BUILD YOUR OWN

# idbox! 3D PRINTER

## Pack 10

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Windows 7 & 8

Mac OS X

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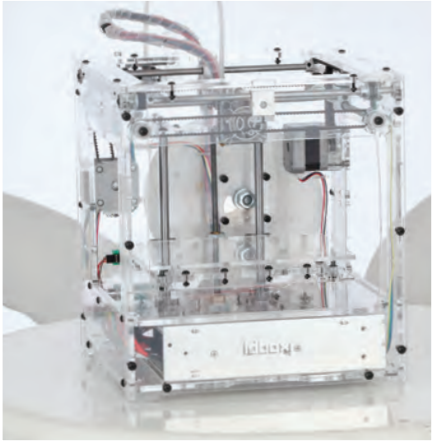
# idbox! 3D PRINTER



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### User Guide Section 1: Download, install and configure Repetier-Host for the idbox

In this new section of *Build Your Own 3D Printer*, you will find out how to download and install the software that you need to control the printer. You will also see how to set up the software so you can print out your 3D files successfully. Plus, how to connect the printer to your computer.

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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.



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# User Guide Section 1: Download, install and configure Repetier-Host for the idbox

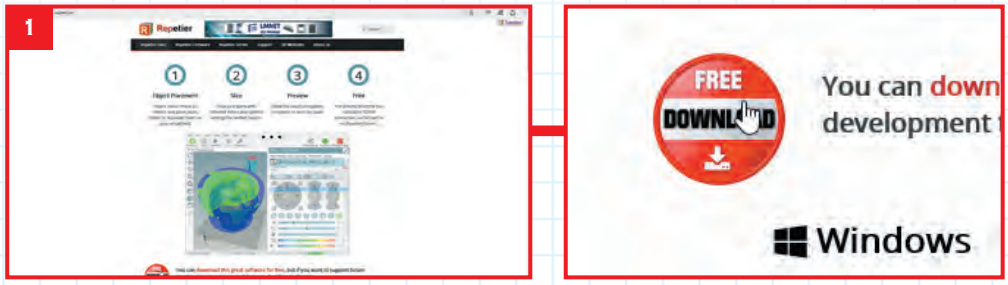
In this section, you will download **Repetier-Host** – the software that your computer uses to communicate with the idbox. You will then set up **Repetier** and its bundled 'slicing' software to work with your idbox.

**Repetier-Host** is a free-to-use piece of software that is employed around the world by people who print out files on a 3D printer – files created on, or downloaded to, their computers. It can be set up to work with a wide range of 3D printers and once set up – which does not take very long – will make printing out 3D designs easy. The set-up for the idbox is simple and straighforward, and after the first installation, it will not have to be done again.

Please check the specification of the PC you want to connect to the idbox to see if it is suitable. Below is the minimum specifications for the Operating System (OS):
Windows 7 or higher
MAC OS X or higher

With older PCs, you may run into problems, such as slicing taking a very long time or the computer crashing when large or complex objects are being printed.

## Preparing to download Repetier-Host




**1.** Go to the **Repetier** website (www.repetier.com) and click on the FREE DOWNLOAD link.

**2.** You'll be taken to a page where you are invited to make a donation to support the development of this free-to-use software. If you do not want to donate right now, scroll down the page and you will see a link that says 'Download without donation'.

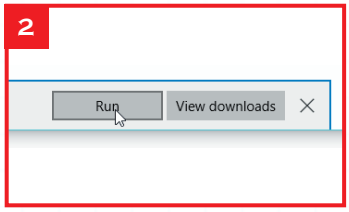
HINT

There is lots of useful information, including pages of Documentation, a Troubleshooting section, Tutorial pages and a Forum on the **Repetier** website.

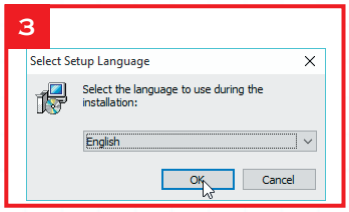
**3.** When you click on this, you will see the 'Download now' page, where you can chose the version of **Repetier-Host** for the operating system on your computer.

## Download and install on a Windows PC

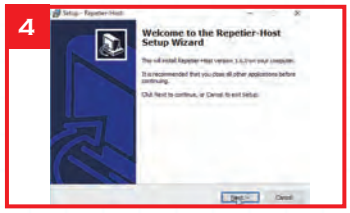
**1.** On the 'Download now' page, click on the link for the latest version of **Repetier-Host** for Windows.




**2.** When it has downloaded, click Run at the bottom of the page. Click Yes to allow the app to make changes to your PC.

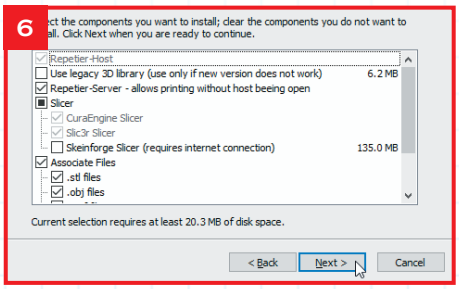



**3.** In the 'Select Setup Language' dialog that appears, choose English, and click on OK.

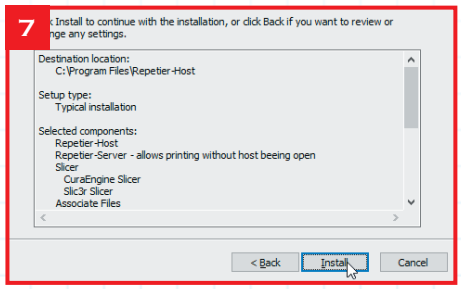



**4.** This takes you to the **Repetier-Host** Setup Wizard. Click Next to start it.

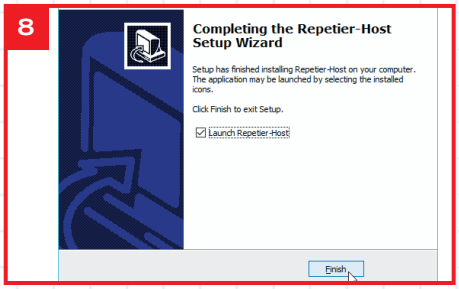
**5.** In the next dialog window, accept the License Agreement and click on Next. The 'Select Destination Location' dialog now appears: click Next on it.



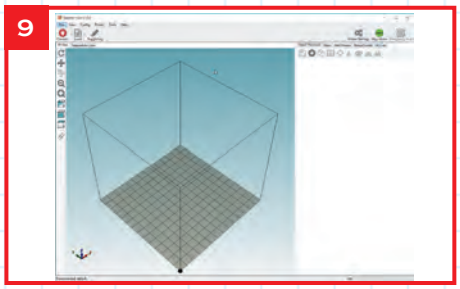

**6.** On the 'Select Components' dialog (above) – uncheck the option to install Repetier-Server, then click Next. Click Next on the Select Start Menu Folder.




Click Next on the 'Select Additional Tasks' dialog. On the 'Ready To Install' dialog (above) click on Install. Files will then be installed on your computer.



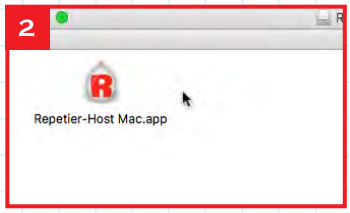

**8.** On the Completing the **Repetier-Host** Setup Wizard dialog, click on Finish.



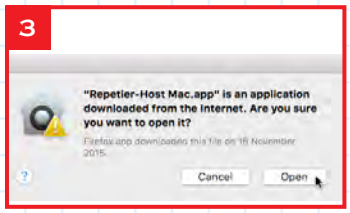

**9.** The program will launch, showing a window like the one above.

## Download and install on a Mac

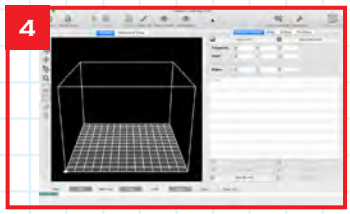
**1.** On the 'Download now' page, click on the link for the latest version of **Repetier-Host** for Mac. It will download into your Downloads folder. When the download has finished, find the file in your Downloads folder and double-click on it.




**2.** A window opens on the desktop with the **Repetier-Host** Mac.app icon in it. In the Finder, open the Applications folder via the Go menu. Drag the icon into this folder. When it has copied, double-click its icon in the Applications folder.




**3.** If the program does not open, right click (or ctrl click) on its icon in the Applications folder and select Open from the menu of options that appears. In the dialog box that then appears (above), select Open.




**4.** The program will launch, showing a screen similar to the one shown here.

From this point on, the User Guide instructions assume that you have finished construction of the idbox. Do **not** proceed if you have not finished the idbox.

## Connecting the idbox to your computer and connecting the power cable

Before you configure **Repetier-Host** to work with your idbox, you have to connect the idbox to your computer using the USB cable. Before you plug in the mains cable to the idbox, there are a couple of things that have to be done, so do not plug in until you have done these.

## Connecting the idbox to your computer

It's now time to connect the idbox to your computer using the USB cable. If you are using a computer running Windows, you have to download and install a driver – software that connects a PC to external devices, such as printers like the idbox. Mac computers come with the driver pre-installed.

Connect the PC and the idbox using the included USB cable. (Do not plug in the power cable of the idbox at this point.) Insert the smaller USB B-type connector into the socket on the right side of the idbox and the larger USB A-type connector into a USB port on the PC.

The idbox does not have a power switch, so connecting the USB cable will automatically turn on the idbox's circuit board. The circuit board takes its power from the PC via the USB cable and does not require power from the power plug, which supplies power to the motors, heater, etc.

The circuit board should be automatically recognised after plugging in the USB cable. If an error occurs, please recheck the USB connection, reinstall the driver (if you are using a PC running Windows) and restart your PC.

### Installing the driver software (Windows only)

If connecting a Windows PC to the idbox, download Arduino IDE version 1.0.6 from the website: https://www.arduino.cc/en/Main/OldSoftwareReleases#previous Click on the Windows Installer link and follow the instructions to install the driver. If even after installing Arduino 1.0.6, you have trouble connecting the PC to the idbox, download and install Arduino IDE version 1.0.5 (available on the same web page). Version 1.0.6 (or 1.0.5) are the recommended versions. Any other versions of the Arduino driver should be used at the user's discretion.

CAUTION! Do not plug in the power cable at this point. Please wait until after you have followed the instructions set out under the heading 'Connecting the power cable', below.

## Connecting the power cable

Do not plug in the power cable until after performing the two procedures described below. Only plug it in when specifically instructed to do so. When you plug the power cable into the idbox, this sends power to the various motors and the heater.

### Before you plug in the power cable

**1.** Check that there is at least 5mm of space between the nozzle and the table (the table and nozzle may be farther apart depending on the assembly). If the gap is too small, turn the cup ring on the Z-axis (the silver cylinder) anticlockwise to lower the table. If the power cable is already connected, the table will not be movable by hand. Unplug the power cable, and then operate the table by hand.

**2.** Move the head by hand toward the centre of the table. When moving the head by hand, hold it with both hands and move it carefully. As with the Z-axis before, it will be difficult to move by hand if the power cable is already plugged in. If the power cable is already plugged in, unplug the power cable and then operate the head by hand.

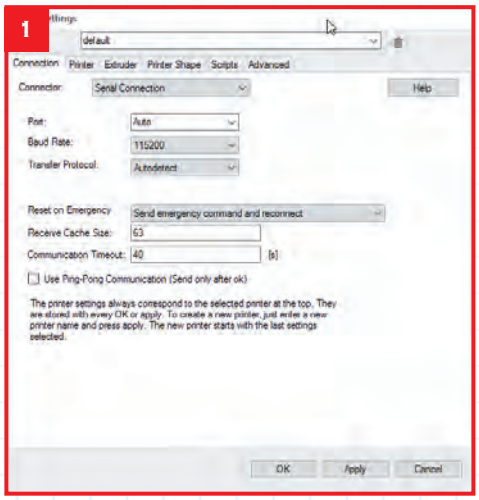
After you have performed the procedures described in the box 'Before you plug in the power cable' shown left, you may now plug one end of the power cable into the back side of the idbox and the other end into a power outlet. (If using an extension cable with switched sockets, plug the extension cable into a power outlet and switch on the socket.) When you turn on the power, the head fan should activate and there should be no sudden movements of the table or the head.

CAUTION! If there are errors in the assembly or configuration, there is a chance that the idbox might suddenly begin moving when the power cable is connected. If the idbox suddenly starts moving after inserting the power cable, immediately remove the power cable. The use of an extension socket with an on/off switch is recommended.

## Configuring Repetier-Host to work with the idbox

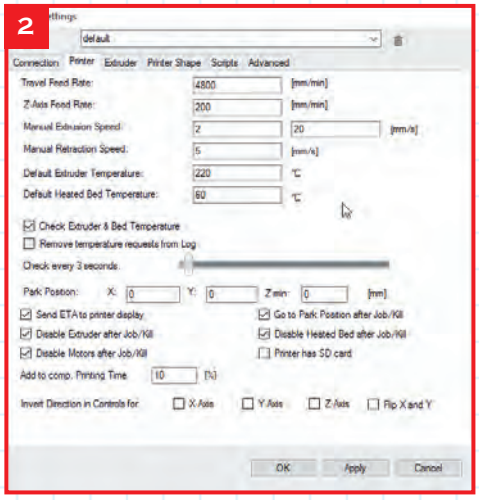
Before you can use **Repetier-Host** to control the output from your idbox, you have to configure the program so it knows how to communicate with the idbox. It needs to know the idbox's bed size, the range of the movements its printer head can do and the temperature settings for the nozzle. These settings only need to be entered once. The way to set up Repetier to work with your computer is shown below, first for a Windows computer and then for a Mac. After this, you check that the computer and idbox are connected properly.

## Configure Repetier-Host for a Windows computer



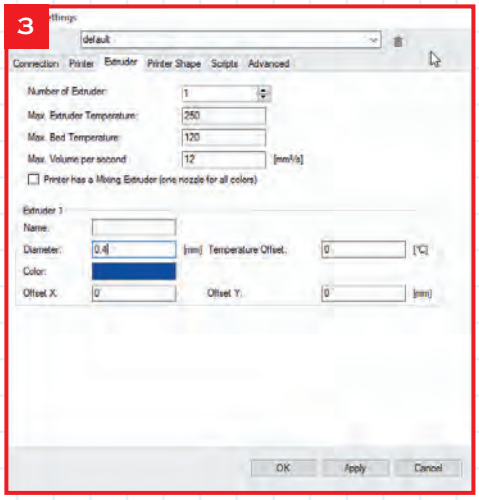

**1.** Click the Printer Settings button on the top right of the window. Once the Printer Settings window is open, click the Connection tab and enter the values as shown in the image on the left and in the SETTINGS text on the right. This procedure should be performed with as few devices attached to the PC as possible. Depending on the precise configuration of your hardware and software, you might also see the setting for Reset on Connect. If so, set it to DTR low->high->low. The setting for Communication timeout can be left at the default value.

**SETTINGS**
**Connector:** Serial Connection
**Port:** Auto (If this does not work, test each of the other options in sequence)
**Baud Rate:** 115200
**Transfer Protocol:** Autodetect
**Reset on Emergency:** Send emergency command and reconnect
**Receive Cache Size:** 63




**2.** Now click the Printer tab and enter the values shown in the image on the left and in the SETTINGS text on the right. The values here are the recommended values for the idbox when printing using PLA. 'Default Extruder Temperature' should be set to 220°C, and 'Default Heated Bed Temperature' should be set to 60°C. The actual temperatures for printing will be determined by the printing temperature upon the start of printing. Even though the idbox does not have a heated bed, you can set the 'Default Heated Bed Temperature' here anyway.

**SETTINGS**
**Travel Feed Rate:** 4800 [mm/min]
**Z-Axis Feed Rate:** 200 [mm/min]
**Manual Extrusion Speed:** 2, 20 [mm/s]
**Manual Retraction Speed:** 5 [mm/s]
**Default Extruder Temperature:** 220°C
**Default Heated Bed Temperature:** 60°C
**Park Position:** X:0 Y:0 Z:0
**Add to comp. printing time:** 10%
Other check boxes: (see image, left)

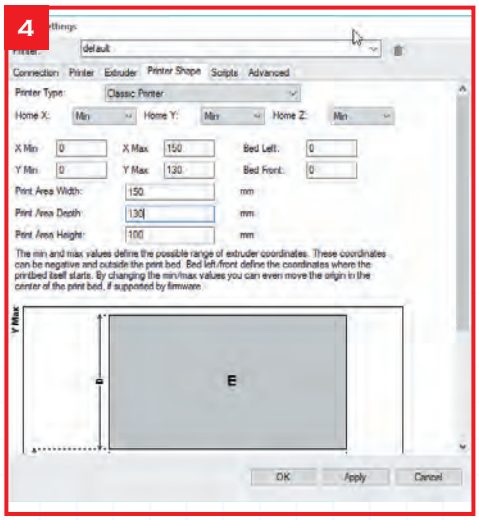



**3.** Next, you set the number of extruders and the nozzle size and so on. Click the Extruder tab. The idbox has a single extruder, so select 1. The diameter of the nozzle supplied with the idbox is 0.4mm, so enter that as the value by Diameter.

