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Pack 06

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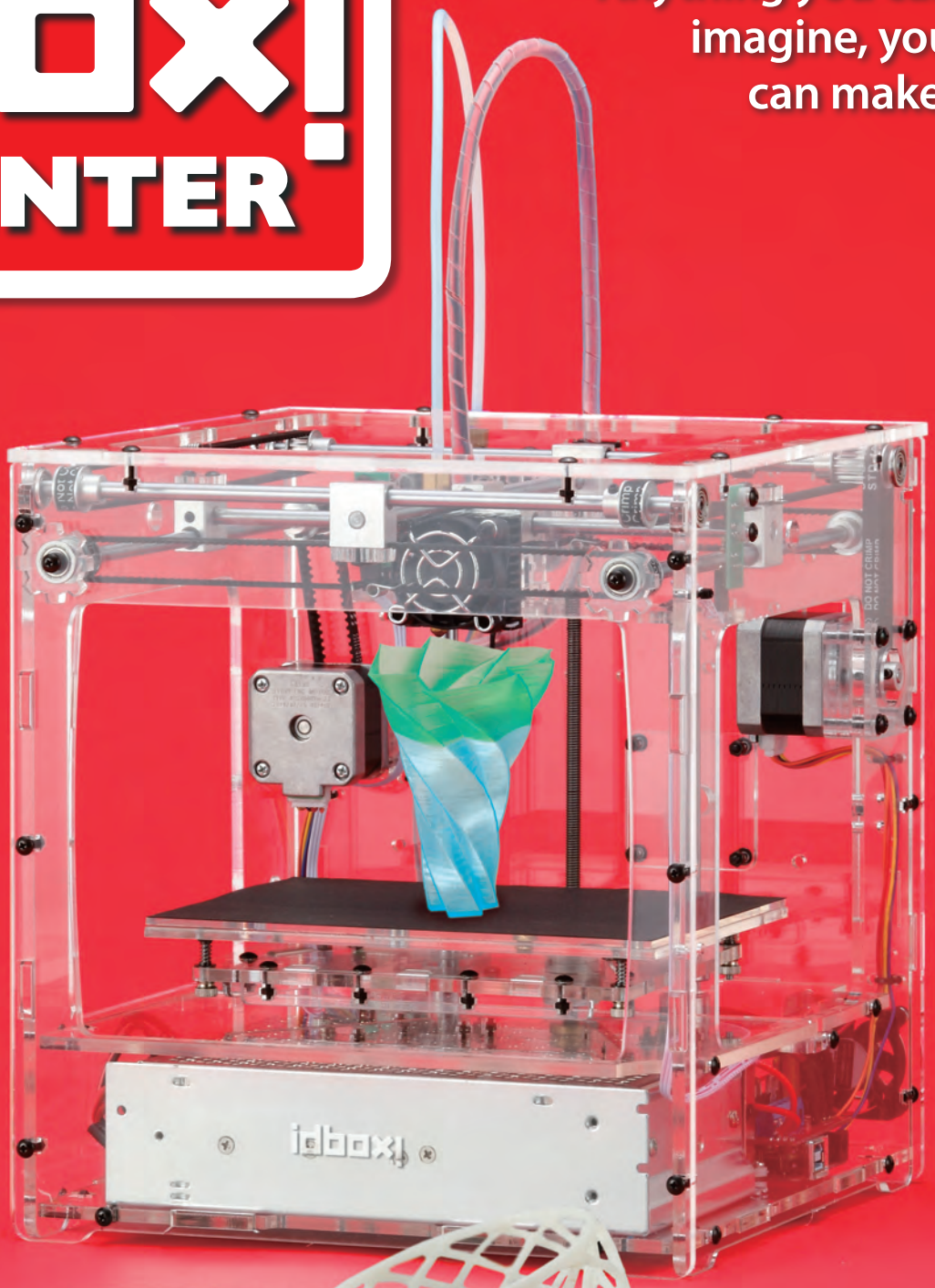

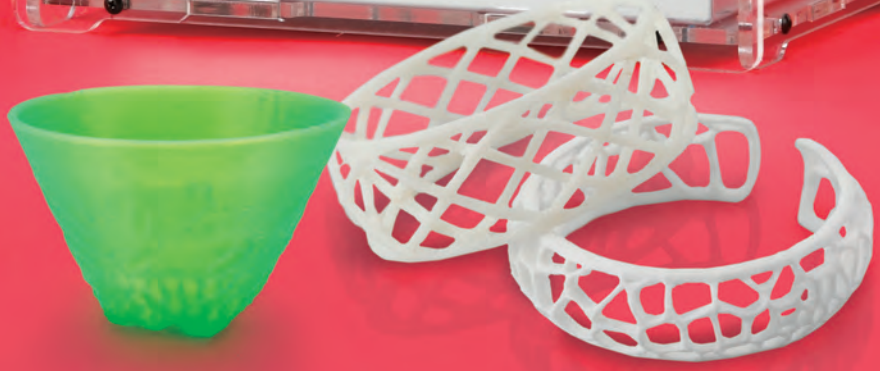

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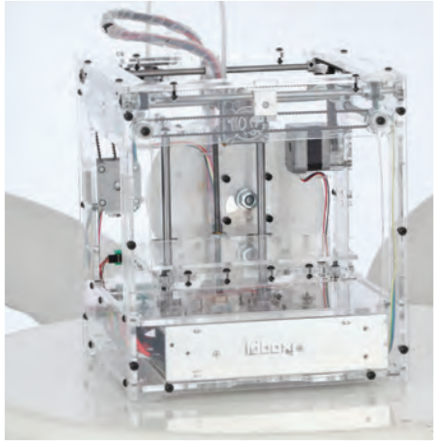
BUILD YOUR OWN idbox! 3D PRINTER



CONTENTS

WARNING: Not suitable for children under the age of 14. This product is not a toy and is not designed or intended for use in play. Items may vary from those shown.

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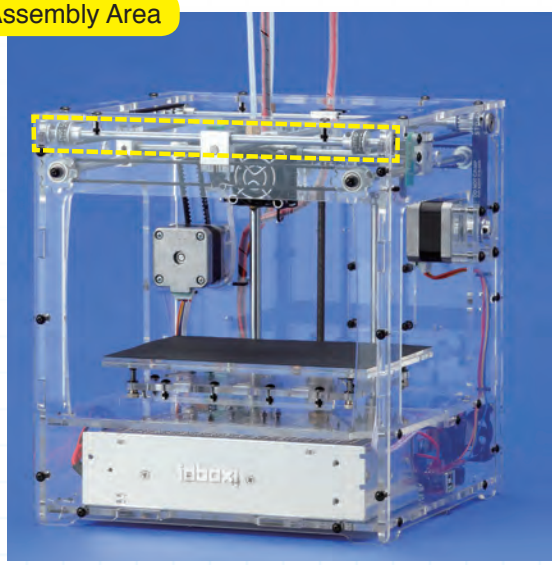
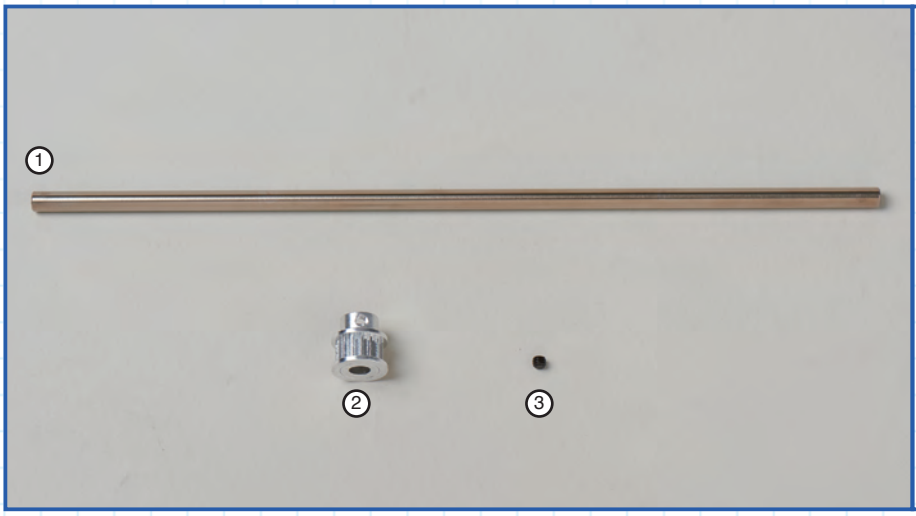
Stage 21 Assembly Area



Stage 21: Add a timing pulley to the front X-axis slider rod

In this stage, you add a short timing pulley to the front X-axis slider rod, securing it temporarily in place with a set screw.

As in previous stages where you added a short timing pulley to a slider rod, you insert the short 3mm set screw into the screw hole in the pulley and slide the pulley onto the rod, loosely tightening it in place with the 2mm Allen key, supplied with Stage 11.



Stage 21 Components

1: Slider rod (X-axis/front) x 1
2: S3M timing pulley/short (15-6-7) x 1
3: M4 enamel set (3mm) x 1

Tools you will need

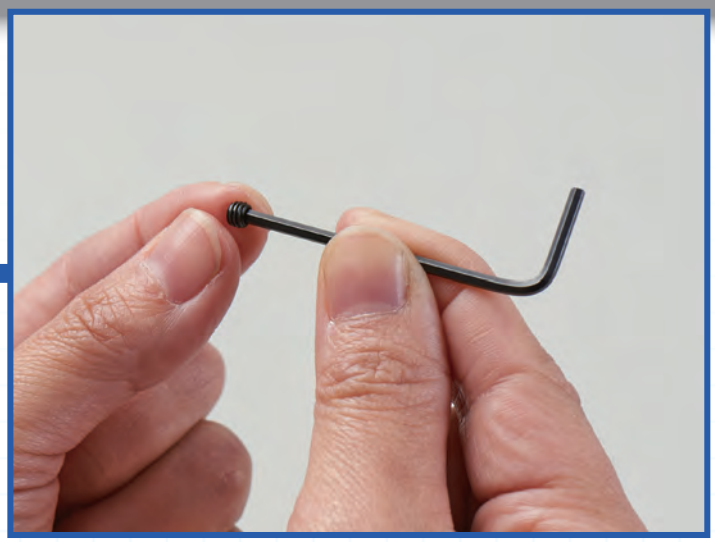
Allen key (2mm) supplied with Stage 11

Add the timing pulley to the slider rod

1

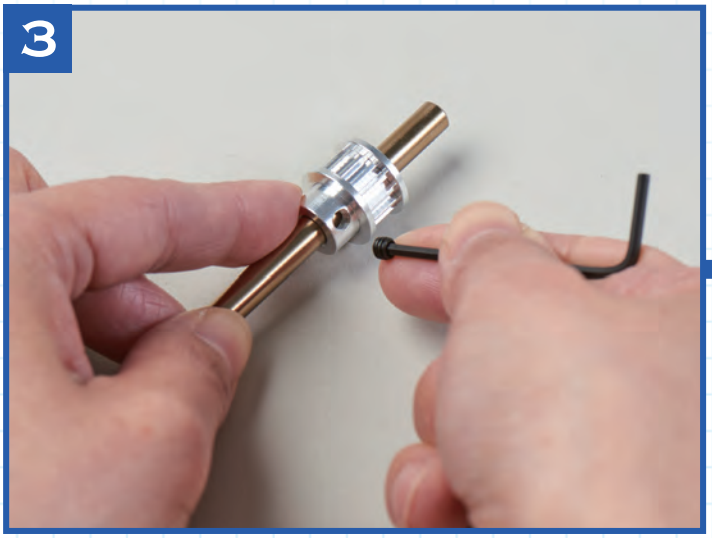
Insert the slider rod through the timing pulley, as shown, so that there is about 2cm between the toothed end of the pulley and the end of the rod. Be careful not to damage the slider rod.

