Using the Sketch Box to build a Model

The Sketch Box is a new tool that allows you to easily create your model using images from your digital camera images as your guide.

In order to use the Sketch Box feature in STAR 6, you will need to take digital pictures of your model. You should take a picture of each side, these pictures should be centered, and also taken so that camera is perpendicular to each side of the model.

The file format must be jpeg format and you should use a graphics package such as Microsoft Paint, PaintShop Pro, or PhotoShop to crop and/or resize your images so, that the scaling is kept the same between all sides.

In order to use the Sketch Box:

1) Create a New Project, click Project menu and then New.
2) Click the Create New Folder to create a Sub-directory to store all the project files plus the JPEG files to be used by the Sketch Box. Rename the New Folder to be your new project name, then double click on the newly created folder, this will move you into the new directory.
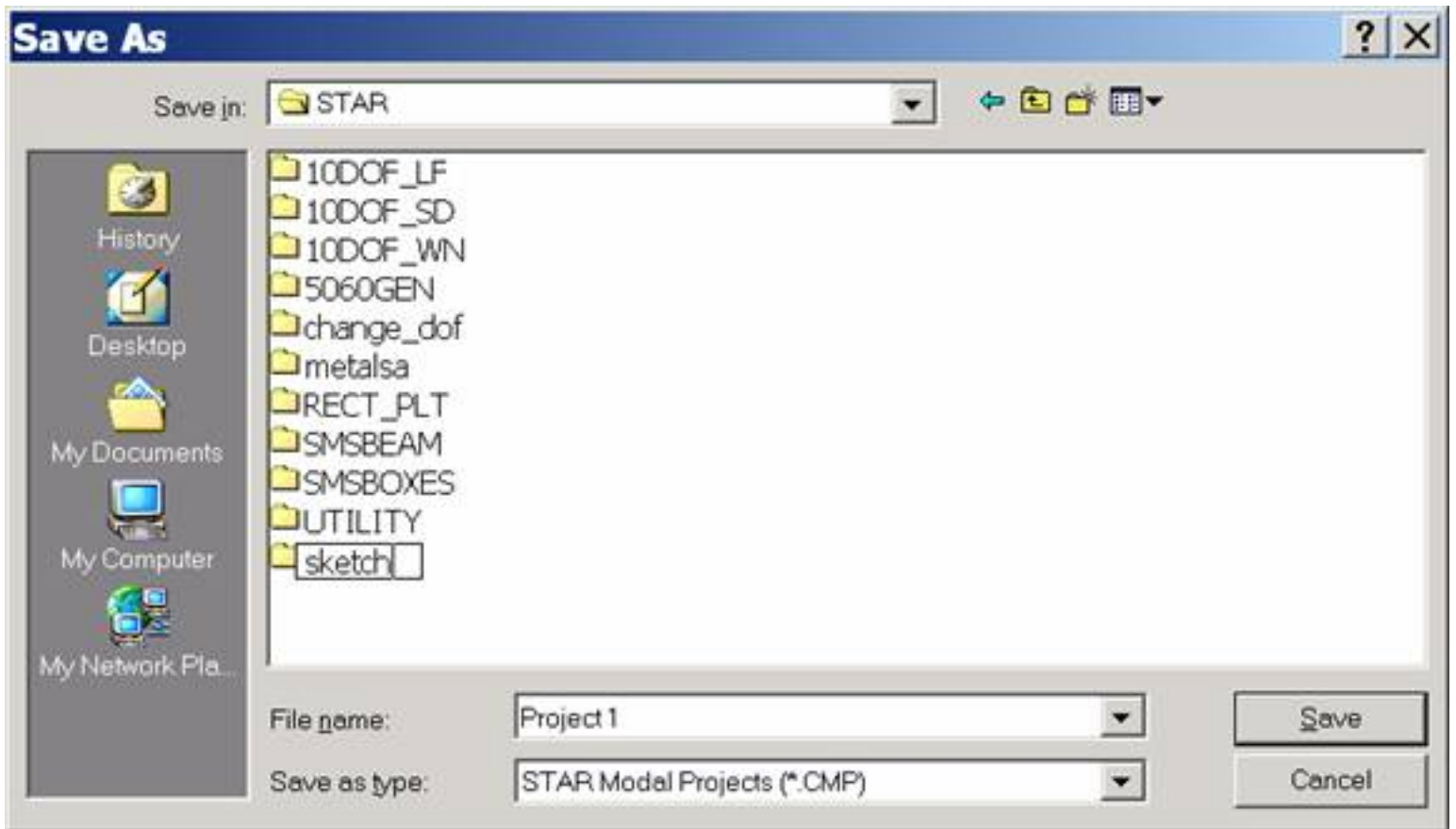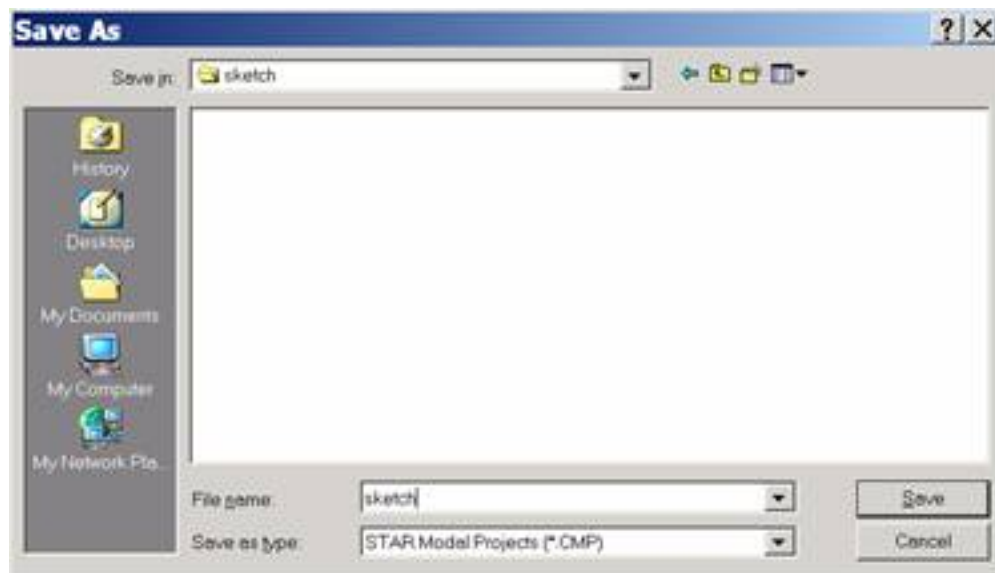
Figure 1

Figure 2

Now, edit File Name so that both the Folder name and project name are both the same. Then, click Save. At this point all of the project files will

be created.

3) For simplicities sake, delete Front, Top and Side Model Views. You can do this by clicking on Front Model View and then clicking on the second icon (Delete View) from the top of the left most Vertical toolbar. This will delete the Front Model View. Repeat the process for the Top and Side Views, leaving only the Perspective Model View. See Figures 3 and 5.
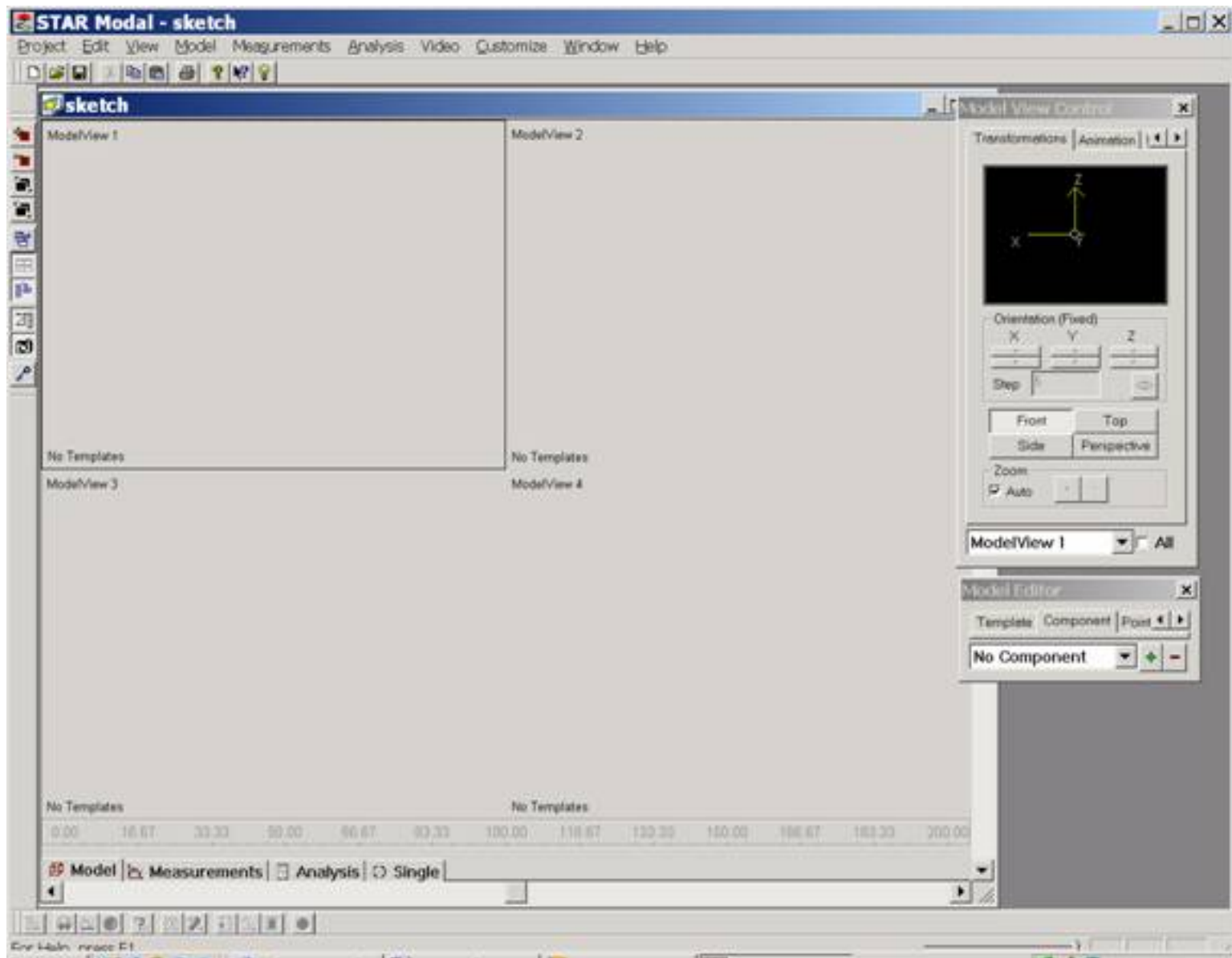