**SETTINGS**
**Number of Extruder:** 1
**Diameter:** 0.4

HINT

The printer settings that **Repetier-Host** uses are chosen by selecting a name entered for the Printer at the top of the Printer settings window. They are stored every time you click on OK or Apply. To create a new set of printer settings, enter a new printer name in 'Printer' and click Apply. The new settings will have whatever the current values are in the Printer Settings window. You can then change them if you want, and then click OK.




**4.** Click on the 'Printer Shape' tab to enter information about the volume of the space the idbox can print in. Where settings are not shown on the right, the default values can be used.

Once all values have been entered, click OK to save the settings and close the window. Clicking OK will save the settings under whatever name is entered at the top of the window by 'Printer'.

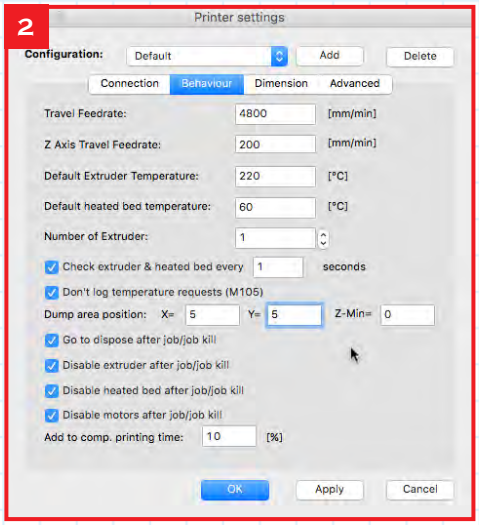
**SETTINGS**
**X Min:** 0 **X Max:** 150 **Bed Left:** 0
**Y Min:** 0 **Y Max:** 130 **Bed Front:** 0
**Print Area Width:** 150 mm
**Print Area Depth:** 130 mm
**Print Area Height:** 100mm

## Configure Repetier-Host for a Mac computer

**1.** Click on 'Printer settings' at the top right of the **Repetier-Host** window. Once the 'Printer settings' window is open, click the Connection tab and enter the values as shown in the image on the left and in the SETTINGS text on the right.

If multiple ports are available for selection in the Port dropdown menu, select any one for now. The values available may not contain the one shown in the image on the left, depending on the Mac being used.

**SETTINGS**
**Port:** usbmodem****
(**** will change depending on the Mac being used.)
**Baud rate:** 115200
**Stop Bits:** 1
**Parity:** None
**Transfer Protocol:** Autodetect
**Receive cache size:** 63

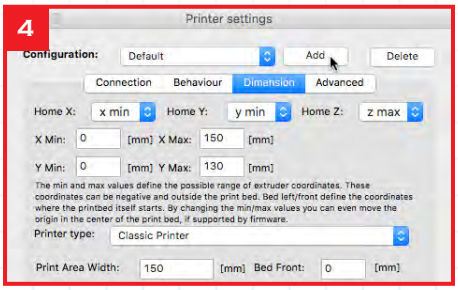



**2.** Click the Behaviour tab and enter the values as shown in the image on the left and in the SETTINGS text on the right. The values here are the recommended values for the idbox when printing using PLA. 'Default Extruder Temperature'– should be set to 220°C, and 'Default heated bed temperature' should be set to 60°C. The actual temperatures for printing will be determined by the printing temperature upon the start of printing. Even though the idbox does not have a heated bed, you can set the Default Heated Bed Temperature here anyway.

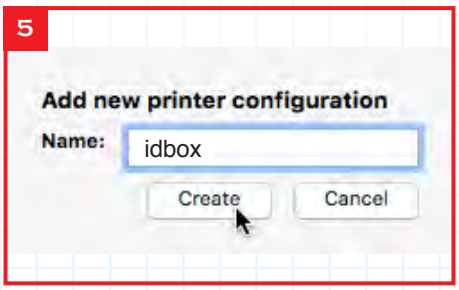
**SETTINGS**
**Travel Feedrate:** 4800 [mm/min]
**Z Axis Travel Feedrate:** 200 [mm/min]
**Default Extruder Temperature:** 220 °C
**Default heated bed temperature:** 60 °C
**Number of Extruder:** 1
**Check Extruder & Heated bed every** 1 seconds
**Dump area positon: X=** 5 **Y=** 5
**Z-min=** 0
**Add to comp. printing time:** 10%
Other check boxes: (see image, left)

**3.** SET THE PRINTABLE AREA
Now click on the Dimension tab to enter information about the volume of the space the idbox can print in. Use the values as shown in the image on the left and in the SETTINGS text on the right.

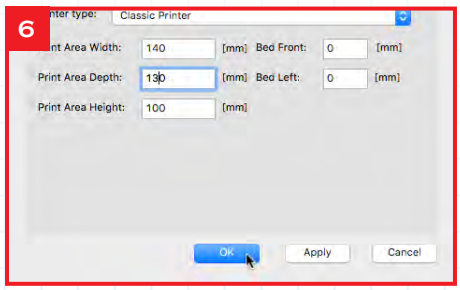
**SETTINGS**
**Home X:** x min
**Home Y:** y min
**Home Z:** z max
**X Min:** 0 [mm] **X Max:** 150 [mm]
**Y Min:** 0 [mm] **Y Max:** 130 [mm]
**Printer type:** Classic Printer
**Print Area Width:** 150 [mm]
**Bed Front:** 0 [mm]
**Print Area Depth:** 130 [mm]
**Bed Left:** 0 [mm]
**Print Area Height:** 100 [mm]




**4.** You now save the new settings and give them a new name. Click the Add button on the top row of the Printer Settings window.

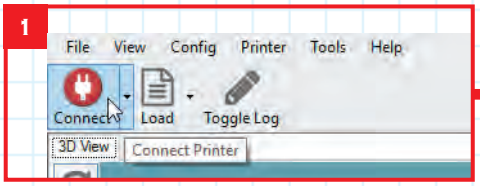


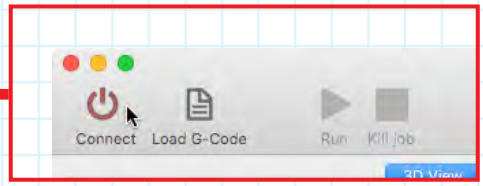

**5.** A dialog box appears. Enter a new name, such as idbox, and click Create.




**6.** Click the OK button at the bottom of the Printer Settings window.

## Check the connection between the computer and the idbox

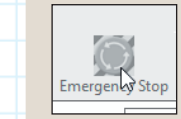


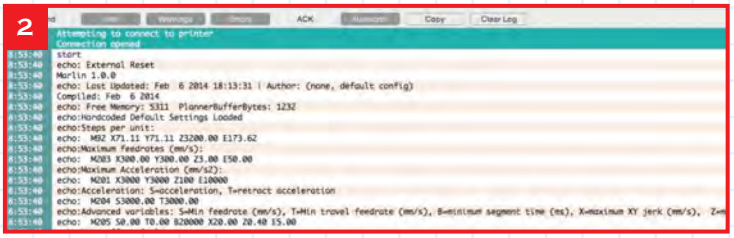




**1.** To check that the software on your computer is 'talking' to the idbox, click on the red Connect button at the top left of the screen. The Windows version is shown above left and the Mac version above right.

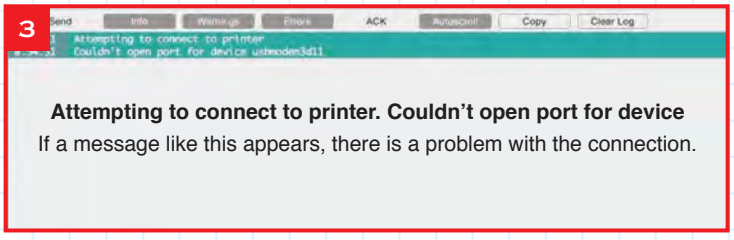
CAUTION!

If at any point from now on, the idbox goes out of control, press the Emergency Stop button (Windows version is shown, but Mac version is virtually identical) to immediately terminate all movement. If the idbox still does not stop, unplug the power cable.




**2. Attempting to connect to printer. Connection opened.**
If the connection is successful, a message similar to the one above should be visible in the log. The version shown is for Windows, but is similar on the Mac. If you can't see any message, click on Toggle Log (Windows) or Load G-Code (Mac). These are close by the Connect button at the top left of the screen (See above).




**Attempting to connect to printer. Couldn't open port for device**
If a message like this appears, there is a problem with the connection.

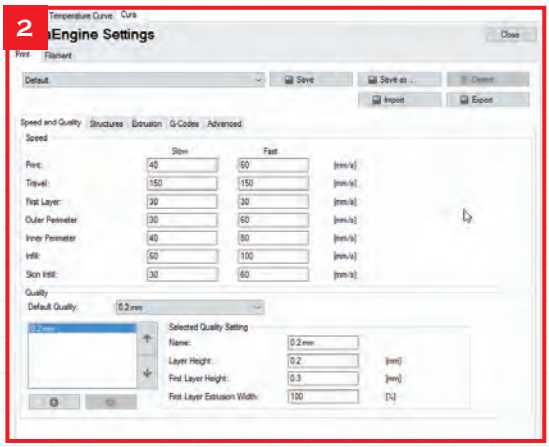
**3.** There could be several reasons why you see an error message. The USB cable might not be plugged in properly, the correct driver (Windows) might not be installed or the wrong Port might have been chosen in the Printer settings. Check that the USB cable is in OK, reinstall the driver and restart your Windows PC. Alternatively, select a different port on the Mac or Windows PC and try each one until one of them works.

# Setting up the slicing software for the idbox

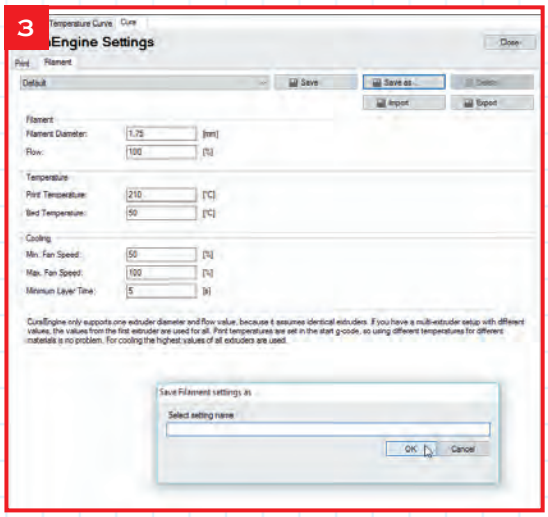
To convert 3D data into the commands that control a 3D printer (G-code), you use a program called a slicer. **Repetier-Host** has different slicers included with it. We will use CuraEngine for Windows and Slic3r for Mac computers.

## Setting up the CuraEngine slicer for Windows computers

**1.** Open **Repetier**, and click on the Slicer tab near the top right of the screen. Select CuraEngine from the drop-down list by Slicer: and then click the Configuration button.




**2.** On the left of the screen, select the Print, then Speed and Quality tabs. Enter the values shown in the image on the left for both the Speed and Quality sections. The values entered for the speed determine the speed of the movement of the head when printing using CuraEngine, and the values for the Quality determine the height of each layer when printing.

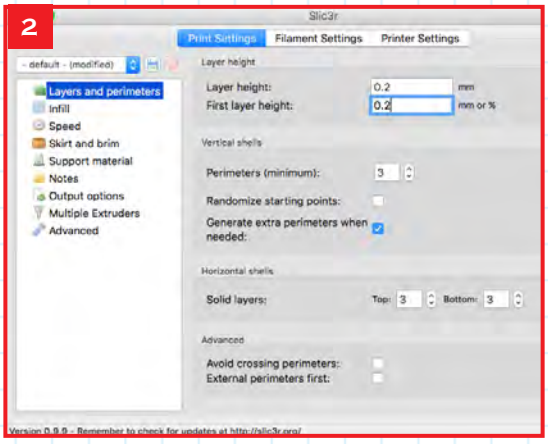



**3.** Click the Filament tab to enter the details of the filament. (Details here are for PLA.) Note the setting by Temperature will change, depending on the filament you are using. To save settings for a filament, click the 'Save as…' button near the top of the pane, and enter a name for the filament, such as PLA, then click OK to save it. Ignore the settings in the Cooling section, as the idbox does not use them.

**4.** The settings can be selected on the right of the screen. If you have not changed the name of the settings, these will show as Default in 'Print Configuration', 0.2mm in 'Quality' and Default in 'Extruder 1:'.

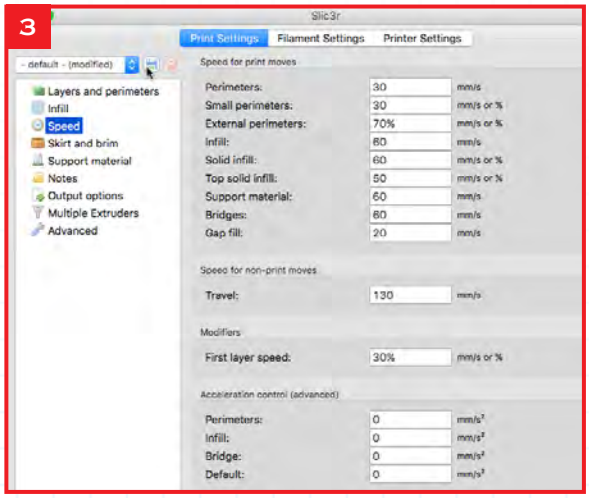
## Setting up the Slic3r slicer for Mac computers

**1.** Click the Slicer tab in the **Repetier** window to open the Slicer panel, then click Configure to open the configuration window for Slic3r.




**2.** Under the 'Print Settings' tab, click on 'Layers and perimeters' in the panel on the left. Enter the values as shown in the image on the left for the two settings shown under SETTINGS below.

**SETTINGS**
**Layer height:** 0.2 mm
**First layer height:** 0.2 mm or %

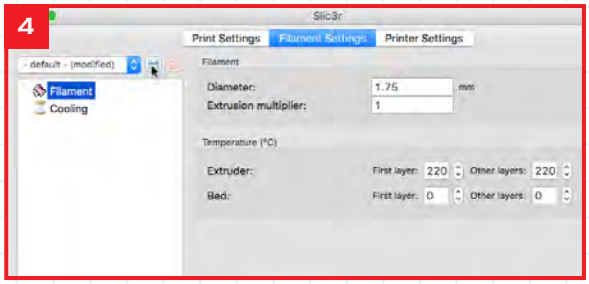



**3.** Click on Speed in the panel on the left and enter the values as shown in the image on the left and under SETTINGS below.

To save the Print Settings, click the floppy disk icon on the top left of the window. In the dialog box that appears, enter a name, such as 'test print', then click OK.

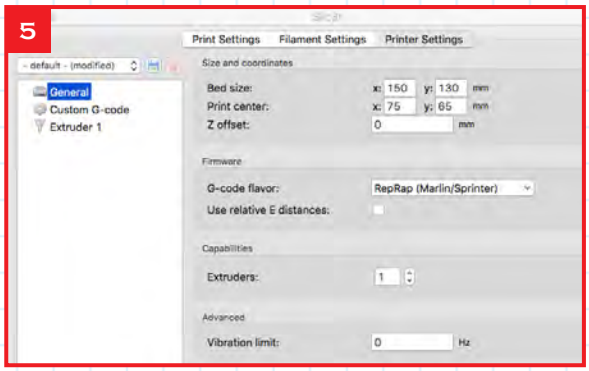
**SETTINGS**
**Perimeters:** 30 mm/s
**Small perimeters:** 30 mm/s or %
**External perimeters:** 70% mm/s or %
**Infill:** 60 mm/s
**Solid infill:** 60 mm/s or %
**Top solid infill:** 50 mm/s or %
**Support material:** 60 mm/s
**Bridges:** 60 mm/s
**Gap fill:** 20 mm/s
**Travel:** 130 mm/s
**First layer speed:** 30% mm/s or %

**All the values under Acceleration control (advanced) are set to** 0 mm/s$^2$



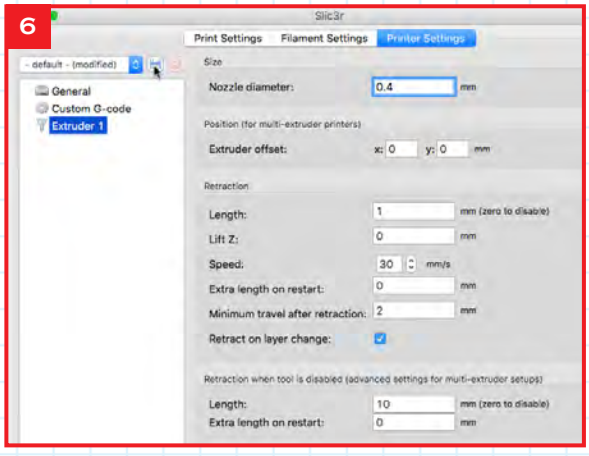

**4.** Click on the Filament Settings tab, and on Filament in the panel on the left. Enter the values as shown in the image on the left and under SETTINGS right. The values under Temperature used here are for PLA and will need to be changed depending on the type of filament you use. Save the settings as you did in Step 3 above, this time entering a name such as PLA.

