ShopBot PRS Gantry Tool
Table Assembly Guide

Intro

This guide will walk you through the mechanical assembly of your ShopBot PRS Gantry tool. It does not include instructions for wiring, software training, troubleshooting, or maintenance. Additional documentation is available at www.shopbotdocs.com.

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Section 1: Before you start

Tools and materials required:

Frame assembly:

- Framing square
- Level (6' or longer is ideal)
- 8' straightedge (if using a shorter level)
- Tape measure
- Set of standard and metric allen wrenches
- Standard ratchet and socket set
- Adjustable wrench
- Flat wrench (included in box)
- Two "Quick Grip"-style clamps (recommended) or C-clamps
- Lightweight machine oil (available at any home improvement or auto supply store)

Mounting the table surface:

- Drill and standard-size bits
- 1" Spade or Forstner drill bit
- 1-1/2" wood screws
- One gallon of general-purpose wood glue
- Paint roller for spreading glue (recommended but not required)
- At least 2 sheets of material for your table surface:
- For 96x48 tables, you will need one sheet of **Medium Density Fiberboard (MDF)** and one sheet of **3/4" cabinet-grade plywood.** When choosing plywood, keep in mind that a higher number of plys typically creates a more stable board that is less likely to warp (in other words, don't use cheap 5-ply utility sheathing!) Tables larger than 96x48 will require more material per layer in order to cover the entire work area.

Note: If you are installing a vacuum table, please see the separate document titled "Installing a Vacuum Hold-down system." Your material requirements will be different from the ones listed here.

Wiring the control box (this document does not provide wiring instructions, but it will be helpful to make sure you have all your tools first):

- Incoming power cable (please see the wiring diagram inside your control box for specifications).
- Wire cutters and strippers
- Needle-nose pliers
- Standard sized Flat-head and Phillips-head screwdrivers
- Small (suitable for electronics) flat-head and Phillips-head screwdrivers

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Electrical precautions

WARNING: RISK OF ELECTRIC SHOCK

The control box needs to be connected to your electrical service by a licensed electrician who has experience with industrial equipment. Please do not risk personal injury or damage to your machine by having an unlicensed individual perform this job.

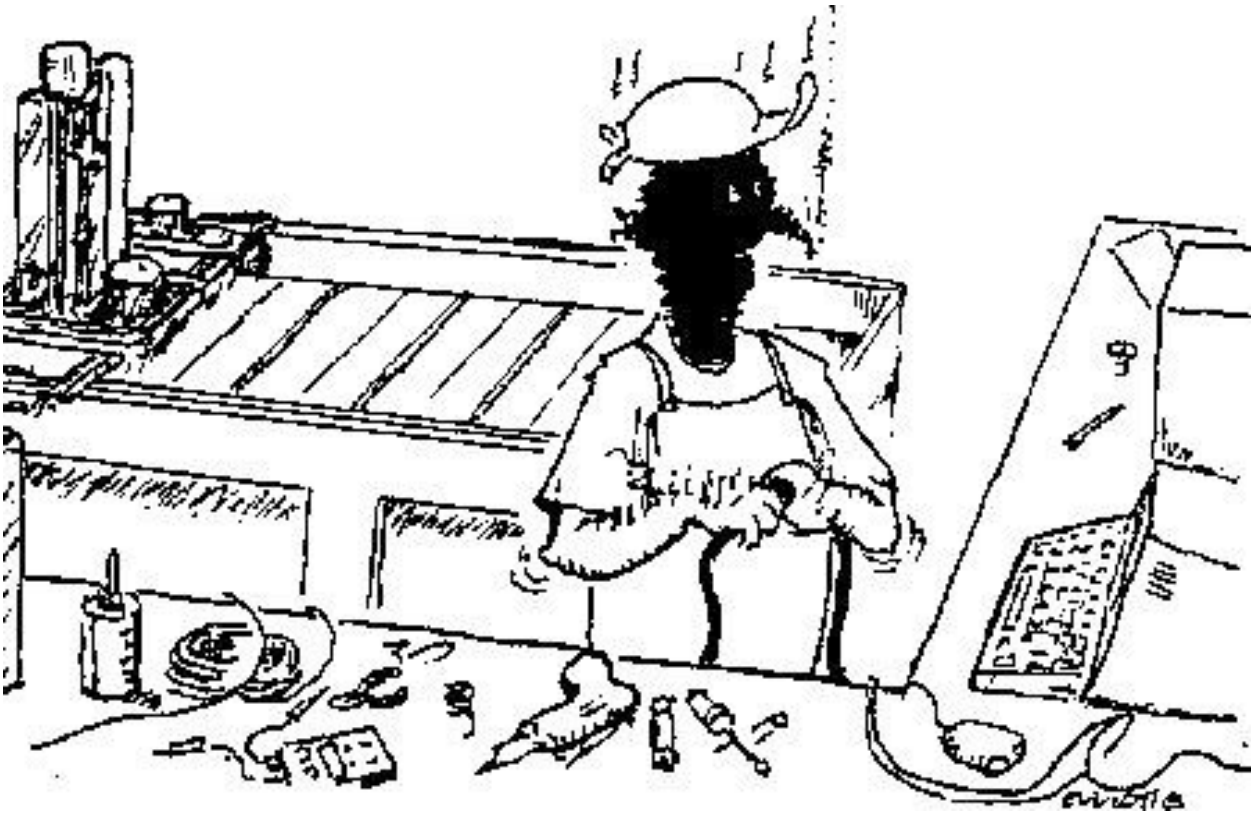
Connecting the power to your control box can be done before or after you complete assembly of the tool, but it is easiest to wait until the tool is set up in its final position. If you have purchased a high frequency spindle and/or a vacuum blower, these will also need to be connected by your electrician. Wiring diagrams and specifications are located inside the door of the control box.

There are a few other electrical precautions you should be aware of:

Motor connections: DO NOT connect or disconnect your motor cables while the control box is powered on. This can damage or destroy the motors or drivers.

Induced currents: AVOID moving any axis by hand when the control box is powered off. If you must push/pull an axis by hand, do so very slowly. Spinning the motors can generate an electric charge and damage the drivers or other electronic components.

Static Discharges: Electronic circuits are very sensitive to static and power surges. Please have your electrician follow all wiring and grounding instructions. Avoid doing any vacuuming around your machine before it is properly grounded, as vacuums can generate a large amount of static electricity that can damage the control box if the machine is not grounded.



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Overview of the ShopBot PRS CNC tool

We've pre-assembled many components of your machine to reduce the number of assembly steps. In many places, bolts or hardware are loosely fit in place to show you their intended location, so you'll need to remove this hardware before fitting the corresponding component into place.

Use caution when lifting boxes and assembled components out of the crate. There are several assembly steps where having an assistant will make things much easier. In particular, you will need assistance unpacking the crate and lifting the gantry onto the table rails. Do not attempt to lift the gantry without assistance.

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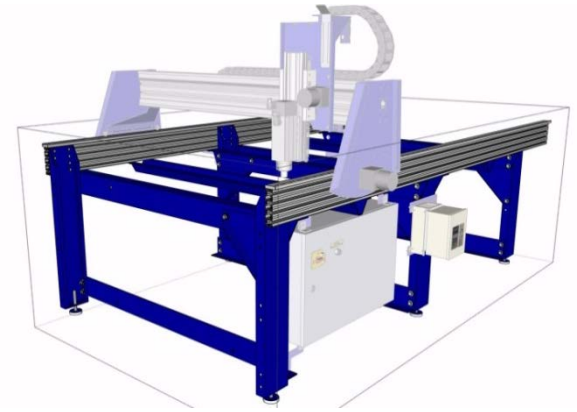
Terms to know

Before you unpack the crate, let's go over the some of the major components and get familiar with the terminology and directions we'll be using. This is only a quick overview to help get you started. For each assembly section, there will be a visual guide with all parts and hardware clearly labeled.

Major components:



The base of your machine is referred to as the **table frame**.

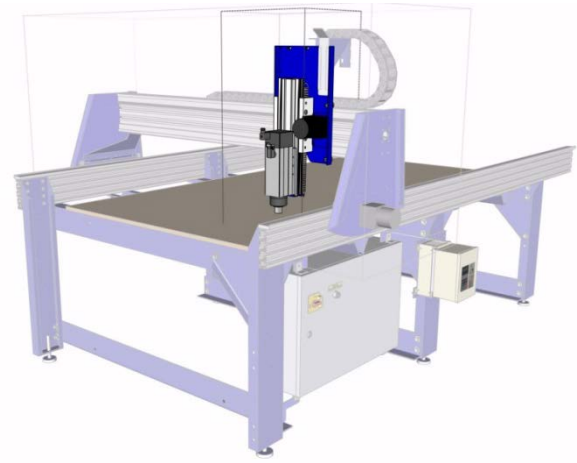
The two long aluminum extrusions on each side are called **table sides**, which create the path of travel for the **X-axis.**

The table sides and related components are included in the long cardboard package secured to the top of your crate.

The assembly that rides along the table sides is called the **Gantry.**

The gantry consists of an extruded aluminum beam, which has been fitted with V-rails (for wheel bearings) and gear rack. This forms the path of travel for the **Y axis.**

The blue plates on either side of the gantry are referred to as **end plates.**



The **YZ car** moves across the gantry, and also controls the height of the cutter head (either a router or high-speed spindle, depending on your tool).

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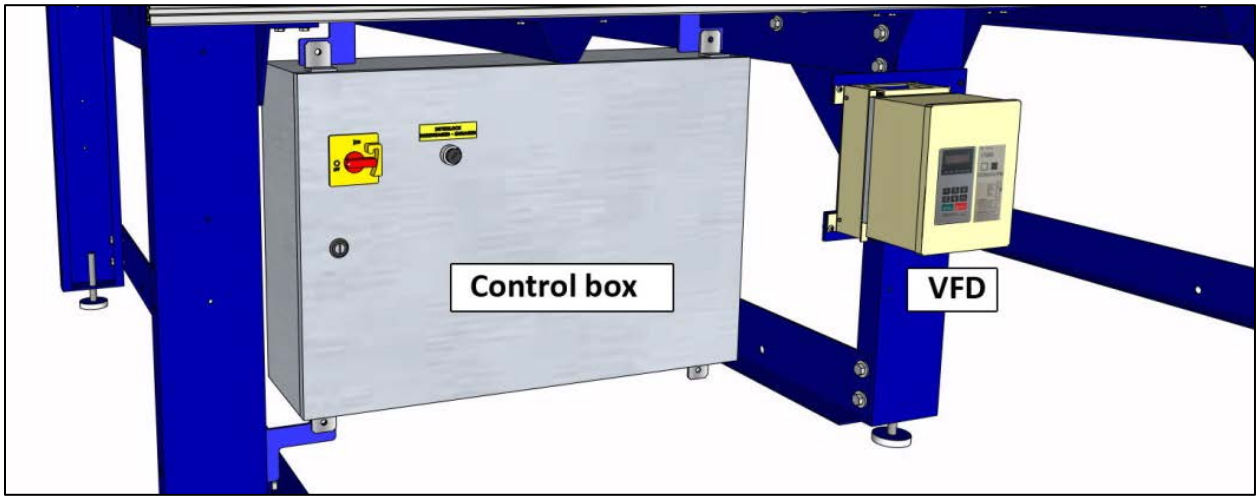

Control box

The control box is the “brain” of your machine and contains a control board, motor drivers, and numerous other electronic components that allow the tool to move with precision, accuracy, and power. It connects to your PC through a single USB cable.

VFD *(For spindles only)*

This controls speed and power for your spindle. The control box provides the VFD with on/off signals, but speed is controlled through an RPM controller unit, which connects to your PC through a separate USB cable.

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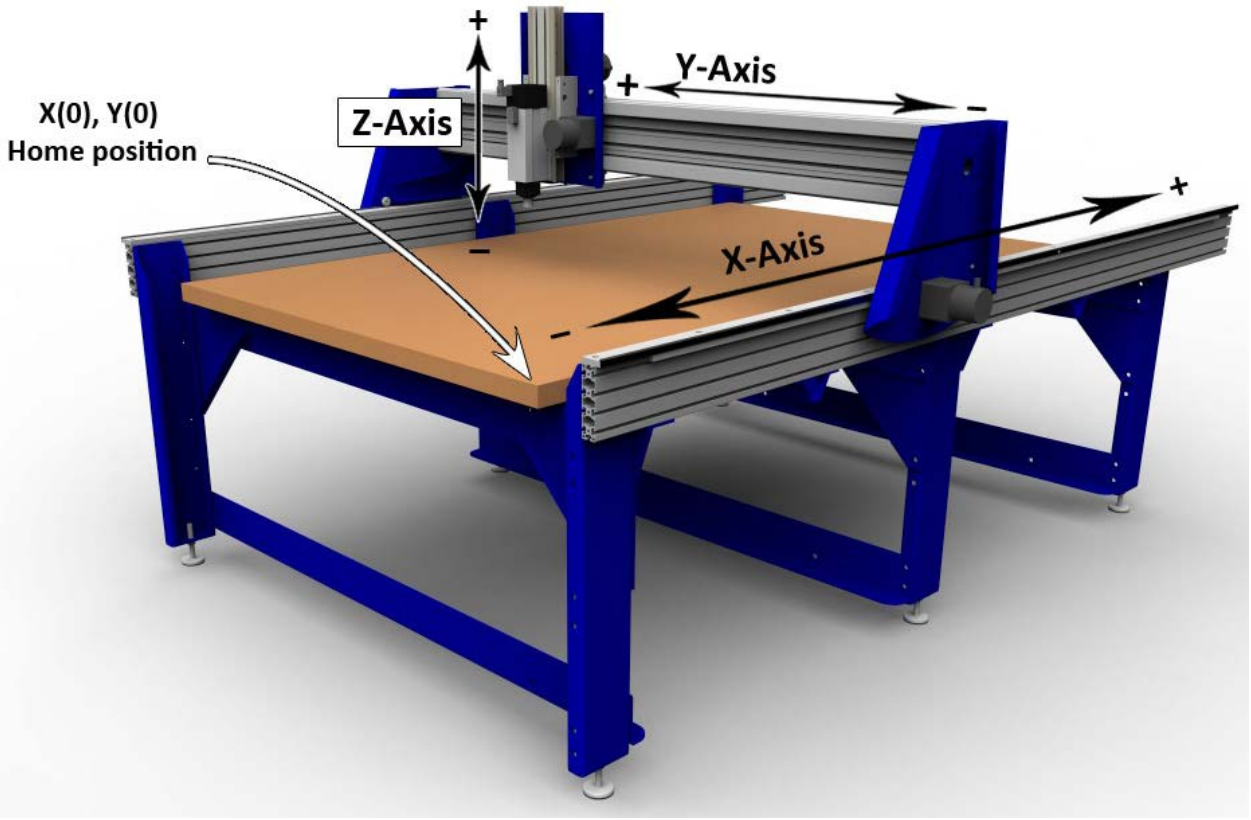
X/Y/Z axis and directions of travel



In all of our assembly and training instructions, we will frequently refer to the machine by each axis so It will help to become familiar with them before you start. Another frequently-used term is the **XY home position,** which is indicated here and on your table drawing at the back of this guide. For a detailed explanation of your machine's coordinate location system, please reference the full user's manual. For now, just make sure that you understand the directions of travel for the X, Y, and Z axis, as well as where the XY home position is located.

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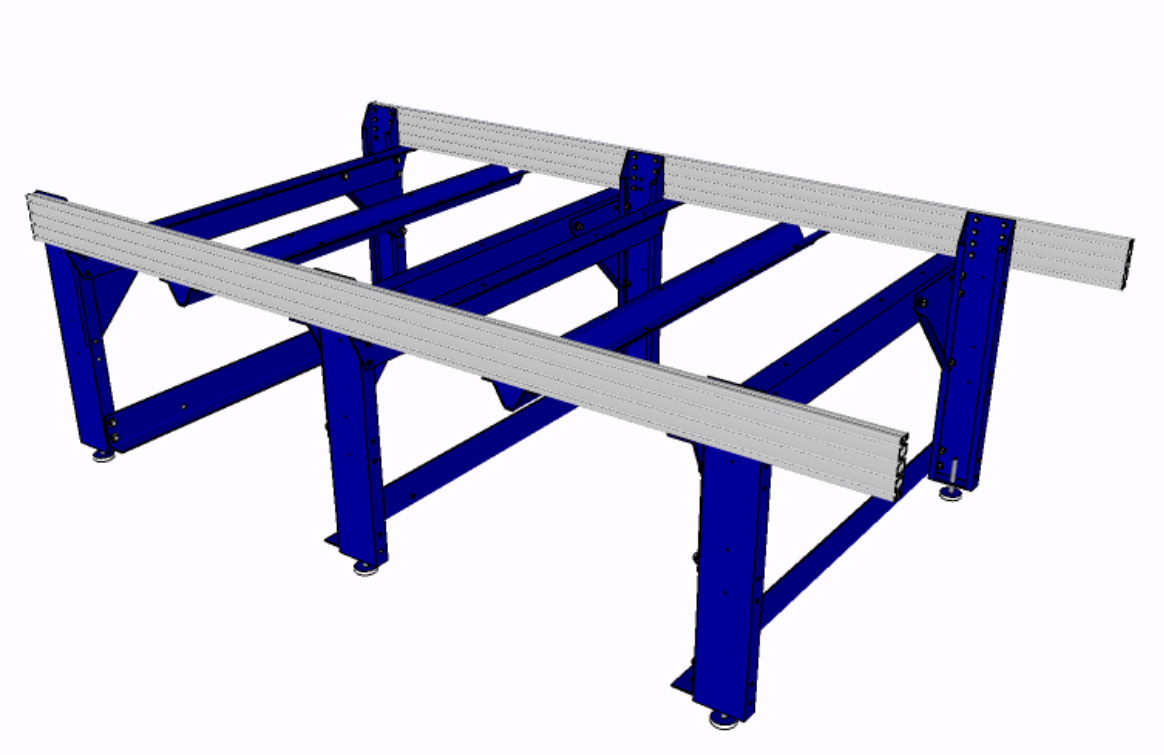
Section 2: Table assembly



Time to get started!

