mcor technologies

Matrix 300+ / IRIS
Training & Set-up Manual

1.Thank you

Firstly from everybody in Mcor Technologies we would like to thank you for purchasing our 3D printer. We have worked tirelessly to design and build you a quality piece of precision machinery. This manual explains everything you need to know to operate your machine correctly to obtain maximum results. We hope you have years of satisfaction with our 3D printer and look forward to hearing from you via our forums and website.

Signed:

…….

Dr Conor MacCormack

CEO

Mcor Technologies Ltd

2.Content

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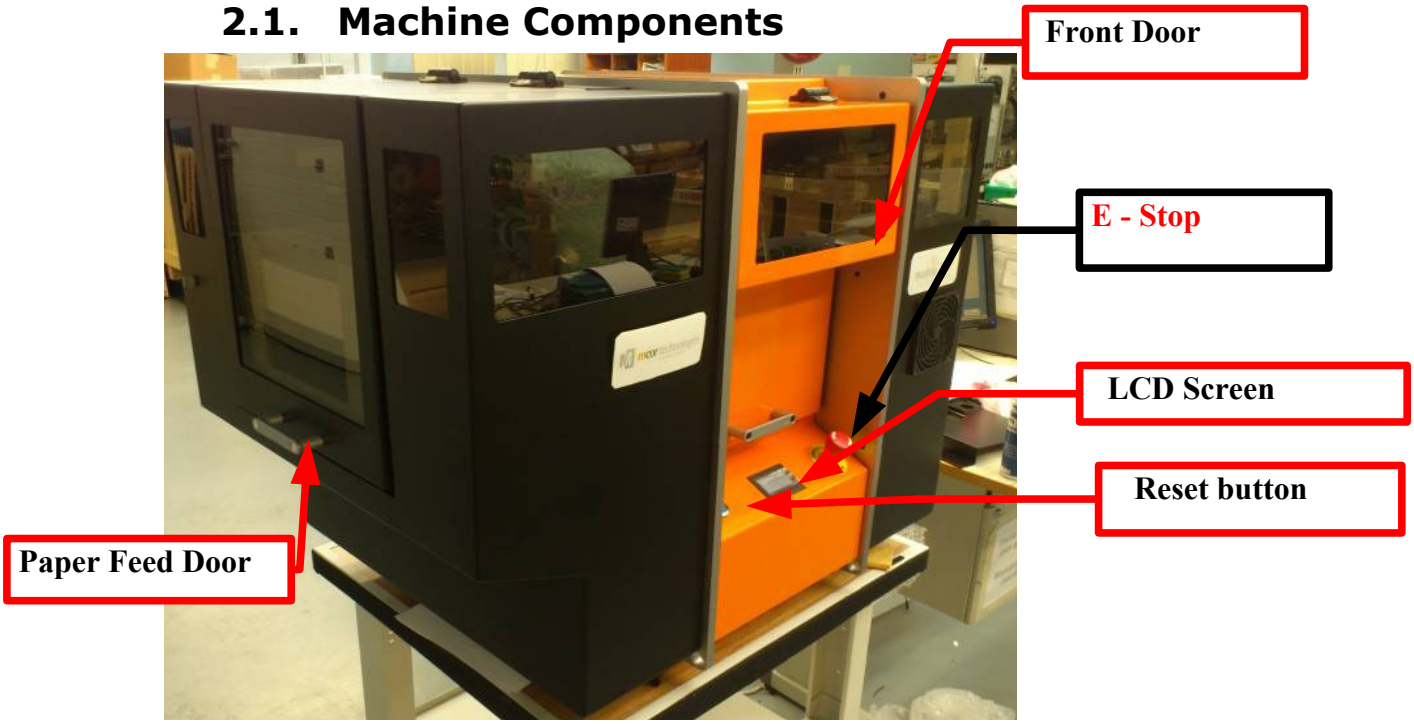
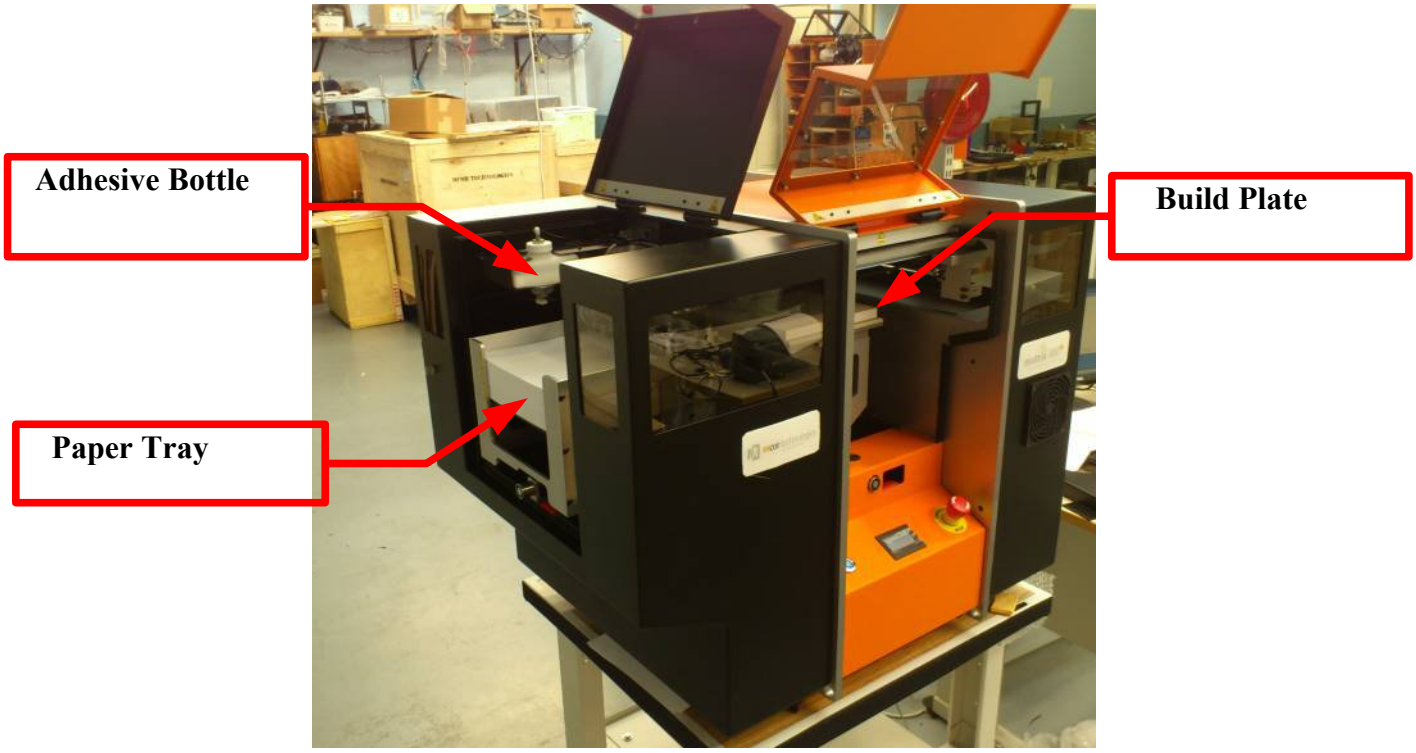
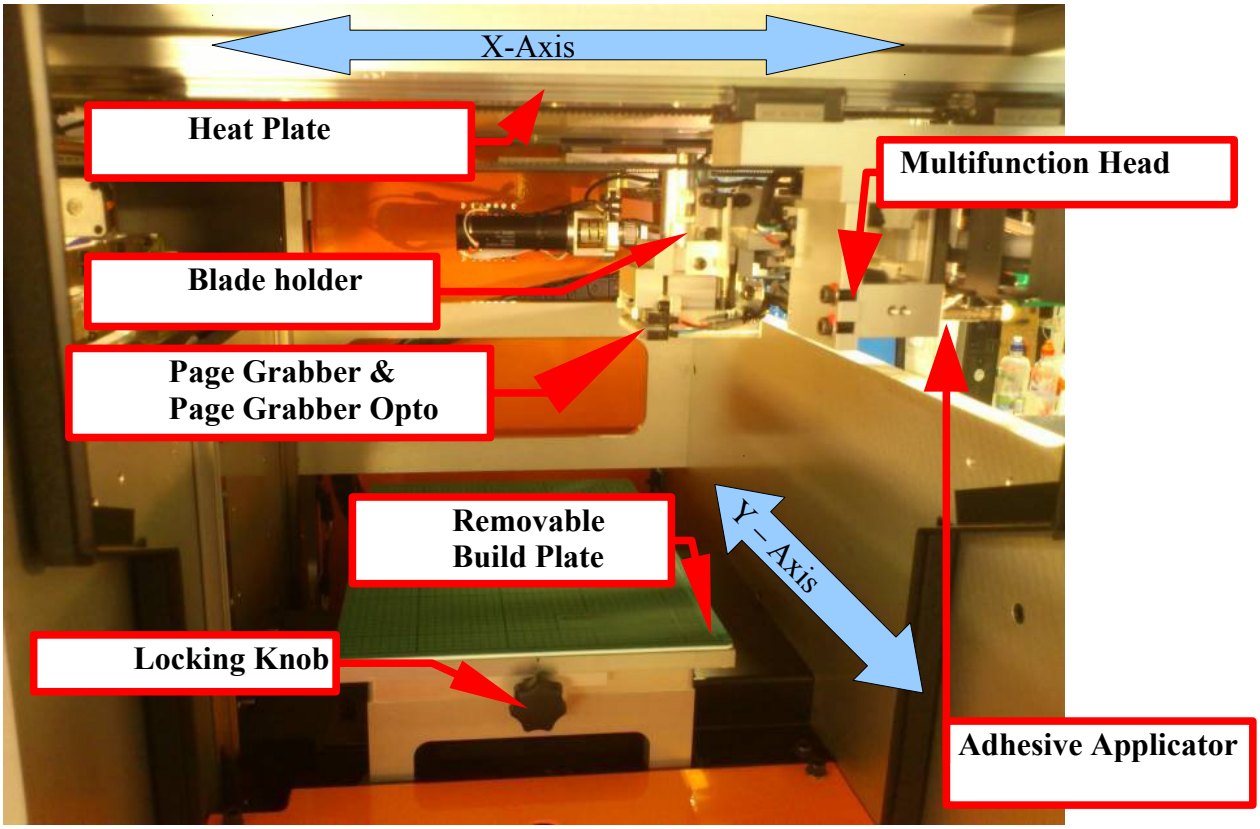
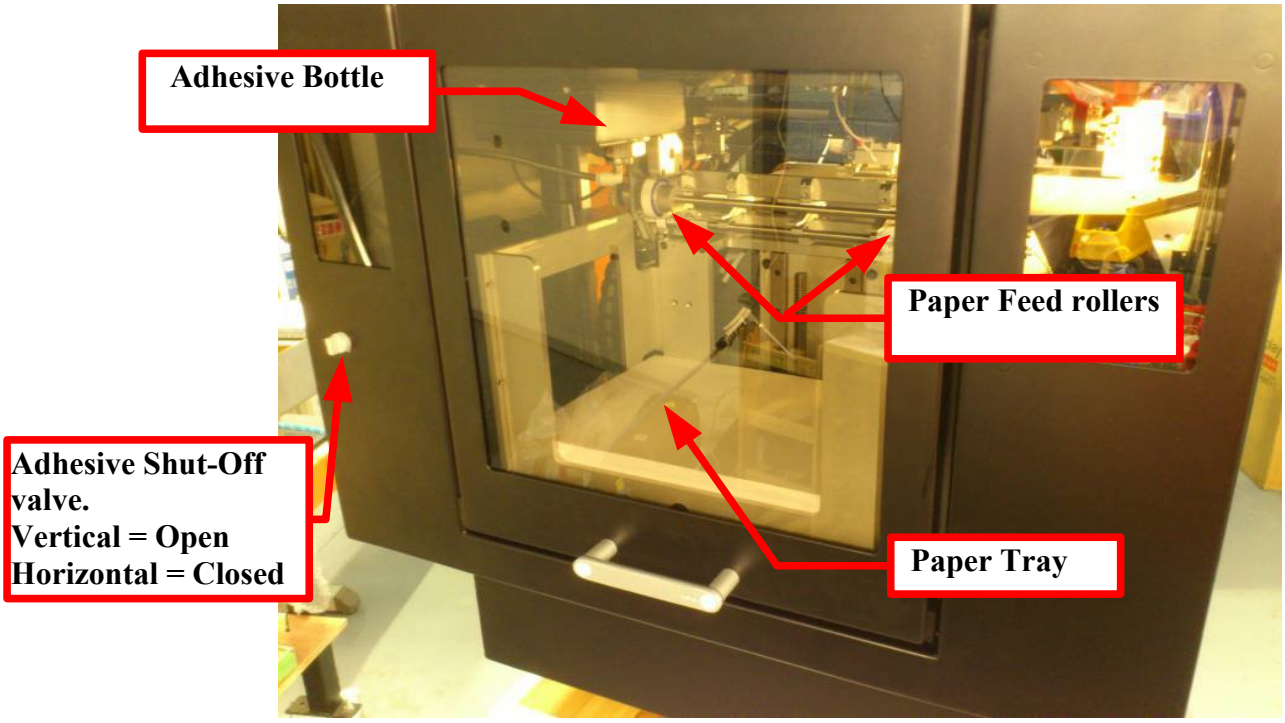
2.1. Machine Components





Ensure when closing either door that your fingers are clear from any pinch points which could cause injury.





2.2. What Is the Matrix 300+ / IRIS?

The Matrix 300+ / IRIS is the worlds only paper based Colour 3D printer that uses sheets of office paper to produce detailed, durable, low cost and eco-friendly parts. The printer uses a process called SDL, Selective Deposition Lamination (an evolution of Laminated Object Manufacturing, LOM).

BY using SDL the machine can vary the concentration of adhesive on the model from that on the support material. This makes the model considerably stronger than the support material. This makes the removal of the waste material, De-cubing (weeding) much easier.(The support material is cut in to cubes by the machine to facilitate ease of removal)

The consumables on your machine are A4/Letter paper, water soluble adhesive and cutting knife. The machine is connected to a standard PC at all times which sends the information to the 3D printer. The software on the PC which comes with the 3D printer is called SliceIT. SliceIT enables the manipulation of CAD data via the stl, wrl, or obj file format for the generation of data necessary for the Matrix 300+ / IRIS.

Once the model has been prepared within SliceIT, paper loaded, knife depth set and adhesive bottle filled, we are ready to make 3D objects by simply hitting print.

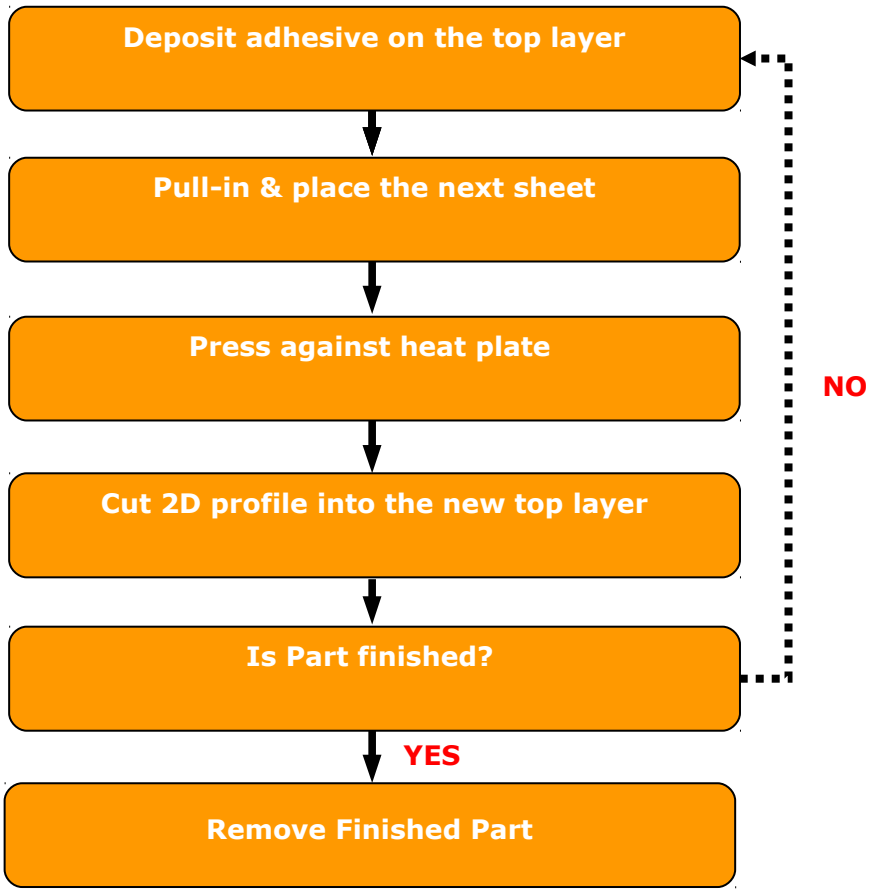
When the build is finished the parts are removed from the waste by a process called De-cubing (weeding). De-cubing times vary depending on the intricacy of the part. Keeping in mind how the part can be weeded is an important aspect of the Matrix 300+ / IRIS and needs to be considered before printing can begin. This is explained in more detail in the de-cubing chapter.

When the parts have been weeded you will see that they are durable and can be finished in a number of ways such as spray painted, hardened, plated, coated, sealed or cast.

2.3. So, how does it work?

The Matrix 300+ / IRIS uses simple sheets of A4/Letter paper to build up the 3D object you desire. If your machine was purchased outside of the US you will be using A4. Otherwise you will be using US Letter paper. The software which controls the Matrix 300+ / IRIS is called SliceIT and it is this software that takes the digital 3D data that you want to make and slices it into layers equal to the thickness of the A4/Letter sheet, approx 0.1mm. Once SliceIT calculates the 2D profile on each of these newly created layers, it sends the information to the Matrix 300+ / IRIS to start building. The 2D profile is accomplished using our drag blade. The depth of the drag blade is accurately set and this ensures a perfect cut every time.

The sequence within each layer for the machine is as follows:



As you can see in the flowchart above, once the 2D profile is cut the machine checks if its finished and if not it goes back and starts applying adhesive for the next layer. If the layer is the last layer in the model, the part is finished and the part can be removed.

In the case of colour parts the pages will be preprinted with an image, also generated by SliceIT, before been loaded in to the Iris paper tray.

How do I get this 3D digital data?

There are numerous ways to generate your 3D data. You can use standard mainstream 3D CAD programs, online packages, downloaded designs and 3D scans of the actual physical object. All of the main stream packages available support the "stl, wrl, or obj" file format. Stl is short for Stereo-lithography. VRML (wrl) is Virtual Reality Modelling Language, OBJ is a geometry definition file format.(Note that wrl and obj files may be accompanied by graphic images in the form of JPEG, GIF, PNG or bitmap. Obj files are always accompanied by a materials file, mtl.). Within the CAD program simply save the design as an stl, wrl, or obj and the program will generate the data automatically. Note that SliceIT can 3D print a colour file in monochrome.

Free designs are available from the below, although all of these stl, wrl, or obj files may not be printable, for various reasons. Mcor also supply some basic examples.

www.thingiverse.com

www.grabcad.com

2.4. SliceIT

The software package which controls the Matrix 300+ / IRIS is called SliceIT. There are help files in SliceIT to guide you through using the software, but here we will only outline the main steps. SliceIT is used to read in the stl, wrl, or obj file, position and manipulate the part, slice the model into layers and send the information to the 3D printer.

There are 6 main steps needed to successfully send information to the Matrix 300+ / IRIS machine. These main steps are as follows: (Steps 5a and 5b apply only to colour models).

1. Create a project
2. Open and model – load the stl, wrl, or obj data
3. Manage the model – orientate, scale, copy, add planes etc.
4. Generate the layers
5. Save / manage the Project – saves all the information from 1 to 4
   - 5a: Pre-print all of the colour pages if applicable
   - 5b: Load the preprinted pages into the Iris paper tray, if applicable
6. Print in 3D – send the information to the Matrix 300+ / IRIS

The help files within SliceIT will guide you through steps.

2.5. Minimum Requirements

The following requirements are needed to run the machine correctly

1) Desktop PC running 64Bit version of Windows 7.
2) 8Gb of Ram.
3) Minimum 1Gb graphics card.
4) Dedicated Ethernet card on the PC connected directly to printer at all times. Speed 10/100 or greater.
5) Cross over cable – supplied with machine
6) Temperature range (10 – 25 Deg C)
7) Relative Humidity range (30 – 70%)
8) Table capable of supporting 160Kg. (The Iris comes with it's own cabinet)
9) Suitable ceiling height to enable door to open fully. Typically sitting on a 800mm high table, 2.4m ceiling height

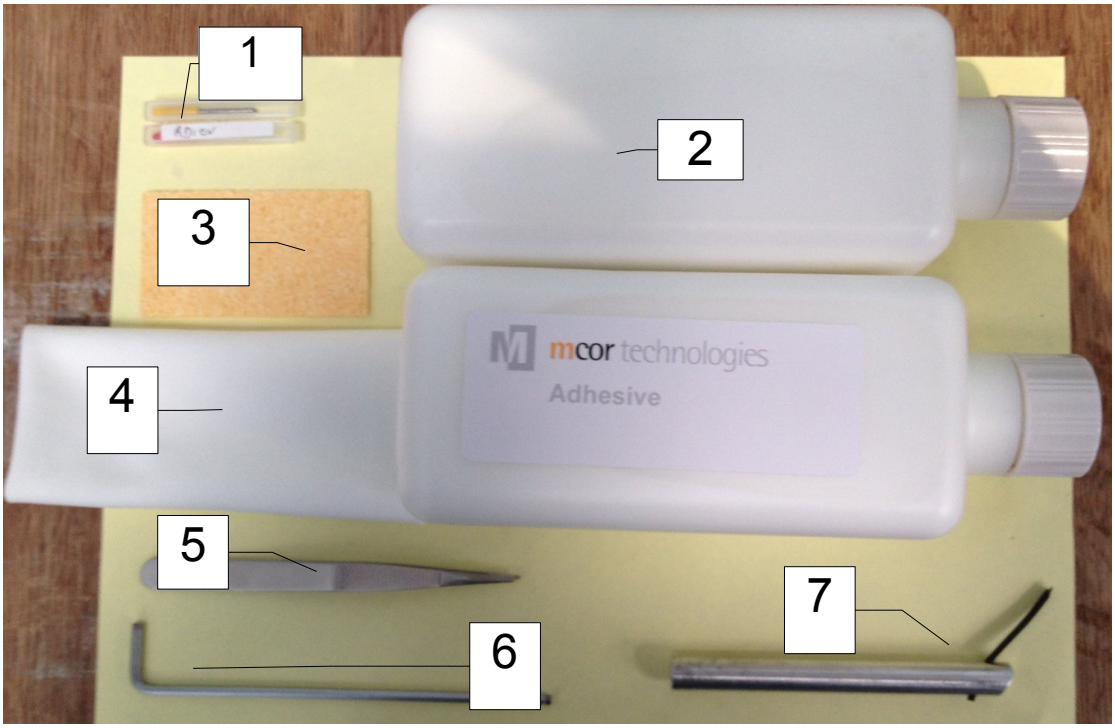
Note: It is not advisable to run the 3D printer off of a laptop computer. Prolonged use of a laptop can result in communication faults.
Note 2: The environment can effect the paper more so than the machine. It is necessary to maintain a stable humidity and temperature around the machine. Low humidity and high temperature can cause paper feeding issues in the 2D printer and also cause the adhesive to spread poorly and cure prematurely. High humidity and low temperature can cause waves in the paper and interfere with the penetration / absorption of the adhesive.
Reference:
"http://www.xerox.com/downloads/usa/en/s/supp_lib_Helpful_Facts_About_Paper.pdf"

2.6. Machine Location

As stated in point 6 in the minimum requirements, the machine should be located on a sturdy table capable of supporting the 160Kg mass of the machine.
Obviously this only applies to 300+ machines as the IRIS comes with a cabinet. Sufficient space should be left at the font and paper feed side of the machine to allow both doors to open fully. Attention should also be paid to the ceiling height to enable the opening of the doors. Because there is a large amount of mass moving at high velocity within the machine, the momentum can cause the table to oscillate during normal operation. Ensure that the location of the machine is situated to maintain the machine in the operational range as listed in points 4 and 5 in the minimum requirements.

