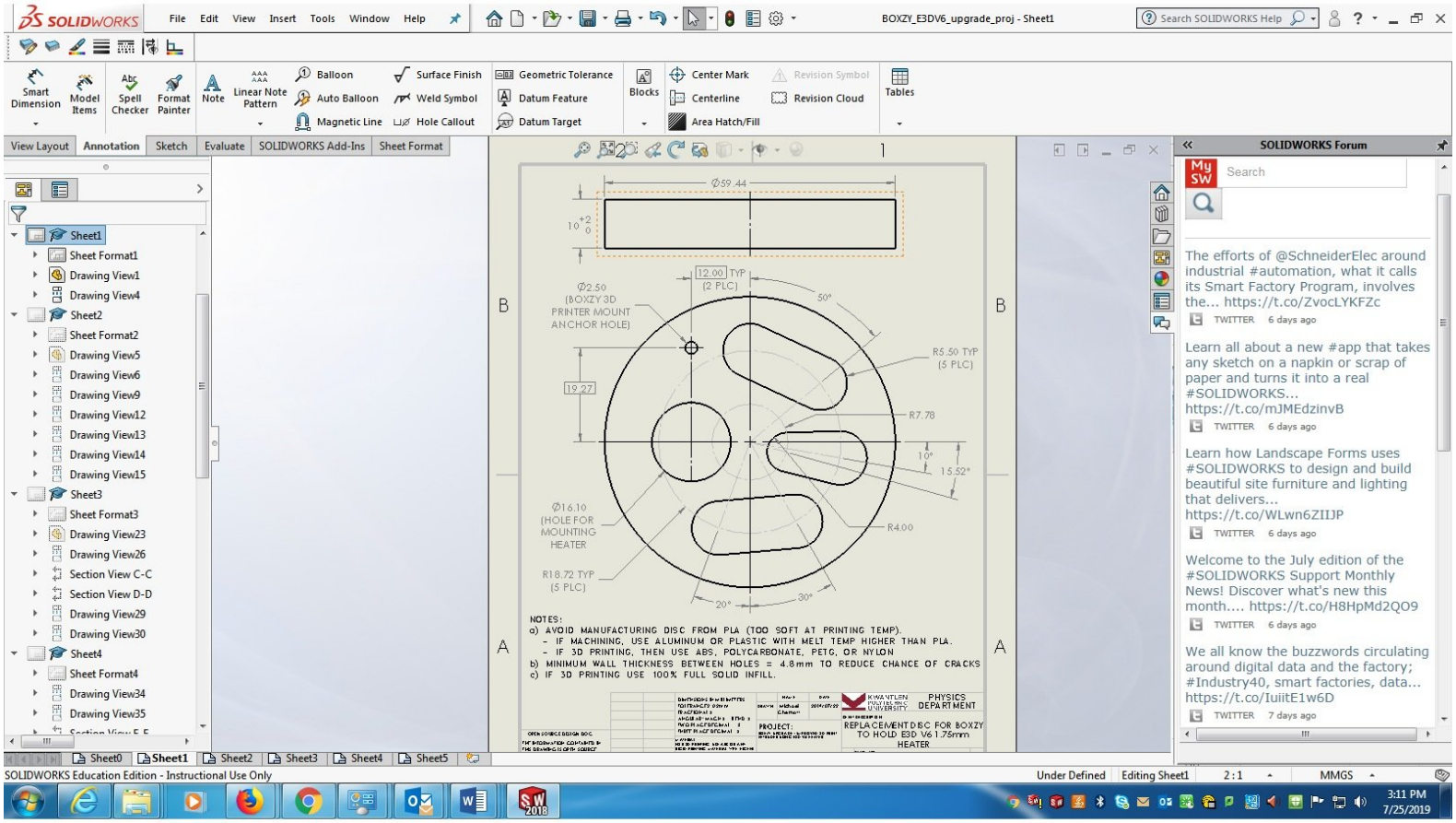
Reduce jams by replacing a boxzy printhead with an E3D V6 print-head

The BOXZY 3D printhead often plugs up due to thermal creep. This guide shows how to replace it with an E3D V6 print head without losing Z-height.

Written By: Michael Chernoff



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INTRODUCTION

I had problems with the 3D print head included with the BOXZY. It kept jamming and back-plugging. An effort to replace the head led to me breaking the laser cut acrylic mounting plate the 3D head was attached to.

