5. Extruder Assembly

Guide for the assembly of the Extruder.

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Step 1 — Get the necessary tools

- 2.5 and 1.5 mm Allen key
- Needle-nose pliers
Step 2 — 3D printed parts

- Extruder-cover
- Extruder-body

⚠️ Attention! Starting August 2017 there is a redesigned P.I.N.D.A. probe holder, remaining parts of Extruder-body are unchanged. See the second picture.

- Extruder-idler
- Fan-nozzle (can be in black color, dimensions are the same).
- Extruder-cable-holder

ℹ️ Printed parts are in the bag labeled "E-AXIS".
Step 3 — [TIP] Top nut insertion

If you're experiencing troubles with getting nut into the top hole, just follow these simple steps.

- Screw M3 nut a bit on a long screw (M3x40 from 9.SPARE bag works in most cases).
- Push the screw with the nut into the hole where it is supposed to be.
- Grab the screw with pliers and gently hammer the nut in place using a wrench.

Step 4 — Placing the nuts

- Place the M3 nuts (2 pcs) into the traps on the left side of the extruder body.
- Slide the M3nS square nuts (4 pcs) into the traps on the right side of the extruder body.

⚠️ Place the nuts as deep as possible.

⚠️ Ensure you have placed all nuts (from both sides of the body).
Step 5 — Preparing the extruder body

- Slide the extruder body on the nozzle as shown in the picture.
- Push the nozzle all the way down and make sure that cables are on the side as shown in the picture.

⚠️ Be careful with all extruder cables from now on.

Step 6 — Preparing the extruder cover

- Place the M3 nuts (2 pcs) into the traps of the extruder cover.

⚠️ Top nut needs to be pushed all the way down! (the nut trap has 2 diameters, only last 3 mm have correct diameter for the nut trap).
**Step 7 — Placing the extruder cover**

- M3x18 (1 pc)
- M3x25 (1 pc)

Mind the correct orientation of cables leading from the extruder heater.

Using the 2.5mm Allen key tighten both screws to mount the extruder cover on the extruder body.

⚠️ Make sure to use the proper length of screws when mounting the extruder cover. Check all nuts are in their places.

⚠️ Tighten until the nozzle stops moving in the extruder, if there's still a gap between the cover and the body it's alright.

ℹ️ The M3x18 screw needs to reach just the first square nut. The second square nut is for a different screw used in another step.
Step 8 — Preparing the extruder motor

- Press the pulley on the motor.

⚠️ The screws must be facing directly against the pad (flat part) on the shaft.

ℹ️ If you're experiencing trouble, loosen the grub screw a bit.

- Note the correct orientation (the screw has to be closer to the motor).

⚠️ Don't tighten the pulley at the moment, we have still time for that.
Step 9 — Mounting the motor and the idler

- M3x30 screws (2 pcs)
- Don't forget to have the idler in place (the screw has to go through it).
- Mount the motor on the extruder body as shown in the picture, double check proper orientation of the motor cables.

⚠️ Mind the correct orientation of motor cables.

Step 10 — Tighten the motor screws gently.

- Tighten the motor screws gently.
Step 11 — Tightening the pulley

- Using the 1.5mm Allen key tighten the pulley.

⚠️ Make sure that the part with smaller diameter is perfectly aligned with the nozzle entrance.

⚠️ Make sure the pulley can rotate freely.

ℹ️ Use a piece of 1.75 mm filament (from the spool) to align the pulley with the openings for the filament (see the picture).

Step 12 — VIDEO for step 11

- Using the 1.5mm Allen key tighten the pulley. Make sure that the part with smaller diameter is perfectly aligned with the nozzle entrance. Use a piece of filament to align the pulley with the openings for the filament.

ℹ️ Video is available in an online (digital) version only.
Step 13 — Prepare the Extruder idler

- Place the M3nS square nuts (2 pcs) into the traps of the extruder body.
Step 14 — Preparing shaft with bearing

- 5x16sh shaft
- M5w washer (2 pcs)
- 625 bearing (1 pc)

Place the washers and bearing on the shaft as shown in the picture.
Place the shaft with bearing into the idler.

⚠ Check the shaft is pressed all the way in!

Step 15 — Prepare the Extruder idler screws

- M3x40 screw (2 pcs)
- M3w washer (4 pcs)
- Extruder spring (2 pcs)

Assemble the screws as shown in the picture.
Step 16 — Placing the screws

- Screw the extruder screws into the extruder body using the 2.5 mm allen key as shown in the picture.

⚠️ Length of the springs should be circa 13 mm when tightened.

⚠️ It is alright to tighten the screws with higher force, we need to induce pressure on the idler.
Step 17 — Preparing the Front print fan

- 5015 print fan
- M3x20 screws (2 pcs)
- Screw the fan on to the extruder using the 2.5 mm Allen key as shown in the picture.

⚠️ Do not tighten fully at this moment, fan should just be secured in place.

ℹ️ Front print fan is in the box 2.3.4.5.SUP
Step 18 — Preparing the fan nozzle

- Fan nozzle
- M3x20 screw (1 pc)

Tighten the fan nozzle using the 2.5 mm Allen key. Gently tighten screws holding up the fan in place.

⚠️ DON'T tighten the screws too hard, all parts are made of plastic and you can break them.