2.7. Tool-kit

Each machine is supplied with a tool-kit to help you with the day to day operation of the machine and carry out any routine maintenance procedures.
The tool-kit items are shown below:



1. Blades
2. Mcor adhesive
3. Glue wheel cleaning sponge.(Dampen with warm water to use).
4. Lint free cloth.(Use with IPA to periodically clean the paper feed rollers).
5. Tweezers.(Used when weeding / removing waste / support material).
6. 3mm Allen key.(Used to remove / install transport bracket).
   4mm & 2.5mm Allen keys supplied for maintenance use only if requested.
7. Glue wheel / wipe cleaning tool.(Use this tool to remove paper / glue from the glue wheel or wipe. **Use of any metal instruments / tools can seriously damage the mechanism and void warranty).**

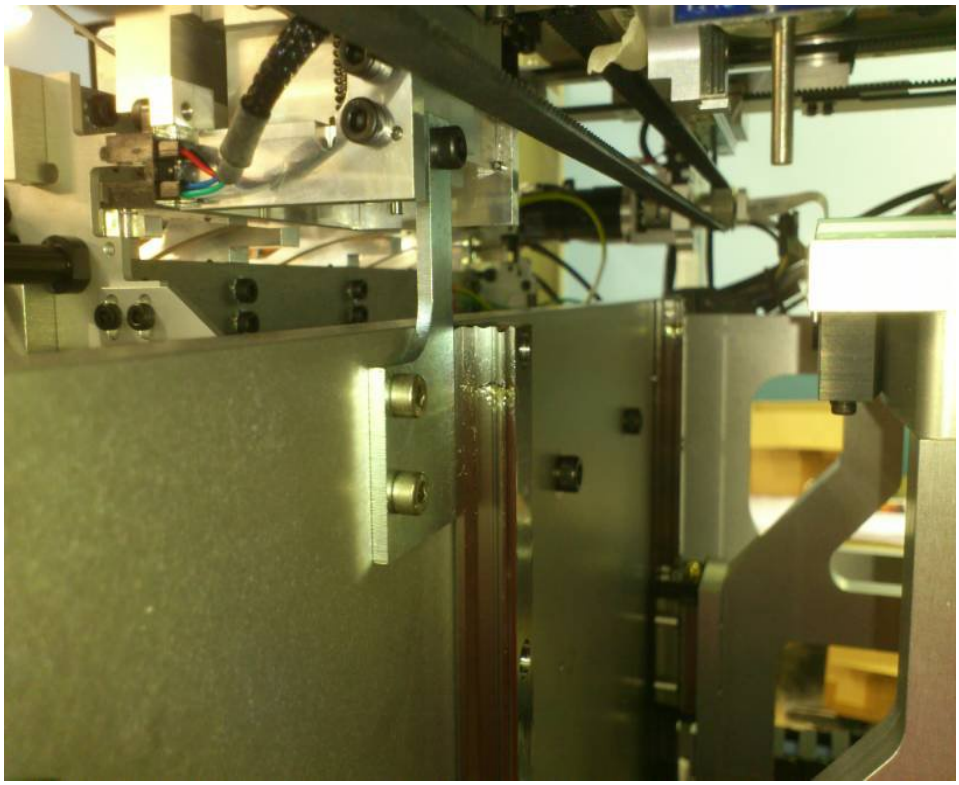
   Note that there will also be a media device shipped with the printer. This will have the operational software, license file and demo files.

3.Powering up

WARNING: Before the machine can be switched on and operated the transportation restraints have to be removed. There are two restraints, one for the multifunction head and one for the paper feed mechanism.

3.1. Multifunction head restraint:

Open the front door and remove the bracket shown in the image below with a 3mm hex key wrench.



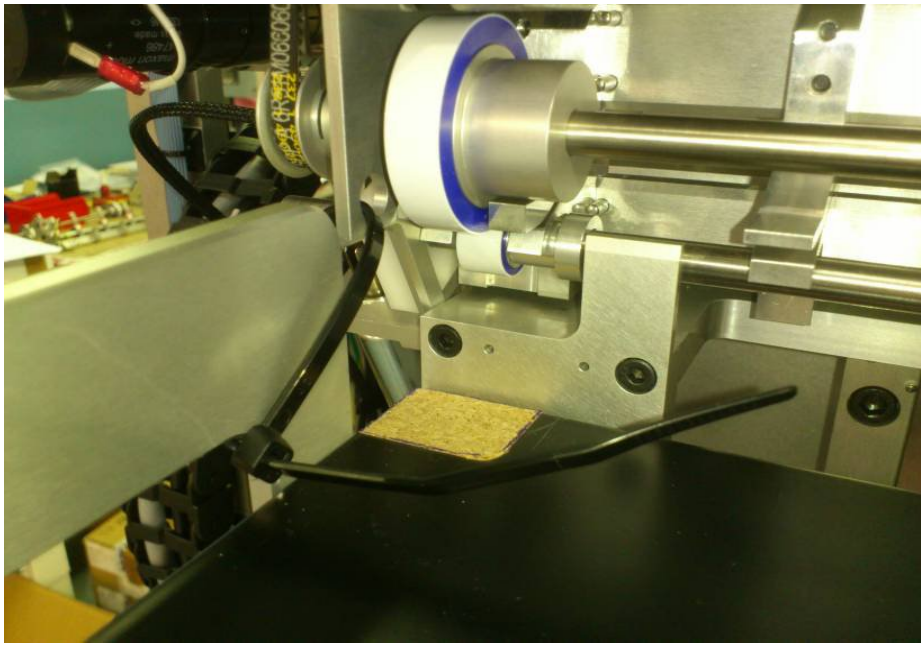
Remove the Transportation Bracket From the Multifunction Head

3.1.1. Removal sequence

- Remove fasteners No1 & No2 on the bulkhead.
- Move by hand the multifunction head into the centre of the machine
- Then remove fastener No3 making sure not to drop the fastener into the machine.

3.2. Paper Feed mechanism restraint:

Open the page door and remove the cable tie connecting the paper feed roller mechanism to the side of the paper tray.



Paper Feed Cable tie removal

Connect the power cord from the Matrix 300+ / IRIS to a standard wall outlet. Then connect the supplied Ethernet cross over cable between the matrix300+ and the PC.

3.3. Install the blade holder

Locate the knife holder and install into the multifunction head. It should be in the box of ancillaries which shipped with the box. It will be wrapped in bubble pack.

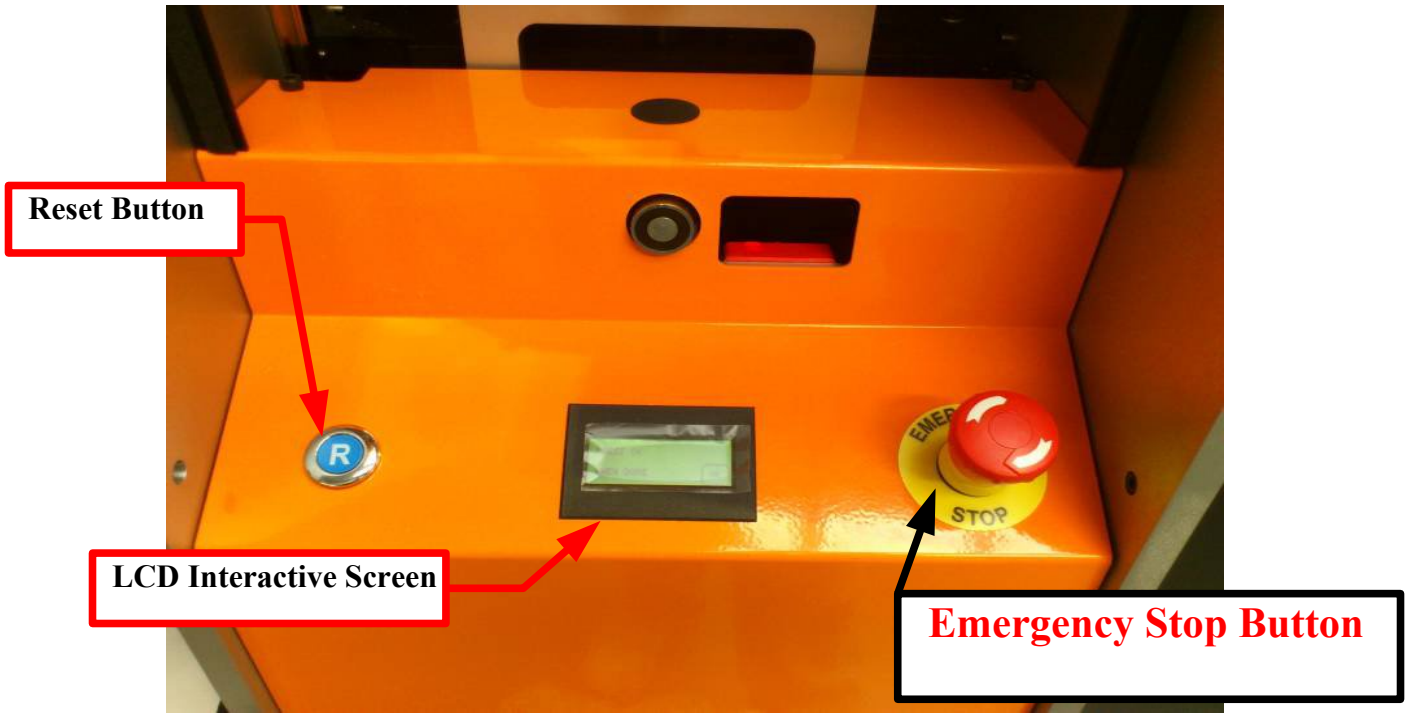
Note, if you need to move the machine please remove the blade holder and secure outside the machine to prevent the mechanism falling out and becoming damaged.

3.4. Moving the machine:

If the machine is to be moved, either within a building or to another building, the reverse of this procedure must be carried out to secure the moving of parts and minimise any damage to the machine. Improper transportation of the unit can result in irreparable damage and void the warranty.

4.Initialisation

Instructions are relayed to the operator via the LCD touch screen in the centre control panel. The control panel is shown below



The ON/OFF switch is located at the rear of the machine. Before the machine is switched on close both doors. When the machine is switched on the following message will be displayed on the LCD screen

At this point the machine checks if both doors have been closed, if they are the following message will be displayed on the LCD:

The reset button is the blue button on the left hand side on the LCD screen.

Once the reset button has been pressed, the machine will then perform an initialization routine which should take 1-2 minutes. It also carries out an internal diagnostic check.

If you forget to close one or both of the doors, the machine will detect this and inform the operator to close whatever door is open, for this example the front door was left open when the machine was powered on, and the following message was displayed:

Again, when the doors have been closed, the machine will request that the reset button be pressed and initialisation can take place.
The system then "homes" all the axis, X, Y, Z Build and Z Paper Feed, parks the multifunction head in the XY home location and the Z build at the build height and finally seals the adhesive axis by rotation the adhesive wheel.
When complete, the machine is in standby mode and the LCD should display the "Standby" sign as below.

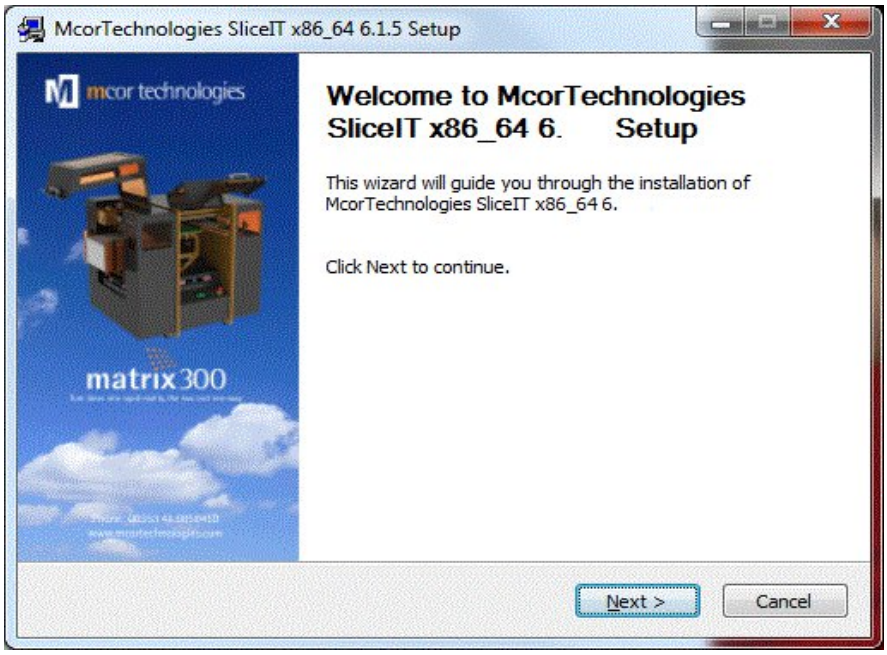
From this point onwards the doors are locked. If the doors are forced open the build with stop and the job will be terminated.

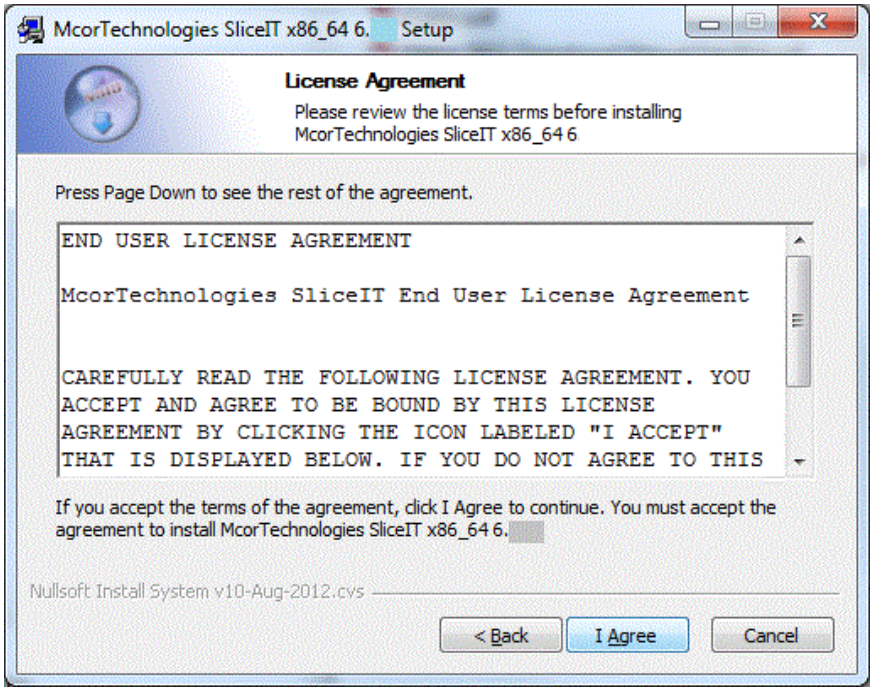
5. SliceIT

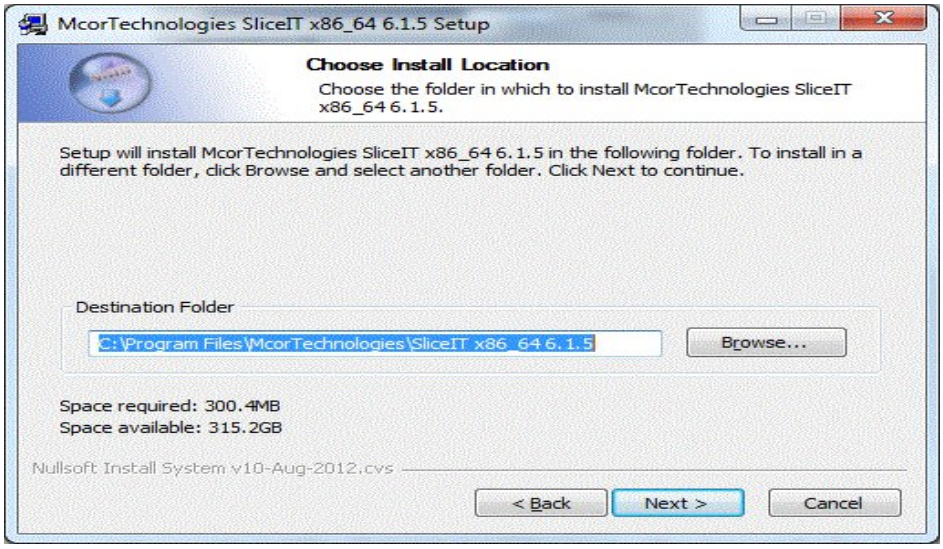
5.1. Installing SliceIT

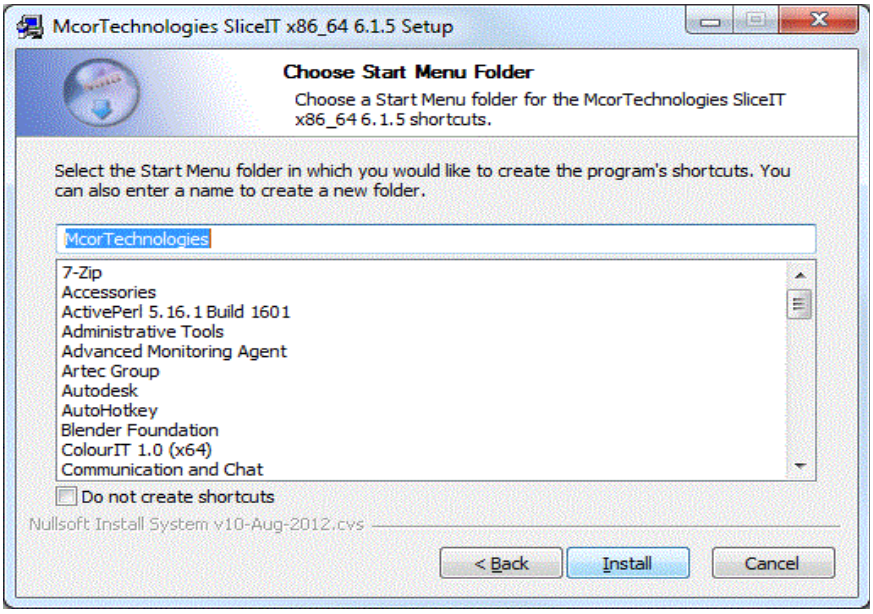
When you double click on the installation software, SliceIT will self install with minimal interaction.

As the machine logs the knife travel through SliceIT, it is preferred that the connected PC only has one user log-in. I.E. "3DPrinter". If several users log on as themselves, the log files that hold this value will be incomplete and the machine may run past the usable knife life.

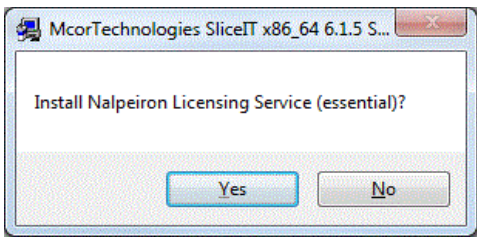


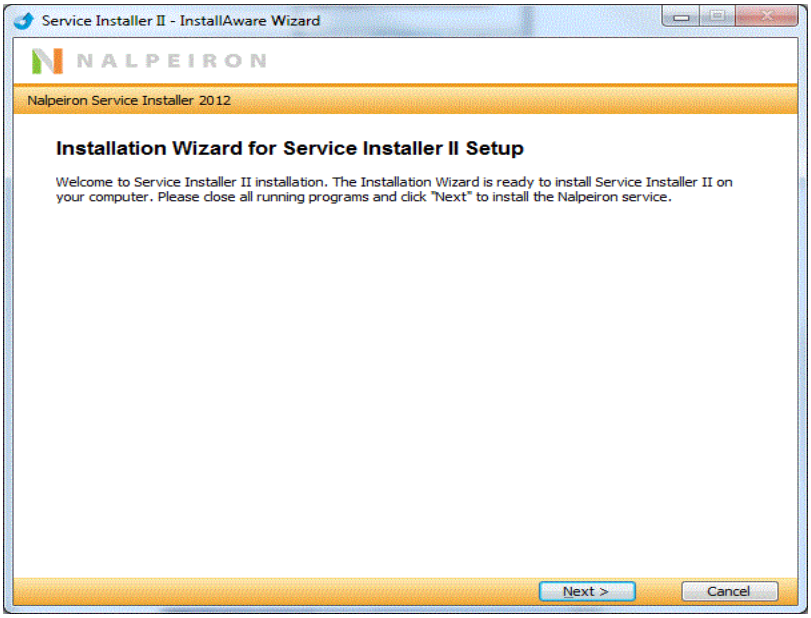






Before SliceIT completes the installation it will ask if you wish to install the Nalperion Licensing service, below. It is essential to install this service the first time you are installing SliceIT on the PC which will be connected to the printer. This is not necessary on your own remote pc / laptop. Click Yes in the dialogue and a separate installer will start to install the service. When that installer has finished click Finish and you will be returned to the primary Mcor installer.





Software installed successfully. Click Finish to end and open SliceIT automatically.

