UserGuide 2027

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1 Introduction

Welcome, and thank you for using Origin!

Origin is a powerful data analysis and publication-quality graphing software, tailored to the needs of scientists and engineers. What sets Origin apart from other applications is the ease with which you can customize and automate your data import, analysis, graphing and reporting tasks.

Customizations can range from simple modifications to a data plot, saved as a graph "template" for later use, to customized data analyses which produce publication-quality reports, saved as an Analysis Template. Batch plotting and analysis operations are also supported, wherein templates are used for repeat analysis of multiple files or datasets.

We are confident that you will find Origin to be an effective tool for analyzing your data and presenting your findings. And to help you get the most from Origin, we offer first-class customer and technical support, training and consulting services.

In this guide, unless otherwise noted, "Origin" will refer to both Origin and OriginPro. OriginPro offers all the features of Origin, plus extended analysis tools for Peak Fitting, Surface Fitting, Statistics, Signal Processing and Image Handling.

The purpose of this guide is to try and present a broad overview of Origin's capabilities. We hope that new users will find this to be a valuable orientation to the Origin workspace and its primary features. For those who are already using Origin, we hope you will find useful information on new features and perhaps learn a thing or two about Origin features that you had overlooked previously.

More detailed information is provided in the Origin Help file (**Help:Origin** from your Origin software's main menu) and numerous other learning resources exist. For a complete listing of available resources, see the **Origin Resources** chapter of this guide.

Some things to look for in this guide:



We have added short tutorials to numerous topics throughout this guide. These short tutorials are intended to give you a quick introduction to a key Origin feature. These tutorials will be marked with this icon.



Also, sprinkled throughout this guide, you'll find tips on using Origin. These tips are marked with this icon.



Important changes to key features and other critical information will be marked with this icon.

We like to get feedback from our users on ways to improve and expand Origin's data analysis and graphing capabilities. We would love to hear from you. You can find contact information in the Origin Resources chapter of this guide.

2 Installing and Updating Origin

2.1 Notes for Upgrade Users

- The Origin upgrade installs into a new program folder - it does not update a previous version. It is therefore not necessary to install or uninstall a previous version of Origin before upgrading.
- If you are upgrading from Origin 2018 or a later version, the process should be pretty painless. Origin 2018 and later versions share a common license file and User Files Folder. The first time you run Origin, it should be licensed and know where your User Files are located.
- If you are upgrading from Origin 2017, you will be prompted to pick a new User Files Folder (see **Selecting a User Files Folder**, below). If you have custom Origin files from your previous version, you can transfer them to your new **User Files Folder**. From the **Preferences** menu, select **Transfer User Files**. Provided your Maintenance has not expired, you should not have to re-license your software. If your Maintenance has expired, you will need to re-license your Origin software (See **Registering Origin**, below).
- If you are upgrading from Origin 2016 or earlier, you will need to complete the license management process. When your upgrade is launched for the first time, a license dialog will display asking for your **Product Key** If you have custom Origin files from your previous version, you can transfer them to your new **User Files Folder**. From the **Preferences** menu, select **Transfer User Files**.
- If you have a dongle package, please update your dongle after the Maintenance renewal to make sure your dongle is available for the latest version. Upgrade your dongle by entering a **Product Key** in the **License Activation** dialog. Once done, you can use this dongle for Origin installed with the same serial number on any other computers without re-activating the dongle.

Lastly, we want to point out that your Origin software has some great new features. For more information on key features by version, see the **originlab.com/VersionComparison** page on our website.

2.2 Notes for Administrators of Multi-user Packages

Instructions for getting started with the multi-seat node-locked and concurrent network packages are available on the OriginLab website (**originlab.com/GetStarted**).

In addition to the InstallShield setup that runs from the Product DVD, an MSI installer and sample transform are available. The MSI installer is ideal for use at multi-user sites, as it can be used to build an Origin installation package for distribution. Information on the MSI installer and alternate deployment techniques can be found on our website:

- MSI Installation
- Silent Install
- Building an Installation Package
- Installing Origin on a Remote Access Server such as Windows Terminal Server or Citrix.

2.3 Installing Origin

Origin is a Windows application. You can run Origin on an Intel-based Mac from **Boot Camp** or by running a virtualization software. For more information, see the **Running Origin on Mac using Virtualization Software**, on the OriginLab website.

There are three steps that must be completed to prepare Origin for use:

- Installation
- Selecting a User Files Folder
- License management

Both the Origin upgrade and the newly-purchased products install into a new program folder. Origin does not overwrite previous versions when upgrading, so your old version continues to function. Likewise, your original version does not have to be installed when running the upgrade.

If you are installing from a DVD, the startup program that launches when you insert the Origin DVD, includes an Origin installation button. If the startup program does not automatically run, you can browse the DVD to launch the setup.exe.



If you are upgrading from a previous verison, the installer will automatically use your old version serial number.



Origin only supports 64-bit since Origin 2020.

2.3.1 How to Proceed if You Already Have the Origin Trial Version Installed

If you already have the trial version of Origin installed on your computer, you can convert it to the full product or upgrade.

- If you have purchased the Origin package with node-locked license management, run Origin and select **Help:Convert Trial to Product**; or you can use **Help: Activate License**, click **Activate for this computer** radio button under the "Or if you have purchased already" section. In either case, you will be asked to enter the **Product Key** that was generated when you registered your software purchase on originlab.com.
- For all other license management packages, run the Origin **Add or Remove Files** program located in the Origin program icon folder, or rerun the Origin installer (both require a log in account with administrator permissions). When the Origin setup program starts, select the **Modify** option and then select **Install Product (requires serial number)**.

2.3.2 How to Correct or Change your Serial Number After you Complete an Installation

If you installed Origin with an incorrect serial number, you can correct it by running the Origin **Repair or Uninstall Origin** program located in your Origin program icon folder, or rerun the Origin installer (both require a log in account with administrator permissions). When the Origin setup program starts, select the **Modify** option and then click **Yes** to change your serial number.

2.4 Selecting a User Files Folder

Each Windows login user must maintain a User Files Folder (UFF) for storing Origin user data:

- If you are upgrading from Origin 2018 or later versions, your User Files Folder (UFF) location is unchanged.
- If you are upgrading from Origin 2017 or earlier, you will be prompted to pick a location for a new UFF. You must choose a different path from your old UFF.
- To transfer the contents of your old UFF and your toolbar and workspace configurations to the new UFF, you can run the Origin software and selecting **Preferences**: **Transfer User Files**. For more information, see Transfer User Files.

Consider these points in selecting your UFF:

- If you have a mobile computer, it is best to select a location on your computer rather than on your network.
- For non-mobile computers, you can select a location on the computer or on the network, as long as you have stable access to the folder. However, it is NOT recommanded to select a network drive (e.g. OneDrive), in that it may influence Origin performance.
- Do not select the same UFF as other Origin users. To learn how to share custom files with other Origin users, please see the chapter on Sharing Origin Files, later in this Guide.

Each time Origin starts, the program checks to see that your UFF is accessible. If Origin cannot connect to the UFF, you will be prompted to select a new location for the UFF. Note that you can change the location of your UFF at any time while running Origin. From the **Preferences** menu, select **Options** and then click the **System Path** tab.

2.5 Licensing Origin

All Origin packages include license management. The type of license management provided with your package is determined at the time of your Origin purchase.

2.5.1 Node-locked

Each Origin computer requires a license to run Origin. The license is obtained from the OriginLab website by entering a **Product Key** in the **License Activation** dialog when you start Origin. In-dialog instructions are provided for computers with no internet access.

2.5.2 Concurrent Network

Each Origin computer must connect to a FLEXnet license service to run Origin. Your IT department or Origin administrator installs a FLEXnet license server provided by OriginLab (available from the Origin DVD), obtains a license for this server from the OriginLab website, and then sets up a license service. The license service counts and restricts the number of Origin computers that can run concurrently. For more information, see the Help Center on the OriginLab website (**originlab.com/HelpCenter**).

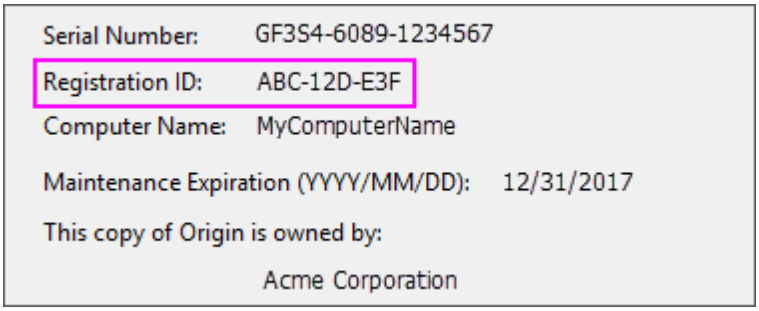
2.5.3 Dongle

A dongle (USB hardware key) is provided with the Origin dongle-license package and must be present in the computer's USB port to run Origin. From Origin 2019, dongles are cross-version.

2.6 Registering Origin

Registering Origin is required to obtain product support from OriginLab and the team of Origin distributors. Registration also activates Origin's **Check for Updates** menu command (**Help: Check for Updates**), allowing you to obtain patch and help file updates directly from your Origin software. In addition, Origin's **App Center** and **Template Center** dialog, which provide direct access to Apps&Templates and their updates from your Origin software, requires that your installation be registered.

For **Node-locked** licenses, registration is completed automatically when you activate your Origin via the License Activation dialog box that opens when you start Origin. To verify that you are registered, select **About Origin** from the **Help** menu. The dialog should display the **Registration ID** that is assigned to your Origin installation.



For all other license management packages, open Origin, and then select **Register on-line...** from the **Help** menu to open the **Registration** dialog box. Use the Registration dialog to register your Origin installation on the Origin website. During this process, a **Registration ID** is issued. Enter or copy and paste this Registration ID into the Registration dialog to complete the process. The **About Origin** dialog should now display your Registration ID.

2.7 Maintenance

Most Origin packages are sold with the first year of Maintenance included. Maintenance provides you with free Origin upgrades, and may also include priority technical support, discounts on Origin training and consulting services, and a home-use license.



Maintenance customers should receive notice of their eligibility for a free upgrade, when choosing **Help: Get Help Files/Check for Updates**.

- To check if your Origin package includes Maintenance, select the **Help** menu and then select **About Origin**. If your package includes Maintenance, the About Origin dialog will show your Maintenance expiration date.
- To learn about the benefits of Maintenance, contact OriginLab or your local Origin distributor.
- As your maintenance expiration date approaches, Origin will display a maintenance expiration message with a link to the OriginLab website to learn how to renew your maintenance. This reminder message provides a check box to prevent showing in the future.

2.8 Service Releases

When called for, OriginLab publishes free service releases (patches). A service release typically provides bug fixes and may include some minor improvements. All customers are encouraged to apply service releases to ensure that your Origin software performs correctly. To check if a patch is available, select the **Check for**

Updates command from the **Help** menu. Patches are also available from the Support area of the OriginLab website (**originlab.com/Support**).

2.9 Notification of Upgrade

OriginLab regularly releases new versions of Origin, adding features and feature improvements based on customer input. Customers with maintenance are entitled - and encouraged - to use the most recent Origin version. After a new version release, OriginLab and the team of Origin distributors notify maintenance customers by email. However, to make sure you receive notification of a new version release, please create an account on the OriginLab website (**originlab.com**) and select the check box in your user profile to receive "product updates".



2.10 Setting the Origin Display Language

Origin packages sold to organizations in a limited number of countries, including Japan, Germany, Switzerland, Austria, Liechtenstein, and China, may support running Origin with English display, or with Japanese, German or Chinese display. To access this language control, select **Change Language** from the **Help** menu.

2.11 System Transfers - Deactivating a License

2.11.1 Node-locked Licenses (Computer ID-based)

A system transfer is required if you plan to replace your licensed Origin computer with a different computer.

- If Origin can still be used on your computer:

Open Origin and then select **Deactivate License** from the **Help** menu. After successful deactivation, your Computer ID will be removed from OriginLab's server so that you can install and activate on another computer.

- If your licensed Origin computer is no longer available:

1. Log into your portal at www.originlab.com.
2. Under **Licensing**, click the **Manage my License(s)** link.
3. Click on the **Serial Number** associated with the license that you want to deactivate.
4. Click the **go** link in the **Deactivation** column.

2.11.2 Concurrent Networks

A system transfer is only required if you need to replace the FLEXnet license server. A system transfer is not required when replacing an Origin computer.

To obtain a replacement FLEXnet server license file, complete the "System Transfer Request Form" available from the Support area of the OriginLab website.

2.12 Uninstalling Origin

To uninstall Origin, run the Origin **Repair or Uninstall** program located in the Origin program icon folder, or use the Windows **Uninstall or change a program** tool. In both cases, the Origin Setup program displays providing options to **Modify**, **Repair/Update**, or **Remove**. Select the **Remove** option and complete the wizard as prompted.

The **Remove** program deletes all folders and files that were installed by the Origin setup program. It also deletes folders and keys created by the installer in the Windows registry. Make sure you deactivate the license before uninstall Origin.

3 Origin Resources

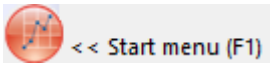
The following tables list key Origin resources available to you. If you purchased Origin from a local distributor, your Origin distributor may provide additional resources. Please contact your distributor to learn more.

3.1 Direct Support Resources for Origin

	For Information On ...	Go Here
Technical Support	• Contact information for OriginLab or your Origin Distributor • Report a bug • Suggest a feature	**originlab.com/Support**
Chat Online	• Chat online with an OriginLab representative	**originlab.com** ... and click  in the lower-right corner
User Forum	• Share information with and get help from the Origin user community	**originlab.com/Forum**
Send Feedback	• Open a web form so that you can provide direct feedback (positive or negative), and/or allow you go make suggestions for improving Origin.	Origin menu **Help: Send Feedback**
Training and Consulting	• Making optimal use of OriginLab products • Help in developing custom tools for your particular application	**originlab.com/Training**

3.2 Resources Installed with your Origin Software

	For Information On ...	Go Here

Learning Center	• Load graph samples and analysis samples • Transfer User Files when upgrading to the latest version • Learning Center for direct access to Tutorials, Videos, Origin Blog, User Forum and social media pages.	**Help: Learning Center** (or press F11)
Sample Projects	• Load analysis samples project (This is a tab in **Learning Center**)	**File: Sample Projects...** *or* **Help: Learning Center: Sample Project** (or press F11)
Help Files	• Online or local (CHM) Help for Origin (GUI, Programming)	**Help: Get Help Files/Check for Updates** (to update CHM files)
Context-sensitive Help	• Control-by-control explanation of Origin dialog boxes • The dialog box must be open • Some dialogs have multiple sections/tabs and you may have to click on that section/tab to set the focus	Press **F1** when the dialog box is open *or* Click  in the upper-right corner of the dialog box
Start Menu - Windows-like Search	• Recent files • Help with problems or questions that arise while using Origin • Direct access to Origin features and dialog boxes • Open or search for Apps relevant to a particular task • Location of Origin menu commands for searched-for features	Press **F1** when no dialog box is open *or* Click the **Start** menu icon at the bottom-left of the workspace.  For additional information on using this feature, see The Origin Interface, Start Menu.

Tutorials	• Step-by-step instructions on performing many Origin operations, from the simple to the complex	**Help: Origin : Tutorials**

3.3 Online Resources for Origin

	For Information On ...	Go Here
Online Documentation	• Product documentation	**originlab.com/Doc**
Help Center	• Resources list • Installation and License Documentation • Contact Info	**originlab.com/HelpCenter**
Video Tutorials	• Help with a range of Origin features including "tips and tricks" • Available in playlists and categories • Search Origin video or YouTube pages by keyword or type **v *<key phrase>*** in the Origin **Start** menu.	**originlab.com/Videos** **youtube.com/user/TheOriginlab**
Webinars	• Live and recorded webinars highlighting key features	**originlab.com/Webinars**
Origin Blog	• Blog posts with plenty of software tips and tricks	**blog.originlab.com**

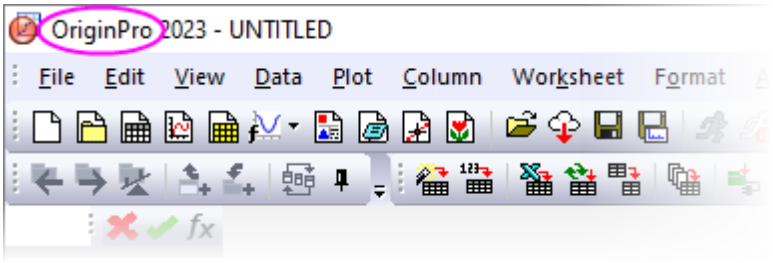
Case Studies	• How others are using Origin in their work	**originlab.com/CaseStudies**
Graph Gallery	• Outstanding examples of Origin graphs, many of them submitted by the Origin community	**originlab.com/GraphGallery**



Information on key Origin features often can be found by just doing a quick web search. Open a browser and search on phrases such as... "Origin shortcut keys", "LabTalk graph legend", or "OriginC NAG functions".

4 OriginPro

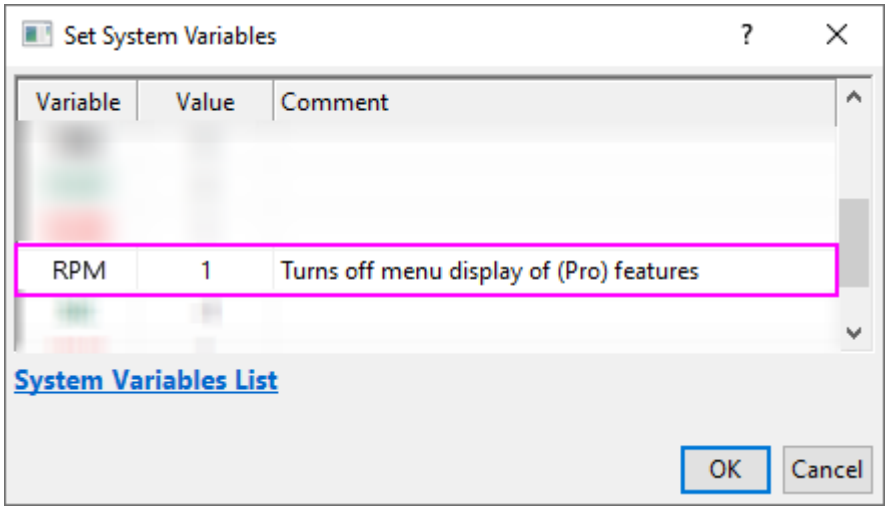
OriginPro, the professional version of Origin, provides all of the features of Origin, plus additional analysis tools and capabilities. If you don't know which product you have -- **Origin** or **OriginPro** -- look to the title bar.





Users of standard Origin will note that some menu commands are marked with **(Pro)**, indicating that the feature is available only in OriginPro. If you own the standard version of Origin, but find that you need features of OriginPro, you can upgrade by **contacting your Origin representative**.

If you wish to continue using standard Origin without seeing **(Pro)** menu commands, click **Preferences: System Variables** and enter the following in the **Set System Variables** dialog box and click **OK** (*Comment* is optional):



4.1.1 Curve Fitting

In addition to Origin's linear and nonlinear curve fitting capabilities, OriginPro includes support for the following:

- Linear fitting with X error.

- Nonlinear fitting with X and Y errors (orthogonal regression).
- Fitting with implicit functions (orthogonal distance regression).
- Fitting Comparison: Fit and rank all functions in a category, compare two models to one dataset or two datasets to one model.
- Global fitting of multiple curves using different functions, with the option of sharing parameters.

For more information, see these web pages: Linear and Polynomial Fitting and Nonlinear Fitting.

4.1.2 Surface Fitting

With OriginPro, you can perform 3D Surface Fitting. Choose from 21 built-in surface fitting models including Gauss2D, DoseResponse2D, Exponential2D, and Polynomial2D; or define your own function.

- Fit worksheet data (XYZ) or matrix data (Z values).
- Locate and fit multiple peaks using one of several peak identification methods.
- Automatic peak parameter initialization.
- Apply constraints and bounds to parameters and fix parameter values.
- Output parameter and statistical results plus residual curves.
- Find specific Z values along the fit surface and include them in your output.
- Option for automatic recalculation of results and saving tool settings to a Theme file for repeat use.

For more information, see this web page: Surface Fitting.

4.1.3 Peak Fitting

OriginPro includes the **Peak Analyzer** tool with support for the following:

- Peak finding (Local Max, Window Search, 1st Derivative, 2nd Derivative, Residual after 1st Derivative).
- Detect and subtract baseline (Constant, Dataset, XPS, End Points Weighted, Straight Line, User-Defined, None).
- Fit Peaks with built-in or user-defined functions.
- Fit individual peaks with different fitting functions.
- Fit Baseline as part of the peak fitting process (user-defined or built-in functions).
- Control fit parameters (fix, share, set bounds).

For more information, see this web page: Peak Fitting.

4.1.4 Statistics

OriginPro includes support for advanced statistical analyses in these areas:

- Descriptive statistics (cross-tabulation, distribution fit, correlation coefficient, partial correlation coefficient).

- ANOVA (one-/two-way repeated measures, three-way).
- Multivariate analysis (principal components, cluster, discriminant/canonical discriminant analyses; partial least squares).
- Survival analysis (Kaplan-Meier, Cox Proportional Hazards, Weibull Fit, test of equality of survival functions)
- Parametric hypothesis tests (two-/pair-sample t-Test on rows, one-/two-sample test for variance, one-/two-sample proportion test).
- Nonparametric tests (one-/paired-sample Wilcoxon signed rank, paired-sample sign test, Mann-Whitney, two-sample Kolmogorov-Smirnov, Kruskal-Wallis ANOVA, Mood's median test, Friedman ANOVA, support for simultaneous tests).
- Power and sample size (one-/two-/paired-sample t-test, one-/two-proportion test, one-/two-variance test, one-way ANOVA).
- ROC curve analysis.

For more information, see this web page: Statistics.

4.1.5 Signal Processing

In addition to Origin's standard suite of signal processing tools, the following are available in OriginPro:

- Signal transforms (short-time Fourier analysis, Hilbert transform, 2D FFT/2D IFFT).
- Filtering (IIR filter design, 2D FFT filter).
- Correlation (2D correlation).
- Wavelet Analysis (continuous wavelet transform, discrete wavelet transform, inverse discrete wavelet transform, multi-scale wavelet decomposition, smoothing, noise removal, 2D wavelet decomposition, 2D wavelet reconstruction).
- Rise-time Gadget (linear search, histogram, largest triangle).
- Decimation (moving average, finite impulse response).
- Coherence.
- Envelope curves (upper and/or lower, smooth during envelope detection).

For more information, see this web page: Signal Processing.

4.1.6 Gadgets

Origin Gadgets provide a quick and easy way to perform exploratory analysis on plotted data. While there are specific Gadgets for each analysis, all work by allowing you to graphically and interactively position a region-of-interest (ROI) object around the data that you wish to analyze. OriginPro includes these additional Gadgets:

- Cluster Gadget (stats on points inside/outside the ROI; with support for masking, editing, copying and deleting points).
- 2D Integration Gadget (integration on image plot or contour plot from matrix or worksheet data).
- Rise-time Gadget (analyze rise/fall time of stepped signals).

For more information, see this web page: Exploratory Analysis.

4.1.7 Image Processing

Origin and OriginPro include a collection of easy-to-use image processing tools. OriginPro includes additional tools in the following areas:

- Image adjustments (function lookup table, leveling).
- Image conversion (dynamic binary, threshold, RGB merge/split, image scale).
- Spatial filters (user filter).
- Arithmetic transforms (alpha blend, extract to XYZ, image simple math, math function, morphological filter, pixel logic, replace background, subtract background, subtract interpolated background).

For more information, see this web page: Image Processing.

4.1.8 Apps

Many add-on Apps are coded to integrate with an OriginPro feature and therefore, they require an OriginPro license to run. OriginPro-only Apps will be listed in the **Origin File Exchange** with a red PRO symbol beside them.

Here are some of our more popular **OriginPro Apps**:

- Redundancy Analysis
- Speedy Fit
- Correlation Plots
- Neural Network Regression
- X-Ray Diffraction Analysis
- Phylogenetic Tree
- 2D Peak Analysis
- Standard Curve Analysis
- Linear Mixed Effects Model
- Rank Models
- Peak Deconvolution
- Design of Experiments
- 2D Confidence Ellipse
- Independent Component Analysis (Requires R software)
- Logistic Regression
- Sequential Fit
- Piecewise Fit
- Piecewise Smooth
- Principal Component Analysis
- Principal Component Analysis for Spectroscopy

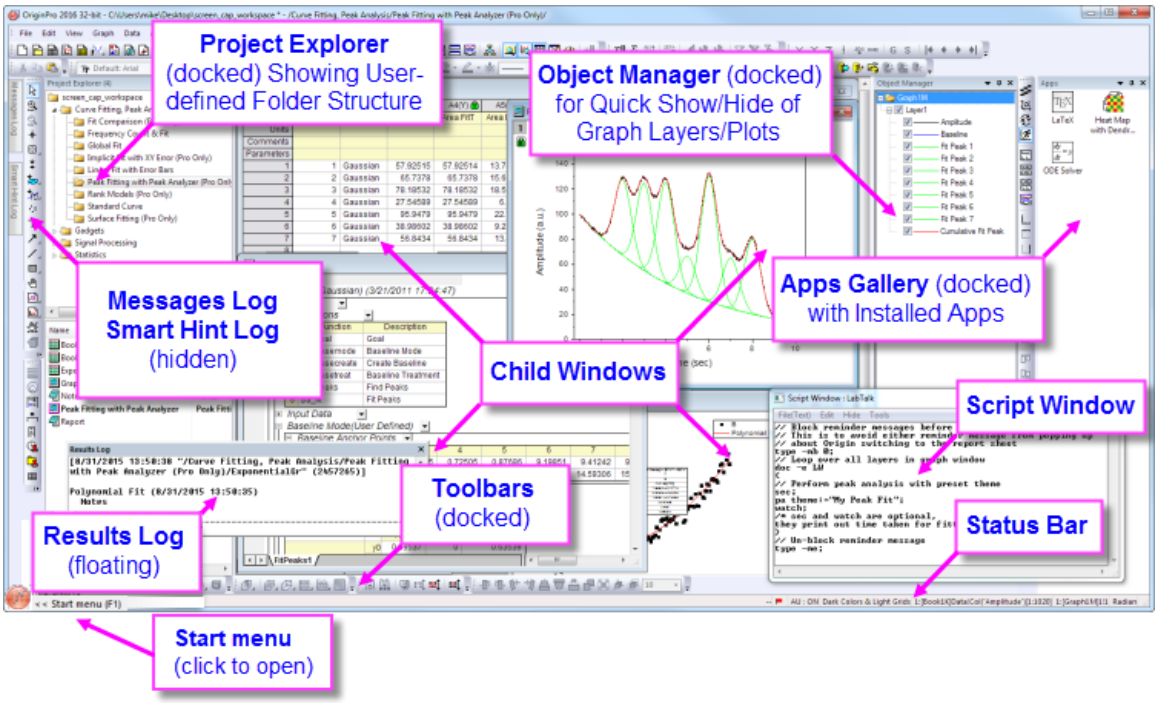
- Slope Analyzer
- Global Peak Fit
- 3D Smoother
- Cyclic Voltammetry
- Enzyme Kinetics
- Polynomial Surface Fit
- Heat Map with Dendrogram

For general information on Apps visit **www.originlab.com/apps**.

5 The Origin Interface

5.1 The Origin Workspace

This chapter contains basic information on navigating the Origin workspace. Long-time Origin users can skim this chapter.

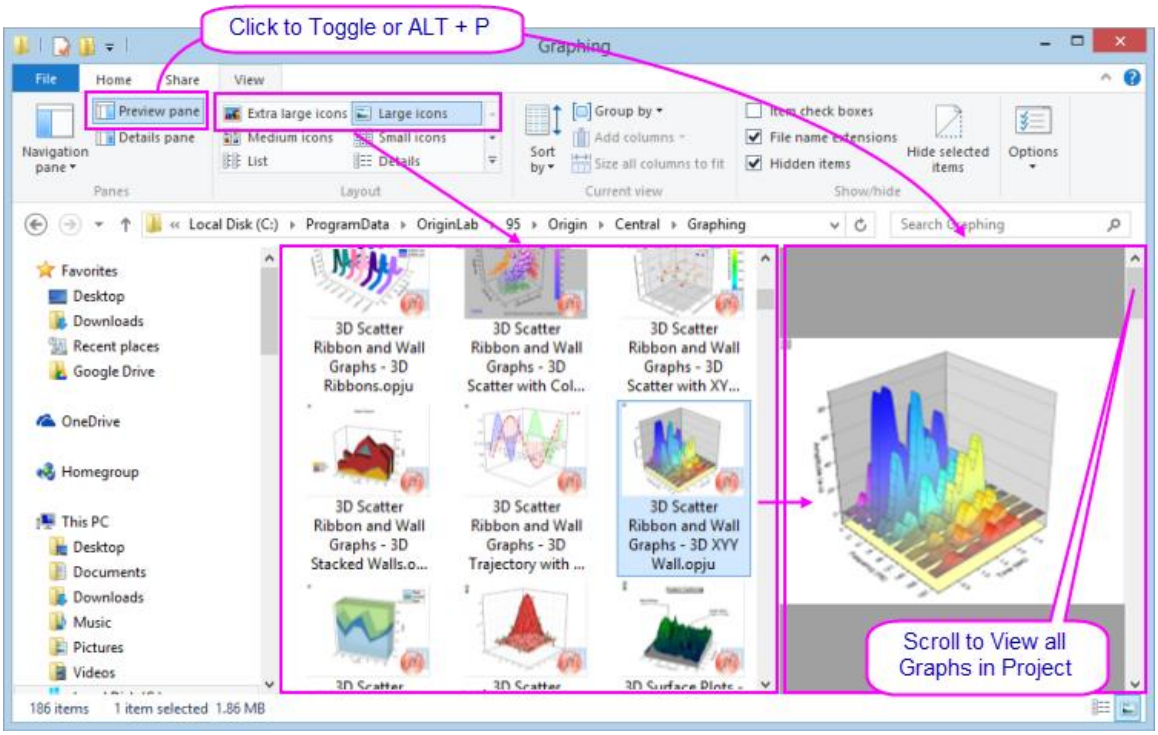




Window size and position are automatically adjusted to accommodate different displays. This is done to accommodate switching between your laptop and a higher-resolution monitor, without having to resize/reposition every window and dialog box. There is a system variable to control rescaling behavior: **@SRWS** .

5.1.1 Windows File Explorer Previews

While not part of the Origin interface, you can use Windows **File Explorer** (previously "Windows Explorer") to preview graphs in a project file.



- Windows Explorer's **Large** or **Extra large icons** views (right-click in File Explorer and choose **View: Large Icons** or **Extra Large Icons** or select from the Explorer **View** menu) will show an image of *the last active graph before the project file was saved*.
- Open the Preview Pane (**ALT + P**) and scroll through all graphs in the project file.
- If you do NOT wish to save graph previews into the file (either in icon view or in the Explorer Preview Pane), you can set LabTalk system variable **@PESS=0** or **=-1**. For information on changing the value of a system variable, see FAQ-708 How do I permanently change the value of a system variable?

5.1.2 Origin Menus and Menu Commands

- **Context-sensitivity of menu bar and menus**: The menu bar and menu commands are context-sensitive; they change as you change window type (from worksheet to graph to matrix, for instance). Only menus pertinent to the active window will display.
- **Menu bitmaps, toolbar buttons and shortcut keys**: Some menu commands also have bitmaps that display to the left of the command. Additionally, you may see a shortcut key combination listed to the right of a menu command. The button bitmap and the shortcut keys indicate alternate ways to access the same functionality.
- **Shortcut menu commands**: Many commands are available from shortcut menus. To open a shortcut menu, right-click on an Origin object (worksheet window, graph axis, text object, etc.). Only pertinent menu commands will show.
- **Collapsible menus**: By default, main and shortcut menus in Origin are "collapsed", meaning they display an abbreviated set of commands. When you use a menu item which isn't included, it is added to the

menu. If you prefer to always see full menus, click **Preferences: Options** > **Miscellaneous** tab and clear the **Enable Collapsible Menus** box.

- **Most recently used analysis menu commands**: Most-recently used menu commands will appear at the bottom of the analysis menus (**Worksheet**, **Analysis**, **Statistics**, **Image**, etc.). This gives you quick access to tools when performing repeat operations.
- **Most recently used files**: Several **File** submenus (e.g. **File: Recent Projects**) keep a list of your most recently opened or saved files. Thus, files that you are currently working on are easily located and opened.
- **Custom Menu Organizer**: Since Origin 8.1, Origin users have been able to use the **Custom Menu Organizer** to add or remove menu items. To learn more, see the chapter *Customizing Origin*, later in this Guide.

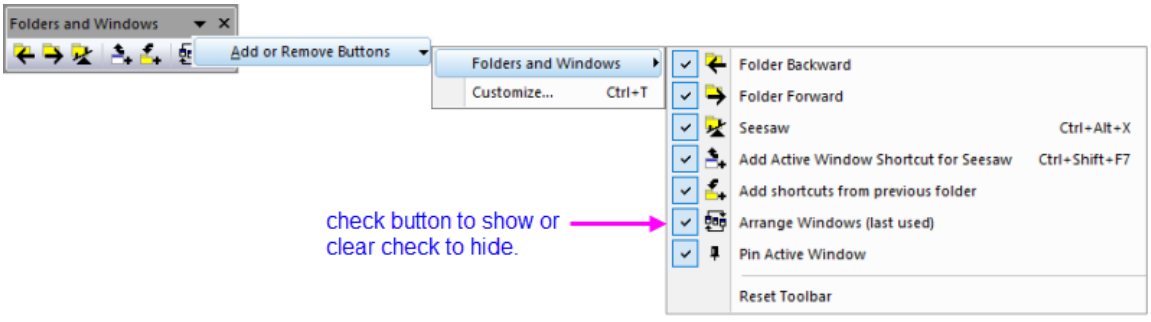


There is a plain-text log of all Origin file activity. The file is named as "OriginProjHistory.txt" and saved to User Files (**Help: Open Folder: User Files Folder**). Maximum number of entries is controlled by system variable **@MHF** (default = 1000).

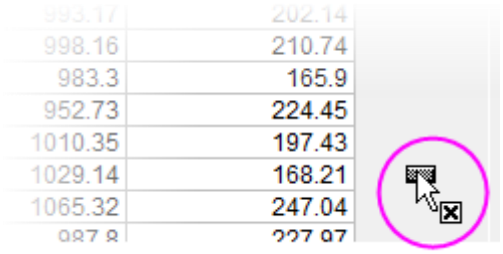
5.1.3 Origin Toolbars

Use the **Customize Toolbar** dialog box (**View: Toolbars**) to control toolbar display and reset or reinitialize toolbars.

- **Customize toolbar button appearance**: Use controls on the **Options** tab of the **Customize Toolbars** dialog box to modify button and toolbar appearance.
- **Dock/Float a toolbar**: Toolbars can be undocked and made to float on the workspace. To float a toolbar, hover over the left-end of the toolbar. When the pointer becomes a four-headed arrow, drag the toolbar off of the toolbar space. To return the toolbar to its former docked position, double-click the toolbar title bar.
- **Hide/Show a toolbar**: Clicking the **Close** button on a floating toolbar removes the toolbar from view. To restore a hidden toolbar, open the **Customize Toolbars** dialog box and on the **Toolbars** tab, place a check mark beside the toolbar.
- **Hide/Show a button**: Click the small arrow at the right end of a toolbar and open a flyout menu to enable/disable toolbar buttons.



- **Move/Hide button**: Alt + drag a button to move it to a new position within or between toolbars. Alt + drag to an empty portion of the workspace to create a new toolbar; ; or to hide a button, Alt + drag a button to any child window (cannot be empty workspace) and when the button displays as "X", release to hide the button in the toolbar.

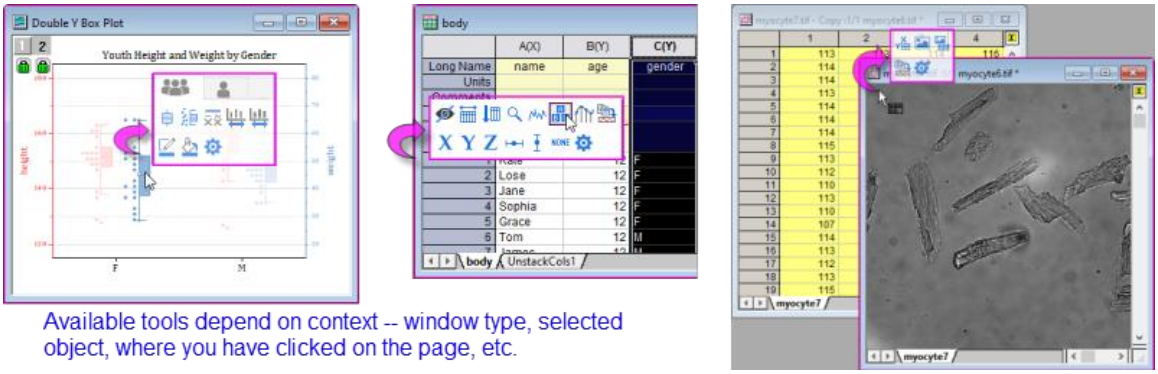


- **Hide/Show all toolbars in the Origin interface**: Select **View: Hide Toolbars** menu or press the hotkey **Ctrl**+**Alt**+**R**

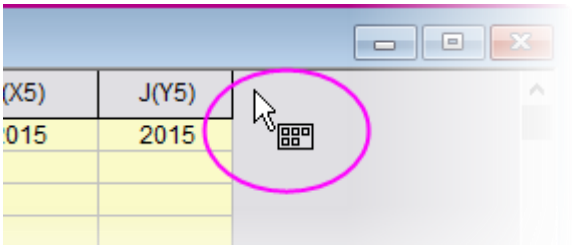
For more information on customizing Origin's standard toolbars, see **Customizing Toolbars and Buttons**, later in this User Guide.

5.1.4 Mini Toolbars

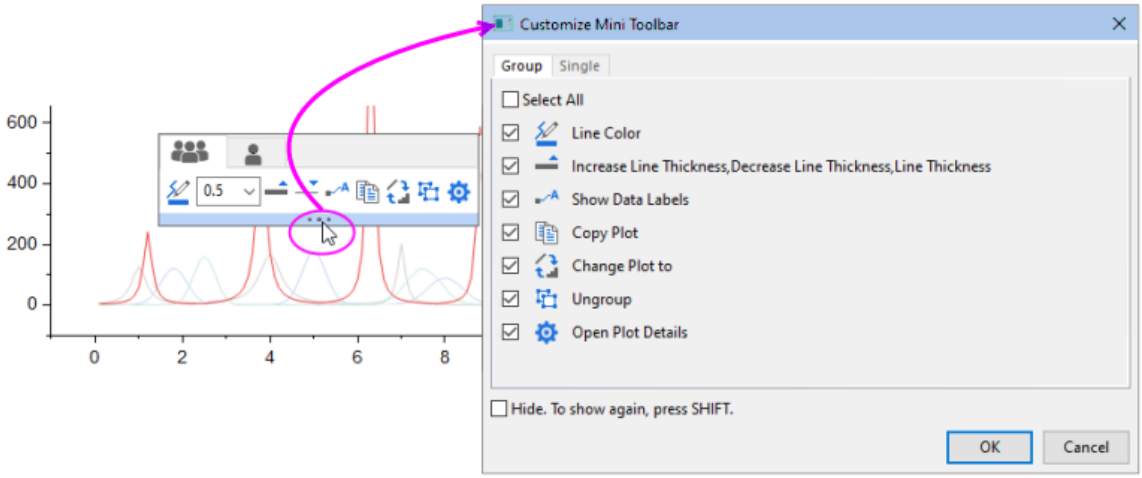
OriginLab continues to add **Mini Toolbar** support for common objects and tasks. These toolbars appear when the user selects an object or when the user clicks in certain key areas inside the page. Available controls depend on context (selected object, window type, etc).



- Before using Mini Toolbars, make sure there is a checkmark beside **View: Mini Toolbars** (default).
- To display the toolbar, select an object such as a data plot, a text label, or a worksheet cell.
- In addition, there are toolbars for more-general page- and layer-level customizations and these toolbars are displayed by hovering near the margins of the window. When you see your mouse cursor change to something like this , this is your cue that clicking in this spot will display a Mini Toolbar of relevant tools.

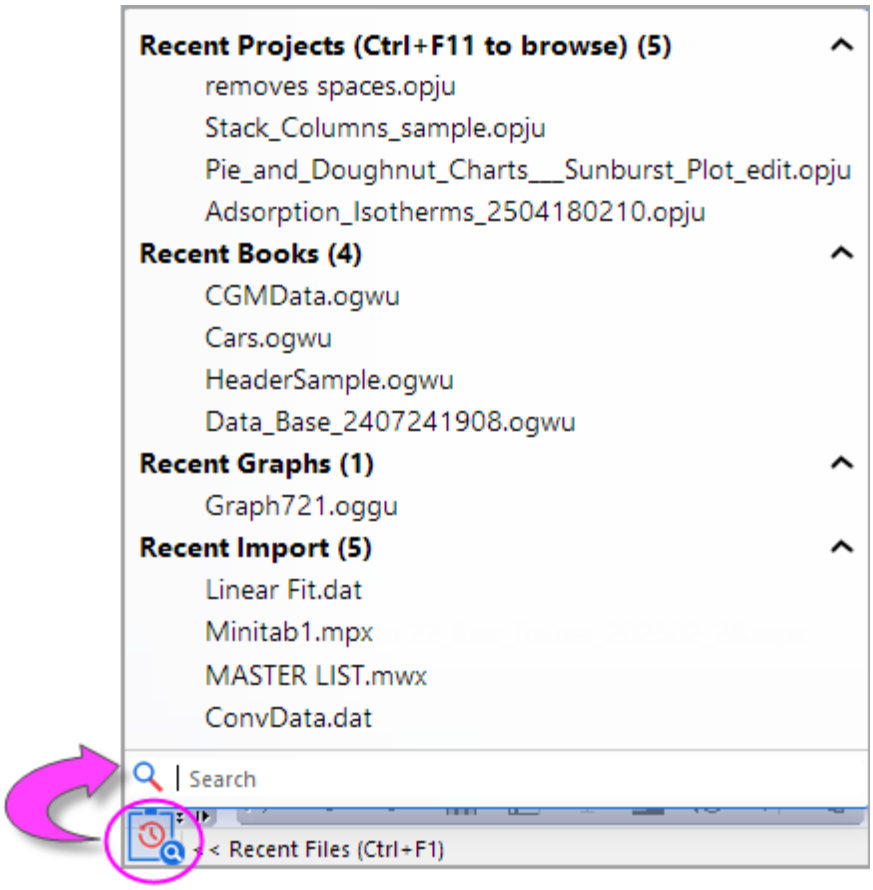


- Most Mini Toolbars have a **Properties** button  that gives access to more complex settings (e.g. a graph window's Plot Details dialog box).
- If you move away or you do not act quickly enough, a Mini Toolbar will fade away. To restore a Mini Toolbar after it has faded, press the SHIFT key.
- To add or remove buttons from a Mini Toolbar, click on the three dots at the bottom center of the toolbar. This opens the **Customize Mini Toolbar** dialog box where you can enable or disable buttons as needed.



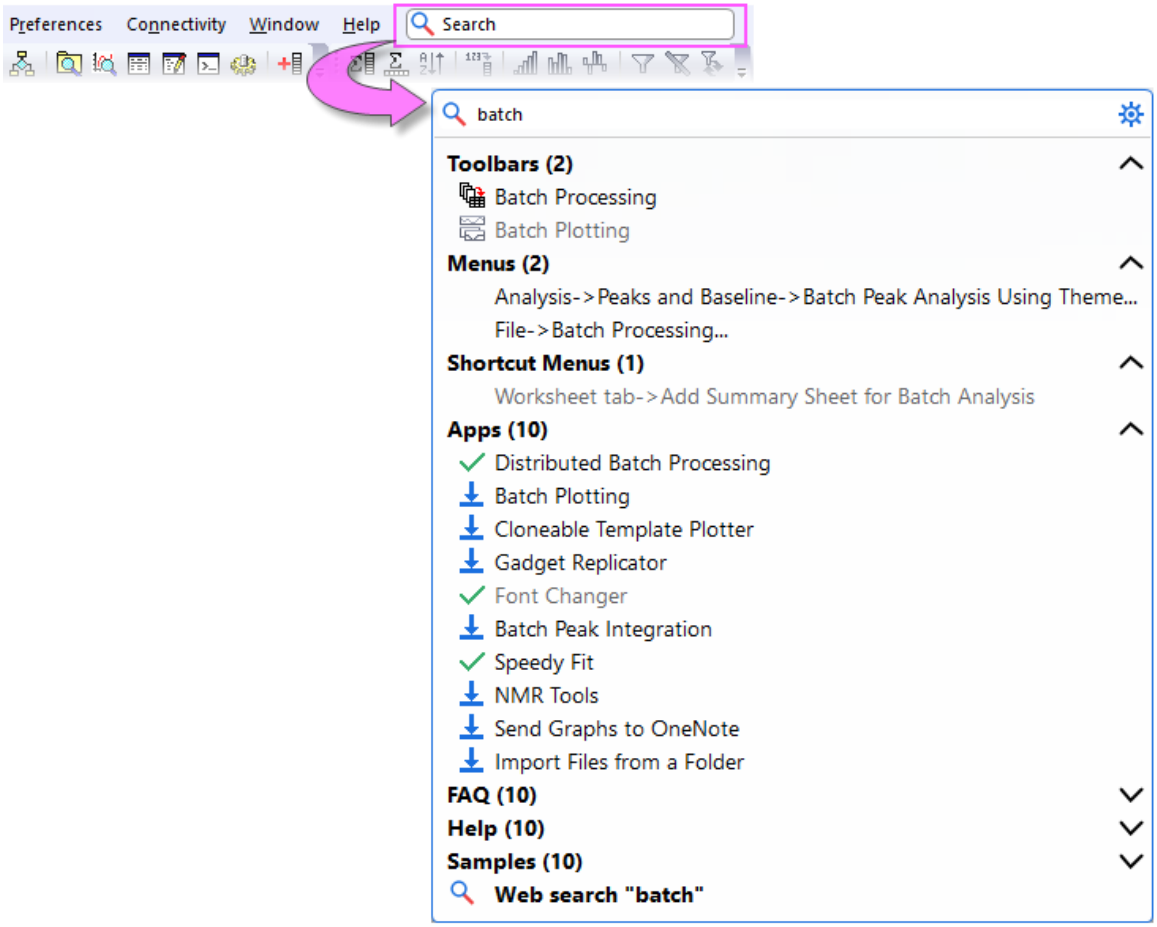
5.1.5 Recent Files

There is a magnifying-glass icon over an Origin logo at the left-bottom corner. Hover on the icon + logo with your mouse, then click on it, then it will pop up to show the recent items with a search tool. You also can press the **Ctrl+F1** button on your keyboard to pop-up it.



5.1.6 Search Tool

There is a search box with magnifying-glass icon at last of main menu.



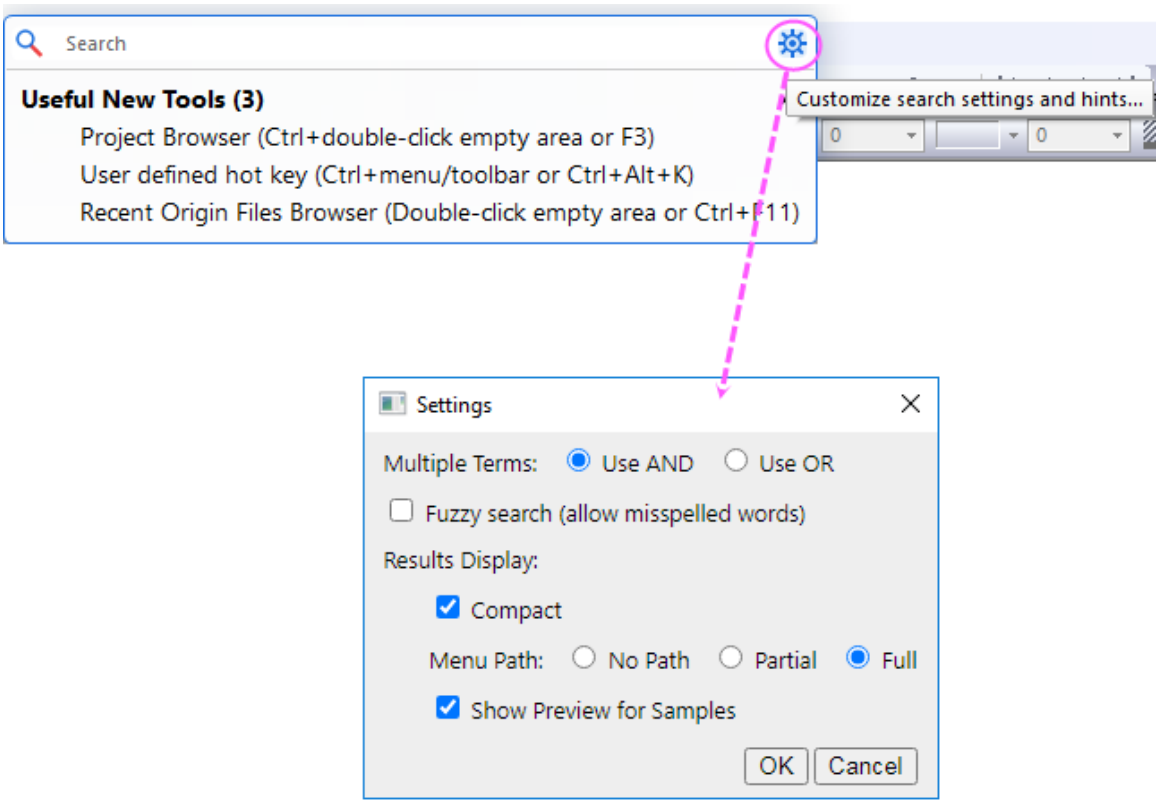
When you first click the box, the search tool will index with progress bar scrolling. Once the indexing is finished, you can enter the keyword(s) to search available resources. Press the **F1** button on your keyboard will also expand the search panel.

Then all Origin resources related to the keyword(s) will be listed in these categories:

- **Toolbars**
- **Menus**
- **Mini Toolbars**
- **Shortcut Menus**
- **Apps**
- **FAQ**
- **Help**
- **Samples**
- **Templates**

All these categories will be shown as collapsible sections with number of items displayed. If no result is found under the categories, the sections will be hidden.

Without entering any keyword, only **Useful New Tools** are listed in the panel. Click the **Settings** button beside the **Search** box to open the **Settings** dialog to customize the searching mechanism and the results display.



5.1.7 Learning Center

Learning Center is a "startup" dialog that gives quick access to graphing and analysis examples, plus learning resources (tutorials, videos, the OriginLab blog, etc.).

1. To open the dialog, choose **Help: Learning Center** or press F11.
2. Check or clear the **Show on Startup** box to show or hide this dialog each time Origin starts.



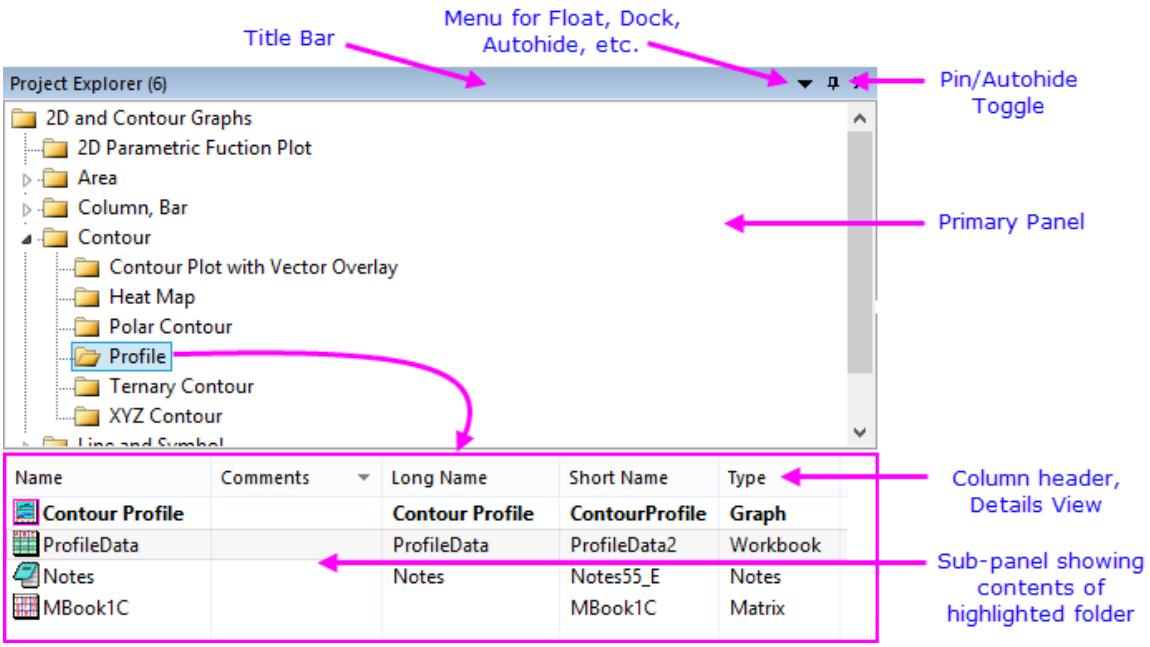
- View and load sample graphs, including sample data and notes on re-creating the graph.
- Load analysis samples with data.
- Browse the **Learning Resources** tab for tutorials and videos and links to the Origin Blog, User Forum and Origin social media pages.
- Move files from your previous **User Files Folder** to your new User Files Folder.



To see new graphs in newest version, open the Learning Center, click the **Graph Samples** tab, set the plot filter drop-down to *All Plot Types* and search the version number, such as *2024*.

5.1.8 Project Explorer

Project Explorer (PE) is a tool to help you organize the contents of your Origin project files (OPJ).



Project Explorer (PE) is split into two panels. The primary panel shows the OPJ folder structure. The sub-panel shows windows contained in the folder that is highlighted in the primary panel.



Prior to 2018, the PE sub-panel listed sub-folders in the folder selected in the top panel. To restore this display mode, set the value of system variable **@PEF = 1**.

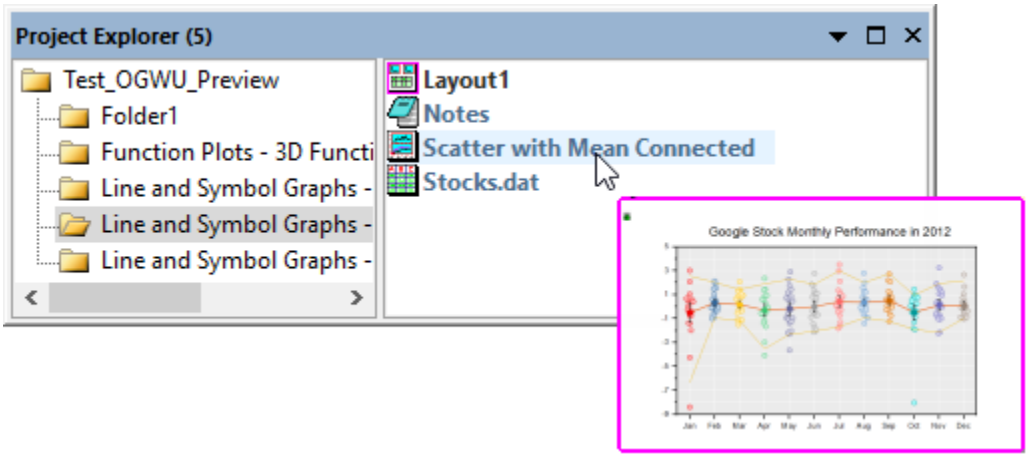
5.1.8.1 Using Project Explorer to manage your projects

- Right-click the PE title bar or click the drop-down menu to display the panels stacked (**Vertical Alignment**) or side-by-side (**Horizontal Alignment**).
- Context menus in both panels provide options to delete, hide, print, etc. Menu options vary depending on what is selected or where you have right-clicked.
- Multiple-selection of windows in the sub-panel is supported (press Shift or Ctrl while clicking with your mouse).
- The sub-panel supports differing views of windows: **Details** (default), **List**, **Small Icons**, **Large Icons**, **Extra Large Icons**.
- In any view, mousing over a window icon shows a popup preview of the graph, worksheet, matrix, layout, image, or notes window.

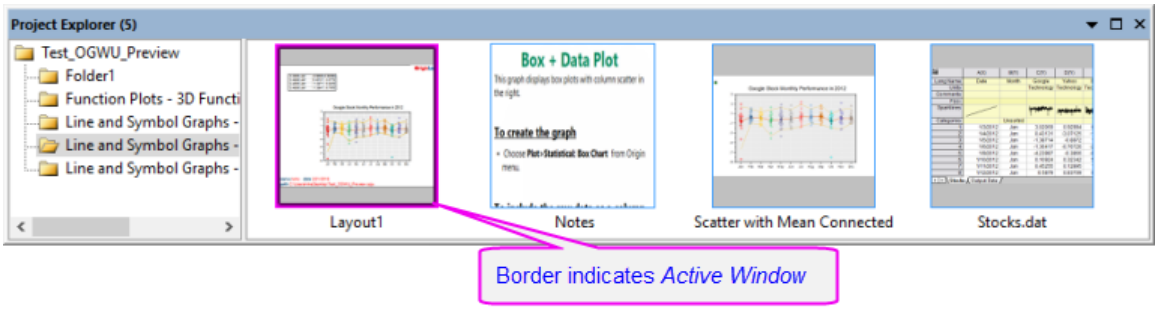


To disable PE previews, set the value of system variable **@PESS**.

- Control display of popup previews by right-clicking in the subpanel and placing a check mark beside **Hold Ctrl Key for Preview Popup**. Henceforth, popups will only appear as you press CTRL.



- When displaying windows as **Extra Large Icons**, the PE sub-panel displays a thumbnail of graphs, layout windows, workbooks, matrixbooks, images and notes window.

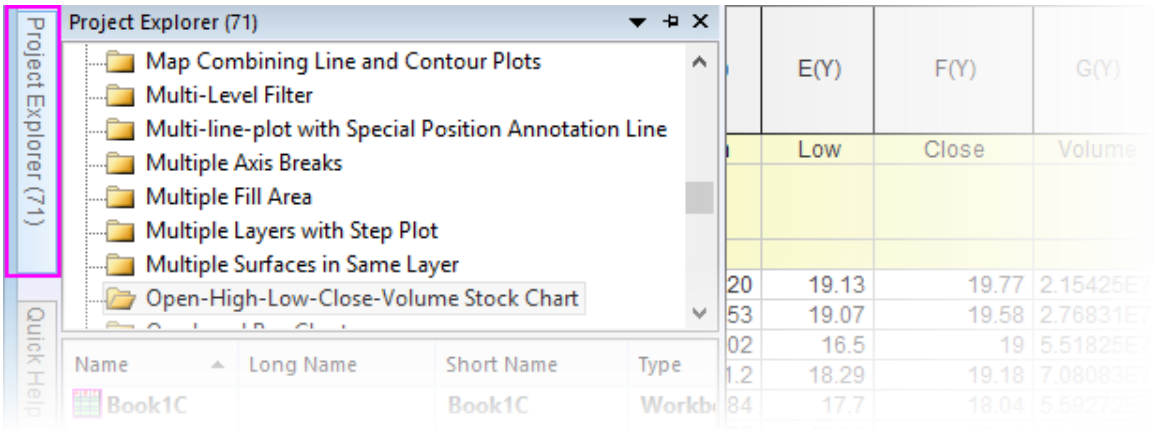


- You can right-click on PE folder (upper panel) and choose **Copy** -- or select the folder and do a CTRL + C and CTRL + V -- to copy and paste the folder structure and content to (a) another folder in the current project or (b) another project running in a second Origin session. To copy a single workbook window, right-click on the window (lower panel) and copy and then paste the window to (a) another folder in the same project, or (b) to a new project running in a second Origin session.

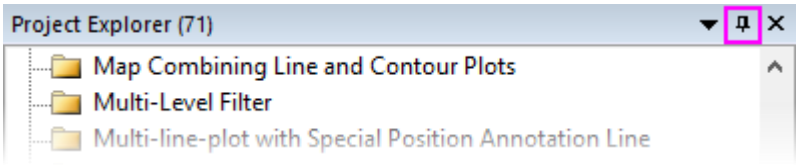


1. Select **Help: Open Folder: Program Folder**, click the **Samples** subfolder, then drag the file *Tutorial Data.opj* to your Origin workspace.

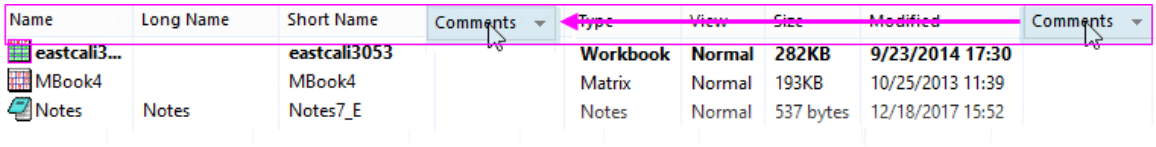
2. By default, Project Explorer is docked to the left side of the Origin workspace in auto-hide mode. Mouse over the **Project Explorer** tab to show the PE window.



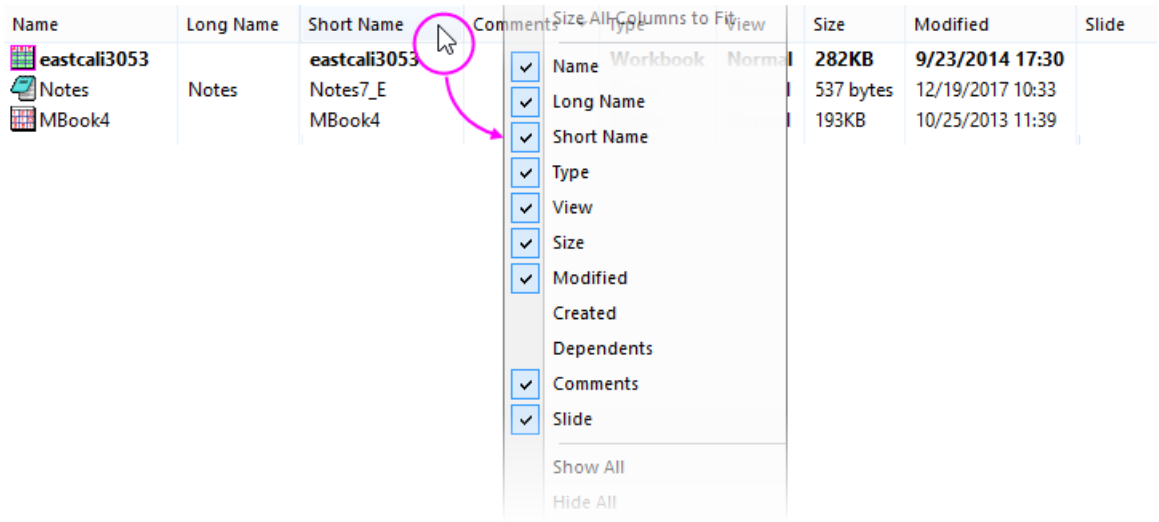
3. Click on the "push pin" icon on the PE title bar to pin the window in the docked position.



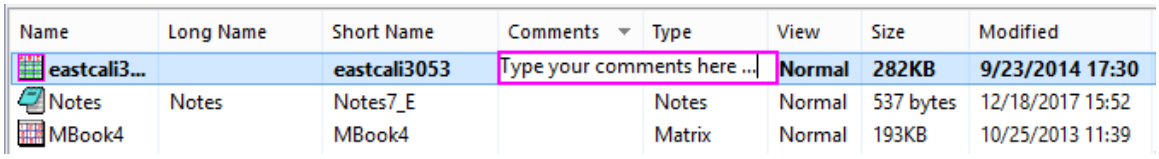
4. By default the sub-panel is in Details view. In this view, window metadata such as **Name**, **Size** and **Comments** show below these column headings. Try dragging column headers to reorder them.



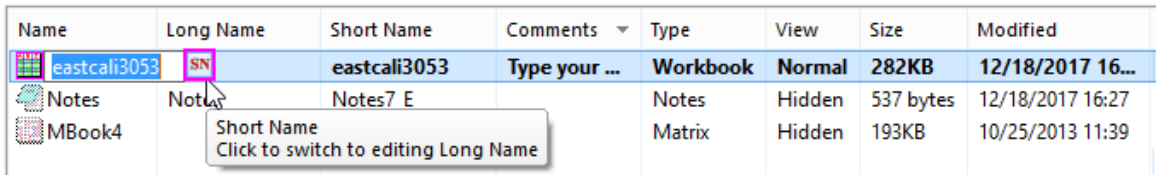
5. Right-click on the column headings and show or hide any of the headings by checking or unchecking the box beside each.



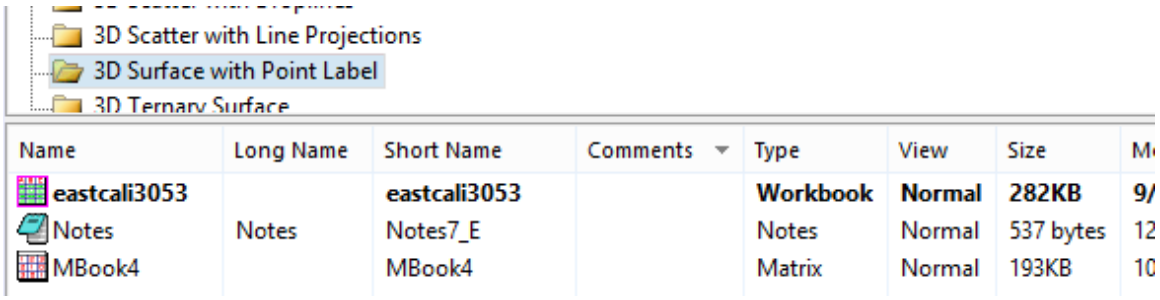
6. To add a comment in the **Comments** field, click once, pause briefly and click a second time. This puts you into edit mode. Enter a comment.



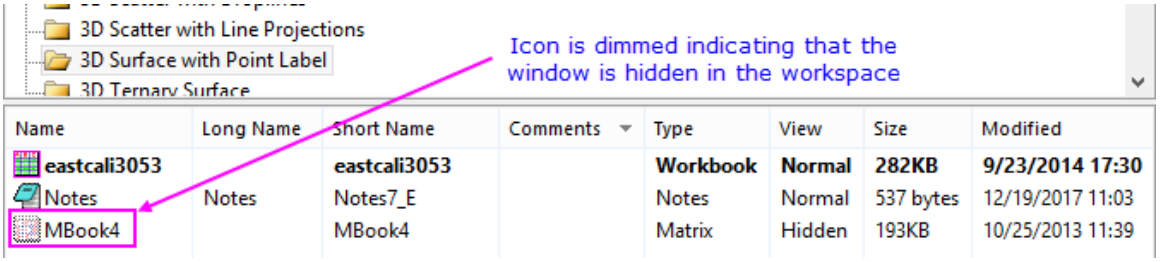
7. To change the Name of a window, right-click in the row and choose **Rename**. By default, the **Name** field displays the window **Short Name**; or if a window Long Name exists, the window **Long Name** (all windows must have a Short Name but Long Names are optional). Click the **SN** or **LN** button to the right-side of the editable **Name** field to edit the Short Name or Long Name. If the Long Name does not exist, you can enter one.



8. In the top panel of Project Explorer, scroll to the folder **3D Surface with Point Label** and click on it. The sub-panel shows that there are three windows in the folder. Note that the worksheet window *eastcali3053* is bold indicating that it is the "active" window - the window that is being acted upon as well as the window that determines what operations are available. There is also a Notes window, and a matrix window named *MBook4*.

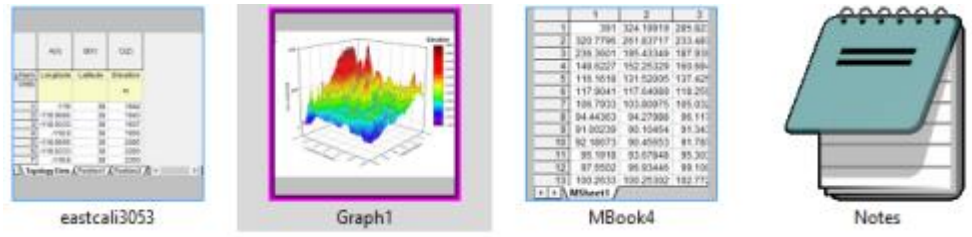


9. In the sub-panel, double-click on *MBook4* and note that it is now bold and has a magenta "halo", indicating that it is the active window. You will also see that the whole window(in the workspace) displays with a halo which can be customized in color with the system variable @AWC-- another indicator that this is the "active" window. Double-click on this *MBook4* icon again and note that the icon is now dimmed. Note also that the actual window disappears from the workspace. This is because *MBook4* is now hidden. Double-click the *MBook4* icon again and the window is restored and made active.

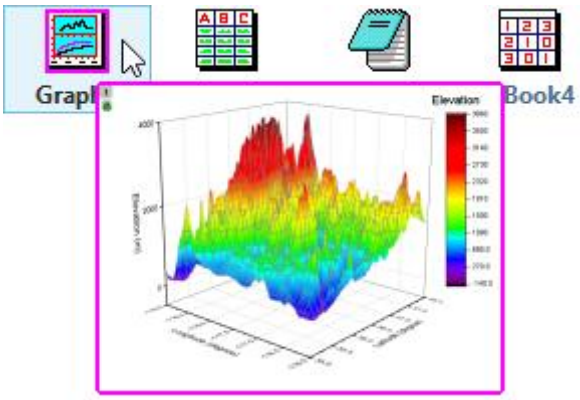


10. With *MBook4* active, click **Plot > 3D: Surface: 3D Colormap**. This creates a 3D colormap surface graph (close the attention message). Note also that a new window -- *Graph1* -- has been added to the sub-panel of Project Explorer.

11. Right-click in an empty portion of the sub-panel and choose **View: Extra Large Icons**. Note that *Graph1* now displays a graph thumbnail.



12. Right-click again and choose **View: Large Icons**. Note that windows are now represented by icons but if you hover on them, you can see the window contents as a pop-up.



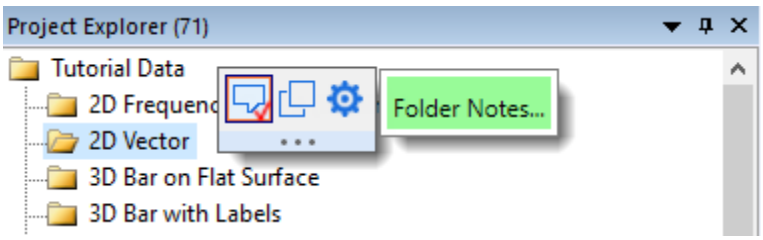
5.1.8.2 Folder Notes

You can add **Folder Notes** to a PE folder.

1. Right-click on a folder and choose **Folder Notes** .
    - If no folder **Comment** exists, this adds a blank **Folder Notes** window to the folder (see this page for options for adding and displaying Notes window content).
    - If there is existing **Comment** (**hint**: right-click on the folder and choose **Properties**), adding **Folder Notes** will copy the **Comment** to the Folder Notes window.
    - When switching between folders, for example using the new **Folders and Windows** toolbar, these **Folder Notes** will always be displayed in the workspace, if *pinned* or *minimized*.
    - If you *close* **Folder Notes** (i.e. by clicking the **Close** button), they are embedded in the folder and will only be displayed again by right-clicking on the folder in PE and choosing **Folder Notes**.

In addition ...

- Press Ctrl + hover on a PE folder to see rendered Notes window content.
- System variable **@FNS** is added to determine which is the default Folder Notes syntax (= *0* (Text), = *1* (HTML), = *2* (Markdown), or = *3* Origin Rich Text (default)).
- A Mini Toolbar is added for adding **Folder Notes**, **Duplicate Folder** or to **Open Folder Properties Dialog**.



5.1.8.3 Folders and Windows Toolbar

A **Folders and Windows** toolbar is added for working with Project Explorer folders and folder contents. When first running Origin, you may see this new toolbar "floating" in the Origin workspace. You can drag it (by the title bar) to an empty portion of the toolbar spacer; or you can choose **View: Toolbars** and click the **Reinitialize** button to reset toolbars to the standard configuration.

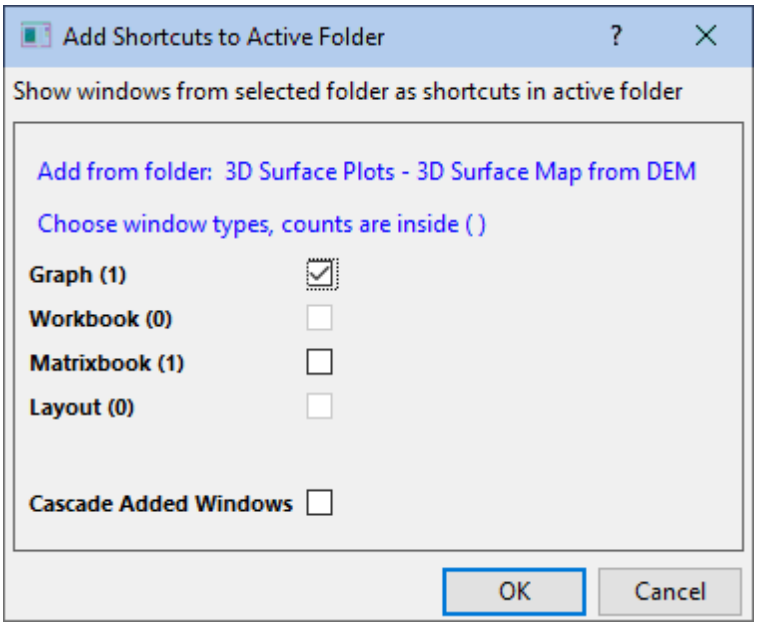


The *Folders and Windows* ***toolbar makes it easier to switch between PE folders (***'**Seesaw**) or to add the active window as a shortcut in the previous folder; plus, to pin the active window in place or to arrange windows in the active folder **Window: Arrange Windows <Last used>**.

- **Folder Backward**: From current folder, return to previous folder.
- **Folder Forward**: From previous folder, return to current folder.
- **Seesaw**: Alternate between two folders (Ctrl + Alt + X). From the menu, **Windows: Seesaw**.
- **Add Active Window Shortcut for Seesaw**: Share the active window to the previous folder as a shortcut (Ctrl + Shift +F7). Alternately, right-click the window title and add shortcut to previous folder.
- **Add shortcuts from previous folder**: Add shortcuts by window type, to the current folder.
- **Arrange Windows (last used)**: Same as **Window: Arrange Windows <Last used>**.
- **Pin Active Window**: Pin window so that it isn't included when **Arrange Windows (last used)** is clicked. Alternately, right-click the window title and **Pin Window** (or unpin).

5.1.8.4 Window Shortcuts

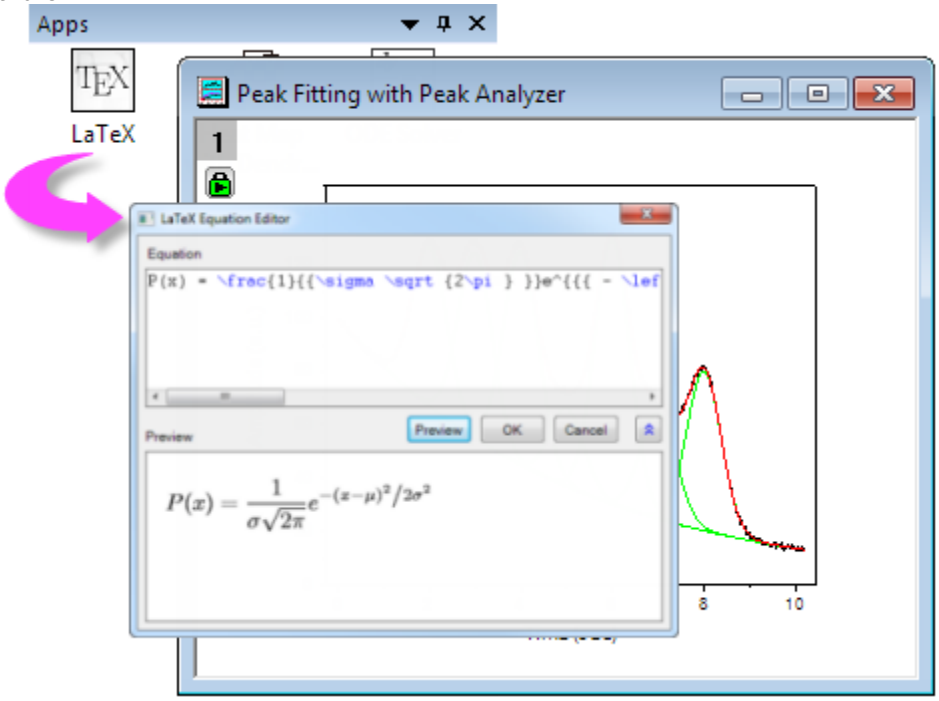
When you are in a Project Explorer folder, you can hover on another folder, right-click and **Add Shortcuts**. This opens a dialog for adding windows as shortcuts, by type, to the active folder.



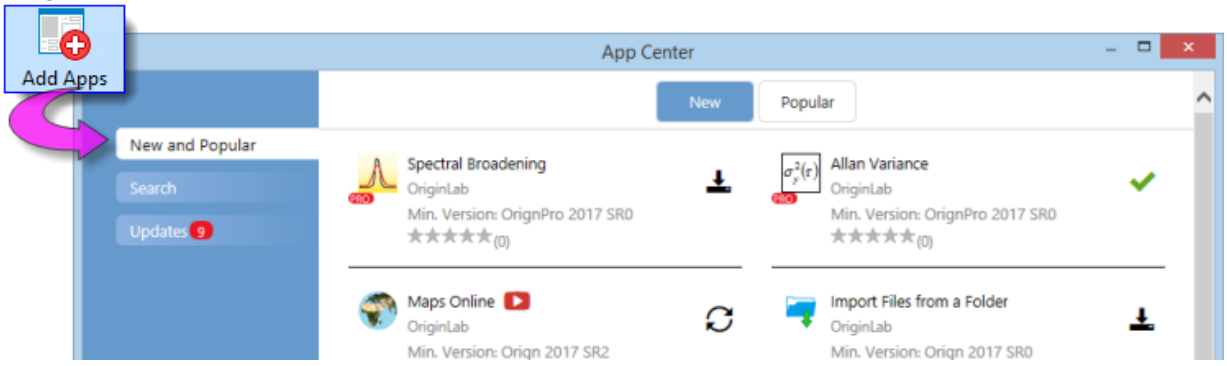
- When a shortcut window is added to the active folder, a home button ("Go to original") . Clicking the button will navigate to (and activate) the original window in its containing folder.
- A shortcut window will display the name of the PE folder in parentheses, on the window title bar.
- Clicking **Close**  on a shortcut window will hide the shortcut in the current folder.
- To remove shortcuts from the active folder, right-click on the folder in Project Explorer and **Remove Shortcuts** (dimmed when there are no shortcuts to remove).
- Minimized or maximized windows added as shortcuts will be restored up or down so that they are visible but do not fill the workspace.

5.1.9 Apps Center and App Gallery

Apps are add-on applications for Origin that perform specific graphing and/or analysis tasks. A small number of Apps that are broadly applicable to science and engineering fields are pre-installed with your Origin software.



Use the **App Center** dialog for browsing, updating or downloading Origin Apps. This new dialog gives you direct access to all of the Apps on the OriginLab File Exchange without you having to open a browser and navigate there.



To launch the App Center, click the **Add Apps** button that appears on all tabs of the Apps Gallery, docked at the right-side of your Origin workspace. If you do not see the Apps Gallery, click **View: Apps** (or ALT + 9) and verify that there is a check mark beside **Apps**.

- Installed and **Up-to-date Apps** will appear in the App Center with a green check mark beside them
- Installed Apps for which there is a newer version will appear with an **Update** icon beside them
- Those not installed will appear with a clickable **Download and Install** icon beside them

Origin's **Statistics**, **Analysis: Fitting** and **Analysis: Peaks and Baseline** menus include a **Find Apps** entry. Clicking **Find Apps** opens the App Center to show only Apps that relate to the current menu (e.g. Statistics). You can download or update Apps directly from the App Center.

Use the **Apps Gallery** to organize and access your installed Apps.



New Apps and App updates are are continually made available to Origin and OriginPro users. Be sure to open your App Center occasionally (press **F10**) and if it displays the red **Download Now** button, click to get the latest list of available Apps.



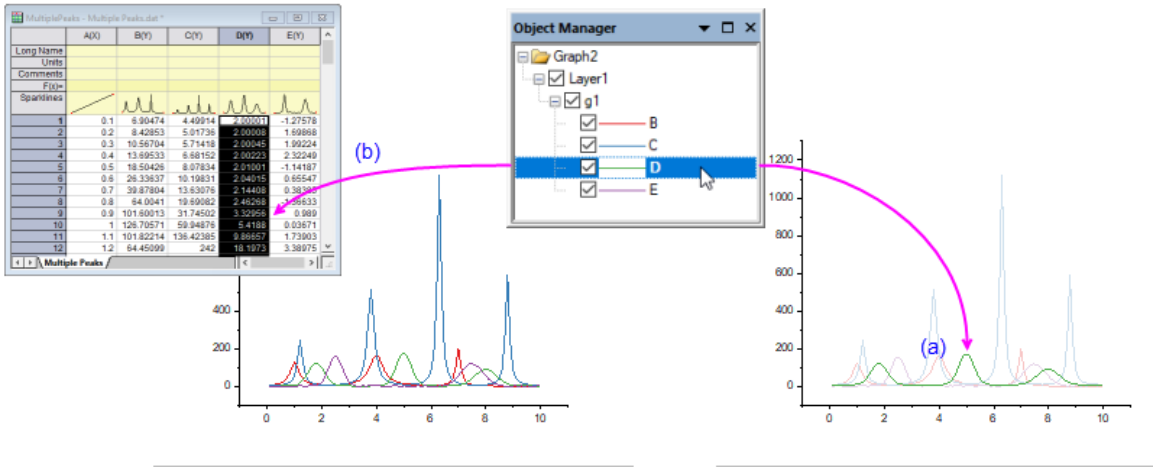
For more information on Apps, please visit **www.originlab.com/apps**.

5.1.10 Object Manager

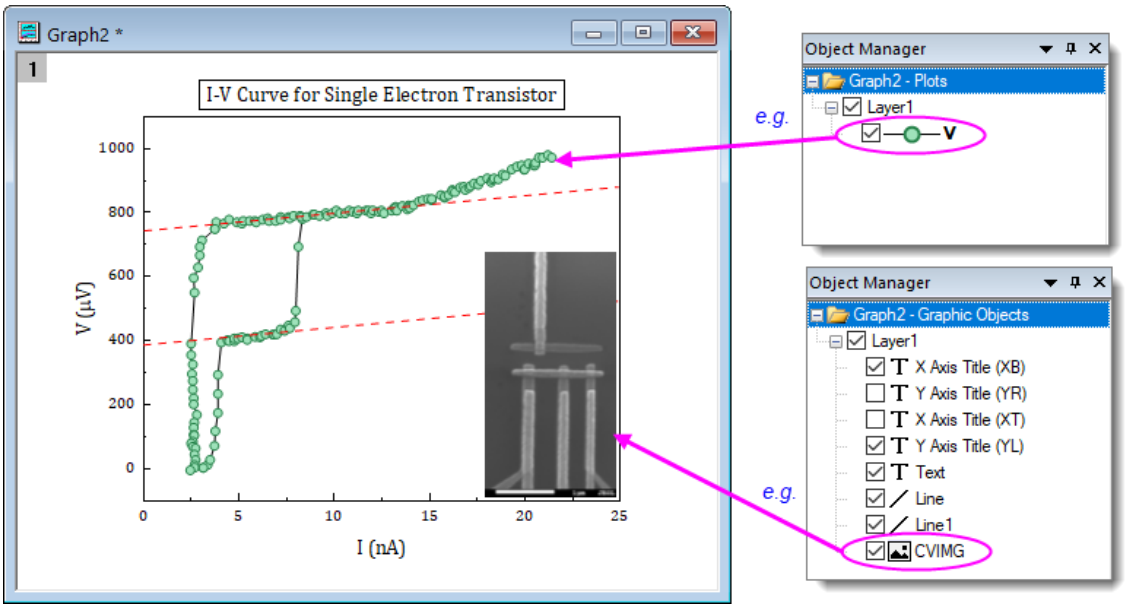
The **Object Manager** is a dockable panel that opens to the right side of the workspace, by default. Use the Object Manager for quick manipulation of the active graph or workbook window.

Graph Windows

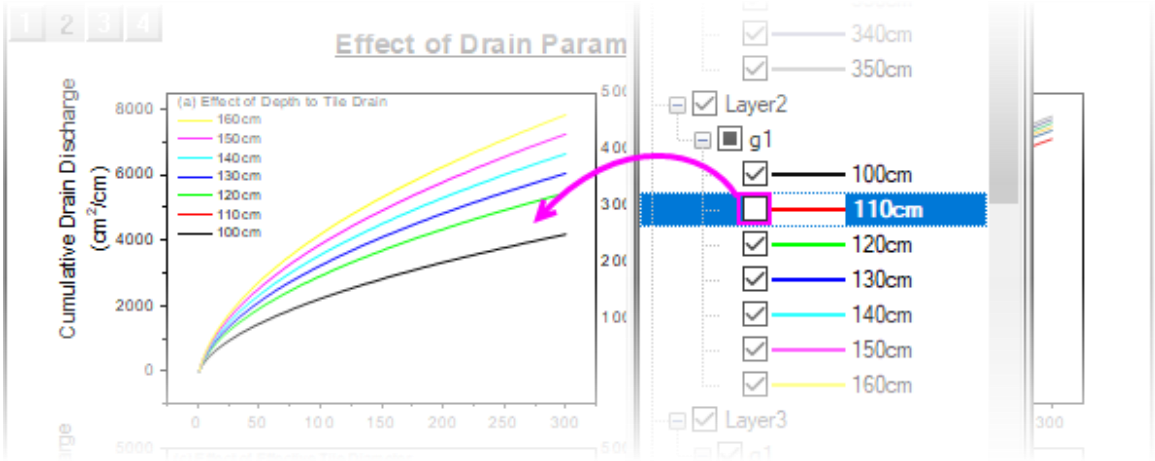
- Select an element (layer, plot group, data plot or special point) in the Object Manager to select the corresponding element in the graph window and *vice versa*. Selection also (a) dims all other plots in the graph layer and (b) selects the source data in the worksheet.



- **Object Manager** can show a "Graph Objects" view and a "Plots" view of graph windows. To toggle between the two views right-click in an empty portion of the Object Manager and choose **Show Plots**/**Show Graph Objects**; or press Ctrl + Shift + S.



- Hide or show plots or graph objects by clearing or checking the corresponding box in the Object Manager.

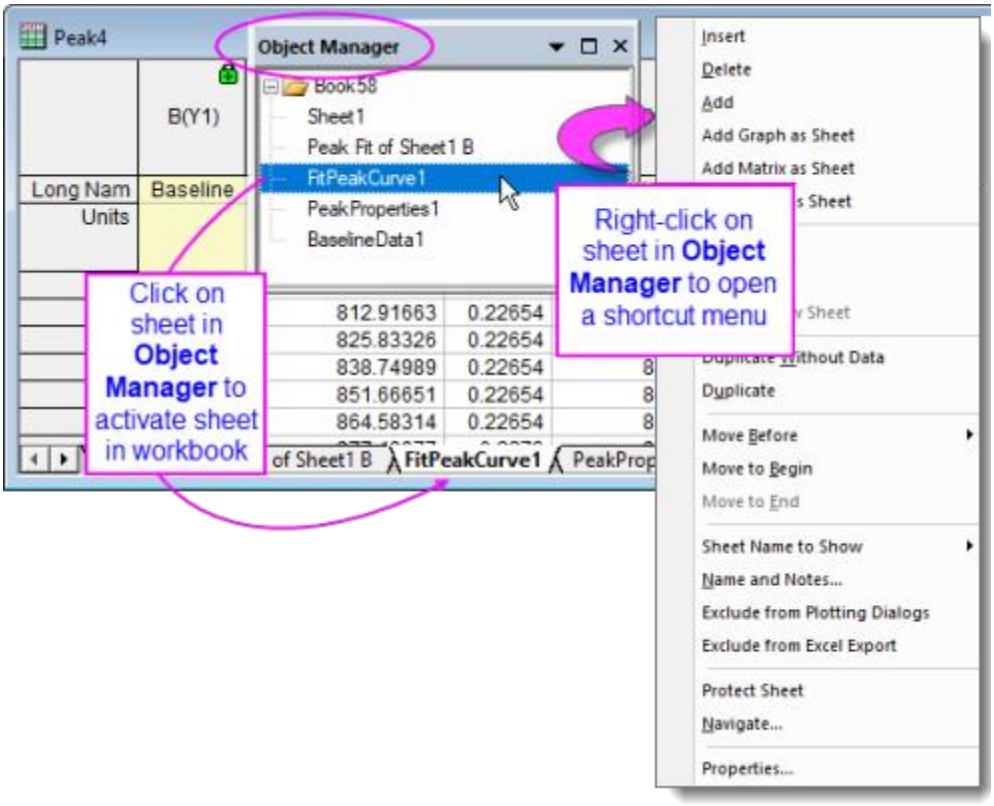


- At the graph level, change Object Manager list order (**Drawing Order** or its reverse -- **Order of Appearance**).
- At the layer level, change layer order.
- At the plot level, show labels, show or hide plots, reorder plots or create plot groups.
- Within a plot group (labeled as g*N*), ungroup plots, re-order plots by dragging or by shortcut menu command, change plot type.
- Remove a plot (permanently) from the graph window.
- Access the **Plot Details**, **Layer Contents** and **Plot Setup** dialog boxes.
- Right-click on the layer icon and **Reverse Plot Order**.

Workbook or Matrix Windows

The Object Manager also supports certain actions for workbooks and matrices:

- List all sheets in the active workbook or matrix.
- Quickly select multiple sheets by pressing CTRL + Up/Down arrow.
- Click a sheet in Object Manager to activate the corresponding sheet in the workbook or matrix.
- Right-click in Object Manager for access to common worksheet operations, including **Delete**, **Insert**, **Add**, **Move**, **Copy**, and **Duplicate**.
- Right-click on a matrix or virtual matrix in Object Manager to **Rename**.



Layout Windows

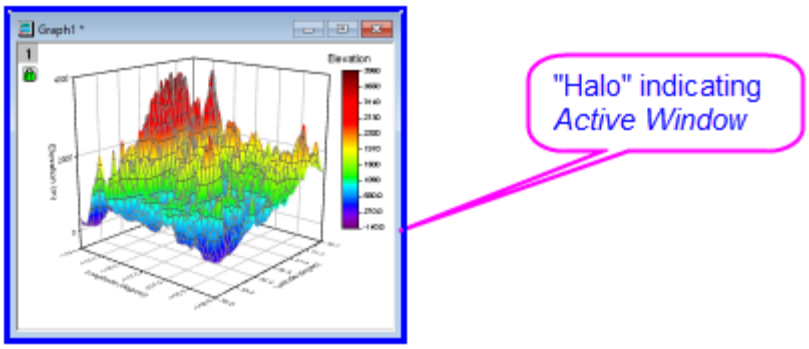
When a **Layout Page** is active, the **Object Manager** lists and allows arrangement of objects via shortcut menu commands.

- All objects, including added graphs, tables and text objects, list in the Object Manager.
- Hide or show objects by clearing or checking the adjacent box.
- Select multiple objects in Object Manager, then right-click and align or distribute them using shortcut menu commands.

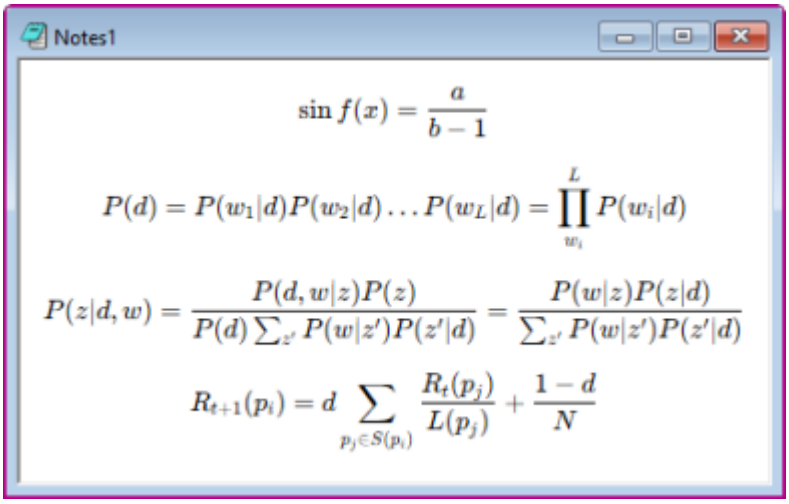
5.1.11 Origin Child Windows



Active windows -- the window that will be acted upon by graphing and analysis operations -- display a colored frame to make the active window more obvious. You can customize the active window indicator properties (frame color, where the frame shows, frame line style) with "@ System Variables" **@AWC** (color) and **@AWI** (style).



- **Workbooks**: The Origin workbook provides a framework for importing, organizing, analyzing, transforming, and plotting your data. The tabbed workbook contains between 1 and 1,024 sheets. Each sheet may contain more millions of rows and more than 65,000 columns of data. In addition to your data, workbook windows may also store graphs, annotations, column-based functions, scripts and programmable button objects, LabTalk variables and import filters.
- **Matrixbooks**: Like the worksheet, a matrixsheet is a grid of cells, arranged in rows and columns. The primary difference is that in the worksheet, each column is a dataset and each dataset can be configured to contain various types of data (text, text & numeric, numeric (double), numeric (int), etc). In contrast, the matrix is a single, numerical dataset of Z values, related in the XY plane by row (Y) and column (X) index numbers. The matrixbook contains between 1 and 1,024 sheets. Each sheet can contain multiple matrix objects (up to 65,504).
- **Graphs**: The graph window is the primary container for your data plots. Origin supports over 100 chart types, chosen specifically for their applications in various technical fields. Each chart is created using a built-in, user-modifiable graph template that can be saved with your custom settings. In addition to data plots, the graph may also contain annotations (text and drawing objects) or button objects that, when triggered, perform some custom graphing or analysis task. Graph windows can be inserted into worksheet cells or "floated" on worksheets (outside the grid) in a workbook window.
- **Images**: The image window is a window for importing, viewing and editing raster images and videos (.avi, .mov, .mp4).
- **Function Graphs**: The function graph is a specialized graph window that displays a curve described by a function. The function graph differs from other Origin graphs in that it is not produced from a dataset of discreet values (though you can generate data after plotting).
- **Layout Pages**: The layout window allows you to combine and arrange graph and worksheet windows and various annotations onto a single "display panel." It is used primarily for creating presentations.
- **Excel workbooks**. Excel workbooks can be opened or created in Origin. Workbooks can be saved separately or as part of your Origin project file.
- **Notes**: The Notes window supports plain text, Rich Text, HTML and Markdown. Use it for simple tasks such as recording analysis procedures, making notes to students and colleagues, and cutting and pasting text from other applications; or use it for rendering highly formatted text, including HTML reports and mathematical expressions.



Note: For more information on Origin's child windows, see

Help: Origin: Origin Help > Origin Basics > Elements of the Origin Workspace > Creating a Child Window

Help: Origin: Origin Help > Origin Basics > Elements of the Origin Workspace > Basic Child Window Operations

To save an Origin child window independently of the Origin project file:

- Select **File: Save Window As...** to save active window. File extensions OGW(U), OGG(U), OGM(U) are for Origin Workbook, Graph and Matrix windows, respectively.
- Right-click the window title bar and choose **Save as...** from the context menu.

Note: To save an Excel window as an external Excel file, right-click the Excel window title in Origin and choose **Save Workbook as...** from the context menu.



Origin 2018 added **Unicode (UTF-8)** support for Origin projects, child windows and templates. When you save a window file -- *with the exception of the project file which as of Origin(since 2023) can only be saved as Unicode-compliant (*.opju)* -- you will have the option of saving a file with or without a "**u**" appended to the file type (*.otp or *.otpu). If you intend to use the file only in the latest version of Origin, you should choose the Unicode-compliant (appended "u") option as it offers some performance advantages.

To open a worksheet, graph, matrix, or notes window that was saved to a file:

- Select **File: Open** or click the **Open** button on the Standard toolbar to open window files.
- Select **File: Recent Books**, **File: Recent Graphs** to open recently saved workbook and graph window files.

Note: Origin supports window **Short Name**, **Long Name** and **Comments** and the Short Name must be unique in the Origin project. The window Short Name will be renamed if such a name has already exists in the project. If you open window file in the current project, then save the project, the window will be included in the project.

To open an Excel workbook file:



If you are intending to work with Excel files in Origin, please see this section of the Origin Help file before proceeding.

- Select **File: Open Excel** menu to open a external Excel file. Or, you can click **Import Excel** button in the **Standard** toolbar or select **Data: Import from File: Excel (XLS, XLSX, XLSM)...** from the main menu to import the Excel file.

Note: If you choose **Open Excel**, the Excel file is opened as an Excel workbook, in an Excel session that runs inside Origin. In this mode, you have only limited access to Origin features. If you choose **Data: Connect to File: Excel** or **Data: Import From File: Excel**, the Excel file is imported into an Origin workbook and all Origin features are available.

5.1.11.1 Arranging Child Windows

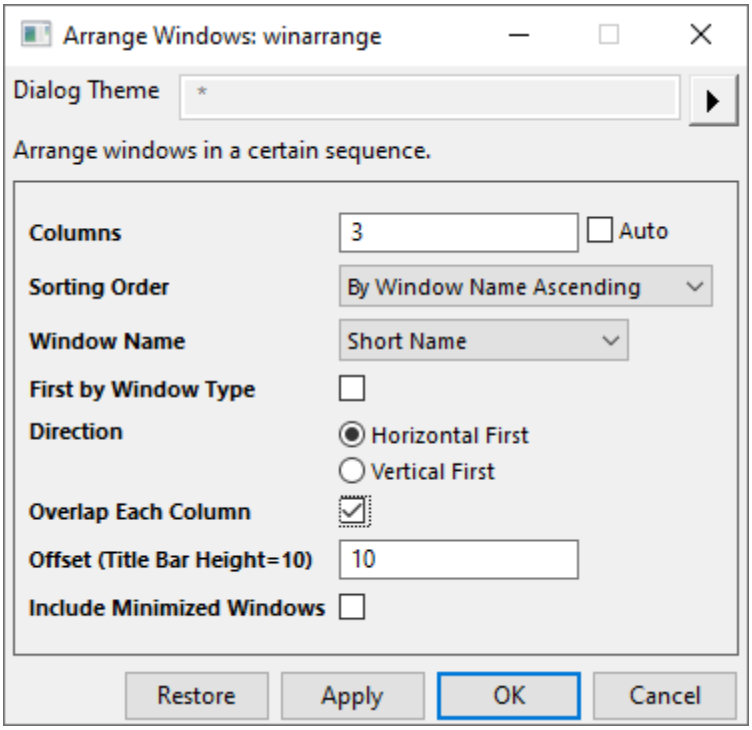
Origin includes some window arranging tools that go beyond the basic **Tile** and **Cascade** functionality. Users in industry and research who work with high resolution monitors and many windows should find the tools helpful.



- The new **Folders and Windows** toolbar has a **Pin Active Window** button that is used to exclude the active window when windows are arranged by menu command or toolbar button. Clicking this button adds a pin button to the window title bar. Alternately, right-click on any window and choose **Pin Window** from the shortcut menu.
- Occasionally, you may decide -- after arranging windows -- to enlarge a window for better viewing. You can restore the window to its previous size and position by clicking **Window: Restore Window Size** (Ctrl + Shift + Z).

5.1.11.1.1 Arrange Windows Dialog

Central to using these tools is the **Arrange Windows** (winarrange) dialog (**Window: Arrange Windows**).



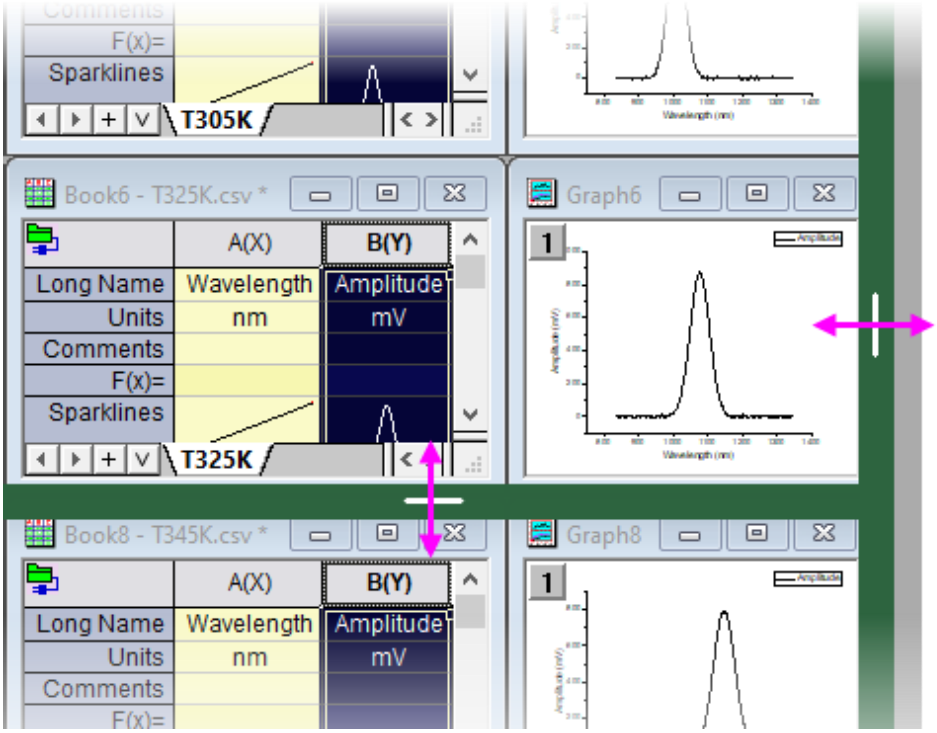
Use the dialog to sort and arrange windows in the Origin workspace.

- Arrange windows into columns.
- Sort by order of activation, Project Explorer order, or window name (ascending, descending).
- Sort within window type.
- Horizontal (left to right) or vertical direction (top to bottom).
- Overlap each column (cascade) by user-defined **Offset**.
- All above arrangement include minimized windows or not.

5.1.11.1.2 Snapping Windows

Windows that are arranged in rows and columns can be "snapped"; that is, dragged and resized along a common edge. The visual cue for engaging the snap is a green bar.

1. Toggle this feature off or on using **Window: Snap Windows** (Ctrl+F12).



- To resize a single window without snapping, press SHIFT while dragging window border.
- When tiled windows cover the workspace, swap two window positions by pressing ALT while dragging the window title bar.
- To snap a window into an empty space, press SHIFT while dragging.

5.1.11.2 Float and Pin Child Windows

From Origin 2023b, Child Windows can be moved outside of the Origin workspace as independent floating windows. Such windows have customizable Menus and Toolbar buttons, so you don't have to move back to the main Origin window to access them.

Float windows are auto pinned so that they will remain when switching folders in Project Explorer.

Pinned window inside Origin will auto remain when switching folders in Project Explorer. To roll back to old behavior, set system variable @pws=0.

5.1.12 The Command Window and Script Window

The **Command Window** can be used to issue LabTalk commands to Origin, to do simple mathematical calculations, or to check the value of LabTalk variables. The Command Window maintains a time-stamped command history that can be carried over from session to session, and intellisense which provides auto-completion features when writing X-function commands. The Command Window is dockable and has two panels. The left-hand panel displays the command history, while the right-hand panel provides the command line.

The **Script Window** predates the Command Window. It does not support all Command Window features (there is no command prompt and no scrollable command history) but it is handy for running simple LabTalk

commands at the cursor (run multi-line scripts by highlighting the entire script and pressing Enter). In addition, the window's **Tools** menu also opens the **LabTalk Variables and Functions** dialog box where you can view a list of Origin variables, functions, macros, loose datasets, etc.



Script Window also supports for Unicode, auto-completion, syntax-coloring, and font-size control/zoom (Ctrl + mouse wheel). These features should improve usability, particularly for those with 4k monitors. If you want a "plain text" Script Window, set **@NSW=0** (for help with setting the value of a system variable see this FAQ).

To open the Command Window:

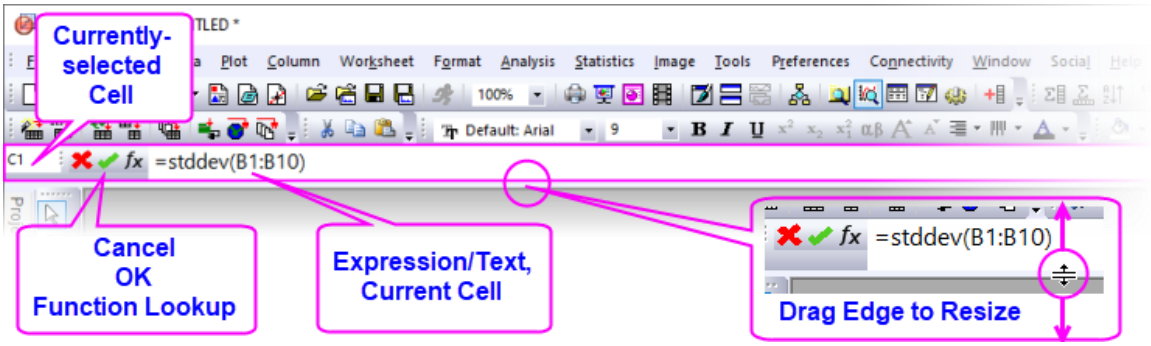
- Click the **Command Window** button  on the Standard toolbar. Alternately, select **Window: Command Window** menu or press ALT+3.

To open the Script Window:

- Select **Window: Script Window** menu or press SHIFT+ALT+3.

5.1.13 The Formula Bar

The **Formula Bar** is similar to formula bars in OpenOffice and Excel. While it is not necessary to use the Formula Bar to enter cell expressions, it does offer the advantages of function search, interactive range selection and improved visibility of expressions, particularly of long expressions that exceed cell width.



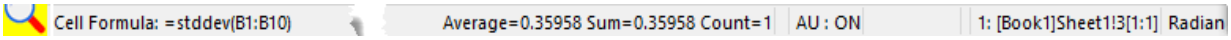
1. With a workbook active, toggle the Formula Bar on or off by clicking **View: Formula Bar** on the main menu.
2. To change font size, change the value of LabTalk system variable **@FBFS** (default is "130").

For more information, see the **Workbooks, Worksheets and Columns** chapter.



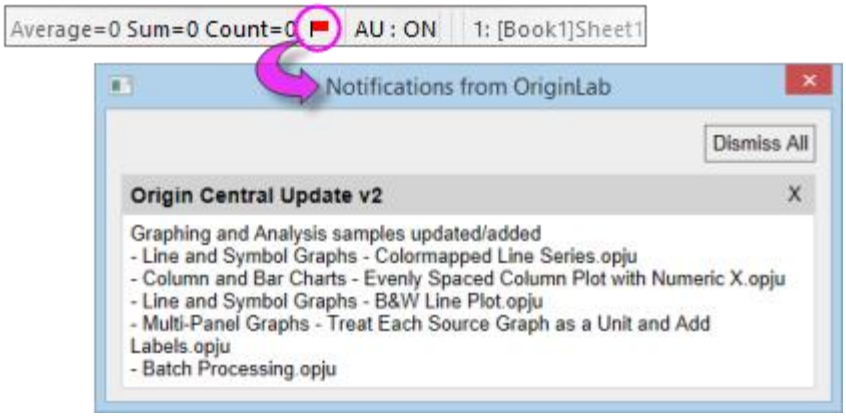
- The **Search Functions** dialog that is opened from the **Function** menu in certain dialogs (e.g. **Set Column Values**) can be opened by clicking **Tools: Search Functions**.

5.1.14The Status Bar

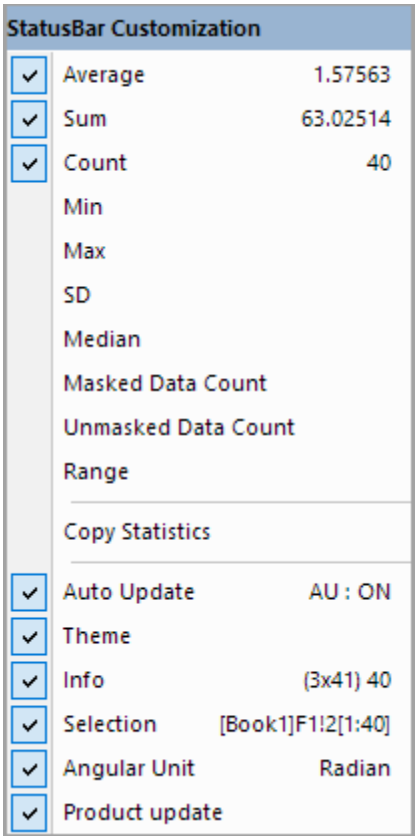


The **Status Bar** is located at the bottom of the Origin workspace. It reports multiple parameters, including:

- Help messages and tool descriptions.
- Statistics on the current workbook, matrix or graph selection.
- Whether the **AutoUpdate** analysis feature is turned on.
- The name of the **System Theme**, if any.
- Information pertinent to the active window.
- Angular unit (radians, degrees, or gradians).
- Tool tips for functions listed in the **Set Values F(x)** menu.
- **Notifications from OriginLab**, represented by a small red flag to the right side of the Status Bar.



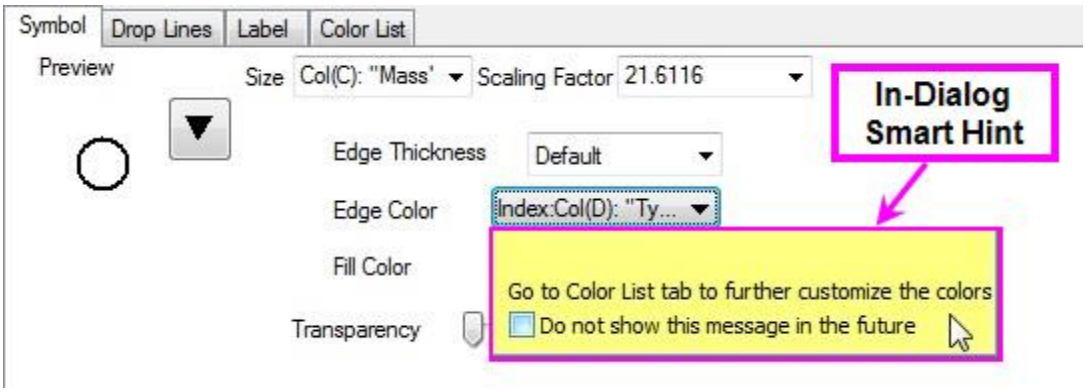
Customize and Copy Status Bar Data



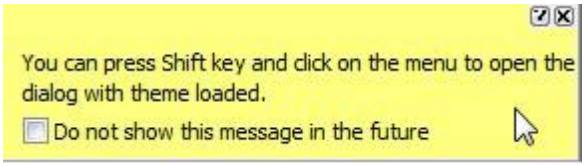
- You can select what shows in the Status Bar by right-clicking on the Bar and selecting (or clearing) items from the context menu.
- Copy displayed statistical values by selecting **Copy Statistics** from the context menu. The copied data are TAB separated between quantity and values, with each key value pair separated by a CRLF delimiter.

5.1.15 Smart Hints and the Smart Hint Log

Smart Hints are triggered by user actions and are intended to give the user help with current task. These hints may appear briefly inside a dialog box, as in this example.

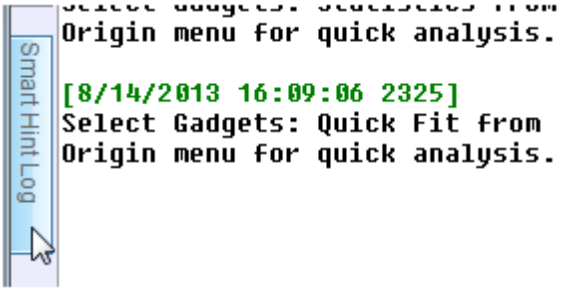


Alternately, Smart Hints may appear in the lower left corner of the Origin workspace, as in this example.



Unless you hover over a Hint, it will quickly fade. You can prevent display of individual Smart Hints by checking the "Do not show this message in the future" box at the bottom of a Smart Hint.

Hints are logged for the current Origin session and can be reviewed by clicking the **Smart Hint Log** tab, docked at the edge of the Origin workspace (Note that in-dialog Hints are not logged).



To open (and close) the Smart Hint Log window:

1. From the Origin menu, select **View: Smart Hint Log** or press ALT+7.

To prevent a particular Smart Hint from displaying again in the current session, right-click on the hint in the Smart Hint Log window and check **Do not show this hint again** from the context menu. A message asks you to confirm that you do not want to show or log this message.

To turn off all Smart Hint display in the session, open the **Script Window** and type the following:

```
@SHS = 0;
```

To turn on Smart Hint display (including those were individually hidden), type @SHS = 1, and click **Help: Reactivate All Hints**.



When you set the value of a system variable using the Script Window, you are altering Origin's behavior for the current session only. To set the value of a system variable across sessions, see this FAQ.

5.1.16 Code Builder

Origin integrated development environment (IDE) is called **Code Builder**. Code Builder provides tools for writing, compiling, and debugging your Origin C functions. Additionally, it can be used for running and debugging Python code.

To open Code Builder:

1. From the Origin menu, select **View: Code Builder** or click the **Code Builder** button on the Standard toolbar or press ALT+4.
2. Code Builder can also be opened by clicking **Connectivity: Open untitled.py**. In this mode, you can paste and run Python code by pressing CTRL + F5.

5.1.17 Messages Log

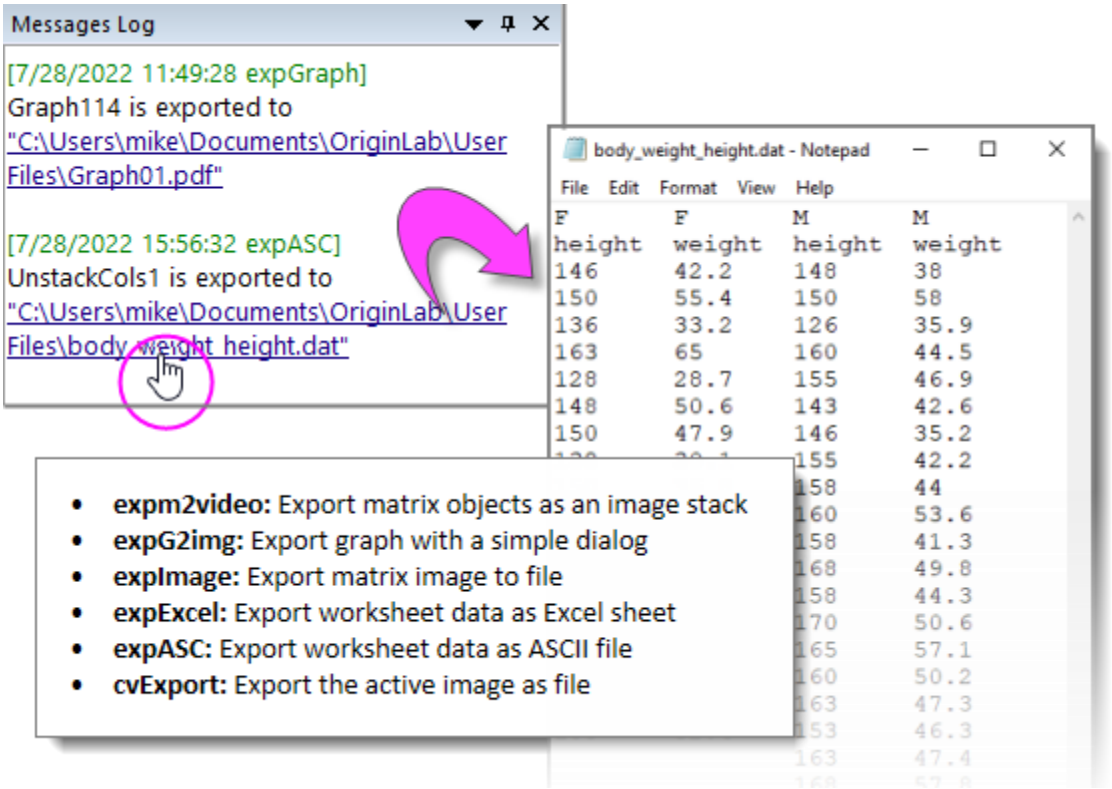
The **Messages Log** window shows messages about operations including Output Information, Results and Errors. It displays messages that are not sent to the **Script Window** or the **Command Window**.

To open (and close) the Messages Log window:

1. From the Origin menu, select **View: Messages Log** or press ALT+6.

Clickable link of export results

Export dialogs (see bullet list in image) will add a date-time stamped clickable link to the Messages Log. Click the link to open the file with the default application (e.g. Notepad for *.dat).



- To open file location in Windows Explorer without opening the file, right-click on a link and choose **Open File Location**; or press Ctrl while clicking on the link.

- Two system variables are added to control image export link behavior. See Exporting Graphs and Layout Pages to an Image File for more information.

5.1.18 Results Log

Origin automatically types many analysis and fitting results to the **Results Log**. Each entry in the Results Log includes a date/time stamp, a window name, a numeric stamp which is the Julian day (see *Dates* below), the type of analysis performed, and the results.

In most cases, when results are reported to the **Results Log**, it opens automatically. Manually open (or close) the Results Log by doing one of the following:

1. Click the **Results Log** button  on the Standard toolbar. Alternately, from the Origin menu, select **View: Results Log** or press ALT+2.

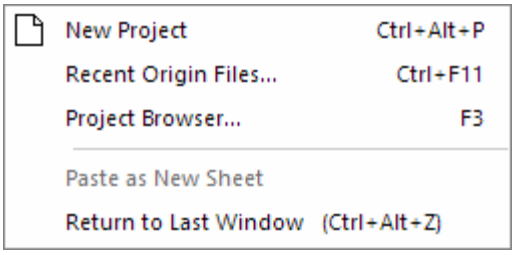
Right-click in the Results Log to open a shortcut menu with commands to **Copy**, **Print**, **Clear...**, and **View Results**.

5.1.19 Float, Dock and Auto-Hide Windows

There are several Origin windows, which can be floated, docked, auto-hidden, or hidden. These windows include **Project Explorer**, **Results Log**, **Command Window** and **Messages Log**. This allows you to customize your Origin workspace so as to maximize utility and save screen space.

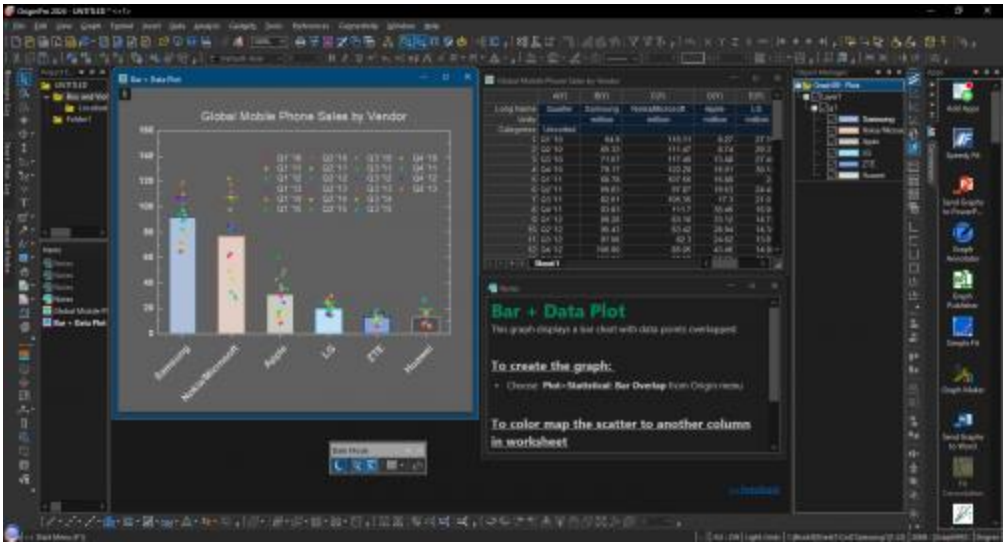
5.1.20 Context Menu

Right-click on the grey workspace area, you can create a new project, open **Recent Origin Files** and **Project Browser** dialog, or return to the last window.

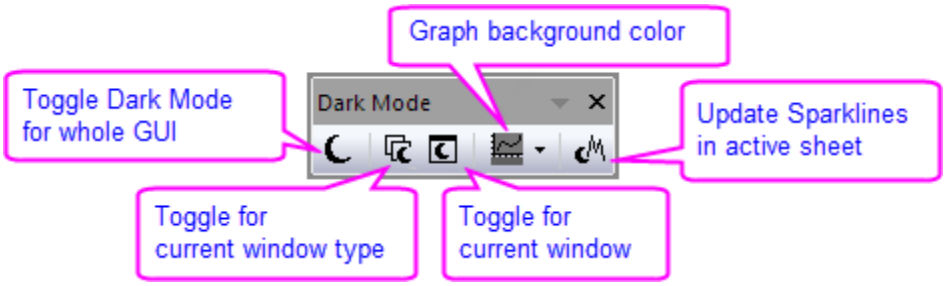


5.2 Dark Mode

Dark mode is supported from Origin 2024.



- By default, Origin follows Windows dark mode settings. You can use the Dark Mode toolbar or System Variable @CTP to turn on/off Dark Mode independently. Besides, there are buttons on the Dark Mode toolbar to toggle dark mode for individual window for particular window type.



- Multiple built-in dark color themes available under **Preference: Dark Theme** menu.
- When exporting or copying dark-mode graph as image, there is option to copy/export as displayed, or without dark mode applied

5.3 Numbers in Origin

- **Displayed vs. Actual Cell Value**: When you import or type your data into a workbook or matrixbook, Origin uses a combination of user-specified settings to determine how to display the data in each cell. What displays is a visual representation of the data value. The actual data values are stored with the full precision allowed by the dataset's Data Type (see table below). When you perform calculations, it is the actual data values that are used and not the displayed values.
- **When Contents Exceed Cell Width**: Prior to Origin 2020b, if the sequence of characters in a sheet cell exceeded what could be displayed at the current cell (column) width, Origin represented cell contents as a series of pound signs (**######**). This has changed to mimic MS Excel's worksheet behavior:

  - Text strings will not trigger display of pound signs **######** regardless of column width. To view the full string, you must increase column width.
  - Numeric values that exceed column width will first be rounded to the nearest decimal and only if that is not sufficient to display the full integer value, will pound signs **######** display in place of the numeric value.
  - This rounding of numeric values affects the displayed value only. The internally-stored value does not change.
  - To restore the old behavior of displaying pound signs **######** whenever cell contents were not fully displayed, set system variable **@WPE = 1**. For information on changing the value of a system variable, see this FAQ.

- **Missing Values in the Worksheet**: When spreadsheet programs first appeared it was recognized that there was a need for a special number that was "not a number" which would - when used in a calculation - generate itself. Origin has such a number and its internal value is *-1.23456789E-300*. Because Origin recognizes this value as a special value, it can be used to enter a missing value into a worksheet or matrix and it can be used in calculations or scripts (for instance, to return a missing value unless some condition is met). Origin displays missing values in a worksheet or matrixsheet as "--". However, you shouldn't confuse this display (output) with what you enter as a missing value (input).
- **Decimal, Scientific and Engineering Notation**: You can display workbook or matrixbook data in **Decimal:1000**, **Scientific:1E3**, **Engineering:1k**, and **Decimal:1,000 notations**. You can manually choose from these data display options but you can also pre-define thresholds for automatic display of scientific notation. By default, these thresholds are set to **6** (upper) and **-3** (lower).
- **Dates and Times in Origin**: Origin's long-time mathematical system for dates and time is based on Astronomical Julian Day Numbers, with a 12 hour offset. This system defines January 1, -4712 (January 1, 4713 BCE), 12 hours Greenwich Mean Time as zero. Recently, two alternate time systems were added: (1) a true Julian Date value (0 is at noon instead of the following midnight) and (2) a "2018" system in which 0 is defined as 00:00 on January 1, 2018. The 2018 system supports greater precision when, for instance, importing data with the Import Wizard (e.g. **Custom Date Format** supports "MM'/'dd'/'yyyy HH':'mm':'ss'.'######"). Previously, precision was limited to 0.0001 seconds. For more information, see **Dates and Times in Origin**.

> **Note:** For more information on numbers, see
>
> **Help: Origin: Origin Help > Origin Basics > Elements of the Origin Workspace > Numbers in Origin**

Origin workbooks and matrixbooks support the following **Data Types**:

Workbook	Matrixbook	Bytes	Range of Values
double	double	8	±1.7E±308 (15 digits)

real	float	4	±3.4E±38 (7 digits)
short	short	2	-32,768 to 32,767
long	int	4	-2,147,483,648 to 2,147,483,647
char	char	1	-128 to 127
byte	char, unsigned	1	0 to 255
ushort	short, unsigned	2	0 to 65,535
ulong	int, unsigned	4	0 to 4,294,967,295
complex	complex	16	±1.7E±308 (15 digits), each 8 bytes

5.4 Topics for Further Reading

- Project Explorer
- Customizing Toolbars
- Mini Toolbars
- The Object Manager
- Finding Data in your Origin Project
- Basic Child Window Operations
- Numbers in Origin
- Dates and Times in Origin
- FAQ: How do I turn off the collapsible menus and show full menus?
- Customizing Toolbars
- Setting Your Preferences
- The Numeric Format Tab of Preferences: Options

6 Origin File Types

6.1 Roundup of Origin File Types



A series of Unicode-compliant (UTF-8) file types was added for Origin 2018. Users upgrading from previous versions may recognize that the old familiar file types now have a Unicode counterpart, denoted by an appended '**u**' (e.g. ***.opj** => ***.opju**). With the exception of the *.opj file type, Origin(since Origin 2023) will read and write both the Unicode and non-Unicode file types and non-Unicode file types remain backward compatible with earlier versions of Origin.

- **Origin 2023** and later versions will still read the older, non-Unicode *.opj file type *but you can no longer save as *.opj*. Going forward, you will need to save your project files as Unicode-compliant *.*opju* files.
- **Origin 2023** and later versions will still supports saving other non-Unicode file types such as *.ogw, *.otp, *.ogg, etc.

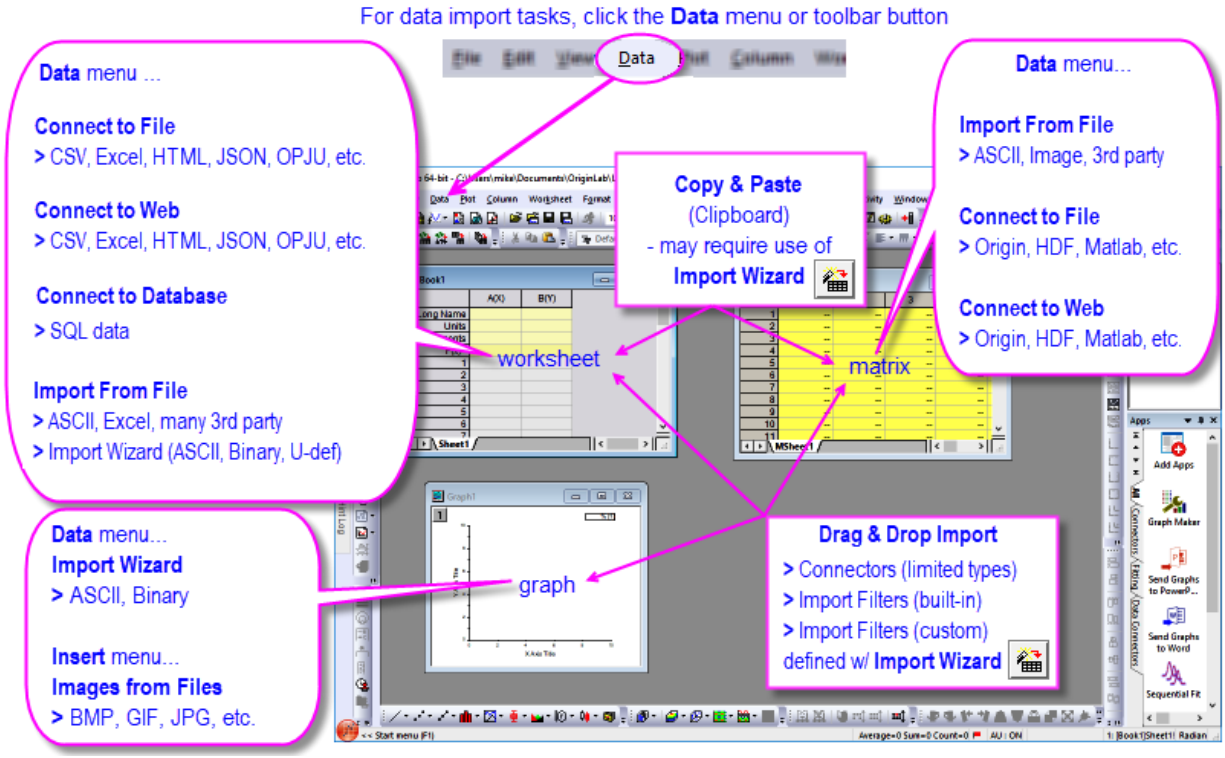
File Type	File Extension	Used As
Origin Project Files	*.opj;*.opju	A container for all data. See **Alert**, above.
Child Window Files	*.ogw(u);*.ogg(u);*.ogm(u);*.txt	The child windows for workbooks (.ogw(u)), graph (.ogg(u)), matrix(.ogm(u)), notes (.txt).
Template Files	*.otp(u);*.otw(u);*.otm(u)	A stored customizable suite of data-handling and format options: graphs(.otp(u)), worksheets (.otw(u)), matrix(.otm(u)).
Import Filter Files	*.oif	An external file which handles basic import file parsing and data extraction.
Fitting Function Files	*.fdf	A fitting function definition file.
Region of Interest Files	*.roi	One or more sets of XY coordinates that define the position of one or more regions-of-interest (ROI) within a given matrixsheet or Image Window.
LabTalk Script Files	*.ogs	A text file organized in sections of LabTalk script.

Origin C Files	*.c;*.cpp;*.h;.etc	A file used for developing Origin C programs.
X-Function Files	*.oxf;*.xfc;	An Origin tool with a flexible mechanism for performing a wide variety of data manipulation tasks.
Origin Package Files	*.opx	A package file created for distributing custom applications.
Origin Menu Files	*.xml;*omc;	A file that contains Origin menu information. An *.xml can be edited outside of Origin for menu customization purposes. An *.omc file contains the configuration of customized menus.
Initialization Files	*.ini	A file that controls the configuration of some Origin features on startup.
Configuration Files	*.cnf	A text file that contains LabTalk script commands.
Custom Plot Symbols	origin.uds	A binary file that holds the bitmap images of custom symbols.

6.2 Topics for Further Reading

- Opening, Closing and Backing Up the Origin Project File
- Protecting Origin Projects
- Origin Template Files
- The Theme Organizer
- System Themes
- Import Wizard, Save Filters Page
- Origin Fitting Functions, the Fitting Function Organizer and the Fitting Function Builder
- OGS Files and Getting Started with LabTalk
- Running LabTalk Script from OGS Files
- Using X-Functions in LabTalk
- Packaging Multiple Files as an OPX File

7 Import Data



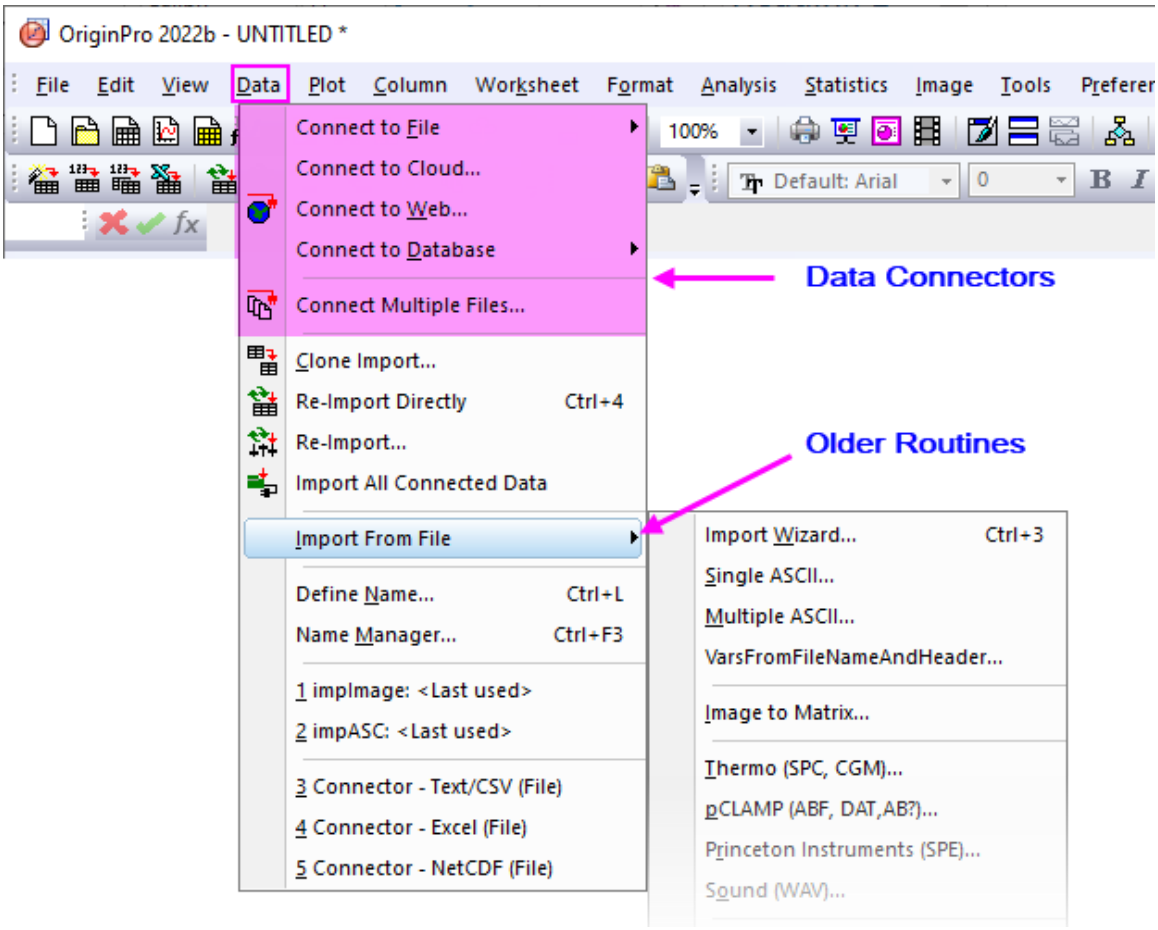
A new generalized data import mechanism we call **Data Connectors** was added in Origin 2019b. As the name implies, Data Connectors create a link between your project and an external source file. The source file may be local, it can be on a company network; it can even be on a web-server. Data Connectors support options for excluding imported data when saving the project (smaller files, plus, maintain a live link to source data) and for protection of data against accidental alteration or deletion. Data Connectors also make possible import of previously-unavailable data sources, including **HTML Tables** and **JavaScript Object Notation (JSON)**. Data Connectors support **drag-and-drop** and **Auto Import on Project Open**. In addition, OriginLab continues to expand Connector support to new data formats. In **Origin 2021b**, for instance, we have improved Connectors for **National Instruments TDMS** and **NetCDF** files; plus we've added a new **Thermo Fisher Scientific MSRawFile** Connector.

Other supported import mechanisms:

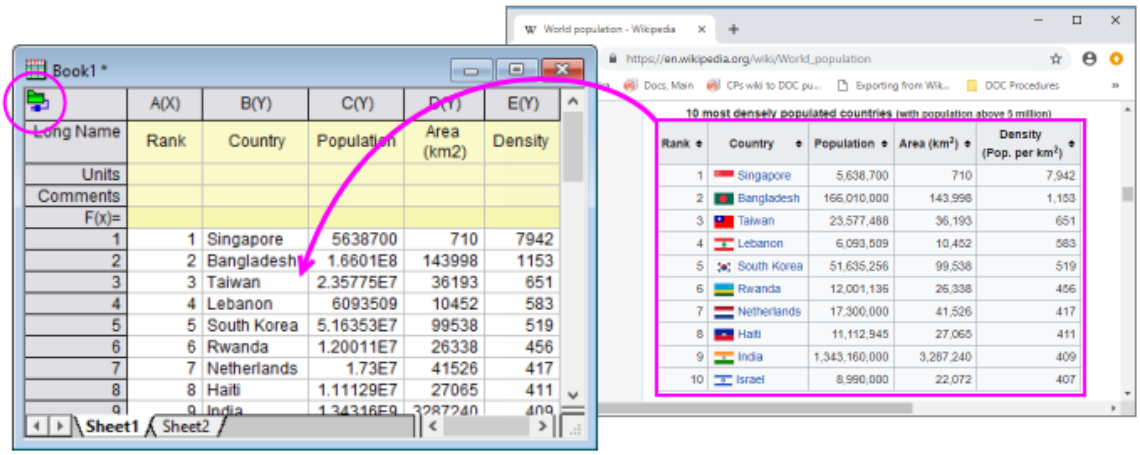
- OriginLab continues support for Origin's long-standing **X-Function + filter-based routines** for ASCII, CSV, Excel, binary files, and many third-party formats, including MATLAB, pClamp, NI TDM and NetCDF. If you are a long-time user and you have import filters and Themes that you have long relied on, they should still work as they always have.
- **Copy-paste** for quick import of simply-structured data (mostly useful for quickly adding data to worksheets).
- For complex ASCII, binary or User-defined file types, you can use the graphical interface of the **Import Wizard** to parse your file and save settings to an import filter file. The Import Wizard supports power features such as saving file metadata to variables and use of custom Origin C functions for data processing and import.
- If you work with **SQL** databases, you can use Origin's **Database Connector** and **SQL Editor** interface to create connection strings and SQL queries.

7.1 A Note to Upgrade Users

Longtime Origin users who are upgrading from older versions should note that import routines have moved from the **File** menu to a new **Data** menu. Here, you will also find Origin's newest data-import tool: **Data Connectors**.



7.2 Data Connectors



Data Connectors are a general mechanism for importing data to your Origin projects from *local* or from *web-based* files and pages. Data Connectors differ from older Origin import methods primarily in two default (but modifiable) behaviors:

- Data imported via Connector is *locked* to editing. This helps ensure data integrity.
- Data imported via Connector is *not saved* with the project. This helps to keep your project files smaller.

Data Connectors support a number of common data formats, including:

- **Text/CSV**
- **Excel**
- **Origin File** (project, workbook, matrix)
- **MATLAB**
- **JavaScript Object Notation (JSON)**
- **HDF**
- **TDMS**
- **HTML Table**
- **Import Filter** (use a custom import filter with the Data Connector mechanism)
- **Shapefile**
- **NetCDF**
- **XML**



To connect to **SQL** database, see **Database**.

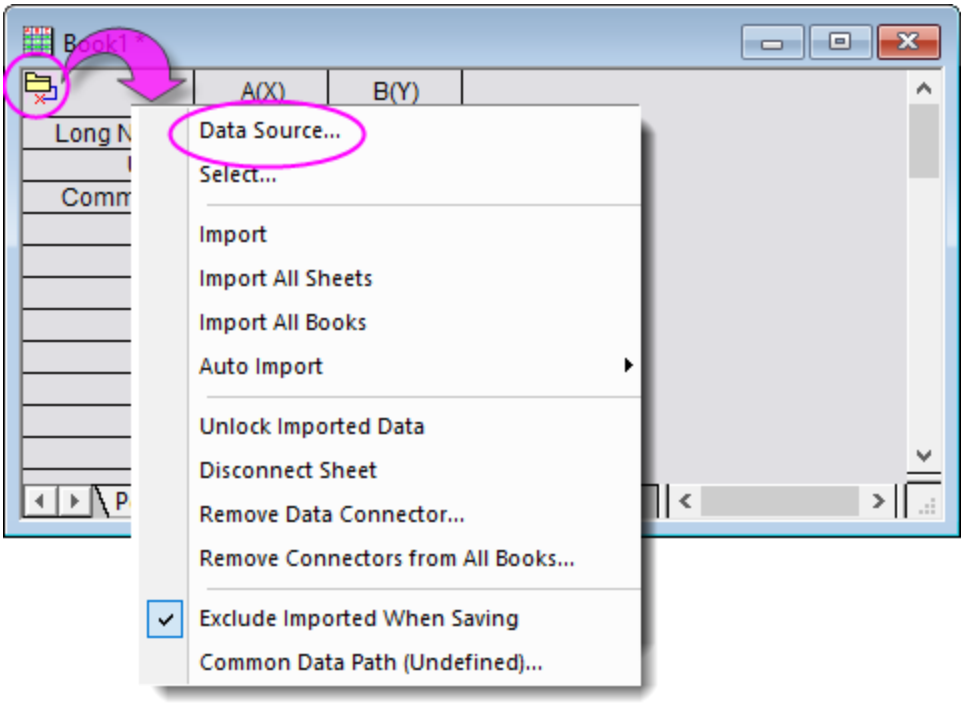
To import data with a Data Connector:

1. With your workbook active, click the **Data** menu.
    - If you are connecting to a local or network file, click **Connect to File** and pick a file type.
    - To connect to multiple files, click **Connect Multiple Files**.
    - If you are connecting to web data, click **Connect to Web** and enter a URL.

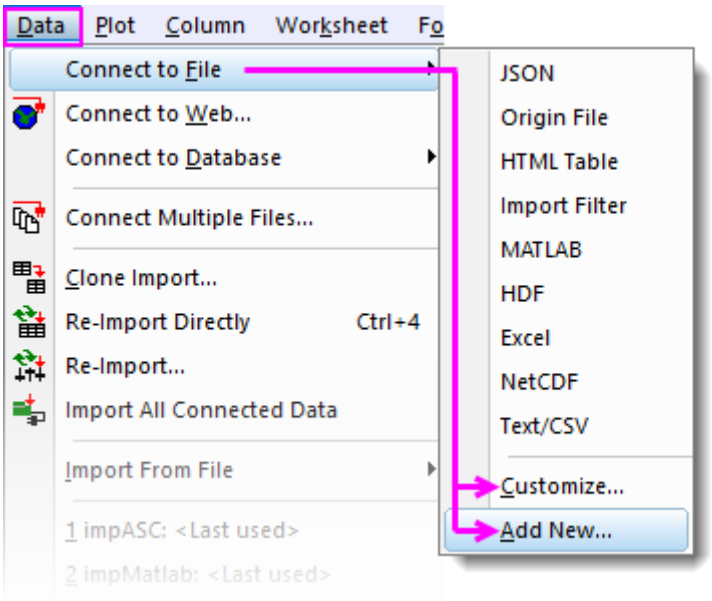
7.2.1 Things to Know about Data Connectors

- By default, when import data file size exceeds 500kB, the imported data and graphs made from that data are NOT saved with the Origin file (see LabTalk system variable **@FSE**). All analysis output resulting from imported data ARE saved with the Origin file. Not saving raw data with your project file can significantly reduce file size and improve performance when working with large projects.