I found a guide to using an E3D V6 print head on the "unofficial Boxzy forum" (now defunct), and modified the instructions to avoid losing any of the available Z-height. The E3D V6 print-head has a built in cooling fan and a heat-break to reduce thermal creep that can cause filament to melt in the bowden tube and form plugs.

Now I can 3D print more reliably with a Boxzy. This doesn't yet solve the power supply glitching issues that can cause the BOXZY to glitch and suddenly shift during 3D prints, but does make the extruder more reliable. (Please see my upgrading the power supply tutorial to solve this issue).

The goal here is to mill/3D print a replacement plate that can be used to hold an E3D V6 print head (complete with cooling fan) without losing any available Z-height.

If the replacement mounting plate has been made, then from drilling and tapping the canister to mounting the printer head, and re-wiring it back to the control board takes 30 minutes total.

TOOLS:

- drill press (1)

desktop drill press

- small vise (1)
- tap for M2.5x 0.45mm holes (1)
- 2.05mm size drill bit with 135 degree point (1)
- clamp to attach vise to drill press (1)
- pencil or thin sharpie (1)
- M2.5 allan key (1)
- 1/4" drill bit (1)

PARTS:

- Alloy Steel Cup-Point Set Screw, M2.5 x 0.45 mm Thread, 3 mm Long (4)

McMaster carr order number 91390A094 for package of 25

- Alloy Steel Cup-Point Set Screw, M2.5 x 0.45 mm Thread, 6 mm Long (3)

McMaster Carr order number 91390A256 for package of 50

- Reusable Threadlocker, Vibra-Tite Vc-3, 0.17 oz. Tube (1)

liquid thread sealant

MCMaster Carr order number 75145A68 for a 0.17OZ tube

- E3D v6 1.75mm print head with 0.4mm brass nozzle and 12V fan and heater. If BOXZY power supply has been upgraded from 19VDC to 24VDC 600W then get a version with the 24VDC heater cartridge (1)

