

THE NEXT GENERATION
OF 3D PRINTING
IS HERE

LCHR USER MANUAL



DISPOSAL INSTRUCTIONS

Do not throw this electronic device into the waste when discarding. To minimize pollution and ensure utmost protection of the global environment, please recycle or return to Photocentric for recycling.

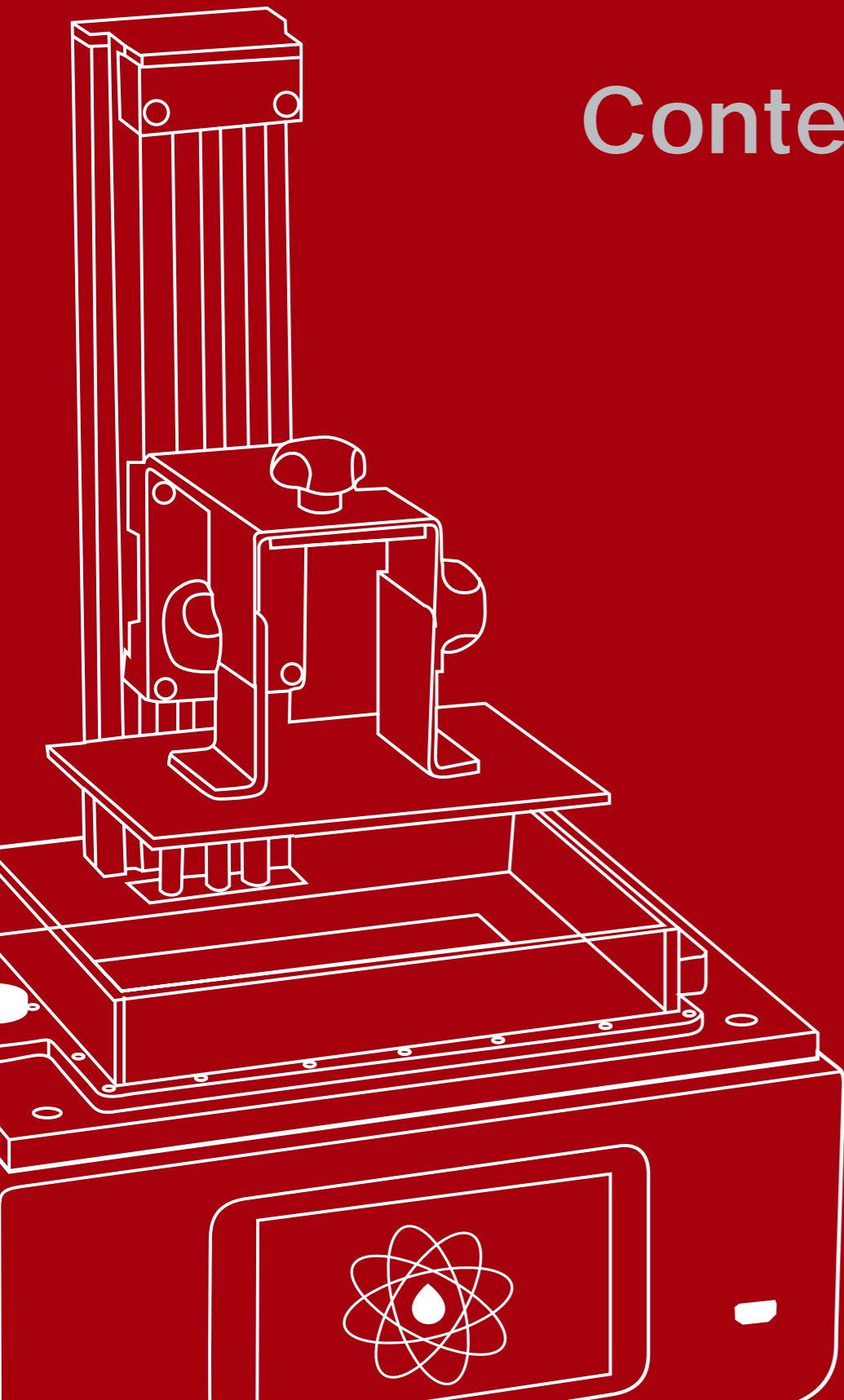
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Liquid Crystal
HR

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EU DECLARATION OF CONFORMITY

LIQUID CRYSTAL 3D-PRINTER

Model: LC HR

We hereby declare that the product above is in compliance with the essential requirements of the following:

Low Voltage (LV) Directive 2009/95/EC, 2014/35EU. Electromagnetic Compatibility Directive(EMC), 2004/108/EC,2014/30/EU.

Restriction of the use of certain hazardous substances (RoHS) Directive, 2011/65/EU Commission Regulation (EU) No. 453/2010 and IEC 60950-1 Safety of ITE

Technical Documentation is stored at the manufacturer's address below.

Date of Issue: 02. December 2016

Place of Issue: Peterborough

Amanda Keating
Director

Manufacturer
Photocentric Ltd
Cambridge House, Oxney Road
Peterborough, PE1 5YW, UK
Year of CE Marking: 2016



USER MANUAL

NEW DAYLIGHT TECHNOLOGY HIGH RESOLUTION 3D PRINTER



Congratulations!

You have just purchased a new type of 3D printer using Daylight Polymer Printing (DPP) technology. This is a patent applied-for method of image creation that hardens liquid with the normal visible light emitted from an LCD screen. This revolutionary system is a new method of Additive Manufacturing that uses the same intensity and part of the spectrum that we use to see. This is the energy providing source that initiates the free radical or cationic polymerisation necessary to change the liquid photopolymer resin into your hardened object. The light emitted from the screen is not modified and the images are safe for viewing.

These are some of the advantages of DPP technology:

- i) Low cost- We use high resolution low cost LCD screens that are widely available in monitors, tablets, mobile phones and televisions. These provide phenomenal value for money, which we pass onto you.*
- ii) Reliable- Because we don't modify the back light the screens are used normally and have a long life expectancy.*
- iii) Very large scale- The screen lights every pixel, it is like a light projector which in turn exposes every voxel, so you can create large areas of custom product*

simultaneously. As the format grows this makes it much more efficient than all alternative means.

- iv) Very low energy usage- It uses the amount of electricity to run a tablet, this is an order of magnitude lower than that required to operate a laser or a digital light projector.*
- v) Low adhesion at the build interface- the heat created by the screen is very low and the small amount of initiation energy in the polymerisation creates very little attraction to the vat film.*
- vi) Limited over-exposure- Using this low intensity visible light, the energy is dissipated very quickly, it either strikes a photoinitiator and creates a free radical or it loses all the energy hitting solid material, so there is very limited ability to over-expose and create solid parts where you don't want them.*



SAFETY INFORMATION

Read the instructions carefully. Keep this document for future reference. Follow all warnings and instructions marked on the product. Observe the following guidelines when connecting and disconnecting power to the external power supply unit:

- Install the power supply unit before connecting the power cord to the AC power outlet.
- Unplug the power cord before removing the power supply unit from the printer.
- Operate on a table or flat, stable surface, ensuring that the machine cannot fall and is level.
- Do not operate outdoors.
- Do not allow resin or any liquids to get inside the chassis, wipe up any liquid spills immediately.
- Do not use solvents to clean the printer as they may damage the screen. Use a little detergent and warm water to clean any resin spills.
- Disconnect the printer from AC before storage or when not used for a long period of time. This 3D printer is connected to the electrical network with an input of 110 or 240 V AC, 50/60 Hz, and has an operational voltage of 12 V.
- Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord.
- If an extension cord is used with this product, make sure that the total ampere rating of the equipment plugged into the extension cord does not exceed the extension cord ampere rating. Also, make sure that the total rating of all products plugged into the wall outlet does not exceed the fuse rating.
- Use the product only with the supplied power supply cord set. If you need to replace the power cord set, make sure that the new power cord meets the following requirements: detachable type, UL listed/CSA certified, VDE approved or its equivalent, 4.5 meters (15 feet) maximum
- In case of malfunction, disconnect the printer immediately from network.
- Do not attempt to fix this product by yourself, as opening or removing covers may expose

you to dangerous voltage points or other risks. Refer all repairs to qualified service personnel. Please send an email to your national supplier or contact technical service at: info@photocentric3d.com

Unplug this product from the wall outlet and refer servicing to a qualified service personnel if:

- The power cord or plug is damaged, cut or frayed.
- Liquid has been spilled in the machine.
- The machine was exposed to rain or water.
- The machine has been dropped or the case has been damaged.
- The machine does not operate normally after following the operating instructions.

