Lambda Research Corporation

LCD BACKLIGHTNING

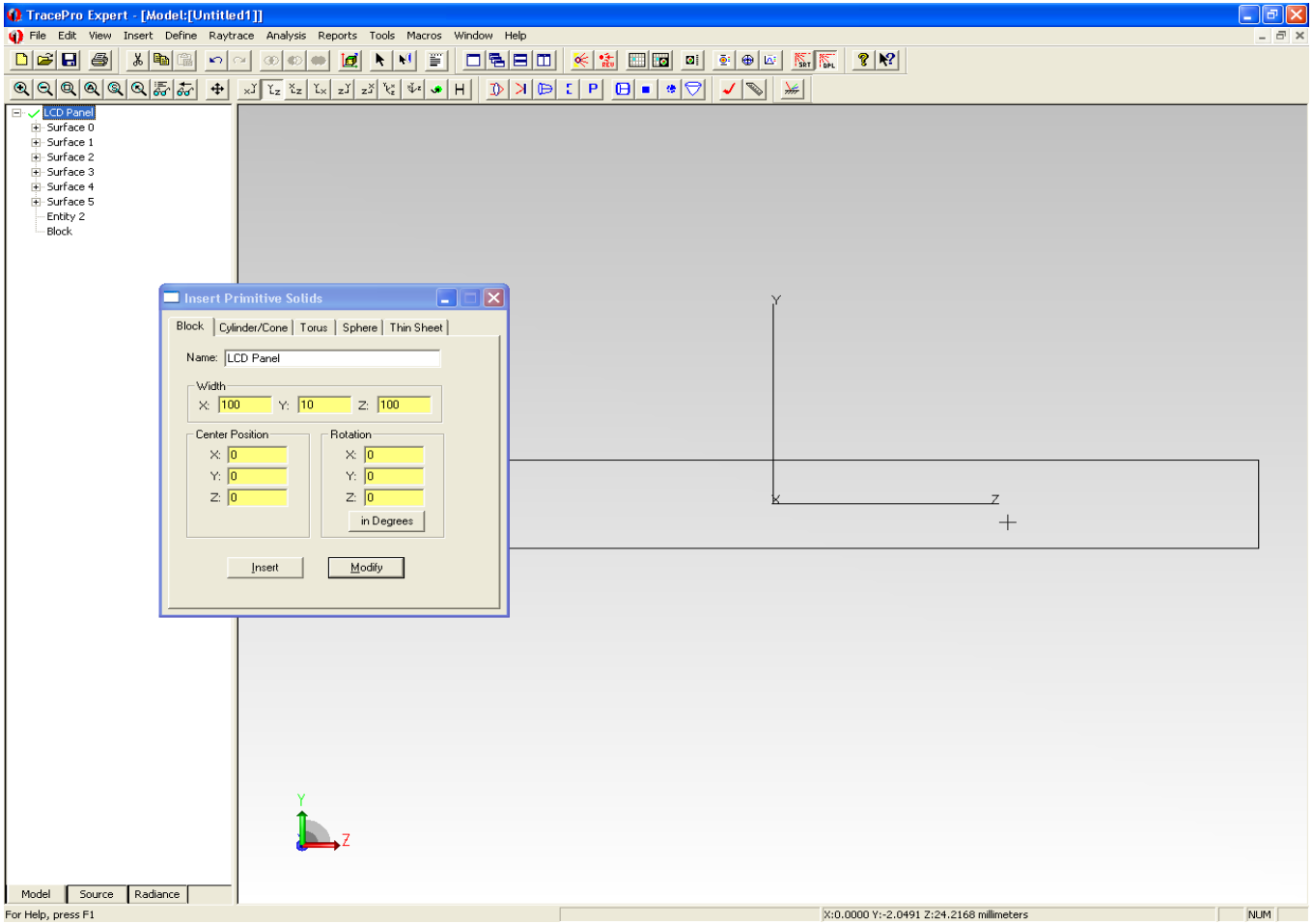
LCD Back Lighting

The steps include:

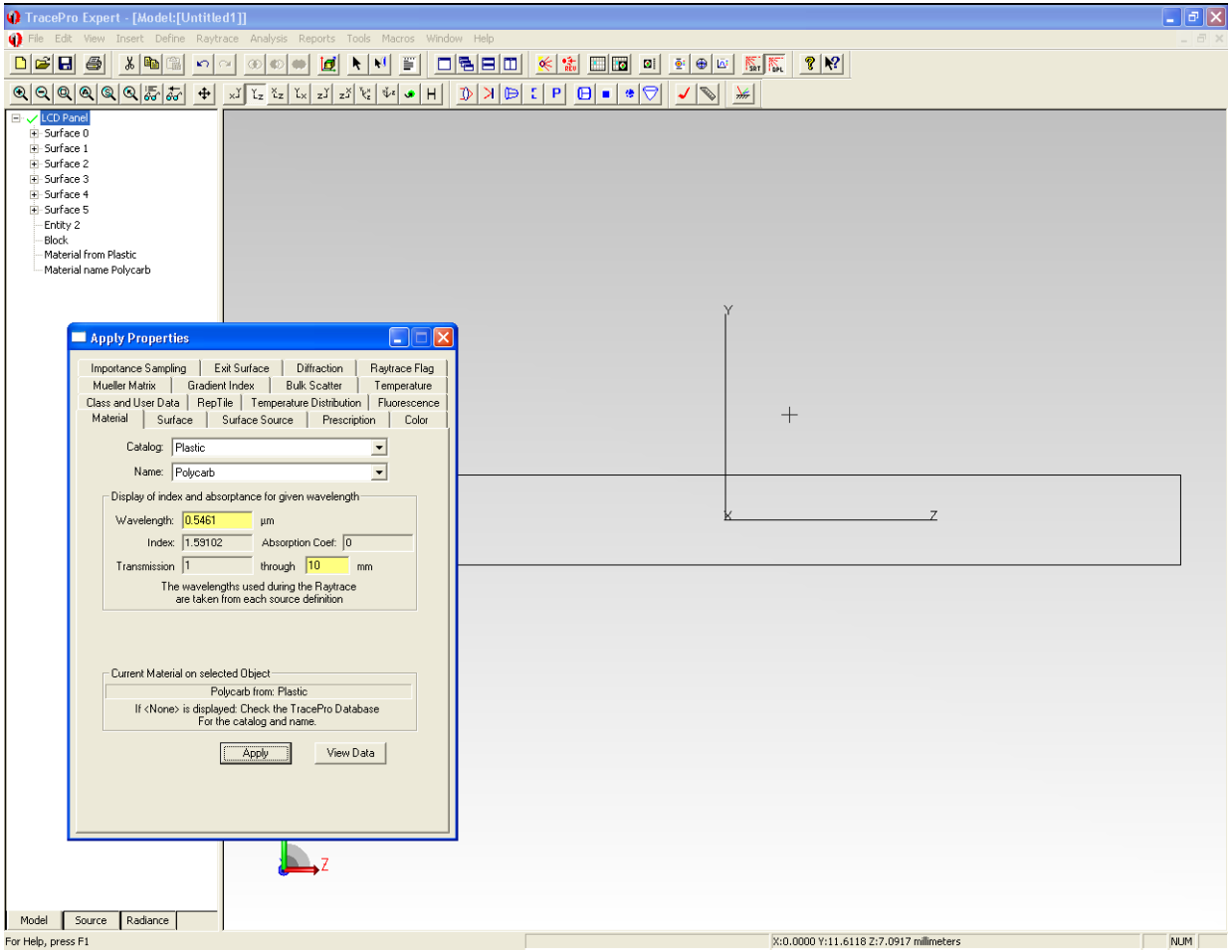
- Generating a solid model
- Applying material properties
- Applying surface properties
- Creating and applying RepTile properties
- Creating surface sources
- Tracing rays
- Viewing irradiance

Create an LCD Panel

- Insert Menu, select Primitive Solid.
- Select the Block Tab and enter the Width values 100 for X, 10 for Y and 100 for Z and name LCD Panel.
- Click the Insert button to create the block.
- Press the Zoom All button or select the View Zoom All menu to see the new object


TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Surface 0
Surface 1
Surface 2
Surface 3
Surface 4
Surface 5
Entity 2
Block
Insert Primitive Solids
Block Cylinder/Cone Torus Sphere Thin Sheet
Name: LCD Panel
Width
X: 100 Y: 10 Z: 100
Center Position
X: 0
Y: 0
Z: 0
Rotation
X: 0
Y: 0
Z: 0
in Degrees
Insert
Modify
Y
X
Z
Y
Z
Model Source Radiance
For Help, press F1
X:0.0000 Y:-2.0491 Z:24.2168 millimeters
NUM

