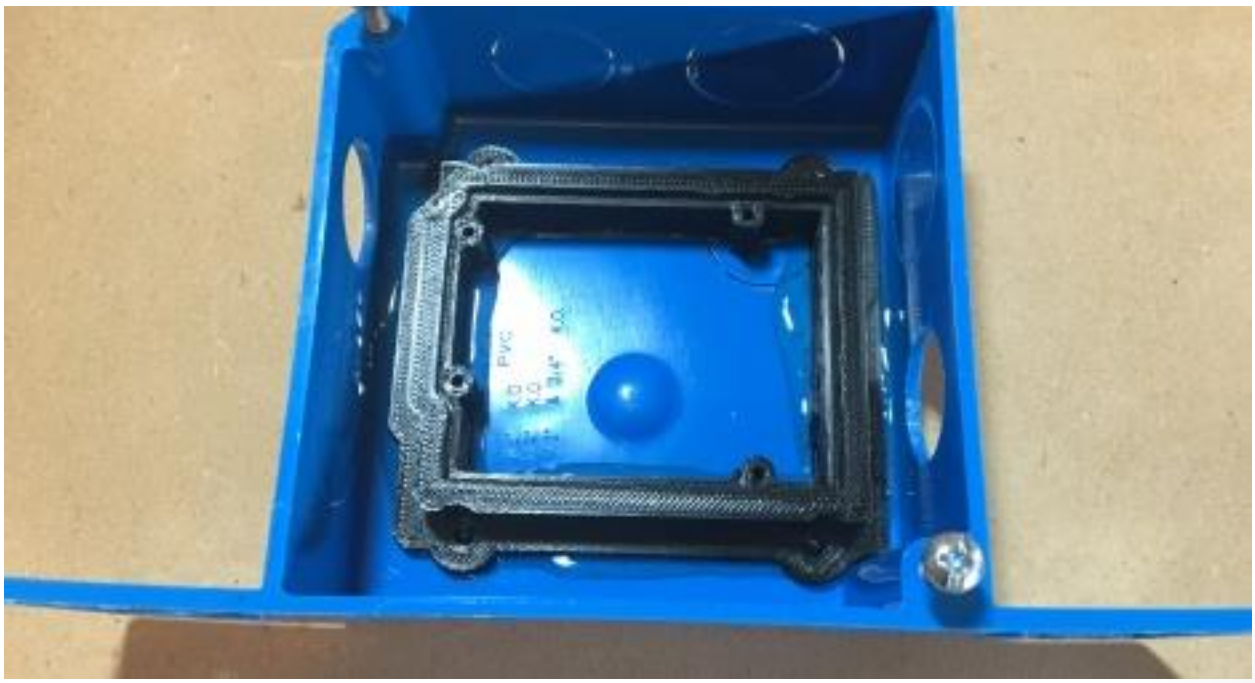
Screw collar onto Dremel tool as shown.



Drill holes in electrical enclosure tabs with 5/16” drill bit.