DISPOSAL INSTRUCTIONS

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SAFETY GUIDELINES



IRRITANT

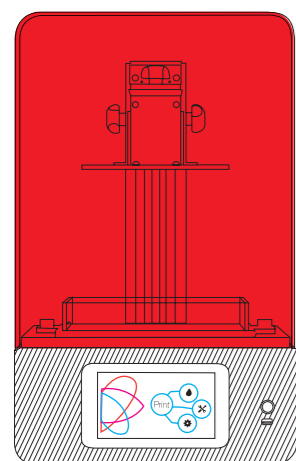
- Keep the printer and resins out of the reach of children.
- The resin is an irritant to skin and eyes. Always wear gloves when coming into contact with the liquid resin. Always use in a well ventilated room.
- Resins are classified as irritants, not harmful, but in exceptional circumstances people can be sensitive to the resin and develop a skin irritation or rash. Avoid this possibility by always wearing gloves and avoid breathing fumes.
- The printer should be operated on a stable and level surface, preferably away from direct ambient light.

Please note that the latest instructions will always be available from:

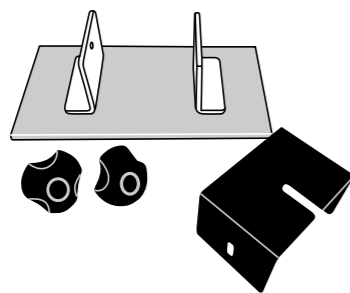
www.photocentric3d.com/support

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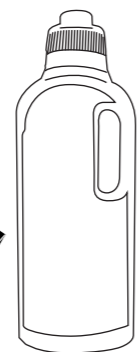
The box contains



Liquid Crystal HR 3D Printer with red hood



Platform



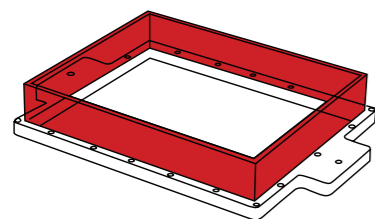
250g of Hard Red resin



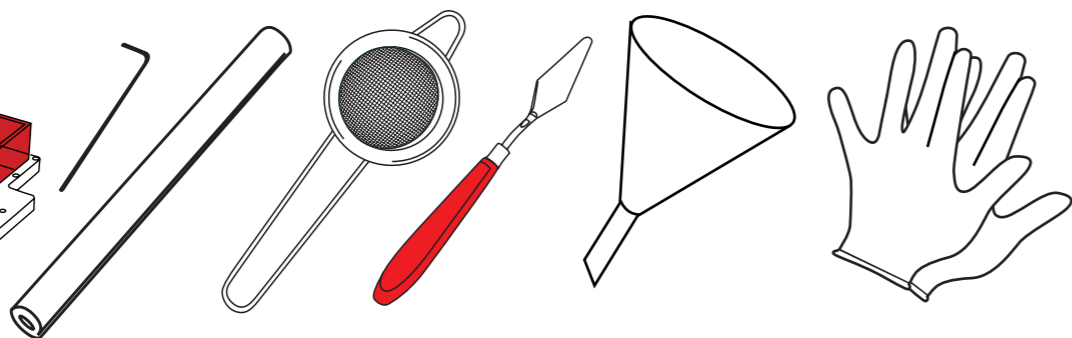
Power supply for the printer



WiFi Dongle



Vat ready to use



Allen key, vat film 2 sheets, strainer, small spatula, funnel, gloves

MINIMUM COMPUTER REQUIREMENTS

- 1.2 GHz processor or above.
- Windows
- 2 GB RAM memory or above.

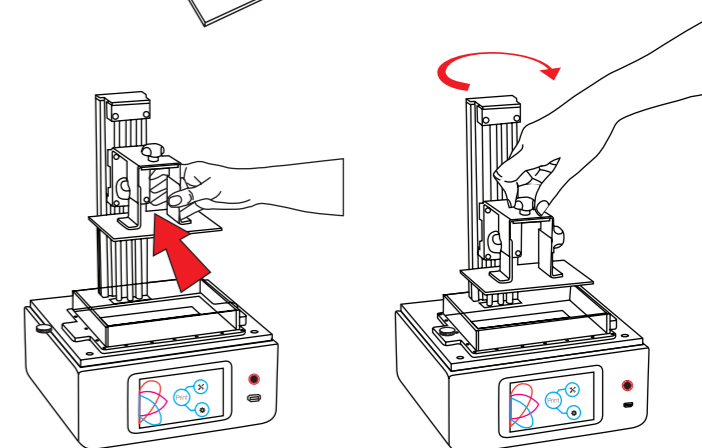
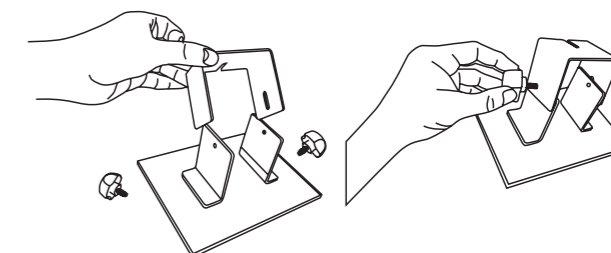
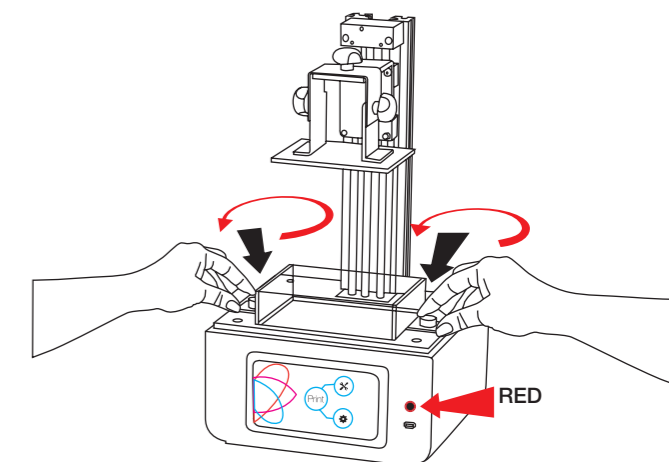
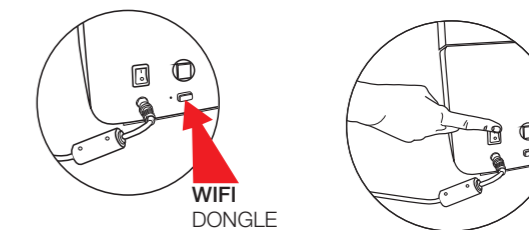
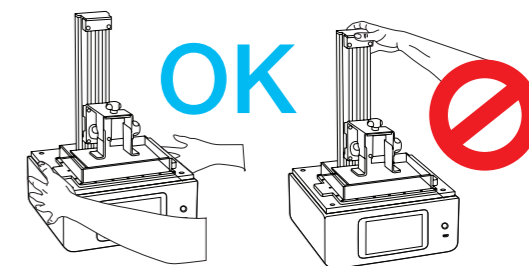
RECOMMENDED ITEMS

- Extra gloves.
- Paper towels.
- Access to a sink with hot water to clean the object.
- Liquid soap (detergent) to clean the object.
- Soft brush or sponge to clean the object.
- Glass or clear plastic container to post expose the object in.
- Ultrasonic cleaner (Optional)

