

# FilePlottingTools Manual

Version 1.1

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## Overview

FilePlotting Tools is an Excel add-in developed in VB.net that simplifies the process of making plots from transient thermal text file data, and comparing this data across different files. The software was developed to handle delimited text files containing time vs. temperature data from thermal analysis, or thermal testing. It assumes that the first column in a file is Time, and the remaining columns are Temperature data from nodes or test sensors. The software could be extended to read in other types of time vs. DATA files by changing the conversions on the Formatted worksheet.

## Contact and Release Information

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The FilePlottingTools Website is:

<https://fileplottingtools.larc.nasa.gov>

Source code is publically available from NASA LaRC by request.

Please report any bugs to the email address above.

## System Requirements

Excel 2007 or 2010

## Installation Instructions

1. Close all instances of Excel.
2. If you have an earlier version of "FilePlottingTools" already installed on your machine, you may need to uninstall it before you can install the updated version
  - a. To uninstall existing copies, open the Control Panel, and select Programs and Features
  - b. Find "FilePlottingTools" in the programs list, and press the Uninstall Button
3. Choose the proper version to install on your machine:  
2007 version if you have Office 2007  
2010 version if you have Office 2010
4. Run the Setup.exe file included in the installation folder
5. Follow the instructions to continue installation.

## Before Using the Add-In for the First Time

The add-in features do not work if Excel is running in compatibility mode, and only works with macro enabled files (\*.xlsm). When you open Excel, if the top of the excel window says “Compatibility Mode”, you will need to turn it off. You will also need to “enable all macros” for the plugin to work. Instructions for completing both operations are provided below.

### Turn Off Compatibility Mode

1. Go to Excel Options (either from the Button in Excel 2007, or the File menu in Excel 2010). A dialog will appear as shown in Figure 1.
2. In the list on the left hand side of the Options window, click “Save”
3. Change the dropdown for “Save files in this format” to a Macro Enabled Workbook “\*.xlsm”.  
*NOTE: You could also select “\*.xlsx”, however you will be prompted to save any files using the plotting features as a .xlsm file. It is easier to select “\*.xlsm”.*
4. The Options window should look like Figure 1.  
*NOTE: Excel must be restarted before changes will take effect, however if you need to Enable All Macros, leave the options window open, and complete the next section before restarting Excel.*

### Enable All Macros and Enable VBA Project Model

1. Open the excel “Trust Center” by going into the options window (described in previous section), and clicking the “Trust Center” button in the list at the left. Then click the “Trust Center Settings...” button that appears on the right side of the window.
2. Click on “Macro Settings” of the trust center window, the dialog in Figure 2 will display.
3. Configure the Macro Settings pane as shown below, “Enable all macros”, and make sure “Trust access to the VBA project object model” is checked.
4. Restart Excel for changes to take effect.

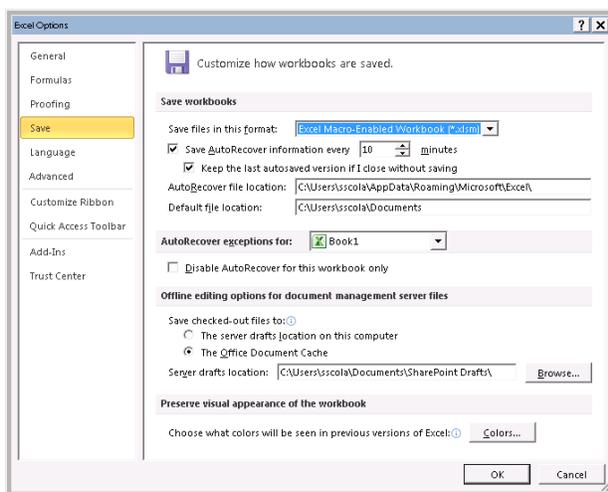


Figure 1. Turn off Compatibility Mode

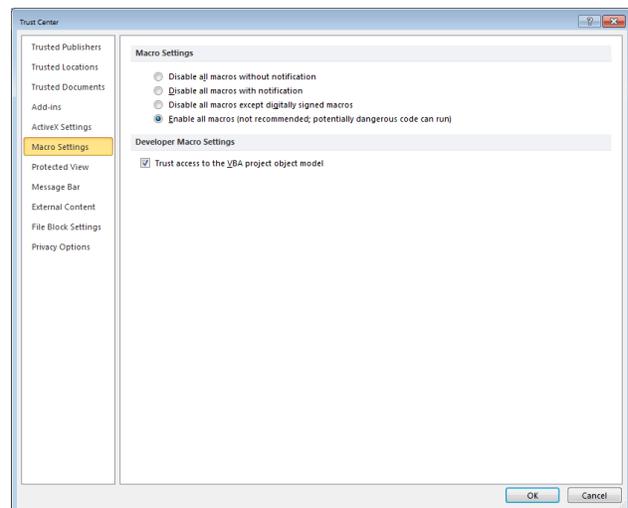


Figure 2. Macro settings in Excel

## Link to the Thermal Desktop® Library

In order to import Thermal Desktop® SAV files, a library called "SinapsXNet.dll" is required by the plugin, and must be referenced. This library is included with the Thermal Desktop® ExcelPlotter installation.

