Ultimaker

ULTIMAKER ORIGINAL+

ASSEMBLY MANUAL

Original manual V3.0

DISCLAIMER

Please read and understand the contents of this assembly manual. Failure to read the manual may lead to personal injury, inferior results or damage to the Ultimaker. Always ensure that anyone who assembles the 3D printer knows and understands the contents of the manual.

We can not control the conditions in which you assemble the Ultimaker Original+. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, injuries, damage, or expense arising out of or in any way connected with the assembly, handling, storage, use or disposal of the product.

The information in this document was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness.

Intended use
Ultimaker 3D printers are designed and built for fused deposition modeling for various high quality plastics like PLA, ABS, CPE within a commercial/business environment. While this printer is delivered as a DIY-kit it is suitable for the education of 3D printing. How does it work, what does the printer do? The multiplex housing is ideal for making all kinds of adjustments. Although we achieved a very high standard in the reproduction of 3D models with the usage of Cura, the user remains responsible to qualify and validate the application of the printed object for its intended use. While being an open filament platform the best results will be achieved with Ultimaker certified filament, while effort has been made in order to match material properties with machine settings.

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PREFACE

This is the assembly manual for the Ultimaker Original+.
The manual guides you through the steps to successfully assemble the 3D printer.

Please read all information and follow the instructions and guidelines in this manual carefully. This ensures that possible accidents and injuries will be prevented and that you will obtain great quality prints.

Every effort has been made to make this manual as accurate and complete as possible. The information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Should you discover any errors or omissions, please bring this to our attention, so that we can make amendments. This will enable us to improve our documentation and service to you.

1 INTRODUCTION

Your Ultimaker Original+ kit consists of several parts. This chapter describes the components (quantities, article numbers and names) that are part of the Ultimaker Original+ kit. Check if all parts are included before you start assembling.

Assembling the Ultimaker Original+ takes about 8 - 16 hours and requires the following tools: hex key 2 mm (included), hex key 2.5 mm (included), a flat screwdriver, crosshead screwdriver and socket wrench or pliers.

WHAT'S IN THE BOX?

LAYER 1

1	0,75 kg filament
1	Power cord
1	Serial number sticker

LAYER 2

Additional pack

1	1144	USB cable
1	1225	Blue tape
1	1227	Hex key 2 mm
1	1228	Glue stick
1	1402	Hey key 2.5 mm
1	1250	SD card

Bearing pack

10	1021	Ball bearing 8 mm
4	1056	Sintered bushing
2	1065	Linear bearing
1	1142	Small ball bearing
2	1170	Square flanged linear bearing

Belts pack

2	1085	Short timing belt
4	1086	Long timing belt

Cable pack

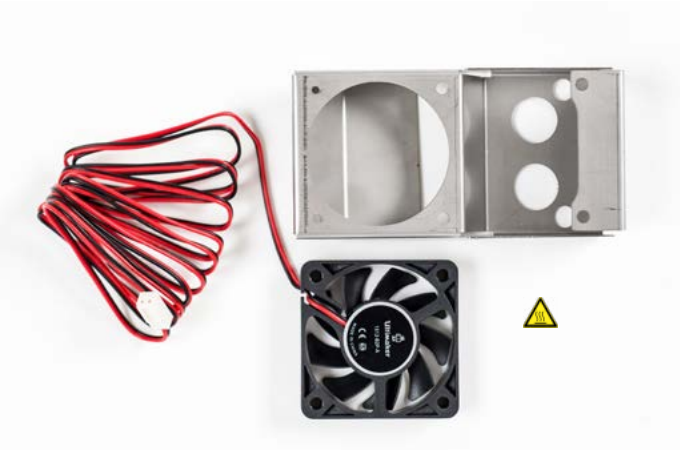
1	1171	Heated bed cable
1	1183	Double flat cable 10 wire
1	1185	PT100 B sensor
1	1513	Heater cartridge

Cable management pack

4	1010	Velcro parts
2	1131	Short cable duct
2	1132	Long cable duct (you will only need 1)

Fan pack

1	1326	Warning sticker
1	1501	Metal fan duct
1	1512	Print head fan



Feeder pack

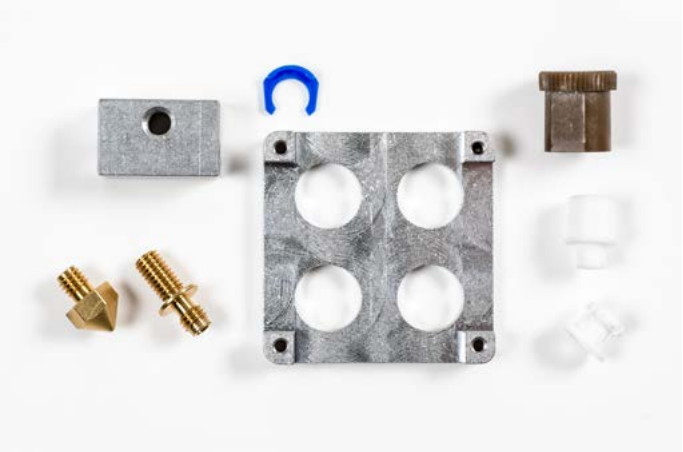
1	1016	Feeder quick fit coupling
1	1071	Clamp clip
1	1133	Knurled wheel
1	1134	Cap nut M8
2	1136	Washer M8
1	1137	Nut M8
1	1143	Feeder spring

Grease pack

1	1226	Grease
1	1524	Copper grease

Hot end pack

1	1048	Aluminium hot end holder
1	1049	Aluminium heater block
1	1053	Hot end isolator tube
1	1054	Nozzle
1	1055	Teflon coupler
1	1067	PEEK isolator
1	1069	Tube coupling collet
1	1071	Clamp clip



Injection molding pack

1	1030	Injection molded set
2	1241	Motor spacer
1	1243	Heated bed cable clip

Limit switch pack

1	1023	Black wired limit switch
1	1025	Blue wired limit switch
1	1026	Red wired limit switch

Nuts & bolts pack

4	1139	Spacer 16 mm
3	1152	Table spring
19	1201	Washer M3
28	1202	M3x10 bolt
16	1203	M3x12 bolt
80	1204	M3x16 bolt
12	1205	M3x14 bolt
17	1206	M3x20 bolt
17	1207	M3x25 bolt
21	1208	M3x30 bolt
120	1209	Hex nut
17	1211	Set screw
35	1214	Lock nut
10	1217	M4x10 bolt
4	1256	Glass retainer clip
3	1257	Knurled nut
3	1288	Washer M6
2	1348	M3x4 bolt
6	1355	Countersunk bolt M3x8
5	1356	Countersunk bolt M3x20
2	1362	Self tapping bolt
8	1502	Spacer 8 mm
1	1514	Metal cable clamp
12	1540	Nylon hex nut
8	1541	Nylon M3x12 bolt
6	1542	Nylon M3x25 bolt
2	1545	Spacer 3 mm
4	1680	Print head thumb screw

Pulley pack

2	1084	Pulley 5 mm
10	1085	Pulley 8 mm

UltiController pack

1	1129	Knob
1	1146	UltiPanel rev 1.1
1	1522	UltiController window

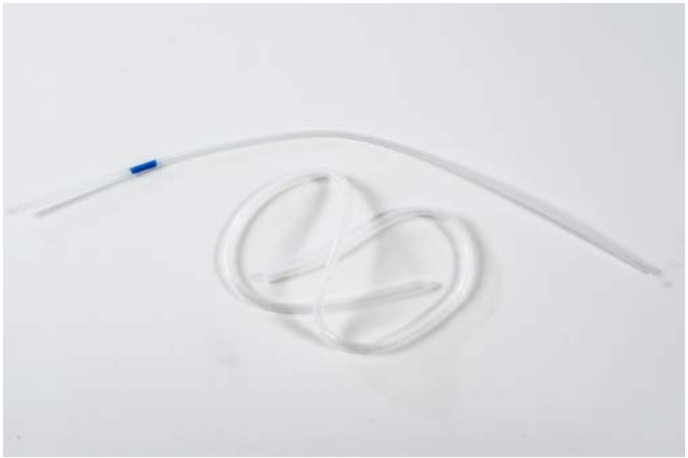
LAYER 3

Axle pack

2	1011	Y linear shaft
2	1012	X linear shaft
2	1028	Z linear shaft
2	1046	Print head shaft X, Y
1	1159	Z motor with trapezoidal lead screw
1	1187	Trapezoidal lead nut

Bowden pack

1	1097	Spiral sleeve
1	1266	Bowden tube



Electronics pack

2	1315	Jumper (on main board)
1	1546	Main board 2.1.4

Motors

1	1017	Feeder motor
2	1082	X, Y motor

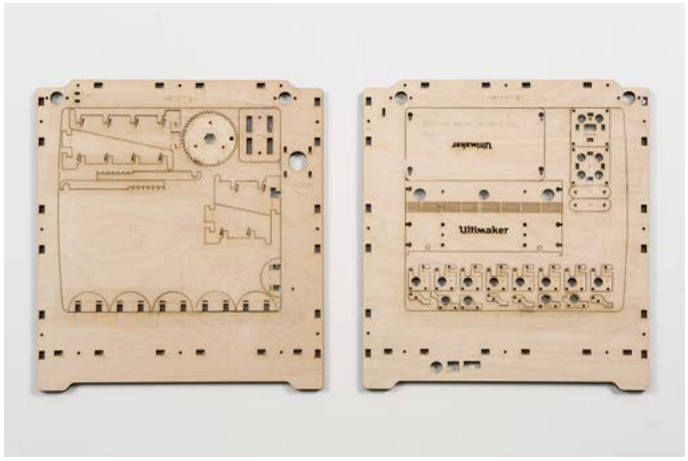
Power adapter

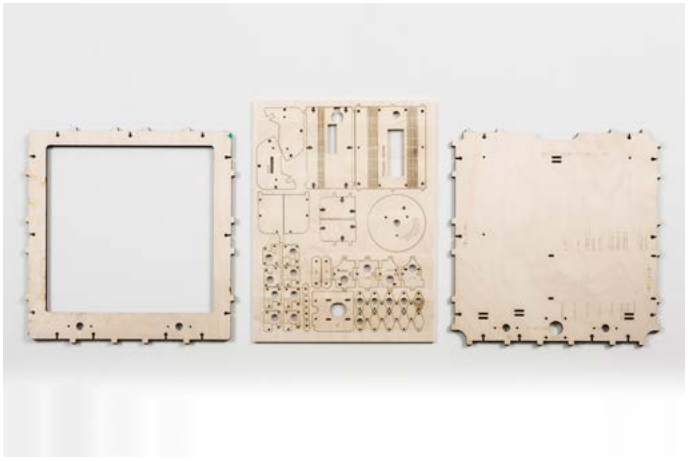
1	1238	Power adapter

LAYER 4

Laser pack

1	1154	Glass plate
1	1155	Heated bed
1	1294	Warning sticker
1	1673	Front plate
1	1674	Back plate
1	1675	Left plate
1	1676	Right plate
1	1677	Top plate
1	1678	Bottom plate
1	1679	Parts plate
1	1818	Aluminium base plate





2 FRAME

In this chapter, the assembly of the frame of the Ultimaker Original+ is described. You will start preparing the panels, then you will assemble the frame and as a last step attach various parts to the frame.

For this part you will need the 2 mm hex key and socket wrench or pliers.

2.1 PREPARING THE PANELS

First prepare all the panels by attaching the necessary parts. This makes it much easier to put the frame together later. Before you start, take the panels and remove all other wooden parts from them.

PARTS NEEDED

Laser pack

1	Front panel
1	Back panel
1	Left panel
1	Right panel
1	Bottom panel

Bearing pack

8	1021	Ball bearing 8 mm

Limit switch pack

1	1023	Black wired limit switch
1	1025	Blue wired limit switch
1	1026	Red wired limit switch

Nuts & bolts pack

2	1201	Washer
4	1203	M3x12 bolt
2	1204	M3x16 bolt

Cable management pack

4	1010	Velcro parts

Serial number

1	Serial number sticker

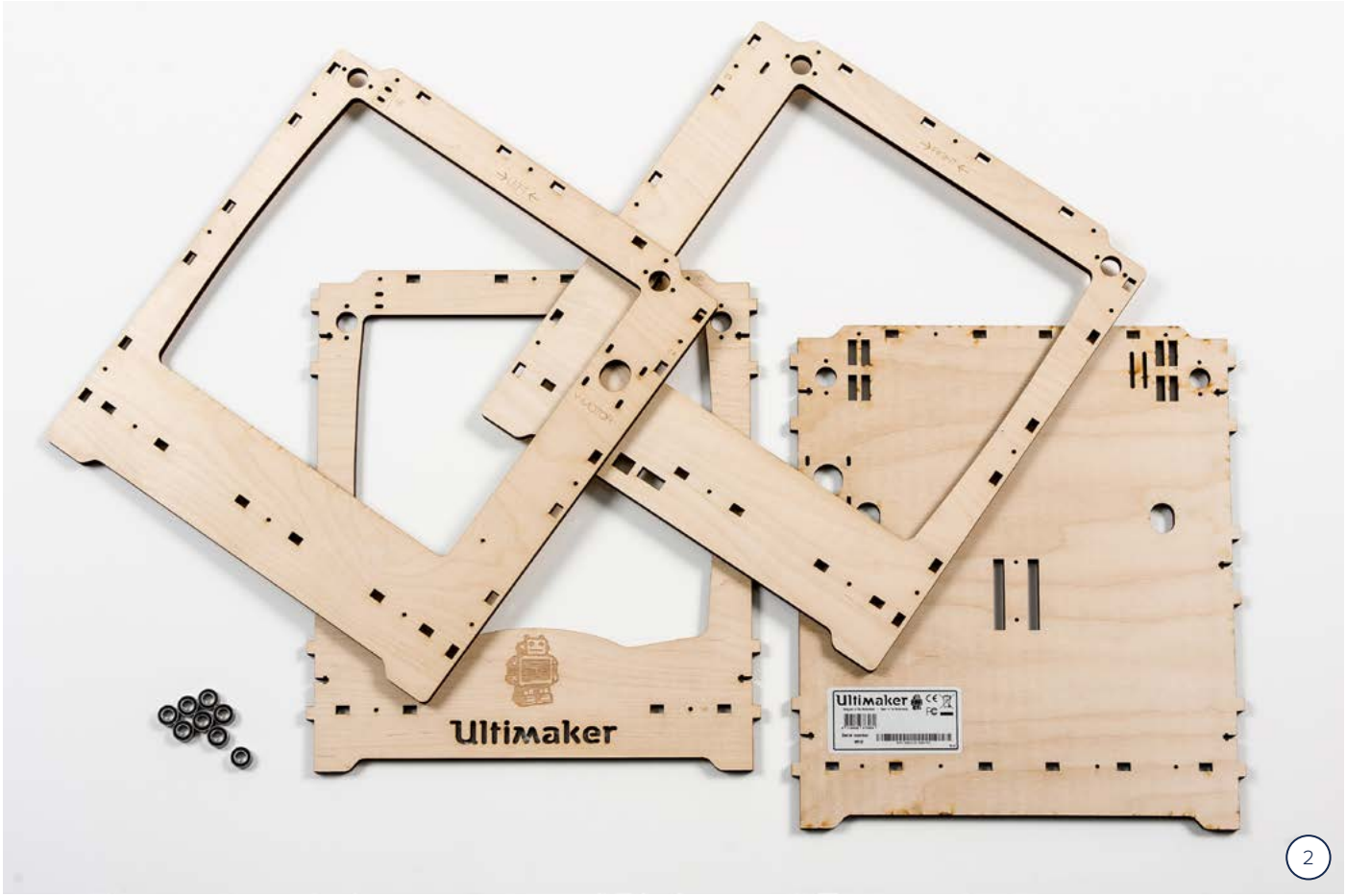
2.1.1. STICKERS

Each Ultimaker Original+ kit has its own unique serial number. You find your Ultimaker Original+'s serial number on the box and on a sticker in the kit. Start by placing the serial number on the non-engraved side of the back panel. Fig. 1. The kit also contains a warning sticker. Take the bottom panel and stick the warning sticker to the engraved side of the panel (in one of the corners).

1

2.1.2. BALL BEARINGS

For this step you need the front, back, left and right panels and the 8 ball bearings (Fig. 2). Every panel has 2 corresponding holes.



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1. Take a panel, place the ball bearings on the corresponding holes and push them in. Make sure that they are inserted deep enough and do not stick out. Fig. 3.

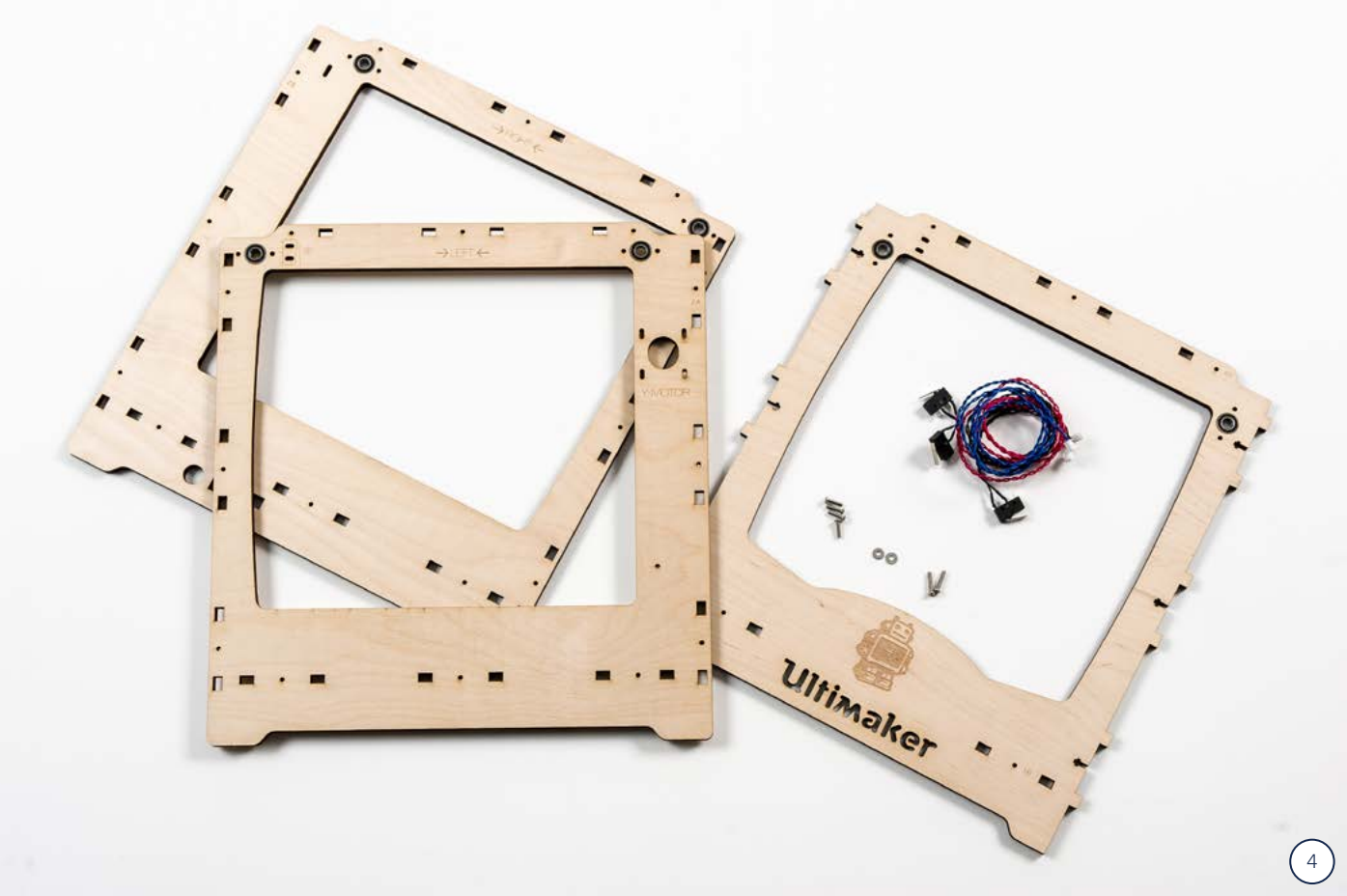
   Use a redundant piece of wood to push the bearings into the frame.

2. Repeat this step for the other 3 panels.


3

2.1.3. LIMIT SWITCHES

The limit switches are used to determine the 0 point of the print head and Z stage. They make sure that the print head stays within the limits of the frame and the build plate can be calibrated. For this step you need the front, left and back panels, the limit switches and the bolts and washers (Fig. 4).



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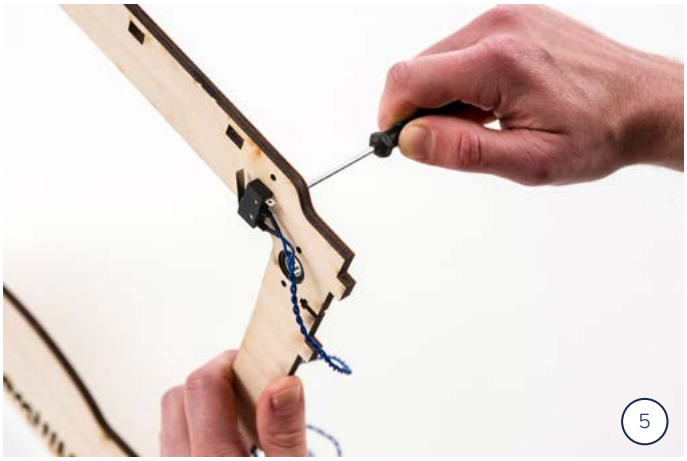
The orientation of the limit switches is engraved on the panels, except for the front panel.

Blue wired limit switch

To mount the blue wired limit switch, perform the following actions:

1. Take the front panel.
2. Place the blue wired limit switch with the lever pointing upwards.
3. Push the limit switch towards the center of the panel as much as possible and attach with two M3x12 bolts. Fig 5 and 6. Hold the limit switch against the frame while tightening the bolts.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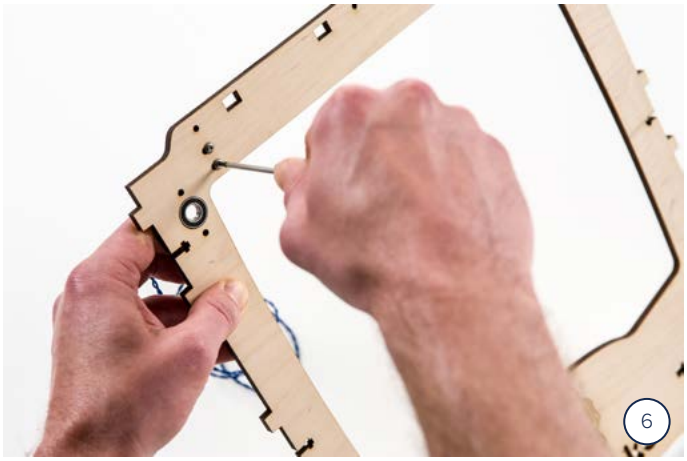
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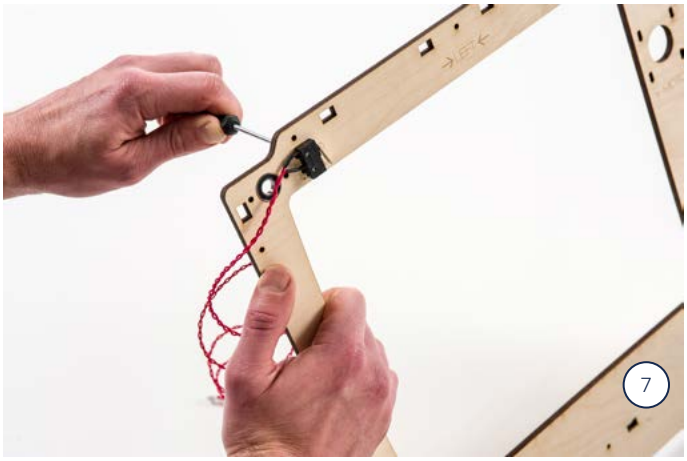
Red wired limit switch

To mount the red wired limit switch, perform the following actions:

1. Take the left panel.
2. Place the red wired limit switch with the lever pointing downwards.
3. Push the limit switch towards the center of the panel as much as possible and attach with two M3x12 bolts. Fig 7. Hold the limit switch against the frame while tightening the bolts.



Black wired limit switch

To attach the black wired limit switch, perform the following actions:

1. Take the back panel.
2. Place the black wired limit switch with the lever pointing to the left.
3. Loosely attach the black wired limit switch with two M3x16 bolts and two washers. The fine-tuning of its position will be done at the end of the assembly process. Fig. 8 and 9. Hold the limit switch against the frame while tightening the bolts.

Make sure the flat (sharp) sides of the washers are towards the wood.

2.1.4. BOTTOM PANEL

In this step you will place the Velcro parts that will be used later to organize the electronics. You need the bottom panel and the Velcro parts.

1. Move 4 pieces black Velcro parts through the four sets of slots of the bottom panel. Fig. 10.
2. The Velcro parts should stick out at the engraved side of the bottom panel. Fig. 11.

Make sure the soft side is facing itself after placing.

2.2 ASSEMBLING THE FRAME

In the next steps you will put all the panels together and assemble the cube shaped frame.

While assembling the frame, be careful not to put any force on the panels because they are weak in this configuration. However, when the frame is finished the structure is very strong.

PARTS NEEDED

Laser pack

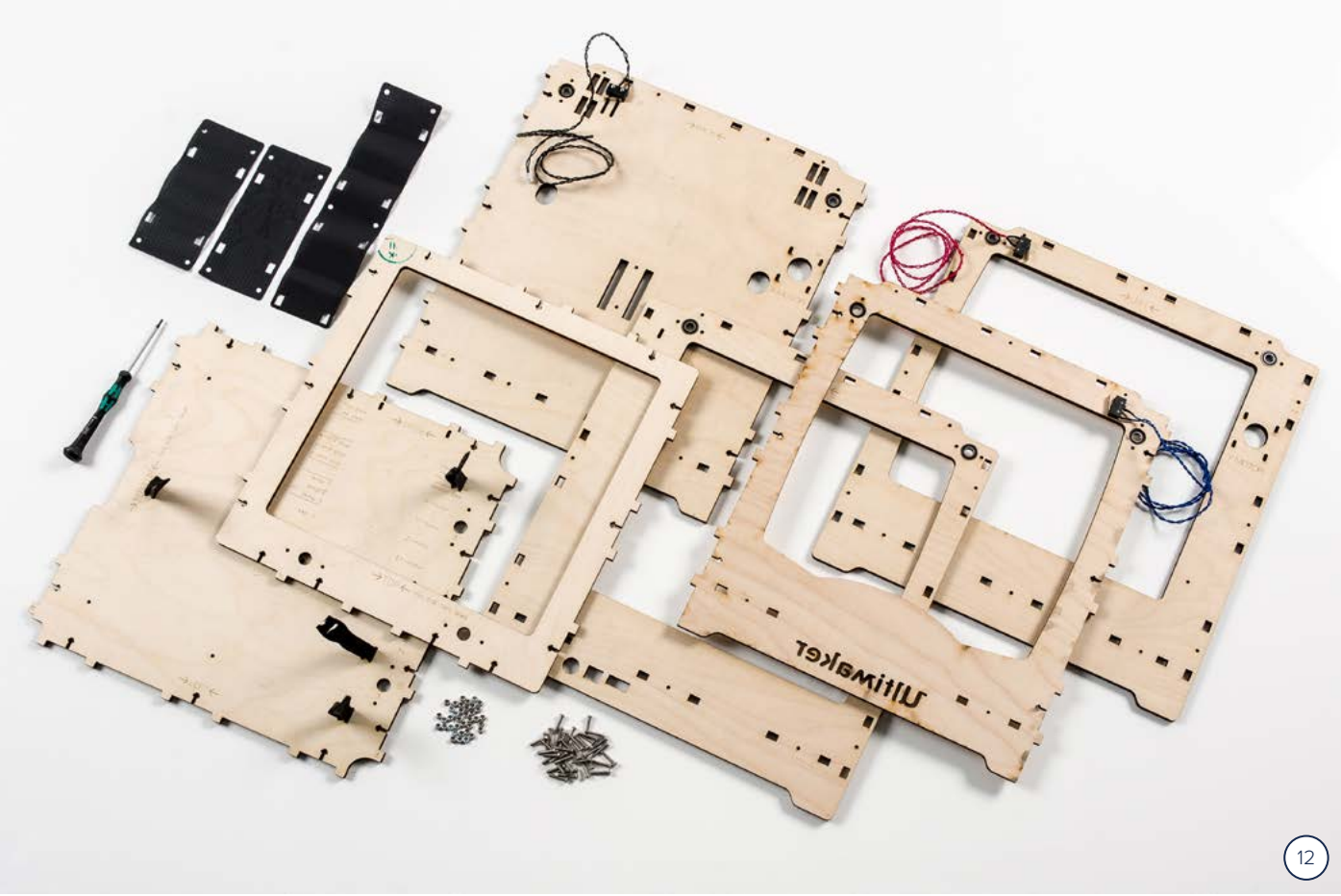
1	Front panel
1	Back panel
1	Left panel
1	Right panel
1	Top panel
1	Bottom panel

Cable management pack

1	1131	Long cable duct
2	1132	Short cable duct

Nuts & bolts pack

37	1204	M3x16 bolt
37	1209	Hex nut



2.2.1. FIRST FOUR PANELS

To assemble the frame, perform the following actions:

1. Place the back panel on the table. Make sure the markings are facing towards you.
2. Put the top panel, with the markings downwards, into the back panel. Fig. 13.
3. Put the bottom panel, with the markings downwards and towards you, into the back panel. Fig. 14.
4. Put the front panel in the top and the bottom panel. Fig. 15.

