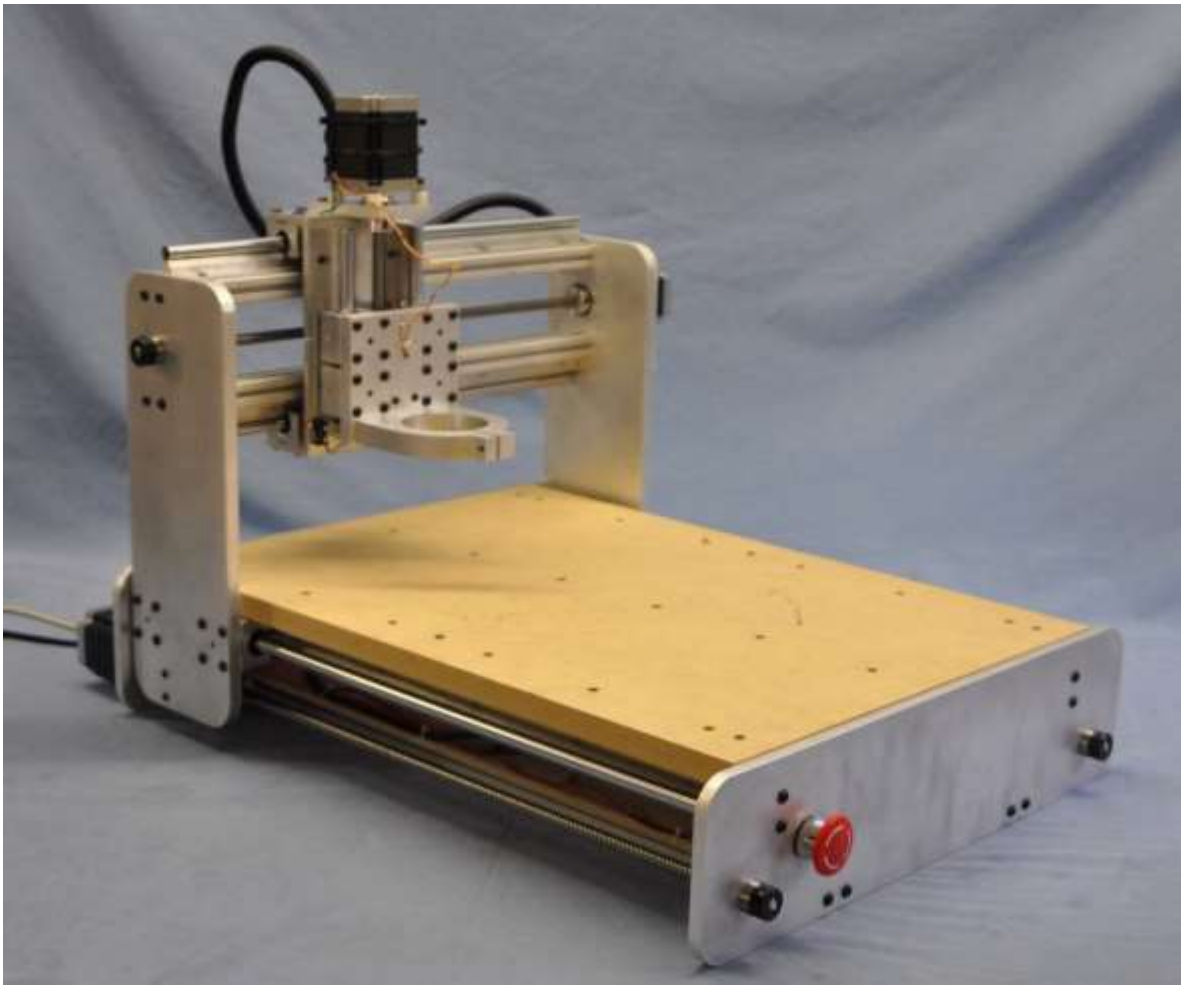
KL3 CNC Router Assembly Instructions



Specifications

The KL3 CNC Router has the following features:

- An rigid aluminum frame
- SBR 12 linear bearing hardware
- High lead ACME drive (1/2"/revolution on X and Y, 1/8"/revolution on Z)
- Anti-backlash acetal nuts on all axes
- Home switches on all axes
- MDF Spoil-board with 1/4-20 threaded inserts

The assembled foot print

Length:	29.5"
Width:	23.5"
Height:	21.5"

Assembled Weight:

60 lbs

Cutting Area

X:	18.7"
Y:	13.2"
Z:	3.1"

The complete router part list can be found in the appendix.

Getting Started

Safety First

Safety is your responsibility. Always use the proper protective equipment and "safety sense" when building or operating a CNC Router.

Routers have high voltage power supply. Router bits rotate at high speeds and have cutting edges that are hazardous . The operator should understand the hazards before operating the router.

Please review the entire assembly instructions before beginning building the KL3 CNC Router.

Required Tools

To assemble the kit together you will need the following:

- A set of metric and SAE Allen wrenches for mounting hardware
- 5.5 mm, 7 mm wrench for mounting hardware
- A pair of long nose pliers to hold the nuts
- Diagonal Cutters or sharp knife to trim nylon ties
- Calipers to measure part placement.
- Small standard screwdriver to connect electronics
- Small Phillips screwdrivers to mount home switches
- Small square to correctly align the frame structure

Tools you may need for the electronic setup include:

- 25 to 40 watt soldering iron
- Multimeter to correctly connect the power supply and stepper motors. The multimeter is also a good tool to have for general electronic trouble shooting.

To complete the KL3 CNC router you will need:

- Computer with parallel port and control software
- A DeWalt 611 Trim Router
- Router bits
- 1/4-20 clamping hardware

Building the KL3 CNC Router

We recommend a large flat working surface for assembling the router.

The threads in the aluminum blocks can be damaged easily. Start all machine screws by hand to avoid cross threading the aluminum blocks.

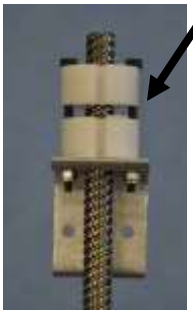
1. ACME Anti-Backlash Nut Assembly

Parts list for the 4 ACME anti-backlash nut assemblies:

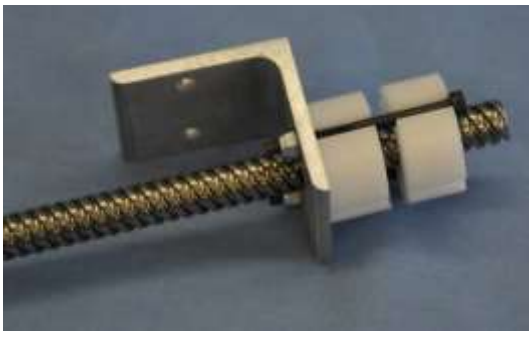
A. 4 ACME aluminum mounting brackets
B. 2 3/8-8 ACME -1 start nuts (Z axis)
C. 6 3/8-8 ACME - 4 start nuts (X and Y axis)
D. 8 M3 x 40 machine screws
E. 8 M3 nuts

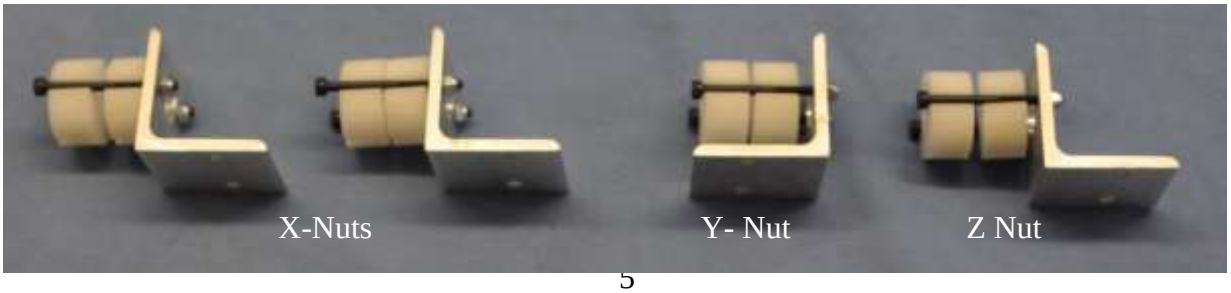
Note that as the ACME nuts wear, they can be adjusted at any time to maintain minimal backlash. When adjusting the ACME nuts ensure the ACME rod is still able to be rotated easily at the adjustment position.

Note that the Z nut assembly requires the 1 start nut and the Y nut bracket orientation is reversed.



1. Mount 2 M3 screws through the mounting brackets on the side with the large hole, and loosely install the M3 nuts.
2. Place 2 ACME nuts between the M3 machine screws, then temporarily thread the correct ACME rod through both nuts keeping them separated 1/16" to 1/8". (this is critical for Z to give full motion and to allow the Z home switch to function correctly)
3. Tighten the M3 nuts evenly until the backlash is zero while ensuring the ACME rod turns with minimal torque.
4. Remove the ACME rod.
5. Repeat steps 1 through 4 for the other 3 anti-backlash assemblies so that the result is as shown in the pictures.

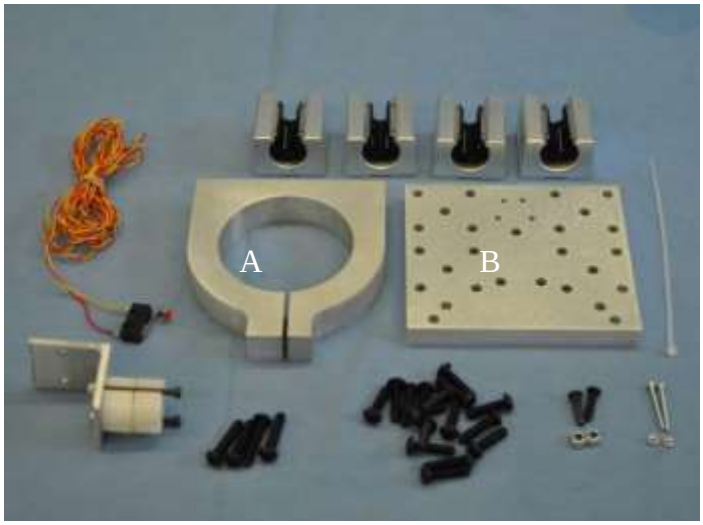




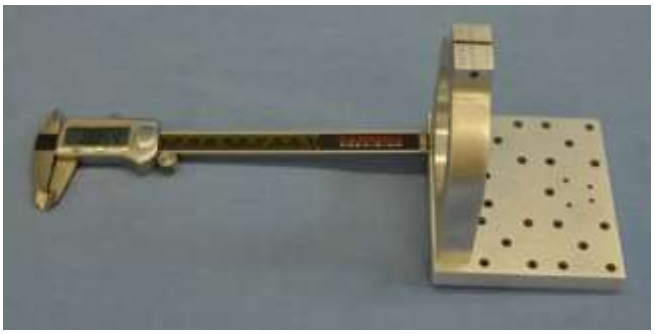
2. Spindle Mount Assembly

Parts for the spindle mount assembly include:

A. 1 spindle mount
B. 1 spindle plate
C. 4 SBR 12 bearing blocks
D. 4 M5 x 25 machine screws
E. 16 M5 x 18 machine screws
F. 2 M4 x 20 machine screws
G. 2 M4 nuts
H. 1 Z home switch
I. 2 M2.5 x 20 machine screws
J. 2 M2.5 nuts
K. 1 nylon zip tie

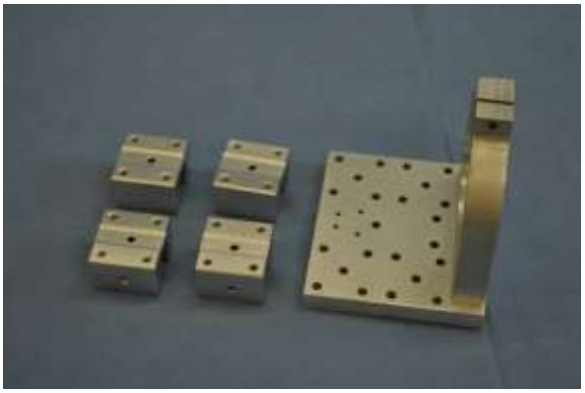


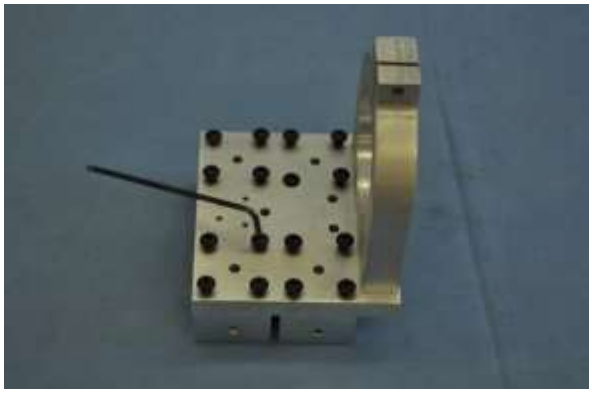
1. Install and hand tighten the spindle mount to the plate with 4 M5 x 25 machine screws.
2. Measure and align the bottom surfaces of the spindle plate and spindle mount so that the measured gap on both ends is equal.
3. Tighten the 4 M5 machine screws and check alignment (re-align if needed).



