Guide for **3D Scanning**

Advanced Output Center

General Information



	NextEngine HD	Handyscan REVScan	Artec Eva
Minimum Size	1” x 1” x 1”	3” x 3” x 3”	3” x 3” x 3”
Maximum Size	13.5” x 10.1” (Diameter)	No perceived maximum	No perceived maximum
Resolution	0.2mm (0.007”)	0.1mm (0.004”)	0.5mm (0.01”)
Accuracy	0.127mm (0.005”)	0.05mm (0.001”)	0.1mm (0.004”)
Texture Capture	Yes	No	Yes
Material	Non-reflective, opaque materials are optimal. Scanner must have a line of sight to object features.		
Pricing	Free	Positioning Targets 10 for $1	Free
Access	Self-serve, open to currently enrolled students, active faculty, and staff; Users must be certified; See Access section for details		
Location	Check out from Advanced Output Center, 1232 Sullivan Scanner can only leave the building with an equipment pass from AOC staff.		
Applicable Fines	- $50 a day for late returns - Cost of replacement or repair for loss or damages		

Scanner selection based on object size.

Small stationary object needing detail captured such as a toy or small statue.

Use: NextEngine HD

Person or large object that may end up moving positions during scanning process and/or large color object

Use: Artec EVA

Larger object that needs high detail captured.

Use: Handyscan

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Accessing the 3D Scanners

Authorizations

- Before using the 3D scanners, you must complete a certification session online. Currently enrolled students, faculty and staff can be certified for 3D scanning.
- The information covered during certifications will change as software and hardware are updated or reconfigured. To keep users up to date on 3D scanning techniques and policies, certifications will be good for two calendar years, after which you will need to be re-certified.
- Sign up for the certification course online at: http://sites.saic.edu/aoc

Reservations

- Reservations must be made through Acuity on our website at least 12 hours before the time being reserved, and no more than 2 weeks in advance.
- Reservations can only be made in 12 hour blocks. If a scanner block extends past end of day, scanner is due back at lab closure.
- Reservations are non-transferable from one person to another. You can only make and use reservations for yourself.
- Reservations can be rescheduled or cancelled by following links in the confirmation email sent by Acuity.
- You will be given a 10-minute grace period to show up for your reserved time slot. If you do not show up after that point, your reservation might be considered a no-show.
- In the unlikely event that your reserved time slot must be canceled due to equipment malfunction or other unforesee-able issues, you will be notified as quickly as possible and given the option to make a new reservation at the earliest available time slot.
- In the event that a 3D scanner is taken offline, it will not be available for reservation until it is operational again.

Walk-ins

- There are no walk-in appointments on our 3D scanners until social distancing and Covid-19 guidelines are lifted. All laser cutter usage must be a reservation only.

Special Conditions

- The 3D scanner can only leave the building with an equipment pass from AOC staff.
- Late returns will be fined $50/day.
- The 3D scanner must be returned the same day it is checked out, half an hour before the AOC closes.

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Artec Eva 3D Scanner

Artec Eva Contents:

Dell Laptop

- Dell laptop
- Laptop Case (not pictured)
- Power Supply cable
- Mouse

Artec Eva

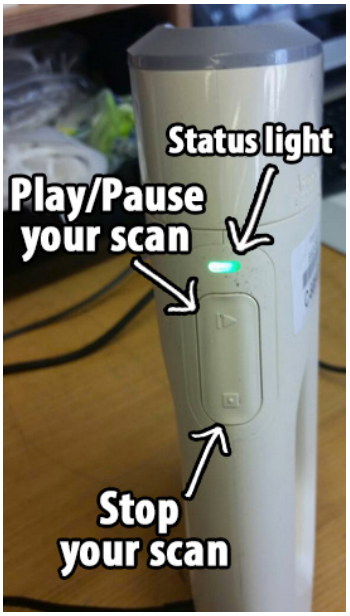
- Artec Eva
- Power Supply
- Power Supply cable
- An 8' USB cable
- Case (not pictured)

Optional Artec External Battery

- The Artec has an added option of using a portable rechargeable battery. This can be useful if you are scanning in an area without access to a wall outlet.
- If you are interested in this option, try to let the AOC know ahead of time through email or in person so we can have both the battery and laptop at full charge for you.

Hardware Setup:

- Begin setup by plugging the Artec power supply cord into an outlet. Screw the other end into the back of the scanner tightly and carefully. The scanner will begin blinking green.
- Next, plug the USB cord into the Dell laptop and plug the other end into the side of the scanner.



Back view of the Artec Eva

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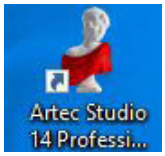
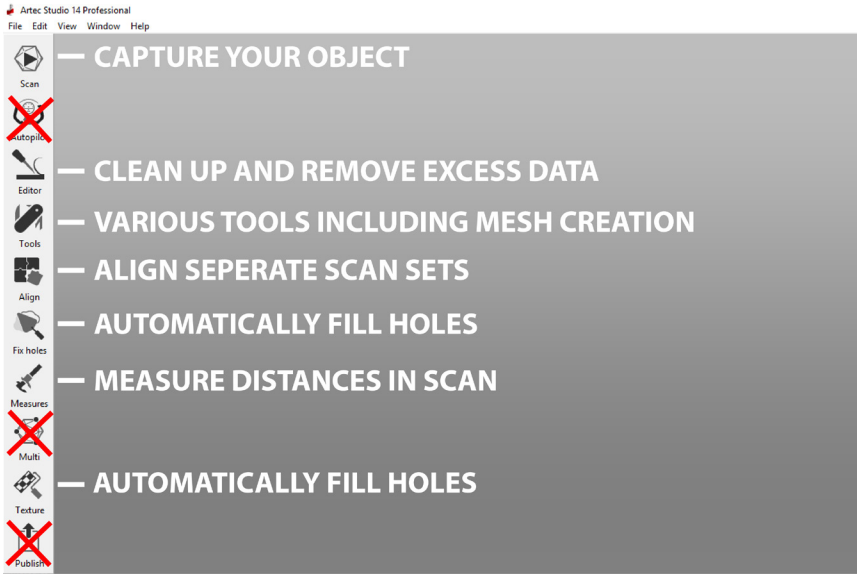
Artec Studio 14 Overview



- Using the scan software requires a lot of memory. It is highly recommended you close out all other applications before beginning.
- Open **Artec Studio 14**. Before you begin, you may want to save your project from the "**file**" menu so you can continue to save your work as you progress.
- Keep in mind that as your project grows with more and more scans, it will take much longer to save. Do not try to save everything from your whole session at once. These scanners are due back 30 minutes before closing - no exceptions.
- Below is a diagram of the Artec Studio 14 workspace. The software as a whole is user-friendly and does a good job of explaining how to run commands and processes. The three main areas of the software are the **menu buttons** on the left, the **viewport** in the middle, and the **scan panel** on the right. Although the menu buttons appear to be organized chronologically from top the bottom, there is some jumping back and forth that needs to be done and the following steps will go into more detail about each step.



- This guide will not be using certain features like **Autopilot**, **Multi**-scan or **Publish**. These features have either been deemed not accurate enough, not useful enough, or too specific to be used in most scanning situations.

Handling the Artec Eva

- The Artec Eva is a lightweight hand-held device, be very careful to set it down away from the edges of the table or platform you are working on as it does not have a cradle to rest in when not in use.
- The Artec is not cordless so you must be mindful of tripping hazards.
- On the front face of the Artec, you have two cameras and circular light-source. Do not directly touch any of these areas. If they appear dirty, alert an AOC staff member - do not attempt to clean.

- Refer back to the **"Hardware setup"** step of this guide to view the locations of the Artec's buttons.
- If you are using the Artec's portable battery, attach it to yourself through a belt while you hold the lap-top with one hand and the scanner in the other. You can also set the laptop down like normal if your location permits and hold the battery while you scan.