Figure 3

Once, you delete the Front, Top and Side views, click in the Perspective

view and also note that it is called ModelView4. In the Model View Control use the Right arrow to scroll to the Sketch Box tab. The Model View Control will appear as below:
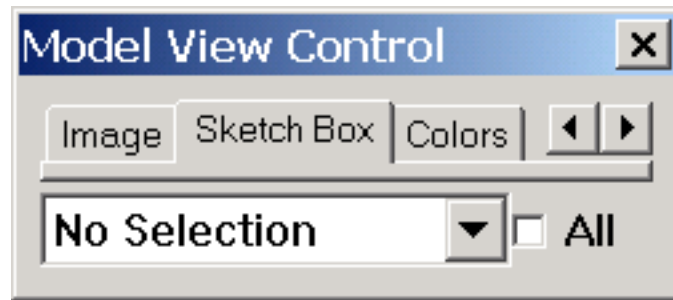
Figure 4

4) Click the down arrow in the drop down list and select ModelView 4. Once, this occurs the Model View Control dialog will be enabled, see Figures 5 and 6.
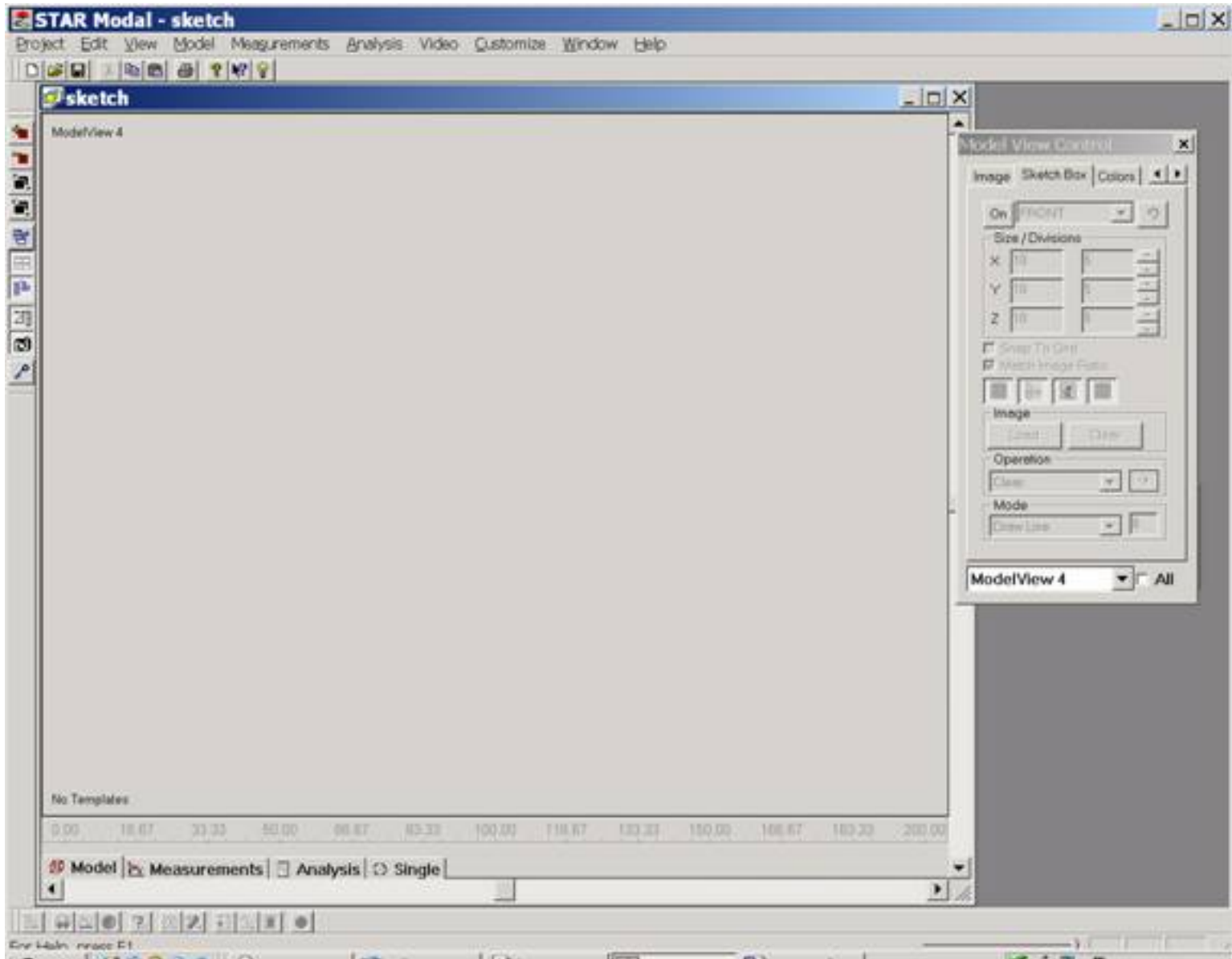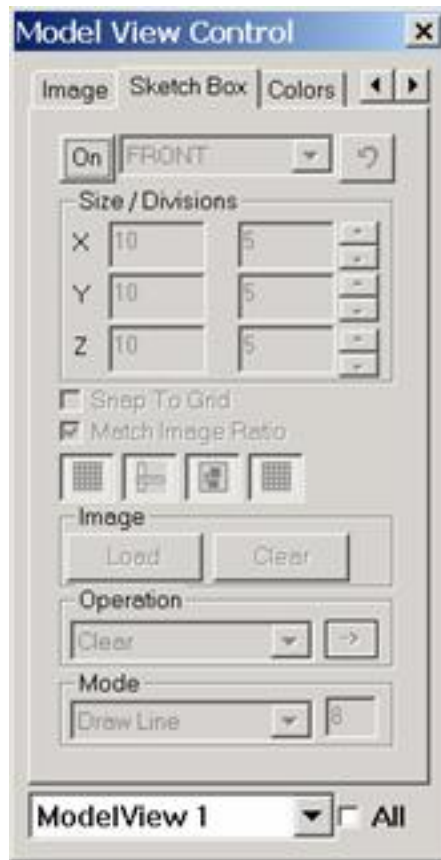
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Figure 5

Figure 6

Operation of the Sketch Box

Click the On button (upper left Sketch Box tab) this enables the Sketch Box as shown in Figure 7.
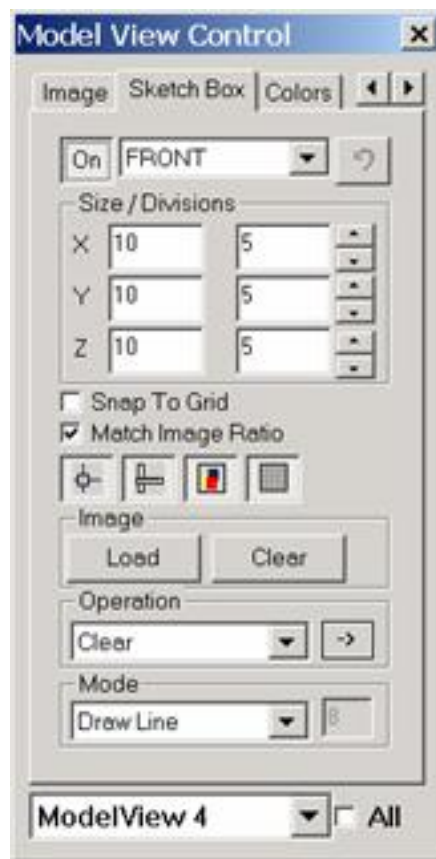
Figure 7

Side Selection

To the right of the On button is the Side selection drop down list, choose either the Front, Back, Top, Bottom, Left, or Right. These are the faces where you will be doing the drawing.

The ALL selection will display the entire model and is only used for display purposes. (You cannot use any of the Drawing Modes or Operations when displaying using ALL.)

Undo

To the right of the Side selection is the Undo button. This will allow you to Undo each step in the Sketch Box, starting with the most recent all the way back to the very first mouse click.

The Undo does not work for the Add to Model or Clear.
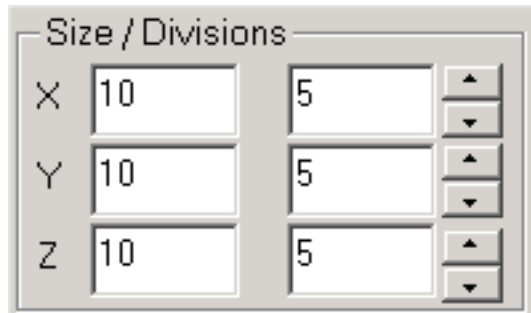
The Size/Divisions sets the physical dimensions of the model in either inches (English units) or centimeters (Metric units). The values can be set automatically when importing JPEG images with Match Image Ratio enabled, or manually by simply editing the Size field. Once, these values are set and the drawing process has begun, "DO NOT CHANGE THESE VALUES".

When specifying the number of Division you are actually setting the number of grid points within a particular plane, XY, YZ or XZ. So, if using the default of 5 Divisions, you will see 5 grid points within the original 10 by 10 grid outline. This means that there will be 49 potential measurement points on each face.

The number of grid points for the example below will be, one point at each edge – Right and Left, plus the 5 Division selected from above, totaling 7, horizontally and then the same applies to the Vertical axis, totaling 49 grid points. So, for the entire model, there would be 294 points.
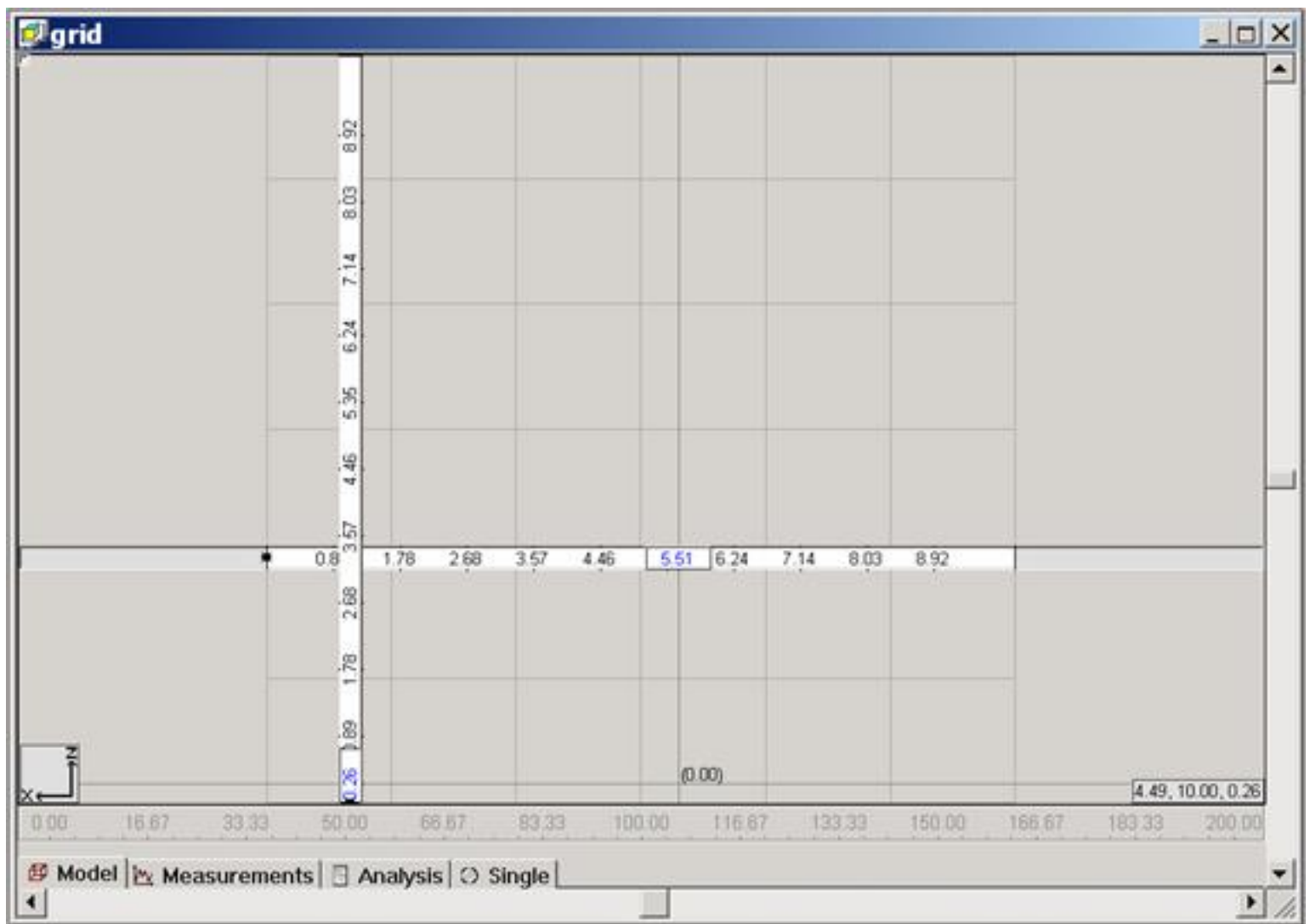
Figure 8