The diagrams in this manual depict a ShopBot with a “generic” 96x48 table. Depending on the size and shape of your tool, the table layout may look a little different (fewer or more legs, different shape, etc.). For specific dimensions, reference the table drawing included in the back of this assembly manual.

Please note: It is critical that you assemble your tool according to the measurements in the table drawing.

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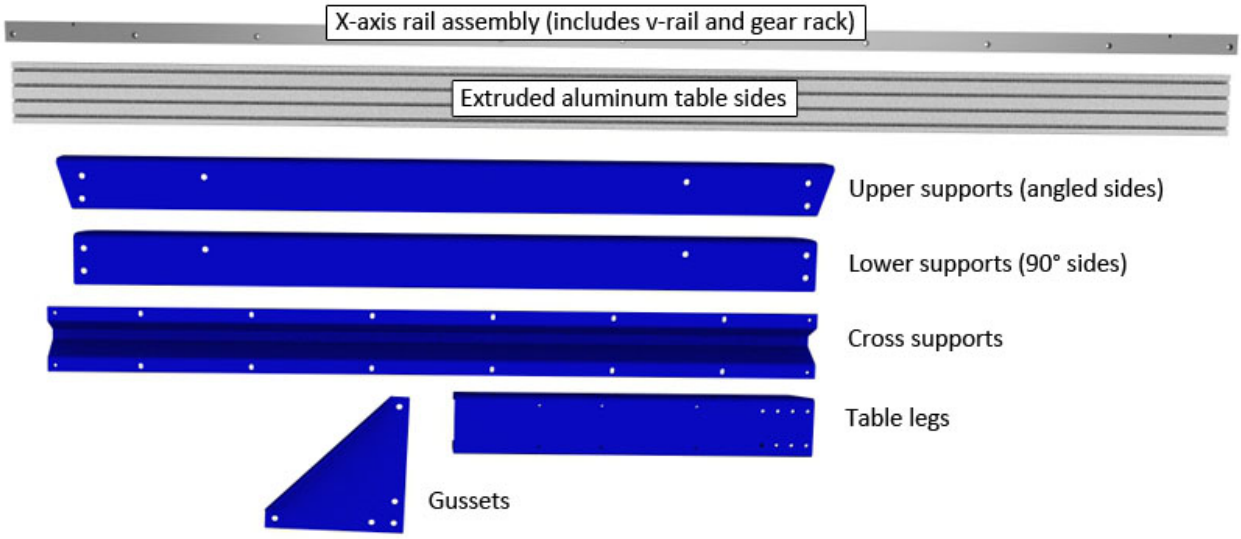
Visual guide to table parts and hardware



Except for the table levellers, all of this hardware is included in the small box marked "table hardware":

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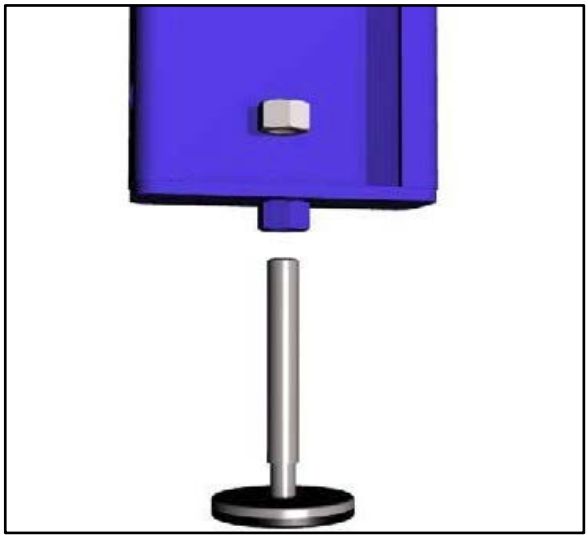
Attach hardware to the table Legs



Screw a **leg leveler** into the bottom of each Table Leg, then thread **a 5/8" hex nut** onto the leg leveler. Leave this nut loose for now.

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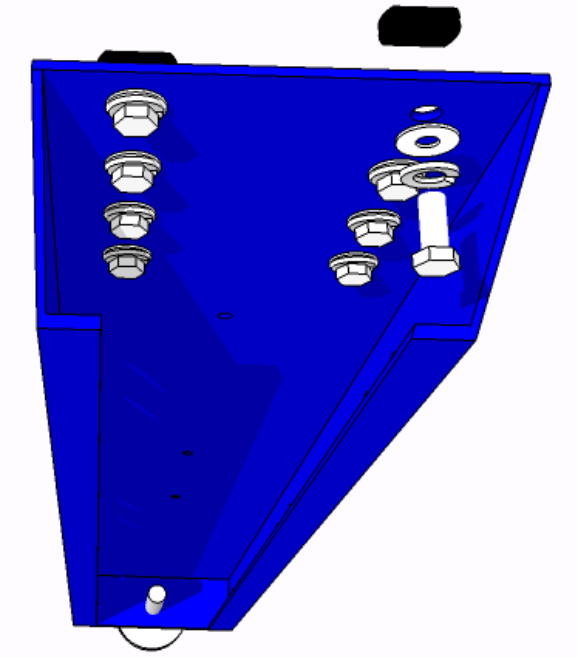
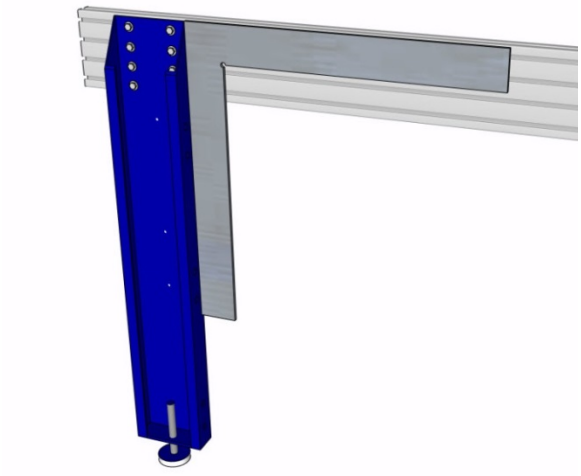
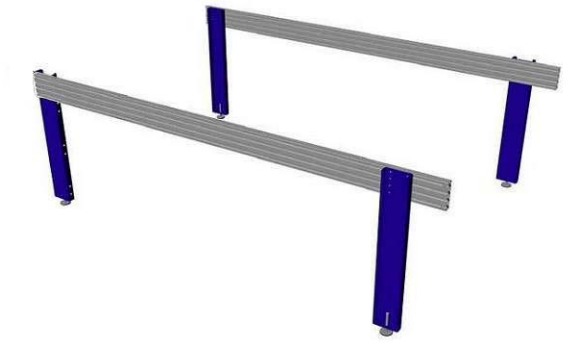
Attach the legs to the table sides



Attach the first leg by sliding the T-nuts into the T-slots on the table side. Place the leg according to the table drawing in the back of this guide and ensure T-nuts are lined up with the holes. Place **5/16" hex bolts, lock washers, flat washers and T-nuts** into the eight holes on each of the table legs, as shown here.



Hold a framing square against the leg and the extrusion while you tighten the bolts.



Repeat this process with the other table side. You should have one leg on each table side at this point. Next, temporarily attach a second table leg to the **outside** of each table side (this will allow you to slide the rest of the components down the table sides without the legs getting in the way). It should look like the picture to the left.

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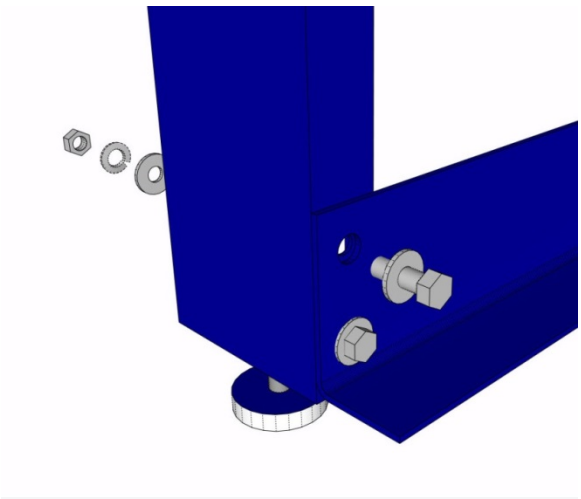
Attach the lower support



Use the same order of **1/2" hardware (hex bolt and flat washer on one side—flat washer, lock washer, and hex nut on the back side)** to secure the lower support to the first set of table legs.

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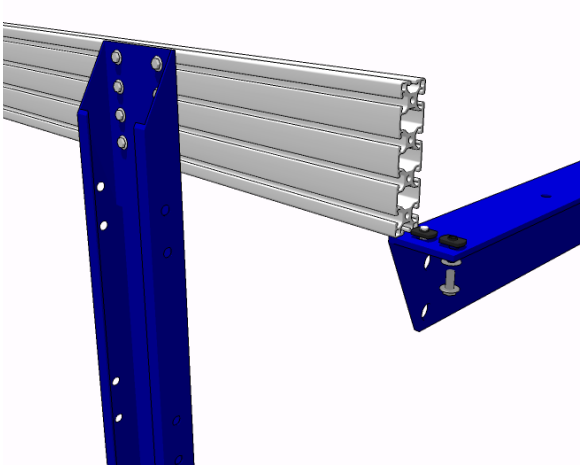
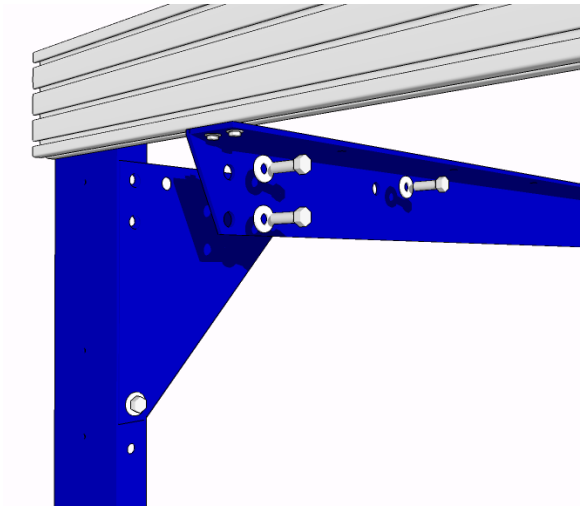
Attach the first upper table support and gussets



Attach two **5/16" hex bolts, flat washers, and T-nuts** to each side of one of the upper supports.

Slide the T-nuts into the bottom channel of the far end of the table side (where you have temporarily mounted the legs on the outside of the rails). Then slide this support all the way down to the other pair of table legs, leaving approximately 3/16" between the leg and the upper cross support for the gussets.



Insert a gusset between each table leg and upper support.

Attach this to the leg using **1/2" hardware (hex bolt with a flat washer on one side and then a flat washer, lock washer, and hex nut on other side).**

DO NOT fully tighten the bolts on the upper support. You will need some room for adjustment when you square and level the table after assembly.

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Your table should now look like this.

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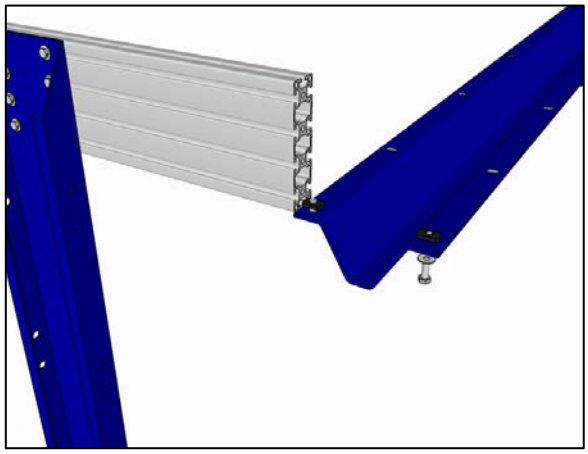
Slide the first cross-support into position



Attach two 5/16" hardware assemblies **(5/16" hex bolt, lock washer, flat washer, and T-nut)** to each end of a cross-support beam.

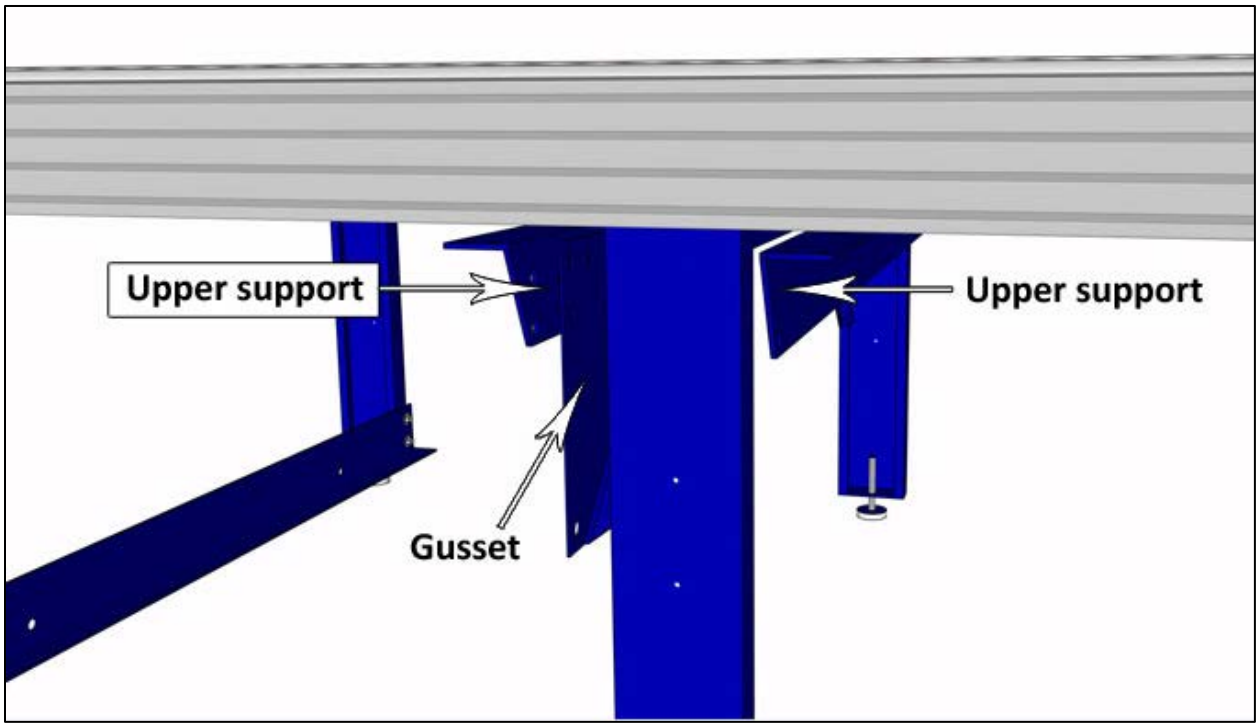
Then slide the T-nuts into the bottom channels of the table sides and slide the cross supports into position.

For proper spacing of the cross supports, please reference the table drawing in the back of this manual (spacing will be different for each model).

Remember, don't fully tighten any of the cross-supports yet.

Add the middle legs (This step is not needed if you are setting up a 48x48 or 60x48 table)

For the middle legs you will need to repeat some of the previous steps. First you will need to add a second upper support. However, **this support needs to be installed facing the opposite direction of the first one.** The middle leg will be "sandwiched" between two upper supports so keep that in mind during installation.



Next, add another cross-support. Reference the spacing from the middle leg according to your table drawing. Complete the middle leg installation by attaching the lower support to either side of the middle leg pair.

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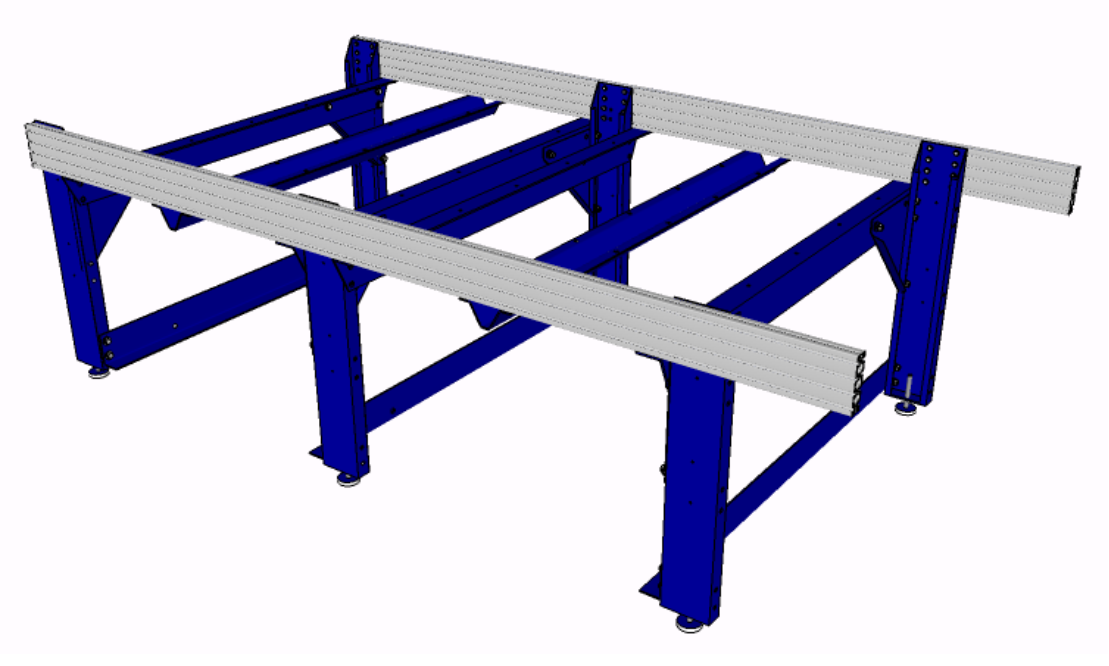
Add the final set of legs

Slide the last remaining upper support into place, then move the last two legs from the outside to the inside of the table sides. Just like with the other legs, bolt the gussets and upper support to the leg, followed by the lower support. Your table should now look like this:



Before moving on to the next step, check to make sure that you don't have any leftover cross-supports or gussets. We have included extra pieces of all your table hardware, so don't be too concerned if you have a few extra nuts and bolts left over.