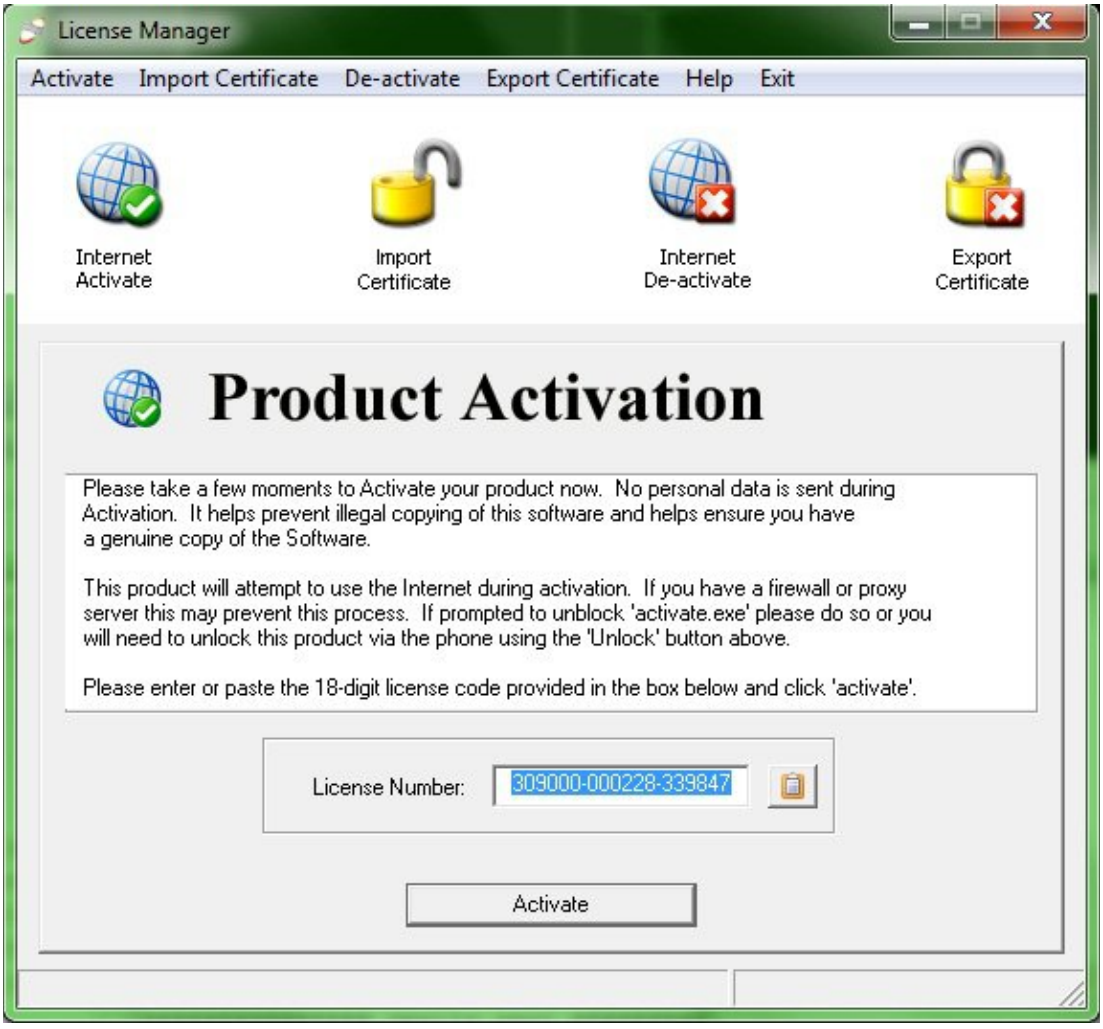
5.2. Licensing Activation

In Slice-IT there are two ways to activate the product: **Internet activation** or **manual self-serve activation**. Both methods require interaction with the **License Manager** utility which can be invoked from the **Help** menu.

Internet activation is the simplest method and requires that the PC you are licensing the software on has an Internet connection. To activate this way:

- Click on the Internet Activation icon in the License Manager.
- Type or paste in the license key you received from Mcor Technologies.
- Press the Activate button.
- You should receive a message to say the product has been activated.

At this point you are ready to use licensed functions in Slice-IT.



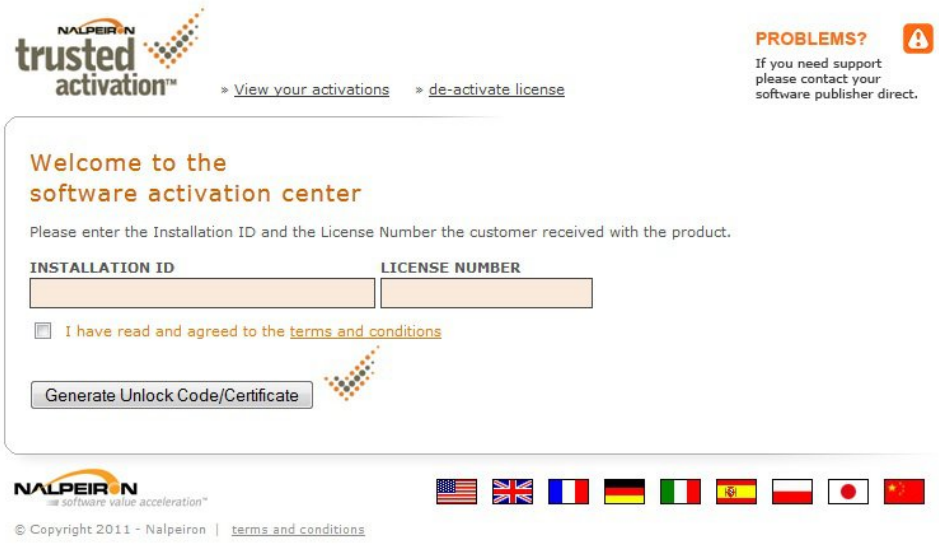
Internet Activation

Manual self-serve activation requires a little more effort. You do not need an Internet connection on the machine connected to the Matrix printer, but you do need access to another PC with an Internet connection (This method is intended to be used in a situation where the PC connected to the Matrix printer has one network card and so precludes an Internet connection.) To activate with this method you must generate and import a certificate (which is a long sequence of digits) at the self-serve web-site (http://www.internetactivation.com). To do this:

- Click on the Import Certificate icon in the License Manager
- Copy the installation ID to the clip-board (there's a button to do this or select and use Ctrl-C) and transport it to the Internet connected PC using a standard USB memory stick or other transportable memory device.
- On the Internet connected PC visit the self-serve web-site and paste in the installation id.
- Also type or paste in the license key you received from Mcor Technologies.
- Press the Generate Certificate button
- A certificate should be available for you to copy.
- Paste the certificate into the Activation Certificate field of the License Manager Import Certificate screen back on the PC connected to the printer
- Click the Import Certificate button.

Your product should now be activated and you are ready to use licensed functions in SliceIT.

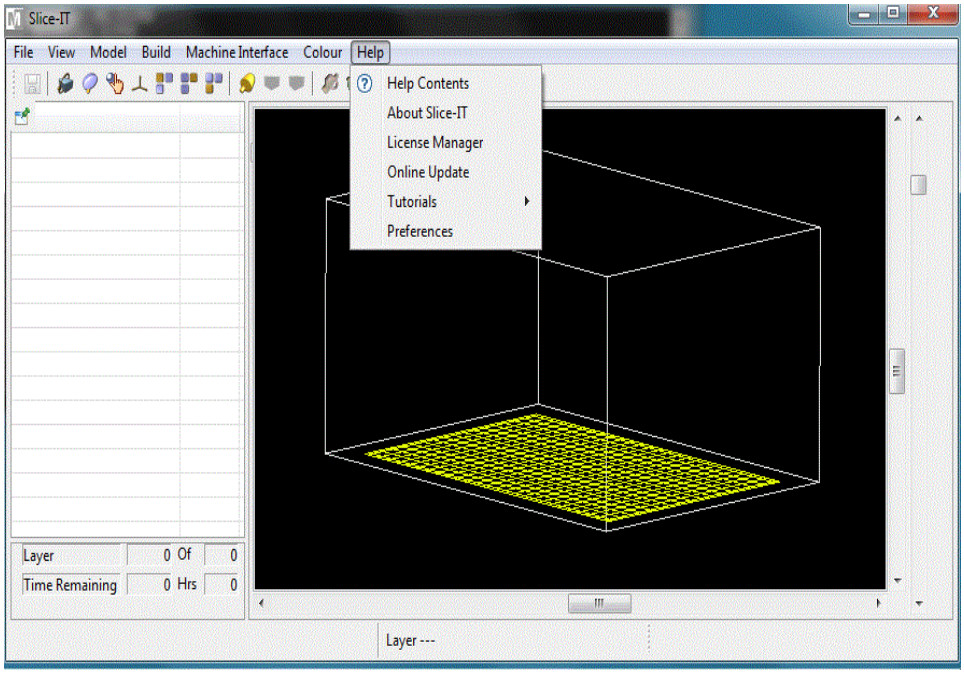
Import Certificate



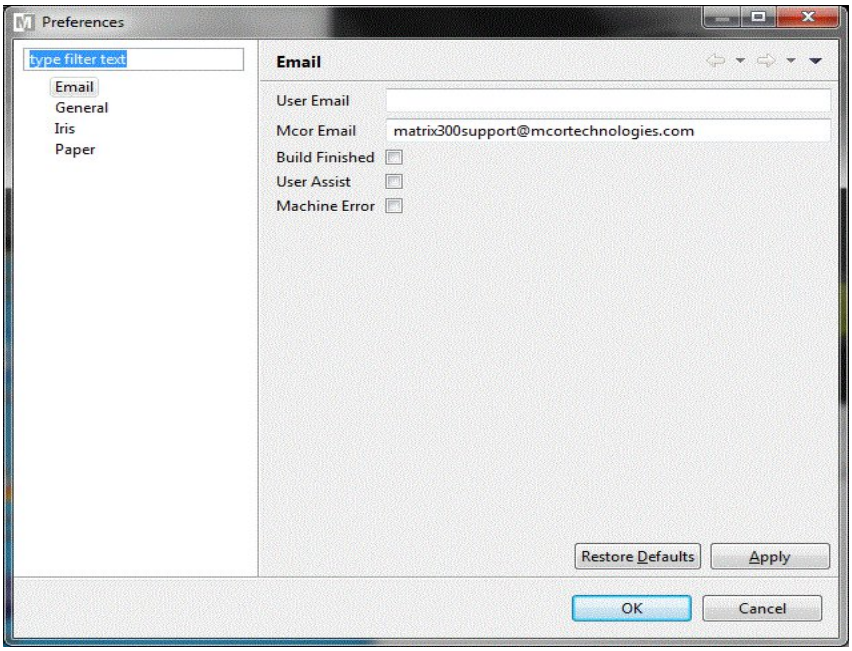
Self-serve web-site

5.3. Setting Paper Type

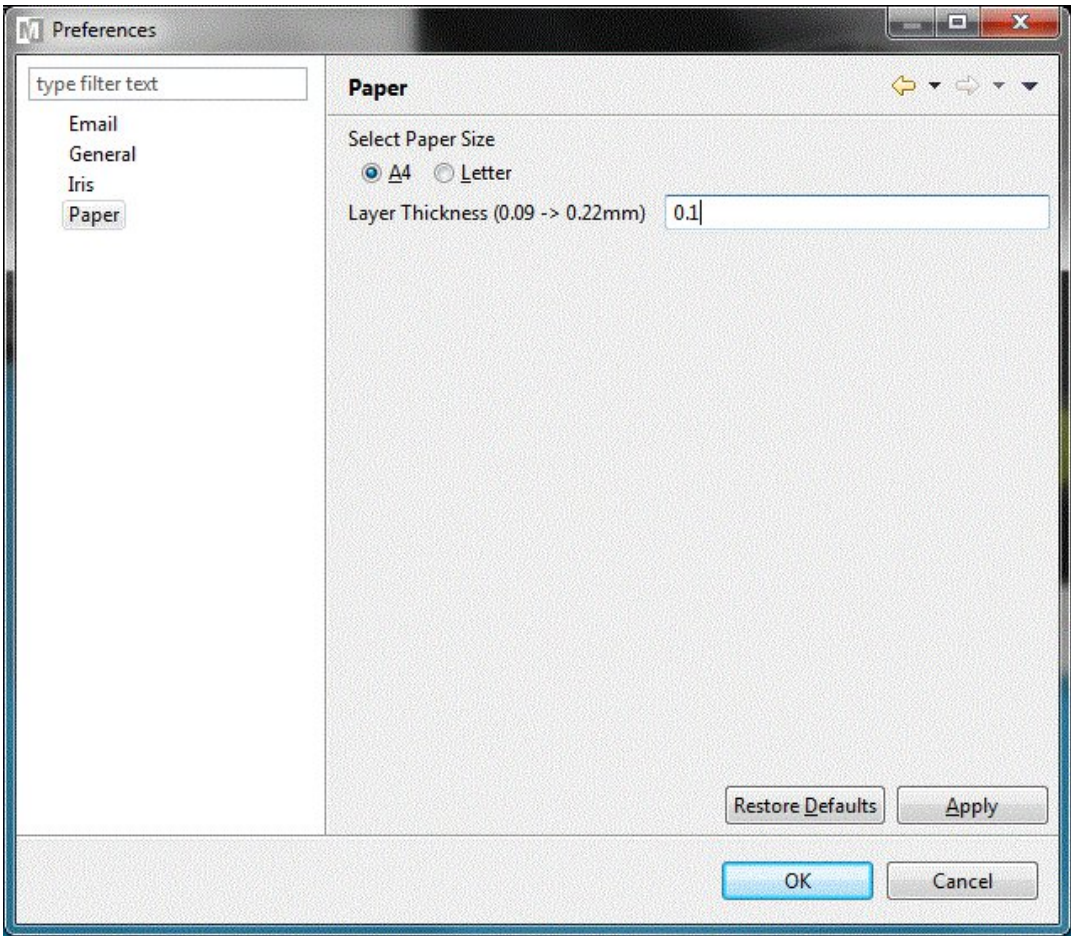
Next we need to set the paper type for the machine. Note that the machine is configured at the factory to run either A4 or Letter paper. The Slice-IT needs to be set up to the same paper configuration as the machine, then when the model is been printed Slice-IT tests to see if it configuration matches machines. The steps required are illustrated below. (Note that the Read Duplex option in the preferences should only be turned on when calibrating the 2D printer).



Select Preferences under the help menu

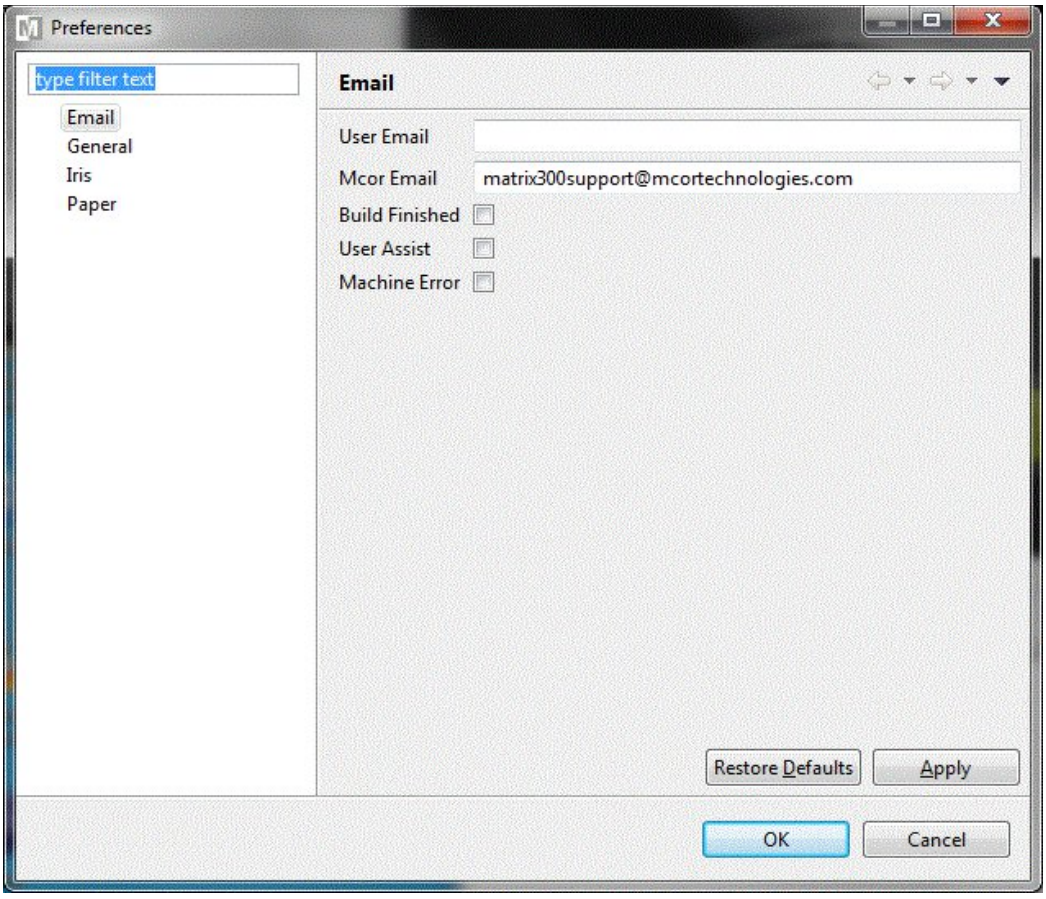


Select Either A4 or Letter depending on machine configuration. You can also input the thickness of the paper / layers here.



5.4. Email Setting

Slice-T also has the ability to send an email to the users to alert them to the status of the machine such as paper tray empty, or to any errors it may encounter. The figure below show how to set the email preferences. Note the user can select to receive email notifications on the following events (Build finished, user assist and machine error)

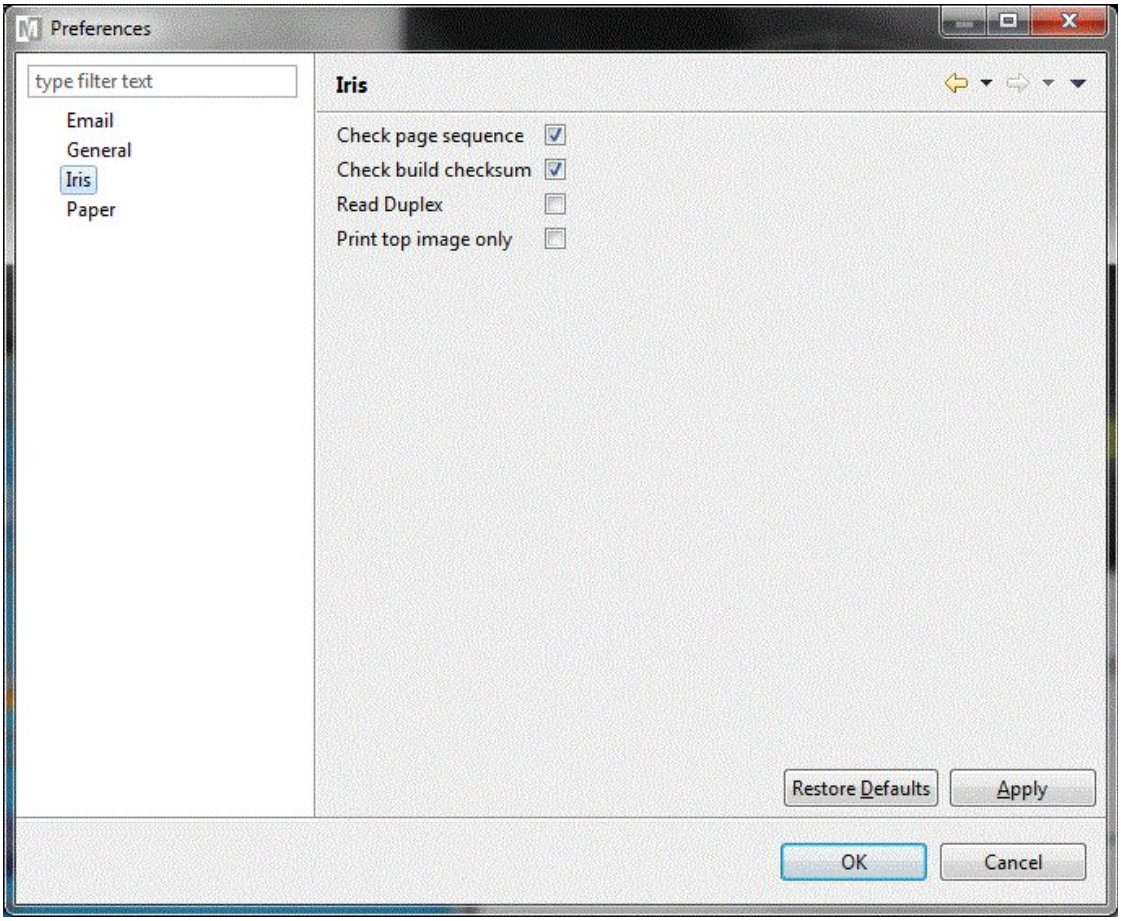


The user enters their email address and selects which events they want to be notified on. Slice-IT also has the option to email the same information to Mcor Technologies, but if a second email address is required you may delete this and add your own.

Note that this feature requires the PC to have access to the internet. It may be prevented from working by a firewall. There is a test function in Machine Interface to check for this. If blocked please contact your network administrator.

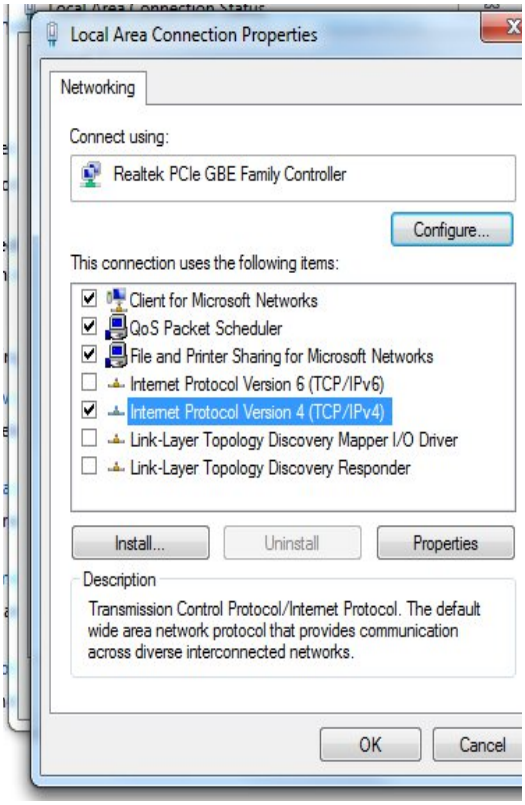
5.5. Iris Only settings.

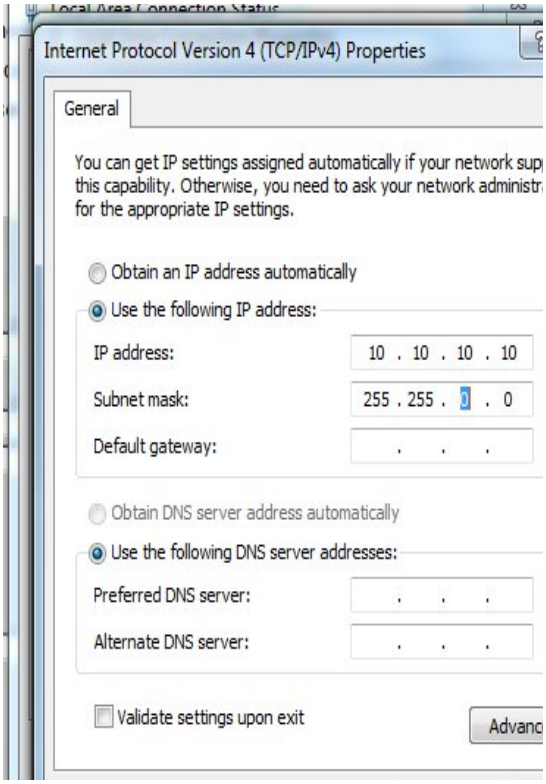
In the Help, Preferences section of SliceIT, you can select certain options for running an Iris. The options and their functions are explained in the Help Contents of SliceIT.



