II. INTRODUCTORY EXERCISES

In this chapter you will learn how to use the Sauna thermal modeling package. With Sauna's intuitive approach and 3D perspective graphics, the package is easy to learn and fun to use.

Sauna uses a finite difference, thermal network method. This intuitive approach employs the thermal/electric analogy. Thus, a Sauna model consists of a network of temperature nodes and thermal resistors, just like a circuit model consists of a network of voltage nodes and electrical resistors. This straightforward modeling method is familiar to nearly all mechanical and electrical engineers.

While the thermal network method has been in use for many years, Sauna's approach is thoroughly modern. With Sauna, a model is created by combining the building block of plates, circuit boards and plates with fins. Creating a Sauna model is quite similar to creating a model with a solids modeling program. It's rarely necessary to enter resistance values or calculate convection coefficients. All these modeling details are handled by Sauna.

At this point, you're ready to begin the tutorial exercises. This is the very best way to learn about Sauna. It is not recommended that you begin by studying the manual. While much reference material is available, it's better to review this information at a later time.

Tutorial exercises - a road map

There are three chapters which contain tutorial exercises. Here is a quick summary of the contents:

Chapter 2: Introductory Exercises. All users should work through the eight exercises in this chapter. You can expect to spend 6-8 hours doing these exercises. This may seem like a lot, but if you don't complete these exercises, you will use Sauna inefficiently. Even worse, if you don't complete the exercises, there's a much greater chance of errors in your models. So please take the time to work through these exercises.

Several of the introductory exercises are available to Sauna Evaluation Package users. So you may have already completed some of the introductory exercises, which will save you some time.

Once you have completed the introductory exercises, you will be able to create models for a variety of heat sinks, boards and boxes.

Chapter 3: Intermediate Exercises. In this chapter you will learn the techniques for slicing assemblies, creating stackups, advanced board analysis, and modeling of fan cooled boxes. These are important topics. It is hoped that nearly all Sauna users will complete these exercises.

Chapter 4: Supplemental Exercises. These exercises cover topics which are of interest to many, but not all, Sauna users.

Now you're ready to start learning about Sauna.

Using The Menus

When you run Sauna, the first thing that will be displayed is a window which identifies the program version. To clear this window from the screen, click on the Done button. After clearing the version window, the computer screen will be similar to this picture:

