

Rapid Guide to Rapid Prototyping
By
Dominic Martinez
and
Luis Gutierrez
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Hy D. Tran, PhD, PE
Assistant Professor
Department of Mechanical Engineering
University of New Mexico
Albuquerque, NM 87131
tran@me.unm.edu

1. The FDM 1650 can build plastic parts from a solid CAD Model. You use the “Quickslice” program to convert your solid model to a format that the Stratasys FDM can understand. Both computers in ME154 can run Quickslice, but only the computer on the right is connected to the Rapid Prototyper. Before you begin,
 - 1.1 Sign Log Sheet
2. Turn on Machine by pressing **START** button before beginning any software process to allow machine to warm up. The Modeling Temperature must reach 270°C and the Support Temperature must reach 265°C before production can begin. The Envelope Temperature is set to 70°C but after the machine reaches 60°C production can begin. Temperatures are set based on our type of material and diameter of plastic dispenser tip. It will take 15-20 minutes for the Rapid Prototyper to come to temperature, so you might as well warm it up now.
3. After creating file in Pro-E or Solidworks export as .STL file. **Be sure to create model file using mm units.** In Pro-E choose **File** menu then arrow down to **Export**. Choose **Model** and choose on the right side **STL**. Under Options leave angle control at default setting of 0.5, however the coarseness of plastic part can be controlled using Deviation Control setting, the smaller the setting the more accurate the part but it will also take longer to build with Rapidprototyper. See figure 1 below.

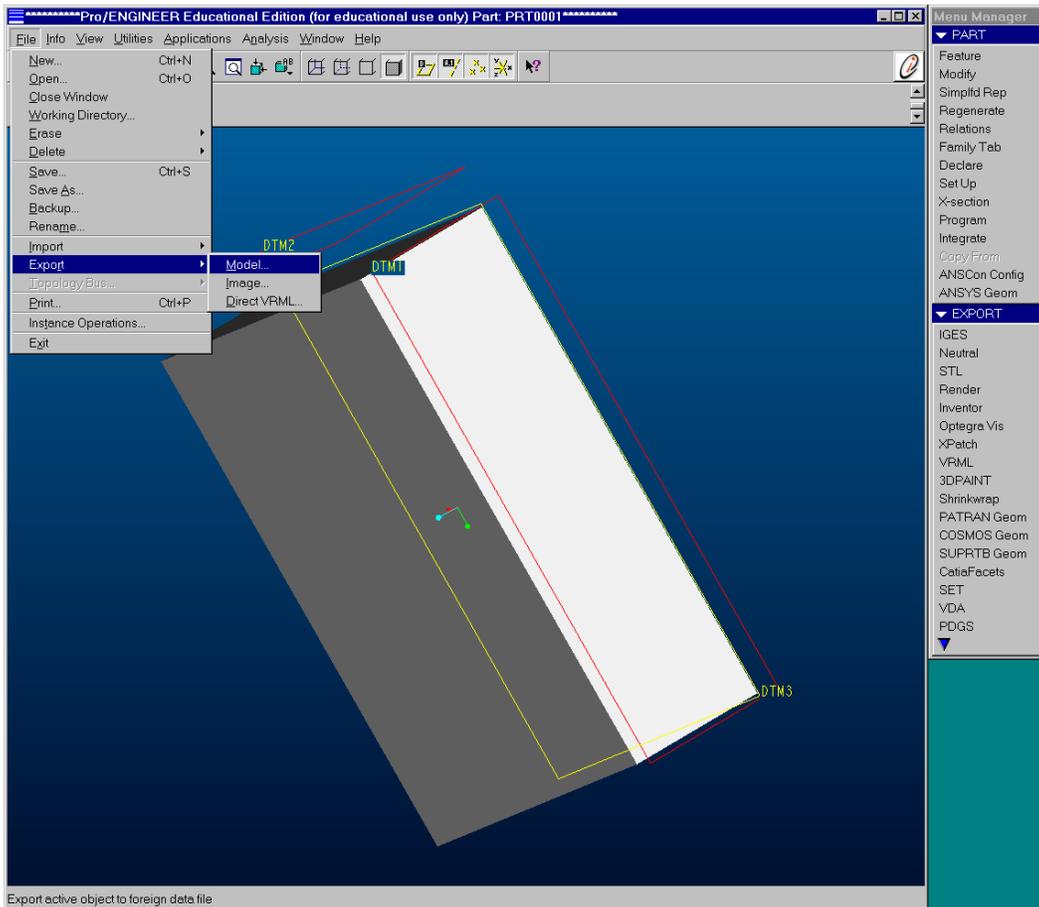


Figure 1: Exporting STL file from Pro-E.

4. Close Pro-E; copy your STL to a zip disk and transfer the STL file (via the zip disk) to one of the computers in ME154. Open the Quickslice software by double clicking the shortcut on desktop.
5. Open the STL file. See figure 2 below.

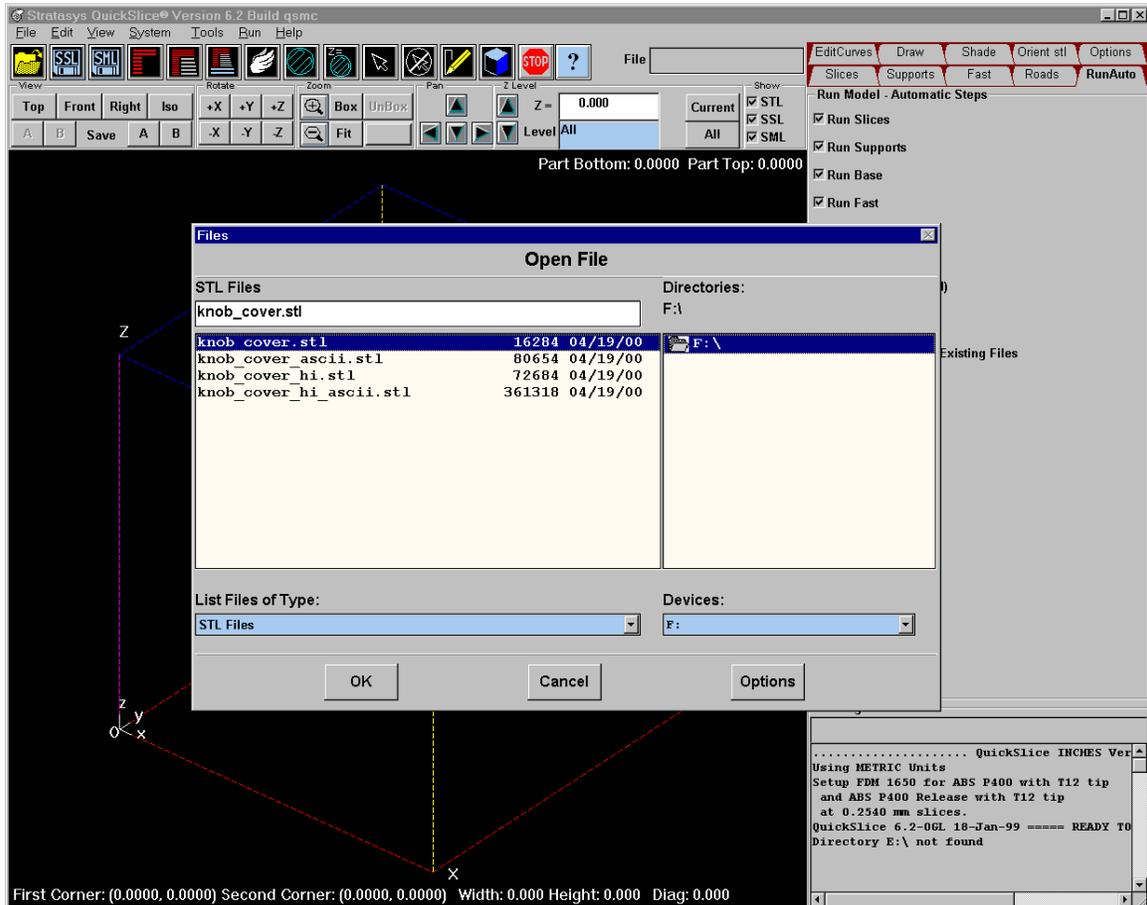


Figure 2: Opening STL file using Quickslice.

