Removing and Replacing the X-Drive Gears

To remove and replace the X-Drive Gears you will need the following tools:

- #2 Phillips screwdriver or power drill with #2 screw bit
- 10mm Socket and ratcheting wrench
- Permanent thread cement
- Small set of ring pliers (optional)

Removing the X-Drive Gears

1. **Ready the machine.** Unplug the machine from the power outlet and place 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. Remove the dust collection bag from the back of the machine.

2. **Remove the bottom cover.** Carefully lay the machine on its back with the dust collection port facing down. Remove the 12 screws securing the black sheet metal cover onto the base (four of which are located in the rubber feet) and remove the cover. Return the machine to the upright position. Be careful to not pinch any wires that can drop out of the base as you return the machine to upright.

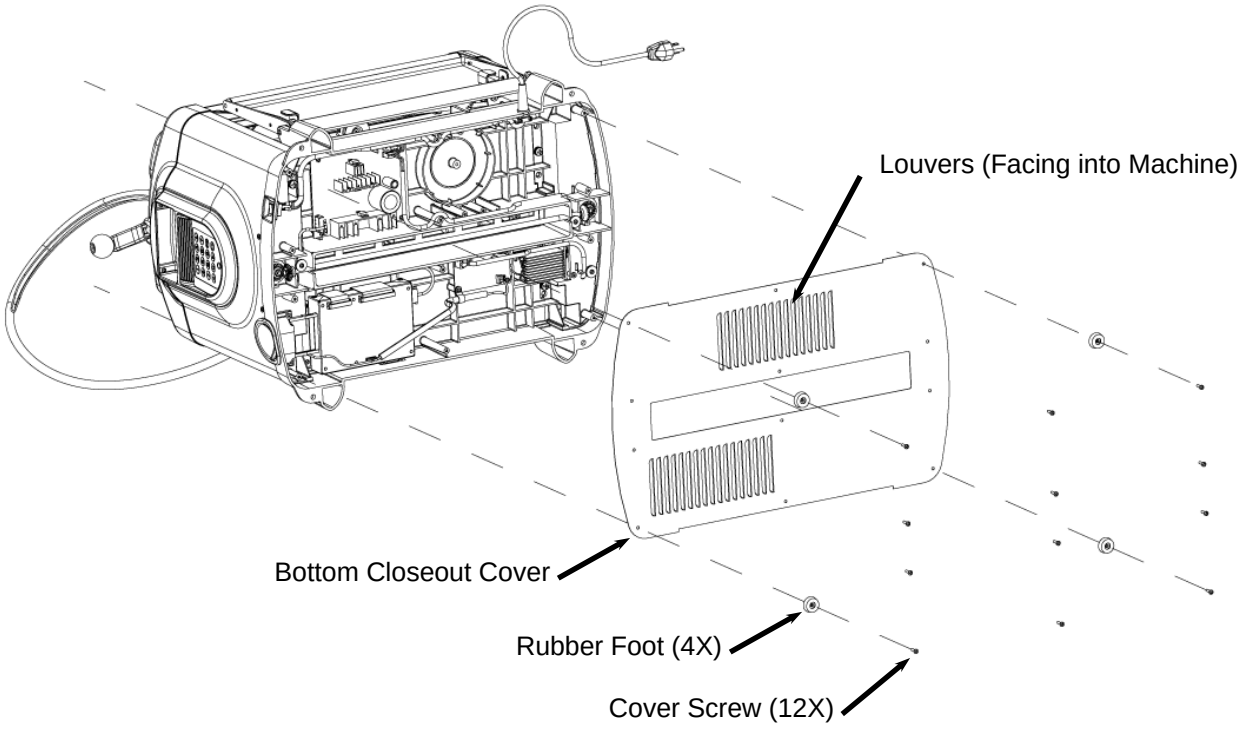

FIGURE 1: REMOVAL OF THE BOTTOM COVER

3. **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.

