BUILD YOUR OWN

idbox! 3D PRINTER

Pack 12

Anything you can imagine, you can make!

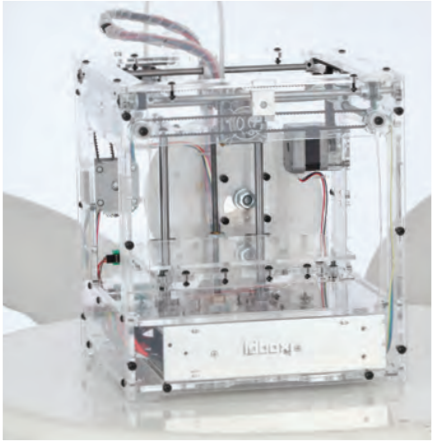
Compatible with
Windows 7 & 8
Mac OS X

3D technology is now available for you at home!

DeAGOSTINI
MODEL SPACE™

BUILD YOUR OWN

idbox! 3D PRINTER



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A tablet case STL file is provided on the ModelSpace website for you to use as a test print. Go to the download page at **www.model-space.com** and download the file for the object, **TabletCase_idbox.stl**.

DeAGOSTINI MODEL SPACE™

www.model-space.com

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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.

User Guide Section 3: Using your idbox

You can now finish off the test of your idbox by loading the filament and sending it through the extruder to the printer head to see if the extruder works. You can then try out a test print. After that, there is a guide to how to get the best from Repetier – the powerful program that controls the printer – and a section on troubleshooting, plus some important extra information that clarifies some points in User Guide 2. Be sure to follow the order of operations set out below, before you proceed with the instructions in User Guide 3.

Order of operations

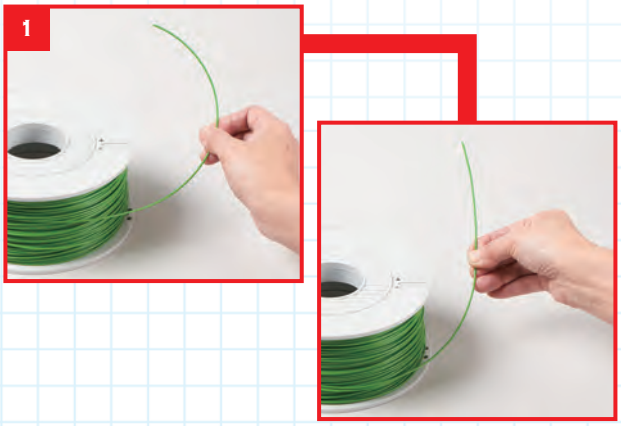
Before you attempt to test the extruder and output a test print, make sure you have finished constructing the idbox as set out in Assembly Guide Stage 55, being sure that you have performed all the instruction on pages 255 to 256 of User Guide 1 in Pack 10 and all the instructions on pages 283 to 292 of User Guide 2 in Pack 11 before you attach the bottom or base covers. Read the Corrections on page 321 before you attempt the instructions on pages 290 to 292 of User Guide 2.

Test extrusion and set up the filament

CAUTION!

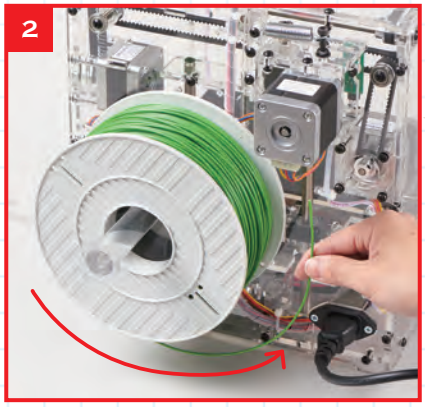
Before you test the filament extrusion and perform your first test print, be sure that you have followed the instructions in **User Guides 1** and **2** and are familiar with how to set up and use Repetier and the slicing software to control the idbox.

1



Straighten out a length of about 10cm from the end of some filament using your fingers.

2

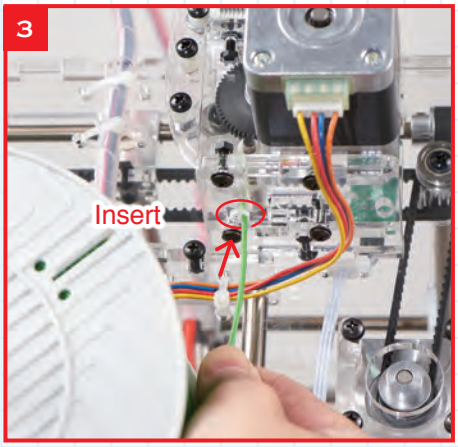


Check that the filament on the spool is fed upwards into the extruder assembly from below, as shown.

CAUTION!

Filament cannot be fed properly into the extruder assembly if it comes off the spool from the top, as shown here.

3

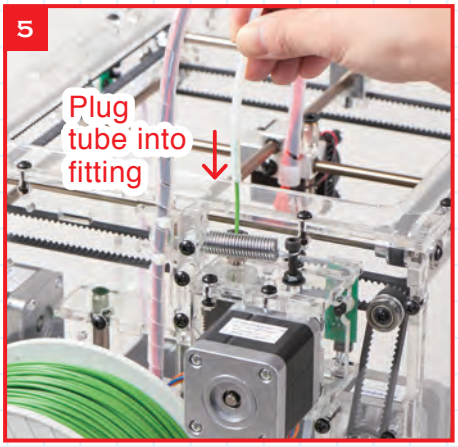


Insert the end of the filament into the round hole (ringed in red, above) in the base of the extruder assembly drive unit.

4

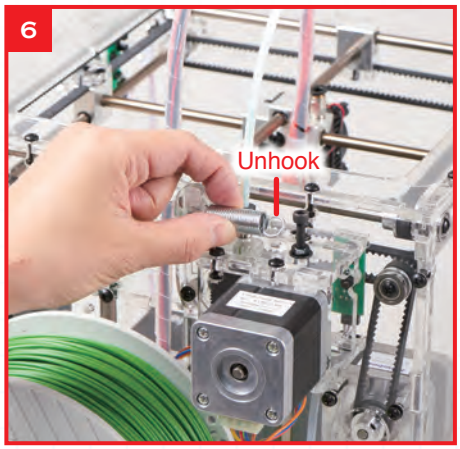
Pull the arm back, which allows you to pass the filament between the arm and the drive roller, until about 5cm protrudes from the tube fitting.

5



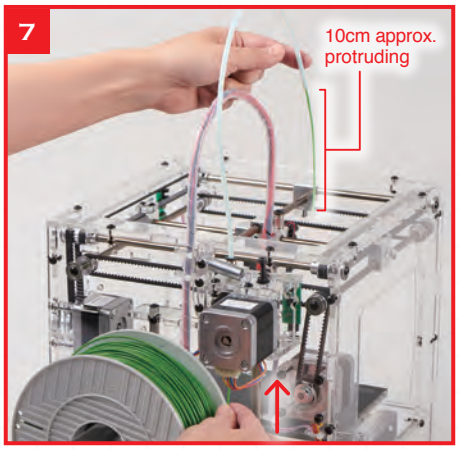
Insert the filament into the filament guide tube. Insert the end of the tube all the way into the tube fitting on the extruder assembly, until you feel some resistance.

6



Unhook the tension spring from the cap bolt, so that the filament can be fed easily through the guide tube.

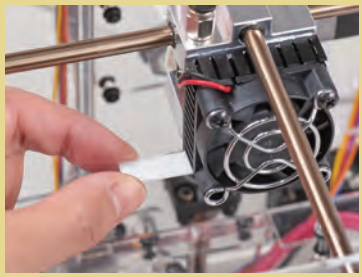
7



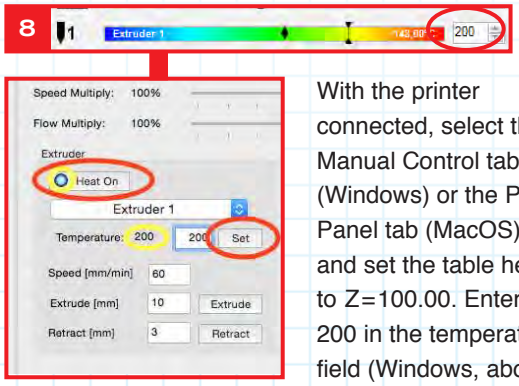
Feed the filament through the guide tube, until there is about 10cm sticking out from the head end of the guide tube.

POINT

When using PLA,
remove the fan draught blocking strip
(see Assembly Guide Stage 29).
Leave it in if using ABS.



8

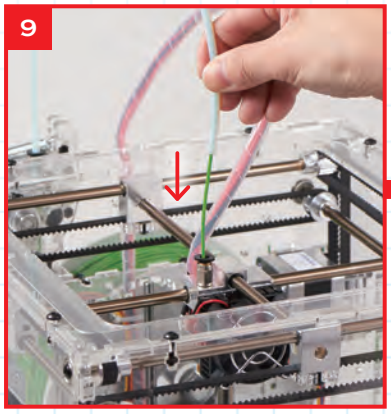


With the printer connected, select the Manual Control tab (Windows) or the Print Panel tab (MacOS) and set the table height to Z=100.00. Enter 200 in the temperature field (Windows, above, MacOS, left) and turn the heat on.

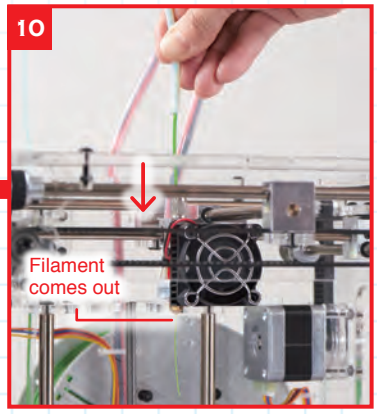
POINT

When test extruding PLA, set
the temperature to 200 degrees C. For ABS,
set the temperature to 240 degrees C.

9

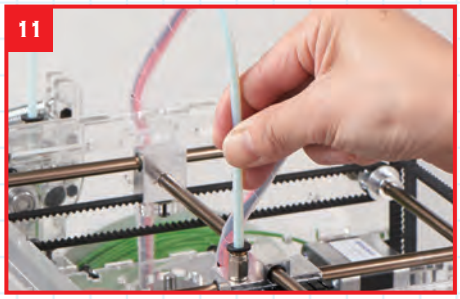


10



When the head has reached operating temperature, insert the filament that has come out of the guide tube into the tube fitting. As you push down, the filament should melt and come out of the nozzle.

11



Push down, until the filament protruding from the guide tube has entered the tube joint. Then, push the guide tube until it is all the way into the tube joint.

12

Hook the tension spring back over the cap bolt. If this is not done, the filament will not be forced into the guide tube by the drive roller.

HINT

If filament does not come out when it is supposed to, check that the guide tube is firmly inserted into the tube joints.

13

Click on the extrude arrow on the Manual Control tab (Windows, shown left), or on Extrude on the Print Panel tab (MacOS). The extruder motor should run and filament should be extruded from the nozzle, dropping onto the modelling table below. The idbox is ready for output. If you do not want to output just now, remove the filament. For how to do this, see Steps 8 and 9 on page 315.

Printing your first object

It's time to try printing something from the idbox. A tablet case STL file is provided on the website. Go to the download page at **www.model-space.com** and download the file for the object (TabletCase_idbox.stl).

Outputting from the idbox

1

Click on the Object Placement tab (Windows and MacOS) in Repetier, then open the TabletCase_idbox.stl file by clicking on the Add Object icon (Windows) or the Add STL file button (MacOS). You need to rotate the object by 180 degrees around the X-axis, so, in Windows, click the Rotate Object icon and enter 180 in X:, then click on the Center Object icon. In MacOS, enter 180 in Rotate: X and then click on the Center Object button.

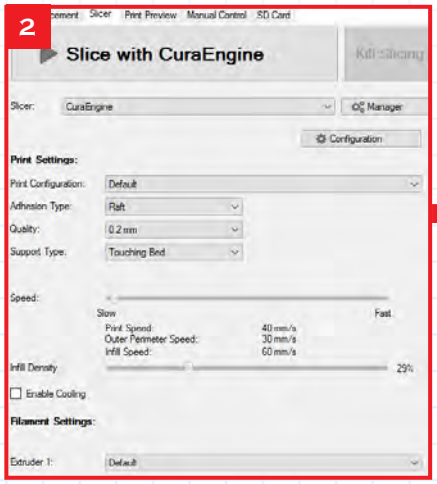
Now switch to the Slicer tab (Windows and MacOS). If you have worked through User Guides 1 and 2, you will have set, or will know how to set, the appropriate settings needed to output using PLA on the idbox. Select these options now (see Step 2).

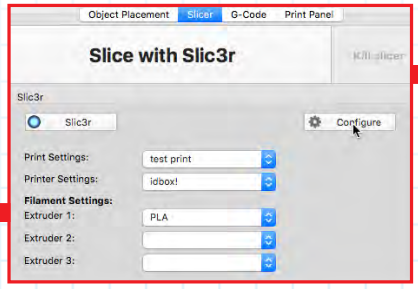
HINT

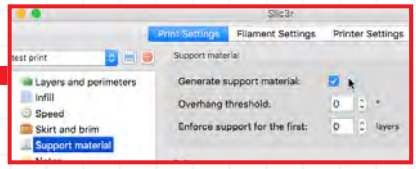
If you want to learn more about CuraEngine slicer, hover over the Adhesion Type and Support Type drop-down menus in the Print Settings section of CuraEngine on the Slicer tab in Windows: tool tips appear with useful information.

If you want to learn more about using Slic3r, look at the Slic3r online manual at http://manual.slic3r.org/

2







CuraEngine (Windows)
Make sure that CuraEngine is selected as the Slicer, then, under Print Settings, choose the appropriate settings for Print Configuration and Quality. Under Adhesion Type, choose Raft, and under Support Type, choose Touching Bed. Under Filament Settings, choose the appropriate option for Extruder 1.

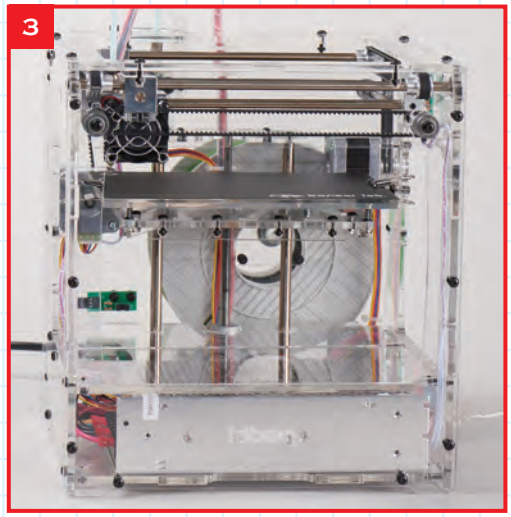
Slic3r (MacOS)
Make sure that Slic3r is selected, then choose the appropriate settings from the Print Settings:, Printer Settings: and Extruder 1: drop-down lists.

You also need to tweak the Print Settings. Click on Configure, and under the Print Settings tab, click on the Support material option. Put a tick in the Generate support material checkbox. Save the changes, then close the configuration window.

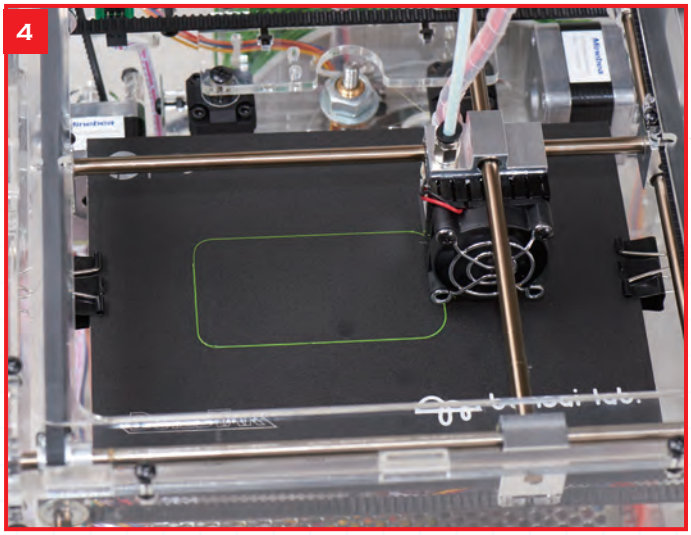
POINT

Before you press the Print button on the Print preview tab (Windows), or the Run button on the toolbar (MacOS), make sure the filament is loaded and ready (see pages 311 to 312) and that the modelling table is covered with a suitable layer such as BuildTak or similar, and that the table and its covering layer are held in place using the clips supplied with Stage 55.