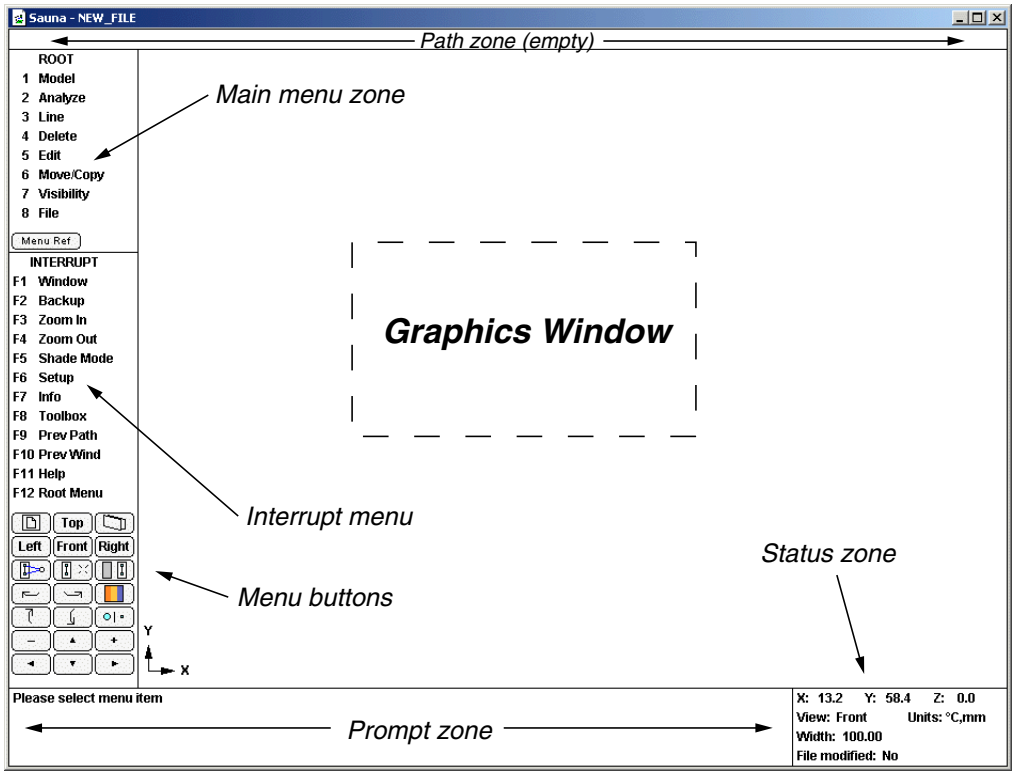

Figure 2-1: Sauna screen layout

If you look at the above figure, you will see that Sauna divides the screen into these 7 areas:

- **Main menu zone**. The menu entitled "ROOT" is located in the main menu zone. The main menu zone contains different menus and selections according to the type of operation being performed. Since you have just started to use the program, the main menu zone contains the beginning, or Root, menu. Notice that there is a Menu Ref button just below the menu. If you click on this button, a window will pop up with a complete description of the menu selections.

- **Interrupt menu**. Unlike the main menu zone, the same Interrupt menu is always visible on the screen. With the Interrupt menu you have immediate access to the most frequently used commands. For example, at any time you can select <F12 Root Menu> to return to the Root menu and start a new set of commands.

- **Menu buttons**. The menu buttons provide shortcuts to the most commonly used Sauna commands.

- **Prompt zone**. The message "Please select menu item" is displayed in the prompt zone above. At other times, the prompt zone will display a message asking you to type in data.

- **Path line**. At the very top of the screen is the path line. At the Root menu level the path line is empty. As you use the menus to enter commands, the path line will list the string of commands, or "path", that you have just entered.

- **Graphics window**. The graphics window is the largest area of the display. As you use Sauna to create thermal models, the 3D color representation of the model will be shown in this window.

- **Status zone**. The status zone contains information about the current model and graphics window.

Menu selections can be made by using the mouse or by using the keyboard.

Making menus selections with the mouse: If you look at the screen, you will see a small arrow known as the cursor. When you move the mouse, this cursor also moves. To select a menu item from either the main menu zone or the Interrupt menu, simply move the cursor over the desired menu item and click the left mouse button.

Making menu selections with the keyboard: Using the keyboard is also an efficient way to make menu selections. To choose from the main menu zone, just type the selection number. Do not hit the <Enter> key. To choose from the Interrupt menu, hit the appropriate function key.

A trial run

To get the feel of the menus, *select "Model"* from the Root menu by either clicking with the mouse or typing "1". This will cause the Model menu to be displayed in the main menu zone. Also, notice that the path line now shows "Root > ".

Next, *select "Assembly"* from the Model menu. As before, a new menu will be displayed and the path line will be updated. *Select "Planar Plate"* from the Assembly menu. This time a new menu is not displayed. Instead, the "Planar Plate" selection is highlighted and the prompt zone shows this message:

Enter the plate label (<Enter = Sauna assigns)

Normally you would type in the label for the new assembly and hit <Enter>. However, we'll stop here since this is just a trial run for using the menus. To return to the Root menu, *select <F12 Root Menu>* on the Interrupt menu. You will be back at the starting point. As you can see, using the menus is not at all difficult.

Trapping graphic elements and digitizing points

Before starting the introductory exercises, you also need to know how to select elements shown in the graphic zone and how to define new points.

As mentioned before, there is a small arrow on the screen known as the cursor. When it's appropriate to select an element shown on the screen, the program will prompt you with a message starting with the key word trap. For example, you might be prompted with this message: "Trap a thermal resistor". To respond, use the mouse to position the cursor directly over a thermal resistor. Then, complete the trap by clicking the left mouse button. The trapped element will be redrawn with the verify color and line pattern. If you miss the element, or trap the wrong element type, you will hear a beep, indicating that a bad trap was made and that you should try again.

In a similar manner, you can use the cursor to indicate, or digitize, a new point. In response to the prompt: "Digitize a point", move the cursor to the desired location and click the left mouse button. A small box will be drawn on the screen to show the location of the digitized point.

That's all you need to know about trapping and digitizing. Now it’s time to create a model.