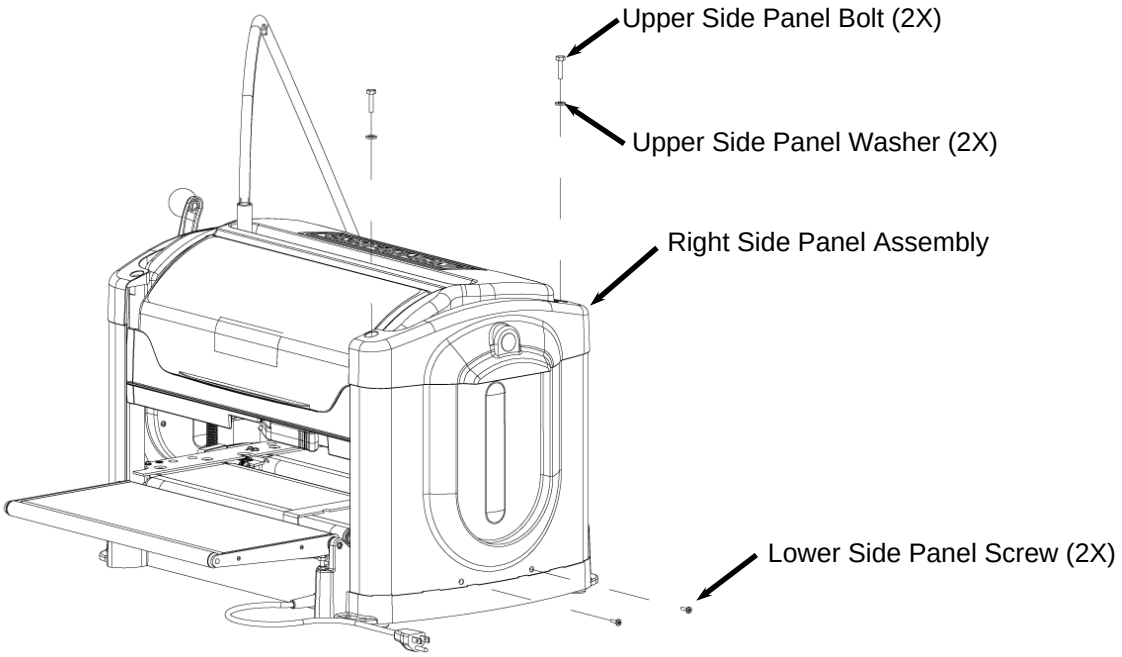

FIGURE 2: REMOVAL OF THE RIGHT SIDE PANEL

4. **Remove the black plastic cover over the drive gears.** This cover simply pops off when it is squeezed and pulled up and out. You will then have access to the gears.

