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Pack 11

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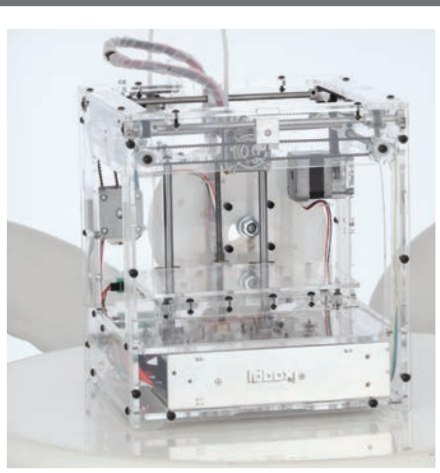

CONTENTS PACK 11

Assembly Guide

The next five detailed and easy-to-follow stages of construction for your 3D printer.

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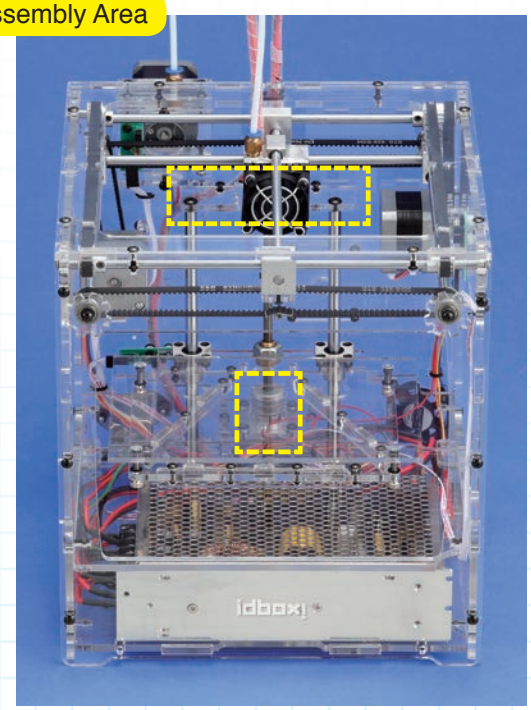
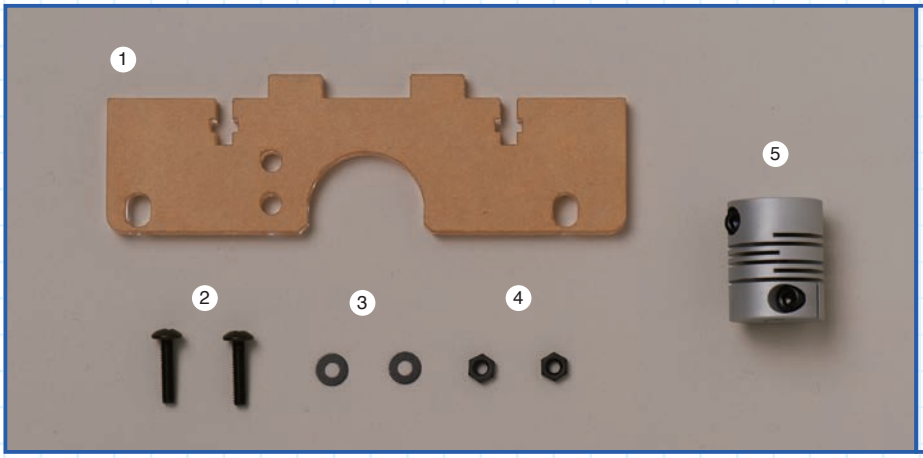
Stage 46 Assembly Area



Stage 46: Temporarily attach the Z-axis top mounting plate and add the Z-axis coupling

In this stage, you work on the Z-axis assembly. You start by loosely attaching the top mounting plate for the Z-axis and add the coupling to the shaft of the Z-axis motor. The mounting plate is then added to the inside of the rear panel of the housing.

When you add the Z-axis top mounting plate to the rear panel of the housing, make sure you have it correctly orientated: viewed from the front, the plate has two small holes (one above the other) which should be on the left when the plate's tabs are inserted into the slots of the panel. The nuts are tightened later on when the table is assembled. The coupling can be put on the motor shaft either way up, it doesn't matter, but make sure it is at the right level in relation to the motor mounting plate.



Stage 46 Components

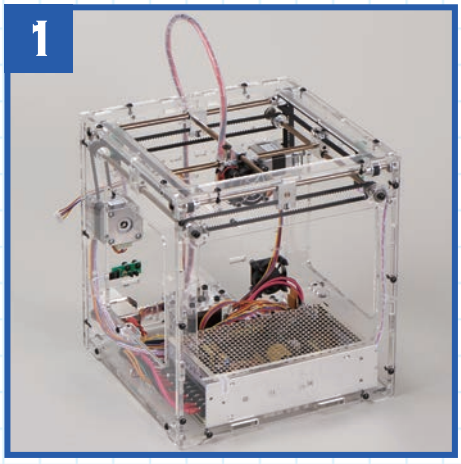
1: Z-axis top mounting plate
2: M3 truss head screws (14mm) x 2
3: M3 washers x 2
4: M3 nuts x 2
5: Coupling (5-5)

You will need

Adhesive tape
Sheet of paper
Allen key (50 x 2.5mm) supplied with Stage 44

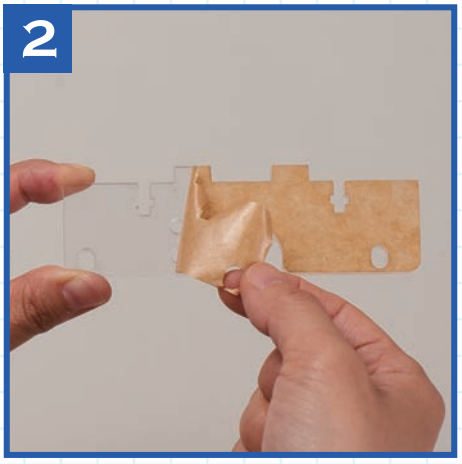
Parts to have ready

1



For this assembly, you will need the printer housing.

2



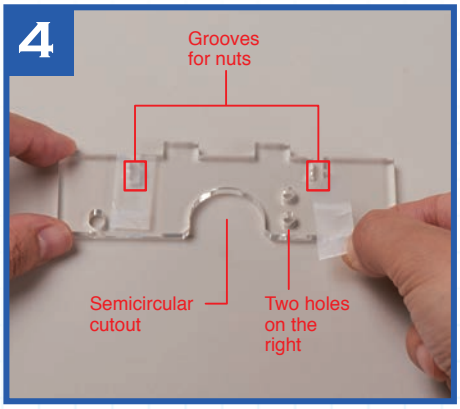
Peel the protective layers off the Z-axis top mounting plate.

Add the Z-axis top plate to the back of the housing

3

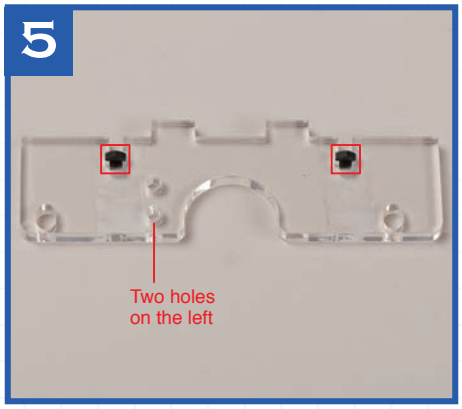
Put an M3 washer on each of the M3 14mm truss head screws supplied with this stage.

4



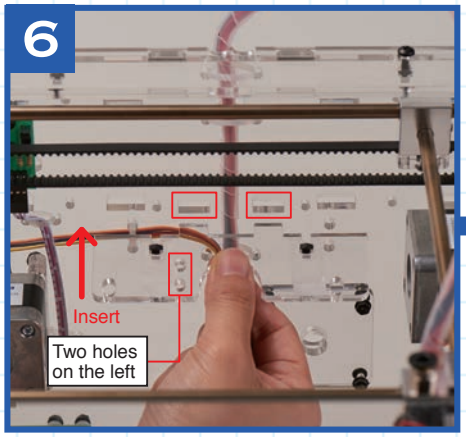
Place the mounting plate on your work surface. Put adhesive tape over the grooves (outlined in red) to prevent the nuts falling out.

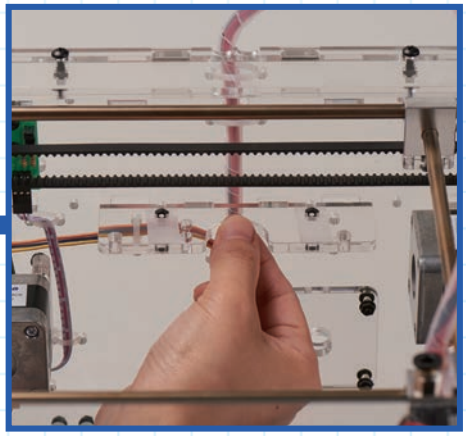
5



Turn the plate over and slot the M3 nuts into the grooves.

