Removing and Replacing the Y-truck

To remove and replace the Y-truck you will need the following tools:

- 4mm Allen wrench
- 12mm stamped flat wrench
- #2 Phillips screwdriver (magnetic tip preferred)
- Socket wrench with 10mm socket
- Permanent thread cement

Removing the Y-truck

1. **Ready the machine** by unplugging it from the power outlet and placing it on a stable work platform. Raise the head up several inches and move the Y-truck to the center of the machine for best access.

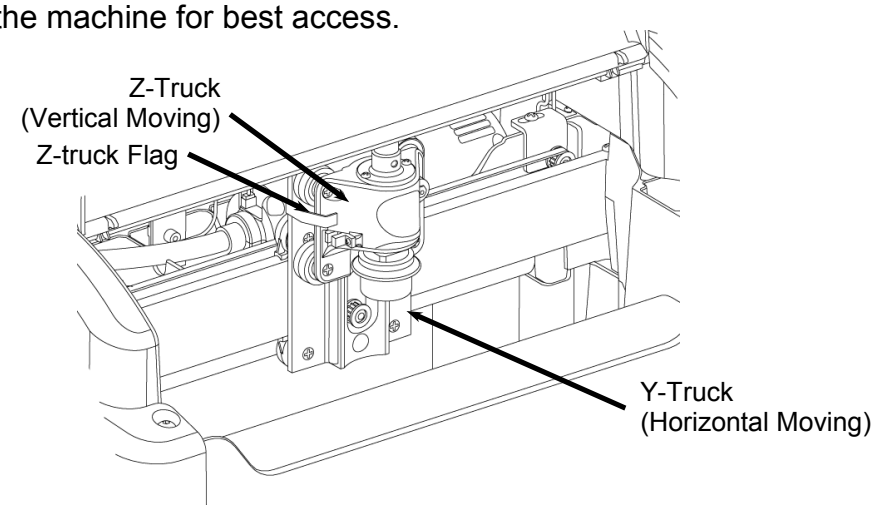


FIGURE 1: VIEW OF THE Z-TRUCK

2. **Ready the flexshaft for removal from the Z-truck:** Move the Z-truck to the very top of its travel (until it reaches the hard stop) so that the flexshaft support tube protrudes from the head cover (See Figure 2).

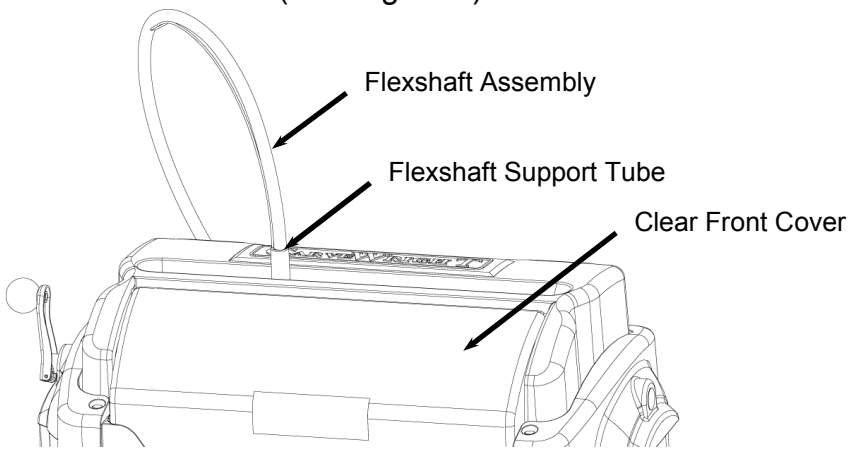


FIGURE 2: EXTERIOR VIEW OF THE FLEXSHAFT AND HEAD COVERS

3. **Detach the flexshaft from the top of the Z-truck:** The flexshaft assembly is retained by a ball detent located in the flexshaft receptacle (See Figure 3). Firmly grasp the flexshaft support tube while reaching under the clear front cover with your other hand to grab the Z-truck. Pull up firmly on the flexshaft support tube and twist slightly while bracing the Z-truck. **DO NOT PULL ON THE SHEATH.** The flexshaft will pop out of the detent. Wrap the end of the flexshaft in tape so that the core will not fall out and lay the detached flexshaft end to the side.

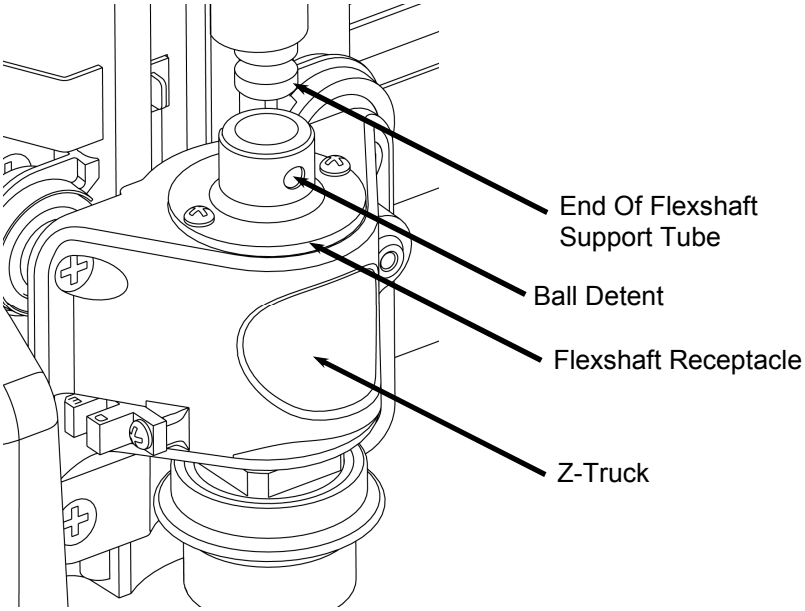


FIGURE 3: VIEW OF THE FLEXSHAFT CONNECTION TO THE Z-TRUCK

4. **Remove the screws securing the cover:** Remove the four cover screws as shown in Figure 4 with the #2 Phillips screwdriver. Use a magnetic tipped screwdriver if possible to avoid dropping the screws into the machine.

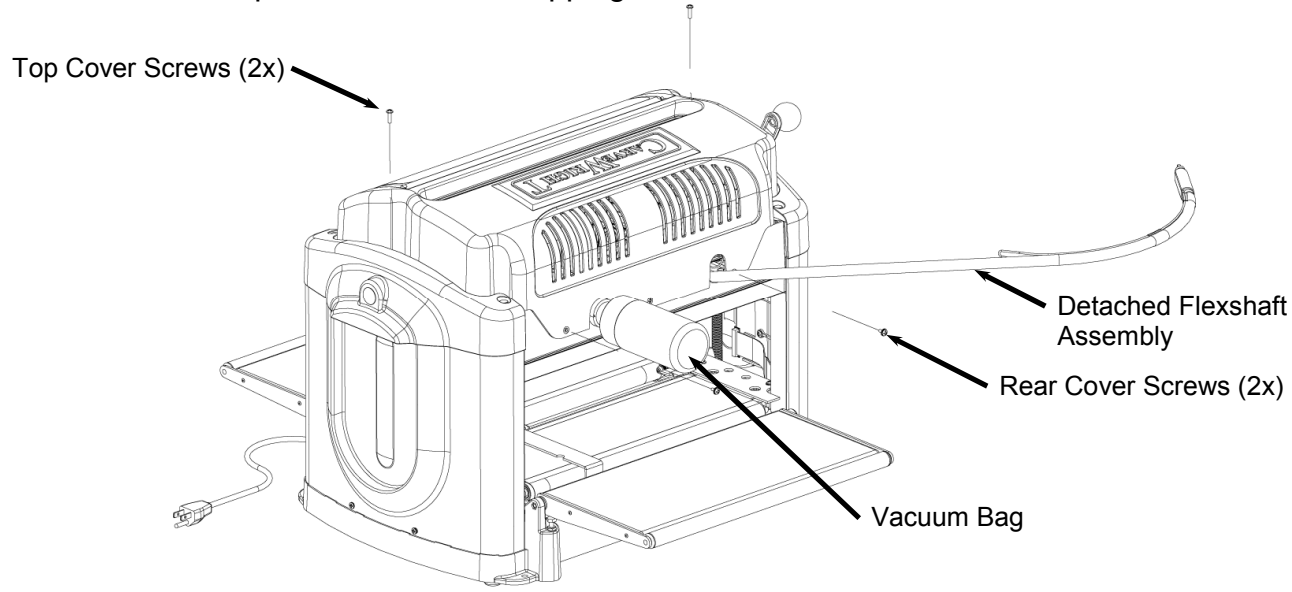


FIGURE 4: EXPLODED VIEW OF THE COVER SCREWS

5. **Detach the cover and locate the cover cables:** Lift the cover straight up and locate the two cables still connecting it to the head. On the side nearest the AC cut motor you will see the cable that connects the cover interrupt switch. For this repair we want to avoid disconnecting this cable if possible. If for some reason you have to disconnect this cable to entirely remove the head cover, you will need to locate and disconnect the two bullet connectors at the back of the AC motor. In most machines you will need to remove the screw in the small plastic enclosure to access the two bullet connectors. On the opposite side you will see the 8-wire head cover cable harness (terminated with a 10-pin connector).

