



# **Sense™**

## **3D Scanner**



**User Guide**

## COPYRIGHT NOTICE

© 2014 by 3D Systems, Inc. All rights reserved. This document is subject to change without notice. This document is copyrighted and contains proprietary information that is the property of 3D Systems, Inc. Cubify, 3D Systems, and the 3D Systems logo are registered trademarks, and Sense is a trademark, of 3D Systems, Inc. Use of the Cubify.com website constitutes acceptance of its Terms of Service and Privacy Policy.

### **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 (IEC) 60825-1 and meets the requirements of the applicable EC directives.

### **WARRANTY**

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.

# TABLE OF CONTENTS

---

- INTRODUCTION ..... 4**
- SAFETY AND COMPLIANCE ..... 5**
- SENSE SCANNER SETUP ..... 6**
  - What's Included ..... 6
  - Download The Sense Software ..... 6
  - Install The Sense Software ..... 6
  - Run The Sense Software ..... 6
  - Activate Your Sense Scanner ..... 7
- HOW TO SCAN ..... 8**
  - Sense Navigation ..... 8
  - Scanning Best Practices ..... 8
  - Scanning Procedure ..... 8
  - Edit A Scan ..... 10
- SENSE SCANNER TIPS AND TRICKS ..... 12**
- SENSE SETTINGS ..... 13**
  - Scan Settings ..... 13
  - Edit And Enhance Settings ..... 14
  - Export Settings ..... 15
- FEATURES AND SPECIFICATIONS ..... 17**

## INTRODUCTION

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 Cubify Sculpt to import your scan, where you can then manipulate the scan as you would a clay model. You can add texture, mash up multiple models, add color, and design with symmetry. The final model you create in Cubify Sculpt is a 3D print-ready file.

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

## 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 Sense 3D scanner 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.**

## SENSE SCANNER SETUP

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

### WHAT'S INCLUDED

Included in the box is 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

1. Navigate to [Cubify.com](http://Cubify.com).
2. Click **Cubes+** > **Sense**.
3. Click **Tech Specs**.
4. Click **Download Software** for your operating system.

### INSTALL THE SENSE SOFTWARE

Follow the instructions to complete the software download and installation.

After the software is installed, you link the scanner to a Cubify account.

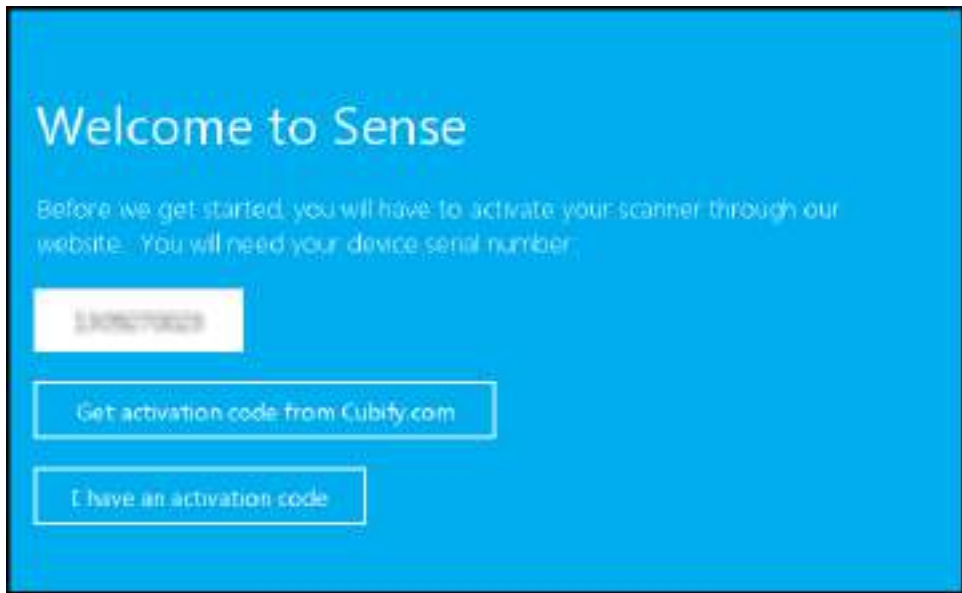
### RUN THE SENSE SOFTWARE

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.

