3DSYSTEMS

# Sense™2

## 3D scanner

Capture your world in 3D


## User Guide

Original Instructions

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# 1 INTRODUCTION

Thank you for purchasing the Sense™2 3D scanner. You can think of scanning as a sort of physical photography. By scanning a physical object, you can create a 3D digital model. Unlike traditional photography, however, you can use the digital model to return to the physical mode by sending the image to a 3D printer.

You can also use Sketchfab and Facebook to publish, share, and embed interactive 3D files you create.

The Sense 3D scanner gives you the ability to observe a scene in three dimensions and then translates the observations into a 3D model. You can then use various Geomagic applications to translate the scans into information such as:

- Identification of people and their body properties
- Classification of objects such as furniture, packages, and so on
- Measurements such as size and volume
- Location of walls and floor

## COPYRIGHT

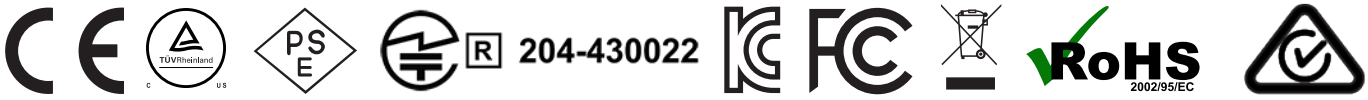


## FCC NOTICE

This equipment has been tested and found to comply with the limits for a class “A” digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

## COMPLIANCE

This equipment conforms with International Electric Committee (IEC) 60950-1 and meets the requirements of the applicable EC directives.




### CAN ICES-3 (B)/NMB-3(B)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes: (1) l’appareil ne doit pas produire de brouillage, et (2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

### WEEE Warning Message

This symbol indicated that this product is to be collected separately. The following apply only to users in European countries:

- This product is designated for separate collection at an appropriate collection point. Do not dispose of as household waste.
- For more information, contact the retailer or the local authorities in charge of waste management.

### WARRANTY

No warranties of any kind are created or extended by this publication. 3D Systems warrants that the Sense 3D scanner will be free from defects in materials and workmanship, during the applicable warranty period, when used under the normal conditions described in the documentation provided to you, including the respective User Guide. 3D Systems will promptly repair or replace the Scanner, if required, to make it free of defects during the warranty period. This warranty excludes repairs required during the warranty period because of abnormal use or conditions (such as riots, floods, misuse, neglect or improper service by anyone except 3D Systems or its authorized service provider). The warranty period for the Scanner is twelve (12) months and shall start the date Your Scanner is purchased. For consumers who are covered by consumer protection laws or regulations in their country of purchase or, if different, their country of residence, the benefits conferred by our standard warranty are in addition to, and operate concurrently with, all rights and remedies conveyed by such consumer protection laws and regulations, including but not limited to these additional rights.

THIS WARRANTY IS THE ONLY WARRANTY PROVIDED FOR THE SENSE 3D SCANNER. TO THE MAXIMUM EXTENT PERMITTED BY LAW, 3D SYSTEMS EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES FOR THE SENSE 3D SCANNER AND EACH OF ITS COMPONENTS, WHETHER THOSE WARRANTIES ARE EXPRESS, IMPLIED OR STATUTORY, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR INTENDED OR PARTICULAR PURPOSES.

### LIMITATION OF LIABILITY

3D SYSTEMS WILL NOT BE RESPONSIBLE FOR CONSEQUENTIAL, EXEMPLARY OR INCIDENTAL DAMAGES (SUCH AS LOSS OF PROFIT OR EMPLOYEE'S TIME) REGARDLESS OF THE REASON. IN NO EVENT SHALL THE LIABILITY AND/OR OBLIGATIONS OF 3D SYSTEMS ARISING OUT OF THE PURCHASE, LEASE, LICENSE AND/OR USE OF THE EQUIPMENT BY YOU OR OTHERS EXCEED THE PURCHASE PRICE OF THE SENSE 3D SCANNER.

