

## SOFTWARE/PRODUCT/FINISHING

## OVERVIEW

A part that is larger than the build envelope of a 3D printer can still be printed. Oversized parts may be sectioned and subsequently bonded. For additional details, see the *Best Practice: Bonding*.

## Common reasons for sectioning include:

- Making parts that are larger than the build envelope of the 3D printer.
- Orienting sections so that each has optimal surface finish or strength.
- Sectioning parts so they can be bonded around a part made of another material.
- Verifying print parameters using only a section of a part.

The most common reason for sectioning parts is the part exceeds the dimensions of the build envelope in the X, Y or Z direction (Figure 1). If possible, section the part in a computer-aided design (CAD) program so that you can add mating features, such as alignment pins or dovetails. However, Insight™ software has options for sectioning parts and adding registration features.

## 1. OPTIONS

## 1.1. Parts Oversized in the X-Y Plane

Parts that exceed the X-Y build area can be sectioned using **Section with profile**, accessed from the **Slice** menu (Figure 2). The options available in the control window are defined below (Figure 3).

- **Job name for save:** The name of the new job that contains the slice curves for the right section, which is saved and removed after sectioning.
- **Job name for remain:** The name of the new job that contains the slice curves for the left section nearest the envelope origin, which remains on screen after sectioning.
- **Apply registration features:** Automatically applies shape modifications to the selected profile curve to assist with registration of the two sections when being joined after building. When enabled, a saw-tooth pattern is applied to both sections.
  - **Pattern amplitude:** Specifies the amplitude (depth) of the registration feature.
  - **Pattern cycle distance:** Specifies the frequency that the registration features are repeated.

## Reference materials:

- Processes
  - Best Practice: Bonding

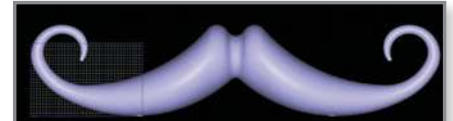


Figure 1: Part is oversized for the build envelope of a Fortus® 900mc 3D Production System.

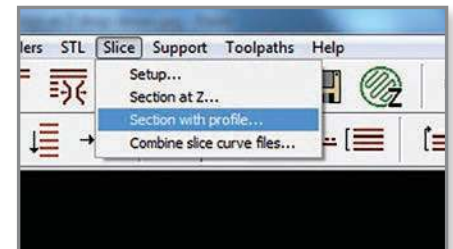


Figure 2: Section with profile is found in the Slice menu.

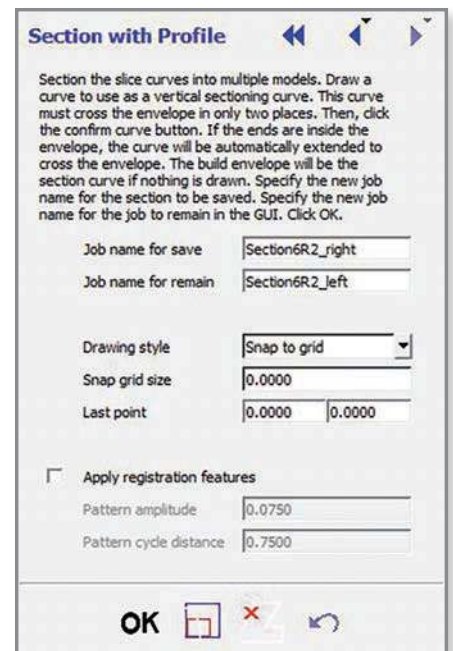


Figure 3: Section with profile control window.

## 1.2. Parts Oversized in the Z Direction

Parts that exceed the maximum Z height of the build envelope can be sectioned using **Section at Z**, accessed from the **Slice** menu (Figure 4). The options available in the control window are defined below (Figure 5).

- **Section Z height:** Specifies the Z height at which the part will be sectioned. Curves below this height will remain in the Insight software as the current job, and curves above this height will be saved in a new job.
  - **Enter a custom value:** Specifies sectioning at any point along the Z height.
  - **Part middle:** Selects the Z height representing the middle of the full part height.
  - **Current Z:** Selects the current layer as the **Section Z height**.
- **Invert top section:** Reorients the uppermost section 180 degrees in the Z direction after sectioning. This is commonly used to reduce the amount of support material required, based on geometry.
- **Mating raster gaps:** Creates air gaps between the rasters on the mating surfaces. When using glue to bond parts together, this provides a porous surface for the adhesive. When bonding with solvent, the bond will be stronger with this feature turned off.
- **Apply registration features:** Creates a mating tapered plug on the bottom piece and a tapered socket on the top piece.
  - **Offset to features:** Determines the offset, or width, of the part from the outside wall to the start of the registration feature.
  - **Height of features:** Specifies the height of the registration plug. A system-defined taper is added throughout the registration feature's height to assist with part assembly.
- **Job name for save:** Name of the new job that contains the slice curves for the top section, which is removed from the screen after it is saved.
- **Job name for remain:** Name of the new job that contains the slice curves for the bottom section, which remains in the Insight software and becomes the current job.