- **IMPORTANT**: Since, by default, connector-imported data (> 500kB) is not saved with the project file, users should always ask themselves whether they need to preserve imported data. This could be an issue when the data source is web-based and stored in a place beyond your control. If you prefer to save all data imported via a Data Connector, with your Origin file, click the Data Connector icon and clear the check mark beside **Exclude Imported When Saving** prior to saving your file†. Note that each Data Connector-containing book will have its own **Exclude...** check mark. Alternately, if you decide the Data Connectors are not needed, you can click the Data Connector icon and choose **Remove Data Connector** (from this book) or **Remove Data Connectors from All Books** (in the project).
- Data can be re-imported at any time by clicking the Data Connector icon (or) in the upper left corner of the worksheet and choosing **Import** (**Ctrl+4**) or **Import All**.
- By default, imported via a Data Connector is locked from editing. You can graph it and analyze it but you cannot modify it. While this ensures against accidental modification, some users may find this too restrictive. Unlock sheet data by clicking the Connector icon and choosing **Unlock Imported Data**. See this FAQ for more information on removing editing restrictions from Connector-imported data.
- A workbook can have *only one type* of Connector (e.g. Text/CSV). For files with a simple structure such as Text/CSV, you can have multiple sheets with each connecting to a separate file, as long as they share the same Connector. For files with more complex structures such as Excel or MATALAB, you will initially connect to one sheet/variable, then use the Data Navigator's **Add and Connect Sheet(s)** shortcut menu command to add other sheets/variables in the book, as needed. You can only connect a single Excel or MATLAB file to a single Origin workbook or matrixbook.
- In books containing files with a simple structure (e.g. CSV), when you right-clicking on a sheet tab and add a new sheet, the sheet is added with an empty Connector. The unconnected state is denoted by a pale-yellow Connector icon (see Connector states, below). Click on the Connector icon to open a shortcut menu where you can connect the sheet to a data source.



- Data Connectors that you do not use can be hidden by choosing **Data: Connect to File: Customize...** and clearing the checkbox next to unused Connectors.
- Data Connectors for file formats not shipped with Origin, are available by clicking **Data: Connect to File: Add New...**. New Data Connectors are added to the **Data** menu.





†Origin caches data imported by **Data: Connect to Web**, for a period of time determined by LabTalk system variable **@CFDT**, plus file size. By default, a 10MB file will use cached data for ~24 hrs. In other words, if you re-import (i.e. reconnect to the web file) within 24 hrs, you will be using data that was cached on first import. If you re-import to this 10MB file after 24 hrs passes, the cache is cleared and the data are freshly imported. To learn how to control this caching behavior see, these topics:

- LabTalk system variable **@CFDT**.
- The LabTalk **delete -web** command.

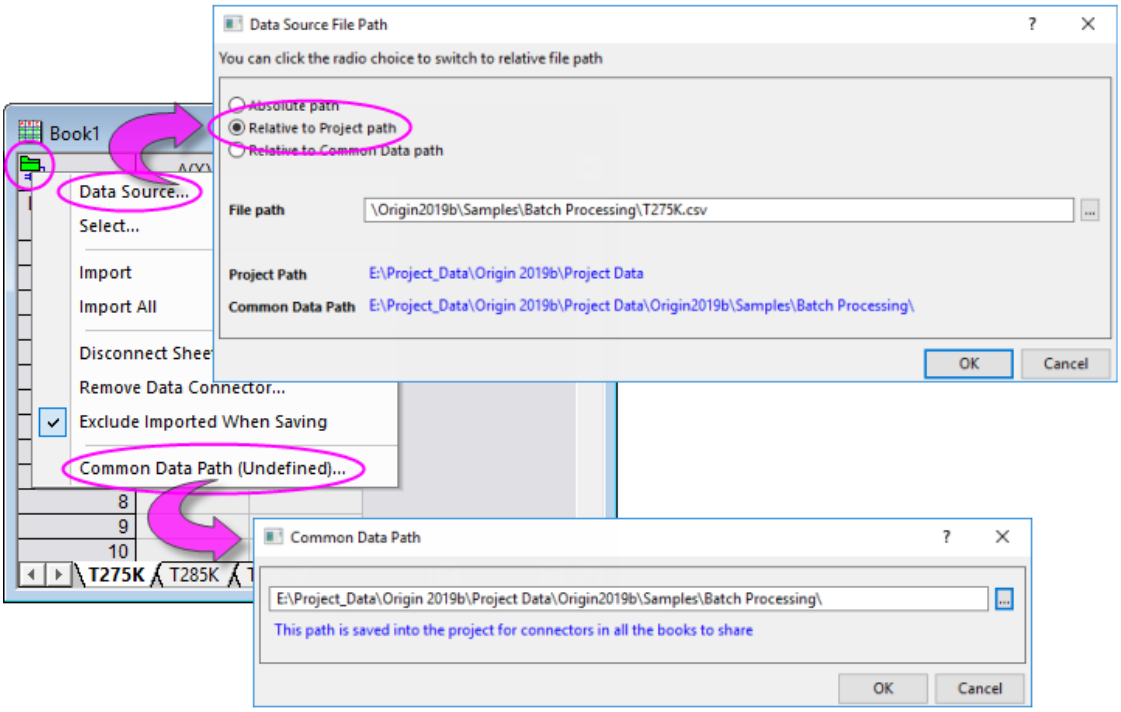
7.2.2 Data Source File Path

A Data Connector icon appears in one of five states:

- When the data source is connected, the icon looks like this: 
- When data in the sheet are unlocked to editing (either by the Connector menu or **@IPDC=0**), the icon looks like this: 
- When a data source import is pending, the icon looks like this: 
- When a new sheet is added to a connected book, an empty Connector is added to the sheet and the icon looks like this: 

- When the data source is no longer viable (e.g. the data source has been moved), the icon looks like this: 
- When the sheet is protected against all edits (worksheet protection), the Connector menu is disabled and the icon looks like this: 

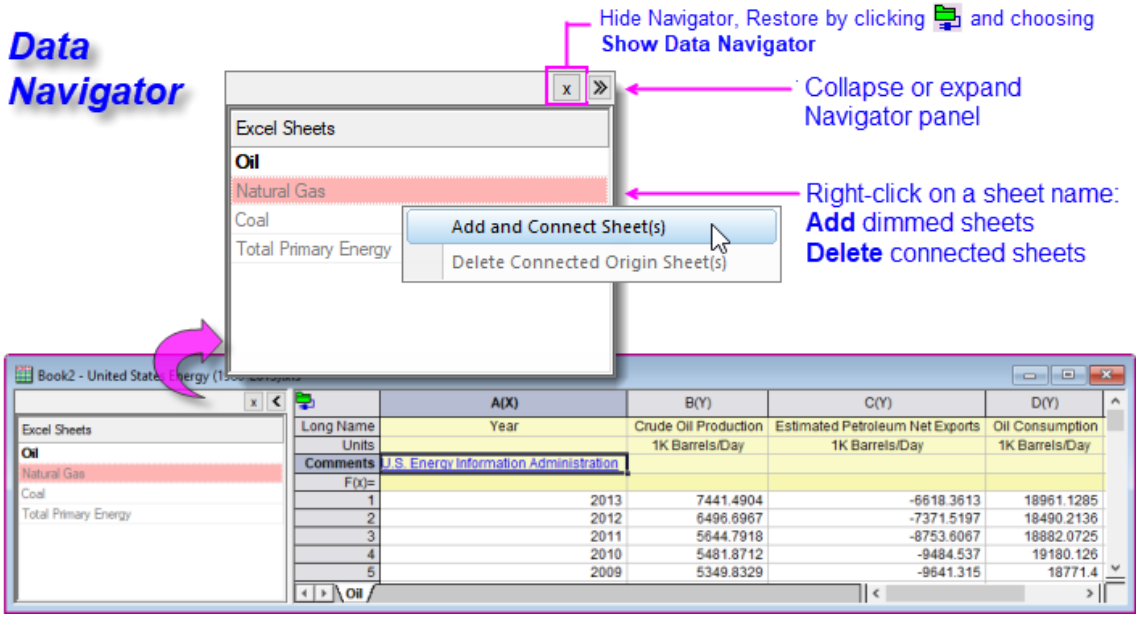
Regardless of the state of the connection, you can click the Connector icon, then use the **Data Source File Path** and **Common Data Path** to help you maintain the connection between your Origin files and your source data.



- **Relative to Project Path**: If your data are stored in folders under the project file, you could set Data Source File Path to **Relative to Project path**. You can then move the project and data sources together, and their relative paths are preserved. No path corrections are then needed when re-opening the project file from a different location on your network.
- **Relative to Common Data Path**: If data sources are under some common path, you could set Data Source File Path to **Relative to Common Data Path**. If the files are subsequently moved, you can re-establish the **Common Data Path** and then **Import All Books**.

7.2.3 Data Navigator

The **Data Navigator** is a collapsible panel that is automatically added to the workbook when you connect to multi-page/multi-variable files such as Excel, MATLAB or Origin Projects.



- Origin will import data from the first sheet and list other sheets in dimmed type.
- Right-click on a dimmed sheet -- or press CTRL or SHIFT and select multiple sheets -- then choose **Add and Connect Sheets**.
- The file name is assigned to the book **Long Name** and sheets are the original sheet name is assigned to sheet **Name**.
- Connected sheets can be deleted from the current Origin workbook.

7.2.4 Data Connectors and Drag-and-Drop

There is drag-and-drop support for the file types listed under **Data: Connect to File**:

- For files with a simple header information (e.g. only column name and units), a Data Connector is added and the file is properly parsed with no need for an import filter.
- For files that are not properly parsed (i.e. header information ends up in the data portion of the worksheet), consider making an Origin Import Filter (*.oif) file using the Import Wizard.
- Import filters can be saved to the data file folder, the User Files\Filters folder or in the current window. If you intend to use a template for your data import, you can save the filter to the window; otherwise the filter file (*.oif) should be placed either in the data file folder or in \User Files\Filters.

7.3 Connecting to Text/CSV

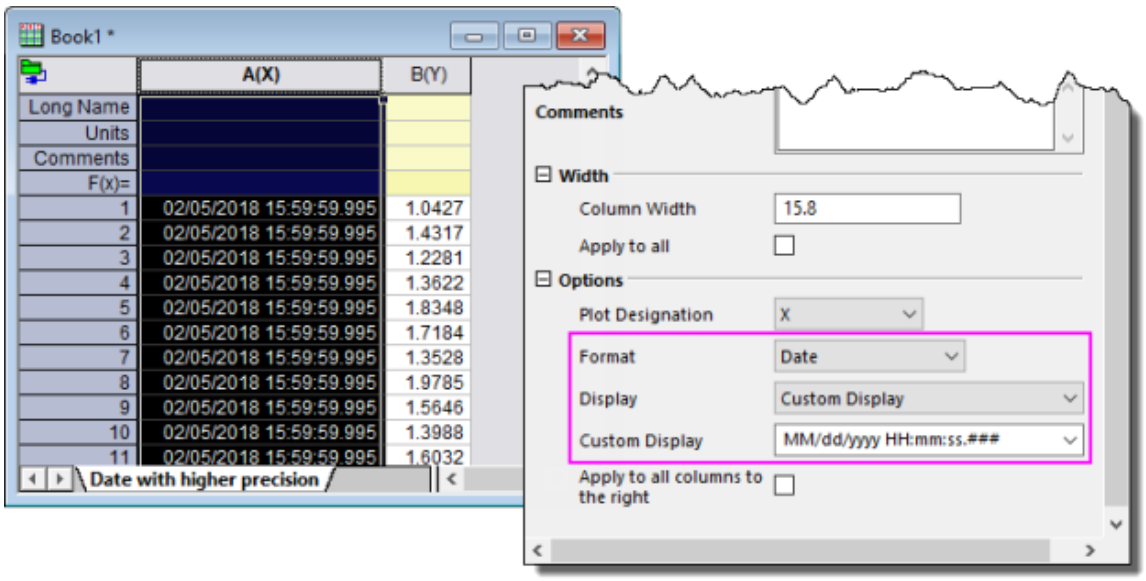
You can use a Data Connector to import local or web-stored text files (TXT, DAT, CSV). Data Connector methods work well for these file types, simplifying and in some cases eliminating, some of the problems associated with Origin's older X-Function-based import routines. For instance, import of date-time data always required manual configuration of date-time columns. With Connectors, if your date-time data are of a standard, easily-recognized format, that configuration is done for you automatically.

To connect to a file on a local or LAN drive:

1. With the workbook active, choose **Data: Connect to File: Text/CSV**.
2. Browse to and select your file.
3. Set your **CSV Import Options**. In many cases, you can simply accept defaults and your file will be cleanly imported, so as a test, try importing data without modifying defaults. If the results are unsatisfactory, rerun the import and modify the default settings. Click the **Other Options** button (to the left of **OK**) for more options.

In this mini-tutorial, we use the **Text/CSV Connector** to import a text file with a date-time component. While older Origin import methods treated the date-time data as text, requiring the user to manually set the date-time column to Date after import, the Text/CSV Connector is able to automatically configure the worksheet column on import.

1. Click the **New Workbook** button and choose **Data: Connect to File: Text/CSV**.
2. Browse to the <*Origin Program*>\Samples\Import and Export\ folder and open Date with higher precision.dat.
3. In the **CSV Import Options** dialog, accept default settings and click **OK**. Data are imported to the workbook.
4. Click on the column *A* header to select the column, then right-click and choose **Properties**. Note that **Format** has been automatically set to *Date*, **Display** has been set to *Custom Display* and a custom format shows in **Custom Display**.



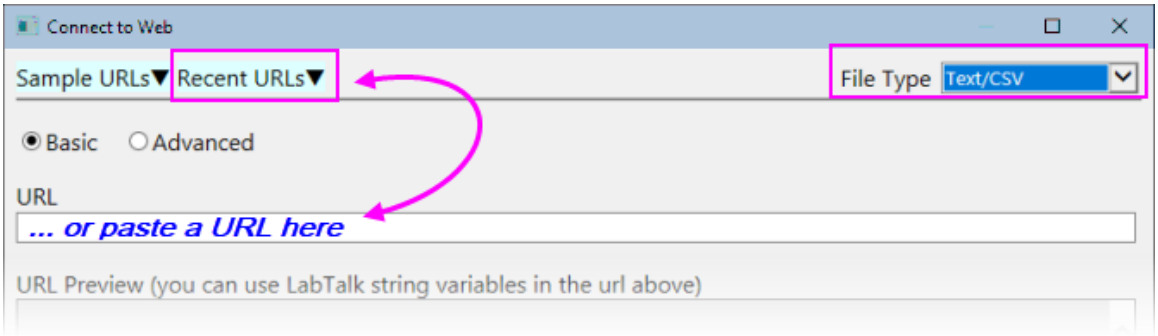
In this mini-tutorial, we use a Data Connector to import multiple files. These identically-structured files have multiple rows of metadata that we want to preserve. So, you will make use of an import filter file that has been developed using the Import Wizard, to import the files and write file metadata out to multiple column label rows in each worksheet. In so doing, you will see (a) how to import multiple files using a Data

Connector and (b) how you can use an import filter file (*.oif) developed with an earlier version of Origin, to import files using Origin's newer Data Connector technology.

1. Start a new project and with the workbook active, choose **Data: Connect Multiple Files**.
2. In the **files2dc** dialog box, set the following:
   - **Data Connector** = *Import Filter*
   - **Source** = *Specified Files*
   - **File Names** = <*Origin Program*>\Samples\Import and Export\S15-125-03.dat, S21-235-07.dat and S32-014-04.dat
   - **Same Book** = enabled (checking the box will bring all files into one book)
3. Click **OK** and in the dialog that opens, set **Import Filter** = Data Folder: VarsFromFileNameAndHeader.oif
4. Click **OK** and the three files are imported as separate sheets in the workbook.

To connect to a file on the Web:

1. Choose **Data: Connect to Web**.
2. If you have a file URL, enter it in the **URL** box. Otherwise, set **File Type** to *Text/CSV* (optional but helps to filter **Recent URLs**), then click directly on **Recent URLs** and pick from the list.





You can use the **CSV Import Options** dialog to specify a partial import of web-stored files just as you can for locally-stored files. Check the **Partial Import** box for guidance on the syntax used to define **Column** and **Row** import.

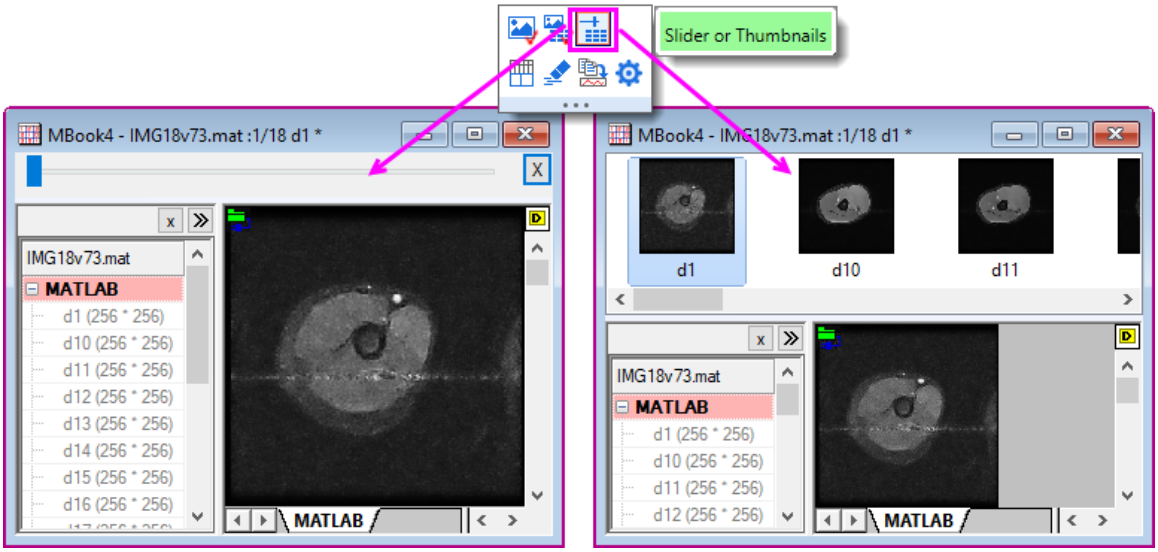
Note: To learn more about working with the Text/CSV Connector, see the Origin Help:

Help: Origin: Origin Help > Text/CSV Connector

7.4 Connecting to MATLAB Files

While Origin continues to support older X-Function based MAT file import, Data Connectors offer some distinct advantages for import of both locally-stored and web-stored MATLAB files:

- Connecting to a MATLAB file at the root level will add all variables as Origin matrix objects in the matrixsheet.
- A slider is added so that you can flip through Origin matrix objects in the sheet. You can toggle between slider and thumbnails using the **Slider or Thumbnails** Mini Toolbar button.
- The Connector also adds a collapsible **Data Navigator** panel to the window. If you wish to add variables as individual sheets, you can right-click on the Data Navigator list and add them.



To connect to a MATLAB file:

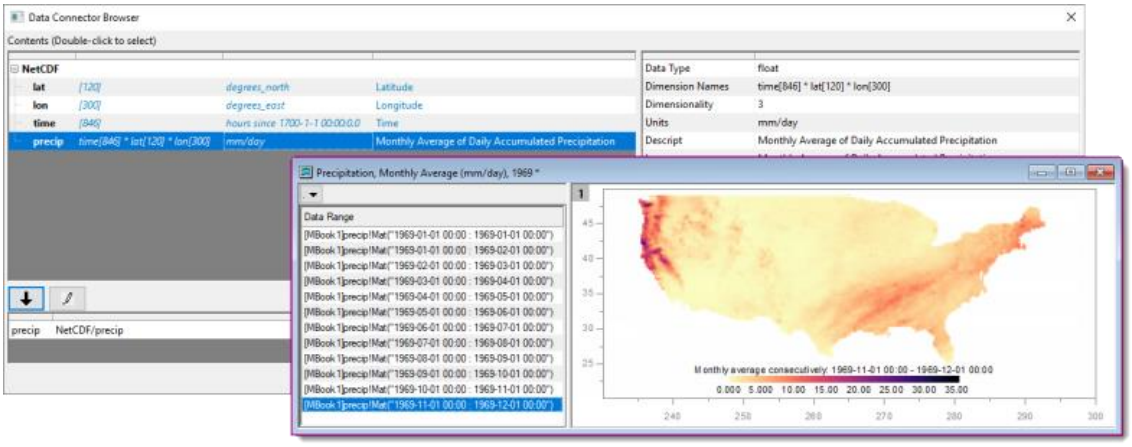
1. With a workbook or matrixbook active, click **Data: Connect to File: MATLAB** or **Data: Connect to Web** and enter a URL to your .mat file.
2. Select the variables that you want to import (add them to the Browser's bottom panel) and click **OK**.

Note: To learn more about working with the JSON/MATLAB Connector, see the Origin Help:

Help: Origin: Origin Help > JSON/MATLAB

7.5 Connecting to NetCDF and Shapefiles

The NetCDF file format is used for sharing multi-dimensional scientific data. The format is widely used in climate science. Shapefiles are commonly used to store geographic boundaries and other geo-spatial data.



To connect to a NetCDF file:

1. With a workbook or matrixbook active, click **Data: Connect to File: NetCDF**; or **Data: Connect to Web** and enter a URL to your .nc file.
2. Select the variables that you want to import by adding them to the Browser's bottom panel.
3. Adjust **Import Options** ("pencil" button) as needed and and click **OK** twice.
4. If a workbook is active but the variable requires a matrixbook, you will be prompted to add a new matrixbook or an embedded matrixbook in the active workook.

To connect to a Shapefile:

1. With a workbook or matrixbook active, click **Data: Connect to File: Shapefile** and browse to and choose your .shp file.
2. Specify whether to **Load Attributes** and (optionally) encoding and/or **Convert to WGS84**, and click **OK**.

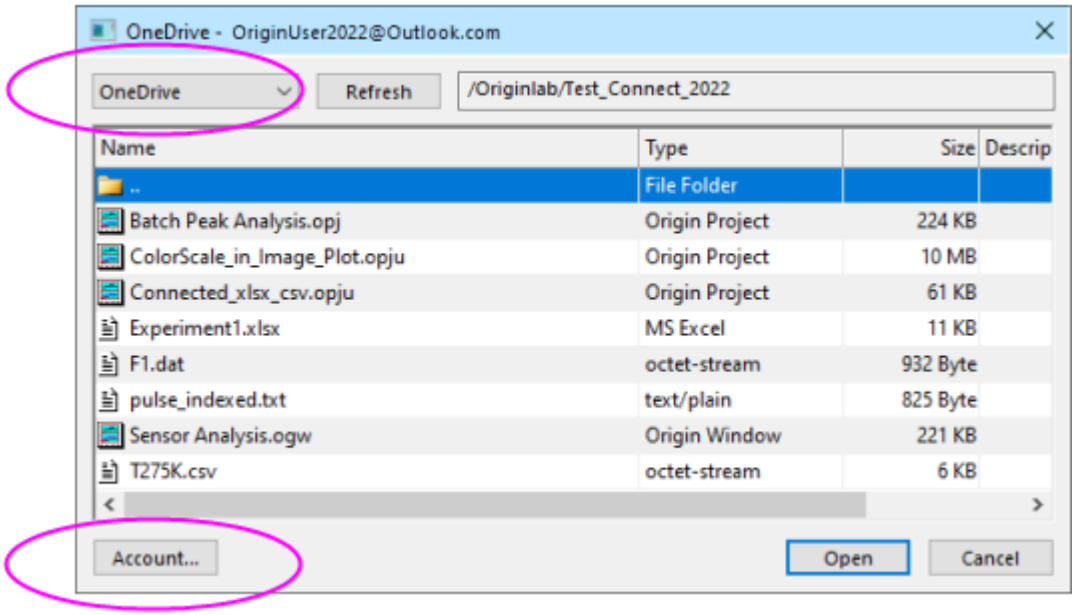
Note: To learn more about working with the NetCDF Connector, see the Origin Help:

Help: Origin: Origin Help > NetCDF Connector

7.6 Connecting to a Cloud Drive

You can connect to **Origin**, **MS Excel** and **ASCII** files stored on MS OneDrive or Google Drive. Once you've established your account credentials, connecting to cloud files is similar to connecting to local files:

1. With a workbook active, click **Data: Connect to Cloud**. This opens the browser for picking files.
2. Use the browser's drop-down controls to switch cloud services or accounts, if needed.



3. Pick a file and click **Open**.

Note that the first time you connect to a cloud account, you'll be asked to verify that account. OriginLab will only access and transfer data between your cloud account and your local computer using a temporary file. No other communication of information occurs.

7.7 Working with Excel Data

There are several ways to work with MS Excel data in Origin:

- You can copy Excel data to the Clipboard and paste or paste link that data into Origin.
- You can use a **Data Connector** to import a local Excel file by (1) clicking **Data: Connect to File: Excel**, (2) clicking the button on the **Standard** toolbar, or (3) dropping your Excel file onto the Origin workspace.
- You can use a **Data Connector** to import Excel data from the web by clicking **Data: Connect to Web: Excel** (see below).
- You can use Origin's older X-Function-based routines to import a local Excel file by clicking **Data: Import From File**. This option was recently hidden to accommodate the Excel Connector but if you prefer to use this method, see this section of the **Origin Help** file.

Things to know:

- Origin imports files of type .xls, .xlsx or .xlsm.

- If you are importing data using the Excel Connector, you can refresh your Origin-side data at any time by clicking the Connector icon and choosing **Import**; or re-import your Excel data at the time that you open the Excel-connected Origin project.
- If you are using the older (X-Function based) impMSExcel import routine: Certain file import information is saved to the workbook on import. Having once imported an Excel file to an Origin workbook, you can use the **Re-import** button on the Standard toolbar to re-import an updated Excel file -- including those that contains multiple sheets -- to your Origin workbook.
- Origin does not support dynamically linking one Excel workbook with another Excel workbook, nor does it recognize or translate Excel formulas.

Note: To learn more about working with Excel data, see the Origin Help:

Help: Origin: Origin Help > **Working with Microsoft Excel** and **Connecting to File > Excel**

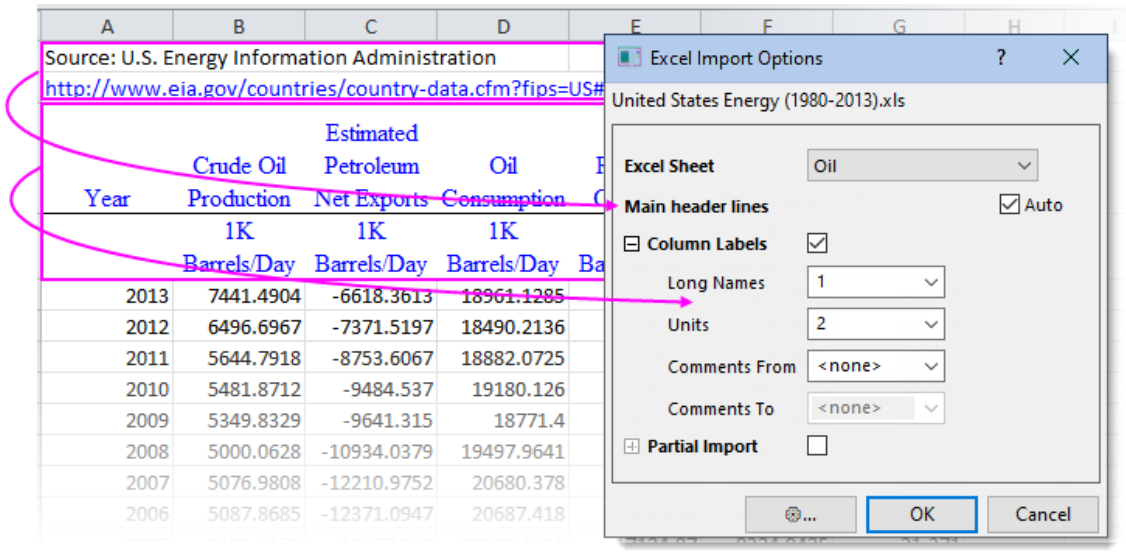


Both the **Excel Connector** and **impMSExcel** routines support partial import of Excel data. For more information, see the Origin Help file topic **Partial Importing and Re-importing**.

7.7.1 Connecting to Excel Files

Origin's **Data Connectors** create a live link between your external data files and your Origin project.

- To connect to a local file, click **Data: Connect to File** or click the button located on the **Standard** toolbar.
- To connect to a web-stored file, click **Data: Connect to Web**.
- You can connect one Excel file per Origin workbook.
- If the file is a multi-sheet file, you must first connect to a single sheet. This opens the the **Data Navigator** panel (described above) where you can connect to additional pages, as needed.
- When all sheets are identically structured, ensuring that the first sheet is properly parsed (e.g. the header information is correctly handled) will allow you to connect additional sheets without making adjustments.



1. Click the **New Workbook** button to create a new workbook, then choose **Data: Connect to File: Excel**.
2. Browse to and open <*Origin Program*>\Samples\Import and Export\United States Energy (1980-2013).xls.
3. In the **Excel Import Options** dialog that opens, accept default settings and click **OK**.
4. In the **Data Navigator** panel that opens to the left side of the workbook, hold the CTRL key and select the other three (dimmed) sheets, right-click and choose **Add and Connect Sheet(s)**. The remaining sheets -- *Natural Gas*, *Coal* and *Total Primary Energy* -- are imported into the workbook. Note that if the unconnected sheets are large in size, you can opt to connect to them one-at-a-time, as needed.

7.8 Import from File

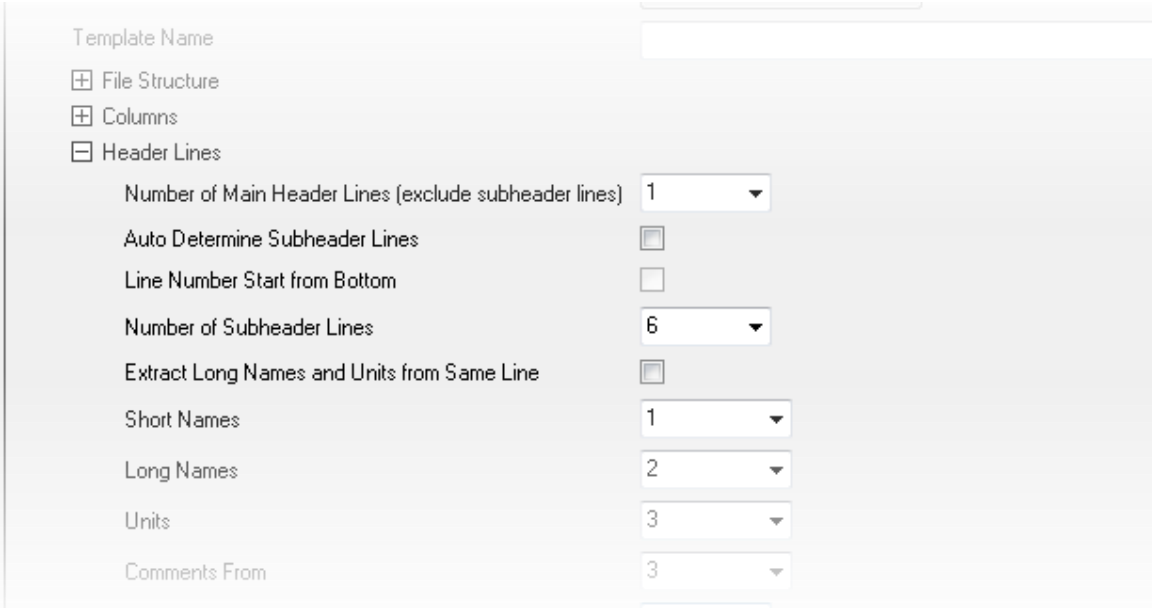
The import routines listed under **Data: Import From File** pre-date Data Connectors. While the **Import From File** routines are no longer being developed, they *are* still supported.

Note, also, that Connectors may not exist for some of the file types listed in this table. If no Data Connector exists, you should use the **Data: Import From File** methods.

The Standard toolbar **Import Single ASCII** button now calls the **Data: Connect to Files: Text/CSV** routine. For the **impASC** routine, see the next section.

7.8.1 Importing ASCII Files with impASC

- The **Data: Import From File: Multiple ASCII...** () method is generally satisfactory for importing text files having a simple structure (works for single or multi-file import). This routine will typically handle files with commonly-used delimiters and a simple header structure, without adjustments.
- If the file import needs adjustments, select the **Show Options Dialog** checkbox when selecting your file(s) in the **ASCII** dialog. This will open the **impASC** dialog box prior to file import, allowing you to tweak the way that the files are handled.



Note: To learn more about working with the **ASCII Import using the impASC dialog**, see the Origin Help:

Help: Origin: Origin Help > Customizing the ASCII Import Options

7.8.2 Saving Import Settings

Once you've adjusted **impASC** dialog import settings, you can save them in one of two ways:

- With the worksheet template.
- As a **Theme** file from within the impASC dialog box (including saving for drag-and-drop).

Saving import settings with the worksheet template offers portability (e.g. templates are easily shared with colleagues). Saving import settings as a Theme offers the advantage of being able to recall any number of import options combinations (Themes) when importing via the impASC dialog box.

For more information on Themes and templates, see the *Customizing Origin* chapter later in this User Guide. Additionally, see topics listed under "Topics for Further Reading", below.



You can quickly load your custom import theme from the list at the bottom of the **Data** menu. You can also use the **Data: Import from File: Add/Remove File Types ...** menu to open the **Import Menu Customization** dialog box where you can select and add **User Themes** to the **Data: Import From File** menu.

7.8.3 Third Party Formats

If a **Data Connector** does not exist for a certain third-party format, you can still use Origin's older X-Function-based import routines. These include many widely-used formats, including pClamp, NI TDM, and NetCDF. As with all X-Function-based routines, you can customize third-party file import options and save your settings with the worksheet template or as a dialog Theme for later use. As with other supported file types, you can import third party files by drag-and-drop.

File Type	Method	To Learn More, see Help: Origin: Origin Help > Importing and Exporting Data
Thermo (SPC, CGM) pCLAMP (ABF, DAT, AB?) Princeton Instruments (SPE) Sound (WAV) NetCDF (NC) CDF (CDF) HDF5 (H5, HE, HDF5) NI DIAdem (DAT) Famos (DAT, RAW) ETAS INCA MDF (DAT, MDF) IgorPro (PXP, IBW) Prism (PZFX, XML) MATLAB (Mat) Minitab (MTW, MPJ) KaleidaGraph (QDA) SigmaPlot (JNB) MZXML(mzData, mzXML, mzML, imzML) EarthProbe (EPA) EDF (EDF, BDF, REC, HYP) Somat SIE (SIE) JCAMP-DX (DX, DX1, JDX, JCM) HEKA (DAT) SPSS (SAV) BRUKER OPUS SAS (sas7bdat) Tektronix (ISF) Data Translation (DCF, HPF) Binary 2D Array (IMG, B2D) Image	**Data: Import from File:**	**> Importing Third Party Files**

Note: Some of these 3rd party file formats are hidden by default. To add, choose **Data: Import From File: Add/Remove File Types...**. This opens the **Import Menu Customization** dialog box where you can choose which file types to show in the **Import From File** menu. To insert a separator after a menu command, right-click on the command in the right-hand panel and choose **Add Separator**. To remove a

separator, double-click on it in the right-hand panel.



If no Data Connector exists for a given file type (i.e. those listed in the table above), then drag-and-drop support is managed by file extension, using the **Filter Manager** dialog. From the main menu, click **Preferences: Import Filters Manager...**.

Note: To learn more about working with the **Third-party Formats**, see the Origin Help:

Help: Origin: Origin Help > Importing Third Party Files

7.9 The Import Wizard

For import of complex ASCII files -- those not satisfactorily handled by the methods previously discussed -- you can use the interactive **Import Wizard**. Files with an optional header section followed by a sequential binary structure, can also be imported using the Import Wizard:

Another advantage to using the Import Wizard to your ASCII data is that you can create import filters that are targeted to a group of similarly-named data files. This is especially helpful when those files contain metadata that that needs to be handled in a certain way. The filter can then be used for drag-and-drop import operations and it can be added to the **Data: Import From File** menu. You can view and edit these import filters by **Preferences: Import Filters Manager** menu.

To run the Import Wizard:

1. Choose **Data: Import From File: Import Wizard...** or click the button located on the **Standard** toolbar.

- Develop Origin import filter files (*.oif) for import of ASCII files not handled satisfactorily by the Text/CSV Connector.
- Import data from the web pages using the Clipboard (see below).
- Extract variables from the import file name and header.
- Specify custom delimiters and date formats to parse your data.
- The ability to post-process your imported data using a custom LabTalk script.

Note: For more information, view the help topic:

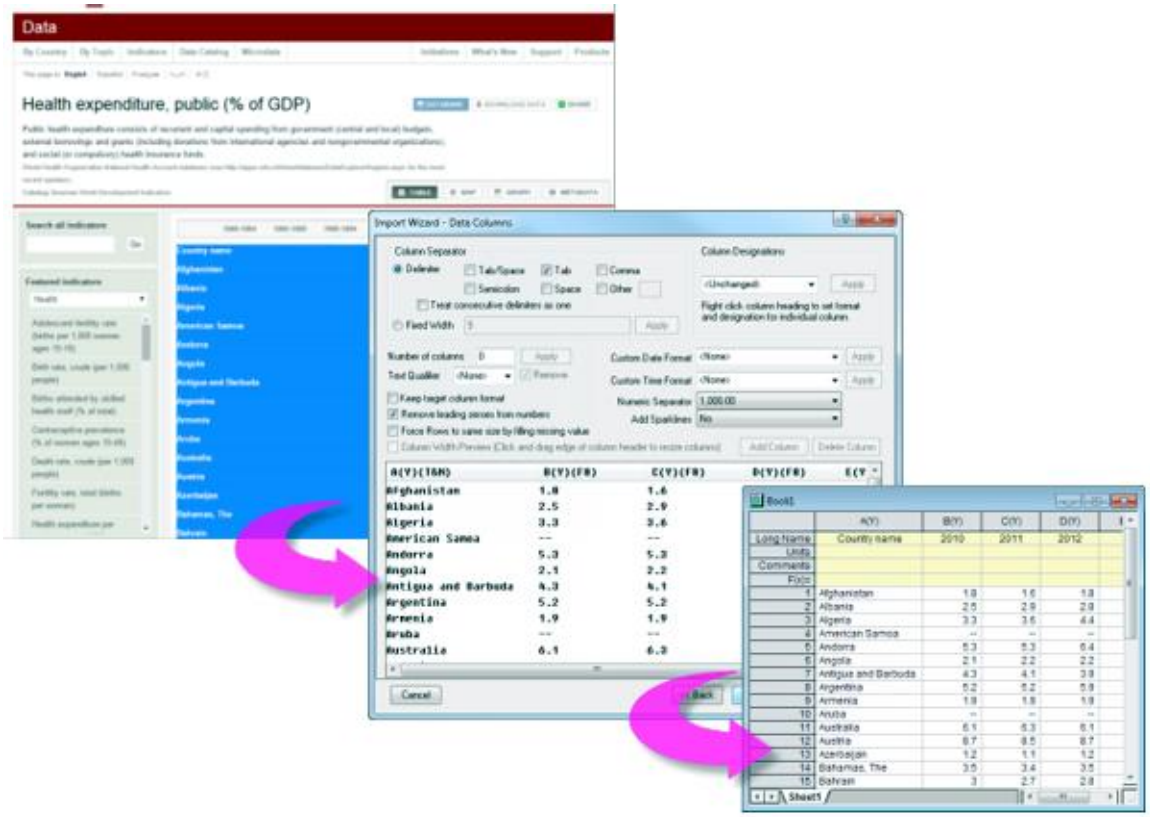
Help: Origin: Origin Help > Importing and Exporting Data > The Import Wizard

7.10 Copy/Paste the Clipboard Data

One obvious way to get data into Origin is simply to copy data to the Clipboard and paste it into Origin. This can be as easy as selecting a block of data in an Excel workbook and pasting it into an Origin workbook.

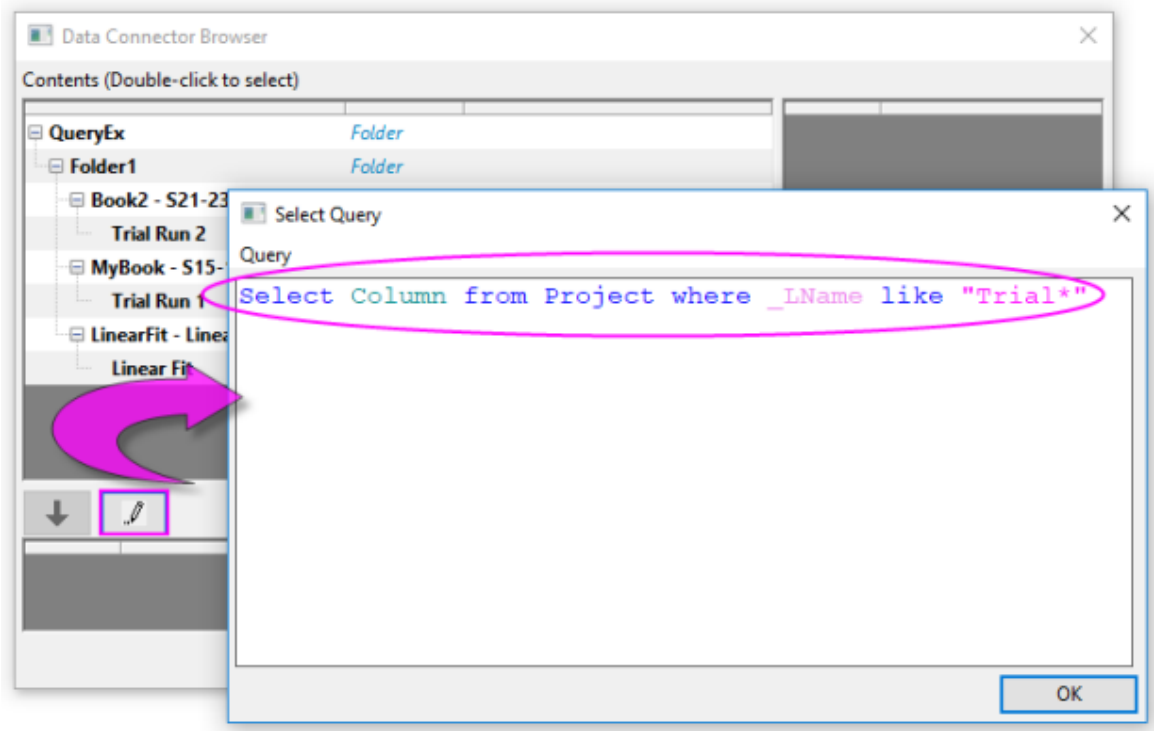
However, Clipboard data may not be formatted, arrayed or delimited in a way that makes it easy to paste your data into Origin. Here are some things you should know:

- Data copied from Excel and pasted to Origin will be brought over with full precision, regardless of the number of displayed decimal digits in Excel.
- When working with Excel files with header information, paste the Clipboard data into data row 1 in Origin (not into the column label rows), then select a row and use the (right-click) shortcut key commands **Set as Long Name**, **Set as Units**, **Set as Comment**, etc. to tag your header information.
- Data copied from the web can be formatted in various ways. You may have to experiment a bit to find a method that brings the data over cleanly. If a simple copy and paste doesn't work, try using the **Import Wizard**. The Import Wizard provides an interactive interface for parsing Clipboard data, with the added benefit that you can save your procedure to an import filter file (.oif) for reuse with identically formatted data. For more information, see the tutorial Using the Import Wizard to Import Clipboard Data.



7.11 Selectively Import Data by Querying an Origin File

You can selectively import columns of data from an external Origin file by specifying an SQL-like Query in the **Data Connector Browser** prior to import.



To selectively query Origin files using the Origin Connector:

1. With the worksheet active, choose **Data: Connect to File** or **Connect to Web**.
2. Browse to your Origin file and click **Open**. This opens the Data Connector Browser.
3. Click the **Select Query** button .
4. Enter your Query in the Select Query dialog, then click **OK**.

Data will be selectively imported into the active workbook as specified by your query.

Common Keywords:

Keyword	Description
_SName	short name, e.g. _SName, Sheet_SName
_LName	long name, e.g. _LName, Book_LName
_Comments	comments, e.g. _Comments, Sheet_Comments
Column_D1	column user-defined parameter, where *1* is the parameter index

Column_[Name]	column user-defined parameter, where [Name] is a parameter name containing spaces

Examples:

```
Select Column from Project where _SName == "A";

Select Column from Project where _Comments like "S*3";

Select Column from Project where (Column_P1 like "*y*" and Column_D1 > 3);

Select Column from Project where Sheet_SName like "Trial*";

Select Column from Project where (Book_SName like "Book*" or Book_LName like
"*fit*")
```

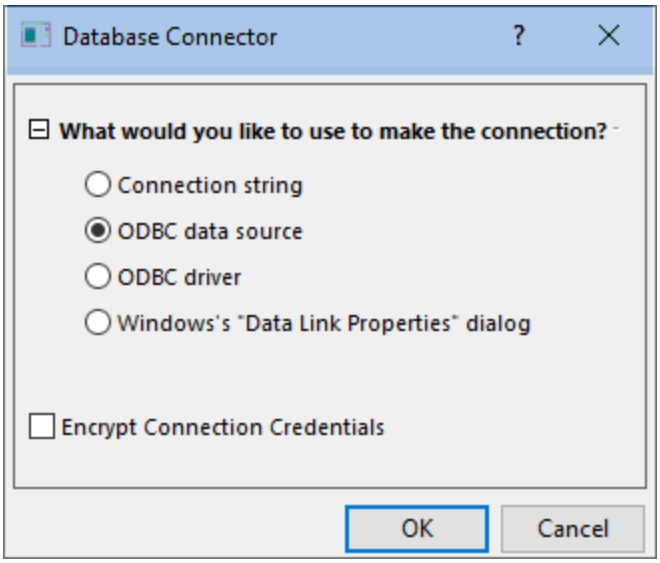
For more information, see Examples of using SQL query condition in Origin Connector.

7.12 Database

Origin supports connecting to databases by ODBC and OLE DB. Additionally, Origin includes a simple SQL Editor to add connection strings and generate SQL queries within Origin.

To import SQL data, start with the **Data: Connect to Database** menu command:

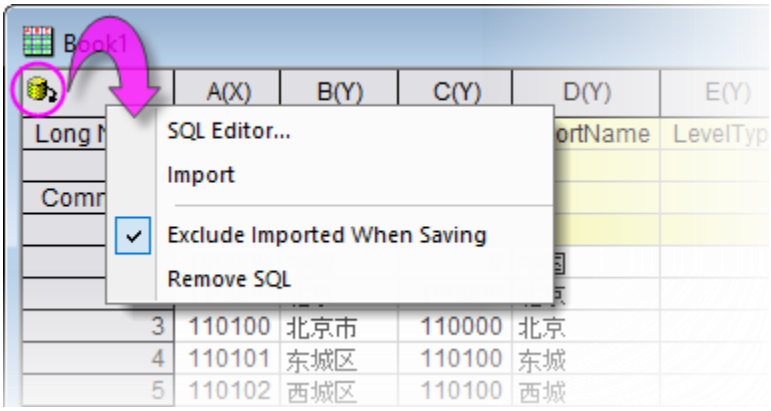
- **Open** lets you browse for and open a saved connection (ODS) or query (ODQ) file.
- **New** opens the **Database Connector** dialog.



- **Connection string**: Select this if you already have a text-based connection string for a given data source (ODBC or OLE DB).
- **ODBC data source**: Select this if you have defined an ODBC data source via the Windows **ODBC Data Source Administrator** applet.
- **ODBC driver**: Select this if you have an ODBC driver and want to create a data source applicable to this data connector instance.
- **Windows Data Link Properties dialog**: Select this if you are using an OLE DB-based data source such as some SQL Server or Access client libraries.

Other things to note:

- Use the LabTalk system variable **@IPDB** to control protection of imported range (0 = no protection, 1 = protected but allow reorder, 2 = protected).
- Similar to other Connectors, you can opt to **Exclude Imported** (data) **When Saving** as OPJU/OGWU.

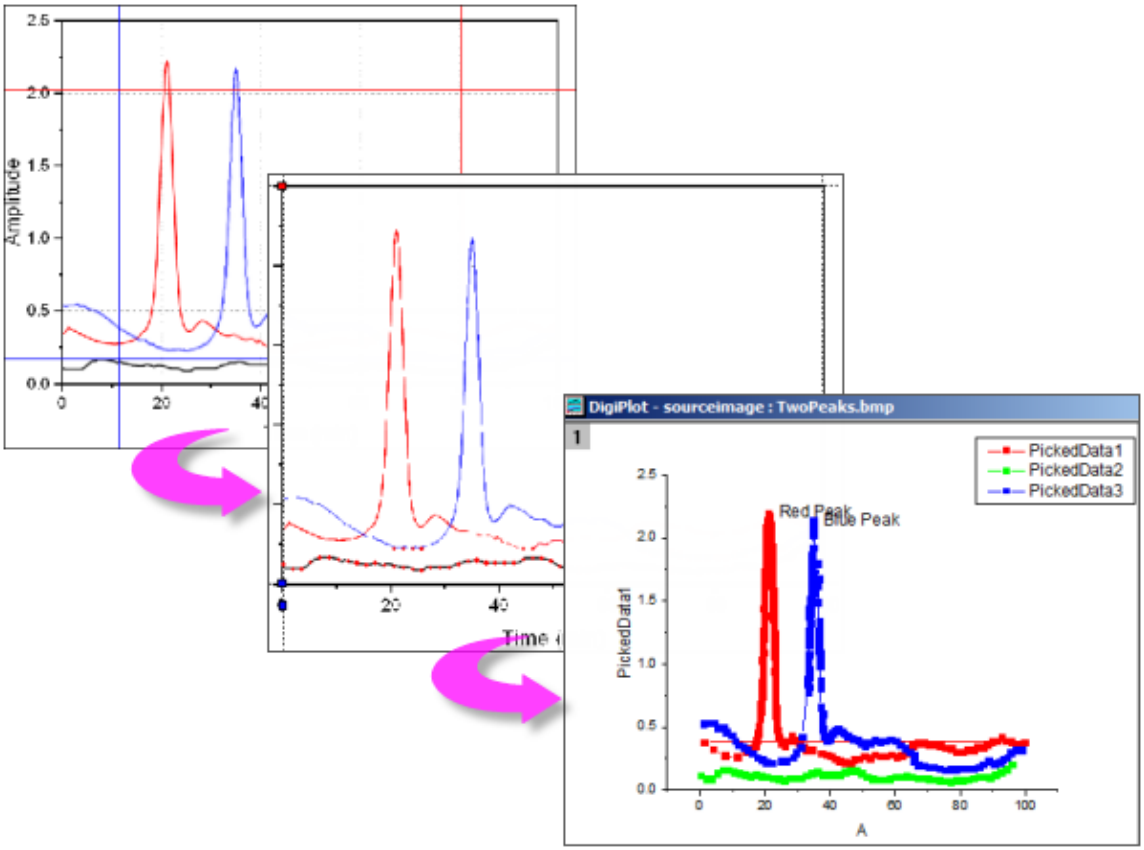


Note: For more information, see the Origin Help

Help: Origin: Origin Help > Importing and Exporting Data > Importing Data from a Database

7.13 Digitizer

At times, you may only have a graphic representation of some data that you would like to explore further. Use the Digitizer to import an image file, then digitize the plots, converting your image to numeric data that you can study and re-plot using Origin's analysis and graphing tools.



- Import most common image formats.
- Rotate the imported image, remove noise and calibrate scales by picking start and end values.
- Pick points on curves manually or automatically.
- Manually add curve inflection points, as needed.
- Interactively remove points that you do not want digitized.
- Support for Cartesian, polar and ternary coordinate systems.

To open the Digitizer:

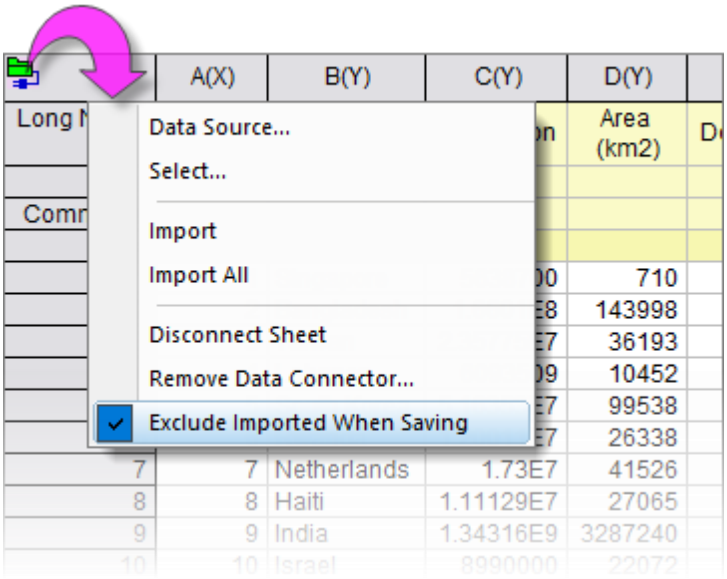
1. Click the **Digitize Image** button on the **Standard** toolbar or choose **Tools: Digitizer...** from the main menu.

7.14 Saving Origin Files without Imported Data

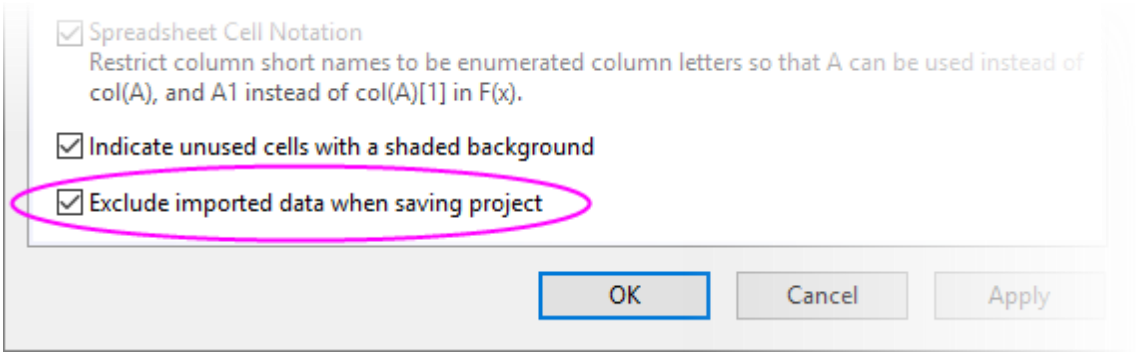
Users have long had the option of saving Origin files without data. **Save Template As...**, **Save Workbook As Analysis Template** and **Save Project without Data**, were three options for saving Origin files without data while preserving settings and operations with the file.

Users now have the option to save Origin files without *imported* data. This is a particularly attractive option for those who work with large data files, where saving of that data with the file would hinder performance or waste disk space.

- By default, data imported using a **Data Connector**, will not be saved with the book when the import file size exceeds 500kB. Each book has its own **Exclude Imported When Saving** check mark and clearing the check mark on *any* page in the book will cause all imported data to be saved with the book.



- Any book in the project -- not only those with **Data Connectors** -- can be configured to exclude imported data by right-clicking on the window title bar, selecting **Properties**, then checking the **Exclude imported data when saving project** box at the bottom of the dialog.



The act of excluding data when saving differs from saving a template file in a couple of important ways:

- When you exclude imported data, you are still saving all output resulting from analysis operations on imported data -- fitting results, statistical analyses, Set Values calculations, etc. -- you just don't save imported data or graphs of that imported data.
- Books which you have saved without imported data retain a "live" link to the original data source. For Data Connector-containing books, click the **Data Connector** icon and click **Import** (active sheet) or **Import All** (all sheets in book). For books used for standard file import, activate the empty book and click **Data: Re-import Directly**; or click the **Re-Import no dialog** button on the **Import** toolbar (see next).

7.15 Re-Importing Data Files

There are two import commands in the **Data** menu that are specifically intended for repeat import of the same file (i.e. the file path and name must be the same):

- **Re-Import Directly**. When you import a file into an Origin worksheet or matrixsheet, by default a number of parameters, including file path and name, are saved in the sheet. If you have an external data file that is periodically updated or you want to reload a standard file into the worksheet, you can re-import directly without opening an import dialog.

- **Re-Import...**. This menu command opens the corresponding X-Function import dialog box for the file type so that you can adjust your import options before re-importing.

Notes:

- Only one file can be re-imported at a time. When you use either of these two menu commands, only the file associated with the active worksheet or matrixsheet, will be imported. If the selected data are imported from multiple files, re-importing will fail.
- If you import an *ASCII* file via the **Import Wizard** and select **Data: Re-Import...**, the **impASC** dialog will open instead of the **Import Wizard**.
- Re-import does not work for *Binary* or *User Defined* data types brought in using the Import

Wizard.

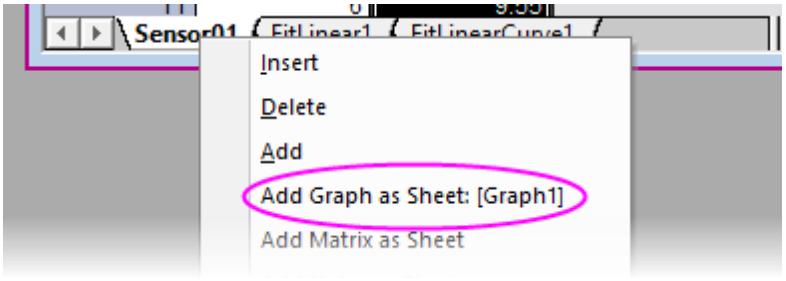
7.16 Clone Import

Clone import works by "modeling" an import -- and optionally, an associated analysis operation -- and then applying what was done to the initial file, to a series of similar files. As long as the active book contains imported data and associated operations, it can be cloned. In this sense, cloning is similar to creation of an **Analysis Template** but is somewhat more limited in power (e.g cannot be used with the **Batch Process** tool).

Clone import is supported by both **Data Connector** and **X-Function**-based import methods. A brief tutorial will show you the basics of cloning import and analysis operations.

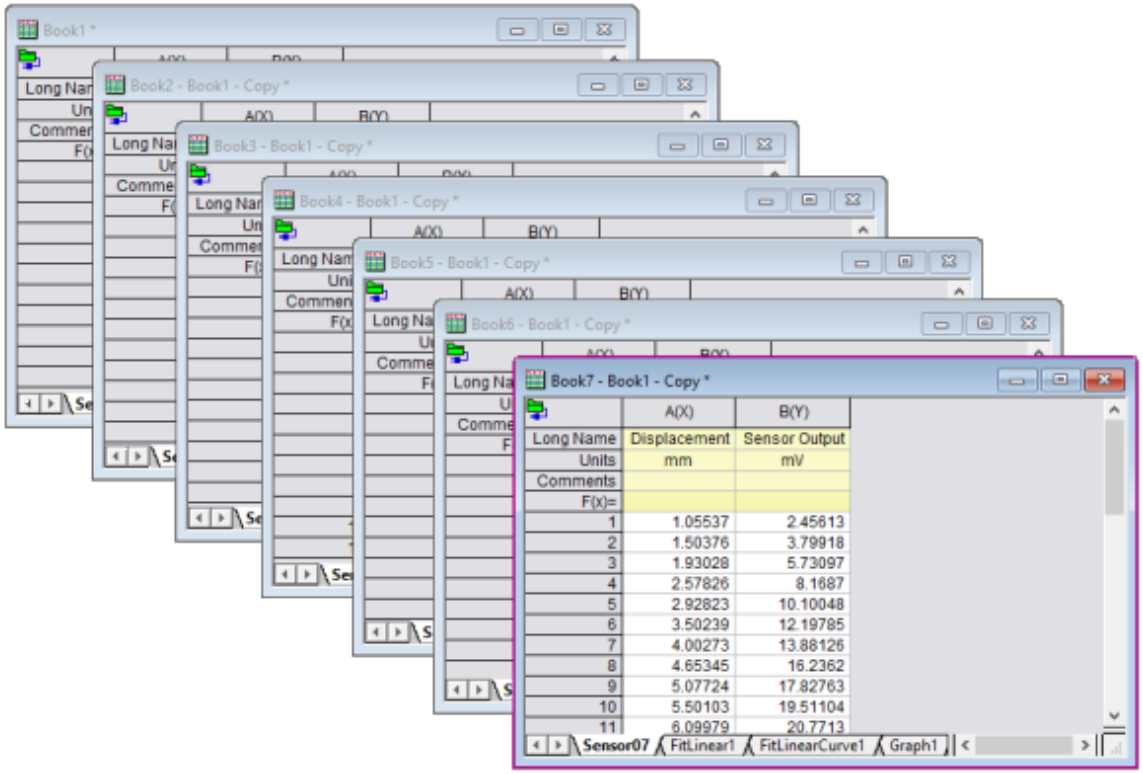


1. Click the **New Workbook** button  to open a new workbook.
2. Using Window's File Explorer, browse to your <Origin Program>\Samples\Curve Fitting folder and find a file called *Sensor01.dat*. Drag-and-drop the file onto the new workbook. The .dat file is imported using the **Text/CSV Connector**.
3. Click the column B header to select the column, then click the **Scatter** button  to create a scatter plot.
4. Click on the X or Y graph axis scale and in the **Axis** dialog box that opens, click the **Scale** tab, then press Ctrl and select both **Horizontal** and **Vertical** axis icons in the left panel. Set **Rescale** to Auto and click **OK**.
5. With the graph active, click **Analysis: Fitting: Linear Fit** and open the dialog box. Set **Recalculate** = **Auto**, accept other default settings and click **OK**. Answer *No* to the **Reminder Message** and click **OK**.
6. Right-click on one of your workbook tabs and click **Add Graph as Sheet**. This will add your scatter plot with the linear fit results, as a page in your workbook.



7. Make sure the sheet with data imported from *Sensor01.dat* is active and click the **Clone Import** button  on the **Import** toolbar.
8. Browse, once again, to your <Origin Program>\Samples\Curve Fitting folder, press Ctrl or Shift and select files Sensor02.dat - Sensor07.dat. Click **Add Files** and then click **OK**. What you should see is that using the original book as a model for import and analysis operations, the Sensor files are imported using the Text/CSV

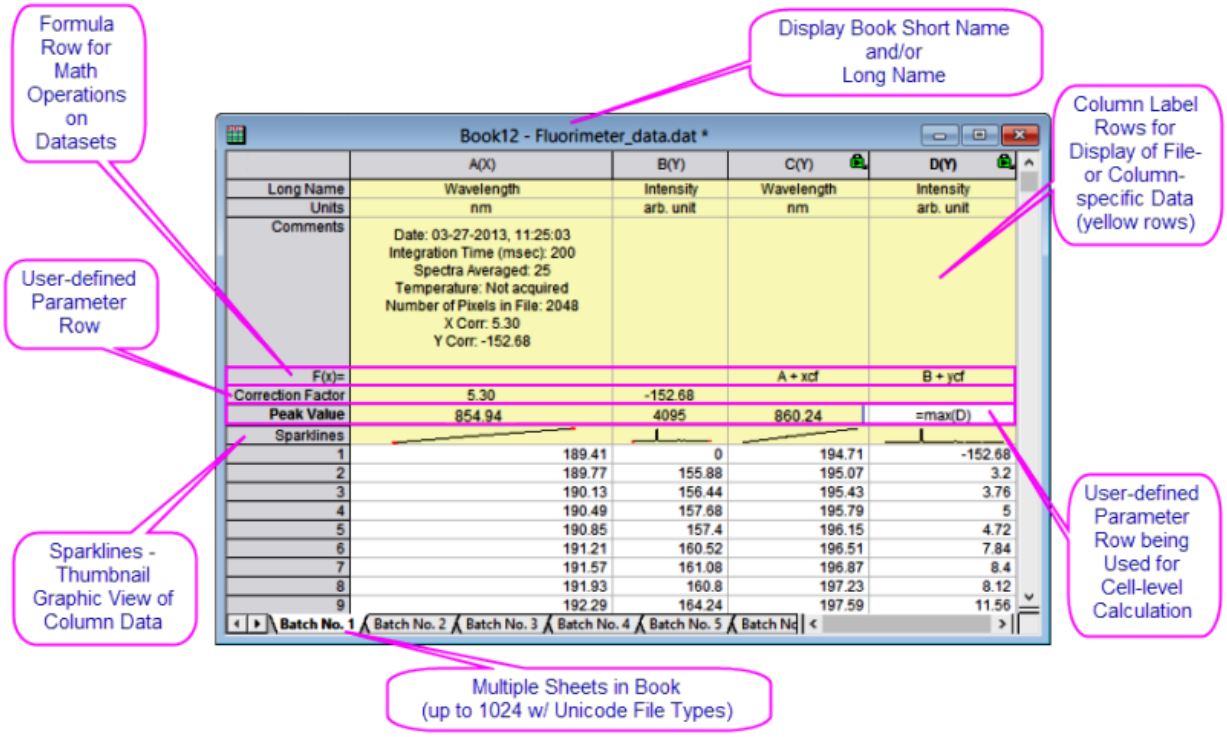
Connector and, one-by-one, they are processed (it may take a few seconds for all operations to go to completion).



7.17 Topics for Further Reading

- Data Connectors
- Importing Simple ASCII Data Files
- Customizing the ASCII Import Options
- Updating Excel Data in Origin.
- Video: Use Clone Import to Batch Process More Data Files
- Tutorial: Importing Multiple Files into Workbooks Cloned from Active Workbook
- Importing Third Party Files
- Importing Data by Drag-and-Drop
- Tutorial: Updating Graphs by Re-importing Data from a Database
- Tutorial: Connect to Web Data by Copy Link Address
- Importing Data from a Database
- Drawing or Deleting Data Points
- Tutorial: The Digitizer

8 Workbooks Worksheets Columns



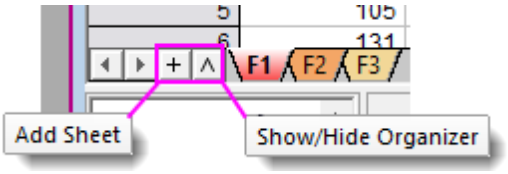
8.1 Workbook, Worksheet and Column Basics

The Origin workbook is a nameable, moveable, sizeable window that provides a framework for importing, organizing, analyzing, transforming, plotting and presenting your data.

- Each workbook is a collection of one or more worksheets (up to 1024).
- Each worksheet contains a collection of columns (up to 65,500) and each column contains rows of cells (up to 90,000,000).
- Each column has a **Short Name** (e.g. "A") that uniquely identifies it within the worksheet and a **Column Designation** (e.g. "(X)" which determines how it is handled, by default, in plotting and analysis operations.
- Each worksheet, and each worksheet column, has data-containing cells identified by row (index) number; and a preceding metadata containing area ("header") comprised of optional label rows, including **Long Name**, **Units**, **Comments**, etc.



Two convenient buttons were recently added to the workbook window: **Add Sheet** and **Show/Hide Organizer**.

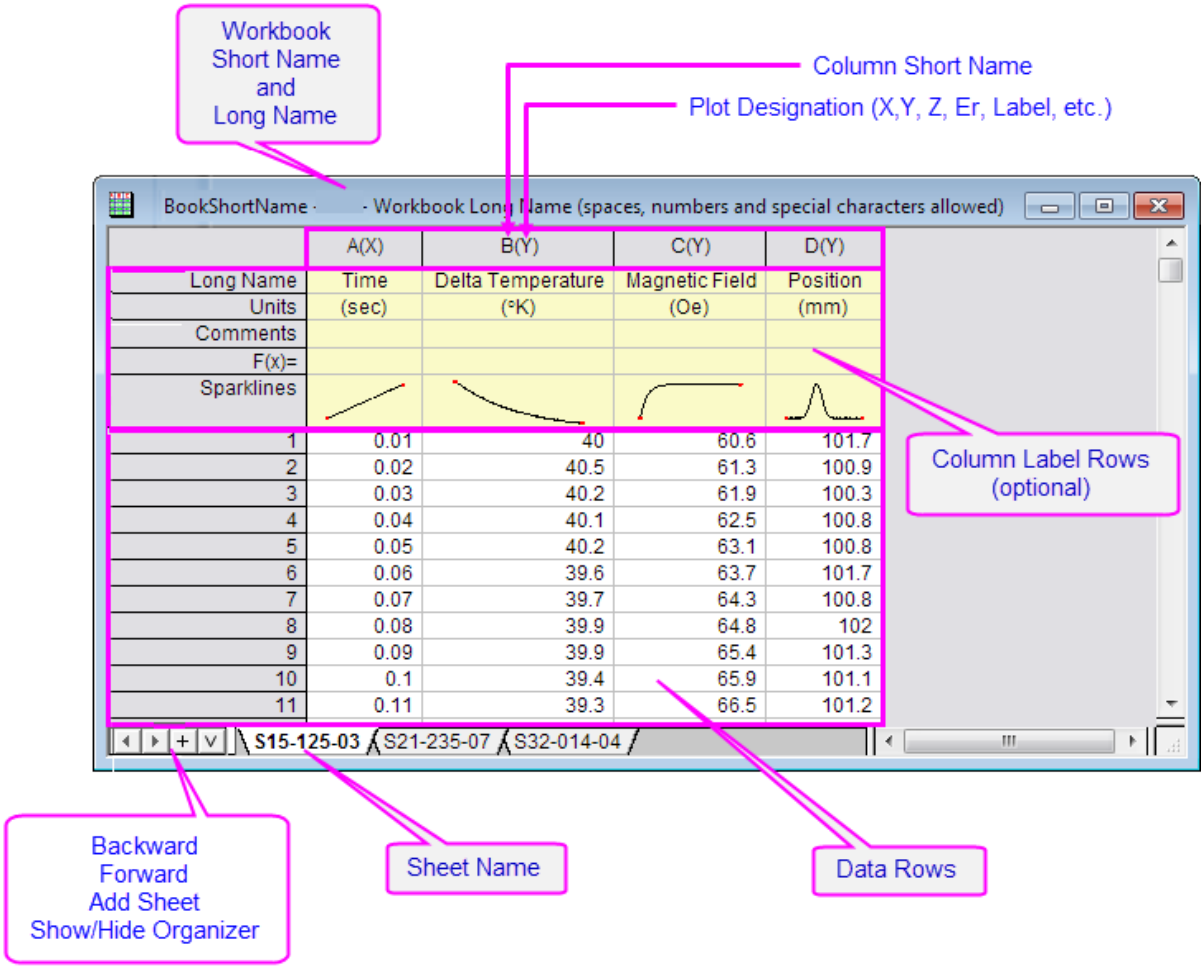


8.1.1 Some Workbook, Worksheet and Column Limits

Object	Maximum Number
Worksheets in a workbook	1024†
Rows in a worksheet, 1 column	90,000,000
Rows in a worksheet, 5 columns	90,000,000
Rows in a worksheet, 32 columns	90,000,000
Columns in a worksheet, 1 row	65,500
Columns in a worksheet, 100 rows	65,500
Columns in a worksheet, 1000 rows	65,500

† > 255 sheets requires saving file to Unicode-compliant (e.g. *.opju) file format. Unicode formats not compatible with Origin versions prior to Origin 2018.

8.1.2 Naming Workbooks, Worksheets and Columns



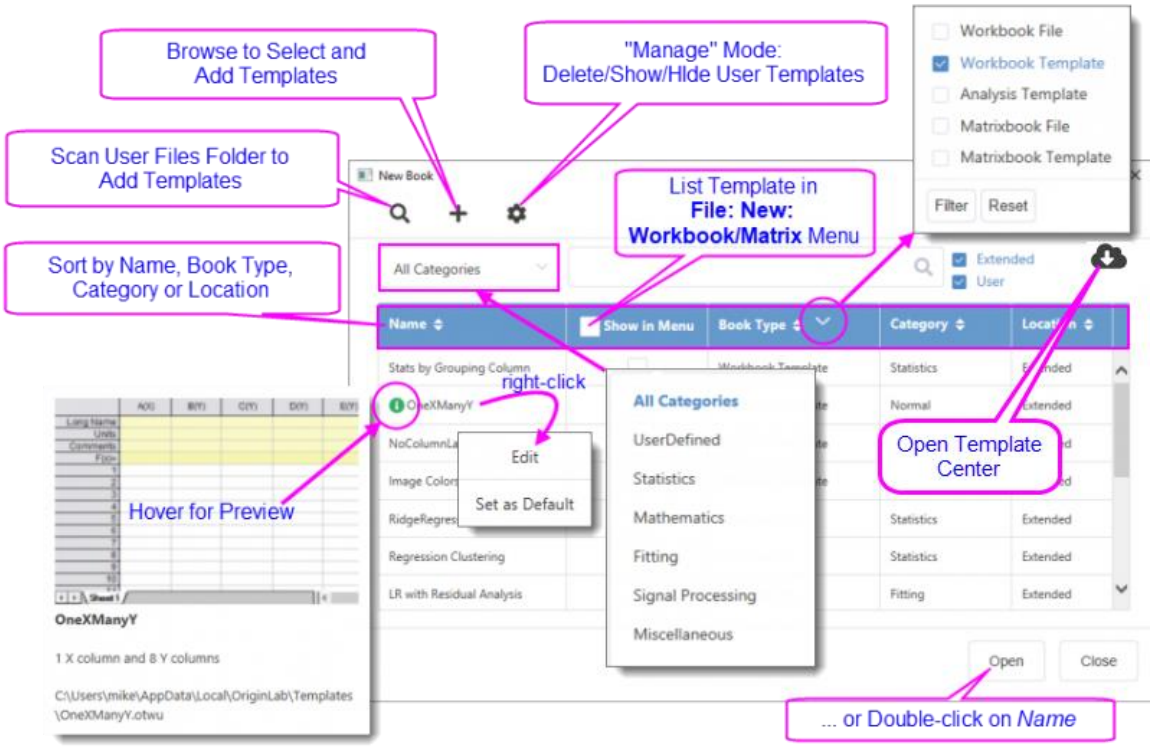
Workbooks	• A Workbook has a **Short Name** and an optional **Long Name** and **Comments**. Origin uses the **Short Name** for internal operations. • **Short Name** must be unique within the project file, can contain only alpha-numeric characters (letters and numbers), must begin with a letter and are limited to 13 characters. • A Workbook **Long Name** is optional, need not be unique within the project file, can use any characters in any order and has a limit of 5,506 characters (including spaces). • To name a workbook, right-click on the window title bar and choose **Properties**. Here you can edit Long name, Short name and Comments. Use the Window Title drop-down to control which name(s) show on the window title bar.
Worksheets	• A Worksheet has a **Name** and optional **Label** and **Comments**. • The **Name** must be unique within a workbook. • A Worksheet **Name** has a 64 character limit, including spaces. These special

	characters are not allowed: **{}|"<>()![]**. • Worksheet **Label** and **Comment** are optional. They need not be unique within the project file, can use any characters in any order, and can be of any practical length. • To name a worksheet, double-click on the sheet tab, or right-click on the tab and choose **Name and Comments**. More details are listed under **Worksheets**, below.
Columns	• A Column has a **Short Name** and an optional **Long Name**. • The **Short Name** must be unique within the worksheet. When spreadsheet cell notation is enabled (default setting), you cannot edit the column Short Name (see Column Short Name Restriction). When cell notation is disabled, you can edit the column Short Name. When editing Short Names note that they must use only alphanumeric characters (no special characters), must begin with a letter or number, and cannot exceed 18 characters. • A Column **Long Name** is optional, need not be unique within the project file, can use any characters in any order and has a limit of 30,000 characters. The **Long Name** can be edited directly by clicking in the **Long Name** cell or by right-clicking on the column header and choosing **Properties** from the shortcut menu. • Dialog box and Status Bar references to data range will use **Long Names**, provided that (1) **Long Name** exists and (2) you have selected **Use Long Names when available** (**Preferences: Options: Miscellaneous**). Otherwise, **Short Names** are used.

8.1.3 Workbooks

Origin workbooks are highly customizable and can be saved *with* data (e.g. **Workbook File**) or *without* data (e.g. **Workbook Template**). Since they can be configured for many different applications, there is a good chance that you will collect a number of custom files over time. The **New Book** dialog is useful for organizing and choosing these files for use.

8.1.3.1 New Book and Book Templates



8.1.3.1.1 To add a empty new Workbook

- Click the **New Workbook** button  on the Standard toolbar.

or

- Select **File: New: Workbook: Black Workbook** menu.

8.1.3.1.2 To open the New Book dialog

1. Click **File: New: Workbook: Browse** or press **Ctrl + N**.



An **Open Template Center** button  was recently added to the New Book dialog. Click the button to browse for additional workbook templates that you can download and add to your template list.

- The dialog lists both add-on (Extended) and User-defined (User) files.
- Files can be sorted by **Name**, **Book Type**, **Category** or **Location**.
- A file preview shows when you hover on the  icon.

- Right-click on a template name and **Edit** metadata or **Set as Default** (e.g. **New Workbook** button ). Also, right-click to **Clear Default**.
- Enable **Show in Menu** to list a window in the **New: Workbook** or **New: Matrix** menus.
- Filter windows by category using the "All Categories" menu.
- Filter windows by type using the **Book Type** drop-down menu. **Reset** to show all.
- Right-click on a template to **Set as Default** or **Edit** metadata.
- Enable/disable **Show on startup and new project**.



Each window's **Properties** dialog has a **Comments** box for entering text. These comments are included in the **New Book** dialog previews and the Project Explorer previews. In addition, comments are searchable from the **Edit: Find in Project** tool.

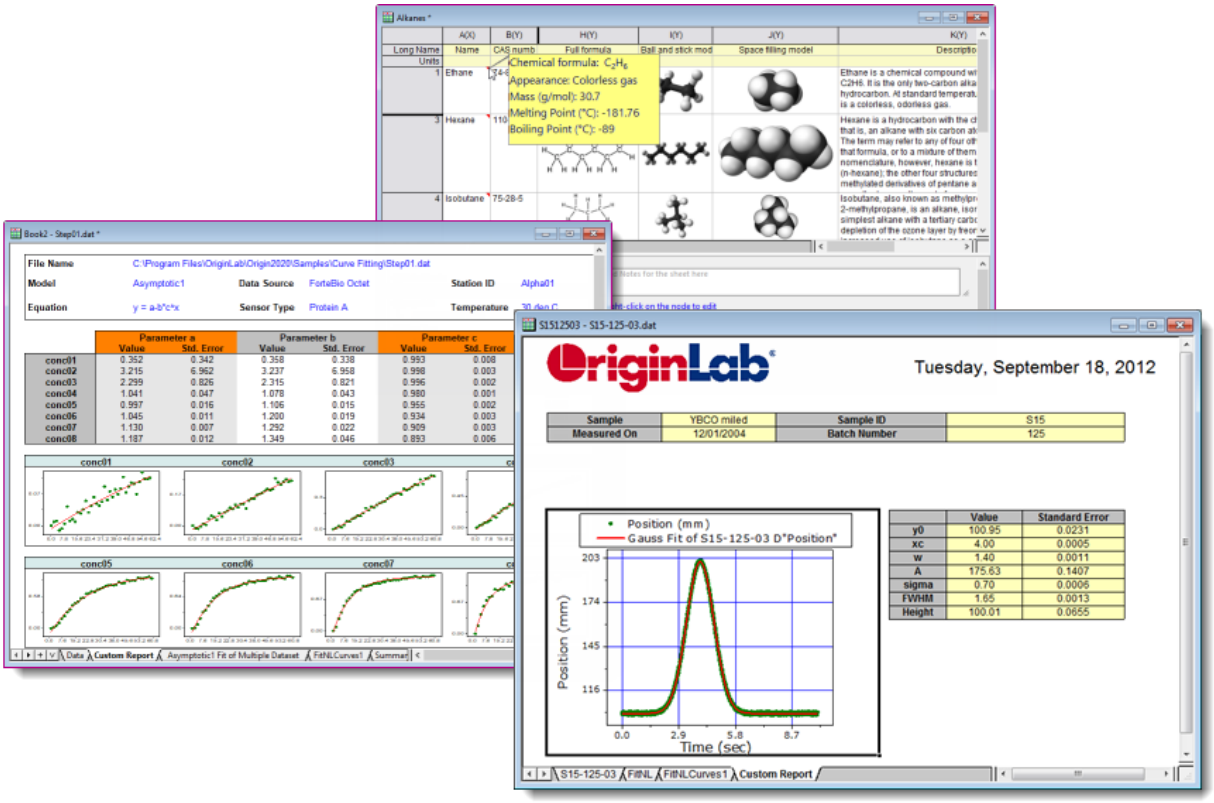
8.1.3.2 Spreadsheet Cell Notation (SCN)

Origin workbooks support **Spreadsheet Cell Notation** (**SCN**). Spreadsheet Cell Notation allows the sort of cell-level calculations that are familiar to users of spreadsheets (more details below).

- By default, **SCN** is ON for all new workbooks.
- In Origin **2017** - **2019**, when SCN was enabled in the workbook, you saw this icon in the upper-left corner of the worksheet.
- Beginning with Origin **2019b**, the SCN icon is hidden (by default) but SCN remains enabled (also by default) to make room on the workbook window for the **Data Connector** icon.
- Most users will want to leave SCN enabled but in rare cases (e.g. you need to customize the column Short Name), you may want to turn SCN off. To disable SCN, right-click on the workbook title bar and choose **Properties**. Look for the **Spreadsheet Cell Notation** check box about half-way down the page.
- When SCN is turned off, users of *all* versions will see this icon in the upper-left corner of the workbook.
- If you open a project or workbook window in Origin and SCN is turned OFF in a particular workbook, the SCN OFF button will display in the upper-left corner. This includes projects or workbooks that were created prior to Origin 2017. To enable SCN, right-click on the book title bar, choose **Properties** and check the **Spreadsheet Cell Notation** check box.

8.1.3.3 What Types of Data Can I Store in the Workbook?

The workbook serves as a flexible container for all of your work-related data -- not just text and numeric data. You can add graphs, matrices, images, notes; and store calculations, scripts and variables, text objects and programmable buttons, and create live links to other project data. Beyond its role as a flexible data container, the workbook can also serve as a medium for batch analysis and reporting.



This table summarizes the kinds of objects that can be saved in the workbook window at the workbook, worksheet and worksheet cell levels, and how to access them.

Element	Workbook	Worksheet	Worksheet Cell
Graphs	Right-click on the sheet tab > **Add Graph as Sheet**	Right-click in the gray area beyond the last column > **Add Graph**	Right-click on the cell > **Insert Graph**
Matrices	Right-click on the sheet tab > **Add Matrix as Sheet**	--	--
Images	--	--	Right-click on the cell > **Insert Images from Files**
Notes	Right-click on workbook title bar > **Properties > Comments**	Click the workbook's **Show/Hide Organizer** button > **Data Sheets > enter notes in box**	Click on the cell and **Insert Note** with the Mini Toolbar (see below).
Variables	Click the workbook's **Show/Hide Organizer**	Added text objects	Right-click on the worksheet cell and

	button > *page.info*, *Imported Files*, *User Tree*, etc. • The Insert Variable Dialog Box (Used with Worksheets) • The Insert Variable Dialog Box (Used with Text Labels)	linked to data/variables	**Insert Variables**; or select a cell and **Define Name** using Mini Toolbar.
Functions and Formulas	Right-click in the gray area to the right of last column > **Show Script Panel**	Select a column, right-click and **Set Column Values**. Alternately, enter formula in **F(x)=** cell.	Click on a cell and use the Formula Bar or direct cell entry, to create cell formula.
Scripts	Right-click in the gray area to the right of last column > **Show Script Panel**	• Right-click the selected column > **Set Column Values** • Added text/drawing objects and associated scripts	--
File Metadata	Click the **Show/Hide Organizer** button on the workbook toolbar	--	--
Links	--	--	Enter cell-level links to URLs, other worksheet ranges/cells, project graphs, matrices and image files.
Text and Drawing Objects	--	Add **Programmable Buttons** and **Text Labels** and **Drawing Objects** to the	--

		worksheet.	
Arrows	--	--	Right-click and **Insert Arrow**

8.1.4 Worksheets

A workbook can have up to 1,024 sheets. A sheet has a single **Name** which can contain spaces and special characters. Optionally, you can add a **Label** and/or a **Comment**.

To edit the sheet Name

1. Double-click on the sheet tab and enter a **Name**. Alternately, right-click on the sheet tab, choose **Name and Comments** and edit the **Name** field.

System variable **@SSL** can be used to modify sheet naming behavior. Look for **@SSL** in the LabTalk System Variable List.



When mousing over the worksheet tab, **Name**, **Label** and **Comments** appear as a tooltip.

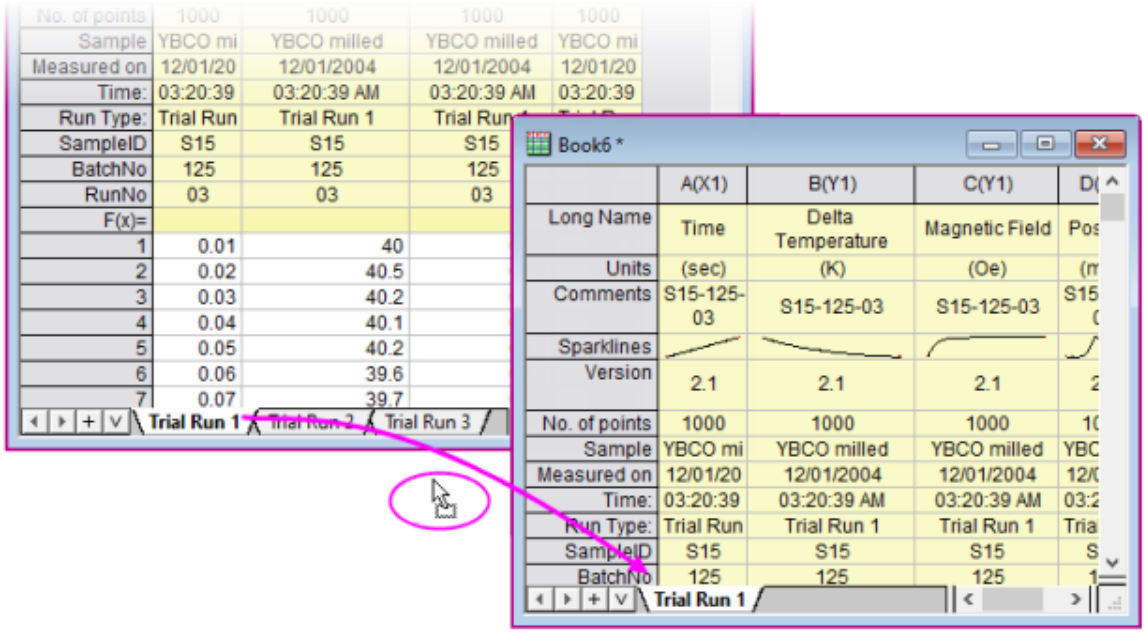
To add worksheets to the workbook, right-click on a worksheet's tab and choose one of the following:

- **Insert**. Inserts a single worksheet ahead of the active sheet.
- **Add**. Appends a single worksheet.
- **Duplicate Without Data**. Duplicates the active worksheet without duplicating the data.
- **Duplicate**. Duplicates the active sheet, including the data.

Each sheet in a workbook can have its own set of customizations. When you **Insert** or **Add** a worksheet, the new sheet is based on the ORIGIN.otwu file (specifically the version of ORIGIN.otwu that is saved to your **User Files Folder** if you have customized this file). To add a sheet that is based on *another* sheet in the workbook (including number of columns and special formatting), you would use the **Duplicate** or **Duplicate Without Data** shortcut command.

To move sheets between existing books or use them to create new books:

You can also (a) drag existing sheets between books or (b) drag and drop sheets onto an empty portion of the workspace, to create a new book.



To select multiple sheets when dragging between books or when dropping sheets onto the workspace to create new books:

1. Press Shift/Ctrl on multiple worksheet tabs, then drag selected tabs to another window or an empty portion of the workspace.

or...

1. Right-click on a worksheet tab, and choose **Navigate**. In the Navigate Worksheets dialog, Ctrl/Shift + select sheets, then right-click and choose **Move to**, then **New Book** or **Selected Book**.

8.1.4.1 Worksheet Properties

To open the Worksheet Properties dialog

1. Right-click in the gray area to the right of the worksheet grid (but inside the workbook window) and choose **Properties**.

You can use the Worksheet Properties dialog box to customize properties of the sheet, including...

- Display of row labels, header labels and grid lines (**View** tab).
- The number or rows and columns and other sheet dimensions such as column or row header height (**Size** tab).
- Enabling of rich text, text wrap, how to display truncated cell content, sheet font and color (**Format** tab).
- Auto add rows, ignore hidden rows in plotting and analysis, cell resizing (**Miscellaneous** tab).
- Printing/exporting of grid lines, headers and footers, background color (**Print/Export** tab).
- Script to run after import or upon data change (**Script** tab).

- Display and edit a user tree (e.g. the user adds some configuration info for use in the template) (**User Tree** tab).

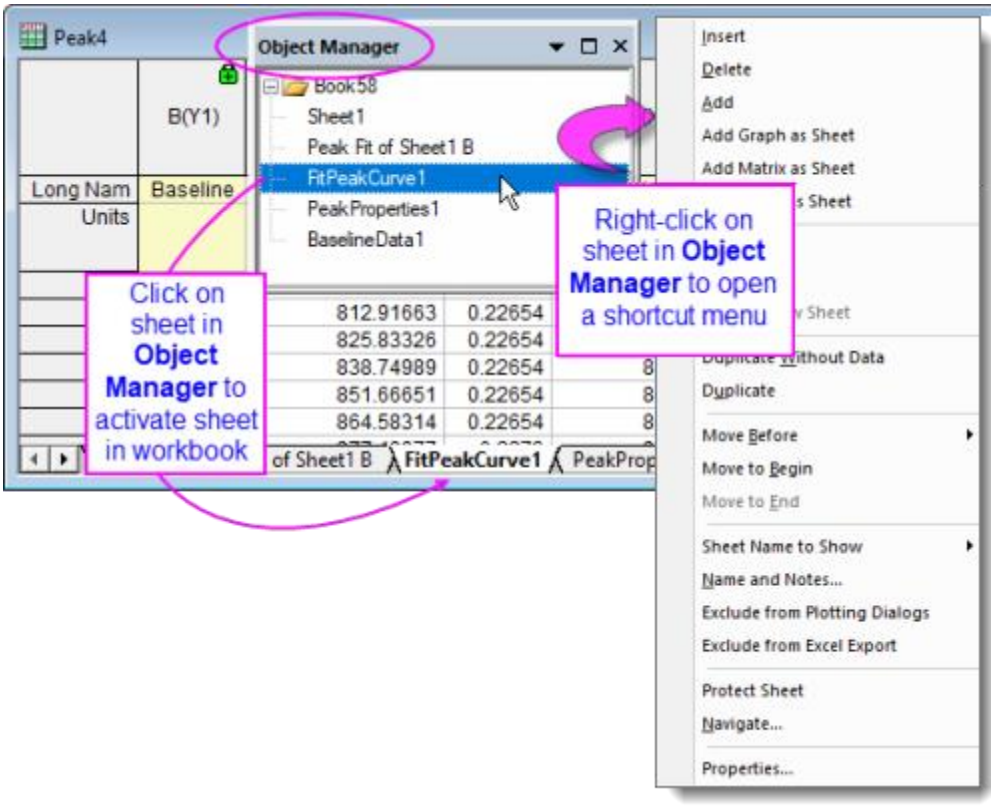
Note that many of the sheet customizations can be applied at the cell level by right-clicking on a selected cell and choosing **Format Cells**.

For more information, see The Worksheet Properties dialog box.

8.1.4.2 Manipulating Sheets with Object Manager

Use the **Object Manager's** shortcut menu commands to manipulate display of workbook content:

- List all sheets in the active workbook.
- Click a sheet in Object Manager to activate the corresponding sheet in the workbook.
- Right-click in Object Manager for access to common worksheet operations, including **Delete**, **Insert**, **Add**, **Move**, **Copy**, and **Rename**.

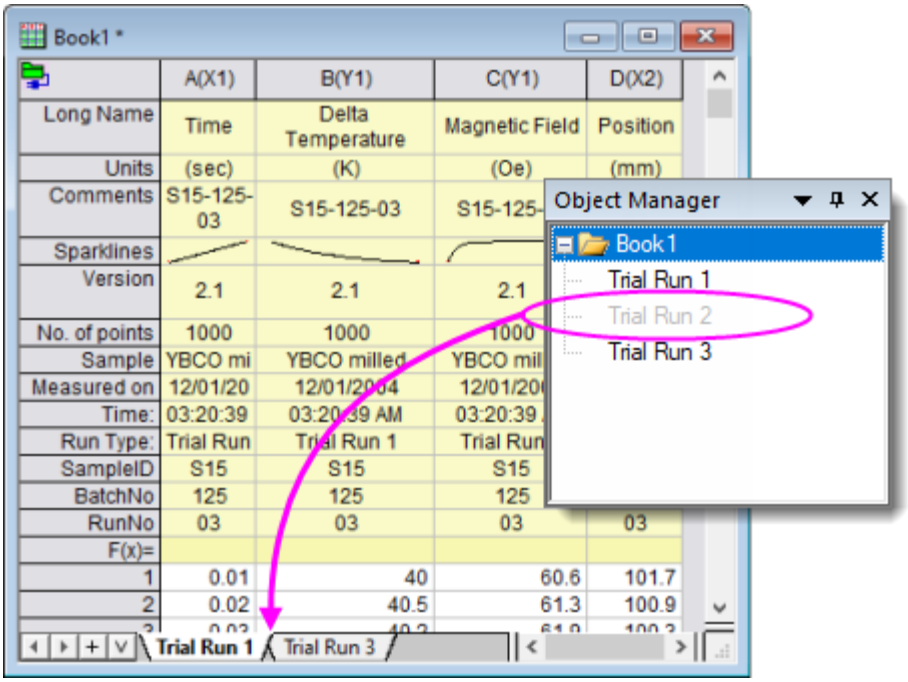


8.1.4.2.1 Hide/Show Sheets

You can hide (and show) worksheets by using the **Object Manager**.

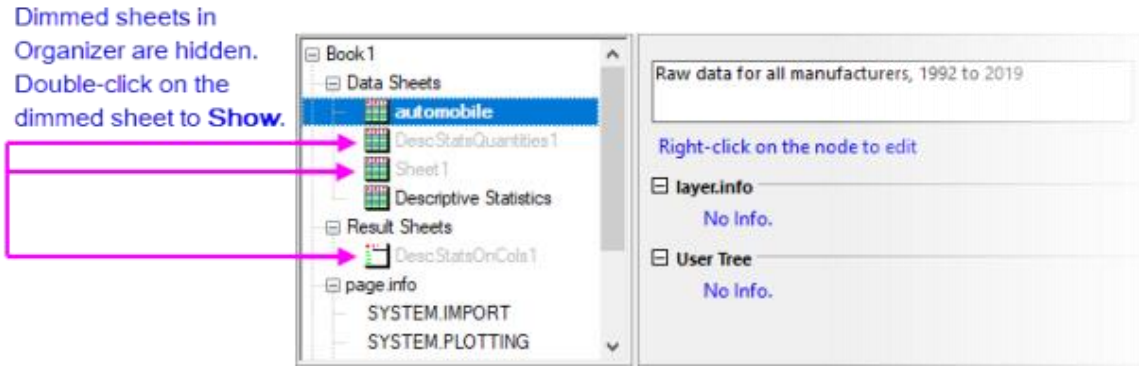
1. In the Object Manager, select one or more worksheets.
2. Right-click and choose **Hide**. Hidden sheets are dimmed in Object Manager and hidden in the workbook.

3. To show the sheet(s), right-click on the dimmed sheets and choose **Show**.



- Note that you can also right-click on one or more worksheet tabs and choose **Hide/Show**.
- Additionally, there is a **Navigate** shortcut menu item, available in both sheet-tab and Object Manager shortcut menus, that opens the **Navigate Worksheets** dialog. You can hide or show sheets by clearing or checking the **Show** check boxes in this dialog.
- Another way to show sheets is via the **Workbook Organizer**:

1. Right-click in the gray area to the right of the last worksheet column and choose **Show Organizer**.
2. In the lower left panel, hidden sheets will be dimmed (grayed-out). Double-click on the dimmed sheet to **Show**.

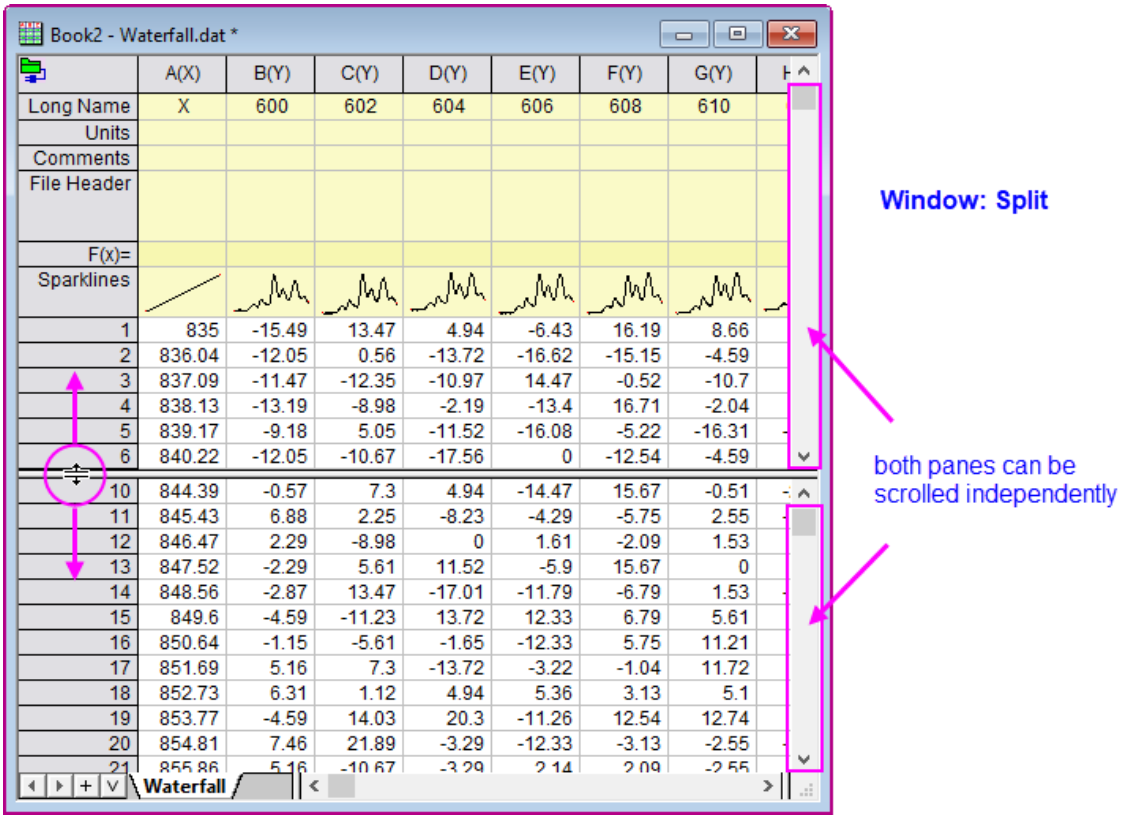


8.1.4.3 Worksheet Views: Split and Freeze

Origin has two utilities for locking the view in part of the worksheet, while allowing you to scroll through the remainder of the sheet. The two could be used interchangeably in some situations.

8.1.4.3.1 Splitting the worksheet into panels using dividers

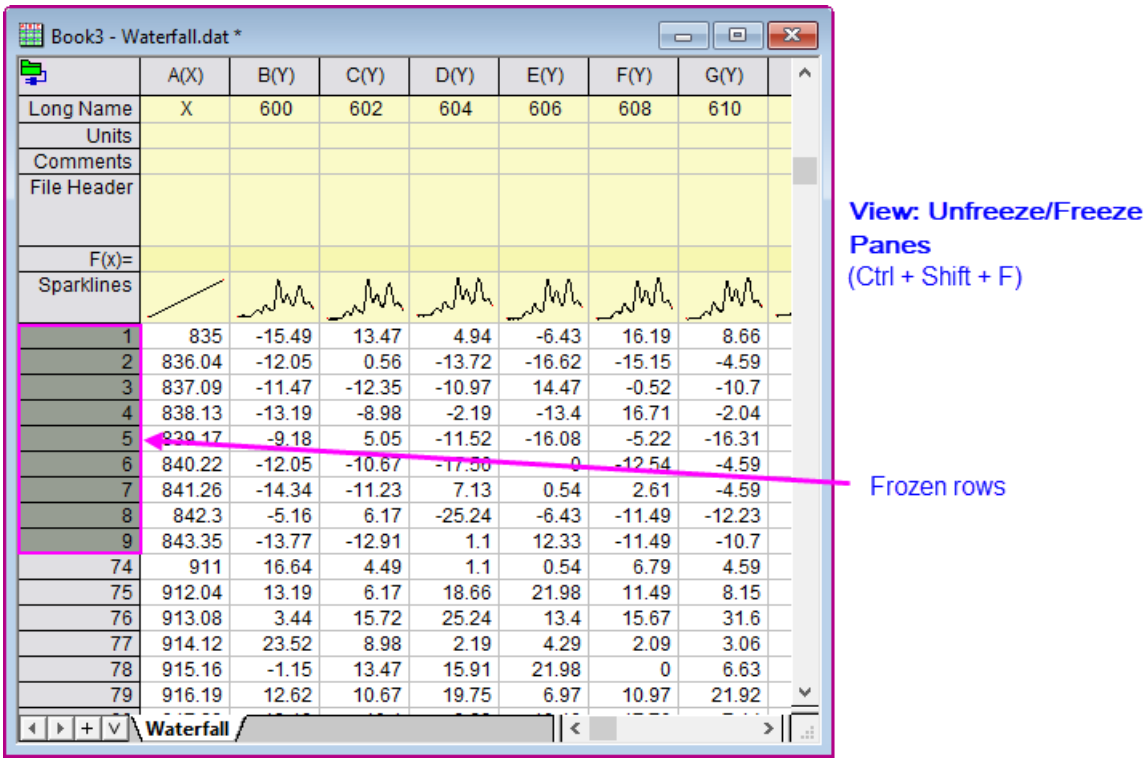
This places a moveable, vertical or horizontal divider at the selected row or column; or if a single cell is selected, both a vertical and a horizontal divider. This divides the worksheet into identical and scrollable views of the worksheet data area. The user is able to scroll within each panel while rows or columns in the other panel(s) remain visible.



1. Select a worksheet row/column or a single cell and choose **Window: Split**.
2. To remove the split choose **Window: Remove Split**.

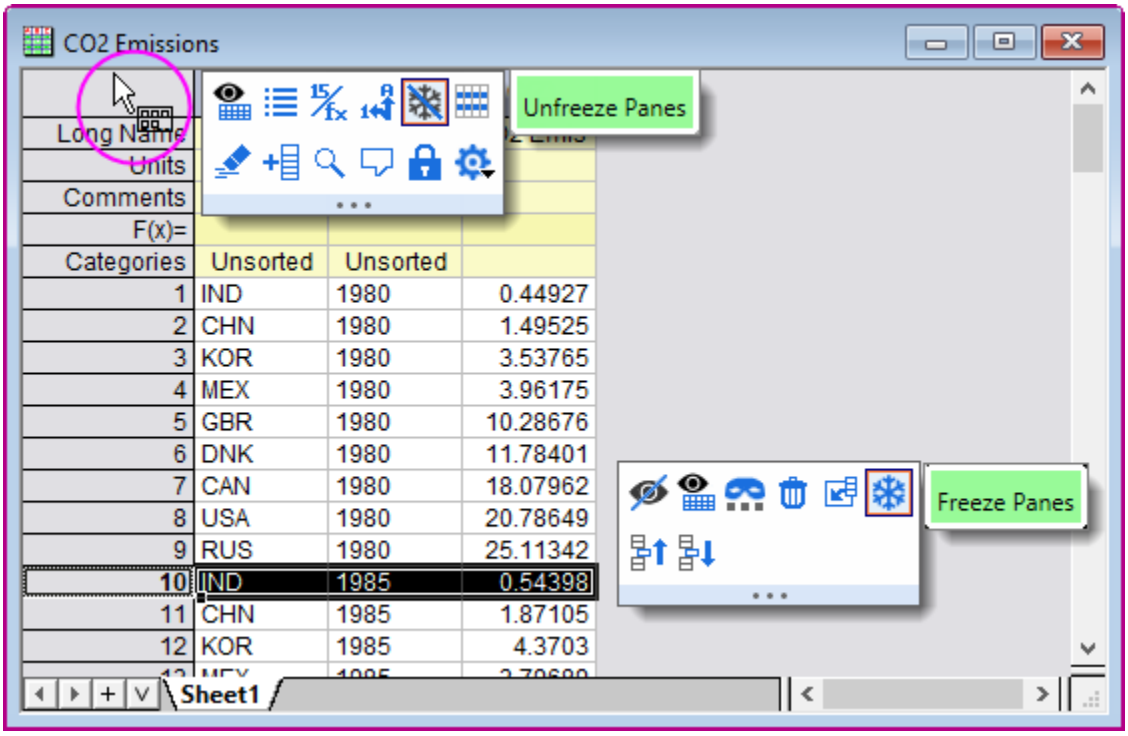
8.1.4.3.2 Freeze rows or columns in the worksheet

The user can freeze the first 1 to 10 rows and/or columns in the worksheet, thus locking them in view while the remainder of the rows or columns remain scrollable. Locked row and column headers are shaded in a darker color to indicate freeze.



1. Highlight a row or column, or a single cell between index row/column = 1 and 10, then do one of the following:

    - Choose **View: Freeze/Unfreeze Panes**.
    - Press **Ctrl + Shift + F**.
    - Select a row/column or a single cell and click the Mini Toolbar button **Freeze Panes**.
    - Click in upperleft-most cell in the sheet and click the **Unfreeze Panes** button.



8.1.5 Worksheet Columns

- **To add a new column** to the right end of an existing worksheet, right-click in the gray area to the right of the worksheet columns and choose **Add New Column** or Click the **Add New Column** button on the **Standard** toolbar.

- **To add multiple columns** to the worksheet, make the worksheet active then choose **Column: Add New Columns...** from the main menu. Specify the number of columns to add in the **Add New Columns** dialog box and click **OK**; or use the **Format: Worksheet...** menu item or the **F4** hot key to open the **Worksheet Properties** dialog, then set the desired value for **Column Number** in the **Size** tab.

- **To insert a column** into the worksheet, highlight a column, then right-click and choose Insert. A column is inserted ahead of the selected column and column Short Names are adjusted accordingly.

Worksheet columns can be renamed by:

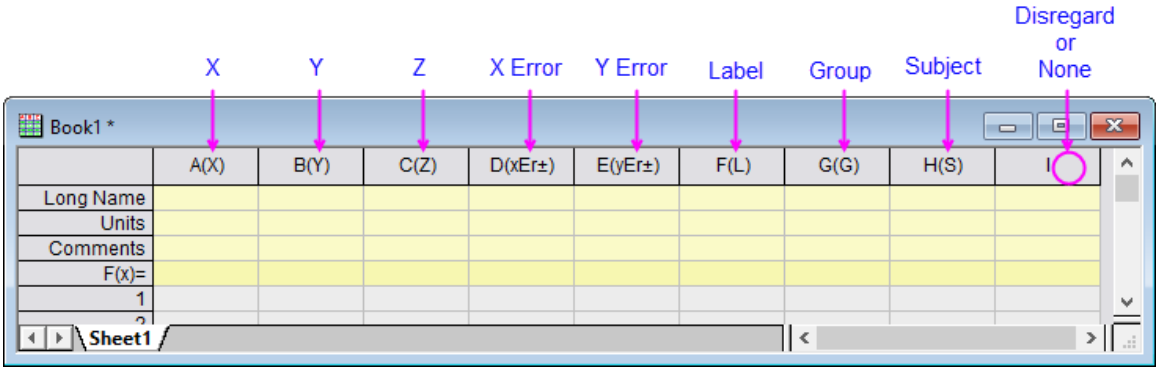
- Double-clicking on the column heading opens the **Column Properties** dialog box. Enter/edit **Short Name** and/or **Long Name**.
- Type a **Long Name** directly into the worksheet header cell by double-clicking in the cell.
- Import a data file and specify that the workbooks, worksheets, and columns be named upon import.
- Use the **Enumerate Labels** tab of the **Worksheet Properties** dialog to enumerate or duplicate column names and labels.

- Type names into a few columns (e.g. **Peak 1** and **Peak 2**), then highlight the cells and drag the bottom-right corner of the selection to auto fill and enumerate the names for other columns. This also works for other column label rows such as Comments.

See the above table for rules on worksheet column naming.

8.1.5.1 Column Designations

As mentioned, worksheet **Column Designations** (aka "Plot Designations") generally determine how data are handled during analysis and plotting operations. For instance, you might select an X column + three Y columns to perform a simultaneous linear fitting of each Y dataset against a common set of X values. Or you might select the same columns to graph 3 line plots against a common set of X values. In addition, there are designations for Z values, for error data, for labels, etc. (for more information, see Setting Column Designation in the Origin Help file).



While there are a number of places in the user-interface where you can designate columns during some analysis or plotting operation, at a basic level, they are set in the worksheet by (1) clicking on the column header to select a column, then (2) doing one of the following:

- Choose an option from the column-level Mini Toolbar.
- Click a button on the **Column** toolbar.
- Right-click on the column and choose **Set As** and choose an option from the shortcut menu.
- Right-click on the column, choose **Properties** and set **Plot Designation**.

8.1.5.2 The Column Properties Dialog Box

The **Column Properties** dialog box is used to customize properties of the column including...

- **Long Name**, **Short Name**, **Units**, **Comments**, etc.
- **Format** (Numeric, Text, Time, Date, etc.).
- **Plot Designation**.

To open the '''Column Properties''' dialog box:

1. Double-click on the column header.
2. Right-click the selected column(s) and choose **Properties...**.

Use the **Properties** tab to edit the column **Short Name**, if desired. Other properties -- **Long Name**, **Units** and **Comments** -- can be edited here or entered directly into the column label row cells.

8.1.5.3 Formatting Column Data

Data in the Origin worksheet is treated as either **text** or **numeric** data. While the display of text data in the worksheet is fairly straightforward, the display of numeric data is more complicated.

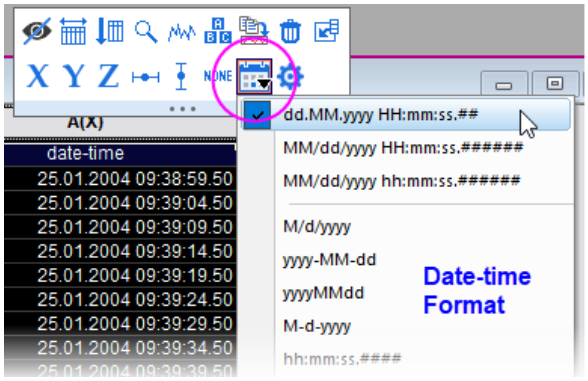
Unless otherwise specified, all numbers in the worksheet are stored internally as floating point, double precision (**Double(8)**) numbers. This includes date and time, data which is formatted to display in degrees-minutes-seconds or numbers that are formatted to display a fixed number of decimal digits.

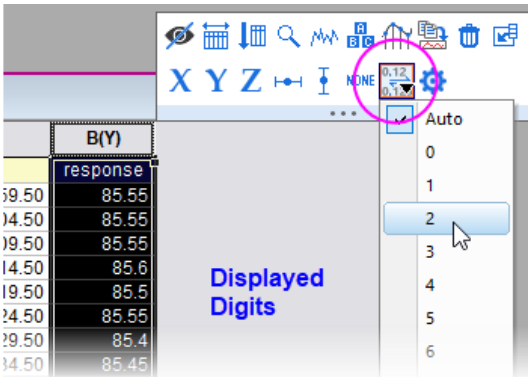
When dealing with numeric data, understand that what you see in the worksheet is a *representation* of a number that is stored internally. This is important for two reasons:

- Calculations involving worksheet values are always done on the double-precision number that is stored internally, not the value that is displayed in the worksheet.
- You can apply various **Format** and **Display** options to change the way that this stored number displays in the worksheet.



While the central place for formatting worksheet data is the **Properties** dialog, as described above, keep in mind that there are quick-access **Mini Toolbar** buttons for changing the Display of numeric and date-time data. Note that the **Format** of selected columns must first be set as **Date** or **Numeric**/**Text & Numeric** for these buttons to be visible.





8.1.5.3.1 Numeric Display Formats

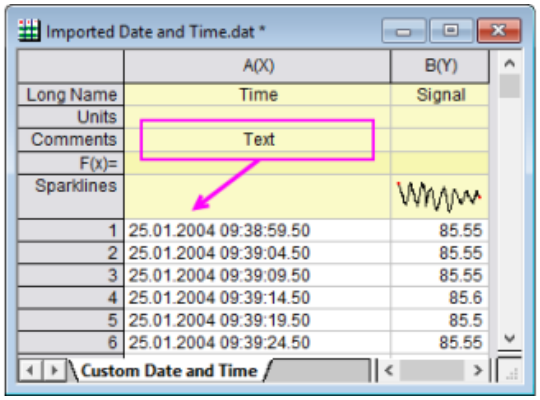
1. Double-click on a column heading to open the **Column Properties** dialog.
2. Click the **Properties** tab, then set **Format** = **Numeric**.
3. Set **Display** to **Decimal: 1000**, **Scientific: 1E3**, **Engineering: 1K**, **Decimal: 1,000** or **Custom** (see below).

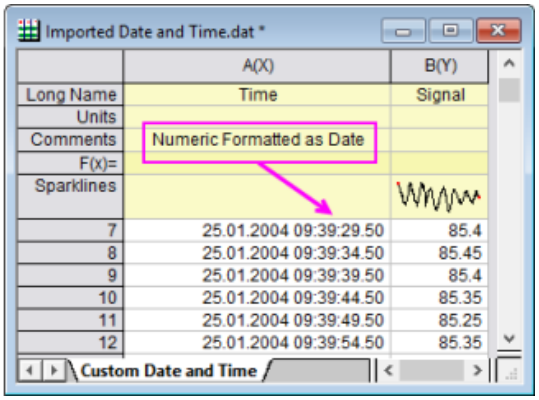
8.1.5.3.2 Date and Time Formats

By default, Origin stores date-time data as a modified Julian Day value and it uses this number for date-time calculations. Typically, however, you will prefer to display this Julian Day value in a more meaningful date-time format:

1. Double-click on a column heading to open the **Column Properties** dialog.
2. Click the **Properties** tab, then set **Format** = **Time**, **Date**, **Month** or **Day of Week**.
3. Set the **Display** list to one of the listed options.
4. If none of the listed options are appropriate you can choose **Custom Display** and construct your own custom date-time string using these date-time format specifiers.

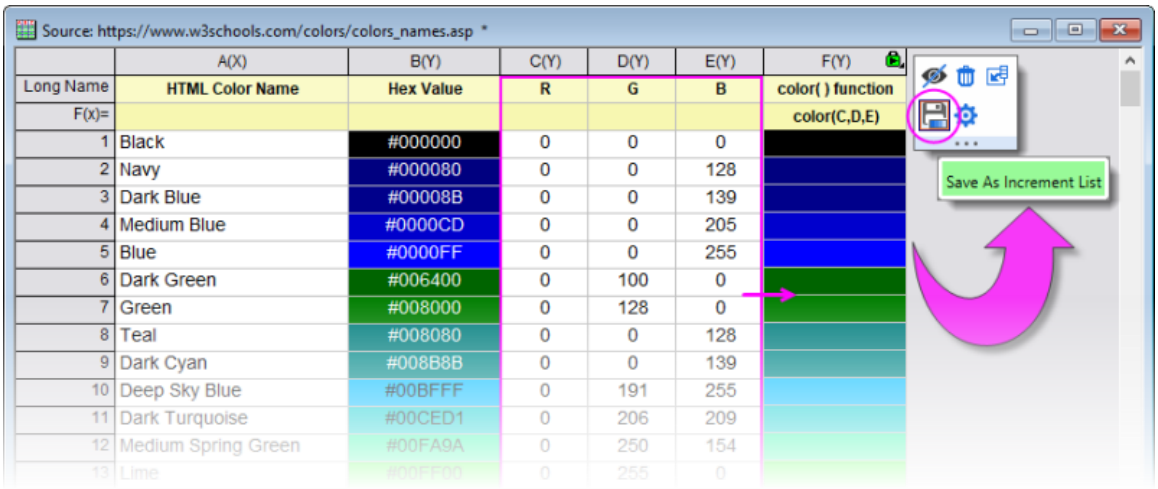
When importing date-time data into the worksheet, Origin will sometimes treat this data as text (Origin's **CSV Connector** generally does a better job of recognizing date-time data). If your date-time data are left-aligned in the worksheet cell, Origin "sees" it as text. You will need to open the **Column Properties** dialog box and choose your **Format** and **Display** options. When you see that your date-time data are right-aligned in the cell, you know that Origin "sees" the data as numeric data, displaying in a date-time format.





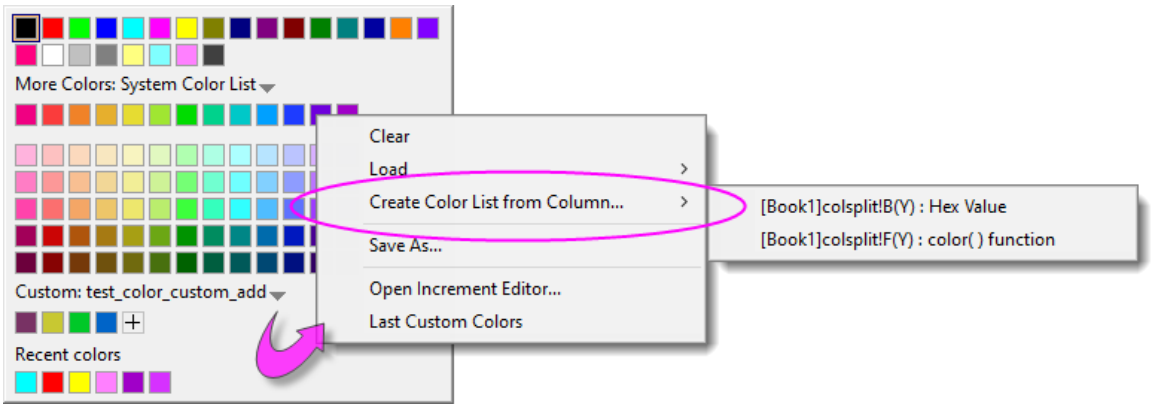
8.1.5.3.3 Color Format

Origin 2021 introduced a new column and cell **Format** -- **Color**.



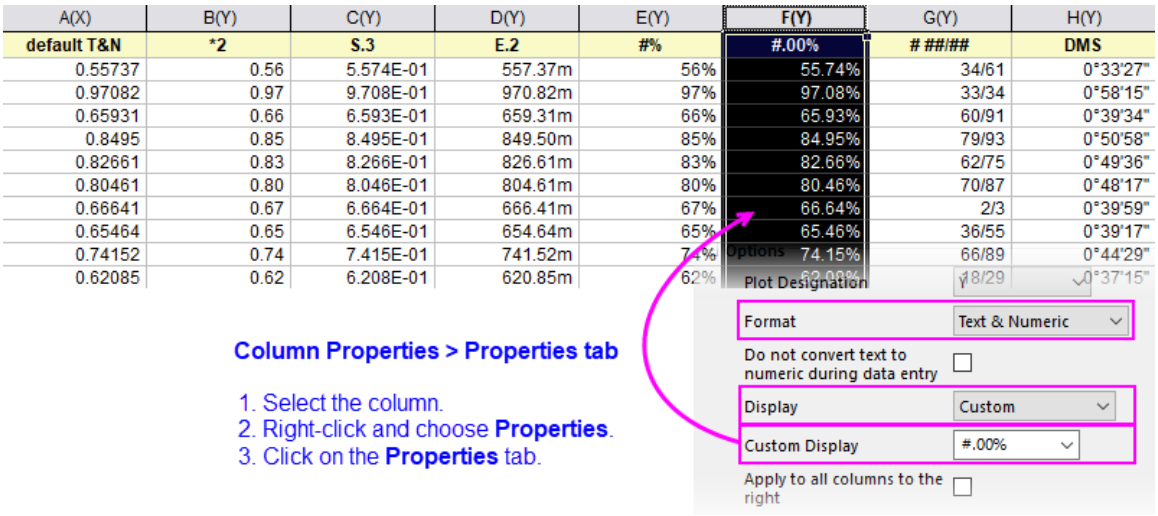
- Supports direct entry of HTML color codes into the worksheet cell to set cell background color, with the option to display or hide the HTML codes in the **Color** cell.

- Use the **color()** function to calculate hex values and set colors from RGB values in other data columns using Set Column Values or cell formula (e.g. `color(A,B,C)` sets color using RGB values in columns A, B and C).
- Select a column in which **Format** = **Color** and use a **Mini Toolbar** button to **Save as Increment List** (color list) for use in your graphs.
- Alternately, from the **Custom** colors menu in the **Color Chooser**, choose **Create Color List from Column** and pick a **Color** worksheet column from the flyout.



8.1.5.3.4 Other Custom Display Formats

Origin can display numeric values in the worksheet in a variety of custom formats. This illustration shows various formats applied to the same set of numeric values (column **A(X)**).



The following is a sample listing of some supported custom format options (this just happens to be the pre-populated list that ships with Origin 2019). Note that you can enter custom formats directly into the **Custom Display** list and they will be saved to this list.

There are many other format options. For more information, see **Custom Numeric Formats**

Format	Description	Example if cell value =

		123.456
**n*	Display *n* significant digits.	***3** displays *123*
.n	Display *n* decimal places.	**.4** displays *123.4560*
S.*n*	Display *n* decimal places, in scientific notation of the form **1E3**.	**S.4** displays *1.23456E+02*
E.*n*	Display *n* decimal places, in engineering format.	**E.2** displays *123.46*
* "pi"	Display a number as a decimal, followed by the symbol π.	* **"pi"** displays *39.29727π*
#/4 "pi"	Display a number as a fraction of π, with a denominator of "4".	**#/4 "pi"** displays *157π/4*
#/# "pi"	Display a number as a fraction of π.	**#/# "pi"** displays *275π/7*
##+##	Display a number as two digits, a "+" separator, then two digits (e.g. surveying stations).	**##+##** displays *01+23*
#+##M	Display a number as one digit, a "+" separator, then two digits, plus a suffix of "M".	**#+##M** displays *1+23M*
#*n*	Display a number as an integer of *n* digits, pad with leading zeros as needed.	**#5** displays *00123*
#%	Display a number as a percentage.	**#%** displays *12346%*
# ##/##	Display a number as proper fraction.	**# ##/##** displays *123 26/57*
# #/*n*	Display a number as proper fraction, in *n*ths.	**# #/8** displays *123 4/8*
DMS	Display a number in *Degree° Minute' Second"*, where 1 degree = 60	**DMS** displays

	minutes, and 1 minute = 60 seconds.	*123°27'22"*
D MD*n* EW (longitude) D MD*n* NS (latitude)	Display a number in Degrees and Decimal Minutes. Parameter *n* specifies decimal places. Positive values will have "E" or "N" appended, Negative values will have "W" or "S" appended. If you wish to preserve negative values do not append "EW" or "NS".	**D MD3 EW** displays *123° 27.360 E*
D MD*n* EWB (longitude) D MD*n* NSB (latitude)	Display a number in Degrees and Decimal Minutes. Parameter *n* specifies decimal places. Letter "B" ("before") specifies that positive values should have "E" or "N" prefixed, negative values will have "W" or "S" prefixed. If you wish to preserve negative values do not append "EWB" or "NSB".	**D MD3 EWB** displays *E 123° 27.360*
%#x	Display a number as a 32-bit hexadecimal (max 8 hexdigits). The "#" symbol specifies "Ox" prefix.	**%#x** displays *0x7b*
%#0*n*x	Display a number as a 32-bit hexadecimal (max 8 hexdigits) notation, as an *n*-character string, pad with leading 0 as needed.	**%#06x** returns *0x007b*
%#0*n*l64X	Display a number as a 64-bit hexadecimal notation (max 13 hexdigits, 15 total including #="0x"), as an *n*-character string, pad with leading 0 as needed.	**%#014l64X** returns *0X00000000007B*
-+*n*	Display a negative/positive (**-+**) format that can be combined with other custom formats. For instance, if you had a column containing both positive and negative numbers, you might set **Custom Display** as "-+.2" to display numbers to 2 decimals with a prefix of "-" or "+". Normally (by default), the "-" does display while the "+" does not. However, this syntax also substitutes a "long minus" in place of the usual "short minus" used in displaying worksheet negative numbers. Note that the "-" and "+" symbols may be combined in your custom string (e.g. "-+") or used alone (e.g. "-").	**-+.2** displays *+123.4560*

Custom Display =

.2	-+.2
0.35	+0.35
-0.00	−0.00
1.38	+1.38
-0.56	−0.56
1.04	+1.04
0.59	+0.59
-1.02	−1.02

8.1.6 Column Label Rows

Column label rows store metadata -- data that is used to describe other data. Typically, this metadata may be brought in as header information in imported files, or it may be manually entered. Display of column label rows is optional and the user can selectively show them or hide them, as needed.

Column label row information is often used in plotting operations (e.g. worksheet **Long Names** used as graph legend text or Axis titles). The **F(x)=** row is used in performing math operations on columns of data (see below). Data stored in **User-defined Parameter** rows might be used in labeling or grouping of datasets in plotting, data manipulation, statistical analysis or math operations (see **Tutorial 2**, below).

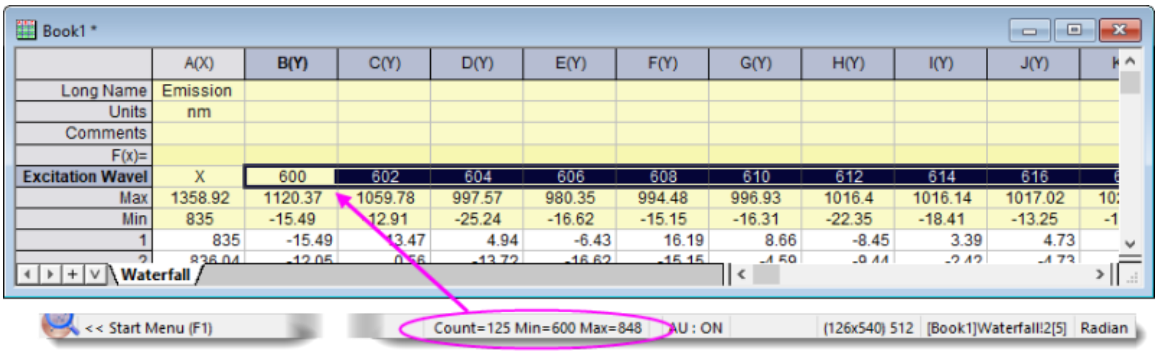
Book1 - automobile.dat

	A(X)	B(L)	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)
Long Name	Month	Make	Power	0~60 mph	Weight	Gas Mileage	Engine Displacemen
Units			kw	sec	kg	mpg	cc
Comments							
Sparklines							
1	Dec	Buick	132	14	2238	11	5736.5
2	Dec	Acura	154	12	2324	11	5212
3	Dec	GMC	158	13	1531	10	5900.4
4	Dec	Chrysler	132	10	2088	12	6277.4
5	Dec	Kia	121	12	1202	12	5736.5
6	Dec	Suzuki	106	10	1417	14	5736.5
7	Dec	Volvo	95	14	1661	13	5031.7
8	Dec	Mercedes	132	14	2208	12	5736.5

automobile

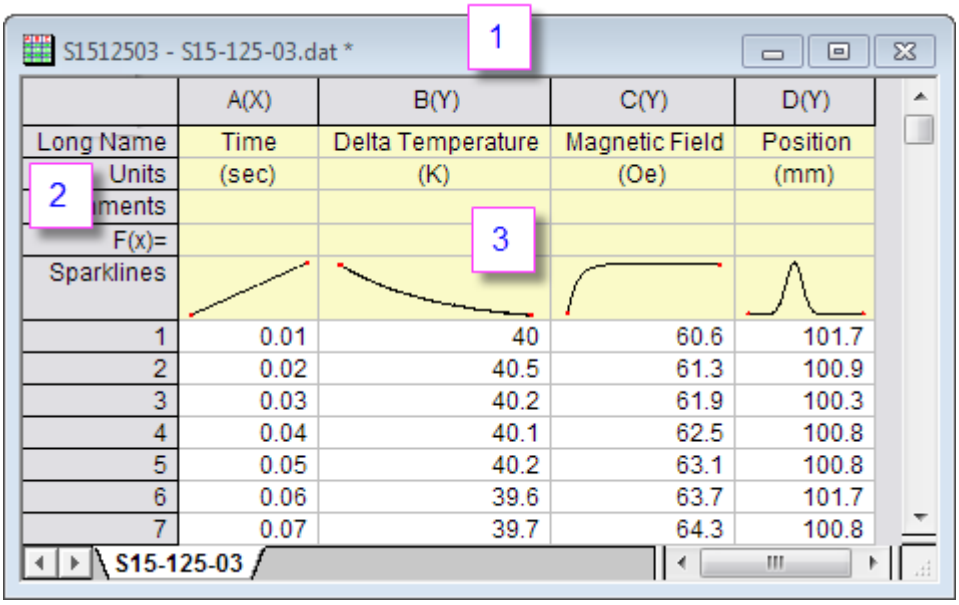
Tips...

- You can copy a selected subrange of worksheet cells and include associated column label row information with the copy-paste operation. To copy label rows with data cells, right click on your subrange selection and choose **Copy (including label rows)**.
- You can highlight label row cells and stats will be reported to the **Status Bar**.



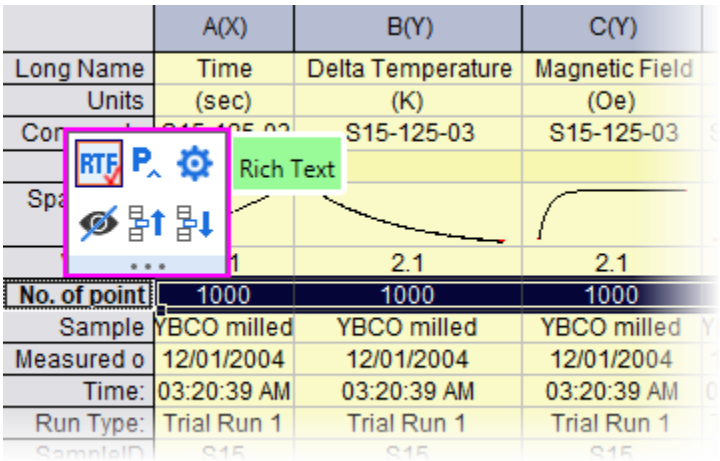
8.1.6.1 Managing Display of Column Label Rows

Display (showing or hiding) of column label rows is controlled by shortcut menu commands:



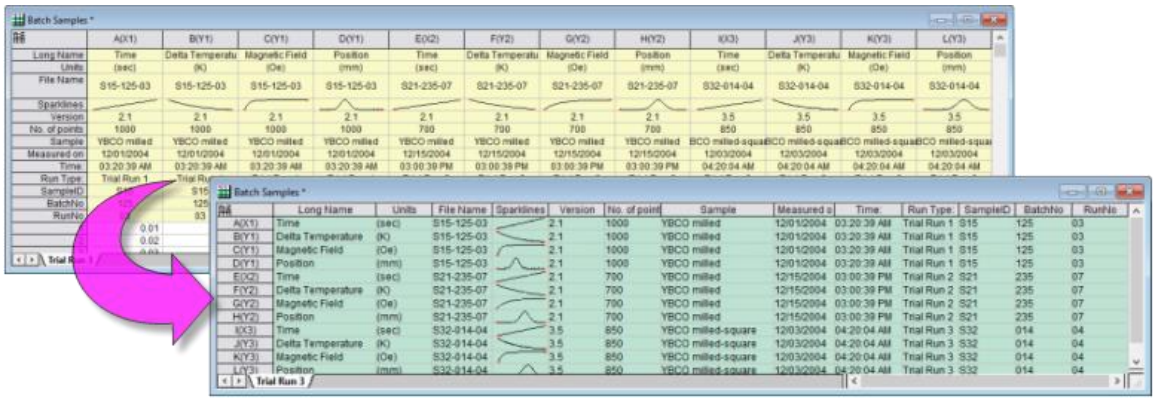
1. Right-click here and choose **View** from the shortcut menu.
2. Right-click here and choose **Edit Column Label Rows** or other label row command.
3. Right-click here to control worksheet elements (display Row Label, Column Header, etc) or select a cell in this area, then right-click to **Set Comments Style**.

There is also a worksheet column label row Mini Toolbar for managing label rows. Use it to do such things as hide selected label rows, enable Rich Text or change label row order.



8.1.6.2 Column List View

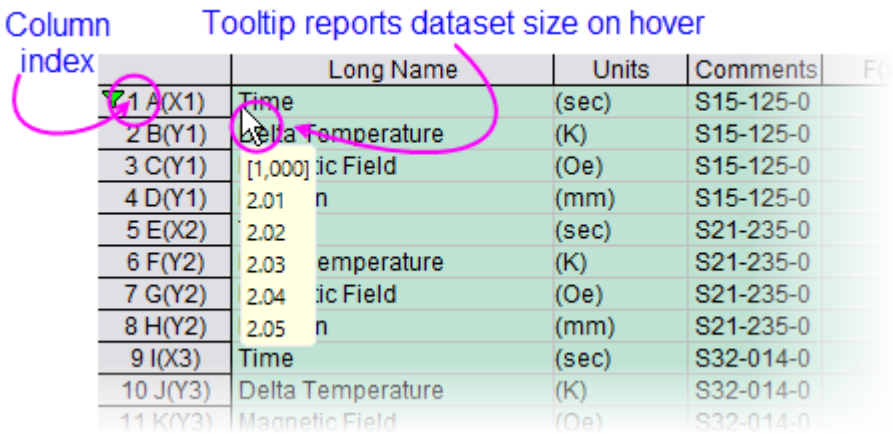
Origin 2019 introduced a new view mode for the worksheet called **Column List View** that is a transposed view of the column label row metadata. This view is potentially useful if your worksheets have many rows of metadata and you want to focus on some particular aspect of that metadata. With the worksheet active, choose **View: Column List View** or press **Ctrl + W**.



Further, you can apply a data filter to metadata in Column List View. When you return to the standard worksheet view (clear the mark beside **View: Column List View**), only data associated with the filtered metadata will show in the worksheet.



Column List View displays column index number ahead of column short name (+ column designation). In addition, you can hover on the left edge of column long name and a tooltip reports dataset size. To disable the display of column index, set **@DSI=1**.



8.1.6.3 Sparklines

Numeric data stored in a column will graphically display in the column header in a special label row called **Sparklines**. A sparkline is, by default, a small inset line plot of the data in a column, plotted as the dependent variable (Y) against the row number or the associated X column as independent variable (X). When importing data, Origin displays sparklines by default when the number of columns is less than 50.

	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Time	Delta Temperature	Magnetic Field	Position
Units	(sec)	(K)	(Oe)	(mm)
Comments				
F(x)=				
Sparklines				
1	0.01	40	60.6	101.7
2	0.02	40.5	61.3	100.9
3	0.03	40.2	61.9	100.3
4	0.04	40.1	62.5	100.8
5	0.05	40.2	63.1	100.8
6	0.06	39.6	63.7	101.7

To Show or Hide Sparklines:

- Show Sparklines by clicking **Column: Add or Update Sparklines**. This opens the **sparklines** dialog.
- Show Sparklines for selected columns by clicking the **Add Sparklines** button  on the **Column** toolbar.
- Right-click on the worksheet's **Sparklines** column label row and choose **Add or Update Sparklines**.
- Delete sparklines by right-clicking the **Sparklines** column label row and pressing the Delete key.
- In addition to the default line plot, Sparklines can display as Histogram or Box Charts. Highlight one or more columns by clicking on the column header, then choose **Column: Add or Update Sparklines**. In the dialog box that opens, set the **Plot Type** to **Histogram** or **Box**.

	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)
Long Name	Power	0~60 mph	Weight	Gas Mileage	Engine Displacement
Units	kw	sec	kg	mpg	cc
Comments					
F(x)=					
Sparklines					
1	132	14	2238	11	5736.5
2	154	12	2324	11	5212
3	158	13	1531	10	5900.4
4	132	10	2088	12	6277.4
5	121	12	1202	12	5736.5
6	106	10	1417	14	5736.5
7	95	14	1661	13	5031.7
8	132	14	2208	12	5736.5
9	128	13	1412	12	5736.5
10	124	17	1518	13	5900.4
11	110	10	1810	13	5212

	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Sepal Length	Sepal Width	Petal Length	Petal Width
Units	cm	cm	cm	cm
Comments				
F(x)=				
Sparklines				
11	5.4	3.7	1.5	0.2
12	4.8	3.4	1.6	0.2
13	4.8	3	1.4	0.1
14	4.3	3	1.1	0.1
15	5.8	4	1.2	0.2
16	5.7	4.4	1.5	0.4
17	5.4	3.9	1.3	0.4
18	5.1	3.5	1.4	0.3
19	5.7	3.8	1.7	0.3
20	5.1	3.8	1.5	0.3
21	5.4	3.4	1.7	0.2

- Sparkline plot properties can be customized. Double-clicking on a sparkline pops open a graph window. Double-clicking on the pop-up window opens the Plot Details dialog box where you can customize the plot. When you close the pop-up window, your customizations are applied to sparkline.



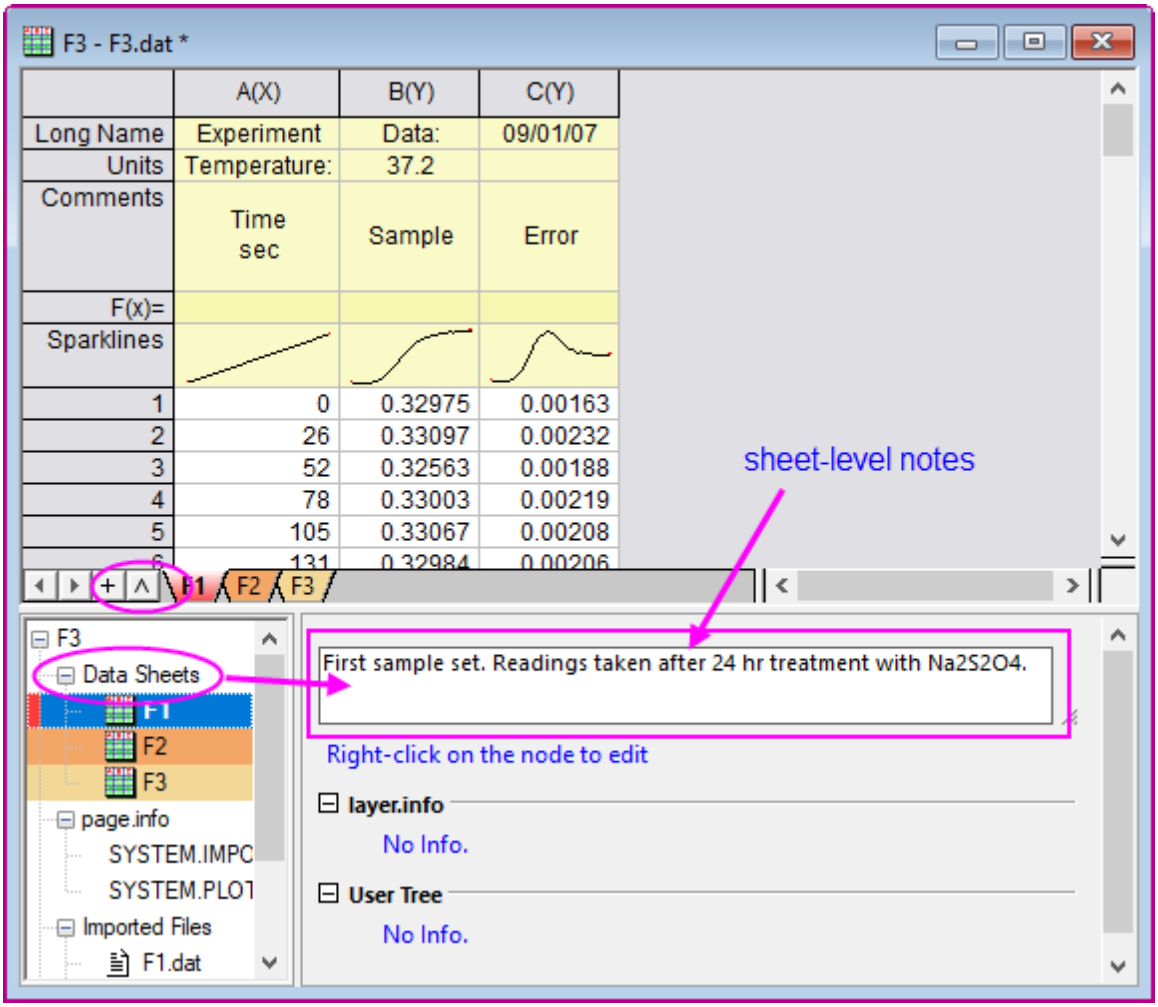
Sparklines can, in large numbers, cause Origin to act sluggishly. If your project is difficult to work with and you suspect sparklines may be contributing, you can prevent sparkline creation and hide existing sparklines in the project using system variable **@SPK**. Additionally, you can delete sparklines from the current project using **delete -spk**.

8.1.7 The Workbook Organizer

As mentioned, the workbook commonly stores metadata, some of which is visible in the column label rows. Other metadata may be hidden in the workbook. Such hidden metadata might include things like import file path and name, date and time of data import, file header information not written to the column label rows, variable names and values, etc. This hidden metadata can be viewed in the **Workbook Organizer** panel.

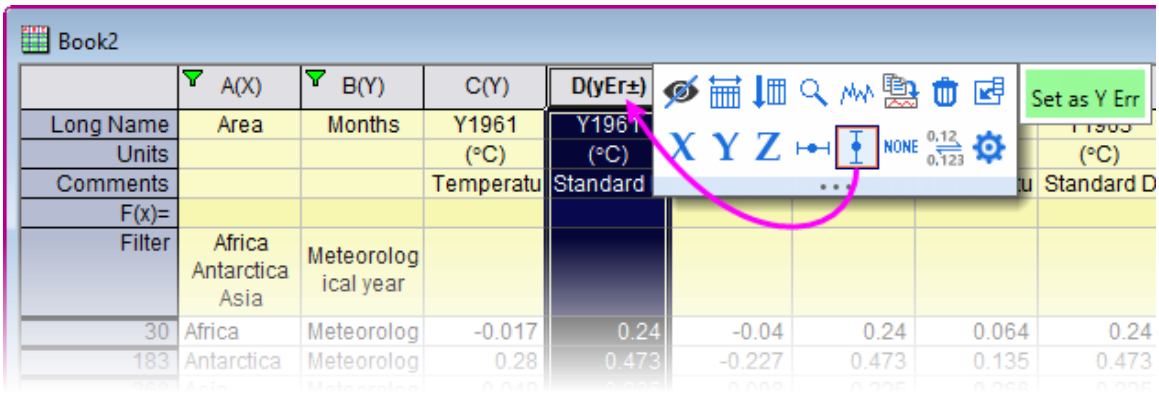
To show (or hide) a workbook's Organizer panel:

- Click the **Show/Hide Organizer** button on the workbook button bar.
- Right-click on the workbook title bar and select **Show Organizer**



8.1.8 Managing Workbooks with Mini Toolbars

A number of common book-, sheet-, column and cell-level properties can be set or toggled ON/OFF with a **Mini Toolbar** button.