## 2 SAFETY AND COMPLIANCE

**CAUTION: Indicates something may happen that could cause loss of data, damage to equipment, or could cause personal injury.**

### SAFETY GUIDELINES

- Follow all safety rules in this section and observe all cautions and warnings in this guide.
- To avoid damage to the laser projector, do not open the casing. Doing so will void your warranty.
- It is important that the scanner operates in the temperature range of between 10 °C and 40 °C for optimal use. Higher or lower temperatures may alter the scanner's performance, resulting in the scanner malfunctioning.
- The sensor is a class 1 laser product, certified by an external party to adhere to IEC 60825 safety requirements. The Sensor is compliant with part 1 of the IEC 60825 publications - "Safety of laser products."

**CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.**

# 3 SENSE SCANNER SETUP

Unpack and set up your scanner and scanner software before you get started with the basics of scanning.

## WHAT'S INCLUDED

The box contains the Sense 3D scanner with attached USB cable and the Quick Start Guide.

Remove the scanner from the box and plug the USB cable into your computer.


## DOWNLOAD THE SENSE SOFTWARE

Navigate to http://www.3dsystems.com/shop/sense/downloads, and follow the instructions to complete the software download and installation.

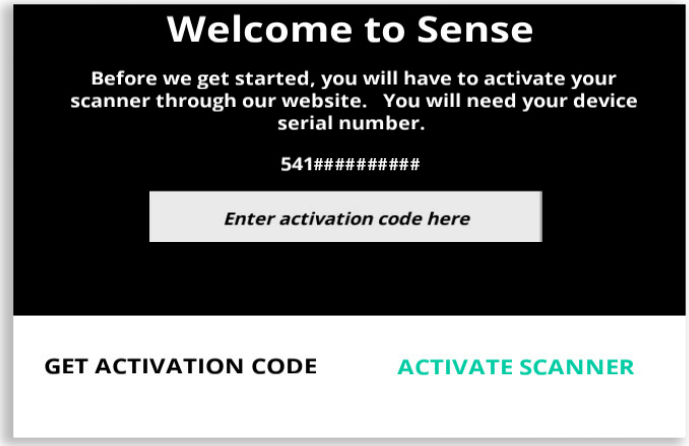
## RUN THE SENSE SOFTWARE

When you installed the Sense software, a shortcut was created on your desktop. Use the shortcut to open the application.

**NOTE: If the scanner is not connected to your computer, a message will state "Device not connected." Plug the USB connector for the scanner into the USB port on your computer.**

You will then be prompted to activate your Sense 3D scanner.

## ACTIVATE YOUR SENSE SCANNER




If you do not have an activation code, click on **Get activation code**. Once you have your activation code, you can enter it into the activation dialog box. Click **Activate scanner** to complete the activation.

# 4 SENSE SCANNING TIPS AND TRICKS

Many practices that ensure good photography also apply to scanning. Use the following tips to get the most from your scanning experience:

### LIGHTING

- Different lighting conditions can affect the quality of a scan. The Sense for Intel RealSense 3D scanning application is designed for indoor use, and will work less than optimally in direct sunlight.
- Position your subject in a way that will cause as little shadow as possible. You may need to add additional light to reduce shadows.
- You'll get the best results if the light shines with equal intensity over the subject being scanned. Areas that are less illuminated might show up too dark in the scan, and areas that are over-illuminated might show inaccurate colors.
- If you scan in darkness, the scanner will capture geometry but not color.

### POSITIONING

- Position your subject so that you have 360° clearance around it.
- In preview mode, make sure that the whole object you want to scan shows inside the green box on the screen. This helps ensure that you capture the entire object while scanning.
- Keep the scanner within its optimal distance range of the subject, which is approximately 0.45m - 2m (18" - 6.5 ft.).

### MOTION

- Multiple passes on the object are allowed. If there are gaps in the scanned data after a single pass, continue scanning to try to fill the gaps.
- If the 3D view turns white as you're scanning, it is because the object being scanned is too close to the scanner. To correct the view, move the object out to at least the minimal defined distance of 0.5m (20 inches).

