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How to replace Nextruder heatsink (XL Single-tool)

help.prusa3d.com/g389796

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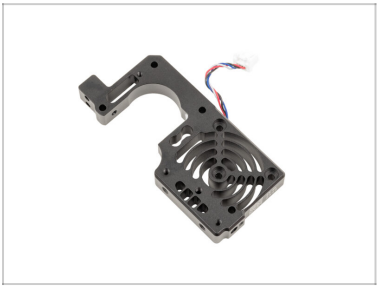
STEP 1 Introduction



- This guide will take you through the replacement of the **Heatsink** on the **Original Prusa XL (Single-tool)**.

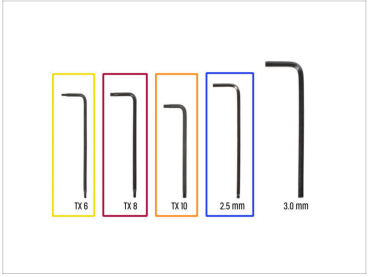
The **following instructions are intended for XL Single-tool only**, although most steps are common. If you have a Multi-tool XL, please go to **How to replace Nextruder heatsink (XL Multi-tool)**

Some parts might slightly differ. However, it does not affect the procedure.

All necessary parts are available in our e-shop prusa3d.com.

The following instructions require extreme attention. The procedure involves direct intervention in the planetary gearbox.

STEP 2 Tools necessary for this guide



- **For this guide, please prepare:**
- Torx TX10 key
- Torx TX6 key
- Torx TX8 key
- 2.5 mm Allen key
- Universal wrench
- Nose pliers
- Side cutters *recommended for cutting zip ties*

STEP 3 Additional parts

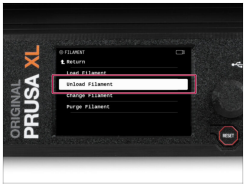
- **For this guide, please prepare:**
- Prusa lubricant (1x) *supplied with your printer*
- PG-assembly-adapter (1x)

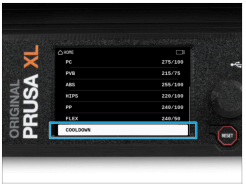
  ⚠ **The PG-assembly-adapter is not included in the box** and needs to be printed. You can download the STL file from printables.com.

  ⓘ The STL file is located in **Parts for maintenance** section. Before proceeding, please ensure to **review the recommended print settings** provided in the caption.

⚠ **DO NOT continue without the PG-assembly-adapter. It is necessary for the assembly!**

STEP 4 Filament unloading





ⓘ The following step is only necessary if you have a filament loaded in the current toolhead.

- Unload the filament from the hotend. On the screen, navigate to *Filament -> Unload Filament* and select the tool, you want to working on.
- Remove the filament from the hotend. It is not necessary to completely remove it from the printer. Just a few centimeters (inches) above the extruder.
- Cool down the printer to room temperature. On the screen, navigate to *Preheat -> Cooldown*.

⚠ **CAUTION: Wait for the printer to fully cool down** to room temperature before proceeding further.

STEP 5 Printer preparing

- Turn the power switch OFF (symbol "O").
- From the rear side of the printer, unplug the PSU cable.

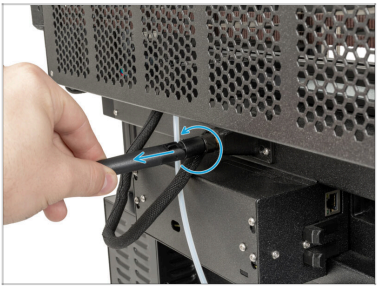
STEP 6 Protecting the heatbed

- **Before you proceed, it is recommended to protect the heatbed.**
- Make sure the heatbed is cooled down to ambient temperature. Place the empty cardboard box approximately to the front center part of the heatbed.

STEP 7 PTFE unplugging

- Turn the printer so the left side of the printer is facing you.
- Gently push the black collet to release the PTFE tube.
- Pull out the PTFE tube.

STEP 8 Wi-Fi antenna detaching



- This step is only for the printer, which has a Wi-Fi antenna on the back of the printer.
- Turn the printer, so the back side of the printer is facing you.
- Unscrew the Wi-Fi antenna from the antenna connector and place it nearby.

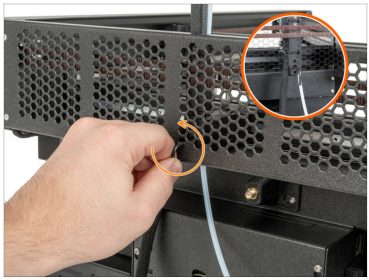
STEP 9 Disconnecting the Nextruder cable

- Turn the printer, so the back side of the printer is facing you.

⚠ There is an antenna cable behind the antenna-holder, do not pull the connector!

- Loosen two screws on the cover slightly. No need to remove them completely. Push the cover to the right and gently remove it from the screws.
- Push the safety latch and disconnect the Nextruder cable from the connector "DWARF1".
- Attach the antenna-holder to the screws and push the cover to the left. Tighten the screws.

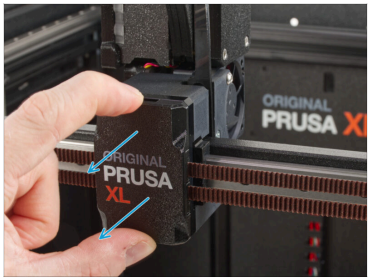
STEP 10 Dock detaching

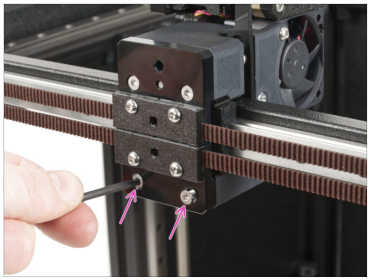


For older CoreXY back covers without hexagonal cutouts (honeycomb pattern), loosen the screw in the dock as instructed. The procedure remains the same.

