

# **BUILD YOUR OWN** **idbox!** **3D PRINTER**

Compatible with  
**Windows 7 & 8**  
**Mac OS X**

3D technology is  
now available for  
you at home!

## **Pack 04**

Anything you can  
imagine, you  
can make!



# **BUILD YOUR OWN** **idbox!** **3D PRINTER**

## CONTENTS

### Assembly Guide

49-60

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

Stage 12: Attach a timing pulley to a Y-axis

slider rod

49-51

Stage 13: Attach a large timing pulley and a

slider to a Y-axis slider rod

52-54

Stage 14: Add the left-hand Y-axis slider rod

to the housing

55-57

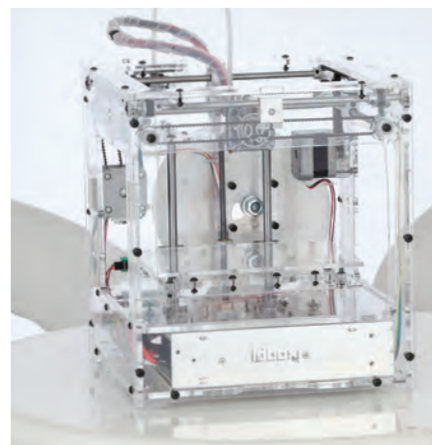
Stage 15: Attach a short timing pulley to the

right-hand Y-axis slider rod

58-60

**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.

**DeAGOSTINI**  
**MODEL SPACE™**  
[www.model-space.com](http://www.model-space.com)



All rights reserved © 2015

Published in the UK by  
De Agostini UK Ltd,  
Battersea Studios 2,  
82 Silverthorne Road,  
Battersea, London SW8 3HE

Published in the USA by  
De Agostini Publishing USA Inc.,  
915 Broadway, Suite 609,  
New York, NY 10010



## Stage 12 Assembly Area

# Stage 12: Attach a timing pulley to a Y-axis slider rod

With this stage, you commence the assembly of the gantry, the means by which the print head is supported and moved. A timing pulley must be attached to a Y-axis slider rod. The slider rods must not be scratched or bent, so take great care with them.

This time, you will insert a slider rod through a timing pulley, and then fix the pulley in place with a set screw (a screw with no head). Because set screws are small, be careful not to lose them. To tighten the set

screw, you use the 2mm Allen key that was supplied with Stage 11. Please note: in this stage, the set screw is not fully tightened. It should merely hold the pulley on the rod without being fully done up.



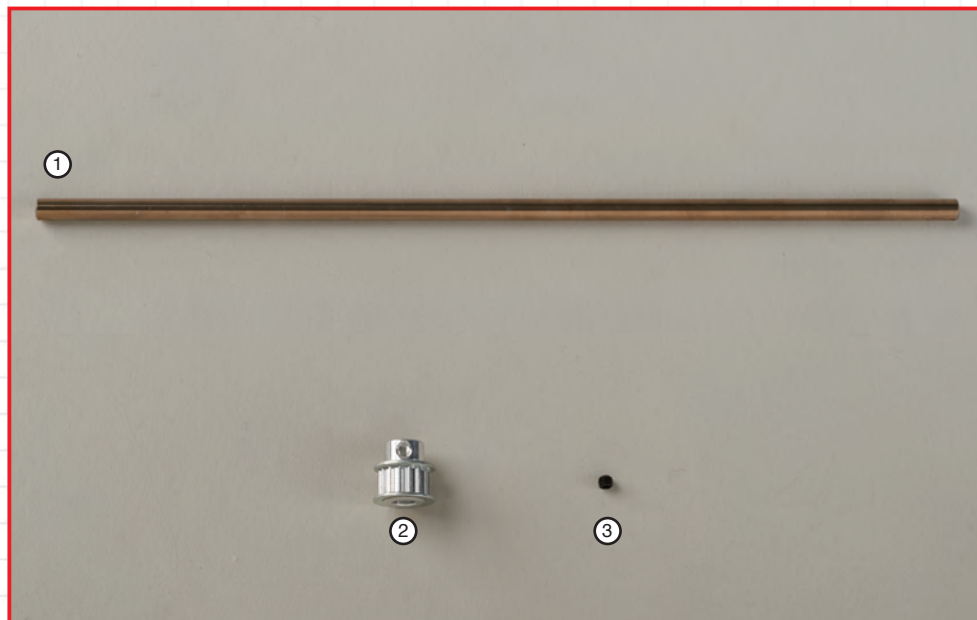
## Stage 12 Components

- 1: Slider rod (Y-axis/left) x 1
- 2: S3M timing pulley/short (15-6-7\*) x 1
- 3: M4 set screw (3mm) x 1

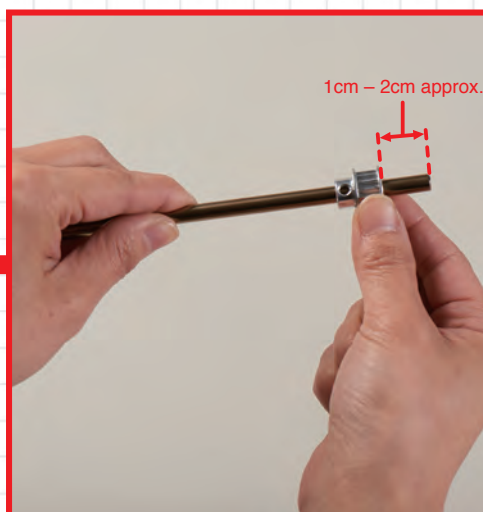
\*What these numbers mean is explained in a later stage.

## Tools you will need

Allen key (2mm) provided with Stage 11

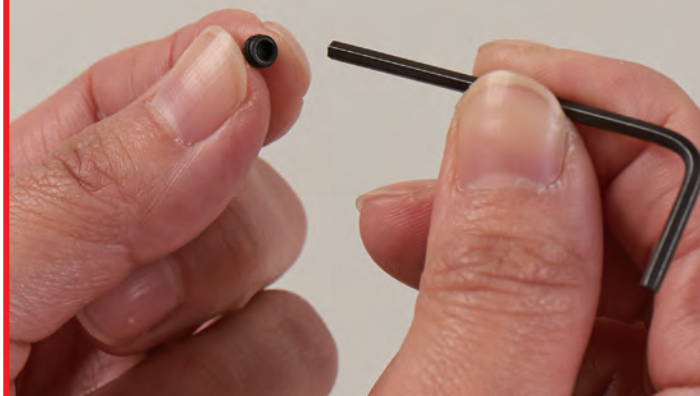


## Slide the timing pulley onto the slider rod

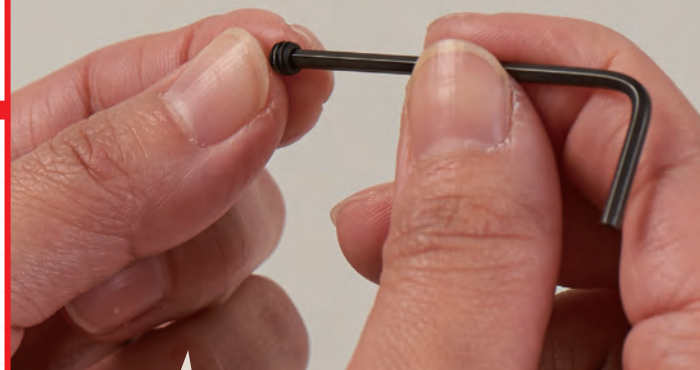


Insert the slider rod through the timing pulley, as shown. There should be about 1cm to 2cm between the toothed end of the pulley and the end of the rod.