Instructions for setting this up in the plugin are:

1. Go to Start Menu\Thermal Desktop and run "Excel Plotter Setup"
2. Do a search on your main hard drive for SinapsXNet.dll (DO NOT USE THE SEARCH BAR IN THE START MENU, IT MAY NOT WORK, OPEN YOUR MAIN HARD DRIVE AND USE THE SEARCH BAR IN THE FOLDER). The location may be different on different computers.
3. There may be multiple copies of the file on your machine. Use the one that is 1,156KB in size.
4. OPTIONAL: Copy (DO NOT MOVE) the file to another location that will be easier to remember.
5. In Excel, press the "Set SAV Library" button on the FilePlottingTools Ribbon.
6. A dialog box will pop up; enter the full path of the library in the area provided (path\filename). You can use the browse button to select the file.
7. This process is only required once, unless the file is moved

## The Main Ribbon

After the add-in is installed, a new ribbon, “FilePlottingTools” will be visible in Excel, as shown in Figure 3:

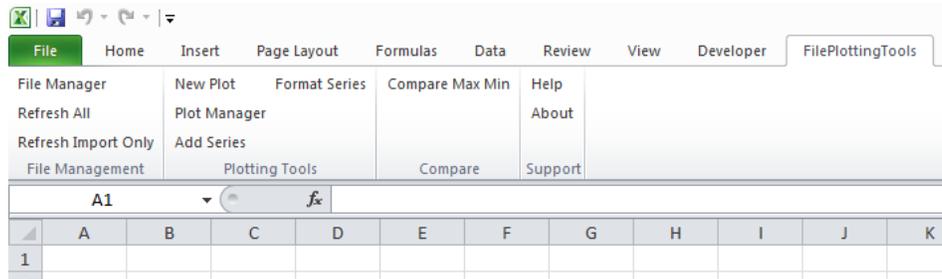


Figure 3. The main FilePlottingToolsRibbon

The ribbon is broken into 4 sections, File Management, Plotting Tools, Compare, and Support. The functions of each button will be described in the following sections.

## File Management and Text File Format

The software will accept any text file with any file extension that is delimited into columns. If multiple files are being compared, the plotting and comparison functions will only work if each file has the same number of columns. The current data formatting in the software assumes the first column is time, and the remaining columns are temperature. An example file is shown in Figure 4, with spaces as the delimiter. The user can specify a custom delimiter if required.

	0	1.0	2.0	3.0	4.0	5.0	6.0
1	0.00	69.98	69.98	69.98	69.98	69.98	69.98
2	0.08	69.76	69.62	69.67	69.76	69.77	
3	0.17	69.69	69.41	69.64	69.62	69.66	
4	0.25	69.79	69.37	69.99	69.60	69.68	
5	0.33	70.13	69.57	70.69	69.69	69.86	
6	0.42	70.75	70.05	71.53	69.84	70.20	
7	0.50	71.58	70.47	72.08	70.01	70.72	
8	0.58	71.40	70.12	71.69	69.83	70.58	
9	0.67	71.02	69.65	71.08	69.44	70.14	
10	0.75	70.54	69.09	70.35	68.92	69.58	
11	0.83	70.00	68.47	69.55	68.33	68.98	
12	0.92	69.45	67.83	68.68	67.67	68.33	
13	1.00	68.88	67.20	67.79	66.98	67.63	
14	1.08	68.29	66.57	66.91	66.29	66.91	
15	1.17	67.68	65.93	66.02	65.57	66.19	
16	1.25	67.09	65.31	65.14	64.86	65.49	

Figure 4. Example text file format. First column is elapsed time in seconds, subsequent columns are nodal temperatures

In addition to text files, the plotter also handles native Thermal Desktop® .SAV files. Only one type of file can be used in a single Excel workbook.

## Importing Text Files

1. Click on the “File Manager” button on the ribbon
2. A window appears with options for importing files.
3. Drag and drop your text files onto the white area in the top of the box, they can be of any extension.
4. You can also drag folders onto the white area. In this case, a second dialog will appear, asking what type of file you wish to import from the folders. There is a list of default Thermal Desktop user files extensions, or you can enter your own.
5. Once all files have been added, they can be ordered as needed using the “+” and “-” buttons on the number pad of the keyboard. The order of the list is the order in which the files will be imported
6. Two options are available for the files, “compare” or “stitch”. Compare will import each file as a separate entity, and assumes each file has the same number of columns with data for the same items in each. Stitch assumes that the files should be combined into one file, in the order in the list. Use this option if you have multiple files from analysis or test that represent one analysis case (i.e. if you have run multiple cases to represent a long transient analysis).
7. Select the delimiter of the file. A custom delimiter can also be entered.
8. The import window should look like the one in Figure 5. Press OK when complete. This will import the data from the files.