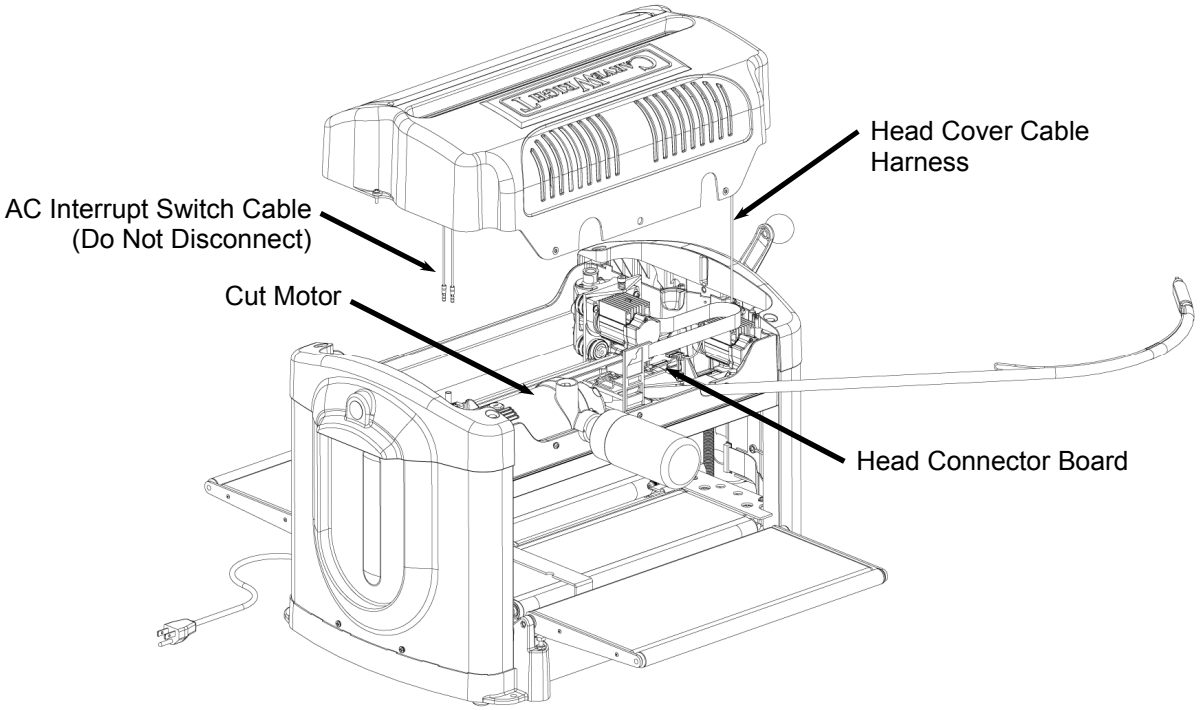


FIGURE 5: EXPLODED VIEW OF THE LIFTED COVER

6. **Unplug the head cover cable at the head connector board attached just to the left of the Y-drive motor pack.** The location of this connector on the connector board will vary depending on the machine's production date (See Figure 7). You may have to reach underneath the head to unplug the cable. Notice how the cable is routed alongside and under the Y-truck motor pack. This routing is important to remember when re-assembling the cover.

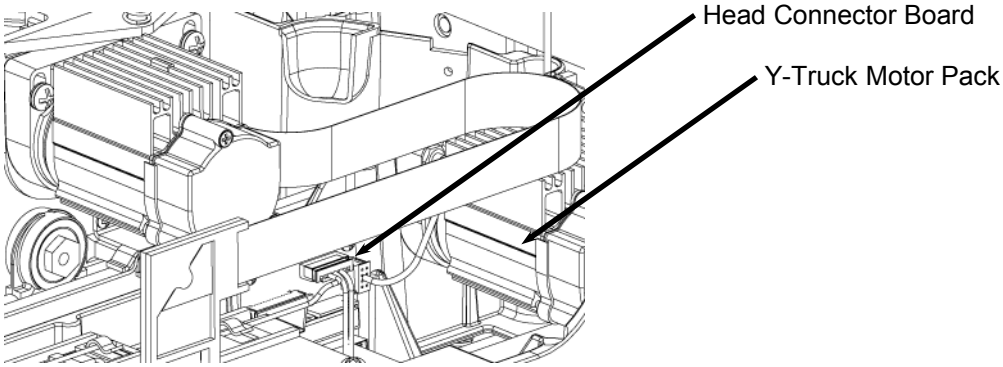


FIGURE 6: LOCATING THE HEAD CONNECTOR BOARD

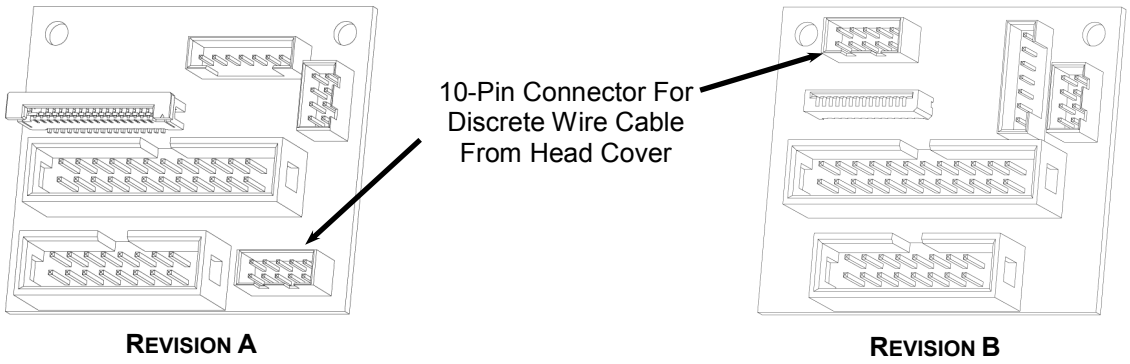


FIGURE 7: LOCATION OF CONNECTOR FOR HEAD COVER CABLE FOR THE EARLIER REVISION A AND LATER REVISION B MACHINES

7. **Lay the head cover to the side:** With the AC Interrupt Switch Cable still connected, carefully lay the cover onto the back outfeed tray (See Figure 8). Make sure to avoid pulling on the cable during the rest of the repair. You can also lay the cover over the side as shown in **Picture 1** of Appendix A.

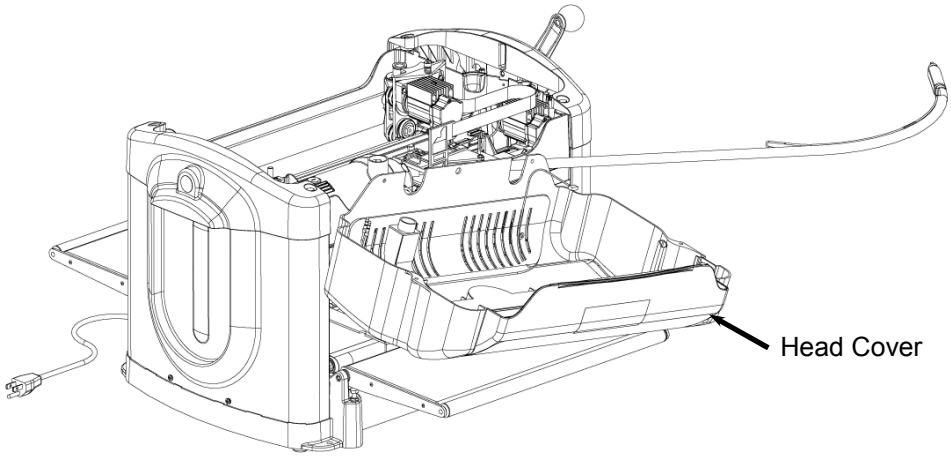


FIGURE 8: EXPLODED VIEW OF THE REMOVED COVER

8. **Remove the right side panel assembly:** Remove all four side panel fasteners. Using the 10mm socket remove the two hex head bolts (and washers) from the top of the assembly. Remove the two Phillips head screws from the base of the side panel with the screwdriver. Lift off the side panel.