If each of the 294 grid point were used, it will require a measurement or a constraint in order to display motion at that location. Let's keep the models simple but, also with enough points to make the test and the results meaningful.

Figure 9

The "Snap to Grid" feature will cause a drawn point to be moved to the nearest grid point. The Snap to Grid is checked to enable and uncheck to disable. The Snap to Grid, can also be used in conjunction with the Match Image Ratio.

The "Match Image Ratio" if checked, sets the Size in the Size/Divisions by using the information embedded in the JPEG images. The grid dimensions can easily be set using only two sides, Front/Right or Left or Back/Right or Left. Once, these are set "DO NOT CHANGE THEM".

If the "Match Image Ratio" is unchecked then, the Size/Division must be set manually.

There are four buttons, displayed above, Show/Hide Guides, Show/Hide Rulers, Show/Hide Images, and Show/Hide Grid. In Figure 9, all the buttons are depressed which is the Show position. In Figure 10, all the buttons are disabled, which hides Guides, Rulers, Images and the Grid.

Figure 10

Show/Hide Guide: The Guides appear as cross hairs that display the horizontal and vertical positions of the cursor on the grid. There is a small box that is overlayed on each of the rulers displaying the cursors exact location.

Once, a lines has begun to be drawn, an angle in degrees is displayed representing the angle between the last point clicked and the present position of the mouse.

Show/Hide Ruler: The rulers lengths are derived from the Size/Divisions. The Horizontal and Vertical Rulers can be either hidden or displayed.

The rulers can be repositioned anywhere on the grid. To change the location of the Rulers slide the cursor over the ruler, you wish to move then, when the cursor changes from an Arrow to a double ended Arrow, hold the left mouse button down and slide the ruler either up/down or to the right/left to its' new home.

Show/Hide Image: Show or Hide the images that are used to create the model. Choosing to Hide Images will hide the images for all sides.

Show/Hide Grids: The Grids can be enabled/displayed or disabled/hidden. In the lower left corner of the display, shows the plane in which you are drawing.

Import Images

The Load button, allows you to assign a JPEG files to the side shown in the Side Selection   Use the Open dialog to find the appropriate jpg file. (All JPEG files should be located in the Project directory.)

The Clear button clears the entire Sketch Box, loaded images and any and all drawn lines. You should make absolutely sure that you really want to use Clear, because the Undo feature will not Undo a Clear.

Sketch Box Operations

The Sketch Box has a number of functions that can be selected: Add to

Model, Clear, Merge Points, Mirror, Stretch, Move To, and Move By. Select the Operation by clicking the down arrow to shown the list and then highlight your selection. These are all operations that are for use with the Draw Line mode.
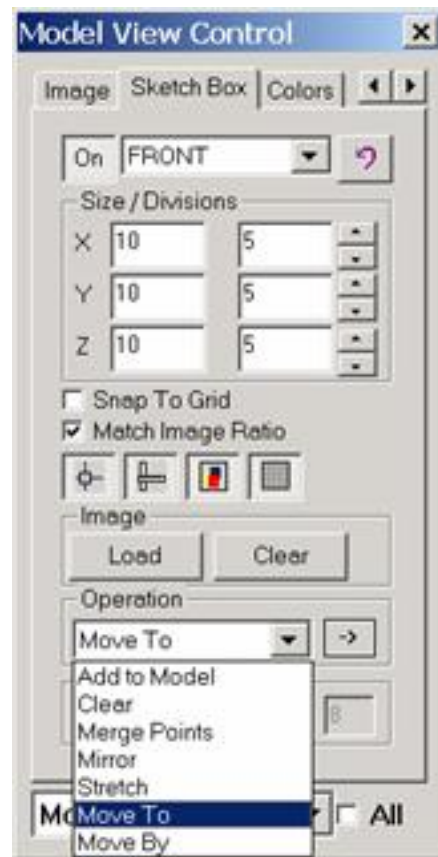
Figure 11

Add to Model: When the drawing process is complete, select Add to Model and then click the → Execute button. This creates a Template, Points, Lines, and a Component automatically. Use the Add to Model only when you are completely satisfied that the model is correct. Once, this is done the Undo feature will no longer work for the model.

Also, once the Add to Model operation is executed the Sketch Box is closed. To continue using the Sketch Box you will need to enable it again.

Clear: Clear will erase all work done in the Sketch Box. You will be

prompted to continue with a Yes or No.

Merge Points: This operation has two functions:

1) Merge two points that have the same X, Y and Z values.
2) Merge two points that have the similar X, Y and Z values.

When selecting the Merge Point function and clicking the Execute button you will be prompted to specify a range such as 0.5. When clicking OK, the merge function will look for points within 0.5 (project slate units) of the selected point and then merge them into a single point.

For example: Define a square: pt 1 = 0,0,0 pt 2 = 1,0,0 pt = 3 1,1,0 and pt = 4 0,1,0. To draw the square, we draw lines from 1 to 2, 2 to 3, 3 to 4 and from 4 to 1. Using this example, we will have two points at pt 1, one point is where we started and the other is to complete the square. The Merge Points allow you merge the two points to a single point.

Mirror: The Mirror function will create a Mirror image of the side that is currently being displayed. Note: The Mirror operation does not show up in the Sketch Box so, listed below is an example of how to utilize the Mirror function.

Example: Create a Triangle on the Front side, click the Add to Model operation and then click Execute. This creates a Template, Points, Lines and Component for the Triangle displayed on the Front side. (You can verify this by going to the Model menu, and click Setup. Check the Template, Points, Lines, and Components) Next, go back to the Sketch Box and turn it On, display the Front Side, next click the Mirror operation, and then click Execute. This will create an unseen triangle for the Back side. Now, select the Add to Model operation and then again click the Execute button. When executing the Add to Model operation, this actually closes the Sketch Box and goes to the Model View and displays the

currently created models. You should see two identical triangles displayed in the XZ plane as shown in Figure 12.
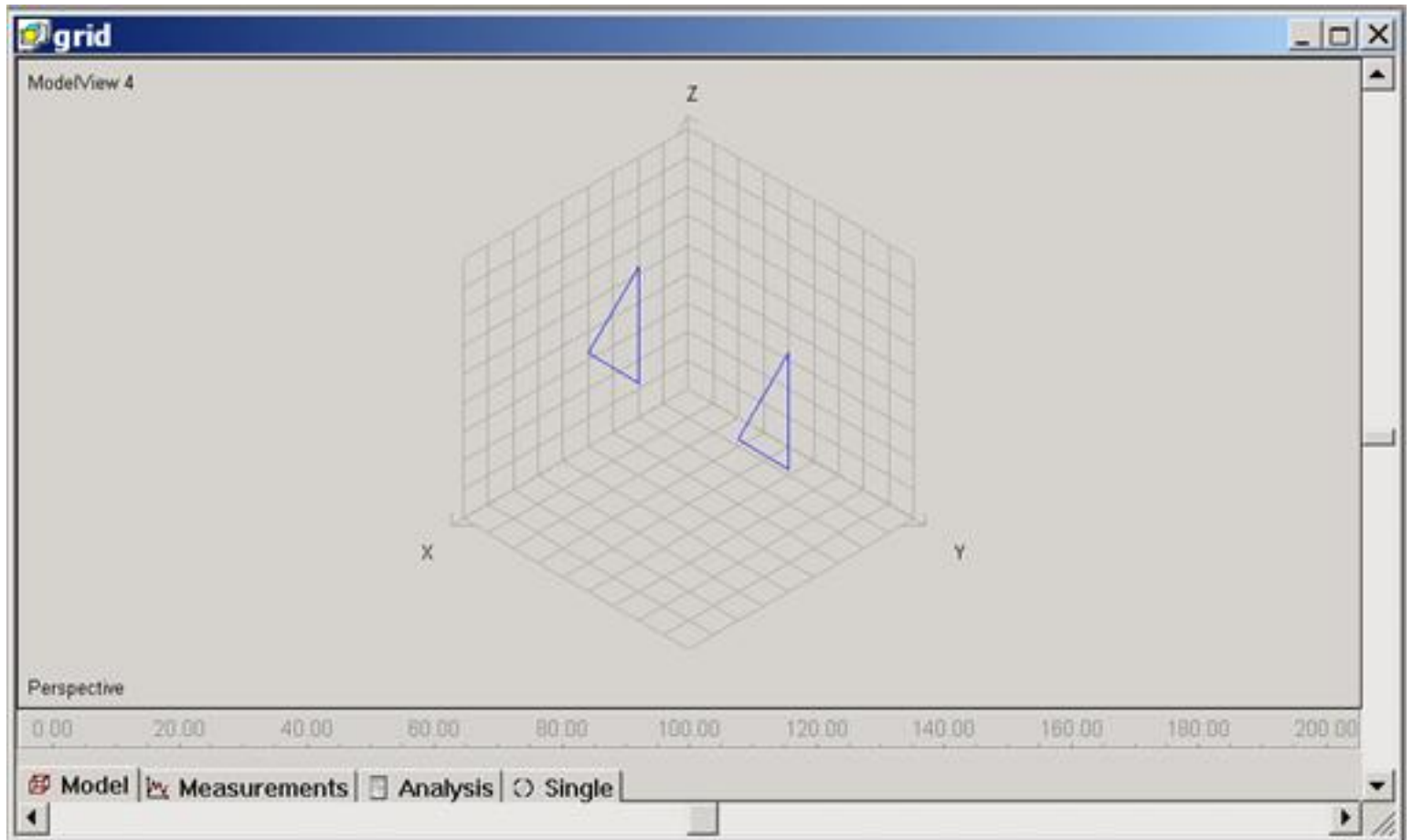
Figure 12

Stretch: If the sides such as Right and Left or Front and Back have the same X, Y, and Z dimensions, you can use Stretch to create the alternate side without having to draw it.