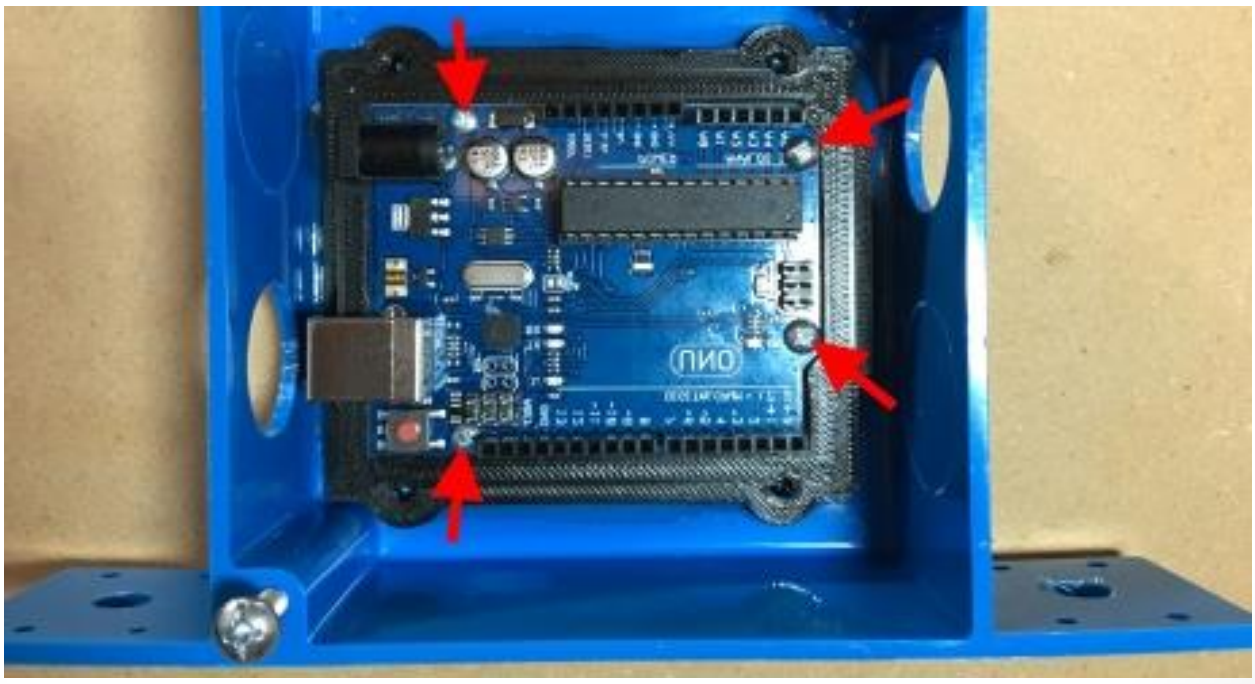


Remove the 2 knockouts indicated in picture.