- Using a 2.5mm Allen key, untighten the screw inside the (middle hole) dock.
- Keep the Nextruder cable bundle next to the printer.

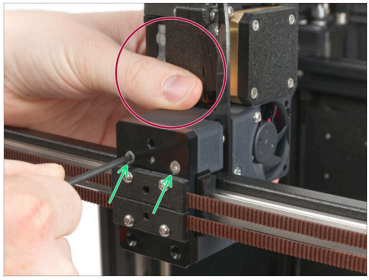
STEP 11 Nextruder releasing

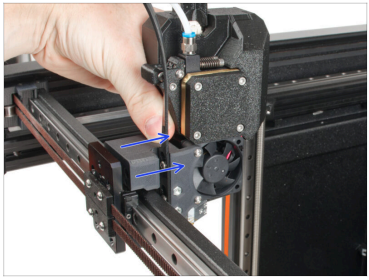




- Turn the printer, so the front side is facing you.
- Snap off the x-carriage-cover back from the X-carriage. **Do not throw the parts away!**
- Using a T10 Torx key, remove two M3x12bT screws. **Do not throw the parts away!**

STEP 12 Nextruder detaching





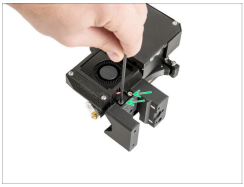
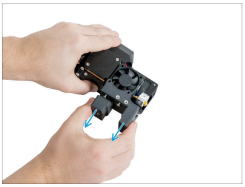
- Hold the Nextruder during disassembly.
- Untighten two M3x12bT screws using a T10 Torx key. **Do not throw the parts away!**
- Detach the Nextruder and place it nearby, we will rebuilt it in the next steps.

STEP 13 Cable bundle removing



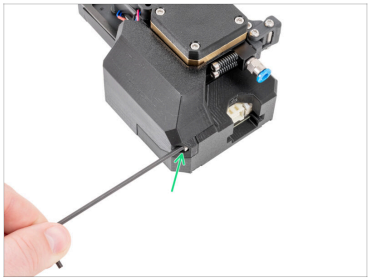
- From the front side of the Nextruder, using a T10 Torx screwdriver untighten two screws to release the cable support. **Do not remove the screws completely!**
- Press the blue fitting and pull out the PTFE tube.
- Press the secure pin and remove the Nextruder cable.

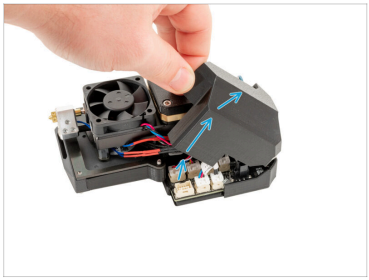
STEP 14 Nextruder body removing

- From the right side of the Nextruder, using a T10 Torx screwdriver unscrew two M3x20rT screws. **Do not throw them away!**
- From the left side of the Nextruder, unscrew two screws using a 2.5 mm Allen key. **Do not throw the parts away!**
- Pull out the Nextruder body from the Nextruder. **Do not throw the parts away!**

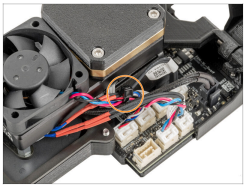
STEP 15 Dwarf door opening

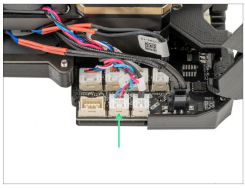


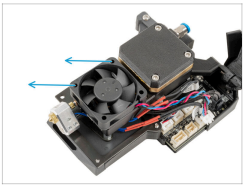


- Loosen the screw, just a few turns are enough to release the dwarf-cover-door. **No need to removing the screw completely.**
- Open the dwarf-cover-door widely.

STEP 16 Heatsink fan removing

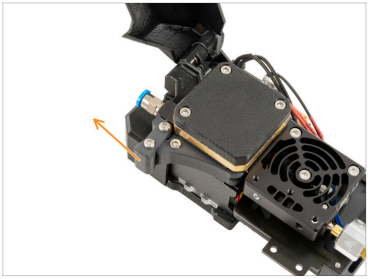


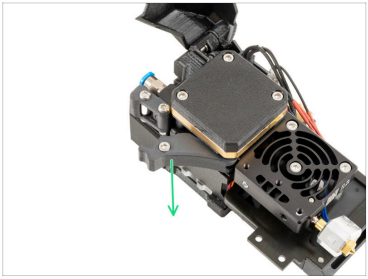




- Gently remove the zip-tie using a pliers. **Watch out for the cables!**
- By pressing the security latch, remove the heatsink fan cable from the Dwarf board.
- Remove the heatsink fan. **Do not throw the parts away!**

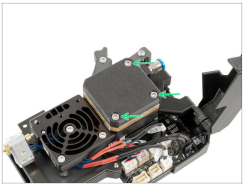
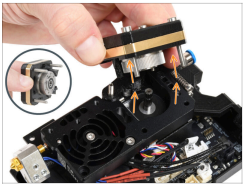
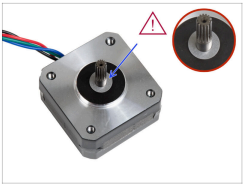
STEP 17 Nextruder idler opening





- Push the idler-swivel upward.
- Pull the idler-lever downward in order to release tension on the gearbox.