1. INSTALLATION & ASSEMBLY INSTRUCTIONS

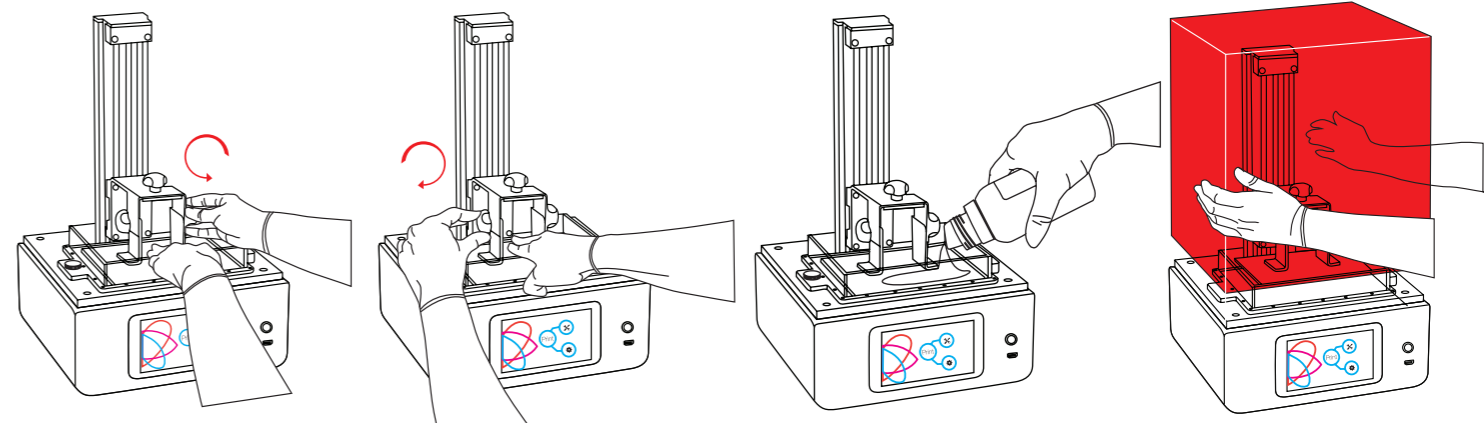
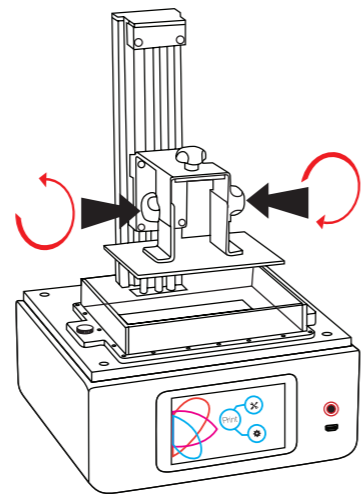
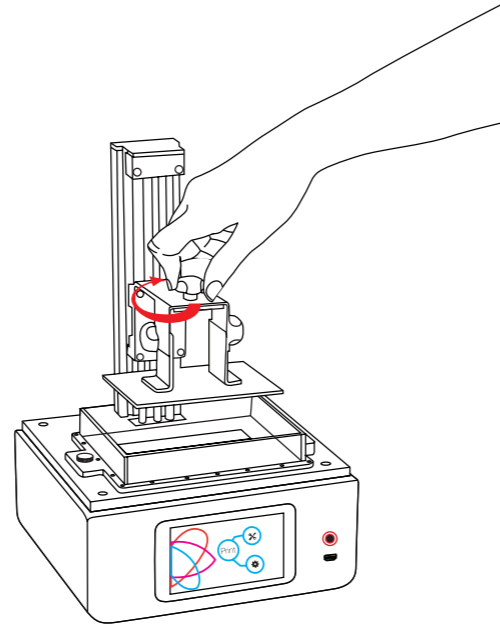
ASSEMBLY INSTRUCTIONS

1. Open the box and carefully remove the printer. Do not pull the printer out by the linear drive/z-axis.
2. Place the printer in the work area and screw in the 4 feet supplied in the ancillary box. Make sure it is level.
3. Connect the USB wifi dongle supplied in the back of the printer.
4. Connect the B end of the power supply cable to the power supply and insert into the back of the printer. Turn the printer on using the rocker switch located at the back of the printer. The touchscreen at the front will turn on. The screen will start making a system check and the welcome screen will appear a few seconds later.
5. Assemble the platform from the ancillary box by placing the black U bracket over the outside of the L brackets. Slide it onto the printer arm and tighten the top knob only, leave the two side knobs loose.
6. If you are experiencing difficulties setting up your printer please visit our website: www.photocentric3d.com/support.



2. THE HOMING PROCEDURE

Loosen the two side bolts and the central one on the print platform. From the front screen press 'Maintain' and then 'Home z-axis' button on the front panel to lower the platform. Note that the platform will not move until the hood is placed on the printer. Align the glass platform to fit the screen and tighten the central bolt. Wearing gloves press down hard in the middle of the glass and then tighten both side bolts on the platform one after the other. Press '+10', and the platform will lift 10mm, pour the amount of resin you need into the vat, then press '-10' to return it to the screen and you are homed!



NOTE: You can check the screen is working by pressing the "Show calibration" button located in the "Maintain" tab and a red grid will appear.

NOTE: If you have an object that is 100 cm³ then it will use 115g of resin. Always overfill by at least 20% to ensure consistent resin flow. For most prints, filling the vat to 1/3 full is more than enough. Place the hood back on the printer.

NOTE: Don't remove the hood during the operation or the print will stop.



3. STARTING A TEST PRINT

STARTING A PRE-SLICED FILE FROM THE TOUCHSCREEN

Now you have set up your printer lets make your very first print! Your LCHR has been shipped with a default test print pre-loaded. For your first print use this print and the sample resin supplied with your printer.

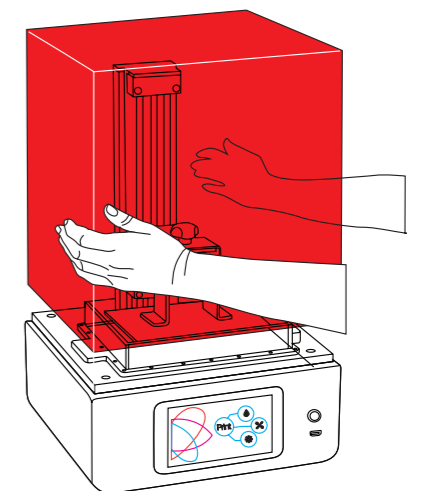
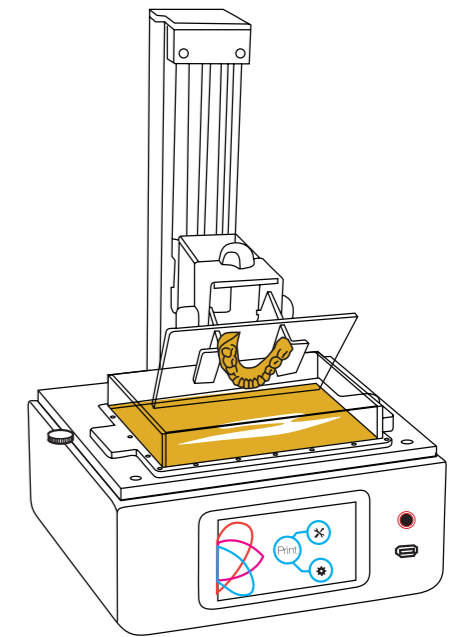


1. Home it with the resin supplied.
2. On the homepage, press the "Print" button, which will display the following screen.
2. Click the test file Ring.cws to highlight it and press "Print!". The print will then start.

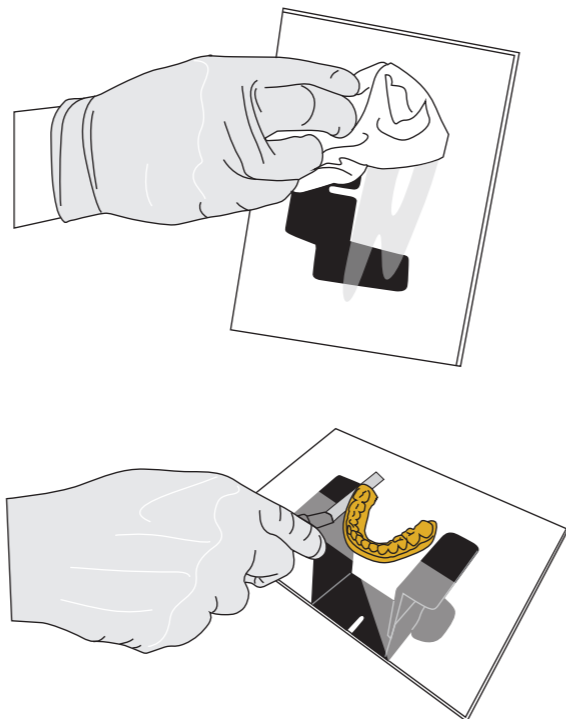


4. WASHING

1. When your print has finished, press the '+50' button and the platform will rise to above the level of the vat. Remove the hood and loosen the two side bolts, tilt the platform slightly to allow the resin to drip off. Put the hood back on and leave to drain for a few minutes.
2. Remove the hood again and with absorbent paper under it, remove the platform completely and set it down on the paper. Place the hood back on to protect the resin in the vat from light.