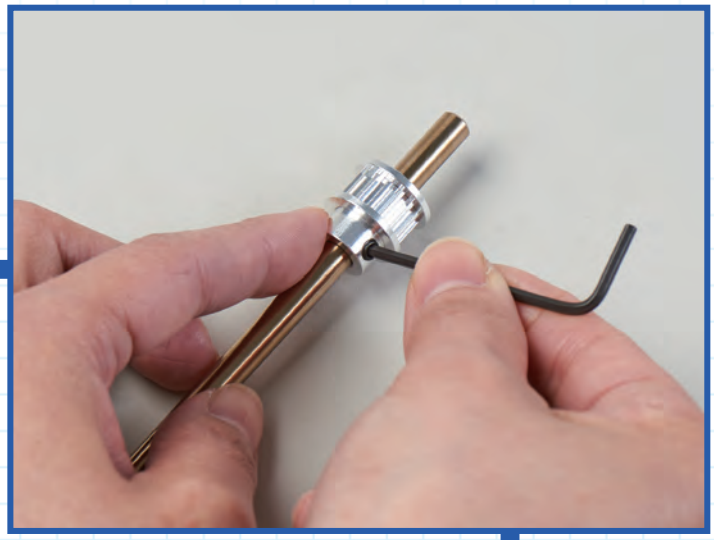
2



Insert the long end of the Allen key into the hexagonal hole in the head end of the set screw.

3





Insert the set screw into the timing pulley's screw hole, and turn the Allen key clockwise to tighten it. Stop turning when you begin to feel resistance.

HINT

To avoid damaging the threads on the set screw and in the timing pulley, it is important to make sure that the set screw is straight in the screw hole. If you need to use force to turn the Allen key, stop, remove the screw from the hole, and try again.

The set screw is tight enough (for now) when the pulley is just barely held in position and does not slide down when the rod is held vertically.

Understand timing belt descriptions

CLOSE-UP

The teeth on the timing pulleys mesh with the ridges on the timing belts to transmit the turns of the motors to the rods. The belts supplied are described as follows: 'S3M timing belt/long (459-6)' for the long belts and 'S3M timing belt/short (195-6)' for the short ones. The S3M at the front of the description describes the distance between the ridges, in this case 3mm. The first number inside the brackets refers to the length or circumference of the belt. So the large belts have a circumference of 459mm and as the distance between ridges is 3mm, they have 459 ÷ 3 = 153 teeth. The short belts are 195mm long.

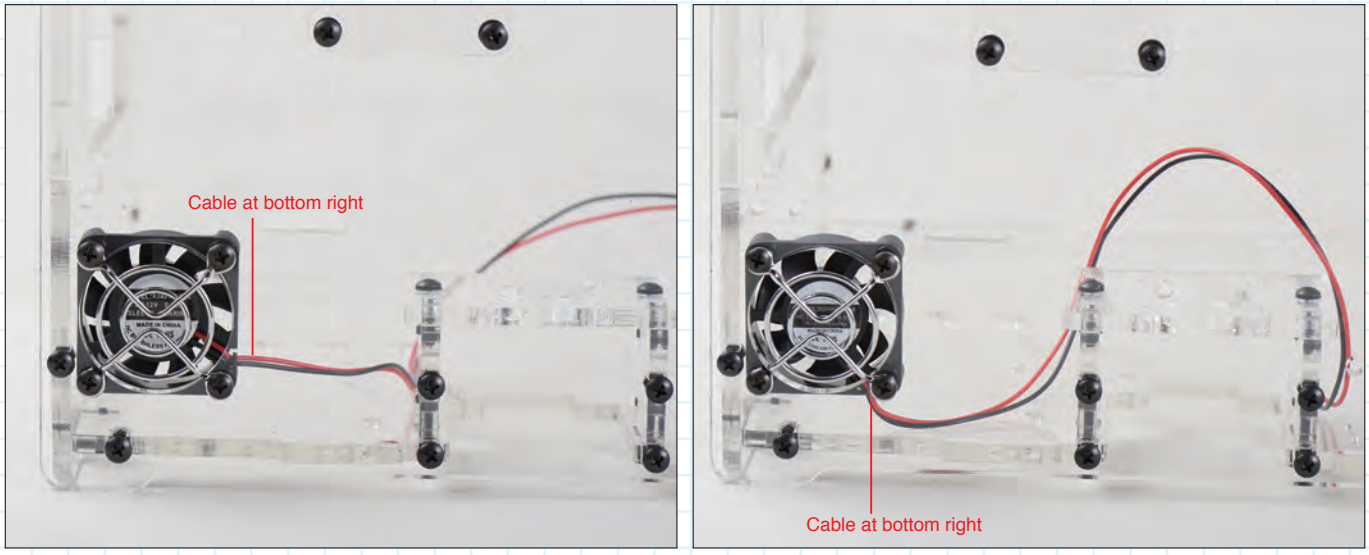
The 'teeth' of the timing pulley, and the corresponding ridges on the timing belt are made to fit each other exactly, so that there is no play or slippage when one turns the other.

Stage finished

You've fitted a short timing pulley to the front X-axis slider rod and loosely tightened the set screw that holds the pulley onto the rod.

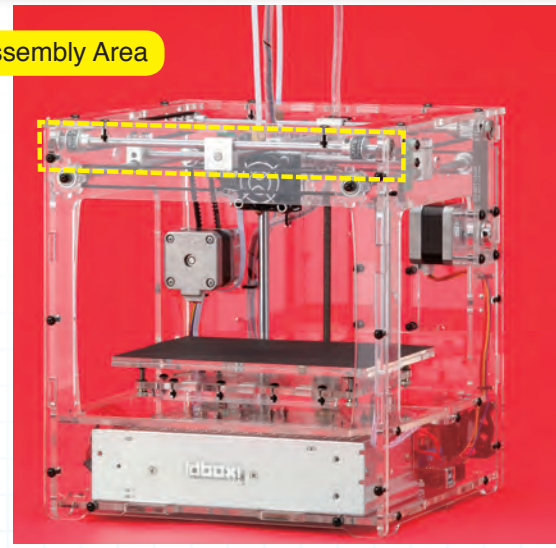
Correction

In Stage 5, you installed the cooling fan on the rear panel of the housing so that the cable was at the top right when viewed from the rear. Please change this by removing the cooling fan and then reinstalling it so that the cable emerges from it at the bottom right, as shown in the images below. There might be slight variations from fan to fan in the precise spot where the cable emerges from the fan (see below), but in all cases the cable should emerge at the bottom right.



With some fans, the cable emerges as shown above left, and with others as shown above right.

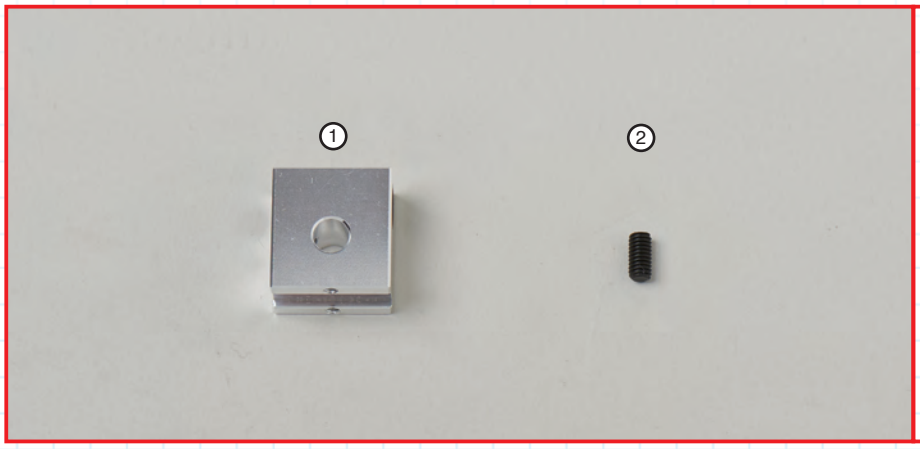
Stage 22: Add a slider to the front X-axis slider rod



In this stage, you screw the 8mm set screw into its screw hole in the slider (both parts supplied with this stage), then put the slider on the front X-axis slider rod.

This stage is not complex. All you have to do is insert the 8mm set screw into the screw hole in the slider and screw it partly in, until about 3mm remains proud.

Next, get the front X-axis slider rod you worked on in Stage 21, and insert it though the hole in the slider, sliding the slider partway along.



Stage 22 Components

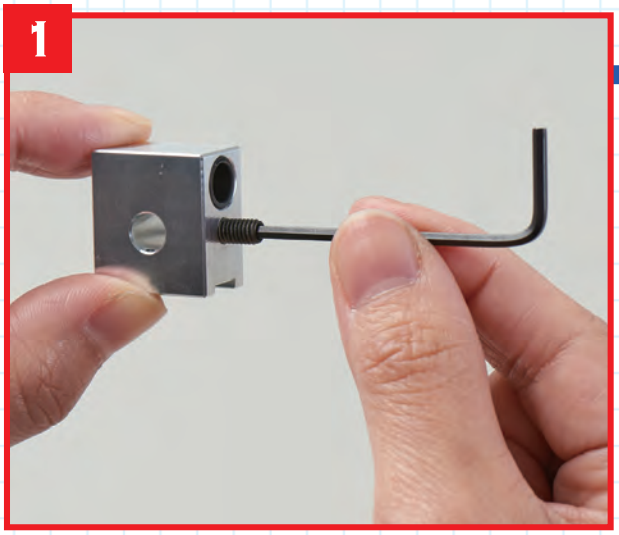
1: Slider × 1
2: M4 set screw (8mm) × 1

Tools you will need

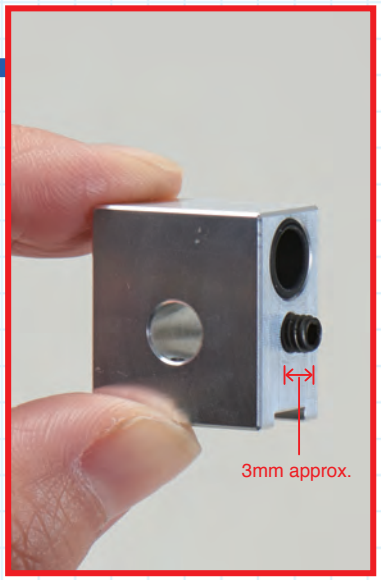
Allen key (2mm) provided with Stage 11

Screw the set screw into the slider and the slider onto the rod

1



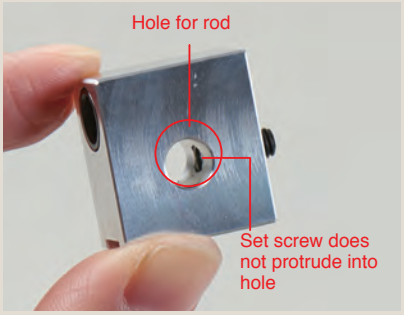
Put the long end of the 2mm Allen key into the hexagonal hole in the head end of the 8mm set screw, and insert the screw into the screw hole in the slider. Turn the Allen key clockwise until about 3mm of the screw remains proud of the slider, as shown, right.