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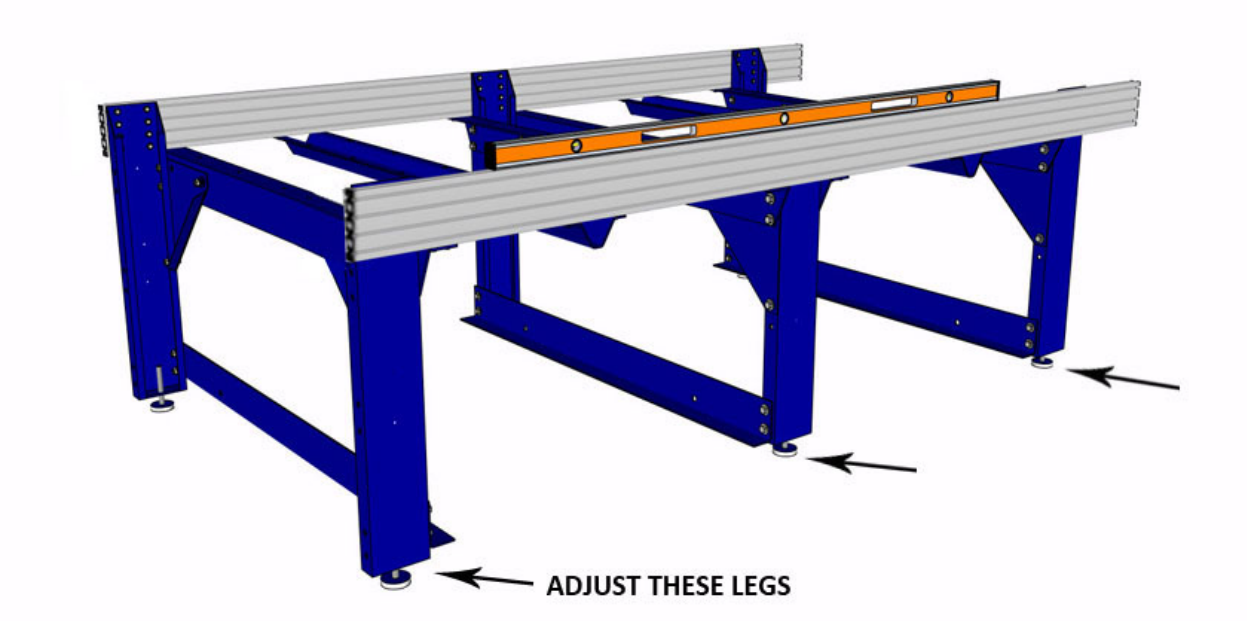
Level and square the table frame

Level and square the front table side



From this point on, we will refer to the table sides as **front and rear**. The **front side** of the table will be closest to the 0,0 point as indicated on your table drawing. Using the longest level you have (6 or 8 feet is ideal), set the level on the front table side and adjust the leg levelers until this table side is level. Do the main adjustments with the end legs, as the middle leg is primarily just there for support. After those are level make sure that the center leg properly supports the beam and does not cause the table side to bow or sag.

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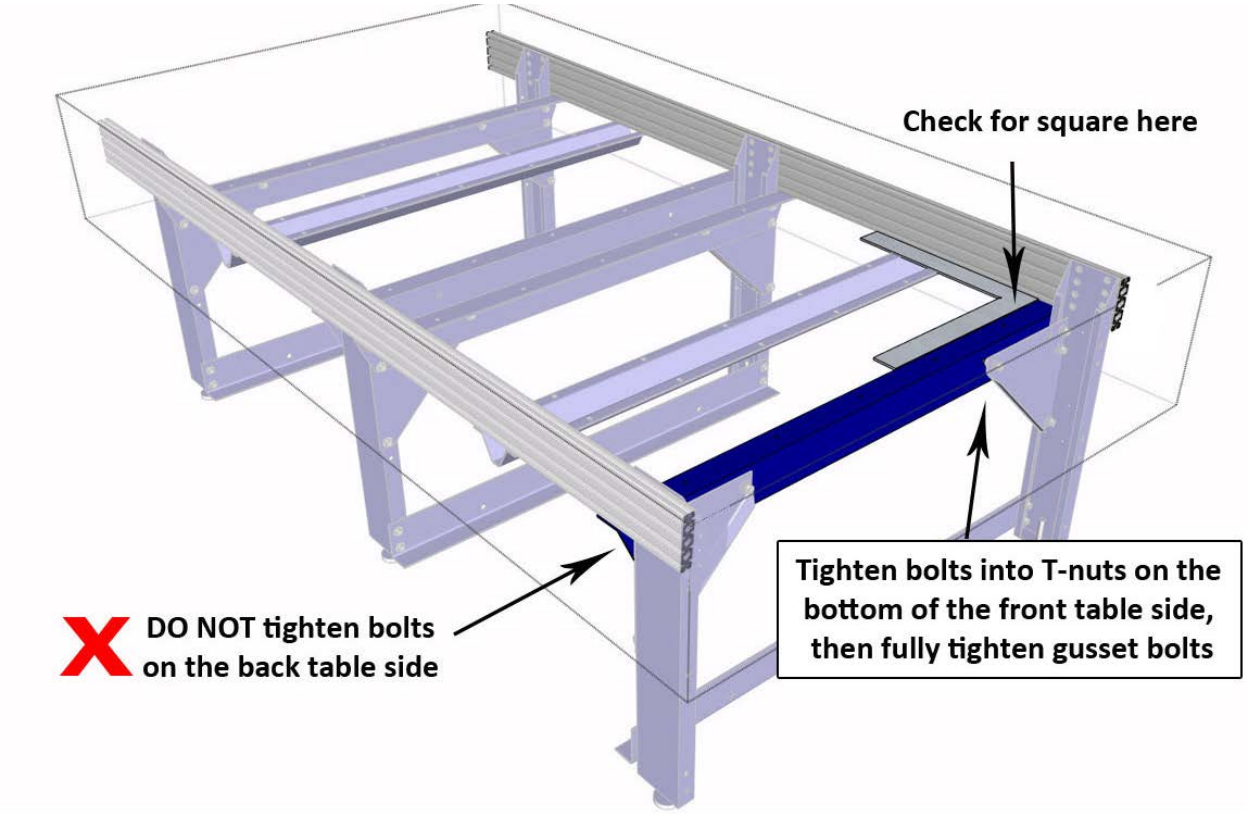

Next, use a framing square to check that the first cross-support is square to the FRONT table side only. Adjust if needed and then fully tighten the bolts on this side. Repeat this step with the next cross support, until everything attached to the front table side is square.

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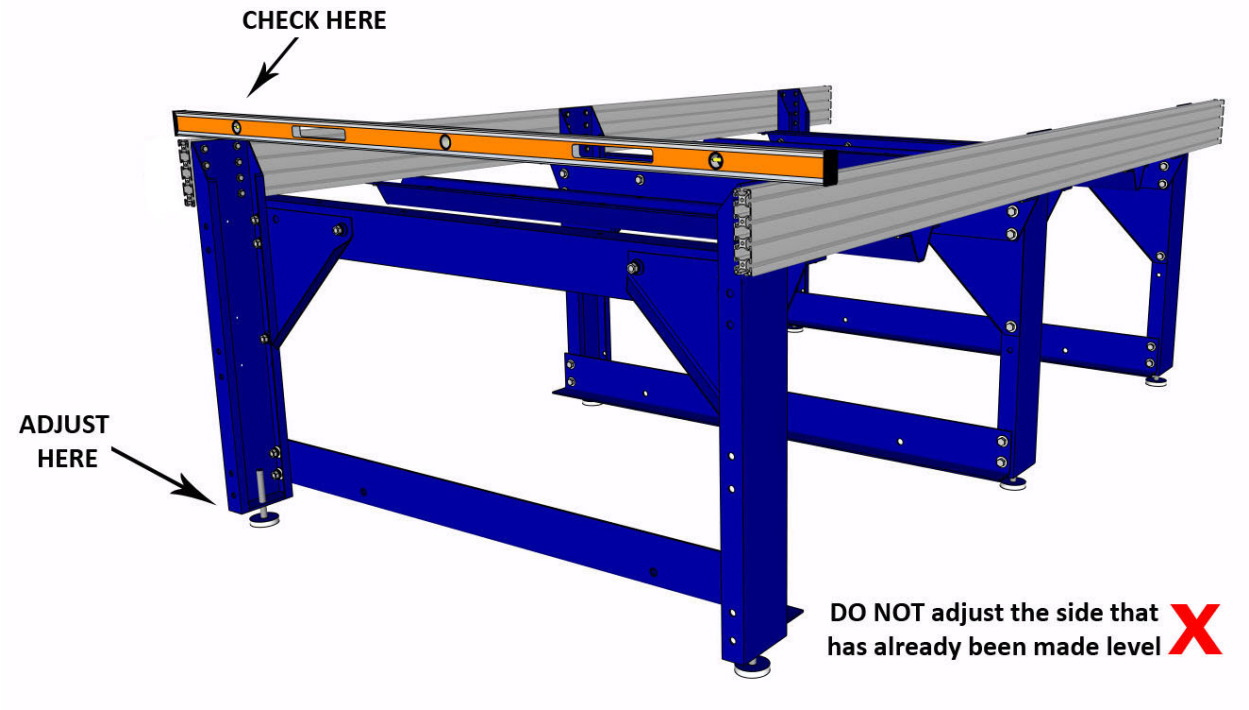
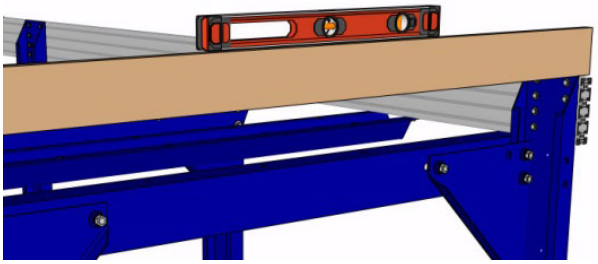
Level the rear table side

Level the rear table side by checking it against the front. Place the level so that it spans the two table sides at one end, then adjust the leveling feet on the back table side. Once this is level, move down to the next set of legs.





TIP: When checking a long span, a longer level will give a more accurate reading. We recommend using a level that spans the entire width of your table.

If this is not possible, you can still place a shorter level on top of a straightedge. Whatever you use for the straightedge, make sure that it is actually straight with parallel sides.

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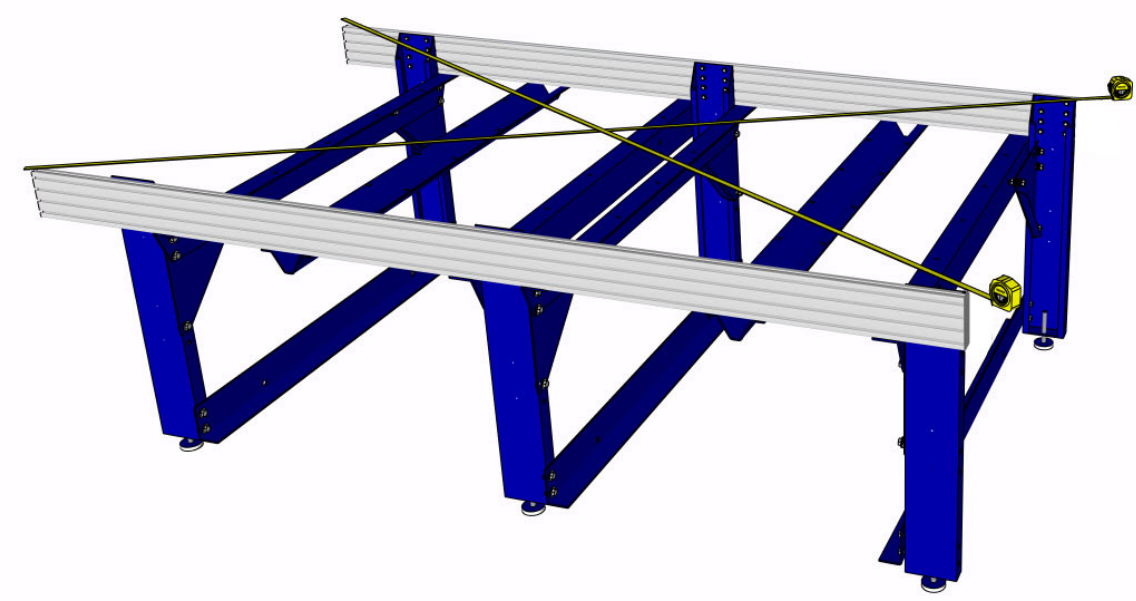
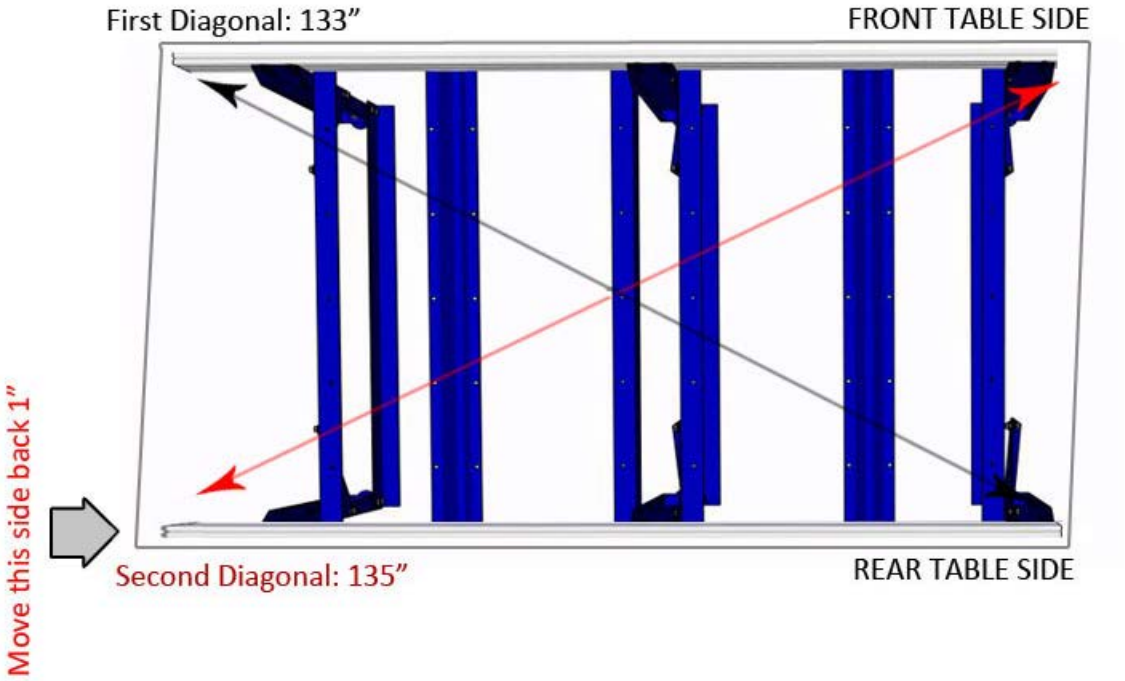
Square the rear table side

Measure the table across both diagonals. The measurements should be the same (to within 1/16”).



If your measurements are the same, skip this step and move on to mounting the table surface.
If your measurements are different, you will need to adjust the rear table side. Before continuing, check the bolts holding the cross-supports onto the rear table side and ensure that they are loose enough to slide within the grooves.

The example shown here is exaggerated to illustrate the correct method of squaring your table:



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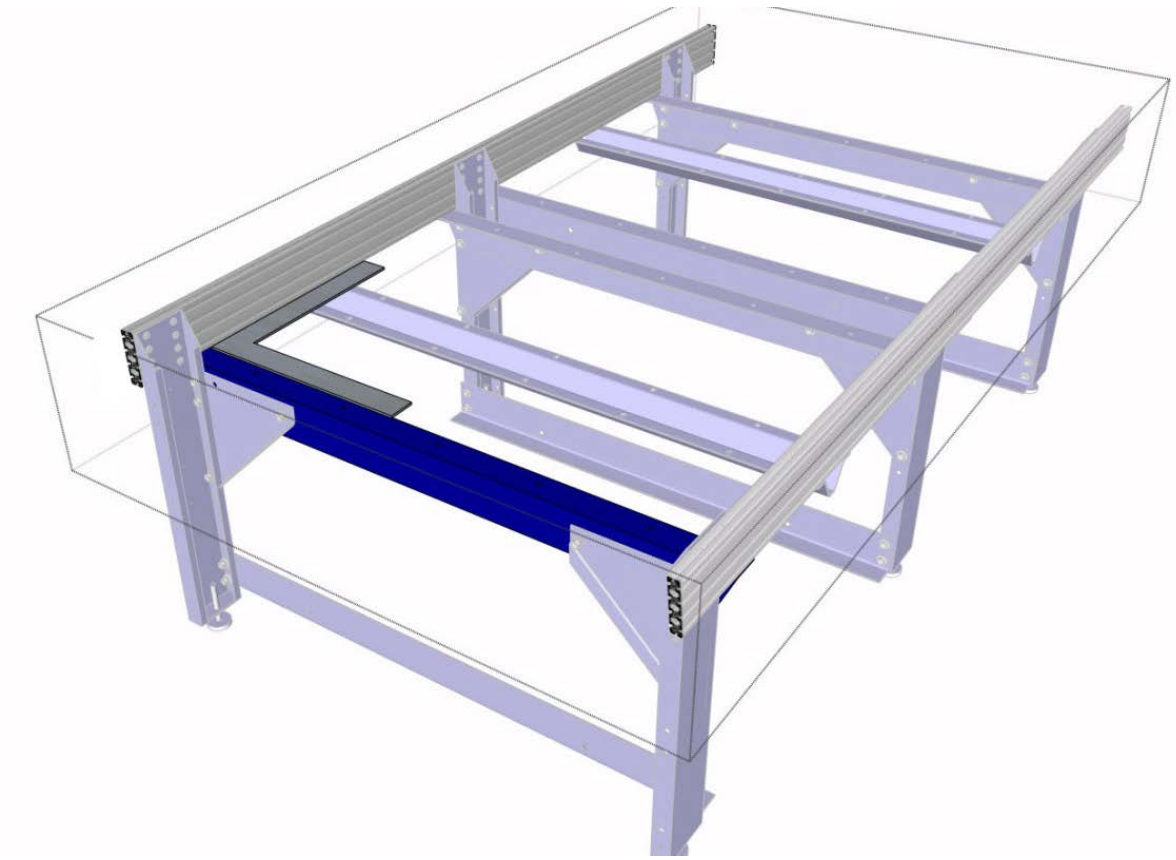
The rear table side should be moved 1/2” of the difference between the two measurements. In this example, there is a 2” difference between the diagonal measurements so the rear table side should be moved 1”. Use a rubber mallet (or a hammer and protective block of wood) to knock the table into square.

