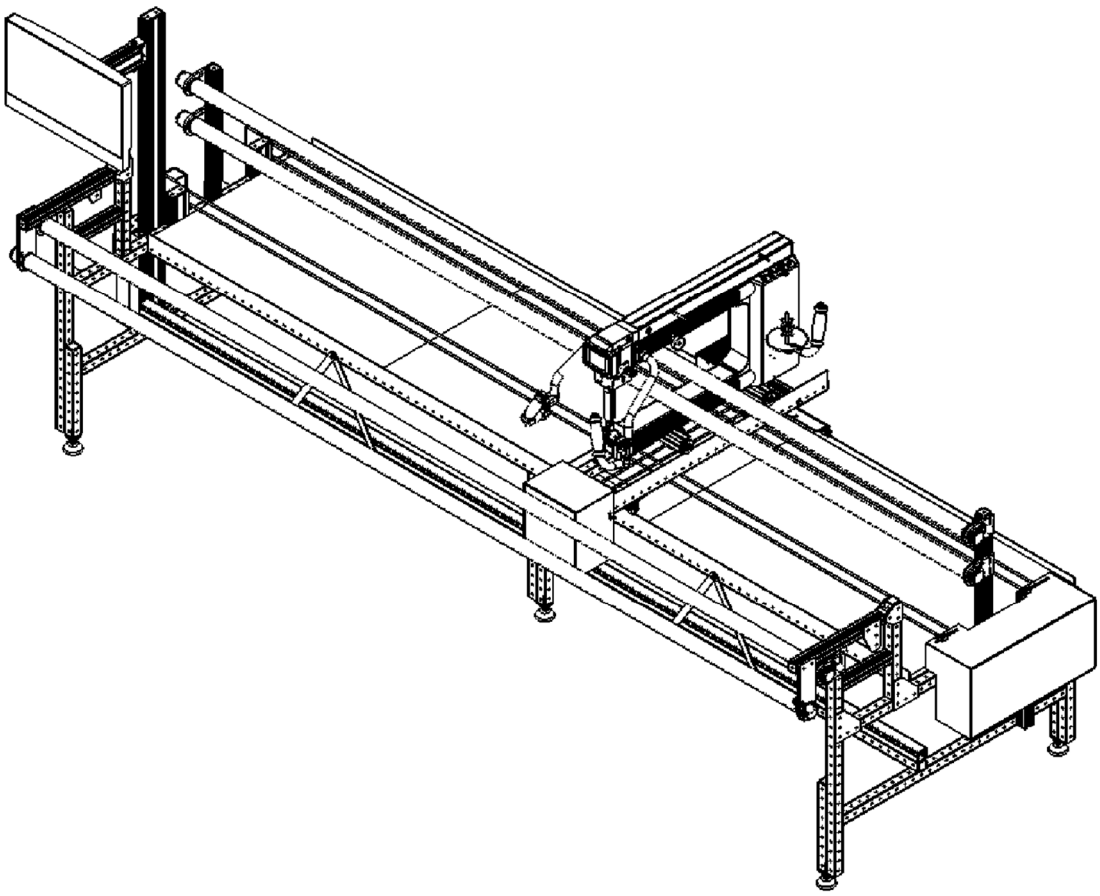


ABM International, Inc.

(M) Autopilot Assembly Manual

1.0: Parts List

Use this list below to confirm you have all of the required parts to complete the installation.

ACC1191 (M) Autopilot – Mach3

COM1040 Mach 3 PC, Touchscreen Beam, Swingarm, Software & Hub

ELE1150 PC
BOM1268 Screen Mount Beam Assembly – 1.5" x 3" x 48"
BOM1269 Swingarm Mount Assembly
ACC1174 Software Package and USB Hub kit – Mach 3

BOM1270 CNC Mechanical Set

BOM1256 Y-Axis Guard Assembly
BOM1257 X-Axis Guard Assembly
BOM1258 X-axis Motor T-slotted Beam Assembly
BOM1259 X-Axis Drive Shaft Assembly
BOM1245 QD Clamp Set
BOM1246 Belt Clamp Set
BOM1247 Timing Pulley Set
BOM1248 Belt Set
BOM1251 Y-Axis Drive Pulley Assembly
BOM1253 X-Axis Drive Bearing Assembly (2 PCS)
BOM1254 X-Axis Idler Bearing Assembly with Guard (2 PCS)

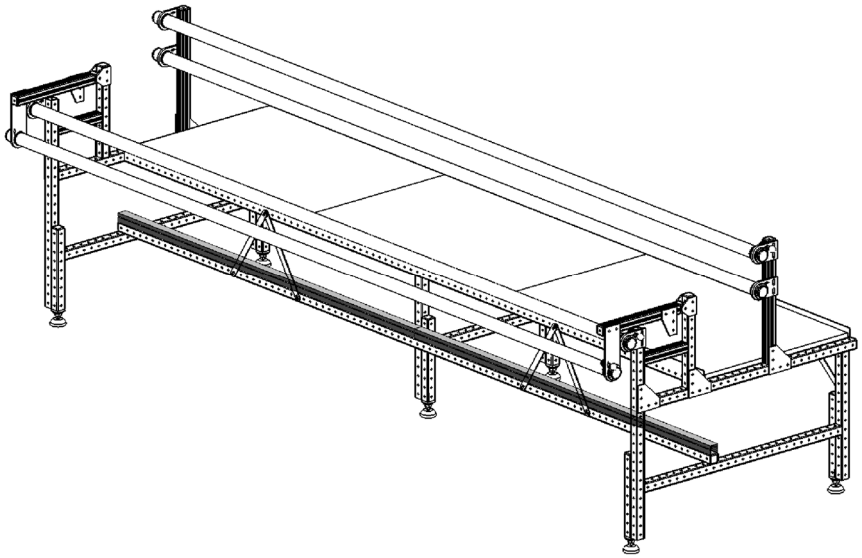
BOM1488 (M) Autopilot Electrical Set

BOM1261 Autopilot X-Axis Motor Assembly
BOM1262 Autopilot Y-Axis Motor Assembly
ELE1275 (M) Power Distribution Box
BOM1481 (M) Power Distribution Box Hardware Set
BOM1266 Autopilot Cable Mount Set
BOM1489 (M) Autopilot Cable Set
BOM1496 (M) Cable Strain Relief Set
BOM1497 (M) Power Distribution Box Cable Set
BOM1442 Touchscreen Beam Spacer Kit
(M) Autopilot Installation Instructions
Mach 3 User Manual

ELE1291 Wire Duct Gray 6' (2 PCS)

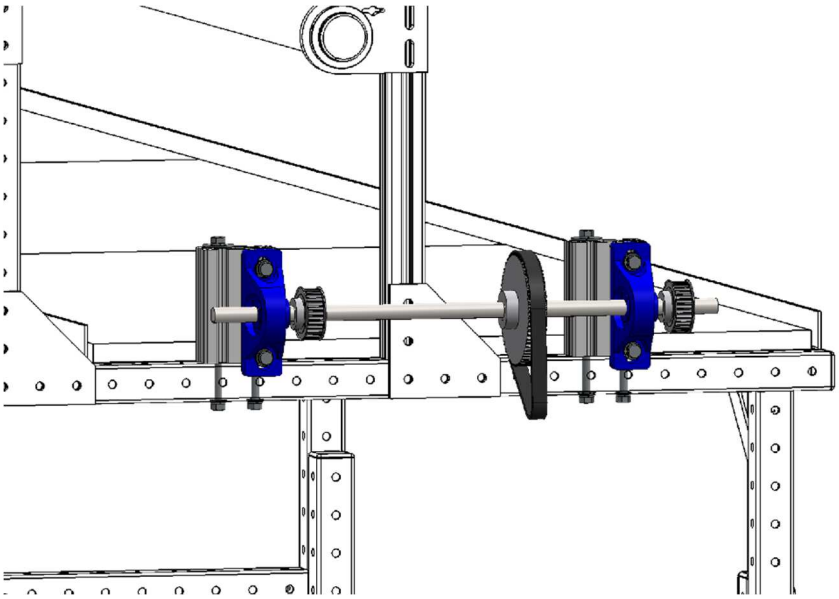
2.0 X-axis Assembly

Step 1: Remove the covers of the gray wire duct and install the (2) pieces to the top of the lower perforated tube of the frame.

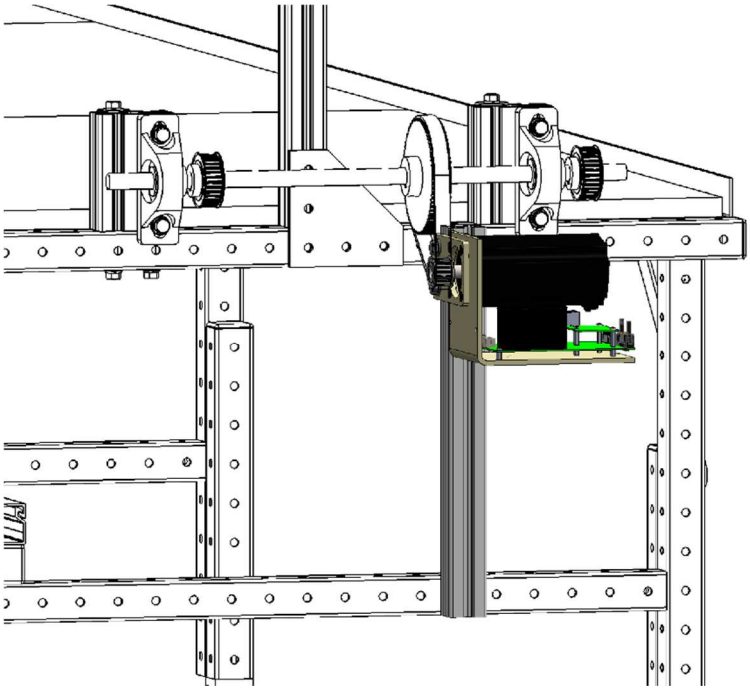


Step 2: See the figure of Step 3. Assemble (2) X-axis drive bearings assemblies with (2) medium drive pulleys and (1) large drive pulley. Make sure to place a key into the slot of the shaft for each of the pulleys. Leave the pulleys and bearing assemblies loose on the shaft. Drape the X-axis main timing belt onto the center of the shaft. **DO NOT TIGHTEN THE SET SCREWS**.