- Click **Orient stl** tab on top right side of page. See figure 3 below. Clicking on **Switch STL Units** will change between Metric and English units, make sure it is set on Metric units. (The conversion is not reliable).

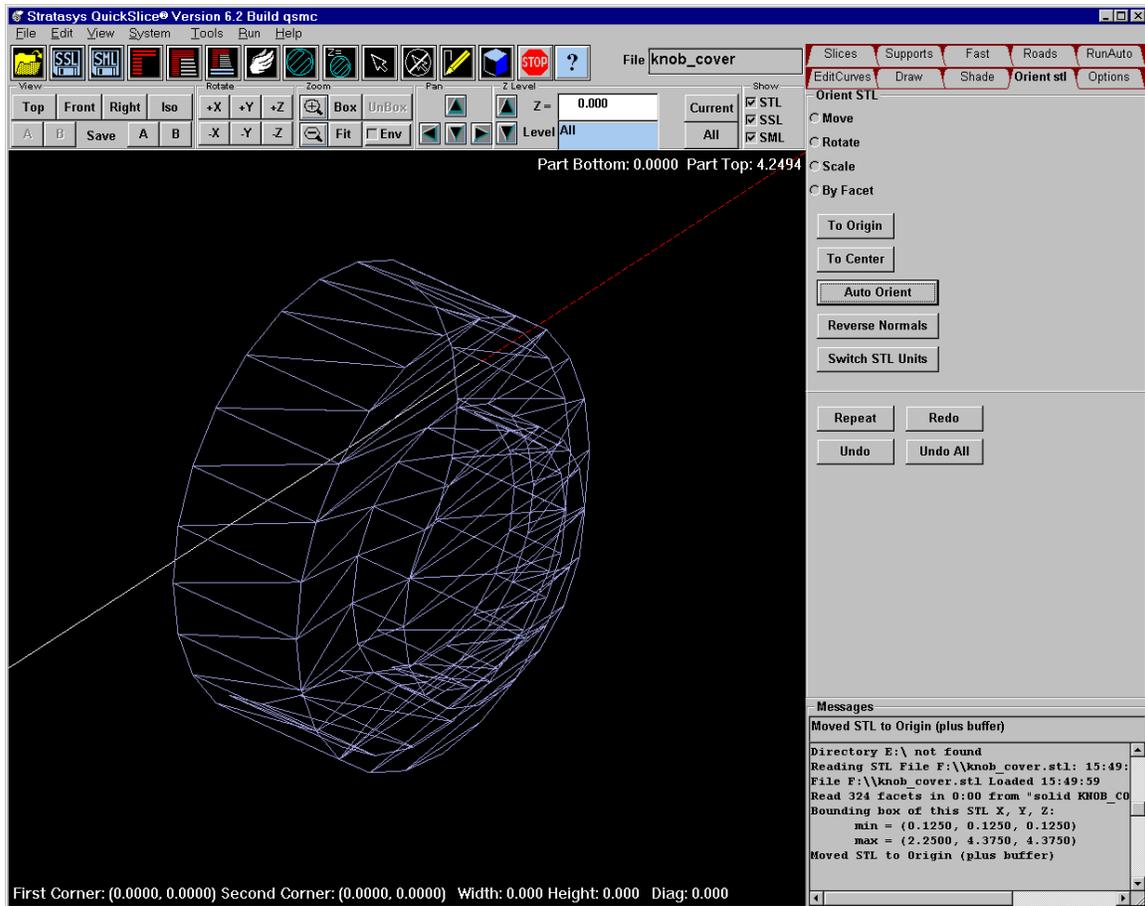


Figure 3: Choosing model orientation.

- Click on **Auto Orient** as shown in figure 3. A new menu will appear then choose **Find Orientations** as shown in figure 4 below. An orientation must be chosen that will use the least amount of support material since a layer cannot be built in mid-air. Creating supports will be discussed later in manual.

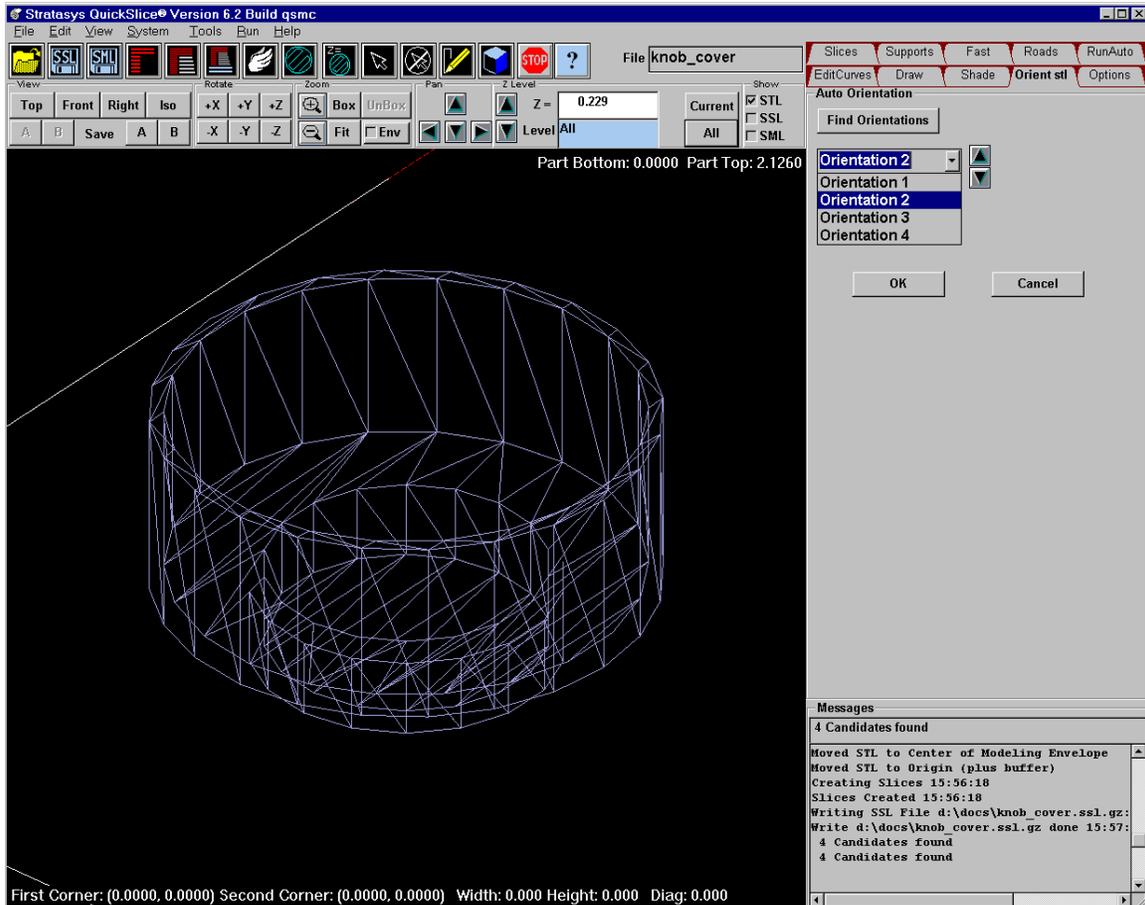


Figure 4: Finding orientation.

- After choosing orientation click **OK**. Figure 3 will appear again and choose **To Origin** since Rapidprotyper will begin part building at origin of foam material.

