

**THOR<sup>3D</sup>**

**User Manual**

**v 2.3**

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# At the beginning

## Introduction

Congratulations on your purchase of a brand-new Thor3D scanner! This device features the latest 3D-scanning technology based on a structured-light approach. This user manual contains information regarding scanner software installation as well as guidelines for the scanning process.

## Handling the scanner

You should always remember that a 3D-scanner such as Thor3D is a professional, high-accuracy optical device and thus should be handled carefully. Proper care will ensure long life and reliable performance of the scanner.

## THOR3D PC Software minimum hardware requirements

- OS: Windows 8.1, 10
- CPU: multi-core (Intel Core i5 or higher)
- GPU: OpenGL 4.3 supported (NVIDIA 400 or higher)
- RAM: 8 Gb (human scan) or 16 Gb (car scan)

## THOR3D installation and initial start

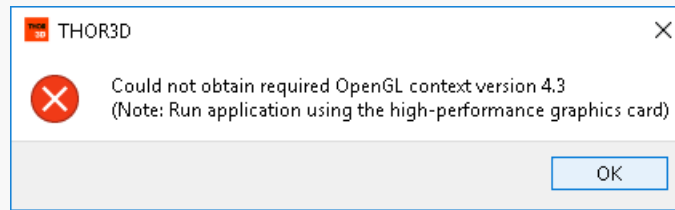
To install the program, run the .msi file you received with your scanner and follow the prompts to install the software on your laptop or PC.

*\* If your computer has more than one video card (for example, an Intel and an NVIDIA), make sure that THOR3D software is always using the more powerful graphics card by default.*

*\* Please note that we do not recommend using 4K screen resolution.*



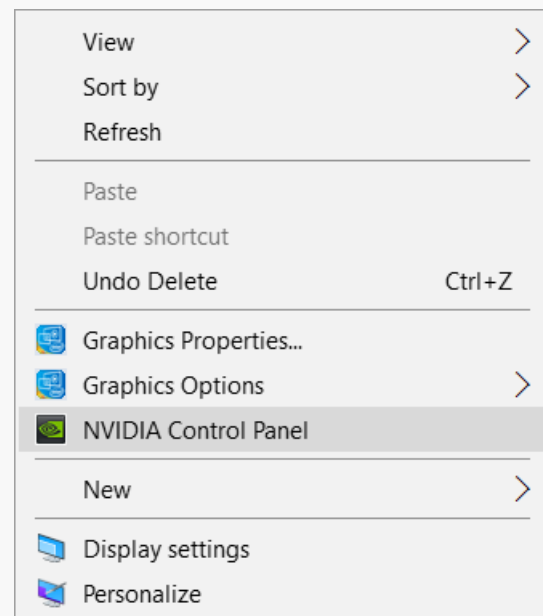
If during start-up you get this error:



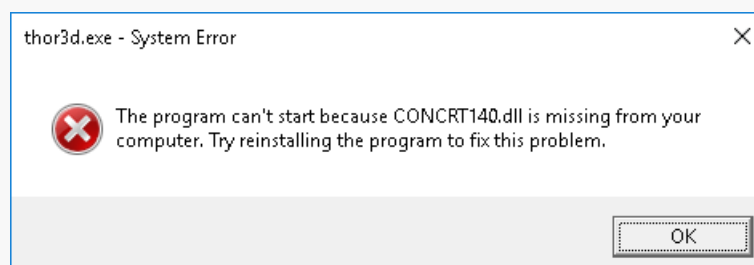
This error occurs when the PC or laptop does not have the minimum required graphics card installed (those which support OpenGL 4.3). If there are two graphic cards on the laptop, you might be launching the program using the weaker one.

To set the default graphic card for this program do the following:

1. Open the desktop context menu.
2. Choose "NVIDIA Control Panel".
3. Enter the "Manage 3D Settings menu" and open the "Program Settings".
4. Press the "Add" button and choose Thor3d.exe from the list. If it's not on the list, press "Browse...", navigate to the folder with the program and add "thor3d.exe".
5. Try running the program again. Should the error persist, you'll have to upgrade your video card to a newer one.



If during start-up you get this error:



This error indicates that a vital file is missing from your PC or laptop (Visual C++ Redistributable 2015 x64, a file called vc\_redist\_x64.exe). This is easily fixed by downloading the correct file from the Microsoft website and installing it manually:

<https://www.microsoft.com/en-us/download/details.aspx?id=48145>

# Scanning

## Preparation for scanning and optimal scanning conditions

The best results are achieved when scanning in a common office-lighting conditions. Scanning in bright rooms or under direct sunlight may result in poor scanner performance. While it is recommended to use non-flickering light sources, fluorescent lighting can also be used without any serious quality loss. Scanning in complete darkness is also possible. If during the scanning (especially in a dark room) you are seeing a lot of “noise” on the screen, try moving the turning table near a wall so the wall is about a meter behind the model. It is also possible to get rid of such noise by placing a source of light behind the scanned object.

*\* The recommended rotational speed of the turning table is 4-5 revolutions per minute. The scanner itself is able to capture objects at much higher speed, but setting the rotational speed of the turntable too high will most likely cause the person being scanned to shake. Scanning at lower speed will take more time, thus making it harder for the model to stand still. Non-moving objects can be scanned for extended periods of time without affecting the result.*

If scanning without a turning table, try to maintain the same distance between you and the object. Make sure there are no objects in ~1.5m radius around the model so you don't trip over something while scanning.

## Scanning limitations

As any other structured light scanner, Thor3D has difficulties capturing shiny metal surfaces and transparent materials, as well as black colored surfaces. That's why it's recommended to spray a matte substance over shiny, transparent and black surfaces, and when scanning people – remove glasses before being scanned and try to avoid dressing in completely black suits/dresses.

## Scanning people: Guidelines

1. Turn on the turning table. Ask the model to stand very still and not to blink or move their eyeballs.
2. Enter the preview mode by pressing the “Start Preview” button. Find the proper distance by making sure the model can be seen on the screen in blue color.

*\* It is recommended to go in downward motion while scanning. Begin by scanning the model's head. Make sure to partly capture shoulders as well, it is easily achievable thanks to the huge field of view of Thor3D.*

- Wait for the model to make a full rotation, then slowly lower the scanner to fully capture the face and the upper body of the model. Try to keep the scanner perpendicularly to the scanned surface and maintain the same distance while you move down.



- Wait until the model completes the turn and lower the scanner by 40-50 centimeters and slightly change the angle so the chin and neck can be captured.

*\* When scanning objects with complex geometry (clothes with a lot of creases or sharp edges) it is recommended to move the scanner in a swinging motion by changing the angle by 5-10°.*

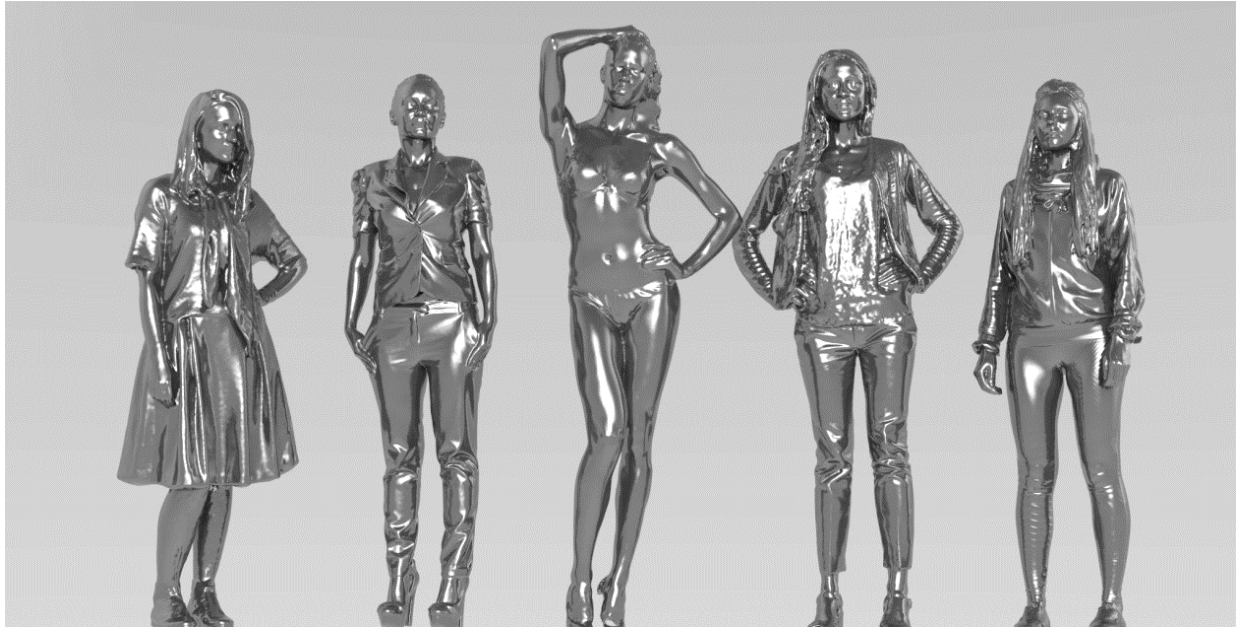
- Wait until the table completes the 3<sup>rd</sup> turn and move the scanner down to the level of hips.
- Gradually move down while keeping the scanner pointed perpendicularly to the scanned surface. When scanning legs, don't just tilt the scanner, move your body down as well. Scan the legs separately, don't try to capture them together with the shoes.
- During the last turn focus on the shoes. Make sure that the scanner is capturing the turning table and a part of the floor as well as his will ensure the correct floor detection. Scan the shoes for a complete turn, then stop scanning by pressing "Stop".

*\* When scanning black or shiny shoes, it might be necessary to change the angle you're scanning at. If the shoes cannot be seen on the screen, try raising the scanner and capturing the shoes at a 20-30° angle.*

- Insert a USB flash drive into the scanner and wait for 5-10 seconds for initialization. Press the "Save" button on the screen and wait until the scan is saved, take the flash drive out and insert it into your PC.
- After scanning, turn the scanner off by pressing the "Power Off" button on the screen. If for some reason it is not possible to turn the scanner off using the "Power Off" button, try swiping three times across the screen from right to left.

While scanning, it is recommended to use portable steps or a small platform to be able to reach the top of a model's head easier. Refrain from quick and sudden movements while descending from the steps.

Keep in mind that the quality of the scanned model relies heavily on the stillness of the scanned object. That is why it is recommended to use simple poses with hands fixed on the body. Here are several examples of poses that are simple to scan:



Using a turning table when scanning humans or medium size objects will let you cut down scanning time significantly and make scanning much easier, as well as improve the quality of your scans.

## Scanning with markers: Guidelines

To achieve the best result when scanning objects with lack of unique geometry and large flat surfaces, you will need to use special black and white markers. The markers can be magnetic (for metal objects) or printed on sticky labels.

Here are a few tips for scanning with Thor3D scanners and markers:

- At any given time during scanning, the scanner needs to see a minimum of 3 markers in every frame. When it doesn't, scanning will automatically stop.
- Although 3 markers per frame is the minimum, the optimal number is 5. That is because in certain circumstances, even if the marker is visible to the camera, the software doesn't recognize it as such. This could be due to glare, for example.
- When affixing markers, apply them on flat areas of the object and not on sharp edges of the object. Also, remember, that the scanner might sometimes not see a marker when looking at it from an awkward angle. This means that when




scanning around a large corner (like from the bumper of the car to the back door), try affixing more markers in the field of view.