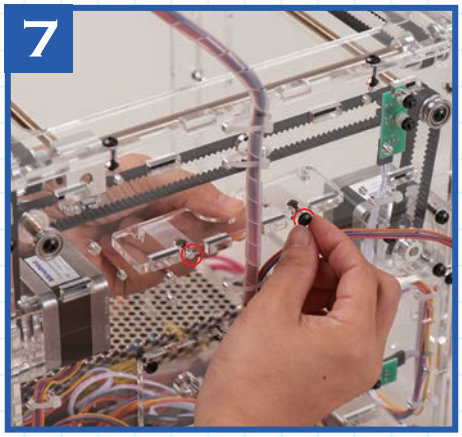
6





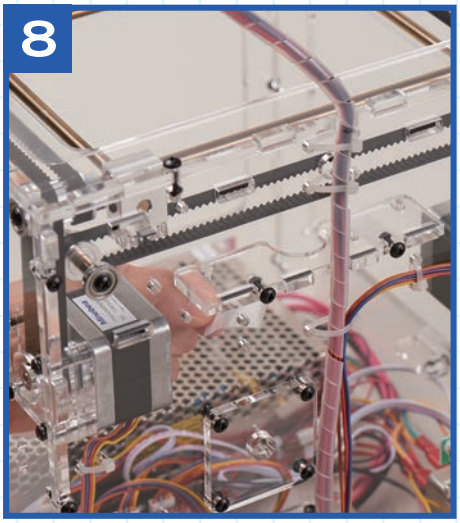
Holding the plate the same way up as in Step 5, insert its tabs into the two slots in the rear panel of the housing, shown outlined in red above left.

7



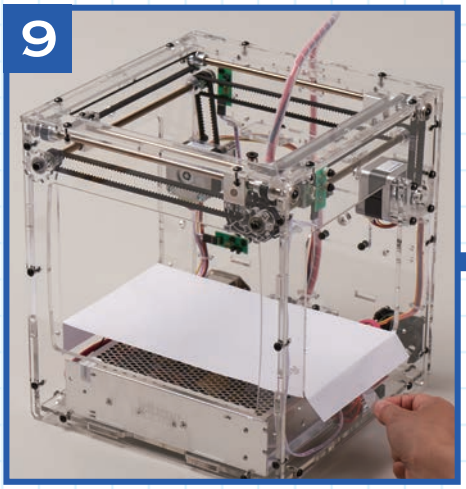
With the rear panel facing you, insert the 14mm truss head screws (with washers) through the screw holes in the rear panel and into the nuts in the plate. Finger tighten them only.

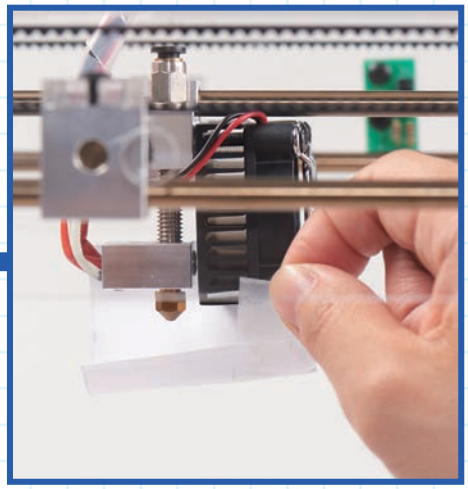
8



Peel off the tape that you used to hold the nuts in place.

9

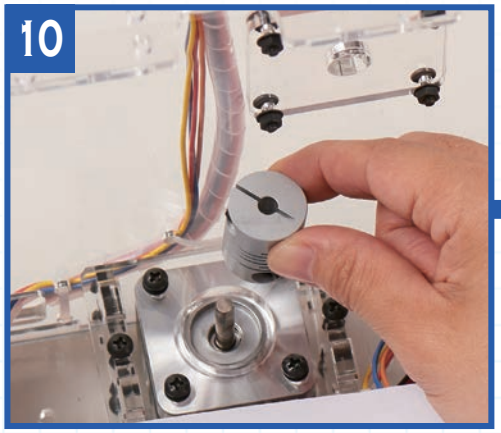


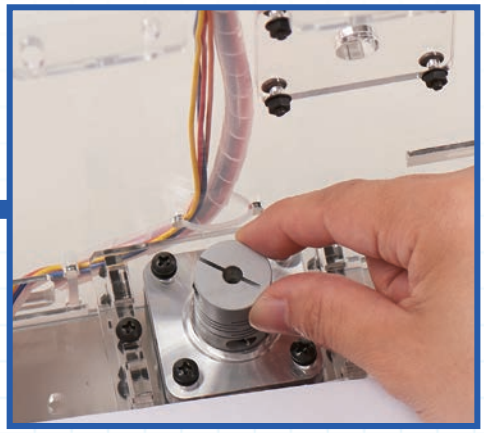


In the next stage, you add the table into the housing. To protect the bottom of the housing and the printer nozzle, use tape to secure a sheet of paper (such as copier paper) over the bottom of the housing and tape some paper over the tip of the nozzle, as shown.

Attach the coupling to the Z-axis motor

10



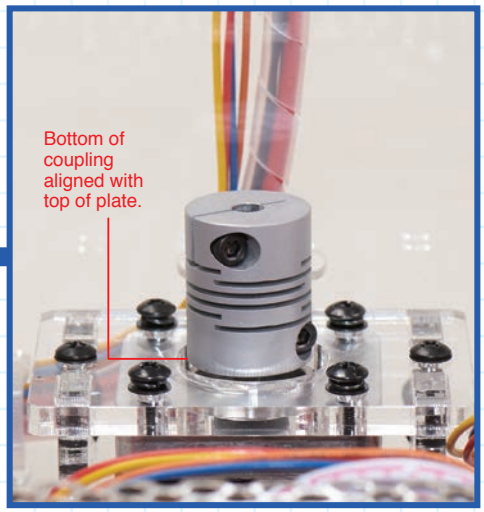


Put the shaft of the Z-axis motor into the hole in the coupling. It does not matter which way up the coupling is positioned.

HINT

If the coupling will not fit over the motor shaft, try loosening its hexagonal bolt using the 50 x 2.5mm Allen key. The coupling is fixed to the motor shaft when the lower hexagonal bolt is tightened. The upper bolt in the coupling is used to grip the Z-axis lead screw.

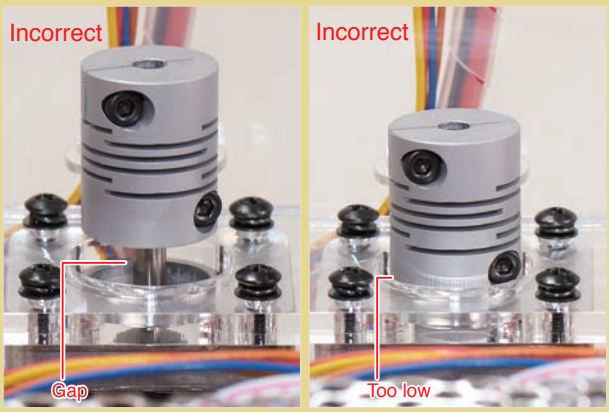
11



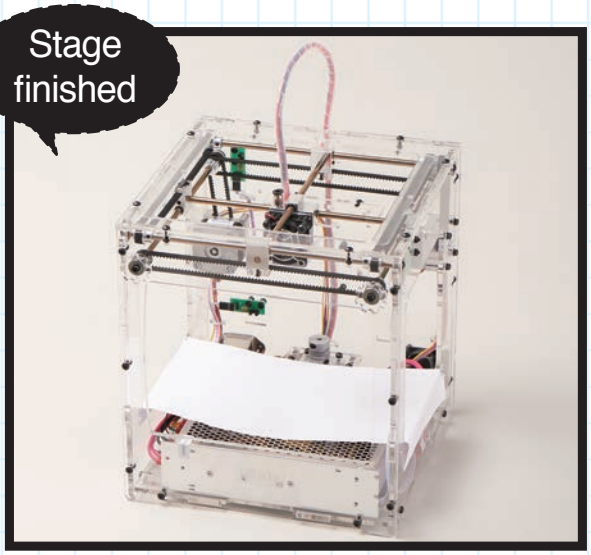
Align the coupling's bottom with the top of the plate that forms the motor mount and tighten the lower hexagonal bolt in the coupling using the 50 x 2.5mm Allen key.

POINT

Look from the side to see if you have the coupling aligned correctly. Ensure its bottom is aligned with the top surface of the mounting plate. There should not be a gap and the bottom of the coupling should not be below the plate. Check that the coupling is on securely after tightening the bolt.

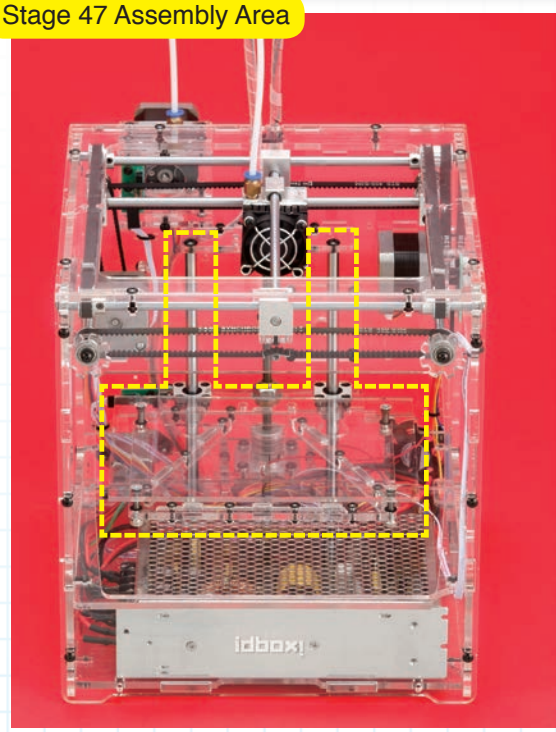


Stage finished



The Z-axis top mounting plate is temporarily attached to the rear housing panel and the coupling is attached to the Z-axis motor. Leave the protective papers in position.