3



When you have adjusted the settings appropriately on the Slicer tab, click on Slice with CuraEngine (Windows), or Slice with Slic3r (MacOS). When the G-code has been generated, you are taken to the Print Preview tab (Windows). Press Print (in Windows), or the Run button (in MacOS). The head and the modelling table will move to their start positions and the head will begin heating up. When the head has reached operating temperature, modelling starts. The object being output here will take approximately one hour to print.



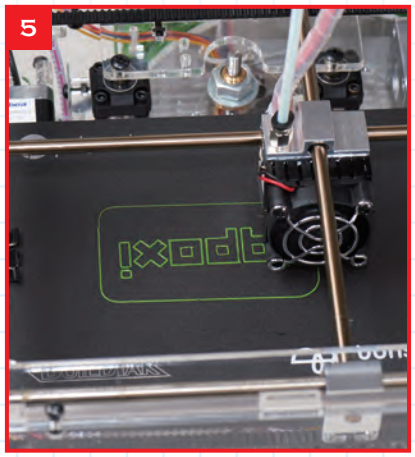
CAUTION!

If the distance between the nozzle and the modelling surface is too small, the nozzle will push into the modelling surface and damage it, or the nozzle may clog. If this happens, click on the Emergency Stop button and then press the All Axes Home icon on the Manual Control tab (Windows) or the Home All button on the Print Panel tab (MacOS).

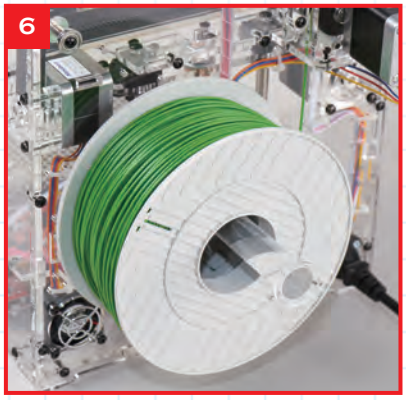
HINT

If the skirt looks even and the filament is adhering to the modelling surface, all should go well. If it does not adhere or looks uneven, it could be that the distance and level of the modelling surface in relation to the nozzle needs readjusting to get the proper clearance.

First out of the nozzle is the skirt around the object. Make sure it is adhering to the modelling surface and is evenly laid down.

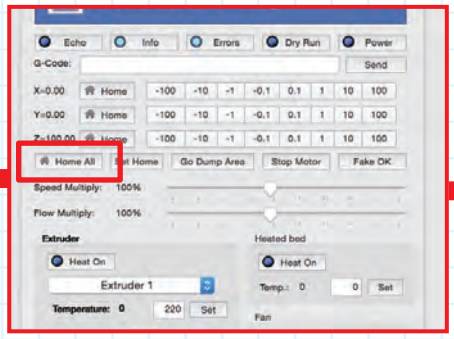


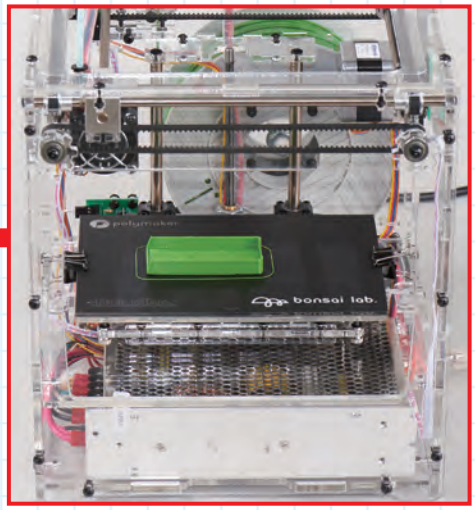
After the skirt is laid down, check that the first part of the model is even and is adhering properly. During printing, the time remaining is displayed at the top of the Manual Control tab (Windows) or the top of the Print Panel tab (MacOS).



Keep an eye on the spool holding the filament, to check that the filament does not get tangled while being fed into the extruder.

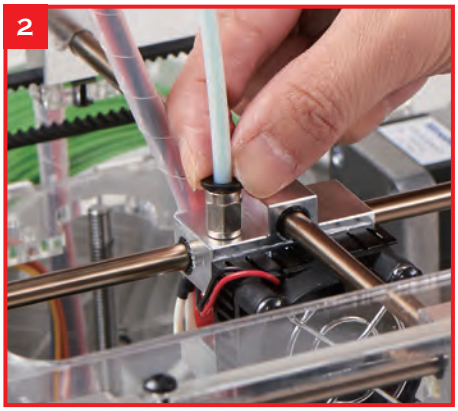
Retrieve the printed object





Once the printer has finished, click the All Axes Home icon (shown above left, outlined in red) on the Manual Control tab (in Windows), or the Home All button (shown above right, outlined in red) on the Print Panel tab (in MacOS).

2

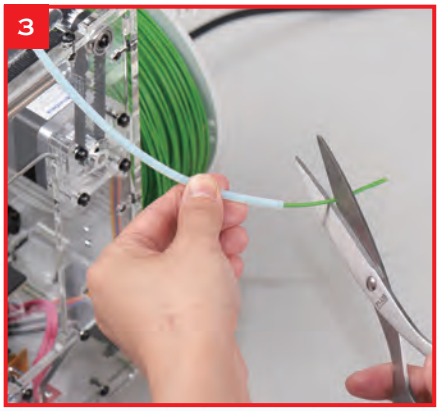


While the nozzle temperature is still high, carefully wipe any filament from the nozzle, but remember – the nozzle and head are very hot. Then, push down the black rubber part of the tube fitting, so you can remove the guide tube easily.

HINT

When the nozzle is hot, take great care not to burn yourself. Do not try to forcibly remove filament from the nozzle when it has cooled, as you might unscrew it, damaging it or other parts of the head assembly.

3

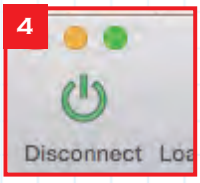


Trim back the end of the filament near where it entered the head block tube fitting. Use scissors if the filament is thin, or nippers if it is thick or difficult to cut. Remove the unused filament from the guide tube, winding it back onto the spool.

HINT

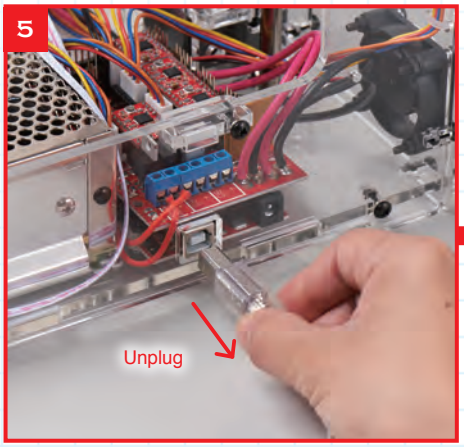
Cut the filament shorter, so its end does not spread. If it does, this might make it difficult to use later.

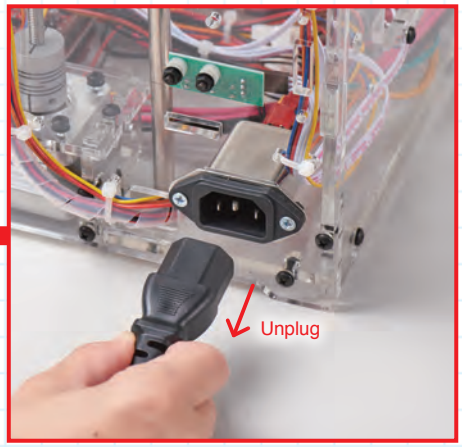
4



Click the Disconnect button in Repetier.

5





Unplug the USB cable connecting your computer to the idbox, and unplug the power supply to the idbox.

6

Remove the clips that are holding the modelling table in place and carefully remove the table from the housing. Be careful not to hit the housing with the table or bump the model against the housing, as this may distort it.

POINT

Do not remove the object when the modelling table is still on the table base, as this might put the assembly out of alignment.

7

Carefully peel the object from the modelling table, gently bending the table, if necessary, to help get it off.

HINT

Do not apply too much force, but you can bend the table to get the model unstuck. If you are using BuildTak (which is self adhesive and is stuck to the modelling table), it will flex.

Get to know Repetier-Host

Repetier-Host is the software that runs on your computer to control the idbox. Download and installation of this software was explained in User Guide 1 (pages 255-256, Pack 10). Below, you can find out what this program can do. Here is a guide to the Repetier screen for Windows computers (below), and for MacOS computers (at the bottom of the page). The different colours used are simply for clarity.

Windows

1 File
Use to import STL or G-Code files.

2 View
Switch the viewpoint and fit objects to available space.

3 Config(uration)
Printer settings and program preferences.

4 Printer
Information about the printer and printing jobs.

5 Tools
Belt and leadscrew calculator and bed height map.

6 Help
Info about the software and links to useful web pages.

7 Connect
Click to connect to the printer; changes to 'Disconnect' when printer is connected.

8 Load
Import files into Repetier.

9 Toggle Log
Turn on/off display of information at bottom of screen.

10 Hide/Show Filament
Disables/enables visualisation of filament.

11 Hide/Show Travel
Disables/enables visualisation of travel.

12 Printer Settings
Opens the Printer Settings window.

13 Easy Mode
Icon goes green when in Easy Mode, red when not.

14 Emergency Stop
If any problem occurs during printing, click on this button immediately.

15 Rotate
Click and drag on screen to rotate view.

16 Move viewpoint
Click and drag on screen to move view across screen.

17 Move Object
Click and drag on object to move it.

18 Zoom
Click and drag on screen to enlarge/reduce view.

19 Zoom Objects to fit
Fits object(s) to available screen space.

20 Isometric View
See display viewed from an angle.

21 Front View
See display, viewed from side.

22 Top View
See display, viewed from top.

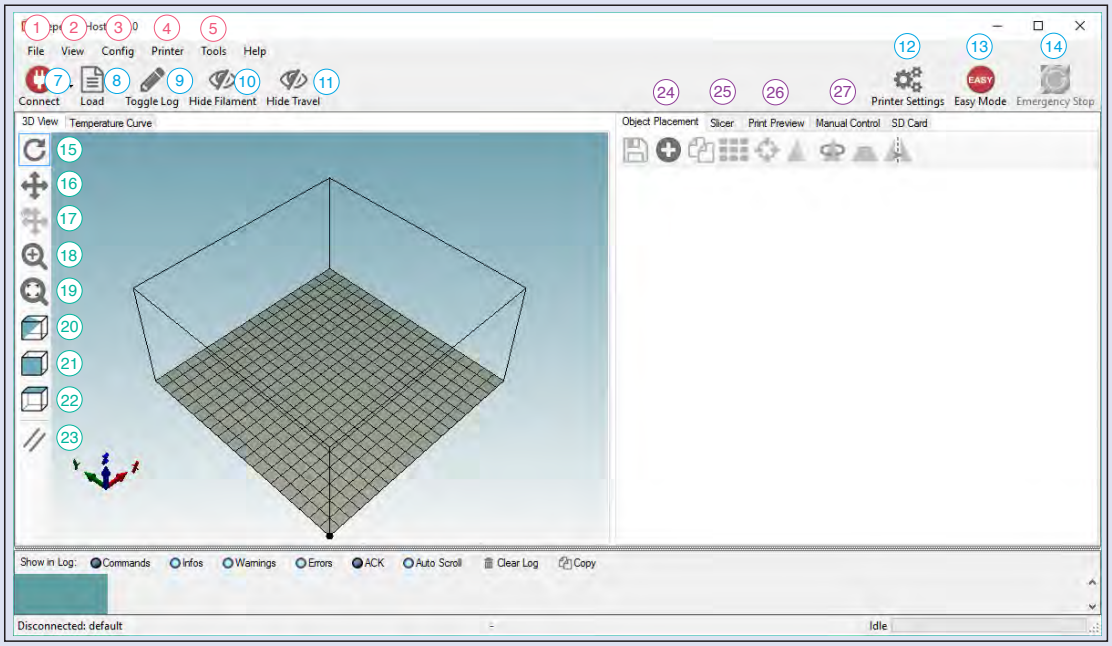
23 Use parallel projection
See display in parallel projection.

24 Object Placement
Add, position, scale, rotate objects and more.

25 Slicer
Select settings for slicer and generate G-Code.

26 Print Preview
Print button, printing stats.

27 Manual Control
Manually control movement in all axes, set head temperature and extrude filament.



MacOS

A File
See 1 File

B Edit
Select menu options such as Cut, Copy, Paste and Undo

C Printer
Printer settings and suchlike

D Window
Change the size of the window

E Temperature
See 4 Printer

F Help
See 6 Help

G Connect
See 7 Connect

H Load G-code
Load G-Code from a file

I Run
Run a print job

J Kill job
Exit the print

K SD card
Read data from SD card

L Toggle log
See 9 Toggle Log

M Shows filament
See 10 Hide/Show Filament

N Shows travel
See 11 Hide/Show Travel

O Printer settings
See 12 Printer Settings

P Preferences
Open software preferences panel

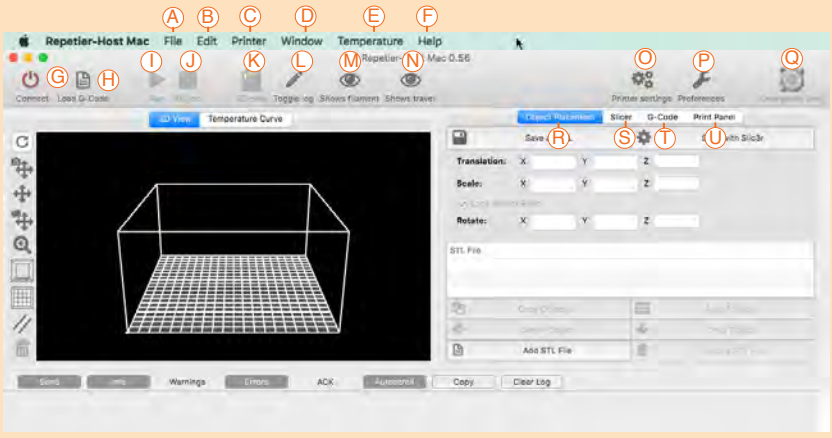
Q Emergency Stop
See 14 Emergency Stop

R Object Placement
See 24 Object Placement

S Slicer
See 25 Slicer

T G-Code
Show G-Code

U Print Panel
See 27 Manual Control

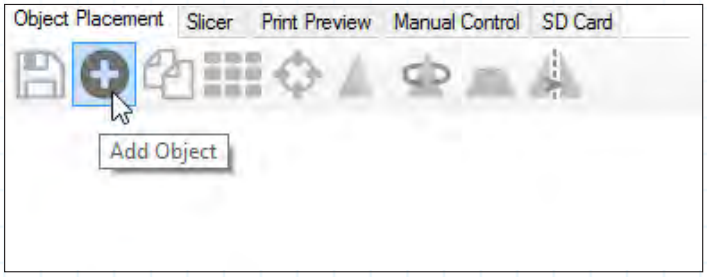


Open an STL file and move the object

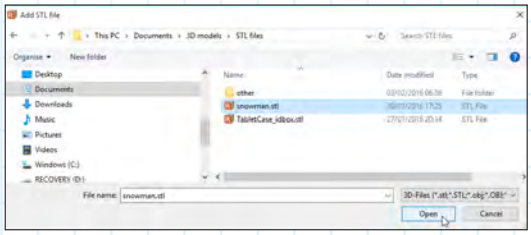
Designs that have been created in 3D modelling software, such as AUTODESK 123D, can be printed out from a 3D printer. The design has to be saved as an STL file before it is imported into Repetier. Find out here how to import files and view them.

About STL files

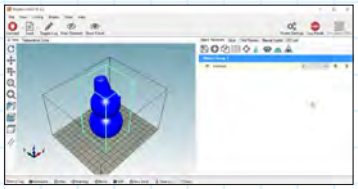
An STL file contains data about 3D objects in the form of triangles. The more complex the shape, the more triangles. STL files are used by most 3D printers and 3D software.



You can open an STL file in Repetier either by clicking on the Load button (see previous page) or by clicking on the Add Object button on the Object Placement tab, as shown above.

