ARKEPRO OPERATORS MANUAL (V1.1)

Support Contact:

support@mcortechologies.com

To download updates, videos, manuals, software:

http://service.mcortechologies.com/files/ArkePro/

PLEASE REFER TO INSTALLATION MANUAL TO INSTALL YOUR 3D PRINTER
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## Mcor ArkePro
### Features and Specifications

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<tr>
<th>Resolution</th>
<th>Recyclable Parts/Material</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>X &amp; Y 0.2mm Z axis: 0.1mm</td>
<td>Yes</td>
<td>Ethernet 10/100, USB A-B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colour</th>
<th>Equipment Dimensions</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD Colour 4800 x 2400 DPI in X, Y and 254 in Z</td>
<td>900 mm (35.4 in) wide x 610 (24 in) mm high x 660 mm (26 in) deep</td>
<td>64bit Windows 7, Windows 8, Windows 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Build Size</th>
<th>Power Requirements</th>
<th>Regulatory Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>184 mm x 168 mm x 125 mm (7.25 in x 6.6 in x 4.9 in) Adaptive build volume</td>
<td>350W, Input 90-250V 50/60Hz 2.1-5A</td>
<td>CE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Build Material</th>
<th>File Formats</th>
<th>System Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist Paper</td>
<td>STL, OBJ, VRML, DAE, 3MF</td>
<td>Mcor Orange</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware Requirement's</th>
<th>Office Compatibility</th>
<th>Equipment Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>8GB memory and 100GB hard drive, 1GB graphics card</td>
<td>Yes</td>
<td>100kg</td>
</tr>
</tbody>
</table>
**ARKePro** is a full color 3D printer enabling professionals to produce highly stable tactile models and prototypes. This office ready 3D printer uniquely uses inkjet with specialized paper and adhesive (using patented SDL Technology) to build robust, textured, heat resistant, durable and effective parts for use across a wide variety of industry sectors and applications.

The ARKePro 3D printer is office ready, safe, clean, eco-friendly, and professional grade, enabling creativity and innovation in ways never before possible.

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inkjet CMYK color printing technology</td>
<td>Photo quality color&lt;br&gt;Add identification numbers, QR codes, text and instructions, allowing traceability of your parts within your business</td>
</tr>
<tr>
<td>Specialist paper &amp; adhesive build materials</td>
<td>Free from dust, emissions or VOCs (Volatile Organic Compounds)&lt;br&gt;Stable, strong and tactile models&lt;br&gt;High heat resistant compared to 3D plastics &amp; polymers&lt;br&gt;Office friendly and recyclable materials</td>
</tr>
<tr>
<td>Strong and adaptively applied adhesive (Patented SDL Technology)</td>
<td>Highly robust and stable models&lt;br&gt;Easy post-processing</td>
</tr>
<tr>
<td>Adaptive build process</td>
<td>Minimizes material usage and print time</td>
</tr>
<tr>
<td>Free Moor Orange &amp; Peel software</td>
<td>Full control over your color designs</td>
</tr>
<tr>
<td>Professional grade &amp; high resolution</td>
<td>Accurate and reliable</td>
</tr>
<tr>
<td>LED touch screen with progress bar</td>
<td>Easy to use</td>
</tr>
<tr>
<td>Full connectivity with Ethernet and USB with no spooling requirement</td>
<td>Print anywhere, anytime, securely without the need for a dedicated PC</td>
</tr>
<tr>
<td>ICC (International Color Consortium) profile mapping</td>
<td>Unmatched WYSIWYG color accuracy even if you wish to apply coatings</td>
</tr>
<tr>
<td>Dedicated customer support and apps team</td>
<td>Successful customer experience</td>
</tr>
<tr>
<td>Sold through distributor channel partners</td>
<td>Locally provided training, support and supplies backed by Moor</td>
</tr>
</tbody>
</table>
The ArkePro printing process

Mcor 3D printers use a form of additive manufacturing referred to as Selective Deposition Lamination (SDL). The unique glue system allows for total control over the adhesion between layers thus creating a difference in bond strength between the part and any support material in the build.

The Arke Pro printing process contains four key stages as follows:

**Glue** – There are 3 glue profiles used on each build layer. First a minimal amount of glue is deposited on the support material, then a heavier concentration of glue is applied to the part itself and a medium density deposition is applied to the outer waste material. The difference in glue concentration allows for a difference in strength between the support and part, therefore allowing for easy support removal without damaging the part.

**Press** - The build plate is dropped clear of the paper roll and then the paper is progressed forward. With a fresh section of paper now above the build area the heat plate is pulled into position and the build plate is raised into the heat plate, drying the glue and bonding the layers in the process.

**Colour** – The print bar uses the latest generation ink jet head to print in full CYMK. A small border is printed around the perimeter of the layer profile.

**Cut** – A tungsten carbide blade is used to mechanically cut the profile of each layer. Once the profile of the part is cut a small border area is cut followed by the waste material being diced into rectangles, the size of which can be controlled in the Orange software. These rectangles allow for easier waste removal, on a complex part the rectangles will be smaller and on a simplex part the rectangles will be much larger.

**Repeat** – Further paper is added and the four stages of the build process are repeated multiple times, up to a maximum height build (125mm). Once the build is complete the build is removed from the Arke Pro and the waste and support materials are removed by hand.

**Weeding (De-Cubing)** – This is the Process where the waste paper is removed from the 3D object using a pair of tweezers. Rushing this process can damage the model or it’s color. Peel away each piece of waste paper individually to avoid damage to the model.

