

1.2 Model Browser Example

What will be learned:

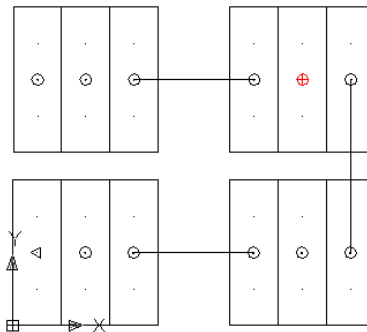
- Overview of Thermal Desktop's Model Browser
- Using Model Browser for model troubleshooting and review
- Assigning material properties
- Basic use of Case Set Manager
- Obtaining steady state and transient solutions in Thermal Desktop
- Calculating heat flow between submodels
- Using Model Browser to create XY plots against time for transient solutions

This tutorial demonstrates some of the capabilities of Thermal Desktop's **Model Browser**. The example model for this tutorial is very simple but the capabilities extend very well to larger models.

Model Browser Example

1. Double click on the file `ModelBrowser.dwg` located in the `Tutorials\Thermal Desktop - legacy\ModelBrowser` folder.

Thermal Desktop opens with the `ModelBrowser` drawing on the screen.



Thermal Desktop's Model Browser can be used to view information about a model. A modeless window (can be resized and minimized) will list model data based on the type of data to be selected. The window is divided into two frames: the tree frame and the output frame. The default is to list by Submodel and ID.


The user may select the **List By** menu (within the Model Browser window) to see what types of objects are available for listing.

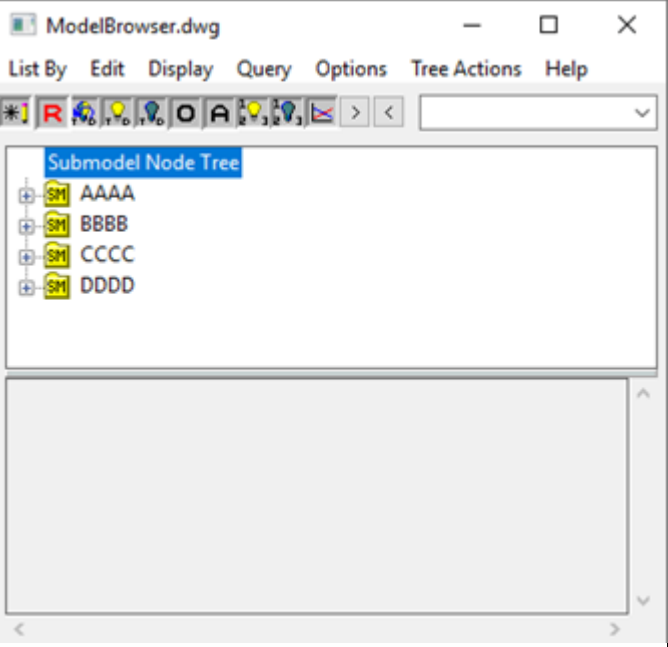
The user can manipulate the AutoCAD graphics by simply making the graphics window active by clicking anywhere on the main AutoCAD window and then performing operations in that window.

Model Browser Example (Continued)

The user can determine what has been selected by looking in the output frame. The output frame will detail how many items have been selected and their type, the visibility state, the layers that the objects reside on, and additional data for the selected items.

As items in the tree frame of the Model Browser are selected, additional information about the selected item is displayed in the lower portion of the window. Single clicking on an item results in high-level information about the selected item being displayed below. Double clicking on an item in the tree frame of the Model Browser results in the expansion of the data tree and more detailed information being displayed.

2.  or **Thermal > Model Browser**.
- The **Model Browser** window appears on the left side of the screen.



Display the Model Browser.

The tree display is the upper half.

The output frame is the lower half.

3. Click on **AAAA** in the tree.
- The display at the bottom of the Model Browser changes to show only the objects associated with AAAA.