2



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



## HINT

The photo above shows the 2mm Allen key being placed in the hexagonal socket on the set screw – there is only one socket; the other end of the set screw is flat. So as not to overtighten the screw, insert the long end of the key into the screw to reduce the force when tightening it.

## Set screws

Set screws are used for clamping or adjusting machinery. The head and shaft of a set screw are the same diameter and there is a hexagonal socket in one end. It is tightened with an Allen key, rather than a screwdriver. The set screws used in the idbox have flat ends so that when they are tightened, they do not damage what they are pressing against, but even so, take care not to overtighten them.



Hexagonal socket



Flat end

## Correct



Put the screw on the long axis of the Allen key

## Incorrect



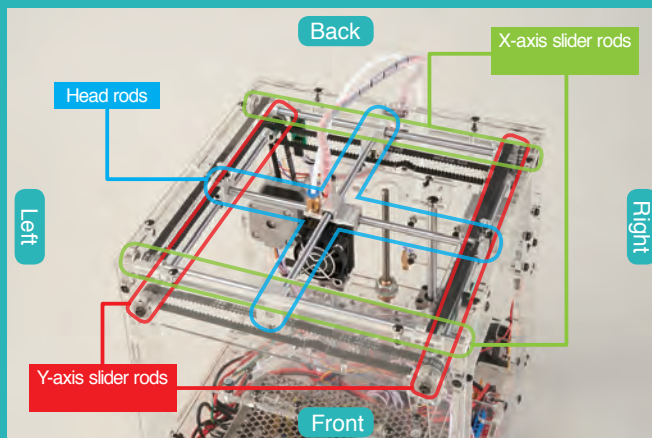
Do not use the shorter end of the Allen key

## The XY gantry

CLOSE-UP

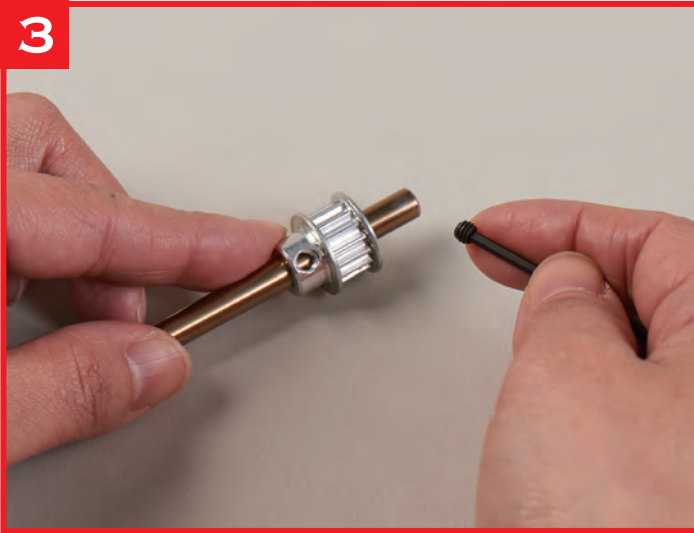
As the print head moves from side to side along the X axis and from front to back along the Y axis, the nozzle deposits melted plastic to build up your model. The head slides along the head rods, the movement of which is controlled by belts that loop over the timing pulleys attached to the slider rods. So that the head can move accurately, the rods have to be precisely parallel and not warped or scratched. The rods used in the idbox are high-quality items manufactured by THK Co. Ltd., Japan.

When you look at the idbox from the front, the slider rods for the Y axis are mounted at the left and right, while the slider rods for the X axis are mounted at the front and back of the gantry. In this stage, you are working with the left slider rod for the Y axis.

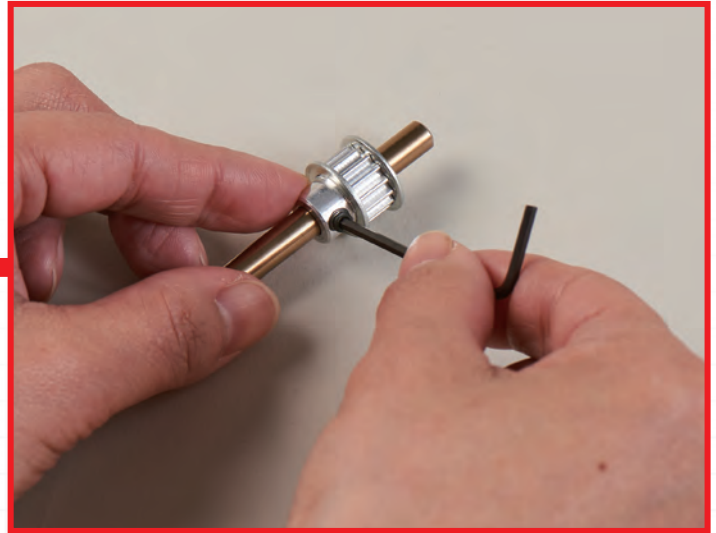




3



Insert the screw into the screw hole in the timing pulley and tighten it up clockwise. Do not tighten it fully at this stage.



**POINT**

The set screw, and the hole it is going into, are small and it can be tricky to get the screw aligned properly. The screw should fit into the hole freely – if you have to use force, the chances are that the screw is cross-threaded, so unscrew it and try again.



4



Stop tightening the set screw when you feel some resistance when turning the Allen key. You want it tight enough to just hold the pulley onto the rod without tightening it fully. A good test is to try holding the rod vertically – if the pulley slides down, the screw is too loose; if it stays on, it is tight enough.

**HINT**

When you are inserting the screw into the pulley, stop it falling off the Allen key by holding it with your finger as shown.



You have inserted the slider rod through the timing pulley and tightened the set screw to hold the pulley in position. Put the assembly away for use in an upcoming stage, being especially careful that the slider rod does not get scratched or bent.