4. Mount the 4 linear bearings to the spindle mount with the M5 x 18 machine screws. Hand tighten the screws, they will be fully tightened in a later step.

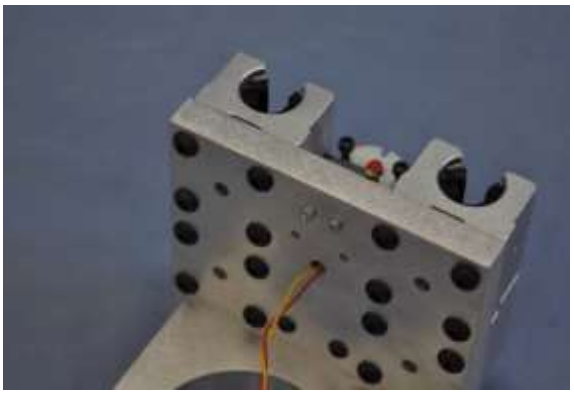
If the linear bearings have Allen screws on the sides install the bearings so that the side Allen screws are facing outward (as shown) for ease of adjustment later.



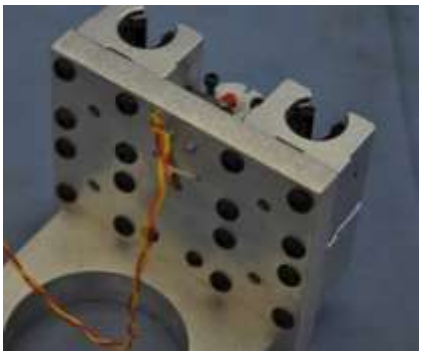


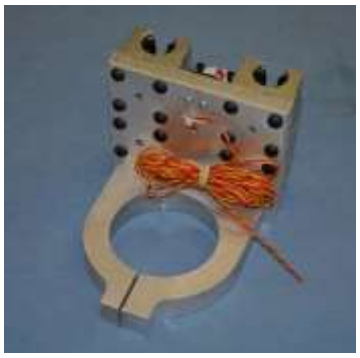
5. Install the Z ACME nut assembly as shown with 2 M4 X20 machine screws and nuts. Hand tighten the screws, they will be fully tightened later in section 5.

6. Insert the Z home switch wire into the hole as shown.
7. Install and tighten the home switch with the 2 M2.5 x 20 machine screws and M2.5 nuts.



8. Use a nylon zip tie to retain the wires.
9. Re-wrap the wire to keep it safe from damage.

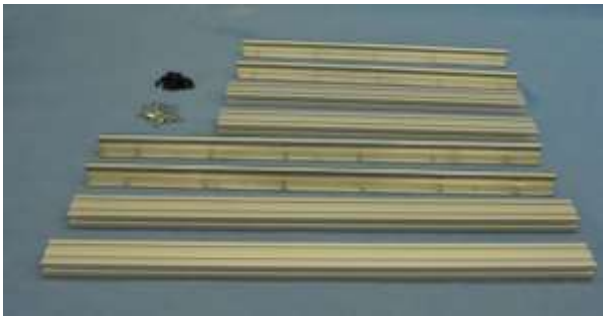




3. X and Y Linear Rail Assembly

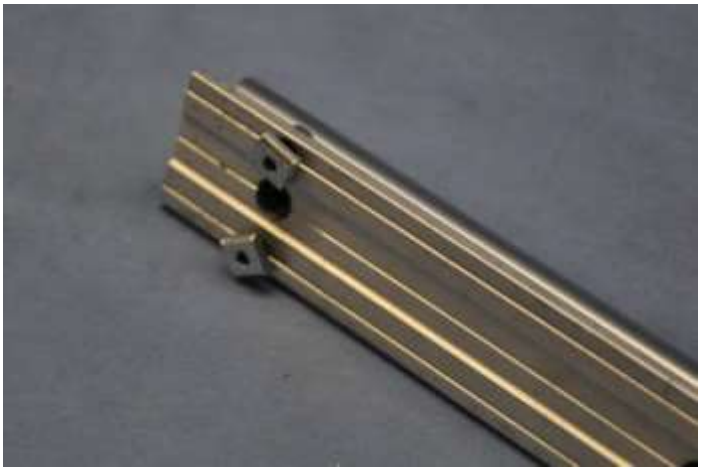
Parts list for the X and Y linear rail assembly:

A. 2 long aluminum extrusions
B. 2 short aluminum extrusions
C. 2 long SBR12 linear rails
D. 2 medium SBR 12 linear rails
E. 44 M4 T-nuts
F. 44 M4 x 8 machine screws.



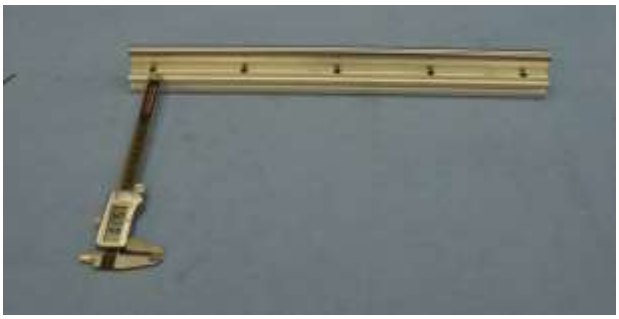
1. Insert the M4 screws through all of the linear rail mounting holes.
2. Install M4 T nuts (1 to 2 turns only) on all of the screws.

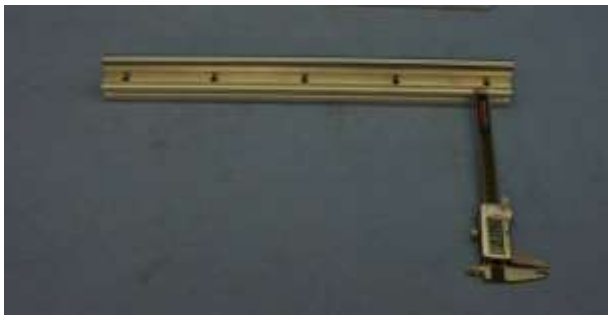
The T-nuts need to be installed with the correct orientation. (see picture).




3. Gently slide the linear rail on the large face of the extrusion while orienting each nut.

4. Hand tighten all the screws.
5. Measure and align the gap from the top surface of the rail to the top surface of the extrusion so that the measured gap is equal on both ends.



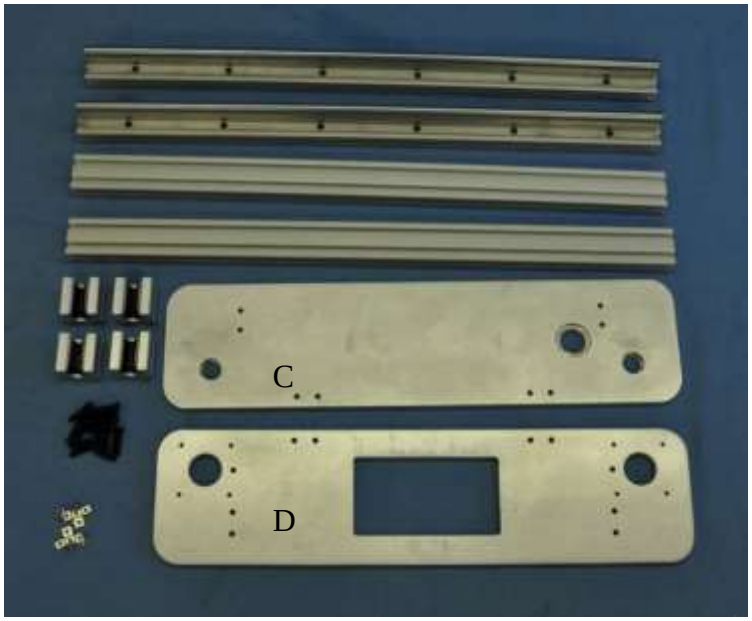


6. Tighten screws.
7. Repeat steps 1 through 6 for the other 3 rail assemblies.

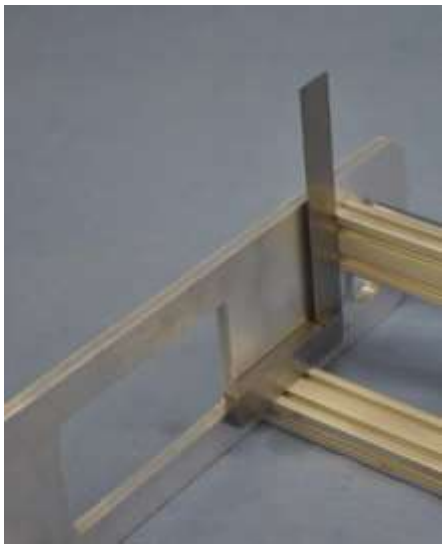
4. Base Assembly

Parts for the base assembly include:

A. 2 X rail assemblies
B. 2 base supports (long aluminum extrusions)
C. 1 front end plate
D. 1 back end plate
E. 16 M5 x 25 machine screws
F. 4 SBR 12 bearing blocks
G. 12 M4 T-nuts



1. Install the back plate to the rails with the M5 X 25 machine screws.
2. Use a flat surface and small square to align the rails.
3. Tighten the screws.

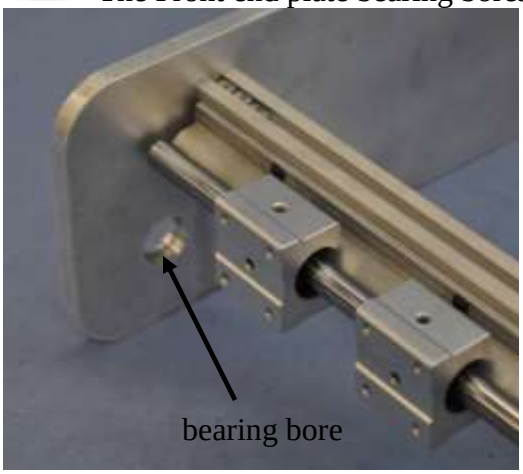


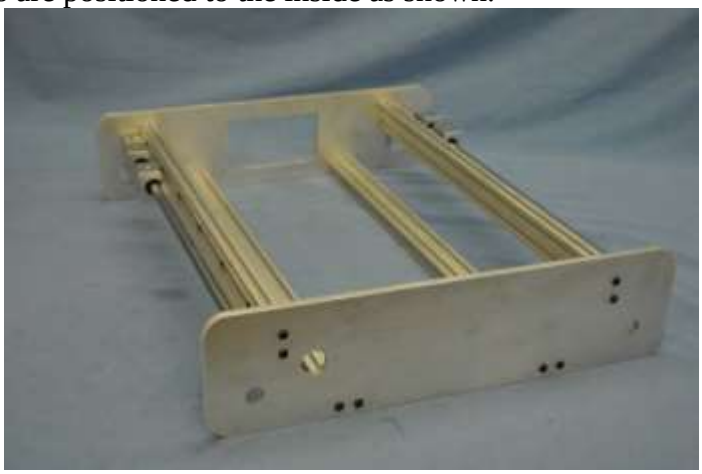
4. Slide 3 M4 T-nuts into the top of both rail assemblies (these will be used later in section 15 to fasten MFD table to the base assembly).
5. Slide 3 M4 T-nuts into the outside top of both bottom base supports (these will be used later in section 12 to fasten MFD electronic mounting board to the base assembly).
6. Carefully install 2 SBR12 linear blocks onto each rail.

If the linear bearings have Allen screws on the sides install the bearings so that the side Allen screws are facing up (as shown) for ease of adjustment later.

7. Fasten the front base plate to the rail assemblies and bottom base support with 8 M5 x 25 machine screws.
8. Check to ensure that the bearing bore is facing the inside and rails are aligned and square.
9. Tighten machine screws.

The Front end plate bearing bores are positioned to the inside as shown.