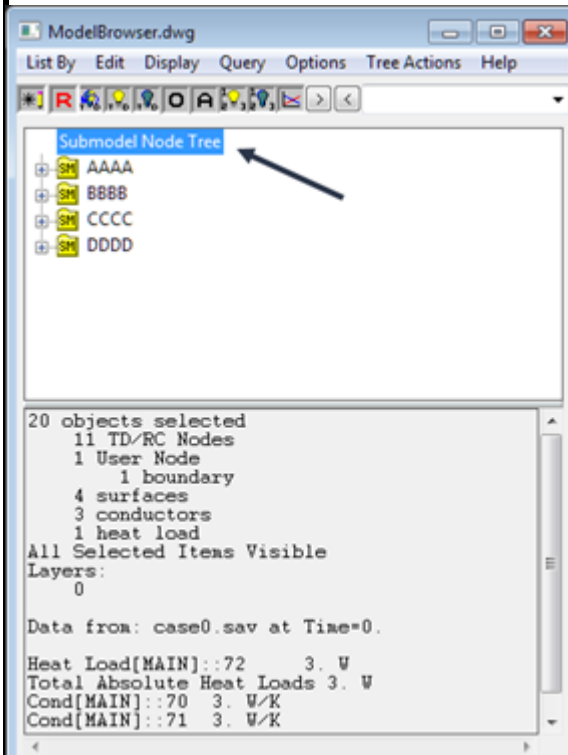
As individual items, in this case submodel AAAA, are selected, the display area at the bottom of the Model Browser changes to reflect the components of the selected item.

AAAA includes:

- 5 objects selected
 - 2 TD/RC Nodes
 - 1 User Node
 - 1 boundary
 - 1 surface
 - 1 conductor

Model Browser Example (Continued)

4. Click on **Submodel Node Tree** located in the main view area of the Model Browser.



When Submodel Node Tree is selected, all of the submodels that make up the model are selected, and displayed in the output frame.

20 objects selected

- 11 TD/RC Nodes
- 1 User Node
- 1 boundary
- 4 surfaces
- 3 conductors
- 1 heat load

Note: Use the scroll bar on the right of the output frame to view additional data.

5. Double click on submodel **AAAA**.

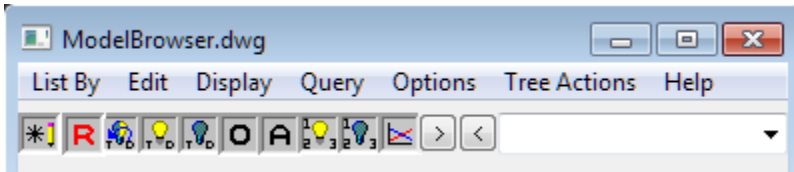

The tree expands to show nodes, 1, 2, and 3 are associated with submodel AAAA.

An 'A', 'B', or 'D' in the icon for a node indicates that the node is Arithmetic, Boundary, or Diffusion, respectively. A circle indicates that the node definition is obtained from a surface, solid, or finite element.

6. Select **node 1**.

Note: Select by single clicking on the object with the **left** mouse button.


Node 1 consists of a User node and a surface.

Model Browser Example (Continued)	
<p>7. Double click on node 1.</p> <p>Note: Expand by double-clicking on the object name or clicking on the plus sign (+) to the left of the object.</p>	<p>The tree underneath node 1 is expanded and AAAA.1^::47 is displayed.</p> <p>Items with the symbol :: (double colon) are graphical entities. The numbers after the :: are unique for each entity.</p> <p>The ^ indicates that the node definition was originally defined by a surface, but the user overrode the definition.</p>
<p>8. Select AAAA.1^::47.</p>	<p>Only the node is selected. The surface, that is below the node is not selected. When an item with a :: is selected the objects below it in the tree are not selected, by default.</p> <p>When an entity without a :: is selected all the objects below it are selected.</p>
<p>9. Double click on AAAA.1^::47.</p>	<p>The submodel AAAA tree expands again and Rect[MAIN]::45 is displayed underneath AAAA.1^::47.</p>
<p>10. Select Rect[MAIN]::45.</p>	<p>The output frame of the Model Browser shows that Rect[MAIN]::45 is a surface and is the only object selected.</p> <p>MAIN is the name of the submodel for the surface's conductors</p>
<p>Being a separate window, the Model Browser has its own title bar, menu bar, tool bar icons and Windows control buttons. If items are selected in the Model Browser tree, use the icons and menus in the Model Browser.</p> 	
<p>11.  or Edit > Edit on the Model Browser menu bar.</p> <p>The Thin Shell Data dialog box appears.</p> <p>Note: The Thin Shell Data dialog box for Rect::45 can also be displayed by double clicking on it.</p>	<p>Alternatively, you can right-click on Rect[MAIN]::45 and select Edit from the menu that appears</p>