Make sure that the wires of the limit switches are not in between the panels when you place them.

5. Loosely secure the four panels with thirteen M3x16 bolts and thirteen hex nuts. You can fully tighten the bolts when the frame is complete. Fig. 16.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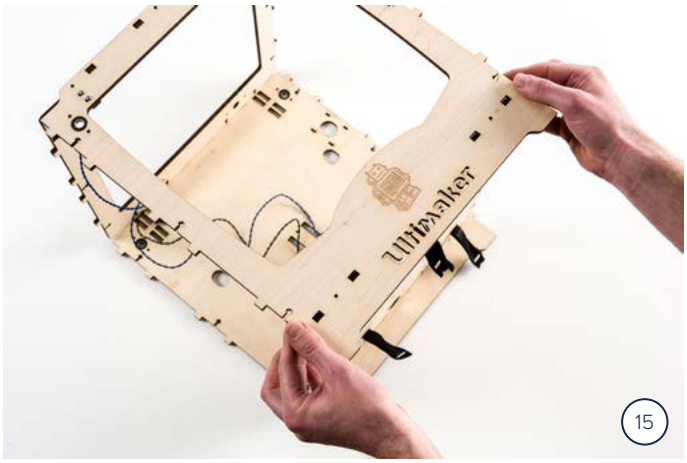

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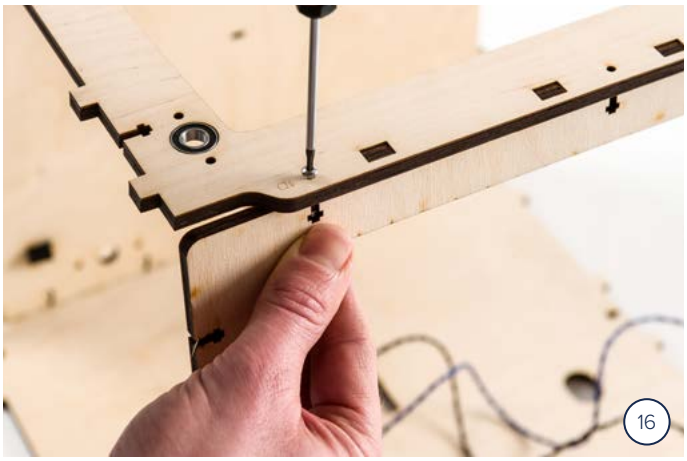
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2.2.2. CABLE DUCTS

Before adding the right and left panel you will place the cable ducts. These keep the motor and limit switch wires out of the way for safety reasons.

Right side

1. Put the frame on its left side.
2. Place a short cable duct on the right side of the back panel. Fig. 17.
3. Fold the short cable duct. Fig. 18.
4. Place a small piece of tape on the cable duct to keep it folded. Make sure the tape will not get stuck between the panels so it can be removed easily later. Fig. 19.
5. Place the right panel. Fig. 20.
6. Loosely secure the right panel with twelve M3x16 bolts and twelve hex nuts. Fig. 21.


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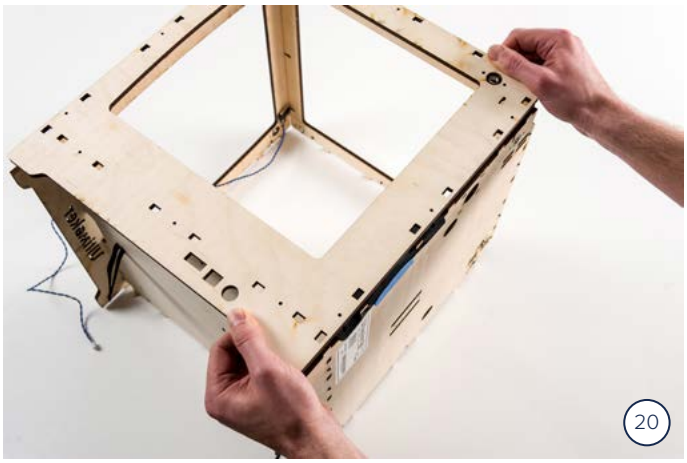
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Left side

1. Turn the frame over and put it on its right side.
2. Place the second short cable duct on the left side of the back panel, fold it and tape it like you did with the cable duct on the right side. Fig. 22 and 23.
3. Place a long cable duct on the left side of the front panel, fold and tape it like the other cable ducts. Fig. 24 and 25.
4. Place the left panel. Fig. 26.
5. Loosely secure the left panel with twelve M3x16 bolts and twelve hex nuts.
6. Remove the pieces of tape you attached in the previous steps.
7. Put the frame upright and now tighten all the bolts (front, back, left and right side) completely.


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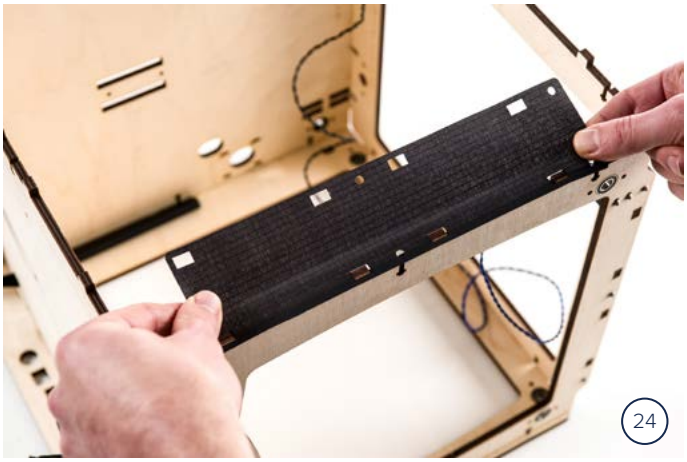
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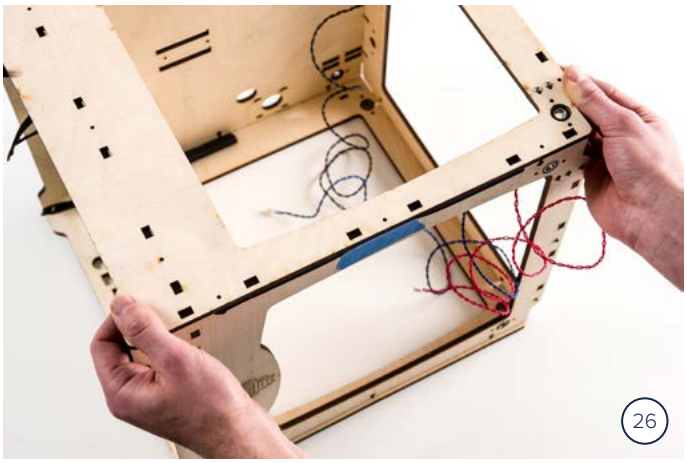
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2.3 ATTACHING VARIOUS PARTS

In the next steps you will attach the last parts to complete the frame.

PARTS NEEDED

Motor pack

2	1082	X/Y motor (with round axle)

Pulley pack

2	1084	Pulley 5 mm

Belt pack

2	1085	Short timing belt

Injection molding pack

2	1241	Motor spacer

Laser pack

2	Wooden part 3B
1	Wooden part 11A

Nuts & bolts pack

8	1201	Washer M3
1	1203	M3x12 bolt
6	1204	M3x16 bolt
8	1207	M3x25 bolt
4	1209	Hex nut
2	1211	Set screw
3	1214	Lock nut
1	1514	Metal cable clamp

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2.3.1. MOTORS

To prepare and attach the X and Y motors, perform the following actions:

1. Take the two 5 mm pulleys and replace the set screws in the pulleys with the new separately supplied stainless steel set screws. Fig. 28.
2. Place the pulley (5 mm internal diameter) on the X and Y motors. Make sure to keep the top of the pulley flush with the top of the motor axle. Fig. 29.
3. Take the eight M3x25 bolts and put a washer around each bolt. Make sure that the flat (sharp) side of the washer will face the wood. Fig. 30.
4. Place the short timing belts around the pulleys. Fig. 31.


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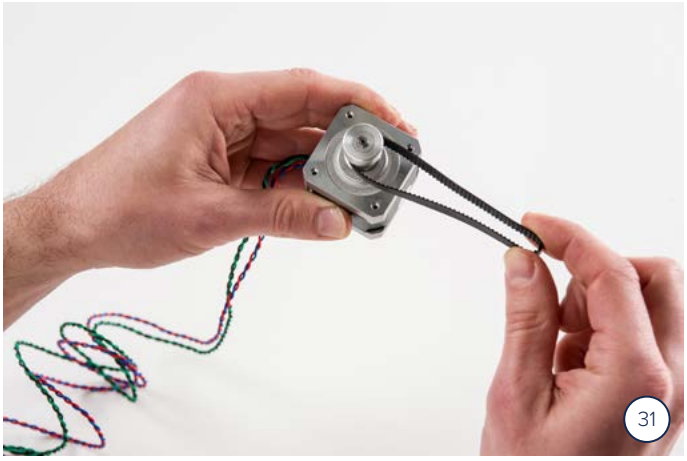
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5. Attach the X motor to the back panel with four M3x25 bolts and a black motor spacer. Make sure the wires face downwards. Fig. 32.
6. Attach the Y motor to the left panel with four M3x25 bolts and a black motor spacer. Make sure the wires face downwards. Fig. 33 and 34.

When placing the motor, make sure that the wires of the black limit switch are in between the motor spacer and the frame.

Do not attach the X motor and Y motor too tight. The X motor and Y motor must be able to move up and down. You will adjust their position later.

7. Hook the cables behind the hook of the motor spacers, towards the edge of the plate. Fig. 35.

Use a screwdriver to open the hook and insert the cables.


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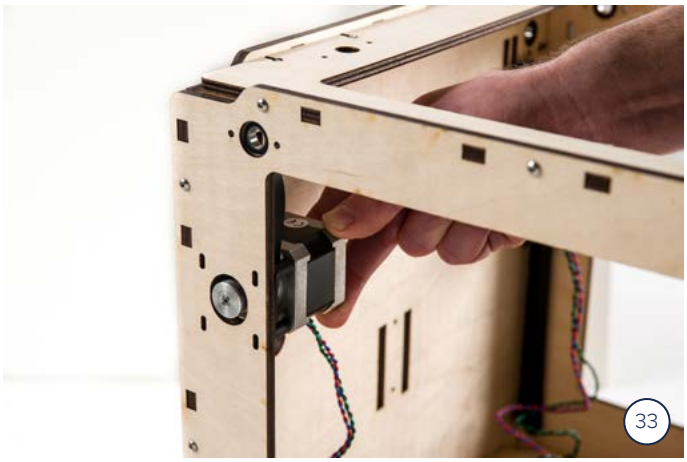
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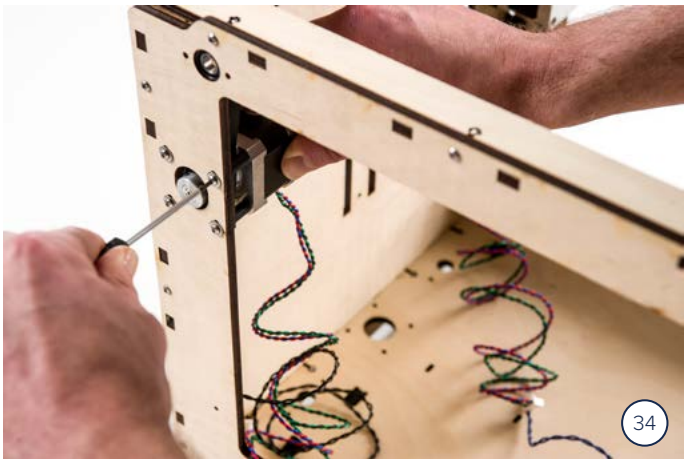
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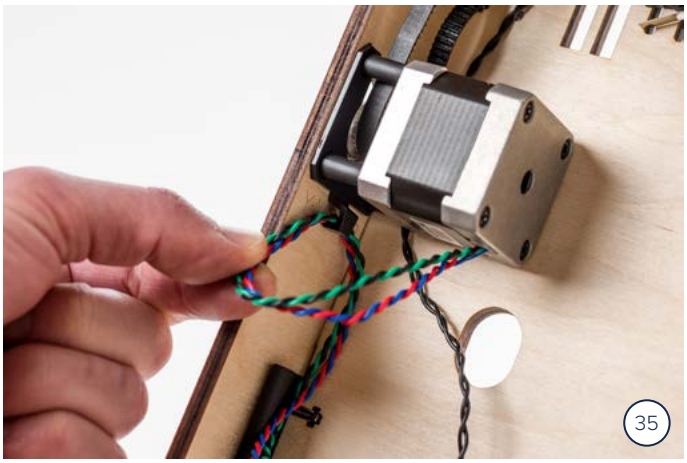
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2.3.2. OTHER PARTS

1. Take wooden part 11A and attach it to the outside of the back panel. Use two M3x16 bolts and two lock nuts, place the lock nuts on the outside of the frame. Fig. 36.
2. Take the two wooden parts 3B (4 mm) and place them on the top panel, over the holes.
3. Attach each wooden part 3B with two M3x16 bolts and two lock nuts. Fig. 37.
4. Take the metal cable clamp and attach it to the left panel using one M3x12 bolt and one lock nut. This clamp will be used to keep the heated bed cable in place. Make sure to place the lock nut on the inside of the frame. Fig. 38.

Now that the frame is complete, run all the wires from the limit switches and the motors through the cable ducts and the holes in the bottom panel. You can use the Velcro parts to keep the wires together at the bottom.

Great, the frame is now ready!

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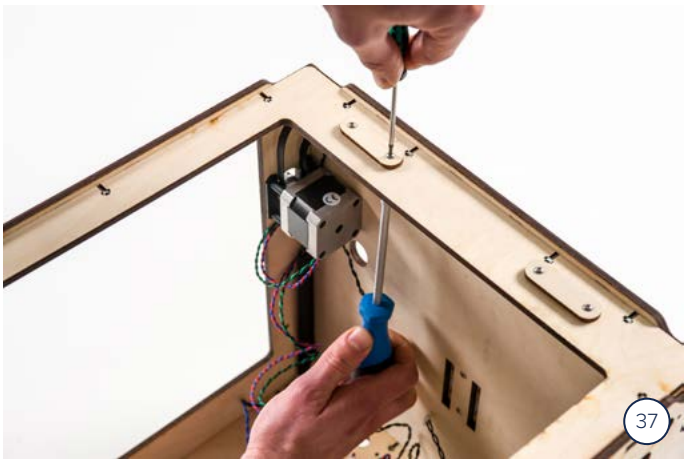
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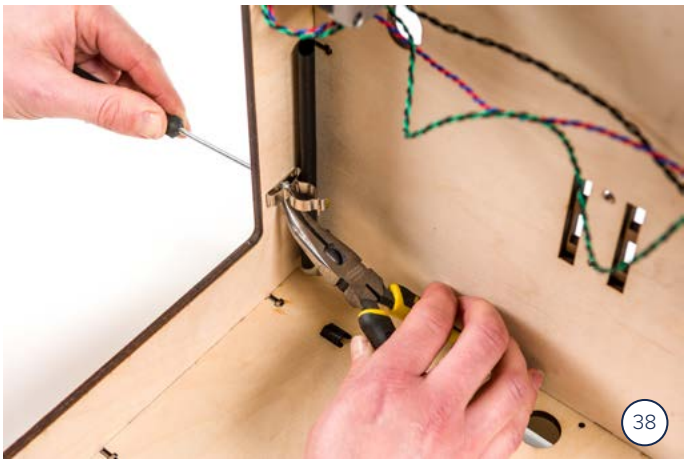
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3 X/Y AXLES

Once the frame is assembled, the X and Y axles can be put in the frame. Therefore you will first assemble the sliding blocks and attach the wooden caps to the frame. When this is done, the X and Y axles can be placed in the frame with pulleys, belts and sliding blocks around them.

For the X/Y axles you will only need the 2 mm hex key.

3.1 SLIDING BLOCKS

PARTS NEEDED

Laser pack

6	Wooden parts marked FRONT (A, B, C (2x), D, E)
6	Wooden parts marked BACK (A, B, C (2x), D, E)
6	Wooden parts marked LEFT (A, B, C (2x), D, E)
6	Wooden parts marked RIGHT (A, B, C (2x), D, E)
4	Small wooden parts marked C (4 mm)

Bearing pack

4	1056	Sintered bushing

Nuts & bolts pack

8	1202	M3x10 bolt
12	1208	M3x30 bolt
24	1209	Hex nut

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3.1.1. ASSEMBLING THE SLIDING BLOCKS

To assemble the four sliding blocks, perform the following actions:

1. Sort the wooden parts marked FRONT from A through E. Make sure the text is facing the same direction. Use the part C with the hole in it.
2. Take the sintered bushing and push it through part A. Fig. 40.

> This might take some force. Use a redundant piece of wood to push the sintered bushing through the wooden parts.

3. Now push it though part B, C, D and E. Fig. 41, 42, 43, 44 and 45.
4. Repeat these steps for the back, left and right sliding blocks. Try to let the sintered bushing stick out equally on each side of the sliding block.

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3.1.2. ATTACHING THE CLAWS

To attach the sliding block claws, perform the following actions:

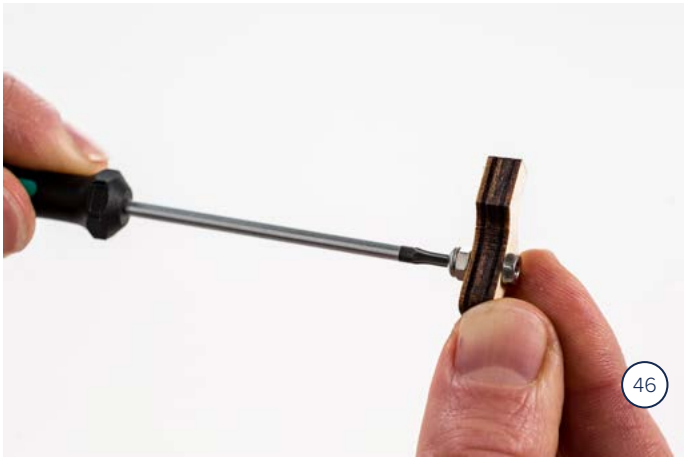
1. Put one hex nut on each of the four M3x10 bolts and put it all the way onto the bolt.
2. Put the bolts with hex nuts through the middle hole of the 6 mm wooden part C (marked FRONT, BACK, LEFT, RIGHT) and secure with one hex nut each. Fig. 46.

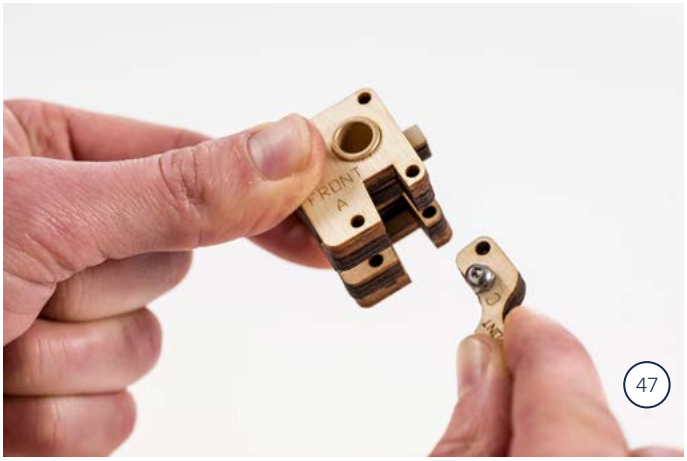
   The last nut should just fit.

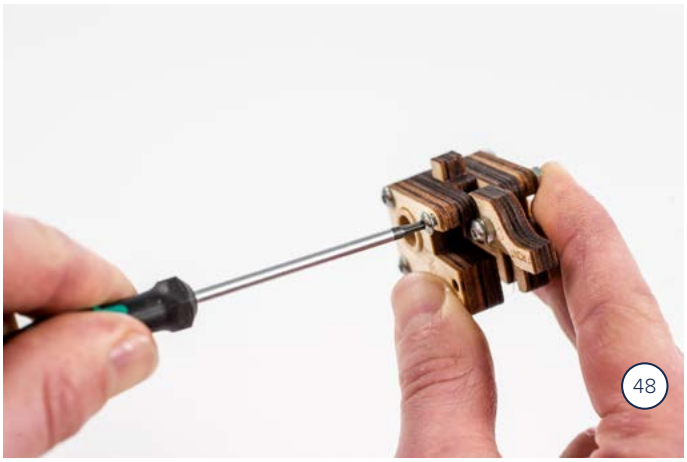
3. Place the claw marked FRONT into the front sliding block (with both engravings in the same direction) and secure the sliding block with 3 M3x30 bolts and 3 hex nuts. Don't put a bolt on the place where the claw will be closed. 8Fig. 47 and 48.

   Do not overtighten the bolts; the claw must be able to rotate.

4. Repeat step 3 for the back, left and right sliding blocks.
5. Prepare the small 4 mm wooden parts C by inserting an M3x10 bolt and place a hex nut on the very end of this bolt. You will need these parts later in the assembly process. Fig. 49.







3.2 ATTACHING THE CAPS

PARTS NEEDED

Laser pack

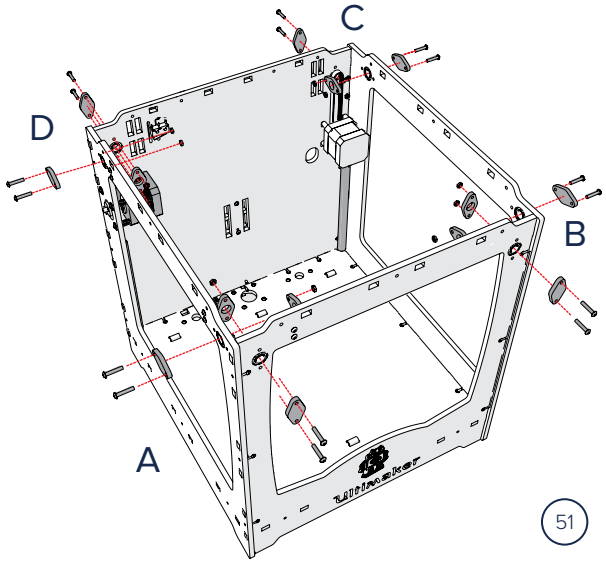
8	Wooden caps without hole
6	Wooden caps with hole

Nuts & bolts pack

12	1204	M3x16 bolt
12	1208	Hex nut

50

The wooden caps have to be attached in four corners (A, B, C and D) of the Ultimaker Original+ (Fig. 51). They keep the axles in place. The wooden caps with hole will be placed on the inside, except for the places where the short motor belts pass over the bearings. The wooden caps without hole go on the outside. Some of the caps only need to be attached with one bolt at this time, to help inserting the axles at a later stage. Attach these caps loosely, so you can still rotate them.



51

To place the wooden caps, perform the following steps:

1. In corner A, attach a wooden cap with hole and a wooden cap without hole to the front panel. Secure with two M3x16 bolts and two hex nuts. Fig. 52 and 53.
2. Also attach a wooden cap with hole and a wooden cap without hole to the left panel. Secure with two M3x16 bolts and two hex nuts. Fig. 54 and 55.
3. In corner B, attach a wooden cap with hole and a wooden cap without hole to the front panel. Secure with two M3x16 bolts and two hex nuts. Fig. 56.
4. Attach a wooden cap with hole and a wooden cap without hole to the right panel. Secure loosely with only one M3x16 bolt and one hex nut. Fig 57.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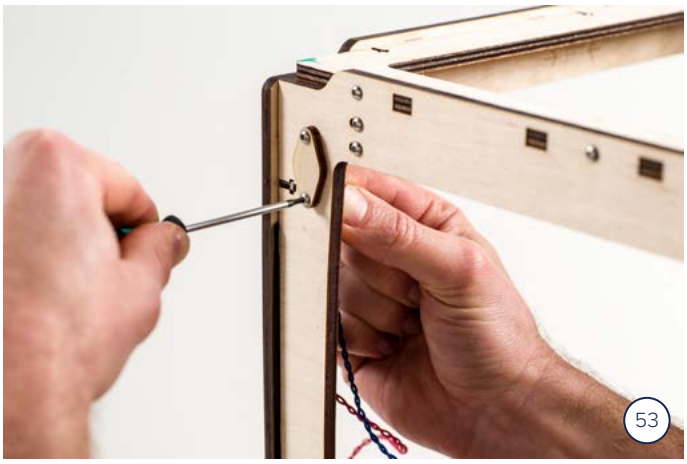
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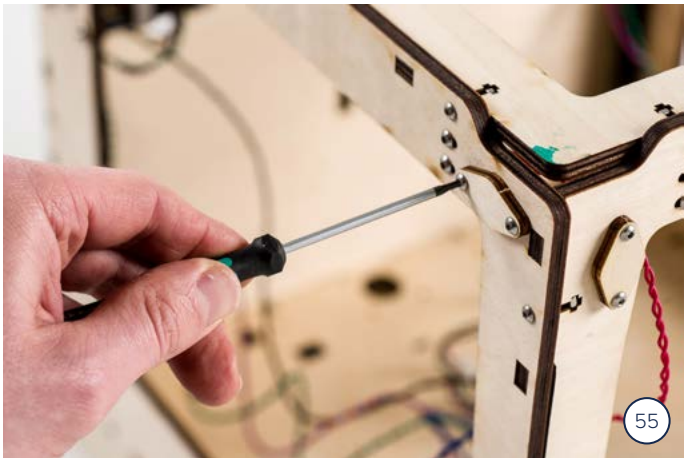
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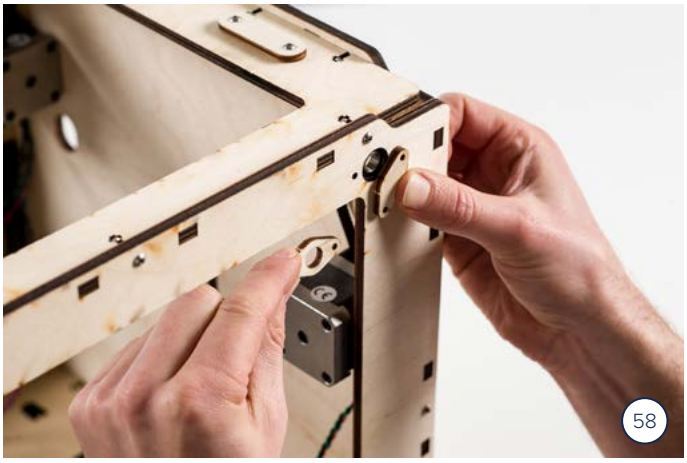
57

5. In corner C, attach a wooden cap with hole and a wooden cap without hole to the right panel. Secure loosely with only one M3x16 bolt and one hex nut. Fig. 58.
6. Attach only a wooden cap without hole to the back panel. Secure loosely with only one M3x16 bolt and one hex nut. Fig. 59.
7. In corner D, attach a wooden cap with hole and a wooden cap without hole to the back panel. Secure loosely with only one M3x16 bolt and one hex nut. Fig. 60.
8. Attach only a wooden cap without hole to the right panel. Secure with two M3x16 bolts and two hex nuts. Fig. 61.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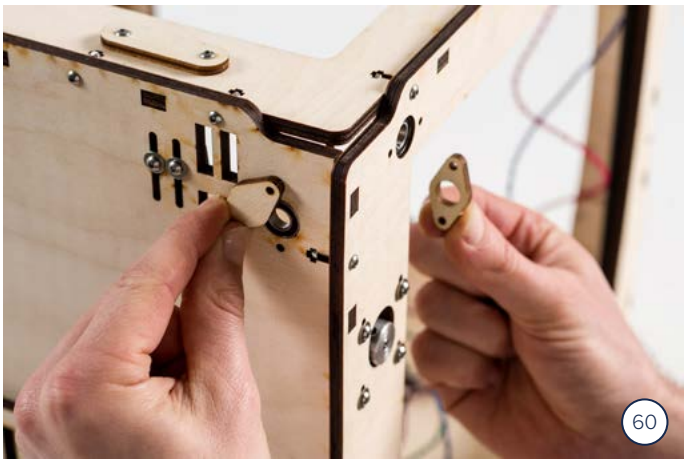
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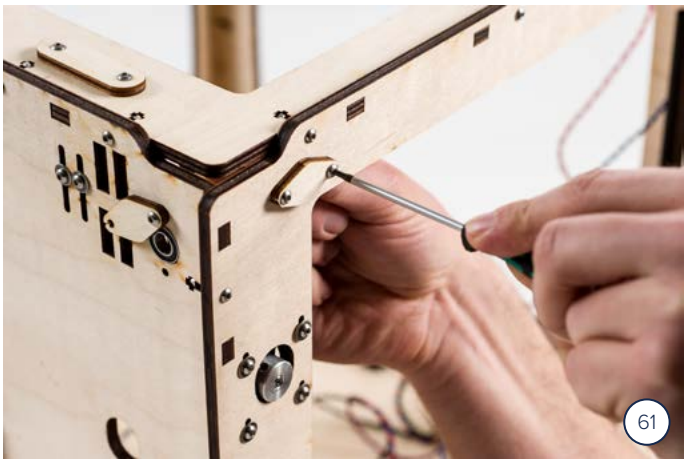
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3.3 PLACING THE X AND Y AXLES

PARTS NEEDED

Axles pack

2	1011	Y linear shaft (long)
2	1012	X linear shaft (short)

Belt pack

4	1086	Long timing belt

Pulley pack

10	1088	Pulley 8 mm

Nuts & bolts pack

4	1204	M3x16 bolt
4	1209	Hex nut
10	1211	Set screw

Pre-assembled parts

4	Sliding block (front, back, left, right)

62

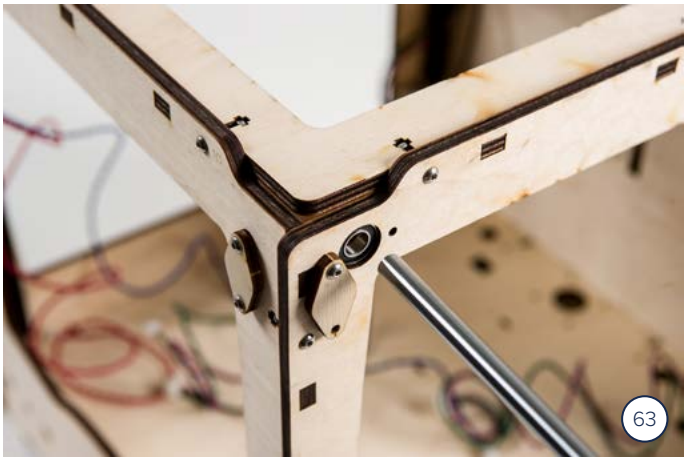
First prepare all the pulleys by replacing the set screws inside the pulleys by the stainless steel set screws that are separately supplied. Do not screw them in too far, the pulleys must be able to slide over the axles.