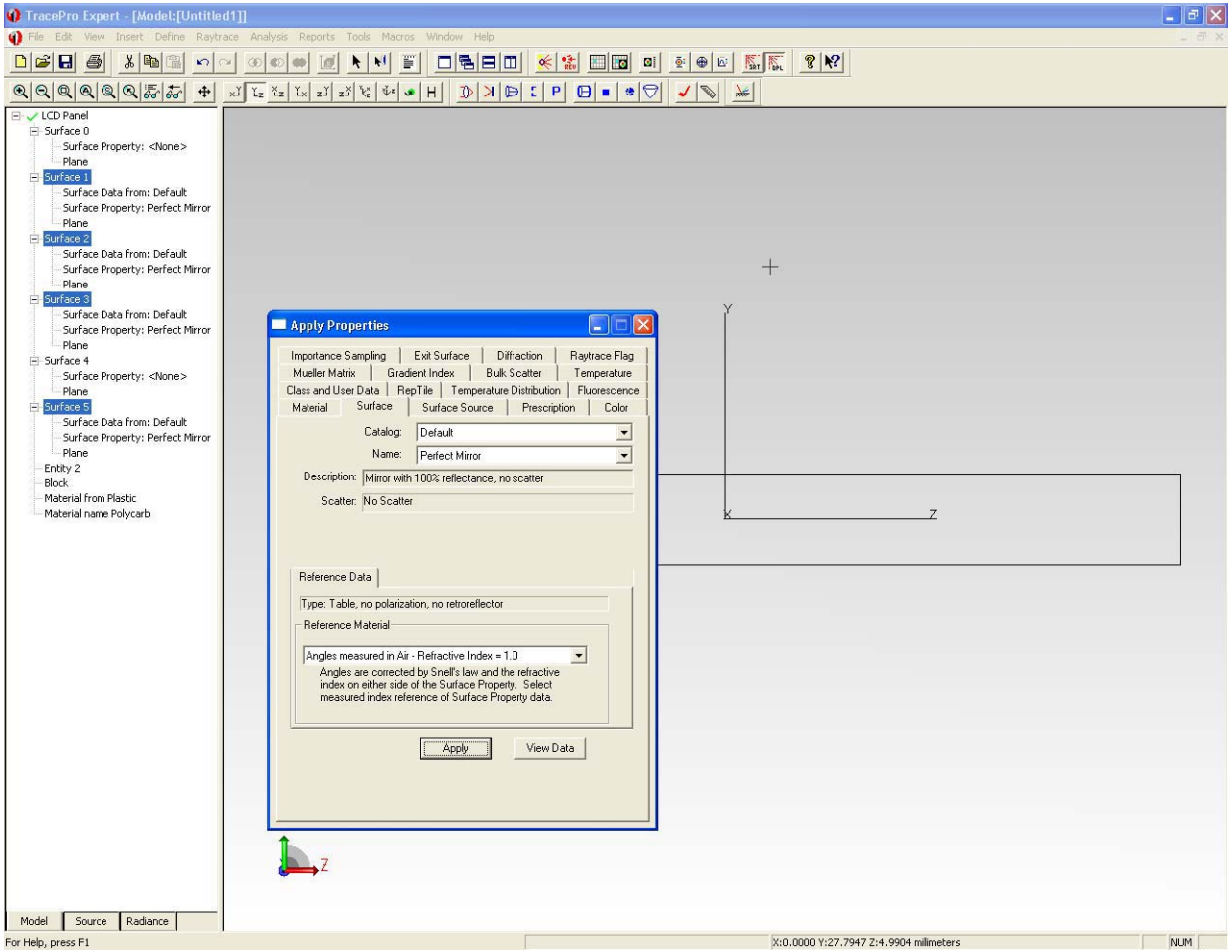
Adding Material Properties to the LCD Panel



Adding Surface Properties to the LCD Panel

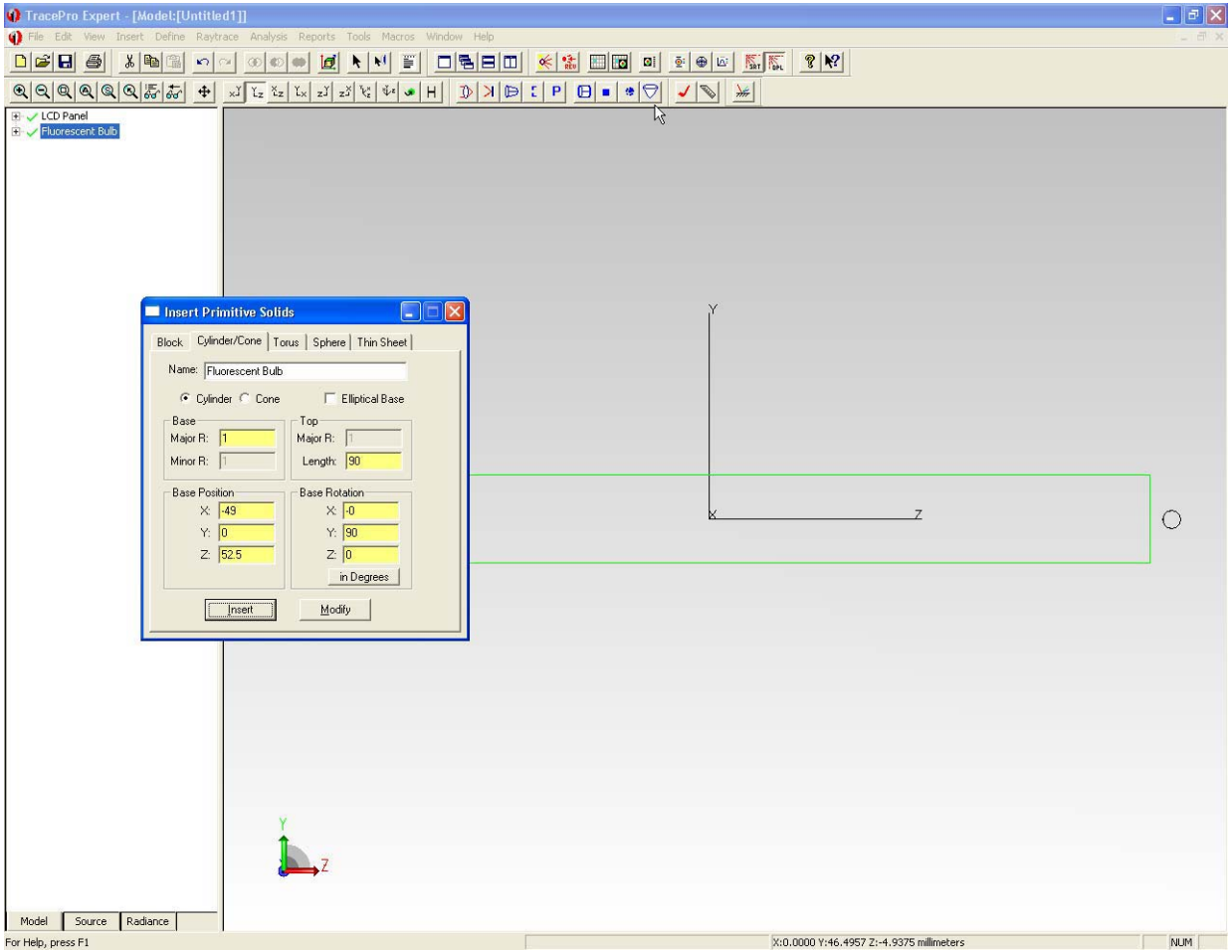
Add a mirrored surface to the bottom and three sides of the panel, need to select surfaces 1, 2, 3 and 5.

- First expand the LED Panel object by clicking on the + sign next to the object.
- Click on Surface 1 to highlight the surface in the System Tree and the viewing area.
- Hold the Ctrl key down and click on surfaces 2, 3, and 5 to add them to the selection.
- In the Apply Properties dialog box, select the Surface tab.
- Using the drop-down list, select the Perfect Mirror property.
- Click the Apply button to apply this property to all the selected surfaces.
- Look in the System Tree to verify that the surface property has been applied to the correct surfaces