- Whether scanning with or without markers, the center of the frame of any optical device will produce better results than the edges of the frame. If you want a great scan of the entire object, make sure to scan each portion of that object with the center of the frame.
- Thor3D scanners show, in real time, how many markers are in the field of view. If you are not sure about whether you've affixed enough markers on the object, turn on the scanner in preview mode and walk around the object. You will see how many markers the scanner sees at all times and if it's less than 3, you'll know where more markers are needed.

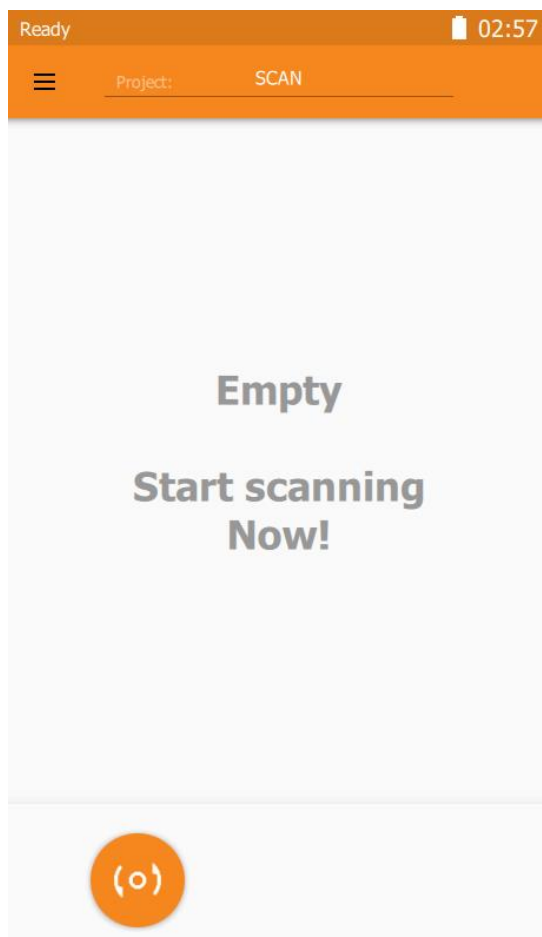
# THOR

## Turning the scanner on


In order to turn your brand-new scanner on, attach the power cable and swipe your finger across the screen from left to right.

\* Using the "Power Off"  menu button to turn off the scanner will let you power it on again without attaching the power cable.

Wait for the scanner to load up and show the main menu:




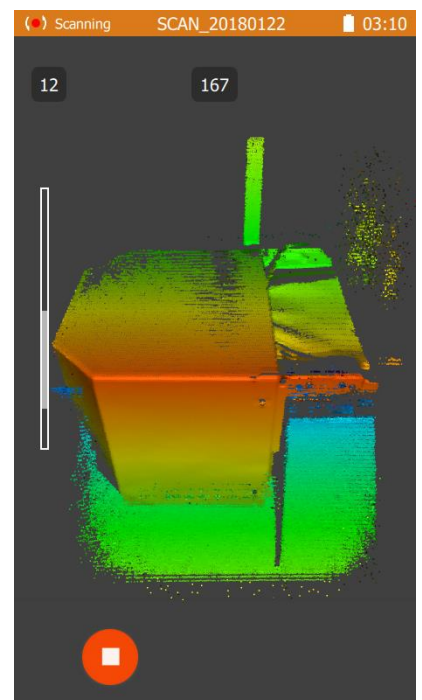
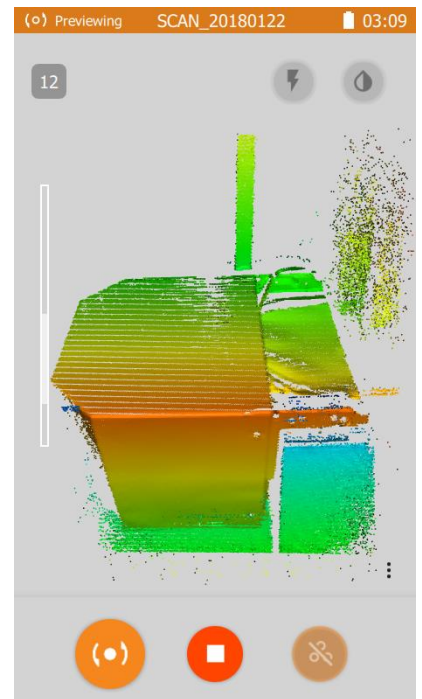
## Preview mode

In order to find optimal conditions for scanning enter the Preview mode by pressing “Start Preview”. 

This mode is designed to help the user to find proper distance to the object. The colors on the screen represent surfaces captured by the scanner within the last frame. If you move too far away from the object, the color will turn blue, until it disappears from the screen. Moving too close will result in the color turn red.

While finding the proper distance, you should use surfaces that protrude the most as a reference. Even though the scanner can see the whole surface of the object when facing the camera, rotating it by 90° might bring some parts too close to the scanner, thus rendering them unscannable.

This is why it is recommended to measure the distance with protrusive parts pointing in your direction. After you’ve made sure you found the proper distance, press the “Start Scan” button. 



## Settings on Scanner

Menu “Settings” on the scanner allows adjusting parameters of scanning to environment:

“Menu” / “Settings”

### Sensitivity Reconstruction

The scanner indicates a lack of sensitivity when the object is not visible on the screen during scanning. This happens when object being scanned is of very dark color, or there is too much ambient light. **Increase sensitivity** by changing the value up (to 10) with  $\boxed{+}$ .

The scanner indicates excessive sensitivity by generating noise around the model: this might happen when scanning in dark conditions or complete darkness. **Reduce sensitivity** (down to 0) with  $\boxed{-}$ .

Default value: 5

### Texture Brightness

Make it higher  $\boxed{+}$  or lower  $\boxed{-}$  to make the texture more or less bright. This proves especially useful for scanning humans as this setting helps achieve the most natural-looking texture.

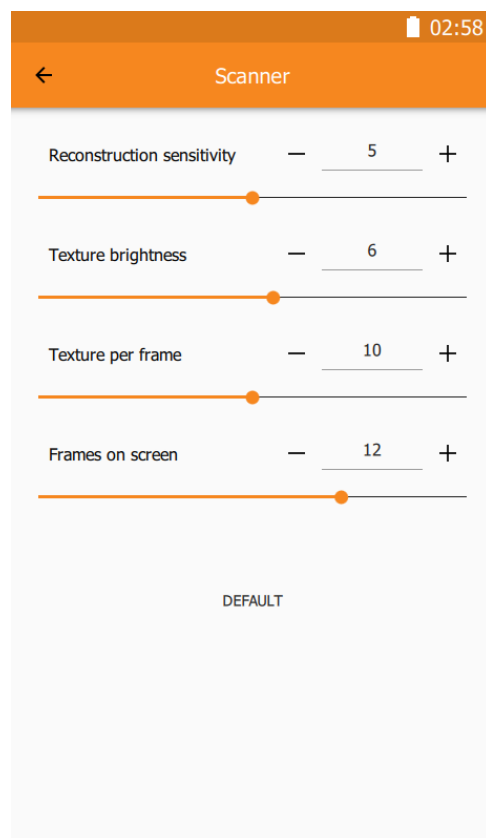
You also might like to leave the default value, and instead adjust brightness when processing the model in THOR3D desktop software.

Default value: 6

### Texture per Frame

This parameter indicates with what frequency the recording of texture frames is carried out. These frames are needed for texturizing the final model. The lower the parameter, the higher the frequency and thereby the higher the amount of texture frames recorded.

Default value: 10



# DRAKE

## To begin

To turn the scanner on, press the power button which is located under the screen. Wait until the scanner loads and the main window appears on the screen. The main window will contain:

- Status Bar
- Control Panel
- Side Panel
- List of scans (if any)
- Main Thumb Control Buttons


### Status Bar

The status bar will display the current status of the scanner, battery life, time of day, as well as the strength of the Wi-Fi signal whenever a Wi-Fi USB adapter is plugged in.



### Control Panel

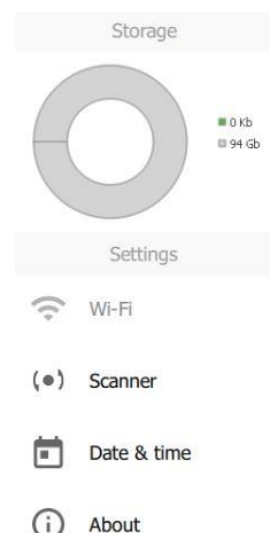
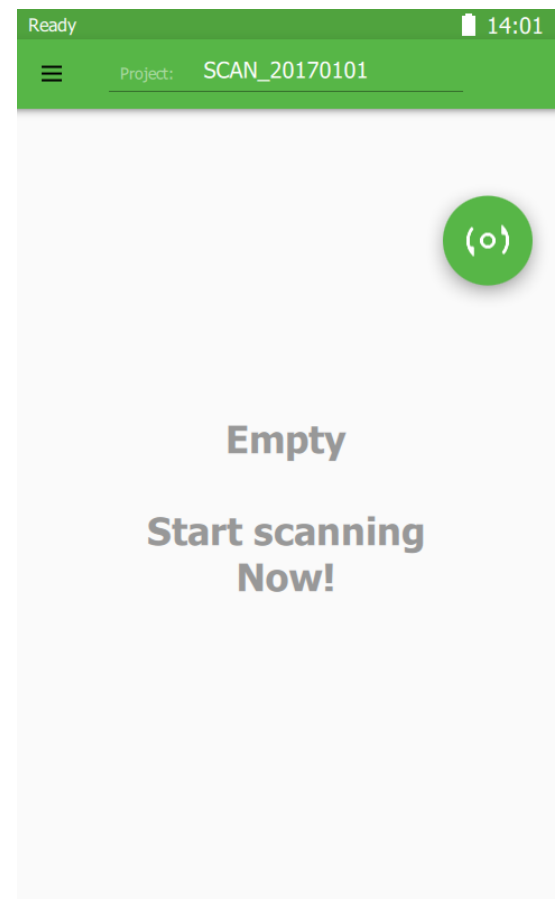
Here, you can change the name of your scan by pressing the heading in the center. All objects scanned will be placed in the folder with that name. If the folder is not named, by default it will be named like "SCAN\_20170101" (Year, month and date).

On the left, you will find the  button, which when pressed will open the side panel.



### Side Panel

This side panel contains information on the memory available on the internal hard-drive of the scanner, as well as available memory on the USB drive which is currently plugged in. To properly eject the USB drive press the Eject button in the center of the diagram.



Below that, you will find the following menu items:

- Wi-Fi – allows you to connect to your local Wi-Fi network. It is available only when a USB Wi-Fi adaptor is connected to the scanner.
- *About* – contains information about the scanner: model, serial number, version of software, version of firmware, calibration number and calibration version.

On the bottom of the panel, there is a “safe” off button. To properly turn the scanner off, press and hold this button for two seconds.



For a hard-reboot, you may also press and hold the power button for two seconds. This button is located on the scanner itself, under the screen.

## List of scans

The center of the screen is devoted to the list of scans. These scans are sorted by date (the newest on top) and are located in the appropriate folder. There is an icon next to each scan, which represents the first frame captured. You can switch between folders (a.k.a. projects) at any time by selecting the appropriate section on the screen or by creating a new project by naming it on the control panel above. You can use any USB drive (Flash, HDD) to save your projects, preferably, however, they should be formatted for the NTFS file system. Once a USB drive is properly connected, you will see a new button on the screen which will allow you to transfer the data from the internal hard-drive of the scanner:



*\* To check whether you have enough space on your USB drive, as well as properly eject the USB drive, go to the side panel.*

After pressing this button, your files will begin to copy, with the exception of those that are already on the USB drive.