3.3.1 FRONT X AXLE

1. Take one X axle (short).
2. Rotate the wooden cap without hole (right panel, front).
3. Insert the X axle through the right panel (and wooden cap with hole) and move towards the left panel. Fig. 63.
4. Place the following parts on the front X axle:

- One timing pulley, with the thin side facing outwards. Place a long timing belt around this pulley. Fig. 64.
- The front sliding block. Make sure that the T-slot is facing inwards and the text is upright. Fig. 65.
- One timing pulley, with the thin side facing outwards. Place a long timing belt around this pulley. Fig. 66.

5. Move the front X axle all the way into the left panel. Fig. 67.
6. Rotate the wooden cap without hole to its normal position and fix with a M3x16 bolt and hex nut. Fig. 68.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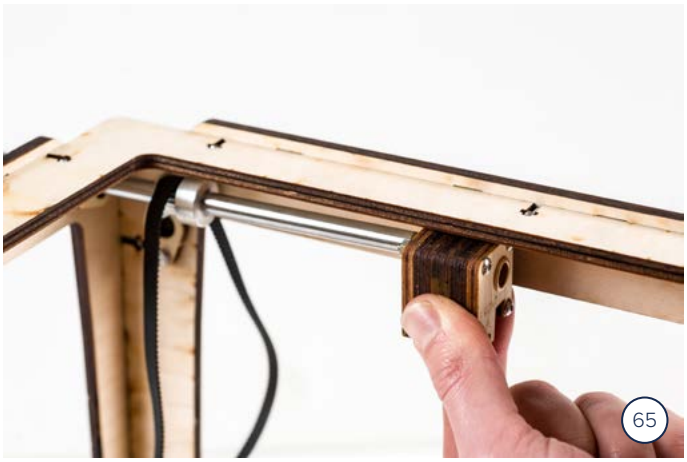
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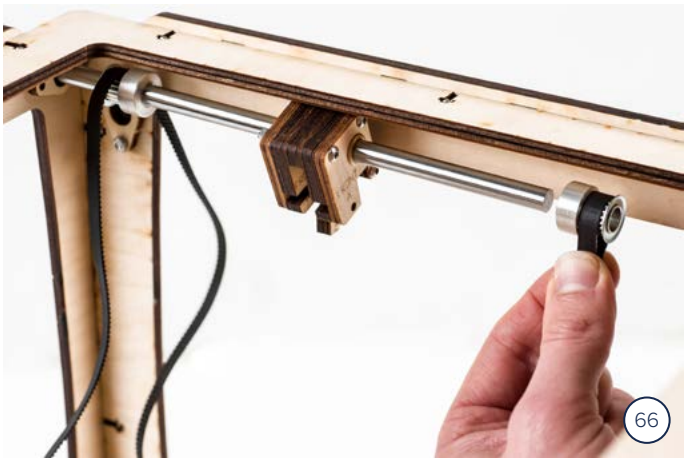
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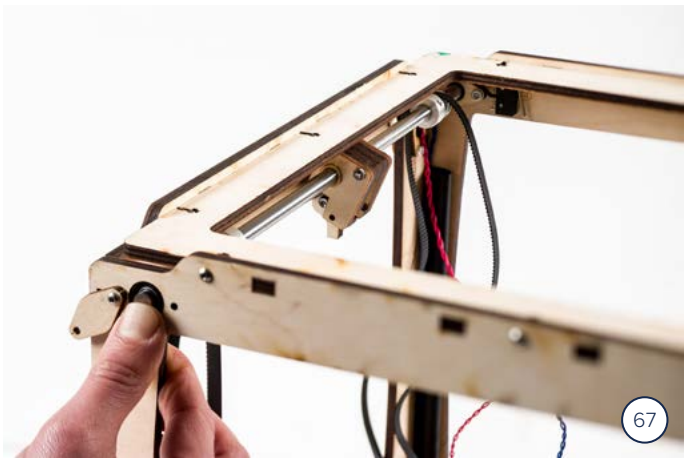
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3.3.2 BACK X AXLE

To correctly place the back X axle, perform the following actions:

1. Take the other X axle (short).
2. Rotate the wooden cap without hole (right panel, back).
3. Insert the X axle through the right panel (and wooden cap with hole) and move towards the left panel.
4. Place the following parts on the back X axle:

- One timing pulley, with the thin side facing outwards. Place the long timing belt connected to the front X axle around this pulley. Fig. 69.
- The back sliding block. Make sure that the T-slot is facing inwards and the text is upright. Fig. 70.
- One timing pulley, with the thin side facing outwards. Place the long timing belt connected to the front X axle around this pulley. Fig. 71.
- One timing pulley, with the thin side facing outwards. Slide the Y motor up and place the short timing belt connected to the Y motor around the pulley. Fig. 72.

5. Move the back X axle all the way into the left panel.
6. Rotate the wooden cap without hole (right panel, back) back to its normal position and secure with a bolt M3x16 and a hex nut.


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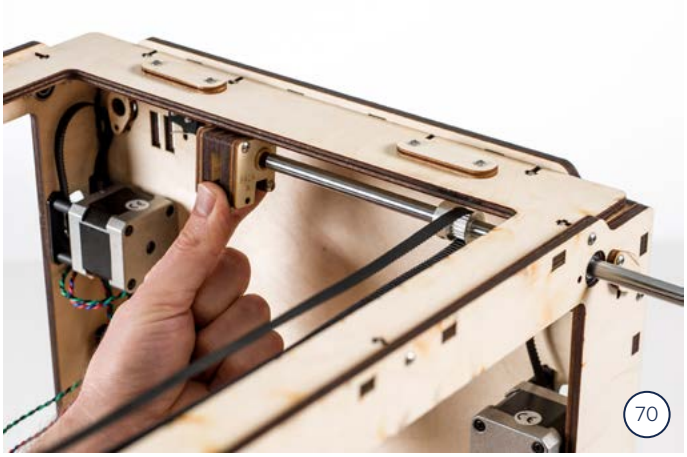
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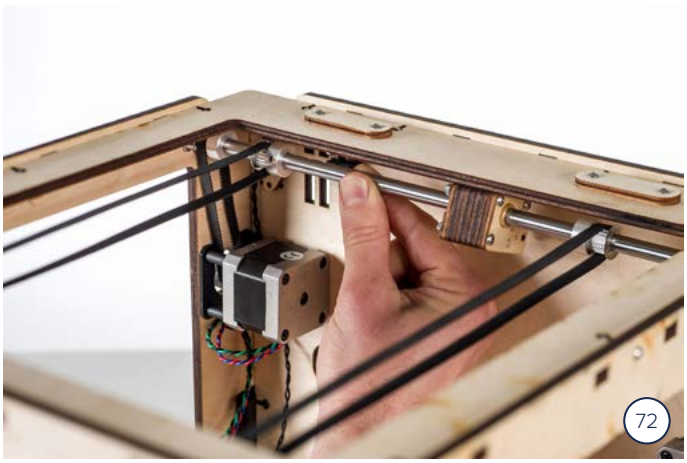
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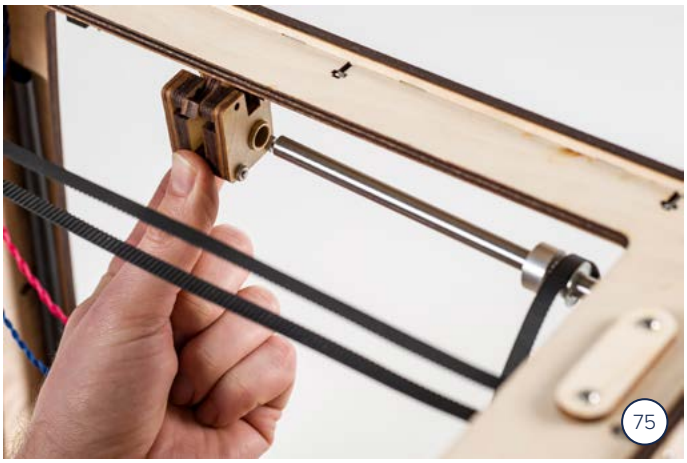
3.3.3 LEFT Y AXLE

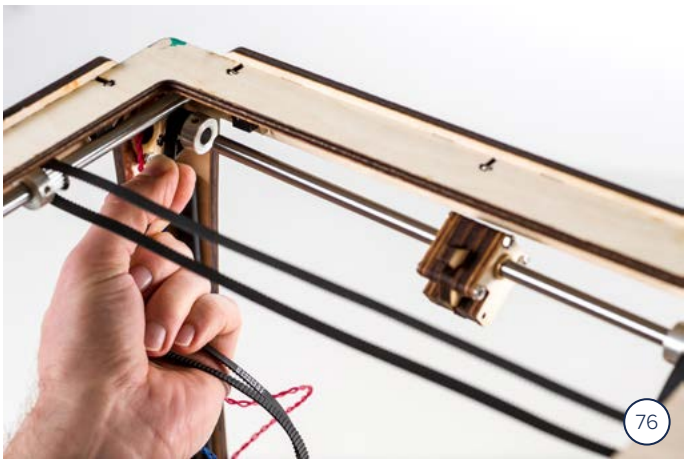
To correctly place the left Y axle, perform the following actions:

1. Take one Y axle (long).
2. Rotate the wooden cap without hole (back panel, left).
3. Insert the Y axle through the back panel (and wooden cap with hole) and move towards the front panel. Fig. 73.
4. Place the following parts on the left Y axle:

- One timing pulley, with the thin side facing outwards. Place a long timing belt around this pulley. Fig. 74.
- The left sliding block. Make sure that the T-slot is facing inwards and the text is upright. Fig. 75.
- One timing pulley, with the thin side facing outwards. Place a long timing belt around this pulley. Fig. 76.

5. Move the left Y axle all the way into the front panel. Fig. 77.
6. Rotate the wooden cap without hole (back panel, left) back to its normal position and secure with a bolt M3x16 and a hex nut. Fig. 78.





3.3.4 RIGHT Y AXLE

To correctly place the right Y axle, perform the following actions:

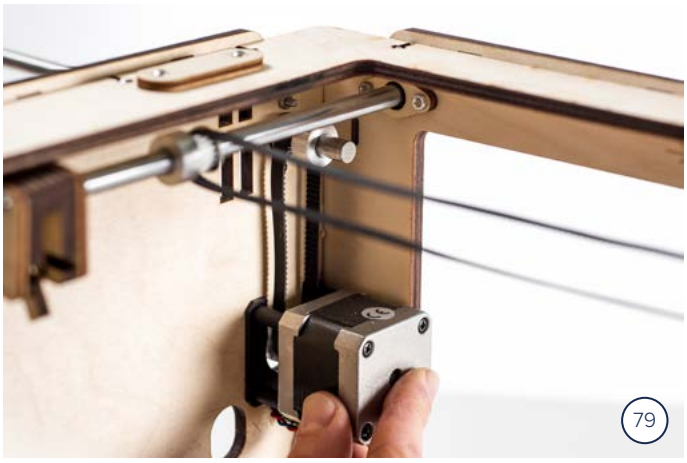
1. Take the other Y axle (long).
2. Rotate the wooden cap without hole (back panel, right).
3. Insert the Y axle through the back panel and move towards the front panel.
4. Place the following parts on the right Y axle:

- One timing pulley, with the thin side facing outwards. Slide the X motor up and place the short timing belt connected to the X motor around the pulley. Fig. 79.
- One timing pulley, with the thin side facing outwards. Place the long timing belt connected to the left Y axle around this pulley. Fig. 80.
- The right sliding block. Make sure that the T-slot is facing inwards and the text is upright.
- One timing pulley, with the thin side facing outwards. Place the long timing belt connected to the left Y axle around this pulley. Fig. 81.

5. Move the right Y axle all the way into the front panel.
6. Rotate the wooden cap without hole (back panel, right) back to its normal position and secure with a bolt M3x16 and a hex nut.

Check if all axles are able to turn freely. If not, add a washer between the axle and the wooden cap.

Lastly, place the long belts inside the sliding blocks and close the claws (Fig. 82). Do not secure yet, this will be done later.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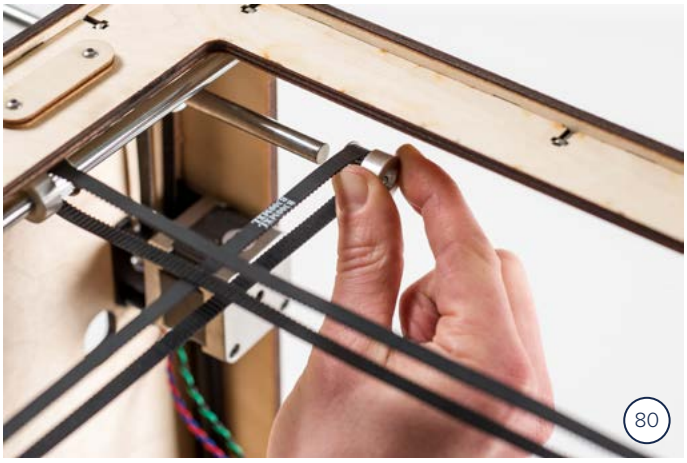
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4 Z STAGE

Assembly of the Z stage consists of several parts. You will start by preparing the aluminium base plate and heated bed, that together form the Z stage. After this, the Z stage cap will be assembled and the Z stage can be installed in the Ultimaker.

Assembling the Z stage requires the following tools: hex key 2 mm, hex key 2.5 mm, flat screw driver and socket wrench or pliers.

4.1 ASSEMBLING THE Z STAGE

PARTS NEEDED

Laser pack

1	1154	Glass plate
1	1155	Heated bed
1	1818	Aluminium base plate
1		Wooden main part Z stage cap 6 mm
2		Wooden middle part Z stage cap 4 mm
1		Wooden left part Z stage cap 4 mm
1		Wooden right part Z stage cap 4 mm

Bearing pack

2	1170	Square flanged linear bearing

Axle pack

1	1159	Z motor
1	1187	Trapezoidal lead nut

Cable pack

1	1183	Heated bed cable

Grease pack

1	1524	Copper grease

Injection molding pack

1	1243	Heated bed cable clip

Nuts & bolts pack

3	1152	Table spring
6	1202	M3x10 bolt
6	1203	M3x12 bolt
4	1205	M3x14 bolt
10	1209	Hex nut
4	1214	Lock nut
8	1217	M4x10 bolt
4	1256	Glass retainer clip
3	1257	Knurled nut
3	1288	Washer M6
4	1355	Countersunk bolt M3x8
3	1356	Countersunk bolt M3x20

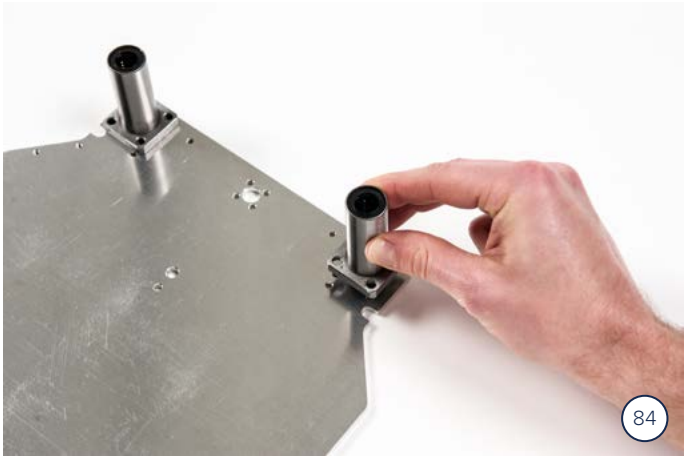
4.1.1. PREPARING THE ALUMINIUM BASE PLATE

First you will prepare the aluminium base plate on which the bed will be placed later. You need the base plate, the bearings, the lead nut, eight M4x10 bolts and four M3x10 bolts (Fig 83).

83

To correctly prepare the base plate, perform the following actions:

1. Place the aluminium plate in front of you, as shown on the pictures below.
2. Place the two linear bearings over the corresponding holes in the corners. Fig. 84.
3. Loosely secure them with four M4x10 bolts each, use the 2.5 mm hex key. Make sure that the bearings can still move a little bit, you will calibrate them later. Fig. 85.
4. Place the golden lead nut in the hole in the middle of the aluminium base plate and secure with four M3x10 bolts from the bottom of the base plate. Fig. 86 and 87.



4.1.2. PREPARING THE HEATED BED

Before you can place the heated bed on the base plate, you need to attach some parts. You need the heated bed, the heated bed cable, two glass retainers, four small countersunk bolts (M3x8) and four lock nuts (Fig. 88).

88

Perform the following actions:

1. Place the two glass retainer clips on the back of the heated bed, with the wide side at the bottom (black) side.
2. Secure them with two countersunk bolts and two lock nuts each. Fig. 89.
3. Place the heated bed in front of you with the aluminium side facing down and the screw terminal towards you.
4. Insert the heated bed cables with the thick gray wires (heater) on the right side and the thin black wires (sensor) on the left side. Fig. 90.
5. Tighten the screws in the terminal to secure the wires in place, using a flat screwdriver. Fig. 91.

Make sure all the wires are locked in place. Pull each wire individually to check this. If they are not well secured you may experience a heated bed failure.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4.1.3. PREPARING THE BED AND BASE PLATE

Now that the base plate and bed have been prepared, you can connect them to finish the Z stage. You need three long countersunk bolts (M3x20), three springs, three knurled nuts, three large washers (M6), two more glass retainer clips, the heated bed cable clip and some copper grease (Fig. 92).

92

Perform the following actions:

1. Take the M6 washers and apply some copper grease on the round side. Fig. 93.
2. Place the washers over the knurled nuts with the grease upwards. Fig. 94.
3. Put the knurled nuts through the three holes of the base plate, in the front, right and back middle. Fig. 95.
4. Place a spring on each of the knurled nuts. Fig. 96.

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5. On the front two springs, place a glass retainer clip. Fig. 97.
6. Put the heated bed on top of the springs and secure with the three countersunk M3x20 bolts. Fig. 98 and 99.

Tighten the bolt and knurled nut in the back until there is approximately 1 mm of space between the bed's screw terminal and the aluminium base plate. Adjust the front two nuts until there is about equal tension on the three springs. You will fine-tune this later. Fig 100.

7. Place the heated bed cable clip over the heated bed cable in the back left of the base plate and secure with two M3x10 bolts. Fig. 101.
8. Open the glass retainer clips, slide the glass plate onto the heated bed and close the clips. Fig. 102.


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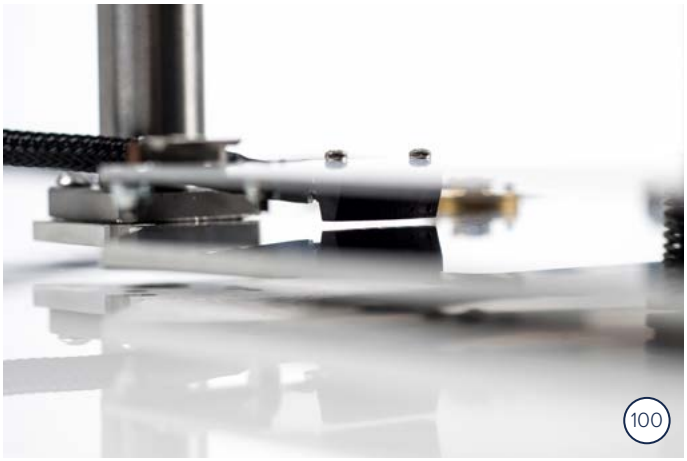
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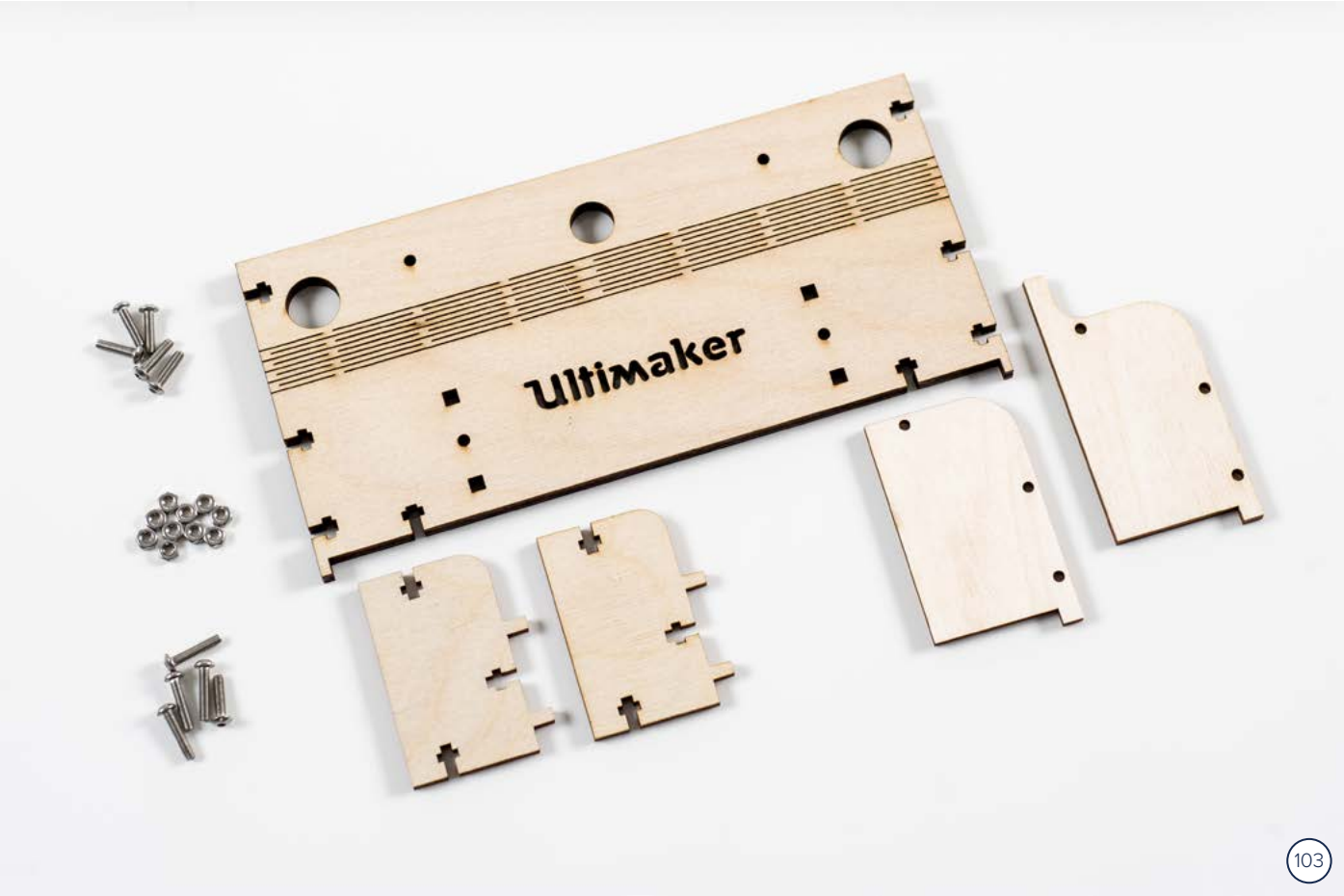
4.1.4. Z STAGE CAP

The Z stage cap will be placed over the back of the Z stage, to cover the bearings. You need the wooden parts, ten hex nuts, six M3x12 bolts and 4 M3x14 bolts (Fig. 103).



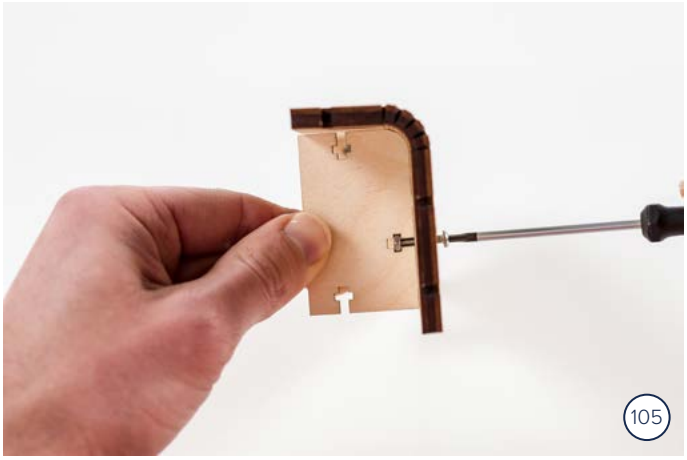
103

To assemble the Z stage cap, perform the following actions:

1. Place the big 6 mm wooden part face down in front of you so the text Ultimaker is mirrored.
2. Take the wooden middle parts and place them into the middle slots. Fig. 104.
3. Fold the 6 mm wooden part 90 degrees and attach it to the middle parts with four M3x14 bolts and four hex nuts. Fig. 105.
4. Place six hex nuts in the slots at the sides and attach the wooden left and right parts with six M3x12 bolts. Fig. 106 and 107.

Make sure the part with the extra tab at the top is placed on the left side (towards the U of Ultimaker). This tab will activate the Z limit switch.