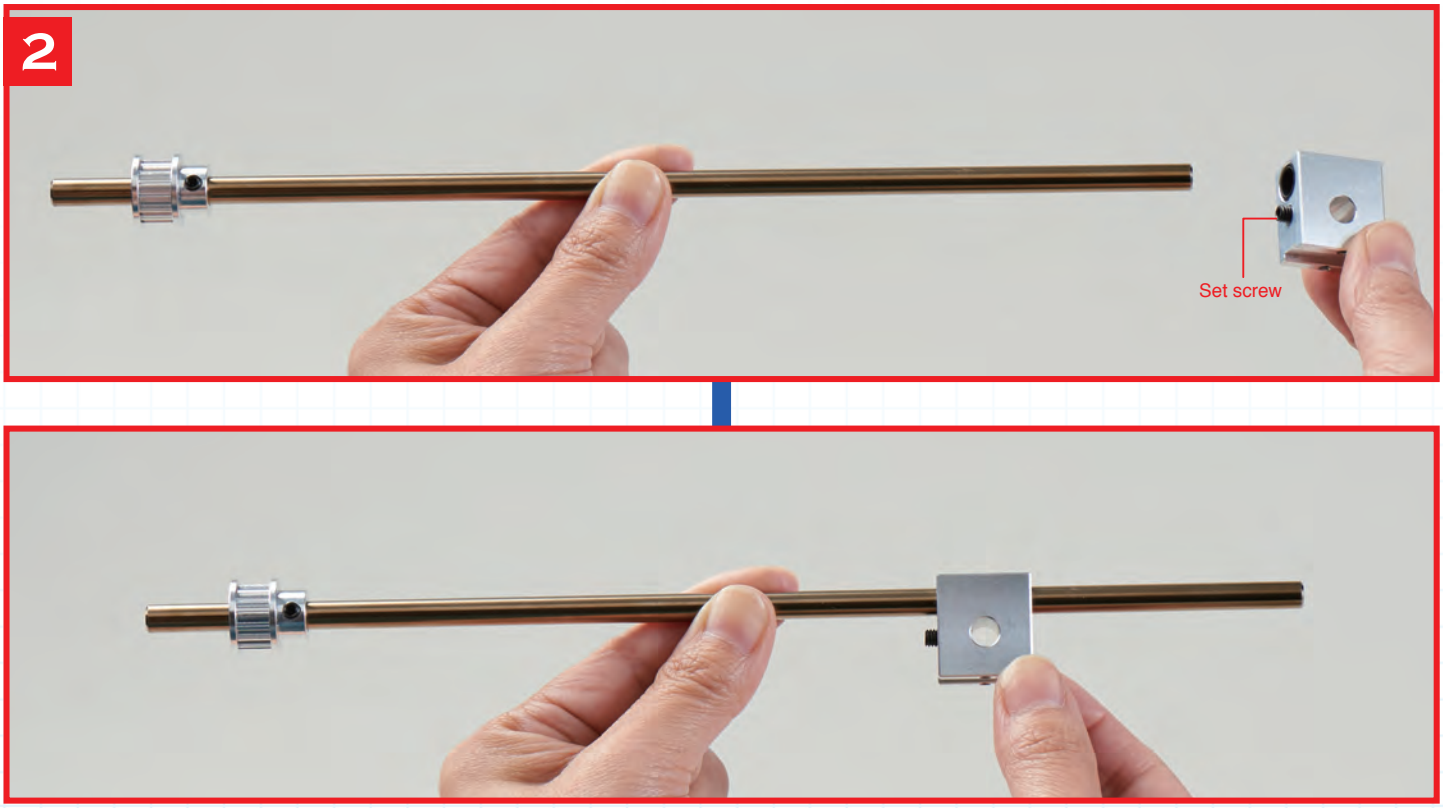


Stop when just over half of the screw is in.

HINT

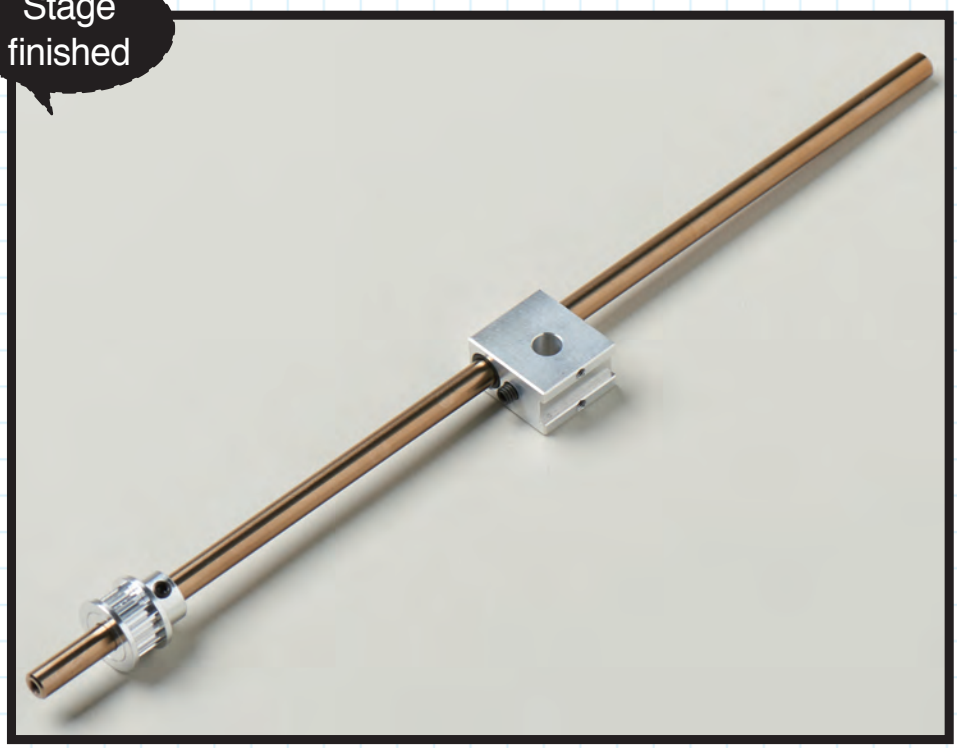
If you screw the 8mm set screw too far into its screw hole in the slider, it might scratch the rod when you put it in, which is something you don't want. To avoid this, screw the set screw in so that 3mm or so of it remains proud of the screw hole.





Put the front X-axis slider rod (that you worked on in Stage 21) through the hole in the slider, and move the slider about halfway along, as shown above, with the set screw facing the short timing pulley.

Stage finished

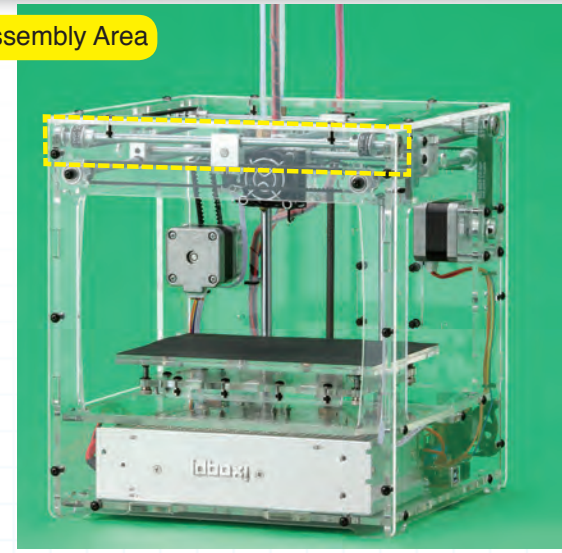


You've put a slider on the front X-axis slider rod. Keep the pieces safe for a future assembly stage.

Where to keep your idbox

Avoid placing your idbox in high temperature, high humidity, dusty locations and keep it out of direct sunlight. High temperatures could cause the panels to deform and sunlight might make the acrylic discolour. Humidity and dust might cause some of the parts to malfunction.

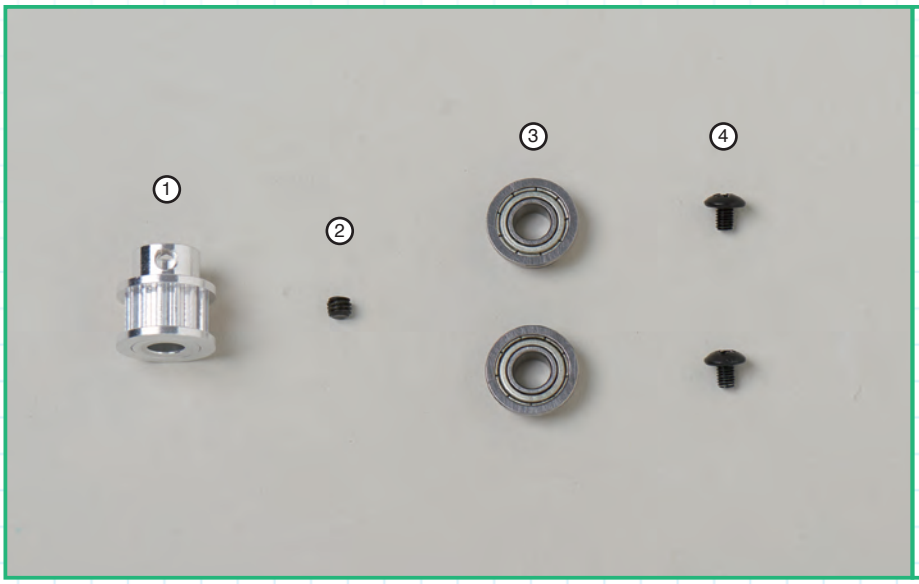
Stage 23 Assembly Area



Stage 23: Add the front X-axis slider rod to the housing

In this stage, you first add a short timing pulley to the front X-axis slider rod, then install the rod into the housing to complete the XY gantry.