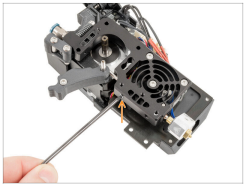
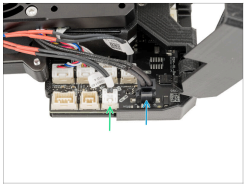
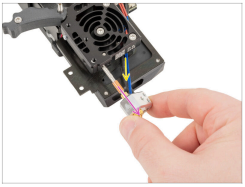
STEP 18 Gearbox & motor assembly removing

- Fully loosen three M3x25 screws from the printed gearbox cover. **Keep the screws in the assembly, don't remove them completely.**
- Carefully slide the gearbox assembly off. **It is necessary to remove the entire assembly in one piece.** This means PG-cover (top plastic cover), PG-ring (brass ring), PG-assembly (metal gears), and main-plate (bottom plastic plate), all joined by M3x25 screws.
- **Set the gearbox assembly and the extruder motor aside.**

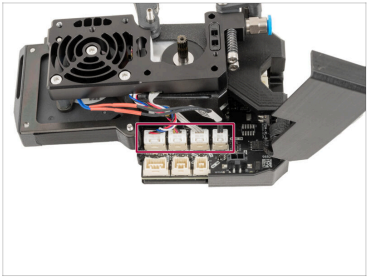
  ⚠ **Pay attention to not lose the spacer from the motor shaft.**

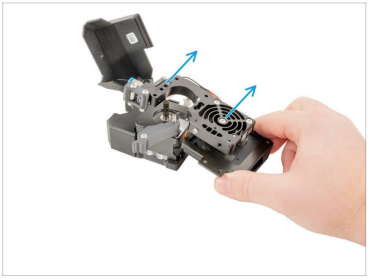
STEP 19 Hotend assembly removing

- With a Torx TX 8 key loosen the grub screw in the extruder. **Do not remove the screw completely.** A few turns are enough to release the hotend assembly in the heatsink.
- By pressing the security latch, remove the hotend thermistor cable from the Dwarf board.
- By pressing the security latch, remove the hotend heater cable from the Dwarf board.
- Carefully pull the hotend assembly out of the heatsink. **Do not throw the parts away!**
- At the same time pull the disconnected hotend cables from below the heatsink.

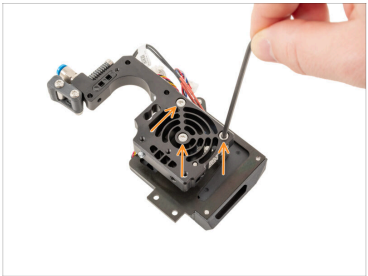
STEP 20 Heatsink assembly removing

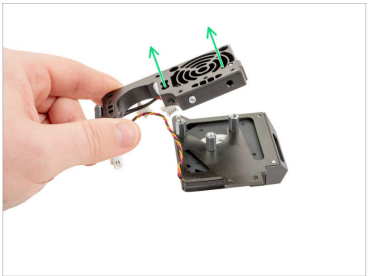




- By pressing the safety latch, unplug all remaining cables from the Dwarf board.
- Remove the heatsink assembly and set it aside.

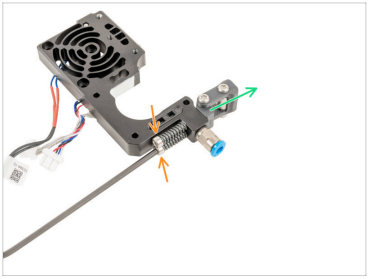
STEP 21 Print fan removing

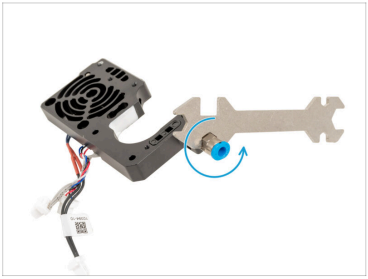




- Remove the three M3x10 screws from the heatsink. **Do not throw the parts away!**
- Separate the heatsink and the print fan assembly. **Do not throw the parts away!**

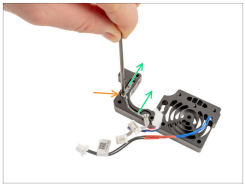
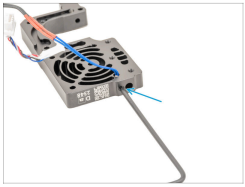
STEP 22 Idler-swivel removing





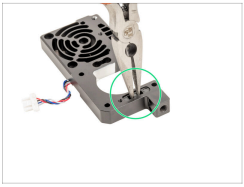
- Remove the two M3x30 screws to remove the idler-swivel from the heatsink. **Do not throw the parts away!**
- Remove the idler-swivel from the heatsink. **Do not throw the parts away!**
- Using a universal wrench, remove the Fitting QSM-M5 by turning it counter-clockwise. **Do not throw the parts away!**

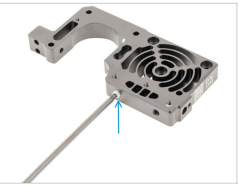
STEP 23 NTC thermistor & Hall sensor removing


- Using a T6 Torx key, remove the M2.5x6rT screw. **Do not throw the parts away!**
- Carefully remove the Hall filament sensor. **Do not throw the parts away!**
- Using a T6 Torx key, remove the set screw from the bottom of the heatsink to remove the NTC thermistor. **Do not throw the parts away!**
- Pull out the NTC thermistor from the heatsink. **Do not throw the parts away!**

STEP 24 Filament sensor removing





⚠ **BE EXTRA CAREFUL when removing the filament sensor.** The filament sensor contains a tiny parts (spring, magnet, steel ball) that tend to fall out when the sensor is removed.

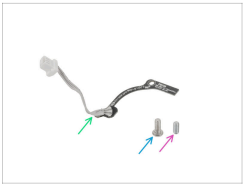
- Very carefully pull the filament sensor out from the heatsink using the needle-nose pliers.