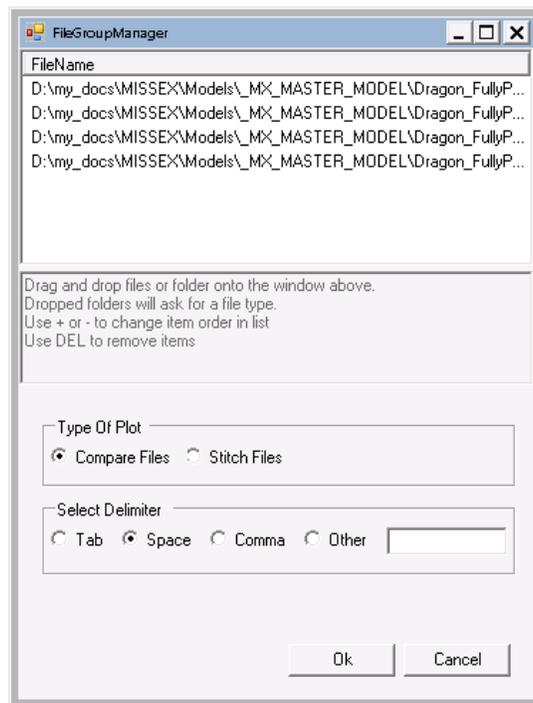


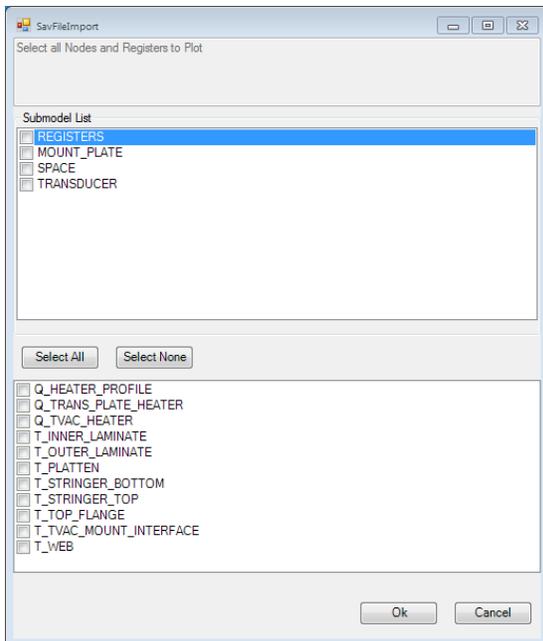
Figure 5. File manager with 4 files to compare, space delimited

## Importing SAV Files

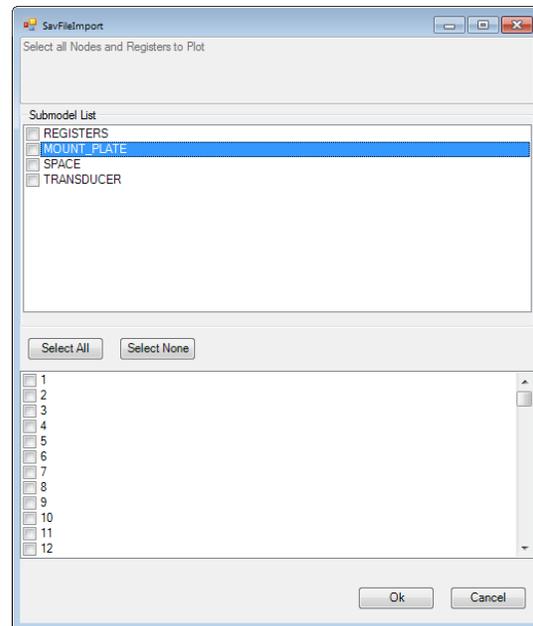
Importing SAV files is the same as importing Text files, however the delimiter options in Figure 5 will be greyed out as they are not required. In order to import SAV files, the library must be found on your

computer (see Link to the Thermal Desktop® Library). All SAV files must be from analysis cases with the same nodes and registers.

1. After loading all SAV files into the File Manager (Figure 5), and ordering them as desired, press the OK button.
2. The dialog shown in Figure 6 will appear. Select the registers and/or nodal temperatures you would like to plot from each file. All selections will be imported from all files.
3. Press the OK button, and the selected data will be imported.



a. Registers can be imported from the SAV file



b. Each submodel will be displayed in the upper text box, and all node numbers will be displayed in the lower text box

Figure 6. Options for SAV file import

## Imported Data Format in the Excel Workbook

When the files are imported, the raw data will be placed in a worksheet called "ImportSheet". If "Compare Files" was selected, the data will be in the format shown in Figure 7. The user must fill in the data shown in the red box in Figure 7, which includes labels and node numbers for each plotted item, and temperature limits if applicable. These values will be used for plot labels, and to make limit lines on plots. The temperature limits must be filled out in the same units as the imported data. Only the headers for the first file need to be filled in, the software assumes each column in each file uses the same information.

**Data filled out by user:**

Component Description	TEST1	TEST2	TEST3	TEST4	TEST5	TEST6	TEST7	TEST8	TEST9	TEST10	TEST11	TEST12
Node Number	MAIN1.T1	MAIN1.T2	MAIN1.T3	MAIN1.T4	MAIN1.T5	MAIN1.T6	MAIN1.T7	MAIN1.T8	MAIN1.T9	MAIN1.T10	MAIN1.T11	MAIN1.T12
Non-Op Max	100	100	100	100	100	100	100	100	100	100	100	100
Op Max	90	90	90	90	90	90	90	90	90	90	90	90
Op Min	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Non-Op Min	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20