There are three procedures to carry out for this stage. First, you add a short timing pulley to the slider rod you last worked on in Stage 22. Next, you insert the rod into the housing, hooking the long timing belts over its pulleys and adding the bearings that support it. Finally, you adjust the position of the X-axis' long timing pulley.



Stage 23 Components

1: S3M timing pulley/short (15-6-7) × 1
2: M4 set screw (3mm) × 1
3: Bearings (F686ZZ) x 2
4: M3 truss head screws (4mm) x 2

Tools you will need

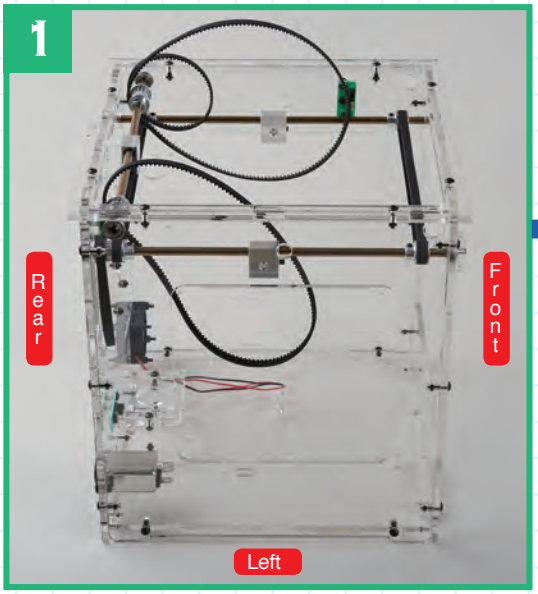
Allen key (2mm) provided with Stage 11
Phillips screwdriver (size 1)

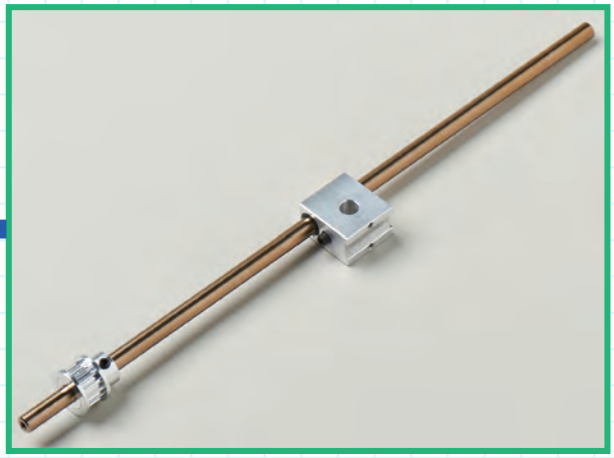
Useful Items

Thread-locking adhesive
Cocktail sticks

Parts to have ready

1





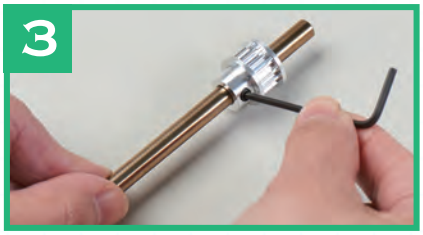
You'll need the housing and the front X-axis slider rod you last worked on in Stage 22. Start by turning the housing so that the left side of the housing is facing you.

Add the small timing pulley to the slider rod

2

Put the X-axis slider rod through the hole in the S3M timing pulley/short (15-6-7), as shown, so the toothed section is closer to the end of the rod and there is about 2cm between the end of the pulley and the end of the rod.

3



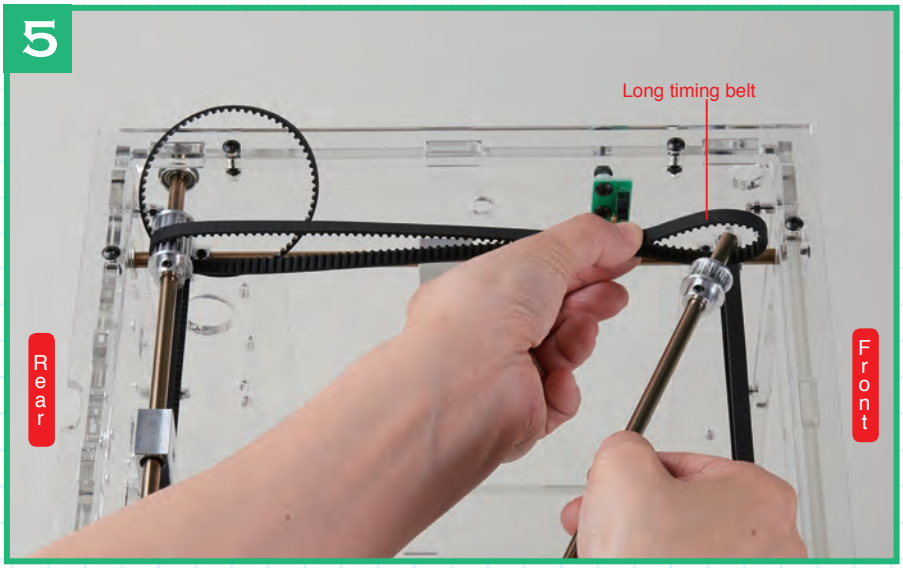
Insert the M4 3mm set screw into the screw hole of the pulley and loosely tighten it with the 2mm Allen key. Stop when you begin to feel resistance.

Install the slider rod into the printer housing

4

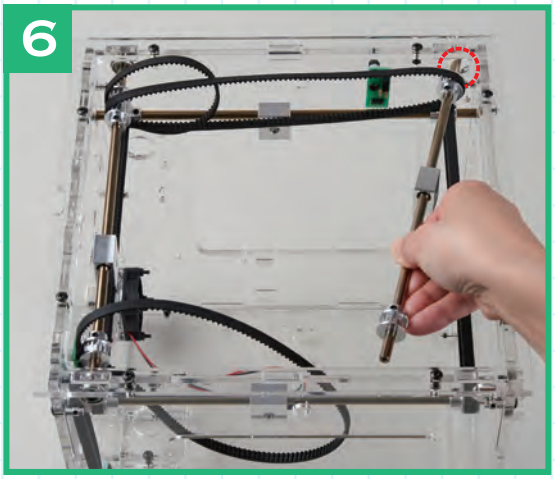
Hold the slider rod as shown so that the set screw on the slider is pointing away from you.

5



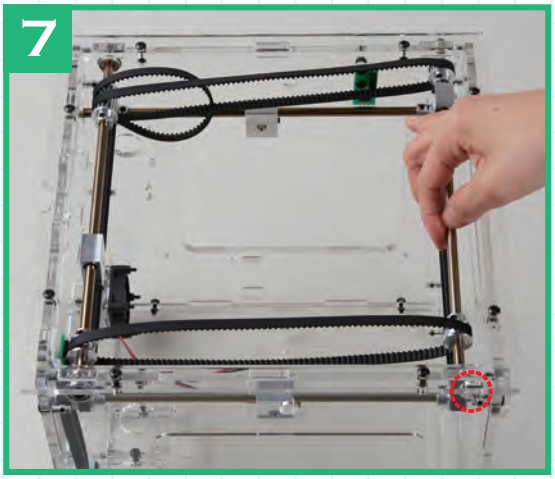
Put the long timing belt (at the rear when you view the housing from the left) over the short timing pulley at the end of the slider rod furthest from you.

6



Insert the end of the slider rod through the hole (ringed in red) in the housing's right panel. Make sure the belt does not come off.

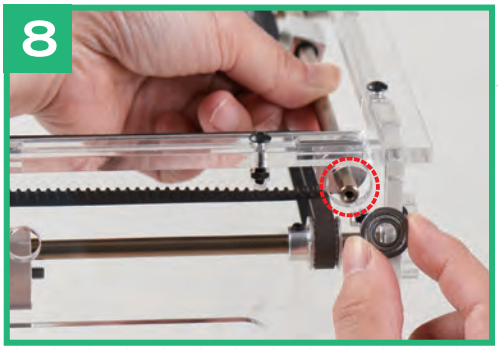
7



Put the long timing belt closest to you over the timing pulley closest to you and insert the end of the rod through the hole ringed in red in the housing's left panel.

POINT

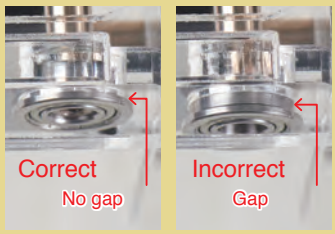
Hold the belt as shown above, so that the end you are putting over the pulley goes on easily.

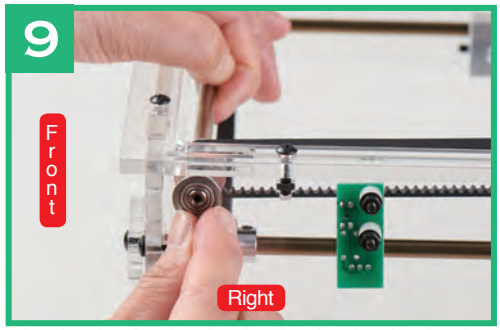


Put one of the bearings into the hole (ringed in red, above) with its flange on the outside, inserting the end of the rod through the hole in the centre of the bearing.

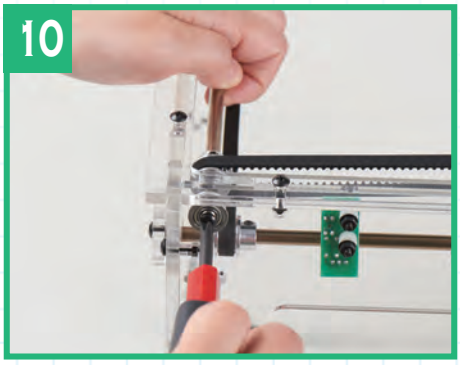
POINT

Insert the bearing firmly, so that there is no gap between the flange and the casing.

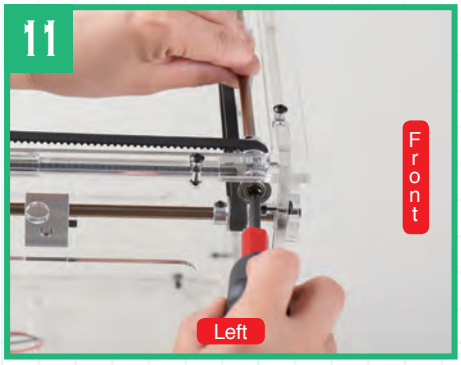




Turn the housing so its right side is facing you and repeat the procedure from the previous step to install the second bearing. You might need to pull gently to stretch the belt.



