EESy Solutions

Engineering Equation Solver Newsletter

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Welcome

This is the 37th issue of EESy Solutions, a newsletter that provides news, tips, and updates for users of the Engineering Equation Solver software. This issue introduces our new website location, www.fchartsoftware.com. It describes the Academic Update Service that will go into effect in 2020 and it presents some new capabilities of the Macro Window.

EES has been commercially available for more than two decades. If you have missed any of the previous issues of EESy Solutions, they can be downloaded from www.fchartsoftware.com.

New Website for F-Chart Software: www.fchartsoftware.com

F-Chart Software has moved to a new location! Our new URL is www.fchartsoftware.com, which replaces www.fchart.com. You may not notice the difference, but the new website should provide faster and more reliable service. We maintain a license server on our website. EES versions starting with 10.661 are linked to the new site.

Access to www.fchart.com should automatically redirect to www.fchartsoftware.com but the redirection does not always work, particularly when bookmarks are used. Be sure to update your bookmarks to point to www.fchartsoftware.com.

Academic Update Service for 2020

Up to and including the 2019-2020 Academic version, EES has been programmed to expire on Sept. 1 of the following year. As a result, it has been necessary for departments to replace their existing EES programs each year with a newer version that was made available at no cost. The version that will be released in June, 2020 will not expire and it will no longer be necessary to replace the program. Free access to our website to download the EES setup program will end on September 1, 2020. After that date, access to the setup program residing on our website for any reason will only be made available with an annual subscription to the Academic Update Service (AUS). The cost of this optional service is $500 per year for the Academic Commercial version and $1000 per year for the Academic Professional version. The optional Academic Update Service will allow departments to take advantage of program enhancements and bug fixes introduced after Sept. 1, 2020. Departments that do not have a subscribe to Academic Update Service can continue to use the Academic version of EES released in June 2020.

Using REFPROP .FLD Files to Extend the EES Property Library

The National Institute of Standards and Technology (NIST) has developed REFPROP (also called NIST Standard Reference Database 23), which provides high accuracy property data for pure refrigerants and refrigerant mixtures. REFPROP is the most authoritative source for fluid property data. REFPROP also provides high accuracy data for refrigerant mixtures, ammonia-water, and most mixtures of organic fluids. EES can access the property data provided by REFPROP with the optional EES_REFPROP interface.

The coefficients in the equations REFPROP used to calculate property data for pure fluids are provided in files having the .FLD file name extension. These files are contained in the Fluids folder within the REFPROP directory, which is C:\Program Files (x86)\REFPROP\Fluids by default Each file provides information for a separate fluid. For example, IOCTANE.FLD provides the necessary information for iso-octane. Professional EES versions 10.633 and newer can read .FLD files developed for REFPROP version 10 *without requiring* the EES_REFPROP interface. The ability to read .FLD files provides access to high-quality property data for fluids that are not already part of the EES property library.

An $INCLUDE directive is used to load the information in the .FLD file. After executing this directive, EES is able to provide thermodynamic property information for the fluid in the same manner as for built-in fluids. The fluid name used in EES property functions is the file name (without the .FLD) appended with _rp. An example that provides property information for iso-octane follows.

```
$INCLUDE C:\Program Files (x86)\REFPROP\Fluids\IOCTANE.FLD
$UnitSystem SI K kP kJ mass
R$='IOCTANE_RP'
T=300 [K]
T_c=t_crit(R$)
h_fg=enthalpy_vaporization(R$,T=T)
rho=density(R$,T=T,x=0)
```

After executing this program, the EES Solution window will show T_c=544 [K], h_fg=306.7 [kJ/kg] and rho=686.2 kg/m^3.

The values returned by EES in this manner may not be exactly the same as those provided by REFPROP. EES uses the coefficients in the .FLD file for its own property calculations, which are not identical to those in REFPROP. However, the differences will be small. Transport properties (viscosity, thermal conductivity, surface tension) are not provided for fluids using .FLD at this time. Online help showing the fluid property reference and applicable ranges of property information is also not provided for fluids entered with .FLD files. This information can be obtained from the REFPROP program. The default reference states for specific enthalpy and specific entropy provided in the .FDL file may be changed in EES using the $Reference directive.