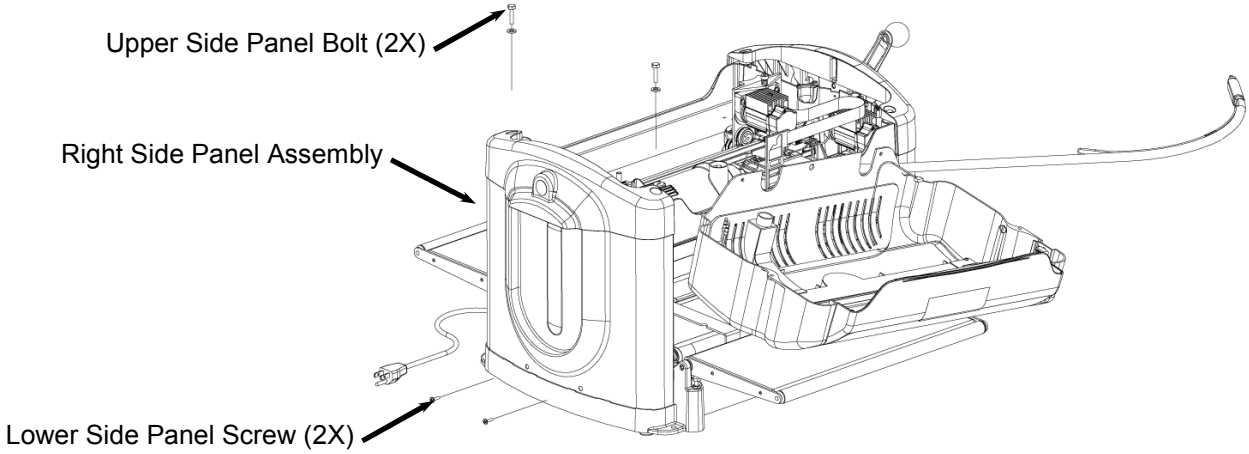


FIGURE 9: EXPLODED VIEW OF THE RIGHT SIDE PANEL FASTENERS

9. **Detach the FFC cable guard:** Unplug the 8-wire cable coming from the Z-motor pack from the slot in the FFC cable guard. Remove the screw holding the FFC cable guard.

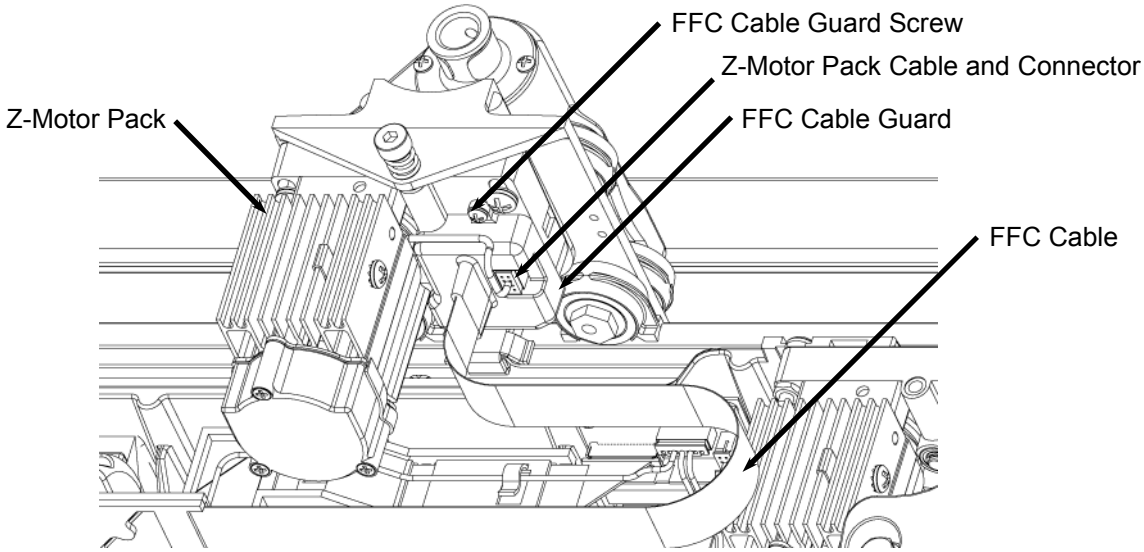


FIGURE 10: VIEW OF THE BACK OF THE Z-MOTOR PACK

10. **Disconnect the FFC cable:** Slide the FFC cable guard along the FFC Cable to expose the FFC cable connector on the electronics board. Unplug the FFC cable from the connector. It may be glued in place so take care in pulling it straight out. Lay the cable to the side out of the way.

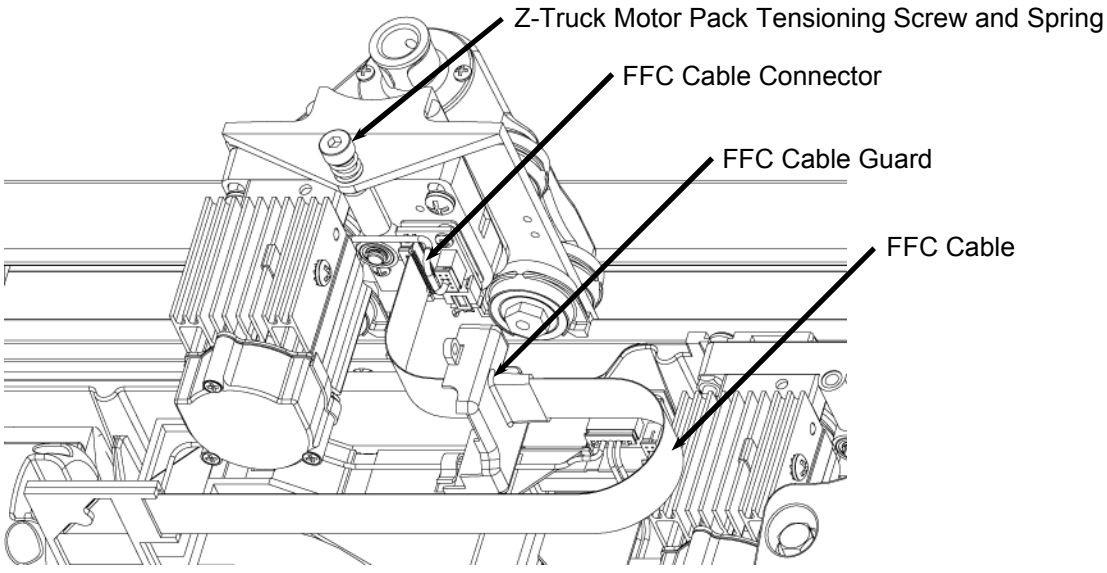


FIGURE 11: VIEW OF THE BACK OF THE Z-MOTOR PACK

11. **Remove tension from, and free, the Y-belt:** Using the 4mm Allen wrench, remove the Y-belt tension shoulder bolt and spring. Loosen, but do not remove, the Y-belt tensioner plate screw. Slide the tensioner plate to the left so that all tension is relieved from the belt. Slip the end of the belt over the pulley on the tensioner plate. Slip the opposite end of the belt over the pulley in the Y-drive motor pack.

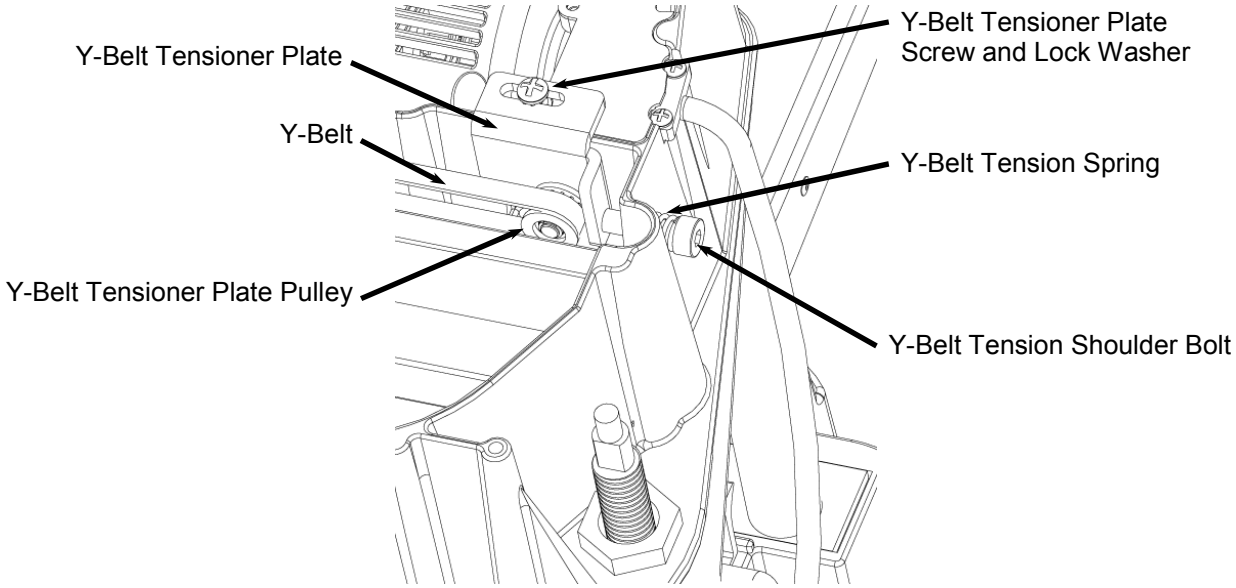


FIGURE 12: VIEW OF THE Y-BELT TENSIONER PLATE

12. **Remove the Y-truck roller bearing wipers:** Remove all four of the roller bearing wipers on the Y-truck by gently pulling them off. Also if your machine still has a Z-truck Flag, as in Figure 1, you may remove it permanently. It is no longer used or needed.

