Checking and Replacing the AC Motor

To remove and replace the AC Motor you will need the following tools:

- #2 Phillips screwdriver (magnetic tip preferred)

Removing the AC Motor

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.

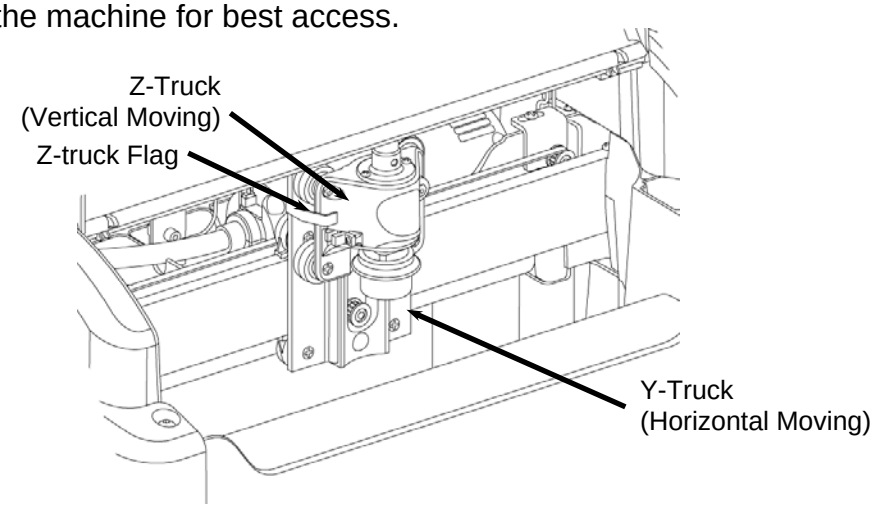


FIGURE 1: VIEW OF THE Z-TRUCK

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).

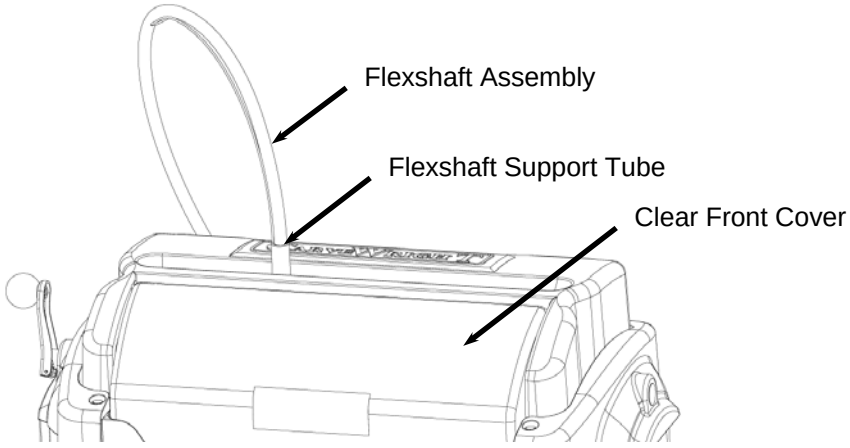


FIGURE 2: EXTERIOR VIEW OF THE FLEXSHAFT AND HEAD COVERS

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.

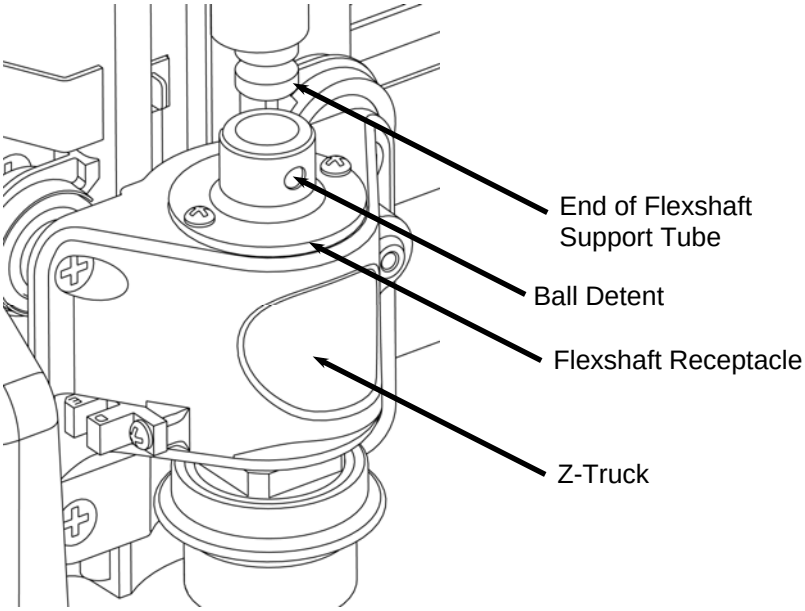


FIGURE 3: VIEW OF THE FLEXSHAFT CONNECTION TO THE Z-TRUCK

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.

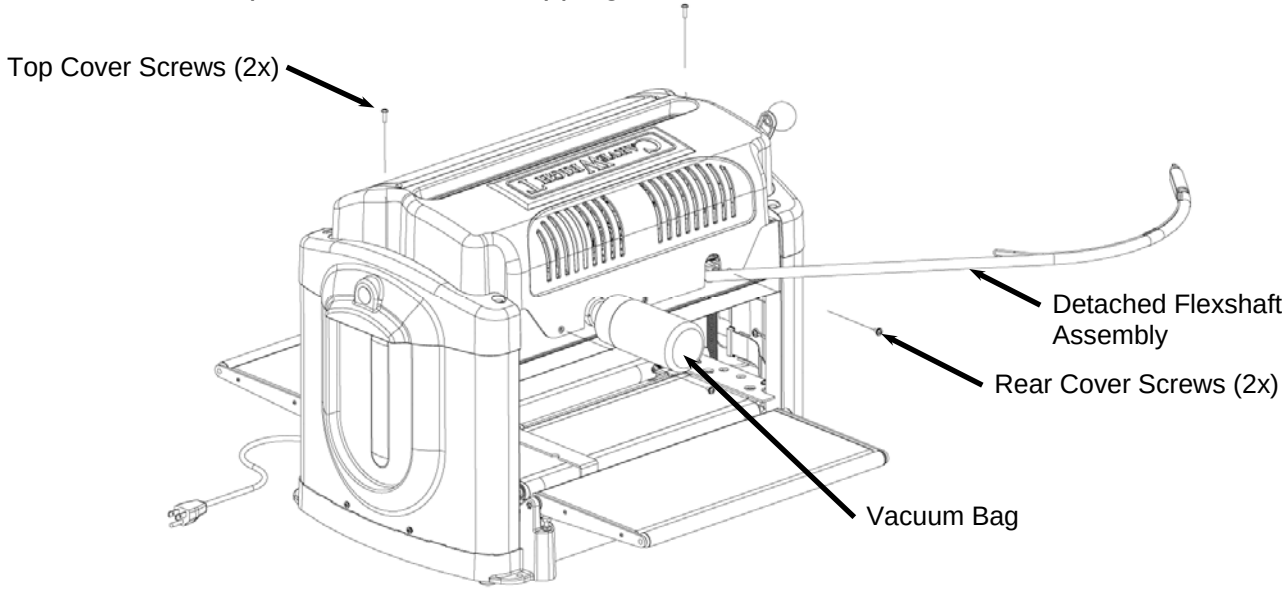


FIGURE 4: EXPLODED VIEW OF THE COVER SCREWS

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).