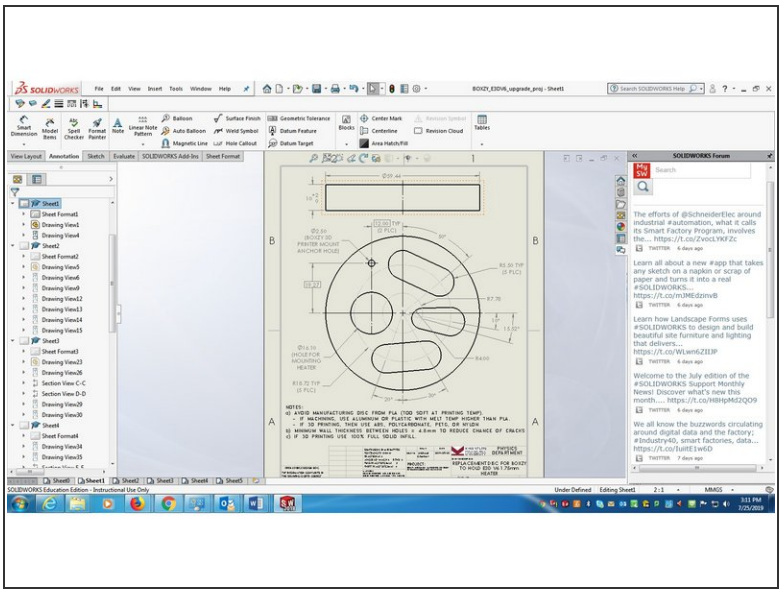
kit

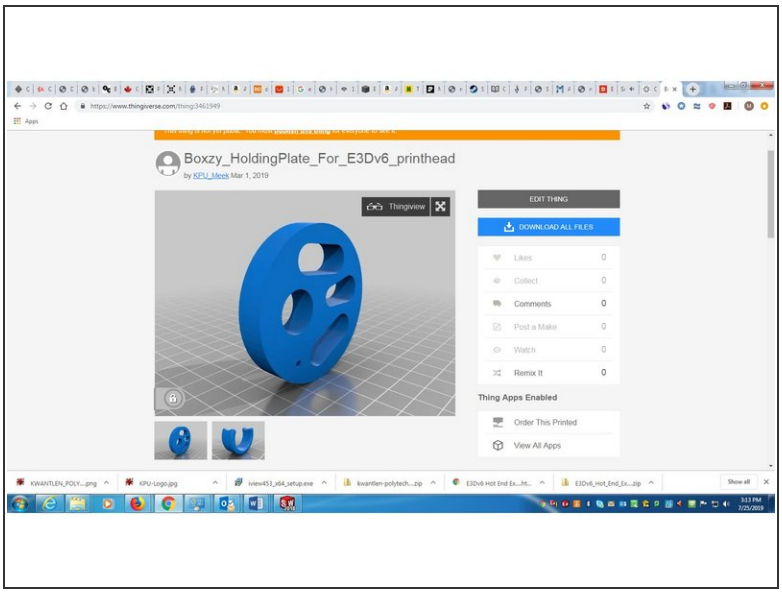
I ordered mine from matterhackers https://www.matterhackers.com/store/printer-

accessories/v6-hotend-full-kit-1.75mm-universal

- Boxzy 3D printer head mount (can be ordered from Boxzy, or re-used from the 3D printer head included with BOXZY) https://boxzy.com/product/3d-printer-nozzle-mount-2/ (1)
- 12 VDC power supply (any wall wart will do) (1)
- 1x 3D printed (or milled) replacement 3D printerhead mounting plate (please see the following link on thingverse) (1)
  https://www.thingiverse.com/thing:3461949
- BOXZY 3D Printer canister (I reused the one I already had) (1)
  the one featured here: https://boxzy.com/product/3d-printer-canister/
- Printer Canister internal harness (1)
  https://boxzy.com/product/3d-printer-canister-internal-harness/
- (QTY 8) 3/4" lengths of adhesive lined heat-shrink tubing suitable for the solder joint for two 24AWG wires together. (1)

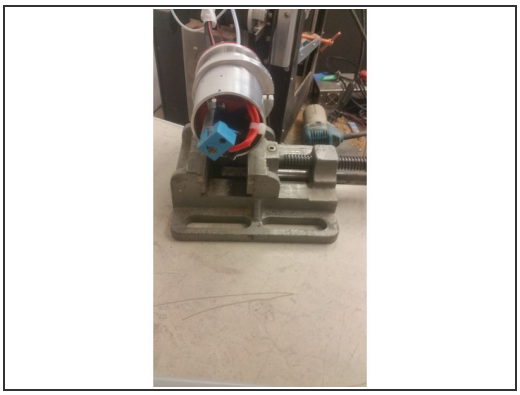
Step 1 — Print the modified mounting disc for E3D V6 1.75mm heater

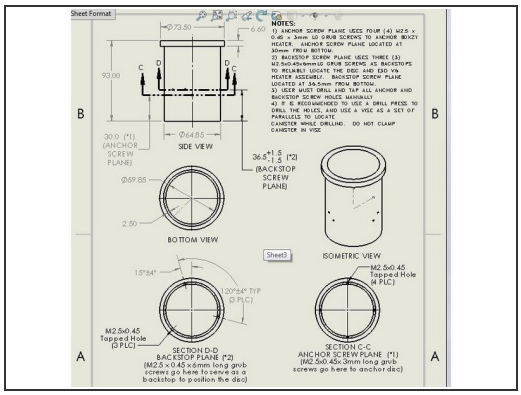


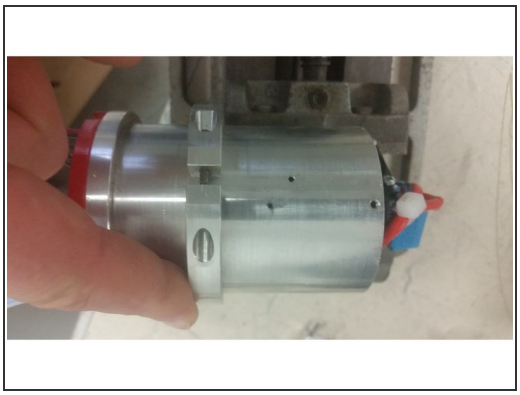


- Engineering drawing of 3D printed disc. Have this disc either machined, 3D printed, or laser cut. Use something with a higher melting point than PLA. Recommend 3D printing with ABS, or PETG.
- 3D model (and PDF) available from thingverse here https://www.thingiverse.com/thing:346194...