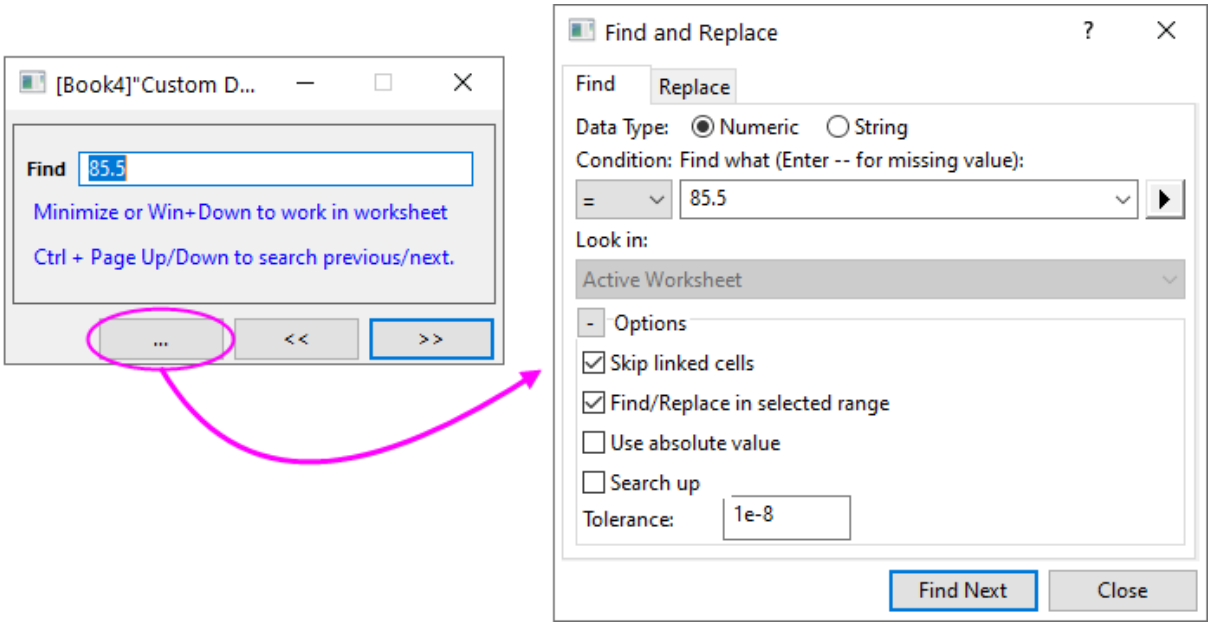
- To see which tools are available, make a worksheet selection and then hover on your selection.

- Page-level formatting options are shown by hovering in the upper-left corner of the sheet or near the window margins in the gray area to the right of the worksheet columns.
- Go here for a full list of worksheet Mini Toolbars.

8.1.9 Find and Replace in Worksheets



- Clicking **Find** opens a small dialog for searching the current worksheet selection.
- Small dialog supports string or numeric, forward and backwards search.
- While the dialog is minimized, you can edit within the selection or press CTRL + Page Up/Page Down to search backwards or forwards; or change the worksheet selection and restore the dialog to perform a new search.
- Click the ellipsis button (**...**) to open Origin's larger **Find and Replace** dialog.





Origin has another "Replace" tool that can be scripted: **wreplace**. To open a UI dialog, open the Script Window (**Window: Script Window**) and type **wreplace -d**. To learn about scripting options, see the X-Function documentation for wreplace.

8.2 Simple Utilities for Filling Columns with Data

Origin provides several utilities for filling a worksheet range or column, with data. The simplest of these use a menu command to fill a worksheet column with either **row index numbers**, **uniform random numbers** or **normal random numbers**. This is useful for generating quick datasets to test and try out other Origin features.

These simple procedures create a dataset in a pre-selected worksheet range or column(s):

Action	Toolbar Button	Menu Command
Fill a range or column with row numbers		• **Column:Fill Column With:Row Numbers** *or* • Right-click and select **Fill Range/Column(s) With Row Numbers**
Fill a column with uniformly distributed random numbers between 0 and 1		• **Column:Fill Column With:Uniform Random Numbers** *or* • Right-click and select **Fill Range/Column(s) With Uniform Random Numbers**
Fill a column with normally distributed random numbers		• **Column:Fill Column With:Normal Random Numbers** *or* • Right-click and select **Fill Range/Column(s) With Normal Random Numbers**
Fill a column with a patterned or random set of numbers	--	• Right-click and select **Fill Range/Column(s) With A set of Numbers...**
Fill a column with a patterned or random set of Date/Time Values	--	• Right-click and select **Fill Range/Column(s) With A set of Date/Time Values...**

Fill a column with arbitrary set of Text&Numeric values	--	• Right-click and select **Fill Range/Column(s) With Arbitrary set of Text&Numeric values...**

The **auto fill** feature can be used in filling column label rows and the worksheet data cells:

To use auto fill to *extend* a pattern in the data across a range of cells (numeric data only):

1. Select a contiguous block of cells and move the mouse cursor to the bottom right corner of the selection.
2. When the cursor becomes a "**+**", hold down the **ALT** key and drag the mouse to the bottom or the right.

To use auto fill to *repeat* a pattern in the data across a range of cells (text or numeric data):

1. Select a contiguous block of cells and move the cursor to the bottom right corner of the selection.
2. When the cursor become a "**+**", hold down the **CTRL** key and drag the mouse toward the bottom or to the right.



Tips of data selection methods:

- When selecting a range of worksheet data, press Ctrl + click or Ctrl + drag, to deselect unwanted cells.
- Select a column and press Ctrl + Shift + RIGHT arrow to extend selection to the the last occupied column. Select a row and press Ctrl + Shift + DOWN arrow to extend selection to the last occupied row.

Datasets can also be generated quickly using **LabTalk** script. As an example:

1. With a new worksheet active, open the **Script Window** from the **Windows** menu, and copy-paste the following lines of script code into that window:
2.

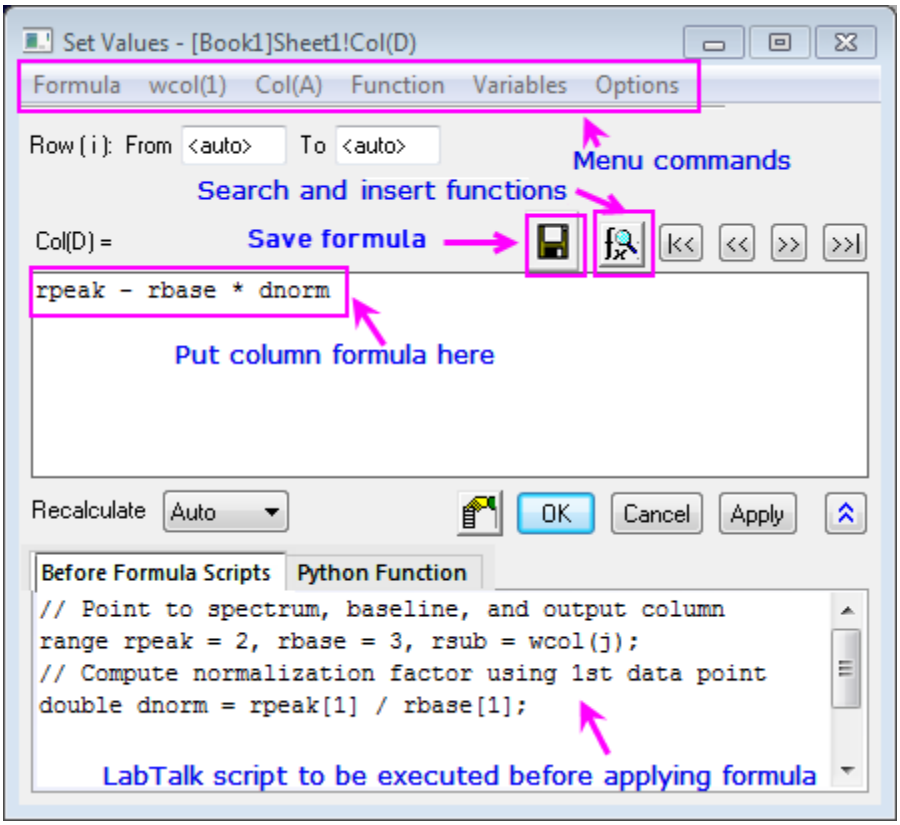
```
col(1)={0:0.01:4*pi};

col(2)=sin(col(1));
```

3. Highlight the two lines and press ENTER to execute them. The first two columns of the worksheet will be filled with data.

8.3 Setting Column Values

The **Set Values** dialog box is used to set up a mathematical expression that creates or transforms one or more columns of worksheet data. The dialog box includes a menu bar, a control used to define output range, a tool for searching and inserting LabTalk functions into your expression, a column formula box used to define a one-line mathematical expressions, a **Before Formula Scripts** panel (usage optional) intended for data pre-processing and defining of variables used in your one-line expression and for Python users, a **Python Function** tab for defining and using Python functions which can also be used in your expressions.



Since Origin 2017, the column formula box (the upper box) in **Set Values** has supported a simplified **spreadsheet cell notation** like is used in MS Excel and Google Sheets. A cell is addressed using column Short Name + row index number (e.g. the first cell in column A -- formerly represented as "col(A)[1]" -- is now simply "A1").

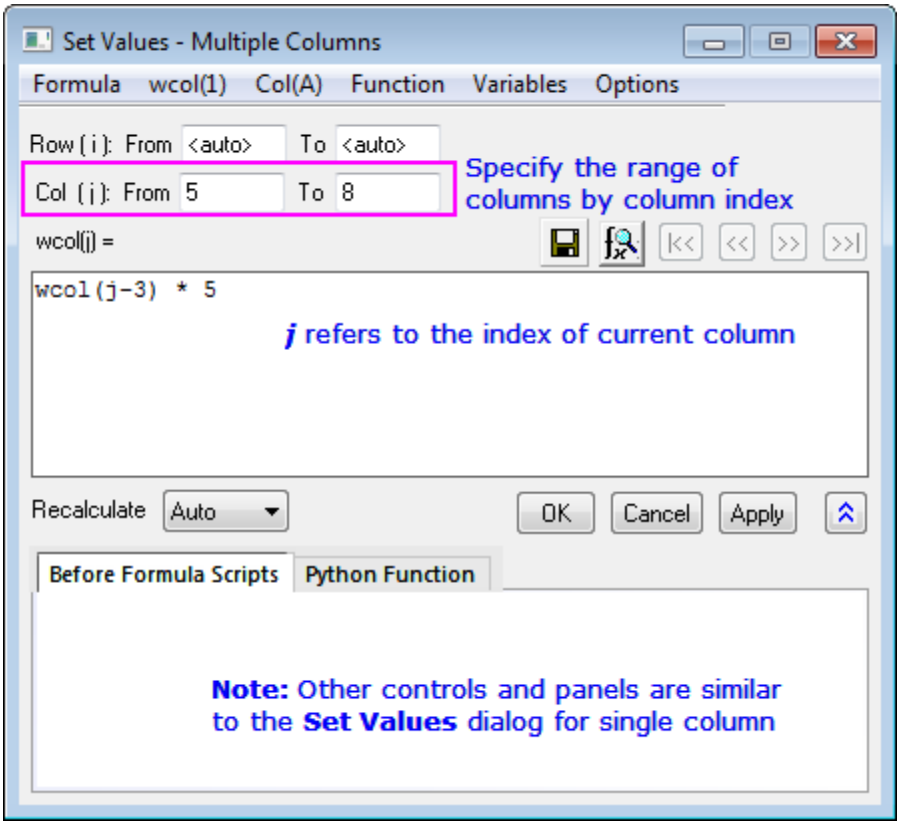
In new workbooks, spreadsheet cell notation is enabled by default. Spreadsheet cell notation can *only* be used in defining the column formula. It *cannot* be used in the **Before Formula Scripts** panel of Set Values, nor can it be used in your LabTalk scripts. Note that the "old" column and cell notation will work in spreadsheet mode, so if you are an experienced user and you prefer to use the old notation, you may enter it as you always have. For an introduction to the spreadsheet cell notation syntax as well as a contrast with the "old" methods, see **Column Formula Examples**.

To open the **Set Values** dialog box for a single column:

1. Select a worksheet column or a range of cells in a worksheet column.
2. From the menu, choose **Column: Set Column Values...** or right-click on the worksheet column and choose **Set Column Values...** from the shortcut menu.

To open the **Set Values** dialog box for multiple columns:

1. Select multiple, contiguous worksheet columns (skip no columns) or the entire worksheet.
2. From the menu, choose **Column: Set Multiple Column Values...** or right-click on the worksheet column and choose **Set Multiple Column Values...** from the shortcut menu.



8.3.1 Set Values Menu Commands

Menu Commands	• **Formula**: Load a saved formula into the column formula box. Formulas are saved using **Formula: Save** or **Formula: Save As...**. • **wcol(1)**: Use the menu to include worksheet columns in either your column formula or your Before Formula Scripts (column reference is inserted at the cursor). A Column Browser is available to help in selecting the correct columns. Columns are listed by column index. • **Col(A)**: Similar to wcol(1) menu functionality but columns are listed by column name (including Long Name, if it exists). • **Function**: Add LabTalk functions to your expressions (function name is inserted at the cursor). Note that when you hover over a function in the menu list, the function description will be shown in the Status Bar. When a function is selected, its description will be displayed in a pop-up Smart Hint. • **Variables**: Add a variable or a constant to **Column Formula** or **Before Formula Scripts**; Add range variables (including by selection) or file metadata, to **Before Formula Scripts**.

	• **Options**: Allow direct editing of column formula in worksheet **Formula** row; add a comment about the column formula; or preserve text in Set Values columns (do not treat as text as missing values).
Column Formula	• Add a single line expression for generating data. Functions, conditional operators and variables can be used.
Before Formula Scripts	• LabTalk scripts to be executed before the expression in the column formula box is executed.
Python Function	• Define and use Python functions in your expression.



Access to Origin's built-in functions:

- The **Set Values** dialog and the **F(x)=** cell get **Auto Complete** support. Begin typing to see a list of possible functions.
- Additionally, you can find and insert a function from the **Functions** menu in **Set Values** dialog. When you mouse over one of the functions in the sub-list of **Function** menu, a one-line tooltip is displayed in the Status Bar. If you select the function, a Smart Hint appears with a more detailed explanation and a link to the full function description, syntax, examples, etc.
- Additionally, you can click the **Search and Insert Functions** button to search for available functions by keyword and, once found, insert the function into your expression. Note that the **Search Functions** dialog can also be opened directly from menu **Tools: Search Functions**.

To learn more, see **Set Column Values - Quick Start**

8.3.2 The "F(x)=" Worksheet Column Label Row

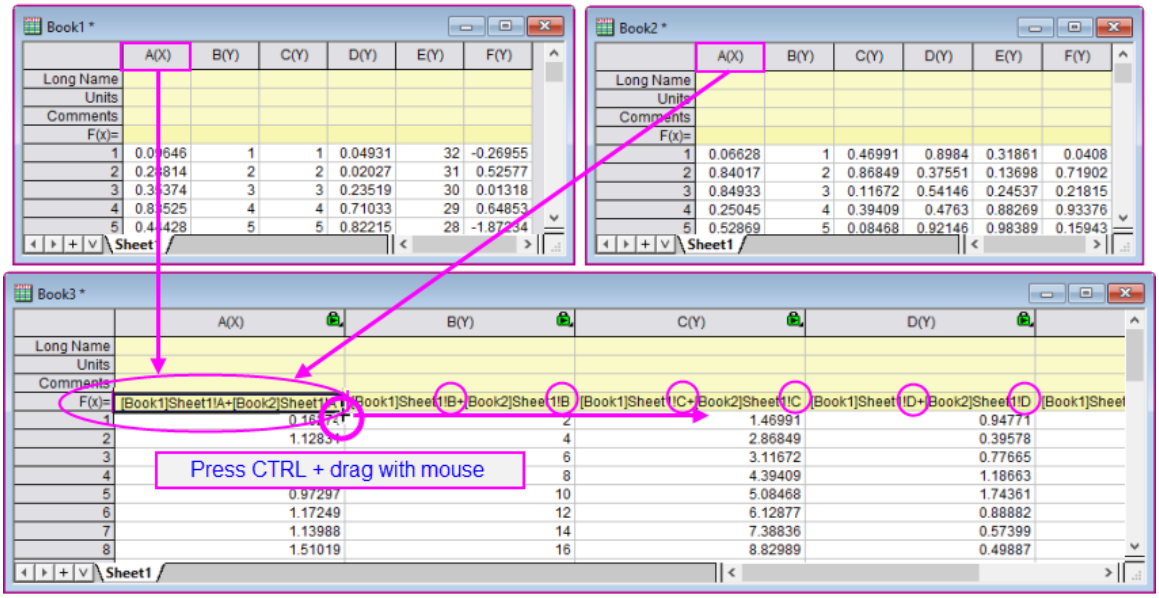
For simple expressions, you can use the **F(x)=** row to set column values. Any expression you enter here is directly entered into the **Set Values** dialog and *vice versa*. Note that the simplified spreadsheet cell notation that works in the formula box in Set Values also works in **F(x)=**:

1. Double-click in a cell in the **F(x)=** column label row.
2. Enter an expression to enter output in the data column below.

	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Wavelength	Intensity	Wavelength	Intensity
Units	nm	arb. unit	nm	arb. unit
F(x)=			A + xcf	B + ycf
Correction Factor	5.30	-152.68		
1	189.41	0	194.71	-152.68
2	189.77	155.88	195.07	3.2
3	190.13	156.44	195.43	3.76

Ease of use to the F(x)= label row:

- The Auto Complete hint enables when you enter a formula in **F(x)=** cell and **Set Values** dialog. If you prefer not to use Auto Complete, you can disable it by setting system variable **@FAC=0**.
- **Autofill** is supported for column formulas entered in **F(x)=** cell. That is, the formula will auto-adjust to use a sequence of new input datasets when autofill. To use, hover at the lower right corner of the cell and when the cursor becomes a "**+**", press Ctrl and drag to the right with your mouse.



8.3.3 Set Column Values Tutorials

Tutorial 1: A Quick Units Conversion using F(x)=

1. Start with a new workbook and import the file **\Samples\Graphing\WIND.DAT**.
2. We will assume that column B contains Speed values in miles per hour (MPH). Click on the column heading for column C, then right-click and choose **Insert**. Origin inserts a new column C and moves Power values to column D.
3. Now, we'll convert the MPH values in column B to kilometers per hour (KPH). Double-click in the **F(x)=** cell of column C and enter

```
B*1.6
```

and press Enter. Column C is filled with values in units of KPH.

Tutorial 2 : Computing Moving Average and Moving Standard Deviation

1. Import the file **Samples\Signal Processing\fftfilter1.DAT**.
2. Add two more columns to the worksheet by clicking the  twice.
3. Click on the header of the 3rd column to select it, then right-click and select **Set Column Values...** from the context menu.
4. In the **Set Values** dialog, enter the following in the upper panel:

```
movavg(B,5,5)
```

and press **Apply**. Column 3 is filled with an 11-point moving average of the data from column B (note that you can insert functions such as **movavg** from the **Function** menu of the Set Values dialog box).

5. Click the **>>** button above the edit box to switch to the 4th column.
6. In the edit box for the 4th column, enter the formula:

```
movrms(B,5,5)
```

and press **OK**. This 4th column will be filled with root-mean-square (RMS) values, using a window size of 11 at each point.

Tutorial 3: Set Values for Multiple Columns

1. Create a new project by clicking the **New Project** button  on the **Standard** toolbar.
2. Click the **Import Multiple ASCII** button  to import the files *F1.dat* and *F2.dat*

in the *<Origin Folder>\Samples\Import and Export* path. In the **impASC** dialog, set **Multi_File (except 1st) Import Mode** to **Start New Books** and click **OK**.

3. Two workbooks are created, named as F1 and F2. Click the **New Workbook** button  on the **Standard** toolbar to create another workbook.
4. With the 3rd workbook active, click the **Add New Columns** button  to add a column. Highlight all columns and select **Column: Set Multiple Columns Values** from the main menu or right-click the columns and select **Set Multiple Columns Values** from the shortcut menu to open the **Set Values** dialog box.
5. Expand the bottom panel by clicking the Show Scripts button . Enter this script in the **Before Formula Scripts** edit box,

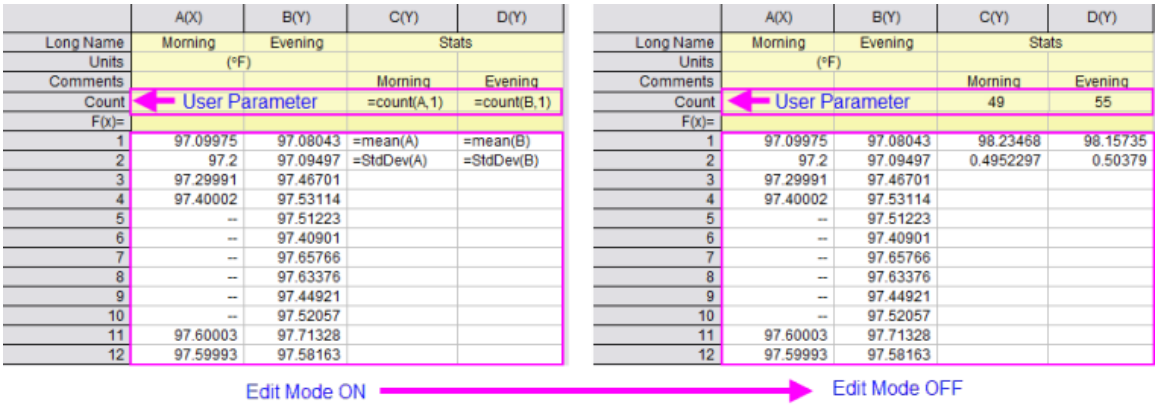
```
range r1=[F1]F1!wcol(j); //"j" is the column index.

range r2=[F2]F2!wcol(j);
```

6. Enter **(r1+r2)/2** in the **Column Formula** edit box
7. Select **Options: Direct Edit Formula Cell** to clear this option.
8. Select **Options: Formula Text...** and enter *(F1+F2)/2* in the **Formula Text** dialog, then click **OK**.
9. Click the **OK** button in the **Set Values** dialog box. You will see the results in the worksheet, and *(F1+F2)/2* will display in the **F(x)=** column label row instead of the formula.

8.4 Setting Cell Values

Origin supports cell-level expressions similar to those used by spreadsheet programs. Cell-level expressions which return a single value (numeric, string or date/time) can be entered into any worksheet data cell or into cells in a User-Defined Parameter row of the column label row area. When Edit Mode (**Edit: Edit Mode**) is toggled on, cell formulas display. When Edit Mode is toggled off, the formula result is displayed. Cell content can be edited regardless of Edit Mode state.

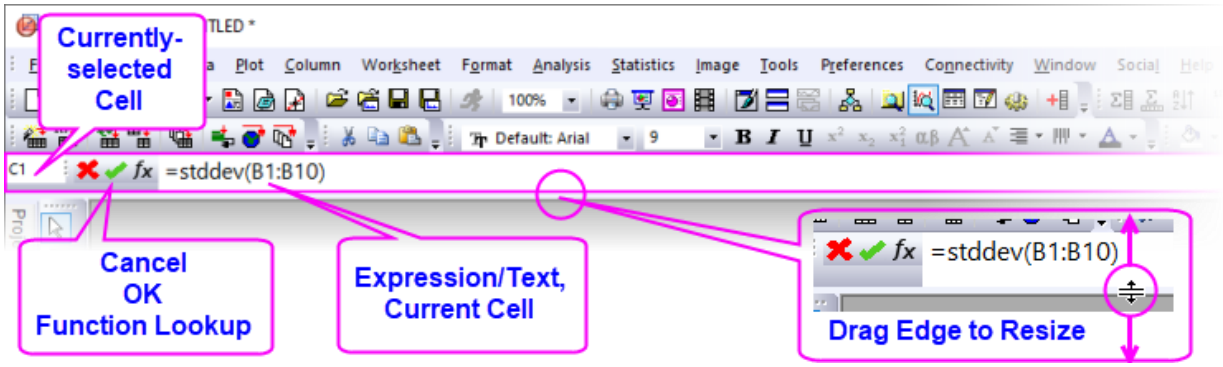


- To use cell formulas, **Spreadsheet Cell Notation** must be enabled (it is by default).
- Cell formulas begin with an equal sign (e.g. =B1 - C1).
- Cell formulas can return a numeric, a string or a date-time value.
- Cell formulas can incorporate cell references, variables, operators, LabTalk-supported functions and constants.
- Cell formulas can reference values in other sheets or books.
- Cell formulas can be extended to other cells by dragging with your mouse.
- The **Auto Complete** hint -- which shows as soon as you enter the first character beyond "=" -- applies to the **Set Values** dialog, the **F(x)=** label row and **cell formulas**.
- There is a periodic refresh performed on cell calculations. If the sheet contains large numbers of cell formulas, this can slow your work. System variable **@SCNT** is added to manage the recalculation time (default is *5000* millseconds) so if the continual recalculation is annoying, you can set a longer time period. Later, if you need to force a refresh, you can open the Script Window/Command Window and run **@SCNT = -1**.

To learn more, see **Using a Formula to Set Cell Values**.

8.4.1 The Formula Bar

When creating cell formulas, or column formulas using **F(x)=**, the **Formula Bar** makes it easier to find and insert functions, select cell ranges and view and edit expressions, particularly long expressions that exceed cell width.



To enter an expression into a cell (data cell or F(x)=), click on the cell, then:

1. Enter an "**=**" and type your expression; or click the  button to open the **Search and Insert Functions** dialog.
2. Search for the desired function then double-click on it to insert it into your Formula Bar expression.
3. Interactively select your data range going to the worksheet and (a) clicking on a column heading or (b) dragging to select a range of cells.
4. When your expression is complete, click the  button or press Enter.



Note that you can drag the edge of the **Formula Bar** to resize it. You can also change the default font size by changing the value of LabTalk system variable **@FBFS** (default is "130").

8.4.2 Set Cell Values Tutorials



Tutorial 1: Extending a cell formula to other cells

1. Click the **New Workbook** button  to open a new book.
2. Click on the column A heading to select, then right-click and choose **Fill Column with Row Numbers**.
3. Click on cell B1 and enter:

```
=A1+A$1
```

4. Press ENTER. This adds the value in A1 to the value in A1.
5. With the cell still selected, hover on the selection handle in the lower-right corner of the cell and when it looks like a "**+**", double-click to extend the cell formula to the bottom of the column.
6. Click the **Add New Columns** button  to add column C.
7. Click on the Cell in C1 but this time enter (omitting the "**$**"):

```
=A1+A1
```

8. Press ENTER. This adds the value in A1 to the value in A1.
9. With the cell still selected,hover on the selection handle in the lower-right corner of the cell and when it looks like a "**+**", double-click to extend the cell formula to the bottom of the column. Note that this time, the resulting values are different.
10. Click **Edit: Edit Mode** to display the underlying cell formulas. Note that the "**$**" in column B "locked" the second cell *A1* reference so that it didn't change but that the *A1* reference in column C changed with the row index number as we extended the cell calculation to other cells.

=A1+A$1	=A1+A1
=A2+A$1	=A2+A2
=A3+A$1	=A3+A3
=A4+A$1	=A4+A4
=A5+A$1	=A5+A5
=A6+A$1	=A6+A6
=A7+A$1	=A7+A7



Tutorial 2: Quickly finding maximum values in multiple columns of data using special keyword "This"

The only place where you can use cell formulas in the worksheet column label rows (worksheet header rows), is in a **User Parameter** row.

1. Create a new workbook and then choose **Data: Import From File: Single ASCII** and import the file **\Samples\Import and Export\S15-125-03.dat**.
2. With your mouse, hover just to the left of the **F(X)=** row label and when the pointer becomes an arrow, right-click and **Add User Parameters**.
3. In the dialog box that opens, enter "MaxValue" and click **OK**.
4. In column **A(X)**, in the **MaxValue** cell, enter:

```
=Max(This)
```

5. Click outside the cell and cell should now display "10".
6. Click back on this cell, then grab the selection handle in the lower right corner of the cell and drag to the right to extend the cell formula to MaxValue cells in columns **B(Y)**, **C(Y)** and **D(Y)**. All MaxValue cells should now display the maximum values in their respective columns.

Tutorial 3: Use a column label row value in a cell calculation

All data in the worksheet column label rows, including **User Parameter** rows, is stored as string data. To use a "number" stored in a column label row in a cell calculation, you must convert the string to a numeric value. In the following example, we use the LabTalk **value()** function to convert column label row data to a numeric so that it can be used in a cell calculation:

1. Create a new workbook and then choose **Data: Import From File: Single ASCII** and import the file **\Samples\Import and Export\S15-125-03.dat**.
2. With your mouse, hover just to the left of the **F(X)=** row label and when the pointer becomes an arrow, right-click and **Add User Parameters**.
3. In the dialog box that opens, enter "Correction" and click **OK**.
4. In column D, enter the value "0.2" into the Correction cell.
5. Click the **Add New Columns** button  to add column E.
6. In cell E1, enter:

```
=D1+value(D[Correction]$)
```

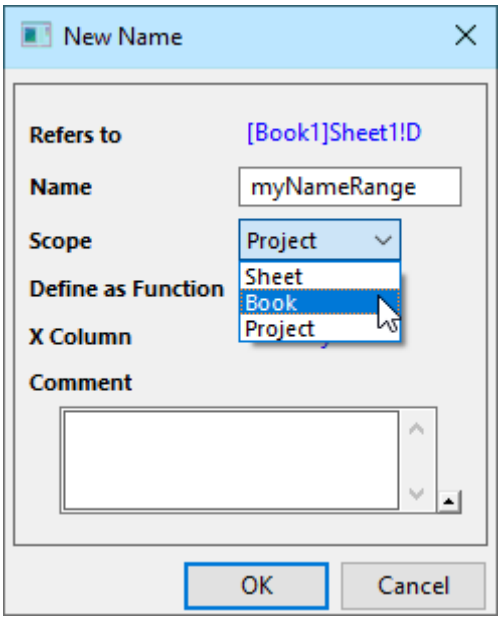
7. Press ENTER. This converts the Correction value to a numeric and adds the numeric to the value in cell D1. The cell should display *101.9*.

NOTE: The "**$**" in the above expression does not function to create an absolute cell reference as in the first example above. In this context, the "**$**" syntax is used to express a string variable stored in a user-parameter cell, before converting that string to a numeric value.

8.4.2.1 Naming Data Ranges

You can assign a name to a worksheet data range or column label rows, and use the name in cell formulas or column formulas and to define **Reference Lines** in graphs.

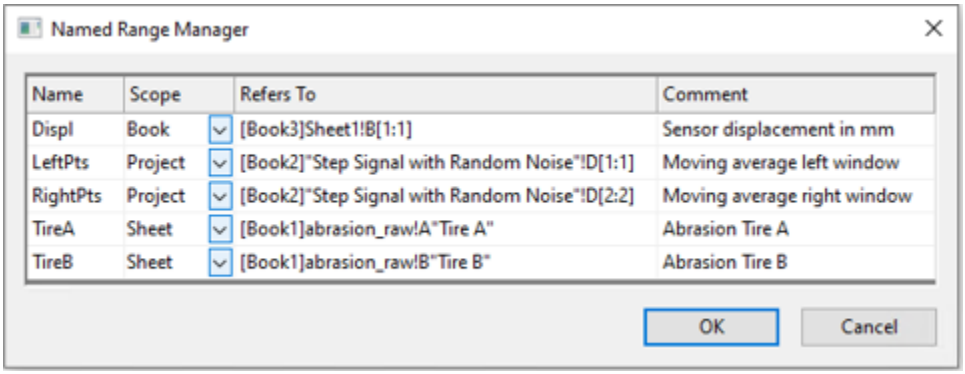
To create a named range:



1. Highlight a cell or a range of cells and choose **Data: Define Name**.
2. In the **New Name** dialog box, enter a **Name** for the selected (**Refers to**) range.
3. Assign a **Scope** to your named range.
4. *Optionally*: if you wish to use the named range to return interpolated values, enable **Define as Function** and/or add a **Comment**.

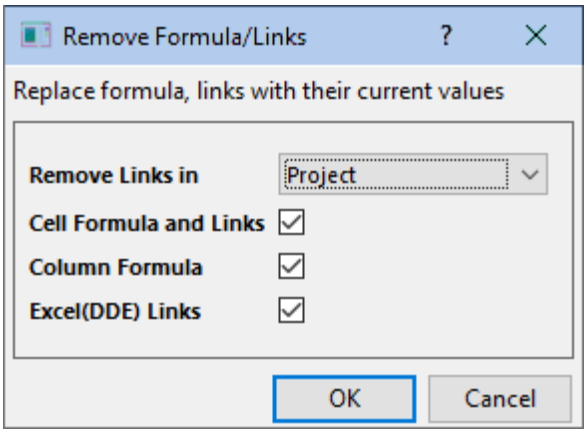
To manage named ranges:

1. With the worksheet active, choose **Data: Name Manager**.
2. Use the dialog to modify name, scope, range and comments.



8.5 Remove Formula/Links

Removing formulas and links can make it easier to share project data with colleagues without having to share such things as externally-linked (DDE) Excel files. It is also useful for significantly reducing project size before archiving data.



Things you can convert to raw numbers:

- Cell formulas
- Column formulas
- Linked cell values (e.g. values copied a report sheet and paste-linked to other worksheet cells in the project).
- DDE links (e.g. paste-linked values from an external Excel sheet).

To open the tool:

1. Click **Edit: Remove Links...**

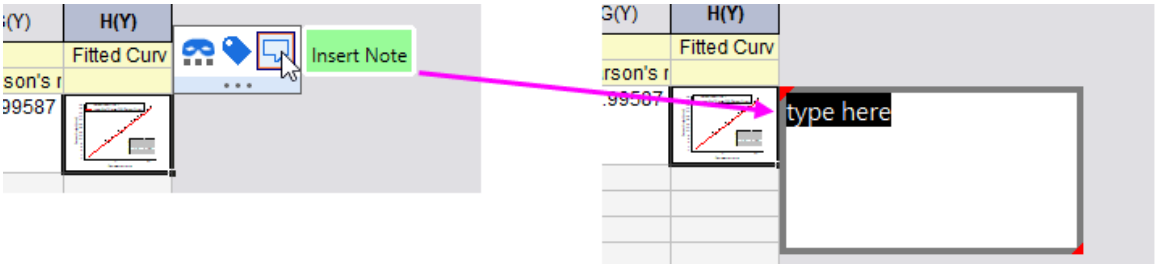
for more information, see the Origin Help file.

8.6 Cell Notes

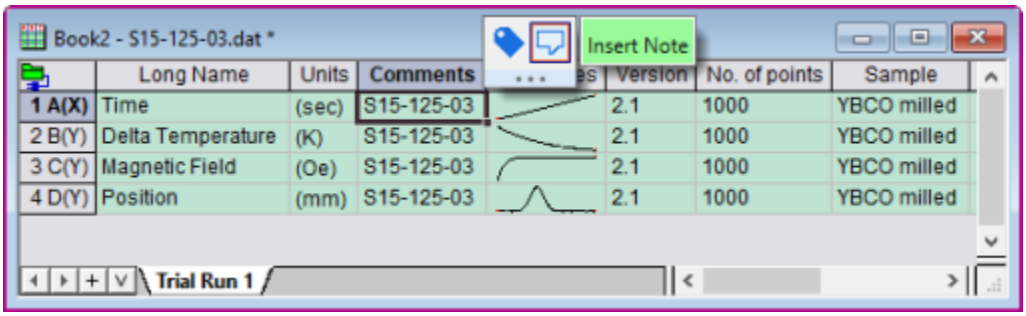
Any worksheet cell -- data row or column label row -- can contain a cell note; even those that contain data or other objects such as images or embedded graphs (**Note**: cells containing Links are not supported).

Worksheet cell Notes support **Rich Text**, meaning you can style text using Origin Rich Text syntax. In addition, you can add images and graphs, and link to worksheet cell values, report table values, etc. See **Notes Windows for Reporting**.

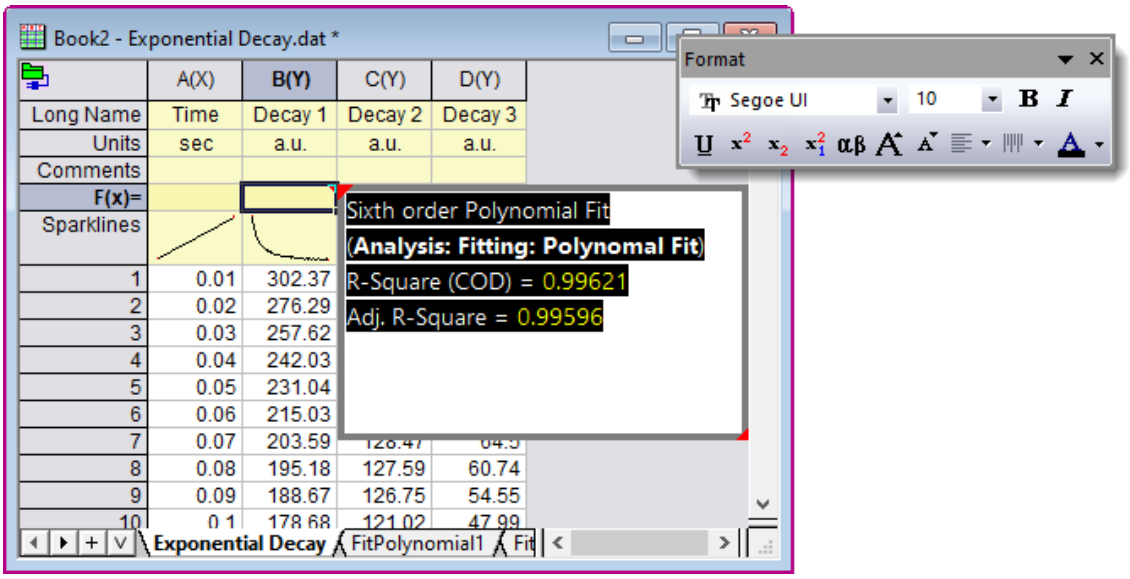
1. To add notes, select the worksheet cell and click the Mini Toolbar **Add Note** button and enter your text.



Note that **Column List View** also supports cell notes in the label row area.

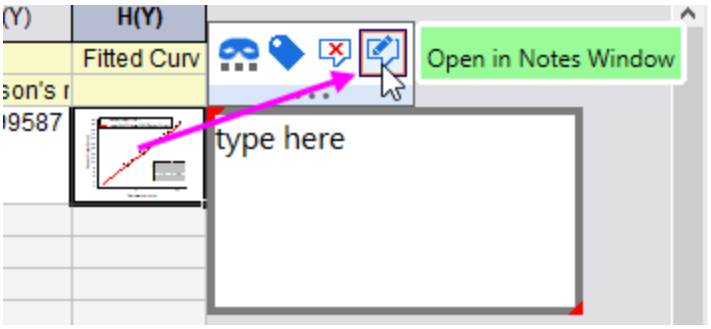


2. While editing your cell note, use **Format** toolbar buttons to format your text.

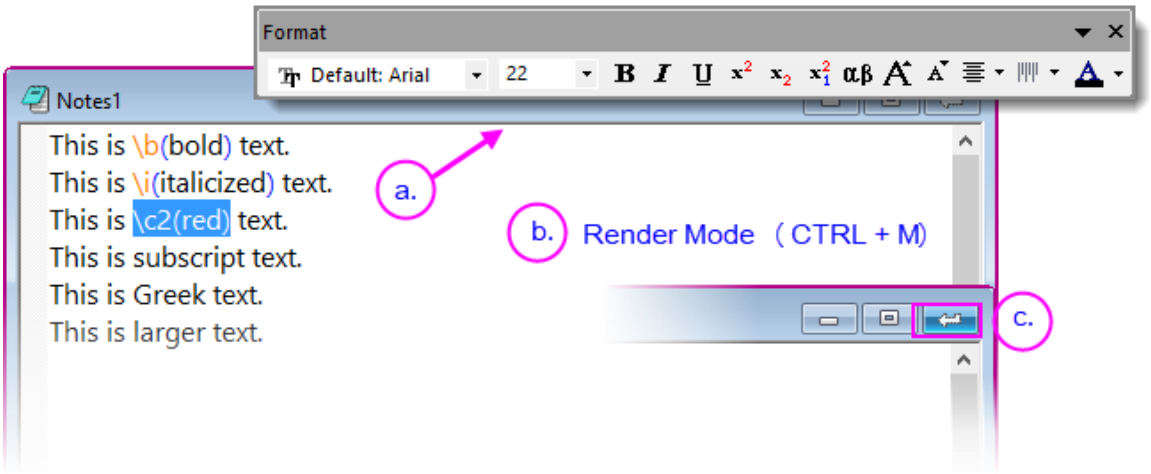


3. Note that a right-click inside the notes popup brings up a shortcut menu for inserting various Origin objects, for resizing the popup to fit added content and to **Edit Raw Text in Notes Window**.

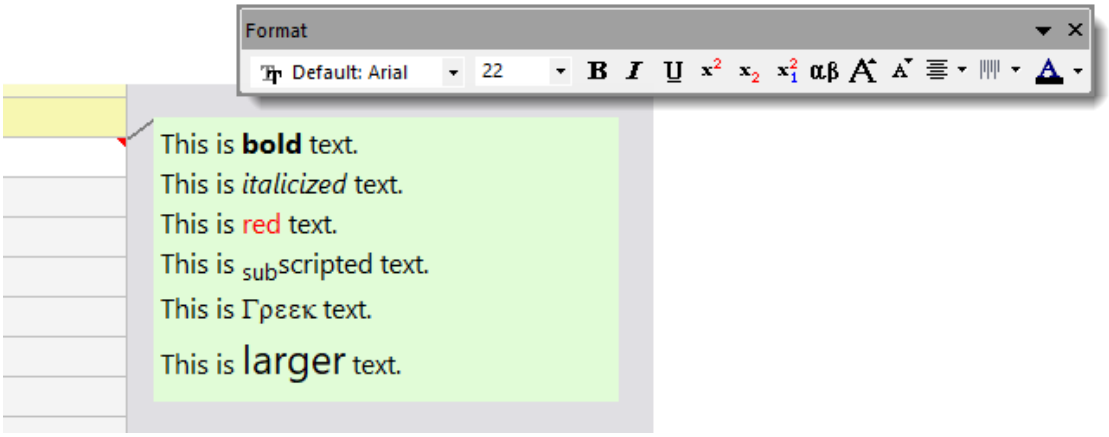
4. Alternately, you can select the cell, then click the Mini Toolbar **Open in Notes Window** button to open content in a Notes window. Rich Text is enabled by default.



5. While editing in the Notes window, use **Format** toolbar buttons (**a**) to format your text. To see your note in "Render" mode (**b**), press *CTRL + M* (**Notes: Render Mode**). To insert the finished Note into the worksheet cell, click the **Close** button (**c**).



6. The reinserted Note can be see by hovering on the worksheet cell.



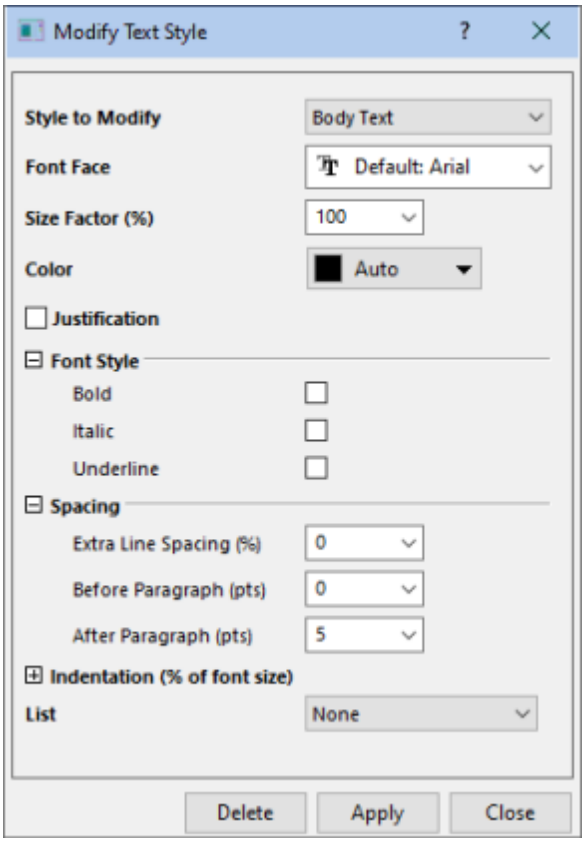
Notes:

- For text that is not assigned a paragraph style (see next section), you can use the **Font Size** control on the **Format** toolbar, to control text size. **Font Size** can be set for each window but *all* Notes windows must share a common **Font** (e.g. Segoe UI).
- Origin supports "substituting" cell Notes in graph legend and text objects using **@WN** (e.g. %(1, @WN, B, 3) for Note in col(B), 3rd cell of 1st plot's source worksheet).
- There is a system variable **@CNF** (default=*12*) for control of cell notes preview font (independent of font when opened in a Notes window).

8.6.1 Text Styles Manager

In addition to styling text with the **Format** toolbar, you can apply a simple set of styles to each line/paragraph. Manage styles with the **Text Styles Manager** dialog box.

1. With a worksheet active, choose **Tools: Text Styles Manager**.
2. Select a **Style to Modify** and **Apply** or **Close**.



Note that you can add styles by selecting <*new*> from the **Styles to Modify** drop-down list; or select a style and **Delete**.

To apply a paragraph style to Notes window text:

1. Open the cell note in a Notes window.
2. With **Render Mode** off (CTRL + M, to toggle), click on a line of text then right-click, choose **Paragraph Styles** and choose a style from the popup menu.
3. To check results, press CTRL + M (**Render Mode**).

8.7 Processing Worksheet Data

Origin provides a number of utilities for manipulating worksheet data. Most of these are found on the **Worksheet** menu while some are on the **Edit**, **Column** or **Analysis** menus (note that a worksheet must be active). Some utilities are available from a shortcut menu: select your data and right-click.

Utility	Menu Access
• Sorting Data	**Worksheet: Sort Range** **Worksheet: Sort Columns** **Worksheet: Sort Worksheet** **Worksheet: Sort Columns by Label**

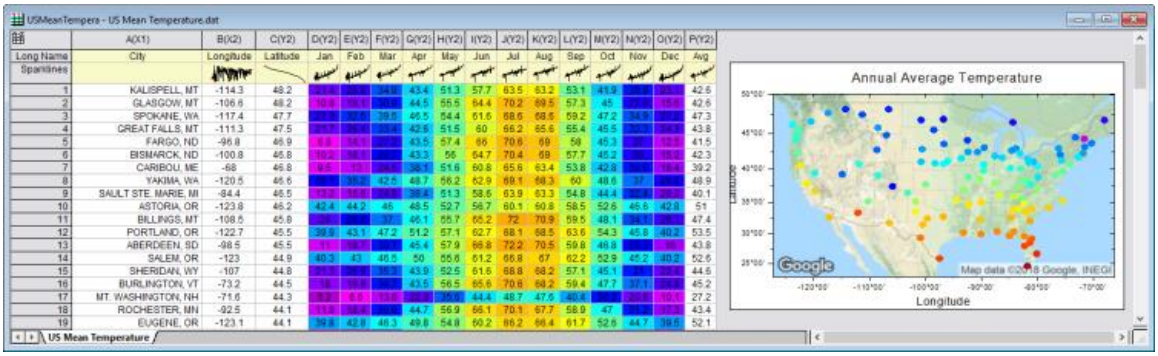
• Find • Replace • Go To (sheet row/column) • Select/Hide Columns	**Edit: Find in Project** **Edit: Find in Sheets** **Edit: Replace** **Edit: Go To** **Edit: Select**/**Column: Select Columns**
• Hide Column • Hide Rows	**Column: Hide/Unhide Columns** **Hide/Unhide Rows** (shortcut menu only)
• Move Columns • Swap Columns	**Column: Move Columns** or **Column** toolbar. **Column: Swap Columns**
• Query Worksheet Data	**Worksheet: Worksheet Query**
• Copy Columns to (new locations)	**Worksheet: Copy Columns to**
• Append Worksheet	**Restructure: Append Worksheet**
• Join Worksheets	**Restructure: Join Worksheets by Column** **Restructure: Join Worksheets by Label**
• Split Columns • Split Worksheet • Split Workbooks	**Restructure: Split Columns** **Restructure: Split Worksheet** **Restructure: Split Workbooks**
• Split Cell Strings to Multiple Columns	No menu access. To open the dialog box: 1. Click **Window: Script Window**. 2. At the cursor, type `text2cols -d` and press Enter. For more information, see this link
• Stack Multiple Columns into One with Grouping	**Restructure: Stack Columns** **Restructure: Unstack Columns** **Restructure: Stack Worksheets**

• Unstack Grouped Data into Multiple Columns • Stack Columns Common to Multiple Sheets by Label	
• Summarize Data with Pivot Table	**Restructure: Pivot Table**
• Filter data by defining conditions on one or more columns	**Column: Filter** menu, or **Worksheet Data** toolbar ***See Also*: Data Masking**
• Data Reduction	**Worksheet: Remove/Combine Duplicated Rows** **Worksheet: Reduce Columns** **Worksheet: Reduce Rows** **Worksheet: Reduce to Evenly Spaced X** **Worksheet: Reduce Duplicate X Data** **Worksheet: Reduce by Group**
• Worksheet Transpose	**Restructure: Transpose**
• Convert Worksheet Data	**Convert to XYZ** **Convert to Matrix**
• Apply Conditional Formatting to Worksheet Cells	**Worksheet: Conditional Formatting: Highlight** **Worksheet: Conditional Formatting: Heatmap** **Worksheet: Conditional Formatting: Duplicates**
• Reverse Order	**Column: Reverse Order**

8.8 Conditional Formatting of Worksheet Data

In addition to the above worksheet data utilities, the Origin worksheet supports **Conditional Formatting**. Conditional Formatting has three modes:

- **Highlight** mode opens a dialog box with controls to apply color to worksheet cells based on one or more conditions (e.g. "equal to", "not equal to", "text that contains", etc).
- **Duplicates** mode opens a dialog box with controls to apply to worksheet cells that contain duplicate values.
- **Heat Map** mode opens a dialog box with controls to apply a color map to cells based on worksheet values. The worksheet Heat Map is zoomable and scrollable, making it easy to get a "big picture" overview of data variation in three dimensions.



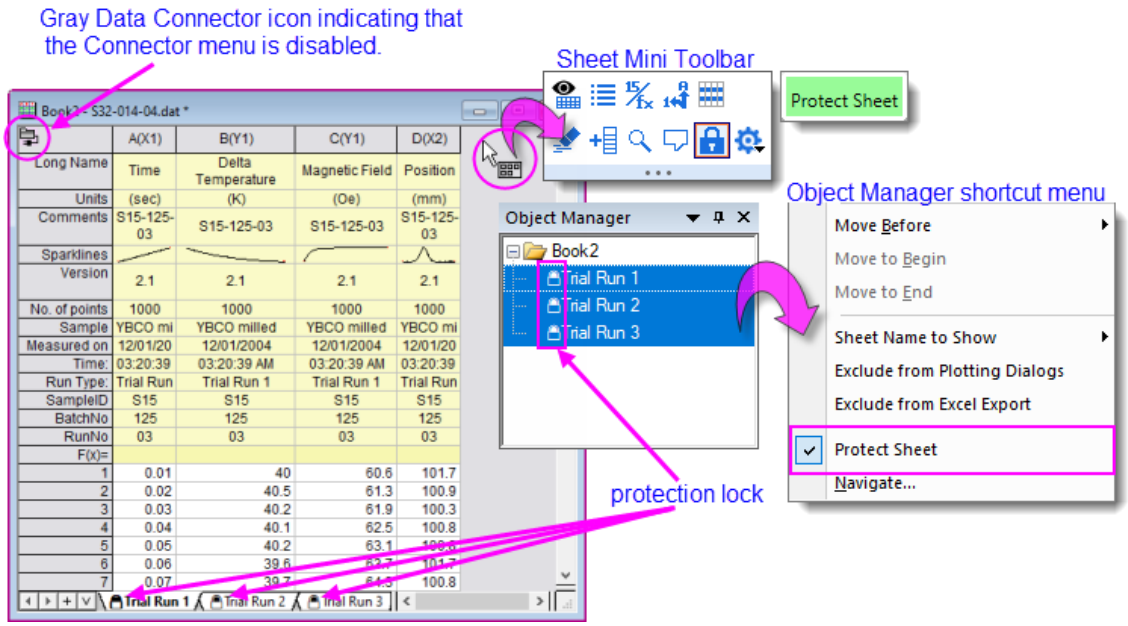
Manage conditional formatting in the active sheet using the **Conditional Format Manager**.



When using 3-Color Limited Mixing to apply color to worksheet heatmaps, you can now precisely control where the middle color falls. Specify by **Percentile**, by **Percent** or by **Value**.

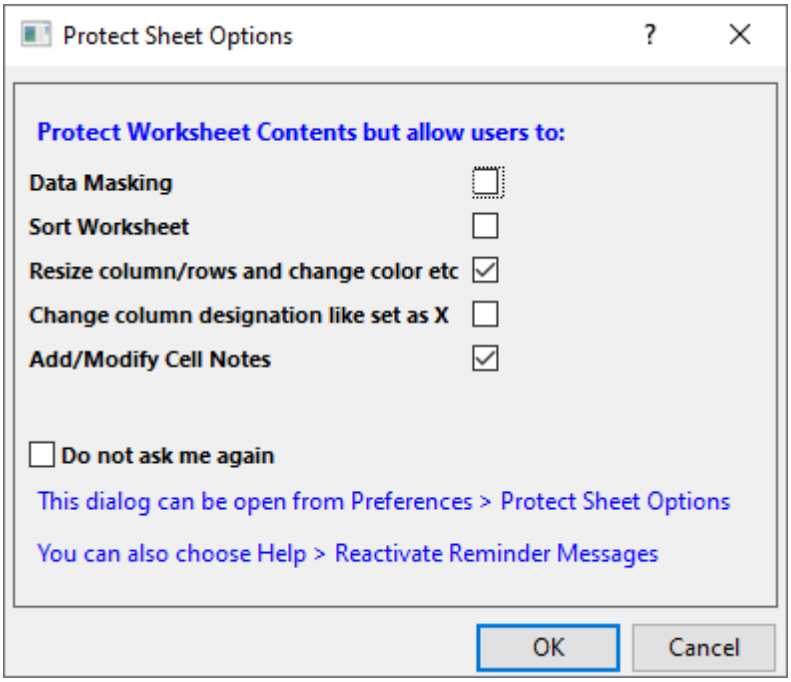
8.9 Protecting Worksheet Data

You can apply blanket protections to one or more worksheets and, in the process, provide for a few exceptions.



- Click the sheet-level Mini Toolbar **Protect Sheet** button.
- Press Ctrl/Shift + select on multiple worksheet tabs then right-click and **Protect Sheet**.
- Press Ctrl/Shift + select on multiple sheets in Object Manager then right-click and **Protect Sheet**.

Any of these actions produces a **Protect Sheet Options** dialog so that you can set some exceptions. This dialog is also available by clicking **Preferences: Protect Sheet Options**.

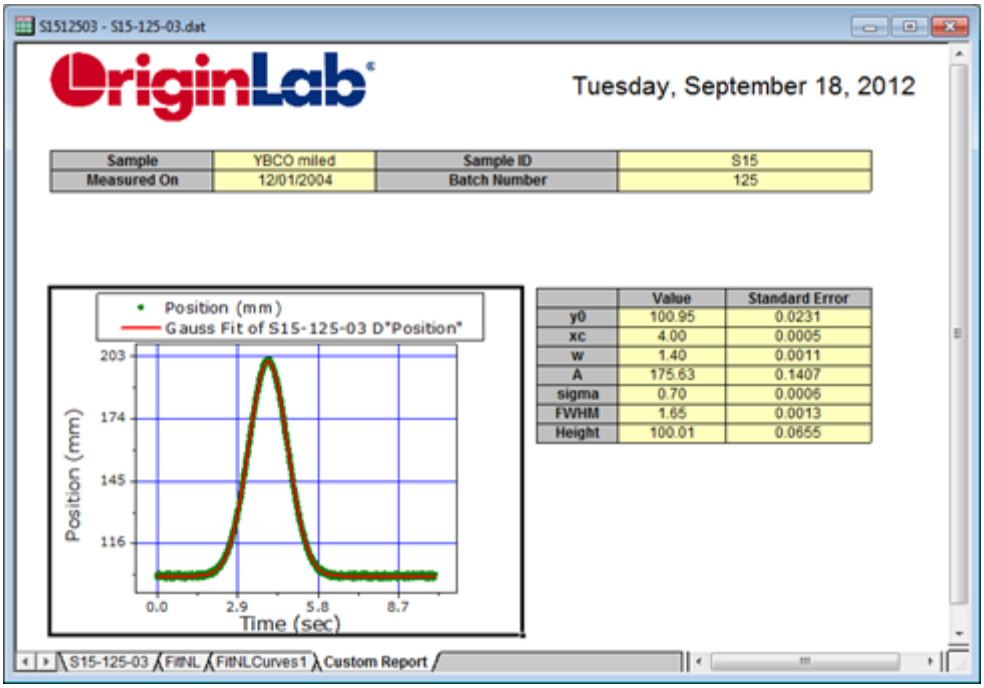


1. To remove protections from one or more worksheets, select the worksheets and remove the check mark beside the **Protect Sheet** Mini Toolbar button; or from the Object Manager or sheet tab shortcut menus' **Protect Sheet** option.

8.10 Workbooks for Analysis and Reporting

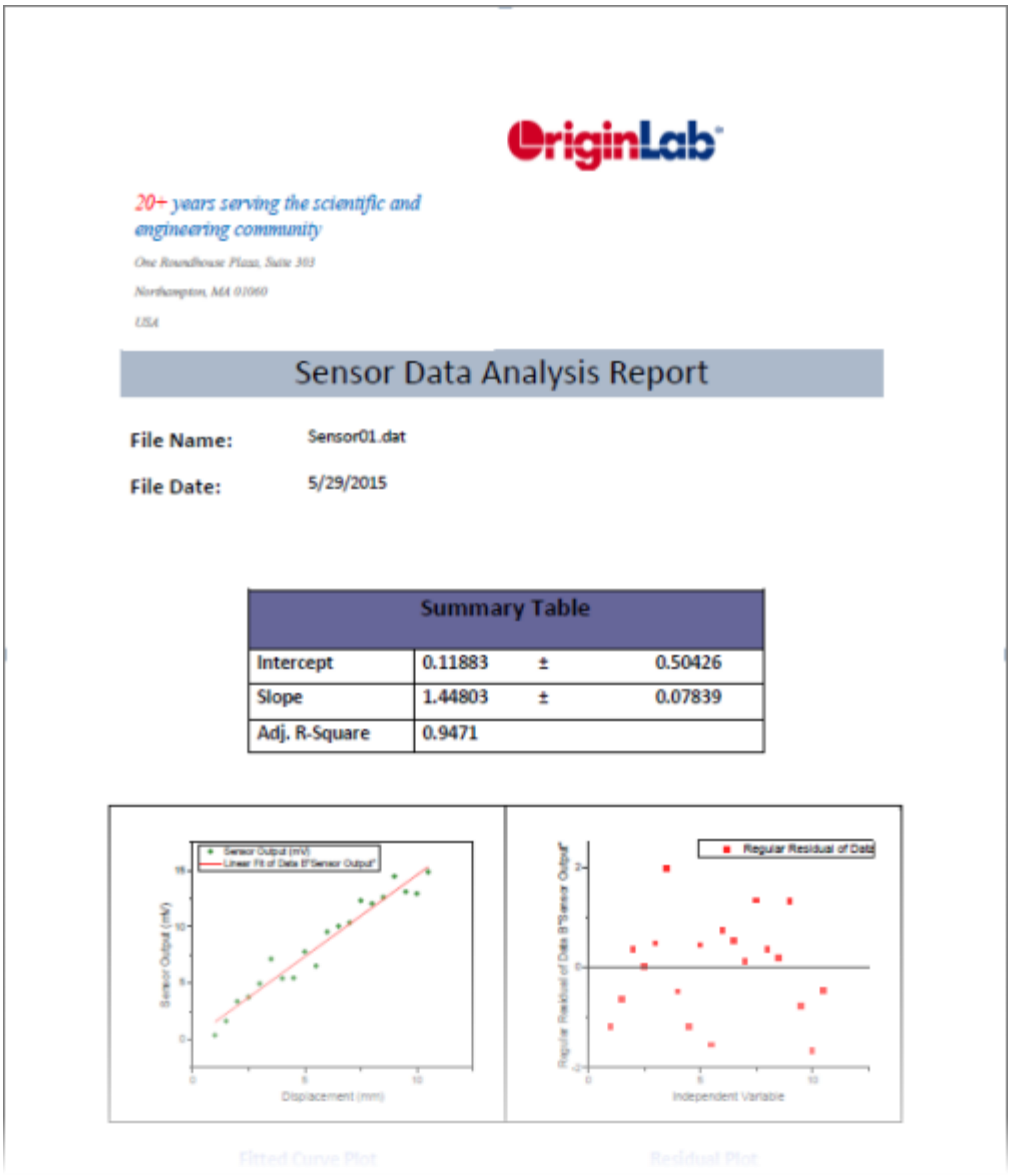
Apart from text and numeric data, the workbook can contain various other types of information -- images, graphs, notes and matrices; links to cell values in other books, project variables, documents or web pages; plus, import file metadata, variables and scripts -- making the workbook a flexible medium for collecting research data or for creating custom reports.

Further, as we will see, the workbook can "store" a complex sequence of analysis operations -- for instance, the application of a data filter, plus a fitting operation on the filtered data, combined with a customized plot of the results -- into something that we call an **Analysis Template**. The Analysis Template makes it possible to automatically generate a custom report of results, simply by supplying new input data.



One attractive option for generating reports (there are others -- see the tip at the bottom of this section) is to export data to a custom **MS Word** template, and optionally, a **PDF** file. This is done by running an output-generating analysis in Origin, then associating key results with bookmarks in a Word template, and, finally, saving the workbook as an Analysis Template. To generate your report, you open the **Batch Processing** tool, point to both your Analysis Template and your Word template, run the batch process and generate your reports.

- For information on generating custom reports using an MS Word Template, see the tutorial Batch Processing with Word Template for Reporting.
- For information on batch analysis and generating custom reports, see the **Batch Analysis** section of the "How to Handle Repetitive Tasks" chapter of this Guide.





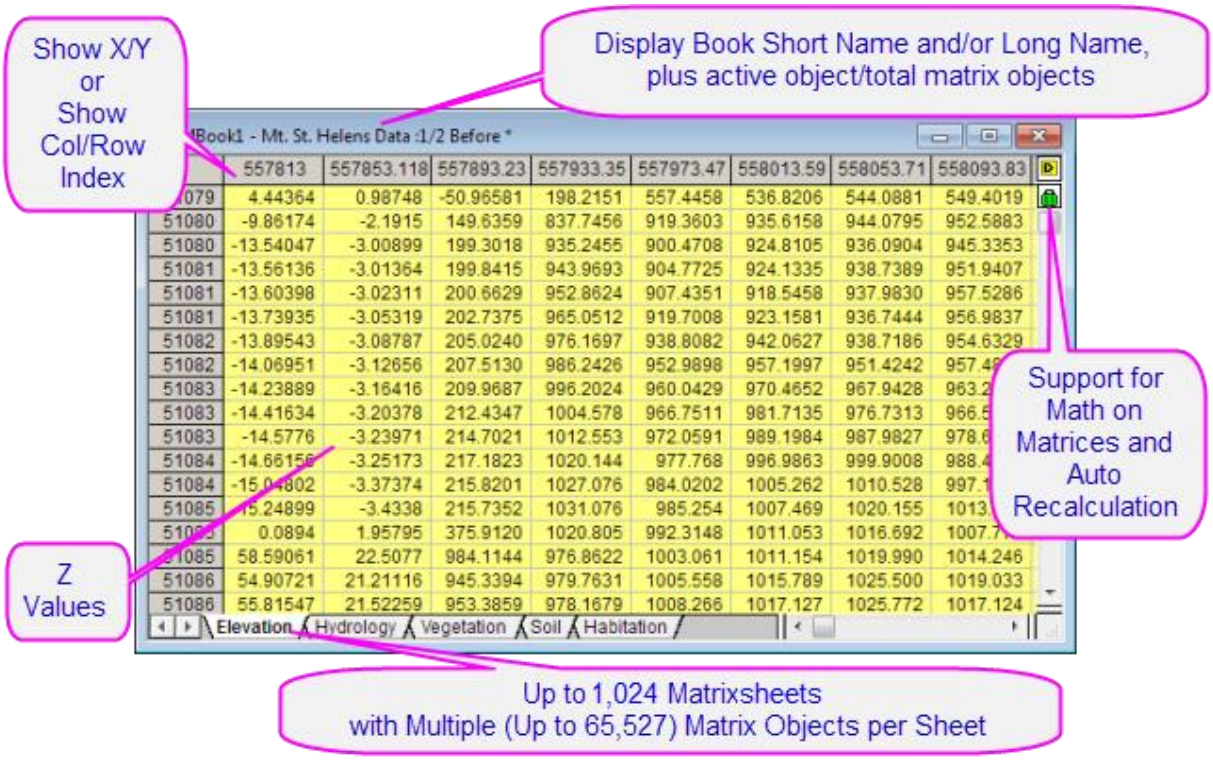
Another option for generating reports is to create **HTML reports** using Origin's **Notes** window. A Notes window can link to graphs, worksheet cells, etc., either directly or using a placeholder sheet. For more information, see HTML Reports from Notes Windows.

8.11 Topics for Further Reading

- The User Files Folder
- Origin Template Files
- What is Saved with the Workbook Template?
- The New Workbook Dialog
- Arranging the Worksheet

- Displaying Supporting Data in the Worksheet Header Rows
- Controlling How Numeric Data Display
- Dates and Times in the Worksheet
- Generating Simple Worksheet Datasets
- Column Short Name Restriction
- Using Formulae to Set or Transform Worksheet Column Values
- Using a Formula to Set Cell Values
- Simple Manipulation of Worksheet Datasets
- Inserting Graphs, Images and other Objects into Worksheet Cells
- Inserting Links into Worksheet Cells
- Inserting Variables into Worksheets
- Conditional Formatting of Worksheet Cells
- Analysis Report Sheets and Columns

9 Matrix Book Matrix Sheet Matrix Objects



9.1 Matrixbooks, Matrixsheets and Matrix Objects

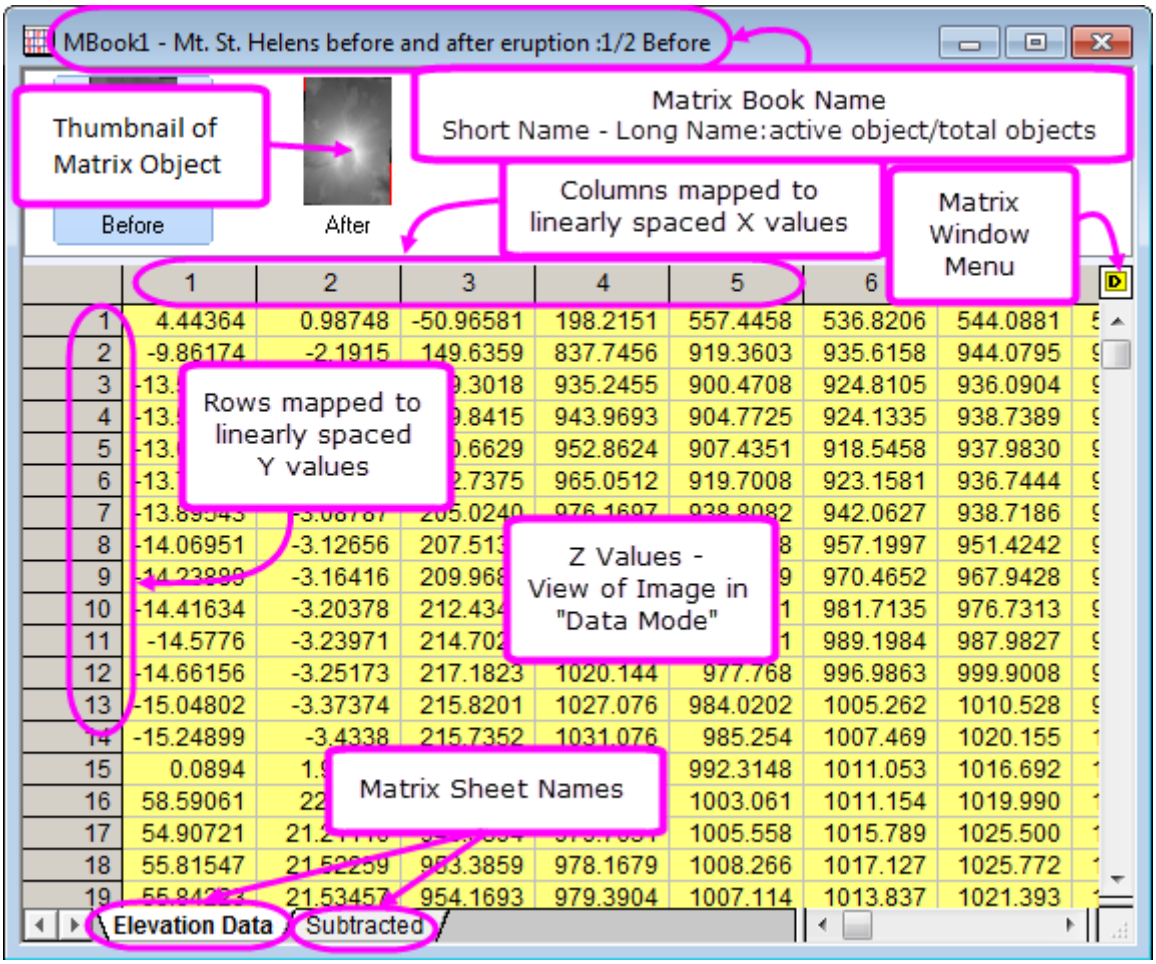
A matrix is a dataset of Z values arranged as an array of columns and rows which are linearly mapped to X and Y values. The following table summarizes some important matrixbook limits:

Maximum Number of...	32Bit OS	64Bit OS
Matrixsheets in a matrixbook **Matrix objects in a matrixsheet** **Cells in a matrix (Note)**	1024† 65,527 90,000,000	1024† 65,527 90,000,000

† > 255 sheets requires saving file to Unicode (e.g. *.opju) file format. Unicode formats not compatible with Origin versions prior to Origin 2018 SR0.

Note: The product of any combination of rows and columns must not be greater than 90,000,000.

9.1.1 Naming Matrixbooks, Matrixsheets and Matrix Objects



Matrixbook	• The matrixbook has a **Short Name** whether you display it or not. Origin uses the **Short Name** for internal operations. • **Short Names** must be unique within the project file, cannot contain spaces, must begin with a letter, consist only of alphanumeric characters (A to Z and 0 to 9), and limited to 13 characters. You can use lowercase characters and the text will appear as such, but upper and lower case are not unique characters. (You cannot name one matrix MBOOK1 and another mbook1.) • **Long Names** are optional, need not be unique within the project file, can contain spaces, can begin with a letter, a number or a special character, and the length cannot exceed 520 characters, including spaces.
Matrixsheets	• The sheet **Name** must be unique within the matrixbook and is limited to 32 characters. • Can contain spaces and numbers. • Can contain special characters except **`!%"|()[]{}<>**. • Can begin with a letter, number or allowed special character.

	• Optionally, sheet can have **Label** and **Comments**.
Matrix Objects	• By default, Origin assigns a matrix object index number to each object, as it is created. This index number cannot be changed. • You can add a name to the object by clicking on the yellow object icon - for a data matrix or for an image matrix - in the upper right corner of the matrixsheet and choosing **Rename** from the menu. Alternately, you can double-click on the matrix object number/name below the thumbnail and enter a name.

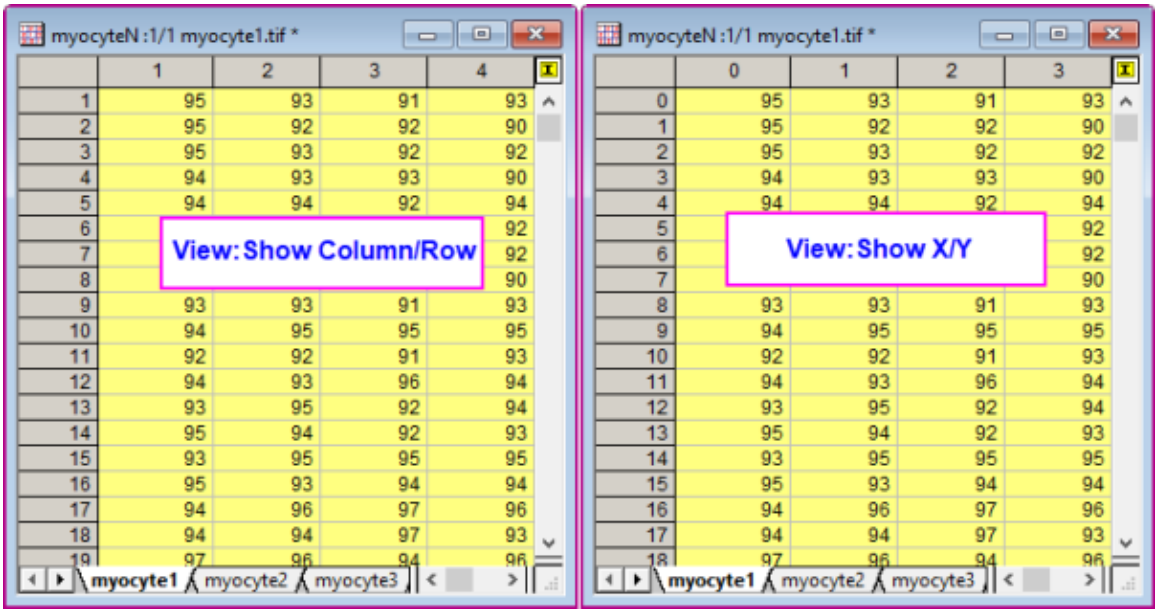
9.1.2 Different Views of the Matrix

In the worksheet, a dataset is contained in a single column and the dataset may consist of **X**,**Y**,**Z**, **Error**, or **Label** data. In the Origin matrix, a dataset is arranged in a specified dimension of rows and columns. The matrix contains a single dataset of **Z** values.

- Matrix columns are mapped to linearly-spaced X values.
- Matrix rows are mapped to linearly-spaced Y values.

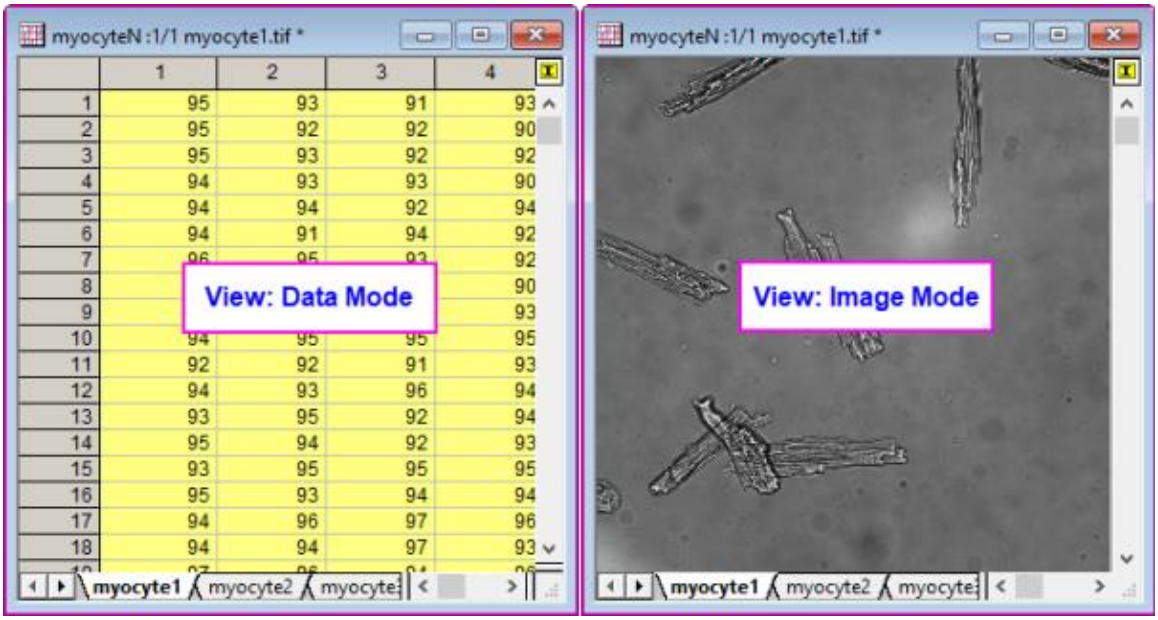
Note that the matrix window has two column and row heading view modes:

- By default, matrix row and column headings display as row and column index numbers (**View: Show Column/Row** from the menu or press **Ctrl+Shift+C**).
- You can opt to view matrix row and column as X and Y values by choosing **View: Show X/Y** from the Origin menu (or press **Ctrl+Shift+X**). The displayed X and Y values are the X and Y coordinate values, calculated by linear interpolation of the axes **From** and **To** values by the number of columns and rows.



In addition to the two row and column heading view modes, there are two matrix display modes:

- In Data Mode (**View: Data Mode** from the menu or press **Ctrl+Shift+D**), the matrix object displays as raw numbers.
- In Image Mode (**View: Image Mode** from the menu or press **Ctrl+Shift+I**), the matrix object displays as either a gray scale image or a color image, depending upon the type of data in the matrix. A matrix of real numbers or complex numbers displays as a gray-scale image while RGB values will display as a color image.



Note: If the matrix object is an image, the object icon will display as whether you are viewing the matrix object in Image Mode (**View: Image Mode**) or Data Mode (**View: Data Mode**). Similarly, when you import numeric data into the matrix, the object icon will display as regardless of **View** mode.

9.1.3 Matrixbooks

Like the workbook window, the matrixbook window is created from a customizable template (.otmu file). The matrix template stores such things as number of sheets in the book, the names of the matrixsheets, matrix dimensions, data type, math functions, data import handling instructions as well as various style and format options.

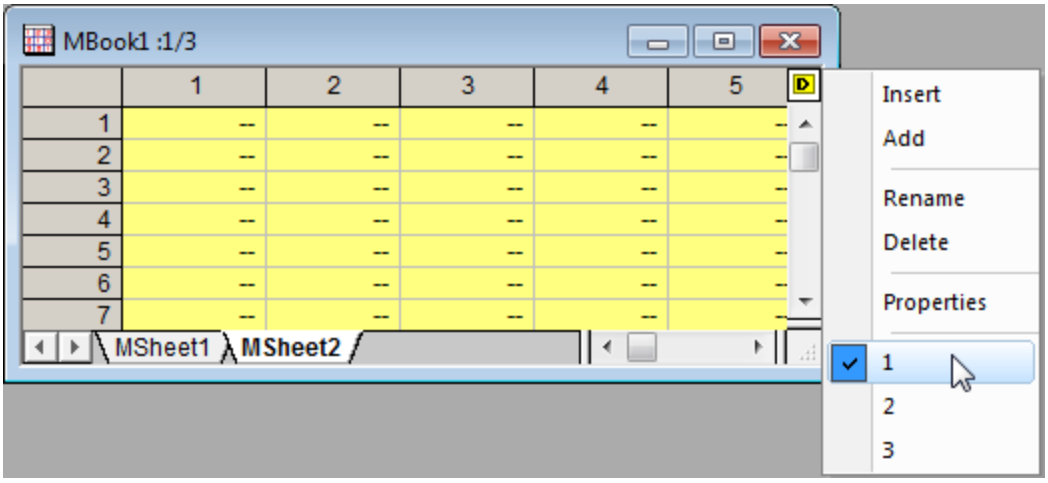
To add a empty new Matrix

- Click the **New Matrix** button on the Standard toolbar.

or

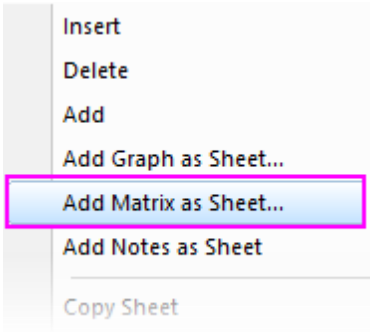
- Select **File: New: Matrix: Black Matrixbook** menu.

When you create a new matrixbook, the book is named MBook*N*, with *N* reflecting the order of window creation. Appended to the book name, you will see something like ":1/3" where the first integer denotes the active matrix object and the second denotes the number of matrix objects in the active matrixsheet. Following the above example, if you click the yellow object icon to the right side of the matrix, the menu shows three matrix objects with the first being the active one - the one with a check mark placed beside it (note that in our illustration, the objects are empty).





You can right-click on a worksheet tab and **Add Matrix as Sheet** and insert a matrixbook into a workbook. This is useful when building Analysis Templates that involve matrix-based operations such as 3D surface fitting or 3D plotting operations.



9.1.4 Matrixsheets



Prior to Origin 2018, an Origin matrixbook could have a maximum of 255 sheets. That number is now increased to 1024. When you have more than 255 sheets in a book, you will need to save the file using one of the new Unicode-compliant formats (opju, ogmu, etc).

A matrixbook can have up to 1024 matrixsheets. The default matrixbook template - ORIGIN.otmu - has a single matrixsheet containing 32 rows and 32 columns. Each matrixsheet can differ in dimensions(number of rows and columns and X & Y range).

To specify the dimensions of the matrixsheet:

1. Click on a tab to activate the sheet and choose **Matrix:Set Dimensions/Labels**. This opens the **Matrix Dimensions and Labels** dialog box.
2. Specify a number of columns (X dimension) and rows (Y dimension).
3. Specify a **From** and **To** value for X (columns) and Y (rows).

Note: The X and Y coordinates of the matrix are evenly spaced. The first X is mapped to the first matrix column and the last X is mapped to the last matrix column. The X coordinates of other columns are interpolated. Matrix rows are similarly mapped using the **From** Y and **To** Y values. When plotting or analyzing matrix data, the position of a point in 3D space is determined by the column X and row Y coordinate values (not column or row index) and the Z value contained in the cell intersected by the row and column.

9.1.5 Matrix Objects

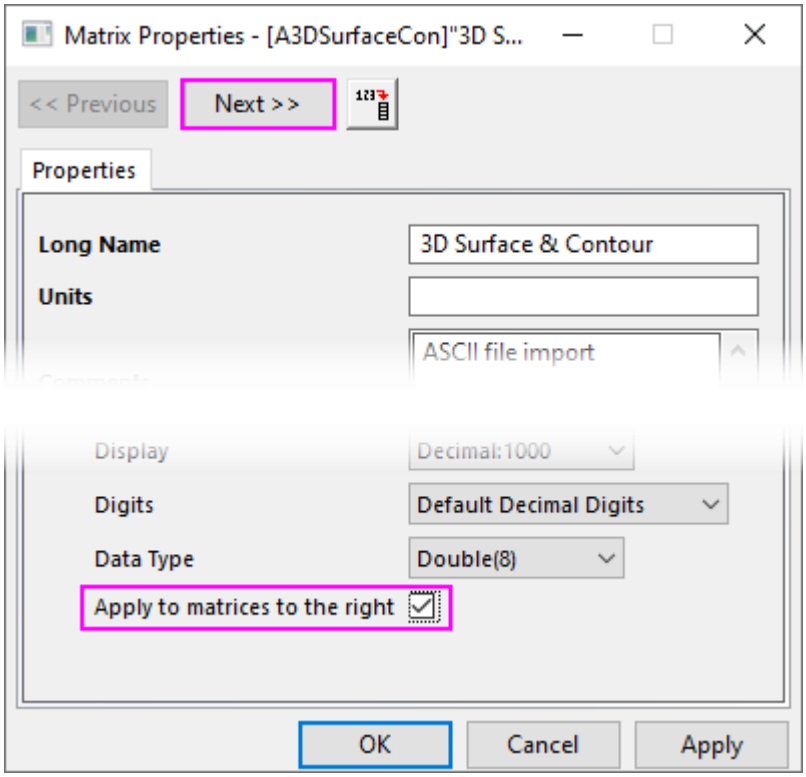
A matrixsheet can contain up to 65,504 matrix objects, though the actual limit is likely to be far less (determined by system resources). Objects in a sheet share the same X/Y dimensions and column (X) and row (Y) headers, but every object can have its own Z header. Other matrix object properties include internal data type and numeric display options.

Matrix object properties are set in the user interface via the **Matrix Properties** dialog box. To open the dialog box:

1. Make sure that the matrix object is active (check mark shows beside it in the object menu).
2. Choose **Matrix:Set Properties...** from the main menu.



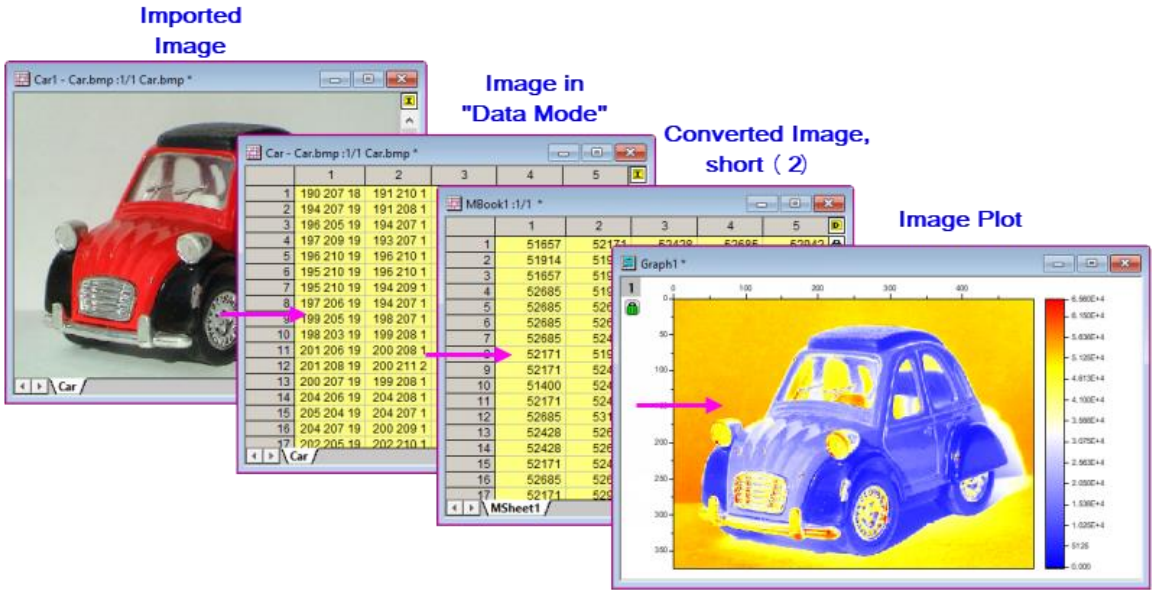
You can set properties for multiple matrix objects without closing the Matrix Properties dialog box by clicking the **<< Previous** or **Next >>** buttons at the top of the dialog box.



9.1.6 Import Image to Matrix

Origin has two structures for importing multi-frame images -- the matrix window and the Image window. The matrix window is better-suited to performing data analysis tasks (e.g. surface fitting, statistics, mathematic transformations of data, etc.) and some graphing operations, but take note of the following:

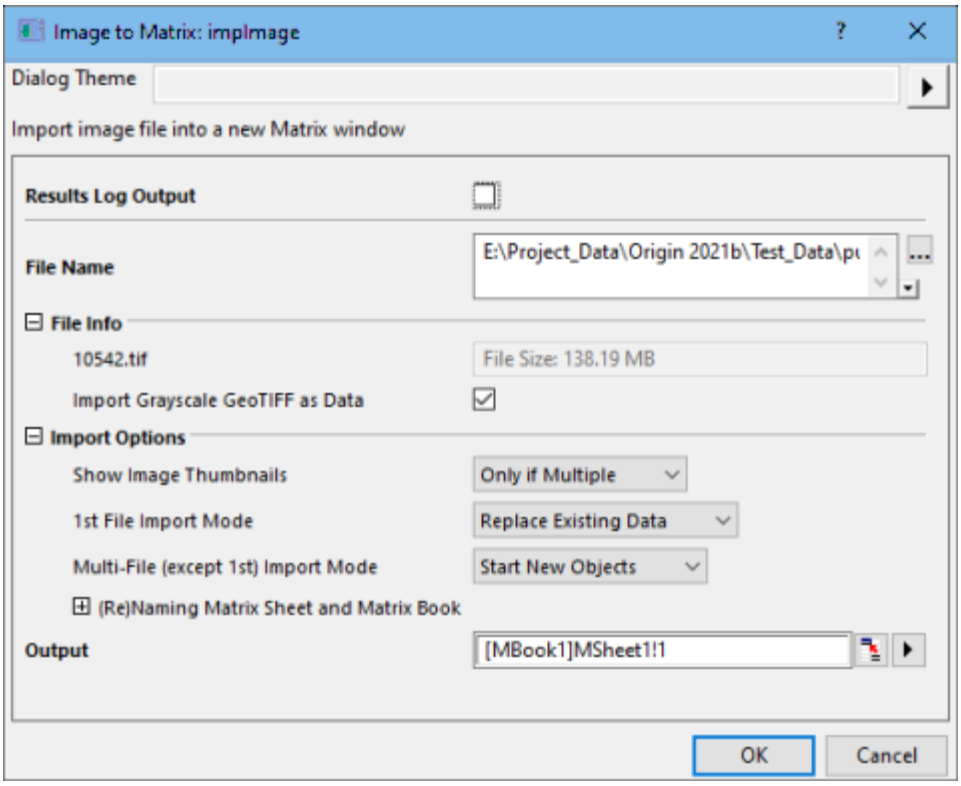
- When you import an image to the matrix, you can -- as with other matrix data -- switch between "Data Mode" (**View Data Mode**) and "Image Mode" (**View: Image Mode**).
- However, until converted to data, matrices contain RGB values (regardless of View mode), as seen in the second window in the sequence below.
- Performing certain analysis or graphing tasks (e.g. Nonlinear Matrix Fit or creating an Image Plot) requires that the matrix first be converted to Z values by choosing **Image: Conversion: Convert to Data**.



For more information, see **Image Conversion** in the Origin Help File.

To import an image or image stack to the matrix window:

1. With the matrix active, choose **Data: Import From File: Image to Matrix**.
2. This opens the **Image to Matrix** (**impImage**) dialog. Note that there are are controls for **Import Grayscale GeoTIFF as Data**, **Show Image Thumbnails** and multi-file import-handling.



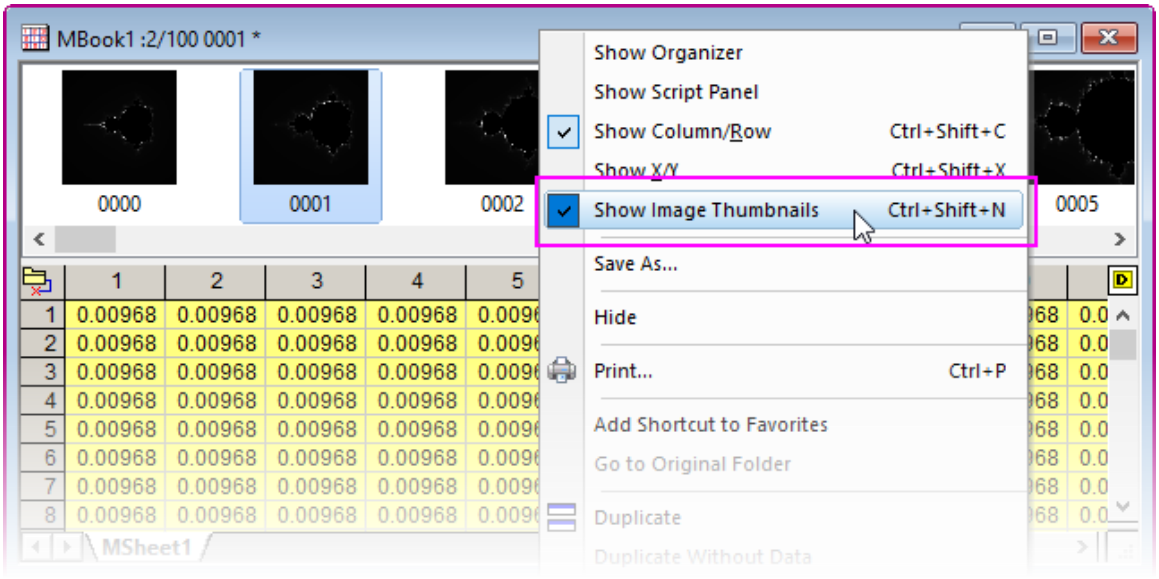
9.1.6.1 Image Thumbnails and Image Slider

When importing multi-frame TIF files, thumbnail/slider display is controlled by system variable **@MSS** (default value =*10*):

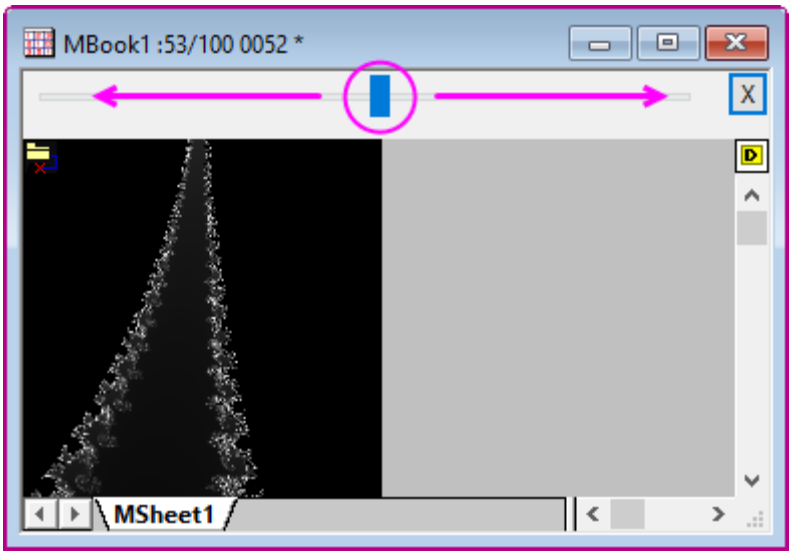
- If the sheet contains a single frame, don't show thumbnail/slider.
- For 1 < frames < 10, show thumbnail
- For frames > 10, show slider

When the sheet contains multiple objects, you can display those objects as a series of thumbnails in a spacer at the top of the matrix window.

1. Right-click on the matrix window title bar and place a check mark beside **Show Image Thumbnails**.



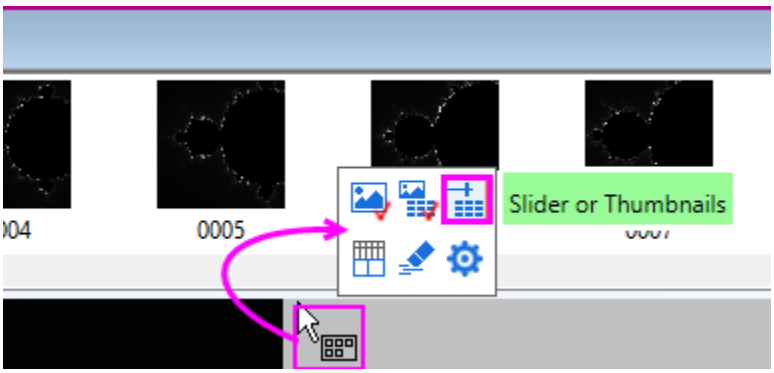
Alternately, you can use a slider control to view these objects in the active matrixsheet.



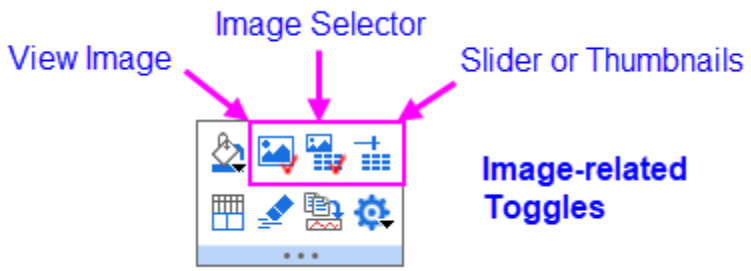
If you are seeing thumbnail images in the spacer at the top of the window, you can switch to the slider by doing the following:

1. Hover in the space between the thumbnails and when the cursor changes to a grid icon, click to show the page Mini Toolbar (you can also click in the gray area to the right of your matrix image).

2. Toggle the **Slider or Thumbnails** button to show slider or thumbnails.



3. Likewise, you can turn off *both* thumbnails and slider by clicking the **Image Selector** button. Click the **View Image** button to toggle between **Data Mode** and **Image Mode**.



9.1.6.2 Naming Matrix Objects

You can assign a name to a matrix object:

1. With the matrix object active, choose **Data: Define Name**.
2. Give the matrix a **Name**, set **Scope** and, optionally, add a **Comment**.

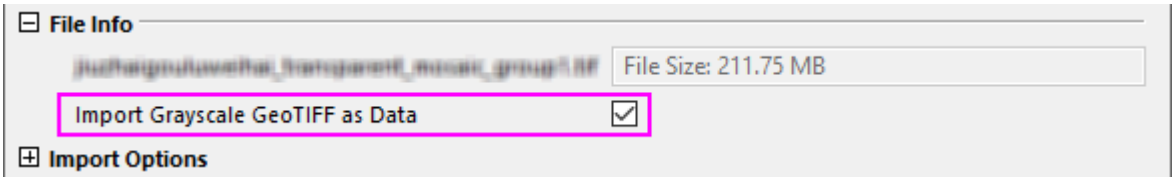
Named ranges can be used in **Matrix: Set Values** (e.g. to perform math operations on other matrix objects of the same dimensions).

9.1.6.3 Import GeoTIFF to Matrix

GeoTIFF is a public-domain image format that stores spatial information in a TIFF file and which has applications in mapping. Origin supports import of GeoTIFF files to both matrices and Image windows.

To import a GeoTIFF file to the active matrix:

1. Click **Data: Import From File: Image to Matrix**.
2. In the Image to Matrix dialog (impImage), check the **Import Grayscale GeoTIFF as Data** box and click **OK**.



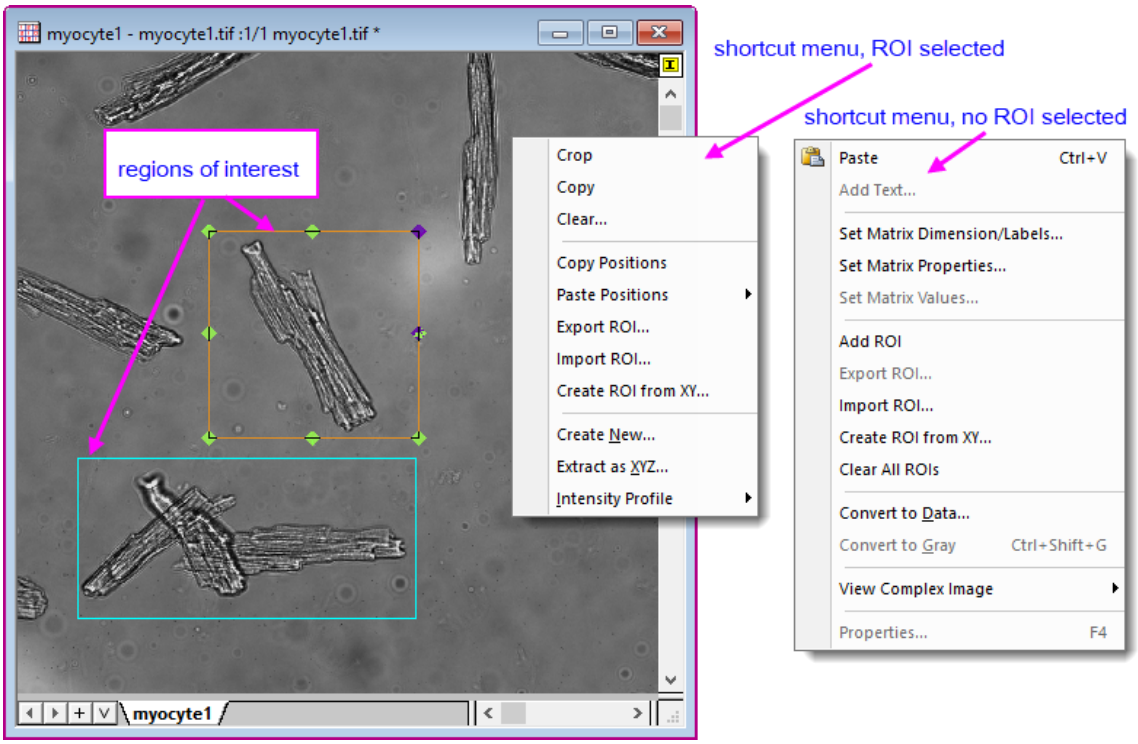
For more information, see the Origin Help file page for **GeoTIFF Importing and Processing**.

9.2 Extracting Information from the Matrixsheet or Object

When viewing matrixsheets or matrix objects in Image Mode (**View: Image Mode**), you can extract information from the matrix using the **Region-of-Interest** (**ROI**) tools:

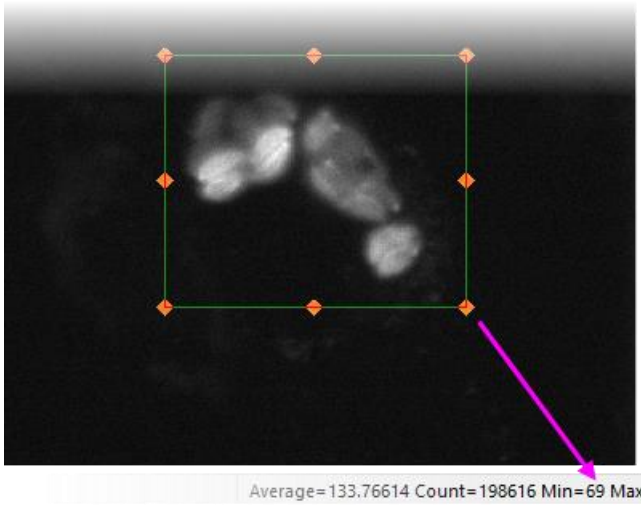
1. Go to **Tools: Region of Interest Tools** and verify that there is a check mark beside the menu item. If not, click on this item or press CTRL + SHIFT + T to enable the ROI tools.
2. To add an ROI, click on the displayed ROI tool (e.g. **Rectangle Tool**) on the **Tools** toolbar and choose an ROI shape from the flyout menu (rectangle, circle, polygon, region). Alternately, you can right-click on the image (make sure no existing ROI is selected) and choose **Add ROI** from the shortcut menu.
3. Using your mouse, drag out an area on the image (not needed if adding from the shortcut menu) and double-click to set your selection. Once the selection is set, additional clicks allow rotating, stretching, or skewing the ROI.
4. You can add multiple ROIs using either the **Add ROI** shortcut menu (hint: right-click on the matrix image) or with the **Tools** toolbar buttons. Note that when adding multiple ROIs using the toolbar buttons, you'll need to rename each as it is created (otherwise, it will be destroyed when you create a new ROI). Double-click on the ROI to open a small dialog and change the **Name** of the object (**hint**: simply append a unique number to each **Name**).

5. Right-click on your ROI and choose an option from the shortcut menu. To discard the selected ROI, press Delete:
    - **Crop**: Crop the image to the minimum rectangular area that will contain the ROI. By default, values outside the ROI will show black (zero values in Data Mode).
    - **Copy**: Rectangle only. Creates an image from the ROI.
    - **Clear**: Clear data within the ROI(s). Available only for TIFF stacks, NetCDF data; otherwise unavailable (dimmed).
    - **Add ROI**: Adds and enumerates name of each ROI (so that manual renaming is unnecessary when adding multiple ROIs).
    - **Copy Positions**: Copy the position of the selected ROI.
    - **Paste Positions**: Paste the position of the selected ROI to another ROI (width, height...all).
    - **Export ROI**: Save the ROI object(s).
    - **Import ROI**: Replace the object(s) with those in a saved *.ROI file (hint: create a "dummy" ROI to import).
    - **Create ROI from XY**: Opens the **Create ROI from XY** (xy2roi) dialog where you designate XY coordinates for creating ROI.
    - **Clear All ROIs**: Remove ROIs from matrixsheet.
    - **Create New**: Use the **mroi2mat** tool to generate a new matrix from the ROI.
    - **Extract as XYZ**: Use the **mroi2xyz** tool to generate a new worksheet of XYZ values.
    - **Intensity Profile**: Use the **mroiprofile** tool to generate statistics for the ROI.
    - **Convert to Data**: Convert RGB image to data.
    - **Convert to Gray**: Convert RGB image to grayscale.
    - **View Complex Image**: View components of the complex image.





ROI stats are automatically reported to the **Status Bar**. Right-click on the Status Bar to hide or show statistics.



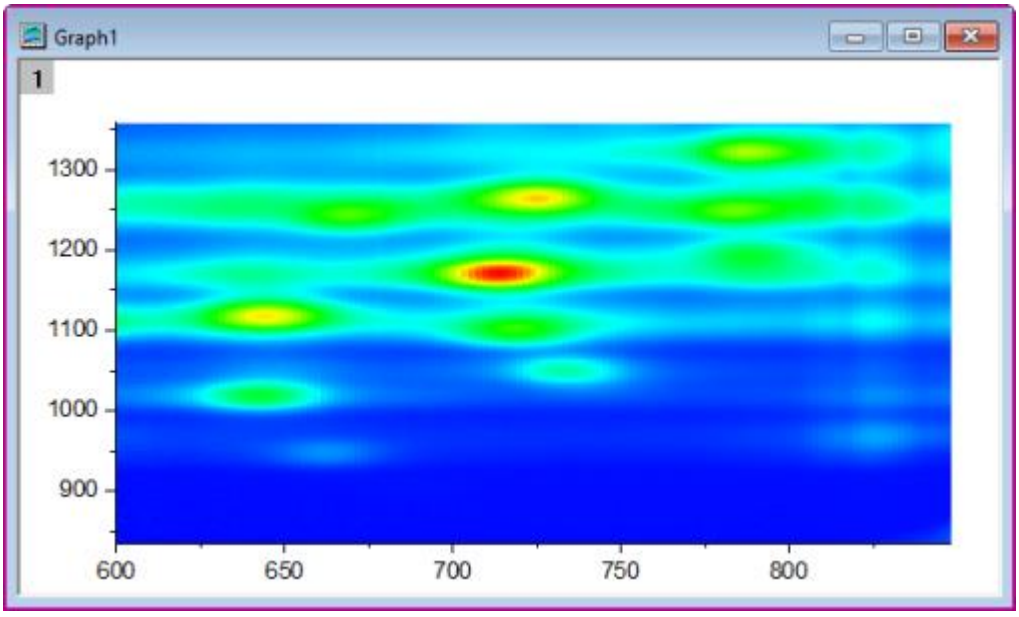
John Murray (University of Pennsylvania), Ke Hu (Indiana University, Bloomington) (2011) CIL:10542, Toxoplasma gondii RH. CIL. Dataset. https://doi.org/doi:10.7295/W9CIL10542 (Public Domain Image.)

9.3 Image Plot

Data in a matrix can be plotted as an **Image Plot**. Axis scales are determined by the matrix XY coordinates (when the matrix is active, choose **View: Show X/Y**).

Note that if you import an image to the matrix (**Data: Import From File: Image to Matrix**) you must first convert the image to data (**Image: Conversion: Convert to Data**) before creating your Image Plot (**Plot: Contour: Image Plot**).

1. Activate a matrix window and choose **Plot: Contour: Image Plot**.



By default, the image plot will use the same colormap, Z scale range and missing value color, as matrix image mode (**View: Image Mode**). See **Matrix: Apply Palette to Color Map**, below.

9.4 Image Window

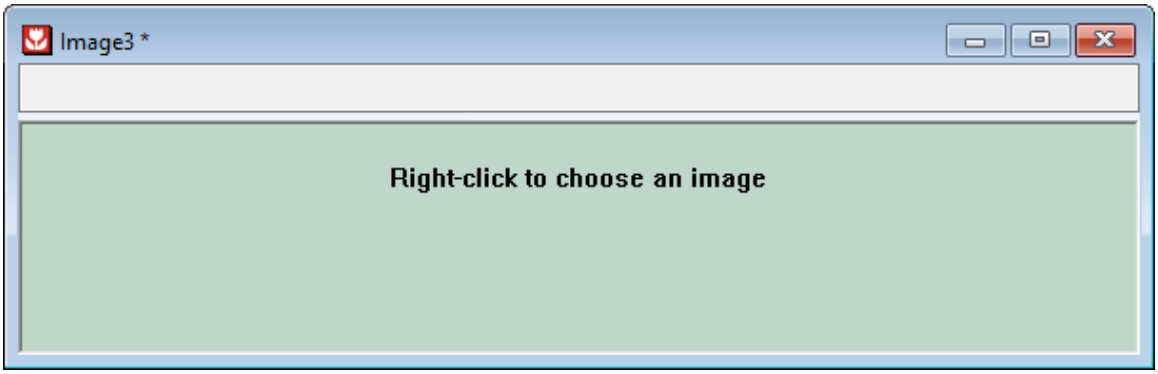
The **Image Plot** described above is used to plot values in a single matrix object. The **Image Window** can be used to:

- Open an image file for basic manipulation (flip, rotate, convert to gray-scale) using the Image Window's Mini Toolbar.
- Edit an image inserted into a worksheet cell or graph window (double-click on the inserted image).
- Import an image set such as the common "TIFF stack".
- Import multiple discrete image files as an image stack.
- Open and play a movie (.avi, .mov, .mp4) file.
- Define one or more regions-of-interest (ROI) for which you can **Copy Positions**, **Paste Positions** (from another ROI), and **Export** or **Import** position information saved to an Origin *.ROI file (a text file with position information on each ROI on the image).
- Open and operate on images inserted to worksheets or graphs: crop, copy, export ROI, etc.

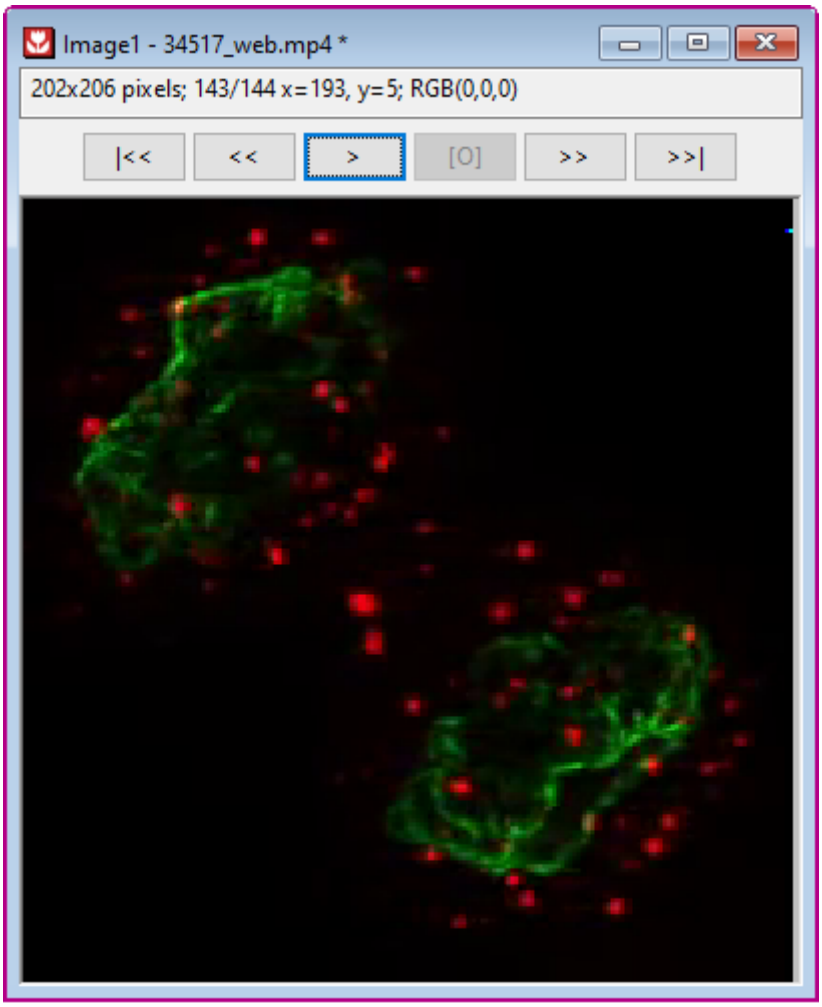
9.4.1 Image and Video Import

1. Choose **File: New Image**, then choose an option from the flyout menu.

    - **Empty Window**: You can later add a file by right-clicking and choosing **Import** or **Import from Web**. Alternately, click the **New Image** button  on the Standard toolbar.

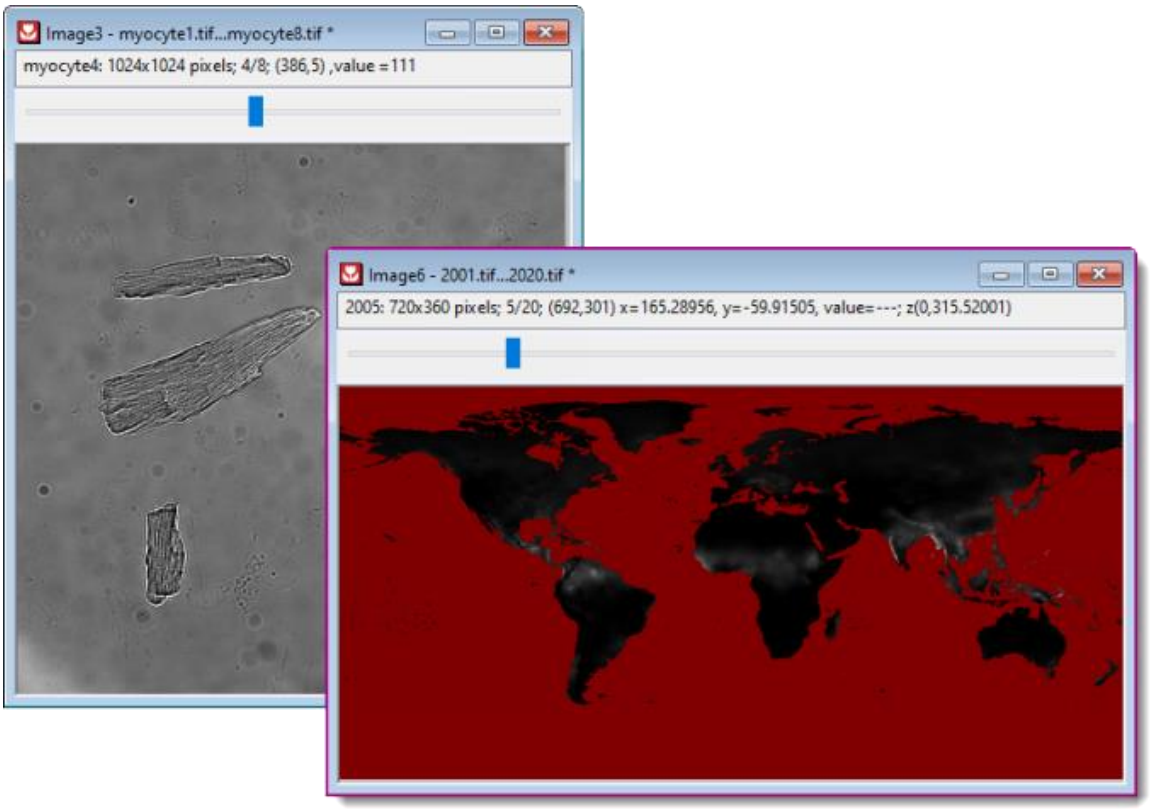


    - **Image/Video** (CTRL + ALT + I): Use the file type drop-down to specify an image or video file format.

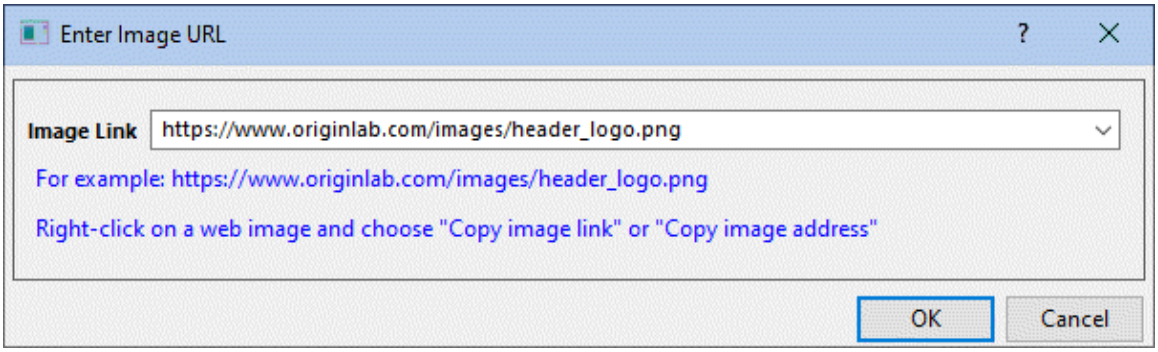


Paula Bubulya, David Spector (2011) CIL:34517, Homo sapiens, cervical carcinoma. CIL. Dataset. https://doi.org/doi:10.7295/W9CIL34517
Public domain image: http://cellimagelibrary.org/images/34517

- **Multiple Image Files** (CTRL + ALT + T): Specify which files to import as a stack, including GeoTIFF. Note that the resulting stack will show an image slider, by default.



- **Web Image** (CTRL + ALT + L): Enter a URL in the dialog to link to a web-stored image. Hint: to grab an image URL, right-click on the web image and choose **Copy image link** or **Copy image address**.



9.4.1.1 Import GeoTIFF as Image

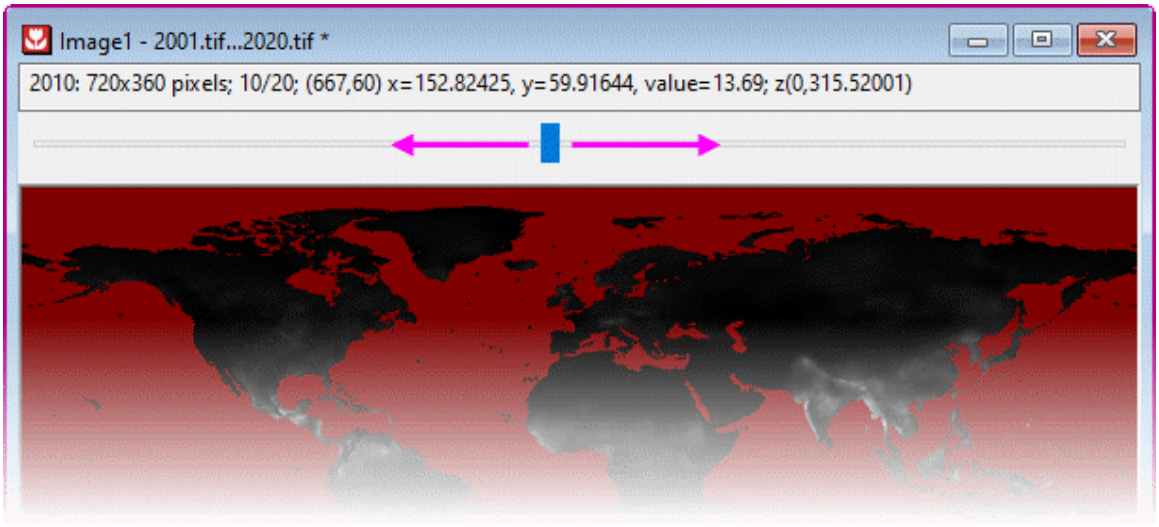
GeoTIFF is a public-domain image format that stores spatial information in a TIFF file and which has applications in mapping. Origin supports import of GeoTIFF files to both matrices and Image windows.

To import a GeoTIFF file as an image:

1. Click **File: New: Image: Image/Video** and choose the GeoTIFF image.

To import multiple GeoTIFF files as image:

1. Click **File: New: Image: Multiple Image Files** and choose your images. Images are imported to the active Image window and a slider is added to scroll images.



- All Images must be the same size.
- Negative numbers (e.g. -999) are treated as missing values.
- The Image window Mini Toolbar has a button for setting **Missing Value Color**
- Convert an Image window containing multiple GeoTIFF files to matrix using **Image: Convert to Matrix**. Each image in the stack becomes an object in the output matrix.



Click inside the window, somewhere near the top, to show the Mini Toolbar.

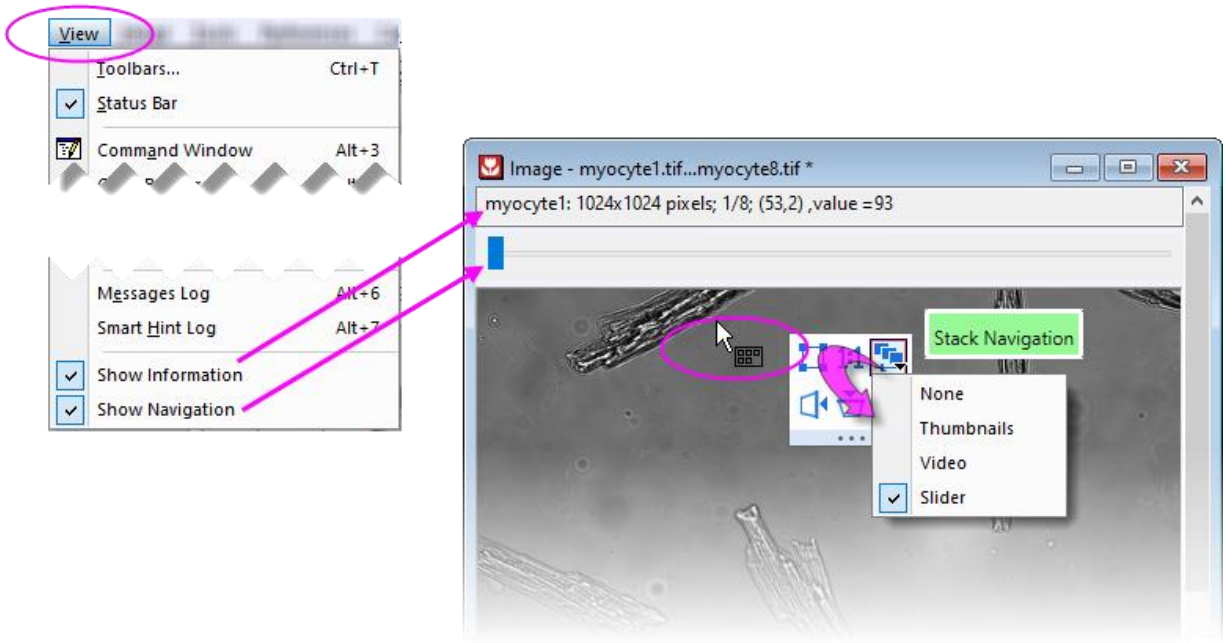
For more information, see the Origin Help file page for **GeoTIFF Importing and Processing**.

9.4.1.2 Image Import Notes

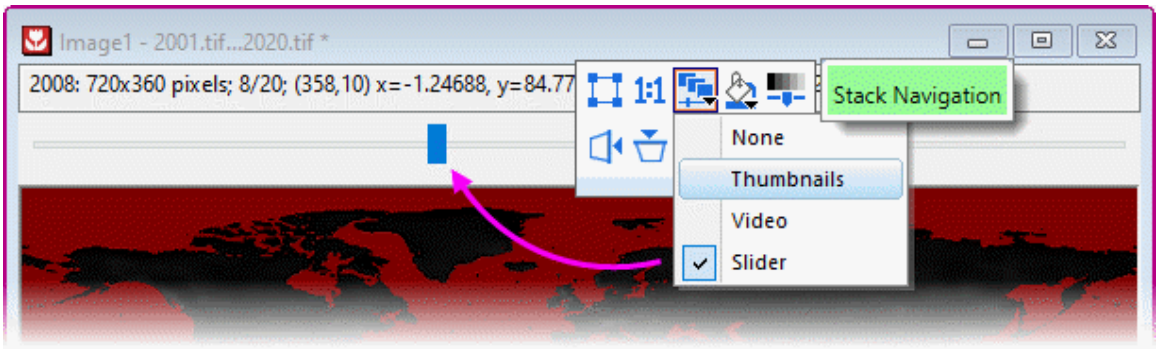
- To help control Origin project file size, right-click on an Image Window image and enable **Linked File**. This saves a link to the image file into the window but excludes the image from the saved project. When you reopen the saved project, the window will appear empty; at this point, you can decide whether you need to re-import the image (CTRL + 4 or **Import** from the window shortcut menu).
- **Actual Size Mode** is turned on by default for images of max width or height of less than 800 pixels. The size threshold can be adjusted using system variable **@IWP** (see this FAQ for info on changing the value of a system variable).

9.4.2 Image Window Navigation

Display of image information and navigation controls is enabled or disabled via the the **View** menu and/or the Image Window **Mini Toolbar** (**None**, **Thumbnails**, **Video** or **Slider**).



The same Mini Toolbar button is shown for GeoTIFF images:



Additional Keyboard control for Video navigation

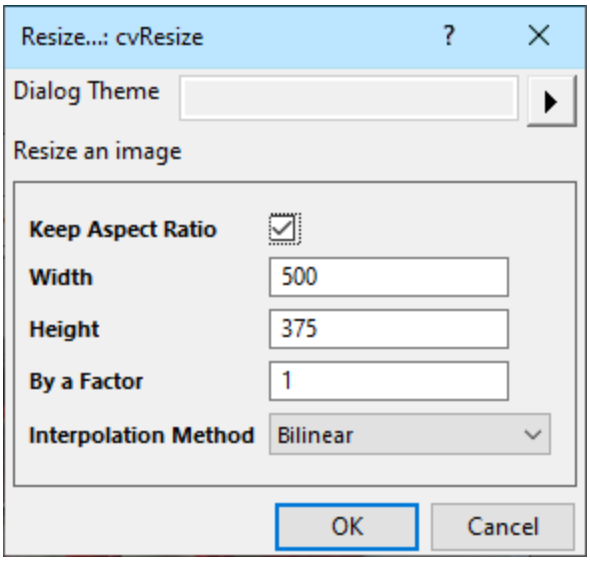
- Pressing the left/right arrow keys will move the frame by 1.
- Shift + arrow key will move the frame by 5.
- Shift + Ctrl + arrow key will move the frame by 20.

9.4.3 Image Resize

To resize the image by one of several interpolative methods:

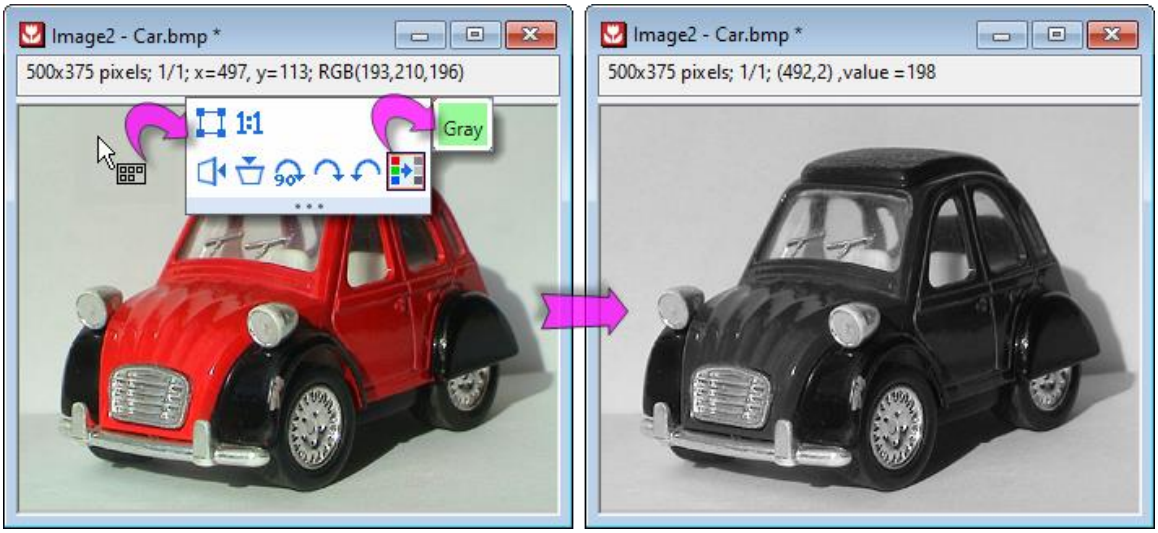
1. With the Image Window active, choose **Image: Resize**.

2. Choose options including your **Interpolation Method** (Nearest Neighbor, Bilinear, Bicubic, Pixel Area Relation, Lanczos) and click **OK**.



9.4.4 Mini Toolbars for Image Window

Mini Toolbar buttons are available for performing simple image manipulation, including rotating, flipping or converting to grayscale.





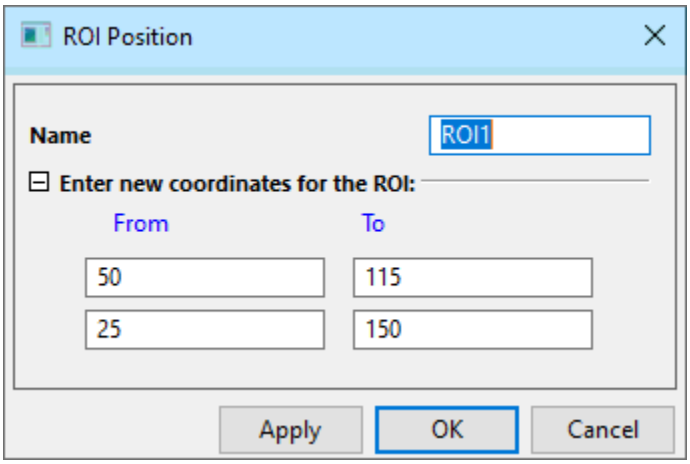
You can apply a color palette to a grayscale image using the **Palette** button  on the Style toolbar. Click **More Palettes** to open the **Color Manager** dialog box and add more palettes.

9.4.5 ROIs in the Image Window

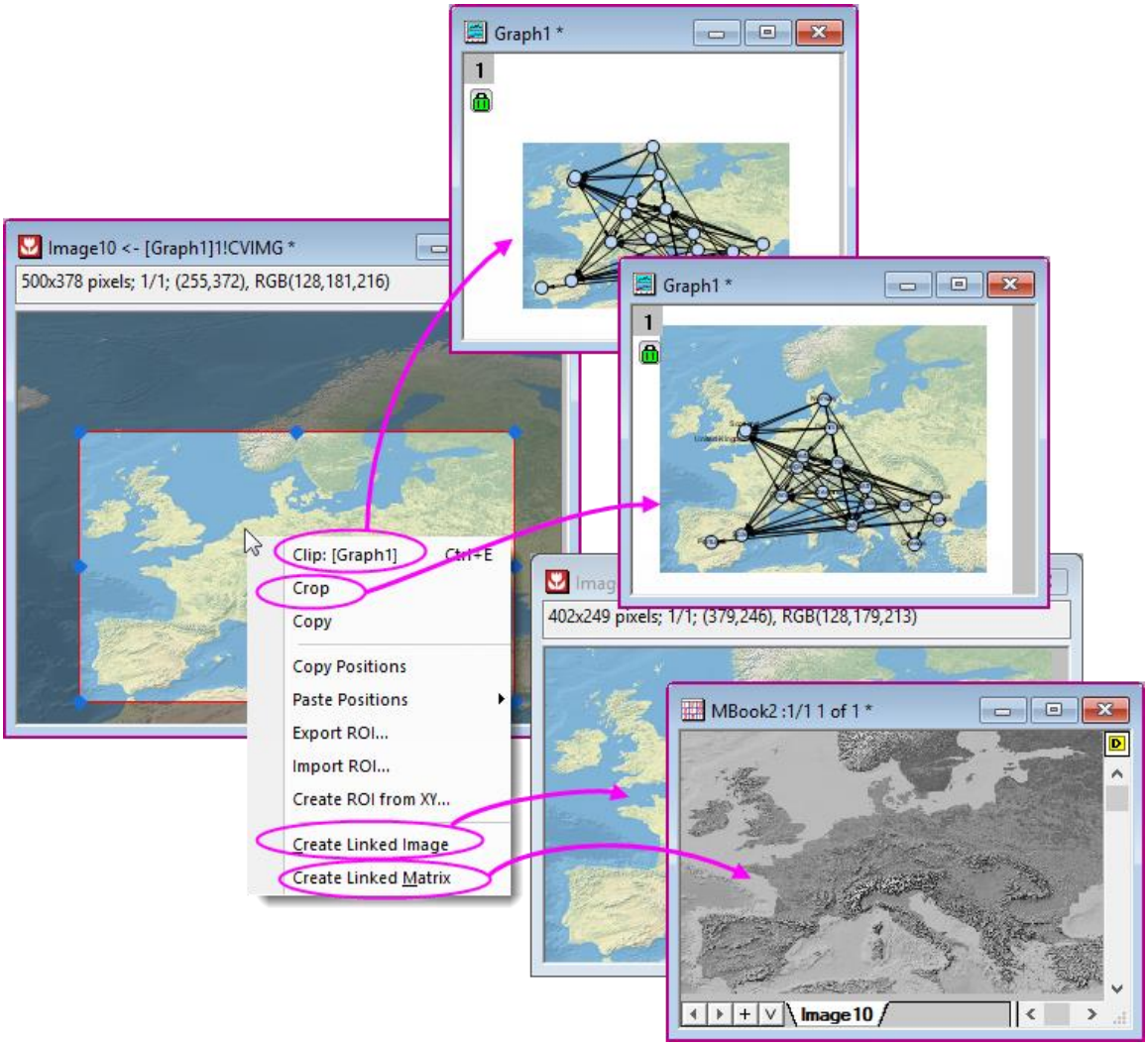
If your ROI is hard to see against the background image, you can select the ROI and use the Style toolbar **Line/Border Color** button to change outline color.

You can define one or more regions-of-interest in the Image window using the **Rectangle Tool**) on the Tools toolbar.

1. Select the tool and drag out an ROI. Once added, adjustments to size and position can be made by selecting the object and dragging the blue selection handles.
2. To add *multiple* ROIs to an image, click on the **Rectangle Tool** and drag out your ROI; right-click on the image and choose **Add ROI** (CTRL + Q); or use the **Add ROI** button on the Image window Mini Toolbar. In either case, you'll need to rename added ROIs as you go: double-click on the ROI and give it a unique name so that it is not replaced by the next added ROI.



Right-clicking on the ROI produces a context menu with the following options:



- **Clip**: Available when the image is opened from a graph (e.g. by double-clicking the graph image). This clips the graph image to the Image window ROI. The original graph image size is reduced to the size of the clipped region. To restore the full image in the graph window, right-click outside of the ROI and choose **Remove Clipping**.
- **Crop**: Crop Image window image and graph image (if exists) to the ROI. Graph image size and position are kept.
- **Copy**: Copy the ROI as an image. You can then paste it to other windows inside Origin, e.g. a graph or worksheet window, or to other applications. For multi-frame image, only the active frame is copied.
- **Apply Scale to Graph**: Available when the image is inserted into a graph by **Image from Image Window**. This updates the graph image to the Image window ROI.
- **Copy Positions**: Copy the ROI box coordinates of 4 vertices. You can choose to paste it as plain numbers, or, **Paste Position** to another ROI box. For the latter option, you can choose to paste only ROI **Width**/**Height**, or **Horizontal**/**Vertical** location.
- **Export ROI**: Saves details (e.g. ROI name, position of vertices, etc.) to a .ROI file.

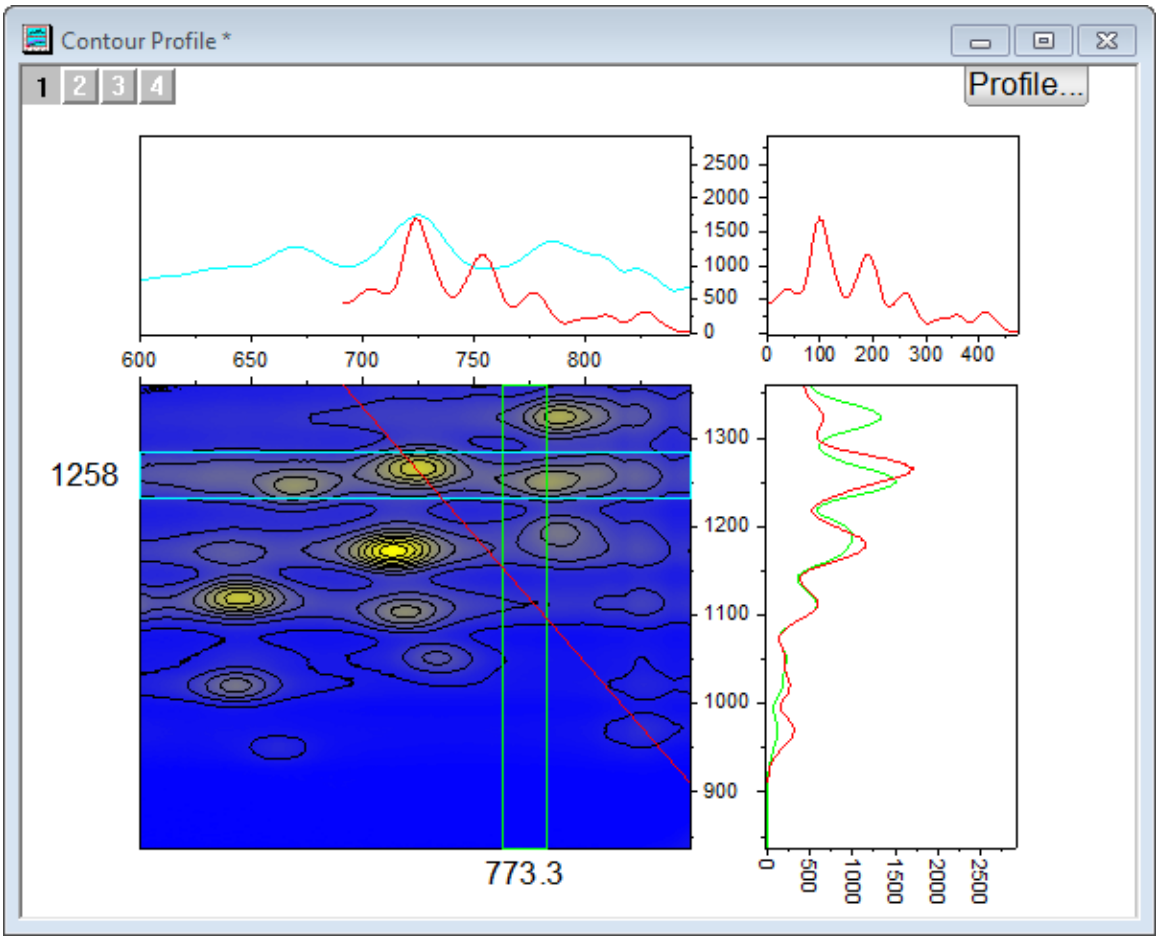
- **Import ROI**: Applies details of a previously-saved ROI, to the selected ROI.
- **Create New from XY**: Create a new ROI box of arbitrary shape from a set of XY coordinates (boundary) and index data. Support for gray-scale image only. See also Create ROI from XY in NetCDF data.
- **Create Linked Image**: Outputs the ROI to a new Image window. Changes to the ROI will be passed to the new Image window.
- **Create Linked Matrix**: Outputs the ROI data to a new matrix window. Changes to the Image window ROI will be passed to the matrix.This makes it easier to carry out many analysis and statistics operations that cannot be done on an Image window (i.e. a matrix is required).

9.5 Profiling Matrix Data

Data in a matrix can be viewed in profile -- either in the X, Y or arbitrary cross-section.

1. Activate the matrix object and choose **Plot > 2D: Profile: Image Profiles** from the main menu.

This creates an image plot and opens the **Image/Contour Profile** dialog box. Use the dialog box to specify X and/or Y profile plots and the location and appearance of the cross-sectional lines. Note that this dialog box is interactive. You can make adjustments to your image profile -- move the cross-sectional lines or change the configuration or the appearance of the plots -- without closing the dialog box. After closed the dialog box, a button **Profiles...**will appear at the right-top corner of graph window, which can be used to reopen the **Image/Contour Profiles** dialog.



9.6 Setting Matrix Values

The **Set Values** dialog box is used to generate or transform data in a matrix object.



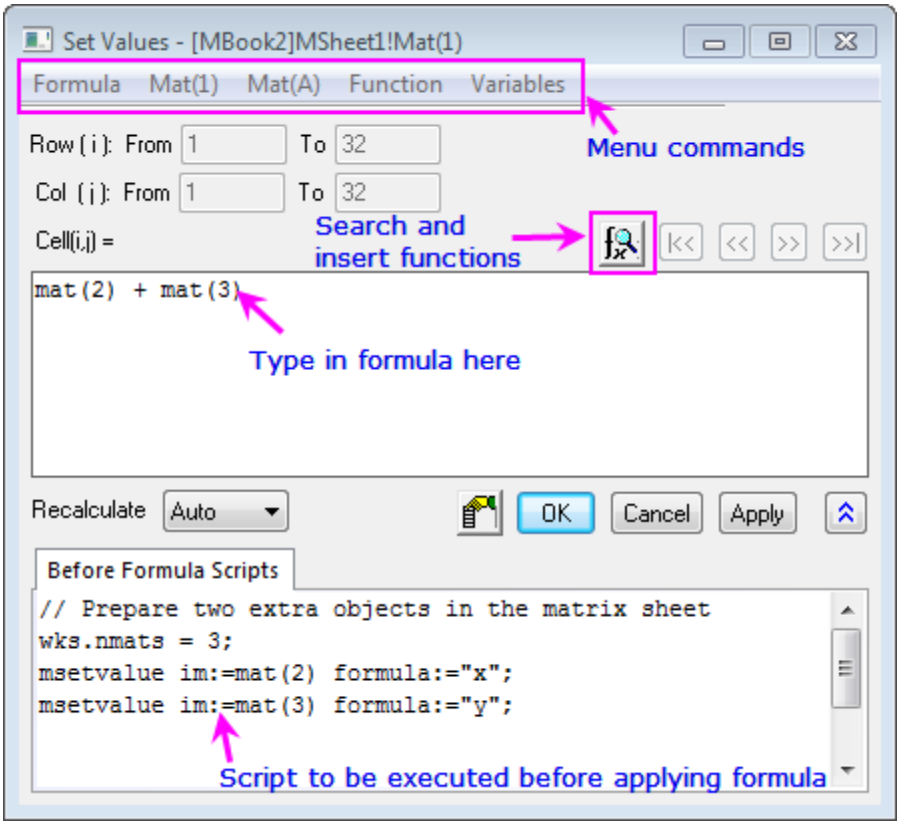
You can assign a name to a matrix object and use the name **Set Values** (e.g. to perform math operations on other matrix objects of the same dimensions).