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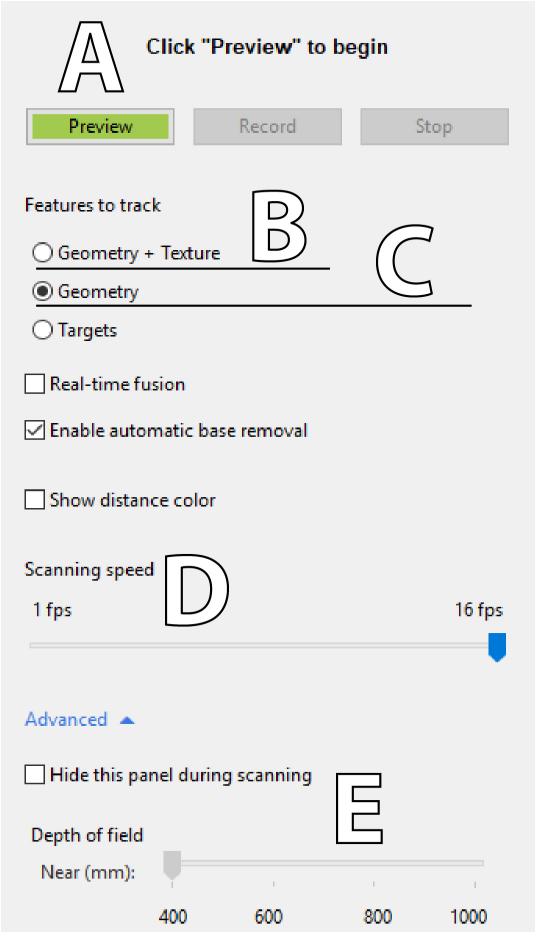
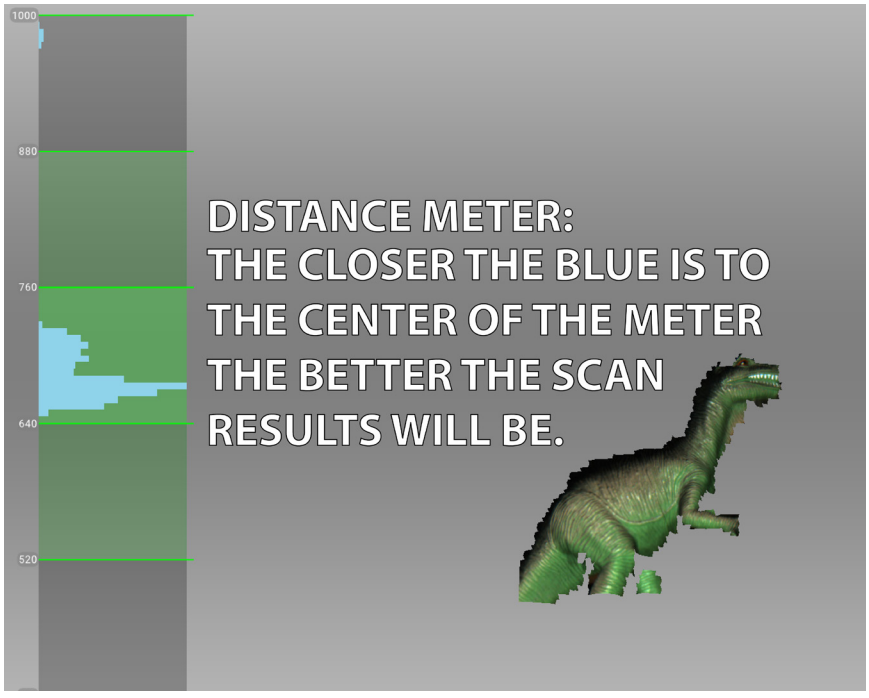


- Before you begin to capture your object, you must preview the object in its environment and make some choices about settings. Hit the **"Scan"** button to configure the scanner.

- **A** - **"Preview"** will initiate the scanners flash bulb so you can view a preview of the object as the scanner gathers data. Before we press this, let's take a look at some settings.
- **B** - Choosing **"Geometry + Texture"** will capture both the shape of the object (example: for monochromatic 3D printing purposes) as well as the color information (for full color 3D printing and animation/rendering). Even if you do not need the textures, it may be a good idea to scan in this mode to make alignment easier in the next sections.
- **C** - **"Geometry"** will only capture the object's shape. If you are short on time and will be doing many scans, this could be a better option as the software will perform faster with texture off.
- If you select "**Enable automatic base removal**" the program will attempt to edit out tables and other unintended scanning surfaces from your scan data.

- After you've chosen these option, press **"Preview"** with the scanner pointing at your object.
- **D** - **"Scanning speed"** denotes how fast the scanner is firing. A higher FPS (yielding a quicker firing flash) works well for indoor situations and within the AOC itself. A higher FPS is also good for shaky hands. Feel free to toggle the slider while viewing your preview scan to see the difference in the scan speed and smoothness.
- **E** - **"Depth of field"** affects how much of the environment the scanner sees.

- If you start to notice a lag when moving from preview to actual capture mode when you start scanning, check to make sure the **"Delay before recording"** value is set to 1-3 seconds. This is located under the advanced tab.



- While viewing your preview scan, get comfortable with the proper distance you will need when you actually capture the object. The green **Distance Meter** on the left will aid you in this. You want most of your data curve to reside in the lightest green area of the meter.
- Move around the object with the scanner pointed at it and observe the meter, making sure you have ample room to capture the object optimally in the environment you are in.
- An incorrect distance will result in sparse scans and lost tracking.
- When in preview mode, your scan will look as pictured to the left with no green outline. When capturing, the edges will glow green.

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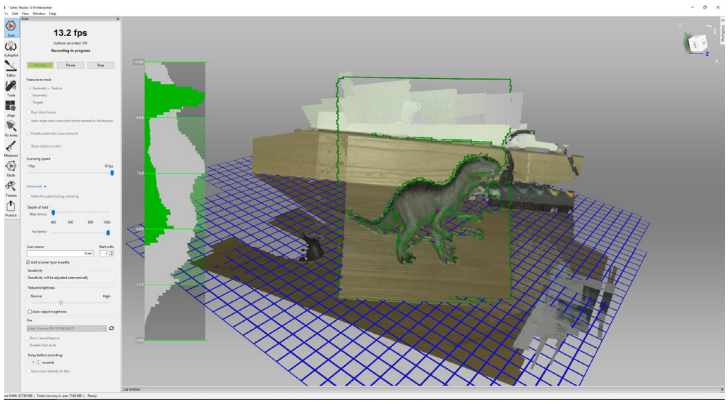
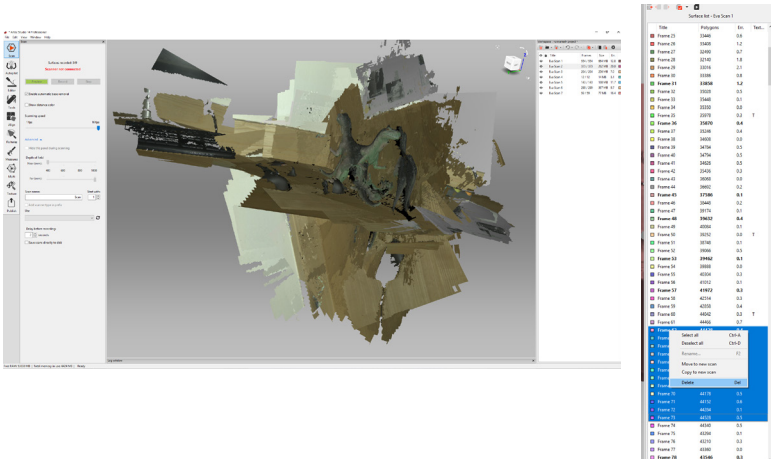
Scanning in Artec Studio 14

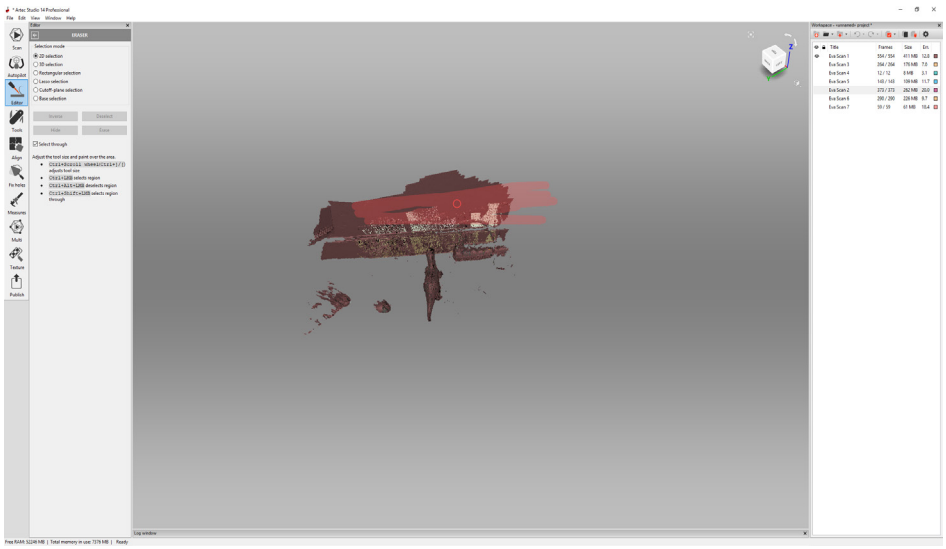




- Scan your object until you are satisfied with the result. It is best to keep the surface count low, as a high number of surfaces can cause longer processing in later steps. We recommend under 400 frames whenever possible.
- After you have finished the scan, select **"Stop."** You can now view the individual frames captured by double clicking on the job in the workspace panel. Here you will be able to select and delete frames that may have become mis-aligned or otherwise are unneeded.
- After our scan we'll want to clean up the model. Enter the **"Editor"** mode on the left tool-bar. As soon as you exit the **"Scan"** mode you'll notice the software runs a Fine Serial Registration. This is normal.