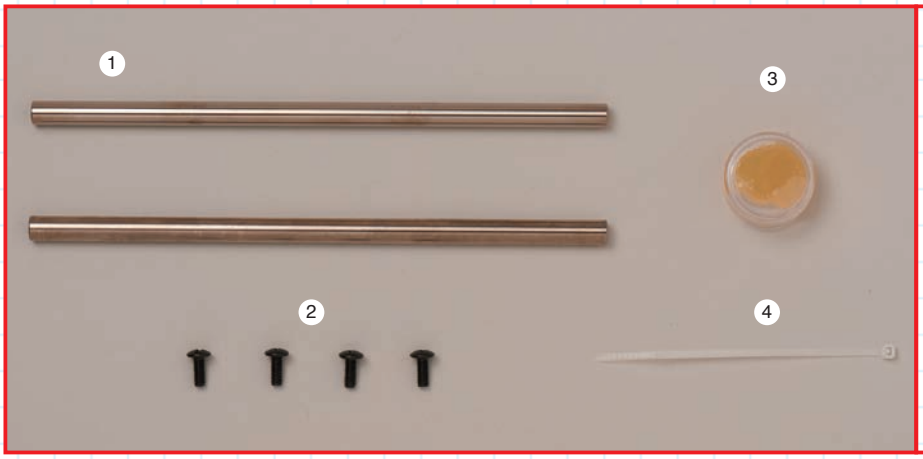
Stage 47 Assembly Area



Stage 47: Pass the Z-axis rods through the linear bushes to attach the table to the housing

In this stage, you first grease the two linear bushes that are attached to the modelling table, then insert the Z-axis rods through the bushes. The tops of the rods are then screwed to the Z-axis upper mounting plate and the bottoms to the bottom of the housing.

There are four columns of steel balls inside each of the linear bushes. The interior of the bushes – and especially the balls – need to be greased before the rods are inserted into the bushes. Next, the table is moved into the housing and the Z-axis rods inserted through the bushes. The rods are then screwed to the Z-axis mounting plate at their tops and to the bottom of the housing at their lower ends.



Stage 47 Components

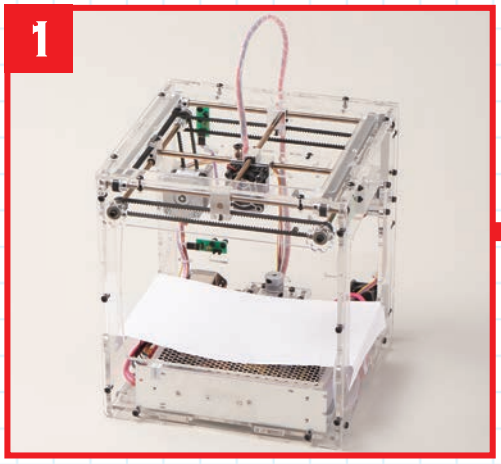
1: Z-axis rods x 2
2: M4 truss head screws (10mm) x 4
3: Grease
4: Cable tie

You will need

Phillips screwdrivers (sizes 1 and 2)

Parts to have ready

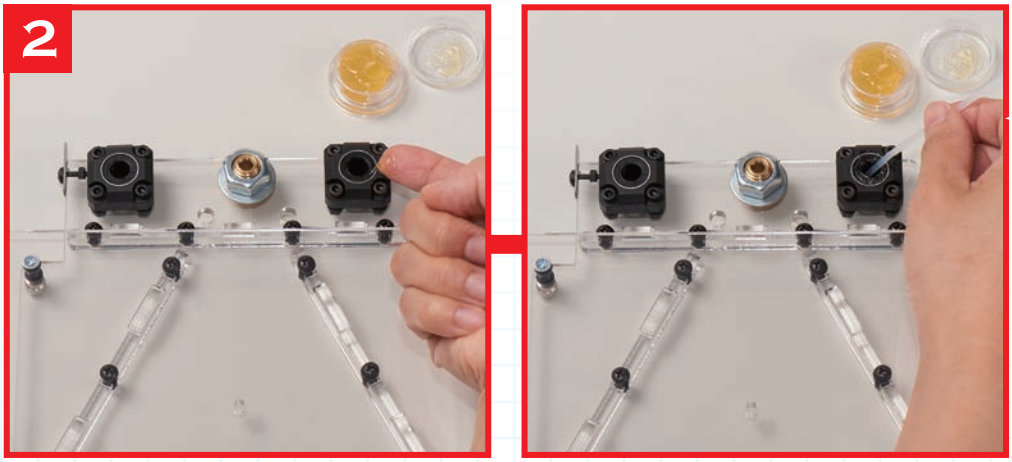
1



Get ready the printer housing and the table, which you last worked on in Stage 45.

Grease the linear bushes

2



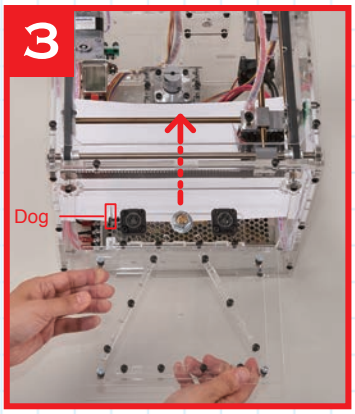
With your finger, put some of the grease supplied into the openings of the linear bushes, then spread it to the bearings inside the bushes using the cable tie supplied.

HINT

Inside each linear bush are four columns of steel balls arranged at 90-degree intervals. Make sure the grease covers all the balls.

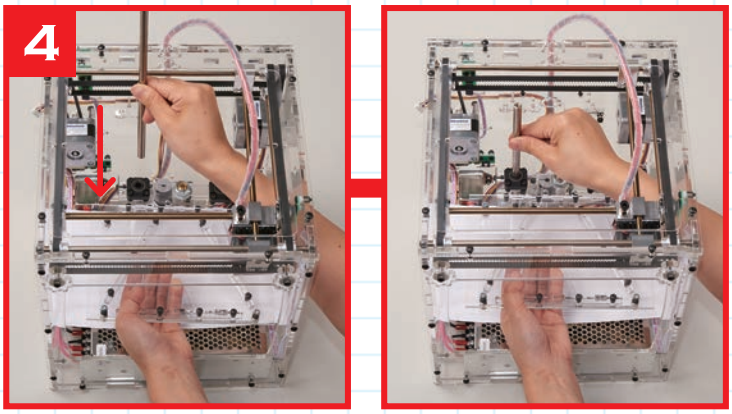
Attach the table by inserting the Z-axis rods into the linear bushes

3



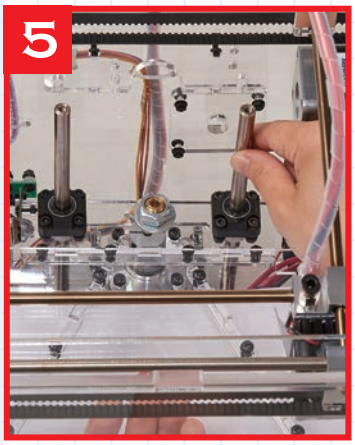
With the 'dog' (small metal plate) at the back left of the table, move the table into the housing through the opening in the front panel.

4



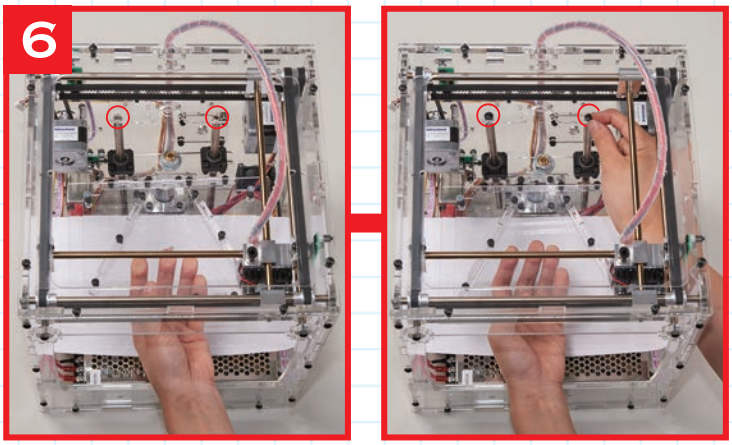
Holding the table with one hand, insert one of the Z-axis rods through the left side linear bush with your other hand. Push the rod gently through the bush until it touches the bottom of the housing.

5



Now pass the other rod through the other linear bush until it touches the housing's bottom.