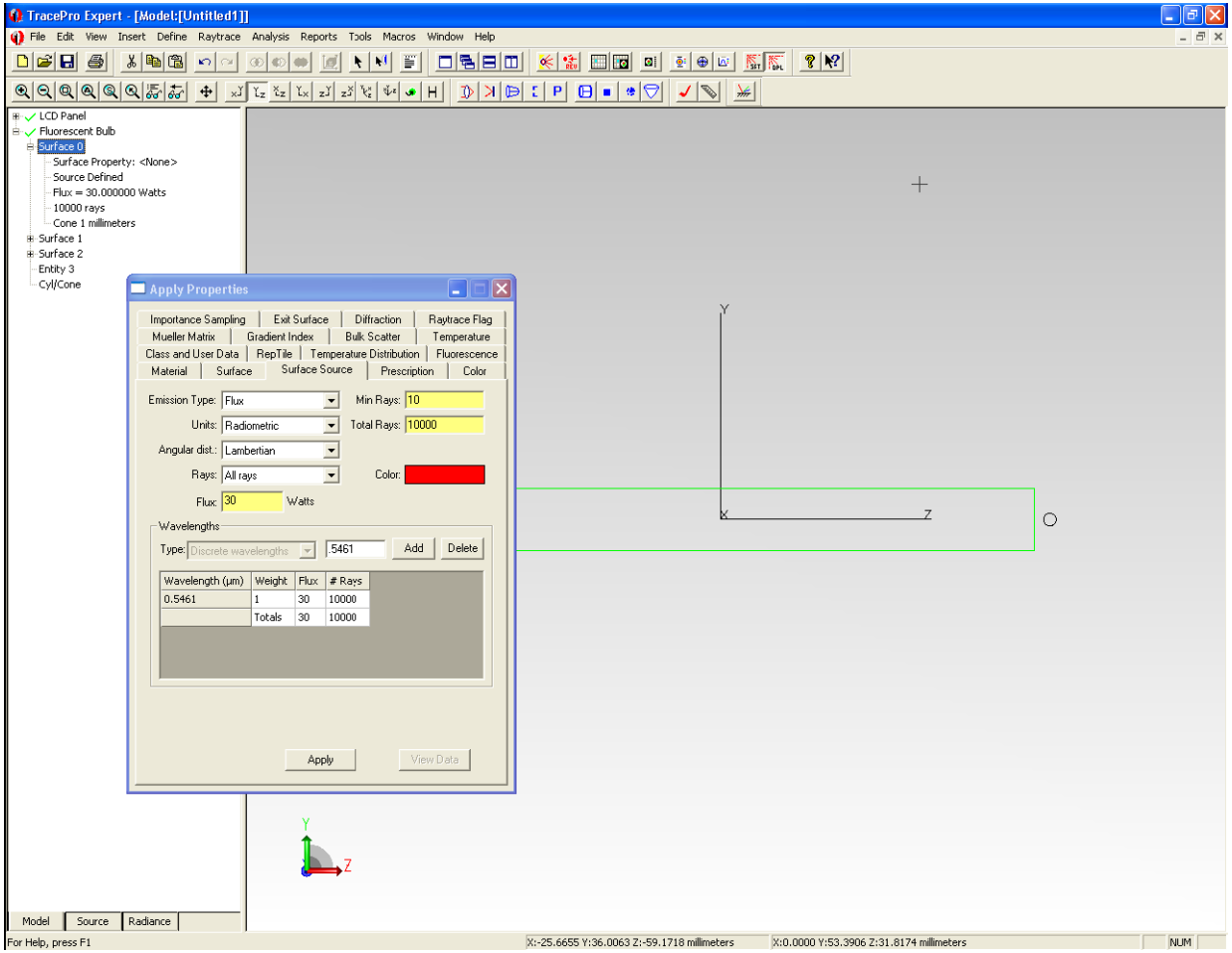

TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Surface 0
Surface Property: <None>
Plane
Surface 1
Surface Data from: Default
Surface Property: Perfect Mirror
Plane
Surface 2
Surface Data from: Default
Surface Property: Perfect Mirror
Plane
Surface 3
Surface Data from: Default
Surface Property: Perfect Mirror
Plane
Surface 4
Surface Property: <None>
Plane
Surface 5
Surface Data from: Default
Surface Property: Perfect Mirror
Plane
Entity 2
Block
Material from Plastic
Material name Polycarb
Model
Source
Radiance
Apply Properties
Importance Sampling
Exit Surface
Diffraction
Raytrace Flag
Mueller Matrix
Gradient Index
Bulk Scatter
Temperature
Class and User Data
RepTile
Temperature Distribution
Fluorescence
Material
Surface
Surface Source
Prescription
Color
Catalog: Default
Name: Perfect Mirror
Description: Mirror with 100% reflectance, no scatter
Scatter: No Scatter
Reference Data
Type: Table, no polarization, no retroreflector
Reference Material
Angles measured in Air - Refractive Index = 1.0
Angles are corrected by Snell's law and the refractive index on either side of the Surface Property. Select measured index reference of Surface Property data.
Apply
View Data
Y
X
Z
Z
For Help, press F1
X:0.0000 Y:27.7947 Z:4.9904 millimeters
NUM

Creating the Fluorescent Bulb

- To create the fluorescent bulb, from the Insert Menu select Primitive Solid, then select the Cylinder/Cone tab.
- Enter the radius, length, base position, and rotation as shown in the dialog box at right and name Fluorescent Bulb.
- Click the Insert button to create the cylinder.

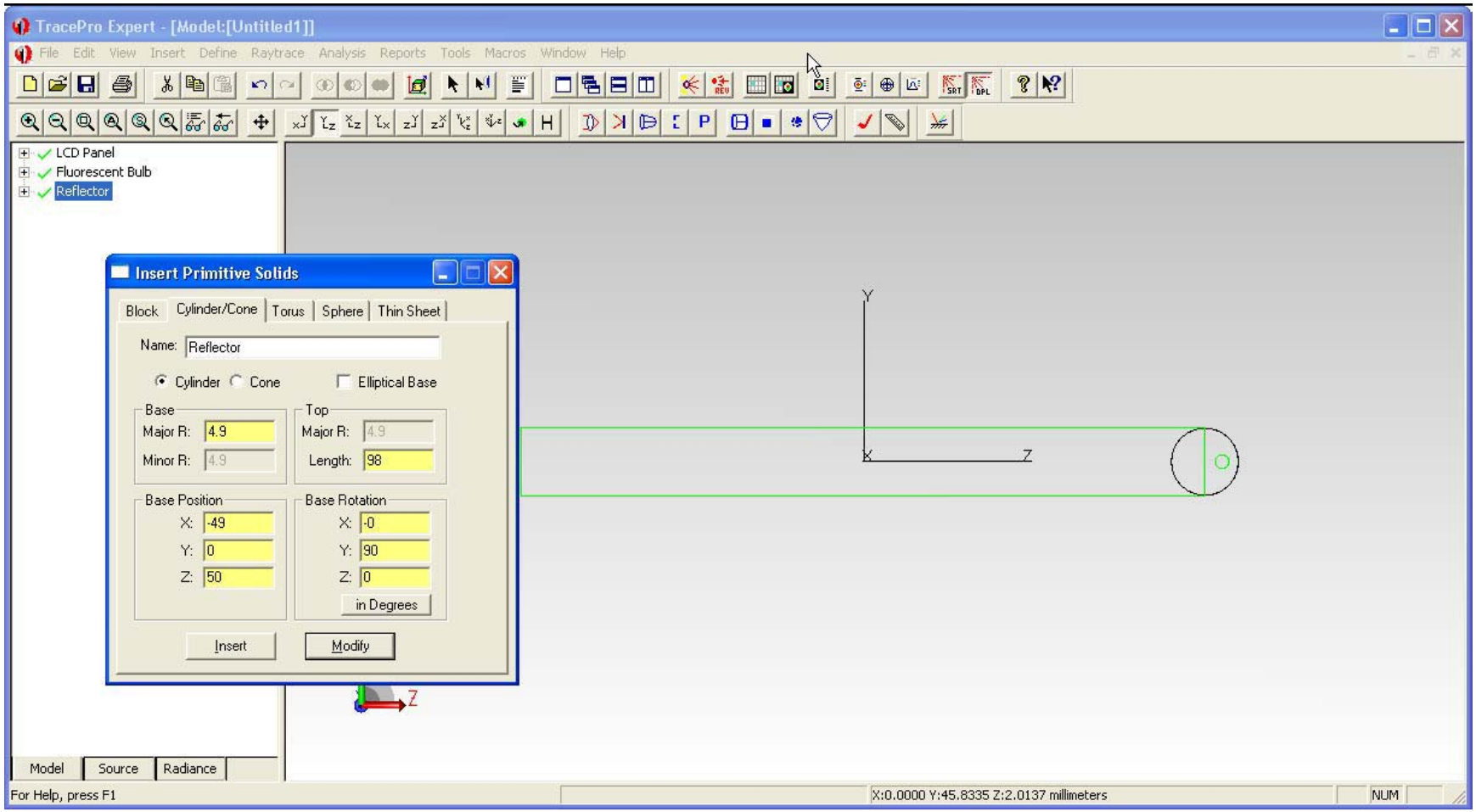

TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Fluorescent Bulb
Insert Primitive Solids
Block Cylinder/Cone Torus Sphere Thin Sheet
Name: Fluorescent Bulb
Cylinder Cone Elliptical Base
Base
Major R: 1
Minor R: 1
Top
Major R: 1
Length: 90
Base Position
X: -49
Y: 0
Z: 52.5
Base Rotation
X: -0
Y: 90
Z: 0
in Degrees
Insert
Modify
Y
X
Z
Y
Z
Model Source Radiance
For Help, press F1
X:0.0000 Y:46.4957 Z:-4.9375 millimeters
NUM

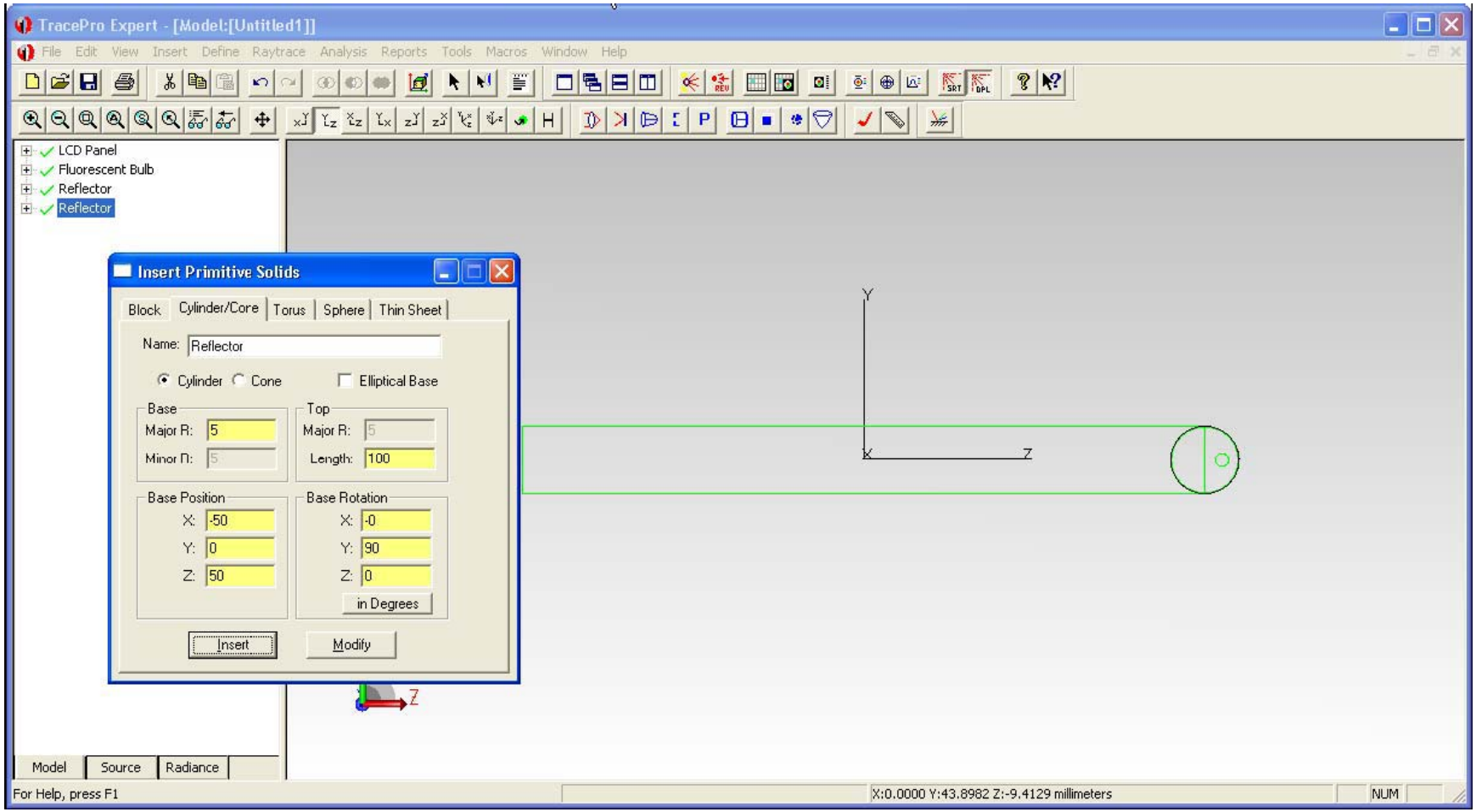
Adding a Surface Source Property to the Bulb



Creating the Reflector around the Source

- Select Insert Primitive Solid to open the Insert Primitive
- Select the Cylinder/Cone tab and insert a cylinder with the dimensions as shown in the dialog box at right.
- Make a second cylinder slightly shorter and smaller in radius than the first. This will define the inside of a cylindrical shell.
- After inserting a cylinder with the dimensions as in the dialog box below, you will have two cylinders that are positioned around the bulb.