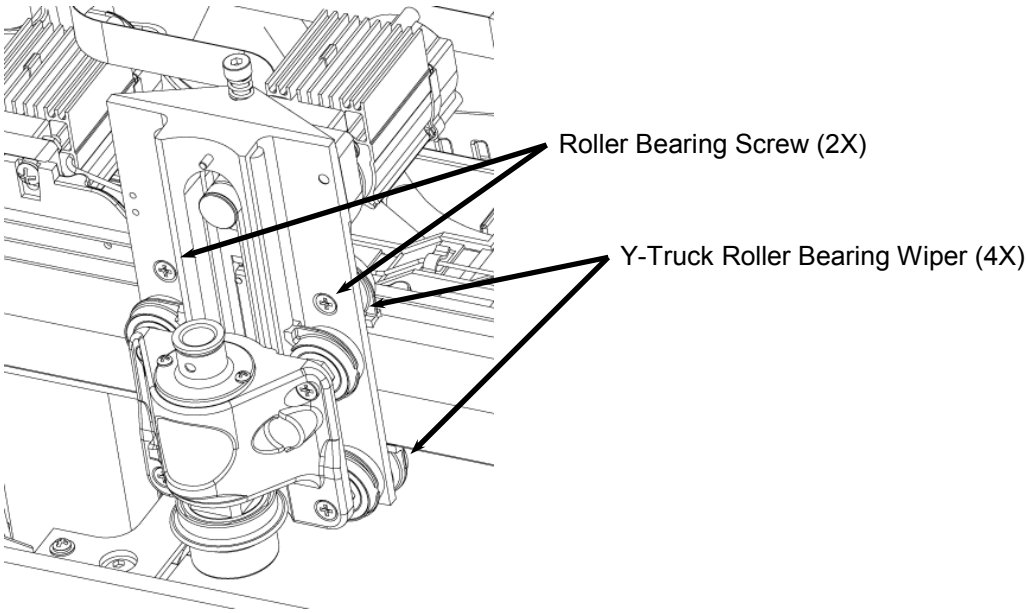


FIGURE 13: VIEW OF THE Y-TRUCK ROLLERS

13. **Rotate the adjustable roller bearings:** First push the Z-tuck to its lowest vertical position. This allows the best access to the two adjustable roller bearings and their screws. To remove the Y-truck, the two top adjustable roller bearings will have to be rotated to clear the vertical rails (or in some cases entirely removed). Since permanent thread cement is used to secure the roller bearing screws we cannot simply unscrew them. Using the 12mm flat wrench rotate the roller bearing studs clockwise about half a turn so the Y-truck can be pulled off the rails.

    If the rollers cannot be rotated with the wrench, the heads of the screws will have to be drilled out using a 3/16" drill bit. Before drilling make sure that you have placed a towel or other cover over the sandpaper belt trays. This cover will catch the metal shavings and will prevent them from contaminating the machine. Center the 3/16" drill bit on the center of the screw head and drill until the head of the screw comes loose. Repeat for both rollers.

14. **Remove the adjustable roller bearings:** Using the 12mm flat wrench and the screwdriver remove the two adjustable roller bearings from the Y-truck. Follow the drilling procedure in step 13 if the screws cannot be extracted.

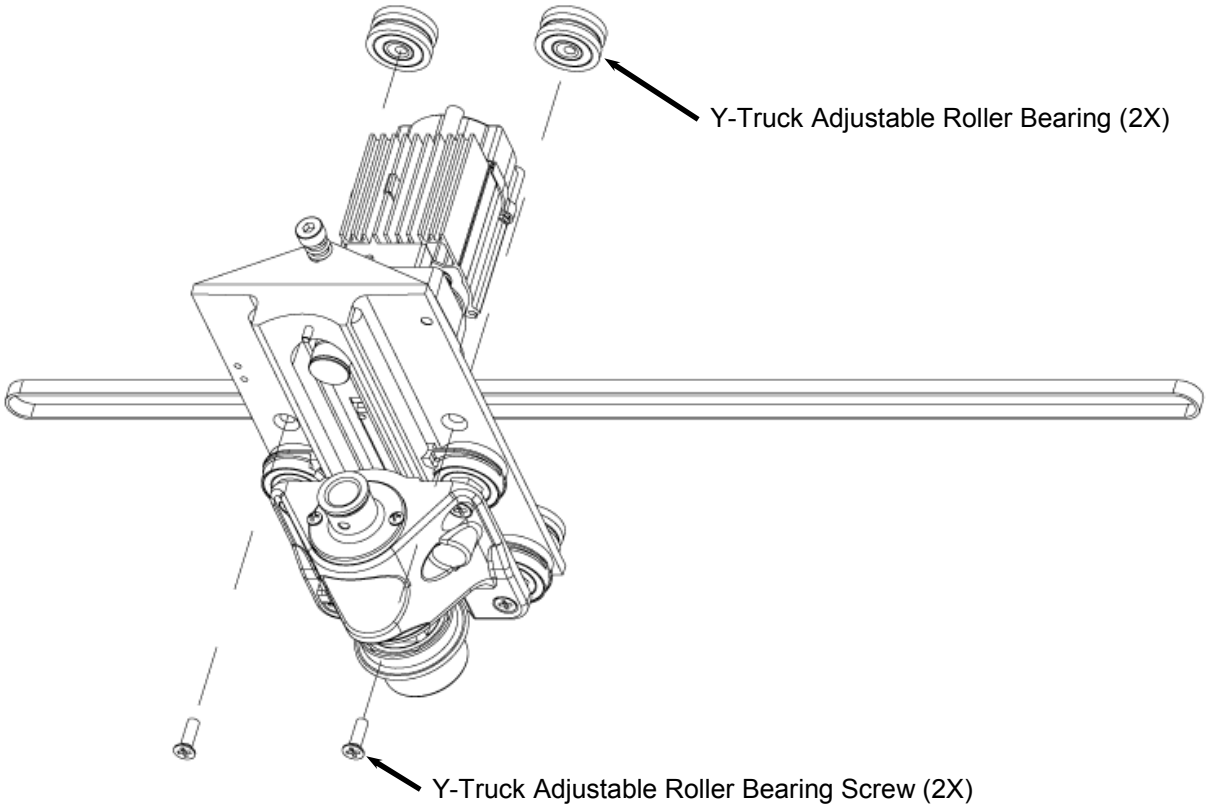


FIGURE 14: VIEW OF THE FREE Y-TRUCK AND ADJUSTABLE ROLLERS

15. **Make the repair to the Y-truck assembly.**

Reassembling the Y-truck

1. **Prepare the new Z-truck:** If you had to drill the screws out of the adjustable roller bearing you will have to obtain two new sets of bearings and screws. Before placing it back on the machine, place a small dab of permanent thread cement along the length of the screw threads and assemble the rollers to the Y-truck assembly. Orient the rollers such that the hex stud on the roller bearing faces away from the truck. In this first step start the thread but do not tighten it. It is imperative that the thread cement be used on these screws or they will loosen quickly during operation.