**Stage finished**



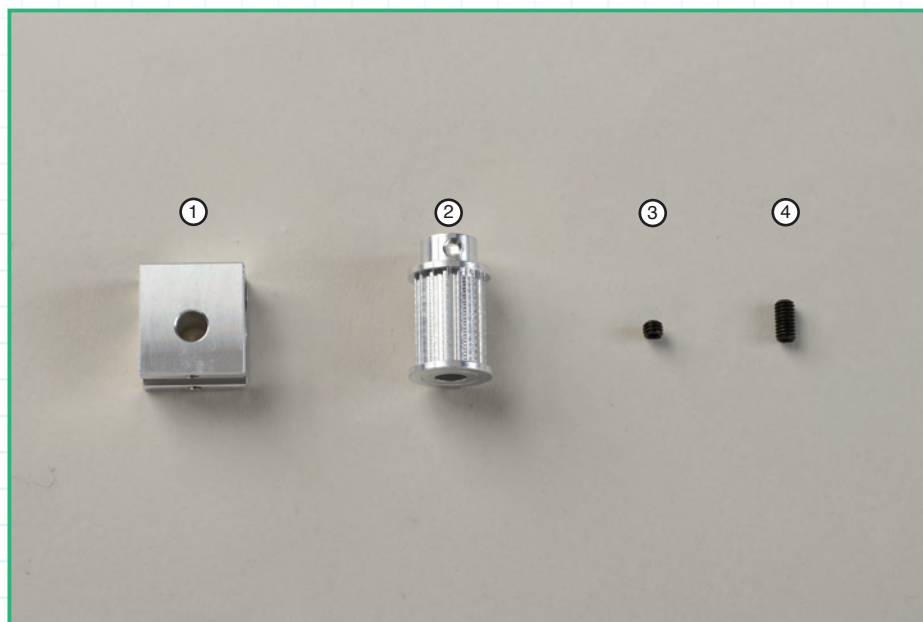
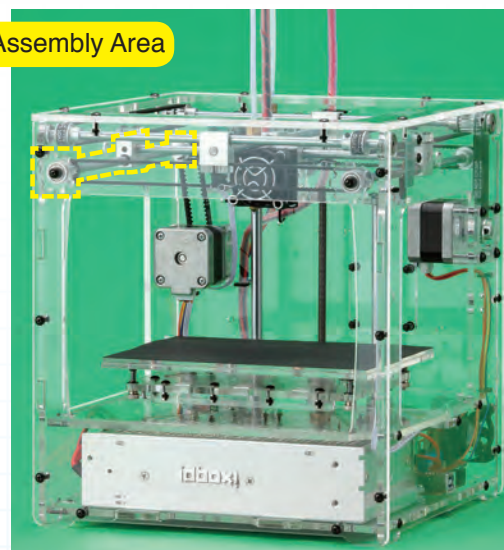
## Stage 13: Attach a large timing pulley and a slider to a Y-axis slider rod

You've already put one timing pulley onto the left-hand Y-axis slider rod and in this stage, you add a slider and another timing pulley to the same rod.

Here you screw the 8mm set screw into the slider. The set screw goes in until 3mm or so of it remains proud of the screw hole. Then, you push the slider on to the slider rod. Next, you screw the 3mm set screw

into the screw hole in the long timing pulley. You then slide the pulley onto the end of the slider rod. It will be opposite to where you put the short timing pulley in the previous stage.

### Stage 13 Assembly Area



### Stage 13 Components

- 1: Slider x 1
- 2: S3M timing pulley/long (15-6-18\*) x 1
- 3: M4 set screw (3mm) x 1
- 4: M4 set screw (8mm) x1

\*What these numbers mean is explained in a later stage.

### Tools you will need

Allen key (2mm) provided with Stage 11

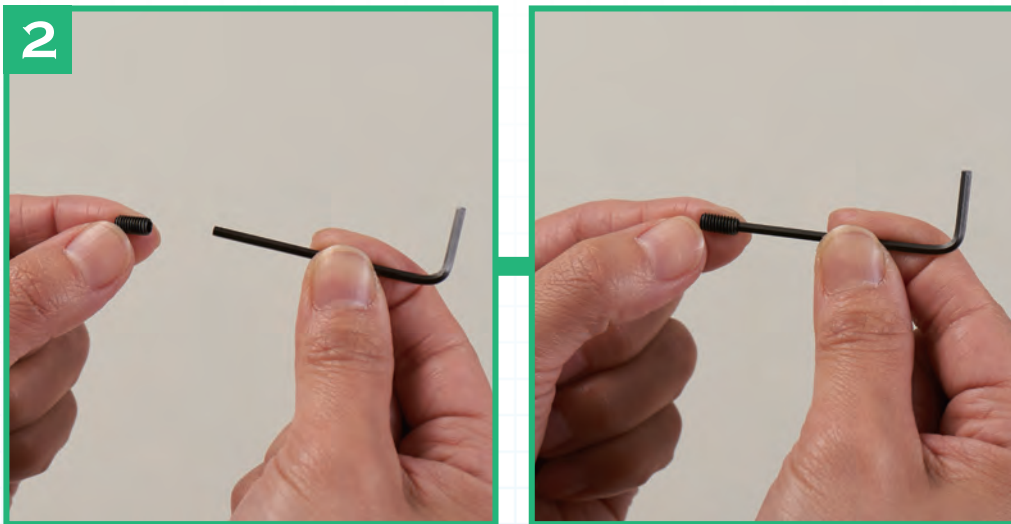


### Parts to have ready



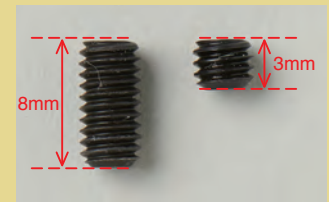
Get ready the left-hand Y-axis slider rod you worked on in Stage 12. Handle the rod carefully, as if it is scratched the slider might stick.

## Put the set screw in the slider and the slider on the rod

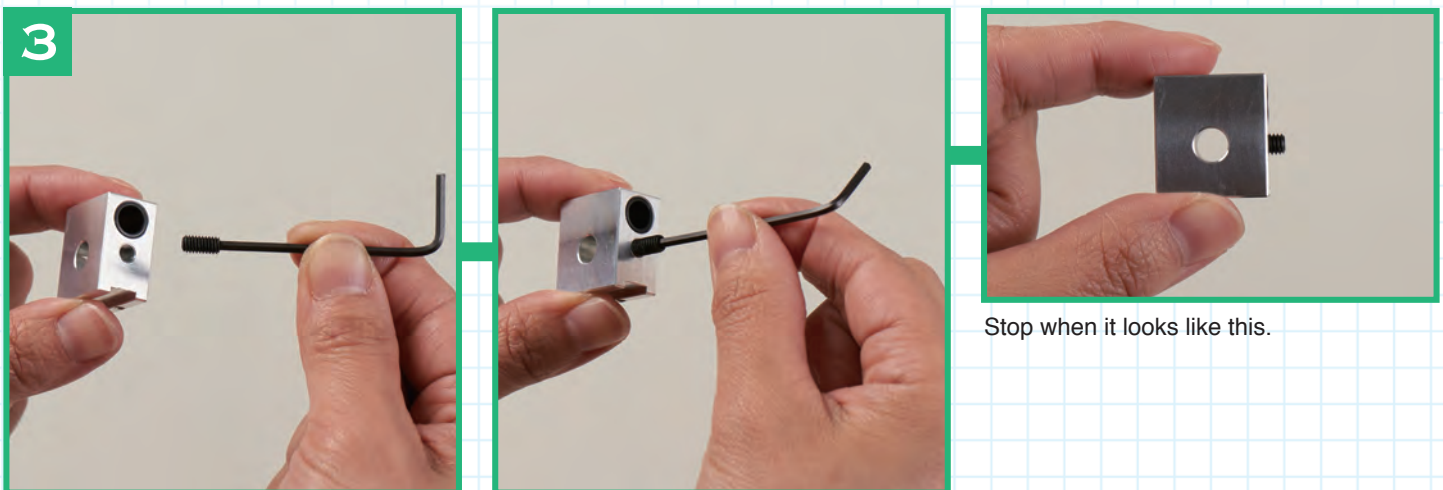


### POINT

There are two set screws supplied with this stage. One is 8mm from head to tip and the other 3mm. Use the longer one for the slider.