104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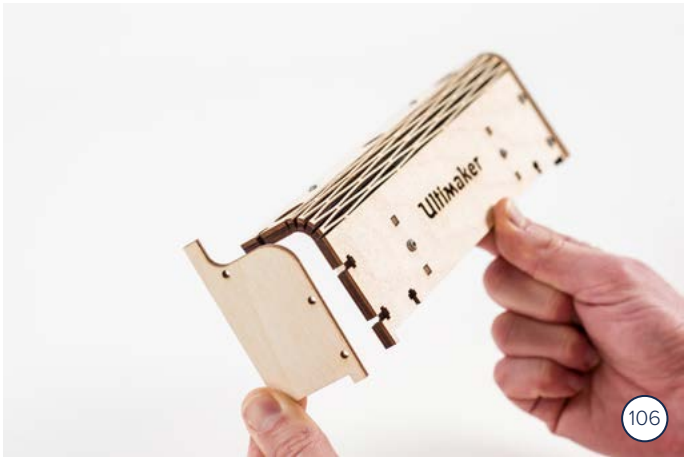

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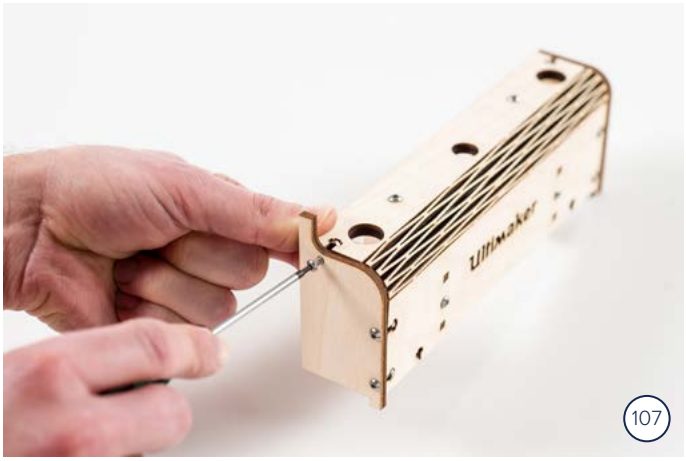

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4.2 INSTALLING THE Z STAGE

PARTS NEEDED

Axles pack

1	1028	Z linear shaft
1	1159	Heated bed

Laser pack

2		Wooden part 3A

Grease pack

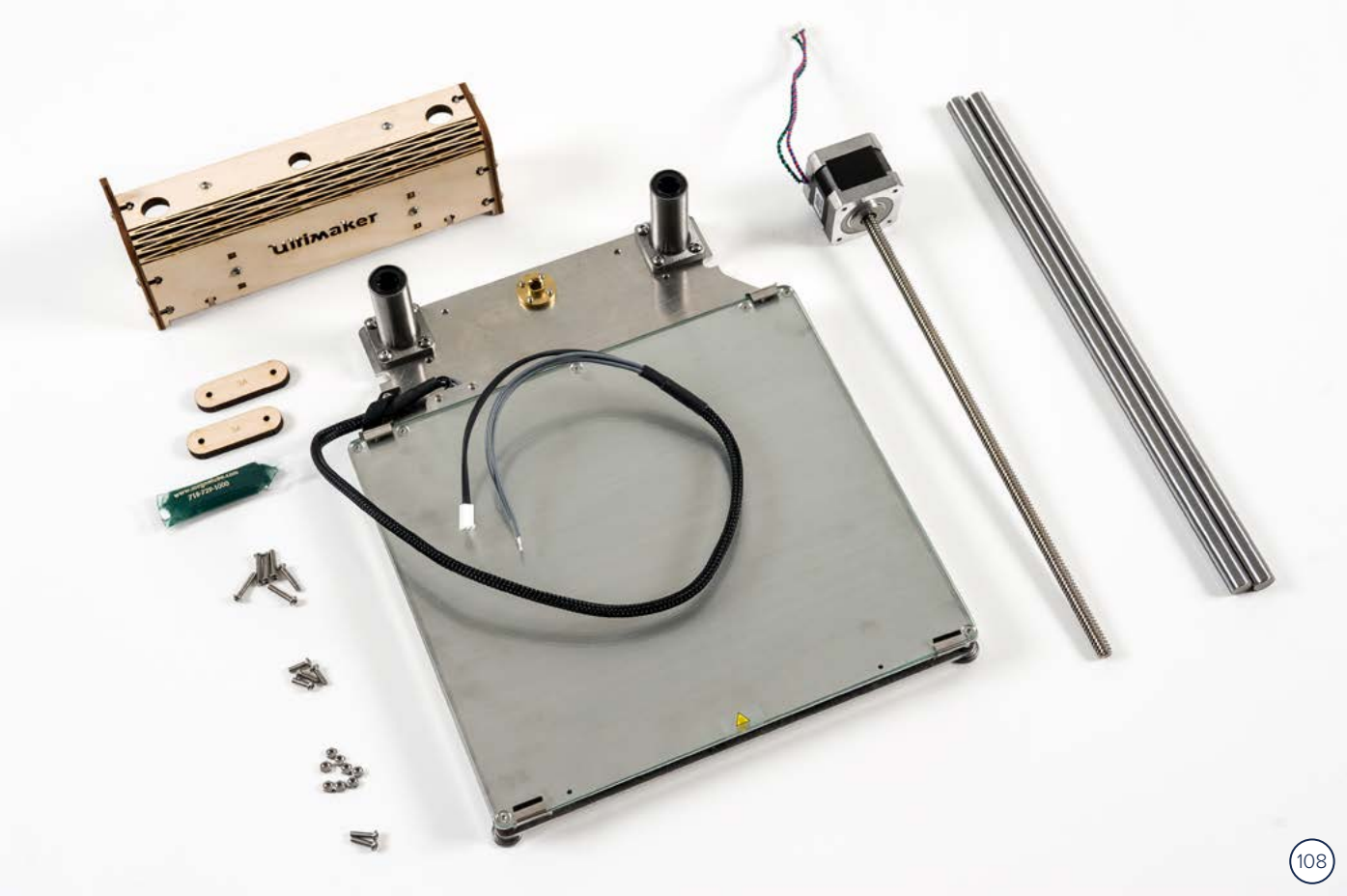
1	1126	Grease

Nuts & bolts pack

4	1202	M3x10 bolt
2	1203	M3x12 bolt
4	1204	M3x16 bolt
6	1209	Hex nut

Pre-assembled parts

1	Z stage
1	Z stage cap



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4.2.1. PLACING THE Z STAGE INSIDE THE FRAME

To install all the Z stage parts in the machine, perform the following actions:

1. Place the frame on its back, with the bottom panel facing you.
2. Insert the two Z linear shafts through the holes in the bottom panel, until they are about halfway. Fig. 109.
3. Place the Z stage and Z stage cap in the frame and over the Z linear shafts. Fig. 110, 111 and 112.
4. Now insert the Z linear shafts completely and make sure they go into the holes in the top panel. The shafts should not stick out of the bottom panel at all. Fig. 113 and 114.

This might take some force. Use a redundant piece of wood and a hammer to knock the shafts into place if necessary.


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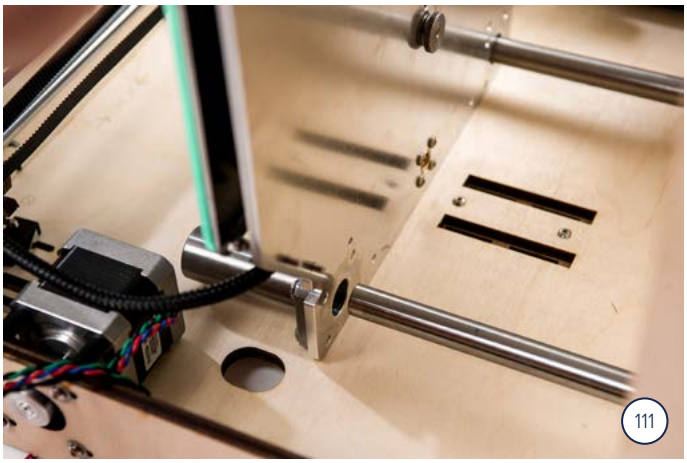
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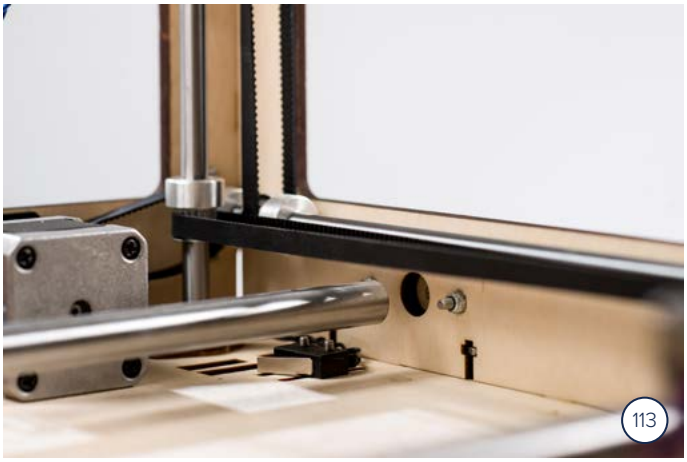
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5. Place the wooden parts 3A over the end of the Z linear shafts and secure with two M3x16 bolts and two hex nuts each. Insert the bolts from the inside of the frame. Fig. 115 and 116.
6. Insert the lead screw of the Z motor through the hole in the middle and screw into the trapezoidal lead nut of the Z stage. Fig. 117 and 118.
7. Secure the Z motor to the bottom panel with four M3x10 bolts. Make sure the motor cable is facing away from the back panel. Fig. 119.
8. Guide the heated bed cable through the metal cable clamp on the left panel and through the hole in the bottom panel. Fig. 120.

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4.2.2. APPLYING GREASE

For the lead screw, a small packet of green grease is supplied. This grease makes sure that the Z motor's lead screw can rotate smoothly.

1. Set the frame upright again and make sure the Z stage is all the way at the top.
2. Open the packet of grease and spread the grease down the lead screw in a straight line. The grease will spread across the whole screw when the Z stage moves up and down later. Fig. 121.

The green grease is only for the Z motor's lead screw. Never use this grease to lubricate the X and Y axles, for this you can use sewing machine oil.

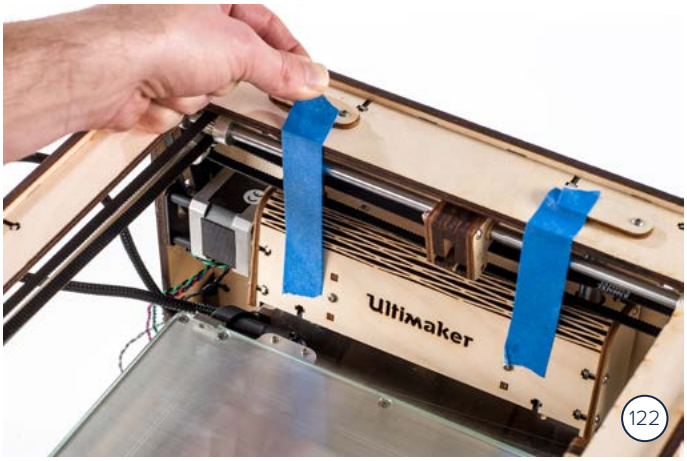
4.2.3. CALIBRATING

To ensure that the Z stage moves smoothly and accurately, you now need to calibrate the square flanged bearings.

1. Move the Z stage cap all the way up and tape it to the top panel to keep it out of the way. Fig. 122.
2. Place the roll of blue tape in the middle of the bottom panel.
3. Grab the base plate on both sides at the back and move it down until it lays flat on the roll of tape. Fig. 123.
4. Tighten the eight M4x10 bolts of the square flanged bearings with the 2.5 mm hex key. Alternate between the left and right bearing. Fig. 124.

   Make sure the Z stage stays in the same position while tightening the bolts.

5. Move the Z stage up and down to check if it moves smoothly.
6. Loosen the Z stage cap from the top panel and place it into the aluminium base plate. Fig. 125.
7. Place two hex nuts in the T-slots of the Z stage cap and secure the cap with two M3x12 bolts. Fig. 126.



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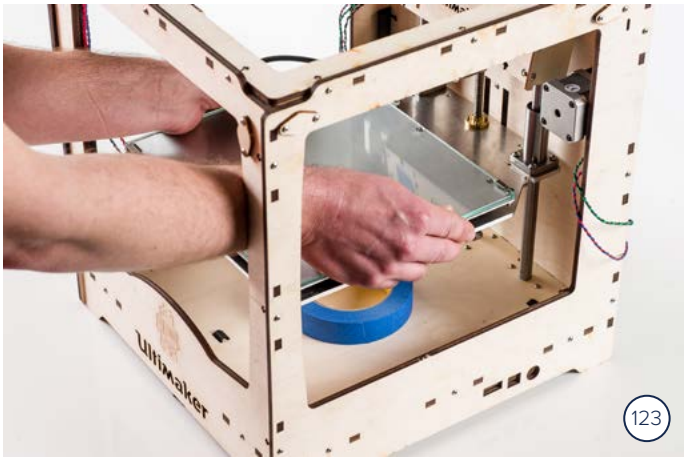

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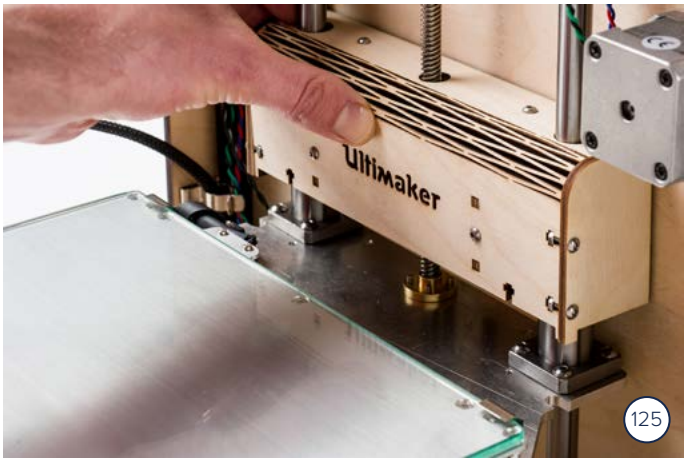

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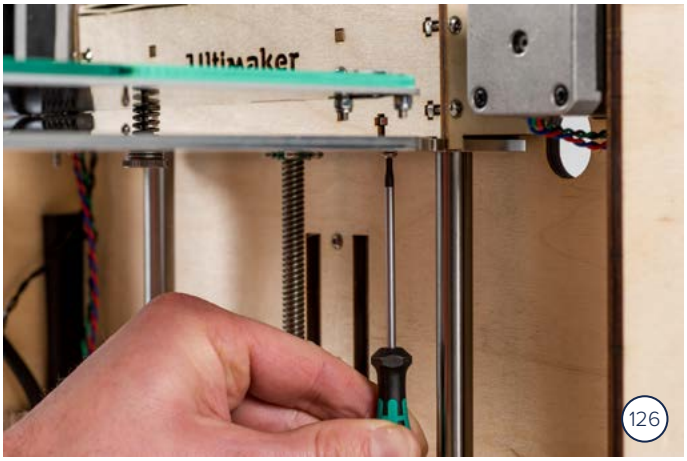


126

5 PRINT HEAD

The print head exists of several parts that must be assembled: the housing, hot end and fan. When the print head is assembled it can be placed in the frame and can be aligned.

For the print head assembly you will need the 2 mm hex key and crosshead screwdriver.

5.1 PRINT HEAD ASSEMBLY

PARTS NEEDED

Hot end pack

1	1048	Aluminium hot end holder
1	1049	Aluminium heater block
1	1053	Hot end isolator tube
1	1054	Nozzle
1	1055	Teflon coupler
1	1067	PEEK isolator
1	1069	Tube coupling collet

Cable pack

1	1185	PT100 B sensor
1	1513	Heater cartridge

Bearing pack

2	1065	Linear bearing

Fan pack

1	1326	Warning sticker
1	1501	Metal fan duct
1	1512	Print head fan

Injection molding pack

1	1037	Print head coupling plate

Laser pack

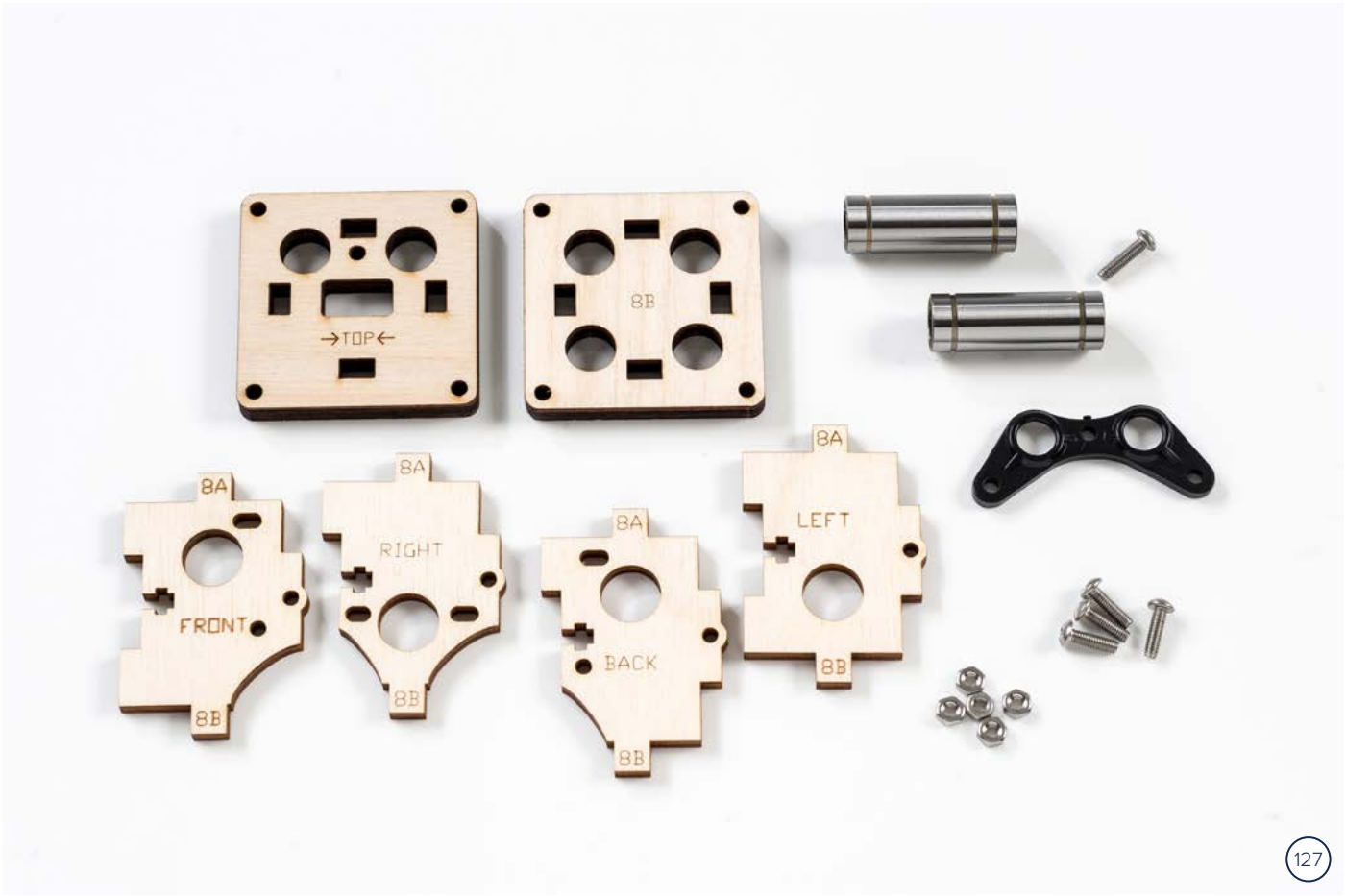
1		Wooden part FRONT
1		Wooden part BACK
1		Wooden part LEFT
1		Wooden part RIGHT
1		Wooden part TOP
1		Wooden part 8B

Nuts & bolts pack

5	1202	M3x10 bolt
1	1203	M3x12 bolt
2	1204	M3x16 bolt
5	1209	Hex nut
2	1348	M3x4 bolt
2	1362	Self tapping bolt
2	1545	Spacer 3 mm
4	1680	Thumb screw

5.1.1. WOODEN PARTS

First prepare the wooden parts of the print head housing. You will need the following parts (Fig. 127):



127

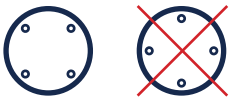
1. Take the wooden part marked TOP and attach the black injection molded part with one M3x12 bolt and a hex nut. Put this part aside, you will need it later on. Fig. 128 and 129.

128

129

2. Take the wooden print head housing parts marked FRONT, BACK, LEFT, RIGHT.
3. Place one linear bearing in the FRONT and the BACK side of the print head housing. Make sure the engravings are on the outside. Fig. 130 and 131.

Look at the inside of the linear bearings and note their orientation. Make sure the 4 rows of balls are in an x shape, not a +.



4. Place one linear bearing in the RIGHT side of the print head housing.
5. Fit the RIGHT side with bearing into the FRONT-BACK sides of the print head housing. Now press the LEFT side on and make sure the bearing fits neatly in the corresponding hole. Fig. 132 and 133.
6. Place the print head housing into the wooden part 8B. Fig. 134.
7. Loosely secure the print head housing with four M3x10 bolts and four hex nuts. Do not tighten completely yet. Fig. 135.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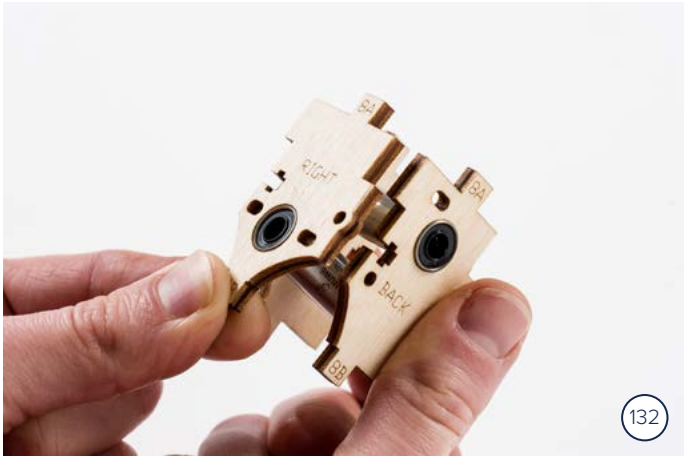
131



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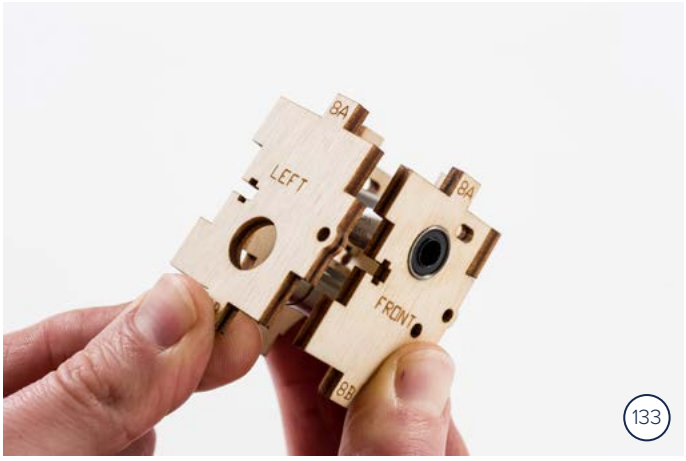

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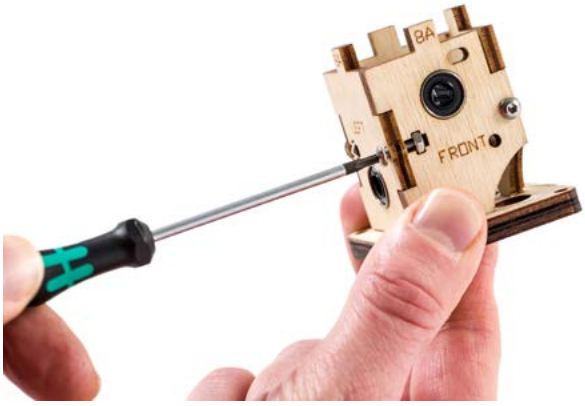


135

5.1.2. HOT END

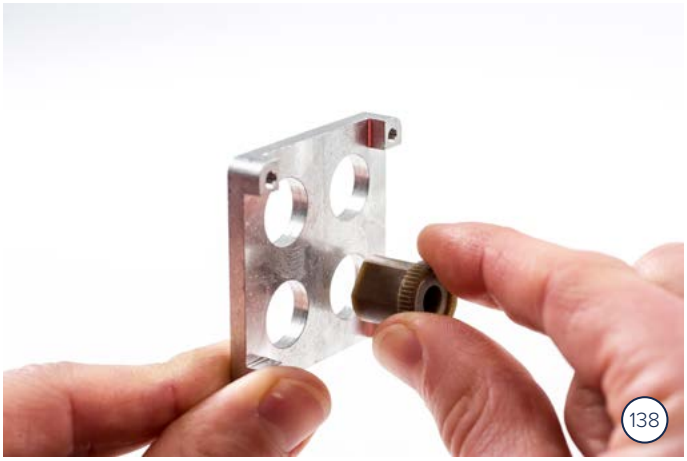
Now prepare the hot end.

1. Take the aluminium heater block and hold it with the big hole up. Attach the nozzle into the bottom of the heater block. Make sure it is as tight as possible (by hand). Fig. 136.
2. Attach the hot end isolator tube to the aluminium heater block. Make sure the short side of the tube goes into the heater block. Fig. 137.
3. Place the peek into the aluminium hot end holder. Fig. 138.
4. Attach the peek to the hot end isolator tube. Hold the aluminium heater block in the same position and rotate the peek. Fig. 139.

Make sure the parts are attached tightly, but be careful not to break the hot end isolator tube.


136


137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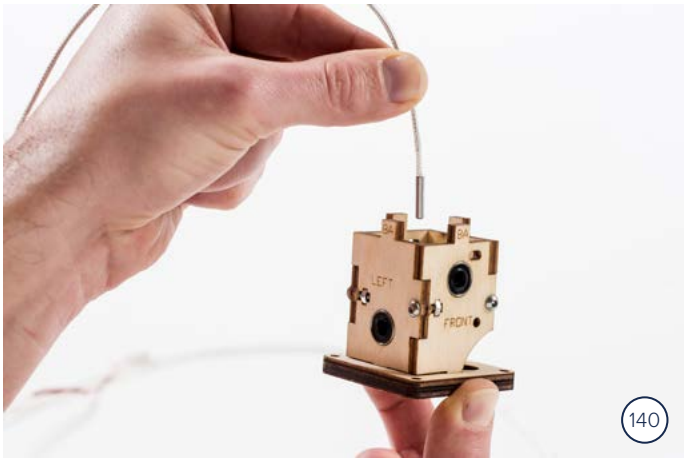
139

5.1.3. CABLES

To connect the hot end cables, perform the following actions:

1. Guide the PT100 and the heater cartridge through the front left hole of the aluminium hot end holder (with the hot end being in the front right hole) and the print head housing. Fig. 140, 141, 142 and 143.

It is easiest to guide the PT100 from the top and the heater cartridge from the bottom of the print head housing and aluminium hot end holder.