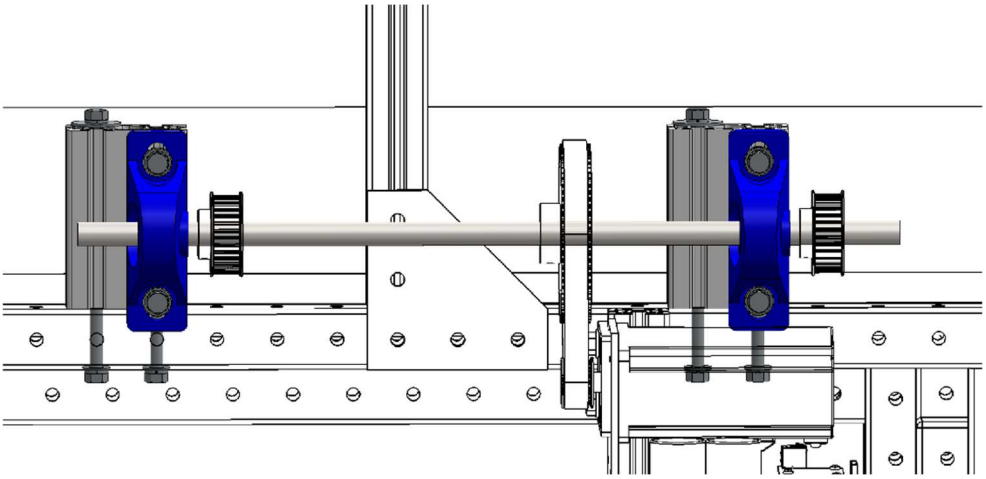
Step 3: With the X-axis main timing belt installed on the large pulley, install the X-axis drive shaft assembly onto the right side of the frame. Attach the bearing assemblies at the 6th and 7th holes for the rear bearing and 16th and 17th hole for the front bearing, counting from the back end of the top tube. Bolt the bearing assemblies using (4) 5/16 x 2-1/4" HEX bolts and (4) flat washers from the bottom up.



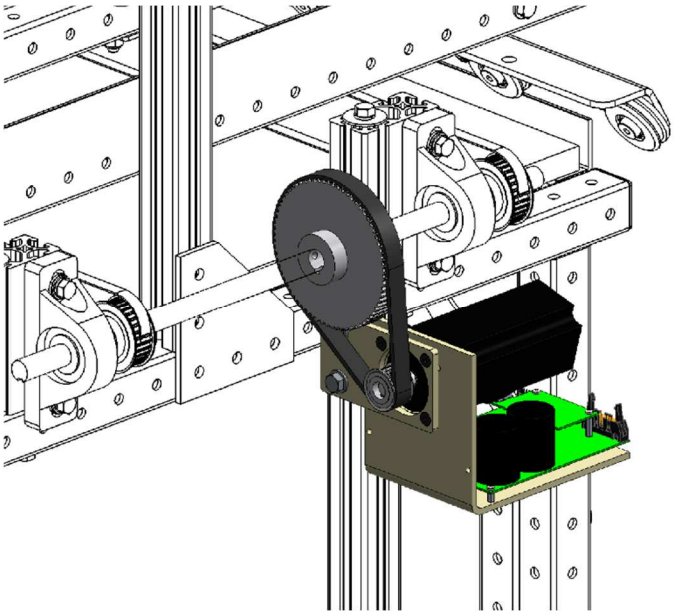
Step 4: Install the 15" X-axis motor t-slotted beam onto the right side of the frame in the eighth hole counting from the rear of the machine at the top frame beam. Use (2) 5/16 x 2" HEX bolts, (2) flat washers and (2) 5/16 T-nuts. Install the X-axis motor assembly using (2) 5/16 x ¾" HEX bolts, (2) flat washers and (2) 5/16 T-nuts. Locate the plate in the center of the beam. **NOTE: MAKE SURE TO USE THE X-AXIS SERVO MOTOR ASSEMBLY. THE MOUNTING PLATE POSITION VARIES BETWEEN THE X AND Y-AXIS.**



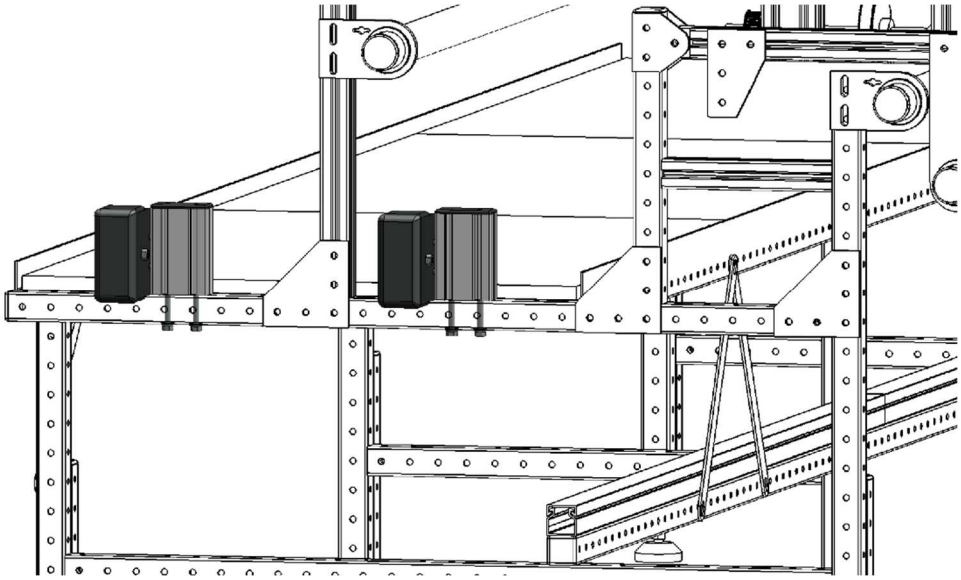
Step 5: Adjust the shaft so the left end is about a ¼" from the left side of the 4-1/2" long extrusion. The shaft should be sticking out of the bearing on the right end 2-1/2 to 2-3/4 of an inch. Tighten the set screws in the bearings. DO NOT TIGHTEN THE PULLEY SET SCREWS.



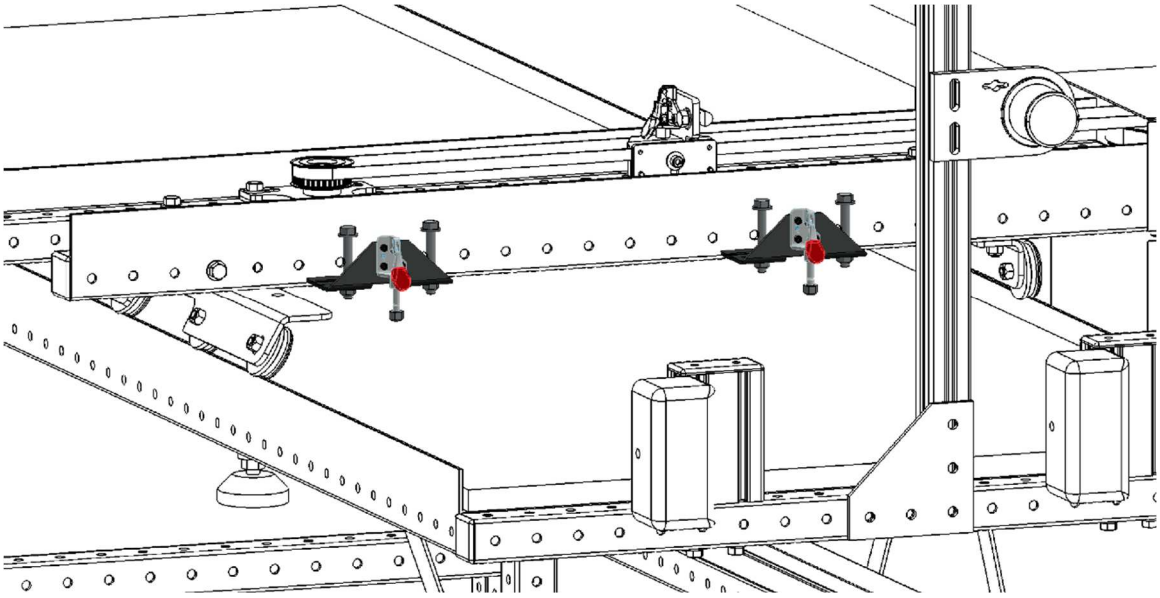
Step 6: Loosen the X-axis motor plate and slide the motor as high as possible on the slotted beam. Install the black X-axis main timing belt onto the motor pulley as well as the large drive pulley. Slide the large pulley on the shaft to align the large pulley and motor pulley. Tighten the set screws on the large pulley. Pull down on the motor plate to tension the black belt and tighten the (2) HEX bolts on the motor plate. **NOTE: THE BELT SHOULD BE TIGHTENED SO THAT RESISTANCE IS FELT WHEN YOU PRESS ON THE UNSUPPORTED SECTION OF THE BELT. THE BELT SHOULD BE TIGHT.**