Insert a 4mm M3 truss head screw into the screw hole in the end of the rod. Tighten it fully with a screwdriver so the end surface of the rod and the head of the truss head screw are in contact and held together.

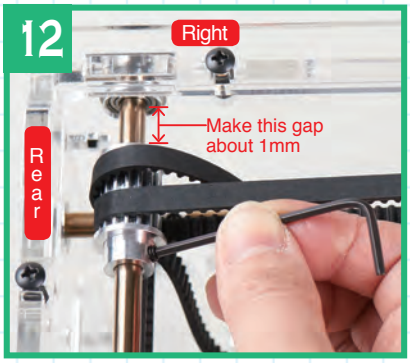


Turn the housing so that its left side is facing you and insert the other M3 4mm truss head screw into the screw hole in the rod, tightening it with a screwdriver.

Thread-locking adhesive

The screws that secure the slider rods can become loose during operation of the printer so it is a good idea to secure them with thread-locking adhesive. If you use it, first tighten the right-hand end of the rod (the 'reference side', see Step 10), then the left-hand end (the adjustment side, see Step 11). Follow the manufacturer's instructions and, to avoid getting thread-locking adhesive onto the acrylic of the idbox, put some on a card and use a cocktail stick to apply a small amount directly onto the thread of the screw. Thread-locking adhesive is available from online shops and motor spares outlets.

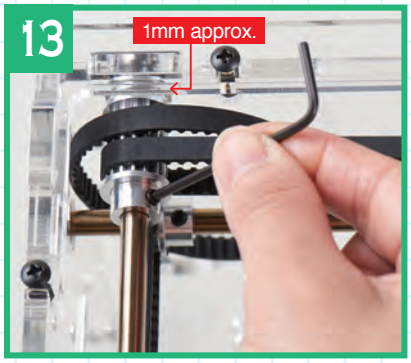
Adjust the position of the X-axis long timing pulley



Turn the housing so that its left side is facing you. Insert the 2mm Allen key into the set screw in the long timing pulley, and turn it anticlockwise to loosen it.

HINT

Turn the set screw just enough to loosen the pulley on the rod; about a 45-degree turn should do it.

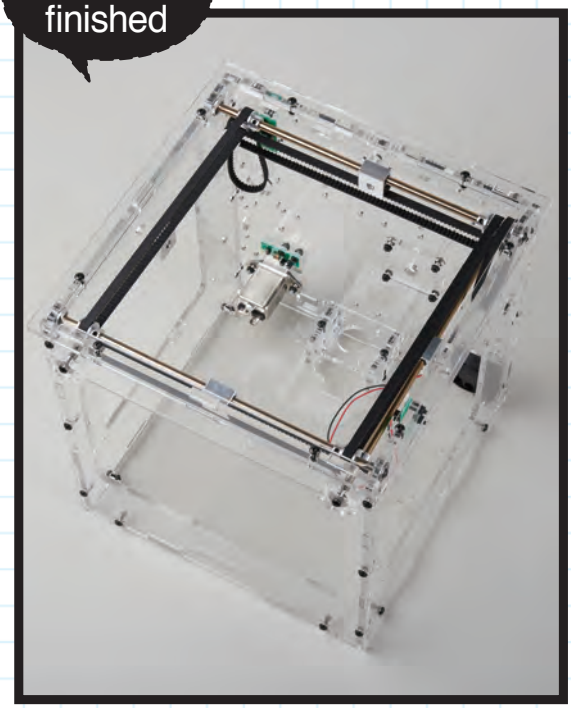


Slide the long timing pulley along the slider rod until there is about 1mm between its end and the inner side of the casing. Tighten the set screw with the Allen key.

POINT

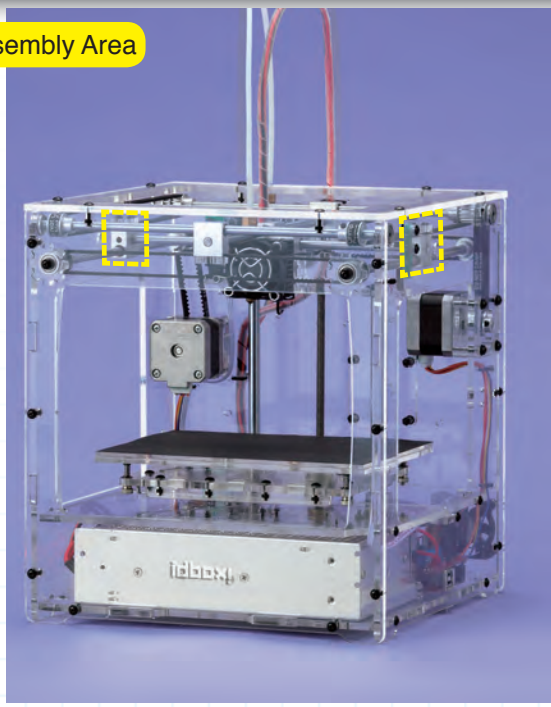
Only tighten the long timing pulley's set screw. Leave the three X-axis short pulleys loosely fastened for now.

Stage finished



The front X-axis slider rod has been installed in the housing. This completes assembly of the XY gantry.

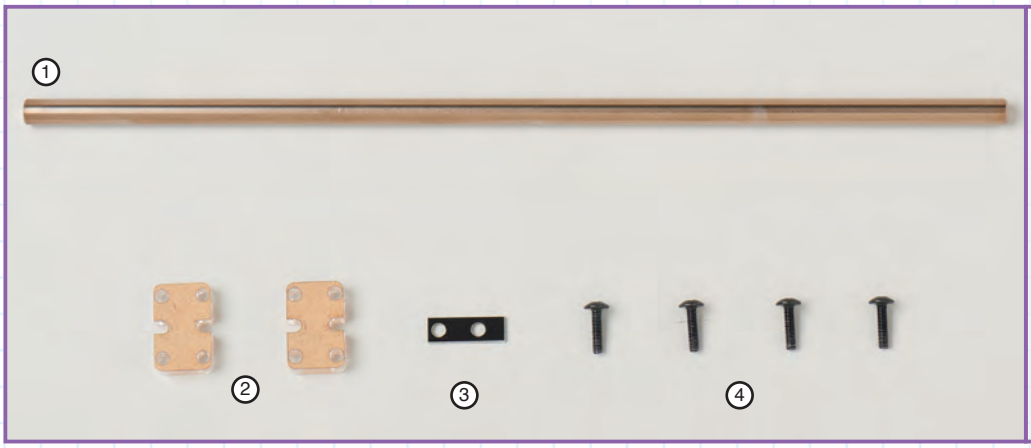
Stage 24 Assembly Area



Stage 24: Install the Y-axis limit switch metal plate and the slider belt clamps

In this stage, you find out about belt alignment and then clamp the timing belts to the Y-axis sliders. A metal plate, known as a 'dog', is added to the right-hand Y-axis slider that works with the Y-axis limit switch.

It is important that the timing belts are aligned properly with the slider rods, otherwise the models you print out will not be accurately reproduced. The belts are aligned by moving timing pulleys. Here, you continue the assembly by attaching the Y-axis belts to the sliders using the belt clamps screwed to the slider. A metal plate is attached to the right-hand Y-axis slider that works with the Y-axis limit switch.



Stage 24 Components

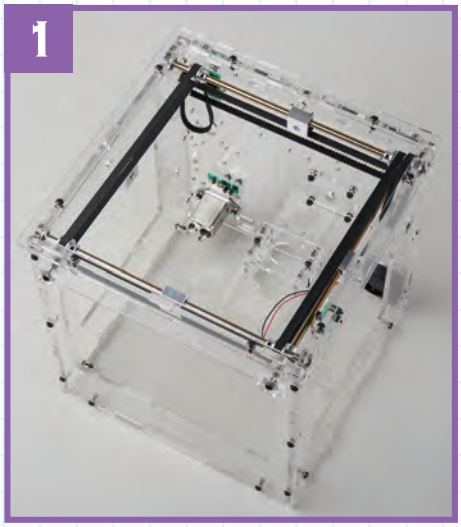
1: Head rod × 1
2: Belt clamps × 2
3: Small metal plate (dog) × 1 (used with Y-axis limit switch)
4: M2.5 truss head screws (10mm) × 8 (four used this stage)

Tools you will need

Allen key (2mm) provided with Stage 11
Phillips screwdriver (size 1)

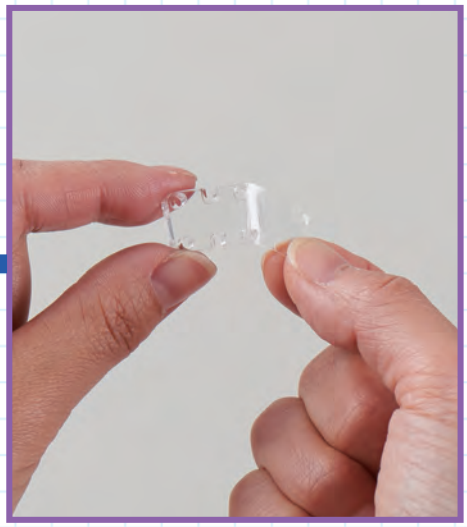
Parts to have ready

1



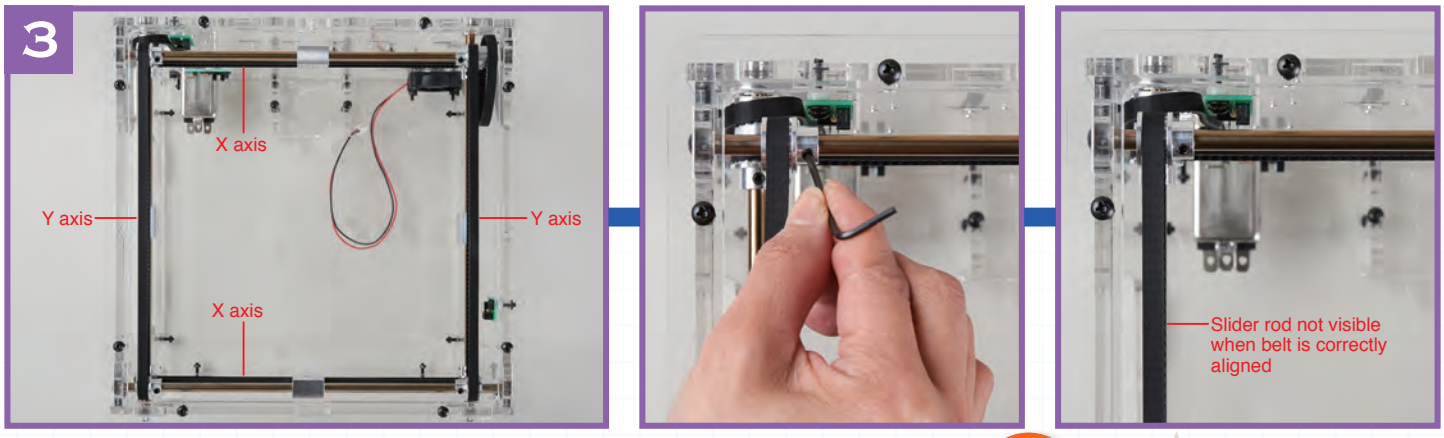
Get the housing assembly ready.