9. We will now need to create slices of model. Click the *Slice Icon*  on menu as highlighted in Figure 5 below, it is the left icon of three red icons. Text in bottom right corner will read “Slices Created” when finished.

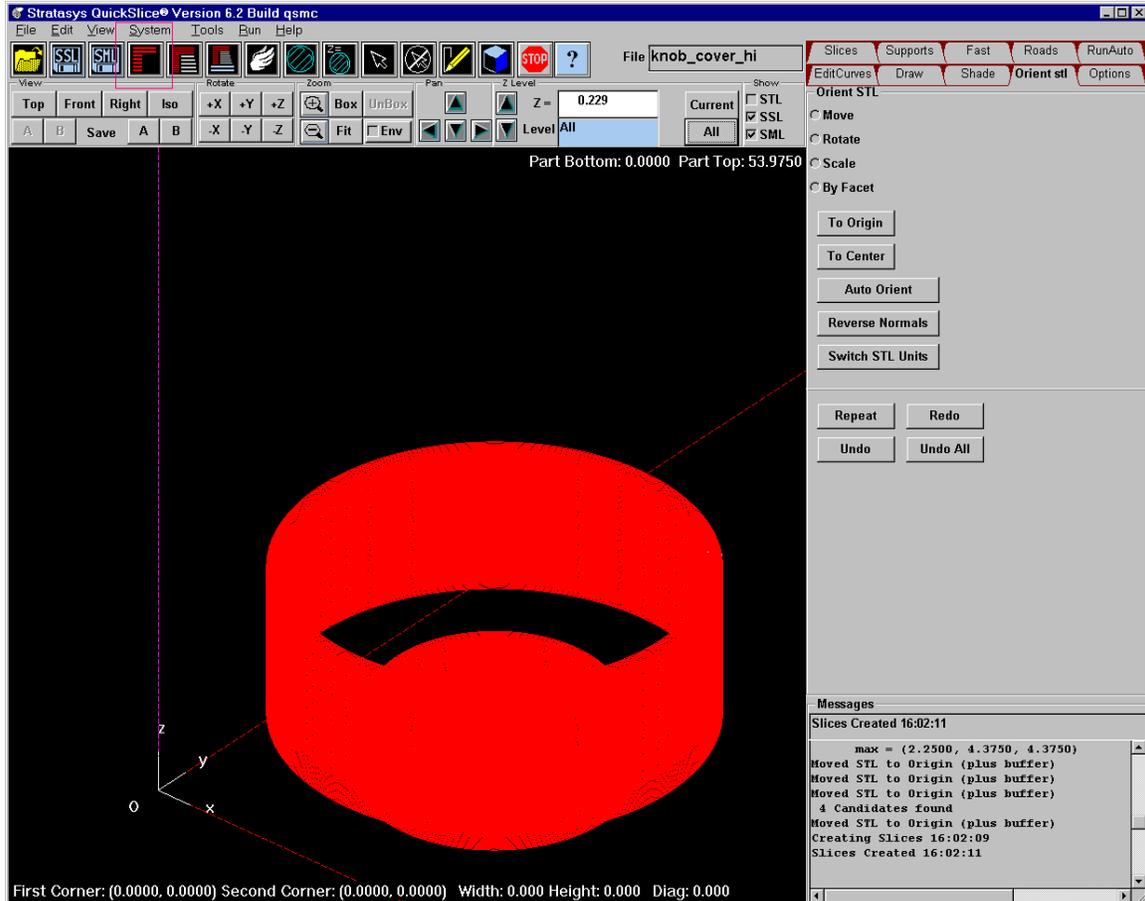


Figure 5: Slice Figure.

10. After slicing only 1 layer will be displayed. Click **All** button located near center of top of screen. All red slices will be displayed.

11. Next supports will need to be built. Click *build supports*  icon which is the center of three red icons at top of screen. See figure 6 for highlight. After supports are generated they will be displayed in a yellow color. Bottom right corner text will read “Direct Supports Done,” when finished.

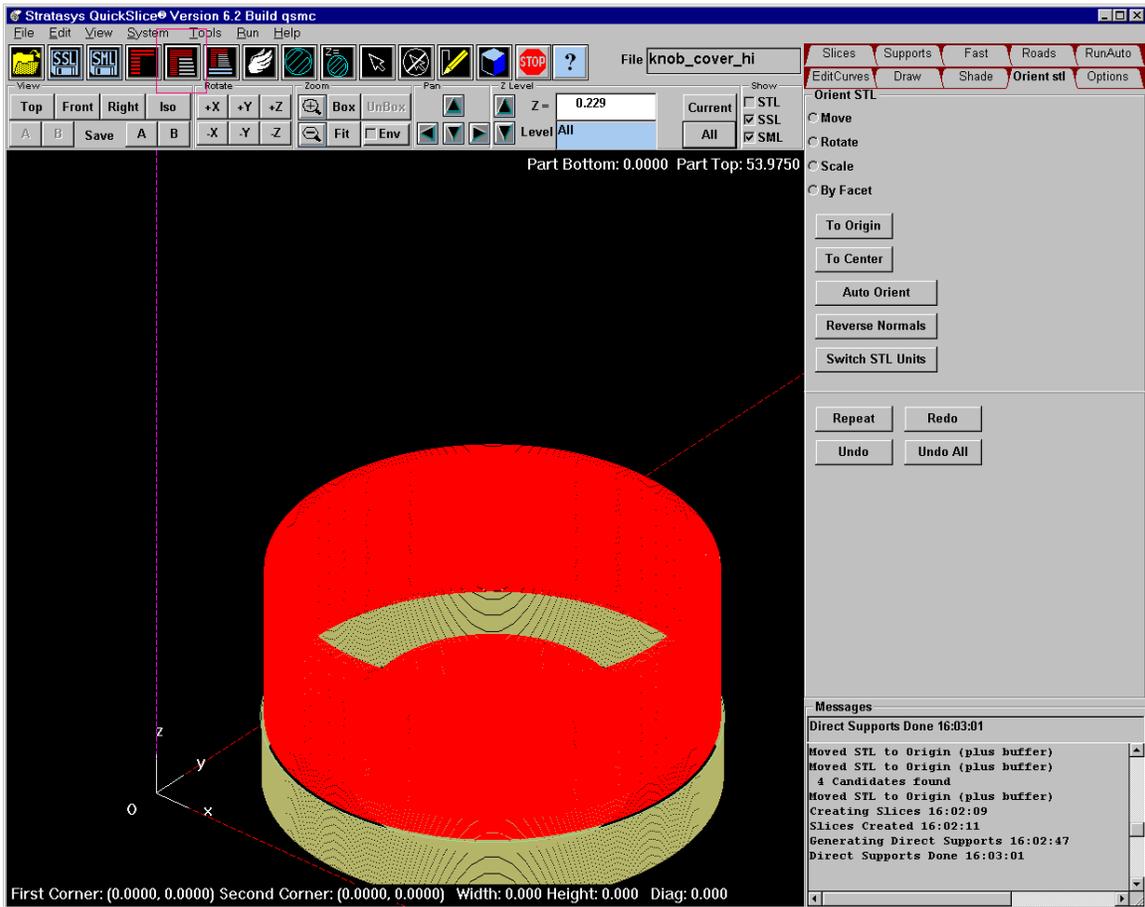


Figure 6: Supports figure.

12. Click on *build base*  icon since all projects will need a base to be stable. Figure 7 below shows base colored in blue. Text in bottom right hand corner displays when machine is finished building base.