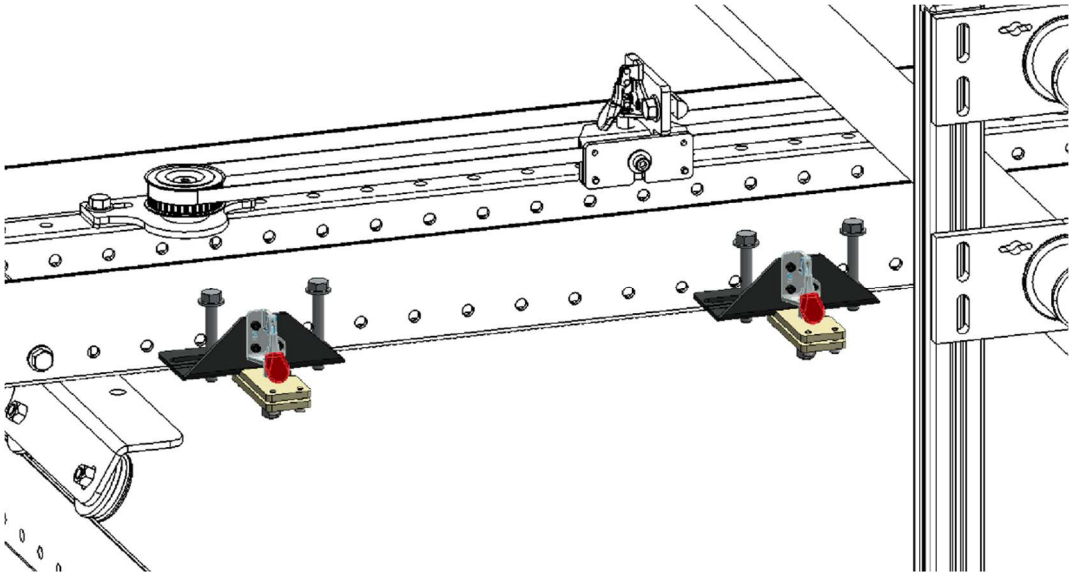
Step 7: Install the (2) X-axis idler bearing assemblies with guards. Install them into the 6th and 7th holes for the rear assembly and 16th and 17th hole for the front assembly counting from the rear of the left side of the frame. Use (4) 5/16 x 2-1/4" HEX bolts and (4) flat washers.



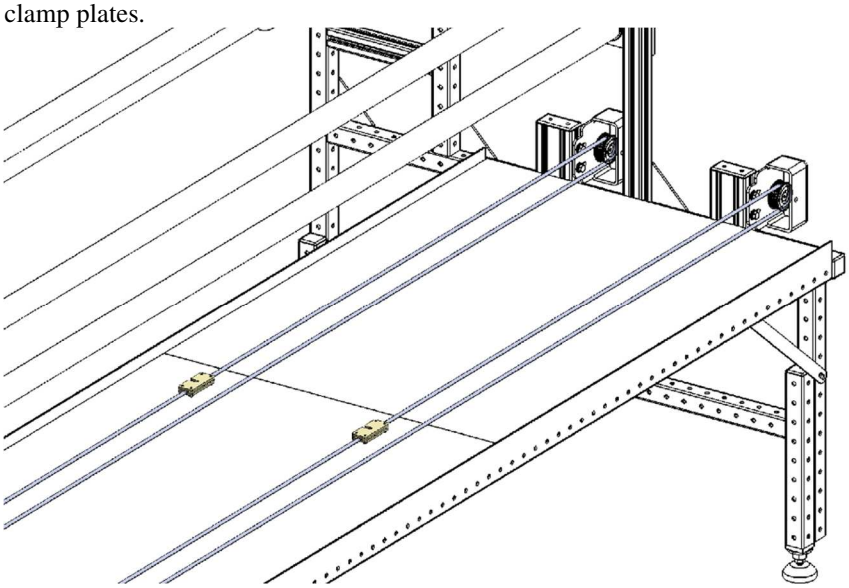
Step 8: Using (4) 5/16 x 2-1/4" HEX bolts, (8) flat washers and (4) nylon insert lock nuts, install the X-axis quick disconnect clamp brackets onto the left side of the lower carriage. Install the brackets so that the red handled clamp is aligned with the center of the idler pulleys on the left side of the machine. The bolts should be in the 7th and 9th hole and the 17th and 19th hole counting from the back of the carriage.



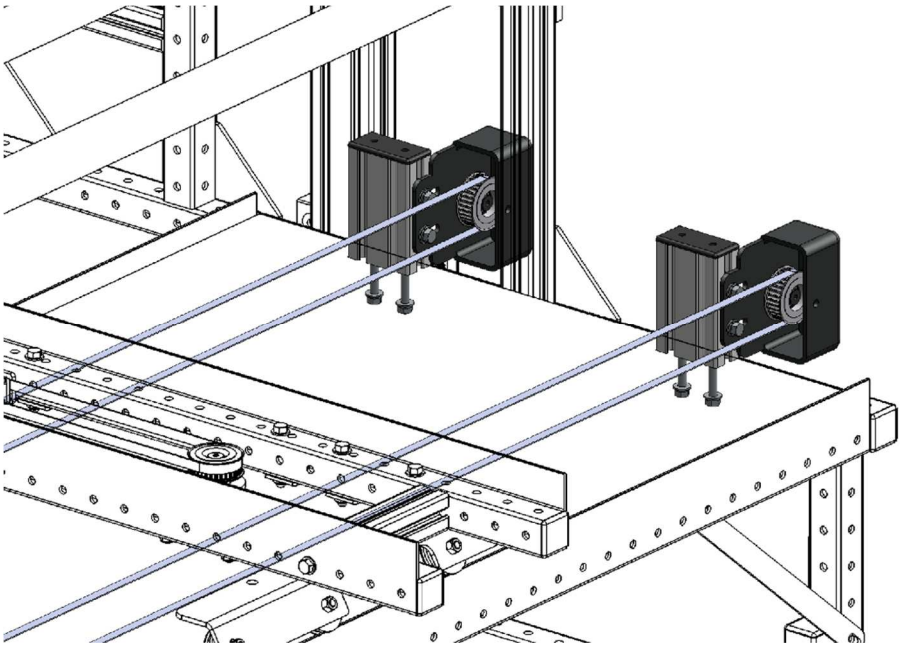
Step 9: Install the X-axis timing belt clamp onto the X-axis quick disconnect clamp. **NOTE: INSTALL THE CLAMP PLATE SO THAT THE SIDE WITH THE SMALL SLOT IS FACING UP**. Lift the red handle and check to make sure the clamp grips the plate assembly firmly. If the plate is loose, use a 7/16 wrench to tighten the hex nut on the bottom end of the clamp. **DO NOT OVERTIGHTEN OR THE CLAMP WILL BEND WHEN YOU ATTEMPT TO LOCK THE PLATE IN PLACE**.



Step 10: Lay the white X-axis timing belts on the frame table with the teeth facing up. On the right side of the frame, pass the timing belt around the medium drive pulleys and secure to the belt clamp plates on the carriage. **NOTE: THE BELT WILL PASS UNDER THE CARRIAGE AND CONNECT TO THE CLAMP PLATES MOUNTED ON THE LEFT SIDE OF CARRIAGE.** Pass the left end of timing belt around the idler pulley assemblies and attach to the timing belt clamp plate. Tighten the timing belt clamp plate bolts and check to make sure that both timing belt clamp plates are equidistant from the left end. Jump the belt over the pulley on the drive end to align the clamp plates.



Step 11: Tighten the belts by loosening the (2) 5/16 HEX head bolts on the slotted idler bearing plates and pulling the plates out away from the frame.

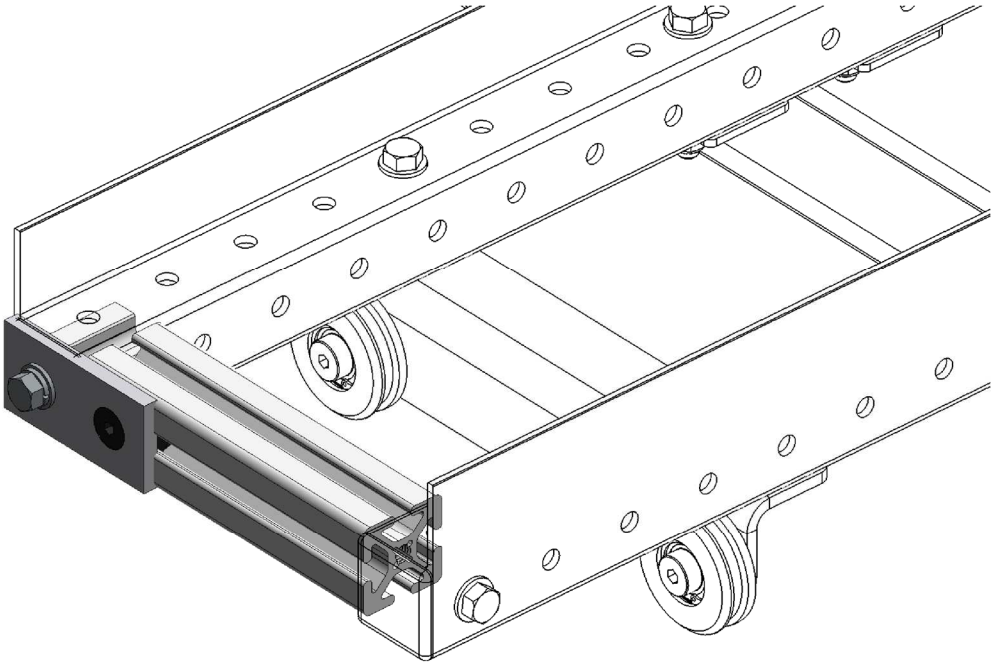


Step 12: Align the medium drive pulleys so the white X-axis timing belt is straight down the length of the frame. Ensure that all of the drive pulleys have keys in the keyways and tighten all (4) set screws on the medium drive pulleys.