3. Gently remove any excess polymer with paper first. Place the platform in a washing-up bowl and remove the objects by sliding the scraper in at the base. Wash off any liquid polymer by running hot water over it. You can gently clean it with a soft brush or sponge and liquid detergent. Take care not to damage it, it will not achieve full hardness until after post exposing in light. An ultrasonic cleaner is useful to clean delicate objects.



5. HARDENING

1. When completely clean, place it underwater in light (UV, sunlight or a table light) for a least 30 minutes to remove the surface tack. The part will only have around 1/4 of its final strength before post-exposure and strength increases slowly with more light. Full strength is achieved with 30 mins in a UV unit, or 60 mins under a normal 60W table lamp. Then remove from water and dry.



30 mins post exposure

60 mins post exposure



60 mins post exposure

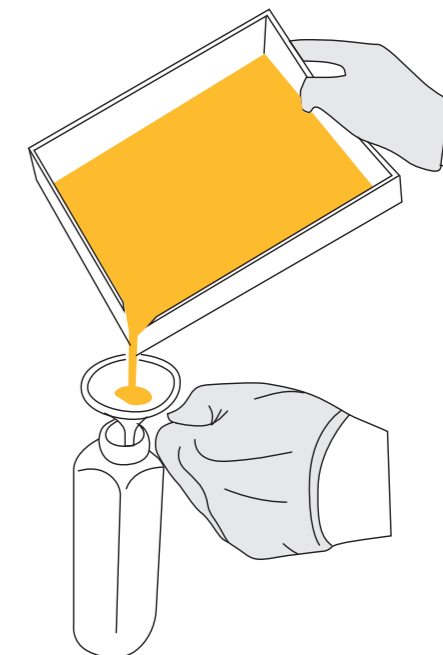


6. PREPARING FOR THE NEXT PRINT

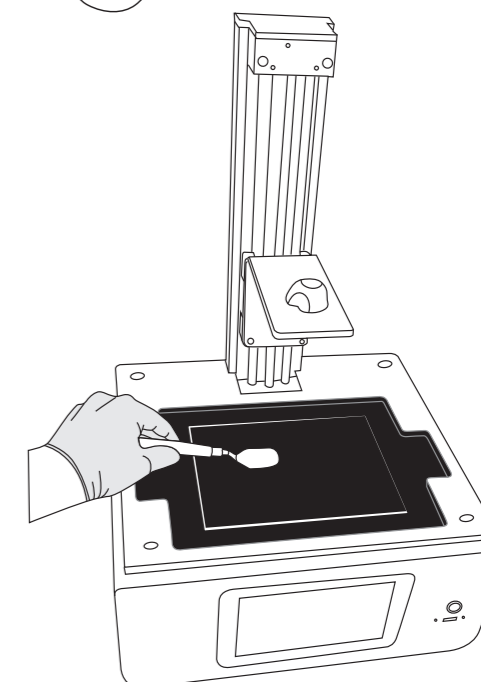
1. Chip off any cured resin and clean the build platform with hot water and liquid detergent. Dry it thoroughly before inserting it back into the printer.



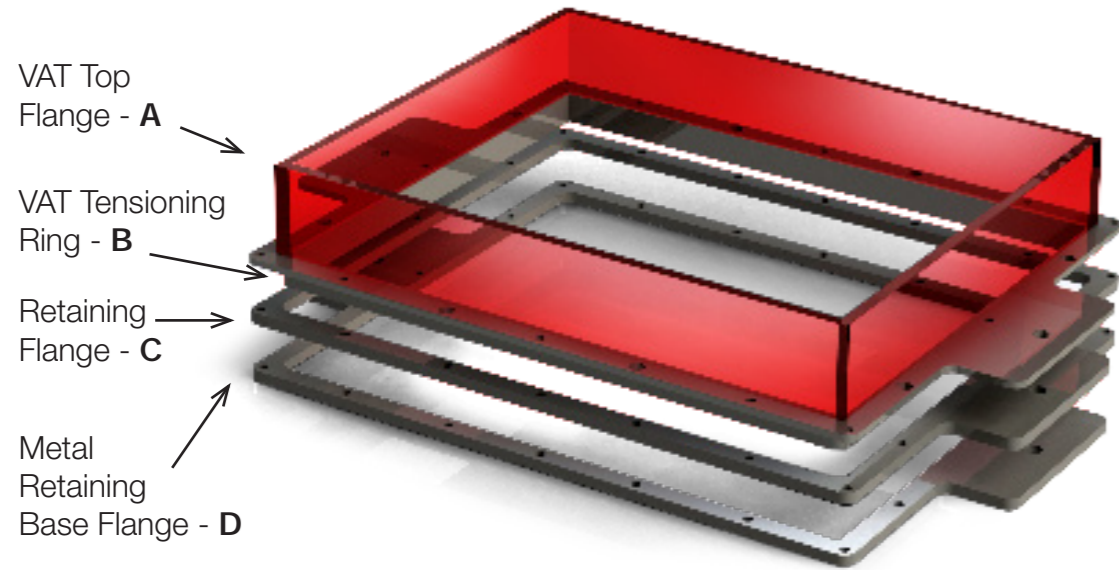
2. Empty the vat and clean it after every print in case you have any solid pieces on the bottom as these would prevent the platform from homing correctly. Loosen the thumb screws and remove the vat from the printer; pour the resin back into the bottle through the filter paper into the funnel provided.



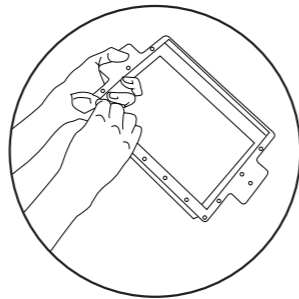
3. If you have a leak on the screen mop up the liquid resin immediately using absorbent paper. Hardened resin can be removed by chipping off with a credit card or plastic scraper. Metal scrapers should only be used with extreme care to avoid scratching the screen.



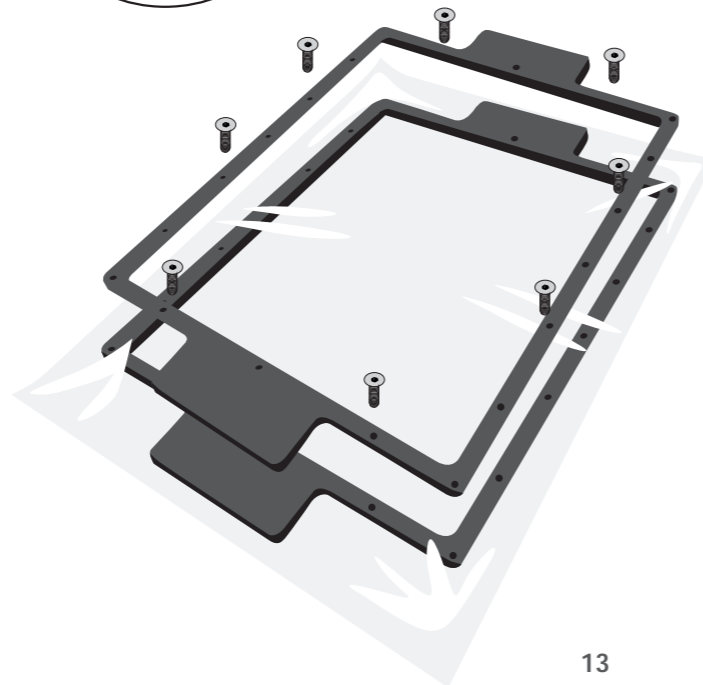
7. RE-SKINNING THE VAT



1. Remove all the retaining bolts from the vat.
2. Dispose of the vat film. Wipe the vat clean and wash all parts with soap and water.
3. Place the "Vat Base Flange D flat on a table" with the brass inserts pointing down.
4. Check the new vat film isn't pierced or dented and lay it on top of the "Vat Base Flange D".
5. Place the "Vat Retaining Flange C" on top of the film, aligning the holes with the corresponding ones on the "Base Flange D".
6. Loosely insert the 8 x M3 8mm bolts as shown.