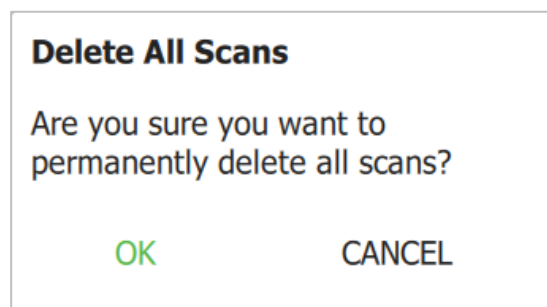
To delete any unnecessary scan from the hard-drive, simply swipe your finger across the scan.



You can cancel any deletion within 5 seconds by pressing “Cancel”. To delete all scans from the hard-drive, use the button:



Press “OK” to confirm deletion of data.



## Main Thumb-Control Buttons

The scanner is controlled via touch-screen. Use your right hand thumb, while the rest of the hand supports the scanner. The main buttons are conveniently located on the right side of the screen and can perform the following actions:

- Start Preview and Start Scanning.
- Stop Preview and Stop Scanning.
- Turn on/off “Marker” Mode.
- Delete all data on the scanner.
- Save all data onto a USB flash drive.



## Preview Mode

Turn on Preview Mode by pressing this button:

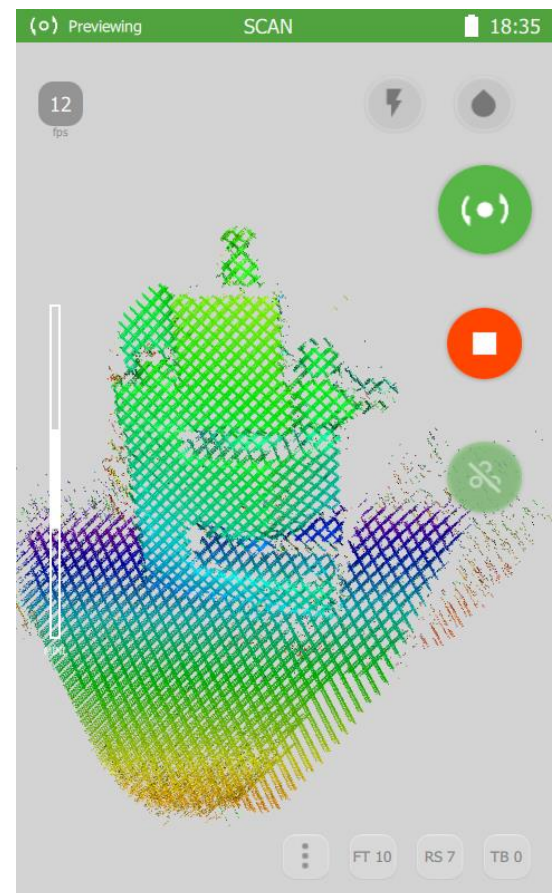


Begin every scan in the Preview Mode. This allows you to find the right distance to the object, evaluate the surface, and gauge whether there are enough markers (if scanning with markers).

It is important to find the optimal working distance between the scanner and the object. The ideal working distance (also known as Depth of View) depends on which set of lenses you are using (Mini, Midi, or Maxi). For ease-of-use, the object on the screen, in real-time, is shown in different colors. If the surface is blue, you are getting too far from the object. If it is red, the scanner is in danger of being too close. The optimal distance is shown in green, so try to keep the scanner at that distance to the object during scanning. Another way to assess the correct distance to the object is to use the white indicator on the left side of the screen. The closer you are to the object, the lower the bar will drop. Try to keep the white bar in the middle of the scale during scanning. Above this white indicator, you will find the real-time frame rate information (FPS), as well as the number of markers visible (if in “marker” mode).

To start scanning press:

to stop scanning press:





## Marker Mode

To activate or deactivate “Marker” Mode toggle on/off the switch during Previewing:




While scanning with markers, it is important that each frame contains at least 3 markers. Because markers are identified in real-time by the software at up to 12 times per second, not every marker will get identified in every frame. That is why it is recommended to have at least 5 markers in each frame. So, 3 is the minimum, 5 or more is recommended. To monitor this, use the marker indicator in the top left corner of the screen:

- If there are 4 or less markers in view – the indicator will turn red (the value is critically low and tracking might be lost).
- If 5 markers are in view – the indicator is yellow (warning).
- If more than 5 markers are in view – green (all is good).

Scanning will automatically stop when tracking is lost (less than 3 markers in view) and go back to Preview mode. You can find a better position for the scanner and start again. You will be able to automatically align all the scans together in post-processing later.

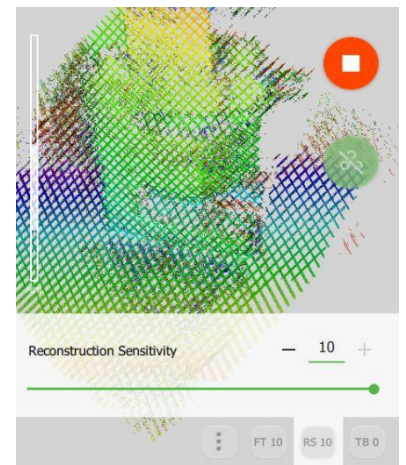
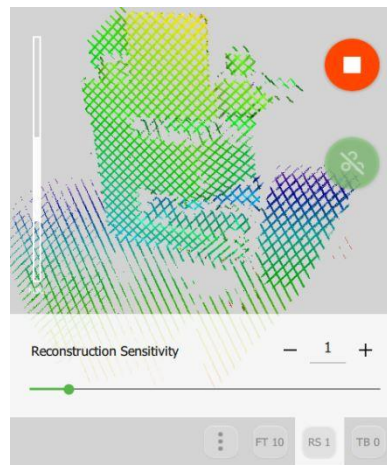
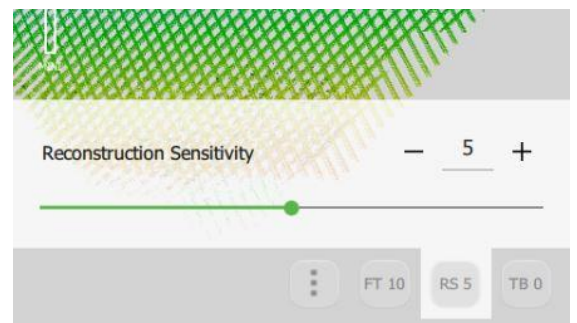
## Settings

Sometimes it is necessary to adjust settings for optimal scanning. To do that, press the  button during Previewing. The changes will take effect in real-time, so if you are pointing the scanner at the object, you will be able to understand when these changes are optimal for your scanning situation.

### Reconstruction Sensitivity

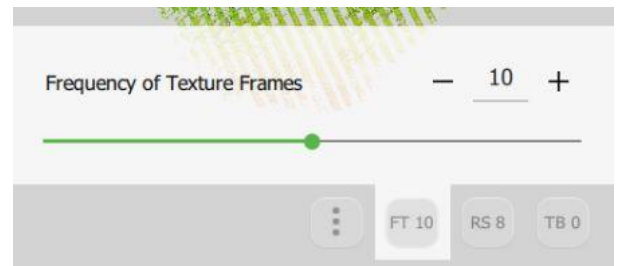
If during scanning there is a lot of “noise” on the screen that means that either the object is very dark (black objects are generally more difficult to scan than those of lighter colors) or there is too much ambient light in the room. To correct this, try adjusting this parameter.

Increasing the value will increase the “sensitivity”, allowing the scanner to see more data, but also increasing the amount of “noise”. Decreasing the value, will decrease both. The default value is set to 6.



## Frequency of Texture Frames

This parameter indicates with what frequency the recording of texture frames is carried out. These frames are needed for texturizing the final model. The lower the parameter, the higher the frequency and thereby the higher the amount of texture frames recorded. Setting the parameter at 0 will turn the textures off.



## Flash Indicator

There are three modes for the power of the circle flash LED: Full flash






Half flash



and Flash light turned off

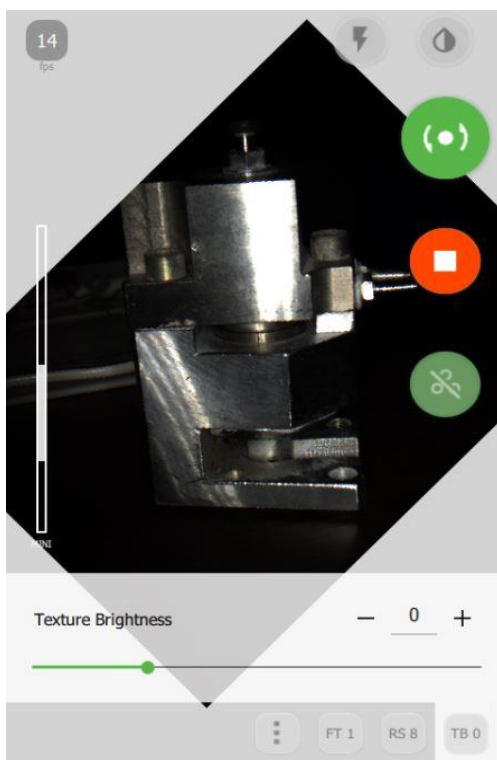


## Color mode

This feature allows to receive data from black and shiny object. If the object has dark color use –  If the object you scan is bright use –  The default value of the color mode is 

## Texture Brightness

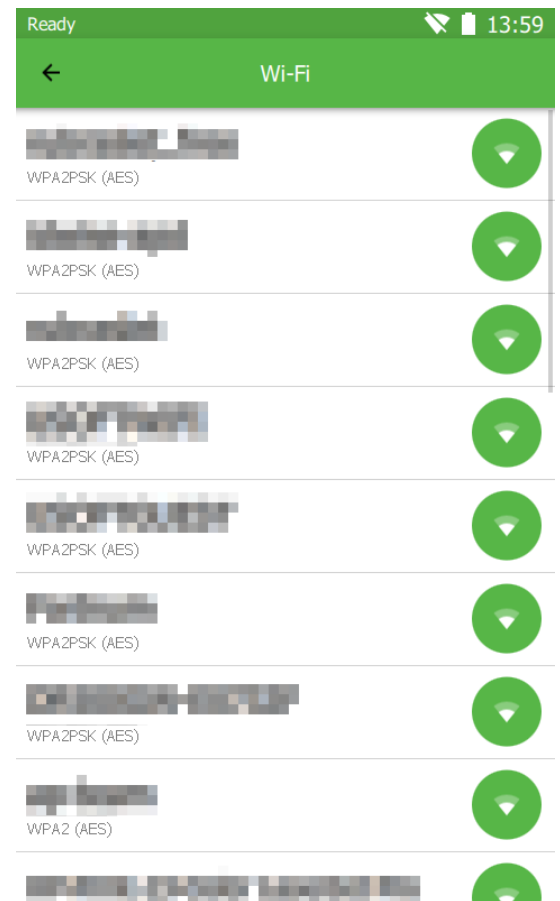
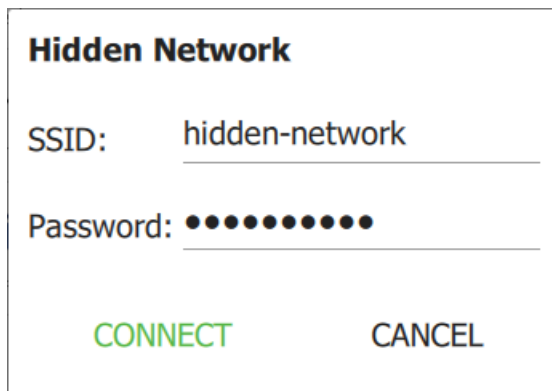
Make it higher or lower to make the texture more or less bright. This proves especially useful for scanning humans as this setting helps achieve the most natural-looking texture. You also might like to leave the default value, and instead adjust brightness when processing the model in THOR3D desktop software.