To open the **Set Values** dialog box, make sure that the matrix object is active, then:

1. From the menu, choose **Matrix: Set Values**.

or

1. Select the matrix by clicking in the upper-left corner (in the empty header cell just below the matrix icon/name), then right-click on the matrix and choose **Set Matrix Values** from the shortcut menu.



Menu Commands	• **Formula**: Load a saved formula into the matrix formula box. Formula are saved using **Formula: Save** or **Formula: Save As...**. • **Mat(1)**: Use the menu to include matrix objects in either your matrix formula or your Before Formula Scripts (matrix object reference is inserted at the cursor). A Matrix Browser is available to help in selecting the correct objects. Objects are listed by object index. • **Mat(A)**: Similar to Mat(1) menu functionality but matrix objects are listed by object Long Name, if one exists. • **Function**: Add LabTalk functions to your expressions (function name is inserted at the cursor). • **Variables**: Add a variable or a constant to **Matrix Formula** or **Before Formula Scripts**; Add range variables (including by selection) or file metadata, to Before Formula Scripts.
Matrix Formula	• Add a single line expression for generating data. Functions, conditional operators and variables can be used.
Before Formula Scripts	• Enter one or more lines of LabTalk script to be executed before the expression in the Matrix formula box is executed.



Use the **Before Formula Scripts** panel at the bottom of the **Set Values** dialog box to define variables or LabTalk functions that you wish to use in your matrix formula.

Click the **Search and Insert Functions** button  to search for built-in LabTalk functions.

9.7 Manipulation of Matrix Data

Utility	Menu Access
• For an XY coordinate pair picked with the Screen Reader, output Z values for for the matrix stack (multiple matrix objects) to a worksheet.	**Matrix: Pixel Extraction**
• Flip or Rotate a matrix.	**Matrix: Rotate90** **Matrix: Flip: Vertical** **Matrix: Flip: Horizontal**
• Resize a matrix using one of four methods (Expand, Shrink, Interpolate and Pad).	**Matrix: Resize**
• Transpose a matrix.	**Matrix: Transpose**
• Generate a 3-dimensional dataset by transforming XYZ values by formula.	**Matrix: Generate Grid**
• Expand the matrix by scaling in the X and Y directions.	**Matrix: Expand**
• Shrink the matrix by some row/column factor, using one of several shrink methods.	**Matrix: Shrink**

• Use a palette file to transform a matrix in Image Mode. Set a system variable to apply a color palette (**Style** toolbar, **Palettes** button) to *all* matrix objects (@MAP=0, default) or only the *active* matrix object (@MAP=1).	**Matrix: Apply Palette to Color Map**
• Convert a matrix of values to worksheet columns (see next section).	**Matrix: Convert to Worksheet**

9.8 Changing the Color Scheme of a Matrix

You can use the **Palette** button and the **Missing Value Color** button in the Mini Toolbar to customize the color of the matrix window.

The selected palettes and missing value color will apply to all matrix objects in the active matrix sheet, but will not change the palettes and missing value colors of objects in other matrix sheets in the same matrix window.

9.9 Converting Matrixes to Worksheets

To convert a matrix to worksheet:

1. With a matrix active, choose **Matrix: Convert to Worksheet: Open Dialog**.

There are two methods for converting matrix data to worksheet data -- **Direct** and **XYZ Columns**. Starting, for instance, with the following arrangement:

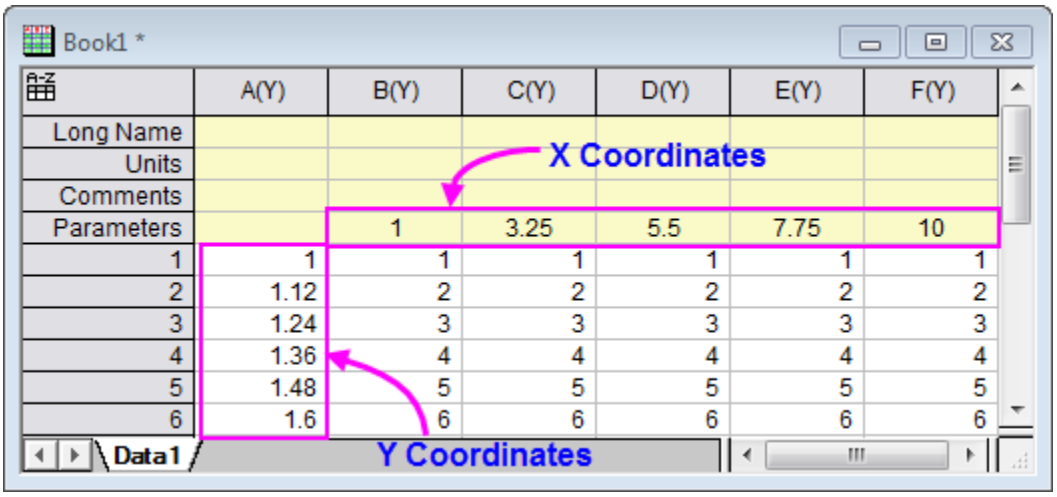
MBook1 :1/1 *

	X 1	3.25	5.5	7.75	10
Y 1	1	1	1	1	1
1.12	2	2	2	2	2
1.24	3	3	3	3	3
1.36	4	4	4	4	4
1.48	5	5	5	5	5
1.6	6	6	6	6	6

Sheet1

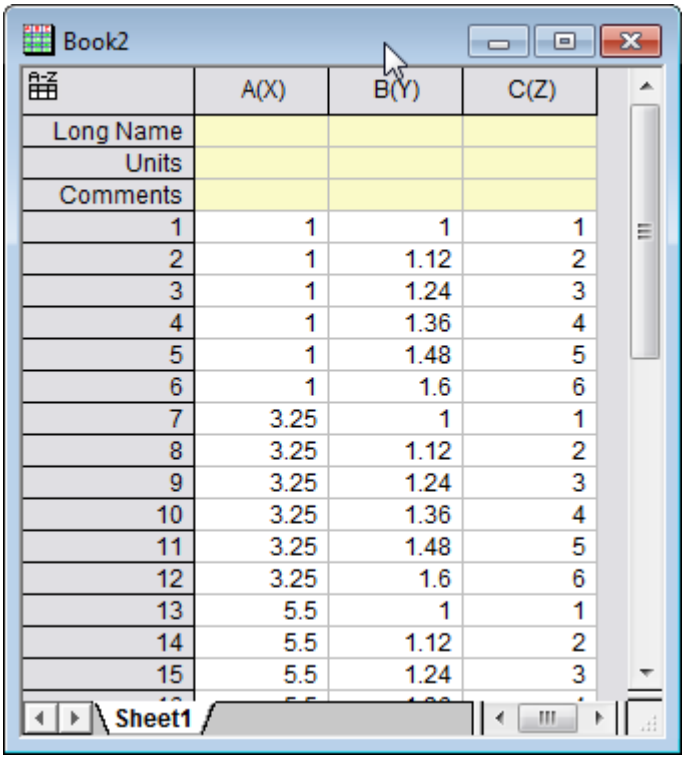
9.9.1 Direct

This copies the Z values in the matrix to a worksheet with no reordering. If the matrix consists of M rows by N columns of Z values, this method produces a worksheet which has M rows and N columns. By default, the X and Y coordinates of the matrix Z values are not copied to the worksheet. You can opt to copy X coordinates to the 1st worksheet row or a parameter row and the Y coordinates to the 1st worksheet column.



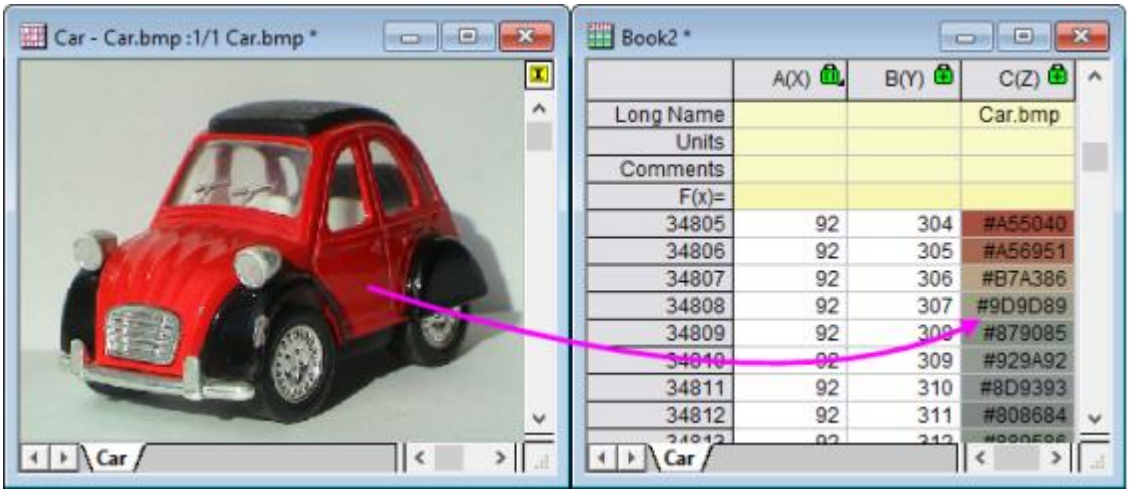
9.9.2 XYZ Columns

When there is a single matrix object, this method produces a worksheet with three columns: X,Y, and Z, with X and Y columns containing the X and Y coordinate values and the Z column containing the matrix Z value at each XY coordinate.



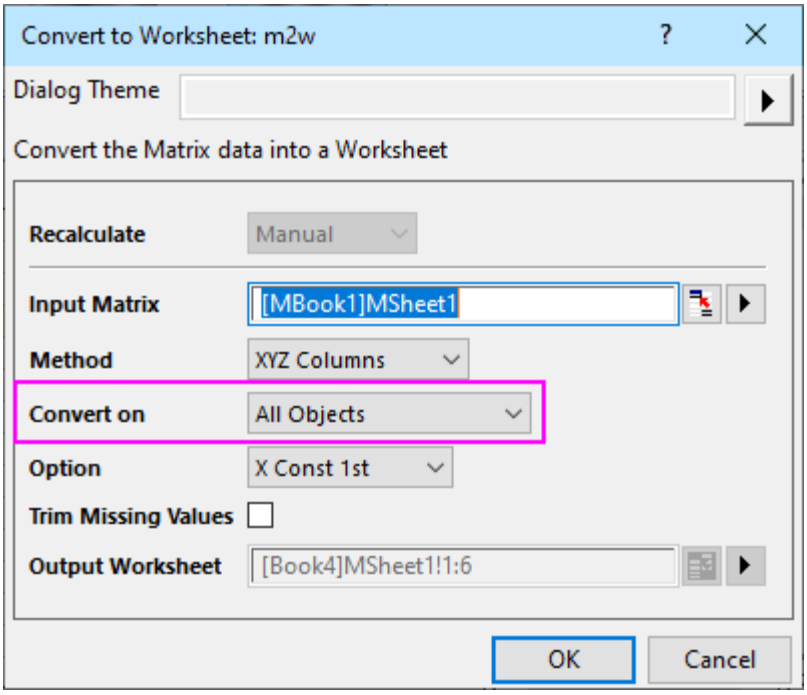
In addition, this method:

- Saves matrix *object* **Long Name**, **Units** and **Comments** to the Z column label rows.
- If the converted matrix contains a color image, the resulting Z column will display a **Color** column of HTML colors for each matrix cell.



When converting multiple matrix objects:

When there are *N* matrix objects, you can set **Convert On** = **All Objects** and output columns as X, Y and Z x *N* (i.e. *XYZZZ...*).



9.10 Converting Worksheets to Matrixes

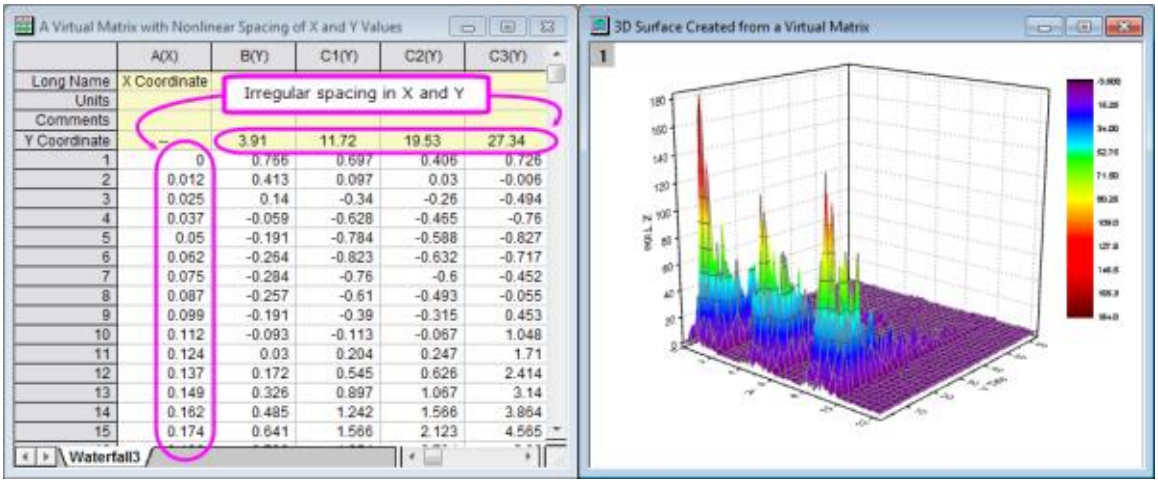
1. With the worksheet active, choose **Worksheet: Convert to Matrix** and choose one of the following methods:

Method	Conversion Type	Notes
Direct	• **X across columns** • **Y across columns** • **No X and Y**	Ideal for spreadsheet data that conforms to the following: • X data values in the 1st column, Y data values in the 1st row and Z values in columns 2 to N and rows 2 to M. • Y data values in the 1st column, X data values in the 1st row and Z values in columns 2 to N and rows 2 to M. **Note**: See **Virtual Matrix**, below.
Expand	• **Row** • **Column**	Some ASCII files have an upper limit for characters allowed on a single line. Use this method when your file breaks a single line of data across multiple lines. • Expand by **Row**: specifies the number of ASCII file rows comprising one matrix row. • Expand by **Column**: specifies the number of ASCII file columns comprising one matrix column.
XYZ Gridding	• **Regular** • **Sparse** • **Random (Renka Cline)** • **Random (Shepard)**	Conversion Type depends upon XY spacing: • Choose **Regular** applied for data that are regularly

	• **Random (Thin Plate Spline)** • **Random (Kriging Correlation)** • **Random (Weighted Average)**	spaced in XY. • Choose **Sparse** when you have missing values. • Choose **Renka-Cline**, **Shepard**, **TPS**, **Kriging** or **Weighted Average** methods for data that are irregularly spaced in XY. Option for **No Extrapolation outside Boundary**. **Note**: a worksheet of XYZZZ... columns will be converted to a matrixsheet with each Z column as a separate object.
XYZ Log Gridding	methods same as **XYZ Gridding**	Calculates logarithmic values for X and Y, then performs **XYZ Gridding**. A worksheet of XYZZZ... columns will be converted to a matrixsheet with each Z column as a separate object.

9.11 Virtual Matrix

Data arranged in a block of worksheet cells can be treated as a "virtual matrix". As is the case with regular matrix data, virtual matrix data can be used to create 3D plots, such as color mapped surfaces or contour plots. The data can include a column or label row with the X or Y values. Unlike a regular matrix which only supports a linear spacing in the X and Y dimensions, a virtual matrix supports irregular spacing of X and Y coordinate values (provided those values are in ascending or descending order).



Note: You can create 3D plots from **XYZ** columns of worksheet data in which data are irregularly spaced in

the X and Y dimensions. This is not considered a "virtual matrix."

9.12 Topics for Further Reading

- Matrixbooks, Matrixsheets and Matrix Objects
- Matrixbook and Matrixsheet Operations
- What is Saved with the Matrix Template?
- Matrix Dimensions and XY Coordinates
- Matrix Object Data Properties
- Setting Matrix Values
- Matrix Conversion and Gridding
- Creating 3D and Contour Graphs from a Virtual Matrix
- Viewing and Profiling Matrix Data

10 Graphing

10.1 Creating a Graph

Graphs can be created from both hard data and from mathematical functions. With Origin, you can create over 100 graph types using Origin's built-in graph templates. Each of these graphs has been specifically chosen for its applications in various technical fields.

All graph types are accessible from the **Plot** menu. Note that while most graph types also have a corresponding **2D Graphs** or **3D and Contour Graphs** toolbar button, some do not. Until you've had time to familiarize yourself with available toolbar buttons, the **Plot** menu should be your "go to" place for creating graphs.

Creating most graphs involves just two steps.

1. Select your data.
2. Select the plot type.

Some Origin graph types have very specific data requirements. Other graphs can be created from multiple data arrangements. See the Origin Graph Types section for specific requirements.

10.1.1 Creating Graphs from Worksheet Data

Origin's most generic graph types -- line, column/bar, pie -- plus a lot of the more specialized types, are created from worksheet data. The following quick tutorial demonstrates importing an ASCII data file and creating a simple graph.



Tutorial: One click to create graph with selected data

1. Open a new workbook and select **Data: Connect to File: Text/CSV** from the main menu.
2. Choose the file Samples/Curve Fitting/Multiple Gaussians.dat and click **Open**.
3. Now highlight columns **B(Y)**, **C(Y)**, **D(Y)** and **E(Y)** by clicking and dragging across the four column headings.
4. Click **Plot > Basic 2D: Line & Symbol: Line & Symbol**. A graph window is created with four line and symbol plots. Note that the plots differ by line color and by symbol type.
5. Return to the worksheet, and again select columns **B(Y)**, **C(Y)**, **D(Y)** and **E(Y)**.
6. This time, select the **Plot > Multi-Panel/Axis: 4 Panel** menu item. Note that a very different plot is created using the same datasets.

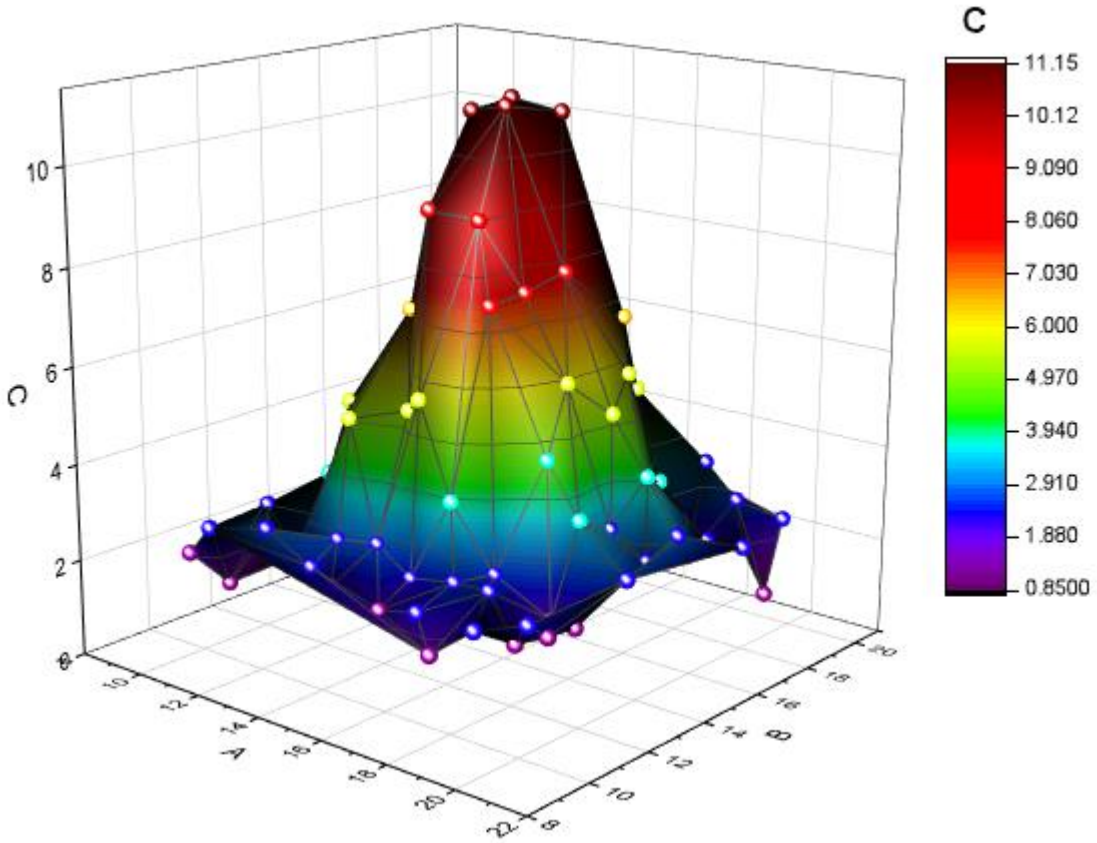
We were able to quickly create two different graphs using the same data. The chapter Customizing Graphs discusses customizing graphs and saving templates in more depth.

We are also able to create 3D plot types from worksheet data. The following tutorial demonstrates creating a 3D surface plot, then overlaying it with a 3D scatter plot.

Tutorial: 3D Surface Plot from XYZ Data

1. Create a new, empty workbook window and import the file **\Samples\Matrix Conversion and Gridding\XYZ Random Gaussian.dat**.
2. Highlight column C and right click. Select **Set As: Z** from the fly-out menu.
3. Select **Plot > 3D: 3D Colormap Surface** to create a 3D Colormap Surface plot.
4. Select the **Graph: Layer Contents...** menu item or right click the layer icon on the left-top of the graph to open the **Layer Contents** dialog. In this dialog, click on drop-down next to the button and select **3D Scatter/Trajectory/Vector** from the fly-out menu.
5. Select column C from the left panel and click on the **Add Plot** button to add the 3D scatter plot to the graph. Click **OK** to close the dialog.
6. Double-click on the plot to open the **Plot Details** dialog. In the left panel, expand the **Layer1** node and then expand the 2nd node which represents the scatter plot. Click and select the branch named **Original**. Be sure to leave the node-level check box selected, otherwise this plot will be hidden.
7. In the **Symbol** tab on the right side, set **Shape** to **Ball**, **Size** to **12** and **Color** to **Color Mapping: Col(C)**.
8. In the **Drop Lines** tab, clear the **Parallel to Z Axis** check box.
9. Select **Layer1** from the left panel of the **Plot Details** dialog. In the **Lighting** tab, under **Mode**, select **Directional**. Click **OK** to close the dialog.
10. Click on the scatter plot in the graph to select this plot, then in the **Style** toolbar, click on the  button and select the **Rainbow** palette.

Your graph should look like this:
:

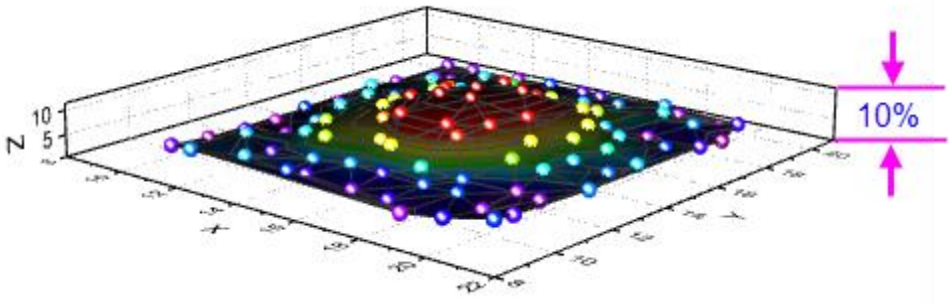




You can hold down the **R** key on your keyboard and use the mouse to freely rotate the 3D surface. With the pointer tool active, click on the layer for additional controls to move, stretch and rotate the surface.



The minimum Z axis length of 3D graph is 10% (Plot Details layer level, **Axis** tab).



10.1.1.1 Worksheet Column Plot Designations

The labels **(X)**, **(Y)**, **(Z)**, etc. in column headings are referred to as the Column Plot Designation. Columns can also be designated as **Label**, **Disregard**, **Y Error** or **X Error**. Each plot type has certain data requirements (e.g. a simple line plot requires one X and one Y dataset) and column plot designations work in concert with settings saved in the graph template, to allow you to quickly create a graph.

To set the Column Plot Designation, select a column or multiple columns, then from the menu choose **Column: Set as:<*option*>**; or right-click and choose an option from the **Set As:** context menu.

In the 1st tutorial above, we plotted 2D graphs, which require Y data from one or more worksheet columns. The Y data were automatically plotted against the X column data to their left. In 2nd tutorial, we plotted a 3D graph using Z data. The Z data were plotted against X and Y data columns to the left of the Z data column.

> **Note:** For more information on Column Plot Designations and how they affect plotting behavior, see **Plot Designation**, in documentation for the Column Properties Dialog Box.

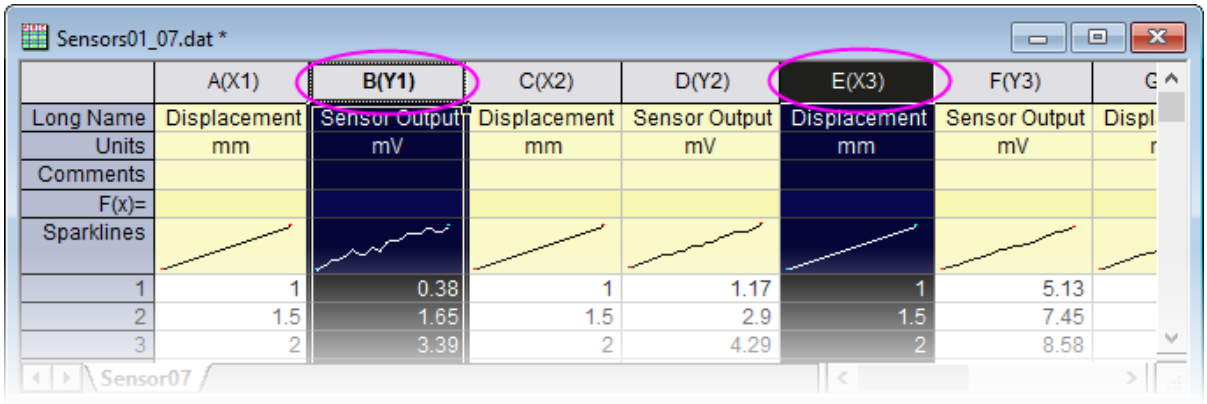
10.1.1.2 Selecting Worksheet Data

Various ways to select data for plotting:

- **Single column**: Click on the column heading, e.g. B(Y)
- **Multiple columns**: To select a small number of contiguous columns, click on the first column heading and drag the pointer to the last column heading. To select a large number of contiguous columns, click on the first column heading, use the scroll bar at the bottom of the worksheet to locate the last column, then press the SHIFT key and click on the last column heading. To select non-contiguous columns, press the CTRL key while clicking on the desired column heading.
- **A range in a column**: Click on the first cell of the range and drag to the last cell of the range.
- **Multiple ranges within a column**: Select one range. Press the CTRL key while selecting each range. When plotting, each range will be treated as a separate data plot in a plot group.
- **Ranges across multiple columns**: If cells are contiguous, click on the first cell and drag to the last cell. If cells are not contiguous, press the CTRL key while selecting each range. Each range selection will be treated as a separate data plot in a plot group.
- **Range(s) across all columns**: Click on the first row heading and drag to the last row heading, to select multiple rows. This will select data in all columns in the worksheet. Press the CTRL key while selecting row headings for non-contiguous rows. Each range selection will be treated as a separate data plot in a plot group.
- **Entire worksheet**: Press CTRL+A to select the entire worksheet; or mouse over the bottom-right corner of the blank cell in the upper-left corner of the worksheet. When the pointer becomes a downward-pointing arrow, click to select the entire worksheet.
- **Specific columns**: To select columns by data in column label rows (header rows); or to select columns using a pattern, choose **Edit: Select**.



As noted in the **Worksheet Column Plot Designations** section just above, if you select Y or Z columns, Origin defaults to plotting the Y column against the nearest X column to the left; or plots the Z column against the nearest X and Y columns to the left. But in the case of simple XY 2D plots (line, line + symbol, etc.), you can ignore this rule and plot by selecting XY columns whether or not the selected X is to the left or right of Y.



10.1.2Creating a Graph from Matrix Data

As discussed in the Matrixbook, Matrixsheets and Matrix Objects chapter, a matrix is a dataset of Z values arranged as an array of columns and rows which are linearly mapped to X (column) and Y (row) values. Matrix data is used to create 3D, contour and heatmap graphs -- all of which require require "3D" data. In earlier versions of Origin you *had* to have your data in a matrix to create such plot types but this is no longer the case (see discussion of the Virtual Matrix below). A few graph types such as a color-filled surface with error bars still require matrix data.

There are still many situations in which you will be creating 3D plots from matrix data. If data are stored in a worksheet and for one reason or another, you need to convert it into a matrix form, see Converting Worksheets to Matrixes.

Once your data are in a matrix form, plotting matrix data is simple: activate the matrix window then select your plot type using a **Plot** menu command or corresponding **3D and Contour Graphs** toolbar button. Since you cannot plot only a portion of the matrix, data selection isn't necessary. You can, however, choose a subset of the data plot to display once the graph is created. See Editing Plot Range, below.

10.1.2.1 The Virtual Matrix

The Virtual Matrix concept was covered in the *Matrixbook, Matrixsheet and Matrix Object* chapter of this Guide. To recap, a virtual matrix is a block of worksheet cells which contain Z values, with X and Y coordinates in the first row or column label row, and first column. X and Y coordinates don't have to be evenly spaced and can even contain text or date/time data.

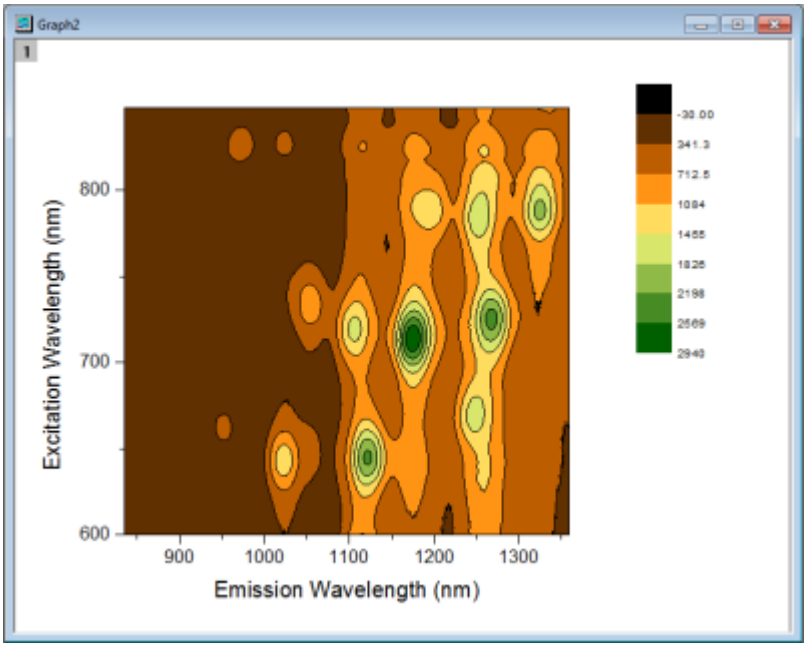
When selecting and plotting virtual matrix data to 3D, Contour and Heatmap graph types, the worksheet's Column Plot Designations are ignored. Instead, a dialog box is opened where you designate your X and Y coordinates. The intersecting data points are then treated as Z values.



Tutorial: Contour Plot from Virtual Matrix

1. With a new workbook active, use the **Data: Import from File: Import Wizard...** menu to open the Import Wizard dialog.
2. Press the browse button in the dialog and select the file **Waterfall.dat** from the **Samples\Graphing** subfolder.
3. This file has an import filter already associated with it. Press the **Finish** button to import the file.
4. With the workbook active, press **CTRL+A** to select the entire sheet.
5. Now select the **Plot > Contour: Contour - Color Fill** menu item. The **plotvm** dialog will open.

6. In the dialog, set the **Y Values in** drop-down to **Column Label**, and then set the **Column Label** drop-down to **Excitation Wavelength(nm)**.
7. Set the **X Values in** drop-down to **1st column in selection**, then press **OK** to close this dialog.
8. The contour plot will be created.
9. Use the **Graph: Speed Mode...** menu item, then in the dialog that opens, set the **Speed Mode** drop-down to **Off** and press OK. This will turn off speed mode so that all data points are plotted (see the discussion of Speed Mode, below).
10. Click on the contour plot to select this data plot, then from the **Style** toolbar, click the **Palette** button  and then select the **Pumpkin Patch** palette. Your graph should look similar to the image below:





Once you customize your contour levels and colors, you can save your settings as a Theme, or simply copy-paste your customizations from one graph to another. To save a Theme, right-click on the graph and choose **Save Format as Theme**; or use the **Colormap Theme** controls on the **Colormap/Contours** tab of the **Plot Details** dialog box.

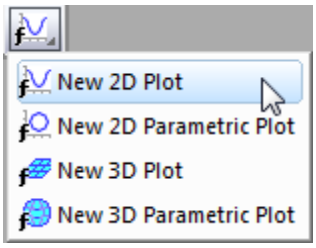
10.1.32D and 3D Function Plots

Unlike plots from worksheet data or plots from matrix data, parametric plots are not plots of actual data. Instead, they are plots of mathematical functions.

To create function plots and parametric function plots, select **File: New: Function Plot** menu. There are four options to choose from:

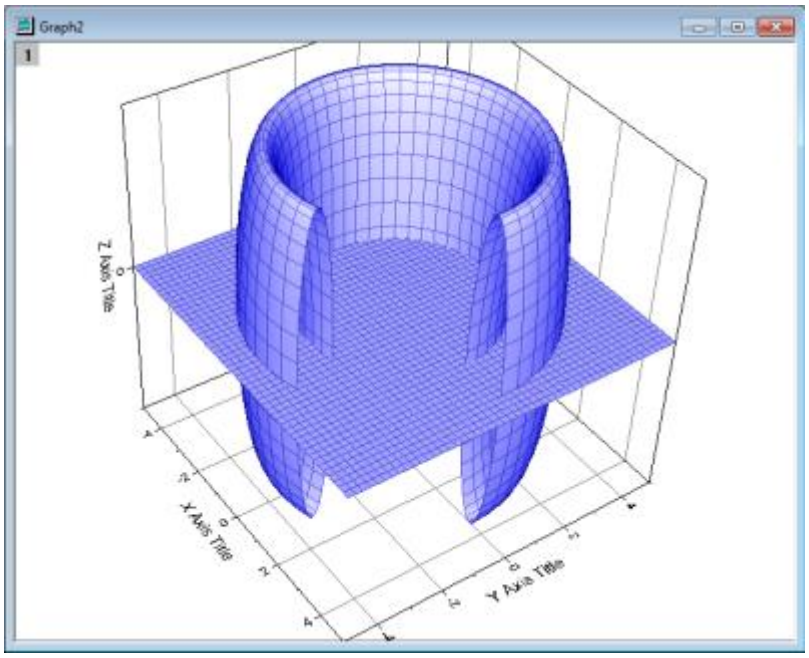
Type	Function Form
2D Function Plot	y = f(x)
2D Parametric Function Plot	x = f1(t) y = f2(t)
3D Function Plot	z = f(x, y)
3D Parametric Function Plot	x = f1(u, v) y = f2(u, v) z = f3(u, v)

These plot types are also accessible from the function plot buttons on the **Standard** toolbar.



Tutorial: 3D Function and 3D Parametric Function in Same Layer

1. From the menu, choose **File: New: Function Plot: 3D Parametric Function Plot...**
2. In the dialog that opens, click on the arrow button at the top right side of the dialog, and from the fly-out menu select the built-in example **Partial Torus (System)** and press **OK** to close the dialog. The function plot will be created.
3. With the function plot window active, invoke the menu **File: New: Function Plot: 3D Function Plot...**.
4. In the dialog that opens, enter -5 and 5 for the **From** and **To** edit boxes for x and y scale.
5. In the **Z(x,y)** edit box, enter **0**.
6. Set the drop-down at the bottom left corner of the dialog to **Add to Active Graph** and press **OK** to close dialog.
7. The **Z=0** plane will be added to the graph, and the plane will properly intersect the parametric surface plot. You can hold down the **R** key and use the mouse to freely rotate the plot.



- Some function plot dialogs provide sample formulas. Click the arrow button beside **Theme** at the top of the dialog box to access them. You can download more examples at http://originlab.com/3dfunctions.
- For 2D parametric, 3D, and 3D parametric function plots, data is generated when the function plot is created. To create data for 2D function plots, right-click the plot and choose **Make dataset copy of Function** or if on the Function tab in Plot Details, click the **Workbook** button.
- You can exclude function plots from the graph legend by right-clicking on the selected legend object and placing a check mark beside **Legend: Hide Legend for Function Plots** (To add them back to the legend, clear the check mark).
- Besides function plots, you can also create graphs with all built-in and user-defined nonlinear curve-fitting or surface-fitting functions. From the menu, choose **Analysis: Fitting: Simulate Curve...** or **Simulate Surface...**. You can even add noise to the plot. Corresponding data is created as well.

10.1.3.1 Adding Function Plots to Existing Graphs

You can add function plots to existing graph windows containing other plot types. See **FAQ-171**, specifically the section entitled **Add Function Plot to an Existing Graph**.

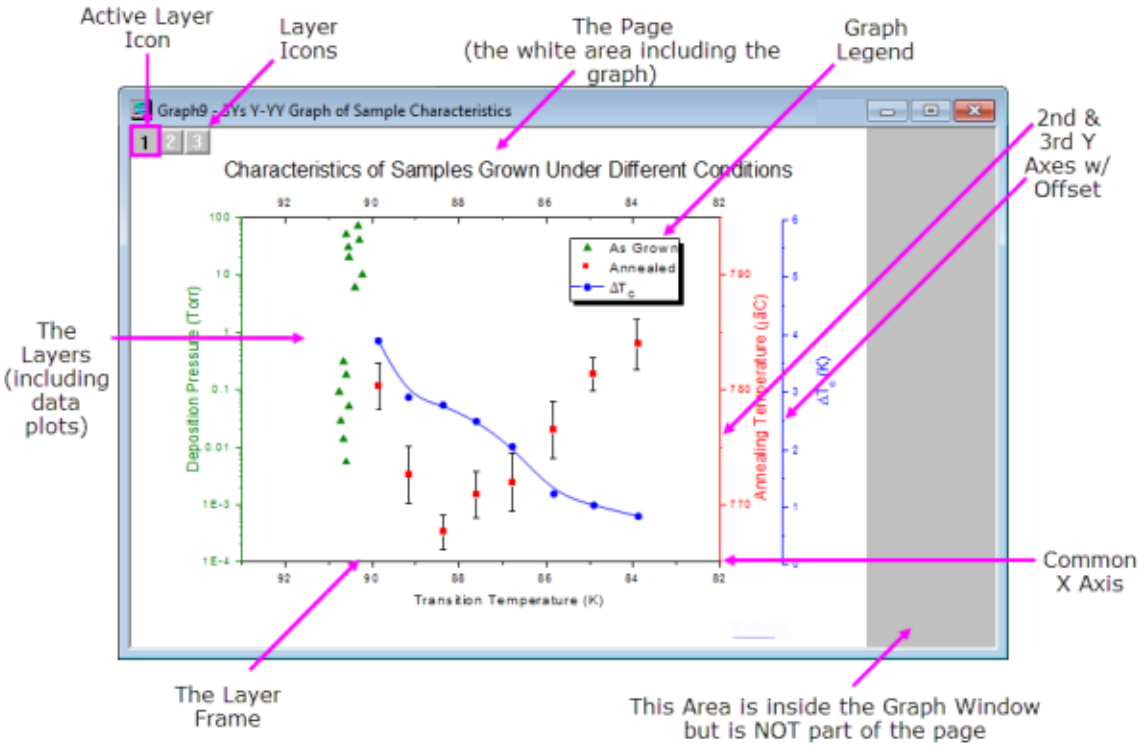
10.2 Plotting without Using Column Plot Designations

While worksheet Column Plot Designations are *always* used when creating graphs from the **Plot** menu or one of the graph toolbars, the **Plot Setup** dialog box does not make use of them. With Plot Setup, you assign column designations on an *ad hoc* basis, allowing you to overcome some of the restrictions of template-based plotting.

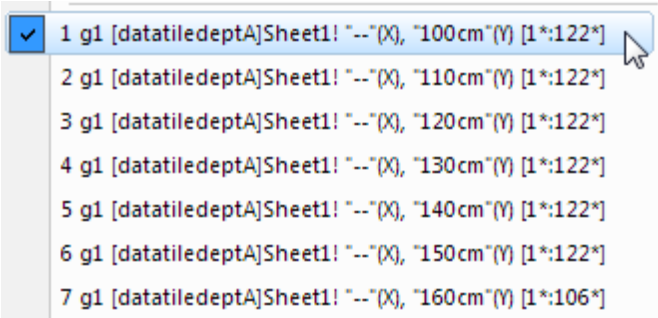
However, to make use of the **Plot Setup** dialog box, you need to have some familiarity with the hierarchy of objects contained in the Origin graph window.

10.2.1 Pages, Layers, Plots and the Active Plot

Each Origin graph window is comprised of a single, editable graph page. The graph page is defined by the white area inside the graph window. Anything that lies outside the page is not printed or exported. By default, the dimensions of the graph page are defined by the printable area of your default printer driver; without adjusting settings, a printed graph should fill the printed page.

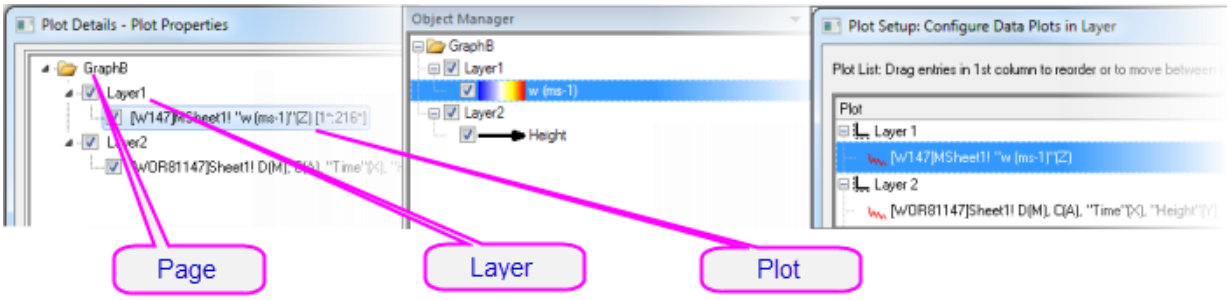


- The graph page must contain at least one, and may contain as many as 1024, graph layers.
- Each graph layer generally contains one or more data plots (graphical depictions of datasets). Note that the graph in the image above contains *three graph layers*, represented by the three non-printing *layer icons* in the upper-left corner of the graph page. Note that there is one layer icon which is highlighted, indicating that this is the *active* layer.
- Just as there is only one active layer, there is only one active plot in a graph. Usually, the active plot is the first plot in the active layer. To verify which plot is active, click on the **Data** menu while the graph is active. The active plot will have a check mark beside it.



The hierarchical structure of the graph page can be seen in these places:

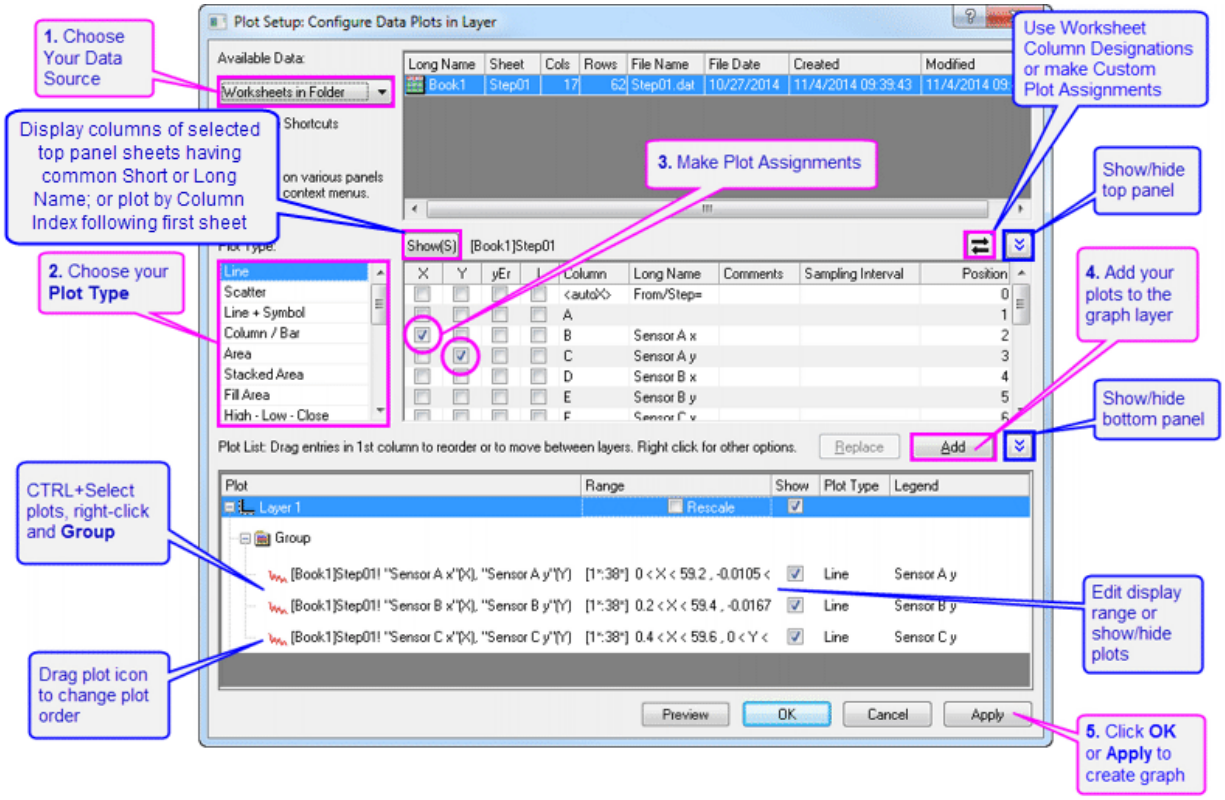
- The **Plot Details** Dialog Box (**Format: Page ...**)
- The **Object Manager** (**View: Object Manager**)
- The **Plot Setup** Dialog Box (**Graph: Plot Setup...**)



10.2.2The Plot Setup Dialog Box

The Plot Setup dialog box is a flexible all-in-one plotting tool for creating graphs and manipulating the data plots in an existing graph.

- Creating graphs without regard to Column Plot Designations
- Creating graphs from a combination of data sources: multiple worksheets, workbooks, matrixbooks, loose datasets, etc.
- Creating graphs combining multiple plot types.
- Adding, removing, replacing data plots.
- Grouping or ungrouping data plots.
- Reordering data plots in a layer or moving data plots to another layer.



To create a graph with the **Plot Setup** dialog, make sure no data is selected in the active worksheet and choose the plot type that you want to create (from the **Plot** menu or by clicking on a toolbar button).

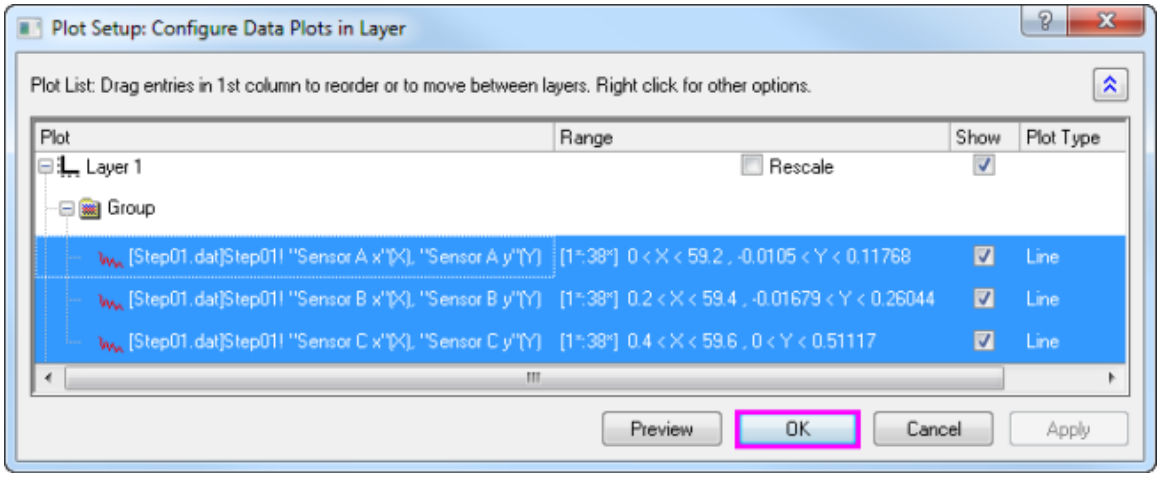
To open the **Plot Setup** dialog for an existing graph window, right-click on any layer icon in the upper left corner of the graph window and select **Plot Setup...**, or choose menu **Graph: Plot Setup...**.



Tutorial: Creating a Simple Line Plot with the Plot Setup Dialog Box

1. Click the **New Workbook** button on the **Standard** toolbar.
2. Click **Data: Import From File: Single ASCII**, browse to the Origin installation folder and import the file \Samples\Curve Fitting\Step01.dat. Starting from column B, columns are actually paired - X data and Y data -- but by default all columns are assigned a "Y" Column Plot Designation on import.
3. Without selecting any data, click **Plot > Basic 2D: Line**. This opens the Plot Setup dialog box.
4. Click the two "double-arrow" buttons to show all three dialog box panels.
5. In the middle panel, select the "X" box for Column B (Sensor Ax) and the "Y" box for Column C (Sensor Ay), then click the **Add** button to add the plot to Layer 1 in the bottom panel.
6. Select the "X" box for column D (Sensor Bx) and the "Y" box for Column E (Sensor By), then click **Add**.
7. Select the "X" box for column F (Sensor Cx) and the "Y" box for Column G (Sensor Cy), then click **Add**. Three plots are added to Layer 1.

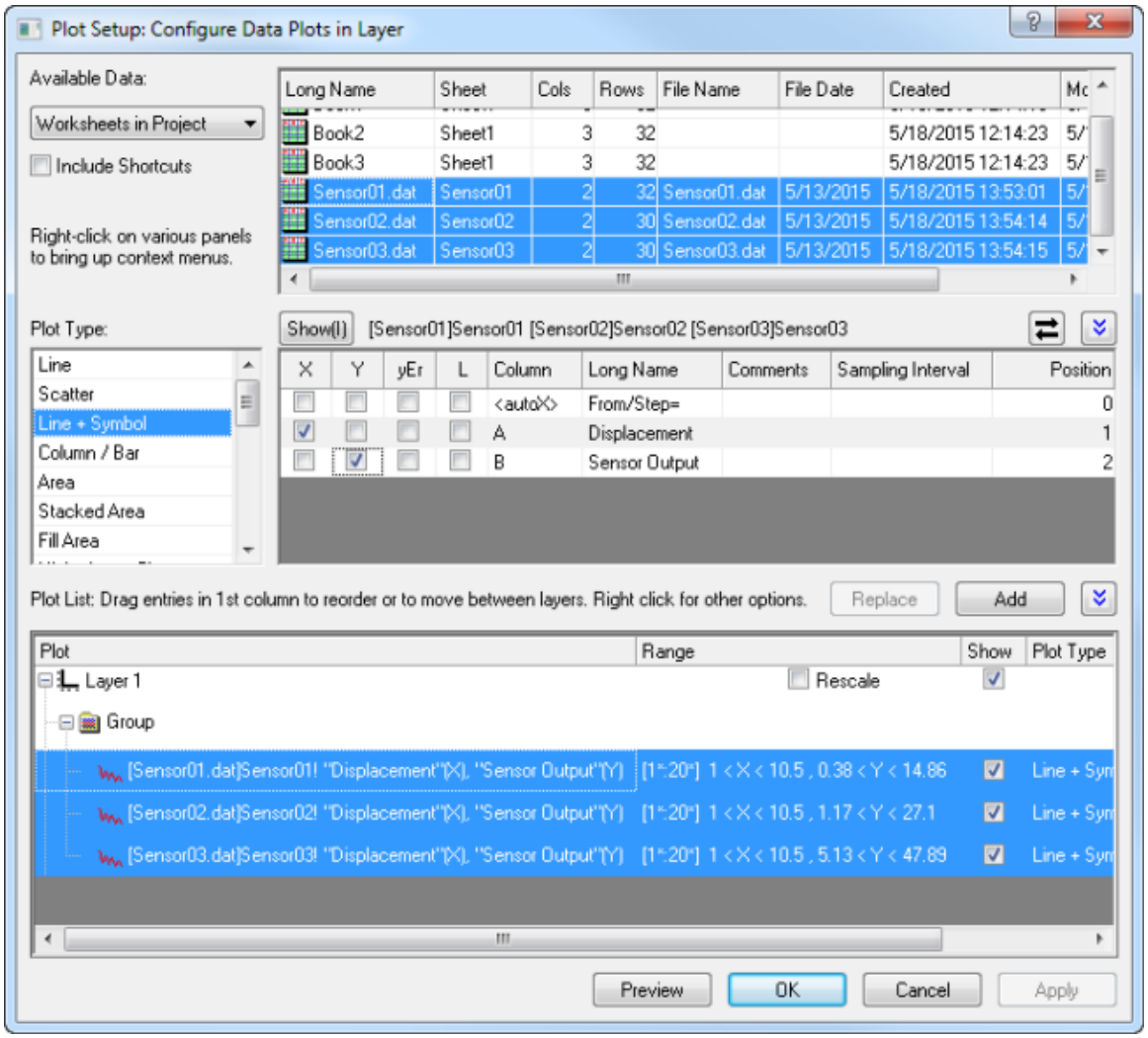
8. Press CTRL and click on each plot in the bottom panel to select all three, then right-click and choose **Group**.
9. Click **OK** to create a grouped line plot.





Tutorial: Creating a Graph with Data from Multiple Worksheets

1. Click the **New Workbook** button on the **Standard** toolbar.
2. Click **Data: Import From File: Multiple ASCII**, browse to the Origin installation folder and select Sensor01.dat, Sensor02.dat and Sensor03.dat under \Samples\Curve Fitting\ to import. After Import, 3 workbooks are created.
3. Without selecting any data, click **Plot > Basic 2D: Line+Symbol**. This opens the Plot Setup dialog box.
4. Expand the top panel if it is hidden. From the **Available Data** list, choose **Worksheets in Folder**.
5. Select Sensor01, Sensor02 and Sensor03 sheets in the top panel.
6. In the middle panel, select the "X" box for Column A (Displacement) and the "Y" box for Column B (Sensor Output), then click the **Add** button.
7. Click **OK** to create a grouped Line+Symbol plot using Sensor Output columns from 3 worksheets.



- The Plot Setup middle panel only allows choosing one X column at a time.
- If your worksheet is set up with the correct Column Plot Designations (e.g. XYXY) but you only want columns with same Long Name, click the toggle in the upper-right corner of middle panel so that only plottable columns show (e.g. for 2D plot types, X columns are not shown). Then you can sort the columns and select all columns with same Long Name and plot them together. The Y columns will be plotted against corresponding X columns.
- To change a data plot's type, choose the corresponding plot in bottom panel. Corresponding X and Y columns will show in middle panel. Choose a new plot type in middle panel and click the **Replace** button.
- All data plots in a group share the same plot type. If you want to change the plot type of a single plot in a group, right-click the Group node in bottom panel and Ungroup first.
- Drag and drop data plots in the bottom panel to move them to different layers.
- If the bottom panel is hidden and you have selected columns in the middle panel, you can directly click the **OK** button to create your graph.

10.3 Manipulating Data Plots

The following sections discuss higher level modifications to existing graphs such as changing plot type, adding or removing plots from the layer and controlling the density of plotted points (Speed Mode). For more detailed plot customizations, including those involving such things as changing plot symbols, colors, and legend customizations, see the Customizing Graphs chapter.

10.3.1 Changing Plot Type

Some Origin plot types (e.g. scatter, line, line+symbol) allow you to interchange the plot type of an existing plot with a few other select plot types. Some examples:

- Scatter, line, line+symbol, column/bar are interchangeable.
- 3D scatter/trajectory/vector, 3D bars, 3D surface are interchangeable.

To change the plot type of an existing plot:

- Right-click on the data plot and choose **Change Plot to: *Graph Type*** from the shortcut menu.
- Click on the data plot and choose **Format: Plot...** and in Plot Details choose from the **Plot Type** drop-down list.
- Click on the data plot, then click one of the supported graph toolbar buttons.

Note that if you switch plot types and the selected plot is part of a plot group, *all* plots in the group are switched.



A word of caution: This is an old Origin feature, and for a quick change of common plot types in a single-layer graph it works well. Changing plot types in a multi-panel, multi-layer graph can lead to unwanted outcomes. When working with more complex graphs, it is better to create a graph directly using the specified **Plot** menu command or toolbar button .

10.3.2 Exchanging Data Plots

You can quickly change the data source (X, Y, or worksheet) of a plot using these context menu commands. Right-click on a data plot, then select one of these options:

- **Change X/Y/Z**. These menu items allow you to swap the current X,Y or Z data with data from any column in the project.
- **Select Columns**. This opens the **Column Browser** where you can select another column in the **Current Folder**, in the **Current Folder (recursive)** (includes subfolders) or in **Current Project**.
- **Change Worksheet**. This menu item allows you to replace both X and Y with data from another worksheet. The selected worksheet must have the same Short Names, the same Column Plot Designations and the same row index range as the current worksheet.

Tutorial: Changing X and Y assignment of a data plot

1. Start with a new workbook and import the file **automobile.dat** from the **Samples\Statistics** sub-folder of the Origin installation folder.
2. Select the **Gas Mileage** column and select the **Plot: Basic 2D: Scatter** menu item. The **Gas Mileage** column is plotted against the default X column **Year**.
3. Right-click on the data plot and select **Change X**: **Engine Displacement**. The **Gas Mileage** column is now plotted against **Engine Displacement**.

Note: If new data is significantly outside of the current range for X or Y axes, you will be asked if the graph should be rescaled. If data are not significantly different, you may want to manually rescale the graph (Hot key: CTRL+R).

If you have performed some analysis on the data plot (e.g. linear regression with **Recalculate** set to **Auto**), the fit results will automatically update when you change X/Y or the worksheet.

10.3.3 Adding, Removing and Hiding Data Plots

Use the following methods to add or remove data plots from a graph.

10.3.3.1 Adding Data by Drag and Drop

You can add data to a graph by drag and drop. When using this method, Origin relies on worksheet Column Plot Designations to create the plot.

1. Select the worksheet data (one or more columns or a range of one or more columns).
2. Move the mouse over the left or right edge of the selected range.
3. When the pointer looks like this , hold down the left mouse button and drag the data to the graph window. Release the mouse.
4. If there are multiple layers in the graph, drag the data to the desired layer, then release the mouse.

Usually the current plot type is used when plotting by drag-and-drop. To change the global plot type to use when drag and drop, choose **Preferences: Options...** from the main menu. Go to the **Graph** tab and change the **Drag and drop plot** type.

10.3.3.2 Adding Data with Insert: Plot to Layer

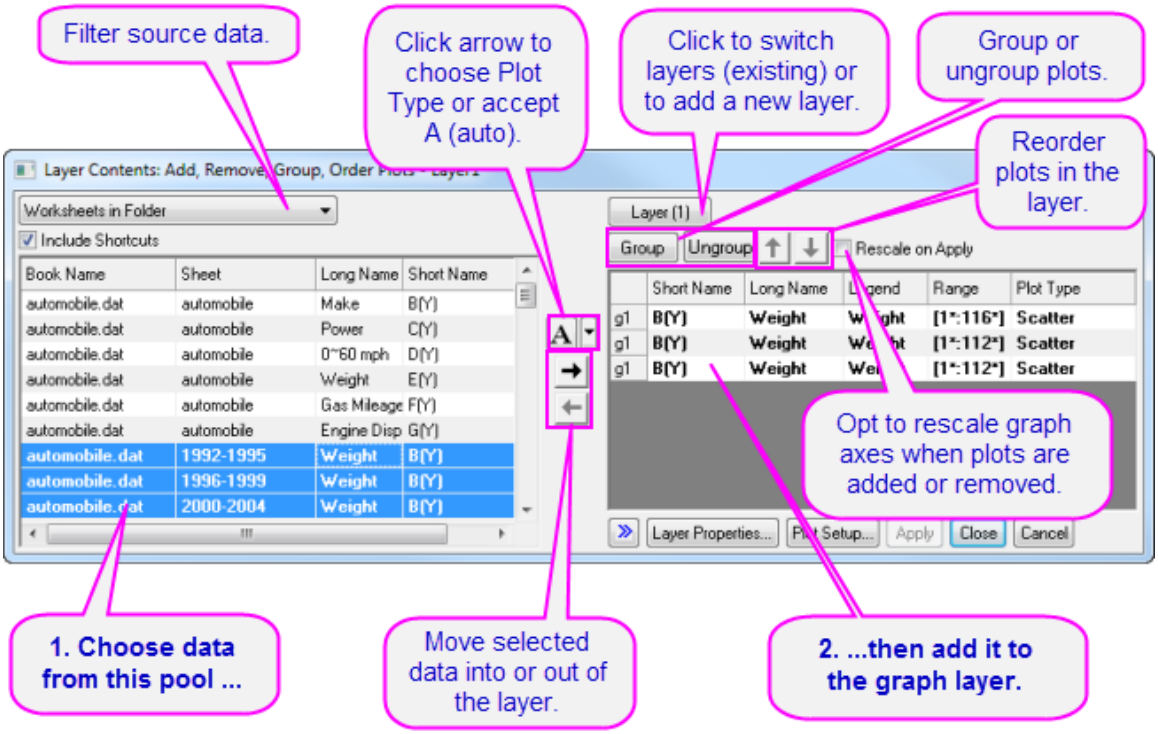
Use the **Insert** menu to insert some types of plots to the active graph layer. Choice of plot type depends on the active graph window and the last-activated data source (worksheet or matrix). For instance, if you create a 2D graph, select data in a workbook window, then return to graph window and click **Insert: Plot to Layer**, your insert choices will be **Line**, **Scatter**, **Line + Symbol**, **Column...**, Area and **Contour...**.

To use the **Insert** menu command, you should have an existing graph window:

1. Go to the worksheet or matrix window and select your dataset(s).
2. Return to the graph window, make sure that the target layer is active layer, then choose **Insert: Plot to Layer: *Plot Type***.

10.3.3.3 Adding and Removing Data with the Layer Contents Dialog Box

Open the **Layer Contents** dialog box by double-clicking or right-clicking on the layer icon(s) in the top left corner of the graph page. Controls in the left panel can be used to filter and list available datasets. The right panel lists datasets that are plotted in the active layer.

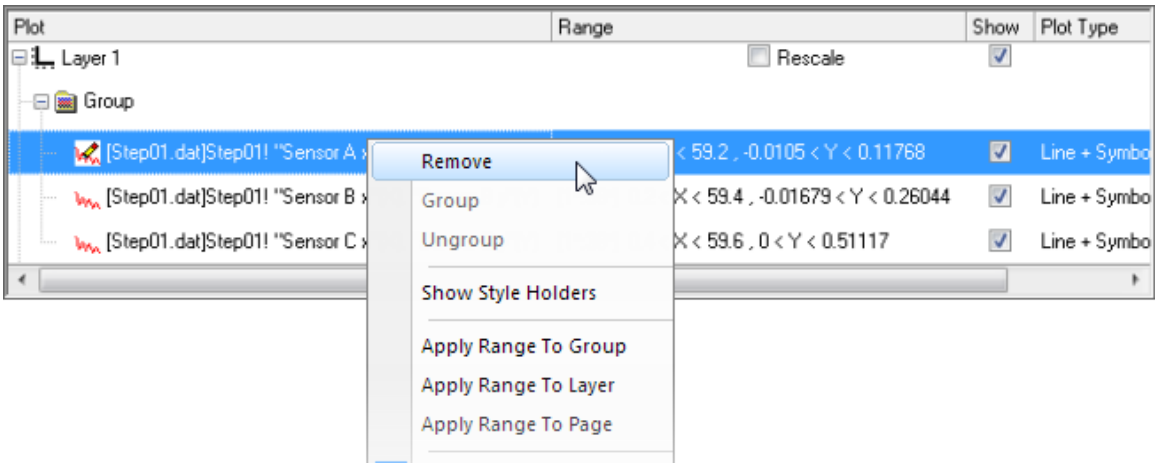


Controls in the center of the dialog box allow you to add or remove plots from the active graph layer. When adding data to the graph, click the list button (downward-pointing arrow) to pre-select the plot type before adding data to the layer. Use controls in the right panel to group or ungroup plots, or re-order plots in the layer.

10.3.3.4 Adding, Removing, Replacing or Hiding Data Plots with the Plot Setup Dialog Box

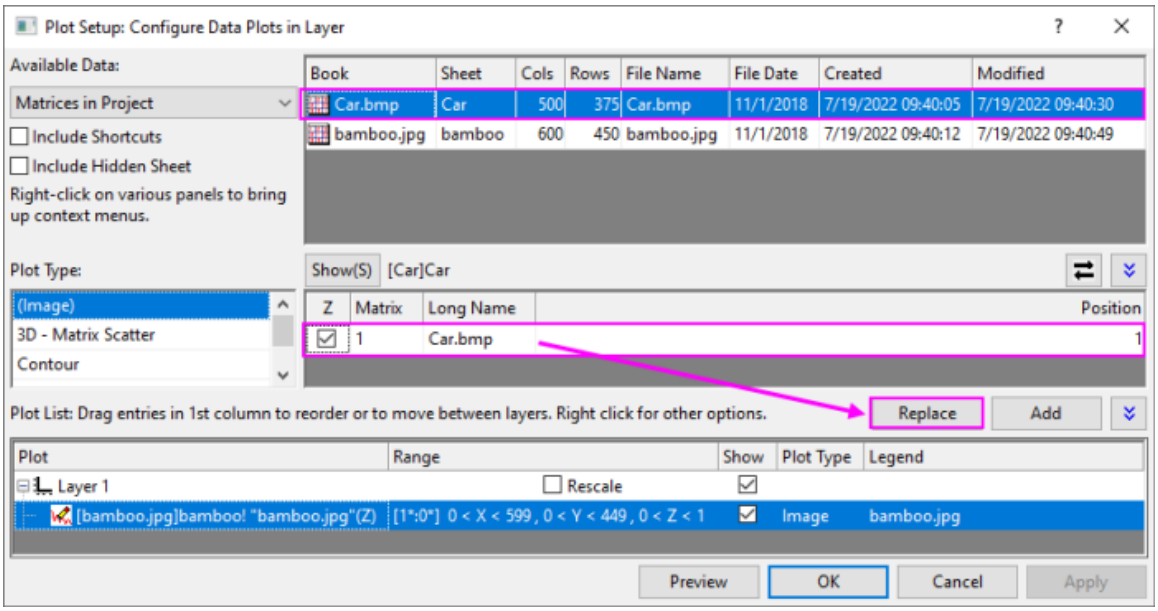
Among other things, the Plot Setup dialog box can be used to add or remove data plots from the graph.

1. To add plots to the graph, use the top panel of Plot Setup to identify your source data.
2. Use the controls in the middle panel to specify the plot type and how the data selection should be treated (as X, Y, yError or Label).
3. In the bottom panel, choose the Layer to which you want to add plots, then click the **Add** button.
4. To remove a plot from the layer, select the plot in the bottom panel, then right-click and choose **Remove**.



5. To hide a plot, uncheck the **Show** check box for the plot.

6. To replace a plot, select the plot in bottom panel, then change the X and Y selection and plot type in middle panel and click the **Replace** button. Note that replacing one **3D**/**Contour Plot/Image** matrix with another is also supported.



10.3.3.5 Adding Data by Direct ASCII Import

You can import ASCII files directly into the active graph window using the the **Import ASCII** toolbar button. Note that this method works only with files having a simple structure and it supports only the simplest of graph types - **Line**, **Scatter**, **Line + Symbol**, **Column** and **Bar** charts.

1. Click the **Import ASCII** button. This opens the Import ASCII dialog box.
2. Choose a file.
3. Click **Open**.

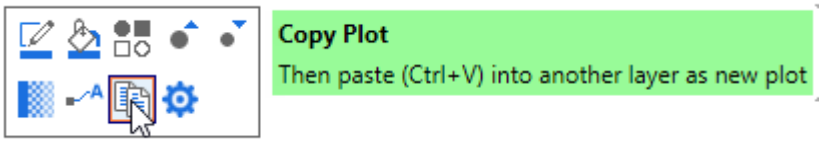
The file is imported and plotted in the active graph window.

10.3.3.6 Adding Data by Copying and Pasting a Plot

With many Basic 2D graphs (e.g. Scatter, Line, Line + Symbol, Bubble, etc.), you can copy a plot from an existing graph layer and paste it to another layer in the same window or into a separate graph window. Prior to Origin 2020, this would only produce a black line plot. Origin 2020 expanded copy-paste of plots to other plot types, while preserving plot properties (symbol size, color, etc.).

1. Click on the plot to select it and press CTRL+C.
2. Click on the target graph and press CTRL+V.

You can also copy a plot by selecting the plot in the graph and clicking on the **Copy Plot** button on the Mini Toolbar.



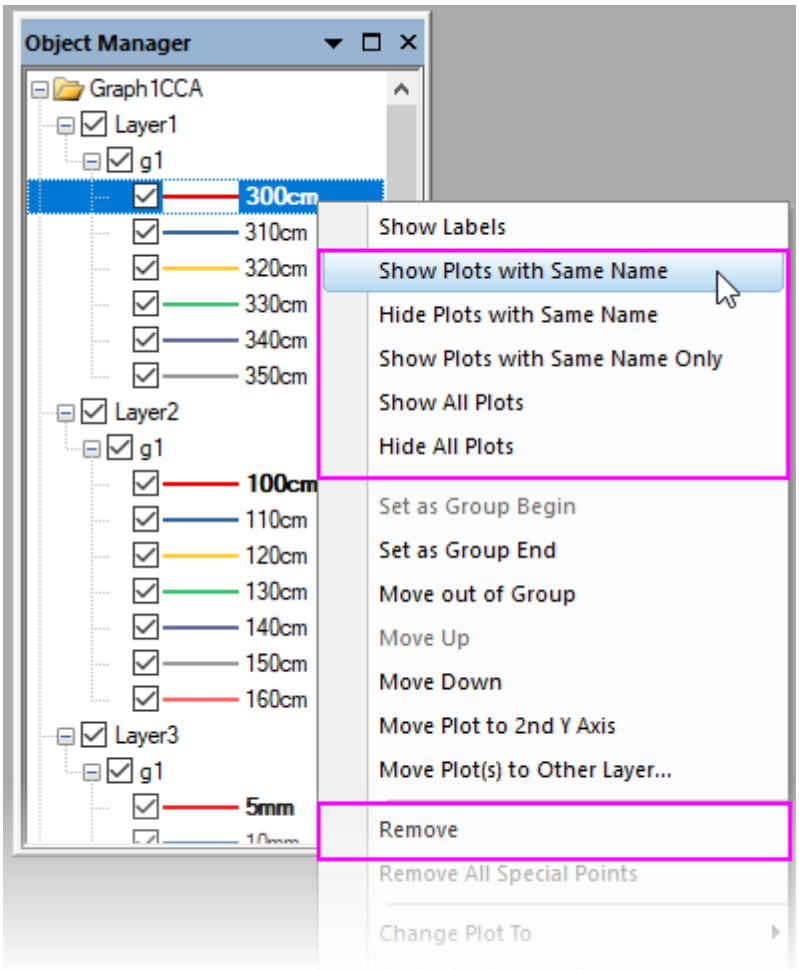


Previous versions also allowed you to select and copy a simple plot (Line, Scatter, Line + Symbol, 2D Column/Bar) and paste underlying data into a worksheet. The default settings no longer support this but you can reverse this by setting LabTalk system variable **@CPNP=1**.

10.3.3.7 Removing or Hiding Plots with the Object Manager

The **Object Manager** is a dockable panel that allows for easy manipulation of graph layers and data plots. See the section on The Object Manager in this Guide.

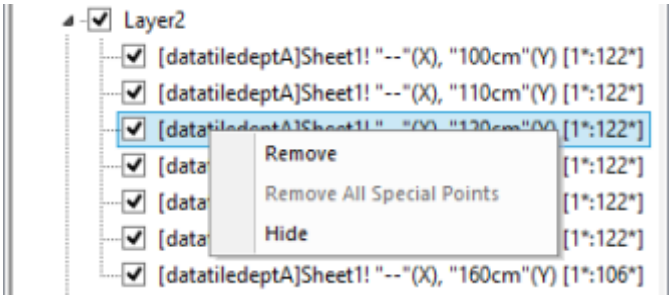
To hide or remove plots, right-click on a plot and choose from the shortcut menu:



- Show or hide plots of the same Long Name.
- Show all plots.
- Remove a plot from the graph window (hidden plots can be quickly shown again; removed plots must be added back using one of the above methods).
- If the plot is part of a group, you can right-click on an individual plot and remove just that plot or you can right-click on the group icon and remove the entire plot group.
- When you right-click on a plot, you can use **Hide Plots with Same Name** and **Hide All Plots** shortcut menu items to quickly hide selected plots in the window without removing them entirely (restore plots by enabling their display in the **Object Manager** or in **Plot Details**).

10.3.3.8 Removing or Hiding Data with Plot Details

In the left panel of the Plot Details dialog box (**Format: Plot...**), right-click on a plot and choose **Remove** or **Hide** from the context menu. **Remove** will delete the data plot from the graph so if you just want to temporarily hide a plot, choose **Hide**. Neither of them will delete data from worksheet or matrix.



10.3.3.9 Deleting Plots using the Delete Key

Click on a data plot (either in the graph window or Object Manager) and press the **Delete** key. If the selected plot is part of a group, the entire group is deleted.

Note that this is more sweeping than the **Remove** shortcut menu command in that it will remove an entire plot group from the graph window. This action does *not* delete worksheet or matrix data.

To restore the deleted plots, choose **Edit: Undo Remove Plot** from the main menu.

10.3.3.10 Editing Plot Range

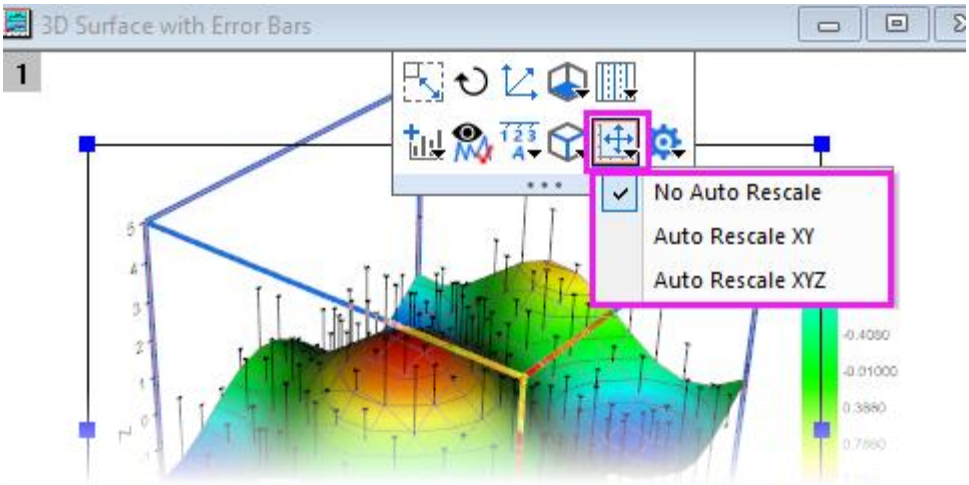
Once a graph is made, you can edit the plot display range, specifying only a portion of the plotted data:

- Right-click on the plot and choose the **Edit Range...** shortcut menu command. Edit the **From** and **To** values.
- In the right panel of the Layer Contents dialog box (**Graph: Layer Contents**), turn on the **Range** column by right-clicking on the column headings and choosing **Range**. Click on a plot's range values, then click the **...** button that appears to the right side of that column.
- In the bottom panel of Plot Setup (**Graph: Plot Setup**), click on the plot range in the **Range** column and click the **...** button that appears to the right side of that column.

10.3.3.11 Rescaling after Adding/Removing Data Plots

Adding or removing data plots from a 2D or 3D graph may result in the need to rescale axes.

- Origin will generally ask the user how to handle rescaling.
- Some dialog boxes that are used to add or remove datasets from a plot (e.g. Layer Contents) typically have a rescale check box.
- You can also select the layer beforehand, then click the Mini Toolbar **Auto Rescale** button, to automatically rescale. This is equivalent to opening the Axis dialog box **Scale** tab and setting **Rescale** = **Auto**.



- Choose **Graph: Rescale to Show All** to rescale the graph after editing the plot range.

10.3.4Grouping Data Plots

When you make multiple range or column selections, then create a graph, Origin *groups* the resulting data plots in the graph layer. This applies to most **1D** (statistical) and **2D** graphs, plus **3D XYY** (XYY 3D bar, 3D ribbon, 3D wall, and 3D waterfall plots) and **3D XYZ** (3D scatter, 3D bar) graphs.

Grouping provides for quick creation of presentation-ready graphs because each plot in the group is assigned a differentiating set of plot attributes (line color = black, red, green...; symbol shape = square, circle, triangle...; etc.). Assignments are made by cycling through a pre-determined (user-modifiable) increment list of styles. For instance, the first plot of a grouped line plots might be denoted by a black line; the second plot might be denoted by a red line (the second color in the color list), the third plot by a green line (the third color in the color list), and so on.

Tutorial: Creating a simple grouped data plot

1. Open a fresh worksheet and click the **Import Single ASCII** button on the Standard toolbar.
2. Browse to the Samples\Graphing subfolder in the Origin software folder and **Open** GROUP.DAT.
3. Select **B(Y)**, **C(Y)**, and **D(Y)** columns
4. Click the **Line & Symbol** button on the 2D Graphs toolbar. Note that line and symbol color and symbol type are automatically differentiated for each plot.

Tutorial: Grouping (or ungrouping) plots manually

- ***Via the Layer Contents dialog box***

1. To open the **Layer Contents dialog box**, double-click on the **layer *n*** icon in upper-left corner of the graph window.

2. To create a group, select the desired data sets from the **Layer Contents** list (use CTRL + select, SHIFT + select, or simply drag the mouse to select multiple data sets).
3. Click **Group**. Note that each plot in Layer Contents is now preceded by a **g*n*** (for "group1", "group2", etc.).
4. To ungroup, click on one of the grouped data plots in the **Layer Contents** list and click **Ungroup**.

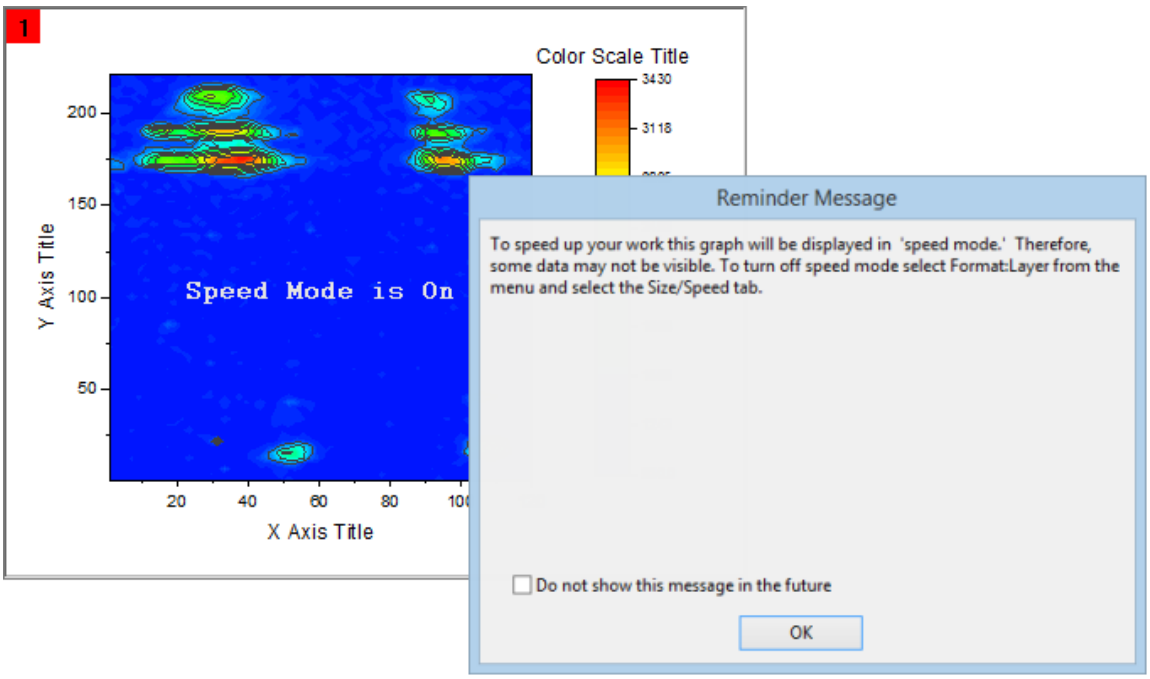
- ***Via the Plot Setup dialog box***

1. To open the **Plot Setup** dialog box, ALT + double-click on the **layer *n*** icon in upper-left corner of the graph window.
2. To create a group, select the desired plots from the **Plot List** (use the CTRL or SHIFT keys to select multiple data sets).
3. Right-click and select **Group**. Note that a **Group** icon now precedes the selected plots in the Plot List.
4. To ungroup, right-click on the **Group** icon and choose **Ungroup** from the shortcut menu.

10.3.5 Speed Mode

With **Speed Mode**, you can control the number of data points displayed in a graph layer. This option is most used when working with large data sets, though note that there have been improvements in this area and Origin now has **Density Dots** and **Color Dots** graph templates specifically for creating scatter plots of large datasets.

Speed Mode can be turned on for any 2D or 3D graph. When Speed Mode is enabled, the layer icon displays in red and a **Speed Mode is On** banner appears in the layer. The banner is *not included when printing, copying, or exporting the graph*.



To adjust Speed Mode settings:

1. With your graph active, select **Format: Layer...** from the Origin menu.
2. Select the **Display/Speed** tab.
3. For plots created from worksheet data, Select the **Worksheet Data, Maximum Points Per Curve** check box to enable Speed Mode for all the data plots in the layer that are created from worksheet data. Type the desired value (*n*) in the associated text box. If the number of data points in a data plot exceeds *n*, Origin displays a subset of the data plot containing n points, drawn by extracting values at regular intervals from the data set.
4. For 3D data plots created from a matrix or for contour data in the layer, Select the **Matrix Data, Maximum Points Per Dimension** check box to enable Speed Mode. Type the desired value (*n*, *m*) in the X and Y text boxes. If the number of data points in a data plot exceeds *n* or *m*, Origin displays a subset of the data plot composed of -- at maximum -- *n* by *m* points. This subset is drawn by extracting values at regular intervals from the matrix columns (X) and rows (Y).

For broad control, you can select **Speed Mode** from the **Graph** menu. This opens the speedmode X-Functiondialog. The dialog lets you specify which windows the settings should apply to (**Target**) and also, offers several levels of data plot thinning from **Off** to **High**, plus **Custom**.



Click the **Enable/Disable Speed Mode**  button on the Graph toolbar, to toggle Speed Mode on/off for all layers in the graph window.

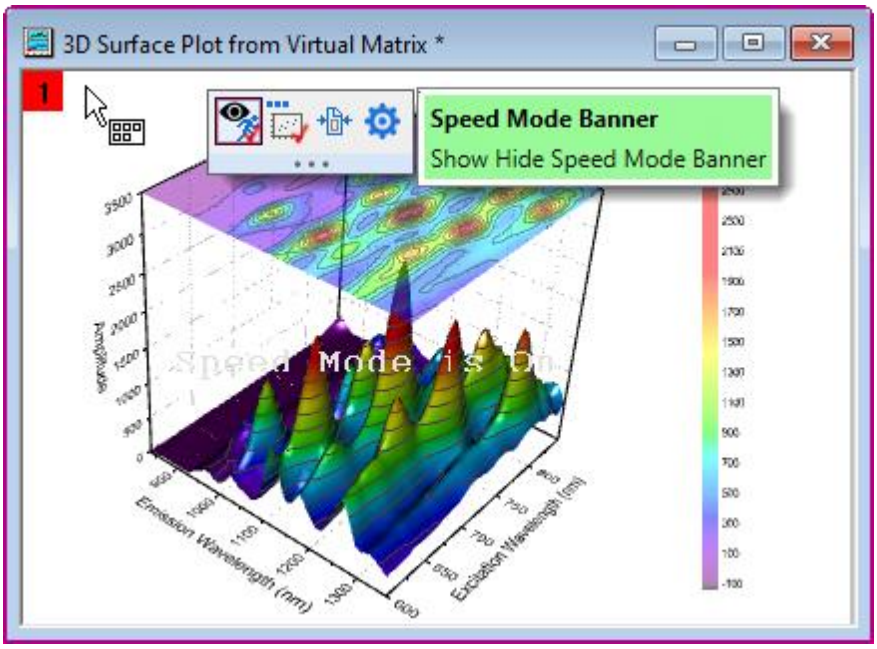
To turn off the **Speed Mode is On** banner for all graphs:

1. Select **Preferences: Options** to open the Options dialog box.

2. Select the **Graph** tab and clear the **Speed Mode Show Watermark** check box and refresh the graph, if needed. Note that this only disables the banner across the graph; it does not disable Speed Mode.



There is a page-level Mini Toolbar button to toggle the **Speed Mode Banner** off or on, at the individual graph level.



10.3.5.1 Notes on Speed Mode

- Besides **Speed Mode**, Origin has another generalized data reduction mechanism for plots with scatter points (e.g line & symbol). The Plot Details's plot-level **Display** tab has a **Data Points Display Control** drop-down so that you can systematically skip plotting of points by one of several methods (e.g. *Skip Points by Increment*).
- LabTalk control of where to begin skipping (e.g. **layer.plot1.symbol.skipstart**=*10*, will start skipping at row 10).
- **Skip Points** and **Speed Mode** plot the last data point, by default, but this is controlled by system variable **@SMEP**.
- The Speed Mode controls on the **Display/Speed** tab of the layer's Plot Details only apply to what you see on screen. They do not apply to graphs that are printed or exported, by default.
- If you wish to **skip points** in printouts, use controls in the **Print** dialog. See the discussion of the Skip Points feature as it applies to some graph windows in the Origin Help file.
- If you wish to apply Speed Mode settings to graphic export, please see this discussion of **Performance Group** controls on the **Miscellaneous** tab of the Plot Details dialog box or use controls under the **Export Settings** node in the **Graph Export** dialog.
- Speed Mode settings are saved with the graph template. If you make changes to Speed Mode settings for a particular graph type, you will have to resave the graph template to make those changes permanent.

- Always exercise judgement when using Speed Mode. Since Speed Mode systematically weeds out a portion of your data points, any graph in which Speed Mode is turned on, may -- or may not -- accurately represent your data, to your satisfaction. Always familiarize yourself with your data and adjust and compare Speed Mode settings to ensure that trends in your data are accurately depicted.

10.4 Publishing Your Graph: Copy/Paste, Image Export, Slide Shows and Printing

There are a number of ways to present your finished graph.

- Copy a graph page and paste it in other applications such as Word, Powerpoint, etc.
- Export the graph page as an image file (raster or vector).
- Send Graphs to PowerPoint.
- Printout.
- Slideshow within Origin.
- Create Movies.

Please read details in the Publishing and Export chapter of this User Guide and the "Topics for Further Reading" there.

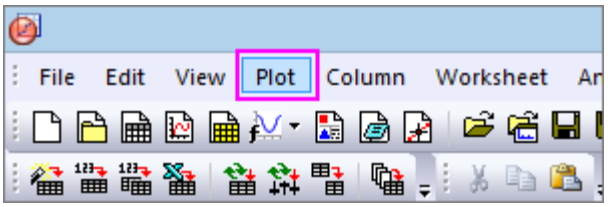
10.5 Origin Graph Types

Origin supports over 100 plot types. Origin's 2D graphs are plotted from **Worksheet** data. Origin's 3D graph are plotted from **Worksheet** data (*XYY*, *XYZ*), a worksheet arrangement we refer to as a **Virtual Matrix** or from **Matrix** data.



Origin **Graph Samples** of most 2D and 3D graph types are included with your Origin software. To view graphs, supporting data and guidelines for making the graphs, choose **Help: Learning Center**(**F11**).

The tables below list all Origin graph types, grouped by **Plot** menu category:

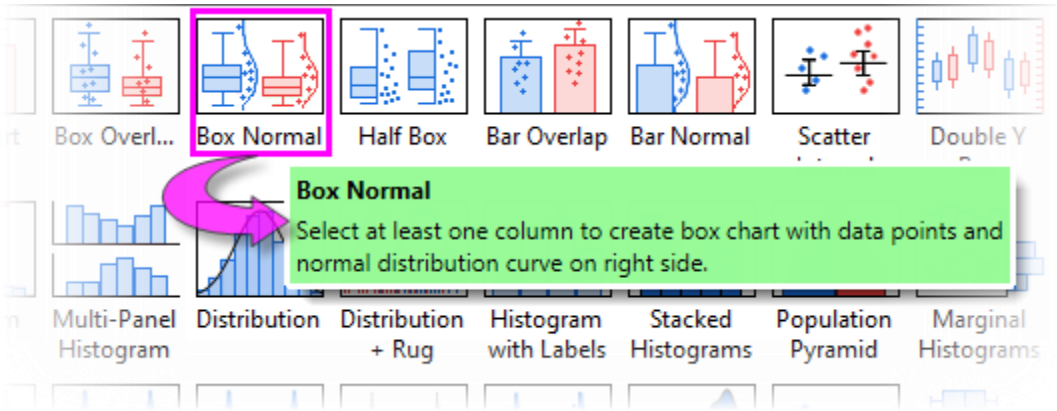


- The **Plot** menu icon for each graph type precedes the graph name.
- The **Notes** column provides basic information on data requirements. For more specific data requirements, click on the graph name beside the **Plot** menu icon.

10.5.1 Plot Menu Graphs by Category

Plot menu templates display basic data requirements on hover.

When the cursor hovers over a plot icon, pressing **F1** key will pop up the help documentation for that plot, including the plot created by **Extended Template** and Apps.

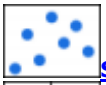
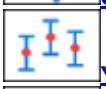
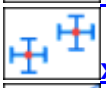
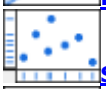
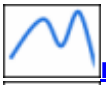
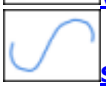
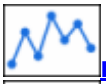
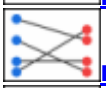
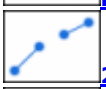


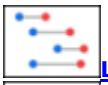
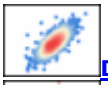
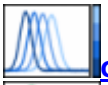
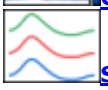
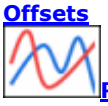
You can modify the size of the **Plot** menu icons using the LabTalk system variable **@PPS**. To find out how to change the value of a system variable, see Customizing Origin Using System Variables.

- **Basic 2D**
- **Bar, Pie, Area**
- **Multi-Panel/Axis**
- **Statistical**
- **Contour**
- **Specialized**
- **Categorical**
- **3D**
- **Browser Graph**
- **Function Plot**
- **My Templates**
- **Other Graphing Tools**

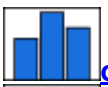
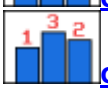
10.5.1.1 Basic 2D

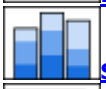
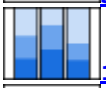
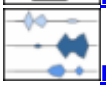
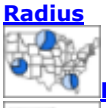
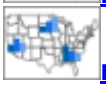
Graph Types	Notes

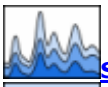
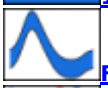
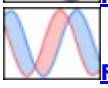
 Scatter  Scatter Central  Column Scatter  Y Error  XY Error  Error Band  Scatter + Rug  Bubble  Color Mapped  Bubble + Color Mapped	• Start with a **Worksheet**. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 Line  Horizontal Step  Vertical Step  Spline	• Start with a **Worksheet**. • Select one or more Y columns or at least a portion of one Y column. • Multiple Y columns are grouped in layer. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 Line + Symbol  Line Series  Before and After Graph  2 Point Segment  3 Point Segment	• Start with a **Worksheet**. • Select one or more Y columns or at least a portion of one Y column. • Multiple Y columns are grouped in the graph layer (except Line Series). • For Line Series graph, select 2 or 3 Y columns. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used.

 **Spline Connected**	• For specific data requirements, follow links in the **Graph Types** column.
 **Lollipop Plot**  **Vertical Drop Line**	• Start with a **Worksheet**. • For Bar, Column or Column + Label, select one or more Y columns (multiple Y columns are grouped in layer). • For Floating Bar/Column, select two Y columns. • For Stack graphs and Lollipop plots, select two or more Y columns. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **Density Dots**  **Color Dots**	• Start with a **Worksheet**. • Select one Y (Density Dots) or two Y (Color Dots) columns. • For more information, follow links in the **Graph Types** column.
 **Colormapped Line Series**  **Stacked Lines by Y Offsets**  **Row-wise**	• Start with a **Worksheet**. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.

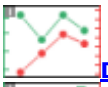
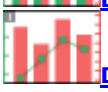
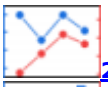
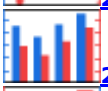
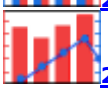
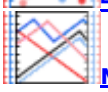
10.5.1.2 Bar, Pie, Area

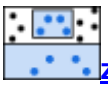
Graph Types	Notes
 **Column**  **Column + Label**	• Start with a **Worksheet**. • For Bar, Column or Column + Label, select one or more Y columns (multiple Y columns are grouped in layer).

 **Bar**  **Stacked Column**  **Stacked Bar**  **100% Stacked Column**  **100% Stacked Bar**  **Floating Column**  **Floating Bar**  **Kite Diagram**	• For Floating Bar/Column, select two Y columns. • For Stack graphs and Lollipop plots, select two or more Y columns. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **3D Color Pie Chart**  **2D Color Pie Chart**  **Doughnut Plot**  **Pie of Pie**  **Bar of Pie**  **Doughnut of Pie**  **Doughnut with Total**  **Pie with Different Radius**  **Doughnut with Different Radius**  **Pie Map**  **Bar Map**	• Start with a **Worksheet**. • Select exactly one Y column or a range from one Y column. • If there is an associated X column, the X data are used in the graph legend; otherwise row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **Area**	• Start with a **Worksheet**. • If there is an associated X column, X column

 **Stacked Area**  **100% Stacked Area**  **Fill Area**  **Fill 2 Colors**	supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.

10.5.1.3 Multi-Panel/Axis

Graph Types	Notes
 **Double-Y**  **Double-Y Column Graph**  **Double-Y Column-Line Symbol**	• Start with a **Worksheet**. • Select two Y columns. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **2Ys Y-Y**  **2Ys Column**  **2Ys, Column-Line Symbol**	• Start with a **Worksheet**. • Select two Y columns. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **3Ys Y-YY**  **3Ys Y-Y-Y**  **4Ys Y-YYY**  **4Ys YY-YY**  **Multiple Y Axes...**	• Start with a **Worksheet**. • Select one Y column for each Y axis. • **Multiple Y Axes** opens interactive dialog. Choose plot type, number of axes, plots per layer, axis color to match plot, etc. • For specific data requirements, follow links in the **Graph Types** column.

 **Vertical 2 Panel**  **Horizontal 2 Panel**  **4 Panel**  **9 Panel**  **Stack...**  **Multiple Panels by Label...**	• Start with a **Worksheet**. • Select one Y column (or range) per panel. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **Zoom**	• Start with a **Worksheet**. • Select at least one Y column or a range from at least one Y column. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow the link in the **Graph Types** column.

10.5.1.3.1 1 Layer, 2 Y Axes

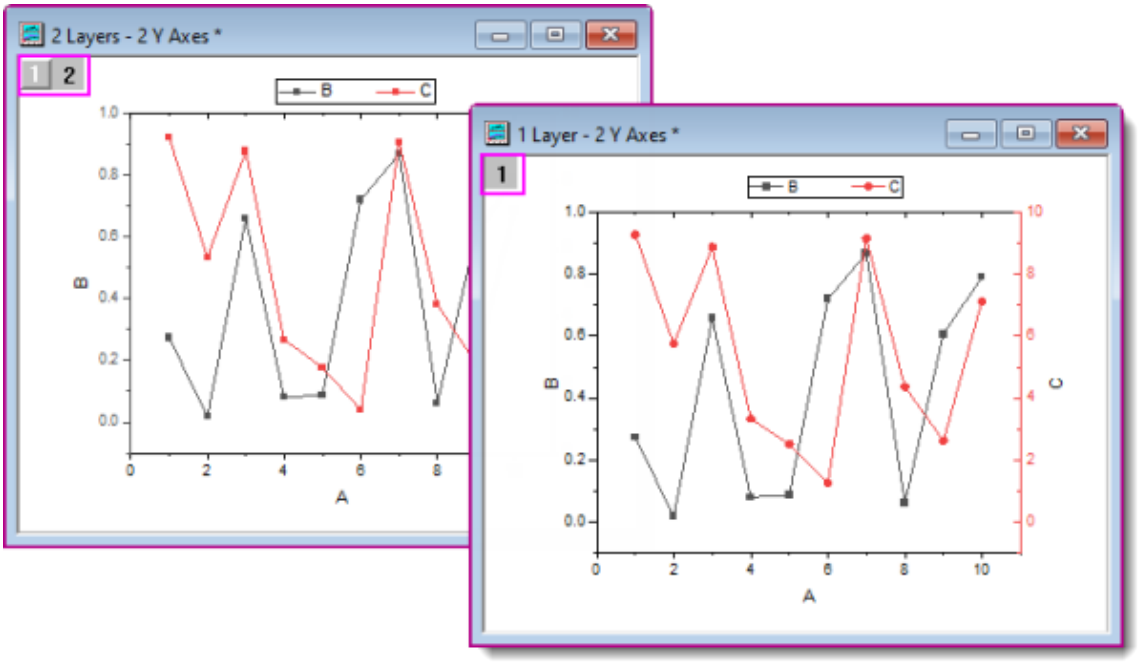
It has long been possible to create "Double-Y" plots in Origin. Previously, "2 Y axes" meant "2 layers." Since **Origin 2023**, Origin introduces support for a new "1 layer, 2 Y axis" plotting mechanism. The new mechanism has general applications for 2D **scatter**, **line**, **line + symbol** (incl. variations such as the "Before-After" graph), **column**, **box**, **histogram**, and **area** charts. Using new GUI controls, the user can create such a graph using only the basic plot type templates.

Beginning with **Origin 2023**, the Multi-Panel/Axis category (**Plot: Multi-Panel/Axis**) has two rows of "Double-Y" templates with the new, **single-layer** on top and the older, **two-layer** templates below.



The new and the legacy templates will produce the same graph, the only difference being that the legacy template will create two layers while the new template will create only one. The plotting procedure is the same for both:

1. In the worksheet, select 2 columns of "Y" data.
2. Click **Plot: Multi-Panel/Axis** and choose the desired template.

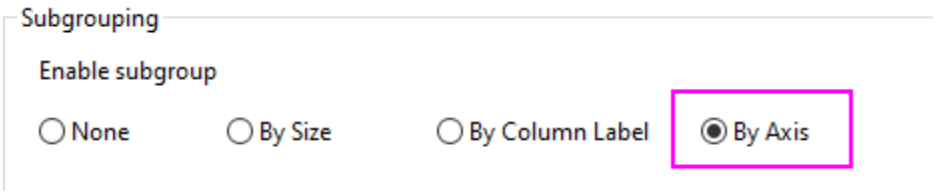




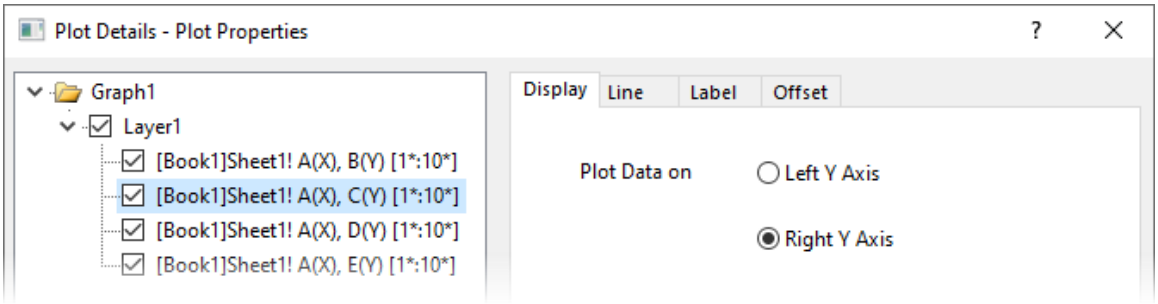
See **Customizing Graphs** for an example of creating a "1 Layer, 2 Y Axes" graph.

Other controls that are added to support this new "1 layer, 2 Y axis" plotting mechanism:

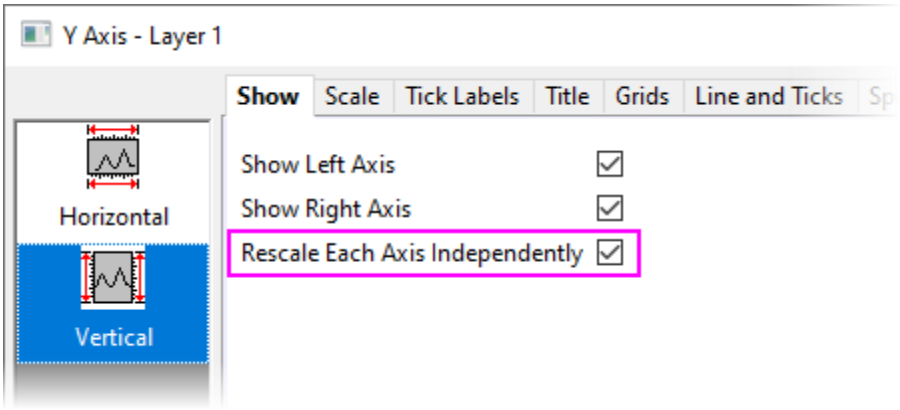
- The Plot Details **Group** tab now has a **Subgrouping** = **By Axis** option. In the graph above, we did not use this setting. Instead, we chose to use a single group and make use of line+symbol template's default increment lists for line color and symbol shape. However, we could just as well have split the left and right Y plots into two separate groups and thus, implement separate Plot Details **Group** tab behaviors for each group.



- The aforementioned plot types now include a **Display** tab at the plot level in Plot Details. Use radio buttons **Plot Data on** the **Left Y Axis** or **Right Y Axis**.

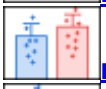
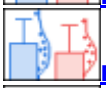
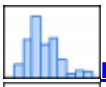
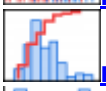
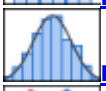
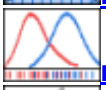
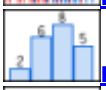
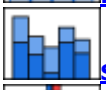
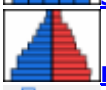
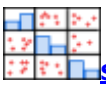


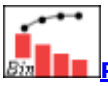
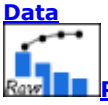
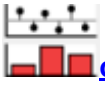
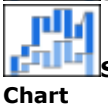
- The Axis dialog box now has a **Rescale Each Axis Independently** check box that should be enabled for a "double-Y" graph (If for some reason, your two vertical axes don't seem to want to scale independently, check on this setting).

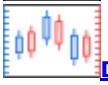
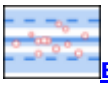
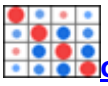
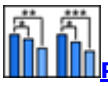


10.5.1.4 Statistical

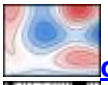
Graph Types	Notes
Box Chart Interval Plot Bar Chart Box Overlap Box Normal	• Start with a **Worksheet**. • Select at least one Y column or a range from at least one Y column. • For specific data requirements, follow the link in the **Graph Types** column.

 **Half Box**  **Bar Overlap**  **Bar Normal**  **Scatter Interval**  **Marginal Box Charts**  **Beeswarm Plot**	
 **Histogram**  **Histogram + Rug**  **Histogram + Probabilities**  **Multi-Panel Histograms**  **Distribution**  **Distribution + Rug**  **Histogram with Labels**  **Stacked Histograms**  **Population Pyramid**  **Marginal Histograms**  **Marginal Plots** (Grouped Marginal Histogram)	• Start with a **Worksheet**. • Select at least one Y column or a range from at least one Y column. • For specific data requirements, follow links in the **Graph Types** column.
 **Scatter Matrix**	• Start with a **Worksheet**. • Select two Y columns or a range from two Y columns. • For specific data requirements, follow the link in

	the **Graph Types** column.
 **Violin Plot**  **Violin with Box**  **Violin with Point**  **Violin with Quartile**  **Violin with Stick**  **Split Plot**  **Half Violin**  **Ridgeline Chart**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). • Split violin requires exactly 2 data columns, plus a third grouping column. • For data requirements and other information on plot variations, see Violin Plot. For data requirements and other information on Ridgeline Charts, follow the link in the **Graph Types** column.
 **Pareto Chart - Binned Data**  **Pareto Chart - Raw Data**	• Start with a **Worksheet**. • Select one Y columns or a range from one Y column (Raw), or a Y column of Binned results. • For specific data requirements, follow the link in the **Graph Types** column.
 **QC (X-bar R) Chart**	• Start with a **Worksheet**. • Select at least one Y column or a range from at least one Y column. • For specific data requirements, follow the link in the **Graph Types** column.
 **Bridge Chart**  **Stacked Bridge Chart**  **Stacked Total Bridge Chart**	• Start with a **Worksheet**. • Select one or more Y columns (or a range of one or more Y columns). If there is an X column to the left of the Y column(s), this X column is treated as categorical data; otherwise, the worksheet's row indices will be used. • Origin Bridge Charts are variants of one basic chart type. For more information, see Bridge

 **Horiz-Bridge Chart**  **Double Y Box**	Charts.
 **Probability Plot**  **Q-Q Plot**	• Start with a **Worksheet**. • Select one Y column or a range from one Y column. • For specific data requirements, follow the link in the **Graph Types** column.
 **Bland-Altman Plot**	• Start with a **Worksheet**. • Select two **Method** columns and one **Subject** column (optional).
 **Correlation Plot**	• Correlation Plot is an APP tool. To use it, please make sure the app is installed. • Start with a **Worksheet**. • The data can be checked in the dialog.
 **Paired Comparison Plot**	• Paired Comparison Plot is an APP tool. To use it, please make sure the app is installed. • Start with a **Worksheet**. • Select one **Data** column, then select **Group** columns in the dialog.

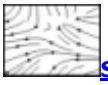
10.5.1.5 Contour

Graph Types	Notes
 **Contour - Color Fill**  **Contour B/W Lines + Labels**	• Contour Color Fill, B/W Lines + Labels, Gray Scale Map, Contour Profiles: **XYZ**, **Virtual Matrix**, **Matrix**. • Contour - Categorical Z: **XYZ**, **Virtual Matrix**. • For specific data requirements, follow links in the

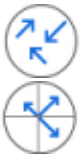
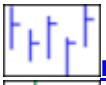
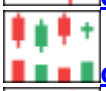
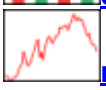
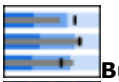
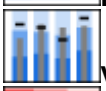
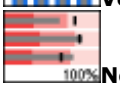
 **Gray Scale Map**  **Contour - Categorical Z**	**Graph Types** column.
 **Heatmap**  **Heatmap with Labels**  **Split Heatmap**	• Heatmap and Heatmap with Labels start with a **Worksheet** (XY, XYZ), **Virtual Matrix** or **Matrix**. • Split Heatmap starts from a **Worksheet**. • For specific data requirements, follow links in the **Graph Types** column.
 **Contour Profiles**  **Image Profiles**	• Start with a **Worksheet**, **Virtual Matrix** or **Matrix** (Image Profiles, Matrix only). • For specific data requirements, follow links in the **Graph Types** column.
 **Polar Contour theta(X), r(Y)**  **Polar Contour r(X), theta(Y)**	• Start with a **Worksheet** or **Matrix**. • For data requirements and other information on polar contour graphs from worksheet data, see **Polar Contour from XYZ Data**. • For data requirements and other information on polar contour graphs from matrix data, see **Polar Contour from Matrix Data**.
 **Ternary Contour**	• Start with a **Worksheet**. • Columns should be designated as XYZZ. • For specific data requirements, follow the link in the **Graph Types** column.
 **2D Kernel Density**	• Start with a **Worksheet**. • Select at least one Y column or a range from at least one Y column. • For specific data requirements, follow the link in the **Graph Types** column.

 Image Plot	• Start with a **Matrix**. • Z values are from an imported raster image.

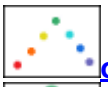
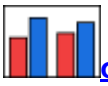
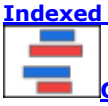
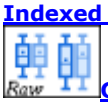
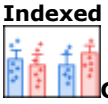
10.5.1.6 Specialized

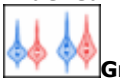
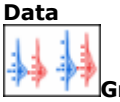
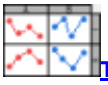
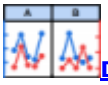
Graph Types	Notes
 **Vector XYAM**  **Vector XYXY**	• Start with a **Worksheet**. • For XYAM Vector, select three Y columns (or a range of the three Y columns). • For XYXY Vector, select two X columns and 2 Y columns (or a range of two X and two Y columns). • For specific data requirements, follow links in the **Graph Types** column.
 **Streamline Vector Plot**	• Start with a **Matrixsheet** with two matrix objects. • The two matrix objects are the derivatives of the plotted curve in the (x,y) directions, respectively.
 **Ternary**  **Ternary, Line+Symbol**  **Ternary, Line**  **Right-Triangle Ternary**  **Ternary Vector**  **Piper**  **Stiff**  **Stiff Map**  **Durov**	• Start with a **Worksheet**. • For specific data requirements, follow links in the **Graph Types** column.

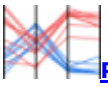
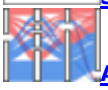
 **Radar**  **Line Fill**  **Line**  **Symbol**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). The X column displays as the title of the radial axis around the chart. If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • Radar Charts are also known as "Spider Plots". • For more information, see **Radar Chart (Spider Plot)**.
 **Polar theta(X) r(Y)**  **Polar r(X) theta(Y)**  **Bar theta, r**  **Bar r, theta**  **Line + Symbol theta, r**  **Line + Symbol r, theta**  **Symbol theta, r**  **Symbol r, theta**  **Wind Rose - Binned Data**  **Wind Rose - Raw Data**	• Start with a **Worksheet**. • Select one or more Y columns or a range from one or more Y columns. If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For data requirements and other information on polar graphs, see **Polar Graph**.
 **Stacked Radial**  **Radial Bar Plot**  **Radial Stacked Bar**	• Start with a **Worksheet**. • Select at least one Y column of values (or a range from at least one column). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, see **Radial Bar and Radial Stacked Bar Plot**

 **Polar Vector θr θr**] **Compass Plot**	• Start with a **Worksheet**. • For **Compass**, Select at least one Y column of values (or a range from at least one column). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For **Polar Vector θr θr**, select two pairs of XY columns in the order θr θr.
 **Smith Chart**	• Start with a **Worksheet**. • Select at least one Y column of values (or a range from at least one column). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, follow the link in the **Graph Types** column.
 **High-Low-Close**  **Japanese Candlestick**  **OHLC Bar Chart**  **OHLC-Volume**  **Line**	• Start with a **Worksheet**. • For specific data requirements, follow links in the **Graph Types** column.
 **Bullet Chart**  **Vertical Bullet Chart**  **Normalized Bullet Chart**	• Start with a **Worksheet**. • Select one X column and at least two Y columns. • For more information, see Bullet Chart.

10.5.1.7 Categorical

Graph Types	Notes
 **Grouped Scatter - Indexed Data**	• Start with a **Worksheet**. • Select at least one Y column as input data. • One or more column(s) of categorical data provide grouping information. • For more information, see the link in the **Graph Types** column.
 **Color Mapped**  **Bubble + Color Mapped**	• Start with a **Worksheet**. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.
 **Grouped Columns - Indexed Data**  **Grouped Floating Bar**	• Start with a **Worksheet**. • Select at least one Y column (Grouped Columns) or two Y columns (Grouped Floating Bar). • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For **Grouped Columns - Indexed Data**, an additional column supplies the Group information. • For **Grouped Floating Bar Graphs**, subgroup by size (i.e. number of columns) or by column label.
 **Grouped Box Charts - Indexed Data**  **Grouped Box Charts - Raw Data**  **Grouped Column Scatter - Indexed Data**  **Grouped Interval Plot - Indexed Data**  **Grouped Mean Bar -**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column), plus a second column with grouping information. If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • Plots of **Indexed Data** are all style variations of the **Grouped Box**. • For more information, follow the links in the **Graph Types** column.

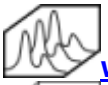
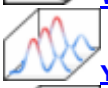
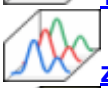
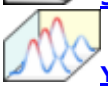
Indexed Data  **Grouped Violin - Indexed Data**  **Grouped Half Violin - Indexed Data**  **Grouped Half Box - Indexed Data**	
 **Trellis Plot**	• Start with a **Worksheet**. • Select at least one Y column as input data. Optionally, you can have an additional associated Y error column for each Y column. Other column(s) generally contain grouping information. • For more information, see the link in the **Graph Types** column.
 **Double Y Trellis Plot**	• Start with a **Worksheet**. • Select two Y columns as input data. Optionally, you can have an additional associated Y error column for each Y column. Other column(s) generally contain grouping information. • For more information, see the link in the **Graph Types** column.
 **Cluster Plot**	• Start with a **Worksheet**. • You need at least two Y columns, one of which should contain grouping information. • Grouping columns can be used to create separate panels in the horizontal and/or vertical directions and/or to modify plotted points (color, scatter point size, scatter point shape, etc.).
 **Parallel Plot**  **Parallel Sets**	• Start with a **Worksheet**. • Select at least one (ideally, two or more) column(s) or a range from one or more columns. Column designation does not matter. Each column will be treated as data on a single variable.

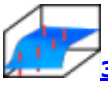
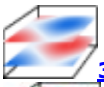
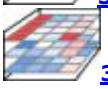
 **Parallel Index**	• Variables may be numeric (Parallel Plot or Parallel Index) or they may be categorical (Parallel Sets). • Parallel Sets plots have a "curvature" option that is sometimes seen in plots termed "Alluvial Diagrams" (see next). • For more information, follow links in the **Graph Types** column.
 **Sankey Diagrams**  **Alluvial Diagrams**	• Start with a **Worksheet**. • For Sankey Diagrams, select exactly two columns of categorical data + 1 column of numeric data. Column designation is ignored • For Alluvial Diagrams, select two or more columns of categorical data. Column designation is ignored. • For more information, follow links in the **Graph Types** column.
 **Chord Diagram**  **Chord Diagram with Ratio Layout**	• Start with a **Worksheet** or **Virtual Matrix**. • Select at least three columns of values (worksheet) or a block of values (virtual matrix) from at least three columns. • The first column will be treated as X and should be monotonic. • For more information, see Chord Diagram and Chord Diagram with Ratio Layout.
 **Ribbon**  **100% Ribbon**	• Start with a **Worksheet**. • Select at least two Y columns of values (or a range from at least two columns). • If there is an associated X column, X column supplies X values; otherwise, sampling interval of the Y column or row number is used.
 **Network**	• Start with a **Worksheet**. • The plot requires one of three data arrangements: Adjacency matrix, Incidence Matrix or Edge List. • A dialog box is used to specify input and analysis

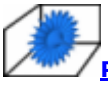
	parameters. • Regardless of data arrangement, an intermediary worksheet will be created to tabulate node and link information.
 **Sunburst Plot**  **Circular Packing Graph**	• Start with a **Worksheet**. • Select multiple categorical X columns and one Y column.

10.5.1.8 3D

Graph Types	Notes
 **3D Scatter**  **3D Scatter + Z Error Bar**  **3D Line**  **3D Trajectory**	• Data requirements vary by plot type. See links in the **Graph Types** column.
 **3D Vector XYZ XYZ**  **3D Vector XYZ dXdYdZ**	• Start with a **Worksheet**. • Select 6 worksheet columns, designated as XYZ XYZ. • For more information, see links in the **Graph Types** column.
 **3D Ribbons**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). Ideally, select at least two Y columns (or a range of at least two Y columns). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, see the link in the **Graph**

	Types column.
 **3D Walls**  **3D Stacked Walls**  **3D 100% Stacked Walls**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). Ideally, select at least two Y columns (or a range of at least two Y columns). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, see the link in the **Graph Types** column.
 **Waterfall**  **Y Color Mapped Waterfall**  **Z Color Mapped Waterfall**  **3D Waterfall**  **Y Color Mapped 3D Waterfall**  **Z Color Mapped 3D Waterfall**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). Ideally, select at least two Y columns (or a range of at least two Y columns). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, see the links in the **Graph Types** column.  **Waterfall**, **Y Color Mapped Waterfall** and **Z Color Mapped Waterfall**, are only available from the **2D Graphs** toolbar.
 **3D Color Fill Surface**  **3D X Constant with Base Surface**  **3D Y Constant with Base Surface**  **3D Color Map Surface**  **3D Color Map Surface with Projection**	• Start with a **Worksheet** or **Matrix**. • For specific data requirements, follow links in the **Graph Types** column.

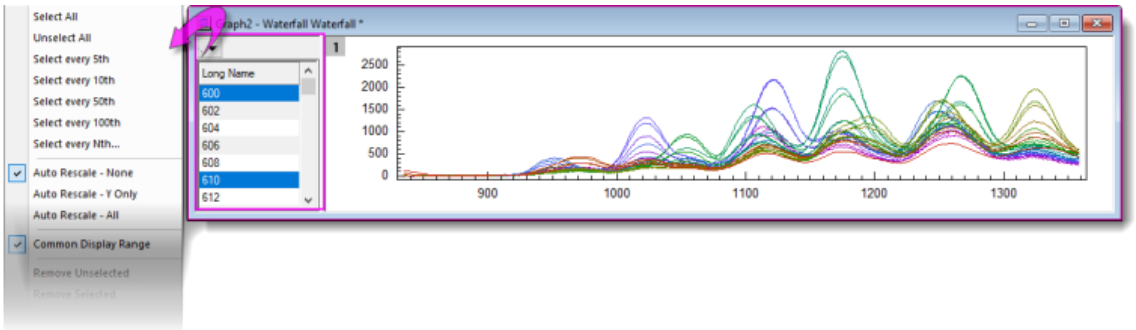
 **3D Wire Frame**  **3D Wire Surface**	
 **3D Color Fill Surface with Error Bar**  **3D Color Map Surface with Error Bar**  **Multiple Color Fill Surfaces**  **Multiple Color Map Surfaces**	• Start with a **Matrix**. • For specific data requirements, follow links in the **Graph Types** column.
 **3D Stacked Surfaces**  **3D Stacked Heatmaps**	• Start with a **Worksheet** or **Matrix**. • For specific data requirements, follow links in the **Graph Types** column.
 **3D Bars**  **3D Stacked Bars**  **3D 100% Stacked Bars**	• Start with a **Worksheet** (XYZ) or a **Virtual Matrix** or **Matrix** of Z values. • For specific data requirements, follow links in the **Graph Types** column.
 **XYY 3D Bars**  **XYY 3D Side by Side Bars**  **XYY 3D Stacked Bars**  **XYY 3D 100% Stacked Bars**	• Start with a **Worksheet**. • Select at least one Y column (or a range from at least one Y column). Ideally, select at least two Y columns (or a range of at least two Y columns). If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For more information, see the links in the **Graph Types** column.

 **3D Ternary Colormap Surface**  **3D Ternary Symbol**	• Start with a **Worksheet**. • Select two Z columns (XYZZ) or a range of data from two Z columns (Z columns may be multiples of 2). • For more information, follow links in the **Graph Types** column.
 **3D Tetrahedral**	• Start with a **Worksheet**. • Select two Z columns (XYZZ) or a range of data from two Z columns (Z columns may be multiples of 2). • For more information, follow links in the **Graph Types** column.
 **Parametric Surface**	• Start with a **Matrix**. • The matrix should have, at minimum, 3 objects in the same matrixsheet. • For more information, follow links in the **Graph Types** column.

For an overview of Origin's 3D graph types and their source data requirements, see these topics:

- Creating 3D Graphs
- 3D and Contour Graphing
- Creating Contour Graphs
- Creating 3D and Contour Graphs from Virtual Matrix

10.5.1.9 Browser Graph



Browser graphs are useful for selectively plotting data from worksheets containing many columns (and rows), into a single graph layer:

- Select a single plot or every *N*th column for plotting.
- Easily change column selection.
- Stretch the window in either dimension to obtain the best view.
- Specify automatic rescale and/or common display range for all plots.
- Works with other Origin tools including Gadgets.
- Plots can be further customized via Plot Details dialog box.
- You can export a Browser Graph as a video (GIF, TIFF, AVI):

1. Click the menu button and choose **Flip Through**.
2. Click the **Export** button and set **File Type** = *GIF*, *TIFF* or *AVI*.
3. Modify other settings as needed and click **OK**. Unless it has been turned off, export will dump a clickable link to the Messages Log.

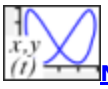
The page-level Mini Toolbar includes an **Add Browser** button so that you can add a Browser panel to a regular 2D line plot.



Graph Types	Notes
Black Lines **Color Lines** **Histogram** **Stack**	• Starts with a **Worksheet**. • Plot selected Y columns, plot every *n*th column or plot all columns. • For more information on use and configuration of Browser Graphs, see Graph with Browser Panel

10.5.1.10 Function Plot

Graph Types	Notes
New 2D Plot	• Function plots are not created from physical data. • Once a function plot is created, you can obtain the

 **New 2D Parametric Plot**	derived dataset. • For more information on function plots, follow links in the **Graph Types** column.
 **New 3D Plot**  **New 3D Parametric Plot**	• Function plots are not created from physical data. • When a 3D Function is plotted, a matrix of Z values is simultaneously generated. • For more information on function plots, follow links in the **Graph Types** column.

10.5.1.11 My Templates

Dialog Box	Notes
 **My Templates**	• This Category lists and gives direct access to the custom templates in your **User Files Folder**.

10.5.1.12 Other Graphing Tools

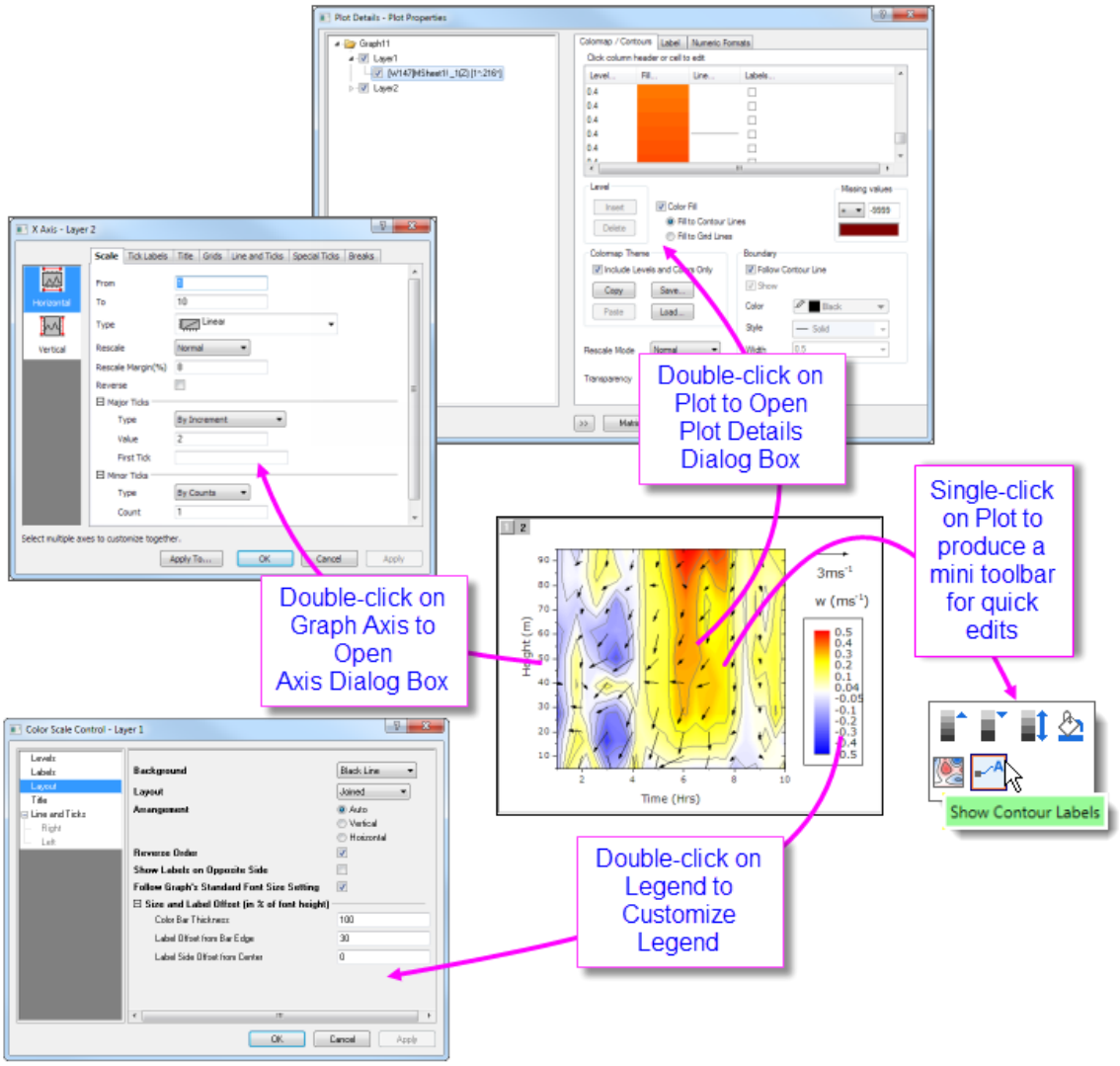
App	Notes
 **Graph Maker App**	• The **Graph Maker** app is pre-installed in your Origin software. • Launch the App from the **Plot** menu or from the Graph Maker app icon in the Apps Gallery to the right side of your Origin workspace. • Use the **Graph Maker** app with Preview pane, to interactively plot grouped data. • Choose from line, scatter, line+symbol, column, box and histogram chart types. • Supports fitting for scatter plots. • Drag-and-drop worksheet columns to set up the graph. • Graph settings are saved and can be re-loaded.

 **Template Library**	• Use this dialog to organize your custom graphing templates.
 **Template Center**	• Use this dialog to search and download the online graph templates

10.6 Topics for Further Reading

- The Page-Layer-Plot Hierarchy
- Page Viewing Modes
- Graph Template Basics
- Creating Graphs from Graph Templates
- The Graph Template Library
- Graph Axes
- Zooming In or Out on the Graph Page
- Creating Multi Layered Graphs
- Adding Data Plots to the Graph Layer
- The Layer Contents Dialog Box
- The Object Manager
- Graph Layers
- Linking Layers
- 3D and Contour Graphing
- Graph with Data Slicer
- Plotting Mathematical Functions
- Batch Plotting
- Appendix 2 - Complete Listing of Origin Graph Types

11 Customizing Graphs



11.1 Introduction

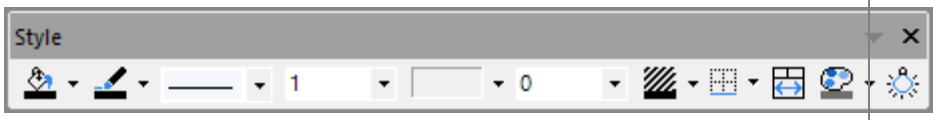
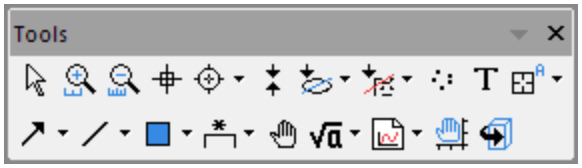
This chapter introduces you to various aspects of graph customization. All Origin graphs start from a graph template. If the graph you are making is fairly standard for its type, the options that were stored in the graph template may be entirely adequate to produce a polished-looking graph. The business of basic graph creation was covered in the last chapter, **Graphing**.

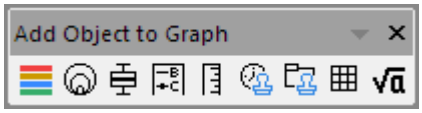
Sooner or later, however, you are going to want to add annotations, modify axis scales, or change plot colors. Hence, the purpose of this chapter is to introduce you to some key Origin graph customization tools and techniques, as well as to point you toward resources that will help you manage more complex graph customization tasks.

We begin with a discussion of the graph customization-related toolbars, as these toolbars have tools that are commonly used for quick modifications of graph elements.

11.2 Dockable Toolbars

Toolbar buttons useful for graph customization tasks, include the following:

Description	Toolbar (default configuration)
Format toolbar buttons: • Creating and customizing text objects.	
Style toolbar buttons: • Editing colors, line thickness, fill patterns.	
Tools toolbar buttons: • Add text objects, lines, curves, arrows, rectangles/circles/ polygons.	
Graph toolbar buttons: • Add graph layers incl. inset graphs, merging or extracting graphs; exchanging axes; anti-aliasing and Speed Mode.	

Add Object to Graph toolbar buttons: • Add legends/color scales/bubble scales; date & time and project path stamps; XY scale; table objects.	
Object Edit toolbar buttons: • Arranging and aligning objects and layers on the page.	

11.3 Menus, Dialogs and Buttons Used in Graph Customization

Many quick graph customizations can be done using Origin's graphing **Mini Toolbars**. More complex customization options can be accessed from commands on the **Format** or **Graph** menus. The following table lists key menu commands and dialog boxes plus a few toolbar buttons, used in customizing graphs.

Task	Dialog Name	Method
Customize the graph Page, Layer, or Data Plot	**Plot Details** dialog	• Double-click on Page, Layer or Data Plot • **Format: Page...** menu • **Format: Layer...** menu • **Format: Plot...** menu *See*, Customizing Page, Layer and Data Plots
Customize Axes	**Axis Dialog**	• Double-click on axes or tick labels • **Format: Axes...** menu • **Format: Axis Tick Labels...** menu

		• **Format: Axis Titles...** menu *See*, Customizing Graph Axes
Add a Default Legend (most 2D graphs)	N/A	• Click the **Reconstruct Legend (CTRL+L)**  button on the **Add Object to Graph** toolbar • Right-click on the legend object and choose **Legend: Reconstruct Legend** • Choose **Graph: Legend: Reconstruct Legend** from the main menu *See*, Graph Legends
Customize the Legend	(**Text Object -**) **Legend** dialog	• Ctrl + double-click on the legend object text *See*, The (Text Object Properties) Text tab
	Update Legend dialog	• Right-click legend and choose **Legend: Update Legend** or choose **Graph: Legend: Update Legend...** *See*, The legendupdate Dialog Box
	Legends/Titles tab at Page level of **Plot Details** dialog	• Double-click in the white area just inside graph window frame (but outside of the data plot), then click on the **Legends/Titles** tab • Choose **Format: Page** and click on the **Legends/Titles** tab *See*, The (Plot Details) Legends/Titles tab
Add a Color Scale (color-mapped plots)	N/A	• Click the **Add Color Scale**  button on the **Add Object to Graph** toolbar *See*, Color Scales

Add a Bubble Scale (symbol-size mapped plots)	N/A	• Click the **Add Bubble Scale**  button on the **Add Object to Graph** toolbar *See* Bubble Scale
Merge multiple graph windows into one graph window	**Merge Graphs** dialog	• **Graph: Merge Graph Windows...** menu *See*, Merge and Arrange Graphs (tutorial) and The Merge Graph Dialog Box.
Adjust multi-layer graphs: resize, move, swap, align, or add layers	**Layer Management** dialog	• **Graph: Layer Management...** menu • Right-click on the layer icon. *See*, Layer Management-Quick Start
Simple adjustment of multi-layer graphs: arrange and/or resize layers	**Arrange Layers** dialog	• **Graph: Arrange Layers...** menu • Right-click on the layer icon.
Save settings as graph template	**Save Template As** dialog	• **File: Save Template As...** menu • Right-click graph window title and choose **Save Template As...** *See*, Graph Template Basics
Manage graph templates, plot to a template	**Template Library**	• **Plot > Template Library** menu (worksheet or matrixsheet is active) *See*, The Graph Template Library
Save settings as graph Theme	**Save Format as Theme** dialog	• Right-click and choose **Save Format as Theme...** context menu (graph is active) *See*, Saving Formats to a Theme
Manage Graph Themes: edit, combine, apply Theme, set as	**Theme Organizer** dialog	• **Preferences: Theme Organizer..** > **Graph** tab.

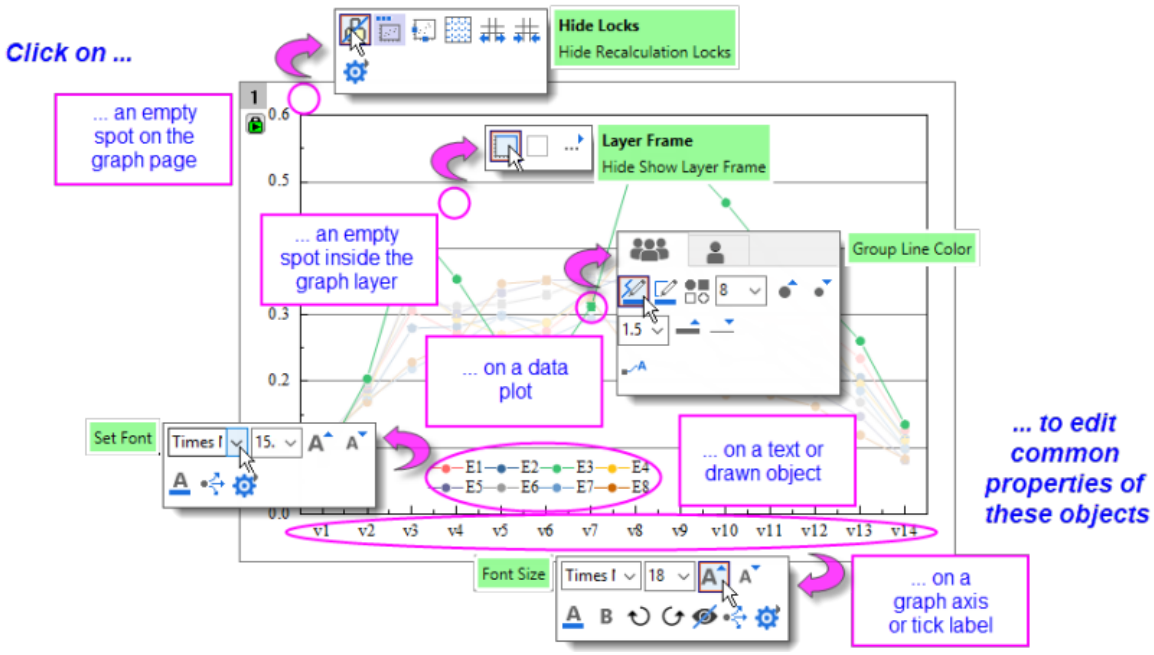
System Theme		• F7 hotkey. *See*, Theme Organizer

11.4 Quick Editing: Mini Toolbars and Object Manager

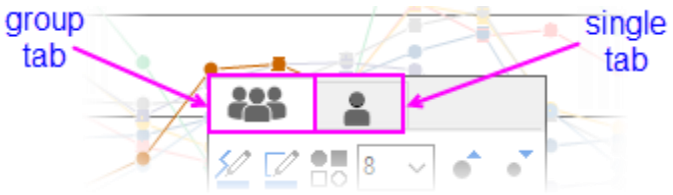
While the dialog boxes listed in the previous section will provide full access to plot properties, settings are sometimes buried and hard to find. Often, the most convenient way to carry out common graph editing tasks is to use Mini Toolbar buttons or Object Manager short-cut menu commands -- or a combination of the two.

11.4.1 Mini Toolbars for Graph Editing

Most Origin graphs support a set of "quick editing" tools for interactively modifying common graph object properties. Tools are context-sensitive so that -- (1) depending on where you click inside the graph window, (2) what the selected object is and (3) whether you have selected an individual plot or a plot group -- you will have a different set of tools available to edit your selection.



- Workspace display of Mini Toolbars is controlled via **View: Mini Toolbars**.
- There are five levels -- i.e. five groupings of graph properties -- that can be edited with Mini Toolbars: **page**, **layer**, **plot**, **text or drawn objects** and **graph axes**.
- When editing grouped plots, a single click will select a single plot. The Mini Toolbar displays two tabs -- one for the customizing the **group**, the other for customizing the **single** plot.



- Most Mini Toolbars have a "properties"  button that opens a related Origin dialog box where you will find the full range of available controls.



Unless you have changed your selection, you can do a one-time restore of a Mini Toolbar after it has faded by pressing the SHIFT key.



If you disable selection of individual graph layers, plots and graphic objects with the **Selectable** Mini Toolbar button, these elements remain selectable in the Object Manager (OM).

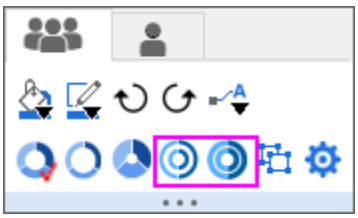
To restore graph window selectability,

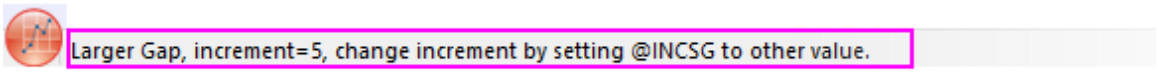
- Highlight the element in OM, and click the Mini Toolbar **Selectable** button again (**Hint**: If OM doesn't list plots in the active graph window, right-click on OM and **Show Plots**. Likewise, if OM only shows plots, right-click on OM and **Show Graph Objects**).



11.4.1.1 Controlling Buttons that Increment

Some Mini Toolbar buttons will increase or decrease some property by some increment, each time you click the button (e.g. font size, rotation angle, layer grid spacing). In such cases, you can modify that increment by manipulating the value of a LabTalk system variable.



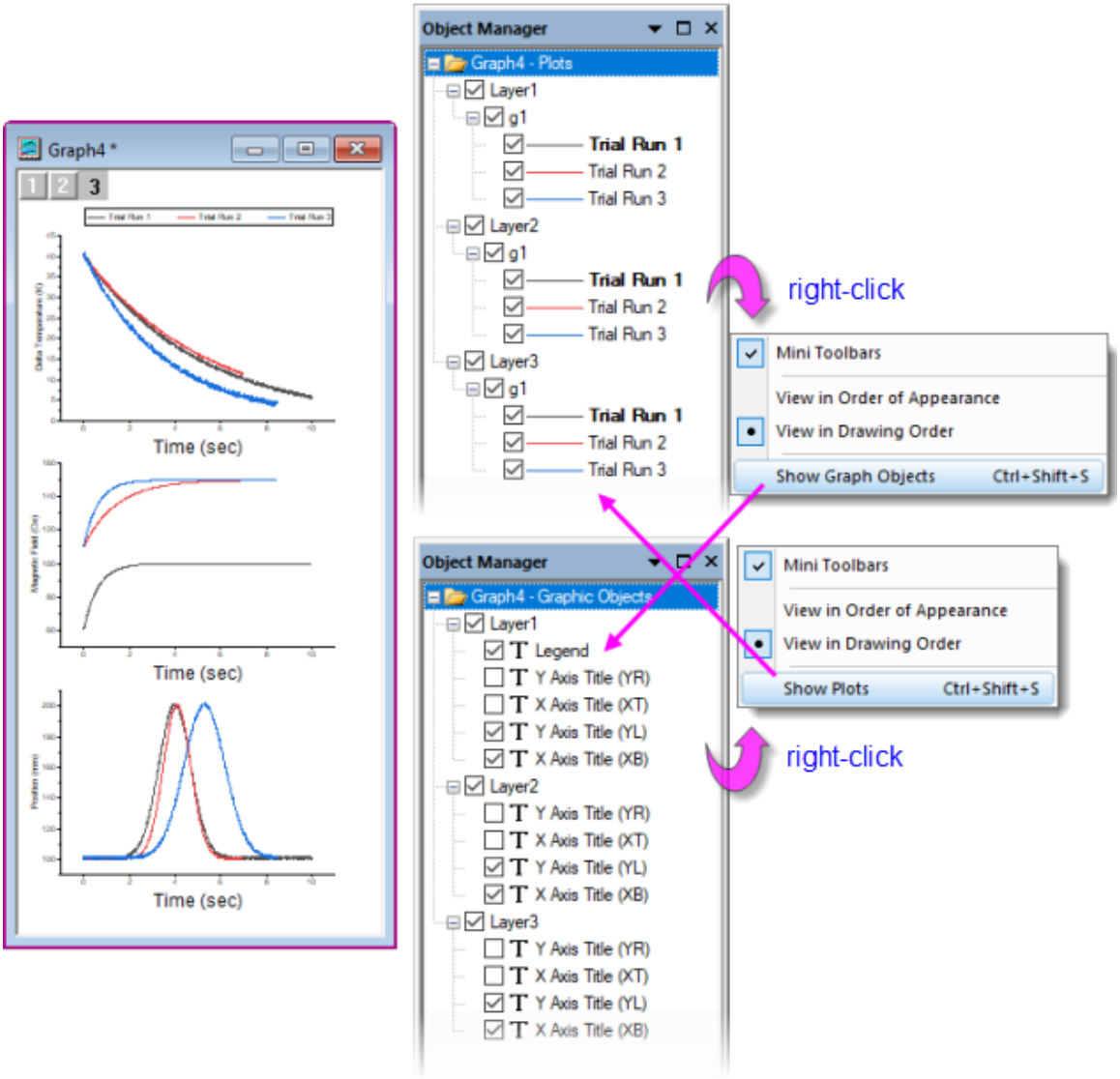


For information on these LabTalk system variables, see this Appendix in Origin Help.

11.4.2 Manipulating Graphs with the Object Manager

The **Object Manager** is general tool for managing Origin windows but it is especially useful for manipulating graph windows. When a graph window is active, the Object Manager offers alternate views -- toggled by right-clicking in an empty portion of the Object Manager and choosing **Show Plots** or **Show Graph Objects**(Ctrl+Shift+S):

- **Show Plots**: a collapsible, hierarchical list of plots by layer, plot group, etc.
- **Show Graph Objects**: a collapsible, hierarchical list of window objects (legends, text objects, images, etc.) by layer.