**SETTINGS**
**Diameter:** 1.75 mm
**Extrusion multiplier:** 1
**Extruder: First layer:** 220 **Other layers:** 220
**Bed: First layer:** 0 **Other layers:** 0




**5.** Click on the Printer Settings tab, and then on General in the panel on the left. Enter the values as shown in the image on the left and under SETTINGS below.

**SETTINGS**
**Bed size: x:** 150 **y:** 130 [mm]
**Printer center: x:** 75 y: 65 [mm]
**Z offset:** 0 [mm]
**G-code flavor:** RepRap (Marlin/Sprinter)
(If the exact above option shown by 'G-code flavor' above is not offered, select one that includes RepRap.)
**Use relative E distances:** (leave blank)
**Extruders:** 1 (Number of nozzles)
**Use firmware retraction:** (leave unchecked)
(The option to alter the 'Use firmware retraction:' setting might not be visible depending on the version of Slic3r that you have installed.)
**Vibration limit:** 0 Hz




**6.** Click Extruder 1 in the panel on the left sidebar. Enter the values as shown in the image on the left and under SETTINGS below. Save the settings as you did in Step 3 above, this time entering a name, such as idbox.

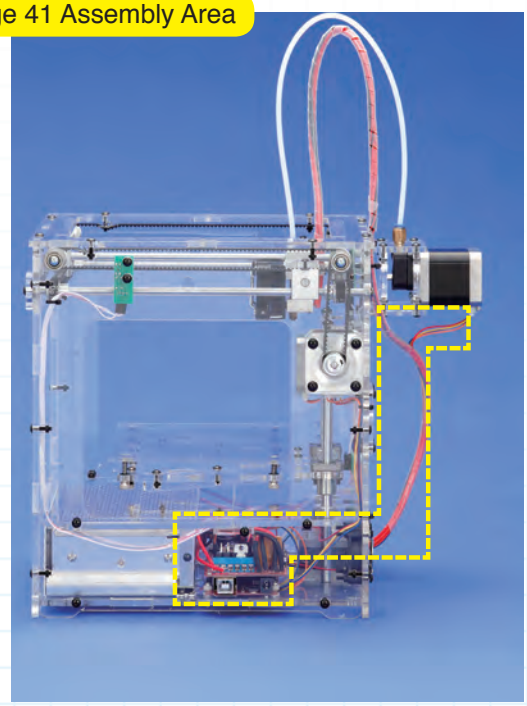
**SETTINGS**
**Nozzle diameter:** 0.4 mm
**Extruder offset: x:** 0 **y:** 0 mm
**Length:** 1 mm (zero to disable)
**Lift Z:** 0 mm
**Speed:** 30 mm/s
**Extra length on restart:** 0 mm
**Minimum travel after retraction:** 2 mm
**Retract on layer change:** (check)
**Wipe while retracting:** (leave unchecked)
('Wipe while retracting:' might not be visible, depending on the version of Slic3r that you have installed.)
**Length:** 10 mm (zero to disable)
**Extra length on restart:** 0 mm

**7.** Click the close button on the top left of the Slic3r window, to return to **Repetier**. To use the settings, select the names you used for them in the three fields outlined in red in the image on the left. The names of the fields are:
**Print Settings:**
**Printer Settings:**
**Extruder 1:**

**Your 3D Printer User Guide will be continued in the next pack!**

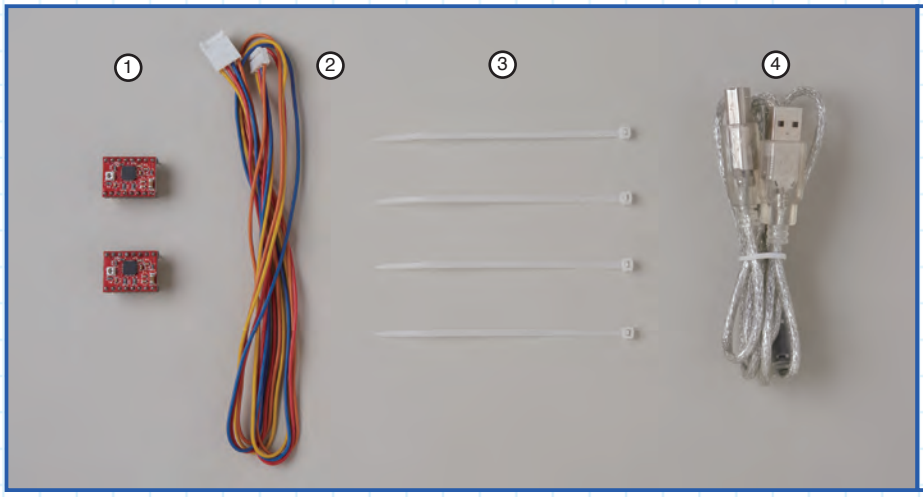
# Stage 41: Add the Z-axis and feeder motor drivers, and the feeder motor cable

Stage 41 Assembly Area



In this stage, you add the Z-axis motor driver to the driver board, then add the feeder motor driver before plugging the feeder motor cable into the driver board.

The two motor drivers you add to the driver board this time are identical to each other and also to the two you added in Stage 39. This time the motor drivers are for the Z-axis and feeder motors. Remember to make sure they are fully seated and that they are plugged in the right way round. You then secure the feeder motor cable to the housing and plug it into the driver board. Finally, connect your PC to the circuit board using the USB cable.




## Stage 41 Components

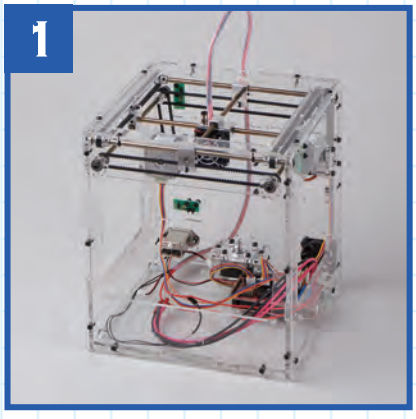
**1:** Motor drivers x 2
**2:** Feeder motor cable (650mm) x 1
**3:** Cable ties x 4
**4:** USB cable x 1

## You will need

Ruler
Marker pen
Scissors
PC to connect to idbox via USB cable

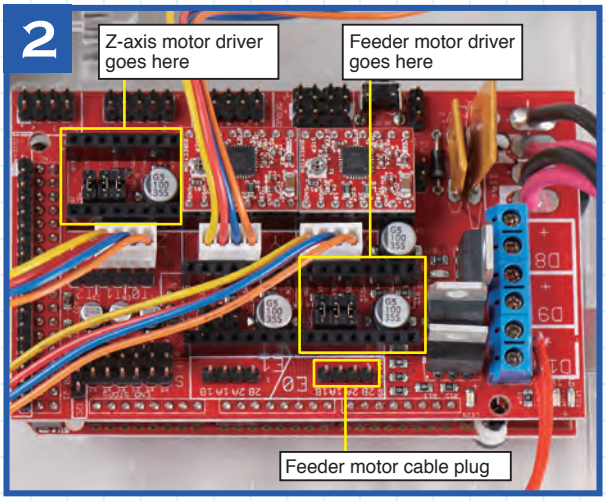
## Parts to have ready

**1**



Get ready the printer housing and turn it so that the front is facing you.

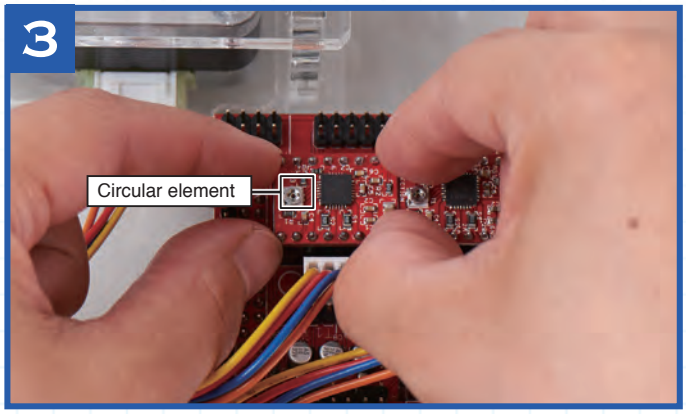
**2**




Have a look at the driver board and the diagram, left – make sure you know where to plug in the Z-axis motor driver and the feeder motor driver. Locate the feeder motor cable plug, below.

## Plug the motor drivers into the driver board

3

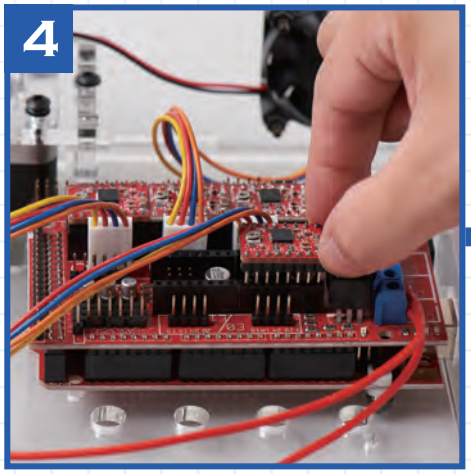


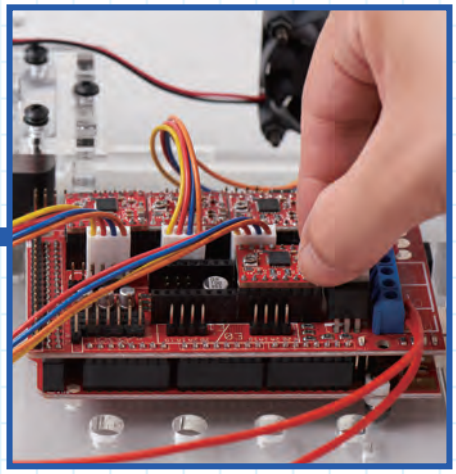

CAUTION!

Make sure that the circular element on the top of the motor driver is on the left when viewed with the front of the housing facing you.
Be careful not to touch this element.

Hold one of the motors drivers as shown and plug it into the position for the Z-axis motor driver (see previous page, Step 2). Make sure that the circular structure on the driver is aligned as shown above. Hold the driver parallel to the driver board while you plug it in slowly and firmly until it is in all the way.

4

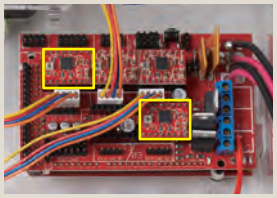




Now plug the other motor driver into the position for the feeder motor driver. Again, press firmly while holding it parallel to the driver board until it is fully inserted.

CAUTION!

Make absolutely certain that the motor drivers are correctly plugged in, with their pins in the correct sockets and the circular structures to the left. Failure to do so might result in fire during operation of the printer.



HINT

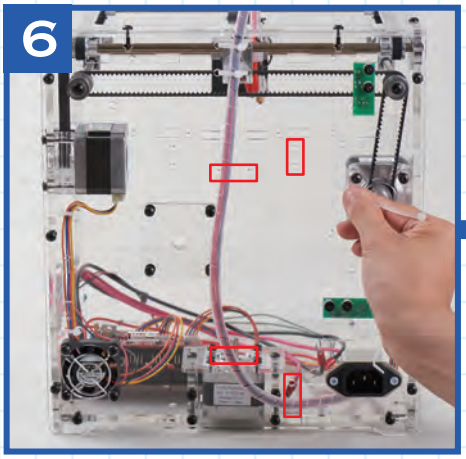
Ensure the driver motors are not at an angle to the driver board and that the pins are all the way in.

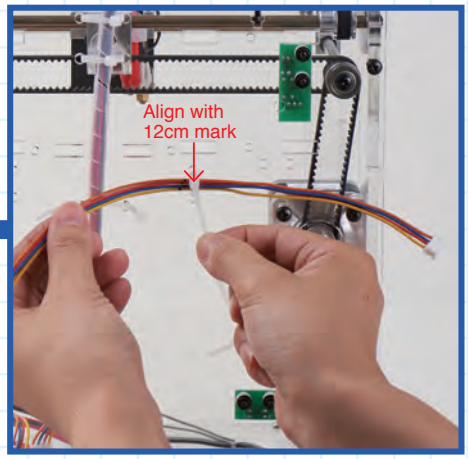
## Attach the feeder cable to the housing, then plug it into the driver board

5

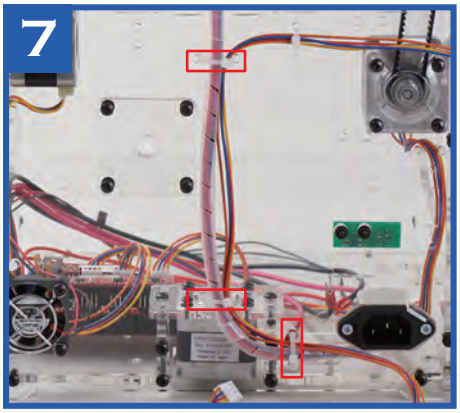
With a marker pen, make a mark on the feeder motor cable 12cm in from the end of the cable, measuring from the smaller (motor end) connector.

6

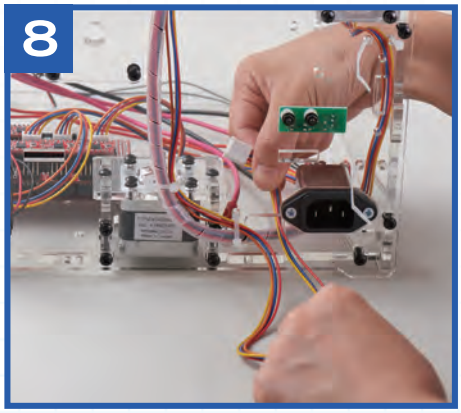




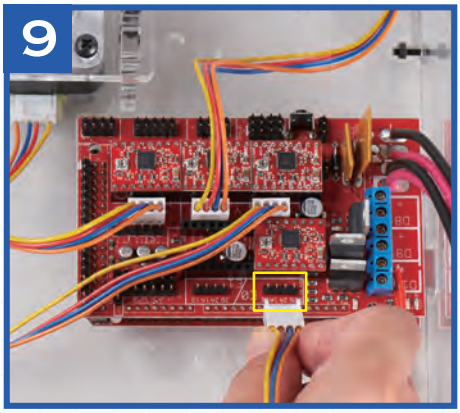

Turn the housing so the rear panel is facing you. Put a cable tie through each of the four sets of holes outlined in red in the image above left. Align the tie at the top right with the mark on the feeder motor cable and, with the motor end socket on the right, tighten the cable tie around the cable. Trim off the excess cable tie with scissors.




At the other three cable tie positions (outlined in red, above), use the cable ties to secure the feeder motor cable and the spiral tube to the housing. When you've done up each cable tie, trim off the excess with scissors.

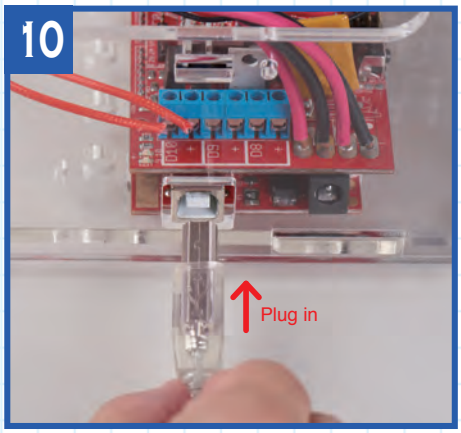



Pass the feeder motor cable through the hole in the casing to the left of the noise filter.




Turn the housing so the front is facing you. Untwist the feeder motor cable you've just passed into the housing (if necessary) and plug the connector into the pins (outlined in yellow, above) on the motor board for the feeder motor cable.