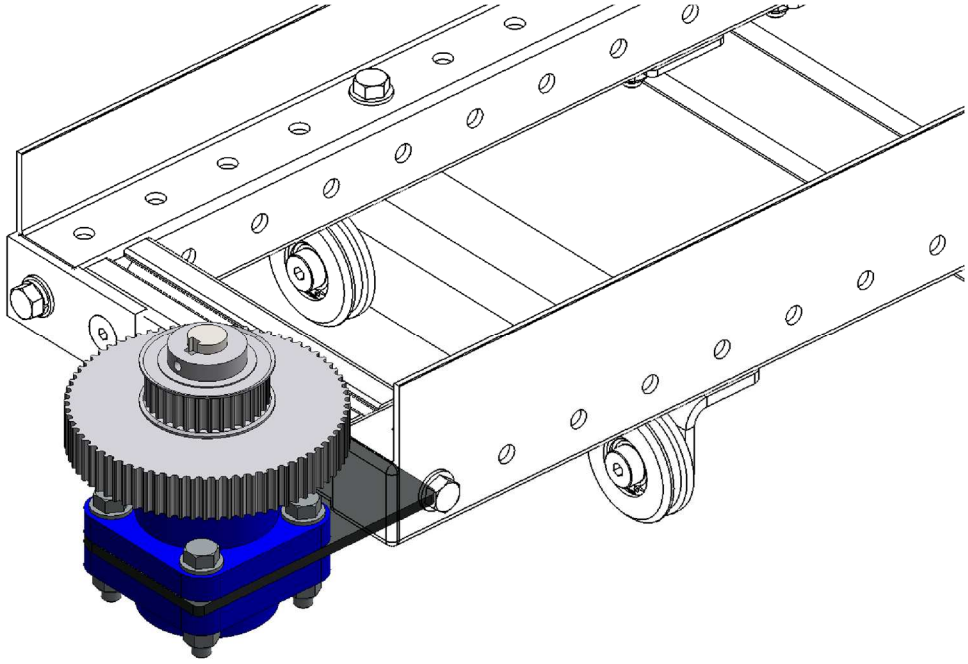
3.0 Y-Axis assembly

Step 1: In order to complete the installation of the Y-axis assembly onto an Innova, the front 6" t-slotted beam of the lower carriage must be located at the extreme front of the carriage. If the front beam is not in this position, please relocate it now.

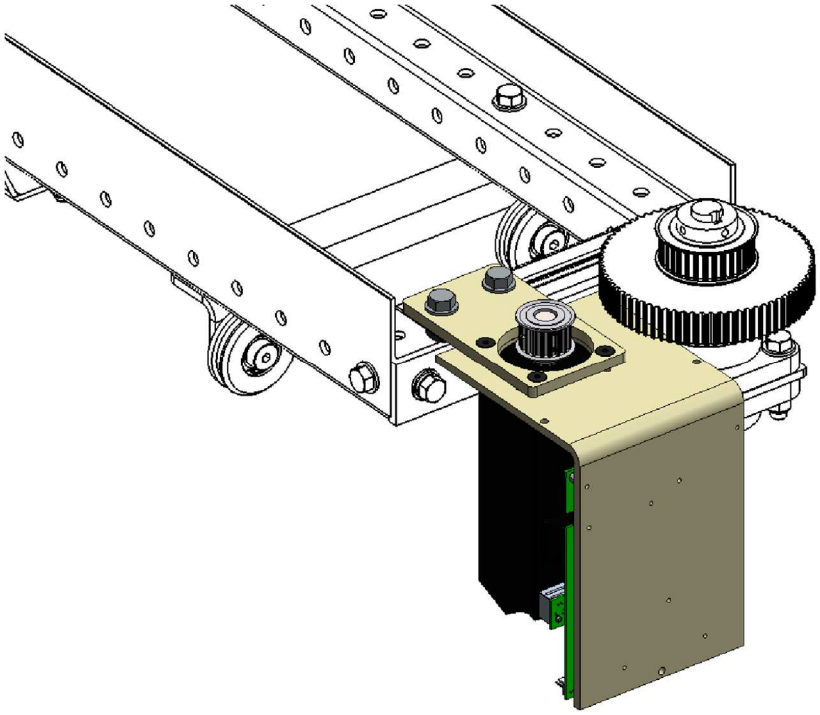
Remove both hex head bolts on the either side of the carriage that hold the front t-slotted beam and remove the beam. Install (2) 5/16 t-nuts in the top of the beam, (1) 5/16 t-nut in the front face of the beam and (2) 5/16 t-nuts in the bottom of the beam. Re-install the beam in the first hole at the front of the carriage. Install the carriage support cross block into the front end of the left carriage rail and pass the original bolt holding the t-slotted beam through it and secure. Using a 5/16 x ¾" hex head bolt and flat washer attach the cross block plate to the front face of the t-slotted beam. Make sure to tighten both sides of the 6" t-slotted beam to either lower carriage rail.



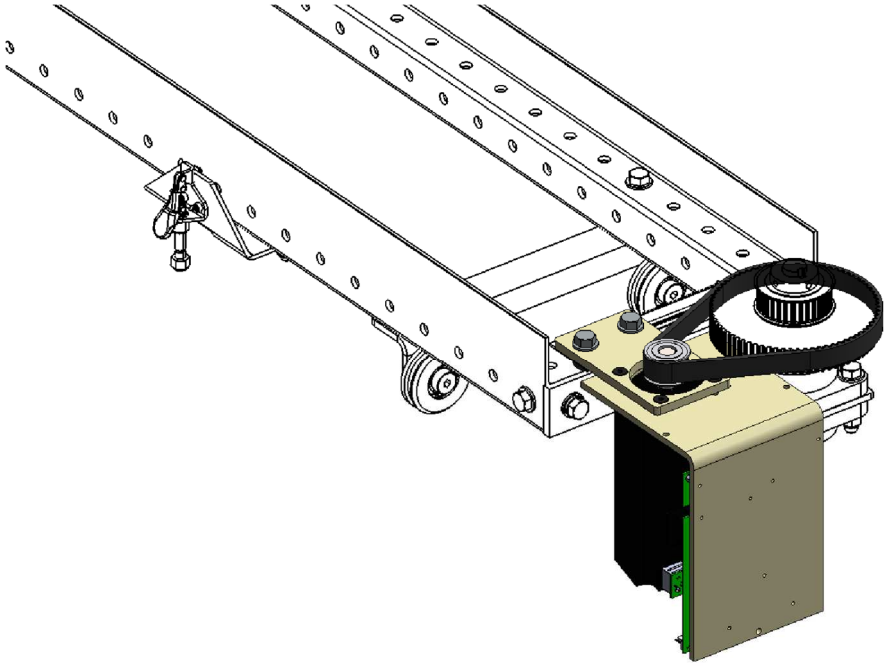
Step 2: Install the Y-axis drive pulley assembly to lower side of the front t-slotted beam using (2) 5/16 x ¾" hex head bolts, flat washers and (2) 5/16 t-nuts previously installed in the beam. Adjust the assembly so the large diameter pulley is flush to outside of the lower carriage right rail. Tighten the bolts.



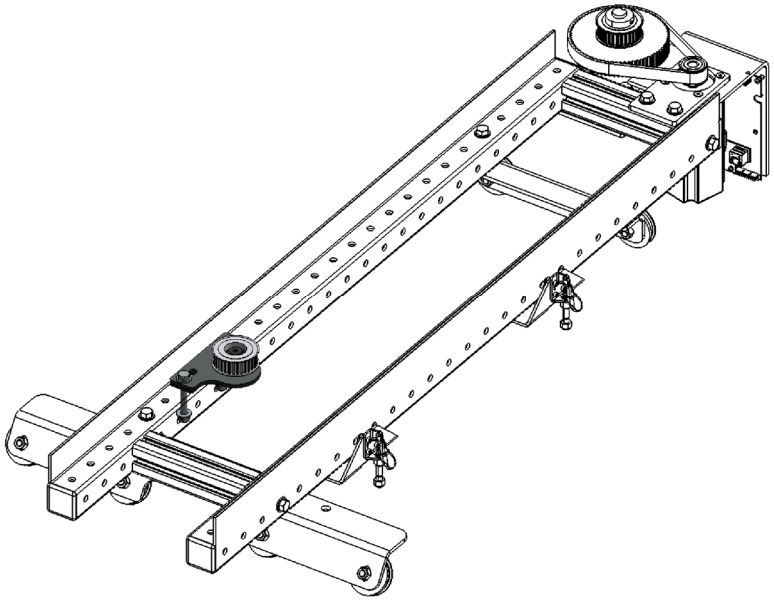
Step 3: Install the Y-axis servo motor assembly onto the top side of the front t-slotted beam using (2) 5/16 x ¾" hex head bolts, (2) flat washers and (2) 5/16 t-nuts previously installed in the beam.



