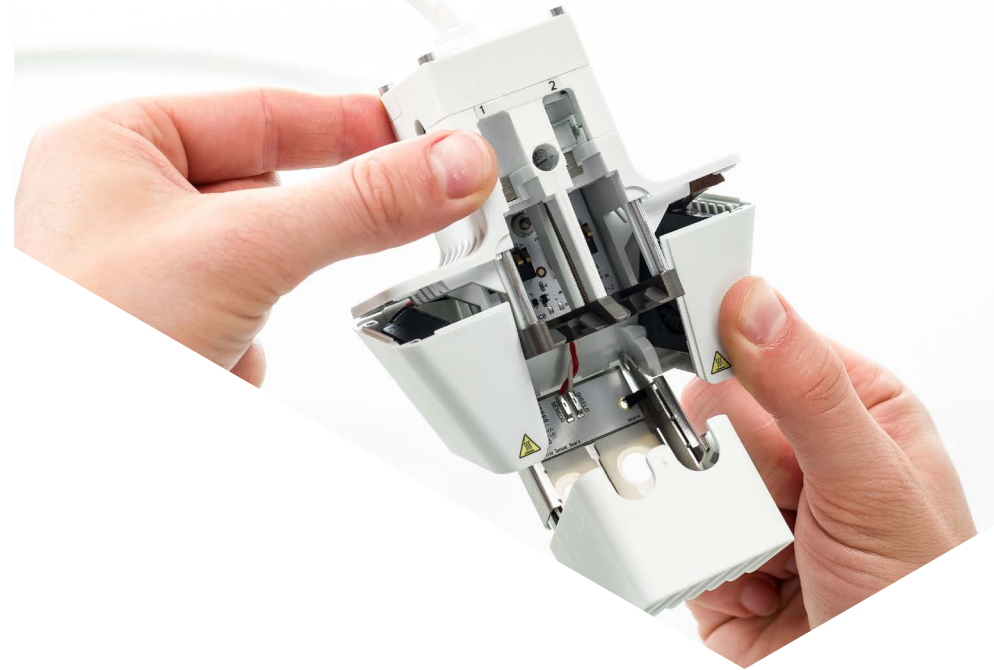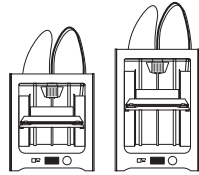## Repair manual

Print head assembly

Instructions

> **Caution:** Assembling the Ultimaker 3 print head involves several PCBs. To prevent damage to these boards, it is highly recommended to take ESD safety precautions when assembling the Ultimaker 3 print head.

Tip: *All orientations are noted as seen from the front of the print head.*

Equipment/supplies needed

Tools
- 2.0 hex screwdriver
- 0.15 Nm torque screwdriver - 2.0 hex
- 0.3 Nm torque screwdriver - 2.0 hex
- Flat-sided screwdriver
- Flat-nose pliers
- Cutting pliers
- Loctite 248
- Loctite 401
- Magnalube
- Heat shrink 5 mm
- Heat blower
- Capacitive sensor board press tool (recommended)

Time
- 30 minutes

Parts
- 2x 1069 Tube coupling collet
- 2x 1266 Bowden tube
- 1x 1479 Bearing housing middle
- 1x 1482 Side fan bracket
- 1x 1981 Print head cable (for Ultimaker 3)
  or
- 1x 2187 Print head cable (for Ultimaker 3 Extended)
- 1x 1991 Bottom plate
- 1x 2012 Print head board
- 1x 2014 Capacitive sensor cable
- 1x 2015 Capacitive sensor board
- 1x 2022 Bearing housing bottom
- 1x 2025 Bearing housing top
- 4x 2069 Header cable clip
- 1x 2108 Front fan bracket
- 1x 2113 Front fan cover
- 1x 2116 Lifting ring
- 1x 2117 Lifting switch

Parts (cont.)
- 1x 2123 Linear bearing LMKW6 double
- 1x 2128 Linear bearing LMK6 short
- 1x 2130 Lifting ring spring DR1300
- 1x 2131 Print head Bowden tube exit
- 1x 2133 Axial fan
- 2x 2135 Radial fan
- 4x 2136 Hot end magnet
- 2x 2137 Clamp clip white
- 1x 2138 Lifting ring bottom
- 2x 2139 Front fan magnet
- 1x 2142 M2.5x8 bolt
- 4x 2144 M2.5x75 bolt
- 1x 2151 Print head cable cover
- 6x 2152 M2.5x6 screw
- 1x 2153 M2.5x35 bolt
- 2x 2158 Foam tape
- 1x 2161 Silicone nozzle cover
- 2x 2163 Magnetic field conductor