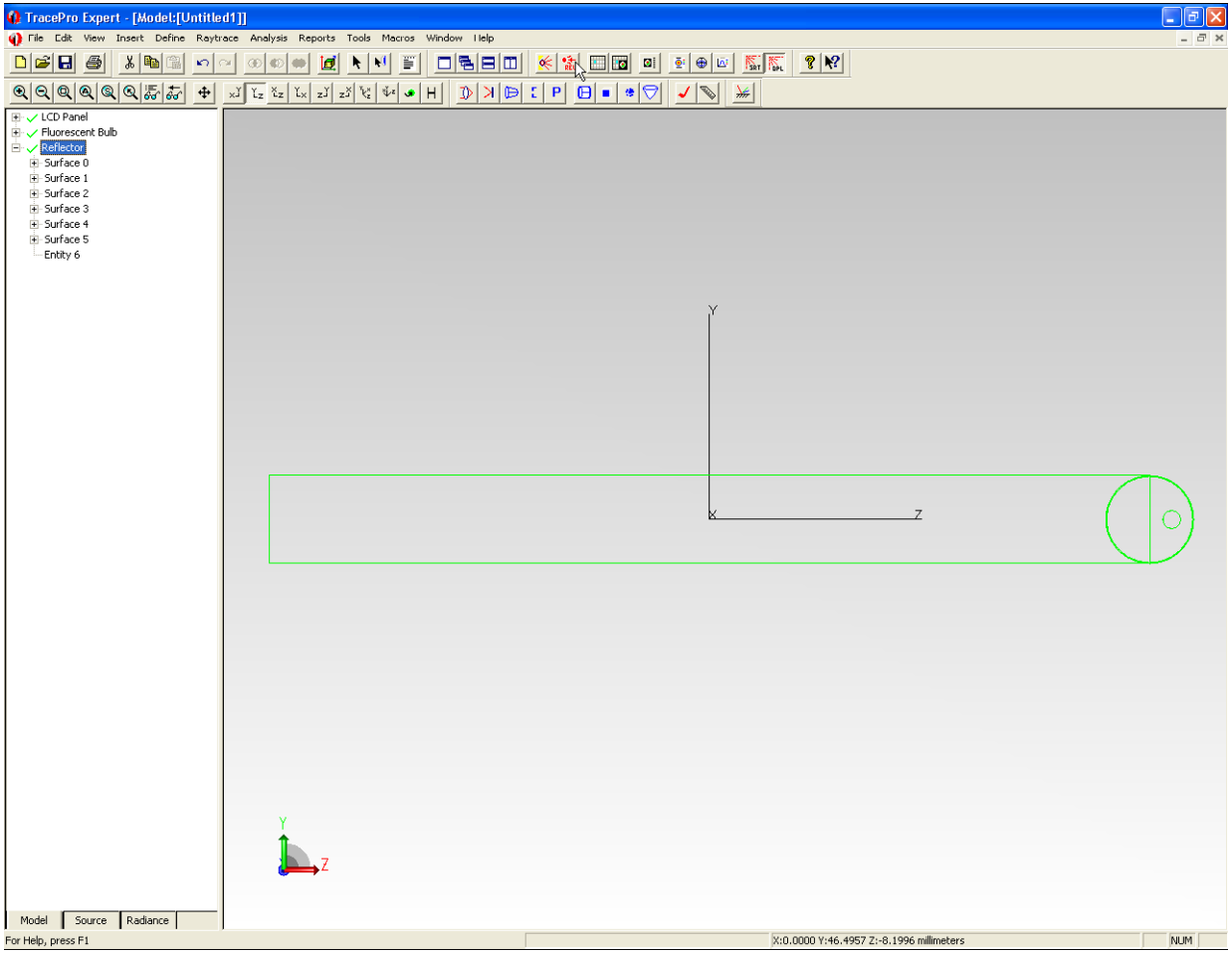

TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Fluorescent Bulb
Reflector
Insert Primitive Solids
Block Cylinder/Cone Torus Sphere Thin Sheet
Name: Reflector
Cylinder Cone Elliptical Base
Base
Major R: 4.9
Minor R: 4.9
Top
Major R: 4.9
Length: 98
Base Position
X: -49
Y: 0
Z: 50
Base Rotation
X: -0
Y: 90
Z: 0
in Degrees
Insert
Modify
Y
X
Z
Model Source Radiance
For Help, press F1
X:0.0000 Y:45.8335 Z:2.0137 millimeters
NUM


TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Fluorescent Bulb
Reflector
Reflector
Insert Primitive Solids
Block Cylinder/Core Torus Sphere Thin Sheet
Name: Reflector
Cylinder Cone Elliptical Base
Base
Major R: 5
Minor R: 5
Top
Major R: 5
Length: 100
Base Position
X: -50
Y: 0
Z: 50
Base Rotation
X: -0
Y: 90
Z: 0
in Degrees
Insert
Modify
Y
X
Z
Model Source Radiance
For Help, press F1
X:0.0000 Y:43.8982 Z:-9.4129 millimeters
NUM

Creating the Reflector (continued)

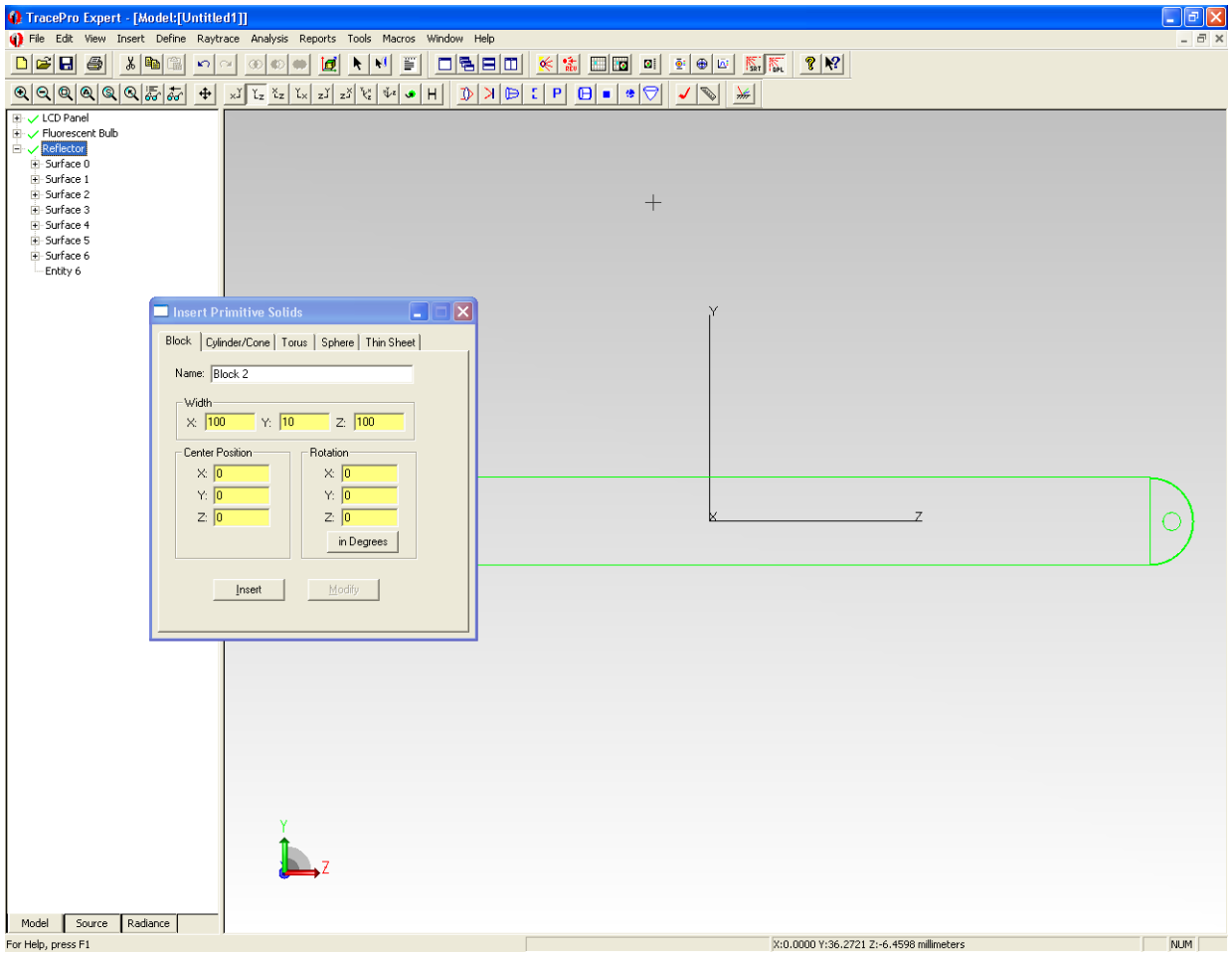
- The reflector shell will be made by subtracting the inner cylinder from the outer cylinder using a Boolean Subtraction operation.
- Select the outer (larger) cylinder in the System Tree.
- Select the inner (smaller) cylinder in the System tree while pressing the Ctrl key. This is called a Ctrl+Click and extends the selection to include both objects.
- Select the Boolean Subtract icon, or use the Edit Boolean Subtract menu to perform the Boolean operation.
- The result will be one object with 6 surfaces, as shown below.
- If you make a mistake, click on the Undo Icon or select Edit Undo to reverse the subtraction operation and try again.