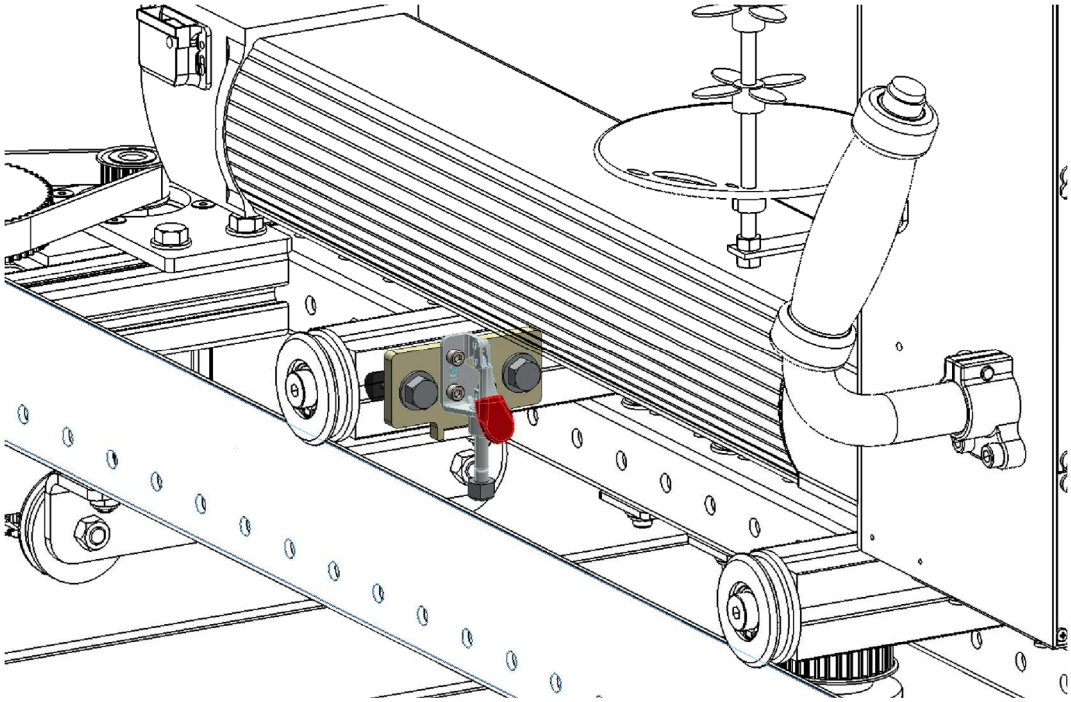
Step 4: Install the black Y-axis main timing belt on to the motor pulley and large drive pulley. Tension the belt by loosening the motor plate screws and pulling the motor away from the large pulley. Tighten the bolts **NOTE: THE BELT SHOULD BE TIGHTENED SO THAT RESISTANCE IS FELT WHEN YOU PRESS ON THE UNSUPPORTED SECTION OF THE BELT.**



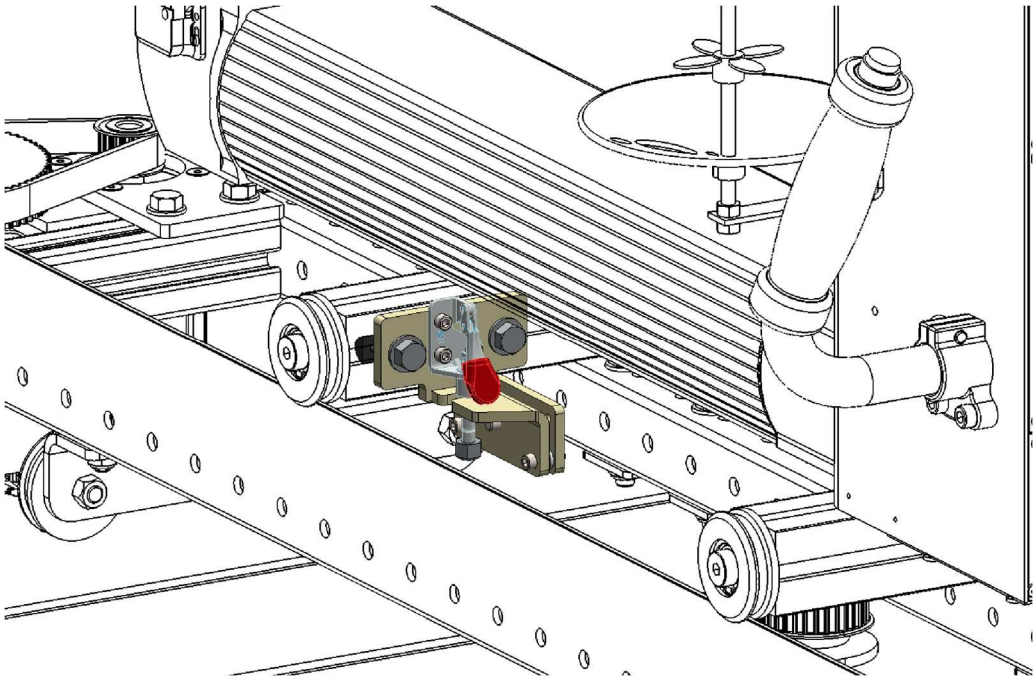
Step 5: Install the Y-axis idler pulley onto the inside of the right carriage rail in the 7th and 9th hole counting from the rear of the rail. Use (2) 5/16 x 2-1/4" hex head bolt, (4) flat washers and (2) nylon insert lock nuts.



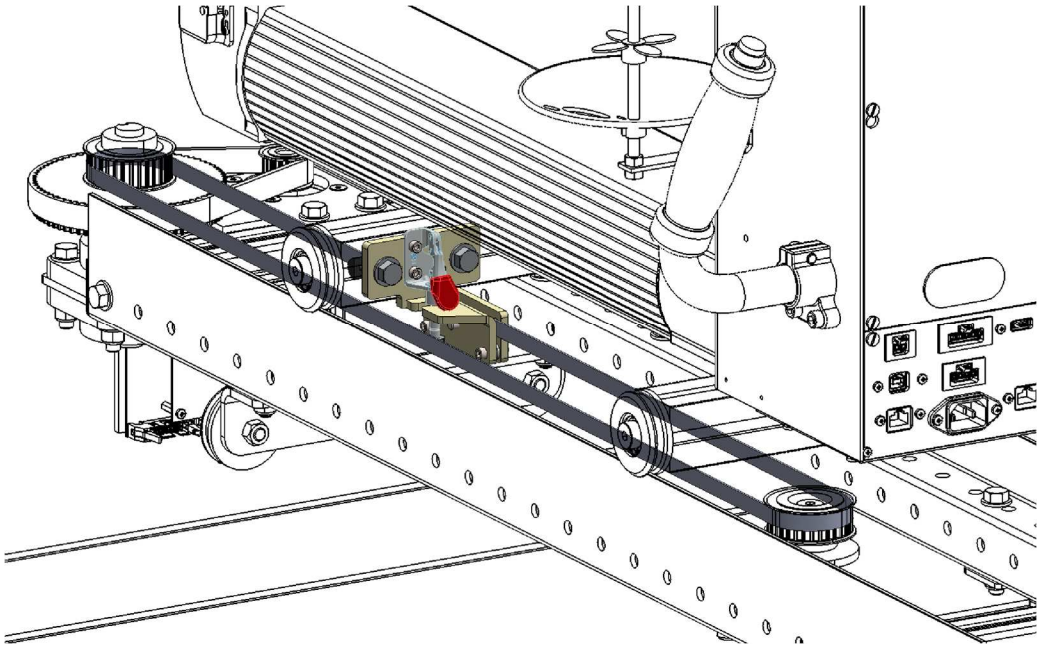
Step 6: Install the Y-axis quick disconnect clamp on to the right front wheel beam of the Innova using (2) 5/16-18 x 3/4" hex head bolts, (2) FW and (2) 5/16 drop in t-nuts. See the diagram below for correct orientation. NOTE: Remove the right front wheel of the Innova and slide the T-nuts in from the end.



Step 7: Install the Y-axis timing belt clamp plate onto the quick disconnect clamp. Be sure to follow the orientation in the diagram below. Lift the red handle and check to make sure the clamp grips the plate assembly firmly. If the plate is loose, use a 7/16 wrench to tighten the hex nut on the bottom end of the clamp. **DO NOT OVERTIGHTEN OR THE CLAMP WILL BEND WHEN YOU ATTEMPT TO LOCK THE PLATE IN PLACE**.



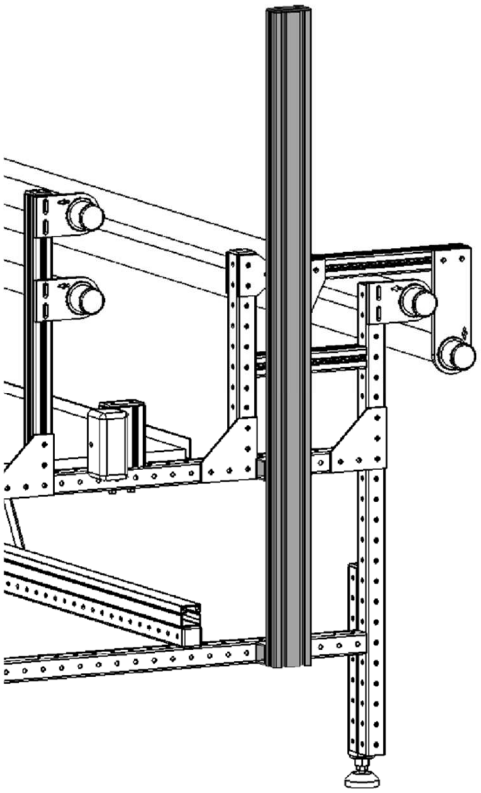
Step 8: Install the white Y-axis timing belt onto the front medium drive pulley and the rear idler pulley. Install the open ends of the belt as high as possible in the clamp plate and tighten the (2) #8 bolts and the (1) ¼" bolt in the center. **NOTE: THE CLAMP PLATE MUST BE INSTALLED ON THE LEFT SIDE OF THE WHITE TIMING BELT LOOP. TO CHECK FOR PROPER INSTALLATION, THE INNOVA SHOULD MOVE TOWARD THE FRONT WHEN THE LARGE PULLEY IS TURNED COUNTER-CLOCKWISE WHEN VIEWED FACING FROM THE TOP LOOKING DOWN**.