Model Browser Example (Continued)

12. Select the **Surface** tab.
13. Type **Fred** in the **Comment** field, as shown below.
14. Select **OK**.

Once the comment is added and OK selected, the tree “flashes” and rebuilds itself. The rectangle is renamed Rect-Fred[MAIN]::45, incorporating the comment that was entered.

15.  to rebuild the data tree and deselect the **Rect-Fred::45**.

This rebuilding capability is controlled with the Model Browser **Options > Auto Update** command. The Auto Update feature is useful with small models, but as models become larger, this can be time consuming.

Deselect *Rect-Fred::45* and rebuild the tree.

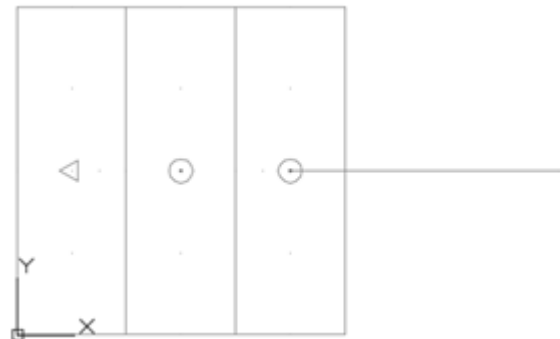
Rect[MAIN]::45





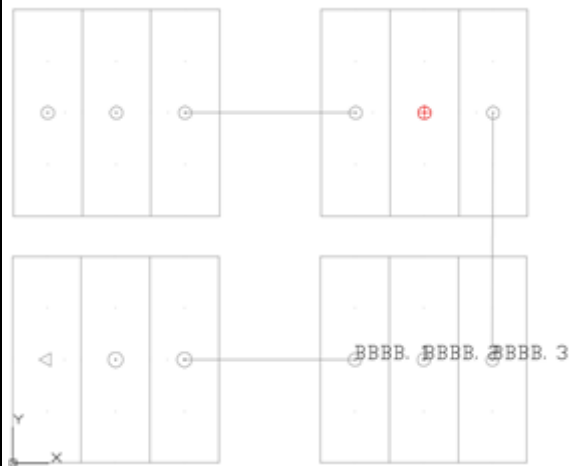
Subdivision	Numbering	Radiation	Cond/Cap	Insulation	Surface	Trans/Rot
<p>Comment: <input type="text" value="Fred"/></p> <p>X Max: <input type="text" value="1"/> m</p> <p>Y Max: <input type="text" value="1"/> m</p> <p>Note: Parameters that are defined with expressions cannot be GRIP edited</p>						

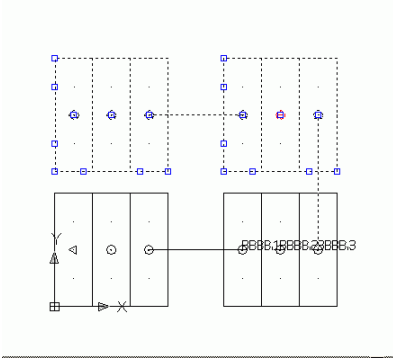
16. Select submodel **AAAA**.
17.  or **Display > Only** on the Model Browser menu bar.

Notice the graphics in the main Thermal Desktop drawing area change to show only the selected items. Submodel AAAA is in the lower left of the drawing area.

Note: It may be necessary to move the Model Browser out of the way, or minimize it, to view the drawing area.