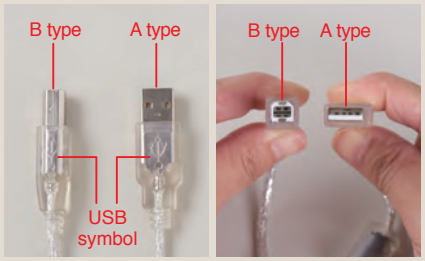
## Check the power supply from a computer to the circuit board



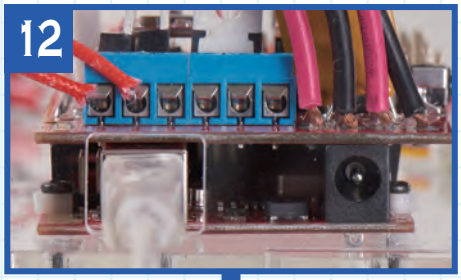

With the right side of the printer facing you, plug the B-type connector of the USB cable into the USB port on the circuit board.

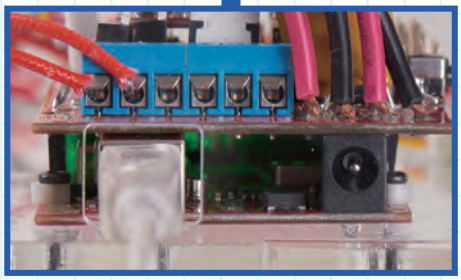
HINT

There are two different connectors on the USB cable supplied this time. The smaller, squarer one is the B-type and is plugged into the idbox. The wider, flatter one is the A-type, and this is plugged into the USB port on a computer.



With your computer turned on, plug the A-type USB connector into a USB port on the computer.

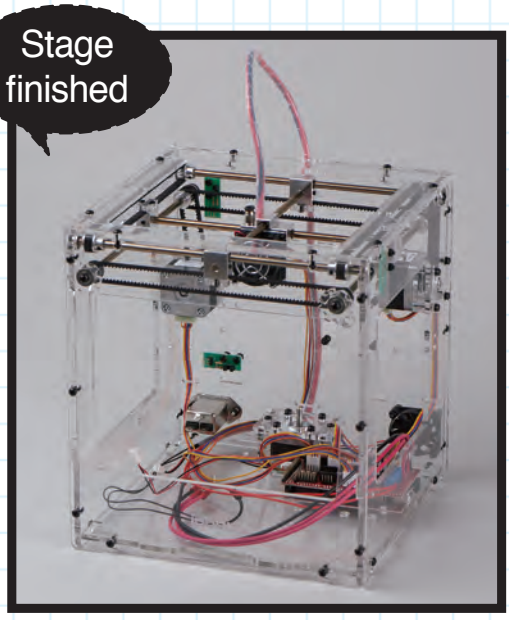


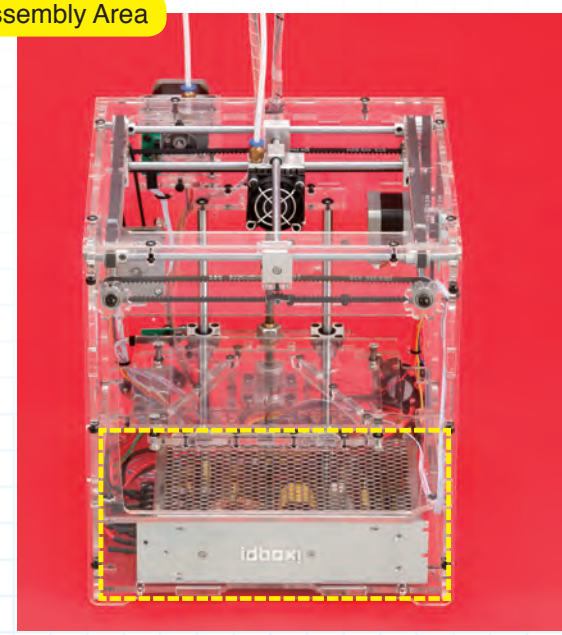
The circuit board is powered via the USB cable by your computer. When you connect the USB cable to your computer you should see a green light come on on the circuit board (lower photo). Check this, then remove the USB cable and keep it safe.

The Z-axis motor and feeder motor drivers have been fitted to the driver board and the feeder cable has been plugged into the driver board.

Stage finished



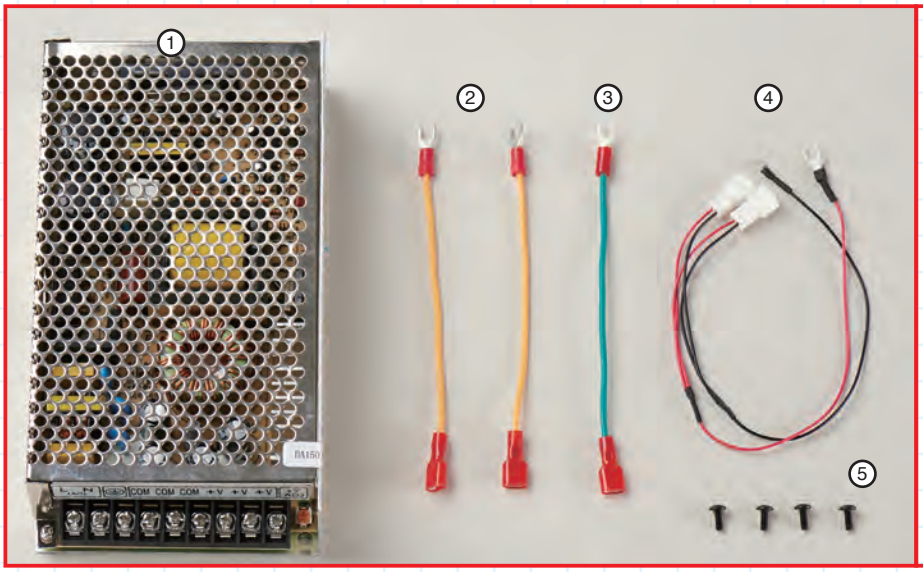
Stage 42 Assembly Area



# Stage 42: Connect up the power supply and fix it to the housing

In this stage, you will wire up the power supply, then attach it to the housing. After that, connect up more of the wiring inside the housing. It is vital to get the wires connected properly, so take care as you do it.

The power supply has no fewer than nine terminals to which you attach cables in this stage. After wiring up the power supply, you attach it to the inside of the base of the housing and connect it to the thick power cables, the fan cables and the noise filter. Make sure you follow the instructions carefully and be sure to check over your assembly so you can be certain that the cables are all connected properly. This is extremely important, as if the cables are not correctly wired up, there is a real danger that the printer will fail when the power is switched on.




## Stage 42 Components

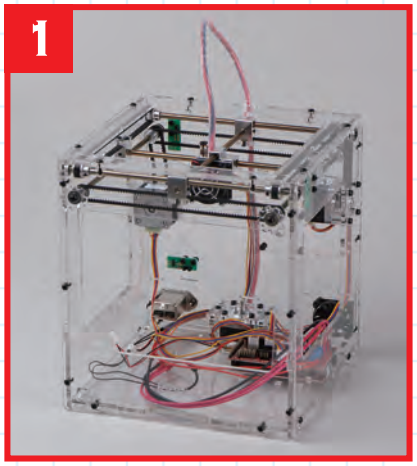
**1:** Power supply x 1
**2:** Power lines x 2
**3:** Earth wire x 1
**4:** Power supply wires for the fans x 2
**5:** M3 truss head screws x 4

## You will need

Phillips screwdriver size 1
Phillips screwdriver size 2

## Parts to have ready

**1**



The printer housing.

## Set the input voltage to 230V (for UK)

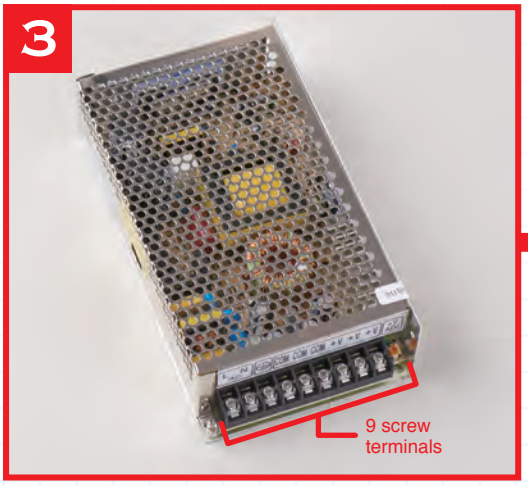
**2**

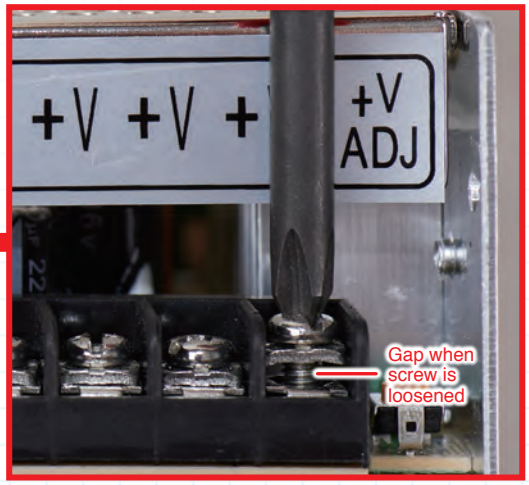
There is a switch on the side of the power supply where you can select the input voltage from the mains to the power supply. For the UK, make sure it is switched to 230V and not 115V.

Incorrect

## Connect up the nine screw terminals on the power supply

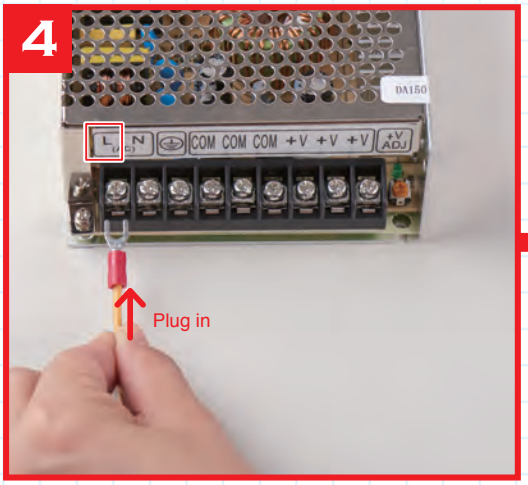
**3**




There are nine screw terminals on the end of the power supply. Use a size 2 Phillips screwdriver to loosen them all before you start attaching cables.

**4**

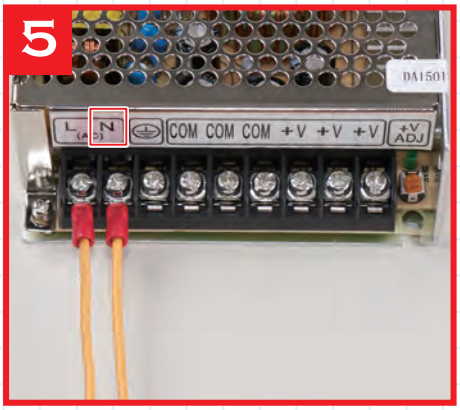


**POINT**

When you insert the Y-shaped end of a cable into a screw terminal, do it so the crimp mark is uppermost so it goes in securely.

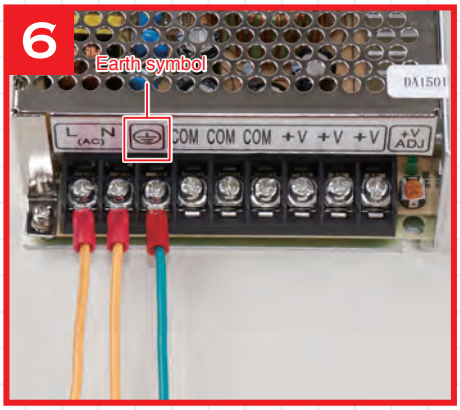
Plug the Y-shaped end of one of the yellow power lines into the terminal on the left with the letter L above it. Tighten the screw of the terminal with the screwdriver.

**5**



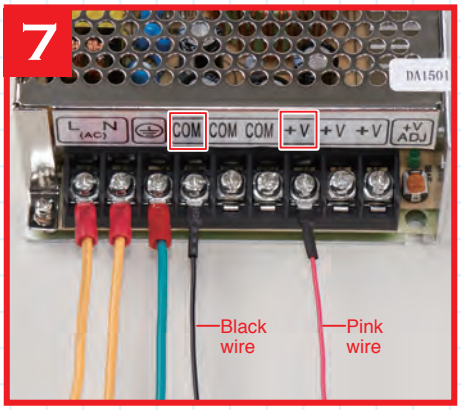
Plug the second of the two yellow power lines into the terminal with the letter N above it and tighten the screw.

**6**

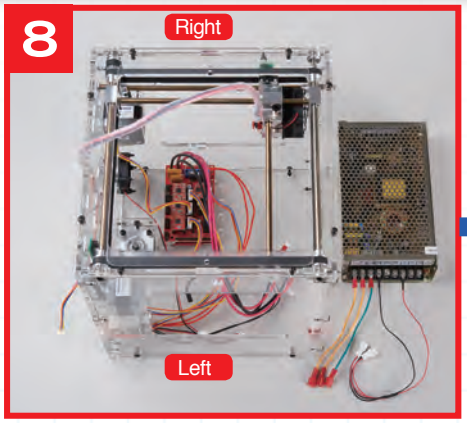


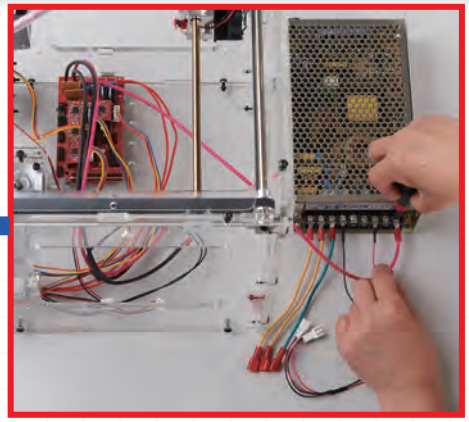

Plug the green Earth cable into the terminal with the Earth symbol above it and tighten the screw.

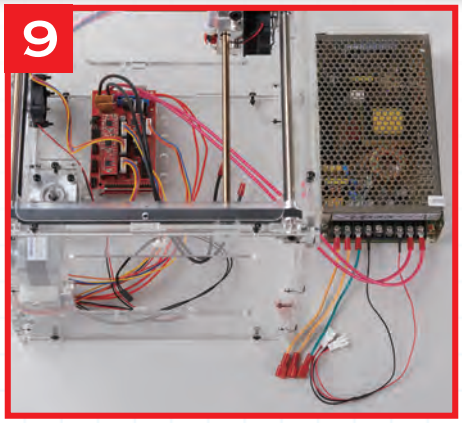
**7**




Plug the black wire for the fan power supply line into the fourth terminal from the left, which has COM above it. Put the pink wire into the seventh terminal, which has +V above it. Tighten the screws.

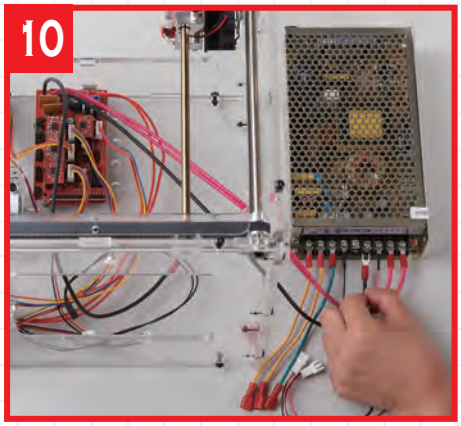


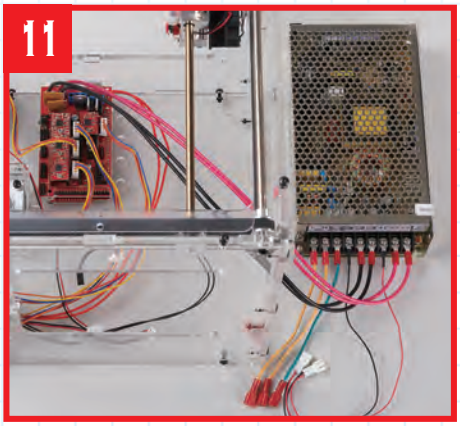



Turn the housing so its left side is facing you. Place the power supply as shown, so it is to the right of the housing. Pass the rightmost of the two thick pink power cables from the driver board through the opening in the front panel of the housing and plug it into the rightmost terminal of the power supply, which has +V above it, and tighten the screw.

Pass the second thick pink cable from the driver board through the hole in the front panel and plug it into the power supply's eighth terminal from the left, which has a +V above it, and tighten the screw.




Take the rightmost of the two thick black cables from the driver board and plug it into the sixth from the left of the power supply's terminals, which has COM above it, and tighten the screw.