  ⚠ **CAUTION: Avoid gripping the part firmly, as this may cause irreparable damage.**

  ⚠ **Don't lose the small parts!** You will need them again later. **Keep them aside in a safe place.**

- Using a T6 Torx key, remove the hotend grub screw from the heatsink. **Do not throw the parts away!**
- Now, you can throw the old heatsink into the bin.

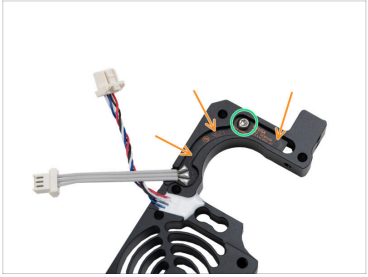
STEP 25 Heatsink: parts preparation

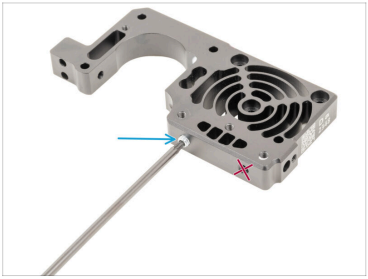




- **For the following steps, please prepare:**
- Heatsink (1x)
- Hall filament sensor (1x) *removed in previous steps*
- M2.5x6rT screw (1x) *removed in previous steps*
- Hotend grub screw (1x) *removed in previous steps*
- Filament sensor assembly 1x) *removed in previous steps*

⚠ **BE EXTRA CAREFUL.** The filament sensor contains a tiny parts (spring, magnet, steel ball) that tend to fall out when the sensor is removed.

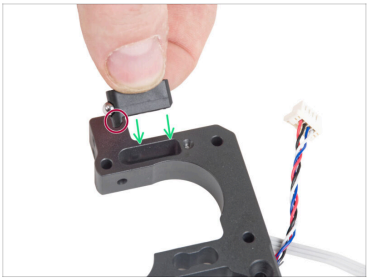
STEP 26 Hall sensor installing

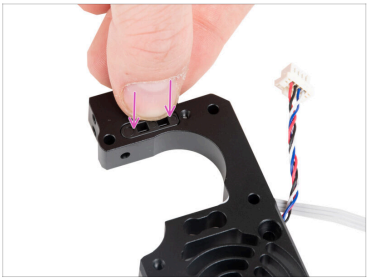




- Place the Hall filament sensor into the similarly shaped pocket in the heatsink.
- Fix it with M2.5x6rT screw. Tighten it very carefully, you can crack the electronics board.
- Insert the grub screw into the slot closer to the bottom of the heatsink. See the picture.

STEP 27 Filament sensor installing



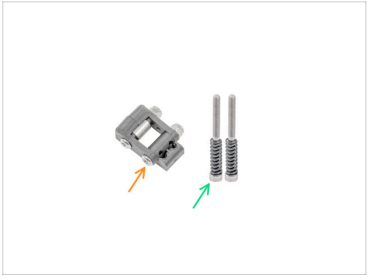


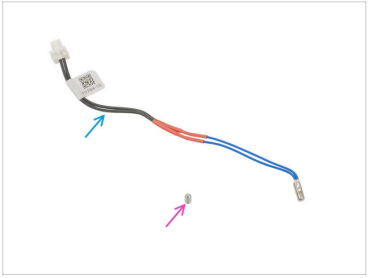
- Insert the Prusa ball holder assembly into the heatsink. Make sure the steel ball part is closer to the side of the heatsink.

⚠ Note the correct orientation of the Prusa ball holder assembly. There is a protrusion on the part. The protrusion must be facing down.

- Push the assembly into the heatsink.

STEP 28 Idler-swivel & NTC thermistor: parts preparation





- **For the next steps, please prepare:**
- Idler-swivel assembly (1x) *removed in previous steps*
- M3x30 with spring screw (2x) *removed in previous steps*
- NTC thermistor (1x) *removed in previous steps*
- NTC thermistor grub screw (1x) *removed in previous steps*

STEP 29 Idler-swivel securing

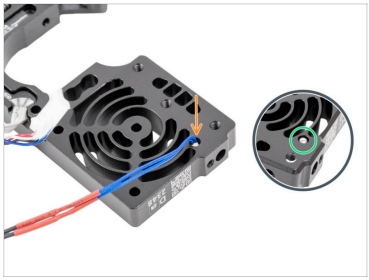
ⓘ The color of the idler-swivel may be different. **The part is the same.**

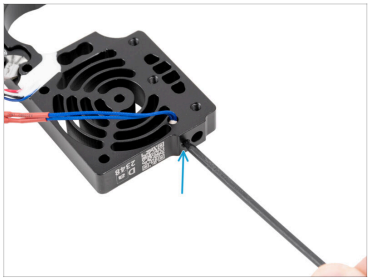
- Tighten the idler-swivel with two M3x30 screws.

  ⓘ Note the correct orientation of the part. The screw heads on the idler-swivel must be facing up (like in the picture).

- The tip of each screw should be flush with the plastic part on the other side.