Imported Data, file 1													File 2...			
0	69.98	69.98	69.98	69.98	69.98	69.98	69.98	69.98	69.98	69.98	69.98	69.98	0	69.98	69.98	69.98
0.08	69.72	69.59	69.59	69.79	69.71	69.72	69.78	69.78	69.81	69.74	70.35	69.95	0.08	69.67	69.56	69.52
0.17	69.57	69.24	69.43	69.53	69.48	69.62	69.62	69.61	69.69	69.59	71.01	69.94	0.17	69.41	69.15	69.14
0.25	69.58	69.24	69.6	69.44	69.36	69.79	69.53	69.5	69.93	69.74	72.21	70.03	0.25	69.22	68.81	68.86
0.33	69.83	69.36	70.09	69.45	69.41	70.32	69.54	69.47	70.77	70.34	74.32	70.31	0.33	69.12	68.53	68.68
0.42	70.39	69.77	70.74	69.52	69.62	71.25	69.62	69.54	72.31	71.36	77.65	70.83	0.42	69.08	68.29	68.58
0.5	71.11	70.06	71.12	69.64	69.96	72.1	69.73	69.66	74.02	72.36	81.51	71.44	0.5	69.03	68.05	68.45
0.58	70.89	69.7	70.66	69.42	69.79	71.86	69.56	69.5	74.05	72.25	81.91	71.55	0.58	68.94	67.75	68.22
0.67	70.5	69.21	70	69.03	69.4	71.37	69.21	69.19	73.84	71.53	81.35	71.38	0.67	68.56	67.26	67.65
0.75	70.03	68.68	69.28	68.53	68.88	70.78	68.78	68.79	72.31	70.51	80.44	71.04	0.75	68.08	66.74	66.96
0.83	69.52	68.13	68.52	67.97	68.28	70.14	68.28	68.34	71.11	69.3	79.36	70.62	0.83	67.57	66.21	66.21
0.92	69	67.55	67.71	67.38	67.64	69.48	67.76	67.86	69.84	67.97	78.14	70.15	0.92	67.03	65.64	65.4

Figure 7. ImportedSheet file format for comparison option

The data in the ImportSheet is formatted in the “Formatted Data” worksheet, as shown in Figure 8. A number of options are available in the upper left side of this worksheet for converting the time and temperature to different units, shifting the time values by a certain amount, or changing chart labels from Description to Nodes, or both. Comments are provided in each adjustable parameter. If data in a column exceeds one of the four temperature limits in the header rows, that cell will be highlighted to indicate which limit was exceeded. Dark and light shades of red are used for the non-op max and op-max limits respectively and dark and light shades of blue are used for the non-op cold and op-cold limits respectively. The maximum and minimum temperatures of each column are plotted in rows 15 and 16 respectively. Row 17 provides the Time To Limit (TTL) for each node. This represents the FIRST time that a limit is exceeded, based on the TTL flag selection in row 5. All formatting options have comments on them that provide a description of the allowable options.

Figure 8. Formatted Data worksheet, comparison option

## Refreshing Imported Data

There are two buttons in the file management section of the ribbon that can be used to update (refresh) the imported data:

The first button, “Refresh All” updates both the “Imported Data” worksheet and the “Formatted Data” worksheet. This option deletes everything from row 7 down on the formatted sheet, and re-copies all the equations and linkages to the imported data sheet. This is necessary if the number of columns or number of rows in the files has changed, or if additional text files were added, or if existing files were removed. (NOTE: If the structure of the files has changed, any plots that were created may no longer link to the correct columns and will need to be re-created also).

The second button, “Refresh Import Only”, only updates the data in the imported sheet, and does not modify anything in the formatted data sheet. This is useful if the data in the text files have changed, but not the number of files, or number of rows and columns in the files. It saves time for large data sets by not having to regenerate the Formatted Worksheet.

## Plotting Tools

Once the data is imported, plots can be made to compare data between files, or within files. Created plots can then be formatted individually, or at the same time so that all plots have the same scale and dimensions.

## Creating New Plots

To create a new plot, press the “New Plot” button on the ribbon. All plots will be created from the Formatted Data worksheet, starting at row 19. A dialog will appear (Figure 9) showing three different options for creating plots. Each of these options are described below.

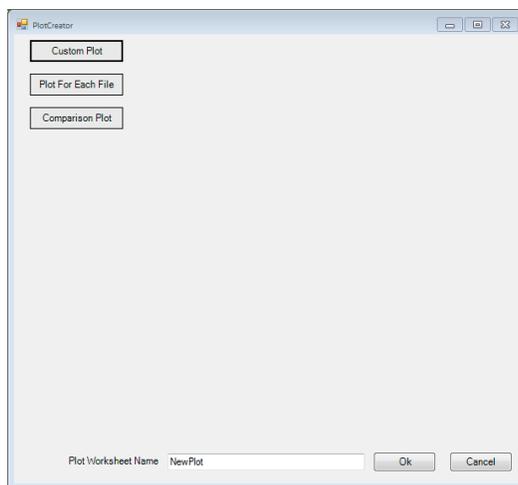


Figure 9. New plot Dialog

## Custom Plot

The dialog for a custom plot is shown below. This option creates a single plot that can contain any data from any of the imported files. Start by selecting a file in the upper list, and then selecting each item to plot in the lower list. You can add as many items from as many files as desired. Check marks on the files will indicate if something is selected from that file. You can also choose to plot component temperature limits (HS: Hot Survival Limit, HO: Hot Op. Limit, CO: Cold Op. Limit, CS: Cold Survival Limit). These will show up as red dashed horizontal lines on the plot. Press Ok when finished, and a new plot will be created with the items selected, as shown in Figure 11.