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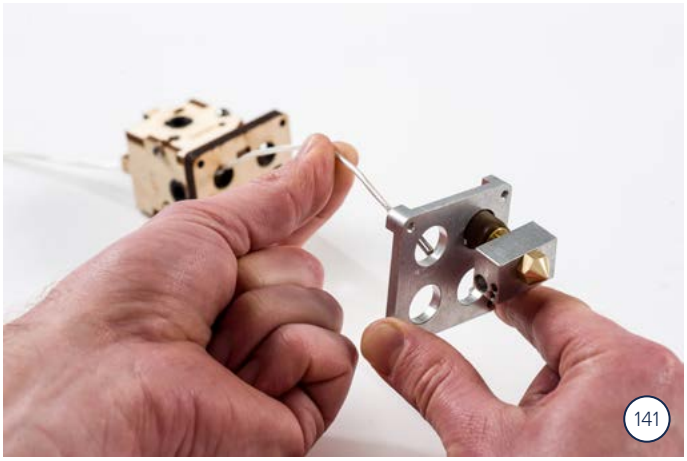
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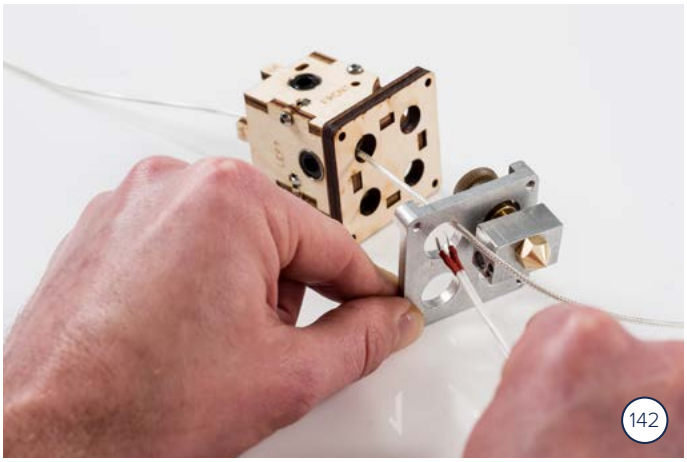
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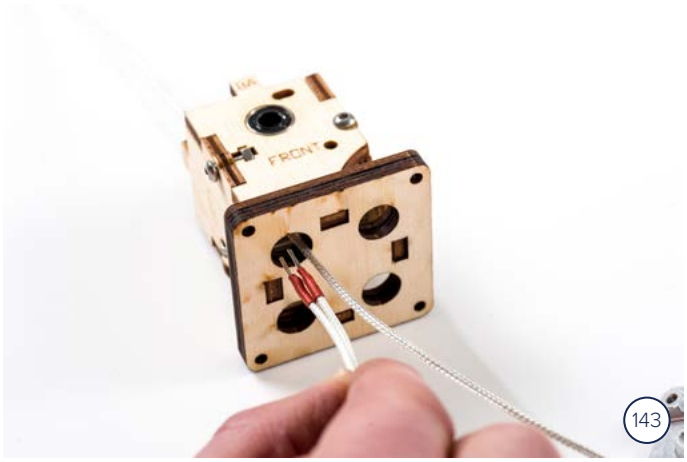
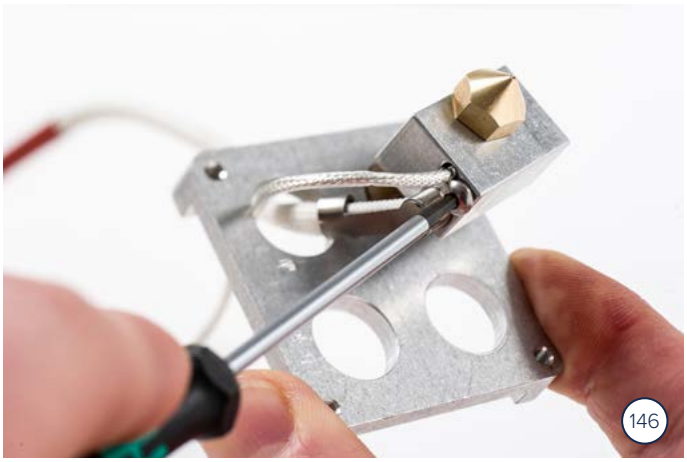


143

2. Place the PT100 and heater cartridge in the side of the aluminium heater block with the three holes. The heater cartridge goes in the biggest hole and PT100 in the middle hole. Fig. 144 and 145.
3. Secure the PT100 and heater cartridge with one M3x10 bolt. Fig. 146.
4. Guide the wires of the fan through the back left hole of the aluminium hot end holder and the print head housing. Fig. 147.
5. Now guide all the wires (PT100, heater cartridge and fan) through the middle hole of the wooden part TOP. Fig. 148.


144


145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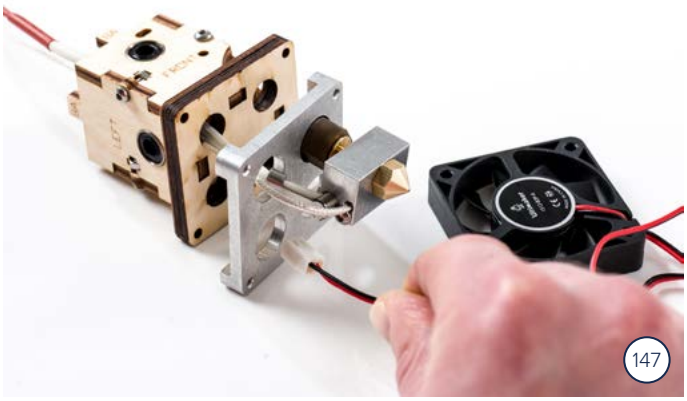
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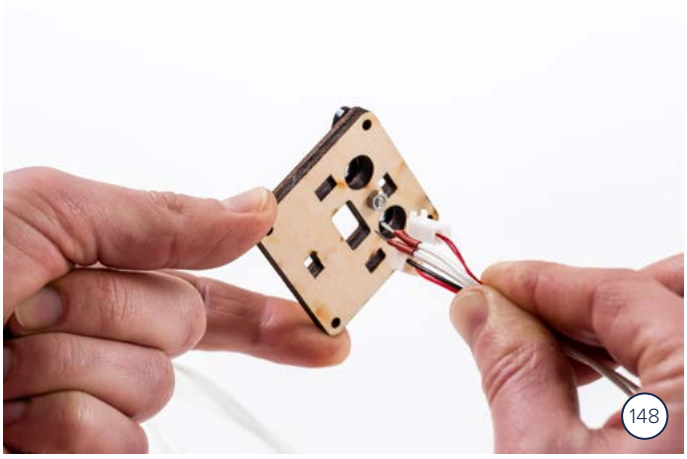
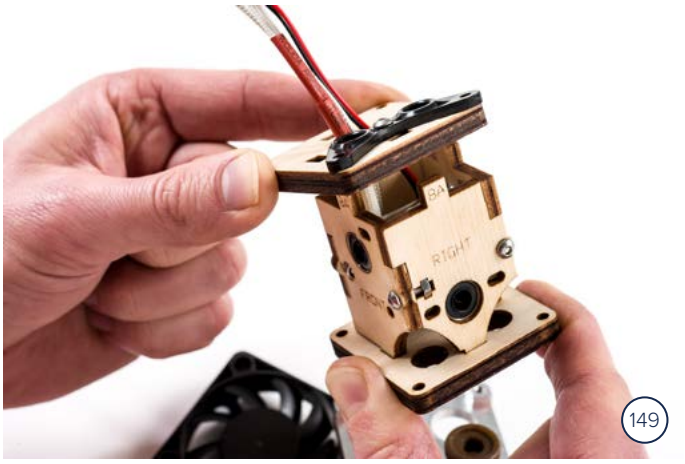

148

5.1.4. TIGHTENING UP

1. Place the wooden part TOP on the rest of the assembly, with the injection molded part on the right side. Fig. 149.
2. Tighten the four M3x10 bolts of the print head housing. Fig. 150.
3. Place the teflon coupler into the fronr right hole of the wooden part 8B and the peek isolator. Fig. 151 and 152.
4. Place the tube coupling collet into the front hole of the injection molded part. Fig. 153.
5. Place the two 3 mm spacers around two of the thumb screws and put them through the left side of the print head housing. Screw them into the aluminium hot end holder. Fig. 154.
6. Put the other two thumb screws through the right side of the print head housing, through the injection molded part. Screw them into the aluminium hot end holder.



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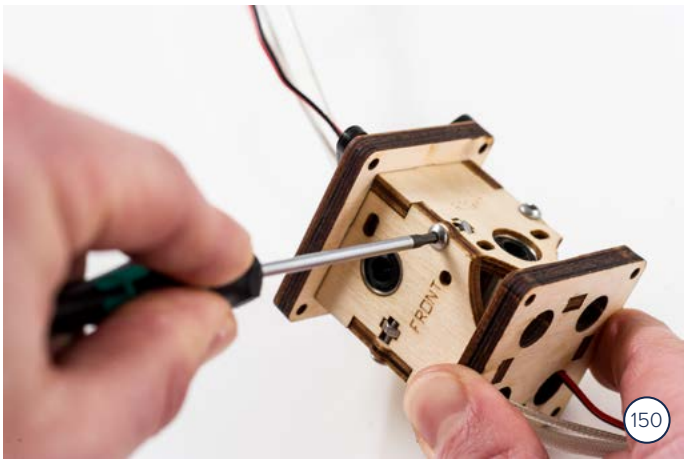

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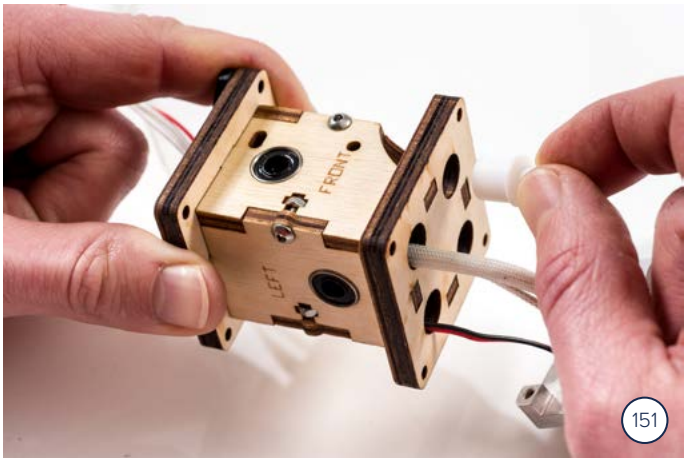

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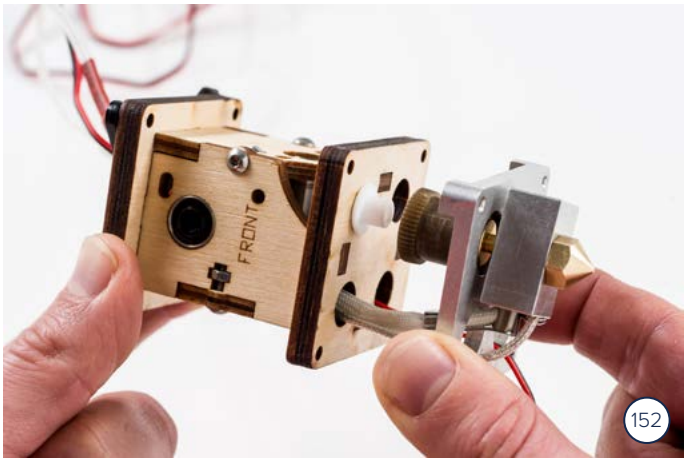

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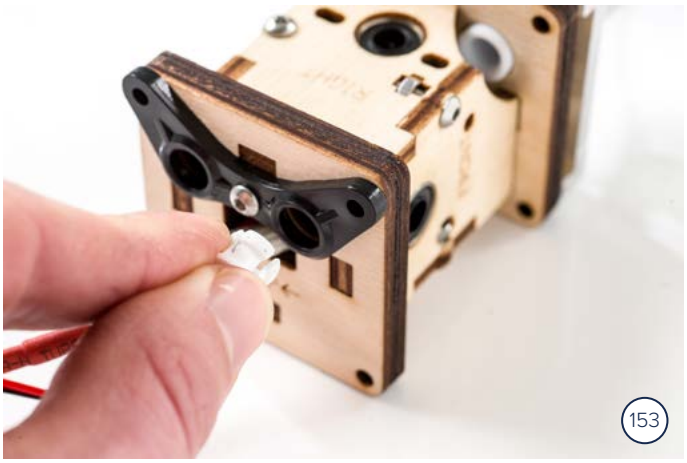
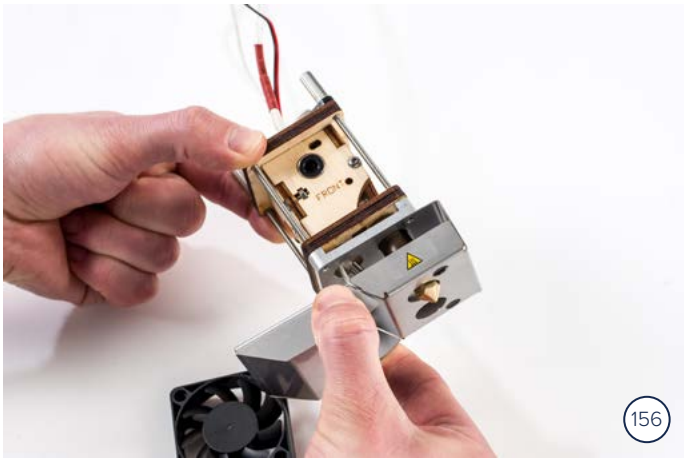

153


154

5.1.5. FAN ASSEMBLY

1. First place the warning sticker on the metal fanduct. Fig. 155.
2. Place the metal fanduct around the heater block, make sure the fan will be on the left side of the print head. Fig. 156.
3. Use two M3x4 bolts to lock it into place by screwing them into the aluminium plate of the hot end assembly. Fig. 157.
4. Position the fan correctly between the metal fancap and the hot end with the sticker facing downwards. Fig. 158.
5. Use the two M3x16 bolts to secure the fan and fancap to the aluminum plate of the hot end assembly. Fig. 159.
6. Secure the fan to the metal fancap by using the two self tapping screws, use the crosshead screwdriver. Fig. 160.


155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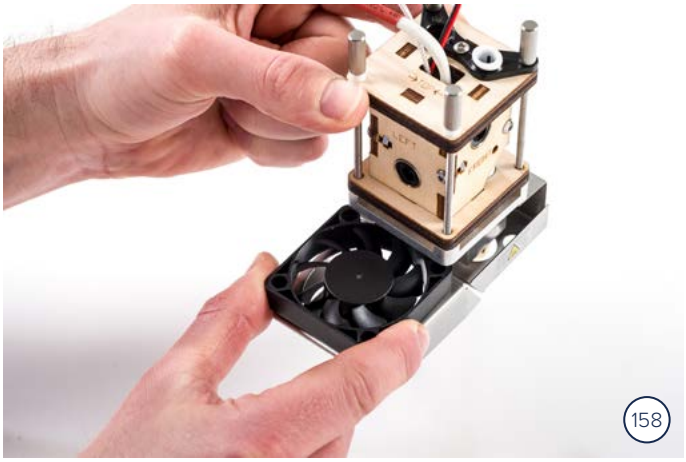
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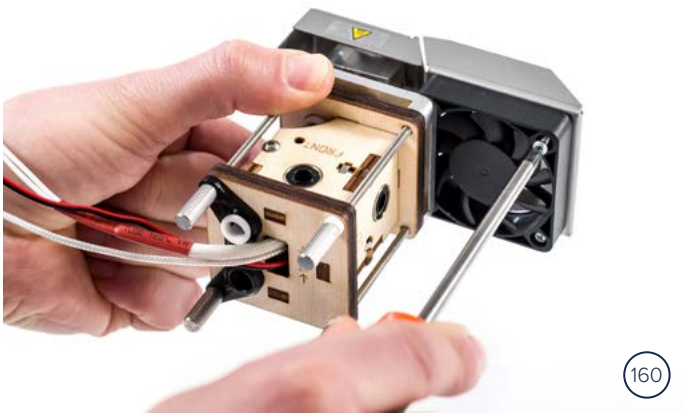

160

5.2 PLACING THE PRINT HEAD IN THE FRAME

PARTS NEEDED

Axles pack

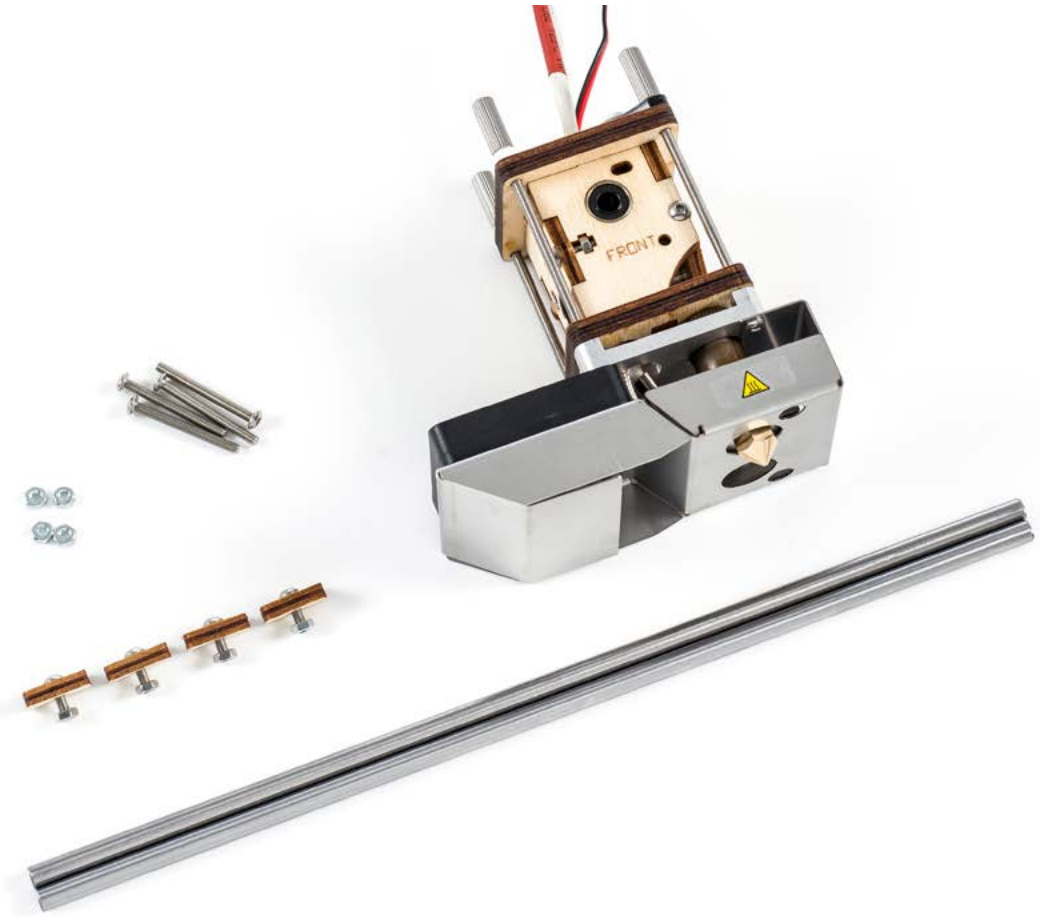
2	1046	Print head shaft X, Y

Nuts & bolts pack

4	1208	M3x30 bolt
4	1209	Hex nut

Pre-assembled parts

4	Wooden part C
1	Print head

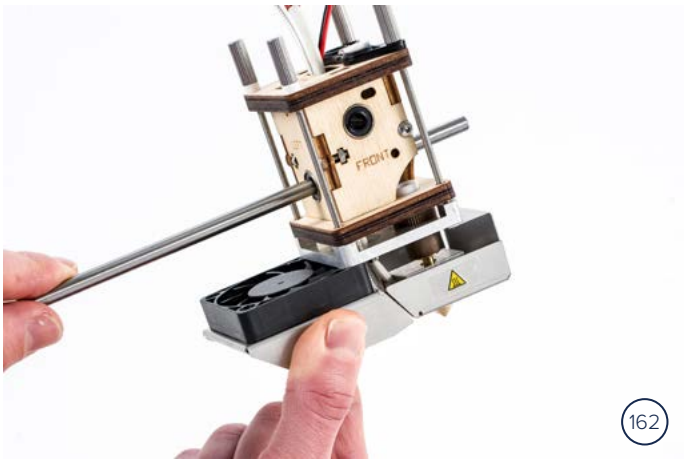


161

To place the print head in the frame, perform the following actions:

1. Guide the X print head shaft through the print head, from left to right. Fig. 162.
2. Place the print head with the X shaft inside the frame, mind the orientation. Fig. 163.
3. Place the X print head shaft into the left sliding block. Fig. 164.
4. Tilt the right sliding block and insert the right side of the X print head shaft into the sliding block. Fig. 165.
5. Close the claws of the left and right sliding blocks. Now place the wooden parts C to secure the X print head shaft, but do not tighten yet. Fig. 166 and 167.

Use a hex key to keep the claws closed while placing the wooden part C.



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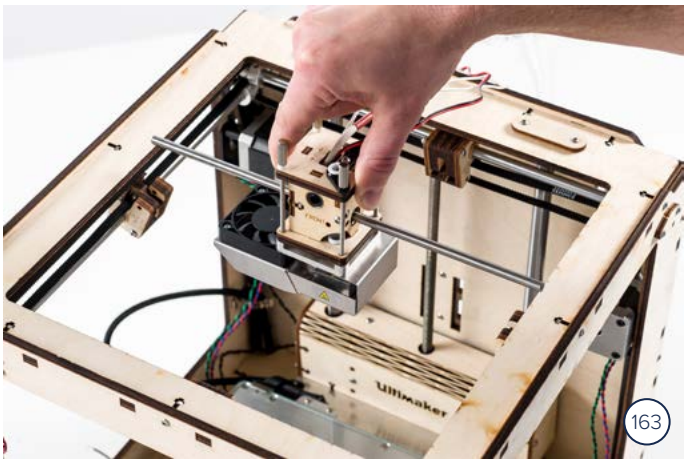

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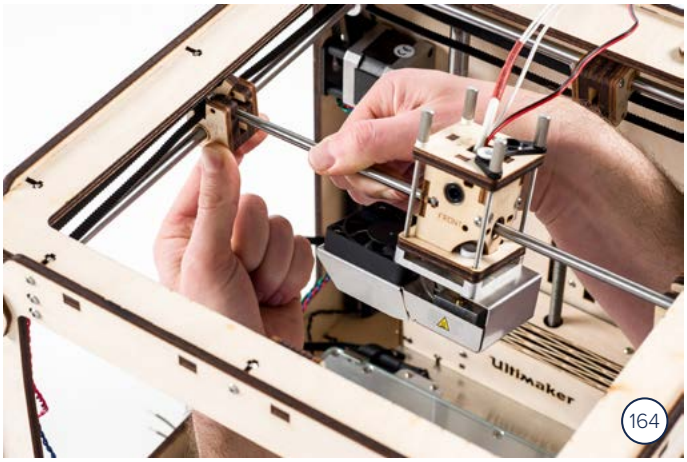

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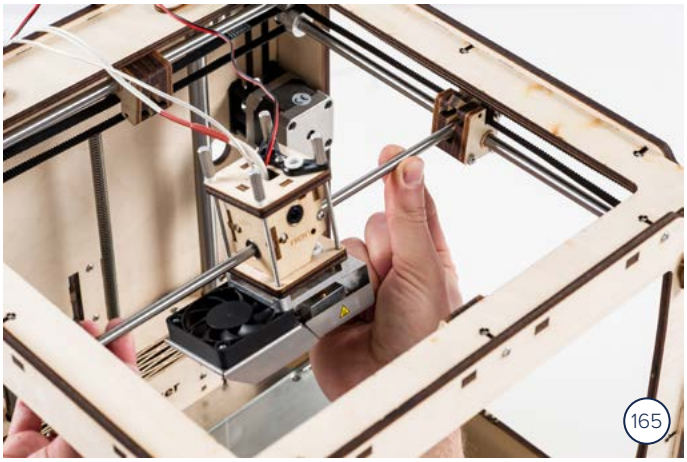
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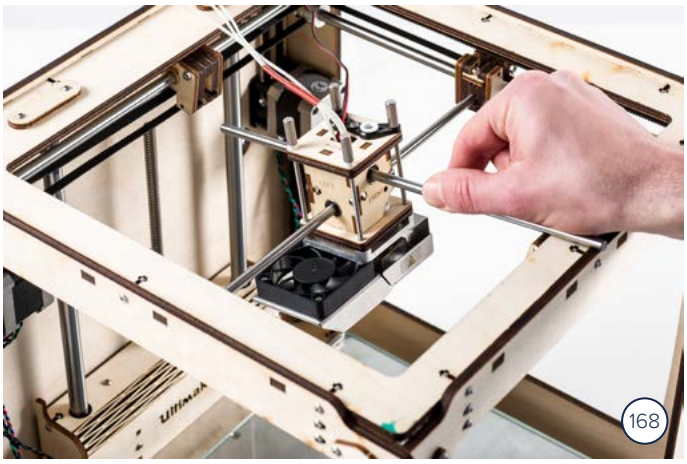
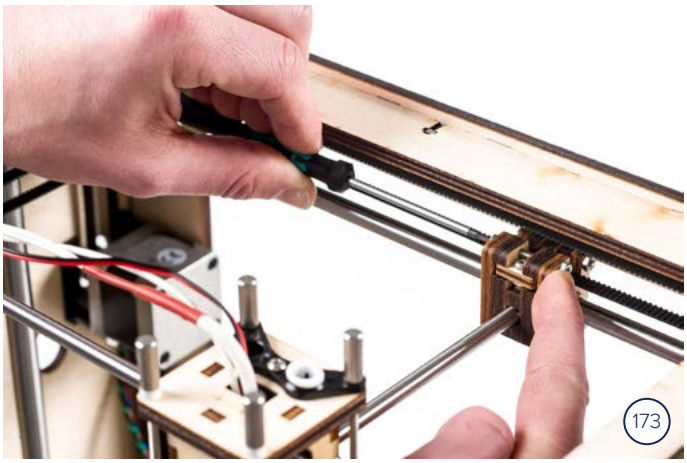
167

6. Now guide the Y print head shaft through the print head, from front to back. Fig. 168.
7. Tilt the front and back sliding blocks and insert the Y shaft into the sliding blocks.
8. Close the claws of the front and back sliding blocks. Now place the wooden parts C to secure the Y print head shaft. Fig. 169 and 170.
9. Tighten the four bolts of the wooden parts C. Fig. 171 and 172.

Check if the shafts are completely secured in the sliding blocks and cannot move.

10. Insert the M3x30 bolts in all four sliding blocks and lock in place with four hex nuts. Fig. 173.





5.3 ALIGNING THE PRINT HEAD

After placing the print head into the frame, you have to make sure that the print head shafts are exactly 90°. To correctly align the shafts, perform the actions described below.

PARTS NEEDED

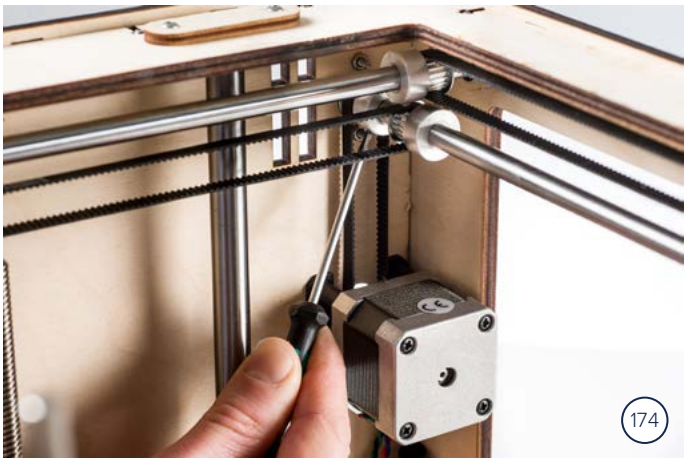
Laser pack

2	Calibration stick

5.3.1. MOTORS

1. First, tighten the two pulleys attached to the short belts of the X and Y motor. Push the pulley towards the frame and use the 2 mm hex key to tighten the set screw. Fig. 174 and 175.
2. Tension the short belts by firmly pushing the motor downwards and tighten the four M3x25 bolts on each motor. Fig. 176 and 177.