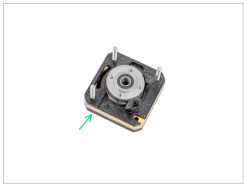
STEP 30 NTC thermistor securing





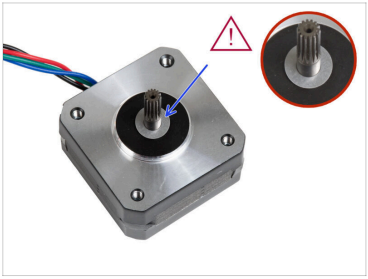
- On the extruder motor side, insert the NTC thermistor into the hole in the heatsink.
- The NTC thermistor must be placed in the centre of the heatsink. See the picture.
- Insert and firmly secure the M3x4T grub screw using a T6 Torx key. Screw it all the way in. **Applying more force may cause permanent damage to the thread.**

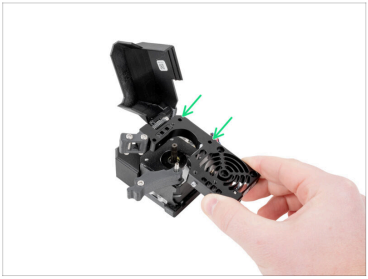
STEP 31 Gearbox & motor assembly: parts preparation



- **For the following steps, please prepare:**
- Motor assembly (1x) *removed in previous steps*
- Gearbox assembly (1x) *removed in previous steps*
- PG-assembly-adapter (1x)

STEP 32 Heatsink placing

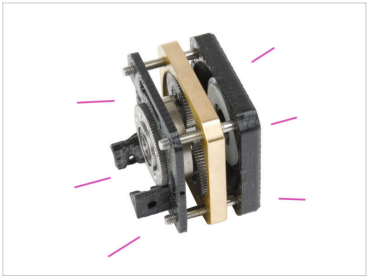


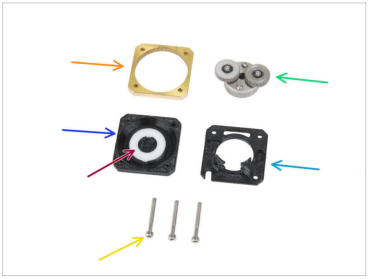


Double-check that the spacer is still in place on the motor shaft!

- Carefully place the heatsink assembly onto the motor assembly. Look at the picture.

STEP 33 Gearbox disassembling





- Dismantle the gearbox assembly into its component parts:
  - PG-ring (1x)
  - PG-assembly (1x)
  - PG-front-case (1x)

    ⚠ Make sure there is a plastic spacer inside the case. It can be black or white. **Do not remove the plastic spacer** from the case.
  - Main-plate (1x)
  - M3x25 screw (3x)
- Using a paper towel clean all the parts from grease.

STEP 34 Gearbox assembling

- In the following steps, we will reassemble the entire gearbox assembly to ensure proper installation.

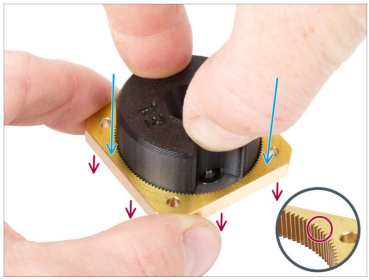
⚠ **The following instructions need to be done correctly and carefully.** Achieve better understanding and successful assembly by watching the video alongside the guide: prusa.io/PG-assembly

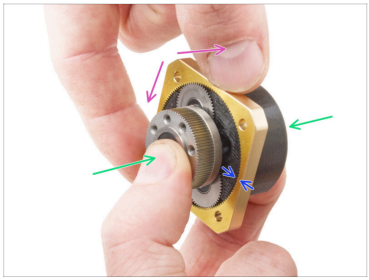
ⓘ The video is for MK4, but the procedure is identical.

- After watching the video, follow the steps in this guide.

- Attach the PG-assembly-adapter on the PG-assembly. Note the pockets for the gears in the adapter.

STEP 35 PG-ring assembling

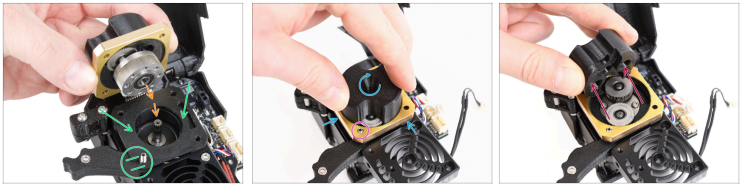




⚠ **Do not assemble the gearbox without the PG-assembly-adapter.** This tool is intended to ensure that the gears are correctly fit together.

- Slide the PG-ring onto the adapter.
  - Note there is a chamfer on one side of the PG-ring teeth. This side must be facing down (to the PG-assembly).
- Grasp the entire assembly in one hand so that it can be rotated with the PG-ring.
- With the other hand, slide the PG-ring onto the PG assembly in a wobbling motion (move the PG-ring left and right repeatedly) - a quarter turn is enough.
- Stop when the surfaces of the gears are approximately flush with the surface of the PG ring.

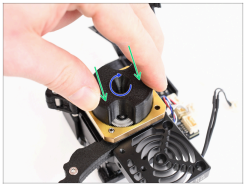
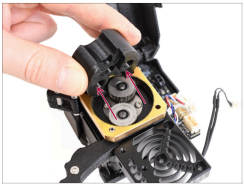
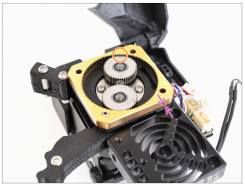
STEP 36 Gearbox inserting



Proceed very carefully in this step.

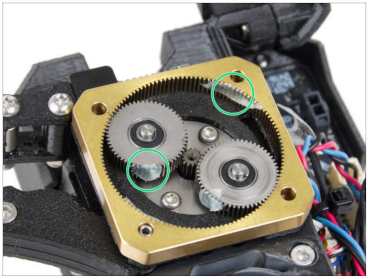
- Attach the main-plate on the heatsink. Note the orientation of the part. Use the cutout for the socket screw as a guide (lower left corner).
- Maintain the position of the PG-assembly and attach it on to extruder motor shaft.
- Make sure the PG-ring perfectly fits on the socket set screw.
- Very gently and freely rotate with the whole PG assembly (PG-assembly-adapter, PG-assembly and PG-ring) until it drops down so that there is minimal gap between the assembly and the main-plate. Do not push on the assembly.
- Remove the PG-assembly-adapter.