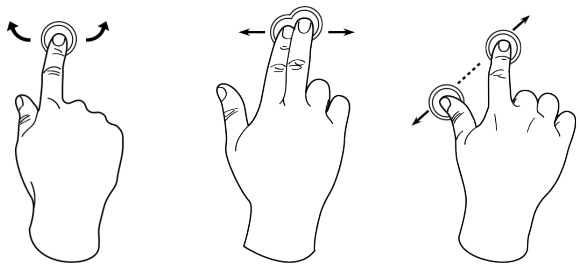
### GENERAL

- Before scanning a small object or one without a lot of distinct features (such as a standard coffee mug), add some items around the object. This will help the scanner maintain tracking by giving it more to lock on to.

### SENSE NAVIGATION

The following shortcut keys, mouse controls, and touch gestures can be used to navigate around the workspace:

| Action | Shortcut |
|---|---|
| **Keyboard** | |
| • Start/Pause scanning | • Spacebar |
| • Next | • Enter |
| **Mouse Controls** | |
| • Rotate | • Left button |
| • Scroll | • Middle wheel |
| • Pan | • Right button |
| **Touch** | |
| • Rotate | • One finger, any direction |
| • Pan | • Two fingers, right-to-left |
| • Zoom | • Two-finger pinch motion |



Rotate Pan Zoom

# 5 HOW TO SCAN

This section will give you all of the details relevant to scanning, editing, and sharing your model.

## SCAN MENU BAR


A **File View** opens the files you have saved within the application. It presents you with thumbnail previews of each of the OBJ files.

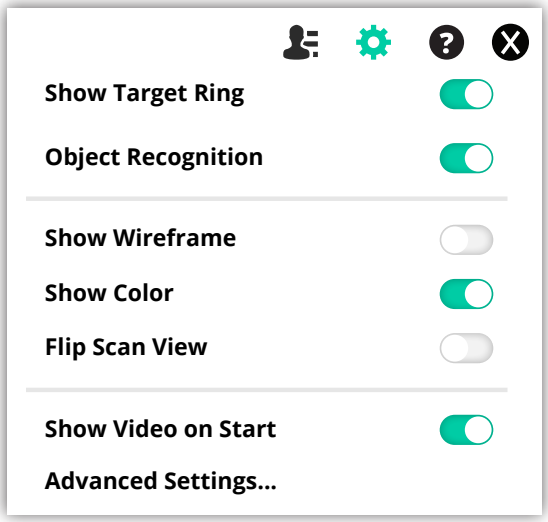
B **Log In** to or **Log Out** of your Sketchfab or Facebook account.

C **Options Menu** brings up a menu to adjust various parameters of the application. See details below.

D **Help** displays the Help menu. For details, refer to the section ***"Help Menu" on page 9***.

E **Exit/Minimize** the application.