Check if the two short belts are equally tight.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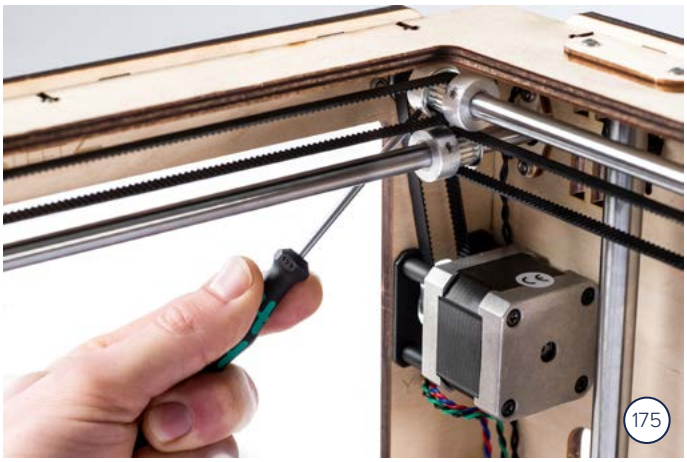
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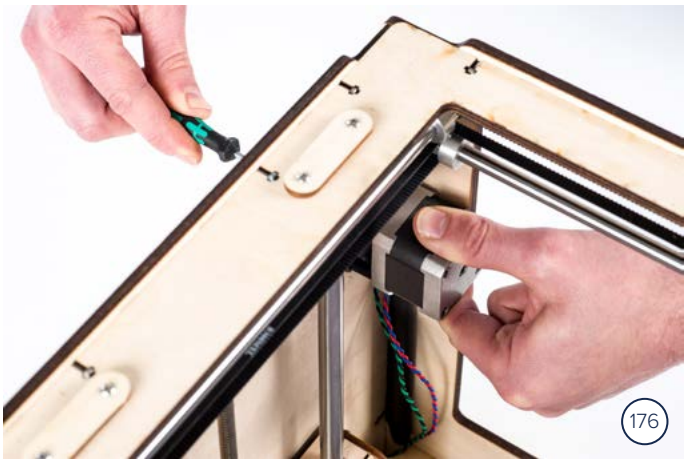
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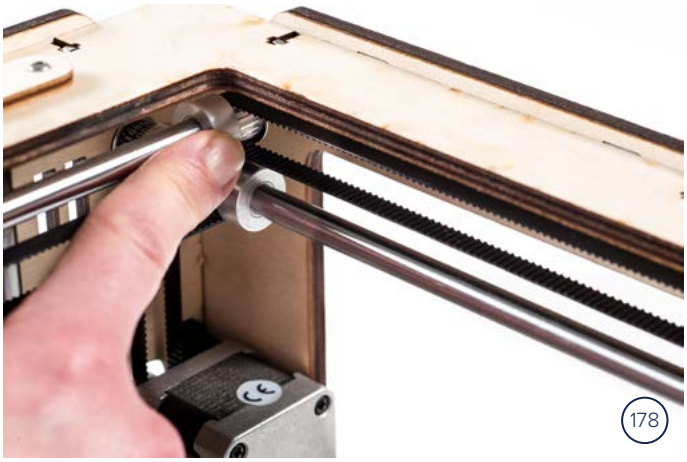
177

5.3.2. X AXLES

1. Position the pulleys on the X axles so that the long left and right timing belts are positioned in a straight line above the Y axles. Fig. 178.
2. Place the two calibration sticks on each side of the back X axle. Fig. 179.
3. Move the print head towards the back until the set screw of the left pulley (connected to the long left timing belt) is visible and place the X print head shaft into the calibration sticks.

   Make sure the calibration sticks use the same notch.

4. Tighten the set screw of the left pulley with the 2 mm hex key. Fig. 180.
5. If needed, move the print head slightly backwards or forwards until the set screw of the right pulley (connected to the long right timing belt) is visible.
6. Tighten the set screw of the right pulley with the 2 mm hex key. Fig. 181.
7. Check if the pulleys on the front X axle are still in the correct position and tighten the set screws with the 2 mm hex key.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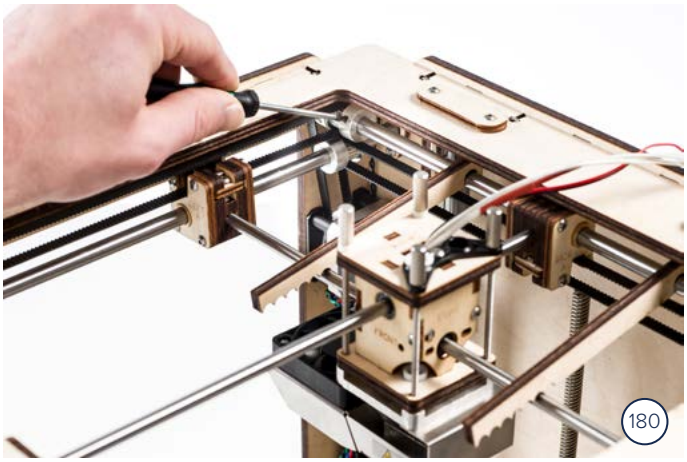
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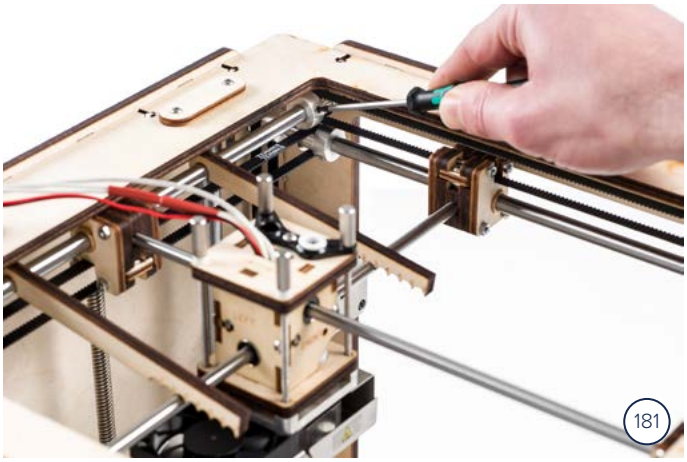

181

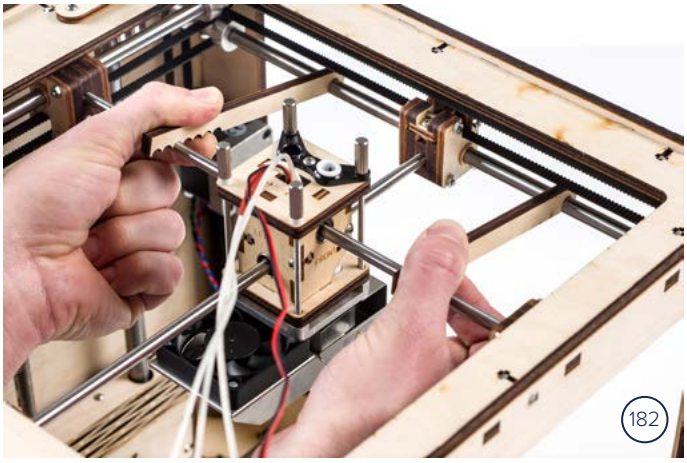
5.3.3. Y AXLES

1. Position the pulleys on the Y axles so that the long front and back timing belts are positioned in a straight line above the X axles.
2. Place the two calibration sticks on each side of the right Y axle. Fig. 182.
3. Move the print head towards the right until the set screw of the back pulley (connected to the long back timing belt) is visible and place the Y print head shaft into the calibration sticks.

   Make sure the calibration sticks use the same notch.

4. Tighten the set screw of the back pulley with the 2 mm hex key. Fig. 183.
5. If needed, move the print head slightly to the left or right until the set screw of the front pulley (connected to the long front timing belt) is visible.
6. Tighten the set screw of the front pulley with the 2 mm hex key. Fig. 184.
7. Check if the pulleys on the left Y axle are still in the correct position and tighten the set screws with the hex key. Fig. 185.

Check if the head moves smoothly. Move the print head diagonally through the printer, you should not feel any resistance. If you do, the print head is probably not calibrated correctly. If necessary, repeat the steps above.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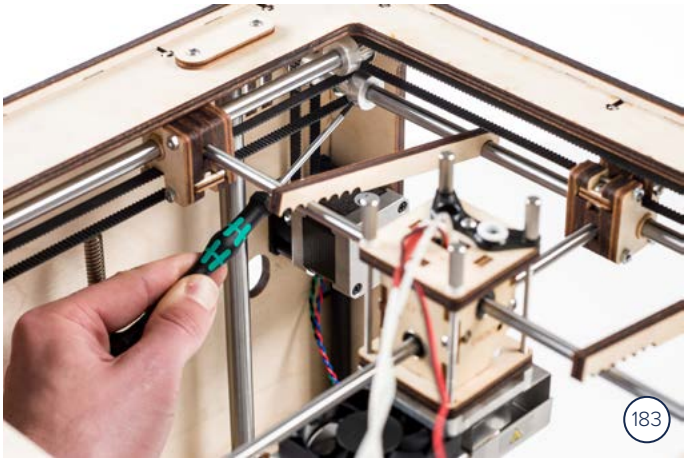
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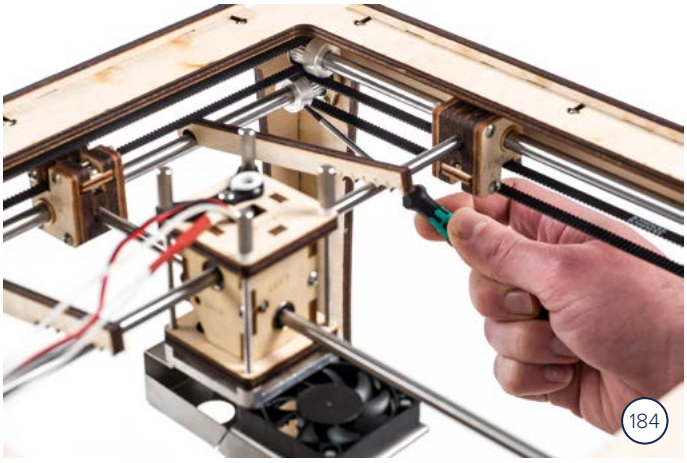
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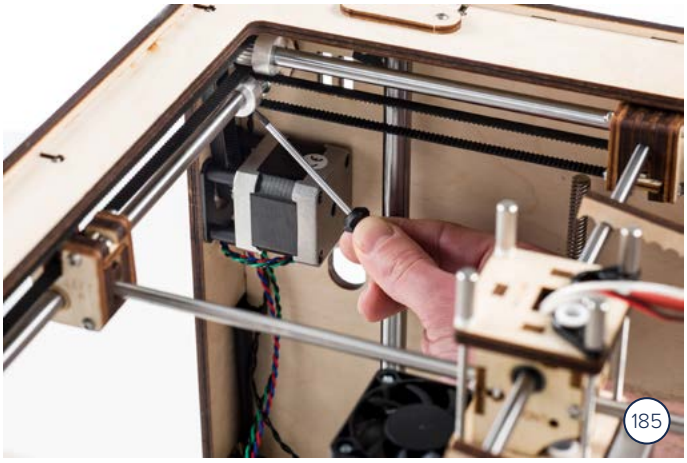

185

6 FEEDER

The feeder consists of three parts that must be assembled before the feeder can be placed on the Ultimaker: the main feeder housing, clamp and drive bolt. Once the feeder is placed on the Ultimaker, the bowden tube and spool holder will be connected as well.

For this part the 2 mm hex key and socket wrench or pliers are needed.

6.1 ASSEMBLING THE FEEDER

PARTS NEEDED

Injection molding pack

1	Small black gear
1	Black wheel
1	Side plate A
1	Side plate B
1	Mounting plate
1	U-bracket
1	Bolt clip

Laser pack

1	Wooden part 10A
1	Wooden part 10B
1	Wooden part 10C
1	Wooden part 10D
1	Wooden gear
1	Wooden gear cap

Motor pack

1	1017	Feeder motor (axle with one flat side)

Bearing pack

2	1021	Ball bearing 8 mm
1	1142	Small ball bearing

Feeder pack

1	1016	Feeder quick fit coupling
1	1133	Knurled wheel
1	1134	Cap nut M8
2	1136	Washer M8
1	1137	Nut M8
1	1143	Feeder spring

Nuts & bolts pack

1	1201	Washer M3
4	1204	M3x16 bolt
3	1205	M3x14 bolt
9	1206	M3x20 bolt
6	1207	M3x25 bolt
1	1209	Hex nut
13	1214	Lock nut

6.1.1. MAIN FEEDER HOUSING

For the assembly of the feeder housing you will need the following parts (Fig. 186).

186

To assemble the main feeder housing, perform the following steps:

1. Put the small black gear onto the motor axle, note the D shape of both. Make sure the top of the gear is flush with the axle. Fig. 187 and 188.

   Use a redundant piece of wood to place the gear, this might take some force.

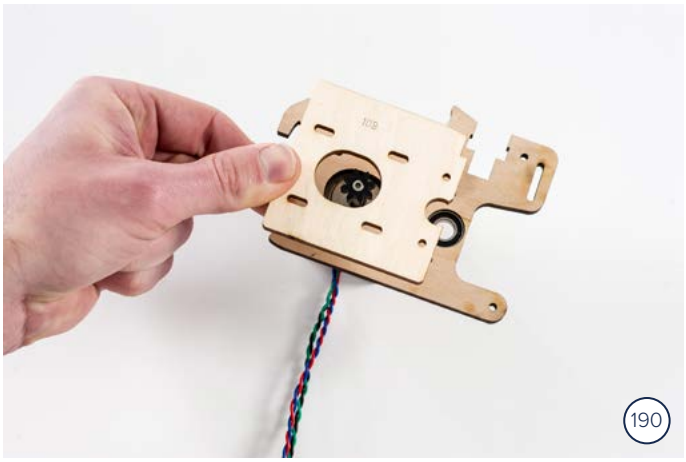
2. Place the wooden parts 10A and 10C in front of you, as shown in the image. Insert a ball bearing into the corresponding hole. Make sure that the bearing is flush with the top side of the wooden parts and does not stick out. Fig. 189.
3. Place wooden part 10A on the motor with the engraving towards the motor, then put 10B on top. Fig. 190.

   Make sure the motor cables are facing down.


187

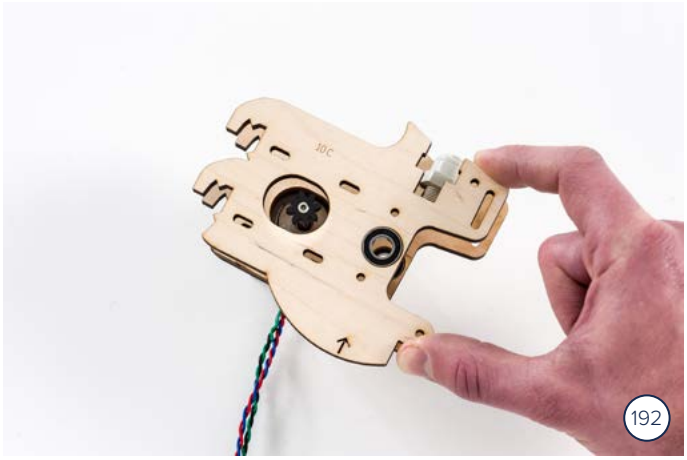

188


189


190

4. Put the quick fit coupling into the T-slot, note the orientation. Fig. 191.
5. Place wooden parts 10C and 10D on top and loosely secure the wooden parts to the motor with two M3x25 bolts (through part 10D) and two M3x20 bolts (through part 10C). The motor's position will be adjusted later. Fig. 192, 193 and 194.
6. Place one M3x25 bolt through the hole in the top right corner and secure with a lock nut. Fig. 195.
7. Place two M3x20 bolts through the holes around the bearings and secure with two lock nuts. Fig. 196.


191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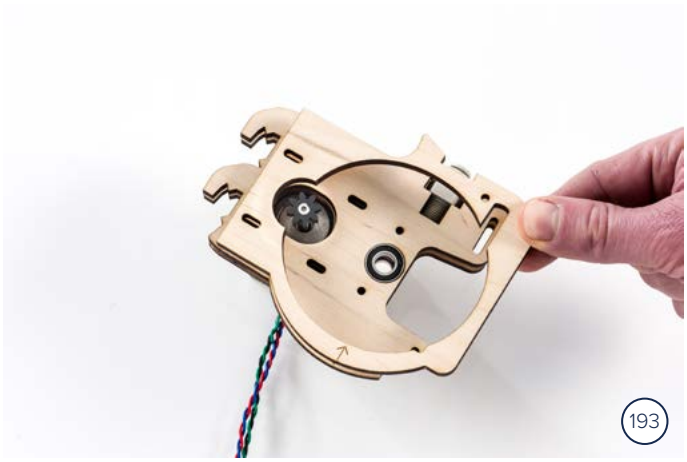
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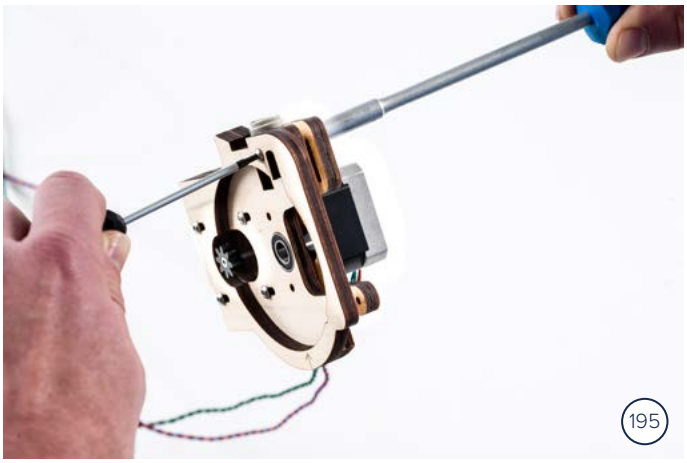
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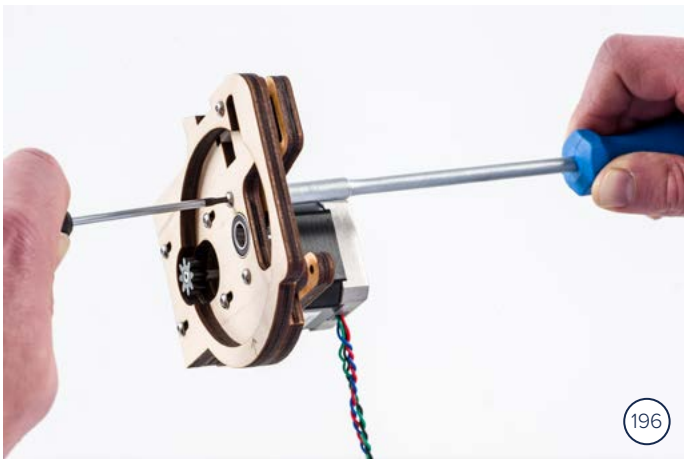
196

6.1.2. CLAMP ASSEMBLY

For the assembly of the feeder clamp you will need the injection molding parts, small ball bearing, feeder spring, washer and nuts and bolts (Fig. 197).

197

To assemble the feeder clamp, perform the following steps:

1. Place the small ball bearing into the hole in the black wheel and ensure it sticks out equally on both sides. Fig. 198.

   Use a redundant piece of wood to fit the bearing in place.

2. Insert four M3x16 bolts through the flat side of side plate A. Fig. 199.
3. Place the mounting plate over the four bolts and put a hex nut in the T-slot. Fig. 200 and 201.
4. Lastly, place side plate B over the four bolts and secure with four lock nuts. Fig. 202 and 203.

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203

5. Put the black wheel in the notch in the mounting plate. Insert one M3x20 bolt through the side plates and ball bearing and place one lock nut on the end of the bolt. Fig. 204 and 205.
6. Put the U-bracket onto the clamp assembly. Take one M3x25 bolt and put a washer and the spring around it. Insert the bolt through the hole in the U-bracket and tighten. Fig. 206 and 207.

Because of the tension on the spring it might take some force. The length of the spring should be 11 mm.

7. Attach the clamp assembly to the main feeder housing in the bottom right corner, using one M3x20 bolt and one lock nut. Do not overtighten, the clamp assembly should be able to rotate. Fig. 208.
8. Loosely attach the lever to the slot in the main feeder housing with one M3x20 bolt and one lock nut. Make sure the flat side of the lever is pointing up. Fig. 209.


204


205


206

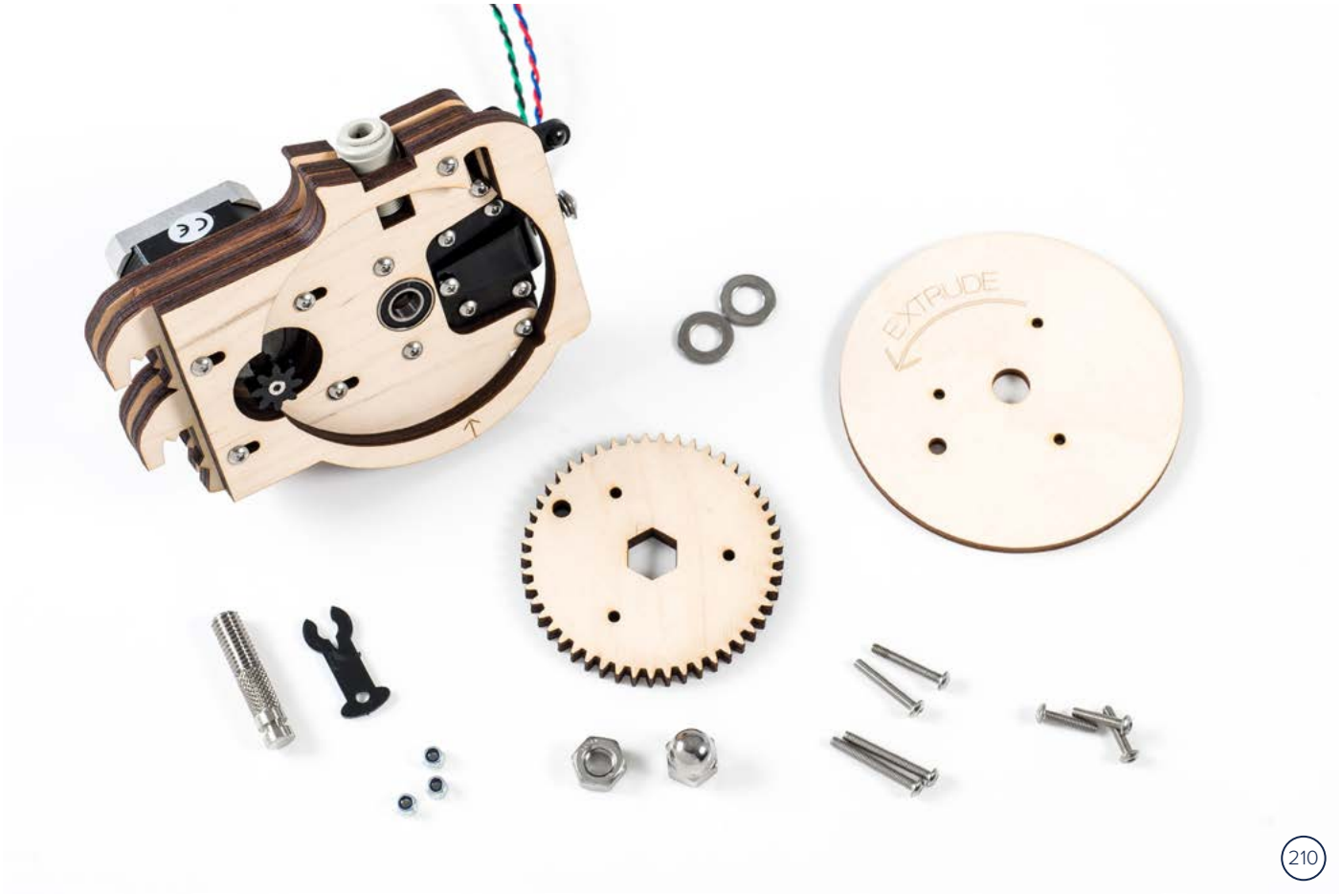

207


208


209

6.1.3. DRIVE BOLT ASSEMBLY

For the drive bolt assembly you will need the pre-assembled feeder, wooden gear, wooden gear cap, knurled wheel, bolt clip, M6 nut, M6 washers, M6 cap nut, bolts and lock nuts (Fig. 210).

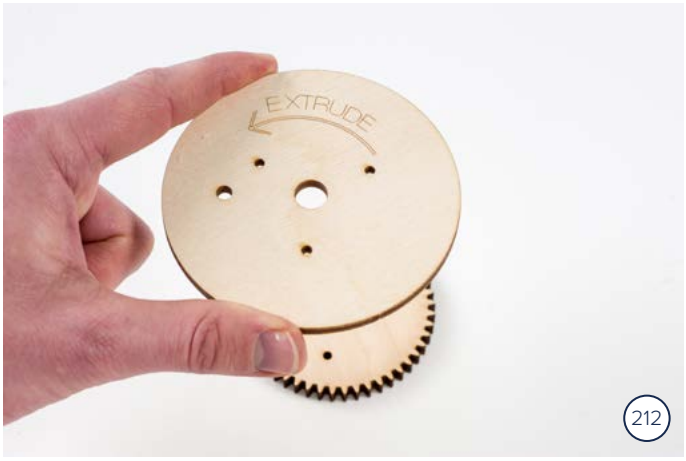


210

To assemble the drive bolt, perform the following steps:

1. Take the wooden gear and place the M8 hex nut into the corresponding hole. Make sure it is as straight as possible; if the nut is slanted, this might lead to feeder problems later on. Fig. 211.
2. Line up the four holes of the wooden gear cap and the wooden gear. Attach the two parts with three M3x14 bolts and lock nuts. Make sure the lock nuts and the engraving are on the outside of the wooden gear cap. Fig. 212 and 213.
3. Insert the knurled wheel through the M8 hex nut, until an equal portion of the screw thread can be seen on both sides of the wooden parts. Fig. 214 and 215.
4. Attach the cap nut to the screw thread of the knurled wheel. Make sure the cap nut is secured as tight as possible and the knurled wheel stays in the same position. Fig. 216.


211



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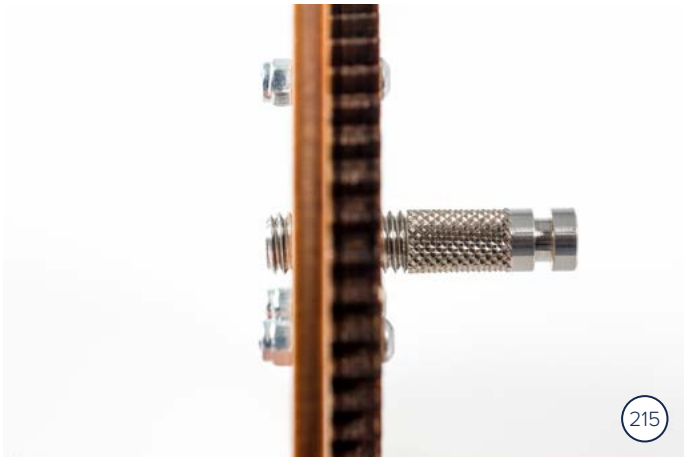
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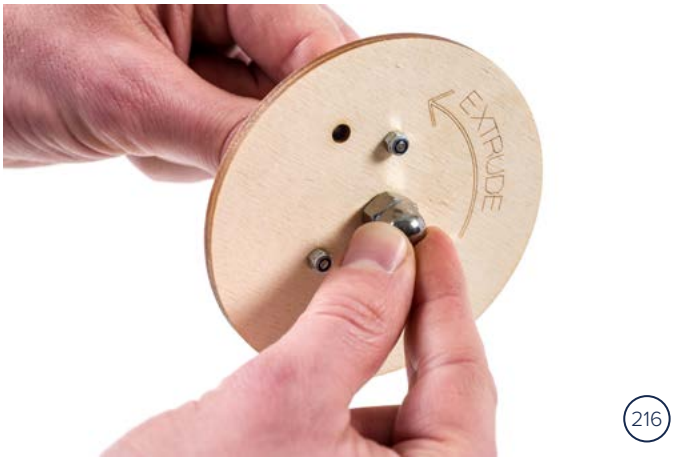
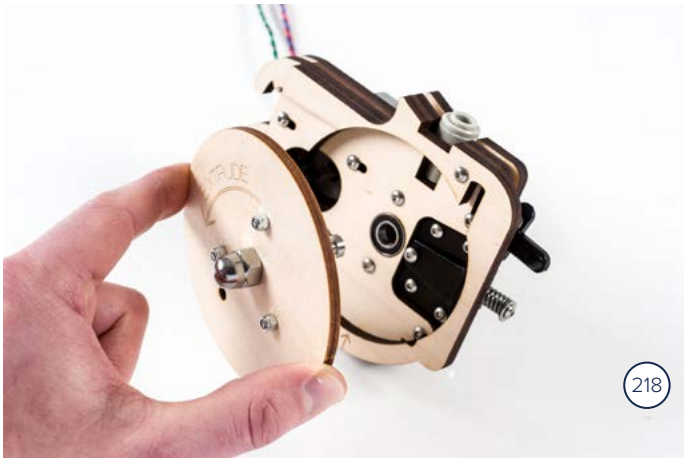


216

5. Place two M8 washers over the knurled wheel. Ensure the flat sides of the washers are facing each other. Fig. 217.
6. Put the drive bolt assembly through the two ball bearings and check if the notch in the knurled wheel is aligned with the ball bearing. Fig. 218 and 219.
7. Move the motor inwards so the black gear is pressed against the wooden gear. Secure the two M3x25 bolts, then rotate the wooden gear until one of the M3x20 bolts can be accessed through the hole in the gear cap. Tighten this bolt and repeat for the second M3x20 bolt. Fig. 220.
8. Place the bolt clip around the notch in the knurled wheel to lock the drive bolt assembly in place. Fig. 221.
9. Lastly, place the feeder onto the frame. Fig. 222.