STEP 37 PG assembly alignment

- Attach the PG-assembly-adapter back on the PG-assembly again to verify that all parts are properly seated.
- Rotate with the PG-assembly-adapter. The PG assembly must be easy to rotate without having to exert much force.
- Remove the PG-adapter. You will no longer need it during assembly. We recommend keeping it for maintenance.
- Ensure that the PG-assembly is not sticking out above the PG-ring. It should be positioned lower than the level of the PG-ring's surface or at the same level as the ring.
- There must be no gap between PG-ring and the Main-plate. If you see a gap, remove the planetary gear assembly and repositon it again.

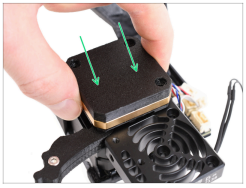
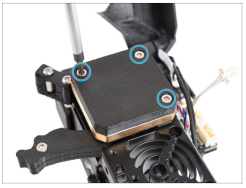
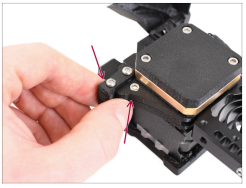
STEP 38 Gears lubricating



- Open the Prusa Lubricant. Using the opposite side of the cap, puncture the hole in the opening of the tube.
- Apply a small amount of Prusa Lubricant all around the PG-ring and PG-assembly teeth.

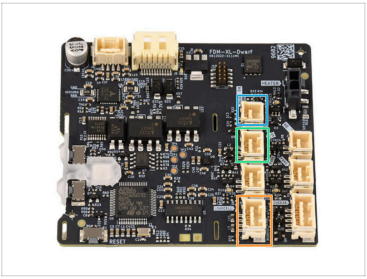
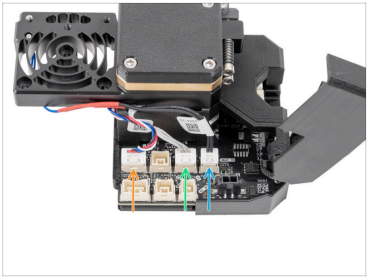
  ⓘ Tip: apply a small amount of lubricant to the tip of the zip tie and then spread the lubricant over the gears.
- Using a paper towel, wipe off any excess lubricant on the front surfaces.

STEP 39 Gearbox covering

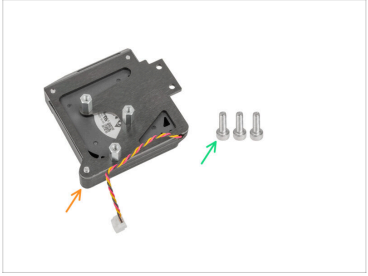
- Place the PG-case on the gearbox.
- Insert three M3x25 screws into the PG-case, but do not tighten them completely. They will be tightened later.
- Close the idler-lever and lock it in position with the idler-swivel.

STEP 40 Nextruder cables connecting

- Plug the load cell sensor cable into the Dwarf board.
- Plug the filament sensor cable into the Dwarf board.
- Plug the heatsink thermistor cable into the Dwarf board.

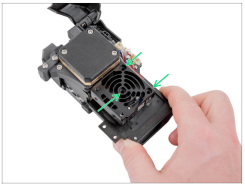
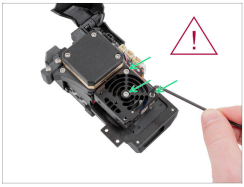
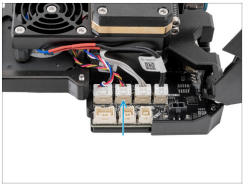
STEP 41 Print fan assembly & fitting: parts preparation



- **For the next steps, please prepare:**
- Print fan assembly (1x) *removed in previous steps*
- M3x10 screw (3x) *removed in previous steps*
- Fitting QSM-M5 (1x) *removed in previous steps*

  Starting from September 2024, you may receive a new black Fitting M5-4. The assembly and functionality remain identical to the blue one.

STEP 42 Print fan assembly securing

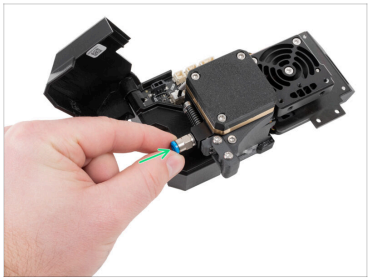




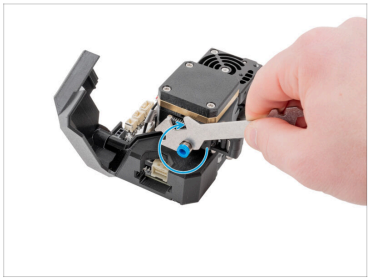
- Align the three metal spacers with the holes in the heatsink, make sure the board and fan cables are guided below the top spacer before you attach the heatsink, so that they are not pinched.

⚠ **Don't pinch any cables!**

- Insert and secure three M3x10 screws. **Don't pinch any cables!**
- Connect the print fan to the print fan connector.

STEP 43 Fitting securing

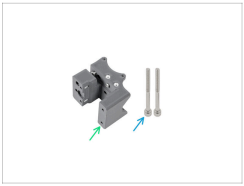




Starting from September 2024, you may receive a new black Fitting M5-4. The assembly and functionality remain identical to the blue one.