Starting at the one side of the table, check the cross-supports against the rear table side with a square. Fully tighten the bolts as you go, and re-check the diagonal measurements frequently as you work down the table. When the table is square, you are ready to mount the table surface.



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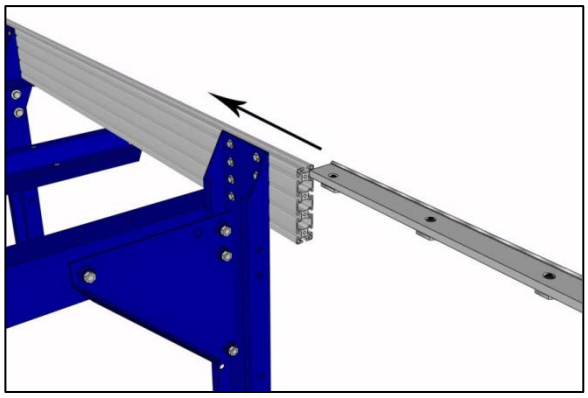
Mount the rails

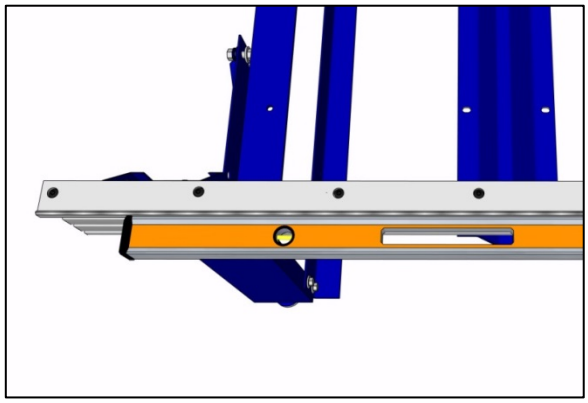
Remove the rails from the long white boxes that came strapped to your crate, and locate the 5/16 x3/4” button head screws and 5/16” T-nuts in your hardware package.



Place one screw into the counter-bored holes in the top of each rail and then loosely thread a T-nut onto each screw.

As you did earlier, make sure that the flange on the T-nut faces the inside of the groove on the table side.

Orient one of the rails so that the V-track is facing the outside of the table. Guide the rail onto the table so that the T-nuts fit into the groove on the top face of the table side. **Do not fully tighten the bolts on either rail.**



Push the rail assembly towards the inside of the table, so that it sits flush with the inside face of the table side.

Start at one end of the table and tighten the bolts down the length of the rail. As you do this, check each side of the rail with a level or straightedge to be sure that the rail is perfectly straight. Once this first rail is straight and the bolts are fully tight, you can move on to the next step: placing the gantry onto the rails.

DO NOT tighten the bolts on the second rail.

At this point it is recommended to place a sheet of plywood onto the table to serve as a work surface. The table and spoiler board should be put on last to enable any adjustments needed throughout the rest of the assembly.

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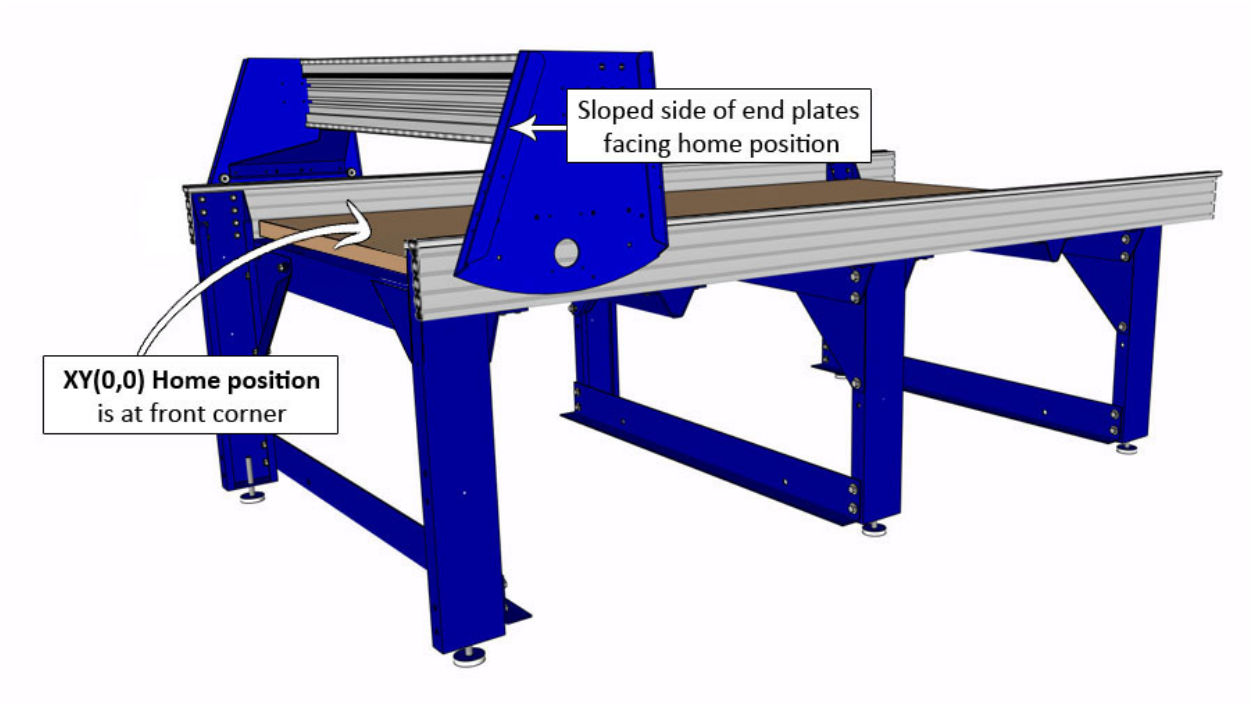
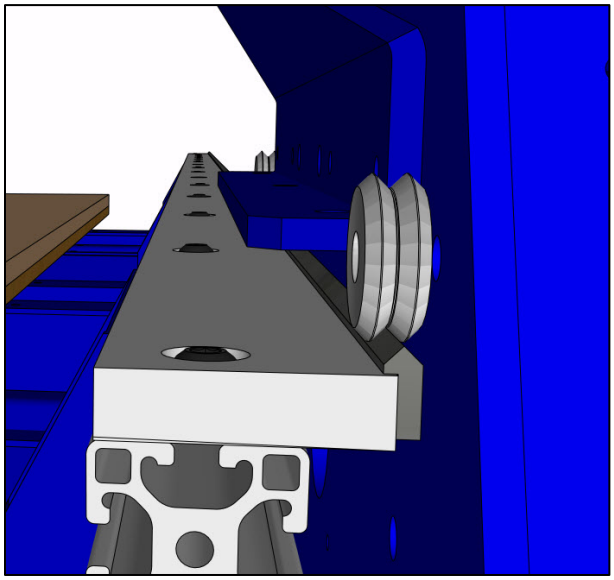
Place the gantry onto the rails

CAUTION: The gantry is heavy and must be lifted by 2 or more people.
Use proper lifting techniques to reduce your risk of injury.

Place the gantry onto the rails according to the image shown below. All four V-wheels on the inside of the end plates should sit on the rails.





Detail of V-wheels engaging with the rail

Mount a clamp onto one of the rails to prevent the gantry from rolling off the table during the next few steps.

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Using the gantry as a guide for aligning the second rail

Roll the gantry to the center of the table, and make sure that the four wheels are all fully engaged with the rail. Tighten the bolts directly under and around the gantry on the rear table side rail. Move the gantry 12” in one direction and tighten a few more bolts, adjusting the position of the rail if necessary.
Next, move the gantry back in the other direction and repeat these steps, working outwards from the center until the entire rail is straight and tight.

If you have a wheel that “floats”

While moving the gantry down the length of the table, all wheels should remain in contact with the rails. If you have a wheel that “floats” above the rail at any point, this needs to be corrected before you move on. The most likely issue is that the rails are not perfectly parallel, causing one of the wheels to ride up. This can be corrected by loosening and carefully adjusting the rear table side’s rail.

If the problem is constant throughout the length of travel, first check that the rails are still level with each other. Then measure between the rails at several points along the table to make sure they are correctly spaced according to the size of your machine (tolerance is 1/16” or 1.6mm)

Table size (Y axis):	48”	60”	72”	108”
Distance between rails (outside to outside)	65-13/16” (167.12cm)	77-13/16” (197.64cm)	89-13/16” (228.12cm)	125-13/16” (319.56cm)

If these measurements are also correct, please contact tech support for further assistance.

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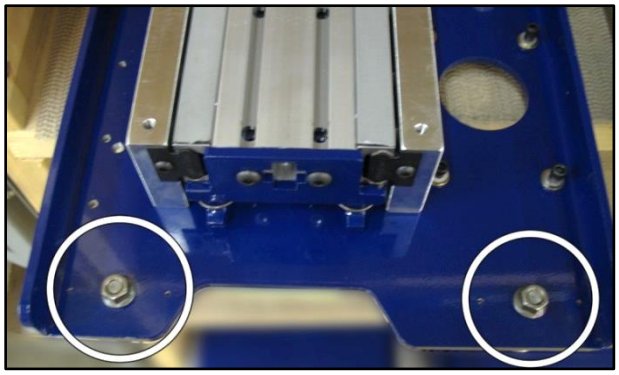
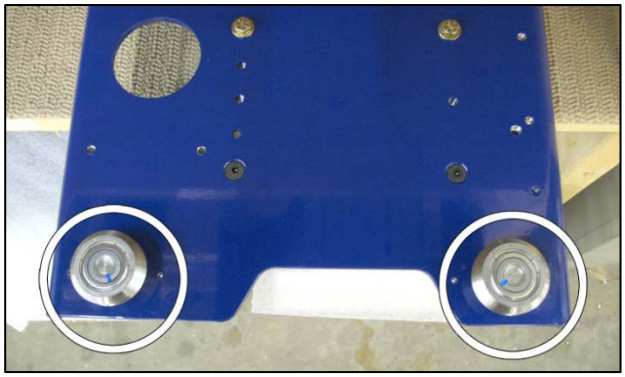
Place the YZ car onto the gantry

For the next step, place a clamp directly on either side of one of the end plates. This will keep it from moving while you mount the YZ car.

Remove the lower wheels from the YZ car (front and back view shown here) and set them aside.





With the lower wheels removed, place the YZ car onto the gantry.

The upper wheels will rest on the v-rail on the top of the gantry beam.

Replace the lower wheels

- To fit the lower wheels back onto the YZ car, tilt the entire assembly back towards you so that the bottom of the YZ car plate is pulled 1-2” away from the beam.
- Notice the marks on the face of the lower wheels. The wheels are *eccentric*, meaning that they are mounted onto an off-center threaded stud. Place the wheels back into the holes on the YZ car plate so that they are pointed straight up (12 o clock position). This places them in the “lowest” possible position and allows for maximum adjustment later on.
- Loosely thread the nuts back onto the wheel studs
- Tilt the plate back towards the beam until the lower wheels are straddling the v-rail.

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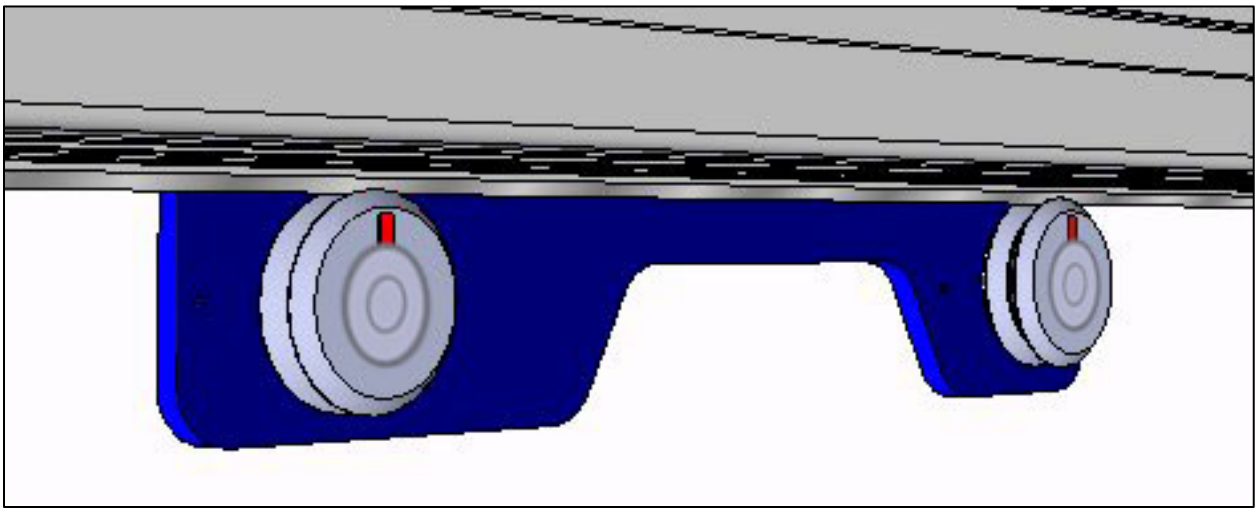
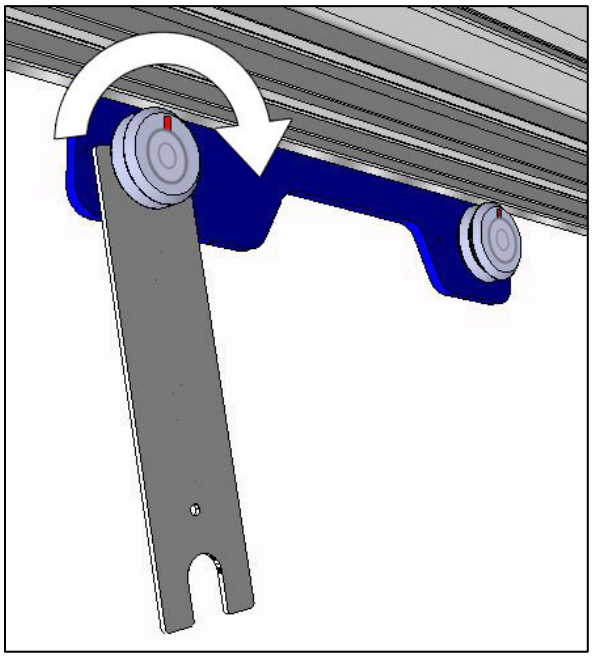
Adjust the lower wheels

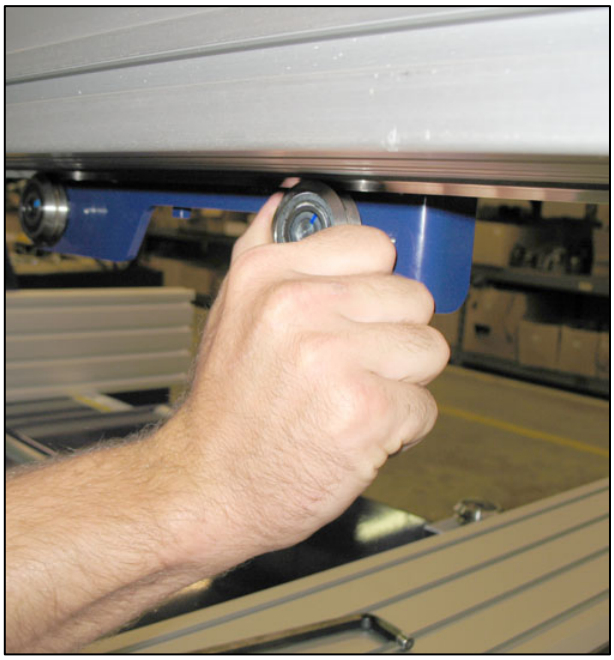




Once they are in place, the wheels need to be rotated into position so that they tightly engage the rail. This allows for smooth, controlled movement in the Y axis and maximum accuracy.

Use the flat wrench included with your hardware kit to slowly turn each wheel clockwise until you feel the wheel engage with the rail.

Use the wrench to hold the each wheel in position while you tighten the nut on the wheel stud.



Test the wheel engagement by rolling the YZ car back and forth across the gantry. Grab the wheel with one hand, using light to medium pressure. If the wheel stops and "skids" along the rail, tighten the wheels **slightly**.

Do not over-tighten the wheels. The YZ car should glide smoothly across the gantry; if you feel it binding up at any point then loosen the wheels slightly until it moves freely again. Once the wheels are adjusted, hold them in place with the wrench and double-check that the nuts are tightened securely.