**Infiltraion** – This is the Process where a liquid, or combination of liquids are applied to the model surface. This will make the color bright and will make the model more durable. To make the color ink visible on the bottom of each model layer the paper must become transparent, therefore Mcor infiltrants are designed to make the paper become transparent and then to fix this permanently so the color is always visible. Please bear this in mind if you choose to use a different infiltrant.
Product overview

Ensure when closing the lid and side doors that your fingers are clear from any pinch points which could cause injury.

When any of the doors are opened the safety interlocks will prevent the Arkepro from initialising. Opening a door during a build or during initialisation will require the Arkepro to be restarted.

Adhesive bottle – The adhesive bottle stores the glue and is pressurised to ensure the correct glue flow. A water based glue is used which is non-toxic and office safe. There is a low level sensor in the bottom of the bottle which will activate a pause in the ArkePro if triggered. A visual check should be made before starting a large build to prevent stoppages.

Build Area – The build area is where the part actually prints on to the magnetic build mat. The max build is 184mm * 168mm * 125mm. The volume is slightly larger as it includes the support material around the build.

Do not leave any objects sitting on the build plate as they may cause damage to the ArkePro when the ArkePro is initialised. The ArkePro can also detect the presence of an existing build and may stop as a result.
**Inkjet Printer** – The inkjet printer uses the latest generation inkjet technology. The inkjet head uses 2 replaceable cartridges, one is black and the other is colour (Cyan, Yellow and Magenta). The print head is within the cartridge so, if there is any issue with the nozzle it can simply be replaced. If a single colour is empty the other colours can still be used, (it will trigger a low level alert) however combination colours will not work.

**Tungsten Carbide blade** – The tungsten carbide blade uses a voice coil to operate rather than a linear slide, this provides less mechanical parts, quicker actuation and less maintenance. The blade used is an offset drag blade with a 10,000m useable life. The blade itself is housed in an adjustable blade holder which allows for an accurate depth for cutting.

**Glue Wheel** – The glue wheel deposits the glue on the build in order to allow each layer to stick together. It is powered by a stepper motor and can rotate in both directions in the Y axis. This again uses a voice coil to move up and down. The wheel has dimples accurately machined in to the surface. These dimples allow for the deposition of approximately 4µg (microgram) of adhesive per drop. The processing algorithm increases / decreases the overall deposition of adhesive by increasing or decreasing the distance between rows of adhesive.

**Heat Plate** – The bridge holds the heatplate, located in it’s home position at the right hand side of the ArkePro. The heatplate has 2 heaters mounted on to it. They run of mains electricity and are controlled by a solid state relay housed in the electronics enclosure. The target temperature is 80ºC. When the layer is coloured, cut and glue has been applied, the build plate lowers and the paper is progressed. The heat plate is then brought over the build area and the buildplate is pressed into the new paper and against the heatplate. A combination of heat and pressure cures the glue, laminating the sheets. The process is repeated until the part is complete. The build will always end on a cutting operation.

![Warning](image)

**The heat plate will retain heat and therefore can remain hot long after the ArkePro has stopped running. Be careful not to touch the heat plate while on or for a prolonged period after stopping.**
## Consumables (Some items must be purchased separately to 3D Printer)

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **3D Adhesive** – (Purchase required prior to Install) | This is the adhesive that bonds the layers together. Always top up your 3D Printer between builds.  
**Tip:** When opening, do not cut the nozzle on the top. Instead simply unscrew the complete top.  
The adhesive is developed to work in ARKePro, so any other adhesive will damage the ArkePro and will not work properly. Doing so would invalidate the warranty. |
| **3D Printing Paper** – (Purchase required prior to Install) | This is the specialist bio paper build material that is designed specifically to work with SDL technology and our inks and adhesive. Normal paper will not work in the ArkePro, so you must use this paper or you will invalidate your warranty. |
| **Mcor 3D Ink Cartridges** – (Purchase required prior to Install) | Black and tri-color cartridges are used to apply the color to 3D models.  
The cartridges are developed for the ArkePro. Do not try to use alternative cartridges or refill your cartridges as this would give bad results and invalidate your warranty. The ArkePro knows if you have tried to do this. |
<p>| <strong>Developer M1 or M3</strong> (Not required for Install, but required for finishing) | These two-part coatings are designed to deliver the best full colour print results. They are designed to be applied to a printed part after weeding is complete. Please follow the instructions to ensure best results are achieved. |</p>
<table>
<thead>
<tr>
<th>Image</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Printhead Maintenance Tray](image1.png) | **Printhead Maintenance Tray** – (1x Supplied with ArkePro)  
This is a consumable and needs to be replaced periodically, every 2-6 months depending on usage. |
| ![Magnetic Build Mat](image2.png) | **Magnetic Build Mat** – (1x Supplied with ArkePro)  
This is a newly designed build mat that only works on ArkePro. It must be the correct side up and is not reversible. Change the mat periodically as deteriorates. Estimated to be renewed each month or bi-monthly. |
| ![Cutting Blade](image3.png) | **Cutting Blade** – (1x Supplied with ArkePro)  
Lasts for 10km of cutting which can be as often as a week. The blade depth must be checked every 12 hours of printing to avoid build failure. |
Installing Consumables

Make sure that the ArkePro is powered off before the first installation of accessories. Failure to do so could cause damage to you or the ArkePro.

Maintenance tray

The first item to install is the maintenance tray. The location of the tray can be seen below. This is also the position that the print head will rest in when not in use. Slide the printhead to the front and away from the position of the maintenance tray housing bracket to install it. Push back and down to locate the maintenance tray completely.