Header bracket

1. Place the magnets
- Take two hot end magnets *(2136)* and place them on top of each other in the right recess of the header bracket *(2022)*. Fully insert the magnets.
- Place a magnetic field conductor *(2163)* and place it in the recess behind the hot end magnets.
- Repeat these steps for the left side.
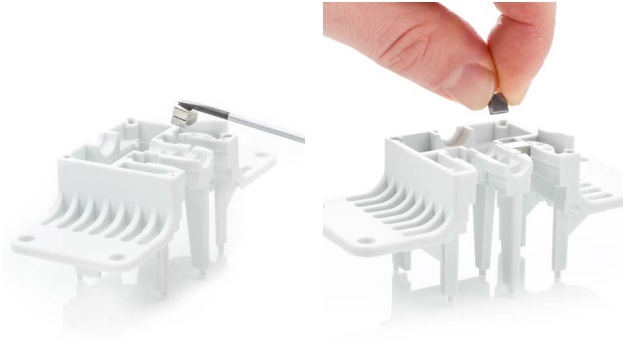
2. Attach the bottom plate
- Align the pins of the header bracket with the holes in the bottom plate *(1991)* and click the parts together.
- Apply a small amount of Loctite 248 to the first 2 mm of the thread of the M2.5x35 bolt *(2153)*.
- Insert the bolt through the hole in the bottom plate and tighten it to 0.3 Nm, using the torque screwdriver.
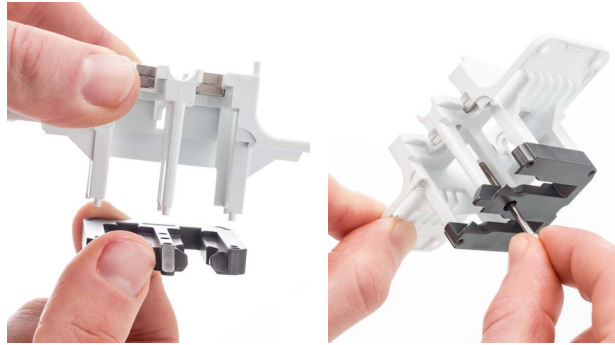
3. Place the print head PCB
- Take the Y linear bearing *(2128)* and place it through the hole in the print head PCB *(2012)*.
- Lower the print head PCB with the bearing into the header bracket until the bottom tab fits in the bottom plate.
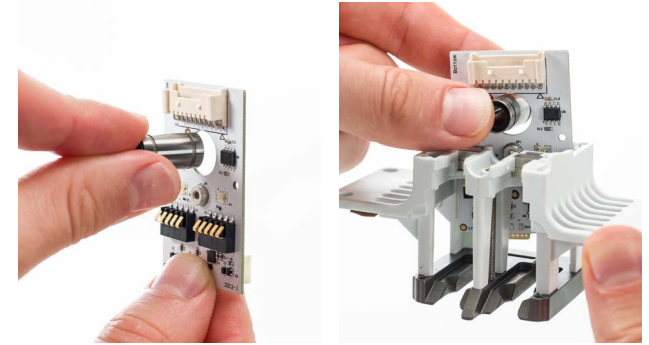
4. Secure the print head PCB
- Align the small pins of the header bracket with the holes in the print head PCB.
- Insert the M2.5x8 bolt *(2142)* through the hole in the back of the header bracket.
- Tighten the bolt to 0.3 Nm, using the torque screwdriver.


For internal use only

Lift switch

1. Prepare the bearing housing middle
- Insert the filament guide *(2131)* into the bearing housing middle *(1479)*, above the '2'.
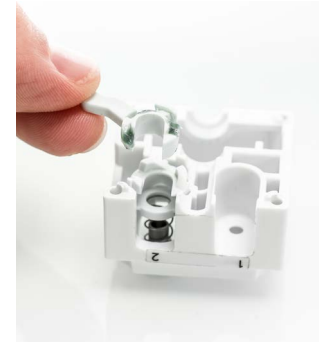- Place the bearing housing middle upside down and place the spring *(2130)* over the filament guide.