## Wi-Fi Settings

To enable wireless data transfer from Drake to a network computer via a local Wi-Fi connection, first plug in a USB Wi-Fi adapter. An indicator will appear in the top right corner of the screen (an antenna with a line through it). This indicates that the Wi-Fi adapter is plugged in, but not yet connected to the local network. A list of available Wi-Fi connections can be found by selecting the appropriate option on the side panel from the main screen.

Choose the network you would like to connect to from the list. A pop-up dialog box will prompt you to enter the Wi-Fi password. Press “CONNECT”. If the network is hidden, scroll to the bottom of the list and select “Hidden Network”. Enter the name of the network (SSID) and password and press “CONNECT”.



After connecting, this network will be saved and you will not need to enter your credentials again in the future. This network will now be first in the list of networks and when connected, an indicator signal strength will appear in the status bar.

✳ *Aside from a Wi-Fi USB adapter, you can also be using an Ethernet USB adapter to connect to a local network.*

Find the scanner under “Network” on any computer that is also connected to the same network. Look for a device called “THOR” and after transferring the data from the scanner, look for it in a folder by the name of “Scans”. For quick access, press **WIN+R**: [\\THOR\\Scans](\\\\THOR\\Scans) and create a shortcut to this folder.

✳ *Data transfer speeds over Wi-Fi depends on the type of network equipment you have installed.*

## Manual calibration

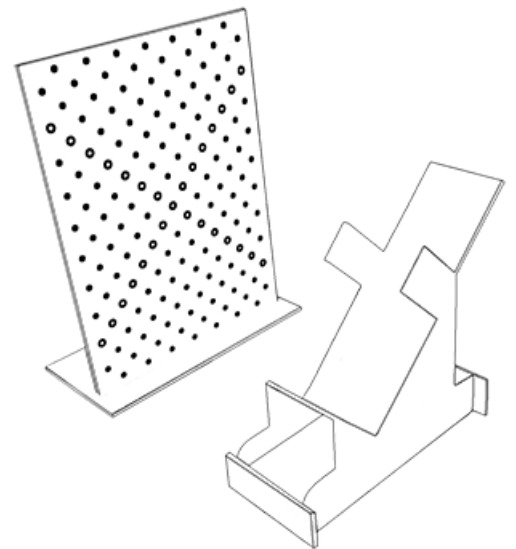
The Drake 3D scanner is a precise measurement instrument and is factory-calibrated. In order to ensure high accuracy of every scan, Thor3D has a calibration procedure that the user can perform himself.

### Preparation for calibration

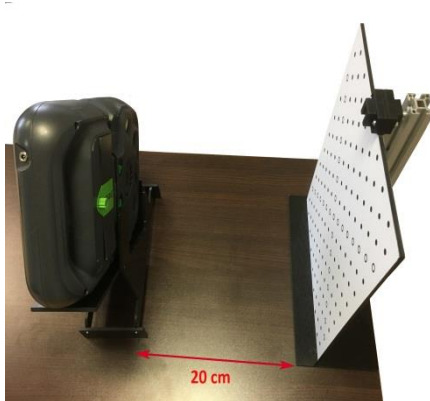
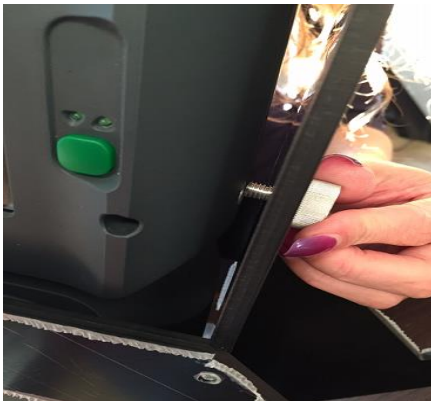
To calibrate the scanner, unpack the calibration stand and assemble it.

Attach the pole to the base

Attach the correct board to the base and the pole.



*\* Board will vary depending on which lens is being calibrated.*



Ease the scanner into the stand and secure it by screwing in the tripod mount at the base of the device

Place the stand with the scanner approximately 20cm (8in) away from the board

You are ready to calibrate.

## Calibration procedure

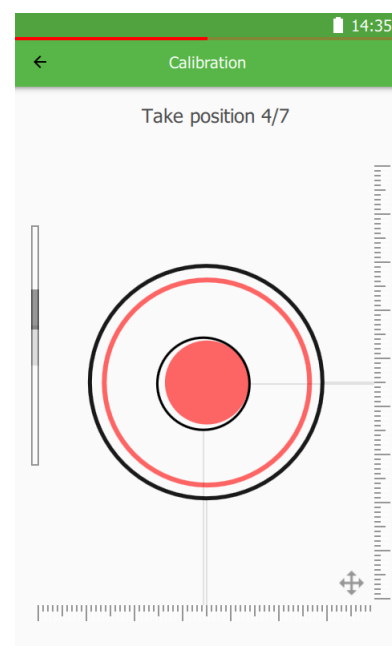
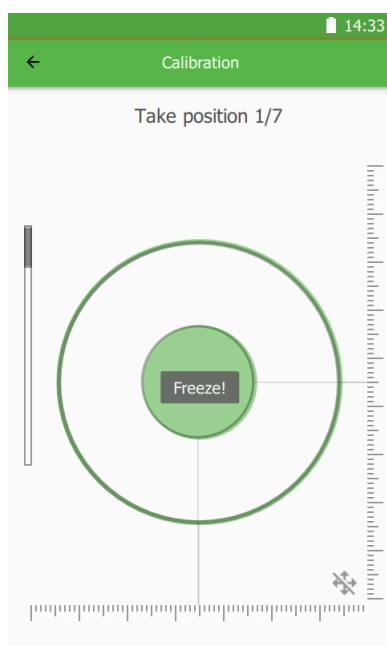
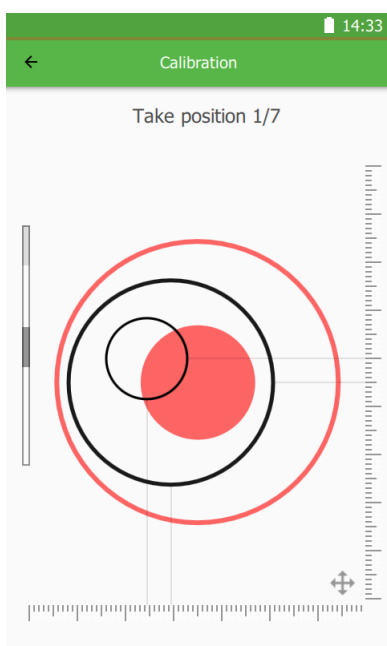
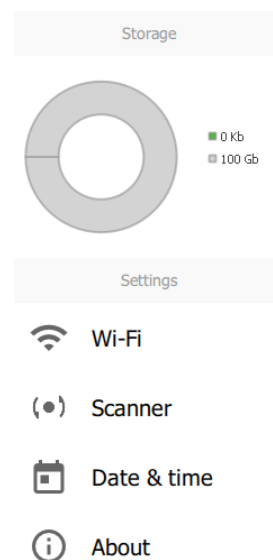
To begin calibration procedure, turn on the scanner and open Side Panel.

- Select “Scanner” and “Calibration”
- Press “Start”

The device will start to scan and the screen will prompt you to move into the first position. To place the scanner perfectly in the first position, follow the prompts on the screen.

The scanner needs to be aligned in three ways:

1. Find the correct distance to the calibration board by moving the stand with the scanner closer and further from it. The indicator on the left side of the screen will illustrate when the device is at the correct distance.
2. Second, angle the scanner a few degrees to the right and to the left, until the smaller of the two red circles is aligned to the same-sized black circle.
3. Thirdly, shift the stand with the scanner slightly to the left and right until the larger red circle is aligned to the black circle of the roughly the same size.



Once the positioning is correct, the scanner will prompt you to “Freeze” and the red indicator circles will turn green. Do not move the scanner while this is happening. It will take 2-3 seconds to finish. Once finished, the screen will prompt for second position. Move the scanner slowly away from the board and watch the distance indicator for guidance as to how far to move. Once the software finishes calibration in second position, it will prompt for the third, the fourth, etc. There are 7 positions in total.



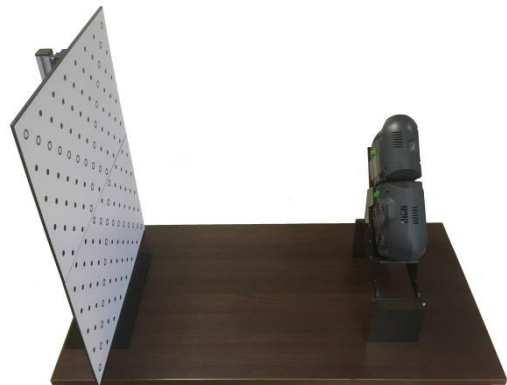
Once the scanner has been calibrated at all 7 positions, the software will restart automatically and the device is ready for use.

*\* To ensure the highest accuracy, do not calibrate the scanner in a well lit room (avoid direct sunlight) and in high or low temperatures. The scanner is best calibrated in a room with temperatures between 21 and 24 degrees C (70 and 75 degrees F).*

*\* Depending on your model, the distance from the board to the scanner will vary greatly. The scanning board will also be different for each model. Drake MINI will use the smallest board with the smallest circles on it and the first position of the scanner will be approximately 18cm (7in) away from the board. Drake MIDI will use the medium board and its starting position will be at approximately 32cm (12in) away from the board. Drake MAXI needs the largest calibration (a combination of two medium boards) and its starting position will be approximately 50cm (30in) away from the board.*

*\* Calibration of Drake MAXI will also require the user to raise the scanner higher and two extra pieces of the stand will be provided in the calibration kit. Attach the two extra “legs” to the main stand, thereby raising the scanner off the table by 18cm (7in)*



*\* The screen is less sensitive to the touch when the scanner is plugged in. During calibration, it is easier and quicker to disconnect the power cable from the scanner.*



# Project workflow

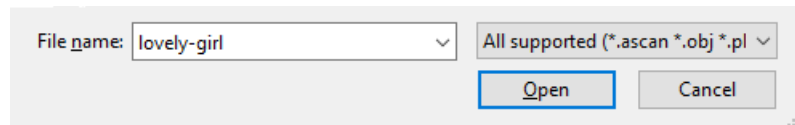
## Creating a project

To create a new project, load your scan by clicking the “Open” button:

 OPEN	“Open” button in Simple
	“Open” tool button
CTRL+O	“File / Open”