Providing Hypertext in EES Diagram Windows

Hypertext provides a hidden link to a website when a user clicks on the text. The capability to provide hypertext within EES Diagram windows exists, but it is hidden. The trick is to use a transparent Link button. Clicking the text then starts the browser program with the intended URL.

As an example, suppose you have a Diagram window that requires users to enter the name of a fluid. They may not know what fluids are available in EES, so you need to provide a hypertext item that links to the list of fluids. Here is how it is done. Open the Diagram window and put it into Development mode. Click on the text tool in the Diagram Tool Bar to create the text the user will click on.
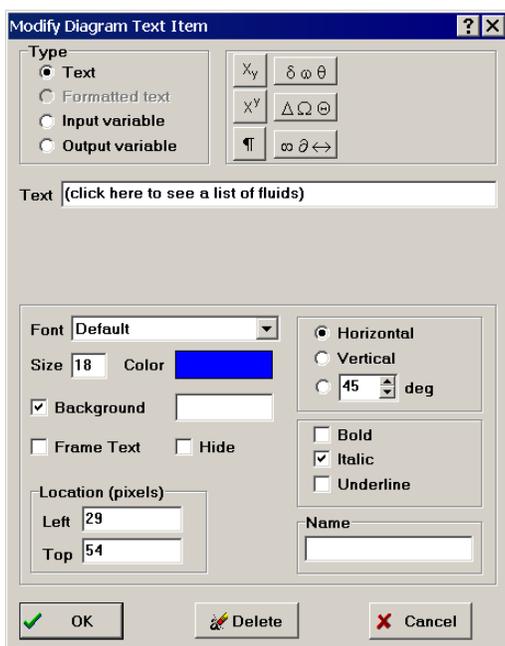
Next, click the Link button on the tool bar. Specify a transparent button and enter the desired height and width of the button. Enter the URL in the box to the right of the Start External Program. Dismiss the dialog. Drag the button so that it is located over the text. Then hide the Diagram tool bar. When you click on the text, it will start the default browser and open the URL.
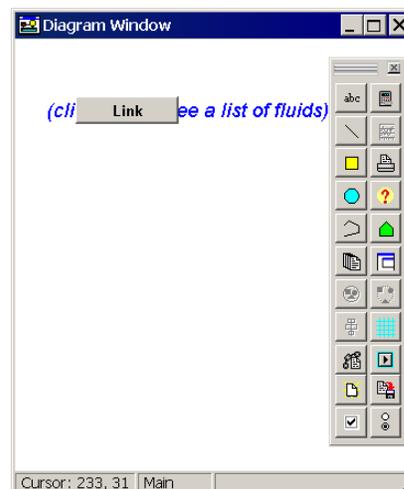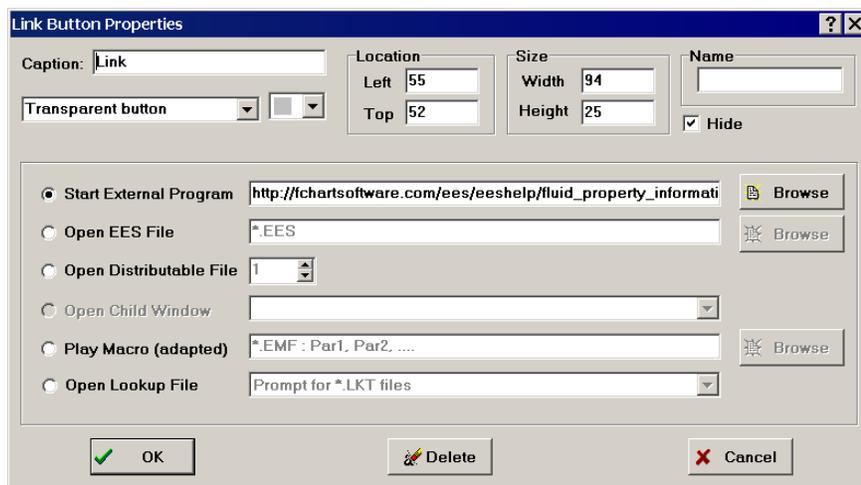
New Macro Capabilities

The capability to enter and execute macros is provided in the Professional version of EES. Macros are scripts (a list of text commands) that allow EES to do any of the tasks in the EES menu commands in addition to others that are not possible any other way. Macros can be started in many ways, such as with a Link button in the Diagram window, clicking the Play button in the Macro Window, or by providing a $RunMacroAfter directive in the Equations window. Entering macros is easy and the use of macros can significantly increase the capabilities of EES.