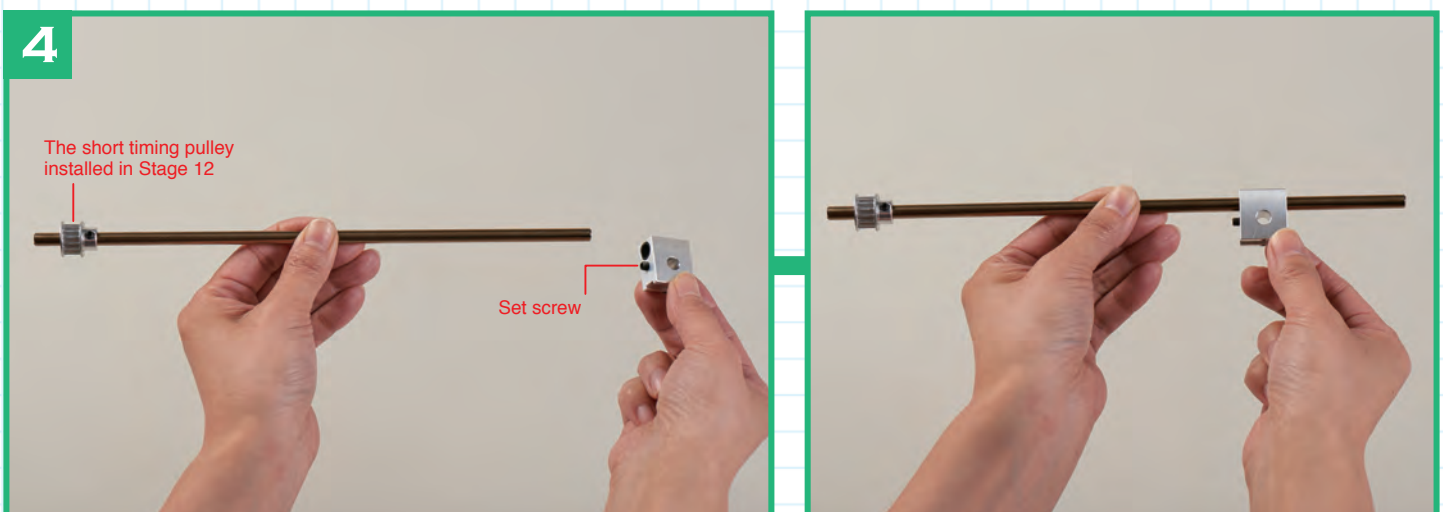


Put the long axis end of the 2mm Allen key into the hexagonal socket in the 8mm set screw.



Stop when it looks like this.

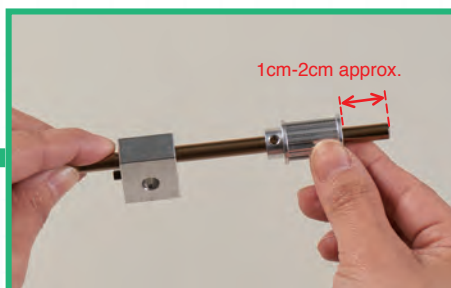
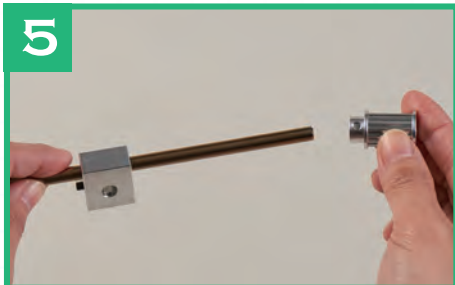
Screw the set screw clockwise into the screw hole in the slider, until about 3mm of the screw is left sticking out from the screw hole.



Push the slider onto the slider rod, as shown above.

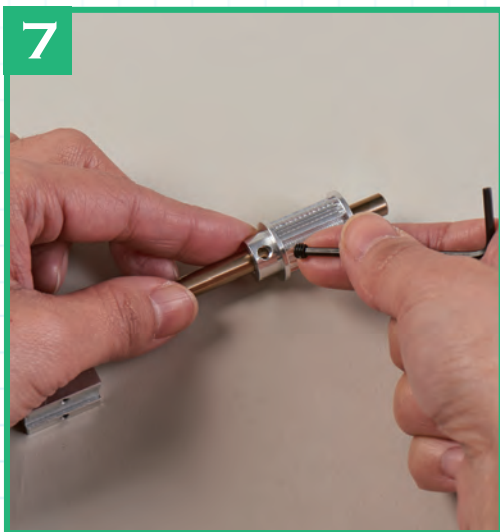


## Put the long timing pulley onto the slider rod



Slide the long timing pulley onto the slider rod, as shown, with the screw hole end of the pulley facing left (towards the slider), and leaving between 1 and 2cm of rod showing.

Put the long axis end of the Allen key into the hexagonal socket in the head of the small (3mm) set screw.



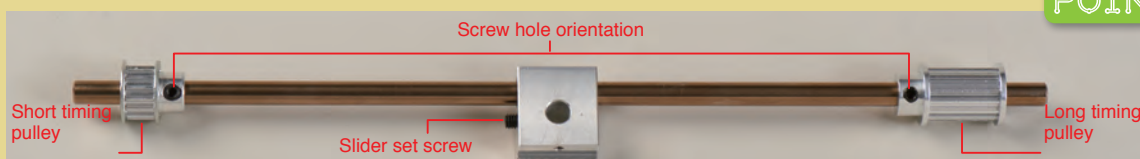
Insert the screw into the screw hole in the timing pulley and tighten it up clockwise. Do not tighten it fully at this stage. Stop tightening when you begin to feel some resistance.