Object Manager Tips:

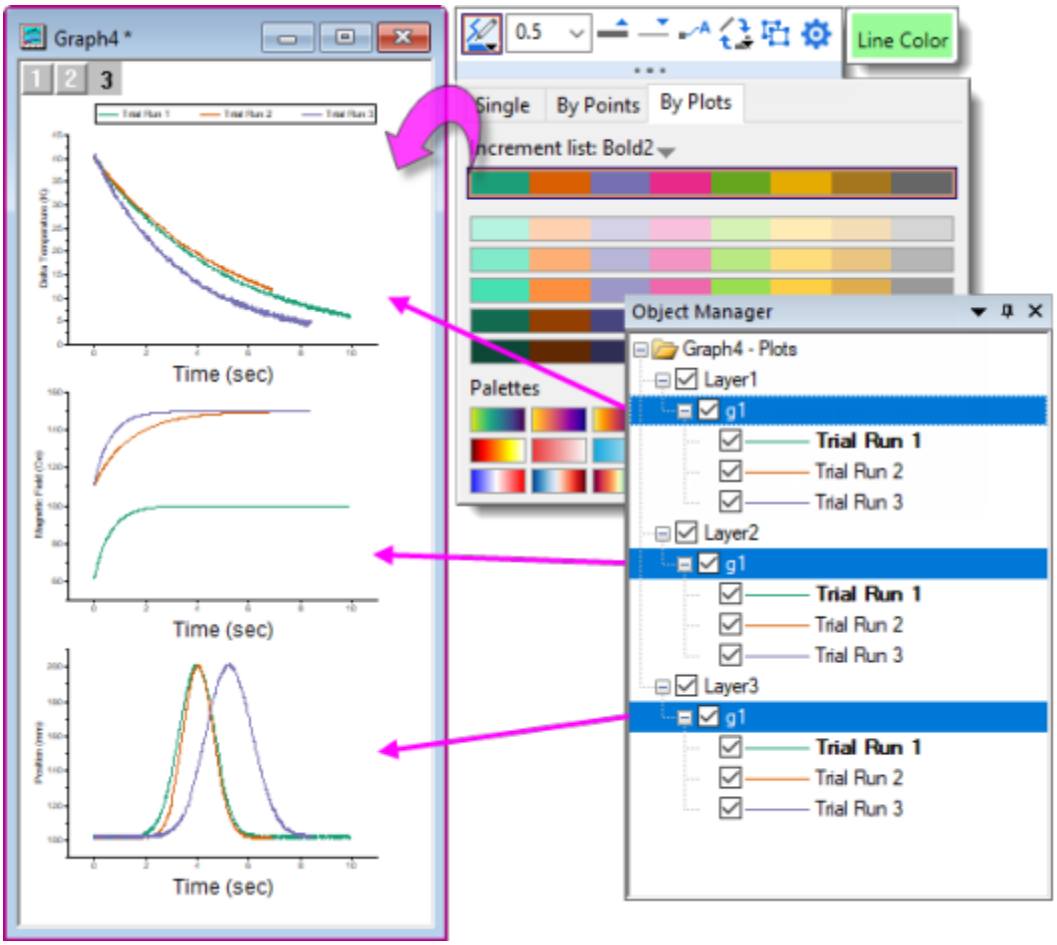
- Whether in **Show Plots** or **Show Graph Objects** view, right-clicking on an element will open a shortcut menu of relevant actions (ungrouping a set of plots or designating a plot as the first plot in a plot group, for instance).

- Common to both views is a check box beside each element; when checked, the element displays in the graph window, when cleared, the element is hidden.
- Besides openning **Plot Details** to rename the layer, you can right-click on the layer icon (e.g. *Layer1*) in Object Manager and choose **Rename**.
- Additional shortcuts give quick access to source data, to Plot Details, allow you to rearrange plot or object order and to other relevant tasks such as opening an inserted image in an Image window for further editing.

11.4.3 Editing Graphs Using Object Manager and Mini Toolbars

When a graph is active and you select graph elements in the Object Manager, a Mini Toolbar will show (make sure the **Mini Toolbars** option is checked in the **Show Plots**/**Show Graph Objects** shortcut menu as shown in the image above).

With the available buttons, you can make quick customizations to common plot properties such as line color, line thickness, display of labels, etc.



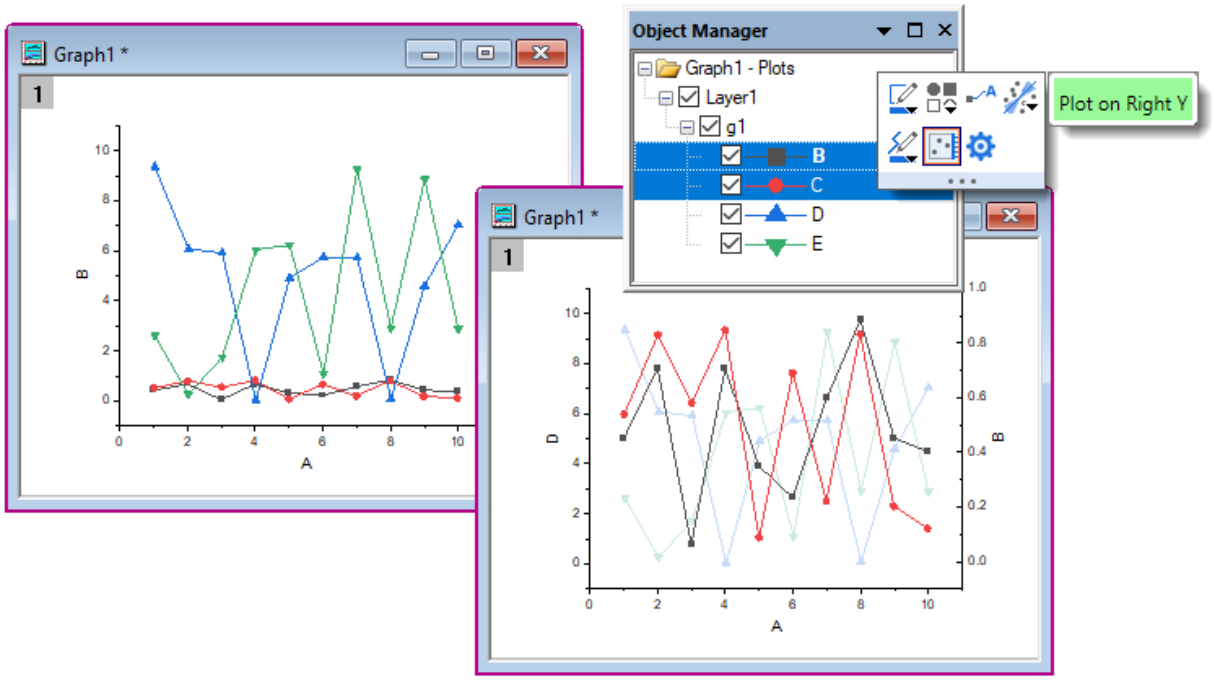


In Object Manager **Show Graph Objects** view, there is a **Select All with Same Name** shortcut menu entry. Use in combination with Mini Toolbar buttons (e.g. **Font Size**) to make quick graph changes.

11.4.3.1 Example: 1 Layer, 2 Y Axes

There is now general support for "Double-Y" graphs in a single layer. Previously, two independent Y axes meant "two layers." Beginning with **Origin 2023** the user can create Double-Y graph in single layer using only the basic plot type templates using new GUI controls,.

In the following simple example, the user has plotted four Y datasets against a single X dataset. Because values in two of the Y datasets are of an order of magnitude larger than values in the other two, two plots appear "flat" and seem to show little variation with changes in X. However, using a combination of **Object Manager** and **Mini Toolbars**, we can select the "flat" plots and **Plot on Right Y**. With a more appropriate scale, the plots no longer appear flat.





In addition to the above simple example, you can find an example of a single-layer **Double-Y Violin Plot** in your Learning Center samples by pressing **F11** and searching on "**2023**". Also, Origin includes some templates for simple cases, see **Multi-Panel/Axis** section for more information.

11.5 Customizing Page, Layer and Data Plots

A graph window is a collection of objects, organized in a hierarchical structure. As we shall see, there are editable properties at the **Page**, **Layer**, **Data Plot** and **Data Point** levels.

Quick formatting of many plot properties can be done using Mini Toolbar or dockable toolbar buttons, as mentioned above. However, more comprehensive access to plot properties is available from each graph's **Plot Details** dialog box.

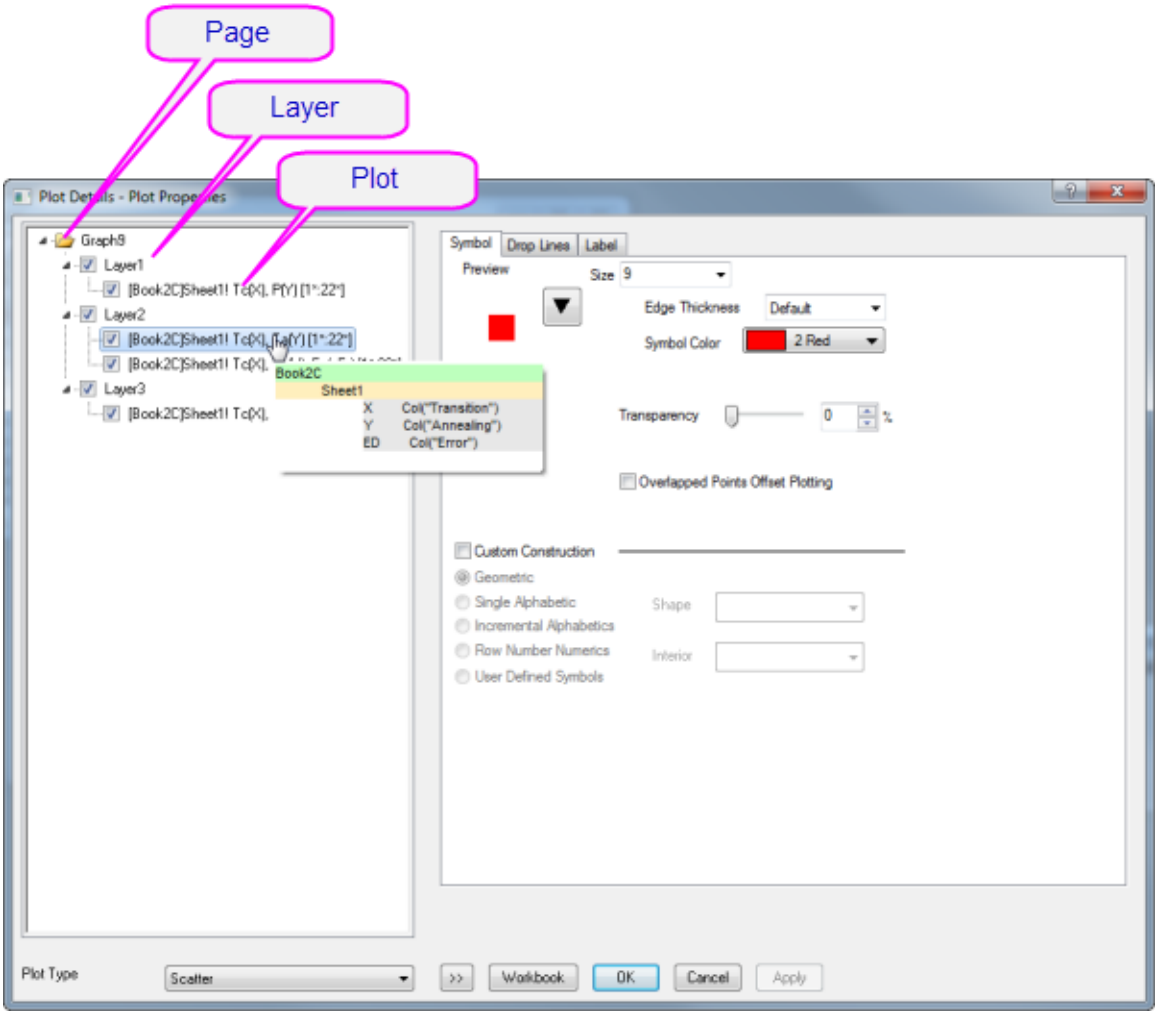
To open Plot Details:

- Double-click on your plot.
- Click the **Format** menu, then choose **Page...**, **Layer...** or **Plot...**, to open Plot Details at the corresponding level.

The figure below shows an example of the **Plot Details** dialog box:

- The left panel depicts the **Page** > **Layer** > **Plot** hierarchy as an expandable/collapsible tree.
- The right panel contains controls, organized by tabs, that pertain to the object that is currently selected in the left panel.

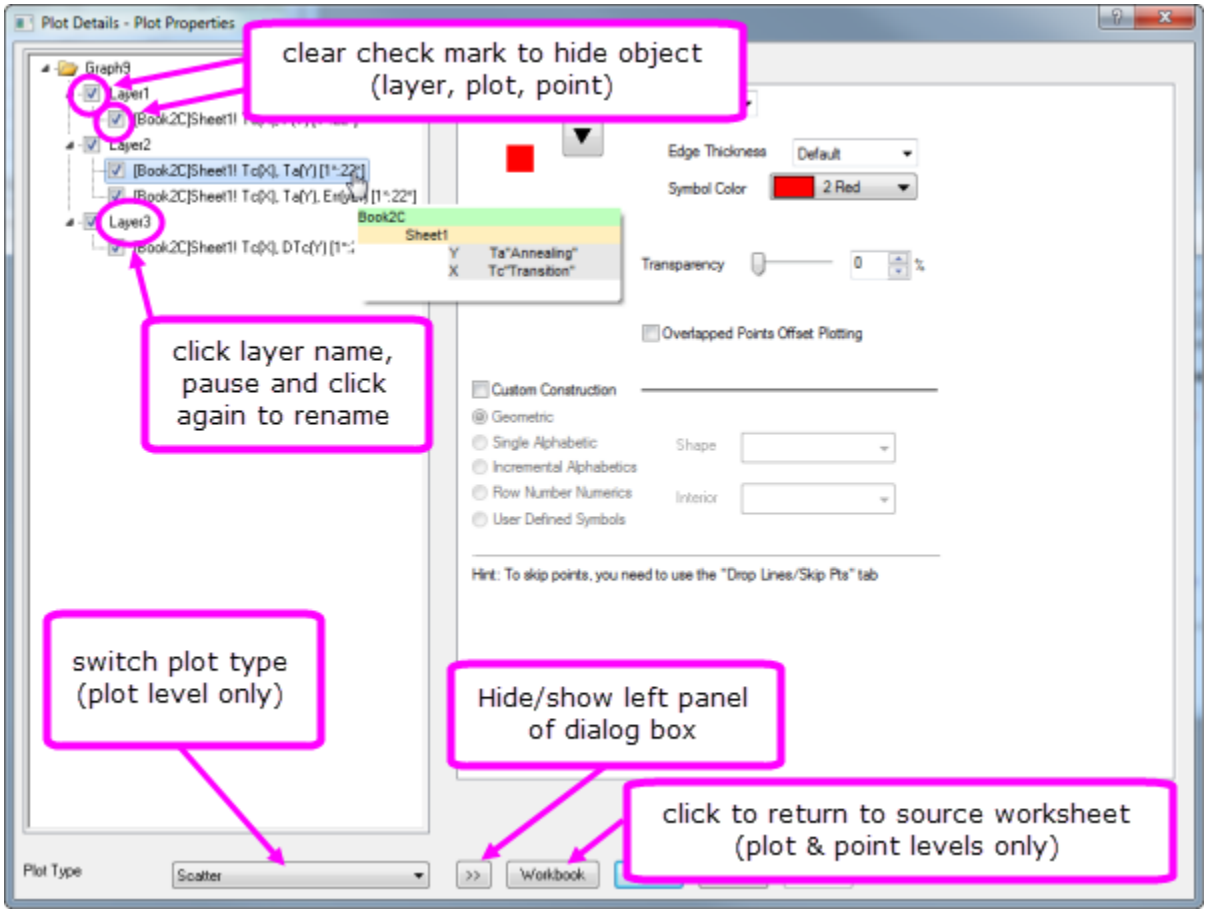
  - To customize an object, select it in left panel and modify the corresponding properties that appear on the various tabs in the right panel.



Selected Left Panel Object	Right Panel, Controls for...
Page	Settings that pertain to the whole page -- Print/Dimensions, layer drawing orders, page display color, legends/titles, etc.
Layer	Settings that are specific to the graph layer -- Layer background colors, layer size and speed mode settings, layer display settings, stack settings for applicable plot

	types. Some plot types will include extra tabs/controls specific to the plot type.
Plot	Plot-specific properties. The tabs and controls vary by plot type (e.g. Scatter plots have a Symbol tab with controls pertaining to scatter symbols, Line plots a Line tab with controls pertaining to line plots). Anything to do with a particular data plot -- color, fill patterns, colormapping, labeling -- will be found at this level in Plot Details.
Data Point	Properties that apply to user-specified "special points". Available for any plot for which plots discrete points (scatter, line + symbol, column/bar, etc.). The tabs and controls are generally similar to those available at the Plot level but any property that you set at the level of a special point, will apply only to that point.

:

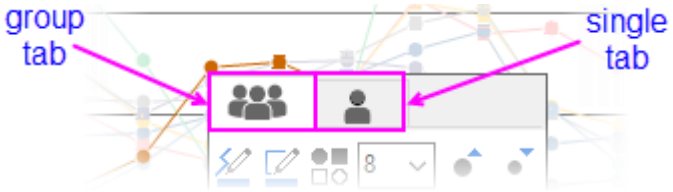




Prevent text and label objects from scaling when resizing layer, by going to the **Size** tab of Plot Details (Layer level) and setting **Fixed Factor** to **1**.

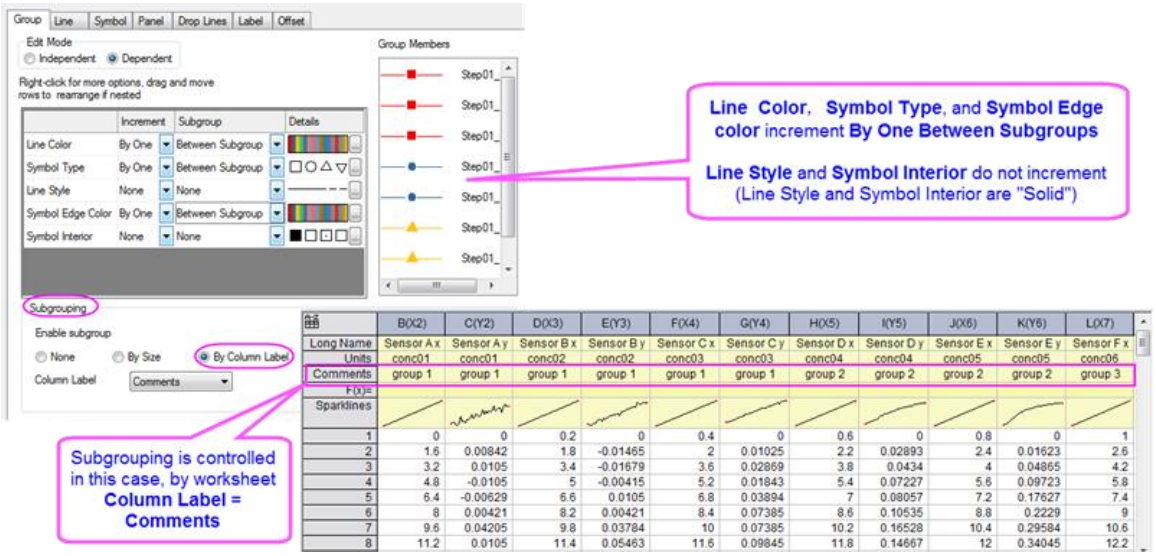
11.5.1 Customizing Grouped Plots

Beginning with **Origin 2020**, there was a change in selection behavior that affects grouped plots. Now, a single-click on a plot selects the plot. A second click (or CTRL+click) selects a single point. SHIFT+click selects the entire group. Note that when using the new mini toolbars, a single click on a plot group displays tools for editing the plot **group** or the **single**, selected plot. To revert to the old plot selection behavior, set @GSM=0.



When you select and plot multiple data ranges to a single graph layer, the plots are ***grouped*** in the layer. Generally speaking, plots within a group are automatically differentiated by assigning styles built from one or more customizable "increment lists", one for each plot property (symbol shape, symbol color, line style, etc.).

By default, some properties are configured to increment "by one" (e.g. line color is assigned according to the "Candy" color list and each successive plot is assigned the next color in the list) and some will be configured *not* to increment (e.g. line style is solid for every plot), though this is ultimately controlled by the user. In any case, the increment lists for each property are saved with the graph template (.oggu) or Theme file (.oth) so that you can easily use them later to create graphs with the same look.



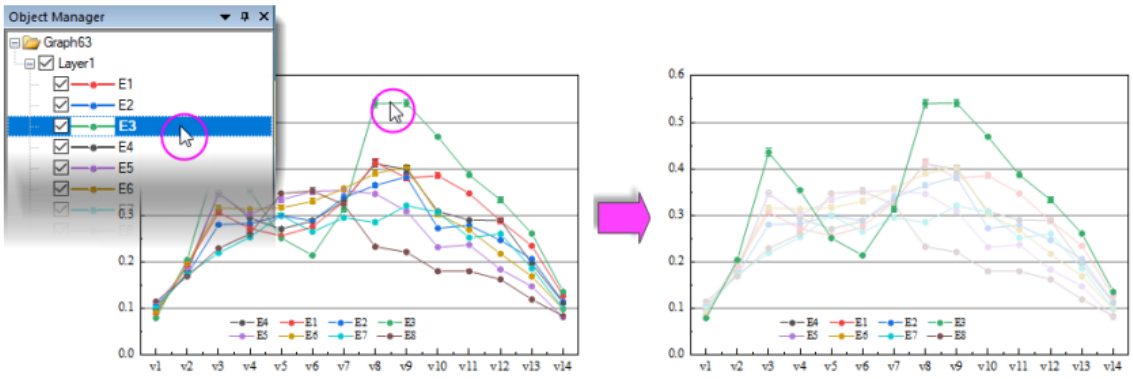
The above image shows the Plot Details **Group** tab settings for a line + symbol plot in the upper-left. On this **Group** tab, the first column lists **Line Color**, **Symbol Type**, **Line Style Symbol Edge Color** and **Symbol Interior**. Properties of **Line Color**, **Symbol Type** and **Symbol Edge Color** are set to increment **By One** and **Between Subgroups** (subgrouping occurs using the column **Comments**), while **Line Style** and **Symbol Interior** are set to increment by **None** (they do not vary).

As previously mentioned, this arrangement is completely customizable and you can save customizations with the graph template:

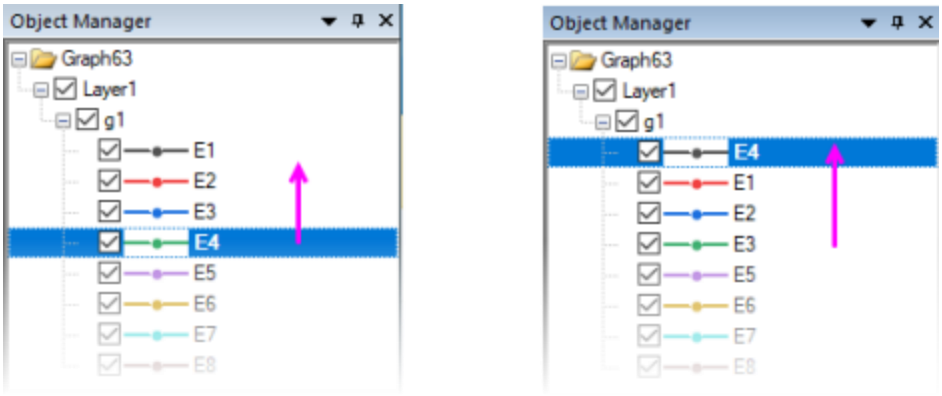
- To find out more about customizing of grouped and subgrouped plots, see The Plot Details Group Tab Controls.
- To find out more about saving graphs as templates, see Graph Template Basics.

11.5.1.1 Using Object Manager with Grouped Plots

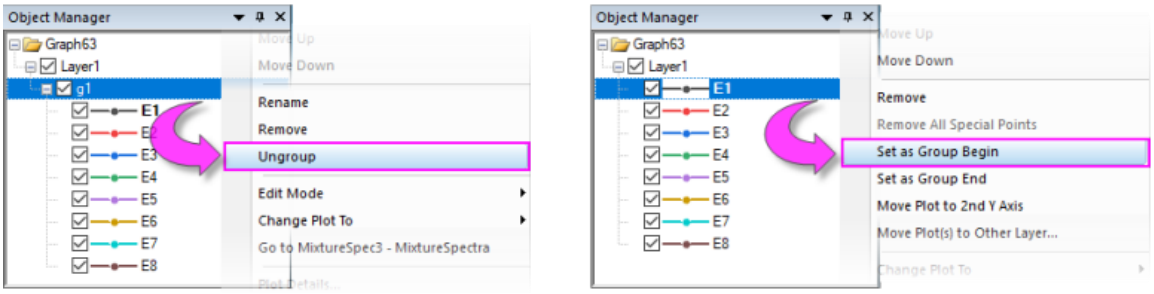
- To highlight a single plot and dim others (grouped or ungrouped) in the layer, click once on the plot in Object Manager. Conversely, clicking once on a plot in the Object Manager, highlights the plot in the graph window, while dimming others.



- To reorder plots in the layer, drag a plot icon within the group; or right-click on the plot (in Object Manager) and choose **Move Up** or **Move Down**.



- To group or ungroup data plots in the layer, right-click on the group icon ("**g*N***") and choose **Ungroup**. To group plots in the layer, right-click on a plot and choose **Set as Group Begin**.



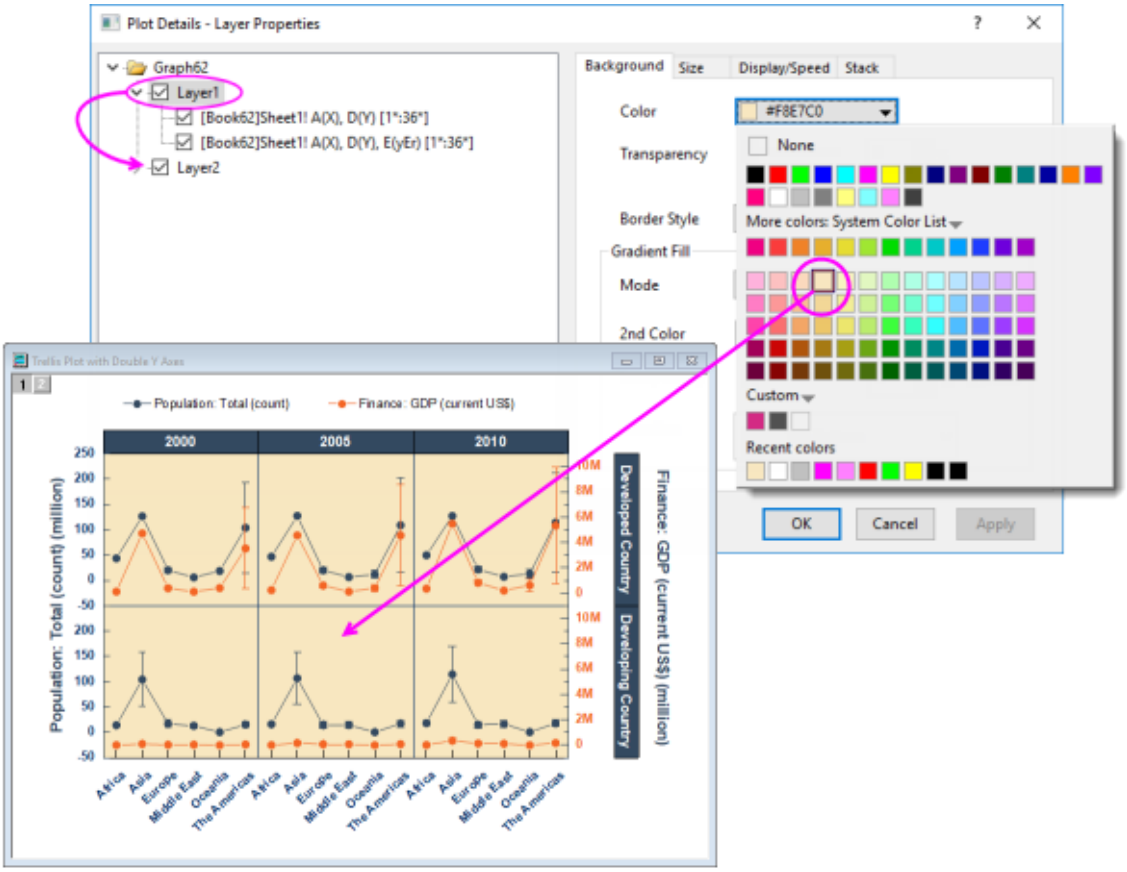
- To move a plot from one group to another, drag the plot to the other group.
- To move a series of plots *out* of the group, right-click the last plot that you want to keep in the group and choose **Set as Group End**.
- To remove a plot from the layer (and the graph), right-click on the plot and choose **Remove**.
- To move a plot to a second Y axis, or move the plot to another layer, right-click on the plot in Object Manager and choose **Move Plot to Second Y Axis** or **Move Plot(s) to Other Layer ...**.

11.5.2 Customizing Multi-layer Graphs

The graph layer is a fundamental concept in Origin and it is a primary building-block of most complex Origin graphs (e.g. a graph with both left and right Y axes may be constructed by overlaying one layer on another, and sharing a common X axis between the two layers). While the graph layer is, fundamentally, a self-contained unit it is, at times, desirable to create dependencies between layers:

- One type of dependency is what we call "linking" of layers, which involves establishing spatial relationships or relationships between axis scale values. You can read more about linking graph layers, below.
- Another type of dependency is based on what we call "common display" and this is most useful in a situation where we have multiple similar panels in a graph and we want to do something like change the background color of each graph, or perhaps the change plot colors used in each layer.

At the graph page level in Plot Details, you will find a **Layers** tab that has controls that affect all layers within a given graph page. The **Common Display** controls can be used to enable simultaneous editing of layer, plot and axis properties of multi-layer graphs. For instance, in the following example, we have a two-layer trellis plot -- the two layers being necessitated by there being a left-Y axis and a right-Y axis with two completely different scales -- and as a simple illustration, we have used the Common Display controls to simultaneously add a background color to both layers. We could have accomplished the same thing without using the Common Display controls but this would have required twice the work -- set the background color of layer 1, then set the background color of layer 2.



This was a simple illustration but we can use the Common Display controls for application of more complex mix of layer, plot and axis properties. Some of Origin's built-in multi-layer graph templates have Common Display elements turned on by default. When working with multi-panel graphs, you may want to choose **Format: Page**, click the **Layers** tab in Plot Details, and check the **Common Display** settings. See **Common Display** for more information.



The Common Display **Apply to** control supports including or excluding certain layers from common display customizations. For instance, you might have a 4 panel graph, each with an inset layer and using this control, you could apply a common background color to the inset layers without applying the same background color to the 4 primary layers (panels). See **Common Display** for more information.

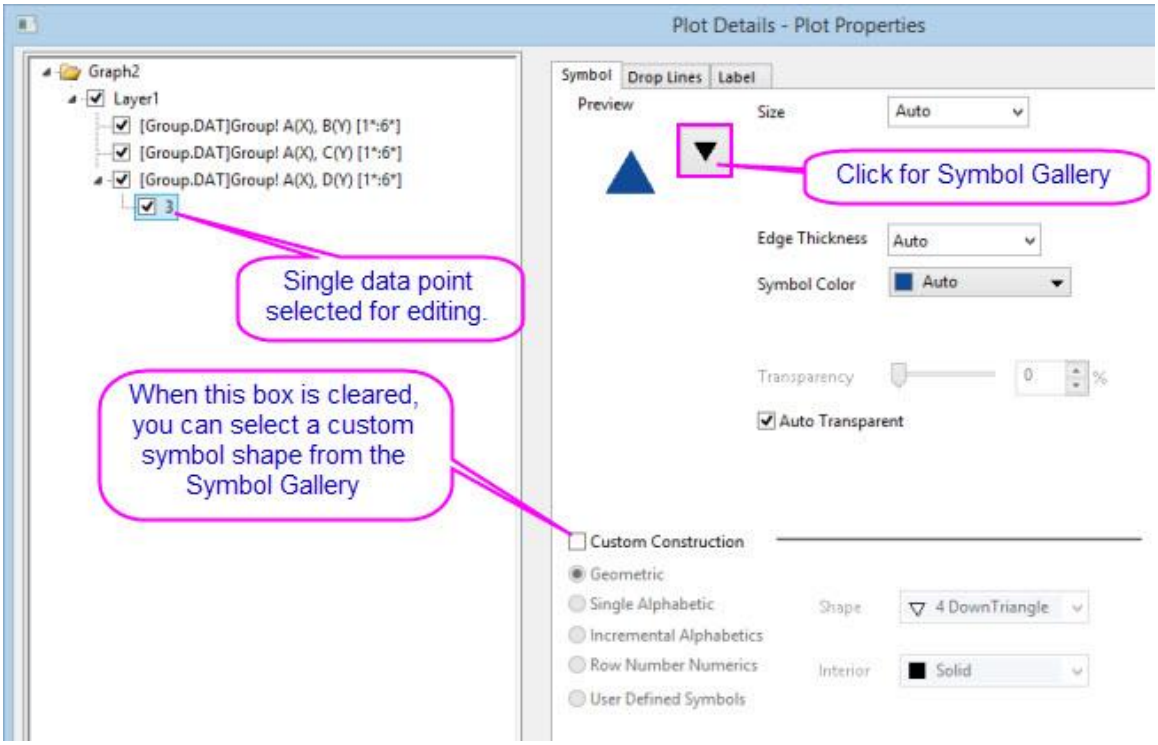
11.5.3Special Points: Customizing a Single Data Point

For some plot types such as scatter, column or pie, you can modify the display properties of a single data point.

To edit a single point:

1. Click twice (slowly) or press CTRL + click on a data point to select it. Use the Mini Toolbars to edit properties of the data point; or click available buttons on the **Style** or **Format** toolbars.
2. For access to a wider range of customization options, (a) double-click on the selected point or (b) CTRL + double-click on an unselected data point. This opens the Plot Details dialog box with the focus set to edit the data point (identified in the left-panel of Plot Details by its row index number). Then use controls on

the tabs in the right panel to modify the appearance of the data point, add drop lines, data label, etc. Changes you make to the special point will not affect the appearance of other points in the same plot.



Note:: When the **Custom Construction** box is checked, you can use these controls to customize the plot symbol of the selected point. **Custom Construction** can be applied to any plot symbol -- not simply those that are designated as special points.





Origin supports adding your own plot symbols. For more information, see **User Defined Symbols Grid**.

To remove customizations made to a single data point:

- Right-click the single point in the left panel of the Plot Details dialog and choose **Delete**.
- In the graph window, click on the single point to select it, then press DELETE on the keyboard.

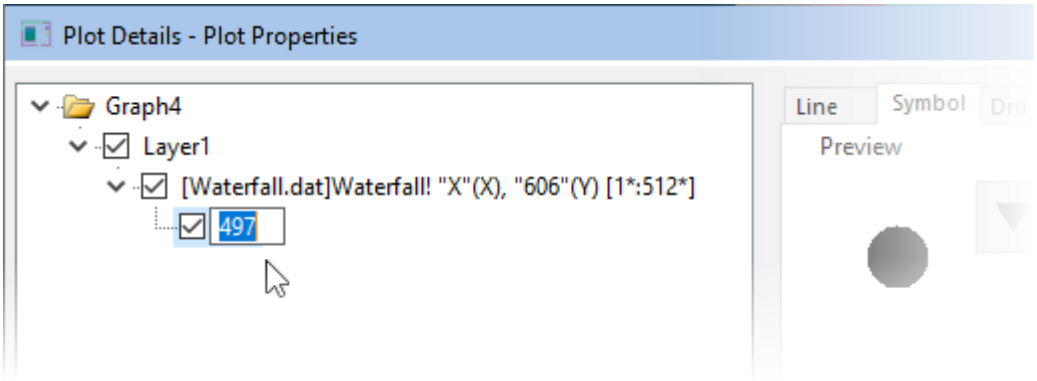
The point itself is not deleted; only the custom style is removed, with the point reverting to the style of the containing data plot.



Adding a special point at the beginning or end of a plot is not always easy, but there is a simple, foolproof technique:

1. Select a special point anywhere on the plot, then double-click on the point to open Plot Details.

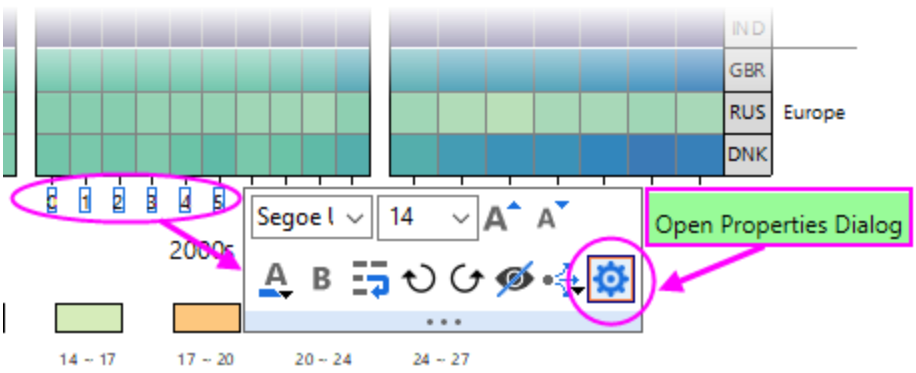
2. In the left-hand panel of Plot Details, click once on on the point index number and wait until the index number becomes editable.



3. To add the special point to the first point in the plot, type *Begin*; to add to the last point type *End*. If you know the index number of the first or last point, you can type that instead.
4. Click outside the edit box. Make other special point customizations as needed, the click **Apply** or click **OK** to close Plot Details. The special point will be added to the beginning or end of your plot.

11.6 Customizing Graph Axes

Many common edits to axis properties can be done quickly from **Mini Toolbar** buttons. Click on an element to edit.

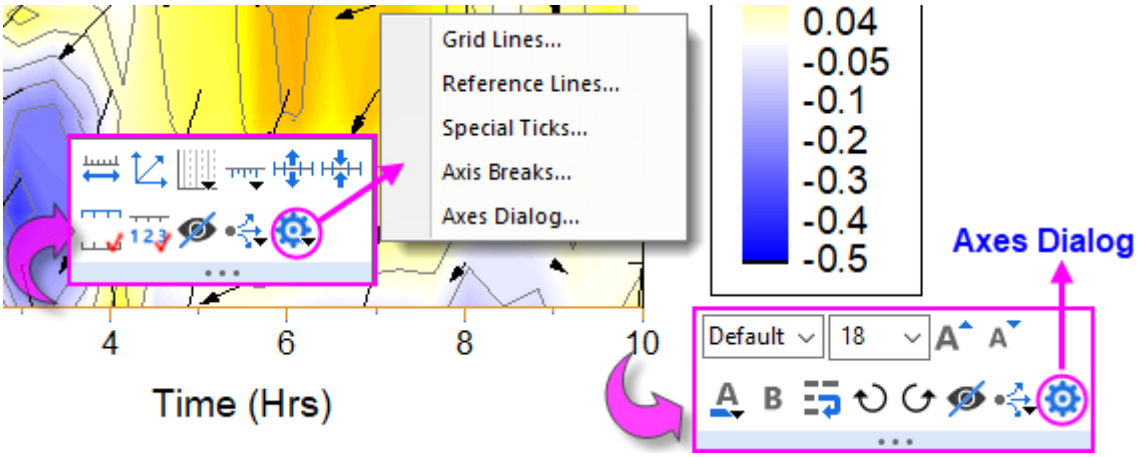


For more complex edits of axis properties, open the **Axis Dialog**:

- from the Axis Mini Toolbar > **Open Properties Dialog**.
- from the Origin menu > **Format: Axes**.

11.6.1 Customizing Axes with Mini Toolbars

For quick adjustments to axis properties, you can use Origin's axis Mini Toolbars. As with all Mini Toolbars, available tools will vary by plot type and selected object. For instance, note that clicking on a graph axis line brings up a different set of buttons than clicking on the axis tick labels.

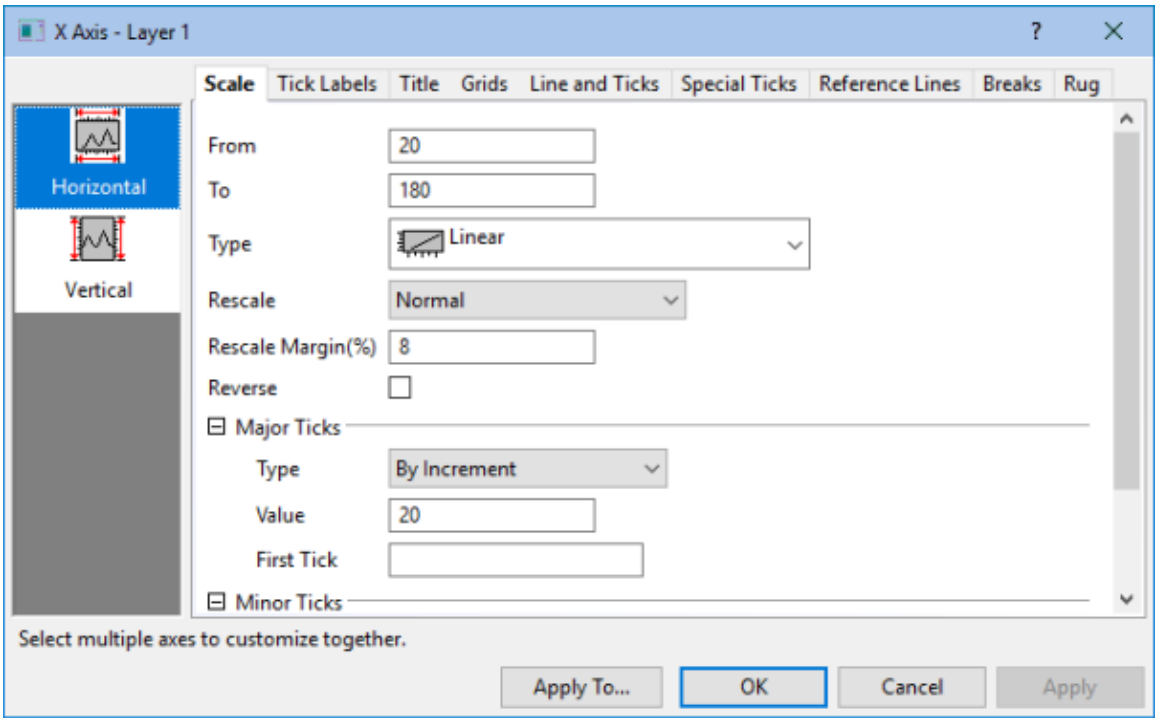


Note that clicking the "gear" button on the axis line Mini Toolbar produces a popup menu with simplified "Mini Dialogs" for axis line elements. For access to all axis settings, click **Axes Dialog** on either toolbar.

11.6.2 Customizing Axes with the Axes Dialog Box

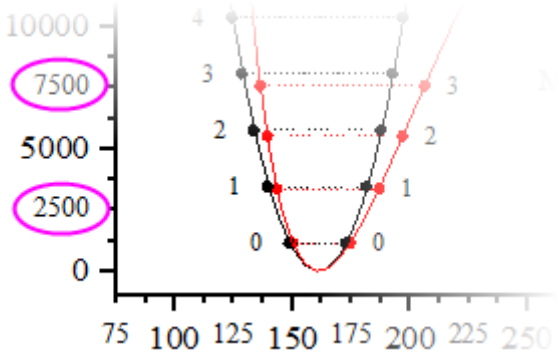
All graph axis customizations can be made in the **Axes Dialog** box. Click on the Mini Toolbar "gear" button and choose Axes Dialog; or double-click on the graph axis or tick labels. This will open the **Axis Dialog - Layer *N*** dialog box.

This image shows the tab-based axis dialog used by most 2D and 3D graphs.



- In the left panel, you can select one or more icons (hold the **CTRL** key to select multiple icons) to specify the axis or axes to be customized, then select the desired tab and choose your options.
- Click the **Apply To...** button to apply the axis format settings of the currently selected axis to another axis.

Tab	Controls for
Scale	Scale range of values, scale type, rescale mode and margin, reverse scale, major and minor ticks.
Tick Labels	Display and Format options for major and minor tick labels, including custom labeling using LabTalk substitution or mathematical expression. For information on custom formatting of numeric data including display of percentages, fractions, pi, and geographic (Lat/Lon) formats, see Origin Custom Formats.  Font size of major and minor tick labels can be scaled separately (**Axis Dialog** > **Tick Labels** > **Minor Tick Labels** > **Font Scaler(%)**).

	
Title	Axis title (often set using variable notation) and font options. Note that you can directly edit by double-clicking the text object in the graph.
Grids	Control display and properties of grid lines at major and minor ticks.
Line and Ticks	Global axis line and tick display options for all axes.
Special Ticks	Placement of special tick labels.
Reference Lines	Reference lines are optional lines that you add to your graph, either for emphasis or to mark some key statistic. Additionally, they can be paired to add fill color to some portion of your graph (e.g. "recession bars" in plots of financial data).  • You can use **named ranges** to place Reference Lines on a graph. • You can set a default line style for Reference Lines -- either in the **Reference Lines** dialog or in a customized graph -- by right-clicking on the Reference Line and choosing **Set as Default Line Style**.

	
Breaks	Enable line breaks and configure each break.

Note: For more information on axis customization and for axis controls for specialized graph types (e.g. polar, ternary, radar chart.etc), refer to:

Help: Origin: Origin Help > Graphing > Graph Axes

11.7 Customizing Data Plot Colors

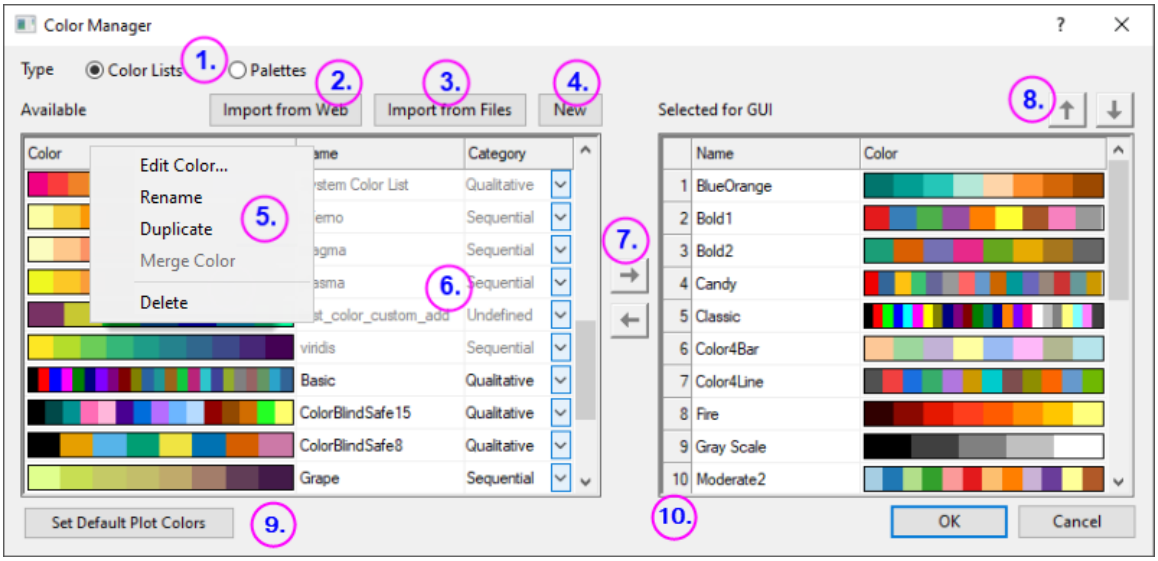
Origin ships with a number of installed color lists or palettes. If you prefer to create your own color lists or you have a standard set of palettes and want to port them over to Origin, there are a number of tools available in the software for doing that. See the next section, **Color Manager**, for more information.

11.7.1 Color Manager

Use the **Color Manager** for importing, creating and organizing the color lists and palettes that you use in Origin:

To open the Color Manager:

1. Choose **Preference: Color Manager**.



The following list numbers correspond to controls shown in the image above:

1. Click these radio buttons to display installed **Color Lists** or **Palettes**.
2. Click **Import from Web** to open a dialog where you can specify a URL to install palettes. Support for Scribus (.xml), Office Color Table (.soc), Adobe Color (.aco), Adobe Color Table (.act), Adobe Swatch Exchange (.ase) and JASC PaintShopPro (.pal).
3. Click to install locally-stored palettes. Support for Scribus (.xml), Office Color Table (.soc), Adobe Color (.aco), Adobe Color Table (.act), Adobe Swatch Exchange (.ase) and JASC PaintShopPro (.pal).
4. Click to open the **Build Colors** dialog where you can build a color using a number of tools: using standard color controls, direct entry of HTML codes or use an eye-dropper tool to pick onscreen colors. You can read more about the **Build Colors** dialog in the Origin Help file.
5. Right-click on the **Available** list(s) to:
    - **Delete** or **Rename** lists (you can also rename by clicking directly on the name). Lists that are dimmed have already been **Selected for GUI**. Those that are **Selected for GUI** appear from drop-down lists throughout the user-interface -- in **Plot Details**, from the **Fill Color** button  on the **Style** toolbar and from the Mini Toolbar **Fill Color** button  when a plot or special point is selected.
    - **Merge Color** two or more **Color Lists/Palettes** selected in the Color Manager. Note that the *total number of colors in selected lists/palettes cannot exceed 256* (i.e. Merge Color will not be available).
6. Use the list control to set *Category* = **Undefined**, **Sequential**, **Diverging** or **Qualitative**.
7. Use these controls to add or remove color lists and palettes from the user-interface (GUI).
8. Use these controls to move a selected list or palette up or down in the various GUI color lists.
9. Click **Set Default Plot Colors** to open the Theme Organizer's **System Increment Lists** tab, where you can set default colors for use in your plots.
10. Drag list-number icons to rearrange GUI color list order.

11.7.2 Applying Color to Your Graphs

There are many options for applying color to your graphs. We will try and cover the basics here, pointing you to other resources for more in-depth discussion.

List of key topics on the subject of plot color:

- The Color Manager
- Customizing Data Plot Colors
- Using a Dataset to Control Plot Color
- The Plot Details Color Map/Contours Tab Controls for 3D and Contour Plots

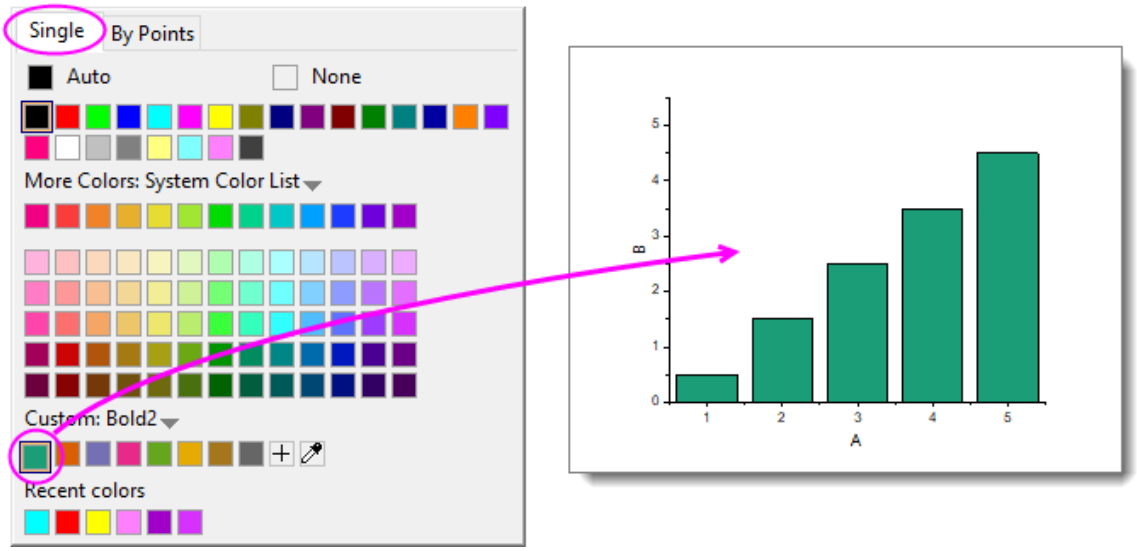
11.7.2.1 Applying Colors Singly





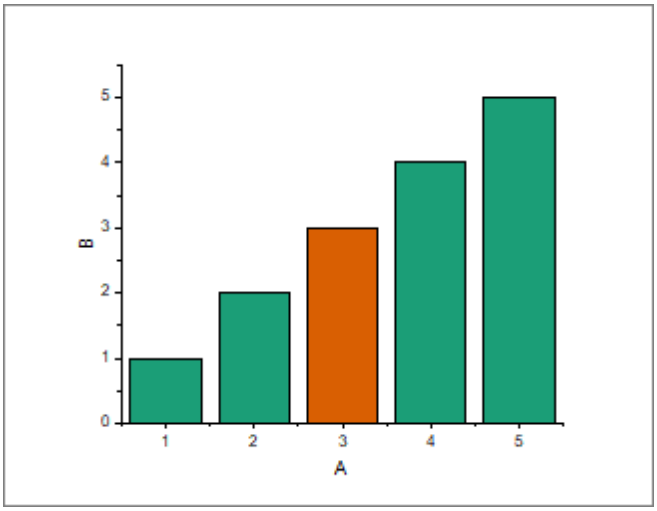
Picking and applying a single custom color has been made easier with the addition of the "eyedropper" tool to the **Single** tab of the **Color Chooser**. Previously, the eyedropper tool was buried in the **Build Colors** dialog.

Applying colors singly simply means applying a single color to a plot as opposed to applying color from a color list to a series of plots. It is the most basic way to apply color to a single plot or special point. Simply select a color well from anywhere on the **Single** tab -- from the LabTalk colors at the top, from a selected color list, or from a custom or recently used color.



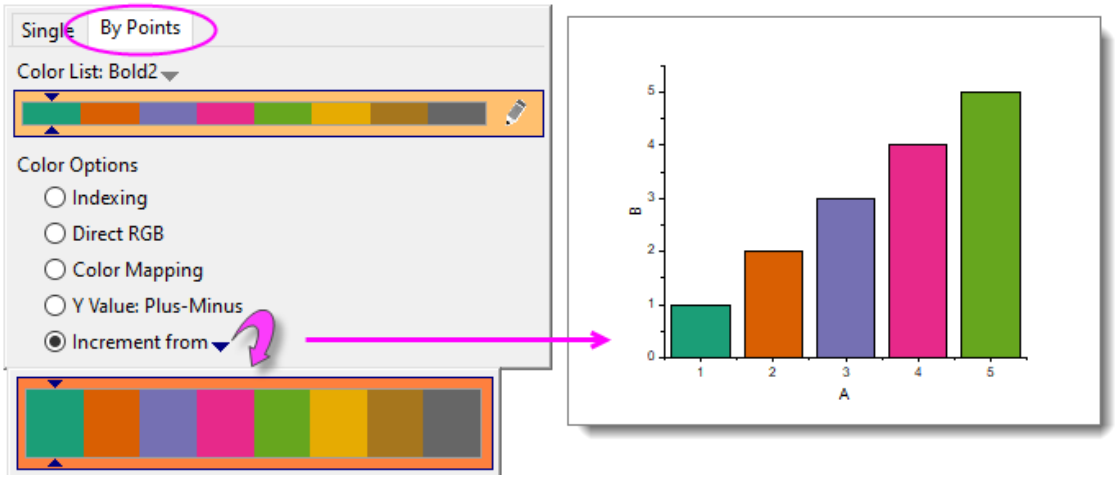
- Select a plot (e.g. scatter plot) and click the **Fill Color** button on the Mini Toolbar that appears.
- Select a plot and click the **Fill Color** button on the **Style** toolbar.
- Double-click on a plot to open the Plot Details dialog box where you can click on a tab to the right side (e.g. **Symbol** tab for a scatter plot) and set color for the element.

- To create a special point -- i.e. to assign special characteristics to one data point in your plot -- press Ctrl+click to select the point, then use the **Mini Toolbar**, **Style** toolbar or **Plot Details** controls to customize color for that point.



11.7.2.2 Applying Colors By Points

Applying colors **By Points** generally means applying a color to each point in a plot by one of several schemes. The simplest involves picking an **Increment From** color from a predefined color list and assigning colors, in sequence, to each point in the plot.



As in the case of applying a single color, you can apply these settings using controls in Plot Details; or by selecting the plot and using the **Fill Color** buttons on the floating **Mini Toolbar** or **Style** toolbar docked to the top of your workspace.

Other schemes typically make use of a column of values to assign color to points:

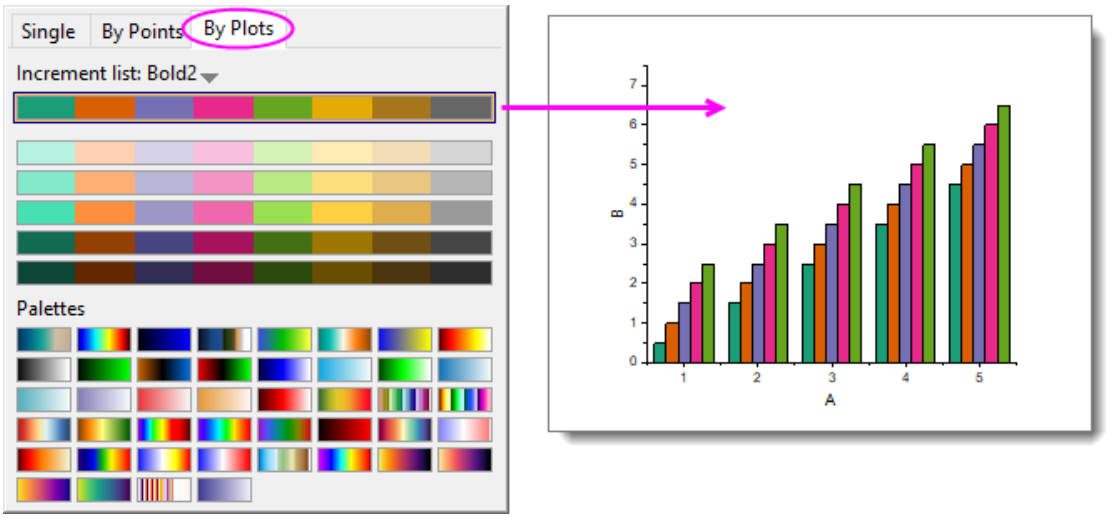
- Indexing assigns point color by associating an integer or text string (categorical value) to different colors in a list.
- Direct RGB assigns color using a value derived from columns of RGB values.

- Color Mapping -- used for 2D, Contour and 3D plots -- assigns colors in a list or palette, to values across the range of the plot's Y or Z values.

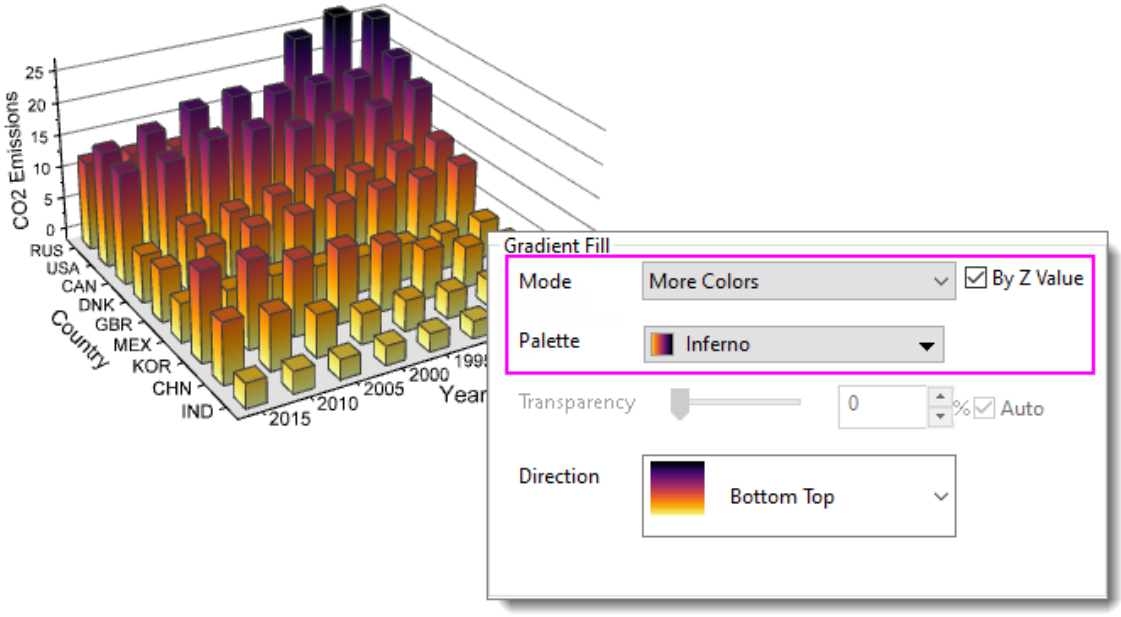
There are several other schemes which are specific to a certain plot type (or family of plots), but the list above covers most of what you will use. For more information see Using a Dataset to Control Plot Color.

11.7.2.3 Applying Colors By Plots

You apply color **By Plots** when you want to assign differentiating colors to a series of plots. Typically, this series of plots comprises a "plot group." In a plot group, plot attributes including color, are assigned to each plot by incrementing through a style list -- color, line-style, symbol shape, etc.



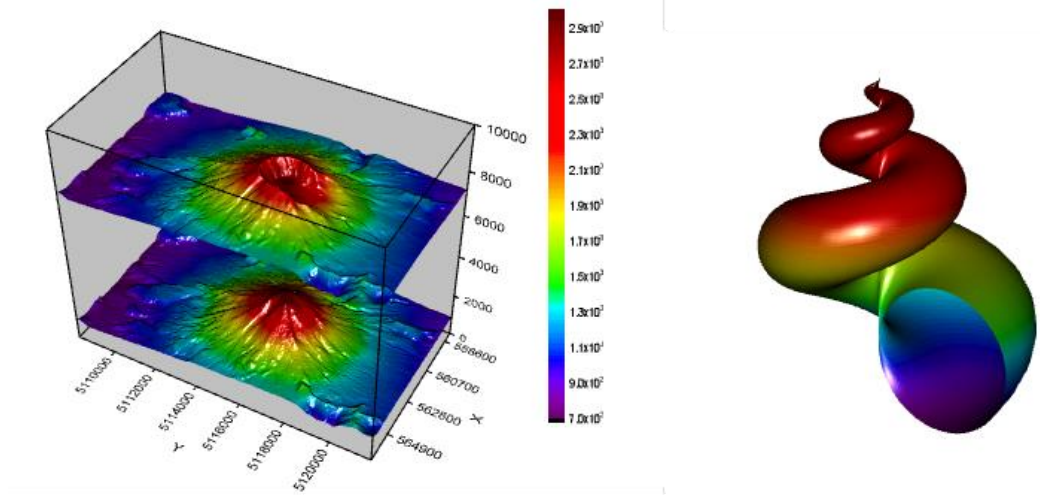
From **Origin 2023**, a new way to apply a color palette to 3D bar charts is available. The method works best for 3D bars as it allows you to apply a color palette by Z value (this is neither "apply colors by plots" in the above sample graph, nor "applying a colormap" as described below, but something unique to 3D column/bar plots).



To find out more about this graph customization, press F11 and on the Learning Center **Graph Samples** tab, set the drop-down list to **3D Bar Charts** and search on "*gradient*."

11.7.2.4 Applying Colormaps to 2D, 3D and Contour Plots

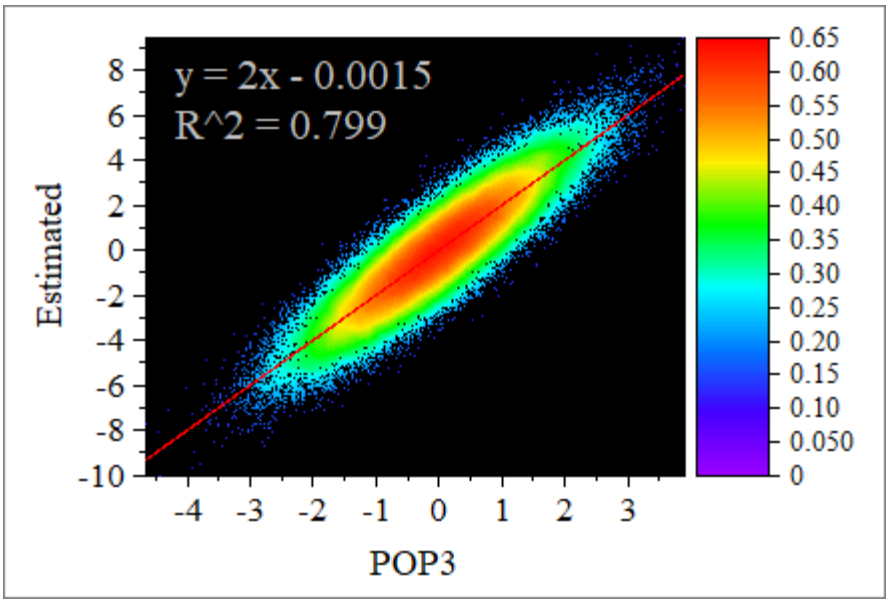
While you can use a color list with a contour or 3D plot, it is probably more common that you will use a color palette. This allows a wider range of color variation and can add realism to 3D surfaces and 3D function plots.



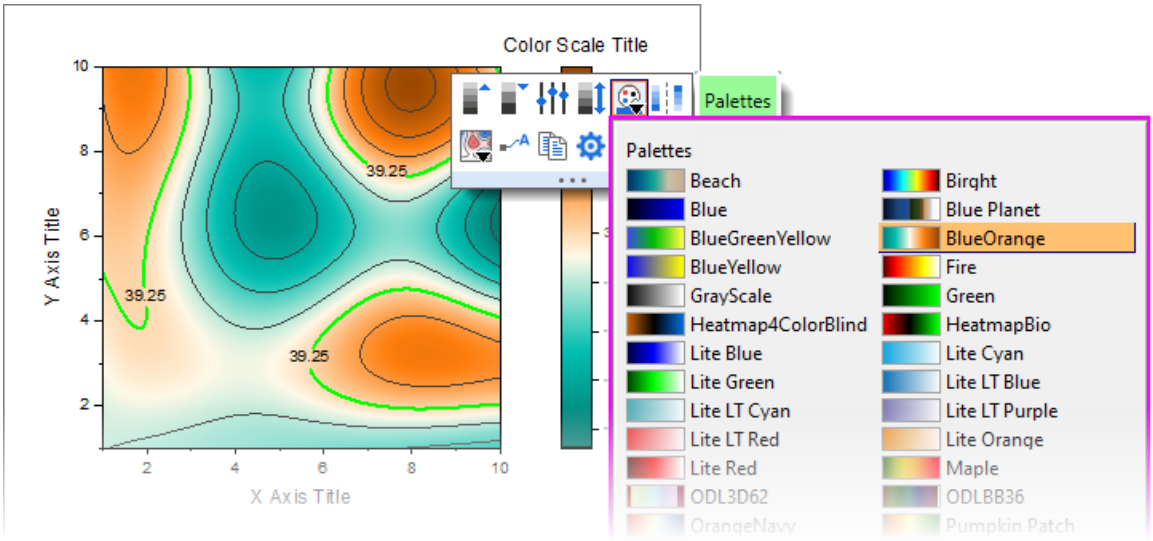


You can add new color palettes to Origin by drag-and-drop. Support for Scribus (**.xml**), Office Color Table (**.soc**), Adobe Color (**.aco**), Adobe Color Table (**.act**), Adobe Swatch Exchange (**.ase**) and JASC PaintShopPro (**.pal**).

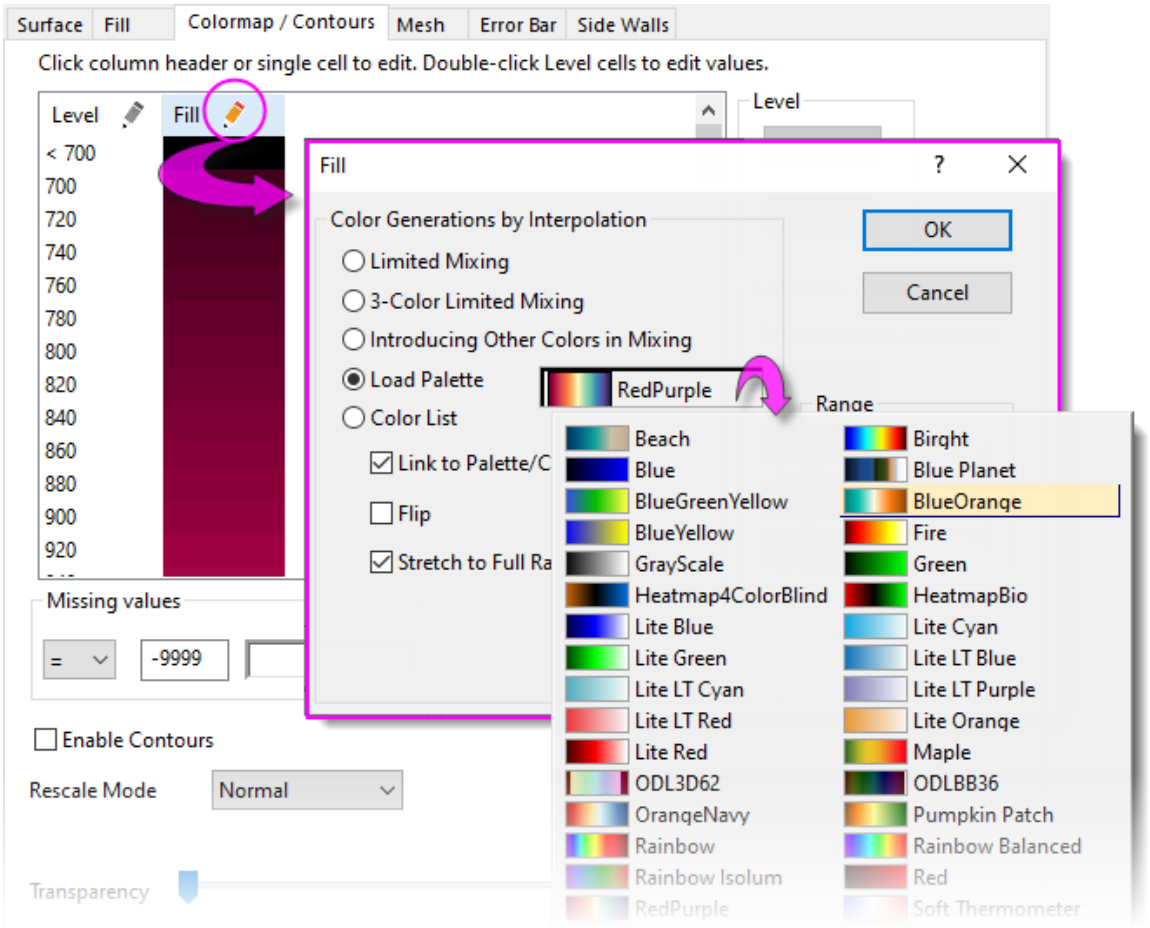
Colormapping can also be applied to 2D plots. This allows you apply a greater range of color variation to data points than would be possible with incrementing or indexing. A good example of applying a color map to a scatter plot would be Origin's **Density Dots** plot in which, typically, thousands of scatter points are plotted and an algorithm is used to calculate point density and assign color to ranges of point densities.



Applying a colormap to a 3D or contour plot is much the same as applying color singly, by points or by plots. You select a plot -- then using the **Palette** button on the floating **Mini Toolbar** or the **Style** toolbar. You pick a palette.



You can also use the controls on the **Colormap**/**Contours** tab of Plot Details. This tab gives many more options beyond simply picking and applying a colormap.



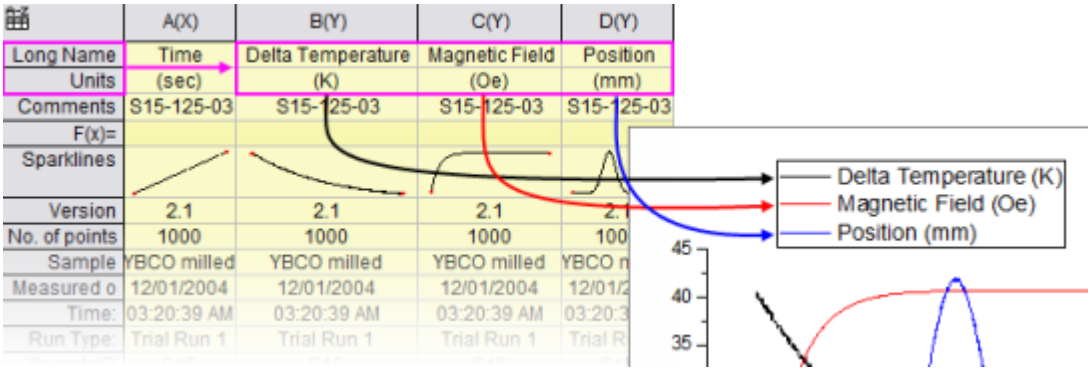
For more information on applying color to colormapped plots, including contour and 3D surfaces, see these topics:

- The Plot Details Colormap/Contours Tab
- Tutorial: Contour Plots and Color Mapping
- Colormap Surface Graph
- Symbol Plot with Size and Colormap from Other Columns
- Parametric Surface with Colormap from Data

11.8 Graph Legends

11.8.1 How the Default Legend is Created

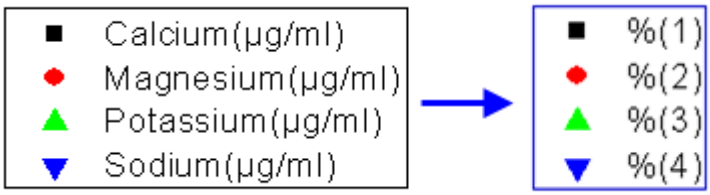
A graph legend is automatically created when you plot data. For most 2D and some 3D graph templates, the default legend combines (A) **plot style information** stored with the graph template, with (B) **dataset information stored in the worksheet column label rows**, and places the resulting legend object on the graph page.



Note that the default legend object is not created with literal text and plot symbols but instead is created from LabTalk script.

- This allows the legend object to be dynamically linked to plotted data and worksheet metadata, so that the legend can be updated when data or plot metadata change.
- Because construction of the legend object relies on scripting rather than literal information, you can save customizations to a graph template and recreate the graph with its accompanying legend object using new data, as often as is needed.

The legend script relies on "substitution notation" to convert variable values to readable symbols and text. You can see this notation when you double-click inside of the legend object (as if to edit it).



- You control which dataset metadata are used in constructing the default legend text by setting the [the **Translation mode of %(1), %(2)** list] in the **Legends/Titles** tab of the **Plot Details** dialog box (**Format: Page...**).
- Custom strings can be constructed using LabTalk substitution. Customizations can be saved to the graph template for repeat use.



Origin has a **Fit Layers to Page** tool that is useful for arranging a graph and a large, text-wrapped legend on the page.

11.8.2Adding and Updating the Default Legend

The table below lists tasks associated with adding or updating the graph legend, and where to find editing controls for each legend type. Before proceeding, we should point out that there are two legend refresh modes:

- **Updating** a legend will preserve any customizations that you might have made to the existing legend, including size and position adjustments and legend symbol and text customizations.
- **Reconstructing** a legend will overwrite any customizations. When you add or reconstruct the legend, you are creating a copy of the legend that is stored in the graph template.



The legend object occasionally goes missing. If you cannot add or reconstruct your legend, there is a good chance it already exists but is outside of the page and can't be seen. Try clicking **Graph: Legend: Reset Legend Position** which should restore the legend to its default location.

In addition, the graph template stores a **Legend Update Mode** setting that determines how the legend is refreshed when adding or removing data plots from the graph. See **Controlling Legend Update**, below.

Task	Method (graph is active)
Add or reconstruct legend	• **Graph: Legend: Reconstruct Legend** menu. • **Reconstruct Legend** button  (**Add Object to Graph** toolbar). • CTRL+L.  Legend customizations not saved with the template, will be lost when you reconstruct.
Update legend	Open the **legendupdate** dialog box: • **Graph: Legend: Update Legend** menu. • Right-click on legend and select **Legend: Update Legend**. **Note:** "Updating" a legend does not overwrite legend customizations.
Customizing special legends	Right-clicking on these special legends opens a dialog box with customization options specific to each legend type: • Categorical legends. • Box chart legends.

	• Point-by-point legends.
Add color scale	Only available for color-mapped plots (e.g Contour Plots). • Click the **Add Color Scale** button  (**Add Object to Graph** toolbar). • Right-click in the layer and select **New Color Scale**. • **Insert: Color Scale** menu. • When you have multiple color-mapped plots in a single graph window, you can click on each plot to select it, then add a corresponding color scale.
Control color scale	Available when a color scale object has been added to a graph. To open the **Color Scale Control** dialog: • Double-click on the color scale object. • Right-click on the color scale object and choose **Properties**.
Add bubble scale	Available for bubble plot, or when symbol size is controlled by a dataset. • Select **Insert: Bubble Scale**. • Right-click in the layer and select **New Bubble Scale**. • Click the **Add Bubble Scale** button  in the **Add Object to Graph** toolbar. • Right-click the legend to select **Add Bubble Scale** from the context menu.
Control bubble scale	Available when bubble scale object has been added to a graph. To open the **Bubble Scale Control** dialog: • Double click on the bubble scale object. • Right-click on the bubble scale object and choose **Properties**.



The **legendupdate** dialog box and the **Legend/Titles** tab at page level of **Plot Details** both have an **Auto Legend Translation Mode** drop-down that determines which worksheet metadata (e.g. column **Long Name**, **Comments**, etc.) is used to generate the legend text. For a list of **Custom** options, see **Legend Substitution Notation**.

Note: For more information on creating and customizing graph legends, see:

Help: Origin: Origin Help > Graphing > Graph Legends and Color Scales

11.8.3 Controlling Legend Update

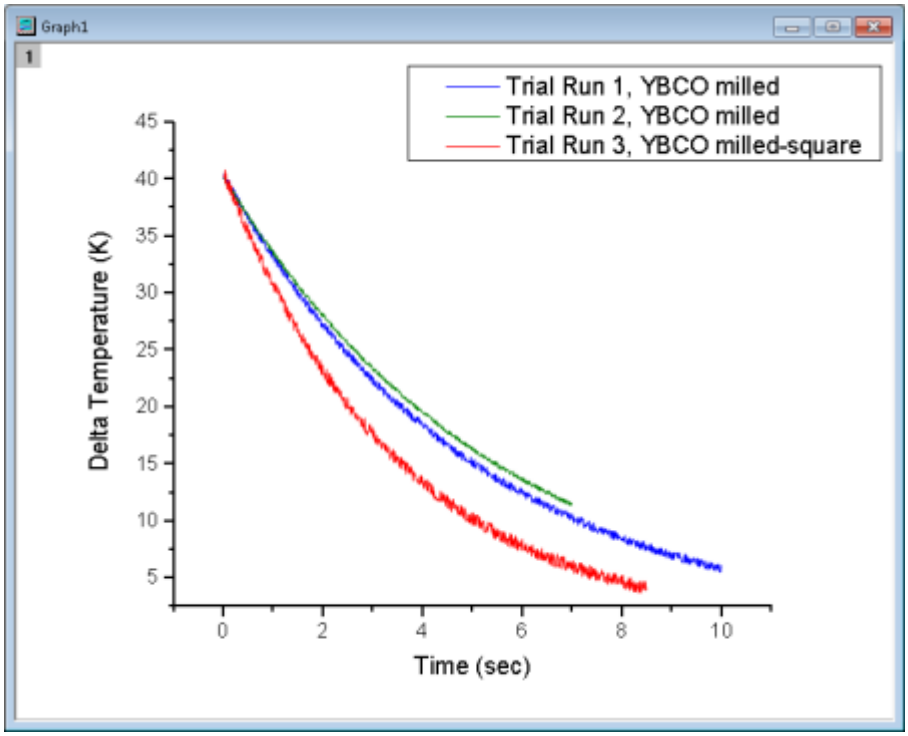
When a data plot is added or removed from a graph layer, the default behavior is to update the legend. The **Legend/Titles** tab at the graph page level in the **Plot Details** provides a **Legend Update Mode** drop-down to control this behavior.

The default setting **Update when Adding** only affects the legend display of data plots that are added or removed. Previous legend customizations to existing plots, such as literal text entered manually, will be maintained.



Tutorial: Customize legend and add data plots

1. Start with a new project in Origin.
2. Open Windows Explorer and navigate to the subfolder **<Origin EXE folder>\Samples\Import and Export**
3. Shift-select the files **S15-125-03.dat**, **S21-235-07.dat**, **S32-014-04.dat** and then drag-and-drop the files onto an empty Origin workbook. The three files will be imported into three separate workbooks.
4. Click on one of the workbooks, select the column B, and create a line plot.
5. Right-click on the legend and select **Legend: Update Legend...** to open the **legendupdate** dialog.
6. Change the **Auto Legend Translation Mode** drop-down to **Custom**, and in the edit box that appears below, enter the string:
   @WS, @LD3
   and then press **OK** to close the dialog box. The legend updates, displaying the sheet name and the third user parameter.
7. Click on the second workbook, select column B, move the mouse over the right-edge of the column until it changes to , and then drag-and-drop this data onto the graph to create a 2nd data plot.
8. Repeat the procedure with column B from the third workbook. The graph will now display three data plots, and the legend will automatically update to display the identifier for all three plots.
9. Click on each individual curve and use the **Style** toolbar to set a different line color for each. The legend will automatically update and display the new line color.



11.8.4Special Legend Types

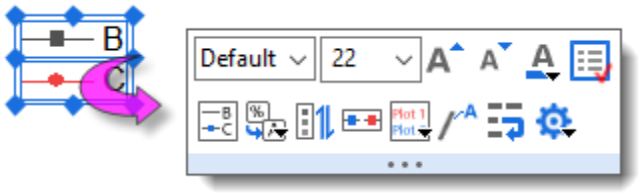
As mentioned, Origin supports these specialized legends for use with specific graph types. These legends can be customized and updated similarly to the Data Plot legend used by most 2D graph types.

Legend Type	Menu to Create	Used in situations where ...
Legend for Categorical Values	**Graph:Legend:Categorical Values**	At least one plot attribute (e.g. color, symbol shape.etc) is controlled by data indexing. See the Legend for Categorical Values help page.
Point by Point Legend	**Graph:Legend:Point by Point**	The plot symbol style is controlled by data indexing, an increment list, or color mapping. See the Point by Point Legend help page.
Legend for Box Chart Components	**Graph:Legend:Box Chart Components**	The graph is a box chart, or a grouped box chart. See the Legend for Box Chart Components help page.

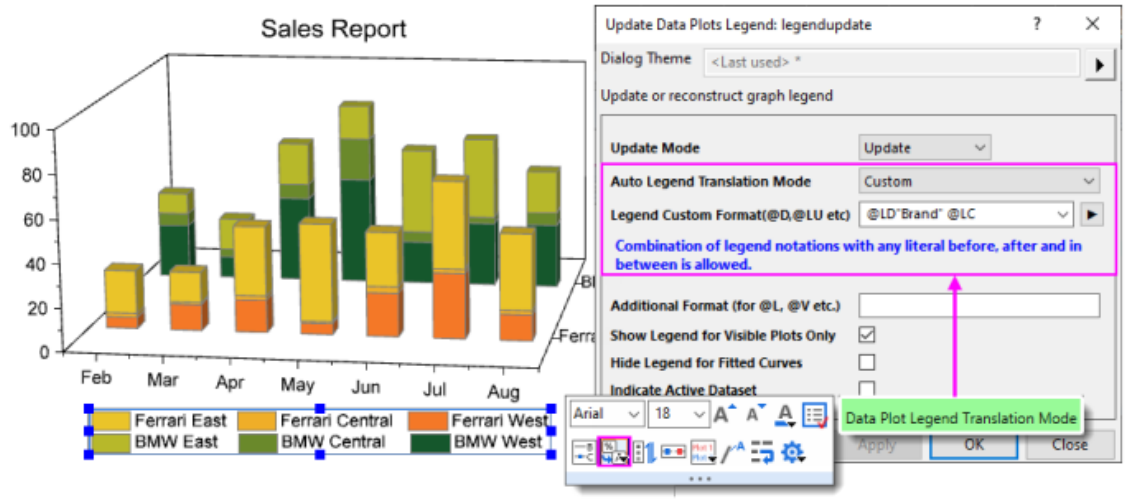
11.8.5Tips for Quick Legend Edits

Many edits to the graph legend can be made from the legend's Mini Toolbars. The default legend for 2D graphs has two Mini Toolbars:

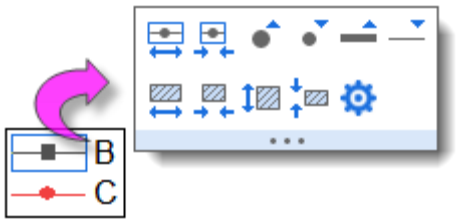
- The **Legend** toolbar -- available when you select the legend object -- has general controls for font, legend reconstruction, reversing order, etc. Click on the legend object to produce the blue selection handles.



You also gain quick access to more complex controls such as **Data Plot Legend Translation Mode** -- identifying the column label row metadata that you wish to use to create your graph legend.

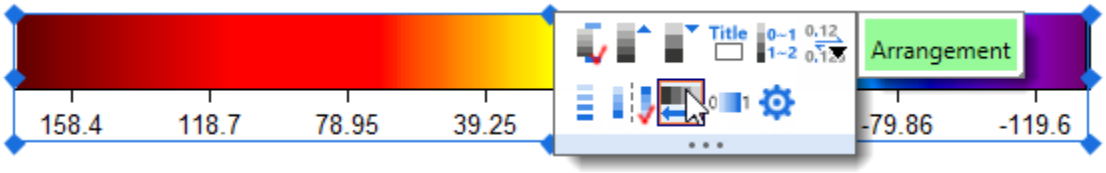


- The **Legend Symbol** toolbar becomes available when you click on a legend symbol. Use it to change symbol or pattern block height and width, line thickness, etc.



In addition to the Mini Toolbar for the default legend, there are toolbars specifically for **Color Scales** and **Bubble Scales**.

To format your legend or scale using a Mini Toolbar:



1. Select a legend or legend component (e.g. legend symbol). A Mini Toolbar with context-specific buttons will show.
2. If the toolbar fades too quickly, restore it by pressing the Shift key.



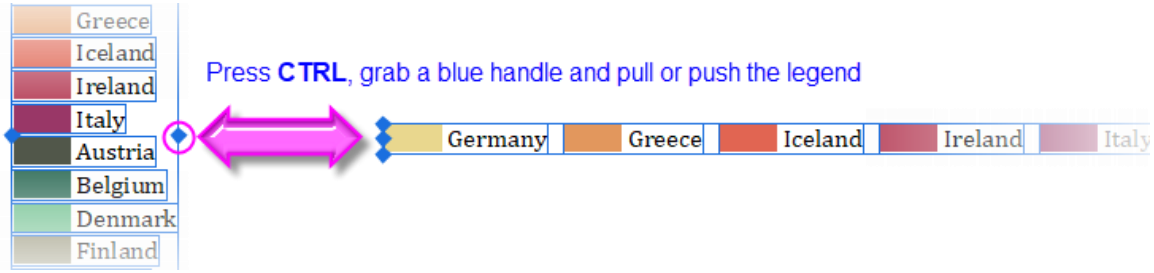
To format multiple legend objects on a page using a Mini Toolbar, press Ctrl and select the objects. Release Ctrl to display a Mini Toolbar for editing. Alternately, when the graph window is active, go to Object Manager and right-click on a legend object and choose **Select All with Same Name** and use the Mini Toolbar that appears in the Object Manager space

.

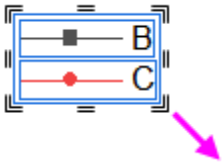
11.8.5.1 Other Legend Editing Tips

- Apart from the Mini Toolbar buttons, you can also right-click on the legend object, choose **Legend** and open a shortcut menu with some useful commands such as **Text Color Follows Plot**, **Reverse Order**, and **Show Legend for Visible Plots Only**. The same menu commands are available from **Graph: Legend**.

- Both the Mini Toolbar and the shortcut menu have an **Arrange in Vertical**/**Horizontal** button/command for changing the legend aspect; or you can modify it interactively by selecting the legend object, then pressing CTRL while dragging a selection handle (e.g. drag horizontally to create a legend that is all on one line).

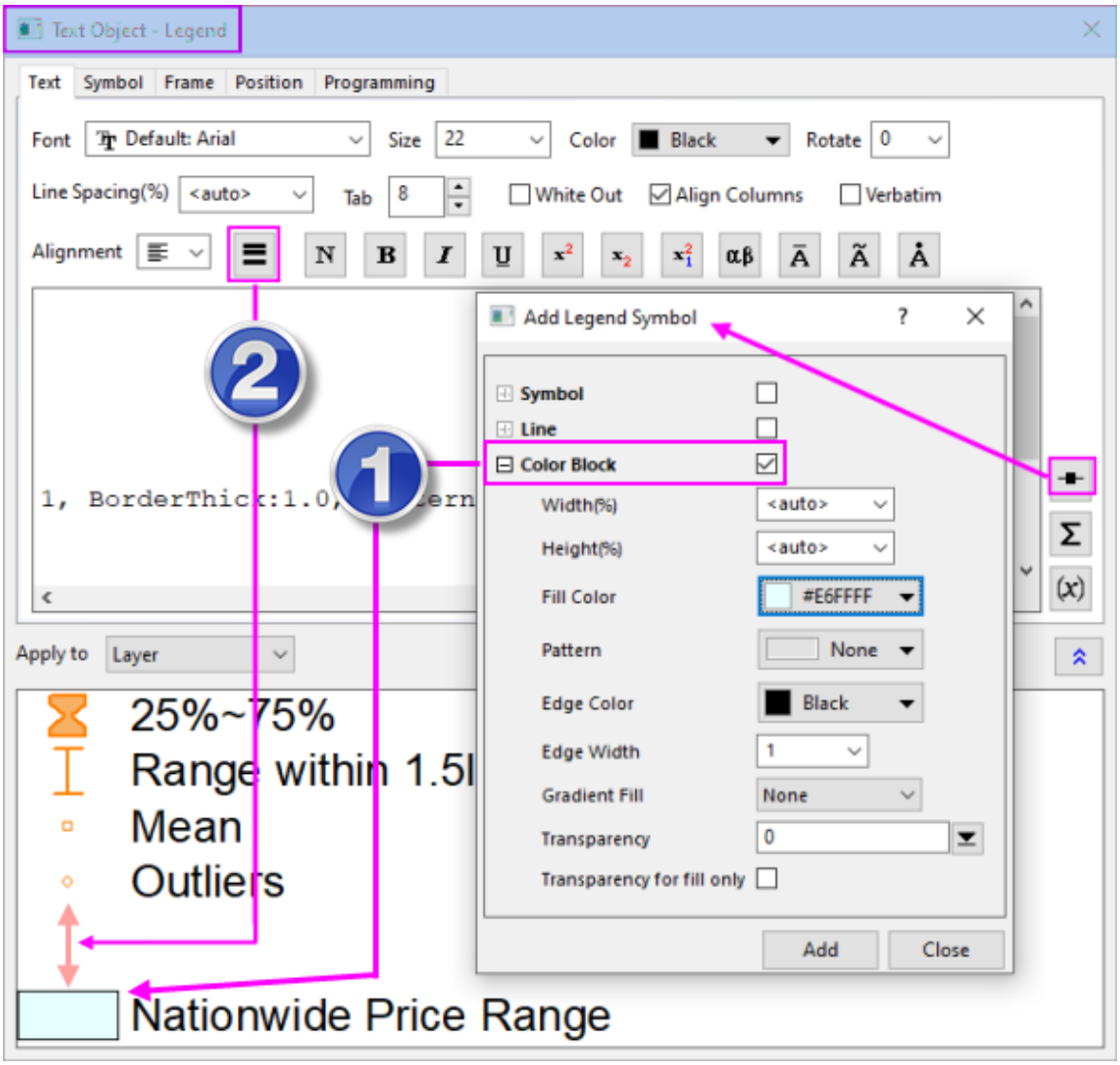


- You can modify the white space around legend entries in the default 2D legend, by clicking precisely on the legend frame and dragging the selection handles.

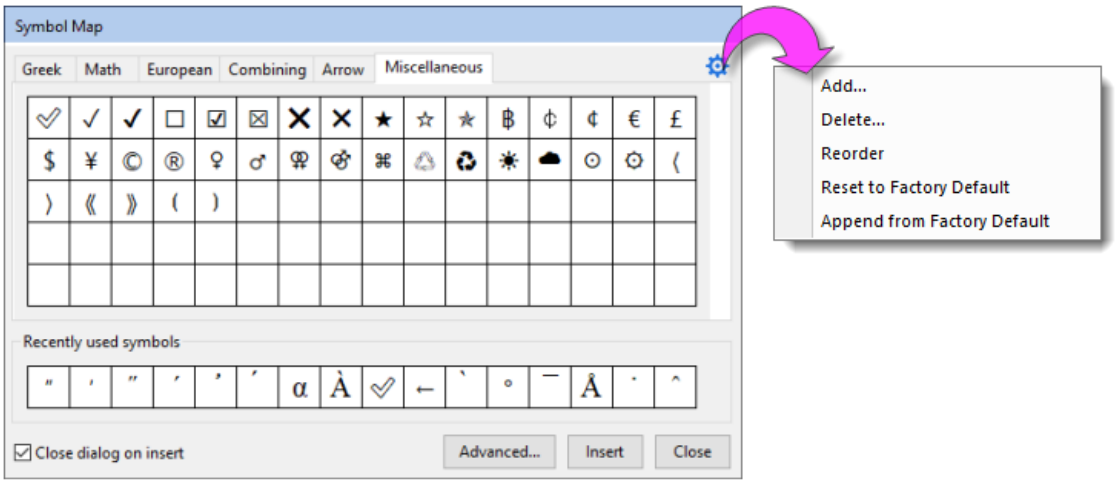


- While plot metadata stored in column label rows is an ideal source for legend text, you can simply overwrite the existing legend text with literal text. Either double-click on the legend text to enter in-place edit mode or if that proves to cumbersome, right-click on the legend and choose **Properties** (taking care not to overwrite the "\l( )" notation that creates the plot symbol). CTRL + double-clicking on the legend will also open the this dialog.

- As discussed above, the default legend is automatically-generated by combining worksheet metadata with customizable plot styles. However, there are times when your auto-generated legend needs some "tweaking":



- One common legend customization is to manually add legend symbols and text that are independent of any data plot (you can read about that here). Besides frequently used symbol, you can also add an independent **Color Block** (**1**):
    1. Right-click on the legend object and choose **Properties** to open the Text Object - Legend dialog.
    2. Click the **Add Legend Symbol** button .
    3. Enable **Color Block**, customize the block and click **Add**.
    4. Manually add text at the end of the string that is used to generate the block before closing **Properties**.
- Another desirable adjustment is to add some white space between legend entries. This is done using the **Separator** button on the Text Object - Legend toolbar (**2**).
    1. In the upper panel of the Text Object - Legend dialog, place the cursor at the end of the line *preceding* where you want to place the separator, then click the **Separator** button  (**hint:** separator thickness can be controlled by editing the numeric portion of the inserted syntax **\sep:50**).
- If you are adding special characters to the legend manually, there is a simplified **Symbol Map** dialog for doing that. Most-used symbols are arranged on tabs for easy access. To access the full Symbol Map dialog, click the **Advanced** button.



- Double-click a legend symbol to open the **Plot Details** dialog box.
- Any changes that you make to the legend can be saved with the graph template (**File: Save Template As**) If you do not want a legend object added to your graph each time you create the graph, delete the legend object and re-save the graph template.

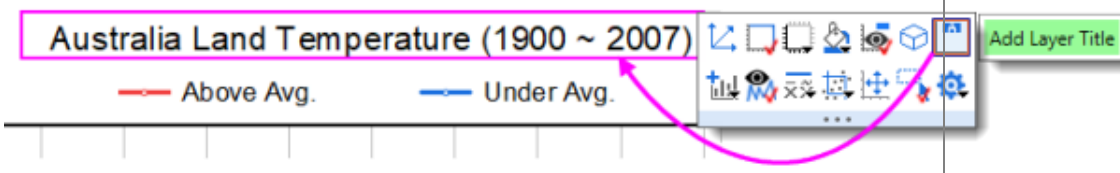
11.9 Annotating Your Graph

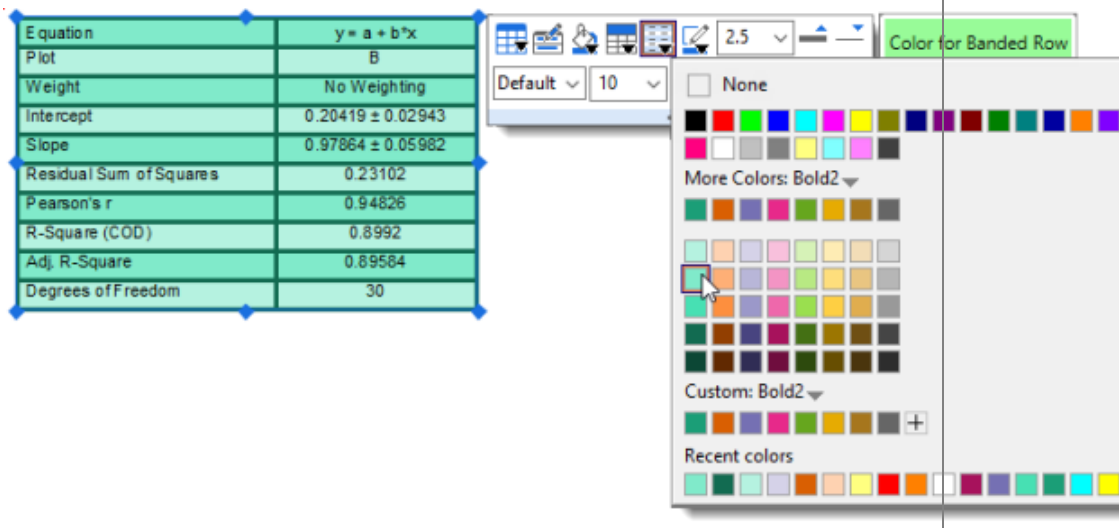
When we speak of "annotating" a graph, we are talking about adding text or drawing objects to the graph. Generally, these "annotations" help to enhance the graph in some way -- add a page title, add an arrow to draw attention to some graph feature, label data points, add a date-time stamp to note the time of graph creation, etc.

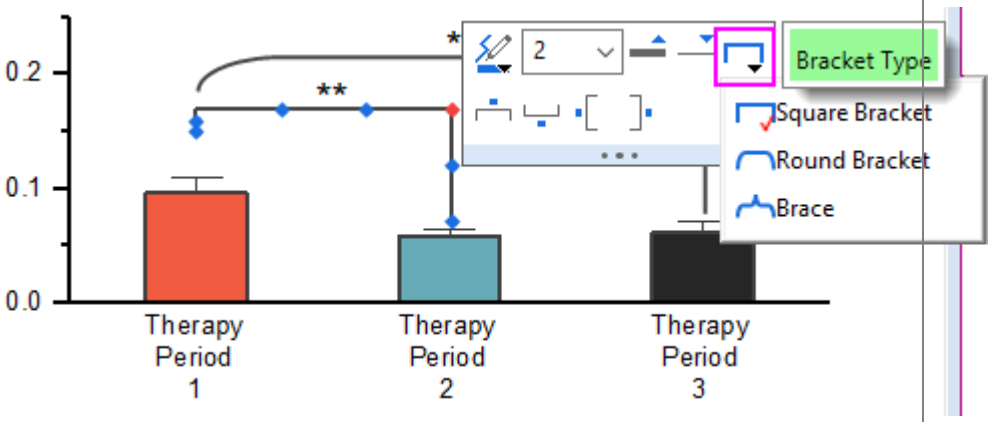
Annotating a graph can be as simple as adding a static text object and formatting it with **Mini Toolbar** buttons. Or you might add a more complex object that is dynamically linked to a variable value or to some LabTalk script that is executed whenever some user-specified event occurs.

The following table lists some common graph annotation tasks and available tools for accomplishing those tasks:

Task	Method
Label Data Points and Plots	• Choose **Format: Plot ...**, then click the **Label** tab and select **Enable** (not available for all plot types). • Select a plot and use the Mini Toolbar **Show Data Labels** button  to turn on labels. Some label buttons may support formatting options for the data labels (hint will be a downward pointing arrow as on the button shown here). • To label a single data point, click twice on the point (hint: not a double-click but a click, pause, click). When the single-point is selected, click the **Show Data Labels** button on the Mini Toolbar. • For format options not supported by Mini Toolbars, you will generally use controls on the **Label** tab of Plot Details. Note that labeling options will depend on the plot type.
Add Text Objects	• Click the **Text Tool**  button, then click on the graph to place the object. • Right-click on the graph and choose **Add Text** from the shortcut menu. • Double-click on text to do rich text editing; or click on the object and use the text object Mini Toolbar to change font color, bold, align, wrap text, etc.
Add Page Title	• To add a page title to the graph window, hover near the top of the page (just below the title bar) and click the **Add Page Title** Mini Toolbar button. 
Add Layer Title	• To add/modify layer title in the active layer, click on the graph layer, then click the **Add Layer Title** Mini Toolbar button; or right-click on the graph and choose

	Add/Modify Layer Title from the shortcut menu.  • This is a new type of text object which is (a) center-aligned horizontally on the layer and in which (b) wrap-text is enabled. Once a title is added, it can be toggled ON/OFF with the Mini Toolbar button.
Add Vertical/Horizontal Line	• With a 2D graph active, use the **Insert: Straight Line...** menu item. Note that this tool allows use of a simple LabTalk expression in the **At Value** field (e.g. "mean(plotdata(1,Y))" which translates to "mean of 1st plot's Y dataset") for positioning the line object. For information, see **At Axis Value**.
Annotate a Data Point	• This is another another option for labeling individual data points. Click the **Annotation** tool on the **Tools** toolbar. See The Annotation Tool.
Add Drawing Objects	Use the corresponding toolbar buttons on **Tools** toolbar. Origin supports: • Arrow, Curved Arrow. • Line, Polyline, Curve, Freehand Draw. • Rectangle, Circle, Polygon, Region.
Insert Equation, Word Object, Excel Object, Other OLE Object	• Insert Equation button group on the **Tools** toolbar. For equations, note that you can download a free App from the OriginLab File Exchange, for adding **LaTeX** objects to worksheets and graphs.
Insert Worksheet, Insert Graph	• Click the **Insert Worksheet** or **Insert Graph** buttons on the **Tools** toolbar (the two share a split button). This opens a browser dialog from which you can choose a worksheet or graph. Both insert an image object (name = *WBook* or *GPage*) into the graph. • To style inserted tables(worksheets), including coloring alternating rows and a new

	Mini Toolbar for modifying the appearance of grids, frames, cell colors, fonts, etc. For more information, see Inserting Worksheets in Graphs (and Layouts).
Insert Image	• Right-click on the graph and choose **Insert Images From Files**. You will be asked whether you want to insert your image as a background for the active graph layer. Answering yes will cause the image to be imported and placed behind plots, graph legends, text objects, etc.
Add Table	• Click the **New Link Table** button on the **Add Object to Graph** toolbar and then click on the graph. • From the main menu, choose **Insert: Table**. • To edit table content, double-click the table object. • To format the table, select it and use the available Mini Toolbar. 
Insert Date & Time Stamp	• **Date & Time** button on the **Add Object to Graph** toolbar.
Insert Project Path	• **Project Path** button on the **Add Object to Graph** toolbar.
Add Bracket with Asterisk	• To indicate statistical groupings, click the **Add Asterisk Bracket** button on the **Add Object to Graph** toolbar. • To change bracket shapes, click on the barcket and select from drop-down list of

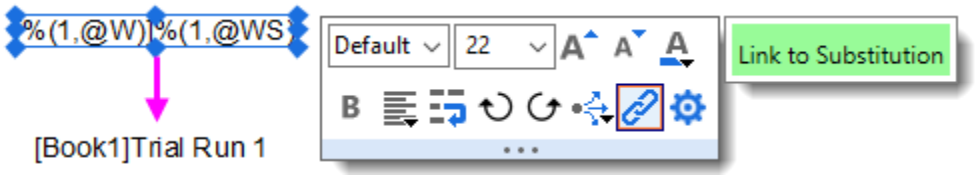
	Bracket Type Mini Toolbar button.  • Manually adjust the size and placement of brackets by dragging handles on the object. • To format the bracket, click the bracket and use the Mini Toolbar buttons.
Add XY Scale	This is useful when using a nonlinear xy scale. • **New XY Scale** button and click on a graph layer. • Select **Insert: XY Scaler**.

11.9.1 Tips for Editing Your Graph Annotations

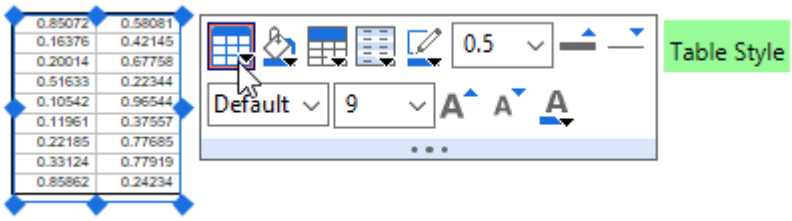
Beginning with **Origin 2021**, use Alt+Enter when creating multi-line text objects. To revert to using Ctrl+Enter to insert a line break, set **@FCA=1**.

- Pressing CTRL when drawing with the **Rectangle** or **Circle** tools, will draw a square or circle (as opposed to a rectangle or ellipse).
- Use **Mini Toolbar** buttons for quick edits to selected objects. For more complex edits, right-click an object and choose **Properties** to edit object properties and set defaults.
- For text objects, including the axis titles and graph legends, you can edit text objects directly in "In-place Edit" mode. Double-click on a text object to edit. Use the **Format** toolbar buttons to add superscript, subscript, and Greek characters.

- You can enable text wrapping for text objects, including legend objects. Open the object's Properties dialog, click the Frame tab and enable **Wrap Text, Adjust Height**; or select the object and click the **Wrap Text** Mini Toolbar button.
- ***NEW:*** By default, there is an 80 character limit (with spaces) to in-place editing of wrapped text. Below this threshold, double-clicking on the object will put you into in-place edit mode; above the threshold, double-clicking will open the Properties dialog. You can adjust this threshold using system variable **@TLIP**.
- ***NEW:*** When long text objects are *not* wrapped, you can use system variable **@TLIPN** (default = 60) to determine the character threshold for entering in-place edit mode or to open the Properties dialog, upon double-clicking.
- Note that while manual editing of axis titles and legends may be the best "quick solution", in most cases, you are better off using worksheet column metadata to automatically create axis title and legend text.
- Do NOT set font size while in "In-place Edit Mode" unless you need to mix font sizes within a single text object. The correct way to change font size is to click the text object once so that the green selection handles appear, then select font size from the **Format** toolbar. If you set while in In-place Edit mode, Origin will not indicate the proper font size when you hover on the text object.
- When you are in In-place Edit mode, you can right-click and choose **Symbol Map** to insert special characters into your text object.
- You can insert data from of a worksheet cell into a text object by copying and pasting the cell contents. While in In-place Edit mode in the text object, right-click and choose **Paste** or **Paste Link**. Data added by **Paste** is static; **Paste Link** is dynamic and thus, the text object will update if the data in the linked cell changes.
- Also, when in In-place Edit mode, you can right-click and choose **Insert Info. Variable...** to insert project variables into the text object. Since the pasted information is linked to a LabTalk variable value, the inserted data updates if the variable value changes.
- You can insert variable values into a text object using the LabTalk **%**, and **$** substitution notation by setting the **Link to (%,$), Substitution Level** to **1** in the text object's **Properties** dialog box, **Programming** tab. Right-click on the text object and choose **Properties** from the shortcut menu. Alternately, you can use the **Link to Substitution** Mini Toolbar button, saving you from having to open the **Properties** dialog.



- You can use controls on the **Programming** tab of Properties to associate your LabTalk script with a text or drawing object (for instance, see Linking Text Labels to Data and Variables). Enter your script in the text box and specify a **Script, Run After** condition for running the script. Use the **Apply to** drop-down to set the scope for the script.
- You can copy a range (of cells) from a workbook and paste it into a graph as a table object. Table content is (a) edited by double-clicking on the object and (b) can be formatted using Mini Toolbar buttons.





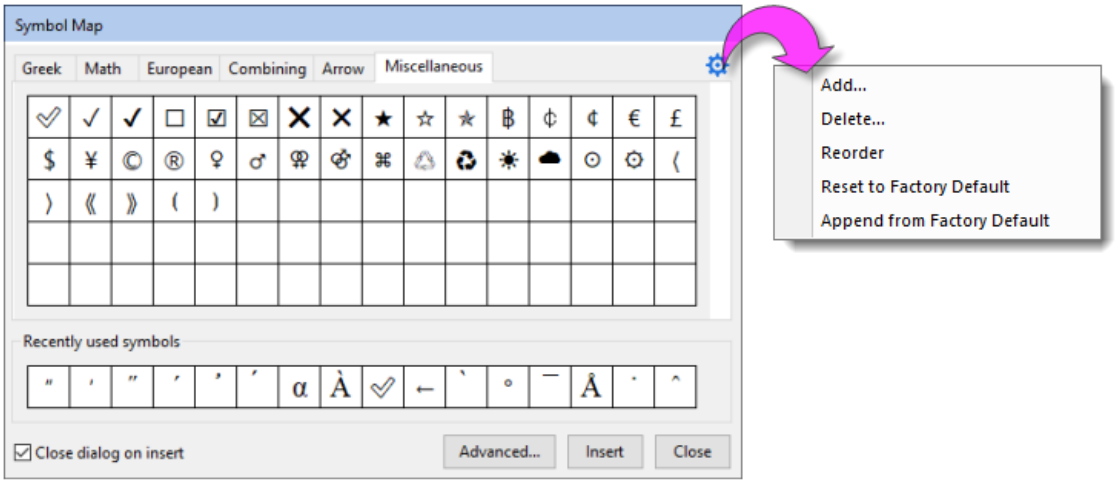
You can add text formatting (e.g. super-/subscripting) to non-consecutive characters via the text object's **Properties** dialog:

1. Right-click on the text object and choose **Properties**.
2. On the **Text** tab, press CTRL and in the text box, highlight multiple characters by dragging with your mouse.
3. Click the desired text formatting button above the text box and click **OK** to close.

11.9.1.1 Simple Symbol Map

The Simple Symbol Map is a "settings" menu to assist in managing symbols.

1. To insert a symbol, highlight the symbol and click **Insert**.
2. For help with **Advanced** or other dialog settings, see the **Origin Help** file.



From the "gear" icon...

- **Add**: Enter space-separated Unicode 4-character sequence. Symbols will be appended to the current tab.
- **Delete**: Enter space-separated Unicode 4-character sequence. Symbols will be removed from the current tab; or click **Select** to pick symbols to remove.
- **Reorder**: Drag to reorder, click **Done** to apply changes.
- **Reset to Factory Default**: Resets to default symbol set for current tab.

- **Append from Factory Default**: Restores previously-deleted default symbols to current tab (does not affect user symbols).

For more information, see the Origin Help file page **Adding Unicode and ANSI Characters in Text Labels**.

11.9.2 Grouping, Aligning and Arranging with the Object Edit Toolbar



You can group text labels and drawn objects so that they move or resize as a unit:

1. To select objects, press SHIFT + click; or drag out a box around objects using the **Pointer** tool.
2. To group the selected objects, click the **Group** button on the **Object Edit** toolbar.
3. To ungroup objects, click the **Ungroup** button on the **Object Edit** toolbar.

You can align multiple text labels and/or drawn objects with one another using the tools on the same **Object Edit** toolbar:

1. Select objects to be aligned by holding the SHIFT key while selecting (or drag out a selection box using the **Pointer** tool), then click one of the align objects buttons on the toolbar. Note that objects will be aligned with respect to the *first*-selected object.

You can bring overlapping objects to the front or send them to the back:

1. Select the objects that you want to move to the front or the back.
2. Click the **Front** button or the **Back** button on the **Object Edit** toolbar.

Note: For more information on graph annotations, see your Origin User Guide:

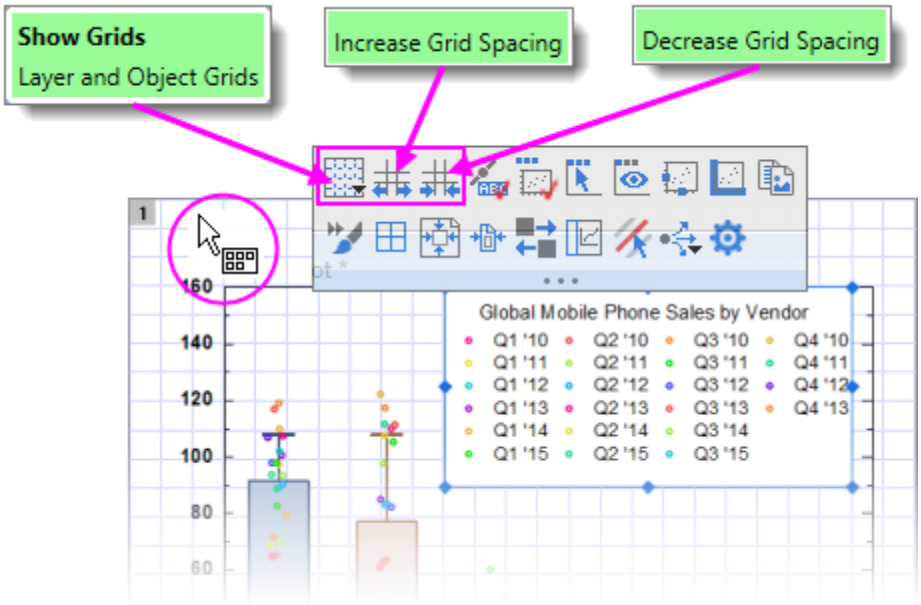
Help: Origin: Origin Help > Graphing > Adding Text and Drawing Objects

You can also use the **Object Edit Toolbar** to manipulate graph layers. Use buttons to align and set a uniform size for multiple graph layers or to swap layer order.

11.9.3 Using Page or Layer Grids to Place Objects

For manually placing objects -- graph layers, text objects, legends, etc. -- you can turn on a non-printing, non-exporting page or layer grid:

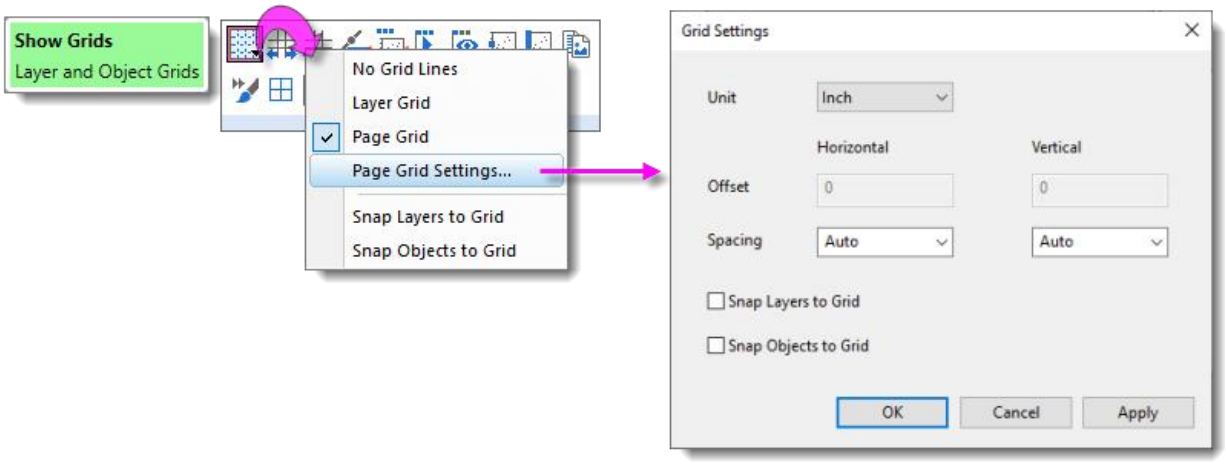
- With the graph active, choose **View: Show: Page Grid/Layer Grid** (displays only one at a time).
- Alternately, you can turn on grids by clicking near the page margin and clicking the Mini Toolbar **Show Grids** button. In addition, you'll find buttons for increasing or decreasing grid size by increments.



11.9.3.1 Control of the Grid

Grid display and related grid settings are found by clicking on the **Show Grids** button.

1. Click **Show Grids**, then click **Page Grid Settings**.



11.9.4Object Attachment and Scaling in Graphs

There are two settings that you should know something about, particularly if you subsequently modify axis scales or resize the graph layer after adding annotations: One is the object's **Attach to** method, the other is the layer's **Scale Elements** behavior.

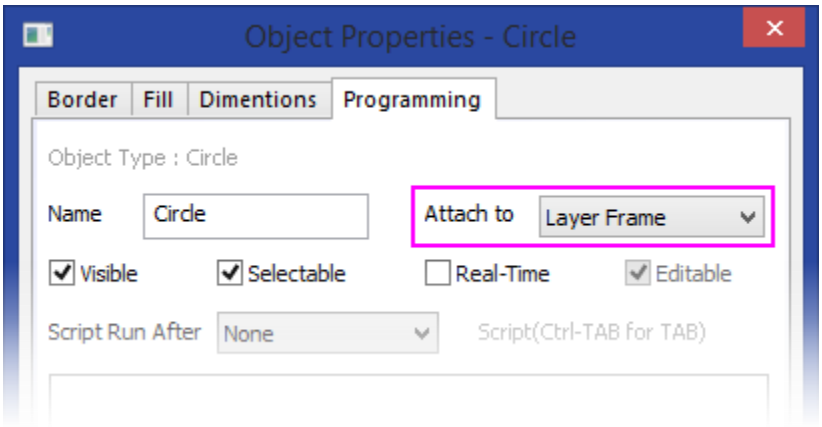
11.9.4.1 Object Attachment

When you add a text or drawing object to an Origin graph window, the object becomes part of the active graph layer. Thus, if you resize or delete that graph layer, you will resize or delete the added object.

In addition to being part of the graph layer that was active at the time of object creation, note also that objects are attached to the graph in one of three ways, depending upon the *type* of object and *where* it is created on the page.

To view the "Attach to" setting for any object:

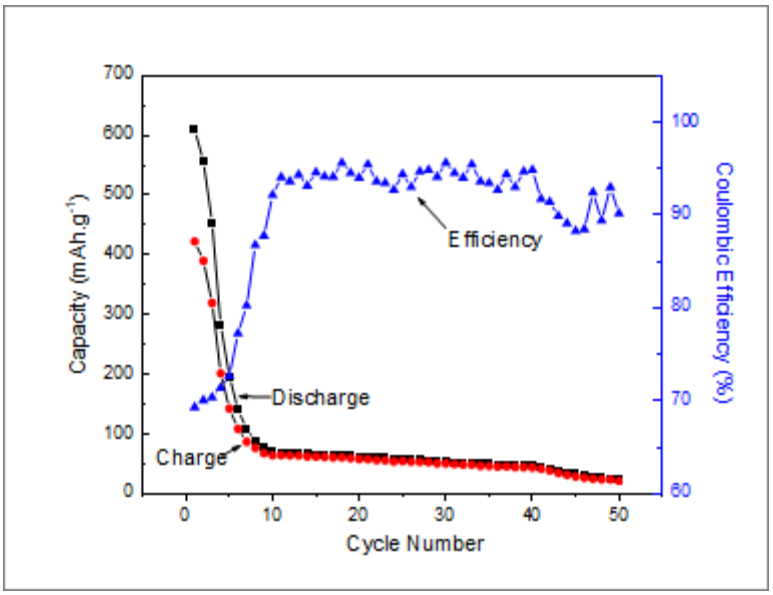
1. Right-click on a text or drawing object and choose **Properties...**.
2. Click on the Programming tab and note the object's **Attach to** setting.



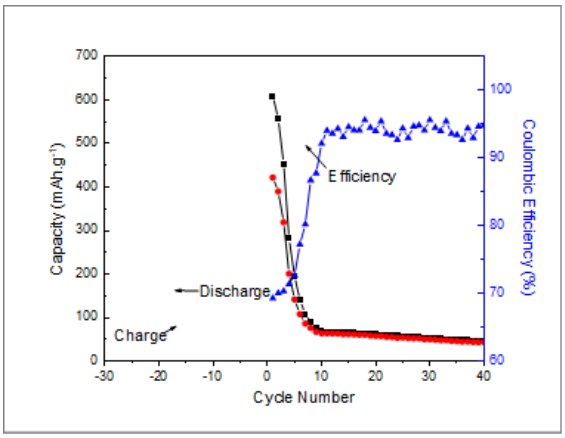
Though objects remain a part of the layer that was active at the time of their creation, you can manage some object behaviors by changing the object attachment method. An object is attached in one of three ways:

- **Page**. When attached to the page, objects are not affected by moving or resizing the graph layer, nor are they affected by a change in axis scales. These objects are still associated with a particular graph layer and they will be hidden or deleted if the layer is hidden or deleted.
- **Layer Frame**. Objects that are attached to the layer frame, are resized and moved with respect to the layer frame. However, they are not tied to axis scales and are not affected by changes in the layer's axis scale values. Objects are hidden or deleted if the associated layer is hidden or deleted.
- **Layer and Scales**. Objects are linked to a particular range of axis scale values. If you resize the layer, the object is resized accordingly. If you rescale the axes, the object moves in relation to the visible scale and will disappear from view if the linked axis scale range is not displayed. These objects are hidden or deleted if the associated layer is hidden or deleted.

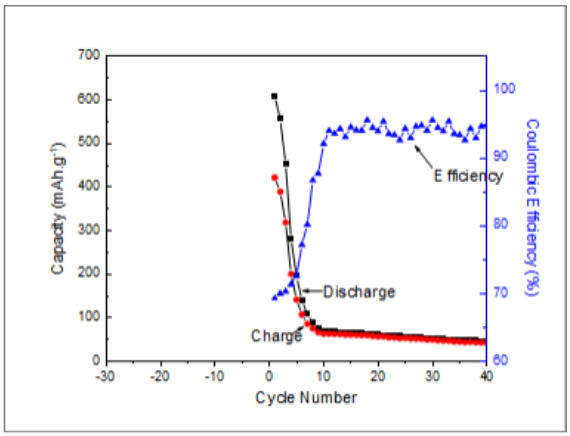
To briefly illustrate why object attachment is important, let's look at the following graph. After the graph was created, arrows and text objects that point to their respective data plots, were added to the graph. Both arrows and text objects are attached to the graph **Layer Frame**.



Now, consider what happens to these objects when we modify the graph's X axis scale (recall that objects attached to the Layer Frame "are unaffected by changes in the layer's axis scale values"). Note that by changing the axis scale display range, we have shifted the data plots but the text objects and arrows did not move with them.



Objects attached to Layer Frame

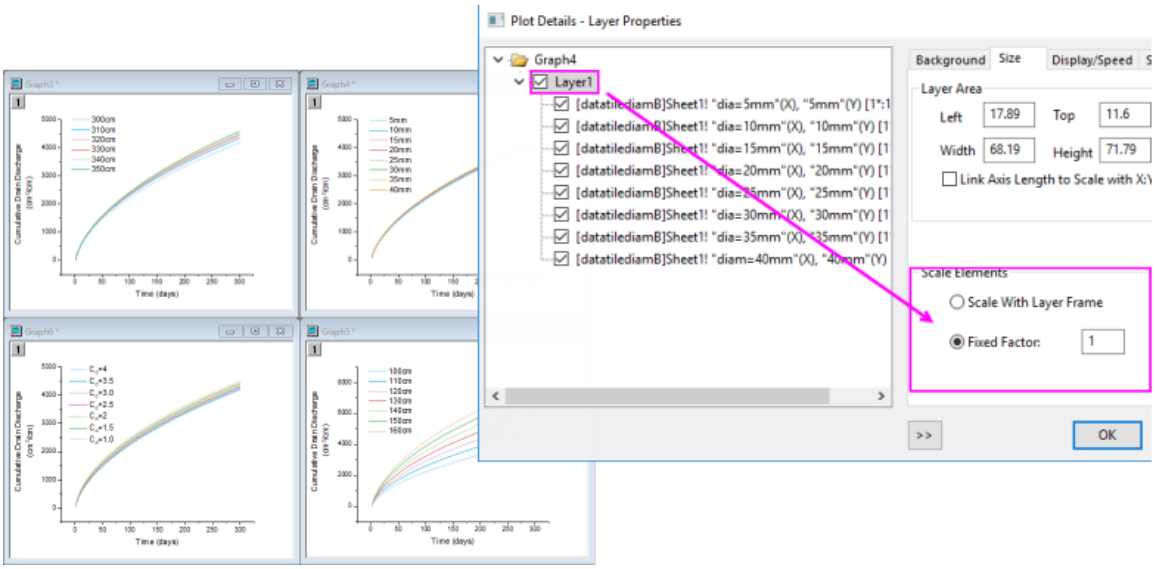


Objects attached to Layer and Scales

The remedy for this is to change the text and drawing objects' **Attach to** method to be Layer and Scales because "if you rescale the axes, the object moves in relation to the visible scale." Sometimes we may want an object to move with scale changes; at other times we may not. You can force either behavior if you keep in mind the **Attach to** setting.

11.9.4.2 Object Scaling

Object scaling often comes up when manually resizing the graph layer or when merging separate graphs into a single multi-panel graph (**Graph: Merge Graph Windows**). By default, added objects are set to **Scale with Layer Frame** -- that is, when the graph layer is resized, associated objects such as text objects, axis lines and ticks, and axis titles -- will be scaled proportionally. In the case where you merge four single layer graphs into a single, four layer multi-panel graph, these objects will be scaled down with the reduction in size of the layer frame.



However, this is another default behavior that you may want to change (e.g. you have set your font size to 10 pt. and you want to preserve that size), and you can do this using the **Scale Elements** control on the **Size** tab (Layer level) of Plot Details. If our goal is to keep objects at their current size when merging graphs, for instance, we can open the Plot Details dialog box and at the layer level (**Format: Layer...**), click on the **Size** tab, choose the **Fixed Factor** radio button and set the scaling factor to *1*.



If you have resized the graph layer, either by merging multiple graphs into a single graph or by manually resizing the layer, you will find that the font sizes do not display at their "correct" size (i.e. if you select a text object, the **Font Size** list on the Format toolbar shows the original font size). Further, if select a text object, the Status bar will report two font size numbers -- "size" and "actual". You can reset font size so that they are shown as actual size, not scaled size, by choosing **Graph: Fix Scale Factors**. For more information, see FAQ-441 How do I export graphs with exact size and resolution as specified by publishers?

11.10 Inserting Images to Graphs

There are two general approaches to adding images to graph windows:

- Insert the images as floating or background images.
- Insert images within a text object.

11.10.1 Floating or Background Images

- Images can be inserted to graphs from file or from **Image Windows**.
- Images can be inserted as floating images or as a layer background.
- Double-click on a graph image to open the image in an **Image Window**.
- Once opened in the Image Window, define a region-of-interest (**ROI**) and **Clip** the image (graph image clipped to ROI) or **Crop** the image (image is cropped in Image Window and graph).
- Use the Image Window to **Set** (image) **Scale** or **Set** (image) **Coordinates** of the inserted image.
- Images may be saved with the project or linked to an external file (**Link File**) to control project size.

Prior to Origin 2022b, images linked to an external file had to be manually reimported on project open. Now, linked images are automatically reimported, including modified source images. Disable or modify auto import with system variables **@LFAU** and **@LFC**.

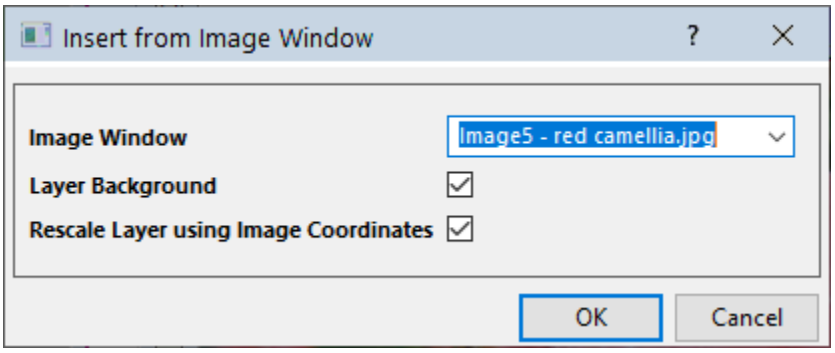
11.10.1.1 Inserting Image from File

You can insert an insert an image into graph page, with the option of inserting it as a background image that is linked to layer and scales.

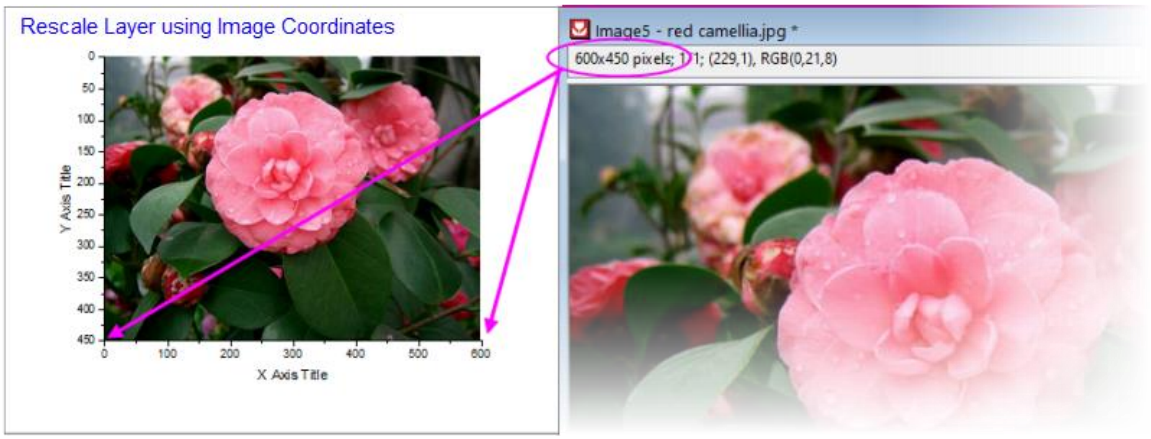
1. With the graph layer active, choose **Insert: Image from File**. The image is inserted as a floating image.
2. To convert the image to a background image, double-click to open it in an Image Window.
3. Right-click on the Image Window image and choose **Set as Layer Background**.
4. Click the **Close** button on the Image Window.

11.10.1.2 Inserting Image from Image Window

You can also insert images to graphs from an Image Window:



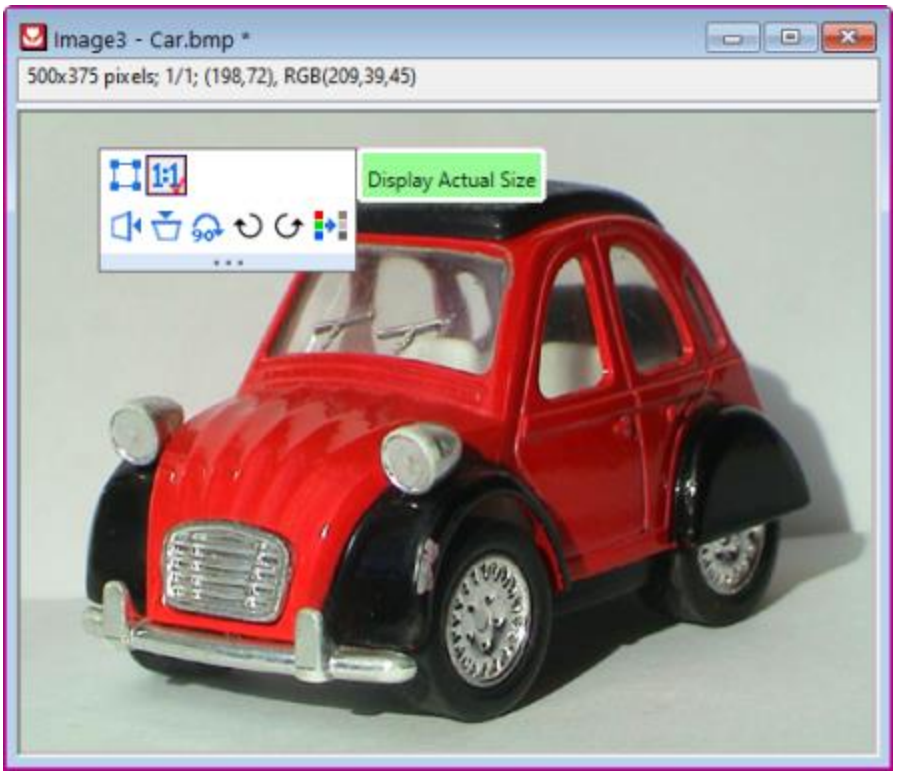
1. With the graph window active, choose **Insert: Image from Image Window**. The **Insert from Image Window** dialog opens.
2. Set the **Image Window** drop-down to the desired image.
3. Optionally, choose to insert the image as **Layer Background** and to **Rescale Layer using Image Coordinates** (**Layer Background** only).



11.10.1.3 Manipulating Images with the Image Window

11.10.1.3.1 Mini Toolbar

Clicking on an Image Window image produces a **Mini Toolbar** with buttons for simple image manipulations (flip, rotate, convert to gray scale, etc.).

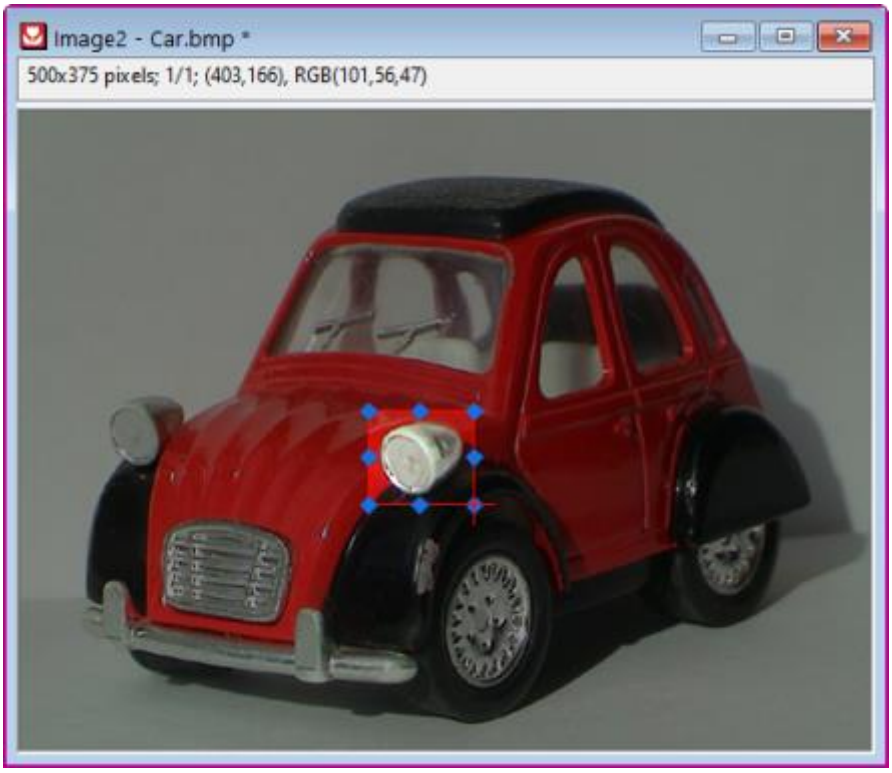


11.10.1.3.2 Region-of-Interest (ROI)

Placing an ROI object on the Image Window image allows you to perform certain image editing operations.

Add an ROI to the image by one of the following:

- Click the **Add ROI** button  on the Mini Toolbar.
- Right-click on the image and choose **Add ROI**.
- Click the **Rectangle Tool**  on the Tools toolbar.



Once added, the ROI can be resized (by dragging handles) or moved. Additionally, various operations can be performed on the ROI, including:

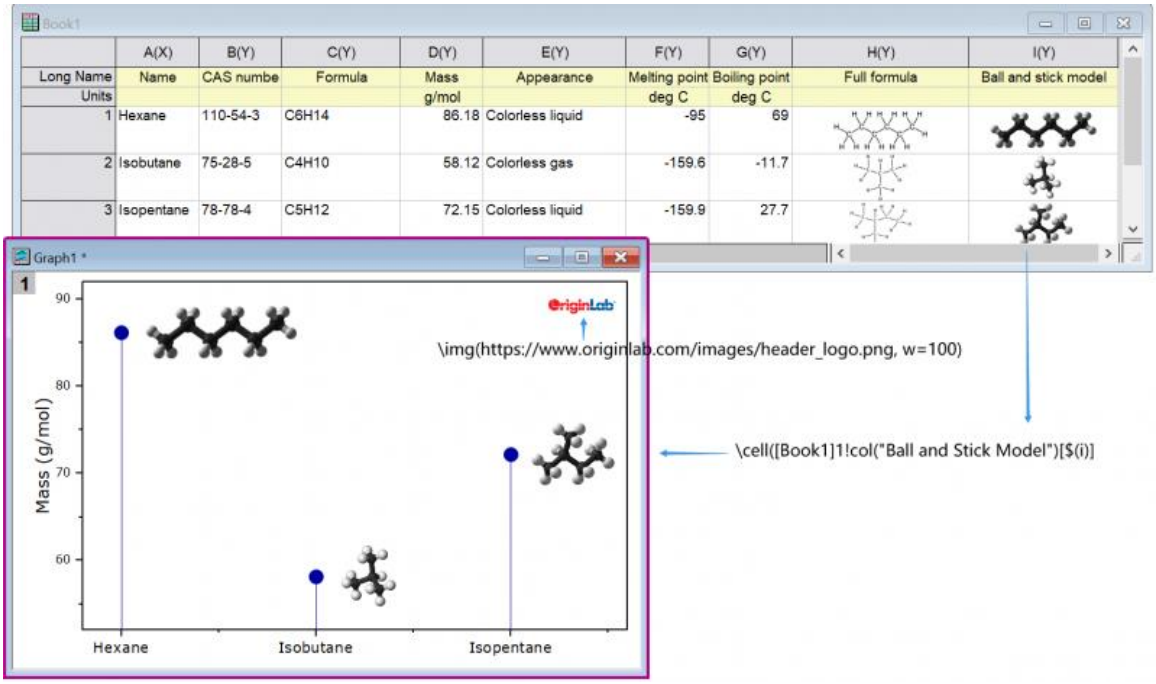
- **Clip** graph image to ROI, **Crop** image to ROI or **Copy** ROI as image to graph.
- **Copy Positions**/**Paste Positions** for copying ROI dimensions to a second ROI on another Image Window.
- **Export ROI** or **Import ROI** to save or apply previously-saved ROI dimensions.

For more information on the **Image Window**, see the Origin Help File.

11.10.2 Inserting Images into a Text Object

Images can also be inserted as part (or the entirety) of a text object. Source images can be from:

- **Local image file or Web image URL**
- **Worksheet cell**



11.10.2.1 Local Image or Web URL

When you insert an **Image from File** or **Image from Web** using the following methods, the image is *linked* and not stored in the Origin project file. This helps control project file size.

1. On the Tools toolbar, click the **Text** tool  and click once on the graph to enter "in-place" edit mode.
2. Enter text if needed and when ready to insert image, right-click and choose **Insert: Image from File** or **Image from Web**:
    - When inserting an image from file, browse to your local image file and click **Open**.
    - When inserting an image from Web, you'll need a URL (hint: locate your Web image, then right-click and copy the address (**Copy Image Address**, **Copy Image Link**, etc, depending upon browser).

To examine (or modify) the syntax used for inserting an image, you can select the inserted object and choose **Properties**. In the Text Object dialog, you should see something like these examples:

Examples:

```
\img(file://"C:/Program Files/OriginLab/Origin2023/Samples/Image Processing and Analysis/white camellia.jpg",w=200)

\img(https://www.originlab.com/images/header_logo.png, w=200)
```

... where option "w=" is the default width in pixels, of the inserted image. Width is user-modifiable by editing the "w=" value in Properties or -- if no width is specified -- by simply dragging the object's selection handles.

11.10.2.2 Worksheet Cell

You can also insert an image from a worksheet cell into a text object, but you'll need to make use of a special syntax. The syntax is not complicated and combines a `\cell( )` escape sequence with a cell reference -- either a range reference (e.g. *[Book1]Sheet1!col(C)[1]*) or a named range reference.

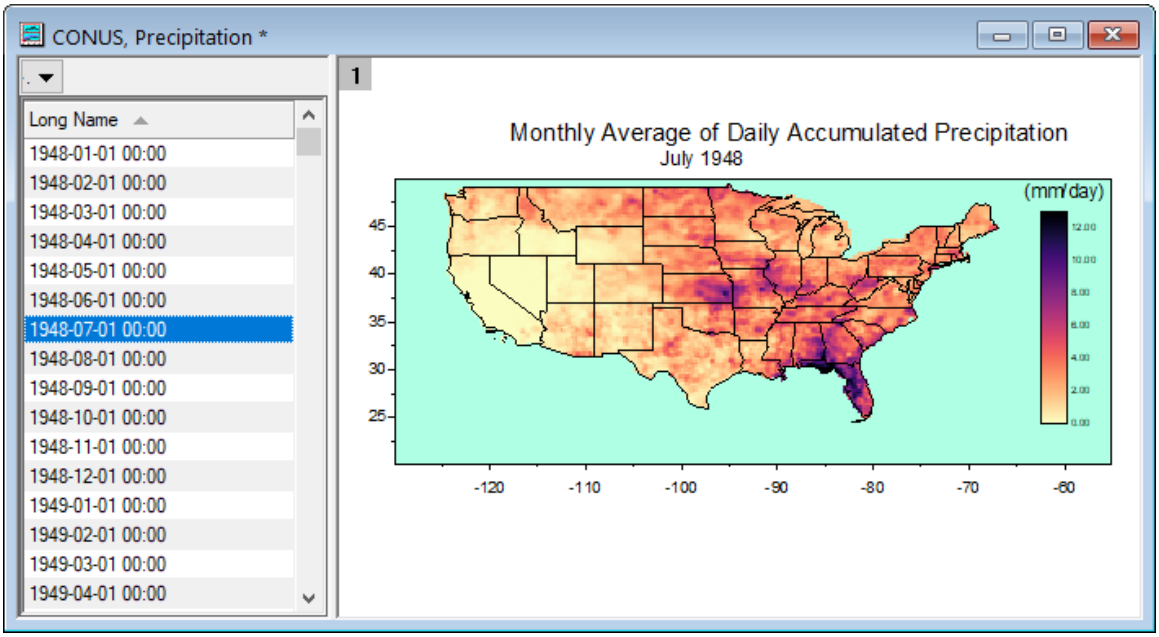
1. On the Tools toolbar, click the **Text** tool  and click once on the graph to enter "in-place" edit mode; or right-click and choose **Add Text** from the shortcut menu.
2. Enter your string into the text object using the examples below as a guide:
   - If you are copying and pasting a string (e.g. `\cell([Book1]Sheet1!B[1])`), click outside the text object to leave edit mode. Your cell image should display in the text object.
   - If you are typing directly into the text object in "in-place" mode, enter your syntax (e.g. `\cell([Book1]Sheet1!B[1])`) and when finished, right-click on the object, choose **Properties** and on the **Text** tab, remove one of the leading "\" characters from your cell reference (Origin automatically "protects" "\" characters entered into text objects which is why you'll need to remove one "\". See Escape Sequences).
   - If you are typing directly into the Text Object (**Properties**) dialog, enter your syntax (e.g. `\cell([Book1]Sheet1!B[1])`) directly to display the cell image.