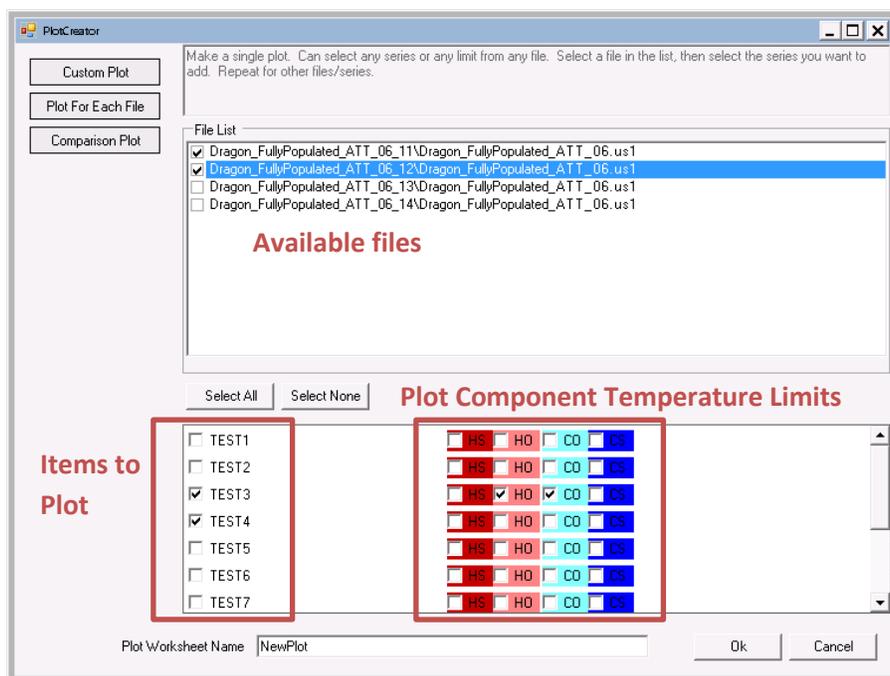


Figure 10. Custom plot: A single plot is created; data from any file can be used in the plot

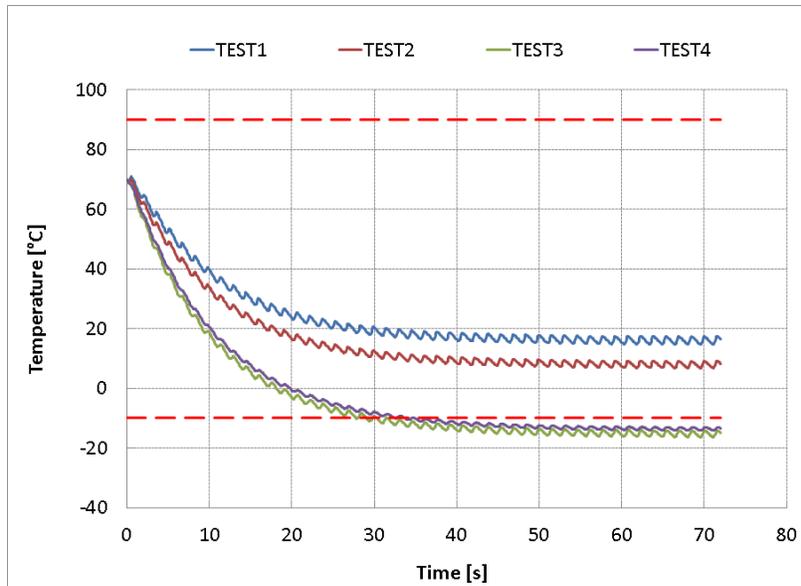


Figure 11. Example plot with 4 items and two limit lines

### Plot for Each File

The dialog for the Plot for Each File is shown in Figure 12. This button makes one plot for every file that was imported. Each plot will contain the same columns from each file. For example, if only TEST1 is selected, a plot will be made for all imported files of TEST1 column.