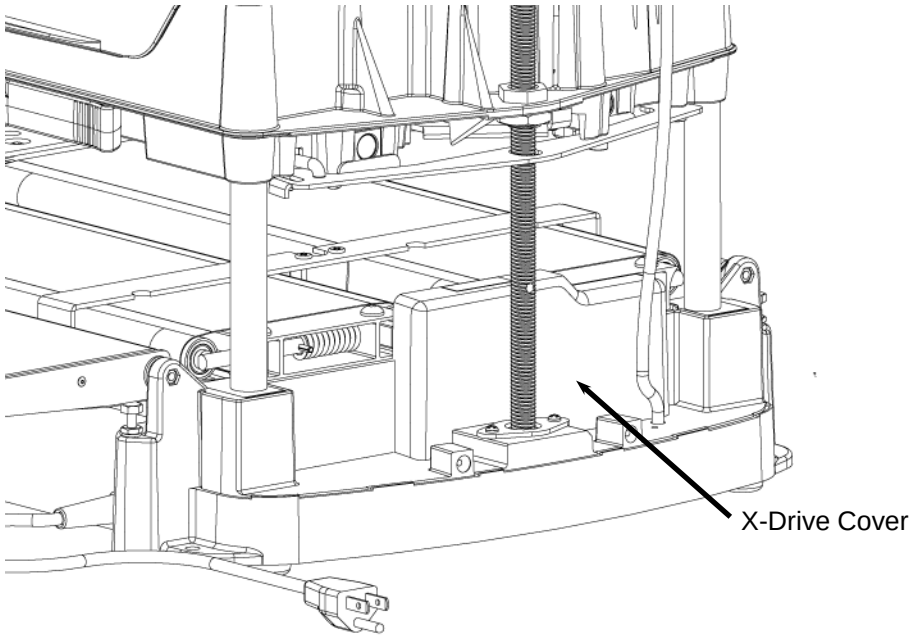

FIGURE 3: REMOVAL OF THE X-DRIVE COVER

5. **Remove the screws holding the X-Drive DC motor pack.** Use the #2 Philips head screw-driver to remove the two screws (and lock washers) holding the X-Drive DC motor pack as shown in Figure 4. Once these screws are removed the motor pack will drop down into the base. Reach up into the base from below to reposition it when reassembling.