Step 2 — Drill and tap BOXZY canister

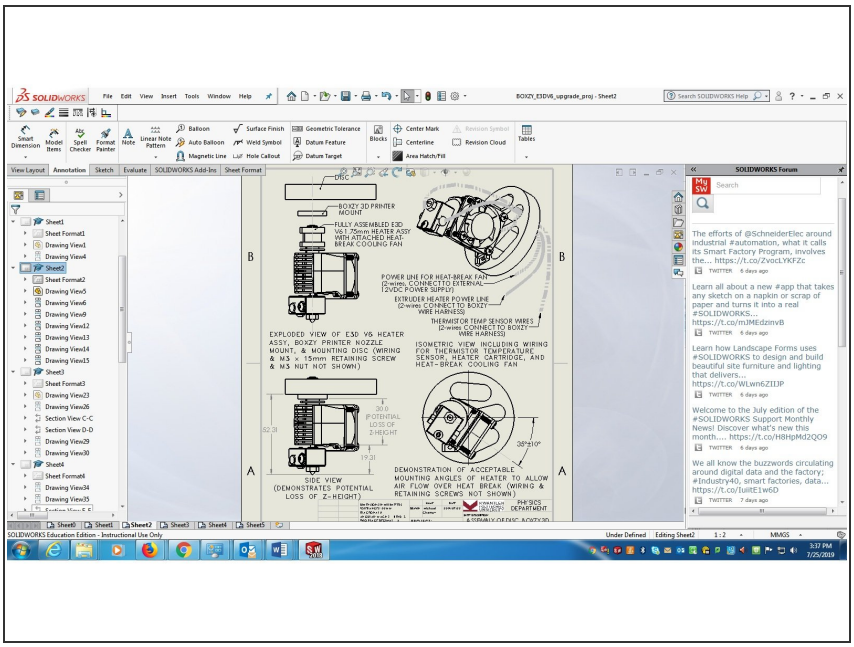






- Take the 3D printer canister. Remove all screws and pull out the top lid, the bottom lid, and the heater cartridge.
- Now place the empty canister onto a fixed set of parallels. In this case I used the jaws of a vise as parallels instead of a clamp.
- Mark out the four (4) holes on the anchor screw plane with a marker at 30mm from the bottom. Now drill out all four (4) anchor screws with a 2.05mm drill. (See sheet 4 on the attached PDF). Use the canister alignment ring as a stop.
- Reposition the canister alignment ring to adjust canister position to the backstop plane location at 36.5mm from the bottom. Now drill the three (3) holes on the backstop screw plane, and mark out the three (3) holes at 36.5mm from the bottom. Drill them out with a 2.05mm drill. (See sheet 4 on the attached PDF).
- Now tap all seven (7) holes with a M2.5x0.45 tap.
- Take all three (3) of the M2.5x0.45x6mm grub screws and coat with Loctite thread locker compound. Now screw them into the three (3) holes on the backstop screw plane. Make sure the screws are all flush with the outer surface of the printer canister.

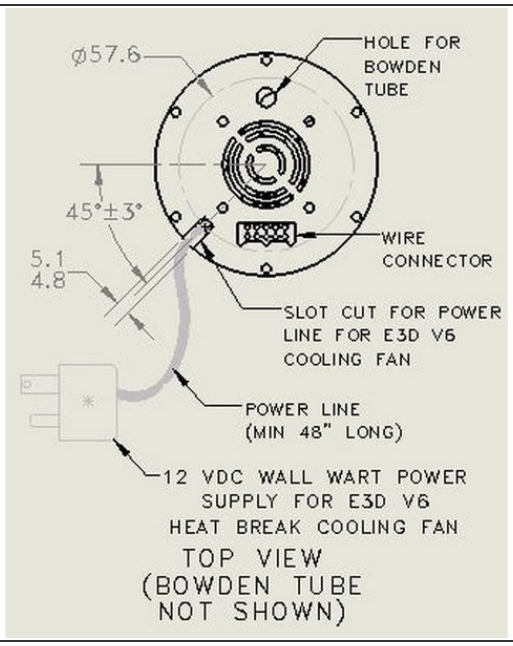
Step 3 — Assemble E3D V6 1.75mm heater & fan, and mount onto disc