2



Carefully peel the protective paper and transparent film off the two belt clamps supplied with this stage.

Adjusting timing pulley position to align belts

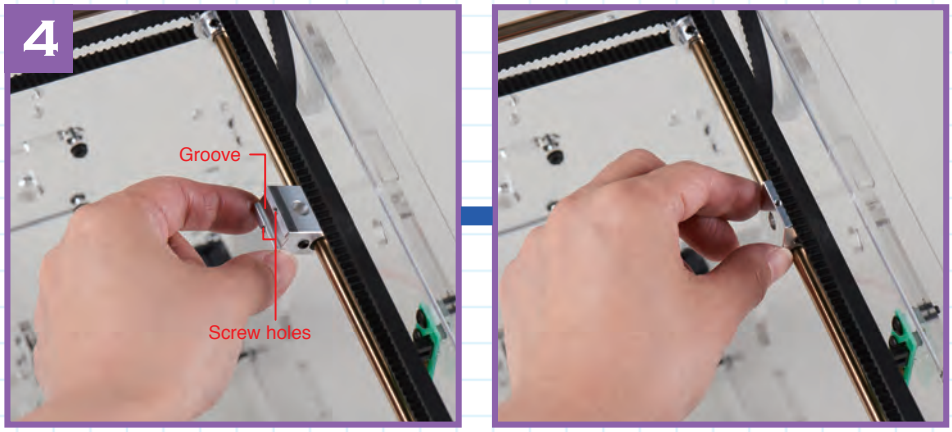


To align the timing belts, adjust the position of the pulleys on the slider rods. The belts have to be parallel with – and vertically in line with – the rods. For the Y-axis belts, you move the timing pulleys on the X-axis slider rods. When the belt is aligned, it is directly above the slider rod. To check, look down on the belt and rod from directly above; if the Y-axis belt is not aligned, loosen the pulley on the X-axis with the Allen key and move the pulley until the belt is directly above the rod, then tighten the pulley as it was before.

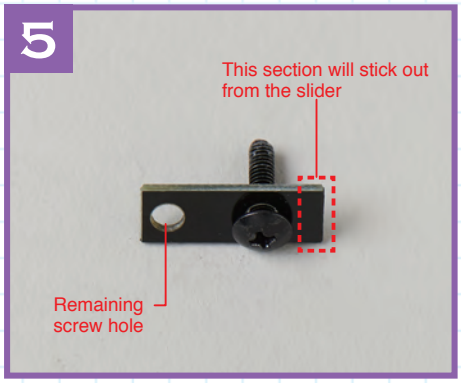
HINT

If the timing belt is not directly above the slider rod, the slider will not move properly. This causes the printer head to move inaccurately, which will degrade the quality of your printed models. During assembly work, the belts might go out of alignment as the pulleys that align them are only loosely fastened, so keep an eye out for this and correct as necessary.

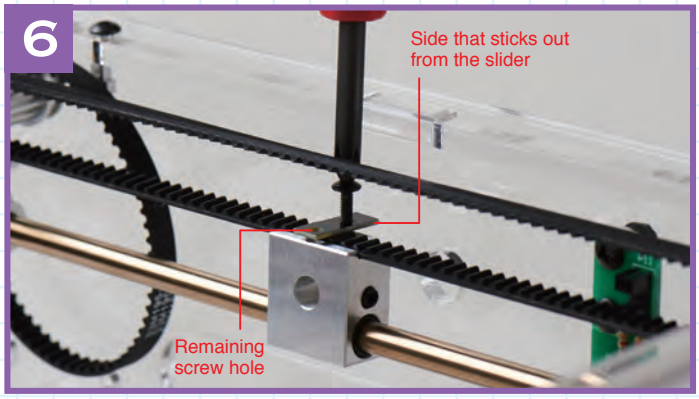
Add the plate and belt clamps to the Y-axis sliders



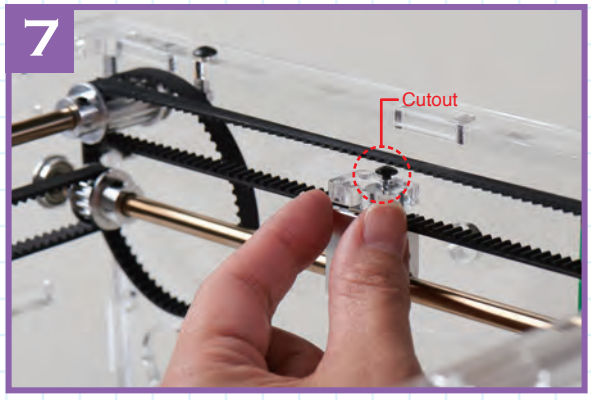
Rotate the right-hand Y-axis slider on the slider rod, so the lower side of the timing belt fits into the groove in the slider.



There are two holes in the Y-axis limit switch plate. Put an M2.5 10mm truss head screw through the hole that is closer to the centre of the plate.

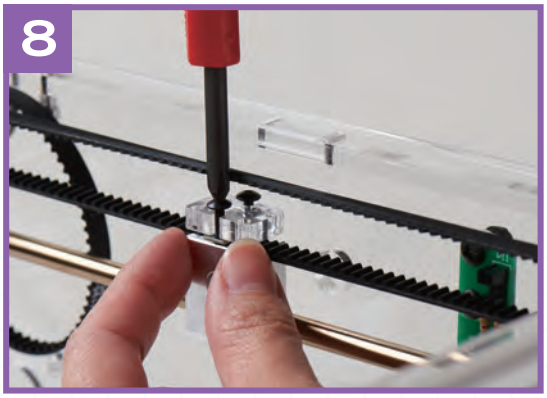


Insert the screw into the screw hole on the side of the slider that is closer to the right-hand side panel of the housing, tightening it a couple of turns. Make sure the part of the metal plate that sticks out is on this side, too.



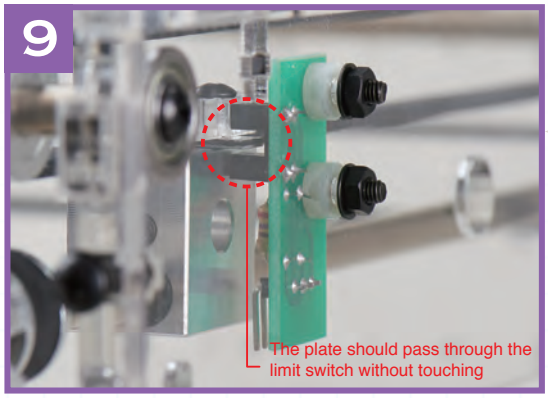
Put one of the belt clamps on top of the plate, fitting one of the cutouts in the clamp around the screw.

8



Insert another M2.5 10mm truss head screw into the cutout on the other side of the clamp, through the hole in the plate and into the screw hole in the slider. Then begin to tighten it. Tighten each screw in turn until they are both done up securely. Do not use too much force, however, or you might crack the acrylic the clamp is made of.

9



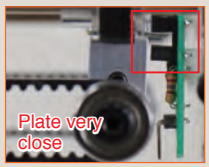
NOTE

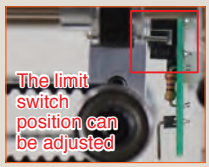
Move the slider gently when checking the clearance of the plate in the limit switch or the plate or switch might get damaged.

Move the slider by hand to the limit switch, checking that the part of the plate that sticks out passes through the U-shaped limit switch without touching it. After checking, move the slider back to the centre of the rod.

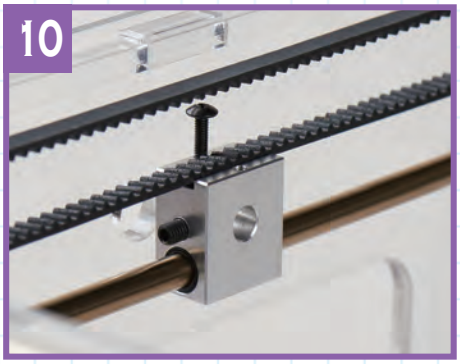
HINT

If the plate hits the limit switch or is too close, loosen the screws that hold the switch and move it either up or down until the plate passes through without touching, then retighten the screws.



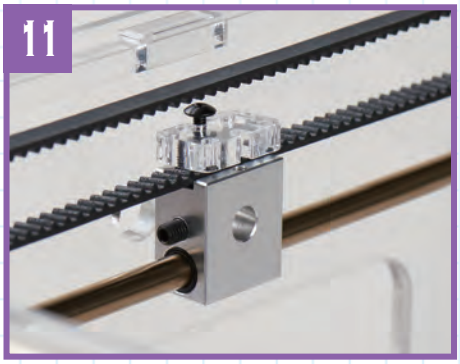


10



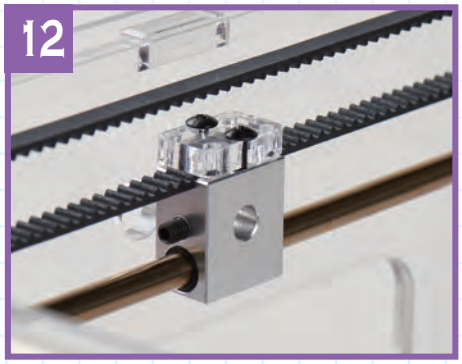
On the Y-axis' opposite rod, turn the slider so its groove is uppermost and fit the belt into it. Screw an M2.5 10mm truss head screw into one of the slider's screw holes a small way using a screwdriver (there is no metal plate to fit on this side).

11



Put the other belt clamp on top of the slider and belt so the clamp's cutout fits around the screw, as shown above.

12



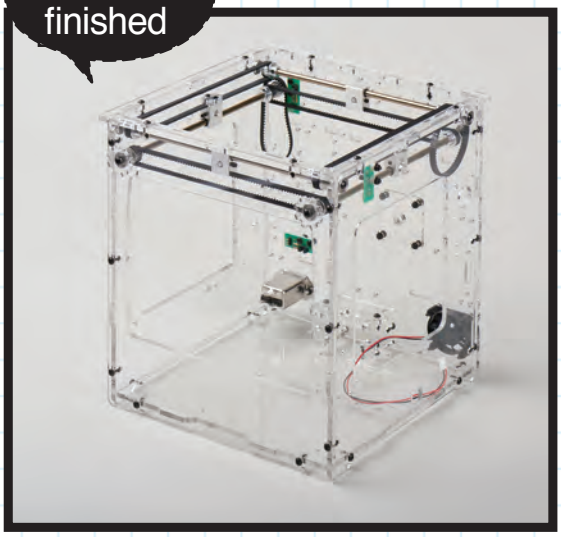
Insert another M2.5 10mm truss head screw through the other cutout in the clamp and into the screw hole in the slider. Tighten the screws alternately, little by little, until they are both done up securely, but do not overtighten.