5.6. Setting up the PC Network Card

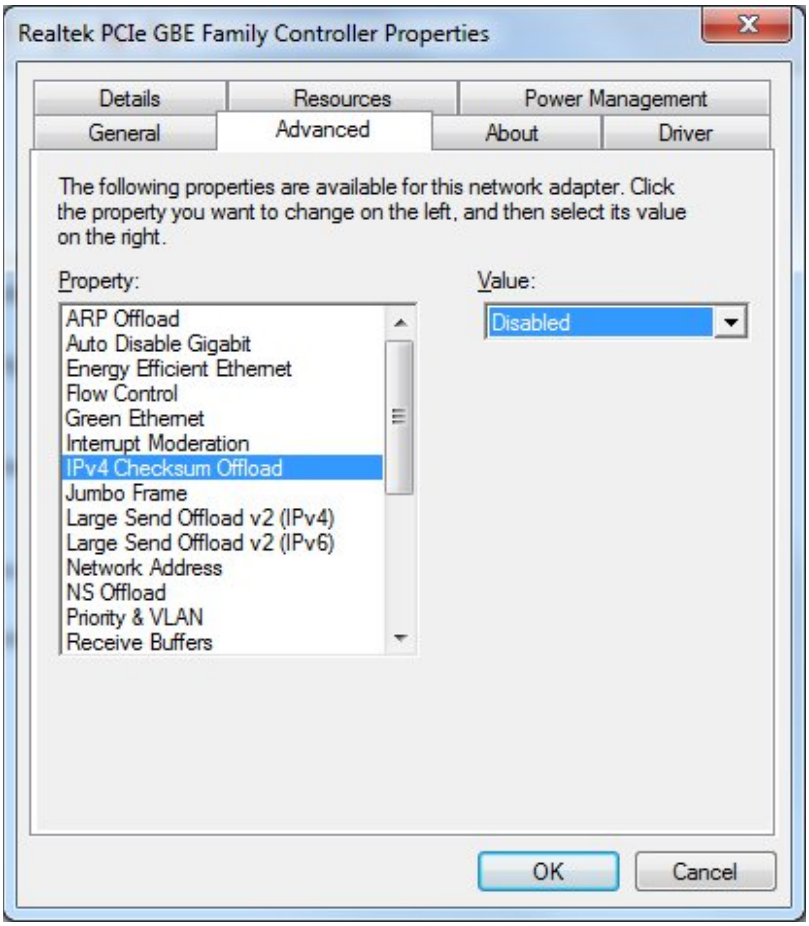
Finally we need to set the IP address on the network card on the PC that's permanently connected to the Matrix 300+ / IRIS printer. Open up the network card TCP/IP 4 properties (the location varies depending on the operating system) and follow the illustration below and enter the same numbers exactly. It is best to disable the other IP protocols. Then enter the IP address and subnet values.





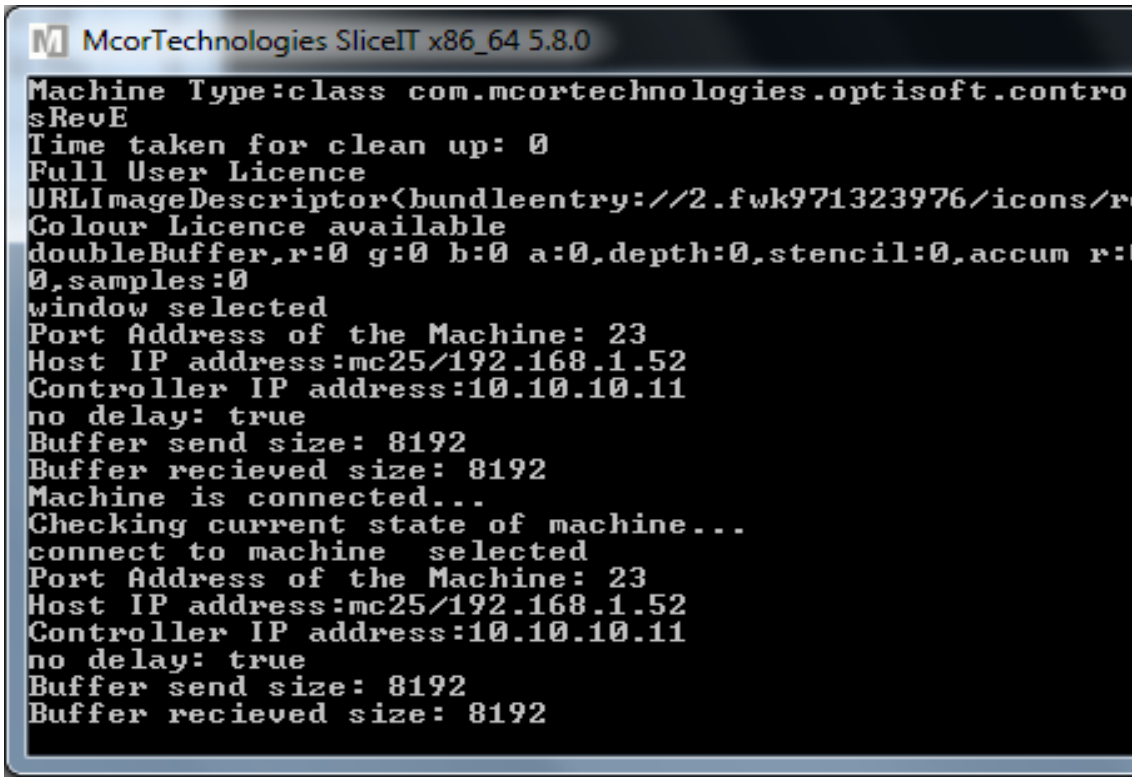
Communications issues with Network cards

Some network cards can cause communication failures to the Iris, resulting in a stoppage or failure of the build. The error would be "PC Connection Dropped". In order to prevent this from happening the following setting can be changed. Go to, "My Computer" "Properties", "Device Manager", "Network Adapters" and highlight the card connected to the Iris. Then select the properties of the unit and go to the "Advanced" tab. From here disable all of the "Checksum Offload" or any "offloads" options as below. This should prevent communication related failures.



Connecting to the controller

Now that the IP address has been entered into SliceIT and the computer network card, it is now possible to test the connection from the printer to the PC. To do this simply select "Test Controller Connection" under the "Machine Interface" drop down menu, the results are displayed on the Slice-IT console.



Running the software

The SliceIT software has an extensive help menu and tutorials which will help you load an stl, wrl, or obj file, place it in the correct orientation and get the data ready for the Matrix 300+ / IRIS printer. Once the stl, wrl, or obj files have been processed then the data can be sent to the Matrix 300+ / IRIS printer to begin the build process.

To ensure normal operation of the machine, the PC needs to be connected to the 3D printer at all times during the build operation

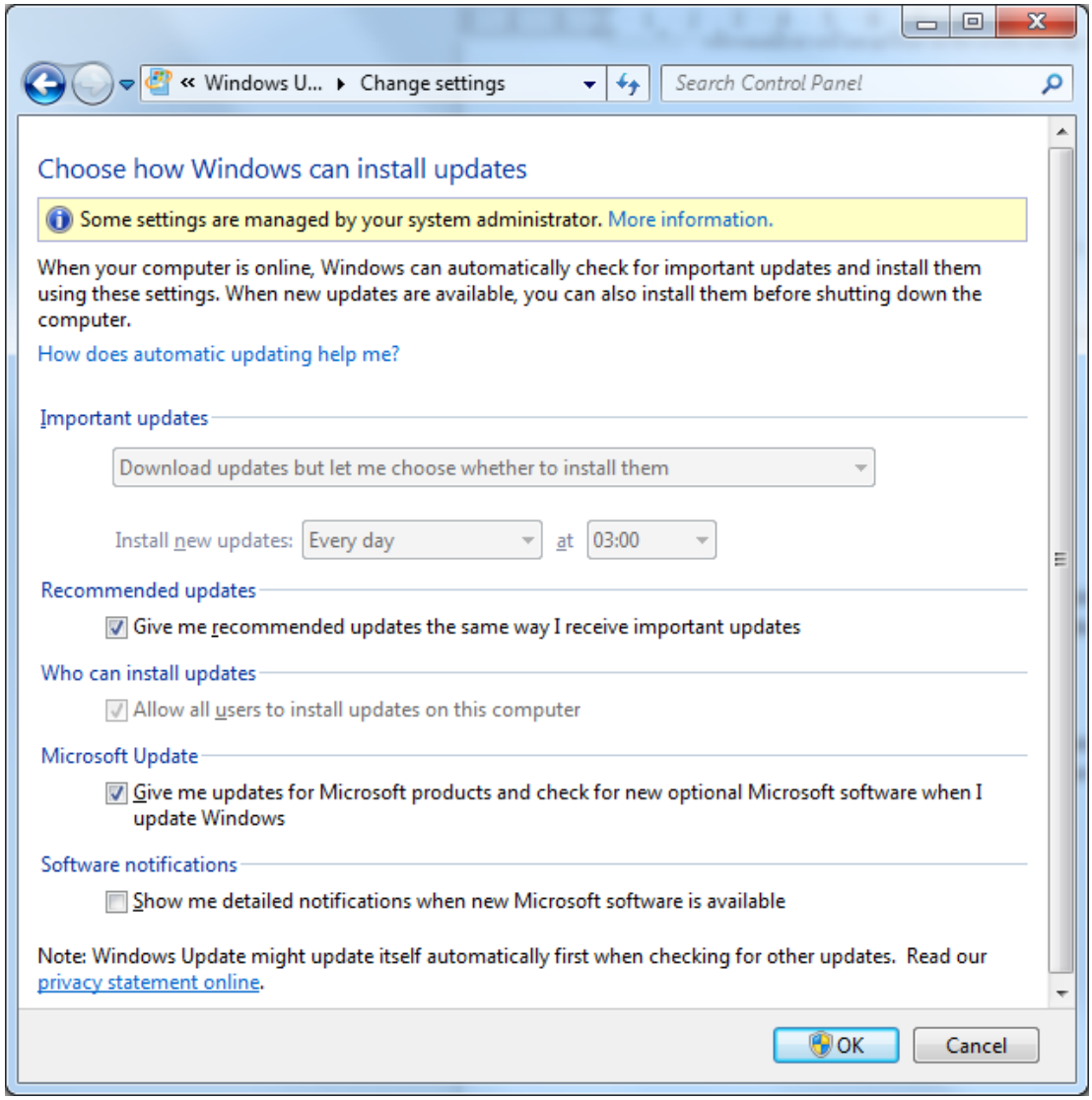
6. Computer Settings

Power

Ensure that the power settings on the computer are modified to ensure that the hard drive never sleeps. If the hard drive goes to sleep SliceIT will stop running and the printer will stop working.

Automatic Updates

Ensure that updates are configured not to install automatically. Some updates trigger an automatic reboot, if this happens during a build it could cause the build to stop. It is possible to have the computer download the updates automatically but require permission to install.



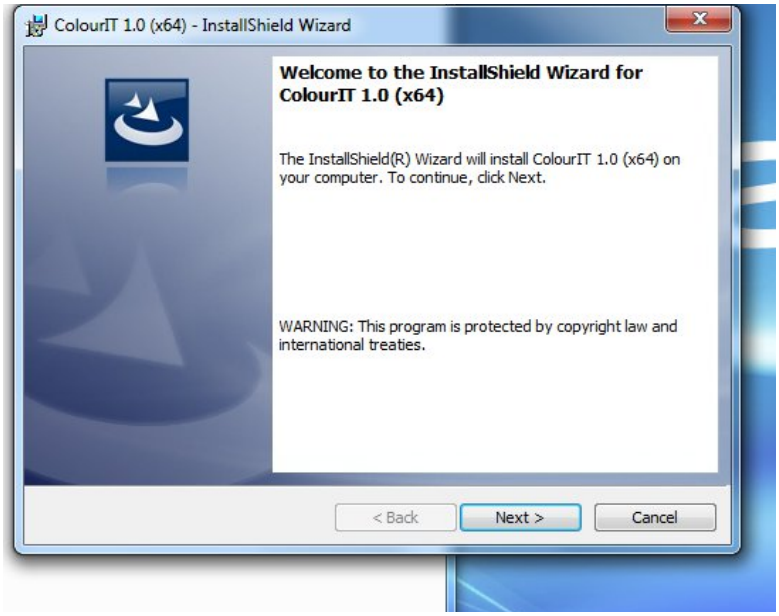
7. ColourIt Installation (Iris only)

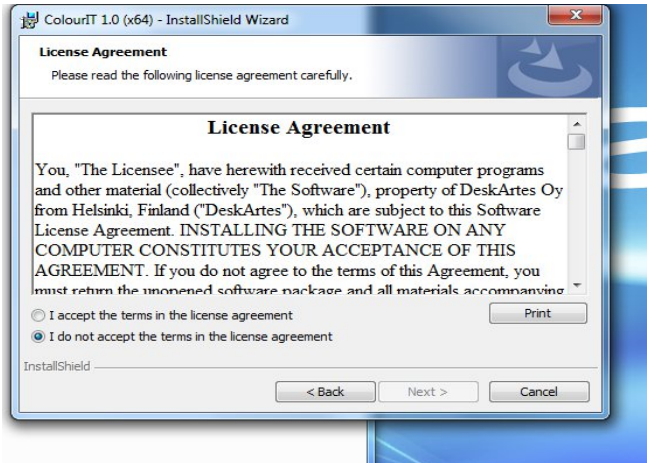
Your Iris 3D printer comes with a complementary copy of ColourIT, Mcor Technologies proprietary colour management software.

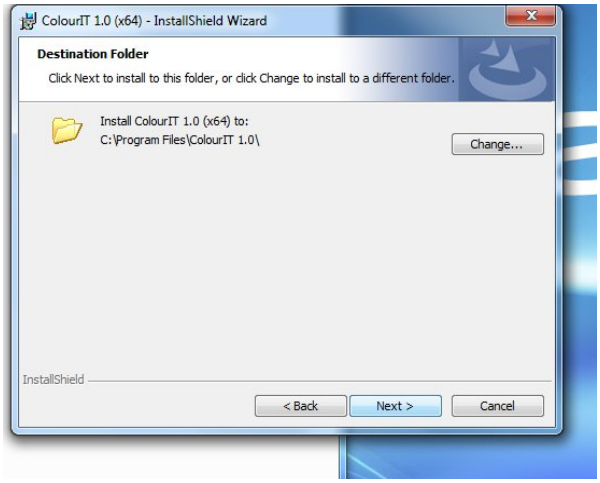
ColourIT is designed for repairing triangle files and adding colour by painting and texturing. The verification, repair and colouring functions allow you to reliably and continuously print coloured models with IRIS 3D Colour Printer. The repair with ColourIT is targeted for single shell models and corrects topology errors, fills gaps and removes self-intersections automatically. ColourIT software is kept intentionally simple and easy to use, suitable for both frequent and infrequent users

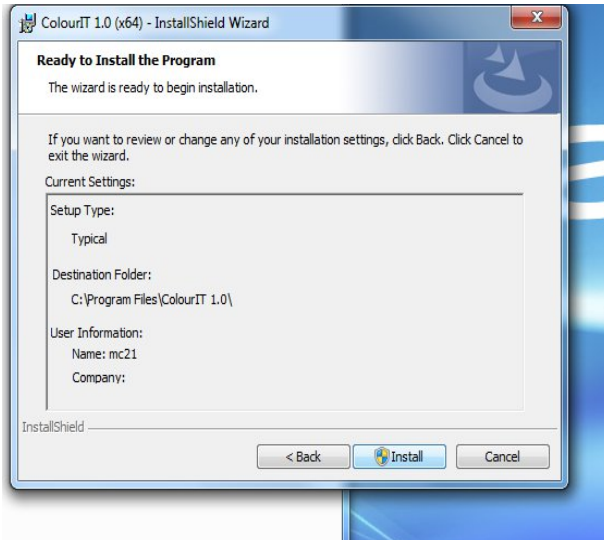
Below are the instructions for installing ColourIT. Note that since each machine comes with only one licensed version of ColourIT which is locked to a single PC you must take care when installing it. The licensing program reads unique identifying markers from the pc and these are then sent via email with the serial number of your 3D printer before the license is received. As ColourIT can utilise large amounts of RAM and CPU it is probably best not to install it on the licensed pc connected to the 3D printer.

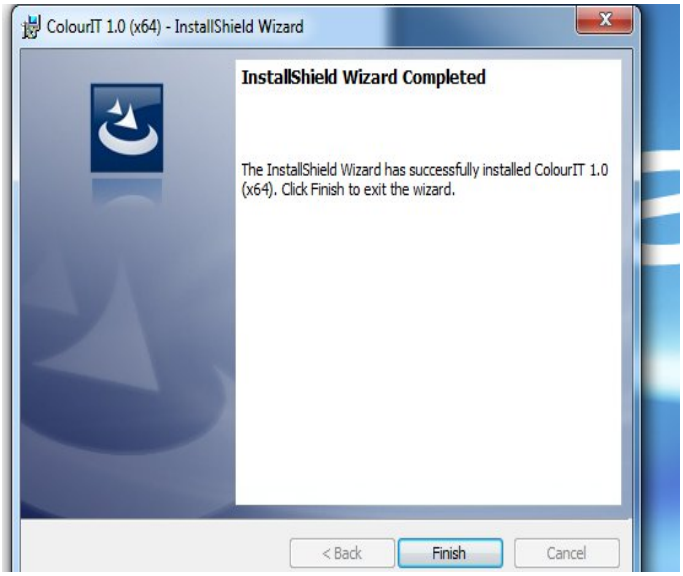
The ColourIt installation includes comprehensive tutorials on operation of the software.



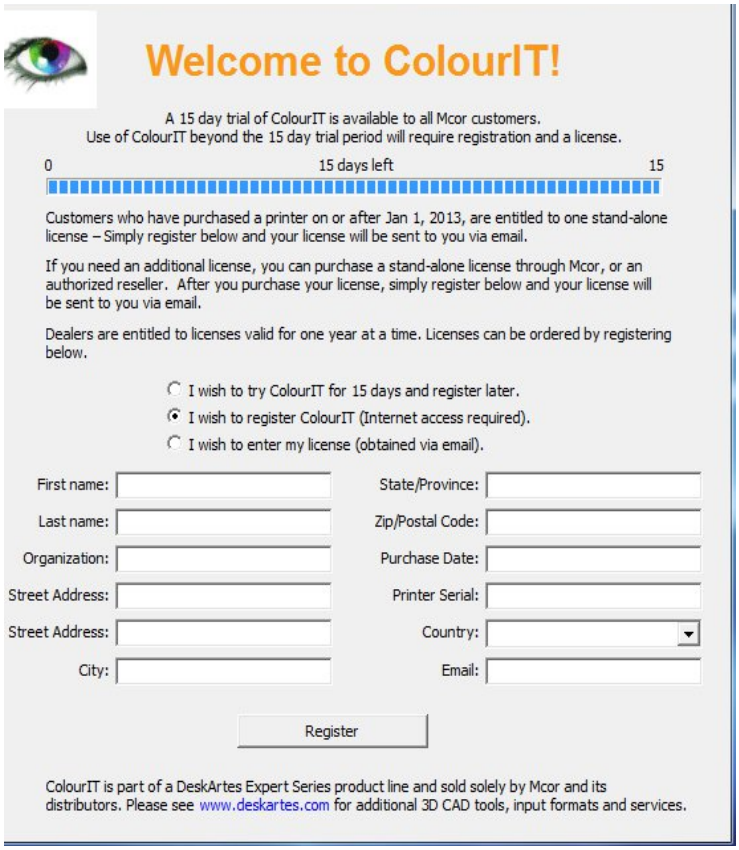




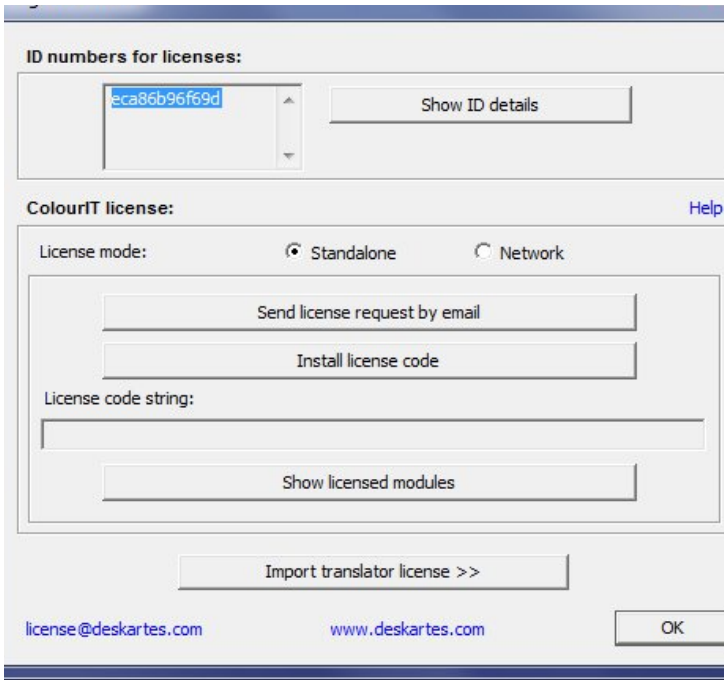




Installation is now complete. You can double click on the ColourIT icon to start the program:



The first time you start ColourIT the above screen will appear asking you to register the product in order to receive your user license. You get one user license per installation and this license will be locked to one computer. If you do not register you get a limited 15 day trial. If you use the trial you can later go to Help; License; and the below screen will appear. You can use this to get your license.



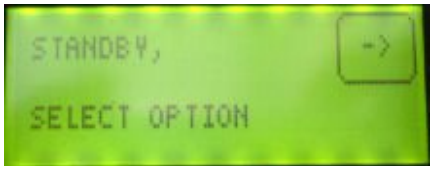
8. Machine Set-up

There are seven steps that must be completed in order to start building a part. This guide will go through each step of the set-up process so that your part will come out of the machine perfect every time. The seven steps are as follows:

1. Set-up Build
2. Attach First Sheet
3. Clean adhesive wipe
4. Knife set-up
5. Adhesive set-up
6. Load Paper (**Print and load pre-printed paper for Iris**)
7. Run the software

8.1. Set-up Build

If the machine has not already been powered up then do so. After initialization the following message should be displayed on the touch screen LCD:



At this point there are 4 options to choose from. The four options are as follows:

Option 1:

Option 2:

Option 3:

option 4:

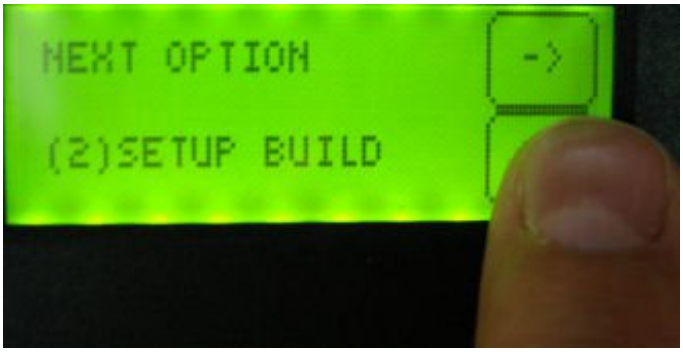
Option 1: Enables the operator to gain access to the machine by turning off the interlocks on the front and paper feed side door.