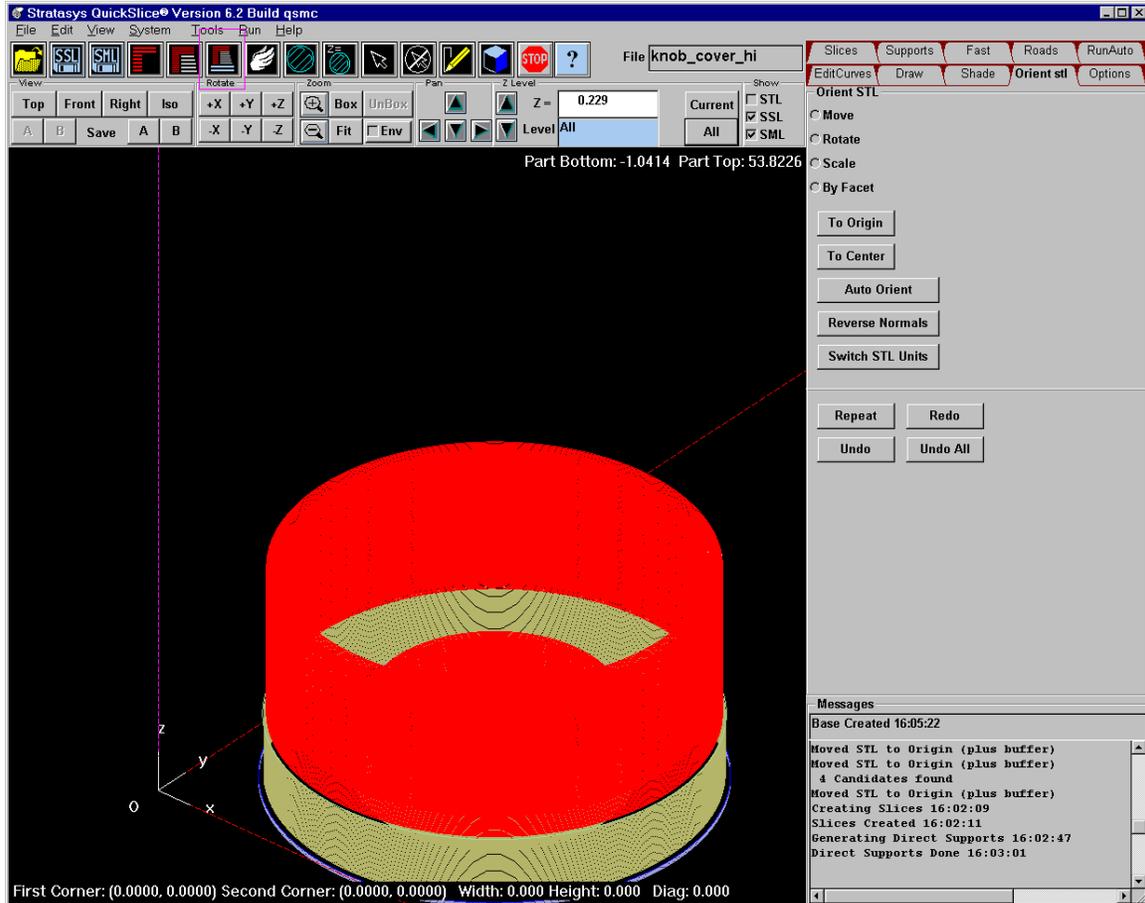


Figure 7: Base Figure.

- 12.1. Optionally, look at the “Fast” options (tab on upper right of screen). The “Fast” options build a less dense object, and can build up to 20% faster, depending on your part. Select “Fast” options, then, apply them by clicking the “Fast” icon (the wing).

13. After creating base, we will need to create roads which are the building block for the

layers. Click on the *Create Roads*  icon located at the top of screen. Text in bottom right corner will display when roads have been created.

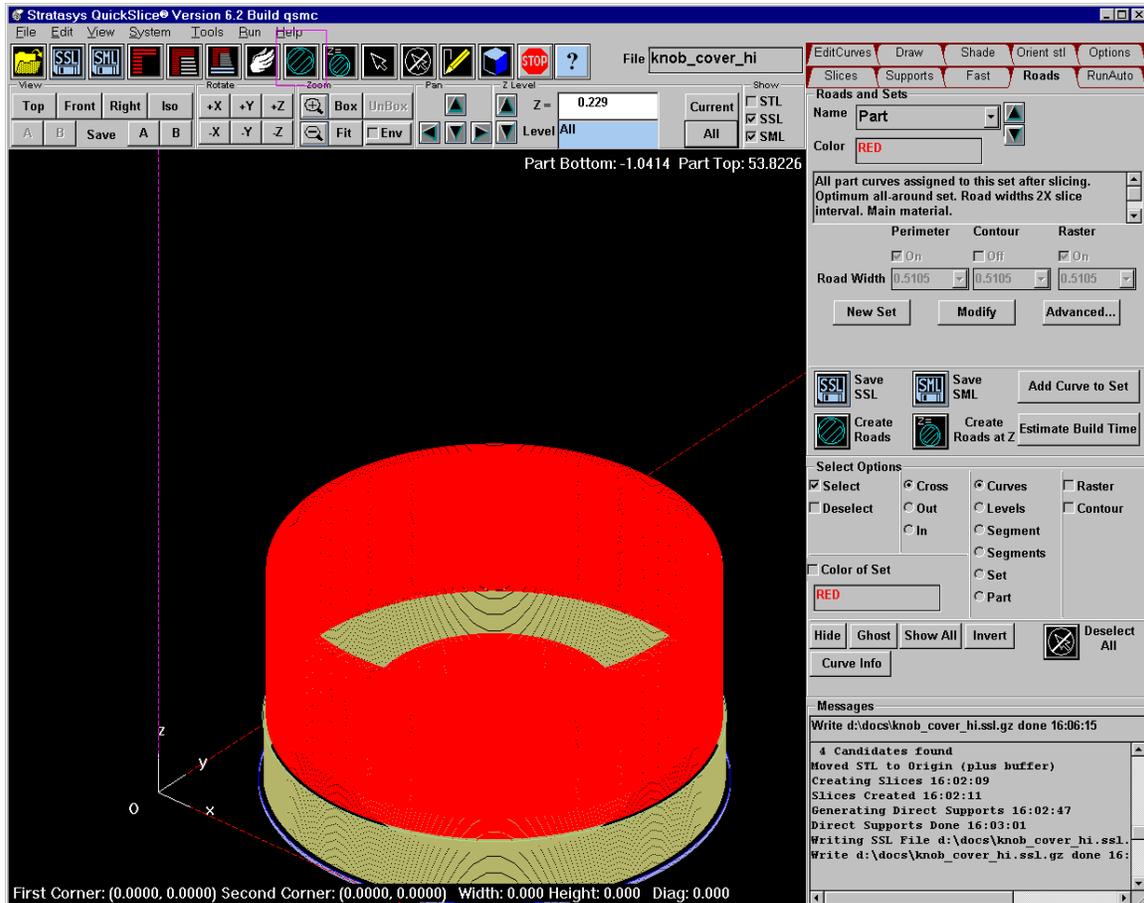


Figure 8: Roads icon shown.

14. After creating roads we will save two different versions of the file for later use. Click the **File** menu go down to **Save As SSL** this is a slice file, choose a name and your working directory to save SSL file. Next from the **File** menu click the **Save As SML** icon, this is a solid model file that will be sent to the Rapidprototyper machine, again choose a name and your working directory, the name can be the same as the SSL file name since the file extension will be different.

15. After saving SML file, bottom right hand corner will display length of time to build and amount of material used. Write down the amount of material used in Rapidprototyper log sheet as well as your name, part name, and description.

16. Sending SML file to Rapidprototyper. The bottom right hand text box will display where SML file was saved to. Remember or write down this location for later use.