CLOSE-UP

About limit switches

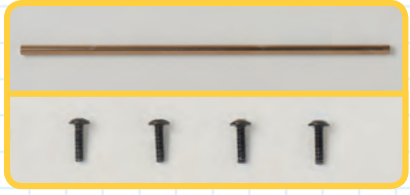
When the metal plate (dog) attached to the slider enters the U-shaped section of the limit switch, it blocks light emitted on one side being detected by a sensor on the other side. When this happens, the printer knows that the axis has reached its origin or home position. The optical switches used in your idbox are superior to mechanical switches because there is no wear and tear involved in their operation.

Stage finished



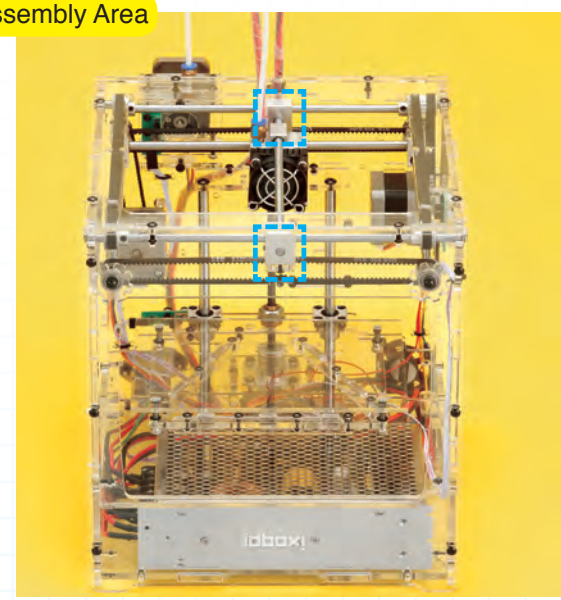
The left and right Y-axis sliders are now fixed to their timing belts using the belt clamps.

Store the parts



Keep the head rod and the four M2.5 10mm truss head screws that you did not use this time safe for future use.

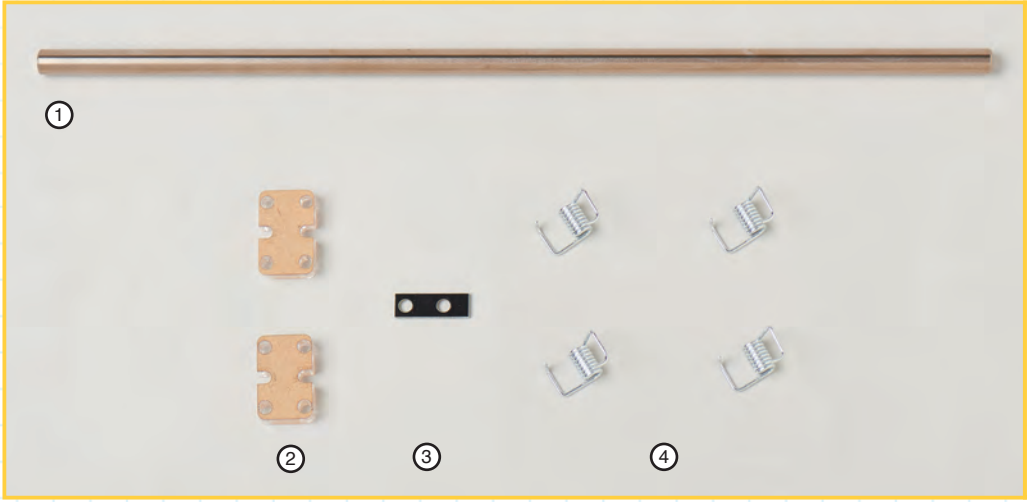
Stage 25 Assembly Area



Stage 25: Install the X-axis limit switch metal plate and timing belt clamps

In this stage, you clamp the timing belts to the X-axis sliders using the belt clamps. You also add a metal plate to the rear slider that is used with the limit switch.

To get access to the X-axis sliders and belts, you have to turn the housing upside down and with its opening at the front facing you. Work on the rear X-axis slider first, attaching the metal plate or 'dog' that works with the limit switch, then put on the belt clamp before moving to the front slider and clamping its belt to it also.



Stage 25 Components

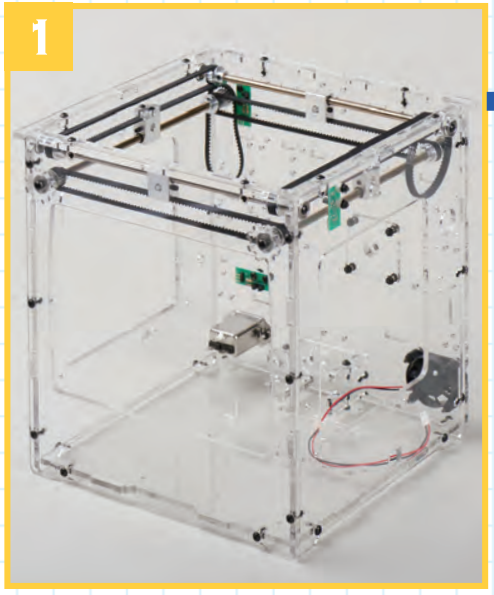
1: Head rod × 1
2: Belt clamps × 2
3: Small metal plate or 'dog' × 1 (used with X-axis limit switch)
4: Torsion springs x 4

Tools you will need

Phillips screwdriver (size 1)

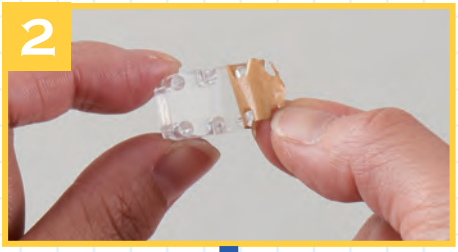
Parts to have ready

1



You'll need the housing assembly that you last worked on in Stage 24, and the four remaining M2.5 10mm truss head screws that were supplied with Stage 24.

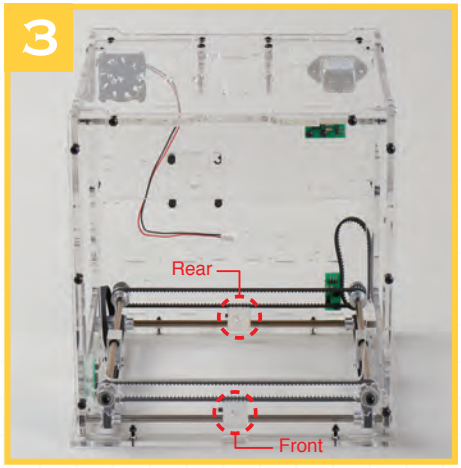
2



Carefully peel the protective paper and transparent film off the two belt clamps supplied with this stage.

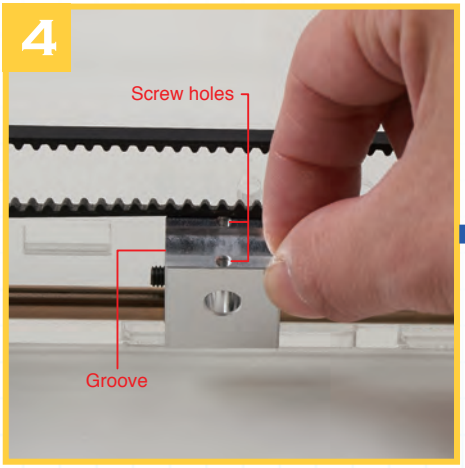
Add the plate and belt clamps to the X-axis sliders

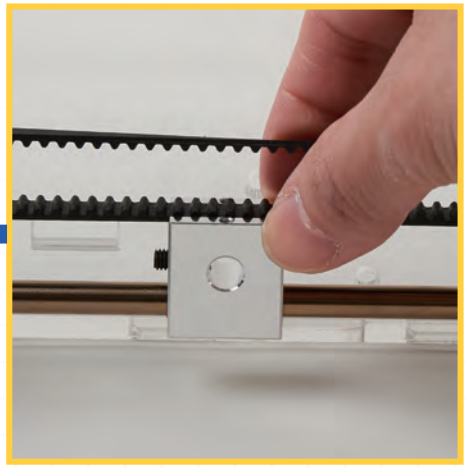
3



Turn the housing upside down and with the front facing you to get access to the X-axis belts and sliders.

4



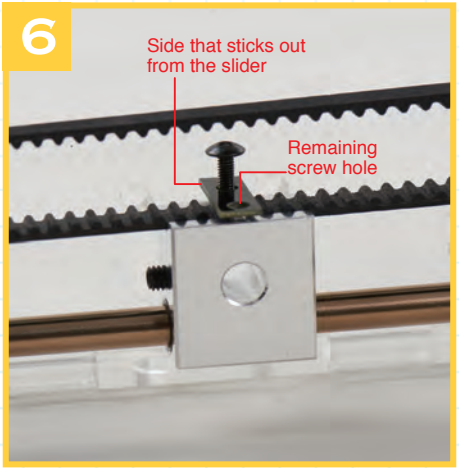


Rotate the rear X-axis slider on the slider rod so the lower, non-toothed, side of the timing belt fits into the groove in the slider.

5

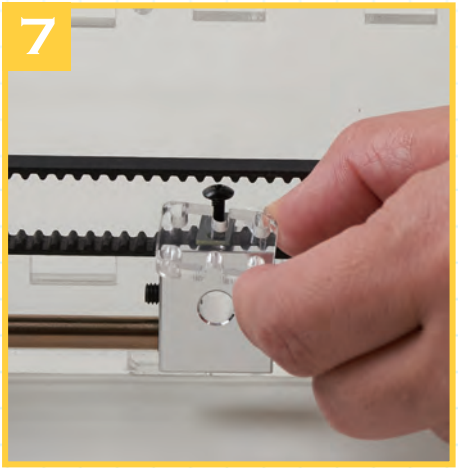
There are two holes in the X-axis limit switch plate. Put an M2.5 10mm truss head screw through the hole that is closer to the centre of the plate.

6



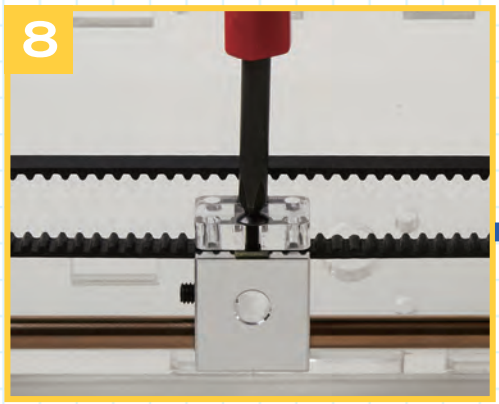
Insert the screw into the screw hole on the side of the slider that is closer to the rear panel of the housing, tightening it a couple of turns. Make sure the part of the metal plate that sticks out is on this side, too.