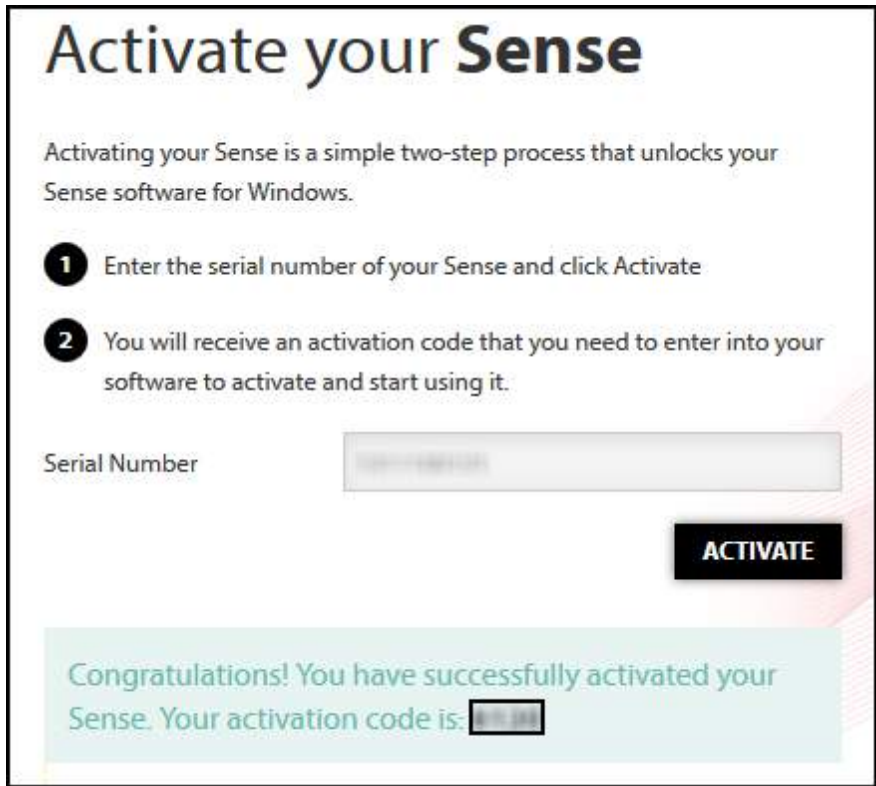
You will then be prompted to activate your Sense 3D scanner.

## ACTIVATE YOUR SENSE SCANNER



- If you have not linked your Sense 3D scanner to your Cubify account and have not received a 4-digit activation code, click **Get activation code from Cubify.com**. Log in to retrieve the code.

**Note:** If you do not have a Cubify account, go to [www.Cubify.com/sense](http://www.Cubify.com/sense). Click **My Cubify**, and then click **Sign up now**. Fill out the required information, and click **Sign Up**. You must then log in to get the activation code.



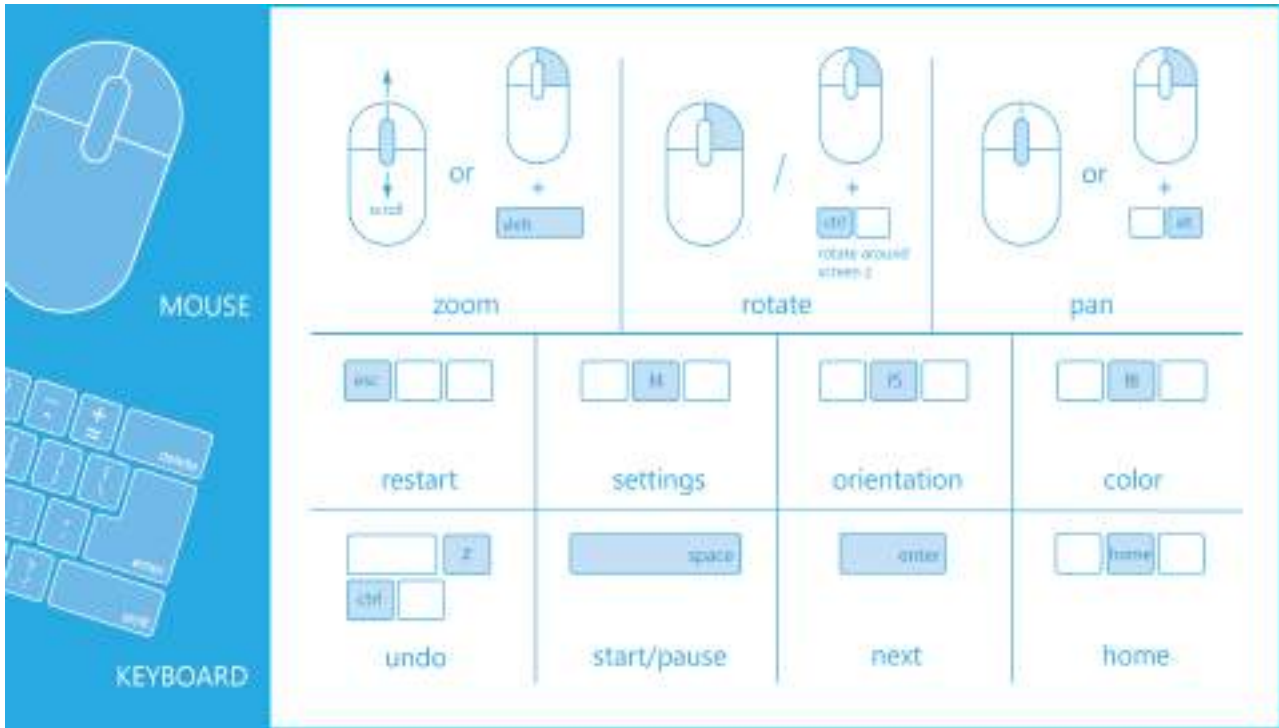
- After you have the 4-digit activation code, return to the Sense software and click **I have an activation code**.
- Enter the code, and click **Activate scanner**.