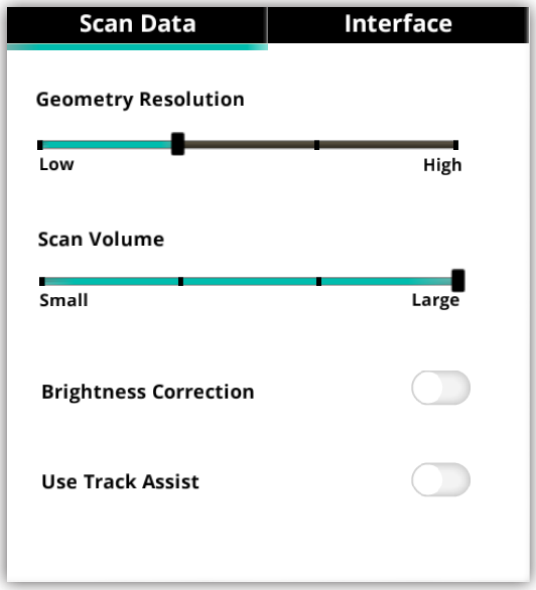
## SETTINGS MENU

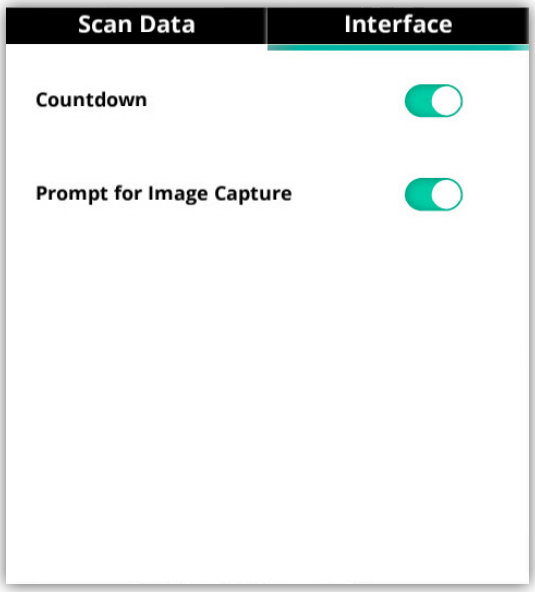



The Settings Menu provides the following options:

- **Show Target Ring** - toggles the display of the target ring on your screen; it can be useful for keeping the scanner pointed at the center of the object being scanned.
- **Object Recognition** - attempts to automatically identify and highlight the object you are scanning. The scan data will automatically be cropped to remove everything but the identified object.
- **Show Wireframe** - Toggle on and off wireframe view.
- **Show Color** - Toggle display of the model's color.
- **Flip Scan View** - Toggle between portrait and landscape orientation. (only available on the SR300, handheld camera)
- **Show Video on Start** - Choose whether or not to show the introductory video when the application starts.
- **Advanced Settings** - Access further settings. See below.

## ADVANCED SETTINGS




The Advance Settings dialog boxes, available from **Settings Menu > Advanced Settings**..., give you access to several options pertaining to the Scan Data and Interface.

### Scan Data

- **Geometry Resolution** - move the slider from low to high to adjust the resolution of the scanned image. The higher values will consume more processing power and memory, and may cause delays in the scanning process.
- **Scan Volume** - this parameter controls the size of the area (cubic volume) that will be scanned if a specific object is not being tracked.
- **Brightness Correction** - toggle automatic brightness correction on or off.
- **Use Track Assist** - turn on if you intend to use the track assist images that are provided in the *Sense Track Assist* document, available from the Help Menu. Refer to the section ***"Sense Track Assist" on page 9*** for an overview.

### Interface

- **Countdown** - toggle on or off the scanning countdown that appears after beginning a scan.
- **Prompt for Image Capture** - this prompt appears when scanning an object. Every 30 degrees, the application will prompt you to pause your motion so that the object resolution will be optimally captured. Toggle this setting to show or hide the prompt.

## SENSE TRACK ASSIST

When an object has relatively uniform geometric features, such as a cylinder or sphere, the lack of unique geometry can cause the camera to lose tracking.

In these cases, we have provided a document with printable images and instructions that will assist you in obtaining the best possible scan results. You can access the *Sense Track Assist* document from the Help Menu.

## HELP MENU

The Help menu provides the following options:

- **About** - shows information about the application.
- **Language** - select your preferred language. You will need to restart the application for this change to take effect.
- **User Guide** - displays a PDF of the User Guide.
- **Scanning Tips** - open the *Best Practices for 3D Scanning* document.
- **Acknowledgments** - displays information about copyrights and contributors.
- **Check for Update** - see if there is an update for your software.
- **Play Video** - play the introductory video.
- **Track Assist** - open *Sense Track Assist* document. Refer to the section ***"Sense Track Assist" on page 9*** for an overview.

