Step 1 — How to insert nuts

- **Inserting Hex Nuts:** To assure that hex nuts are properly seated, do the following:
  - Insert a screw through a washer.
  - Insert the screw through the hole on the flat side (not the hex cavity side).
  - Add the hex nut on the screw and tighten the screw.
  
  ![](image.png) Ensure the hex nut is aligned with the hex cavity while tightening.
  - When the nut is fully seated, you need to remove the screw being careful not to dislodge the nut.

- **Inserting Nyloc Nuts:** You can use the same method as hex nuts.

- **Inserting Square Nuts:** They tend to fall out if the piece holding them is inverted. After they are inserted, check that they are properly seated by inserting a screw to engage that nut.
Step 2 — Extruder parts

- extruder_body
- extruder_cover
- extruder_idler
- pinda_mount
- hotend_collet_clip
- filament_sensor_cover
Step 3 — X carriage parts

- `x_carriage`
- `x_carriage_back`
- `cable_guide_back` (part A and B)
Step 4 — Extruder motor

- Locate the extruder motor so the wires face to the left. Rotate the shaft so that the flat is facing up.
- Mount the Bondtech pulley on the extruder motor shaft with the toothed portion on top with the set screw contacting the flat portion of the shaft.
- The motor shaft should protrude by approximately 1mm.
- Secure the set screw to avoid the gear moving. We will fine tune the position later.
- Verify the motor cables orientation.
- Secure the extruder motor to the extruder_body using two M3x25 screws.
- Verify the motor cables orientation.
Step 5 — X carriage preparation

- Press an M3 hex nut into the *extruder_body*.
- Insert three M3 hex nuts
- Insert two M3 nylock hex nuts
Step 6 — X carriage assembly

- Verify that the M3x25mm screws are snug
- Using an M3x10 screw attach the extruder_body to the x_carriage.
- Using an M3x40 screw and an M3 washer attach the extruder_body to the x_carriage.

⚠️ Verify that extruder_body and x_carriage are correctly aligned. Adjust if necessary with the M3x10 and M3x40 screws
Step 7 — Filament sensor assembly

⚠️ In order to avoid electrostatic discharge to the filament sensor, touch something metallic that is linked to the ground, for example pipework or a faucet.

ℹ️ Verify that the laser sensor is clean. If not, use a cotton bud (q-tip) with a dab of Isopropyl alcohol.

- Insert the filament sensor into the extruder_body. Avoid touching any of the components on the PCB.

- Using an M3x10 screw, secure the filament sensor.

⚠️ Don't over-tighten the filament sensor to avoid damaging the PCB.
Step 8 — Filament sensor cover assembly

- Insert the small PTFE tube in the `extruder_body`
- Use two M3x10 screws and the `filament_sensor_cover` to close the top of the `extruder_body`

Step 9 — Extruder idler preparation

- Locate the Bondtech drive gear. This is the one that has NO set screw.
- Lubricate the needle bearings with a dab of lithium based grease
- Slide two Bondtech needle bearings in the Bondtech drive gear.
Step 10 — Extruder idler preparation

- Place the idler gear into the *extruder_idler*. Note the orientation of the teeth.

⚠️ Make sure that both needle bearings are still present in the idler gear.

- Insert the shaft from the direction as shown in the figure.

- Insert a square nut in the lateral pocket.

⚠️ Double check the orientation of the gears.

⚠️ Double check that no needle bearings fell out during these steps
Step 11 — Extruder idler assembly

- Slide a M3 washer on a M3x40 screw.

- Insert the screw in the top left hole of the `x_carriage` until it is just protruding from the other side of the `extruder_body`.

- Add a M3 nylon washer on the end of the screw.

- Add the `extruder_idler` in the opening and push the screw.

- Leave a space to insert the second M3 nylon washer.

- Insert the second M3 nylon washer and push the screw further to secure it.

- Slightly tighten the screw, ensuring that the `extruder_idler` can still rotate freely.
Step 12 — Hotend assembly

Hotend wires are not visible in these images. Use the heatblock to orientate the hotend correctly.

- Push down the PTFE tube while raising up the collet.
- Insert the hotend_collet_clip. This locks the PTFE tube in place.
- Insert the hot end into the extruder_body so that the heater and thermistor wires are properly oriented.
- Note the position of the heater and thermistor wires.
Step 13 — Extruder cover assembly

- Insert one M3 square nut
- Insert one M3 hex nut
- Insert one M3 hex nut
- Insert two M3x40 screw to lock the hotend in place

⚠ Check that the hotend has not rotated, adjust if necessary.
Step 14 — Hotend fan assembly

- Carefully route the motor wires as shown in the figure.
- Make sure the wires sit correctly in the channel.
- This surface will be touching the `extruder_body`. Wires are going out from this side.
- Carefully route the hotend fan wires in the `x_carriage`.
- Attach the hotend fan with four M3x14 rounded head screws.

⚠ Check that no wires are pinched.
⚠ Check hotend fan orientation.
Step 15 — Bondtech gear alignment

- Open the `extruder_idler`
- Insert a piece of 1.75 mm filament through the `extruder_body` into the PFTE tube.
- Using the Bondtech set screw, carefully center the filament on the drive teeth.
- Tighten the set screw. Don't tighten too much as you will damage the thread.
- Remove the filament.
- This is a good moment to put a dab of lithium based grease on the gears. Make sure to only put grease on the gears, not the drive teeth!
Step 16 — Extruder idler tensioner screw

- Make sure you have totally removed the filament from the `extruder_body`.
- Slide an extruder spring on a M3x40 screw.
- Close the `extruder_idler` door.
- Slide the screw with the extruder spring in the `extruder_body`.
- Tighten the screw in the `extruder_idler` until the head is flush with the surface of the body.

ℹ️ If you have trouble closing the `extruder_idler`, try rotating the Bondtech idler gear with your finger.
Step 17

- Slide a M3 washer on a M3x18 screw. Do the same for another M3x18 screw.

- Attach the print fan using the screws

⚠️ Be careful not to over tighten in order to avoid damaging the fan.
Step 18 — Pinda probe assembly

- Place a square nut in the *extruder_body* for the *pinda_mount*.

- Slide an M3x10 screw in the *pinda_mount* and engage the square nut, but do not tighten.

- Insert the Pinda in the mount so that the sensor end is 12mm below the bottom of the *pinda_mount*. Tighten the screw just enough to keep the Pinda from falling out. The optimum Pinda position will be adjusted later.

- Route the Pinda wires

- Route the print fan wires

- Secure the cables with a zip tie. Be sure to leave some slack since the Pinda position will need to be adjusted later.

- This is an example of how the Pinda and print fan cables should be wired.
Step 19 — Print fan shroud assembly

There is currently no official print fan shroud for the Bear extruder. I recommend the original R1 shroud from Prusa. Some other good alternatives are the shroud from RH_Dreambox or Robps.

- Insert the print shroud. If necessary, slightly unscrew the print fan.
- Use an M3x10 screw to attach the shroud.

Step 20 — Next chapter

- Congratulations you have finished this chapter :-)
- Go to the next chapter: 4. Extruder and X axis assembly

To reassemble your device, follow these instructions in reverse order.

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