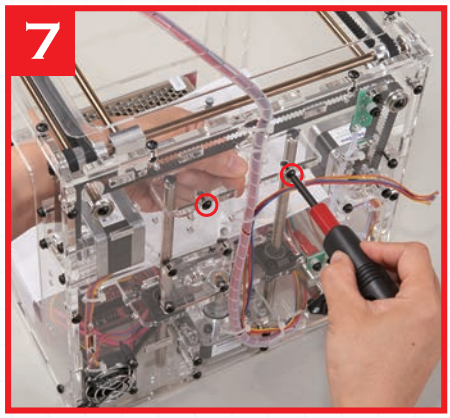
6



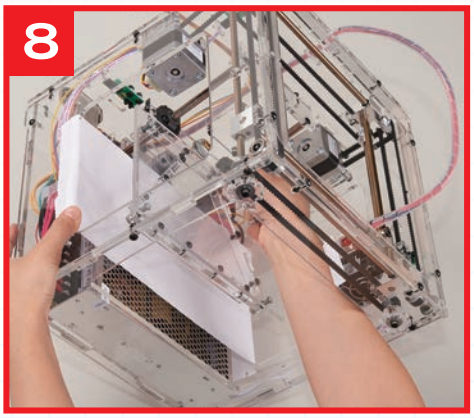
Align the tops of the rods with the holes ringed in red in the Z-axis mounting plate and insert M4 truss head screws through the holes. Finger tighten the screws into the screw holes in the tops of the rods.

POINT

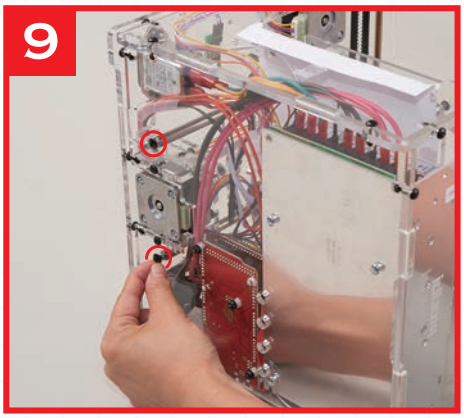
Handle the rods and bushes gently, as the operation of the printer depends on the table being guided up and down smoothly by the rods. If you have to, rest the table on the paper you put over the bottom of the housing.



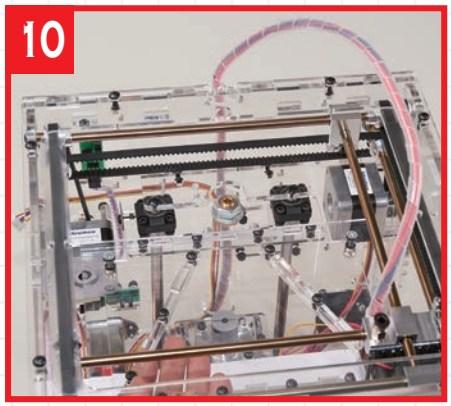
Turn the housing so the rear is facing you and tighten the two screws that hold the Z-axis top plate to the rear of the housing with a size 1 Phillips screwdriver.



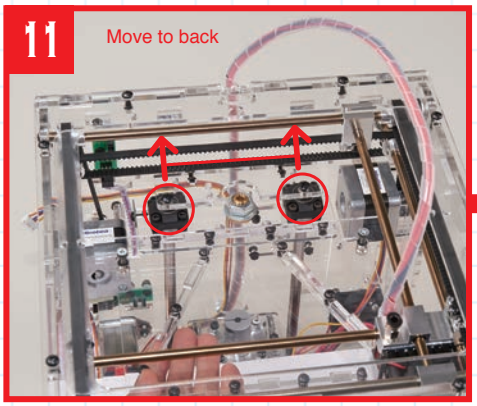
Turn the housing so its front is facing you and, holding the table steady, lie the housing down on its right side.

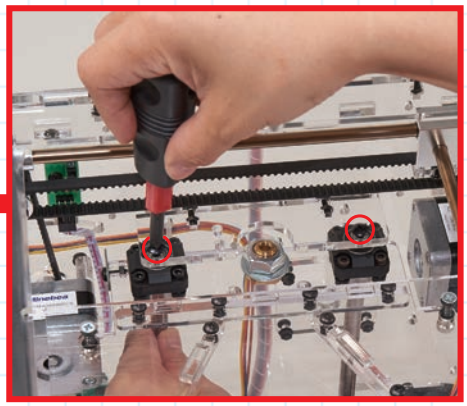


Align the bottoms of both rods with the screw holes (ringed in red) and insert M4 screws through the holes and finger tighten them in the rods' screw holes.

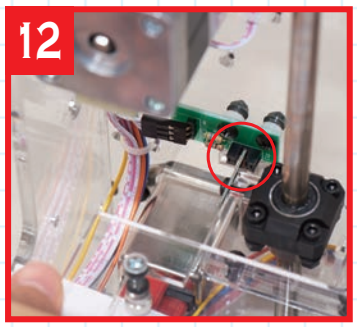


Holding onto the table, turn the housing the right way up. Holding the table level, move the table slowly up to the top of the rods. Do not let the table touch the nozzle.

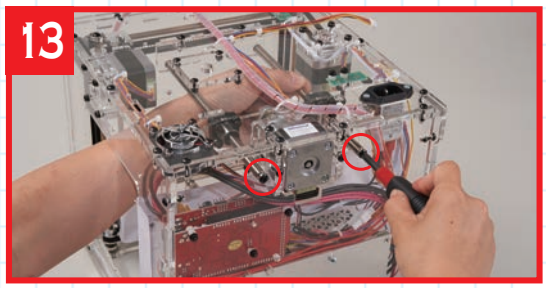




Push the table so the screws (ringed in red) move to the back of the oblong screw holes in the Z-axis top mounting plate. Holding the table in position, grip each rod in turn to stop it spinning while you tighten the screws using the size 2 Phillips screwdriver.



Lower the table slowly and carefully, checking that the metal plate (circled) fits between the sides of the limit switch. If it does not, adjust the position of the switch by loosening its screws with a size 1 Phillips screwdriver and moving the switch until it does. When the switch is in the correct position, tighten its screws.

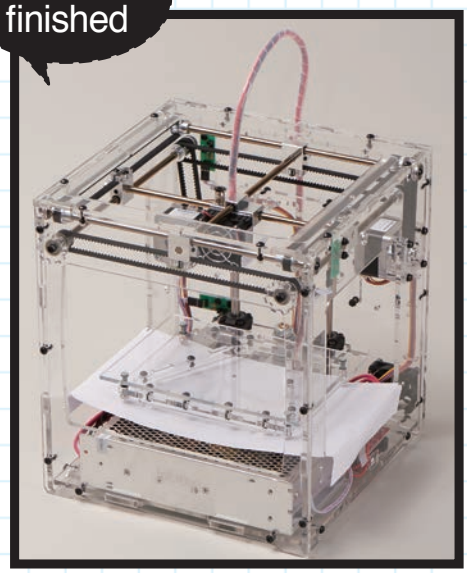


Holding the table at the bottom of the housing, turn the housing so it is on its front, and use a size 2 Phillips screwdriver to tighten the screws to attach the Z-axis rods to the housing's base.

HINT

It is important to tighten the screws at the top of the Z-axis rods with the table at the top, then to tighten the screws at the bottom with the table at the bottom. It's a good idea to keep a hand supporting the table every time you turn the housing.

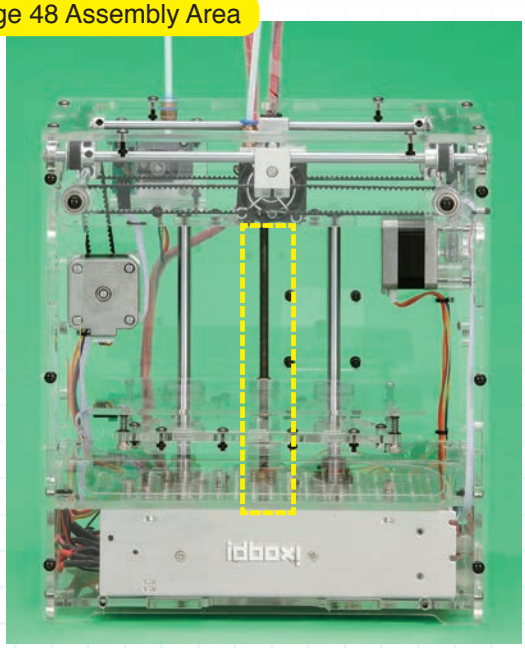
Stage finished



The table has been added to the housing. Keep the protective papers in place for the moment.

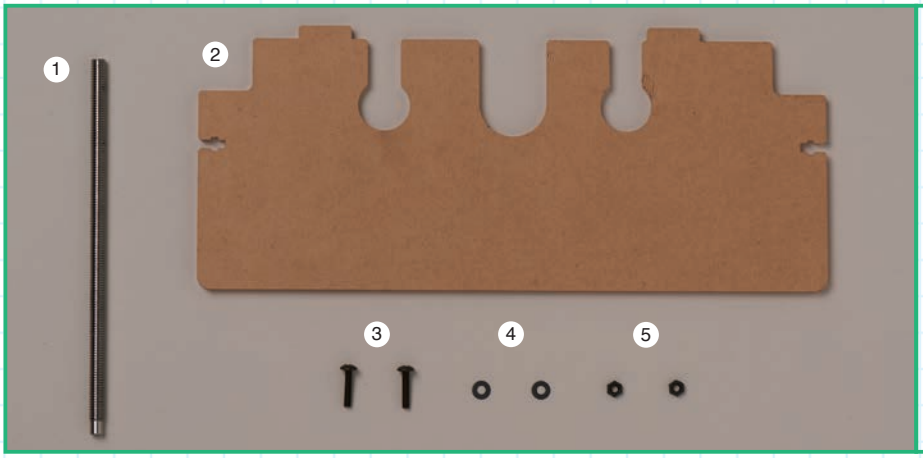
Stage 48: Attach the lead screw to the table and the Z-axis motor coupling

Stage 48 Assembly Area



In this stage, you affix the lead screw through the modelling table's brass nut, then insert its lower end into the Z-axis motor coupling, securing it in place by tightening the coupling's upper hexagonal bolt.