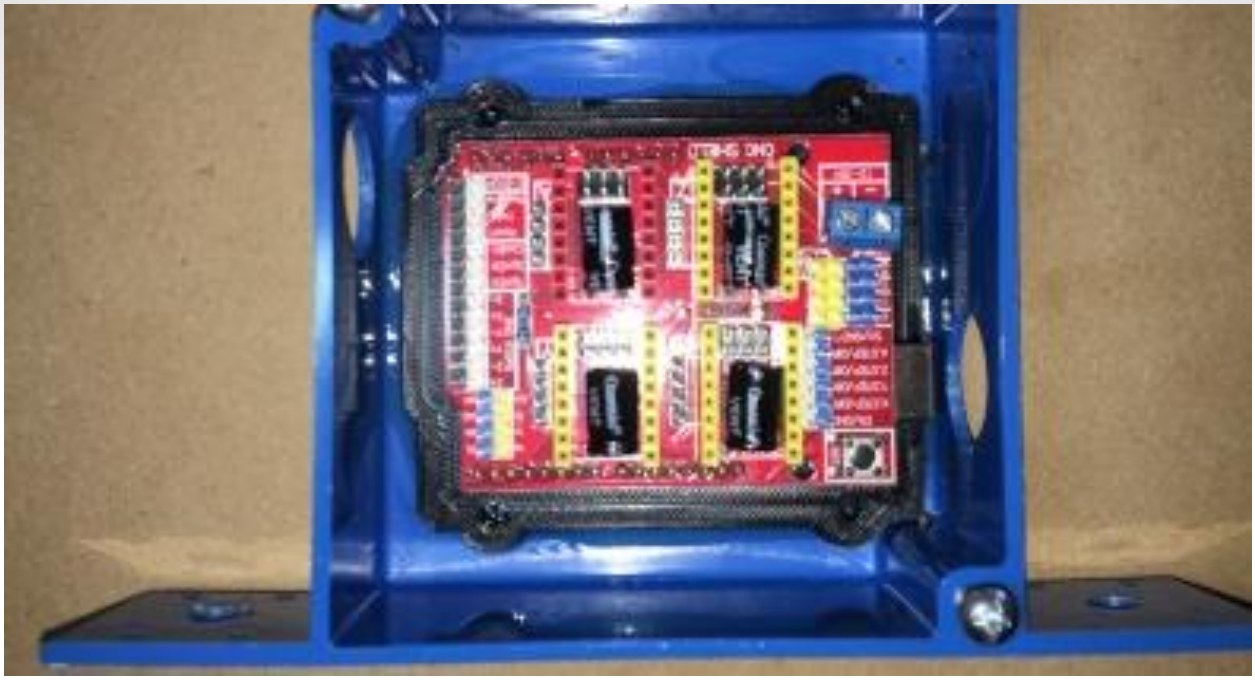


Epoxy arduido mounting bracket inside electrical box as shown.

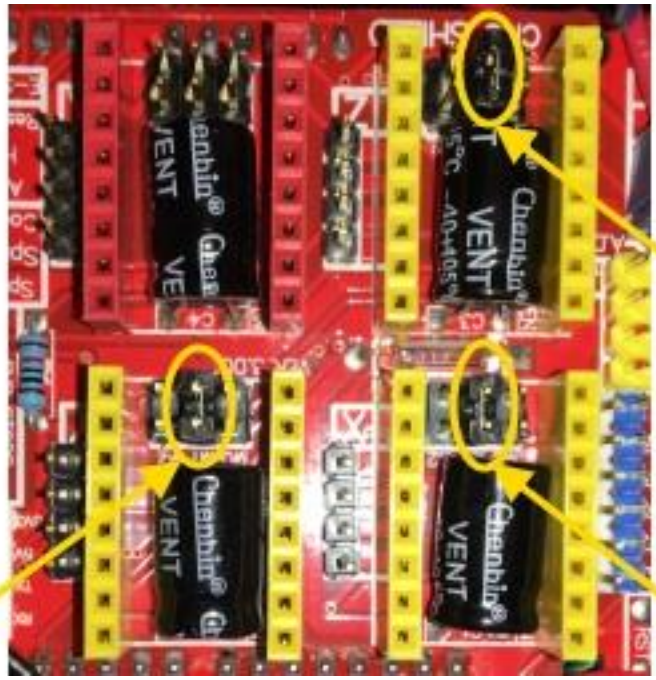
Make sure mounting bracket is aligned so that when areduino is in place the USB port is directly aligned with the knockout as shown.



Clean out holes in arduino mounting bracket with 1/16” drill bit and then secure arduino to mount using (4) #4 screws.



Plug CNC shield board directly into (on top of)arduino as shown. The male pins on the bottom of the shield board will plug into the female pins on the arduino.