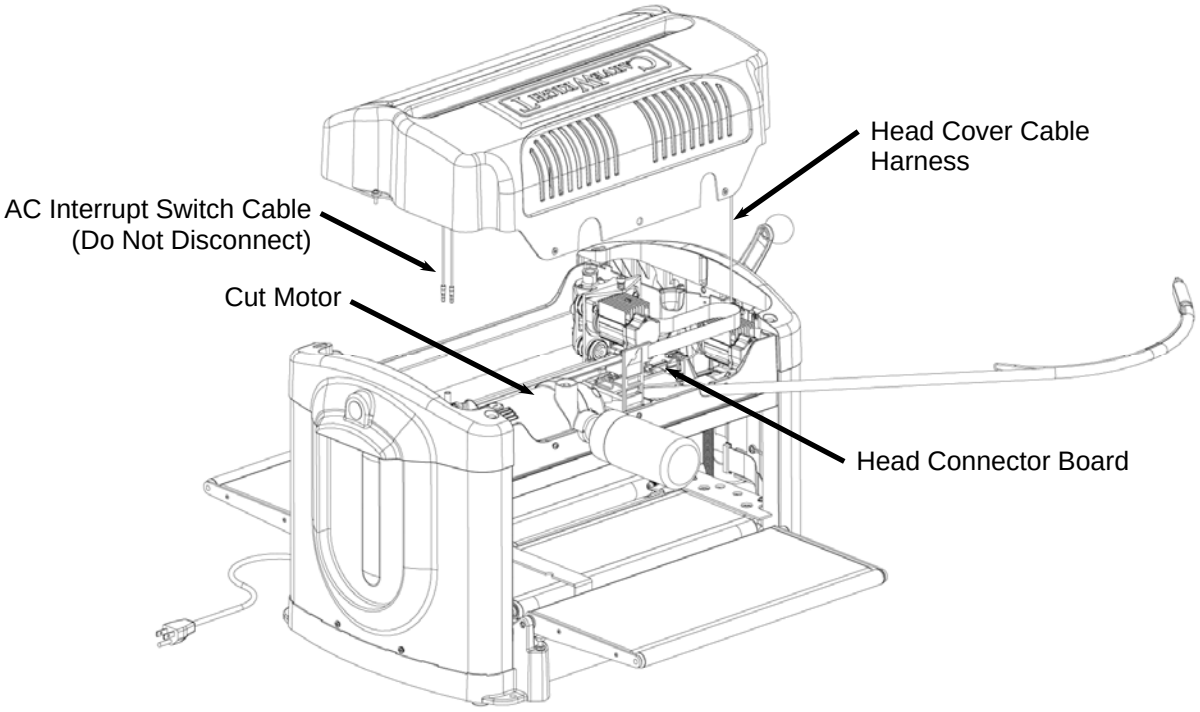


FIGURE 5: EXPLODED VIEW OF THE LIFTED COVER

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 along side and under the Y-truck motor pack. This routing is important to remember when re-assembling the cover.

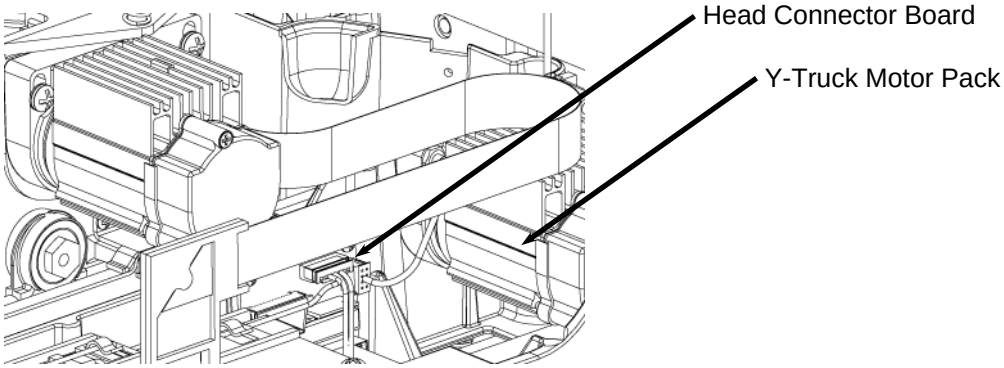


FIGURE 6: LOCATING THE HEAD CONNECTOR BOARD

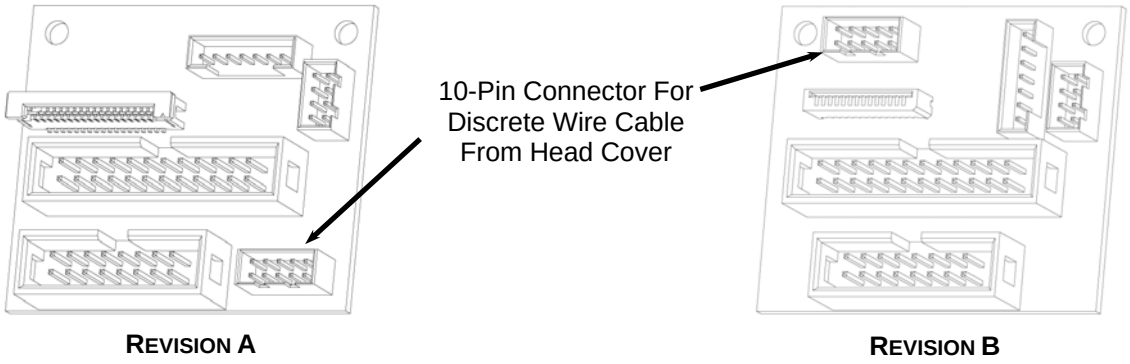


FIGURE 7: LOCATION OF CONNECTOR FOR HEAD COVER CABLE FOR THE EARLIER REVISION A AND LATER REVISION B MACHINES

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.