Examples:

```
\cell([Book1]1!col(C)[2]) // Book1, Sheet1, col C, row2, size = current font height
\cell(alpha,200) // named range "alpha", width=200 logical pixels

\cell(alpha,h=300) // named range "alpha", height=300 logical pixels
```

11.11 Working with Map Data



You can overlay geopolitical boundaries on graphs or Image Plots of NetCDF data from the **Insert** menu.

- **Insert: World Map** will apply boundaries within the graphs current Lat and Lon ranges.
- Depending upon the graph's Lat and Lon ranges, other options may be available (e.g. Continental USA Map, Map of China, etc.).

11.11.1 Importing Shapefiles

You can also import locally-stored shapefiles using Origin's **Shapefile Connector**:

1. With a workbook active, choose **Data: Connect to File: Shapefile**.

11.11.2 Map-related Apps

There are at least two add-on Apps for inserting geographic data:

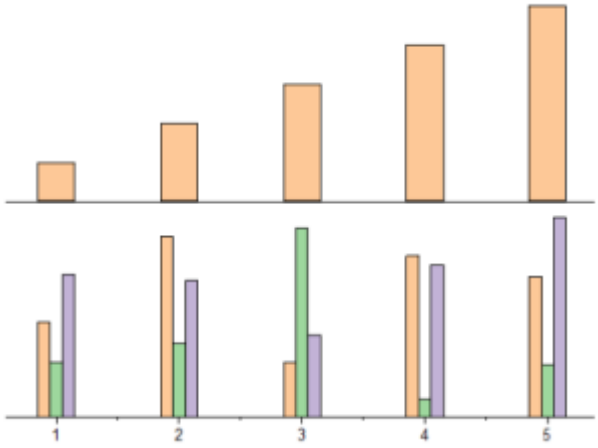
- OriginLab's free **Google Map Import** App lets you place a Google Map as background on the graph page using specified coordinates.
- **Maps Online** is another free OriginLab App that lets you connect to one of several map databases.

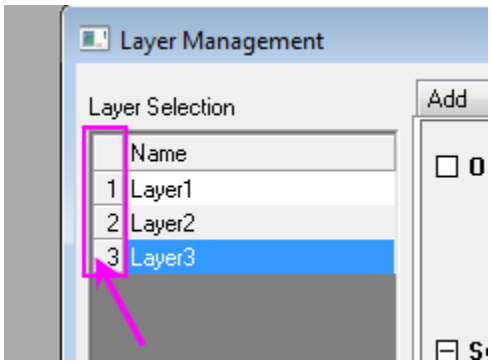
You can find and install these Apps by pressing **F10** and searching on *maps*. For information on App installation, see **Where Do I Find Apps?**

11.12 Arranging Graphs and Layers

Task	Method

Merge multiple graph windows into a single graph window.	• **Graph: Merge Graph Windows...** menu command *or* • **Merge Graph Windows** button  on the **Graph** toolbar.  Origin has two dialog boxes -- **Fitting Layers to Page** and **Fit Page to Layers** -- that are useful for arranging multiple graph panels on the page and for adjusting graph margins.
Extract data plots in one layer to multiple layers.	• **Extract to Layers** button  on the **Graph** toolbar. **Hint:** to preserve your original graph, click the **Duplicate** button  before extracting to layers.
Extract multiple layers in a single graph to multiple graph windows	• **Graph: Extract to Graphs** *or* • Click the **Extract to Graphs** button  on the **Graph** toolbar. All layers are extracted to individual graph windows, even if a layer is linked to another layer. By default, the layextract dialog box has **Extracted Layers** set to **1:0**, which specifies that all layers be extracted. To extract only certain layers, clear **Auto** and use the **layextract** X-Function's comma/colon notation to control which layers are extracted. The notation **1:0** means starting with layer 1, extract all layers to graphs (**0** denotes all). Specifying **1,3:4**, for example, tells Origin to extract only the first, third and the fourth layer. Note that you can enable **Keep Source Graph** to preserve the original graph.
Add, arrange, resize, position, swap, align, or link layers	• **Graph: Layer Management...** menu. • Position selected layers using **Object Edit** toolbar buttons. Hold SHIFT + click to select multiple layers and Align Left, Right, Top, Bottom, etc.  You can use the Layer Management tool's **Swap** control (**Graph: Layer Management**,**Size/Position** tab) to physically swap layer positions without reassigning layer numbers. Before doing so, set each linked layer's **Units** to **% of Page** (**Size/Speed** tab of Plot Details).

Simple arrangement of layers	• **Graph: Arrange Layers...** menu. • Row by column layer arrangement with control of page size and spacing between layers.
Link graph layers	• **Linked Axes Scales** tab, layer level of **Plot Details** dialog box. • **Link** tab of the **Layer Management** dialog box. When linking layers, the child layer must have a higher layer number than the parent layer. Linked layers can be moved and resized together. You can link layers' axis scale values to be **Straight (1:1)** or you can specify a **Custom** mathematical relationship. • For Column/Bar/Box chart, *each set* of linked layers can share the **Spacing** tab **Gap Between Bars (%)** setting of the **Link to** layer (requires that page-level **Layers** tab **Column/Bar/Box Gap Across Layers** be enabled). 
Reorder layers	There are several ways to reorder graph layers (reassign Layer number for each Layer). Learn more about reassigning layer numbers in the **mini tutorial** below this table. • **Method 1**: Open the **Layer Management** dialog and click the row header (shown in image below) and drag it up or down to change the Layer order.



For more information, see the Layer Management tool.

- **Method 2**: Enter the following LabTalk script in the **Command Window** (**Window:Command Window**), then press **Enter** to execute.

```
page.reorder(n,m)
```

The command changes the *n*th Layer to the *m*th Layer.

- **Method 3**: Use the **Front** and **Back** buttons on the **Object Edit** toolbar (these buttons work on the *active* layer as indicated by the graph layer icon 1 2). Alternately, right-click on the graph layer icon and change layer order using shortcut menu commands (e.g. **Bring to Front**).



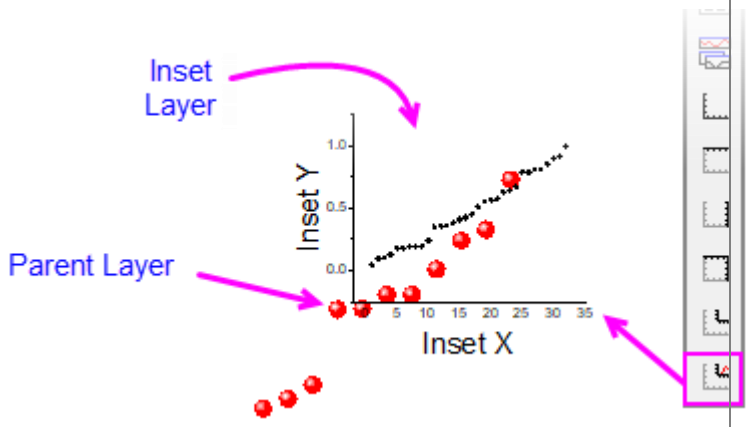
When two layers are linked by a common X axis (e.g. Double-Y graph), you can swap layer drawing order by right-clicking on the "front" layer in Object Manager and choosing **Push to Back**. This will not break layer linking.

Note: Reordering layers may break layer linking relationships.



A Note on Inset Graphs: In certain situations (see Tutorial, below), the order in which the layers are drawn on the screen becomes an issue. In this image, we have added an inset graph using the **Add Inset Graph with Data** button (**Graph** toolbar). The problem is that the data plot of the parent layer (red symbols) shows through the inset layer (small, black symbols). To fix this, we do two things:

- Set the inset layer background **Color** = *White* -- by default, it is *None* (**Format**: **Layer**, then **Background** tab).
- Set the layer **Drawing order** to **Draw layer by layer** (**Format: Page** then **Layers** tab).

<table>
<tr><td></td><td>

By default, an inset layer is added "on top of" the parent layer but if needed, you can click on the inset layer to select it, right-click and choose Bring to Front.</td></tr>
<tr><td>Exchange X-Y Axes</td><td>• Graph: Exchange X-Y Axes menu command
• Exchange Axes button on the Graph toolbar.</td></tr>
<tr><td>Move a plot(s) to another layer</td><td>• Method 1: Open Plot Setup dialog(by selecting Graph:Plot Setup), expand the bottom panel, select a plot and drag it from a layer to another layer.
• Method 2: Run <code>laymplot -d;</code> (e.g. open the Script Window, type the command and press <Enter>) to open the Move Plot dialog to specify plot(s) to move and a target layer.
• Method 3: Copy (CTRL+C or Copy Range context menu) a plot and pasting (CTRL+V or Paste context menu), between different layers or different graphs. Note: the pasted plot won't be associated with the source data of the copied plot, but exists as a loose dataset.</td></tr>
</table>

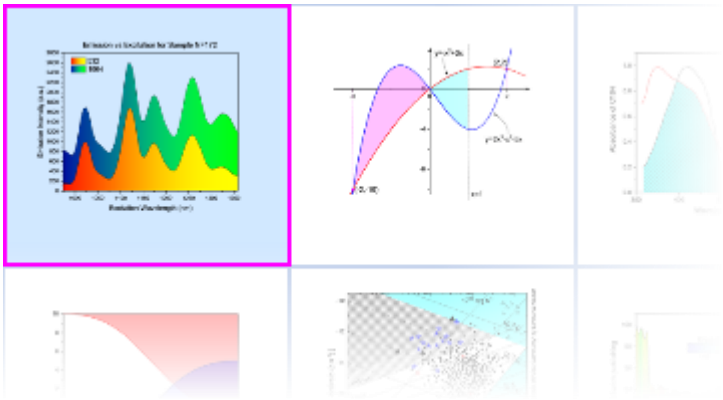


In a multi-layer graph, layer order determines drawing order. The 1st layer is plotted and then 2nd layer is plotted on top of it, and so on. The layer with higher number is drawn on top of the layer with lower number. This is important when plots in one layer overlay plots in another layer. When necessary, you can change layer order to change plot drawing order.

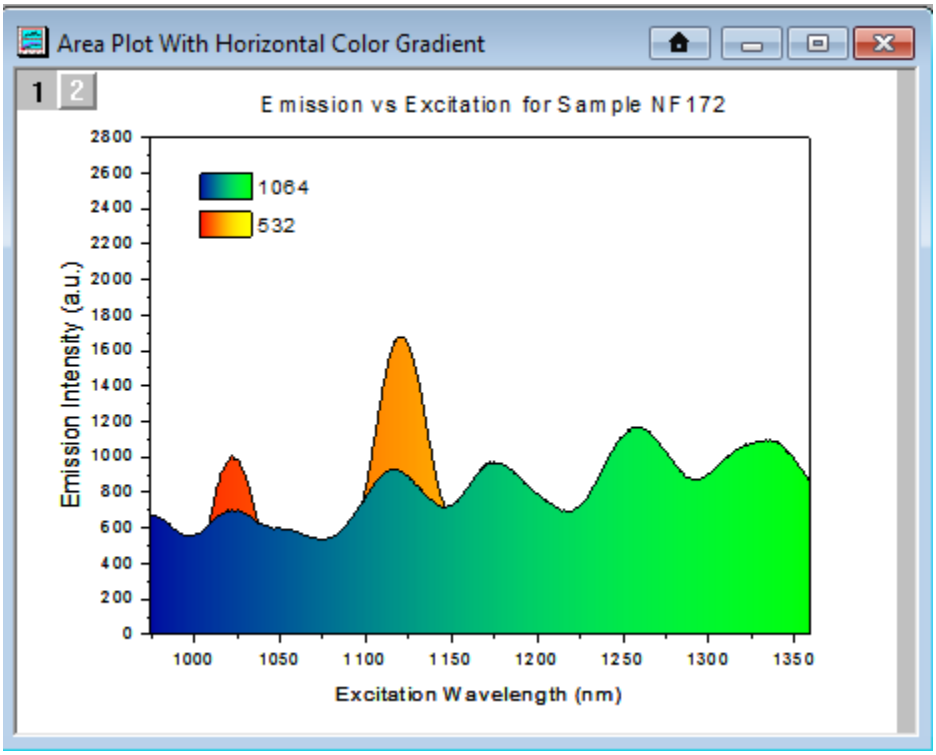
This mini tutorial shows you how layer reassignment works. Use the preview window to see how layer number reassignment affects your graph.

1. Click **Help: Origin Central** or press F11.

2. Click on the **Graph Sample** tab, set the **Samples in** drop-down list to **Area Plots** and double-click on this graph:

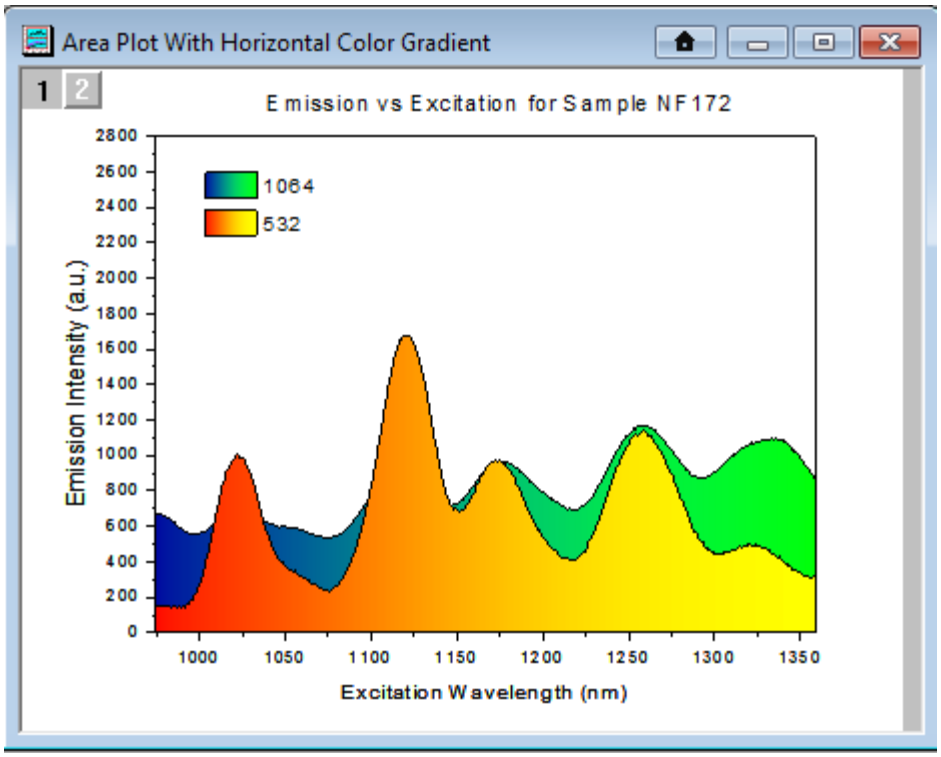


3. Activate the graph **Area Plot With Horizontal Color Gradient**, then click the **Extract to Layers** button  on the **Graph** toolbar. Set both number of rows and columns to 1, click OK, then, click OK again for the page spacing. The green layer is on the top of the yellow layer in the figure. The purpose of this last step was simply to create a two layer graph in which the data in one layer partially hides the data in the other layer. What we will do now is to reorder the layers and set the yellow layer on the top, giving you a better view of the two plots.



4. Choose **Graph: Layer Management...** menu, then drag the row header "1" of the Layer1 in the **Layer Selection** downward under the Layer2 (indicated by a blue line), and click **OK**.

5. You can see the yellow layer is on the top now.



Alternate Method: You can use the **Front**  or **Back**  toolbar buttons (located in the **Object Edit** toolbar, or at the top of **Layer Selection** box in the **Layer Management** dialog) to bring a layer forward or push it backwards. As happens when you rearrange layer order with the **Layer Management** dialog, this method swaps layer numbers.



You can easily add an inset layer with data by clicking the **Add Inset Graph With Data** button  on the **Graph** toolbar or **Insert: New Layer(Axes): Inset With Data (Linked Dimension)** .



You can copy a layer from one graph window to another graph window. Click to select the layer first (a frame shows around the layer). Then press Ctrl+C or right-click and choose **Copy**. Click on the target graph window, then right-click to **Paste**.

Note: For more information on merging graphs, see your Origin User Guide:

Help: Origin: Tutorials > Graphing > Layers > Merging and Arranging Graph Layers

Help: Origin : Origin Help > Graphing > Reference > The Merge Graph Dialog Box

11.13 Templates and Themes

Origin's flexible **Page** > **Layer** > **Plot** hierarchy, plus an extensive list of editable object properties makes it easy to customize and save your graph settings for repeat use. You can preserve your custom settings in a couple of ways -- either with templates or with Themes. These concepts are introduced below.

Note: For detailed information please refer to Origin Help file, see:

Help: Origin: Origin Help > Graphing > Creating Graphs from Graph Templates

Help: Origin: Origin Help > Customizing Your Graph > Graph Formats and Themes

11.13.1 Templates

A new Origin installation lists close to 240 plot types, each one backed by an Origin graph template file (*.otp or *.otpu). For most users, a **Plot** menu graph is the starting point for customizing and saving your own custom graph templates. The basic process goes like this:

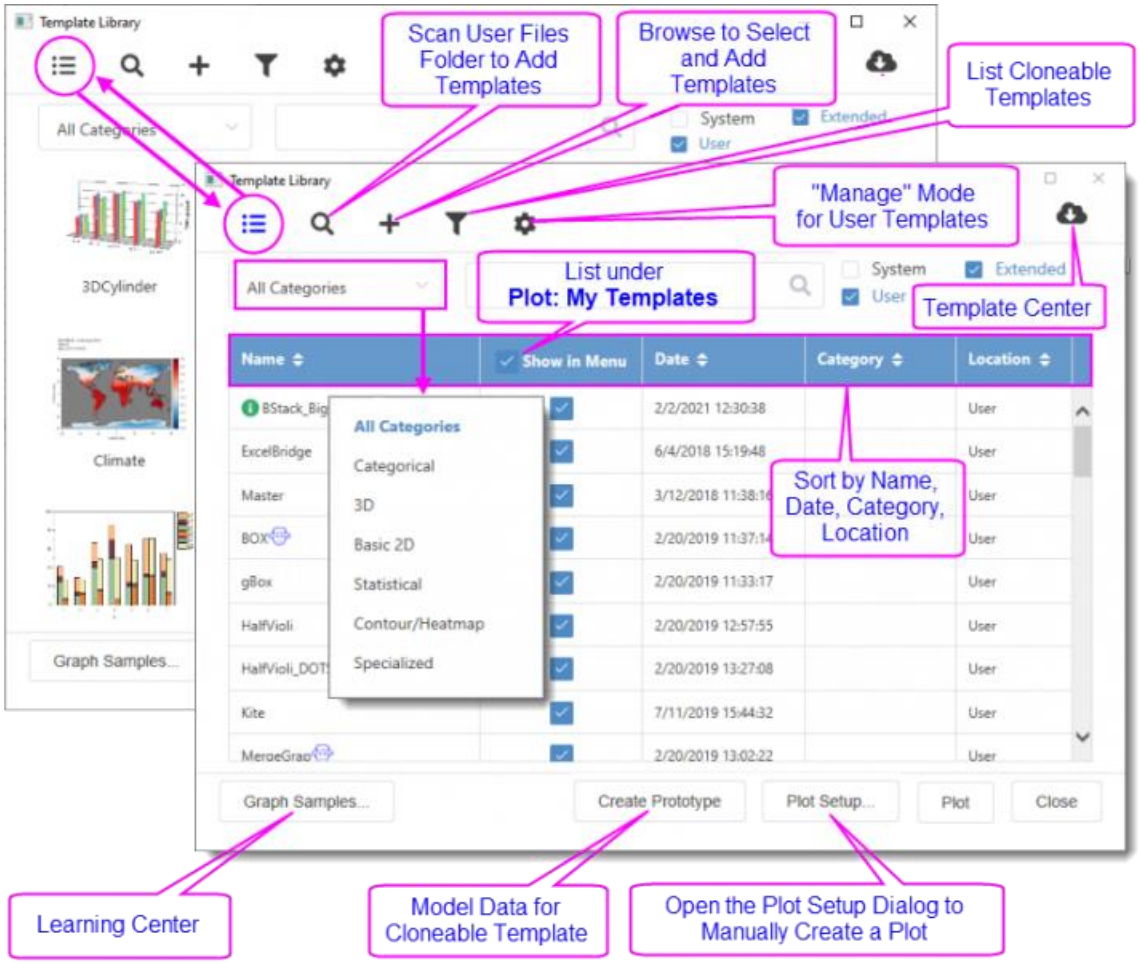
1. Plot your worksheet or matrixsheet data using the **Plot** menu (or equivalent graphing toolbar button).
2. Customize the graph's default settings.
3. Save the graph as a graph template file (*otp or *.otpu) by choosing **File: Save Template As** and filling in the requisite information. By default, custom templates are saved to your **User Files Folder** (hint: easily find this folder by clicking **Help: Open Folder: User Files Folder**).

A few things to note:

- The **Plot** menu is the definitive list of built-in plot types. At one time, a graphing toolbar button was created for each new plot type but in recent versions, few toolbar buttons have been added as toolbar space has become limited.
- In a fresh Origin installation, each one of Origin's 240 built-in graph types uses a specific "system" template when creating a particular graph type. When you click on a **Plot** menu graph or graphing toolbar button (e.g. **Area** ), one of these system templates is used to plot the selected data.
- System templates are installed to the Origin Program Folder. They are completely customizable but as the Program folder is write-protected, you cannot overwrite the original system template file (*see next*).
- Instead, when you customize and save a system template, it is saved *by default* to your User Files Folder (UFF). If you save the customized template to the same system template name, the customized template replaces the system template as the template associated with the **Plot** menu command or corresponding toolbar button used to create that plot type. Additionally, the customized template is added to the user's **Template Library**.
- To view your custom graph templates, click **Plot** (workbook or matrix should be active) and click *Category* = **MyTemplates**.
- You can save a graph template anywhere (and with any name) that you like -- it does not need to be saved to your UFF. However, by saving customized templates to your UFF, they will be collected in one, easily-remembered place and they will be readily available when you upgrade your Origin software (since Origin 2018, all Origin versions have shared a common User Files Folder).

- For an overview of graph templates, see Graph Template Basics.
- For information on the Template Library, see The Graph Template Library.
- For information on "cloneable" templates, see Cloneable Templates.

11.13.1.1 The Template Library



Summary of Features:

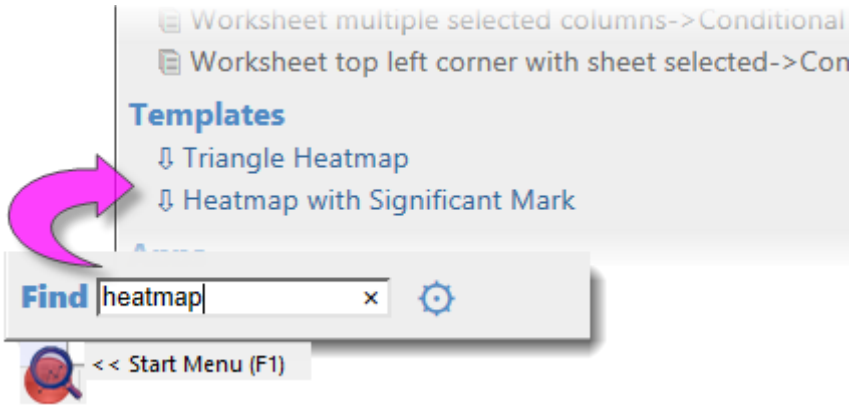
- Toggle between list and thumbnail view modes. Thumbnails images are automatically generated when you save a template.
- In either mode, you can hover on the template to preview, read template location, comments, etc.
- In list mode you can sort; or opt to list a **User** or **Extended** template under **Plot: My Templates**.
- Templates are listed as **System**, **Extended** or **User**. System templates are Origin's default templates for creating **Plot** menu graphs. They can be plotted to and customized but cannot be overwritten. **Extended** templates are add-on templates that are installed with Origin. **User** templates are those that you specifically customize then save using **File: Save Template As**; or which you add using the Library's **Add**

or **Scan** functions. Note that **User** templates can include customized **System** templates that you have saved to \User Files.

- To scan your User Files folder (UFF) for custom templates, click the **Scan User Template** icon. To browse and add a template file to the Library, click the **Add Template** icon.
- Click the **List Cloneable Templates** icon to show only cloneable templates.
- Click the **Manage Mode** icon to delete, show or hide a given template. Hiding a template removes it from My Templates but does not remove it from the Template Library (note that you can also remove a template from My Templates simply by clearing **Show in Menu**). Deleting a template removes it from the Library and moves the template to *User Files\DeletedTemplates*.
- Click the **Template Center** icon to open a dialog and search the OriginLab site for additional graph templates.



You can search for **Template Center** templates and install them directly from the **Start** menu.



11.13.2 Themes and Copy/Paste Format

An Origin Theme is a file containing a set of object properties. There are four kinds of Theme files in Origin: **graph** Themes, **worksheet** Themes, **dialog** Themes and **function plot** Themes.

Graph Themes are a collection of properties of different elements in a graph window. A graph Theme can be very simple (e.g. graph axis major and minor tick direction settings) or it could be something more complex (e.g. a combination of page dimensions, layer background, axis scales, and color palettes). Whether simple or complex, the purpose of graph Themes is to allow you to quickly change one or more object properties in an existing graph, or to apply a consistent set of properties to a selection of graph windows, without having to recreate a suite of settings, or to apply those settings one-by-one to individual graph windows.

All graph objects have a customizable set of properties that are specific to the object type. Therefore, it follows that the properties that can be saved as a Theme differ depending upon the selected object. You can (1) copy a Theme from one object and "paste" it to another object of the same type or (2) you can save a Theme from one object as a named Theme and apply that named Theme to other like objects at a later time.

1. Right-click on an object in a graph window (e.g. a plot) and choose **Copy Format**. Depending on what you click on, there may be sub-menu items under the **Copy Format** shortcut menu, which give you the option as to what exact format to copy.

- To apply the copied formats to a single object, right-click on your target graph and choose **Paste Format To**. Again, this shortcut menu might has some sub-items that limit what to paste. In this way, the formatting option(s) from your source object should be applied to your target object.
- To apply the copied formats to multiple windows in the project, keep the source graph window active and select **Edit:Paste Format(Advanced)...** from the Origin menu. This opens the **Apply Formats** dialog box. Here you have the option of editing or selectively applying formats to one or more graph windows in the Origin Project.

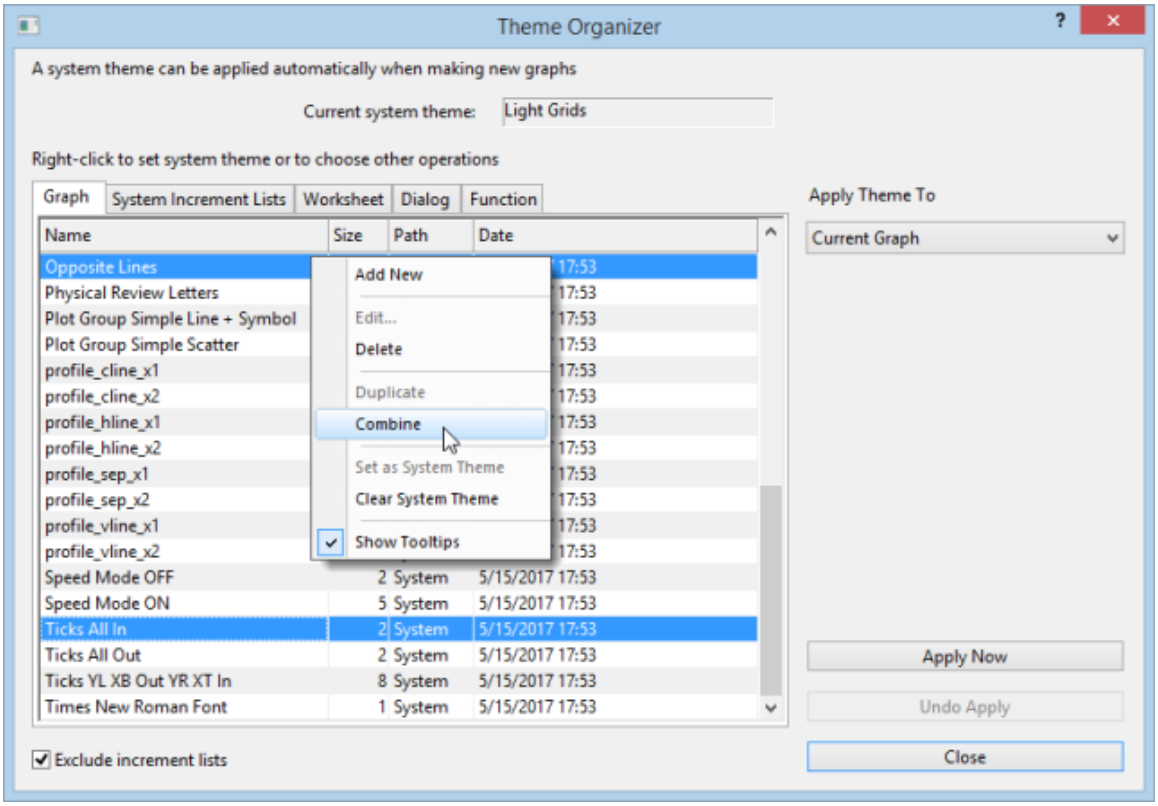
2. If you would prefer to save formats to a named Theme file that you can re-apply at a later time, choose the **Save Format As a Theme...** shortcut menu item, then use **Preferences: Theme Organizer** to apply the Theme when needed.

11.13.2.1 Theme Organizer

Use the **Theme Organizer** (**Preferences: Theme Organizer**) to organize and apply Themes to graphs. With this dialog box you can apply a graph Theme simultaneously to multiple graphs in the Origin project file.

To combine multiple Themes in the Theme Organizer dialog box:

1. Press the **CTRL** key while selecting multiple Themes, then right-click and choose **Combine** from the shortcut menu. The shortcut menu in the tool provides an option for editing a Theme, allowing the user to add/delete properties from an existing Theme.



- The Theme Organizer has separate tabs for managing graph, increment list, worksheet, dialog boxes and plotted mathematical function Themes.

- If you right-click on a graph Theme and save it as your System Theme, then each time you plot a new graph, this System Theme will be applied regardless of the settings that were saved with the graph template†.
- Use the **System Increment Lists** tab to manage increment lists and selectively apply them to project graphs.
- You can load a graph Theme in the **Export Graph** dialog and the Theme will be applied to the exported image file.

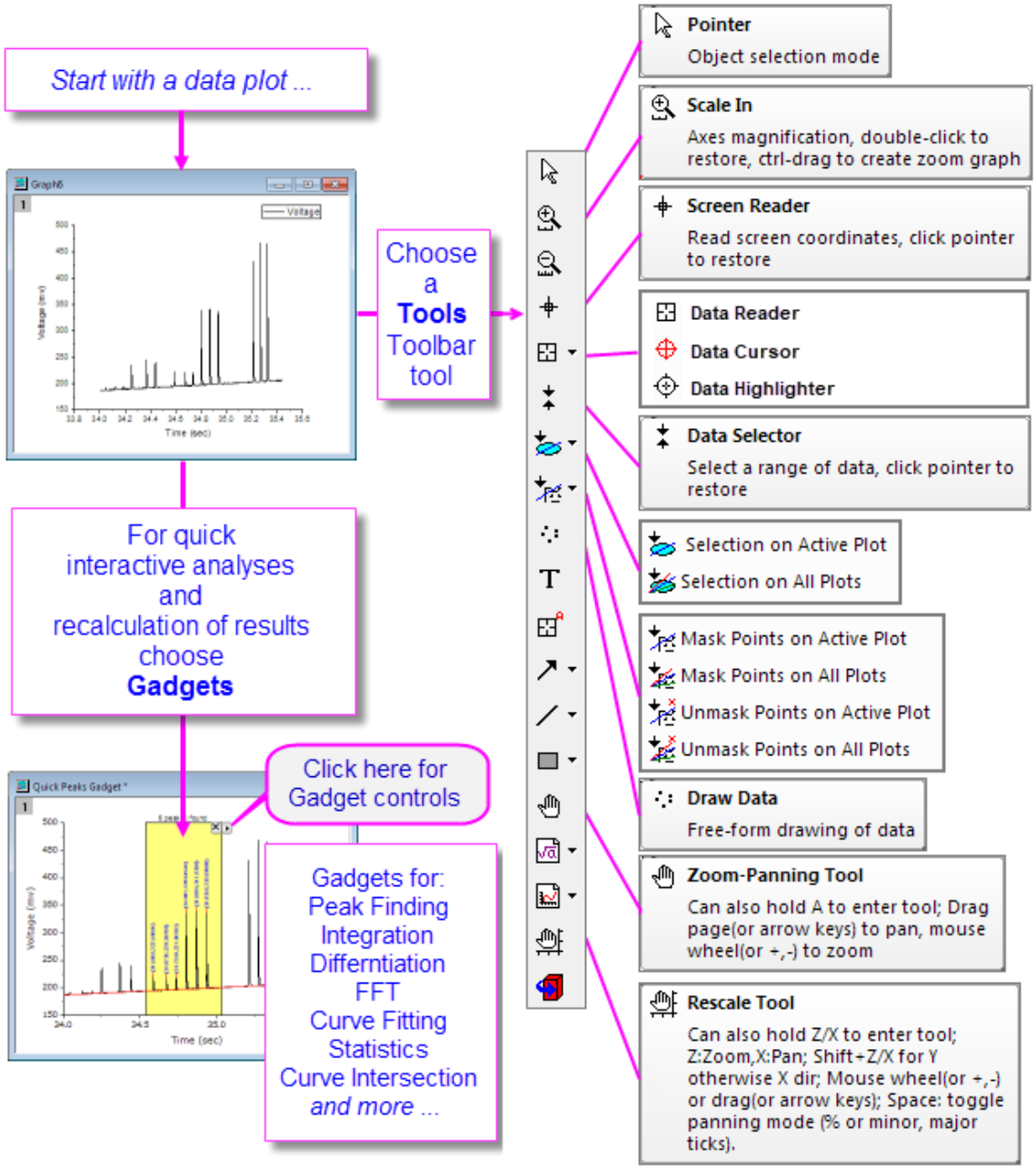


† If you don't *want* a System Theme to be applied automatically to the graph, save the graph as a template (**File: Save Template As**) and clear the **Apply System Theme to Override** check box.

11.14 Topics for Further Reading

- Plot Details: Customizing Graph Page Elements
- Plot Details: Customizing Graph Layer Elements
- Plot Details: Customizing Plot Elements
- The Preferences: Options: Axis tab Settings
- The Preferences: Options: Graph tab Settings
- Graph Axes
- Controlling the Graph Axis Display Range
- Graph Legends
- Color Scales
- Customizing Data Plot Colors
- Using a Dataset to Control Plot Color
- Using a Dataset to Control Plot Attributes
- Labeling Data Points
- Adding Text and Drawing Objects
- Adding Unicode and ANSI Characters in Text Labels
- Linking Text Labels to Data and Variables
- Associating Script with an Object
- Hiding Labels, Data and Layers
- Working with Maps
- Graph Template Basics
- Graph Template Library
- System Templates
- System Themes

12 Graphical Exploration of Data

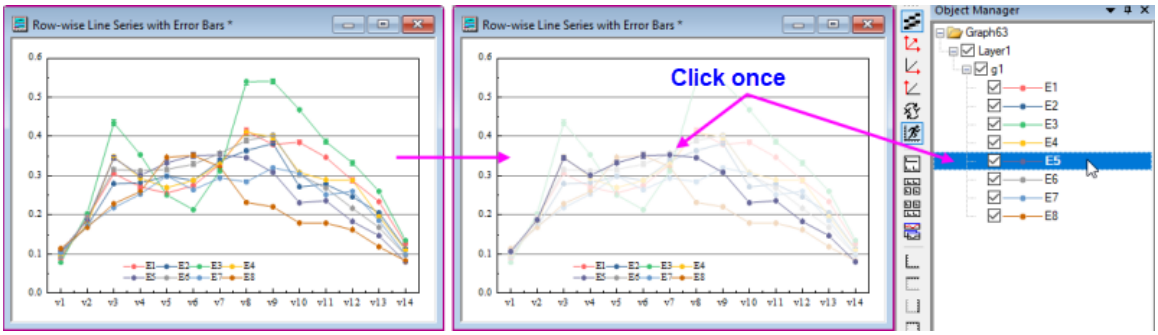


Origin includes a number of tools for graphically exploring your data including those for zooming and panning data plots, reading XY coordinate values and other data point metadata, or highlighting or masking selected data points.

With Origin 2016, OriginLab began releasing add-on tools called **Apps**. Many exploratory and analysis-related tools have been added to OriginLab's **File Exchange** since that time. If you find you need some exploratory or analysis tool that is not a standard part of Origin, you might check to see if the tool exists as an App. If it does not, request it!.

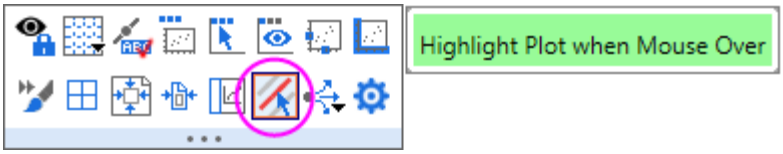
12.1 Plot Highlighting

While plot highlighting can be used to select a subset of data for more in-depth analysis, at a basic level it is useful for quick visual comparisons.



To engage plot highlighting:

- Click on one plot in the graph layer. Other plots in the layer and in linked layers sharing the same X axis, will be dimmed.
- Click on the plot in the **Object Manager**.
- To highlight/dim plots on *hover* (without clicking), click the **Highlight Plot when Mouse Over** Mini Toolbar button (page-level).

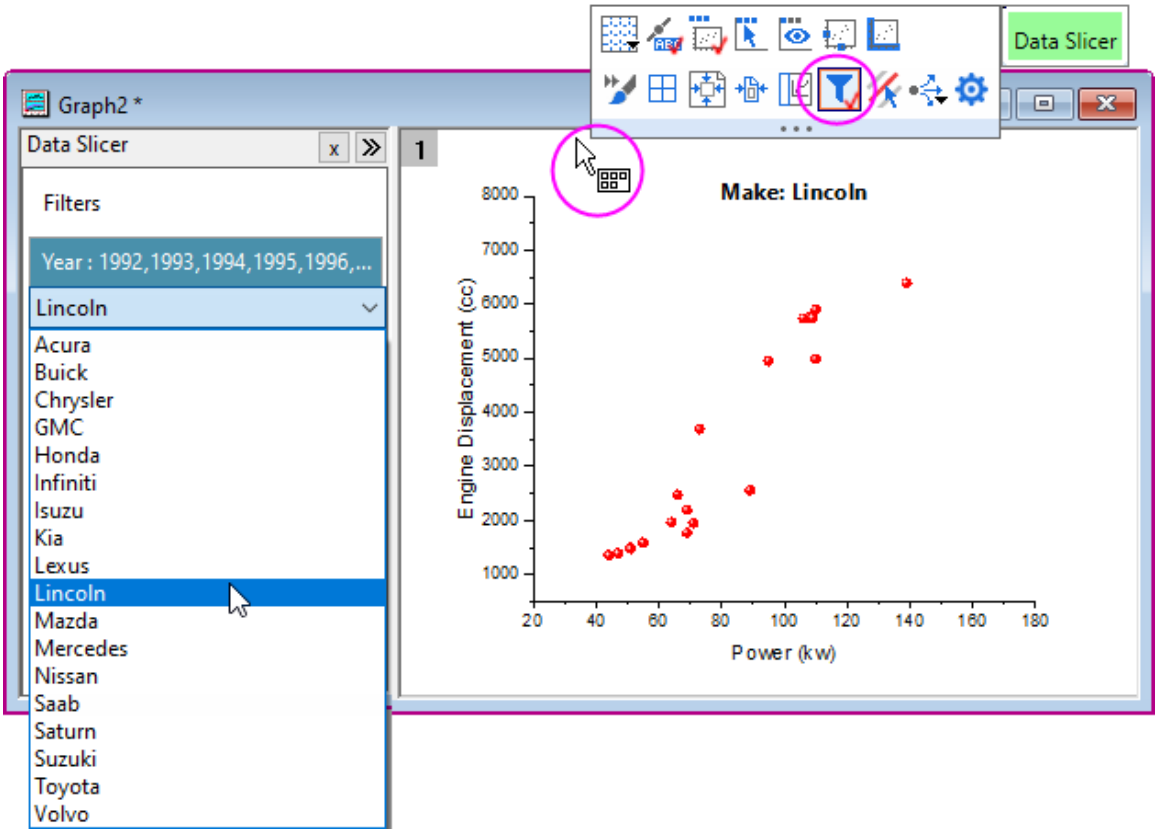


Other Origin features useful for quick visual inspection of data plots:

- If you have many columns of Y data, plotting a **Browser Graph**, or adding a Browser panel to an existing 2D line plot, can be useful for quick visual inspection. Clicking the menu on the Browser panel, you can plot every *N*th column or **Flip Through** plots using a specified **Move By** factor.
- For scatter data, use the customizable **Data Point Tooltip** to read coordinate values and column metadata on mouseover.
- You can also use **Tools** toolbar buttons to zoom or pan your graph, as you will see in the next section.
- Origin has various other tools available for visually inspecting and recording information on your data plots and those are covered in the remaining subsections of this chapter.

12.2 Data Slicer

If you are plotting worksheet data where a data filter has been applied, you can enable a **Data Slicer** panel, make quick changes to filter conditions and see the effect on your plot. The tool is intended for plotting and comparing single categories.



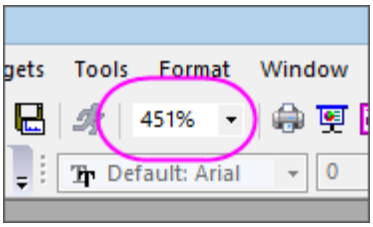
1. Apply one or more filters to your worksheet data and create your plot.
2. Hover just inside the graph window but outside the layer and when you see the Mini Toolbar cursor, click and look for the **Data Slicer** button.
3. Once the Data Slicer panel is enabled, you will want to right-click on the title bar of both the worksheet and the graph and **Duplicate** the two windows. Duplicating the two will allow you to make side-by-side comparisons.
4. In the left panel of the duplicated graph, click on the listed filter(s) and choose another category from the drop-down list.

12.3 Zooming, Panning and Rescaling

This section discusses the use of toolbar tools, and keyboard and menu commands that change the view of your 2D graph. We have split these tools and commands into two groups:

- Page-level zoom and pan operations that do *not* change axis scales.
- Axis rescale operations which zoom and pan the graph by changing axis **From** and **To** values.

Page level zoom and pan do not alter the graph; they only determine which portion of the graph page is visible within the graph window. You can read the current zoom level in the **Zoom** dropdown list of the **Standard** toolbar. Page-level zoom and pan will not affect the printout or export of the graph. On the other hand, axis rescaling tools (e.g. and) *do* alter the graph and, thus, will affect the printout and export of the graph.



12.3.1 Page-level Zoom and Pan

Action	Button	Shortcut Key	Menu	Notes
Zoom-Panning: Zoom and pan the graph page.		**A** + **+/-** keys (zoom) or arrow keys (pan)		Click the toolbar button; or with the **Pointer** tool active, place the cursor on the graph page and press "A", then ... • Use +/- keys or mouse wheel to zoom in or out. • Use the arrow keys to pan horizontally or vertically.
Stepped Zoom-Pan†: Zoom graph in or out, by increment.		**CTRL + I** **CTRL + M**	**View:Zoom In** and **View:Zoom Out**	• Stepped zoom. • CTRL+I activates zoom in; click on the graph to establish the focal point. • CTRL+M zooms out; clicking on graph not needed.
Whole Page: Show the whole graph page.		**CTRL + W**	**View: Whole**	• Reset the view of the page after using the

			Page	Zoom-Panning tools, above.
Zoom All: All objects in the window are shown.	--	--	**View: Zoom All**	• Can be used to locate "lost" objects lying outside the graph page.

†**Notes:**These are older tools and methods that have been deprecated. Toolbar buttons are not shown by default. To add them to the workspace, use the Customize Toolbars dialog box (**View: Toolbars** > **Graph** button group).

12.3.2Axis Rescaling

Action	Button	Shortcut Key	Menu	Notes
Rescale: Rescale and pan the graph in both X and Y dimensions.		**Z** + right mouse button and drag vertically(scale in Y)/horizontally(scale in X)	--	• Scroll mouse wheel to rescale X. • SHIFT + scroll to rescale Y. • Drag with the left mouse button to pan (will rescale both X and Y). • Select the **Pointer** tool to exit Rescale mode.
Rescale the graph in the X dimension.	--	**Z** + scroll wheel *or* **Z** + **+/-** keys	--	• Rescale the graph in the X dimension without limits.
Pan the graph in the X dimension.	--	**X** + scroll wheel *or* **X** + **+/-** keys	--	• Rescales X. • Does not rescale Y.
Rescale X: Rescale the graph in the X dimension.		--	--	• Rescales (Resets) X to full X range + some padding factor.

Rescale the graph in the Y dimension.	--	SHIFT + **Z** + scroll wheel *or* SHIFT + **Z** + **+/-** keys	--	• Rescale the graph in the Y dimension without limits.
Pan the graph in the Y dimension.	--	SHIFT + **X** + scroll wheel *or* SHIFT + **X** + **+/-** keys	--	• Rescales Y. • Does not rescale X.
Rescale Y: Rescale the graph in the Y dimension.		--	--	• Rescales (Resets) Y to full Y range + some padding factor.
Rescale XY: Rescale the graph in both X and Y dimensions.		--	--	• Rescales (Resets) X and Y to full range + some padding factor.
Rescale Z: Rescale the graph in the Z dimension.		--	--	• Rescales (Resets) Z to full range + some padding factor.
Scale In/Scale Out: Rescale the graph in X and Y dimensions.	 and 	--	--	• Select **Scale In** button, then drag out rectangle(s) to define axis scale range desired. • Reset by clicking on the **Scale Out** button (no need to drag) several times. • Rescales both X and Y. • Press ESC (or select another tool) to quit magnifying mode. • With a graph active, press Ctrl then click

				the **Scale In** button  and drag out a rectangle on a 2D graph to copy an enlarged portion to a new window. Note that this **Enlarged** graph is dynamic. Move or resize the rectangle on the original graph and the **Enlarged** graph is updated. This will also work on any graph that has multiple linked layers as long as the layers are overlapped and share a common axis (**% of Linked Layer** has **Left/Top** set to *0* and **Width/Height** set to *100*, plus **Straight (1 to 1)** linking to the parent layer).
Rescale: Rescale the graph in the all dimensions.		CTRL + R	**Graph: Rescale to Show All**	• Rescales (Resets) all axes to display all data in the layer (+ some padding factor).
3D Graphs				
Rescale in the X dimension.	--	Z + scroll wheel	--	If the plot extends beyond the 3D frame, go to Plot Details > **Miscellaneous** tab (layer level) and set controls under **Clipping**.
Rescale in the Y dimension.	--	SHIFT + Z + scroll wheel	--	

Rescale in the Z dimension.	--	D + scroll wheel	--	



- If you do not see a toolbar button, it may be turned off. To add or remove buttons from a toolbar, see The Customize Toolbar Dialog Box.
- To prevent an axis from rescaling when using one of the axis rescaling tools, set **Rescale** = **Fixed**. If *both* X and Y axes are set to **Fixed** and you pick one of these axis rescaling tools, you are reminded that X and Y axes are in "Manual Rescale mode" and are prompted to proceed. Answering *Yes* will allow you to override and manually rescale in one or both dimensions. If you need to block such manual overrides of **Fixed** axis scales, set **@nrm = 1**.

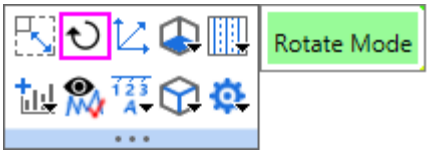
12.4 Rotation of 3D openGL Graphs



This **openGL** toolbar that previously displayed when a 3D layer was selected, has been replaced by layer-level Mini Toolbar buttons.



When you click inside the layer of a 3D graph, the layer is selected and a Mini Toolbar appears. Click the **Rotate Mode** button to enter rotation mode; then use one of the hotkey/mouse combinations listed below; or drag the radial rotation handles in the graph with your mouse.

Hot Key	Menu/Action	Context
Rotate 3D graphs with the 3D floating buttons		
X + Arrow key	Rotate the 3D graph around the X axis.	With graph layer active and with **Rotate Mode** button selected in the 3D floating button group. 
Y + Arrow key	Rotate the 3D graph around the Y axis.	
Z + Arrow key	Rotate the 3D graph around the Z axis.	
Q + Arrow key	Rotate the 3D graph in screen.	
W + Arrow key	Rotate the 3D graph around any axes.	

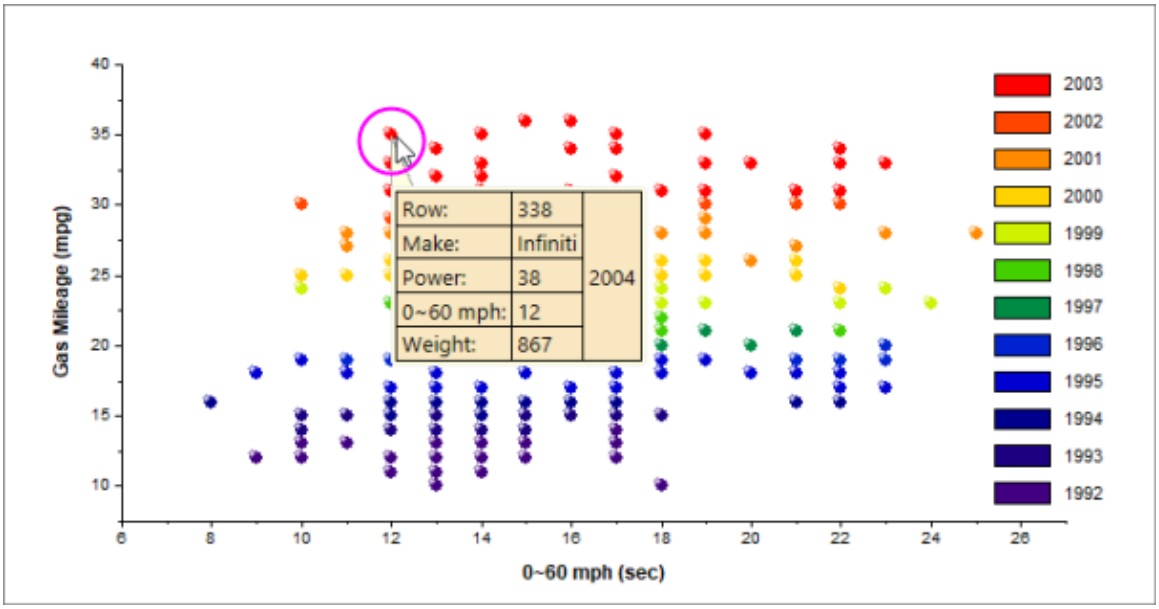
Rotate 3D graphs using R key		
R + Mouse	Drag to rotate the 3D graph in an arbitrary direction.	Press "R" before pressing other keys. Hovering on a 3D graph while pressing "R" changes the Pointer tool  to a . Press Ctrl and/or Shift as needed, and rotate by (a) dragging with your mouse or (b) pressing the arrow keys on your keyboard.
R + Ctrl + Mouse/Arrow key	Rotate the 3D graph around the X axis.	
R + Shift + Mouse/Arrow key	Rotate the 3D graph around the Y axis.	
R + Ctrl + Shift + Mouse/Arrow key	Rotate the 3D graph around the Z axis.	

12.5 Reading Coordinate Values and Distances

Origin provides several tools to aid in labeling and graphical exploration of your data plots. Most of these tools are available from the **Tools** toolbar (**View: Toolbars**). There is a related tool -- **Vertical Cursor** -- available from the **Gadgets** menu.

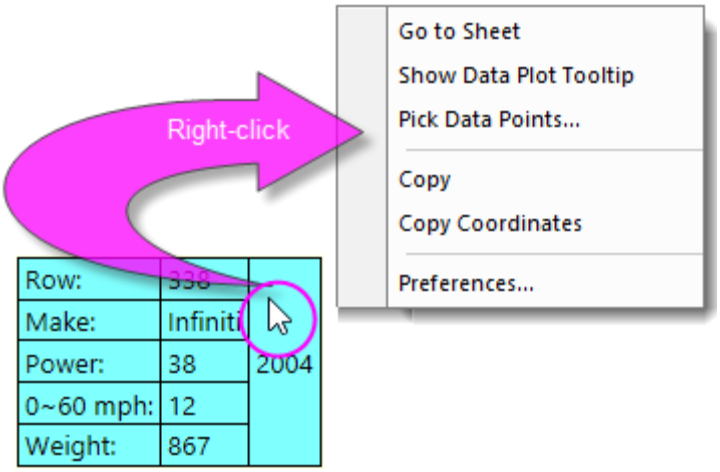
12.5.1 Data Point Tooltip

Most 2D plot types, 3D Scatter, XYY Bar and XYZ Bar plots support a floating, customizable tooltip that reads data point values when you hover on a data point.



Tooltip Shortcut Menu

For tooltip customization and other options, right-click directly on the data point tooltip.



- **Go to Sheet** pops up the worksheet with source data highlighted.
- **Show Data Plot Tooltip** toggles display of a non-customizable data plot tooltip in place of the customizable data point tooltip (see, below).
- **Pick Data Points** puts the cursor into data reading mode and opens a **Pick Points** dialog. Double-click on points in the graph and when finished, click **Done**. This generates summary data (source, X-Y coordinates, etc.) for your picked points.
- **Copy** copies data point tooltip information, including labels, to the Clipboard.
- **Copy Coordinates** copies only coordinate values. Right-click on a cell and **Paste** each value to a separate cell within the row; or **Paste (keep spaces)** to paste values to the selected cell as a space-separated string.
- **Preferences** opens the **Data Point Tooltip** dialog allowing you to customize tooltip content and formatting. Use documentation of the **Data Info** window, below, as a guide to configuring your tooltips.

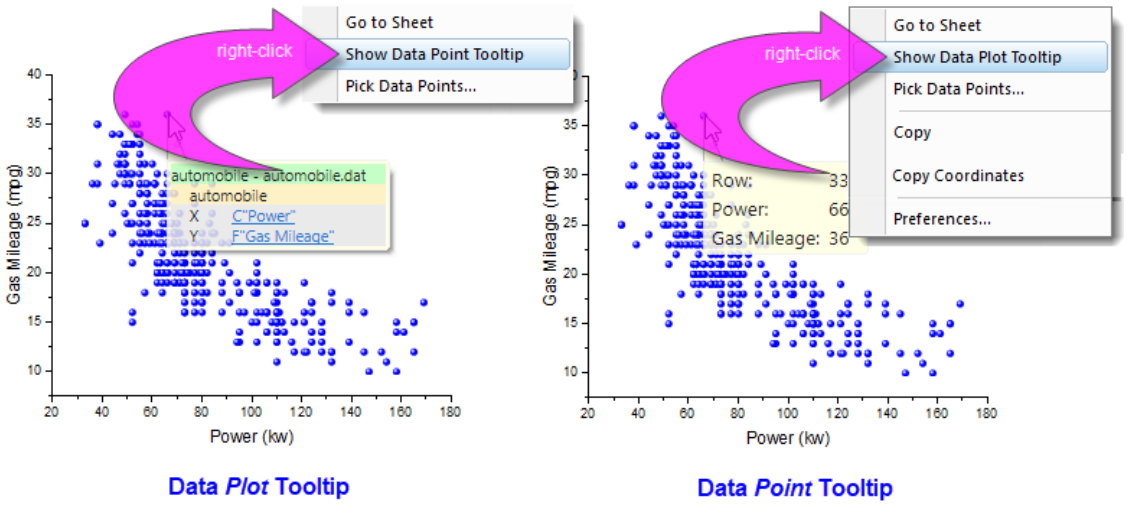
The **Data Point Tooltip** dialog is a slightly simpler version of the Data Info window's preferences dialog (**Data Info Report Settings**). See **The Data Info Window** for help with customizing your Data Point Tooltip.



By default, the Data Point Tooltip displays with a moderate degree of transparency. You can affect tooltip transparency by changing the value of LabTalk System Variable **@TDT**. For information on changing the value of a LabTalk System Variable, see this FAQ.

12.5.2 Data Plot Tooltip

There is a second tooltip that can be displayed in place of the Data *Point* Tooltip and this we refer to as the Data *Plot* Tootip. This non-customizable tooltip displays the source book, worksheet and coordinate datasets, on hover.



The Data Point Tooltip displays by default. If you prefer to use the Data Plot Tooltip, right-click on the Data Point Tooltip and choose to **Show Data Plot Tooltip**. Conversely, right-click on the Data Plot Tooltip and choose **Show Data Point Tooltip**.

12.5.3 Managing Tooltip Display

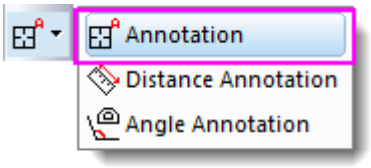
You can turn off display of data tooltips by activating the graph window, clicking on the **View** menu and clearing the check mark beside **Data Tooltips**.

There is a second way to control tooltip display that is more complicated but allows a greater degree of control. This entails changing the value of LabTalk system variables @PT and @PTI.

```
@PT=0; //Disable both data plot and data point tooltips
@PT=1; //Enable data plot tooltips for 2D graph
@PT=2; //Enable data plot tooltips for 3D OpenGL graph (default)
@PT=3; //Enable data plot tooltips for both 2D graph and 3D OpenGL graph
@PTI=0; //Disable only data point tooltips
@PTI=1; //Enable data point tooltips (default)
```

12.5.4 The Annotation Tool

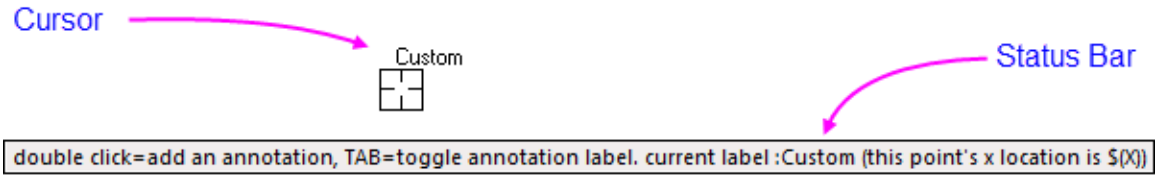
The **Annotation** tool shares a "split-button" with the **Distance Annotation** and **Angle Annotation** tools.



Use the **Annotation** tool to label a data point. The tool works with Symbol/Line+Symbol and Column/Bar plots. Choose from several standard data point labels or create your own custom label using LabTalk script.

To annotate a data point:

1. Click the **Annotation** button on the **Tools** toolbar and move the cursor to the desired data point. The **cursor** and the **Status Bar** will display the current label form.



2. Use the TAB to toggle between the following standard annotation forms: (*X coordinate value*, *Y coordinate value*); (*X coordinate value*, *Y coordinate value*)[*index number*]; *X coordinate value*; *Y coordinate value*; *index number* (row number); or Custom (see Tutorial, next).
3. When you've selected your label form, double-click to add a label to the data point; or single-click on the point and press Enter.

Tutorial: Customizing the Annotation String

The annotation string can be customized by combining literal characters with the X and Y coordinate values:

1. Start with a graph of your data
2. Open the **Script Window** (**Window:Script Window**) and type the following command, then press Enter:

```
system.annotation.customlabel$="X value: $(x,.2), Y value: $(y,*5)
```

3. Click the **Annotation** button, hover on your graph, then press the **Tab** key several times to cycle through the annotation choices until the custom string format specified above is displayed in the Status Bar. The cursor will display the word "Custom".
4. Start double-clicking on data points (or single-click and press Enter) to add the custom annotation string. The X values will be displayed with two decimal places and the Y values will be displayed with 5 significant digits, as specified by your

script.

Adjustments using the Pointer Tool:

- To move a label to another data point, click the **Pointer** tool , press the ALT key and drag the label.
- To re-position overlapping labels, drag the label. A leader line is automatically added.
- To copy a label to another data point, press CTRL + SHIFT and drag the label to a new data point.

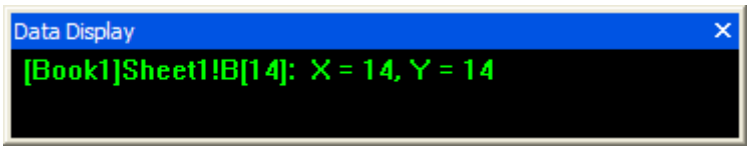
Note: Please view more information on string formatting in the Programming help file:

Help: Programming: LabTalk > Language Reference > Object Reference > Alphabetical Listing of Objects > String

12.5.5The Screen Reader Tool

The **Screen Reader** uses the **Data Display** window to report the XY(Z) coordinates of the cursor on the graph page. Note that the Screen Reader is not reading *data point coordinates*; rather it is reading *page coordinates* relative to the graph axes.

The Data Display window opens automatically when you select the Screen Reader tool from the **Tools** toolbar (by default, the Data Display window is docked at the bottom of your Origin workspace).



You can alter basic properties of the Data Display window by right-clicking on the window title bar or by right-clicking inside the window.

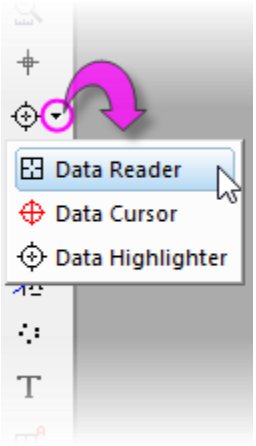
To use the **Screen Reader**:

1. Click the **Screen Reader** button on the **Tools** toolbar. This opens the **Data Display** tool.
2. Click on a location in the graph page to read its X,Y, and Z coordinates (ternary and contour only). Coordinate values show in the Data Display window.
3. To increase cross-hair size, press the space bar.
4. Click the **Pointer** button on the **Tools** toolbar to exit screen reading mode.

12.5.6The Data Reader Tool

The **Data Reader** is used to read information associated with a data point in your plot. This could be coordinate values or it could be more complex information including metadata or even images that relate to the data point. The Data Reader works in concert with the customizable **Data Info** window.

The **Data Reader** tool is grouped with two related tools -- the **Data Cursor** and the **Data Highlighter**. Only one of these toolbar buttons will show at any given time. To select a hidden tool, click on the small arrow to the right of the button and select a tool from the pop-up menu.



You can zoom into the graph while using the **Data Reader**. While the tool is active, press CTRL and use your mouse wheel to zoom in or out on the page.

To use the Data Reader tool:

1. Click the **Data Reader** button on the **Tools** toolbar. This opens the **Data Info** window.
2. Click on a data point to read its X,Y (and Z, if they exist) coordinates. Coordinate values display in the Data Info window (and Data Display window).
3. To move the cross-hair to the next data point along the data plot, use the LEFT and RIGHT arrow keys or click on the data point using your mouse. If you have multiple plots in a layer, use the UP and DOWN arrow keys to move to a data point on another plot or use your mouse to click on the point.
4. To change the vertical and horizontal cross-hair size, click on a point and press the spacebar.
5. Click the **Pointer** button on the **Tools** toolbar or **Esc** key to exit the Data Reader tool.

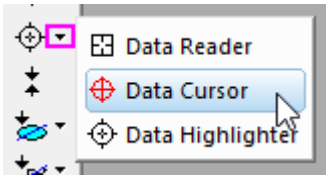
There are a number of system variables that control Arrow key acceleration and data-increment for the Data Reader. For more information, see the summary table in **Reading Coordinate Values in the Graph**.

12.5.7 The Data Cursor Tool

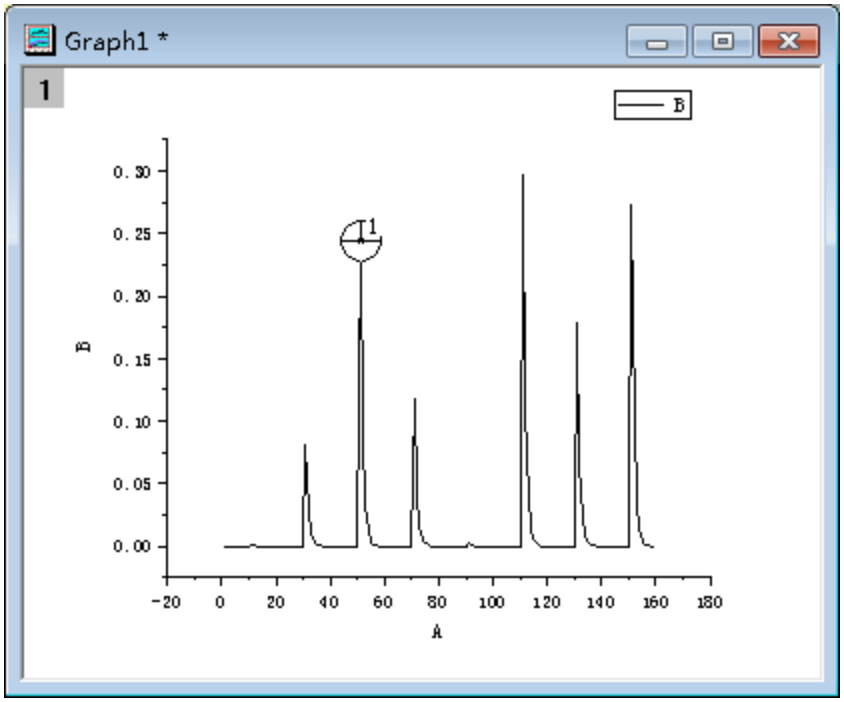
The **Data Cursor** tool -- grouped on the Tools toolbar with the **Data Reader** tool -- allows you to place one or more cursors on a data plot and (using the **Data Info** window) read the cursor coordinates or measure the X and Y distance between two cursors, or the distance between a cursor and a point selected with the **Data Reader**.

Tutorial: Using the Cursor Tool to Measure Relative Distance

1. Import the file *Samples\Spectroscopy\Sample Pulses.dat* and create a line plot.
2. Click and select the **Data Cursor** button from the **Tools** toolbar.

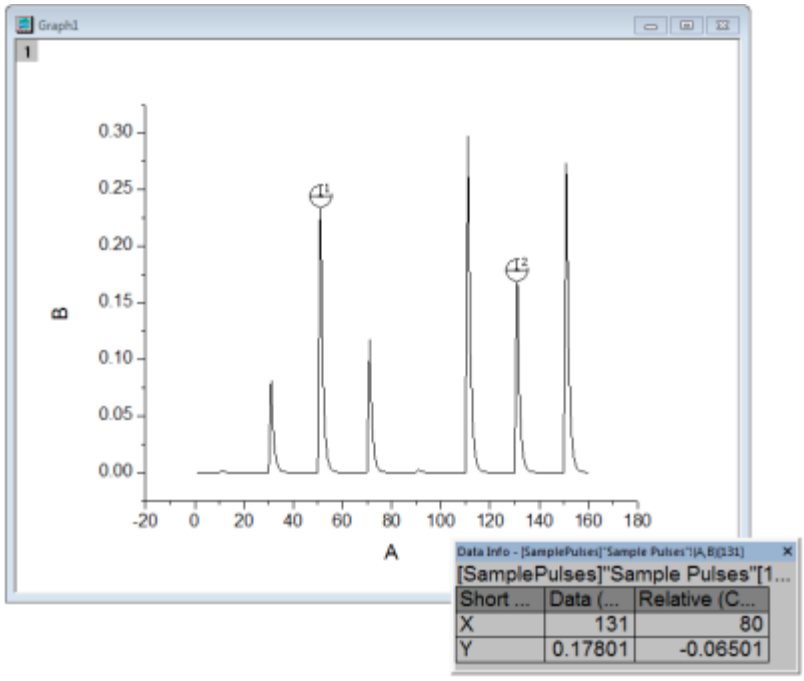


3. Double-click on one of the peaks or click once on a data point and press ENTER, to add a cursor object.



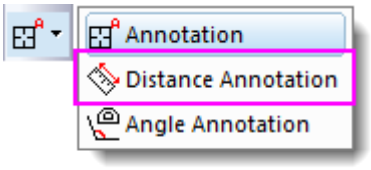
4. Repeat to place a second cursor object on another peak.
5. Double click in the **Data Info.** window to open the **Data Info. Report Settings** dialog. If this window is not visible, select the **View: Show Data Info** menu item to open the Data Info. window.
6. Switch to the **Columns** tab and then right-click in the gray area to the right of the columns and choose **Add Column**.
7. In the new column that is added, click on the source row of new column, and select **Relative (Cursor2 - Cursor1)** from the drop-down, and then press **OK** to close the dialog.
8. Now you can drag and move the cursor objects and the third column in the **Data**

Info window will display the X and Y distances between the two cursors.

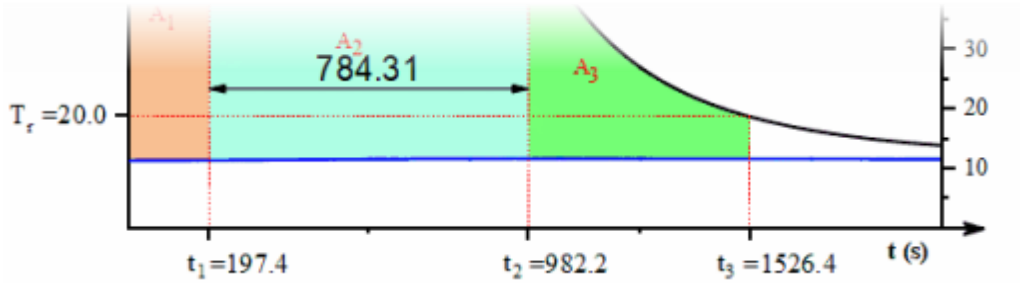


12.5.8 Distance Annotation Tool

The **Distance Annotation** tool shares a **Tools** toolbar "split-button" with the **Annotation** and **Angle Annotation** tools.



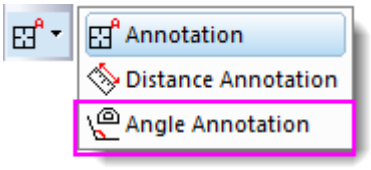
Use the Distance Annotation tool for drawing a scale-labeled, double-headed arrow between two points on a 2D graph.



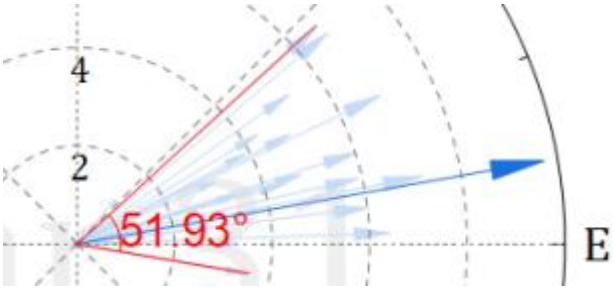
1. Click the **Distance Annotation** button on the Tools toolbars.
2. On a graph, place the crosshair on the starting point and drag with your mouse. Press Shift to force the double-headed arrow to the horizontal or vertical
3. To fine-tune arrow placement, right-click on the drawn arrow and choose **Properties**. Use **Dimensions** tab settings to control exact placement of object.

12.5.9 Angle Annotation Tool

The **Angle Annotation** tool shares a **Tools** toolbar "split-button" with the **Annotation** and **Distance Annotation** tools.

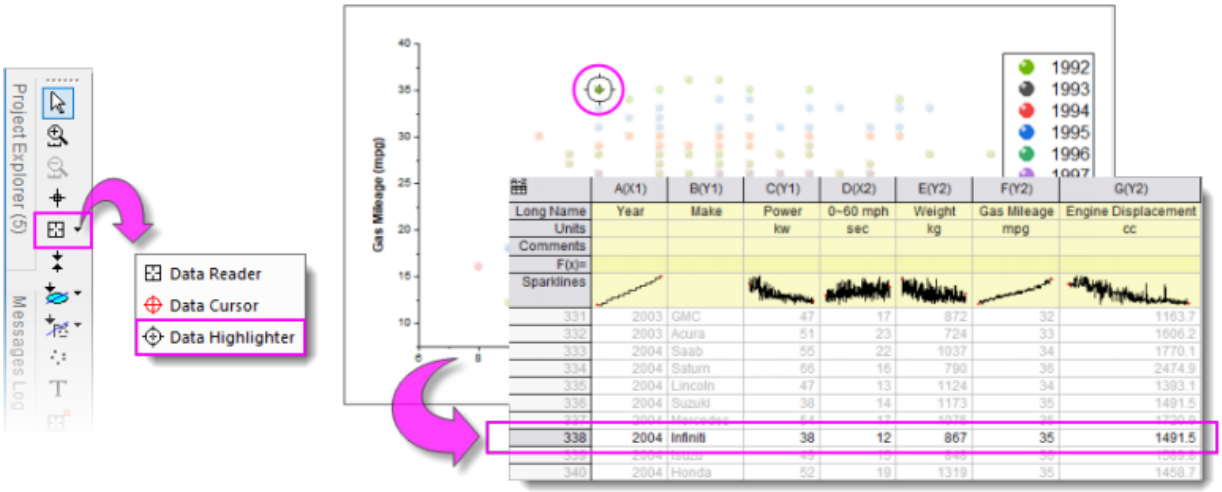


Use the **Angle Annotation** tool to draw and label an interior angle of < 180°.



12.5.10 The Data Highlighter Tool

The **Data Highlighter** is grouped on the Tools toolbar with the **Data Reader** and **Data Cursor** tools. Use the Data Highlighter to pick one or more points in the your graph and simultaneously highlight the corresponding data row in the worksheet. Unselected points are dimmed in the graph and the worksheet.



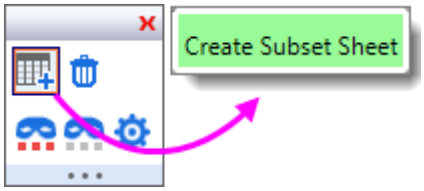
While in Data Highlighter mode ...

- CTRL+click to select multiple points in the graph.
- Drag out a rectangle/freehand object on the graph to select multiple points.
- Use SPACE to toggle between rectangle and freehand selection modes.
- Use left/right arrow keys to highlight individual points in sequence by row index.
- In the worksheet (still in Highlight mode), CTRL+click multiple rows or SHIFT+select blocks of rows, and highlight corresponding points in the graph.
- Press ESC to exit Highlight mode in the graph while keeping highlighted rows selected in the worksheet.



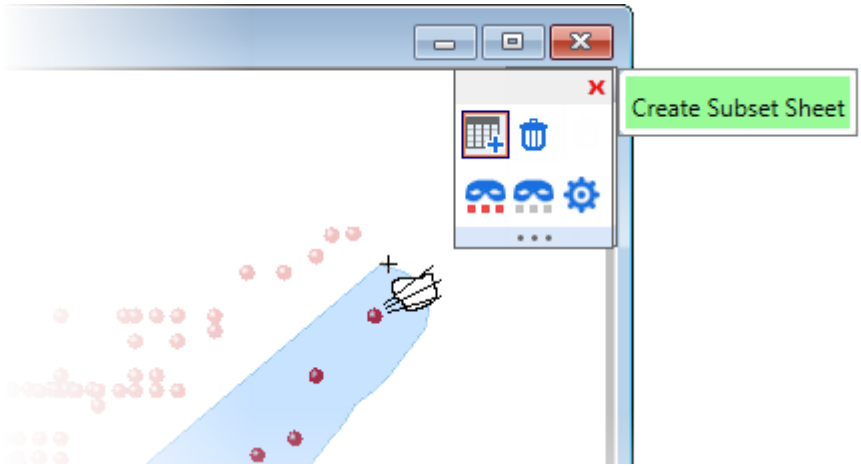
Some users did not know about ESC'ing (Highlight mode) in the graph window and found that when trying to plot selected data in the worksheet, the Plot Setup dialog opened. In this case, you can skip pressing the ESC key by setting system variable @QDHT=1. This will allow you to go directly to the worksheet and directly plot the highlighted data.

Another option, is to use the graph window's **Create Subset Sheet** Mini Toolbar button to output selected points to a new worksheet.



12.5.10.1 Collect Data from Multiple Sheets

When the **Data Highlighter** is active, a Mini Toolbar displays at the upper-right corner of the graph or worksheet window. The toolbar has buttons to **Create Subset Sheet**, **Delete Points**, **Mask/Unmask Highlighted Points** or **Dimmed Points**; plus a **Highlighter Properties** for configuring how to pick and collate data from multiple worksheets.



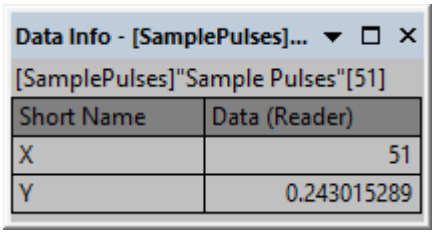
How to Pick Points Plotted from Multiple Sheets

Use this method for picking a subset of points from a graph window containing plots from multiple worksheets, and adding them to a single sheet:

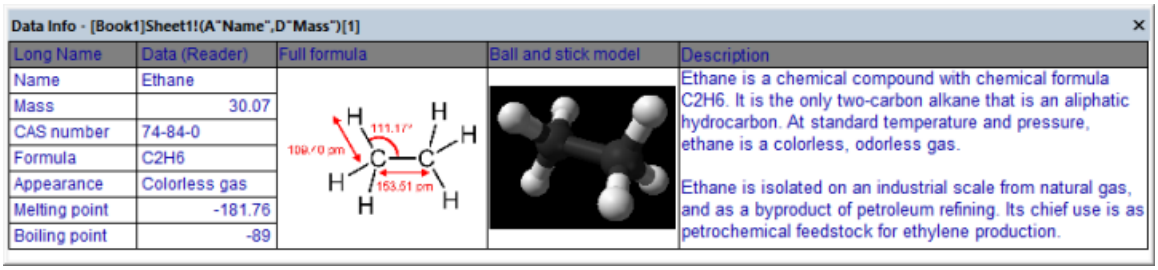
1. Pick the **Data Highlighter** tool , then CTRL+click to select multiple points from a SINGLE plot; or drag out a rectangle/freehand object on the graph to select multiple points (hint: press spacebar for ROI shape).
2. When finished, click the **Create Subset Sheet** button on the Highlighter Mini Toolbar.
3. Click the **Open Properties Dialog** button on the Mini Toolbar and set **Add Data Mode** = **Append** or **Append with Gap**.
4. Continue to pick points from other plots (worksheets) as in step 1, clicking the **Create Subset Sheet** button each time you finish picking points from one of the plots.
5. When you have finished, pick the **Pointer** tool .

12.5.11 The Data Info Window

The **Data Info** window opens when you choose either the **Data Reader** , the **Annotation** or the **Data Cursor** tools . When you click on a plotted data point with one of these tools, the **Data Info** window displays information about this particular data point.

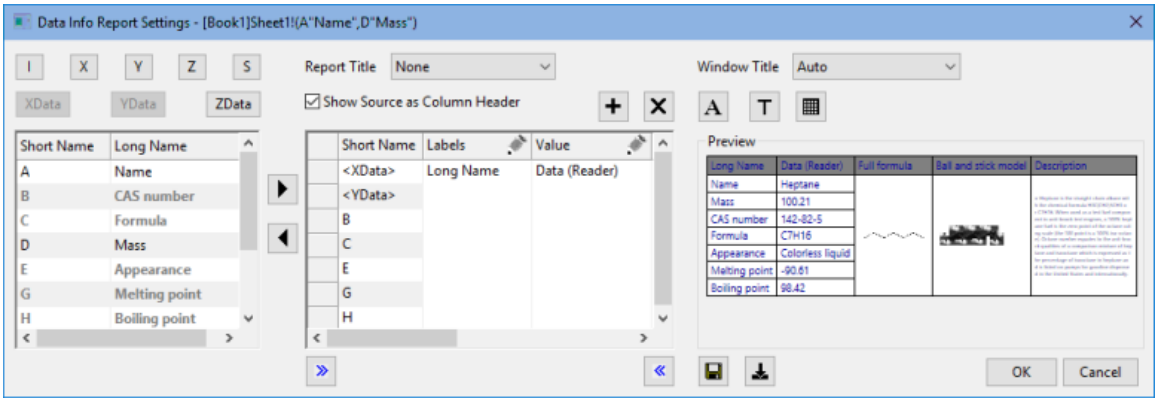


In its default configuration, the **Data Info** window reports only a column short name, plot designation (e.g. "X") and the XY coordinate values of a data point. However, the window is capable of displaying any of the worksheet-contained information that is associated with a data point including metadata and images.

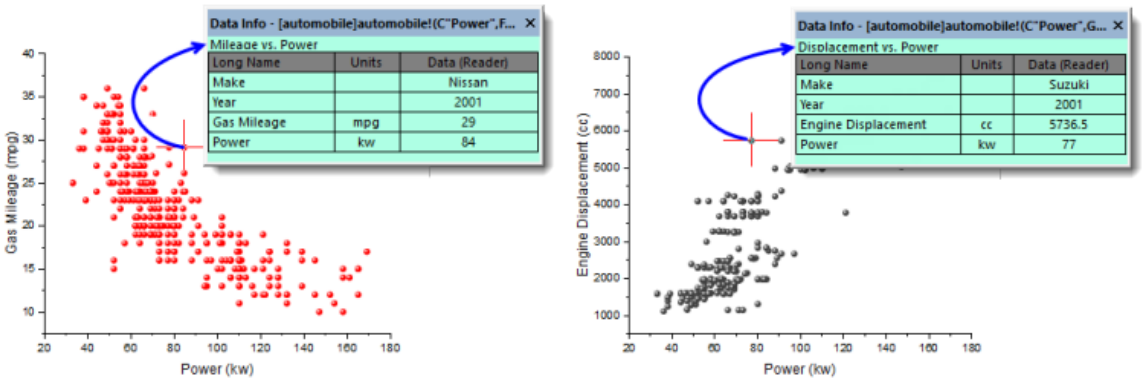


To customize the **Data Info** window:

1. Double-click on the Data Info window; or right-click and choose **Preferences...**.
2. Use the controls in the **Data Info Report Settings** dialog box to customize the display of the Data Info window:

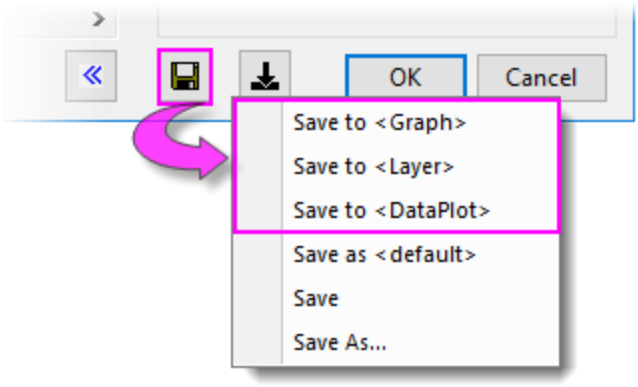


- The **Data Info** window can report any information in the source data worksheet. You are not limited to displaying plotted data.
- The window can display anything that can be inserted into the worksheet cell, including inserted graphs and images.
- The window can be customized with a **Window Title** and **Report Title**.
- Window configurations can be saved as Themes, including **Save to <Graph>**, **Save to <Layer>** and **Save to <DataPlot>**. This allows, for instance, all graph windows in your project or all graph layers in your multi-panel graph to have a unique Data Info window. Saved Themes can loaded and applied to the current Data Info window.





If you save your **Data Info** Theme settings in the graph, then save the graph window as a standalone graph window file (OGG, OGGU), know that the OGG/OGGU file travels *only with the data that are plotted in the graph*. Therefore, if your Data Info Theme uses data in *other* columns in your worksheet, the Data Info display will be incomplete if, for instance, you reopen the window file in a new project.



For more information on customizing the **Data Info** window, see:

- The Data Info Window.
- Tutorial: The Data Reader Tool (discussion on customizing the Data Info window).

12.5.12 Gadgets

Origin provides several **Gadgets** for data exploration and analysis. These gadgets are accessible from the **Gadgets** menu when a graph window is active. Three gadgets in particular are suitable for data exploration:

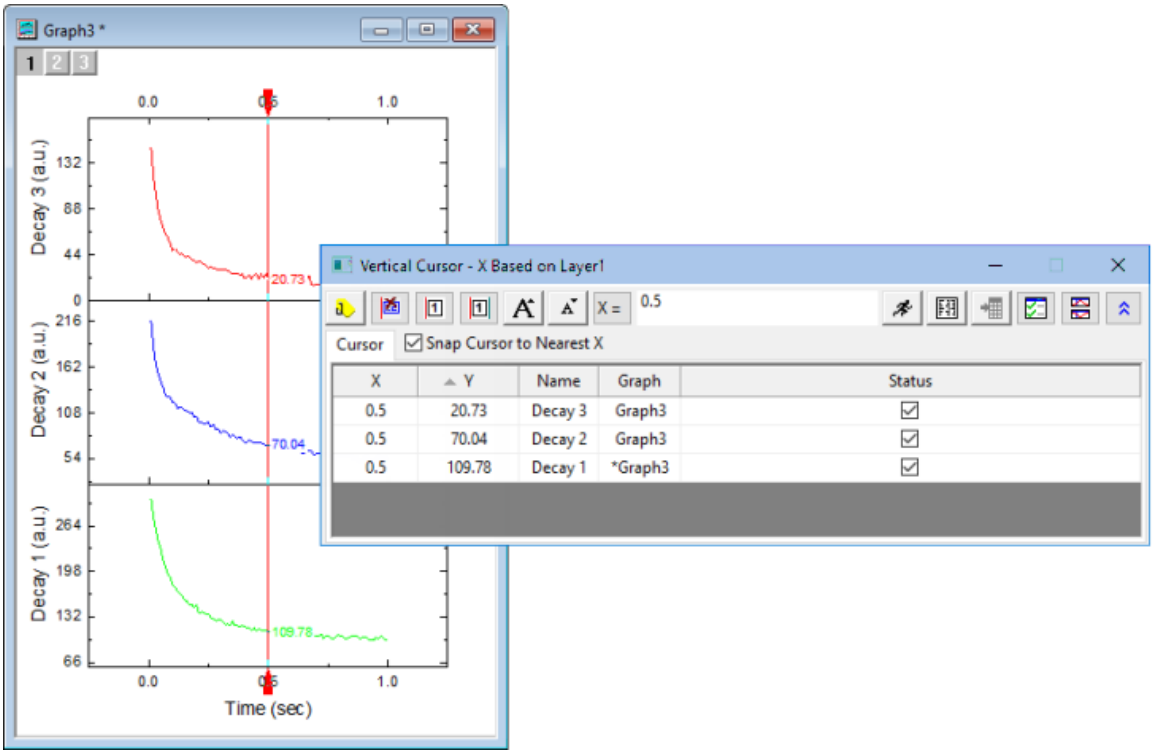
- **Vertical Cursor**
- **Statistics**
- **Cluster** (OriginPro)

The **Vertical Cursor** gadget is especially useful for reading XY coordinate values for data points in stacked panel plots or multi-plot graphs, where plots share a common X scale.

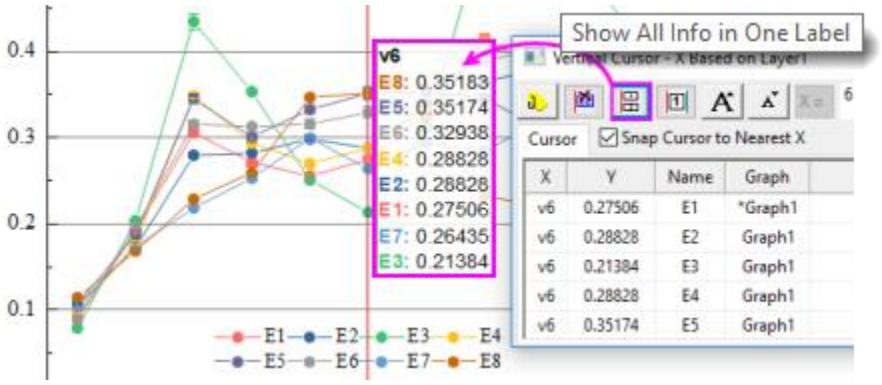
To open the Vertical Cursor:

1. With a graph window active, choose **Gadgets: Vertical Cursor...** from the main menu. This opens the **Vertical Cursor** dialog box.

Using the controls in this Gadget's dialog box, you can add data labels to the graph, increase or decrease label font size, hide labels, etc.

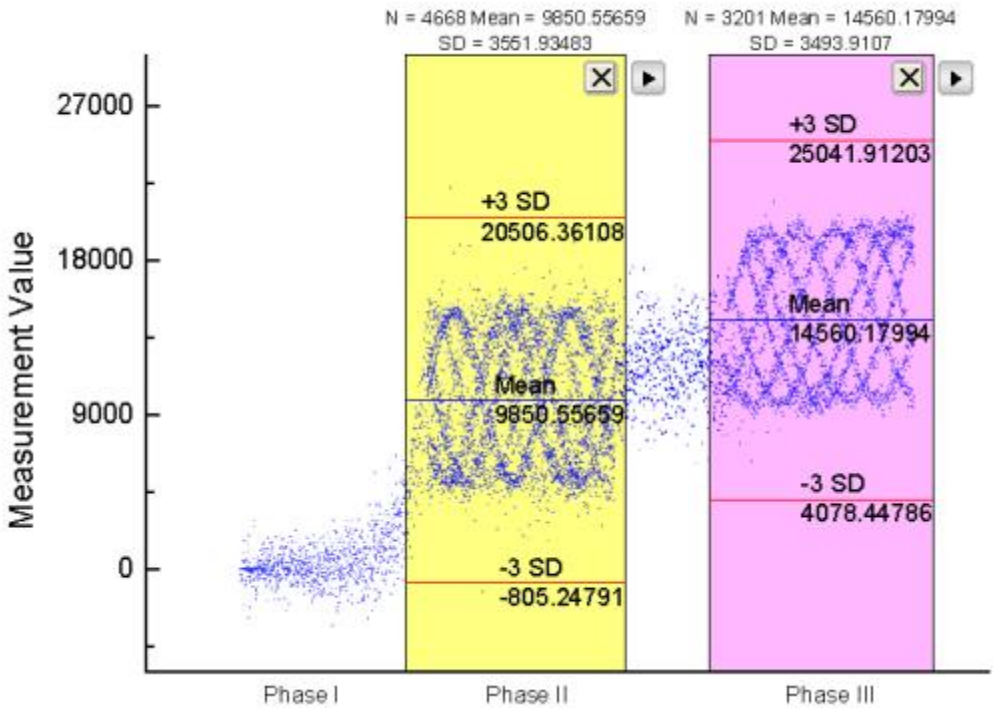


When labeling plots with the Vertical Cursor, you can opt to combine separate data labels into a single label by clicking the gadget's **Show All Info in One Label** button.



The **Statistics** gadget returns basic statistics on data points falling inside a rectangular region-of-interest (ROI) on the graph.

- Display basic statistics for data inside the ROI.
- Display mean and *n*th Standard Deviation lines inside the ROI.
- Update results dynamically as ROI is moved or resized.

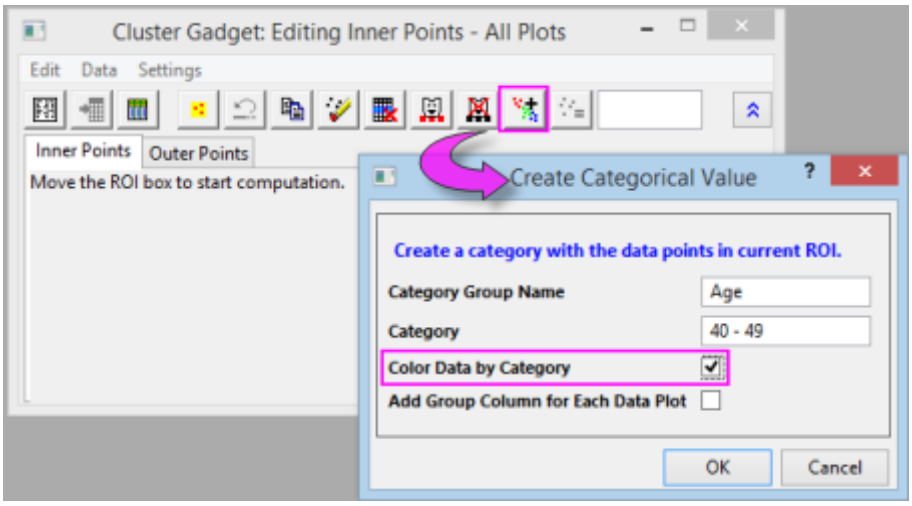


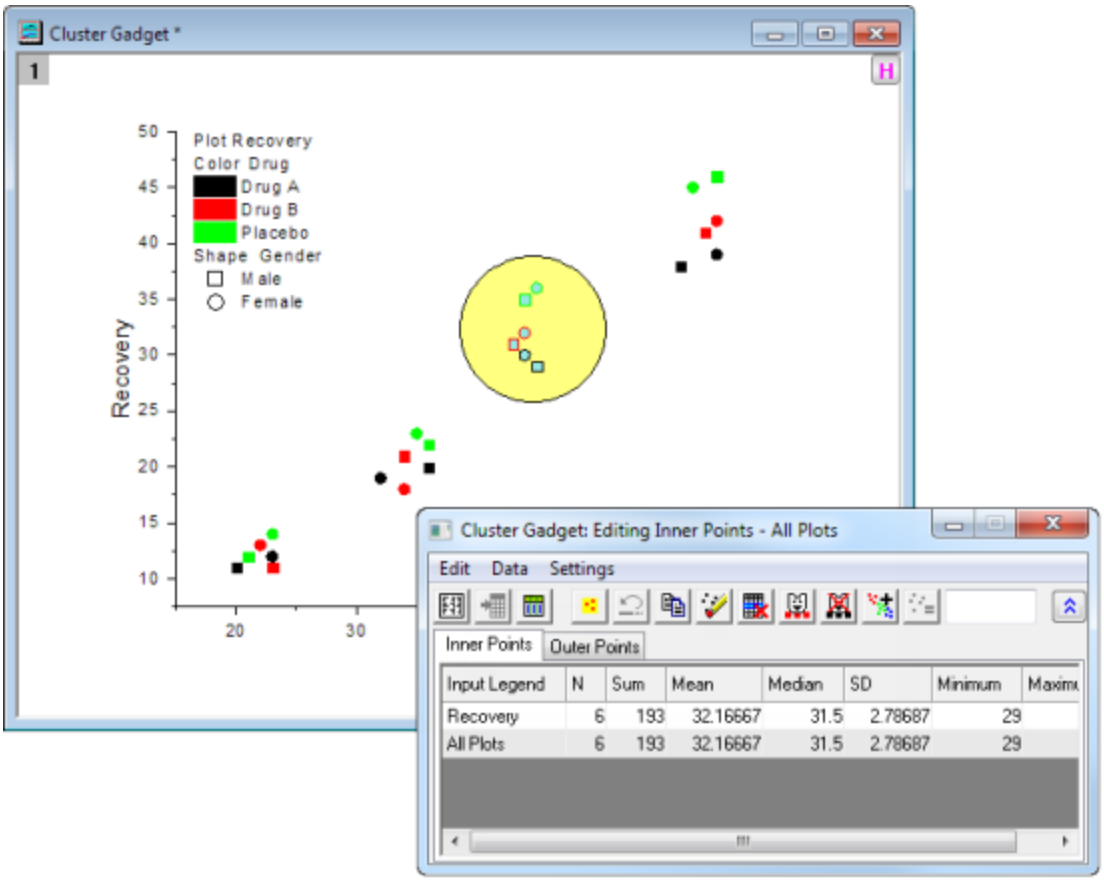
The **Cluster** gadget (available in OriginPro) provides the following features:

- Display basic statistics for data inside a region of interest (ROI).
- Switch between rectangular or elliptical ROI.
- View statistics for points inside and outside of the ROI.
- Edit, copy, mask, delete or group data points.
- Update results dynamically as ROI is moved/re-sized.
- Output results to a worksheet.



When you use the **Cluster** gadget to define a category (points within a ROI on a plot), you can apply a differentiating color to points within the ROI.





Note: To learn more about these gadgets, see:

Help: Origin: Origin Help > Gadgets

12.6 Drawing Data Points on the Graph

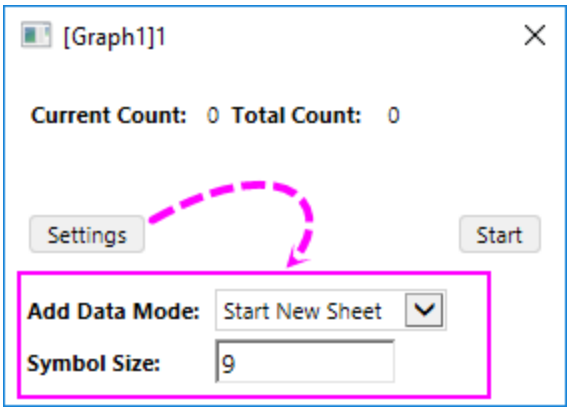
This section discusses methods of graphically creating and modifying data plots.

This collection of tools and menu-driven operations is helpful in exploring certain "what if" scenarios, or to quickly generate some data for purposes such as testing a fitting function. These procedures work only with 2D scatter plots.

12.6.1 Drawing a Data Point

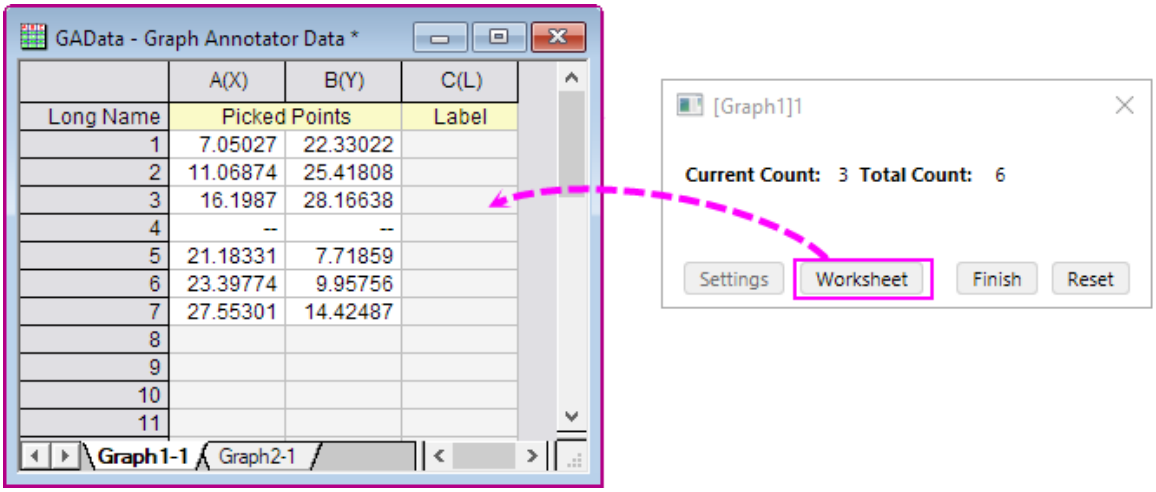
1. Activate the graph window.
2. Click on the **Draw Data Tool** .

3. A small dialog opens and displays the graph window short name. Click the **Settings** button to expand the options as below:



4. Set **Add Data Mode** to **Append With Gap**. Click the **Start** button, then hover on the graph and double-click to set a data point. Continue clicking to set as many data points as you need.

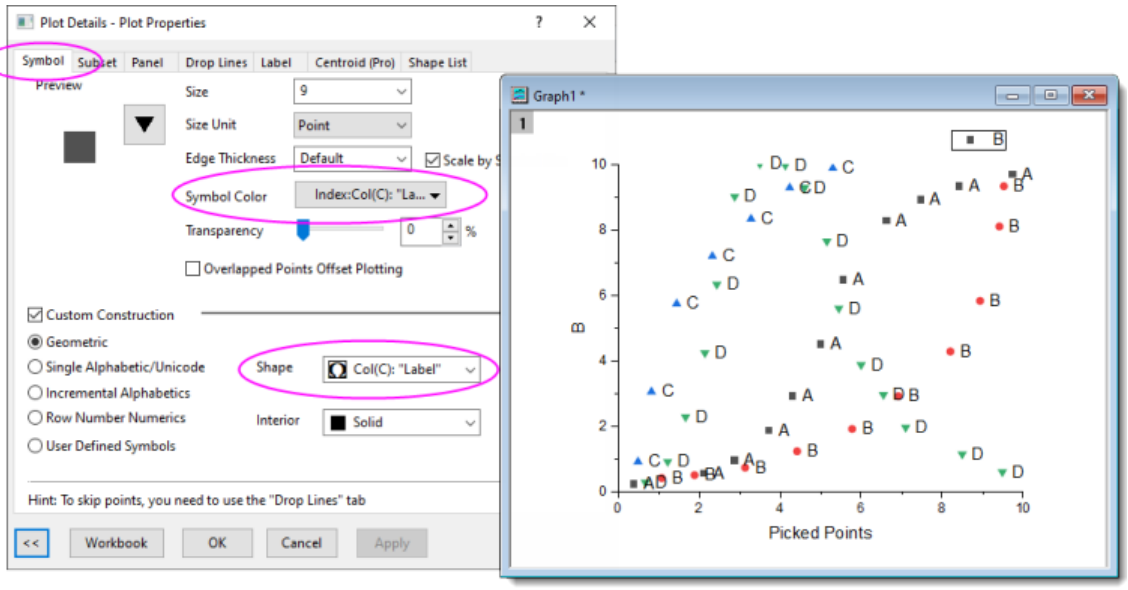
5. Points drawn on a new graph window will be added to a new sheet in the *GAData* book. Click the **Worksheet** button to pop-up this new Workbook.



6. Click **Finish** to end the point series.

- Each time you click **Finish**, a "--" separator is added to the worksheet columns to delineate a group of XY coordinates (drawn points).
- Points drawn on a new graph window will be added to a new sheet in the *GAData* book. Each graph window will have its own sheet in the workbook.

7. To label data points, go to the new Worksheet and enter label information in the **Label** column. Note that **Label** column info can also be used to create plot groups by opening Plot Details and editing controls on the **Symbol** tab (e.g. **Symbol Color** is indexed, by points, using the **Label** column data).



12.6.2 Moving or Deleting Data Points in the Graph

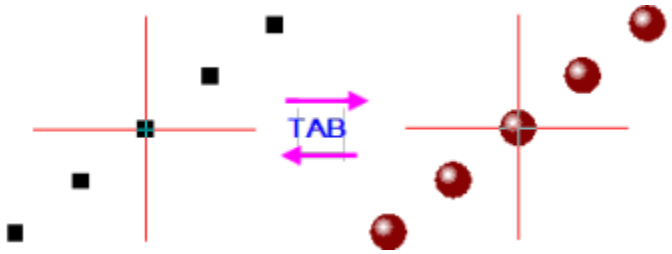
12.6.2.1 Moving a Data Point

Move data point in graph will change the underlying data in worksheet. For data imported with data connector, by default it's locked with the external data and therefore unmovable. You would need to click the data connector icon and unlock imported data, disconnect sheet, or fully remove data connector before moving data points in graph. Then do the following :

1. Select **Data: Move Data Points** (you'll be warned that you are about to change your data). There are hints on status bar about how to move.
2. Crosshair will be put to a point in graph. Use arrow keys to navigate to or directly click on point you want to move.
3. Drag the point to new location or use Ctrl + arrow keys.
4. Click the **Pointer** button  on the **Tools** toolbar or press **ESC** to exit the **Move Data Points** mode.

The data point is moved in the plot and the X and Y coordinates are changed in the worksheet cell.

By default, **Move Data Points** function caused scatter points to revert to the template's default style. You can press the TAB key to toggle between default symbol and customized symbol.



12.6.2.2 Deleting a Data Point

You can delete individual data points from your graph:

1. Select **Data: Remove Bad Data Points**.
2. Double-click on the data point, or click to select the data point and press **ENTER** key.
3. Click Arrow button on **Tools** toolbar or press **ESC** key to exit the Remove Bad Data Points mode.

The data point is deleted from both the data plot and the worksheet cell. In the worksheet, only the data cell for the Y value will be cleared and shown as missing value.

12.7 Topics for Further Reading

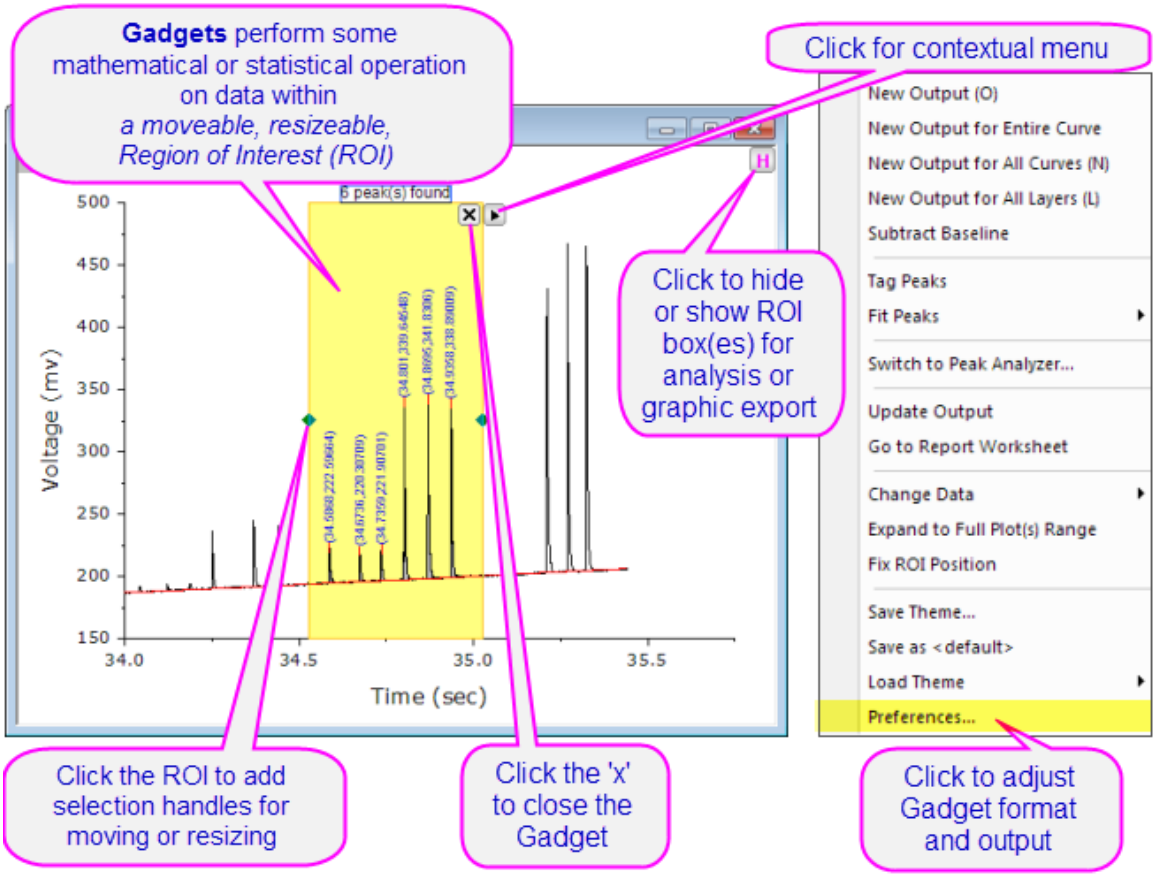
- Gadgets
- The Data Analysis chapter of this User Guide
- The Cluster Gadget (OriginPro)
- The Vertical Cursor Gadget
- The Digitizer
- The Statistics Gadget
- Masking Data
- Data Filtering
- Drawing or Deleting Data Points in the Graph
- List of Origin Built-in Toolbars and Buttons

13 Gadgets

Gadgets provide a quick and easy way to perform exploratory analysis on plotted data. The concept is simple: While each Gadget has a specific purpose, each is built around applying a set of customizable analysis operations to a range of plotted data defined by a movable, resizable, region-of-interest (ROI) object.

You can drag to modify the ROI at any time, then change your analysis options and recalculate results by clicking the arrow button in the upper-right corner of the ROI and choosing one of the menu options. For general access to Gadget formatting and analysis options, choose **Preferences** at the bottom of the context menu. Use the Preferences **Dialog Theme** box to save a group of Gadget settings to a Theme file.

Multiple Gadgets are supported on a graph. You can distinguish ROIs by giving each a different color. Click on an ROI object to bring it forward. When an ROI is selected, you can use the TAB key to switch the ROI.





Origin 2016 introduced add-on tools called **Apps**. Since being introduced, many new exploratory and analysis-related tools have been added to OriginLab's **File Exchange** and more tools are being released all the time. Please visit the File Exchange to review available tools.

13.1 Origin Gadgets

The **Gadgets** main menu is available when a graph window is active. There are 14 gadgets available in Origin.

Cluster Gadget	View statistics on points inside or outside of a graphically-defined region-of-interest (rectangular, circular/elliptical or arbitrarily-shaped). PRO
Differentiate Gadget	Calculate and plot the *n*th-order derivative of selected data.
FFT Gadget	View FFT spectrum of selected data.
Integration Gadget	Calculate the area under a curve, or between two curves.
2D Integration Gadget	Calculate the 2D integration for a contour or image graph created from matrix or XYZ worksheet data. PRO
Interpolate Gadget	Perform linear, spline, b-spline or Akima spline interpolation of selected data.
Intersect Gadget	Calculate the intersection points of two or more data plots.
Quick Fit Gadget	Perform linear, polynomial, or nonlinear fitting of selected data.
Quick Peaks Gadget	Locate peaks, and compute area and other peak properties.
Quick Sigmoidal Fit Gadget	Perform Sigmoidal fit of selected data.
Rise Time Gadget	Analyzes rise/fall time for the step-like signal. PRO
Statistics Gadget	Compute and display simple descriptive statistics of selected data on the graph.
Vertical Cursor Gadget	Read coordinate values and label data plots across multiple graph layers that share the same X axis.
Image/Contour Profile	Analyze the image or contour from matrix data and generate profiles.
Curve Translate Gadget	Drag a curve in the vertical or horizontal direction, adjusting source data in the process.

Note: To learn more about these gadgets, see:

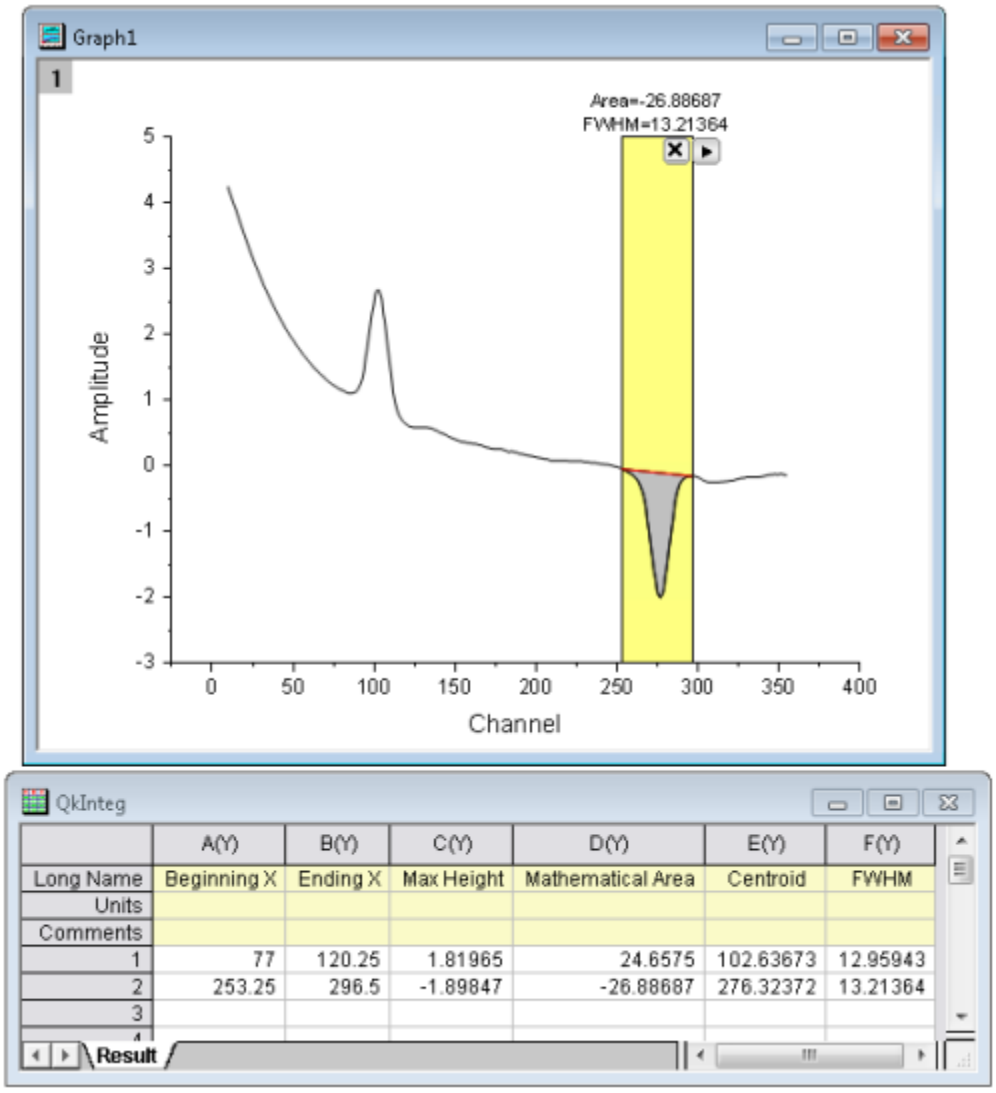
Help: Origin: Origin Help > Gadgets

Help: Origin: Origin Help >Matrixbooks Matrixsheets and Matrix Objects > Viewing and Profiling Matrix Data



Tutorial: Using the Integrate Gadget to Output Results to a Worksheet

1. With a new workbook active, import the file **Peaks on Exponential Baseline.dat** located in the *Samples**Spectroscopy* subfolder under the Origin installation folder.
2. Create a line plot of the data in column B.
3. With the graph active, go to the main menu and click **Gadgets: Integrate...**.
4. In the dialog box that opens, click the **Baseline** tab and select **Straight Line** from the **Mode** drop-down list.
5. Click the **Output** tab, and under the **Output Quantities to** node, select **Append to Worksheet** and clear the other check boxes.
6. Expand the **Quantities** node, select **None** from the **Dataset Identifier** drop-down list and enable **Beginning X** and **Ending X**.
7. Press **OK** to close the dialog box. The Region-of-Interest (ROI) rectangle object is added to the graph.
8. Resize and move the ROI object to cover just the first peak in the data plot, then press the arrow button located at the top-right of the ROI and select **New Output**; or press **"O"** on your keyboard. This will write the parameters for the first peak to a worksheet.
9. Drag and move the ROI to cover the second peak, and repeat the steps above to generate output for the second peak.
10. Press the arrow button again and this time select **Go to Report Worksheet**. A worksheet with the integration results will open.



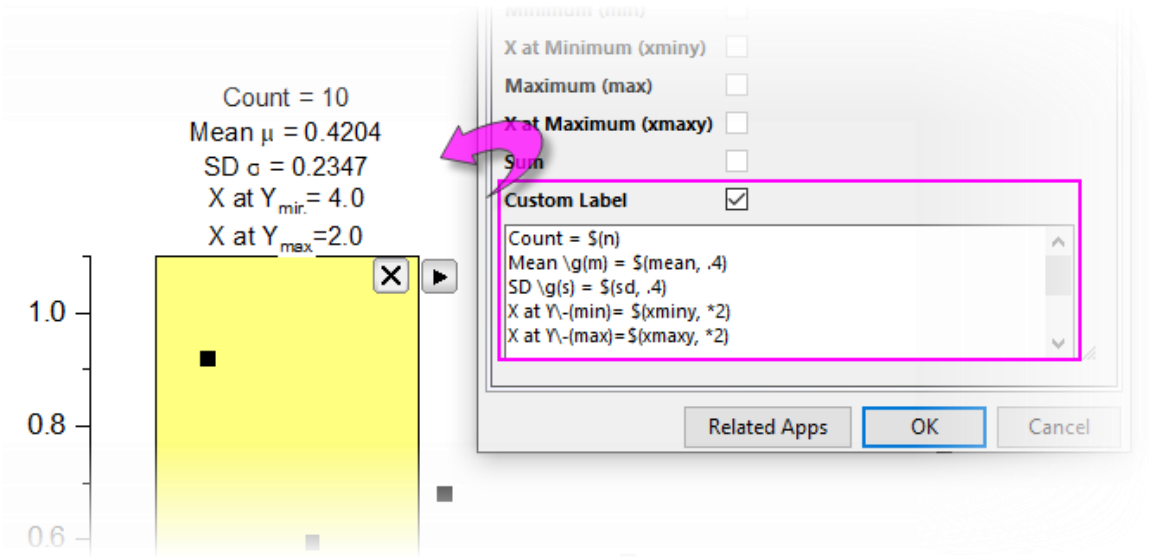
QkInteg

	A(Y)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)
Long Name	Beginning X	Ending X	Max Height	Mathematical Area	Centroid	FWHM
Units						
Comments						
1	77	120.25	1.81965	24.6575	102.63673	12.95943
2	253.25	296.5	-1.89847	-26.88687	276.32372	13.21364
3						

Result

13.1.1 Custom Label for ROI Box

Origin supports custom labeling of the **ROI Box** for the **Quick Fit** and **Statistics** gadgets. Custom labels are preserved and updated when you select new output. Further, they can be saved as part of a **Dialog Theme**.

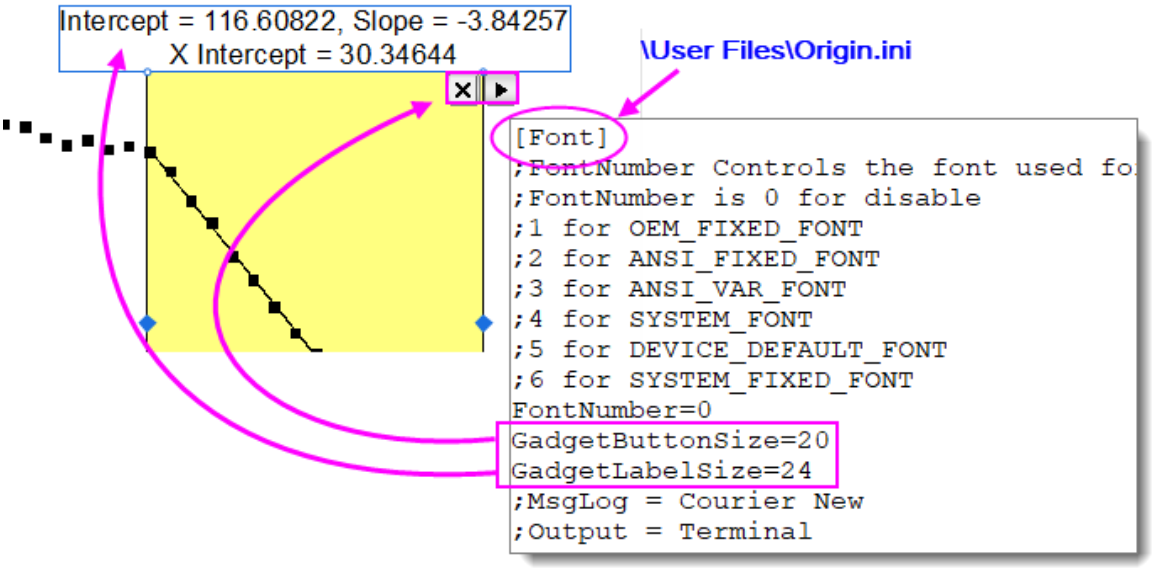


13.1.2 Custom Label and Button Size

13.1.2.1 General Change Label Font Size and Button Size of Any Gadget

To customize the label font size and button size (both the close button and the menu flyout button):

1. Open \User Files\Origin.ini and search for the **[Font]** section.
2. Add two lines to this section as shown in the image below, then save the file with your additions.
3. Any new Gadgets added to the window should use the new font and button size. Adjust as needed.



13.1.2.2 Quick Fit Gadget

1. Choose a gadget from the **Gadgets: Quick Fit** menu.

2. Open the gadget dialog (**hint**: if the ROI is already added, click the menu button and choose **Preferences**).
3. Click the **ROI Box** tab and enable **Custom Label**.
4. Build your custom label using a mix of (a) literal text (b) escape sequences (e.g. Greek symbols or superscripts) and (c) custom variables. Specify decimal places, etc. using Origin custom formats.

Dialog Label	Custom Variable	Example
Reduced Chi-Sqr	chisqr	Chi-Square \g(c)\+(2) = $(chisqr, .2)
R-Square	cod	R-Squared r\+(2) = $(cod, .2)
Pearson's r	r	r = $(r, .2)
Y Intercept	intercept	Y Intercept = $(intercept, .2)
Slope	slope	Slope = $(slope, .2)
X Intercept	xintercept	X Intercept = $(xintercept, .2)

13.1.2.3 Statistics Gadget

1. Choose **Gadgets: Statistics: Open Dialog** (**hint**: if the ROI is already added, click the menu button and choose **Preferences**).
2. Click the **Show on Center-Top of ROI Box** tab and enable **Custom Label**.
3. Build your custom label using a mix of (a) literal text (b) escape sequences (e.g. Greek symbols or superscripts) and (c) custom variables. Specify decimal places, etc. using Origin custom formats.

Dialog Label	Custom Variable	Example
N	n	Count = $(n)
Mean	mean	\g(m) = $(mean, *4)
SD	sd	\g(s) = $(sd, .2)
Minimum	min	Min = $(min, .2)

X at Minimum	xminy	X Min = $(xminy, .2)
Maximum	max	Max = $(max, .2)
X at Maximum	xmaxy	X max = $(xmaxy), .2)
Sum	sum	Sum = $(sum, .2)

13.2 Topics for Further Reading

- Gadgets
- The Image/Contour Profile tool
- Tutorial: Using Multiple Gadgets
- Tutorials for Individual Gadgets
- Peak Analyzer
- Digitizer

14 Data Analysis

14.1 Introduction

Origin contains powerful tools for all of your data analysis needs, including curve fitting, statistics, peak analysis and signal processing. Most of Origin's analysis tools can make use of a stored collection of settings -- something known as a **Dialog Theme** -- that makes repeat analyses a snap. Furthermore, the output from one operation can become the input for another operation, thus allowing you to set up a chain of operations, with results that update whenever there are changes to source data, as would happen when importing a series of data files.

The following sections cover (1) selecting the data that you wish to analyze and (2) the Origin and OriginPro tools available for analyzing that data. Please refer to the How to Handle Repetitive Tasks chapter of this User Guide for more information on Analysis Templates, Dialog Themes and other time-saving features.



Apps are add-on tools that extend Origin's graphing and analysis capabilities. Many analysis-related tools are available *free-of-charge* from OriginLab's File Exchange. To find out more about Apps in Origin, see the Apps for Origin chapter of this User Guide.

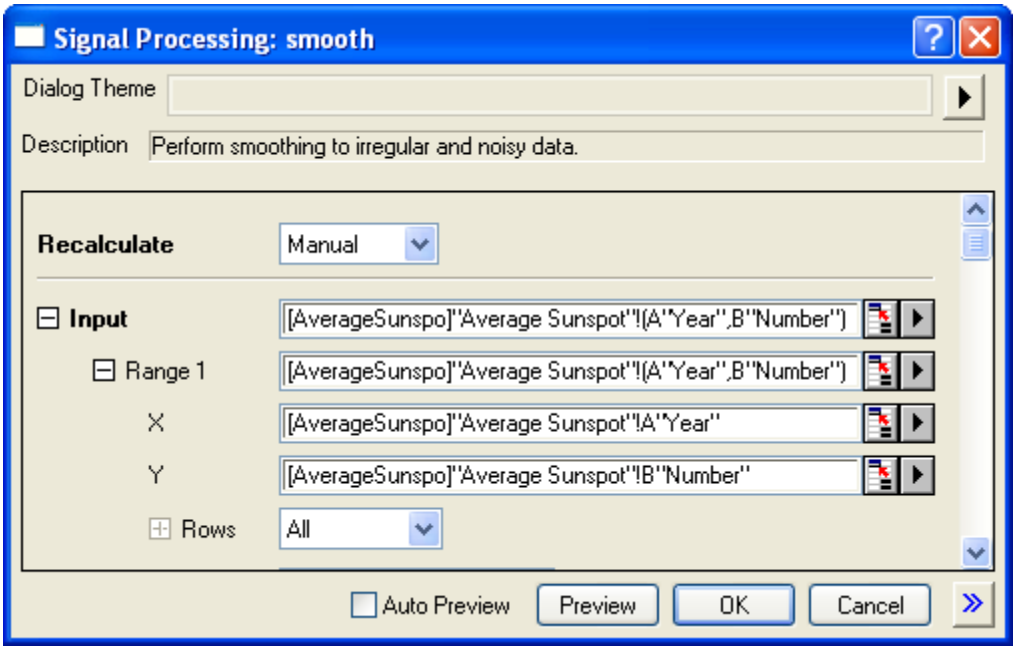
14.2 Data Input

Origin's analysis tools will work with workbook, matrix and/or graph data, depending upon the tool. By default, analyses will be on done on selected data (note that in the case of matrix data, "selected data" will the the matrix sheet or matrix object, depending on the analysis). When working with worksheet or graph data, you may want to restrict your analysis to a subset of the data -- say, a certain range of rows or columns in a worksheet or a certain X range in a graph.

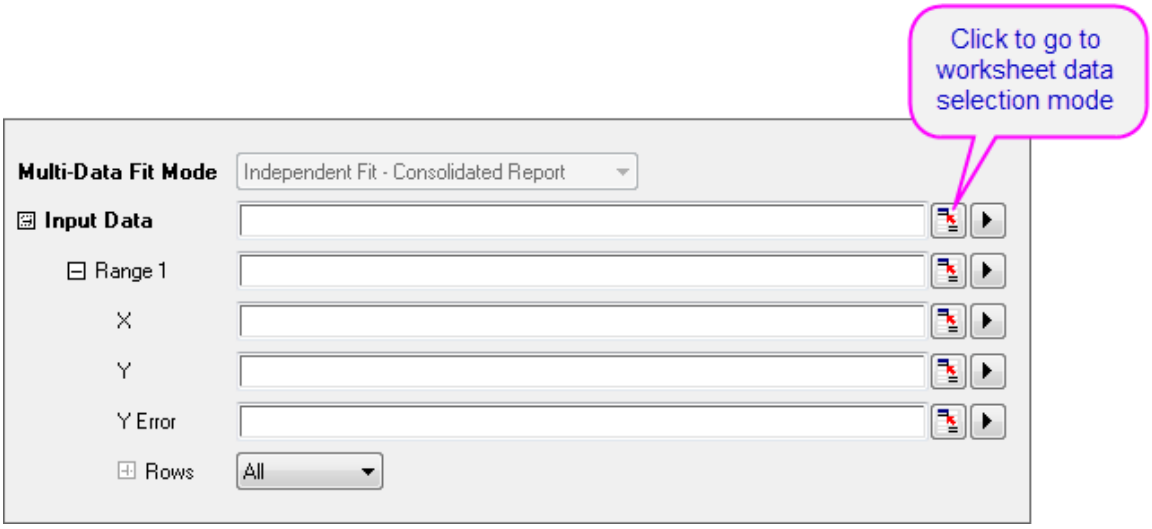
Data selections can be made *before* or *after* opening an analysis dialog. Most of Origin's X-Function based analysis tools have a **Input** branch with a range selection control that you can use to interactively select your data (as explained below).

14.2.1 Selecting Data in the Worksheet

When you highlight a range of worksheet data, then open one of X-Function based dialog boxes -- that would include nearly all of those that open from the **Analysis** or **Statistics** menus -- you will see your range selection already entered into the dialog box **Input** branch. Most will find that selecting worksheet data prior to opening an Analysis or Statistics dialog box, is the easiest way to specify which data you wish to analyze.

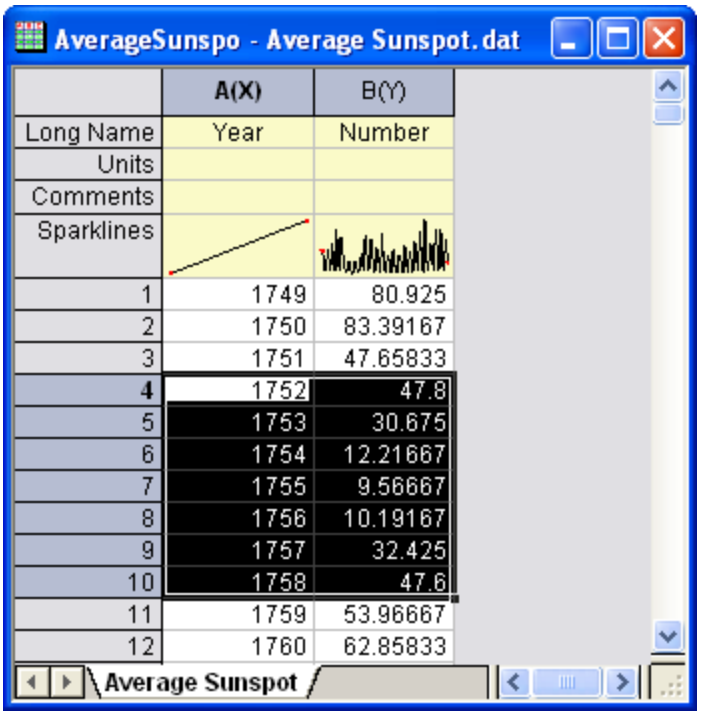


If you open one of the X-Function dialog boxes *without* pre-selecting your data, the first thing you should do upon opening the dialog is to select data in **Input** branch:



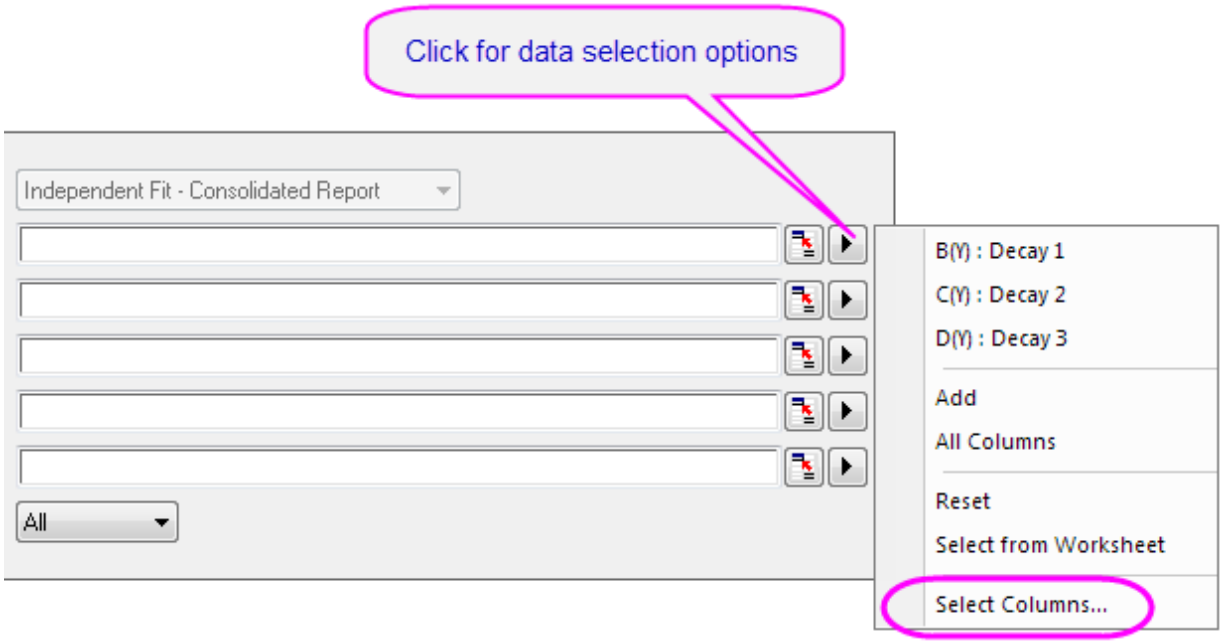
1. Click the range selection control next to **Input** (or **Input Data**). The dialog box will roll up.
2. Go to worksheet and highlight your worksheet data, then click the button at the right end of the rolled up dialog box. The **Input** branch will now show the selected range.

Note that you do not have to select entire datasets (columns). You can select a portion of your worksheet data and analyses will be confined to that selected subset of your data. Also if the analysis supports multiple datasets, you could support multiple ranges such as multiple Y columns or Y ranges. If the analysis only supports one dataset, you may be able to select multiple ranges in the worksheet, but only the 1st range will be picked in the analysis.



Notes

- The **Input Data** branch has a hierarchical structure. If the analysis supports multiple datasets, you can add multiple ranges under **Input Data** and they will show as **Range 1**, **Range 2**, etc., each with its corresponding **X**, **Y**, **Error** and **Row** controls.
- Mousing over each level will show a tooltip indicating where the data on that level is from (i.e. book, sheet and column).
- A **Rows** control under each range node lets you set range by row index or X value. If you want to apply the same row range to all ranges under **Input Data**, click the arrow button to the right of the range node and choose **Apply Row Range to All**.
- Depending on where you are in the **Input Data** hierarchy, the range selection button may have some limitations (e.g. if you click range selection control next to **Y**, though you could select multiple columns in a worksheet, only the 1st column is accepted).
- Clicking the **arrow** button to the right of the range selection control will show more selection options, including individual worksheet columns that can be quickly added to your data selection.
- Depending on which level you are in, the selection options when clicking the **arrow** button may vary. For instance, clicking the "arrow" button next to **Input Data** and clicking the Select Columns... menu item, will open the **Column Browser** allowing you to select multiple columns from different worksheets.



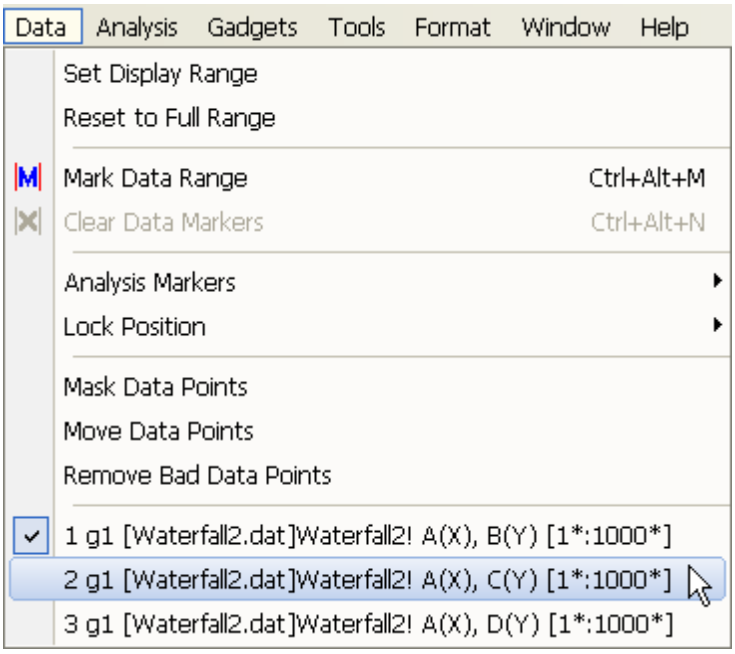
1. Use the **List Datasets** drop-down list to filter which sheets you want to pick from. The top panel list can be sorted by clicking any of the column headings, making it easy to select, for example, all columns that share the same **LName** or **Comments**.
2. Then click the **Add** button to add the column to your selection list in bottom panel.
3. To modify the data input range of any dataset, click the range button to the right of any dataset added to the bottom panel and edit the **From** and **To** values.

14.2.2Selecting Data in the Graph

When a graph window is active and you select one of the **Analysis** menu tools, the default behavior is for the analysis dialog box to open showing the selected range of the active dataset as your **Input Data** (note that analysis dialogs include an **Input Data** node that allows adjustments -- adding more datasets with the interactive range selector button, changing a data range, etc.).

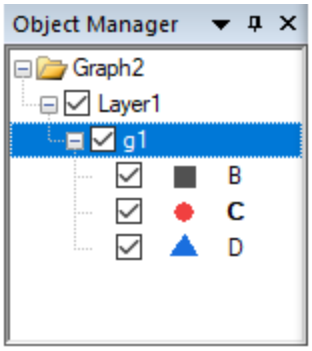
14.2.2.1 The Data List and the Active Data Plot

The active data plot is the one that shows in the data list (bottom of the **Data** menu) with a check mark next to it. If the active graph layer contains a plot group, the default behavior is to make the first plot in the group the active data plot (note the "g1" beside each range in the following image, indicating that all are members of plot *group 1*). You can activate a different plot by clicking on another of the data plots listed at the bottom of the **Data** menu. Subsequently, when you open an analysis dialog box, this newly-selected plot will be listed as your input data.

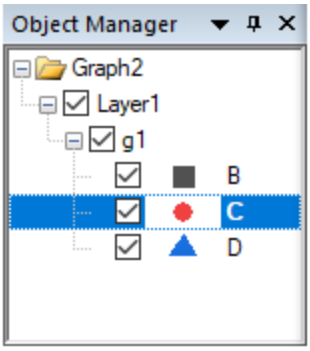


However, for most purposes, you can ignore the data list and select your plot data directly in the graph window or using the **Object Manager**:

- If your data plots are part of a *plot group*, select the *entire* group by pressing SHIFT + clicking on a plot. Alternately, click on the group icon in the Object Manager. Either will set **Input Range** to *all* plots in the group.
- To select just a *single* plot -- whether it be an independent plot or part of a group -- click once on the plot. Alternately, click on the plot icon in the Object Manager. Either will set **Input Range** to only the selected plot.



Select Plot Group



Select Single Plot



You can also indicate the active dataset by placing a red box around the plot's legend entry. In the case of grouped plots, the red box shows on the first plot in the group.

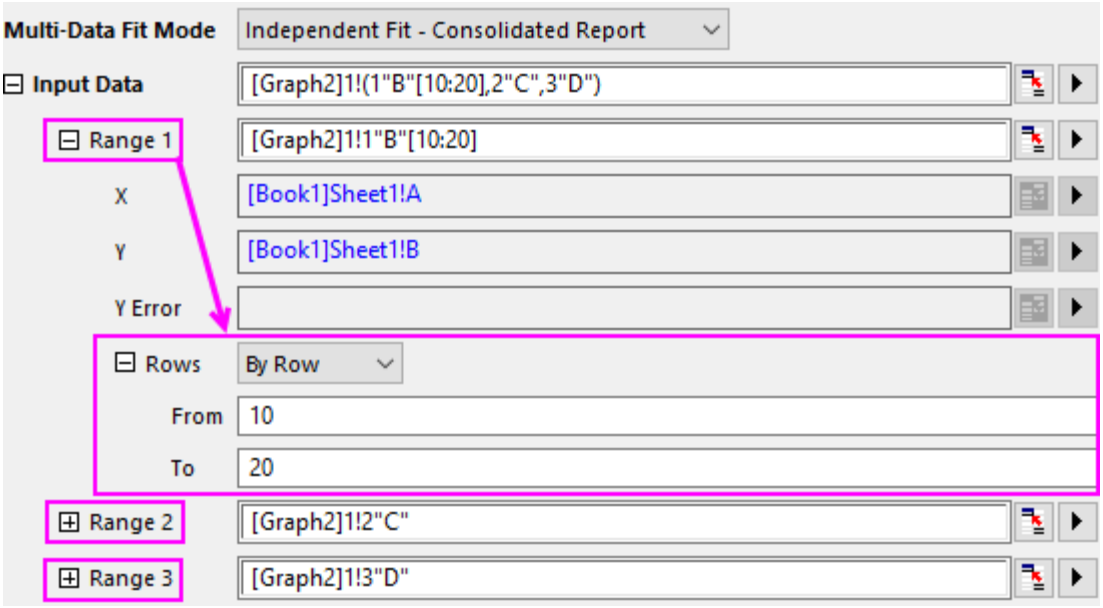
To turn this feature on or off:

- Click on your graph window, select **Format: Page...**, click on the **Legends/Titles** tab and enable or clear the **Indicate Active Dataset** box.
- Select the graph legend, then right-click on it and choose **Legend**, then select/deselect the **Indicate Active Dataset** menu entry.
- Select the graph legend, then right-click on it and choose **Legend: Update Legend** and enable or clear the **Indicate Active Dataset** box.

14.2.2.2 Customizing X scale range using Analysis Dialog "Rows" controls

You can adjust data range using the **Rows** controls under the **Input Data** branch of most analysis dialogs. If you have an analysis dialog box open:

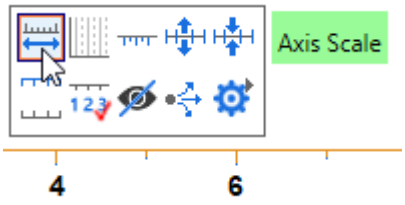
1. Click on **Input Data** branch to expand.
2. Change the **Rows** drop-down list to **By Row** or **By X** and enter your **From** and **To** values. Note that each **Range *N*** will have its own **Rows** controls.