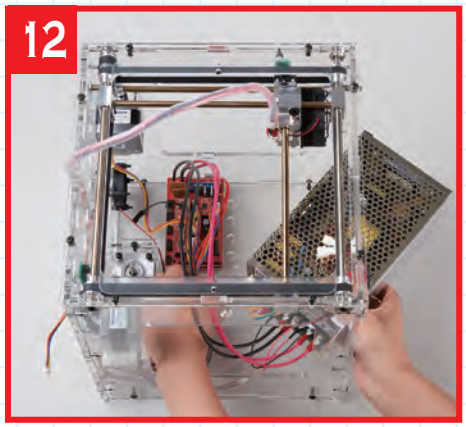


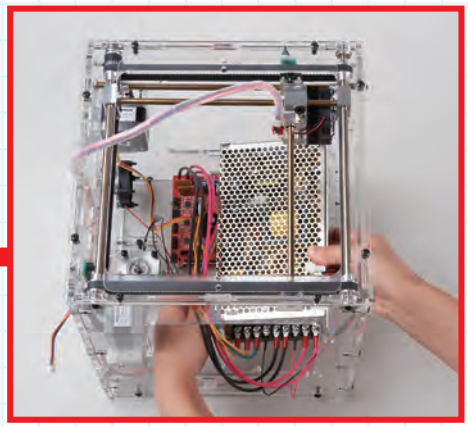

Take the other thick black cable from the driver board and plug it into the fifth from the left of the power supply's terminals, which has COM above it, and tighten the screw.

CAUTION!

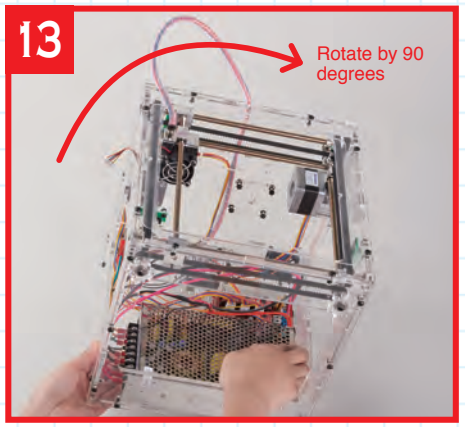
It is very important that the wires connected to the power supply are in the correct terminals. Check particularly that the pink and black wires are in the correct positions as shown below.

## Attach the power supply to the housing



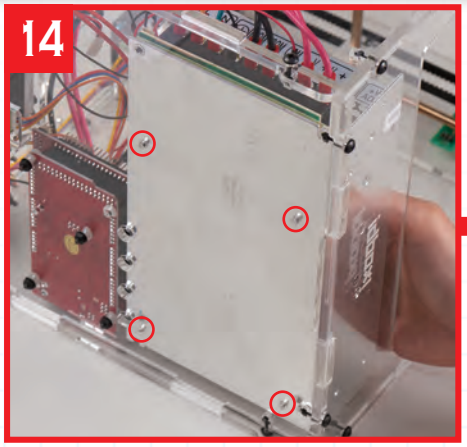



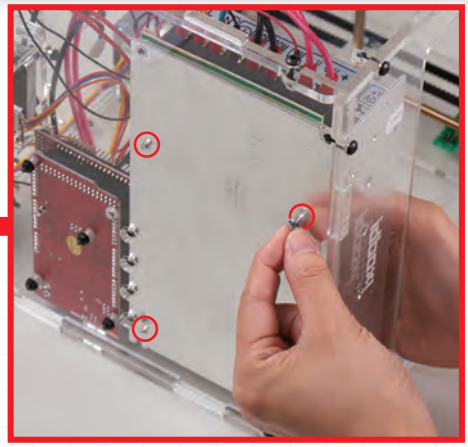
Pass the power supply through the front panel (you'll have to angle it to get it through). Make sure the cables do not go under the power supply, and beware of damaging the housing while you manoeuvre the power supply.




With the front panel facing you, rotate the housing by 90 degrees so it lies on its right panel. Support the power supply while you do this.

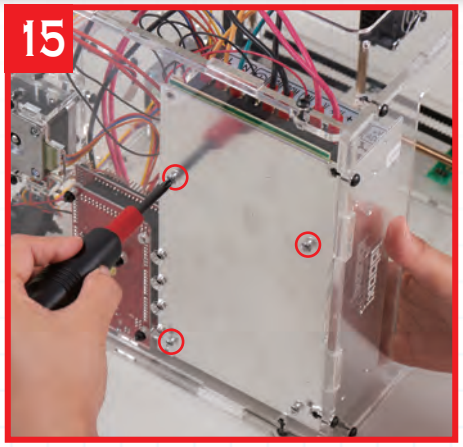
14





Hold the power supply in position with one hand so that the four screw holes in its underside align with the screw holes in the bottom panel (ringed in red). Insert an 8mm M3 truss head screw into each of the screw holes and screw them in with your fingers.

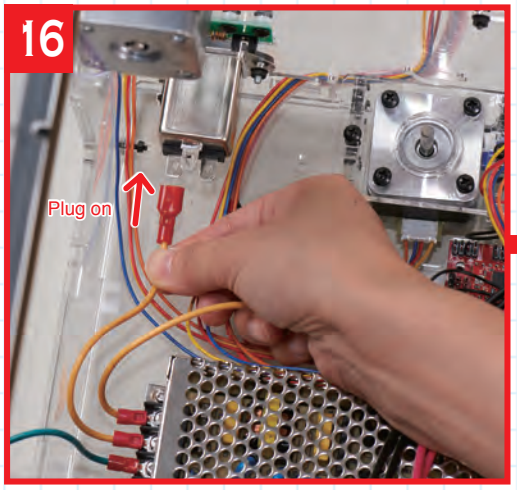
15

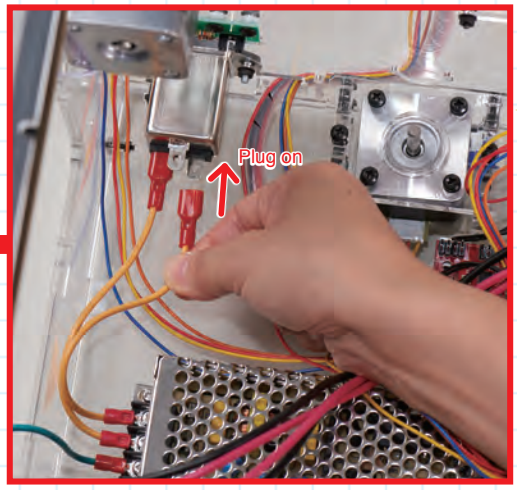


Tighten all four of the screws with a size 1 Phillips screwdriver.

## Connect the remaining cables

16

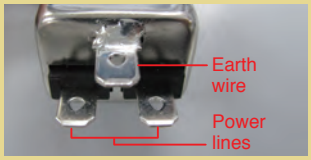


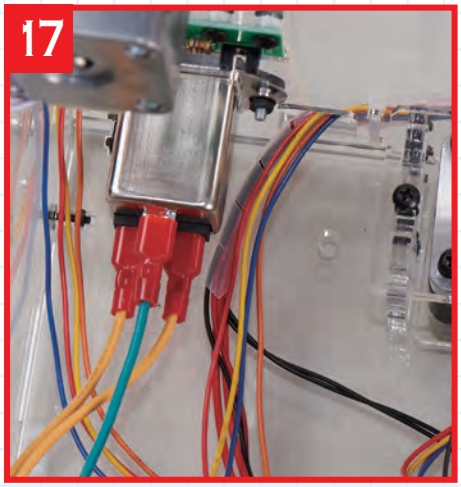

Turn the housing so its base is back on your work surface. Plug the two yellow power supply lines as shown above onto the two lower terminals of the noise filter, which is at the rear left of the housing. Push them all the way on, firmly yet gently.

POINT

The noise filter has three metal pins. Of these, two are side by side and have a black cover to their bases. These are the pins for the power lines. The other pin is for the Earth wire. Make sure you plug the correct wires onto the correct pins.

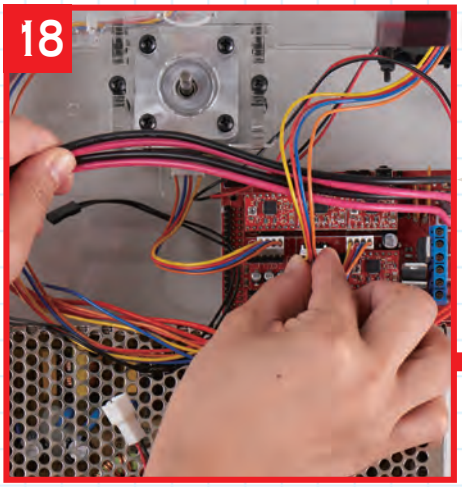



17



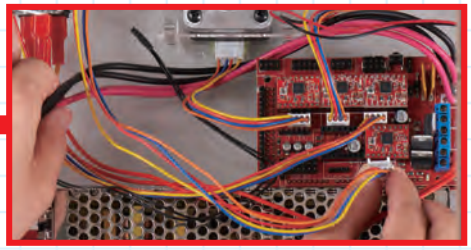
Plug the connector of the green Earth wire onto the central, upper metal pin on the noise filter.

18



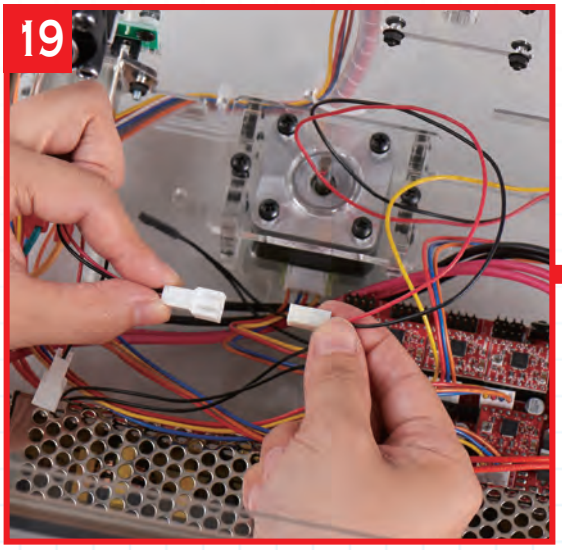
HINT

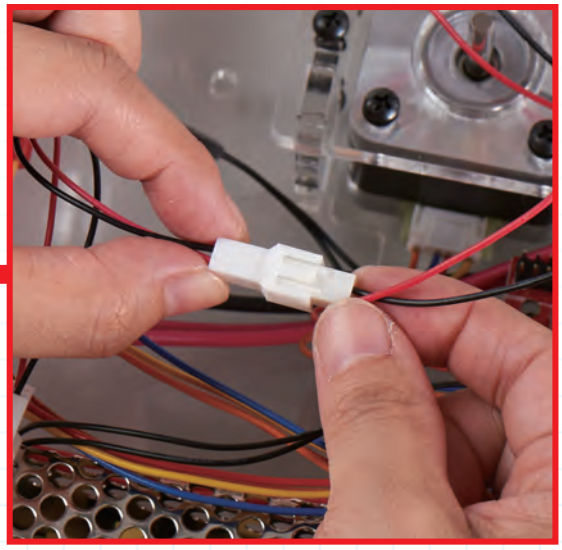
When tidying the thick power cables to the bottom of the housing, unplug the motor cables one at a time and plug them back in as soon as you can to avoid mixing them up.



Tuck the four thick power cables (two black, two pink) into the bottom of the housing, as shown above left and above right. If you unplug any of the connectors from the driver board while you do this, make sure you get them back into the correct locations.

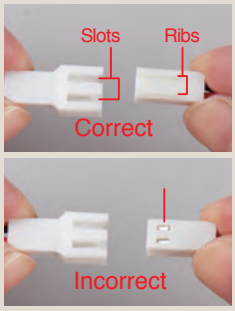
19





HINT

The fan power connectors are designed to be put together so the ribs on one side of the smaller connectors fit into the slots on the larger connectors.

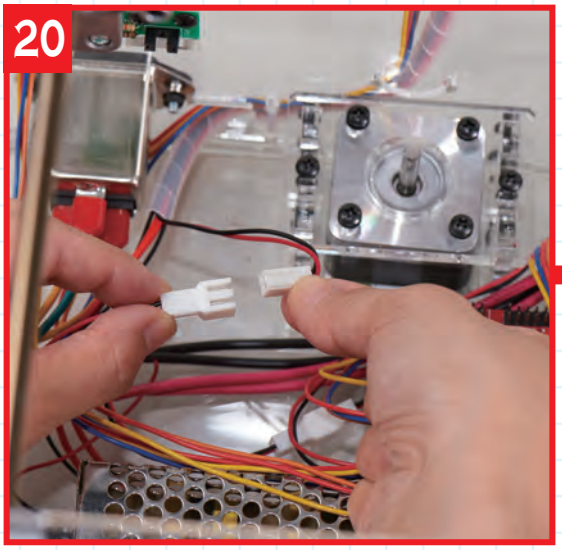


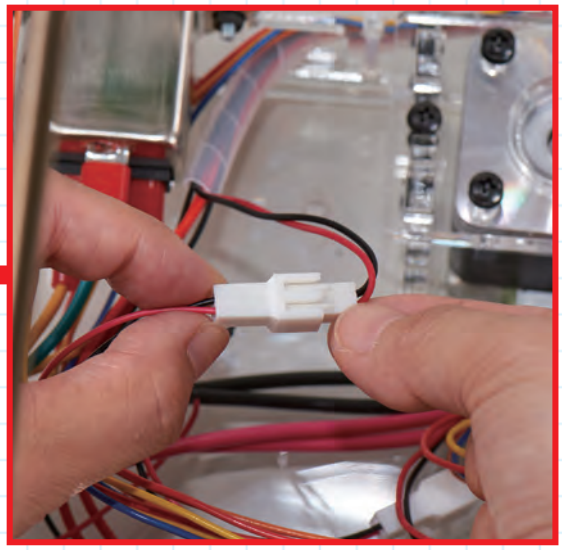




Take the connector for one branch of the fan power supply wires, and plug it into the connector for the fan at the lower back right of the housing. (The connector leading to the fan can be connected to either branch.)

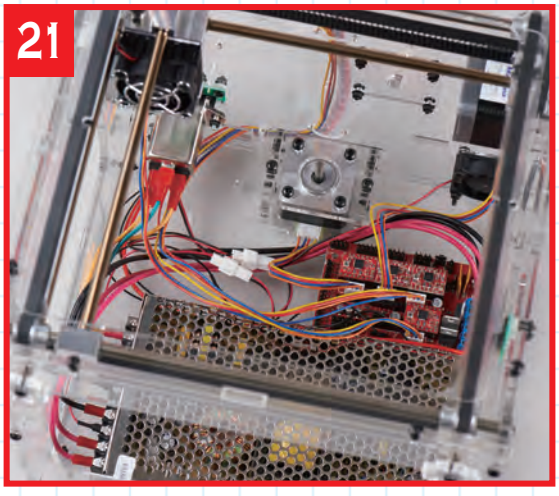
20





Plug the connector for the fan in the printer head into the connector on the other branch of the power supply wires.

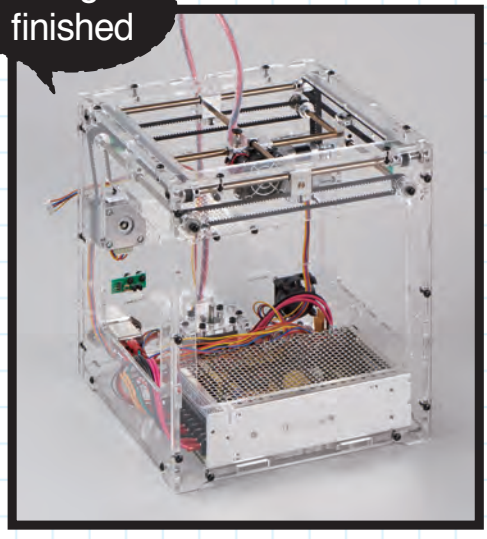
21



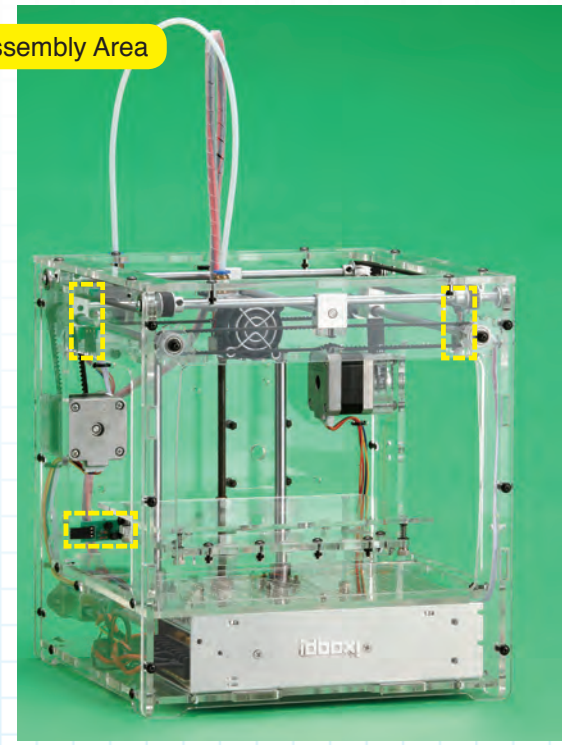
In the photo, you can see where the various cables you have connected up in this stage run from and to. In the next stage, more cables are added, and the wiring is tidied up with cable ties.