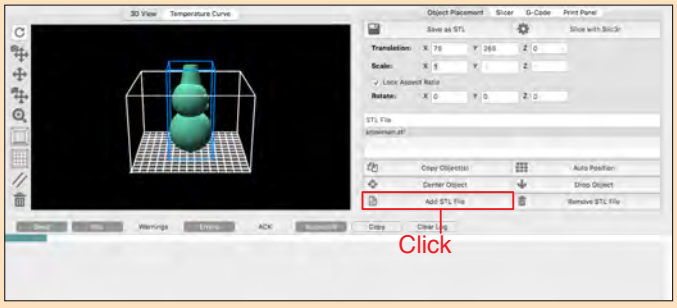


Navigate to where the file is stored, select it and click on Open.



The file is read and the object appears; in this case, the snowman.

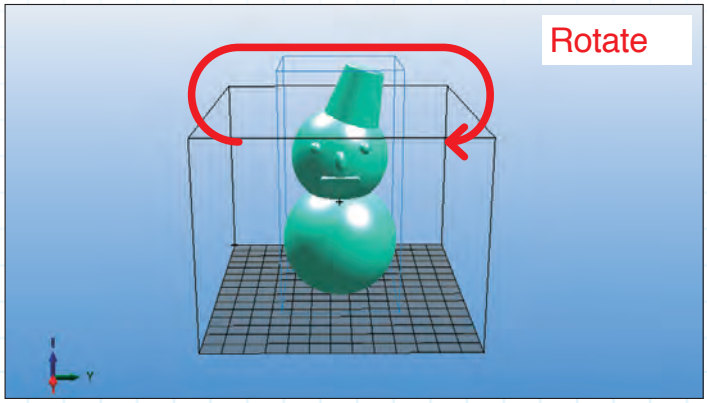
MacOS



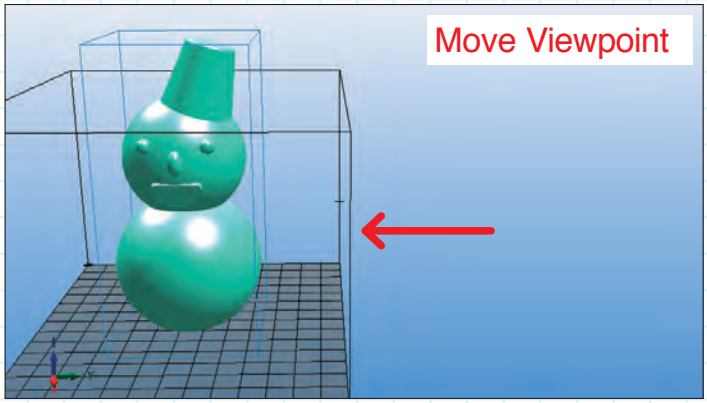
Select the Object Placement tab and then click on Add STL File. Navigate to where the file is kept, then select the file and click on Open.

Quick ways to move an object

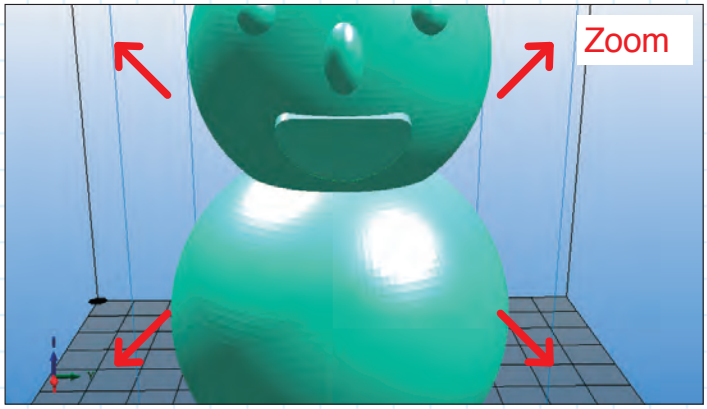
When you open the STL file, the image of the object is on top of the modeling table. It is easy to manipulate the object using the controls on the left of the screen, and you can also use the keyboard and mouse to do the same actions as shown below.



To rotate the object, hold down the Ctrl key and the mouse wheel, and move the mouse.



Hold down the mouse wheel and then move the mouse to pan the object across the screen.

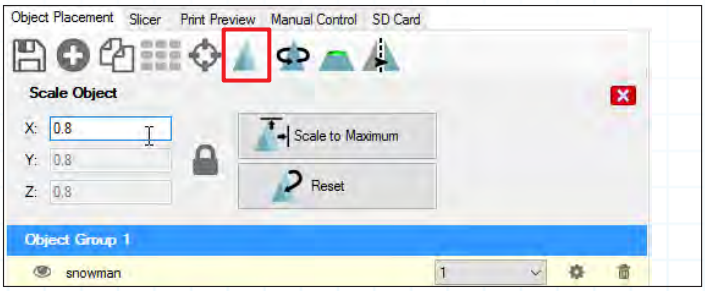


Turn the mouse wheel to change the object's size onscreen.

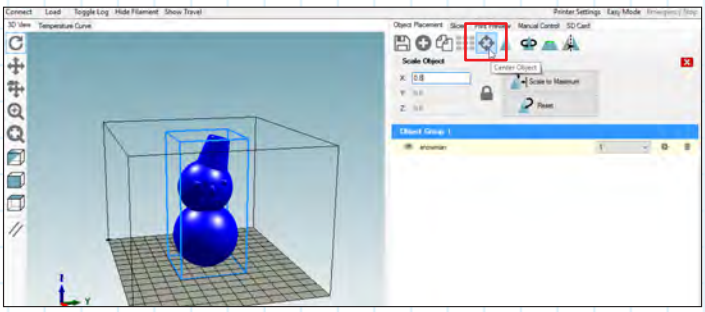
Adjust size and position

You can change the scale of an object to make sure it fits in the modelling space of the printer (in this case the idbox), and change its orientation by rotating it.

Change the scale

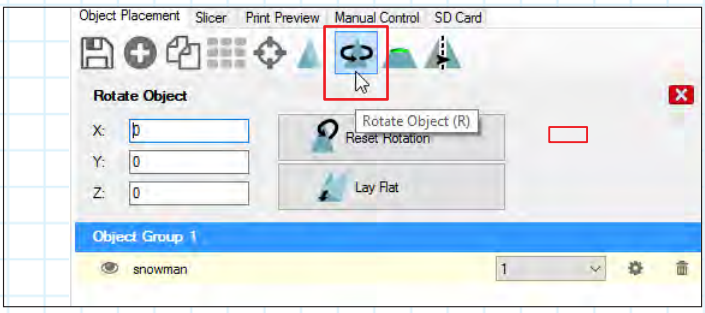


1 The snowman is a bit too large for the modelling space, so it needs to be made smaller by changing the scale. Select the Object Placement tab, then click on the Scale Object icon (outlined in red, above). Enter a value of 0.8, then click Return, and the object will change to 80 per cent of its initial size.

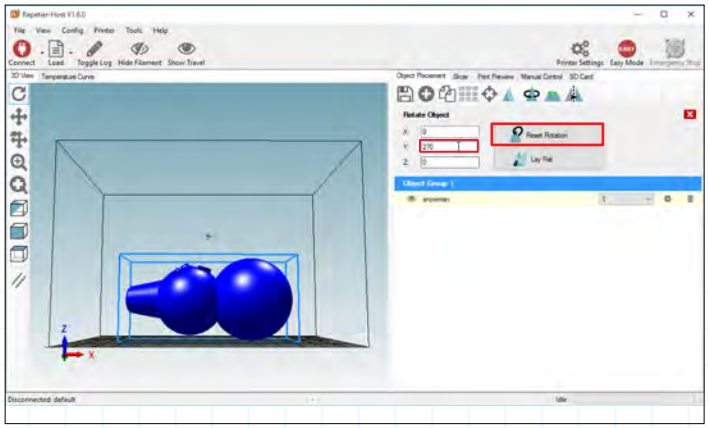


2 Click on the Center Object button (outlined in red, above) and the object is moved to the centre of the modelling space.

Rotate



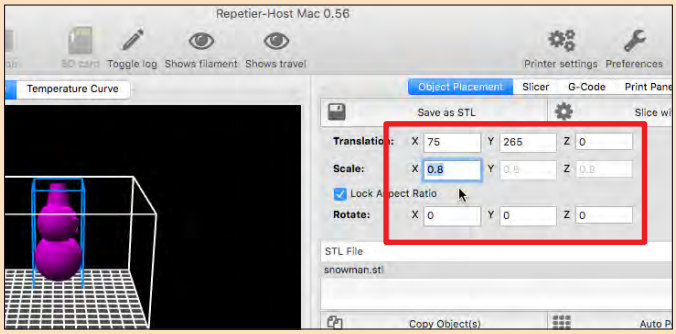
1 To rotate the object, click on the Rotate Object button and fill in a value in one of the fields under Rotate Object.



2 If you enter 270 in the Y: field, the snowman will lie down. Try out the other controls on the Object Placement tab to see what they do. You can always return the object to its original state by clicking on the reset button – Reset Rotation is shown outlined in red, above.

MacOS

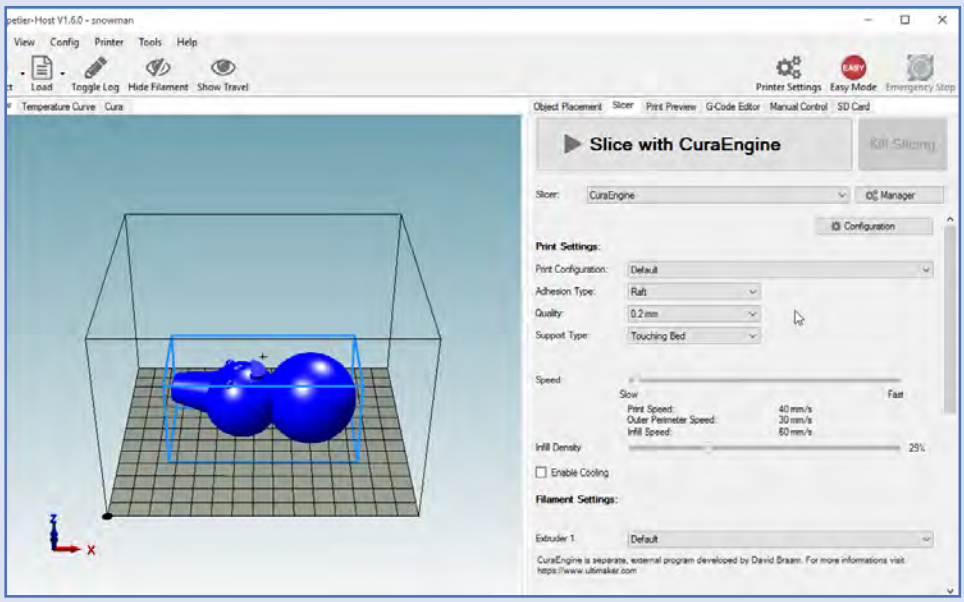
The Rotate and Scale commands appear under the Object Placement tab. There are also fields that let you move the object.



The Translation fields can be used to move the object around in the modelling space in three dimensions. The scale changes the size of the object: values less than one reduce it, and over one enlarge it. The rotate fields turn the object in three dimensions.

Choose the settings before slicing

After importing and positioning an object, you move to the Slicer tab where you select the options regarding the printer you are using (in this case the idbox) and the filament you are printing with. There are also settings that you can choose that relate to the object being printed. On this page, we examine the options you can select to give your print the best chance of working properly.



Options for CuraEngine (Windows)

On the Slicer tab, you select the settings for the printer and the filament from a selection of drop-down lists. Most of the settings will have already been determined when you set up Repetier for the idbox and when you set up CuraEngine for the printer and the type of filament. You also get to choose options to make it more likely that your model will print out properly. These settings are determined, typically, by the shape and size of the object being printed, as well as the print material. To change any of the pre-set settings, click on the Configuration button and look on the Print and Filament tabs of CuraEngine Settings (see page 261).

Print Configuration

The values for this will have been set and named (or left at Default) when you set up CuraEngine (see page 261).

Filament Settings

The values for this will have been set and named (or left at Default) when you set up CuraEngine (see page 261).

Enable Cooling

On the idbox, cooling is determined by the fan draught blocker strip and not by software. Use the fan draught blocker for ABS and not for PLA.

Speed and Infill density

The values for this will have been set and named (or left at Default) when you set up CuraEngine (see page 261).

Support Type

The choices are None, Touching Bed or Everywhere. Use support when your model has areas that don't touch the modelling surface. Touching Bed is most commonly used option.

Adhesion Type

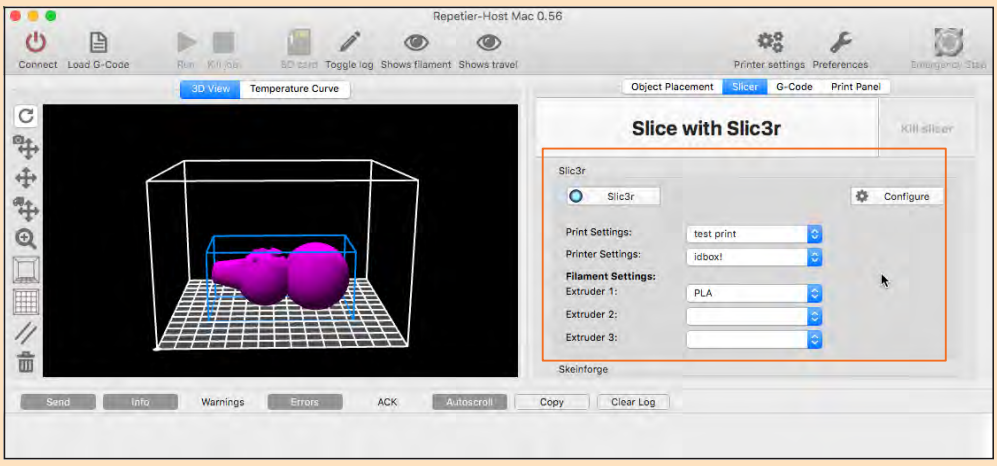
The choices are None, Raft or Brim. Raft is mostly used to help ABS models adhere to the modelling surface. It is also used when printing objects with small footprints. Brims stabilise objects that have isolated parts.

Quality

The values for this will have been set and named (or left at Default) when you set up CuraEngine (see page 261).

MacOS

The slicer you use with MacOS is Slic3r, and you choose your options on the Slicer tab.

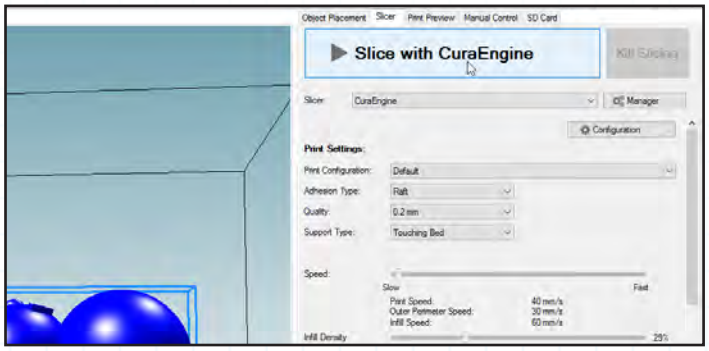


Options for Slic3r (MacOS)

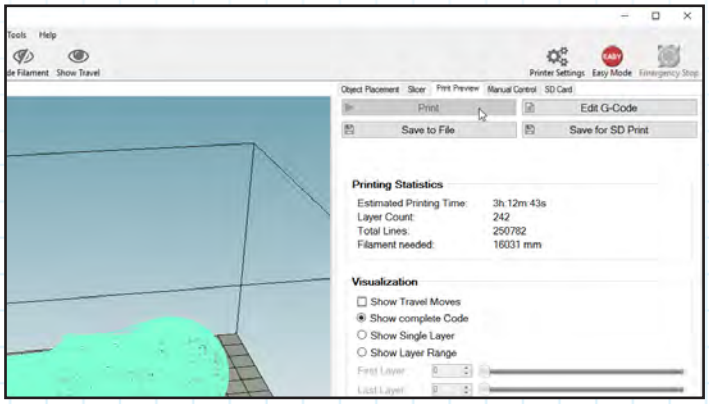
The values you can select from the drop-down lists by Print Settings, Printer Settings and under Filament Settings will have been set on pages 261 to 262 if you have followed User Guide 1. If you want to change any of them, click on the Configure button. It is a good idea to put a tick by Generate support material on the Support material settings section under the Print Settings tab.

Slicing and printing

With the selections made on the Slicer tab, it's time to generate the instructions that will tell your printer how to make the model. To do this you use slicing software that generates the G-Code.