- Assemble the E3D V6 1.75mm heater assembly (by default, order the e3d V6 version with the 12VDC fan, and the 12VDC heater cartridge. If the BOXZY power supply has been upgraded from a 19VDC power supply to a 600W 24VDC power supply, then order an E3D V6 heater assembly with a 24VDC heater cartridge instead.)
- Now connect the E3D V6 to the 3D printer mount (https://boxzy.com/product/3d-printer-noz...) and mount it onto the disc using the 15mm long cap screw. (Please see sheet 3 on the attached PDF)
- Now thread the wires from the heater cartridge, the thermistor and the E3D V6 heat-break cooling fan through the large hole in the middle of the mounting disc.
- Test the Z-Height of the assembly. Push the disc & heater assembly up into the canister until it presses against the backstop screws.

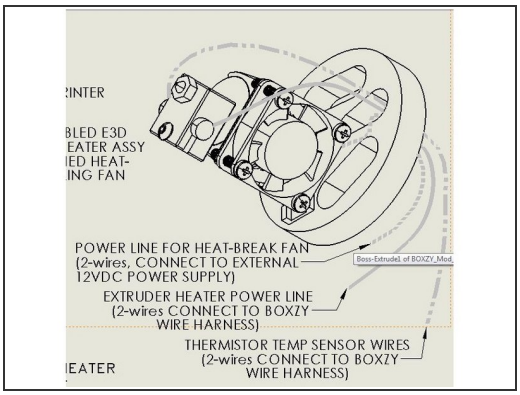
- Now insert the four (4) M2.5x0.45x3mm grub screws and insert them into the four (4) anchor screw holes. Tighten them until they are flush with the outside of the canister. Make sure that both the anchor and backstop screws are flush with the outer surface of the BOXZY printer canister, or the canister won't fit in the BOXZY mounting.
- Now remove the four (4) anchor screws (but leave the three ((3)) backstop screws).

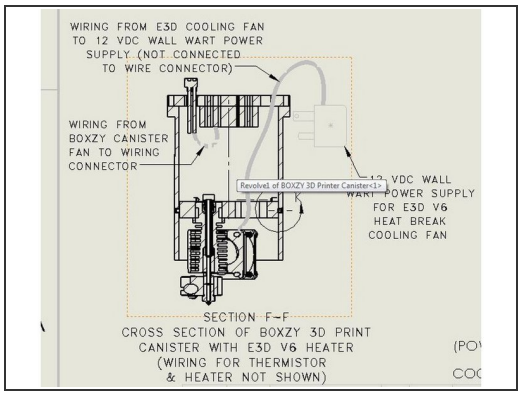
Step 4 — Cutting the slot and feeding the bowden tube.



- Take the top lid off of the BOXZY 3D printer canister, and use the 7/32" drill bit to make a starter hole for the slot at the position shown on the picture, near (but not too near) the wiring pins.
- Use any appropriate tool to cut out the slot. I used a fine toothed hacksaw, lined it up with the edges of the 7/32 hole and sawed out the piece from the lid in order to make the slot.
- Now feed the bowden tube through the bowden tube hole and into the E3D V6 hotend.