2. Place the lifting ring
- Place the lifting ring *(2116)* on the spring.
- Make sure the teeth are upwards and the opening is towards the front.
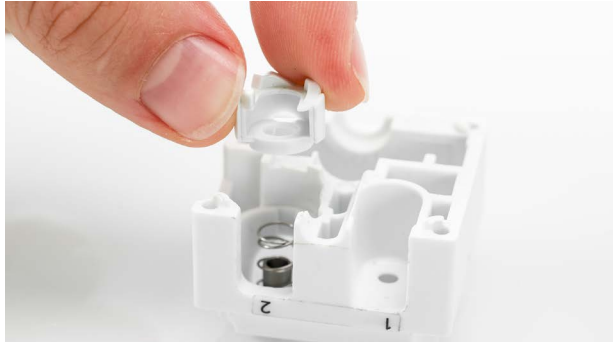
3. Place the lifting switch
- Apply a small amount of Magnalube to both sides of the lifting switch *(2117)*.
- Place the lifting switch on the lifting ring.
- Make sure the switch is towards the back and the opening is towards the front.

4. Place the lifting ring bottom
- Place the lifting ring bottom *(2138)* on the lifting switch.
- Make sure the teeth are facing down and the opening is towards the front.

For internal use only

Print head housing

1. Attach the bearing housing middle
- Apply some pressure to the lifting switch and filament guide and carefully turn the bearing housing middle around.
- Hold this assembly over the print head and gently lower it over the print head PCB.
- Make sure the parts click together and continue to apply some pressure to keep them together.

4. Insert the tube coupling collets
- Push a tube coupling collet *(1069)* in each of the holes in the bearing housing top.

2. Place the X linear bearing
- Turn the print head around so it is right side up again.
- Place the X linear bearing *(2123)* in the notch of the bearing housing middle.

Tip: *Continue to apply some pressure to the print head parts; they are not yet secured.*
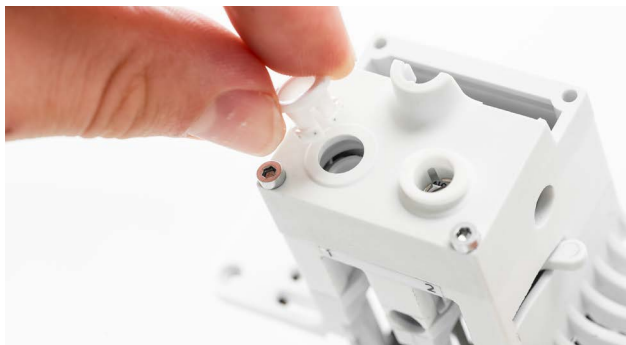

3. Secure the bearing housing top
- Place the bearing housing top *(2025)* over the X linear bearing.
- Apply a small amount of Loctite 248 to the first 2 mm of the threads of two of the M2.5x75 bolts.
- Insert the bolts through the holes in the bearing housing top and tighten them to 0.15 Nm, using the torque screwdriver.
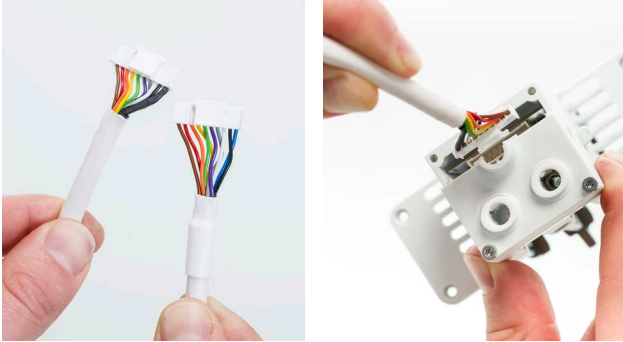

Caution: Overtightening the M2.5x75 bolts can damage the print head. This puts more pressure on the linear bearings, causing excessive wear of these parts. Only use the 0.15 Nm torque screwdriver.

Print head housing

5. Connect the print head cable
- Note the two sides of the print head cable *(1981 or 2187)*; the side without shrink sleeve goes into the print head.
- Insert the connector of the print head cable into the print head PCB, with the clip towards the front of the print head.
- Make sure it clicks into place.

Tip: *If the cable does not click into place, use the hex screwdriver to push it completely into the connector.*

6. Place the cable cover
- Click the cable cover *(2151)* into place.
- Make sure that the print head cable does not stick out of the strain relief.

7. Secure the cable cover
- Apply a small amount of Loctite 248 to the first 2 mm of the threads of two of the M2.5x75 bolts *(2144)*.
- Insert the bolts through the holes in the cable cover and tighten them to 0.15 Nm, using the torque screwdriver.

Caution: Overtightening the M2.5x75 bolts can damage the print head. This puts more pressure on the linear bearings, causing excessive wear of these parts. Only use the 0.15 Nm torque screwdriver.

For internal use only

Front fan bracket

1. Connect the capacitive sensor cable
- Push the red wire of the capacitive sensor cable *(2114)* into the connector marked 'SENSOR'.
- Push the white wire of the capacitive sensor cable into the connector marked 'SHIELD'.