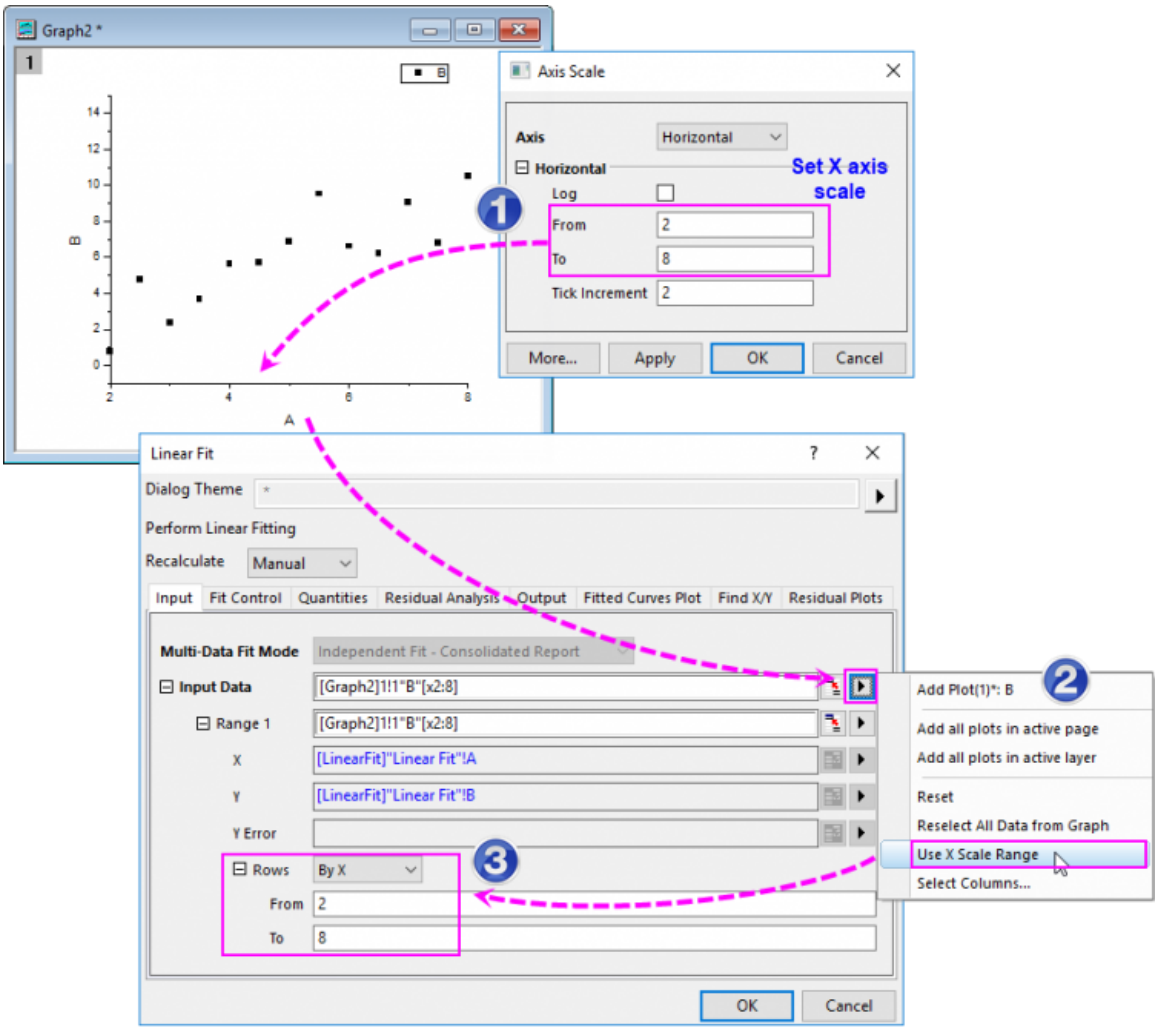
14.2.2.3 Customizing X scale range using Axis Scale Mini Dialog

Before opening an analysis dialog...

1. Click on an axis then click the Mini Toolbar **Axis Scale** button to open the Axis Scale dialog box.

2. 

3. Adjust the X axis scale to your desired range.
4. Now open your analysis dialog (e.g. Linear Fit) and click the arrow button beside the **Input Data** box and select **Use X Scale Range** from the context menu:

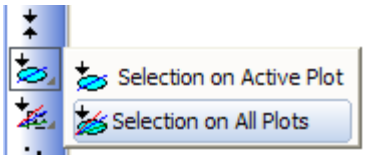


As you can see, the customized scale range of X axis on the graph has been used to specify the input data range for your analysis (**Rows** = **By X**).

14.2.2.4 Selecting data graphically using The Regional Data Selector

You can graphically select a range of data using the **Regional Data Selector** tool:

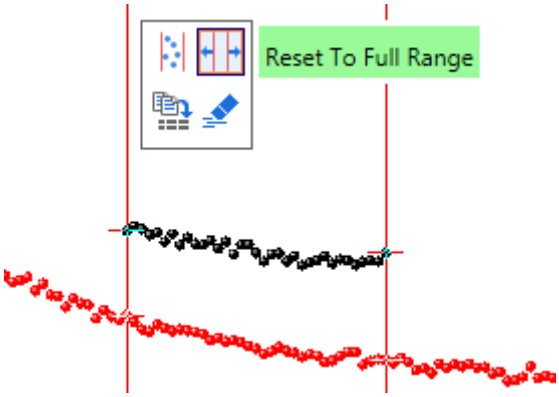
1. With a graph window active, click and hold on the **Regional Data Selector** button on the **Tools** toolbar, and then choose either the **Selection on Active Plot** or **Selection on All Plots** button.
2. Drag out a rectangle or freehand object to select an area of the plot(s). Note that you can press **Space** to toggle between rectangle  and freehand modes .



When you make your selection, **Data Markers** are placed on the graph to mark the selected range(s). You can now use Origin's analysis tools (e.g., Linear Fit) to perform an analysis on the selection, but note that some analysis dialog boxes do not work on multiple data ranges. The smoothing dialog box, for example, (**Analysis: Signal Processing: Smooth...**) will only smooth data in the active dataset or a single, selected plot.



There is a new Mini Toolbar for controlling X scale range when using **Data Markers**. Click on a Data Marker and use the buttons to **Set Display Range** or **Reset to Full Range**.



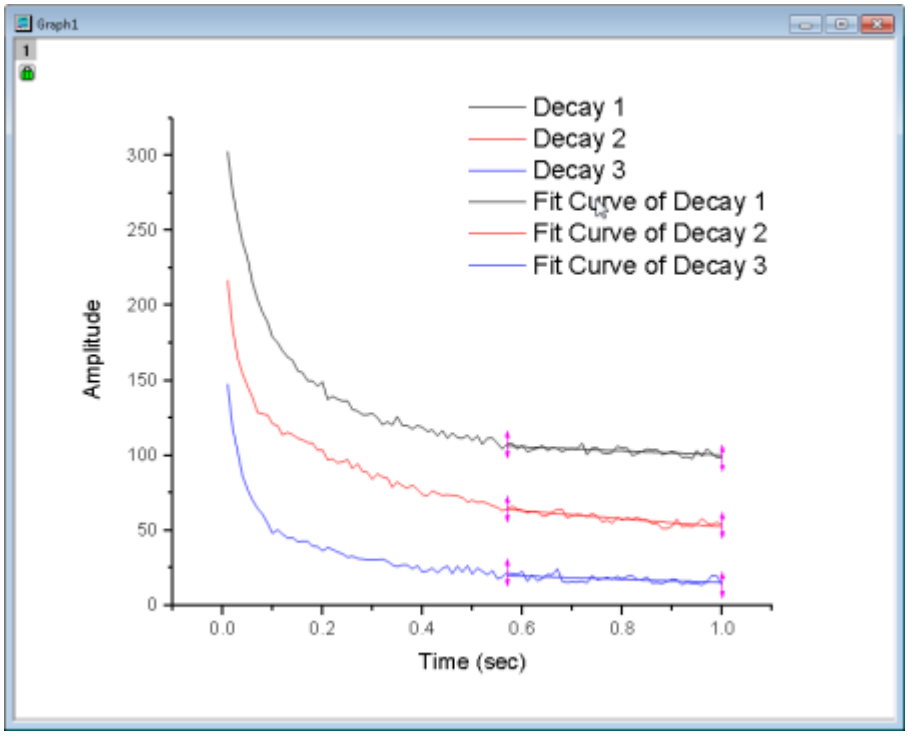


Tutorial: Linear Regression on Partial X Range

1. Import the file **\Samples\Curve Fitting\Exponential Decay.dat** into a new workbook.
2. Select all Y columns and create a line plot.
3. Click and hold the **Regional Data Selector** button on the **Tools** toolbar, and then choose the **Selection on All Plots** button .
4. Drag out a rectangle to select the tail-end of the three curves between values of approximately 0.6 and 1.0 along the X axis.
5. Use the **Analysis:Fitting:Linear Fit** menu to open the **Linear Fit** dialog.
6. **Input Data** branch is filled with three ranges. Mouse over Input Data branch will show tooltip which shows 1X,1Y, ...3X and 3Y.
7. If you want to change the data selection, click the **arrow** button in **Input Data**

and choose **Reselect All Data from Graph**. The dialog will roll up. Drag out a rectangle in graph again to make your selection and then click the button at the right end of the rolled up dialog box. The new data selection will show in **Input Data** branch.

8. Accept default Linear Fit settings and press **OK** to close the dialog. Linear fitting will be performed on all three curves over the selected range.



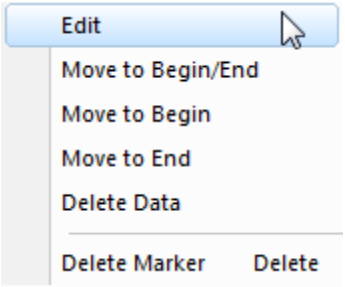


In addition to the **data selection** and **data masking** methods discussed in this section, Origin offers **data filtering** and **data reduction** tools. Please visit the linked pages for details.

14.2.2.5 Editing a Data Marker

To edit a **Data Marker**:

- To modify a data range, right-click a data marker and choose **Edit**; or double-click on the data marker. The red marker changes to a dark color with arrows on both ends and the cursor changes into a cross-hair. Drag the beginning or ending marker to a new position or use one of the keyboard shortcuts listed below and modify the data range. To escape edit mode, double-click on the marker or press the Enter key.
- There are other options when right-clicking the data marker such as **Delete Marker**, **Delete Data**, etc..



Note: If you have used the **Regional Data Selector** tool to place markers on multiple plots (**Selection on All Plots**), be aware that moving markers will affect the data range of *the active plot only*; the ranges of other selected plots will not follow that of the active plot. This is a limitation of the Regional Data Selector.

Alternately, you can use these keyboard shortcuts to select and edit data markers:

1. Select data markers using these keys ...

Hot Key	Action
s	Select the first pair of data markers on the graph (those marked with "1").
Tab	Select the next pair of data markers (not in edit mode) or the other data marker of the pair (in marker edit mode).
Home	Return to the first data marker.
End	Go to the last data marker.

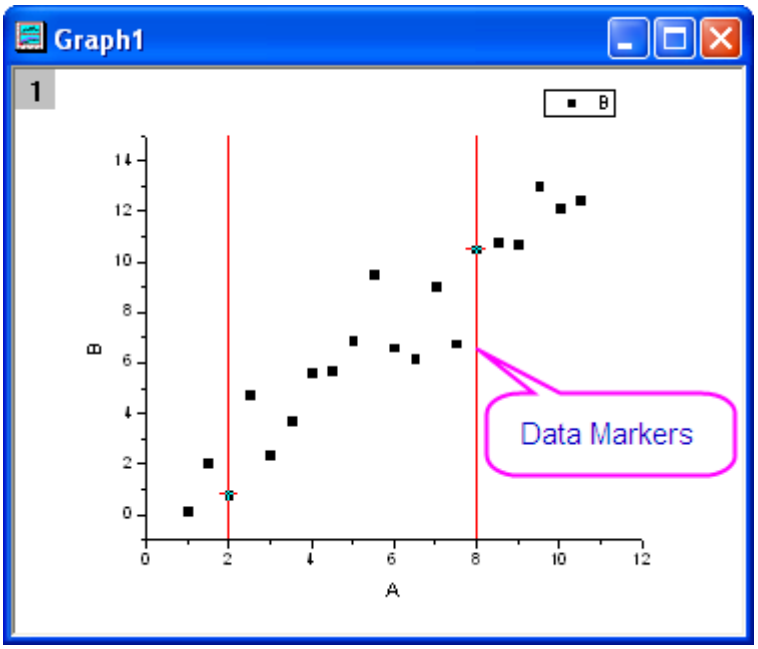
2. ... then activate and edit the data marker using these key combinations:

Hot Key	Action
Enter	Activate the selected data marker for editing. (Press **Enter** again to exit data selection mode.)
Arrow	Move the active data marker exactly one data point.
Ctrl/Shift + Arrow	Move the active data marker multiple data points.

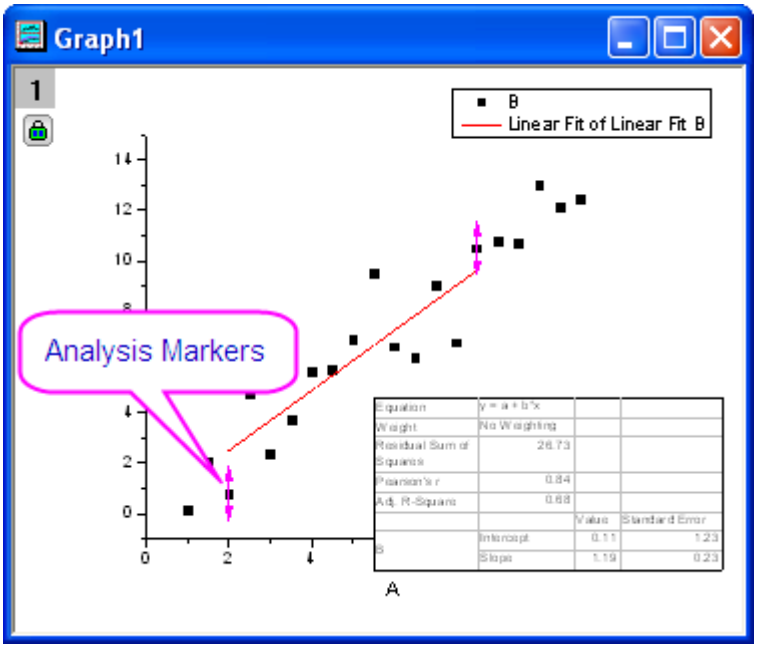
Delete	Delete the the active data marker.

14.2.2.6 Difference between Data Markers and Analysis Markers

- **Data Markers** define a sub-range that you select using the **Data Selector** tool.
  If you want to remove the data markers from a graph, you can select **Data: Clear Data Markers** from the main menu, or click the **Clear Data Markers** button on the **Markers and Locks** toolbar.



- When the analysis routine is completed, Data Markers are replaced with **Analysis Markers**. By default, Analysis Markers will not show if the analysis is done on the entire dataset. If performed on a subrange, Analysis Markers will show at the beginning and end of that subrange. To modify the data range and rerun your analysis, you must right-click an analysis marker and choose **Change Parameters...**. Change the Input Data range and rerun the analysis.



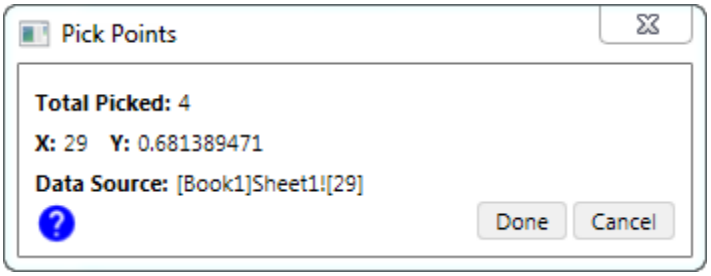
Note:

1. If you set **Recalculate** to **None** in the analysis dialog box, then no analysis markers are generated.
2. Data markers and analysis markers are not exported when you choose **File: Export Graphs**.
3. To select the exact same range again for another analysis, click the green lock and choose **Plot Input Data with Data Markers** to create a new graph and do analysis on it.
4. There is a **Markers and Locks** toolbar to control analysis markers and locks, such as **Marker Hide Show**  to toggle analysis markers on or off, etc. There is also an **Analysis Markers** submenu, available from the **Data** menu; or when you right-click on an analysis marker or green lock and choose **Analysis Markers**.

14.2.2.7 The Pick Points Tool

You can also pick the data points in the graph using the **Pick Data Points** tool. This works best for scatter or line + symbol plots of smaller datasets.

1. Select **Data: Pick Data Points**. The **Pick Points** dialog will pop up.
2. With the square cross-hair, you can read the coordinate of current data points in the **Pick Points** dialog (also the Data Source). Double-click on the point you want to pick until the cross-hair cursor became round, the actual X&Y values will be recorded and the total number of picked points will be counted up.



3. Once you finished the picking, click the **Done** button to output the results to a new workbook.

14.2.2.8 The Data Highlighter

In some cases, the **Data Highlighter** on the **Tools** toolbar, can be useful for selecting some portion of your data for further analysis. For instance, you have a 2D scatter plot and you are interested in data points in a particular region of the graph.

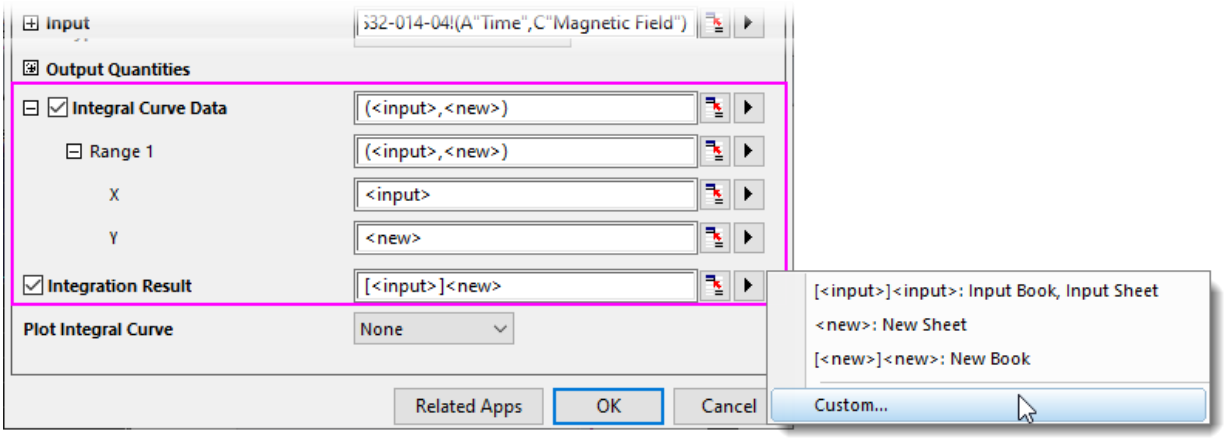
1. Click the the **Data Highlighter** button  on the Tools toolbar.
2. Highlight the desired group of data points. Note that you can toggle between rectangular and freehand selection modes by pressing the spacebar while the Highlighter is active. Selection points in the graph simultaneously highlights selected rows in the source worksheet.
3. Go the source worksheet, right-click on it and choose **Create Subset Sheet**.

You now have a secondary worksheet named as **wcopy*N***, that contains only the data points that you selected in the graph.

For more information, see **The Data Highlighter Tool**.

14.3 Data Output

Origin's analysis tools typically have an **Output** branch (the exact name varies by tool), in which you can specify the output that you wish to generate and where you would like that output to go. This happens to be the output branch of the Integration tool.



Output can be directed to various places -- a range of worksheet cells or columns, or possibly to a worksheet, a workbook, a matrixsheet, or a graph layer. Output options depend upon the target object as well as the type of window that was active when the tool was opened. You can determine your output target by:

- Typing directly in the associated text box, using a standard **range notation**
- Selecting data with the **interactive range control**.
- Type or select your target using a set of predefined **range strings**.

This being an introductory manual, we will stick with the simplest to use -- using **predefined range strings**. For information on other options, follow the links above.

14.3.1 Specifying Output Using Range Strings

Referring to the image above, note that range strings are enclosed by **< >** characters. Valid strings will differ from dialog to dialog (e.g. **<source>** is available from the **Book** list under the **Output Fitted Values To** branch of the **Fit Linear** dialog, but it is not used to specify **Output** in the **Smooth** dialog).

The most common strings:

- **<none>**: Generate no output.
- **<new>**: Create a new Origin object -- a column, a worksheet, a graph, etc.
- **<input>**: Use the input object for output.

You can type these strings directly into the edit box but the easiest thing to do is to just select them from the flyout menu (options will vary by tool). Alternately, you can click the **Custom** button and open the **Range String Builder**. Despite the intimidating name, it is just a way to step through the process of specifying your output target. For more information on range strings and Range String Builder, see **Output Results** in the Origin Help file.

14.4 Data Masking

Masking is another technique that you can use when you want to analyze only a subset of your data, or when you have spurious data points that you do not want included in your analysis. Masking or unmasking data will trigger recalculation of linked operations.

- You can mask data points in both worksheets and graphs.
- When data exist in both the worksheet and the graph, masking data in one will mask (and mark) the corresponding data in the other.
- **Mask** toolbar buttons work on both graphs and worksheets.
- **Tools** toolbar buttons work on graphs.
- When data are selected in the worksheet, a Mini Toolbar **Mask Data** button becomes available.
- Additionally, you can mask worksheet data by mathematical condition.



The active worksheet's **Masked** and/or **Unmasked Data Count** can be reported to the **Status Bar**.

14.4.1 Masking with the Mask Toolbar (worksheet, graph)

These toolbar buttons are used to mask and manipulate masking of selected data. Note that this includes graphs, once data have been selected (see the next section on **Tools** toolbar buttons for graph selection).

Action	Toolbar Button	Shortcut Command	Notes
Mask data		**Mask: Range**	Mask the selected data range. Masked data will display in the mask color.
Unmask data		**Mask: Clear Range**	Unmask the selected data range. Unmasked points are included in analysis operations and plot "normally".
Swap mask		**Mask: Swap**	Swap masked and unmasked points in the active dataset.
Change mask color		**Mask: Change Color**	Change the mask color of the masked data range.
Hide/Show masked points		**Mask: Hide**	Toggle display of masked points ON and OFF on-screen, and in printed and exported graphs.
Disable masking		**Mask: Disable Masking**	Toggle the mask ON or OFF for all masked data in the worksheet. When toggled OFF, all data points are analyzed and included in printed and exported graphs.

14.4.2 Masking with the Tools Toolbar (graph)



There was a change made to the default masking mode, starting with Origin 2021:

- Default is changed from mask by *row index number* to mask by *rectangular region*.
- Otherwise, behavior remains as before: toggle between masking modes (see next) by pressing Spacebar.
- Use system variable **@MTI=1** (persistent) to revert to mask by row index as default.

To mask points, click on the graph window to activate it:

1. Choose **Data: Mask Data Points** from the main menu or click the **Mask Points on Active Plot** button or **Mask Points on All Plots** button on the **Tools** toolbar, then hover on the graph.

2. To mask a single point, double click on the point. To mask a region of points, press the Space bar to toggle among masking *by row index number*, *by rectangular region* or *by freehand region* (differences explained below), then drag out a region.
3. Once data are masked in the graph, you can use the **Mask** toolbar buttons, described above.

Mask Points on Active Plot	Mask Points on All Plots of Active Layer	Purpose
		Mask data points *by rectangular region*. Only the data points inside the rectangle that you drag out, will be masked.
		Mask data points *by freehand region*. Only the data points inside the region that you drag out, will be masked.
		Mask data points *by row index number*. All data points between the lowest and highest selected index numbers are masked regardless of whether they lie inside your rectangle.

To remove the mask from data points in the graph window:

1. Choose either the **Unmask Points on the Active Plot** tool or the **Unmask Points on All Plots of Active Layer** tool on the **Tools** toolbar.
2. Use the space bar, as needed, to choose points by index, rectangular region or by freehand region, then drag to unmask your data points. The tool will be active until press ESC or click the **Pointer** tool.

14.4.3 Mask Mini Toolbar Button (worksheet)

When worksheet data are selected -- cells or entire columns -- A Mini Toolbar **Mask Data** button becomes available. The button works as a toggle to mask or unmask data within the selection.

14.4.4 Mask Cells by Condition (worksheet)

There is a tool for masking worksheet data values by condition (e.g. **<= 0**).

1. With the data selected (cells or one or more columns), choose **Column: Mask Cells by Condition**. This opens the colmask dialog.
2. Choose your **Condition** and **Value**, plus other options as needed and click **OK**.

14.4.5 Copy Mask Status

Two ways to copy mask status (the masked cells location) to other columns or worksheet.

- menu **Edit: Copy: Copy Mask Status**.
- menu **Worksheet: Copy Columns to**, or right click on columns and select from context menu **Copy Columns to**. This will open the colcopy X-Function. Uncheck **Copy Data** and check **Copy Mask**.

14.5 Mathematics

Origin provides a number of mathematics tools to perform basic calculations, interpolation, and area or volume calculations.

14.5.1 Basic Math

Tool Name	Description	Menu Entry
• Simple Column Math/Simple Curve Math • Normalize Columns/Curves • Average Multiple Curves • Differentiate	• Perform basic calculations on worksheet columns or XY data plots	**Analysis:Mathematics** (workbook, graph)
• Simple Math	• Perform element-wise arithmetic on two matrices.	**Analysis:Mathematics** (matrix)
• Subtract Reference Data	• Subtract one dataset from another	**Analysis:Data Manipulation** (workbook, graph)
• Subtract Straight Line	• Subtract a straight line defined graphically by clicking in the graph.	**Analysis:Data Manipulation** (graph)
• Subtract	• Subtract matrices in sheet by another matrix.	**Analysis:Mathematics** (matrix)
• Vertical Translate	• Use a Gadget to graphically translate	**Analysis:Data Manipulation** (graph)

• Horizontal Translate	curve(s) in vertical or horizontal.	
• Differentiate Gadget	• Perform differentiation over a region of interest in a graph	**Gadgets:Differentiate...** (graph)
• Intersect Gadget	• Calculate the intersection points of two or more data plots.	**Gadgets:Intersect...** (graph)
• Vertical Cursor	• Read and tag X, Y coordinate values for data plots across multiple graphs that share the same X axis.	**Gadgets:Vertical Cursor...** (graph)
• Set Column Values	• Use formulae to set/transform worksheet column values	**Analysis:Mathematics** (workbook)
• Inverse	• Generate pseudo inverse of a matrix	**Analysis:Mathematics** (matrix)
• Median Filter • Special Filter • Custom Filter	• Apply median/special/custom filter to a matrix	**Analysis:Mathematics** (matrix)

14.5.2Interpolation

Tool Name	Description	Menu Entry
• Interpolate Gadget	• Perform interpolation over a region of	**Gadgets:Interpolate...** (graph)

	interest	
• Interpolate/Extrapolate • XYZ Trace Interpolation(3D Graph) • Trace Interpolation(2D Graph)	• Perform interpolation/extrapolation on a group of XY data. • Perform periodic interpolation on XYZ worksheet data • Perform interpolation on cycle or periodic curves	**Analysis:Mathematics** (workbook, graph)
• Interpolate/Extrapolate Y from X • 3D Interpolation	• Perform interpolation/extrapolation on a group of XY data to find Y at given X values. • Perform 2D interpolation on a group of XYZ data to find Z at given XY values w/ choice of 8 methods. • Perform interpolation with a 3D function on XYZ dataset.	**Analysis:Mathematics** (workbook)
• 2D Interpolate/Extrapolate	• Perform 2D interpolation/extrapolation for a matrix	**Analysis:Mathematics** (matrix, graph from matrix)

14.5.3Area/Volume Calculation

Tool Name	Description	Menu Entry

• Integrate Gadget	• Perform integration over a region of interest in a 2D Graph	**Gadgets:Integrate...** (graph)
• 2D Integrate Gadget PRO	• Calculate max height, volume, FWHM (X,Y) for a contour or image graph created from matrix or XYZ worksheet data (OriginPro Only).	**Gadgets:2D Integrate...** (graph)
• Integrate(2D Graph) • Polygon Area(2D Graph) • XYZ Surface Area (3D Graph) PRO	• Perform integration on input data • Calculate the area of enclosed plot regions • Calculate the area of the XYZ surface	**Analysis:Mathematics** (workbook, graph)
• 2D Volume Integrate PRO • Matrix Surface Area PRO	• Calculate the volume beneath the matrix surface from zero plane • Calculate the area of the matrix surface	**Analysis:Mathematics: 2D Volume Integrate** (matrix, 3D graph from matrix) *or* **Analysis:Mathematics: Matrix Surface Area** (matrix, 3D graph from matrix)

14.6 Curve Fitting

In addition to Origin's built-in curve-fitting tools, there are a number of add-on Apps designed for various curve-fitting operations that are available for free from the OriginLab File Exchange. To find and install these Apps click **Analysis: Fitting: Find Apps**. The App Center will open, displaying only fitting-related Apps.

Browse available Apps and click the **Download and Install** button to install an App.



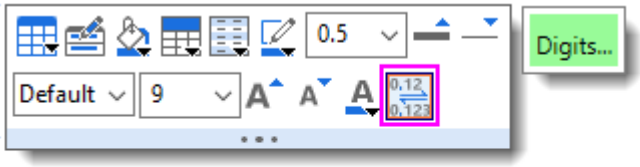
You can use named range values as X "From" and "To" values, initial parameter values, lower and upper bounds and fixed parameter values, in the linear fit, nonlinear fit (NLFit), polynomial fit and multiple linear regression dialog boxes.

14.6.1 Linear and Polynomial Fit



Most curve fitting and peak finding analyses add an optional Result Table with equation, weighting, slope, intercept, etc., to the active graph. There is a Mini Toolbar button for adjusting displayed digits in the Result Table.

Equation	y= a+ b*x
Plot	B
Weight	No Weighting
Intercept	−0.04945 ± 0.01316
Slope	0.96067 ± 0.02279
Residual Sum of Squares	0.03706
Pearson's r	0.99167
R-Square (COD)	0.9834
Adj. R-Square	0.98285



Linear and polynomial fitting can be performed on worksheet data or data plots in a graph. **Linear Fit of Matrix Stack** is performed on a series of matrix objects.

Tool Name	Menu Entry
• Linear Fit	**Analysis:Fitting:Linear Fit** *or* **Gadgets:Quick Fit** (graph)
• Fit Linear with X Error PRO	**Analysis:Fitting:Fit Linear with X Error**
• Multiple Linear Regression	**Analysis:Fitting:Multiple Linear Regression**
• Polynomial Regression	**Analysis:Fitting:Polynomial Fit** *or* **Gadgets:Quick Fit** (graph)
• Perform a linear fit on a series of matrix objects for each pair of XY coordinates.	**Analysis: Linear Fit of Matrix Stack** (matrix)

14.6.2 Nonlinear Curve Fit

You can perform nonlinear curve fitting using one of many built-in fitting functions, or you can create a user-defined fitting function. OriginPro supports implicit function fitting, surface fitting, and fit comparison. Some tools are available only in OriginPro.

The table below summarizes available nonlinear curve fitting tools:

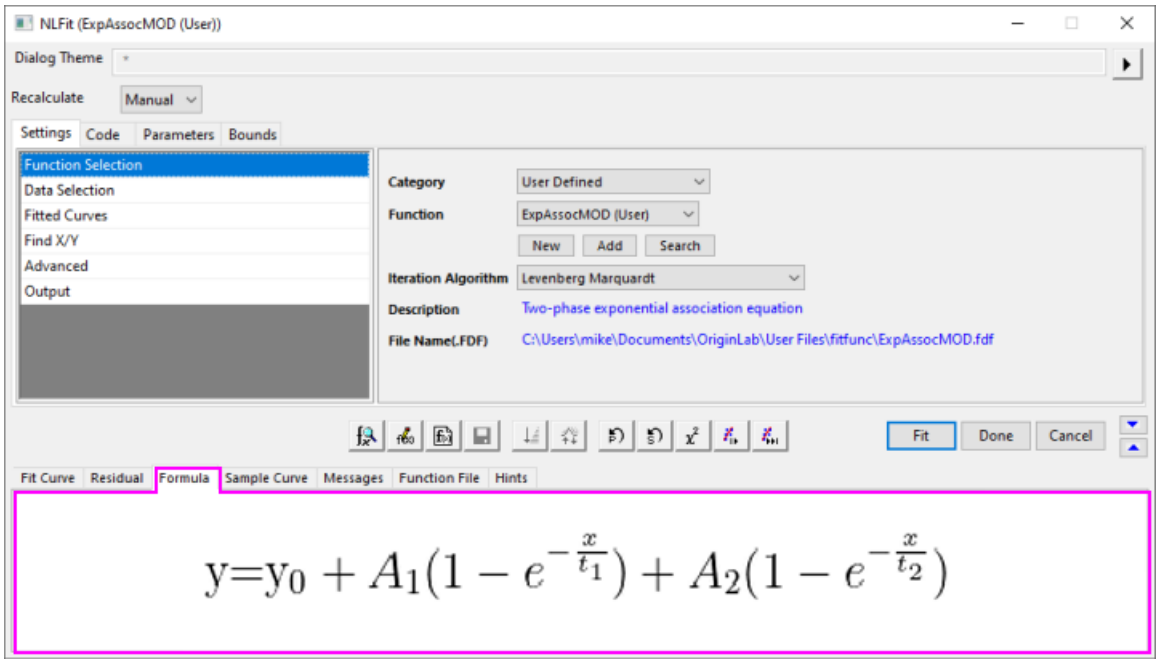
Tool Name	Features	Menu Entry

• Quick Fit Gadget	• Fit a region of interest in a graph interactively • Fit with built-in or user-defined fitting functions • Fit one or multiple datasets • Choose from a number of pre-defined analyses (incl. Linear, Cubic, Peak and Sigmoidal).	**Gadgets:Quick Fit** (graph) *or* **Gadgets:Quick Sigmoidal Fit** (graph)
• Nonlinear Curve Fitting	• Fit with built-in or user-defined fitting functions • Fit one or multiple datasets • Compare fit, multiple parameter sets • Global fit with parameter sharing • Global fit, parameter sharing with multiple functions PRO • Fit with replicas • Advanced options including bounds, constraints, fit control	**Analysis:Fitting:Nonlinear Curve Fit** (workbook, graph)
• Implicit Curve Fitting PRO	• Fit with implicit functions • Orthogonal Distance Regression (ODR) algorithm	**Analysis:Fitting:Nonlinear Implicit Curve Fit** (workbook, graph)
• Surface Fit PRO	• Fit data from a matrix or worksheet XYZ columns	**Analysis:Fitting:Nonlinear Surface Fit** (workbook, graph) *or* **Analysis:Nonlinear Matrix Fit** (matrix)
• Fitting Function Builder	• Create or edit user-defined fitting functions	**Tools:Fitting Function Builder**

• Fitting Function Organizer	• Manage fitting functions by categories • Move or share functions between categories	**Tools:Fitting Function Organizer**
• Fitting Function Library App	• Download fitting functions from originlab.com • Request or Share a Function with OriginLab	Click the **Fitting Function Library** icon in the Apps Gallery
• Simulate	• Simulate a curve from a given function • Simulate a surface from a given function PRO	**Analysis:Fitting:Simulate Curve** *or* **Analysis:Fitting:Simulate Surface**
• Fit Comparison PRO	• Compare fit results from two datasets using one function function • Compare fitting results for one dataset using two fitting functions	**Analysis:Fitting:Compare Datasets** *or* **Analysis:Fitting:Compare Models** (workbook, graph)
• Fit and Rank Functions PRO	• Compare fit results of two or more functions for a single dataset	**Analysis:Fitting:Rank Models** (workbook, graph)



User Defined fitting functions support an EMF or SVG image of the **Formula** (**Equation**) to display in lower panel of **Nonlinear Curve Fitter (NLFit)** or **Fitting Function Organizer**.



To add an EMF or SVG image to your user-defined function:

1. Create the EMF/SVG using an equation editor (**hint**: Origin's LaTeX App can convert a user-defined fitting function into a LaTeX equation object).
2. Name the EMG/SVG image just as you named the user-defined fitting function (e.g. *MyFunction.SVG*), making sure to add the correct file type, and place the image in \User Files\fitfunc.

14.7 Peak Analysis

Origin provides several tools for peak analysis. With these tools, you can define and subtract baselines, find peaks, integrate peaks, and fit peaks. Some tools are available only in OriginPro.

Note that a number of free Apps designed for peak analysis are available from the OriginLab File Exchange. To find and install these Apps click **Analysis: Peaks and Baseline: Find Apps**. The App Center will open, displaying only peak-fitting related Apps. Browse available Apps and click the **Download and Install** button  to install an App.

The table below summarizes various built-in tools available for peak analysis:

Tool Name	Features	Menu Entry
• Quick Peaks Gadget	• Perform peak analysis over a region of interest • Create baseline	**Gadget:Quick Peaks** (graph)

	• Subtract baseline • Find peaks • Integrate peaks • Fit peaks	
• Multiple Peak Fit	• Pick multiple peaks • Fit peaks	**Analysis:Peaks and Baseline:Multiple Peak Fit** (graph, workbook)
• Peak Analyzer	• Create baseline • Subtract baseline • Find peaks • Integrate peaks • Fit multi-peak datasets PRO • Fit baseline PRO • Find hidden peaks • Compute many peak characteristics PRO	**Analysis:Peaks and Baseline:Peak Analyzer** (graph, workbook)
• Batch Peak Analysis	• Use a theme file created using Peak Analyzer tool • Perform batch peak analysis on multiple datasets	**Analysis:Peaks and Baseline:Batch Peak Analysis Using Theme** (graph, workbook)

14.8 Signal Processing

Origin provides signal processing tools for many tasks, including producing signal transforms, smoothing/filtering, and correlation on 1D and 2D signals. Advanced tools are available in OriginPro.

You may refer to the tables below for the signal processing tools and their menu entry.

14.8.1 Signal Transforms

Tools	Menu Entry

• FFT Gadget	**Gadgets:FFT...** (graph)
• Fast Fourier Transform (FFT) • Inverse Fast Fourier Transform (IFFT)	**Analysis:Signal Processing:FFT** (workbook, graph)
• 2D FFT PRO • 2D IFFT PRO	**Analysis:Signal Processing:FFT** (matrix)
• Short-time Fourier Transform (STFT) PRO	**Analysis:Signal Processing:STFT** (workbook)
• Hilbert Transform PRO	**Analysis:Signal Processing:Hilbert Transform** (workbook, graph)
• Image Profiling	**Plot>2D:Profile:Image Profile** (matrix, worksheet, XYZ data)

14.8.2 Filtering

Tools	Menu Entry
• FFT Filter	**Analysis:Signal Processing:FFT Filters** (workbook, graph)
• 2D FFT Filter PRO	**Analysis:Signal Processing:2D FFT Filters** (matrix)
• IIR Filter Design PRO	**Analysis:Signal Processing:IIR Filter** (workbook, graph)

14.8.3 Smoothing

Tools	Menu Entry

• Smooth	**Analysis:Signal Processing:Smooth** (workbook, graph, matrix)

14.8.4 Correlation

Tools	Menu Entry
• Correlation	**Analysis:Signal Processing:Correlation** (workbook, graph)
• 2D Correlation PRO	**Analysis:Signal Processing:2D Correlation** (matrix)

14.8.5 Convolution

Tools	Menu Entry
• Convolution	**Analysis:Signal Processing:Convolution** (workbook, graph)

14.8.6 Wavelet Analysis (Pro Only)

Tools	Menu Entry
• Continuous Wavelet Transform • Discrete Wavelet Transform (Decomposition) • Inverse Discrete Wavelet Transform (Reconstruction) • Multi-Scale Wavelet Decomposition • Smoothing • Noise Removal	**Analysis:Signal Processing:Wavelet Analysis** (workbook, graph)
• 2D Wavelet Decomposition	**Analysis:Signal Processing:Wavelet**

• 2D Wavelet Reconstruction	**Analysis** (matrix)

14.8.7 Other Advanced Tools (Pro Only)

Tools	Menu Entry
• Rise Time Gadget	**Gadget:Rise Time** (graph)
• Decimation	**Analysis:Signal Processing:Decimation** (workbook, graph)
• Coherence	**Analysis:Signal Processing:Coherence** (workbook, graph)
• Envelope Curves	**Analysis:Signal Processing:Envelope** (workbook, graph)

14.9 Image Processing

Origin provides a collection of tools for basic image processing. These tools are accessible from the **Image** menu when a matrixbook is active. Some tools are PRO only.

The tools are organized in the following sub-menus:

- **Image:Adjustments**
- **Image:Arithmetic Transforms**
- **Image:Conversion**
- **Image:Geometric Transforms**
- **Image:Spatial Filters**

14.10 Topics for Further Reading

- Analysis Dialog Boxes: Specifying Your Input Data
- Outputting Analysis Results
- Recalculation of Analysis Results
- Generating Analysis Report Sheets
- Performing Math Operations on Datasets
- Linear/Polynomial Regression
- Nonlinear Curve Fitting

- Peak Analysis using Origin
- Signal Processing
- Image Processing and Analysis

15 Statistics

15.1.1 Apps for Statistics

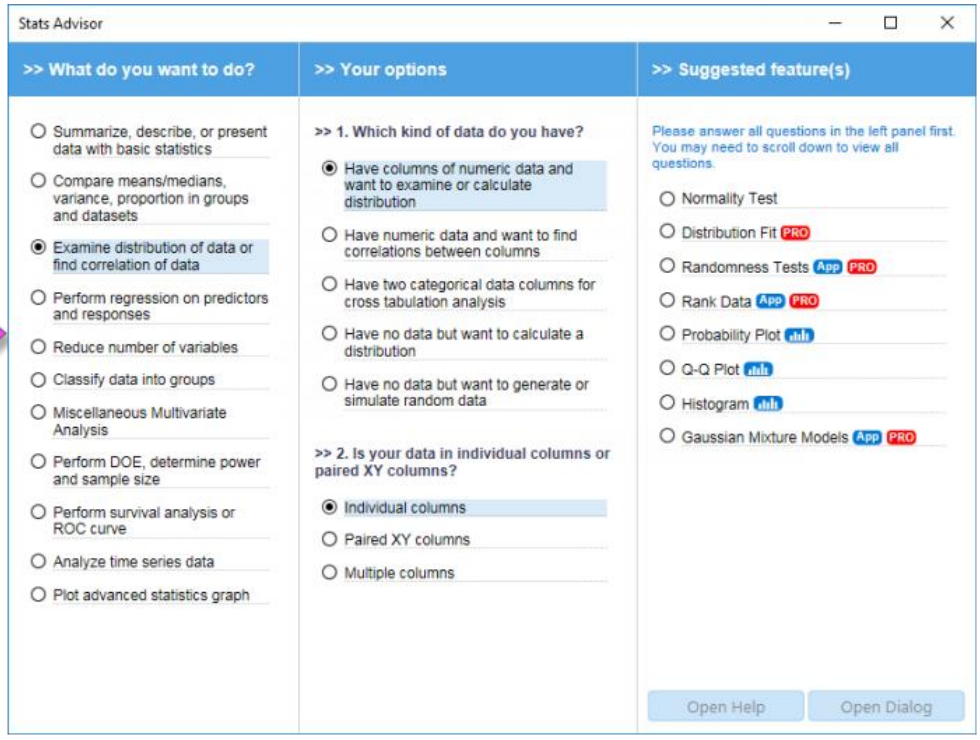
Origin 2016 introduced add-on tools called **Apps**. Since being introduced, a number of statistics-related graphing and analysis Apps have been added to OriginLab's **File Exchange** and more tools are being released all the time.

A few Apps are installed with your Origin software. Note that as of the fall of 2019, all Apps are available at no extra cost and they are easily added to Origin. Click **Statistics: Find Apps**. This opens the App Center to show only statistics-related Apps. Browse available Apps and click the **Download and Install** button to install an App.

Origin includes a pre-installed App called **Stats Advisor**. This App uses an interactive "wizard" interface to help you choose appropriate statistical tests and to tell you where to find them in your Origin software, or -- if the test is available from another add-on App -- where to find it on the **OriginLab File Exchange**.

Look for this App in the **Apps Gallery**, located to the right side of your Origin workspace



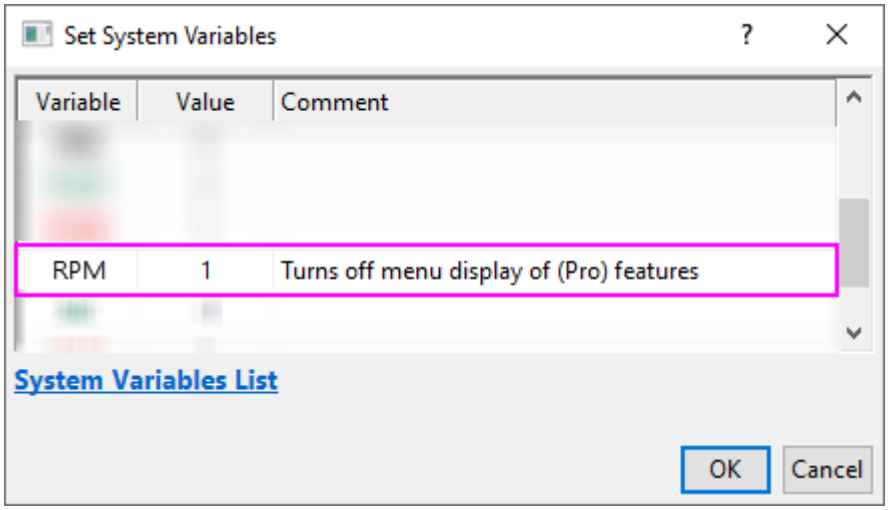


15.2 Basic Statistics



Many of Origin's advanced statistical tests are available only in **OriginPro**. Users of standard Origin will see these Pro-only tests marked as **(Pro)** in the main menu. If you own the standard version of Origin but find that you need features of OriginPro, you can upgrade by **contacting your Origin representative**.

If you wish to continue using standard Origin without seeing **(Pro)** menu commands, click **Preferences: System Variables** and enter the following in the **Set System Variables** dialog box and click **OK** (*Comment* is optional):



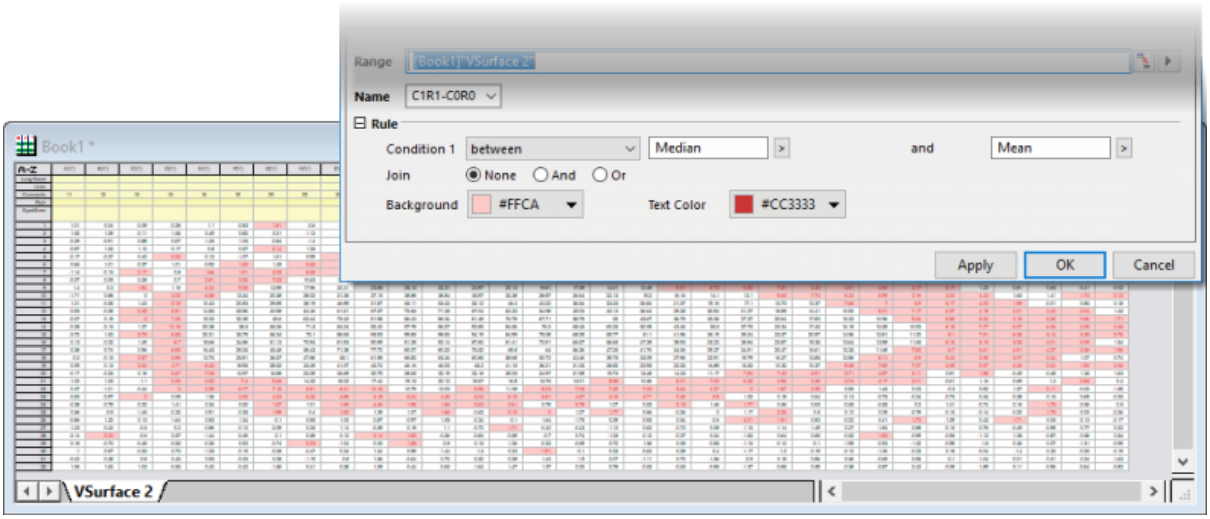
15.2.1 Basic Statistics on Worksheet

Descriptive Statistics	Menu entry with worksheet active
• Statistics on Columns • Statistics on Rows	**Statistics:Descriptive Statistics**
• Statistics on Y by X Bin	No menu access. To open the dialog box: 1. Click **Window: Script Window**. 2. At the cursor, type `statsxy -d` and press Enter.
• Cross Tabulation and Chi-Square PRO	**Statistics:Descriptive Statistics**
Frequencies/Counts	
• Discrete Frequency • Frequency Counts • 2D Frequency Counts/Binning	**Statistics:Descriptive Statistics**
Distribution	

• Distribution Fit PRO • Normality Test	**Statistics:Descriptive Statistics**
Relationship	
• Correlation Coefficient PRO • Partial Correlation Coefficient PRO	**Statistics:Descriptive Statistics**
Detecting Outliers	
• Grubbs Test • Dixon's Q-test	**Statistics:Descriptive Statistics**



You can apply **Conditional Formatting** to a worksheet by applying mathematical expressions or statistics to cell values. For more information, see **Conditional Formatting**.



15.2.2 Descriptive Statistics on Graph

Origin provides a couple of gadgets to explore and summarize data plotted in graphs.

Descriptive Statistics	Menu entry with graph active

• Cluster Gadget PRO	**Gadgets:Cluster...**
• Statistics Gadget	**Gadgets:Statistics...**

15.2.3 Descriptive Statistics on Matrix

Descriptive Statistics	Menu entry with matrix active
• Output descriptive statistics (mean, sd, min, max, etc.) on the matrix stack (series of matrix objects), for each pair of XY coordinates.	**Analysis: Descriptive Statistics**

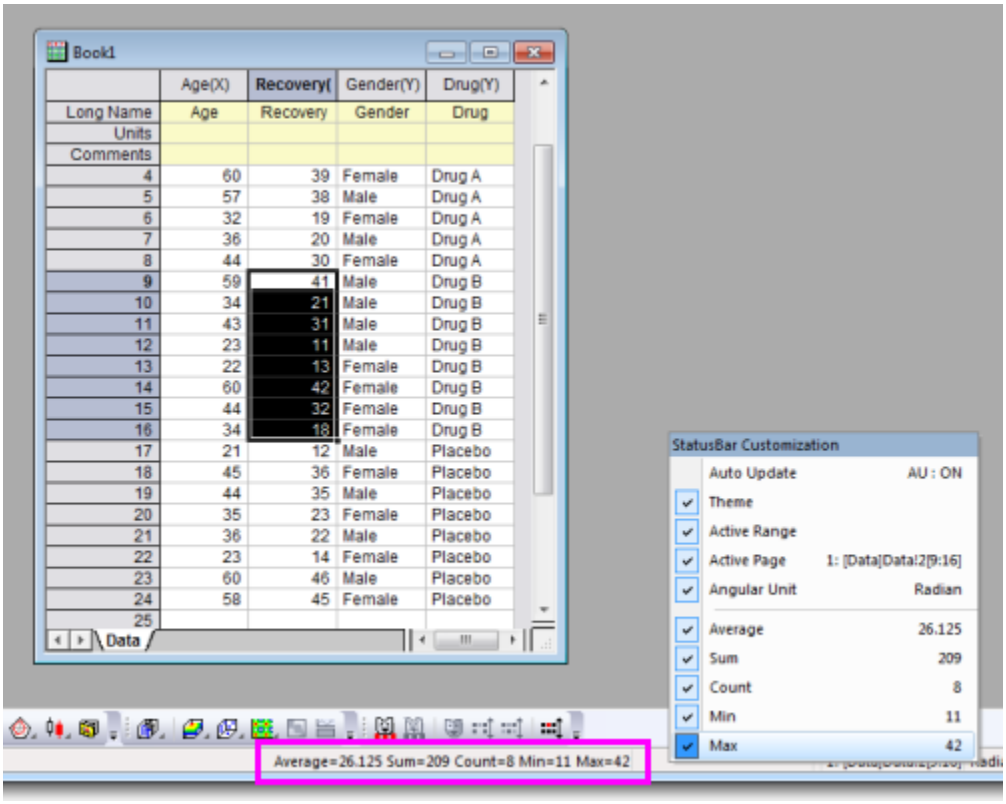
15.2.4 Statistics on Selected Range

Origin provides some quick ways to obtain basic statistics on a selected range of worksheet cells, or data plot(s) in a graph.

15.2.4.1 Status Bar

Select a range of cells in a worksheet. Note that the selection can include cells from one or more columns, and you can use the CTRL key to select non-contiguous groups of cells.

Basic statistics (average, sum, count, min, max) for your selected data will be displayed in the status bar. Right click on the status bar to customize what quantities to display.



15.2.4.2 Command or Script Window

Statistics, Report to Script/Command Window

1. Select a range of cells in a worksheet, or click and select a group of data plots or an individual data plot in a graph.
2. Open the **Command Window** or the **Script Window** from the **Windows** menu, and type one of these commands, then press ENTER:

```
stats

moments

quantiles
```

With the Command Window, the results are typed out below the command line. With the Script Window, you will need to issue an additional command to return your results:

```
stats;
```

```
stats.=;
```

Note: For more information, please refer to the:

Help: X-Function > X-Function Reference > Statistics

15.3 Statistical Graphs

Origin provides numerous statistical graph types. All graphs can be easily customized and saved as a template for repeat use. View the **Graphing** and **Customizing Graphs** chapters of this guide for more information.

Graph Type	Plot Menu Category
Box Charts: Box, Interval Plot, Bar Charts, Box Overlap, Box Normal, Half Box, Bar Overlap, Bar Normal, Scatter Interval, Double-Y Box, Marginal Box Charts.  **Box Scale** is available for box charts, diagramming key user-selected box statistics.	**Statistical**
Box Charts, Violin Plots, etc., Grouped: Grouped Scatter - Indexed Data, Grouped Box Charts - Indexed Data, Grouped Box Charts - Raw Data, Grouped Column Scatter - Indexed Data, Grouped Interval Plot - Indexed Data, Grouped Mean Bar - Indexed Data, Grouped Violin - Indexed Data, Grouped Half Violin - Indexed Data, Grouped Half Box - Indexed Data.	**Categorical**
Violin Plots: Violin Plot, Violin with Box, Violin with Point, Violin with Quartile, Violin with Stick, Split Violin, Half Violin.	**Statistical**
Histograms: Histogram, Histogram + Rug, Histogram + Probabilities, Multi-Panel Histogram, Distribution, Distribution + Rug, Histogram with Labels, Stacked Histograms, Marginal Histograms.	**Statistical**
Population Pyramid	**Statistical**
2D Kernel Density	**Contour**
Heatmap: Heatmap, Heatmap with Labels, Split Heatmap	**Contour**
Contour - Categorical Z	**Contour**

Cluster Plots	**Categorical**
Probability: Probability Plot, Q-Q Plot.	**Statistical**
Pareto and QC Chart: Pareto Chart - Binned Data, Pareto Chart - Raw Data, QC (X-bar R) Chart.	**Statistical**
Bland-Altman Plot (Tukey mean-difference)	**Statistical**
Scatter Matrix	**Statistical**
Trellis Plot: Trellis Plot, Double-Y Trellis Plot, Double-Y Trellis Plot	**Categorical**
Parallel Plot: Parallel Plot, Parallel Sets, Parallel Index.	**Categorical**

The following statistical graphs are only available within the **Plots** branch of the statistical analysis dialogs.

Graph Type	Menu Entry
• Means Plot • Means Comparison Plot	**Statistics: ANOVA: One-Way ANOVA, Two-Way ANOVA** **Statistics: ANOVA: One-Way Repeated Measure ANOVA** PRO
• Survival Curve • One Minus Survival Curve • Hazard Curve • Log Survival Curve	**Statistics: Survival Analysis: Kaplan-Meier Estimator** PRO
• Scree Plot • Component Plot	**Statistics: Multivariate Analysis: Principal Component Analysis** PRO
• Dendrogram	**Statistics: Multivariate Analysis: Hierarchical Cluster Analysis** PRO
• Classification Summary Plot • Classification Fit	**Statistics: Multivariate Analysis: Discriminant Analysis** PRO

Plot • Canonical Score Plot	
• ROC Curve	**Statistics: ROC Curve** PRO

15.4 Comparing One, Two or More Groups

Origin provides parametric and non-parametric tests to compare one, two, three or more groups.

15.4.1 Parametric Hypothesis Tests

Feature	Menu Entry
• One-Sample t-Test • Two-Sample t-Test • Pair-Sample t-Test • One-Sample Test for Variance PRO • Two-Sample Test for Variance PRO	**Statistics: Hypothesis Testing**
• One-Sample Proportion Test PRO • Two-Sample Proportion Test PRO	**Statistics: Hypothesis Testing**
• Two-Sample t-Test on Rows PRO • Pair-Sample t-Test on Rows PRO	**Statistics: Hypothesis Testing**

15.4.2 ANOVA

Feature	Menu Entry
• One-Way ANOVA • Two-Way ANOVA • Three-Way ANOVA • One-Way Repeated-Measures ANOVA PRO • Two-Way Repeated-Measures ANOVA PRO (Supports both Balanced and Unbalanced data)	**Statistics: ANOVA**

15.4.3 Non-parametric Tests

Feature	Menu Entry
• One-Sample Wilcoxon Signed Rank Test • Paired-Sample Wilcoxon Signed Rank Test • Paired-Sample Sign Test • Mann-Whitney Test • Two-Sample Kolmogorov-Smirnov Test • Kruskal-Wallis ANOVA • Moods Median Test • Friedman ANOVA	**Statistics:Nonparametric Tests**

Notes:

Multiple nonparametric tests can be run simultaneously. (Accessible from the **Statistics:Nonparametric Tests** menu) Available options are:

- **(NPH) K Independent Samples**: Kruskal-Wallis ANOVA and Mood's Median Test
- **(NPH) Paired Samples**: Paired-Sample Wilcoxon Signed Rank Test and Paired-Sample Sign Test
- **(NPH) Two Independent Samples**: Mann-Whitney Test and Two-Sample Kolmogorov-Smirnov Test

15.5 Advanced Statistics

Several additional tools are available in **OriginPro**.

15.5.1 Multivariate Analysis

Origin offers several multivariate analysis methods to help you simplify, classify, or make predictions from your data.

Feature	Menu Entry
• Principal Component Analysis • K-Means Cluster • Hierarchical Cluster • Discriminant Analysis • Canonical Discriminant Analysis • Partial Least Squares	**Statistics:Multivariate Analysis**

Notes: Canonical Discriminant Analysis is integrated with Discriminant Analysis. It is accessible from the **Statistics:Multivariate Analysis:Discriminant Analysis: Canonical Discriminant Analysis(System)** menu.

15.5.2 Survival Analysis

OriginPro includes widely used survival tests to quantify survivorship in a population.

Feature	Menu Entry
• Kaplan-Meier Product-limit Estimator • Comparing Survival Curves • Cox Proportional Hazards Model • Weibull Fit Model	**Statistics:Survival Analysis**

Notes: Comparing Survival Curves is accessible in the **Kaplan-Meier Product-limit Estimator** feature.

15.5.3 Power and Sample Size

Statistics, Power and Sample Size Origin provides eight types of power and sample size analysis, useful in designing experiments. Origin can compute the power of the experiment for a given sample size and can also compute the required sample size for given power values.

Feature	Menu Entry
• One-Proportion Test • Two-Proportion Test	**Statistics: Power and Sample Size**

• One-Sample t-Test • Two-Sample t-Test • Paired-Sample t-Test • One-Variance Test • Two-Variance Test • One-Way ANOVA	

15.5.4 ROC Curve

ROC Curve analysis is useful in determining if an incident has occurred, or in comparing the accuracy of two methods that are used to discriminate between diseased and healthy cases.

Feature	Menu Entry
• ROC Curve	**Statistics: ROC Curve**

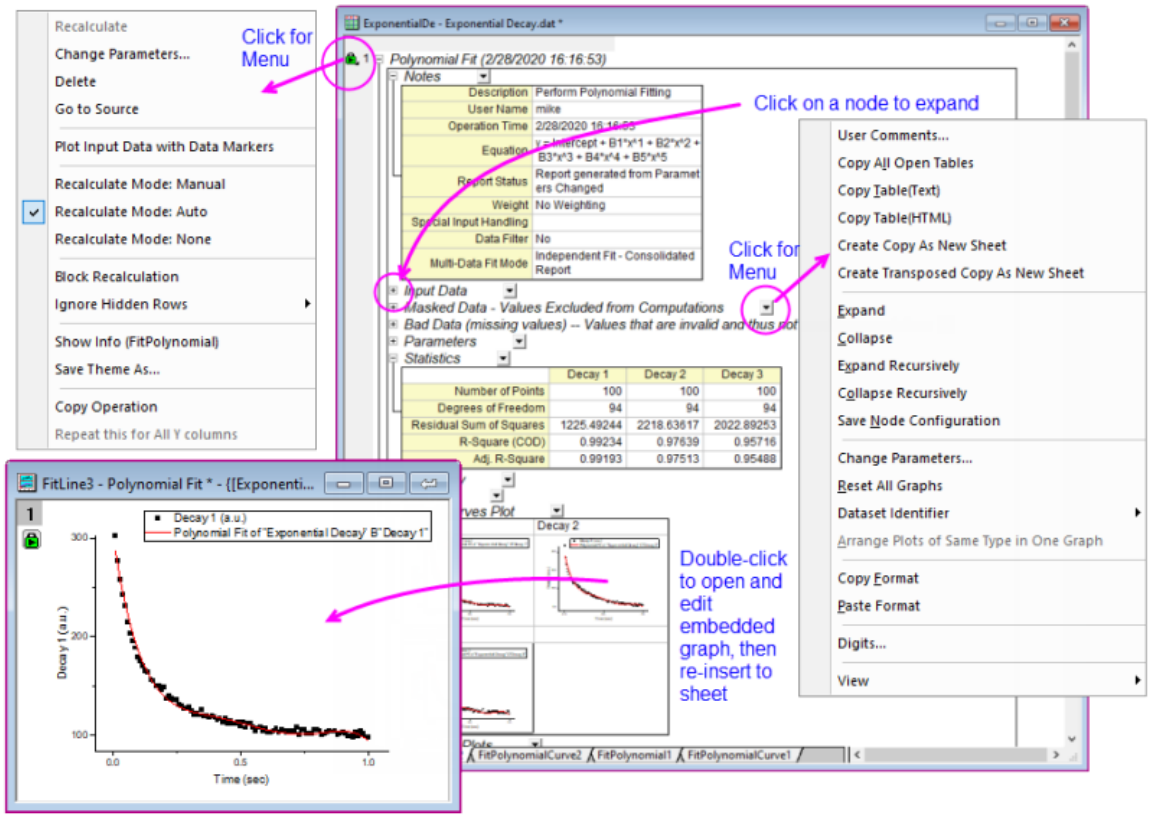
15.6 Topics for Further Reading

- Statistics on Worksheet Columns
- Statistics on Worksheet Rows
- Descriptive Statistics
- Statistics Charts, General
- Appendix 2 - Origin Graph Types
- Appendix: Statistical Graph Types by Template
- Normality Testing
- Distribution Fit
- Parametric Hypothesis Testing
- ANOVA
- Nonparametric Tests
- Multivariate Analysis
- Survival Analysis
- ROC Curves

- Power and Sample Size Tests
- LabTalk Supported X-Functions: Statistics

16 How to Handle Repetitive Tasks

16.1 Analysis Report Sheets



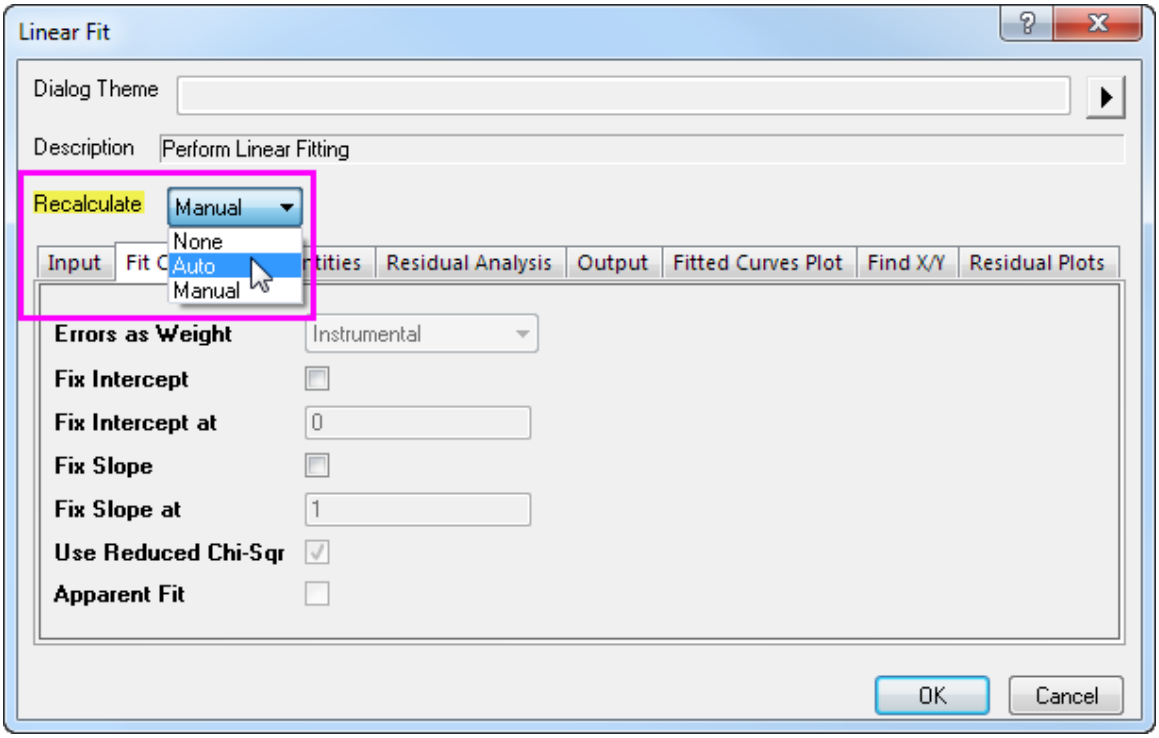
Analysis operations, such as those performed with the tools listed in the Analysis chapter or in the Statistics chapter, create detailed **Analysis Report Sheets**.

- Analysis Report Sheets contain tables that are organized in a tree structure.
- Expand or collapse each branch to show or hide table contents.
- Tables are not static reports. They are constructed using placeholders linked to particular analysis results and thus, results can be recalculated with changes to input or analysis parameters.
- You can add comments to the sheet or copy tables and paste or paste-link them to other windows in your project.
- Analysis Report Sheets often contain embedded graphs such as fit curves or residual plots. To customize these plots, double-click on them. This opens the embedded graph in a separate window where -- as with any Origin graph -- you can customize it using Mini Toolbar buttons or Plot Details controls. When you are done customizing, click the Close  button and re-insert the customized graph back into the report sheet.

For more information on **Analysis Report Sheets**, see the Origin Help File.

16.2 Recalculation

All Analysis and most data processing dialog boxes in Origin include a **Recalculate** control. This control allows you to tie output operations to the source data. When Recalculate is set to **Auto** or **Manual**, changes to the source data will trigger an update of the output (pending, in the case of **Manual**). This allows you to analyze multiple datasets by, for instance, serial import of a new data file to replace existing data. This feature is also the basis for creating **Analysis Templates**. The Analysis Template concept is explained below.



The **Recalculate** control has three modes:

None	• No lock is displayed in the output. • Changes to the input data will not result in an update of the output.
Auto	• An **auto** green lock displays on the output columns and graphs of the output data. The main operation lock displays on the left-most column as , while any related operations columns to right of the main operation display the "+" icon . • The output will be automatically updated when input data is changed. • You can also click on a lock icon and open the dialog to make changes to the analysis settings, including changing the **Recalculate** mode.
Manual	• A **manual** green lock is displayed in up-to-date output columns, and graphs that

contain plots of the output data. Any related operations columns to right of the main operation display the "+" icon .

- A yellow lock indicates that input data have changed and recalculation operations are pending. You can trigger updates individually by clicking on a yellow lock and selecting **Recalculate** from the shortcut menu; or you can update *all* pending operations by clicking the yellow **Recalculate** button on the Standard toolbar.
- You can also click on a lock icon and open the dialog to make changes to the analysis settings, including changing the **Recalculate** mode.

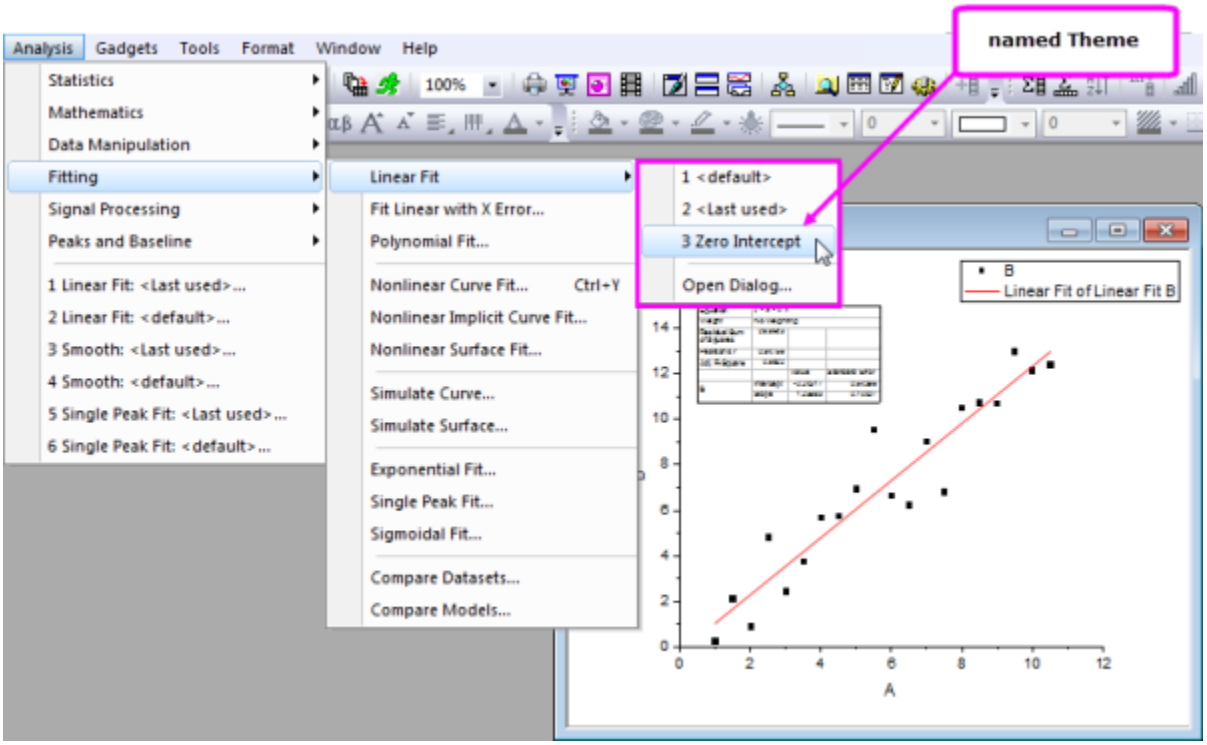
Tips for Managing Recalculation Operations

- A left-click on the lock displays a menu that provides multiple options including changing analysis parameters, opening source data sheet, switching to result sheets, and controlling the status of the operation such as switching from manual update to auto update.
- The **Standard** toolbar displays a **Recalculate** button that shows green when all project operations are up-to-date and yellow when there are recalculation operations pending. If you have opened a project and you see that the **Recalculate** button is yellow, understand that calculations are pending and that the data and data plots you see in the project may not be up-to-date.
- If a lock icon appears dark gray in color , this indicates that the associated operation was performed in OriginPro and the window or project has been opened in standard Origin. The operation is not supported by standard Origin and to modify or re-run the analysis, you will need to locate a computer with an OriginPro license.
- If a lock icon appears red something has occurred which makes recalculation operations impossible. Such conditions are rare but would occur if, for instance, you passed a project file that included a user-defined curve fitting operation to a colleague but failed to pass along your user-defined fitting function.
- Having many recalculation operations in your project file can slow down your work. You can block recalculation -- both **Manual** and **Auto** recalculation -- by clicking on a lock icon and choosing **Block Recalculation** from the popup menu. Placing a block on pending recalculations places a yellow "block" icon on each associated operation in the chain. Placing a block on up-to-date calculations places a green "block" icon on each operation in the chain. To remove the block, click on the "block" icon and clear the check mark (Note that clicking the yellow **Recalculate** button on the Standard toolbar does not update blocked operations).
- To suspend all recalculation, press **Ctrl+0**, choose **Analysis: Pause Auto Recalculate** (worksheet only) or click the **Pause Auto Recalculate** button on the Standard toolbar.
- You can hide the lock icons on your graph window by clicking on the graph and, from the main menu, choosing **View: Show** and clearing the check mark beside **Lock Icons**. This does *not* remove associated operations from the graph window. To re-display the icons, repeat the procedure.

16.3 Dialog Themes

Settings in analysis dialogs and most other data processing dialogs can be saved as a **Dialog Theme** file. Once saved, these Theme files containing your custom settings can be recalled as needed. Multiple theme files can be saved from a dialog, allowing for easy repeat analysis of datasets that may each require different settings.

Last used dialog box settings are automatically saved as a **<last used>** Theme. Origin also allows you to save your custom settings as the **<default>** Theme. The default Theme, last used Theme, and any named Theme that you have saved, can all be accessed from the Dialog Theme fly-out menu that opens from the dialog box. The same Themes are also available from the main menu item associated with the analysis dialog box.



Dialog Themes are managed with the **Theme Organizer** tool, available from the **Tools** menu.



Tutorial: Saving and Re-using a Dialog Theme

1. Import the file **Linear Fit.dat** from the **Samples\Curve Fitting** subfolder.
2. Highlight column B and select **Analysis: Fitting: Linear Fit...**
3. In the **Linear Fit** dialog that opens, check the **Fix Intercept** checkbox (under **Fit Options**) and set the **Fix Intercept at** edit box to **0**.
4. Click the  button next to the **Dialog Theme** control and select **Save as ...**. In the **Theme Name** box, enter **Zero Intercept** and press **OK**. Press **OK** again to close the Linear Fit dialog box and perform the analysis. *FitLinear1* and **FitLinearCurve1** result sheets are added to the workbook.
5. Return to the source data and highlight column C. Select **Analysis: Fitting: Linear Fit** from the menu. You will see a fly-out menu with multiple Theme options including the **Zero Intercept** Theme you saved in the previous step.

6. Select your saved Theme. The analysis is automatically performed on Column C using the settings saved in the Theme. Note that the dialog box does not open.



Tips for Working with Themes:

- Hold the **SHIFT** key while clicking on your Theme in the main menu and the associated dialog box will open with settings from the selected Theme loaded into the dialog box.
- The default Theme Origin shipped for an analysis is called **System Default**. Click the fly-out menu in the analysis dialog and choose **System Default** to load it.
- Click the fly-out menu in the analysis dialog and choose **Delete** to delete Themes you have created, including any customized **<default>** Theme.
- The customized **<default>** Themes for all analysis dialogs are saved in Defaults.xml in the **User Files Folder**. Deleting this file restores system default settings of all analysis dialogs.

16.4 Workbook and Project Templates

There are a number of reasons for saving a single workbook or an entire project, as a "template" file. Here are a few typical scenarios.

- You might import data files that always have a fixed number of columns with a repeating pattern of column designations (e.g. XYyError, XYyError, etc.) so you create a custom workbook just for importing these files (**File: Save Template As**).
- You regularly import data files of similar structure and you perform some routine graphing and analysis operations on the data, then generate a report using a worksheet or a workbook embedded Notes window. This would be a typical example of an Analysis Template (**File: Save Workbook As Analysis Template**).
- You perform some operations similar to those described in the previous example but you can't save your workbook as an Analysis Template because all data are cleared from the workbook on saving and that would destroy a sheet of reference values that you rely on for your analysis. Instead, you could opt to clear only the imported data and save your workbook as a window file (**File: Save Window As**). This preserves the sheet of reference data and like the Analysis Template, saves analysis and graphing operations with the workbook.
- You routinely import data, do some analysis and generate a report and would like to make use of the Analysis Template concept (as in the second bullet point), but you have multiple windows in your project, including Layout windows that cannot be embedded in the workbook. So, a single workbook Analysis Template won't do the job. In this case, you could save the project without data by "cloning" it (**File: Clone current Project**).

16.4.1 The Workbook as Template

The workbook can contain worksheets with data, metadata, floating or embedded graphs, embedded matrices and notes, plus scripts, variables and other supporting data.

You can save a workbook as a template for repetitive graphing and/or analysis tasks. Depending on your needs, there are three options for saving your workbooks -- as a **workbook** (OGWU), as a **template** (OTWU) or as an **Analysis Template** (OGWU):

- **Workbook (OGWU)**: Choosing **File: Save Window As** saves *all* workbook content.
- **Analysis Template (OGWU)**: Choosing **File: Save Workbook as Analysis Template** clears all data columns that are used in analysis operations in the workbook before saving. Operations are preserved as are data that are *not* associated with analysis operations.
- **Template (OTWU)**: Choosing **File: Save Template As** saves the structure of the workbook, plus any analysis operations that exist in the workbook, but all data including data that are not associated with these analysis operations, are cleared.



The **New Book** dialog is a template library for managing workbook, matrixbook and Analysis Templates. See Workbooks for an overview of dialog box features.



Tutorial: Creating an Analysis Template

1. Start with a new workbook and import the file **Samples\Curve Fitting\Sensor01.dat**.
2. Select column B and use the **Analysis: Fitting: Linear Fit** and open the **Linear Fit** dialog.
3. Change the **Recalculate** drop-down to **Auto**.
4. Click the **Fit Control** tab, check the **Fix Intercept** check box and enter **0** in the **Fix Intercept at** edit box.
5. Click **OK** to close the dialog and perform the linear regression.
6. Answer "Yes" to the prompt and switch to the **FitLinear1** report sheet to view results including plots of the best-fit line and residuals.
7. Now switch back to the original data sheet and import the file **Samples\Curve Fitting\Sensor02.dat**. The analysis results will be automatically updated with this new data. Note that you could continue to use this workbook for importing other data; or you could right-click the workbook window title and choose **Duplicate without Data** to create a new workbook with the linear fitting operation saved into it. This allows you to import new data into the new workbook and thus save a project with multiple such workbooks, if desired.
8. With the workbook active, select the menu **File: Save Workbook as Analysis Template...**, and in the dialog that opens, give a name such as **Linear Fit of Sensor Data** and click **Save**.
9. Choose **File: Recent Books** and select the template that was saved in the previous step. The workbook will open and the data sheet will be empty.
10. Import the file **Samples\Curve Fitting\Sensor3.dat** into the empty data sheet

(1st sheet). The analysis results will be automatically generated upon data import.

Analysis Templates can include summary sheets and custom report sheets (worksheet-based or HTML), making them an ideal medium for importing, analyzing, plotting and reporting the results of your routine analyses. When used in combination with the the **Batch Processing** tool, you can repeat a set of analyses and graphing operations for any number of data files and create a PDF summary report for each one, as it is processed. View the **Batch Plotting** and **Batch Analysis** sections of this chapter for examples of using the workbook as a template for handling repetitive tasks.



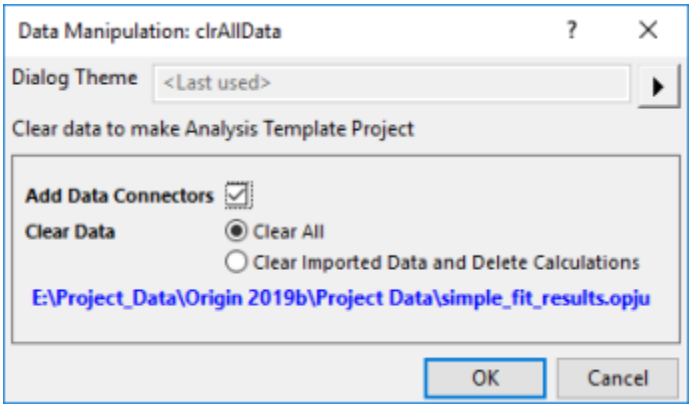
Notes windows now support **HTML**. Notes windows can be added to the workbook (right-click on sheet tab and **Add Notes as Sheet**) making it easy to incorporate HTML reports into your **Analysis Templates**. For more information, see **HTML Reports From Notes Windows**.

16.4.2 The Project as Template

The Origin project file can also be used as a "template" for carrying out repetitive graphing and analysis tasks -- particularly when your analyses and graphing tasks can't be resolved within a single workbook.

The basis steps of creating a "project template" are as follows:

1. Create the desired graphs and/or analysis results from data in your workbook(s) and save the project.
2. After saving the project, choose **File: Clone current Project**. A small dialog opens for configuring your cloned project:



   - **Add Data Connectors**: Check this box to add **Data Connectors** from the cloned project to your saved project. Each cloned worksheet will have a connection to the original worksheet in the saved project. If you plan to import data from other similar files in your cloned project, you should CLEAR this box.
   - **Clear All**: Clear imported data only. Analysis operations are preserved in the cloned project.
   - **Clear Imported Data and Delete Calculations**: Clears imported data and analysis operations.
3. Click **OK** to create your cloned project. Selected data are cleared and the cloned project named UNTITLED is added to the workspace.
4. Name and save the cloned project and when you are ready to process more data files, you can open it and import new data:

- If your analysis and graphing operations are linked to a particular set of data files that are periodically updated, you don't necessarily need to use Connectors. You can simply re-import the files (**Data: Re-import...** or **Re-import Directly**).
- If your operations are linked using Data Connectors, click the Connector icon  and from the popup menu choose **Import** (this Connector only) or **Import All** (all Connectors in the book).
- One possible scenario is that you store all of your data in a single Origin project file. If you have added Data Connectors from your cloned project, to your original project then you can selectively import just the data that you need to perform your graphing and analysis operations. When you have finished, you can save the file to a new name, preserving your cloned project for re-use.

16.5 Batch Plotting

Origin provides several methods for batch plotting of graphs from multiple datasets or files. The following two sections outline how to create multiple graphs from (1) data that is already in worksheets, or (2) multiple data files. In addition to these two procedures, batch plotting can also be performed programmatically using LabTalk script or Origin C.

16.5.1 Duplicating Graphs with Data from Other Books/Sheets/Columns

If you have several workbooks, worksheets or columns with similar data structure as you the data used to plot the graph, you can have Origin clone that graph via **Window: Duplicate (Batch Plotting)** menu with new data. There are two cases:

- If you have plotted a graph with a single dataset and customized it, and want to clone the graph with other data in the same worksheet: Choose **Window: Duplicate (Batch Plotting): Duplicate with New Columns**. Pick other data (columns) that you want to plot. Each column will be plotted as a new graph.
- If you have plotted a graph with data in one worksheet or workbook and customized the graph, and you want to clone the graph with other worksheets or workbooks with a similar data structure: Choose **Window: Duplicate (Batch Plotting): Duplicate with New Sheets/Duplicate with New Books**. Origin will list all worksheets or workbooks with a similar data structure. Pick the worksheet or workbook you want to plot from. Each worksheet or workbook will be plotted as a new graph.



Tutorial: Duplicating a graph with data from other books/sheets

1. Press the **New Project**  button on the **Standard** toolbar.
2. Press the **Import Wizard**  button on the same toolbar. This opens the Import Wizard dialog box.
3. Click the browse button  to the right of the **File** box. Browse to the **Import and Export** folder and select the files **S15-125-03.dat**, **S21-235-07.dat**, and **S32-014-04.dat**. Click **Add File(s)**, then press **OK**. In the Import Wizard dialog box, press **Finish**. The files are imported into three separate workbooks.
4. Drag and select all three Y columns in one of the workbooks, then select the menu item **Plot>2D: Multi-Y: 3Ys Y-YY** to create a graph with multiple Y axes and one

shared X axis. Make any desired customizations to the graph.

5. Right-click on the title bar of the graph window then select **Duplicate (Batch Plotting)** shortcut menu.
6. In the dialog box that opens, press Ctrl and select the other two workbooks/worksheets then press **OK**. Two more graphs are created with data from the other two workbooks/worksheets.

16.5.2 The Workbook as a Template for Processing Multiple Files

If you want to plot graphs from many data files but don't want to import all files to workbooks before plotting, you can import one file, create the desired graph(s) based on that data, then add the graph(s) to your workbook and save the workbook as a template. Using this template you can process multiple files, creating a workbook for each file and its corresponding graph.



Tutorial: Creating graphs from multiple data files

1. With a new workbook active, choose **Data: Import From File: Single ASCII** and import the file **Sensor01.dat** from the **Samples\Curve Fitting** subfolder of the Origin installation folder.
2. Highlight column B and create a line+symbol graph of the data.
3. Double click on the X axis to open the Axis dialog. Make sure **Scale** tab is active. Select both **Horizontal** and **Vertical** on the left panel and set **Rescale** to be **Auto** and click **OK**. This will ensure that the graph scale will update automatically on data change.
4. In the workbook, right-click on the worksheet tab and select **Add Graph as Sheet**, then select the graph created above and click **Done**. This will add a new workbook sheet containing an embedded graph.
5. Switch to the data sheet, double-click on the tab rename the sheet as **Data**.
6. Select the **Worksheet: Clear Worksheet** menu item to clear the data in this sheet. Note that this step is optional. Clearing the data will reduce the size of the template saved in the next step.
7. Select the **File: Save Window As...** menu item, assign a name such as **Sensor Data and Graph** and press **Save**.
8. Now we can use this template to process multiple files. Select the **File: Batch Processing...** menu item.
9. In the dialog box that opens set the **Batch Processing Mode** to **Load Analysis Template**, then set the **Analysis Template** control to point to your saved template.
10. Set **Data Source** to **Import from Files** and select the three files **Sensor01.dat**, **Sensor02.dat**, and **Sensor03.dat** from the **Samples\Curve Fitting** subfolder.
11. Set the **Data Sheet(s)** to **Data** and set **Result Sheet** to **<none>**.
12. Press **OK** to close the dialog box. You should get three workbooks with the data imported into the first sheet and the graphs updated in the 2nd sheet. To further

edit any of the graphs, double-click on the graph to pop up an editable page.



If processing of your data requires some custom import settings, those settings will be saved to the data sheet by default. Settings thus saved to the sheet will be used for import when batch processing of multiple files using the workbook as a template.

16.6 Batch Analysis

Origin provides several ways to perform batch analysis of multiple files, data columns, or data plots.

16.6.1 Analyzing Multiple Datasets in Dialogs

Some analysis dialog boxes, for instance Linear Fit and Nonlinear Fit, support analysis of multiple datasets. Report sheets created by these dialog boxes include a summary table listing the parameter values for each dataset and other pertinent results such as goodness-of-fit indicators. The summary table can be copied to an external sheet for further processing.



Tutorial: Fitting Multiple Datasets

1. Open a new workbook and import the file **Samples\Curve Fitting\Multiple Gaussians.dat** from the Origin installation folder.
2. Set the Long Names of the four Y columns as **Peak 1**, **Peak 2**, **Peak 3** and **Peak 4**.
3. Select all four Y columns, and use the **Analysis: Fitting: Nonlinear Curve Fit...** menu item to open the **NLFit** dialog box.
4. Select **Gauss** from the **Function** drop-down list, then press the **Fit** button to perform fitting and close the dialog box.
5. Switch to the **FitNL1** report sheet. You will see a table named **Summary** which lists the fit parameters and fit statistics for each dataset.

Summary

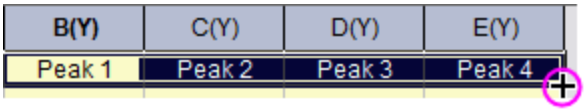
	y0		xc		w		A		sigma	FWHM	Height	Statistics	
	Value	Error	Value	Error	Value	Error	Value	Error		Value		Reduced Chi-Sqr	Adj. R-Square
Peak 1	1.933	0.165	24.888	0.247	12.724	0.643	115.121	6.803	6.362	14.981	7.219	0.444	0.937
Peak 2	4.954	0.057	20.046	0.144	8.621	0.325	49.182	1.929	4.311	10.151	4.552	0.088	0.962
Peak 3	0.147	0.016	24.973	0.242	12.393	0.620	11.116	0.643	6.197	14.592	0.716	0.004	0.937
Peak 4	-2.033	0.048	20.015	0.053	4.611	0.112	-51.452	1.188	2.305	5.429	-8.903	0.087	0.985



In the NLFit report sheet, click on the downward-pointing arrow button next to the table named **Summary** and select **Create Copy as New Sheet**. This will create a copy of the table in which all cells are linked to the report. Any updates/changes to the fit will automatically update the values in this copied sheet. This sheet can then be used to plot or to perform secondary analysis on the fit parameters.



When enumerating something like a column Long Name, as you did in step 2 above, enter the string in the first cell (e.g. "Peak 1"), select the cell and hover over the lower-right corner. When the cursor becomes a "**+**", drag across the other cells and the contents of the first cell will be extended to those cells.



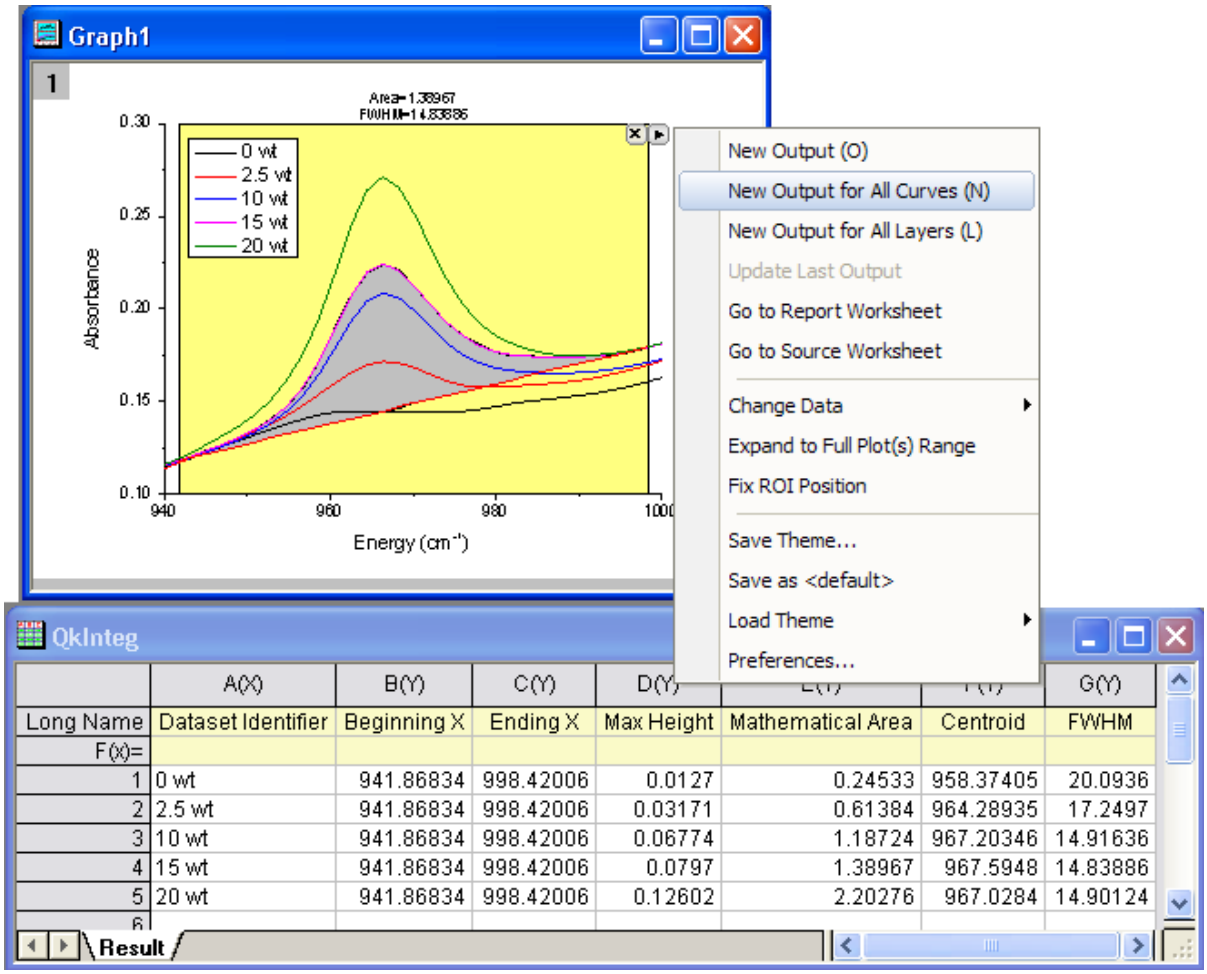
16.6.2Using Gadgets for Analyzing Multiple Curves

Origin includes several gadgets for performing interactive analysis on plotted data. Gadgets allow selecting a data range of interest, switching from one dataset to another, and setting various preferences specific to the analysis being carried out.

Most gadgets offer an option to perform the analysis on all data plots in the current layer, or all data plots in the graph page. This allows for performing repetitive analysis on multiple datasets using the same settings, and generating a table of results across all datasets.

Tutorial: Using the Integrate Gadget to Integrate Multiple Curves

1. Open the project "Samples\Spectroscopy\Absorbance Spectra.opj".
2. With the graph window active, choose **Gadgets: Integrate** from the main menu.
3. In the dialog that opens, click the **Baseline** tab and set the **Mode** drop-down to **Straight Line**.
4. Click the **Output** tab, expand the **Output Quantities to** node, and check **Append to Worksheet**. Press **OK** to close the dialog box.
5. A region of interest (ROI) object is placed on the graph. If necessary, click on the ROI and resize this object to cover the entire data range plotted in the graph. The integrated area will be displayed as a shaded region.
6. Click the arrow button at the top right of the ROI object, then choose **Change Data** from the context menu and switch to another plot in the layer. Check that the current baseline setting works for other curves in the layer.
7. Click the arrow button , select **New Output for All Curves (N)** or simply press the "N" key. Integration is performed on all curves.
8. Click the arrow button again and select **Go to Report Worksheet**. Expand the report worksheet to view the integration results from all curves.



	A(X)	B(Y)	C(Y)	D(Y)			G(Y)
Long Name	Dataset Identifier	Beginning X	Ending X	Max Height	Mathematical Area	Centroid	FWHM
F(x)=							
1	0 wt	941.86834	998.42006	0.0127	0.24533	958.37405	20.0936
2	2.5 wt	941.86834	998.42006	0.03171	0.61384	964.28935	17.2497
3	10 wt	941.86834	998.42006	0.06774	1.18724	967.20346	14.91636
4	15 wt	941.86834	998.42006	0.0797	1.38967	967.5948	14.83886
5	20 wt	941.86834	998.42006	0.12602	2.20276	967.0284	14.90124
6							

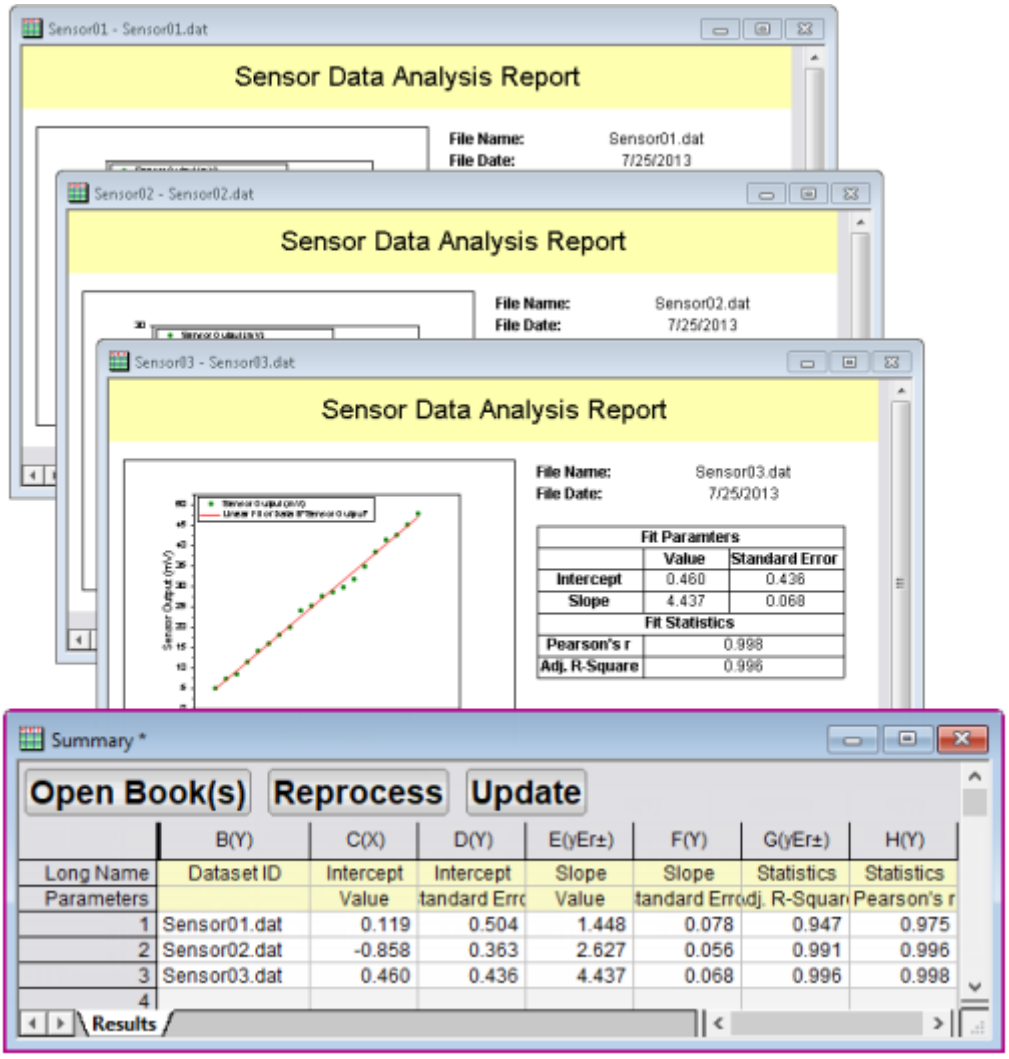
16.6.3 Batch Analysis Using an Analysis Template

The **Batch Processing** tool allows you to process multiple files or datasets using an **Analysis Template**. Simply perform the analysis on one of the files, include all desired results and report sheets in one workbook, and save that workbook as an Analysis Template. The Batch Processing tool then uses the Analysis Template to process multiple files/datasets. You have the option to retain one workbook for each file/dataset, and additionally, to create a summary table with select analysis parameters and other metadata that you have pre-configured in your analysis template.

Tutorial: Batch Analysis of Multiple Files using an Analysis Template

1. From the main menu, choose **File: Batch Processing...**. This opens the **Batch Processing** dialog box.
2. Set **Batch Processing Mode** to **Load Analysis Template**.
3. Press the browse button ... to the right of the **Analysis Template** box and browse to and select the file *<Origin Program Folder>***\Samples\Batch Processing\Sensor Analysis.OGW**. This Analysis Template contains multiple sheets set up for linear regression analysis, reporting, and summary tables.

4. Set **Data Source** = **Import From Files**, then click the browse button  to the right of the **File List** and from the **Samples\Curve Fitting** folder, select files **Sensor01.dat**, **Sensor02.dat** and **Sensor03.dat** .
5. Set **Dataset Identifier** to **File Name**, **Data Sheet(s)** to **Data**, and **Result Sheet** to **Result**. Note that these are the names of existing sheets in the Analysis Template.
6. Uncheck **Delete Intermediate Workbook**.
7. Click **OK** to close the dialog box and process the three files (you can answer "No" to the prompt). You will obtain three books with the data, analysis results, and report for each file, and a fourth book containing the summary table of analysis results from all files.





Saving the initial workbook as an Analysis Template is optional. You can simply save the Origin project (.opj) and next time replace the data in your workbook to update all results and graphs. The **Batch Processing** tool also has an option to repeatedly import files into the active window, allowing you to simply re-use an existing book within a project (which contains all desired analysis and graphs) as an on-the-fly template for

the batch analysis.



You can batch generate analysis reports using a custom **MS Word** template, with the option of outputting a **PDF** and/or an **MS Word** file for each report. Additionally, you can opt to combine reports into a single file. For information on **Batch Processing with a Word Template for Reporting**, see this tutorial.

16.7 Repeating Analysis on Other Datasets or Data Plots

For some analysis operations, you can perform the analysis on one dataset or data plot and then repeat the analysis for all other data. This feature is available via a special shortcut menu entry, when you click on the lock associated with the operation.

- In worksheet columns or reports, clicking the lock will show the menu command **Repeat this for All Y columns**. Selecting this will repeat the analysis on all other Y columns in the source data sheet.
- In a graph, clicking the lock will show the menu command **Repeat this for All Plots**. Selecting this will repeat the analysis for all other data plots in the graph page, even if the plots are in different layers.

This is particularly useful for such analysis dialog boxes as **smoothing** or **interpolation** that support input of only one dataset. As long as the data are *contained in one worksheet* or *plotted in one graph*, the analysis can be repeated on all other datasets.



Users should note a change for **Origin 2022b**: In earlier versions, if the original analysis output created a new sheet or book, **Repeat this for All** would create a new sheet or book for the remaining Y columns or plots. Users expressed a desire to send all output to a single sheet regardless of the original output specification. If input columns share a common X dataset, the X dataset will be written to the output sheet only once. To roll back to the previous behavior, set **@RAO** = *0* (default is *1*).



Tutorial: Smoothing Multiple Columns in a Worksheet

1. Import the file **Samples\Curve Fitting\Multiple Gaussians.dat** into an empty workbook.
2. Select column B and click **Analysis: Signal Processing: Smooth** to open the **smooth** dialog box.
3. Accept the defaults and press **OK** to perform smoothing. A new column will be added with the smoothed data.
4. Click on the lock in the output column and select **Repeat this for All Y columns**. Three more columns of smoothed data with same settings will be generated from the data in columns C thru E.

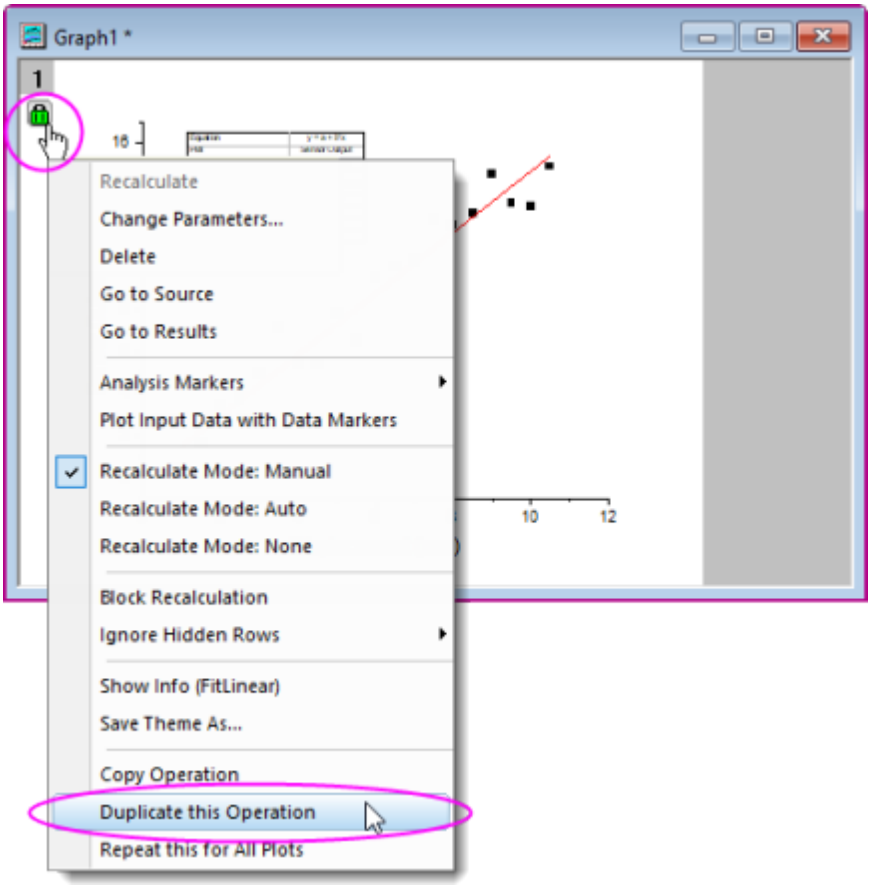
16.8 Duplicate this Operation

Output produced by the Origin's analysis operations is linked to its source data by a particular analysis and a particular set of analysis parameters. This linkage is signified by the placement of an "operations lock" on analysis output and -- unless the user turns *off* recalculation for a particular operation -- such results are

generally "locked" to editing. You can find out more by reading about Analysis Report Sheets and Recalculation, in the introductory sections of this chapter.

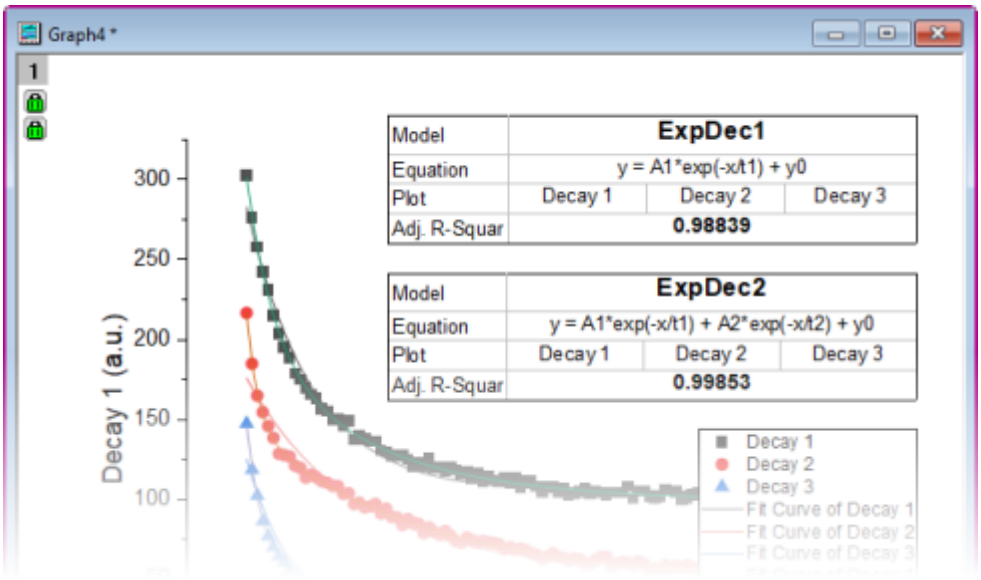
The lock icon placed on analysis output can be clicked on to open a menu, giving you post-analysis access to operation parameters and other information. This includes the dialog box and parameter-set used to produce the analysis output, opened by clicking **Change Parameters**.

Towards the bottom of this menu, you will see a **Duplicate this Operation** entry.



One possible use of the feature goes like this:

1. The user performs an analysis operation on a data plot, say, a fitting operation using the nonlinear curve fitter (NLFit).
2. The user is not sure which fitting function best models her data so she tries a fit using one potential function.
3. The user clicks the resulting operations lock and chooses **Duplicate this Operation**.
4. A duplicate analysis is run and a second operations lock is added to the graph window.
5. The user clicks the second operations lock, chooses **Change Parameters** and when the NLFit dialog opens, chooses her alternate fitting function and performs a new fit operation. The new fit operation results in new output which can now be compared to the output generated by a fit of the first fitting function.



16.9 Repeating Analysis Using Data Filters

Large multi-column datasets can be quickly reduced by applying filter conditions to one or more columns. This Data Filter feature can also be used in conjunction with the colcopy (column copy) X-Function to produce multiple graphs from the same source data using different filtering conditions. The filtered data can also be analyzed, allowing you to compare graphs and analysis results across multiple filter conditions.

Selected columns from the source data sheet can be copied to create child sheets where the filter condition stays synchronized with the parent sheet, or is locked to the child sheet. When the source data sheet is updated, all child sheets, associated graphs and analysis results will automatically update using their respective filter conditions. Additionally, the filter condition of a particular child sheet can be pushed back to the parent sheet at any time.

The image below displays the source workbook with data for several makes of automobiles. Two books were created with a subset of columns and a data filter to restrict the data to a particular make of automobile. Linear regression analysis of the filtered data was performed, allowing comparison of the results across the two filters.



Tutorial: Locking a Filter Condition on Copied Columns

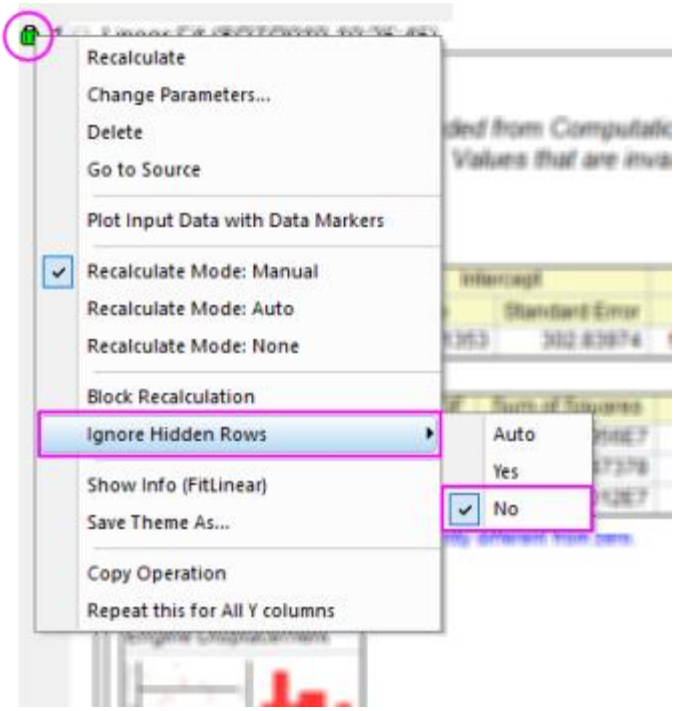
1. Import the file **Samples\Statistics\Automobile.dat**
2. Click on the **Make** column, then click the **Add/Remove Data Filter** button on the Worksheet Data toolbar.
3. Click on the filter icon that was added to the column, and uncheck all makes but *Honda* (**Hint:** Clear the check mark beside **Select All**, then check *Honda* and click **OK**).
4. Hold down the CTRL key and click and select the **Make**, **Power** and **Engine Displacement** columns. Next, right-click and select **Copy Columns to...** from the shortcut menu.
5. In the dialog that opens, expand **Copy Labels** and place a check mark beside **Long Name** and **Units**, then click **OK**. A new worksheet will be added to the workbook and it will contain only the Honda data, for *Power* and *Engine Displacement*.
6. Click and hold the tab of the new worksheet and drag it to an empty spot in the Origin workspace to create a separate workbook.
7. Click on any of the locks in the columns of this copied sheet, and select

Worksheet Filters: Lock. The filter conditions will be locked to this sheet. If you change the filter condition in the original data sheet, this copied sheet will not be affected.

8. You can now return to the original **automobile** book, click the filter icon and change the filter condition to Toyota, then use **Copy Columns to** to create another worksheet.
9. Highlight column B in your Honda workbook,then right-click and choose **Set As: X**. Do the same for the Toyota book.
10. Highlight column C in your Honda workbook and click the **Scatter** button  on the 2D Graphs toolbar. Do the same for the Toyota book. This gives you two plots of Power vs Engine Displacement, one for Honda, one for Toyota.
11. Click on the Honda graph and choose **Analysis: Fitting: Linear Fit**. Accept the dialog defaults and click **OK**. Do the same for the Toyota graph. A linear fit is performed for both datasets and an Analysis Report Sheet is generated for each.
12. Compare the fitting results for the two automobile makes.



By default, when there is a data filter on a column that is input for an analysis operation, filtered data (hidden rows) are ignored in the analysis. To include hidden rows, click on an analysis lock icon and set **Ignore Hidden Rows** = *No*.



16.10 Automating Tasks Using Programming

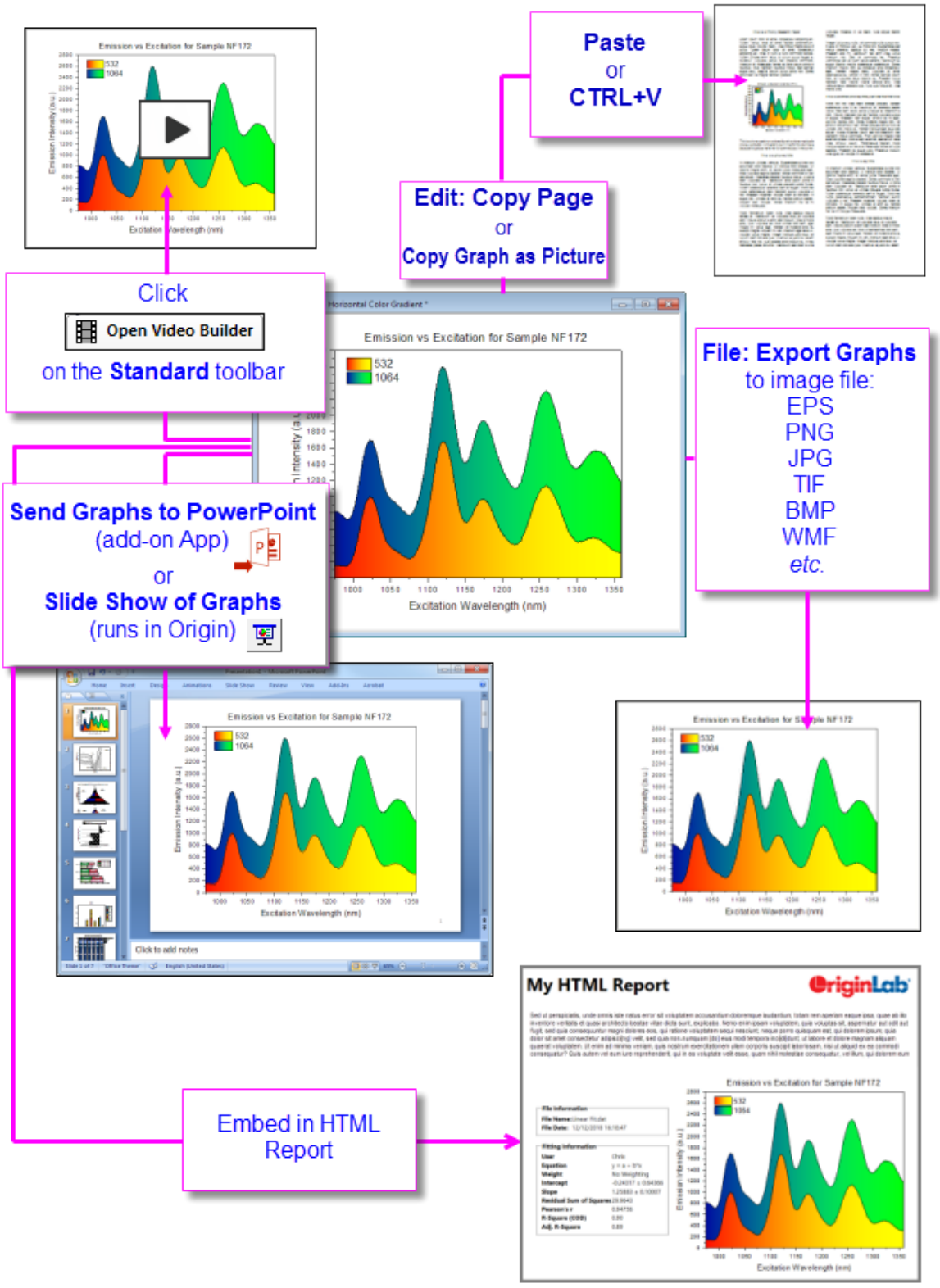
In addition to the above mentioned methods for automating tasks using the interface, graphing and analysis features can also be accessed programmatically from the **LabTalk** scripting language, from **Origin C** or from **Python** (internal or external). Access to Graph Themes and templates, and Analysis Templates can be programmed. You can set up some of the procedures manually by first creating templates (graph templates, Analysis Templates™, etc.) using the graphical user interface, and then write your code to call the templates as needed.

You can get a broad look at what programming options are available in Origin by browsing the Programming Chapter of this User Guide. More in-depth programming-related information is linked to from that chapter.

16.11 Topics for Further Reading

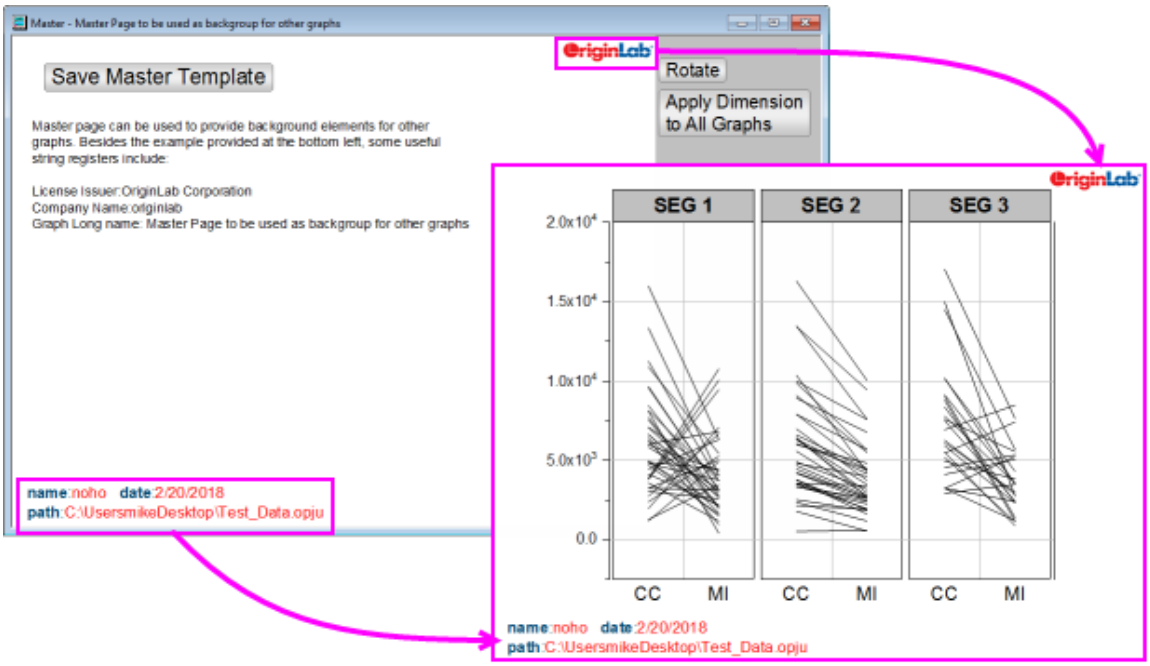
- Recalculation of Analysis Results on Data or Parameter Change
- Saving Analysis Dialog Settings as a Theme
- The Theme Organizer, Dialog Themes
- Analysis Templates
- Batch Processing and Analysis Templates
- Copy and Paste Operations
- Using Data Filters to Obtain Different Views of Your Data
- Analysis Report Sheets and Columns
- Tutorials: Batch Processing
- Video: Batch Processing
- Tutorial: Combine Quick Peaks Gadget with Peak Analyzer

17 Publishing and Export



17.1 The Master Page

The **Master Page** feature is used to add one or more common objects to **exported** or **printed** graphs. Use the master page to add a set of properties and objects -- a custom background, a company logo, text labels, images, etc. -- to selected graph windows in your project.



To make use of this feature, you must first create your Master Page. The Master Page should contain only the properties and objects that you want to display on your selected graph windows:

1. From the menu, choose **File: New: Master Page**. If you are not in the project root folder when selecting this menu item, you will be asked to switch to the project root folder.
2. Customize the Master Template. Note that the comments that show beneath the **Save Master Template** button are "hidden" and will not be applied to your graph windows.
3. Click the **Save Master Template** button. When you save, the **Master Template** will be saved to the User Files Folder as "name of active window".otpu (e.g. "C:\Users*YourName*\Documents\OriginLab\User Files\Master.otpu").

Things to know about the Master Page:

- Master items will only show in graphs pages of the same dimensions as the template. **Apply Dimension to All Graphs** applies Master Template page dimensions to all graphs of the *same aspect ratio*.
- If you create a graph and modify page size, then choose **File: New: Master Page** and load a Master Template into the workspace, the Master Template will be loaded with the page dimensions of your modified graph page.
- The **Rotate** button swaps the Master Template page dimensions (toggles orientation between landscape and portrait).
- When you click **Apply Dimension to All Graphs** you are prompted to apply dimensions only to graphs of the same aspect ratio, or to all graphs of the same orientation (portrait or landscape).

- Master Page items on a graph with portrait orientation will not show on a graph with landscape orientation and *vice versa*.
- When NOT using Master Items, **Edit: Copy Page** (CTRL + J) will place *an OLE-editable Origin graph object* on the Clipboard. When using Master Items, **Edit: Copy Page** will place an *image* on the Clipboard; the **Copy Graph as Image** dialog will open asking you to accept or adjust image settings before clicking **Copy**.
- If a graph uses Master Items, **Send Graphs to PowerPoint** *does not* support **Insert Graphs as Embedded Object**. Instead, use **Insert Graphs as Picture** which *does* support Master Items.
- There is a mechanism for selectively excluding Master Items in your exported or printed page. *Any object* that you do not want to appear in the exported or printed page should begin with "NoExport" (e.g. open an arrow object's **Properties** dialog and on the **Programming** tab, rename "Arrow" to "NoExport_Arrow").
- When you customize and save your Master Page to the User Files Folder, the next time you choose **File: New: Master Page**, you load your customized template.
- If you don't want to show Master Items in the workspace, click **View: Show: Master Items** and remove the check mark. The exported graph will still contain the Master Items (they just won't show in the workspace).
- If you want to remove Master Items from a graph in both the workspace *and* exported images, click **Format: Page...**, **Display** tab and clear the **Use Master Items** check box.

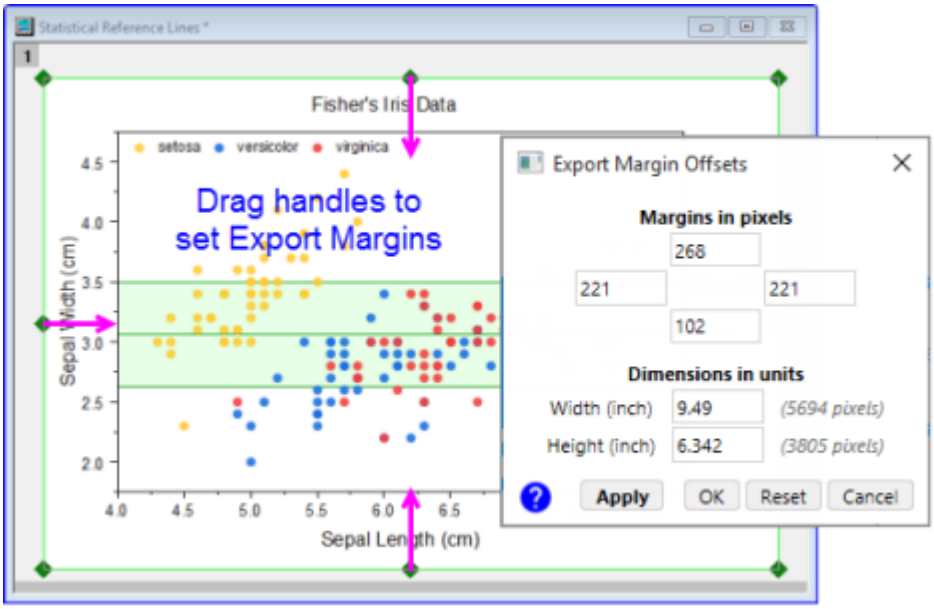


You could use the Text tool to add project and system information to your Master Template as static text objects, but since the idea is to build a template for re-use, consider "soft-coding" information in your text labels. To learn more, see these topics:

- Substituting Variable Values in Text Labels]
- LabTalk String Registers

17.2 The Export Margin Offsets Dialog Box

By default, the margins of your copied or exported graph are determined by the **Margin Control** in **Copy Page Settings** group of **Preferences: Options** (Copy actions) or the **Export Settings** branch of **Export Graphs** (Export actions). You can interactively modify the default margins using the **Export Margin Offsets Dialog Box**.

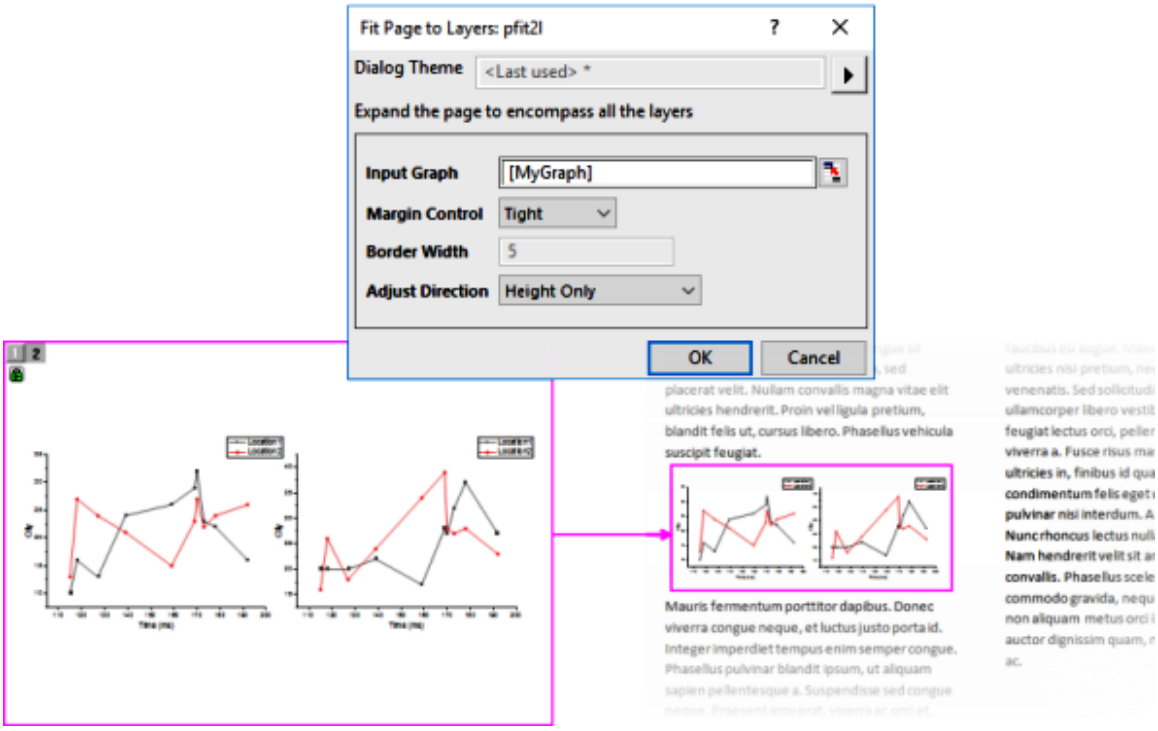


1. Click on the graph window (to activate) and choose **Edit: Set Export Margins**. This opens the **Export Margin Offsets** dialog.
2. Drag the blue selection handles that appear at the page margins; or enter values into the dialog edit boxes and click **Apply**.

17.3 Fit Page to Layer and Layer to Page

There are two small dialog boxes that are also helpful for removing white space or placing a margin around your graph before exporting:

- **Fit Page to Layers**: Choose **Graph: Fit Page to Layers** to open the **pfit2l** dialog box.
- **Fit Layers to Page**: Choose **Graph: Fit Layers to Page** to open the **gfitp** dialog box.



Both dialogs can be used to remove white space. Both can perform resizing, with or without changing graph aspect ratio. You can view the documentation for both to decide which might work best for you but basically it boils down to whether you need to keep a particular page size. If so, you'll likely want **Fit Layers to Page**; if not, either one may work for you.

17.4 Copying and Pasting Graphs to Other Applications

There are two ways you can include Origin graphs in another application's files (e.g. Microsoft Word .docx files):

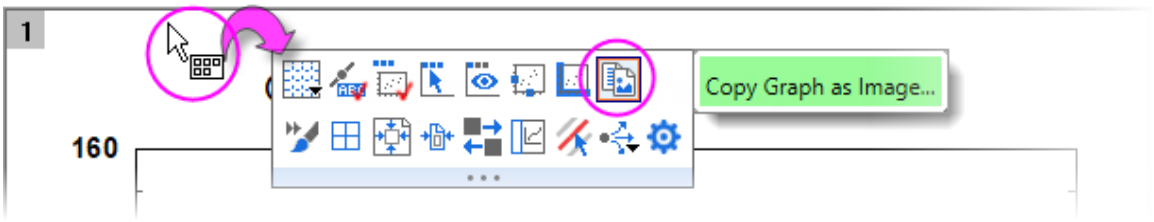
- As an *image*
- As an *editable OLE graph object*

When you paste as an *image*, you are pasting a static object. In MS Word, for instance, you may be able to modify the image using Word's picture-editing tools, but you cannot make edits to the graph in Origin and have it update the graph in Word (short of deleting the existing image and replacing it with a new one).

By contrast, when you paste an *editable OLE graph object* you can later double-click on the object in the host application to launch a new instance of Origin. The graph and any associated data sheets will be available for editing. After editing, use Origin's **File: Exit and Return to...** menu item to update the embedded object, close Origin and return to the host application.

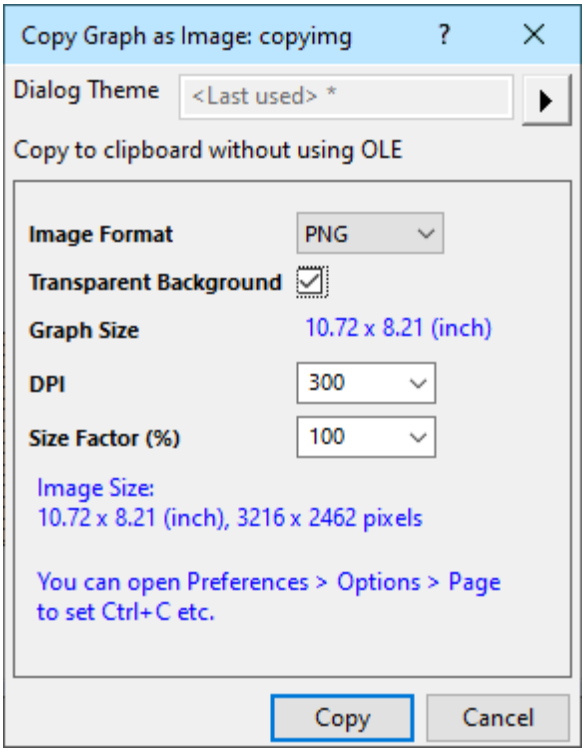
17.4.1 Copy Graph as Image

1. Click on your Origin graph to activate it, then ...
2. Choose **Edit: Copy Graph as Image** (CTRL+ALT+J). Alternately, click on the graph window near the page margin and click the **Copy Graph as Image** button on the Mini Toolbar.



3. In your host application choose **Paste** or press CTRL+V.

When copying the graph as an image (CTRL+ALT+J), you have a choice of image formats (PNG, EMF, DIB, HTML, JPG). Additionally, you can make quick size adjustments and specify background transparency (PNG). The **Copy Graph as Image** (copyimg) dialog includes a **Dialog Theme** control which allows repeating **<Last used>** settings, saving current settings as default **Save as <default>** or saving settings to a named Theme (**Save As...**).





There is a **Copy** control on the **Preferences: Options: Page** tab that lets you assign the CTRL+C hotkey combination to either **Copy Graph as Image <last used>** or **Copy Page (CTRL+J)** (i.e. "editable OLE graph object"). This allows you to bypass the **Copy Graph as Image** dialog and speed up placing a standardized image on the Clipboard using CTRL+C.

17.4.2 Copy Graph as Editable OLE Graph Object

1. Choose **Edit: Copy Page** (CTRL+J).
2. In your host application choose **Paste** or press CTRL+V.

Note: For more information, please refer to the:

Help: Origin: Origin Help > Exporting and Publishing Graphs > Pasting or Embedding Graphs in Other Applications

17.5 Organizing Your Graphs for Presentation or Export

If your Origin project file contains a large number of graphs that you plan to export or use in an Origin slide show, you can make things easier by adding shortcuts to your graphs to a Project Explorer **Favorites** folder and arranging them there:

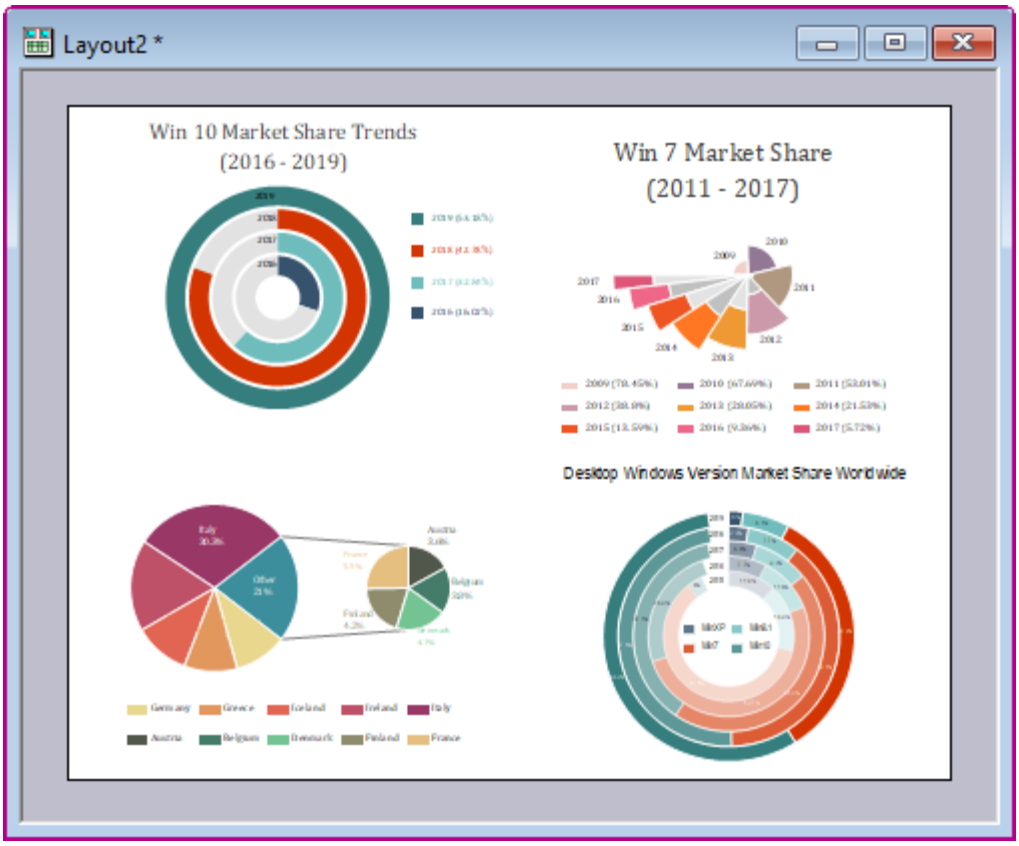
- Right-click on a window and choose **Add Shortcuts to Favorites**. This will add a shortcut to each graph window, to a new **Favorites** subfolder (visible in Project Explorer).
- When sending graphs to PowerPoint or creating an Origin slideshow, you can (1) set slide order in the corresponding dialog box or (2) set slide order following this procedure.



If you are preparing a manuscript for publication, you may want to see FAQ-441 How do I export graphs with exact size and resolution as specified by publishers?

17.6 The Layout Page

A layout page, as the name implies, is a window useful for laying out different elements for publication or export. Use it to assemble graphs, result tables, text objects, etc. onto a single panel.



Typically, you start by creating a blank panel:

1. Click the **New Layout** button on the Standard toolbar.
2. Right-click on the blank layout to paste Clipboard content, add text, insert images from files, add graphs, tables, etc.
3. When inserting an image from file, right-click in the area where you want to insert. When adding graphs or worksheets, pick a window in the Browser and drag out an area on the layout with your mouse. Note that added objects can be moved or resized by dragging with your mouse.
    - You can make edits to inserted images, by double-clicking on the image. This opens the image in the **Image Window**.
    - You can make edits to the graph by double-clicking on the inserted graph object. This opens the source graph for editing. Edits to the source graph will update the graph on the layout page.
    - Inserted tables can be edited by double-clicking on the table object. Style adjustments can be made by selecting a table object and using available **Mini Toolbar** buttons.
4. Note that selected elements on the layout page can be aligned using **Object Edit** toolbar buttons.

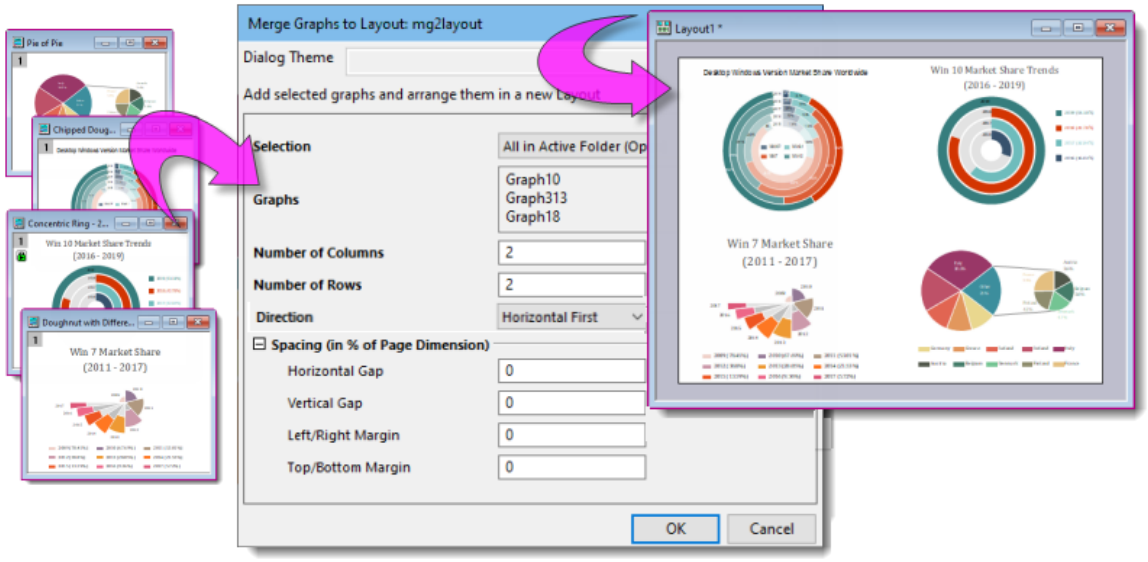


Exporting of layout pages to .SVG files is supported. When adding graphs to the layout, choose **Add Graph** from the layout shortcut menu and elements of your SVG file (e.g. text) will be editable in applications such as Inkscape or Adobe Illustrator.

For more on the layout page, see **Using the Layout Page Window** in the Origin Help file.

17.6.1 Merge Graphs to Layout

As an alternative to manually creating layouts, Origin offers a tool that will merge select graphs into a single layout page of equal spacing. In this case, merged graphs are images and, therefore, not editable using the procedure described in step #3 of the previous section. However, if further graph edits are not needed, you can use this method to quickly produce a nice-looking layout.



In addition to **Merge Graphs to Layout**, Origin includes "merge graphs" utilities in several other dialogs: **Merge Graph Windows**, **Arrange Layers** and **Layer Management**.

To merge graph images into a single layout:

1. With a graph window active, click **Graph: Merge Graph to Layout: Open Dialog**.
2. Use the **Selection** drop-down to specify how to select graphs. To choose individual graphs, choose *Specified* and use the browse button beside **Graphs** to open the Graph Browser and pick graphs.

Use the **Fit Page to Objects** menu command (**Format: Fit Page to Objects**) to apply a uniform margin to the active Layout page. This works the same as the aforementioned **Fit Page to Layers** does for graph windows.

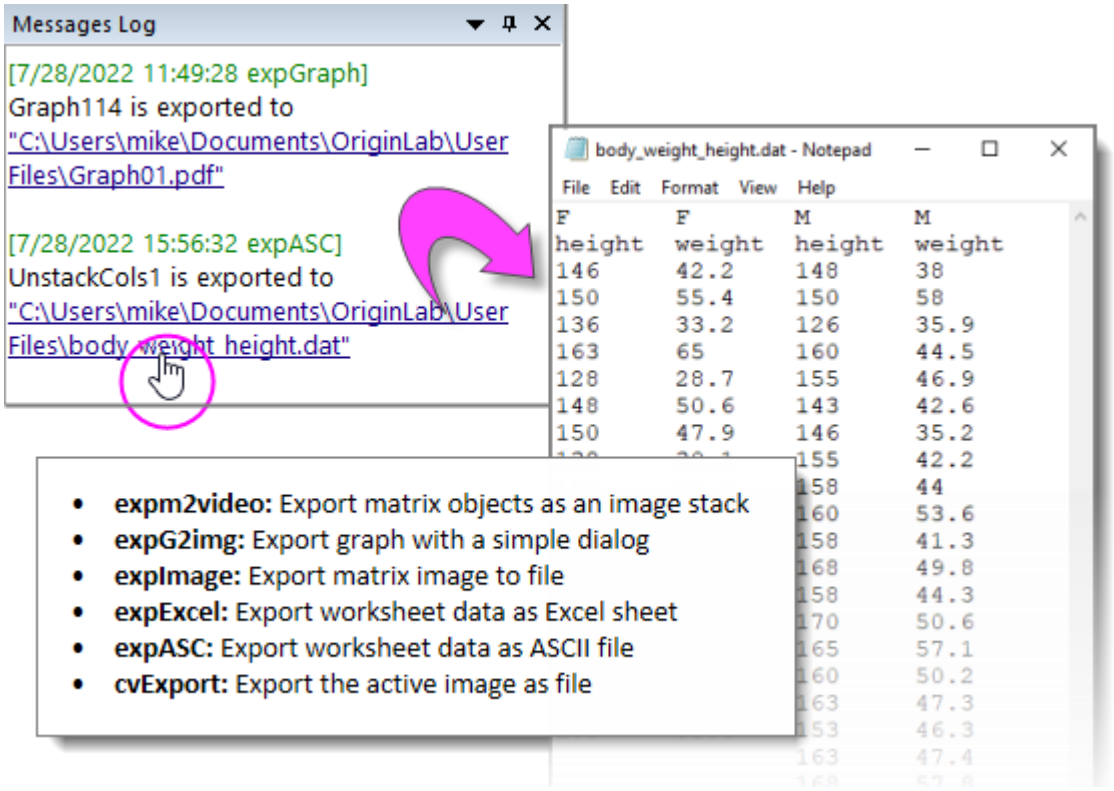
17.7 Exporting Graphs and Layout Pages to an Image File

Origin 2021b added a simplified graph export routine to complement the existing graph export routine:

- **File: Export Graph**: If you simply want to export one or two graphs to one of several common image format (PNG, BMP, JPEG, TIFF, EMF) and need only minimal control of image size, this routine is quick and easy.
- **File: Export Graphs (Advanced)**: If you want to batch export graphs (e.g. *All in Active Folder*, *All in Project*, etc.), or export to vector types such as PDF or EPS, use this routine. The dialog supports outputting to a specified path, auto naming, application of Speed Mode settings to exported graphs, plus margin control, image size and other filetype-specific settings.



Beginning with **Origin 2023**, the following export dialogs will add a date-time stamped clickable link to the Messages Log. Click the link to open the file using an internal Origin viewer (see below):



In addition, two system variables are added to manage Messages Log output for images:

- **@VID** is added to select image viewer (raster, EMF): 1 = use Origin viewer (default); 0 = use system default application.
- **@MSG** is added to control what is output to the Messages Log: 0 = output both file and and link (default); 1 = output link only; -1 = disable message output.

To open file location in Windows Explorer (*without opening the file*):

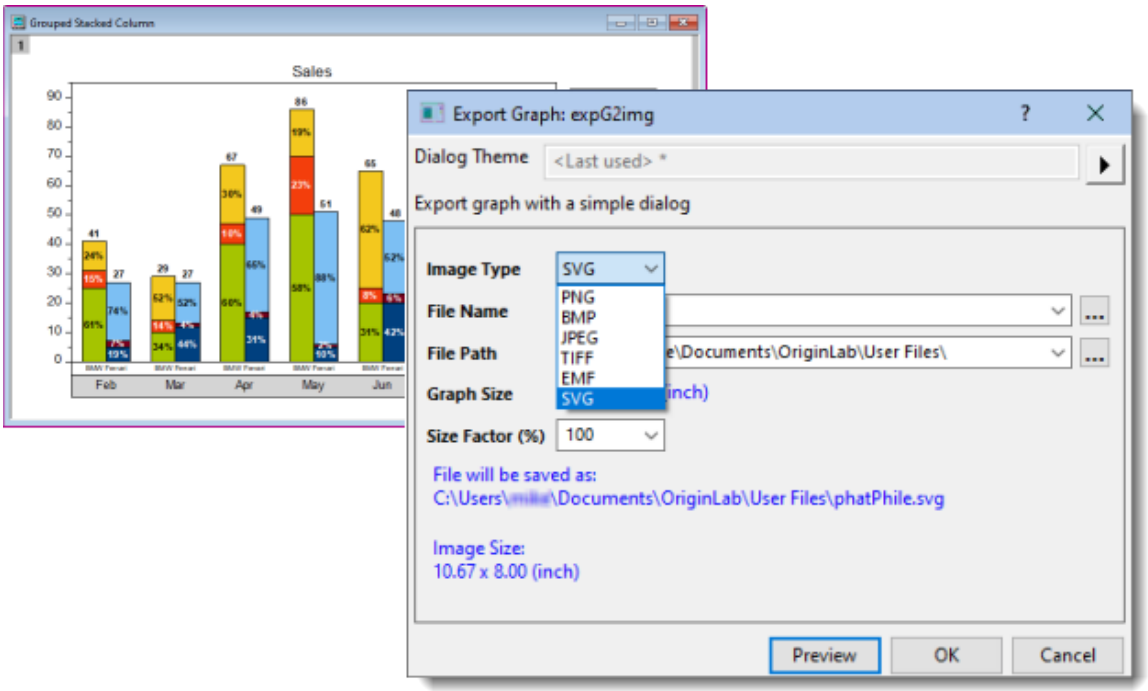
1. Right-click on a link and choose **Open File Location**; or press Ctrl while clicking on the link.