You're now ready to begin scanning.

# HOW TO SCAN

## SENSE NAVIGATION

Refer to the following image for keyboard and mouse navigation to use while you're scanning:



## SCANNING BEST PRACTICES

Many practices that ensure good photography also apply to scanning. Your subject should be facing the light source in order to minimize shadows and enhance colors. Position your subject so that you have 360-degree clearance and can scan from all angles.

## SCANNING PROCEDURE

Using the Sense 3D scanner, you can scan people or objects.



1. Select what to scan, an object or a person.
  - If you select **Object**, choose the appropriate object size.



- Small objects: less than 16 inches
  - Medium object: less than 40 inches
  - Large objects: less than 80 inches
- If you select **Person**, choose either **Head** or **Full Body**.



The Scan toolbar at the top of the screen provides the following options:



- A - **Reset View** returns the view to the initial position
- B - **Home**, which returns to the initial Start screen

- C - **Settings** for the current scan
  - D - **Help**, which shows helpful tips for scanning and model creation
2. Click **Start Scan**.  
You have approximately 3 seconds to get in place to start your scan.
  3. Hold the scanner approximately 15 inches away from your subject, and ensure that the image is centered on your computer screen.
  4. Slowly and steadily move the scanner around the subject while viewing the image on the screen.

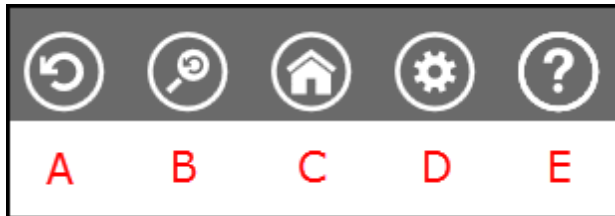
 **Best Practice**

- Remember to keep the image centered on the screen.
  - 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.
  - Holding the scanner still over a portion of the object can also fill data gaps.
  - 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 avoid losing tracking by giving it more to lock on to.
  - When scanning a human body, begin by aiming at the torso, and then get a whole body contour scan. Finish by scanning the head.
5. To pause the scan, click the Pause button.  
Click the button again to resume the scan.
  6. When you are satisfied with the scan, click **Next** to finish.

**EDIT A SCAN**

Several tools are available as you edit a scan:

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



- A - **Undo** erases the last change done on the scan.
- B - **Reset View** returns the view to the initial position.
- C - **Home** returns to the initial Start screen.
- D - **Settings** shows the settings for the current work flow.
- E - **Help** shows some helpful tips for scanning.

- **Edit tools**



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

- Use the **Erase** tool to remove unwanted portions of your scan. Move the cursor over the area that you want to erase, and then let go of the mouse button; the unwanted portion will be removed.
- The **Solidify** tool will make your scan print-ready by filling in all the holes and closing the model to make it solid.

- **Enhance tools**



- To automatically enhance brightness, contrast, and clarity in your scan, use the **Auto Enhance** tool.
- To remove unwanted areas, click the **Trim** tool and drag the cursor over the area you want to slice away. The tool always removes the smaller of the two pieces and deletes the smaller mass.
- To improve the look of the scan, click the **Touch Up** tool and drag the cursor over the area you want to improve.