Make sure you get the lead screw the right way up – the end with the unthreaded tip is at the bottom. When you put the lead screw through the brass nut, try not to damage the thread of either the nut or the screw itself. When the lead screw is about halfway through, put its unthreaded tip into the hole in the top of the coupling and clamp it in place by tightening the upper hexagonal bolt.



Stage 48 Components

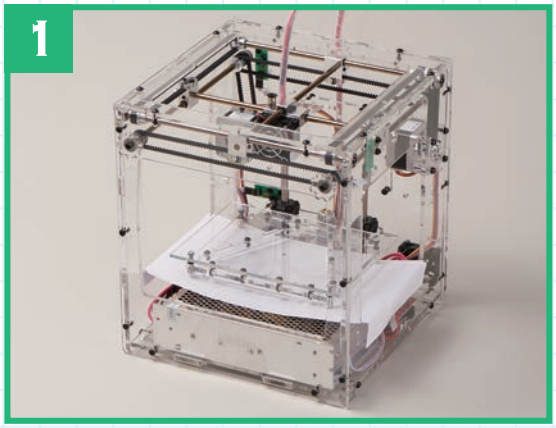
1: Lead screw
2: Bottom cover panel
3: M3 truss head screws (14mm) x 2
4: M3 washers x 2
5: M3 nuts x 2

You will need

Allen key (50 x 2.5mm) supplied with Stage 44

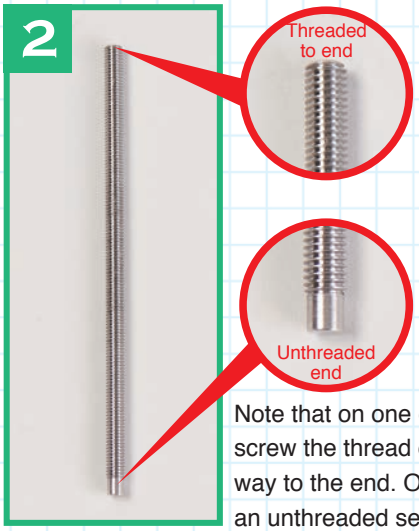
Parts to have ready

1



Take the printer housing. Do not remove the protective covering from the bottom cover panel yet, as this will not be used until a later stage.

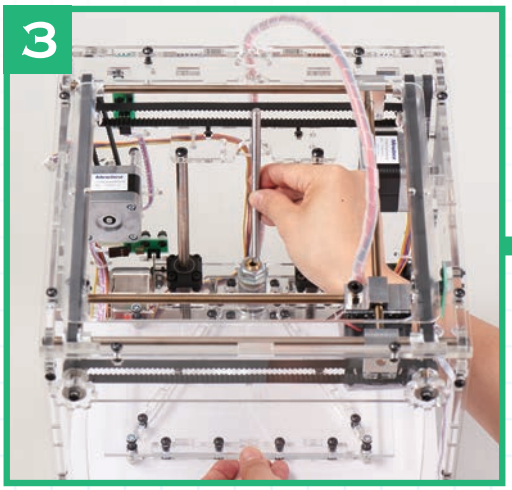
2

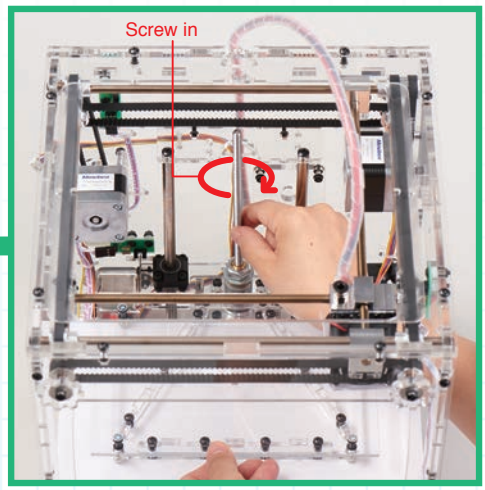


Note that on one end of the lead screw the thread continues all the way to the end. On the other end is an unthreaded section.

Fit the lead screw into the brass nut

3

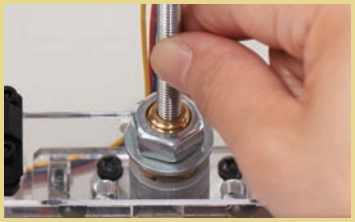




Take the end of the lead screw that has an unthreaded section. Insert it into the brass nut and screw it in by turning it clockwise.

POINT

Take great care when handling the lead screw. The correct operation of the printer in the Z-axis (up and down) depends on the lead screw being in good condition, with no nicks or scratches on its threads. Be very careful to screw it into the brass nut without cross-threading it.



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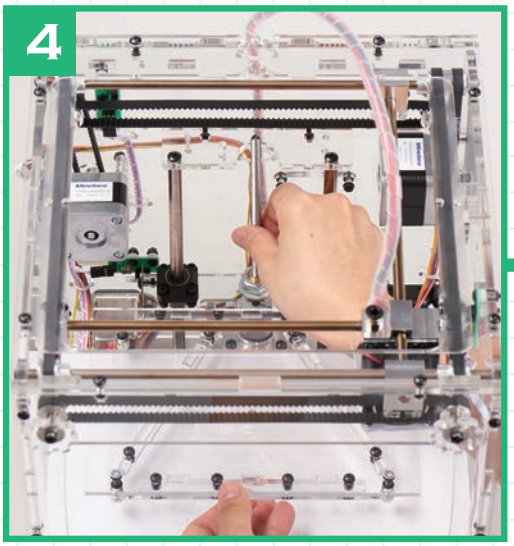
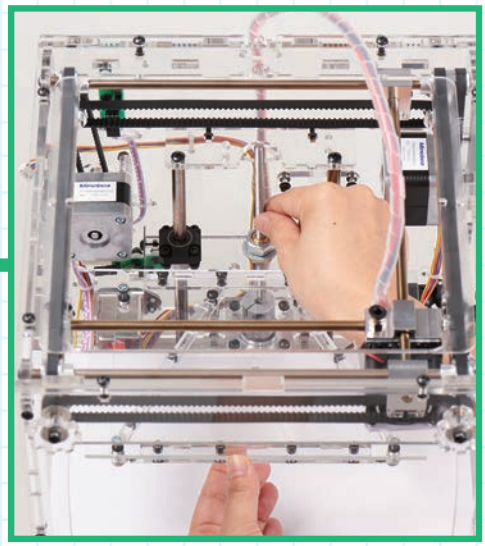
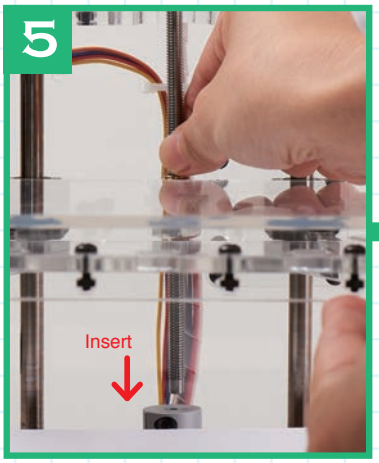


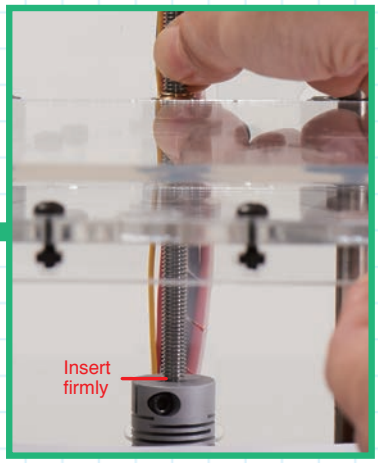


Keep the top of the lead screw clear of the timing belt and, as you continue to turn it through the brass nut, support the table as it moves up the lead screw.

Secure the lead screw in the coupling

5



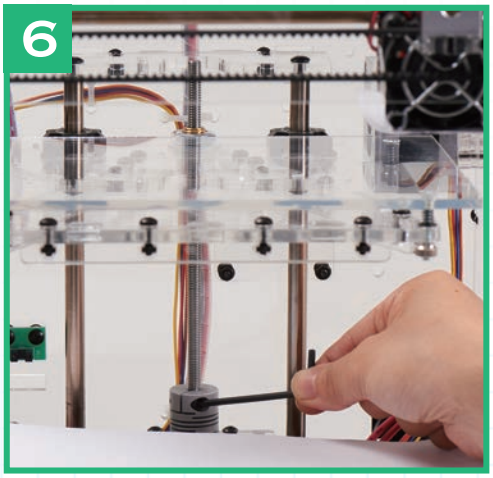


When you have turned about half of the length of the lead screw through the brass nut, insert the unthreaded end of the lead screw firmly into the hole in the top of the Z-axis motor coupling.

