

# EESy Solutions

Engineering Equation Solver Newsletter

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## 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 and other useful information can be downloaded from our web site: [www.fchart.com](http://www.fchart.com).

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## Instant Update Service

EES is an unusual program in that it is under continuous development. New versions appear frequently - often daily - to fix bugs and add new capabilities. In the last year, there have been over 300 new versions which resulted in more new features than at any point since its inception. Most of our users have taken advantage of the annual update we have offered during past years. However, many users have indicated that they wish to update more frequently than once per year so we now offering Instant Update service.

With Instant Update, users can download a new version from our server whenever they wish to update. The cost for this service is 25% of original cost of the program per year. The service can be ordered for multiple years. Users with Instant Update service will be provided with an account name and password to our server from which they can download a new Commercial or Professional version of EES whenever they wish to do so. The standard update on CD is also available. Contact f-Chart Software if you wish to order either type of update

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**F-Chart Software**  
[www.fChart.com](http://www.fChart.com)

## What's New?

EES has undergone significant changes during the last year with over 300 versions released since April 2000. Here is a short description of some of the new features in EES version 6.

### Multiple Parametric and Lookup Tables

Previous to version 6, EES only allowed one Parametric and one Lookup table. Now, there is no limit on the number of Parametric and Lookup tables that can be defined. Tabs with editable names are provided on the Parametric and Lookup windows (and on the Integral table window as well) to simplify access to the tables. The **Solve Table** command can do the calculations for a specified Parametric table or for *all* Parametric tables. Functions that access the Lookup tables (e.g., Lookup, Interpolate, Differentiate) are now designed to accept the name of the Lookup table that appears on the tab. Plots can be generated from any table. All tables are stored in the .ees file with the Save command.

### Unlimited Plot Windows

Version 6 eliminates the 10-plot window limit that existed in previous versions. Plot management has been simplified by the use of tabs in the Plot window. The tabs can be given names for easy identification. The plot routines can be generated from data in any Parametric, Lookup, Integral, or Array table.

### Improved Table Access

All of the EES tables have been redesigned to simplify changes in properties and copy-paste operations. For example, clicking the left mouse button in the column or row header selects that column or row. The Copy command copies the selection to the clipboard so that it can be pasted directly into a spread-sheet or word processor application. Right-clicking anywhere on the table brings up a pop-up menu with options, including the capability to insert and delete rows and columns and add/remove borders. Selected cells in a table can now be printed.

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### Plot Window Enhancements

In addition to removing the limitation of 10 plot windows, a number of other enhancements have been added to the plots in version 6 including:

- Two X-axis scales can be defined. The second X-axis scale is initially placed at the top of the plot, but it can be moved to any location using the Ctrl-up/down arrow keys.
- Left and right Y-axis scales have always been supported in EES. However, now the scale choice has been simplified and the scale choice can be changed after the plot is constructed. The right Y-axis scale can be moved with the Ctrl-left/right arrow keys.
- Text placed on the plot window can contain the name, value, and units of any EES variable. The value can optionally be updated on the plot when it is changed in your program.
- A new algorithm has been devised to automatically select the interval used on the X and Y-axis scales. The new algorithm provides better-looking plots.
- Graphical objects can be copied from other applications (e.g., MathType, PowerPoint, etc.) and pasted into EES plot windows. The object can then be moved or resized. It is possible to paste an EES plot into another plot window to create a plot-within-plot display.
- Controls have been added to the Preferences command to allow EES plots to be copied to other applications without loss of quality. Plots can be copied as a high precision bitmap and/or as an enhanced metafile picture. The resolution of both image types can be specified from 100 to 1200 pixels per inch in black and white or color. With these capabilities, EES can generate and export publication-quality plots.
- Controls are provided to separately display error bars in the X and Y directions.
- Multiple plots can be selected in the Modify Plot dialog and changes, e.g., symbol size, can be made to all selected plots at one time.

### Diagram Window Enhancements

The Diagram window (and child diagram windows in the Professional version) are perhaps the most powerful but least used feature in the program. The Diagram window provides a place to display graphics and text. The graphics can be drawn in EES or copied (or scanned) from another application. For example, a schematic diagram of a system identifying state point locations can be displayed in the Diagram window. In addition, the Diagram window can be used as a graphical user interface for inputting and outputting information and for generating reports. Buttons can be placed on the Diagram window to initiate calculations, show plots, save user inputs and start-up other applications. Major changes have been made to the Diagram and child Diagram windows in Version 6 including:

- Older versions of EES allowed only one graphical object to be copied into the Diagram window. It is now possible to copy any number of graphic objects to and from EES. The clipboard format for these objects is identical to that used in popular graphics programs so it is now easy to exchange graphics with PowerPoint, CorelDraw and other graphical applications. After they have been copied to the Diagram window, the graphic objects can be moved, and resized. All graphics are now saved within the .ees file making the .wmf files used in previous versions unnecessary.
- Buttons have been provided on the Diagram Window Text Input Dialog to facilitate entry of subscripts, superscripts and symbols.
- Graphic and text items in the Diagram window can be grouped. Group and ungroup can be specified using the group/ungroup buttons on the toolbar or the pop-up menus that appear when right-clicking the mouse.
- The width and height of all buttons in the Diagram window can be adjusted by selecting the button and holding the Ctrl key depressed while pressing any of the arrow keys.