217



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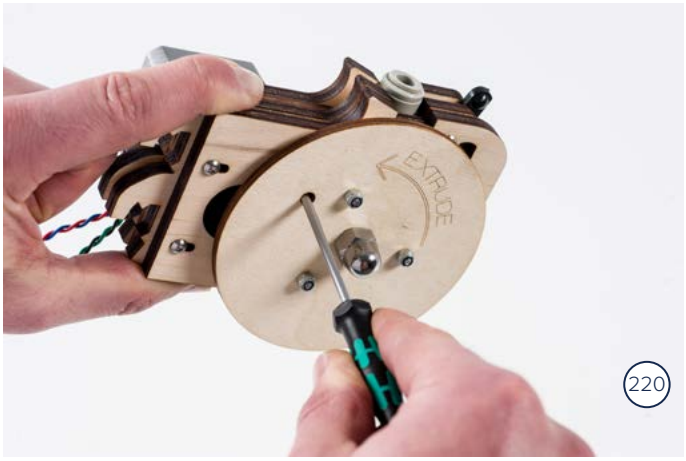

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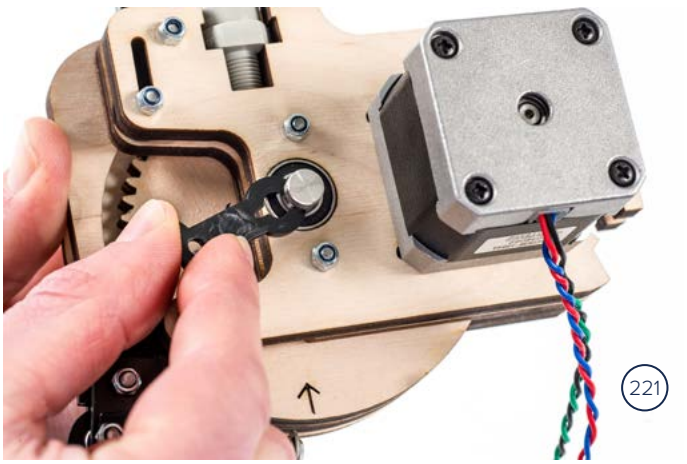
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222

6.2 BOWDEN TUBE

PARTS NEEDED

Bowden pack

1	1097	Bowden tube
1	1266	Spiral sleeve

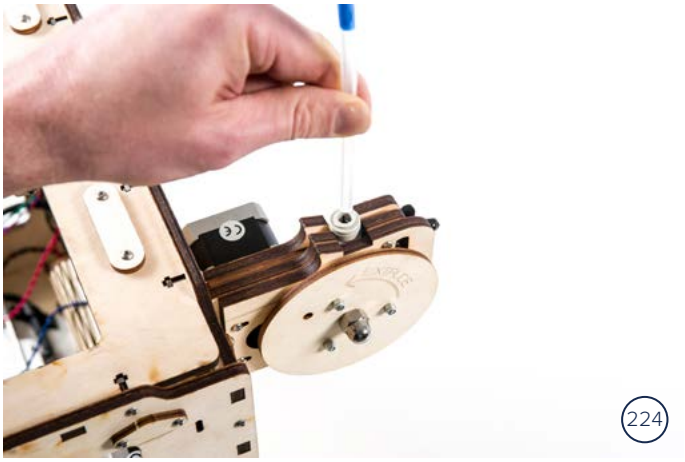
Feeder pack & hot end pack

2	1071	Clamp clip

223

The bowden tube has one end marked with blue tape. This end has been slightly drilled out to make the inserting of material easier.

1. Take the bowden tube and place the end with the blue tape into the feeder quick fit coupling. Fig. 224.
2. Place the clamp clip around the tube coupling collet to lock the bowden tube in place. Fig 225.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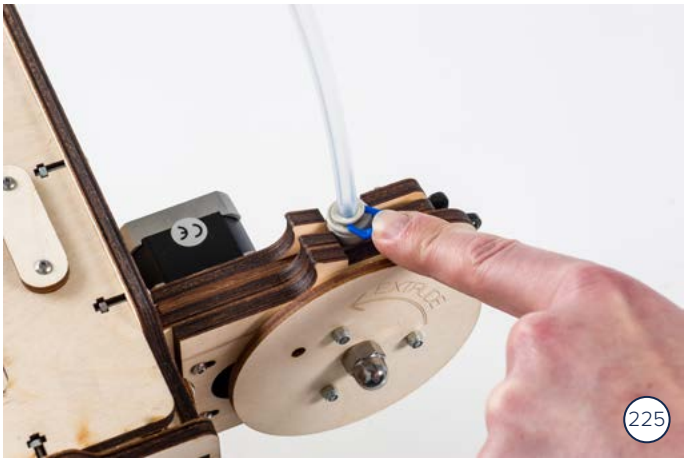
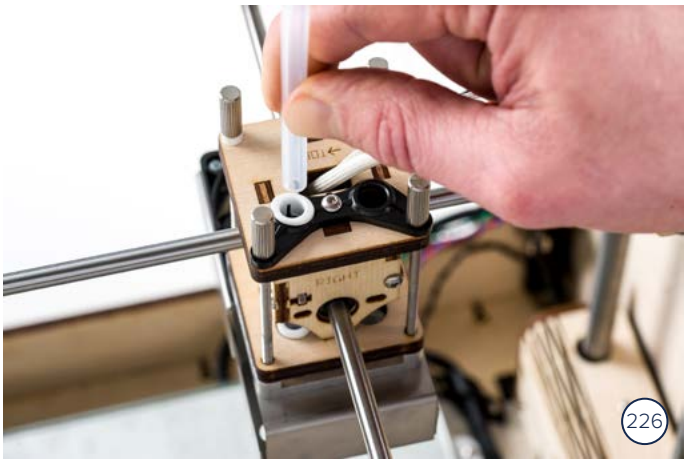

225

3. Place the other side of the bowden tube into the tube coupling collet on the print head. Push it through the print head housing, into the teflon coupler. Fig. 226 and 228.

   Insert the screwdriver through the back of the print head housing to guide the bowden tube in place.

4. Place the clamp clip around the tube coupling collet to lock the bowden tube in place. Make sure it stays fully inserted into the teflon coupler. Fig. 227.
5. Take the print head cables (PT100, heater cartridge and fan) and line them up with the bowden tube. Wrap the spiral sleeve around the print head cables, bowden tube and, when you reach the feeder, the feeder motor wires. Fig. 229.
6. Insert the spiral sleeve through the hole in the back panel below the feeder and guide all wires through the back right cable duct and hole in the bottom panel. Fig. 230 and 231.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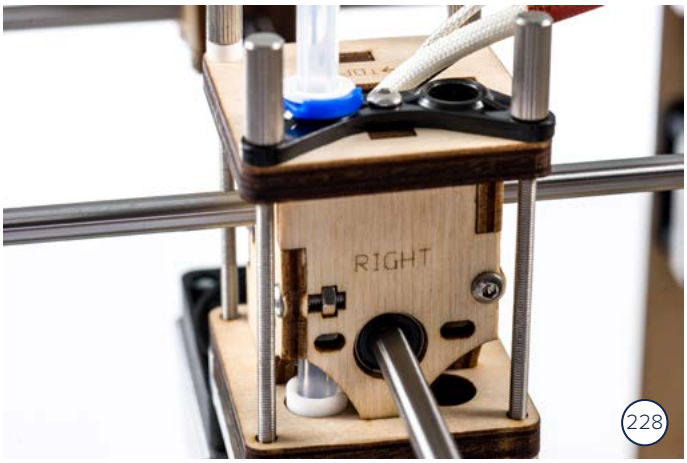

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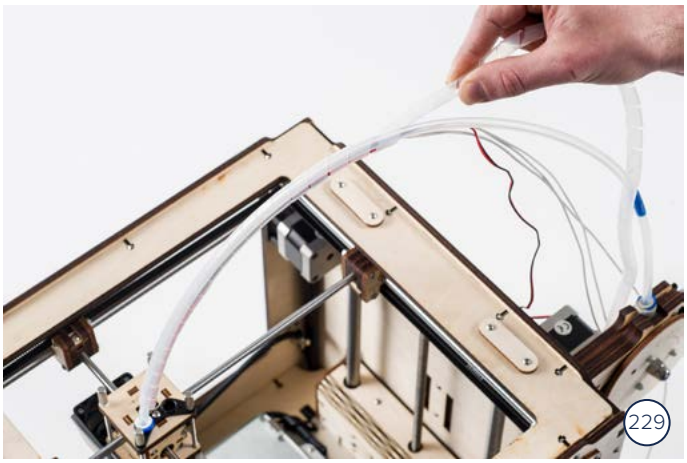
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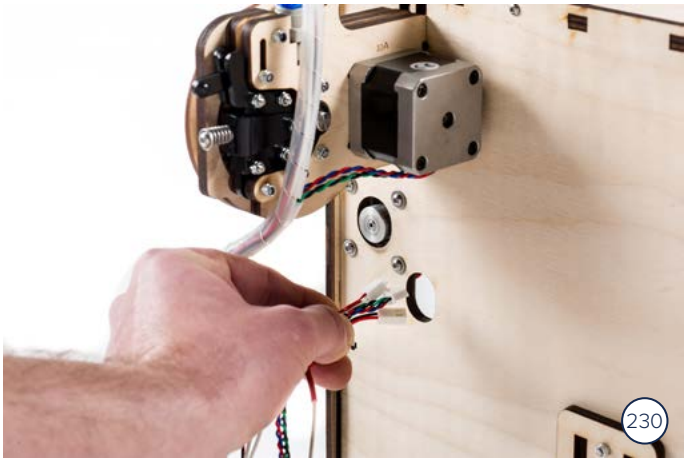
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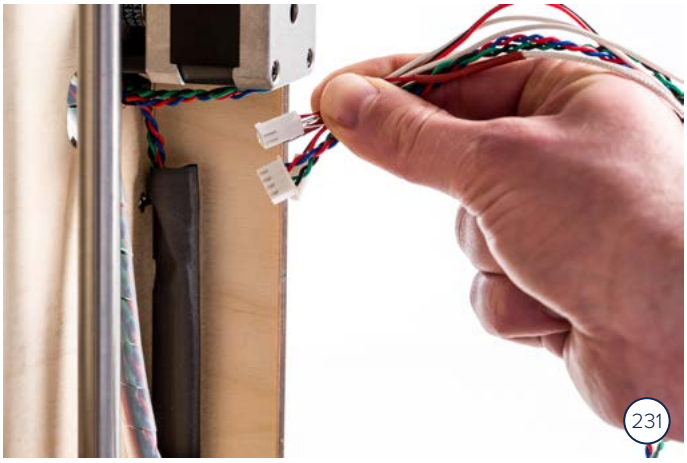

231

6.3 SPOOL HOLDER

PARTS NEEDED

Laser pack

2	Wooden parts 11B (short)
2	Wooden parts 11B (long)
6	Wooden parts 11C

232

The laser pack contains two different spool holders. The small spool holder can hold exactly one spool of Ultimaker filament. The larger spool holder can hold exactly two spools of Ultimaker filament.

1. Take the two short wooden parts 11B and place two wooden parts 11C in the corresponding slots. Fig. 233.
2. Firmly push the wooden parts 11C down until it clicks into place.
3. Repeat the steps above for the long spool holder, using four wooden parts 11C.
4. Take one of the spool holders and slide it into the slots of wooden part 11A on the back panel. Fig. 235.

233


234


235

7 ULTICONTROLLER

The UltiController is the display and control panel of your Ultimaker Original+. This chapter describes how to assemble it and place it on the front panel.

For the assembly of the UltiController you must use the 2 mm hex key and crosshead screwdriver.

PARTS NEEDED

Laser pack

1	UltiController front
1	UltiController back
1	UltiController left
1	UltiController right

UltiController pack

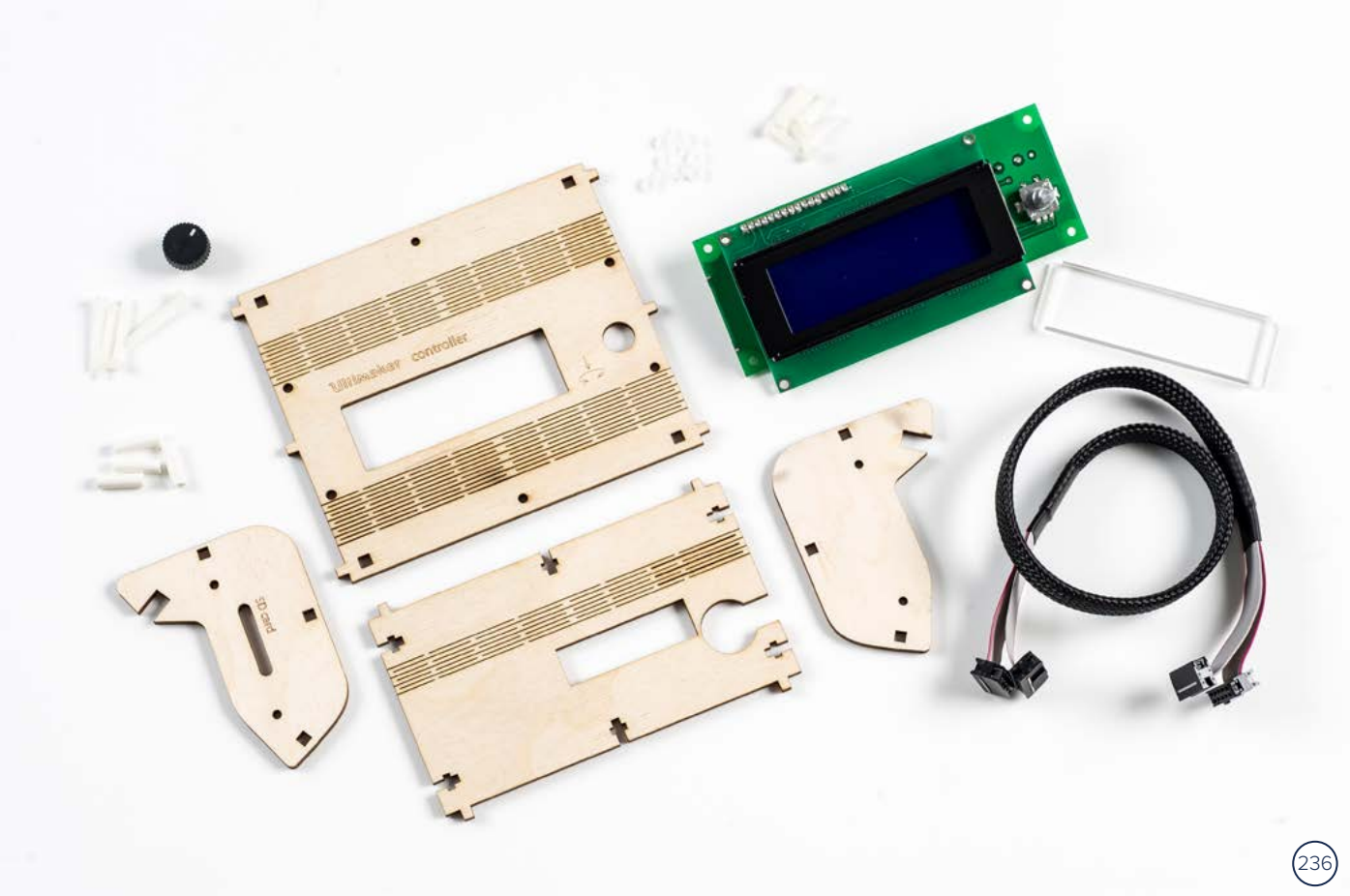
1	1129	Knob
1	1146	UltiPanel rev 1.1
1	1522	UltiController window

Cable pack

1	1171	Double flat cable 10 wire

Nuts & bolts pack

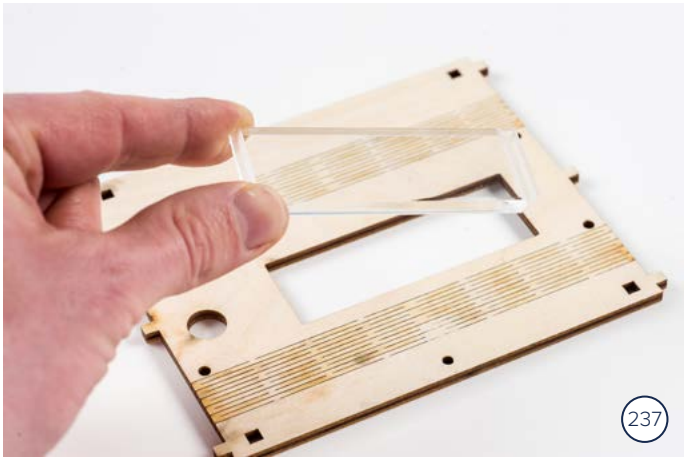
4	1139	Spacer 16 mm
10	1540	Nylon hex nut
6	1541	Nylon bolt M3x12
4	1542	Nylon bolt M3x25



236

To assemble the UltiController, perform the following actions:

1. Remove the foil from the display and the window.
2. Place the wooden part front face down and fit the UltiController window in the cutout. Fig. 237.
3. Insert four nylon M3x25 bolts through the wooden part front, put four 16 mm spacers over them and place the UltiPanel on top. Fig. 238, 239 and 240.
4. Secure the UltiPanel to the wooden part front with four nylon hex nuts by using the crosshead screwdriver. Fig. 241 and 242.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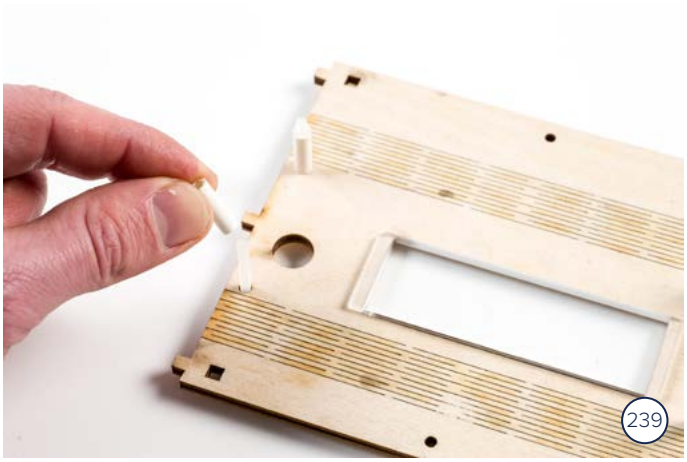
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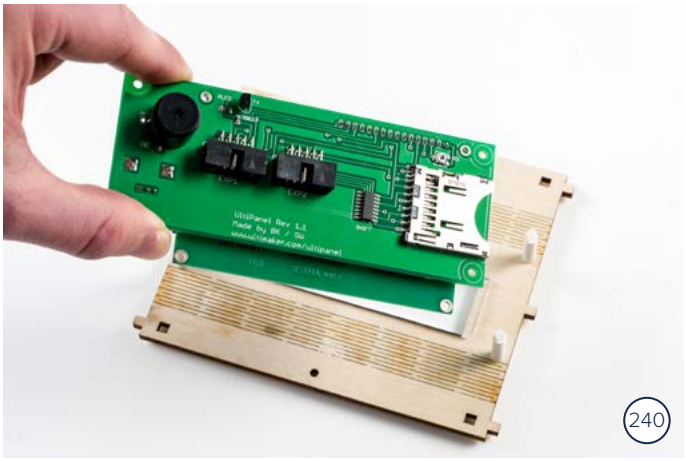
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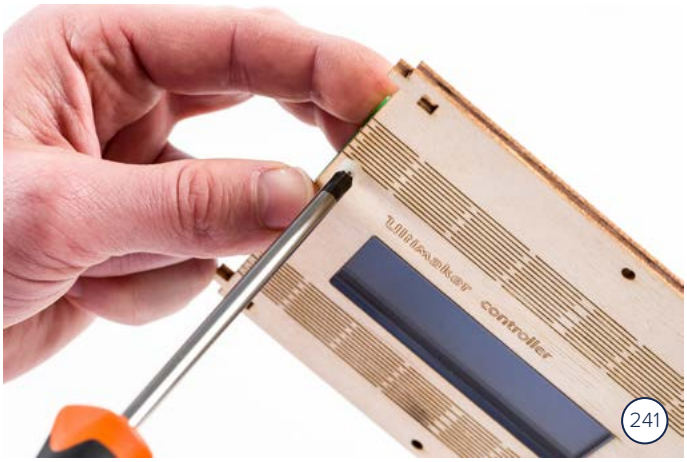
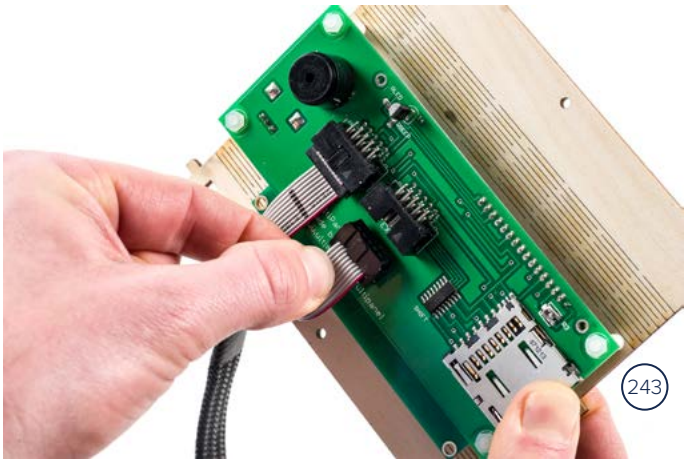
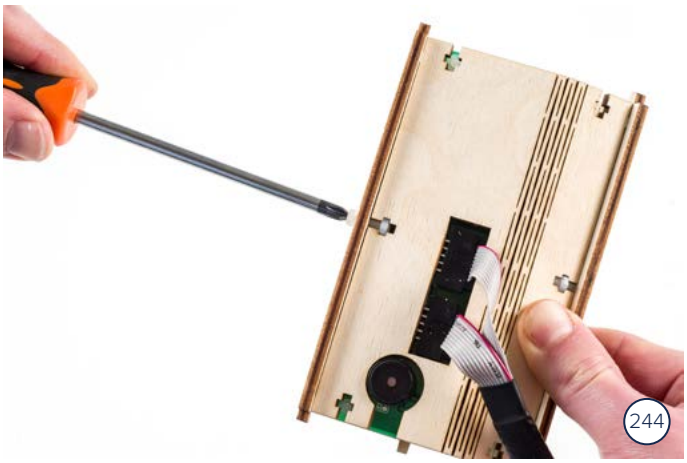


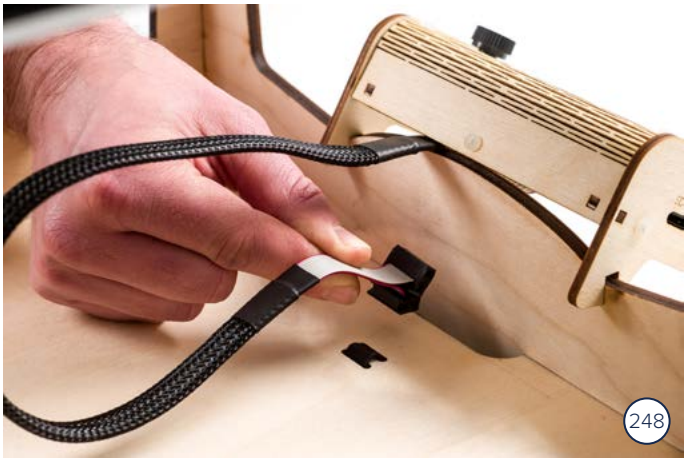
241


242

5. Plug the flat cables into the connectors and mark the other end of the cable connected to EXP1. Fig. 243.
6. Put the flat cables through the wooden part back and attach the back to the front with two nylon bolts M3x12 and two nylon hex nuts. Fig. 244.
7. Attach the side part with two nylon bolts M3x12 and two nylon hex nuts each. Make sure to place the side with the SD card slot over the SD card holder. Fig. 245.
8. Push the button in place. Fig. 246.
9. Place the UltiController on the front panel and put the flat cables through the hole in the bottom panel. Fig. 247 and 248.







8 ELECTRONICS

The last step of the assembly process is connecting the electronics. You will first mount the main board to the bottom side of the Ultimaker Original+ and then connect all the wires to it.

Use the 2 mm hex key and flat screwdriver to mount and connect the electronics.

8.1 MOUNTING THE MAIN BOARD

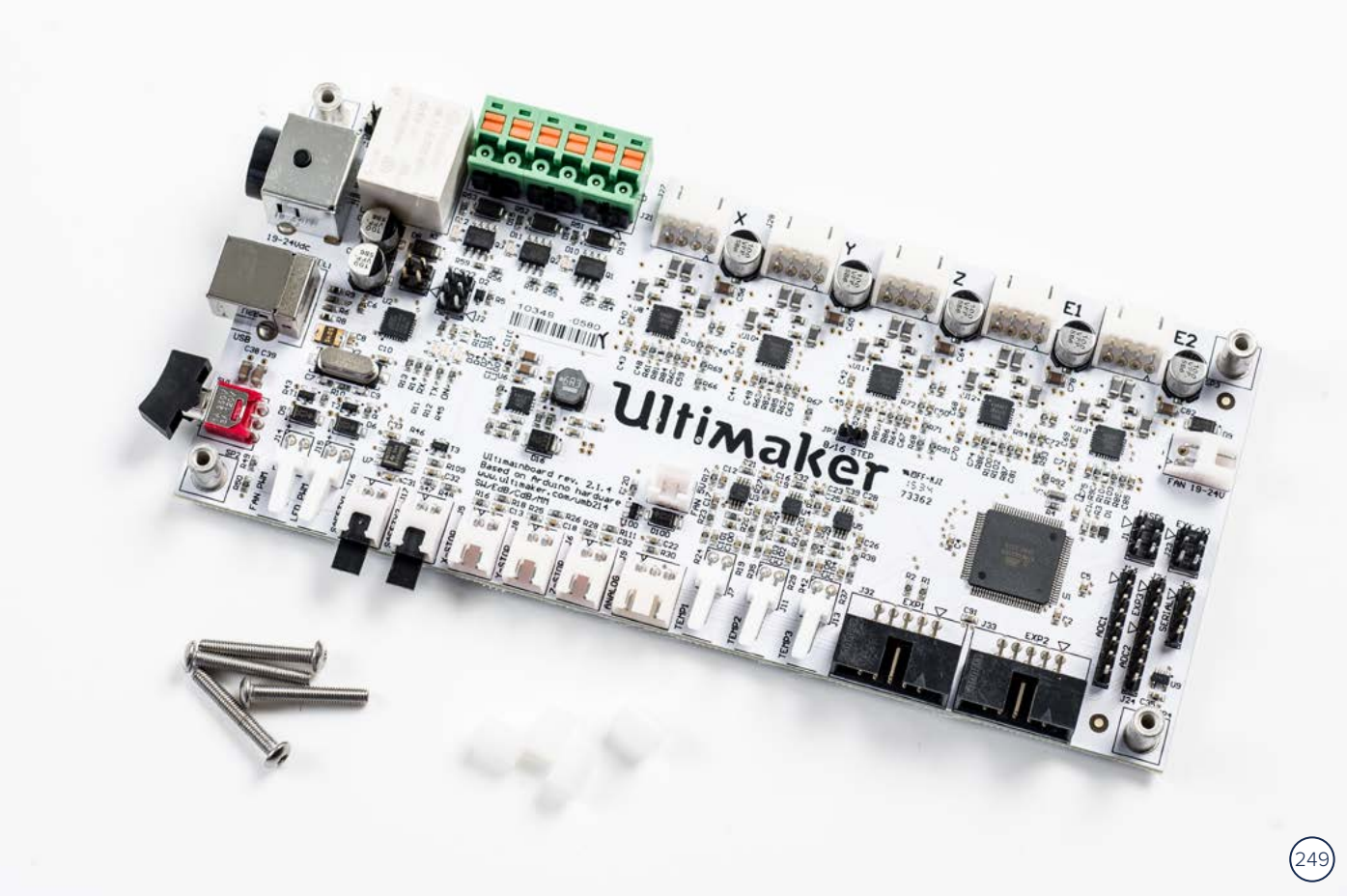
PARTS NEEDED

Electronics pack

2	1315	Jumper (on main board)
1	1546	Main board 2.1.4

Nuts & bolts pack

4	1206	M3x20 bolt
4	1502	Spacer 8 mm



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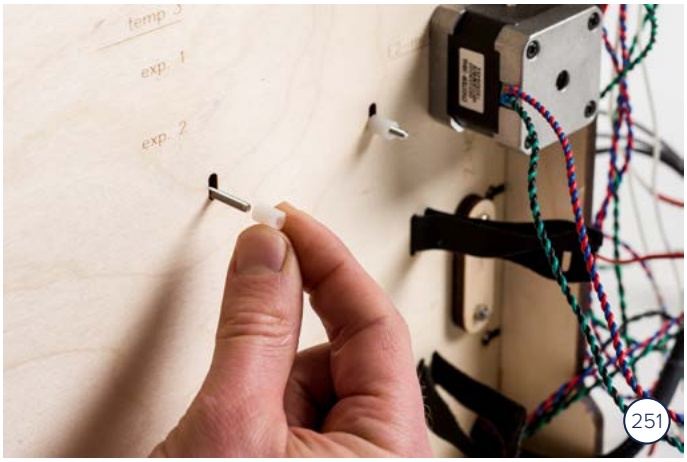
When handling electronics make sure that you are not statically charged. This can permanently damage your electronics. Touch bare metal before continuing with the following steps.