Location of the maintenance tray
Inserting the maintenance tray

The maintenance tray should be inserted with the two upper tabs pointed to the bridge side of the ArkePro and the single lower tab pointing towards the print bar.

The maintenance tray is first inserted at 45° angle and then you need to push down firmly on the two upper tabs to locate the tray into position. Gently slide the print cartridge back over the maintenance tray.

Removing the maintenance tray

To remove the maintenance tray when full or for shipping the user should first slide the 2D print head out of the way. Then in the reverse manner to the steps taken to insert the new tray the user should gently pull upwards on the two tabs to the front of the tray.

The maintenance tray is a consumable and will need to be replaced approximately every 6 months depending on usage. When the ArkePro initialises and before each build begins the 2D printbar will clear its nozzles in to the maintenance tray. Over time the white inner base of the maintenance tray will become discoloured with waste ink. There are also 2 rubber wipes on the maintenance tray which remove any dust or dirt from the cartridge nozzles.
Ink cartridges

There are two different ink cartridges, colour (Cyan, Yellow & Magenta) and Black. Each of these two cartridges have different shaped heads. Remove the cartridges from the packaging and then peel off the plastic strip from the ink nozzle.

The position of the respective cartridges is labelled on the printer carriage. There is also a clear instruction of how to load the ink. This label can be seen below.

![Ink labels](image)

It is important to make sure that the carriage is in the home position and supported from underneath when opening and closing the lid of the carriage to avoid damaging the system. See images on next page
The cartridges have a ridge which should sit into a groove in the green lid of the carriage. Slot each cartridge into the respective side of the carriage and then secure them in place by closing the green lid until you feel it click into place. The cartridges contain microchips which hold volume and identity information. Non Mcor cartridges will not work and may damage the system. The cartridges are not refillable.

Supporting the carriage
Installing / removing the adjustable blade holder

The blade holder is located on the left rear side of the Y gantry, this is pointed out below.

![Position of blade holder](image)

**Inserting / removing**

The blade holder can be removed by pulling it downwards from the knife voice coil assembly. Access is gained by selecting the “set-up build” option on the screen which lowers the build-plate. The blade holder is held in position with a spring loaded ball bearing which sits in the groove of the blade holder cap. When inserting the blade holder, firmly press upwards to ensure that it is correctly held in place. The knife holder is used as the buildplate height verification during a build. If it is not correctly inserted the ArkePro may experience difficulties.

To remove the adjustable knife holder firmly grab the cap and pull straight down. The holder can only safely be removed if the buildplate is in the lower position as there is not enough vertical space to remove it without damaging the smooth surface / knife tip.
Loading and removing the paper

The paper is fed from the left (feed) side of the ArkePro to the right (waste) side. There are two roller locations at either end of the paper path. To load and unload the paper the lid and two end doors need to be opened.

Paper roll loading and feeding

First remove the old roll from the paper feed if present, just lift the roll out from the roll retainers. Tear the paper if necessary and wind backwards before removing the tube. (Any remaining paper will be pulled through the waste end). Remove the paper roll inserts from the used tube to insert them in the new roll later.

Remove the new roll from the box and put in the paper roll inserts which were removed from the old roll (or for first install these inserts are located in the ArkePro kit box). (Discard the cardboard tube if present. This is no longer needed.)
The inserts sit on to bearings behind a retaining clip as can be seen in the following images. Make sure that the rollers sit correct in position on the bearings.

Paper roll end loading and sitting in bearings

With the doors opened, the loose side of the paper should feed from the front of the roll up as per the following image. The paper should be fed through the two guide plates, over the top roller, and under the under the black paper guide on the top plate. Make sure that the holes on the paper line up correctly with the pins on each wheel before securing by closing the latches over the paper. The front (right hand side when viewed from end) pin wheel floats to allow for proper alignment.

Initial paper feed setup
The first layer of the build will run prior to feeding the paper the whole way across the build area. The ArkePro will apply a layer of glue to the magnetic mat and then pause. The paper should then be fed through completely and attached to the paper collection tube.

Feed the paper through immediately after the ArkePro stops, do not allow the glue to cure before feeding the paper as this will result in the paper not adhering to the build plate correctly which may result in damage to the ArkePro or a failed build.

The paper should be fed across the build area and under the paper guide on the right side of the top plate. Be careful when feeding the paper under the heat plate as it may be hot.

**Paper fed over build area**

The paper should be fed under the guides over the pin wheels and then behind the white plastic roller on the paper collection side. The holes in the paper edges should align with the pins in the wheel. Use a short piece of tape to secure the paper to the roll as shown:

Check that the paper is secure and aligned correctly in the system. Then rotate the collection roller downwards gently to take any slack out of the system and create an overlap on the roll. Close all of the doors securely starting with the side doors and then the lid.
Removing and clearing reusable waste roller.

Remove the excess paper from the re-usable roller between builds. In order to do this you first need to break the feed by tearing or cutting the paper before it reaches the build area. (This is necessary to finish and remove a build.) Then wind on any excess cut paper around the reusable roller.

Once the paper is torn, close the lid and press continue; the ArkePro will wind on a certain amount after a build, you can then pull the rest through the ArkePro by winding the reusable roller manually.

The paper collection roll is held in place by two rubber catches, one on either end of the tube. These should be pulled down and away from the ArkePro to release them. Rotate them upwards clear of the shaft and cog.
With the two catches released the roll can be removed from the ArkePro. Grab the roller in the middle and lift and pull away from the ArkePro to clear the bearings.