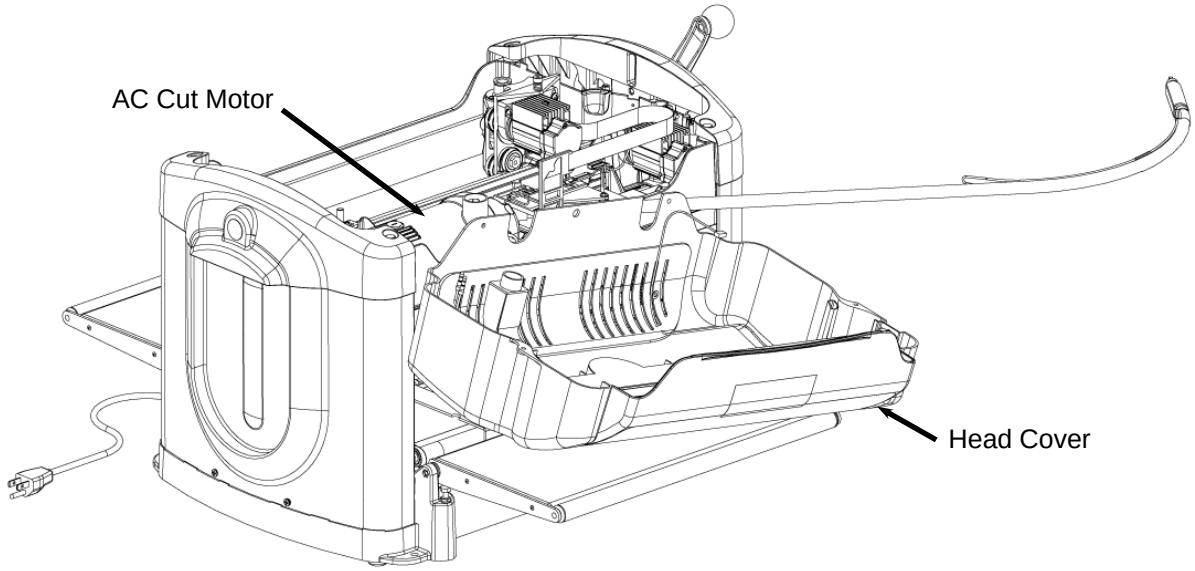


FIGURE 8: EXPLODED VIEW OF THE REMOVED COVER

8. **Remove the AC Motor RPM Sensor from the motor casing.** Remove the AC Motor Screw and lift the entire sensor board out (do not disconnect from cable at this time). If you are replacing the sensor, disconnect the sensor at the connector. Make sure to hold the connector base when pulling apart as it is possible to pull the connector off the sensor board.

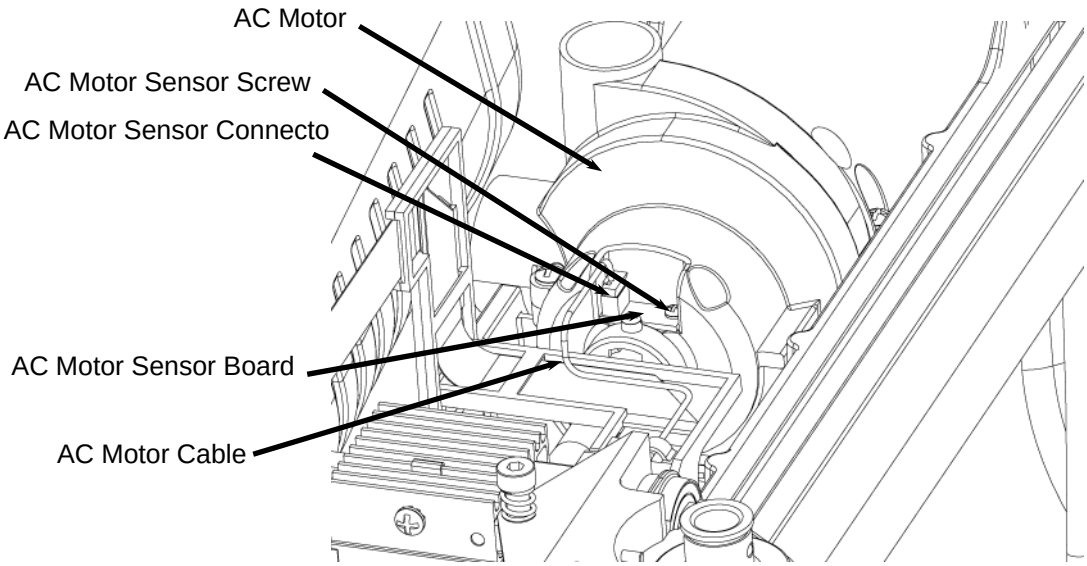


FIGURE 9: LOCATION OF AC MOTOR SENSOR

9. **Verify that the magnet is in place.** This is only required for machines that have a serial number starting with an A. The first step in resolving a "Check Cut Motor Sensor" error is to verify that the magnet is still mounted onto the AC motor spindle correctly. Look down into the rectangular hole uncovered by the removal of the AC motor sensor and turn the flexshaft core with your fingers. This will spin the motor shaft. As the shaft spins, look and see if the material holding the circular magnet in place seems to be ripped or shredded. If so the motor will have to be replaced.

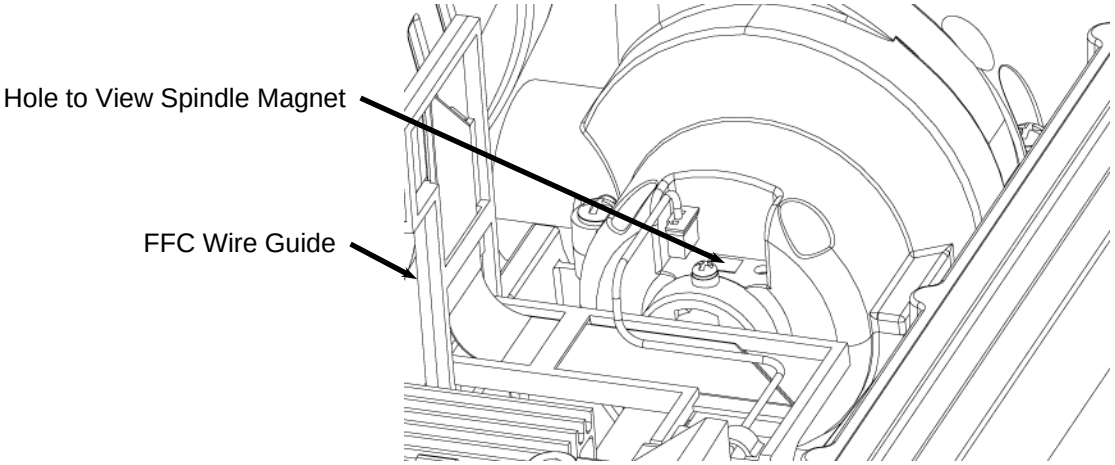


FIGURE 10: VERIFYING THAT THE MAGNET IS IN PLACE

10. **Remove the AC Motor wire bay cover.** In early A Serial Number machines this bay is a fiber liner and is not screwed together. In newer A series machines and B Series machines this is a two piece plastic assembly. Remove the single screw retaining the bay cover and remove the cover and screw