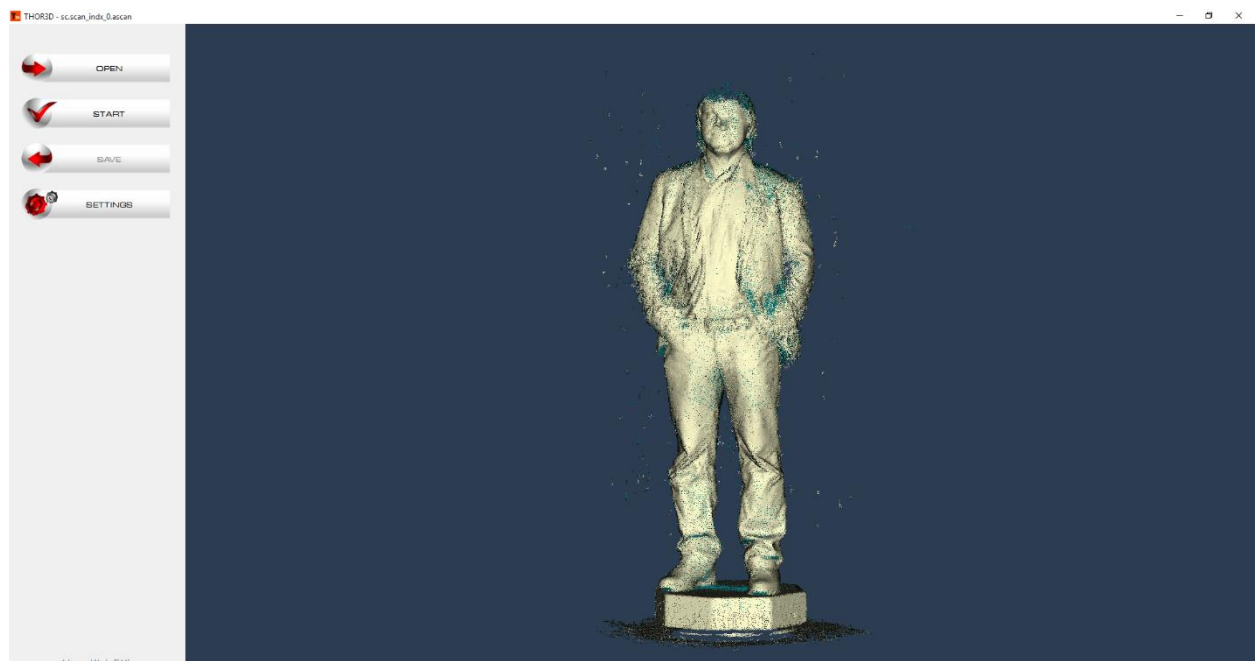
A pop-up window will appear. Browse to the scan you’ve just taken and open it.

*\* All “raw” scan data files have .ASCAN extension. You can associate this file type in the settings with THOR3D and open your projects simply by double-clicking them in Windows Explorer.*



*\* Instead of using “Open” button try to drag and drop your scan files into the working window. This will instantly start loading them.*

After you've loaded the scan you are presented with the «raw» scan data visualization. This is only an estimation of the model and is used as quick preview. Most of the visible imperfections such as noise around the model and overlapping parts are corrected during the automatic processing phase.

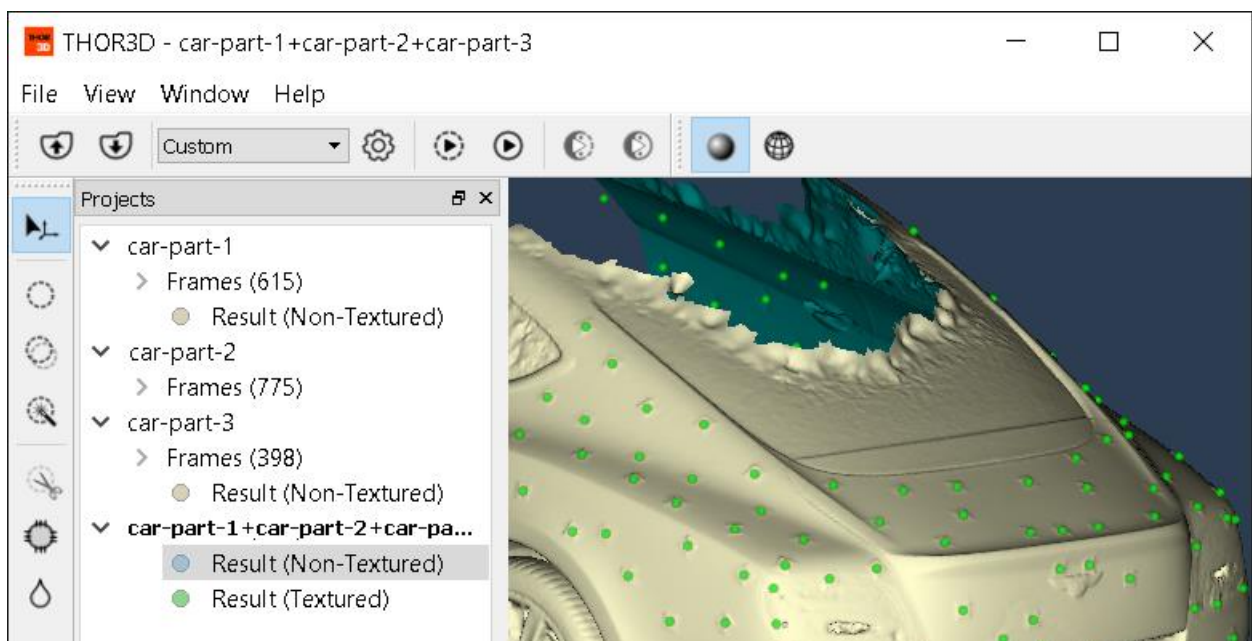


## Interface navigation

The **Simple** mode enables even an inexperienced user to achieve a great result. The whole model finalization process is comprised of three simple actions — Opening the file, Starting post-processing and finally Saving the model.



The **Advanced** mode is designed to let the user make complex adjustments to the model to fit any taste or need. You can enter it by pressing the **F11** button, pressing “Advanced Mode” label on the bottom of the Simple Mode’s side panel. This mode enables you to separately see and edit the polygonal and textured versions of the model.



Clicking on the arrow to the left of “Frames” will reveal a list of every frame captured by the scanner. Frames with an orange rectangular indicator contain texture frames. These texture images can be previewed by hovering the mouse cursor over them or clicking on them.

Choosing several frames will enable you to see the corresponding area of the scan. Raw data frames can be edited or deleted. This is used to correct some common mistakes made during the scanning phase. For instance, scanning someone’s face twice will often yield subpar results with blurry texture. But even in such case it is possible to remove one of the “takes” by removing unwanted mesh data using the deletion tool.



## Camera movement/rotation/distance

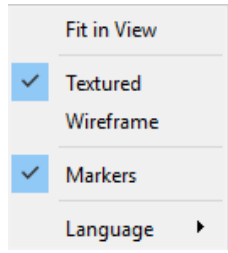


You can move and rotate the camera position in the 3D viewer using your mouse.

To **move** the model press and hold both right `RClick` and left `LClick` mouse buttons and move your mouse.

To **rotate** the model press and hold `LClick` and move your mouse.

To adjust the **distance** to the model press and hold `RClick`, and move your mouse. Going right or down will make the model appear larger, moving in the opposite directions will increase the distance to the model. You can also use your mouse wheel to adjust the distance to the model.

Single `RClick` will summon a context menu with a set of model visualization modes. They can also be toggled using the button panel on the top part of the screen.

	Fit in view	Places the model in the center of working area
	 <b>Textured</b>	Show the model with texture
	 <b>Wireframe</b>	Only show the wireframe of the model
	<b>Markers</b>	Show markers
	<b>Language</b>	Change the language manually

## Changing language


If the software is available in your language, THOR3D will automatically choose the language of your Windows system. If the software hasn't been translated into your language, please contact your local reseller and request it.

To change the language manually, `RClick` in the working area to summon a context menu and choose the language "View / Language" or use the main menu.



## Model processing

After finishing the scanning, it is necessary to finalize the model in the THOR3D PC software.

Move your raw data from the scanner to your computer, upload to software and press “Start” **F6**. The program will begin finalizing the textured model automatically. If the texture is not needed, it is possible to finalize the model without it. In this case, press **F5** or use tool buttons.

 <b>START</b>	“Start” button in Simple
	“Start Non-Textured” tool button
	“Start Textured” tool button
<b>F5</b>	“File / Start / Non-Textured”
<b>F6</b>	“File / Start / Textured”

Processing time and the quality of the model rely on the parameters in “Settings”:

 <b>SETTINGS</b>	“Settings” button in Simple
	“Settings” tool button
<b>F10</b>	“File / Settings ...”

More information on each of the parameters is available in the *Processing settings* chapter of the manual.

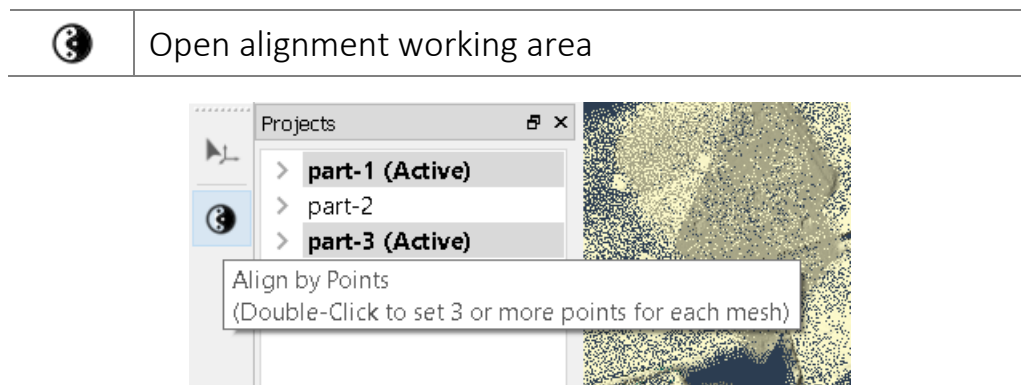
## Alignment and processing

If the object was scanned in parts, they need to be aligned manually to form the finished model.

Open several scans and select them with **CTRL** key in the project tree and start processing by pressing “Start Non-textured” **F5** to process them all together.

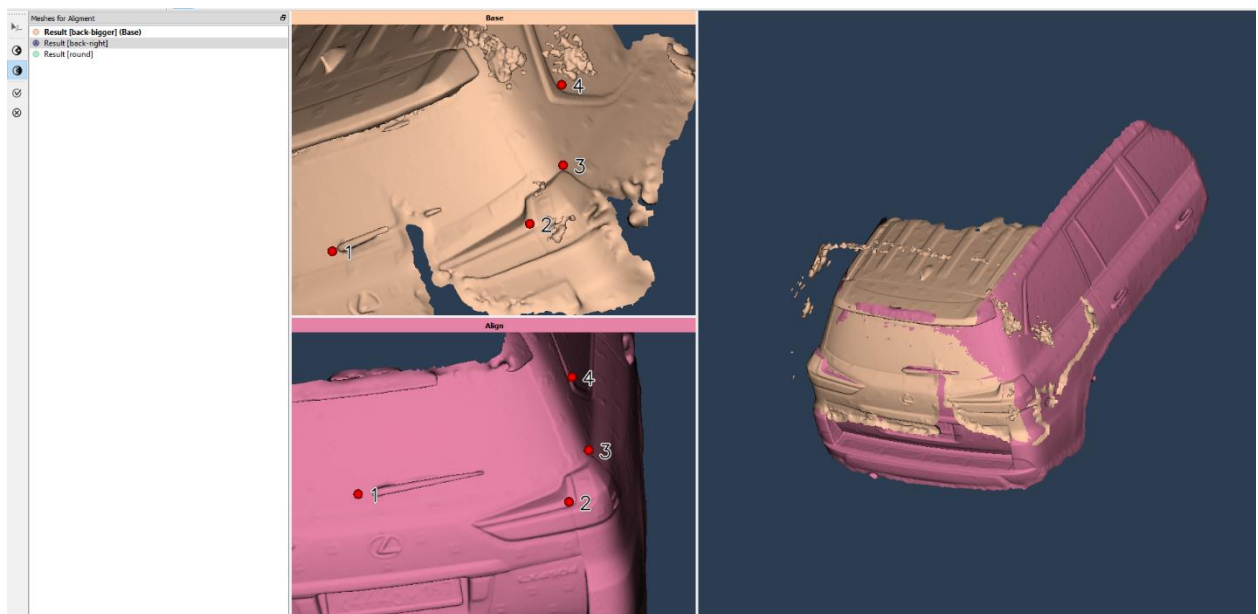
✱ *Processing time and the quality of the model rely on the parameters in “Settings” **F10**.*

To activate the align window, choose all *Non-Textured* or *Textured Results* from the project tree in the left part of the screen with **CTRL** key and press “Align by Points”:

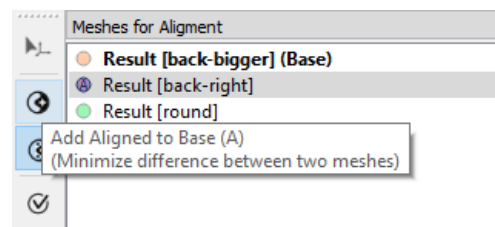


The working window has two additional windows: **Base** (always depicts the part assigned as the foundation, to which all other parts are to be aligned) and **Align** (depicts the part, selected in the project tree, to be aligned to the Base). The alignment result is depicted in the very right window.