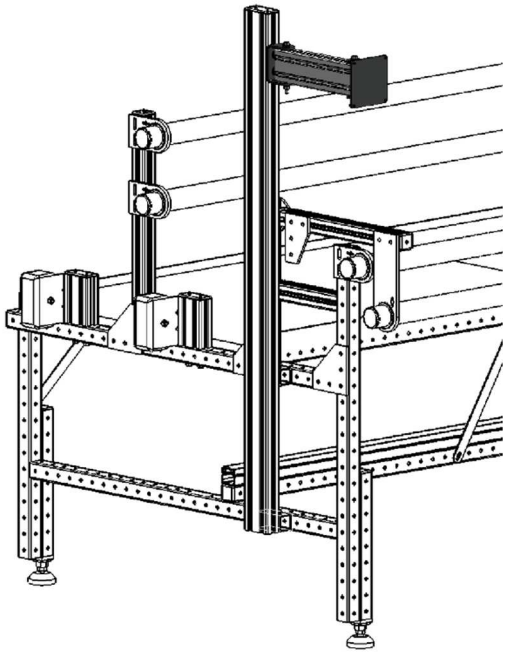
Step 9: Tighten the white belt by pulling the idler pulley assembly toward the rear of the carriage and tightening the (2) hex head bolts.

4.0 PC and Power Distribution Box Assembly

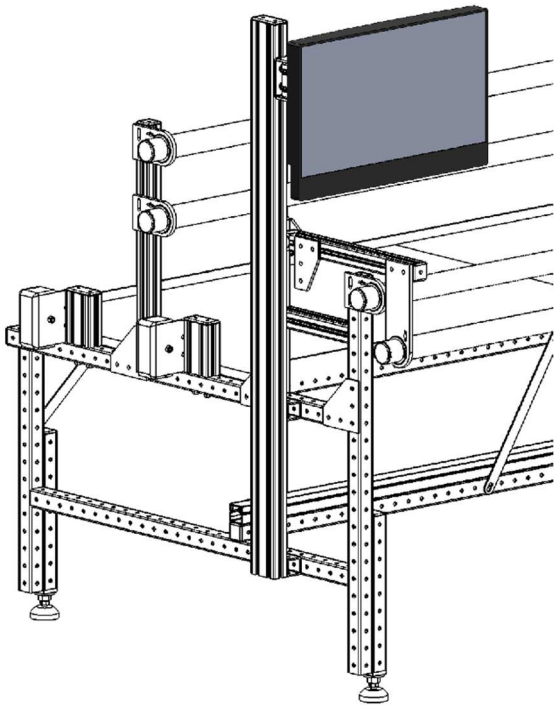
Step 1: Locate BOM1142 Touchscreen beam spacer kit. Attach the touch screen beam to the left side of the frame in the location illustrated below. Use the hardware provided in the kit.



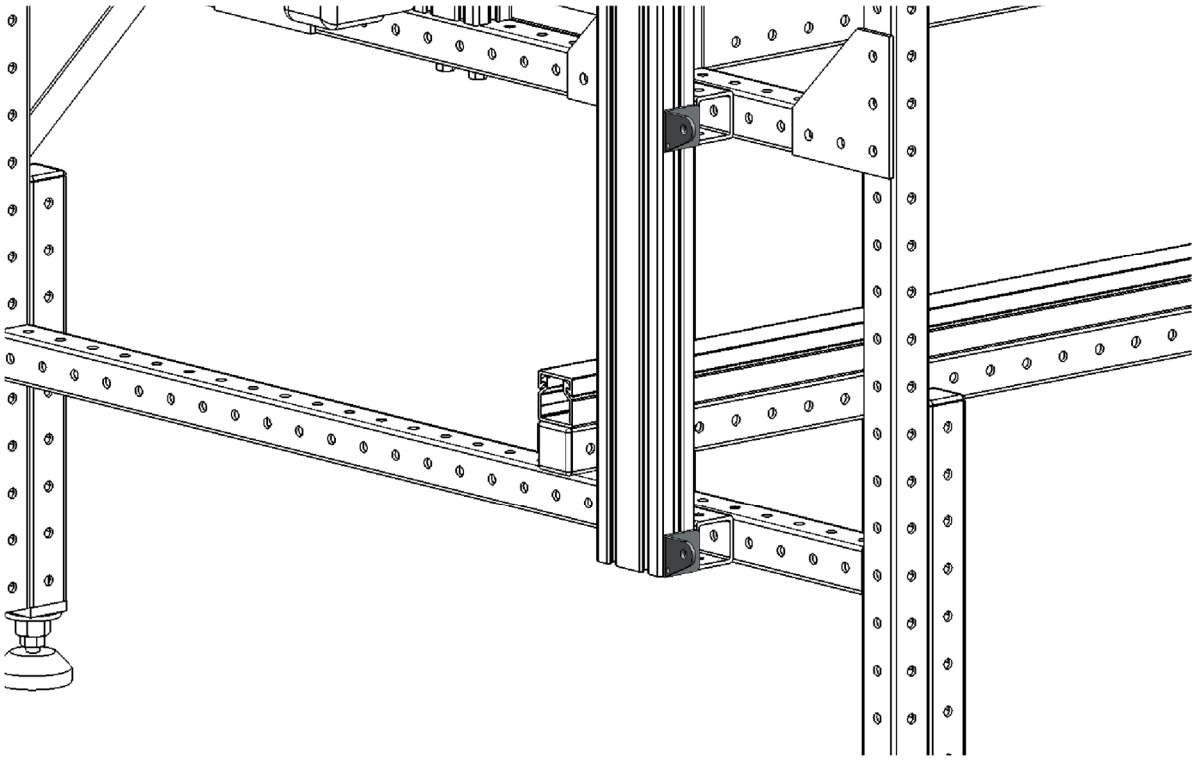
Step 2: Install the touch screen mount onto the beam. Adjust to an appropriate height for the user.



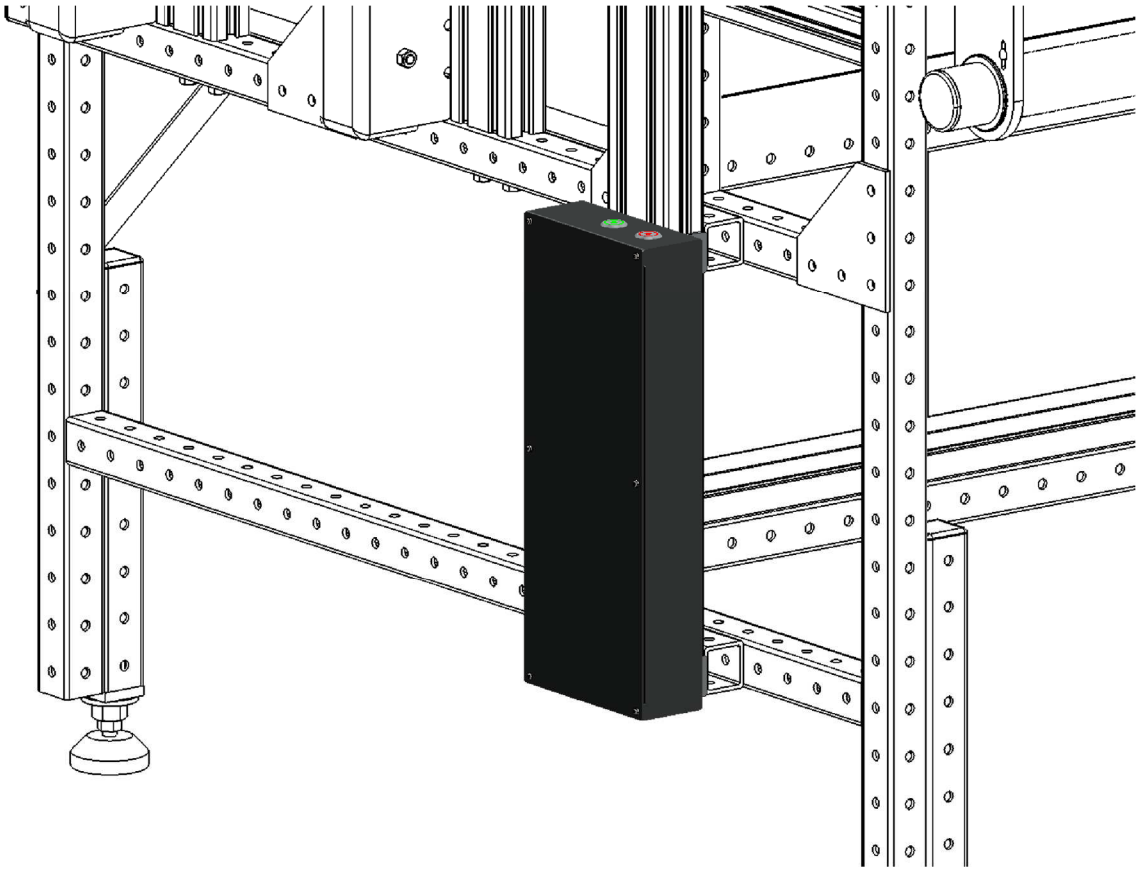
Step 3: Install the computer onto the mount and secure it using the provided hardware.



Step 4: Install the square side of the (2) angle brackets from the power distribution hardware set on to the front of the touchscreen beam. Use (2) 5/16-3/4 Hex, (2) flat washers, (2) lock washers and (2) t-nuts. Make the bottom one flush with the bottom and tighten completely. Leave the upper one loose for now.