### HINT

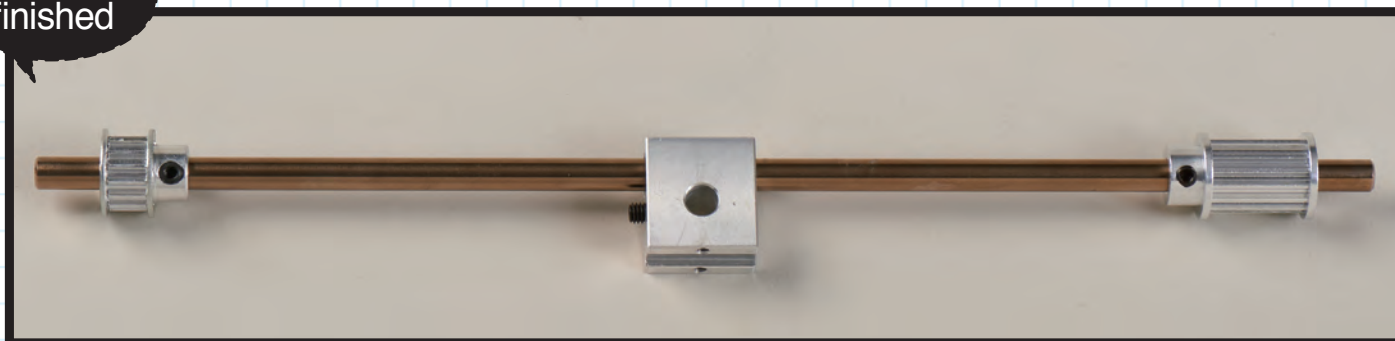
You want the screw tight enough to hold the pulley onto the rod so it does not slide up or down when the rod is vertical.

### POINT

Line up the screw holes as shown on the right to make work on subsequent stages go more smoothly.



Stage finished



You've added the slider and the long timing pulley to the left-hand Y-axis slider rod. Keep the assembly safe for later use, making sure the rod does not get scratched or bent.



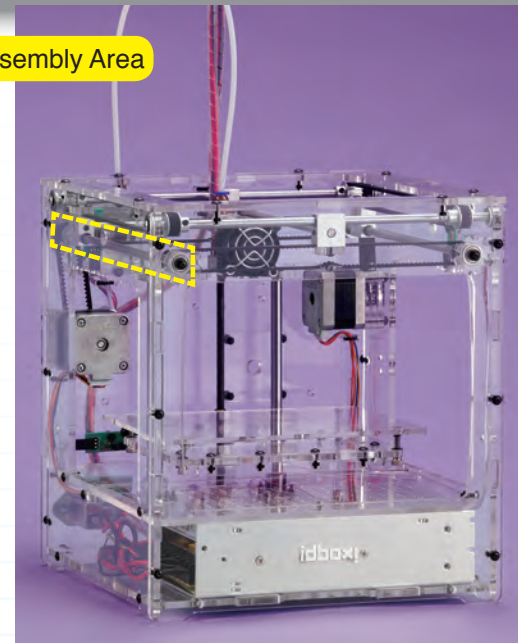
## Stage 14 Assembly Area

## Stage 14: Add the left-hand Y-axis slider rod to the housing

There are three timing belts supplied with this stage, and this time you loop them over the left-hand Y-axis slider rod before installing it into the housing. It is supported by two flanged bearings that you insert into holes in the housing.

In this stage, you continue assembling the XY gantry, this time working on the left-hand Y-axis slider rod. It is important to put the belts supplied with this stage in place around the rod before you assemble the

housing. This is because you are screwing the rod firmly to its rear support bearing, which you insert into the rear panel, and loosely to its front bearing, inserted into the front panel.



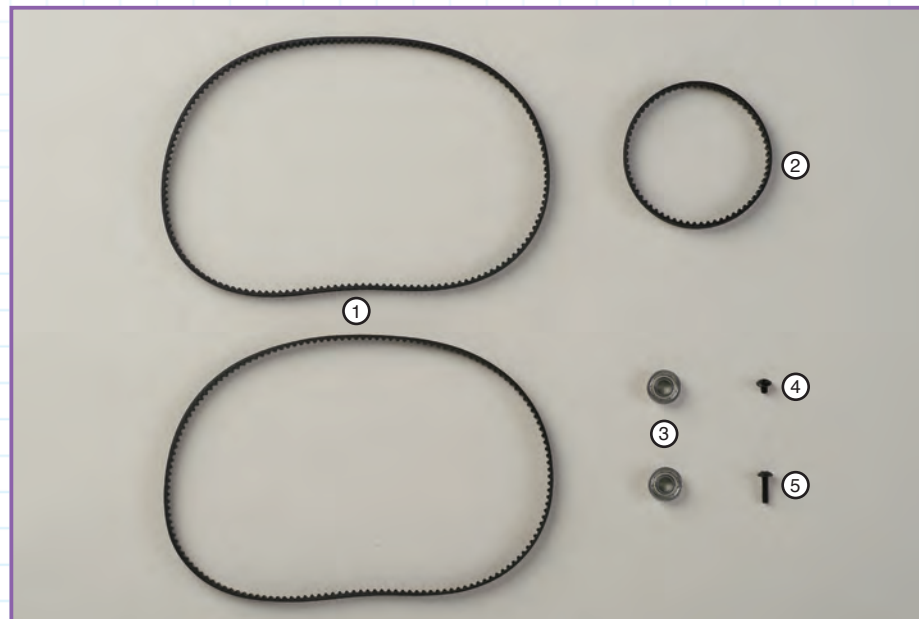
### Stage 14 Components

- 1: S3M timing belts/long (459-6") × 2
- 2: S3M timing belt/short (195-6") × 1
- 3: Bearings (F686ZZ\*) × 2
- 4: M3 truss head screw (4mm) × 1
- 5: M3 truss head screw (12mm) × 1

\*These numbers will be explained in an upcoming stage.

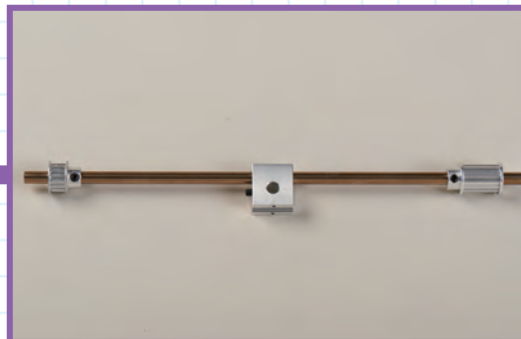
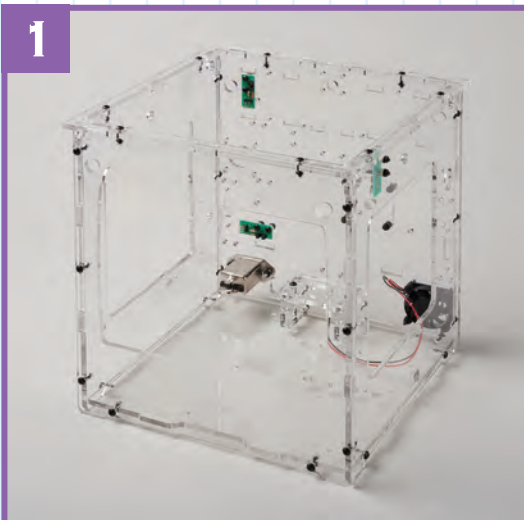
### Tools you will need

Phillips screwdriver (size 1)



### Parts to have ready

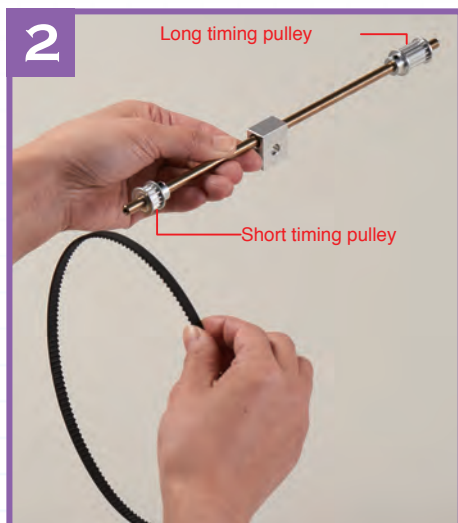
1



You'll need the left-hand Y-axis slider rod you last worked on in Stage 13, plus the printer housing. Position the housing so the idbox logo is at the front (facing you).