Lambda Research Corporation

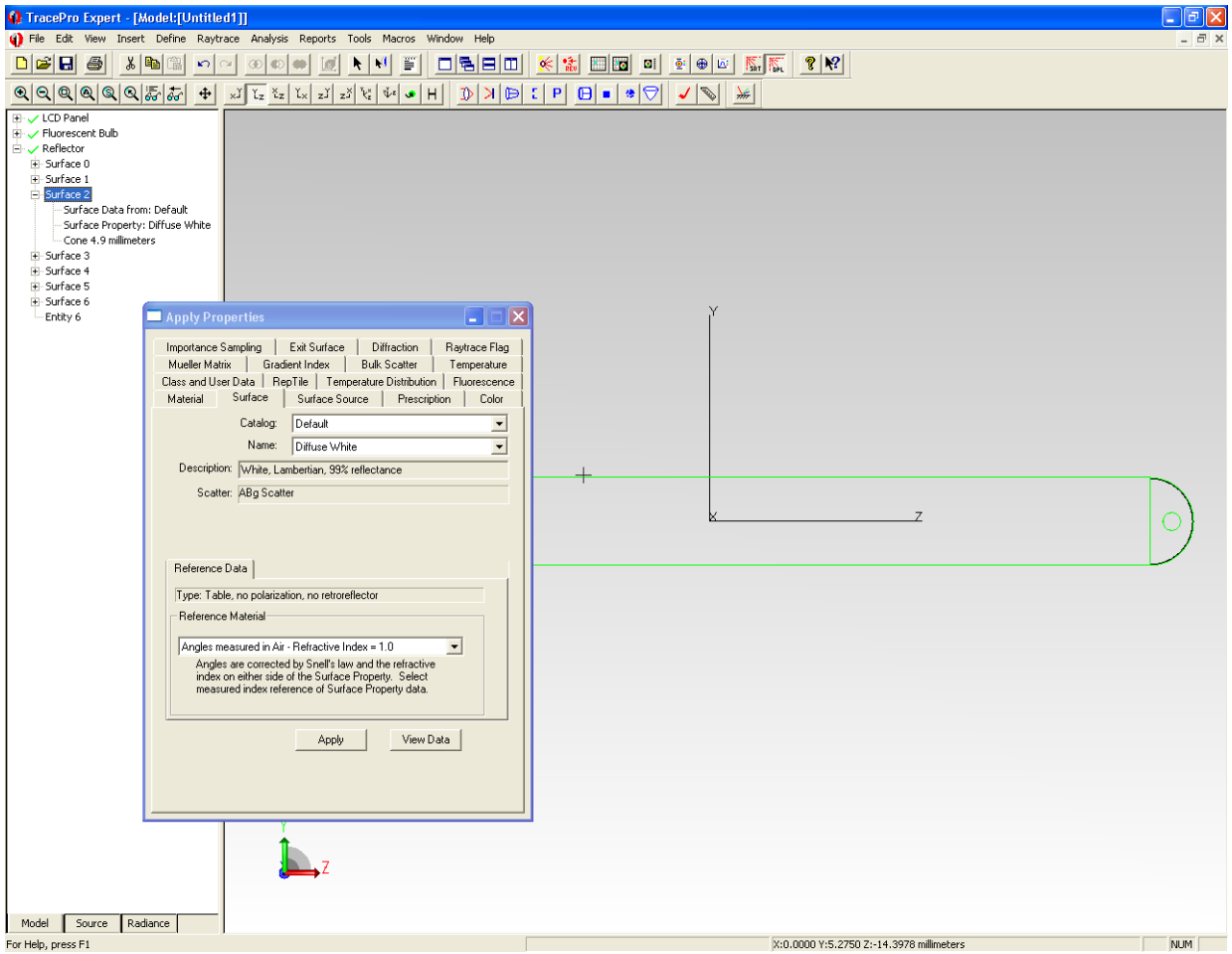


Creating the Reflector (continued)

- Need the right half of the reflector shell. Another Boolean Subtract is used to complete the creation of the reflector geometry. Start by inserting a second block and use it to cut off half the reflector.
- Open the Insert Primitive Solids dialog box and make a block with the dimensions shown.
- Select the reflector shell
- Ctrl+Click select the block.
- Click the Boolean Subtract icon.
- This should create the half-cylinder reflector that you need.

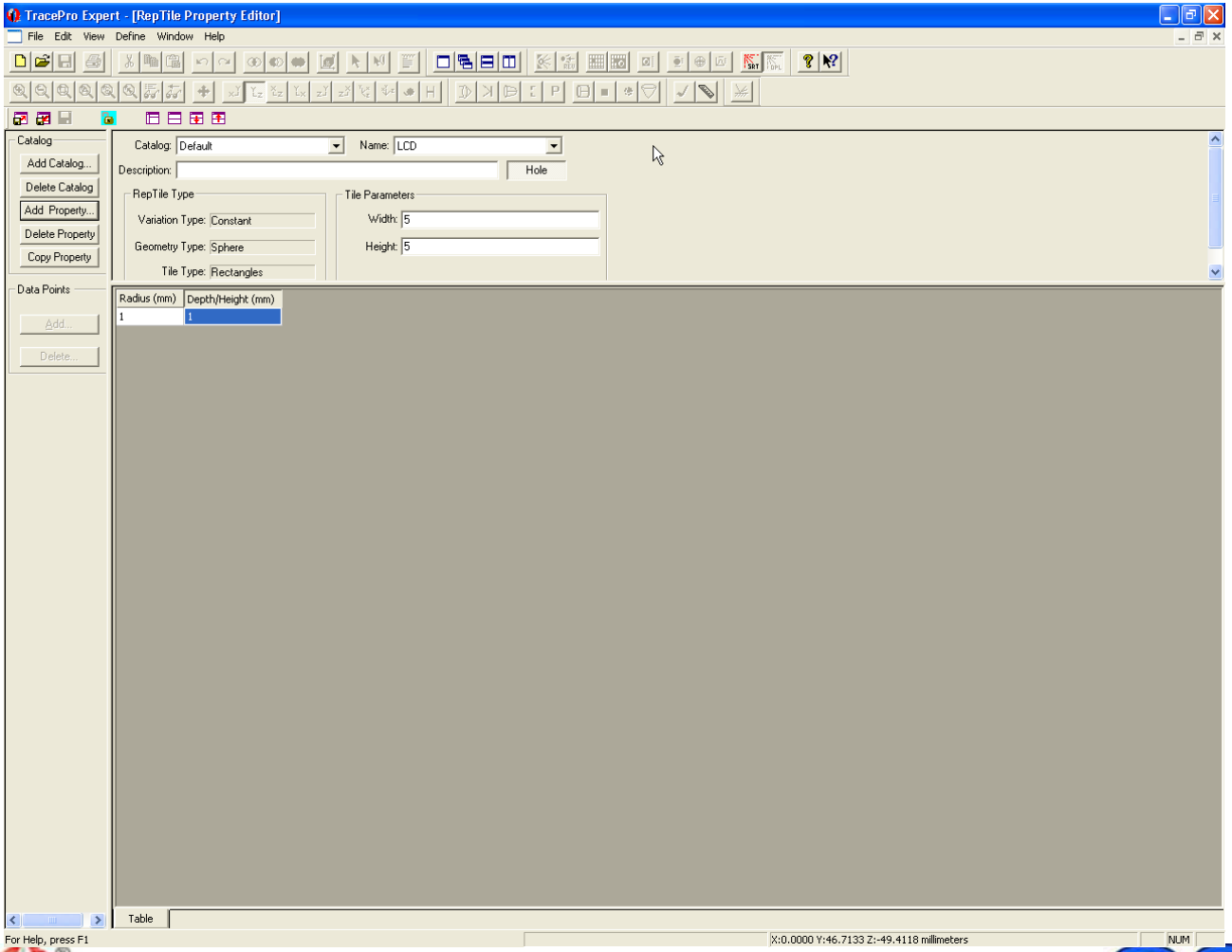

TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Fluorescent Bulb
Reflector
Surface 0
Surface 1
Surface 2
Surface 3
Surface 4
Surface 5
Surface 6
Entity 6
Insert Primitive Solids
Block
Cylinder/Cone
Torus
Sphere
Thin Sheet
Name: Block 2
Width
X: 100 Y: 10 Z: 100
Center Position
X: 0
Y: 0
Z: 0
Rotation
X: 0
Y: 0
Z: 0
in Degrees
Insert
Modify
Y
Z
Model
Source
Radiance
For Help, press F1
X:0.0000 Y:36.2721 Z:-6.4598 millimeters
NUM