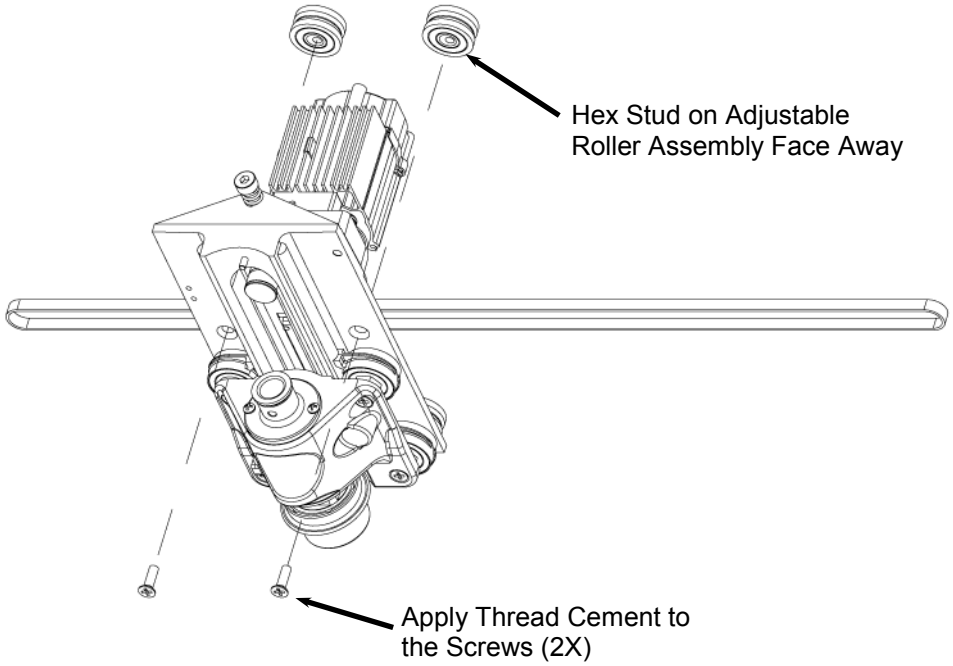


FIGURE 15: VIEW OF AN UNASSEMBLED Y-TRUCK

2. **Assemble the Y-truck back onto the head:** Re-assemble the Y-truck with the loose rollers onto the rails. Loop the belt over both pulleys to help stabilize the assembly. Hand-tighten the roller screws to hold the assembly in place.

3. **Re-tension the Y-truck belt:** In order to keep the truck in place while you tighten it, replace the Y-belt tensioning shoulder screw and spring with the 4mm Allen wrench (See Figure 12). This screw and spring set the tension on the belt to the correct level. Tighten the shoulder screw all the way down. Tighten the Y-belt tensioner plate screw.

4. **Tighten the adjustable roller bearings:** This is the most important step in the replacement process. First using the 12mm flat wrench to hold the roller stud, tighten the roller screw so that the face of the hex stud is snug against the back of the Y-truck casting. Do this for both rollers but do not fully tighten the screws. The

problem that must be avoided is creating a cant to the truck by not having the face of the roller stud flush with the Y-truck casting. See Figure 16 and 17 for a comparison of a properly and improperly assembled roller.

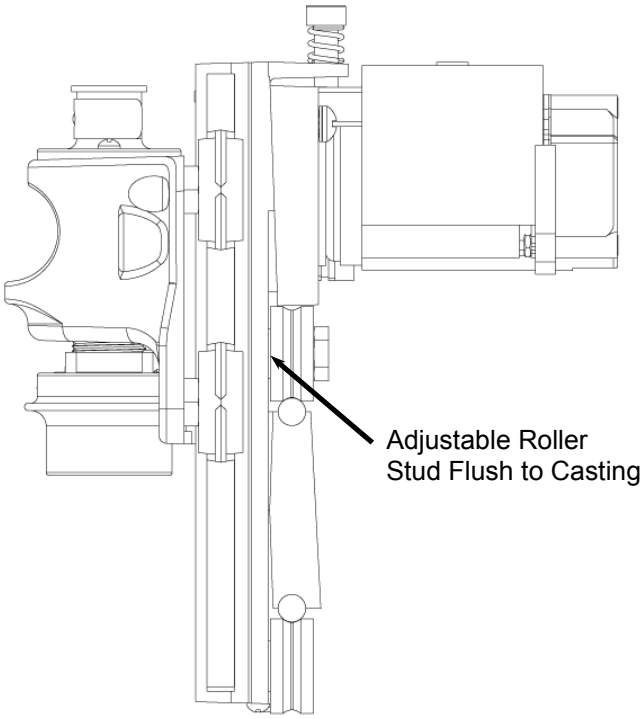


FIGURE 16: SIDE VIEW OF A PROPERLY INSTALLED Y-TRUCK

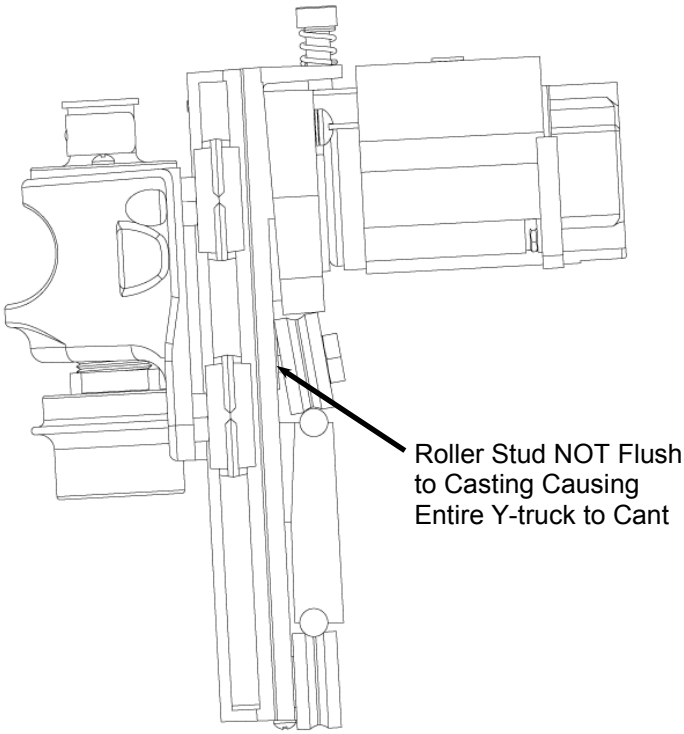


FIGURE 17: SIDE VIEW OF A IMPROPERLY INSTALLED Y-TRUCK (CANTED)

5. **Preload the bearings against the vertical rails:** The adjustable roller studs are made such that the screw hole is off center of the central bearing axis. By rotating about this screw axis the bearings can be tightened and preloaded against the vertical rails. Once the rollers are tightened so that they are flush to the back of the casting we will use the flat wrench to preload them against the vertical rails.

    a. Using the flat wrench, rotate the bearing roller counter-clockwise until the bearing contacts the vertical rod. Do not hold the screw in place while rotating the bearing for this step.

    b. Once contact has been made rotate the wrench slightly clockwise in order to take all load off the bearing and vertical rail. They can still be touching but not loaded against each other.

    c. Using the wrench to hold the stud in place hand tighten the screw with the screwdriver (do not tighten all the way yet).

    d. After tightening check to see that the hex stud is till flush to the casting as in Figure 16.

e. Repeat steps a-d for second bearing.

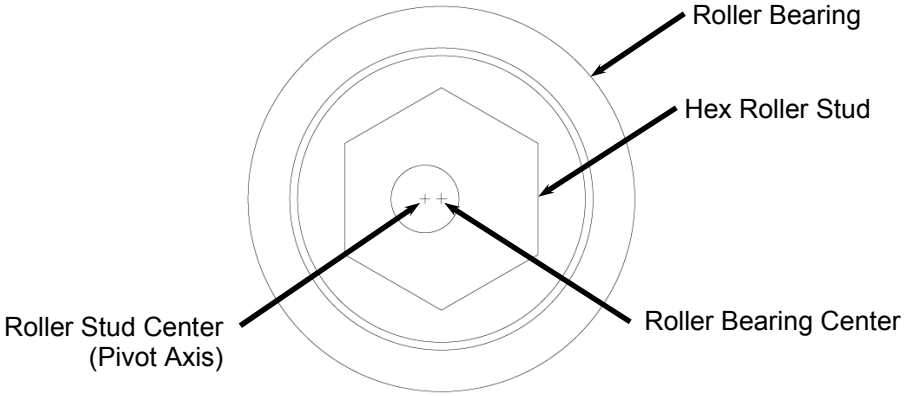


FIGURE 18: ROLLER BEARING AND ROLLER STUD

f. Next, turn the wrench counter-clockwise (as seen from the front of the machine) while holding the screw in place. Alternate tightening each roller only slightly to balance the preloading. After each tightening check to see that the hex stud is till flush to the casting as in Figure 16. The proper preload level is reached when you can no longer rotate the bearing against the rail with your fingers. If it is too loose you will be able to have the bearing skate across the rail surface without the truck moving. Once the rollers have the correct preload hold the wrench still and tighten the screw as much as possible by hand.