Model Browser Example (Continued)	
18. Select Submodel Node Tree .	The message Mixed visibility for selected items appears in the lower portion of the Model Browser. This message means that although there are many objects in the submodel node tree (and they are listed in the output frame) some of the selected items in the drawing area cannot be seen by the user (not visible).
19. Select Rect-Fred[MAIN]::45 .	This turns visibility off for the selected item.
20.  or Display > Turn Visibility Off in the Model Browser.	
21.  or Display > Undo Turn Visibility Off in the Model Browser	This reverses the last visibility change. If the last change was to turn the visibility of an object(s) on, then after this command the visibility will be turned off or vice versa.
22. 	All the entities in the drawing are now visible. This command turns on the visibility of all items on visible layers.
23. Select submodel BBBB .	The lower portion of the Model Browser changes to display the objects associated with BBBB.
24.  or Display > Turn Ids On on the Model Browser menu bar.	<p>The node IDs are displayed for submodel BBBB.</p> 
25. Right-click on submodel BBBB and select Send Selection Set to AutoCAD .	Notice all items in submodel BBBB are highlighted.

Model Browser Example (Continued)	
26. Right-click on submodel CCCC and select Send Selection Set to AutoCAD .	<p>The CCCC submodel is highlighted in the drawing area and grip points are displayed.</p> <p>Also, these entities are now an AutoCAD selection set, so any command issued outside of the Model Browser, such as Modify > Move, will function on these selected objects after making the main window active.</p>
27. Hold down <Ctrl> and select submodel DDDD . 28. Right-click on submodel DDDD and select Send Selection Set to AutoCAD .	<p>Both CCCC and DDDD are selected.</p> 

Model Browser Example (Continued)

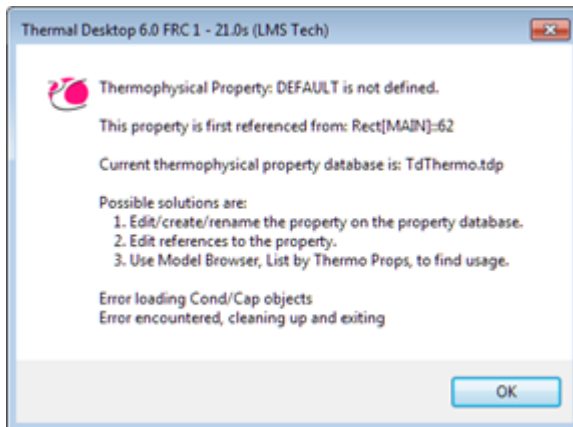
29.  or **Thermal > Case Set Manager** on the main Thermal Desktop menu/toolbar.

The **Case Set Manager** dialog box appears.

30. Select **Case Set 0** if it is not already selected.

31. Select **Run 1 Selected Case**.

A **Thermal Desktop/AutoCAD** dialog box appears with a message stating Thermophysical Property DEFAULT has not been defined.



32. Select **OK** to close the dialog box.

The Case Set Manager is the link between Thermal Desktop and SINDA/FLUINT. Under the Case Set Manager, the user can define different solution sets for the model.

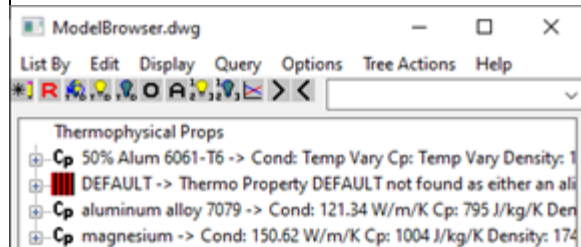
Case Set 0 is a simple steady-state analysis.


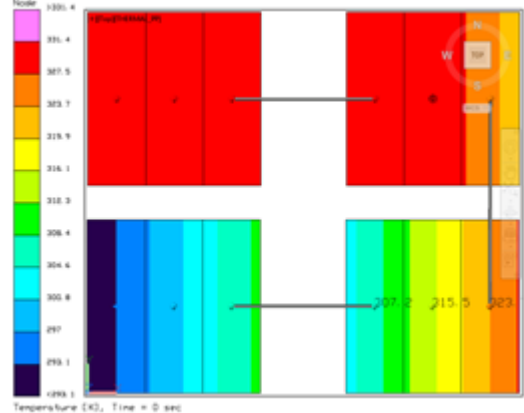
After a Case Set is defined and selected, the Run 1 Selected Case button writes out the SINDA/FLUINT input files, starts SINDA/FLUINT and brings the results back into Thermal Desktop for postprocessing.