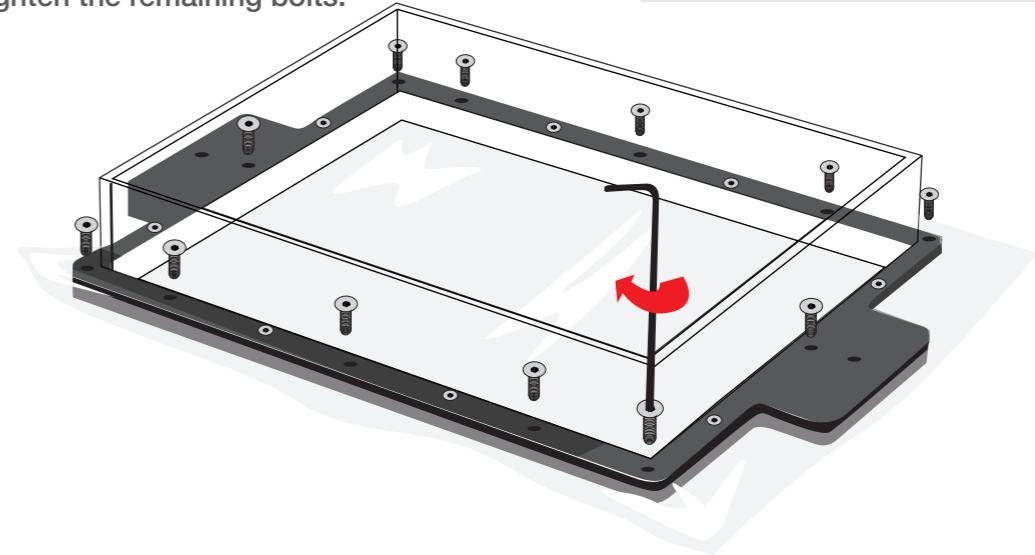


Important:
Clean all the parts before reassembly

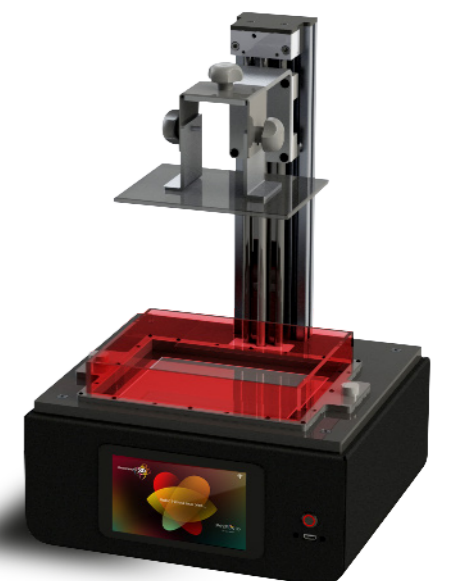
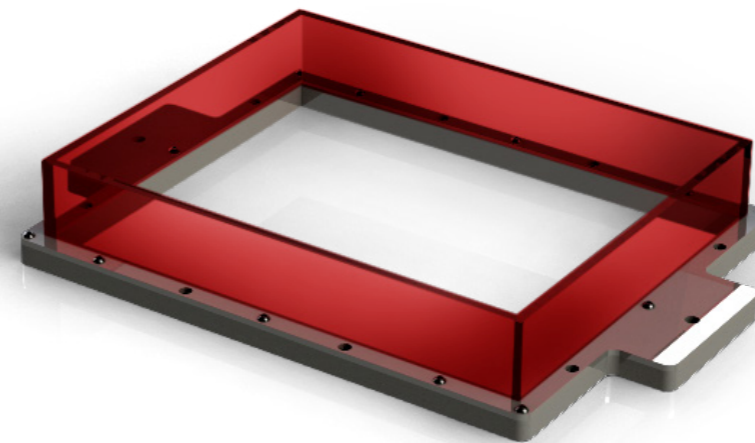


7. Place the main vat tray over the film and gently press down. Screw the four corners first loosley. Tighten the M3 bolts which were inserted in step 6. Tighten the four corner bolts, insert and tighten the remaining bolts.

Note: Do not fully tighten each bolt individually. This will cause the Main Vat to tension at an angle. Aim to half tighten the bolts and fully tighten once all the bolts are secured.



8. The vat should now be tensioned. Trim excess edges off the film.
9. Fill with water and leave on absorbent paper to check for leaks. Drain and dry with paper towel before use.



8. CREATION WORKSHOP INSTALLATION INSTRUCTIONS

8.1 INSTALL CREATION WORKSHOP

1. Go to www.photocentric3d.com and download Creation Workshop in "support". The latest version of this is always online.

2. Execute the Creation Workshop software by double clicking on "CreationWorkshop.exe". If the software requires a license number insert the license number supplied. If you experience difficulties visit our website www.photocentric3d.com, and click on "support".

Note: You will need to connect to the internet within 30 days of using your license otherwise the license will deactivate. Then going forward the codes will need to be recognized online every 30 days after the first activation to validate and update the software.

MINIMUM COMPUTER REQUIREMENTS

- Dual Core processor or above
- Windows
- Software NOT compatible with MAC and Linux
- 2 GB RAM memory or above

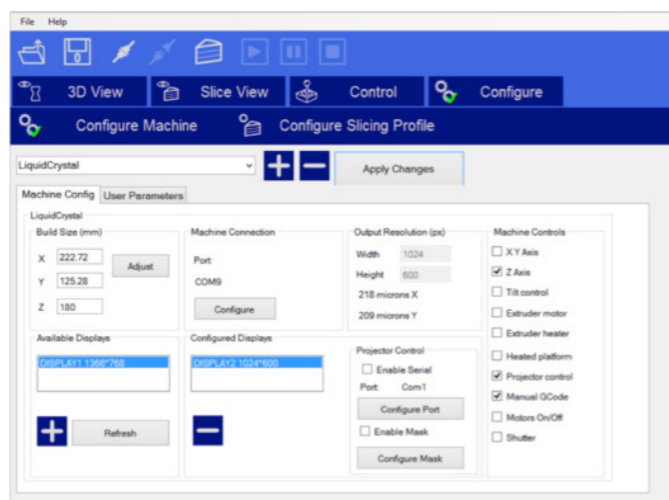
8.2 QUICKSTART CREATION WORKSHOP

In this chapter we will learn how to prepare our 3D parts for printing.


1. Switch on your computer and Open Creation Workshop.exe. Now, load your object (STL, OBJ or AMF).

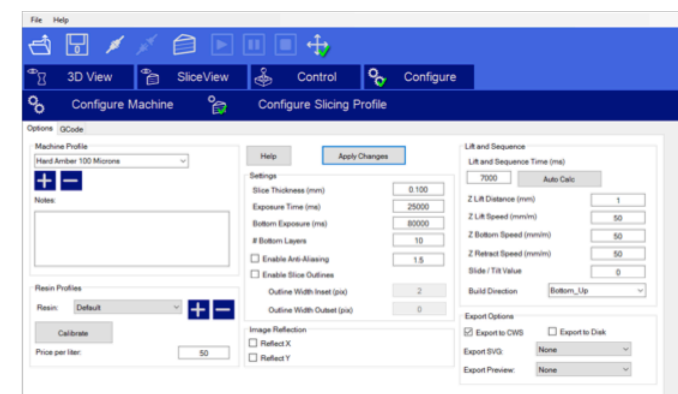
2. With the object loaded and located in the build area check the settings of the printing profile. Go to the "Configure" screen and open the "Configure Slicing Profile" tab. Select the printing profile from the "Machine Profiles" list that matches your resin and desired resolution for example "LCHR Hard Amber 100 Microns large objects".