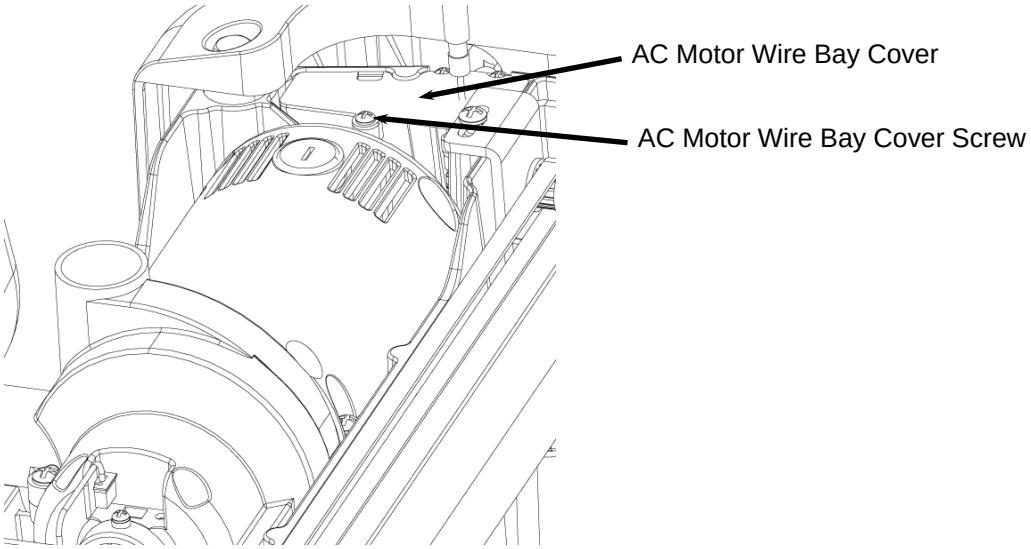


FIGURE 11: AC MOTOR WIRE BAY

11. **Disconnect the AC motor wires.** Locate the two wires exiting the back of the AC cut motor and unplug both. One is connected to the cover and the other to the supply line coming up from the base.

12. **Remove the AC Motor.** Remove the three screws holding the AC cut motor to the aluminum head casting. Carefully lift the motor and attached flexshaft out of the machine. Feed the flexshaft under the FFC wire guide and use caution to avoid damaging the white FFC cable.

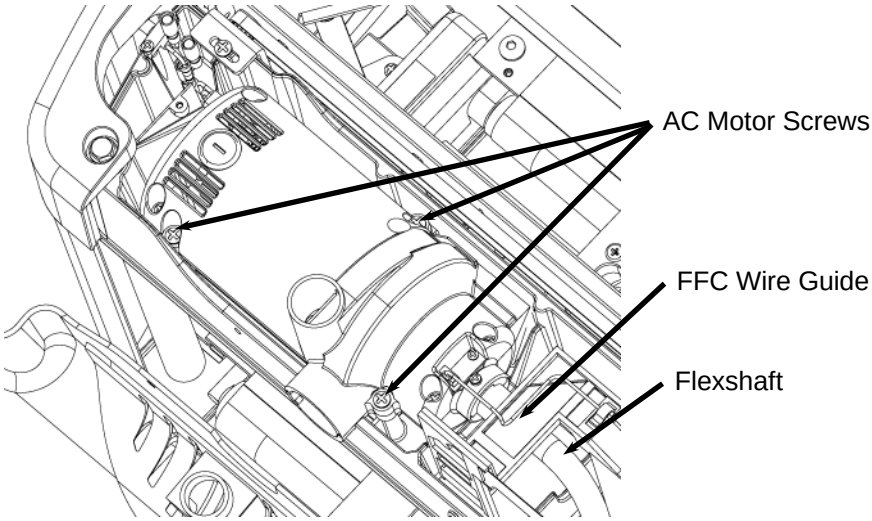


FIGURE 12: LOCATION OF AC MOTOR SCREWS

13. **Prepare the Flexshaft Assembly for removal**. Once the AC cut motor and flexshaft have been removed from the machine, remove the flexshaft core and place it in a clean location. Next loosen the flexshaft retaining screw, located on the motor housing, 2 ½ to 3 turns. Completely removing the retaining screw risks dropping the screws into the machine.