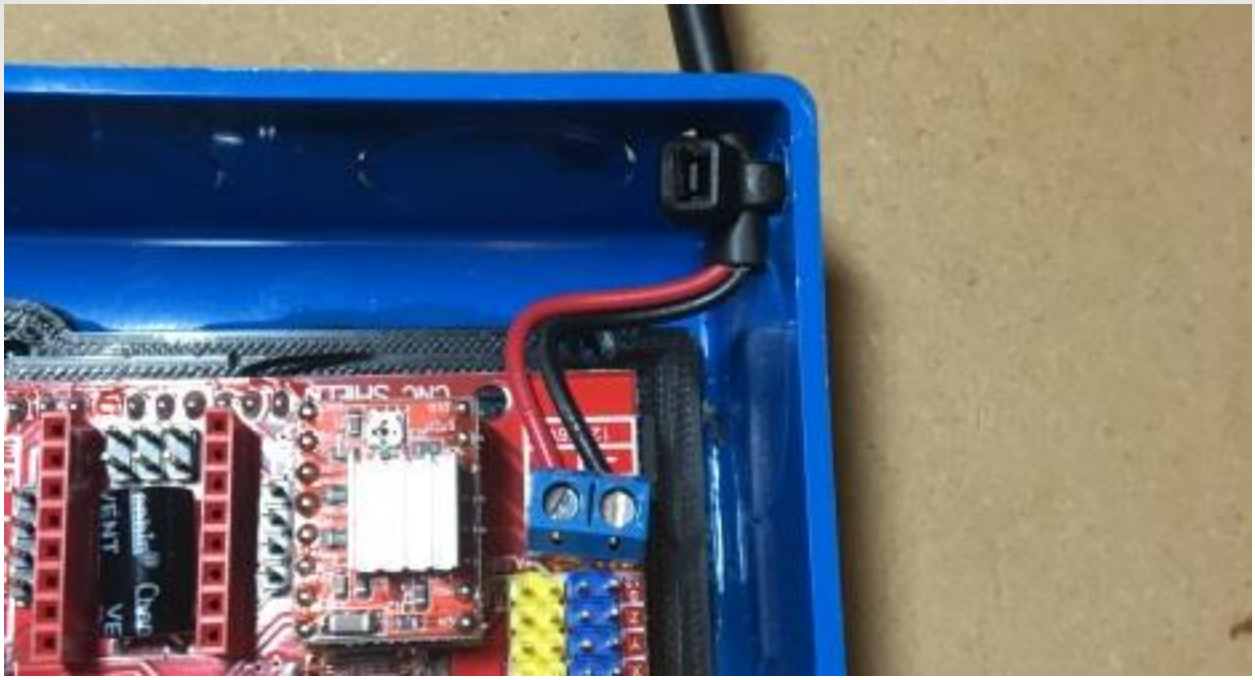


Install jumper on center set of pins for the X,Y & Z axis as shown in photo. This sets the motors to ¼ microsteps for finer resolution.

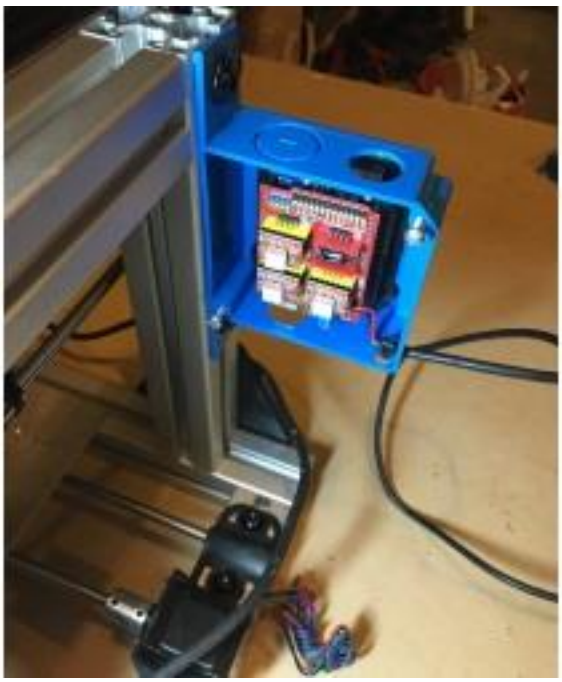
Insert (3) A4988 stepper drivers into the 3 yellow sockets on CNC shield. Note the orientation shown in the picture.

Remove adhesive backing from (3) heat sinks and apply each of them to the IC chips on A4988stepper drivers.

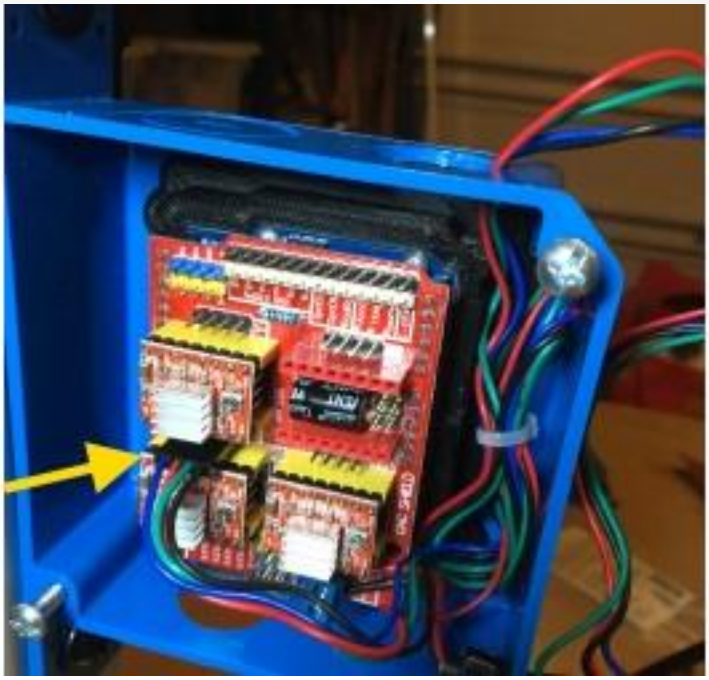
Drill 3 holes in corner of electrical box as shown.