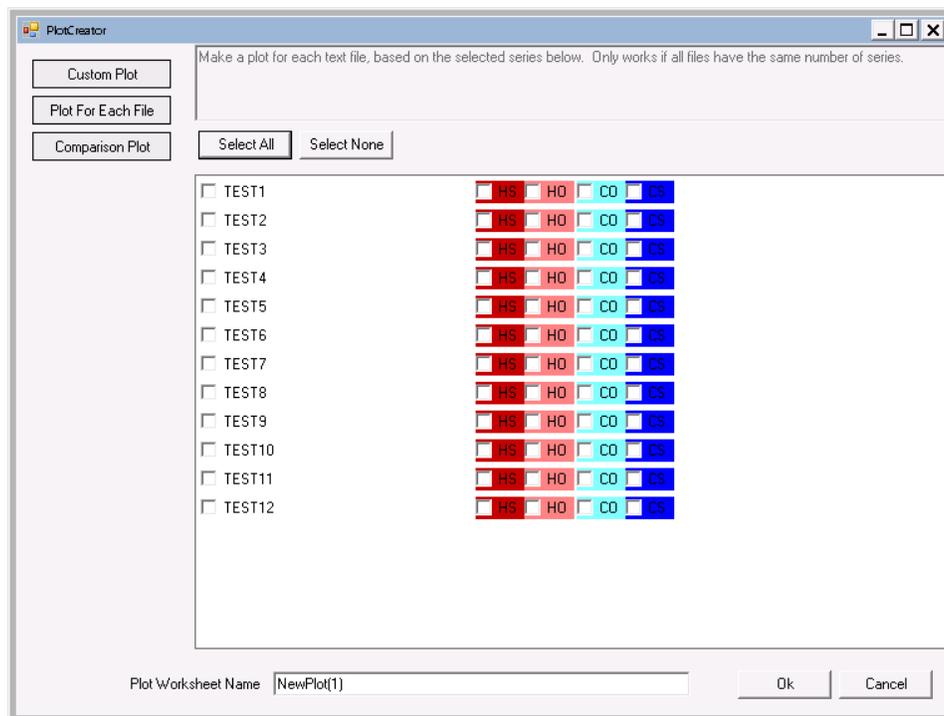


Figure 12. Plot for Each File. Make multiple plots, one for each file that was imported, with the same items.

## Comparison Plot

The dialog for a comparison plot is shown in Figure 13. This option makes a single plot that compares the same columns from each selected file. First select each file that you wish to compare in the upper list. Then select the series to compare in the lower list. For the values selected below, you will get a single plot with four series. Both TEST1 and TEST2 will be plotted for each of the 2 selected files.

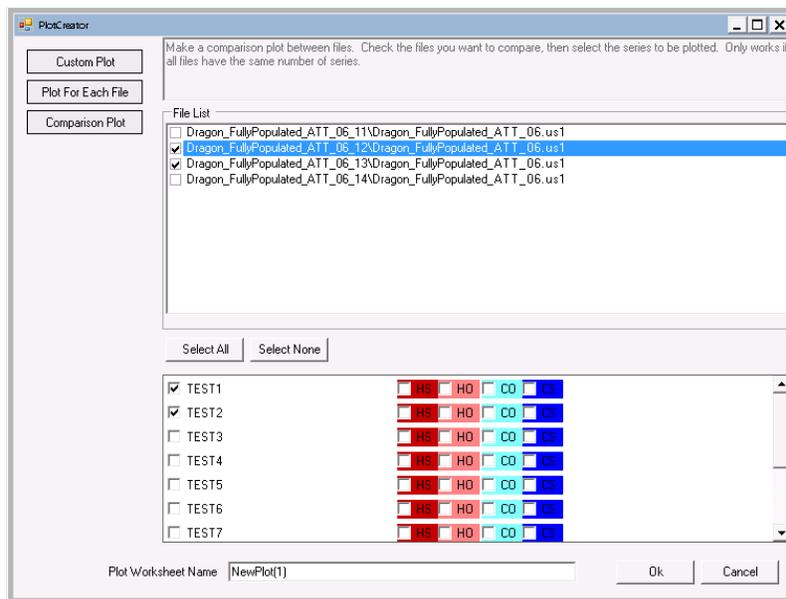


Figure 13. Comparison plot. Makes a single plot. Select the files to compare, and then select the items to compare.

## Editing Existing Plots

A number of options are available for formatting plots. Each button will be described below.

### Plot Manager Button

After you have generated a number of plots, you can use the “Plot Manager” button to quickly format the plots. Figure 14 shows the plot manager dialog. Select the plots to modify in the list on the left, and then select the desired options in the right panel. All selected plots will be updated to the selected options. If options are not set, no changes to that category will be made to the selected charts. A description of each property that can be modified is provided below.