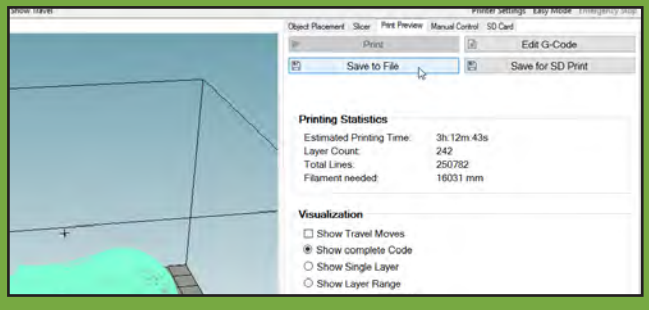


When you are ready, and have chosen suitable settings, click on Slice with CuraEngine to generate the G-Code for your model.



When the slicing is finished and the G-code has been generated, you are taken to the Print Preview tab. Make sure your computer is properly connected to the printer before you click on Print.

HINT If you don't want to print the object right away, or you think you might want to output it more than once, you can save the G-Code for re-use. The code is saved to a file that you can open and then just print without having to position an object or regenerate the G-code. Click on Save to File on the Print Preview tab and save the file to a suitable location.



Slicing

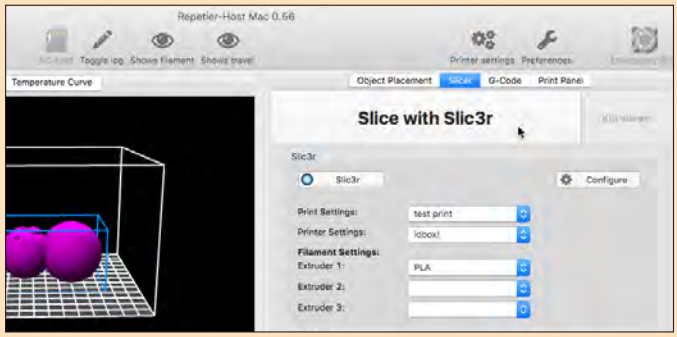
A 3D model made with the idbox is built up of a series of layers, or slices, of filament, each layer having material deposited in a carefully controlled manner on the layer below. Slicing software generates the information that allows your printer to lay down these layers.

G-Code

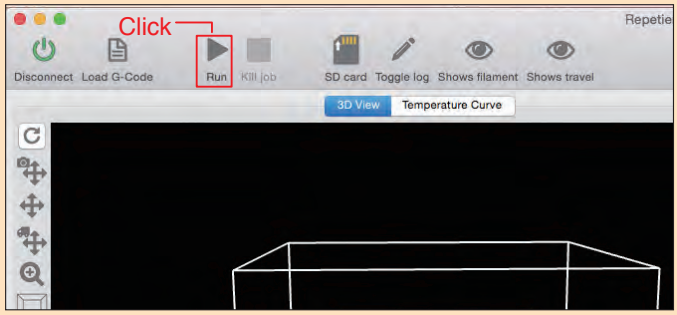
Slicing software, such as CuraEngine demonstrated here for Windows and Slic3r demonstrated here for MacOS, produces the G-Code, the series of instructions that have the effect of moving the printer head and modelling platform, and telling the extruder when to extrude to build up the layers of your model.

MacOS

The procedure for MacOS is very similar to that for Windows. When you have chosen your settings, the object is sliced.



Click on Slice with Slic3r to start the slicing process.



When the code has been generated, click on Run to print.

Corrections, trouble-shooting and maintenance

In this last section of User Guide 3 are some suggestions as to how to investigate problems when testing the idbox (see User Guides 1 and 2 for the testing procedures), as well as hints and tips for successful printing and maintenance suggestions. First, though, are some important clarifications and revisions.

Corrections

Page 290

On page 290 of User Guide 2 in Pack 11, Step 3 under the sub-heading Heat up the hot end then tighten the nozzle, refers to a 6mm spanner being used to tighten the nozzle. However, the nozzle nut tool supplied with Stage 55 should be used instead. Please see page 238 for how to assemble and use the nozzle nut tool to tighten the nozzle.

Pages 291 to 292

1. On page 291 of User Guide 2 in Pack 11, the text in Step 5 describes using three knurled nuts to adjust the height of the table. There are, in fact, four knurled nuts, one at each corner of the table. In addition, the knurled nuts do not have the protrusions as described in Step 5.

2. On page 292 of User Guide 2 in Pack 11, the text in Step 9 describes turning a knurled nut at front centre but there is no nut at front centre. The nut that should be turned is at front right.

3. On page 292 of User Guide 2 in Pack 11, the text in Step 12 describes turning knurled nuts at front centre and rear left. However, the nuts that should be turned are at front left and (if necessary) rear left.

Problems during testing or operation

See Stage(s)

Head or modelling table is not moving

If during testing of the idbox as described in User Guide 2 there is no movement in the X, the Y or the Z axis, try the following:

- Check that the connect button in Repetier has been pressed.
- Check that the motor cables from the driver board to the motors are properly connected. → Stages 39 and 40
- Check that the motor drivers are properly inserted into the driver board. → Stages 39 and 41

Extruder motor is not working

If the gears do not move, check the connections to the extruder motor. → Stages 39 and 40

Lead screw does not turn (but Z-axis motor does)

If the motor is turning but the coupling is not, check the tightness of the screws in the coupling. → Stages 46 and 48

Motor does not stop when head reaches edge

The likelihood is that a limit switch is not operating properly. Check the following:

- Check that the dog (metal plate) has been correctly assembled and that it enters the U of the switch. → Stages 24 and 25
- Check that the cable to the limit switch is properly plugged into the driver board. → Stage 43
- Check that the motor driver is correctly plugged in. → Stages 39 and 41

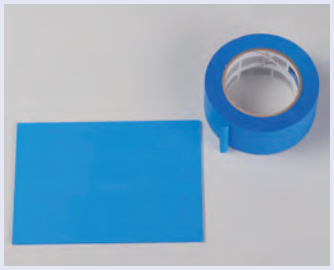
Clunking or stuttering sound is heard when the head moves

Press the Emergency Stop button. Move the head manually, to see if it moves along the rods smoothly. If it does not, loosen the screws of the enclosure slightly, then when the head moves smoothly when moved by hand, tighten them again. If it still does not move smoothly, a slider might be displaced, so try adjusting again using the jig. → Stages 26 and 27

Output hints and tips

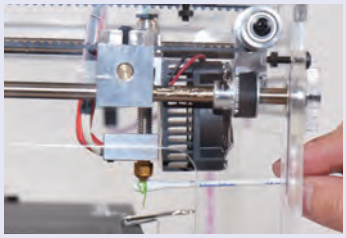
Alternatives to BuildTak

You should not output directly onto the acrylic surface of the modelling table. Alternatives to BuildTak, the self-adhesive covering for modelling tables, include polyamide insulating tape, also known as Kapton (shown) which can be bought online or at retail outlets.



Cleaning filament from the nozzle

When the head heats up, filament my leak from the nozzle. This can be cleaned up with a cotton bud, as shown here. The best buds to use are less-fluffy ones.



Don't leave the printer unattended when printing

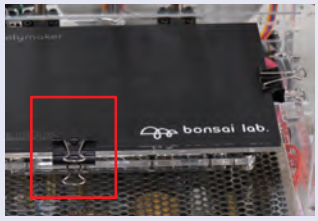
The head is operating at high temperature, so you must be able to supervise its operation at all times, even though some objects can take hours to print out.

Printing with ABS

To get ABS to adhere to the unheated bed of the idbox, you can try spraying a BuildTak-covered modelling surface with 'extra hold' hairspray. And remember to use the fan draught blocker. You will also have to change the settings, so that the extruder temperature is set to 230-240 degrees Celsius.

Can the modelling table clips be moved?

As long as the modelling surface is securely clipped to the table base, it doesn't matter where the clips are located, as long as they are not positioned where they might be hit by the nozzle. There is a chance that the left clip might be in the way when larger models are being output, in which case it can be moved to the front, as shown in the photo, right. Try to determine, after the G-Code has been generated, if there is any chance that a clip might be in the way and move it so there is 20mm clearance around it. Do not forget to allow for the skirt around an object.



Things to do when changing from ABS to PLA

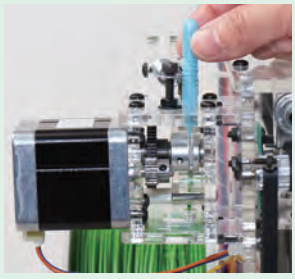
The main thing to be concerned about is the fact that PLA melts at a lower temperature than ABS, so you have to remove any ABS left in the nozzle before changing to PLA. So, after using ABS, keep the temperature at 240 degrees C and clean out the nozzle by inserting a metal rod with a diameter of 1.9mm – piano wire will do – in the tube fitting of the head and moving it slowly up and down until the remaining ABS is pushed from the nozzle. Then you manually change the temperature to 200 degrees Celsius before setting up with PLA filament as described on pages 311 to 312.

Maintenance and cleaning

Filament debris builds up in the drive roller groove

During printing, as filament passes between the drive roller and the arm, bits of it may flake off and accumulate in the groove of the drive roller. If this happens, the roller might not be able to grip the filament properly.

If there is filament debris on the roller, you should clean it off when it builds up. One method you might want to try is to us a suitably sized interdental brush.



The photo above shows an interdental brush being used to clean the drive roller.

If the lead screw is squeaky when operating

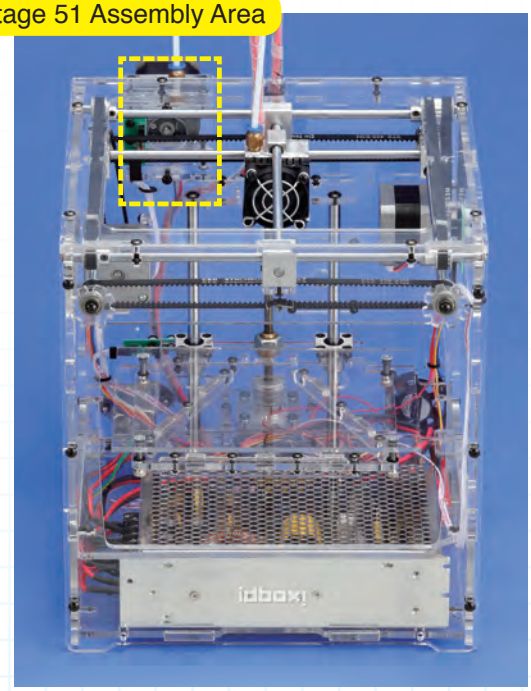
If there is a squeaking noise when the lead screw is turning, it needs to be regreased. Wipe off the old grease and apply a new coating, and treat any rods where movement is no longer smooth in the same way.

Tighten up regularly

Under normal operating conditions, screws can work loose, especially those around the motors and other moving parts. Check all screws, nuts and bolts periodically, and tighten them up without overtightening them.

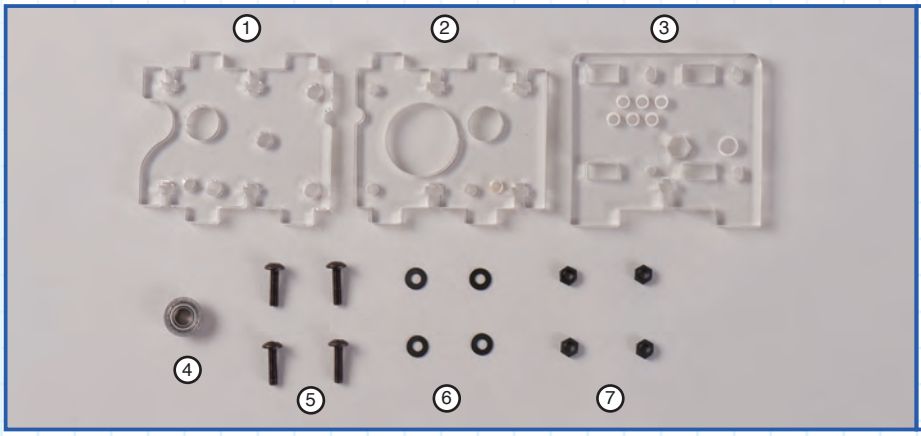
Stage 51: Insert the extruder drive shaft into the U-shaped extruder assembly

Stage 51 Assembly Area



In this stage, you will insert bearings into the sides of the U-shaped extruder assembly while adding the drive shaft with its drive roller and large gear.

First, add a bearing to laser-cut part A, then fit the drive shaft into the bearing with the drive roller. Then, add the second bearing to laser-cut part B and put the other end of the drive shaft through this bearing. Next, fix nuts into the laser-cut parts A and B and secure laser-cut part C to the assembly, using screws that are only finger-tightened for now. Make sure you orientate the laser-cut parts correctly during the assembly process.



Stage 51 Components

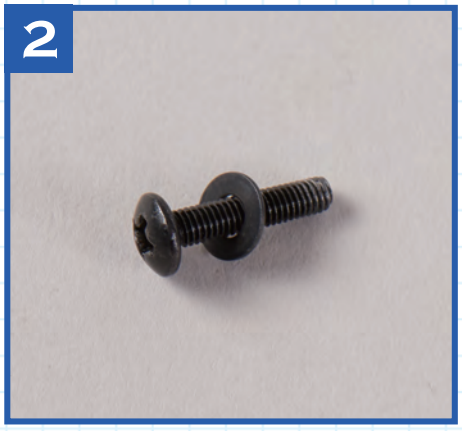
1: Laser-cut part A
2: Laser-cut part B
3: Laser-cut part C
4: Bearing (F685ZZ)
5: M3 truss head screws (12mm) x 4
6: M3 washers x 4
7: M3 nuts x 4

Parts to have ready

1

Get ready the large gear and drive roller that you assembled in Stage 50, and also the bearing and M5 washer supplied with Stage 50.

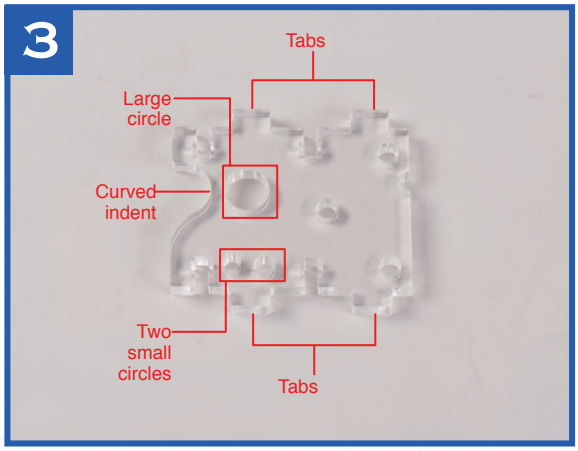
2



Put an M3 washer onto each of the 12mm M3 truss head screws supplied.

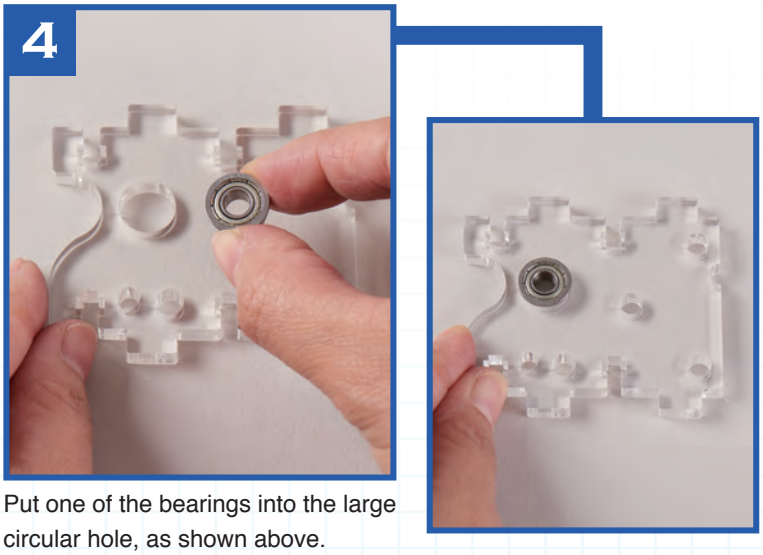
Assemble the large gear into laser-cut parts A and B

3



Position laser-cut part A as shown, with the curved indent on the left, and the large circular hole above the two small circular ones.

4



Put one of the bearings into the large circular hole, as shown above.