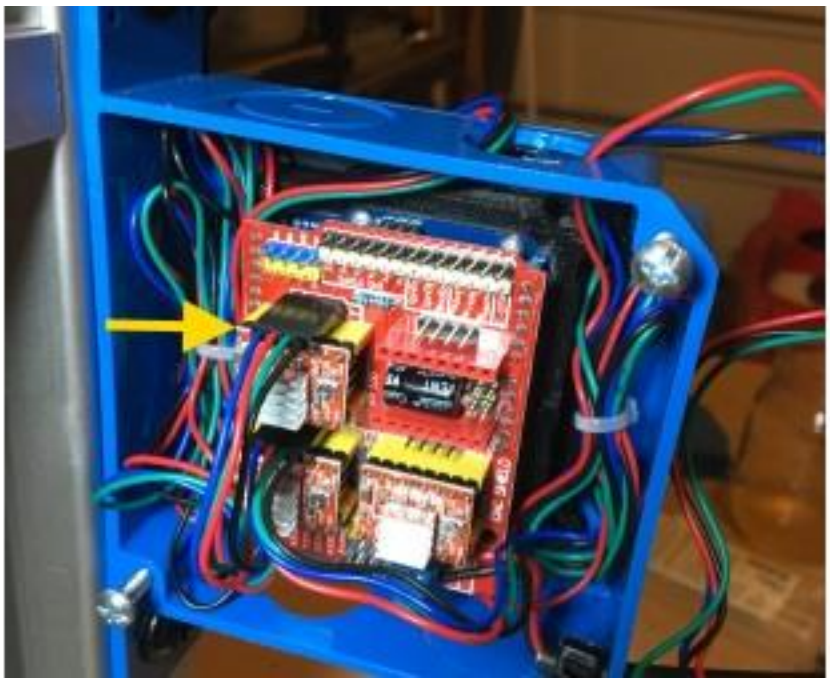
Run wire from 24vdc power supply through rear hole, connect wires to terminals on CNC board as shown and then use zip tie through 2 bottom holes to secure wires so they cant be pulled out.



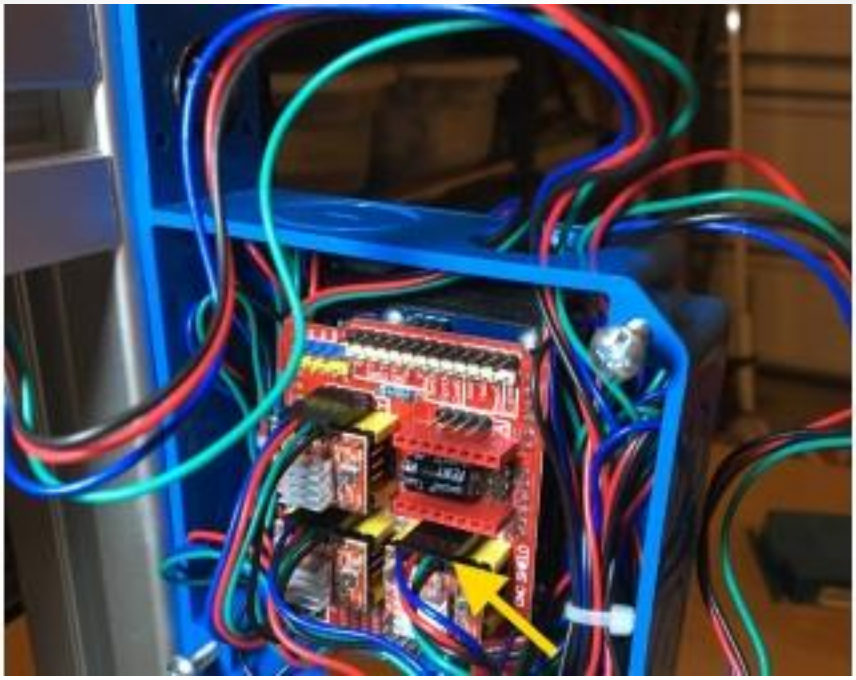
Use (2) end feed fasteners to attach electrical box to rear side of frame upright as shown.