**NOTE:** Descriptions of all the parameter sheet options are available through the Insight™ software help menu. Many of these settings can have detrimental effects on your parts if not used properly. Therefore, it is recommended that only experienced users make changes to these values. To ensure the best possible part quality, Stratasys® recommends that you always review the toolpaths on your parts, and make modifications if necessary, before downloading them to your system.

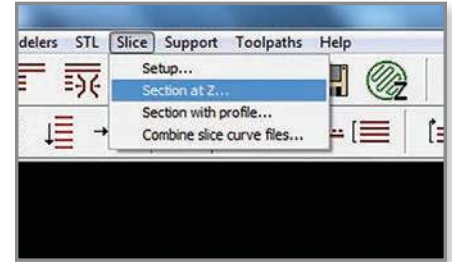


Figure 4: Section at Z is found in the Slice menu.

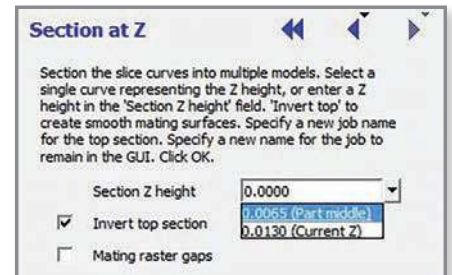


Figure 5: Section at Z control window.

## 2. PROCESS

### 2.1. Sectioning Oversized Parts in X-Y

**STEP 1:** Configure the modeler.

**STEP 2:** Open, orient and slice the STL file (Figure 6).

**TIP:** Try orienting the part at an angle to fit onto the build platform to enable printing without sectioning.

**STEP 3:** If the part exceeds the maximum X or Y dimension, an **Error Summary** will pop up. Click  to accept the error (Figure 7).

**STEP 4:** From the **Slice** pull-down menu, select **Section with profile**. When the Section with Profile control is active, the cursor changes to a pencil.

**STEP 5:** Enter the desired names in the **Job name for save** and **Job name for remain** fields or leave the default names.

**STEP 6:** Select the desired **Drawing style**; by default **Snap to grid** is selected. Click outside the blue build envelope box to start the sectioning curve. Click again to add additional segments to the curve. Continue clicking to create the desired shape of the sectioning profile. The last click must be outside of the blue build envelope box (Figure 8).

**TIP:** By selectively shaping the sectioning curve, indexing features can be added to allow for easier alignment when bonding the printed parts.

**STEP 7:** **(Optional)** Apply a registration feature by checking the box next to **Apply registration features**. You may use the default **Pattern amplitude** and **Pattern cycle distance** or enter your own values next to each respective option (Figure 9).

**STEP 8:** Click  to confirm the sectioning curve.

**STEP 9:** Click **OK** and when prompted to save the job for the un-sectioned part, click **Yes**.

**STEP 10:** After sectioning is complete, click **OK** to confirm the save location of the new slice file. The section closest to the origin will remain on the screen while the other section is removed and saved (Figure 10).

**STEP 11:** Continue processing the remaining part.

**STEP 12:** Save the job and close.



Figure 6: Part is oriented and sliced.



Figure 7: An Error Summary is displayed when a file that exceeds the build envelope is sliced

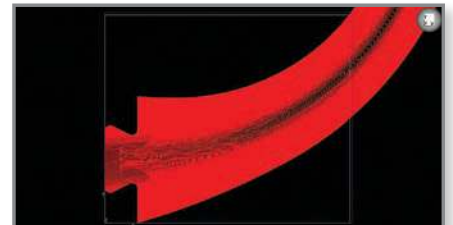


Figure 8: Define the sectioning curve by clicking the first point outside the build envelope and ending outside of the build envelope.

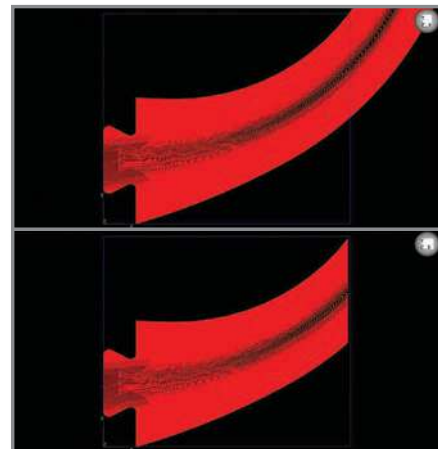


Figure 9: A registration feature is applied to the surface of the sectioned part.