In the example below: Load an image for the Front and Right sides, this will set the Size/Divisions for the model grid. Next, choose the side you want to be stretched. In this case, we will use the Right side, because it has a more interesting shape. Make sure that the Right side image is being displayed and not hidden. Using your mouse outline the Right side (computer case) as shown in the Figure 13 below.
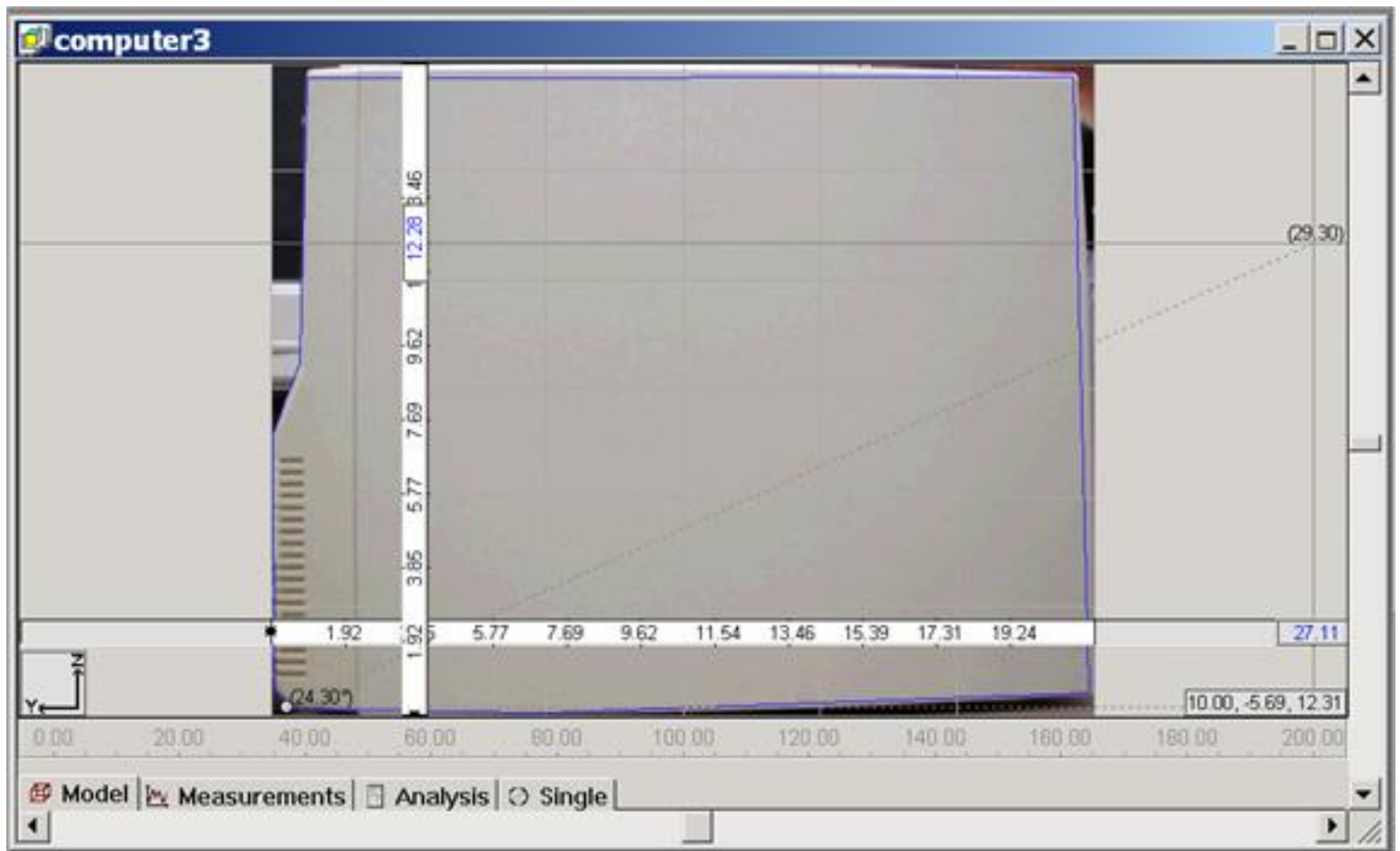
Figure 13

Before, performing the Stretch operation, go back to the Front side and find the position of the right side on the horizontal ruler. In the Figure 14 below that the Right side is located at 10 and the Left side is at 0.
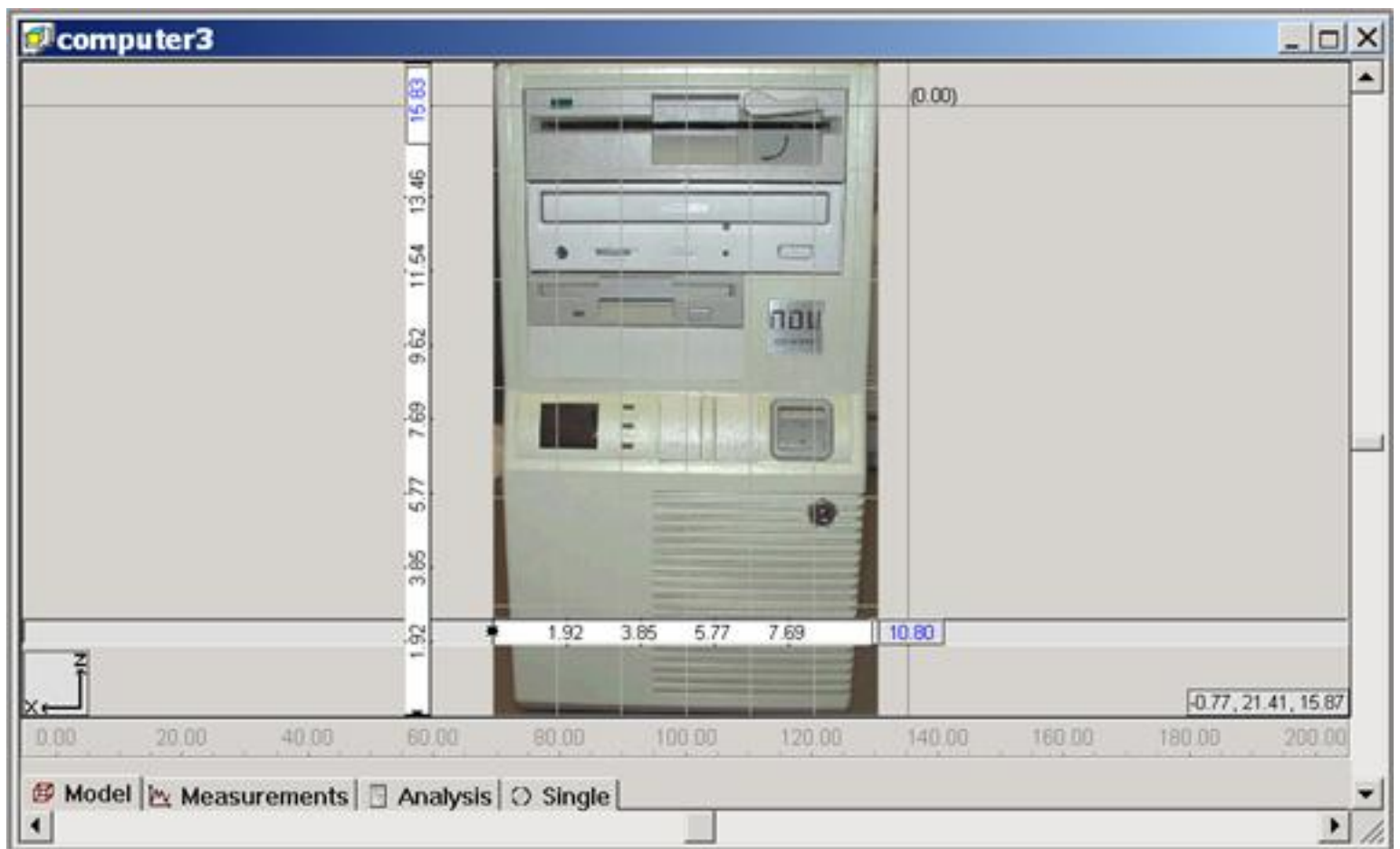
Figure 14

Now, choose the Stretch operation and click the Execute button. You will be prompted to set a value for "Stretch To". The Right side has set a From value = 10, the Left To is set to a value = 0 and then click OK to continue.

Next, we are prompted for the number of Divisions to be set within the stretched side. Since, in this case we will not be measuring any points within the computer case, set the number of Divisions = 0. See Figure 15 below.

Figure 16

Move By: This operation is used to move a completed side into or out of the defined grid by a specified amount. The Move By action is made perpendicular to the displayed plane. If the side being displayed is the XY plane then, the Move By would move the object in/out in the Z direction.