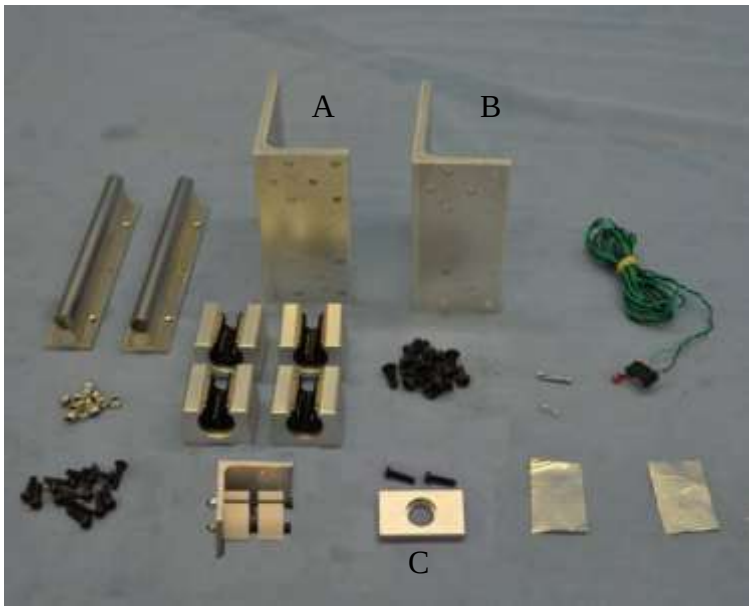




5. Y Support Installation

Parts for the Y support installation include:

A. 1 top L bracket
B. 1 bottom L Bracket
C. 1 Z bearing mount
D. 2 short SBR12 linear rails
E. 1 Y axis anti-backlash assembly
F. 14 M5 x12 machine screws
G. 2 M5 x18 machine screws
H. 14 M4 x 16 machine screws
I. 14 M4 nuts
J. 1 Y home switch
K. 2 M2.5 x 16 machine screws
L. 2 M2.5 nuts
M. 2 pieces of aluminum tape

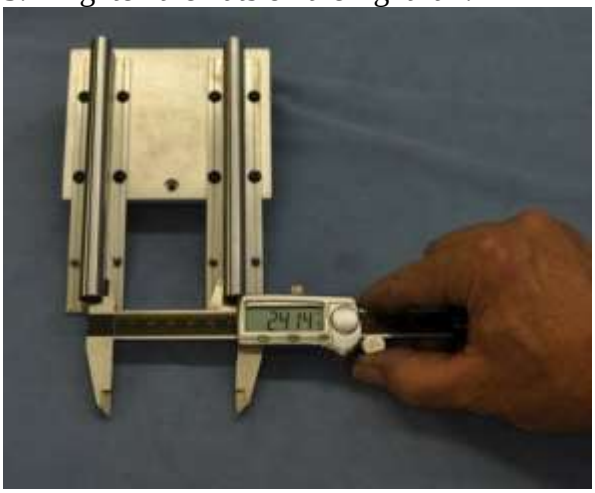


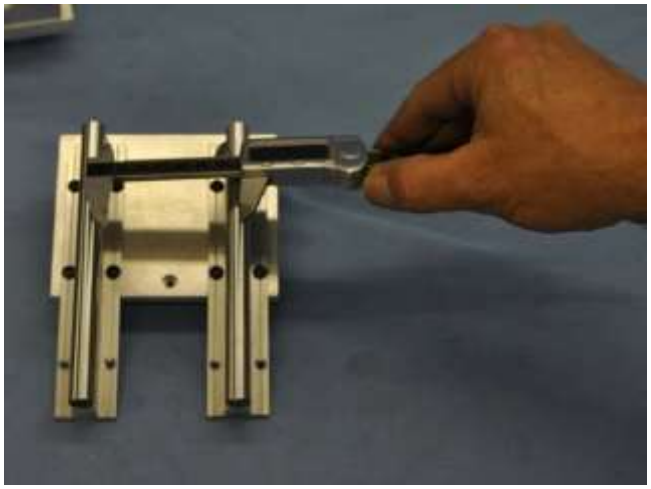
1. Install the 2 SBR12 rails to the top L bracket with 8 M4 x 16 machine screws and 8 M4 nuts.
2. Hand tighten the machine screws.
3. Use a small square to align the left rail to the L bracket top surface, then tighten the left rail.

4. Measure and align both the top and bottom of the right rail with the left rail.

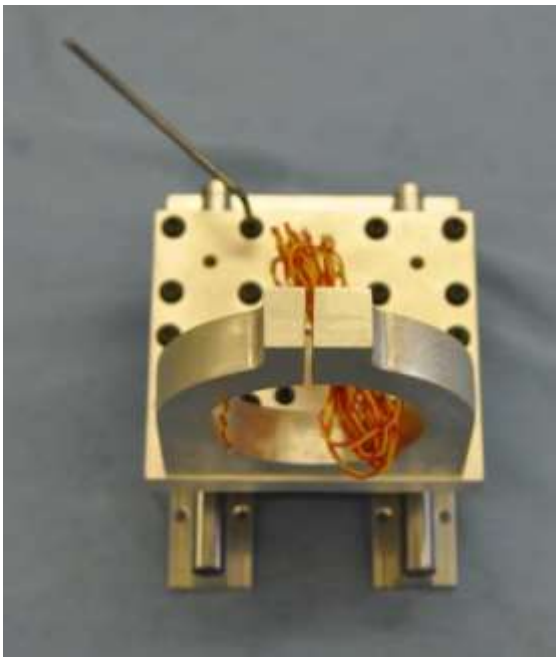
Note that the measurement between the 2 rails calculates to be 2.41".

5. Tighten the nuts on the right rail.

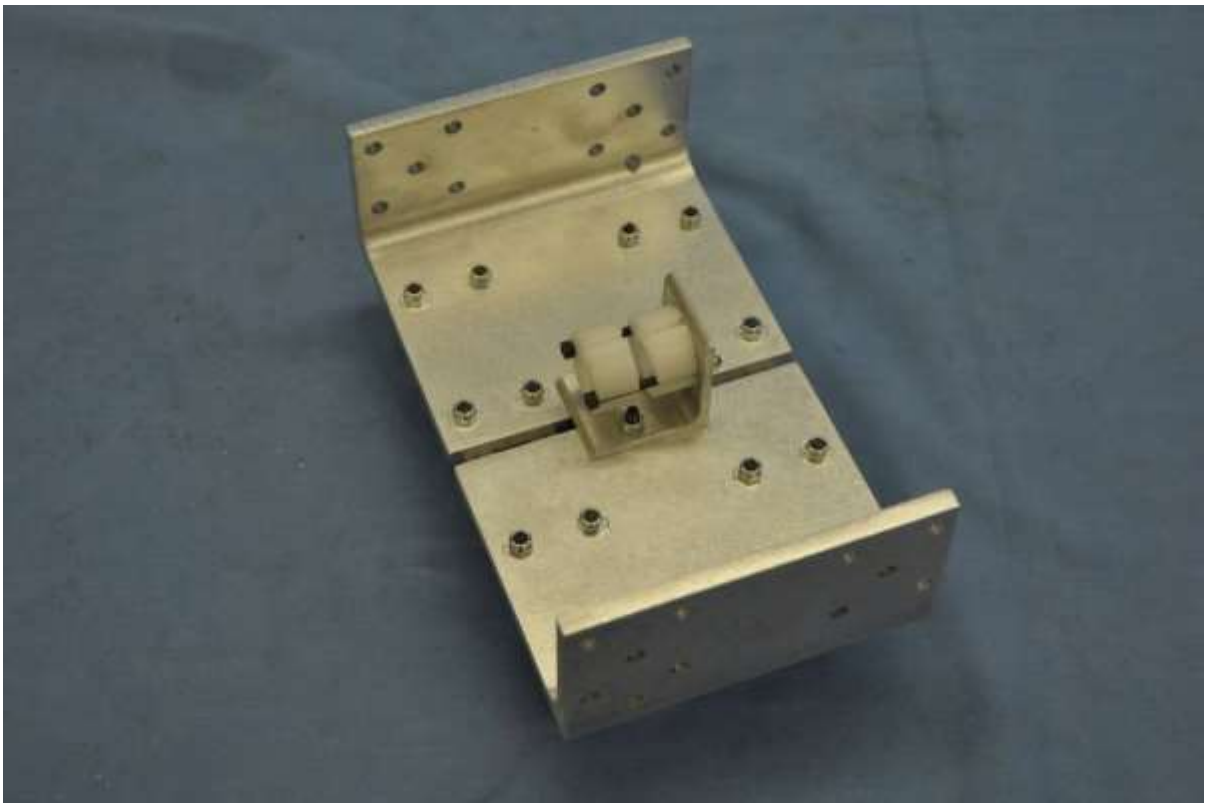




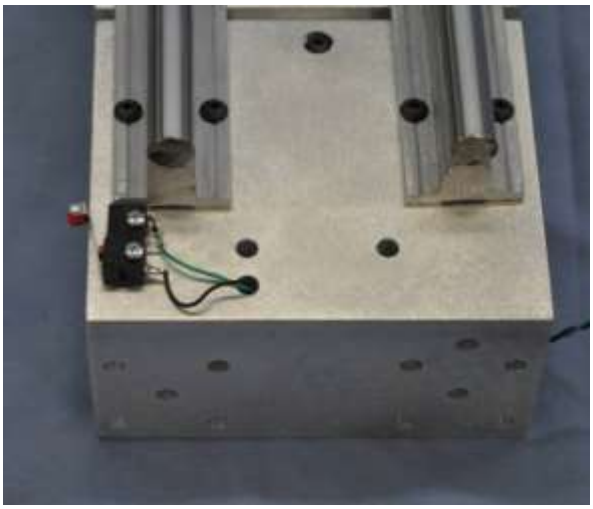
6. Gently place the spindle mount assembly on the rails and slide it back and forth a few times.
7. Tighten the M5 screws on the spindle assembly
8. Remove the spindle assembly.
9. Install the bottom L bracket with 4 M4 x 16 machine screws and nuts.
10. Hand tighten the screws, they will be fully tightened later in section 6.

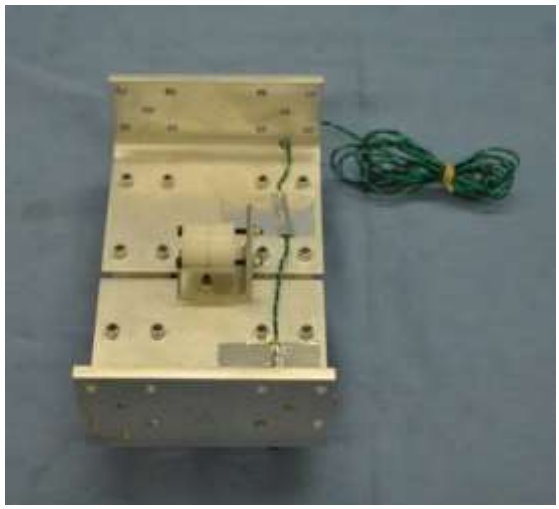


11. Install the Y axis anti-backlash nut assembly as shown with 2 M4 x 16 and 2 M4 nuts.
12. Hand tighten the screws, they will be fully tightened in a later step.

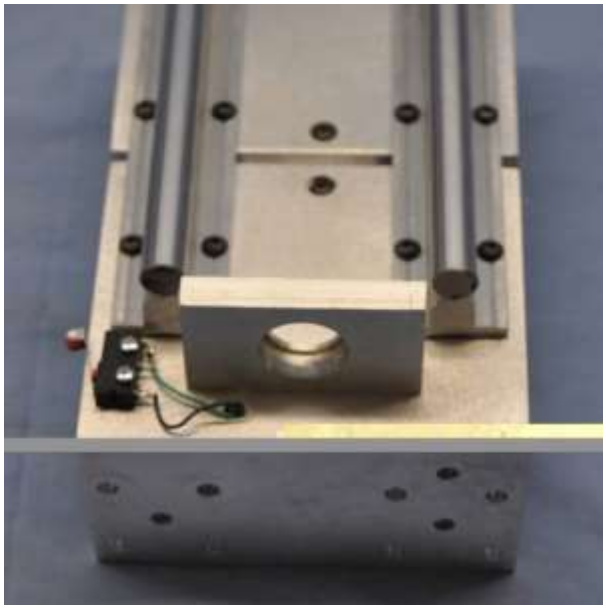


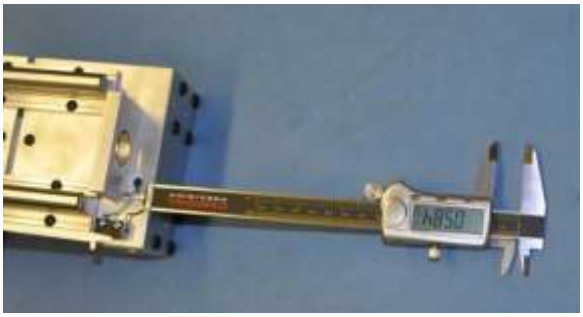
13. Feed wire through the holes as shown.
14. Install and tighten the Y Home switch with 2 M2.5 x16 machine screws and M2.5 nuts.
15. Use aluminum tape to retain the wires as shown
16. Re-wrap the wire to keep it safe from damage.