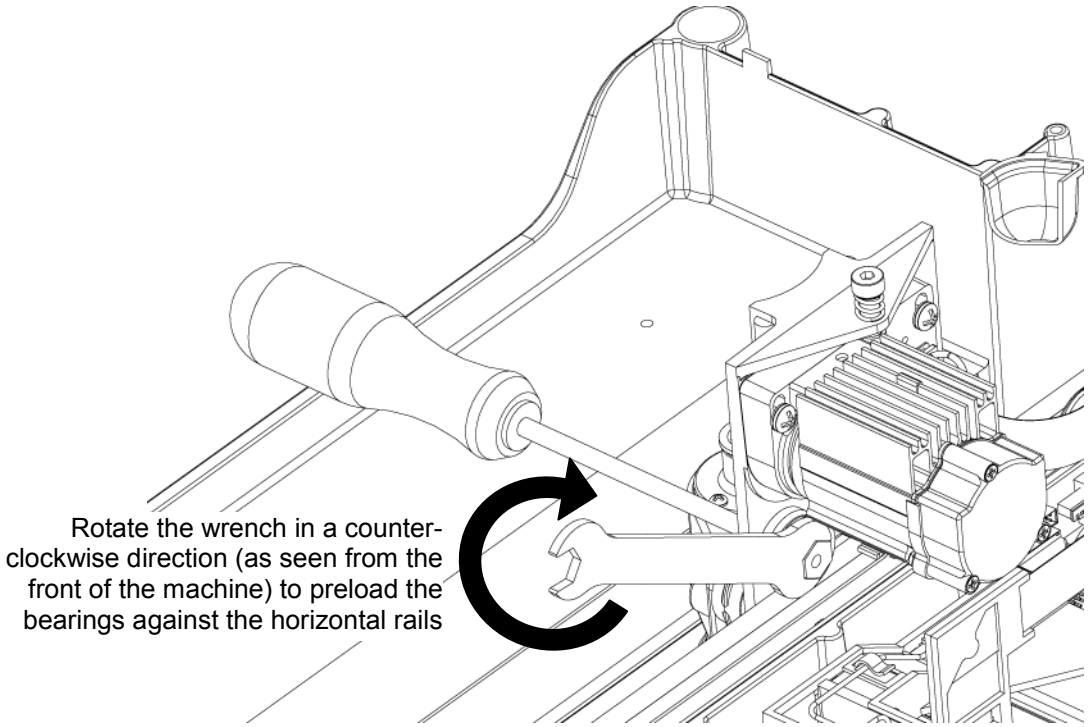


FIGURE 19: TIGHTENING THE ROLLER BEARINGS

6. **Test the assembled Y-truck:** Move the tightened Y-truck back and forth along its entire travel range. The Y-truck should move smoothly and quietly along the rails. If the travel is jerky, stiff, or otherwise not smooth you may want to retry the roller-tightening step. If noises are heard coming from the assembly you may loosen it again and test the travel without the bearing tight. This may indicate whether the motor pack needs adjustment.

7. **Replace the roller bearing wipers:** Snap all four of the bearing wipers onto the roller bearings. Make sure that they snap snugly around the circumference of the bearing and sit flat on the vertical roller rods.

8. **Re-assemble the FFC cable guard:** Slide the FFC cable guard onto the free end of the FFC cable with the screw hole pointing up.

9. **Re-assemble the FFC cable:** Plug the FFC cable into the FFC connector on the head termination board. Be careful to protect the FFC cable at all times from nicks or bends. We recommend placing a small blob of glue on the interface between the cable and connector after the cable has been fully seated. Use thick glue such as Liquid Nails so that it does not penetrate into the connector. Do not use thin glues such as superglue. Replace and tighten the screw securing the FFC cable guard as shown in Figure 11.

10. **Replace the head cover.** There are several important steps and checks needed as you replace the head cover.

    a. Move the Y-truck all the way to the left side of the machine and make sure that the FFC cable does not drag on the Y-truck heatsink (See Figure 20). If the FFC cable is dragging bend it upwards so that it consistently clears the heatsink.

    b. Make sure that the blow deflector is correctly placed. If it is out of place the board sensor can quickly become covered in dust and inoperable and/or the Z-truck will hit the blow deflector and stall. The deflector sits over the edge of the head casting and lines up with the air tube in the cover when assembled. Also see **Picture 2** in Appendix A.

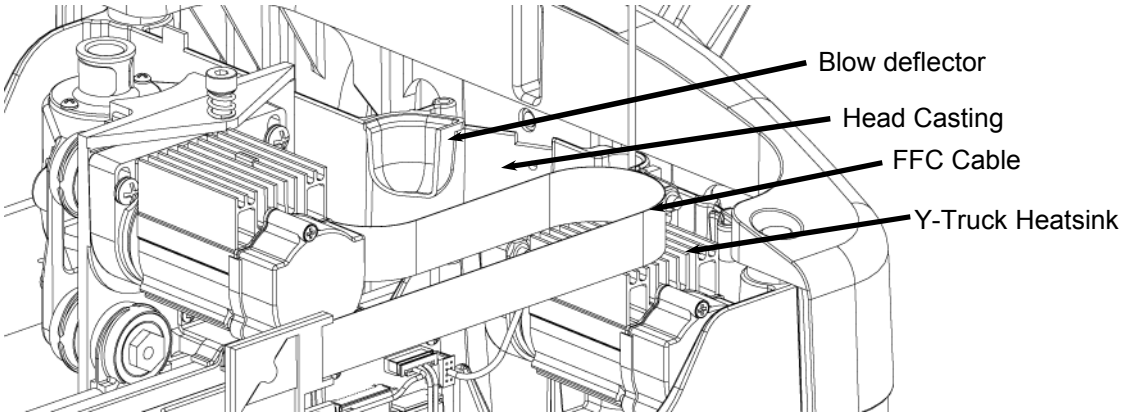


FIGURE 20: PLACEMENT OF THE BLOW DEFLECTOR - ISO

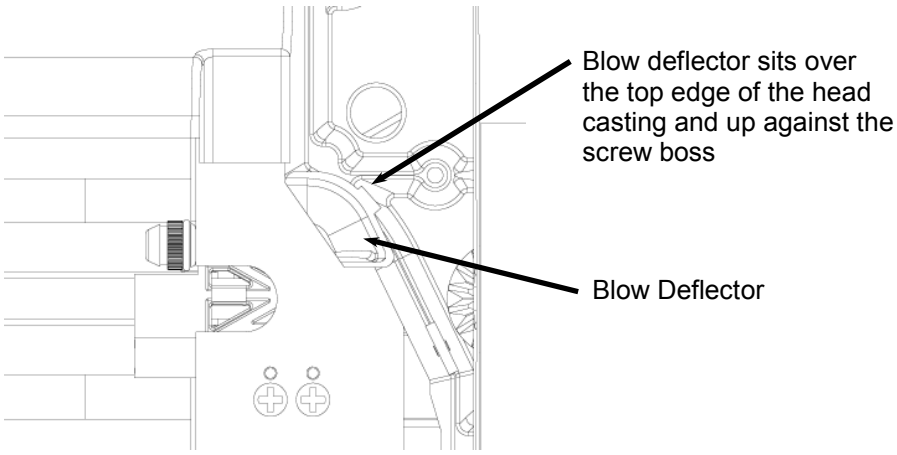


FIGURE 21: PLACEMENT OF THE BLOW DEFLECTOR - TOP

c. Route the Head Cable Harness down between the wall of the head casting and the side of the Y-motor pack, under the Y-motor pack and plug it into the connector board as shown in Figure 22. Make sure that the connector is oriented correctly using the keying ribs and slots before plugging it in. Note that the white wire will be oriented toward the non-keypad side of the machine.

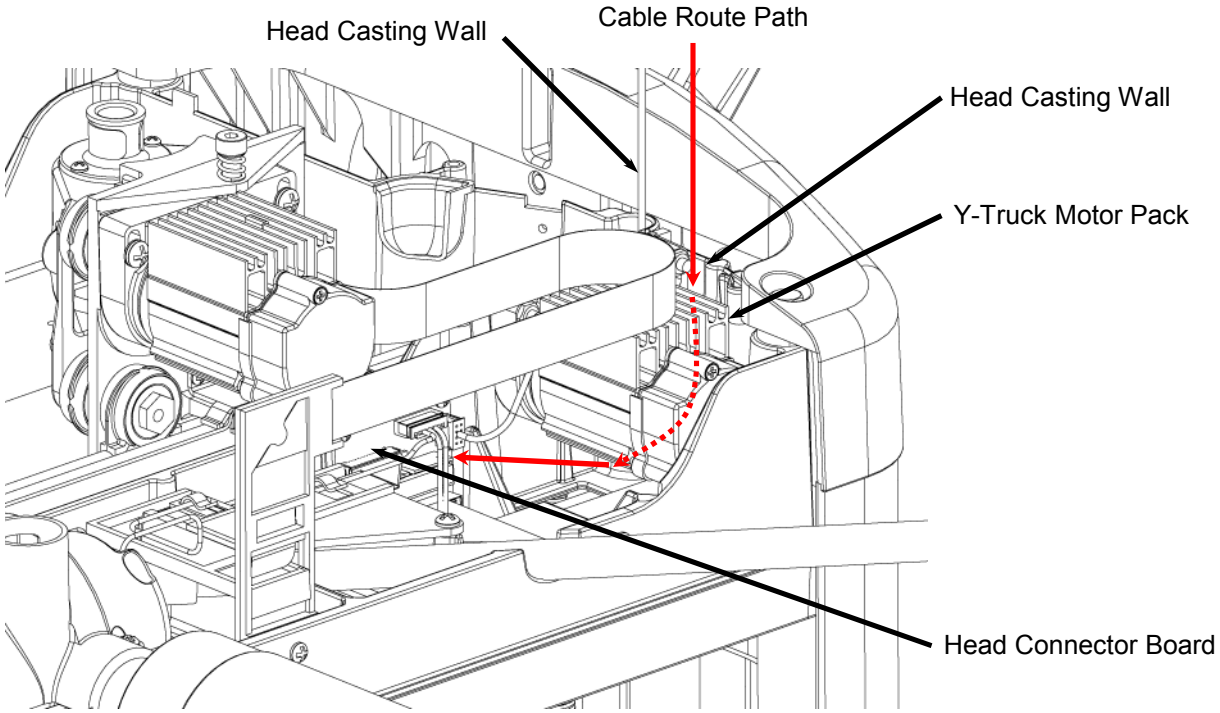


FIGURE 22: ROUTING THE HEAD CABLE HARNESS

d. Gently lift and replace the head cover onto the head making sure that the FFC cable, the AC Interrupt Switch Cable, and the Head Cable Harness are not pinched.

