EESy Solutions

Engineering Equation Solver Newsletter   *No. 13, Spring 2003*

Welcome

EESy Solutions is a newsletter developed to provide news, tips, and tricks relating to Engineering Equation Solver. **EESy Solutions** is provided at no cost to all registered users of EES. Did you miss any of the previous issues? These newsletters and other useful information can be downloaded from our web site: www.fchart.com.

Instant Update Service

Instant Update Service was initiated in Spring, 2001 and as of April 15 2002, all new licenses of EES were provided with one year of Instant Update Service. Although updates are still available on a CD, Instant Update Service is the most appropriate alternative for EES, since it is updated frequently. The latest version is placed on our server so that subscribers can download a new version whenever they wish to do so. The cost for this service is 25% of original cost of the program per year. Contact F-Chart Software if you wish to subscribe to Instant Update Service and take advantage of some of the new features described below.

Academic Site Licenses

F-Chart Software renewed its contract with McGraw-Hill in June 2002 so that Limited Academic versions of EES will continue to be provided with at least six McGraw-Hill textbooks for the next few years. Several new textbooks involving EES are in the planning stage. Fully functional Academic versions of EES are provided by McGraw-Hill to educational institutions in the U.S that adopt selected McGraw-Hill textbooks at no cost for the adoption period. Alternatively, academic site licenses can be purchased from F-Chart Software by educational institutions within the U.S. and abroad independent of any textbook consider-ations.

What's New?

As in years past, literally hundreds of changes have made to EES during the past year. The capabilities of the program continue to grow. What follows is a short description of some of the more important new capabilities.

Where's the List of New Features?

Until recently, EES automatically opened file Hello.EES which contained a chronological list of new features. The capability to automatically open Hello.EES still exists, but the new features list has been moved to the Help menu.

Unit Checking Enhancements

The unit checking capability provided by EES is proving to be among its most useful capabilities, both within academia and industry. The following improvements have been made to the unit checking capability during the last year.

- Unit checking is now done for equations in internal Functions, Procedure, Modules and Subprograms, as well for the parameters supplied to these routines.

- The units of numerical constants used in an equation can be entered by following the constant with its units enclosed in brackets.

- The Formatted Equations window now provides options to display the units of constants and variables in the equation.

- The $CheckUnits directive can be used to turn off/on unit checking for a selected range of equations as well as to turn off/on automatic unit checking.

- Right-clicking in the Equations, Solution, or Table windows and in the Variable Info dialog brings up a list of frequently used units, eliminating the need to key them in.

Long Equations

The 255 character limitation for the length of an equation has been removed. This capability extends to Functions, Procedures, Modules, and Subprograms, so that there is no longer any limit on the argument list.

Report Window (Professional Version)
The new Report window provides nearly all of the capabilities of a word processor including the ability to change fonts, sizes, colors, styles, and margins. Sub and superscript capability are provided and graphics such as equations and figures can be pasted from EES or other applications. In addition, the text in the Report Window can include EES variables that are updated automatically.

Diagram Window Enhancements
The Diagram window was originally developed to hold a static figure representing the system being analyzed. It still does this, but it can do so much more. In the Professional version, the Diagram window provides a powerful graphic user interface. The following new capabilities have been added to the Diagram window.

- The location and size of text and graphic items placed on the Diagram window can be specified with EES variables, as well as with numerical constants. Using EES variables allows programmatic control over the visibility of selected text and graphics. This capability can be used, for example, to display a different figure when a user selects an option from a drop-down text list.

- Some of the capabilities of the Report window have been included in the Diagram window. It is now possible to paste items from other programs as Linked objects. Double-clicking on the object in Development mode opens the original program allowing the item to be edited. Equations from MathType and formatted text and figures from Word are examples of the items than can be pasted into the Diagram window in this manner.

Improved Convergence Capability
The numerical algorithms used in EES to solve equations require guess values for the unknown variables to initiate the solution process. By default, EES provides a guess value of 1 for all variables and in many cases, this is sufficient. Some non-linear equations, however, will not converge with the default guess values. It has been found that dependence on the guess values can be reduced by algebraically rearranging the equation. EES now does this automatically.

Property Data
A major difference between EES and other equation solvers is the extensive library of thermodynamic and transport properties that are provided in EES. Property data have been added for deuterium and cyclohexane. Improvements have been made to the property data for propane, n-butane, isobutane, hexane, R123, and R134a.

Calculator Window
Are you old enough to remember the Apple IIe computers? These computers would evaluate any algebraic expression followed by a ?. Well, EES also provides this capability in the Calculator window accessed from the Windows menu. In addition to numerical values, EES will allow any EES variable or function to be included in the expression. The Calculator window floats in front of other windows providing convenient access. You won't need that calculator any more.

Conditional Compilation
Conditional compilation is one of those features, that, once you see it, you can't do without it. This feature uses the $IF and $IFNOT directives. Equations that are placed between a $IF or $IFNOT directive and $ENDIF are used by EES only if the condition that follows $IF or $IFNOT is true. There are a number of possible conditions, but the most useful are the Parametric Table tests. For example, suppose values of variable X are provided in a Parametric table. It is then not possible to include equation X=10 in the Equations window; but sometimes you wish to use the Parametric table and other times you don't. In the past, the solution to this problem would be to comment out the equation when using the Parametric table and remove the comments when not using it. A better alternative is to use conditional compilation, e.g.,

$IFNOT ParametricTable
X=10
$ENDIF

Conditional compilation can also test for specific tables, e.g., $IF ParametricTable='Table 1'

Conveniences

Many small changes have been made to make EES simpler to use. Here's a sampling.