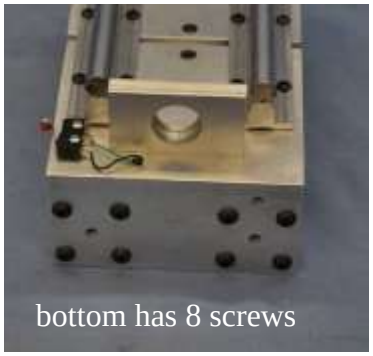


17. Install the Z bearing mount as shown (bearing bore facing downward) with 2 M5 x 18machine screws.
18. Hand tighten all the nuts.
19. Measure and align the Z bearing mount so that the measured gap is equal.
20. Tighten the Z bearing mount machine screws.





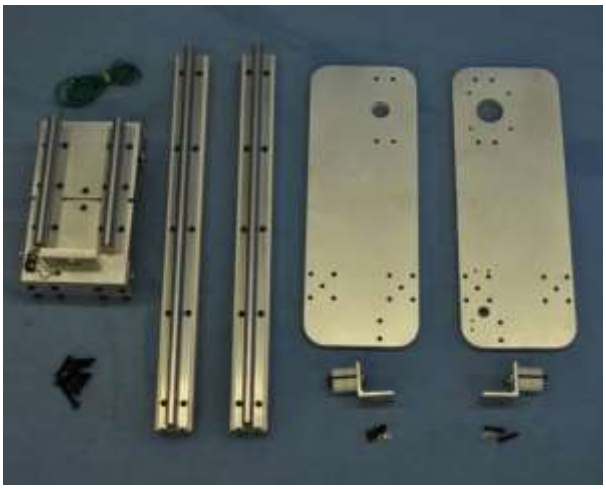
21. Install the 4 bearing blocks as shown with 14 M5 x 16 machine screws.
22. Hand tighten the screws, they will be fully tightened later in section 6.



6. Gantry assembly

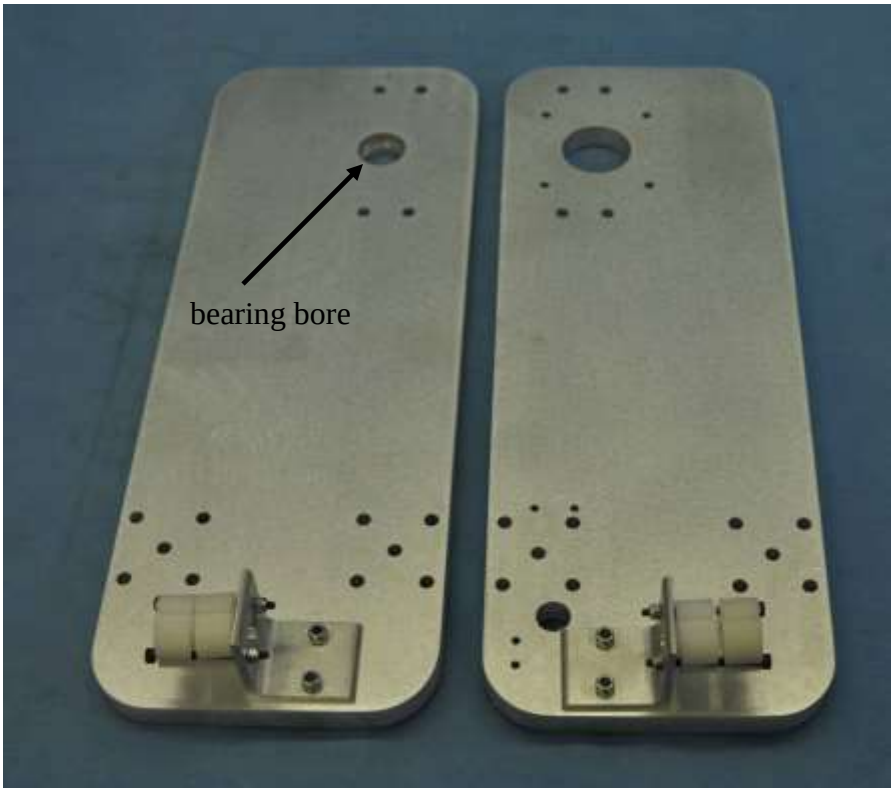
Parts for gantry assembly include:

A. 1 left side plate
B. 1 right side plate
C. 2 Y linear rail assemblies
D. 8 M5 x 25 machine screws
E. 2 X anti-backlash nut assemblies
F. 4 M4 x 20 machine screws
G. 4 M4 nuts

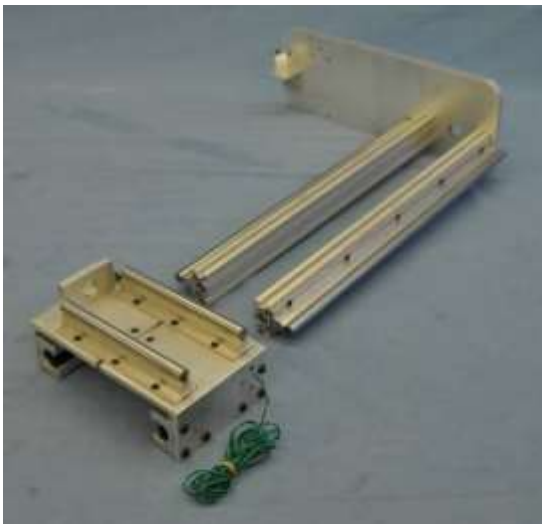


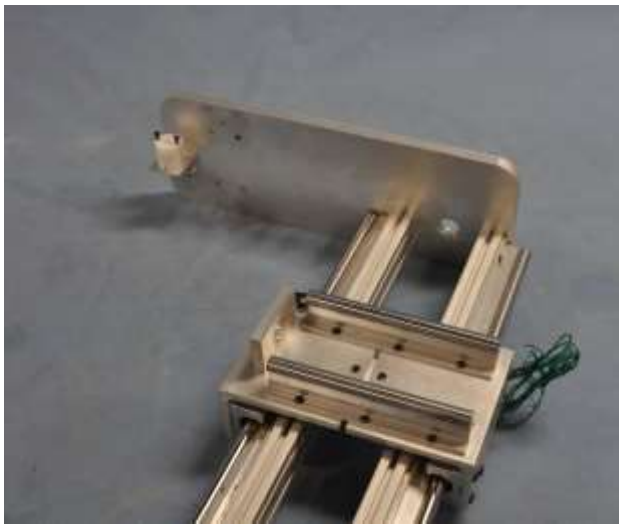
1. Install the anti-backlash nut assemblies as shown with the M4 x 20 machine screws and nuts.
2. Hand tighten the screws, they will be fully tightened in a later step.

Note the bearing bore orientation on the left plate is on the same side as the anti-backlash assembly.



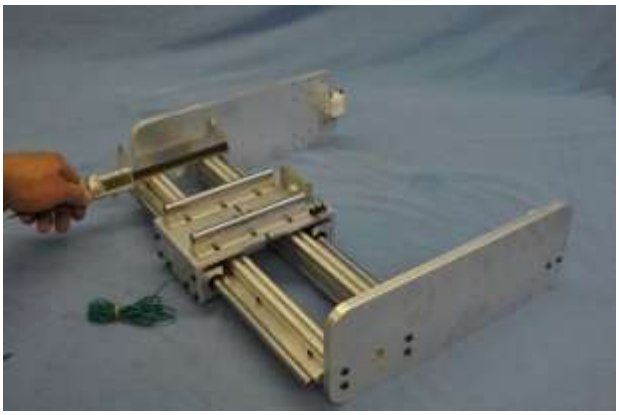
3. Install 4 M5 x25 machine screws as shown to hold the Y rail assemblies to the side plate.
4. Gently slide the Y support onto the rails.

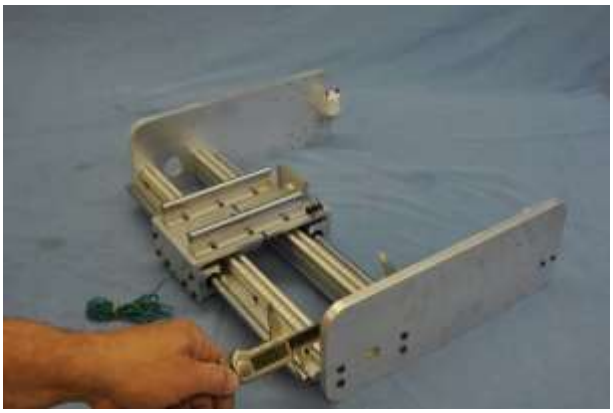




5. Install 4 M5 x25 machine screws to the remaining side plate.
6. Hand tighten the screws, they will be tightened up in a later step

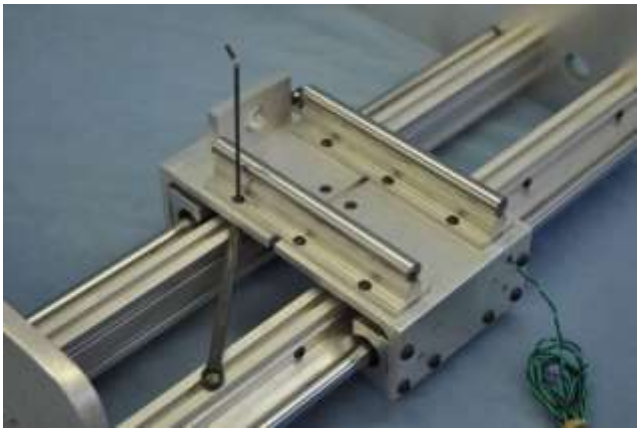
7. With the assembly on a flat surface, measure and align the Y rails.





8. Tighten the 4 M5 x 18 machine screws on both gantry side mounts.

9. Slide the Y support back and forth to ensure smooth movement
10. Tighten the 4 bottom rail M4 machine screws.



11. Measure and align the distance from the rail surface to the front face of the Y supports at all 4 corners as shown.
12.

13. Tighten the 14 M5 screws (check alignment and re-adjust if necessary).

7. Gantry Installation

Parts list for gantry installation include:

A. 1 base assembly
B. 1 gantry assembly
C. 16 M5 x 18 machine screws

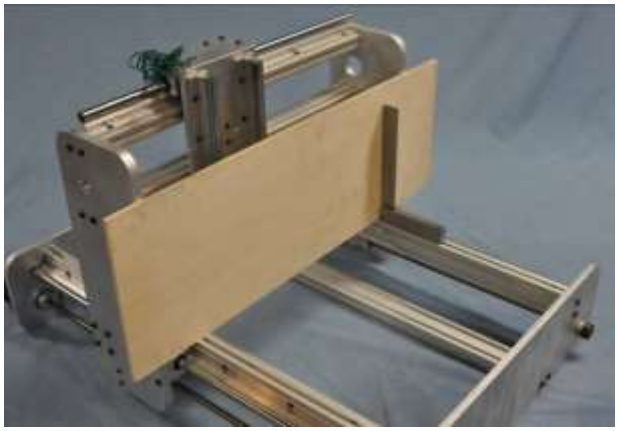
The threads in the aluminum blocks can be damaged easily. Start all machine screws by hand to avoid cross threading the aluminum blocks

1. Gently place the gantry into position by lifting one side of the base to give clearance for the anti-backlash assemblies.