3. If you find your object to be slightly overexposed then simply reduce the exposure time. Always click "Apply Changes" to save if you had to change any values. If you don't click this your data will not be re-set.



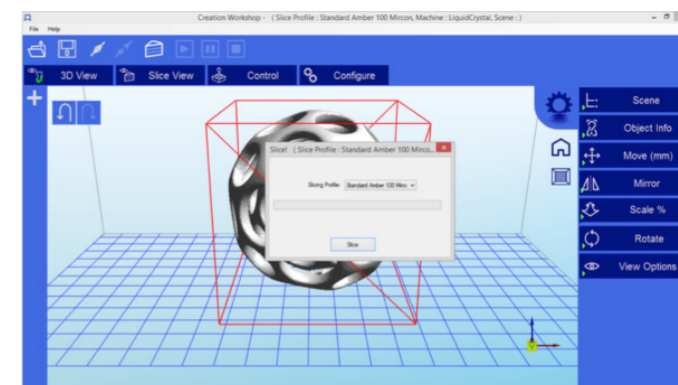
The screen should look like this, make sure "Export to CWS" is ticked:

4. Now click "3D View" and check that the object is correctly placed inside the printing area. Make sure the file is saved with the  button before you start slicing. Name your file and choose an appropriate location for it. Saving directly to a usb can sometimes slow down the slicing process, it is better to save it to a location on your pc. **When saving, make sure you save the file type as a scene file (*.cws) and that these symbols are not included in the name of the .cws file;**




Tilde (~), Number sign (#), Percent (%), Ampersand (&), Asterisk (*), Braces { }, Backslash (\), Colon (:), Angle brackets (< >), Question mark (?), Slash (/), Plus sign (+), Pipe (|), Quotation mark (").

5. Press the  slice button to start the slicing operation. A confirmation window will show.



Always re-click the "Slice" button if you adjust the file in any way.

6. Now check the "Slice View" screen to check that the first layer of every object is in contact with the build base. If it is above the build platform it will not adhere. If you click on the view box located in the bottom left corner you can scroll forward through the slicing views using the slider bar and check that the object is always inside the build area. Make sure that your objects are 2 squares  inside the edge of the build area shown.

See page 22 for detailed Creation Workshop instructions.

9 SENDING PRINTABLE FILE TO THE PRINTER

Now you have your printer installed and configured. There are 2 ways to start a print:

1. **Save to USB** Save the file as .cws or .zip format on a USB stick and insert it in the front socket. Then wait for 10 seconds and press Print to refresh and the printable files will show on the screen. Select your file and press 'Print'.
2. **Print from your web browser on your PC.** These instructions are described below.

Please read these software instructions to help you start printing.



9.1. SETTING UP A NETWORK CONNECTION

The LCHR supports two different types of network connection: Ethernet and WiFi. To set up ethernet, simply plug the ethernet cable into the back of the printer and connect it to your router.

Steps to set-up Wifi:

1. Power on the printer with the rocker switch at the back of the printer.
2. Click "Settings" on the touchscreen on the front of the printer.
3. Once booted click "Wifi Settings".
4. Wait until your desired Wifi network shows.



5. Select the desired network and press the button "Setup Network".

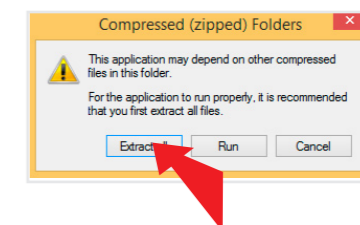
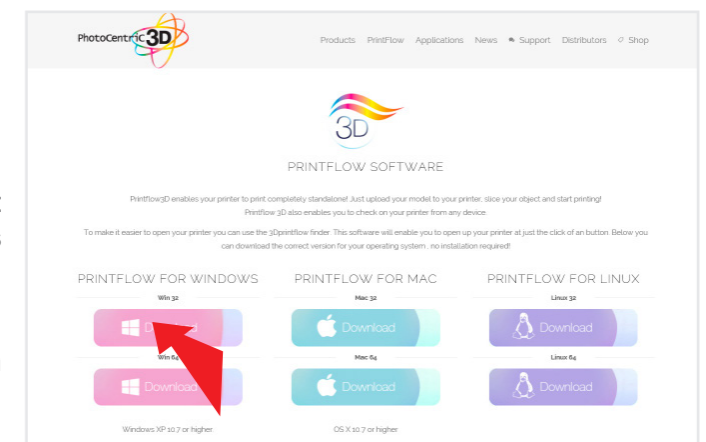


6. Enter your Wifi Password and press "Accept".
7. Finish by pressing "Save".
8. Press "Home" to get back to the main screen.



9.2 STARTING A PRINTER FROM A BROWSER.

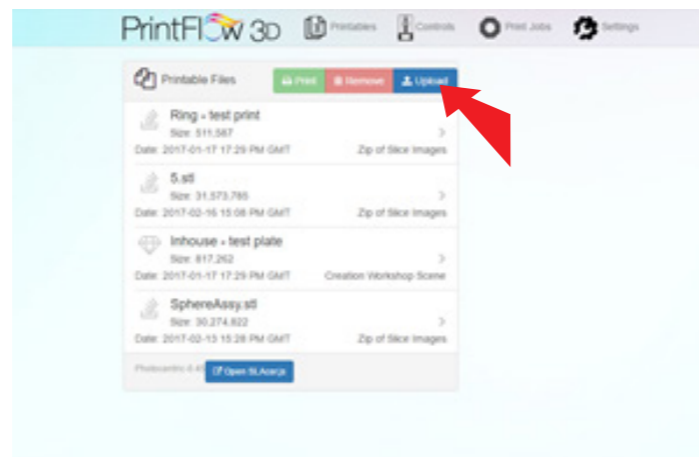
1. Make sure your printer is turned on and connected to a network. If the LED at the front button is illuminated then the printing screen is turned on.
2. Download the desktop software called "Printflow3D_opener" for your operating system from www.photocentric3d.com/printflow.
3. Move the Printflow3D_opener.exe onto your desktop, double click and start the software.



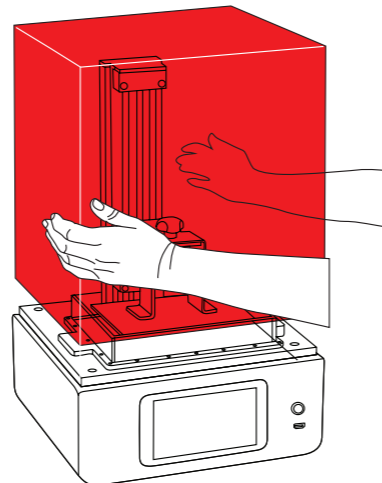
- When your printer has been found successfully, it should open up the following window.



- Click "Upload" and select your .CWS file created with Creation Workshop software (see page 11 for Creation Workshop instructions); your window should look like this.



- Consult the section 2 the homing procedure to home your printer.



- Go back to the tab "Home" and then press "Print". This will cause the software to start the print.

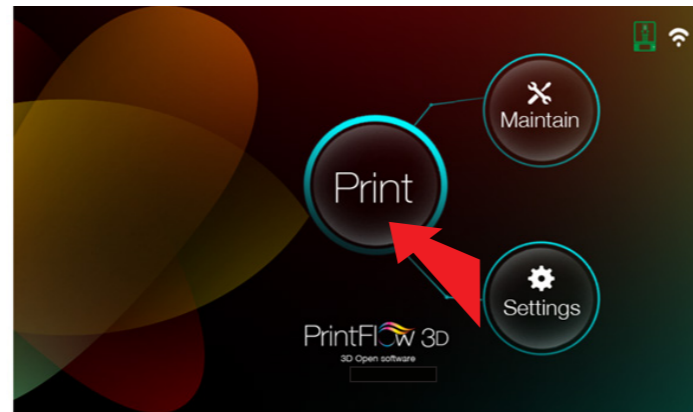


9.3 STARTING A PRINT FROM THE TOUCHSCREEN

To start a print from a touchscreen you can either use print files already loaded on the printer or you can upload presliced .CWS files from a USB stick. To upload files from the USB stick, simply insert the USB in the front of the printer, go to the homepage and wait. After a few seconds, press the Print button and all of the files should be uploaded to the printables and be available to print.