The power supply terminals have been wired up, and the power supply has been fixed inside the housing.

Stage finished



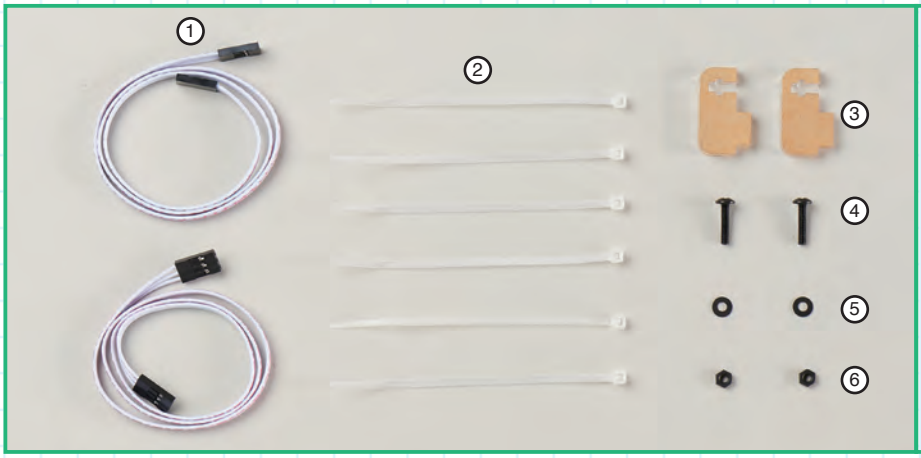
# Stage 43: Connect the X-, Y- and Z-axis limit switches to the driver board




In this stage, you connect up the three limit switches to the driver board using the two cables supplied with this stage and the one supplied with Stage 3. You will also plug in the thermistor cable to the driver board and tidy up the cables.

When you insert the pins on the limit switches into the connectors on the ends of the cables, be sure to do this carefully and not bend the pins. Make sure you get the connectors in the correct positions on the driver board.

Secure the limit switch cables using ties supplied with this stage and others attached to the housing in Stage 39. After you have plugged the thermistor cable into the driver board, tidy up the cables in the bottom of the housing.




## Stage 43 Components

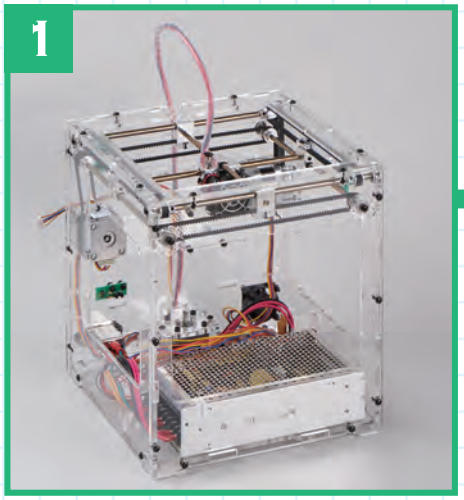
**1:** Limit switch cables x 2
**2:** Cable ties x 6
**3:** Brackets x 2
**4:** M3 truss head screws (14mm) x 2
**5:** M3 washers x 2
**6:** M3 nuts x 2

## Tools you will need

Scissors

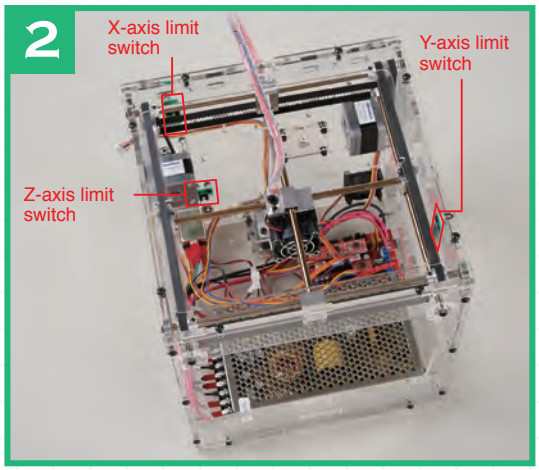
## Parts to have ready

1

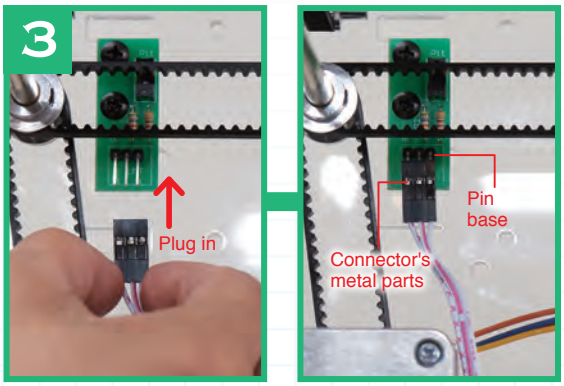


Get ready the printer housing and the limit switch cable that was supplied with Stage 3.

## Connect the cables to the limit switches



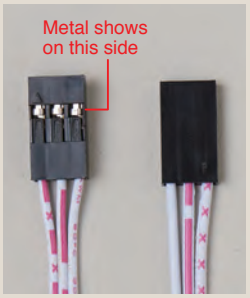

The Z- and X-axis limit switches are at the rear and the Y-axis limit switch is on the right.

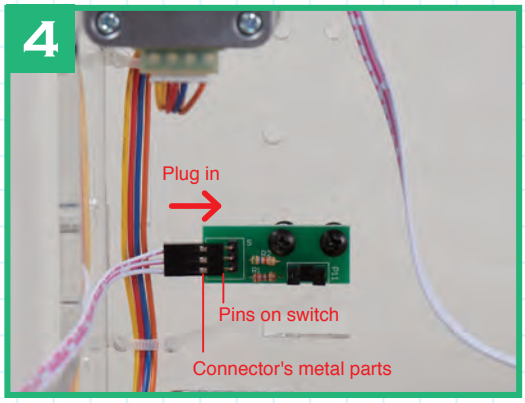



Connect the X-axis limit switch first. Turn the cable's connector so that you can see the side where the metal parts show. Plug it in carefully from below until just the bases of the switch's pins are visible.

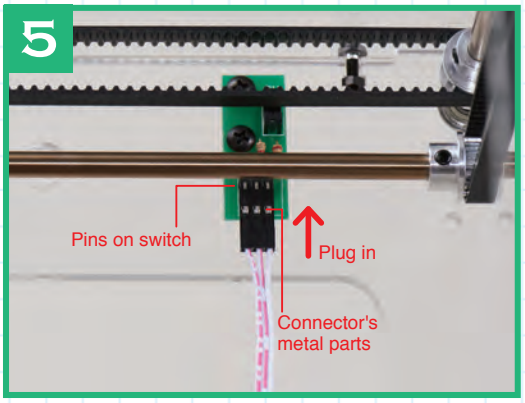
HINT

The sides of the connectors are different. Make sure you plug them in so the metal parts show.



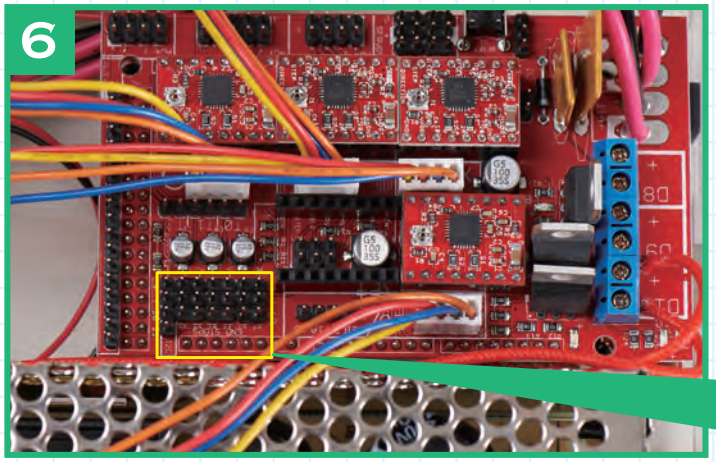




Now connect the Z-axis limit switch. Carefully plug the pins on the switch into the sockets on the connector, making sure the metal parts of the connector are visible, as shown above.




Turn the printer housing so its left side is facing you, and plug in the Y-axis limit switch cable connector from below. Again, put in the connector so its metal parts are showing.

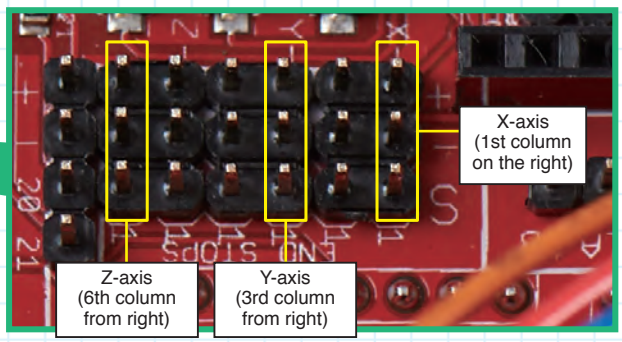
## Connect the limit switch cables to the driver board



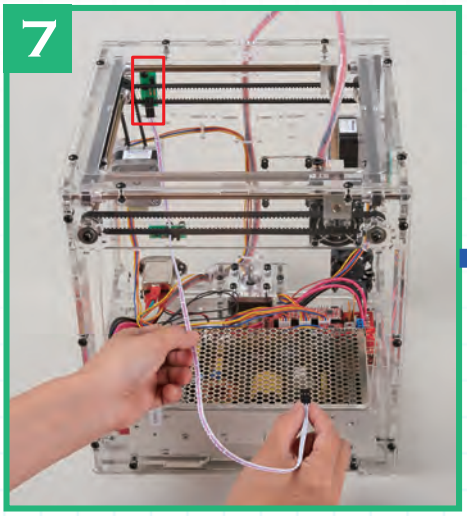

Turn the printer housing so the front panel is facing you and find the location of the pins for the limit switch cables, outlined in yellow above, and shown in close-up on the right.

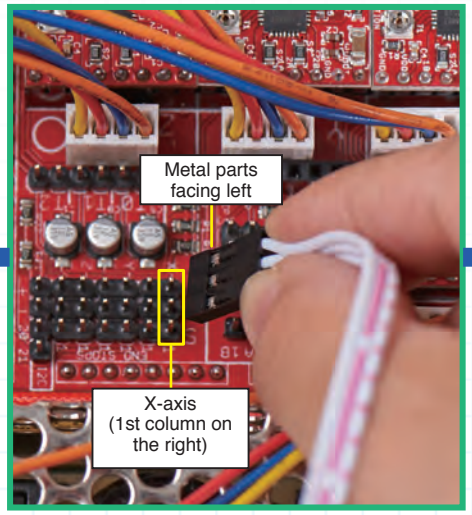
POINT

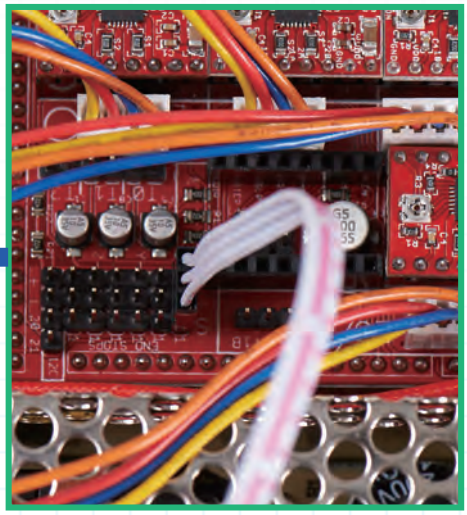
You must get the connectors from the limit switches plugged into the correct sets of pins or the printer will not operate properly. Take care!



7

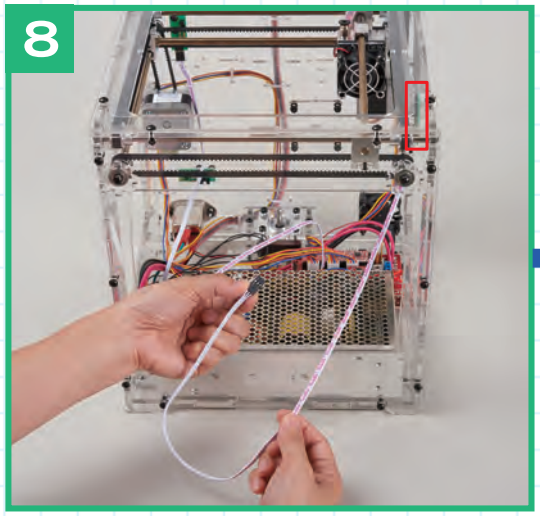


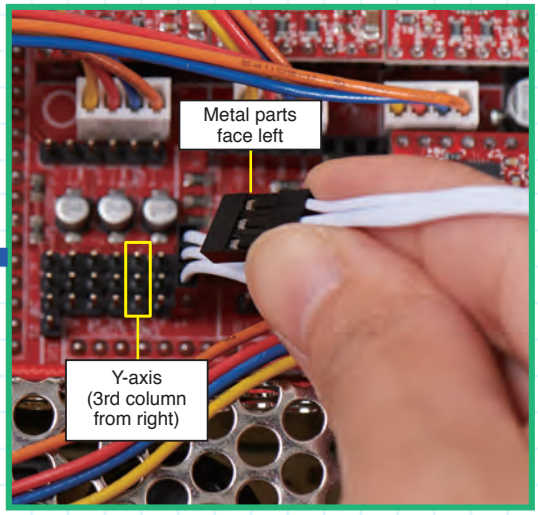


Untwist the cable from the X-axis limit switch, if necessary, and plug the connector into the first column of pins on the right. The side of the connector where the metal parts are visible should be facing to the left.

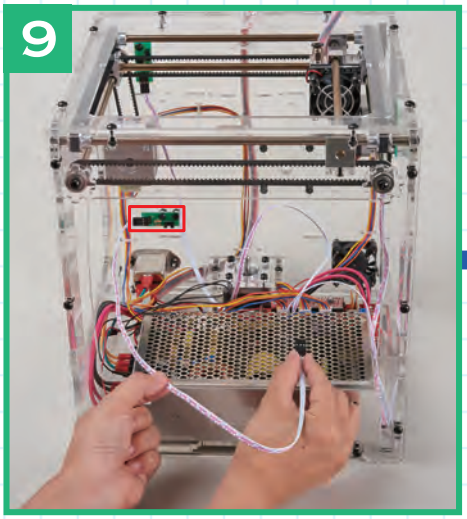
8

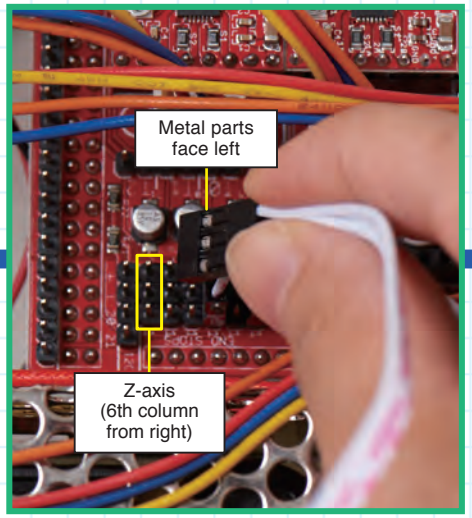


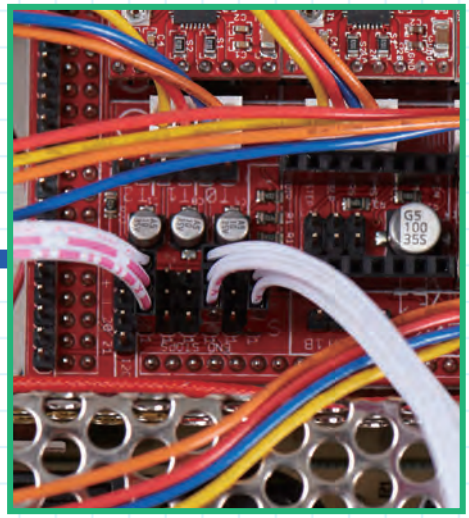



Untwist the cable from the Y-axis limit switch if necessary, and plug the connector into the third column of pins from the right. The side of the connector where the metal parts are visible should be facing to the left.