Run wires through top hole and plug connector from the bed carrier nema 17 motor to the X axis plug on CNC board as shown. Note : blue wire on left.

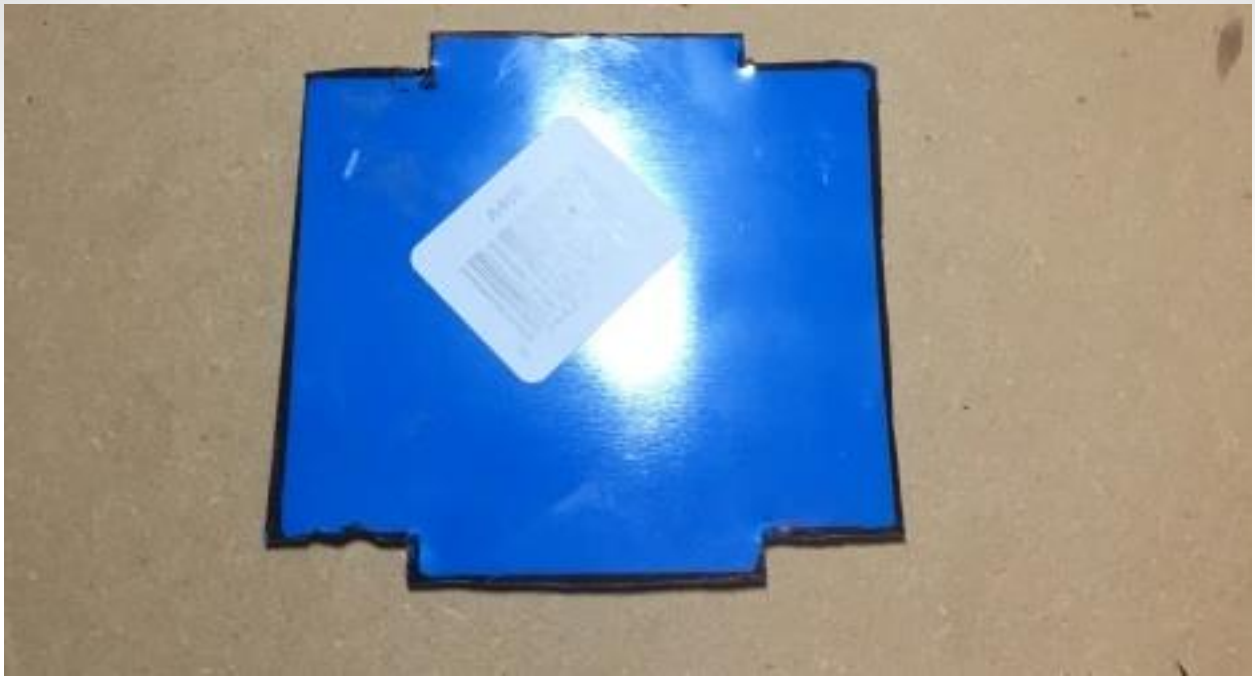


Run wires through top hole and plug connector from the horizontal carrier nema 17 motor to the Y axis plug on CNC board as shown. Note : blue wire on left.