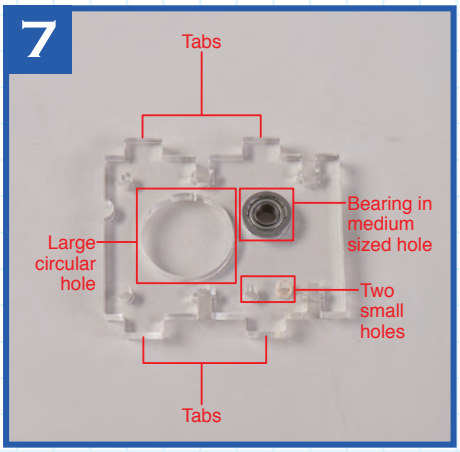
5

Plug the drive shaft, with the large gear and the drive roller mounted on it, into the bearing, so the drive roller is close to the bearing.

6

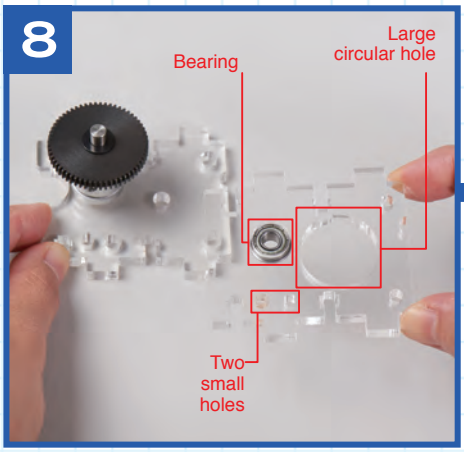
Put an M5 washer on the drive shaft.

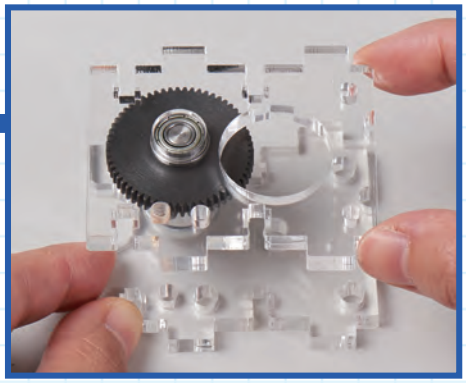
7



Position laser-cut part B as shown, with the large circular hole on the left and the medium-sized circular hole on the right, above the two small holes. Fit the other bearing in the medium-sized circular hole.

8

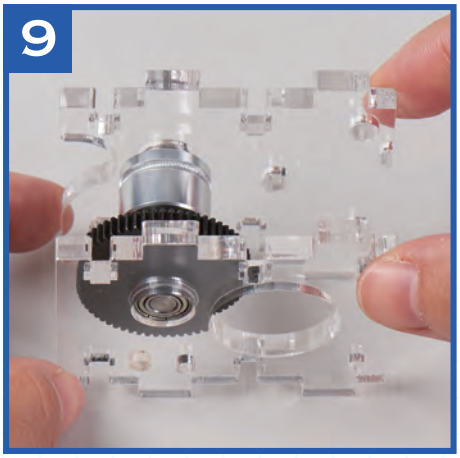




Turn the laser-cut part B over, so that the large circular hole is on the right. Put the drive shaft on part A through the bearing, so that part A is sitting on top of part B.

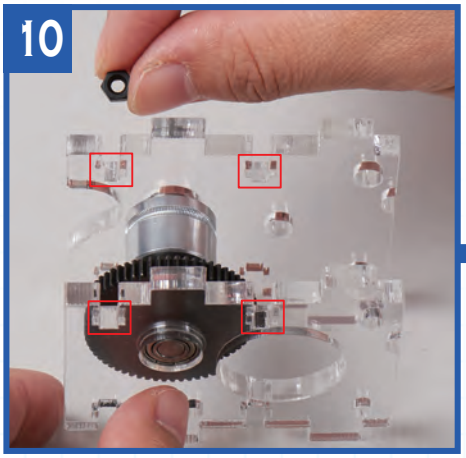
Add laser-cut part C to complete the U-shaped assembly

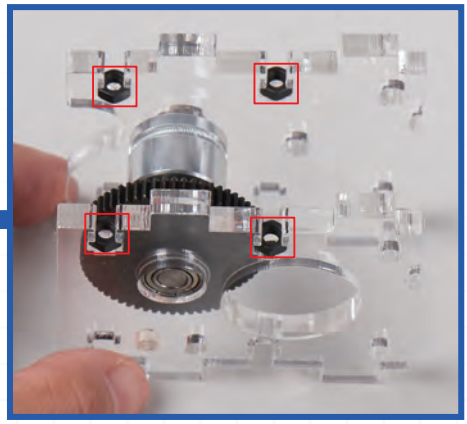
9



Turn the assembly so that the large hole is facing you, on the right.

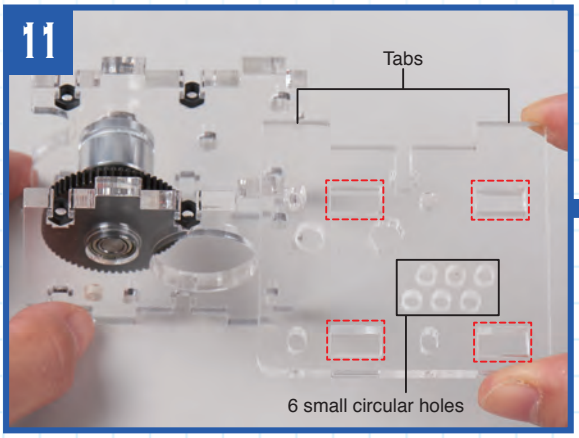
10

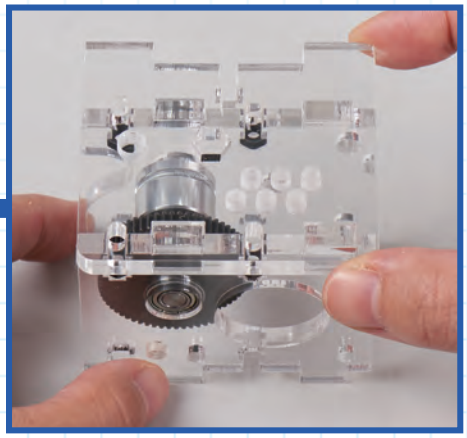




Put an M3 nut into each of the slots shown outlined in red, above.

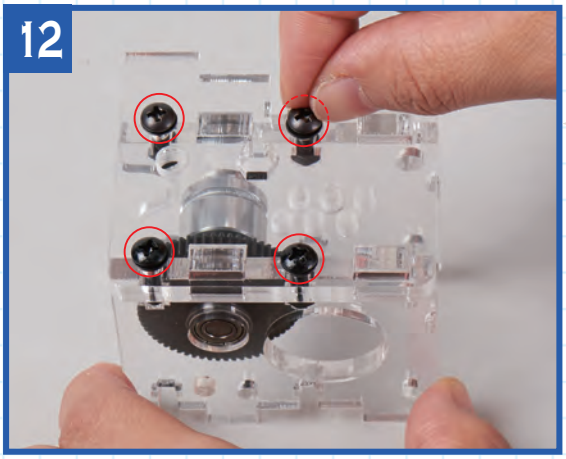
11





Hold laser-cut part C as shown, so that the two tabs are at the top and the six small circular holes are towards the bottom right. Insert the four tabs on laser-cut parts A and B into the slots outlined in red, above left, in laser-cut part C.

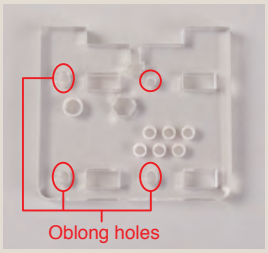
12



Put washers over the shafts of each of the four 12mm M3 truss head screws. Then, insert the screws into the nuts (inserted in Step 10, above) and finger-tighten them.

HINT

To allow for adjustment when the screws are fully tightened, three of the four holes are oblong. One is circular.

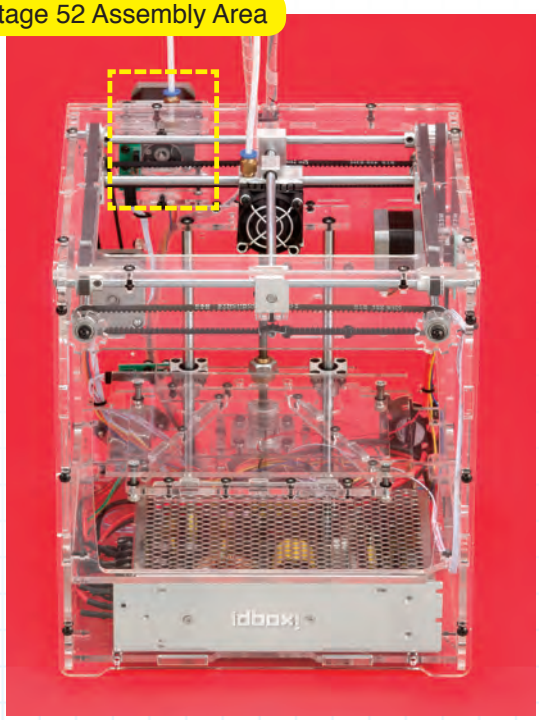


Stage finished

The drive shaft, with its large gear and drive roller, has been assembled into the U-shaped mounting part of the extruder.

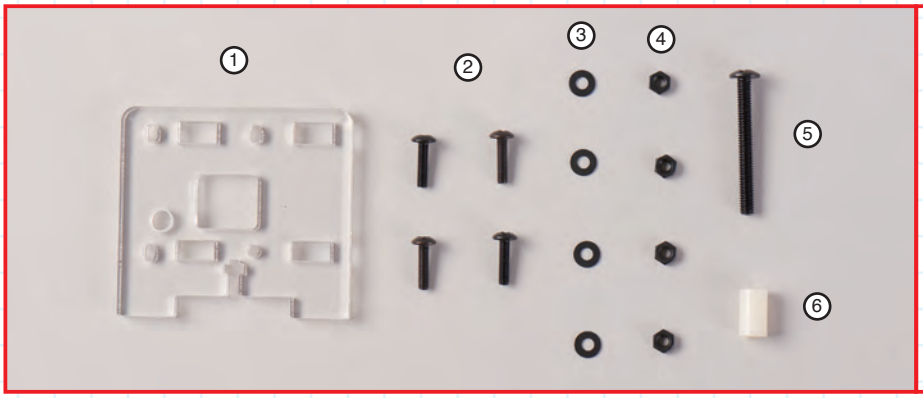
Stage 52: Put together the extruder arm and drive assembly

Stage 52 Assembly Area



In this stage, you will add laser-cut part D, which makes up the fourth side of the drive unit, and attach the extruder arm to the unit using an M4 screw.

After inserting the four M3 nuts into the sides of the U-shaped drive unit, add laser-cut part D to the existing assembly and then finger-tighten the M3 screws into the nuts to hold it in place. Now, add the arm to the drive unit, securing it with a 35mm M4 truss head screw. This passes through a hole in the side of the drive unit, then through a hole in the arm and then through a spacer. Tighten the 35mm M4 screw enough to hold the arm in position but not enough to restrict the arm's movements.



Stage 52 Components

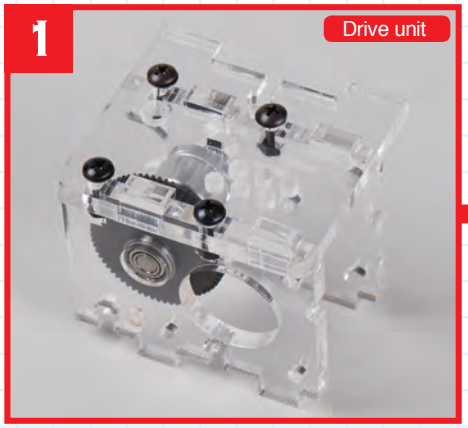
1: Laser-cut part D
2: M3 truss head screws (12mm) x 4
3: M3 washers x 4
4: M3 nuts x 4
5: M4 truss head screw (35mm)
6: M4 spacer (12mm)

Tools you will need

Phillips screwdriver size 1
Tweezers or pliers

Parts to have ready

1

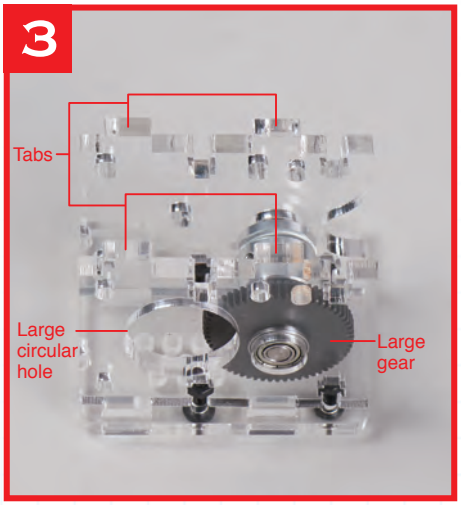


Get ready the drive unit that you assembled in Stage 51 and the extruder arm you put together in Stage 49.

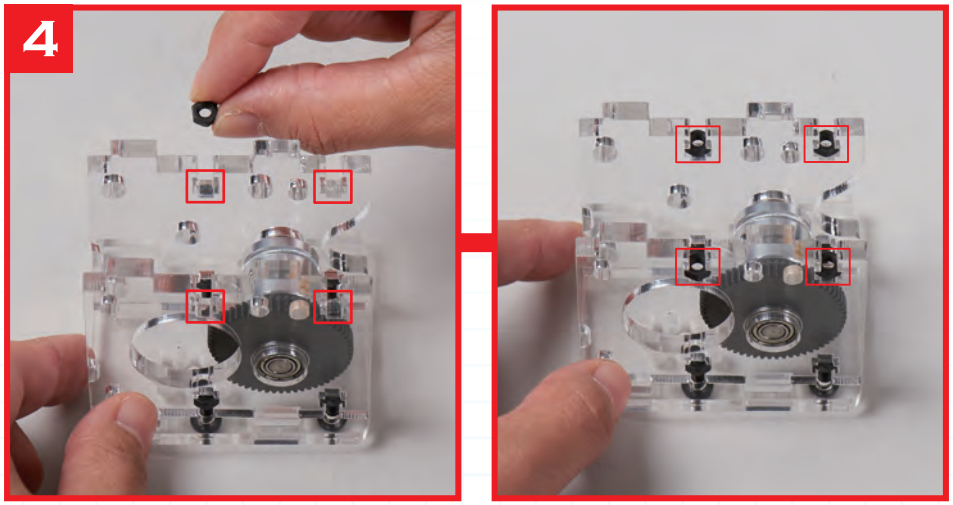
2

Put an M3 washer on each of the four 12mm M3 truss head screws supplied with this stage.

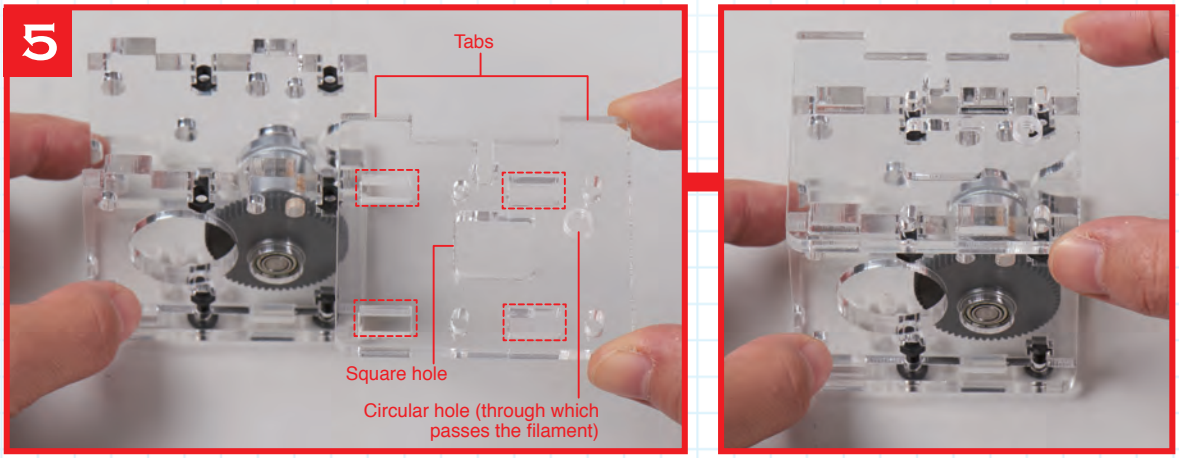
Add laser-cut part D to the drive assembly



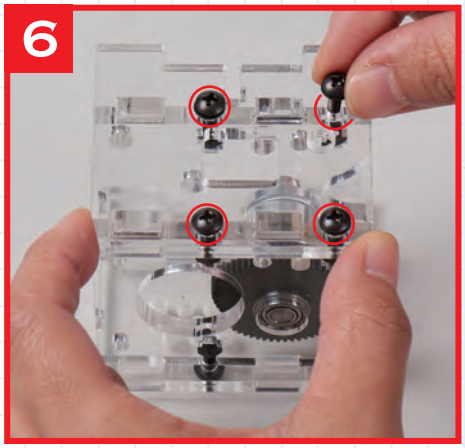
Position the drive assembly so the large circular hole is at the front left and the large gear is at the front right.