To change the Base from one scan to another, **RClick** on it and select “Set Base”. To change the positions of Base and Align windows, simply drag and drop them with **LClick**.



Double **LClick** to place at least 3 points on each model in similar areas to align them. Make sure that *Point #1* on the base corresponds with *Point #1* on the selected part, and so on. Remove a point by double clicking on it. Move the point while holding down the **CTRL** key.



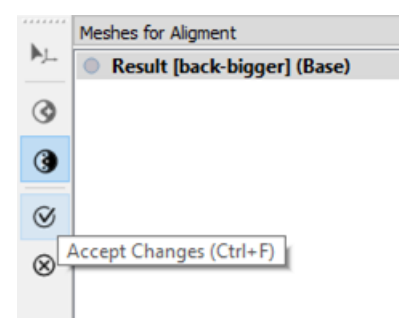
If you like the result that you see on the right, click “Add Aligned to Base” button.

	<b>A</b>	Add aligned part to base with minimize difference between them
--	----------	--

*\* If you were using markers during scanning, there is no need for manual alignment. After entering the Align window, simply press “A” on the keyboard or the button. This will align the surfaces automatically.*

Repeat the operation until all parts are aligned to the base, and **LClick** “Accept Changes” button to accept alignment results and get back to the main working window.

To nullify alignment results, **LClick** “Cancel Changes” button. This operation closes alignment window.



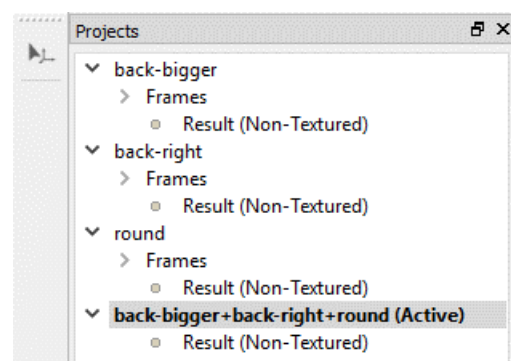
	<b>CTRL+F</b>	Apply changes
	<b>CTRL+Z</b>	Discard changes

Once you finish alignment, you will see that selected projects form one proper object. Repeat alignment if you see that some parts of the object are still out of place. In order to create one final model from several aligned scans, select all related scans in the project tree on the left and with **LClick** select:

	<b>CTRL+F5</b>	Start Multiple Non-Textured to generate a non-textured result
	<b>CTRL+F6</b>	Start Multiple Textured to generate a textured result

The final result will appear as a separate, new project at the end of the list.

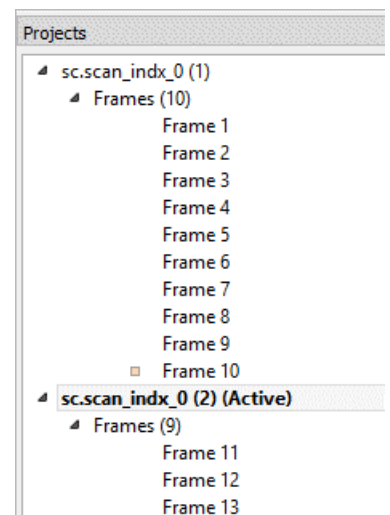
To apply texture to the final result (if the final model was processed without texture initially), select the result and **LClick** “Start Textured” **F6**.



## Splitting the project

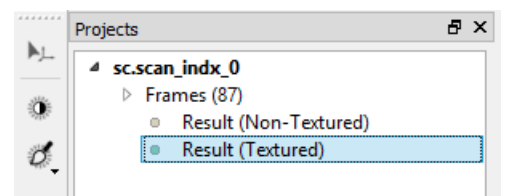
THOR3D has a tool to split a project into two. This is sometimes necessary when during scanning frames did not align correctly in real time.

In order to identify the frame where misalignment started, scroll through the frames in the project tree and visually try to identify the place where two frames do not seem to belong next to each other because the geometry in each frame is different. Once this frame is detected, **RClick** on it and select “Split Project”. Confirm your selection with “Yes” in the pop up window. You will receive two projects, the second one starts from the selected frame (#11 – see image).







## Model editing

After the model has been finalized, it's possible to make certain adjustments to either the texture or 3D geometry of the model. From the project tree on the left choose Result (Non-Textured) to edit geometry, or Result (Textured) to edit texture.



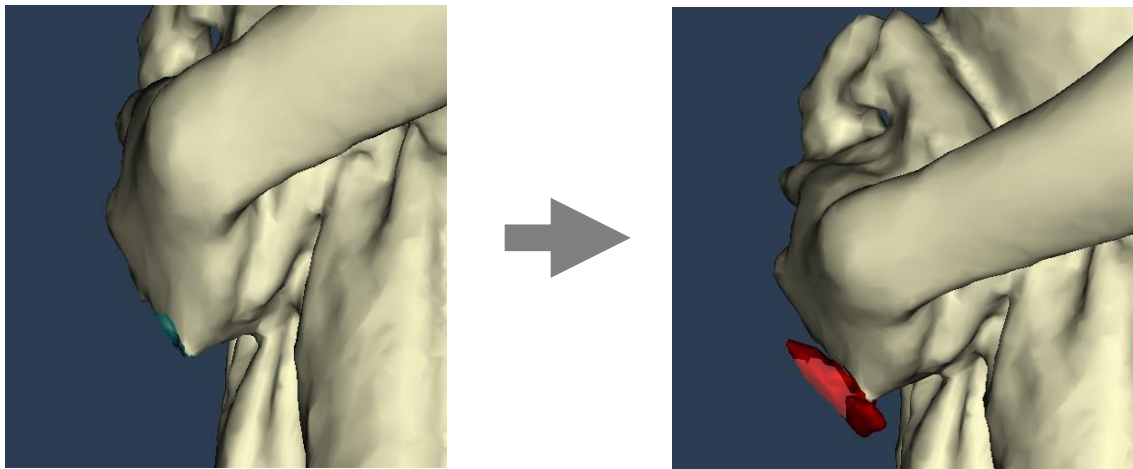
## Selection tools

There are four selection tools available to the user:

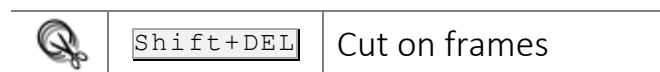
	<b>M</b>	Marquee Brush Tool – Used for front surface selection
	<b>CTRL+M</b>	Marquee Brush Tool (Double Side) – Select all surfaces sides
	<b>L</b>	Polygonal Lasso Marquee (Double Side)
	<b>W</b>	Magic Wand Tool – Select the whole object

Use them to select areas or parts you don't need. Use **SPACE** to rotate the model when selecting. Use **CTRL** key to deselect areas. With **CTRL+D** deselect all areas.

After selecting the area use “*Cut Marked Area*” tool to delete it.

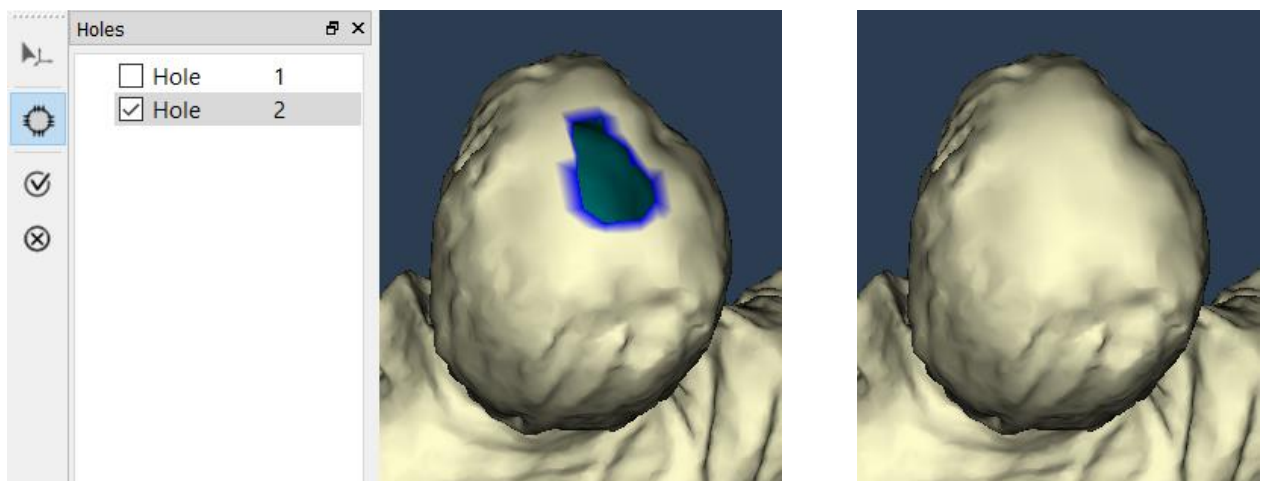


In this scenario, *Marquee Double Side Brush Tool* was used to select (and later erase) a small, unnecessary part of the mesh, which appeared because the model was moving.




The “*Cut on frames*” tool allows deleting the marked area from the result and from the frames simultaneously.