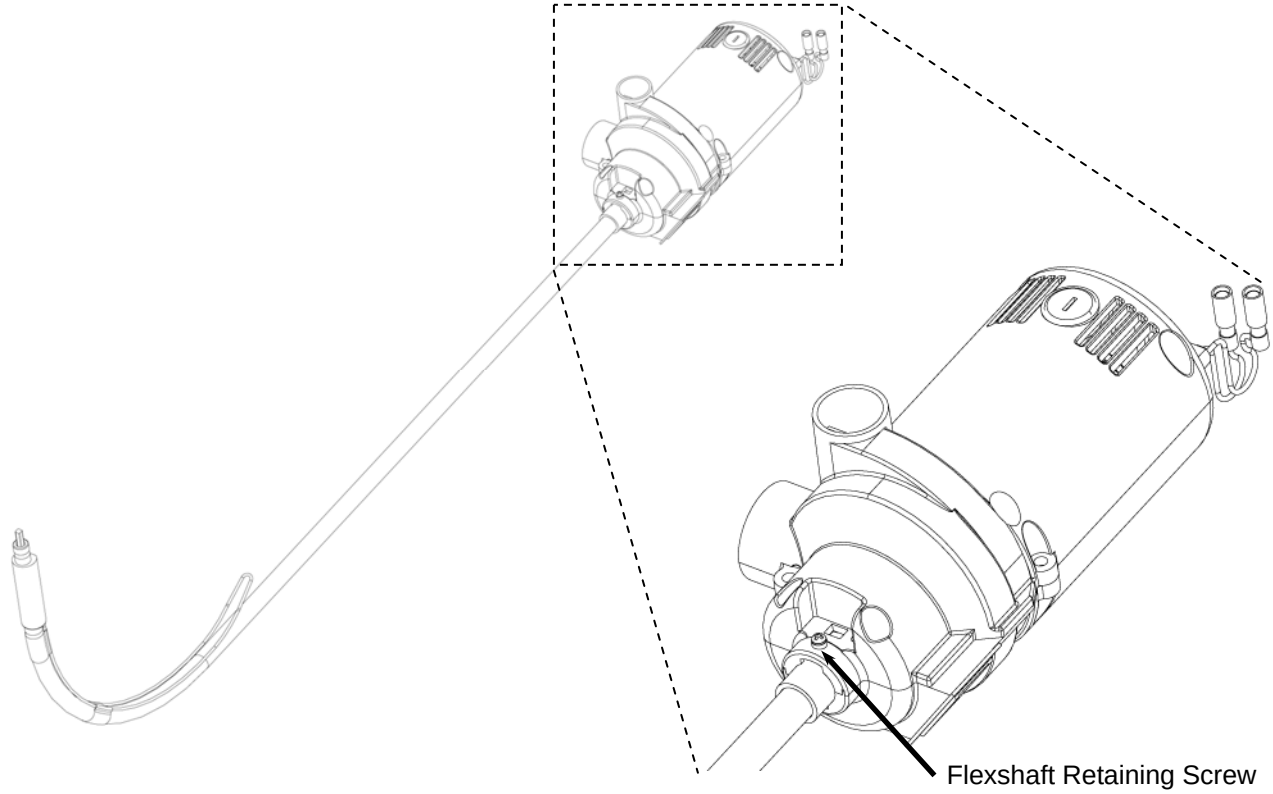


FIGURE 13: FLEXSHAFT RETAINING SCREW

14. **Remove the Flexshaft Assembly from the motor**. Grab the flexshaft sheath and twist in a clockwise direction while pulling it out of the motor. The sheath is retained with a bayonet style connection so the tabs and slots will need to align before it can be removed.

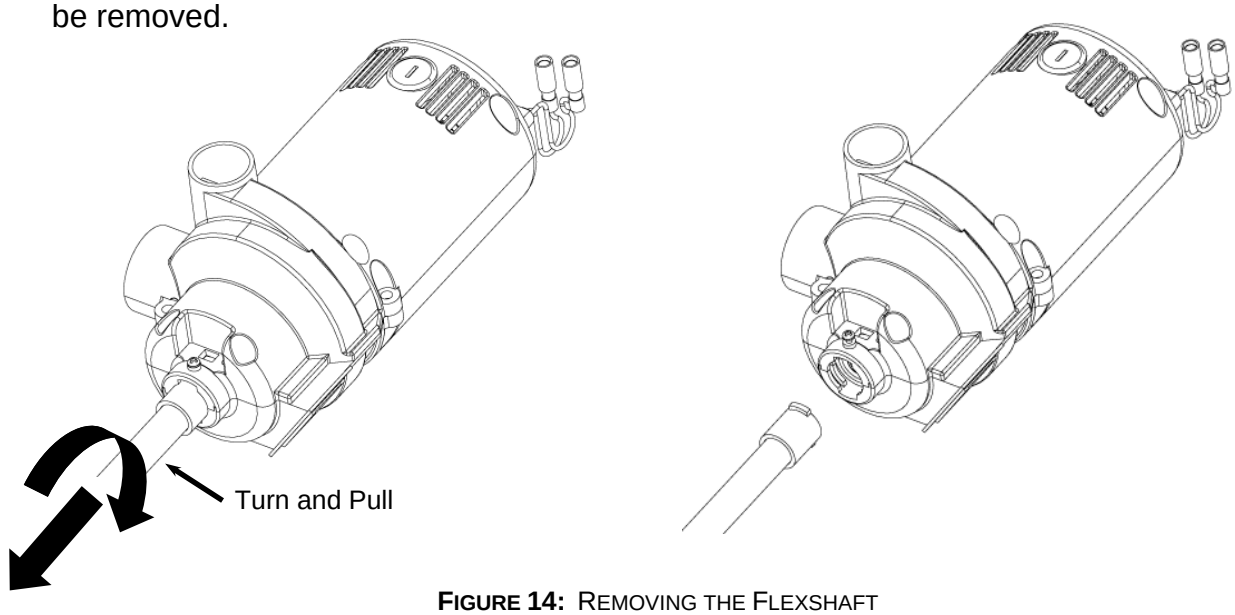


FIGURE 14: REMOVING THE FLEXSHAFT

Reassembling the AC Motor

1. **Assemble the Flexshaft Sheath onto the AC motor.** Orient the curved end of the flexshaft assembly toward the front of the machine as shown in Figure 15 and insert the tabs on the end of the flexshaft sheath assembly into the slots on the AC motor housing. Turn the flexshaft assembly 90 degrees in the counter clockwise direction and tighten the flexshaft retaining screw. **Failure to correctly orient the flexshaft during assembly can cause the core to bind and overheat very rapidly.**

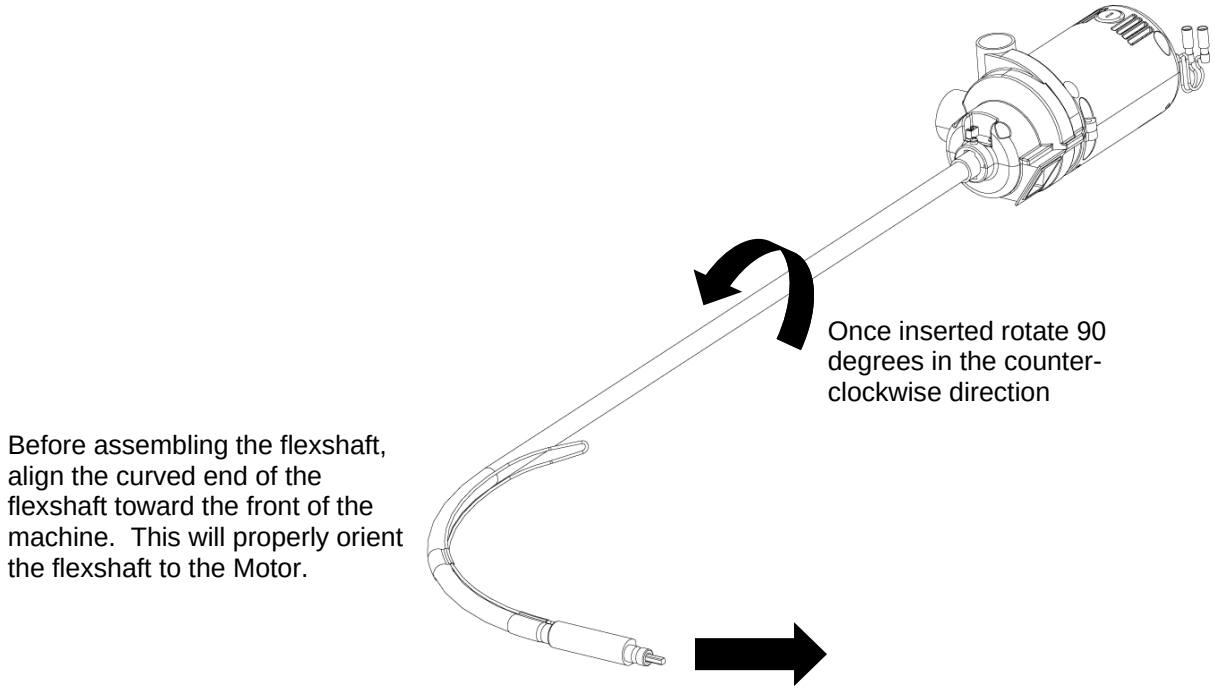


FIGURE 15: INSERTING THE FLEXSHAFT

2. **Assemble the AC Motor into the machine.** Carefully lace the flexshaft sheath under the FFC wire guide and out the slot in the back of the head casting. Replace and tighten the three AC motor screws.