- **Share tools**



- To save your scan to your computer, click **Save**. You can save the scan as an `stl`, `ply`, or `obj` file format; the formats will work in any 3D modeling software. If you have a 3D printer available on your network, you can choose a printer and open the saved file with the printer's client software.
- **Upload** your scan in order to share and cloud print on Cubify.com.
- If you have the Cube software installed, click **Print**. The software will open automatically. Your scan will show on the Cube's automated print pad, enabling you to print directly to your Cube.

## SENSE SCANNER TIPS AND TRICKS

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 3D scanner 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**
  - In preview mode, make sure that the whole object you want to scan shows yellow on the screen. This helps ensure that you capture the entire object while scanning.
  - Keep the scanner within its optimal distance range of 15 to 60 inches (38.1 to 152.4 cm).
- **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.
  - Holding the scanner still over a portion of the object can also fill data gaps.
  - If the 3D view turns white as you're scanning, it's because you're holding the scanner too close to the object being scanned. To correct the view, move the scanner out to at least the minimal defined distance of 15 inches (38.1cm).
- **General**
  - When scanning a human body, begin by aiming at the torso, and then get a whole body contour scan. Finish by scanning the head.
  - 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 avoid losing tracking by giving it more to lock on to.

## SENSE SETTINGS

### SCAN SETTINGS

Modify any scan settings to change the output accordingly.

# Settings

---

Orientation                      Landscape   [Portrait](#)

Resolution                      Low   Med   [High](#)


Object Size                      Small   Med   Large   [Custom](#)


Width                       0.6 m

Height                       0.6 m

Depth                       0.6 m

Prompt on Startup                      

Object Recognition                      

Color                      

Frame Rate                      

Target Ring                      

---

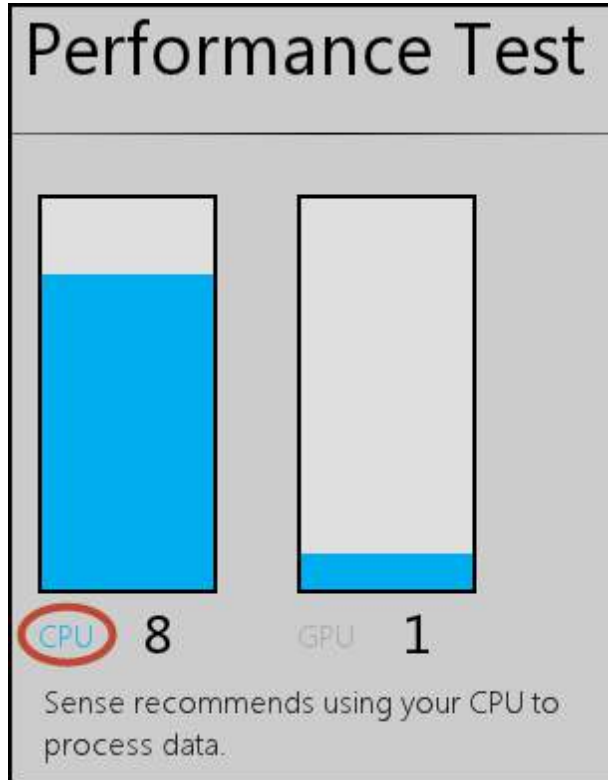
Performance Test

Tutorial & Video

About

- Orientation - toggle between landscape and portrait scan views. This corresponds to the way that is most comfortable for you to hold the scanner.
- Resolution - determines the density of the scan data acquired; higher resolution will yield denser scans, but can slow down the capture speed.
- Object Size - determines the size of the scan volume; you can specify this according to the size of the object you are scanning.
  - When Custom is selected, you can specify Width, Height, and Depth values.
  - Prompt on Startup - you can toggle the object selection screen on or off at startup.
- 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.
- Color - Toggle the acquisition of color from the scanner.