Editing your scan - Erasing

- After the Fine Serial Registration has completed, you may have to select **"Editor"** again. Now we'll select the **"Eraser"** and clean up the scan.
- There are different modes in the **"Eraser."**
  - 2D selection will paint through all surfaces.
  - 3D selection will only paint the top-most surface.
  - Rectangular selection is like 2D but you can only drag a rectangular marquee.
  - Cutoff plane will allow you select multiple points are remove an entire plane (like a table surface).



- Use whatever tool you prefer, select the area to remove and select **"Erase."**
- You can toggle off different scans (#1 is active here) by selecting the eye icon next to the scan set. It is recommended to only clean up one scan set at a time as they will often sit on top of each other and be hard to identify when multiple scans are active.
- Once you have selected everything you wish to erase, you can erase and proceed to align.

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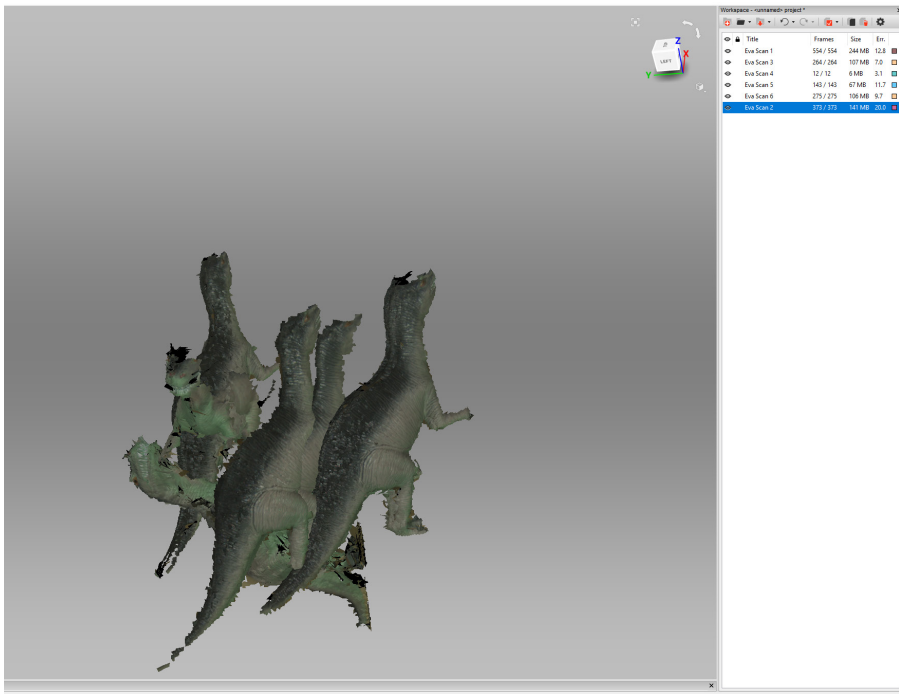
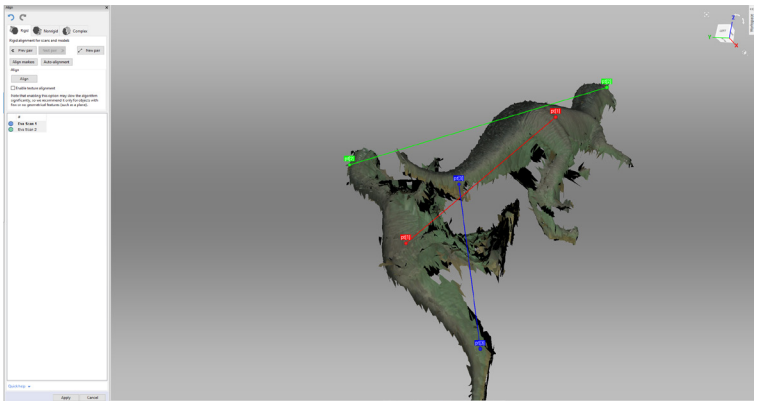
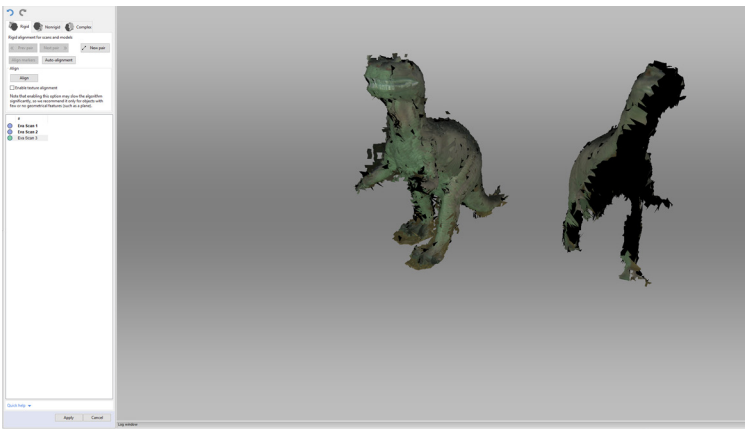
Editing your scan - Alignment

- Now that our data has been cleaned up. We'll want to start aligning out scans together before we finally merge them together into a single mesh.
- First make sure all scans that are cleaned up and will be part of the final mesh are visible on the menu to the right, then access the **"Align"** mode on the left hand toolbar.
- Depending on how complete your scan data is, you will be able to complete alignment simply through trying the **"Auto-Align."** If you have enough data, this will align all the scans for you. If this does not work, you will need to either go back and scan additional data, or proceed to manual alignment, which is detailed below.







- To perform manual alignment, you will need to select two scans and select matching points on each model by creating **"pairs"** and aligning markers.
- Before starting manual alignment, you will want to select 2 scans to start with. It is a good idea to start with the most complete scans you have made. The first one will have a dark blue dot next to it, and the second will have a lighter blue dot. The dark blue is your reference scan, meaning that the light blue scans are going to be moved to the dark blue scans location. This is important as we add more scans to the alignment.
- Select **"New Pair"**, select two matching points on each model. Continue this process until you have at least 3 pairs. After 3 pairs have been made, click **"Align meshes".** This will move the light blue scan to the reference scan.
- Proceed by moving down your list of scans and repeating this process. Once 2 scans are aligned together, you should set them both as the reference scan, and clicking on that scan until all the already aligned scans are also dark blue.

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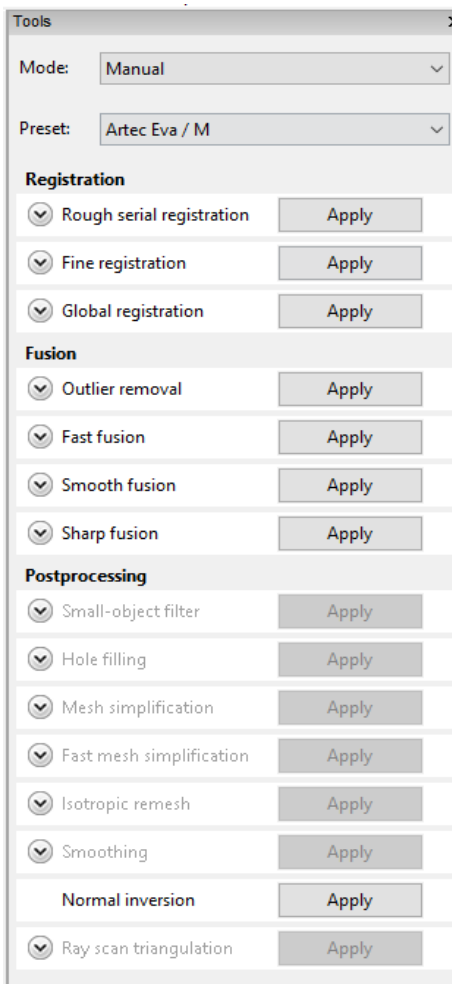
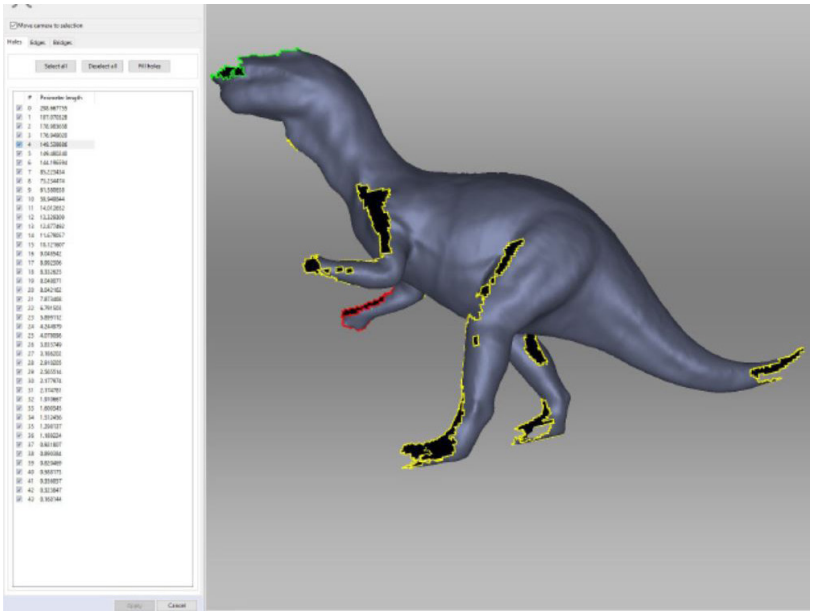
Finalizing your scan - Tools