2. Tilt the gantry back to align and insert the first M5 x 18 machine screws on each side.

3. Gently pivot the gantry into position and install the remaining 14 M5 x 20 machine screws.

4. Hand tighten the machine screws
5. Use a square to align the side plates.

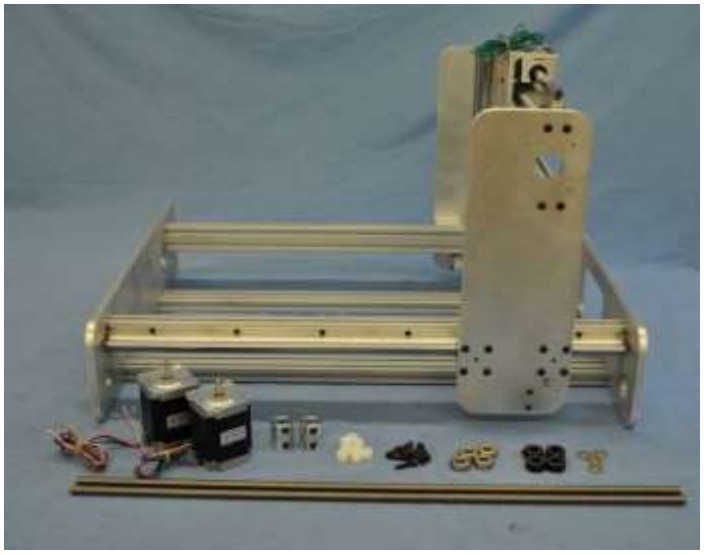


6. Measure and align the bottom of the Y rail to the X rail surface.

7. Tighten the 16 M5 x 18 machine screws. (check alignment)

8. The gantry should slide along the X axis with little effort.

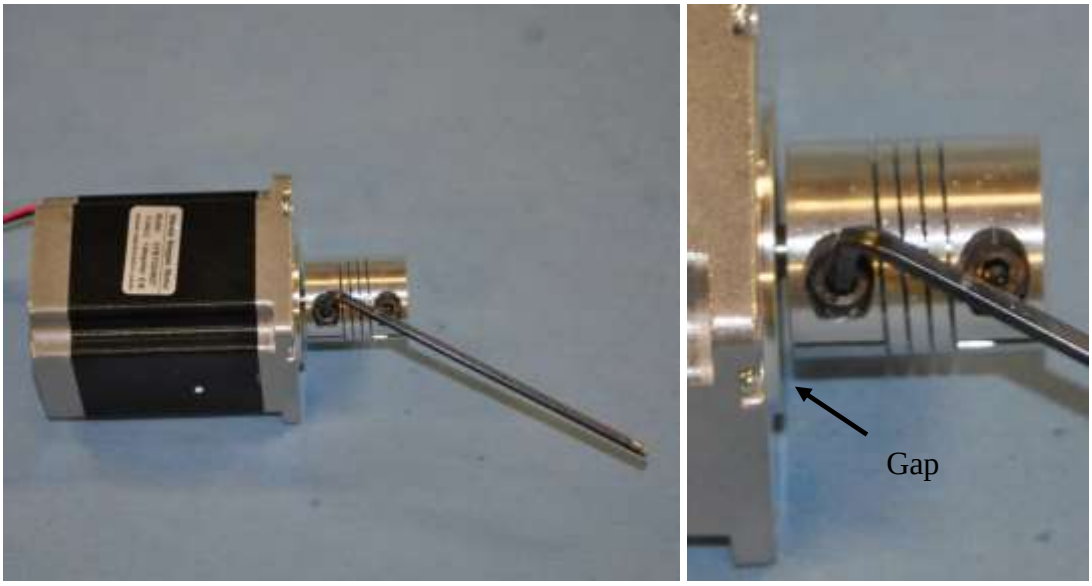
8. X ACME rod Assembly



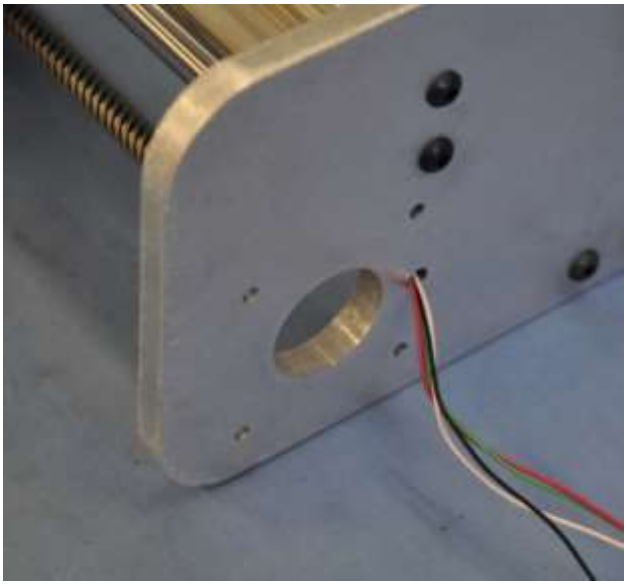
Parts for the ACME rod assembly include:

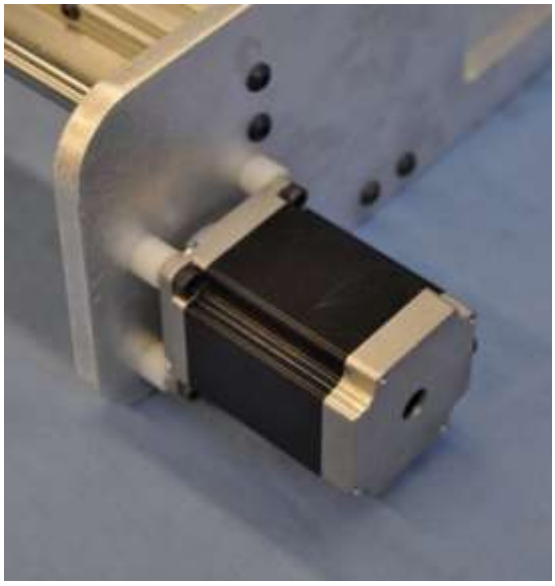
A. 2 long ACME rods
B. 2 Helical couplers
C. 4 deep groove bearings
D. 4 thrust washers
E. 4 locking collars
F. 2 X - NEMA 23 stepper motors
G. 8 plastic spacers
H. 8 M5 x 20 socket head machine screws

1. Install and tighten the helical coupler to the stepper motor shaft.
2. Ensure that there is clearance between the stepper motor and coupler face as shown.



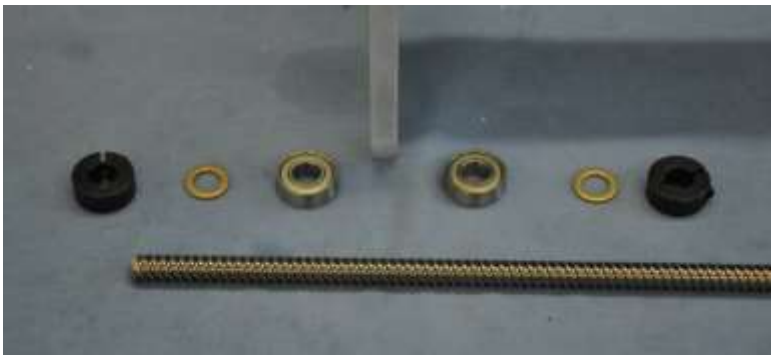
3. Insert the stepper motor wires through the hole as shown
4. Install and tighten the M5 x 20 socket head machine screws into the stepper motor mounting holes, through the spacer into the back plate as shown.
5. Re-wrap the stepper motor wires to keep them safe from damage.





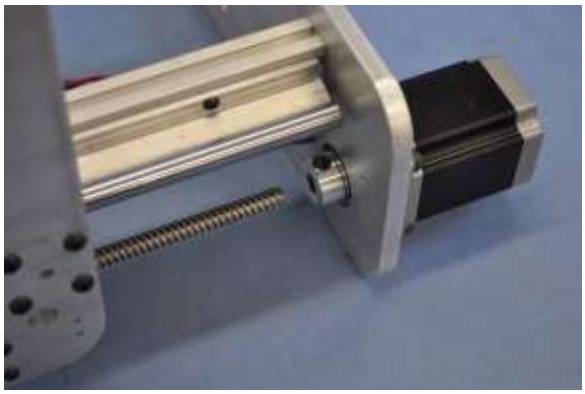
The order is important and is repeated on each axis. The order is as follows:

- Locking collar
- Washer
- Bearing
- Plate
- Bearing
- Washer
- Locking collar



6. Insert the X ACME rod into the front end plate.
7. Insert the bearing, thrust washer, and locking collar as shown.

8. Thread the ACME Rod into the ACME nut, ensuring that the 2 nuts are separated, until there is plenty of rod on the other side.
9. Insert the ACME rod into the helical coupler.
10. Tighten the set screw on the helical coupler clamping the ACME rod.

11. Move the inner locking collar, thrust washer, and bearing against the back plate.
12. Tighten the inner locking collar.
13. Insert the outer bearing, thrust washer, then locking collar.
14. Hold the locking collars firmly together while tightening the outer locking collar.



15. Repeat steps 1 thru 14 for the remaining X ACME rod.

The ACME rod should have zero axial motion. If there is motion, loosen the outer collar and repeat step 14.

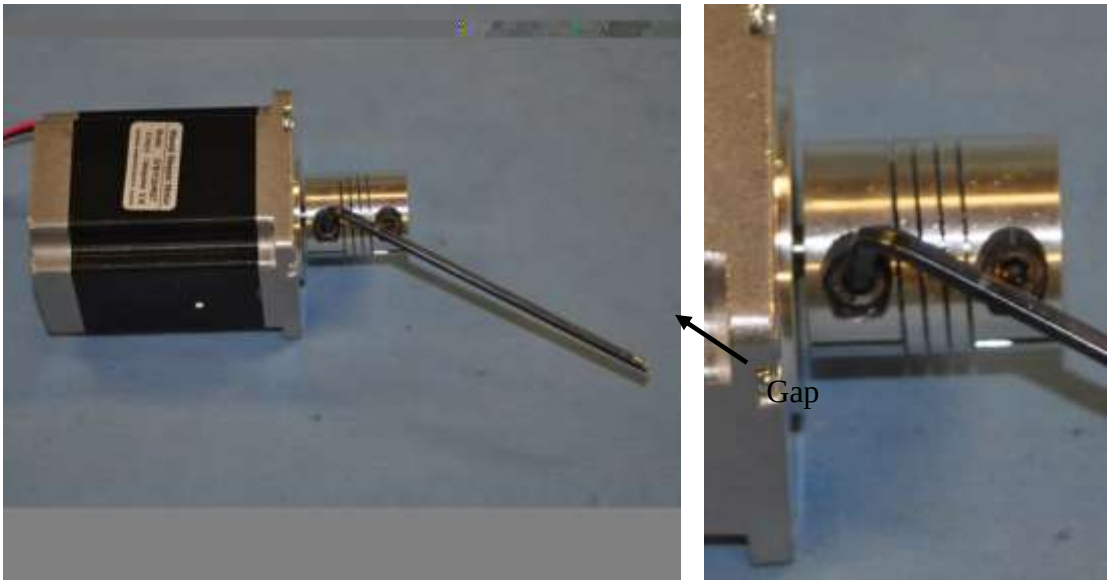
16. Tighten the ACME mounting M4 machine screws and nuts on both sides.

9. Y ACME rod Assembly

Parts for the ACME rod assembly include:

I. 1 medium length ACME rod
J. 1 helical coupler
K. 2 deep groove bearings
L. 2 thrust washers
M. 2 locking collars
N. 1 Y - NEMA 23 stepper motor
O. 4 spacers
P. 4 M5 x 20 socket head machine screws

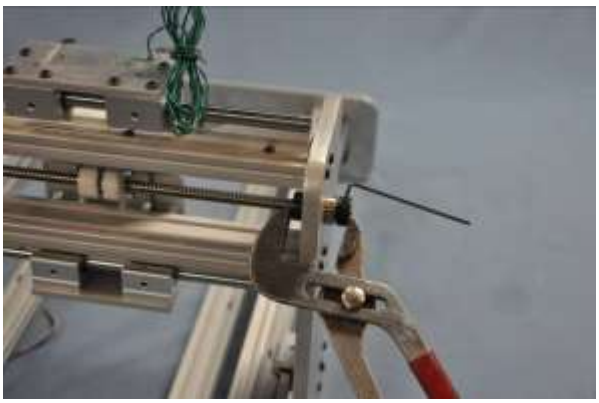
1. Install and tighten the helical coupler to the stepper motor shaft.
2. Ensure that there is clearance between the stepper motor and coupler face as shown.

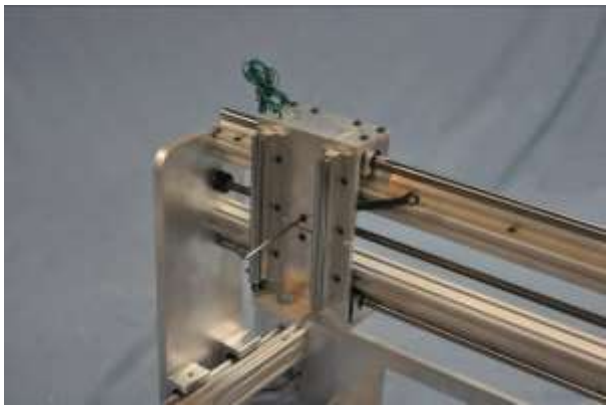


3. Install and tighten the M5 x 20 socket head machine screws into the stepper motor mounting holes, through the spacer into the side plate as shown.

4. Insert the bearing, thrust washer, and locking collar as shown.
5. Thread the ACME Rod into the ACME nut, ensure that the 2 nuts are separated, until there is plenty of rod on the other side.
6. Insert the ACME rod into the helical coupler.
7. Tighten the set screw on the helical coupler clamping the ACME rod.

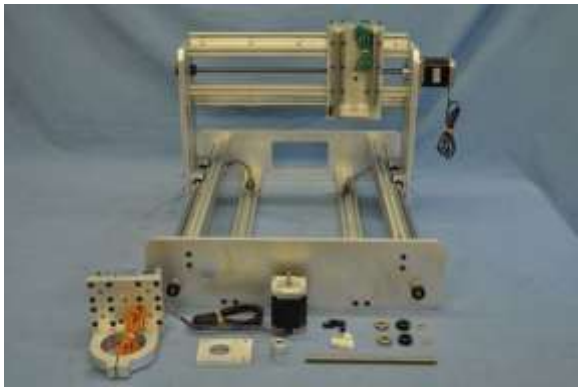
8. Move the inner locking collar, thrust washer, and bearing against the back plate.
9. Tighten the inner locking collar.
10. Insert the outer bearing, thrust washer, then locking collar.
11. Hold the locking collars firmly together while tightening the outer locking collar.
12. Tighten the 2 ACME mounting M4 machine screws and nuts.