Example: Draw a square, then choose the Move By operation, next click the execute button and you will be prompted for a distance, enter "-2.0" and click OK. Next, to view the results of the Move By, go to Sketch Box Side selection and choose ALL. You will notice that the square has moved inside the defined grid. See Figure 16 below.
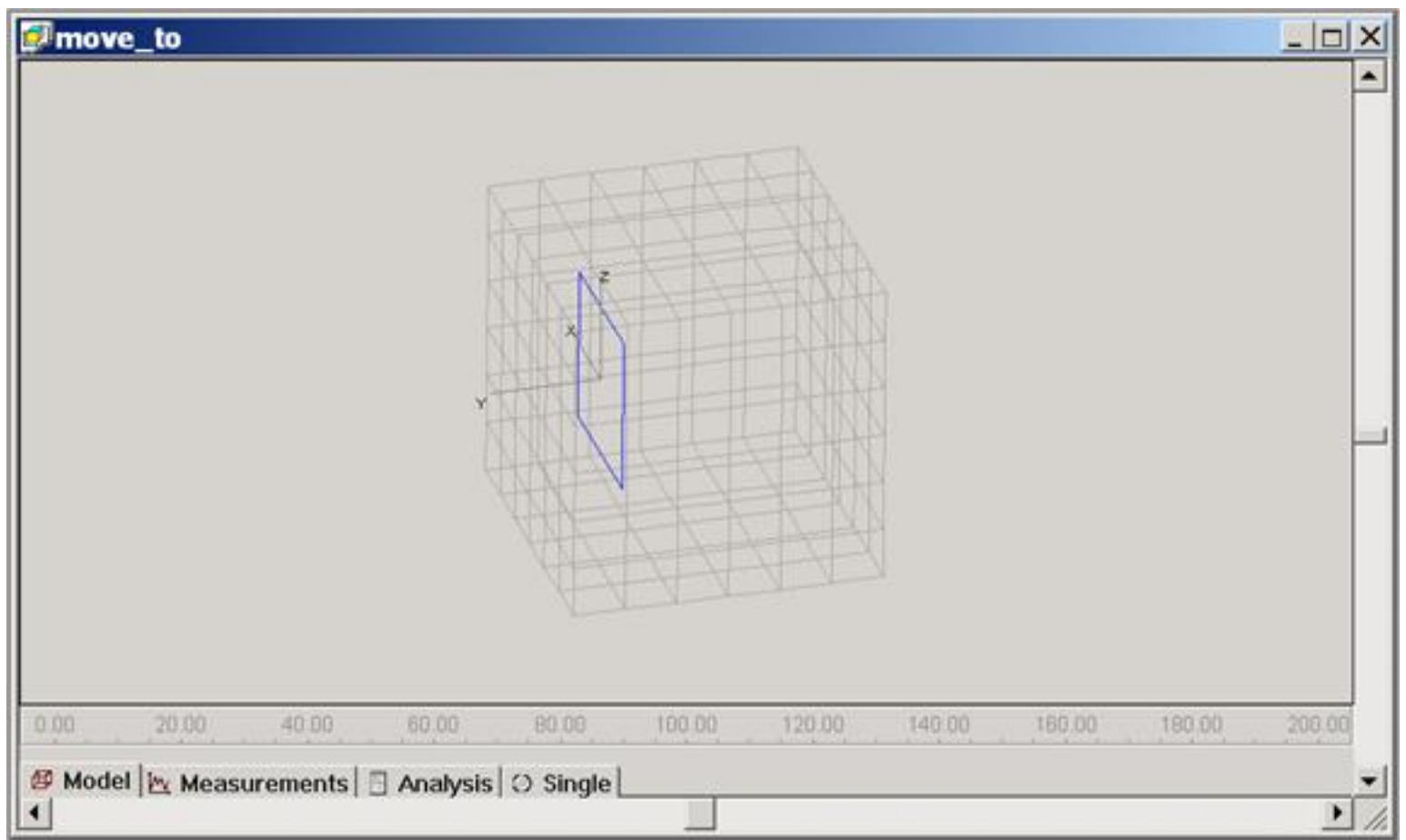
Figure 16

Use positive values to move outside the defined grid or negative values to got into the grid and then click OK.

Note: Check the Rulers to see whether +5 or -5 moves, the side into or out of the grid. If the model is built on the grid of 0 to 10 then, if the Left side is 0 and then the Right side would be 10. So, to move the Right side into the Model you would need to move by -5. Alternately, if you were moving the Left side into the grid then you would move by +5.
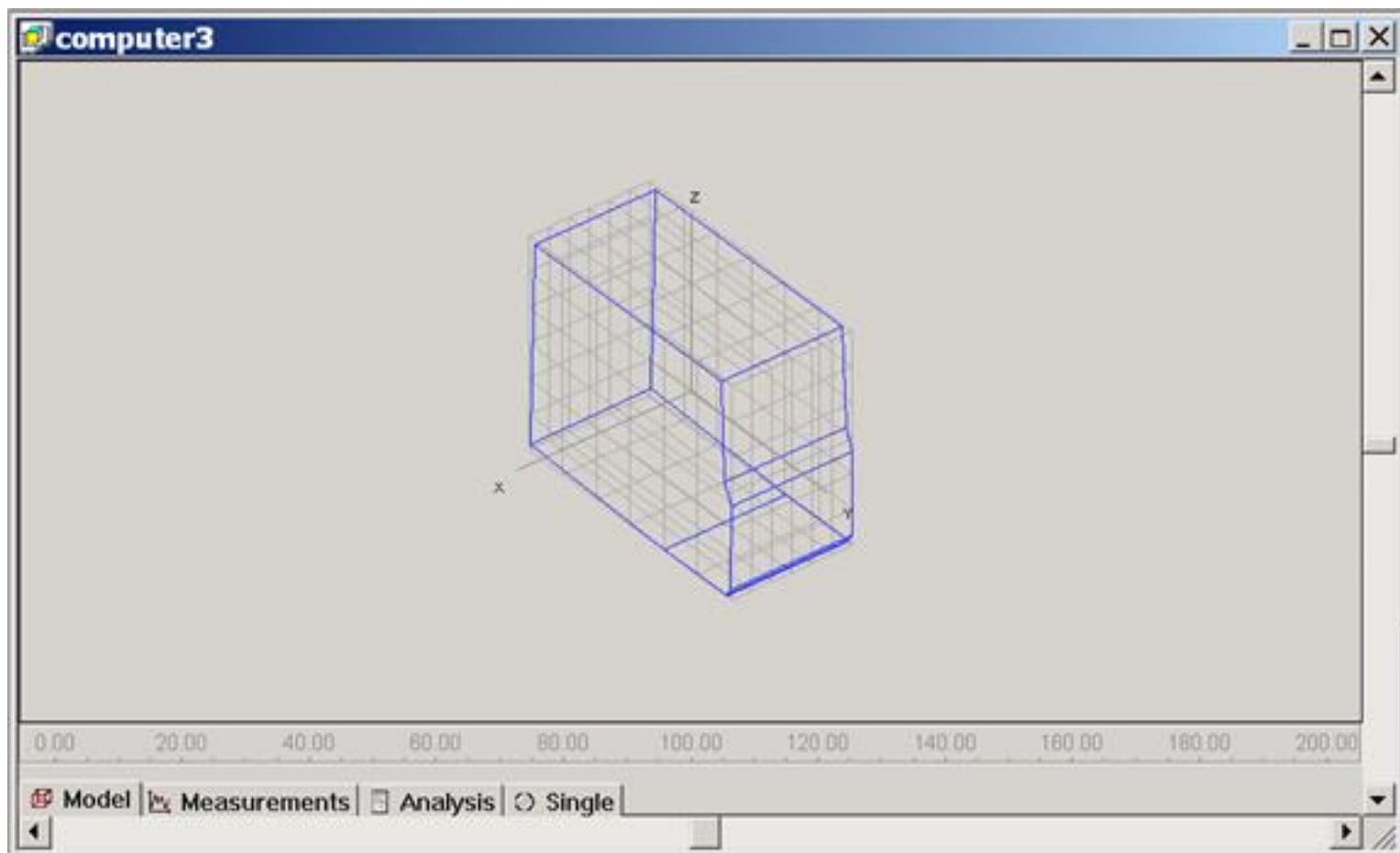
Move To: This operation is used to move a completed side into or out of the defined grid to a specified location. The Move To action is made perpendicular to the displayed plane. If the side being displayed is the XY plane then, the Move By would move the object in/out in the Z direction.

In the previous example the square is drawn, on the Front side and the

Grid dimensions are 10 by 10 by 10 see Figure 17 below. Also, the Front side is located at 0 and the Back would be at 10.
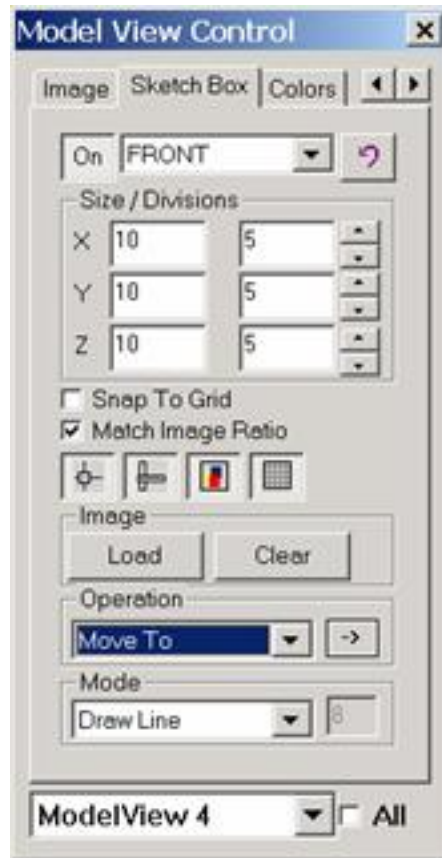
Figure 17

So, using the Move To operation to move the Front side to +5, will move it along the Y axis, to a ruler location of 5 (the center of the grid). See Figure 18 below.
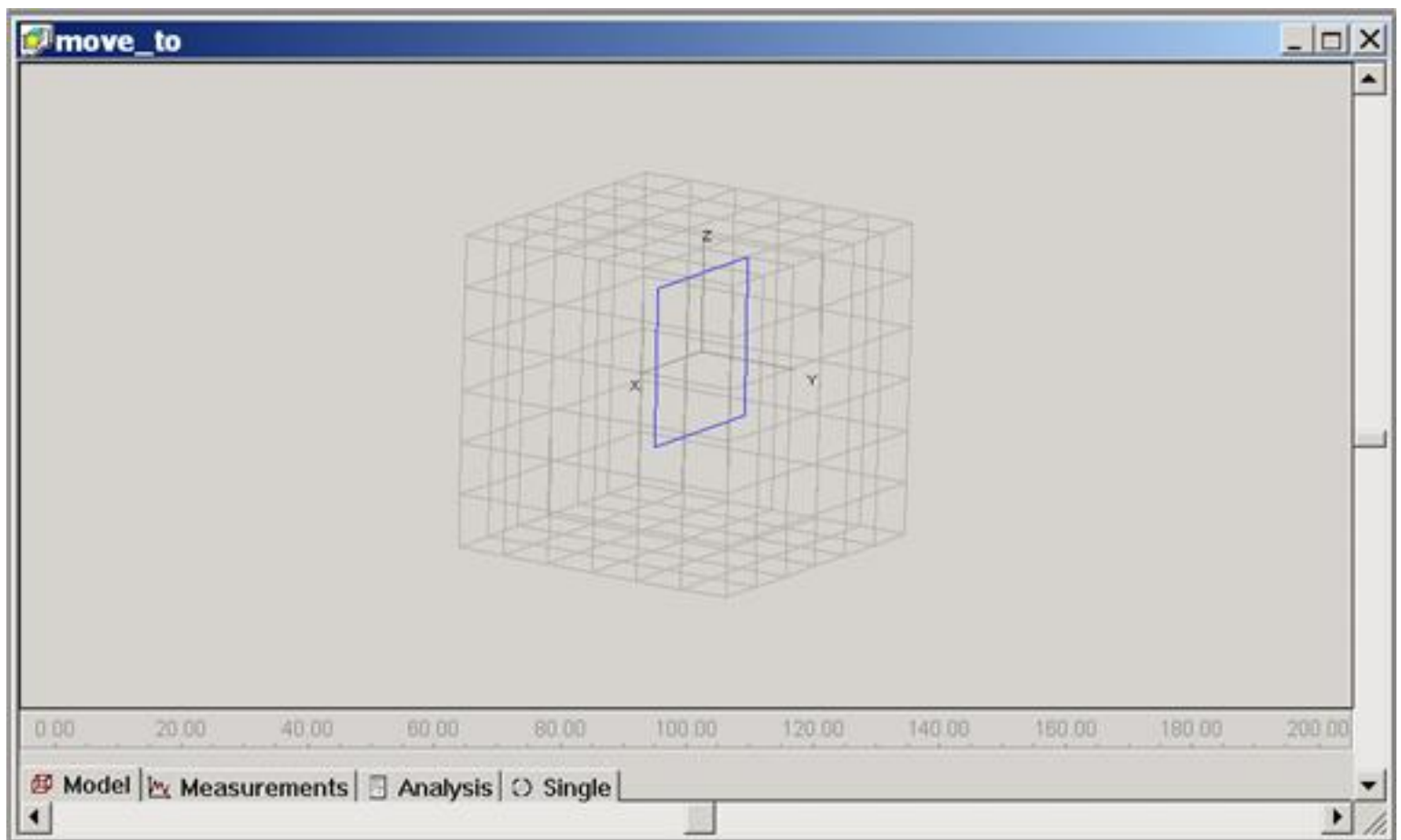
Figure 18

Sketch Box Modes

Draw Lines: Set Mode to Draw Lines so, that each left mouse click will draw a line between the last left mouse click to the current location of the mouse.