- After alignment you'll want to head back to the **"Tools"** menu and run "**Global Registration."** This process can take several minutes to complete. This process will align all scans together.
- Once this is complete you can run a fusion mode. In our example we'll run a **"Fast fusion,"** but the type of fusion you wish to run is up to you. **"Sharp fusion"** is best for sharp angles and geometric models, "**Smooth fusion**" is best for organic shapes and curved models, while **"Fast fusion"** is a reliable combination of the two.
- After the fusion is complete there are a few more tools you can run on your mesh in this menu. Often times your mesh will still have minor fractals floating around your mesh. These can easily be removed with the **"Outlier Removal"** tool under Fusion before you perform the fusion, or the **"Small-object filter"** removal tool under Postprocessing if you have already preformed the fusion.
- "**Hole filling**" is a quick command to try to close any remaining holes in your mesh after the fusion. Often times, this command will not fill all the holes on your mesh, particularly larger holes. If you are having this problem you may need to go back further and perform additional scans, or proceed to the **"Fix Holes"** tool. This tool is detailed below.
- If your mesh is very large or complex, you may need to scale down the polycount before export for your purposes. To do this use either the **"Mesh Simplification"** or **"Fast Mesh Simplification"** tools, which will lower the resolution of geometry but create a much smaller final file.
- The final important tool to be aware of is the **"Smoothing"** tool which can be used to smooth over areas of the scan that are overly geometric. This is great for making areas that were automatically filled look more natural. Keep in mind though, this often will make the file larger and more complex.

Finalizing your scan - Fix Holes

- **"Fix-Holes"** mode is very useful for creating a closed mesh, which is required for many 3D processes, including 3D printing.
- This mode will list all openings in the mesh on the left, allowing you to select and de-select which holes you would like filled.
- Keep in mind that the bigger the hole, the less natural the fix will look. Over larger areas this tool tends to make jagged geometric areas to cover the holes, so scanning these areas is usually the preference.
- Once you have selected all the holes you would like to fill, click **"Fix Holes"** at the top of this menu, and then apply at the bottom.



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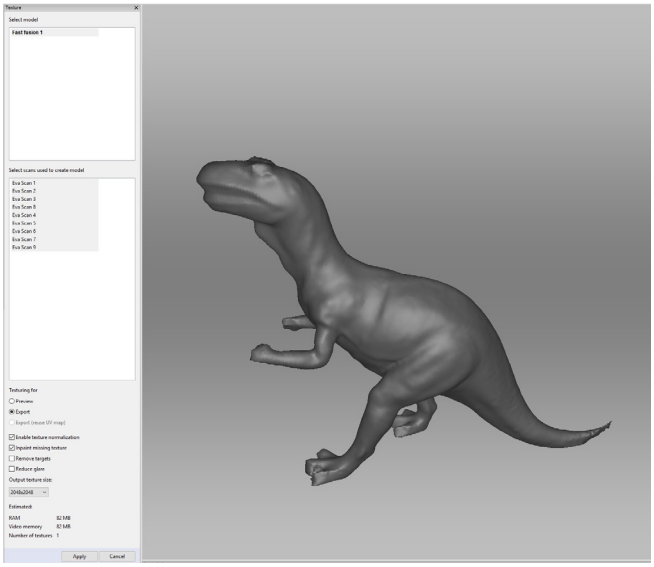
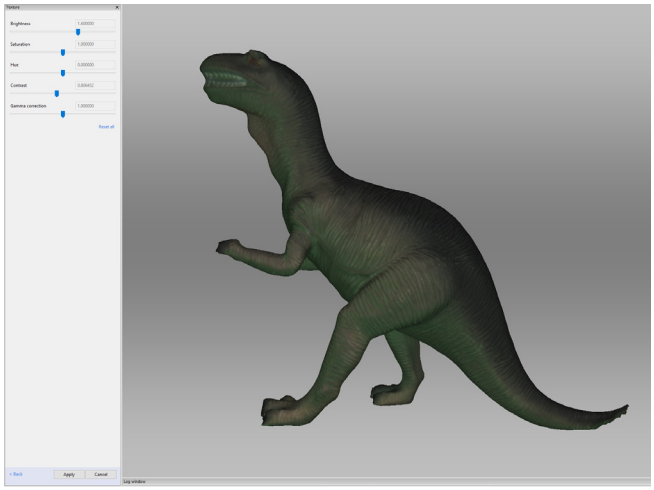
Finalizing your scan - Texture Application



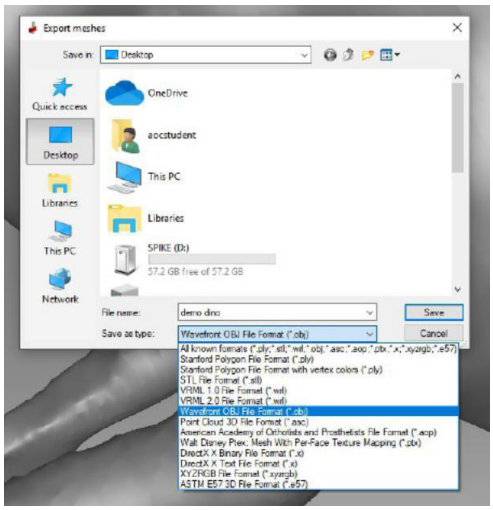
- The last thing we'll do before exporting the model is remap the texture from our scans onto our final mesh. This can be done by accessing the **"Texture"** mode.
- Select the fused model and then all the scans used to generate that model. Set the desired resolution and hit apply. You will not see the texture remapped to the model surface.
- At the bottom you can select whether this texture is for preview or export - you will most likely be using for export if this is the final stage of your scanning.
- You can also set various settings such as resolution and glare reduction if needed before applying the texture.

- Once the computer finishes applying the texture you will be presented with some sliders that give you basic control over things like color saturation and brightness. While these tools are limited, it is a good idea to make sure you like the look of your model and texture before you export, as this becomes a much more difficult, sometimes even impossible, task to perform after the fact.



Finalizing your scan - Exporting

- When you have completed all of these steps and you are satisfied with the final model, you'll want to save the model by exporting the mesh from the **"File"** menu.
- Select **"Export"** then **"Meshes"** and you will get a window to select your export settings.
- Use the drop down menu to select file type. Most scans intended for 3D printing or any digital output will want to be exported as either an .STL or an .OBJ. There are, however, reasons you may want to use different file types than these. Check what file type is best for what you plan to do with your scan before exporting.
- It is also important to note that different file types will package the color differently. You can research which file type will be best for color if you need color in your final model, but usually we recommend the .OBJ file type if this is the case.



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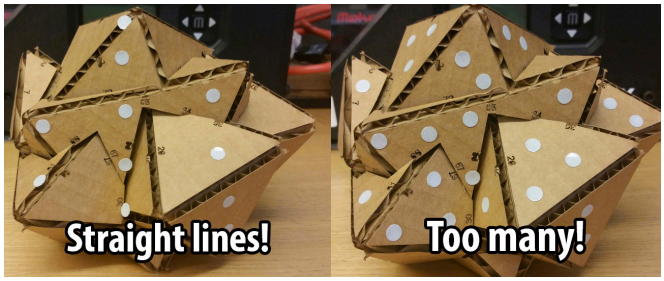
HandyScan REVscan G2:

Handyscan Object Preparation

- Object's surface should be opaque and non-reflective. Coatings such as paint or powder can be used as needed. The ideal surface for scanning is a matte white.
- Place reflective dots (available for purchase) on your object, 1"-4" apart in a random grid-like orientation. Don't place dots in a straight line.
- Dots can also be placed on a separate surface such as a board, which can then be placed beneath or behind the object to scan. The AOC has pre-stickered boards for use.
- In order to track the object's position in space, the scanner must be able to see at least 4 dots at all times.
- Do not go overboard when placing dots. More dots will not give you a better scan.