HINT

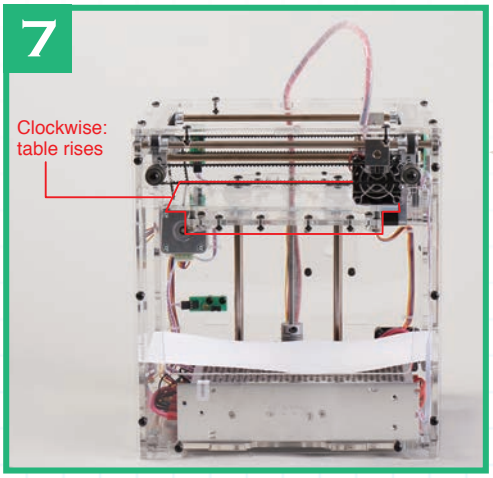
If the hole in the coupling does not align with the end of the lead screw, move the motor in the horizontal plane until it does. If the lead screw's end will not go into the hole, loosen the upper hexagonal bolt in the coupling so the hole opens up.

6



Use the 50 x 2.5mm Allen key to tighten the hexagonal nut in the coupling.

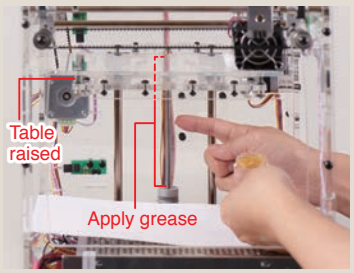
7



When you rotate the lead screw in a clockwise direction, the table rises.

HINT

If you hear a squeaking sound when you rotate the lead screw, raise the table and apply a thin layer of the grease (supplied with Stage 47) to the length of the screw.



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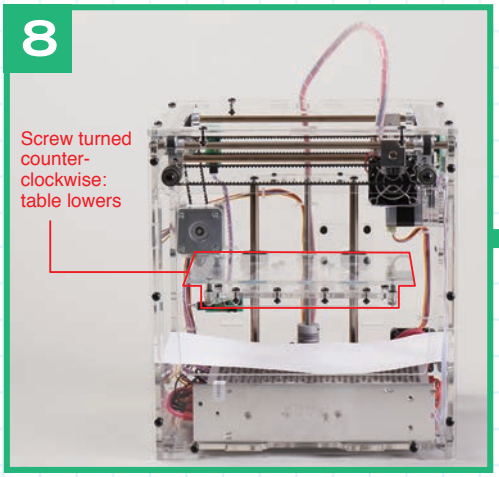
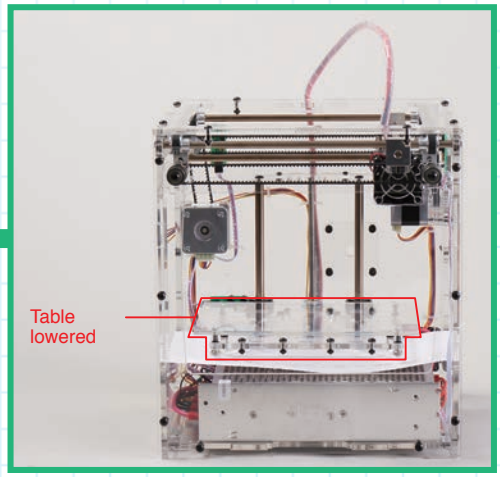
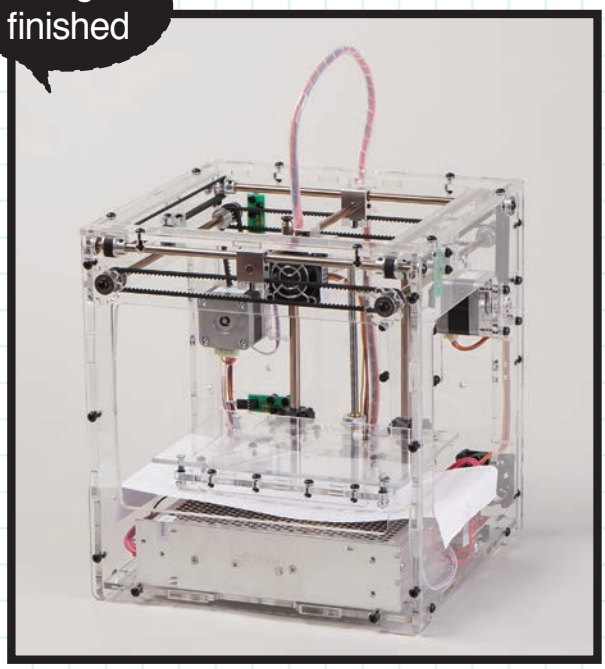




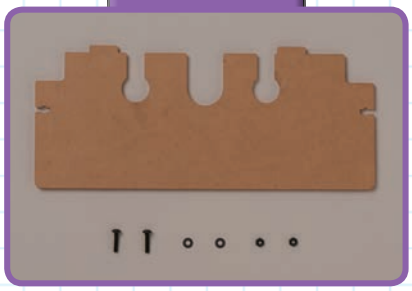
The table is lowered by turning the lead screw counterclockwise. Turn the lead screw until the table is lowered all the way to the bottom.

Stage finished



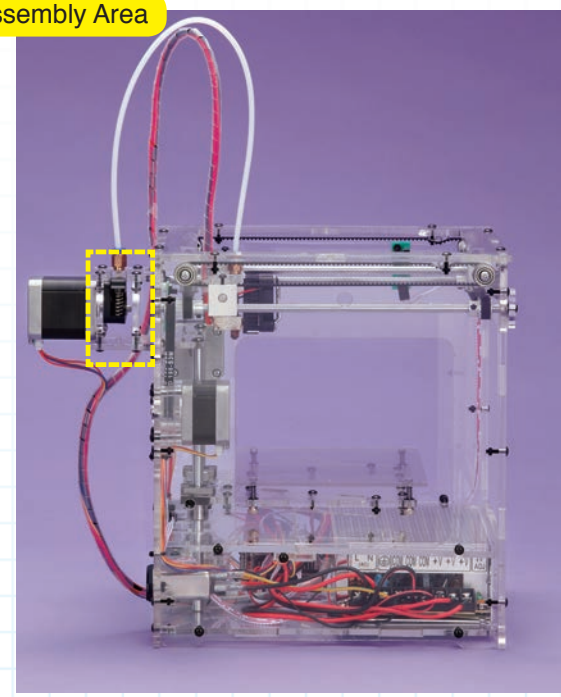
The lead screw has been fitted through the brass nut and its end secured in the Z-axis motor coupling. Put the housing away somewhere safe, ready for the next stage.

Store the parts



Put the unused parts from this stage away safely, for use later.

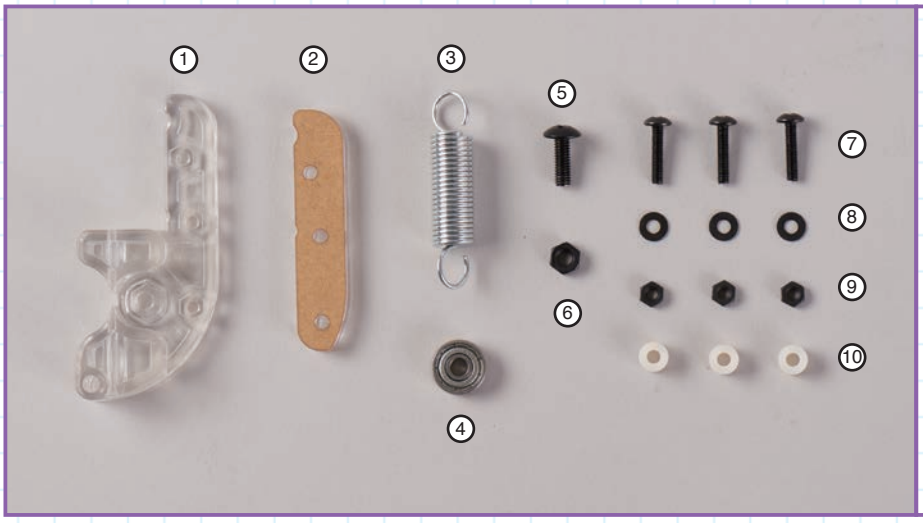
Stage 49 Assembly Area



Stage 49: Assemble the arm of the extruder

In this stage, you start to put together the extruder, the part of the idbox that feeds filament to the head. This time you work on the extruder arm. During assembly, it is important to make sure you get the acrylic panel named ‘arm part B’ the right way round.

The extruder feeds filament to the printer head. The type of extruder used in your idbox is a Bowden extruder, which is installed on the outside of the housing rather than in the printer head itself. A Bowden extruder has several advantages, in that it keeps the weight of the moving parts round the head to a minimum, enabling fast movements of the head and thus faster modelling. The arm you put together this time is used to guide filament to the extruder drive unit. Treat the acrylic parts gently and do not use excessive force when tightening the screws.