**STEP 13:** Open the slice file for the other section of the part. Continue processing.


**NOTE:** It may be necessary to repeat the sectioning procedure until all sections fit in the build envelope.

**STEP 14:** Sectioning Oversized Parts in X-Y procedure complete.



*Figure 10: Part oversized in X-Y plane, before sectioning (top), after sectioning (bottom).*

## 2.2. Sectioning Oversized Parts in Z

- STEP 1:** Configure the modeler.
- STEP 2:** Open, orient and slice the STL file (Figure 11).
- STEP 3:** If the part exceeds the maximum Z dimension, an **Error Summary** will pop up. Click  to accept the error.
- STEP 4:** Determine the layer height at which sectioning will be done. Below this layer will be the bottom section and above this layer will be the top section.
- STEP 5:** Display the layer from Step 3 and switch to a top view.
- STEP 6:** Select **Section at Z** from the **Slice** menu pull-down.
- STEP 7:** (Optional) In the **Section at Z Controls**, check the box for **Invert Top Section**.
- STEP 8:** (Optional) Check the box **Apply registration features**. You may use the default values or enter custom values for **Offset to features** and **Height of features**.

**TIP:** It is recommended that you add alignment features if the sections will be assembled and bonded.

- STEP 9:** (Optional) When bonding the two parts with glue, check the box for **Mating raster gaps**.
- STEP 10:** Enter the desired names in the **Job name for save** and **Job name for remain** fields or leave the default names.
- STEP 11:** Select the **Current Z option** from the **Section Z height** pull-down menu and click **OK**. When prompted to save the job for the un-sectioned part, click **Yes** (Figure 12).
- STEP 12:** Continue processing the remaining part.
- STEP 13:** Save the file and close.
- STEP 14:** Open the slice file for the top section. Continue processing.

**NOTE:** It may be necessary to repeat the sectioning procedure until all sections fit in the build envelope.

- STEP 15:** Sectioning Oversized Parts in Z procedure complete.

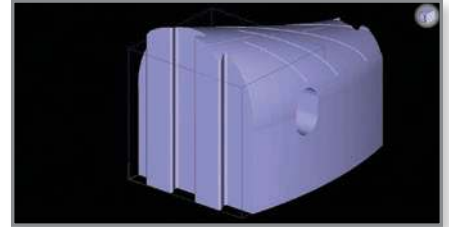


Figure 11: Part oriented and oversized in the Z direction.

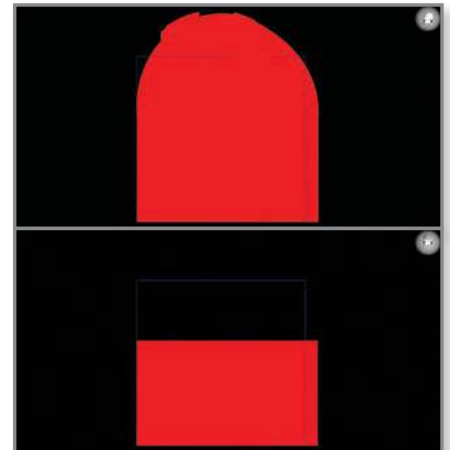


Figure 12: Part oversized in Z, before sectioning (top), after sectioning (bottom).



Figure 13: Oversized part that was sectioned in multiple places and printed on a Fortus 900mc™.

### 3. TOOLS & SUPPLIES

#### 3.1. Software:

- Insight software (document developed with Insight 9.0)

#### CONTACT:

To obtain more information on this application, contact:

#### Stratasys Application Engineering

1-855-693-0073 (U.S. toll-free)

+1 952-294-3888 (international)

ApplicationSupport@Stratasys.com

Stratasys | [www.stratasys.com](http://www.stratasys.com) | [info@stratasys.com](mailto:info@stratasys.com)

7665 Commerce Way Eden Prairie, MN 55344 +1 888 480 3548 (US Toll Free) +1 952 937 3000 (Intl) +1 952 937 0070 (Fax)	2 Holtzman St. Science Park, PO Box 2496 Rehovot 76124, Israel +972 74 745-4000 +972 74 745-5000 (Fax)
--	--

#### ISO 9001:2008 Certified

© 2014 Stratasys. All rights reserved. Stratasys, Stratasys logo, FDM and Fortus are registered trademarks of Stratasys Inc. Insight and Fortus 900mc are trademarks of Stratasys Inc. All other trademarks are the property of their respective owners, and Stratasys assumes no responsibility with regard to the selection, performance or use of these non-Stratasys products. Product specifications subject to change without notice. Printed in the USA. BP-FDM-SectioningOversizedParts-12-14

The information contained herein is for general reference purposes only and may not be suitable for your situation. As such, Stratasys does not warranty this information. For assistance concerning your specific application, consult a Stratasys application engineer. To ensure user safety, Stratasys recommends reading, understanding, and adhering to the safety and usage directions for all Stratasys and other manufacturers' equipment and products. In addition, when using products like paints, solvents, epoxies, Stratasys recommends that users perform a product test on a sample part or a non-critical area of the final part to determine product suitability and prevent part damage.