GOOD

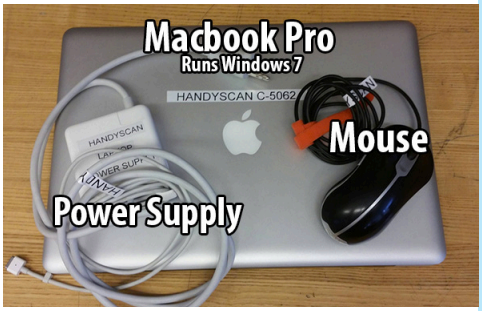


BAD

HandyScan Contents:

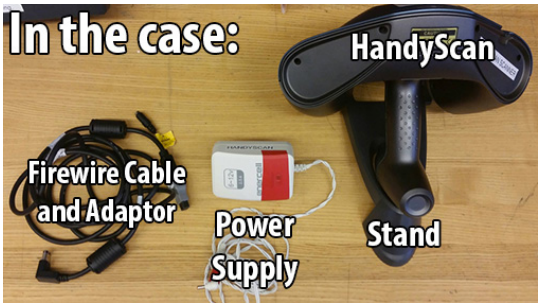
Macbook Pro

- Macbook Pro
- Laptop Case (Not Pictured)
- Power Supply
- Mouse



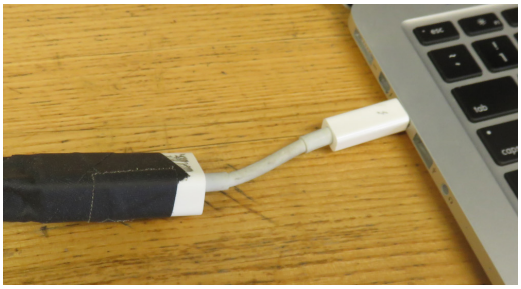
Handyscan

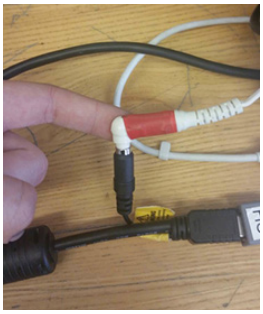
- Handyscan
- FireWire Cable w/ adaptor taped
- Power Supply
- Stand
- Case (not pictured)



Hardware Setup:

- Begin setting up by powering on the Macbook with the mouse plugged into the USB port and with the laptop connected to power as the software can drain the battery. Next, plug the adapter into the Thunderbolt port of the Macbook. Plug the other end of this cord into the top of the scanner itself.





- Next, plug power cord into a wall socket and plug the small end into the empty port on the firewire cable.
- The scanner will power on and you will be able to open up the software at this point.

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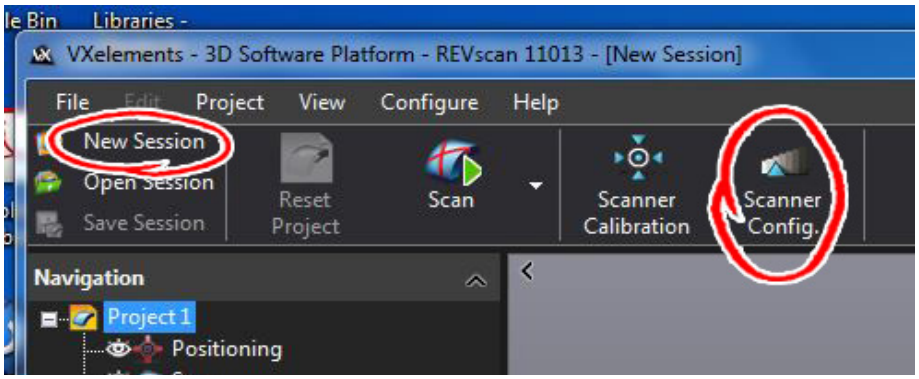
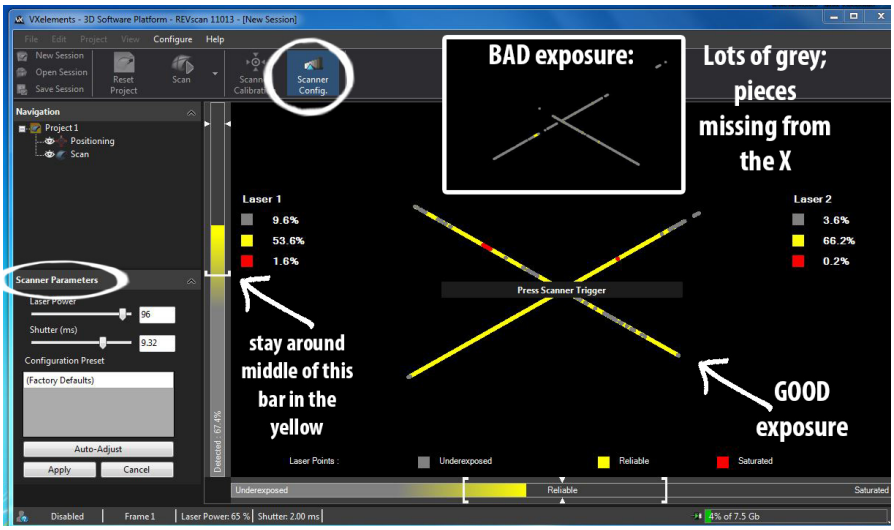
Configuring the HandyScan in VXElements

- Using the scan software requires a lot of memory. It is highly recommended you close out all other applications before beginning.
- Open **VXElements**. Start a **"New Session"**...

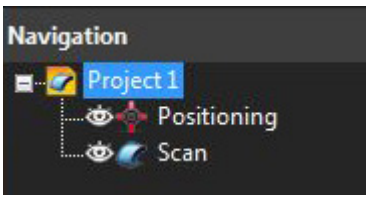


- Click on **"Scanner Config"** shown above to set the scanner's exposure.

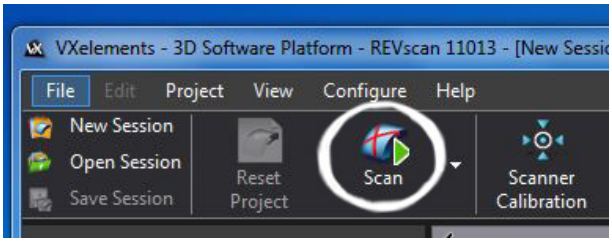


- Point the HandyScan at your object and pull the trigger. The X on the screen represents the scanner's laser-crosshairs. For ideal exposure, the X should be completely yellow or close as possible.
- Under the "Scanner Parameters" panel on the left, adjust exposure by increasing the "Laser Power" first, then the "Shutter" slider as needed.
- It can be a good idea to check your exposure with the **"Auto-Adjust"** button in certain situations (remember, Auto-Adjust is only useful if the "X" completely covers the object being scanned), but you should always be calculating your exposure yourself.

- When you are satisfied with your calibration, hit **"Apply"** to exit.
- Next, set your scanning resolution by clicking **"Scan"** under "Project 1" or the name of your project on the left. Under scan parameters, change the value in the resolution box to your desired resolution quality. The default is 0.079 and any value lower than that will scan at a higher resolution.



- To begin scanning, hit the **"Scan"** button at the top left of the software.



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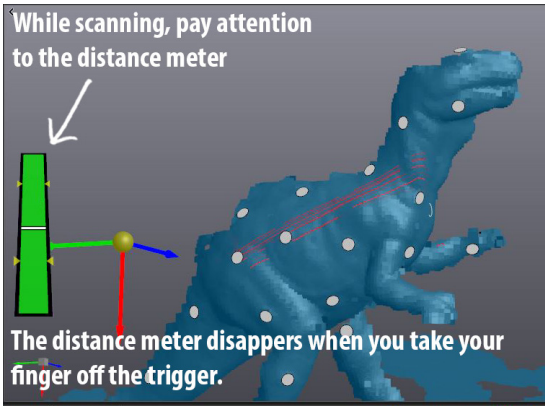
Scanning in VXElements

- To scan, point the scanner at the object and hold the trigger button on the front of handle down. Move slowly and steadily around the your object. When scanning with the boards, attempt to keep the scanner at a perpendicular angle instead of a parallel angle in relation to the target board as parallel angles are more difficult for the scanner to read the dots on the surface.



- Try to keep the scanner about one foot away from the object. Watch the **distance meter** in VxElements (in the scanning window on the left side) for feedback on the proper scan distance. When the meter is green, you are scanning at optimal distance. To prevent the cord from entering the scanning path and to prevent tripping hazards, always hold the scanner with one hand and pull the cord back with the other.

Safety and breaks

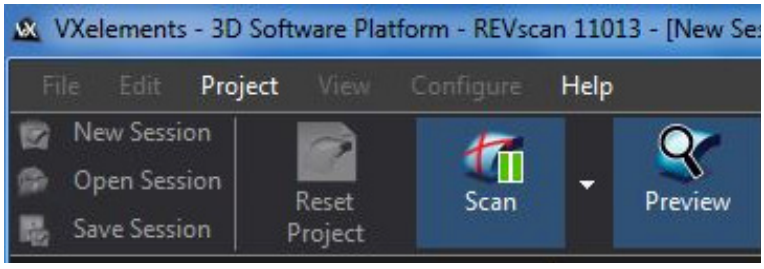
- Feel free to take **breaks** while scanning by releasing the trigger button. Remember, whenever you are not actively handling the scanner, make sure you keep it nestled in its cradle with the lenses facing down. Keep watch over the cords to make sure there is no danger of the scanner being pulled off the table. If need to take a break and step away from the scanning area, bring the scanner and its all components to the AOC. We can keep the items behind the staff desk so they remain safe. If you don't return for more than 60 minutes, we will have to release the scanner for others to use.