9.4 REMOVE A FILE FROM THE TOUCHSCREEN

1. From the home page press "Print".



2. Select the printable you want to remove and click the red button with the X on the right.

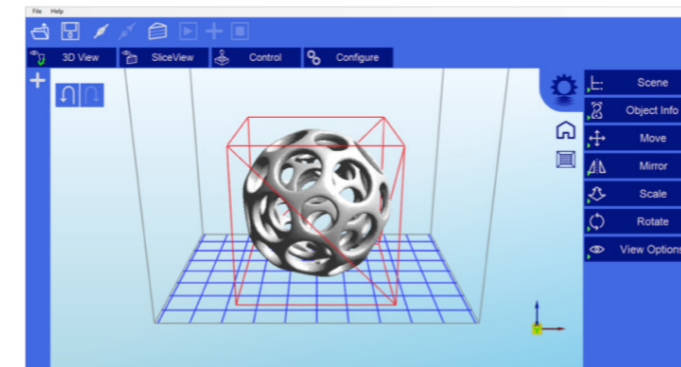


3. Click "Yes" to delete the file.



10. DETAILED CREATION WORKSHOP SOFTWARE INSTRUCTIONS

Main screen



Click to open files in one of the following formats: .STL, .OBJ, .3DS or .AMF. You can also open scene files with the .CWS extension.

Click to save the current object as a .STL or .CWS file. The .CWS format allows you to prepare a scene to be printed repeatedly in the future, together with supports and positioning.

Click to start the connection between your computer and your Liquid Crystal 3d printer. Once the button is grayed out, this means that the printer is connected.

Click this button to disconnect your printer from the computer. If the button is grayed out, it means that the machine is currently disconnected.

These three buttons start, pause and stop a print. These buttons only become active once you have sliced your object.

3D View
Clicking this button allows you to view the 3D objects within their boundary box. You can add supports in this function.

Slice View
Clicking this button accesses the "Slicing" screen. You can see the individual slices that have been generated as well as the G-code.

Control
This allows you to control the z axis motor, home it and lift it after a print has finished.

Configure
This is the setup screen that allows you to configure the slicing and printing profiles.

1. Loading a Model



Click here to 'Load' your file. Multiple objects can be loaded and manipulated independently. You can also open scene files with the .CWS extension.

2. Scene View

The Scene View allows you to manipulate various aspects of the scene.

Selecting

You can select a model by double clicking on the model, or selecting it with the scene view

Removing a Model

You can remove a model by right-clicking on the name in the scene graph and selecting "Remove".

The Minus sign "-" will also remove the current model. You can also delete a model by selecting it and then pressing the "delete" key on your keyboard.

Cloning a model

You can select a model in the scene and click the "+" sign to clone it. The cloned object will appear in the scene view.

3. Object Info

This tabs provides you with information about your model

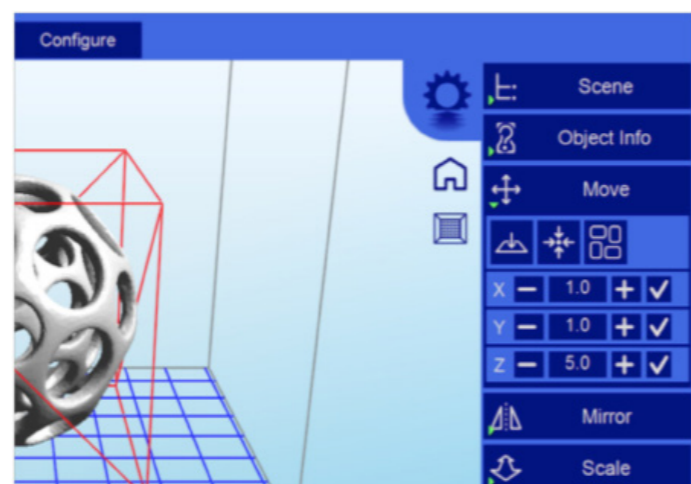
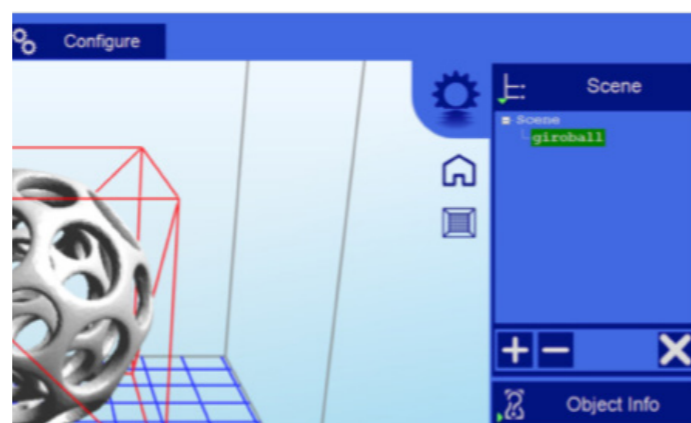
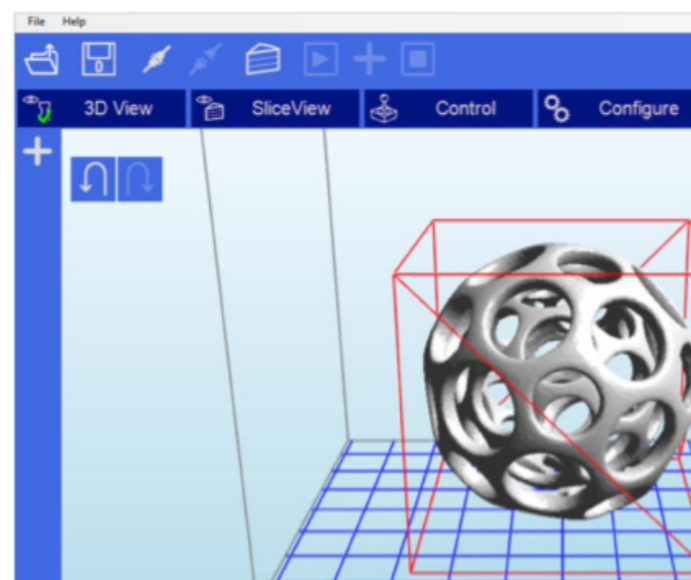
4. Move View

The Move function allows you to move objects on the build platform along the x:y:z axis by the distance entered.

From left to right, the other tools are:

The 'Place on Platform' button will position the bottom of the model to rest on the bottom of the build platform. The 'Center' button will center the model at (0,0,0).

- Auto-Arrange will automatically lay out all models to fit on the build platform. Any model that does not fit within the build platform will be moved outside the build area.



5. Mirroring Objects

The Mirror view allows you to mirror the selected object on the specified axis.

6. Scaling objects

A model can be scaled (reduced or increased) by selecting it, and using the 'Scale' view to enter in a new scaler value. Press the tick button to re-scale your object.

7. Rotating Objects

Rotating a model works in a similar way to moving a model. Simply select the model you want to work with, and use the X/Y/Z +/- buttons to rotate the model by your specified degrees.