## SCAN SETTINGS

The application provides the following choices in order to optimize your scan:


**Object**: any item other than a person.

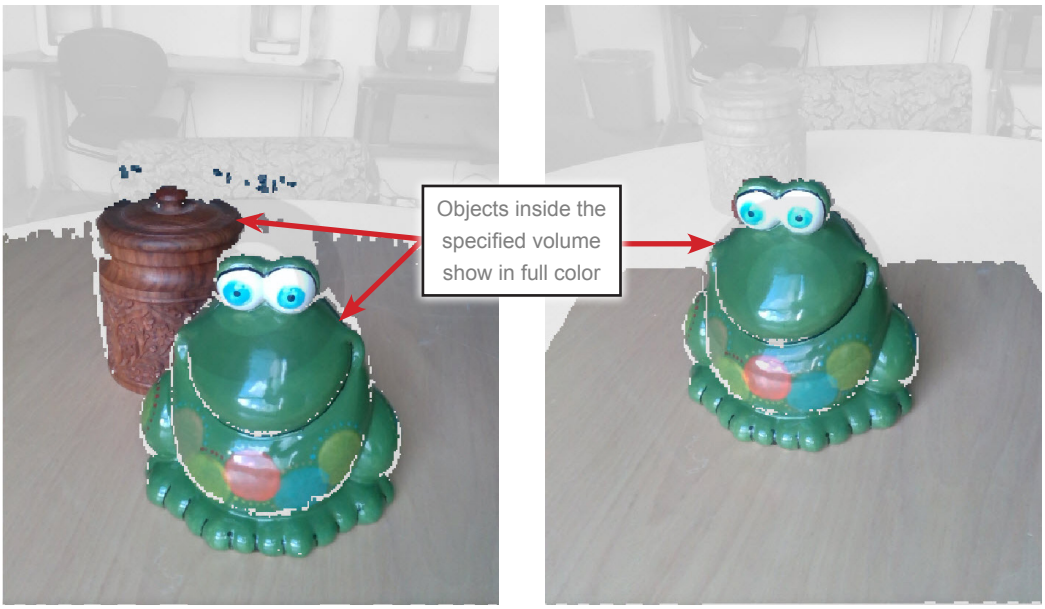
**Head**: a person's head and shoulders

**Body**: a person's full body

## THE SCANNING USER INTERFACE

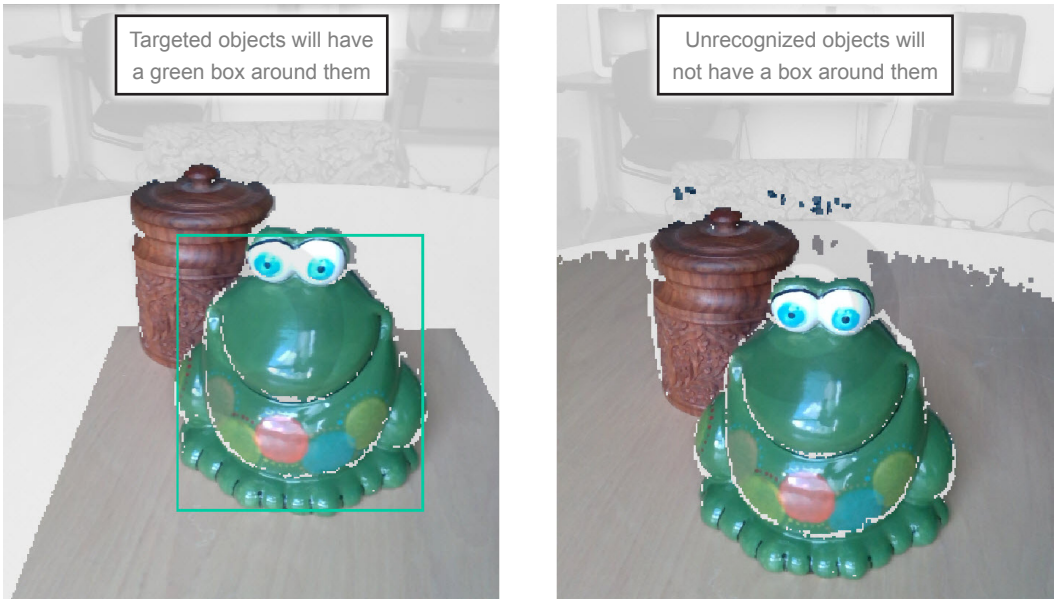
### Data within the Scan Volume

When an object is contained inside the specified volume, it will appear in full color. Objects outside this range are grayed-out and fade into the background.