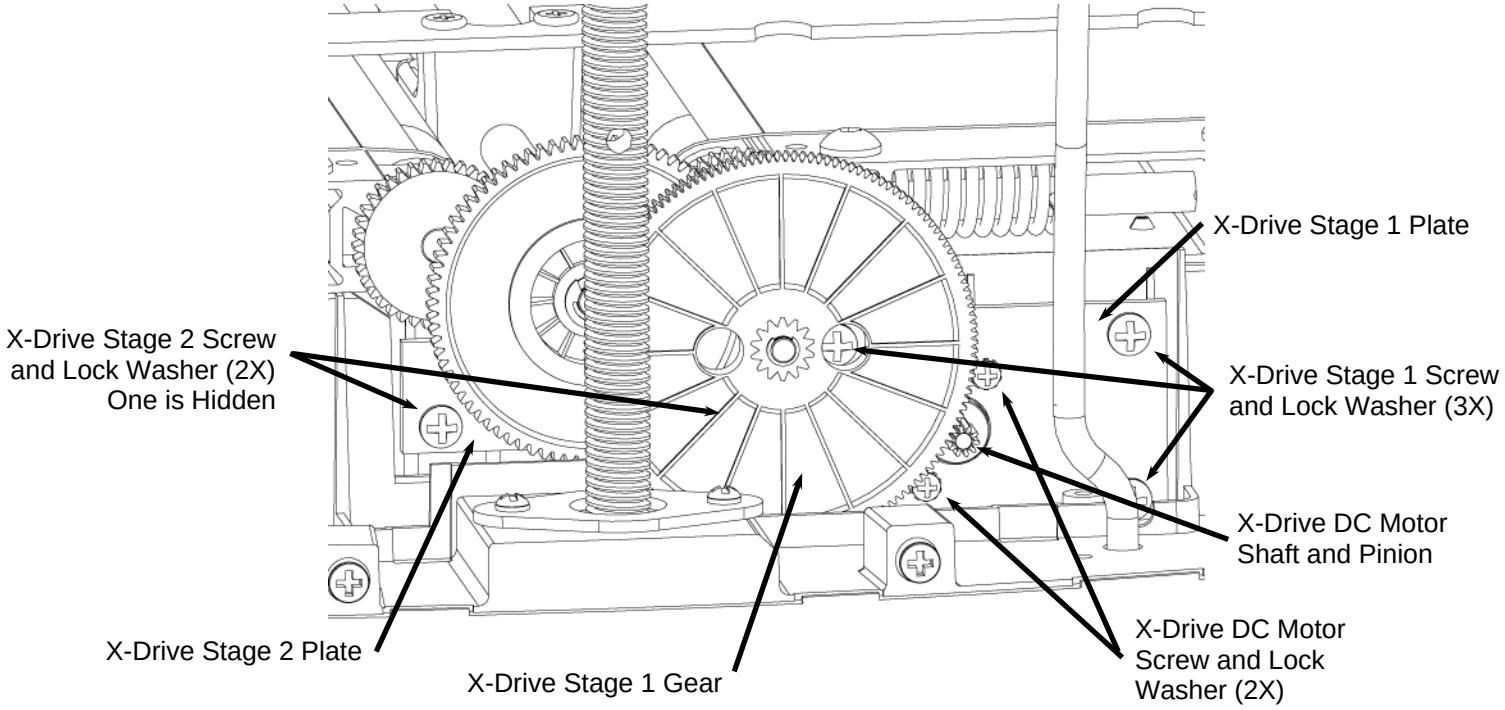

FIGURE 4: VIEW OF THE X-DRIVE GEAR TRAIN

Note: Depending on when the machine was made, the X-drive gear train either contains two separate reduction stages – Stage 1 (which is the largest gear) and Stage 2 or one continuous plate onto which both gears are mounted. In either case, we are going to replace all of the x-drive gears (and plates) with a new single plate. STEP 6-7 below shows the configuration where there are two separate reduction gear plates. In the case of a single plate, remove the 4 screws holding the plate and remove.

6. **Remove the X-Drive Stage 1 plate and gear.** Use the #2 Philips head screw-driver to remove the three screws and lock washers securing the Stage 1 plate (see Figure 4). Pull the plate upward while rotating the top of the plate out toward the outside of the machine. The entire plate assembly will come loose.

7. **Remove the X-Drive Stage 2 plate and gear.** Use the #2 Philips head screw-driver to remove the two screws and lock washers securing the Stage 2 plate. Pull the plate straight out to remove.

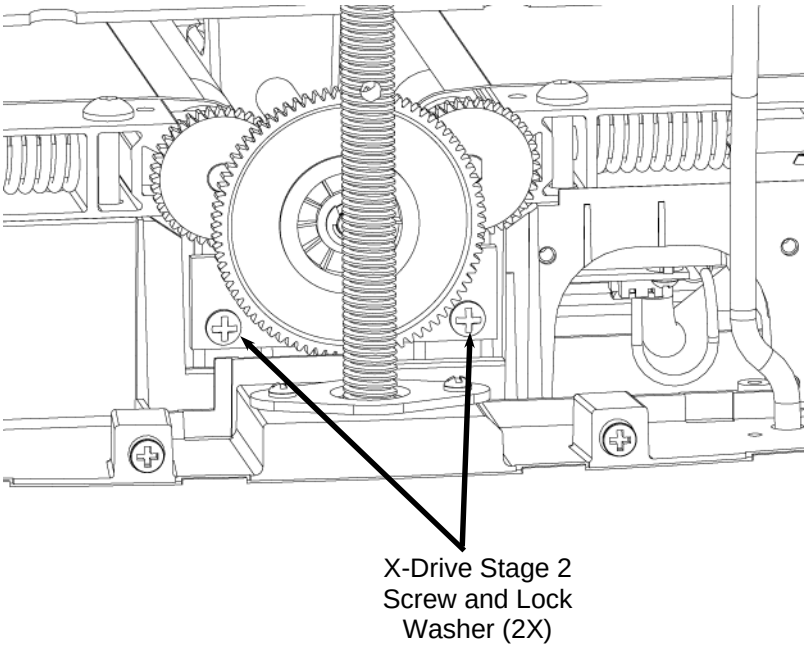

FIGURE 5: VIEW OF THE X-DRIVE STAGE 2 GEAR

Reassembling the X-Drive Gears

1. **Clean the X-drive enclosure.** Using compressed air blow out any debris from the X-Drive enclosure. It is critical that there be no dust or debris that could ever work its way into the X-Drive gears.

2. **Replace the single X-drive gear train plate assembly.** Slide the X-drive gear plate assembly into position from the right of the leadscrew. The inner gear on the Stage 2 gear assembly will mesh with the two metal gears on the ends of the belt tray drive rollers. Turn the center gear slightly by hand to make sure that it is centered and meshing properly. Replace the four screws (with lock washers) and only start then in the holes.