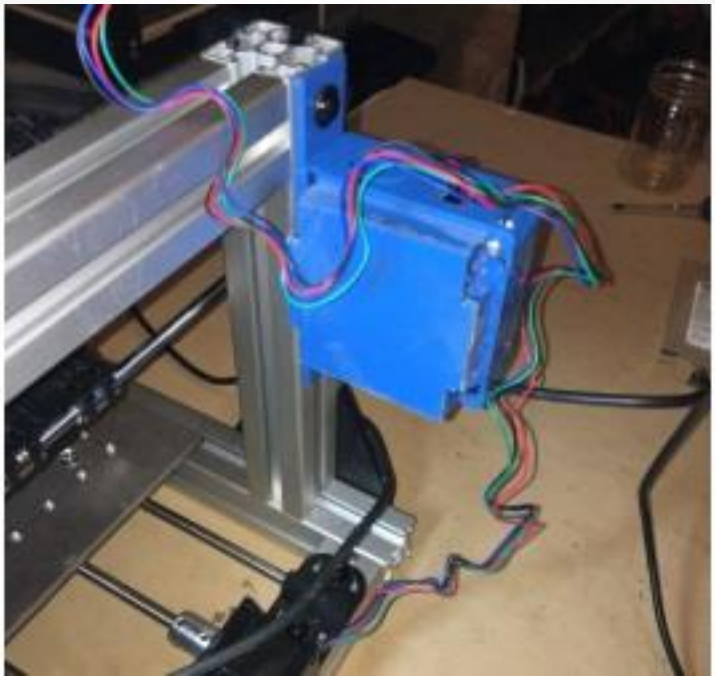
Run wires through top hole and plug connector from the vertical carrier nema 17 motor to the Z axis plug on CNC board as shown. Note : blue wire on left.

Trace shape of mud ring onto junction box cover.

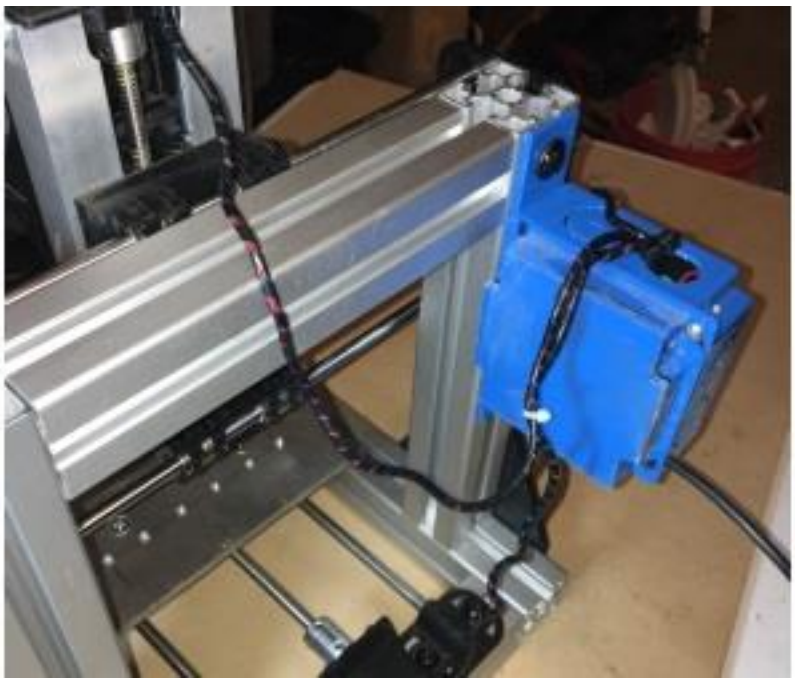


Use tin snips to cut out cover.

Use belt sander or file to clean up cover, match edges to the mud ring and then epoxy cover to mud ring to create a raised cover for the electrical box.