Tip: *Gently pull each wire to check if they are firmly connected.*

2. Place the capacitive sensor board
- Carefully bend the two pins of the front fan bracket *(2123)* upwards.
- Place the capacitive sensor board *(2115)* over the pins, with the connectors upwards and the wires away from the front fan bracket.
- Firmly push the board all the way over the pins, until there is no gap between the capacitive sensor board and the front fan bracket.
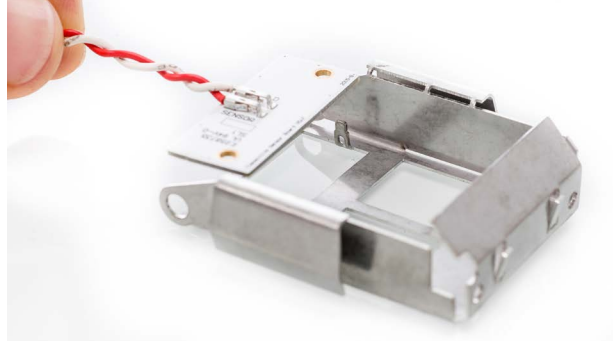
Tip: *Use the capacitive sensor board press tool to correctly push the parts together.*

3. Apply the shrink sleeve
- Place the shrink sleeve over the left pin of the front fan bracket and cut off 5 mm.
- Bend both pins outwards to lock the capacitive sensor board in place.
- Use a heat gun at [...]°C to shrink the sleeve around the pin.

Caution: The shrink sleeve around this pin protects the pin from making contact with the heater cartridge of the print core in slot 2. It is important that this shrink sleeve is applied correctly.

For internal use only

Front fan bracket

4. Place the silicone nozzle cover
- Fit the silicone nozzle cover *(2161)* into the front fan bracket.
- Make sure the larger hole is on the right and the smaller recessed areas are facing away from the capacitive sensor board.
- Adjust the position of the silicone nozzle cover until it is completely flat on the underside of the front fan bracket.
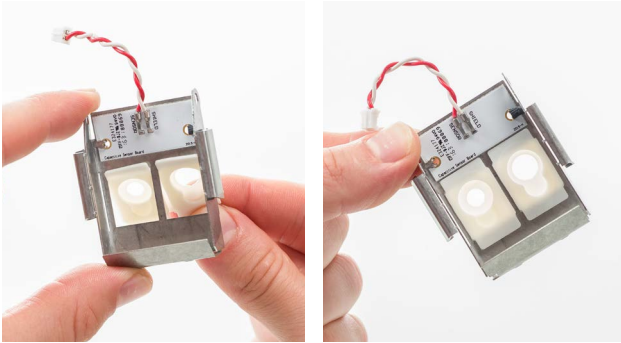
5. Place the front fan magnets
- Apply a small drop of Loctite 401 to a piece of paper.
- Carefully dip two cylindrical front fan magnets *(2139)* into the Loctite 401 and insert them into the recesses at the sides of the front fan cover *(2113)*.

Caution: Apply pressure until the magnets are fully inserted, otherwise the front fan bracket may not close completely.

6. Place the front fan
- Slide the axial fan *(2133)* into the front fan cover.
- Make sure the sticker is towards you and the wires are on the top left side.


7. Attach the cover and bracket
- Hold the front fan bracket in a 90° angle against the front fan cover and align the holes.
- Secure the two parts with two M2.5x6 screws *(2152)*.
- Guide the axial fan wires behind the tab and press it shut with pliers.
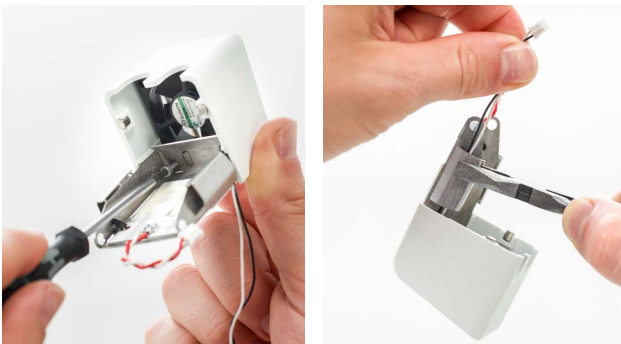
Side fan bracket