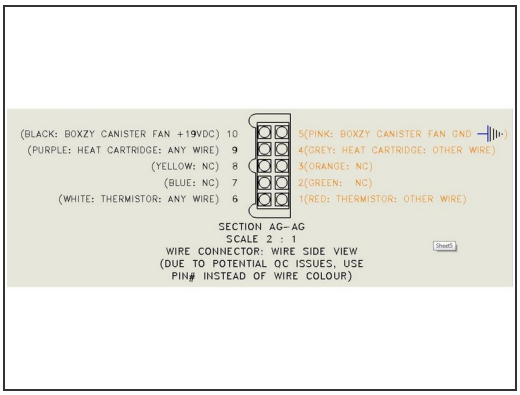
Step 5 — Wiring the E3D V6 cooling fan

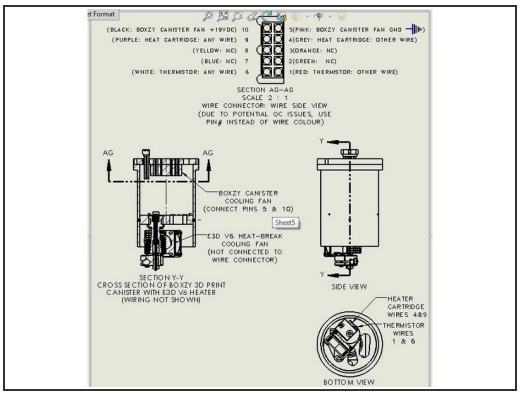


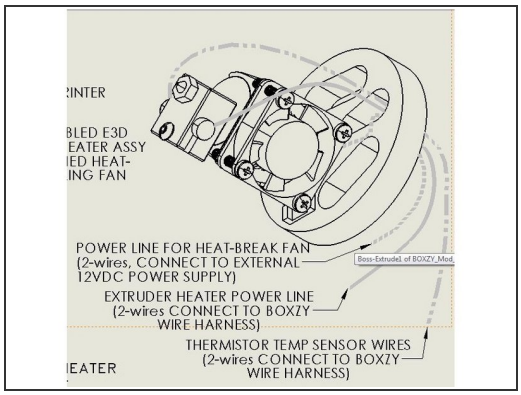


- Now ready to be wired up the print-head. Step one is to verify that the wires for 1) the E3D V6 cooling fan 2) The thermistor & 3) The heating cartridge are fit thru the center hole in the disc
- Now take a wall-wart power supply (rated at 12VDC and a minimum 500mA output). Cut off the connector, and trim the end of the wires. Make sure there is at least 48" of wire to work with.
- Now use a digital multimeter to find the +12VDC wire and the GND. Now fit the +12VDC thru a small length of heat shrink tubing, and then solder the 12VDC connector from the wall-wart to the positive+ wire on the E3D V6 1.75mm cooling fan. Solder the wires together, then fit the heat shrink tubing over the solder joint and heat it up to shrink it.
- Now feed the GND wire of the wall-wart through a small length of heat shrink tubing and connect the GND wire of the wall wart to GND wire of the E3D V6 cooling fan. Now solder the joint together. Fit the heat shrink tubing over the joint and then heat shrink it over the solder joint.
- Now fit the power cable from the wall-wart through the slot that had been cut in the top plate.

Step 6 — Wiring the thermistor

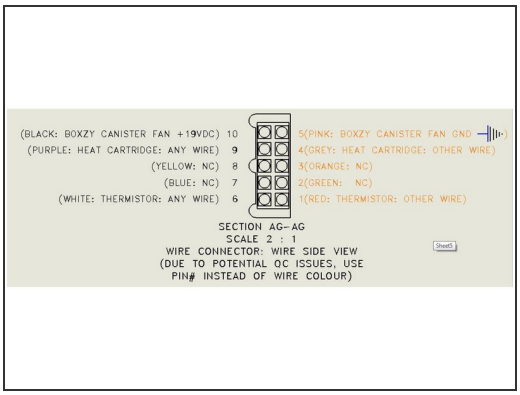


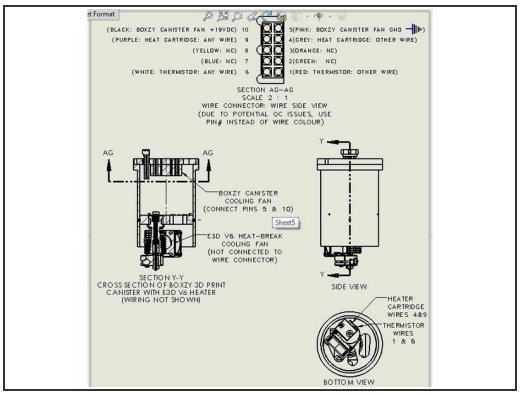


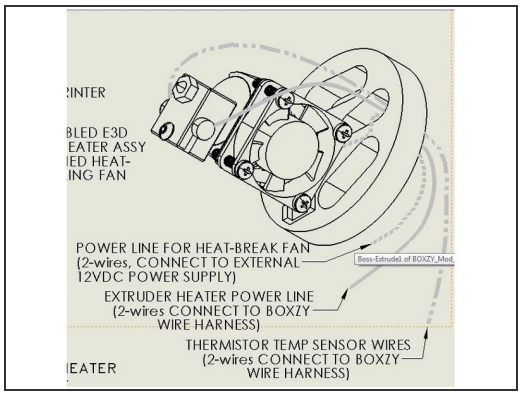


- I did not like the extra wiring harness, and wired directly to the pin connector. The pinout connector is shown from the wiring side. It does not matter which wire of the thermistor is connected to the pins 1 & 6 of the wire pin connector.
- Expose the ends of both the wires on the thermistor. Expose the ends of the wires connected to both pins 1 & 6 of the pin connector. Now connect them. Feed each of the thermistor wires through a piece of adhesive heat shrink tubing. Now join the wires from pins 1&6 of the connector to the thermistor wires and solder them together.
- Now slip the heat shrink tubing over the solder joint and heat shrink the tubing over the solder joint.