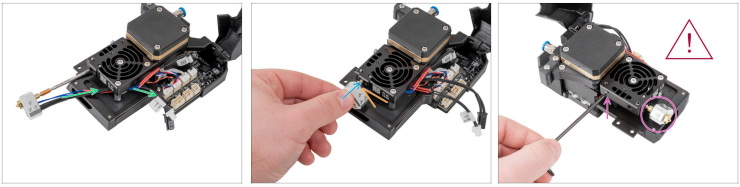
- Mount the Fitting QSM-M5 on the top of the heatsink.
- Gently tighten the Fitting QSM-M5 with a uni-wrench.

STEP 44 Hotend & nextruder body: parts preparation


- **For the next steps, please prepare:**
- Hotend assembly (1x) *removed in previous steps*
- Hotend fan (1x) *removed in previous steps*
- M3x20 screw (2x) *removed in previous steps*
- Nextruder body (1x) *removed in previous steps*
- M3x40 screw (2x) *removed in previous steps*

STEP 45 Nozzle assembly securing

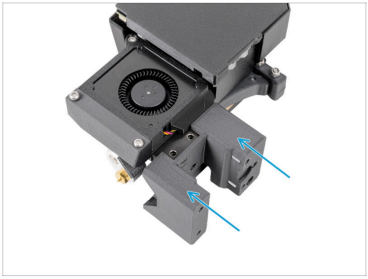


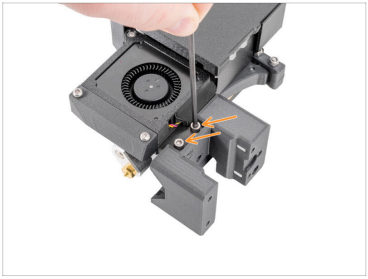
- Insert the heater and the thermistor cable under the heatsink. Look at the picture.
- Insert the nozzle into the heatsink and push it all the way into the heatsink.
- Rotate the heaterblock as in the picture. There must be approximately 35° - 40° angle to avoid damaging the hotend cables.

⚠ **Do not use extra force while tightening, it may damage the hotend tube.**

- Maintain the position and using the TX 8 Torx key carefully tighten the grub screw to secure the hotend.

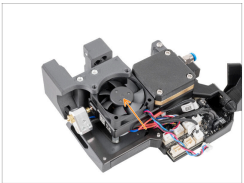
STEP 46 Nextruder body securing

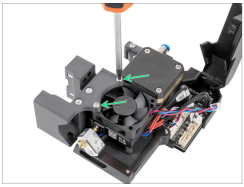


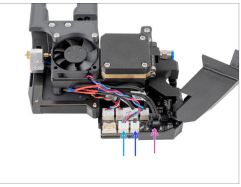


- Close the dwarf-cover-door and turn the Nextruder.
- Attach the nextruder-body to the Nextruder.
- Insert and secure two M3x40 screws.

STEP 47 Hotend fan securing



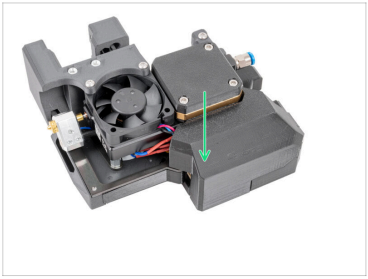


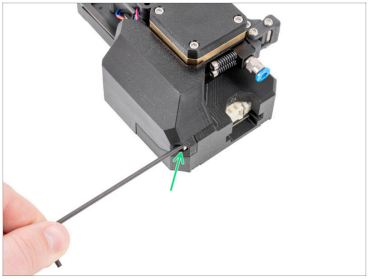


⚠ **Mind the orientation of the fan.**

- Insert the hotend fan between the heatsink and the extruder body. Look at the picture.
- Insert and secure two M3x20rT screws.
- Connect the hotend fan cable to the Dwarf board.
- Connect the hotend thermistor cable to the Dwarf board.
- Connect the hotend heater cable to the Dwarf board.

STEP 48 Dwarf door closing





- Close the dwarf-board-cover on the Nextruder.
- Gently tighten the screw.

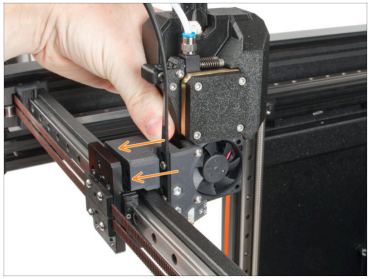
STEP 49 Cable bundle securing

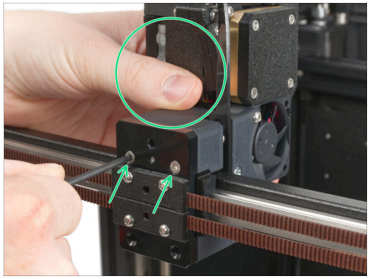
- Attach the cable connector into the top of the Nextruder.
- Insert the semi-transparent PTFE tube into the fitting on the Nextruder. Push it all the way in.
- Hook up the keyhole openings in the flexible plate of the cable bundle onto the screw heads and push it up to correct the position.
- Using a T10 key tighten the marked two screws.

STEP 50 Installing the extruder: parts preparation

- **For the following steps, please prepare:**
- M3x12b screw (4x) *removed in the previous step*

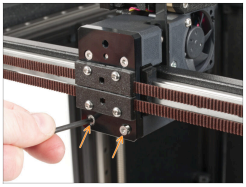
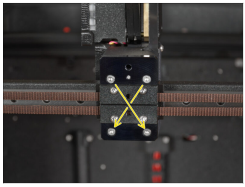
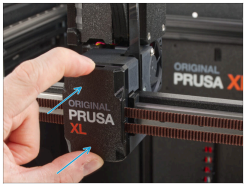
STEP 51 Nextruder attaching





- From the back of the X-carriage, attach the extruder assembly to the X-carriage. See the correct orientation of the extruder.
- Hold the extruder and secure it by inserting and tightening two M3x12b screws into the top screw holes. Do not fully tighten the screws at the moment!