- **Never touch the scanner's lenses.** If they look dirty, alert an AOC staff member for cleaning.

Scanning in VXElements

- The red X seen over your scan data is where the scanner is currently recording, and the last 20 captures it made. Continue to move the scanner around slowly to gather more data and build up the object. Right click the scanning window and select **"Lock Viewport"** to focus on fine detail and filing in missing areas without the model moving around. Another way to personalize your view is to use the scroll wheel on your mouse to double click an area on the object to set your rotation axis.Small holes in the scan are normal, and can be fixed after scanning by either toggling the **"Auto-fill holes"** slider or by moving to another software such as **Geomagic** (found on the AOC lab computers).

- While scanning, the object will look pixelated - this is normal. Go to preview mode by clicking the **"Preview"** button on the top left. This will show you what the scan data would look like should you export the mesh now.



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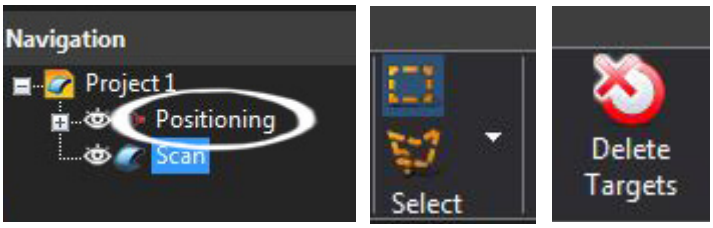
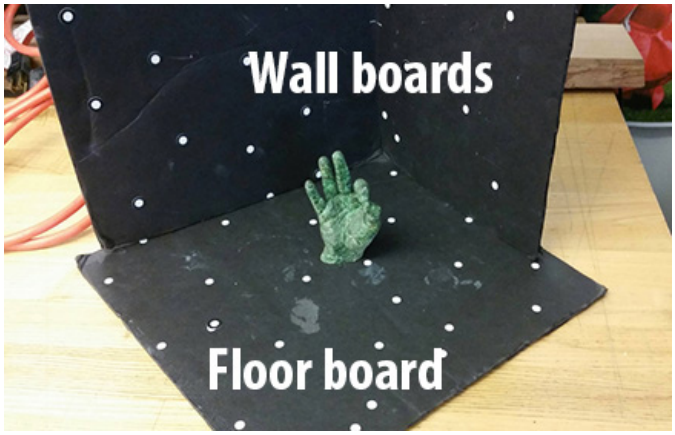
Scanning with a stickered board

- If you are scanning an object using the pre-stickered boards, this process is a bit different. Once you have finished scanning one side of your object, click on the **"Positioning"** tab under the navigation panel. Once here, you will only see the dots that have been registered and not the object itself. Using one of the selection tools at the top, select the dots (CTRL + left mouse) that sat on the boards forming the walls of the setup. Delete these dots by pressing the **"Delete targets"** button at the top and leave the dots that sat on the floor board.





- Once these dots have been deleted, carefully remove the walls of your setup and very carefully (without shifting the placement of the object on the floor board) spin the floor board so the back of the object is facing you. Put the wall boards back up and contiue to scan your object.

- When you are finished scanning and wish to move on to editing, press the pause button at the top left as seen in the last image on page 8 - remember, you can always go back and continue scanning as you begin to edit your scan.

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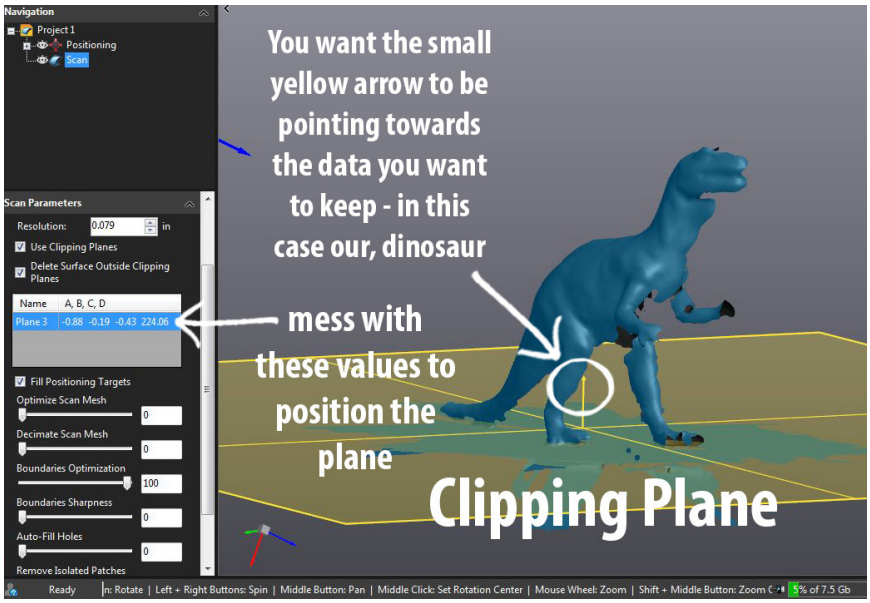
Editing your scan in VXElements: Clipping Planes and Scan Parameters

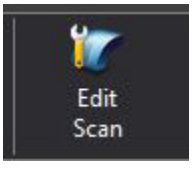
- Once you've paused your scan, you can expirement with the scan parameters seen in the bottom left panel of the software. Here, you can modify your scan globally in many different ways from resolution to decimation. First though, you may want to eliminate some scan data in order to focus in better on what you really want to export. If you scanned a smaller object on a table or pedestal, you may want to quickly eliminate the scan data of this structure and only keep the object. To do so, we will use **clipping planes**. These can be used and placed anywhere to eliminate unwanted scan data.

- To start off, check the box next to **"Use Clipping Planes"** and **"Delete Surface Outside Clipping Planes"**. Next, right click in the grey box below and select **"Add"**. There are many ways to add a clipping plane. The ones that seem to work the best are creating one from drawing a line, choosing 3 vertices, or choosing 3 tracker dots. The tracking dots method can be particularly helpful if you were using pre stickered boards and want to get rid of the table or platform you scanned on. Hold CTRL and left mouse click to place your verticies or CTRL and left mouse drag to draw a line.



- After you have positioned your plane, scroll to the bottom of scan parameters and hit **"Apply"**. The software will delete all model data below that plane.

- While you are still in scan parameters, try messing around with some of the sliders. At this point, if you are not satisfied with your resolution, you can mess with your global **resolution** to boost the quality of the entire model. To do this, change the value in the resolution box to a smaller number. The default is 0.079. After you have done this, hit **"Apply"** at the bottom. Keep in mind that if you scanned at a low resolution, boosting this value up too much at this point could create holes and strange geometry. It is best to do it at the beginning. After you have achieved an acceptable global resolution, feel free to expiriment the scan parameter sliders such as decimation, filling holes, and sharpening operations. Hit **"Apply"** again when you are all done.



- Before we export our model, we may want to do a bit more fine tuning. Hop into the edit scan mode by clicking the **"Edit Scan"** button at the top.

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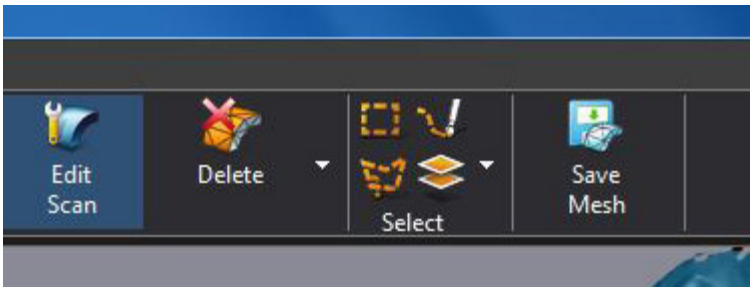
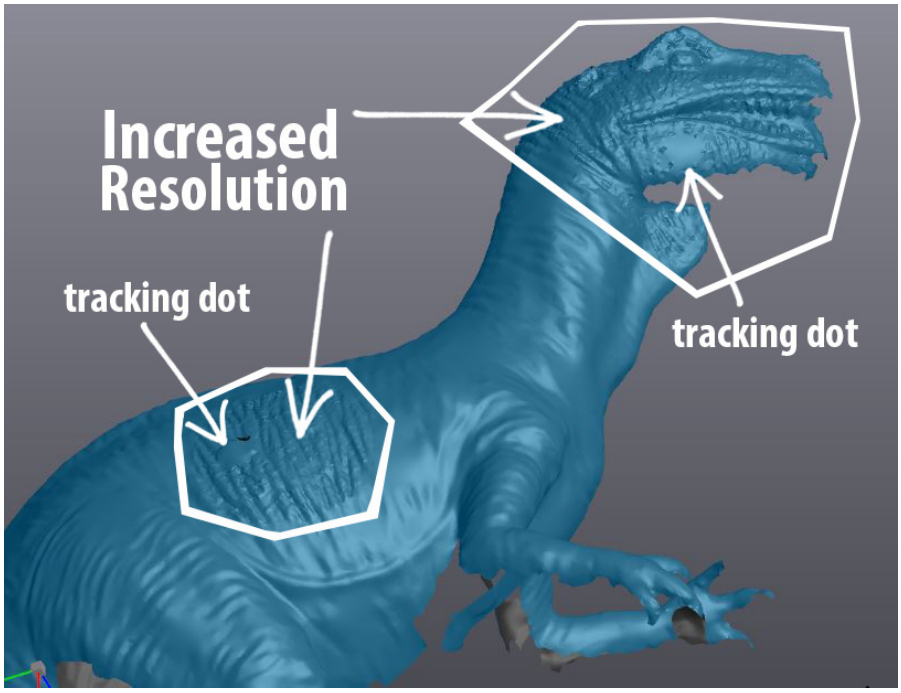
Editing your scan in VXElements: "Edit Scan" tool