Option 2: Is used to set up the machine prior to each new build

Option 3: Is used to run a build if the machine is already set up.

Option 4: Is used to set the machine into maintenance mode to conduct tests by the maintenance personnel. This option should not be selected unless instructed to do so by a service engineer or support staff.

Because we are starting to make a new 3D model, we need to select option 2, so press the touch screen as below:



You will then notice 3 things happening.

Firstly the multifunction head moves to the centre of the front door for easy access.

Then the build axis lowers down to its lowest position.

Finally the paper feed lowers to its lowest position to enable the loading of paper, at a later stage.

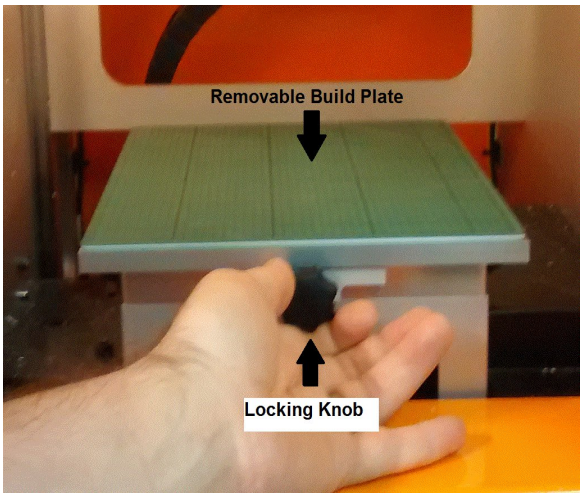
Once the 3 actions have completed, the LCD will display the following:

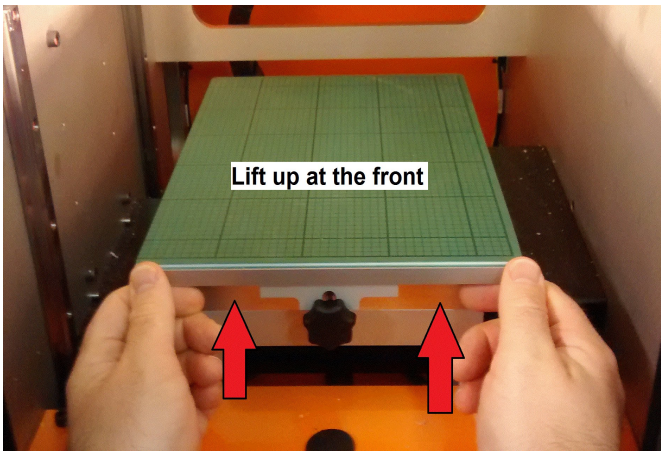
Do not press OK until the set-up is complete!

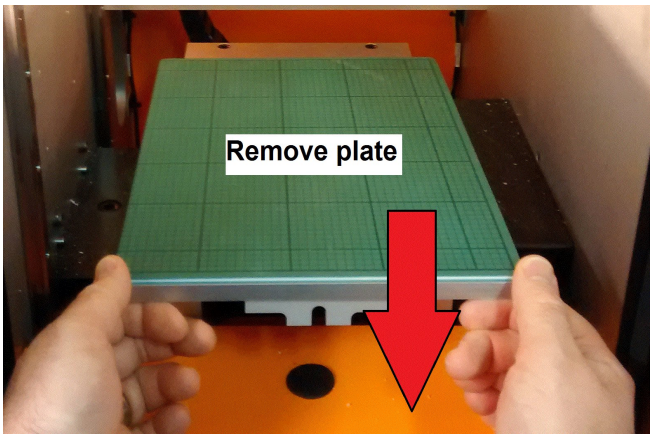
The doors can now be opened to allow access to the machine to attach the first sheet.

8.2. Attach the first Sheet

Step 1: remove the build plate by loosening the knob on the front of the build plate. It is not necessary to completely unscrew this knob. Once loose, lift the front of the build plate and slide out the entire assembly.

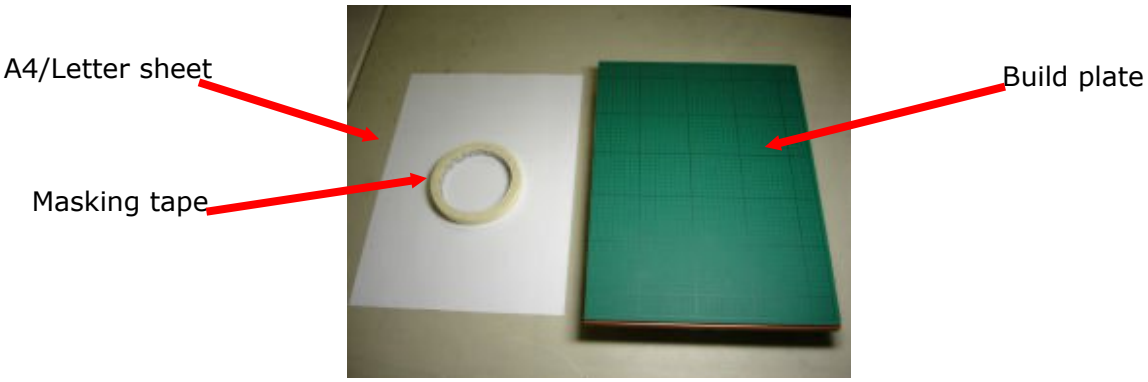


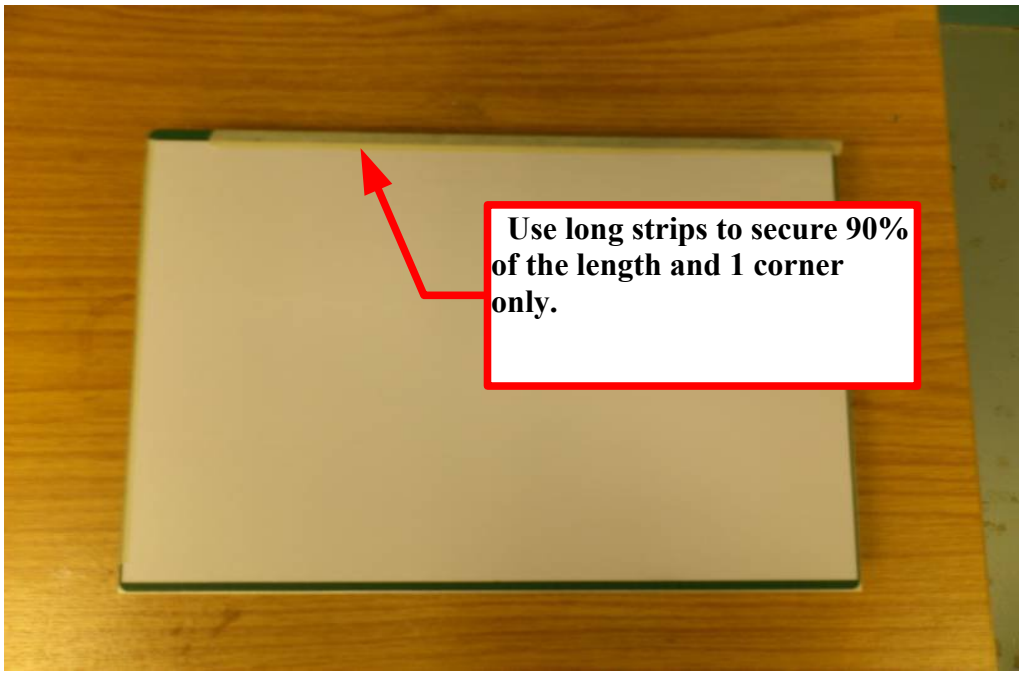




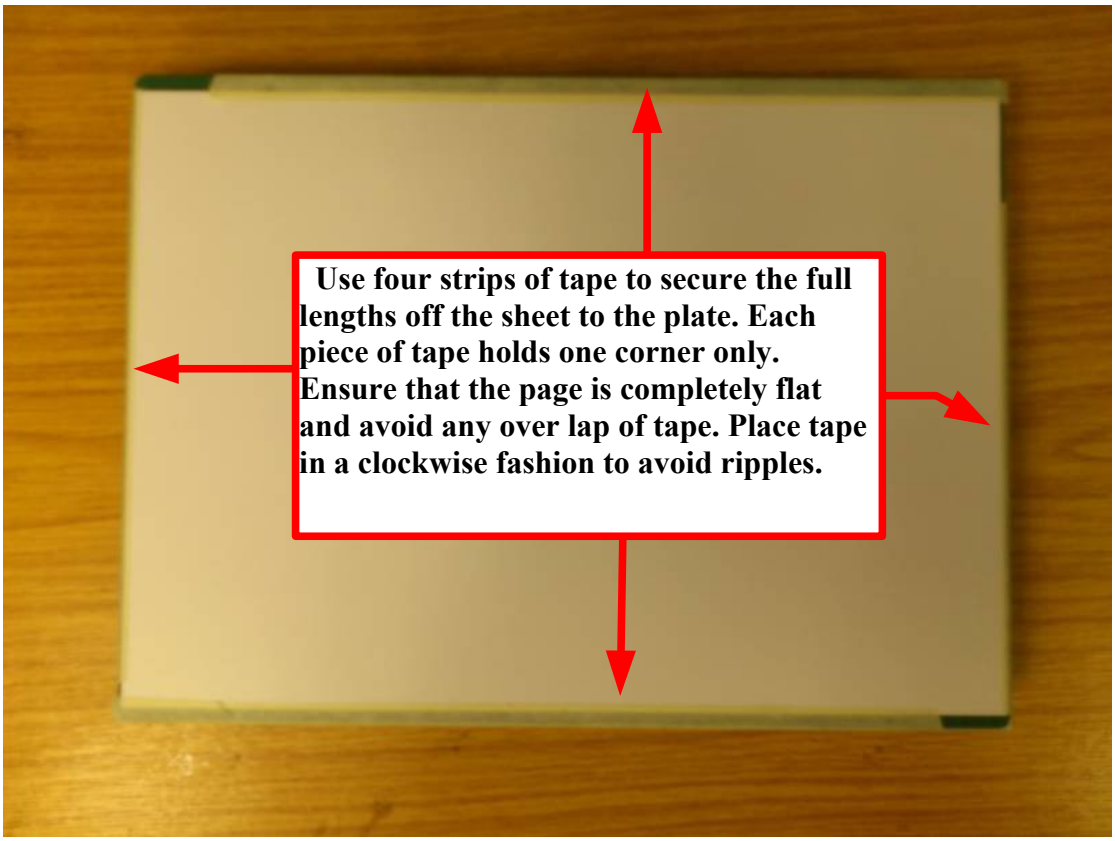
The Knob is not connected to the removable build plate therefore be careful not to completely unscrew as it could fall out and into the machine.

Step 2: Place the build plate on a level surface along with a single sheet of A4/Letter paper and a roll of non waxed masking tape. Position the page in the centre of the cutting mat. Start at one corner and using a full length of masking tape, tape down 90% of the long side. Then move over to the top and do the same. Repeat this for the other two sides in a clockwise direction. Ensure that the sheet is flat when finished. Ensure that only 2mm of the A4/Letter page is covered along the edges. All edges of the paper must be secured. Do not allow the tape to over lap as this can cause a height difference.





Ensure that the tape isn't too long and wrapped under the build plate, as this could interfere with the fixed build plate, preventing the removable build plate from perfectly being flat.



Step 3: Check that all 4 corners of the sheet are secure and then place the build plate back into the machine.

The front of the plate should fit over the threaded barrel of the locking knob. This is then tightened to secure the removable build plate in position.

Note that when you replace the build plate you should also check for any glue residue on the heat plate. It may be necessary to clean this with a damp sponge to prevent it from effecting the build.

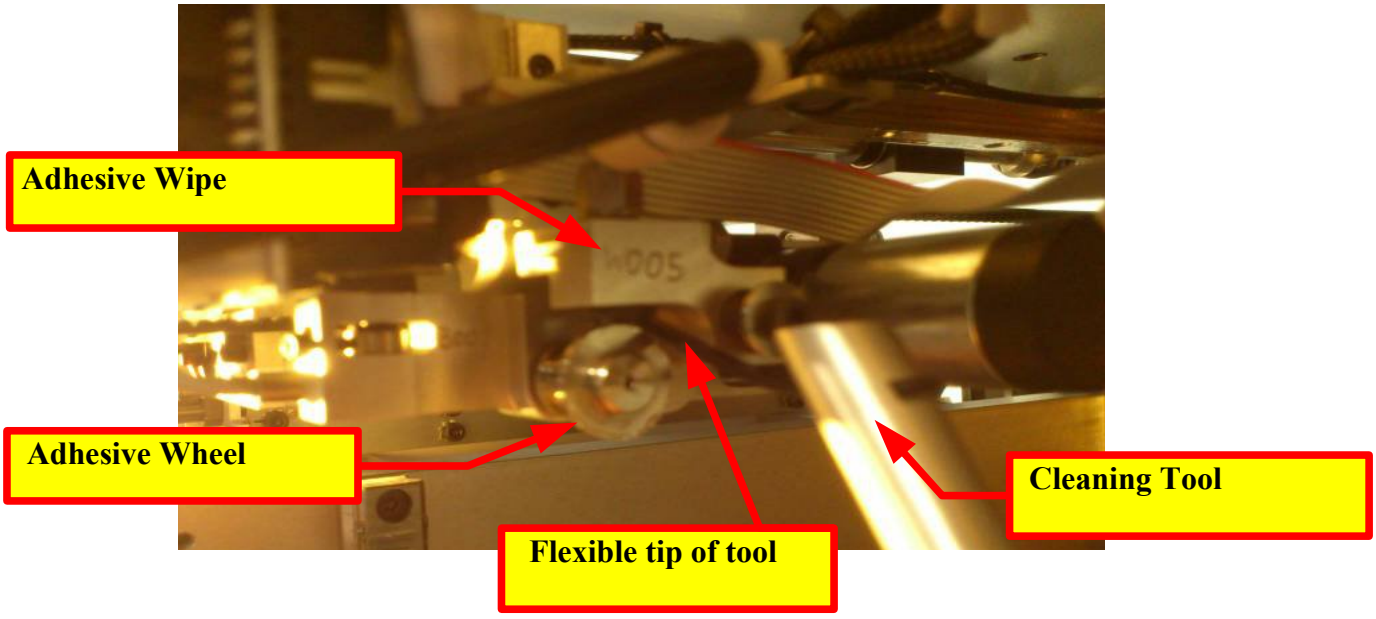
8.3. Clean Adhesive Wipe

At the start of every build the adhesive wheel must be cleaned. The adhesive wheel is shown below and can be accessed by opening the front door.

If the adhesive wheel is going to be cleaned using the provided sponge the wheel needs to be rotated therefore the adhesive system must be turned off. If only using the wheel cleaning implement, it is not necessary to shut off the adhesive valve.

For this demonstration, please turn off the adhesive system now by turning the shut off valve on the side of the machine to the horizontal position

Use the adhesive wheel cleaning implement that come with the Mcor Toolbox supplied with the machine to clean the adhesive wheel.

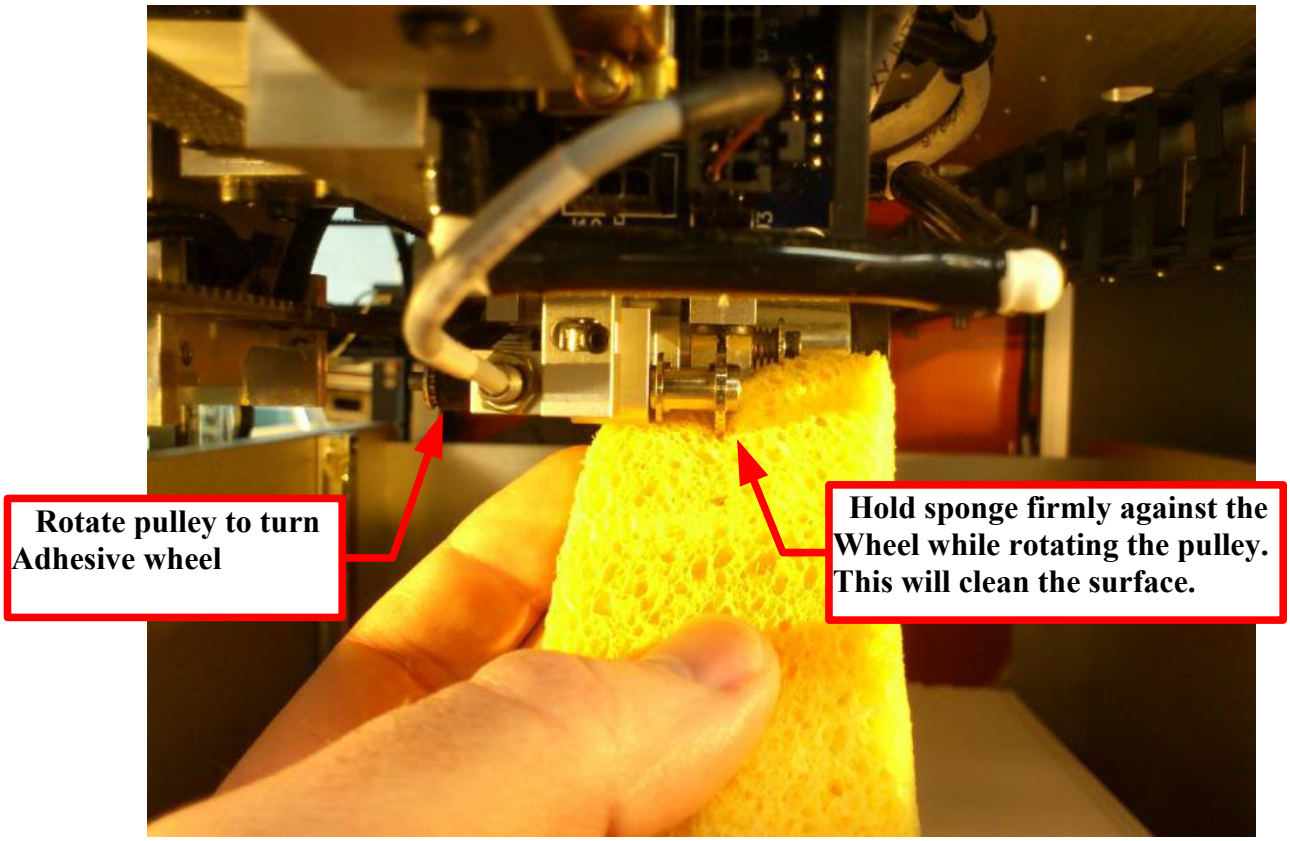


The adhesive wheel cleaning tool has an aluminium body but a firm but flexible plastic tip that is strong enough to remove any debris / dust build-up but delicate enough not to damage the wheel or the adhesive wipe above the wheel.

Most of the debris will be located at the top of the adhesive wheel where the adhesive wipe is. In extreme cases a medium / soft toothbrush can be used.

Do not place any objects between the wipe and the wheel as this will damage the mechanism. Never use metal implements to clean the wheel.

Next take the sponge supplied with the tool-kit and dampen it slightly. Then place it under the adhesive wheel and rotate it slowly by placing two fingers on the inside of the pulley on the left of the wipe and moving slowly, making sure not to be too rough as to damage the pulley or the belt.



Do not turn back on the adhesive shut-off valve at this point since cleaning with the sponge and rotating the wheel would ensure that the wheel location is out of alignment.

However once the machine continues to re-initialise (after loading paper) the alignment is checked and set, and the valve can be turned back to the vertical and open position

8.4. Knife Set-up

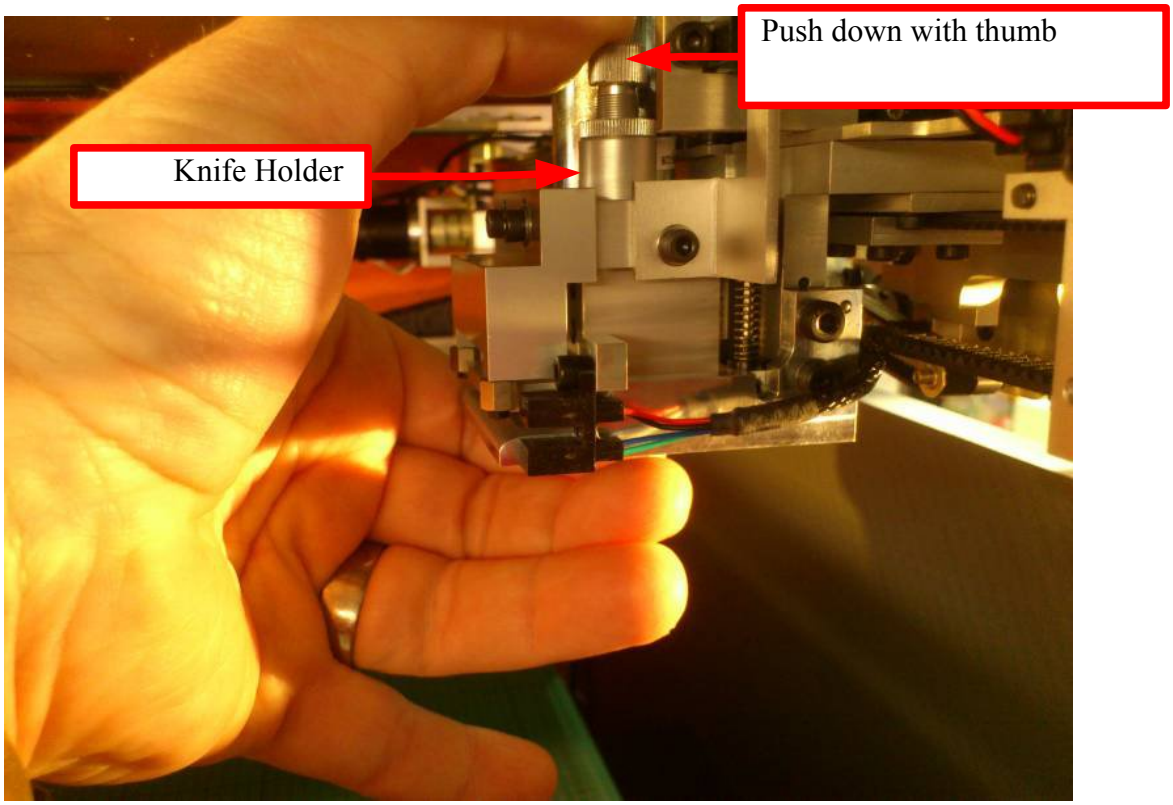
There a 3 different circumstances when the knife should be changed:

- If this is your first time using the machine there will be no blade in the blade holder
- The software tells you that the knife has exceeded its travel life and must be changed
- At the start of every build

Note that the knife holder only allows for adjustment of the knife in one direction, out of the body of the knife holder, for this reason every time the knife depth has to be adjusted, we must first remove it from the knife holder.