To remove the paper from the collapse-able tube first grasp the waste paper with one hand and twist the end stop with the other hand, this aligns the pin with the slot. Then slide the core out of the roll which will allow the you to collapse the tube. The paper can then be easily removed from the tube. Replace the core and ensue the pin slots into the cut-out in the tube. The paper collection tube is then ready to be put back into the ArkePro.
When replacing the reusable roller in the ArkePro it is important to ensure that the roller drive gear sits correctly on the motor gear and holding bearings.

Close both latches securely and test that the roll is locked in place and fully engaged.
Orange Software
Installing

Hardware requirements:

8GB RAM and at least 100GB hard drive, 1GB graphics card

Software requirements

Windows: 64 bit Windows 7, Windows 8 or Windows 10

The Orange installer is available to download from the Mcor website at “service.mcortechologies.com/files/ArkePro/” When running the installer, it will scan for any previous installations of Mcor Orange and prompt you to remove them if there are any found. It is recommended to uninstall any previous versions that are present on the computer. Also when installed ensure to “Restore Defaults” in the settings section as this will update any hidden settings.

Please follow all prompts in the install wizard to complete installation.
Connectivity

The methods of connectivity that can be used with the Arke Pro are USB cable (A – B), thumb drive and Ethernet. This allows the Arke Pro to run in a variety of workplaces and environments. (The 2 cables are provided with in the Arke Pro accessories kit.)

USB: The USB connection ports allow the Arke Pro to be run either from a thumb drive on which the projects are preloaded or directly from the user’s computer. There are 2 different ports to support this. They are indicated in the following image.

The ports on the front are standard USB A type port which are suitable for thumb drives.

The port at the rear is a USB B type port to allow communication between the on-board computer, inside the Arke Pro, and the user’s own computer.

Ethernet

The Ethernet socket is located on the rear beside the USB port and can be seen above. Firmware updates are carried out over this connection. The ArkePro must be connected to a router that automatically assigns an IP address.
Orange Software
General overview

The following shows the layout of the main Orange screen. As you can see there are three main sections to this window, the tool bar, the ribbon and the build area viewer. The most commonly used functions are found in the ribbon, these allow the user to position, scale, and rotate the part or selection of parts which are currently highlighted as well as to manipulate the view of the build area.

![Orange Software Interface]

The information for the currently selected part is shown in the boxes, as can be seen in the above screenshot. Multiple parts are selected using SHIFT + left mouse button. Parts can be deselected either by clicking an area of the build which contains no part or by selecting the globe button in the ribbon panel. All the parts in a build can be selected using ‘Edit -> select all’ from the tool bar or by pressing CTRL + A. Pressing CTRL + A or select all for a second time will deselect all parts.

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The purpose of each of the buttons under the Mcor logo in the following screenshot are all related to the viewing pane.

The globe surrounded by arrows allows for the rotation of the view by using left mouse click and drag.

The home button with an i resets the position of the view to an isometric view.

The three boxes with a white side panel allows for viewing from the top, left and right.

The looking glass allows for changing the zoom level in and out in correlation with the + and –.

The three buttons in the above screenshot relate to (from left to right) positioning the part, rotating the part, scaling the part.

Each of these variables can be set either by click and dragging or by entering a definite value. It is impossible for a part to be positioned outside of the build area and if as such the part will either be scaled down to an appropriate size or pushed inside the build area by the software.

When positioning the part with a click and drag operation, ALT and drag will allow for sliding the part up and down in the Z axis.

When rotating the part using a click and drag operation CTRL will increment the rotation angle by 15° at a time.

The buttons located at the top of the ribbon are the most commonly used tools from the tool bar and include an option to ‘Add Part’ which opens a file browser for you to point to the desired file, ‘Create Build’ which will generate the layer information and ask you to save the output trough a file browser window, ‘Settings’ which opens the preference window.
**Importing part**

Orange can except a variety of file formats including OBJ, WRL, STL, DAE and 3MF. There are three options for importing a part into Orange:

1. Add Part button in the ribbon bar
2. File -> add part in the toolbar
3. Drag and drop from File explorer

Both the button in the ribbon bar and the toolbar options will open a file explorer window and allow you to point to the file.

The part scale is assumed to be in mm however Orange will detect a part which it recognises to be too small and scales it up appropriately.

**Saving a project**

When you set up a project it can be saved to open again later. This is different from saving a build. The Mcor project will be saved as a .mprj file type. The .mprj file contains all of the information required for a project including the 3D file, the scale, location and rotation as well as any cut planes.

This file is useful for sharing project setup as well for printing more difficult parts. If reprinting a difficult part, the project can be easily opened and refined rather than having to set it up again.

To save the project use the toolbar option on File -> Save AS…

If the project is modified later you can use CTRL+S to update the saved file.

CTRL+L can be used as a shortcut to load a previously saved project. This can also be done through the toolbar option of File-> Load

**Create Build**

The build file is a custom .mcor file which contains all of the layer information for a build. This is the file that will be sent to the printer. To create a build, you can either use the shortcut in the ribbon at the top or point to Print-> Create build in the toolbar.

When the build is created it will automatically open a window which shows the tool paths. By using the slider on the left or the arrows in the layer number box the user can scroll through each layer to preview the tool paths and ensure that they are happy with the waste spacing and the cut line positions.
**Tool path preview**

This tool path viewer can be reopened, as long as the project has not been altered in any way, by selecting Print -> View Tool-paths.

As well as creating the tool-paths for the project, Create Build also creates the images which are sent to the print bar.