# Assembly Guide

## Put the timing cam belts onto the slider rod



With the short pulley closest to you, put one of the long timing belts over the short pulley. Take the other long belt and put it over the long timing pulley at the other end of the rod.



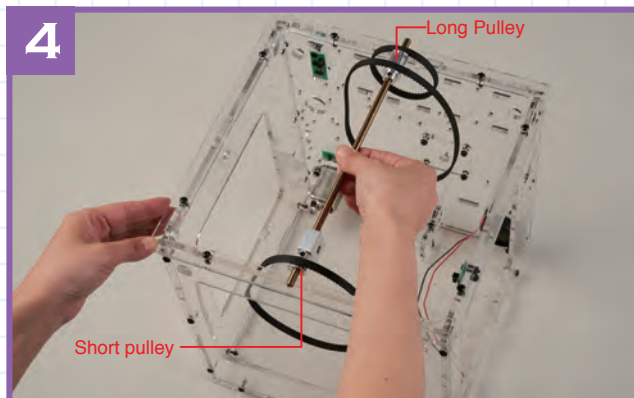
3

Now put the short belt over the long timing pulley.

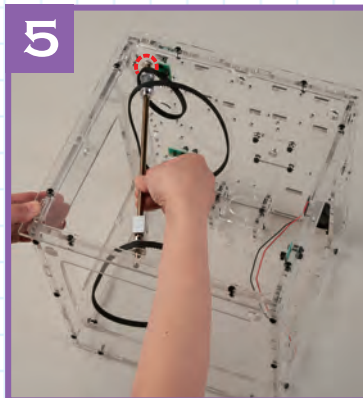
### HINT

It doesn't matter if the belts are not actually on the pulleys just yet, as long as they are over the slider rod. Their positions will be sorted out later.

## Put the slider rod into the printer housing

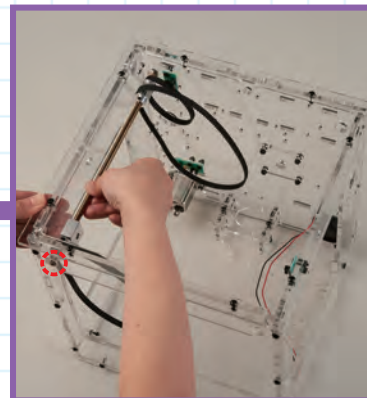


Hold the rod so that the short pulley is at the front (closest to you) and move it to the top of the housing.



5

Put the far end of the rod through the hole (ringed in red, above left) in the rear panel, then put the other end of the rod through the hole (ringed in red above right) in the front panel.



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



### HINT

Support the rod with one hand, and align it so that it goes into the bearing more easily.

### POINT

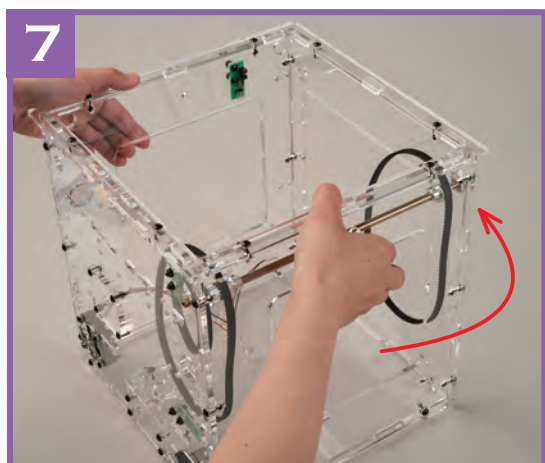
Make sure the bearing is fully inserted into the hole in the panel.

Correct

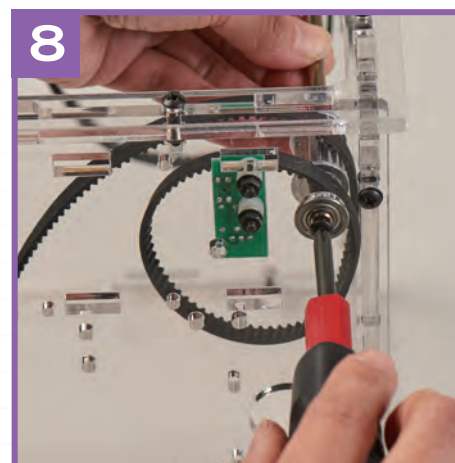
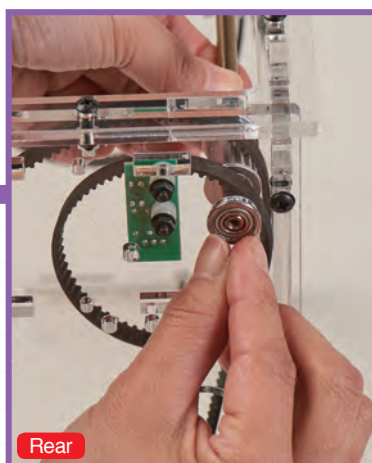
Incorrect







Turn the housing so the rear panel is at the front (facing you). Put the other bearing into the hole at the top right of the panel, inserting the slider rod through the bearing's hole.



Use a screwdriver to screw the 4mm M3 truss head screw into the end of the slider rod. Hold the rod firmly while you tighten the screw.



Turn the housing so that the front of the housing is at the front (facing you) and screw the 12mm M3 truss head screw into the end of the slider rod. Do not tighten it fully at this stage.