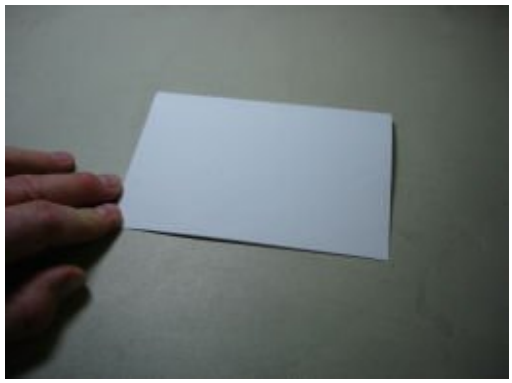
Here are the steps to removing the knife.

Step 1: Take the blade holder out of the top head of the machine being careful not to put dust over the belt and shafts. Place your thumb on the top of the Knife holder as shown below and place your other fingers on the bottom of the Knife holder, this ensures that the knife holder does not fall out when it is been removed. Then lightly press your thumb to release the knife holder into your fingers or your other hand. Be careful not to drop the holder as this may damage the blade.

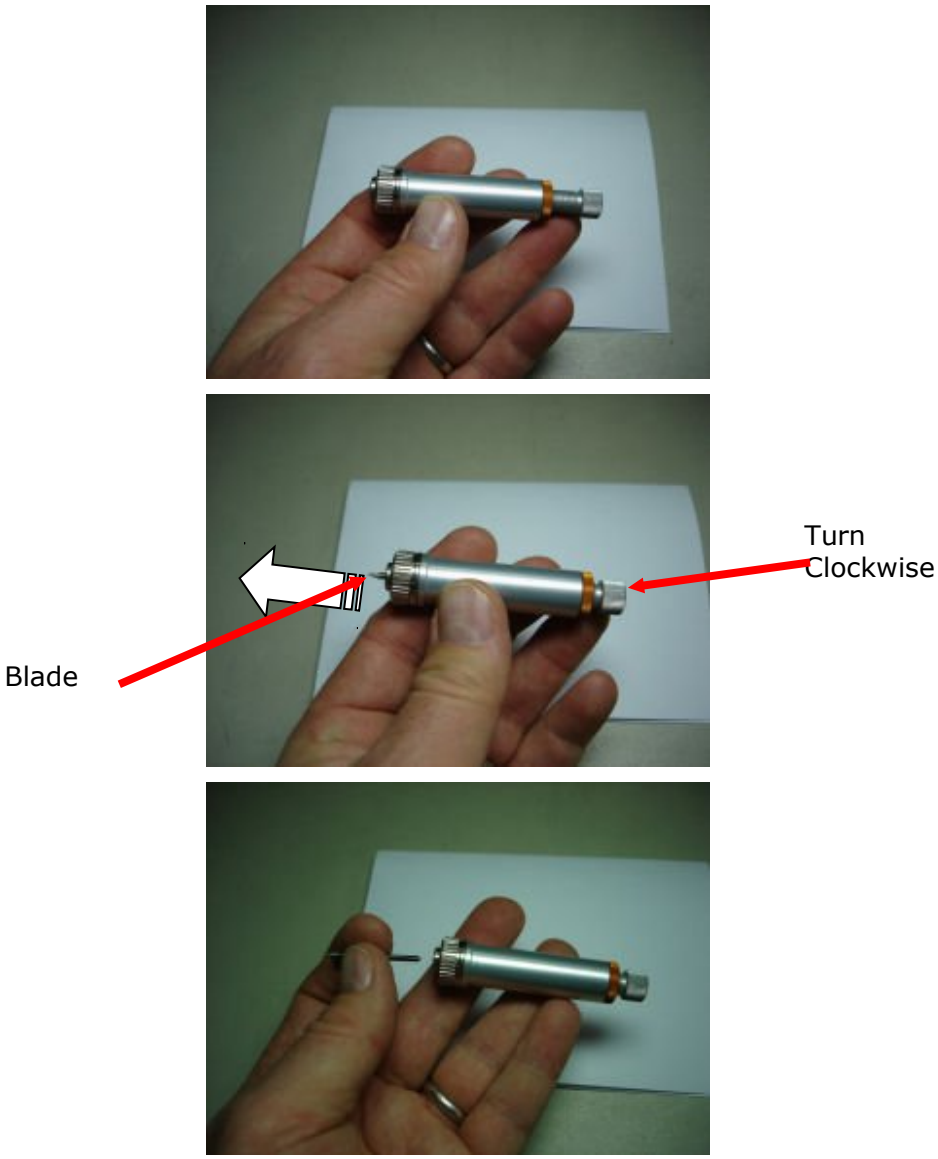


Step 2: get an A4/Letter sheet and the blade holder

Step 3: Fold the paper in half once, then twice so that our test piece is 4 layers thick.

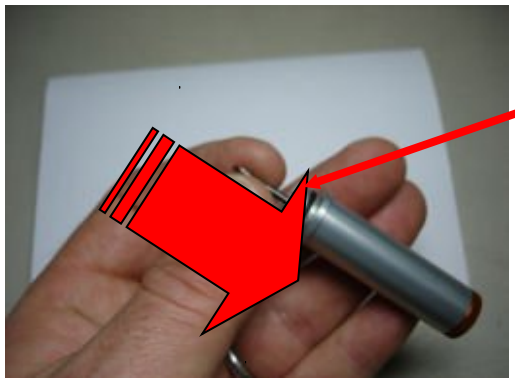


Step 4: Screw out to the blade to it Max position by turning the threaded adjuster (shown on the right hand side in the figure below) in the clockwise direction until the blade protrudes to the maximum position. Then remove the blade completely.

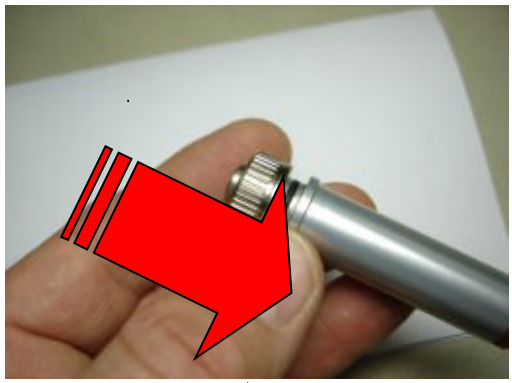


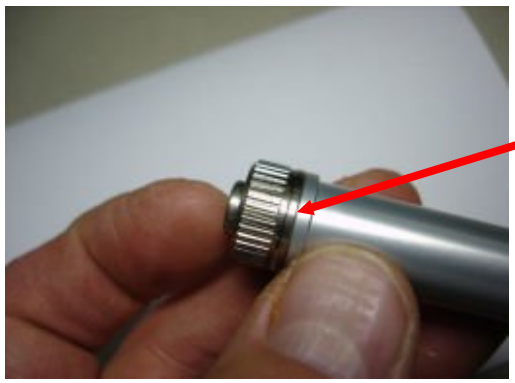
Note: It is important to remove the blade before removing the nose cap, as the nose cap is made from stainless steel and the blade is made from tungsten carbide. The nose cap can damage the cutting face if contact is made.

Step 5: Twist the nose cap to remove and unscrew the threaded adjuster completely. Then reinsert the blade (or a new blade if needed) and press down as far as possible until flush.

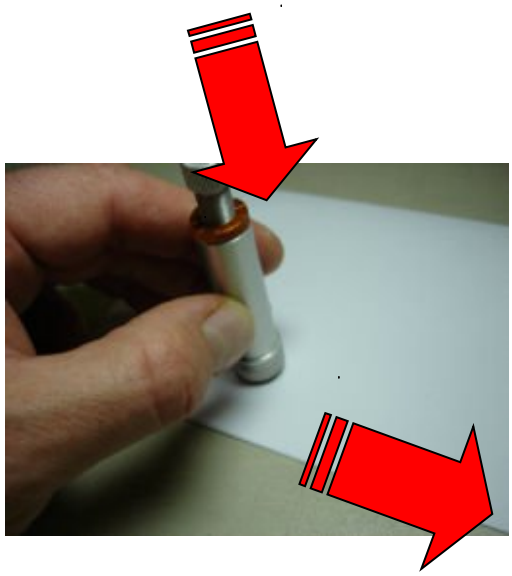


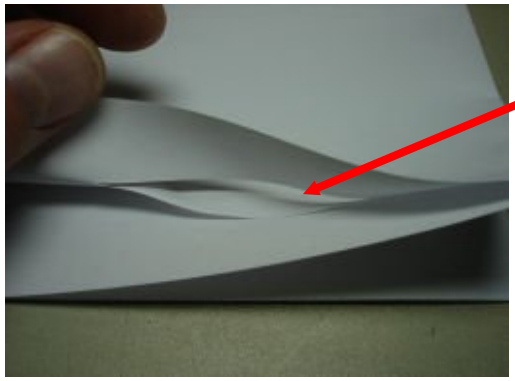
Step 6: Replace nose cap making sure not to make contact with any part of the blade. Ensure that there is no gap between the nose cap and the body of the blade holder. Insert threaded adjuster by rotating clockwise.



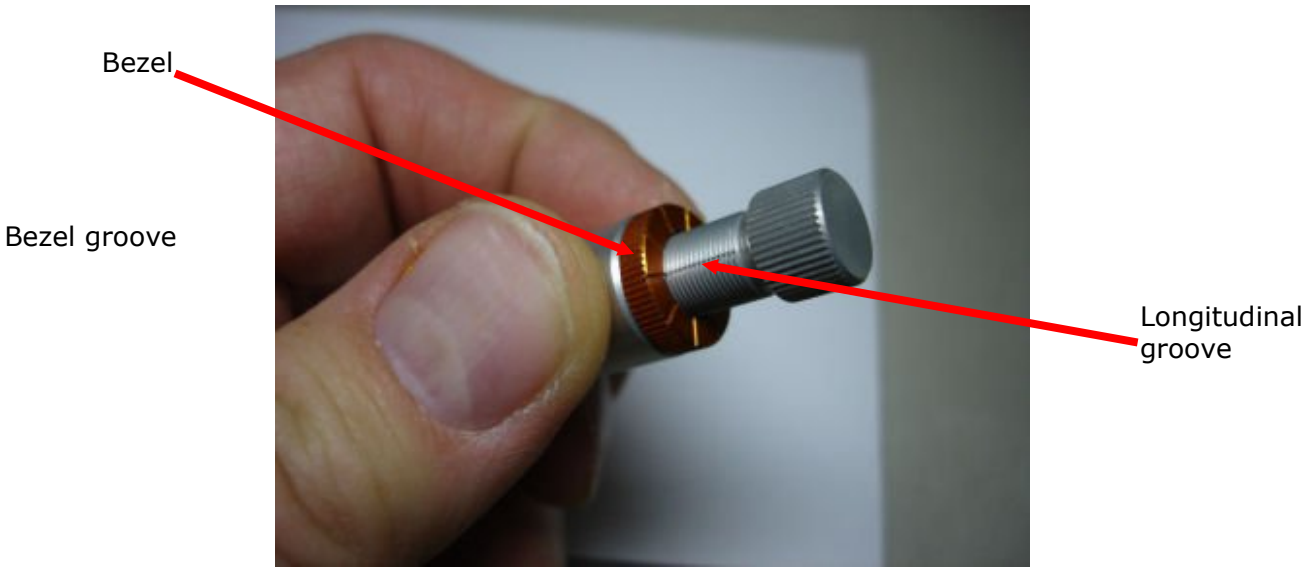


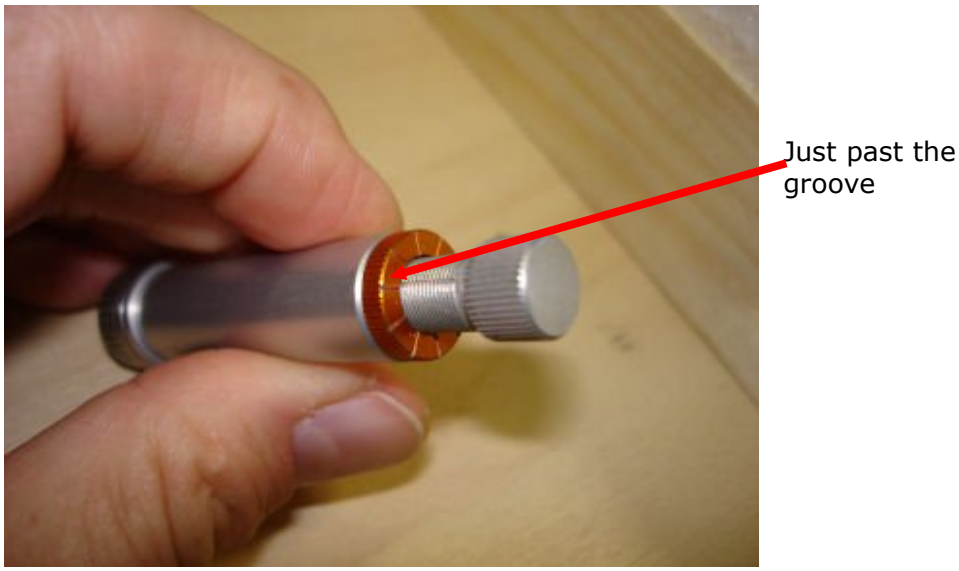
Step 7: Place the blade holder onto the folded sheet and start rotating clockwise the threaded adjuster until the blade holder cuts just one page. This is done in small increments until one page is cut. Apply pressure straight down, perpendicular to the page.

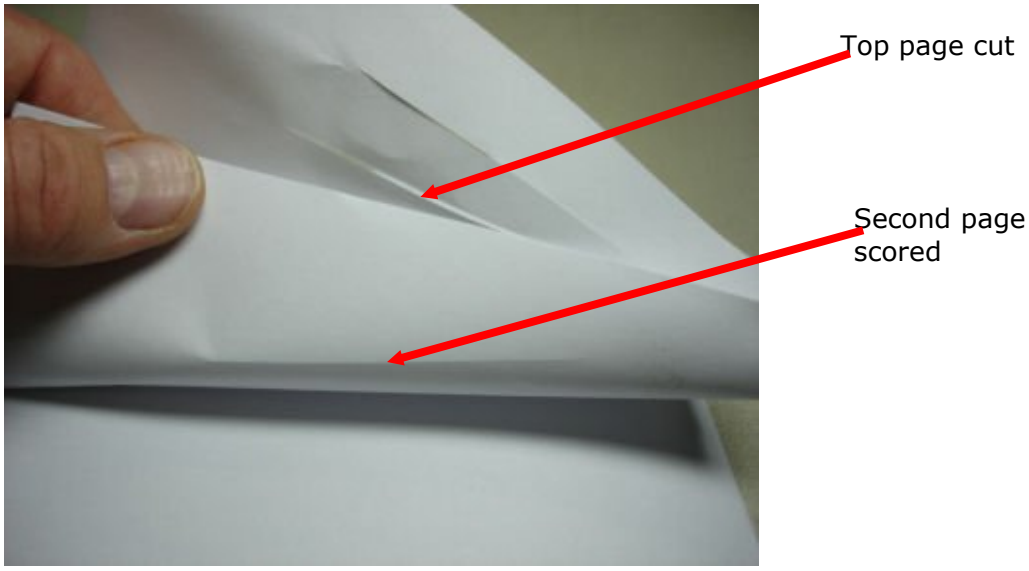




Step 8: Rotate the bezel so that any of the grooves on the bezel align with the single longitudinal groove in the threaded adjuster. Then the threaded adjuster is rotated in a clockwise direction to the next groove in the bezel and then just past the groove see second image below. Each division between bezel grooves represents 0.05mm. At this setting the blade completely cuts the top layer and scores the second layer underneath.







Step 9

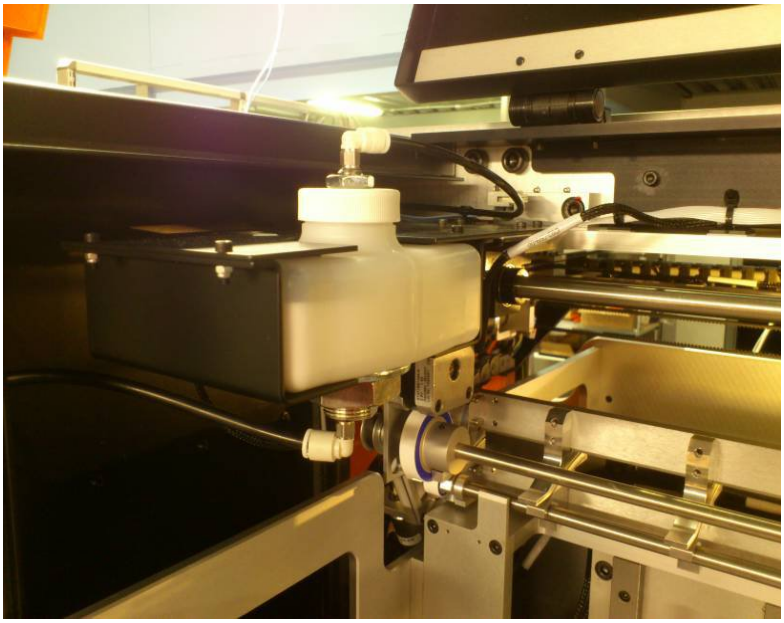
Place blade holder back into the multifunction head. Ensure it is held securely by the spring loaded ball bearing. You should hear a metallic bang / snap sound when properly located.

8.5. Adhesive set-up

- With reference to the image below, examine the level of the adhesive in the bottle. If the level of the adhesive is less than 25% then adhesive needs to be added. (Always check the mfg date on the bottle. Adhesive has a shelf life of 1 year if stored correctly).

The following steps are used to fill the adhesive bottle.

Step 1: Open the adhesive bottle



Step 2: Fill the bottle with Mcor Adhesive. Ensure that you do not over fill. In general, stop filling when the adhesive level reaches the neck of the bottle.

Step 3: Put the lid back on and tighten securely. If the adhesive air pump continues to cycle this means that the bottle is not sealed. The pump should stop after approx 15 -30 seconds, depending on the pre-set target pressure.

8.6. Load Paper

This machine currently only uses 80gsm A4 or 20lbs Letter paper.
Before you begin making a part, check how much paper is in the paper tray. The amount of paper needed depends on the size of the part being built. A ream of paper is 50mm high so you can estimate the amount of paper based on the height of the part being made. 100mm equals two reams etc. It's always safer to put in more paper than needed to prevent unplanned stoppages. The following techniques will improve the reliability of the paper feed mechanism.

- If possible always use the same grade and manufacturer of paper
- Ensure that the room where the paper is stored and where the machine is operated is maintained between the Relative Humidity (RH) range 30-70%, and a temperature range 17-25°c.
- Never touch the paper feed rollers with your fingers as the oils from your hands can cause the coefficient of friction to change on the rollers.
- Clean the rollers at the first sign of slippage using IPA (Isopropyl alcohol) or IPA alcohol wipes.
- Do not add more than three reams of paper to the paper feed.

Load the pre-printed paper or the new clean paper in to the paper tray.

[The paperfeed optical sensors may also need to be cleaned at this stage, see procedure p 65.]

At this stage both doors can be closed and we can continue the procedure with the touch screen LCD.

The LCD screen will display the following:

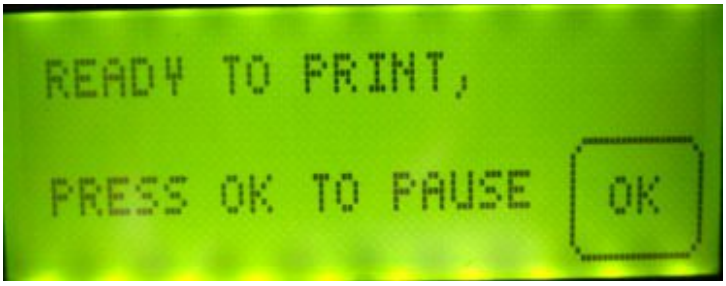
When you press OK, the machine then asks:

Note that from this point onwards, the software keeps track of the knife travel internally so that the calculation of when to change the blade is accurate. If you have inserted a new knife, select "YES" if you didn't, select "NO". If you select "YES" it will assume that knife has been changed and will reset the internal travel value to 0km, therefore do not say "YES" unless it has been changed. This only applies for a newly installed blade and not when adjusting.

The LCD then displays the following:

Then you will need to press the reset button "R"

The machine will then re-initialize and when complete the LCD will display:



If you have cleaned the adhesive wheel, make sure that the shut-off valve is opened by rotating it to the vertical position.

Now the machine is ready to accept data from the PC.

9. Part completion

Once the part is complete the following message is displayed on the LCD screen.

The operator then selects "next to remove" option by selecting the arrow on the right. When this is selected, the build axis lowers down to its lowest position to enable the removal of the build plate and the part thereon.
The locking knob is loosened and the build plate removed with the part attached on top.

At the end of each build it's vitally important for the correct operation of the machine to leave it in the correct state.

The following steps should be adhered to at the end of every build.

NB: At the end of every build

- Once the part has been removed from the build plate, place a single sheet of A4/Letter paper in position as previously detailed
- **Replace** build plate into the machine. Failure to do so may result in serious damage to the machine
- Close the doors, and follow the touch screen instructions on the Matrix 300+ / IRIS to ensue that the machine is in the **"Standby mode"**
- **Never leave the machine powered off for prolonged periods as this can effect the adhesive.**

10. De-cubing the part (weeding)

Once the part has been removed from the machine it must be de-cubed or weeded. This is the name given to the process of removing the excess paper from around the desired 3D object. The process is exactly the same of monochrome and coloured models.

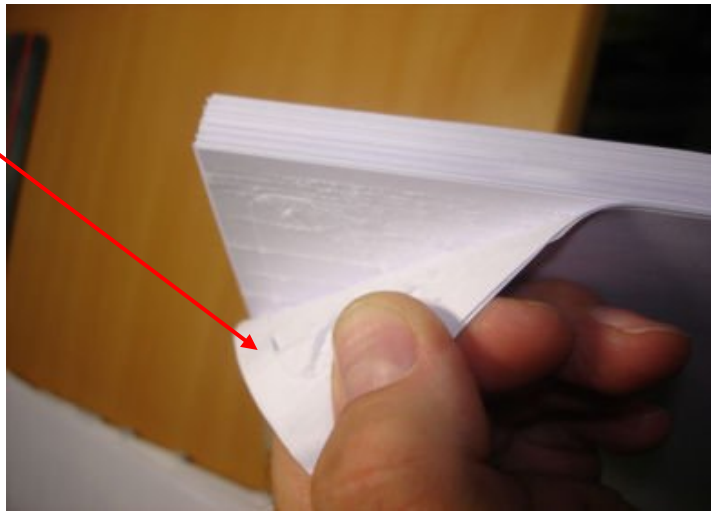
The first thing to do is remove the non waxed masking tape from the build plate and separate the build from the removable build plate.