   Now make sure that the pinion of the DC motor pack is inserted through the hole in the plate. If it is not you will have to reach underneath the machine and insert it into the hole. Because of fit constraints, the DC motor pinion cannot be inserted into the hole in the gear plate once the four screws are tightened. Once the gears are adjusted and the motor pinion inserted into the hole, firmly hand-tighten the four screws. Do not mechanically over-tighten because the plastic base can strip out. Once fully tightened, turn the large Stage 1 gear one full revolution by hand to make sure that there is not excessive drag on the system at any point around its circumference.

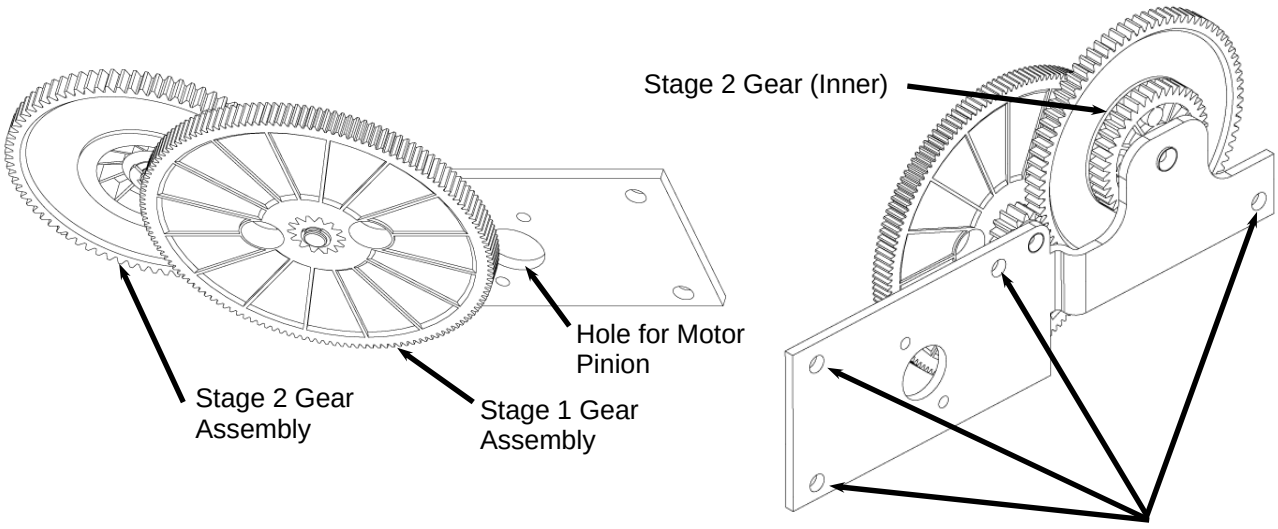

FIGURE 5: SINGLE X-DRIVE GEAR PLATE (AND GEARS)

3. **Replace the X-Drive DC motor pack.** Slide the machine to the side of your workbench so that you can reach up underneath and access the X-Drive motor pack. First put a spot of permanent thread cement on the two screws used to secure the motor pack. Next, position the pack so that the holes in the X-drive plate and the motor line up. Insert and tighten the moderately. Turn the Stage 1 gear by hand and make sure that there is enough clearance between it and the pinion attached to the motor shaft. Slide the motor left or right in order to get the right clearance. Firmly hand-tighten the two screws.

4. **Do a final test on the X-Drive gear train.** Turn the Stage 1 gear by hand at least 6 revolutions in both directions to make sure that the gears run smoothly. If you have tested each set as it is assembled it should run smoothly. Note: there is considerable load on the system so turning the gear by hand is somewhat difficult. Look specifically for spots of increased load as you turn the gear. Place a small dab of grease (the size of a pencil erasure) on the teeth of the Stage 1 and Stage two gears to reduce noise and wear.

5. **Replace the black plastic cover over the drive gears:** Insert the two hooked tabs on the bottom of the cover into the slots in the base and slide into place. The cover will snap in place if it is correctly located.

6. **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.

7. **Replace the bottom cover:** Carefully lay the machine on its back again with the dust collection port facing down. Replace the metal cover with the louvers pointing into the machine (see Figure 1). Insert and tighten the 12 screws. The four rubber feet are placed at the corners of the machine.