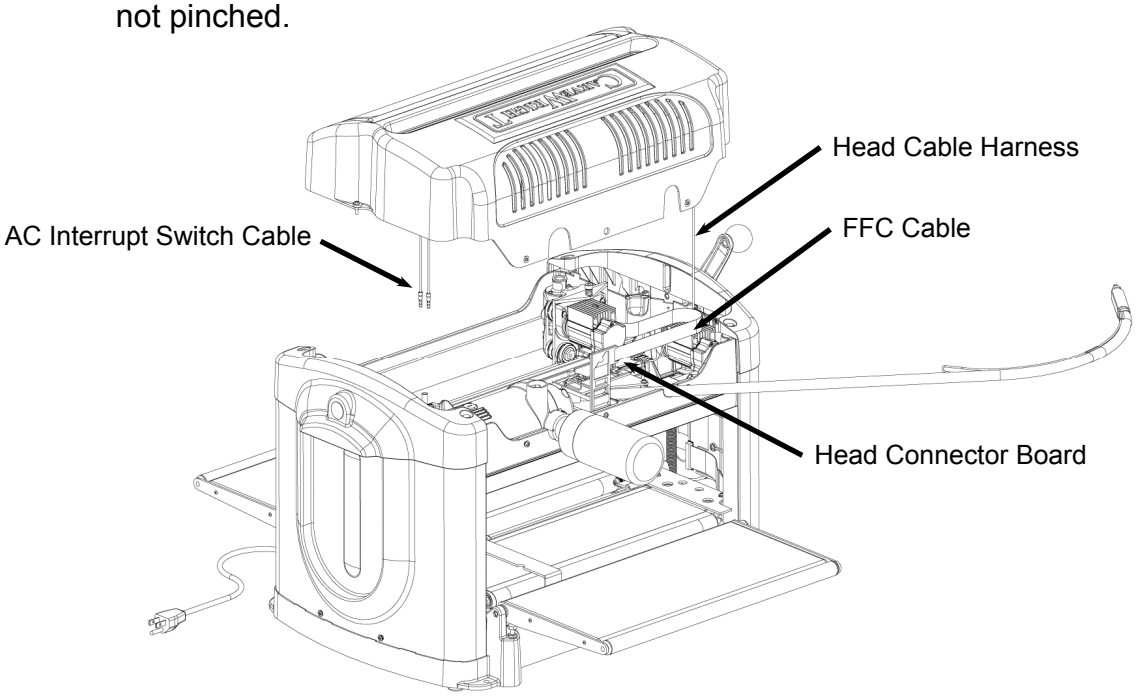


FIGURE 23: RESEATING THE HEAD COVER

e. Once the head cover is placed back onto the head you will need to reseat the wire harness retainers in the correct locations before replacing the screws. These retainers should be attached to the cables themselves and keep the cables confined to certain areas. In some machines there will be one on both cables, but on most machines you will only find one on the Head Cable Harness. You will have to reach in from the front of the machine to access them. Make sure that the retainers are placed over the edge of the head casting and under the edge of the cover. Make sure that they do not prevent the head cover from setting flat. See **Picture 3** and **Picture 4** in Appendix A for further clarification.

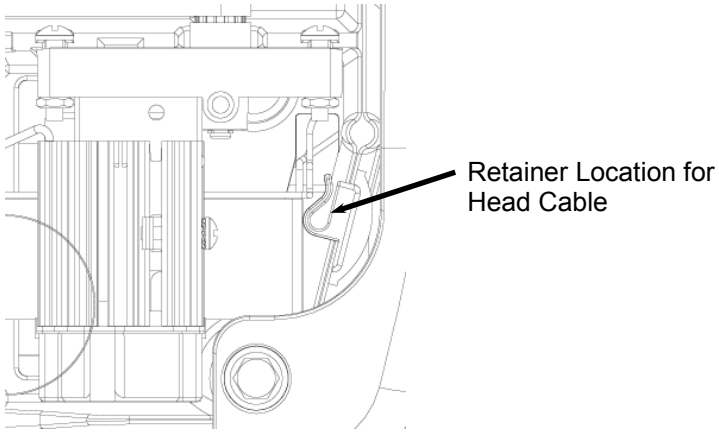


FIGURE 24: LOCATING THE HEAD CABLE HARNESS RETAINER

f. Replace the four screws as shown in Figure 4. The two long screws go in the vertical locations.

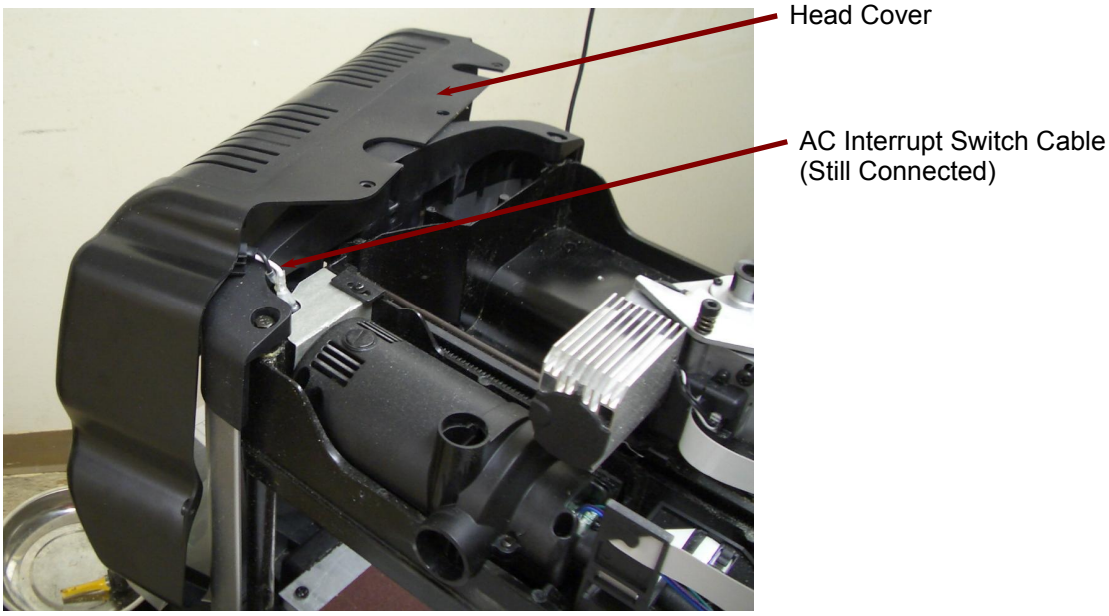
g. Verify that the head cover is laying flat on the head. Verify that the blow deflector is lined up with the vertical blow port located in the head. Verify that the FFC cable does not drag on the Y-motor heatsink when the Z-truck is pushed all the way to the left hand side.

11. **Replace the right side panel assembly:** Place the side panel assembly back onto the machine making sure that the bottom of the panel sits into the grooves and tabs located on the base casting. Insert the two bottom screws and tighten with a #2 Phillips screwdriver. Insert the top hex head bolts (with washers) and tighten with the 10mm socket.