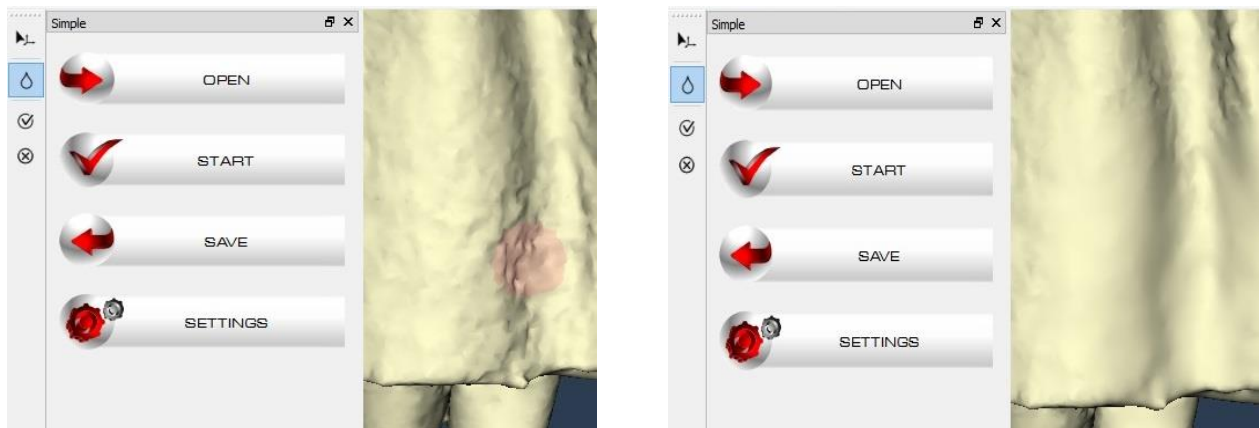
Removal of any geometry usually leaves behind a number of holes in the model. They can conveniently be filled using the “*Fill Selected Holes*” tool button. Click it to activate the filling holes window. The holes are listed based on their size in the descending order. Choose the holes you want filled and press “*Accept changes*” button or **CTRL+F**. To close the filling holes window press “*Cancel Changes*” button or **CTRL+Z**.



## Smoothing

Another tool that might prove useful is “*Smooth area*” tool, which enables the user to even out any rugged edge or make any particular area appear smoother. Choose the size of a brush by using your mouse scroll wheel and click your mouse over the area you want to adjust.

		Smooth Area
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




After finishing, apply the changes by pressing “*Accept Changes*” **CTRL+F**. You may also discard them by pressing “*Cancel Changes*” **CTRL+Z**.

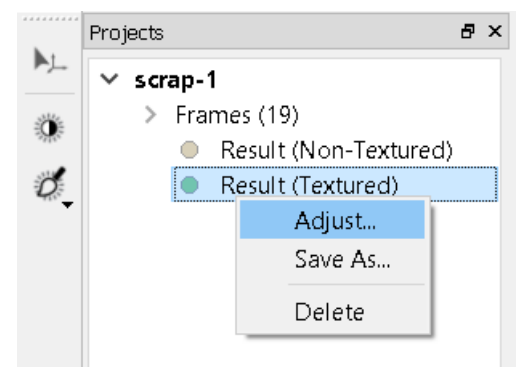
**\*** Making any adjustment to the geometric model will require the recalculation of texture.  
To do so, press **F6** or “*Start Textured*” button.

## Texture correction

The captured texture can be adjusted using the tools:

		Luminosity brush
		Adjust texture brightness, contrast and color balance

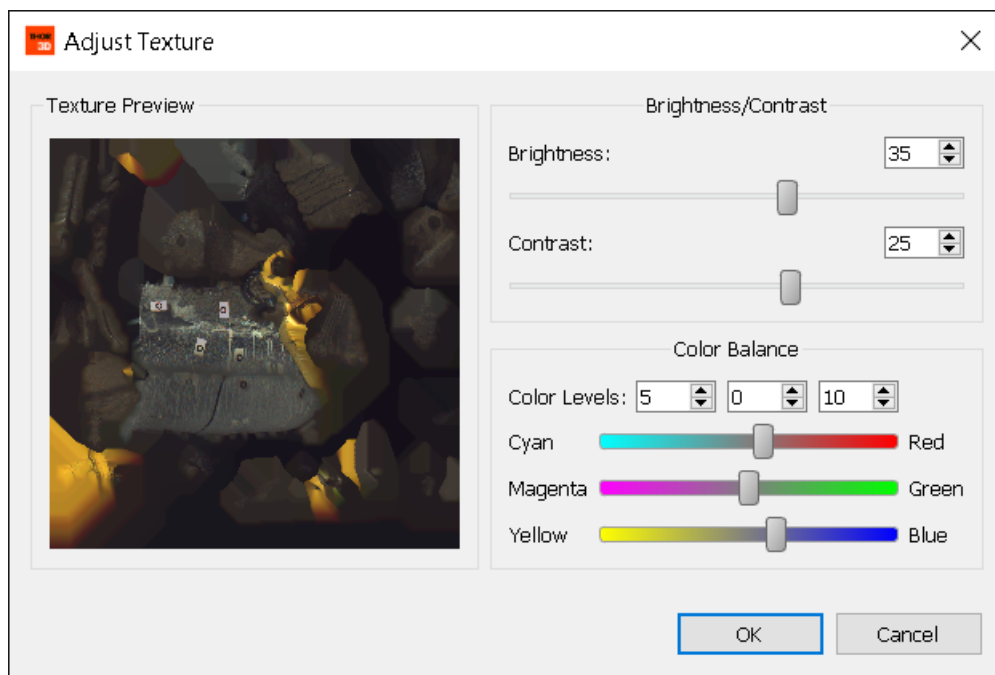
To activate the tools, first open the textured model by clicking on “*Result (Textured)*” in the project tree on the left.





## Adjust texture

With **LClick** a pop-up window will appear.



There are three main texture parameters for you to adjust:

- Brightness
- Contrast
- Color Balance

Make adjustments by either moving the sliders or manually entering the values in corresponding number windows.

Choosing the **Model Preview** option on the bottom left of the window will let you see adjustments in real time.

Once done editing, apply the changes by pressing “OK” or discard them by clicking “Cancel”.

*\* The texture correction is mainly used for two purposes: making the texture brighter or preparing the model to match the color profile of your 3D printer if needed.*

## Luminosity Brush



Lighten or darken parts of texture using “Luminosity Brush”:

- **LClick** to **lighten** texture and **CTRL+LClick** to **darken** it.
- Rotate mouse wheel to change the **size** of the brush.
- **RClick** on the object and adjust the **strength** and **hardness** of the brush.
- Hold down **SPACE** for **navigation**.

## Project saving

Once your 3D model is ready, you can export it using:



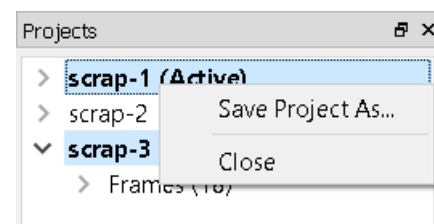
 <b>SAVE</b>	"Save" button in Simple
	"Save Result As" tool button
<b>CTRL+S</b>	"File / Save Result As..."

THOR3D supports four export formats: .OBJ, .WRL, .PLY, .STL

To save your work and continue at a later time:

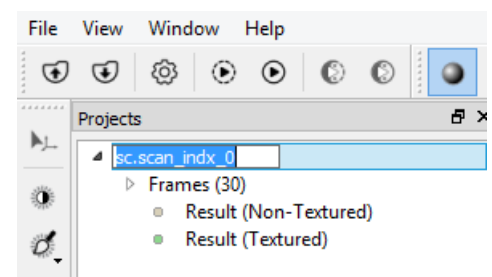
- Select a project and **RClick** to "Save Project As..." (or select the project and go to "File / Save Project As...") to save the project with all results and changes.
- To save several projects at once, select them using the **CTRL** key in the project tree, and with **RClick** select "Save Project As...", and choose the folder for saving.
- To save all projects from the project tree, go to "File / Save All", and choose the folder for saving.

New Project	Ctrl+N
Open	Ctrl+O
Recent	
Start	
Save Project As...	Ctrl+Alt+S
Save Result As...	Ctrl+S
Save All	Ctrl+Shift+S
Settings...	F10
Exit	Alt+F4





## Renaming

The names of all projects and Results are auto-generated. We suggest renaming them as you begin working with them to easily move between them. To do this, double **LClick** on the name and type the new one.



## Viewer and editor

Use THOR3D PC software to view your 3D models and edit them. THOR3D supports import of .OBJ, .PLY and .STL files. Open the files with any convenient method:

 OPEN	"Open" button in Simple
	"Open" tool button
CTRL+O	"File / Open"

Or simply drag and drop your files to the window.

Available functions for 3D models imported from other software or created by using non-Thor3D scanners:

- Edit model's geometry
- Edit model's texture
- Align 3D models into one object
- Save 3D model in different format

# Processing settings

## Presets

Presets allow to select preliminary saved settings for different optical parts from the list. By default, there are presets for Drake Maxi, Midi, Mini and Thor. It is also possible to create your own preset.



## Resolution

This parameter sets the resolution at which the model is processed is probably the most important setting which will greatly influence the end-result. The smaller the value, the higher the resolution of the model. Higher resolution will result in a more detailed model, but will require more time to process. The minimal value for this parameter is 0.1 mm, maximum is 20 mm.

The range of this setting will vary depending on the model of your THOR3D scanner. The recommended Resolution settings for THOR, DRAKE Mini, DRAKE Midi and DRAKE Maxi, as well as the maximum resolution achievable are as follows:

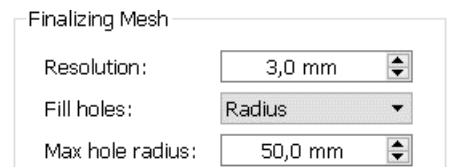
	THOR	DRAKE Maxi	DRAKE Midi	DRAKE Mini
Recommended	2.5 mm	1.0 mm	0.7 mm	0.3 mm
Maximum	1.0 mm	0.7 mm	0.4 mm	0.15 mm

To achieve the best results with maximum resolution, it is necessary to collect more raw data than usual (than if using “recommended” settings) by scanning your object for a longer period of time.

Using higher resolution will require noticeably more time to post-process the model.

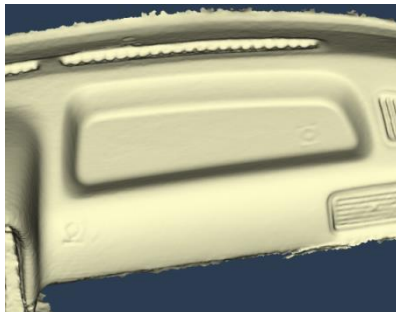
## Filling holes

The “*Fill holes*” parameter lets the user choose the way holes in the model are filled. Choosing **All** will result in all holes being filled, regardless of their size and count. Choosing By **Radius** will only fill the holes smaller than the value of “*Max hole radius*” parameter.

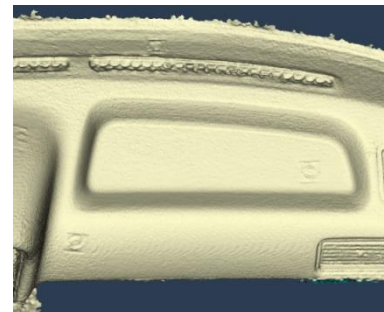


## Sharpness

The “*Sharpness*” parameter affects appearance of the polygonal surface. **Lower** sharpness arranges polygons more smoothly, avoiding sharp angles, while **higher** sharpness makes geometry more detailed and thus crisp. Use slider to adjust the parameter.



*Lower sharpness*



*Higher sharpness*

## Remove targets

Check the box and choose the radius of the marker to remove it from the object’s geometry. For example, set 15 mm radius to remove the magnetic Thor3D markers that were included with your THOR3D scanner.

☒ Remove targets  
Target radius:

This parameter will vary depending on which Thor scanner you are using. It will also vary depending on what type of markers you are using (magnetic markers which were included with your scanner, or those you printed yourself on your office printer). If the markers were especially made and are round (no extra white surface around the marker), then this parameter can be set lower than if they are made up of squares.