Also, Operations such as Add to Model, Clear, Merge Points, Mirror, Move To, Move By, and Stretch are used in conjunction with Draw Line.

Draw Polygon: Enables the creation of a Polygon, select Draw Polygon, specify the number of sides, move the cursor into the Sketch Box side and position the cursor where you want the center of the Polygon, click the left mouse button and hold, move the cursor in any direction away from the

center and you will see an expanding polygon. As shown in Figure 19 below.
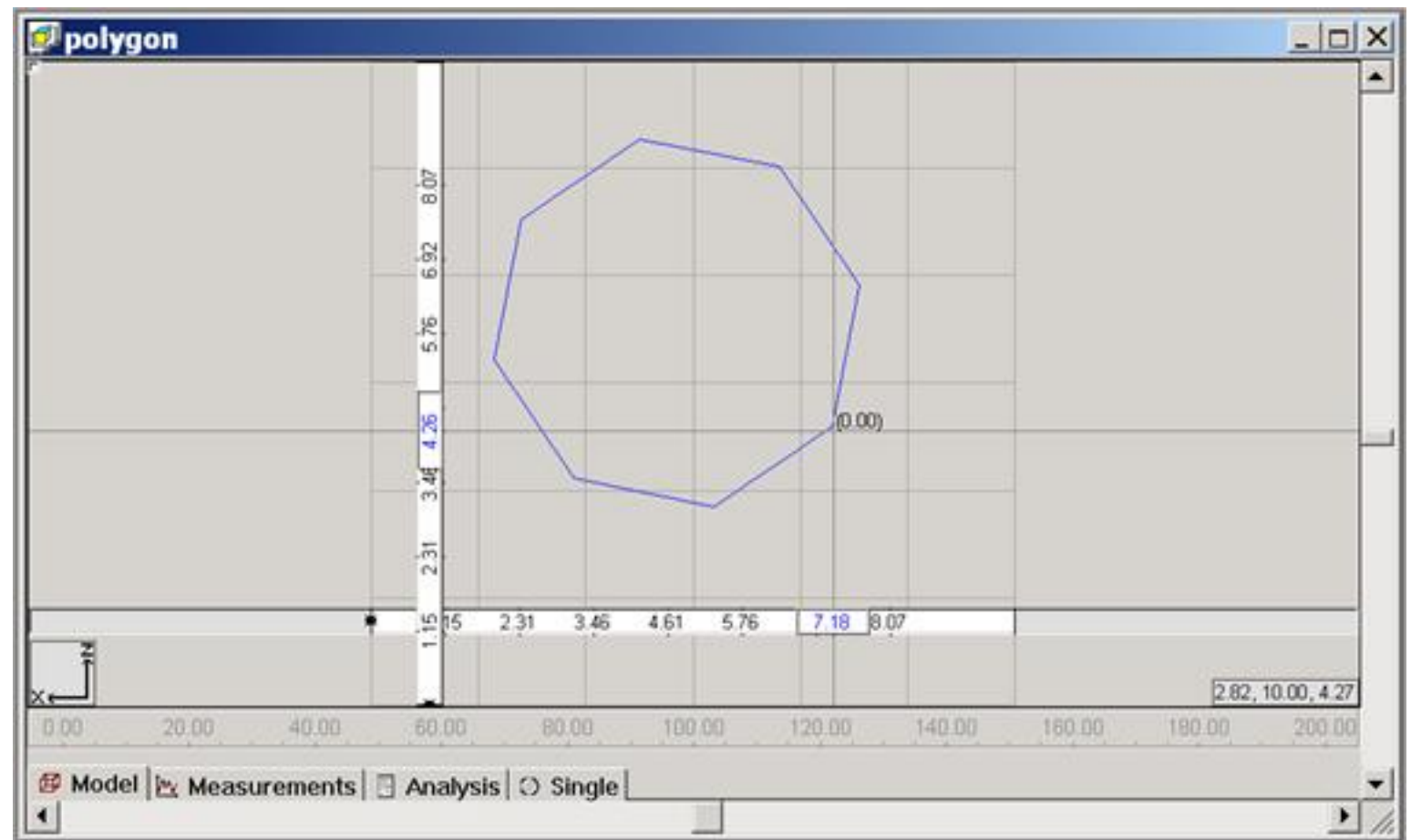
Figure 19

Move Point: The Move Point mode allows you to select a point and reposition it using either a drag and drop method or via the Up/Down or the Right/Left arrows keys.

Using the Move Point Mode:

During the drawing of a model, it is possible to get a point close to but not exactly where you want it. This can be remedied by changing selecting a point and moving it to its proper position.

To do this, change the Mode from Draw Line to Move Point, then click on

the point you want to move. The cursor will change from the Black Arrow to a White Cross, once that happens click and hold down the left mouse button and slide the mouse to the new location. Once, the point has been properly placed then release the left mouse button.

Another function of the Move Point is to merge points between sides when JPEG images have been used to create sides. Since, the images are only two dimensions so, from side to side the contours will typically not match. See Figure 20 below.
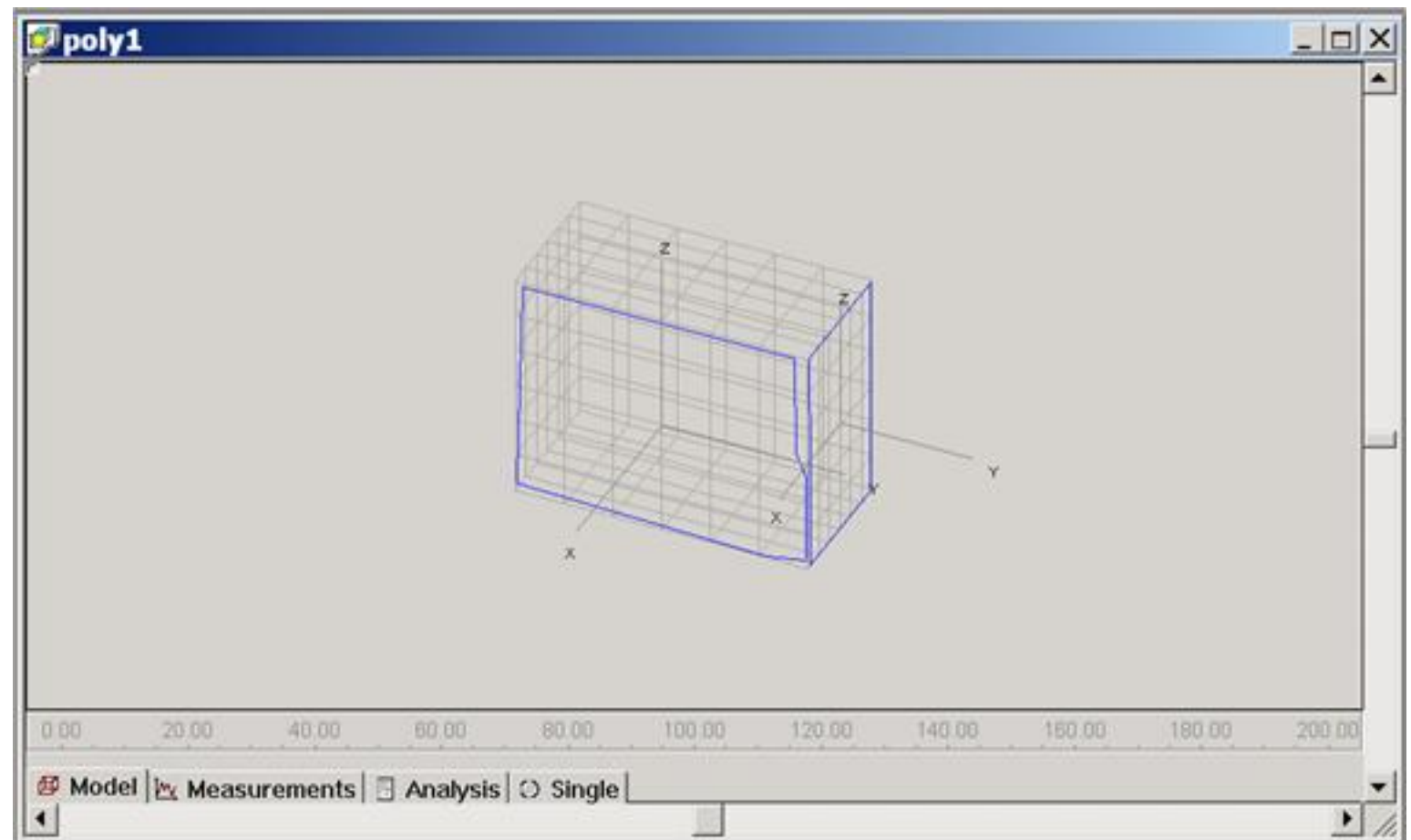
Figure 20