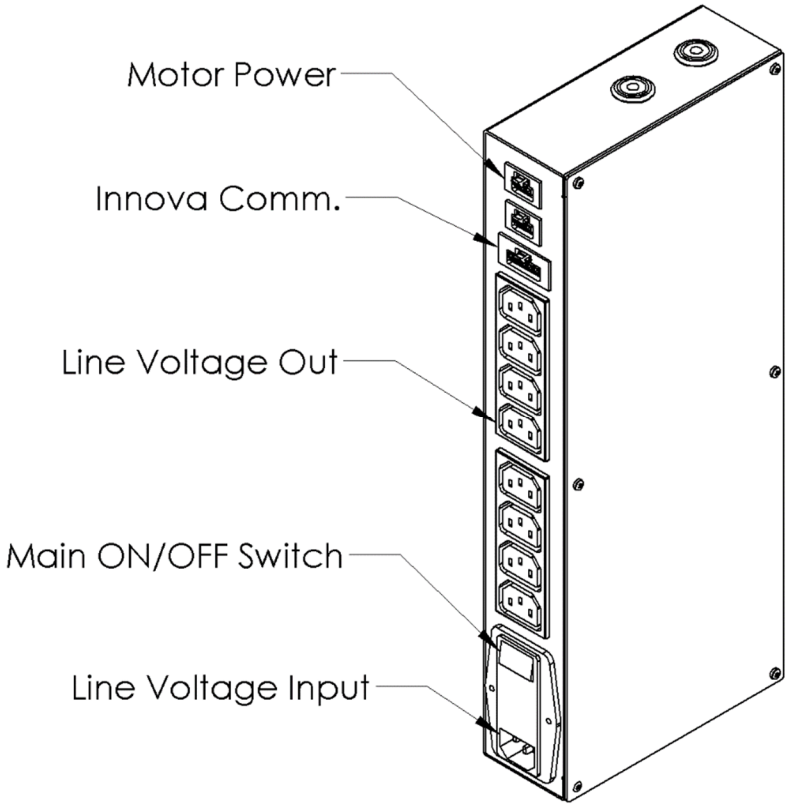


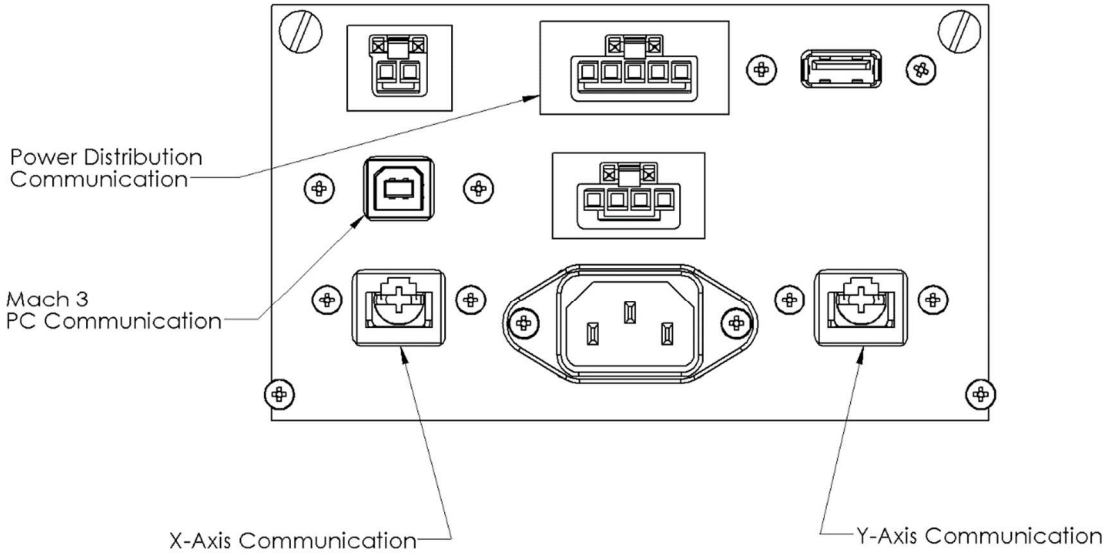
Step 5: Install the power distribution box on to the (2) angle brackets using (2) 5/16-3/4 Hex, (2) flat washers, and (2) lock washers. Tighten the upper angle bracket to the touchscreen beam,



5.0 Final Connections

Familiarize yourself with the terminals located on the power distribution box (PDB) and the rear of the M series Innova.

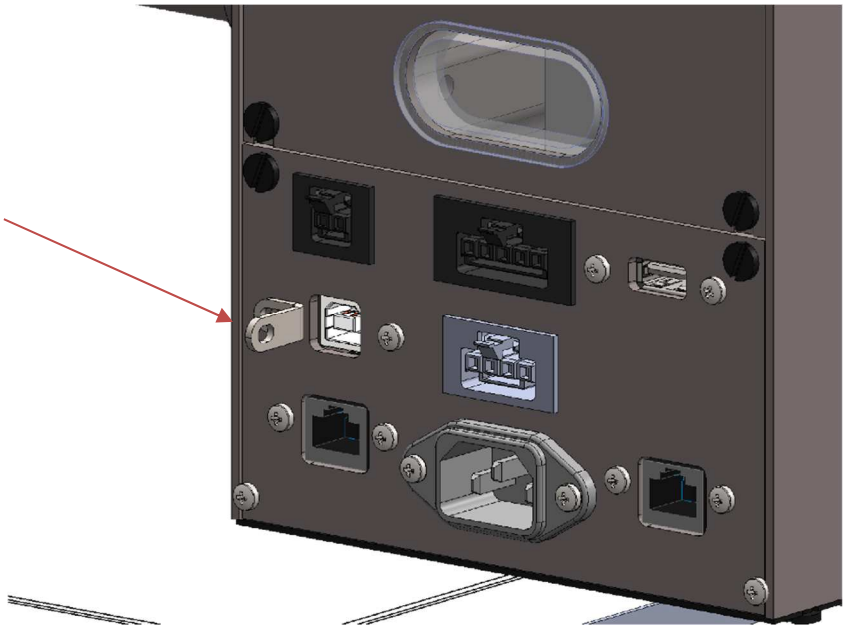




Most of the cables of the M series Autopilot will run through the gray wire duct located under the table. There will be three exit point for the cables – the left end near the PC, the right end near the x motor, and the middle near the center leg.

Cables that exit at the middle will travel up to the front of the carriage and either terminate at the Y motor or travel along the inside of the left rail to the back end of the carriage and then terminate at the back of the Innova.

Step 1: Install (1) strain relief bracket on to the Mach 3 PC Communication port. Use the included M3 x 12mm screw.



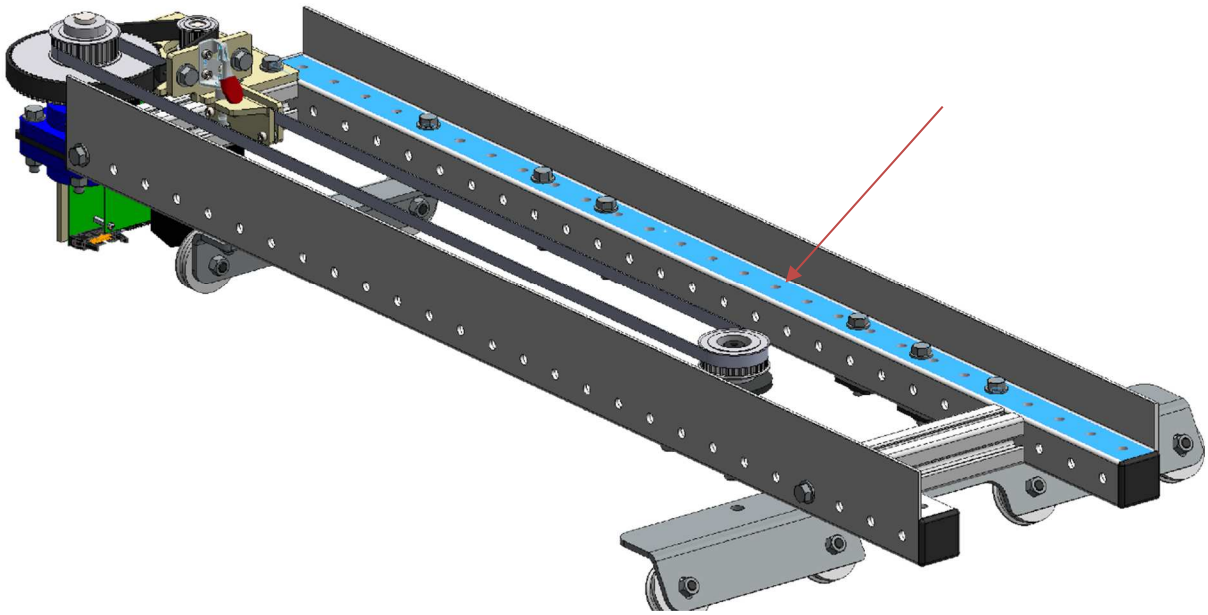
Step 2: Locate the BOM1489 (M) Autopilot Cable Set and the two BOM1497 (M) Power Distribution Box Cable Set bags. Also locate the box containing the powered hub and USB cables. Connect the following cables to the back of the Innova:

1) 7’ Y motor communication cable
2) 25’ X motor communication cable
3) 20’ PC Power extension cord – 10’ (2 connected in series to make 20’)
4) 16’ USB PC communication cable (found in the box with the hub)
5) 20’ PDB communication cable
6) X-Axis encoder cable

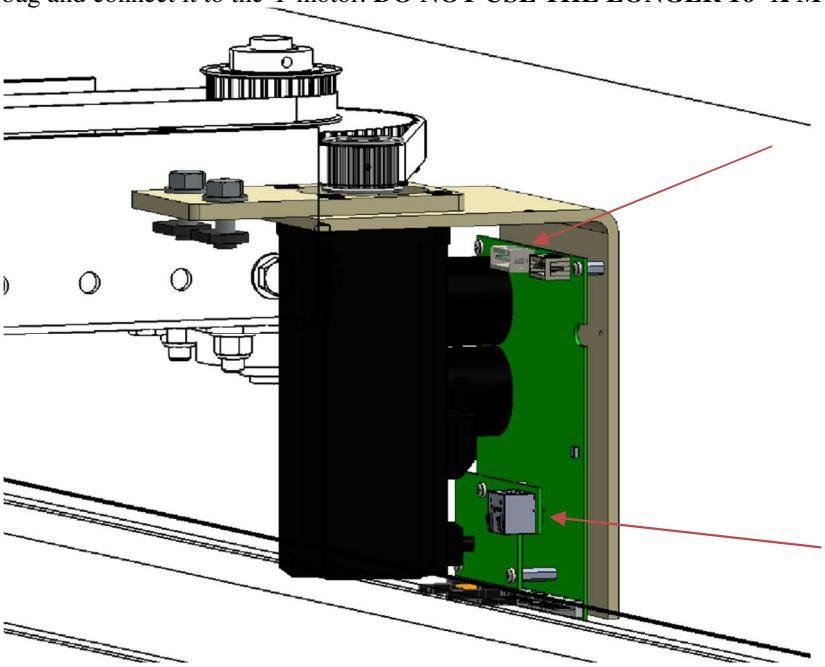
Step 3: Use a Nylon tie to hold the 16’ USB PC Communication cable to strain relief bracket. The strain relief should hold the connector perpendicular to the back cover. If necessary, adjust the bracket by loosening the screw and repositioning.