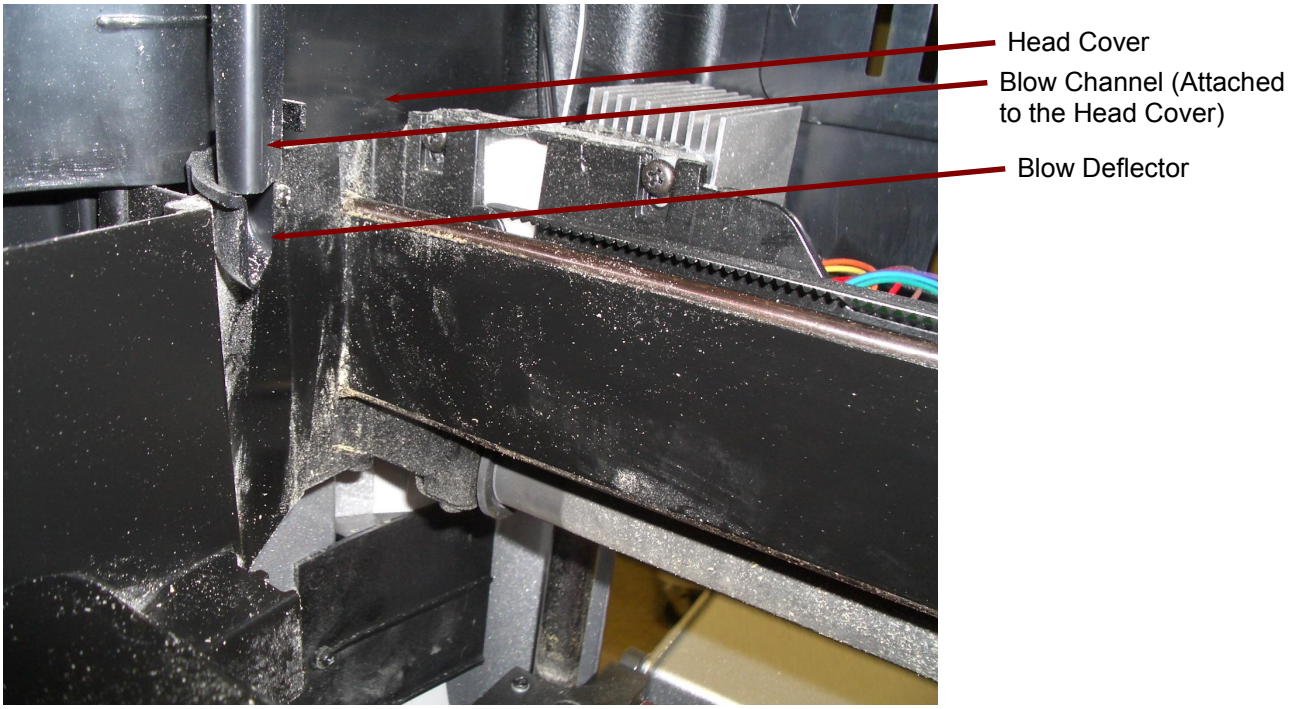
12. **Prepare the flexshaft assembly for re-insertion into the machine:** Gently pull the protruding flexshaft core (with squared end) out of the sheath several inches. Push the core back into the sheath and make sure that it slips into, and engages, the cutting motor. It will drop into the receptacle on the motor side about 5/8ths of an inch. Turn the core by hand and feel for resistance of the motor. If the shaft spins without resistance, push the core inward while rotating until it drops into the slot and engages the motor.

13. **Insert the flexshaft into cutting head:** Looking through the slot in the top cover, locate the flexshaft receptacle on the top of the Z-truck. Inside the receptacle there is a square recess that mates with the exposed square end of the flexshaft core. Turn the chuck on the bottom of the cutting head (open the safety cover for access) until the square core end can be inserted into the recess. Press the flex shaft all the way down into its receptacle. A click will be heard and felt as the shaft snaps into place.

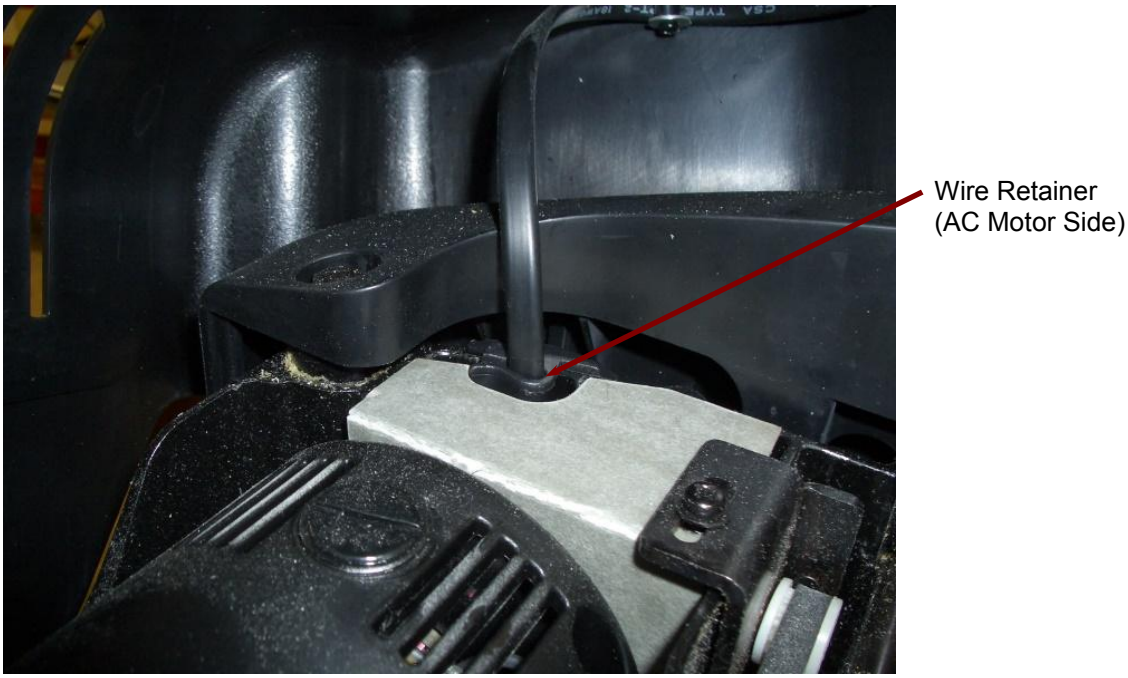
Appendix A



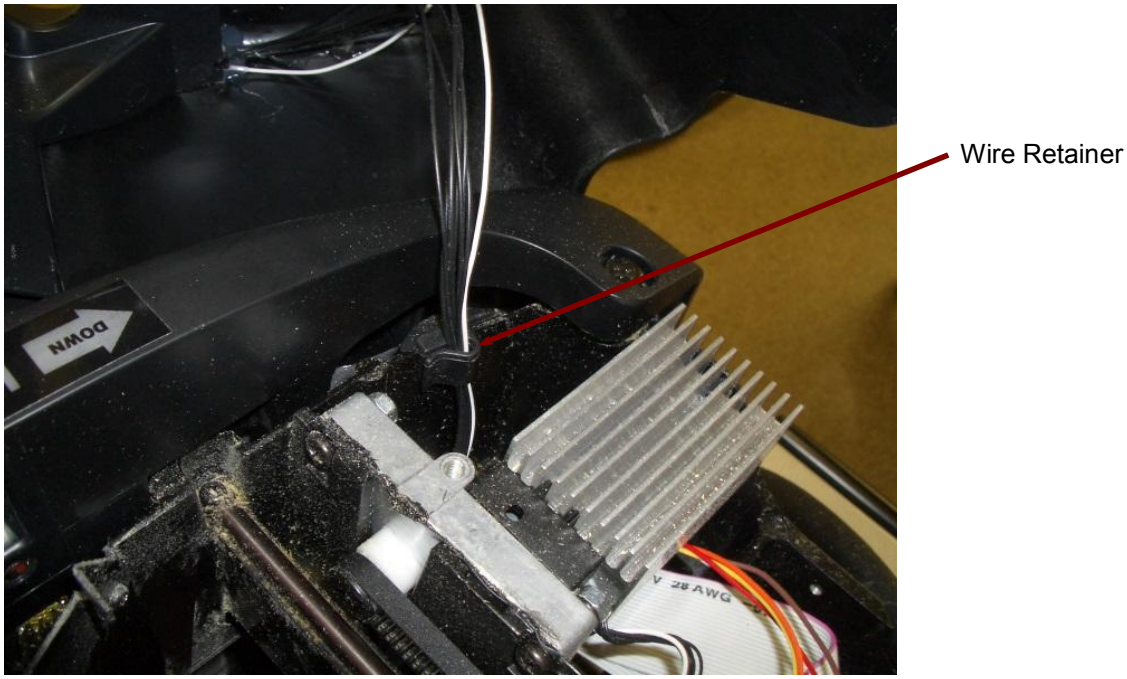
PICTURE 1: LAYING THE HEAD COVER OVER THE SIDE OF THE MACHINE



PICTURE 2: LOCATION OF THE BLOW DEFLECTOR



PICTURE 3: LOCATION OF AC INTERRUPT SWITCH CABLE WIRE RETAINER



PICTURE 4: LOCATION OF HEAD CABLE HARNESS WIRE RETAINER