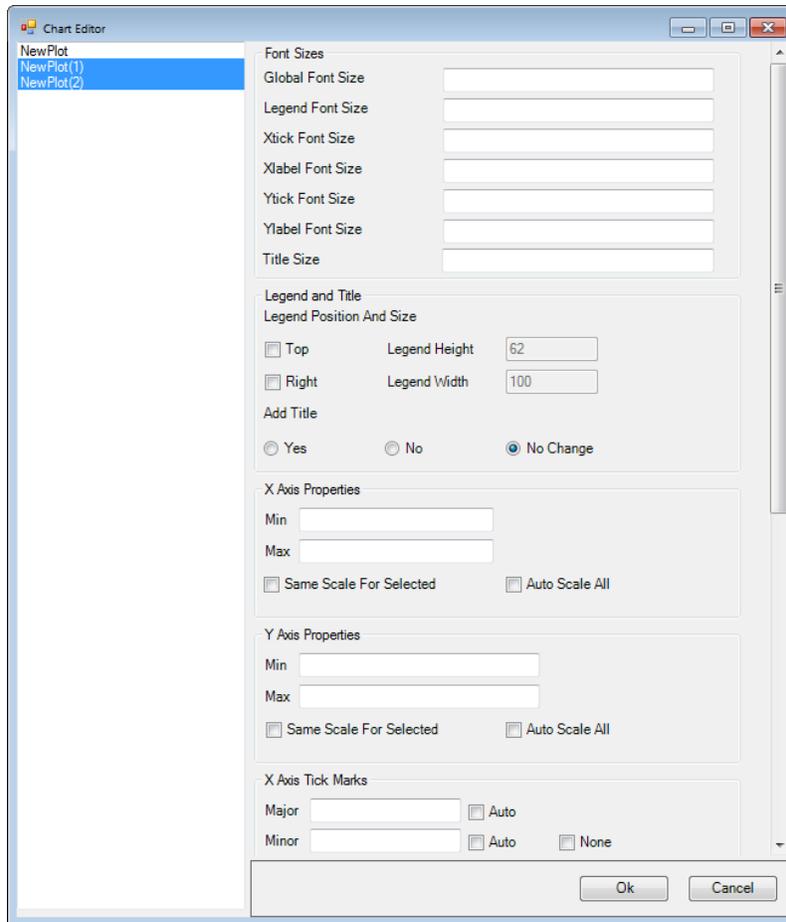


Figure 14. Plot manager dialog. Select the plots to format in the list, then make the desired changes.

### Font Sizes

Enter the desired font sizes of the items show, in points.



Figure 15. Font sizes, in points.

### Legend and Title Options

Figure 16 shows the legend and title options available in the plot manager. The legend can be placed on the top of the chart, or to the right of the chart. Use the Height and Width text boxes respectively to size the legend. You can adjust these as needed, along with the Legend font size to fit within the chart space.

A title can be added to the chart if desired. If “Yes” is selected, a title will be added to the top of the chart with the current chart name (the name in the chart worksheet tab). Selecting “No” will remove titles from charts, and “No Change” will keep the charts as-is with respect to titles.



Figure 16. Legend and Title Options

### *X and Y axis Ranges*

The maximum and minimum values on the X and Y axis can be adjusted with these options. Values can simply be entered in the Min and Max entry boxes as desired. The “Same Scale For Selected” check box will make all selected charts use the same scale, based on the overall min and max axis values of the selected charts. The “Auto Scale All” check box will use the default Excel Autoscale option for each selected chart.

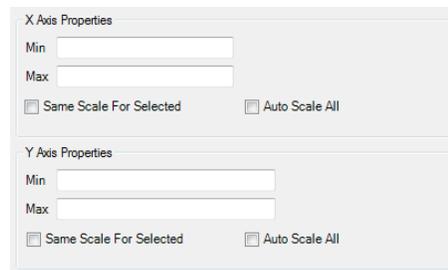


Figure 17. X and Y axis range options

### *X and Y Axis Tick Marks*

X and Y axis tick mark spacing can be adjusted with these options. Specific values can be entered in the text boxes. The “Auto” check box will set the tick marks to the default Excel values. “None” will remove minor tick marks.

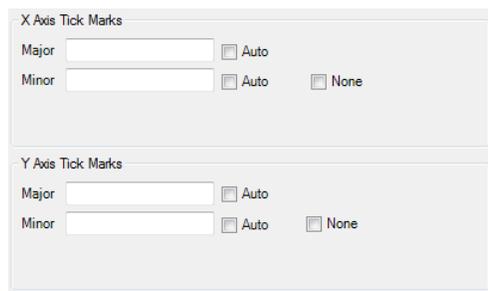


Figure 18. X and Y axis tick mark options

## Grid Lines

Add major and/or minor gridlines to plots. Can use either “Solid” style lines, or “Dash” style lines.



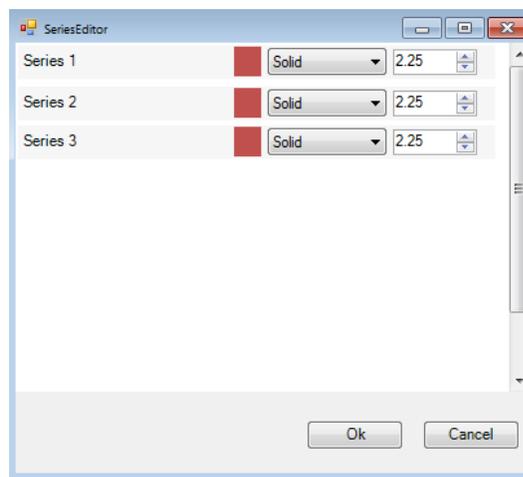
Figure 19. Grid line options

## Series Format

The series format button brings up a dialog that allows the color, line style, and line weight of each chart series to be adjusted (Figure 20). The total number of series in the series list will be based on the chart with the maximum number of series that is selected when the Format Series Button is pressed. For example, there are three series shown in Figure 20, which means that maximum number of series in any selected chart was 3. Providing formats to each of these three series will format all series in the selected charts the same. It is based on series order, and not series name. All series that are named “Limit” will be skipped. This is the default name for temperature limit series on all generated plots.



a. Series format button



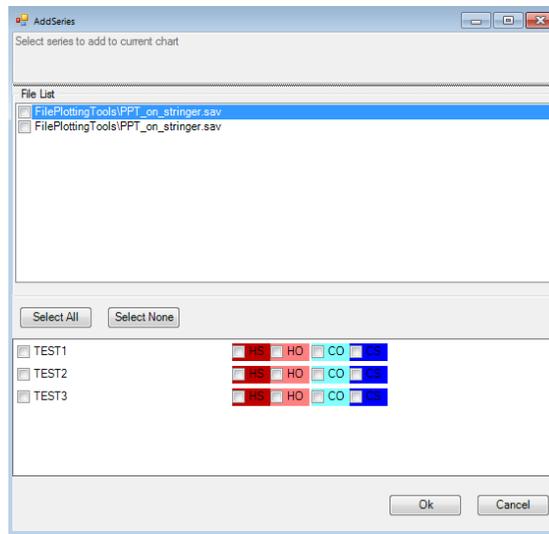
b. Series format dialog

c.