The Thermophysical Property DEFAULT is used only as a name place holder and does have property definitions. Therefore, the model definition is incomplete and the solution cannot be started.

33. Select **List By > Thermo Props** on the Model Browser menu bar.

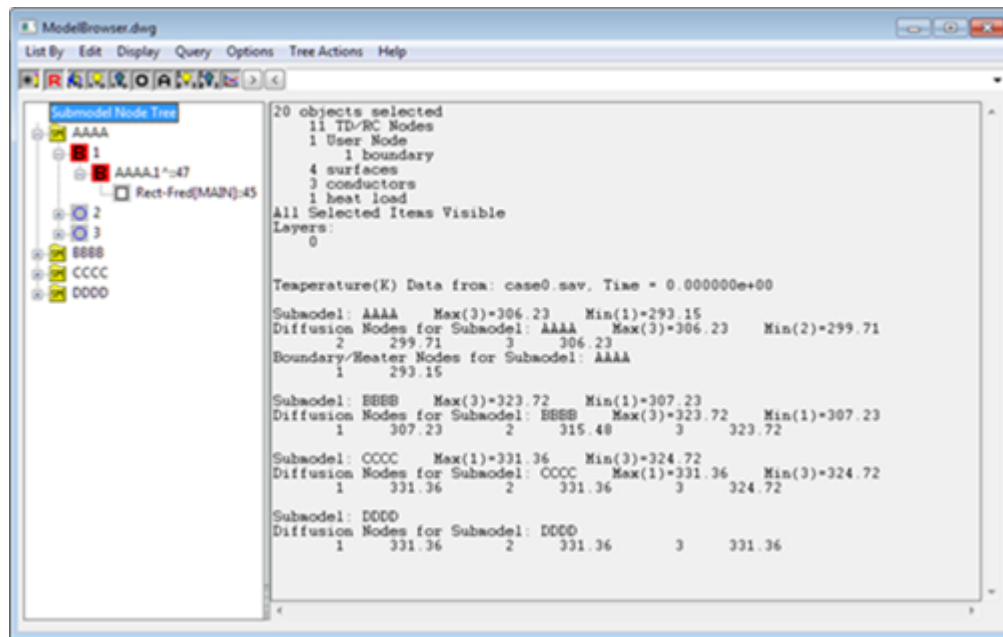
This command rebuilds the **Model Browser** so that objects are listed by the materials that use them.



Model Browser Example (Continued)	
<p>34. Click on the + next to DEFAULT -> to expand the list.</p> <p>35. Right-click on Rect[MAIN] : : 62 (the surface) and select Edit.</p> <p>36. Click on the Cond/Cap tab.</p> <p>37. Click on the arrow next to the Material field and select Stainless Steel from the drop-down list.</p> <p>38. Select OK to close the dialog box.</p>	<p>Change the DEFAULT material to Stainless Steel.</p> <p>Rebuilding the tree will verify that the DEFAULT material has been replaced.</p>
<p>39.  or Thermal >Case Set Manager on the main Thermal Desktop menu/tool-bar.</p> <p>The Case Set Manager dialog box appears.</p> <p>40. Select Run 1 Selected Case.</p> <p>A Sinda/Fluint Run Status dialog box appears confirming the successful completion of the process.</p> <p>41. Select OK to close the dialog box.</p>	<p>A solution is calculated for the default conditions: steady state with no radiation. If the image below does not appear, select a different Layout tab at the bottom left of the Thermal Desktop window.</p> 
<p>42. Select List By > Submodel.Id from the Model Browser menu bar.</p> <p>43. Select Submodel Node Tree, if not already selected.</p> <p>44. Scroll down the list in the output portion of the Model Browser look at the additional available information.</p>	<p>The submodel tree rebuilds and the window is back to its original form.</p> <p>In addition to the summary of the contents of the model, the output portion of the Model Browser includes the temperatures of the selected nodes, along with the Max and Min of the current selection set.</p> <p>These values are the current postprocessed data. If the current postprocessed data were heat rates, then these values would be heat rates.</p> <p>To increase the size of the output portion of the window, the divider between the windows can be dragged.</p>