Commands to Control the Parametric Table

Macro commands to create a new Parametric table (NewTable) or Delete an existing Parametric table (DeleteParametric) are available, along with commands to add (InsertParametricRuns) or delete (DeleteParametricRows) rows from an existing Parametric table. Recently, macro commands have been added to insert (InsertParametricColumn) or delete (DeleteParametricColumn) a column from an existing Parametric table. The display details and units of a column in the Parametric Table can be entered or changed with the VarInfo macro. The value of a cell in the Parametric table can be set or changed with the Parametric macro command. Parametric tables can be saved as an external file using the SaveTable macro. The StoreParametric and RetrieveParametric macro commands allow a Parametric table to be created in one EES file and used in another EES file. Finally macros are available to solve (SolveTable) or optimize (MinimizeTable and MaximizeTable) a Parametric table. In summary, it is possible to completely script the operation of Parametric tables.

The Input Macro Command

The values of input variables in an EES macro are typically set using the Diagram window or by typing them directly into the EES macro window. However, the Input macro command can provide a more direct and convenient alternative to the Diagram window to enter input values. The Input command will prompt the user to enter the values of up to 5 EES variables. For example, playing the simple macro below prompts the user to enter the temperature, pressure and fluid name and then it solves the equations to display the specific enthalpy in the Solutions window.

New Macro Capabilities—continued

Saving Macros with an EES file

EES originally required macros to be saved in separate .emf (EES Macro File) files. Starting with EES version 10.690, the Professional version of EES can save macro files with the .EES file, eliminating the need to provide separate .emf files. Right-click on the tab in the Macro window and select Save Macro with EES file. The .emf file name extension will be removed from the macro name that is saved on the tab. The macro will be saved when the EES file is saved and automatically reopened when the EES file is reopened.
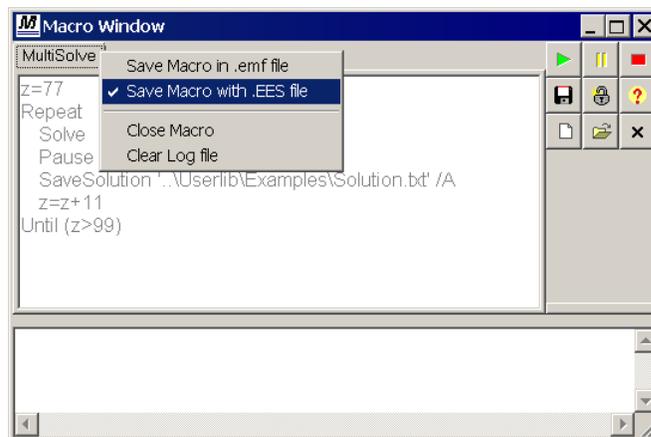
Other Recent Changes to EES

- New or improved property correlations are provided for R1243zf, R1234ze(Z), R423A, R427A, R453A, R455A, R460A, R466A and R513B.

- The Mastering EES menu item in the Help menu will open the Mastering EES ebook if it is located in the EES folder. A separate menu item is provided to check for new versions of Mastering EES.

- An option has been added to the Variable Palette to allow it to highlight variables that appear only once in the Equation window. Such variables are often mistyped and the source of errors.

- Text in the Diagram window can now be displayed at a specified angle between –90° and 90°.

- The SquareWave function has been modified to accept an optional 5th parameter that provides the Duty Cycle, or fraction of the time that the high value is returned.

- The option to draw plot lines have a thickness of 3 points has been added.

F-Chart Software

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Instant Update & Technical Service

EES uses a different model for updating than most other programs. Each time that there is a change in the EES program, either to correct a problem or to add a new feature, the version number is incremented by 0.001 and the latest version of EES is placed on our website. Although the program has become very robust and stable, there have been many new versions of EES released since the last EESy Solutions was distributed.

Any user who has a current subscription to our Instant Update Service can download the latest version. All new non-academic licenses of EES are provided with one year of Instant Update Service. The fee to continue Instant Update Service after the first year is 20% of the current cost of the program per year if renewed within 12 months after expiration. Contact F-Chart Software if you wish to re-subscribe to Instant Update Service (IUTS).