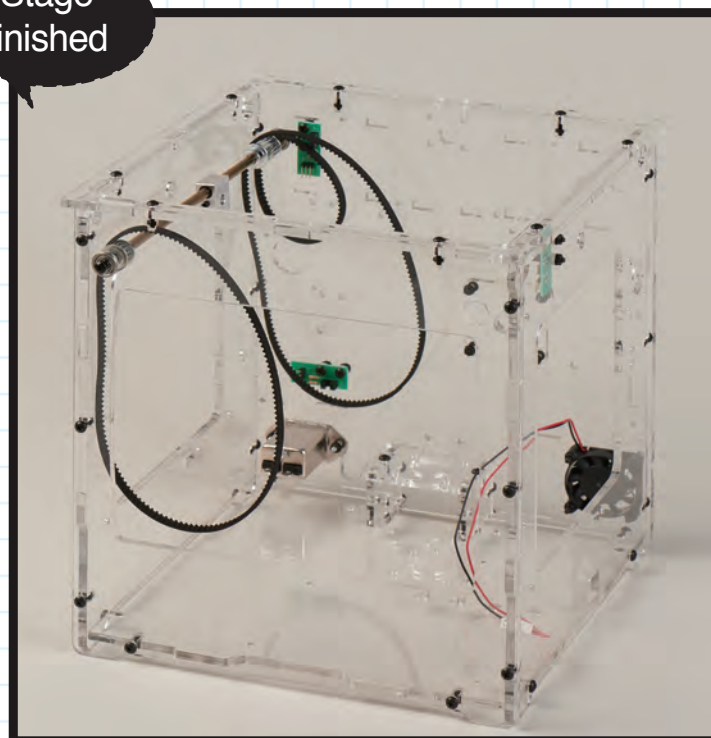


Leave a gap between the truss head screw's head and the end of the slider rod, as there is another part to be fitted here at a later stage.

## POINT

The rear of the casing is the 'reference side' for the Y-axis slider rod. This screw must be tightened fully so that the end surface of the rod and the head of the truss head screw are in contact and held together securely.

## Stage finished



You've now installed the left-hand Y-axis slider rod into the housing. In the next stage, you will work on the right-hand Y-axis slider rod.

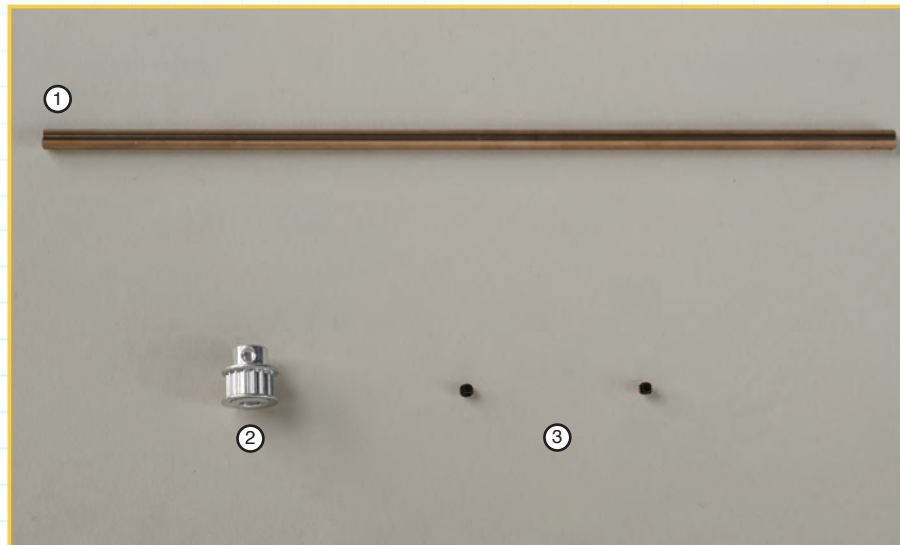
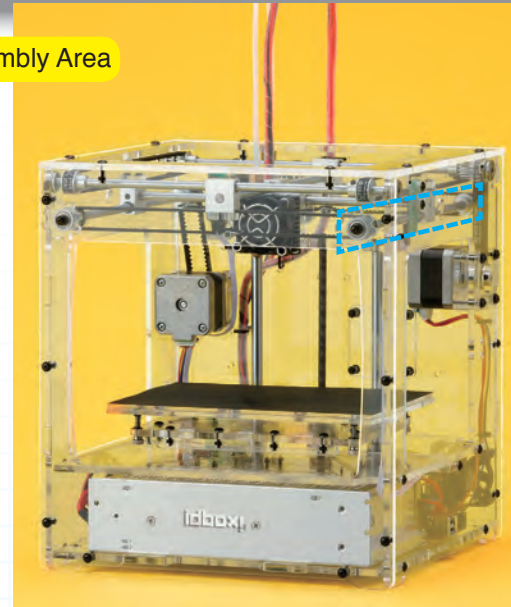


## Stage 15: Attach a short timing pulley to the right-hand Y-axis slider rod

This time, you attach a timing pulley to the Y-axis slider rod that is at the right of the housing, when the housing is viewed from the front. The pulley is secured to the rod by a set screw.

Using the parts supplied with this stage, you insert the slider rod through the timing pulley, and then fix the pulley in place with a set screw. Because set screws are small parts, be careful not to lose them. To tighten

the set screw, you can use the 2mm Allen key that was supplied with Stage 11. In this stage, the set screw is not tightened all the way; it should merely hold the pulley on the rod without being fully tightened.



### Stage 15 Components

- 1: Slider rod (Y-axis/right) x 1
- 2: S3M timing pulley/short \*(15-6-7) x 1
- 3: M4 set screw (3mm) x 2

\*What these numbers mean is explained overleaf.

### Tools you will need

Allen key (2mm) provided with Stage 11

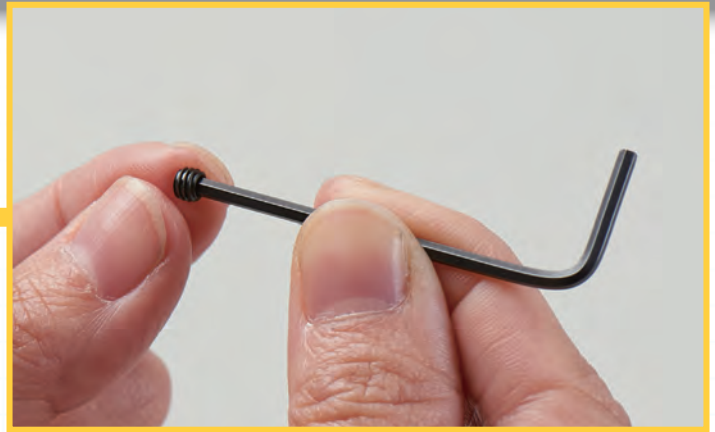
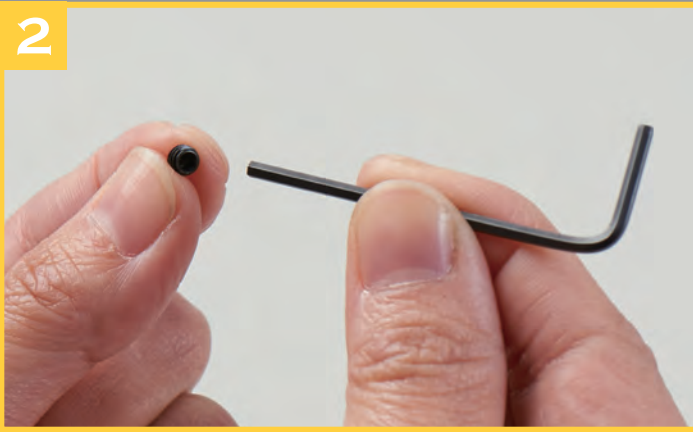


### Put the timing pulley onto the slider rod



Insert the slider rod through the timing pulley, as shown, so that there is about 1 to 2cm between the toothed end of the pulley and the end of the rod.