3. **Reconnect the AC Motor wires.** Locate the two wires exiting the back of the AC cut motor and connect the black wire to the black wire from the supply line coming up from the base. Connect the white wire to the head cover AC switch.

4. **Replace the AC Motor Wire Bay Cover.** Locate the two remaining loose wires with bullet connectors and set them into the slot in the AC motor wire bay cover before tightening the screw.

5. **Replace the AC Motor RPM Sensor.** Plug in the AC motor RPM sensor to the cable and replace the AC motor screw (See Figure 9). Be sure to test the RPM sensor before reassembling the rest of the machine by accessing the sensor check menus on the keypad (See Operators manual for more information).

6. **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. If the FFC cable is dragging bend it upwards so that it consistently clears the heatsink.

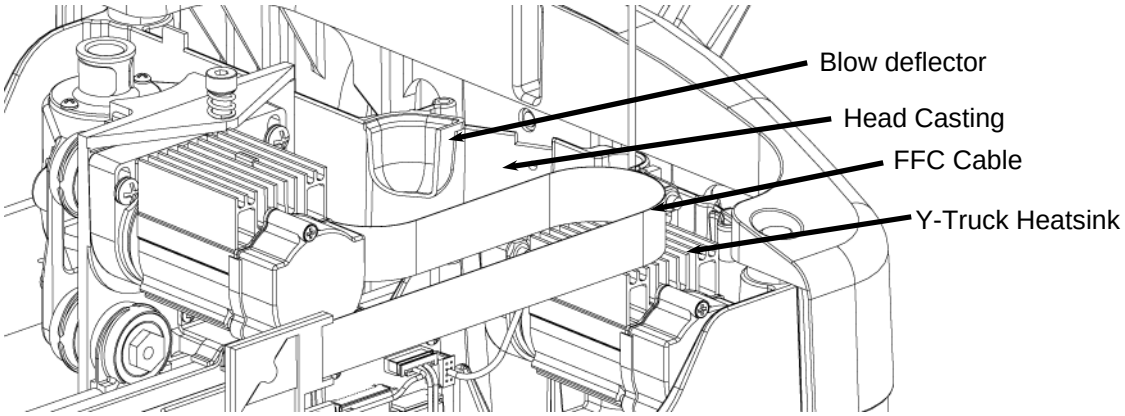


FIGURE 16: PLACEMENT OF THE BLOW DEFLECTOR

    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.

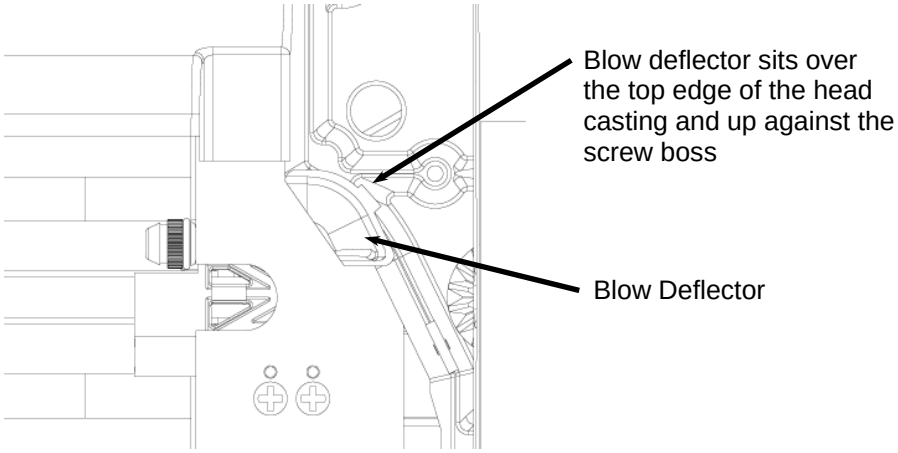


FIGURE 17: PLACEMENT OF THE BLOW DEFLECTOR - TOP

    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 18. 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.

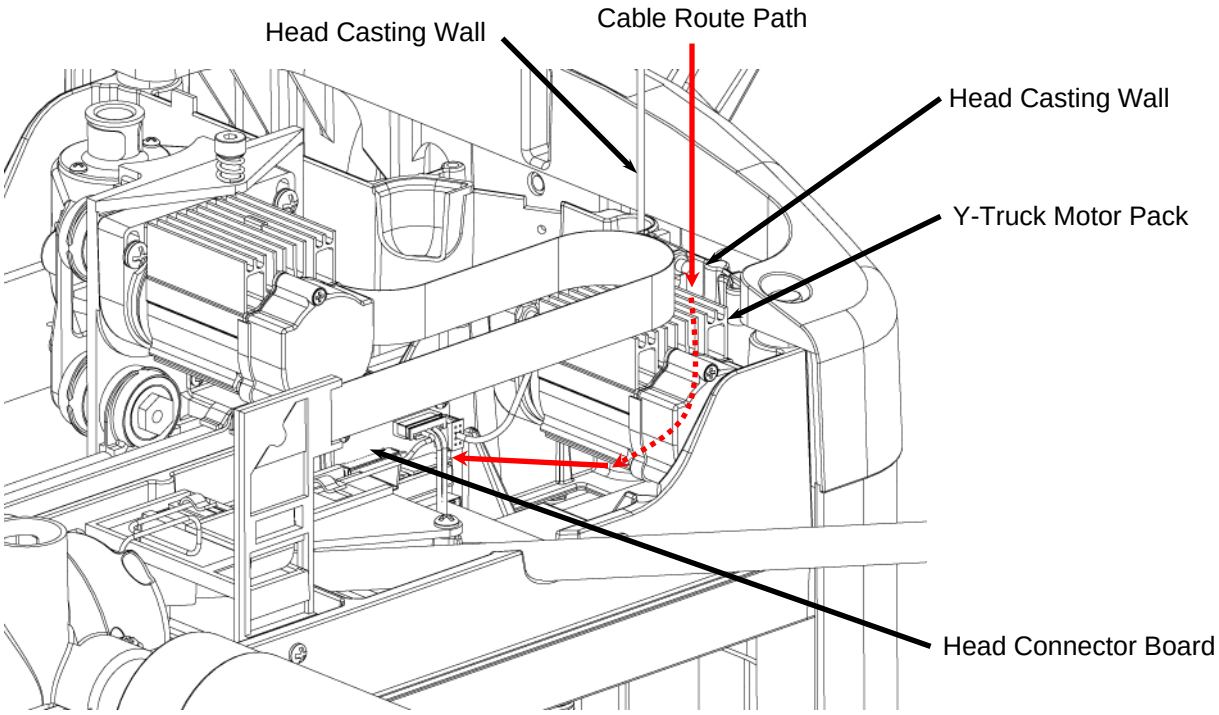


FIGURE 18: ROUTING THE HEAD CABLE HARNESS

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.