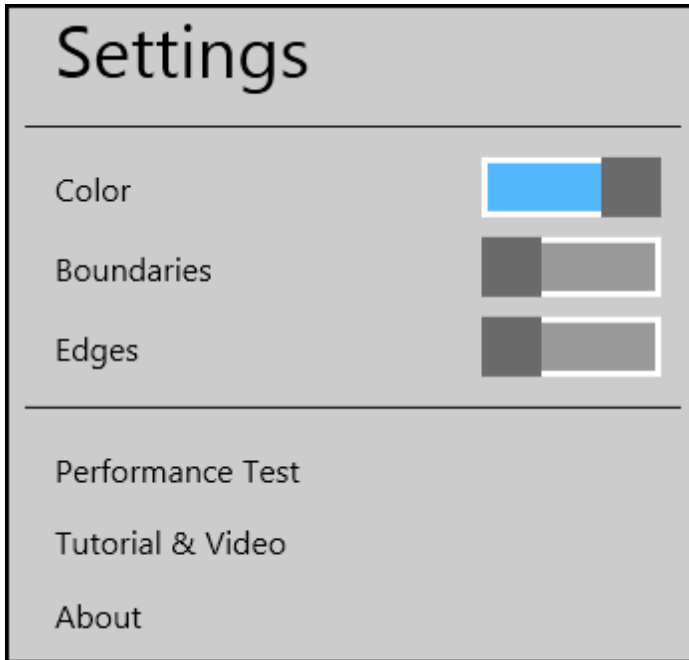
- Frame Rate - toggles the on-screen display of frames per second (FPS); useful for gauging your computer's capability. The maximum is 30 FPS; a good computer will scan at approximately 10-15 FPS. Anything below about 5 FPS is going to yield a poor scanning experience.
- Target Ring - toggles the display of the target ring on your screen; it can be useful for keeping the scanner pointed at the center of the object being scanned.
- Performance Test - measures your computer's CPU and graphics card processing power, and recommends the one with the best performance. You are able to switch between the two; the blue highlighting indicates the selected data processing method.



- Tutorial & Video - shows video on launch; shows on-screen tips for each step of the scanning process.
- About - information about the Sense scanner and software

### EDIT AND ENHANCE SETTINGS

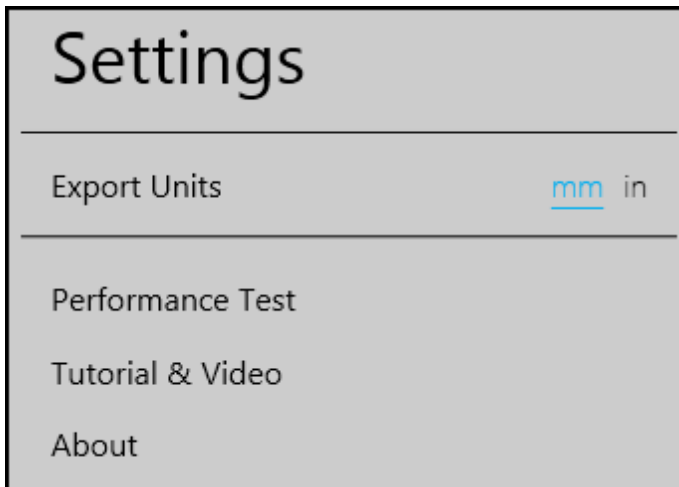
Specify any of the following settings during the editing process.



- Color - toggles the display of color on the model.
- Boundaries - toggles highlighting of the boundaries of your scan.
- Edges - toggles display of the edges of each triangle in your scan.
- Performance Test - measures your computer's CPU and graphics card processing power; allows you to switch between the two.
- Tutorial & Video - shows video on launch; shows on-screen tips for each step of the scanning process.
- About - information about the Sense scanner and software

### EXPORT SETTINGS

Specify the settings when you share your scan file.



- Export Units - units of measure options for exporting your scan.
- Performance Test - measures your computer's CPU and graphics card processing power; allows you to switch between the two.

- Tutorial & Video - shows video on launch; shows on-screen tips for each step of the scanning process.
- About - information about the Sense scanner and software



## FEATURES AND SPECIFICATIONS

Specification	Value
Supported operating systems	Windows 7® (32-bit or 64-bit) Windows 8® (32-bit or 64-bit)
Maximum power consumption	2.25 watts
Scan volume	Min: 0.2m x 0.2m x 0.2m Max: 3m x 3m x 3m
Dimensions	17.8cm x 12.9cm x 3.3cm
Operating range	Min: 0.35m Max: 3m
Field of view	Horizontal: 45° Vertical: 57.5° Diagonal: 69°
Hardware recommendations	
<ul style="list-style-type: none"> <li>• Intel Pentium or equivalent processor</li> <li>• RAM</li> <li>• Screen resolution</li> <li>• Color</li> <li>• Available hard disk space</li> </ul>	<ul style="list-style-type: none"> <li>• 2 GHz or faster</li> <li>• 2 GB minimum</li> <li>• 1280 x 1024 minimum</li> <li>• 32-bit</li> <li>• 4 GB</li> </ul>
Depth image size	240(w) x 320(h) px
Spatial x/y resolution @ 0.5m	0.9mm
Depth resolution @ 0.5m	1mm
Operating temperature	10°C - 40°C
Data interface	USB 2.0
Data format	16-bit
USB cable length	213cm
Maximal image throughput	30 fps
Color image size	240(w) x 320(h) px