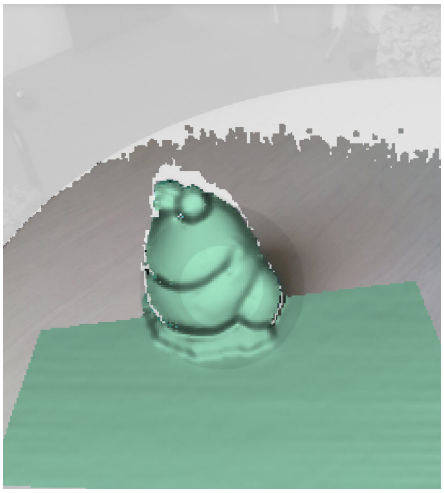

### Object Recognition

Using the Object Recognition option, available in ***"Options Menu"***, helps to stabilize tracking, increase mesh quality, and sets the trimming plane.



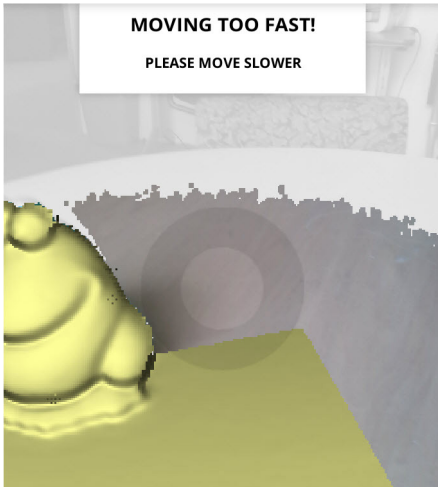
### Data Build-up

During scanning collected data will appear as “green” snow over top of the object or person.



### Tracking Indicators

If you move too fast or too slow while scanning, a message box will appear instructing you to move slower and the collected scan data on screen will turn yellow.




### Lost Tracking Indicators

Occasionally, the software will lose tracking of the scanned object. This occurs when you move too fast while scanning or when the object falls outside of the camera’s view. This will cause the collected data on screen to turn red. Focusing the camera back on a previously scanned area will regain tracking.

## SCANNING PROCEDURE

### Start, Pause, Restart, and Finish Controls


**Scan**: begin the scan

**Pause**: pause the scan.

**Continue:** resume scanning after Pause.

**Restart**: start a new scan during a scanning session

**Finish**: complete the scan

### Scanning an Object

1. Ensure that you have 360°-access to the object and that the room is well lit. For guidelines on an optimal scanning environment, refer to the section ***"Sense Scanning Tips and Tricks" on page 7***.
2. Select the type of the object you wish to scan.
3. Stand the appropriate distance from the object, according to the object selection.
4. Once the object is properly framed on the screen, click the **Scan** icon at the left.
5. Slowly and steadily move the scanner around the object while viewing the image on the screen.
6. To pause the scan, click the **Pause** button.
   Click the **Continue** button to resume the scan.
   Click the **Restart** button to start over.
7. When you are satisfied with the scan, click the **Finish** button.