Insert an M3 nut into each of the slots shown outlined in red, above.



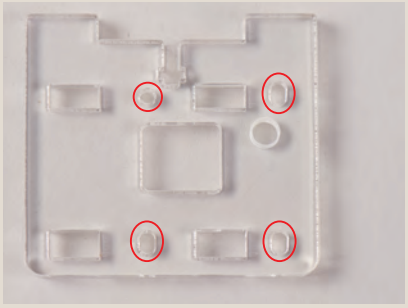
Hold the laser-cut part D as shown, with its tabs at the top. The square hole should be central and the circular hole to the right. Insert the tabs on laser-cut parts A and B into the slots (outlined in red in the image, above left) in laser-cut part D.



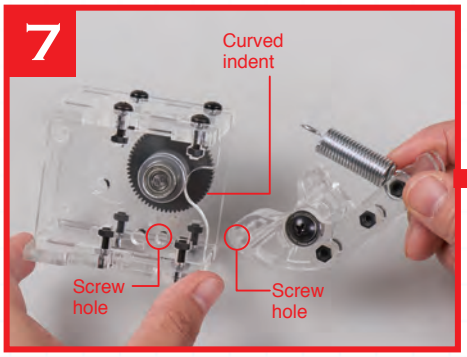
Insert the screws with washers through the screw holes (ringed in red, above). They will fit into the nuts you added in Step 4. Finger-tighten them.

HINT

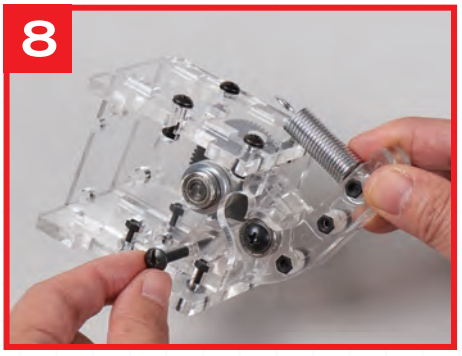
Three of the screw holes in laser-cut part D are oblong, and the one at the top left is circular. This allows you to adjust the position of the part when the screws are fully tightened.



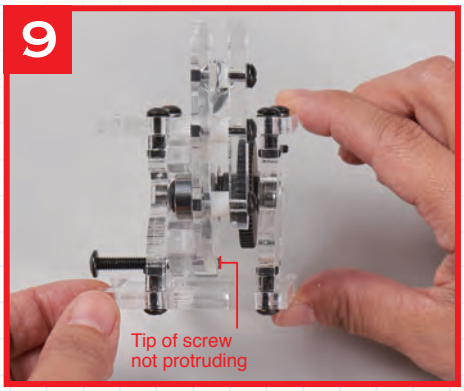
Add the arm to the drive unit



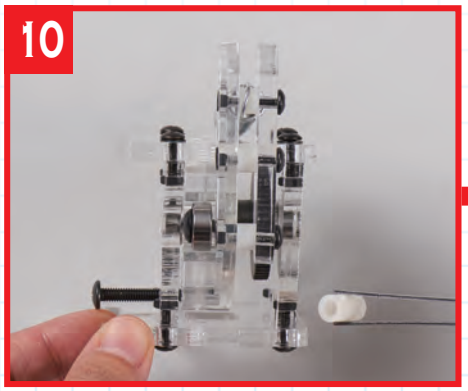
Hold the drive unit, so the curved indent is at the front right. Move the lower end of the extruder arm into the drive unit and align the screw holes (ringed in red, above) in the arm and in the drive unit, as shown.

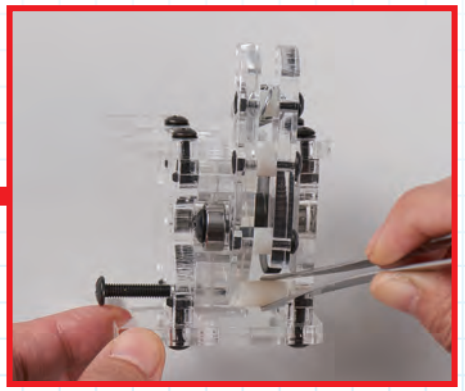


Insert the 35mm M4 truss head screw about halfway into the aligned screw holes.



Turn the drive unit so the arm is facing you and check that the 35mm M4 truss head screw does not poke out of the hole in the arm. If it does, pull it back.





Pick up the 12mm M4 spacer with tweezers and position it as shown above, so that one of its ends aligns with the screw hole in the arm.

Holding the spacer in position, push the 35mm M4 truss head screw in, so it enters the spacer.

Move the assembly so the M4 screw is uppermost, then tighten the screw into the threaded hole in laser-cut part B.

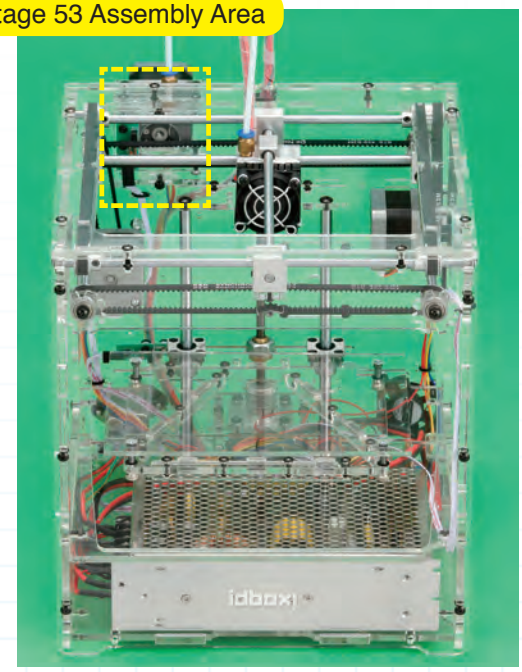
POINT

Do not over-tighten the screw as this might prevent the extruder arm moving freely.

The arm has been added to the drive unit for the extruder.

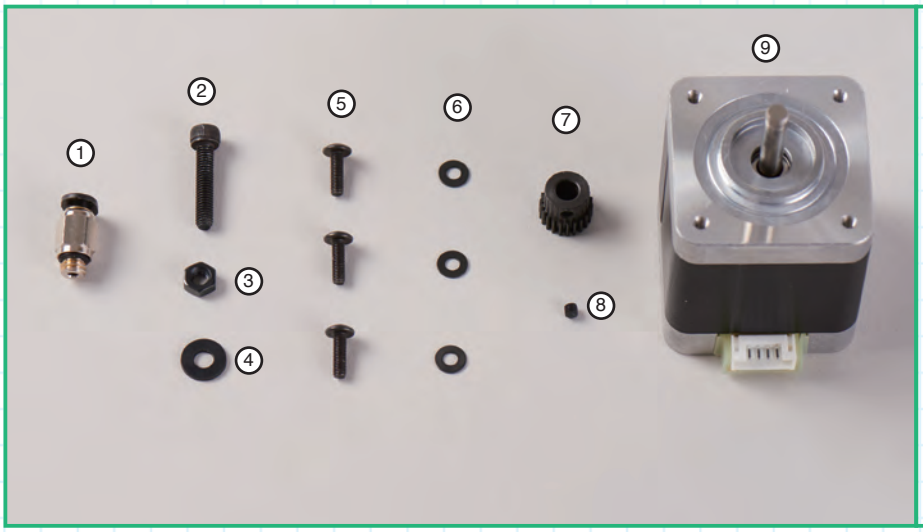
Stage 53: Finishing off the extruder assembly

Stage 53 Assembly Area



In this stage, you add the cap bolt and tube fitting to the drive unit, then add the small gear to the extruder motor's drive shaft. Next, you attach the motor to the drive unit, setting the correct gap between the small and large gears.

The extruder is designed to deliver filament smoothly to the print head. To make this possible, the parts must be accurately set up. Because of this there are a number of adjustments to be made this time. Of particular importance is getting the distance set correctly between the two gears: the small gear, which you add to the shaft of the extruder motor in this stage, and the large gear, which you have already assembled into the drive unit in previous stages.



Stage 53 Components

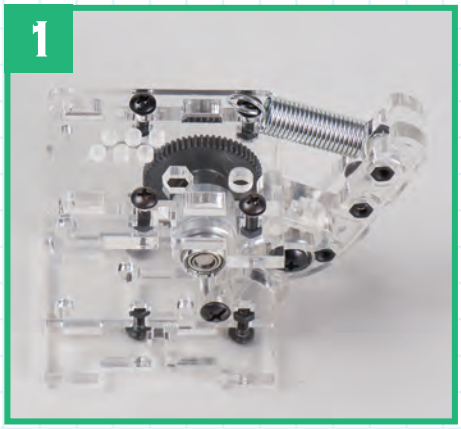
1: Tube fitting
2: M4 cap head bolt (20mm)
3: M4 nut
4: M4 washer
5: M3 truss head screws (10mm) x 3
6: M3 washers x 3
7: Small gear (P0.5-22)
8: M3 set screw (3mm)
9: Extruder motor

Tools you will need

Phillips screwdriver size 1
Allen key (1.5mm) supplied with Stage 30
Tweezers
Thin paper, such as copy paper

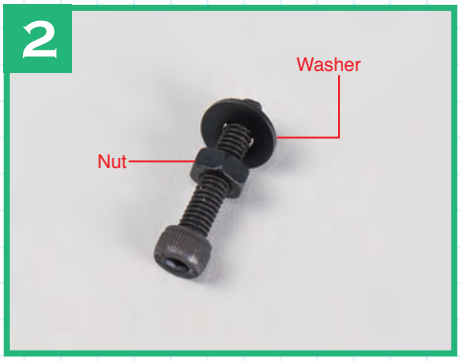
Parts to have ready

1



Get ready the drive unit assembly that you last worked on in Stage 52.

2

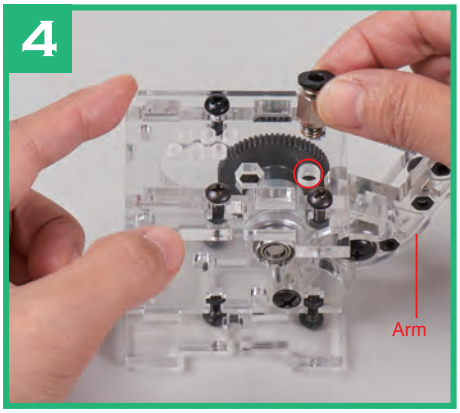


Screw the M4 nut about halfway down the shaft of the M4 cap head bolt and then put the washer on the bolt.

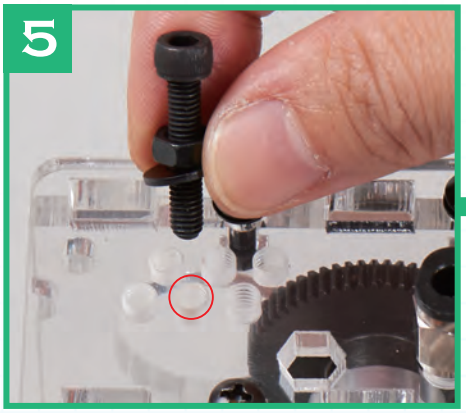
3

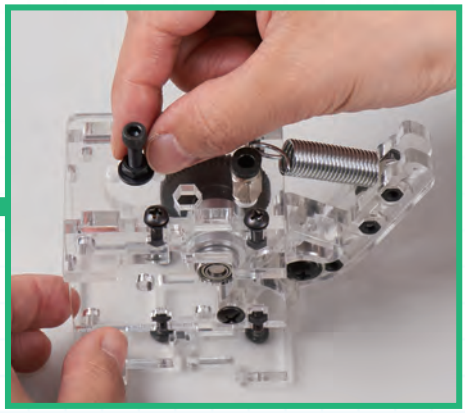
Put an M3 washer on each of the three 10mm M3 truss head screws that are supplied with this stage.

Add the tube fitting and cap bolt to the drive unit

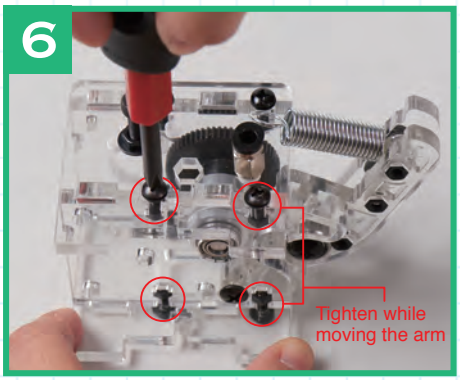


Position the drive unit so the arm is on the right and screw the tube fitting into the threaded hole (ringed in red, above) in the uppermost plate in the drive unit.





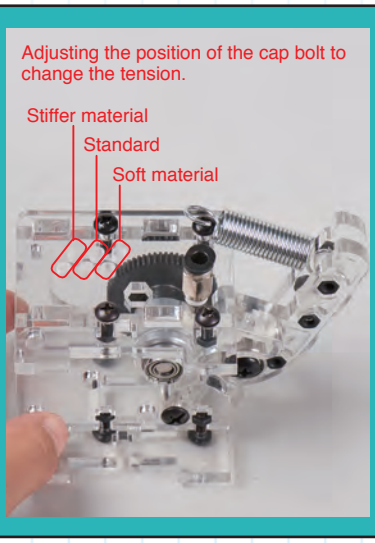
Screw the 20mm M4 cap head bolt into the centre front threaded screw hole (shown ringed in red above) of the six closely spaced screw holes on the top of the upper plate of the drive unit. Turn the screw until the tip of the screw is level with the underneath of the plate and then lock it in position by tightening the nut with your fingers.



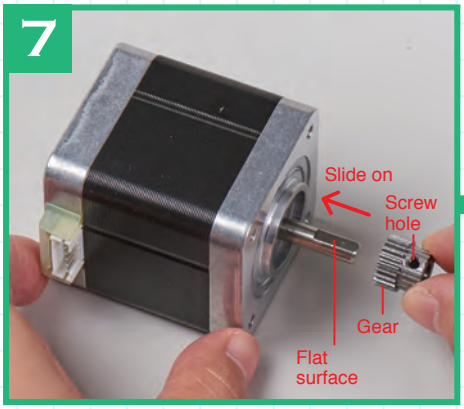
Tighten the truss head screws shown ringed in red above. Tighten the two on the right while moving the arm of the extruder, to be sure that the nuts are clear of the arm and that the arm moves freely.

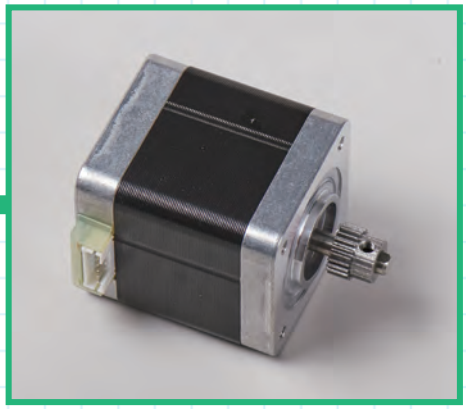
Match the tension and material

To make sure the filament is extruded evenly, the filament is pressed against the drive roller by the arm, which is pulled towards the roller by the tension spring. By changing the position of the cap bolt, to which one end of the spring is attached, you can change the tension in the spring and thus how hard the arm presses the filament onto the drive roller. Softer filament materials, for instance, need less tension (the cap bolt is screwed in closer to the arm) and stiffer materials need more tension (the cap bolt is screwed in further from the arm). The photo right shows the three holes into which the cap bolt can be fitted, depending on the material used.