⚠️ Double check that the fan can rotate freely.
Step 19 — P.I.N.D.A. probe preparation

- Prepare the P.I.N.D.A. probe (autocalibration) by removing both of the nuts (if included in delivery)

*i* P.I.N.D.A. probe is in the 2.3.4.5.SUP box.
Step 20 — P.I.N.D.A probe and print fan cables preparation

- Pass the P.I.N.D.A. probe through the mount.
- Guide both cables through a cable clip on the extruder body as shown in the picture.

**Exact position of the P.I.N.D.A. probe will be adjusted later (in Chapter 9, Preflight check), so there is no need to adjust or tighten fully at this point.**

- The best position for mounting at this point is to align the last thread of the probe with the end of the mount

**Note the loop on the cable from the probe, it's necessary to apply it correctly!**

Step 21 — The P.I.N.D.A. probe tightening

- Secure the P.I.N.D.A. probe with M3x10 screws

**Note the loop on the cable from the probe, it's necessary to apply it correctly!**

**New design of the holder requires only one screw M3x10. See the last picture.**
Step 22 — Mounting the Left hotend fan

- M3x18 screws (4 pcs)

⚠️ Note the correct orientation of the fan. The sticker has to face towards the nozzle!

- Guide cables from the extruder motor via slot in the extruder body, put the fan in place.

- Using M3x18 screws mount the fan to the extruder body using the 2.5mm allen key as shown in the picture.

- Tighten fan screws gently using the 2.5 mm Allen key.

ℹ️ The Left hotend fan is in the box 2.3.4.5.SUP
Step 23 — Preparation for step 24

- M3x40 (1 pcs) with M3n nut (1 pcs)

- Printed manual might suggest to use screw M3x30, but the correct is M3x40.

- Screw the nut fully
Step 24 — Preparing for extruder mounting on the X-axis

- M3x40 screws (1 pcs)
- M3x30 screw (1 pcs)
- M3x18 screw (1 pcs)
- M3x40 (1 pcs) with M3n nut (1 pcs)

⚠️ Pay attention to use proper screws as indicated in the picture.

- Place the M3n nut (1 pcs) into the trap
Step 25 — Extruder cables preparation

- Guide cables from the extruder as in the picture.

⚠️ Cables from the P.I.N.D.A. probe, the extruder motor and both fans must pass the X-axis between the lower smooth rod and the X-axis belt.

Step 26 — Arranging extruder cables

- Arrange cables from the extruder upper part neatly in extruder cable holders.
- Make sure the cables from the extruder motor are guided as shown in the picture
Step 27 — Securing extruder in place

⚠️ Please tighten the screws in the order described below:

- First, tighten the top screw. **Don't tighten it fully!**
- Now tighten the left screw. This one you can tighten fully.
- Tighten the right screw fully and then return to the top screw and tighten it as well.
- After tightening all screws mentioned above tighten the last screw, which will be used for cable management.
Step 28 — Cable management

- Guide the cables as shown in the picture.
- Make sure that the wires from the thermistor are going above the heater wires.
- Running them below will cause issues later, don't do that!

Step 29 — Cable management - right side

- Insert a zip tie (longer one in package) in the right side of the X-carriage so that cables from the extruder motor and the fan are below the zip tie and held in place.

⚠️ Double check the orientation of the zip tie.

- Once all cables are neatly arranged, finalize it by tightening the zip tie and cutting off the excessive piece.

⚠️ Use pliers to cut off any excess zip tie.
**Step 30 — Attachment of the Extruder cable holder**

- Extruder cable holder
- Make sure the cable holder is oriented upwards.
- Place the two halves of the cable stiffener on the M3x40 screw.

**Step 31 — Tighten the Extruder cable holder**

- Use two zip ties for fastening.
- Use pliers to cut off any excess zip tie.
Step 32 — Preparing the filament

⚠️ Starting mid of February 2018, there will be only one 50cm NYLON filament included.

- There are two NYLON filaments included in the kit with lengths 50 and 30 cm. Both have Ø 3 mm. For this step please use the longer one and **DON'T CUT** any of them!

⚠️ Push it all the way down. If you experience difficulties when inserting the filament use pliers to make a sharp tip on the filament.

ℹ️ The filament is for the support of the whole harness. Don't cut it, it'll go all the way with the wires to the cover for electronics.

⚠️ Note the correct orientation of nylon filament, it needs to point up as shown in the picture!

ℹ️ Nylon filament is pictured in orange colour, but in your kit can be the black version, which is the same, just different colour.
Step 33 — Spiral wrap ziptie

- Wrap the spiral wrap (the largest and the longest one) around the cables and the nylon filament.
- Start with cables from the upper part, after 1 turn add cables from the hot end.
- Double check by moving the extruder fully to the left or right that spiral wrap does not interfere with the printer frame.
- Use zip ties and tighten the wrapped cables and spiral wrap. Tight the spiral wrap to the cable stiffener.
- Use one piece at the beginning of the spiral wrap.
- Tighten zip ties carefully, too much pressure can damage cables inside! Don't tighten the zip tie over cables only!
Step 34 — Finalizing the extruder

- Check for free movement of the X-carriage and inspect cables in the full left and right positions.

- Once you are satisfied with organisation of the extruder cables finalize spiral wrap to the full length.

- Separate the filament at the last whirl of the spiral wrap.

Step 35 — All done!

- Congratulations! You've just assembled the extruder.

- You can continue by assembling the LCD in the next chapter - 6. LCD assembly