The ACME rod should have zero axial motion. If there is motion, loosen the outer collar and repeat steps 11 and 12.

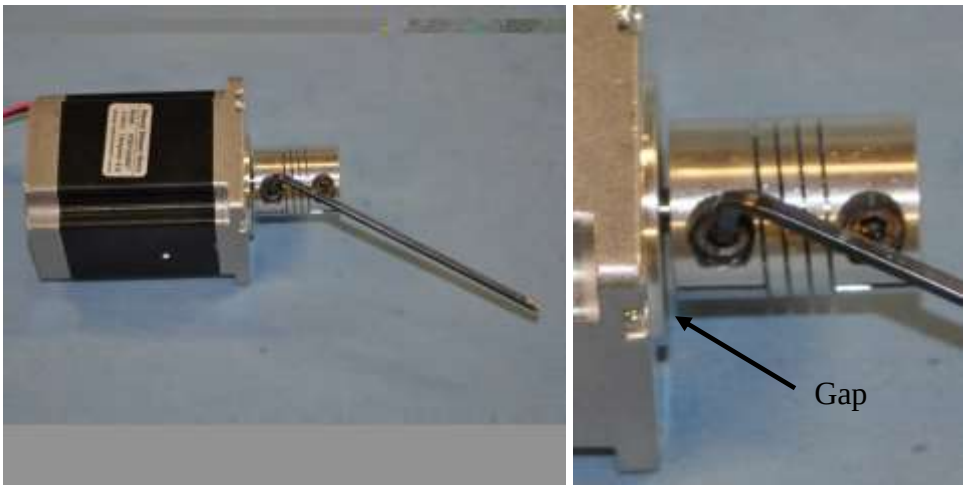
10. Z ACME rod Assembly



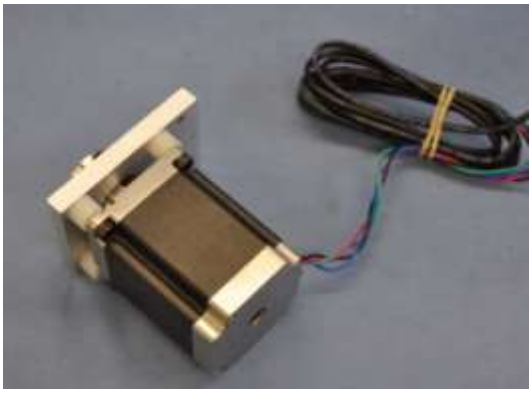
Parts for the ACME rod assembly include:

A. 1 spindle mount assembly
B. 1 short ACME rod
C. 1 helical coupler
D. 2 deep groove bearings
E. 2 thrust washers
F. 2 locking collars
G. Z stepper mounting plate
H. 1 Z -NEMA 23 stepper motor
I. 4 spacers
J. 4 M5 x 20 socket head machine screws
K. 2 M5 x 20 machine screws

1. Install and tighten the helical coupler to the stepper motor shaft.
2. Ensure that there is clearance between the stepper motor and coupler face as shown.

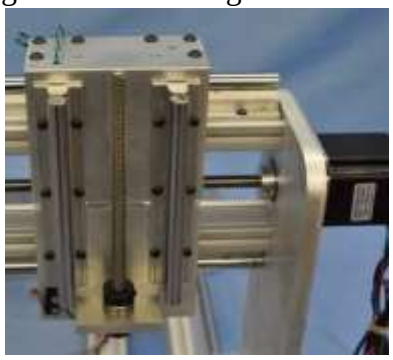


3. Install and tighten the M5 x 20 socket head machine screws into the stepper motor mounting holes, through the spacer into the z mounting plate as shown.



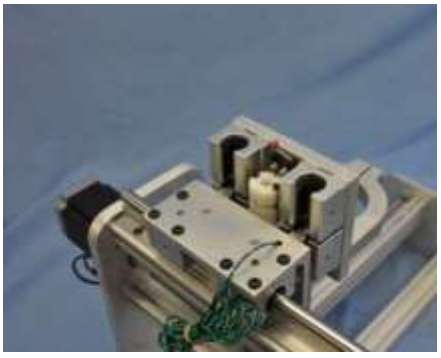
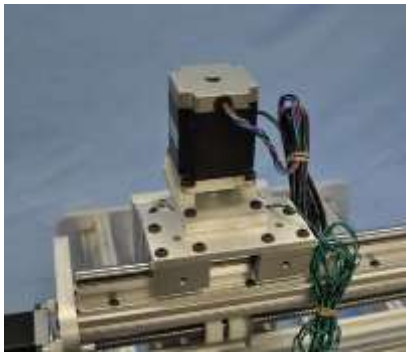
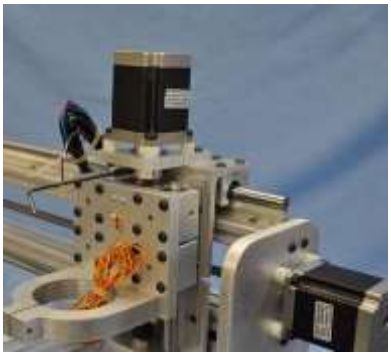
4. Insert a bearing, thrust washer, then locking collar onto the ACME rod.
5. Tighten the set screws and insert through the Z bearing mount.
6. Insert a bearing, thrust washer, then locking collar onto the top of the Z bearing mount.
7. Hold the locking collars firmly together while tightening the outer locking collar.



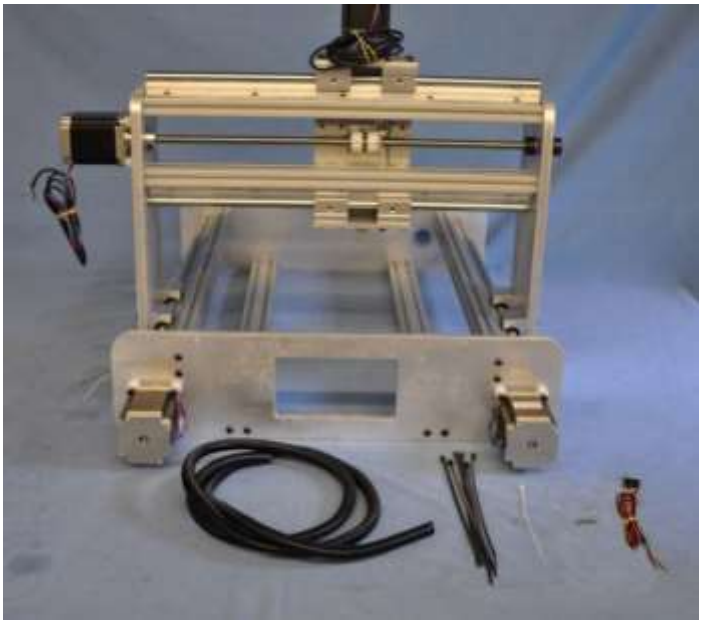


The ACME rod should have zero axial motion. If there is motion, loosen the outer collar and repeat steps 4 and 5.

8. Tighten the Y ACME mount M4 machine screws and nuts.
9. Carefully slide the spindle mount assembly onto the routers Y assembly
10. Thread the ACME rod through the anti-backlash nut assembly keeping a gap between the 2 ACME nuts.
11. Install and tighten the Z stepper motor assembly with 2 M5 x 20 machine screws.
12. Tighten the set screw on the helical coupler.

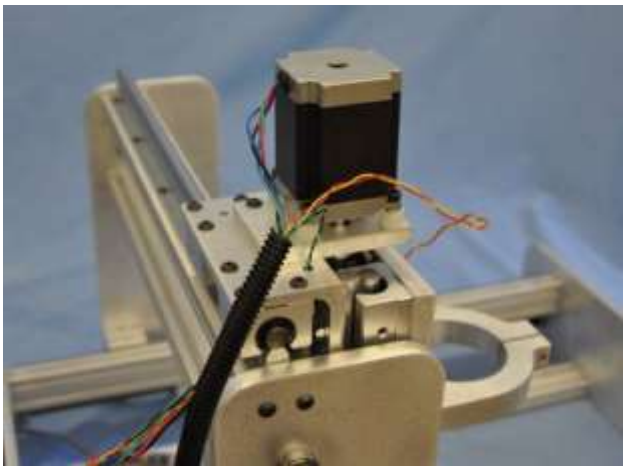
11. Electrical Routing

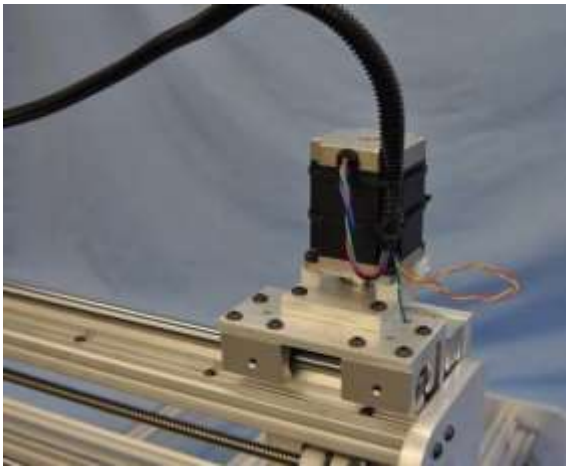


Parts for the electrical routing include:

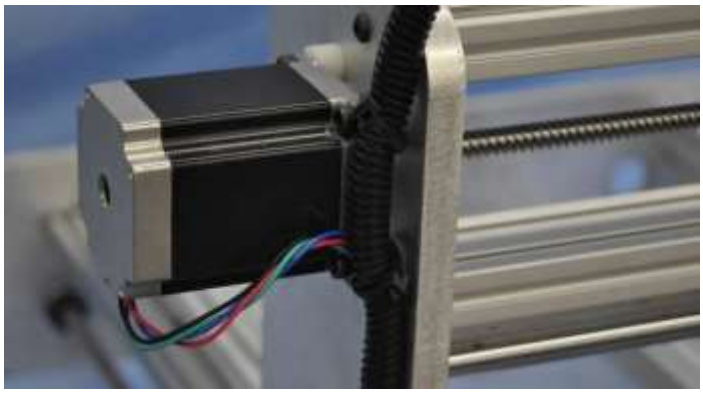
A. 1 router assembly
B. 1 corrugated sleeve
C. 10 nylon zip ties
D. 1 X home switch
E. 2 M2.5 x 20 machine screws
F. 2 M2.5 nuts

1. Insert the Z stepper wires, and both sets of home switch wires into flexible sleeve.
2. Use 2 sets of nylon ties to wrap the Z stepper motor and support the sleeve as shown.

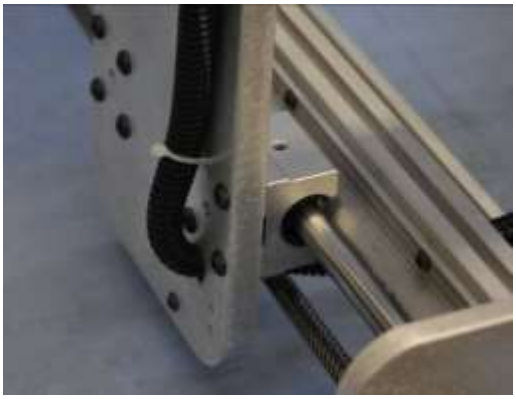
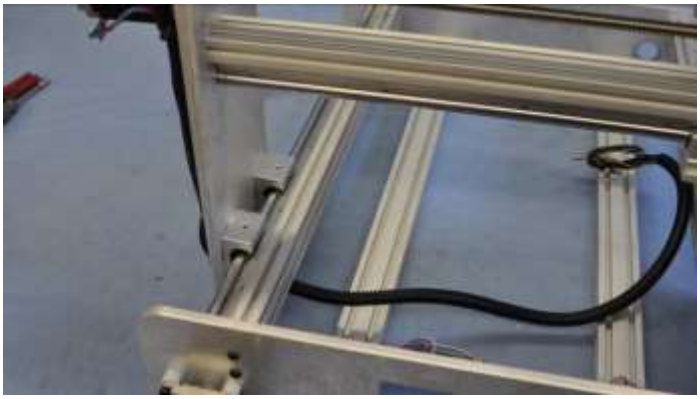




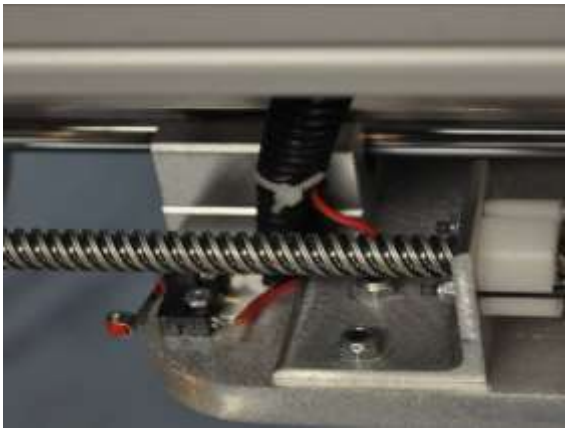
3. Ensure that the sleeve has ample room for the Y motion, then use nylon zip ties to fasten it to the Y Stepper motor mounts as shown.