9



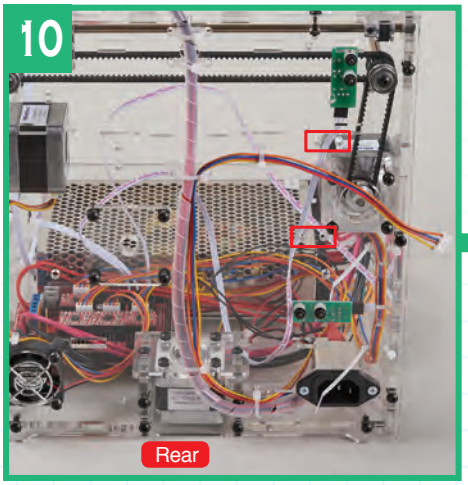


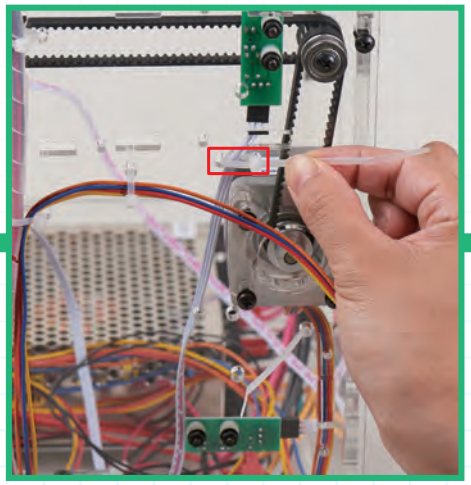



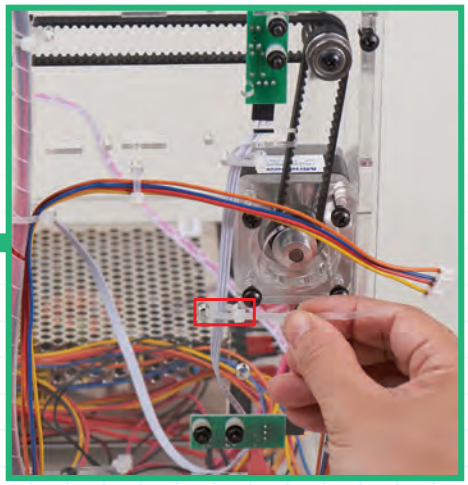
Untwist the cable from the Z-axis limit switch, if necessary, and plug the connector into the sixth column of pins from the right. The side of the connector where the metal metal parts are visible should be facing to the left.

## Secure the limit switch cables to the housing

10

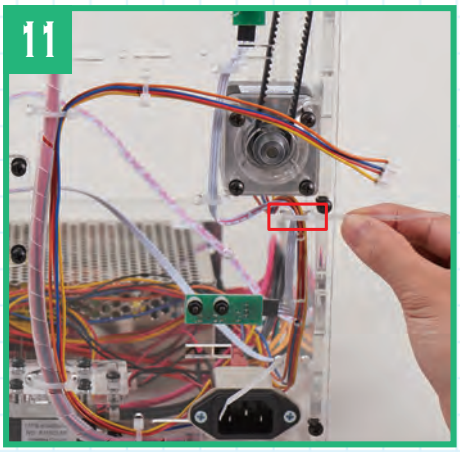




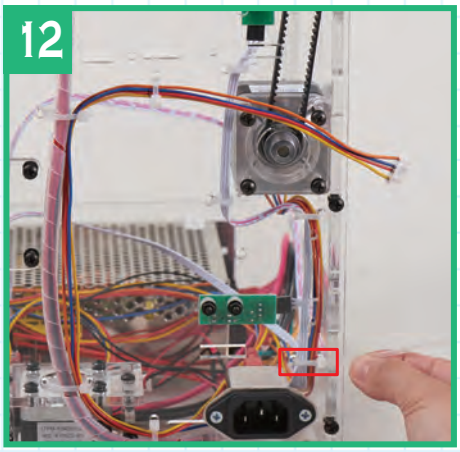
Turn the housing so its rear panel is facing you. Pass cable ties through the two sets of holes (outlined in red) and do up the ties to secure the cables for the X-axis limit switch, as shown above. Trim the excess from the cable ties with scissors.

11



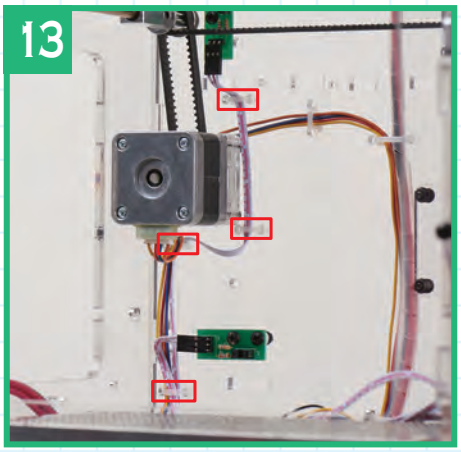
Put the X-axis limit switch cable together with the X-axis motor cable and bind them to the housing with the upper cable tie inserted (but not tightened) in Stage 39.

12



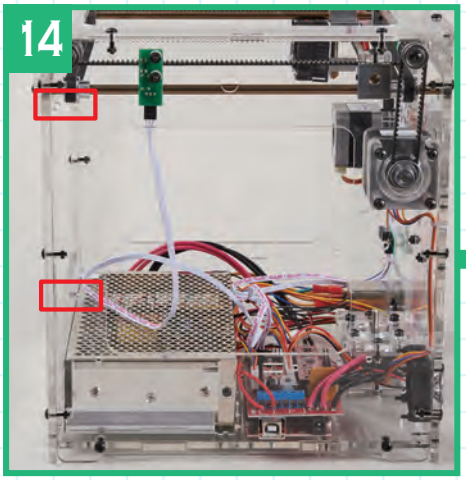
Add the Z-axis limit switch cable to the bundle of the X-axis limit switch and motor cables at the lower cable tie (Stage 39), and do it up.

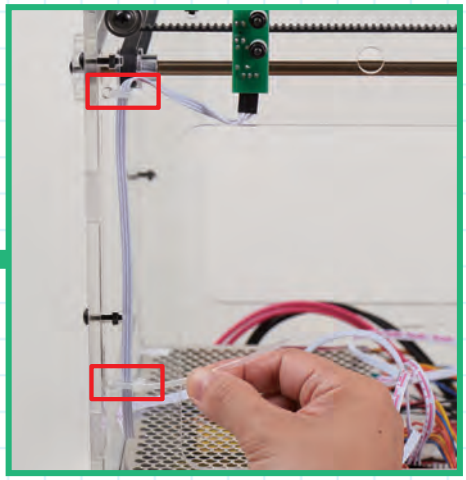
13



Trim off the excess from the straps of the ties and turn the housing so the front is facing you so you see how the cables have been fixed in place.

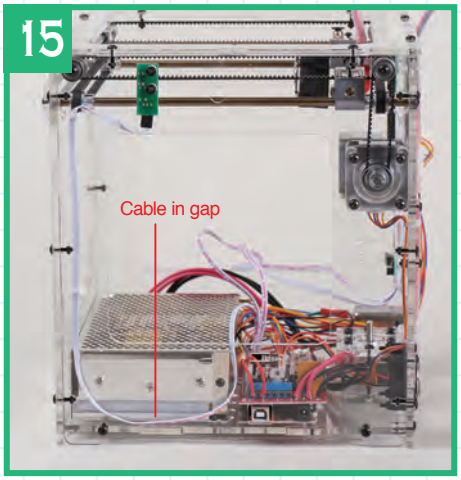
14





Turn the housing so its right panel is facing you. Pass cable ties through the two sets of holes (outlined in red), and do up the ties to secure the cables for the Y-axis limit switch, as shown above. Trim off the excess from the cable ties.

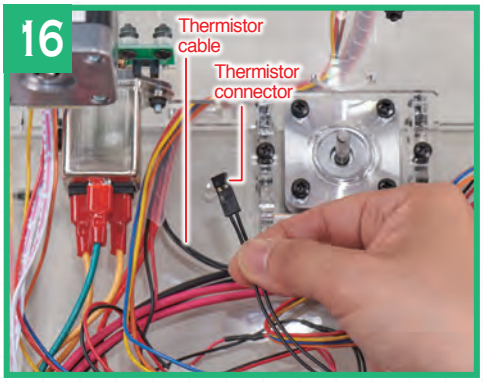
15




Move the Y-axis limit switch cable into the gap between the power supply and the housing, as shown above.

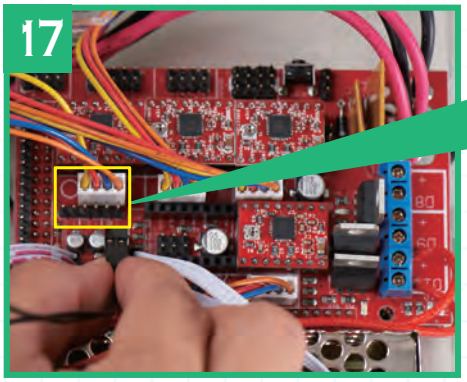
## Connect the thermistor cable to the driver board

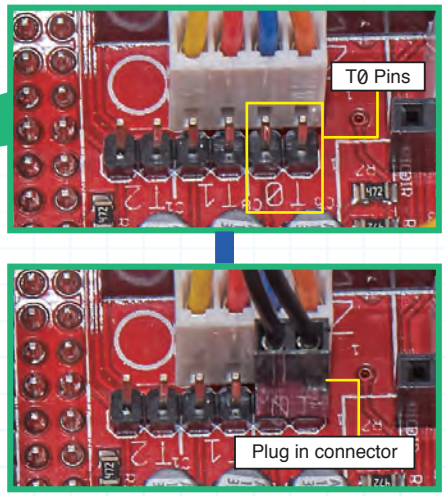
16




The thermistor, which is in the head block, has a cable that needs to be connected to the driver board. Locate the thermistor cable, which emerges from the spiral wrap that enters the rear of the housing.

17

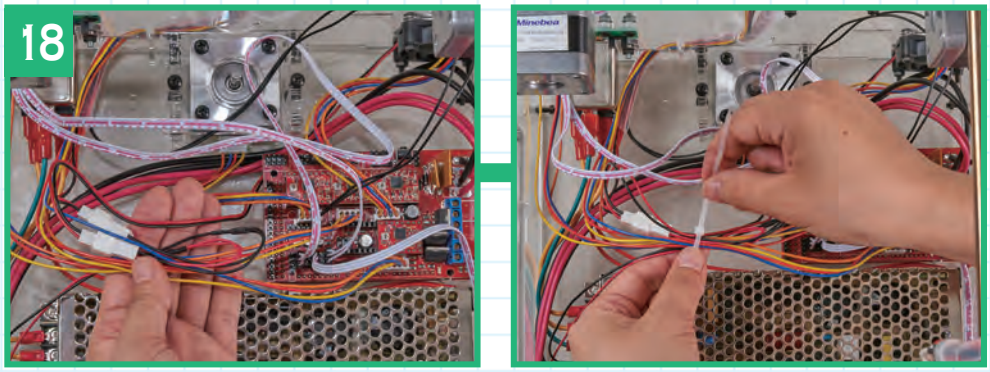





The pins on the driver board for the thermistor are the two on the right (with T0 by them) in the row of six pins in front of the Z-axis motor connector. The thermistor connector can be plugged in either way.

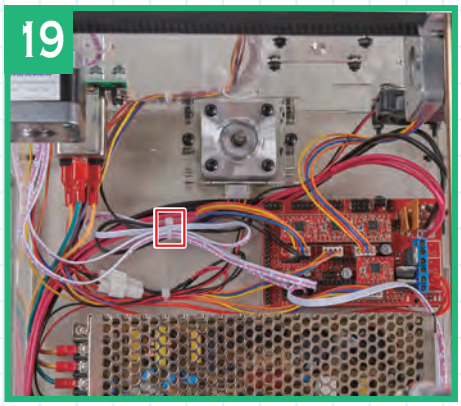
## Gather together the cables at the bottom of the housing

18



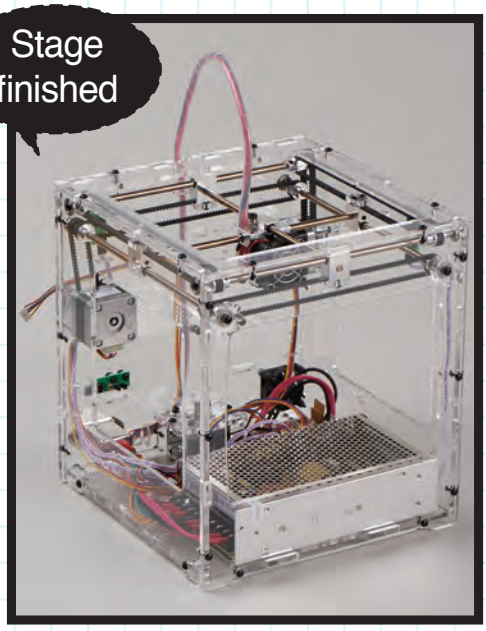
Start by gathering together the cooling fan cable and the X-axis and feeder motor cables. Make loops in the cables if necessary to make the bundle neater, then bind them together with a cable tie as shown above, trimming the excess with scissors.

19



Next, gather the Z- and X-axis limit switch and the thermistor cables into a neat bundle and bind them with a cable tie. Note that the Y-axis limit switch, the Y-axis motor, the power supply and the cartridge heater cables are not held together.

Stage finished

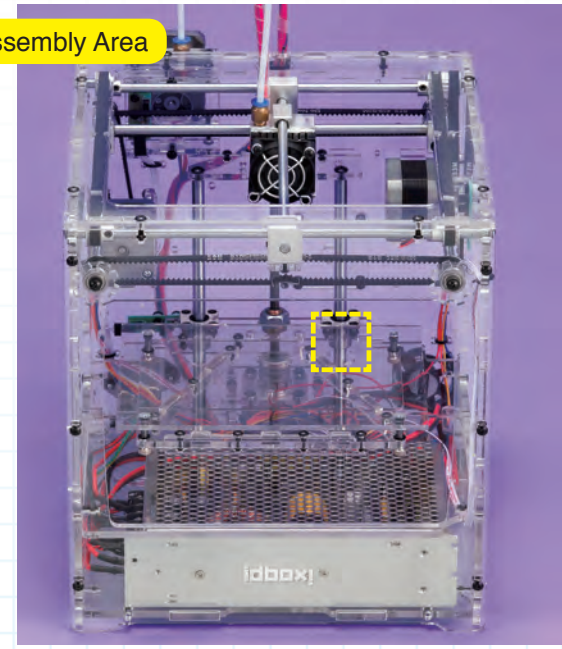


The limit switch cables have been connected and the thermistor cable plugged into the driver board. The cables in the bottom of the housing have been tidied up.

Store the parts

Keep the brackets, washers, nuts and truss head screws supplied but not used with this stage somewhere safe.

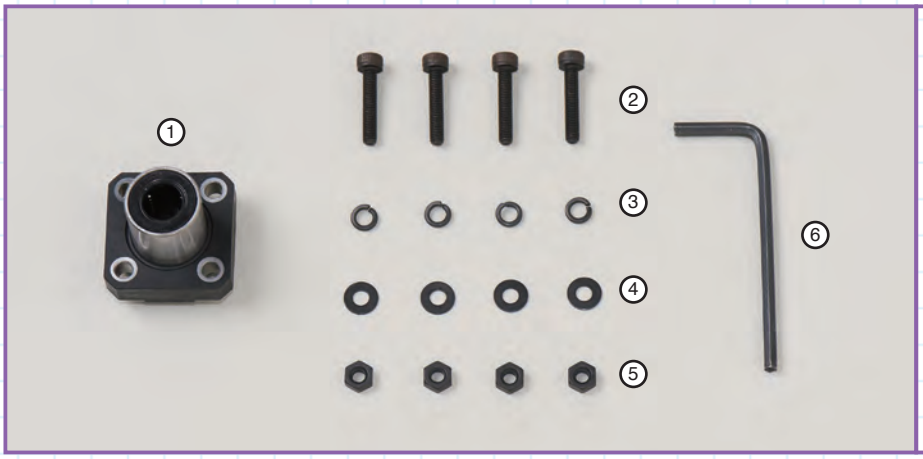
Stage 44 Assembly Area



# Stage 44: Attach two brackets to the housing and add a linear bush to the modelling table

In this stage, you will attach two brackets to the housing, then add a linear bush to the table base using cap bolts (bolts with hexagonal sockets in their heads). The bush acts as a bearing that keeps the table moving smoothly up and down on the Z-axis rods.

When you add the brackets to the printer housing – one on the left and one on the right – you might find that adding a bit of PVA glue to hold the nuts in position will make it easier to do the assembly. As usual when working with acrylic, do not apply too much force when tightening the screws into the nuts; use just enough to tighten them securely. The same advice apples when you add the linear bush to the table, especially as it is easy to apply much more force using an Allen key.