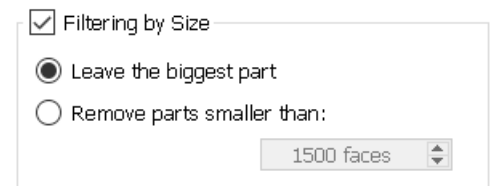
	THOR	DRAKE Maxi	DRAKE Midi	DRAKE Mini
Round	12 mm	6.5 mm	6.5 mm	3.5 mm
Square	15 mm	7.2 mm	7.2 mm	4.0 mm

This function automatically locates all markers on the surface, cuts them out and fills in the holes. Although this algorithm is sophisticated, and it tries to use the surrounding geometry to fill these newly-created holes to match that geometry, if the marker is placed on a surface with dramatic changes in geometry (like an edge of a table), the hole might be filled in incorrectly. That is why it is recommended to place markers strategically on the object, specifically on flat parts of the surface.

## Filtering noise

The software employs a simple yet powerful algorithm that filters noise and unwanted objects.

- Choosing **Leave the biggest part** will cause the scene to contain only the largest object, with any unconnected piece removed.
- Setting **Remove parts smaller than**, on the other hand, will only remove the objects that have less polygons than specified.

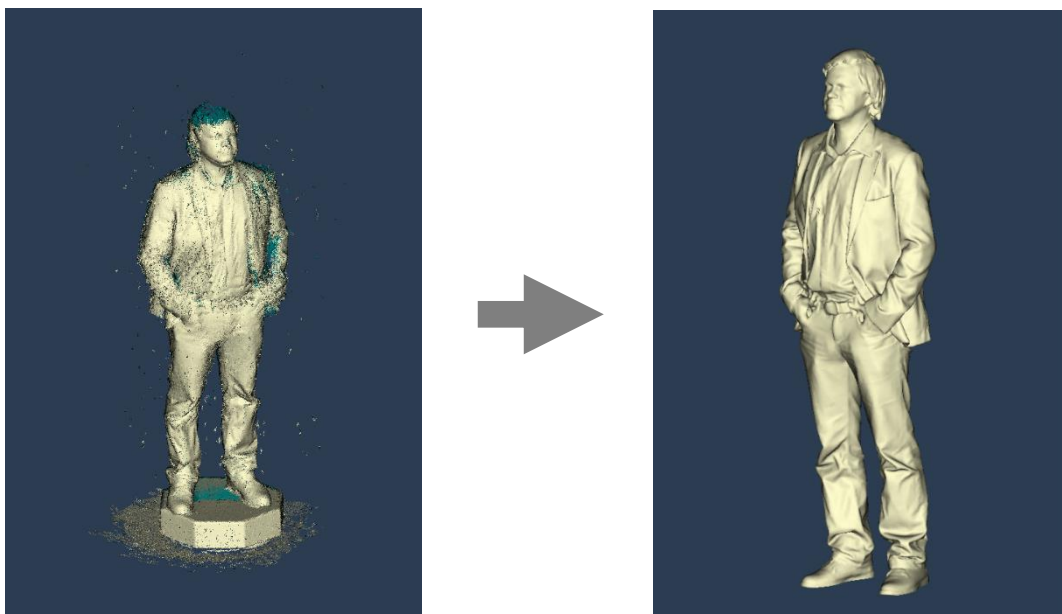
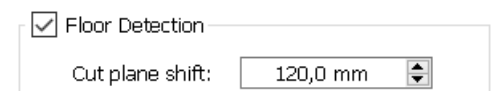


Filtering can also be applied on point cloud data (frames). This helps eliminate noise artifacts incorporated into model's geometry. Click on *Frames* in the project tree and select *"Filter the noise"* tool button on the left to apply filtering with parameters on *Settings*.



## Floor detection and removal

Thor3D software is able to automatically recognize the floor and remove it. The **Floor Detection** parameter sets the height of the floor, which is convenient for the removal of the turn table as well. If the person is standing directly on the floor, set the parameter at 5 mm. If a turn table is used, the parameter should be set according to the height of the table. In case of the Thor3D turn table, setting the parameter at 150 mm will give you a clean cut.



## Basement creation

After removing the floor, a custom 3D-base can be attached to the model. **Count of sides** will specify the number of edges of the base, **Height** and **Radius** parameters — their respective dimensions.

☒ Basement Creation

Count of sides:

Height:

Radius:



## Simplification

A non-simplified processed model is often too detailed for many purposes, which is why a simplification algorithm can be employed to reduce the polygon count. Simplifying a model will let you save a lot of time and make it easier to edit the model in other programs with minimal quality loss.

The **Amount of faces in the simplified mesh** parameter sets the level of simplification in % of the original model. For example, if the original model has 1 000 000 polygons, 20% of the original will result in a model with 200 000 polygons.

☒ Simplification

Amount of faces in the simplified mesh:

☐ Absolute

Select the **Absolute** parameter to manually set the number of polygons the model will have.

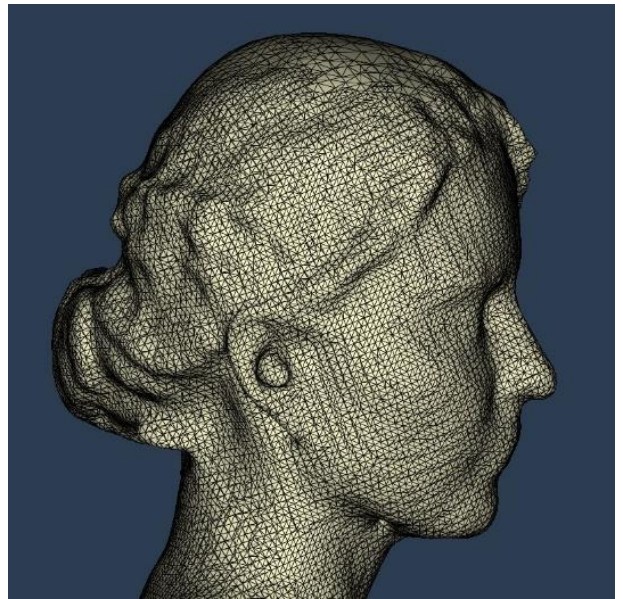
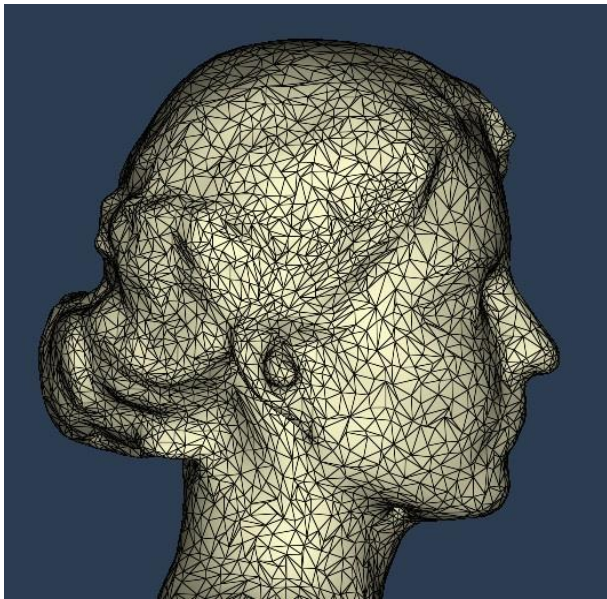
☒ Simplification

Amount of faces in the simplified mesh:

☒ Absolute



Different numbers will yield different results. The higher the polygon count is, the more detailed the model will be. It will, however, take more time to process and require more space on your PC.



There is access to the Simplification  in the Tool Section.

## Measurement tool




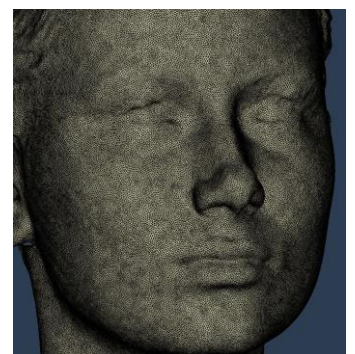
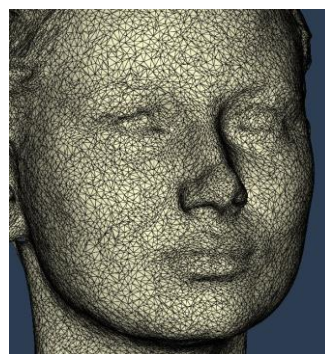
Allows you to measure the distance in millimeters between two selected points either on frames or on the polygonal result.

## Remeshing

The size of each polygon depends on the surface curve. The length of the polygon's edge may vary in the borders of the resolution parameter. The Remeshing algorithm allows to get rid of the deviation in the polygon size and set the length to the preferred average value.

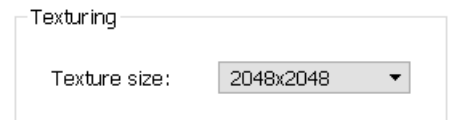
You may also start remeshing

algorithm by pressing  in the Tool Section.



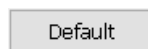
## Texturing

The Thor3D scanners are equipped with a camera that enables you to capture texture (color). Application of texture is the last step during model processing, which is done by combining the photo frames into one seamless texture. The **Texture size** can be set at 1024x1024, 2048x2048 or 4096x4096. Higher setting will result in a more accurate and crisp picture, but will require more time to process.



## Restoring default settings

If experiencing problems with finding proper parameter settings, try using the *"Default"* button to restore the default settings of the software.



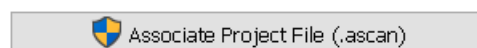
## Interface

The *"Interface"* tab lets you change several user interface appearance options, such as:

- **Surface front color** – the color of the outer surface of the 3D polygonal model.
- **Surface back color** – the color of the inner surface of the 3D polygonal model.
- **Screen color** – the color of the background.
































*"Associate Project File"* sets THOR3D as a default program to open .ASCAN files





# THOR3D glossary

Controls panel		
Button	Shortcut	Description
	<b>CTRL+O</b>	Open a Thor3D project (.ASCAN, .OBJ, .PLY, .STL)
	<b>CTRL+S</b>	Export model into OBJ/WRL/STL/PLY
	<b>F10</b>	Open settings menu
	<b>F5</b>	Start processing without texture
	<b>F6</b>	Start processing with texture
	<b>CTRL+F5</b>	Start processing multiple projects without texture
	<b>CTRL+F6</b>	Start processing multiple projects with texture
Tools Panel		
	<b>V</b> <b>ESC</b>	Navigation used for navigation over scene. For set anchor point press and hold <b>CTRL</b> , then <b>LClick</b> on model. For temporary switch to navigation press and hold <b>SPACE</b> .
	<b>M</b>	Marquee brush tool
	<b>CTRL+M</b>	Marquee double side brush tool
	<b>L</b>	Polygonal Lasso Marquee (Double Side)
	<b>W</b>	Magic wand tool
	<b>DEL</b>	Cut marked area
	<b>Shift+DEL</b>	Cut on frames
	<b>F</b>	Fill selected holes
	<b>S</b>	Smooth area tool
	<b>L</b>	Luminosity brush
	<b>A</b>	Adjust texture brightness, contrast and color balance
	<b>Alt+F</b>	Filter noise by size
	<b>Alt+S</b>	Simplify mesh
	<b>Alt+R</b>	Remeshing
	<b>R</b>	Ruler
		Open alignment working area
	<b>A</b>	Add aligned part to base with minimize difference between them
	<b>CTRL+F</b>	Apply changes

		Discard changes
<i>View Panel</i>		
		Disable wireframe preview
		Enable wireframe preview

**THOR<sup>3D</sup>**

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