Applying a Surface Property to the Reflector



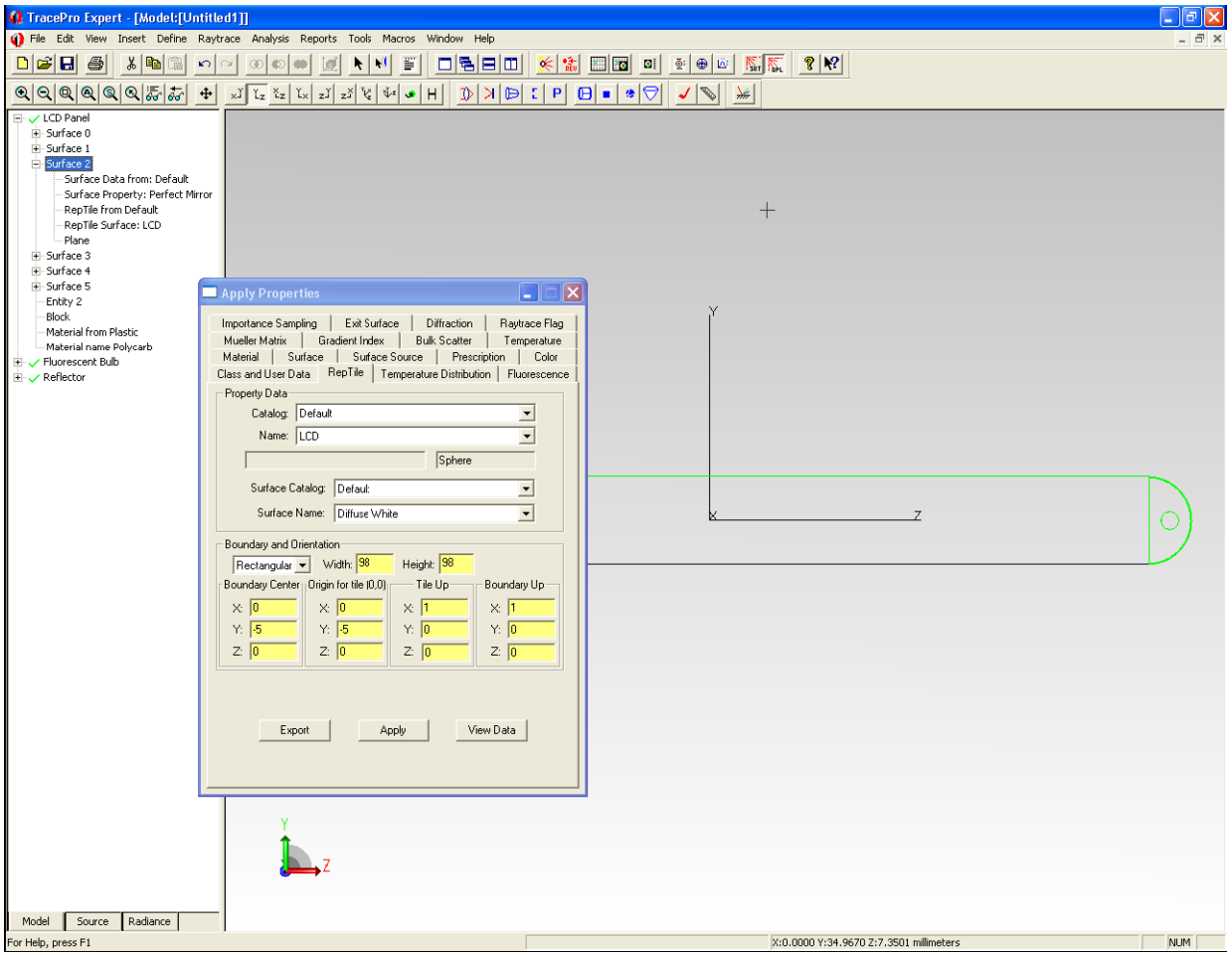
Creating a Dot Pattern Using RepTile

- Define Edit Property Data RepTile Properties to open the RepTile Property Editor
- click . Add Property.
- Type in LCD for the name, and select Variation Type = Constant, Geometry Type = Sphere, and Tile Type = Rectangles.
- Click OK to create the property.
- Enter 5 for both the Width and Height.
- In the spreadsheet part of the editor, enter 1 for the radius and 1 for the height.
- Finally, click the Bump button to change it from Bump to Hole.
- The completed property should appear as shown.
- Click the Save icon to save the property in the database (or select File Save) and close the Editor.


TracePro Expert - [RepTile Property Editor]
File Edit View Define Window Help
Catalog
Add Catalog...
Delete Catalog
Add Property...
Delete Property
Copy Property
Catalog: Default
Name: LCD
Description:
Hole
RepTile Type
Variation Type: Constant
Geometry Type: Sphere
Tile Type: Rectangles
Tile Parameters
Width: 5
Height: 5
Data Points
Add...
Delete...
Radius (mm)
Depth/Height (mm)
1
1
Table
For Help, press F1
X:0.0000 Y:46.7133 Z:-49.4118 millimeters
NUM

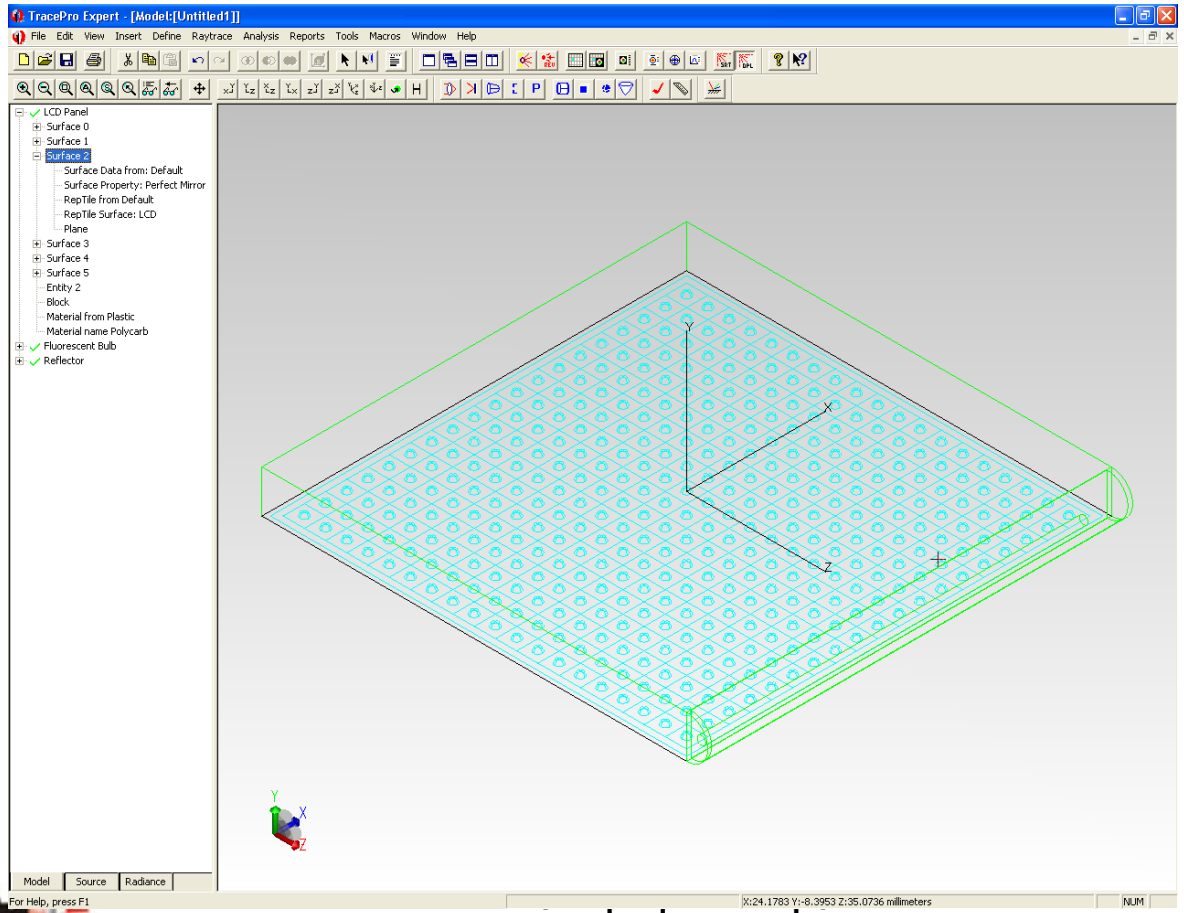
Creating a Dot Pattern Using RepTile Continued

- Select surface 2 of the LCD Panel in preparation for applying the RepTile property.
- Open the Define|Apply Properties dialog box and select the RepTile tab.
- Select the LCD panel dot pattern property and Diffuse White surface property
- Enter the values shown for boundary dimensions, center, (0,0) tile, and Up Vectors.
- Press Apply to update the surface.
- A 98x98 mm rectangular region on the bottom surface filled with spherical holes (as seen from the outside of the solid).
- The holes are spaced 5 mm apart and are 1 mm in radius.


TracePro Expert - [Model:[Untitled1]]
File Edit View Insert Define Raytrace Analysis Reports Tools Macros Window Help
LCD Panel
Surface 0
Surface 1
Surface 2
Surface Data from: Default
Surface Property: Perfect Mirror
RepTile from Default
RepTile Surface: LCD
Plane
Surface 3
Surface 4
Surface 5
Entity 2
Block
Material from Plastic
Material name Polycarb
Fluorescent Bulb
Reflector
Apply Properties
Importance Sampling
Exit Surface
Diffraction
Raytrace Flag
Mueller Matrix
Gradient Index
Bulk Scatter
Temperature
Material
Surface
Surface Source
Prescription
Color
Class and User Data
RepTile
Temperature Distribution
Fluorescence
Property Data
Catalog: Default
Name: LCD
Sphere
Surface Catalog: Default
Surface Name: Diffuse White
Boundary and Orientation
Rectangular
Width: 98
Height: 98
Boundary Center
Origin for tile [0,0]
Tile Up
Boundary Up
Export
Apply
View Data
Model
Source
Radiance
For Help, press F1
X:0.0000 Y:34.9670 Z:7.3501 millimeters
NUM