Once, Move Point has been selected, for every point that has been used to create your model, there will be a small Blue and White circle. Look around the outside edges of your model and look for gaps between the

two sides such and the Front and Back. You will need to move all the points that are creating this gap, in order to make the contour match.
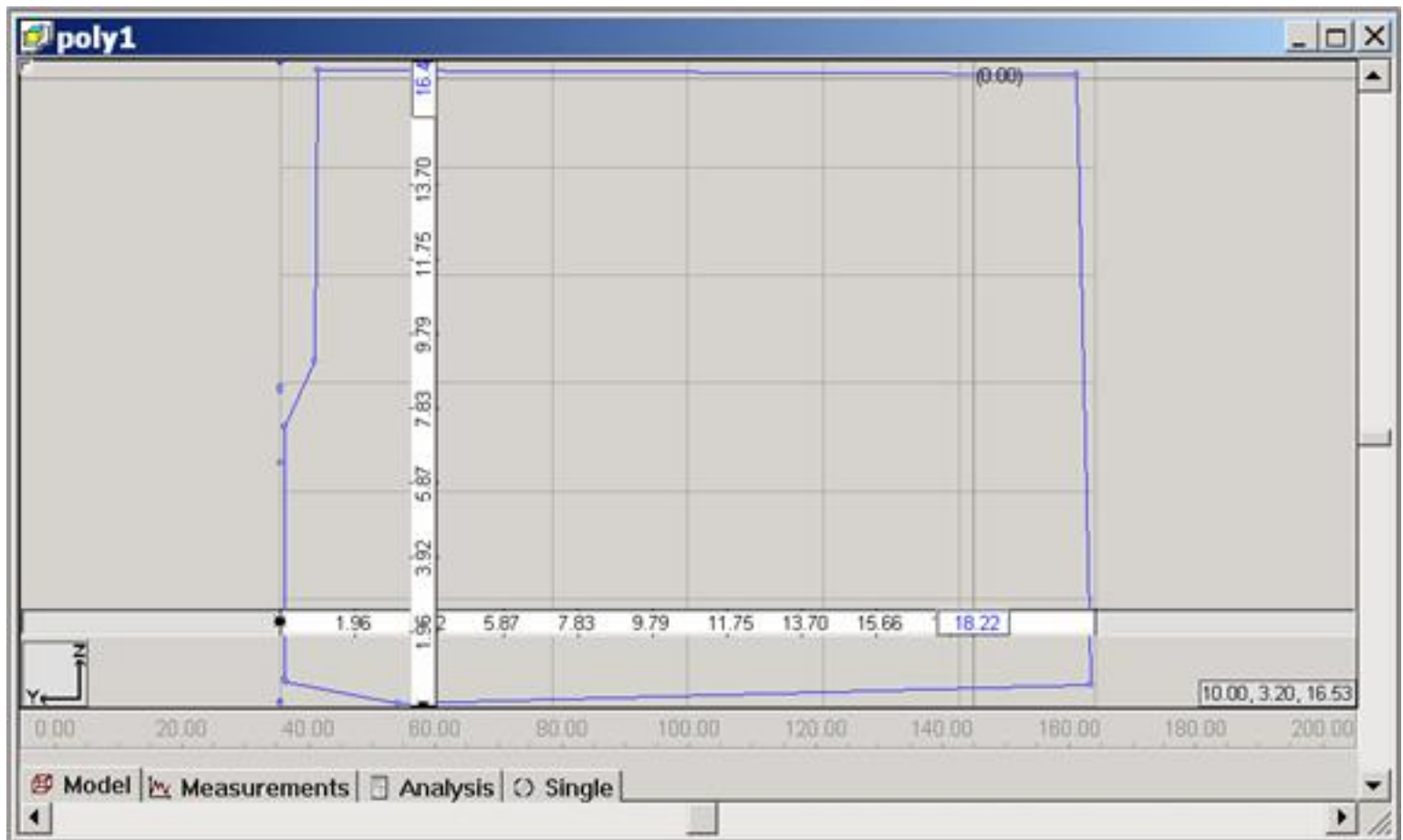
Figure 21

In Figure 21 above, we are merging/moving the points of the Front side to match the contour of the Right side. To move a point, left click on the point (blue/white circle). See the small blue circles along the left edge in the Figure above. Select one of the small blue circles by clicking on it and the cursor will change from a pointer to a large white cross. Once, this happens, click again and hold the left mouse button down and slide the mouse to the point where you want to reposition the selected point and release. Repeat the process for each point that makes up this gap.

In our above example, the Front side had a total of eight points that describe the outline of the computer case (four on the each side). Therefore, when using the Move Point, there are a total of eight points that

need to be moved, two at each location.

Once, all the points (blue circles) have been moved to conform to the Right Side, go to the Side selection and choose All. You can view the results in the Figure 22 below.
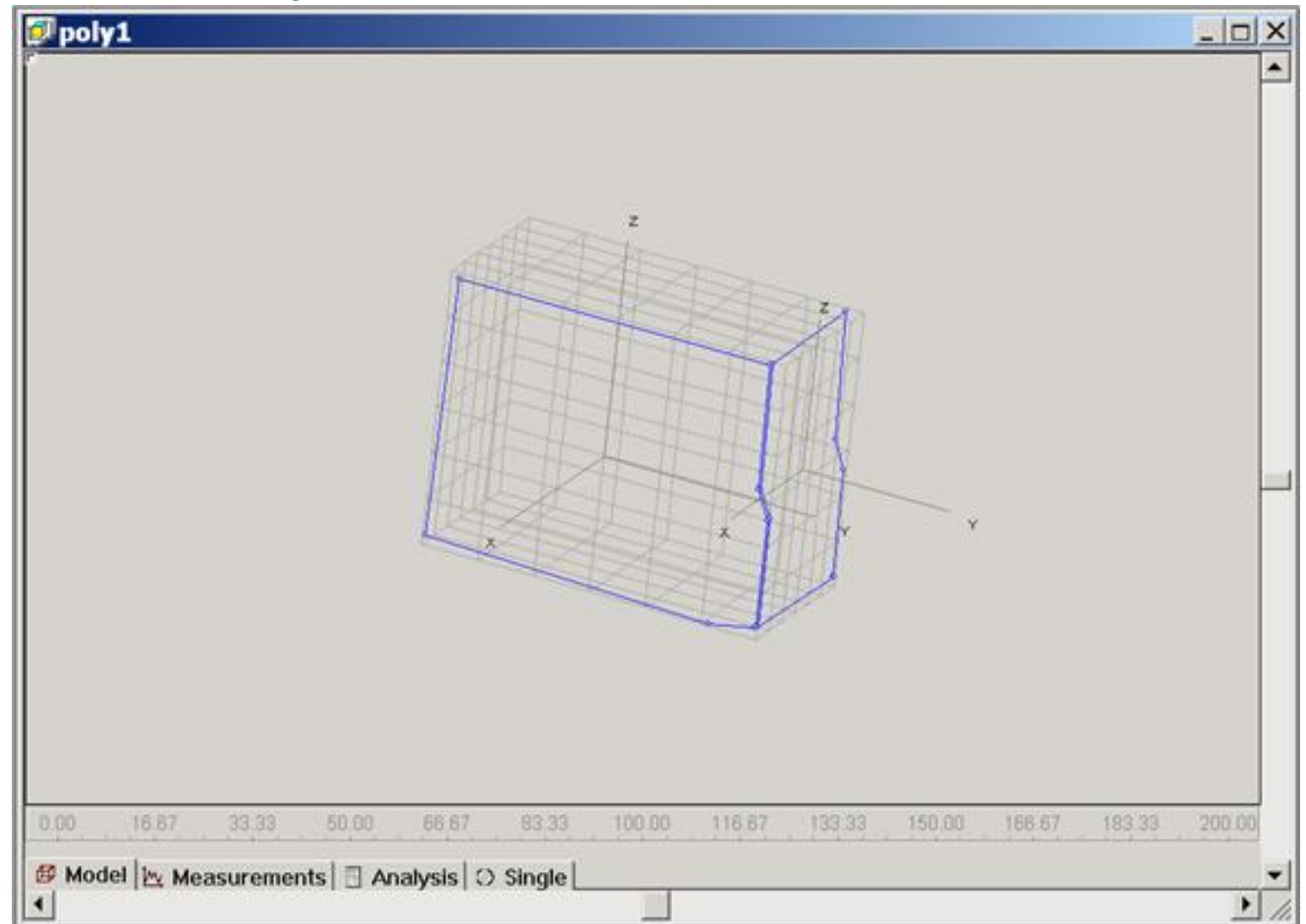
Figure 22

The Move Point can be used on each and every side. Not shown here was that we went back to the Front side and straightened all the vertical lines. This was necessary because the image that was used to draw the computers front panel was not taken perpendicular to the object. So, the picture was a bit skewed.

The next thing we can do to easily complete the computer case is to Stretch the Right side to form the Left and Back sides.

To do this, choose the Stretch operation and click the Execute button, then set the Stretch To = 0 and set the Number of Divisions = 0. See Figure 23 below for the result.

You'll notice that to keep things simple, we have not included any of the internal available grid points in our model and we have just drawn the outline of the computer case.
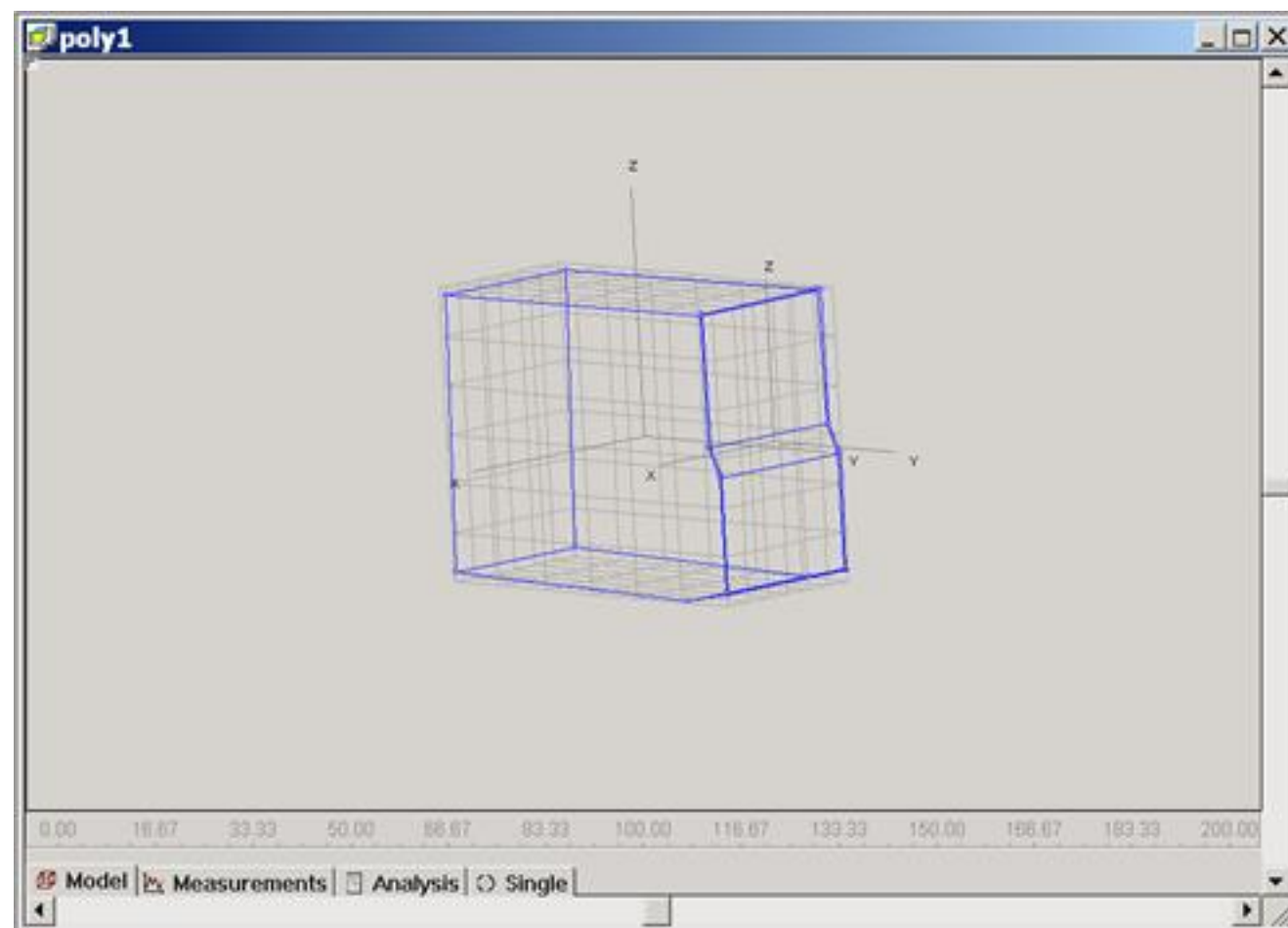
Figure 23

Finally, when we are satisfied with the model, change the Operation to "Add to Model" and click the Execute button. This ends the Sketch Box session and creates a Template, Points, Lines, and Components.