**1. Prepare the radial fans**
- Cut the two top corners off the two radial fans *(2135)*.
- Loop the wires of the fan at the back.
- Place a piece of foam *(2158)* on the top of the fan, making sure the wire goes through the cut-off corner.
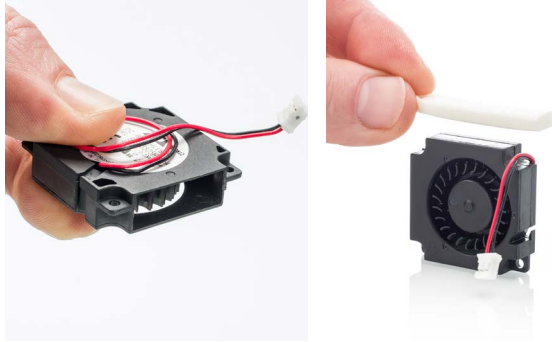
Tip: *Place the wires of one fan over the right side corner, place the wires of the other fan over the left side corner.*
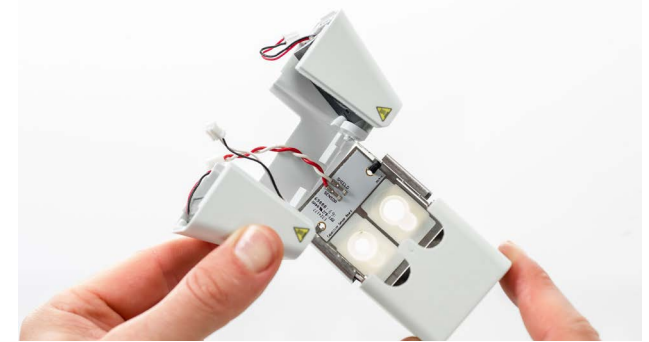
2. Place the fans in the side fan bracket
- Slide the fans into the side fan bracket *(1482)*.
- Make sure the fans are facing towards the inside, the foam is up and the open side of the fan is down.
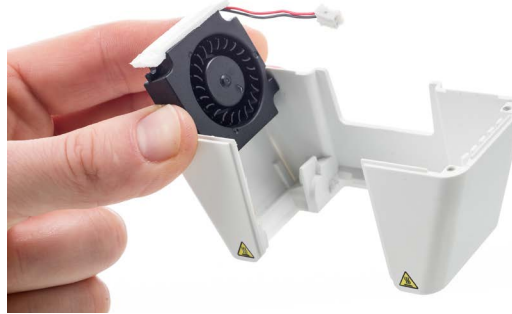
3. Attach the front fan bracket
- Gently bend the side fan bracket open.
- Align the pins of the side fan bracket with the holes in the front fan bracket and click the front fan bracket into place.

Tip: *Make sure to keep all wires on the inside of the side fan bracket.*

Final assembly

1. Align the sub-assemblies
- Place the print head into the side fan bracket.
- Make sure the parts are aligned, but don't push them together yet.
- Ensure that the plugs for the radial fans are at the sides and the wires of the axial fan and capacitive sensor are in the recess at the back of the bottom plate.

2. Connect the plugs
- Connect the red-black wires of the right radial fan to the first connector, marked '←'.
- Connect the red-white wires of the capacitive sensor to the second connector, marked 'Sensor'.

- Connect the black-white wires of the axial fan to the third connector, marked '▲'.
- Connect the red-black wires of the left radial fan to the fourth connector, marked '➡'.

Tip: Push all excess wire into the side fan bracket. If the wires are sticking out at the back, they can easily be damaged during printing and normal printer operations.

3. Secure the fan bracket
- Push the print head assembly fully into the side fan bracket and align the parts.
- Secure the side fan bracket with eight M2.5x6 screws *(2152)*.
- Tighten them to 0.3 Nm using the torque screwdriver.
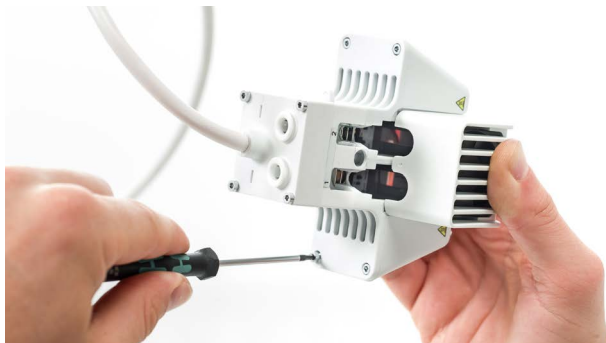
4. Insert the Bowden tubes
- Take two Bowden tubes *(1266)* and insert the flat side into the print head.
- Secure each Bowden tube with a clamp clip *(2137)*.

5. Place the header cable clips
- Bend open the four header cable clips *(2069)* to place them around the print head cable.
- Click the cable clips onto the right Bowden tube.
- Evenly space the clips over the tube.