17. Quit Quickslice. If you're not on the right-hand computer, copy your SML file to the right hand computer. Open the FDM Send software by double-clicking the shortcut located on desktop, or from Start→Programs→Quickslice→FDM Send
18. When FDMSend software opens, traverse the dialog box to the directory where your SML file is. (See Figure 9)

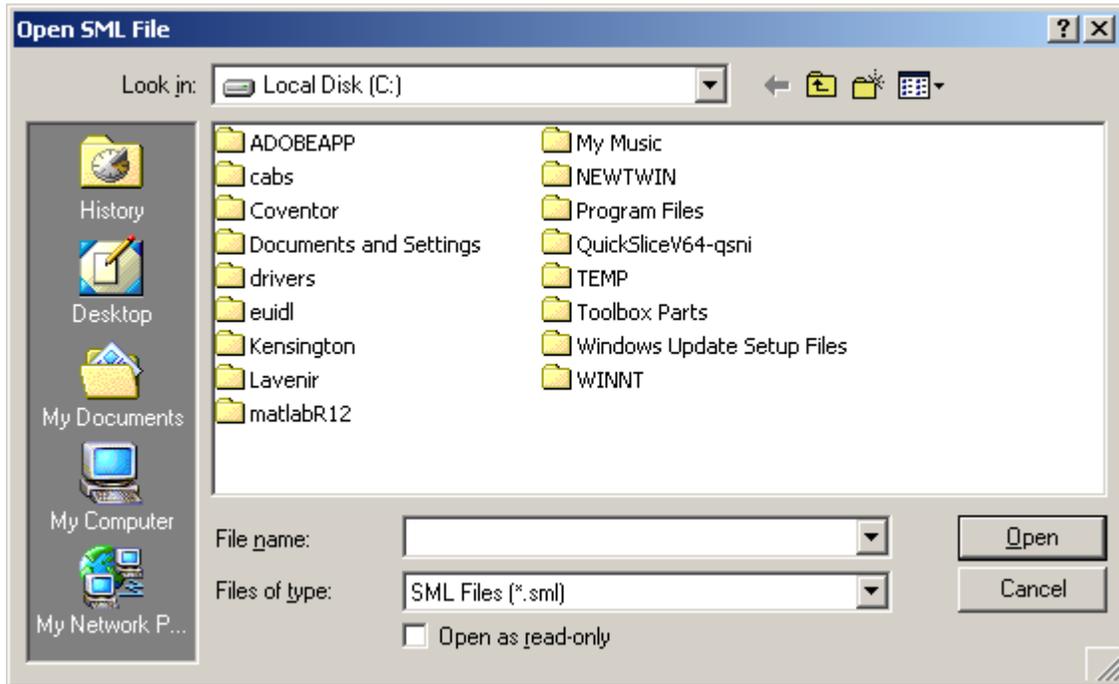


Figure 9: “Open SML” dialog for FDMSend.

19. To send SML file to Rapidprototyper:
 - 19.1 First press pause button on Rapidprototyper, light above pause button will go out.
 - 19.2 Now click “Open” for the .SML file you're going to send. Pause Light will begin flashing.
 - 19.3 Press pause button one more time and plastic dispenser will find “home” position.
- 4 When machine stops, move dispensing tip around using arrow keys on machine, see figure 10, we want to begin building on a non-used area of foam layer.
- 19.5 Press Z key to move foam pad up and down once desired location is found, arrow keys on up and down arrows will light up as shown in figure 10. The lower modeling tip must just barely be touching foam base to begin building, see figure 11.
- 19.6 Once desired location is set press pause button once more and machine will begin building part. Machine will not build part if door is not locked, keys are located in cabinet beneath Rapidprototyper.

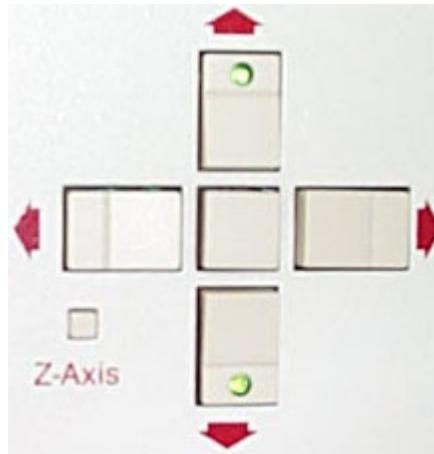


Figure 10: Arrow Keys for moving building dispenser

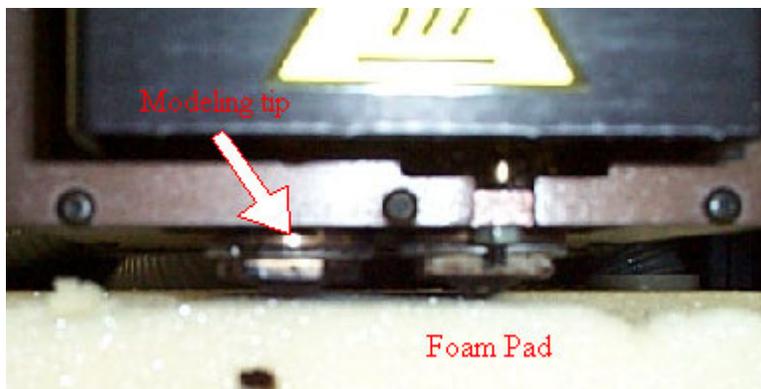


Figure 11: Placement of dispensing tip for part building.

20. DO NOT close the FDMSend program! Using CTRL-ALT-DEL click **LOCK WORKSTATION** so building will continue uninterrupted. Press **AUTO SHUTOFF** button so that machine will turn off automatically when it is finished building part.
21. Return when estimated build time is complete, retrieve part, sweep machine out using small brush located beneath Rapidprototyper, and unlock and logoff computer.

Appendix: Multiple Part Building

1A. Follow above procedure for opening and slicing STL files to step 10. Do this for each part that you want to build together.

2A. Save SSL files individually in your working directory.

3A. Open Quickslice software by double clicking Quickslice shortcut on desktop.

4A. To open one SSL file in Quickslice, you may need to select **SSL files** from **List Files of Type**, as shown below in Figure 1A, in order to see your SSL files.