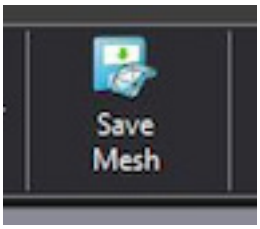


- In this editing mode, you can use different selection tools to select certain areas of your scan data and either delete them or raise/lower the resolution of that selection only. With any of the selection tools, remember to hold CTRL and either drag or paint in your selection with the left mouse button, reserving the right mouse button for navigation. When you let go of the left mouse button, your selection will turn yellow, letting you know it has been selected.

- Once you have your selection, you can delete it by clicking the **"Delete"** button show above. To increase or decrease the resolution of your chosen area, click the small white arrow next to the delete button and a drop down menu will appear with more options. Choose "increase resolution" or "delete resolution". Once this has been applied, you will see a drastic change between the two areas of your scan.
- As your resolution sharpens, you will begin to see the areas where the tracking dots sat on your object. To combat this look, you can re-scan your object with the dots re-arranged into different places and then combine the two in a program such as **Geomagic**. Also, you can expiriment with taking your model into a 3D sculpting program such as **ZBrush** which has brushes and tools that allow you to easily make marks and copy geometry. If you used a pre-stickered board instead of stickering the object itself, you will not have this problem.



Export your model



- When you are finished editing, click the **"Save Mesh"** button at the top of the software and export your model. For 3D printing, we at the AOC require **.STL files**. .OBJ files may also be useful for programs such as Maya and Zbrush.

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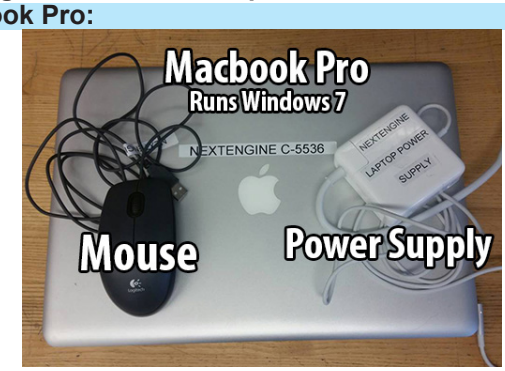
NextEngine HD:

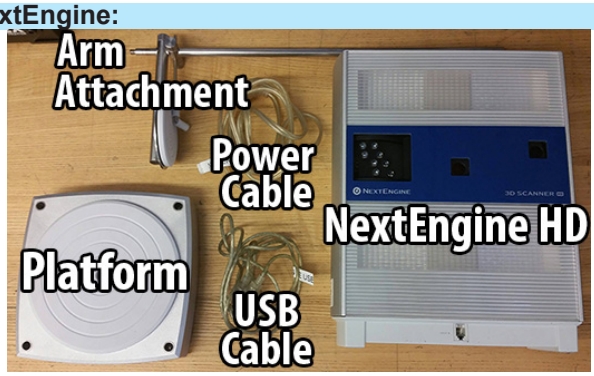
NextEngine Hardware Setup:

Macbook Pro:



- Macbook Pro Laptop
- Laptop Case (Not Pictured)
- Power Supply
- Mouse

NextEngine:



- NextEngine
- Auto-positioner platform
- Arm attatchment for platform
- Power cable
- USB cable

Scanner Setup:

- The NextEngine scanner is not handheld and will need to sit undisturbed on a safe, flat surface while scanning.
- Connect the NextEngine to a power source, then connect the USB cable to the laptop.
- Plug in your mouse (you will need it for efficient navigation) and make sure the Macbook is connected to power as the software will quickly drain the battery.

Platform Setup:

- Decide the proper platform setup for your object.
- For smaller shorter objects, hook up the additional platform arm and place your object on this smaller platform.
- For unstable objects, use the upper extension on the arm to hold objects up for scanning

Setting the focus for the NextEngine:

- The NextEngine can scan the smallest objects with a minimum size of around 1”x1”. For objects this small, you will need to set your focus to Macro. For larger objects, you will want to go with Wide focus. Follow the workflow on the next page to focus your object.

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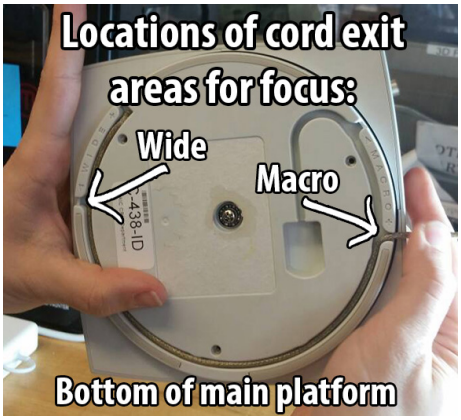
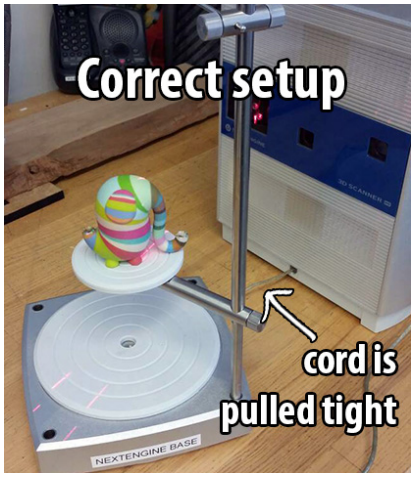
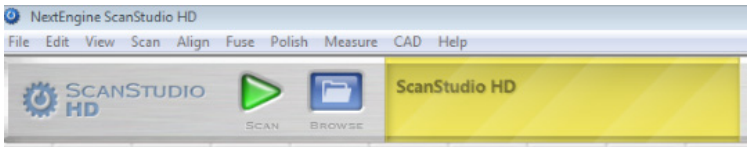
Setting the focus for the NextEngine:

- With the NextEngine, you'll need to refer to the software modes for the recommended scanning distance. Macro mode requires the scanner to be about 9.5" away from the platform and wide mode, 25" away. There is an included tape measure in the case for assisting in this process. You'll want to ignore the notches on the bottom of the platform as these were meant for another device.



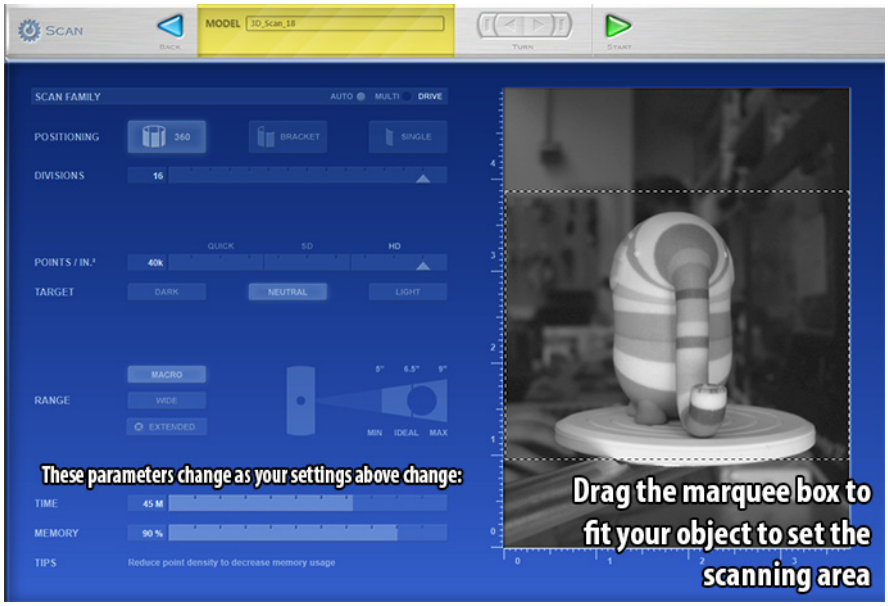


- Open ScanStudio on the Macbook and hit the green **"Scan"** button to view a preview of your focus and settings



- ***Note:** The interface of ScanStudio is very light and options will look greyed out and uneditable - this is not the case; sliders and options can be changed.