### Scanning a Person

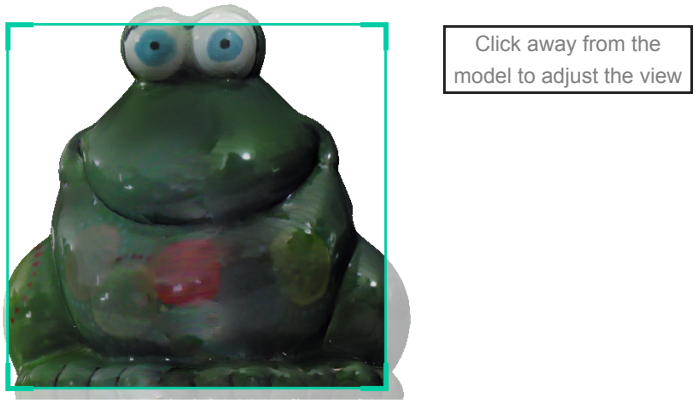
1. Ensure that you have 360°-access to the subject and that the room is well lit. For guidelines on an optimal scanning environment, refer to the section ***"Sense Scanning Tips and Tricks" on page 7***.
2. Select either the head or body option.
3. Stand the appropriate distance from the subject, according to your selection.
4. Once the subject is properly framed on the screen, click the **Scan** icon at the left.
5. Slowly and steadily move the scanner around the subject while viewing the image on the screen.
6. To pause the scan, click the **Pause** button.
   Click the **Continue** button to resume the scan.
   Click the **Restart** button to start over.
7. When you are satisfied with the scan, click the **Finish** button.

## EDIT A SCAN

Once you have completed the scan, or opened a previously-scanned file, there are several tools available to edit your scan:

The toolbar at the top of the screen provides the following options when you are editing the current scan:

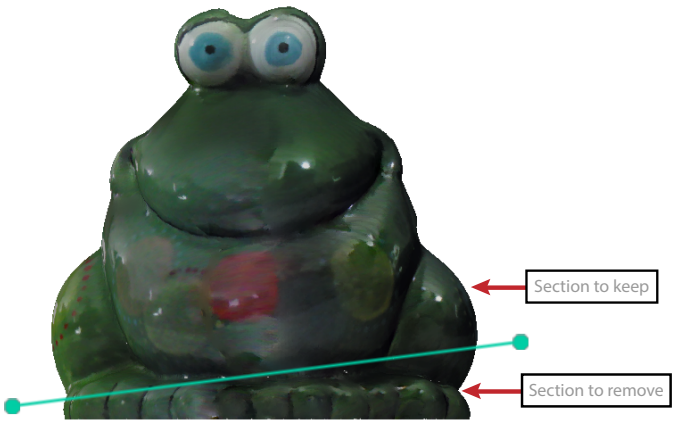
### Crop




If you need to crop your scan, use the cursor to adjust the cropping window around the part of the scan that you want to keep. When you are finished, click **Apply** to remove the part of the scan that you wish to delete. If an error occurred while cropping, simply click **Undo** and your scan will return to its original state.

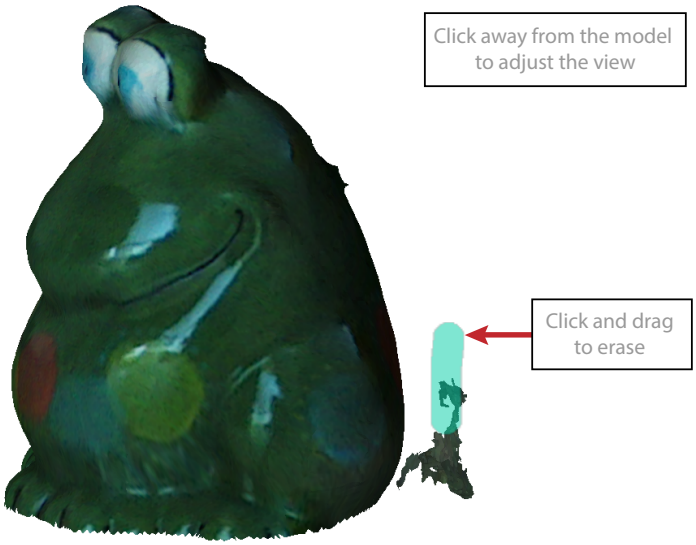
You can rotate, pan, and zoom the model by clicking outside of it and using either the mouse or view-adjustment gestures.

### Trim




To remove unwanted areas, click the **Trim** tool and use the handles of the green control bar to position the line where you would like to trim the object. The tool always removes the smaller of the two sections. When you are finished, click **Apply**.