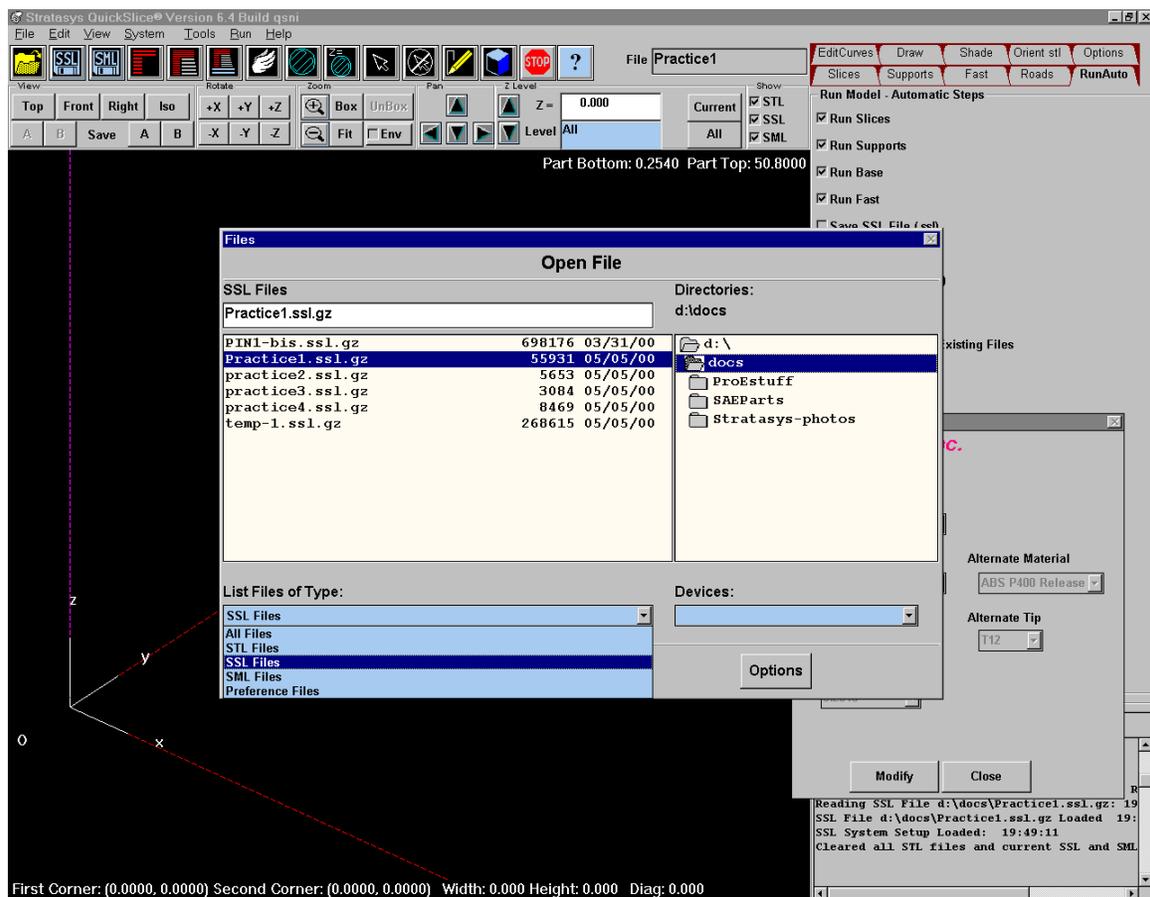


Figure 1A: List Files of Type shown as SSL files.

5A. Since new parts are opened at the origin, before opening a second part you must move the current part away from the origin to allow for space for the second part. Click the **Edit Curves** tab on top right side. Click on **Part** under the Select Options field. See figure 2A.

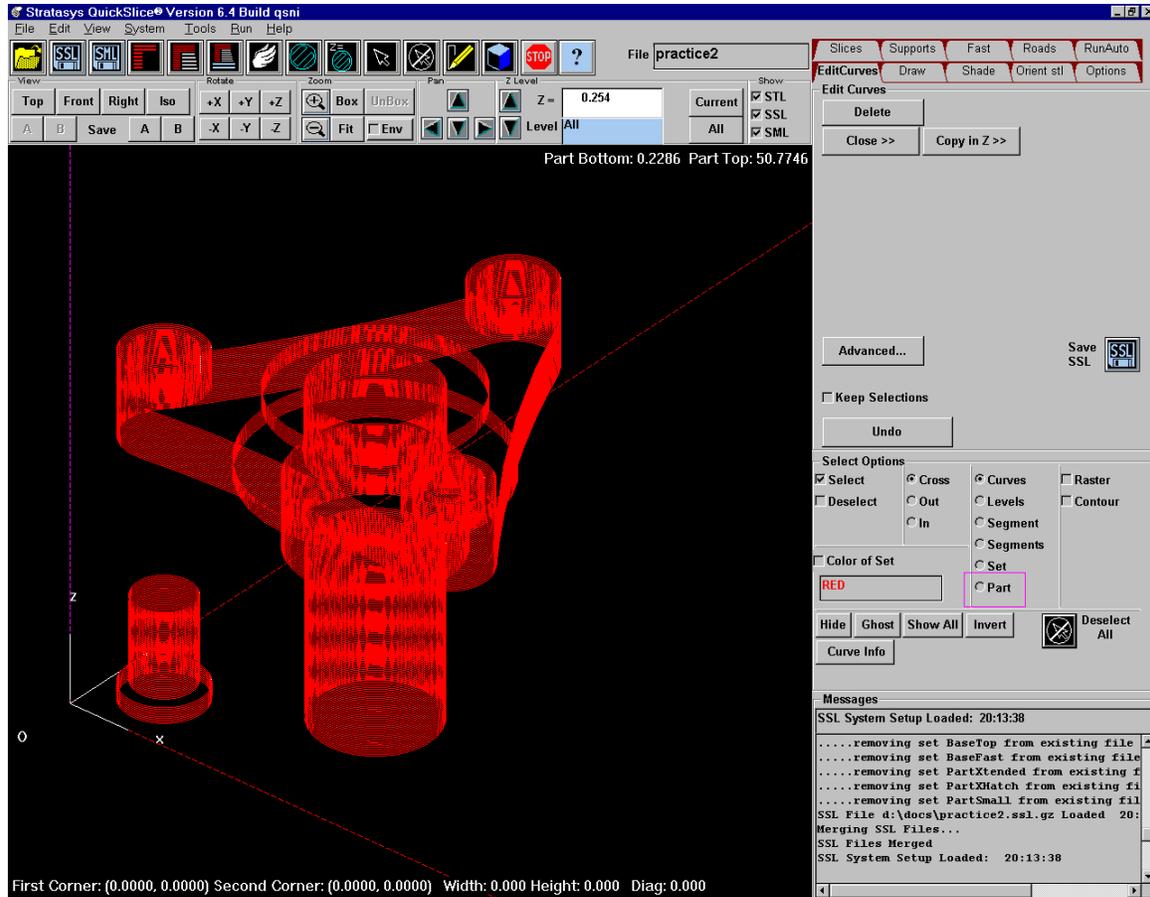


Figure 2A: Moving a part.

6A. Left mouse click anywhere on the part you wish to move, the part will turn white colored as show in Figure 3A.

7A. Click on **Advanced** button, figure 3A shows Advanced button clicked.

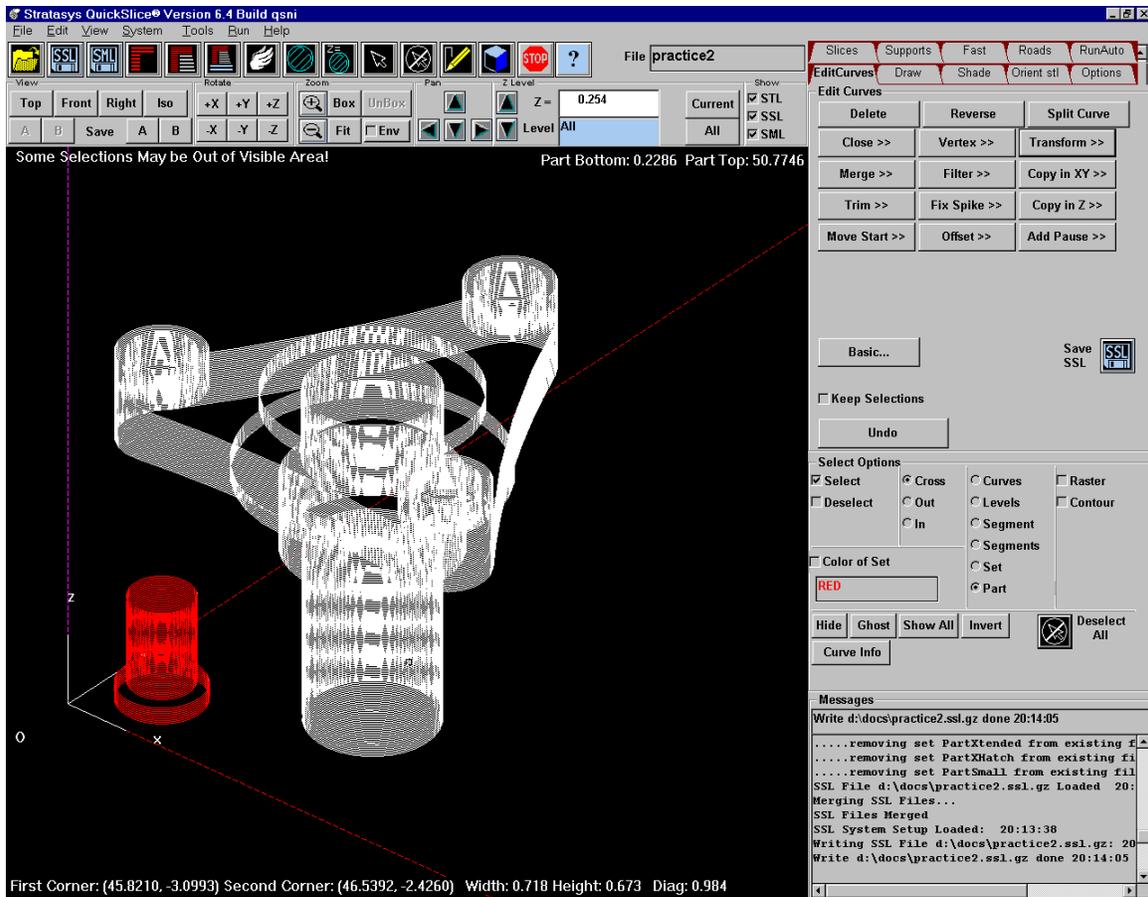


Figure 3A: Moving a part around building area.