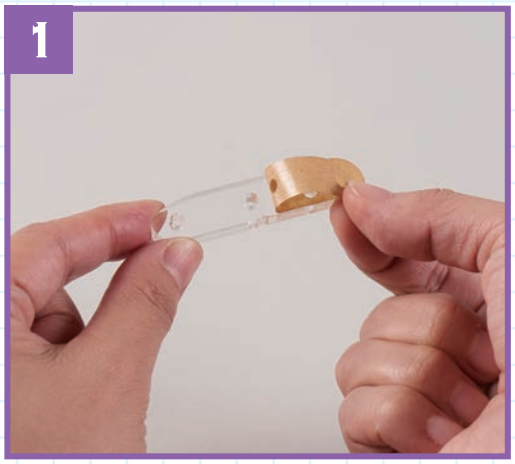
Stage 49 Components

1: Arm part A
2: Arm part B
3: Tension spring
4: Bearing (624ZZ)
5: M4 truss head screw (12mm)
6: M4 nut
7: M3 truss head screws (16mm) x 3
8: M3 washers x 3
9: M3 nuts x 3
10: M3 spacers (5mm) x 3

You will need

Phillips screwdriver (size 1)
Adhesive tape

1

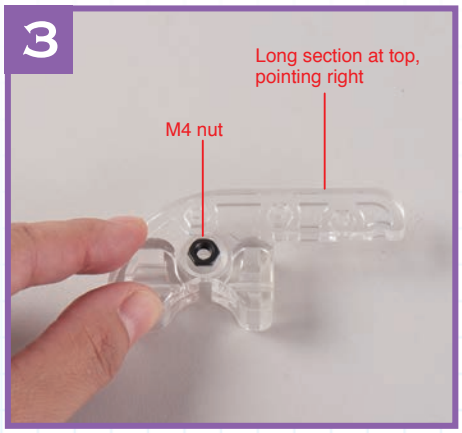


Peel off the protective covering from arm part B.

2

Put an M3 washer on each of the three 16mm M3 truss head screws supplied this time.

Join arm parts A and B



Turn arm part A so the long section of the arm is at the top, and pointing right. Push the M4 nut into the hexagonal hole in arm part A, as shown in the photo above.

Turn arm part A over so the long section of the arm is pointing to the left. Insert the bearing (624ZZ) into the circular hole above where the nut is positioned. The bearing can go in either way up, since it does not have a flange.

HINT

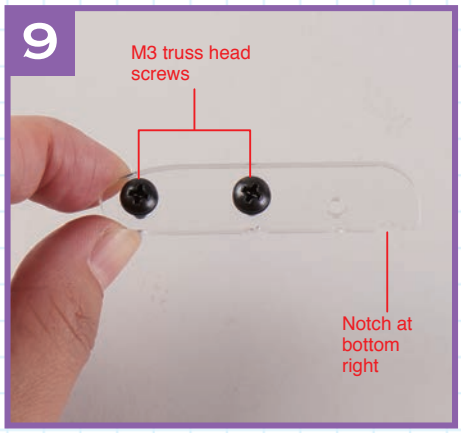
If the M4 nut falls out when you turn the arm over, hold it temporarily in place with adhesive tape.

Insert the 12mm M4 truss head screw through the bearing and tighten it in the nut using a screwdriver.

Put an M3 nut in each of the three hexagonal holes ringed in red above.

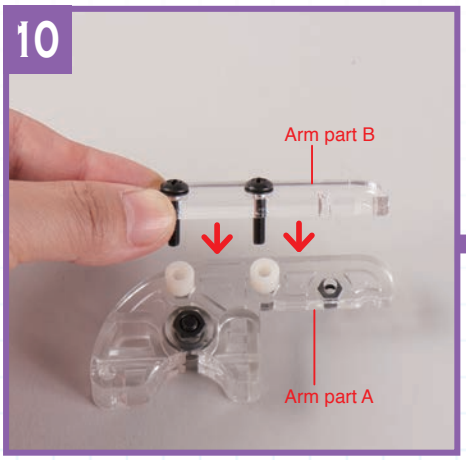
Turn the arm over so the long section is at the top and pointing right. If the nuts fall out, secure them temporarily in position with adhesive tape.

Place a 5mm M3 spacer over each of the two holes shown ringed in red above.



Hold arm part B so that the notch is at the bottom right, and put a 16mm M3 truss head screw (with washer on) through each of the two screw holes as shown.

10



Insert the screws in arm part B through the spacers resting on arm part A.

11

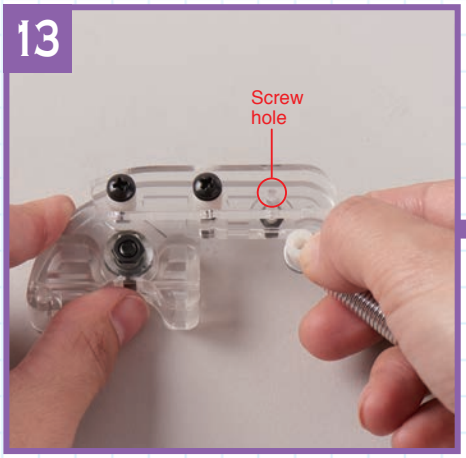
Tighten the screws into the nuts in arm part A using a screwdriver.

Attach the tension spring to the arm

12

Place a 5mm M3 spacer in a hook end of the tension spring.

13



Hold the spacer in place and insert the spring into the gap between the arm parts. Align the spacer with the screw holes in the top and bottom arms.

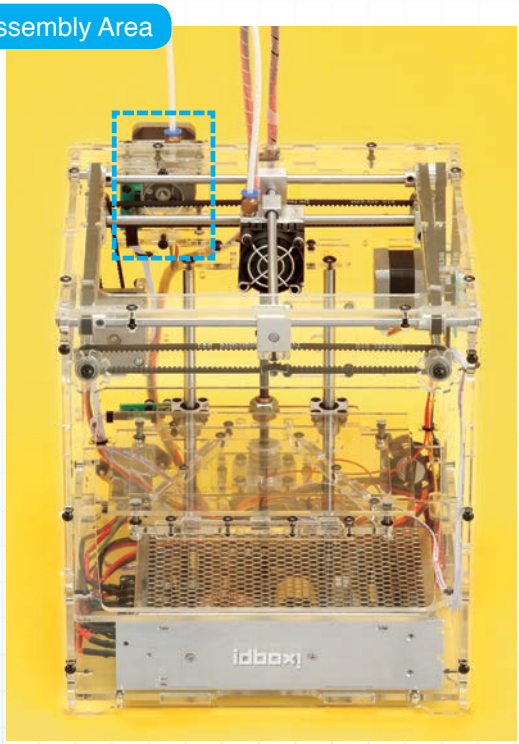
14

Put a 16mm M3 truss head screw (with washer) into the screw hole, through the spacer, and tighten it into the nut below with a screwdriver.

The extruder arm has been assembled. Store it safely for use in a later stage.

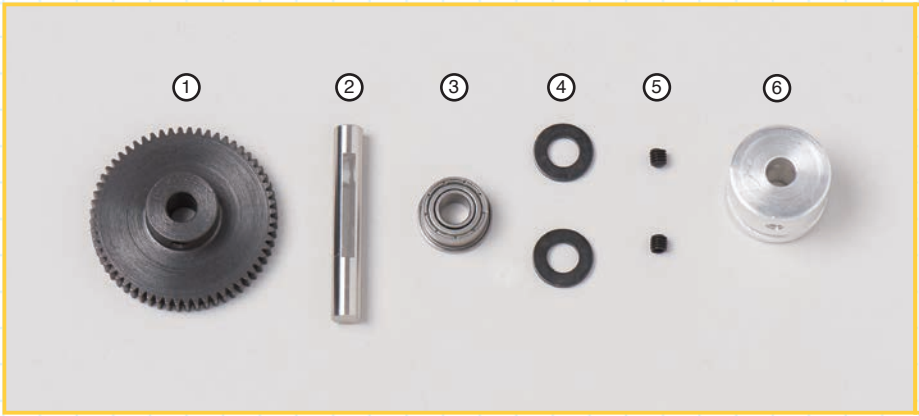
Stage 50: Assemble the extruder's large gear and drive roller

Stage 50 Assembly Area



In this stage, you continue to put together the extruder assembly. This time you attach the large gear to the drive shaft and then add the drive roller to the drive shaft.

This stage is fairly simple, but you must be careful to align and orientate the various components correctly. For instance, when you attach the large gear to the drive shaft, you use the bearing and a washer supplied to act as temporary spacers to set the distance it should be from the end of the drive shaft before screwing it to the shaft with a set screw. When you tighten this screw, it must screw down onto the flat surface of the drive shaft. Similarly, the drive roller's set screw must also be tightened so that it presses against the flat section of the drive shaft.



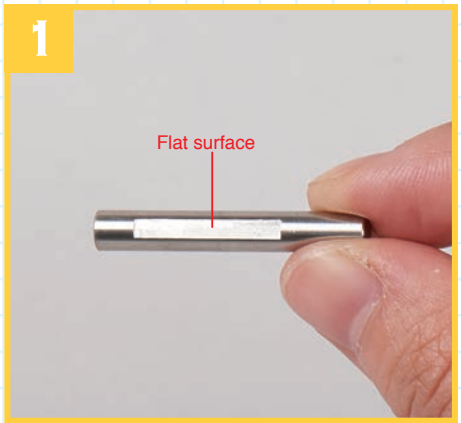
Stage 50 Components

1: Large gear (P0.5-60)
2: Drive shaft
3: Bearing (F685ZZ)
4: M5 washers x 2
5: M3 set screws (3mm) x 2
6: Drive roller

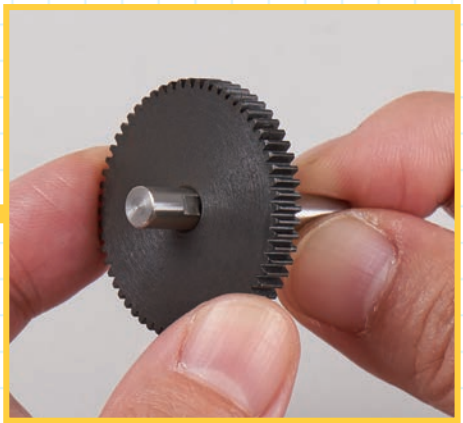
You will need

Allen key (1.5mm) supplied with Stage 30

Attach the large gear to the drive shaft



Look at the drive shaft and you will see that it has a flat surface along part of its length.