Step 7 — Wiring the Heating cartridge

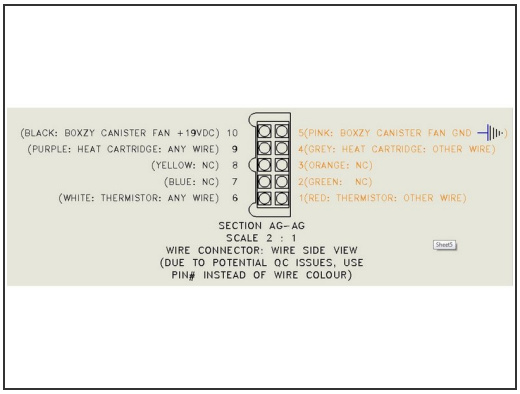


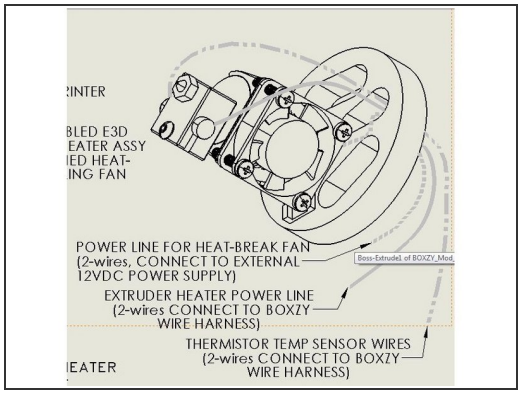


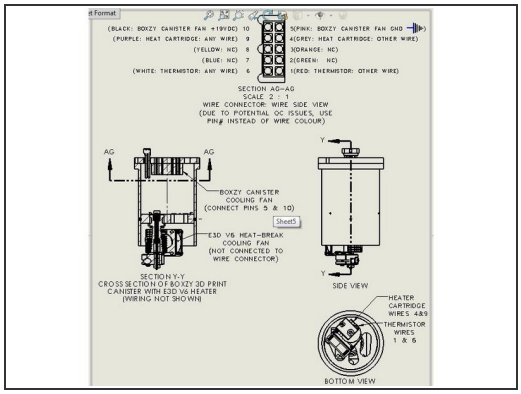


- The pinout connector is shown from the wiring side. It does not matter which wire of the heating cartridgeis connected to the pins 4 & 9 of the wire pin connector.
- Expose the ends of both the wires on the heating cartridge. Expose the ends of the wires connected to both pins 4 & 9 of the pin connector. Now connect them. Feed each of the heating cartridge wires through a piece of adhesive heat shrink tubing. Now join wires from pins 4&9 of the connector to the heater wires and solder them together.
- Now slip the heat shrink tubing over the solder joint and heat shrink the tubing over the solder joint.