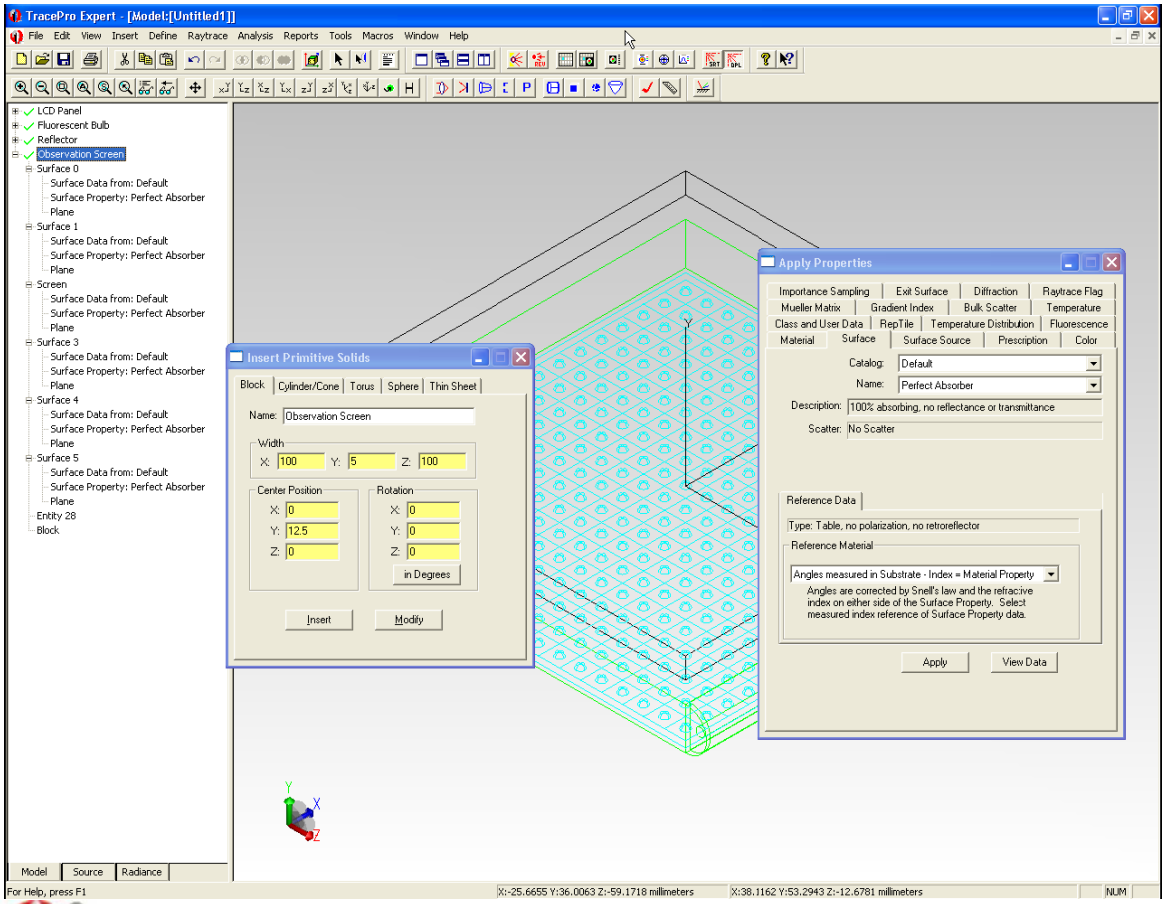
Display the RepTile Surface

- Select View Display RepTile|RepTiles+Boundary.
- Select View Profile|Iso 1.

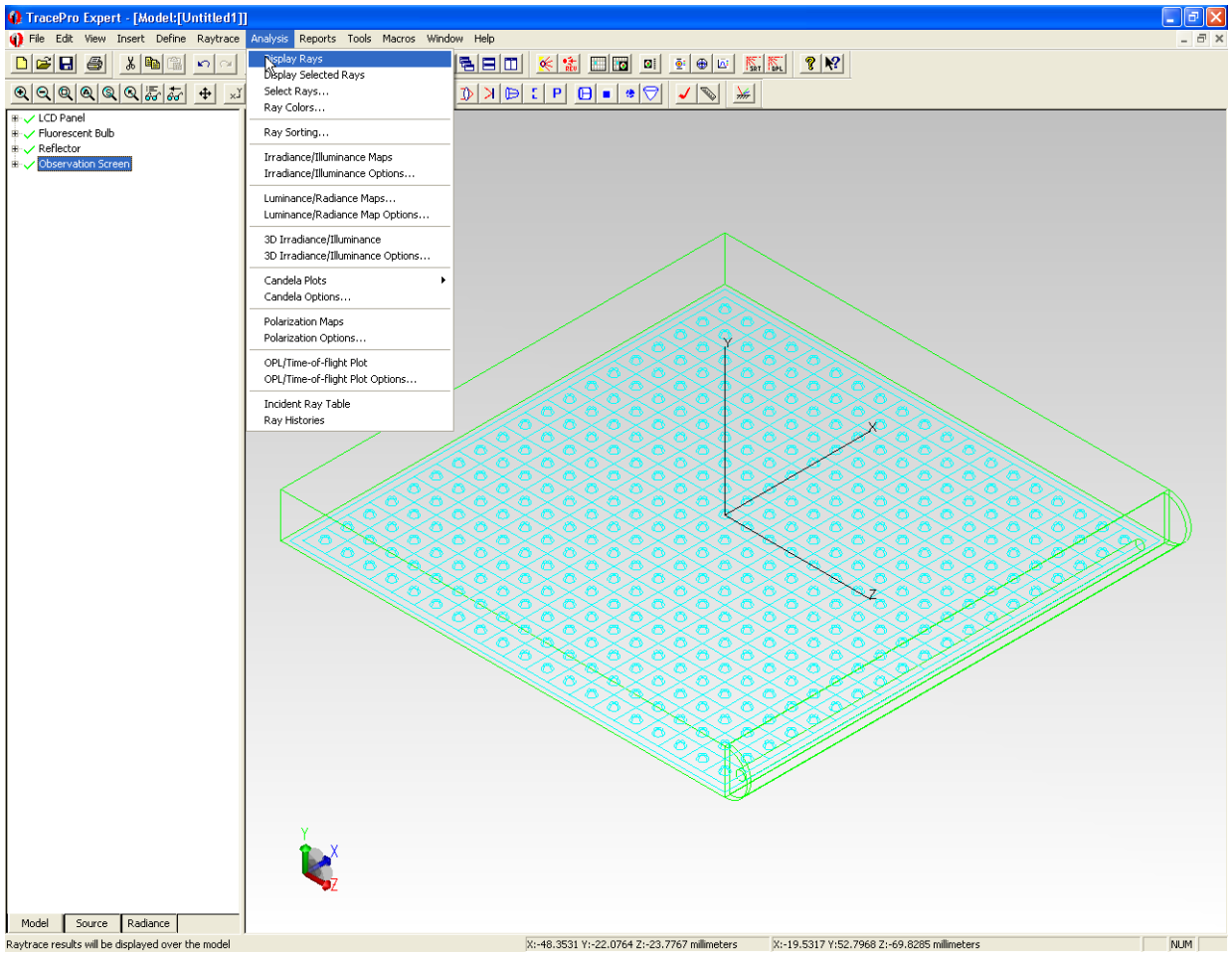


Adding an Observation Screen

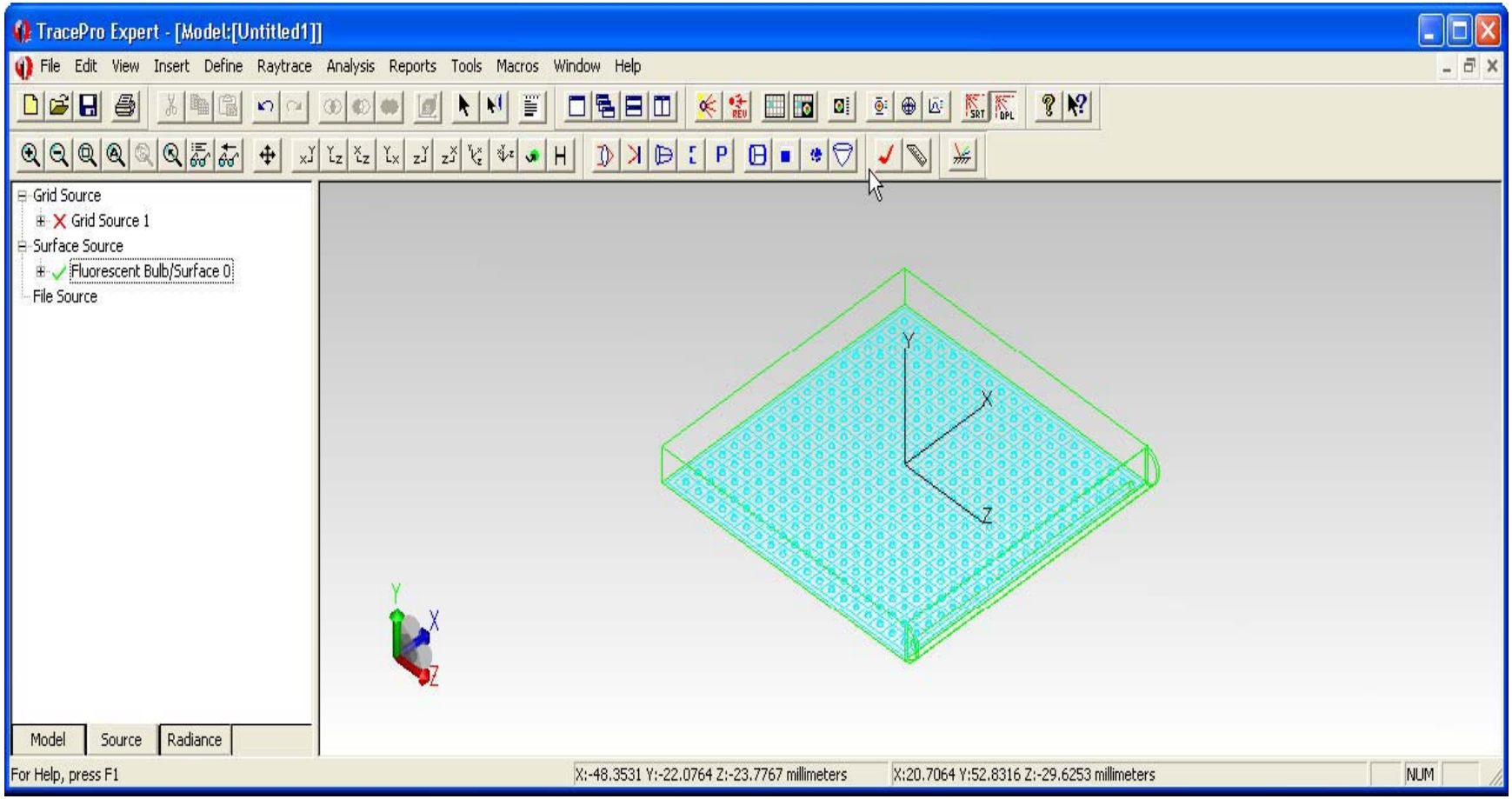
- Add an observation screen to the system, select1. Insert Primitive Solid and select the Block tab.