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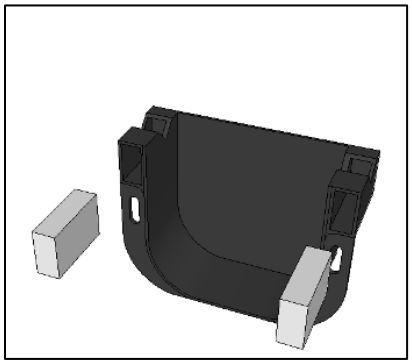
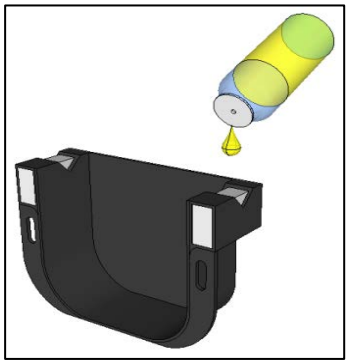
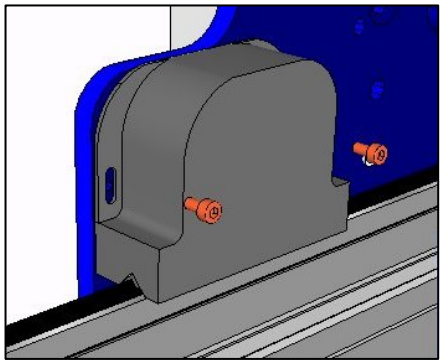
Attach the rail wipers

The rail wipers are designed to keep the wheels and v-rails free of excessive dust and debris. This will greatly prolong the service life of your wheels and allow for smooth, accurate operation of the YZ car.
The Y axis wiper kit includes 4 wiper caps with foam inserts and mounting hardware.

- **Use caution when opening the individual bags so that you don't lose any of the small mounting screws.**
- Place the foam inserts into the wipers and saturate with lightweight machine oil (not included).
- Secure a wiper assembly over each wheel on the YZ car with the included mounting screws. Do not overtighten.

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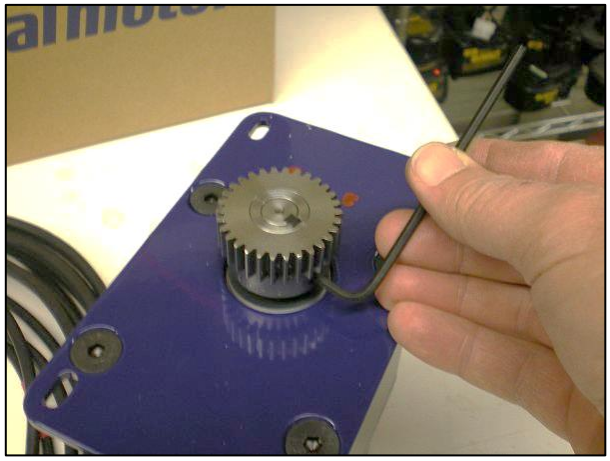
Section 3: Mounting the motors and other peripherals

Mount the motors

Locate the X and Y axis motors (there will be 3 total) and the bag containing the pinion gears. The motor plates are marked to indicate the axis. **Blue indicates a Y axis motor and red indicates X axis**. If you have purchased an accessory item such as a rotary indexer, its cable is marked yellow.



Fit a pinion gear onto the shaft of each motor as shown here.

If you encounter resistance, use the 1/8" hex key (included) to loosen the set screw(s) on the pinion. **Save this hex key. It is used later in the installation.**

Set the pinion so that it sits flush with the end of the motor shaft and tighten the set screw(s).

As a final step, apply a little bit of the included grease to each pinion. This helps to ensure smooth movement and prevent corrosion.

It is very important to mount each motor in its correct location. Double-check the markings on the motor plates as you mount them onto the tool.

For your convenience, the mounting hardware (**1/4-20x3/4" Button head screw, 1/4" lock washer, 1/4" flat washer**) is already fitted to the end plates and YZ car where the motors will be mounted.

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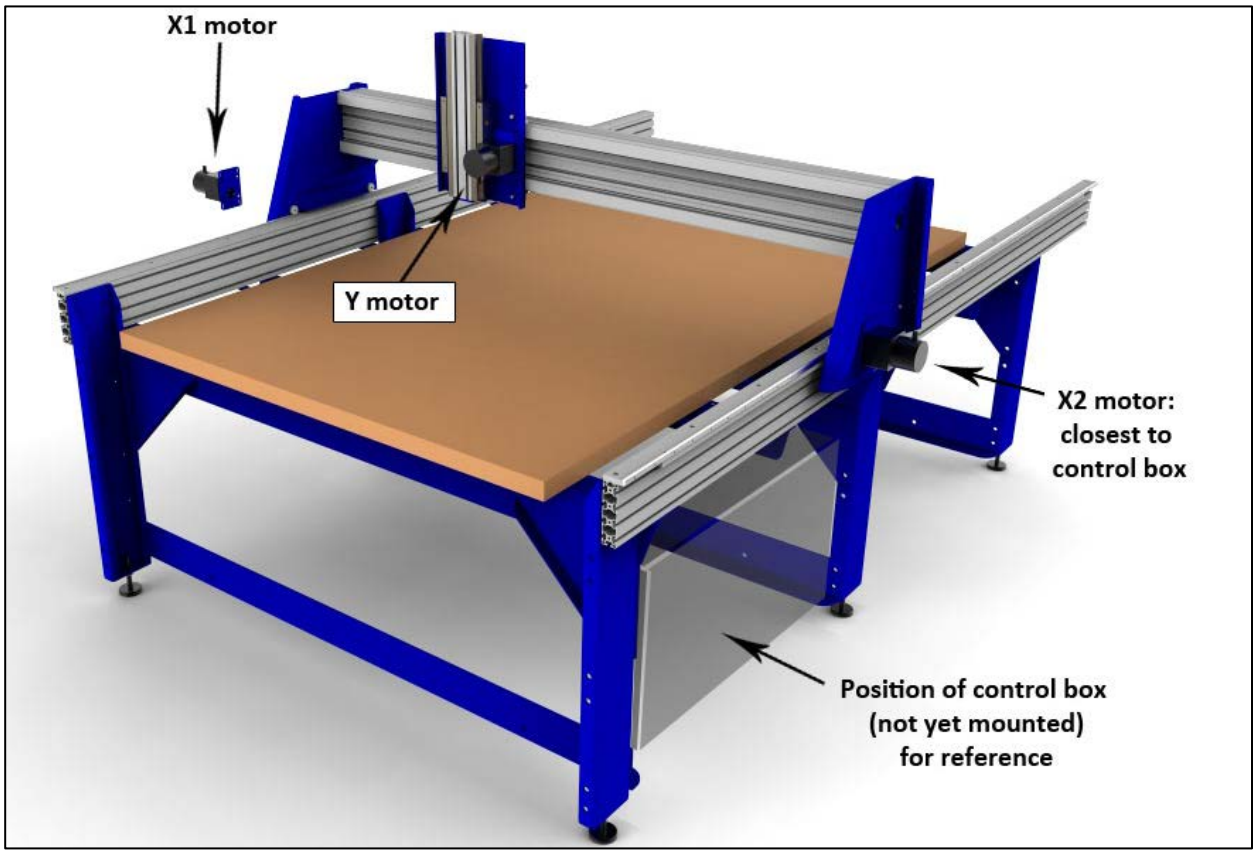
Mount each motor in the positions shown below:



The pinion gears on the motors need to engage tightly with the gear rack. Have someone help you apply upward pressure (approximately 15-20 lbs.) against the rack as you tighten the mounting bolts. You can also use a Quick-Grip clamp if you are working alone.

After all motors are mounted, take a moment to be sure that both X and Y Cars are moving up and down the rails smoothly. The motors will create some resistance, but the motion should be smooth and even with all wheels riding on the rails and pinions fully engaged.

! *Note: it is safe to manually move the motors when the cables are disconnected from the control box. Avoid moving motors by hand once the wiring is complete.*

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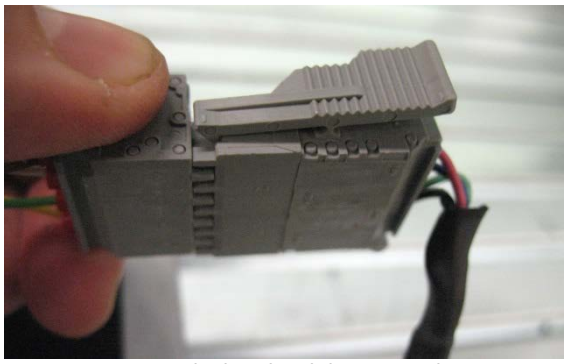
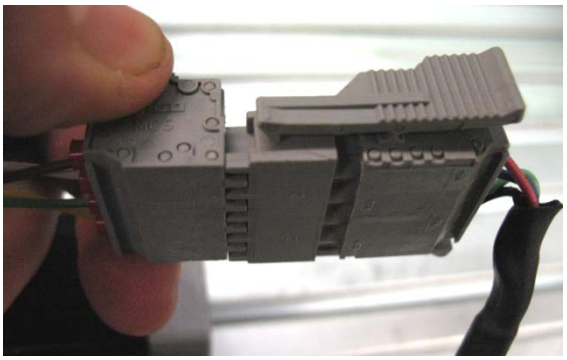
Secure the motor cables

If this is a PRSalpha tool, the motor cables will already be attached to the motor. For PRSstandard tools, you will need to connect the motor cables first. The motor cables are labeled and color-coded. Just match each cable to its motor and connect the gray Wago plug.

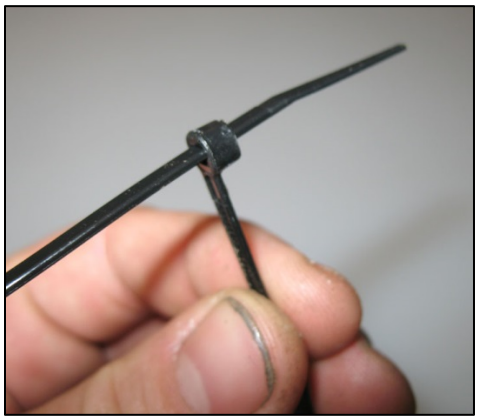


RIGHT: both ends tightly connected



WRONG: notice the gap on the right side

Link three wire ties together to create one long tie. For each motor, wrap the motor cable back towards the motor housing and secure it with the linked tie. This will keep the cables safely out of the way, and create a stress-relief point and help to prevent damage to the motor in case the cables ever snag or pull.



Leave the other end of the motor cables loose for now. We will run them back to the control box once the Y and X axis E-chain (the cable management system) are installed.

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Mounting a router or spindle

Your Shopbot control box has been configured for either a router or a high-speed industrial spindle. Because of differences in wiring, spindles and routers are **not** interchangeable. If you need to mount a router on a tool configured for a spindle (or vice-versa), contact tech support for instructions on how to make the necessary modifications to your control box.

Router option

If you purchased the router option, a mounting bracket has already been attached to your YZ car and aligned square to the Z axis.

- Remove the #10-32 grounding screw from the side of the mounting bracket
- Slide the router into the plastic sleeve inside the bracket. Make sure that the hole in the plastic is located so that the ground screw can contact the router
- Tighten the 5/16" button head screw on the bracket to secure the router
- Replace the ground screw so that it touches the router. **Do not overtighten.**

This completes the router installation. Skip the next section (mounting the spindle and VFD) and continue with the section titled "Installing the Proximity Switches."

Spindle option

Move the gantry back to the far end of the table and pull the Z axis down to its fully lowered position. You will either need an assistant to hold the axis in place while you work, or clamp it in place.

- Your spindle has already been fitted with an aluminum mounting plate. Hold the spindle up against the front of the extrusion so that the extrusion's clearance holes are aligned with the threaded holes in the mounting plate.
- Thread the included **5/16-18x1 1/2" socket head bolts** through the back of the extrusion into the mounting plate. **Do not use washers.**
- Tighten the bolts just enough to pull the spindle plate flat against the extrusion. **Do not tighten the bolts any further, as you will need to square the spindle before continuing.**

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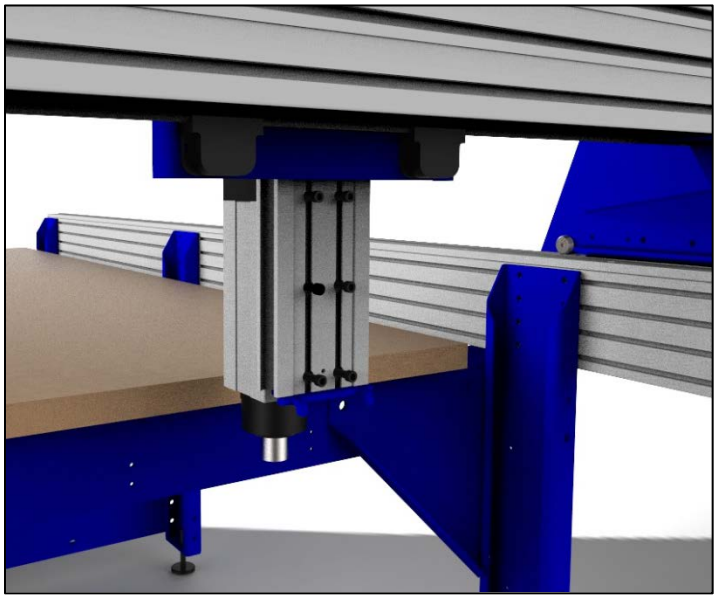
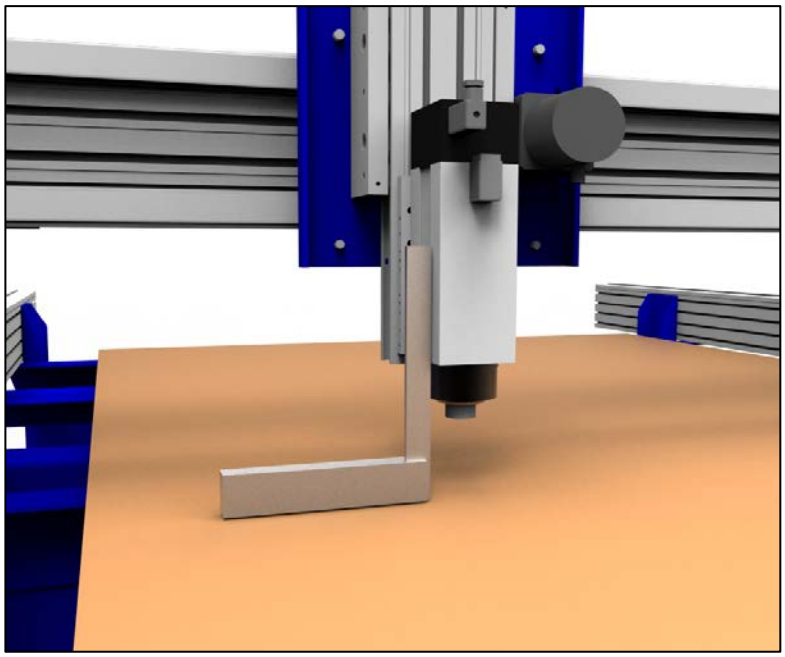
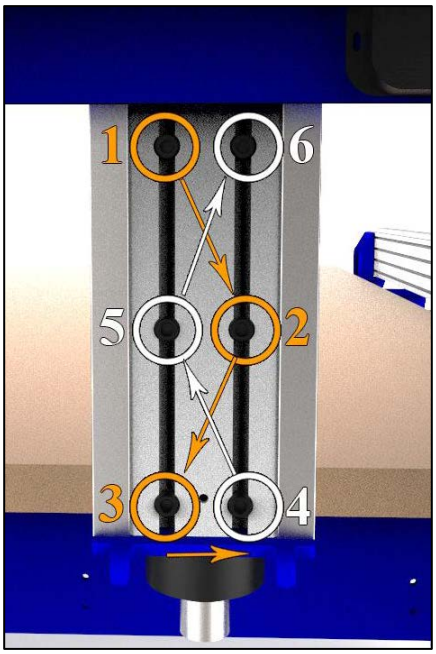




To square the spindle: Position the spindle over the table surface. Place a square between the table surface and the side of the spindle, as shown here. Adjust the position of the spindle as needed.



Once the spindle is square, tighten the bolts using the pictured pattern to ensure that they are fully tightened.

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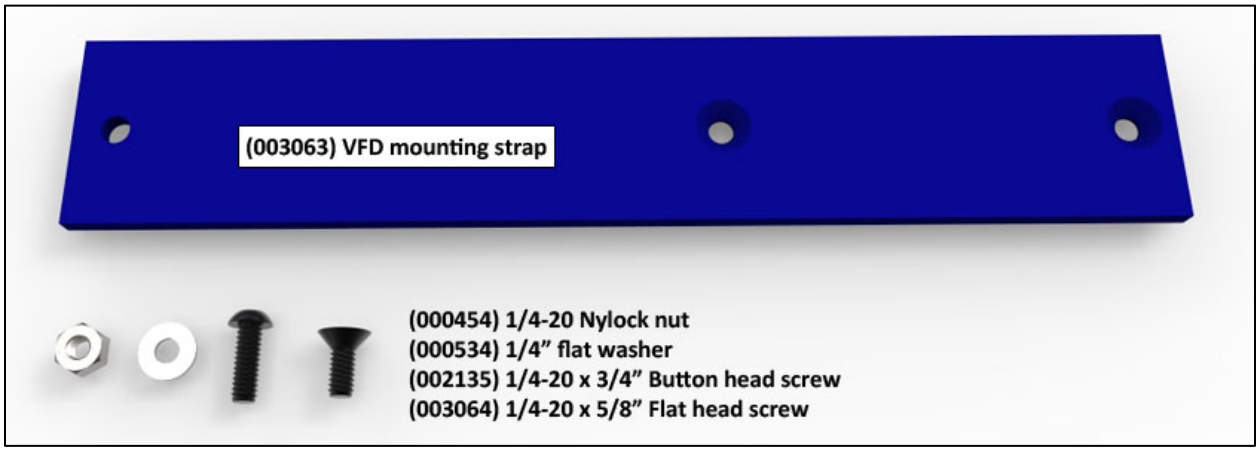
Mounting the VFD (Applies to spindles only. Skip this section if you are using a router).