The last layers of the build will need 15 -30 minutes to fully cure depending on the room temperature and relative humidity. Therefore if you remove the build immediately it would be advisable to start at the bottom of the build as this will be fully cured.

It is very helpful to have the stl, wrl, or obj file of the printed part opened in SliceIT so that the locations of various geometries are known. It is also helpful to see where the cut planes are if they were used during the build set-up in SliceIT.

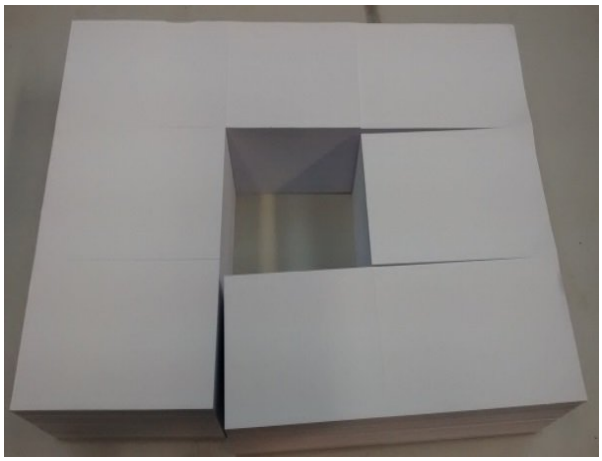
At the start of the building process a number of layers are glued down without any cuts to act as a base for the model. This base is the first thing that needs to be removed.

Set-up layers



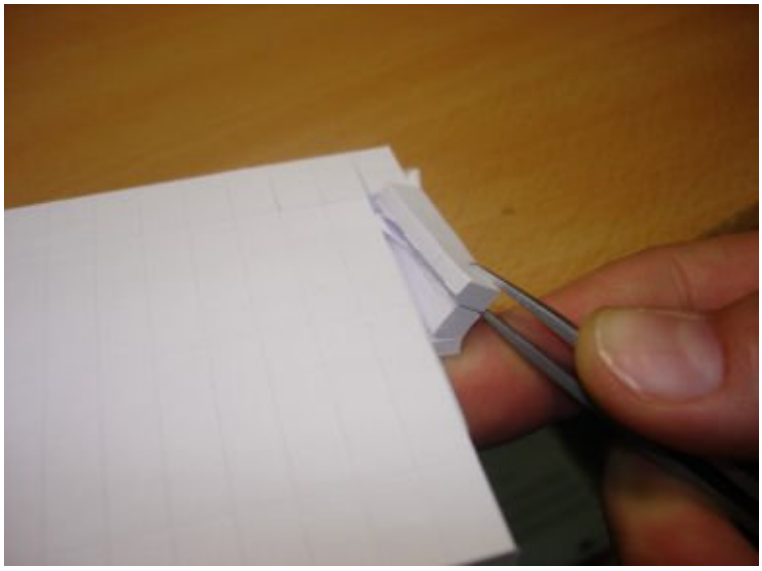
There is a large outer border casing the part and keeping the build together. The next step is to remove this border. Once this is removed you can concentrate on the inner portion.

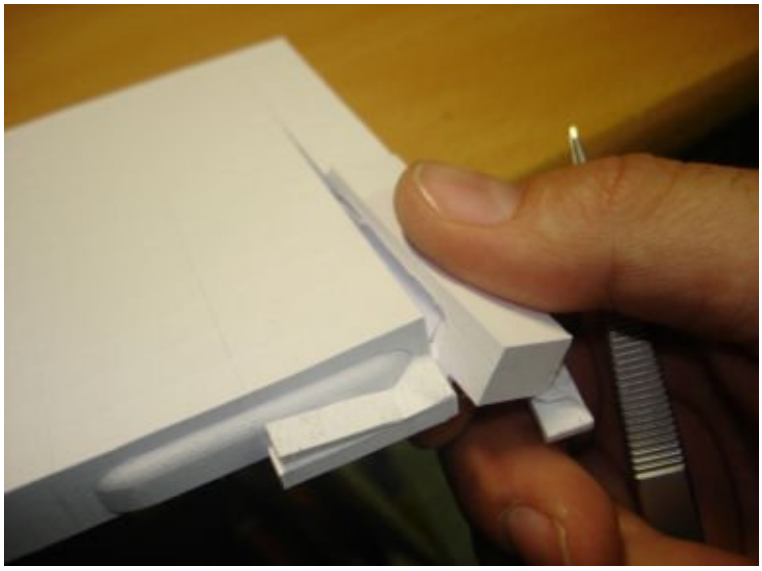
Example of a remaining border after part and support have been removed. The size of this border adjusts itself relative to the size of the model(s). The height will be the same as that of the highest model.

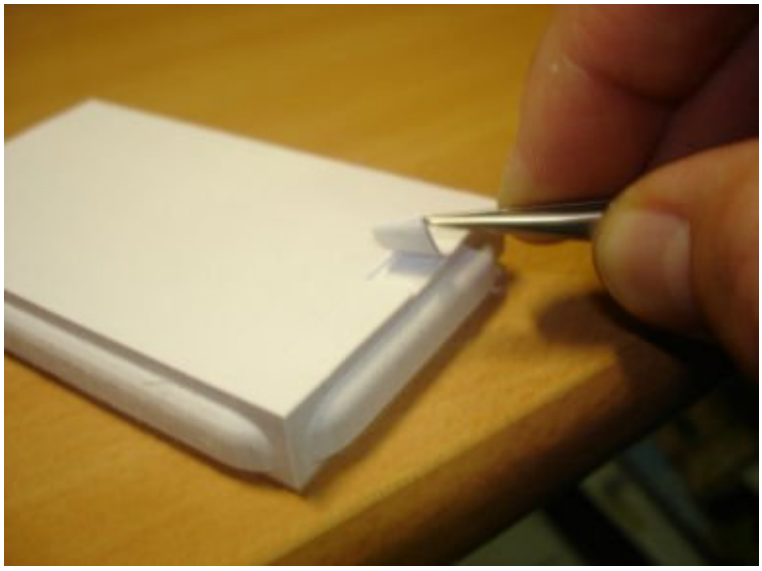


Next the outer waste can be removed by simply breaking it off of the model

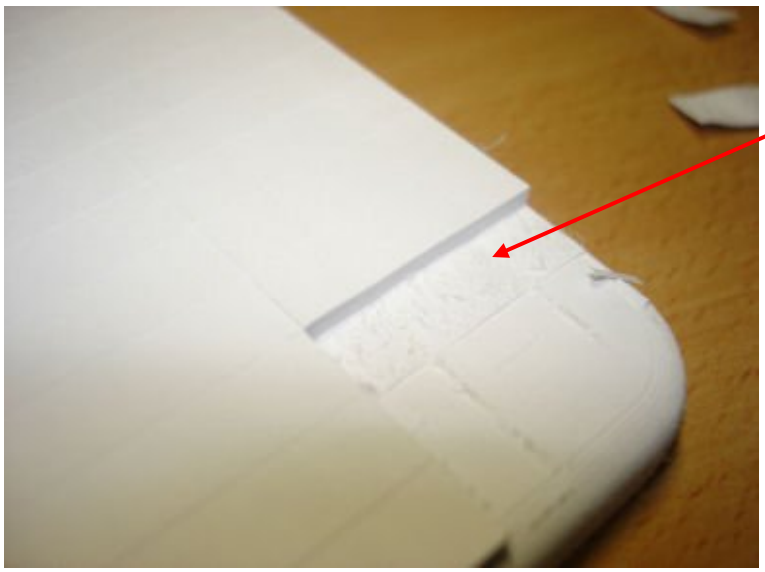
Now that the outer waste material has been removed, the waste (support) closer to the part is next.



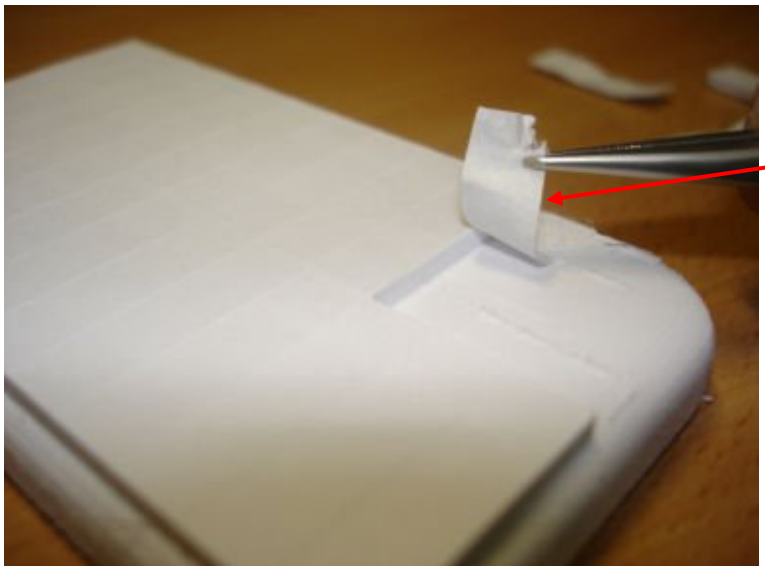




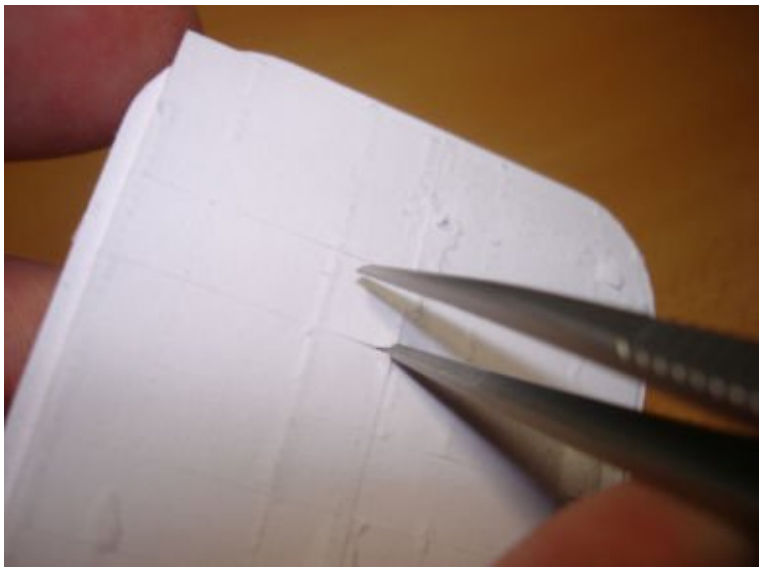
Individual layers can be removed using the supplied tweezers. Sometimes when a layer is removed, the page separates not at a boundary between two layers, but within the sheet itself leaving a half layer. When this happens the layer left behind is not smooth. This is shown in the image below.

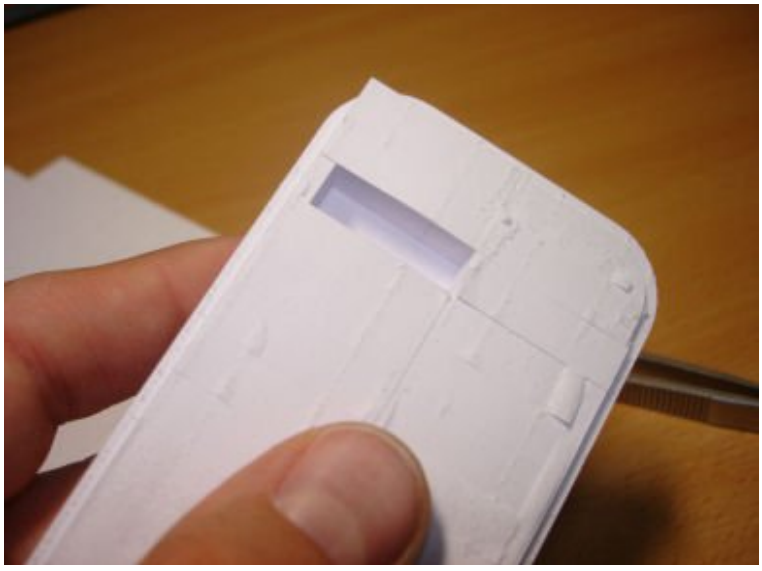


To get this smooth, use the tweezers to remove the half layer to expose the smooth part surface below.

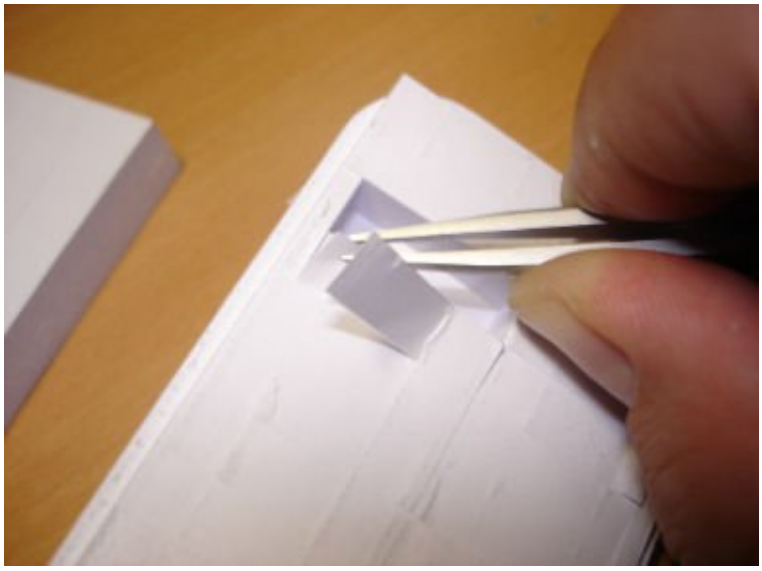


To remove internal cavities, use the tweezers and press in one corner to get a grip on the first piece of waste. Then keep going to expose a hole within the waste. Try to move in an outward spiral pattern.

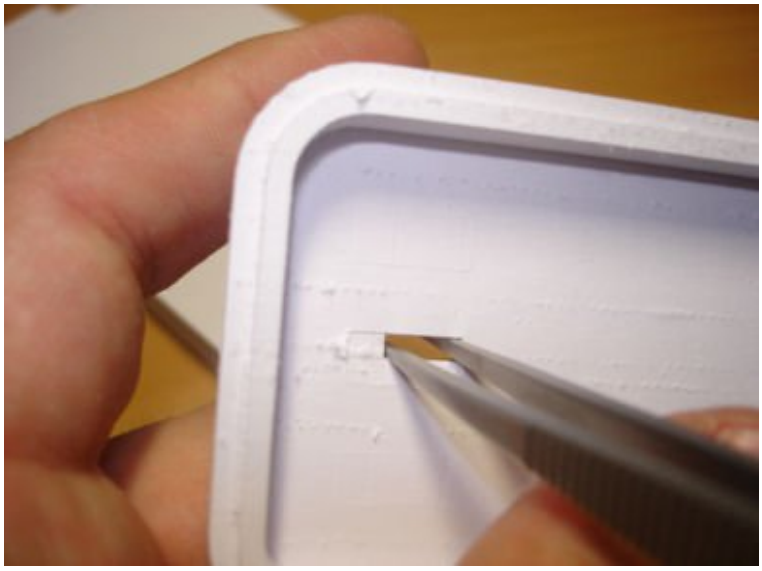




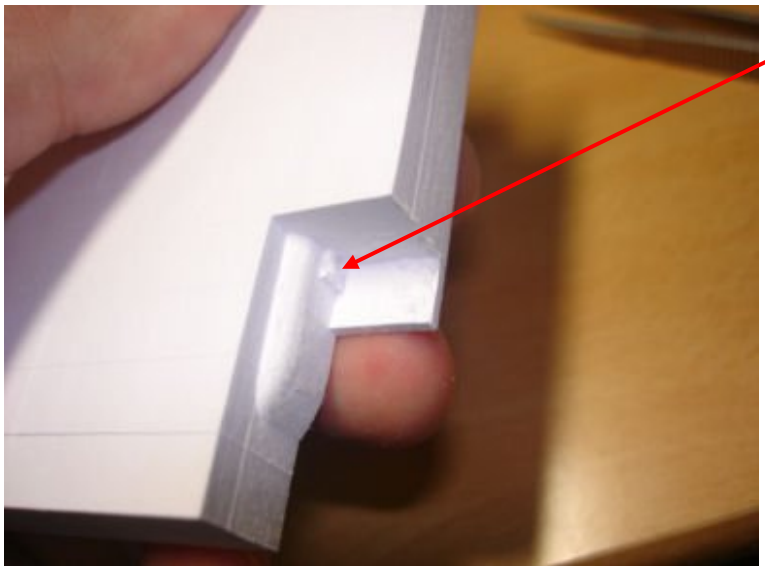
Once the hole within the waste is created, use this to remove the remaining waste until the entire internal cavity is removed.

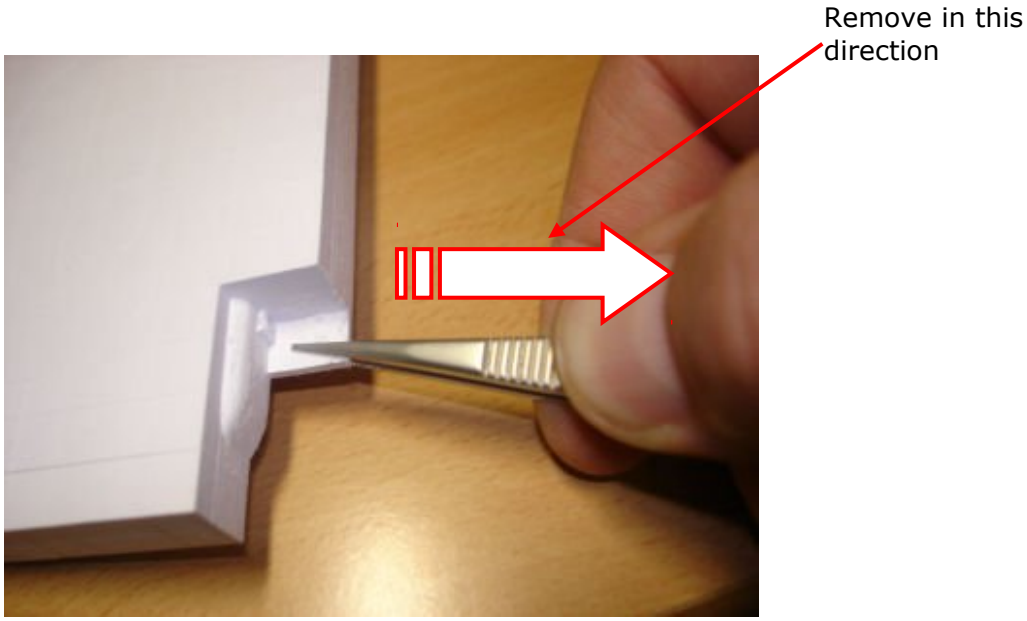


For small through holes, once the waste either side of the part is removed, simply use the tweezers to punch through and open up the hole feature.



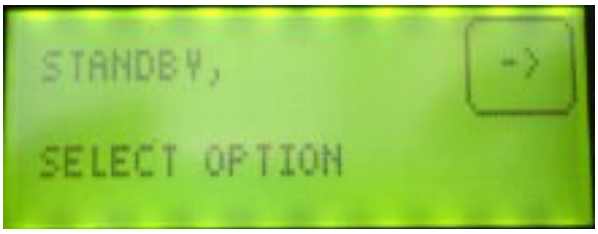
If the part has very fine details, these will have to be orientated so that they are built perpendicular to the Z axis (build axis). In cases of very fine detail, remove the waste material by pulling in the same plane as the page, or perpendicular to the build axis.





11. Standby Mode

In order for the adhesive system to perform optimally, the machine should be either making a part or in left "Standby" mode.
The screen below shows the "Standby" mode which is displayed after power up, when a part is finished or if a part is terminated.



If the machine is left in "Standby" mode for 24hrs it will automatically apply a coat of adhesive on the build area and load and press the page. Note that the machine will apply 2 pages at a time and then repeat every 24 hours, this process will repeat indefinitely as long as there is sufficient paper and adhesive in the machine.

For example: 1 ream of paper in the machine (500 pages) will enable the machine to repeat this process for 250 days and prevent the adhesive lines from clogging and requiring a maintenance call.

To exit "Standby" mode simple follow the on screen options to get to the desired state.

Please note that if you are exiting the "Standby" mode to build a new part, the pages stuck to the build plate will first need to be removed.

12. Operator Input Required

If for any reason the machine is not making a part or has not been left in the "Standby" mode, after 30 minutes the lights inside the machine will begin to flash to inform the operator that their input in required.

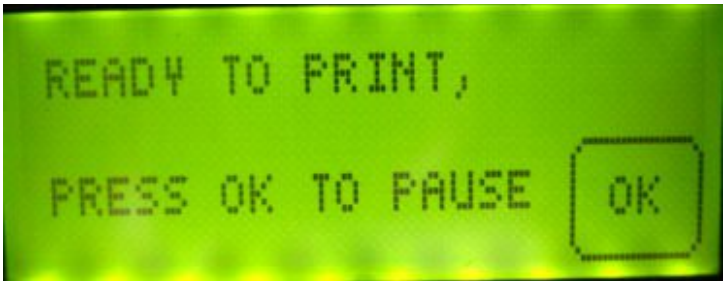
The operator can follow the on screen instruction to either start / restart making a part or place the machine into "Standby" mode.

13. Maintenance

Over time the rollers on the paper feed mechanism require cleaning to remove paper dust and debris.

Cleaning the Paper Feed Rollers during a build

Step 1: If the machine is running, select the "PRESS OK TO PAUSE" option on the LCD screen as shown below.