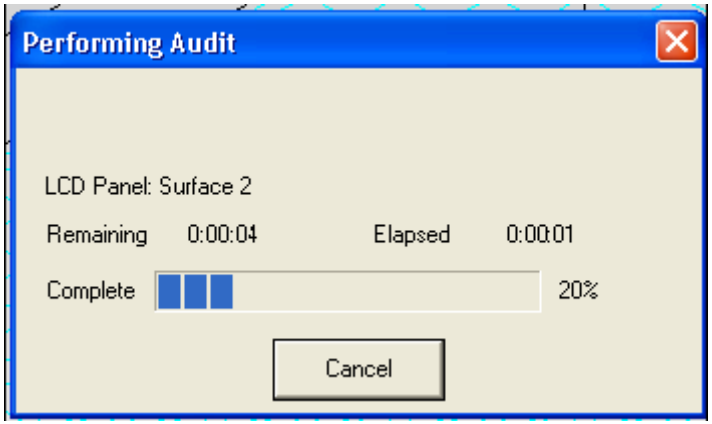


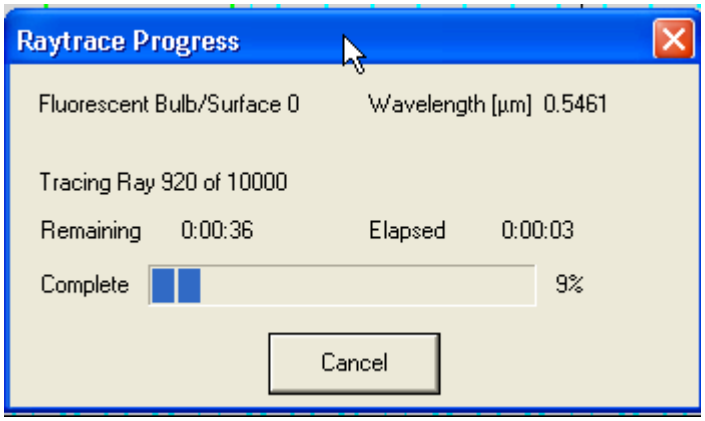
Turning the Display of Rays Off



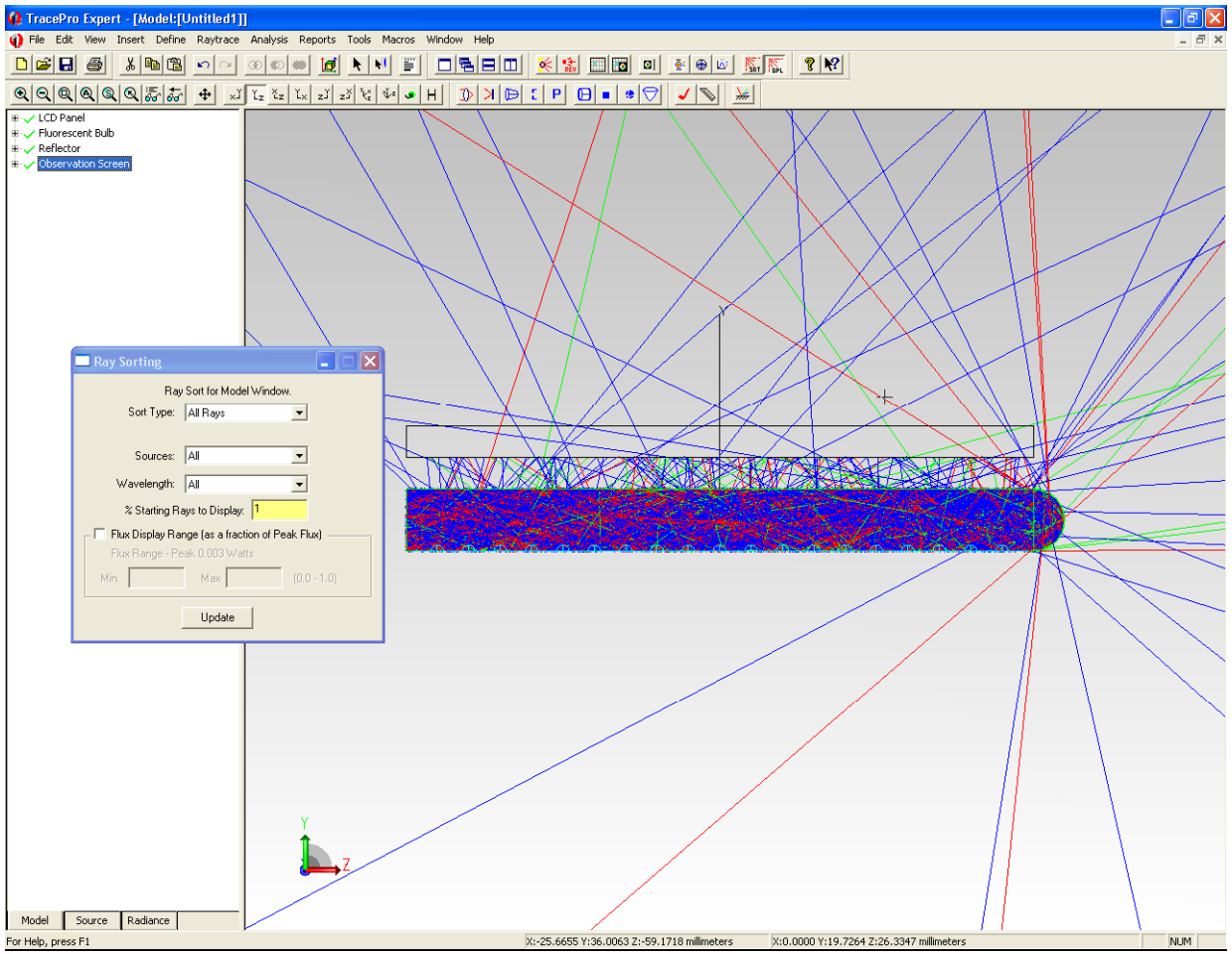
Running a Source Trace Simulation



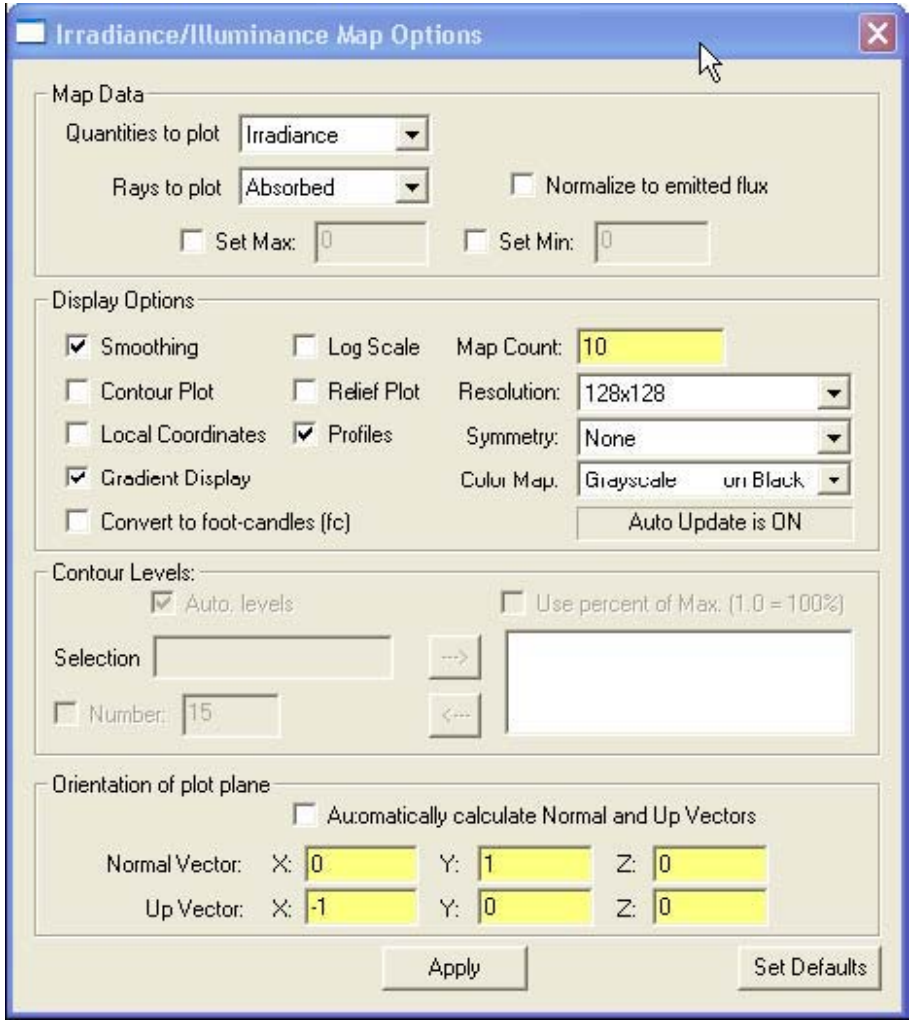

Performing Audit
LCD Panel: Surface 2
Remaining 0:00:04
Elapsed 0:00:01
Complete
20%
Cancel


Raytrace Progress
Fluorescent Bulb/Surface 0
Wavelength [µm] 0.5461
Tracing Ray 920 of 10000
Remaining 0:00:36
Elapsed 0:00:03
Complete
9%
Cancel

Display Ray Trace



Irradiance/Illuminance Map Options



Displaying an Irradiance Map