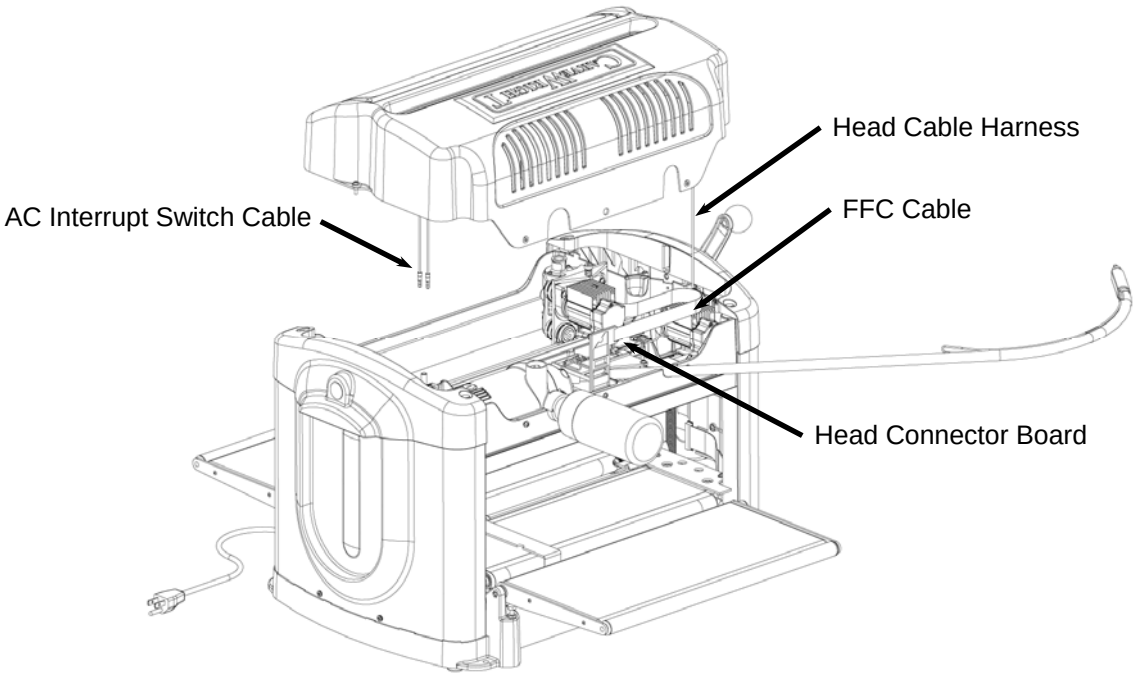


FIGURE 19: RESEATING THE HEAD COVER

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.

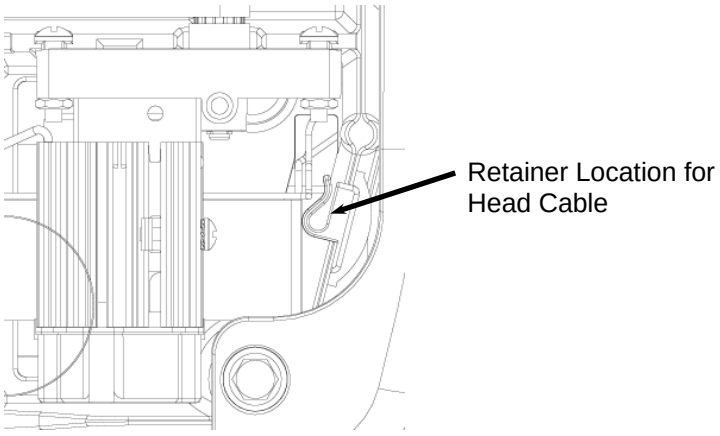


FIGURE 20: LOCATING THE HEAD CABLE HARNESS RETAINER

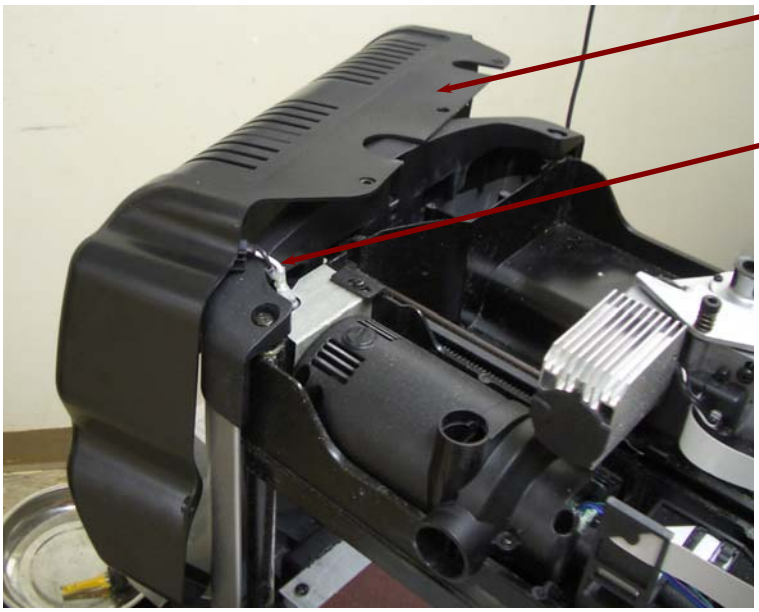
f. Replace the four screws as shown in Figure 4. The two long screws go in the vertical locations.

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.