4. Insert the sleeve through the bottom hole as shown. Note that this is a tight fit and spiraling the sleeve will allow for easy installation.
5. Align the sleeve and retain it with the nylon tie as shown.

6. Install and tighten the home switch with the 2 M2.5 x 20 machine screws and M2.5 nuts as shown.
7. Insert the home switch wire into the sleeve and fasten nylon tie to retain the wire as shown.
8. Adjust wires so that they do not interfere with the ACME screw.

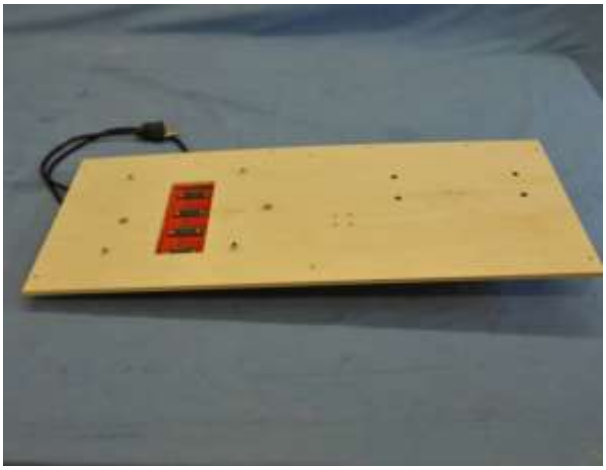



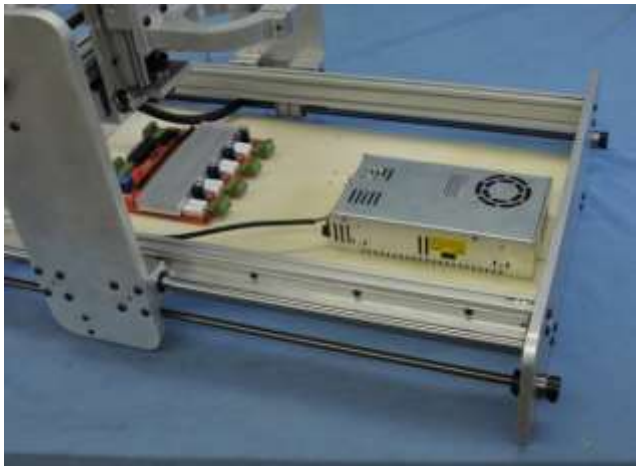
12. Mounting Board Installation

Parts list for gantry installation include:

A. 1 electronic mounting board
B. 1 controller board
C. 1 power supply
D. 4 M4 x 8 machine screws
E. 10 M4 x 12 machine screws
F. 4 M4 x 16 machine screws
G. 4 M4 nuts

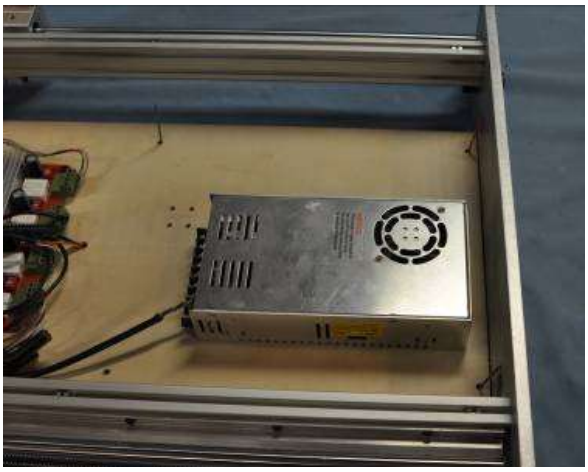
1. Fasten the power supply with 4 M4 x 8 machine screws as shown.
2. Gently fasten the control board with 4 M4 x 14 machine screws and M4 nuts.

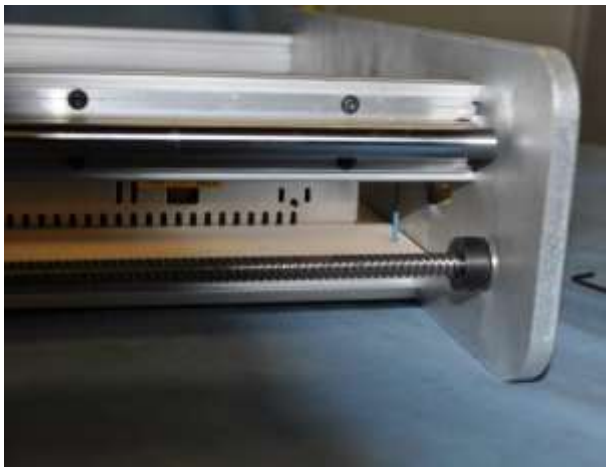


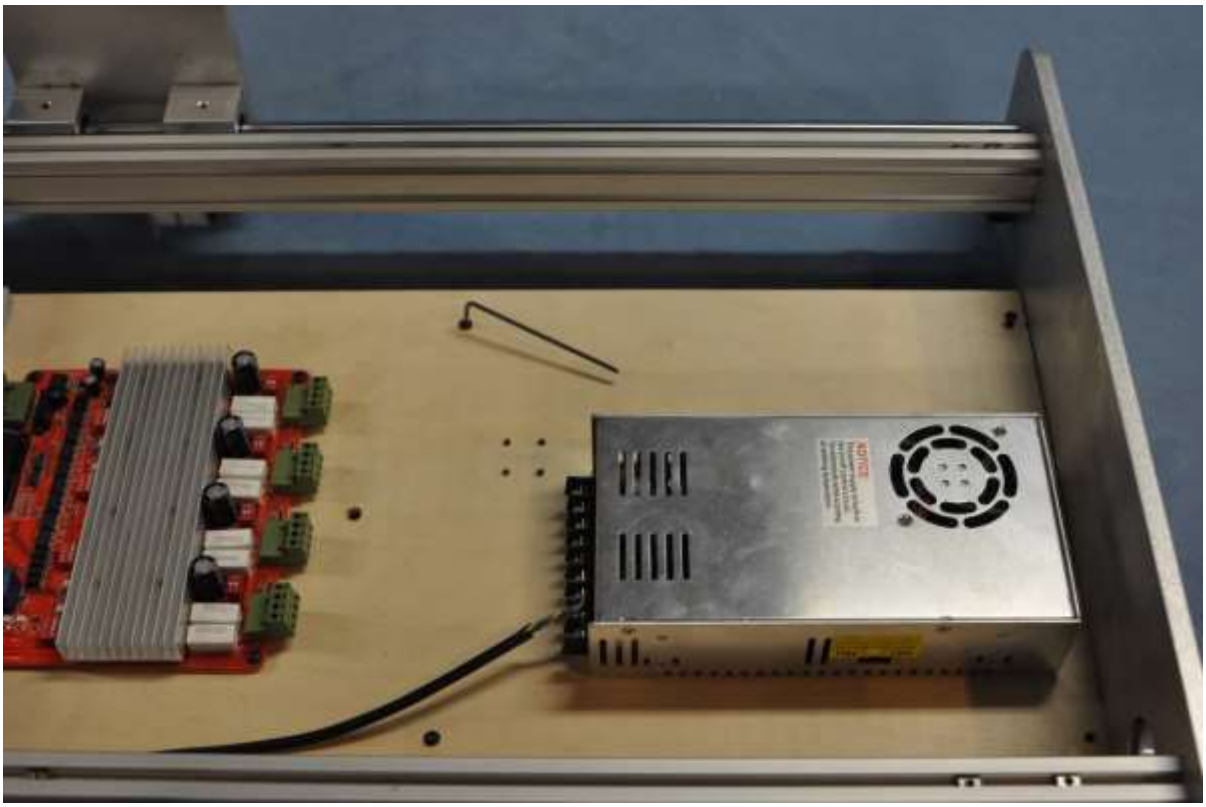


Be careful not to tighten the control board too tight as it will deflect and damage the board.

3. Hold up each side and align each of the T- nuts (installed in section 4) to each hole using the tooth pick.
4. Place the electronic mounting board into position,
5. Start all of the M4 x 16 machine screws, then tighten each of them.







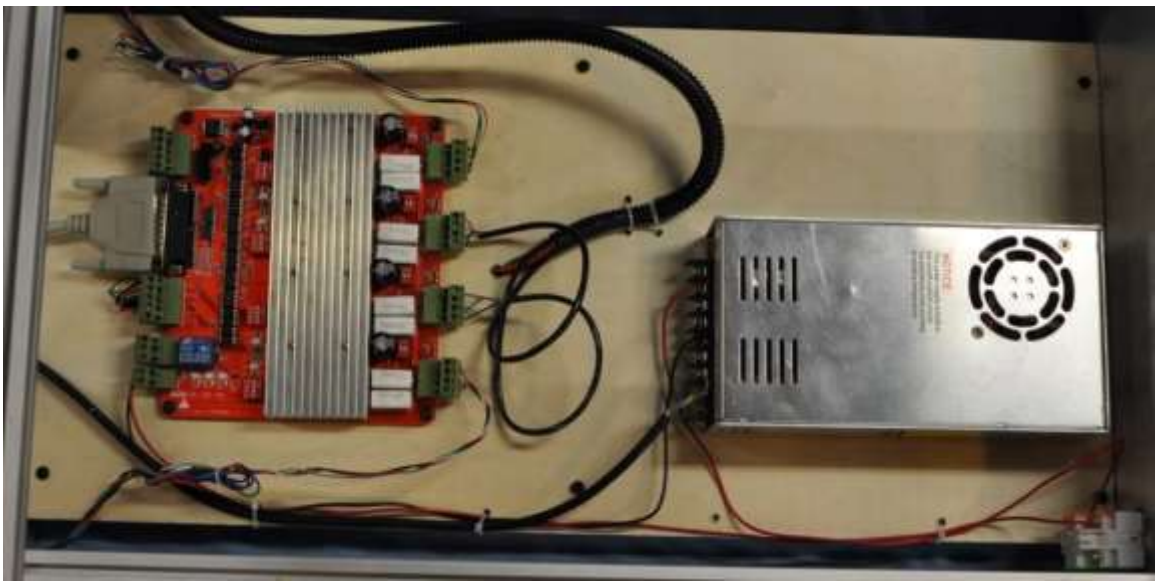
13. Connecting the electronics

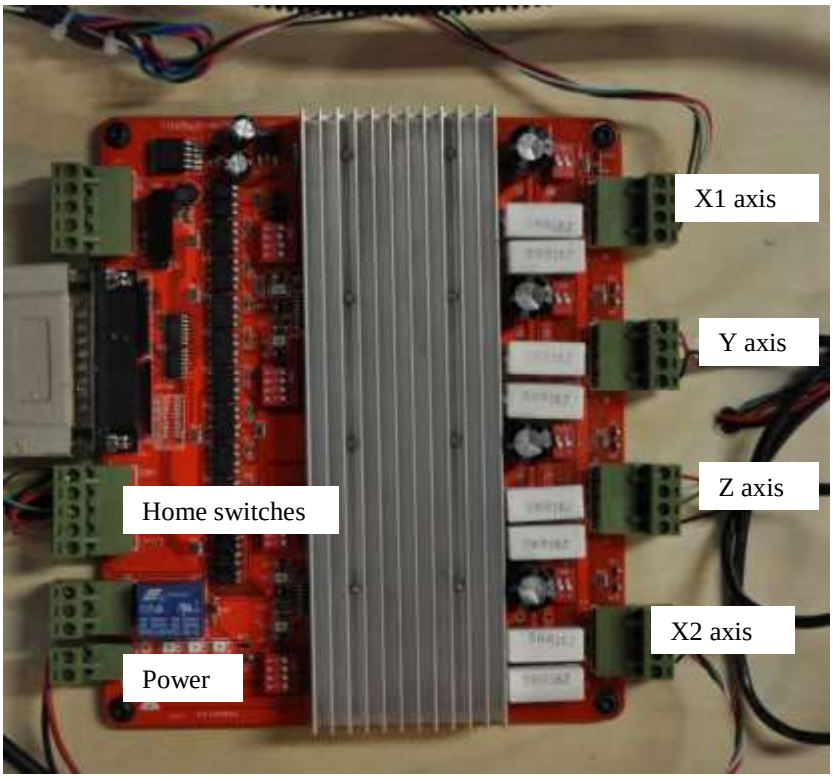
Parts list connecting the electronics include:

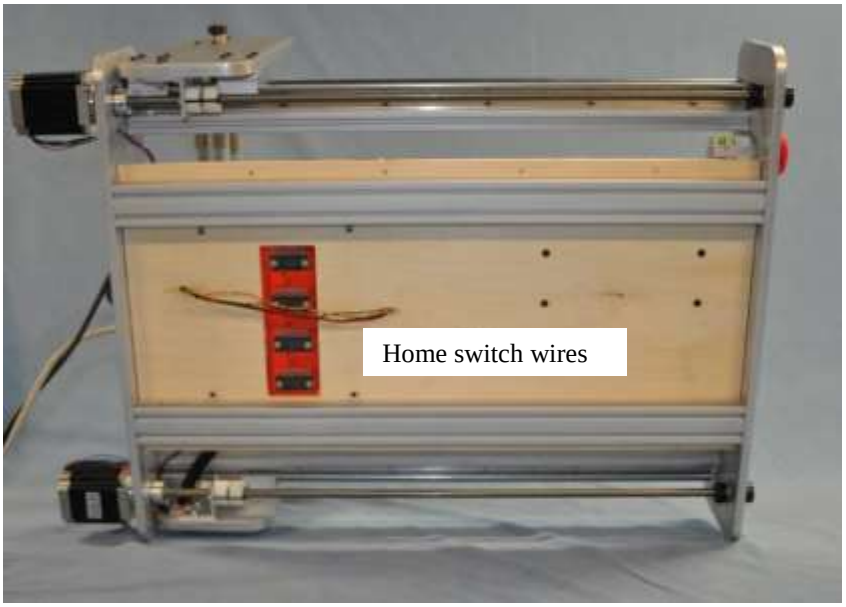
A. 10 nylon zip ties
B. Emergency stop switch
C. Hook up wire

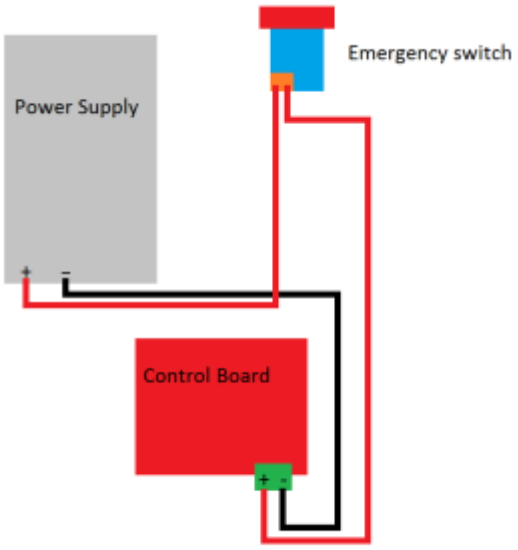
1. Install the emergency stop switch through the front mounting hole.
2. Insert the rubber washer, then install the nut and then red button.

3. Connect the power supply, emergency stop, stepper motors and home switches.
4. Use the nylon ties to neatly bundle the wires.




X1 axis
Y axis
Z axis
X2 axis
Home switches
Power


Home switch wires



Emergency stop switch will stop the power to the stepper motor. In this configuration the spindle will still have power. Please note that there is a relay on the board to turn on/off the spindle that can be connected using a high current relay. See controller board manual for details.

14. Initial Setup

The controller board manual has a section for setting up Mach software. My personal preference is LinuxCNC. I have included a LinuxCNC configuration file on my page. The configuration file uses 1/8 micro-stepping.

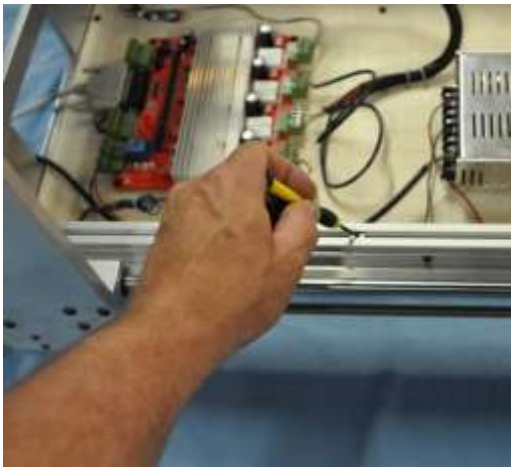
1. Connect the parallel port to the controller and turn on your computer.
2. Open the CNC software.
3. Plug in the Power supply and jog the machine. The sleeve containing the wires should move freely and not bind or come in contact with the moving parts. Adjust sleeve by rotating it at the nylon tie location until it moves correctly.

15. Mounting the Spoil-board

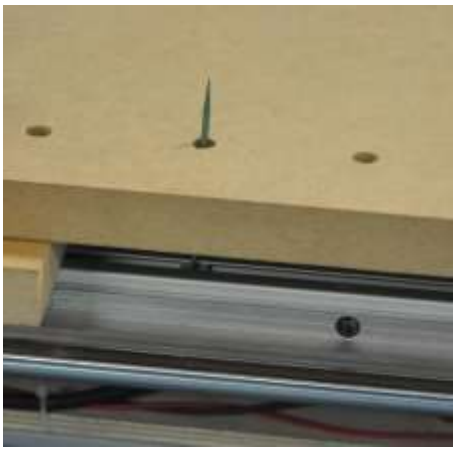
Parts for mounting the spoil-board include:

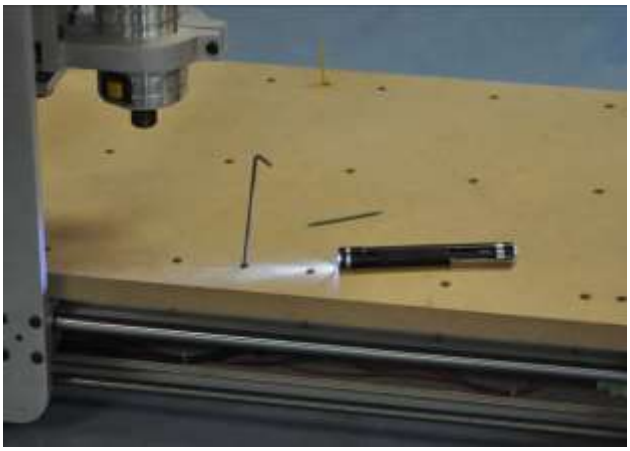
A. 1 router assembly
B. 1 spoil- board
C. 6 M4 x 12 machine screws

1. Position the T-nuts to the correct position.(installed in a section 4).
2. Place the spoil board onto the frame and place a toothpick in each of the 6 mounting holes.



3. Hold up each side and align each of the nuts to each hole using the tooth pick.
4. Place the spoil-board into position, then using a flashlight align each nut with the hole.
5. Start all of the M4 x 16 machine screws, then tighten each of them.



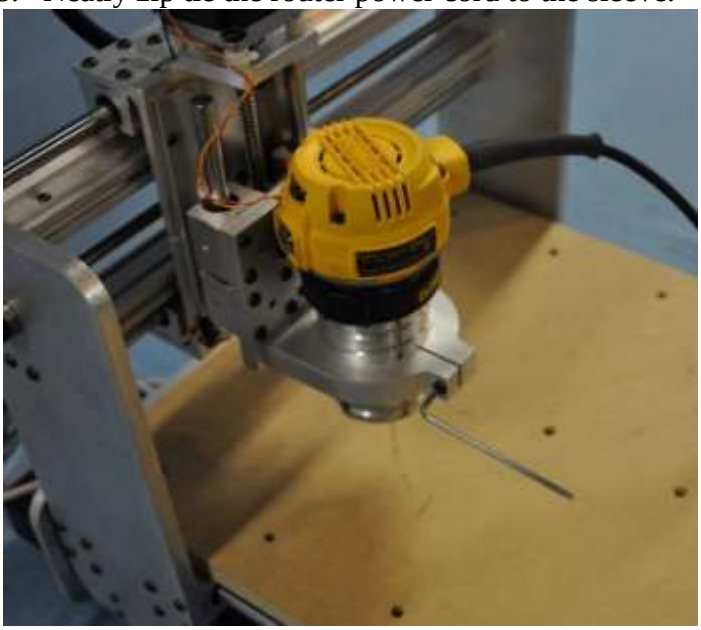


16. Mounting the DeWalt 611 Router

Parts for mounting the DeWalt 611 router include:

A. 1 router assembly
B. 1 DeWalt 611 router (not included)
C. 1 M5 x 25 machine screw
D. 10 nylon zip ties

1. Insert the DeWalt 611 router into the mount.
2. Insert and tighten the M5 x 25 machine screw to clamp the router.
3. Neatly zip tie the router power cord to the sleeve.



Tips for using the KL3

- Always unplug the router before changing the bits.
- The router's height can be adjusted with the M5 x25 machine screw so that the bit touches the spoil-board at the router's lowest position.
- Soft limits can be set in the software so that the router will not move past the end of its travel.
- A correctly calibrated KL3 can move 300 IPM, however 200 IPM is quick and gives a safety factor that avoids missed steps by the stepper motors.

Appendix

Warranty and Return Policy

30 Day Warranty

BobsCNC will guarantee all supplied parts for 30 days after the delivery date. If there are missing or defective parts, the buyer must contact Bobs CNC during this 30 day time frame using the "Contact Us" form located at BobsCNC.com. After 30 days, no warranty is given nor will any refund be given. In order to receive a refund, the kit must not have been assembled or attempted to have been assembled. Bobs CNC will have the sole discretion to determine if a kit or any part of the kit is eligible for a refund.

Technical Assembly

BobsCNC cannot guarantee the buyer's ability to assemble the kit or calibrate the router. The quality of the parts are dependent on proper set up and understanding of the speeds and feed rates, and therefore results may vary. The assembly, calibration, and understanding of these parameters requires technical and mechanical proficiency. Please review the instruction manual and this return policy prior to purchase as there can be no refund for a kit that has been attempted to be assembled or assembled fully.

Return Shipping Damage

Bobs CNC will not be liable for any damage incurred during shipping for a return. It is suggested that in case of a return that the buyer purchase shipping insurance.

Parts included in the basic kit

Aluminum Parts	Quantity	Section
2040 long extrusion (610 mm)	4	3,4
2040 short extrusion (455 mm)	2	3
Back plate	1	4
Front Plate	1	4
Left Gantry	1	6
Right Gantry	1	6
Top Y support	1	5
Bottom Y support	1	5
Z stepper mounting plate	1	10
Z bearing mount	1	5
Spindle plate	1	2
Spindle mount	1	2

ACME nut brackets	4	1

ACME Parts	Quantity	Section
3/8"- 8 (4 start) 25.13" long	2	8
3/8"- 8 (4 start) 19.13" long	1	9
3/8"- 8 (1 start) 7.13" long	1	10
3/8"- 8 (4 start) nuts	6	1
3/8"- 8 (1 start) nuts	2	1
1604ZZ Bearings	8	8,9,10
3/8" ID Thrust washers	8	8,9.10
3/8" Locking collars	8	8,9,10
1/4" to 3/8" Helical coupler	4	8,9,10

Wood Parts	Quantity	Section
MDF table (17" x 23.9")	1	15
Electronic mount board 11.6" cx 23.9")	1	12

Linear Rail Parts	Quantity	Section
X SBR12 (600) mm	2	3
Y SBR 12 (450mm)	2	3
Z SBR 12 (150mm)	2	5
SBR12UU bearing blocks	8	2,4

Hardware Parts	Quantity	Section
Nylon zip ties	21	2,11,13
1/2" Sleeve 60"	1	11
M5 x 20 Socket head (steppers)	16	8,9,10
Plastic spacer (steppers)	16	8,9,10
M5 x 12 Button head	14	5
M5 x 18 Button head	34	2,5,7
M5 x 20 Button head	2	10
M5 x 25 Button head	28	2,4,6
M4 x 8 Button head	44	3
M4 x 12 Button head	20	12,15
M4 x 16 Button head	14	5
M4 x 20 Button head	6	2,6
M4 nylon locking nuts	24	2,5,6,12
M4 T-nuts	56	3,4

M3 x 40 socket head	8	1
M3 nuts	8	1
M2.5 x 16 Button head	2	5
M2.5 x 25 Button head	4	2,11
M2.5 nuts	4	2,5,11

Added parts included in the deluxe kit

Electrical Parts	Quantity	Section
270 oz-in Stepper motors with wire extended	4	8,9,10
4 axis controller	1	12
Emergency stop switch	1	13
Limit switch with wire	3	2,5,11
Power Supply with cord	1	12
Power wire	1	13
Aluminum Tape Pieces	2	5

The kit parts can be purchased separately.

- 4 axis controller of your choice
- Power supply of your choice
- NEMA 23 Stepper motors of your choice
- The rails are SBR 12 that have been drilled with 5 mm holes.
- The Z rail also has two 5 mm holes drilled in the center

Other supplies that you will need are:

- DeWalt 611 router
- Router bits
- 1/4"-20 rods and nuts for clamping