## Stage 44 Components

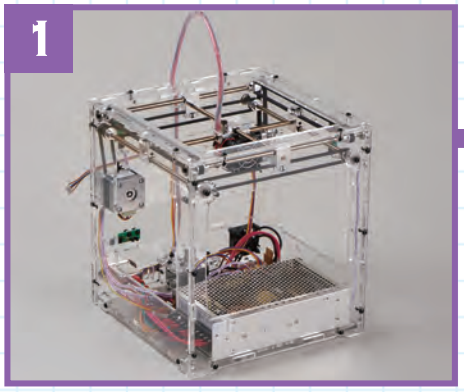
**1:** Linear bush x 1
**2:** M3 cap bolts (15mm) x 4
**3:** M3 spring washers x 4
**4:** M3 flat washers x 4
**5:** M3 nuts x 4
**6:** Allen key (50 x 2.5mm)

## You will need

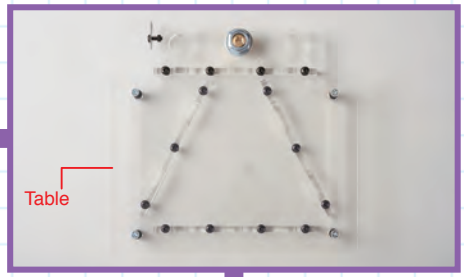
Phillips screwdriver size 1
Allen key (50 x 2.5mm)
PVA glue

## Parts to have ready

**1**



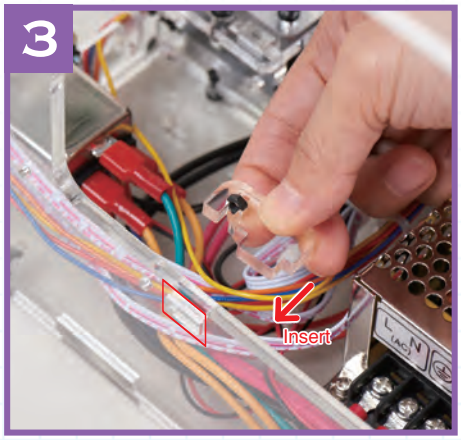
You will need the housing and the table that you last worked on in Stage 11. Also the two truss head screws, washers, nuts and brackets from Stage 43. Peel the protective coverings off both sides of the brackets.



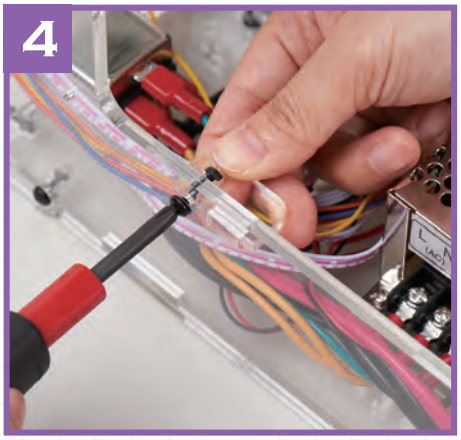
**2**

Put an M3 flat washer on each of the 14mm M3 truss head screws. And put a nut into each of the nut slots in the brackets. You can, if you wish, fix the nuts in place with a drop of PVA glue to stop them falling out.

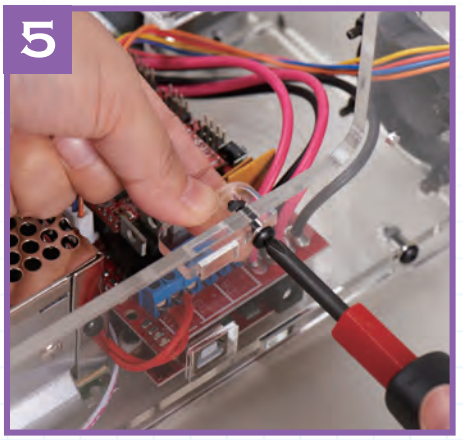
## Attach the brackets to the left and right surfaces of the housing




Insert the tab of one of the brackets into the slot (outlined in red) in the left of the housing as shown above.

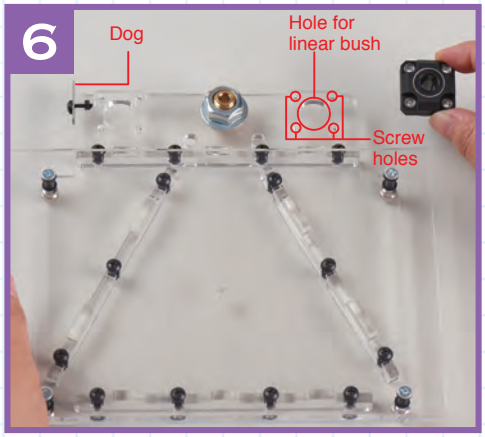



Screw the 14mm truss head screw (with washer) into the nut as shown, and tighten it with a size 1 Phillips screwdriver.




Repeat the process for the other bracket on the right of the housing.

## Attach the linear bush to the table base

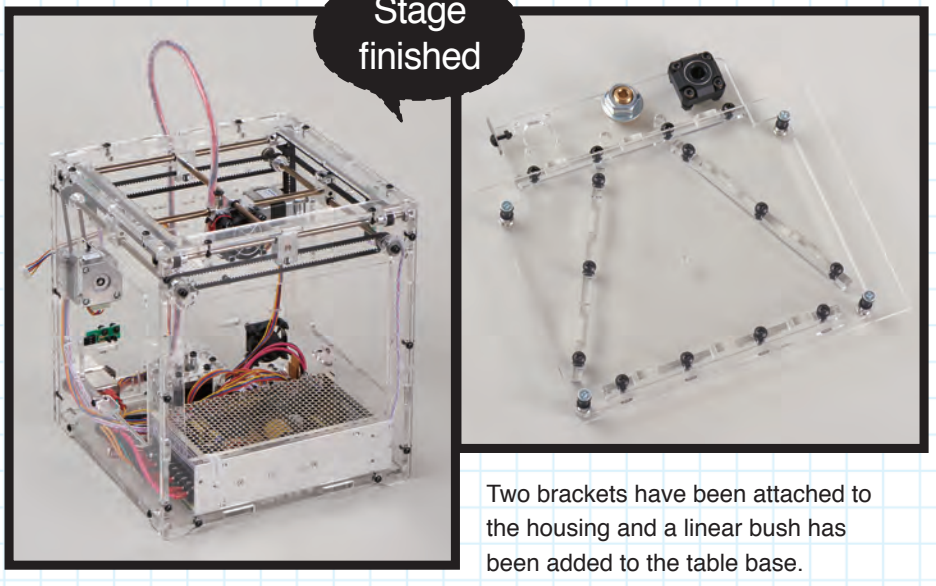



With the dog (protective metal plate) at the top left, locate the circular hole surrounded by four screw holes in the table base where the linear bush is to be attached.

Put the shaft of the bush through the hole and put a 15mm M3 cap bolt through each of the screw holes (ringed in red) in the bush. Hold the bolts in position and turn the table over.

Put an M3 flat washer, then an M3 spring washer over the shafts of each of the bolts and then screw an M3 nut onto each bolt with your fingers.

Turn the table again and, holding the nuts with your fingers, tighten each of the cap head bolts with the 50 x 2.5mm Allen key.

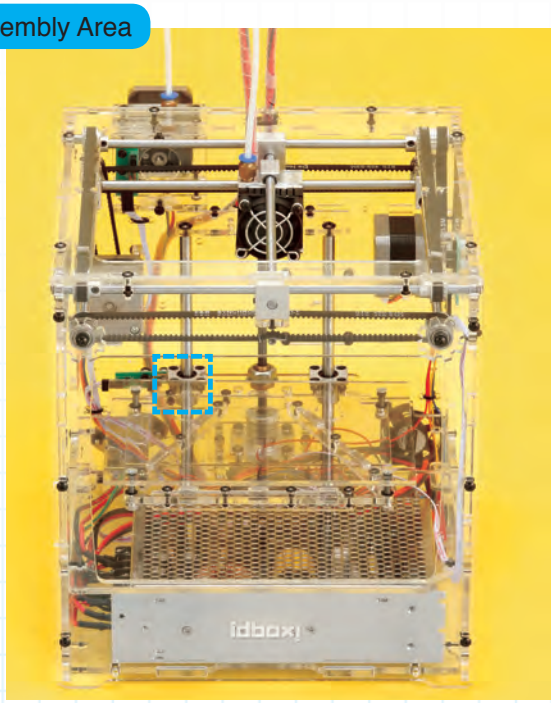



Two brackets have been attached to the housing and a linear bush has been added to the table base.

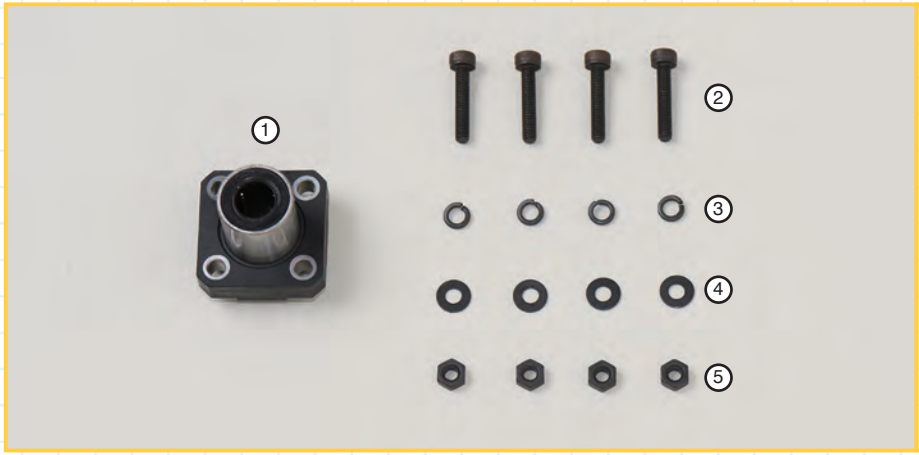
# Stage 45: Add a second linear bush to the table

This assembly is much the same as part of that in the previous stage (Stage 44), where you added a linear bush to the table base, fastening it in place with four cap head bolts. Remember to make sure the bush is the right way up in its hole in the table.

Stage 45 Assembly Area



In this stage, the linear bush is put through a hole in the top left of the table, before being secured in place with the four cap head bolts supplied with this stage. Remember that when putting the washers onto the shaft of a bolt, the M3 flat washer goes on *before* the spring washer. The spring washer is followed by the nut. When you have secured the bush with the nuts, tighten the bolts using the 50 x 2.5mm Allen key supplied with Stage 44. Lastly, check and adjust the alignment of the metal dog, which is next to the newly-added linear bush.




## Stage 45 Components

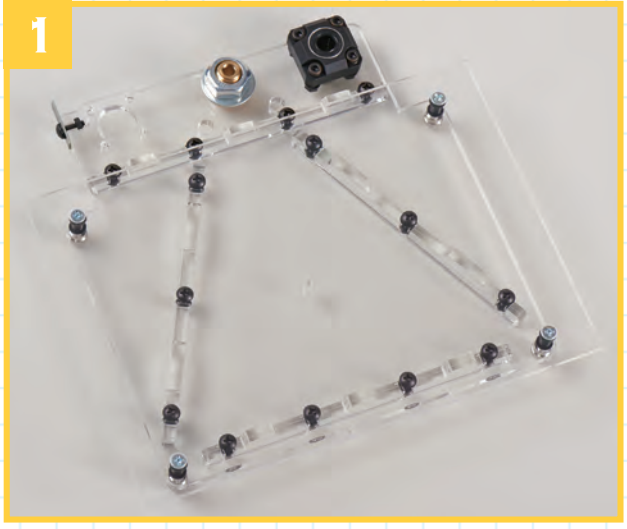
**1:** Linear bush x 1
**2:** M3 cap bolts (15mm) x 4
**3:** M3 spring washers x 4
**4:** M3 flat washers x 4
**5:** M3 nuts x 4

## You will need

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

## Parts to have ready

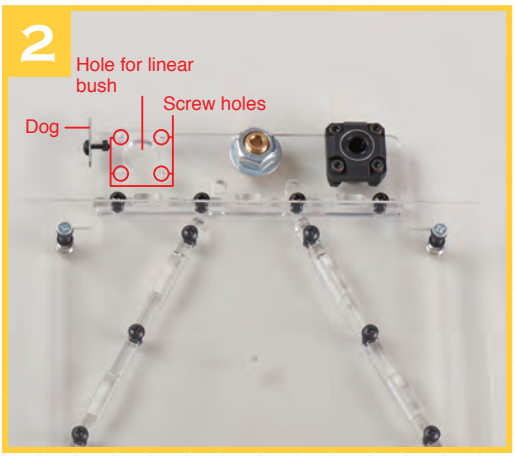
1



Get ready the table you worked on in Stage 44.

## Attach the linear bush to the table base

2




With the dog at the top left, locate the circular hole surrounded by four screw holes at the top left of the table base where the second linear bush is to be added.

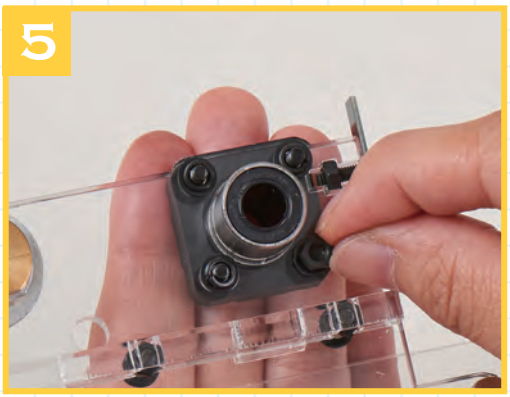
3

Put the shaft of the bush through the hole and put a 15mm M3 cap bolt through each of the screw holes (ringed in red) in the bush.

4

Hold the bolts in position and turn the table over. Put an M3 flat washer and then an M3 spring washer over the shafts of each of the bolts.

5



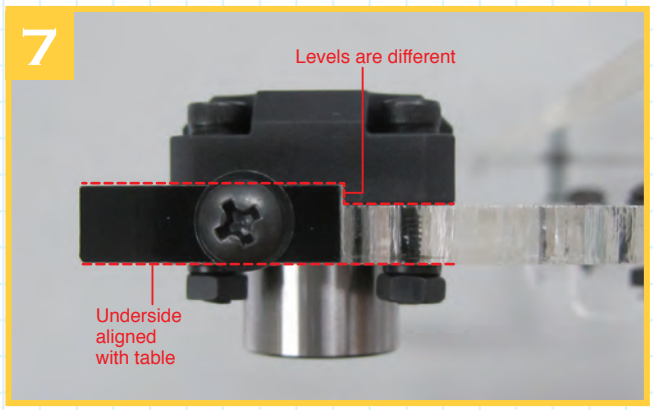
After you've put the washers onto each bolt, screw an M3 nut onto each of the four bolts with your fingers.

6

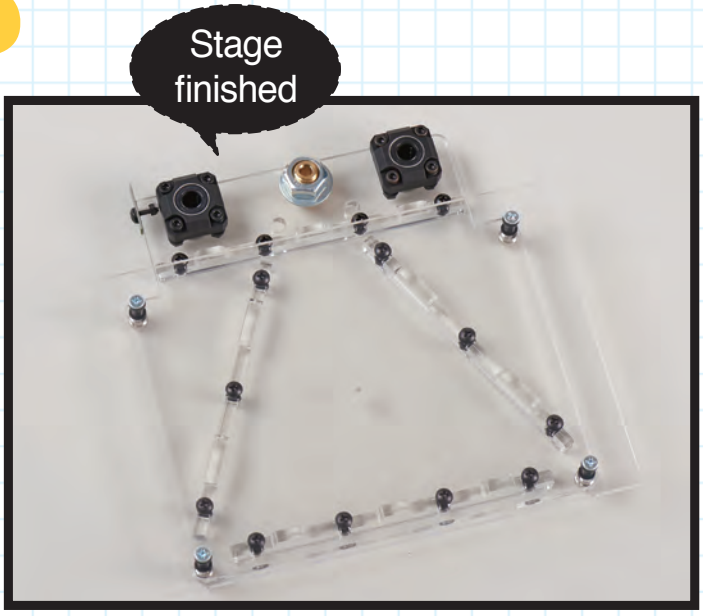
Turn the table and, holding each of the nuts with your fingers, tighten the cap head bolts in turn with the 50 x 2.5mm Allen key.

## Adjust the position of the dog

7




Because it is difficult to adjust the dog after the table has been assembled into the housing, now is the time to check its alignment. Ensure that the underside is aligned with the table (as shown above) and tighten the screw to secure it in position.




The second linear bush has been added to the table. Put the table somewhere safe until it is time to add it to the housing.

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