- Pressing the left or right arrow key when the plot window is foremost will display the previous or next plot.

- A Preferences button is available on the startup screen for new or multiple users allowing easy access to personal setting.

- The $Bookmark directive places a menu item in the Search menu that will move the cursor position to the specified location in the Equations window. This capability simplifies finding specific equations in long programs.

- The $TabStops (formally $TabWidth) directive allows setting up to 5 tab stops.

- Up to version 6.622, Functions, Procedure, Modules, and Subprograms that call on another had to appear in the Equations window is particular order. This requirement has been eliminated.

- Indices of array variables and Duplicate loop limits can now be specified in a Parametric table.

- The width of bars in bar plots can be adjusted.

- Right-clicking in the header cell of any table brings up a menu that includes a Properties item. The Properties menu item displays the sum, average and standard deviation of the values in that column, along with other data.

- Error bars can be placed on any plot, independent of whether or not the Uncertainty Propagation table calculation was used.

- Functions are now provided to return the sum and average of any Parametric or Lookup table.

- Tabs on the plot and table windows can be color-coded for easy identification.

- A text item placed on a plot window can span multiple lines.

- EES plots can be saved in a separate file in .bmp, .jpg, .wmf, or .emf formats.

- Selecting any variable in the Equations window will display a hint window showing its value.

Tips and Tricks

Most of the comments we have received concerning **EESy Solutions** have asked to continue providing tips on the use of EES that are not well-known or documented in the manual. Here are a few of our favorites.

Disable AutoSave for versions previous to 6.653

The AutoSave option was originally intended to provide an additional level of security, but as it turned out, AutoSave could attempt to save a file at a time that it should not attempt to do so, such as during the preparation of a plot. The result could be a corrupted file. The problem was corrected in version 6.653. If your version of EES precedes version 6.653 dated Nov. 28, 2002, you should be sure to disable the AutoSave option in the Preferences dialog. Alternatively, you should consider updating.

Display Values in the Variable Info dialog

The Variable Info dialog displays the guess value and limits for all variables appearing in the Equations window. Sometimes, however, you wish to see the current value of a variable, rather than its guess value. This can be done simply by pressing and holding the right mouse button. When the right mouse button is pressed, the values in the Guess value column will be replaced with the current value of the variables. These values cannot be edited. Releasing the right mouse button will return the display to the normal condition in which the guess values are shown.

Printing Without the EES Header

EES printed output normally displays a header line at the top of the page indicating the file name, EES version number, date and registration information. In some cases, you may wish to hide this header information. This can be done by holding the **Alt** key down while clicking the OK button in the Print dialog.

Adding Graphic Items to Plots and Diagrams
Simple graphical items such as lines, circles, and rectangles, can be drawn on the Plot and Diagram windows using the tools on the Plot or Diagram window toolbar. In addition, graphical objects can be pasted from other programs, such as PowerPoint. It may be necessary to resize the object when it is pasted from another program. See the next item for a means to resize the graphic while maintaining its aspect ratio.

Holding the Aspect Ratio Fixed While Resizing
Graphical objects such as circles, and rectangles, created in EES and graphic objects pasted from other programs can be placed on the Plot and Diagram windows. Clicking on the object will select it and display 'handles' represented with small squares. (Note that the tool bar must be visible for items to be selected in the Diagram window.). Moving the mouse over a handle and "dragging" (i.e., holding the left mouse button down while moving it to a new location) will resize the object. In some cases, you wish to change the size of the object, but maintain a constant aspect ratio. This can be done by holding the **Shift** key down will dragging the mouse.

Controlling the Angle of Lines
Lines and arrows can be placed on the Plot and Diagram windows using the line tool on the Plot or Diagram window toolbar. Clicking on a line displays its handles located at both ends. The line can be resized by dragging its handles to a new location. If the **Shift** key is held down during the dragging operation, the line will be drawn at a fixed angle of 0, 45, or 90°. This capability makes it very easy to draw perfectly horizontal or vertical lines.

Precise Movement of Graphic Items
Any selected text or graphic item in the Plot or Diagram windows can be precisely positioned by using the left, right, up and down arrow keys.

Copy Table with Column Headers
A range of cells in the Parametric, Lookup, Arrays or Integral tables can be selected by clicking in the upper left cell, holding the Shift key down, and the clicking in the lower right cell. Selecting the Copy command in the Edit menu will place the selected cells on the Clipboard in tab-delimited format. These data can then be pasted into another application, such as a spreadsheet program. Normally, the column header information that shows the name and units of the column is not copied. However, if you hold the **Shift** key down, the header information will be placed on the Clipboard, along with the data.

Navigating through Plot Windows
Clicking on the tab at the top of the Plot window selects the plot associated with the tab. If you have many plots, you will find it more convenient to move from one plot to the next using the left and right arrow keys.

Writing to a Lookup Table
The Lookup function is normally used to read a value from a specified row and column of a specified Lookup table. However, inside of a Function of Procedure, the Lookup function can be used to write a value to the Lookup table. For example, the following function will set the value of the cell in Row, Col in the table whose name is held in string variable T$ to Value.

```
Function SetValue(T$, Row, Col, Value)
    Lookup(T$, Row, Col) = Value
    SetValue=1
end
```

Setting Units of Constants
EES allows numerical constants to be assigned units by placing the units within square brackets after the constant. For example, if the units of C and A are $ and m^2, the following equation will pass the EES unit checking tests.

C = 5 [$/m^2] * A