### Erase



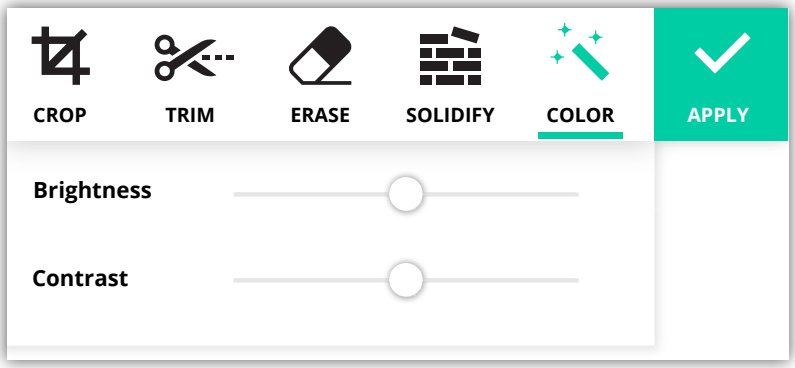
Use the **Erase** tool to remove unwanted portions of your scan. Click and hold the mouse button while moving the cursor over the area you wish to erase, then let go of the mouse button. The unwanted portion will be removed.

You can rotate, pan, and zoom the model by clicking outside of it and using either the mouse or view-adjustment gestures.

### Solidify

The **Solidify** tool will make your scan print-ready by filling in all the holes and closing the model to make it solid. It will automatically detect the bottom plane of the model and convert it to a flat surface.

### Color




You can adjust the **Brightness** and **Contrast** of the model using the sliders that appear after selecting the **Color** tool. You will get a preview after you make the adjustment. Press **Apply** to keep the settings.

## FINISHING A SCAN

Once you are finished scanning and editing your model, click the **Finish** button at the right of the screen. You will be presented with several options for your model:


### Save

To save your scan to your computer, click **Save**. You will be prompted to enter a filename. Your model will be saved in the OBJ format in the default folder and will appear in the **File** view.

### Export

You can export your model in the following formats: WRL, STL, PLY, or OBJ.

### Facebook

You can share an interactive 3D model on Facebook. To do this, you must have both a Facebook and Sketchfab account. You can create a Sketchfab account very quickly using your credentials from several common social networking sites.

### Sketchfab

Login to, or create, your Sketchfab account. You can then upload and share your scans as interactive 3D models.

### Print

If you have a 3D Systems Cube 3D printer connected to your computer, the printer's client software will open automatically. From there, you can use the application to print your model.

# 6 FEATURES AND SPECIFICATIONS

| Specification | Value |
|---|---|
| Supported operating systems | Windows 10® 64-bit |
| Maximum power consumption | 5.0 VDC |
| Scan volume | Min: 0.2 m x 0.2 m x 0.2 m<br>Max: 2 m x 2 m x 2 m |
| Dimensions | 17.8 cm x 12.9 cm x 3.3 cm |
| Operating range | Min: 0.45 m<br>Max: 1.6 m |
| Field of view | Horizontal: 45°<br>Vertical: 57.5°<br>Diagonal: 69° |
| Minimum Hardware Requirements | |
| • CPU<br>• RAM<br>• Screen resolution<br>• Color<br>• Available hard disk space | • Intel Core i5 or equivalent 2GHz<br>• 4 GB<br>• 1280 x 1024<br>• 32-bit<br>• 2 GB |
| Depth image size | 640 px (w) x 480 px (h) |
| Spatial x/y resolution @ 0.5 m | 0.9 mm |
| Depth resolution @ 0.5 m | 1 mm |
| Operating temperature | 10 °C - 40 °C |
| Data interface | USB 3.0 |
| USB cable length | 200 cm |
| Maximal image throughput | 30 fps |
| Color image size | 1920 px (w) x 1080 px (h) |

**3D Systems, Inc.**

333 Three D Systems Circle | Rock Hill, SC 29730 | **USA**

www.Cubify.com | www.3dsystems.com



PN: 393098 Rev. C