**Additional Shortcuts**

Below is a table of the shortcuts available for use in Mcor Orange

<table>
<thead>
<tr>
<th>Key Combination</th>
<th>Function</th>
<th>Key Combination</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL+N</td>
<td>Create new project</td>
<td>F6</td>
<td>Settings</td>
</tr>
<tr>
<td>CTRL+I</td>
<td>Add part</td>
<td>ALT+F4</td>
<td>Exit</td>
</tr>
<tr>
<td>CTRL+L</td>
<td>Load project</td>
<td>CTRL+W</td>
<td>Delete</td>
</tr>
<tr>
<td>CTRL+S</td>
<td>Save project</td>
<td>CTRL+A</td>
<td>Select All</td>
</tr>
<tr>
<td>CTRL+Z</td>
<td>Undo</td>
<td>CTRL+(0-8)</td>
<td>Default views</td>
</tr>
<tr>
<td>CTRL+Y</td>
<td>Redo</td>
<td>CTRL+P</td>
<td>Show all cut planes</td>
</tr>
<tr>
<td>CTRL+D</td>
<td>Duplicate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Running a Build

Powering on

Before powering on the Arke Pro make sure that the heat plate and print bar are in the home position, especially after any error occurs in the Arke Pro. Failure to do so can result in damage to the ArkePro which is not covered under warranty.

Correct position of heat plate and printer bar

The build mat should be placed on the build plate before powering on the ArkePro to prevent damage. Do not leave any edge overhanging. There are raised edges to the left and rear on the permanent steel build plate. Push the magnetic mat to the left and rear, flush with the edges, as shown below.

Correct alignment of build mat
Display panel

When running the Arke Pro the main point of interaction will be through the display panel at the front of the ArkePro. Here we will first look at the different options on the display panel before going into an in depth look at how to run the Arke Pro.

The following images guide you through the different options on the display panel.
Running the Arke Pro

Starting a build on the Arke Pro is a two-step process. During the first stage the ArkePro is prepared and started, the ArkePro will lay down the first layer of adhesive and then moves into a paused state. The second interaction then allows the user to feed the paper fully and continue the build.

Setting blade depth

Between each build the knife holder should be removed, cleaned and the blade depth reset. There are three different circumstances that the cutting blade should be changed;

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

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

Step 1: Remove the blade holder from the multifunction head of the ArkePro being careful not to put dust over the belt and shafts. This is described previously in the section entitled “Inserting/removing tungsten blade holder”. When a new build is started the buildplate will lower and allow better access to remove it.

Step 2: Tear of a length of paper from the roll approximately the size of an A4/Letter sheet

Step 3: Fold the paper in half once, and then again so that our test piece is 4 layers thick.
Step 4: Screw in the thumb screw in the clockwise direction to push out the blade to the Max position. Then remove the blade completely if possible, if not carefully remove the nose cap by gently pulling and twisting at the same time and then pull the blade straight out.

Step 5: Unscrew the thumbscrew (threaded adjuster) completely. (remove the nose cap if not already done). Clean any dust from the nose cap / bearing with a damp sponge. Check that the retained ball bearing is still present and loose in the thumb screw (see image below). Then reinsert the blade (or a new blade if needed) and press down as far as possible until flush. Put the thumbscrew back in and rotate 2 full turns until it is held firmly. Note that the blade will protrude on the cutting end.

Note that the tip of the blade is extremely delicate and brittle. Take great care when handling the blade. Do not use any tools. Avoid dropping the blade / blade holder. The cap of the blade holder is highly polished to avoid damaging the paper, any damage to the cap can cause issues with the build.
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 tungsten blade holder. Put the nose cap back on with a pressing and rotating motion (to preserve the life of the retaining O-ring). The blade is visible below but still safely recessed.

Replacing nose cap

Step 7: Place the tungsten blade holder in to the knife setting tool and onto the folded sheet. Start rotating the thumbscrew clockwise until the blade cuts just one page. This is done in small increments until one page is cut. The thumbscrew has a fine thread with graduations on the side. Each graduation is the equivalent of 0.05mm (i.e. half of 1 sheet of paper). Apply pressure straight down, perpendicular to the page on the body of the holder not on to the metal weight. Ensure that this is carried out on a clean hard flat surface. The setting tool mimics the exact force that the ArkePro presses with during a cutting motion.

Knife setting tool
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.

Aligning bezel with groove (shown outside knife setting tool for clarity)

Step 9: Each division between bezel grooves represents 0.05mm. At this setting the tungsten blade completely cuts the top layer and lightly scores the second layer underneath. Make a straight line and an “S” shape in the paper(as per above image) Then look at the second sheet to see the impact. There should be a visible score mark but not a full cut. In fact the score should cut less than 50% of the second sheet. If it cuts too deeply retract the blade by backing off the thumbscrew. If the blade is set too deep it will dig in to the magnetic mat
Step 10: Place tungsten 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.
**Filling the glue bottle**

The glue bottle has a max and min line marked on it as can be seen in the following image. The ArkePro will ship with a minimum volume of adhesive unless otherwise requested.

Glue bottle levels

First remove the cap of the glue bottle by turning it anti-clockwise. Then carefully and slowly fill the glue bottle to the max line using a bottle of Mcor Arke Pro Adhesive. Over-filling the bottle will cause damage to the system. The level sensor and pressure sensor can both be damaged by the adhesive.  

**Warning:** Use only Mcor Arke Pro Adhesive in the glue bottle, using any other adhesive may void your warranty and damage parts of the ArkePro.

Always check the manufacturing date of the adhesive which has a shelf life of 1 year.