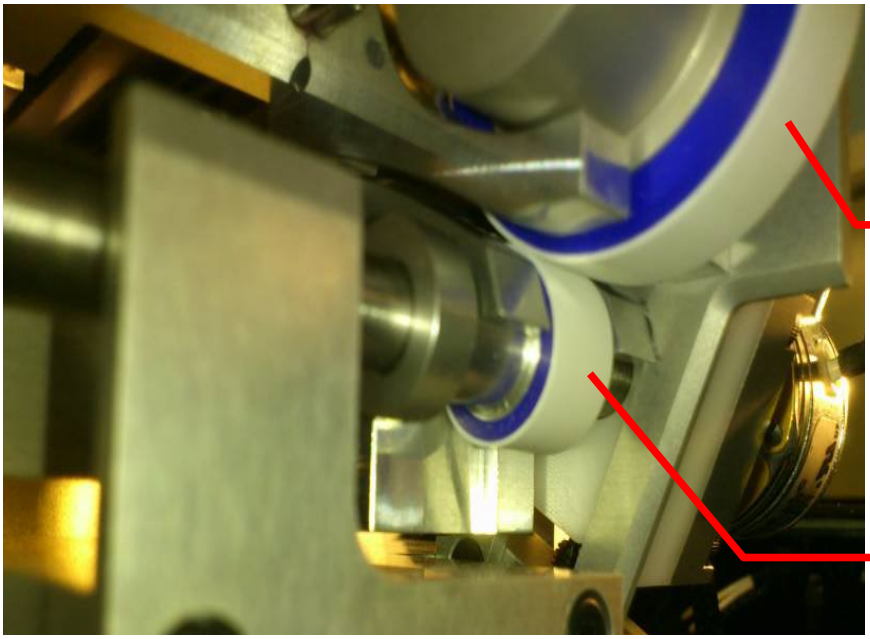


(If the machine is switched off, simply open the paper feed door and remove any paper that might be lodged between the drive roller and the retard roller)

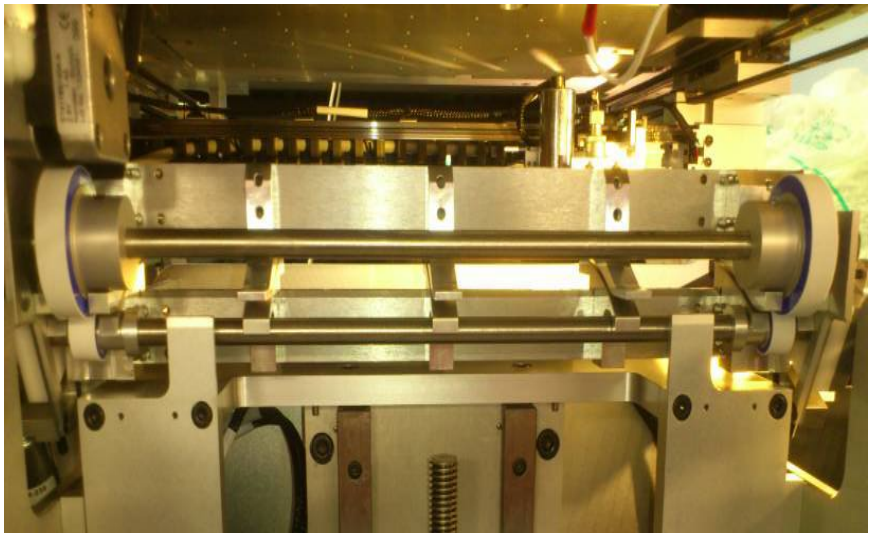
Step 2: scroll through the on-screen LCD options to "Load Paper" as shown below.

This will cause the paper feed tray to lower to its lowest position to enable the greatest amount of space to facilitate the cleaning of the roller. If necessary remove some or all of the paper in the tray.

Step 3: Using IPA (isopropyl alcohol) on a lint free wipe, gently press the wipe into the surface of the roller. With your other hand rotate the roller shaft 5 complete revolutions. Do the same on both rollers making sure not to make contact with the rollers with your bare fingers. [Do not use any other cleaning materials such as acetone or solvents as they can damage the frictional surface of the rollers.].

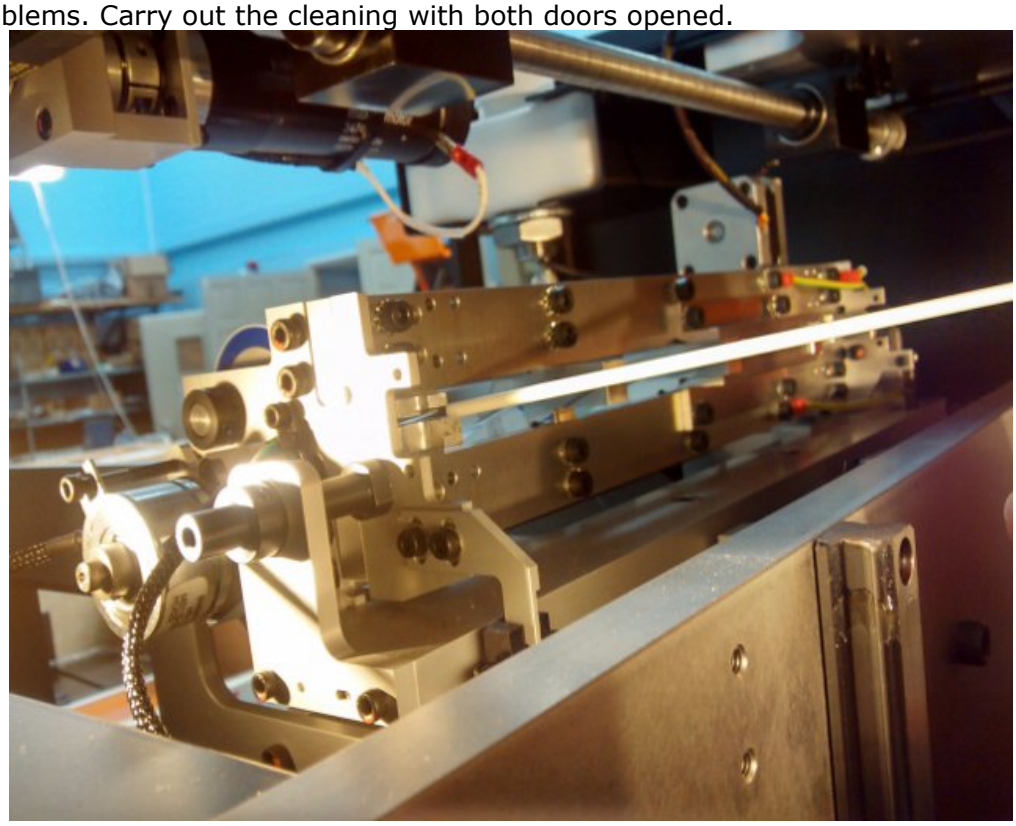


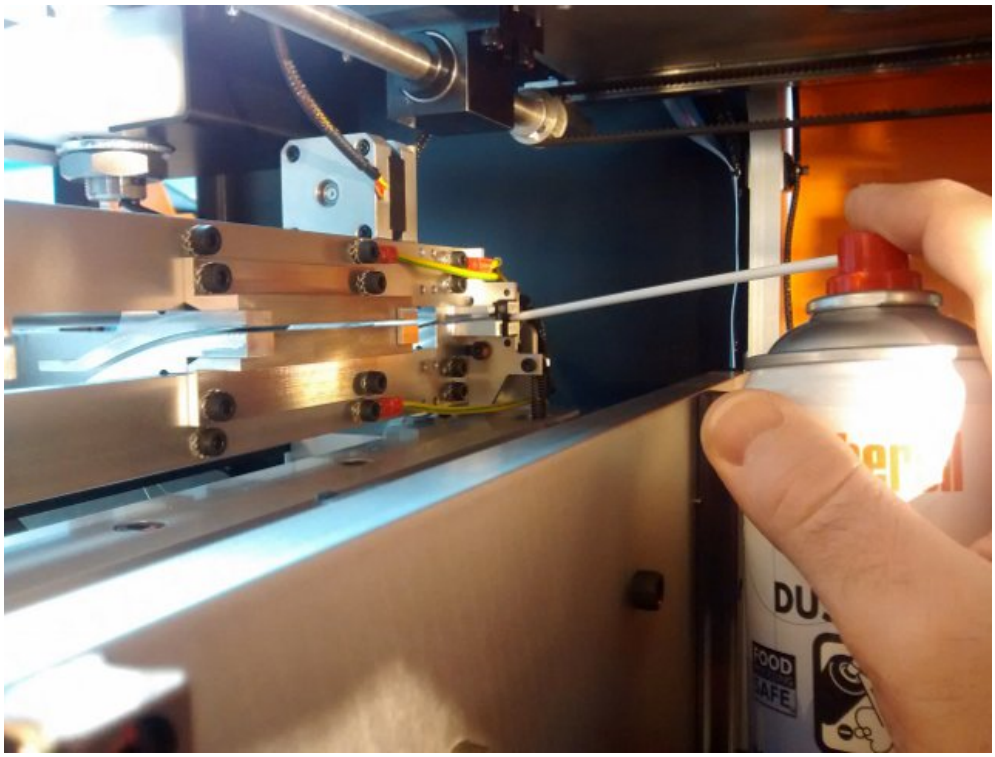
You can also press the wipe against the retard roller and repeat.

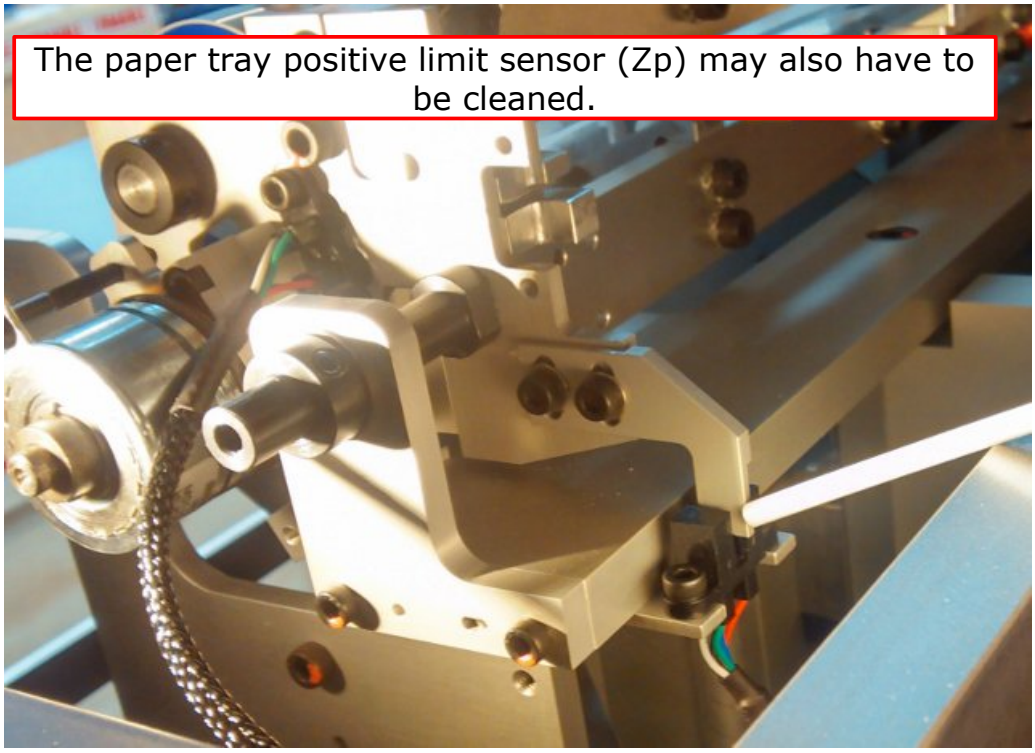


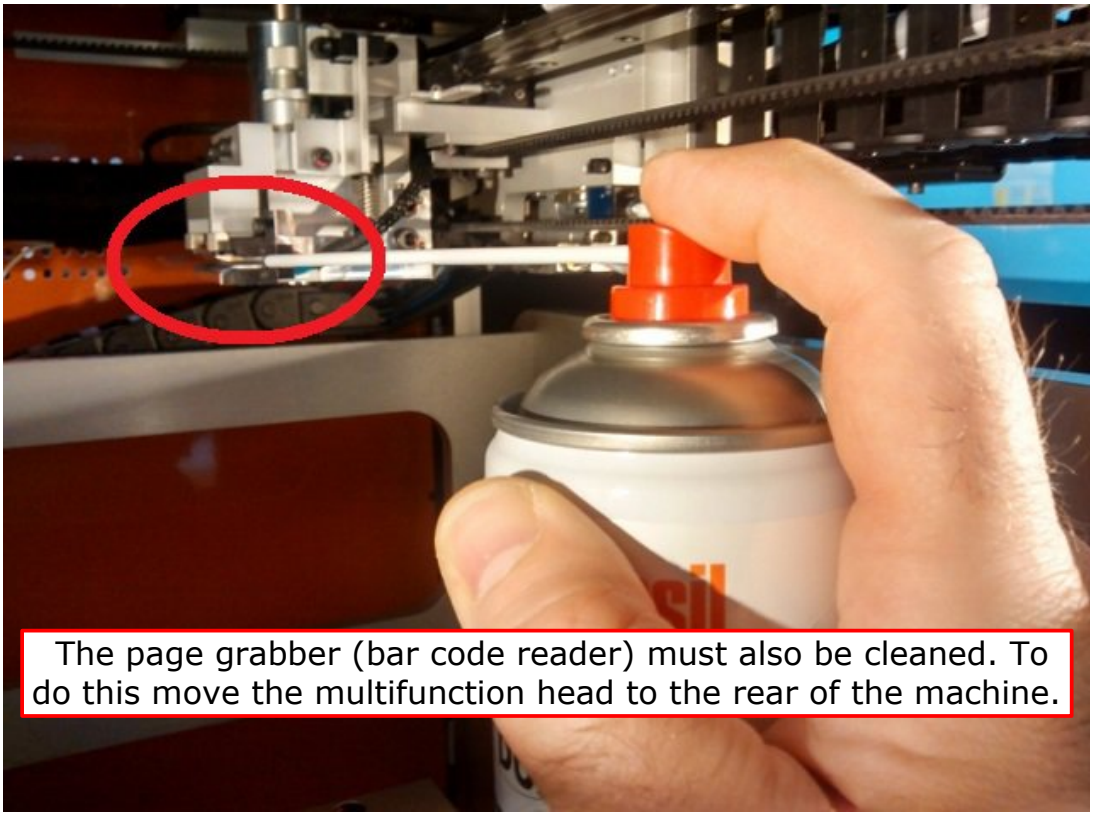
Use a lint Free Wipe with IPA

Periodically and depending on the quality of paper used, the optical sensors on the paper feed and page grabber will need to be cleaned. Use an air duster to blow any dust particles out of the optical sensors. (Use an air duster / can of air, which contains no particles or fluid solvents.) As shown below, clean both ends of the paperfeed. Do this also for the page grabber opto. This may need to be performed monthly or quarterly depending on the paper being used. Dirt on the rollers will result in frequent paper feed issues, paper jams or page separation problems. Carry out the cleaning with both doors opened.









14. Trouble shooting:

If there is a problem with the machine and it stops automatically or if there is an error message on the LCD, the first thing you may notice is that the lights inside the machine will start flashing to highlight to you that your input is needed. [If the error or problem occurs when the machine is unattended, you may receive an email if you have selected that option in the preferences section.] Follow the instructions on LCD screen which will guide you through what to do next. There are 2 types of error.

Recoverable errors mean that the build can be continued once the issue is resolved, i.e. Paper jam cleared, paper is added, glue is added or the knife is changed. The machine continues automatically one the lcd and reset buttons have been pressed.

Non recoverable errors mean that the build cannot be continued without the machine / SliceIT being reset. In some cases a service engineer must be contacted to investigate the problem further. They may request remote access to the machine / computer to reset an internal error or to assess the situation.

Depending on the error and the severity of the fault the build may be resumed by noting the page on which the fault occurred (on 300+ this info is on the bottom left hand side of the SliceIT window; for the Iris just read the page number on the sheet on the build plate). Reset the 3D printer and if the fault is cleared, select option 3 "Run build", then when you reopen the relevant SliceIT project and go to print, deselect "all" and put the noted page number in the "From" box.

Notes:

If the machine repeatedly can not read the bar code on a page even after reprinting it check that the "Read Duplex" option is turned off in the Help, Preferences. This option should only be used for calibrating the 2D printer. If this problem persists you must also verify that the 2D printer is correctly set-up and configured.

If the machine will not initialise when the Reset button is pressed, check that the Emergency stop button has not been pressed down. If so rotate to reset.

Cleaning the heat plate:

It is also a wise precaution to periodically clean any residue of of the heat plate. It is possible that stray adhesive can accumulate here due to bad initial page placement or build stoppages. This can cause parts of the model or waste to separate from the main build, potentially causing build failures.

Recoverable errors:

Message on screen	Cause	Solution
Paper tray empty	There is no paper in the tray.	Access machine and load paper. Follow the load paper instructions. When complete continue build.
PAGE SEPARATION JAM OCCURRED	Pages in paper-feed could not be separated	There is paper present, but it can't be fed properly. Access the machine and either 1. Remove the top 3-5 sheets and discard, if 300+. 2. Clean rollers & continue build, or 3. Check for stuck pages, reprint faulty page and clean rollers. Ensure correct paper weight.
PAGE SEPARATION JAM OCCURRED	Rollers dirty or if persistent the paperfeed optos may be dirty.	A single page will be in location but has not travelled far enough during the feeding and therefore did not break the "one page present" sensor. Access the machine, remove and discard the page in question. Clean the rollers as specified in the manual using IPA and a lint free cloth, then continue build. Use an air duster to clean the paper feed optical sensors.
CHECK SLICEIT TO PROCEED	Adhesive applied but page not placed Page read error – bar code or fiducial marks not read or read incorrect value Pages in paper-feed could not be separated Page has not disengaged from page-grabber after drop-off	If the machine has an error after the adhesive is applied but before the next sheet is applied, the LCD display will instruct the operator to check the SliceIT program. The machine pauses for 5 minutes, to allow the adhesive layer on top to cure. Therefore in this circumstance, follow the on screen instructions on the LCD / Slice It. The machine will then apply a new layer of adhesive. Check top page in tray for correct orientation and good print features Is the page stuck to the page-grabber, check page-grabber opto Ensure "Read Duplex" option is turned off in Help Preferences, unless you are calibrating the 2D printer.
Fill Glue Bottle	Ran out of adhesive	The doors have been automatically released therefore simply open the paper feed door and top up the adhesive bottle as outlined in the manual. The pressure may need to be relieved on the sensor. Power off machine for 5 minutes with lid removed.
Change Knife.	Blade life have been reached	The 7km blade life has been reached and needs to be replaced.

Non recoverable errors:

Message on LCD	Cause	Solution
`Error 28 Occurred`	X-axis drive pulley has slipped on shaft	Check for head collision, reset value through SliceIT. Before resetting the fault, ensure that the multifunction head can travel around the build environment without hitting anything.
`Error 29 Occurred`	Y-axis drive pulley has slipped on shaft	Check for head collision, reset value through SliceIT. Before resetting the fault, ensure that the multifunction head can travel around the build environment without hitting anything.
`Error "#" occurred` `Contact Service`	Various internal causes	Contact your service Engineer and report the given Error Number. They will advise you on how to proceed.
`PAGE DOOR FAULT, CONTACT SERVICE`	Page door opened during build	Close door. Reset machine. If problem persists, contact service Engineer.
`FRONT DOOR FAULT, CONTACT SERVICE`	Front door opened during build	Close door. Reset machine. If problem persists, contact service Engineer.
`Following Error` `Contact service`	A following error has occurred on either the X, Y or glue-axis	Check if the XY head has hit the build and that the glue-wheel is free to rotate. Verify that there is no paper caught in any of the X, Y or glue drive belts. Reset the machine. If this problem persists Contact Service Engineer.

ERROR 7 OCCURRED, CONTACT SERVICE	Heat-plate contact opto not detected	Check build-plate is installed. If not reset the machine to bring down the build platform and press the emergency stop button when down. Power off the machine, reset the Emergency stop. Install the build plate and re-start the machine. If problem persists, Contact Service Engineer.
LCD 4.0+: PC CONNECTION DROPPED, RESTART BUILD **LCD <4.0:** ERROR 24 OCCURRED, CONTACT SERVICE	TCP communication error	Check PC and SliceIT still running. Check network card and cable. In case of persistent problem with Realtek card contact service for workaround.

15. 3D Data Design Considerations:

Regardless of what computer modelling package used the following 3 rules must be adhered to when printing parts on the Mcor range of 3D printers

1. Object
    a. The part that you want to make has to be a single object
    b. The file for printing can consist of multiple objects, but if this is the case they must be spaced at least 10mm (0.4in) apart
2. Interpenetration
    a. The object can't interpenetrate itself. Unlike other 3D printing methods that define the surface by sticking material together, Mcor cuts its geometry – therefore if there is an inter penetrating geometry the blade will cut this interpenetration and the parts will fail.
    b. Another way to think about this is a continuous surface or "shrink – wrap"
    c. There is a selectable option in preferences in SliceIT 6.2 and above to resolve this.
3. Watertight

    Efforts should be made to make the models as watertight as possible – i.e. very little or no gaps

Additional points to keep in mind:

· Thin layers can be flexible allowing for living hinge type operations

· Model can be post processed to add further strength using adhesives such as Cyanoacrylate or acrylic lacquer

· Consideration for weeding parts should be made i.e. thought needs to be given as to how the waste material is going to be removed after building.

· While the maximum build height is 150mm builds smaller than 100mm are better suited

· The orientation of the part becomes important when considering part strength & intricate features.

- o Part Strength. In general printed parts can take greater compressive loads perpendicular to the layers of paper however greater tensile loads in plane with the layers of paper.
- o Intricate Features. In general intricate features should be aligned to the vertical faces if possible.

·The machine is accurate to within 0.05mm in the x-y axis and 0.1mm in the z axis.

· Minimum wall thickness is 2 to 3 mm in the x-y plane and down to 0.5 in the vertical planes

· Note that some modelling software configures the colour files in an illegible format that SliceIT cannot use. You can use ColourIT or other 3rd party software (Meshlab, Netfabb, Blender etc.) to convert these files to a usable format.

16. File size guide

The below data outlines roughly the size of files that can be run on SliceIT.
Colour files require additional processing and this requires more resources.

STL Files

File name	Facet count	File size		Time to open		Time to Generate layers
Golf ball	1 million	53Mb		1 minute		1m 42sec
Face	2 million	97Mb		1m 45s		2m 45sec
Face	3 million	146Mb		3m		4m 30 sec

Wrl

File name	Facet count	File size		Time to open		Time to Generate layers
Face	800k	368Mb		1m 9 sec		5m 27s

Obj

File name	Facet count	File size		Time to open		Time to Generate layers
Face	800k	274Mb		1m 9sec		4m 40sec

All of the above is based on single shell solid models.
This data was generated using SliceIT 5.9 installed on a Windows 7 PC, with Core i5 CPU and 8Gb of RAM.
The default alocation of 4Gb RAM reserved for SliceIT.
Increasing the amount of ram alotted to SliceIT will allow for larger files to be processed.
But remember there is a phycial limit to the size of facets that can be printed and that can be seen.
Refer to "http://www.shapeways.com/tutorials/polygon_reduction_with_meshlab"
for information on the limitations on facet count and effects of facet reduction.

17. Quick Instructions for Machine Use

(Do not operate this machine without first completing the training)

1. **Do not power off the machine at any time**
2. **Restart the SliceIT software after each build is completed**
3. **When the part is complete, remove the build plate from the machine and peel off the masking tape to release the part.**
4. **Place a new page on the build plate and replace the build plate back into the machine**
5. **The machine CAN NOT be operated without the build plate in the machine. Failure to do so will result in damage to the machine**
6. **Clean the adhesive wheel before each build - (see user manual. NEVER USE A METALIC TOOL TO CLEAN THE WHEEL)**
7. **Make sure to turn on the adhesive valve before printing**
8. **When the blade is changed ensure the blade height is correctly set -(see user manual)**
9. **Check the blade depth after approximately the 1st kilometre of use (5 – 10mm of build height).**
10. **Check that the heat plate is clean and has no glue residue on it.**
11. **If the machine is not building a part please leave the machine in Standby Mode by following the LCD instructions ensuring that the build plate is in the machine and a clean sheet is taped down.**

Quick Instructions for machine use:

(Do not operate this machine without first completing the training)

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Cut Here