8A. Click on **Transform>>**.

9A. Click on **Move in XY**, a new menu will appear choose a **dx** coordinate and a **dy** coordinate from the drop down coordinate. Click **OK** and the white highlighted part will move that distance.

10A. To open second SSL file go to **File** menu, **Open**, then click SSL, shown below in figure 4A. Do not close first SSL file.

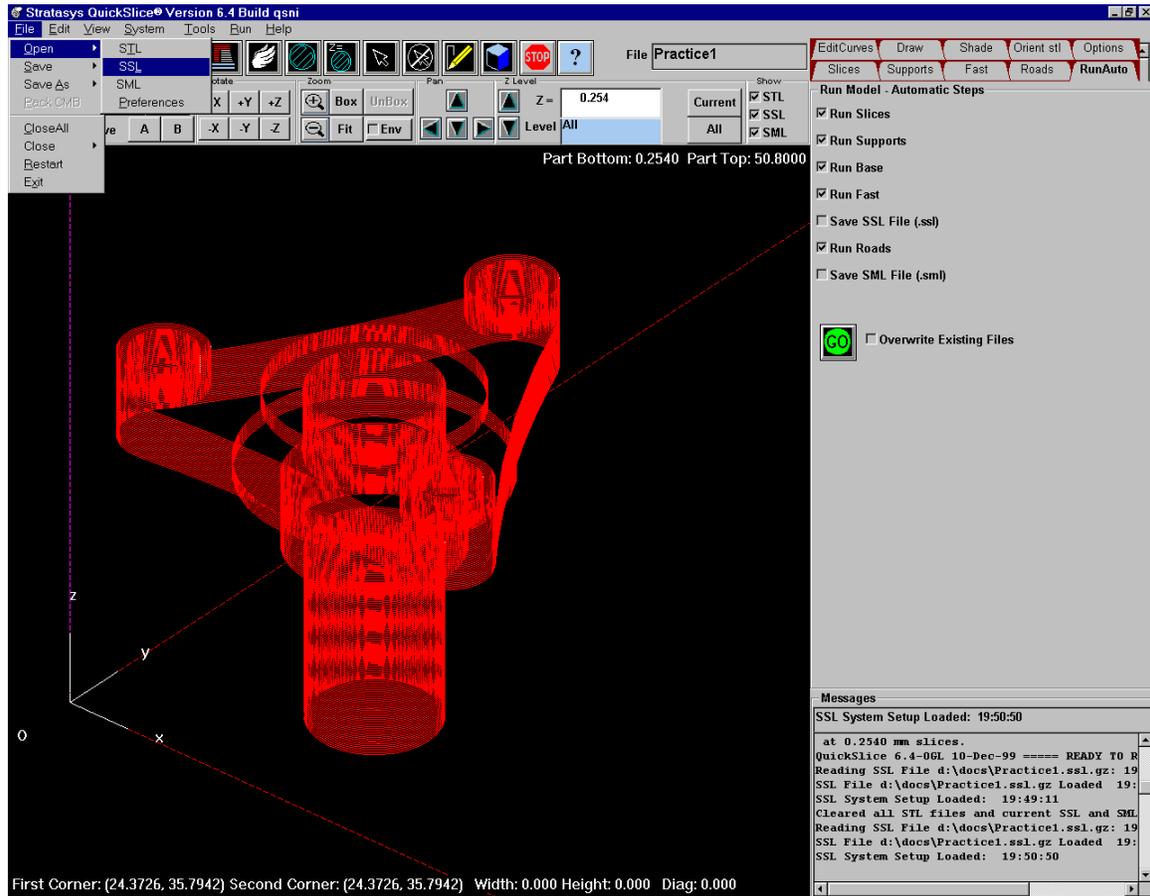


Figure 4A: Opening second SSL file.

11A. A new window will appear to choose the second SSL file, click on **Options** button first to choose a special option, see figure 5A.

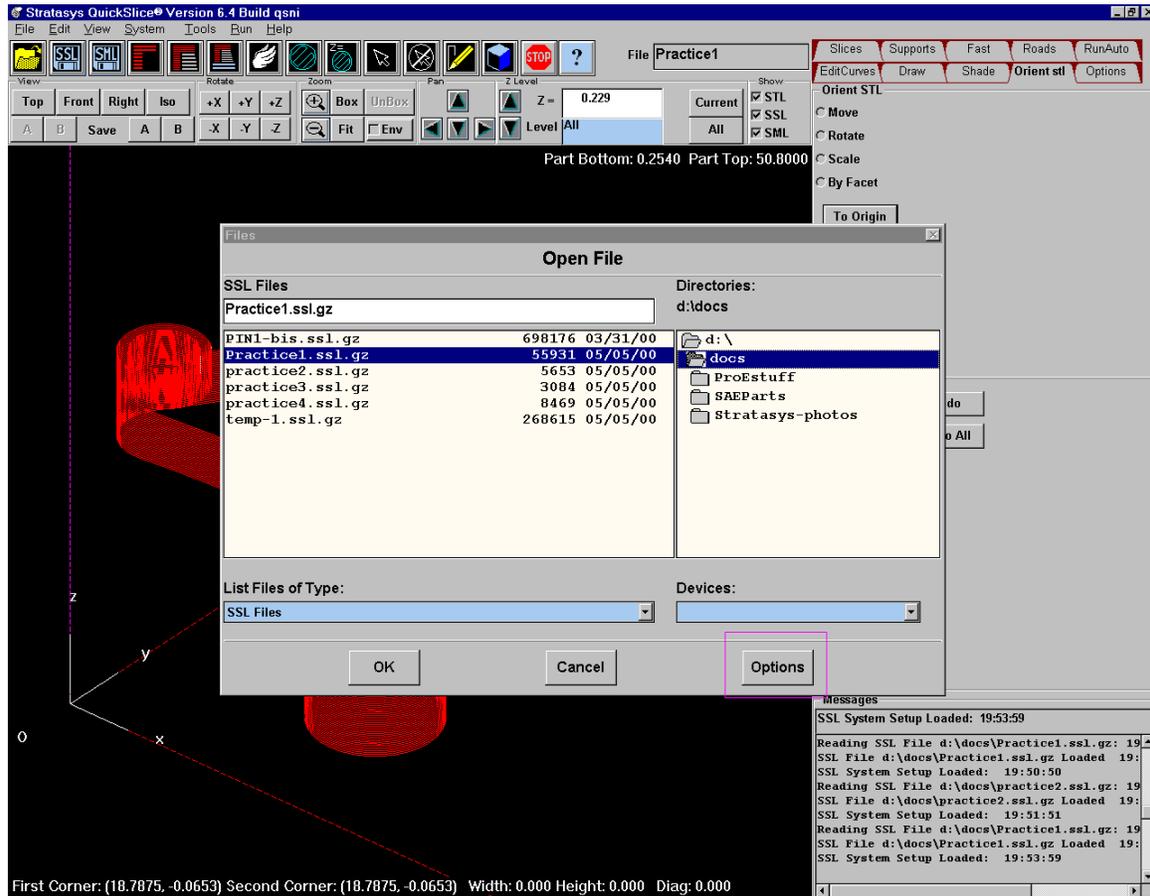


Figure 5A: Click Options Button.