Insert the drive shaft into the hole in the centre of the large gear, on the side of the gear with the screw hole. It does not matter which end of the drive shaft you insert. After insertion, the shaft should protrude from the hole in the gear side of the large gear.

3

Put an M5 washer over the end of the drive shaft that protrudes from the gear side of the large gear.

4

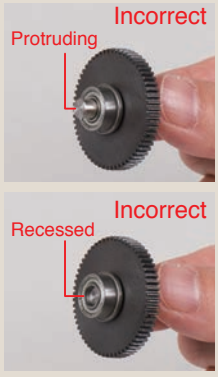
Put the bearing (F685ZZ) onto the protruding drive shaft. The bearing can go on either way at this stage.

5

Align the end of the drive shaft with the left surface of the bearing.

HINT

Align the end of the drive shaft with the left of the bearing to determine the gear's position on the shaft.



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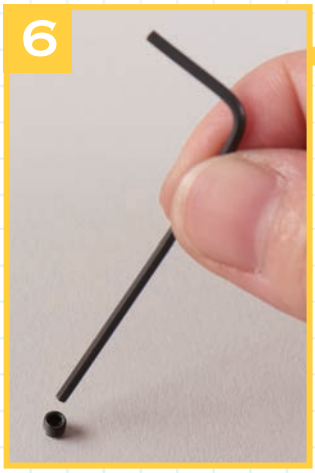
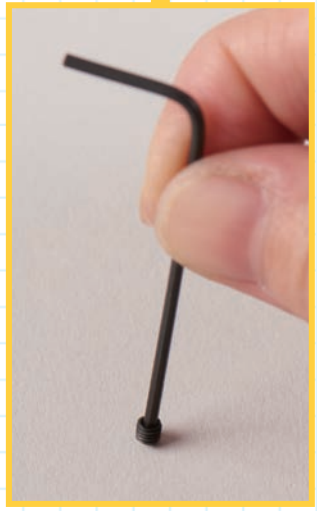
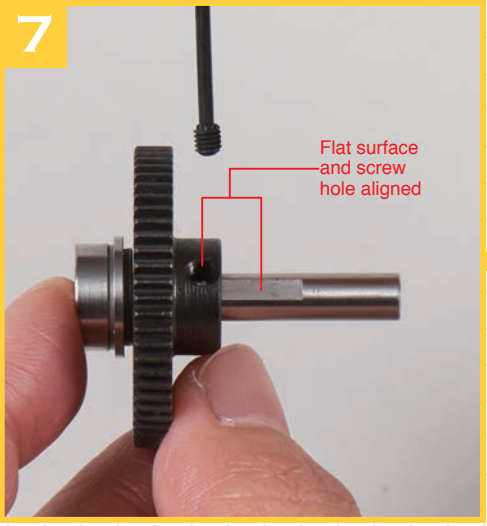




Put the end of the 1.5mm Allen key into the hexagonal hole in the head of a 3mm set screw.

7



POINT

For the gear to be held securely to the shaft, the set screw must be tightened so its non-head end is screwed against the flat surface of the drive shaft.

Align the flat surface of the drive shaft with the screw hole in the large gear. Put the set screw into the screw hole and tighten it up.

8

Remove the bearing from the drive shaft.

9

Remove the washer from the drive shaft.

Attach the drive roller to the drive shaft

10

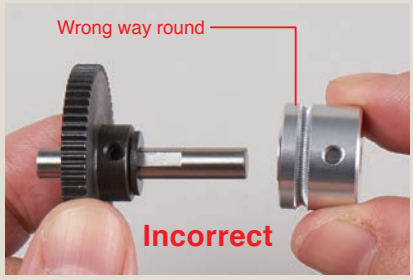
Put the M5 washer you have just removed onto the opposite end of the drive shaft.

11

Put the drive roller on the shaft, with the screw hole on the left and groove on the right.

HINT

Make sure you put the drive roller onto the drive shaft with its groove away from the large gear.



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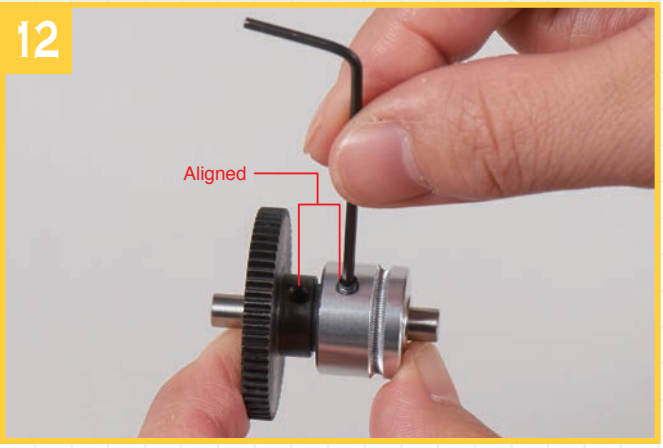


Slide the drive roller along the shaft so that there is no space between the gear, the washer and the end of the drive roller. Align the screw hole on the drive roller with that in the large gear, then secure the drive roller to the shaft by inserting and tightening a 3mm set screw in the screw hole in the drive roller.

Stage finished

The extruder's large gear has been assembled. Check that your components look like those in the photo above.

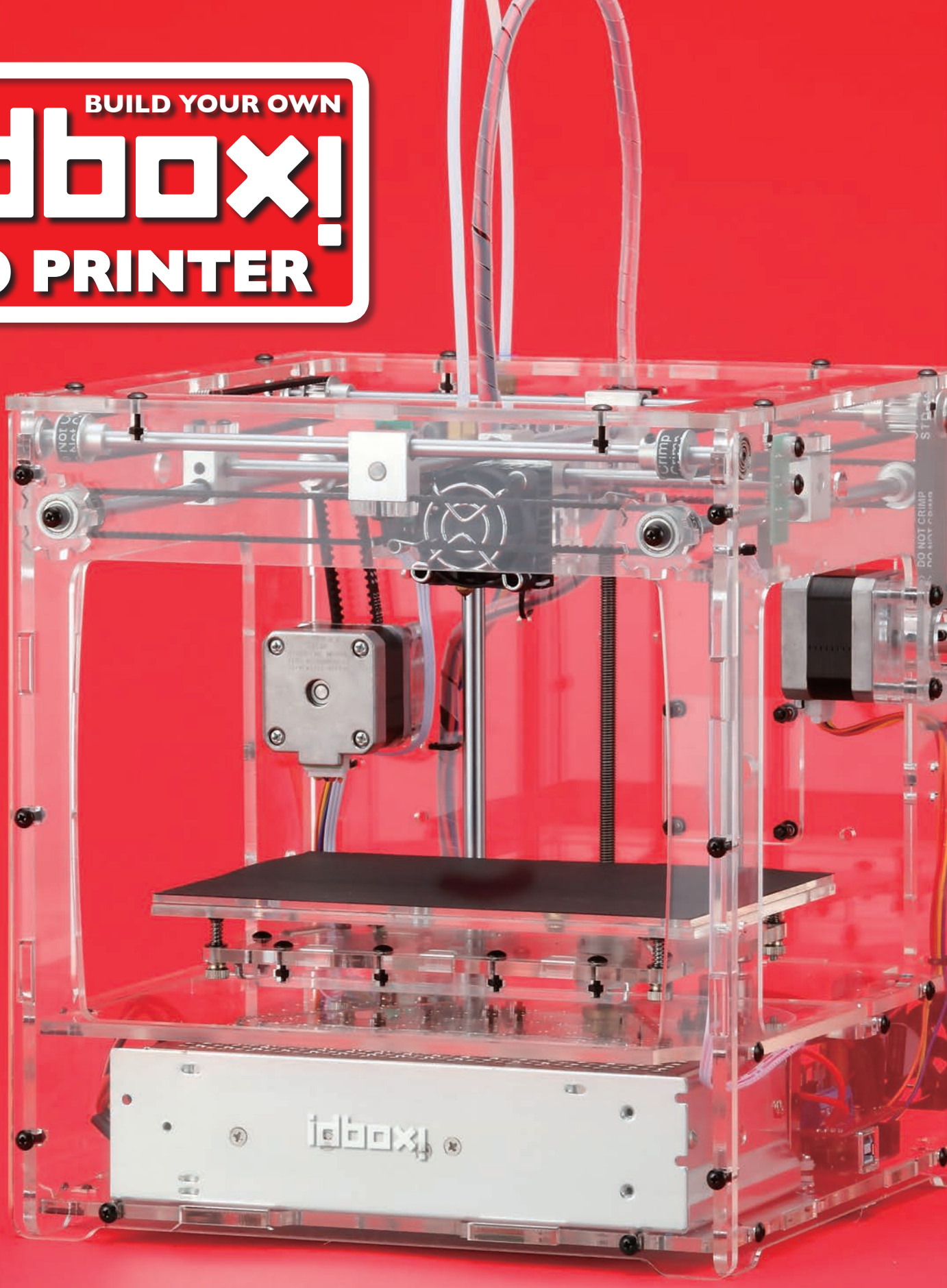
Store the parts

You'll need the bearing (F685ZZ) and M5 washer in the next stage, so store them somewhere safe.

BUILD YOUR OWN

idbox!

3D PRINTER



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