Wipe off any excess adhesive that was spilt while filling the bottle. Replace the cap and tighten by hand turning it clockwise.
Cleaning the Adhesive Wipe and wheel

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 lid. Before cleaning the wipe turn off the adhesive system now by turning the shut off valve on the side of the ArkePro to the horizontal position. (Ideally the wheel should be cleaned at the end of each build.)

![Adhesive Wheel Image]

Use the adhesive wheel cleaning implement that comes with the Mcor Toolbox supplied with the ArkePro to clean the adhesive wheel. The adhesive wheel cleaning tool has an aluminium body but a firm but flexible plastic blade 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 pinching the side of the wheel, moving slowly, making sure not to be too rough as to damage the system.

Do not turn the glue system back on until you are ready to initialize the ArkePro again as the wipe and wheel may not be stopped in a sealed position. You can however align the wheel
to a known sealed position as in the above right image, with the 2 ArkePro marks in line with
the wipe.

**The wipe is the white plastic piece that sits on top of the wheel. This part is made from a
special low wearing machinable plastic. The wipe and wheel are a matched pair, this
operation is carried out in the manufacturing process. Their curves / arches match to micron
level. The wipe acts both as a reservoir and seal. There is a small spring inside the wipe that
maintains physical contact with the wheel.

**Printing from USB**

Using file explorer on your PC, a “*.mcor” file can be copied or saved to a USB thumb drive.
To print from a USB thumb drive, the thumb drive should be inserted into either USB port on
the front panel of the Arke Pro as pictured below. The drive will light up and flash as it is
being read. Then it will stay illuminated.

![USB thumb drive inserted](image)

A list of projects stored on the thumb drive can be viewed by selecting “Print” and then
“USB”. Navigate to the desired project by scrolling through the list and then print by pressing
on the name of the project. The project will automatically be copied to the onboard memory
as the print starts. The memory stick can then be removed if desired.

**Printing from memory**

The on-board computer in the Mcor Arke Pro is capable of storing multiple projects. These
projects are transferred to the memory via USB / Ethernet cable connection or from running
a build from a memory stick as described above. Previously printed projects can be recalled
via the touch screen panel. A list of projects stored on the Arke Pro can be viewed by
selecting “Print” and then “memory”.

**Applying first page**

At rest paper is stopped just before reaching the build area, the cutting blade and glue wheel
are clean and ready for printing and the desired project has been selected. When all the
doors are closed and the user is ready to start the print, the first layer is applied in a two
stage process.

The ArkePro first initialises the build and lays down a layer of glue on the magnetic build
mat. It moves into a paused state and lowers the build plate.
The user then manually feeds the paper across the build area and under the paper guide as
discussed previously, to secure the paper to the paper reusable roller.
Pausing/resuming/cancelling

There may be an occasion when you wish to pause a build, this may be for example, to clean the glue wheel / wipe, change an ink cartridge or to check the cutting blade. This can be done from the touch panel. When a build is running the screen will display a preview of the build, some statistics about the build and in the corners two options, one marked with an “X” and the other “||” (pause).

When the “||” button is pressed the ArkePro will continue to finish the current layer, which ends with the cutting procedure, the ArkePro will stop and the build plate will lower. The doors should not be opened until the LED strip changes to green. This is how the user knows that the ArkePro is in a safe state to open the doors.

In order to terminate the build, the user should press the X button. After pressing the button, they are prompted to confirm the choice. If terminated the build will complete the current motion and then stop immediately (unless the 2D printbar is running in which case it will finish, but in a single line).

It is recommended to pause the build before terminating unless a more immediate stop is required for safety purposes. If an immediate stop is required, opening a door will break the interlock and the ArkePro will come to an immediate stop
Removing a build and de-cubing

When the build is complete the Arke Pro will prompt the user to open the lid and rip the paper, this is to allow the ArkePro to then raise the buildplate up to the max position. This allows access to remove the magnetic build mat. When cut close the lid and press OK.
The buildplate will raise while this message is displayed.

Completed build presented

Only open the lid only when the LED Strip / Progress bar is Green in colour.

Releasing build from platform
Once removed, peel the base / foundation layers off of the build mat. In situations where the build has a larger area, try peeling the mat away from the build but do not bend it too much as it is fragile. The magnetic mat can then be cleaned using water. This will soften the paper and dissolve any residual adhesive.

Peeling off base layers

On all four sides of the build there is a cut all the way to the edge. Locate the cuts and break away the waste band of paper. There will be 4 “L” shaped blocks surrounding the support and build material.

Removing model and support block from waste band

The size of the waste band adapts to the size of the model. There will always be an outer band.
Using your fingers or a tweezers, gently remove the support material to reveal the part inside the block.

Removing support the from part(s). The support is easily removed from bluff smooth surfaces.

It is more difficult to remove support from delicate parts of the model. Tweezers should be used in areas where damage to the model is possible. It is also recommended that the user displays the model in Orange on a monitor so that they can see any potential areas. In Orange, the size of the support material can be adjusted to compensate for such areas.
Running your first build

Here we run through the very first build that is carried out on a new Arke Pro.

The ArkePro ships with 2 build files built in to the ArkePro. (If these are accidentally deleted a simple power cycle will restore them from secure memory).

These build files are “Align Image” & “Glue Calibration”. The glue calibration is there for maintenance / service requirements only. The system comes pre-calibrated.

The “Align Image” file is used to align the ink with the outer part of the model. This prevents the ArkePro from wasting ink.