12A. A new menu will appear, uncheck **Remove Existing Curves**, this will allow this new slice file to be opened without closing the old SSL file. You will now have two SSL files open, see figure 6A.

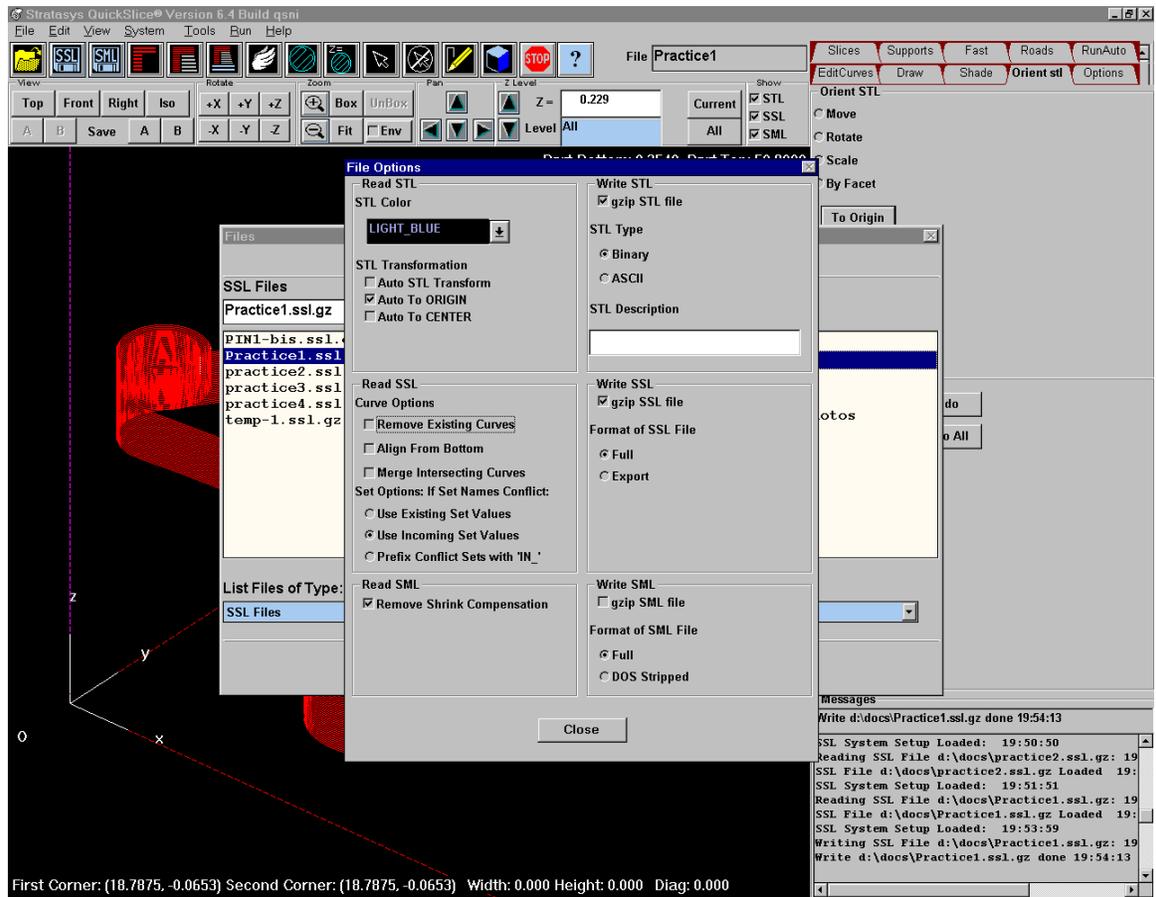


Figure 6A: Unchecking Remove Existing Curves button.

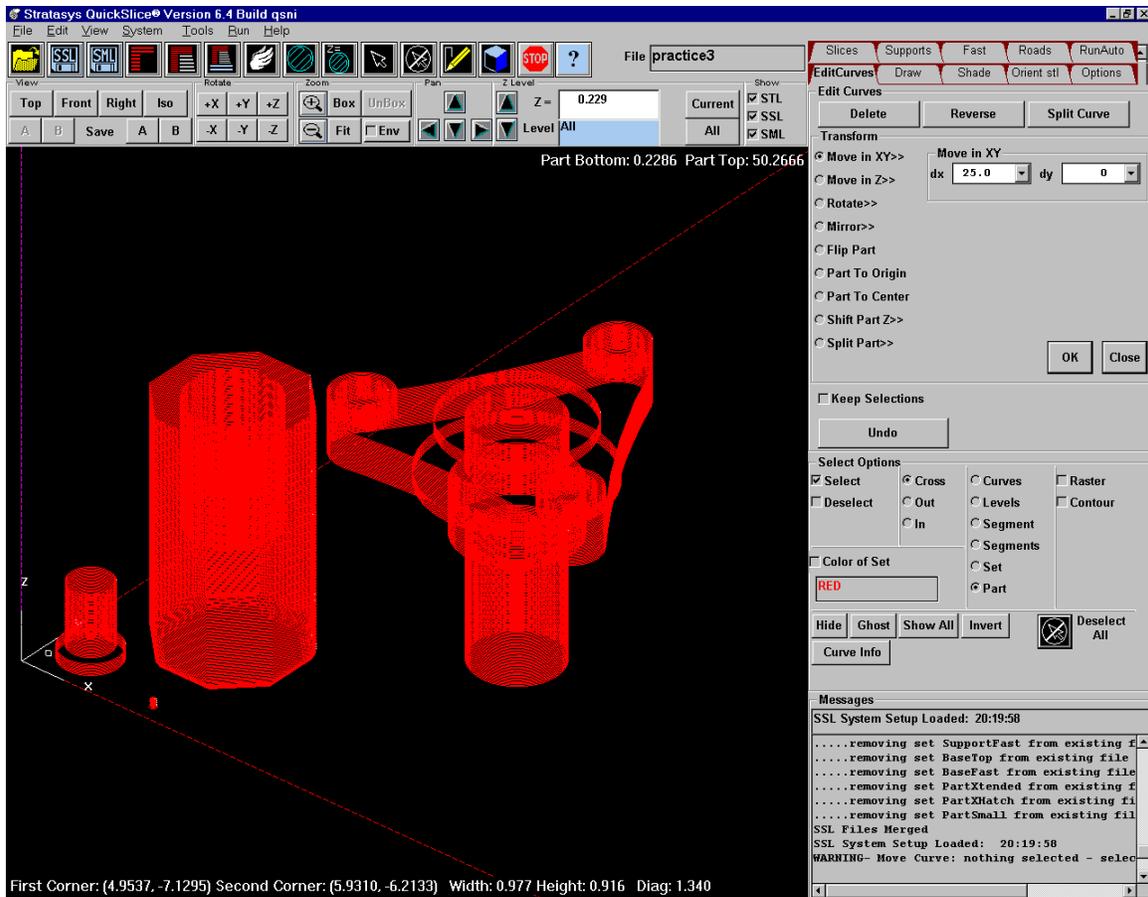


Figure 7A: Four parts shown open.

13A. Before opening a new part always move the current part away from the origin. Once you have opened the number of parts that you want to build, continue with instructions for building supports, bases, and roads. You can save a new SSL file containing the combined parts if you wish.