8. View Options

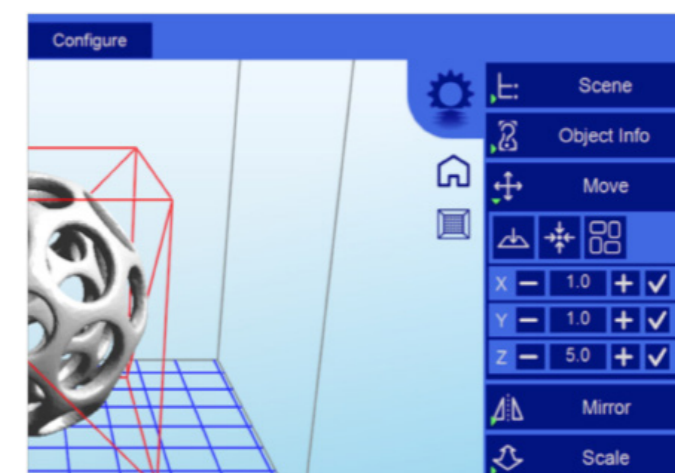
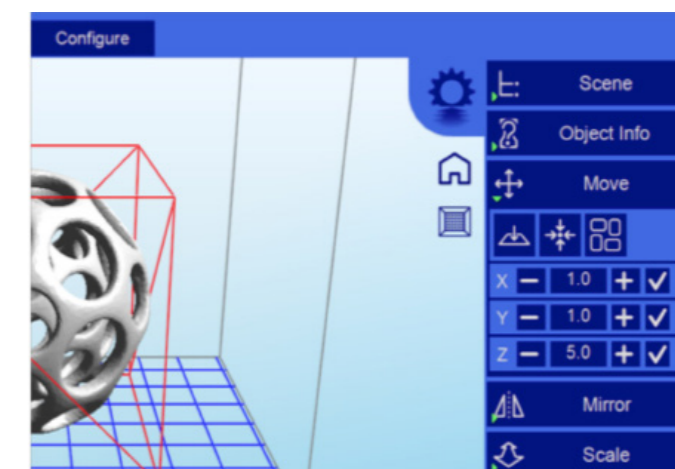
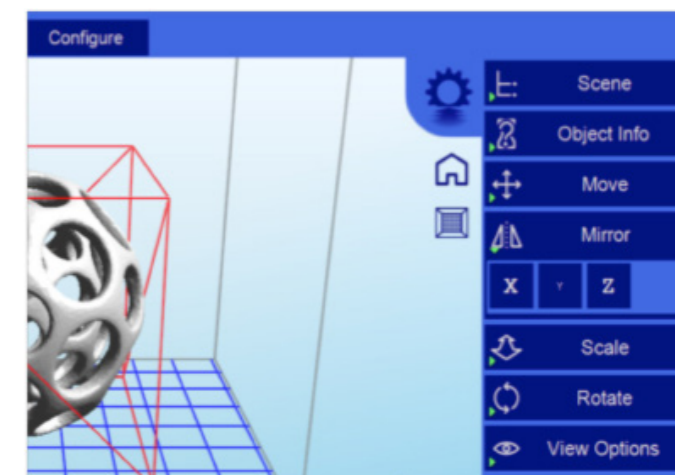
The view option allows you to manipulate various views and models.

On the top row from left to right:

- 50% Alpha-Blending toggle. This will allow you to see through the objects in the scene to see the geometry
- Show Slice Preview on Scene. After slicing this toggles on/off the view of the 3D view of the current slice layer as selected by the horizontal scrollbar.
- Show Console. This toggle button shows or hides the debug window. This window is used for debugging purposes.

On the bottom row from left to right are tools to change the way the objects appear on the screen:

- Show objects with a bounding box.
- Show objects with an outline
- Show selected objects in a different color



9. Working with Model Support tools

Using Supports

Supports are sometime required to properly attach a model to the build space. Because of the nature of DPP the lower layers must be supported by the supports unless it has a wide surface in the first layers. We recommend checking no supports pass through your object. If they do, you can delete them and manually add others if needed.

Adding a single Support

A single support can be generated by clicking the manual support button.

Moving Supports

After a manual or automatic support has been generated, individual supports can be moved around the x:y plane the same way models can be moved. Select the support by double clicking on it to select it, and hold down the 'Shift' key on your keyboard and move the mouse. Supports will automatically scale vertically under the model they support.

Angled Supports

Supports can be angled inwards towards the objects they support. This can often resolve clearance issues with vertical supports. You can turn a vertical support into an angled support by selecting it, and holding the 'Ctrl' key and clicking on the model you want to support.

Manual Configuration

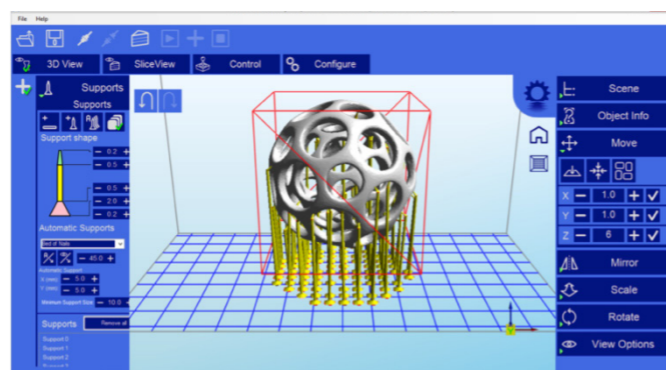
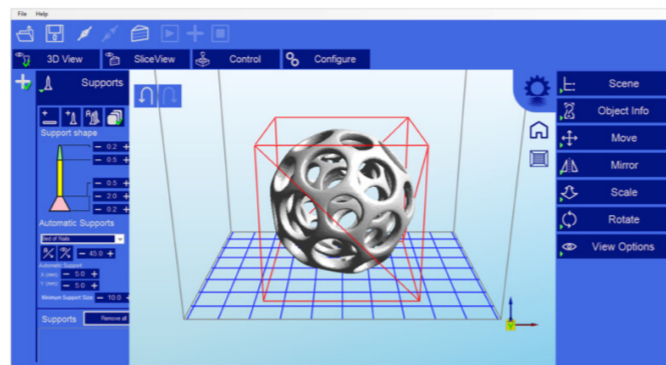
Under the Support Generation view, you can click 'show downward facing polys'. This will highlight all polygons in the model that are pointed downward by the specified degree. This helps you manually place supports under un-supported downward facing areas of a model.

Auto Support on Grid

After a model is loaded into the scene and selected, you can automatically generate a 'bed of nails' support for the model by selecting . You can specify the grid spacing and the size of the generated supports. If you wish to only generate supports on downward facing polygons, check the boxes under 'support general' and 'generate only on downward'

Adaptive supports

You can add supports to areas in the model that are unsupported. There are 2 algorithms to help you accomplish this.



10. Saving a Scene



Click to save the current object as a .STL or .CWS file. The .CWS format allows you to prepare a scene to be printed repeatedly in the future, together with supports and positioning.


After one or more models have been loaded and manipulated on the build platform, the entire scene can be saved as an STL model for later use. Simply click on the 'File->Save Scene STL' menu item to save the scene model. This will flatten all models in a scene into a single STL file. Scenes can also be saved to CWS files.. These scene files can be used to create a scene with supports, slice the scene, and later load to print your scene without the need for re-slicing.

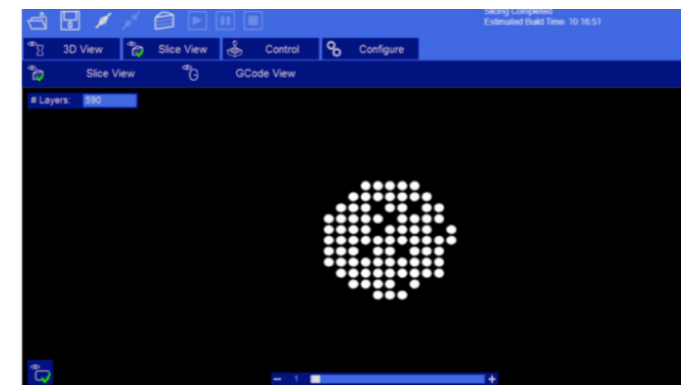
11. Slice View

In the Slice View screen we get the following information:

A display of the current slice where the black background will not cure the resin and the white image cures the resin to form the layer. There is a slider which allows you to view each slice to check for any problems.

There are two buttons for each of the available options.

- The first option has the same name as the screen itself (Slice View). In this setting we can see (as shown in the image) each successive layer of the generated "Slicing". With the lower bar we can scroll through the entire slicing result to check each of the layers. In the upper left corner we can see the total number of layers that have been generated. In the lower left corner we have a  button to turn the projector on and expose the selected layer. This can be useful to check the positioning of the vat.
- G-Code View: On this screen you can see the G-code generated during the "Slicing" operation. This option is intended for advanced users. We recommend to leave this screen untouched.



12. Slicing a Model



Once you have loaded one of the models, configured your machine profile, and configured your build & slicing profile, you can slice a model. Choose the slice icon from the toolbar to bring up the slicing screen.

You can change the currently selected slicing profile to use. Click the 'Slice' button to begin slicing. You can stop slicing by pressing the 'Cancel' button. If your slicing profile is configured to export images, a progress bar will appear here. Otherwise, just the gcode for the scene will be generated and the images will be rendered during build-time.