Step 4: Bundle the (6) cables in to the provided mesh sleeve and attach them to the wire tie mount of the carriage. Check to make sure there is enough slack for complete front to back movement of the Innova on the carriage. Place only one wire tie at each end of the sleeve to hold the cables.

Step 5: Run the cables along the inside of the carriage rail up to the front of the carriage. Use nylon ties to secure the cables to the rail.



Step 6: Connect the 7' Y motor Communication cable to the Y motor. Locate the 15' Y motor power cable in the Autopilot Cable Set bag and connect it to the Y motor. **DO NOT USE THE LONGER 16' X MOTOR CABLE.**



Step 7: Nylon tie the (5) remaining loose cables to an available hole on the front of the carriage. The (5) cables are as follows:

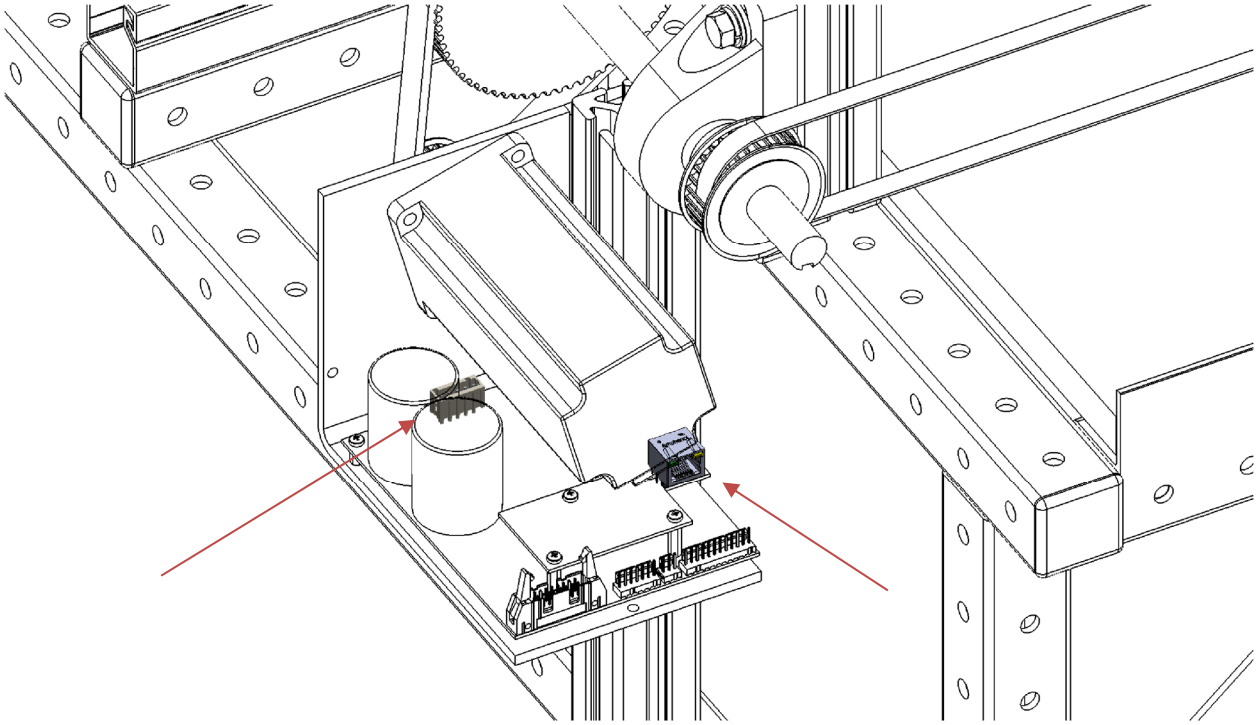
1) 25' X motor communication cable
2) 20' PDB communication cable
3) 16' USB PC communication cable
4) 20' PC Power extension cord – 10' (2 connected in series to make 20')
5) 15' Y motor power cable

Step 8: Push the carriage to one end of the machine – left or right.

Step 9: Run the (5) loose cables from the carriage in to the gray wire duct near the center leg. Leave some slack. Make sure the machine can move from the left end to the right end without the cables pulling tight.

Step 10: Run the 25' X motor communication cable to the X motor assembly.

Step 11: Connect the 25' communication cable to the X motor assembly.



Step 12: Locate the 16' X motor power cable in the Autopilot cable set bag and connect it to the X motor assembly.

Step 13: Following the path of the 25' communication cable, run the 16' X motor power cable through the gray wire duct over to the left end of the frame. Connect the free end of the cable to either motor power socket on the power distribution box.

Step 14: Go back to the center of the frame.

Step 15: Connect the 16' USB cable from the carriage to the powered USB Hub.

Step 16: Connect the power cord to the USB Hub.

Step 17: Locate the 6 foot long (M) PDB 110V adapter cable in the Power Distribution Box Cable Set. Connect it to the hub power cord.

Step 18: Locate the second 16' USB Cable in the box with the hub. Connect the square plug end in to the USB Hub.

Step 19: Run the remaining cables to the left end of the machine. The cables are as follows:

1) 20' PDB communication cable
2) 16' USB PC Communication cable
3) 20' PC Power extension cord – 10' (2 connected in series to make 20')
4) USB Hub power cord
5) 15' Y motor power cable

Step 20: Connect the 15' Y motor power cable to the available motor power socket on the power distribution box.

Step 21: Connect the 20' PC power extension cord and the USB Hub power cord to any of the line voltage out sockets on the power distribution box.

Step 22: Connect the 20' Power Distribution communication cable to the Innova Comm. Port on the power distribution box.

Step 23: Connect the 16' USB PC cable to an available port on the back of the PC.

Step 24: Locate the 6 foot long PC power extension cord in the power distribution box cable set. Attach the power cord to the rear of the computer.

Step 25: Using the (2) provided twist-lock wire tie mounts, route and wire tie the PC power and USB cables to the touch screen beam.

Step 26: Connect the PC power cord to any available line voltage out socket on the power distribution box.

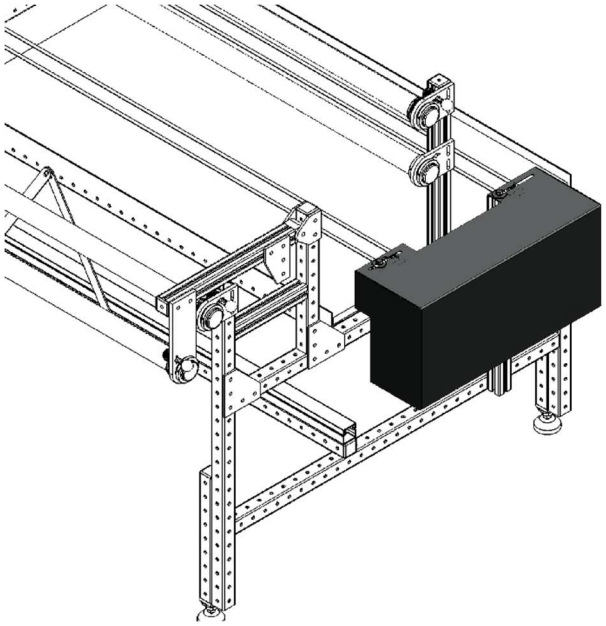
Step 27: Confirm that the machine has a free range of motion and is not limited by any cables. Adjust the length of or re-route the cables if necessary.

Step 28: Coil up and secure any excess cabling to the frame using the provided wire ties**. NOTE: FAILURE TO DO SO MAY CAUSE A TRIPPING HAZARD AND/OR MACHINE DAMAGE.**

Step 29: Locate the power cord in the cable set bags. Connect the Power Distribution box to an available 110V outlet (220V – single phase is acceptable as well, special cable required).

Step 30: Install the gray wire duct covers.

Step 31: Make sure the keys are installed and set screws are tight on the drive shaft of the X-axis. Install the X-axis motor guard onto the right side of the frame. The slots in the top of the guard will align with the tapped holes in the t-slotted beams of the bearing assemblies. Use (2) 5/16 x ¾" HEX bolts, (2) lock washers, and (2) flat washers to secure the guard.



Step 32: Install the Y-axis motor guard onto the front of the lower carriage. Hold the open side of the guard assembly vertically and bring the guard up into the Y-axis servo motor assembly. Rotate the guard up and over the pulley and motor assemblies and fit the slots onto the bolts. **DO NOT FORCE THE GUARD OVER THE MOTOR ASSEMBLY. TAKE CARE WHEN INSTALLING SO THAT THE MOTOR ASSEMBLY AND CABLING IS NOT DAMAGED.**