![Default installed build files](image)

1. Select Print from the screen, then select Memory and then Align Image.

2. Press the “play” button to begin the build. The ArkePro will then lower the buildplate and prepare for the build set up.
3. Once the “play” button is pressed the below screen will be displayed, followed by the prompt when the build-plate stops. Here you set the blade depth as described earlier (p36), verify that the wheel and wipe are clean, ensure that the magnetic mat is correctly installed and that there is sufficient adhesive to run the build. (Glue shut-off valve in the open position)

4. When pressed the ArkePro will begin the build process. The LED strip will turn Blue and the build plate will raise up. As the ArkePro starts you will hear the waste paper motor running. This is to detect if there is already paper fed through from the feed side across the build area. If detected it will prompt you to tear / rip and remove it.

5. As the buildplate raises you will also hear the knife voice coil engage and disengage several times. This is a 3 fold test to:

   1. Detect if the blade holder is actually in position. (using the knife detection block)
   2. Detect the presence of the magnetic build mat.
   3. Detect if there is an existing build still attached to the magnetic build mat.
6. When all checks have been carried out the ArkePro will lay down a foundation layer of adhesive for the first sheet of paper. (this is actually Layer 0 of X). Upon completion the buildplate will lower slightly and the screen will prompt the user to manually feed the paper through and attach it to the collapsible collection roll. (P20).

Only press OK when the paper is secure and the lid / doors are closed. Then press play again.

7. The ArkePro will then feed some paper and press the paper in onto the magnetic build mat. The heat and pressure will cause the adhesive to cure creating a bond on which the model will be built. The screen will display the current layer and the LEDs will be blue.

8. When the printer finishes the model, in this case 5 layers for alignment, a message will be displayed to open the lid and tear the paper.
9. Next you open the lid, tear the paper (see P21), close the lid and press OK.

10. Then press “Play” and the ArkePro will then raise the buildplate in order to remove
the build. As it does so it will wind on the cut waste paper.

11. NOTE: The “Align image” project is different from all other builds that will be
carried out on the Arke Pro as it creates ArkePro specific parameters that are
stored in the ArkePro and used for every colour build. The “Align Image” asks
you to feed information back in to the Arke Pro.

12. You then remove the build but do not touch the screen yet. You must verify where
the knife cuts through the diagonal line. The Red grid represents the X axis value and
the Blue the Y axis value. The values will be whole numbers between 0 & 28 (most
likely close to 14). If the square flat model itself is removed from the support and
waste it is easier to see the crossover location. If the line falls between 2 numbers
make a best guess. The numbers correspond to very small increments (~0.1mm)
13. Below is a close up of an alignment build. In this situation the Red value would be “15” and the Blue value would be “17”.

\[ m/c \quad XXXX \]
14. These number then get entered on the screen as below:

15. Once you press “OK” the second time the ArkePro stores the values and you must close the lid to revert to normal mode operation.

16. You can then press the house icon (home icon) to go back to the home screen.
### Maintenance

#### Preventative Maintenance

Preventative maintenance should be carried out monthly, please reference the preventative maintenance manual below, a stand alone version is available from your local reseller or from the link below.

```
“service.mcortechologies.com/files/ArkePro/”
```

Each Arke Pro ships with a basic preventative maintenance kit. Further stocks of lubricant may be purchased from Mcor or locally if available.

### Equipment Needed

<table>
<thead>
<tr>
<th>Part number</th>
<th>Details</th>
<th>Supplied by</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_03500</td>
<td>Lithium Soap based grease for X and Y axes bearings</td>
<td>Mcor</td>
</tr>
<tr>
<td>Ballistol</td>
<td>Universal lubricant oil for 2D printbar lower shaft</td>
<td>Sourced locally due to shipping constraints</td>
</tr>
<tr>
<td>P_04459</td>
<td>For lubrication of the 2D printbar carriage upper</td>
<td>Sourced locally / supplied</td>
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<tr>
<td></td>
<td>(Molykote 33 light)</td>
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<tr>
<td>Viton gloves</td>
<td>For use when smearing the grease</td>
<td>Sourced locally</td>
</tr>
<tr>
<td>P_01941</td>
<td>Clean room application brush for P_03500</td>
<td>Mcor</td>
</tr>
</tbody>
</table>
Linear Slide Maintenance X axis

The linear slides used for the X axis and heatplate movement must be lubricated every month.

Heatplate:

1. Power down the 3D printer and open the lid. Open both side doors also.
2. In order to lubricate the bridge / heatplate carriages move the head to the mid point position of travel. There are 4 carriages on the heatplate. One at each corner. Each carriage need to be lubricated at the front and rear, inside and outside.
3. Apply 4 beads of grease P_03500 to the ball tracks in the 4 locations as shown in above.
4. Also apply 4 beads to the inside part of the front rail. (not shown for clarity)
5. Next we need to apply grease to rear rail, inside and outside ball tracks (See on next page).
6. Lubrication also needs to be applied to the outside of the rear rail, see below.

7. When complete move the heatplate from left to right in order to work the lubricant in to the bearings. Use slow smooth strokes. (be careful not to hit the Y axis).
Gantry:

1. The gantry has 3 carriages. 1 at the front and 2 at the rear. These carriages are more difficult to gain access to due to the gantry mounting positions.

2. Lubricate the front with beads of grease if possible, otherwise it may be easier to use the clean room brush, P_01941 to apply grease directly in to the ball track of the rail, inside and outside, front and rear. [the clean room brush is specially designed not to lose bristles during use].

3. The rear carriages are very difficult to access and again the brush is probably the best option for lubrication.
On the rear rail it is easier to paint the grease in long runs in to the ball track of the rail, inside and outside. In front of and behind each carriage. Then move the bridge or gantry over and back in order to work the grease in to the bearings.
**Y axis / Gantry**

The Y axis / gantry has 2 components. The left hand side holds the multifunction head and the right hand side holds the 2D printbar.