Step 8 — Wiring the BOXZY Canister Fan

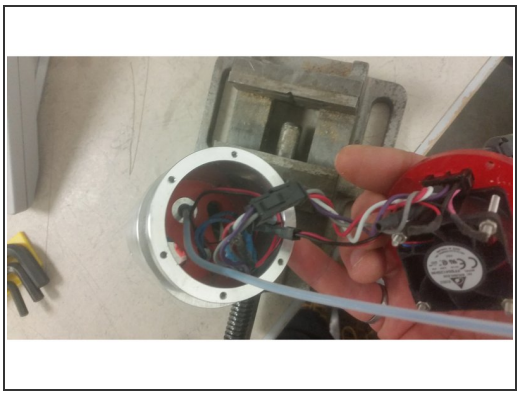


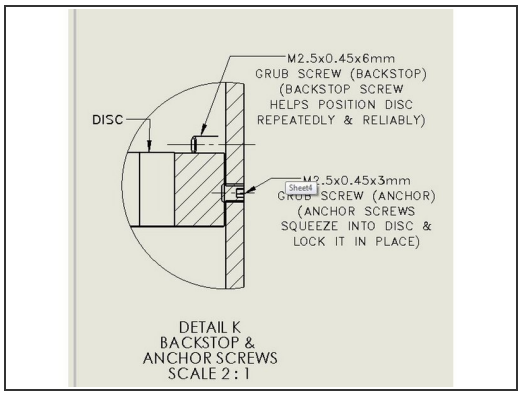


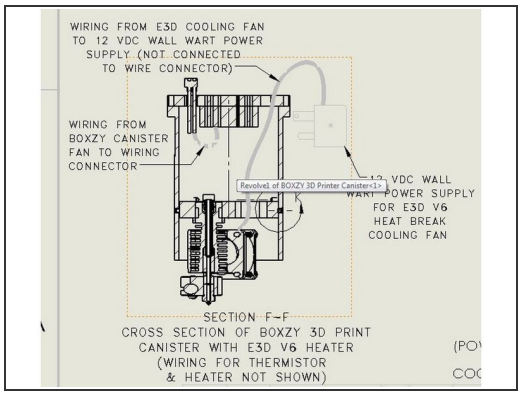


- The pinout connector is shown from the wiring side. It is important to wire the BOXZY canister cooling fan properly to avoid running the fan in reverse. Pin 10 is positive+ voltage. and pin 5 is GND. Due to quality control issues, do not rely on BOXZY wire colouring to determine which wire is the correct wire (blue is not necessarily pin 7).
- Expose the ends of both the wires on the BOXZY canister cooling fan. Expose the ends of the wires connected to both pins 5 & 10 of the pin connector. Feed each of the BOXZY canister fan wires through a piece of adhesive heat shrink tubing.
- Now join the +wire from the BOXZY canister fan to pin 10 (+voltage) on the connector. Solder the wires together, then slide the heat shrink tube over the solder joint and heat shrink it.
- Now join the -wire from the BOXZY canister fan to pin 5 (GND) on the connector. Solder the wires together, then slide the heat shrink tube over the solder joint and heat shrink it.

Step 9 — Fit the pieces together and screw it together

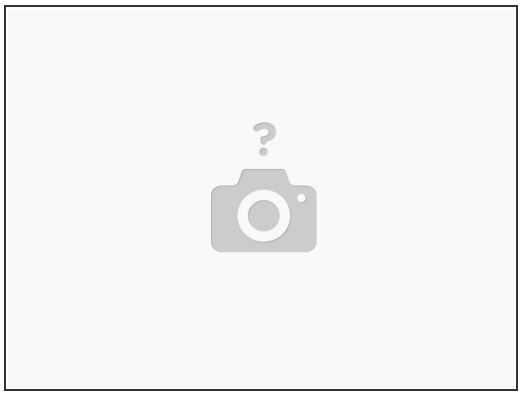






- Ensure that the M2.5x0.45 x 6mm backstop screws are located inside the canister. Now push the E3D V6 / disc assembly until it presses against the backstop screws.
- Now add the loctite to the 3mm M2.5x0.45 screws and screw them in to anchor the disc and E3D V6 heater in place.
- Make sure the Bowden connector is fed through the bowden hole in the top disc, and connected to the E3D V6 heater
- Make sure that the E3D V6 cooling fan is connected to the wall wart power supply and the wire from the wall-wart power supply is fed through the slot in the top disc.
- Verify that the thermister, the BOXZY canister fan, and the heating cartridge are properly connected to the pin connector
- Now screw the top lid onto the connector.
- Now fit the BOXZY connector wire to the assembly. This powers the BOXZY canister fan and the heating cartridge and allows the BOXZY to read the thermistor.
- Plug in the wall wart into a wall socket. This powers the heat-break cooling fan on the E3D V6 printhead.

Step 10 — Now print something, and see that there are fewer jams



- Now try and print something and see that there are fewer jams.
- Please comment and criticize responsibly. I would appreciate advice on how to improve the tutorials.

The goal is to modify the 3D printer head to use an E3D V6 1.75mm printer head instead of the stock printer head to reduce filament jams and have better temperature control.

To avoid losing 30mm of Z-height, the BOXZY printer canister must be modified to add backstop screws and new anchor screw holes to mount the printhead inside the canister.