The Variable Frequency Drive (VFD) controls the speed of the spindle. It mounts to the table frame using the hardware kit labeled “VFD mounting kit.”



Depending on the horsepower of your spindle, you will have either a 10” or 16” VFD. Both sizes use the same mounting hardware, but placement is slightly different.

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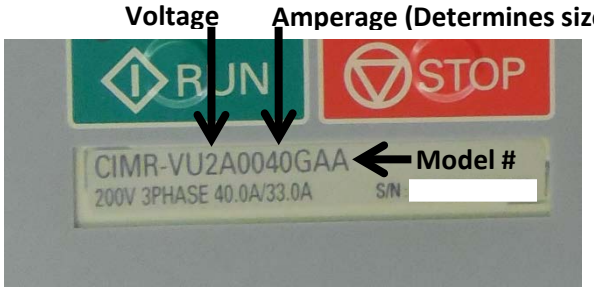
Determining the VFD Model

There are two main types of VFD's, a 10" model and a 16" model. These can be differentiated by their size and model numbers. Model numbers are found on the front of the VFD underneath the "RUN" and "STOP" buttons as shown to the left.

There are five different amperage configurations that could've been shipped with your tool. These will not impact installation, but could be information that tech support may need, so it is included.



An example model number is shown to the left. The model number is CIMR–VU**2**A00**40**GAA.

The first bolded and underlined number is the voltage.
2 = 200-240 Vac, 3-phase
4 = 380-480 Vac, 3-phase
This model is a 200V model. This information will not change your mounting procedure.

The second bolded and underlined section refers to the amperage. This is the part that will determine the sizing of your VFD.
10" VFD Models = 09, 12, and 20
16" VFD models = 30 and 40
In our example this is a 40A VFD (determined from the 40 in the model number) which is a 16" model. For installing this size model you would skip to section titled "Mounting the 16" VFD". The 10" VFD will be covered in the next section.

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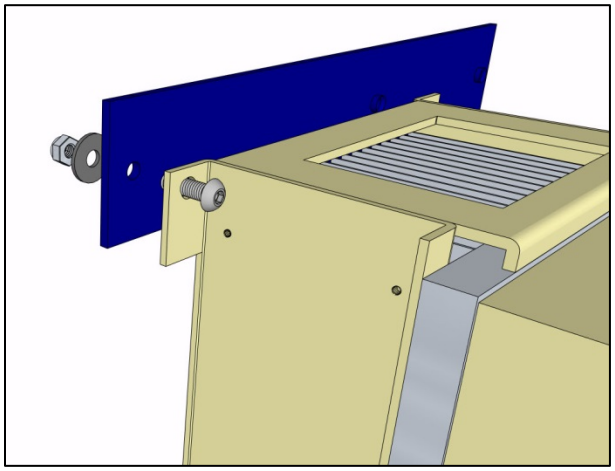
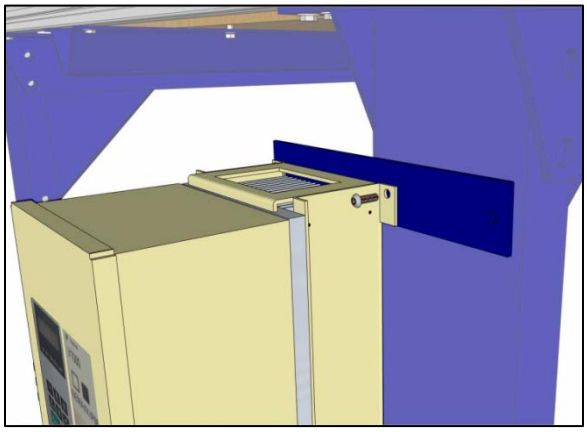
Mounting a 10” VFD

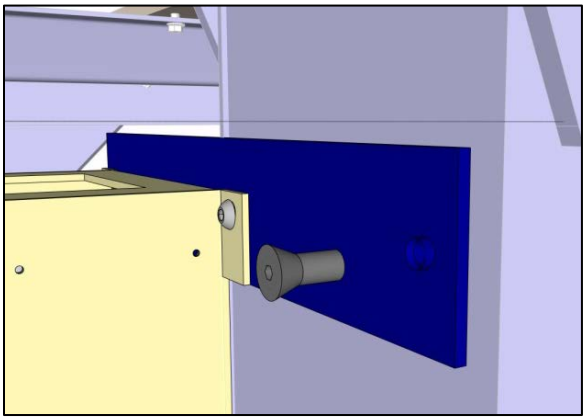


Use a 1/4-20x3/4” button head screw, washer, and nylock nut to attach the upper left corner of the VFD to the left-most hole on the mounting strap.

Repeat on the lower left corner of the VFD with the other mounting strap.

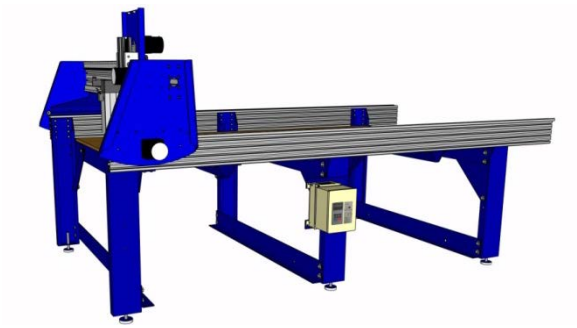
Locate the three pairs of holes on the center leg of the **front side** of your table. The 10” VFD will attach to the **upper and middle pairs.**





Starting with the upper pair of holes, thread another button head screw into the upper right corner of the VFD, through the mounting strap and the table leg. Secure using washer and nut. Repeat with lower right corner of the VFD.

Use the remaining 1/4-20x5/8” flat head screw, washer and nut to secure the far right side of the strap to the table leg. Repeat with the lower strap.



This completes the mounting procedure for the 10” VFD. Skip to the next section, “Connecting power to your Spindle”.

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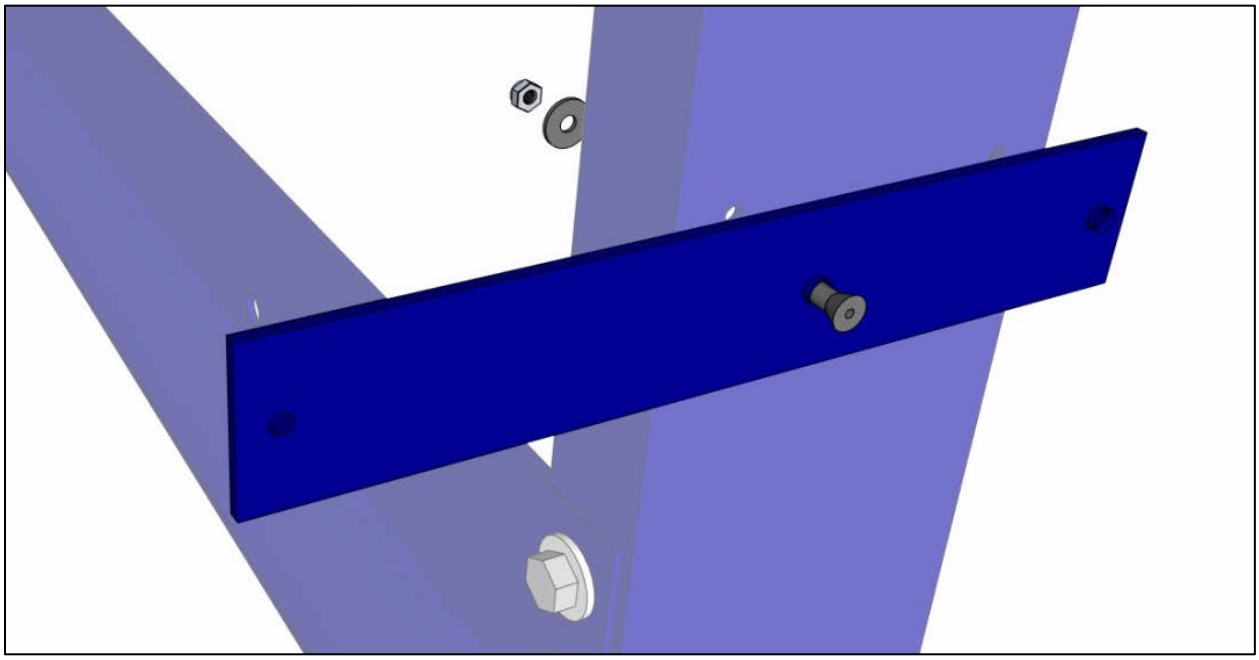
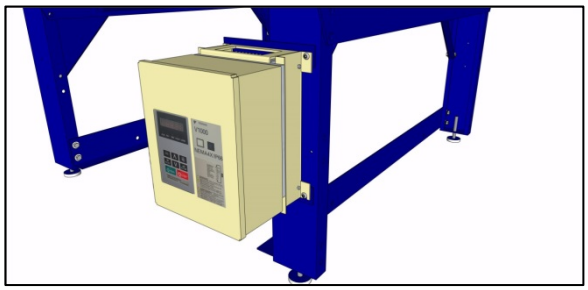
Mounting a 16” VFD



Locate the three pairs of holes on the center leg of the front side of your table. The 16” VFD will attach to the **upper and lower pairs** (skip the middle pair). Attach the first mounting strap to the table leg as shown here, using a 1/4-20 x 5/8” flat head screw, washer, and nylock nut. Repeat with the other mounting strap on the upper pair of holes.

Align the mounting holes at the corners of the VFD with the remaining holes on the mounting straps. On the right side of the VFD, thread a 1/4-20 x 3/4” button head screw through the VFD, strap, and table leg. Secure using washer and nylock nut. On the left side of the VFD, the hardware will go through the VFD and strap only.



This completes the mounting procedure for the 16” VFD.

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Connect power to your spindle

Power is supplied to the spindle through the orange cord coming from your VFD. Run this cord underneath the table towards the rear table side and then plug it into the spindle. Push the cord lock up until you feel it click into place.

The spindle fan (built into the spindle housing) has a separate power cord that you will wire into the control box later. Connect the plug and tighten the screw that locks it into place.

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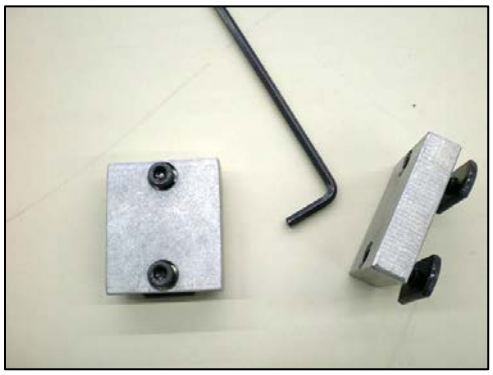
Mount the mechanical end stops and proximity switches

Mechanical end stops



The mechanical end stops primarily exist to stop the gantry from rolling off the table. When properly installed, they are also a useful tool for squaring the gantry to the table frame.

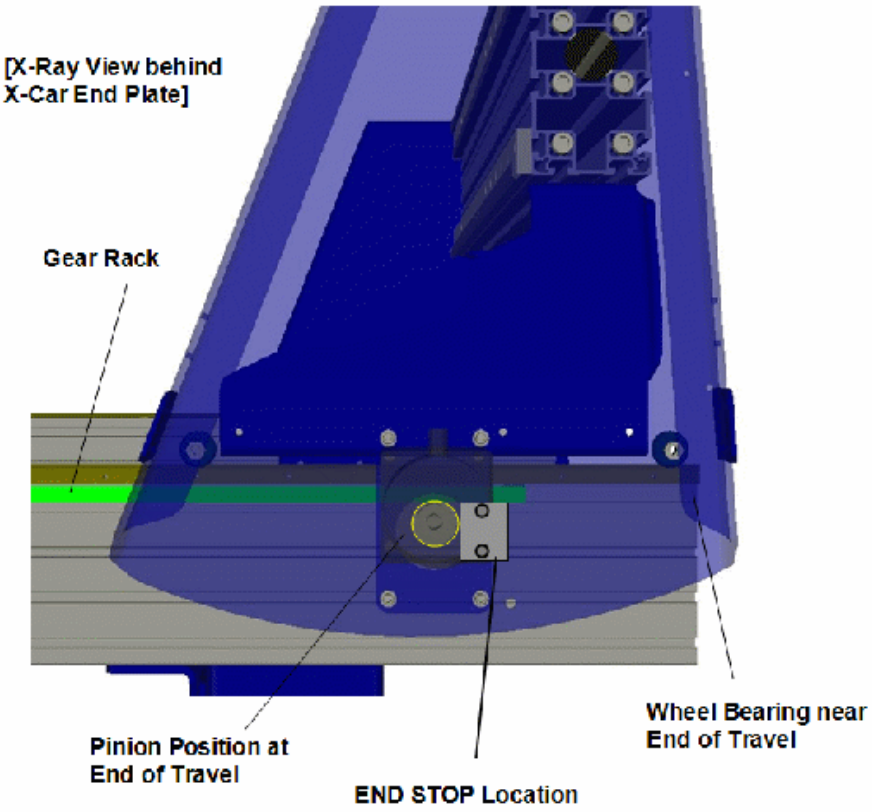
The Y axis stops have already been installed, but we will fine-tune their position later in the installation.

For the X axis, the stops will mount to the outside of each table side using the T-nuts and socket head screws included in the bag marked “end stops.”

You will also need the 1/8” hex key that came with your pinion gears.

This image shows the position of the stops at the far end of the X axis (away from the home position).

- Loosely attach the included hardware to the stop blocks and then slide them into place on each end of the **outside** of the table sides.
- Carefully roll the gantry to one end of the table until the wheels are resting within 1/4” of the end of the X rails. Put a clamp on the rail to hold the car in place at that position.
- Slide the stop blocks so that they are tight against the pinions on the two X motors.
- Tighten the bolts to lock the stop blocks into place.
- Repeat this step at the other end of the table.



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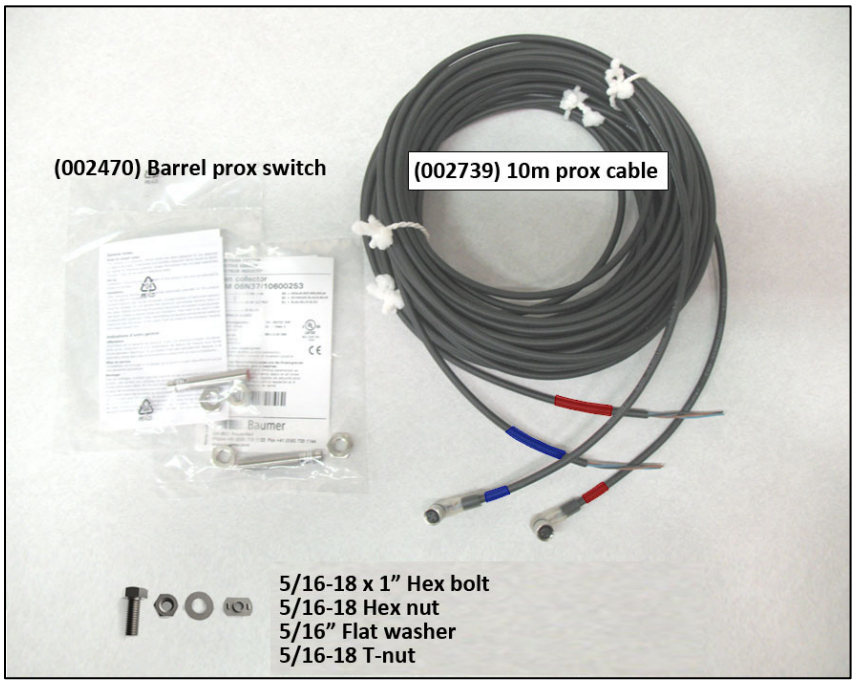
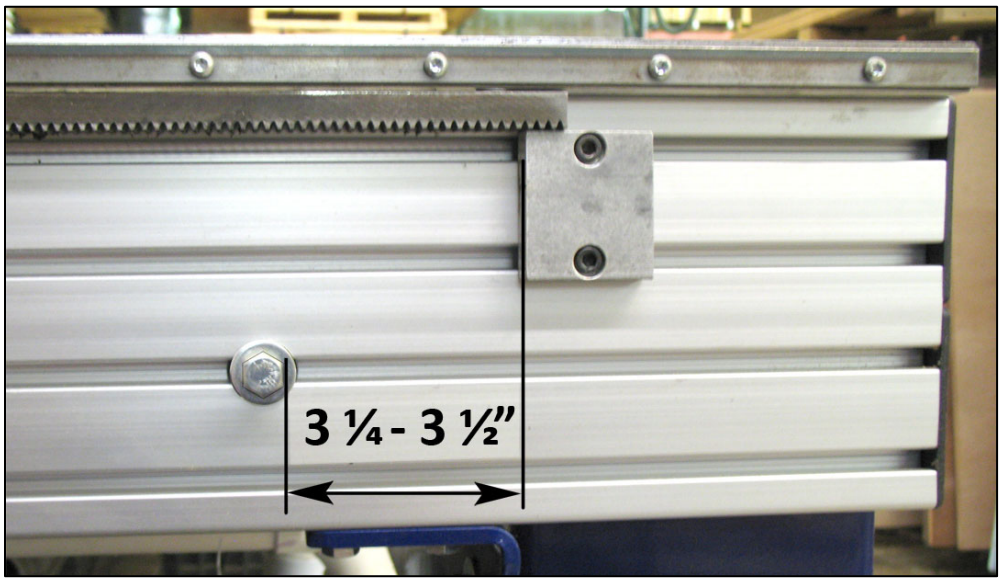
Install the proximity switches

The proximity switches are used to calibrate the XY location of the tool, and also signal the tool to stop movement before hitting the mechanical end stops. They are triggered by a steel target (in this case, a hex bolt).