2



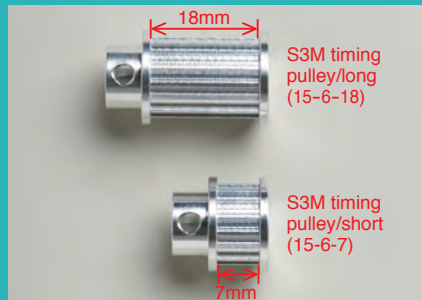
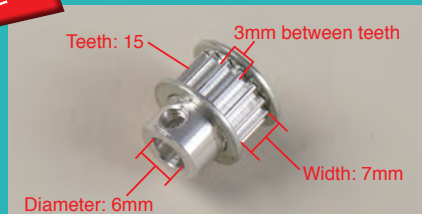
Insert the long end of the Allen key into the hexagonal hole in the head end of the set screw.

## Understanding pulley part numbers

Timing pulleys transfer the motor's movements to the slider rods via toothed belts. The timing pulley supplied with this stage is described as an S3M timing pulley/short (15-6-7). The definition 'S3M' refers to a pulley for a high torque application, the 'S' standing for Super Torque or Super Torque Drive. The '3M' refers to the distance of 3mm between the tops of the pulley's teeth.

The first number within brackets refers to the number of teeth the pulley has. The second number is the diameter of the hole through which a rod or axle fits. The third number is the width, or length, of the toothed section.

CLOSE-UP

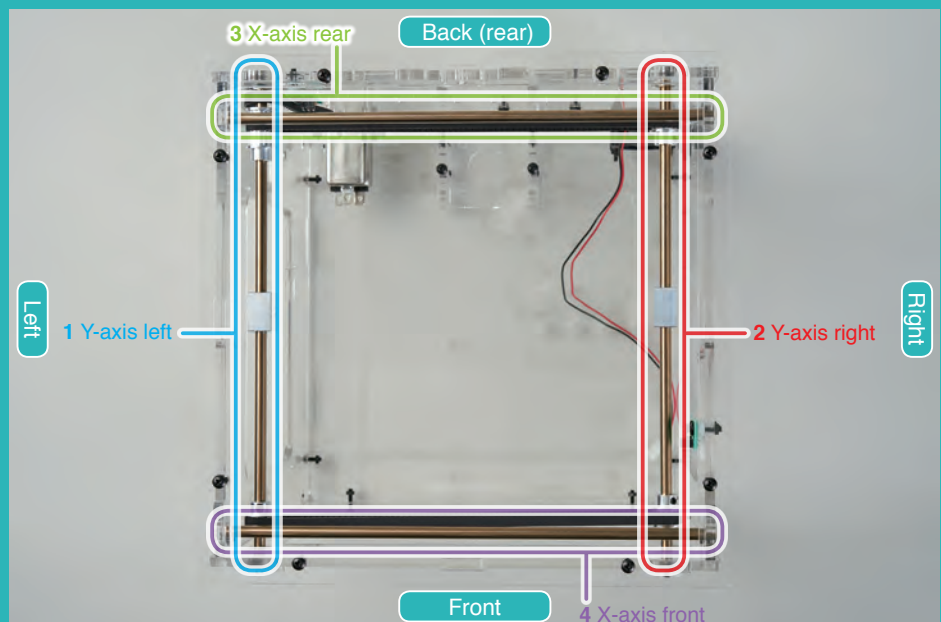


In the two pulleys above, the difference is in the width (length) of the toothed section.

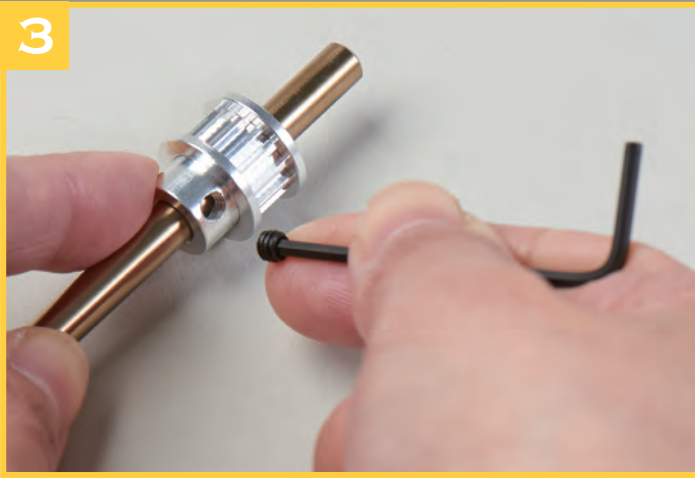
## Slider rod assembly order

You've already installed the left-hand Y-axis slider rod into the printer housing, and in this stage you start work on the right-hand Y-axis slider rod, which is the next one you fit into the printer housing. After the right-hand Y-axis slider, you then move onto the rear X-axis rod and finish with the front X-axis slider rod.

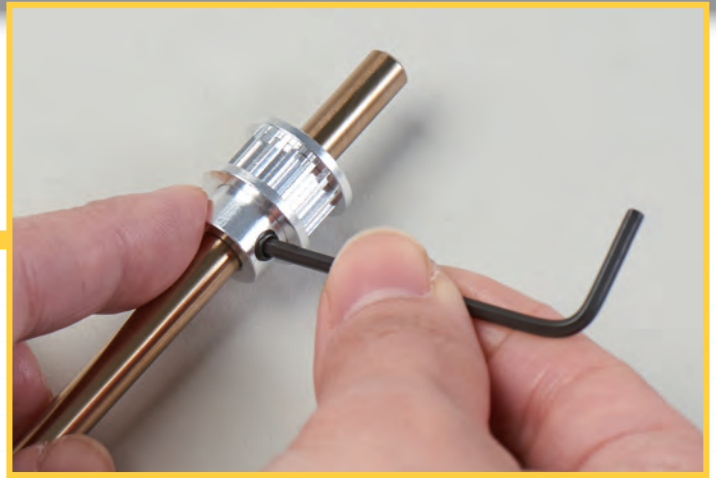
Looking at the printer from above, the slider rod assembly order is shown starting with 1, for the left-hand Y-axis slider rod, and ending at 4, which is the front X-axis slider rod.



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.



### POINT

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

Stage finished

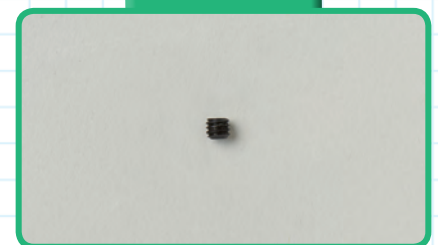


You've fitted a timing pulley to the right-hand Y-axis slider rod and loosely tightened the set screw that holds the pulley onto the rod.



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

Keep it safe



Keep the second 3mm set screw supplied with this stage in a safe place as it will be needed later.



BUILD YOUR OWN

# idbox!

## 3D PRINTER