The multifunction head is held in position with 2 linear bushings on an upper shaft and 2 Igus bearing on a lower shaft. (the lower shaft does not need lubrication, however periodically it should be cleaned with a damp cloth to remove dust particles).

The 2D printbar is held in position using an Igus shaft and bearings in the lower position and a rail and carriage system on the top.

**Multifunction head lubrication.**

The multifunction head must be lubricated every month. The linear bushings holding the head on to the upper shaft must be lubricated using P_03500 and the clean room brush.

Clean the shaft first to remove any spoiled grease or contaminant.

Apply 4 beads of grease, one at either end of each bushing. Then smear this around the shaft using the brush. After this is completed slowly move the head from front to rear to allow the grease to work itself in to the bushings.
2D Printbar carrier lubrication

To assist in the smooth movement of 2D Printbar while printing, the frame carrier and the printhead carrier both need to be lubricated. The recommended lubricant is "Molykote 33 light". The following procedure will bring you through the step required to apply lubricant.

1. Position XY carriage to allow easy access to 2D PrintBar. Below picture shows 2D PrintBar and the 5 designated lubrication points.

![Image showing 2D PrintBar and lubrication points](image_url)

2. Grease to be applied uniformly and do not apply outside of designated area. When using lubricant gloves must be worn. If lubricant is not supplied in plastic syringe then it will have to be placed into a syringe to proceed.
3. Apply lubricant to designated area, behind guide located on RHS of printhead carrier as shown in Photo below. Lubricant to be applied uniformly and do not apply outside of designated area.

4. Apply lubricant to designated area, in front of guide located at centre point of printhead carrier as shown in Photo below. Lubricant to be applied uniformly and do not apply outside of designated area.

5. Apply lubricant to designated area, behind guide located on LHS of printhead carrier as shown in Photo below. Lubricant to be applied uniformly and do not apply outside of designated area.
6. Apply lubricant to designated area, underside of metal carrier frame (and behind the flange) to the left of printhead as shown in Photo below. Lubricant to be applied uniformly and do not apply outside of designated area.

7. Apply lubricant to designated area, underside of metal carrier frame (and behind the flange) to the right of printhead as shown in Photo below. Lubricant to be applied uniformly and do not apply outside of designated area.
8. After the lubricant has been applied to the 5 designated points the printhead needs to be manually moved from one end of the frame carrier to the other several times. This will spread the lubricant evenly across the carrier aiding smooth movement in the printhead.

9. Return Printhead to its home location (Over maintenance tray). The Arke Pro is now ready for restart.
Printbar shaft lubrication:

The lower shaft of the 2D printbar must also be lubricated. This is done using "Ballistol" universal oil. (Only this lubricant can be used. Anything else will void warranty on the unit.)

1. Move the printhead carriage to the centre of the build area. Cut some paper and place it behind the shaft, as indicated in the below image. These will protect the encoder strip and upper carriage from over spray.
2. Gently and carefully press down on the aerosol to dispense 1 to 2 drops of oil on either side of the carrier. This oil will then flow around the shaft and work its way into the carrier bearings.
Alternatively if using Ballistol wipes, use glove and apply as per below images, by moving the print carrier to the centre of travel and “pinching” the shaft with the wipe. This should apply a layer of lubricant around the shaft. When applied to both sides move the carrier back and forth to spread along the shaft and also to work the oil in to the bearing:
**Zb axis**

The 3 Zb lead screws require no lubrication. However the area may occasionally require cleaning with a vacuum cleaner to remove paper dust or build debris.

**General cleaning**

The inside of the Arke Pro will periodically require cleaning with a vacuum cleaner, particularly the feed and waste paper enclosures and the build area. This is as a result of dust from the paper that is been cut during operation and dried glue.

**Maintenance Log**

**Year 1**

**Service Intervals (Months) – Tick when completed.**

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Safety Precautions

The following precautions ensure proper use of the printer and prevent the printer from being damaged. Follow these precautions at all times.

- Use the power supply voltage specified on the nameplate. Avoid overloading the printer’s electrical outlet with multiple devices.

- Ensure the printer is well-grounded. Failure to ground the printer may result in electrical shock, fire and susceptibility to electromagnetic interference.

- Before disassembling or repairing the printer yourself, contact your local Service Representative. See Maintenance and Troubleshooting section of User Manual.

- Use only the power cord supplied with the printer. Do not damage, cut or repair the power cord. A damaged power cord has risk of fire and electric shock. Replace damaged power cord with an approved power cord.

- Do not allow metal or liquids to touch the internal parts of the printer. Doing so may cause damage, fire, electric shock or other serious hazards.

- Power off the printer and disconnect the power cord from the power outlet in any of the following cases:
  - If there is smoke or an unusual smell coming from the printer.
  - If the printer is making an unusual noise not heard during normal operation.
  - A piece of metal or liquid touches the internal parts of the printer.
  - During an electrical (thunder/lightning) storm.
  - During a power failure

The following classifications are used throughout this guide.

**Pinch Points:** Indicate a potentially hazardous location in the printer, were if care is not taken, a finger, hand or other body part can become trapped.

**Caution:** Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury, or damage to the printer.

**Hot Surface:** The hot surface sign indicates the presence of devices with high temperatures. Always use extra care when working around heated components.

CE marking is a certification mark that indicates conformity with health, safety, and environmental protection standards for products sold within the European Economic Area (EEA). The CE marking is also found on products sold outside the EEA that are manufactured in, or designed to be sold.