Start by installing the X axis switch targets on the **rear table side**. Slide one of the T-nuts into the lower middle groove of the extrusion. Thread a hex nut onto one of the hex bolts, add a flat washer, and then loosely thread the bolt into the T-nut. Adjust the position of this assembly according to the diagram below. Tighten the bolt into the T-nut and then tighten the hex nut down against the extrusion.



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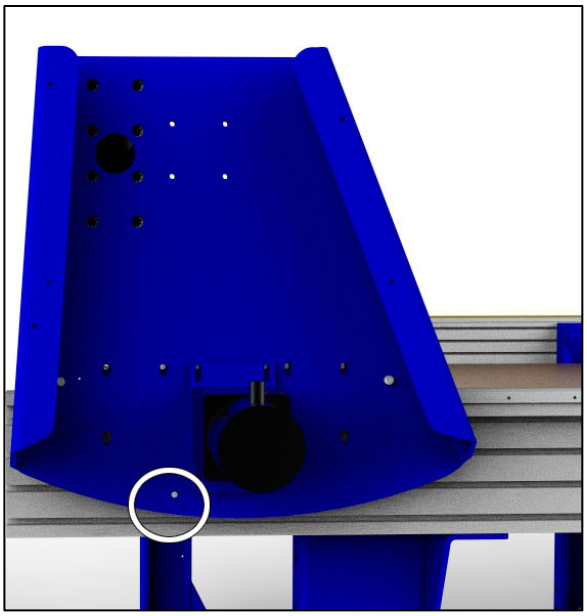
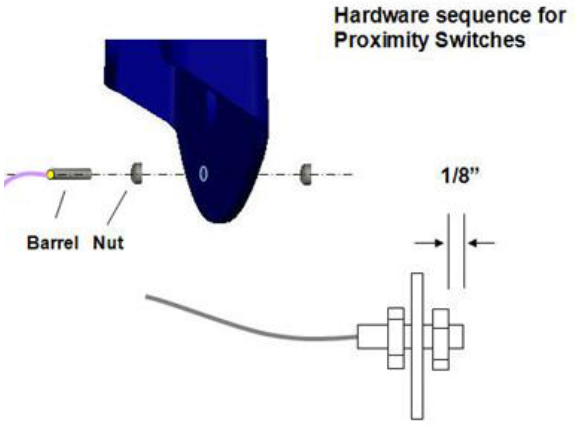


Locate the 8mm threaded hole in the gantry end plate. Roll the gantry into position so that this hole is directly over one of the target bolts.

Thread the barrel prox switch into the hole until it comes to rest on the target. Back it out several turns so that there is a 1/32” – 1/16” (1-2mm) gap between them.



Roll the gantry away from the switch and thread one of the nuts onto the front side of the switch (on the inside of the end plate). Thread the other nut onto the back side so that the end plate is “sandwiched” between the two nuts.

To complete this step, connect the X axis proximity switch cable (marked with red tape) by threading the nut on the connector onto the back of the switch.

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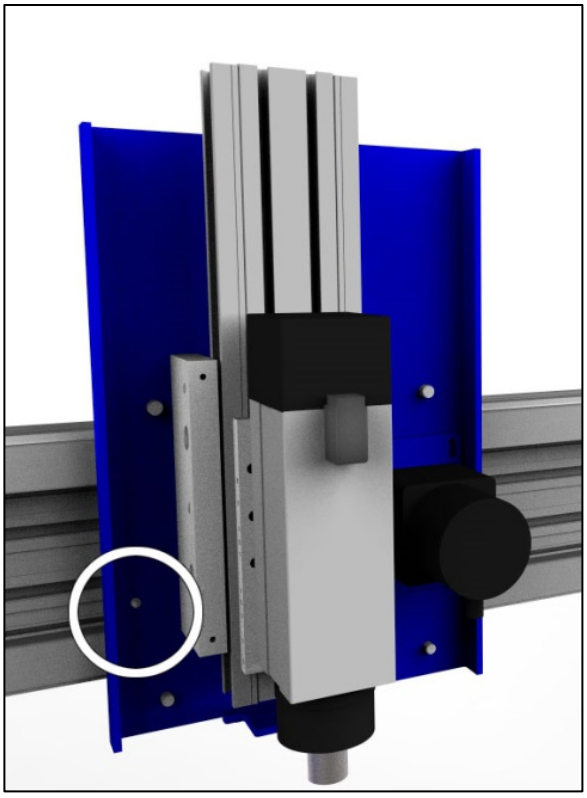

For the Y axis, the stop blocks and proximity targets are already mounted on the gantry. Adjust the stop blocks so that the YZ car hits them right before hitting the side of the gantry to maximize your travel.

Locate the 8mm threaded hole to the left of the spindle/router. Roll the YZ car into each stop block and adjust the target bolt so that this hole is directly over one at each end.

Thread the barrel proximity switch into the hole until it comes to rest on the target. Back it out several turns so that there is a 1/32” – 1/16” (1-2mm) gap between them.

Tighten the nuts onto the switch as you did with the X axis, and then connect the Y axis proximity switch cable (marked with blue tape).

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Mount the Z zero plate assembly

The Z zero plate assembly allows you to accurately calibrate the height of your Z axis before cutting. All the Z zero plate components are packed in a plastic bag inside the box of accessories (along with the proximity switches, etc).

Locate the 30’ gray cable and the two black 3mm screws in the Z zero assembly kit. Attach the gray Wago connector to the upper right side of the YZ car plate, as shown here (left).

The Z zero plate comes with an optional holster to store the Z zero plate when not in use. To attach the holster, simply remove the tape backing on the two pieces of aluminum channel and press it onto the YZ car so that the Z zero plate can slide down into it.

Connect the matching Wago plug on the Z zero assembly to the one you just mounted on the YZ car.

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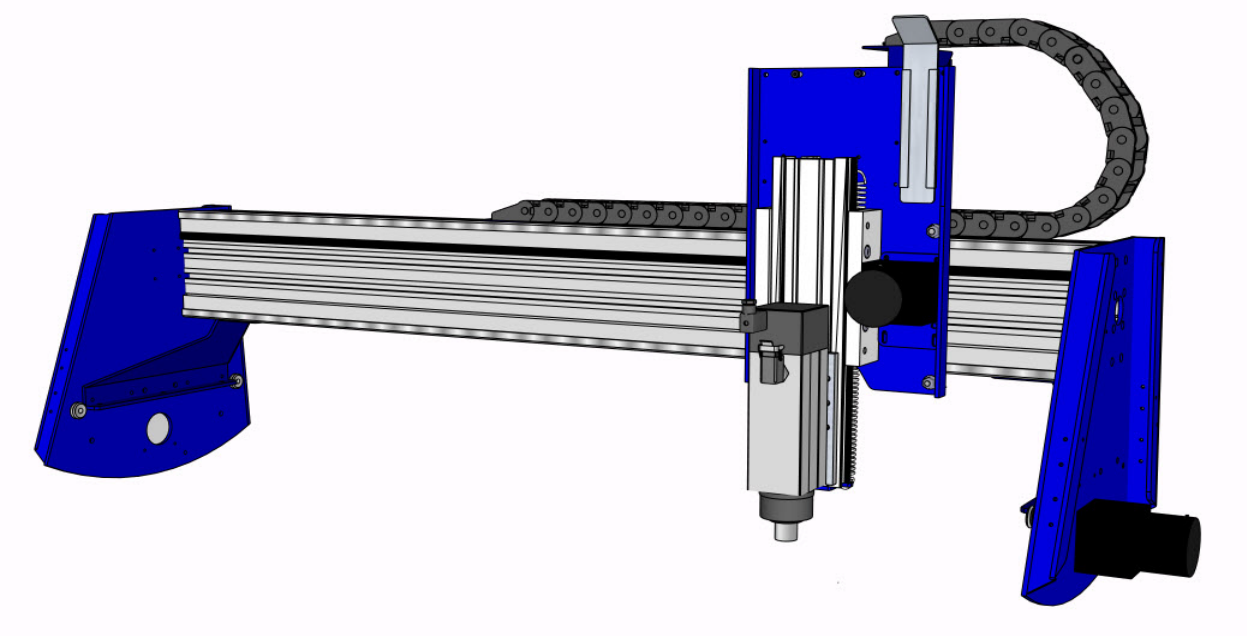
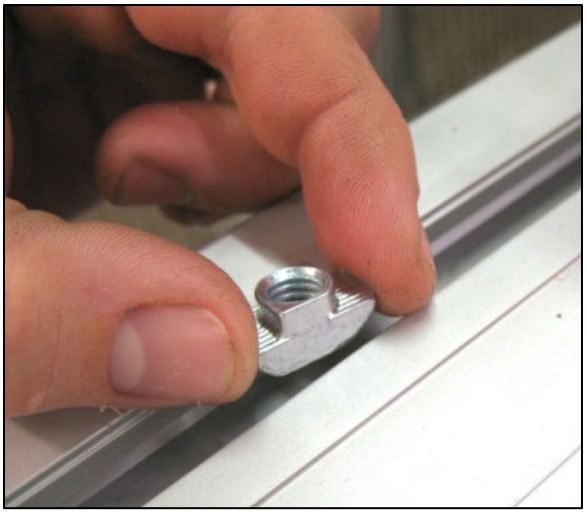
Install the Y axis E-chain

The Y axis E-chain kit is a cable management system for the Y and Z axis cords and cables. The E-chain itself will be located loose in the crate, while the other parts and mounting hardware will be located in a labeled plastic bag.



Please note: Tables 96” and longer also include an X axis E-chain kit as standard equipment. The components are not interchangeable. Typically, the Y axis e-chain will be the shorter than the X, so compare the two lengths if you are unsure which chain to use.



Begin by mounting the lower E-chain bracket onto the top of the gantry. Use two of the twist-in T-nuts included with the E-chain mounting kit. Simply drop them into the grooves.

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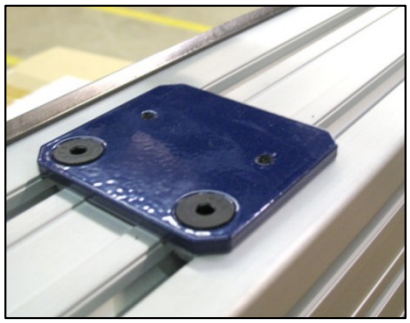
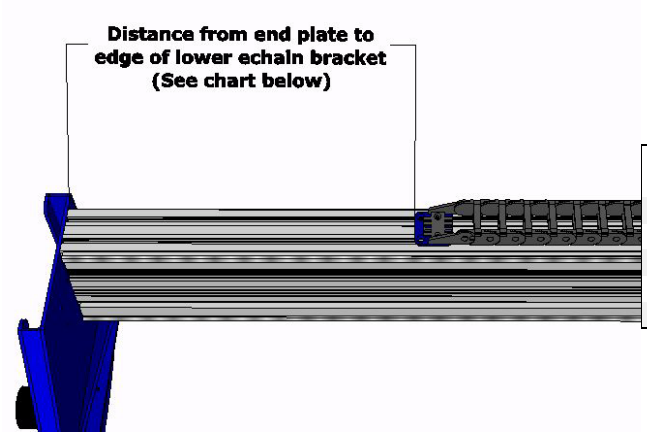
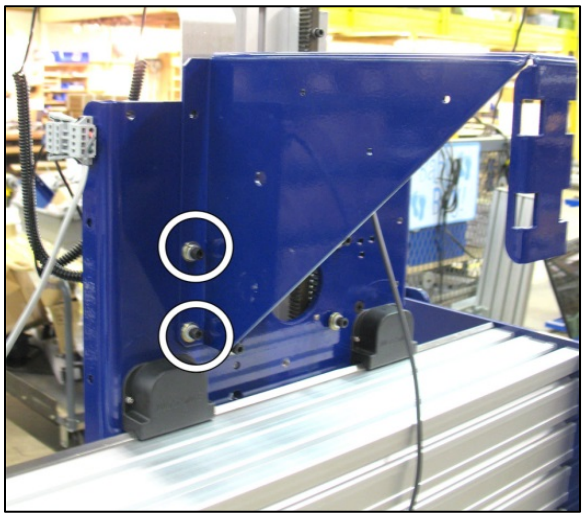


Loosely attach the lower mounting bracket using two 5/16-18x5/8” flat head screws. Position the bracket according to the diagram:



Y axis cutting width	Measured gantry length	Distance from end plate to first edge of lower bracket
32”	48”	22.5”
48”	66”	31.5”
60”	78”	37.5”
72”	90”	43.5”
108”	126”	61.5”



Mount the Y axis upper E-chain bracket onto the back of the YZ car. Use two 1/4-20x1/2” socket head screws, 1/4” lock washers, and 1/4” flat washers. The screws will pass through the bracket and thread into the YZ car.

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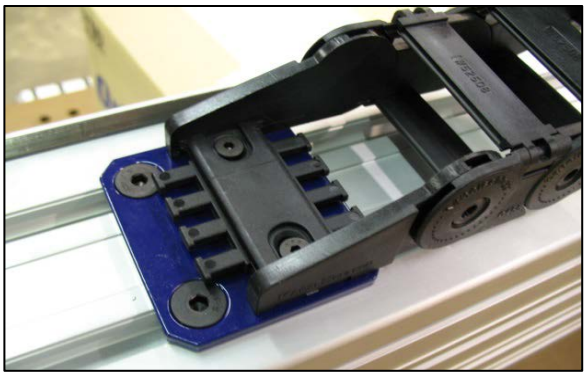
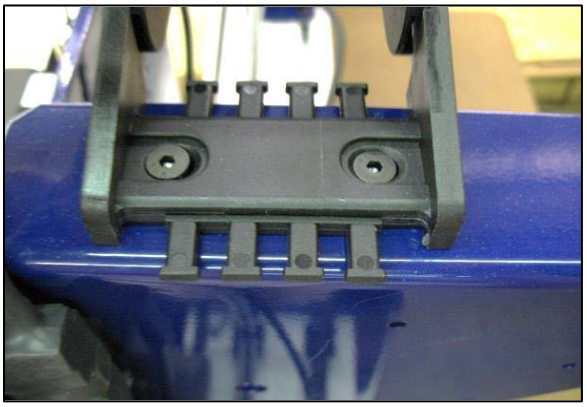


Mount one end of the E-chain to the lower bracket using two #10-32 flat head screws. Position the chain so that it loops towards the right when you are looking at the front of the YZ car.



Loop the chain up and around so that it sits on top of the Y axis upper E-chain bracket. Mount the chain using two #10-32 flat head screws, #10 flat washers, lock washers, and #10-32 hex nuts.

After the E-chain is installed, move the Y axis back and forth across its full extent of travel. The E-chain should never look or act as though it is binding or under tension. If this appears to be the case, loosen the bolts holding the lower bracket in place, and adjust the bracket position until the chain moves freely.

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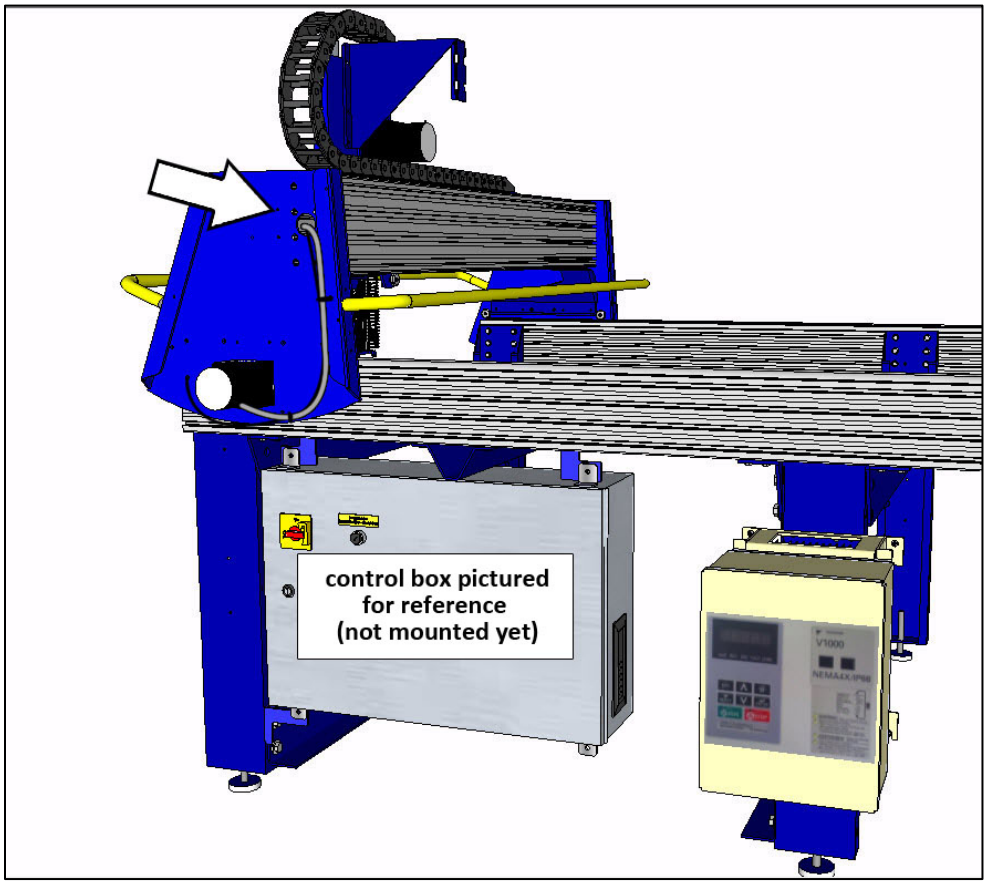
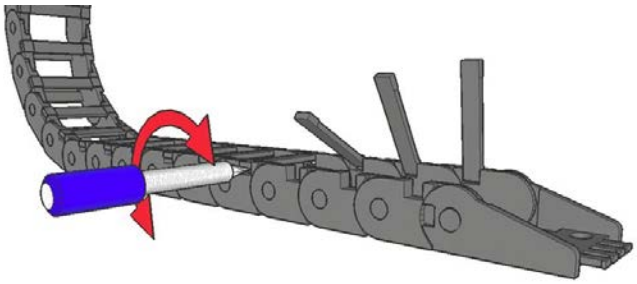
Add wires to the Y axis E-chain

First, route the X2 motor cable (on the left side of the gantry) through the hole in the center of the gantry beam. Secure the cable to one of the holes on the side of the end plate with a wire tie to minimize any slack in the cable.