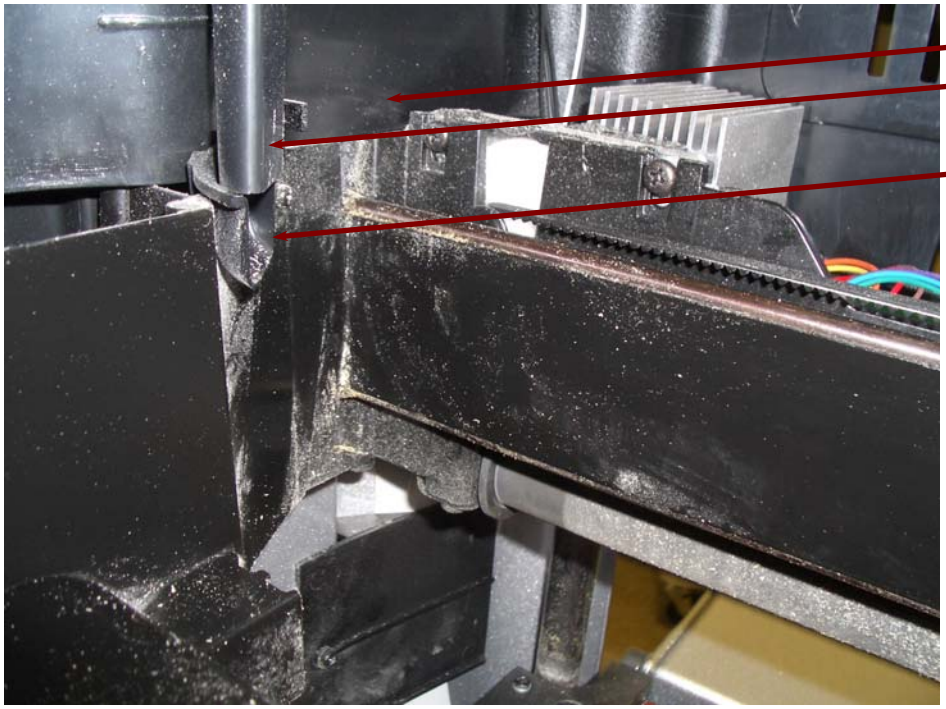
7. **Prepare the flexshaft assembly for re-insertion into the machine:** Reinsert the flexshaft core. Push the core into the sheath and make sure that it slips into, and engages, the AC cutting motor. It will drop into the receptacle on the motor side about 5/8ths of an inch. Turn the core by hand and 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.

8. **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.

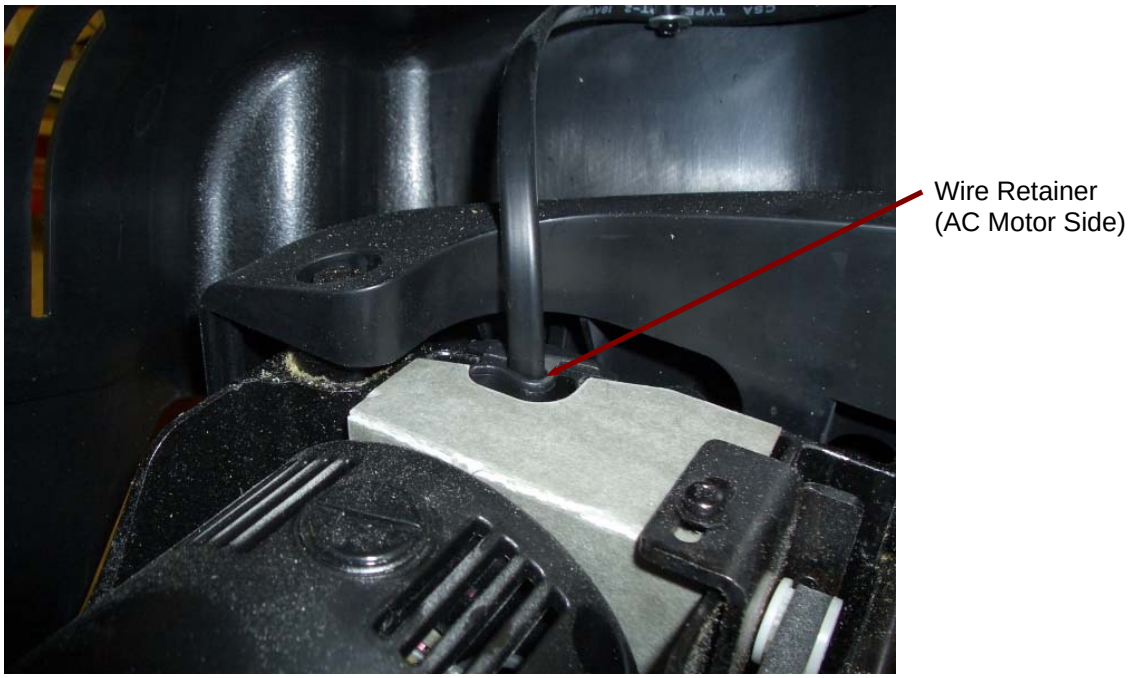
Appendix A



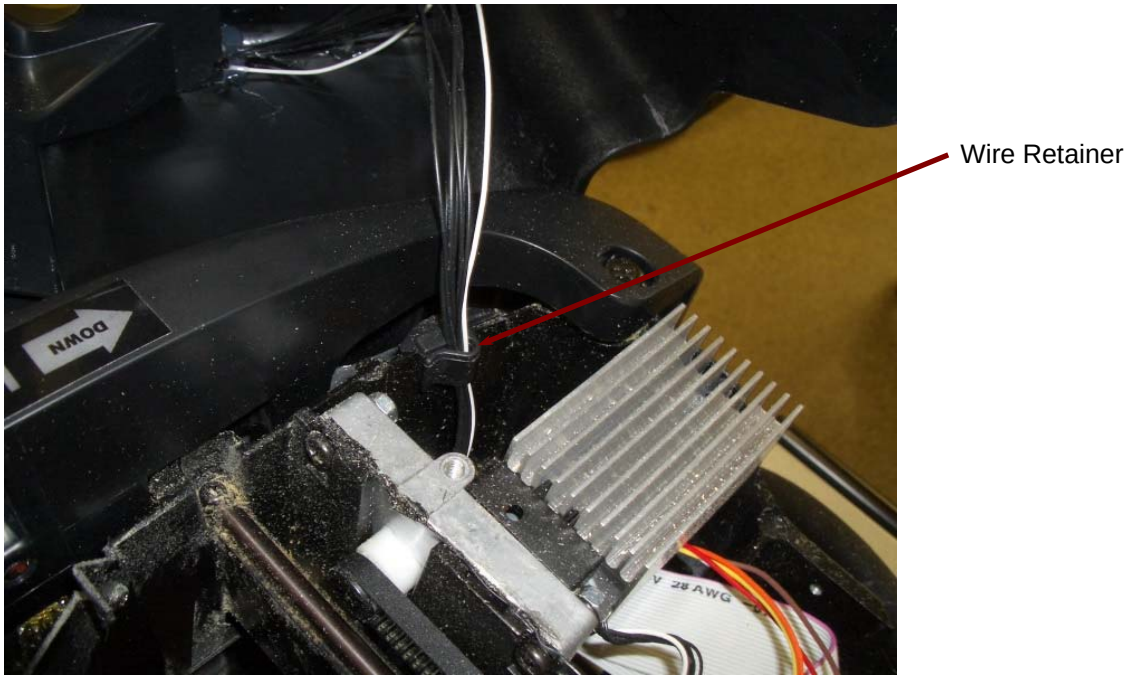
PICTURE 1: LAYING THE HEAD COVER OVER THE SIDE OF THE MACHINE



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