Setting the ScanStudio settings:



- **Positioning:** 360 will scan the entire object in the round; Bracket will do a small segment of 3 scans; Single will do a single scan. Bracket and Single can be good for checking focus and texture capture exposure.
- **Divisions:** More divisions = more singular snapshot scans of the object. This will boost your time.
- **Points:** More points = a higher quality scan with more polyfaces. Will also boost time and size.
- **Target:** refers to the color tone and darkness of the object's surface.
- **Range:** The focus length that will be used to scan.

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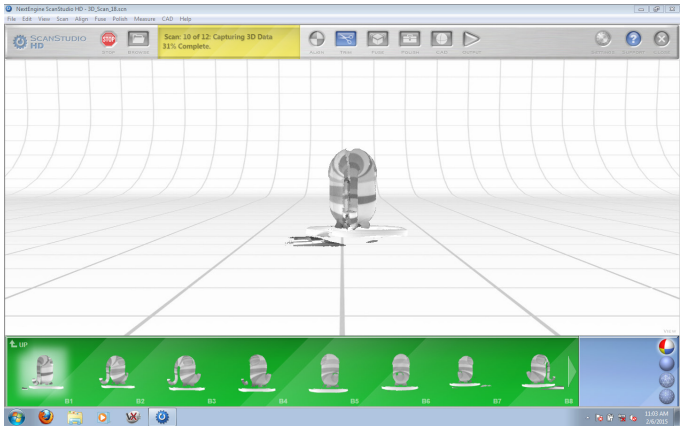
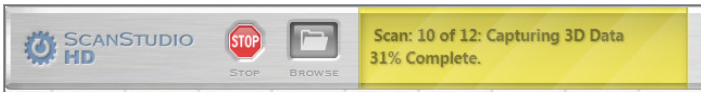
Scanning with the NextEngine:

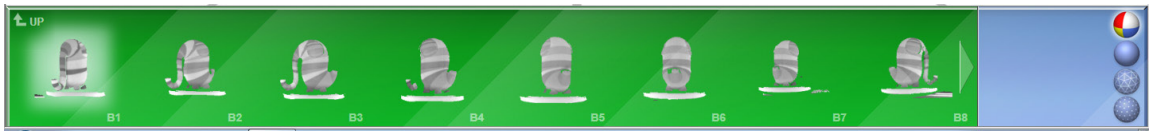


- To begin your scan, press the green **"Scan"** button again. The software will take you to a new screen where you can see your model being scanned. As the object is scanned, keep an eye on the software. Make sure each scan looks adequately full of data - make sure no large chunks of the model are getting lost due to bad focus.

- Above the scan preview, you will see the status of your scan. From here you can stop your scan if need be.



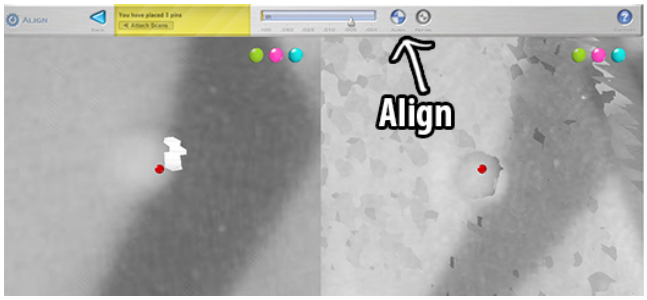
- Below the scan preview, you can see a row of icons representing the scans already completed. You can scroll through them to make sure you are capturing adequate data.



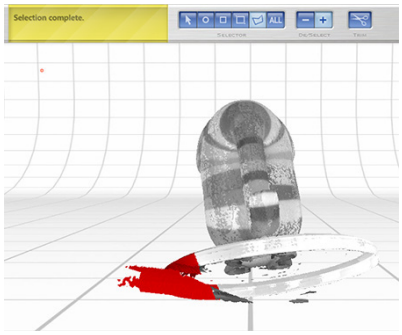
Editing NextEngine scans:

- After your scan is complete, you have the choice of editing, aligning, and fusing your data in **ScanStudio**, or (a much more efficient but more advanced route) bringing all individual scans into **Geomagic**.

- In **ScanStudio**, you can align the individual scans, delete elements you don't want, fuse into a singular mesh (not recommended), fill holes with polish, and export the scans. Most of these operations are much better off being done in **Geomagic**, but can be attempted in ScanStudio.



- To begin editing in **ScanStudio**, double click your scan preview at the bottom to open it up and see all individual scans. You can start the editing process with the **align** operation. Select the first individual scan by double clicking it, then click the scan next to it. You should now see both scans side by side. Next, you simply assign points to each scan in a corresponding manner (EX: placing a point on the eyeball on the left scan and placing a point on the eyeball on the right scan. When done placing points, hit **"align"** at the top and move to the next scan that needs alignment.



- Next, try entering the **Trim** operation. Use the various types of selection tools to select and delete areas you do not want such as the scanning platform. Once you have made your selection, press the scissor button marked **"Trim"** at the top to delete it.

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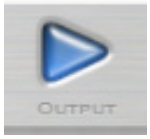
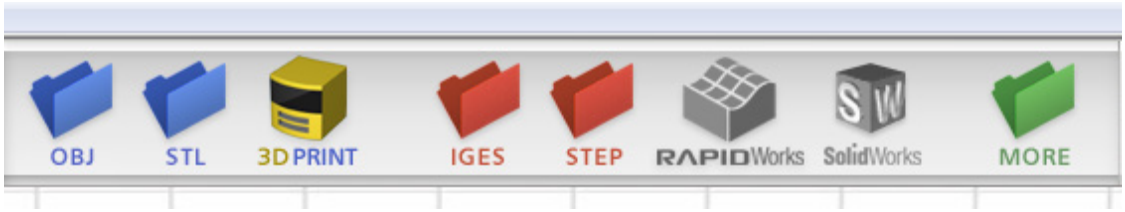
Editing NextEngine scans:

- **Fusing** your scans into one mesh is not recommended in this software as we have other programs that can complete this operation much more efficiently and with a much more accurate result. **Geomagic**, of course, is the best option - Work through the AOC's Geomagic guide for help with this or ask the AOC Manager or Technician for assistance. If you are comfortable with **Artec Studio**, you can import your individual scans into Artec Studio, do the alignment in that program and do a fast, smooth, or sharp fusion to get your mesh.

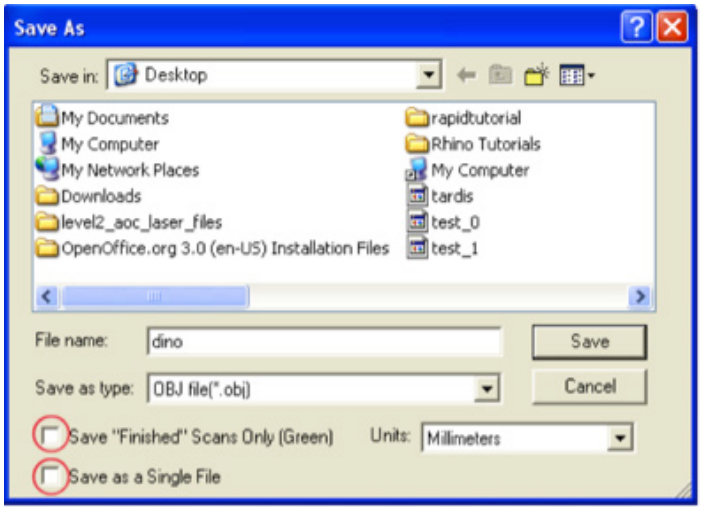
- **Polish** operations in **ScanStudio**, including **filling holes**, is another operation best left to **Geomagic** or **Artec Studio**.



- The final step in **ScanStudio**, is to export your scans. Click the **"Output"** button at the top to open up a menu of export options. The most common options are **STL or OBJ**. For 3D printing, we at the AOC must recieve STL files. OBJ files are files that generate a MTL file that contains the texture information.



- When you go to export and are taken to the "Save As.." window, make sure you uncheck the boxes for **"Save 'Finished' Scans Only (Green)"** and **"Save as Single File"**. This will allow you to import individual scans into other programs to align and fuse them into a singular mesh.



- When you save these scans, make sure you save them to their own folder and then move this folder onto a USB drive. You do not want to lose any of the individual scans as this will impact your eventual mesh.

- Now that you have your folder of scans, you can either import them into Artec Studio or Geomagic to continue your workflow. Consult the Artec section in this guide or the AOC's Geomagic guide for further assistance on completing your mesh for 3D printing.

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