Add the extruder motor to the drive unit

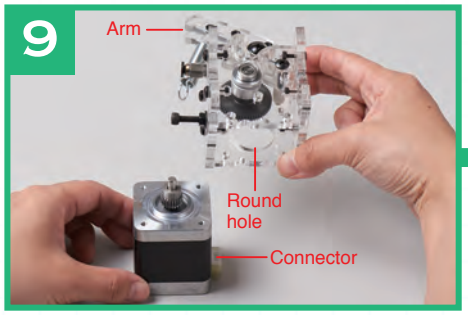


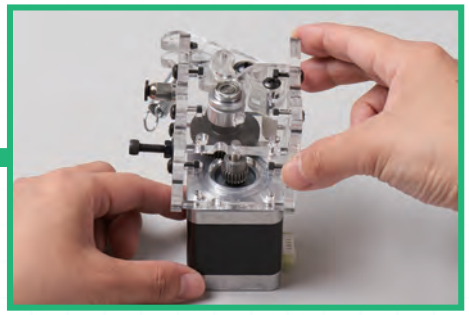


Align the flat surface of the motor's drive shaft with the screw hole in the small gear and slide the gear onto the shaft as shown.

Insert the 3mm set screw into the screw hole in the small gear and tighten it with the 1.5mm Allen key, just enough so that the gear does not fall off the shaft.

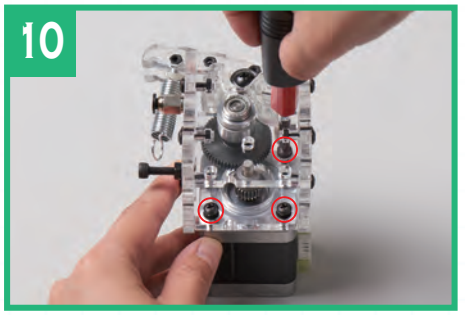
9





Place the motor so its shaft is uppermost and its connector on the right. Hold the drive unit with its arm at the back and cap screw on the left, and lower the large circular hole over the small gear of the motor, fitting it over the ring shape on the motor.

10

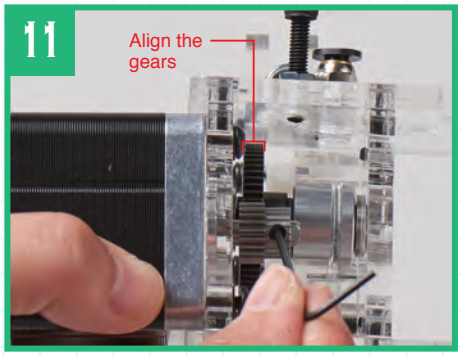


Screw the three 10mm M3 truss head screws (with washers) through the holes in the drive unit (ringed in red, above) and into the screw holes in the motor. Insert the screwdriver through the holes in the upper plate to gain access to the screws.

HINT

Use tweezers to get the screws into the holes in the drive unit before loosely tightening them with the screwdriver, which you can poke through the holes directly above the screw heads.

11

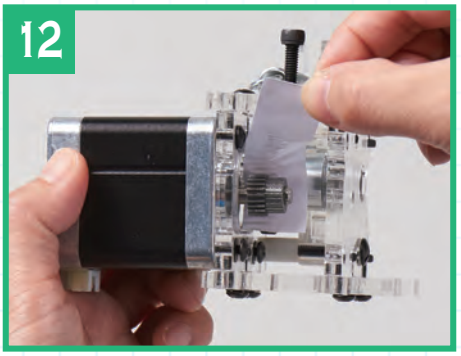


Hold the motor as shown so its connector is at the front and move the small gear along the shaft to align it with the large gear. Tighten the set screw when the gears align.

POINT

Make sure the set screw tightens onto the flat surface of the motor shaft.

12

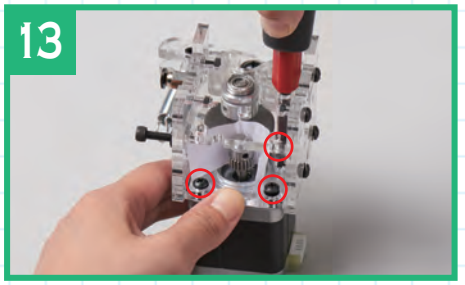


Cut a strip of thin paper to between 1.5 and 2cm in width. Sandwich the paper between the small and large gears by feeding it between the gears and rotating the gears with a finger.

HINT

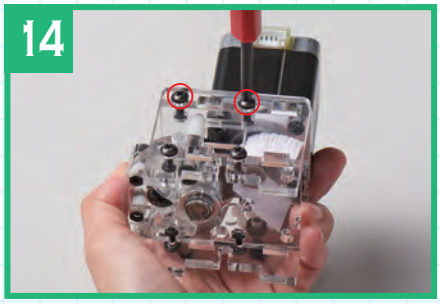
Push on the motor from the back and the drive unit from the front using moderate force while tightening the screws.

13



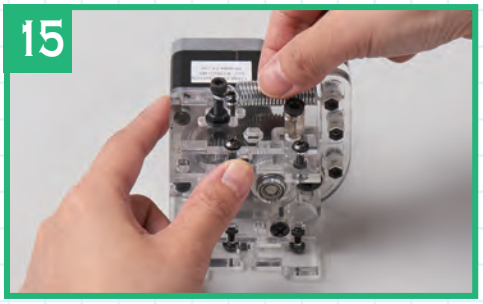
Place the motor on your work surface and, while pushing the gears together, fully tighten the three screws ringed in red.

14



Hold the motor and drive unit as shown above and fully tighten the two screws shown ringed in red, above. When these two screws are fully tightened, pull the paper out from between the gears. The paper is used to set the gap between the teeth of the two gears accurately, so ensuring smooth running.

15



Hook the end of the tension spring over the cap bolt. A bit of pressure might be required.

POINT

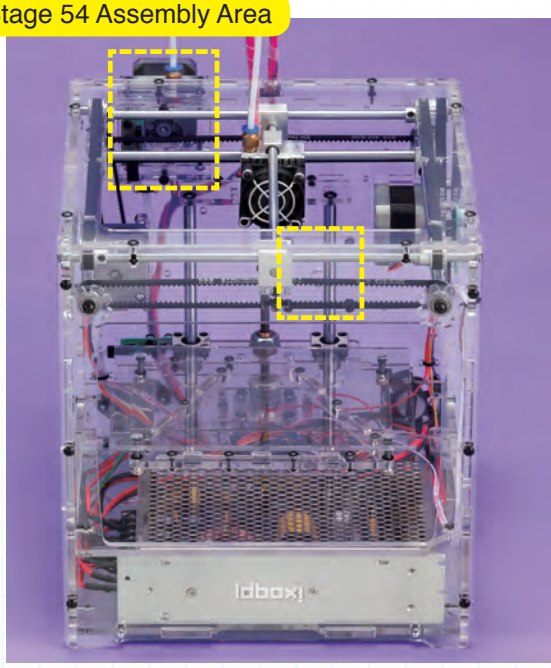
Align the tension spring so its sides are parallel with the top panel of the drive unit.

Stage finished

The drive motor has been added to the drive unit and the extruder is now completed.

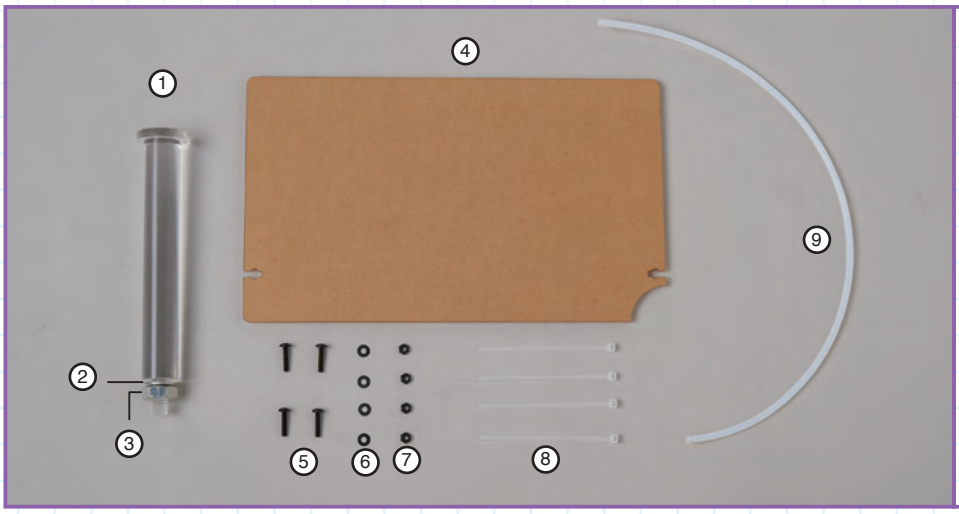
Stage 54: Attach the extruder and the spool holder to the housing

Stage 54 Assembly Area



In this penultimate stage, you attach the extruder assembly (which you finished in Stage 53) and the spool holder to the rear of the housing.

After you have added the extruder assembly, which is secured to the rear panel of the idbox with two screws and nuts, you plug the motor cable into the socket on the extruder motor. You then add the spool holder, which is held in place with a large M10 nut. The spool holder holds the spool of filament that the idbox uses for printing out your models.



Stage 54 Components

1: Spool holder
2: M10 washer
3: M10 nut
4: Bottom cover panel/front
5: M3 truss head screws (14mm) x 4
6: M3 washers x 4
7: M3 nuts x 4
8: Ties x 4
9: Filament guide tube

Tools you will need

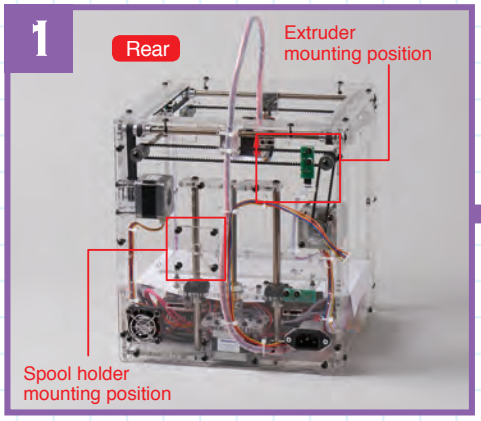
Phillips screwdriver size 1
Spanner supplied with Stage 9
Grease supplied with Stage 47

Useful items

Adhesive tape (or PVA glue) to hold nuts in place

Parts to have ready

1



Get ready the housing and identify the mounting positions for the spool holder and extruder assembly, both of which are on the rear panel. You will also need the extruder assembly that you last worked on in Stage 53.

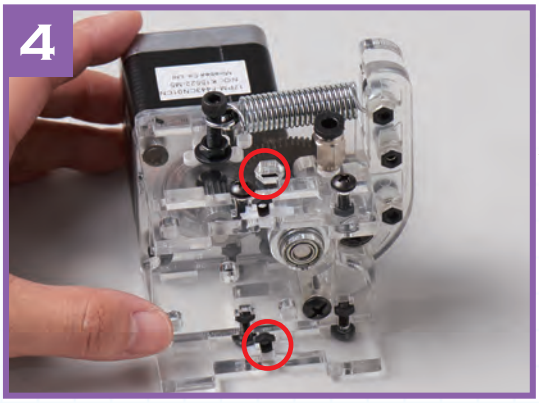
2

Remove the M10 nut and washer from the end of the spool holder and keep them handy.

3

Put an M3 washer on two of the 14mm M3 truss head screws.

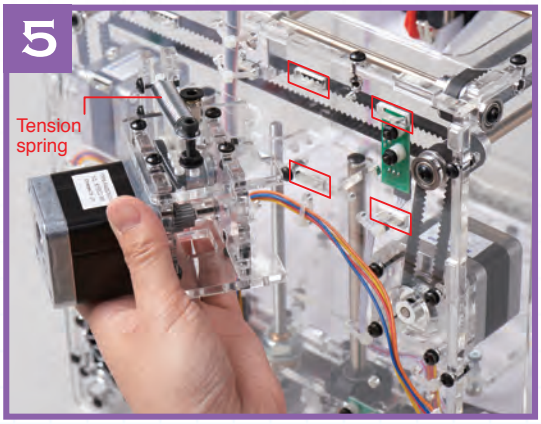
Attach the extruder to the back of the housing



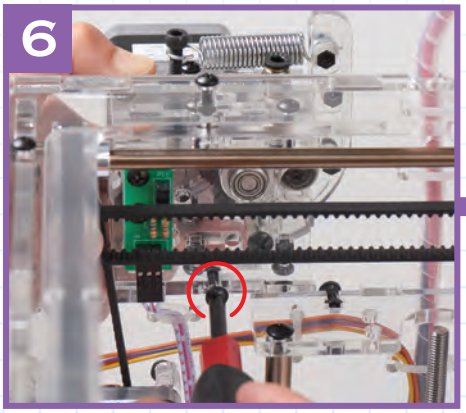
Put an M3 nut into each of the nut slots shown ringed in red, above. The nuts can be temporarily held in position (see HINT, right) to stop them falling out before they are screwed tight.

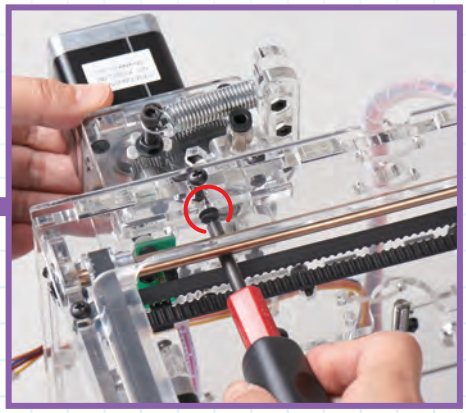
HINT

You can use adhesive tape or PVA glue to hold the nuts in position so they do not fall out before being tightened.

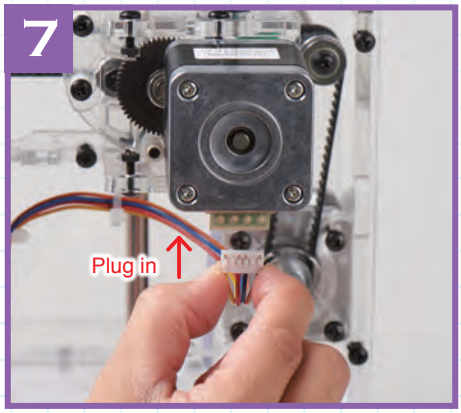


With the tension spring at the top of the extruder assembly, insert the tabs or projections on the assembly into the four slots shown outlined in red, above, on the rear of the housing.



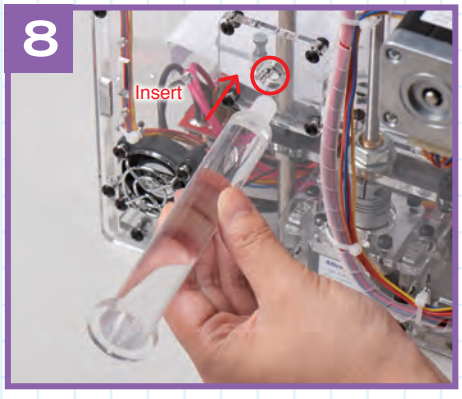


Hold the extruder assembly with one hand while you insert the screws through their holes in the rear casing (ringed in red, above), tightening the screws into the nuts. If you have temporarily secured the nuts with tape, remove the tape now.

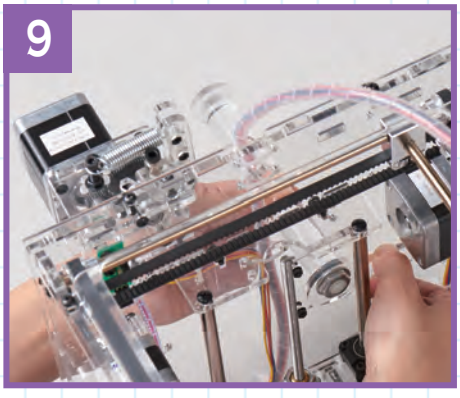


Plug the motor cable connector into the extruder motor's socket. Viewed from the rear, the yellow wire should be on the left.

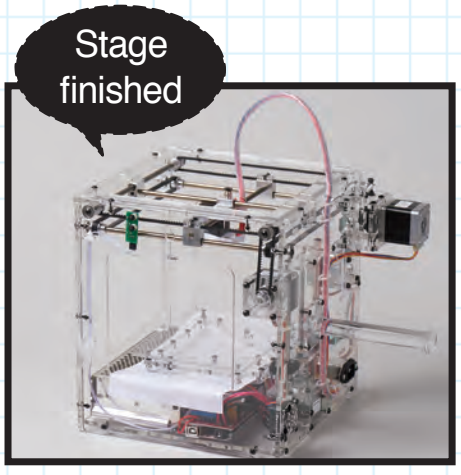
Add the spool holder to the back of the housing



Insert the threaded end of the spool holder through the hole (shown ringed in red, above) in the rear of the housing.



Hold the spool holder in position and put the M10 washer, then the M10 nut, on its threaded end. Then, gripping the spool holder tightly, use the acrylic spanner to tighten the M10 nut.