Model Browser Example (Continued)

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| <p>45. Select Options > Temperatures from the Model Browser menu bar.</p> <p>46. View the Output area.</p> | <p>Scrolling in the text window, you'll see the output looks more like a SINDA TPRINT.</p> |
| <p>47. Select Options > Output Window on Bottom from the Model Browser menu bar to deselect it.</p> | <p>This moves the output area to the right of the tree. The Model Browser window may be resized as desired. The example below shows the window resized horizontally and shortened.</p> |



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| <p>48. Select Submodel BBBB.</p> <p>49. View the Output area.</p> | <p>Selecting on a single submodel, such as BBBB will show the data only for that sub-model.</p> |
| <p>50. Select Options > CSG from the Model Browser menu bar.</p> <p>51. Select Submodel Node Tree.</p> <p>52. View the Output area.</p> | <p>Selecting Options > CSG shows the CSG of the selected nodes, sorted in lowest to highest order. The CSG is the capacitance of a node divided by the sum of all conductances attached to it; it directly affects the timestep of the model for transient runs.</p> |

In order for the CSG to work, the SINDA save file must have capacitance and conductors saved on it. This is set on the Output Tab of the Case Set Manager.



Model Browser Example (Continued)	
<p>53. Select Options > Node Map from the Model Browser menu bar.</p> <p>54. View the Output area.</p>	<p>Options > Node Map shows a SINDA-like NODMAP capability in order for the user to determine how energy is transferred into a node.</p>
<p>55. Select Options > Heat Map in the Model Browser.</p> <p>56. Select submodel CCCC.</p> <p>57. View the Output area.</p>	<p>The heat map shows the energy summary for energy into and out of the selected nodes. Energy between the selected nodes is not in the tabulation.</p> <p>If submodel CCCC is selected, the heat map implies a load of 3W and has 3W leaving into submodel BBBB.</p> <p>If submodels BBBB and CCCC are selected the heat map output will show the energy going from submodel BBBB into submodel AAAA, along with the 3W heat source on submodel CCCC.</p>
<p>58. Select Options > Heat Flow Between Submodels in the Model Browser window.</p> <p>The Heat Transfer Between Submodels dialog box appears.</p> <p>59. Click on the arrow next to the Heat Into Submodel field and select AAAA from the drop-down list.</p> <p>60. Click on the arrow next to the From Submodel field and select BBBB from the drop-down list.</p> <p>61. Select OK.</p>	<p>The results of the heat flow analysis is 3W going into submodel AAAA from submodel BBBB. The program cycles through all the nodes in submodel AAAA and sums the heat flows of all the conductors that connect from submodel BBBB.</p>

Heat Flow Between Submodels [X]

Heat Into Submodel:

From Submodel:

Note: Selecting (GLOBAL) will step through ALL Submodels

Model Browser Example (Continued)		
62.	 or Thermal >Case Set Manager on the main Thermal Desktop menu/tool-bar. The Case Set Manager dialog box appears. 63. Select Case Set 1 . 64. Select Run 1 Selected Case . A Sinda/Fluint Run Status dialog box appears confirming the successful completion of the process. 65. Select OK to close the SINDA/FLUINT Run Status dialog box.	Case Set 1 is a transient analysis that solves for 10,000 seconds.
66.	Select Submodel Node Tree .	<p>With transient results, only the data for the currently postprocessed results are shown in the Model Browser output frame.</p> <p>The Plot command in the Model Browser creates a Data vs. Time plot of the post-processed variable for all selected items in the model tree.</p>
67.	 or Query > Plot Selected in the Model Browser menu. 68. Minimize or close the EZXY Plotter window.	
69.	Close the Model Browser.	Exit Thermal Desktop and save as prompted.
70.	Select File > Exit . A Thermal Desktop/AutoCAD dialog box appears asking to save the drawing changes.	
71.	Select Yes .	