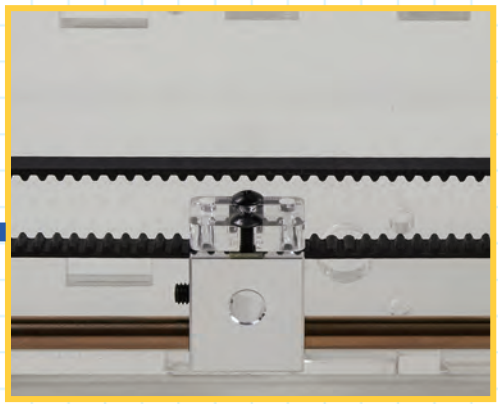
7



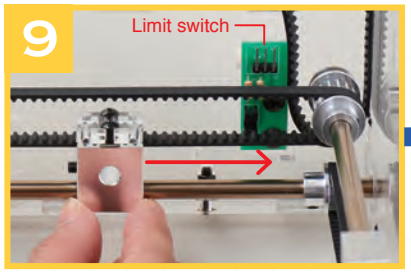
Put one of the belt clamps on top of the plate, fitting one of the cutouts in the clamp around the screw.

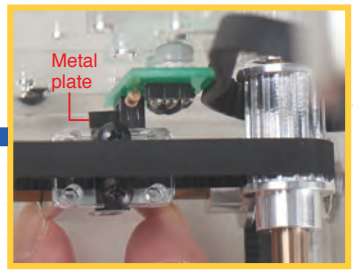
8





Insert another M2.5 10mm truss head screw into the cutout on the other side of the clamp, through the hole in the plate and into the screw hole in the slider. Then begin to tighten it. Tighten each screw in turn until they are both done up securely. Do not use too much force, however, or you might crack the acrylic the clamp is made of.





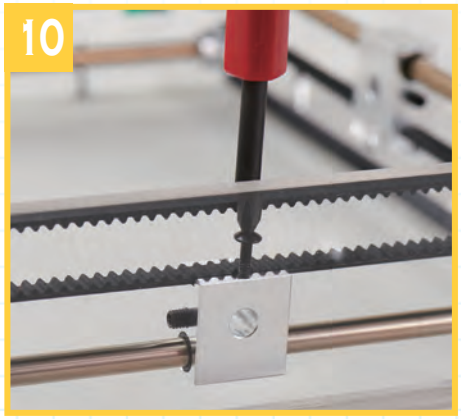
NOTE

Move the slider gently when checking the clearance of the plate in the limit switch or the plate or switch might get damaged.

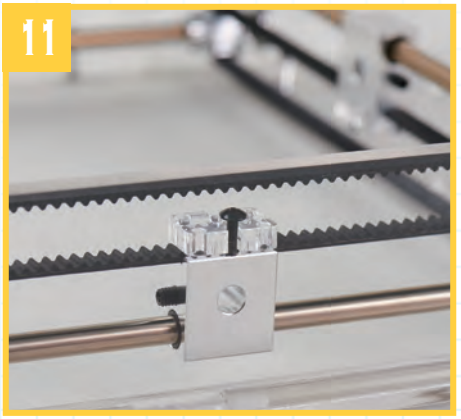
POINT

If the plate hits the limit switch or is too close, loosen the screws that hold the switch and move it either up or down until the plate passes through without touching, then retighten the screws.

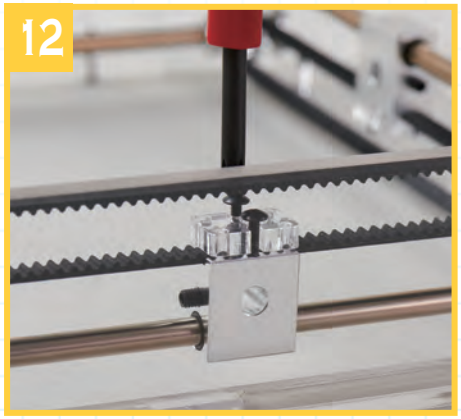
Move the slider by hand to the limit switch, checking that the part of the plate that sticks out passes through the U-shaped limit switch without touching it. After checking, move the slider back to the centre of the rod.



On the X-axis' opposite rod (at the front of the printer), turn the slider so its groove is uppermost and fit the belt into it. Screw an M2.5 10mm truss head screw into one of the slider's screw holes a small way using a screwdriver (there is no metal plate to fit on this side).

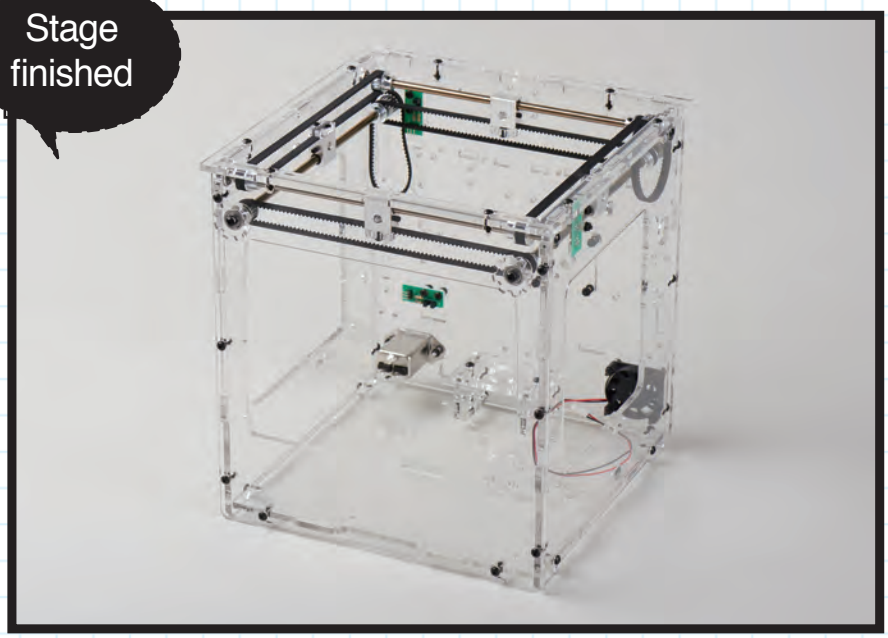


Put the other belt clamp on top of the slider and belt so the clamp's cutout fits around the screw, as shown above.



Insert another M2.5 10mm truss head screw through the other cutout in the clamp and into the screw hole in the slider. Tighten the screws alternately, little by little, until they are both done up securely. As with the rear slider, do not use too much force or you might crack the acrylic clamp.

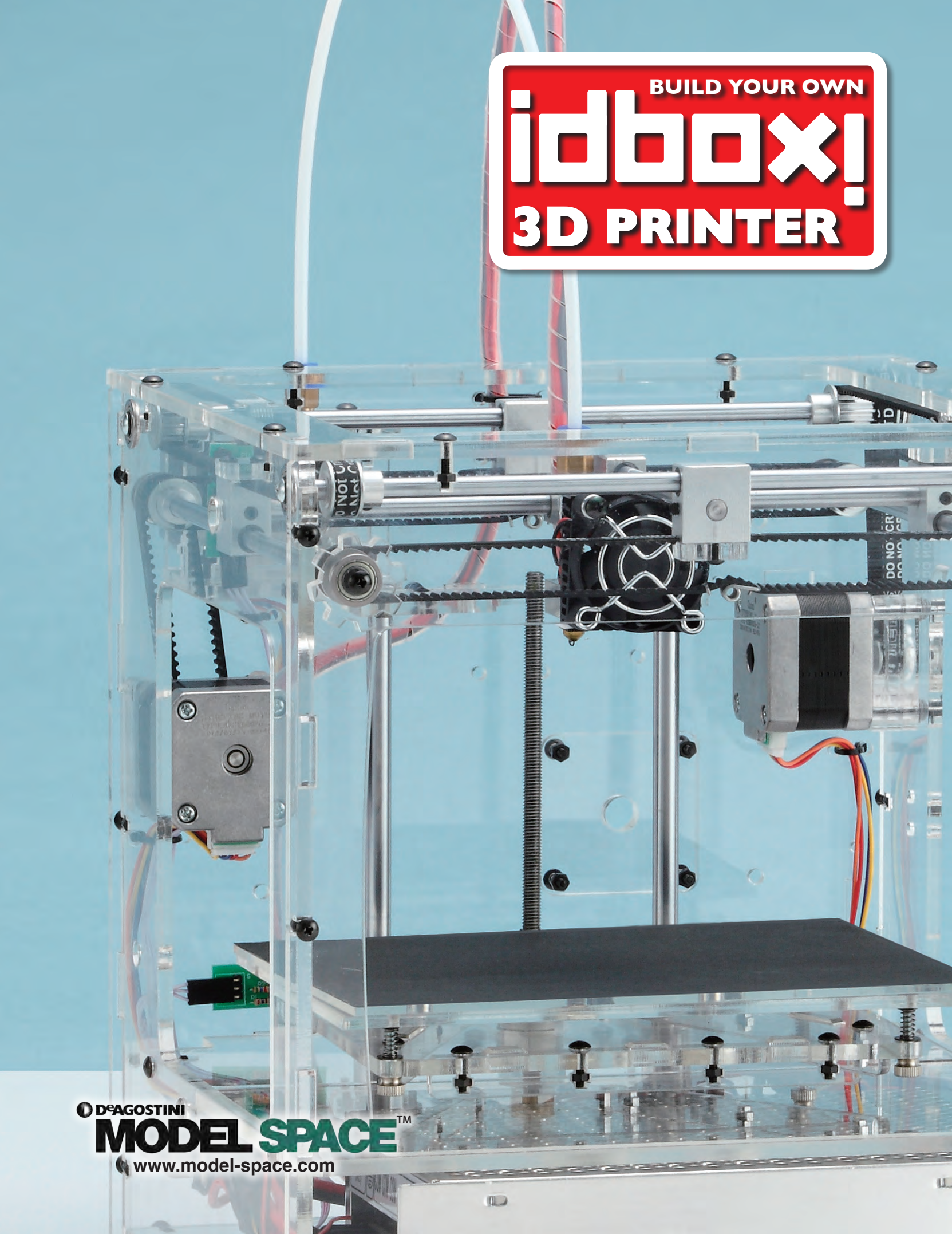
Stage finished



The front and back X-axis sliders have now been fixed to their timing belts using the belt clamps.

Store the parts

Keep the head rod and the four torsion springs supplied with this stage, but not used this time, safe for use later.



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