Open the Y axis E-chain



Starting at either end of the Y axis E-chain, use a flat-head screwdriver to gently pry open the chain's access bars.

Use caution when moving the YZ-car with the access bars open. This can damage the chain.

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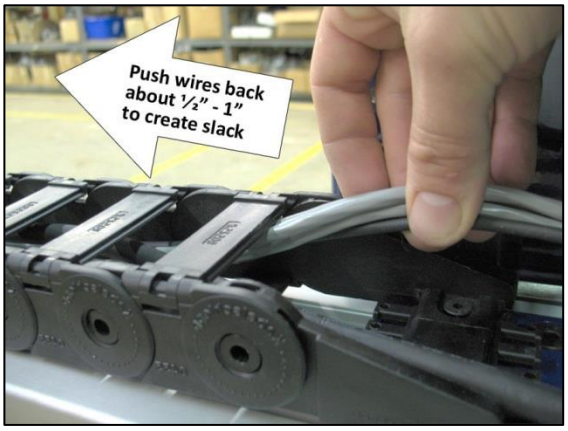
Lay the YZ car cables into the chain, keeping them as flat and organized as you can.

IMPORTANT: The spindle/router power cord should remain separate from the other cables without crossing over them. This will help prevent electrical interference issues.

Check that all necessary cables are inside the chain before closing the bars:

- ☐ Spindle/router power cord
- ☐ Spindle fan power cord (if applicable)
- ☐ Y axis motor cable
- ☐ Z axis motor cable
- ☐ Y axis proximity switch cable
- ☐ Z-zero plate assembly cable

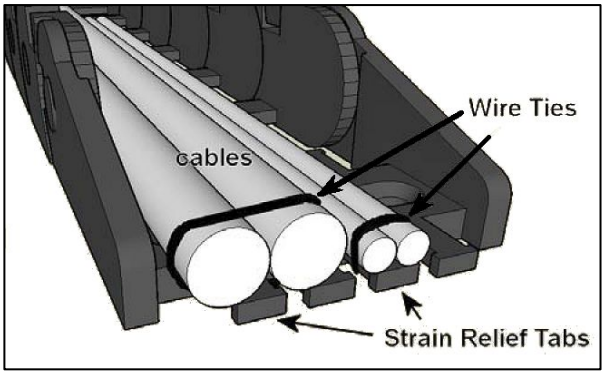


When all cables are inside the chain, close the bars by pressing them down until you hear a "click." Create a small amount of slack in the cables by pulling them tight against the inside of the chain, then pushing them back 1/2" – 1". Use a few of the included wire ties to secure the cables to the strain relief tabs at either end of the chain.

Once the bars are closed, you will need to secure the cables using wire ties and the strain relief tabs on the top side of the chain.

Start with the spindle/router power cord. **Leave enough slack for the Z axis to move through its entire length of travel without the cord pulling tight.**

DO NOT overtighten the wire ties.
DO NOT use wire ties inside the E-chain.



After the cables are secured inside the chain, locate the cable carriers included with the E-chain kit. These are installed by pressing them into the extrusion groove and twisting them one quarter-turn clockwise. Place two carriers in each groove, evenly spaced between the lower E-chain bracket and the end plate.

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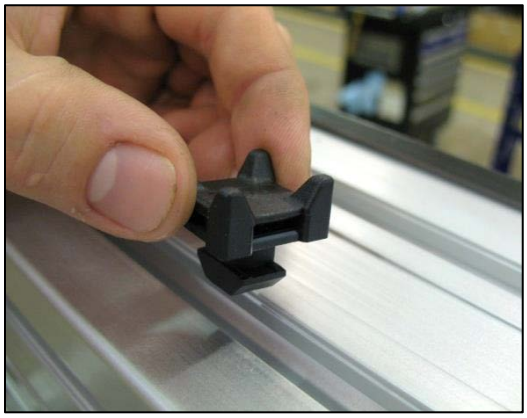
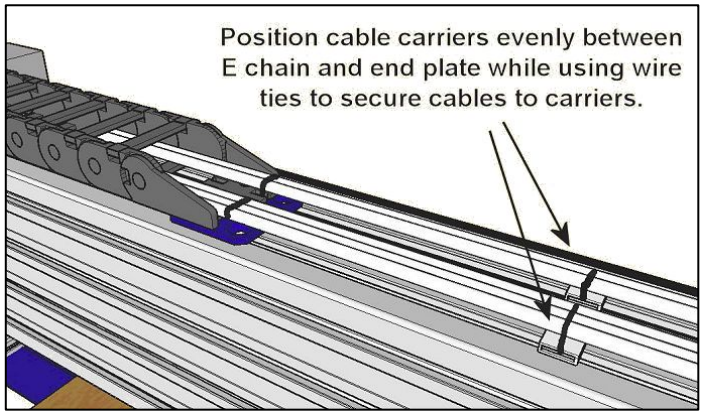
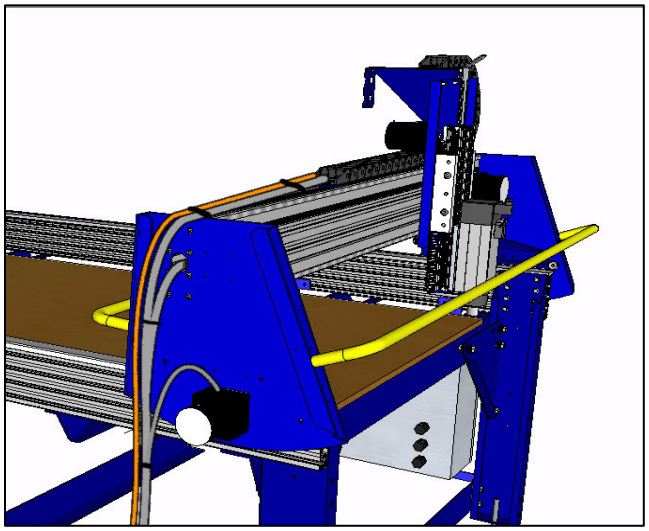




As the cables exit the chain, keep the spindle/router cord separate while bundling the other cables into one or two “cable ropes.”

Make sure to include the X2 motor cable that you routed through the gantry beam, as well as the X1 motor and the X axis proximity switch (located on this side of the gantry).

Secure this bundle to one of the holes in the side of the end plate using a wire tie.



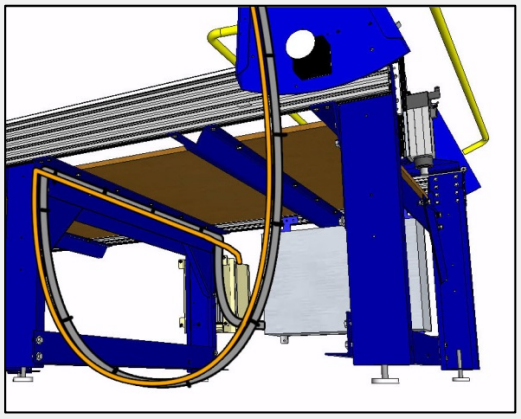
Cable management without an E-chain

Note: This step only applies to tools with a 48” or 60” X axis. Skip to the next section if you are working with a 96” table or longer.

If you are setting up a tool with an X axis of 60” or shorter, or if you had purchased this tool before 2013, an X axis E-chain is not included.

Continue to bundle the cable rope by adding wire ties every 12-16”. Move the gantry along its full extent of travel to determine how much slack is needed in the cable rope. Then secure it to the underside of the table (using any unused holes in the cross-supports) until you reach the other table side where the control box will be installed.

Any leftover cable should be made into large loops and secured under the table. Avoid making tight coils, which can act as an antenna for electrical interference.



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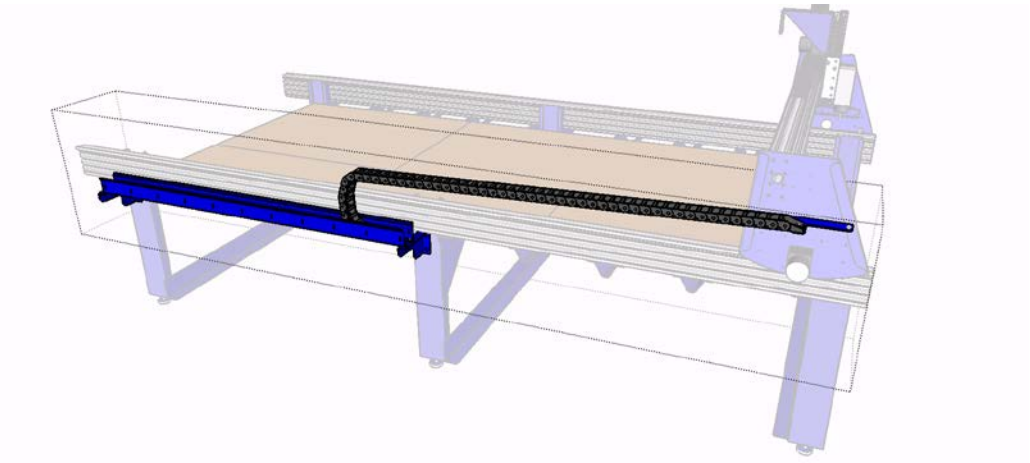
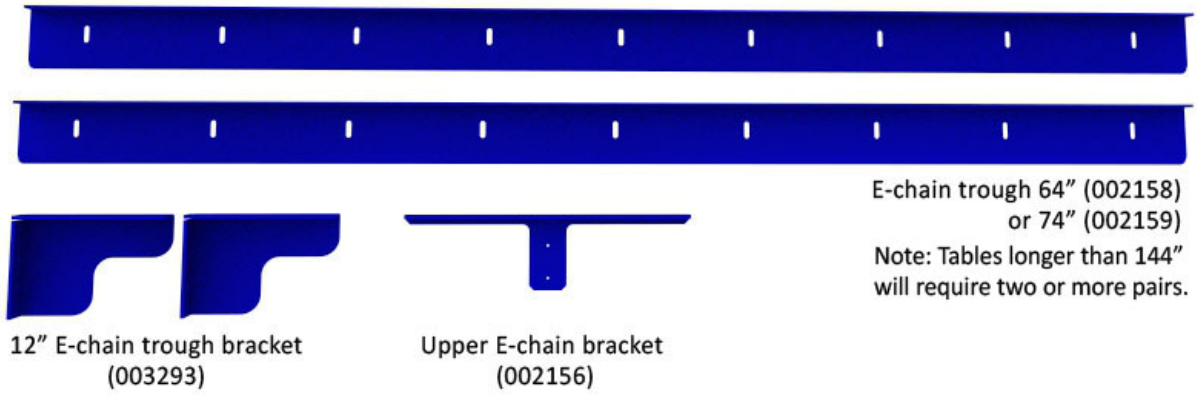
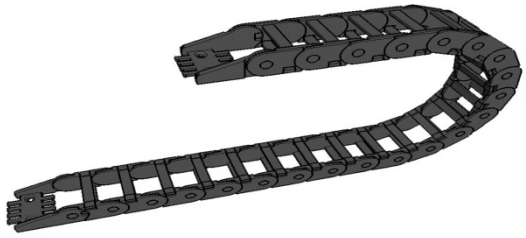
Install the X axis E-chain

(Applies to tools 96" and longer, or by special order on smaller models).



The X axis E-chain kit is a cable management system that carries all cords and cables from the machine to the control box. The E-chain itself will be located loose in the crate, while the other parts and mounting hardware will be located in a labeled plastic bag. **These components are not interchangeable with the Y axis E-chain kit.**





E-chain (sized to match your table)
Please note: The E-chain will be shorter than the actual length of your table.

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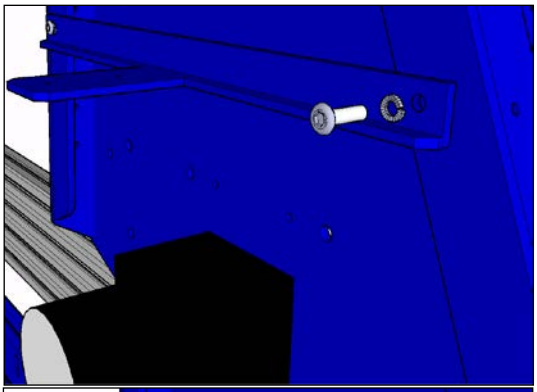
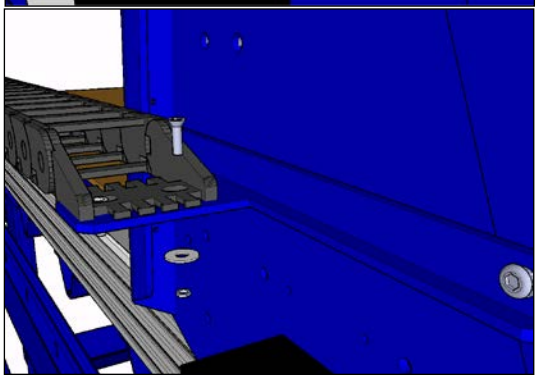


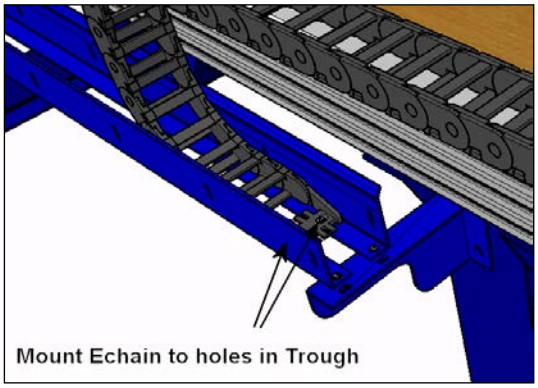
Install the X axis upper E-chain bracket

Mount the upper E-chain bracket to the 1/4-20 tapped holes located in the side of the endplate, using the **1/4-20x3/4" button head Screws** and **1/4" lock washers.**



Install the chain

Attach the E-chain to the tab that extends out from the upper E-chain bracket using two sets of **#10-32 flat head Screws, #10 flat washers, #10 lock washers** and **#10-32 hex nuts.**



Attach the other end of the E-chain to the holes located 3 ½" (64mm) from the end of the trough, closest to the center of the machine.

Use the same #10-32 hardware as in the previous step

Before continuing, move the X axis back and forth through its full extent of travel. The chain should never feel as though it is binding or under tension. If this appears to be the case, loosen the bolts holding the trough brackets onto the table sides and adjust the position of the trough until the chain can move freely.

All wires and cables coming off of the gantry will be carried in the X and Y axis E-chains. Use this checklist to inspect your cables before closing up the chain when you are finished:

- ☐ X1 motor cable (coming through the hole in the center of the gantry beam)
- ☐ X2 motor cable (located right above the upper E-chain bracket)
- ☐ Y motor cable
- ☐ Z motor cable
- ☐ X axis proximity switch (coming through the hole in the center of the gantry beam)
- ☐ Y axis proximity switch
- ☐ Spindle or router power cord
- ☐ Spindle fan cable (if applicable)
- ☐ Z axis proximity switch (for ATC tools only)
- ☐ Pneumatic air hoses (for ATC tools and optional air drills or pneumatic assists)

NOTE: As with the Y axis E-chain, keep the spindle/router power cord separate from the other cables. This helps to prevent electrical interference that may cause connection problems while you are running the machine.

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Mount the table surface (for non-vacuum tables)

Please note: If you are installing a vacuum hold-down system on your machine, please refer to the specific installation guide for vacuum tables. The following instructions will not be correct for your setup.

If your table size is greater than 96x48", you will need to tile multiple sheets to cover the full working area.
Refer to the table drawing at the back of this guide for specs and measurements specific to your machine.

Base layer

The base layer of your table should be a sheet of **3/4" cabinet-grade plywood.** When choosing plywood, keep in mind that a higher number of plys typically creates a more stable board that is less likely to warp (in other words, don't use cheap 5-ply utility sheathing!)
This layer will be bolted directly to the cross-supports using **3/8 x1 1/2" carriage bolts** (included in your hardware kit). To locate the mounting holes:

- Position the plywood on your table frame according to the table drawing. **It is imperative that you follow the table drawing on this step.**
- Clamp the sheet down to keep it from moving, then use a 1/8" drill bit to drill pilot holes through the cross-support holes up through the plywood. It is not necessary to drill out each hole… we recommend using every other one, creating a "checkerboard" pattern across the table.
- Moving back to the top side, use a 1" Forstner or Spade bit to drill a counterbore deep enough for the head of the carriage bolt to sit below the surface of the plywood.
- Drill out the pilot holes with a 3/8" bit.
- Press the carriage bolts into the clearance holes and through the cross-supports, using a mallet to tap them through if necessary.
- **Measure the spacing and location of the sheet one last time to make sure that it is positioned according to the table drawing**
- Use the included 3/8" flat washer and hex nuts to secure the bolts

For illustration purposes only. Hole size/spacing is not to scale.

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Spoilboard

The *spoilboard* is a sacrificial layer of 3/4" Medium-Density Fiberboard (MDF). As it gets damaged over time, you can re-surface the board down to a perfectly flat work surface until the entire board has been used up, then simply replace it with a new sheet.
For this step, you will need about a gallon of wood glue.

- Spread a thin, even coat of glue across the entire surface of the base layer. A cheap paint roller works great.
- Have someone help you set the MDF sheet(s) onto the base. Align this layer so that it lines up flush with the edge of the base, and work quickly- the glue will start to set within a minute.
- For best results, drive a handful of 1 1/2" wood screws into the MDF to clamp it to the base. **Be sure to remove these screws** after 30 minutes.

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