Figure 20. Series format options

## Add Series Button

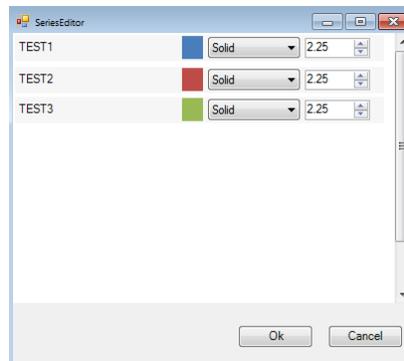
The “Add Series” button in the “Plotting Tools” section of the ribbon allows new series to be added to an existing plot. You can only use this button on one plot at a time. The series will be added to the current (visible) plot. The dialog is shown in Figure 21, and works the same as the “Custom Plot” option when creating a new plot. Select the series to add from any of the available files.



**Figure 21. Add series dialog. Select any series from any file to add to the current plot.**

### Format Series Button

The Format Series button in the “Plotting Tools” section of the ribbon allows the series formats of the current chart (visible chart) to be modified. The dialog is shown in Figure 22. Line color, style, and weight can be modified for any of the series in the current chart, except any limit lines.



**Figure 22. Format Series Dialog. Line color, style, and weight can be changed**

### Comparing Files

For a Comparison type file import, the “Compare Max Min” button will generate a new Work Sheet for comparing the values in each file. This new sheet will determine the overall maximum and minimum values for each data column, and put an orange border around that value in the list. It also highlights all cells that have exceeded a limit in the same fashion as the formatted data sheet. An example is shown below. This can be used to quickly find the extreme hot and cold cases across a large number of data sets.

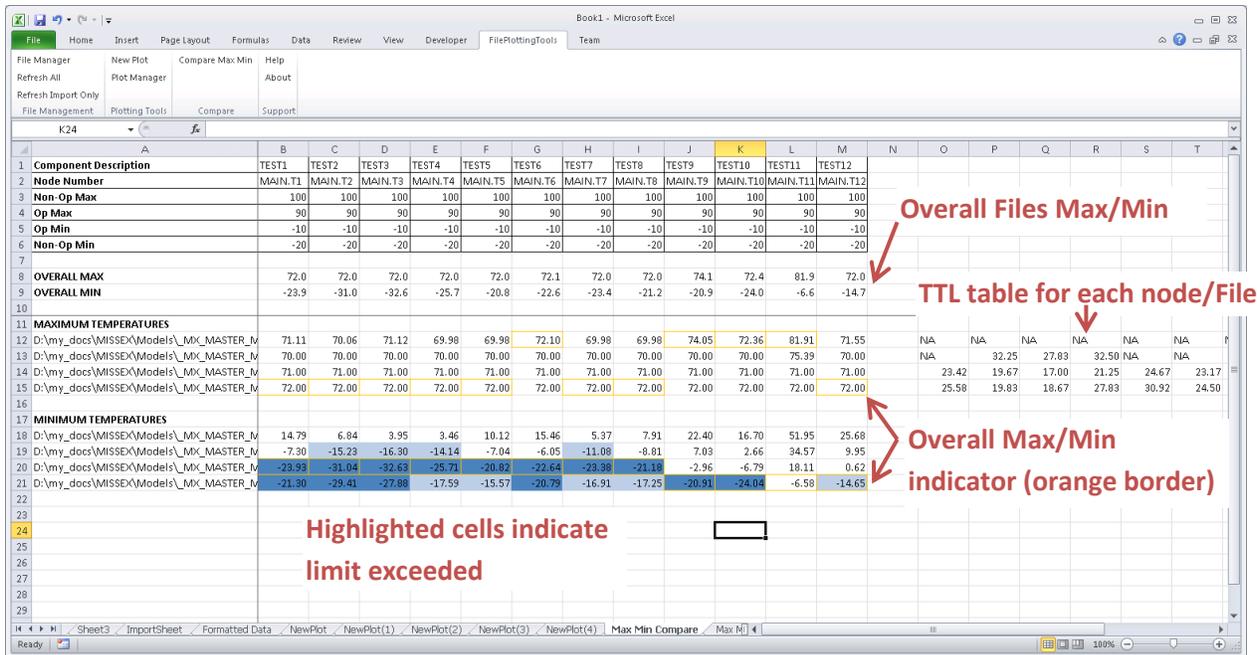


Figure 23. MaxMin comparison worksheet

## Release Notes

### Version 1.0

Initial release, internally tested at LaRC, may contain bugs.

### Version 1.1

Added linking component to Thermal Desktop® SAV files. User must point software to SAV file the first time a SAV file is imported (see Importing SAV Files)