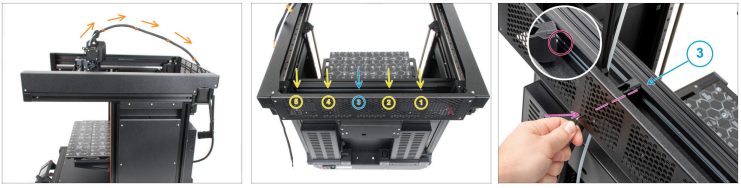
STEP 52 Nextruder securing

- Insert and tighten two M3x12b screws to the lower holes in the X-carriage to secure the extruder assembly. Do not fully tighten the screws at the moment!
- Fully tighten all four screws diagonally to secure the extruder assembly.
- Snap the x-carriage-cover back onto the X-carriage. You must feel a slight "click" to ensure the cover fits on the part.

⚠ Remove the Prusament cardboard box from the heatbed.

STEP 53 Dock securing



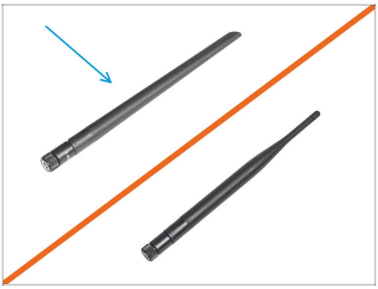
- Guide the extruder cable bundle with the PTFE tube freely over the printer to its rear side.
- Turn the printer, so the back side of the printer is facing you.
- Locate the long metal profile (tch-mounting-insert) in the back of the top extrusion. It has five threaded openings in it.
- There is a screw protruding from the xl-dock-cable-router. The screw must be attached to the third threaded opening on the long metal profile. Look through the rear metal sheet to check if the cable holder is lined up with the correct opening.
- Push the 2.5 mm Allen key all the way through a hole (bottom left in the pattern) in the rear metal sheet as well as through the plastic part until you reach the screw. Tighten it up.

STEP 54 Nextruder cable connecting

⚠ There is an antenna cable behind the antenna-holder, do not pull the connector!

- Loosen two screws on the cover slightly. No need to remove them completely. Push the cover to the right and gently remove it from the screws.
- Connect the Nextruder cable to the upper slot labeled DWARF 1.
- Attach the antenna-holder to the screws and push the cover to the left. Tighten the screws.

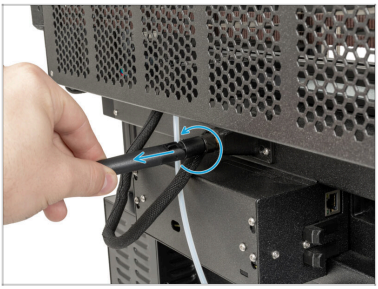
STEP 55 Wi-Fi antenna: parts preparation



- **For the following steps, please prepare:**
- Wi-Fi antenna (1x) *removed in previous step*

The Original Prusa XL is shipped with two versions of the Wi-Fi antenna, each with a different shape. The functionality is the same.

STEP 56 Wi-Fi antenna attaching



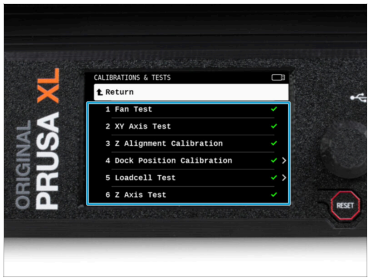
ⓘ This step is only for the printer, which has a Wi-Fi antenna on the back of the printer.

- Screw the Wi-Fi antenna on the antenna connector. The antenna can be rotated around and bent in two directions.

STEP 57 Guiding the extruder PTFE tube

- Turn the printer so the left side of the printer is facing you.
- Insert the free extruder PTFE tube all the way into the upper hole in the part.

STEP 58 Wizard



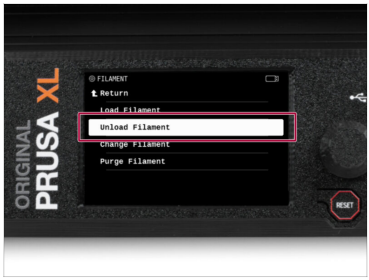
- From the rear side of the printer, plug in the PSU cable.
- Turn the power switch ON (symbol "I").
- Run the tests from the *Control - Calibration & Tests* menu.

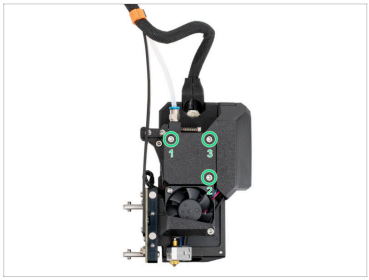
The wizard will test all important components of the printer. The whole process takes a few minutes. Some parts of the wizard require direct user interaction. Follow the instruction on the screen.

NOTE: While testing the axes, make sure that there is nothing in the printer that is obstructing the movement of the axes.

WARNING: Do not touch the printer during the wizard unless prompted! Some parts of the printer may be HOT and moving at high speed.

STEP 59 Calibrating the Nextruder gears





- Plug in the printer and turn it ON.
- Now we need to simulate the movement of the gearbox. On the LCD screen, navigate to Filament - *Unload filament.*
- As soon as the extruder's movement finishes, tighten the three M3x25 screws on the PG-case in the correct order (shown on the picture).
- Then loosen the screws slightly and repeat the process, tightening the screws in the correct order. This ensures that the gearbox is seated correctly.

STEP 60 Well done!

- Congratulations, you have just successfully replaced the heatsink on your Original Prusa XL!

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