1. Place the Ultimaker on its left side and raise the Z stage.
2. Insert four M3x20 bolts through the bottom panel from the inside and place the spacers around the bolts. Fig. 250 and 251.
3. Hold the main board with the connectors towards you and the on/off button towards the right panel. Loosely secure the board to the four bolts. Fig. 252 and 253.


250



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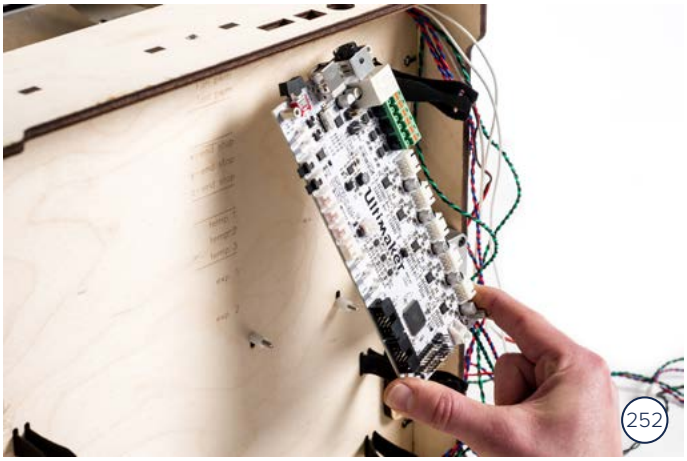


252

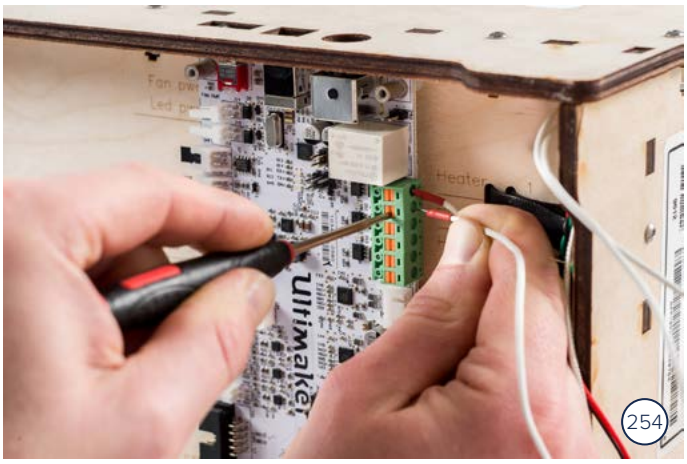

253

8.2 CONNECTING

In the following steps you will connect all the cables to the appropriate places on the main board. On the bottom panel is engraved where all cables should be connected.

8.2.1. HEATERS

1. Take the white heater cartridge wires. Use a small flat screwdriver to press on the terminal marked *Heater 1* and insert the heaters. The positioning does not matter. Fig. 254.
2. Take the thick gray heated bed wires. Use a small flat screwdriver to press on the terminal marked *Heated bed* and insert the heaters. The positioning does not matter. Fig. 255.
3. Gently pull at the cables to ensure they are connected tightly.



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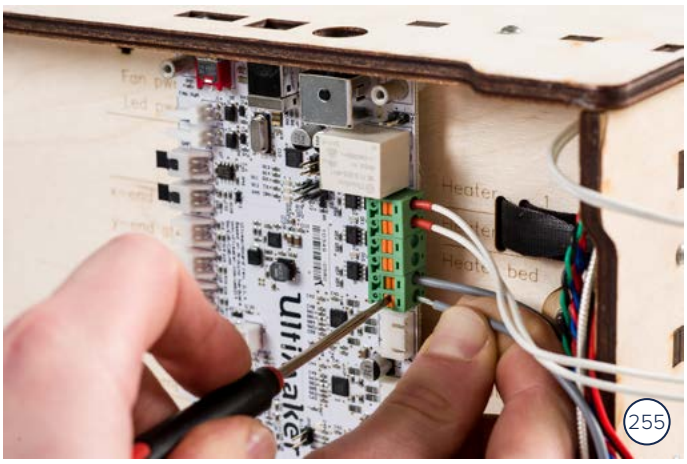

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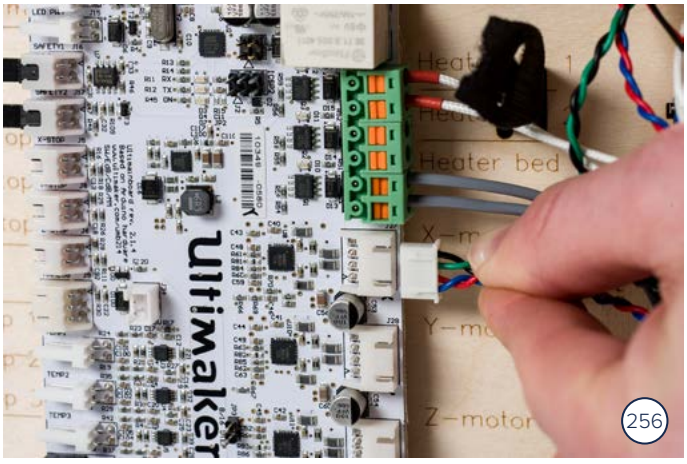
8.2.2. MOTORS

1. Take the plug from the X motor. This is the longest motor cable coming from the top right corner. Connect it to *X-motor*. Fig. 256.
2. Take the plug from the Y motor. This is the cable coming from the bottom right corner. Connect it to *Y-motor*. Fig. 257.



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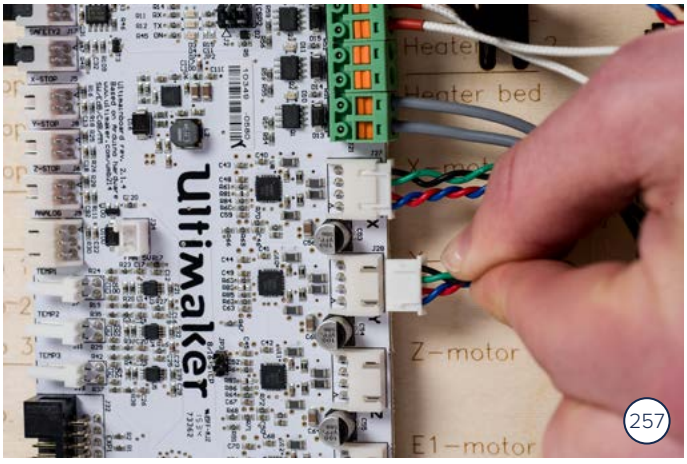
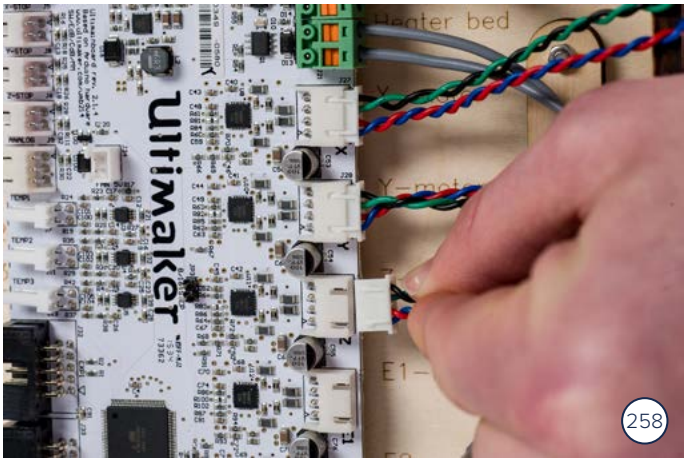


257

3. Take the plug from the Z motor and connect it to *Z-motor*. Fig. 258.
4. Take the plug from the feeder motor. This is the shortest motor cable coming from the top right corner. Connect it to *E1-motor*. Fig. 259.
5. Use the Velcro parts to wrap all the motor wires together. This ensures that they are kept out of the way. Fig. 260.



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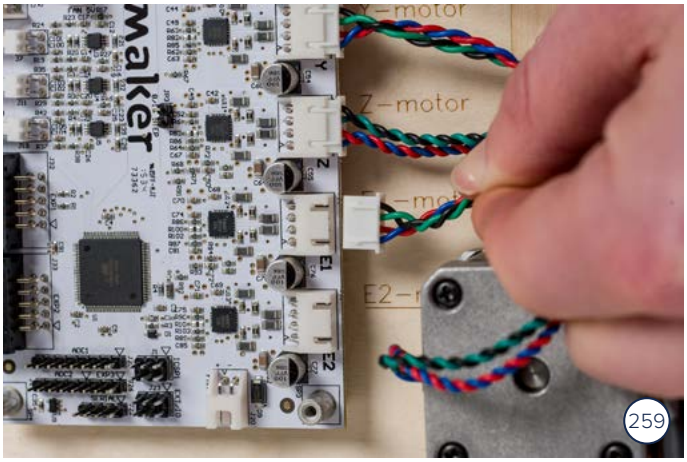

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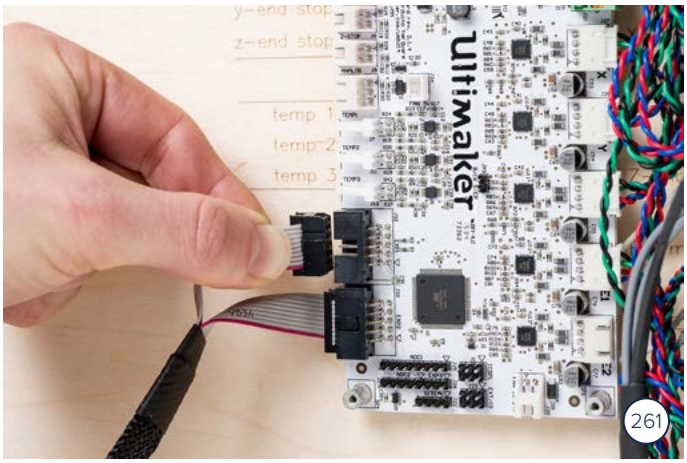
8.2.3. ULTICONTROLLER

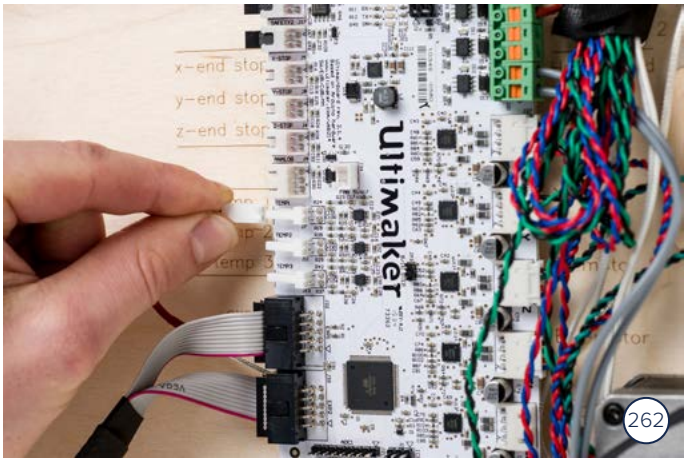
1. Take the flat cables from the UltiController. You have marked one of the cables while assembling the controller.
2. Connect the marked cable to *exp. 1*, connect the other to *exp. 2*. Fig. 261.

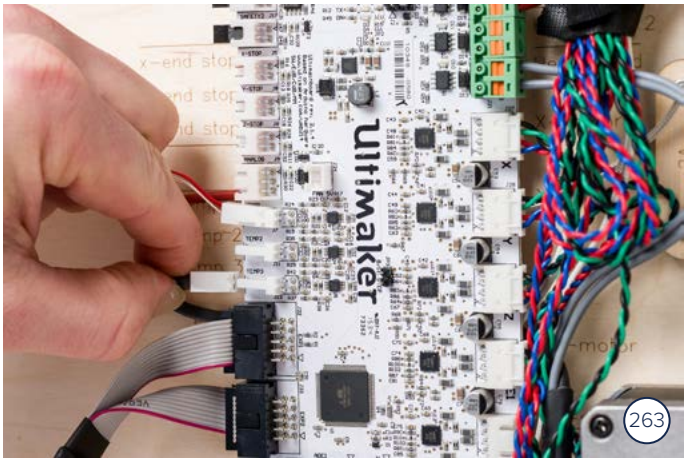


8.2.4. SENSORS

1. Connect the PT100 sensor to *temp 1*. Fig. 262.
2. Connect the black plug from the heated bed cable to *temp 3*. Fig. 263.

Run the sensors under the main board before connecting them. This ensures better cable management.



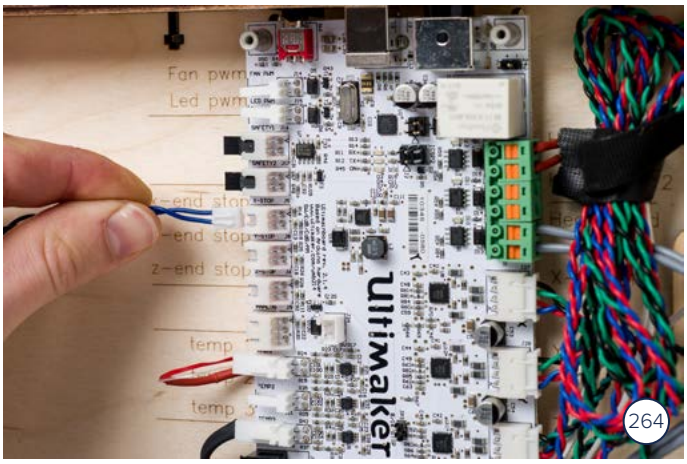


8.2.5. LIMIT SWITCHES

1. Take the blue wired limit switch from the bottom left corner and connect it to *x-end stop*. Fig. 264.
2. Take the red wired limit switch from the bottom left corner and connect it to *y-end stop*. Fig. 265.
3. Take the black wired limit switch from the bottom right corner and connect it to *z-end stop*. Fig. 266.

Run the black wired limit switch under the main board before connecting it. This ensures better cable management.

4. Use the Velcro part to keep all the limit switch wires together.



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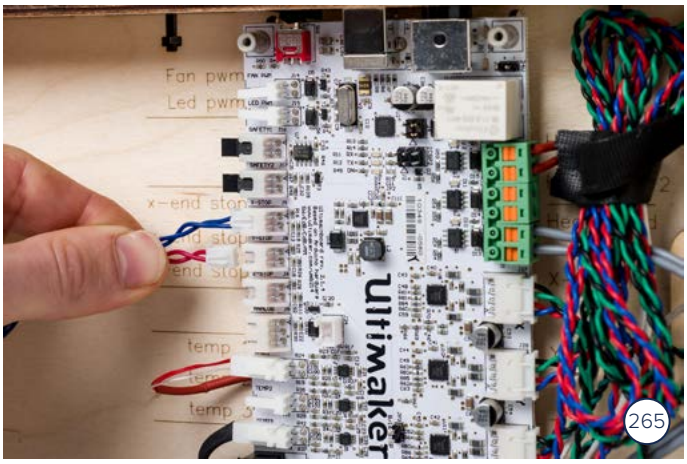

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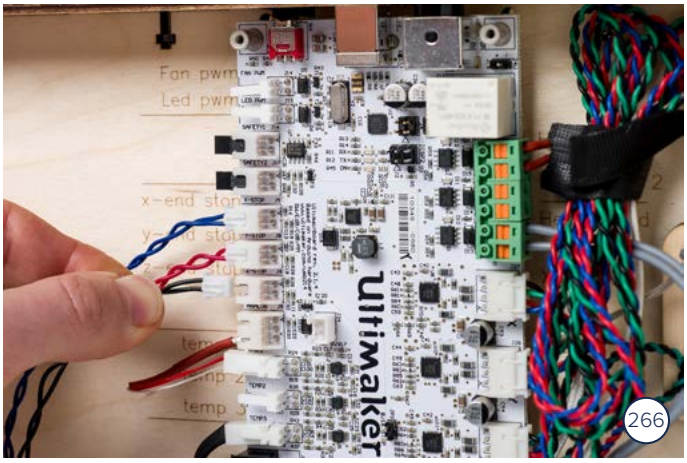

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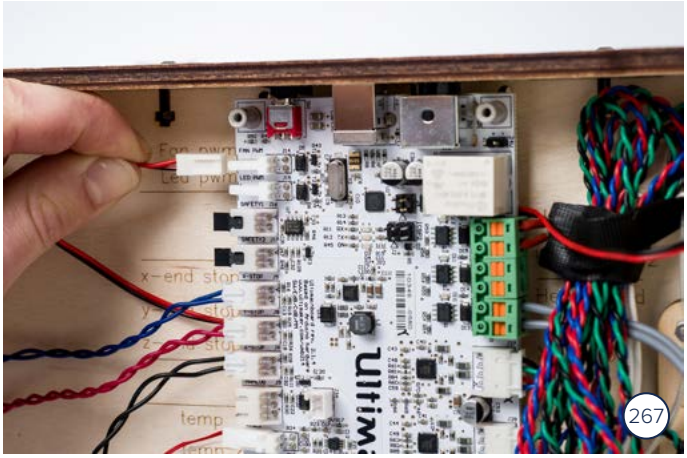
8.2.6. FAN

1. Take the red-black wired fan cable and run it under the main board.
2. Connect the fan to *Fan pwm*. Fig. 267.



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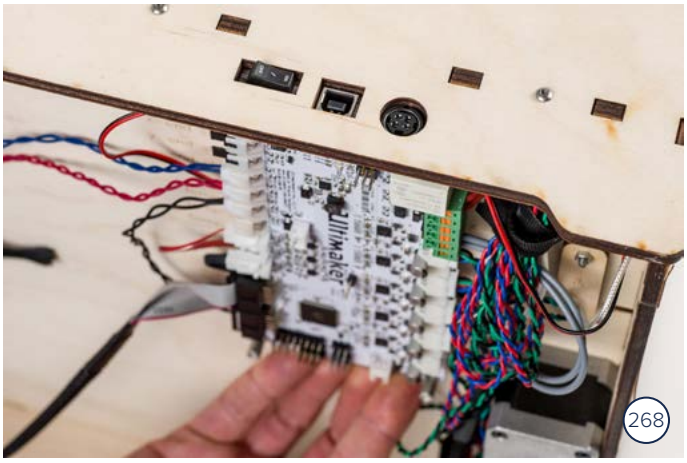
Lastly, push the main board towards the right panel as far as possible and completely tighten the four bolts to secure the main board in place. Fig. 268.



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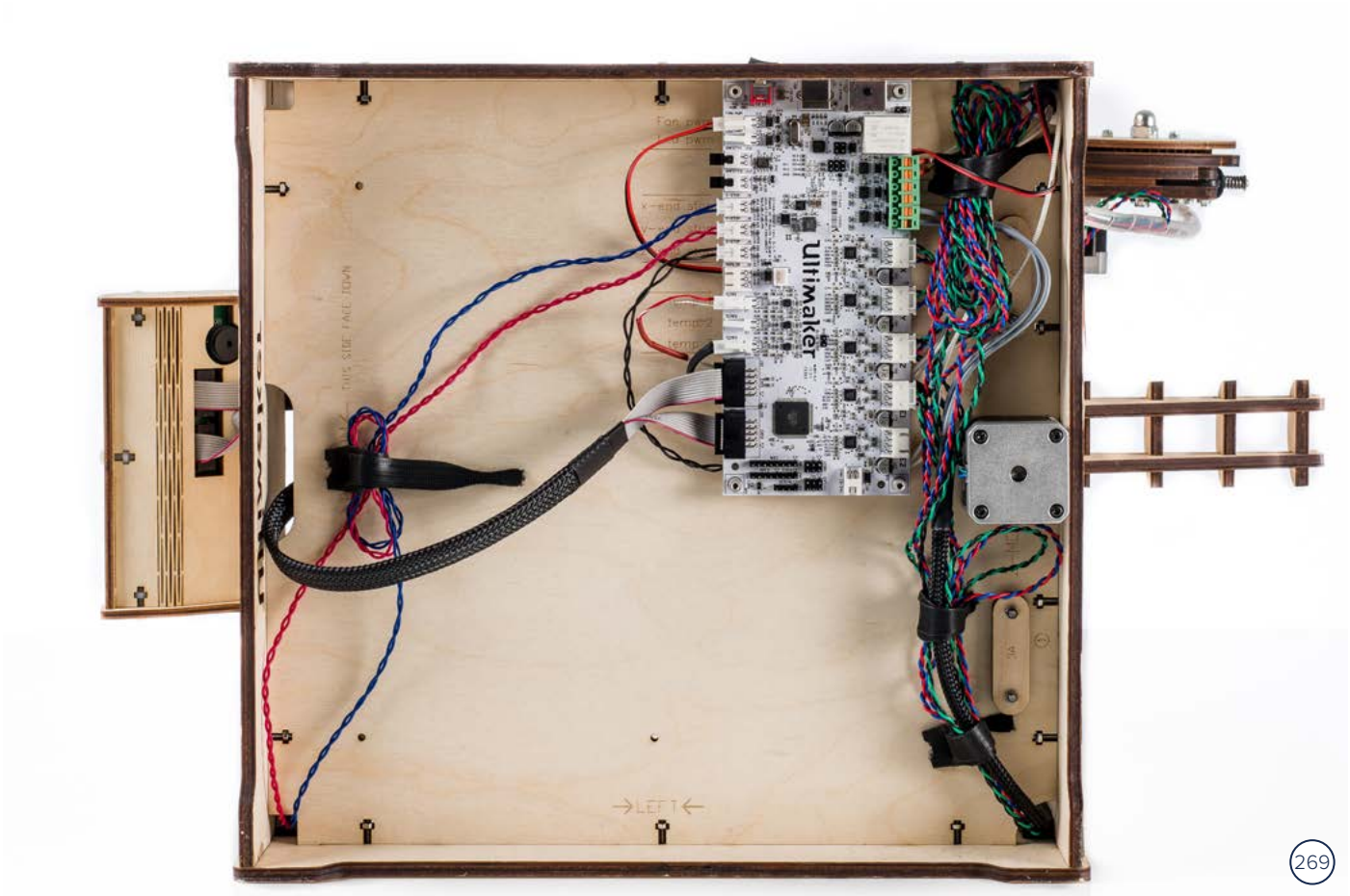
Your electronics should now look like this:



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8.3 COVER

PARTS NEEDED

Laser pack

1	Electronics cover

Nuts & bolts pack

4	1206	M3x20 bolt
4	1502	Spacer 8 mm

Now that all the cables have been connected, you will place a cover over the electronics to protect the main board.

1. Take the four M3x20 bolts and put a spacer 8 mm over each bolt. Fig. 271.
2. Screw the four bolts into the main board's threaded spacers, but only two turns. Fig. 272.
3. Place the wooden electronics cover over the four bolts with the text facing towards you. Fig. 273.
4. Slide the cover sideways until the bolts fit into the narrow part of the holes. Fig. 274.
5. Tighten the four bolts to secure the electronics cover in place. Fig. 275.


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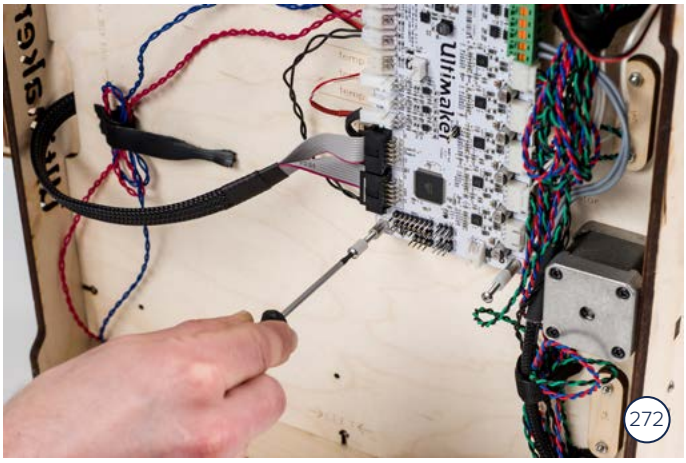

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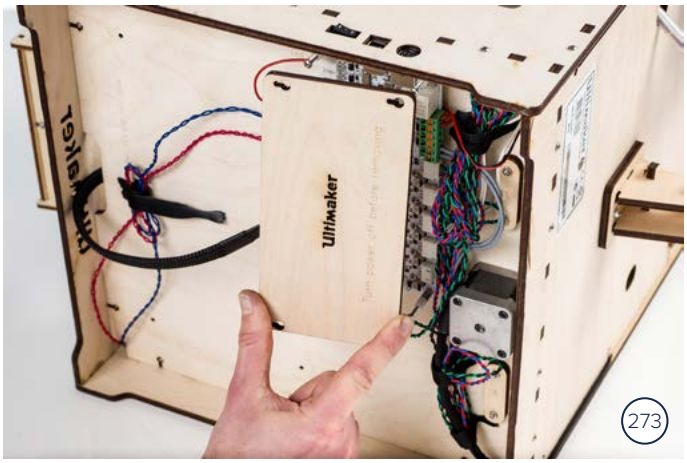

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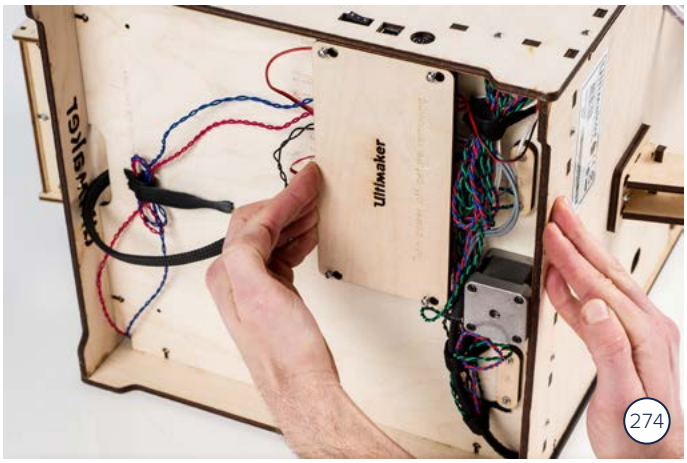

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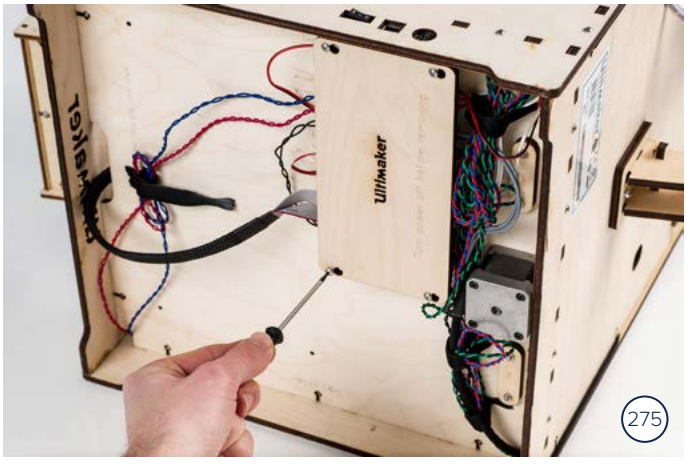

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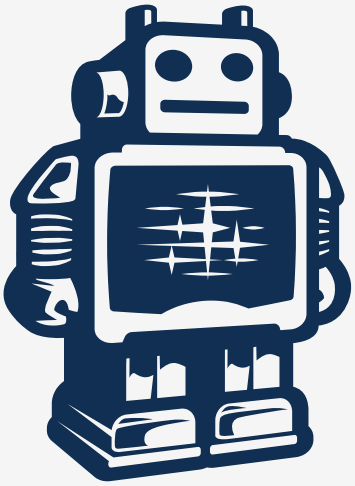
Congratulations! You have completed the assembly of the Ultimaker Original+.

Before you can start printing you must configure and calibrate your Ultimaker Original+. Therefore, follow the steps described on our website.



Ultimaker