Model Setup.

Templates | Points | Lines | Surfaces | Components | Component Links | Measurement Points | Point Wizard |

Com	Measurement Pt	Dir 1	Dir 2	Dir 3	Component Instance	Type
1	0	0.15	21.33	0.65	SKETCH	Rectangular
2	0	0.21	21.32	7.37	SKETCH	Rectangular
3	0	0.19	20.61	8.99	SKETCH	Rectangular
4	0	0.21	20.40	16.83	SKETCH	Rectangular
5	0	9.88	20.43	16.77	SKETCH	Rectangular
6	0	9.88	20.55	9.05	SKETCH	Rectangular
7	0	9.88	21.32	7.45	SKETCH	Rectangular
8	0	9.88	21.33	0.65	SKETCH	Rectangular
9	0	0.08	21.41	0.64	SKETCH	Rectangular
10	0	10.00	21.26	0.64	SKETCH	Rectangular
11	0	10.00	18.32	0.08	SKETCH	Rectangular
12	0	10.00	0.11	0.57	SKETCH	Rectangular
13	0	10.00	0.49	16.60	SKETCH	Rectangular
14	0	10.00	20.43	16.72	SKETCH	Rectangular
15	0	10.00	20.50	9.06	SKETCH	Rectangular

Assign Default

OK | Cancel | Apply | Help

Figure 24

The last thing we need to do is go to the Model Setup dialog, Measurement Points tab and either manually assign the actual measurement points or choose Assign Default (allowing STAR6 to assign the point numbers for you). In Figure 24 the Measurement Points are all 0 and need to be assigned manually.

Figure 25 shows the results of clicking the Assign Default button.

Model Setup.

Templates | Points | Lines | Surfaces | Components | Component Links | Measurement Points | Point Wizard |

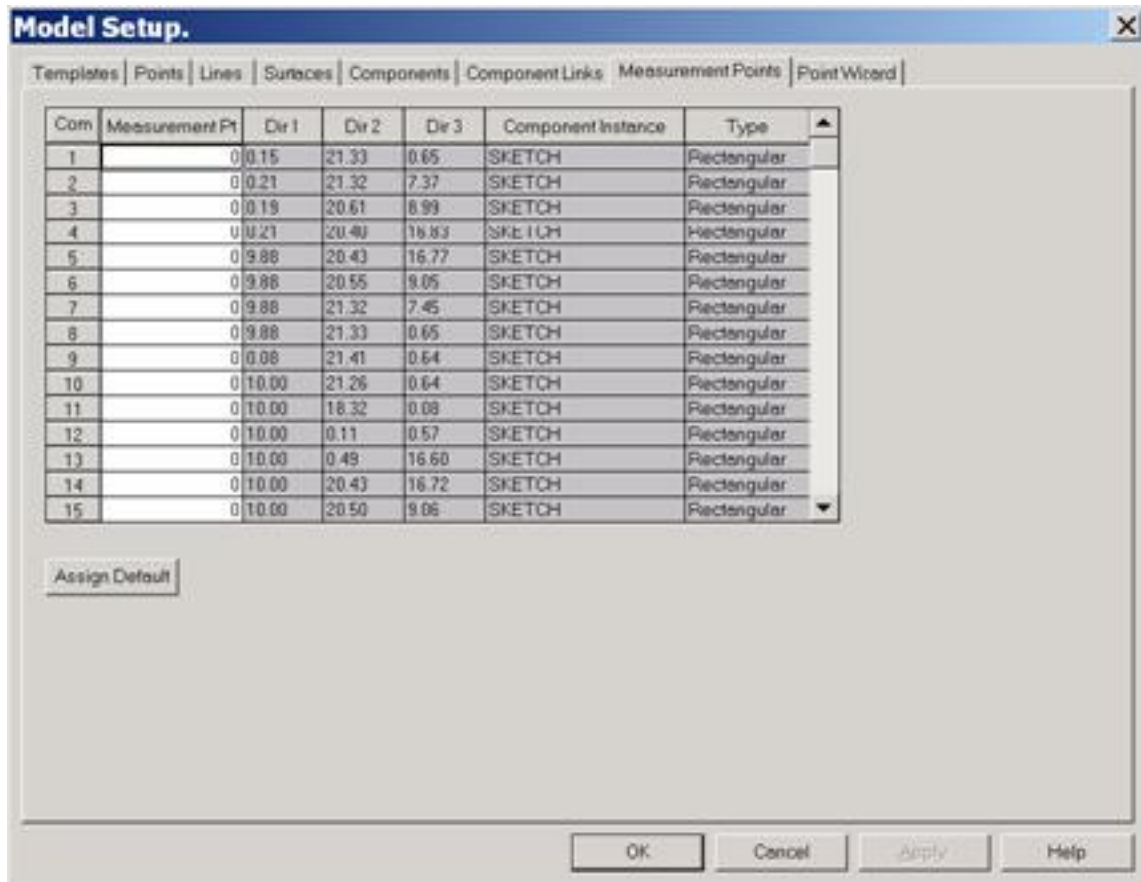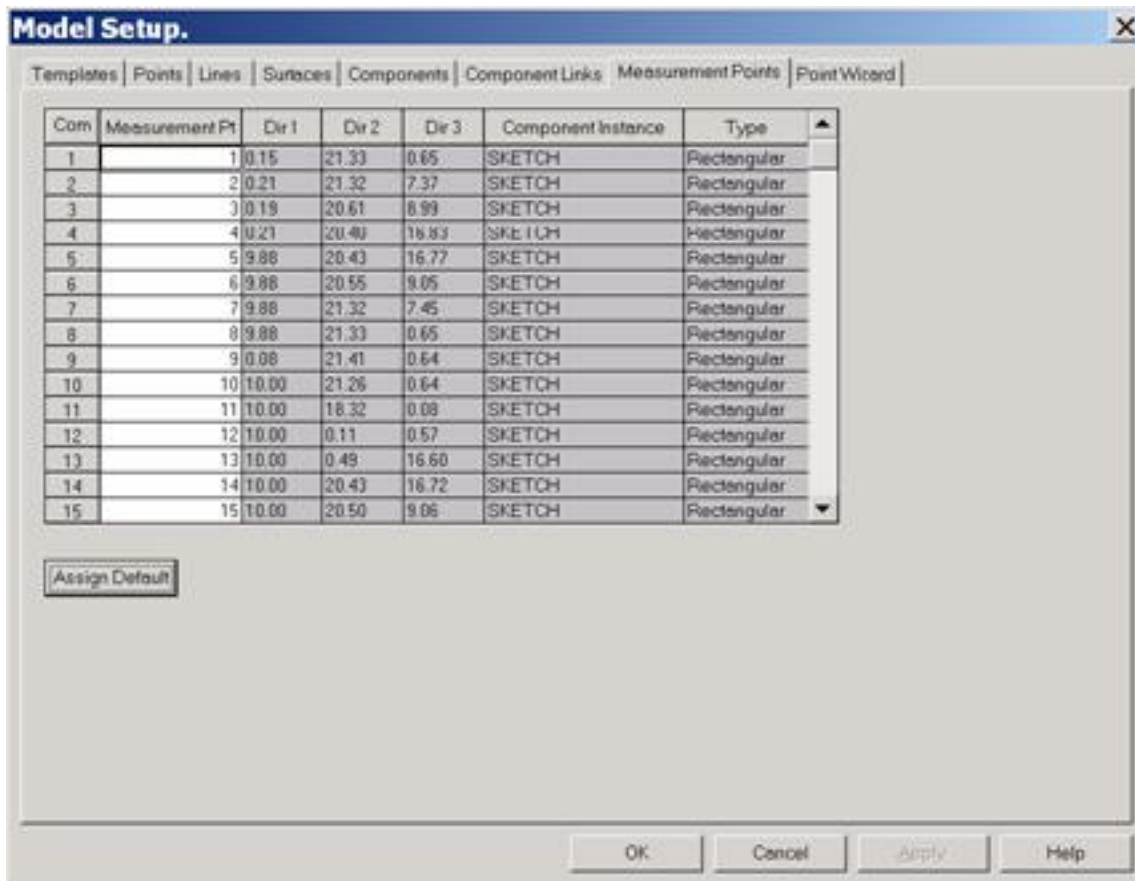| Com	Measurement Pt	Dir 1	Dir 2	Dir 3	Component Instance	Type
1	1	0.15	21.33	0.65	SKETCH	Rectangular
2	2	0.21	21.32	7.37	SKETCH	Rectangular
3	3	0.19	20.61	8.99	SKETCH	Rectangular
4	4	0.21	20.40	16.83	SKETCH	Rectangular
5	5	9.88	20.43	16.77	SKETCH	Rectangular
6	6	9.88	20.55	9.05	SKETCH	Rectangular
7	7	9.88	21.32	7.45	SKETCH	Rectangular
8	8	9.88	21.33	0.65	SKETCH	Rectangular
9	9	0.08	21.41	0.64	SKETCH	Rectangular
10	10	10.00	21.26	0.64	SKETCH	Rectangular
11	11	10.00	18.32	0.08	SKETCH	Rectangular
12	12	10.00	0.11	0.57	SKETCH	Rectangular
13	13	10.00	0.49	16.60	SKETCH	Rectangular
14	14	10.00	20.43	16.72	SKETCH	Rectangular
15	15	10.00	20.50	9.06	SKETCH	Rectangular

Assign Default

OK   Cancel   Apply   Help

Figure 25