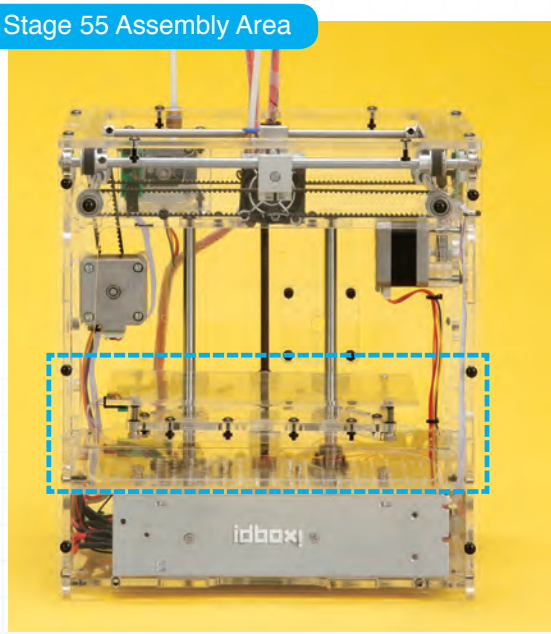


The extruder assembly and the spool holder have been attached to the rear panel of the housing. Keep the parts not used in this stage safe for use later.

Stage 55: Final steps for completion of your idbox

In this last stage, you attach two plates that protect the components in the bottom of the idbox's housing. With these simple additions, you reach the end of the assembly of your 3D printer. It is important, however, to get the order of operations correct (see below) regarding the assembly, setting up and calibration of the idbox.

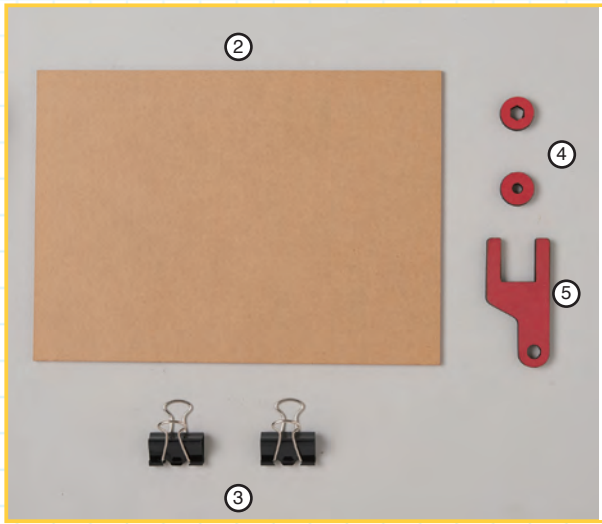
Stage 55 Assembly Area



Order of operations

Before you attempt to use your idbox, make sure you have performed the actions in the order set out here:

1. Follow Steps 1 and 2 on this page.
2. Follow all the instructions on pages 255-256 of User Guide 1 in Pack 10, and all the instructions on pages 283-292 of User Guide 2 in Pack 11. Be sure to read the Corrections on page 321 before you attempt to follow the instructions on pages 290-292 of User Guide 2.
3. Follow Steps 3 to 8 in this Assembly Guide stage.
4. When you are ready to try out the idbox, look at pages 311-315 of User Guide 3 in this pack.



NOTES ON COMPONENTS

The power cable is needed on page 257 of User Guide 1 in Pack 10.

The heater block wrench and nozzle nut tool are needed when you follow the instructions on page 290 of User Guide 2 in Pack 11. See also the Corrections on page 321 of this pack.

The modelling table and clips are needed when you set the height of the modelling surface in relation to the nozzle on pages 291-292 of User Guide 2 in Pack 11. See also the Corrections on page 321 of this pack.

Stage 55 Components

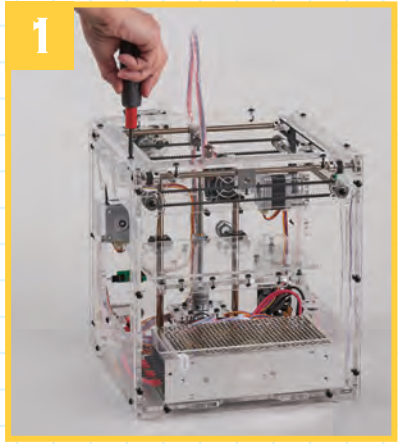
1: Power cable x 1 (not shown)
2: Modelling table x 1
3: Clips x 2
4: Nozzle nut tool (in two parts) x 1
5: Heater block wrench x 1

Tools you will need

Phillips screwdriver size 1
PVA adhesive

Preparations and parts to have ready

1



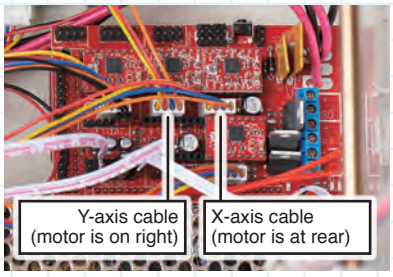
Prepare the housing. Check that all the screws (including the set screws), nuts and bolts are tightened properly. Remove any paper covering the nozzle and the table base.

2

Prepare the nozzle nut tool by sticking the two halves together with PVA adhesive as shown. The hexagonal socket on one side of the tool is used to tighten the printer nozzle. (See page 290 in Pack 11.)

Correction

In a photograph in Stage 43's Assembly Guide, the motor cables of the X- and Y-axes are shown plugged into each other's sockets. **The proper positions for the cables are shown below.** Instructions for fitting the cables correctly are given in Assembly Guide Stage 39.

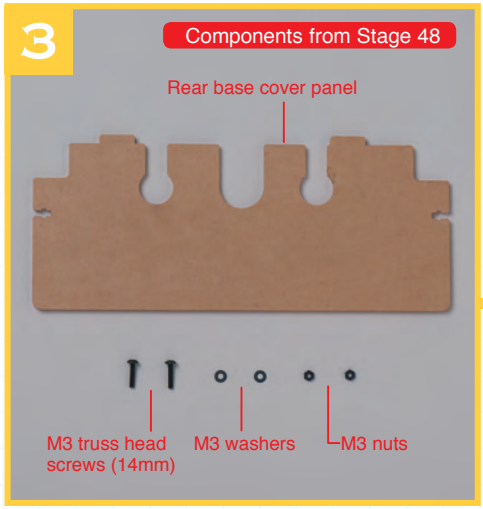


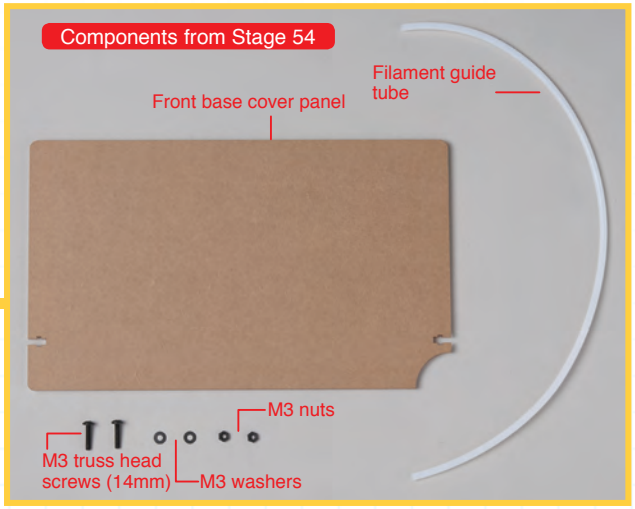
Attach the base covers

CAUTION!

Before you start the remaining steps in this Assembly Guide stage, make sure that you have followed all the Instructions in **User Guide 1** in Pack 10 and **User Guide 2** in Pack 11.

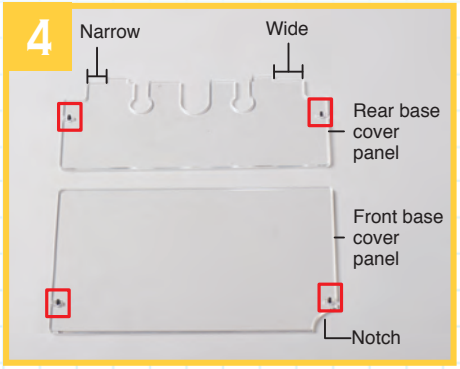
3





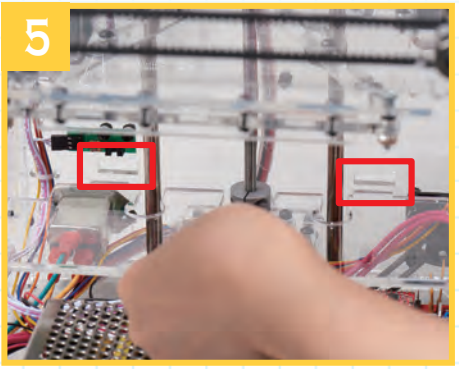
Make sure you have the components shown left, that were supplied with Stages 48 and 54. Peel the protective paper off the acrylic panels and put an M3 washer on each of the four M3 truss head screws. (The filament guide tube, supplied with Stage 54, will be needed when you test the extruder in User Guide 3 of this pack.)

4



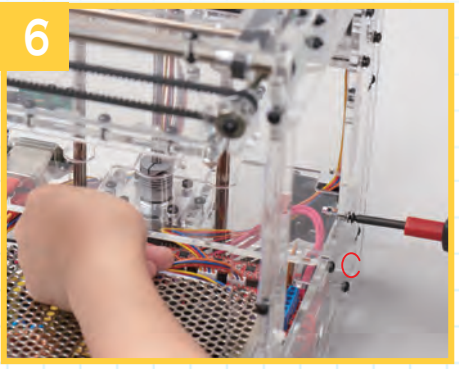
Put an M3 nut into each of the four nut slots, shown above, outlined in red. Secure the nuts in the slots with PVA glue or tape so they don't fall out. Position the rear base cover panel so the narrow section indicated above is on the left and the wider section is on the right.

5



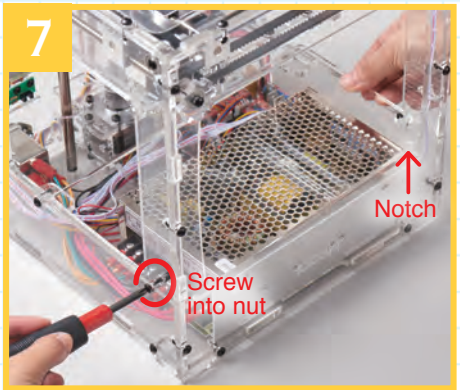
Insert the two tabs on the rear base cover panel into the slots shown outlined in red, above. Try not to touch the Z-axis rods or lead screw with the panel. If a nut falls, retrieve it, taking care not to damage the components in the base of the housing.

6



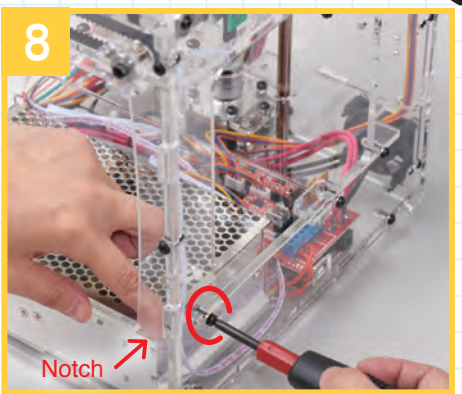
Insert the M3 truss head screws (with washers on) through the screw holes on the left and right of the housing and tighten them into the nuts in the panel with a screwdriver.

7



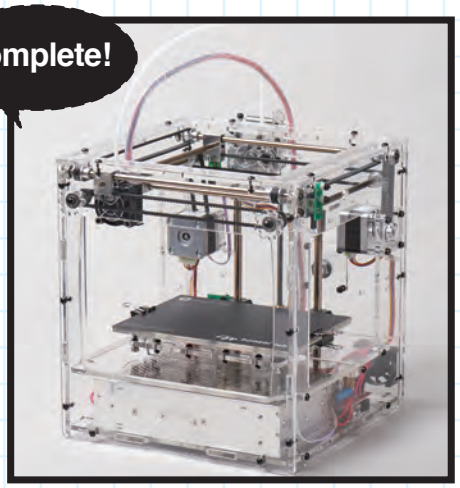
With the front of the idbox facing towards you, position the front base cover panel so the notch is on the right at the front. Insert the M3 truss head screw into the nut on the left (ringed in red) and tighten.

8



Put a finger in the notch and move the panel so that the nut and screw hole on the right (ringed in red, above) align. Then insert the M3 truss head screw and tighten it into the nut in the panel.

Complete!

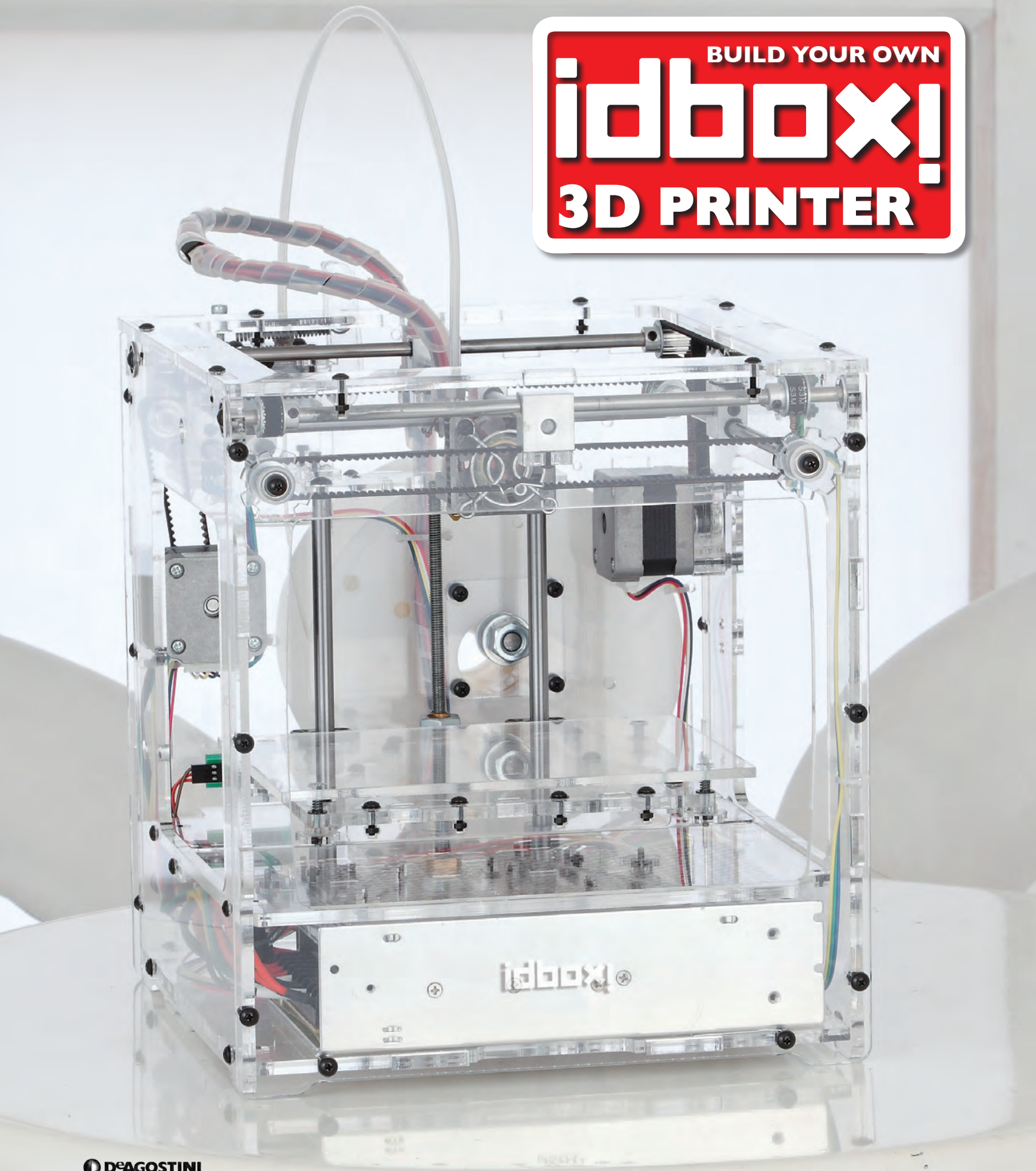


It's done! In the photo above, the filament guide tube and a sheet of BuildTak are shown. These are added when the idbox is being used – see page 313 of the User Guide 3 in this pack.

BUILD YOUR OWN

idbox!

3D PRINTER



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