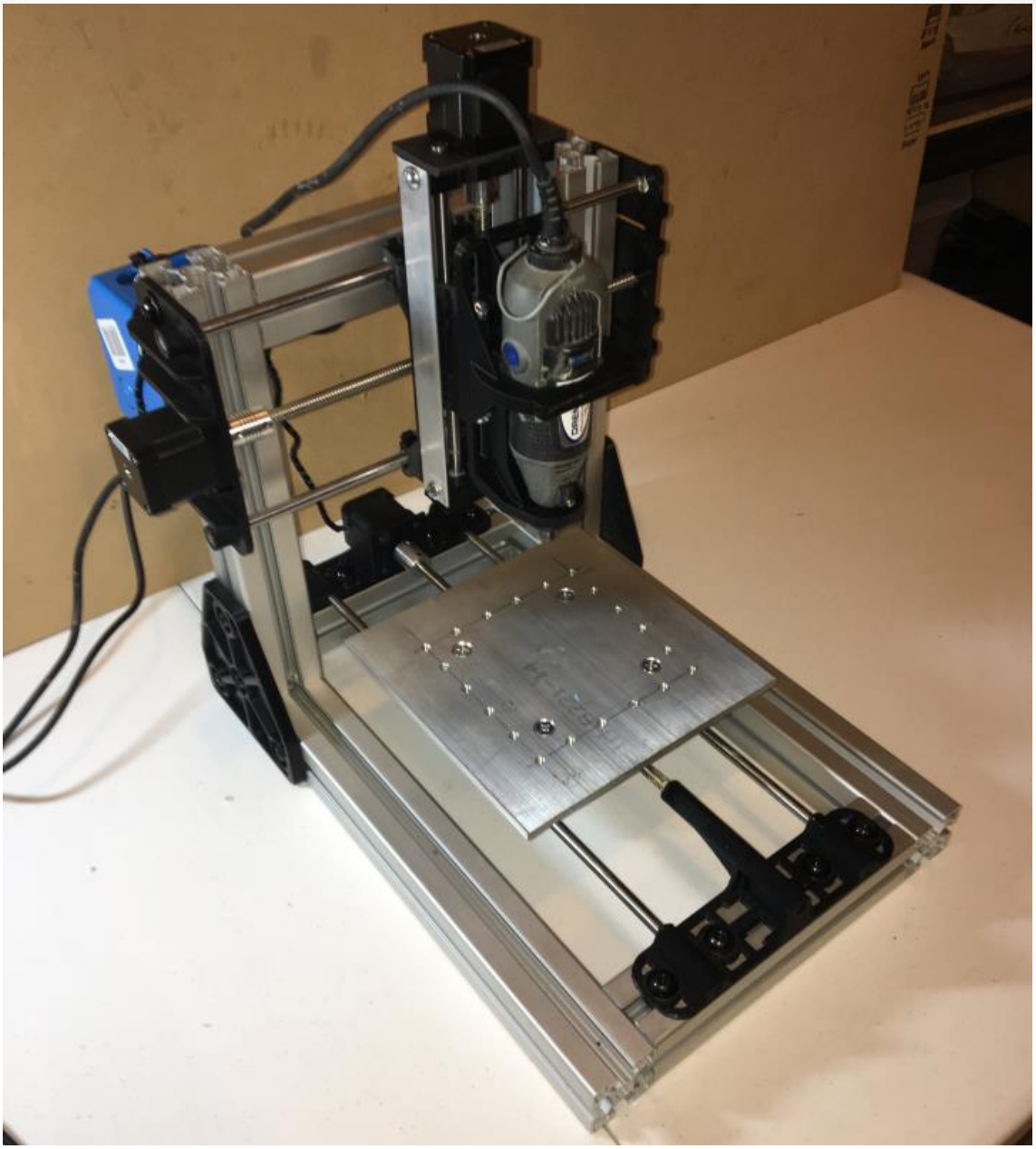
Install cover on electrical box.



Wrap motor wires with spiral wrap as shown.

Install an engraving bit upside down and then adjust horizontal assembly and vertical height until bit touches table or workpiece on table (depending on height you set horizontal assembly to).

Next rotate horizontal thread and move tip to right side of table and make adjustment to ensure horizontal travel is level to table. Next do the same for the table X direction and shim bed supports to make sure travel is level in the X direction. Use feeler gauges to get precise adjustment in both directions.



Assembly is now complete. Review video on loading software and calibration, then review video on engraving Example.