17.7.1 File: Export Graph

File: Export Graph (X-Function = **expG2img**) is a simplified routine for exporting the active graph page to one of the following formats: PNG, BMP, JPEG, TIFF, or EMF. It does not offer the level of control or flexibility as **File: Export Graphs (Advanced)** (next section) but it works well for simple export of individual graph pages.

To export a graph or layout page to raster image using the simplified expG2img dialog:

1. When a graph window is active, choose **File: Export Graph**.
2. For *EMF* images, set a size factor relative to the *Image Size* reported at the bottom of the dialog. For raster formats, choose an output **DPI** setting. Alternately, clear the **Auto** check box and specify a **Width in Pixels**. Clicking **Preview** opens the graph-to-export in an internal viewer.

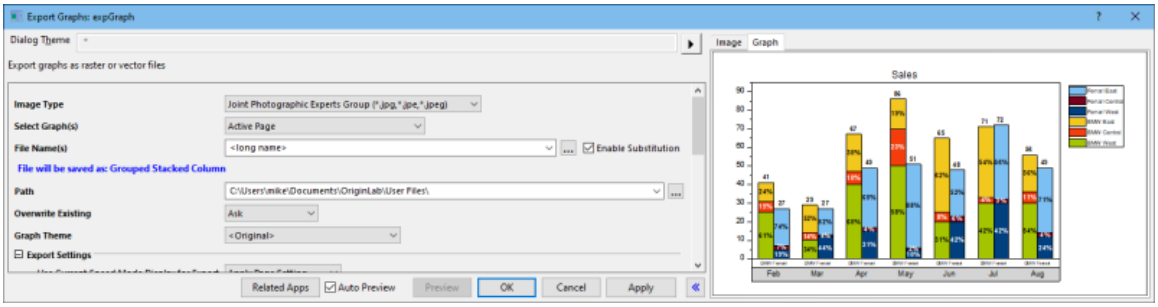


17.7.2 File: Export Graphs (Advanced)

File: Export Graphs (Advanced) (X-Function = **expGraph**) is Origin's primary tool for exporting graphs and layout pages. It supports raster or vector output, flexible multi-page export (e.g. **All in Active Folder**), DPI and Speed Mode control and more.

To export a graph or a layout page as an image file:

1. Select the menu **File:Export Graphs (Advanced)**.

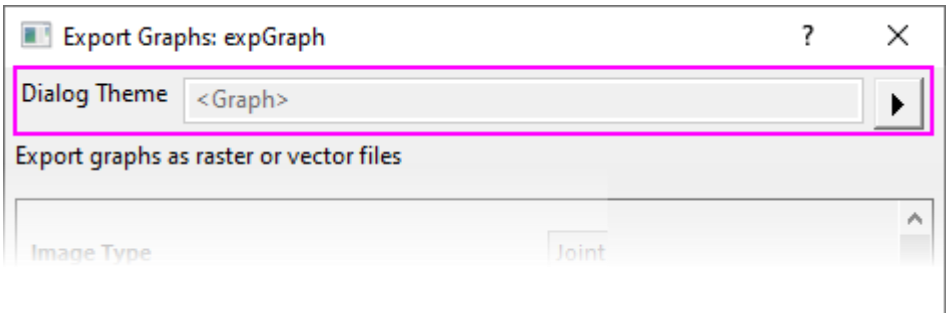


The **expGraph** routine exports graphs to one of 15 file formats:

Raster Formats	BMP, GIF, JPG, PCX, PNG, TGA, PSD, TIF;  When you select **Image Type** = TIF/TIFF, and select multiple graphs for export (e.g. **All in Active Folder**), an **Export as multi-frame TIF** check box is added to the dialog. Check the box to export selected graph windows to a single TIF image (TIF stack).
Vector Formats	CGM, DXF, EPS, EMF, PDF, SVG, WMF

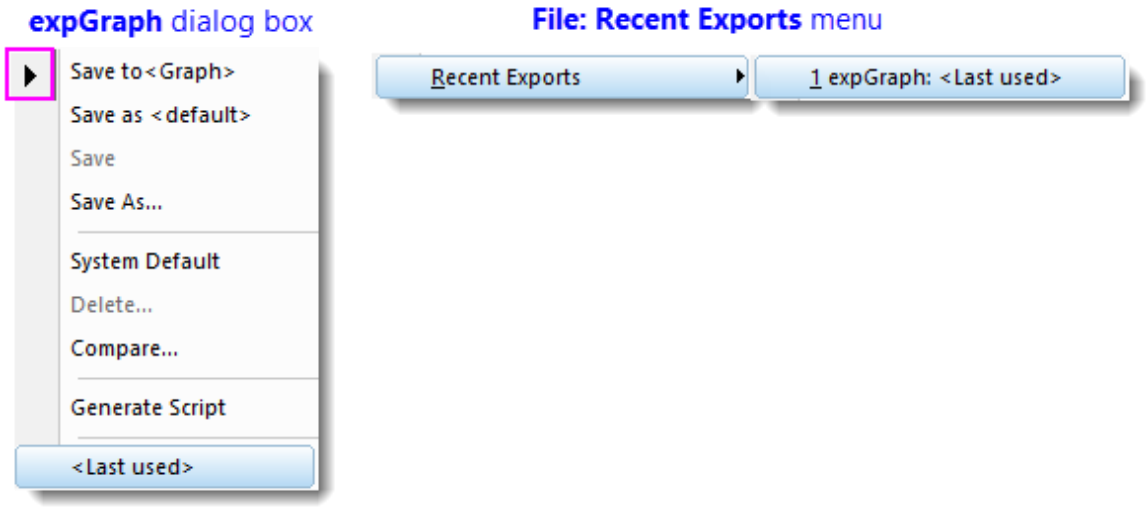
17.7.2.1 Saving Export Settings to a Theme

As is the case with many other Origin dialog boxes, you can save your graph export settings as a **Dialog Theme** for repeat use.



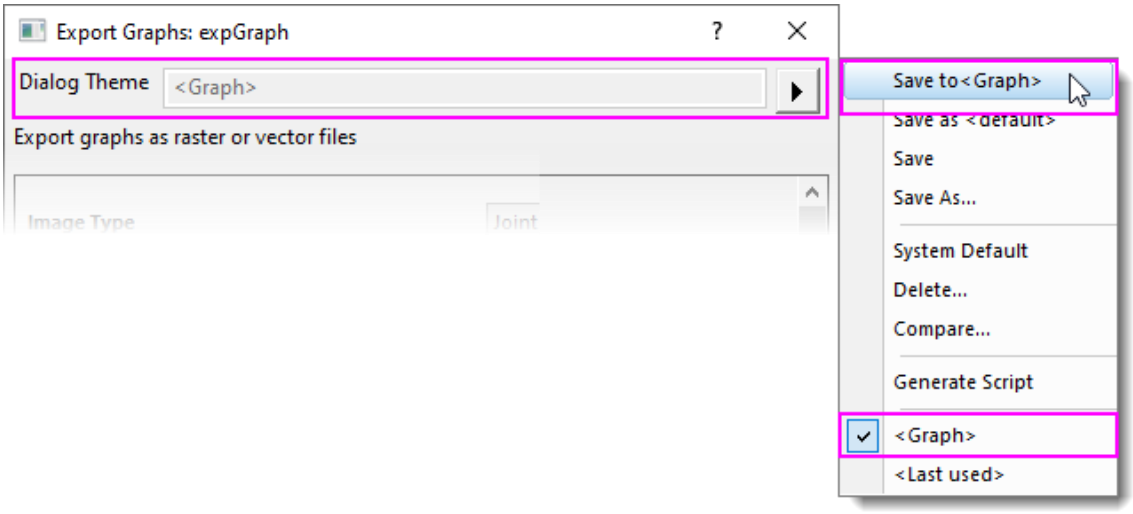
Once you have determined your export settings:

- Click the flyout button to the right of **Dialog Theme** and choose one of the Theme save options.
- Using any group of custom settings creates a temporary default Theme called **<Last used>**. This Theme then becomes available for loading your last used settings and you can access it from the **expG2img** or ''*expGraph* dialog boxes or from the **File: Recent Exports** menu.



Since Origin 2021, **expGraph** dialog box settings are saved to the graph automatically on export.

- To save current settings *withtout* exporting, choose **Save to <Graph>**.
- To restore saved settings after you've modified them in the export dialog, choose **<Graph>**

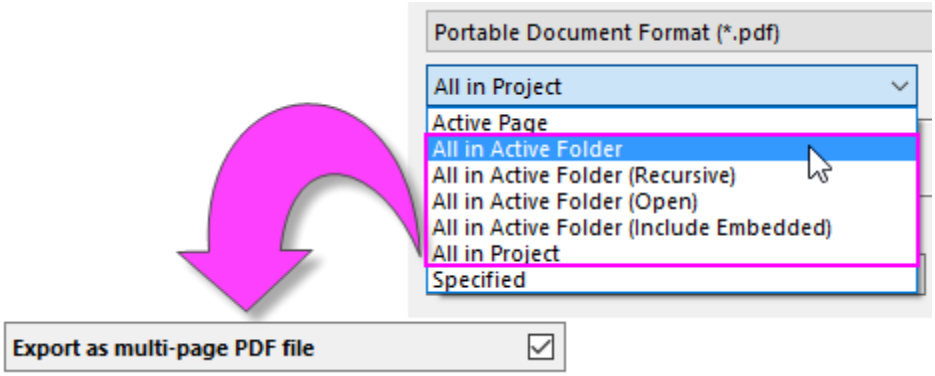


Note: For more information, please refer to the:

Help: Origin: Origin Help > Exporting and Publishing Graphs > Exporting Your Graph or Layout Page to an Image File



You can export multiple graphs, such as all graphs in a folder or all graphs in a project file, to a single, multi-page PDF file. Choose **File: Export Graphs** and open the Export Graphs dialog box. Set **Image Type** to **Portable Document Format (*.pdf)** and **Select Graph(s)** to one of the following options and you will see a checkbox for **Export as multi-page PDF file**.



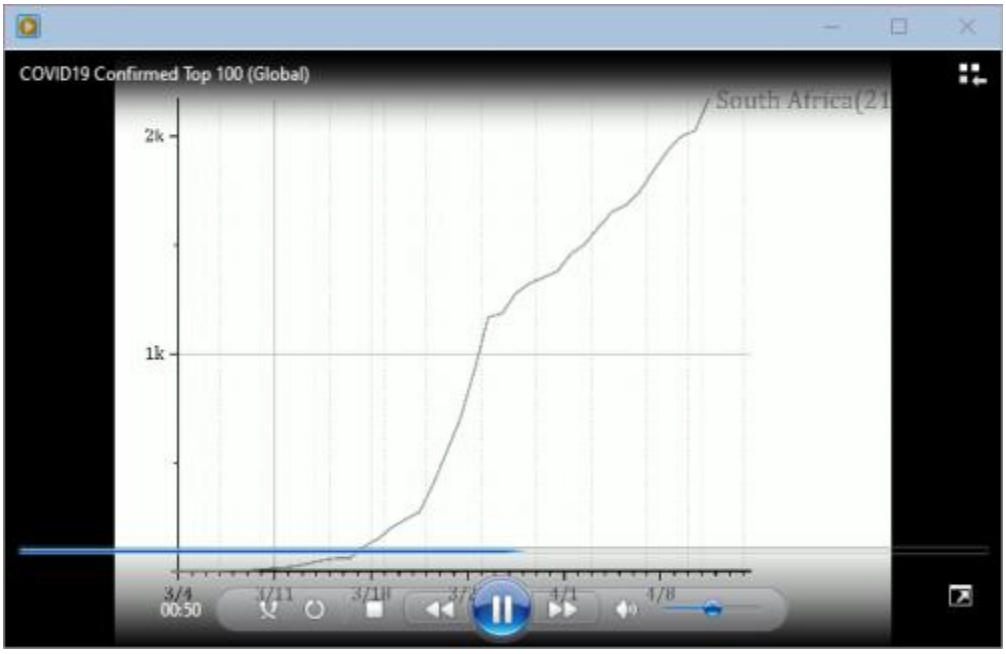
17.8 Exporting Browser Graphs to Video

To export a Browser Graph as a video (GIF, TIFF, AVI):

1. Activate the Browser Graph. Before going further, confirm that the graph is in **Page View** (click just below the window title bar and when the Mini Toolbar appears, verify that there is NOT a red check mark beside the **Window View** button. If there is, clear it).



2. In the panel to the left, click the menu button  and choose **Flip Through**.
3. Click the **Export** button and set **File Type** = *GIF*, *TIFF* or *AVI*.
4. Modify other settings as needed and click **OK**. Unless it has been turned off, export will dump a clickable link to the Messages Log. Click the link to run the video in the supporting application.

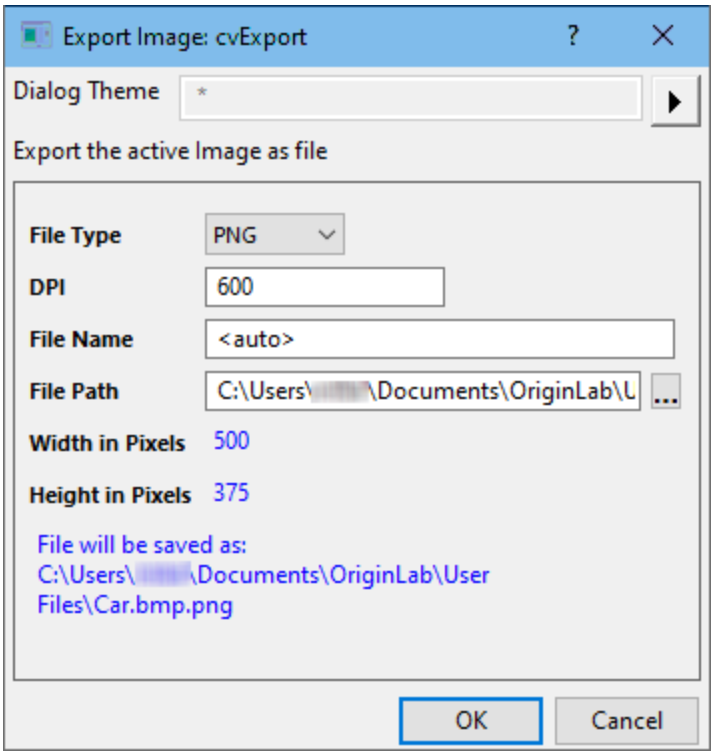


17.9 Exporting Images to a Raster or Video File

Using **File: Export Image** (X-Function = **cvExport**) Image window you can export images to one of several raster formats: BMP, GIF, JPG, PNG, TIF.

To export an (image window) image using cvExport:

1. With the image window active, choose **File: Export Image**.
2. Choose from the list of raster images; or save as a video file (*.avi).



After exporting, a clickable link will be generated in the **Messages Log**.

17.10 Exporting Matrices

17.10.1 Export Matrix as ASCII

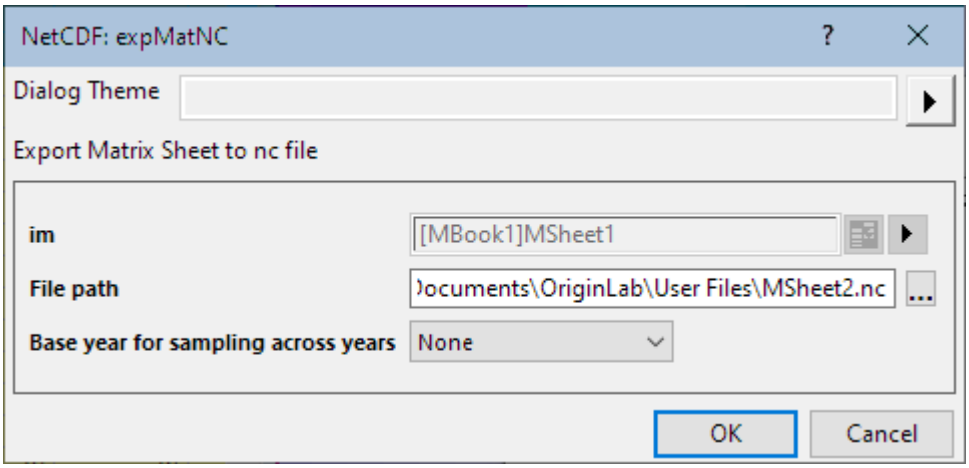
This will create an ASCII file of the data contained in the active matrix object.

1. With the matrix active, choose **File: Export: ASCII**.

17.10.2 Export Matrix as NetCDF

This will export all objects in the active matrix to a .nc file:

1. With the matrix active, choose **File: Export: NetCDF**.
2. For **Base year for sampling across years**, note that when the matrix data are averaged across years, the time variable is not exported with the NetCDF file. Use this to specify how to indicate time:



None	Do not specify a time variable
Use Starting Year	Use starting year as time variable
Use Ending Year	Use ending year as time variable

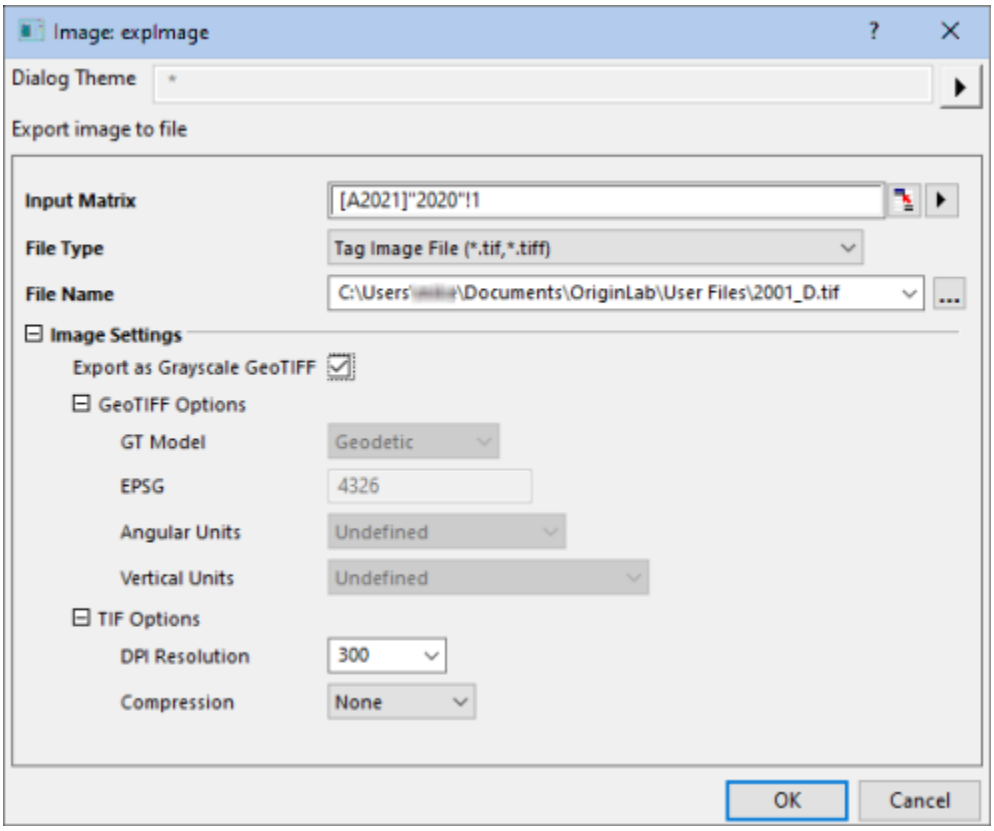
For more information on Exporting NetCDF data, see the Origin Help file.

17.10.3 Export Matrix as Image

Matrix images can be exported using **File: Export: Image** (X-Function = **expImage**).

To export a matrix image to raster file including as Grayscale GeoTIFF:

1. With the matrix active, choose File: Export: Image.
2. Verify that the **File Type** is correct. For GeoTIFF data, the TIF/TIFF format should be pre-selected but to export as grayscale GeoTIFF, check the **Export as Grayscale GeoTIFF** box.



After exporting, a clickable link of exported file path will be generated in the **Messages Log**.

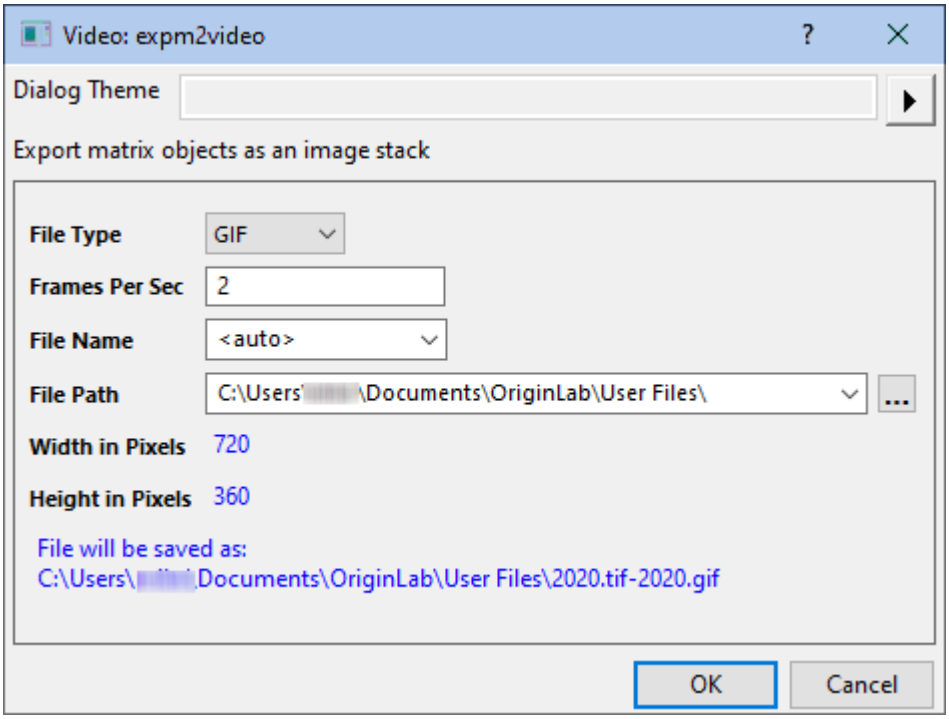
17.10.4 Export Matrix as Video

Matrices containing multiple matrix objects can be exported to GIF, TIF and AVI (X-Function = **expm2video**).



To export a series of matrix objects as a video file:

1. With the matrix active, choose **File: Export: Video**.



17.11 Exporting Worksheets



After exporting worksheet data to ASCII or Excel, a clickable link of exported file path will be generated in the **Messages Log**.

With a worksheet active, the **File: Export** menu item provides the following options:

17.11.1 As ASCII, NI TDM (TDM, TDMS), and Sound (WAV)

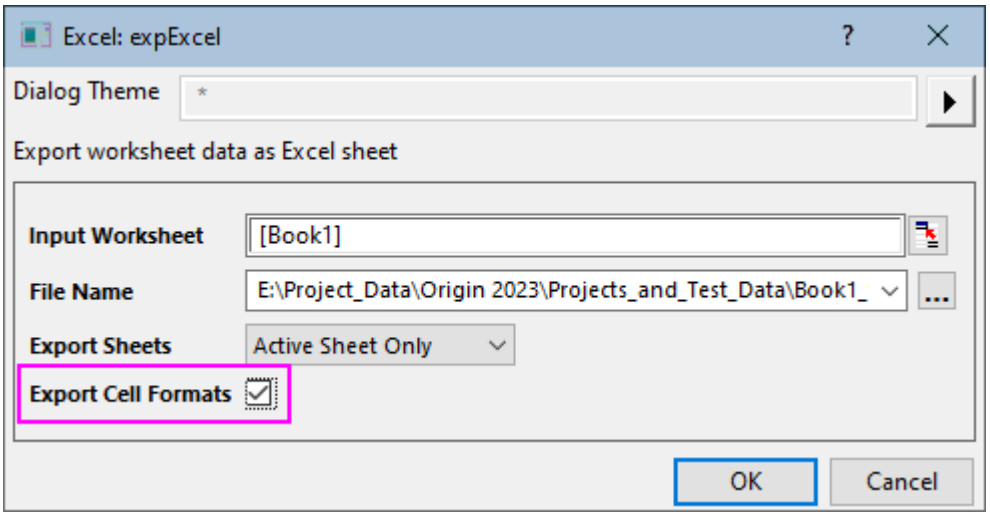
These apply only to sheets containing data columns, and are not available for analysis report sheets (see other options, below). The exported file will contain only data from the worksheet columns. Floating or embedded graphs placed in the worksheet will be ignored.

17.11.2 As Excel

Export books of worksheet columns with text and numeric data to an MS Excel file (XLS, XSLX, XSLM). Note that analysis report sheets with their hierarchical tables, and things such as embedded graphs and images, are not exported to the Excel file. Analysis results that are output to regular Origin worksheets *are* exported.

1. With the worksheet active, choose **File: Export: Excel**.
2. In the dialog that opens, set **Export Sheets** to **Whole Book** or **Active Sheet Only**.

3. Optionally, check the **Export Cell Formats** box to export numeric and style formats (decimal digits, font, background color, etc.).





For information on copying analysis report sheets and pasting to MS Office applications, see FAQ-815 How do I copy report sheet tables and paste them into Word, Excel or PowerPoint?

17.11.3 As SQLite

This option exports the active worksheet(s) as an SQLite file. Specify a file extension of *.sqlite*, *.sqlite3* or *.db* (note that file structure is identical). Options to skip hidden columns or rows. Limited to export of data in worksheet columns.

17.11.4 As Multipage PDF File

This option is available only on sheets with data columns, and not for analysis report sheets. Use the **View: Page Break Preview Lines** menu item to view the vertical and horizontal page break lines that determine which columns and rows will be included in each page of the export. Floating or embedded graphs placed in the worksheet will be included in the exported image.

17.11.5 As Image File

This option is available on both data and analysis report sheets:

1. With the worksheet active, choose **File: Export: As Image File**.
2. In the dialog that opens,

   - Image file formats including PDF and SVG are supported.
   - Floating or embedded graphs placed in the worksheet will be included in the exported image.
   - Set **Export Area** to **Visible**, **Whole** or **Selection**. Note that empty rows no longer exported when **Export Area** = **Whole**.

- Border is added to exported worksheet by default. Change border width or remove border, set the **Frame Thickness** drop-down.

	Descriptive statistics					
	Valid N	Mean	Median	Minimum	Maximum	Standard Deviation
Power	340	79.85	71	33	169	28.07561
0~60 mph	340	15.58824	15	8	25	3.14842
Weight	340	1337.75882	1294	724	2324	341.95962
Gas Mileage	340	21.74706	21	10	36	5.89141
Engine Displacement	340	3408.43735	2901.05	1114.5	7457.4	1719.2832

17.11.6 As PDF File

This option is available for both data and analysis report sheets. In the dialog that opens, you can opt for exporting the entire sheet, the visible area, or a selection. Floating or embedded graphs are included in the exported PDF.



When creating a custom report from a worksheet that combines data, numeric results and graphs, the best option is to export the entire sheet as a PDF file, or export the sheet as a multi-page PDF file.

17.12 Send Graphs to PowerPoint

You can send a group of Origin graphs to MS PowerPoint as pictures or as embedded objects (see limitations of embedded objects and **Master Items**, explained above). Graphs inserted as embedded objects can be further edited in your Origin software. Double-click on the graph in PowerPoint to open the graph in an OLE instance of Origin.

To Send Graphs to PowerPoint:

1. Click the **Send Graphs to PowerPoint** button  on the Standard toolbar.

or...

1. Click the **Send Graphs to PowerPoint** icon  in the Apps Gallery, docked to the right-side or your Origin workspace (if you do not see the Apps Gallery, click **View: Apps** or press ALT + 9).

or...

1. Right-click in the lower-pane of Project Explorer and choose **Send Graphs to PowerPoint**.



Tutorial: Send Graphs to PowerPoint

1. Run Origin and open the sample file <*Origin EXE Folder*>\Samples\Graphing\Column and Bar.opju.
2. Click the **Send Graphs to PowerPoint** button  on the Standard toolbar.
3. Click the **Select Graphs** button and choose **Specified**.
4. Select all except *Graph5B* in the left panel and move them to the right panel by clicking the  in the middle of the dialog box. Click **OK**. A scrollable list of graphs is added to the left panel in the App.
5. Set **Insert Graph as** = **Picture**.
6. Set the **Slide Margin** top dimension as *8%* and leave the others as *0*.
7. Set **Title Line** = **Top of Slide**, and **Title** = *Window Long Name*.
8. Set **Starting Slide Index** = *3* and **Slide Mode** = **Start New**.
9. Use the browse button beside **Load File/Template (optional)** to load the file <*Origin EXE Folder*>\Samples\Import and Export\Column_Plots_in_Sample_OPJ.pptx.
10. Specify a **Save File as (optional)** output path for the resulting PPTX file.



There is also a **Send Graphs to Word** App that is pre-installed with your Origin software. This App is particularly useful for batch export of graphs to a book-marked MS Word document.

17.13 Slide Show of Graphs

Origin has a built-in slideshow utility for viewing or presenting your graphs while running Origin. The slide show can be started in two ways:

- Right-click on any folder in **Project Explorer** and select **Slide Show of Graphs...**

or

- Click the **Slide Show of Graphs** button  on the **Standard** toolbar.

A dialog box opens offering options to set slide order, slide cycle time, whether to include graphs in sub folders, etc. The dialog also lists shortcut keys for use during the slide show (e.g. **G** = go to the actual graph window of the currently displayed slide).

Tutorial: Slide Show of Graphs

1. Use the **File: Open Sample Projects: 2D and Contour Graphs** menu to open the sample project.
2. Click on the **Slide Show of Graphs** button in the **Standard Toolbar**.
3. Accept default settings in the dialog that opens, and press **OK** to start the slide show.
4. You can use the up/down arrow keys or the mouse wheel to flip thru the slides.

17.14 Creating Movies

Origin provides a **Video Builder** tool, accessible from the **Open Video Builder** button  on the **Standard Toolbar**. This tool can be used to manually capture a series of graph windows, and write one frame at a time to a video (.AVI) file.

Videos can be created using LabTalk script or Origin C code, by programmatically computing or updating data and then writing out the graph as a frame in the video, at each step during the computation.

Note: For more information, please refer to the:

Help: Origin: Origin Help > Exporting and Publishing Graphs > Creating Graph Animation

For specific examples of programmatically created movies, including Origin Projects and code, please visit www.originlab.com/animation.

17.15 Notes Windows for Reporting

Over time, Origin's Notes window has morphed from a plain-text window for jotting down your research notes, into a flexible medium for collating a variety of research-related materials.

Because the Notes window can contain *linked* objects -- graphs, images, worksheet cell values, etc. -- it can be useful to add a Notes window to an **Analysis Template™** for purposes of summarizing analysis results. Alternately, you can save your Notes window as a PDF by clicking **File: Print** and choosing a PDF driver.

17.15.1 Notes Window Syntax

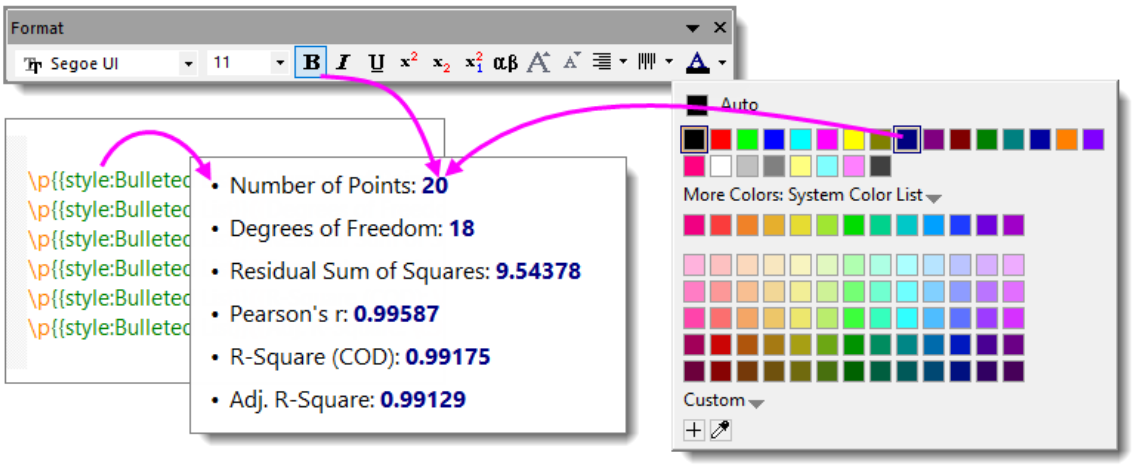
Origin's Notes window supports four syntaxes: **Text**, **Origin Rich Text** (default), **HTML**, and **Markdown**.

1. To switch syntaxes, choose **Notes**: **Syntax**: **Text**.
2. Once you have selected **Text**, you can freely choose other syntaxes from the **Notes** menu.

17.15.2 Rich Text

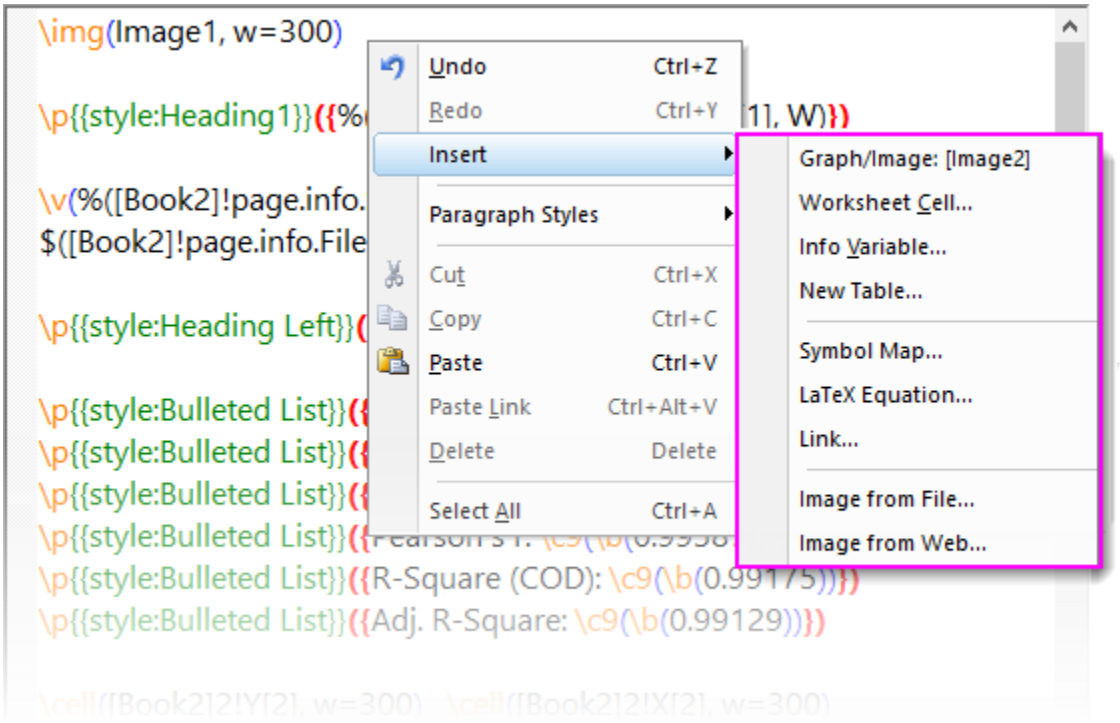
With Rich Text, the Notes window has two modes -- raw text mode and **Render** mode. Toggle between these modes using **Notes: Render Mode** or shortcut key combination CTRL + M.

To add text to the Notes window, you need to be in raw text mode. To style added text, use the **Format** toolbar and/or apply pre-defined paragraph styles.



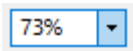
17.15.2.1 Adding Content to Your Notes

You can insert these objects to the Notes window by by right-clicking in the Notes window and choosing from the shortcut menu:

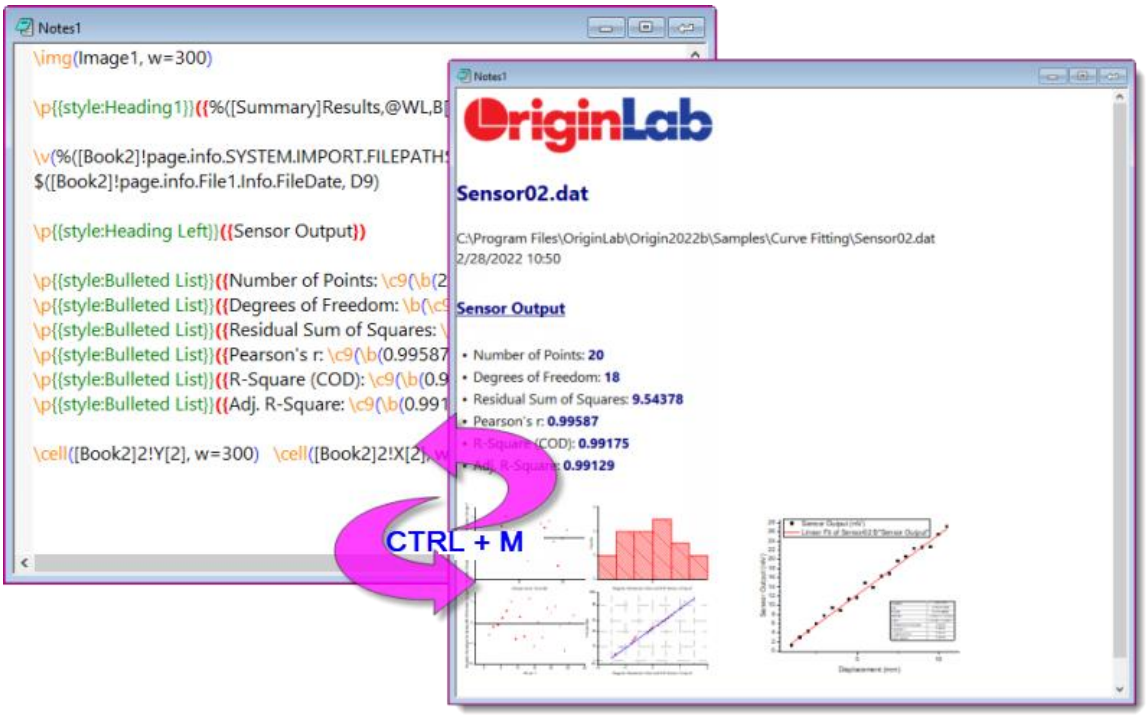


Object	Comments
Graph/Image	Opens the **Graph/Image Browser** where you can pick project graphs and images. Note that you can **Show Embedded Graph** (see the first row of this table for a definition of "embedded graph") and Project Explorer "Favorites" folder shortcuts

	(**Include Shortcut Page**).
Worksheet Cell...	Opens the interactive range selector. Use this to pick a cell value in a worksheet or report sheet. Click **Done** to insert a linked cell value.
Info Variable...	Opens the **Insert Variables** dialog for inserting project variables stored on data import.
New Table	Opens the **New Table** dialog for configuring a basic table. Clicking **OK** closes the dialog and opens a basic workbook containing a single worksheet. Customize the worksheet, add data, etc., then use Notes window Render Mode to view the resulting table.
Symbol Map	Opens a simplified **Symbol Map** with characters sorted by tab. Click **Advanced** to go to the full Symbol Map.
LaTeX Equation	Opens the LaTeX Equation Editor App (if you've not already installed this free App, you are prompted to do so). You can click the **Equation** button  to open a list of Origin's fitting functions (incl. your user-defined functions). Pick a function (or enter a function into the top box) and click **Preview** to see your equation rendered.
Link	Opens a dialog box for entering **Text to display** and a **Link**. The link can be a URL or it can be a link to such things as a worksheet data range (e.g. range://[book1]sheet1!col(1)[100]). Additionally, you can run simple LabTalk commands using a "labtalk://" tag (e.g. labtalk://newsheet).
Image from File	Opens a dialog to browse for image files. Note that the inserted image is linked to an external file and is not saved with the project.
Image form Web	Opens a dialog to specify a **Image Link** for a web image (**hint**: In your browser, right-click on an image and **Copy Image Address**, **Copy Image Link**, etc).

1. Add your content using raw text mode.
2. When you are ready to view your content, turn on (place a check mark beside) **Notes: Render Mode** or press CTRL + M. Note that you can use the **Zoom** combo box 

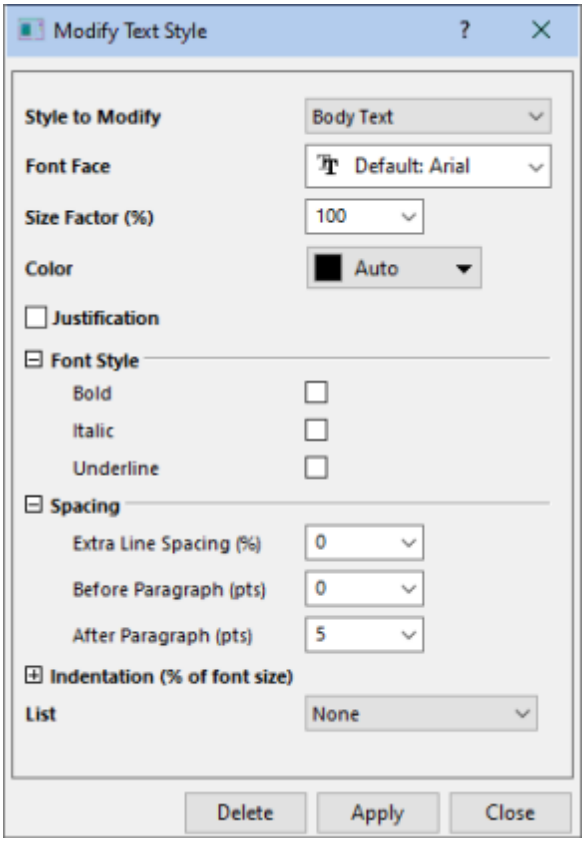
on the Standard toolbar to zoom in or out on the page (CTRL + mouse wheel also works).



17.15.2.2 Text Styles Manager

In addition to styling text with the **Format** toolbar, you can apply a simple set of paragraph styles on a line-by-line basis. Manage styles with the **Text Styles Manager** dialog box.

1. With a worksheet active, choose **Tools: Text Styles Manager**.
2. Select a **Style to Modify** and **Apply** or **Close**.



Note that you can add styles by selecting <*new*> from the **Styles to Modify** drop-down list; or select a style and **Delete**.

To apply a paragraph style to Notes window text:

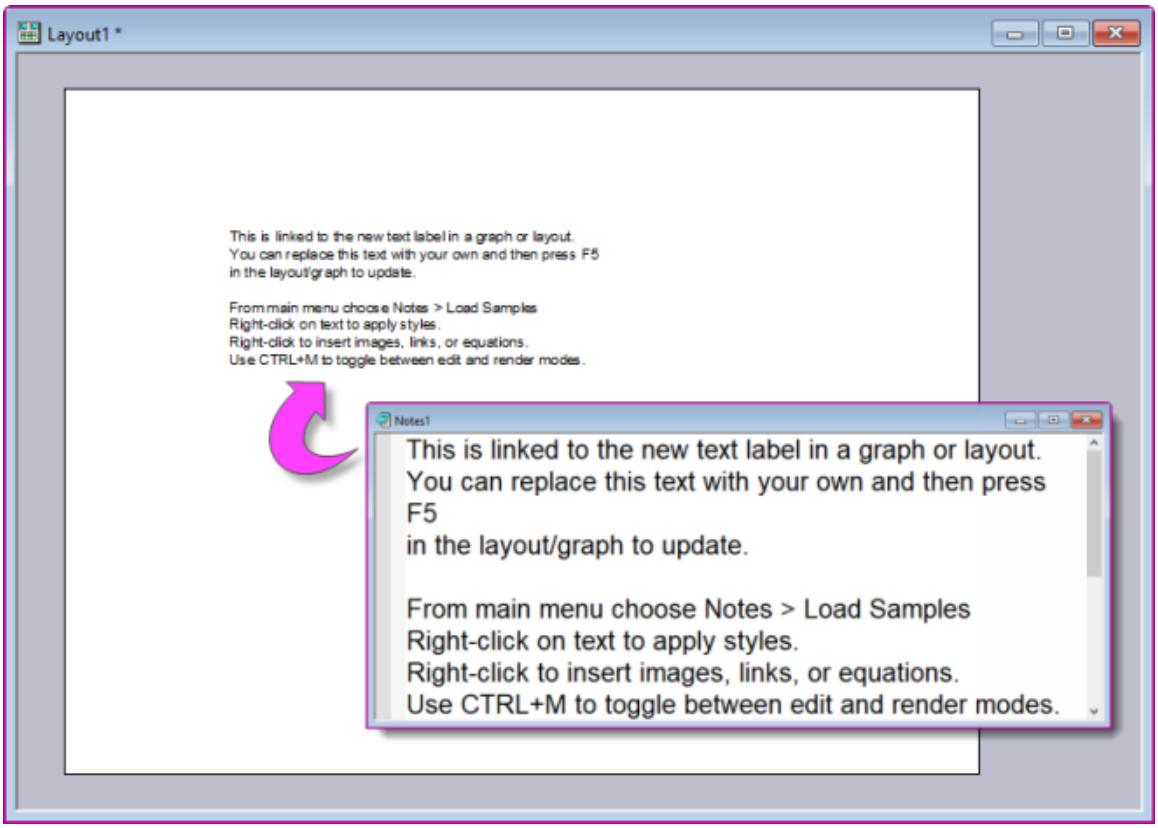
1. Open the cell note in a Notes window.
2. With **Render Mode** off (CTRL + M, to toggle), click on a line of text then right-click, choose **Paragraph Styles** and choose a style from the popup menu.
3. To check results, press CTRL + M (**Render Mode**).



To see a list of built-in paragraph styles, open a fresh Notes window, then from the menu choose **Notes: Load Samples: Built-in Styles.txt**.

17.15.2.3 Adding Rich Text Content to Layout or Graph

You can insert Rich Text content from a Notes window to a text object on a Layout or graph page.



To add the content of an existing Note (Layout or Graph):

1. Select the **Text** tool T, then click on the Layout/Graph and enter "**@@@Notes*N***" (i.e. the Notes window Short Name).
2. Click off the text object to insert Notes content.

To add content by creating a new Note (Layout only):

1. Right-click on the Layout and choose **Insert Notes Text**.
2. See **Adding Content to Your Notes**.

17.15.2.4 Print or Export to PDF

You can output Rich Text content to a physical printer; or print to PDF using a third-party driver such as Microsoft Print to PDF.

To create nice-looking output, you'll need to pay attention to these settings:

- **Paper Size**: This is set in **File: Page Setup** or in the **Advanced** options for your printer driver.
- **Margins**: These are set in **File: Page Setup**.

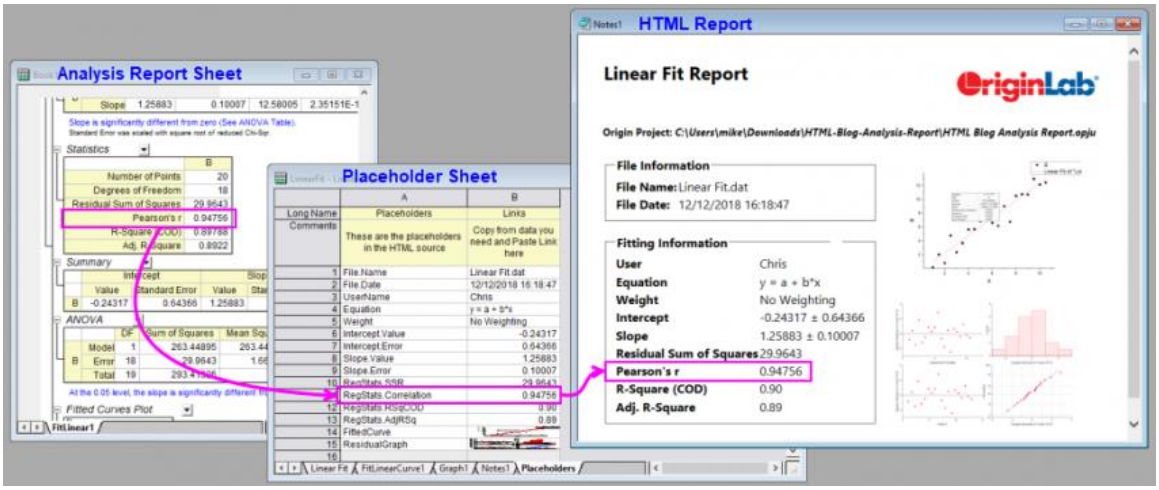
- **Notes Display Margin**: By default, the Notes display margin = *5* (units = points). Thus, you will note that in **Render Mode** (CTRL + M), there is a slight margin to the left side of the Notes page. This display margin is controlled by setting system variable **@NDM**.
- **Notes Window Page Width**: Page width is controlled by the property `note.width` (units = in/cm, etc). Default = *0*, which corresponds to an uncontrolled width.

    - When width is uncontrolled (`note.width = 0`), **Notes Window Page Width** is approximately equal to **Paper Size** – **Margins**. This should produce a satisfactory printout to PDF or paper.
    - If you do specify `note.width`, do not exceed **Paper Size** – **Margins** or your text may be cut off.

17.15.3 HTML and Markdown

You can also use **Notes** windows to create HTML or Markdown reports. Similar to Rich Text, you can build your HTML report using placeholders that link to report sheet elements such as metadata, statistical results or graphs. The resulting HTML report can be printed or exported; or it can be incorporated into your Analysis Template. If Markdown syntax is used, optional HTML syntax can be also included for advanced customization.

To use this feature, the user should have some basic familiarity with HTML or Markdown, and as with most things, the more proficient the user is, the easier it will be to create professional-looking output. However, the skill needed to generate a basic report can be easily mastered. See this OriginLab blog post for guidance.



17.15.3.1 Adding Content to Your HTML Report

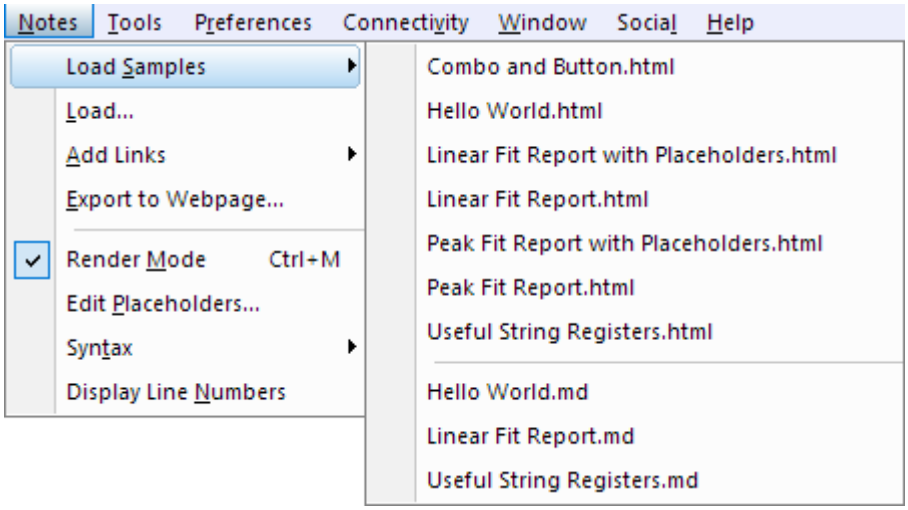
The basic steps of creating reports using an Origin Notes window, are as follows:

1. Create your project to include graphing and analysis results.
2. Click the **New Notes** button  to add a Notes window.
3. From the menu, choose **Notes: Syntax**, then choose **HTML** or **Markdown** (**Hint**: You can toggle between text/view and markup modes by pressing **CTRL+M** and you can choose the default syntax by setting LabTalk System Variable **@NPS**).

4. You can write your code in the Notes window's markup mode or you can use a text editor such as Notepad++, then copy and paste it to your Notes window. If you have no experience with HTML or Markdown, you may want to load samples by activating your Notes window and clicking **Notes: Load Samples** (HTML = ".html", Markdown = ".md").
5. You will likely want to incorporate graphing and analysis results from the current project, into your report. The simplest way to do this is to insert "placeholders" for each Origin object that you intend to include in your report, into your code. These placeholders can be named using any string that makes sense to you and they should be enclosed in double-curly braces (e.g. `{{MyR-SquareValue}}`).
6. Right-click on the Notes window title bar and choose **Edit Placeholders**. Placeholders that you have incorporated into your code will be picked up and added to a **Placeholders** worksheet in the workbook. The sheet will list, in column A, all of the placeholders found in your code. A second column -- Column B -- is blank and is reserved for adding the associated Origin objects (i.e. the variables, analysis and graphing results, etc.) that you want to include in your report.
7. For each placeholder in column A, find the associated Origin object and copy it to the Clipboard (e.g. if it is a numeric quantity in a sheet resulting from some statistical analysis, select the cell quantity, right-click and choose **Copy**, or press CTRL+C on your keyboard).
8. Return to the **Placeholders** sheet, right-click in column B, beside the associated placeholder and choose **Paste-Link**. This associates your placeholder with the intended Origin object.
9. If you intend to include your HTML report in an Analysis Template, you can right-click on a workbook tab in your Analysis Template and choose **Add Notes as Sheet**. This inserts your Notes window into workbook and you can now choose **File: Save Workbook as Analysis Template**.



When a Notes window is active, you can click the **Notes** menu and load a sample HTML file into the Notes window.



17.15.3.2 Using Your HTML Report

As you fill in your Placeholders sheet, you should see your HTML report take shape in the Notes window. Once completed, you can do various things with your HTML report, including:

- Print to hard-copy or to PDF (**File: Print**).
- Export the window as a webpage (**Notes: Export to Webpage**).
- Click the embed button in the upper-right corner of the Notes window to embed the content into your workbook, then save the workbook as an Analysis Template (**File: Save Workbook As Analysis Template**).

17.16 Topics for Further Reading

- The **Preferences: Options** Page Settings
- Pasting or Embedding Graphs in Other Applications
- Exporting Your Graph or Layout Page to an Image File
- Which Image Format Should I Choose?
- The Export Graph Dialog Box
- Send Graphs to PowerPoint
- Send Graphs to PowerPoint Dialog Box Settings
- View Graphs as a Slide Show
- The Slide Show of Graphs Dialog Box Settings
- Creating Graph Animations
- Printing Graphs, Layout Pages and Analytical Results
- The Print Dialog Box
- The Print Options Dialog Box
- Copying and Pasting Graphs inside Origin
- Inserting Graphs and Images into Worksheet Cells
- Tutorial: Creating a Custom Report Sheet
- Using the Layout Page Window
- Creating a Master Page Layout for Graphs

18 Apps for Origin

Origin 2016 introduced **Origin Apps** -- tools that you could easily add to your Origin installation by dropping them onto your Origin workspace. This ever-expanding collection of add-on tools is extending Origin's already-powerful graphing and analysis capabilities.

Because an App is a self-contained, easily-distributed tool aimed at solving a particular problem, it can be developed and deployed quickly, sidestepping the need to wait for a new Origin product release. In addition, an App can be developed by anyone with a basic knowledge of programming in Origin, making it attractive as a means to create and distribute tools for your company or user-community.

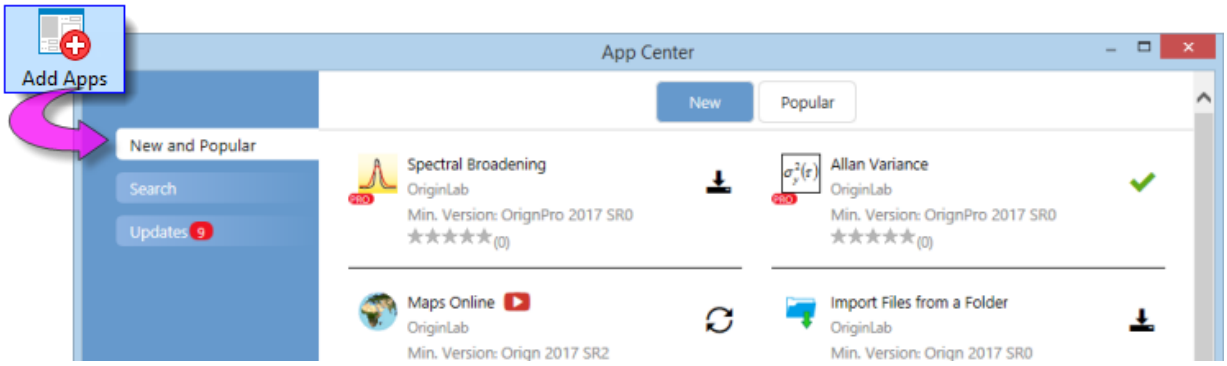
At present, all Apps can be downloaded for free. Note that some Apps require OriginPro; these are denoted in the App description by the PRO symbol.

18.1 Where Do I Find Apps?

Apps are listed on the OriginLab File Exchange. While you can download Apps from the File Exchange using your web browser, it easier to obtain and manage your Apps using the **App Center**.

The **App Center** provides "one stop" App installation and maintenance: Browse and download new and popular Apps, search for Apps, update existing Apps, request an App or submit an App via the OriginLab website.

To open the **App Center**, click the **Add Apps** button that appears on all tabs of the Apps Gallery.



What to look for in the App Center:

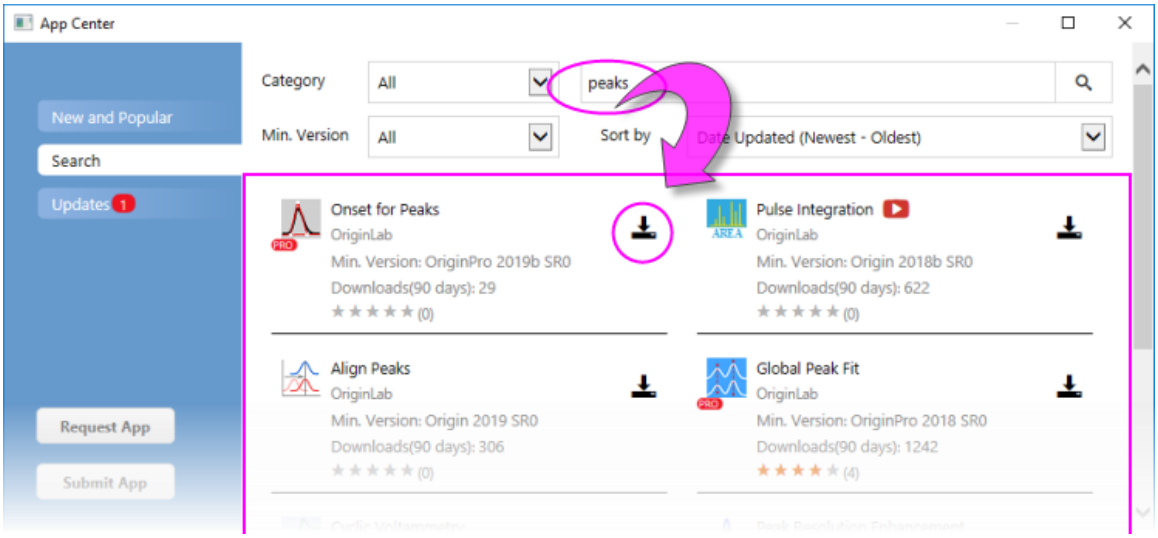
- Installed Apps with an **Up-to-date Version** icon beside them are up-to-date.
- Apps with a clickable **Download and Install** icon beside them are *not* installed. Click this icon to install.
- Apps with an **Update** icon beside them have an available update that you can install. Click this icon to update.
- Click the **New and Popular** tab for a quick look at what's available. Download and update Apps.
- Click the **Search** tab to find Apps by **Category** and **Minimum Version**. Download and update Apps.
- The **Updates** tab will display a red circle icon when there is an update to one or more installed Apps. Improvements and bug fixes are listed for each.

18.1.1 Finding Apps from Analysis and Statistics Menus

You can find Apps for these specific applications by clicking **Find Apps...** from Origin's main menu:

- **Analysis: Fitting**
- **Analysis: Peaks and Baseline**
- **Statistics**

These menu commands open the App Center **Search** tab to show only relevant Apps that are currently available from OriginLab's File Exchange. Click the **Download and Install** button beside an App, to install the App.



18.2 How Do I Install Apps?

If you install your Apps using the **Download and Install** button in the **App Center** dialog, you don't need to do anything else. The App is automatically downloaded and installed. When App updates become available, you can use the **Update** button to update an installed App.

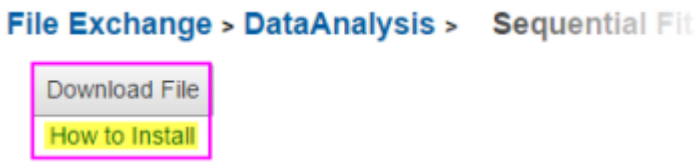
If your workstation does not have internet access:

If your workstation does not have internet access, you will need to find a computer that does (does not need to have Origin installed), download the App from the OriginLab File Exchange to a thumb-drive and bring it back to your workstation.

1. On the internet-connected computer, open a browser window and browse to **originlab.com/fileExchange**.
2. Browse the list of Apps, go to the App's description and download page, then click the **Download File** button and copy the file to your thumb-drive.
3. Return to your Origin workstation, plug in your thumb-drive and run Origin. Open Windows Explorer, browse to your thumb-drive and once you locate the App (it will have a .opx file extension), drag the App file to an empty portion of the Origin workspace. Make sure you are not running Origin as administrator or

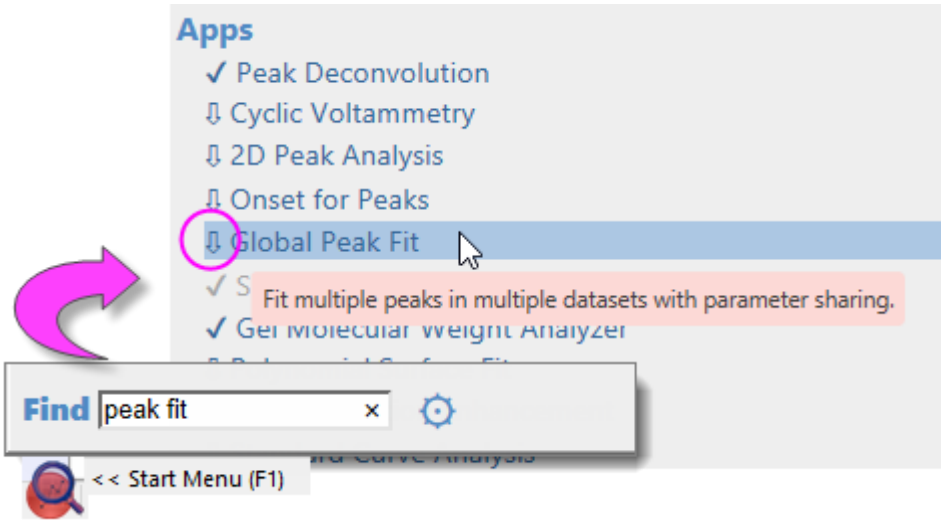
drag-and-drop operations will fail. The App will be installed and the App icon will appear in the **Apps Gallery**, docked to the right side of your Origin workspace.

If you have questions, click the **How to Install** link below the **Download File** button on the File Exchange App description and download page.



18.2.1 Finding Apps from the Start Menu

You can also search for and install Apps directly from the **Start** menu.



18.3 How Do I Run an App?

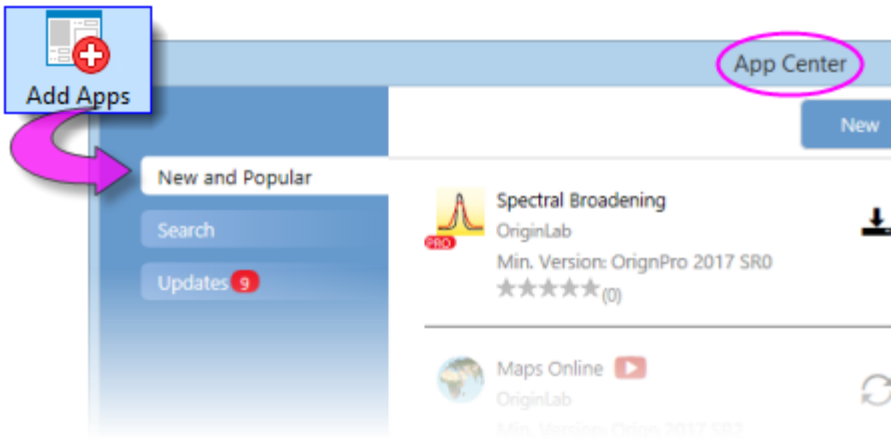
- Upon installation, an App icon is placed in the **Apps Gallery**, docked to the right side of the Origin workspace.
- App operations may be window-specific. If the App is dimmed (grayed out), the active window cannot be operated on by the App. Check the required window type (hover on the dimmed App icon in the Apps Gallery).
- If the Origin window type (worksheet, graph, etc.) is matched to the App, you can launch the App by double-clicking on it in the Apps Gallery.
- If you prefer to launch the App from a toolbar button, open the **Customize** (Toolbars) dialog box (**View: Toolbars**), click the **Button Groups** tab, locate the App's toolbar button and drag the button to the OriginLab workspace or to an existing toolbar. Close the dialog box.
- Specific usage information is available on the description and download page for each App.

18.4 Managing Your Apps

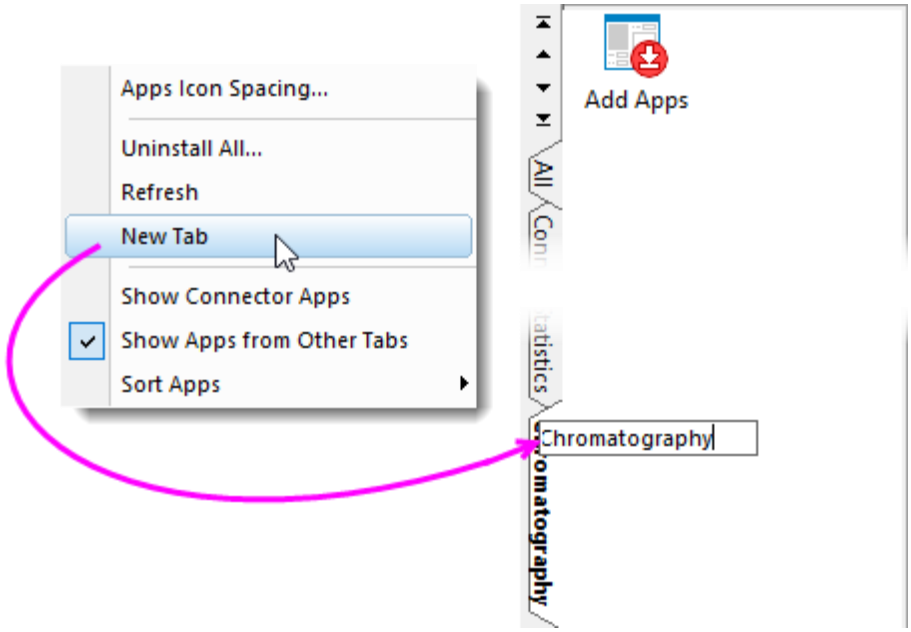
You can use the **App Center** in combination with the **Apps Gallery**, to manage your Apps:

- Use the **App Center** (discussed above) to add and update Apps, search for Apps, request an App or submit a review of an App.

. To launch the App Center, click the **Add Apps** button in the Apps Gallery.



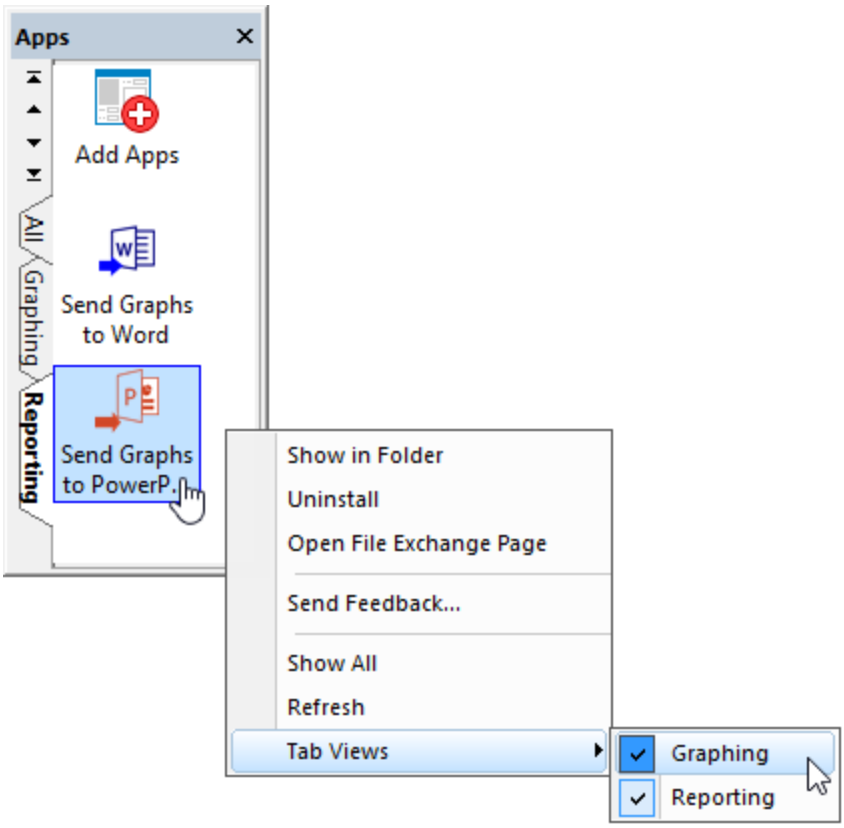
- Organize your Apps by adding tabs to the Gallery. Right-click in an empty portion of the Gallery and choose **New Tab**, then double-click on the default tab name and give the tab a meaningful name.



- Additional higher-level actions available from the shortcut menu:
    - **Apps Icon Spacing ...**

- **Uninstall All ...**
- **Refresh**
- **New Ttab**
- **Show Connector Apps**
- **Show Apps from Other Tabs**
- **Sort Apps (Alphabetically**, **Newest Install**, **Recently Used**).

- A number of App-specific actions can be performed by right-clicking directly on the App icon in the Gallery and choosing from the shortcut menu.



- **Show in Folder**: Opens the user's \AppData\Local\OriginLab\Apps\ folder to the App installation folder.
- **Uninstall**: Uninstalls the selected App.
- **Open the File Exchange Page**: Opens the App's description and download page on the OriginLab File Exchange.
- **Send Feedback...**: Opens a Rate App dialog box to provide feedback.
- **Show All** (user-added tabs only): Shows Apps from all Gallery tabs on the active tab.
- **Refresh**: Refreshes the tab view.
- **Tab Views**: Place or remove the check mark beside the App to determine on which Gallery tab(s) the App shows.

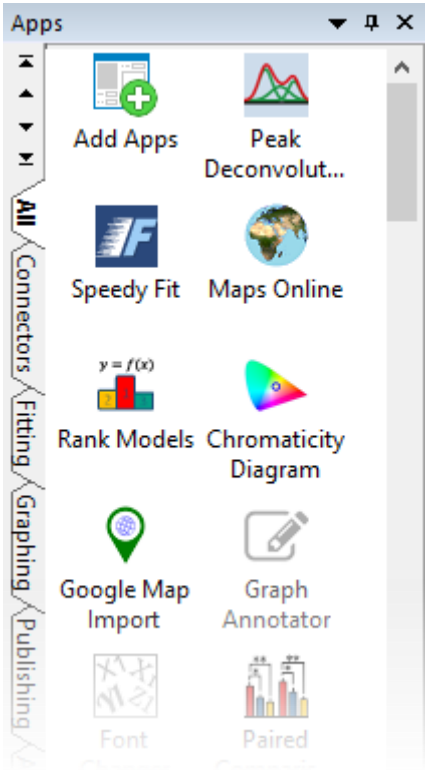
18.4.1 Updating App Center

New Apps and App updates are continually made available to Origin and OriginPro users. Be sure to open your App Center occasionally (press **F10**) and if it displays the red **Download Now** button, click to get the latest list of available Apps.



18.4.2 Docking the Gallery

By default, the Gallery is docked to the right side of the workspace.



If you prefer, you can dock the Gallery to the top of the workspace, just below the toolbars:

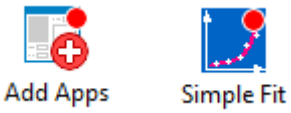
1. Drag the title bar toward the top of the workspace. Guide it to and drop it on he workspace docking button that appears (shown outlined in magenta).
2. Once docked, drag the bottom edge of the Gallery to adjust width, as needed.



18.5 Will I be Notified When Updates are Available?

Several things will indicate when an App update is available:

- A red dot appears in the upper-right corner of the **Add Apps** icon in your **Apps Gallery** (docked to the right side of your workspace). Additionally, the red dot shows on individual Apps when an update is available.



- In the **App Center**, the App will appear with a clickable "update" icon beside it.



- The App Center **Updates** tab will show a red dot with a number indicating how many App updates are available. The tab will list updated Apps and allow you to apply updates for individual Apps or all Apps.



To update an App:

- Click the **Update** icon that appears next to the App in the App Center.
- Right-click on the App in the Apps Gallery and choose **Download and Install Update**
- Click the **Update All Compatible** button that appears on the **Updates** tab in the App Center; or click the "update" icon beside each App.
- Right-click on the **Add Apps** icon in the Apps Gallery and choose **Update All**.

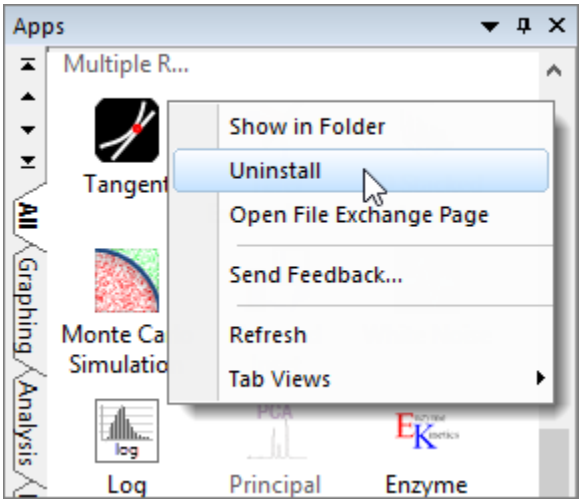




You can verify the version of an installed App by hovering on the App in your Apps Gallery.

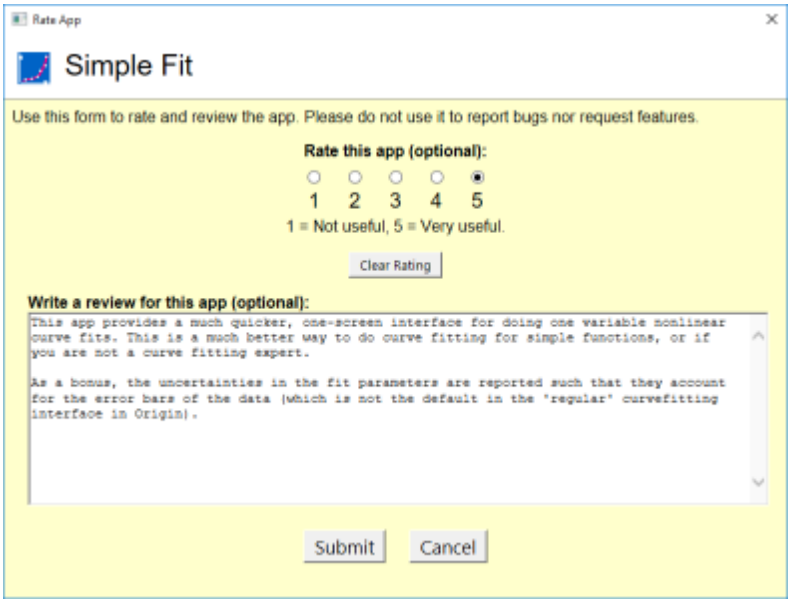
18.6 How Do I Uninstall an App?

Uninstalling an App is easy. Right-click on the App icon in the Apps Gallery and choose **Uninstall** from the shortcut menu.



18.7 How Do I Give Feedback on an App?

OriginLab relies heavily on customer input to improve our software products. We encourage you to give feedback on Apps by right-clicking on the App icon in the Apps Gallery and choosing **Send Feedback...**. It takes just a few seconds!

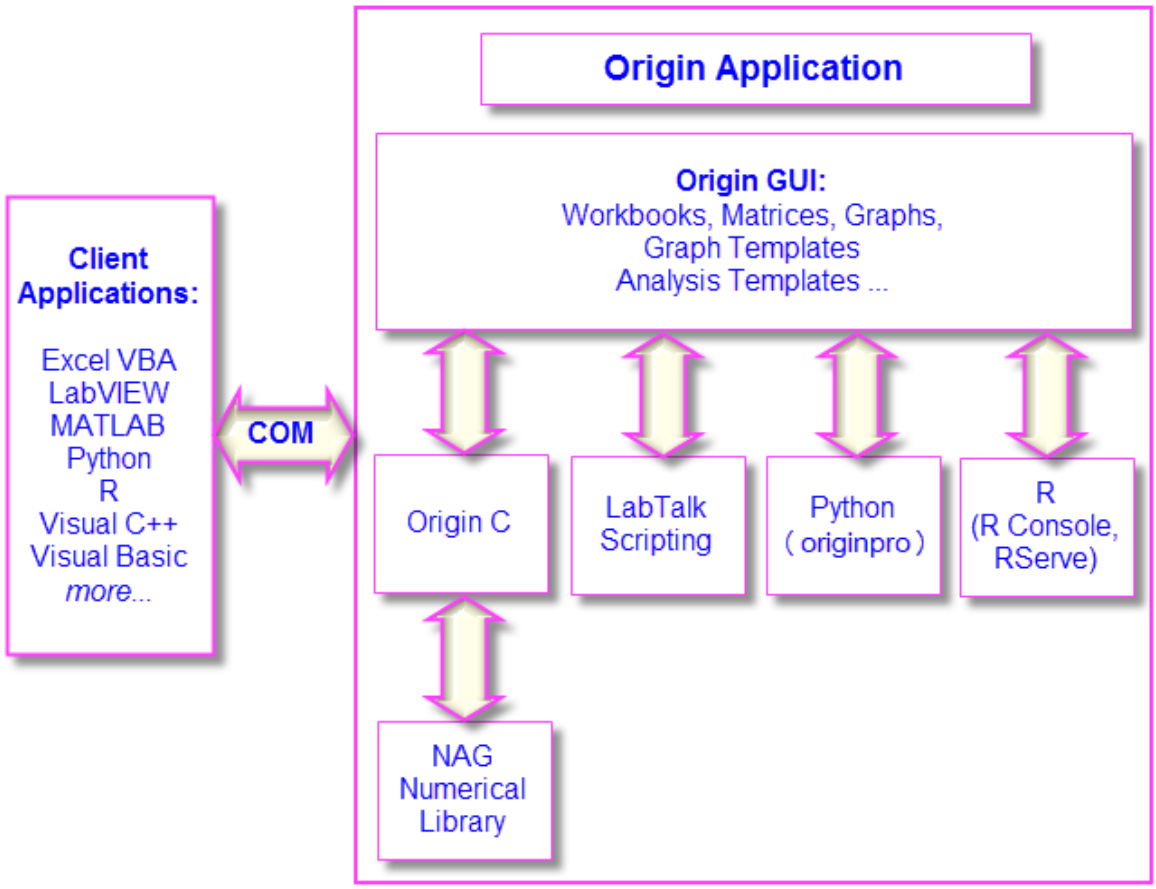


18.8 Can I Request an App?

As previously mentioned, Apps can be developed by anyone with Origin programming knowledge. However, if you do not program but you find that you need some particular functionality that is not currently a part of the Origin product, you can request an App through the OriginLab website. OriginLab is continually building and posting new Apps to the File Exchange.

1. To request an App, open the **App Center** and click the **Request App** button in the lower-left corner of the dialog box. This opens a web page on www.originlab.com.
2. Verify that the **Your Reason for Contacting Us** drop down is set to **Request an App**.
3. Fill out the remaining required fields and click the **Submit Inquiry** button at the bottom of the form.

19 Programming in Origin



As you gain experience with Origin, you may want to access Origin features programmatically, add your own custom routines and tools, or communicate with Origin from other applications. This chapter outlines basic programming options available in Origin. For more detailed information, see the following Origin programming-related resources:

- Programming documentation including guides, language references, and examples are available from the **Help** menu in the product.
- Online programming documentation is available at **www.originlab.com/doc**.
- You can typically locate online programming pages by performing a web search from your browser using phrases such as: **labtalk importing** , **originc interpolate**, or **labview origin send data**.
- An Origin Programming Forum can be found at **www.originlab.com/forum**.
- Sample files for LabTalk, Python, COM Server and Client, etc. can be found in the \Samples folder of your Origin software.

19.1 LabTalk

LabTalk is a scripting language that provides access to most of Origin's functionality. With LabTalk you can access and change properties of Origin objects such as worksheets, columns, graph layers, and data plots. LabTalk script can include calls to X-Functions to perform advanced data processing and analysis.

There are many options for executing your LabTalk scripts. Multiple lines of script can be organized as sections in a file, and those individual sections can be executed from the user-interface at the command prompt in the **Script Window** or **Command Window**; from buttons added to worksheets and graphs; from included or custom-made toolbar buttons; or from custom menu commands.



The following "mini-tutorial" will demonstrate adding a button object to a worksheet, associating a short LabTalk script with the button, then using the button to execute the script and perform a basic statistical calculation while writing the results to the worksheet.

1. Run Origin and start a new project by clicking the **New Project** button  on the **Standard** toolbar.
2. Click **Data: Import from File: Single ASCII** and browse to the file \Samples\Graphing\Box Chart.dat. Select the file and click **Open**. The file is imported into the active worksheet window.
3. With the worksheet window active, click **Format: Worksheet**. In the **Worksheet Properties** dialog, click the **Size** tab and set **Gap from Top** to *25*, then click **OK**. A gap is added to worksheet window.
4. Click the **Text Tool** on the **Tools** toolbar. Click inside the gap that you just added and type "Add Mean Label Row" into the text object. Click outside the text object to exit edit mode.
5. Right-click on the text label and select **Properties...**. Choose **Programming Control** tab, set **Script Run After** to **Button Up**. Copy and paste the following script into the text box:
6.

```
wks.userParam1 = 1;
wks.userParam1$ = "Mean";
for (int ii = 2; ii <= wks.ncols; ii++)
{
        range rr = $(ii);
        Col($(ii))[D1]$ = $(mean(rr),.2*);
}
```

7. Click **OK** to apply settings and close the **Text Object** dialog box. Note that your text object now looks like a button.
8. Click the button. Note that a new header row labelled "Mean" is added to the worksheet and the mean value of each column of data is written to the Mean row cell above the corresponding column.

Note: For more information on LabTalk, Origin's built-in scripting language, please consult your product documentation at **Help: Programming: LabTalk**.

Sample files can be found in the \Samples\LabTalk Script Examples folder of your Origin software.

19.2 Python

Origin provides an embedded Python environment so that you can run Python in Origin. Origin supports command line execution of Python code from the **Python Console** or Origin's **Code Builder** IDE. As of December 2022, the embedded Python version is version 3.11.

Note: For more information on integrated usage of Origin and Python, see these topics in the Python documentation:

- **Introduction to Python in Origin**
- **Embedded Python**
- **Sample Projects with attached Python Code**.



- There is an API for calling Origin from Python. See note under **Automation Server**, below.
- To prevent package version conflicts, Origin now supports multiple PyPackage folders (set system variable **@PYP**).

19.3 R

Origin supports running R commands in the Origin environment. You can issue R commands in the Script Window or from the built-in R Console, or you can run .R files. All releases of R are supported up through version **3.6**.

From Origin, you can connect with R in two ways:

- **R**. Installed on your local computer.
- **Rserve**. Installed on a remote PC.

> **Note:** For more information on integrating Origin and R, refer to the Origin Help file (**R Console** and **Rserve Console**) and the LabTalk Scripting Guide (**Running R in Origin**, **R Objects**, **Rserve Objects**).
>
> Sample files can be found in the \Samples\R folder of your Origin software.

19.4 MATLAB

The MATLAB Console allows Origin users to issue MATLAB commands from Origin, and to transfer data between the two applications either using a graphical interface or using a command line.

- The Console requires both Origin and MATLAB be installed on the same computer.
- Origin also supports importing MATLAB (MAT) files from disk. There are two import routines, the older **Data: Import from File** and the new Connector-based **Data : Connect to File: MATLAB**. Importing MAT files does *not* require that MATLAB be installed.

> **Note:** For more information on the MATLAB Console, refer to the Origin Help file (**MATLAB Console**.
>
> The <*Origin Program Folder*>\Samples\COM Server and Client\MATLAB subfolder contains an example (CreatePlotInOrigin.m, CreatePlotInOrigin.OPJ) that illustrates how to connect to an Origin COM server from a MATLAB client (requires MATLAB).

19.5 Origin C

Origin C is a full-featured high-level programming language based on the ANSI C programming language syntax. Origin C also supports a number of C++ features and a few C# features. Origin C provides access to all aspects of Origin including data import, data handling, graphing, analysis, and exporting. You can access Origin C functions from interface controls such as buttons, toolbars, and menu items, using LabTalk script.

Origin C is organized as a set of functions with support for passing arguments. Origin C functions are compiled to object code and then loaded and executed inside of Origin. Origin C provides increased reliability and manageability for developing and debugging code of greater scope and complexity.

Origin C also provides access to the **NAG Numerical Library** functions included in your Origin installation. NAG functions provide you with a large selection of algorithms for performing computations ranging from simple statistics and Fourier transforms to linear algebra and multivariate analysis. Origin currently supports NAG Library Version **Mark 26.1**.

> **Note:** For more information on Origin C, please refer to the Origin C documentation:
>
> **Help: Programming: Origin C**
>
> There you will find usage information, a language reference, developer notes, examples, etc.
>
> Sample files can be found in the \Samples\Origin C Examples folder of your Origin software.

19.6 X-Function

An X-Function is a self-contained XML file that can be loaded in Origin as a special type of global function. Origin C is the language used to create X-Functions. X-Functions provide a way to expand the functionality of

Origin by adding custom data processing features. Many of the built-in tools in Origin are based on X-Functions. Once an X-Function has been created, it can be accessed from anywhere in the interface that allows for script execution, such as the script window, toolbar buttons, or custom menu items.

> **Note:** For more information on X-Functions, please refer to your product documentation that is installed with your software:
>
> **Help: Programming: X-Functions**
>
> There, you will find information on creating and using X-Functions, a language reference, and tutorials.

19.7 Automation Server

Origin can be used as an **Automation Server**. Client applications such as National Instruments™ **LabVIEW™**, Microsoft **Excel**, **Python**, or custom VB/VC/C# applications can exchange data with Origin, and can also send commands to be executed within Origin.

> **Note:** For more information on Origin's Automation Server functionality, refer to the product documentation installed with your Origin software:
>
> **Help: Programming: Automation Server**.
>
> There you will find examples and language reference information. Sample files can be found in the \Samples\COM Server and Client folder of your Origin software.

19.8 LabVIEW

National Instruments™ LabVIEW™ is widely used for data collection. For example, many instrument and sensor vendors provide LabVIEW drivers for acquiring data. Once the data is collected, the end user will need to graph and analyze the data, and create reports for presentation. Origin provides powerful data analysis and graphing tools, including the Analysis Template feature, which allows for repeat analysis on newly acquired data. The ability to communicate between LabVIEW and Origin can thus greatly improve the efficiency of post-acquisition analysis and presentation.

Origin ships with a collection of LabVIEW sub-VIs. LabVIEW users can simply incorporate these custom sub-VIs in their main LabVIEW application to communicate seamlessly with Origin.

> **Note:** For more information on Origin-LabVIEW connectivity, see the product documentation installed with your Origin software:
>
> **Help: LabVIEW VI**
>
> Examples and tutorials are provided.

19.9 Orglab

Orglab is a freely distributed component DLL for directly creating or reading Origin Project (.opj) and other Origin file types (.ogg, .ogw and .ogm). It is available as a free download. An Origin license is not required to use Orglab. Typical use of Orglab is for instrument manufacturers and other third-party vendors to allow their frontend software to output data as Origin files.

The Orglab module is available for 64-bit systems. To find out more about Orglab and to download the Orglab module, go to the **Products > Orglab** page of **www.originlab.com**.

20 Customizing Origin

20.1 Customizing Default Settings

20.1.1 Setting Preferences with the Options Dialog Box

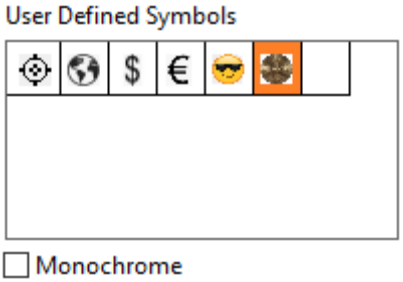
The multi-tabbed **Options** dialog box has controls for Origin global settings pertaining to numeric display, file and system paths, text fonts, Origin program opening and closing behaviors, etc.

To open the Options dialog box:

- Choose **Preferences: Options** (any Origin window is active)
- If you opened an Excel file inside Origin, choose **Window: Origin Options** (Excel workbook is active)

	Controls For
Axis Tab	• Max number of ticks for numeric and date/time scales • Distances from the tick labels to tick marks, axis titles • Display of zeros and scientific notation in tick labels, units display in axis title  Two zero control check boxes were added and turned on by default for **Origin 2020b**: • **Zero is '0'** • **No Trailing Zero** Beginning with **Origin 2021**, these options are turned OFF by default.
Excel Tab	• Use of default plot assignments • Scan datasets for legend text • Prompt before opening Excel files by drag-and-drop or saving Excel workbooks
File Locations Tab	• Set file paths to track last opened, last saved, last exported file • Set default path and file extension for importing different file types • Define applicable file types for ASCII import dialogs
Graph Tab	• Dash lines definitions, line to symbol gap, user-defined symbols, etc. • 2D graph anti-aliasing • Enable in-place editing of linked and embedded graphs in another application

<table>
<tr><td></td><td>
Speed mode reminder watermark

Origin 2022 improved support for user-defined symbols, removing some long-time restrictions and making it easier to apply custom symbols to your graph:


Support for Clipboard, .bmp or .svg formats.
Support B&W or color symbols.
Add symbols via the Options dialog or via Plot Details Add from Clipboard button (Symbol tab > Custom Construction check box > User Defined Symbols radio button).

</td></tr>
<tr><td>Miscellaneous Tab</td><td>

Proxy server configuration
Default templates for ASCII import
Custom date/time formats
Enable collapsible menus
Use of dataset names in the Origin workspace


Origin's Python Packages dialog for managing installation of Python packages used with Origin, supports package installation via proxy server. Open Preferences: Options, go to the Miscellaneous tab, choose Use HTTP Proxy Server and enter the proxy address.
</td></tr>
<tr><td>Numeric Format Tab</td><td>

Thresholds for displaying numbers in scientific notation
Defaults for displayed digits in data and report sheets
Radians, degrees or gradians
Separators for decimal places

</td></tr>
<tr><td>Open/Close</td><td>
Default window closing behaviors
</td></tr>
</table>

Tab	• Project startup, backup and autosave options • Options dialog save options
Page Tab	• Default percent of page size of OLE graphs copied to Clipboard, graph margin and CTRL+C hotkey controls.  Until 2021b, the **Size Factor (%)** (formerly, **Ratio**) was set to *40*. The default is now *100*.
Text Fonts Tab	• Default fonts for text objects • WYSIWYG and in-place editing mode behaviors • Size and positioning of superscripts/subscripts • Footnote size, analysis report sheets  For information on controlling fonts used in the Origin interface, see LabTalk's **system.font(object)**.
System Path Tab	• View/Change the location of the User Files, Autosave, Backup, Unsaved and Group folders • View locations of system folders (Program, License and Application Data)

20.1.2System Variables Dialog

System variables are internal Origin settings that allow for the fine-tuning of a wide range of Origin behaviors. Origin's **Set Systems Variables** dialog box (**Preferences: System Variables...**) can be used to view and set system variable values. In the dialog, there is a link named **System Variables List** which opens a web page with a list of all system variables, the default value, and description.

To customize a particular system variable:

1. Type the system variable name in the first column of **Set System Variables**, without the @ symbol. For example, if you wanted to make a global change to the **Recalculate** mode of analysis dialog boxes, type: DAM
2. Click on the 2nd column to view the current value, and type in a new value. For example, with DAM, to set **Recalculate** to **Auto**, type the value: **1**.
3. Add optional comments in the third column and click **OK** to close dialog.

This modified value will be remembered and applied in every Origin session.

You can quickly read or set the value of a writable system variable in the Script Window (**Window: Script Window**) by typing @*systemVariable*= as, for example ...

```
@DAM=
```

... then pressing ENTER. When setting the value of a system variable in this way, note that that typing in the Script Window sets the variable value for the current session only.

20.1.33D OpenGL Settings Dialog

Origin uses **OpenGL** (Open Graphics Library) for rendering of 3D graphs. OpenGL provides enhanced performance including fast drawing, fast rotation and zoom, transparency, and lighting support.

For optimum performance, your card should support OpenGL version 3.0 or higher. To check your hardware's support for OpenGL, run Origin and choose **Preferences: 3D Open GL Settings...**. Look under **OpenGL Info** for information on graphics hardware and the supported version of OpenGL.

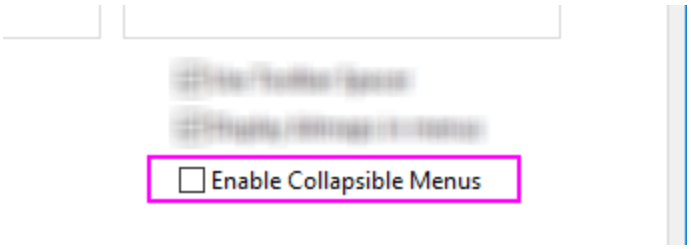
If your graphics hardware is older, you may experience compatibility issues with things such as transparency settings and anti-aliasing. The controls under the **Settings** node in this dialog allow you do such things as disabling transparency. The dialog box also provides information on disabling OpenGL.

For more information on OpenGL in Origin, see the links under "Topics for Further Reading" at the end of this chapter.

20.2Customizing Menus

20.2.1Collapsible Menus

Like many software products, Origin uses an auto-expanding "collapsible" menu feature that shows only a partial list of menu commands when opening longer menus. If you want to show all commands upon opening, click **Preferences: Options**, click the **Miscellaneous** tab and clear the **Enable Collapsible Menus** check box.



20.2.2Custom Menu Organizer

If you have scripts that are frequently run, you can add them to the menu for quick access. With the **Custom Menu Organizer** you can...

- Create up to 3 main menus and corresponding sub-menus
- Assign LabTalk scripts and X-Functions to a menu item
- Restrict menu item access to specific window types

- Hide unused built-in menu items, streamlining your Origin workspace

To open the Custom Menu Organizer, choose **Preferences: Custom Menu Organizer...** from the main menu. Then press F1 or click the button  in the upper-right hand corner of the dialog box for instructions.

Once you create and save a new menu configuration (.omc) file, you can then select that configuration from the **Preferences: Menu** fly-out menu. Multiple configuration files can be created, allowing you to easily switch from one configuration to another. A **Default** configuration is also available in the fly-out, to revert to default menu settings. Configuration files can be shared among colleagues so that you use a common set of menu commands.

20.2.3 Displaying Bitmaps in Menus

You'll note that form some menu commands, a bitmap is displayed to the left of the menu entry. The bitmap indicates that there is an equivalent toolbar button.

On some systems such as VirtualPC or Terminal Servers, such bitmaps may cause a long delay when opening menus. To turn off the display of menu command bitmaps:

1. Select **Preferences: Options** to open the **Options** dialog box.
2. Select the **Miscellaneous** tab, clear **Display Bitmaps in Menus**, and click **OK**.



You can modify the size of the **Plot** menu icons using the LabTalk system variable **@PPS**. To find out how to change the value of a system variable, see Customizing Origin Using System Variables.

20.3 Customizing Toolbars and Buttons

In addition to the standard Windows OS toolbar customizations, Origin provides some clever and easy-to-use tools for creating, programming and distributing custom toolbar buttons. If you or your staff are performing complex but repetitive Origin routines, you'll want to explore creating and sharing custom toolbars.

20.3.1 Displaying, Hiding or Moving Toolbar buttons

- Click the small down arrow at the end of any toolbar and select the **Add or Remove Buttons** context menu. Then select desired sub menu and check/uncheck to show/hide buttons. A **Reset** option is also available.
- Press ALT key and drag a button to any new toolbar location.
- Press ALT key and drag a button to blank Origin workspace to create a new toolbar.
- Press ALT key and drag a button to any window till X shows, then release to delete the toolbar.

20.3.2 Customizing Toolbar Button Appearance

Use controls on the **Options** tab (**View:Toolbars**) to:

- Show toolbar screen tips and shortcut keys on hover
- Increase toolbar and toolbar button size
- Toggle between "flat" or 3D toolbar buttons

20.3.3 Displaying or Hiding a Toolbar

- Double click the left/top end of any docked toolbar to undock. Double-click on title of floating toolbar to dock.
- In floating mode, click X button to hide the toolbar. Drag it to any new location to reposition. Drag it to edge of the Origin workspace to dock.
- In docked mode, drag the left/top end of a toolbar to reposition.
- To show/hide multiple toolbars together, choose **View: Toolbars...** from the main menu. Use the check boxes on Toolbars tab to show/hide toolbars. Click the **New** button to add a new toolbar, then drag buttons from the **Button Groups** tab to add buttons on the new toolbar.
- Use the **Reset**, **Reset All** buttons to reset toolbars.

20.3.4 Creating New Toolbars with New Bitmap Images

Origin supports creating new toolbar buttons with Labtalk script, both built-in or user-defined script to run when click it. Choose **View: Toolbars...** and create new button group on **Button Group** tab.

- Origin ships with three button groups starting with **User Defined...** with a bunch of bitmap images.
- Click any button and click **Settings...** button to link .ogs (Script) file section with the button.
- Drag the button to Origin workspace to create toolbar button.
- If you are feeling really creative, Origin allows you to define a new button group that uses your own 16 color, 16 x 16 pixel bitmaps.
- Export the button group as an .OPX file and share it with others. The person who gets the OPX can drag and drop the OPX file onto Origin workspace to install the toolbar.

Note: To learn more about creating and exporting user-defined toolbars, see:

Help: Origin: Origin Help > Customization and Automation > Customizing Toolbars

20.3.5 Add a Custom Button to the Window Title Bar

Origin supports adding a system button to the left of the minimize button on the window title bar. A custom LabTalk script can then be associated with this button.

Note: Please view the -tbb option of the LabTalk Page command in the Programming help file:

Help: Programming: LabTalk > Language Reference > Command Reference > Alphabetical Listing of Commands > Page

20.4 Customizing the Status Bar

Origin uses the Status bar at the bottom of the Origin workspace to report software hints, statistics and other useful information depending upon current action, selection, window, etc.

- Right-click on Status Bar to customize the display.

- Press ALT and drag items along the Status Bar to reorder.

20.5 Customizing the Origin Workspace

Origin also supports customizing dockable windows such as the **Project Explorer**, **Quick Help** and **Messages Log** windows.

- Right click on the window title bar to specify dock, hide, auto hide, and other settings.
- When auto-hide is unchecked, double click to float the window.
- Drag the window title to move or dock to a new location.
- Arrange dockable windows as multiple tabs along the edge of the workspace to save screen space.
- Choose **View: Toolbars...** from main menu. On the Toolbar tab:
  - The **Reinitialize** button resets menu, toolbar and dockable windows to default settings.
  - The **Export** button exports the current menu, toolbar and dockable window settings to an .OPX file. Drag and drop the OPX file onto another Origin installation to configure the workspace to match your customized settings.



Occasionally, an Origin workspace component goes "missing" -- The Data Display window, one of the panels in Project Explorer, etc. When this happens, you can reset your workspace by choosing **View: Toolbars: Reinitialize**. The downside has been that this also resets workspace customizations and toolbar configurations. Beginning with Origin 2018, clicking the **Reinitialize** button produces an attention message asking if you want to restore the workspace settings from your previous version or use the 2018 system defaults.

20.6 Templates and Themes

The hierarchy of Origin objects such as graph pages, combined with extensive object properties, lends itself to the creation of custom settings for repeat use. You can save your custom settings either as templates or themes, described briefly in the following sections.

> **Note:** For detailed information please refer to Origin Help file, see:
>
> **Help: Origin: Origin Help > Origin Basics > Origin Template Files (OTW, OTP, OTM)**

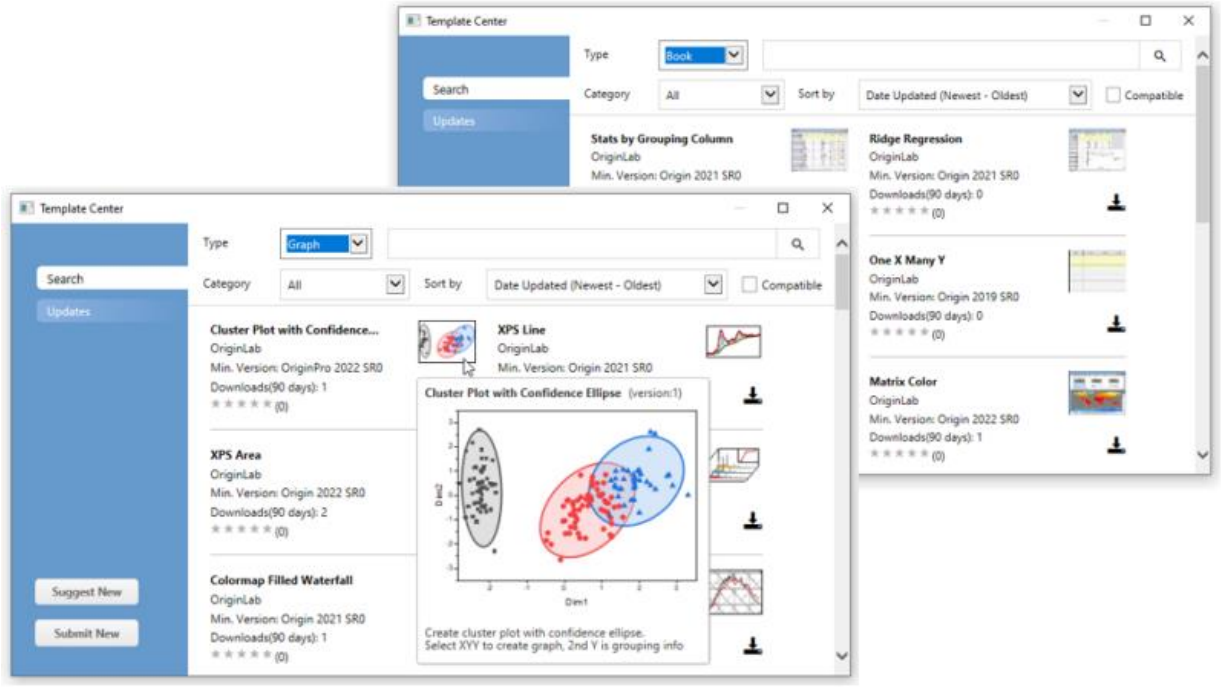
20.6.1 Templates

The Origin template concept applies to graphs, workbooks, matrixbooks, and Analysis Templates™. Templates allow you to choose a set of properties or operations and save those for repeat use.

20.6.1.1 Template Center

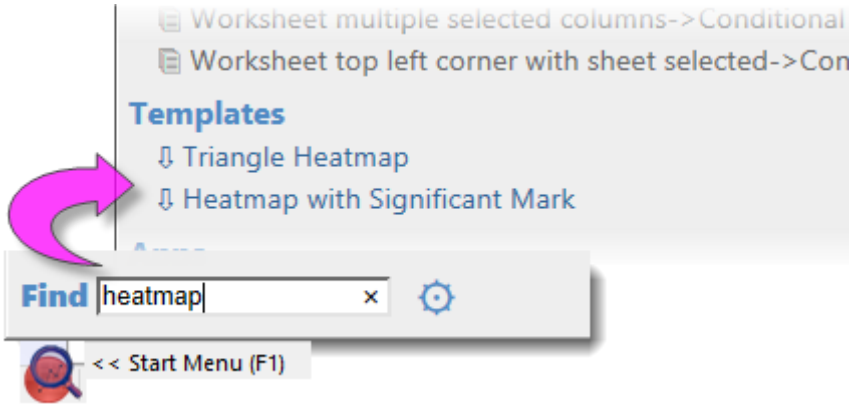
Both the New Book (**File: New: Workbook**/**Matrix: Browse...**) and Template Library (**Plot: Template Library**) dialogs include an **Open Template Center** button that opens a dialog for browsing and downloading additional templates.

To open the Template Center directly, choose **Tools: Template Center** and set the **Type** drop-down to *Graph* or *Book*.





You can search for additional templates and install them directly from the **Start** menu.



20.6.1.2 Workbook Templates and Analysis Templates

You can save workbook or matrixbook settings, such as the number of columns and sheets, column plot designations, fonts, colors, display formats, custom header rows, scripts associated with the sheet, or dimension and coordinate settings, to OTWU (workbook template) or OTMU (matrix template) files.

When the workbook or matrix window is active and you choose **File: Save Template As**, you save any window customizations, minus any data that might exist in the window at the time of saving, to a template file. The template file can then be used to create new windows, as needed, for storing and analyzing your data.

You can use the **New Book** dialog box for managing your workbook, matrixbook and Analysis templates. The New Book dialog is re-designed for Origin 2021b and is covered in the **Workbooks** chapter of this User Guide.

Use the same **New Book** dialog to manage your **Analysis Templates**™. An Analysis Template starts from a workbook but differs in that when you save it as an Analysis Template (**File: Save Workbook as Analysis Template**), it is saved with whatever analysis operations and dependent graphing operations, exist in the workbook at the time of saving. Analysis Templates are discussed briefly in the **Batch Analysis** section of **How to Handle Repetitive Tasks** chapter of this guide.

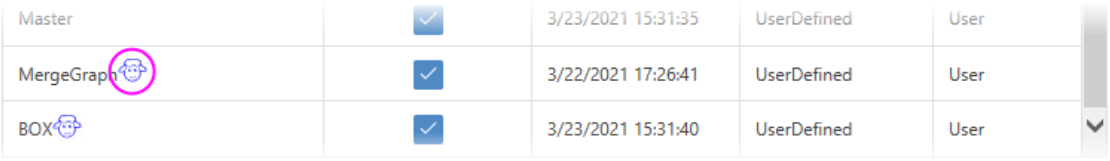
For a more in-depth discussion of **Analysis Templates**, see these topics:

- Analysis Templates.
- Creating and Using Analysis Templates (tutorial).
- Batch Processing with Word Template for Reporting (tutorial).

20.6.1.3 Graph Templates

As mentioned in the Customizing Graphs chapter, Origin ships with about 240 built-in graph templates that are used to create Origin's many science and engineering graph types. Using one of these as a starting point, you can create your own graph, adding more layers, setting scale or dimensional relationships between layers, modifying data plot properties, etc., and then save your customizations as a user-defined graph template (.OTP) file by clicking **File: Save Template as...**. See the "Templates and Themes" section of the Customizing Graphs chapter for a general discussion of graph templates.

One important subset of graph templates are what are called "cloneable" templates. A cloneable template requires a very specific data arrangement in your worksheet or matrix; the idea being that if you have once created a complex arrangement between worksheet datasets, matrix objects, etc. and, for instance, layers or panels in your graph, then you shouldn't need to recreate this arrangement every time you want to recreate such a graph. Cloneable templates are identifiable in the **Template Library** by the presence of a "sheep" icon next to the template name or thumbnail image.



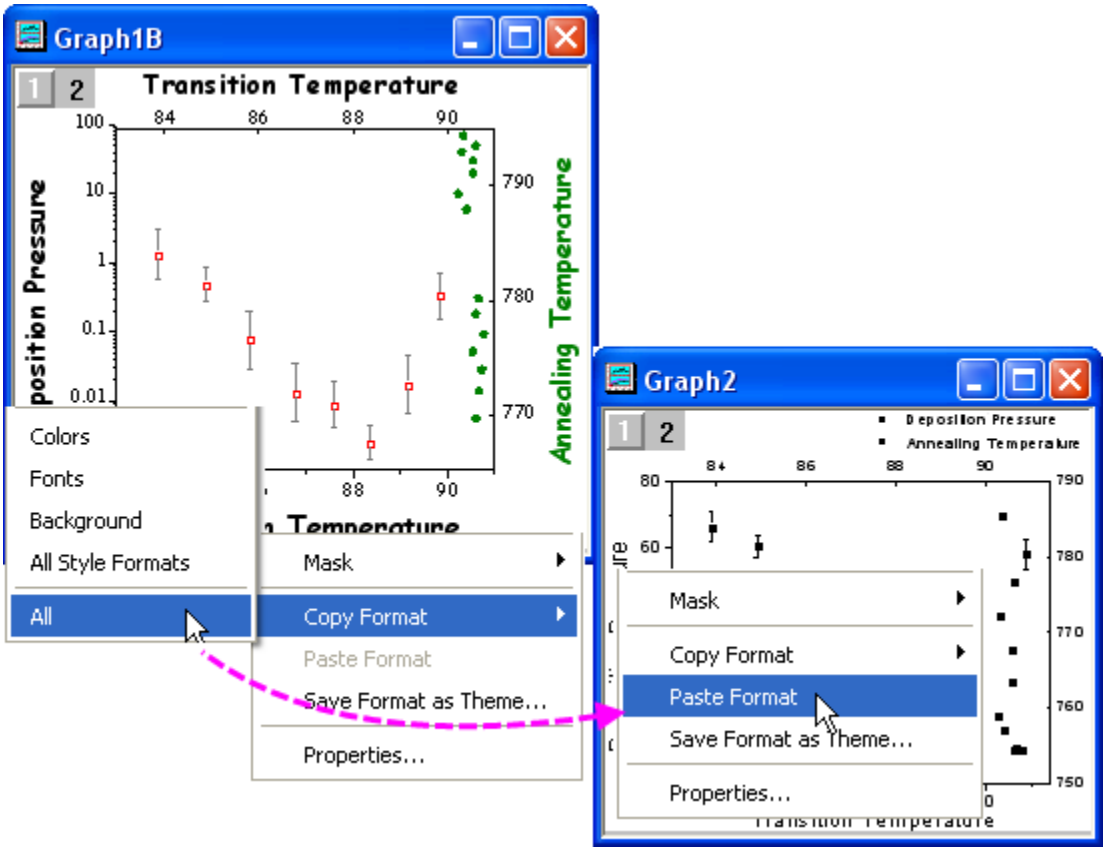
For more information, see the section on cloneable templates in **Graph Template Basics** in your Origin Help file.

20.6.2 Themes

An Origin Theme is a file containing a set of object properties or dialog settings. Thus for example, the customized settings of a graph window can be saved as a Theme, or the customized settings in an analysis dialog can be saved as a Theme. If you were to open the Theme Organizer (see below), you would see that there are tabs for **Graph**, **Worksheet**, **Dialog**, **Function** and **System Increment Lists**.

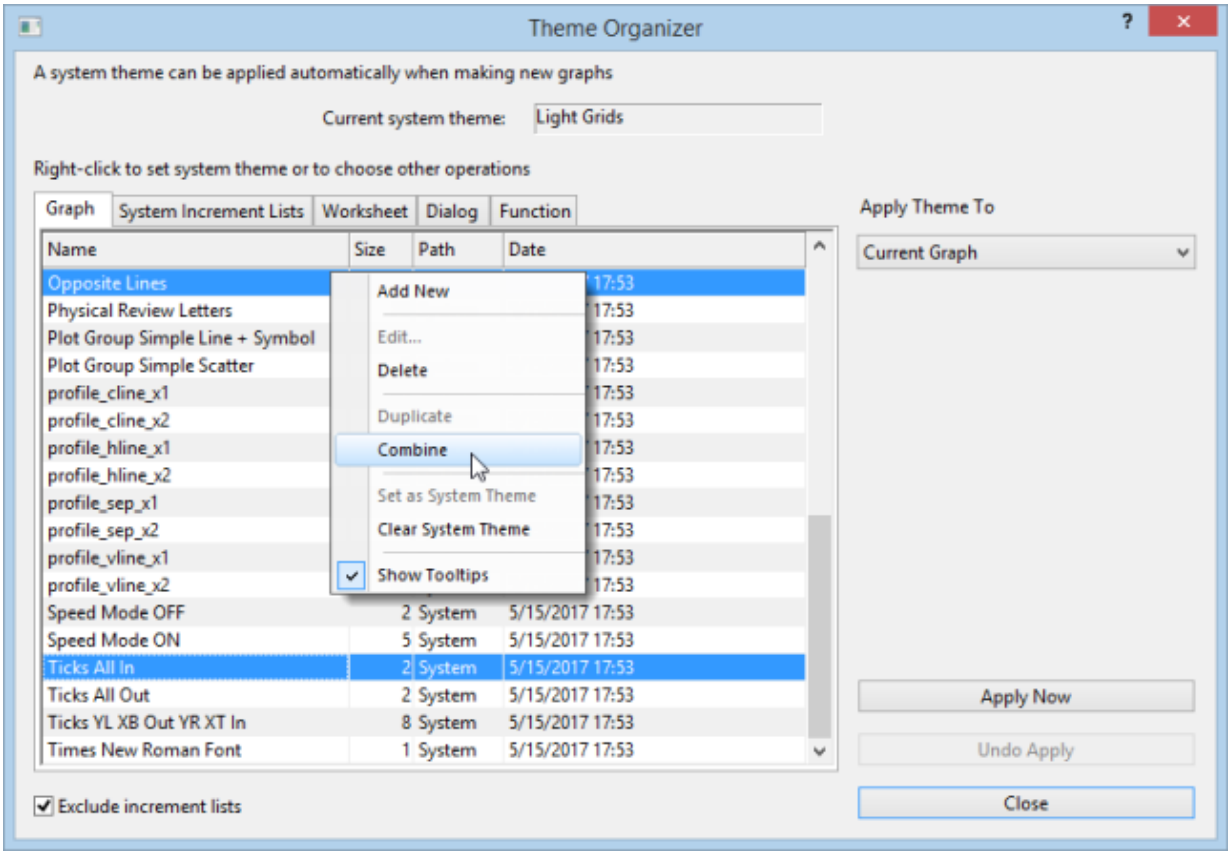
Themes allow you to quickly apply a new set of properties to an object, such as a graph. For example, you might apply a black-and-white Theme to a color graph in order to prepare it for publication. Or you might take the object properties of one graph and apply them to all the other graphs in the same project.

Right-click on plot, layer, object, etc. in graph -- or right click with nothing selected in graph -- and choose **Copy Format** context menu to copy format. Depending where you right click, the corresponding selection's format can be copied. Then right-click on corresponding selection or right click in target graph and click **Paste Format** to apply the copied settings to the target selection or graph. You can also choose **Edit: Paste Format...** to paste the Format to multiple target graphs.

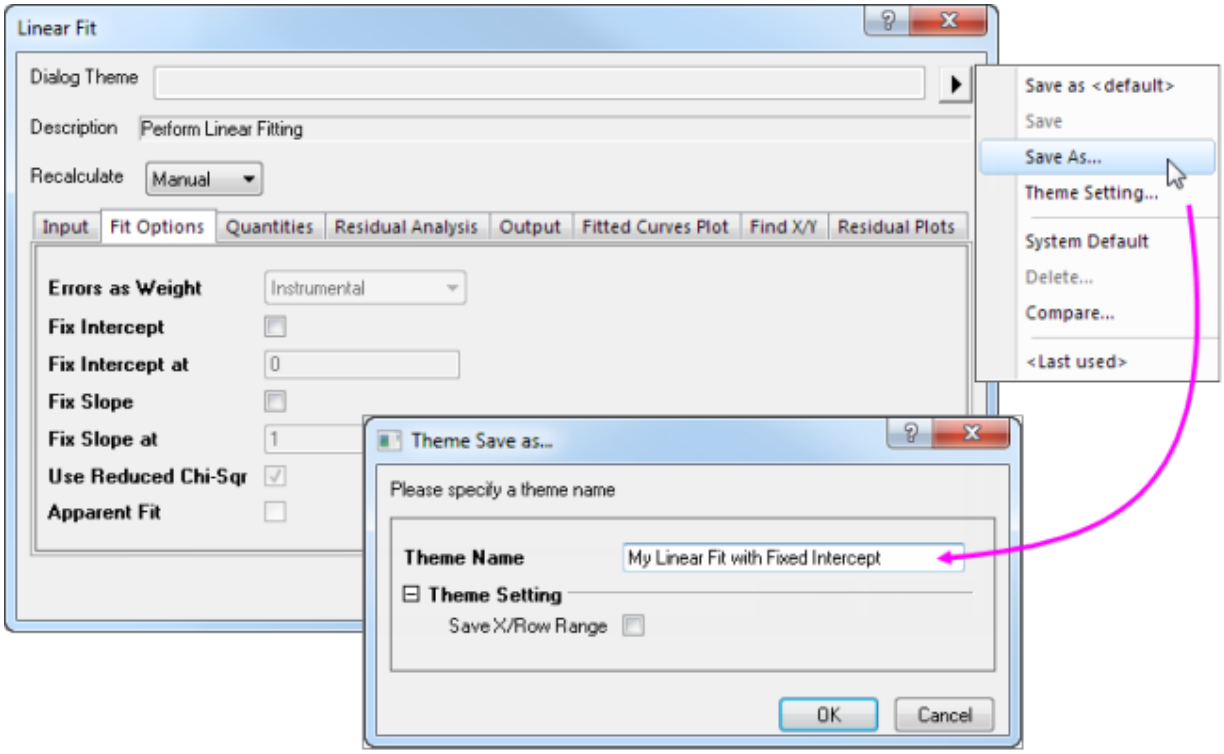


The **Theme Organizer** dialog box is opened from the **Preferences** menu. Use this dialog to organize your graph, worksheet, and dialog themes.

With this dialog you can apply a graph theme to multiple graphs to have consistent look. To combine multiple graph themes in the Theme Organizer dialog, hold down **Ctrl** while selecting the Themes, and then right-click to access the **Combine** context menu. The context menu in the tool provides an option to edit a Theme, allowing the user to add/delete properties to an existing theme. Setting a Theme as a System Theme means that it will be applied to new graphs automatically, if the graph template allows a System Theme to override template settings (see the **Allow System Theme & System Increment Lists to Override** check box).



The Theme concept extends to dialog box settings, as well. For instance, you can choose a particular suite of settings in the **Linear Fit** dialog box (**Analysis:Fitting:Linear Fitting**), and then save those settings to disk as a named Theme file. You can save multiple Theme files for a given dialog box and then load them into the dialog, as needed, using the dialog box's **Dialog Theme** drop-down list. Saving multiple Themes for a dialog box allows you to customize your analysis routines from different experiments, when each requires using a specific (and unique) group of settings.



Dialog themes are explained in more detail in the **How to Handle Repetitive Tasks** chapter of this guide.

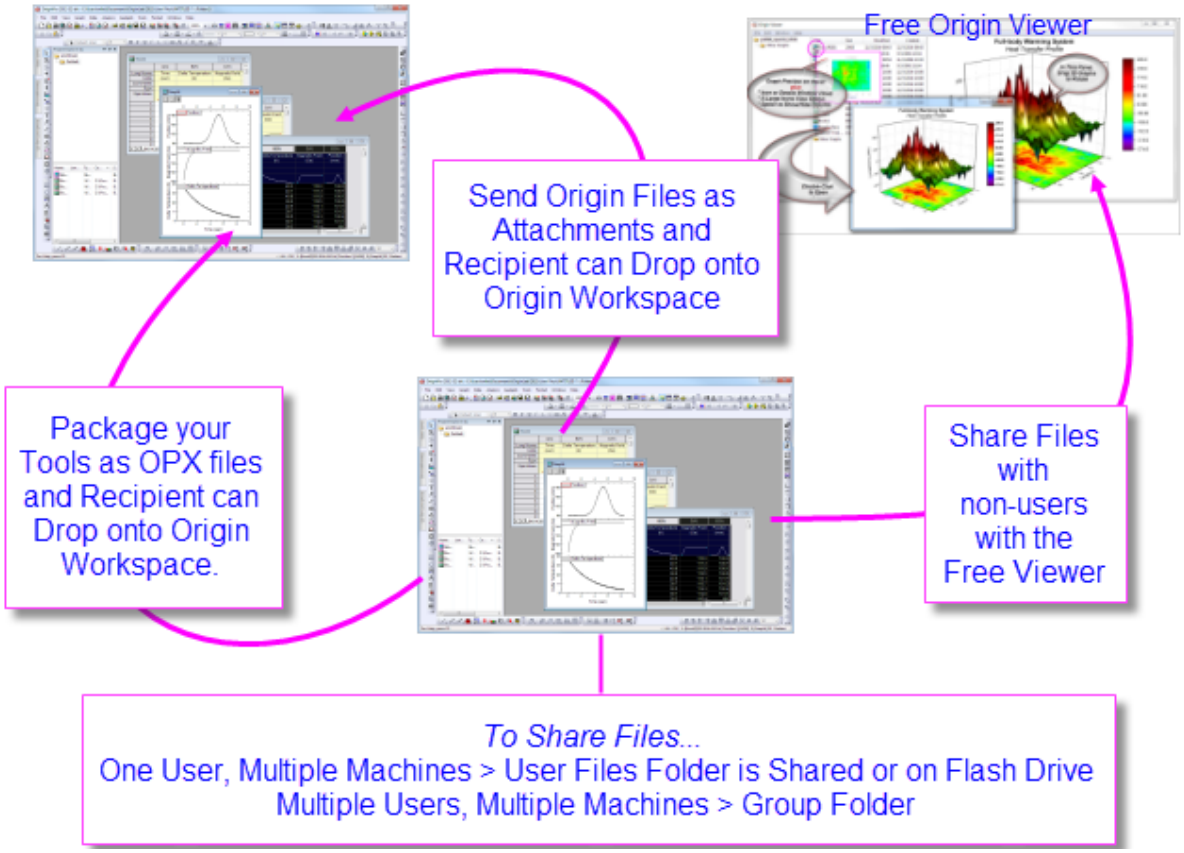


You can select **Graph: Graph Styles...** in the menu main or click **Graph Styles** button  in Graph Page Mini Toolbar to open **Theme Preview** app for previewing and applying graph themes.

20.7 Topics for Further Reading

- The 3D openGL Settings Dialog Box
- Creating Custom Menus
- The Custom Menu Organizer
- Analysis Themes
- How to Manage Multiple Menu Configuration (.OMC) Files
- Managing Collapsible Menus
- The User Files Folder

21 Sharing Origin Files



You may want to customize some aspect of your Origin installation and then share your customizations with other Origin users. Custom settings can be saved in many file types including graph templates (.otpu) and themes (.oth), analysis templates (.ogwu or .opju), dialog themes, curve fitting functions, import wizard filters, LabTalk script files (.ogs), and X-Functions.

21.1 Drag and Drop Sharing

A quick and easy way to share a file with another user is simply to send it as an email attachment. The recipient can then drag and drop the file into the Origin workspace.

Drag-and-drop is supported for most Origin file types. Origin project (.opju) and graph template (.otpu) files automatically open when dropped into the workspace. Other files are copied to the appropriate subfolders in the User Files Folder (UFF). For example, when you drop a fitting function (.fdf) file into the workspace, a dialog opens asking how you want to categorize the new fitting function.



You can use a small dialog to remove formulas and links from the current selection, the active sheet, the active book or the entire project. This converts formulas and links to raw numbers. Removing formulas and links can make it easier to share project data with colleagues without having to share such things as externally-linked (DDE) Excel files; or to significantly reduce project size before archiving data.

21.2 Sharing Files with Multiple Machines for Single Users

If you are a single user and have installed Origin on multiple machines, you can share your custom settings across multiple installations. Set up the User Files Folder (UFF) on a shared location, such as a network drive, or even a USB flash drive, and use the same UFF path with each installation.

Note: For information on changing the UFF path, see:

Help: Origin: Origin Help > Customization and Automation > Setting Your Preferences > The User Files Folder

21.3 Sharing Files with Other Users in a Network

You can set up and use a group folder to share files among users. Multiple groups are allowed, and each group can have some power user(s) set as the group leader. The group leader can use the **Group Folder Manager** tool to publish custom files for sharing with other group members. When a group member launches Origin, the published files will be copied to their Origin automatically and made ready for use.



Origin supports setting multiple group folders, making it possible to share different files between groups. A leader machine can set up multiple groups and publish different files to different groups. A member machine can belong to multiple groups and thus receive all files published by group leaders.

Note: For information on group folders, see:

Help: Origin: Origin Help > Sharing Your Origin Files with Others > Sharing Files with Multiple Clients > Setting a Group Folder Location

21.4 Packaging Files

Origin provides a **Package Manager** tool for packing multiple files into a single Origin Package (.opx) file. This is a convenient way to distribute custom applications that may contain multiple Origin files, such as templates, X-Functions, and LabTalk script files. The Package Manager includes options for running LabTalk scripts before and after installation.

To access the Package Manager, click **Tools**, and then click **Package Manager...**

To install the contents of an .opx file, simply drag and drop into the Origin workspace.

Note: For information on packaging files, see:

Help: Origin: Origin Help > Sharing Your Origin Files with Others > Packaging Multiple Files as OPX

21.5 The Origin Viewer

The **Origin Viewer** is a freely distributed, standalone application that allows viewing and copying of information contained in Origin project files and window (graph, worksheet, matrix) files on computers that do not have Origin installed.

- The Origin Viewer is distributed as a single EXE file - no installation needed.
- Available as a 64-bit Windows application, or as a native Mac application (Not compatible with 11.0.1, Big Sur).

- Project Explorer-like folder view with graph previews on hover, icon or details views, X-large icon view option.
- Open a graph in a pop-up window for better viewing.
- Supports viewing and rotating Origin's OpenGL 3D graphs.



Origin 2018 introduced a new Unicode-compliant project file type (OPJU). Origin Viewer versions **9.6.5** or later allow anyone to save the Unicode-compliant OPJU project files to the pre-2018 OPJ format for sharing of projects with users of older versions of Origin.

If you have Origin graphs or data that you wish to share with colleagues who are not currently using Origin, you might direct them to the Origin Viewer page (www.originlab.com/viewer) where they can find out more and download the free EXE.

21.6 Topics for Further Reading

- The User Files Folder
- Attaching Files to the Origin Project
- Package Manager
- Setting Up a Group Folder
- Exporting Custom Button Groups
- Exporting Toolbar Settings
- Apps for Origin

22 Origin Toolbars

This is a list of Origin toolbars, and buttons by button group. Toolbars are shown in their default configurations. You will note that some buttons are missing from default toolbar configurations. This may be because a button has been deprecated, because it is duplicated on another toolbar, or simply because it is a lesser-used button.

To add or remove buttons from a toolbar:

1. Click **View: Toolbars** to open the **Customize** dialog box.
2. Click on the **Button Groups** tab and drag desired buttons to a toolbar or to an empty portion of the workspace.
3. To remove a button/toolbar, drag it from the toolbar back to the **Buttons** list or click the small "x" in the upper right-corner of the toolbar (removes entire toolbar from the workspace).

Note also that some toolbar buttons have a small downward pointing arrow next to them. Clicking the tool displayed on these "split buttons" carries out the action associated with the displayed tool. Clicking the arrow beside it opens a menu, allowing you to pick another tool. A split button displays the tool that was last used.

To hide/show all toolbars in the Origin interface :

- Click **View: Hide Toolbars** menu

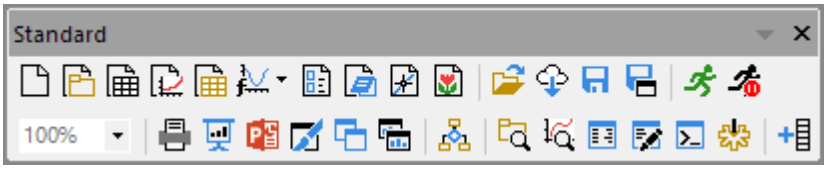
  or
- Press the hotkey **Ctrl**+**Alt**+**R**

Finally, toolbar buttons will be inaccessible (dimmed) if the object that they act on is not active. For instance, the 3D-Rotation Toolbar is only available when a 3D graph is active.

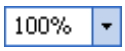


In addition to these dockable toolbars, Origin has context-sensitive **Mini Toolbars** for variety of common editing tasks. These toolbars are discussed in The **Origin Interface** chapter of this Guide. For a complete list of those toolbars, see the **Origin Help File**.

22.1 Standard



Button	Description	Hotkey	Button	Description	Hotkey
	New Project			New Folder	

	New Workbook			New Graph	
	New Matrix			New 2D (Function) Plot	
	New 2D Parametric Plot			New 3D (Function) Plot	
	New 3D Parametric Plot			New Layout	
	New Notes			Digitize Image	
	New Image			Open	Ctrl + O
	Open From Cloud			Save Project	Ctrl + S
	Save Template			Recalculate Auto/Up-to-date vs Manual/Pending	
	Pause Auto Update/Recalculation			Zoom In and Out by Percentage	
	Print	Ctrl + P		Slide Show of Graphs	
	Send Graphs to PowerPoint			Open Video Builder	
	Refresh	F5		Duplicate	
	Custom Routine			Project Explorer	Alt + 1
	Object Manager	Alt + 8		Results Log	Alt + 2

	Command Window	Alt + 3		Script Window	Shift + Alt + 3
	Code Builder	Alt + 4		Add New Columns	

22.2 Folders and Windows

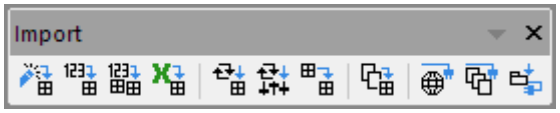
Folders and Windows toolbar is added for working with Project Explorer folders and folder contents. It should be helpful when dealing with multiple project folders and when needing to compare windows in separate folders.

When first running Origin, you may see this toolbar "floating" in the Origin workspace. You can drag it (by the title bar) to an empty portion of the toolbar spacer; or you can choose **View: Toolbars** and click the **Reinitialize** button to reset toolbars to the standard configuration.



Button	Description	Hotkey	Button	Description	Hotkey
	Folder Backward			Folder Forward	
	Seesaw	Ctrl + Alt + X		Add Active Window Shortcut for Seesaw	Ctrl + Shift + F7
	Add Shortcuts from Previous Folder			Arrange Windows (Last Used)	
	Pin Active Window				

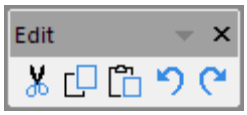
22.3 Import



Button	Description	Hotkey	Button	Description	Hotkey
	Import Wizard			Import Single ASCII	

	Import Multiple ASCII			Import Excel	
	Re-import no Dialog	Ctrl + 4		Re-import with Dialog	
	Clone Import			Batch Processing	
	Connect to Data from Web			Connect Multiple Files	
	Import All Connected Data				

22.4 Edit



Button	Description	Hotkey	Button	Description	Hotkey
	Cut	Ctrl+X		Copy	Ctrl+C
	Paste	Ctrl+V		Undo	Ctrl+Z
	Redo	Ctrl+Y			

22.5 Graph



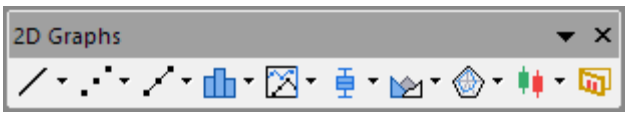
Button	Description	Hotkey	Button	Description	Hotkey
	Enable/Disable Anti-Aliasing			Rescale	Ctrl+R

	Rescale X			Rescale Y	
	Rescale XY			Rescale Z	
	Exchange the X and Y axes			Enable/Disable Speed Mode	
	Extract to Layers			Extract to Graphs	
	Merge			Duplicate with New Columns/Sheets/Books	
	Add Bottom-X Left-Y Layer			Add Top-X Layer	
	Add Right-Y Layer			Add Top-X Right-Y Layer	
	Add Inset Graph			Add Inset Graph With Data	
	Zoom In			Zoom Out	
	Whole Page				

22.6 2D Graphs



Note that only common plot types have a toolbar button. Complete access to Origin plot types is found on the **Plot** menu.



Button	Description	Button	Description

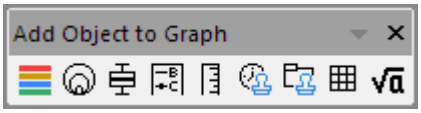
	Line		Horizontal Step
	Vertical Step		Spline Connected
	Scatter		Grouped Scatter - Indexed Data
	Scatter Central		Column Scatter
	Y Error		X Y Error
	Vertical Drop Line		Bubble
	Color Mapped		Bubble + Color Mapped
	Line + Symbol		Line Series
	2 Point Segment		3 Point Segment
	Row-wise		Column
	Column + Label		Grouped Column-Indexed Data
	Bar		Stacked Column
	Stacked Bar		100% Stacked Column
	100% Stacked Bar		Floating Column
	Floating Bar		3D Color Pie Chart

	2D B&W Pie Chart		Double Y Axis
	3Ys Y-YY		3Ys Y-Y-Y
	4Ys Y-YYY		4Ys YY-YY
	Multiple Y Axes		Stacked Lines By Y Offsets
	Colormapped Line Series		Waterfall
	Y Color Mapped Waterfall		Z Color Mapped Waterfall
	3D Waterfall		Y Color Mapped 3D Waterfall
	Z Color Mapped 3D Waterfall		Vertical 2 Panel
	Horizontal 2 Panel		4 Panel
	9 Panel		Stack
	Multiple Panels by Label		Trellis Plot
	Cluster Plot		Box Chart
	Violin with Box		Grouped Box Charts-Indexed Data
	Grouped Box Charts-Raw Data		Interval Plot
	Histogram		Histogram + Probabilities

	Multi-Panel Histogram		Marginal Histograms
	Marginal Boxes		Distribution + Rug
	2D Kernel Density		QC(X-bar R) Chart
	Pareto Chart-Binned Data		Pareto Chart-Raw Data
	Scatter Matrix		Probability Plot
	Q-Q Plot		Parallel Plot
	Area		Stacked Area
	Fill Area		Zoom
	Polar theta(X) r(Y)		Polar r(X) theta(Y)
	Wind Rose-Binned Data		Wind Rose-Raw Data
	Ternary		Piper
	Smith Chart		Radar
	Vector XYAM		Vector XYXY
	High-Low-Close		Japanese Candlestick
	OHLC Bar Chart		OHLC-Volume

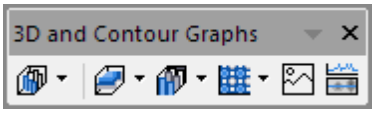
	Line (Stock)		Bridge Chart
	Template Library		

22.7 Add Object to Graph



Button	Description	Hotkey	Button	Description	Hotkey
	Add Color Scale			Add Bubble Scale	
	Add Box Scale			Reconstruct Legend	Ctrl+L
	Add Asterisk Bracket			Add Round Bracket	
	Add Brace Bracket			Add XY Scale	
	Date & Time			Project Path	
	New Link Table				

22.8 3D and Contour Graph



Button	Description	Button	Description
	3D Scatter Plot		3D Trajectory

	3D Scatter + Error Bar		3D Vector XYZ XYZ
	3D Vector XYZ dXdYdZ		3D Tetrahedral
	3D Bars		3D Stacked Bars
	3D 100% Stacked Bars		XYY 3D Bars
	XYY 3D Stacked Bars		XYY 3D 100% Stacked Bars
	3D Ribbons		3D Walls
	3D Waterfall		Y Color Mapped 3D Waterfall
	Z Color Mapped 3D Waterfall		3D Color Fill Surface
	Multiple Color Fill Surfaces		3D X Constant with Base
	3D Y Constant with Base		3D Colormap Surface
	Multiple Colormap Surfaces		3D Color Fill Surface with Error Bar
	3D Colormap Surface with Error Bar		3D Wire Frame
	3D Wire Surface		3D Colormap Surface with Projection
	3D Ternary Colormap Surface		Contour - Color fill
	Contour - B/W Lines + Labels		Gray Scale Map

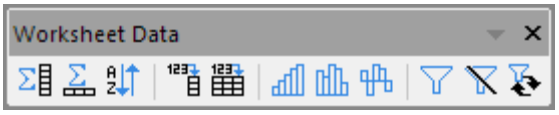
	Contour Profiles		Polar Contour theta(X) r(Y)
	Polar Contour r(X) theta(Y)		Ternary Contour
	Image Plot		Image Profiles
	Heatmap		Heatmap with Labels

22.9 3D Rotation



Button	Description	Button	Description
	Rotate counterclockwise		Rotate clockwise
	Tilt left		Tilt right
	Tilt down		Tilt up
	Increase perspective		Decrease perspective
	Fit frame to layer		Reset Rotation
	Reset		Rotate on any direction
10	Rotation Angle		

22.10 Worksheet Data



Button	Description	Hotkey	Button	Description	Hotkey
	Statistics on Column(s)			Statistics on Row(s)	
	Sort			Set Column Values	Ctrl+Q
	Set All Column Values	Ctrl+F5		Row number	
	Uniform random numbers			Normal random numbers	
	Add/Remove Data Filter			Enable/Disable Data Filter	
	Reapply Data Filter				

22.11 Column



Button	Description	Button	Description
	Set as X		Set as Y
	Set as Z		Set as Y Error Bars
	Set as Labels		Set as Disregard
	Set as Grouping		Set as Subject

	Move to First		Move Left
	Move Right		Move to Last
	Swap Columns		Add Sparkline

22.12 Layout

This toolbars has been hidden in the workspace by default. To show it, select menu **View: Toolbars**.



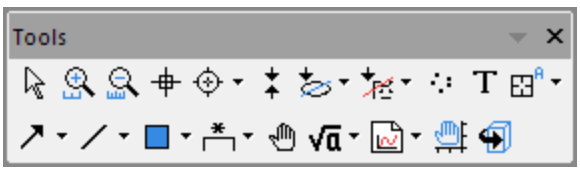
Button	Description	Button	Description
	Add Graph		Add Worksheet

22.13 Mask



Button	Description	Button	Description
	Mask Range		Unmask Range
	Change mask color		Hide/Show masked points
	Swap mask		Disable/Enable masking

22.14 Tools



Button	Description	Hotkey	Button	Description	Hotkey
	Pointer			Scale In	
	Scale Out			Screen Reader	
	Data Highlighter			Data Reader	
	Data Cursor			Data Selector	
	Selection on Active Plot			Selection on All Plots	
	Mask Points on Active Plot			Mask Points on All Plots	
	Unmask Points on Active Plot			Unmask Points on All Plots	
	Draw Data			Text Tool	
	Annotation			Distance Annotation	
	Angle Annotation			Arrow Tool	
	Curved Arrow Tool			Line Tool	
	Polyline Tool			Curve Tool	
	Freehand Draw Tool			Rectangle Tool	
	Circle Tool			Polygon Tool	

	Region Tool			Zoom-Panning Tool	Hold "A"
	Insert Equation			Insert Word Object	
	Insert Excel Object			Insert Object	
	Insert Graph			Insert Worksheet	
	Rescale Tool	Hold "Z": Zoom; Hold "X": Pan		Rotate Tool	Hold "R"

22.15 Object Edit



Button	Description	Button	Description
	Left		Right
	Top		Bottom
	Vertical		Horizontal
	Uniform Width		Uniform Height
	Group		Ungroup
	Distribute Selected Layers/Graphic Objects Evenly in Vertical Dimension		Distribute Selected Layers/Graphic Objects Evenly in Horizontal Dimension
	Front		Back

	Forward		Backward
	Front(data)		Back(data)

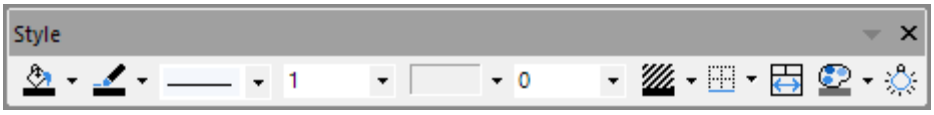
22.16 Arrow

This toolbars has been hidden in the workspace by default. To show it, select menu **View: Toolbars**.



Button	Description	Button	Description
	Horizontal Alignment		Vertical Alignment
	Widen Head		Narrow Head
	Lengthen Head		Shorten Head

22.17 Style



Button	Description	Hotkey	Button	Description	Hotkey
	Fill Color			Line/Border Color	
	Lighting Control Dialog			Palette	
	Line/Border Style		0.5	Line/Border Width	
	Fill Pattern		0	Fill Pattern Width	

	Pattern Color			Clear Borders	
	Left Border			Top Border	
	Right Border			Bottom Border	
	Frame Borders			Inside Horizontal Borders	
	Inside Vertical Borders			Inside Horiz and Vert Borders	
	All Horizontal Borders			All Vertical Borders	
	All Borders			Merge cells	Ctrl+R

22.18 Format



Button	Description	Hotkey	Button	Description	Hotkey
Default: Arial	Font		22	Font size	
	Bold	Ctrl+"B"		Italic	Ctrl+"I"
	Underline	Ctrl+"U"		Superscript	Ctrl+"+"
	Subscript	Ctrl+"="		SuperSubscript	Ctrl+"-"
	Increase Font	Ctrl+">" Ctrl+Shift+		Decrease Font	Ctrl+"<" Ctrl+Shift+

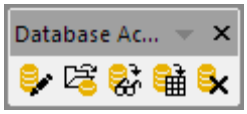
		"."			","
	Greek	Ctrl+"G"		Left	
	Center Horizontal			Right	
	Top			Center Vertical	
	Bottom			Font Color	

22.19 Auto Update



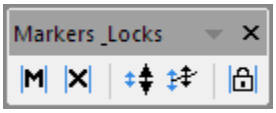
Button	Description
	Pause Auto Update/Recalculations

22.20 Database Access



Button	Description	Button	Description
	Open SQL Editor		Open Query Builder
	Load ODQ File		Preview Import
	Import data		Remove SQL

22.21 Markers & Locks



Button	Description	Hotkey	Button	Description	Hotkey
	Add Data Markers	Ctrl+Alt+M		Clear Data Markers	Ctrl+Alt+N
	Marker Size			Marker Hide Show	
	Lock Positions				

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