### New Functions

The following new functions have been added:

- CP and CV return the specific heats at constant pressure and volume, respectively. CP provides exactly the same result as the SPECHEAT function which is retained.
- The ISENTROPICINDEX function which in previous versions provided the ratio CP/CV has been replaced with the related SOUNDSPEED function which returns the speed of sound through the fluid in [m/s] or [ft/s].
- DATE\$ and TIME\$ string functions have been added to return the current date and time, respectively.
- StringLen returns the number of characters in the string constant or string variable supplied as an argument. For example, StringLen(A\$) returns the length of the string stored in variable A\$.
- The NLookupRows function returns the number of rows in the Lookup table or Lookup file specified in the string argument. For example, NLookupRows('Lookup 1') returns the number of rows in the Lookup file named 'Lookup 1'.
- A WARNING procedure has been implemented (similar to the ERROR procedure) to allow the user to display warning messages. Previously, only the last warning message could be displayed. However, now warning messages are placed in a message queue and all of the messages are displayed when calculations are completed. The warning messages are not generated or displayed unless the 'Show Warning Messages' checkbox in the Options tab of the Preferences dialog is checked.

### Property Data

The fundamental equation of state implemented in version 5 of EES provides the most accurate representation of the thermodynamic property data currently available. Within the last year, property data for methanol, carbon monoxide, n-pentane, n-hexane, and hydrogen have been

added to the high accuracy property data base. Transport properties are also provided for these fluids. Property data have also been added for C2H2, C2H4, and R507A. Transport properties for NO, NO<sub>2</sub>, R404A, R407C, R410A, and R507A have been updated using recently published information. Reference information for all fluid properties are in the on-line help.

### LaTeX and .PDF Output

The new Create LaTeX/PDF Report command in the File menu generates a report including the diagram, equations, solution, tables, and plots in a manner similar to the Print command. However, the Create LaTeX/PDF Report command does not directly print but instead creates a ASCII .tex document that can be read by the LaTeX2e or PDFLaTeX applications. The PDFLaTeX produces a .pdf (portable document interface) file that can be viewed and printed with Adobe Acrobat Reader. Options are provided in EES to directly output the .pdf file so that it is not necessary for the user to know LaTeX to use this output capability. Both the LaTeX compilers and Adobe Acrobat Reader are available at no cost. The quality of the printed output produced in this manner, particularly the formatted equations, is much higher than the standard printed EES output.

### New or Modified Directives

\$IMPORT provides a simple way of reading selected variables from a text file. The format of the \$IMPORT directive is

```
$IMPORT 'FileName', Var1,Var2, X[1..5], S$
```

Filename can a string constant, a string variable, or 'Clipboard'. EES will open the specified file and set the variables to the values in the file.

\$EXPORT has the same format as \$IMPORT. It writes the values of the specified variables to a file or to the clipboard. The \$IMPORT and \$EXPORT directives provide a convenient way to transfer information from one EES program to another or to itself.

\$OPENLOOKUP opens a .CSV, .TXT or .LKT Lookup file and reads that file and places the data into a Lookup table. The filename may be a string constant or a string variable that has been previously assigned to the filename, as in the following examples. If a ? or ?? is provided in place of the file name, a standard open file dialog will prompt the user for the file name. The filename will replace the single ?. If ?? is used, a prompt will occur for each calculation.

\$SAVELOOKUP will save a specified Lookup table into a disk file after calculations are completed. The directive will accept a ? or ?? in place of the filename that the data are to be saved to. In this case, a standard save file dialog will appear from which the filename can be chosen. For example:

```
$ SAVELOOKUP TN$ ?
```

will save the Lookup table having a name that is stored in string variable TN\$ to a file selected from the save file dialog and the selected file will replace the ? so that the save dialog does not reappear. If ?? is used, the replacement will not occur.

\$INTEGRALTABLE accepts a variable for the output step size

#### Miscellaneous Changes

Multiple copies of EES will each have a unique name, e.g., EES(2), EES(3), etc. An option is provided to eliminate the warning that appears when EES is started while other EES applications are running.

Print Preview now allows Zoom In / Out.

The Solution window provides separate tabbed windows to display values of local variables in functions, procedures, and modules.

If the Solution Window was visible when the file was saved, it will be visible when the file is opened.

Subprograms are very similar to Modules, the difference being in how the calculations are actually done, as explained in the online help.

Additional buttons have been added to the speed bar for access to the Lookup, Arrays, Integral, and Plot Windows.

An expiration date can now be optionally specified for Distributable programs generated with the Make Distributable command.

Any macro command can be sent directly to EES from another application such as EXCEL using Dynamic Data Exchange (DDE)

A menu item has been added in the Help menu to access the EES manual in Acrobat format.

Multiple plots can be selected in the Modify Plot command by holding the Shift key down while clicking (or dragging) the mouse in the plot line list. If a change is made to a parameter, that change will be applied to all selected plots when the Apply or OK button is clicked.

A range of variable names can be selected when creating a new Parametric table or when adding variables to the table by pressing the Shift key.

Comments can now be displayed in underline font. The setting is provided for both screen and printed display in the Preferences dialog.

#### ***There's been a lot of changes!***

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The capabilities of EES have significantly increased during the last two years. In the past, we have offered a 3-day short course to help users learn these new features. This summer, the developers of the EES program will offer 1 to 3 days of training at your site. See the website ([www.fchart.com](http://www.fchart.com)) or contact f-Chart Software for more information.